MICROWAVE TRANSISTORS

Selection guide

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Type number survey, alphanumerical, with main characteristics

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General

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<td>19</td>
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Device data in alphanumerical sequence

A. GaAs field-effect transistors | 27 |
B. Silicon bipolar transistors | 61 |

Envelopes | 343 |

Index of all semiconductor devices included in the Handbooks | 355 |
DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

ELECTRON TUBES  BLUE

SEMICONDUCTORS  RED

INTEGRATED CIRCUITS  PURPLE

COMPONENTS AND MATERIALS  GREEN

The contents of each series are listed on pages iv to viii.
The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

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ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

T1  Tubes for r.f. heating
T2a Transmitting tubes for communications, glass types
T2b Transmitting tubes for communications, ceramic types
T3  Klystrons
T4  Magnetrons for microwave heating
T5  Cathode-ray tubes
    Instrument tubes, monitor and display tubes, C.R. tubes for special applications
T6  Geiger-Müller tubes
T7  Gas-filled tubes (will not be reprinted)
T8  Colour display systems
    Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
T9  Photo and electron multipliers
T10 Plumbicon camera tubes and accessories
T11 Microwave semiconductors and components
T12 Vidicon and Newvicon camera tubes
T13 Image intensifiers
T14 Infrared detectors
    Data collations on these subjects are available now. Data Handbooks will be published in 1985.
T15 Dry reed switches
T16 Monochrome tubes and deflection units
    Black and white TV picture tubes, monochrome data graphic display tubes, deflection units
SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

S1  Diodes  
Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes (< 1.5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2a  Power diodes

S2b  Thyristors and triacs

S3  Small-signal transistors

S4a  Low-frequency power transistors and hybrid modules

S4b  High-voltage and switching power transistors

S5  Field-effect transistors

S6  R.F. power transistors and modules

S7  Surface mounted semiconductors

S8  Devices for optoelectronics  
Photosensitive diodes and transistors, light-emitting diodes, displays, photcouplers, infrared sensitive devices, photoconductive devices.

S9  Power MOS transistors

S10  Wideband transistors and wideband hybrid IC modules

S11  Microwave transistors

S12  Surface acoustic wave devices
INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks comprises:

**EXISTING SERIES**

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<td>IC2</td>
<td>Bipolar ICs for video equipment</td>
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<td>IC3</td>
<td>ICs for digital systems in radio, audio and video equipment</td>
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NEW SERIES

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<td>02Na</td>
<td>Video and associated systems Bipolar, MOS Types MAB8031AH to TDA1524A</td>
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Note

Books available in the new series are shown with their date of publication.
COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

C1    Programmable controller modules
      PLC modules, PC20 modules

C2    Television tuners, coaxial aerial input assemblies, surface acoustic wave filters

C3    Loudspeakers

C4    Ferroxcube potcores, square cores and cross cores

C5    Ferroxcube for power, audio/video and accelerators

C6    Synchronous motors and gearboxes

C7    Variable capacitors

C8    Variable mains transformers

C9    Piezoelectric quartz devices

C10   Connectors

C11   Non-linear resistors
      Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)

C12   Potentiometers, encoders and switches

C13   Fixed resistors

C14   Electrolytic and solid capacitors

C15   Ceramic capacitors

C16   Permanent magnet materials

C17   Stepping motors and associated electronics

C18   Direct current motors

C19   Piezoelectric ceramics

C20   Wire-wound components for TVs and monitors

C21*  Assemblies for industrial use
      HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices

C22   Film capacitors

* Will be issued in 1985.
SELECTION GUIDE

GaAs FETs
bipolar transistors
### MICROWAVE GaAs FIELD-EFFECT TRANSISTORS

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<th>I_D (A)</th>
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<th>N_F (dB)</th>
<th>G_{po} (2) (dB)</th>
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(1) Load power for 1 dB compressed power gain.
(2) Low-level power gain associated with P_{L1}.
(3) Low-noise type.

---

**DABS pulse definition.**

(relating to “avionics” transistors on next page)
### Bipolar Microwave Transistors

#### BIPOLAR MICROWAVE TRANSISTORS

1. Radar pulsed power transistors

#### 1.1 L-band

<table>
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<th>VCE V</th>
<th>t_p at δ μs %</th>
<th>P_L W</th>
<th>G_p dB</th>
<th>η_C %</th>
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<td>1,2 to 1,4</td>
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<td>40</td>
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#### 1.2 S-band

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<th>P_L W</th>
<th>G_p dB</th>
<th>η_C %</th>
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#### 2. Avionics pulsed power transistors

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<th>t_p at δ μs %</th>
<th>P_L W</th>
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<th>η_C %</th>
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<td>1,09</td>
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* See Fig. on preceding page.
### 3. Linear power transistors

#### 3.1 Class-A medium power

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<th>$I_C$ mA</th>
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<th>$N_F$ dB</th>
<th>$G_{po}$ (2) dB</th>
<th>$G_a$ dB</th>
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* Low-noise type.

#### 3.2 Class-A high power

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<th>$I_C$ A</th>
<th>$P_{L1}$ (1) W</th>
<th>$G_{po}$ (2) dB</th>
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(1) Load power for 1 dB compressed power gain.
(2) Low-level power gain associated with $P_{L1}$. 
### 4. c.w. power transistors

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### 5. Oscillator power transistors

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### GaAs field-effect transistors

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<th>N_F dB</th>
<th>G_Po (2) dB</th>
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(1) Load power for 1 dB compressed power gain.
(2) Low-level power gain associated with P_L1.
(3) Low-noise type.
## Bipolar class-A transistors

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* Low-noise: \( N_F = 1.8 \text{ dB} \); \( G_a = 12 \text{ dB} \).

(1) Load power for 1 dB compressed power gain.

(2) Low-level power gain associated with \( P_{L1} \).

July 1985
### Bipolar class-B and pulsed power transistors

<table>
<thead>
<tr>
<th>Type number</th>
<th>$f_{GHz}$</th>
<th>$V_{CE/V}$</th>
<th>$P_L/W$</th>
<th>$G_P/dB$</th>
<th>$\eta_C/%$</th>
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(1) $P_L$ and $G_P$ under pulsed condition: $t_{on} = 10 \mu s, \delta = 1\%$.

(2) $P_L$ and $G_P$ under pulsed condition: $t_{on} = 10 \mu s, \delta = 10\%$. 

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Bipolar class-B and pulsed power transistors

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<th>Type number</th>
<th>f GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta_C$ %</th>
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(1) $P_L$ and $G_P$ under pulsed condition: $t_{on} = 100 \mu s$, $\delta = 10\%$.
(2) $P_L$ and $G_P$ under pulsed condition: $t_{on} = 300 \mu s$, $\delta = 10\%$. 

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GENERAL

Type designation code
General recommendations
Mounting recommendations
for flange envelopes
Mounting recommendations
for capstan envelopes
Rating systems
Letter symbols
s-parameters
TYPE DESIGNATION CODE
FOR SILICON POWER BIPOLAR TRANSISTORS

X : Letter
0 : Number

a) XXX 0 0 0 0 X : transistors without matching cell
b) XXX 0 0 0 0 0 X : transistors with input matching cell
c) XX 0 0 0 0 X 0 0 X : transistors with input and output matching cell

X LETTERS
• First letter: mode of operation
  L : Linear
  M : Short pulse
  P : CW class B
  R : Long pulse

• Second letter: encapsulation
  A : SOT-100 K : FO-53
  B : FO-45 O : FO-57B
  C : FO-46 P : FO-102
  D : FO-58 Q : FO-85
  E : FO-38 R : FO-67A/B
  J : FO-41A S : FO-96
  P : FO-102
  T : FO-41B
  v : FO-83
  W : FO-93
  X : FO-91
  Z : FO-57C

• Third letter: common potential
  E : Common emitter
  B : Common base
  C : Common collector

• Fourth letter: supply voltage
  (suffix)
  Q : 10 - 12 V
  R : 15 - 16 V
  S : 18 V
  T : 20 (18 - 21) V
  U : 28 - 30 V
  W : 45 V
  X : 24 V
  Y : 50 V
  Z : 48 V

0 NUMBERS

a) Transistors without matching cell
• first number: frequency of measurement (GHz)
• 2nd, 3rd, 4th numbers: power
  • in watts (W) for P - M and R mode of operation
  • in 100 mW for L mode of operation

b) Transistors with input matching cell
• first and second numbers: frequency of measurement (x 0.1 GHz)
• 2nd, 3rd, 4th numbers: power
  • in watts (W) for P - M and R mode of operation
  • in 100 mW for L mode of operation

c) Transistors with input and output matching cell
• first and second number: lower frequency of use (in 0.1 GHz)
• third and fourth numbers: higher frequency of use (in 0.1 GHz)
• last numbers: power
  • in watt (W) for P - M and R mode of operation
  • in 100 mW for L mode operation
GENERAL RECOMMENDATIONS

SILICON BIPOLAR TRANSISTORS
GENERAL OPERATIONAL RECOMMENDATIONS

INTRODUCTION
These devices operate at high frequencies and high powers. To avoid damage or destruction, it is advisable to follow the advice given below during testing, setting-up procedures and final operation.

MECHANICAL
1. Good thermal and electrical conductivity is essential for efficient operation. Any metallic interface may introduce local overheating and an increase in contact resistance. It is therefore essential to use an adequate heatsink and heatsink compound between the rear face of the transistor or its flange and the heatsink.
2. Connections between the test jig or amplifier circuitry must be as short as possible, in any case not more than 100 µm. Special care must be taken to use the shortest possible high frequency earth (ground) connection.
3. When mounting the transistor on its heatsink, the recommended torque must not be exceeded.

POLARIZATION
1. When testing transistors in a new circuit, it is recommended that the supply voltage is reduced to approximately 70% of its nominal value and that series emitter or collector resistors are used (for common base and common emitter configurations respectively). After initial tests have been made, the series resistors may be decreased and the voltage increased.
2. The use of high value capacitors must be avoided as far as possible. If their use cannot be avoided, series resistors of a few ohms must be inserted.

OPERATION
1. Input power
   While the circuit is not optimized, it is recommended that the power input should be at a lower level than that specified.
2. Output waveform
   It is advisable to check the output waveform with a spectrum analyzer or similar equipment to ensure that no parasitic effects are introduced by the power supply or earth (ground) connections, thus causing unwanted modulation.
3. Junction temperature
   If the circuit design is likely to cause a large temperature rise, it is advisable to check the temperature rise with a pulsed input before applying full power.
RECOMMENDATIONS FOR MOUNTING FLANGE R.F. POWER TRANSISTORS

Flange r.f. transistors are easy to mount but for optimum performance we offer the following recommendations:

- Holes or tapped holes in the heatsink should be free from burrs and spaced at 18,42 mm (+0,05; −0,05) between centres. They must have a depth of at least 6 mm. Recommended screw: for SOT-119, SOT-121 and SOT-161 cheese-head 4-40 UNC/2A, for SOT-123 and SOT-160 also M3. A washer to spread the joint pressure is also recommended.

- For transistors dissipating up to 80 W the heatsink thickness should be at least 3 mm copper (>99,9%, ETP-Cu) or 5 mm aluminium (>99,0% Al). For transistors dissipating more power, the thickness should be increased proportionally.

- The flatness of the heatsink mounting surface must be <0,02 mm with a surface roughness Ra <0,5 µm (preferably by grinding or lapping).

- The sparing use of evenly distributed heatsink compound on the transistor flange is recommended. Suitable heatsink compound brands are: Dow Corning 340, Eccotherm TC-5 (E&C), Wakefield 120.

- The screws through the flange holes should first both be tightened to 0,05 Nm (finger tight), and then tightened to 0,6 to 0,75 Nm, to achieve the published thermal resistance between the mounting base and heatsink.

- When a transistor is removed from the heatsink, the flange will almost certainly have been distorted by the joint pressure. Grinding or lapping of the flange according to the information above is necessary if the transistor is remounted.
RECOMMENDATIONS FOR MOUNTING ¼”, ⅜” AND ½” CAPSTAN HEADERS AS USED FOR R.F. POWER TRANSISTORS

A nickel plated brass nut is supplied with each transistor for securing it to a heatsink.

Screw threads, diameter and nuts:

<table>
<thead>
<tr>
<th>mounting base diameter</th>
<th>thread</th>
<th>maximum diameter of threaded stud</th>
<th>nut thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>¼”</td>
<td>8-32UNC-2A(B)</td>
<td>4,14 mm</td>
<td>3,5 and 5 mm</td>
</tr>
<tr>
<td>⅜”</td>
<td>10-32UNF-2A(B)</td>
<td>4,80 mm</td>
<td>5 mm</td>
</tr>
<tr>
<td>½”</td>
<td>⅛” x 28UNF-2A(B)</td>
<td>6,33 mm</td>
<td>5,5 mm</td>
</tr>
</tbody>
</table>

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed.

- Diameter of the mounting hole in the heatsink:
  - ¼” stud diameter 4,15 +0,05; -0 mm
  - ⅜” stud diameter 4,85 +0,05; -0 mm
  - ½” stud diameter 6,35 +0,05; -0 mm

Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxidation.

- Mounting nut torque:
  - ¼” nut minimum 0,75 Nm (7,5 kg cm) maximum 0,85 Nm (8,5 kg cm)
  - ⅜” nut minimum 1,5 Nm (15 kg cm) maximum 1,7 Nm (17 kg cm)
  - ½” nut minimum 2,3 Nm (23 kg cm) maximum 2,7 Nm (27 kg cm)

- Recommended distance from the surface of the heatsink to the top surface of the printed-circuit board:
  - ¼” capstan header 2,9 +0; -0,2 mm
  - ⅜” capstan header 3,8 +0; -0,2 mm
  - ½” capstan header 4,8 +0; -0,2 mm

It is important that the above maximum printed-circuit board mounting heights are not exceeded in order to prevent stress being applied to the encapsulation. Upward lead bending, in particular, can damage the encapsulation and impair the sealing of the header.

- Experience indicates that flux or flux solutions can penetrate even hermetically sealed ceramic-capped transistors. To prevent this, tin and wash the printed-circuit boards before mounting the power transistors, then solder the transistors in place without using flux.

- The leads may be tinned by dipping them, full length, into a solder bath at about 230 °C. Note, no flux should be used during tinning.

- The full mounting-nut torque (specified above) should be applied only once during the life of the transistor. For pre-assembly testing, apply no more than two thirds of the specified torque.

- Since locking washers are much harder than most heatsink materials, their locking action might deteriorate during the life of the transistor. The use of locking washers is therefore not recommended. Instead, tighten the nuts to their specified torque, allow about 30 minutes for them to bed down, then re-tighten. After this, apply locking paint.
The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.
RATING SYSTEMS

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.
LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

- I, i = current
- V, v = voltage
- P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.

In all other instances upper-case basic letters shall be used.

Subscripts

A, a
- Anode terminal

(AV), (av)
- Average value

B, b
- Base terminal for MOS devices: Substrate

(BR)
- Breakdown

C, c
- Collector terminal

D, d
- Drain terminal

E, e
- Emitter terminal

F, f
- Forward

G, g
- Gate terminal

K, k
- Cathode terminal

M, m
- Peak value

O, o
- As third subscript: The terminal not mentioned is open circuited

R, r
- As first subscript: Reverse. As second subscript: Repetitive.
- As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.

(RMS), (rms)
- R.M.S. value
- As first or second subscript: Source terminal (for FETS only)
- As second subscript: Non-repetitive (not for FETS)
- As third subscript: Short circuit between the terminal not mentioned and the reference terminal

X, x
- Specified circuit

Z, z
- Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.
Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)  
Example $I_B$

b) instantaneous total values  
Example $i_B$

c) average total values  
Example $I_B(AV)$

d) peak total values  
Example $I_{BM}$

e) root-mean-square total values  
Example $I_B(RMS)$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values  
Example $i_b$

b) root-mean-square values  
Example $I_b(rms)$

c) peak values  
Example $I_{bm}$

d) average values  
Example $I_b(\text{av})$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: $I_B$, $I_B$, $i_B$, $I_{bm}$

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript $F$ or $f$ should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript $R$ or $r$ should be used.

Examples: $I_F$, $I_R$, $i_F$, $I_f(rms)$
Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: \( V_{BE} \), \( v_{BE} \), \( v_{be} \), \( V_{bem} \)

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript \( F \) or \( f \) should be used; for a reverse voltage (anode negative with respect to cathode) the subscript \( R \) or \( r \) should be used.

Examples: \( V_F \), \( v_R \), \( v_F \), \( V_{rm} \)

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: \( V_{CC} \), \( I_{EE} \)

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example: \( V_{CCE} \)

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: \( I_{B2} \) = continuous (d. c.) current flowing into the second base terminal

\( V_{B2-E} \) = continuous (d. c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: \( I_{2C} \) = continuous (d. c.) current flowing into the collector terminal of the second unit

\( V_{1C-2C} \) = continuous (d. c.) voltage between the collector terminals of the first and the second unit.
Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.

LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

- \( B, b \) = susceptance; imaginary part of an admittance
- \( C \) = capacitance
- \( G, g \) = conductance; real part of an admittance
- \( H, h \) = hybrid parameter
- \( L \) = inductance
- \( R, r \) = resistance; real part of an impedance
- \( X, x \) = reactance; imaginary part of an impedance
- \( Y, y \) = admittance;
- \( Z, z \) = impedance;
Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

- \( F, f \) = forward; forward transfer
- \( i, i \) (or 1) = input
- \( L, l \) = load
- \( O, o \) (or 2) = output
- \( R, r \) = reverse; reverse transfer
- \( S, s \) = source

Examples: \( Z_S, h_f, h_F \)

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples: \( h_{FE} \) = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

\( R_E \) = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: \( h_{fe} \) = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

\( Z_e = R_e + jX_e \) = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: \( h_{FE}, y_{RE}, h_f \)
Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer.

Examples: $h_1$ (or $h_{11}$),
$h_2$ (or $h_{22}$),
$h_0$ (or $h_{21}$),
$h_r$ (or $h_{12}$).

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: $h_{fe}$ (or $h_{21e}$), $h_{FE}$ (or $h_{21E}$).

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: $Re(h_{ib})$ etc. for the real part of $h_{ib}$
$Im(h_{ib})$ etc. for the imaginary part of $h_{ib}$.
SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves $a_1$, $b_1$, $a_2$ and $b_2$.

$$ s_{11} = \frac{a_1}{a_2} $$
$$ s_{12} = \frac{b_1}{a_2} $$
$$ s_{21} = \frac{b_2}{a_1} $$
$$ s_{22} = \frac{b_2}{a_2} $$

$Z_0$ = characteristic impedance of the transmission line in which the two-port is connected.

$V_i$ = incident voltage

$V_r$ = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$ b_1 = s_{11} a_1 + s_{12} a_2 $$
$$ b_2 = s_{21} a_1 + s_{22} a_2 $$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$ s_i = s_{11} = \frac{b_1}{a_1} \quad a_2 = 0 $$
$$ s_r = s_{12} = \frac{b_1}{a_2} \quad a_1 = 0 $$
$$ s_f = s_{21} = \frac{b_2}{a_1} \quad a_2 = 0 $$
$$ s_o = s_{22} = \frac{b_2}{a_2} \quad a_1 = 0 $$

1) The squares of these quantities have the dimension of power.
The s-parameters can be named and expressed as follows:

\( s_1 = s_{11} = \) Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions \( Z_1 = Z_0 \) and \( V_{s2} = 0 \).

\( s_r = s_{12} = \) Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions \( Z_s = Z_0 \) and \( V_{s1} = 0 \).

\( s_f = s_{21} = \) Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions \( Z_1 = Z_0 \) and \( V_{s2} = 0 \).

\( s_0 = s_{22} = \) Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions \( Z_s = Z_0 \) and \( V_{s1} = 0 \).
DEVICE DATA

GaAs field-effect transistors
N-CHANNEL LOW-NOISE Ku-BAND GaAs FET

The transistor is housed in a miniature ceramic encapsulation and is specified in a low-noise amplifier circuit.

Features:
- Self-aligned process: high conformity and short gate length (0.5 µm);
- TiPtAu metallization ensures long life;
- Hermetically sealed encapsulation protects the chip to provide long term performance stability.

Also available in chip version (CFX13X).

QUICK REFERENCE DATA

Typical values in common-source configuration at $T_{\text{case}} = 25$ °C

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{\text{DS}}$ V</th>
<th>$I_D$ mA</th>
<th>$F_{\text{opt}}$ dB</th>
<th>$G_A$ dB</th>
<th>$g_m^*$ mA/V</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>2.2</td>
<td>8</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>3</td>
<td>10</td>
<td>2.5</td>
<td>7.5</td>
<td>28</td>
</tr>
</tbody>
</table>

* Measuring conditions: $-1 \text{ V} < V_{GS} < 0$

MECHANICAL DATA

Fig. 1 FO-92.

Source connected to metallized lid

Dimensions in mm

August 1985
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Drain-source voltage
- Gate-source voltage
- Saturated drain current
- Total power dissipation up to $T_{case} = 115 \, ^\circ C$
- Storage temperature
- Channel temperature
- Lead soldering temperature up to 0.1 mm from transistor edge; $t_{sld} \leq 8 \, s$

THERMAL RESISTANCE
From channel to case

\[
R_{th \, ch-c} = 200 \, K/W^* 
\]

CHARACTERISTICS

$T_{amb} = 25 \, ^\circ C$

- Gate-source cut-off current
  \[ V_{DS} = 3 \, V; \, I_D = 200 \, \mu A \]

- Saturated drain current
  \[ V_{DS} = 3 \, V; \, V_{GS} = 0 \]

- Pinch-off voltage
  \[ V_{DS} = 3 \, V; \, I_D = 200 \, \mu A \]

- Mutual transconductance
  \[ V_{DS} = 3 \, V; \, -1 \, V < V_{GS} < 0 \]

- Maximum available gain
  \[ V_{DS} = 3 \, V; \, I_D = 35 \, mA; \, f = 10 \, GHz \]
  \[ V_{DS} = 3 \, V; \, I_D = 35 \, mA; \, f = 12 \, GHz \]

\* $K/W$ is SI unit for $^\circ C/W$.

30 August 1982
N-channel low-noise Ku-band GaAs FET

s-parameters (common source)

Typical values; $V_{DS} = 3 \, \text{V}$; $I_D = 10 \, \text{mA}$; $T_{Amb} = 25 \, ^\circ\text{C}$; $Z_0 = 50 \, \Omega$

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{is}$</th>
<th>$s_{rs}$</th>
<th>$s_{fs}$</th>
<th>$s_{os}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.91/−102°</td>
<td>0.027(−31,5)/27°</td>
<td>1.16(1,26)/81°</td>
<td>0.75/−71°</td>
</tr>
<tr>
<td>7</td>
<td>0.89/−113°</td>
<td>0.025(−31,9)/28°</td>
<td>1.08(0,67)/68°</td>
<td>0.75/−81°</td>
</tr>
<tr>
<td>8</td>
<td>0.88/−123°</td>
<td>0.025(−32,1)/32°</td>
<td>1.05(0,45)/57°</td>
<td>0.76/−90°</td>
</tr>
<tr>
<td>9</td>
<td>0.86/−136°</td>
<td>0.026(−31,8)/38°</td>
<td>1.04(0,36)/44°</td>
<td>0.76/−100°</td>
</tr>
<tr>
<td>10</td>
<td>0.85/−151°</td>
<td>0.028(−31,2)/46°</td>
<td>1(0)/31°</td>
<td>0.77/−108°</td>
</tr>
<tr>
<td>11</td>
<td>0.83/+160°</td>
<td>0.031(−30,1)/57°</td>
<td>0.94(−0,58)/20°</td>
<td>0.77/−114°</td>
</tr>
<tr>
<td>12</td>
<td>0.82/+165°</td>
<td>0.036(−28,9)/69°</td>
<td>0.87(−1,19)/12°</td>
<td>0.77/−117°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

---

Fig. 3 Drain current as a function of drain-source voltage and gate cut-off current as a function of gate-source voltage. Typical values; $T_{case} = 25 \, ^\circ\text{C}$.

Fig. 4 Noise and associated gain as a function of frequency. Typical values; $V_{DS} = 3 \, \text{V}$; $I_D = 10 \, \text{mA}$.

APPLICATION INFORMATION

Low-noise amplifier (common-source) at $T_{case} = 25 \, ^\circ\text{C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$F_{opt}$ (dB)</th>
<th>$G_a$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>12</td>
<td>3</td>
<td>10</td>
<td>&lt;3,0</td>
<td>&gt;6,5</td>
</tr>
</tbody>
</table>

Linear amplifier (common-source) at $T_{case} = 25 \, ^\circ\text{C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{DO}$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>10</td>
<td>3</td>
<td>35</td>
<td>&gt;10</td>
<td>typ. 10</td>
</tr>
</tbody>
</table>
Conditions for Figs 5 and 6:
$V_{DS} = 3\, \text{V}$; $I_D = 10\, \text{mA}$; 
$T_{\text{case}} = 25\, \text{°C}$.

Fig. 5 Input impedance derived from input reflection coefficient $s_{1S}$ co-ordinates in ohm x 50.

Fig. 6 Reverse transmission coefficient $s_{rs}$. 

32 July 1982
Conditions for Figs 7 and 8:

\( V_{DS} = 3 \, \text{V}; \, I_D = 10 \, \text{mA}; \)

\( T_{\text{case}} = 25^\circ \text{C}. \)

**Fig. 7** Output impedance derived from output reflection coefficient \( s_{0S} \) co-ordinates in ohm x 50.

**Fig. 8** Forward transmission coefficient \( s_{fs} \).
N-CHANNEL LOW-POWER X-BAND GaAs FET

The transistor is housed in a miniature ceramic encapsulation and is specified in a linear amplifier circuit.

Features:
- Self-aligned process: high conformity and short gate length (0.8 µm);
- TiPtAu metallization ensures long life;
- Hermetically sealed encapsulation protects the chip to provide high temperature stability.

Also available in chip version (CFX21X).

QUICK REFERENCE DATA

Typical values in common-source configuration at $T_{\text{case}} = 25^\circ\text{C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{DO}$ (dB)</th>
<th>$g_{m*}$ (mA/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>8</td>
<td>6</td>
<td>40</td>
<td>80</td>
<td>10</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>6</td>
<td>40</td>
<td>65</td>
<td>7.5</td>
<td>23</td>
</tr>
</tbody>
</table>

* Measuring conditions: $V_{DS} = 3$ V; $-1$ V $< V_{GS} < 0$

MECHANICAL DATA

Fig. 1 FO-92.

Source connected to metallized lid.

Dimensions in mm

August 1985
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Drain-source voltage
- Gate-source voltage
- Saturated drain current
- Total power dissipation up to $T_{\text{case}} = 75^\circ\text{C}$
- Storage temperature
- Channel temperature
- Lead soldering temperature up to 0.1 mm from transistor edge; $t_{\text{slld}} \leq 8\text{ s}$

THermal RESISTANCE
From channel to case

$$R_{\text{th ch-c}} = 200\ \text{K/W}^*$$

**Fig. 2** Power derating curve as a function of case temperature.

CHARACTERISTICS
$T_{\text{case}} = 25^\circ\text{C}$

- Saturated drain current
  - $V_{DS} = 3\ \text{V}; V_{GS} = 0$
- Pinch-off voltage
  - $V_{DS} = 3\ \text{V}; I_{D} = 200\ \mu\text{A}$
- Mutual transconductance
  - $V_{DS} = 3\ \text{V}; -1\ \text{V} < V_{GS} < 0$

$$I_{DSS} \quad 50\ \text{to}\ 110\ \text{mA}$$
$$-V(\text{P})_{GS} \quad 1.5\ \text{to}\ 5\ \text{V}$$
$$g_m \quad >\ 20\ \text{mA/V}$$

* K/W is SI unit for °C/W.
N-channel low-power X-band GaAs FET

s-parameters (common source)

Typical values; \( V_{DS} = 6 \) V; \( I_D = 40 \) mA; \( T_{amb} = 25 \) °C; \( Z_0 = 50 \) Ω

<table>
<thead>
<tr>
<th>f (GHz)</th>
<th>( S_{ss} )</th>
<th>( S_{rs} )</th>
<th>( S_{fs} )</th>
<th>( S_{os} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>0.87/−119°</td>
<td>0.010(−40,4)/63°</td>
<td>1.18(1,44)/68°</td>
<td>0.86/−69°</td>
</tr>
<tr>
<td>7</td>
<td>0.85/−132°</td>
<td>0.012(−38,3)/79°</td>
<td>1.08(0,66)/54°</td>
<td>0.87/−79°</td>
</tr>
<tr>
<td>8</td>
<td>0.82/−146°</td>
<td>0.018(−34,8)/89°</td>
<td>1.02(0,15)/40°</td>
<td>0.87/−89°</td>
</tr>
<tr>
<td>9</td>
<td>0.81/−162°</td>
<td>0.028(−31,1)/91°</td>
<td>0.96(−0,35)/26°</td>
<td>0.88/−98°</td>
</tr>
<tr>
<td>10</td>
<td>0.80/−177°</td>
<td>0.038(−28,4)/89°</td>
<td>0.88(−1,12)/12°</td>
<td>0.90/−107°</td>
</tr>
<tr>
<td>11</td>
<td>0.78/+ 175°</td>
<td>0.051(−25,9)/87°</td>
<td>0.80(−1,97)/ 2°</td>
<td>0.91/+111°</td>
</tr>
<tr>
<td>12</td>
<td>0.76/+ 171°</td>
<td>0.065(−23,8)/88°</td>
<td>0.73(−2,73)/−5°</td>
<td>0.92/+113°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

Fig. 3 Typical values; \( T_{case} = 25 \) °C.

Fig. 4 Linear gain as a function of frequency. \( V_{DS} = 6 \) V; \( I_D = 40 \) mA.

APPLICATION INFORMATION

Linear amplifier (common-source) at \( T_{case} = 25 \) °C

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>( f ) (GHz)</th>
<th>( V_{DS} ) (V)</th>
<th>( I_D ) (mA)</th>
<th>( P_L ) (mW)</th>
<th>( G_{po} ) (dB)</th>
<th>( g_m ) (mA/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>11</td>
<td>6</td>
<td>40</td>
<td>&gt; 50</td>
<td>&gt; 7</td>
<td>&gt; 20</td>
</tr>
</tbody>
</table>

Low-noise amplifier (common-source) at \( T_{case} = 25 \) °C

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>( f ) (GHz)</th>
<th>( V_{DS} ) (V)</th>
<th>( I_D ) (mA)</th>
<th>( F ) (dB)</th>
<th>( G_a ) (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>10</td>
<td>3</td>
<td>10</td>
<td>typ. 3,5</td>
<td>typ. 7</td>
</tr>
</tbody>
</table>

July 1982
Conditions for Figs 5 and 6:

\[ V_{DS} = 6 \text{ V}; \quad I_D = 40 \text{ mA}; \]
\[ T_{case} = 25 \text{ °C}. \]

Fig. 5 Input impedance derived from input reflection coefficient \( s_{IS} \) co-ordinates in ohm x 50.

Fig. 6 Reverse transmission coefficient \( s_{RS} \).
Conditions for Figs 7 and 8:

\( V_{DS} = 6 \text{ V}; \quad I_D = 40 \text{ mA}; \)

\( T_{\text{case}} = 25 \text{ °C}. \)

---

**Fig. 7** Output impedance derived from output reflection coefficient \( s_{os} \) co-ordinates in ohm x 50.

**Fig. 8** Forward transmission coefficient \( s_{fs} \).
N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier circuit and can be used at frequencies up to 15 GHz.

Features:
- Self-aligned recessed gate structure;
- TiPtAu metallization;
- hermetically sealed encapsulation

Also available in chip version (CFX30X).

QUICK REFERENCE DATA

Typical values in common source configuration at $T_{mb} = 25 \, ^\circ C$:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{DS}$ V</th>
<th>$I_D$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\eta_m$ mA/V</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>11</td>
<td>8</td>
<td>50</td>
<td>125</td>
<td>8</td>
<td>60</td>
</tr>
</tbody>
</table>

* Measuring conditions: $-1 \, V < V_{GS} < 0$

MECHANICAL DATA

Fig. 1 FO-85.

Leaf reference

1 Gate
2 Drain
3 Source (flange)

Source connected to flange
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage
Gate-source voltage
Saturated drain current
Gate current
Total power dissipation up to $T_{mb} = 25 \, ^\circ\text{C}$
Storage temperature
Channel temperature
Lead soldering temperature
up to 0,1 mm from transistor edge; $t_{sld} < 8 \, \text{s}$

THERMAL RESISTANCE
From channel to mounting base

CHARACTERISTICS

$T_{mb} = 25 \, ^\circ\text{C}$
Saturated drain current
$V_{DS} = 3 \, V; V_{GS} = 0$

Pinch-off voltage
$V_{DS} = 3 \, V; I_D = 1 \, mA$

Mutual transconductance
$V_{DS} = 3 \, V; -1 \, V < V_{GS} < 0$

Gate-source leakage current
$V_{DS} = 3 \, V; I_D = 200 \, \mu A$

* K/W is SI unit for $\text{°C/W}$.  

---

$V_{DS}$ max. 15 V
$-V_{GS}$ max. 12 V
$I_{DSS}$ max. 130 mA
$I_G$ max. 3 mA
$P_{tot}$ max. 1650 mW
$T_{stg}$ -65 to +175 °C
$T_{ch}$ max. 175 °C
$T_{sld}$ max. 250 °C

**Fig. 2** Power derating curve vs. mounting base temperature.

**Fig. 3** D.C. SOAR at $T_{mb} = 25 \, ^\circ\text{C}$. 

---

$I_{DSS}$ typ. 80 mA
$I_{DSS}$ typ. 60 to 130 mA
$-V_{(P)GS}$ typ. 2,0 V
$-V_{(P)GS}$ typ. 1,2 to 4,0 V
$g_m$ > 40 mA/V
$g_m$ typ. 60 mA/V
$I_{GS}$ typ. 20 µA
N-channel medium-power GaAs FET

S-parameters (common source)

Typical values; $V_{DS} = 8 \text{ V}$; $I_D = 50 \text{ mA}$; $T_{mb} = 25 \text{ °C}$; $Z_0 = 50 \Omega$.

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{ls}$</th>
<th>$s_{rs}$</th>
<th>$s_{fs}$</th>
<th>$s_{os}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0,89/-93°</td>
<td>0,062(-24,2)/ 22°</td>
<td>2,72(8,69)/ 101°</td>
<td>0,65/-66°</td>
</tr>
<tr>
<td>3</td>
<td>0,86/-121°</td>
<td>0,067(-23,5)/ 0°</td>
<td>2,23(6,97)/ 73°</td>
<td>0,66/-88°</td>
</tr>
<tr>
<td>4</td>
<td>0,84/-148°</td>
<td>0,069(-23,2)/ -19°</td>
<td>1,84(5,30)/ 48°</td>
<td>0,67/-106°</td>
</tr>
<tr>
<td>5</td>
<td>0,82/-165°</td>
<td>0,070(-23,1)/ -35°</td>
<td>1,58(3,97)/ 26°</td>
<td>0,68/-123°</td>
</tr>
<tr>
<td>6</td>
<td>0,79/-176°</td>
<td>0,071(-23,0)/ -48°</td>
<td>1,46(3,29)/ 6°</td>
<td>0,69/-138°</td>
</tr>
<tr>
<td>7</td>
<td>0,77/-154°</td>
<td>0,072(-22,9)/ -62°</td>
<td>1,40(2,92)/ -15°</td>
<td>0,69/-155°</td>
</tr>
<tr>
<td>8</td>
<td>0,74/-131°</td>
<td>0,071(-23,0)/ -75°</td>
<td>1,35(2,61)/ -37°</td>
<td>0,70/-170°</td>
</tr>
<tr>
<td>9</td>
<td>0,72/-108°</td>
<td>0,069(-23,2)/ -86°</td>
<td>1,27(2,08)/ -59°</td>
<td>0,69/-175°</td>
</tr>
<tr>
<td>10</td>
<td>0,68/- 89°</td>
<td>0,070(-23,1)/ -94°</td>
<td>1,21(1,66)/ -79°</td>
<td>0,68/-160°</td>
</tr>
<tr>
<td>11</td>
<td>0,62/- 67°</td>
<td>0,071(-23,0)/ -103°</td>
<td>1,29(2,21)/ -96°</td>
<td>0,68/-152°</td>
</tr>
<tr>
<td>12</td>
<td>0,56/- 37°</td>
<td>0,074(-22,6)/ -112°</td>
<td>1,40(2,92)/ -116°</td>
<td>0,70/-147°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

![Fig. 4 Typ. values; $T_{mb} = 25 \text{ °C}$](image1)

![Fig. 5 Load power vs. source power; typ. values; $V_{DS} = 8 \text{ V}$; $I_DS = 50 \text{ mA}$; $f = 11 \text{ GHz}$; $T_{mb} = 25 \text{ °C}$](image2)

![Fig. 6 Load power at 1 dB gain compression vs. frequency; $V_{DS} = 8 \text{ V}$; $I_DS = 50 \text{ mA}$; $T_{mb} = 25 \text{ °C}$](image3)
Fig. 7 Input reflection coefficient $s_{1S}$.  
Fig. 8 Output reflection coefficient $s_{OS}$.  

Fig. 9 Reverse transmission coefficient $s_{rs}$.  
Fig. 10 Forward transmission coefficient $s_{fs}$.  

Conditions for Figs 7, 8, 9 and 10: $V_{DS} = 8$ V; $I_{DS} = 50$ mA.
APPLICATION INFORMATION
Linear amplifier (common source) at $T_{mb} = 25 \, ^\circ C$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{DS}$ V</th>
<th>$I_D$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>8</td>
<td>8</td>
<td>50</td>
<td>&gt; 100</td>
<td>&gt; 8</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>8</td>
<td>50</td>
<td>&gt; 100</td>
<td>&gt; 7</td>
</tr>
</tbody>
</table>

Fig. 11 Input impedance ($z_i$) and optimum load impedance ($Z_L$) vs. frequency (calculated from s-parameters); $V_{DS} = 8$ V; $I_D = 50$ mA; $Z_0 = 50$ Ω.
N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier circuit and can be used at frequencies up to 15 GHz.

Features:
- self-aligned recessed gate structure;
- TiPtAu metallization;
- hermetically sealed encapsulation.

Also available in chip version (CFX31X).

QUICK REFERENCE DATA

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f GHz</th>
<th>V_{DS} V</th>
<th>I_D mA</th>
<th>P_{L1} mW</th>
<th>G_{po} dB</th>
<th>g_m* mA/V</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>11</td>
<td>8</td>
<td>100</td>
<td>280</td>
<td>8</td>
<td>60</td>
</tr>
</tbody>
</table>

* Measuring conditions; \(-1 \text{ V} < V_{GS} < 0\)

MECHANICAL DATA

Fig. 1 FO-85.
Lead reference:
1 Gate
2 Drain
3 Source (flange)
Source connected to flange.

Dimensions in mm
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Drain-source voltage
- Gate-source voltage
- Saturated drain current
- Gate current
- Total power dissipation up to $T_{mb} = 25 \, ^\circ C$
- Storage temperature
- Channel temperature
- Lead soldering temperature up to 0.1 mm from transistor edge; $t_{sld} < 8 \, s$

THERMAL RESISTANCE

From channel to mounting base

```
\begin{tabular}{|c|c|}
\hline
$P_{tot}$ (mW) & 2000 \\
\hline
1000 & 1000 \\
\hline
0 & 0 \\
\hline
\end{tabular}
```

Fig. 2 Power derating curve vs. mounting base temperature.

CHARACTERISTICS

$T_{mb} = 25 \, ^\circ C$

- Saturated drain current $V_{DS} = 3 \, V; V_{GS} = 0$
- Pinch-off voltage $V_{DS} = 3 \, V; \, I_D = 1 \, mA$
- Mutual transconductance $V_{DS} = 3 \, V; -1 \, V < V_{GS} < 0$
- Gate-source leakage current $V_{DS} = 3 \, V; \, I_D = 200 \, \mu A$

* K/W is SI unit for °C/W.

```
\begin{tabular}{|c|c|}
\hline
$I_{DSS}$ & typ. 160 mA \\
\hline
$I_G$ & typ. 130 to 250 mA \\
\hline
$-V_{(P)GS}$ & typ. 4.0 V \\
\hline
$g_m$ & > 40 mA/V \\
\hline
$I_{GS}$ & typ. 60 mA/V \\
\hline
\end{tabular}
```

Fig. 3 D.C. SOAR at $T_{mb} = 25 \, ^\circ C$.
N-channel medium power GaAs FET

S-parameters (common-source)

Typical values; $V_{DS} = 8\,\text{V}$; $I_D = 100\,\text{mA}$; $T_{mb} = 25\,^\circ\text{C}$; $Z_0 = 50\,\Omega$.

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{IS}$</th>
<th>$s_{RS}$</th>
<th>$s_{FS}$</th>
<th>$s_{OS}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.89/ -95°</td>
<td>0.061/ -24.3°</td>
<td>2.63/100°</td>
<td>0.59/ -66°</td>
</tr>
<tr>
<td>3</td>
<td>0.87/ -122°</td>
<td>0.065/ -23.7°</td>
<td>2.16/73°</td>
<td>0.64/ -88°</td>
</tr>
<tr>
<td>4</td>
<td>0.86/ -146°</td>
<td>0.067/ -23.5°</td>
<td>1.78/47°</td>
<td>0.65/ -107°</td>
</tr>
<tr>
<td>5</td>
<td>0.84/ -166°</td>
<td>0.068/ -23.4°</td>
<td>1.55/25°</td>
<td>0.67/ -124°</td>
</tr>
<tr>
<td>6</td>
<td>0.82/ +175°</td>
<td>0.069/ -23.2°</td>
<td>1.41/5°</td>
<td>0.68/ -140°</td>
</tr>
<tr>
<td>7</td>
<td>0.79/ +153°</td>
<td>0.070/ -23.1°</td>
<td>1.33/17°</td>
<td>0.69/ -156°</td>
</tr>
<tr>
<td>8</td>
<td>0.78/ +130°</td>
<td>0.069/ -23.2°</td>
<td>1.27/38°</td>
<td>0.69/ -172°</td>
</tr>
<tr>
<td>9</td>
<td>0.75/ +110°</td>
<td>0.066/ -23.6°</td>
<td>1.20/59°</td>
<td>0.68/ +173°</td>
</tr>
<tr>
<td>10</td>
<td>0.72/ +92°</td>
<td>0.064/ -23.9°</td>
<td>1.15/78°</td>
<td>0.68/ +159°</td>
</tr>
<tr>
<td>11</td>
<td>0.68/ +71°</td>
<td>0.064/ -23.9°</td>
<td>1.20/95°</td>
<td>0.69/ +150°</td>
</tr>
<tr>
<td>12</td>
<td>0.63/ +48°</td>
<td>0.066/ -23.6°</td>
<td>1.30/112°</td>
<td>0.70/ +145°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values is dB.

Fig. 4 Typ. values; $T_{mb} = 25\,^\circ\text{C}$.

Fig. 5 Load power vs. source power; typ. values; $V_{DS} = 8\,\text{V}$; $I_D = 100\,\text{mA}$; $f = 11\,\text{GHz}$; $T_{mb} = 25\,^\circ\text{C}$.

Fig. 6 Load power at 1 dB gain compression vs. frequency; $V_{DS} = 8\,\text{V}$; $I_D = 100\,\text{mA}$; $T_{mb} = 25\,^\circ\text{C}$.
Conditions for Figs 7, 8, 9 and 10: $V_{DS} = 8 \text{ V}$; $I_{DS} = 100 \text{ mA}$. 
APPLICATION INFORMATION

Linear amplifier (common source) at $T_{mb} = 25$ °C

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{DS}$ V</th>
<th>$I_D$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>8</td>
<td>8</td>
<td>100</td>
<td>&gt; 250</td>
<td>&gt; 8</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>8</td>
<td>100</td>
<td>&gt; 250</td>
<td>&gt; 7</td>
</tr>
</tbody>
</table>

Fig. 11 Input impedance ($Z_i$) and optimum load impedance ($Z_L$) vs. frequency (calculated from s-parameters); $V_{DS} = 8$ V; $I_D = 100$ mA; $Z_0 = 50$ Ω.
N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier and can be used at frequencies up to the X-band.

Features:
- recessed gate giving a high maximum drain-source voltage rating;
- TiPtAu metallization ensuring long life;
- hermetically sealed encapsulation protecting the chip to provide high temperature stability.

Also available in chip version (CFX32X).

QUICK REFERENCE DATA

Typical values in common-source configuration at $T_{mb} = 25^\circ C$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$g_m^*$ (mA/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>6,0</td>
<td>8</td>
<td>180</td>
<td>550</td>
<td>8,5</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>8,5</td>
<td>8</td>
<td>180</td>
<td>550</td>
<td>7,5</td>
<td>120</td>
</tr>
</tbody>
</table>

* Measuring conditions: $-1 \text{ V} < V_{GS} < 0$

MECHANICAL DATA

Fig. 1 FO-85.

Lead reference
1 Gate
2 Drain
3 Source (flange)

Dimensions in mm

[Diagram of the F0-85 package showing the lead reference numbers and dimensions.]
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Drain-source voltage
- Gate-source voltage
- Saturated drain current
- Gate current
- Total power dissipation up to $T_{mb} = 25 \, ^\circ C$
- Storage temperature
- Channel temperature
- Lead soldering temperature
  up to 0.1 mm from transistor edge; $t_{sld} < 8 \, s$

THERMAL RESISTANCE
From channel to mounting base

![Graph showing Power derating curve vs. mounting base temperature.](image)

CHARACTERISTICS

- $T_{mb} = 25 \, ^\circ C$
- Saturated drain current
  $V_{DS} = 3 \, V; V_{GS} = 0$
- Pinch-off voltage
  $V_{DS} = 3 \, V; I_D = 3 \, mA$
- Mutual transconductance
  $V_{DS} = 3 \, V; -1 \, V < V_{GS} < 0$

- $I_{DSS}$ typ. 350 mA
- $-V_{(P)GS}$ typ. 4 V
- $g_m$ min. 80 mA/V

* K/W is SI unit for °C/W.
N-channel medium power GaAs FET

S-parameters (common source)

Typical values; $V_{DS} = 8 \text{ V}$; $I_D = 180 \text{ mA}$; $T_{mb} = 25^\circ \text{C}$; $Z_0 = 50 \Omega$

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$S_{IS}$</th>
<th>$S_{RS}$</th>
<th>$S_{FS}$</th>
<th>$S_{OS}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0,84/−117°</td>
<td>0,067/−23,5/46°</td>
<td>3,25/10,2/91°</td>
<td>0,34/−99°</td>
</tr>
<tr>
<td>3</td>
<td>0,81/−144°</td>
<td>0,069/−23,5/2°</td>
<td>2,58/8,28/64°</td>
<td>0,37/−117°</td>
</tr>
<tr>
<td>4</td>
<td>0,79/−168°</td>
<td>0,069/−23,2/−19°</td>
<td>2,12/6,52/39°</td>
<td>0,41/−134°</td>
</tr>
<tr>
<td>5</td>
<td>0,76/176°</td>
<td>0,069/−23,2/−34°</td>
<td>1,82/5,21/170°</td>
<td>0,43/−148°</td>
</tr>
<tr>
<td>6</td>
<td>0,73/148°</td>
<td>0,069/−23,2/−47°</td>
<td>1,65/4,37/−3°</td>
<td>0,45/−162°</td>
</tr>
<tr>
<td>7</td>
<td>0,70/122°</td>
<td>0,069/−23,2/−60°</td>
<td>1,55/3,82/−28°</td>
<td>0,46/−177°</td>
</tr>
<tr>
<td>8</td>
<td>0,69/96°</td>
<td>0,067/−23,4/−73°</td>
<td>1,46/3,31/−52°</td>
<td>0,47/169°</td>
</tr>
<tr>
<td>9</td>
<td>0,67/72°</td>
<td>0,065/−23,8/−84°</td>
<td>1,38/2,81/−75°</td>
<td>0,46/152°</td>
</tr>
<tr>
<td>10</td>
<td>0,64/44°</td>
<td>0,063/−24,0/−94°</td>
<td>1,34/2,52/−98°</td>
<td>0,45/138°</td>
</tr>
<tr>
<td>11</td>
<td>0,62/3°</td>
<td>0,061/−24,4/−106°</td>
<td>1,33/2,48/−122°</td>
<td>0,45/129°</td>
</tr>
<tr>
<td>12</td>
<td>0,63/−33°</td>
<td>0,056/−25,0/−119°</td>
<td>1,34/2,54/−148°</td>
<td>0,44/126°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

Fig. 4 Load power vs. source power; typ. values; $V_{DS} = 8 \text{ V}$; $I_{DS} = 180 \text{ mA}$; $f = 8,5 \text{ GHz}$; $T_{mb} = 25^\circ \text{C}$.

APPLICATION INFORMATION

Linear amplifier (common source) at $T_{mb} = 25^\circ \text{C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>8,5</td>
<td>8</td>
<td>180</td>
<td>$\geq 500$</td>
<td>$\geq 7$</td>
</tr>
</tbody>
</table>
N-CHANNEL MEDIUM-POWER GaAs FET

The transistor is specified in a linear amplifier and can be used at frequencies up to the X-band.

Features:
- recessed gate giving a high maximum drain-source voltage rating;
- TiPtAu metallization ensuring long life;
- hermetically sealed encapsulation protecting the chip to provide high temperature stability.

Also available in chip version (CFX33X).

QUICK REFERENCE DATA

Typical values in common-source configuration at $T_{mb} = 25 \, ^\circ\text{C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_D$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$g_m^*$ (mA/V)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>6,0</td>
<td>8</td>
<td>370</td>
<td>1100</td>
<td>7,0</td>
<td>230</td>
</tr>
<tr>
<td></td>
<td>8,5</td>
<td>8</td>
<td>370</td>
<td>1100</td>
<td>5,5</td>
<td>230</td>
</tr>
</tbody>
</table>

* Measuring conditions: $-1 \, \text{V} < V_{GS} < 0$

MECHANICAL DATA

Fig. 1 FO-85.

Lead reference
1 Gate
2 Drain
3 Source (flange)

Dimensions in mm
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage
Gate-source voltage
Saturated drain current
Gate current
Total power dissipation up to $T_{mb} = 25 \degree C$
Storage temperature
Channel temperature
Lead soldering temperature
up to 0,1 mm from transistor edge; $t_{slid} \leq 8 \mathrm{s}$

THERMAL RESISTANCE
From channel to mounting base

THERMAL RESISTANCE
From channel to mounting base

CHARACTERISTICS
$T_{mb} = 25 \degree C$
Saturated drain current
$V_{DS} = 3 \mathrm{~V}; V_{GS} = 0$
Pinch-off voltage
$V_{DS} = 3 \mathrm{~V}; I_D = 5 \mathrm{mA}$
Mutual transconductance
$V_{DS} = 3 \mathrm{~V}; -1 \mathrm{~V} < V_{GS} < 0$

\begin{align*}
V_{DS} & \max. & 15 \mathrm{~V} \\
-V_{GS} & \max. & 12 \mathrm{~V} \\
I_{DSS} & \max. & 1000 \mathrm{mA} \\
I_{G} & \max. & 8 \mathrm{mA} \\
P_{\text{tot}} & \max. & 5 \mathrm{~W} \\
T_{stg} & -65 \text{ to } +175 \degree C \\
T_{ch} & \max. & 175 \degree C \\
T_{slid} & \max. & 250 \degree C \\
\end{align*}

$R_{th \ ch-mb} \quad 30 \mathrm{~K/W}^*$

* K/W is SI unit for $\degree C/W$. 

Fig. 2 Power derating curve vs. mounting base temperature.

Fig. 3 D.C. SOAR at $T_{mb} = 25 \degree C$. 

$I_{DSS} \quad \text{typ.} & \quad 700 \mathrm{mA} \\
-V_{(P)GS} \quad \text{typ.} & \quad 4 \mathrm{~V} \\
\quad \text{min.} & \quad 2 \text{ to } 6 \mathrm{~V} \\
9_m \quad \text{typ.} & \quad 160 \mathrm{mA/V} \\
\quad \text{typ.} & \quad 240 \mathrm{mA/V}$
**N-channel medium-power GaAs FET**

### s-parameters (common source)

Typical values; $V_{DS} = 8\, \text{V}$; $I_{D} = 370\, \text{mA}$; $T_{mb} = 25\, \text{°C}$; $Z_{0} = 50\, \Omega$

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{is}$</th>
<th>$s_{rs}$</th>
<th>$s_{fs}$</th>
<th>$s_{os}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0,82/−160°</td>
<td>0,060(−24,4)/7°</td>
<td>2,99(9,52)/71°</td>
<td>0,33/−155°</td>
</tr>
<tr>
<td>3</td>
<td>0,81/180°</td>
<td>0,060(−24,4)/−4°</td>
<td>2,26(7,10)/47°</td>
<td>0,36/−165°</td>
</tr>
<tr>
<td>4</td>
<td>0,79/159°</td>
<td>0,062(−24,2)/−14°</td>
<td>1,78(5,03)/24°</td>
<td>0,39/−175°</td>
</tr>
<tr>
<td>5</td>
<td>0,78/139°</td>
<td>0,065(−23,8)/−22°</td>
<td>1,52(3,62)/2°</td>
<td>0,41/179°</td>
</tr>
<tr>
<td>6</td>
<td>0,75/117°</td>
<td>0,070(−23,1)/−31°</td>
<td>1,37(2,75)/−20°</td>
<td>0,43/164°</td>
</tr>
<tr>
<td>7</td>
<td>0,74/91°</td>
<td>0,076(−22,4)/−42°</td>
<td>1,26(2,04)/−43°</td>
<td>0,44/150°</td>
</tr>
<tr>
<td>8</td>
<td>0,74/66°</td>
<td>0,082(−21,7)/−54°</td>
<td>1,17(1,36)/−67°</td>
<td>0,45/135°</td>
</tr>
<tr>
<td>9</td>
<td>0,72/42°</td>
<td>0,090(−21,0)/−66°</td>
<td>1,09(0,78)/−90°</td>
<td>0,45/118°</td>
</tr>
<tr>
<td>10</td>
<td>0,71/13°</td>
<td>0,098(−20,2)/−82°</td>
<td>1,05(0,44)/−115°</td>
<td>0,45/104°</td>
</tr>
<tr>
<td>11</td>
<td>0,71/−10°</td>
<td>0,102(−19,9)/−99°</td>
<td>1,02(0,18)/−141°</td>
<td>0,42/93°</td>
</tr>
<tr>
<td>12</td>
<td>0,74/−63°</td>
<td>0,102(−19,8)/−118°</td>
<td>0,99(−0,01)/−169°</td>
<td>0,38/85°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

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**DEVELOPMENT DATA**

**Fig. 4** Load power vs. source power; typ. values; $V_{DS} = 8\, \text{V}$; $I_{DS} = 370\, \text{mA}$; $f = 8,5\, \text{GHz}$; $T_{mb} = 25\, \text{°C}$.

### APPLICATION INFORMATION

Linear amplifier (common source) at $T_{mb} = 25\, \text{°C}$

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{DS}$ (V)</th>
<th>$I_{D}$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>8,5</td>
<td>8</td>
<td>370</td>
<td>$\geq 1000$</td>
<td>$\geq 5$</td>
</tr>
</tbody>
</table>

---

July 1983
DEVICE DATA

Silicon bipolar transistors
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages.

- Interdigitized structure: high emitter efficiency
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has a SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>2</td>
<td>15</td>
<td>35</td>
<td>120</td>
<td>8</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

SOT-100 (see Fig. 1)
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)
Collector-emitter voltage ($R_{BE} = 50 \, \Omega$) (open base)
Emitter-base voltage (open collector)
Collector current
Total power dissipation
Storage temperature
Junction temperature
Soldering temperature

at 0,1 mm from case; $t_{sld} \leq 10 \, s$

THERMAL RESISTANCE

From junction to case

$$ R_{th \, j-c} = 180 \, K/W $$
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an SOT-100 metal ceramic package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ$C in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>4</td>
<td>15</td>
<td>30</td>
<td>90</td>
<td>6,5</td>
<td>$8 + j28$</td>
<td>$10 + j28$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

SOT-100 (see Fig. 1)
MECHANICAL DATA

Fig. 1 SOT-100.

Dimensions in mm

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td>V_{CBO}</td>
<td>max. 30 V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>V_{CE}</td>
<td>max. 25 V</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td>V_{E}</td>
<td>max. 15 V</td>
</tr>
<tr>
<td>Collector current</td>
<td>I_C</td>
<td>max. 140 mA</td>
</tr>
<tr>
<td>Total power dissipation (T_{mb} = 75 °C)</td>
<td>P_{tot}</td>
<td>max. 700 mW</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_j</td>
<td>-65 to 200 °C</td>
</tr>
<tr>
<td>Soldering temperature at 0.1 mm from case; t_{sld} ≤ 10 s</td>
<td>T_{sld}</td>
<td>max. +235 °C</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE
From junction to case

R_{th j-c} = 180 K/W
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{case} = 25 \degree C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$Z_{i}$ (Ω)</th>
<th>$Z_{L}$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>4</td>
<td>15</td>
<td>25</td>
<td>typ. 110</td>
<td>typ. 9,5</td>
<td>typ. 7 + j22</td>
<td>typ. 10 + j38</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning:
1 = collector
2 = emitter
3 = base
4 = emitter

Marking code
R8 = LAE4001R
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC134).

Collector-base voltage (open emitter)
Collector-emitter voltage
\((R_{BE} = 220 \ \Omega)\)
(open base)
Emitter-base voltage (open collector)
Collector current (d.c.)
Total power dissipation up to \(T_{case} = 100 \degree C\)
Storage temperature
Junction temperature
Lead soldering temperature
at 0,1 mm from the case; \(t_{slid} \leq 10 \text{s}\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(V_{CBO})</td>
<td>max. 30 V</td>
</tr>
<tr>
<td>(V_{CER})</td>
<td>max. 25 V</td>
</tr>
<tr>
<td>(V_{CEO})</td>
<td>max. 16 V</td>
</tr>
<tr>
<td>(V_{EBO})</td>
<td>max. 2 V</td>
</tr>
<tr>
<td>(I_C)</td>
<td>max. 80 mA</td>
</tr>
<tr>
<td>(P_{tot})</td>
<td>max. 480 mW</td>
</tr>
<tr>
<td>(T_{stg})</td>
<td>-65 to +200 \degree C</td>
</tr>
<tr>
<td>(T_J)</td>
<td>max. 200 \degree C</td>
</tr>
<tr>
<td>(T_{slid})</td>
<td>max. 235 \degree C</td>
</tr>
</tbody>
</table>

**Fig. 2** D.C. SOAR at \(T_{case} \leq 100 \degree C\); \(R_{BE} < 220 \ \Omega\).

**Fig. 3** Power derating curve vs. temperature.

**THERMAL RESISTANCE**
From junction to case

\[ R_{th \ j-c} = 210^6 \text{K/W}^* \]

*K/W is SI unit for \degree C/W.
CHARACTERISTICS

$T_{\text{case}} = 25 \, ^\circ\text{C}$

Collector cut-off current

$\begin{align*}
I_E = 0; \quad V_{CB} &= 15 \, V \\
I_E = 0; \quad V_{CB} &= 30 \, V \\
V_{CB} = 25 \, V; \quad R_{\text{BE}} &= 220 \, \Omega
\end{align*}$

$\begin{align*}
I_{CBO} &< 100 \, \text{nA} \\
I_{CBO} &< 100 \, \mu\text{A} \\
I_{\text{CER}} &< 500 \, \mu\text{A}
\end{align*}$

Emitter cut-off current

$\begin{align*}
I_C = 0; \quad V_{EB} &= 1,5 \, V \\
I_C = 0; \quad V_{EB} &= 2,0 \, V
\end{align*}$

$\begin{align*}
I_{EBO} &< 35 \, \text{nA} \\
I_{EBO} &< 0,15 \, \mu\text{A}
\end{align*}$

D.C. current gain

$\begin{align*}
I_C = 25 \, mA; \quad V_{CE} &= 5 \, V \\
h_{\text{FE}}
\end{align*}$

$\begin{align*}
&20 \text{ to } 220
\end{align*}$

Collector-base capacitance at $f = 1 \, \text{MHz}$

$\begin{align*}
I_E = I_C = 0; \quad V_{CB} &= 15 \, V; \quad V_{EB} = 1,5 \, V
\end{align*}$

$\begin{align*}
C_{cb} &\text{ typ. } 0,25 \, \text{pF}
\end{align*}$

Collector-emitter capacitance at $f = 1 \, \text{MHz}$

$\begin{align*}
I_E = I_C = 0; \quad V_{CE} &= 15; \quad V_{EB} = 1,5 \, V
\end{align*}$

$\begin{align*}
C_{ce} &\text{ typ. } 0,5 \, \text{pF}
\end{align*}$

Emitter-base capacitance at $f = 1 \, \text{MHz}$

$\begin{align*}
I_E = I_C = 0; \quad V_{EB} &= 1,0 \, V; \quad V_{CB} = 15 \, V
\end{align*}$

$\begin{align*}
C_{eb} &\text{ typ. } 1,3 \, \text{pF}
\end{align*}$

Forward power gain

$\begin{align*}
I_C = 25 \, mA; \quad V_{CE} &= 15 \, V; \quad f = 2 \, \text{GHz} \\
I_C = 25 \, mA; \quad V_{CE} &= 15 \, V; \quad f = 4 \, \text{GHz}
\end{align*}$

$\begin{align*}
|S_{\text{fe}}|^2 &\text{ typ. } 9,6 \, \text{dB} \\
|S_{\text{fe}}|^2 &\text{ typ. } 3,8 \, \text{dB}
\end{align*}$

Maximum available gain

$\begin{align*}
I_C = 25 \, mA; \quad V_{CE} &= 15 \, V; \quad f = 2 \, \text{GHz} \\
I_C = 25 \, mA; \quad V_{CE} &= 15 \, V; \quad f = 4 \, \text{GHz}
\end{align*}$

$\begin{align*}
G_{AM} &\text{ typ. } 16 \, \text{dB} \\
G_{AM} &\text{ typ. } 10 \, \text{dB}
\end{align*}$
**s-parameters (common emitter)**

Typical values; $V_{CE} = 15$ V; $I_C = 25$ mA; $T_{case} = 25^\circ$C; $Z_0 = 50$ Ω

<table>
<thead>
<tr>
<th>f MHz</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0,63/−165°</td>
<td>0,014(−37,1)/47°</td>
<td>10,7 (20,6)/ 101°</td>
<td>0,59/− 28°</td>
</tr>
<tr>
<td>600</td>
<td>0,64/−171°</td>
<td>0,015(−36,2)/47°</td>
<td>9,01(19,1)/ 96°</td>
<td>0,58/− 29°</td>
</tr>
<tr>
<td>700</td>
<td>0,65/−177°</td>
<td>0,018(−35,1)/47°</td>
<td>8,03(18,1)/ 89°</td>
<td>0,56/− 30°</td>
</tr>
<tr>
<td>800</td>
<td>0,65/ 180°</td>
<td>0,019(−34,5)/47°</td>
<td>7,08(17,0)/ 84°</td>
<td>0,55/− 31°</td>
</tr>
<tr>
<td>900</td>
<td>0,65/ 176°</td>
<td>0,021(−33,7)/48°</td>
<td>6,31(16,0)/ 80°</td>
<td>0,54/− 32°</td>
</tr>
<tr>
<td>1000</td>
<td>0,66/ 172°</td>
<td>0,023(−32,9)/49°</td>
<td>5,75(15,2)/ 76°</td>
<td>0,53/− 34°</td>
</tr>
<tr>
<td>1200</td>
<td>0,67/ 167°</td>
<td>0,026(−31,8)/60°</td>
<td>4,85(13,7)/ 69°</td>
<td>0,53/− 37°</td>
</tr>
<tr>
<td>1400</td>
<td>0,67/ 163°</td>
<td>0,030(−30,5)/60°</td>
<td>4,17(12,4)/ 62°</td>
<td>0,52/− 41°</td>
</tr>
<tr>
<td>1600</td>
<td>0,67/ 155°</td>
<td>0,034(−29,3)/50°</td>
<td>3,67(11,3)/ 56°</td>
<td>0,52/− 44°</td>
</tr>
<tr>
<td>1800</td>
<td>0,67/ 150°</td>
<td>0,038(−28,4)/51°</td>
<td>3,31(10,4)/ 50°</td>
<td>0,52/− 49°</td>
</tr>
<tr>
<td>2000</td>
<td>0,68/ 146°</td>
<td>0,043(−27,4)/50°</td>
<td>3,02( 9,6)/ 45°</td>
<td>0,52/− 53°</td>
</tr>
<tr>
<td>2500</td>
<td>0,70/ 134°</td>
<td>0,053(−25,5)/47°</td>
<td>2,46( 7,8)/ 31°</td>
<td>0,52/− 64°</td>
</tr>
<tr>
<td>3000</td>
<td>0,72/ 123°</td>
<td>0,064(−23,9)/43°</td>
<td>2,05 ( 6,2)/ 18°</td>
<td>0,51/− 76°</td>
</tr>
<tr>
<td>3500</td>
<td>0,74/ 113°</td>
<td>0,075(−22,5)/38°</td>
<td>1,76 ( 4,9)/ 3°</td>
<td>0,50/− 90°</td>
</tr>
<tr>
<td>4000</td>
<td>0,76/ 104°</td>
<td>0,085(−21,4)/33°</td>
<td>1,55 ( 3,8)/ −11°</td>
<td>0,50/−105°</td>
</tr>
<tr>
<td>4500</td>
<td>0,77/  95°</td>
<td>0,095(−20,2)/26°</td>
<td>1,37 ( 2,7)/ −23°</td>
<td>0,51/−123°</td>
</tr>
<tr>
<td>5000</td>
<td>0,79/  88°</td>
<td>0,107(−19,4)/19°</td>
<td>1,19 ( 1,5)/ −35°</td>
<td>0,52/−141°</td>
</tr>
<tr>
<td>5500</td>
<td>0,80/  81°</td>
<td>0,120(−18,4)/12°</td>
<td>1,06 ( 0,5)/ −48°</td>
<td>0,57/−158°</td>
</tr>
<tr>
<td>6000</td>
<td>0,80/  75°</td>
<td>0,133(−17,5)/ 6°</td>
<td>0,96(−0,4)/ −60°</td>
<td>0,62/−173°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
Microwave linear power transistor

APPLICATION INFORMATION

R.F. performance up to $T_{case} = 25^\circ C$ in an unneutralized common-emitter class-A circuit *

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}^{(1)}$ V</th>
<th>$I_C^{(1)}$ mA</th>
<th>$P_{L1}^{(2)}$ mW(dBm)</th>
<th>$G_{po}^{(3)}$ dB</th>
<th>$\bar{z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>4</td>
<td>15</td>
<td>25</td>
<td>&gt; 85(19,3) typ. 110(20,4)</td>
<td>&gt; 8,5 typ. 9,5</td>
<td>typ.7+j22</td>
<td>typ.10+j38</td>
</tr>
</tbody>
</table>

Notes
1 $I_C$ and $V_{CE}$ regulated.
2 Load power for 1 dB compressed power gain.
3 Low-level power gain associated with $P_{L1}$.

Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,54$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.
Fig. 5  \( V_{CE} = 15 \text{ V}; I_C = 25 \text{ mA}; f = 4 \text{ GHz}; T_{case} = 25^\circ \text{C} \).

Fig. 6  \( V_{CE} = 15 \text{ V}; I_C = 25 \text{ mA}; f = 4 \text{ GHz}; \)  maximum low-level linear power gain.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for common-emitter class-A linear power amplifiers up to 4 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f (GHz)</th>
<th>V_{CE} (V)</th>
<th>I_C (mA)</th>
<th>P_L1 (mW)</th>
<th>G_{po} (dB)</th>
<th>\overline{Z}_i (\Omega)</th>
<th>\overline{Z}_L (\Omega)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>4</td>
<td>18</td>
<td>30</td>
<td>typ. 160</td>
<td>typ. 8</td>
<td>typ. 4 + j23</td>
<td>typ. 6,5 + j32</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning:
1 = collector
2 = emitter
3 = base
4 = emitter

Marking code
R9 = LAE4002S
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage

(open base)

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to $T_{case} = 75 \, ^\circ C$

Storage temperature

Junction temperature

Lead soldering temperature

at 0,1 mm from the case; $t_{sld} \leq 10 \, s$

Fig. 2 D.C. SOAR at $T_{case} \leq 75 \, ^\circ C$; $R_{BE} < 220 \, \Omega$.

THERMAL RESISTANCE

From junction to case

$R_{th \, j-c} = 200 \, K/W^*$

* K/W is SI unit for $^\circ C/W$.
Microwave linear power transistor

**LAE4002S**

**CHARACTERISTICS**

\( T_{\text{case}} = 25 \, ^\circ\text{C} \)

**Collector cut-off current**

- \( I_C = 0; \, V_{CB} = 20 \, \text{V} \)
- \( I_C = 0; \, V_{CB} = 40 \, \text{V} \)
- \( V_{CB} = 35 \, \text{V}; \, R_{BE} = 220 \, \Omega \)

**Emitter cut-off current**

- \( I_E = 0; \, V_{EB} = 1,5 \, \text{V} \)
- \( I_E = 0; \, V_{EB} = 3,0 \, \text{V} \)

**D.C. current gain**

- \( I_C = 30 \, \text{mA}; \, V_{CE} = 5 \, \text{V} \)

**Collector-base capacitance at \( f = 1 \, \text{MHz} \)**

- \( I_E = I_C = 0; \, V_{CB} = 18 \, \text{V}; \, V_{EB} = 1,5 \, \text{V} \)

**Collector-emitter capacitance at \( f = 1 \, \text{MHz} \)**

- \( I_E = I_C = 0; \, V_{CE} = 18 \, \text{V}; \, V_{EB} = 1,5 \, \text{V} \)

**Emitter-base capacitance at \( f = 1 \, \text{MHz} \)**

- \( I_E = I_C = 0; \, V_{EB} = 1,0 \, \text{V}; \, V_{CB} = 18 \, \text{V} \)

**Forward power gain**

- \( I_C = 30 \, \text{mA}; \, V_{CE} = 18 \, \text{V}; \, f = 2 \, \text{GHz} \)
- \( I_C = 30 \, \text{mA}; \, V_{CE} = 18 \, \text{V}; \, f = 4 \, \text{GHz} \)

**Maximum available gain**

- \( I_C = 30 \, \text{mA}; \, V_{CE} = 18 \, \text{V}; \, f = 2 \, \text{GHz} \)
- \( I_C = 30 \, \text{mA}; \, V_{CE} = 18 \, \text{V}; \, f = 3 \, \text{GHz} \)

---

- \( I_{CBO} < 100 \, \text{nA} \)
- \( I_{CBO} < 150 \, \mu\text{A} \)
- \( I_{CER} < 500 \, \mu\text{A} \)
- \( I_{EBO} < 50 \, \text{nA} \)
- \( I_{EBO} < 25 \, \mu\text{A} \)

- \( h_{FE} \) 15 to 150

- \( C_{cb} \) typ. 0,3 \, \text{pF}

- \( C_{ce} \) typ. 0,55 \, \text{pF}

- \( C_{eb} \) typ. 1,8 \, \text{pF}

- \( |s_{fe}|^2 \) typ. 8,8 \, \text{dB}
- \( |s_{fe}|^2 \) typ. 2,8 \, \text{dB}

- \( G_{AM} \) typ. 14 \, \text{dB}
- \( G_{AM} \) typ. 11 \, \text{dB}
s-parameters (common emitter)

Typical values; $V_{CE} = 18\,V$; $I_C = 30\,mA$; $T_{case} = 25\,^\circ C$; $Z_0 = 50\,\Omega$

<table>
<thead>
<tr>
<th>$f$ (MHz)</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0,63/−153°</td>
<td>0,023(−32,7)/38°</td>
<td>9,89(19,9)/98°</td>
<td>0,55/−34°</td>
</tr>
<tr>
<td>600</td>
<td>0,63/−161°</td>
<td>0,024(−32,2)/38°</td>
<td>8,22(18,3)/94°</td>
<td>0,53/−35°</td>
</tr>
<tr>
<td>700</td>
<td>0,63/−168°</td>
<td>0,026(−31,6)/38°</td>
<td>7,33(17,3)/87°</td>
<td>0,51/−36°</td>
</tr>
<tr>
<td>800</td>
<td>0,64/−173°</td>
<td>0,028(−30,9)/38°</td>
<td>6,46(16,2)/82°</td>
<td>0,50/−37°</td>
</tr>
<tr>
<td>900</td>
<td>0,64/−177°</td>
<td>0,030(−30,4)/38°</td>
<td>5,82(15,3)/78°</td>
<td>0,50/−38°</td>
</tr>
<tr>
<td>1000</td>
<td>0,64/−179°</td>
<td>0,032(−29,9)/40°</td>
<td>5,25(14,4)/74°</td>
<td>0,49/−40°</td>
</tr>
<tr>
<td>1200</td>
<td>0,64/−172°</td>
<td>0,035(−29,0)/40°</td>
<td>4,47(13,0)/66°</td>
<td>0,48/−44°</td>
</tr>
<tr>
<td>1400</td>
<td>0,65/−165°</td>
<td>0,039(−28,1)/41°</td>
<td>3,80(11,6)/59°</td>
<td>0,48/−49°</td>
</tr>
<tr>
<td>1600</td>
<td>0,65/−159°</td>
<td>0,044(−27,1)/41°</td>
<td>3,35(10,5)/52°</td>
<td>0,48/−53°</td>
</tr>
<tr>
<td>1800</td>
<td>0,65/−154°</td>
<td>0,048(−26,3)/41°</td>
<td>3,02(9,6)/46°</td>
<td>0,48/−59°</td>
</tr>
<tr>
<td>2000</td>
<td>0,66/−147°</td>
<td>0,053(−25,5)/40°</td>
<td>2,75(8,8)/40°</td>
<td>0,48/−64°</td>
</tr>
<tr>
<td>2500</td>
<td>0,67/−134°</td>
<td>0,064(−23,9)/37°</td>
<td>2,24(7,0)/25°</td>
<td>0,48/−77°</td>
</tr>
<tr>
<td>3000</td>
<td>0,70/−122°</td>
<td>0,076(−22,4)/33°</td>
<td>1,84(5,3)/21°</td>
<td>0,48/−91°</td>
</tr>
<tr>
<td>3500</td>
<td>0,71/−111°</td>
<td>0,088(−21,1)/28°</td>
<td>1,58(4,0)/−4°</td>
<td>0,48/−108°</td>
</tr>
<tr>
<td>4000</td>
<td>0,73/−101°</td>
<td>0,10(−19,9)/22°</td>
<td>1,38(2,8)/−12°</td>
<td>0,50/−125°</td>
</tr>
<tr>
<td>4500</td>
<td>0,75/−92°</td>
<td>0,112(−19,0)/16°</td>
<td>1,21(1,7)/−32°</td>
<td>0,52/−143°</td>
</tr>
<tr>
<td>5000</td>
<td>0,76/−85°</td>
<td>0,125(−18,1)/8°</td>
<td>1,05(0,4)/−45°</td>
<td>0,56/−161°</td>
</tr>
<tr>
<td>5500</td>
<td>0,77/−78°</td>
<td>0,138(−17,2)/2°</td>
<td>0,92(0,7)/−58°</td>
<td>0,61/−178°</td>
</tr>
<tr>
<td>6000</td>
<td>0,77/−71°</td>
<td>0,150(−16,5)/−4°</td>
<td>0,81(−1,8)/−69°</td>
<td>0,67/−168°</td>
</tr>
</tbody>
</table>

Typical values; $V_{CE} = 15\,V$; $I_C = 15\,mA$; $T_{case} = 25\,^\circ C$; $Z_0 = 50\,\Omega$

<table>
<thead>
<tr>
<th>$f$ (MHz)</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0,63/−145°</td>
<td>0,030(−30,5)/36°</td>
<td>9,22(19,3)/103°</td>
<td>0,58/−38°</td>
</tr>
<tr>
<td>600</td>
<td>0,63/−154°</td>
<td>0,031(−30,1)/35°</td>
<td>7,76(17,8)/97°</td>
<td>0,56/−39°</td>
</tr>
<tr>
<td>700</td>
<td>0,63/−161°</td>
<td>0,033(−29,6)/33°</td>
<td>6,92(16,8)/90°</td>
<td>0,52/−40°</td>
</tr>
<tr>
<td>800</td>
<td>0,64/−167°</td>
<td>0,035(−29,2)/33°</td>
<td>6,16(15,8)/85°</td>
<td>0,51/−41°</td>
</tr>
<tr>
<td>900</td>
<td>0,64/−172°</td>
<td>0,036(−28,8)/32°</td>
<td>5,56(14,9)/81°</td>
<td>0,50/−42°</td>
</tr>
<tr>
<td>1000</td>
<td>0,64/−177°</td>
<td>0,038(−28,4)/32°</td>
<td>5,01(14,0)/76°</td>
<td>0,49/−44°</td>
</tr>
<tr>
<td>1200</td>
<td>0,65/−176°</td>
<td>0,041(−27,8)/33°</td>
<td>4,26(12,6)/68°</td>
<td>0,48/−48°</td>
</tr>
<tr>
<td>1400</td>
<td>0,65/−170°</td>
<td>0,045(−27,0)/36°</td>
<td>3,67(11,3)/61°</td>
<td>0,47/−53°</td>
</tr>
<tr>
<td>1600</td>
<td>0,65/−162°</td>
<td>0,048(−26,3)/34°</td>
<td>3,23(10,2)/55°</td>
<td>0,47/−57°</td>
</tr>
<tr>
<td>1800</td>
<td>0,65/−157°</td>
<td>0,052(−25,7)/35°</td>
<td>2,92(9,3)/48°</td>
<td>0,47/−63°</td>
</tr>
<tr>
<td>2000</td>
<td>0,66/−149°</td>
<td>0,056(−25,0)/33°</td>
<td>2,66(8,5)/42°</td>
<td>0,47/−67°</td>
</tr>
<tr>
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<td>0,67/−136°</td>
<td>0,066(−23,6)/32°</td>
<td>2,14(6,6)/26°</td>
<td>0,47/−80°</td>
</tr>
<tr>
<td>3000</td>
<td>0,69/−124°</td>
<td>0,076(−22,3)/28°</td>
<td>1,78(5,0)/12°</td>
<td>0,47/−95°</td>
</tr>
<tr>
<td>3500</td>
<td>0,71/−112°</td>
<td>0,089(−21,0)/24°</td>
<td>1,53(3,7)/−2°</td>
<td>0,47/−112°</td>
</tr>
<tr>
<td>4000</td>
<td>0,73/−102°</td>
<td>0,100(−20,0)/20°</td>
<td>1,29(2,2)/−17°</td>
<td>0,49/−130°</td>
</tr>
<tr>
<td>4500</td>
<td>0,75/−93°</td>
<td>0,112(−19,0)/13°</td>
<td>1,16(1,3)/−31°</td>
<td>0,52/−148°</td>
</tr>
<tr>
<td>5000</td>
<td>0,76/−86°</td>
<td>0,125(−18,1)/6°</td>
<td>1,01(0,1)/−43°</td>
<td>0,56/−166°</td>
</tr>
<tr>
<td>5500</td>
<td>0,77/−78°</td>
<td>0,136(−17,3)/0°</td>
<td>0,88(−1,1)/−56°</td>
<td>0,61/−177°</td>
</tr>
<tr>
<td>6000</td>
<td>0,77/−72°</td>
<td>0,148(−16,6)/−7°</td>
<td>0,79(−2,1)/−67°</td>
<td>0,67/−168°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
### Microwave linear power transistor

**s-parameters (common emitter)**

Typical values: $V_{CE} = 18$ V; $I_C = 10$ mA; $T_{case} = 25$ °C; $Z_0 = 50$ Ω

<table>
<thead>
<tr>
<th>MHz</th>
<th>$S_{ie}$</th>
<th>$S_{re}$</th>
<th>$S_{fe}$</th>
<th>$S_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0.65/−135°</td>
<td>0.032(−29.8)/34°</td>
<td>8.41(18.5)/105°</td>
<td>0.64/−34°</td>
</tr>
<tr>
<td>600</td>
<td>0.65/−147°</td>
<td>0.033(−29.5)/33°</td>
<td>7.16(17.1)/100°</td>
<td>0.62/−36°</td>
</tr>
<tr>
<td>700</td>
<td>0.65/−154°</td>
<td>0.036(−28.9)/30°</td>
<td>6.46(16.2)/92°</td>
<td>0.59/−37°</td>
</tr>
<tr>
<td>800</td>
<td>0.65/−161°</td>
<td>0.037(−28.6)/29°</td>
<td>5.68(15.1)/87°</td>
<td>0.57/−38°</td>
</tr>
<tr>
<td>900</td>
<td>0.65/−166°</td>
<td>0.038(−28.3)/28°</td>
<td>5.13(14.2)/82°</td>
<td>0.56/−40°</td>
</tr>
<tr>
<td>1000</td>
<td>0.65/−172°</td>
<td>0.040(−28.0)/28°</td>
<td>4.68(13.4)/78°</td>
<td>0.55/−42°</td>
</tr>
<tr>
<td>1200</td>
<td>0.65/−180°</td>
<td>0.042(−27.5)/29°</td>
<td>3.98(12.0)/69°</td>
<td>0.54/−46°</td>
</tr>
<tr>
<td>1400</td>
<td>0.65/−174°</td>
<td>0.045(−27.0)/29°</td>
<td>3.43(10.7)/62°</td>
<td>0.53/−50°</td>
</tr>
<tr>
<td>1600</td>
<td>0.65/−165°</td>
<td>0.048(−26.4)/29°</td>
<td>3.06(9.7)/55°</td>
<td>0.53/−55°</td>
</tr>
<tr>
<td>1800</td>
<td>0.66/−159°</td>
<td>0.051(−25.9)/30°</td>
<td>2.75(8.8)/48°</td>
<td>0.53/−61°</td>
</tr>
<tr>
<td>2000</td>
<td>0.67/−152°</td>
<td>0.054(−25.4)/30°</td>
<td>2.49(7.9)/42°</td>
<td>0.53/−65°</td>
</tr>
<tr>
<td>2500</td>
<td>0.68/−138°</td>
<td>0.063(−24.1)/29°</td>
<td>2.02(6.1)/25°</td>
<td>0.53/−78°</td>
</tr>
<tr>
<td>3000</td>
<td>0.69/−125°</td>
<td>0.072(−22.8)/27°</td>
<td>1.67(4.5)/12°</td>
<td>0.52/−93°</td>
</tr>
<tr>
<td>3500</td>
<td>0.71/−114°</td>
<td>0.083(−21.6)/24°</td>
<td>1.44(3.2)/−4°</td>
<td>0.53/−109°</td>
</tr>
<tr>
<td>4000</td>
<td>0.74/−103°</td>
<td>0.095(−20.4)/20°</td>
<td>1.26(2.0)/−19°</td>
<td>0.55/−127°</td>
</tr>
<tr>
<td>4500</td>
<td>0.75/−94°</td>
<td>0.106(−19.5)/14°</td>
<td>1.10(0.8)/−32°</td>
<td>0.57/−145°</td>
</tr>
<tr>
<td>5000</td>
<td>0.76/−86°</td>
<td>0.118(−18.6)/7°</td>
<td>0.94(−0.5)/−44°</td>
<td>0.61/−163°</td>
</tr>
<tr>
<td>5500</td>
<td>0.77/−79°</td>
<td>0.132(−17.6)/0°</td>
<td>0.83(−1.7)/−57°</td>
<td>0.65/−179°</td>
</tr>
<tr>
<td>6000</td>
<td>0.77/−72°</td>
<td>0.145(−16.8)/−6°</td>
<td>0.72(−2.8)/−68°</td>
<td>0.71/168°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
**APPLICATION INFORMATION**

R.F. performance up to $T_{\text{case}} = 25 \, ^{\circ}\text{C}$ in an unneutralized common-emitter class-A circuit*

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{\text{CE}}(1)$ (V)</th>
<th>$I_C(1)$ (mA)</th>
<th>$P_{\text{L1}}(2)$ (mW(dBm))</th>
<th>$G_{\text{Do}}(3)$ (dB)</th>
<th>$Z_I$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>4</td>
<td>18</td>
<td>30</td>
<td>$&gt; 126(21)$ typ. 160(22)</td>
<td>$&gt; 7,5$ typ. 8,0</td>
<td>typ. 4 + j23</td>
<td>typ. 6,5 + j32</td>
</tr>
</tbody>
</table>

**Notes**

1. $I_C$ and $V_{\text{CE}}$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{\text{L1}}$.

---

* Circuit consists of prematching circuit board in combination with input and output slug tuners.

---

[Fig. 4 Prematching test circuit board for 4 GHz. (Dimensions in mm.)]

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,54$); thickness 0,8 mm.

[Fig. 5 $V_{\text{CE}} = 18$ V; $I_C = 30$ mA; $f = 4$ GHz; $T_{\text{case}} = 25 \, ^{\circ}\text{C}$.]
LOW-NOISE MICROWAVE TRANSISTOR

N-P-N transistor for common-emitter class-A low-noise amplifiers up to 4 GHz. Self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}} = 25$ °C in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$F_{\text{min}}$ (dB)</th>
<th>$G_a$ (dB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2</td>
<td>10</td>
<td>4</td>
<td>typ. 1,8</td>
<td>typ. 12</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 SOT-100.

Emitter connected to metallized lid

Pinning:
1 = collector
2 = emitter
3 = base
4 = emitter

Marking code
R7 = LAE6000Q
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134).

Collector-base voltage (open emitter)
Collector-emitter voltage
\( R_{BE} = 150 \, \Omega \)  
(open base)
Emitter-base voltage (open collector)
Collector current (d.c.)
Total power dissipation up to \( T_{case} = 150 \, ^\circ C \)
Storage temperature
Junction temperature
Lead soldering temperature
at 0.1 mm from the case; \( t_{sld} \leq 10 \, s \)

\[
\begin{align*}
V_{CBO} & \quad \text{max.} \quad 25 \, V \\
V_{CER} & \quad \text{max.} \quad 20 \, V \\
V_{CEO} & \quad \text{max.} \quad 12 \, V \\
V_{EBO} & \quad \text{max.} \quad 2 \, V \\
I_C & \quad \text{max.} \quad 15 \, mA \\
P_{tot} & \quad \text{max.} \quad 150 \, mW \\
T_{stg} & \quad -65 \, \text{to} \, +200 \, ^\circ C \\
T_j & \quad \text{max.} \quad 200 \, ^\circ C \\
T_{sld} & \quad \text{max.} \quad 235 \, ^\circ C \\
\end{align*}
\]

Fig. 2 D.C. SOAR at \( T_{case} \leq 150 \, ^\circ C; R_{BE} \leq 150 \, \Omega \).

THERMAL RESISTANCE
From junction to case

\[
R_{th \, j-c} = 300 \, K/W^* 
\]

* K/W is SI unit for °C/W.
CHARACTERISTICS

$T_{case} = 25 \degree C$

Collector cut-off current

$I_E = 0; V_{CB} = 10 V$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 V$

D.C. current gain

$I_C = 4 mA; V_{CE} = 10 V$

Collector-base capacitance at $f = 1$ MHz

$I_E = I_C = 0; V_{CB} = 10 V$

Collector-emitter capacitance at $f = 1$ MHz

$I_E = I_C = 0; V_{CE} = 10 V$

Emitter-base capacitance at $f = 1$ MHz

$I_E = I_C = 0; V_{EB} = 1,0 V; V_{CB} = 10 V$

$|h_{fe}|$ (dB)

$V_{CE} = 10 V; I_C = 4 mA; T_{case} = 25 \degree C; Z_0 = 50 \Omega.$

$|h_{fe}|$ (dB)

$V_{CE} = 10 V; I_C = 8 mA; T_{case} = 25 \degree C; Z_0 = 50 \Omega.$

$LAE6000Q$

$I_{CBO} < 100 nA$

$I_{EBO} < 15 nA$

$h_{FE} \quad 20$ to $250$

$C_{cb} \quad \text{typ. } 0,15 \ \text{pF}$

$C_{ce} \quad \text{typ. } 0,50 \ \text{pF}$

$C_{eb} \quad \text{typ. } 0,70 \ \text{pF}$
### s-parameters (common emitter)

Typical values: $V_{CE} = 10$ V; $I_C = 4$ mA; $T_{case} = 25$ °C; $Z_0 = 50$ Ω

<table>
<thead>
<tr>
<th>$f$ MHz</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0,65/ $-78^\circ$</td>
<td>0,025$(-32,1)/50^\circ$</td>
<td>6,53$(16,4)/126^\circ$</td>
<td>0,83/ $-16^\circ$</td>
</tr>
<tr>
<td>600</td>
<td>0,62/ $-94^\circ$</td>
<td>0,028$(-30,9)/47^\circ$</td>
<td>6,16$(15,8)/121^\circ$</td>
<td>0,83/ $-18^\circ$</td>
</tr>
<tr>
<td>700</td>
<td>0,59/ $-100^\circ$</td>
<td>0,032$(-30,0)/43^\circ$</td>
<td>5,82$(15,3)/113^\circ$</td>
<td>0,83/ $-25^\circ$</td>
</tr>
<tr>
<td>800</td>
<td>0,57/ $-111^\circ$</td>
<td>0,034$(-29,4)/39^\circ$</td>
<td>5,40$(14,6)/107^\circ$</td>
<td>0,80/ $-27^\circ$</td>
</tr>
<tr>
<td>900</td>
<td>0,56/ $-120^\circ$</td>
<td>0,036$(-29,0)/36^\circ$</td>
<td>5,00$(14,0)/101^\circ$</td>
<td>0,79/ $-29^\circ$</td>
</tr>
<tr>
<td>1000</td>
<td>0,55/ $-129^\circ$</td>
<td>0,039$(-28,6)/34^\circ$</td>
<td>4,71$(13,5)/96^\circ$</td>
<td>0,78/ $-31^\circ$</td>
</tr>
<tr>
<td>1200</td>
<td>0,53/ $-143^\circ$</td>
<td>0,040$(-27,9)/32^\circ$</td>
<td>4,19$(12,4)/86^\circ$</td>
<td>0,76/ $-34^\circ$</td>
</tr>
<tr>
<td>1400</td>
<td>0,52/ $-156^\circ$</td>
<td>0,042$(-27,5)/29^\circ$</td>
<td>3,70$(11,4)/77^\circ$</td>
<td>0,74/ $-40^\circ$</td>
</tr>
<tr>
<td>1600</td>
<td>0,51/ $-168^\circ$</td>
<td>0,045$(-26,8)/28^\circ$</td>
<td>3,35$(10,5)/70^\circ$</td>
<td>0,74/ $-41^\circ$</td>
</tr>
<tr>
<td>1800</td>
<td>0,51/ $-176^\circ$</td>
<td>0,047$(-26,5)/28^\circ$</td>
<td>3,04$(9,7)/62^\circ$</td>
<td>0,73/ $-45^\circ$</td>
</tr>
<tr>
<td>2000</td>
<td>0,51/ $-175^\circ$</td>
<td>0,049$(-26,1)/27^\circ$</td>
<td>2,78$(8,9)/56^\circ$</td>
<td>0,73/ $-49^\circ$</td>
</tr>
<tr>
<td>2500</td>
<td>0,51/ $-156^\circ$</td>
<td>0,055$(-25,2)/26^\circ$</td>
<td>2,30$(7,3)/41^\circ$</td>
<td>0,71/ $-57^\circ$</td>
</tr>
<tr>
<td>2000</td>
<td>0,51/ $-139^\circ$</td>
<td>0,062$(-24,2)/24^\circ$</td>
<td>1,95$(5,8)/27^\circ$</td>
<td>0,70/ $-68^\circ$</td>
</tr>
<tr>
<td>3000</td>
<td>0,55/ $-126^\circ$</td>
<td>0,069$(-23,3)/22^\circ$</td>
<td>1,70$(4,6)/12^\circ$</td>
<td>0,70/ $-80^\circ$</td>
</tr>
<tr>
<td>4000</td>
<td>0,57/ $-114^\circ$</td>
<td>0,076$(-22,0)/20^\circ$</td>
<td>1,54$(3,7)/-2^\circ$</td>
<td>0,70/ $-93^\circ$</td>
</tr>
<tr>
<td>5000</td>
<td>0,60/ $-104^\circ$</td>
<td>0,084$(-21,5)/14^\circ$</td>
<td>1,38$(2,8)/-15^\circ$</td>
<td>0,70/ $-108^\circ$</td>
</tr>
<tr>
<td>6000</td>
<td>0,63/ $-87^\circ$</td>
<td>0,105$(-19,6)/3^\circ$</td>
<td>1,11$(0,8)/-42^\circ$</td>
<td>0,71/ $-141^\circ$</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>$f$ MHz</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0,52/ $-111^\circ$</td>
<td>0,019$(-34,6)/47^\circ$</td>
<td>9,43$(19,5)/117^\circ$</td>
<td>0,80/ $-21^\circ$</td>
</tr>
<tr>
<td>600</td>
<td>0,51/ $-126^\circ$</td>
<td>0,020$(-33,9)/45^\circ$</td>
<td>8,19$(18,3)/109^\circ$</td>
<td>0,78/ $-23^\circ$</td>
</tr>
<tr>
<td>700</td>
<td>0,50/ $-134^\circ$</td>
<td>0,022$(-33,1)/43^\circ$</td>
<td>7,53$(17,5)/102^\circ$</td>
<td>0,76/ $-25^\circ$</td>
</tr>
<tr>
<td>800</td>
<td>0,50/ $-143^\circ$</td>
<td>0,024$(-32,5)/42^\circ$</td>
<td>6,70$(16,5)/97^\circ$</td>
<td>0,74/ $-26^\circ$</td>
</tr>
<tr>
<td>900</td>
<td>0,50/ $-150^\circ$</td>
<td>0,025$(-32,0)/42^\circ$</td>
<td>6,17$(15,8)/92^\circ$</td>
<td>0,73/ $-28^\circ$</td>
</tr>
<tr>
<td>1000</td>
<td>0,50/ $-157^\circ$</td>
<td>0,027$(-31,4)/41^\circ$</td>
<td>5,68$(15,1)/87^\circ$</td>
<td>0,73/ $-29^\circ$</td>
</tr>
<tr>
<td>1200</td>
<td>0,50/ $-168^\circ$</td>
<td>0,030$(-30,5)/41^\circ$</td>
<td>4,88$(13,8)/79^\circ$</td>
<td>0,72/ $-33^\circ$</td>
</tr>
<tr>
<td>1400</td>
<td>0,50/ $-176^\circ$</td>
<td>0,033$(-29,7)/43^\circ$</td>
<td>4,22$(12,5)/70^\circ$</td>
<td>0,70/ $-38^\circ$</td>
</tr>
<tr>
<td>1600</td>
<td>0,50/ $-173^\circ$</td>
<td>0,036$(-28,8)/39^\circ$</td>
<td>3,76$(11,5)/64^\circ$</td>
<td>0,70/ $-39^\circ$</td>
</tr>
<tr>
<td>1800</td>
<td>0,50/ $-167^\circ$</td>
<td>0,039$(-28,1)/40^\circ$</td>
<td>3,40$(10,6)/58^\circ$</td>
<td>0,70/ $-43^\circ$</td>
</tr>
<tr>
<td>2000</td>
<td>0,50/ $-160^\circ$</td>
<td>0,042$(-27,5)/41^\circ$</td>
<td>3,08$(9,8)/52^\circ$</td>
<td>0,70/ $-47^\circ$</td>
</tr>
<tr>
<td>2500</td>
<td>0,52/ $-144^\circ$</td>
<td>0,050$(-26,0)/38^\circ$</td>
<td>2,54$(8,1)/38^\circ$</td>
<td>0,69/ $-56^\circ$</td>
</tr>
<tr>
<td>3000</td>
<td>0,54/ $-131^\circ$</td>
<td>0,060$(-24,5)/35^\circ$</td>
<td>2,13$(6,6)/24^\circ$</td>
<td>0,68/ $-66^\circ$</td>
</tr>
<tr>
<td>3500</td>
<td>0,56/ $-119^\circ$</td>
<td>0,068$(-23,3)/32^\circ$</td>
<td>1,86$(5,4)/10^\circ$</td>
<td>0,67/ $-78^\circ$</td>
</tr>
<tr>
<td>4000</td>
<td>0,59/ $-108^\circ$</td>
<td>0,078$(-22,2)/28^\circ$</td>
<td>1,66$(4,4)/-4^\circ$</td>
<td>0,67/ $-91^\circ$</td>
</tr>
<tr>
<td>4500</td>
<td>0,61/ $-99^\circ$</td>
<td>0,086$(-21,3)/22^\circ$</td>
<td>1,48$(3,4)/-17^\circ$</td>
<td>0,67/ $-106^\circ$</td>
</tr>
<tr>
<td>5000</td>
<td>0,63/ $-91^\circ$</td>
<td>0,098$(-20,2)/14^\circ$</td>
<td>1,31$(2,4)/-30^\circ$</td>
<td>0,67/ $-122^\circ$</td>
</tr>
<tr>
<td>5500</td>
<td>0,64/ $-84^\circ$</td>
<td>0,110$(-19,2)/8^\circ$</td>
<td>1,19$(1,5)/-43^\circ$</td>
<td>0,69/ $-139^\circ$</td>
</tr>
<tr>
<td>6000</td>
<td>0,64/ $-77^\circ$</td>
<td>0,119$(-18,5)/2^\circ$</td>
<td>1,07$(0,6)/-56^\circ$</td>
<td>0,73/ $-155^\circ$</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
MICROWAVE LINEAR POWER TRANSISTORS

N-P-N bipolar transistors for use in a common-emitter class-A linear power amplifier up to 1 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile, excellent performance and reliability.

The LBE1004R and LBE1010R have a metal ceramic studless envelope. The LCE1004R and LCE1010R have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$Z_i$</th>
<th>$Z_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBE/LCE1004R</td>
<td>c.w.; linear amplifier</td>
<td>1</td>
<td>15</td>
<td>100</td>
<td>typ. 500</td>
<td>typ. 10</td>
<td>5+j10</td>
<td>25+j25</td>
</tr>
<tr>
<td>LBE/LCE1010R</td>
<td>c.w.; linear amplifier</td>
<td>1</td>
<td>15</td>
<td>200</td>
<td>typ. 1000</td>
<td>typ. 9</td>
<td>4+j9</td>
<td>20+j15</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

Marking code
RTC109 = LBE1004R
RTC143 = LBE1010R

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA (continued)

Fig. 1b LCE1004R and LCE1010R (FO-46).

Marking code
RTC108 = LCE1004R
RTC142 = LCE1010R
Torque on nut: min. 0,75 Nm
0,85 Nm
Diameter of clearance hole
in heatsink: max. 4,2 mm.

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LBE/LCE 1004R</th>
<th>LBE/LCE 1010R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage open emitter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 250 \Omega$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 500 \Omega$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter-base voltage open collector</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector current d.c. peak value; $f &gt; 1 \text{ MHz}$</td>
<td>400 mA</td>
<td>800 mA</td>
</tr>
<tr>
<td>Total power dissipation up to $T_{mb} = 75 \text{ °C}$</td>
<td>3 W</td>
<td>6 W</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-65 to +150 °C</td>
<td></td>
</tr>
<tr>
<td>Operating junction temperature</td>
<td>200 °C</td>
<td></td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td>235 °C</td>
<td></td>
</tr>
<tr>
<td>at 0,3 mm from the case; $t_{slid} = 10 \text{ s}$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold metallization ensure an optimum temperature profile, excellent performance and reliability.

The LBE2003S and LBE2009S have a metal ceramic studless envelope. The LCE2003S and LCE2009S have a metal ceramic capstan envelope.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{no}$ dB</th>
<th>$Z_I$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LBE/LCE2003S c.w.; linear amplifier</td>
<td>2</td>
<td>18</td>
<td>30</td>
<td>typ. 250</td>
<td>typ. 11</td>
<td>6,2 + j30</td>
<td>17,5 + j7</td>
<td></td>
</tr>
<tr>
<td>LBE/LCE2009S c.w.; linear amplifier</td>
<td>2</td>
<td>18</td>
<td>110</td>
<td>typ. 900</td>
<td>typ. 9,8</td>
<td>7,5 + j15</td>
<td>17,5 + j39</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1a LBE2003S and LBE2009S.

FO-45

Marking code

RTC407 = LBE2003S
RTC409 = LBE2009S

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA (continued)

Fig. 1b LCE2003S and LCE2009S.

FO-46

Marking code
RTC406 = LCE2003S
RTC408 = LCE2009S

Torque on nut: min. 0,75 Nm
max. 0,85 Nm

Diameter of clearance hole in
heatsink: max. 4,2 mm.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th></th>
<th>LBE/LCE 2003S</th>
<th>LBE/LCE 2009S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage (open emitter)</td>
<td>VCBO max.</td>
<td>40</td>
</tr>
<tr>
<td>Collector-emitter voltage RBE = 100 Ω</td>
<td>VCER max.</td>
<td>–</td>
</tr>
<tr>
<td>RBE = 220 Ω (open base)</td>
<td>VCER max.</td>
<td>35</td>
</tr>
<tr>
<td>Emitter-base voltage (open collector)</td>
<td>VCEO max.</td>
<td>16</td>
</tr>
<tr>
<td>Collector current (d.c.) Ic max.</td>
<td>90</td>
<td>250</td>
</tr>
<tr>
<td>Total power dissipation up to Tmb = 75 °C</td>
<td>Ptot max.</td>
<td>1,4</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>–65 to + 150</td>
</tr>
<tr>
<td>Operating junction temperature</td>
<td>Tj max.</td>
<td>200</td>
</tr>
<tr>
<td>Lead soldering temperature at 0,3 mm from the case; tsld = 10 s</td>
<td>Tslld max.</td>
<td>235</td>
</tr>
</tbody>
</table>
Microwave linear power transistors

LBE/LCE2003S

Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \, ^\circ\text{C}$.
I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leq 220 \, \Omega$.

LBE/LCE2009S

Fig. 3 Power derating curve vs. mounting base temperature.

Fig. 4 D.C. SOAR at $T_{mb} \leq 75 \, ^\circ\text{C}$.
I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leq 100 \, \Omega$.
THERMAL RESISTANCE

From junction to mounting base
\[ R_{\text{th j-mb}} = 65 \quad \text{K/W*} \]
From mounting base to heatsink
\[ R_{\text{th mb-h}} = 1,5 \quad \text{K/W*} \]

CHARACTERISTICS

\[ T_{\text{mb}} = 25 \, \text{°C} \]

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LBE/LCE 2003S</th>
<th>LBE/LCE 2009S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector cut-off current</td>
<td>( I_C = 0; V_{CB} = 20 , V )</td>
<td>( I_{CBO} &lt; 0,1 )</td>
</tr>
<tr>
<td></td>
<td>( I_C = 0; V_{CB} = 40 , V )</td>
<td>( I_{CBO} &lt; 150 )</td>
</tr>
<tr>
<td></td>
<td>( V_{CB} = 35 , V; R_{BE} = 220 , \Omega )</td>
<td>( I_{CER} &lt; 500 )</td>
</tr>
<tr>
<td></td>
<td>( V_{CB} = 35 , V; R_{BE} = 100 , \Omega )</td>
<td>( I_{CER} &lt; - )</td>
</tr>
</tbody>
</table>

Emitter cut-off current

\( I_C = 0; V_{EB} = 1,5 \, V \)
\[ I_{EBO} < 0,05 \] \( 0,2 \) \( \mu A \)
\( I_C = 0; V_{EB} = 3,0 \, V \)
\[ I_{EBO} < 25 \] \( 50 \) \( \mu A \)

D.C. current gain

\( I_C = 30 \, mA; V_{CE} = 5 \, V \)
\[ h_{FE} > 15 \] \( - \)
\( h_{FE} < 150 \) \( - \)
\( I_C = 110 \, mA; V_{CE} = 5 \, V \)
\[ h_{FE} > - \] \( 15 \)
\[ h_{FE} < - \] \( 150 \)

Collector-base capacitance at \( f = 1 \, MHz \)
\( I_E = I_C = 0; V_{CB} = 18 \, V; V_{EB} = 1,5 \, V \)
\[ C_{cb} \text{ typ.} 0,3 \] \( 0,6 \) \( \text{pF} \)

Collector-emitter capacitance at \( f = 1 \, MHz \)
\( I_E = I_C = 0; V_{CE} = 18 \, V; V_{EB} = 1,5 \, V \)
\[ C_{ce} \text{ typ.} 0,45 \] \( 0,6 \) \( \text{pF} \)

Emitter-base capacitance at \( f = 1 \, MHz \)
\( I_E = I_C = 0; V_{EB} = 1 \, V; V_{CB} = 10 \, V \)
\[ C_{eb} \text{ typ.} 1,7 \] \( 3,3 \) \( \text{pF} \)

* K/W is SI unit for °C/W.
Microwave linear power transistors

s-parameters (common emitter)

**LBE/LCE2003S**: Typical values; $V_{CE} = 18$ V; $I_C = 30$ mA; $T_{mb} = 25$ °C; $Z_0 = 50$ Ω

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{le}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,5</td>
<td>0,56/−143°</td>
<td>0,037 (−28,6)/ 41°</td>
<td>9,50 (19,6)/ 101°</td>
<td>0,56/ −34°</td>
</tr>
<tr>
<td>0,6</td>
<td>0,55/−154°</td>
<td>0,040 (−28,0)/ 39°</td>
<td>8,28 (18,4)/ 93°</td>
<td>0,51/ −35°</td>
</tr>
<tr>
<td>0,7</td>
<td>0,55/−164°</td>
<td>0,040 (−27,9)/ 40°</td>
<td>7,13 (17,1)/ 88°</td>
<td>0,50/ −36°</td>
</tr>
<tr>
<td>0,8</td>
<td>0,55/−171°</td>
<td>0,041 (−27,7)/ 40°</td>
<td>6,35 (16,1)/ 82°</td>
<td>0,49/ −37°</td>
</tr>
<tr>
<td>0,9</td>
<td>0,55/−178°</td>
<td>0,043 (−27,4)/ 41°</td>
<td>5,69 (15,1)/ 77°</td>
<td>0,47/ −38°</td>
</tr>
<tr>
<td>1,0</td>
<td>0,55/−176°</td>
<td>0,045 (−26,9)/ 40°</td>
<td>5,14 (14,2)/ 72°</td>
<td>0,46/ −39°</td>
</tr>
<tr>
<td>1,1</td>
<td>0,55/−170°</td>
<td>0,048 (−26,4)/ 40°</td>
<td>4,72 (13,5)/ 68°</td>
<td>0,46/ −39°</td>
</tr>
<tr>
<td>1,2</td>
<td>0,55/−165°</td>
<td>0,051 (−25,9)/ 41°</td>
<td>4,37 (12,8)/ 64°</td>
<td>0,45/ −41°</td>
</tr>
<tr>
<td>1,3</td>
<td>0,56/−159°</td>
<td>0,056 (−25,1)/ 41°</td>
<td>4,05 (12,2)/ 60°</td>
<td>0,44/ −44°</td>
</tr>
<tr>
<td>1,4</td>
<td>0,55/−168°</td>
<td>0,060 (−24,5)/ 41°</td>
<td>3,76 (11,5)/ 57°</td>
<td>0,45/ −46°</td>
</tr>
<tr>
<td>1,5</td>
<td>0,55/−149°</td>
<td>0,062 (−24,2)/ 40°</td>
<td>3,52 (10,9)/ 53°</td>
<td>0,43/ −48°</td>
</tr>
<tr>
<td>1,6</td>
<td>0,55/−146°</td>
<td>0,065 (−23,8)/ 42°</td>
<td>3,33 (10,5)/ 50°</td>
<td>0,43/ −50°</td>
</tr>
<tr>
<td>1,7</td>
<td>0,56/−142°</td>
<td>0,068 (−23,3)/ 42°</td>
<td>3,15 (10,0)/ 46°</td>
<td>0,43/ −53°</td>
</tr>
<tr>
<td>1,8</td>
<td>0,57/−137°</td>
<td>0,070 (−23,1)/ 41°</td>
<td>2,96 (9,4)/ 42°</td>
<td>0,43/ −54°</td>
</tr>
<tr>
<td>1,9</td>
<td>0,57/−132°</td>
<td>0,072 (−22,9)/ 40°</td>
<td>2,80 (8,9)/ 39°</td>
<td>0,43/ −56°</td>
</tr>
<tr>
<td>2,0</td>
<td>0,58/−128°</td>
<td>0,074 (−22,7)/ 40°</td>
<td>2,66 (8,5)/ 36°</td>
<td>0,42/ −57°</td>
</tr>
<tr>
<td>2,2</td>
<td>0,60/−121°</td>
<td>0,081 (−21,8)/ 39°</td>
<td>2,43 (7,7)/ 33°</td>
<td>0,41/ −61°</td>
</tr>
<tr>
<td>2,4</td>
<td>0,62/−114°</td>
<td>0,089 (−20,8)/ 37°</td>
<td>2,24 (7,0)/ 30°</td>
<td>0,40/ −67°</td>
</tr>
<tr>
<td>2,6</td>
<td>0,64/−108°</td>
<td>0,099 (−20,1)/ 36°</td>
<td>2,08 (6,4)/ 27°</td>
<td>0,39/ −75°</td>
</tr>
<tr>
<td>2,8</td>
<td>0,66/−102°</td>
<td>0,105 (−19,6)/ 33°</td>
<td>1,90 (5,6)/ 24°</td>
<td>0,38/ −82°</td>
</tr>
<tr>
<td>3,0</td>
<td>0,68/ +96°</td>
<td>0,108 (−19,4)/ 31°</td>
<td>1,79 (5,1)/ 20°</td>
<td>0,39/ −87°</td>
</tr>
<tr>
<td>3,2</td>
<td>0,71/ +92°</td>
<td>0,124 (−18,7)/ 29°</td>
<td>1,63 (4,3)/ 17°</td>
<td>0,37/ −94°</td>
</tr>
<tr>
<td>3,4</td>
<td>0,73/ +89°</td>
<td>0,125 (−18,0)/ 27°</td>
<td>1,58 (4,0)/ 15°</td>
<td>0,40/ −101°</td>
</tr>
<tr>
<td>3,6</td>
<td>0,75/ +86°</td>
<td>0,137 (−17,3)/ 25°</td>
<td>1,46 (3,3)/ 13°</td>
<td>0,39/ −112°</td>
</tr>
<tr>
<td>3,8</td>
<td>0,76/ +82°</td>
<td>0,142 (−17,0)/ 23°</td>
<td>1,40 (2,9)/ 11°</td>
<td>0,38/ −120°</td>
</tr>
<tr>
<td>4,0</td>
<td>0,77/ +79°</td>
<td>0,149 (−16,6)/ 20°</td>
<td>1,31 (2,3)/ 9°</td>
<td>0,38/ −128°</td>
</tr>
<tr>
<td>4,2</td>
<td>0,78/ +75°</td>
<td>0,155 (−16,2)/ 17°</td>
<td>1,25 (1,9)/ 7°</td>
<td>0,38/ −133°</td>
</tr>
<tr>
<td>4,4</td>
<td>0,80/ +73°</td>
<td>0,167 (−15,5)/ 15°</td>
<td>1,20 (1,6)/ 5°</td>
<td>0,39/ −142°</td>
</tr>
<tr>
<td>4,6</td>
<td>0,81/ +69°</td>
<td>0,177 (−15,0)/ 12°</td>
<td>1,14 (1,1)/ 5°</td>
<td>0,39/ −151°</td>
</tr>
<tr>
<td>4,8</td>
<td>0,81/ +68°</td>
<td>0,187 (−14,6)/ 10°</td>
<td>1,10 (0,8)/ 4°</td>
<td>0,42/ −159°</td>
</tr>
<tr>
<td>5,0</td>
<td>0,81/ +65°</td>
<td>0,194 (−14,3)/ 6°</td>
<td>1,04 (0,4)/ 4°</td>
<td>0,44/ −165°</td>
</tr>
<tr>
<td>5,2</td>
<td>0,80/ +60°</td>
<td>0,203 (−13,8)/ 4°</td>
<td>1,03 (0,3)/ 2°</td>
<td>0,47/ −169°</td>
</tr>
<tr>
<td>5,4</td>
<td>0,81/ +56°</td>
<td>0,219 (−13,2)/ 1°</td>
<td>0,98 (0,2)/ 2°</td>
<td>0,48/ −175°</td>
</tr>
<tr>
<td>5,6</td>
<td>0,81/ +51°</td>
<td>0,229 (−12,8)/ 0°</td>
<td>0,97 (-0,3)/ 2°</td>
<td>0,49/ +178°</td>
</tr>
<tr>
<td>5,8</td>
<td>0,81/ +48°</td>
<td>0,243 (−12,3)/ 0°</td>
<td>0,92 (-0,7)/ 2°</td>
<td>0,51/ +171°</td>
</tr>
<tr>
<td>6,0</td>
<td>0,80/ +44°</td>
<td>0,245 (−12,2)/ 0°</td>
<td>0,90 (−0,9)/ 2°</td>
<td>0,55/ +165°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

* $V_{CE}$ and $I_C$ regulated.
### s-parameters (common emitter)

**LBE/LCE2009S:** Typical values; $V_{CE} = 18 \text{ V}^*$; $I_C = 110 \text{ mA}^*$; $T_{mb} = 25 \text{°C}$; $Z_0 = 50 \Omega$

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.70/177°</td>
<td>0.029(-30.7)/50°</td>
<td>2.75(17.6)/83°</td>
<td>0.25/ -48°</td>
</tr>
<tr>
<td>0.6</td>
<td>0.70/171°</td>
<td>0.033(-29.6)/51°</td>
<td>2.43(16.2)/77°</td>
<td>0.22/ -50°</td>
</tr>
<tr>
<td>0.7</td>
<td>0.70/168°</td>
<td>0.036(-29.0)/53°</td>
<td>5.46(14.6)/73°</td>
<td>0.23/ -52°</td>
</tr>
<tr>
<td>0.8</td>
<td>0.70/163°</td>
<td>0.039(-28.4)/54°</td>
<td>4.80(13.6)/68°</td>
<td>0.22/ -54°</td>
</tr>
<tr>
<td>0.9</td>
<td>0.71/159°</td>
<td>0.041(-27.8)/54°</td>
<td>4.27(12.6)/64°</td>
<td>0.22/ -56°</td>
</tr>
<tr>
<td>1.0</td>
<td>0.71/155°</td>
<td>0.045(-27.0)/55°</td>
<td>3.84(11.7)/60°</td>
<td>0.21/ -59°</td>
</tr>
<tr>
<td>1.1</td>
<td>0.71/151°</td>
<td>0.049(-26.2)/54°</td>
<td>3.53(11.0)/56°</td>
<td>0.21/ -62°</td>
</tr>
<tr>
<td>1.2</td>
<td>0.71/148°</td>
<td>0.054(-25.4)/54°</td>
<td>3.27(10.3)/52°</td>
<td>0.21/ -65°</td>
</tr>
<tr>
<td>1.3</td>
<td>0.71/144°</td>
<td>0.060(-24.5)/53°</td>
<td>3.01(9.6)/48°</td>
<td>0.20/ -74°</td>
</tr>
<tr>
<td>1.4</td>
<td>0.72/143°</td>
<td>0.066(-23.6)/54°</td>
<td>2.80(9.0)/45°</td>
<td>0.20/ -79°</td>
</tr>
<tr>
<td>1.5</td>
<td>0.72/136°</td>
<td>0.070(-23.1)/52°</td>
<td>2.61(8.3)/41°</td>
<td>0.21/ -80°</td>
</tr>
<tr>
<td>1.6</td>
<td>0.72/133°</td>
<td>0.075(-22.5)/53°</td>
<td>2.47(7.9)/38°</td>
<td>0.21/ -83°</td>
</tr>
<tr>
<td>1.7</td>
<td>0.72/130°</td>
<td>0.080(-21.9)/51°</td>
<td>2.33(7.3)/34°</td>
<td>0.22/ -87°</td>
</tr>
<tr>
<td>1.8</td>
<td>0.73/127°</td>
<td>0.084(-21.5)/49°</td>
<td>2.18(6.8)/30°</td>
<td>0.22/ -90°</td>
</tr>
<tr>
<td>1.9</td>
<td>0.73/123°</td>
<td>0.087(-21.2)/48°</td>
<td>2.05(6.3)/26°</td>
<td>0.22/ -94°</td>
</tr>
<tr>
<td>2.0</td>
<td>0.74/120°</td>
<td>0.090(-20.9)/46°</td>
<td>1.97(5.9)/23°</td>
<td>0.22/ -97°</td>
</tr>
<tr>
<td>2.2</td>
<td>0.75/114°</td>
<td>0.100(-20.0)/43°</td>
<td>1.78(5.0)/15°</td>
<td>0.22/ -109°</td>
</tr>
<tr>
<td>2.4</td>
<td>0.77/108°</td>
<td>0.112(-19.0)/40°</td>
<td>1.63(4.3)/10°</td>
<td>0.21/ -122°</td>
</tr>
<tr>
<td>2.6</td>
<td>0.79/103°</td>
<td>0.123(-18.2)/37°</td>
<td>1.51(3.6)/8°</td>
<td>0.24/ -133°</td>
</tr>
<tr>
<td>2.8</td>
<td>0.80/ 7°</td>
<td>0.129(-17.8)/33°</td>
<td>1.36(2.7)/6°</td>
<td>0.25/ -143°</td>
</tr>
<tr>
<td>3.0</td>
<td>0.81/ 2°</td>
<td>0.134(-17.5)/30°</td>
<td>1.28(2.1)/6°</td>
<td>0.27/ -151°</td>
</tr>
<tr>
<td>3.2</td>
<td>0.83/ 0°</td>
<td>0.143(-16.9)/26°</td>
<td>1.15(1.2)/5°</td>
<td>0.28/ -163°</td>
</tr>
<tr>
<td>3.4</td>
<td>0.85/ 0°</td>
<td>0.152(-16.4)/24°</td>
<td>1.10(0.9)/4°</td>
<td>0.30/ -173°</td>
</tr>
<tr>
<td>3.6</td>
<td>0.86/ 2°</td>
<td>0.163(-15.8)/20°</td>
<td>1.00(0)/3°</td>
<td>0.34/ -178°</td>
</tr>
<tr>
<td>3.8</td>
<td>0.87/ 9°</td>
<td>0.168(-15.5)/17°</td>
<td>0.96(0.4)/2°</td>
<td>0.37/ -179°</td>
</tr>
<tr>
<td>4.0</td>
<td>0.88/ 5°</td>
<td>0.175(-15.2)/14°</td>
<td>0.88(-1.1)/2°</td>
<td>0.41/ +168°</td>
</tr>
<tr>
<td>4.2</td>
<td>0.88/ 7°</td>
<td>0.180(-14.9)/11°</td>
<td>0.83(-1.6)/2°</td>
<td>0.42/ +162°</td>
</tr>
<tr>
<td>4.4</td>
<td>0.89/ 9°</td>
<td>0.193(-14.3)/8°</td>
<td>0.79(-2.1)/2°</td>
<td>0.45/ +155°</td>
</tr>
<tr>
<td>4.6</td>
<td>0.90/ 6°</td>
<td>0.200(-14.0)/5°</td>
<td>0.74(-2.6)/1°</td>
<td>0.48/ +149°</td>
</tr>
<tr>
<td>4.8</td>
<td>0.90/ 4°</td>
<td>0.211(-13.5)/2°</td>
<td>0.71(-3.0)/0°</td>
<td>0.52/ +145°</td>
</tr>
<tr>
<td>5.0</td>
<td>0.90/ 0°</td>
<td>0.214(-13.4)/2°</td>
<td>0.66(-3.6)/0°</td>
<td>0.55/ +144°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.

* $V_{CE}$ and $I_C$ regulated.
Microwave linear power transistors

APPLICATION INFORMATION

Microwave performance in c.w. operation for the LBE/LCE2003S up to $T_{mb} = 25 \, ^\circ\mathrm{C}$ in an unneutralized common-emitter class-A circuit.

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (1) V</th>
<th>$I_{C}$ (1) mA</th>
<th>$P_{L1}$ (2) mW(dBm)</th>
<th>$G_{po}$ (3) dB</th>
<th>$\bar{Z}_i$ (4) Ω</th>
<th>$\bar{Z}_L$ (4) Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>18</td>
<td>30</td>
<td>$\geq 200(23)$ typ. 250(24)</td>
<td>$\geq 10$ typ. 11</td>
<td>6,2 + j30</td>
<td>17,5 + j7</td>
</tr>
</tbody>
</table>

Notes

1. $V_{CE}$ and $I_{C}$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{L1}$.

Fig. 6 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Fig. 7 $V_{CE} = 18 \, V$; $I_{C} = 30 \, mA$; $f = 2 \, GHz$; $T_{mb} = 25 \, ^\circ\mathrm{C}$.

Fig. 8 $V_{CE} = 18 \, V$; class-A operation; $f = 2 \, GHz$; $T_{mb} = 25 \, ^\circ\mathrm{C}$.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.
APPLICATION INFORMATION

Microwave performance in c.w. operation for the LBE/LCE2009S up to $T_{mb} = 25 ^\circ C$ in an unneutralized common-emitter class-A circuit.*

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (1) (V)</th>
<th>$I_C$ (1) (mA)</th>
<th>$P_{L1}$ (2) (mW(dBm))</th>
<th>$G_{po}$ (3) (dB)</th>
<th>$\overline{Z_L}$ (Ω)</th>
<th>$\overline{Z_L}$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>18</td>
<td>100</td>
<td>$\geq 700 (28,5)$</td>
<td>$\geq 9$</td>
<td>$7,5 + j14,5$</td>
<td>$17,5 + j38,5$</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>typ. 900 (29,5)</td>
<td>typ. 9,8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes
1. $V_{CE}$ and $I_C$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{L1}$.

Fig. 9 Prematching test circuit board for 2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r \approx 2,54$); thickness 0,8 mm.

Fig. 10 $V_{CE} = 18$ V; $I_C = 110$ mA; $f = 2$ GHz; $T_{mb} = 25 ^\circ C$.

Fig. 11 $V_{CE} = 18$ V; class-A operation; $f = 2$ GHz; $T_{mb} = 25 ^\circ C$.

* Circuit consists of prematching circuit board in combination with input and output slug tuners.
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2005Q has an FO 45 metal ceramic studless package.

LCE2005Q has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{PO}$ dB</th>
<th>$\tilde{Z}_i$ $\Omega$</th>
<th>$\overline{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>1.65</td>
<td>12</td>
<td>80</td>
<td>400</td>
<td>9</td>
<td>7.5 + j9</td>
<td>18 + j31</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-45 and FO-46 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1a LBE2005Q (FO-45).

Fig. 1b LCE2005Q (FO-46).

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 30 V
Collector-emitter voltage (open base) $V_{CEO}$ max. 16 V
Emitter-base voltage (open collector) $V_{EBO}$ max. 3 V
Collector current $I_C$ max. 200 mA
Total power dissipation (T<sub>mb</sub> ≤ 75°C) $P_{tot}$ max. 1.5 W
Storage temperature $T_{stg}$ -65 to 200 °C
Junction temperature $T_j$ max. 200 °C
Soldering temperature at 0.1 mm from case; $T_{sld}$ ≤ 10 s $T_{sld}$ max. 235 °C

THERMAL RESISTANCE

From junction to mounting base $R_{thj-mb}$ 45 K/W
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

LBE2008T has an FO 45 metal ceramic studless package.
LCE2008T has an FO 46 metal ceramic capstan package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^{\circ}\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$F$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{Po}$ dB</th>
<th>$\bar{z}_I$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>1,65</td>
<td>20</td>
<td>150</td>
<td>1100</td>
<td>8</td>
<td>$4,5 + j14,5$</td>
<td>$12,5 + j38$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-45 and FO-46 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO is not damaged.
MECHANICAL DATA

Fig. 1a LBE2008T (FO-45).

Fig. 1b LCE2008T (FO-46).

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage (R_{BE} = 150 \ \Omega) (open base)

Emitter-base voltage (open collector)

Collector current

Total power dissipation (T_{mb} \leq 75 \ ^\circ C)

Storage temperature

Junction temperature

Soldering temperature at 0,1 mm from case; t_{sld} \leq 10 \ s

THERMAL RESISTANCE

From junction to mounting base

\begin{align*}
V_{CBO} & \quad \text{max.} \quad 30 \ \text{V} \\
V_{CER} & \quad \text{max.} \quad 21 \ \text{V} \\
V_{CEO} & \quad \text{max.} \quad 14 \ \text{V} \\
V_{EBO} & \quad \text{max.} \quad 3 \ \text{V} \\
I_C & \quad \text{max.} \quad 0,3 \ \text{mA} \\
P_{\text{tot}} & \quad \text{max.} \quad 3,5 \ \text{W} \\
T_{\text{stg}} & \quad -65 \ \text{to} \ 200 \ \text{°C} \\
T_j & \quad \text{max.} \quad 200 \ \text{°C} \\
T_{\text{sld}} & \quad \text{max.} \quad 230 \ \text{°C} \\
R_{\text{th \ j-mb}} & \quad 26 \ \text{K/W}
\end{align*}
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 4 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 41A metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to \( T_{mb} = 25 \, ^\circ C \) in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>( f ) GHz</th>
<th>( V_{CE} ) V</th>
<th>( I_C ) mA</th>
<th>( P_L ) mW</th>
<th>( G_{po} ) dB</th>
<th>( \bar{Z}_i ) ( \Omega )</th>
<th>( \bar{Z}_L ) ( \Omega )</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>4</td>
<td>20</td>
<td>65</td>
<td>200</td>
<td>7</td>
<td>50 + j65</td>
<td>2.5 + j6</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-41A (see Fig. 1).

PRODUCT SAFETY

This device contains beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxide disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-41A.

Dimensions in mm

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$
Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base) $V_{CE}$
Emitter-base voltage (open collector) $V_{EBO}$
Collector current $I_C$
Total power dissipation ($T_{mb} \leq 75 \degree C$) $P_{tot}$
Storage temperature $T_{stg}$
Junction temperature $T_j$
Soldering temperature at 0,1 mm from case; $T_{sld} \leq 10 \text{ s}$ $T_{sld}$

THERMAL RESISTANCE
From junction to mounting base $R_{th j-mb}$

VCBO max. 45 V
VCER max. 25 V
VCEO max. 20 V
VEBO max. 3.5 V
IC max. 400 mA
P_{tot} max. 1.5 W
T_{stg} -65 to 200 \degree C
T_j max. 200 \degree C
T_{sld} max. 235 \degree C
R_{th j-mb} 41 K/W
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 1 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A circuit.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\overline{Z_i}$ $\Omega$</th>
<th>$\overline{Z_L}$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>1</td>
<td>15</td>
<td>100</td>
<td>typ. 400</td>
<td>typ. 11</td>
<td>6,5 + j4</td>
<td>13 + j23</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-53.
Emitter connected to flange.

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code
RTC112 = LKE1004R

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage
\[ R_{BE} \leq 500 \, \Omega \]
open base

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to \( T_{mb} = 75 \, ^{\circ}C \)

Storage temperature

Junction temperature

Lead soldering temperature
at 0,3 mm from the case; \( t_{sld} \leq 10 \, s \)

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

\[ \begin{align*}
V_{CBO} & \quad \text{max.} \quad 30 \, V \\
V_{CER} & \quad \text{max.} \quad 30 \, V \\
V_{CEO} & \quad \text{max.} \quad 14 \, V \\
V_{EBO} & \quad \text{max.} \quad 3 \, V \\
I_{C} & \quad \text{max.} \quad 400 \, mA \\
P_{tot} & \quad \text{max.} \quad 3 \, W \\
T_{stg} & \quad -65 \, \text{to} \, +200 \, ^{\circ}C \\
T_{j} & \quad \text{max.} \quad 200 \, ^{\circ}C \\
T_{sld} & \quad \text{max.} \quad 235 \, ^{\circ}C \\
R_{th \, j-mb} & \quad = \quad 30 \, K/W \\
R_{th \, mb-h} & \quad = \quad 0.7 \, K/W
\end{align*} \]
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2</td>
<td>15</td>
<td>70</td>
<td>200</td>
<td>8</td>
<td>5 + j19</td>
<td>10 + j38</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1).

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the beryllium oxyde disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage (open emitter) $V_{CBO}$ max. 45 V
- Collector-emitter voltage ($R_{BE} = 330 \, \Omega$) (open base) $V_{CE}$ max. 20 V
- Emitter-base voltage (open collector) $V_{EB}$ max. 18 V
- Collector current $I_C$ max. 3 V
- Total power dissipation ($T_{mb} \leq 75 \, ^{\circ}C$) $P_{tot}$ max. 80 mA
- Storage temperature $T_{stg}$ -65 to 200 °C
- Junction temperature $T_J$ max. 200 °C
- Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10 \, s$ $T_{sld}$ max. 235 °C

THERMAL RESISTANCE

From junction to mounting base

$R_{th \, j-mb}$ max. 45 K/W
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$\tilde{Z}_i$ (Ω)</th>
<th>$\tilde{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>2</td>
<td>15</td>
<td>140</td>
<td>400</td>
<td>7</td>
<td>$2.5 + j15$</td>
<td>$12 + j23$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 45 V

Collector-emitter voltage ($R_{BE} = 220 \Omega$) (open base) $V_{CER}$ max. 20 V

Emitter-base voltage (open collector) $V_{CEO}$ max. 18 V

Collector current $I_C$ max. 160 mA

Total power dissipation ($T_{mb} \leq 75 \, ^\circ C$) $P_{tot}$ max. 3.0 W

Storage temperature $T_{stg}$ -65 to 200 °C

Junction temperature $T_j$ max. 200 °C

Soldering temperature at 0.1 mm from case; $t_{sld} \leq 10$ s $T_{sld}$ max. 235 °C

THERMAL RESISTANCE

From junction to mounting base $R_{th j-mb}$ 22 K/W
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA
R.F. performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ W</th>
<th>$G_{po}$ dB</th>
<th>$\overline{Z}_i$ Ω</th>
<th>$\overline{Z}_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2</td>
<td>20</td>
<td>200</td>
<td>typ. 1,6</td>
<td>typ. 8</td>
<td>2,5 + j12</td>
<td>4 + j4</td>
</tr>
</tbody>
</table>

MECHANICAL DATA
Fig. 1 FO-53.
Emitter connected to flange

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code
RTC144 = LKE2015T

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage
\( R_{be} = 120 \, \Omega \)
open base

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)

Storage temperature

Junction temperature

Lead soldering temperature
at 0,3 mm from the case; \( t_{sld} \leq 10 \, s \)

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

\begin{align*}
V_{CBO} & \quad \text{max.} \quad 45 \, V \\
V_{CER} & \quad \text{max.} \quad 25 \, V \\
V_{CEO} & \quad \text{max.} \quad 20 \, V \\
V_{EBO} & \quad \text{max.} \quad 3,5 \, V \\
I_C & \quad \text{max.} \quad 800 \, mA \\
P_{tot} & \quad \text{max.} \quad 8 \, W \\
T_{stg} & \quad \text{max.} \quad -65 \, \text{to} \, +200 \, ^\circ C \\
T_j & \quad \text{max.} \quad 200 \, ^\circ C \\
T_{sld} & \quad \text{max.} \quad 235 \, ^\circ C \\
R_{th \, j-mb} & = \quad 11 \, K/W \\
R_{th \, mb-h} & = \quad 0,7 \, K/W
\end{align*}
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.
Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \degree C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\overline{Z_1}$ $\Omega$</th>
<th>$\overline{Z_L}$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2,1</td>
<td>15</td>
<td>140</td>
<td>typ. 600</td>
<td>typ. 10</td>
<td>6 + j8</td>
<td>4 + j8</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-53.
Emitter connected to flange.
Torque on nut: max. 0.5 Nm
Recommended screw: M3

Marking code
RTC146 = LKE21004R

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

March 1985
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 30 V

Collector-emitter voltage $V_{CE}$ max. 20 V
$R_{be} = 500 \, \Omega$

open base $V_{CEO}$ max. 14 V

Emitter-base voltage (open collector) $V_{EBO}$ max. 3 V

Collector current (d.c.) $I_C$ max. 600 mA

Total power dissipation up to $T_{mb} = 75 \, ^\circ C$ $P_{tot}$ max. 2.8 W

Storage temperature $T_{stg}$ -65 to +200 $^\circ C$

Junction temperature $T_j$ max. 200 $^\circ C$

Lead soldering temperature $T_{sld}$ max. 235 $^\circ C$

at 0.3 mm from the case; $t_{sld} \leq 10$ s

**THERMAL RESISTANCE**

From junction to mounting base $R_{th \, j-mb} = 22 \, K/W$

From mounting base to heatsink $R_{th \, mb-h} = 0.7 \, K/W$
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2.1 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ\text{C}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{Po}$ dB</th>
<th>$\bar{Z}_I$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>2.1</td>
<td>20</td>
<td>300</td>
<td>1750</td>
<td>10</td>
<td>$5 + j15$</td>
<td>$3 - j1$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134).

Collector-base voltage (open emitter) $V_{CBO}$ max. 45 V
Collector-emitter voltage ($R_{BE} = 10 \, \Omega$) (open base) $V_{CER}$ max. 40 V
Emitter-base voltage (open collector) $V_{EBO}$ max. 3.5 V
Collector current $I_C$ max. 800 mA
Total power dissipation ($T_{mb} \leq 75 \, ^\circ C$) $P_{tot}$ max. 8 W
Storage temperature $T_{stg}$ -65 to 200 °C
Junction temperature $T_j$ max. 200 °C
Soldering temperature at 0.1 mm from case; $t_{sld} \leq 10$ s $T_{sld}$ max. 235 °C

THERMAL RESISTANCE
From junction to mounting base $R_{th \ j-mb}$ 11 K/W
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier up to 2,1 GHz.
Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.
An internal input matching network facilitates wideband operation.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ A</th>
<th>$P_{L1}$ W</th>
<th>$G_{PD}$ dB</th>
<th>$Z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2,1</td>
<td>20</td>
<td>1,2</td>
<td>typ. 5,5</td>
<td>typ. 9</td>
<td>2,5 + j8</td>
<td>2,5 − j7</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-53.
Emitter connected to flange.

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code
RTC190 = LKE21050T

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

March 1985
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage
\[ R_{be} = 47 \, \Omega \]
open base

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)

Storage temperature

Junction temperature

Lead soldering temperature at 0,3 mm from the case;
\[ t_{sld} \leq 10 \, s \]

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

\[ V_{CBO} \text{ max.} \quad 45 \, V \]
\[ V_{CER} \text{ max.} \quad 40 \, V \]
\[ V_{CEO} \text{ max.} \quad 22 \, V \]
\[ V_{EBO} \text{ max.} \quad 3.5 \, V \]
\[ I_C \text{ max.} \quad 3 \, A \]
\[ P_{tot} \text{ max.} \quad 30 \, W \]
\[ T_{stg} \quad -65 \text{ to } +200 \, ^\circ C \]
\[ T_j \text{ max.} \quad 200 \, ^\circ C \]
\[ T_{sld} \text{ max.} \quad 235 \, ^\circ C \]

\[ R_{th \, j-mb} = 4 \, K/W \]
\[ R_{th \, mb-h} = 0.7 \, K/W \]
MICROWAVE LINEAR POWER TRANSISTOR

NPN transistor for use in a common-emitter class-A linear power amplifier up to 3.3 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold metallization ensure an optimum temperature profile and excellent performance at such frequencies.

QUICK REFERENCE DATA
R.F. performance up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$\bar{Z}_i$ (Ω)</th>
<th>$\bar{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2.7</td>
<td>16</td>
<td>200</td>
<td>typ. 800</td>
<td>typ. 9</td>
<td>4 + j10</td>
<td>4 - j3</td>
</tr>
</tbody>
</table>

MECHANICAL DATA
Fig. 1 F0-53.
Emitter connected to flange.

Marking code:
174 = LKE27010R

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)
Collector-emitter voltage ($R_{BE} \leq 150 \, \Omega$) (open base)
Emitter-base voltage (open collector)
Collector current (d.c.)
Total power dissipation up to $T_{mb} = 75 \, ^\circ C$
Storage temperature
Junction temperature
Lead soldering temperature
at 0.3 mm from the case; $t_{sld} \leq 10 \, s$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CBO}$ (max.)</td>
<td>35 V</td>
</tr>
<tr>
<td>$V_{CER}$ (max.)</td>
<td>25 V</td>
</tr>
<tr>
<td>$V_{CEO}$ (max.)</td>
<td>12 V</td>
</tr>
<tr>
<td>$V_{EBO}$ (max.)</td>
<td>3 V</td>
</tr>
<tr>
<td>$I_C$ (max.)</td>
<td>550 mA</td>
</tr>
<tr>
<td>$P_{tot}$ (max.)</td>
<td>5 W</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>-65 to 200 $^\circ C$</td>
</tr>
<tr>
<td>$T_j$ (max.)</td>
<td>200 $^\circ C$</td>
</tr>
<tr>
<td>$T_{sld}$ (max.)</td>
<td>230 $^\circ C$</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

<table>
<thead>
<tr>
<th>Resistance</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th , j-mb}$</td>
<td>12 K/W</td>
</tr>
<tr>
<td>$R_{th , mb-h}$</td>
<td>0.7 K/W</td>
</tr>
</tbody>
</table>
MICROWAVE LINEAR POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-emitter class-A amplifiers up to 2.7 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-emitter configuration, specified in class-A and operates in c.w. conditions. Internal input prematching ensures good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{\text{mb}} = 25 \, \text{oC}$ in an unneutralized common-emitter class-A selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{\text{CE}}$ V</th>
<th>$I_{\text{C}}$ mA</th>
<th>$P_{\text{L1}}$ W</th>
<th>$G_{\text{PD}}$ dB</th>
<th>$\bar{z}_1$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-A</td>
<td>2.7</td>
<td>16</td>
<td>650</td>
<td>2.5</td>
<td>7</td>
<td>2.5 + j11</td>
<td>2 – j9</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device contains beryllium oxide, the dust of which is toxic. The device is entirely safe, provided that the BeO disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-53.

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage (open emitter) 
  Collector-emitter voltage (RBE = 10 Ω) (open base)
- Emitter-base voltage (open collector)
- Collector current
- Total power dissipation
- Storage temperature
- Junction temperature
- Soldering temperature 
  at 0,1 mm from case; tsld ≤ 10 s

THERMAL RESISTANCE
From junction to mounting base

Dimensions in mm

VCBO  max.  35 V
VCER  max.  35 V
VCEO  max.  15 V
VEBO  max.  3 V
IC  max.  1,5 A
Ptot  max.  15 W
Tstg  −65 to 200 °C
Tj  max.  +200 °C
Tsld  max.  +235 °C

Rth j-mb  6 K/W
MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>type no.</th>
<th>mode of operation</th>
<th>$f_{GHz}$</th>
<th>$V_{CE,\text{V}}$</th>
<th>$I_{C,\text{mA}}$</th>
<th>$P_{L1,\text{mW}}$</th>
<th>$G_{po,\text{dB}}$</th>
<th>$\bar{Z}_1,\text{\Omega}$</th>
<th>$\bar{Z}_L,\text{\Omega}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LKE32002T</td>
<td>c.w.; linear amplifier</td>
<td>3</td>
<td>20</td>
<td>65</td>
<td>typ. 310</td>
<td>typ. 11,2</td>
<td>19 + j44</td>
<td>3,0 + j12</td>
</tr>
<tr>
<td>LKE32004T</td>
<td>c.w.; linear amplifier</td>
<td>3</td>
<td>20</td>
<td>130</td>
<td>typ. 710</td>
<td>typ. 11,0</td>
<td>7,5 + j22</td>
<td>2,5 + j5</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-53.

Emitter connected to flange.

Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC114 = LKE32002T
RTC116 = LKE32004T

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
### RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LKE32002T</th>
<th>LKE32004T</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage open emitter</td>
<td>$V_{CBO}$</td>
<td>max. 45</td>
</tr>
<tr>
<td>Collector-emitter voltage open base</td>
<td>$V_{CE}$</td>
<td>max. 25</td>
</tr>
<tr>
<td>Collector-emitter voltage $R_{BE} = 220 , \Omega$ open base</td>
<td>$V_{CER}$</td>
<td>max. 25</td>
</tr>
<tr>
<td>Emitter-base voltage open collector</td>
<td>$V_{CEO}$</td>
<td>max. 20</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>$V_{EBO}$</td>
<td>max. 3,5</td>
</tr>
<tr>
<td>Total power dissipation up to $T_{mb} = 75 , ^\circ C$</td>
<td>$I_C$</td>
<td>max. 400</td>
</tr>
<tr>
<td>$P_{tot}$ max.</td>
<td></td>
<td>1,5</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{stg}$</td>
<td>−65 to +200</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_{j}$</td>
<td>max. 200</td>
</tr>
<tr>
<td>Lead soldering temperature at 0,3 mm from the case; $t_{sld} = 10 , s$</td>
<td>$T_{sld}$</td>
<td>max. 235</td>
</tr>
<tr>
<td>THERMAL RESISTANCE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>From junction to mounting base</td>
<td>$R_{th , j-mb}$</td>
<td>= 45</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>$R_{th , mb-h}$</td>
<td>= 0,7</td>
</tr>
</tbody>
</table>

118 March 1985
MICROWAVE LINEAR POWER TRANSISTORS

N-P-N transistors for use in a common-emitter class-A linear power amplifier up to 4,2 GHz. Diffused emitter ballasting resistors, self-aligned process entirely ion implanted and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability. An input matching cell improves the input impedance and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A circuit.

<table>
<thead>
<tr>
<th>type no.</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$\bar{z}_i$ $\Omega$</th>
<th>$\bar{z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTE42005S</td>
<td>c.w. linear ampl.</td>
<td>4,2</td>
<td>18</td>
<td>110</td>
<td>typ. 550</td>
<td>typ. 7,2</td>
<td>100 + j40</td>
<td>4 + j4</td>
</tr>
<tr>
<td>LTE42008R</td>
<td>c.w. linear ampl.</td>
<td>4,2</td>
<td>16</td>
<td>250</td>
<td>typ. 940</td>
<td>typ. 7,5</td>
<td>17 + j12</td>
<td>3 – j9</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-41B.

Emitter and metallic cap are connected to the seating plane.

Torque on nut: max. 0,4 Nm

Recommended screw: M2,5

Marking code

RTC502 = LTE42005S
RTC196 = LTE42008R

(1) Flatness of this area ensures full thermal contact with bolt head.

CAUTION These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

August 1985 119
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LTE42005S</th>
<th>LTE42008R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage (open emitter)</td>
<td>V_{CBO} max. 40 V</td>
<td>40 V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>V_{CER} max. 35 V</td>
<td>– V</td>
</tr>
<tr>
<td>R_{BE} = 100 Ω</td>
<td>V_{CER} max. – 20 V</td>
<td></td>
</tr>
<tr>
<td>R_{BE} = 250 Ω</td>
<td>V_{CEO} max. 16 V</td>
<td>16 V</td>
</tr>
<tr>
<td>(open base)</td>
<td>V_{EBO} max. 3 V</td>
<td>3,5 V</td>
</tr>
<tr>
<td>Emitter-base voltage (open collector)</td>
<td>I_C max. 250 mA</td>
<td>450 mA</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>P_{tot} max. 4 W</td>
<td>6 W</td>
</tr>
<tr>
<td>Total power dissipation up to T_{mb} = 75 °C</td>
<td>T_{stg} –65 to +200 °C</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_j max. 200 °C</td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_{slid} max. 235 °C</td>
<td></td>
</tr>
<tr>
<td>Lead soldering temperature at 0,3 mm from the case; t_{slid} = 10 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>LTE42005S</th>
<th>LTE42008R</th>
</tr>
</thead>
<tbody>
<tr>
<td>From junction to mounting base</td>
<td>R_{th\ j-mb} = 36 K/W*</td>
<td>12 K/W*</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>R_{th\ mb-h} = 0,7 K/W*</td>
<td>0,7 K/W*</td>
</tr>
</tbody>
</table>

* K/W is SI unit for °C/W.

September 1982
Microwave linear power transistors

LTE42005S

LTE42005S

(1) Second breakdown limit
(independent of temperature).

Fig. 2 D.C. SOAR at $T_{mb} \leq 75 \, ^\circ C$.
I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leq 100 \, \Omega$.

LTE42008R

(1) Second breakdown limit
(independent of temperature).

Fig. 4 D.C. SOAR at $T_{mb} \leq 75 \, ^\circ C$.
I Region of permissible d.c. operation.
II Permissible extension provided $R_{BE} \leq 250 \, \Omega$.
CHARACTERISTICS

$T_{mb} = 25 \degree C$

<table>
<thead>
<tr>
<th></th>
<th>LTE42005S</th>
<th>LTE42008R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Collector cut-off current</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_E = 0; V_{CB} = 20 , V$</td>
<td>$I_{CBO} &lt; 0,1$</td>
<td>$150 , \mu A$</td>
</tr>
<tr>
<td>$I_E = 0; V_{CB} = 40 , V$</td>
<td>$I_{CBO} &lt; 0,25$</td>
<td>$1 , mA$</td>
</tr>
<tr>
<td><strong>Emitter cut-off current</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_C = 0; V_{EB} = 1,5 , V$</td>
<td>$I_{EBO} &lt; 200$</td>
<td>$400 , nA$</td>
</tr>
<tr>
<td>$I_C = 0; V_{EB} = 3,5 , V$</td>
<td>$I_{EBO} &lt; 50$</td>
<td>$200 , \mu A$</td>
</tr>
<tr>
<td><strong>D.C. current gain</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_C = 110 , mA; V_{CE} = 5 , V$</td>
<td>$h_{FE} &gt; 15$</td>
<td>$-$</td>
</tr>
<tr>
<td>$I_C = 250 , mA; V_{CE} = 5 , V$</td>
<td>$h_{FE} &lt; 150$</td>
<td>$15$</td>
</tr>
<tr>
<td><strong>Collector-base capacitance at $f = 1 , MHz$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_E = I_C = 0; V_{CB} = 20 , V; V_{EB} = 1,5 , V$</td>
<td>$C_{cb}$ typ. 0,5</td>
<td>$-$ pF</td>
</tr>
<tr>
<td>$I_C = I_C = 0; V_{CB} = 16 , V; V_{EB} = 1,5 , V$</td>
<td>$C_{cb}$ typ. $-$</td>
<td>2 pF</td>
</tr>
<tr>
<td><strong>Collector-emitter capacitance at $f = 1 , MHz$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_C = I_E = 0; V_{CE} = 20 , V; V_{EB} = 1,5 , V$</td>
<td>$C_{ce}$ typ. 1,5</td>
<td>$-$ pF</td>
</tr>
<tr>
<td>$I_C = I_E = 0; V_{CE} = 16 , V; V_{EB} = 1,5 , V$</td>
<td>$C_{ce}$ typ. $-$</td>
<td>1,5 pF</td>
</tr>
<tr>
<td><strong>Emitter-base capacitance at $f = 1 , MHz$</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_C = I_E = 0; V_{EB} = 1 , V; V_{CB} = 10 , V$</td>
<td>$C_{eb}$ typ. 6,5</td>
<td>20 pF</td>
</tr>
</tbody>
</table>
Microwave linear power transistors

LTE42005S

**s-parameters (common-emitter)**

\[ V_{CE} = 18 \text{ V} \] regulated; \( T_{mb} = 25 \, ^\circ \text{C} \); \( Z_0 = 50 \, \Omega \); typical values.

<table>
<thead>
<tr>
<th>( f ) GHz</th>
<th>( s_{le} )</th>
<th>( s_{re} )</th>
<th>( s_{fe} )</th>
<th>( s_{oe} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,5</td>
<td>0,76/-176°</td>
<td>0,022(-33,2)/37°</td>
<td>8,13(18,2)/85°</td>
<td>0,35/-62°</td>
</tr>
<tr>
<td>0,6</td>
<td>0,75/-180°</td>
<td>0,023(-32,8)/37°</td>
<td>6,95(16,8)/78°</td>
<td>0,34/-66°</td>
</tr>
<tr>
<td>0,7</td>
<td>0,76/-177°</td>
<td>0,023(-32,8)/40°</td>
<td>5,95(15,5)/73°</td>
<td>0,34/-71°</td>
</tr>
<tr>
<td>0,8</td>
<td>0,76/-174°</td>
<td>0,024(-32,5)/41°</td>
<td>5,25(14,4)/67°</td>
<td>0,35/-75°</td>
</tr>
<tr>
<td>0,9</td>
<td>0,76/-171°</td>
<td>0,024(-32,3)/42°</td>
<td>4,69(13,4)/62°</td>
<td>0,35/-79°</td>
</tr>
<tr>
<td>1,0</td>
<td>0,75/-168°</td>
<td>0,026(-31,8)/43°</td>
<td>4,23(12,5)/57°</td>
<td>0,36/-83°</td>
</tr>
<tr>
<td>1,1</td>
<td>0,75/-165°</td>
<td>0,028(-31,0)/43°</td>
<td>3,88(11,8)/53°</td>
<td>0,37/-87°</td>
</tr>
<tr>
<td>1,2</td>
<td>0,74/-163°</td>
<td>0,031(-30,1)/43°</td>
<td>3,61(11,2)/49°</td>
<td>0,39/-90°</td>
</tr>
<tr>
<td>1,3</td>
<td>0,75/-160°</td>
<td>0,035(-29,2)/43°</td>
<td>3,36(10,5)/44°</td>
<td>0,40/-95°</td>
</tr>
<tr>
<td>1,4</td>
<td>0,74/-162°</td>
<td>0,037(-28,5)/44°</td>
<td>3,12(9,9)/41°</td>
<td>0,43/-98°</td>
</tr>
<tr>
<td>1,5</td>
<td>0,73/-157°</td>
<td>0,041(-27,8)/46°</td>
<td>2,95(9,4)/37°</td>
<td>0,43/-101°</td>
</tr>
<tr>
<td>1,6</td>
<td>0,73/-155°</td>
<td>0,045(-27,0)/46°</td>
<td>2,83(9,0)/32°</td>
<td>0,45/-104°</td>
</tr>
<tr>
<td>1,7</td>
<td>0,71/-154°</td>
<td>0,047(-26,5)/44°</td>
<td>2,70(8,6)/28°</td>
<td>0,47/-107°</td>
</tr>
<tr>
<td>1,8</td>
<td>0,70/-151°</td>
<td>0,049(-26,1)/43°</td>
<td>2,56(8,2)/23°</td>
<td>0,48/-110°</td>
</tr>
<tr>
<td>1,9</td>
<td>0,69/-148°</td>
<td>0,050(-25,9)/42°</td>
<td>2,44(7,7)/19°</td>
<td>0,50/-114°</td>
</tr>
<tr>
<td>2,0</td>
<td>0,68/-143°</td>
<td>0,051(-25,9)/39°</td>
<td>2,34(7,4)/14°</td>
<td>0,51/-116°</td>
</tr>
<tr>
<td>2,2</td>
<td>0,67/-138°</td>
<td>0,058(-24,7)/36°</td>
<td>2,16(6,7)/10°</td>
<td>0,55/-124°</td>
</tr>
<tr>
<td>2,4</td>
<td>0,65/-134°</td>
<td>0,067(-23,5)/34°</td>
<td>2,02(6,1)/ 9°</td>
<td>0,59/-129°</td>
</tr>
<tr>
<td>2,6</td>
<td>0,62/-129°</td>
<td>0,077(-22,3)/31°</td>
<td>1,95(5,8)/ 8°</td>
<td>0,64/-134°</td>
</tr>
<tr>
<td>2,8</td>
<td>0,57/-122°</td>
<td>0,082(-21,7)/25°</td>
<td>1,84(5,3)/ 7°</td>
<td>0,68/-138°</td>
</tr>
<tr>
<td>3,0</td>
<td>0,52/-113°</td>
<td>0,086(-21,3)/21°</td>
<td>1,78(5,0)/ 6°</td>
<td>0,72/-143°</td>
</tr>
<tr>
<td>3,2</td>
<td>0,49/-104°</td>
<td>0,093(-20,6)/16°</td>
<td>1,67(4,5)/ 4°</td>
<td>0,74/-150°</td>
</tr>
<tr>
<td>3,4</td>
<td>0,45/- 99°</td>
<td>0,102(-19,8)/13°</td>
<td>1,62(4,2)/ 3°</td>
<td>0,80/-157°</td>
</tr>
<tr>
<td>3,6</td>
<td>0,38/- 92°</td>
<td>0,113(-18,9)/ 9°</td>
<td>1,52(3,6)/ 2°</td>
<td>0,80/-163°</td>
</tr>
<tr>
<td>3,8</td>
<td>0,29/- 83°</td>
<td>0,119(-18,5)/ 6°</td>
<td>1,43(3,1)/ 1°</td>
<td>0,82/-170°</td>
</tr>
<tr>
<td>4,0</td>
<td>0,24/- 69°</td>
<td>0,137(-17,3)/ 2°</td>
<td>1,27( 2,1)/ 0°</td>
<td>0,80/-179°</td>
</tr>
<tr>
<td>4,2</td>
<td>0,20/- 54°</td>
<td>0,165(-15,7)/ 0°</td>
<td>1,08( 0,7)/ 0°</td>
<td>0,68/+ 119°</td>
</tr>
<tr>
<td>4,4</td>
<td>0,15/+ 28°</td>
<td>0,202(-13,9)/ 0°</td>
<td>0,92( 0,8)/ 0°</td>
<td>0,51/+ 122°</td>
</tr>
<tr>
<td>4,6</td>
<td>0,12/- 36°</td>
<td>0,206(-13,7)/ 0°</td>
<td>0,93( 0,6)/ 0°</td>
<td>0,52/+ 174°</td>
</tr>
<tr>
<td>4,8</td>
<td>0,17/- 86°</td>
<td>0,195(-14,2)/ 0°</td>
<td>0,97( 0,3)/ 0°</td>
<td>0,63/- 171°</td>
</tr>
<tr>
<td>5,0</td>
<td>0,24/-114°</td>
<td>0,177(-15,0)/ 0°</td>
<td>0,97( 0,3)/ 0°</td>
<td>0,73/- 174°</td>
</tr>
<tr>
<td>5,2</td>
<td>0,31/-137°</td>
<td>0,164(-15,7)/ 0°</td>
<td>0,93( 0,6)/ 0°</td>
<td>0,79/- 180°</td>
</tr>
<tr>
<td>5,4</td>
<td>0,41/-152°</td>
<td>0,154(-16,2)/ 0°</td>
<td>0,88( 1,1)/ 0°</td>
<td>0,83/+ 174°</td>
</tr>
<tr>
<td>5,6</td>
<td>0,48/-161°</td>
<td>0,134(-17,4)/ 0°</td>
<td>0,81( 1,8)/ 0°</td>
<td>0,85/+ 166°</td>
</tr>
<tr>
<td>5,8</td>
<td>0,53/-168°</td>
<td>0,122(-18,2)/ 0°</td>
<td>0,77( 2,3)/ 0°</td>
<td>0,87/+ 160°</td>
</tr>
<tr>
<td>6,0</td>
<td>0,56/-179°</td>
<td>0,105(-19,6)/ 0°</td>
<td>0,70( 3,1)/ 0°</td>
<td>0,89/+ 154°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
s-parameters (common-emitter)

\[ V_{CE} = 16 \text{ V} \quad \text{regulated; } T_{mb} = 25 \, ^\circ \text{C}; \quad Z_0 = 50 \, \Omega \quad \text{typical values.} \]

<table>
<thead>
<tr>
<th>f (GHz)</th>
<th>( s_{ie} )</th>
<th>( s_{re} )</th>
<th>( s_{fe} )</th>
<th>( s_{oe} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>0,5</td>
<td>0,91/175°</td>
<td>0,021/(−33,6)/50°</td>
<td>4,25(12,6)/76°</td>
<td>0,42/−177°</td>
</tr>
<tr>
<td>0,6</td>
<td>0,91/173°</td>
<td>0,024/(−32,5)/52°</td>
<td>3,59(11,1)/72°</td>
<td>0,42/−180°</td>
</tr>
<tr>
<td>0,7</td>
<td>0,91/171°</td>
<td>0,027/(−31,4)/53°</td>
<td>3,11(9,9)/68°</td>
<td>0,42/+179°</td>
</tr>
<tr>
<td>0,8</td>
<td>0,90/169°</td>
<td>0,030/(−30,4)/53°</td>
<td>2,75(8,8)/64°</td>
<td>0,42/+178°</td>
</tr>
<tr>
<td>0,9</td>
<td>0,90/167°</td>
<td>0,033/(−34,7)/54°</td>
<td>2,45(7,8)/59°</td>
<td>0,42/+177°</td>
</tr>
<tr>
<td>1,0</td>
<td>0,89/165°</td>
<td>0,036/(−28,8)/53°</td>
<td>2,21(6,9)/55°</td>
<td>0,42/+176°</td>
</tr>
<tr>
<td>1,1</td>
<td>0,88/163°</td>
<td>0,039/(−28,1)/54°</td>
<td>2,02(6,1)/53°</td>
<td>0,43/+174°</td>
</tr>
<tr>
<td>1,2</td>
<td>0,88/162°</td>
<td>0,042/(−27,4)/54°</td>
<td>1,88(5,5)/49°</td>
<td>0,43/+174°</td>
</tr>
<tr>
<td>1,3</td>
<td>0,88/160°</td>
<td>0,046/(−26,8)/53°</td>
<td>1,75(4,9)/46°</td>
<td>0,43/+174°</td>
</tr>
<tr>
<td>1,4</td>
<td>0,89/159°</td>
<td>0,048/(−26,3)/54°</td>
<td>1,64(4,3)/42°</td>
<td>0,43/173°</td>
</tr>
<tr>
<td>1,5</td>
<td>0,89/158°</td>
<td>0,054/(−25,4)/57°</td>
<td>1,55(3,9)/40°</td>
<td>0,43/173°</td>
</tr>
<tr>
<td>1,6</td>
<td>0,89/157°</td>
<td>0,059/(−24,6)/54°</td>
<td>1,52(3,7)/36°</td>
<td>0,43/172°</td>
</tr>
<tr>
<td>1,7</td>
<td>0,89/155°</td>
<td>0,063/(−24,0)/52°</td>
<td>1,47(3,3)/32°</td>
<td>0,43/172°</td>
</tr>
<tr>
<td>1,8</td>
<td>0,88/153°</td>
<td>0,066/(−23,6)/50°</td>
<td>1,40(2,9)/28°</td>
<td>0,44/171°</td>
</tr>
<tr>
<td>2,0</td>
<td>0,88/151°</td>
<td>0,076/(−22,4)/49°</td>
<td>1,30(2,3)/22°</td>
<td>0,44/170°</td>
</tr>
<tr>
<td>2,2</td>
<td>0,87/147°</td>
<td>0,085/(−21,4)/47°</td>
<td>1,23(1,8)/15°</td>
<td>0,46/168°</td>
</tr>
<tr>
<td>2,4</td>
<td>0,87/144°</td>
<td>0,092/(−20,7)/44°</td>
<td>1,16(1,3)/8°</td>
<td>0,47/168°</td>
</tr>
<tr>
<td>2,6</td>
<td>0,86/142°</td>
<td>0,102/(−19,8)/42°</td>
<td>1,15(1,2)/2°</td>
<td>0,49/170°</td>
</tr>
<tr>
<td>2,8</td>
<td>0,85/139°</td>
<td>0,110/(−19,2)/37°</td>
<td>1,11(0,9)/−7°</td>
<td>0,49/170°</td>
</tr>
<tr>
<td>3,0</td>
<td>0,83/135°</td>
<td>0,119/(−18,5)/34°</td>
<td>1,12(1,0)/−15°</td>
<td>0,50/169°</td>
</tr>
<tr>
<td>3,2</td>
<td>0,82/129°</td>
<td>0,125/(−18,1)/29°</td>
<td>1,08(0,7)/−25°</td>
<td>0,54/166°</td>
</tr>
<tr>
<td>3,4</td>
<td>0,81/126°</td>
<td>0,132/(−17,6)/26°</td>
<td>1,08(0,7)/−33°</td>
<td>0,57/165°</td>
</tr>
<tr>
<td>3,6</td>
<td>0,79/122°</td>
<td>0,138/(−17,2)/21°</td>
<td>1,06(0,5)/−44°</td>
<td>0,62/165°</td>
</tr>
<tr>
<td>3,8</td>
<td>0,76/120°</td>
<td>0,143/(−16,9)/19°</td>
<td>1,08(0,6)/−55°</td>
<td>0,65/165°</td>
</tr>
<tr>
<td>4,0</td>
<td>0,73/117°</td>
<td>0,148/(−16,6)/13°</td>
<td>1,07(0,6)/−69°</td>
<td>0,70/160°</td>
</tr>
<tr>
<td>4,2</td>
<td>0,69/115°</td>
<td>0,147/(−16,7)/10°</td>
<td>1,04(0,4)/−85°</td>
<td>0,76/155°</td>
</tr>
<tr>
<td>4,4</td>
<td>0,67/112°</td>
<td>0,147/(−16,6)/7°</td>
<td>1,00(0,0)/−104°</td>
<td>0,83/149°</td>
</tr>
<tr>
<td>4,6</td>
<td>0,67/112°</td>
<td>0,140/(−17,1)/6°</td>
<td>0,88(−1,1)/−122°</td>
<td>0,90/142°</td>
</tr>
<tr>
<td>4,8</td>
<td>0,70/112°</td>
<td>0,147/(−16,7)/9°</td>
<td>0,75(−2,5)/−142°</td>
<td>0,93/134°</td>
</tr>
<tr>
<td>5,0</td>
<td>0,72/114°</td>
<td>0,152/(−16,3)/10°</td>
<td>0,59(−4,6)/−164°</td>
<td>0,92/125°</td>
</tr>
</tbody>
</table>

The figures given between brackets are values in dB.
APPLICATION INFORMATION

R.F. performance in c.w. operation for the LTE42005S up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-emitter class-A circuit*

<table>
<thead>
<tr>
<th>$f$ GHz</th>
<th>$V_{CE}$ (1) V</th>
<th>$I_C$ (1) mA</th>
<th>$P_{L1}$ (2) mW (dBm)</th>
<th>$G_{po}$ (3) dB</th>
<th>$\bar{Z}_i$</th>
<th>$\bar{Z}_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.2</td>
<td>18</td>
<td>110</td>
<td>$\geq 450(26.5)$ typ. $550(27.4)$</td>
<td>$\geq 6.6$ typ. 7.2</td>
<td>100 $+$ j40</td>
<td>4 $+$ j4</td>
</tr>
</tbody>
</table>

Notes
1. $V_{CE}$ and $I_C$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{L1}$.

Fig. 6 Prematching test circuit board for 4.2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.54$); thickness 1.6 mm.
Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ($\varepsilon_r = 2.4$); thickness 0.25 mm.

Fig. 7 Load power as a function of source power. $f = 4.2$ GHz; $T_{mb} = 25 \, ^\circ\text{C}$; $V_{CE} = 18 \, \text{V}$, $I_C = 110 \, \text{mA}$ regulated

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.
APPLICATION INFORMATION

R.F. performance in c.w. operation for the LTE42008R up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-emitter class-A circuit*.

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (1) V</th>
<th>$I_C$ (1) mA</th>
<th>$P_{L1}$ (2) mW (dBm)</th>
<th>$G_{po}$ (3) dB</th>
<th>$\bar{z}_i$ (29)</th>
<th>$\bar{Z}_L$ (3) Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,2</td>
<td>16</td>
<td>250</td>
<td>$\geq 800(29)$ typ.</td>
<td>$\geq 7$ typ.</td>
<td>17 + j12</td>
<td>3 − j9</td>
</tr>
</tbody>
</table>

Notes
1. $V_{CE}$ and $I_C$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{L1}$.

Fig. 8 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,54$); thickness 0,8 mm.
Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ($\varepsilon_r = 2,4$); thickness 0,25 mm.

Fig. 9 Load power as a function of source power at 4,2 GHz.

Fig. 10 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 9 and 10:

$V_{CE} = 16\, V$ / regulated; typical values; $T_{mb} = 25\, ^\circ C$.

$I_C = 250\, mA$ / regulated; typical values; $T_{mb} = 25\, ^\circ C$.

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.
Microwave linear power transistors

LTE42008R

Fig. 11 Load power associated with 1 dB compressed power gain, as a function of collector current.

Fig. 12 Low-level power gain associated with $P_{L1}$ as a function of collector current.

Fig. 13 Input impedance as a function of frequency for $P_{L1}$.

Fig. 14 Optimum load impedance as a function of frequency for $P_{L1}$.

Conditions for Figs 11 and 12:
$V_{CE}$ and $I_C$ regulated; typical values; $T_{mb} = 25$ °C.

Conditions for Figs 13 and 14:
$V_{CE} = 16$ V \quad \{ \text{regulated; typical values; } Z_0 = 50 \Omega; T_{mb} = 25 \text{ °C.} \}$
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to a frequency of 4,2 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ \text{C}$ in an unneutralized common-emitter class-A selective amplifier, typical values.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_{L1}$ mW</th>
<th>$G_{po}$ dB</th>
<th>$I_C$ mA</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>4,2</td>
<td>16</td>
<td>1250</td>
<td>7</td>
<td>400</td>
<td>7,5+j12</td>
<td>4-j8</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-41B (see Fig. 1).

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-41B.

Emitter and metallic cap connected to flange.

Torque on screw: max. 0,4 Nm
Recommended screw: M2,5

Marking code: RTC198

(1) Flatness of this area ensures full thermal contact with bolt head.
Microwave linear power transistor

LTE42012R

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage, open base
R\text{BE} = 70 \Omega

Emitter-base voltage, open collector

Collector current (d.c.)

Total power dissipation up to T_{mb} = 75 \degree C

Storage temperature

Junction temperature

Soldering temperature
at 0,1 mm from ceramic; t_{sld} \leq 10 \text{ s}

Fig. 2 D.C. SOAR; T_{mb} \leq 75 \degree C.
I Region of permissible d.c. operation
II Permissible extension provided
1 R\text{BE} \leq 70 \Omega

THERMAL RESISTANCE
From junction to mounting base

Fig. 3 Power derating curve versus mounting base temperature.

R_{th j-mb} = 10 \text{ K/W}

CHARACTERISTICS
T_{mb} = 25 \degree C unless otherwise specified

Collector cut-off current
I_E = 0; V_CB = 20 V

Emitter cut-off current
I_C = 0; V_EB = 1,5 V

D.C. current gain
I_C = 400 mA; V_CE = 5 V

Collector-base capacitance at f = 1 MHz
I_E = I_C = 0; V_CB = 16 V; V_EB = 1,5 V

\begin{align*}
V_{CBO} & \quad \text{max.} \quad 40 \text{ V} \\
V_{CEO} & \quad \text{max.} \quad 16 \text{ V} \\
V_{CER} & \quad \text{max.} \quad 20 \text{ V} \\
V_{EBO} & \quad \text{max.} \quad 3,5 \text{ V} \\
I_C & \quad \text{max.} \quad 800 \text{ mA} \\
P_{\text{tot}} & \quad \text{max.} \quad 8 \text{ W} \\
T_{\text{stg}} & \quad -65 \text{ to } +200 \text{ °C} \\
T_j & \quad \text{max.} \quad 200 \text{ °C} \\
T_{\text{sld}} & \quad \text{max.} \quad 235 \text{ °C}
\end{align*}

\begin{align*}
I_{CBO} & \quad \leq \quad 200 \mu\text{A} \\
I_{EBO} & \quad \leq \quad 600 \text{ nA} \\
h_{FE} & \quad \text{typ.} \quad 80 \\
C_{cb} & \quad \text{typ.} \quad 3 \text{ pF}
\end{align*}
**s-parameters** (common-emitter)

Typical values; $V_{CE} = 16 \text{ V}$; $I_C = 400 \text{ mA}$; $Z_0 = 50 \text{ }\Omega$; $T_{mb} = 25 ^\circ \text{C}$.

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$s_{ie}$</th>
<th>$s_{re}$</th>
<th>$s_{fe}$</th>
<th>$s_{oe}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5</td>
<td>0.94/176°</td>
<td>0.017(-35.4)/ 43°</td>
<td>2.79( 8.9)/ 81°</td>
<td>0.49/-173°</td>
</tr>
<tr>
<td>0.6</td>
<td>0.94/174°</td>
<td>0.018(-34.7)/ 46°</td>
<td>2.39( 7.6)/ 77°</td>
<td>0.54/-173°</td>
</tr>
<tr>
<td>0.7</td>
<td>0.94/173°</td>
<td>0.019(-34.4)/ 47°</td>
<td>2.07( 6.3)/ 72°</td>
<td>0.52/-176°</td>
</tr>
<tr>
<td>0.8</td>
<td>0.93/172°</td>
<td>0.020(-34.1)/ 49°</td>
<td>1.85( 5.3)/ 68°</td>
<td>0.52/-177°</td>
</tr>
<tr>
<td>0.9</td>
<td>0.93/170°</td>
<td>0.021(-33.8)/ 49°</td>
<td>1.66( 4.4)/ 64°</td>
<td>0.53/-179°</td>
</tr>
<tr>
<td>1.0</td>
<td>0.93/168°</td>
<td>0.022(-33.3)/ 50°</td>
<td>1.50( 3.5)/ 60°</td>
<td>0.53/-179°</td>
</tr>
<tr>
<td>1.1</td>
<td>0.92/167°</td>
<td>0.023(-32.6)/ 50°</td>
<td>1.39( 2.9)/ 57°</td>
<td>0.53/-179°</td>
</tr>
<tr>
<td>1.2</td>
<td>0.93/166°</td>
<td>0.026(-31.6)/ 50°</td>
<td>1.31( 2.4)/ 53°</td>
<td>0.54/-177°</td>
</tr>
<tr>
<td>1.3</td>
<td>0.93/164°</td>
<td>0.029(-30.6)/ 49°</td>
<td>1.23( 1.8)/ 49°</td>
<td>0.54/-176°</td>
</tr>
<tr>
<td>1.4</td>
<td>0.93/167°</td>
<td>0.032(-29.9)/ 54°</td>
<td>1.16( 1.3)/ 48°</td>
<td>0.55/-179°</td>
</tr>
<tr>
<td>1.5</td>
<td>0.93/163°</td>
<td>0.037(-28.7)/ 54°</td>
<td>1.11( 0.9)/ 43°</td>
<td>0.54/-176°</td>
</tr>
<tr>
<td>1.6</td>
<td>0.93/162°</td>
<td>0.040(-27.9)/ 53°</td>
<td>1.07( 0.6)/ 39°</td>
<td>0.55/-175°</td>
</tr>
<tr>
<td>1.7</td>
<td>0.93/161°</td>
<td>0.042(-27.5)/ 51°</td>
<td>1.03( 0.3)/ 35°</td>
<td>0.55/-176°</td>
</tr>
<tr>
<td>1.8</td>
<td>0.92/159°</td>
<td>0.043(-27.3)/ 49°</td>
<td>0.99(-0.1)/ 30°</td>
<td>0.56/-174°</td>
</tr>
<tr>
<td>2.0</td>
<td>0.88/151°</td>
<td>0.046(-26.7)/ 46°</td>
<td>0.99(-0.1)/ 22°</td>
<td>0.56/-170°</td>
</tr>
<tr>
<td>2.2</td>
<td>0.89/148°</td>
<td>0.052(-25.7)/ 43°</td>
<td>0.92(-0.7)/ 14°</td>
<td>0.57/-168°</td>
</tr>
<tr>
<td>2.4</td>
<td>0.90/147°</td>
<td>0.059(-24.6)/ 41°</td>
<td>0.88(-1.1)/ 10°</td>
<td>0.58/-168°</td>
</tr>
<tr>
<td>2.6</td>
<td>0.90/147°</td>
<td>0.069(-23.2)/ 38°</td>
<td>0.90(-0.9)/ 1°</td>
<td>0.59/-168°</td>
</tr>
<tr>
<td>2.8</td>
<td>0.87/142°</td>
<td>0.073(-22.8)/ 32°</td>
<td>0.88(-1.1)/ -8°</td>
<td>0.60/-169°</td>
</tr>
<tr>
<td>3.0</td>
<td>0.83/134°</td>
<td>0.075(-22.5)/ 26°</td>
<td>0.90(-0.9)/ -18°</td>
<td>0.61/-168°</td>
</tr>
<tr>
<td>3.2</td>
<td>0.82/129°</td>
<td>0.077(-22.2)/ 21°</td>
<td>0.87(-1.2)/ -27°</td>
<td>0.63/-166°</td>
</tr>
<tr>
<td>3.4</td>
<td>0.83/130°</td>
<td>0.085(-21.4)/ 19°</td>
<td>0.90(-1.0)/ -37°</td>
<td>0.65/-165°</td>
</tr>
<tr>
<td>3.6</td>
<td>0.80/130°</td>
<td>0.091(-20.8)/ 11°</td>
<td>0.91(-0.8)/ -50°</td>
<td>0.69/-165°</td>
</tr>
<tr>
<td>3.8</td>
<td>0.73/127°</td>
<td>0.091(-20.8)/ 3°</td>
<td>0.94(-0.5)/ -64°</td>
<td>0.74/-164°</td>
</tr>
<tr>
<td>4.0</td>
<td>0.69/122°</td>
<td>0.087(-21.2)/ -7°</td>
<td>0.95(-0.5)/ -82°</td>
<td>0.79/-162°</td>
</tr>
<tr>
<td>4.2</td>
<td>0.67/122°</td>
<td>0.078(-22.2)/ -15°</td>
<td>0.89(-1.0)/ -100°</td>
<td>0.84/-157°</td>
</tr>
<tr>
<td>4.4</td>
<td>0.69/126°</td>
<td>0.071(-23.0)/ -19°</td>
<td>0.83(-1.7)/ -121°</td>
<td>0.89/-150°</td>
</tr>
<tr>
<td>4.6</td>
<td>0.72/130°</td>
<td>0.059(-24.6)/ -18°</td>
<td>0.70(-3.1)/ -141°</td>
<td>0.92/-143°</td>
</tr>
<tr>
<td>4.8</td>
<td>0.76/128°</td>
<td>0.054(-25.4)/ -11°</td>
<td>0.60(-4.4)/ -160°</td>
<td>0.94/-136°</td>
</tr>
</tbody>
</table>

The figures between brackets are values in dB.
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\,^\circ C$ in an unneutralized common-emitter class-A selective circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_{L1}$ (mW)</th>
<th>$G_{po}$ (dB)</th>
<th>$I_C$ (mA)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>4.2</td>
<td>16</td>
<td>&gt; 1000</td>
<td>&gt; 6</td>
<td>400</td>
<td>7.5+j12</td>
<td>4-j8</td>
</tr>
</tbody>
</table>

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass of thickness 0.8 mm at input side and Rexolite fibre-glass of thickness 0.25 mm at the output side.

* Circuit consists of prematching boards in combination with complementary input and output slug tuners.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1.7 GHz to 2.1 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent lifetime
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology.

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ A</th>
<th>$P_L$ W</th>
<th>$G_{Po}$ dB</th>
<th>$\bar{z}_I$ $\Omega$</th>
<th>$Z_I$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>1.7 to 2.1</td>
<td>16</td>
<td>1.1</td>
<td>typ. 5.5</td>
<td>typ. 8</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm
FO-83 (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-83.

Pinning:
1 = collector
2 = base
3 = emitter

Torque on screw: max. 0.4 Nm
Recommended screw: M2.5 or cheesehead 4-40 UNC/2A

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
VCBO max. 40 V

Collector-emitter voltage
open base
RBE = 47 Ω
VCEO max. 15 V
VCER max. 20 V
VEBO max. 3.5 V
IC max. 2 A

Total power dissipation
up to Tmb = 75 °C
Ptot max. 18 W

Storage temperature
Tstg -65 to +200 °C

Junction temperature
Tj max. 200 °C

Soldering temperature
at 0.1 mm from case; tsld ≤ 10 s
Tsld max. 235 °C
Microwave linear power transistor

Fig. 2 D.C. SOAR; $T_{mb} \leq 75^\circ C$.
I Region of permissible d.c. operation
II Permissible extension provided
$R_{BE} \leq 47 \, \Omega$.

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

CHARACTERISTICS
$T_{mb} = 25^\circ C$ unless otherwise specified

Collector cut-off currents
$I_E = 0; V_C = 20 V$
$I_E = 0; V_C = 40 V$
$V_C = 20 V; R_{BE} = 47 \, \Omega$
$V_C = 15 V; I_B = 0$

Emitter cut-off current
$I_C = 0; V_E = 1.5 V$
$I_C = 0; V_E = 3.5 V$

D.C. current gain
$I_C = 1 A; V_C = 3 V$

$R_{th j-mb} = 4 \, K/W$
$R_{th mb-h} = 0.7 \, K/W$

Fig. 3 Power derating curve versus mounting base temperature.

$h_{FE} = 15$ to $100$
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ A</th>
<th>$P_{L1}$ W</th>
<th>$G_{po}$ dB</th>
<th>$\frac{Z_i}{\Omega}$</th>
<th>$\frac{Z_L}{\Omega}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>1,7 to 2,1</td>
<td>16</td>
<td>1,1</td>
<td>$\geq 5$</td>
<td>$\geq 7$</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4 Prematching test circuit board for 1,7 to 2,1 GHz, c.w., class-A application (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass ($\varepsilon_r = 2.5$); thickness 0,8 mm. (Dimensions in mm).
Microwave linear power transistor

Fig. 5 Load power and power gain versus frequency; $V_{CE} = 16$ V; $I_C = 1.1$ A; $V_{CE}$ and $I_C$ regulated.

Fig. 6 Input and optimum load impedances versus frequency; $P_L1 = 5.5$ W; $Z_o = 50$ $\Omega$; typical values.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 2.0 GHz to 2.4 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-emitter class-A wideband amplifier

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (A)</th>
<th>$P_{L1}$ (W)</th>
<th>$G_{po}$ (dB)</th>
<th>$\bar{Z}_i$ (Ω)</th>
<th>$\bar{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2.0 to 2.4</td>
<td>16</td>
<td>1.1</td>
<td>typ. 5</td>
<td>typ. 7</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-83 (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-83.

Pinning:
1 = collector
2 = base
3 = emitter

Torque on screw: max. 0,4 Nm
Recommended screw: M2,5 or cheesehead 4-40 UNC/2A

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage, open base
open base
\[ R_{BE} = 47 \, \Omega \]

Emitter-base voltage, open collector

Collector current (d.c.)

Total power dissipation
up to \( T_{mb} = 75 \, ^\circ C \)

Storage temperature

Junction temperature

Soldering temperature
at 0,1 mm from case; \( t_{sld} \leq 10 \, s \)

Dimensions in mm

Winchester 7Z85688A

\[
\begin{align*}
V_{CBO} & \quad \text{max.} \quad 40 \, V \\
V_{CEO} & \quad \text{max.} \quad 15 \, V \\
V_{CER} & \quad \text{max.} \quad 20 \, V \\
V_{EBO} & \quad \text{max.} \quad 3,5 \, V \\
I_C & \quad \text{max.} \quad 2 \, A \\
P_{tot} & \quad \text{max.} \quad 18 \, W \\
T_{stg} & \quad -65 \text{ to } +200 \, ^\circ C \\
T_j & \quad \text{max.} \quad 200 \, ^\circ C \\
T_{sld} & \quad \text{max.} \quad 235 \, ^\circ C
\end{align*}
\]
Microwave linear power transistor

Fig. 2 D.C. SOAR; T_{mb} ≤ 75 °C.
I Region of permissible d.c. operation
II Permissible extension provided
R_{BE} ≤ 47 Ω.

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

CHARACTERISTICS
T_{mb} = 25 °C unless otherwise specified

Collector cut-off currents
I_E = 0; V_{CB} = 20 V
I_E = 0; V_{CB} = 40 V
V_{CE} = 20 V; R_{BE} = 47 Ω
V_{CE} = 15 V; I_B = 0

Emitter cut-off current
I_C = 0; V_{EB} = 1.5 V
I_C = 0; V_{EB} = 3.5 V

D.C. current gain
I_C = 1 A; V_{CE} = 3 V

Fig. 3 Power derating curve versus mounting base temperature.

\[ P_{\text{tot}} = 0 \text{ W} \]

\[ R_{th j-mb} = 4 \text{ K/W} \]
\[ R_{th mb-h} = 0.7 \text{ K/W} \]

ICBO \( \triangle \) 0.5 mA
ICER \( \triangle \) 25 mA
ICEO \( \triangle \) 2 mA
IEBO \( \triangle \) 100 μA
h_FE \( \triangle \) 15 to 100
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-emitter class-A wideband amplifier.

<table>
<thead>
<tr>
<th>Mode of Operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_{C}$ (A)</th>
<th>$P_{L1}$ (W)</th>
<th>$G_{PD}$ (dB)</th>
<th>$Z_{I}$ ($\Omega$)</th>
<th>$Z_{L}$ ($\Omega$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.W.; class-A</td>
<td>2.0 to 2.4</td>
<td>16</td>
<td>1.1</td>
<td>$\geq 4$</td>
<td>$\geq 6$</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4 Wideband test circuit board, class-A application. (Dimensions in mm).

Striplines on a Cu-clad printed circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.55$), thickness 0.8 mm.
Fig. 5 Load power and power gain versus frequency; \( V_{CE} = 16 \, \text{V} \); \( I_C = 1.1 \, \text{A} \); \( V_{CE} \) and \( I_C \) regulated.

Fig. 6 Input and optimum load impedance versus frequency; \( Z_0 = 50 \, \Omega \); typical values.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear wideband power amplifier from 2.3 to 2.7 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}} = 25^\circ\text{C}$ in an unneutralized wideband common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{\text{CE}}$ (V)</th>
<th>$I_C$ (A)</th>
<th>$P_{\text{L1}}$ (W)</th>
<th>$G_{\text{dp}}$ (dB)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>2.3 to 2.7</td>
<td>16</td>
<td>1</td>
<td>typ. 5</td>
<td>typ. 8</td>
<td>11 + j3</td>
<td>7.5 – j9</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-83.
Metallic cap is connected to the flange

Dimensions in mm

Torque on nut: max. 0.4 Nm
Recommended screw: M2.5

Marking code
RTC2327E40R = LV2327E40R

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage

\[ R_{BE} = 47 \, \Omega \]

open base

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)

Storage temperature

Junction temperature

Lead soldering temperature

at 0,3 mm from the case; \( t_{sld} \leq 10 \, s \)

\[ V_{CBO} \, \text{max.} \quad 40 \, V \]
\[ V_{CER} \, \text{max.} \quad 20 \, V \]
\[ V_{CEO} \, \text{max.} \quad 15 \, V \]
\[ V_{EBO} \, \text{max.} \quad 3,5 \, V \]
\[ I_C \, \text{max.} \quad 2 \, A \]
\[ P_{tot} \, \text{max.} \quad 18 \, W \]
\[ T_{stg} \quad -65 \, \text{to} \quad +200 \, ^\circ C \]
\[ T_j \, \text{max.} \quad 200 \, ^\circ C \]
\[ T_{sld} \, \text{max.} \quad 235 \, ^\circ C \]

(1) Second breakdown limit
(independent of temperature)

Fig. 2 D.C. SOAR at \( T_{mb} \leq 75 \, ^\circ C \).

I Region of permissible d.c. operation.

II Permissible extension provided \( R_{BE} \leq 47 \, \Omega \).

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

\[ R_{th \, j-mb} = 4 \, K/W \]
\[ R_{th \, mb-h} = 0,7 \, K/W \]

Fig. 3 Power derating curve versus mounting base temperature.
Microwave linear power transistor

CHARACTERISTICS

$T_{\text{case}} = 25 \degree \text{C}$ unless otherwise specified

Collector cut-off currents

- $V_{CB} = 20 \text{ V}; I_E = 0$
- $V_{CB} = 40 \text{ V}; I_E = 0$
- $V_{CE} = 15 \text{ V}; R_{BE} = 47 \Omega$
- $V_{CE} = 15 \text{ V}; I_B = 0$

Emitter cut-off current

- $V_{EB} = 1.5 \text{ V}; I_C = 0$
- $V_{EB} = 3.5 \text{ V}; I_C = 0$

D.C. current gain

- $V_{CE} = 3 \text{ V}; I_C = 1 \text{ A}$

APPLICATION INFORMATION

R.F. performance in c.w. operation up to $T_{\text{case}} = 25 \degree \text{C}$ in an unneutralized wideband common-emitter class-A circuit

<table>
<thead>
<tr>
<th>Mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE(1)}$ V</th>
<th>$I_C(1)$ mA</th>
<th>$P_{L1(2)}$ mW</th>
<th>$G_{po(3)}$ dB</th>
<th>$\bar{z}_I$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.W.</td>
<td>2.3 to 2.7</td>
<td>16</td>
<td>1000</td>
<td>$\geq 4000$</td>
<td>$\geq 7$</td>
<td>typ. $11 + j3$</td>
<td>typ. $7.5 - j9$</td>
</tr>
</tbody>
</table>

Notes

1. $V_{CE}$ and $I_C$ regulated.
2. Load power for 1 dB compressed power gain.
3. Low-level power gain associated with $P_{L1}$.

Fig. 4 Prematching test circuit board for 2.3 to 2.7 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.55$); thickness 0.8 mm.
Fig. 5 Load power as a function of source power.

Conditions for Fig. 5:
- $V_{CE} = 16$ V
- $I_C = 1$ A
- regulated; typical values; $T_{case} = 25 \, ^\circ C$.

Fig. 6 Input impedance as a function of frequency for $P_{L1}$.

Conditions for Figs 6 and 7:
- $V_{CE} = 16$ V
- $I_C = 1$ A
- regulated; typical values; $Z_0 = 50 \, \Omega$; $T_{case} = 25 \, ^\circ C$. 

Fig. 7 Optimum load impedance as a function of frequency for $P_{L1}$. 
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 3.7 GHz to 4.2 GHz in c.w. conditions in military and professional applications.

Features:
• Interdigitated structure giving a high emitter efficiency
• Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
• Gold metallization realizing a very good stability of the characteristics and excellent life-time
• Multicell geometry giving good balance of dissipated power and low thermal resistance
• Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
• New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO 83).

QUICK REFERENCE DATA

Microwave performance up to Tmb = 25 °C in an unneutralized common-emitter class-A wideband amplifier

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f GHz</th>
<th>VCE V</th>
<th>IC mA</th>
<th>PL1 W</th>
<th>Gpo dB</th>
<th>Zij Ω</th>
<th>ZL Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>3.7 to 4.2</td>
<td>16</td>
<td>500</td>
<td>typ. 2</td>
<td>typ. 5.5</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-83 (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
**MECHANICAL DATA**

Fig. 1 FO-83.

Pinning:
1 = collector
2 = base
3 = emitter

Torque on screw: max. 0.4 Nm
Recommended screw: M2.5 or 4-40 UNC/2A

**RATINGS**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage, open emitter: $V_{CBO}$ max. 40 V
- Collector-emitter voltage,
  - open base: $V_{CEO}$ max. 16 V
  - $R_{BE} = 10 \, \Omega$

- Emitter-base voltage, open collector: $V_{EBO}$ max. 3.5 V

- Collector current (d.c.): $I_C$ max. 1 A

- Total power dissipation: $P_{tot}$ max. 10 W

- Storage temperature: $T_{stg}$ -65 to +200 °C

- Junction temperature: $T_j$ max. 200 °C

- Soldering temperature:
  - at 0.1 mm from case: $t_{sld}$ ≤ 10 s
  - $T_{sld}$ max. 235 °C
Microwave linear power transistor

Fig. 2 D.C. SOAR; $T_{mb} \leq 75$ °C.
I Region of permissible D.C. operation.
II Permissible extension provided $R_{BE} \leq 10$ Ω.

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

CHARACTERISTICS
$T_{mb} = 25$ °C unless otherwise specified

Collector cut-off currents
$\begin{align*}
I_E &= 0; \quad V_{CB} = 20 \text{ V} \\
I_E &= 0; \quad V_{CB} = 40 \text{ V} \\
V_{CE} &= 28 \text{ V}; \quad R_{BE} = 10 \Omega
\end{align*}$

Emitter cut-off current
$\begin{align*}
I_C &= 0; \quad V_{EB} = 1.5 \text{ V} \\
I_C &= 0; \quad V_{EB} = 3.5 \text{ V}
\end{align*}$

D.C. current gain
$\begin{align*}
I_C &= 0.5 \text{ A}; \quad V_{CB} = 3 \text{ V}
\end{align*}$

Fig. 3 Power derating curve versus mounting base temperature.

$\begin{align*}
R_{thj-mb} &= 6.5 \text{ K/W} \\
R_{thmb-h} &= 0.7 \text{ K/W}
\end{align*}$

$\begin{align*}
I_{CBO} &= 300 \mu\text{A} \\
I_{CBO} &= 2 \text{ mA} \\
I_{CER} &= 20 \text{ mA} \\
I_{EBO} &= 0.8 \mu\text{A} \\
h_{FE} &= 15 \text{ to } 100
\end{align*}$

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APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-emitter class-A wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ W</th>
<th>$G_{po}$ dB</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>3,7 to 4,2</td>
<td>16</td>
<td>500</td>
<td>$\leq 1,6$</td>
<td>$\leq 5,0$</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4 Prematching test circuit board for 3,7 to 4,2 GHz; c.w., class-A application (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with Teflon fibre-glass ($\varepsilon_r = 2.55$), thickness 0.4 mm.
Fig. 5 Load power and power gain versus frequency; $T_{\text{amb}} = 25 \, ^\circ\text{C}$; typical values.

Fig. 6 Input and optimum load impedance versus frequency; $V_{CE} = 16 \, \text{V}$ regulated; $Z_0 = 10 \, \Omega$; typical values.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N transistor for use in a common-emitter class-A linear power amplifier from 3.7 to 4.2 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

An input and output matching cell improves the impedances and facilitates the design of wideband circuits.

QUICK REFERENCE DATA

R.F. performance up to $T_{\text{case}}$ is 25 °C in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{\text{CE}}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ W</th>
<th>$G_{\text{PO}}$ dB</th>
<th>$Z_i$</th>
<th>$Z_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; linear amplifier</td>
<td>3.7 to 4.2</td>
<td>16</td>
<td>800</td>
<td>typ. 2.4</td>
<td>typ. 6.5</td>
<td>$6 + j7.5$</td>
<td>$5.5 - j1$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-83.

Metallic cap is connected to the flange

Torque on nut: max. 0.4 Nm

Recommended screw: M3

Marking code

RTC3742E24R = LV3742E24R

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage
\[ R_{\text{BE}} = 47 \, \Omega \]
open base

Emitter-base voltage (open collector)

Collector current (d.c.)

Total power dissipation up to \( T_{\text{mb}} = 75 \, ^\circ\text{C} \)

Storage temperature

Junction temperature

Lead soldering temperature
at 0.3 mm from the case; \( t_{\text{slid}} \leq 10 \, \text{s} \)

---

1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR at \( T_{\text{mb}} \leq 75 \, ^\circ\text{C} \).

I Region of permissible d.c. operation.

II Permissible extension provided \( R_{\text{BE}} \leq 47 \, \Omega \).

---

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

\[
R_{\text{th j-mb}} = 5 \, \text{K/W} \\
R_{\text{th mb-h}} = 0.7 \, \text{K/W}
\]
CHARACTERISTICS

$T_{\text{case}} = 25 \, ^\circ\text{C}$

Collector cut-off current
$\quad I_E = 0; \, V_{CB} = 20 \, \text{V}$

Emitter cut-off current
$\quad I_C = 0; \, V_{EB} = 1,5 \, \text{V}$

Collector-base capacitance at $f = 1 \, \text{MHz}$
$\quad I_E = I_C = 0; \, V_{CB} = 16 \, \text{V}; \, V_{EB} = 1 \, \text{V}$

Collector-emitter capacitance at $f = 1 \, \text{MHz}$
$\quad I_E = I_C = 0; \, V_{CE} = 16 \, \text{V}; \, V_{EB} = 1 \, \text{V}$

Emitter-base capacitance at $f = 1 \, \text{MHz}$
$\quad I_E = I_C = 0; \, V_{CB} = 16 \, \text{V}; \, V_{EB} = 1 \, \text{V}$

APPLICATION INFORMATION

R.F. performance in c.w. operation up to $T_{\text{case}} = 25 \, ^\circ\text{C}$ in an unneutralized common-emitter class-A circuit

<table>
<thead>
<tr>
<th>$f$ (GHz)</th>
<th>$V_{CE(1)}$ (V)</th>
<th>$I_C(1)$ (mA)</th>
<th>$P_{L1}(2)$ (W (dBm))</th>
<th>$G_{po}(3)$ (dB)</th>
<th>$\overline{Z}_i$ ($\Omega$)</th>
<th>$\overline{Z}_L$ ($\Omega$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,7 to 4,2</td>
<td>16</td>
<td>800</td>
<td>$\geq 2$ (33) typ.</td>
<td>$\geq 5$ typ.</td>
<td>$6 + j7,5$</td>
<td>$5,5 - j1$</td>
</tr>
</tbody>
</table>

Notes
1 $V_{CE}$ and $I_C$ regulated.
2 Load power for 1 dB compressed power gain.
3 Low-level power gain associated with $P_{L1}$.

Fig. 4 Prematching test circuit board for 4,2 GHz. (Dimensions in mm.)

Striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,55$); thickness 0,4 mm.
Fig. 5 Load power as a function of source power.

Fig. 6 Load power and power gain, associated with 1 dB compressed power gain, as a function of frequency.

Conditions for Figs 5 and 6:

\[ V_{CE} = 16 \, \text{V} \quad \text{regulated; typical values; } T_{case} = 25 \, ^\circ\text{C}. \]

Fig. 7 Input impedance as a function of frequency for \( P_{L1} \).

Fig. 8 Optimum load impedance as a function of frequency for \( P_{L1} \).

Conditions for Figs 7 and 8:

\[ V_{CE} = 16 \, \text{V} \quad \text{regulated; typical values; } Z_0 = 10 \, \Omega; T_{case} = 25 \, ^\circ\text{C}. \]
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2.3 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A selective amplifier

| mode of operation | $f$ GHz | $V_{CE}$ V | $I_C$ mA | $P_{L1}$ W | $G_{po}$ dB | $\overline{Z_i}$ $\Omega$ | $\overline{Z_L}$ $\Omega$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2.3</td>
<td>16</td>
<td>250</td>
<td>typ. 1.6</td>
<td>typ. 8.1</td>
<td>3.5 + j11</td>
<td>6.4 + j2</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-93 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-93.

Pinning:
1 = collector
2 = base
3 = emitter

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage, open emitter</td>
<td>$V_{\text{CBO}}$</td>
<td>35 V</td>
<td></td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>$V_{\text{CEO}}$, $V_{\text{CER}}$, $V_{\text{EBO}}$</td>
<td>16 V, 20 V, 3.5 V</td>
<td></td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>$I_{\text{C}}$</td>
<td>450 mA</td>
<td></td>
</tr>
<tr>
<td>Total power dissipation up to $T_{\text{mb}} = 75 , ^\circ\text{C}$</td>
<td>$P_{\text{tot}}$</td>
<td>6 W</td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>$T_{\text{stg}}$</td>
<td>-65 to +200 °C</td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>$T_{\text{j}}$</td>
<td>200 °C</td>
<td></td>
</tr>
<tr>
<td>Soldering temperature at 0.1 mm from case; $t_{\text{sld}} \leq 10$ s</td>
<td>$T_{\text{sld}}$</td>
<td>235 °C</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions in mm

[Diagram of casing dimensions]
Microwave linear power transistor

Fig. 2 D.C. SOAR; $T_{mb} \leq 75 ^\circ C$.
I Region of permissible d.c. operation
II Permissible extension at $R_{BE} \leq 70 \, \Omega$.

THERMAL RESISTANCE
From junction to mounting base

CHARACTERISTICS
$T_{mb} = 25 ^\circ C$ unless otherwise specified

Collector cut-off current
$I_E = 0$; $V_{CB} = 25 \, V$
$I_E = 0$; $V_{CB} = 35 \, V$

Emitter cut-off current
$I_C = 0$; $V_{EB} = 1,5 \, V$
$I_C = 0$; $V_{EB} = 3,5 \, V$

D.C. current gain
$I_C = 230 \, mA$; $V_{CE} = 5 \, V$

Collector-base capacitance
$I_E = I_C = 0$; $V_{CB} = 16 \, V$; $V_{EB} = 1,5 \, V$

Collector-emitter capacitance
$I_E = I_C = 0$; $V_{CE} = 16 \, V$; $V_{EB} = 1,5 \, V$

Emitter-base capacitance
$I_E = I_C = 0$; $V_{CB} = 10 \, V$; $V_{EB} = 1 \, V$

$R_{th j-mb} = 12 \, K/W$

$I_{CBO} \leq 10 \, \mu A$
$I_{EBO} \leq 100 \, \mu A$

$\beta$ typ. 40

$C_{cb}$ typ. 2 pF

$C_{ce}$ typ. 2 pF

$C_{eb}$ typ. 15 pF

August 1985
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \degree C$ in an unneutralized common-emitter class-A selective amplifier*.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$P_L1$ (W)</th>
<th>$G_{po}$ (dB)</th>
<th>$\frac{z_i}{\Omega}$</th>
<th>$\frac{z_L}{\Omega}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2,3</td>
<td>16</td>
<td>250</td>
<td>$\geq 1,2$</td>
<td>$\geq 7,5$</td>
<td>3,5 + j11</td>
<td>6,4 + j2</td>
</tr>
</tbody>
</table>

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.

Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,54$), thickness 0,8 mm.
Microwave linear power transistor

Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:
\[ V_{CE} = 16 \, \text{V} \] regulated; typical values.
\[ I_C = 250 \, \text{mA} \] regulated; typical values.

Fig. 6 Input and optimum load impedances versus frequency;
\[ Z_0 = 10 \, \Omega; P_{L1} = 1.6 \, \text{W}; T_{mb} = 25 \, ^\circ\text{C}. \]
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier up to 2.3 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.W.S.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic studless envelope (FO 93).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-emitter class-A selective amplifier

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$I_C$ (mA)</th>
<th>$P_{L1}$ (W)</th>
<th>$G_{po}$ (dB)</th>
<th>$\overline{Z}_I$ (Ω)</th>
<th>$\overline{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2.3</td>
<td>16</td>
<td>400</td>
<td>typ. 2.8</td>
<td>typ. 7.8</td>
<td>2 + j8</td>
<td>5.5 − j1.8</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-93 (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

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RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage
 open base
\[ R_{BE} = 70 \, \Omega \]

Emitter-base voltage, open collector

Collector current (d.c.)

Total power dissipation
 up to \( T_{mb} = 75 \, ^\circ \text{C} \)

Storage temperature

Junction temperature

Soldering temperature
 at 0,1 mm from case; \( t_{slid} \leq 10 \, \text{s} \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{CBO} ) max.</td>
<td>35 V</td>
</tr>
<tr>
<td>( V_{CEO} ) max.</td>
<td>16 V</td>
</tr>
<tr>
<td>( V_{CER} ) max.</td>
<td>20 V</td>
</tr>
<tr>
<td>( V_{EBO} ) max.</td>
<td>3.5 V</td>
</tr>
<tr>
<td>( I_C ) max.</td>
<td>800 mA</td>
</tr>
<tr>
<td>( P_{tot} ) max.</td>
<td>8 W</td>
</tr>
<tr>
<td>( T_{stg} )</td>
<td>-65 to + 200 , ^\circ \text{C}</td>
</tr>
<tr>
<td>( T_J ) max.</td>
<td>200 , ^\circ \text{C}</td>
</tr>
<tr>
<td>( T_{slid} ) max.</td>
<td>235 , ^\circ \text{C}</td>
</tr>
</tbody>
</table>
Microwave linear power transistor

Fig. 2 D.C. SOAR; $T_{mb} \leq 75 ^\circ C$.
I Region of permissible d.c. operation
II Permissible extension provided $R_{BE} \leq 70 \, \Omega$.

THERMAL RESISTANCE
From junction to mounting base

CHARACTERISTICS
$T_{mb} = 25 ^\circ C$ unless otherwise specified

Collector cut-off current
$I_E = 0; V_{CB} = 25 \, V$
$I_E = 0; V_{CB} = 35 \, V$

Emitter cut-off current
$I_C = 0; V_{EB} = 1,5 \, V$
$I_C = 0; V_{EB} = 3,5 \, V$

D.C. current gain
$I_C = 400 \, mA; V_{CE} = 5 \, V$

Collector-base capacitance
$I_E = I_C = 0; V_{CB} = 16 \, V; V_{EB} = 1,5 \, V$

Collector-emitter capacitance
$I_E = I_C = 0; V_{CE} = 16 \, V; V_{EB} = 1,5 \, V$

Emitter-base capacitance
$I_E = I_C = 0; V_{CB} = 10 \, V; V_{EB} = 1 \, V$

$R_{th\,j-mb} = 8 \, K/W$

$I_{CBO} \leq 15 \, \mu A$
$I_{EBO} \leq 15 \, \mu A$
$h_{FE} \text{ typ. } 40$

$C_{cb} \text{ typ. } 3 \, pF$

$C_{ce} \text{ typ. } 2,2 \, pF$

$C_{eb} \text{ typ. } 83 \, pF$
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\,^\circ C$ in an unneutralized common-emitter class-A selective amplifier*

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$I_C$ mA</th>
<th>$P_{L1}$ W</th>
<th>$G_{PO}$ dB</th>
<th>$\overline{z}_1$ $\Omega$</th>
<th>$\overline{z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>2,3</td>
<td>16</td>
<td>400</td>
<td>$\geq 2$</td>
<td>$\geq 7$</td>
<td>$2 + j8$</td>
<td>$5,5 - j1,8$</td>
</tr>
</tbody>
</table>

Fig. 4 Prematching test circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.54$), thickness 0.8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.
Fig. 5 Output power versus source power.

Conditions for Figs 5 and 6:
\( V_{CE} = 16 \) V regulated; typical values.
\( I_C = 400 \) mA regulated; typical values.

Fig. 6 Input and optimum load impedance versus frequency;
\( Z_0 = 10 \) \( \Omega \); \( T_{mb} = 25 \) °C.
MICROWAVE LINEAR POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-emitter, class-A amplifier from 1.4 GHz to 1.8 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output prematching ensuring a good stability and allowing an easier design of wideband circuits
- New 5 GHz technology.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-A wideband amplifier, typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_{L1}$ W</th>
<th>$G_{po}$ dB</th>
<th>$I_C$ A</th>
<th>$Z_i$ Ω</th>
<th>$Z_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>1.4 to 1.8</td>
<td>16</td>
<td>11</td>
<td>11</td>
<td>2</td>
<td>see Fig. 7</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = base
3 = emitter

Torque on screw: max. 0.5 Nm
Recommended screw: M3

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
VCBO max. 40 V

Collector-emitter voltage
open base
VCER max. 20 V

Emitter-base voltage, open collector
VEBO max. 3 V

Collector current (d.c.)
IC max. 4 A

Total power dissipation
up to Tmb = 75 °C
Ptot max. 36 W

Storage temperature
Tstg -65 to +200 °C

Junction temperature
Tj max. 200 °C

Soldering temperature
at 0.1 mm from flange; tsld ≤ 10 s
Tsls max. 235 °C
Microwave linear power transistor

**Fig. 2** D.C. SOAR; \( T_{mb} \leq 75 \, ^\circ\text{C} \).

I Region of permissible D.C. operation
II Permissible extension provided \( R_{BE} \leq 47 \, \Omega \)

**THERMAL RESISTANCE**

From junction to mounting base
From mounting base to heatsink

**CHARACTERISTICS**

\( T_{mb} = 25 \, ^\circ\text{C} \) unless otherwise specified

**Collector cut-off current**
- \( I_C = 0; V_{CB} = 20 \, \text{V} \)
- \( I_C = 0; V_{CB} = 30 \, \text{V} \)
- \( V_{CE} = 20 \, \text{V}; R_{BE} = 47 \, \Omega \)
- \( V_{CE} = 15 \, \text{V}; I_B = 0 \)

**Emitter cut-off current**
- \( I_C = 0; V_{EB} = 1.5 \, \text{V} \)
- \( I_C = 0; V_{EB} = 3 \, \text{V} \)

**D.C. current gain**
- \( I_C = 2 \, \text{A}; V_{CE} = 3 \, \text{V} \)

**Fig. 3** Power derating curve versus mounting base temperature.

- \( R_{th \, j-mb} = 2.2 \, \text{K/W} \)
- \( R_{th \, mb-h} = 0.5 \, \text{K/W} \)

- \( I_{CBO} \leq 1 \, \text{mA} \)
- \( I_{CER} \leq 5 \, \text{mA} \)
- \( I_{CEO} \leq 4 \, \text{mA} \)
- \( I_{EBO} \leq 200 \, \mu\text{A} \)
- \( h_{FE} = 15 \text{ to } 100 \)
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-emitter class-A wideband amplifier

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_{L1}$ W</th>
<th>$G_{po}$ dB</th>
<th>$I_C$ A</th>
<th>$Z_i$ Ω</th>
<th>$Z_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-A</td>
<td>1,4 to 1,8</td>
<td>16</td>
<td>$\geq 9$</td>
<td>$\geq 10$</td>
<td>2</td>
<td>see Fig. 7</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4 Prematching test circuit board for 1,4 to 1,8 GHz, c.w, class-A application (dimensions in mm). Epsilam p.c. board, thickness 0,635 mm, $\varepsilon_r = 10$.

* Amplifier consists of test circuit board without any additional tuning.
Microwave linear power transistor

LZ1418E100R

Fig. 5 Load power versus frequency.

Fig. 6 Linear power gain versus frequency.

Fig. 7 Input and load impedances versus frequency; $Z_0 = 5 \Omega$; typical values.

Conditions for Figs 5 to 7:

$V_{CE} = 16 \text{ V}$ | $I_C = 2 \text{ A}$ regulated; $T_{mb} = 25 \text{ oC}$; typical values.
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ [GHz]</th>
<th>$V_{CC}$ [V]</th>
<th>$P_L$ [W]</th>
<th>$G_d$ [dB]</th>
<th>$\eta_c$ [%]</th>
<th>$\bar{Z}_i$ [Ω]</th>
<th>$\bar{Z}_L$ [Ω]</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10 \mu s$ $\delta = 1%$</td>
<td>1,09</td>
<td>45</td>
<td>38</td>
<td>11</td>
<td>47</td>
<td>$2,2 + j6,4$</td>
<td>$6 + j3$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Marking code:
RTC 1040 S

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) 
VCBO max. 55 V

Collector-emitter voltage (RBE = 10 Ω) 
(open base) 
VCER max. 50 V

Emitter-base voltage (open collector) 
VCEO max. 35 V

Collector current (ton ≤ 10 µs, δ ≤ 1%) 
VEBO max. 3 A

Total power dissipation (ton ≤ 10 µs, δ ≤ 1%, Tmb ≤ 75 °C) 
Ptot max. 60 W

Storage temperature 
Tstg -65 to 200 °C

Junction temperature 
Tj max. 200 °C

Soldering temperature 
at 0,1 mm from case; tsld ≤ 10 s 
Tsld max. 235 °C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; ton = 10 µs, δ = 1% 
Rth j-mb 8 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA
Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B selective amplifier.

Typical values

| mode of operation | $f$ GHz | $V_{CC}$ V | $P_L$ W | $G_0$ dB | $\eta_C$ % | $\bar{z}_i$ $\Omega$ | $\bar{z}_L$ $\Omega$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $\tau_{on} = 10 \mu s$ $\delta = 1%$</td>
<td>1.09</td>
<td>45</td>
<td>72</td>
<td>7.6</td>
<td>40</td>
<td>2.2 + j4</td>
<td>4.3 - j1</td>
</tr>
</tbody>
</table>

MECHANICAL DATA
FO-53 (see Fig. 1)

PRODUCT SAFETY
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

April 1985
MECHANICAL DATA

Fig. 1 FO-53.

Marking code:
RTC 1100 S

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) \( V_{CBO} \) max. 50 V
Collector-emitter voltage (\( R_{BE} = 10 \Omega \))
(open base) \( V_{CER} \) max. 45 V
Emitter-base voltage (open collector) \( V_{CEO} \) max. 35 V
Collector current (\( t_{on} \leq 10 \mu s, \delta \leq 1\% \)) \( I_C \) max. 6 A
Total power dissipation (\( t_{on} \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \, ^\circ C \)) \( P_{tot} \) max. 140 W
Storage temperature \( T_{stg} \) -65 to 200 \, ^\circ C
Junction temperature \( T_j \) max. 200 \, ^\circ C
Soldering temperature at 0,1 mm from case; \( T_{sld} \leq 10 \, s \)
\( T_{sld} \) max. 235 \, ^\circ C

THERMAL RESISTANCE

From junction to mounting base
under pulsed conditions; \( t_{on} = 10 \, \mu s, \delta = 1\% \)

\( R_{th \ j-mb} \) 3,5 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta_c$ %</th>
<th>$\tilde{z}_I$ $\Omega$</th>
<th>$\tilde{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed</td>
<td>1,09</td>
<td>45</td>
<td>120</td>
<td>9,8</td>
<td>49</td>
<td>$1,4 + j5$</td>
<td>$3 - j4$</td>
</tr>
<tr>
<td>$t_{on} = 10 \mu s$</td>
<td>$\delta = 1%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
**MECHANICAL DATA**

Fig. 1 FO-53.

Marking code:
RTC 1140 S

Dimensions in mm

**RATINGS**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)  
VCBO  max.  55 V

Collector-emitter voltage \( R_{BE} = 10 \Omega \) (open base)  
VCER  max.  50 V

Emitter-base voltage (open collector)  
VEBO  max.  35 V

Collector current \( t_{\text{on}} \leq 10 \mu s, \delta \leq 1\% \)  
IC  max.  8 A

Total power dissipation \( t_{\text{on}} \leq 10 \mu s, \delta \leq 1\%, T_{\text{mb}} \leq 75 \degree C \)  
Ptot  max.  190 W

Storage temperature  
Tstg  -65 to 200 °C

Junction temperature  
Tj  max.  200 °C

Soldering temperature  
at 0,1 mm from case; \( t_{\text{slid}} \leq 10 \) s  
Tslid  max.  235 °C

**THERMAL RESISTANCE**

From junction to mounting base  
under pulsed conditions; \( t_{\text{on}} = 10 \mu s, \delta = 1\% \)  
\( R_{\text{th j-mb}} \)  2,5 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_c$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10 , \mu s$ $\delta = 1%$</td>
<td>0,6 to $0,75$</td>
<td>48</td>
<td>180</td>
<td>8,6</td>
<td>45</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57B (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57B.

Marking code:
RTC MO 6075 B 200 Z

Dimensions in mm

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)
VCBO  max.  65 V

Collector-emitter voltage (RBE = 10 Ω)
(open base)
CCER   max.  65 V
VCBO   max.  35 V
VEBO   max.  3.5 V
IC     max.  10 A
Ptot   max.  500 W

Emitter-base voltage (open collector)

Collector current (ton ≤ 10 µs, δ ≤ 1%)

Total power dissipation (ton ≤ 10 µs, δ ≤ 1%, Tmb ≤ 75 °C)

Tstg  -65 to 200 °C

ICE   max.  10 A
Ptot   max.  500 W

Storage temperature

Junction temperature

Soldering temperature

at 0,1 mm from case; tsld ≤ 10 s

Soldering temperature

THERMAL RESISTANCE
From junction to mounting base
under pulsed conditions; ton = 10 µs, δ = 1%

Rth j-mb  0.075 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstand a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 B metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta_c$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed</td>
<td>0.6 to 0.75</td>
<td>48</td>
<td>420</td>
<td>7.2</td>
<td>40</td>
</tr>
<tr>
<td>$t_{on} = 10 , \mu s$</td>
<td>$\delta = 1%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57B (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57B.

Marking code:
RTC MO 6075 B 400 Z

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage (open emitter)</td>
<td>VCBO max. 65 V</td>
</tr>
<tr>
<td>Collector-emitter voltage (RBE = 10 Ω) (open base)</td>
<td>VCER max. 65 V</td>
</tr>
<tr>
<td>Emitter-base voltage (open collector)</td>
<td>VCEO max. 35 V</td>
</tr>
<tr>
<td>Collector current (t_{on} ≤ 10 µs, δ ≤ 1%)</td>
<td>VEBO max. 3,5 V</td>
</tr>
<tr>
<td>Total power dissipation (t_{on} ≤ 10 µs, δ ≤ 1%, T_{mb} = 75 °C)</td>
<td>P_{tot} max. 1200 W</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{stg} -65 to 200 °C</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_j max. 200 °C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>T_{sld} max. 235 °C</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; t_{on} = 10 µs, δ = 1%

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_{th j-mb}</td>
<td>0,04 K/W</td>
</tr>
</tbody>
</table>
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (HGz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$\bar{z}_1$ (Ω)</th>
<th>$\bar{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10 \mu s$ $\delta = 1%$</td>
<td>1.09</td>
<td>50</td>
<td>200</td>
<td>9</td>
<td>50</td>
<td>3.5 + j9</td>
<td>1.5 − j2</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-67A (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the $B_eO$ disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-67A.

Marking code:
RTC 12175 YR

Dimensions in mm

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage (open emitter)
- Collector-emitter voltage (RBE = 10 Ω) (open base)
- Emitter-base voltage (open collector)
- Collector current (ton ≤ 10 µs, δ ≤ 1%)
- Total power dissipation (ton ≤ 10 µs, δ ≤ 1%, Tmb ≤ 75 °C)
- Storage temperature
- Junction temperature
- Soldering temperature at 0,1 mm from case; tslid ≤ 10 s

THERMAL RESISTANCE
From junction to mounting base under pulsed conditions; ton = 10 µs, δ = 1%

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vcbo</td>
<td>65 V</td>
</tr>
<tr>
<td>Vcer</td>
<td>65 V</td>
</tr>
<tr>
<td>VCEO</td>
<td>35 V</td>
</tr>
<tr>
<td>VEBO</td>
<td>3.5 V</td>
</tr>
<tr>
<td>IC</td>
<td>12.5 A</td>
</tr>
<tr>
<td>Ptot</td>
<td>500 W</td>
</tr>
<tr>
<td>Tstg</td>
<td>-65 to 200 °C</td>
</tr>
<tr>
<td>Tj</td>
<td>200 °C</td>
</tr>
<tr>
<td>Tsld</td>
<td>235 °C</td>
</tr>
<tr>
<td>Rth j-mb</td>
<td>0.08 K/W</td>
</tr>
</tbody>
</table>
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1,09 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 67 A metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions. An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_c$ (%)</th>
<th>$\tilde{Z}_i$ (Ω)</th>
<th>$\tilde{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $\tau_{on} = 10 \mu s$ $\delta = 1%$</td>
<td>1,09</td>
<td>50</td>
<td>460</td>
<td>8</td>
<td>36</td>
<td>$1,9 + j4,5$</td>
<td>$0,9 - j2$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-67A (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-67A.

Marking code:
RTC 12 350 YR

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 65 V
Collector-emitter voltage ($R_{BE} = 10 \, \Omega$) (open base) $V_{CER}$ max. 65 V
Emitter-base voltage (open collector) $V_{CEO}$ max. 35 V
Collector current ($t_{on} \leq 10 \, \mu s, \delta \leq 1\%$) $V_{EBO}$ max. 3.5 V
Total power dissipation ($t_{on} \leq 10 \, \mu s, \delta \leq 1\%, T_{mb} \leq 75 \, ^\circ C$) $I_{C}$ max. 25 A
Storage temperature $P_{tot}$ max. 1000 W
Junction temperature $T_{stg}$ -65 to 200 \, ^\circ C
Soldering temperature $T_{j}$ max. 200 \, ^\circ C
at 0,1 mm from case; $t_{sld} \leq 10 \, s$
Soldering temperature $T_{sld}$ max. 235 \, ^\circ C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10 \, \mu s, \delta = 1\%$

$R_{th \, j-mb}$ 0.04 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for DME applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_c$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed</td>
<td>1,025</td>
<td>50</td>
<td>700</td>
<td>6,7</td>
<td>35</td>
</tr>
<tr>
<td>$t_{on} = 10 \mu s$</td>
<td>1,150</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\delta = 1%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA.

FO-96 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 F0-96.

Marking code:
RTC MS 1011 B 700 Y

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)  \( V_{CBO} \) max.  65 V

Collector-emitter voltage (\( R_{BE} = 10 \Omega \)) (open base)  \( V_{CER} \) max.  65 V

Emitter-base voltage (open collector)  \( V_{CEO} \) max.  35 V

Collector current (\( t_{on} \leq 10 \mu s, \delta \leq 1\% \))  \( V_{EBO} \) max.  3,5 V

Total power dissipation (\( t_{on} \leq 10 \mu s, \delta \leq 1\%, T_{mb} \leq 75 \degree C \))  \( I_{C} \) max.  50 A

Storage temperature  \( P_{tot} \) max.  2000 W

Junction temperature  \( T_{stg} \) –65 to 200 \degree C

Soldering temperature  \( T_{j} \) max.  200 \degree C

at 0,1 mm from case; \( t_{sld} \leq 10 \) s

Soldering temperature  \( T_{sld} \) max.  235 \degree C

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; \( t_{on} = 10 \mu s, \delta = 1\% \)

\( R_{th \ j\ -mb} \) 0,02 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_c$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10\mu s$</td>
<td>0,6 to 0,75</td>
<td>48</td>
<td>850</td>
<td>7,5</td>
<td>35</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-96 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-96.

Marking code:
MS 6075 B 800 Z

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 65 V
Collector-emitter voltage ($R_{BE} = 10 \Omega$) (open base) $V_{CE}$ max. 35 V
Emitter-base voltage (open collector) $V_{EBO}$ max. 3,5 V
Collector current ($t_{on} \leq 10 \mu s$, $\delta \leq 1\%$) $I_C$ max. 50 A
Total power dissipation ($t_{on} \leq 10 \mu s$, $\delta \leq 1\%$, $T_{mb} \leq 75^\circ C$) $P_{tot}$ max. 1800 W
Storage temperature $T_{stg}$ $-65$ to $200^\circ C$
Junction temperature $T_j$ max. 200 $^\circ C$
Soldering temperature at 0,1 mm from case; $t_{sld} \leq 10$ s $T_{sld}$ max. 235 $^\circ C$

THERMAL RESISTANCE

From junction to mounting base under pulsed conditions; $t_{on} = 10 \mu s$, $\delta = 1\%$

$R_{th j-mb}$ 0,02 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for IFF applications at 1.09 GHz.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 96 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA
Microwave performance up to $T_{mb} = 25 \degree C$ in a unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta_c$ (%)</th>
<th>$\bar{Z}_i$ (Ω)</th>
<th>$\bar{Z}_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10 \mu s$ $\delta = 1%$</td>
<td>1.09</td>
<td>50</td>
<td>900</td>
<td>7.8</td>
<td>35</td>
<td>2.5 + j4</td>
<td>10 – j11</td>
</tr>
</tbody>
</table>

MECHANICAL DATA
FO-96 (see Fig. 1)

PRODUCT SAFETY
These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-96.

Marking code:
RTC MSB 12 900 Y

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)
VCBO max. 65 V

Collector-emitter voltage (RBE = 10 Ω)
(open base)
VCER max. 65 V
VCEO max. 35 V

Emitter-base voltage (open collector)
VEBO max. 3,5 V

Collector current (ton ≤ 10 μs, δ ≤ 1%)
Ic max. 50 A

Total power dissipation (ton ≤ 10 μs, δ ≤ 1%, Tmb ≤ 75 °C)
Ptot max. 2000 W

Storage temperature
Tstg -65 to 200 °C

Junction temperature
Tj max. 200 °C

Soldering temperature
at 0,1 mm from case, tsld ≤ 10 s
Tsld max. 235 °C

THERMAL RESISTANCE

From junction to mounting base
under pulsed conditions; ton = 10 μs, δ = 1%

Rth j-mb 0,02 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions. Internal input and output prematching ensure a good stability and easy broadband using.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f_{GHz}$</th>
<th>$V_{CC} , V$</th>
<th>$P_L , W$</th>
<th>$G_D , dB$</th>
<th>$\eta_c %$</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed</td>
<td>0,960</td>
<td>50</td>
<td>90</td>
<td>8,6</td>
<td>34</td>
</tr>
<tr>
<td>$\delta = 10%$</td>
<td>to 1,215</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Marking code:
RTC MZ 0912 B 75 Y

Dimensions in mm

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) 
V_CBO max. 65 V

Collector-emitter voltage (R_BE = 10 Ω) (open base)
V_CER max. 65 V
V_CEO max. 35 V

Emitter-base voltage (open collector)
V_EBO max. 3.5 V

Collector current (t_on ≤ 10 µs, δ ≤ 10%)
I_C max. 7 A

Total power dissipation (t_on ≤ 10 µs, δ ≤ 10%, T_mb ≤ 75 °C)
P_tot max. 300 W

Storage temperature
T_stg -65 to 200 °C

Junction temperature
T_j max. 200 °C

Soldering temperature
T_sld max. 235 °C

THERMAL RESISTANCE
From junction to mounting base under pulsed conditions; t_on = 10 µs, δ = 10%
R_th j-mb 0.2 K/W
PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates only in pulsed conditions and is recommended for TACAN applications.

It offers the following technological advantages:

• Interdigitated structure: high emitter efficiency
• Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
• Gold metallization realizes very good stability of the characteristics and excellent life time
• Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 57 C metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed conditions. Internal input and output prematching ensure a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 ^\circ$C in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed $t_{on} = 10 \mu s$</td>
<td>0,960 to 1,215</td>
<td>50</td>
<td>175</td>
<td>7,7</td>
<td>34</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-57C.

Marking code:
RTC MZ 0912 B 150 Y

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage (open emitter)</td>
<td>65 V</td>
</tr>
<tr>
<td>Collector-emitter voltage (RBE = 10 Ω) (open base)</td>
<td>65 V</td>
</tr>
<tr>
<td>Emitter-base voltage (open collector)</td>
<td>35 V</td>
</tr>
<tr>
<td>Collector current (ton ≤ 10 µs, δ ≤ 10%)</td>
<td>14 A</td>
</tr>
<tr>
<td>Total power dissipation (ton ≤ 10 µs, δ ≤ 10%, Tmb ≤ 75°C)</td>
<td>600 W</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-65 to 200°C</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>200°C</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>235°C</td>
</tr>
</tbody>
</table>

Soldering temperature at 0,1 mm from case, tsld ≤ 10 s

THERMAL RESISTANCE
From junction to mounting base
under pulsed conditions; ton = 10 µs, δ = 10%

R_{th \, j-mb} max. 0,1 K/W
MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in space, military and professional applications.
They offer the following technological advantages:
• Intervided stacked structure: high emitter efficiency.
• Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
• Gold metallization realizes very good stability of the characteristics and excellent lifetime.
• Multicell geometry gives good balance of dissipated power and low thermal resistance.

The PEE family has an envelope with stud to be mounted with a nut and the PDE family an envelope without stud to be soldered directly onto the heatsink.

Transistors are mounted in a common-emitter configuration in class-B but they also can operate in class-A or C.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-emitter class-B circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEE1001U</td>
<td>c.w.</td>
<td>1</td>
<td>28</td>
<td>typ. 2</td>
<td>typ. 6,4</td>
<td>typ. 60</td>
</tr>
<tr>
<td>PDE1001U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEE1003U</td>
<td>c.w.</td>
<td>1</td>
<td>28</td>
<td>typ. 4,2</td>
<td>typ. 6,3</td>
<td>typ. 54</td>
</tr>
<tr>
<td>PDE1003U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEE1005U</td>
<td>c.w.</td>
<td>1</td>
<td>28</td>
<td>typ. 7,6</td>
<td>typ. 5,8</td>
<td>typ. 58</td>
</tr>
<tr>
<td>PDE1005U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PEE1010U</td>
<td>c.w.</td>
<td>1</td>
<td>28</td>
<td>typ. 11</td>
<td>typ. 7,4</td>
<td>typ. 68</td>
</tr>
<tr>
<td>PDE1010U</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1a For top view see Fig. 1b.
Torque on nut: min. 0,75 Nm max. 0,85 Nm
Diameter of clearance hole in heatsink: max. 4,2 mm.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PEE/PDE1001U</th>
<th>1003U</th>
<th>1005U</th>
<th>1010U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter</td>
<td>max. 39 V</td>
<td>39 V</td>
<td>39 V</td>
<td>45 V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 10 \Omega$</td>
<td>max. 39 V</td>
<td>39 V</td>
<td>39 V</td>
<td>45 V</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector</td>
<td>max. 3,5 V</td>
<td>3,5 V</td>
<td>3,5 V</td>
<td>3,5 V</td>
</tr>
<tr>
<td>Collector current (peak value)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>total power dissipation up to $T_{mb} = 25 \degree C$</td>
<td>max. 250 mA</td>
<td>450 mA</td>
<td>900 mA</td>
<td>1000 mA</td>
</tr>
<tr>
<td>Storage temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating junction temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 0,7 mm from ceramic; $t_{sld} \leq 10 \text{ s}$</td>
<td>max. 235 $\degree C$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE
From junction to mounting base

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PEE/PDE1001U</th>
<th>1003U</th>
<th>1005U</th>
<th>1010U</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th j-mb}$ (max.)</td>
<td>25 K/W</td>
<td>18 K/W</td>
<td>10 K/W</td>
<td>6 K/W</td>
</tr>
</tbody>
</table>
MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \degree C$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_c$ %</th>
<th>$\bar{z}_1$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-B</td>
<td>3</td>
<td>28</td>
<td>1,2</td>
<td>10</td>
<td>33</td>
<td>50 + j30</td>
<td>2,5 + j5</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Torque on nut: max 0,4 Nm
Recommended screw: M2,5

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) \( V_{CBO} \) max. 45 V
Collector-emitter voltage (open base) \( V_{CEO} \) max. 20 V
Emitter-base voltage (open collector) \( V_{EBO} \) max. 3 V
Collector current \( I_C \) max. 160 mA
Total power dissipation \( P_{tot} \) max. 4,5 W
Storage temperature \( T_{stg} \) -65 to 200 °C
Junction temperature \( T_j \) max. 200 °C
Soldering temperature \( T_{sld} \) at 0,1 mm from case; \( t_{sld} \leq 10 \) s
max. 235 °C

THERMAL RESISTANCE

From junction to mounting base

\( R_{th j-mb} \) 22 K/W
MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, \degree C$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC} , V$</th>
<th>$P_L , W$</th>
<th>$G_p , dB$</th>
<th>$\eta_c , %$</th>
<th>$\bar{z}_i , \Omega$</th>
<th>$\bar{Z}_L , \Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-B</td>
<td>3</td>
<td>28</td>
<td>3.5</td>
<td>7</td>
<td>35</td>
<td>$9 + j18$</td>
<td>$2 - j6$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Dimensions in mm

Torque on nut: max 0,4 Nm
Recommended screw: M2,5

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) \( V_{CBO} \), max. 45 V
Collector-emitter voltage (open base) \( V_{CEO} \), max. 20 V
Emitter-base voltage (open collector) \( V_{EBO} \), max. 3 V
Collector current \( I_C \), max. 900 mA
Total power dissipation \( P_{tot} \), max. 11 W
Storage temperature \( T_{stg} \), -65 to 200 °C
Junction temperature \( T_J \), max. 200 °C
Soldering temperature at 0,1 mm from case; \( T_{sld} \leq 10 \) s

THERMAL RESISTANCE

From junction to mounting base

\( R_{th j-mb} \), 11 K/W
MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. conditions and is recommended in common-base class-B amplifiers up to 3 GHz.

It offers the following technological advantages:
- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance.

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in c.w. conditions.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B selective amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta_c$ (%)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-B</td>
<td>3</td>
<td>28</td>
<td>5</td>
<td>5,2</td>
<td>29</td>
<td>5 + j25</td>
<td>1 + j14</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Torque on nut: max. 0.4 Nm
Recommended screw: M2.5

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage (open emitter): V_{CBO} max. 45 V
- Collector-emitter voltage (R_{BE} = 10 \Omega) (open base): V_{CER} max. 45 V
- Emitter-base voltage: V_{CEO} max. 20 V
- Collector current: I_C max. 1500 mA
- Total power dissipation: P_{tot} max. 18 W
- Storage temperature: T_{stg} -65 to 200 °C
- Junction temperature: T_j max. 200 °C
- Soldering temperature at 0.1 mm from case: T_{sld} ≤ 10 s

THERMAL RESISTANCE

From junction to mounting base:

R_{th j-mb} 7 K/W
C.W. AND PULSED MICROWAVE POWER TRANSISTOR

NPN silicon transistor intended for use in military and professional applications. It operates in c.w. and pulsed conditions and is recommended for NAVAID applications (IFF, DME, TACAN) in common-base class-B amplifier up to 1.3 GHz.

It offers the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistor has an FO 53 metal ceramic flange package.

It is mounted in a common-base configuration, specified in class-B and operates in pulsed and c.w. conditions.

Internal input prematching ensures a good stability and easy broadband usage.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \degree C$ in an unneutralized common-base class-B broadband amplifier.

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta_c$ (%)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pulsed</td>
<td>0.960</td>
<td>28</td>
<td>5</td>
<td>9</td>
<td>45</td>
<td>$7 + 5.5$</td>
<td>$8 + j13$</td>
</tr>
<tr>
<td>$t_{on} = 10 \mu s$</td>
<td>to 1,215</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\delta = 10%$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>c.w.</td>
<td>1.2</td>
<td>28</td>
<td>6.5</td>
<td>10.5</td>
<td>45</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Marking code:
RTC1005M

Dimensions in mm

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) $V_{CBO}$ max. 40 V

Collector-emitter voltage ($R_{BE} = 10 \Omega$) $V_{CER}$ max. 40 V

Emitter-base voltage (open collector) $V_{EBO}$ max. 3 V

Collector current ($t_{on} < 10 \mu s, \delta < 10\%$) $I_C$ max. 1,2 A

Total power dissipation ($t_{on} < 10 \mu s, \delta < 10\%, T_{mb} \leq 75 \degree C$) $P_{tot}$ max. 17,5 W

Storage temperature $T_{Stg}$ -65 to 200 \degree C

Junction temperature $T_j$ max. 200 \degree C

Soldering temperature

at 0.1 mm from case; $t_{sld} \leq 10$ s $T_{sld}$ max. 235 \degree C

THERMAL RESISTANCE

From junction to mounting base $R_{th \ j-mb}$ 7,5 K/W
MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in space, military and professional applications.

It offers the following technological advantages:
- 
  - Interdigitated structure: high emitter efficiency.
  - Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR.
  - Gold metallization realizes very good stability of the characteristics and excellent lifetime.
  - Multicell geometry gives good balance of dissipated power and low thermal resistance.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\,^{\circ}\text{C}$ in an unneutralized common-base class-C circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{z}_1$ $\Omega$</th>
<th>$\bar{z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>1</td>
<td>typ. 25</td>
<td>typ. 11</td>
<td>typ. 58</td>
<td>2 + j6,5</td>
<td>5 + j1</td>
<td></td>
</tr>
<tr>
<td>c.w.</td>
<td>2</td>
<td>typ. 10</td>
<td>typ. 6</td>
<td>typ. 42</td>
<td>7 + j6,75</td>
<td>1,5 – j7</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

Fig. 1 FO-53.

Base connected to flange

Pinning:
1 = collector
2 = emitter
3 = base

Torque on nut: max. 0,5 Nm

Recommended screw: M3

Marking code

RTC2010M = PKB20010U

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) \( V_{CBO} \) max. 40 V
Collector-emitter voltage \( R_{BE} \leq 10 \Omega \)
open base \( V_{CE} \) max. 40 V
Emitter-base voltage (open collector) \( V_{CEO} \) max. 22 V
Collector current (d.c.) \( I_C \) max. 2 A
Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)
Storage temperature \( P_{tot} \) max. 25 W
Junction temperature \( T_{stg} \) –65 to +200 \(^\circ C\)
Lead soldering temperature \( T_j \) max. 200 \(^\circ C\)
at 0,3 mm from the case; \( t_{sld} \leq 10 \) s
\( T_{sld} \) max. 235 \(^\circ C\)

THERMAL RESISTANCE
From junction to mounting base \( R_{th \, j-mb} = 4 \) K/W
From mounting base to heatsink \( R_{th \, mb-h} = 0,7 \) K/W
MICROWAVE POWER TRANSISTORS

NPN silicon transistors primarily intended for use in space, military and professional applications up to 2 GHz.

They offer the following technological advantages:

- Interdigitated structure: high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizes very good stability of the characteristics and excellent life time
- Multicell geometry gives good balance of dissipated power and low thermal resistance

The transistors have an FO 53 metal ceramic hermetic flange package.

Transistors are mounted in a common-base configuration specified in class-B and operates in c.w. conditions.

An input matching cell improves the input impedance and allows an easier design of broadband circuits.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B.

Typical values

<table>
<thead>
<tr>
<th>type</th>
<th>mode of operation</th>
<th>f GHz</th>
<th>VCC V</th>
<th>P L W</th>
<th>G P dB</th>
<th>η C %</th>
<th>z i Ω</th>
<th>ZL Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKB23001U</td>
<td>c.w. class-B</td>
<td>1</td>
<td>2,5</td>
<td>9,5</td>
<td>45</td>
<td>6 + j2</td>
<td>33 + j22</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>1,5</td>
<td>7</td>
<td>32</td>
<td>8 + j0</td>
<td>10 + j14</td>
<td></td>
</tr>
<tr>
<td>PKB23003U</td>
<td>c.w. class-B</td>
<td>1</td>
<td>5</td>
<td>11</td>
<td>70</td>
<td>4 + j4</td>
<td>17 + j19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>3,4</td>
<td>9,3</td>
<td>50</td>
<td>7 + j5</td>
<td>4 + j2</td>
<td></td>
</tr>
<tr>
<td>PKB23005U</td>
<td>c.w. class-B</td>
<td>1</td>
<td>19</td>
<td>11</td>
<td>58</td>
<td>3,5 + j6,5</td>
<td>10 + j6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>8</td>
<td>7,2</td>
<td>53</td>
<td>6 + j8</td>
<td>3 - j1,5</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1)

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

Marking code:
PKB23001U: 2001M
P KB23003U: 2003M
P KB23005U: 2005M

Dimensions in mm

RATINGS

Limiting value in accordance with the Absolute Maximum System (IEC 134).

<table>
<thead>
<tr>
<th>PKB23001U</th>
<th>PKB23003U</th>
<th>PKB23005U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emitter-base voltage (open collector) $V_{EBO}$</td>
<td>max. 3 V</td>
<td>max. 3 V</td>
</tr>
<tr>
<td>Collector-base voltage (open emitter) $V_{CBO}$</td>
<td>max. 45 V</td>
<td>max. 45 V</td>
</tr>
<tr>
<td>Collector-emitter voltage ($R_{BE} = 10 , \Omega$) $V_{CER}$</td>
<td>max. 45 V</td>
<td>max. 45 V</td>
</tr>
<tr>
<td>Collector-emitter voltage (open base) $V_{CEO}$</td>
<td>max. 20 V</td>
<td>max. 20 V</td>
</tr>
<tr>
<td>Collector current $I_C$</td>
<td>max. 0.3 A</td>
<td>max. 0.6 A</td>
</tr>
<tr>
<td>Total power dissipation class-B; $T_{mb} \leq 75 , ^\circ C$ $P_{tot}$</td>
<td>max. 4 W</td>
<td>max. 7.5 W</td>
</tr>
<tr>
<td>Junction temperature $T_j$</td>
<td>max. 200 °C</td>
<td>max. 200 °C</td>
</tr>
<tr>
<td>Storage temperature $T_{stg}$</td>
<td>min. $-65 , ^\circ C$</td>
<td>min. $-65 , ^\circ C$</td>
</tr>
<tr>
<td>Soldering temperature $T_{sld}$</td>
<td>(d = 0.7 mm; $t_{sld} = 10$ s) max. 235 °C</td>
<td>max. 235 °C</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

<table>
<thead>
<tr>
<th>PKB23001U</th>
<th>PKB23003U</th>
<th>PKB23005U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Junction-mounting base to heatsink $R_{th , j-mb}$</td>
<td>30 K/W</td>
<td>18 K/W</td>
</tr>
<tr>
<td>From mounting base to heatsink $R_{th , mb-h}$</td>
<td>0.7 K/W</td>
<td>0.7 K/W</td>
</tr>
</tbody>
</table>
MICROWAVE POWER TRANSISTOR

NPN bipolar transistor intended for use in common-base class-B power amplifiers up to 2,45 GHz. Diffused emitter ballasting resistors, multicell geometry, interdigited structure, localized thick oxide and gold metallization ensure an optimum temperature profile and excellent performances at such frequencies.

The transistor has an FO 53 metal ceramic hermetic package.

QUICK REFERENCE DATA

R.F. performances, common-base, class-B

Typical values

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f GHz</th>
<th>V_{CE} V</th>
<th>P_L W</th>
<th>G_P dB</th>
<th>\eta_c %</th>
<th>\bar{z}_i \Omega</th>
<th>\bar{Z}_L \Omega</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-B</td>
<td>2,3</td>
<td>21</td>
<td>9</td>
<td>10</td>
<td>40</td>
<td>5 + j10</td>
<td>2,5 - j5</td>
</tr>
<tr>
<td>c.w. class-B</td>
<td>2,45</td>
<td>21</td>
<td>8</td>
<td>9</td>
<td>35</td>
<td>7,5 + j25</td>
<td>2,5 - j6,5</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-53 (see Fig. 1).

PRODUCT SAFETY

These devices contain beryllium oxide, the dust of which is toxic. The devices are entirely safe, provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-53.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) 
Collector-emitter voltage ($R_{BE} = 10 \Omega$)
Collector-emitter voltage (open base)
Emitter-base voltage (open collector)
Collector current (d.c.)
Total power dissipation ($T_{mb} \leq 75 \degree C$)
Storage temperature
Operating junction temperature
Soldering temperature
   at 0,7 mm from case; $t_{sld} \leq 10$ s

THERMAL RESISTANCE

From junction to mounting base
From mounting base to heatsink
   (torque on nut: 0,5 Nm with M3 screw)

VCBO max. 35 V
VCER max. 35 V
VCEO max. 15 V
VEBO max. 3,5 V
IC max. 1,7 A
Ptot max. 16,5 W
min. –65 °C
Tstg max. 200 °C
Tj max. 200 °C
T_{sld} max. 230 °C

$R_{th \ j-mb} = 6$ K/W
$R_{th \ mb-h} = 0,7$ K/W
MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 3 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B circuit

<table>
<thead>
<tr>
<th>Type number</th>
<th>Mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta$ %</th>
<th>$\bar{Z}_L$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PKB32001U</td>
<td>c.w.</td>
<td>3</td>
<td>28</td>
<td>typ. 1,3</td>
<td>typ. 8,1</td>
<td>typ. 34</td>
<td>11 + j1,8</td>
<td>3 + j3,5</td>
</tr>
<tr>
<td>PKB32003U</td>
<td>c.w.</td>
<td>3</td>
<td>28</td>
<td>typ. 3,2</td>
<td>typ. 6,3</td>
<td>typ. 33</td>
<td>14 - j4</td>
<td>2,5 - j1</td>
</tr>
<tr>
<td>PKB32005U</td>
<td>c.w.</td>
<td>3</td>
<td>28</td>
<td>typ. 5</td>
<td>typ. 5,2</td>
<td>typ. 31</td>
<td>13 + j2</td>
<td>2 - j4</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-53.

Base connected to flange

Pinning:
1 = collector
2 = emitter
3 = base

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code
RTC3001M = PKB32001U
RTC3003M = PKB32003U
RTC3005M = PKB32005U

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PKB32001U</th>
<th>32003U</th>
<th>32005U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage open emitter</td>
<td>VCBO</td>
<td>max.</td>
<td>45</td>
</tr>
<tr>
<td>Collector-emitter voltage R_{BE} = 10 , \Omega</td>
<td>VCER</td>
<td>max.</td>
<td>45</td>
</tr>
<tr>
<td>Emitter-base voltage open collector</td>
<td>VEBO</td>
<td>max.</td>
<td>3</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>IC</td>
<td>max.</td>
<td>0,4</td>
</tr>
<tr>
<td>R.F. power dissipation (f &gt; 1 MHz) up to T_{mb} = 75^\circ C</td>
<td>Prf</td>
<td>max.</td>
<td>4,5</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_{stg}</td>
<td>max.</td>
<td>-65 to</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_j</td>
<td>max.</td>
<td>200</td>
</tr>
<tr>
<td>Lead soldering temperature at 0,3 mm from ceramic; t_{sld} \leq 10 , s</td>
<td>T_{sld}</td>
<td>max.</td>
<td>235</td>
</tr>
</tbody>
</table>

**THERMAL RESISTANCE**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PKB32001U</th>
<th>32003U</th>
<th>32005U</th>
</tr>
</thead>
<tbody>
<tr>
<td>From junction to mounting base</td>
<td>R_{th j-mb}</td>
<td>max.</td>
<td>22</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>R_{th mb-h}</td>
<td>max.</td>
<td>0,7</td>
</tr>
</tbody>
</table>
MICROWAVE POWER TRANSISTORS

N-P-N silicon power transistor for use in a common-collector oscillator circuits in military and professional applications.

The transistors operate in c.w. conditions and are recommended for applications up to 8 GHz.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology.

The PPC5001T is housed in a metal ceramic flange envelope (F0-102). The PQC5001T is housed in a metal ceramic flange envelope (F0-85).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an oscillator circuit up to 5 GHz.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f , \text{GHz}$</th>
<th>$V_{CE} , \text{V}$</th>
<th>$I_C , \text{mA}$</th>
<th>$P_L , \text{mW}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B; c.w.</td>
<td>5</td>
<td>20</td>
<td>200</td>
<td>450</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

PPC5001T FO-102 (see Fig. 1a)
PQC5001T FO-85 (see Fig. 1b).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1a FO-102.

PPC5001T

Pinning:
1 = base
2 = emitter
3 = collector

Fig. 1b FO-85.

Dimensions in mm

PQC5001T

Pinning:
1 = base
2 = emitter
3 = collector
Microwave power transistors

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage,
\[ R_{BE} = 70 \Omega \]
open emitter

Emitter-base voltage, open collector

Collector current, d.c.

Total power dissipation
up to \( T_{amb} = 75 \, ^\circ C \)

Storage temperature

Junction temperature

Soldering temperature
at 0.1 mm from the case, \( t_{sld} \leq 10 \, s \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( V_{CBO} ) max.</td>
<td>40 V</td>
</tr>
<tr>
<td>( V_{CER} ) max.</td>
<td>35 V</td>
</tr>
<tr>
<td>( V_{CEO} ) max.</td>
<td>16 V</td>
</tr>
<tr>
<td>( V_{EBO} ) max.</td>
<td>3.5 V</td>
</tr>
<tr>
<td>( I_{C} ) max.</td>
<td>0.25 A</td>
</tr>
<tr>
<td>( P_{tot} ) max.</td>
<td>4 W</td>
</tr>
<tr>
<td>( T_{Stg} ) max.</td>
<td>-65 to +200 , ^\circ C</td>
</tr>
<tr>
<td>( T_{j} ) max.</td>
<td>200 , ^\circ C</td>
</tr>
<tr>
<td>( T_{sld} ) max.</td>
<td>235 , ^\circ C</td>
</tr>
</tbody>
</table>

Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base

\[ R_{th \, j-mb} = 24 \, K/W \]

CHARACTERISTICS

\( T_{mb} = 25 \, ^\circ C \) unless otherwise specified

Breakdown voltages

Collector cut-off current

Emitter cut-off current

Collector-base capacitance at \( f = 1 \, MHz \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( I_{C} = 500 , \mu A; I_{E} = 0 )</td>
<td>( V(BR)CBO ) ( \geq 40 , V )</td>
</tr>
<tr>
<td>( I_{C} = 2.5 , mA; R_{BE} = 70 , \Omega )</td>
<td>( V(BR)CER ) ( \geq 35 , V )</td>
</tr>
<tr>
<td>( I_{C} = 0; I_{E} = 100 , \mu A )</td>
<td>( V(BR)EBO ) ( \geq 3.5 , V )</td>
</tr>
<tr>
<td>( I_{E} = 0; V_{CB} = 24 , V )</td>
<td>( I_{CBO} ) ( \leq 100 , \mu A )</td>
</tr>
<tr>
<td>( I_{C} = 0; V_{EB} = 1.5 , V )</td>
<td>( I_{EBO} ) ( \leq 0.2 , \mu A )</td>
</tr>
<tr>
<td>( I_{E} = I_{C} = 0; V_{CB} = 18 , V; V_{EB} = 1.5 , V )</td>
<td>( C_{cb} ) typ. 1.4 , pF</td>
</tr>
</tbody>
</table>

July 1985 223
Emitter-base capacitance at $f = 1$ MHz
$I_E = I_C = 0$; $V_{EB} = 1$ V; $V_{CB} = 10$ V

Collector-emitter capacitance at $f = 1$ MHz
$I_E = I_C = 0$; $V_{CE} = 18$ V; $V_{EB} = 1.5$ V

$C_{eb}$ typ. $5.5$ pF

$C_{ce}$ typ. $0.9$ pF

Fig. 3 Emitter reflection coefficient.

Conditions for Figs 3 and 4:
$V_{CE} = 20$ V; $I_C = 200$ mA;
$Z_0 = 50$ Ω

Fig. 4 Base reflection coefficient.
MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4.2 GHz.
Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA
R.F. performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta$ %</th>
<th>$\overline{Z}_i$ Ω</th>
<th>$\overline{Z}_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTB23001X</td>
<td>c.w.</td>
<td>2</td>
<td>typ. 1,8</td>
<td>typ. 9</td>
<td>typ. 50</td>
<td>8 + j14</td>
<td>8 + j20</td>
<td></td>
</tr>
<tr>
<td>PTB23003X</td>
<td>c.w.</td>
<td>2</td>
<td>typ. 4,0</td>
<td>typ. 10</td>
<td>typ. 50</td>
<td>2,5 + j14</td>
<td>8 + j6</td>
<td></td>
</tr>
<tr>
<td>PTB23005X</td>
<td>c.w.</td>
<td>2</td>
<td>typ. 7,0</td>
<td>typ. 11</td>
<td>typ. 50</td>
<td>1,9 + j12</td>
<td>3 + j20</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA
Fig. 1 FO-41B.
Base and metallic cap connected to flange.

Dimensions in mm

Torque on screw: max. 0.5 Nm
Recommended screw: M2.5
Marking code: 23001 X
23003 X
23005 X

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PTB23001X</th>
<th>23003X</th>
<th>23005X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter</td>
<td>VCBO max. 40</td>
<td>40</td>
<td>40 V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RBE = 10 Ω</td>
<td>VCER max. 40</td>
<td>40</td>
<td>40 V</td>
</tr>
<tr>
<td>open base</td>
<td>VCEO max. 15</td>
<td>15</td>
<td>15 V</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector</td>
<td>VEBO max. 3,5</td>
<td>3,5</td>
<td>3,5 V</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>IC max. 0,25</td>
<td>0,5</td>
<td>0,75 A</td>
</tr>
<tr>
<td>Total power dissipation (f &gt; 1 MHz)</td>
<td>P max. 5,5</td>
<td>10</td>
<td>14,5 W</td>
</tr>
<tr>
<td>up to Tmb = 75 °C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg -65 to + 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>Tj max. 200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td>Tsld max. 235 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 0,3 mm from ceramic; tsld ≤ 10 s</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>PTB23001X</th>
<th>23003X</th>
<th>23005X</th>
</tr>
</thead>
<tbody>
<tr>
<td>From junction to mounting base</td>
<td>Rth j-mb max. 22</td>
<td>12</td>
<td>8,5 K/W</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>Rth mb-h max. 0,7</td>
<td>0,7</td>
<td>0,7 K/W</td>
</tr>
</tbody>
</table>

Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.
CHARACTERISTICS

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>PTB23001X</th>
<th>23003X</th>
<th>23005X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base breakdown voltage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter; I_C = 1 mA</td>
<td>V(BR)CBO</td>
<td>40</td>
<td>–</td>
</tr>
<tr>
<td>open emitter; I_C = 2 mA</td>
<td></td>
<td>40</td>
<td>–</td>
</tr>
<tr>
<td>open emitter; I_C = 3 mA</td>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Collector-emitter breakdown voltage</td>
<td>V(BR)CER</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>R_BE = 10 Ω; I_C = 10 mA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter-base breakdown voltage</td>
<td>V(BR)EBO</td>
<td>3,5</td>
<td>–</td>
</tr>
<tr>
<td>open collector; I_E = 0,5 mA</td>
<td></td>
<td>–</td>
<td>3,5</td>
</tr>
<tr>
<td>open collector; I_E = 1,0 mA</td>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>open collector; I_E = 1,5 mA</td>
<td></td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Collector cut-off current</td>
<td>I_CBO</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>I_E = 0; V_CB = 24 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter cut-off current</td>
<td>I_EBO</td>
<td>0,2</td>
<td>0,4</td>
</tr>
<tr>
<td>I_C = 0; V_EB = 1,5 V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-base capacitance at f = 1 MHz</td>
<td>C_CB</td>
<td>typ.</td>
<td>2,2</td>
</tr>
<tr>
<td>I_E = I_C = 0; V_CB = 24 V; V_EB = 1,5 V</td>
<td></td>
<td></td>
<td>3,8 pF</td>
</tr>
<tr>
<td>Collector-emitter capacitance at f = 1 MHz</td>
<td>C_CE</td>
<td>typ.</td>
<td>0,3</td>
</tr>
<tr>
<td>I_E = I_C = 0; V_CB = 24 V; V_EB = 1,5 V</td>
<td></td>
<td></td>
<td>0,9 pF</td>
</tr>
</tbody>
</table>
MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4.2 GHz.

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta$ %</th>
<th>$Z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTB32001X</td>
<td>c.w.</td>
<td>3</td>
<td>24</td>
<td>typ. 1.8</td>
<td>typ. 9.5</td>
<td>typ. 45</td>
<td>15 + j31</td>
<td>5.5 + j10</td>
</tr>
<tr>
<td>PTB32003X</td>
<td>c.w.</td>
<td>3</td>
<td>24</td>
<td>typ. 3.0</td>
<td>typ. 9.5</td>
<td>typ. 40</td>
<td>5.5 + j29</td>
<td>5 - j2.2</td>
</tr>
<tr>
<td>PTB32005X</td>
<td>c.w.</td>
<td>3</td>
<td>24</td>
<td>typ. 5.5</td>
<td>typ. 9.5</td>
<td>typ. 40</td>
<td>8.5 + j48</td>
<td>4 - j7</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensons in mm

Fig. 1 FO-41B.

Base and metallic cap connected to flange.

Torque on screw: max. 0.5 Nm
Recommended screw: M 2.5

Marking code: 32001X 32003X 32005X

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th></th>
<th>PTB32001X</th>
<th>32003X</th>
<th>32005X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td>VcBO</td>
<td>max.</td>
<td>40</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>RBE = 10 Ω</td>
<td>open base</td>
<td></td>
</tr>
<tr>
<td>VCER</td>
<td>max.</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>VCEO</td>
<td>max.</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td>VEBO</td>
<td>max.</td>
<td>3,5</td>
</tr>
<tr>
<td>IC</td>
<td>max.</td>
<td>0,25</td>
<td>0,5</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>Ic</td>
<td>max.</td>
<td>0,25</td>
</tr>
<tr>
<td>Total power dissipation (f &gt; 1 MHz) up to Tmb = 75 °C</td>
<td>P</td>
<td>max.</td>
<td>5,5</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>Tj</td>
<td>max.</td>
<td>200</td>
</tr>
<tr>
<td>Lead soldering temperature at 0,3 mm from ceramic; tslid ≤ 10 s</td>
<td>Tsld</td>
<td>max.</td>
<td>235 °C</td>
</tr>
<tr>
<td>THERMAL RESISTANCE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>From junction to mounting base</td>
<td>Rth j-mb</td>
<td>max.</td>
<td>22</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>Rth mb-h</td>
<td>max.</td>
<td>0,7</td>
</tr>
</tbody>
</table>

Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.

Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. f > 1 MHz.
Microwave power transistors

Fig. 4 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1 \text{ MHz}$.

**CHARACTERISTICS**

<table>
<thead>
<tr>
<th>PTB32001X</th>
<th>32003X</th>
<th>32005X</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter; $I_C = 1 \text{ mA}$</td>
<td>$V_{(BR)CBO} \geq 40$</td>
<td>-</td>
</tr>
<tr>
<td>open emitter; $I_C = 2 \text{ mA}$</td>
<td>-</td>
<td>$40$</td>
</tr>
<tr>
<td>open emitter; $I_C = 3 \text{ mA}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Collector-emitter breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 10 \Omega$; $I_C = 10 \text{ mA}$</td>
<td>$V_{(BR)CER} \geq 40$</td>
<td>$40$</td>
</tr>
<tr>
<td>Emitter-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector; $I_E = 0,5 \text{ mA}$</td>
<td>$V_{(BR)EBO} \geq 3,5$</td>
<td>-</td>
</tr>
<tr>
<td>open collector; $I_E = 1,0 \text{ mA}$</td>
<td>-</td>
<td>$3,5$</td>
</tr>
<tr>
<td>open collector; $I_E = 1,5 \text{ mA}$</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Collector cut-off current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_E = 0$; $V_{CB} = 24 \text{ V}$</td>
<td>$I_{CBO} \leq 10 \text{ µA}$</td>
<td>$20$</td>
</tr>
<tr>
<td>Emitter cut-off current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_C = 0$; $V_{EB} = 1,5 \text{ V}$</td>
<td>$I_{EBO} \leq 0,2 \text{ µA}$</td>
<td>$0,4$</td>
</tr>
<tr>
<td>Collector-base capacitance at $f = 1 \text{ MHz}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$</td>
<td>$C_{cb} \text{ typ.} = 2,2$</td>
<td>$3$</td>
</tr>
<tr>
<td>Collector-emitter capacitance at $f = 1 \text{ MHz}$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$I_E = I_C = 0$; $V_{CB} = 24 \text{ V}$; $V_{EB} = 1,5 \text{ V}$</td>
<td>$C_{ce} \text{ typ.} = 0,3$</td>
<td>$0,6$</td>
</tr>
</tbody>
</table>

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MICROWAVE POWER TRANSISTORS

N-P-N silicon transistors for use in common-base class-B power amplifiers up to 4.2 GHz.
Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide auto-alignment process and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to \( T_{mb} = 25 \, ^\circ\text{C} \) in an unneutralized common-base class-B circuit

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>( f ) GHz</th>
<th>( V_{CE} ) V</th>
<th>( P_L ) W</th>
<th>( \eta ) %</th>
<th>( Z_i ) ( \Omega )</th>
<th>( Z_L ) ( \Omega )</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTB42001X</td>
<td>c.w.</td>
<td>4.2</td>
<td>typ. 1.0</td>
<td>typ. 6</td>
<td>typ. 33</td>
<td>235 + j0</td>
<td>3.3 – j5.8</td>
</tr>
<tr>
<td>PTB42002X</td>
<td>c.w.</td>
<td>4.2</td>
<td>typ. 2.0</td>
<td>typ. 6</td>
<td>typ. 35</td>
<td>44.5 + j85</td>
<td>2.4 – j15.5</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-41B.
Base and metallic cap connected to flange.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on nut: max. 0.4 Nm
Recommended screw: M2.5

Marking code
RTC4001M = PTB42001X
RTC4002M = PTB42002X

(1) Flatness of this area ensures full thermal contact with bolt head.

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage
open emitter

Collector-emitter voltage
$R_{BE} = 10 \, \Omega$
open base

Emitter-base voltage
open collector

Collector current (d.c.)

R.F. power dissipation ($f > 1 \, MHz$)
up to $T_{mb} = 75 \, ^{\circ}C$

Storage temperature
Junction temperature

Lead soldering temperature
at 0,3 mm from ceramic; $t_{sld} \leq 10 \, s$

<table>
<thead>
<tr>
<th></th>
<th>PTB42001X</th>
<th>42002X</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{CBO}$ max.</td>
<td>40</td>
<td>40 V</td>
</tr>
<tr>
<td>$V_{CER}$ max.</td>
<td>40</td>
<td>40 V</td>
</tr>
<tr>
<td>$V_{CEO}$ max.</td>
<td>15</td>
<td>15 V</td>
</tr>
<tr>
<td>$V_{EBO}$ max.</td>
<td>3,5</td>
<td>3,5 V</td>
</tr>
<tr>
<td>$I_C$ max.</td>
<td>0,25</td>
<td>0,5 A</td>
</tr>
<tr>
<td>$P_{tot}$ max.</td>
<td>5,5</td>
<td>10 W</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>-65 to +200</td>
<td>0C</td>
</tr>
<tr>
<td>$T_j$ max.</td>
<td>200</td>
<td>0C</td>
</tr>
<tr>
<td>$T_{sld}$ max.</td>
<td>235</td>
<td>0C</td>
</tr>
</tbody>
</table>

Fig. 2 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1 \, MHz$.

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

<table>
<thead>
<tr>
<th></th>
<th>PTB42001X</th>
<th>42002X</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{th , j-mb}$ max.</td>
<td>22</td>
<td>12 K/W</td>
</tr>
<tr>
<td>$R_{th , mb-h}$ max.</td>
<td>0,7</td>
<td>0,7 K/W</td>
</tr>
</tbody>
</table>

Fig. 3 Maximum permissible R.F. power dissipation as a function of mounting base temperature. $f > 1 \, MHz$. 
CHARACTERISTICS

Collector-base breakdown voltage
- open emitter; I_C = 1 mA
  \( V_{(BR)CBO} \geq 40 \) V
- open emitter; I_C = 2 mA
  \( V_{(BR)CBO} \geq 40 \) V

Collector-emitter breakdown voltage
- \( R_{BE} = 10 \Omega; I_C = 10 \) mA
  \( V_{(BR)CER} \geq 40 \) V

Emitter-base breakdown voltage
- open collector; I_E = 0,5 mA
  \( V_{(BR)EBO} \geq 3,5 \) V
- open collector; I_E = 1,0 mA
  \( V_{(BR)EBO} \geq 3,5 \) V

Collector cut-off current
- I_E = 0; V_C = 24 V
  \( I_{CBO} \leq 10 \) mA

Emitter cut-off current
- I_C = 0; V_E = 1,5 V
  \( I_{EBO} \leq 0,2 \) mA

Collector-base capacitance at f = 1 MHz
- I_E = I_C = 0; V_C = 24 V; V_E = 1,5 V
  \( C_{cb} \text{ typ.} \geq 2,2 \) pF

Collector-emitter capacitance at f = 1 MHz
- I_E = I_C = 0; V_C = 24 V; V_E = 1,5 V
  \( C_{ce} \text{ typ.} \geq 0,3 \) pF

APPLICATION INFORMATION (see also next page)

PTB42001X

\[\text{Load power as a function of source power}\]

Conditions for Figs 4 and 5:
Class-B operation; \( V_{CE} = 24 \) V; \( f = 4,2 \) GHz; \( T_{mb} = 25 \) °C.
APPLICATION INFORMATION (see also previous page)

R.F. performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B circuit*

<table>
<thead>
<tr>
<th>type number</th>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta$ %</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PTB42001X</td>
<td>c.w.</td>
<td>4,2</td>
<td>24</td>
<td>&gt; 0,8</td>
<td>&gt; 5</td>
<td>&gt; 28</td>
<td>235 + j0</td>
<td>3,3 – j5,8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>typ. 1,0</td>
<td>typ. 6</td>
<td>typ. 33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTB42002X</td>
<td>c.w.</td>
<td>4,2</td>
<td>24</td>
<td>&gt; 1,6</td>
<td>&gt; 5</td>
<td>&gt; 28</td>
<td>44,5 + j85</td>
<td>2,4 – j15,5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>typ. 2,0</td>
<td>typ. 6</td>
<td>typ. 35</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 6 Prematching test circuit boards for the PTB42001X at 4,2 GHz (Dimensions in mm.)

Fig. 7 Prematching test circuit boards for the PTB42002X at 4,2 GHz. (Dimensions in mm.)

Circuits on a double Cu-clad printed-circuit board PTFE fibre-glass dielectric ($\varepsilon_r = 2,5$); thickness 0,8 mm.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.
MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-C amplifier up to a frequency of 4.2 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high V.S.W.R.
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- An input matching cell improving the input impedance and allowing an easier design of wideband circuits

The transistor is housed in a metal ceramic flange envelope (FO 41B).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \degree C$ in an unneutralized common-base class-C selective amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$\overline{Z_I}$ (Ω)</th>
<th>$\overline{Z_L}$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-C</td>
<td>4.2</td>
<td>24</td>
<td>typ. 3.0</td>
<td>typ. 3.0</td>
<td>typ. 33</td>
<td>12 + j35</td>
<td>2.5 − j10</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-41B (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-41B.

Base and metallic cap connected to flange

Pinning:
1 = collector
2 = base
3 = emitter

Torque on screw: max. 0.4 Nm
Recommended screw: M2.5 or 4-40 UNC/2A

Marking code: RTC 4203X
(1) Flatness of this area ensures full thermal contact with bolt head.
Microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage

open base

$R_{BE} = 10 \, \Omega$

Emitter-base voltage, open collector

Collector current (d.c.)

Total power dissipation

Storage temperature

Junction temperature

Soldering temperature

at 0,1 mm from ceramic; $t_{sld} \leq 10 \, s$

Collector-base capacitance

Fig. 2 Power derating curve versus mounting base temperature.

THERMAL RESISTANCE

From junction to mounting base

From mounting base to heatsink

CHARACTERISTICS

$T_{mb} = 25 \, ^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector cut-off current

Emitter cut-off current

Collector-base capacitance

$T_{mb} = 25 \, ^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector cut-off current

Emitter cut-off current

Collector-base capacitance

$T_{mb} = 25 \, ^\circ\text{C}$ unless otherwise specified

Breakdown voltages

Collector cut-off current

Emitter cut-off current

Collector-base capacitance
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-C selective amplifier*

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_D$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w., class-C</td>
<td>4,2</td>
<td>24</td>
<td>$\geq 2,5$</td>
<td>$\geq 5$</td>
<td>$\geq 28$</td>
<td>12 + j35</td>
<td>2,5 - j10</td>
</tr>
</tbody>
</table>

Fig. 3 Prematching test circuit board for 4,2 GHz. (Dimensions in mm).

Striplines on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric ($e_r = 2,54$), thickness 0,8 mm.

Fig. 4 Load power versus source power.

* Circuit consists of prematching circuit board in combination with complementary input and output slug tuners.
MICROWAVE POWER TRANSISTOR

N-P-N silicon transistor for use in common-base class-B power amplifiers up to 4,2 GHz. Diffused emitter ballasting resistors, interdigitated structure, multicell geometry, localized thick oxide and gold sandwich metallization ensure an optimum temperature profile and excellent performance and reliability.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B circuit

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta$ %</th>
<th>$\bar{z}_l$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>3,7 to 4,2</td>
<td>24</td>
<td>typ. 4,5</td>
<td>typ. 7,4</td>
<td>typ. 32</td>
<td>35 + j15</td>
<td>6 + j2</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-83.
Base connected to flange

Dimensions in mm

Torque on nut: max. 0,5 Nm
Recommended screw: M3

Marking code
RTC3742B4X = PV3742B4X

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)

Collector-emitter voltage

(\(R_{BE} \leq 10 \Omega\))

(open base)

Emitter-base voltage (open collector)

Collector current (d.c.)

Total r.f. power dissipation up to \(T_{mb} = 75 \, ^\circ\text{C}\)

Storage temperature

Junction temperature

Lead soldering temperature

at 0,3 mm from the case; \(t_{sld} \leq 10 \, \text{s}\)

\[
\begin{align*}
V_{CBO} & \quad \text{max.} \quad 40 \, \text{V} \\
V_{CER} & \quad \text{max.} \quad 40 \, \text{V} \\
V_{CEO} & \quad \text{max.} \quad 15 \, \text{V} \\
V_{EBO} & \quad \text{max.} \quad 3,5 \, \text{V} \\
I_C & \quad \text{max.} \quad 1 \, \text{A} \\
P_{rf} & \quad \text{max.} \quad 18 \, \text{W} \\
T_{stg} & \quad -65 \text{ to } +200 \, ^\circ\text{C} \\
T_j & \quad \text{max.} \quad 200 \, ^\circ\text{C} \\
T_{sld} & \quad \text{max.} \quad 235 \, ^\circ\text{C}
\end{align*}
\]

Fig. 2 Maximum permissible r.f. power dissipation as a function of mounting base temperature.

\(f > 3,6 \, \text{GHz}; V_{CE} = 24 \, \text{V}\).

\[\text{THERMAL RESISTANCE}\]

From junction to mounting base \(R_{th \ j-mb} = 6,5 \, \text{K/W}\)

From mounting base to heatsink \(R_{th \ mb-h} = 0,7 \, \text{K/W}\)

---

June 1985
CHARACTERISTICS

$T_{mb} = 25 \, ^\circ C$

Collector-emitter breakdown voltage

$R_{BE} = 10 \, \Omega$; $I_C = 30 \, mA$

Emitter-base breakdown voltage

open collector; $I_E = 0,5 \, mA$

Collector cut-off current

$I_E = 0; V_{CB} = 24 \, V$

Emitter cut-off current

$I_C = 0; V_{EB} = 1,5 \, V$

Collector-base capacitance at $f = 1 \, MHz$

$I_E = I_C = 0; V_{CB} = 24 \, V; V_{EB} = 1,5 \, V$

Collector-emitter capacitance at $f = 1 \, MHz$

$I_E = I_C = 0; V_{CE} = 24 \, V; V_{EB} = 1,5 \, V$

Emitter-base capacitance at $f = 1 \, MHz$

$I_E = I_C = 0; V_{EB} = 1 \, V; V_{CB} = 24 \, V$

APPLICATION INFORMATION

R.F. performance in c.w. operation up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B circuit *

<table>
<thead>
<tr>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta$ %</th>
<th>$\overline{Z_i}$ $\Omega$</th>
<th>$\overline{Z_L}$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>3,7 to 4,2</td>
<td>24</td>
<td>&gt; 4</td>
<td>&gt; 6,0</td>
<td>&gt; 25</td>
<td>35 + j15</td>
<td>6 + j2</td>
</tr>
</tbody>
</table>

Fig. 3 Prematching test circuit boards for 4,2 GHz. (Dimensions in mm.)

Input striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,55$); thickness 0,8 mm.

Output striplines on a double Cu-clad Rexolite printed-circuit board with dielectric ($\varepsilon_r = 2,4$); thickness 0,25 mm.

* Circuit consists of prematching circuit boards in combination with complementary input and output slug tuners.
Fig. 4 Load power as a function of source power measured in a selective test circuit.

Fig. 5 Load power as a function of frequency measured in a wideband test circuit. VSWR at input \( \leq 3 \).

Fig. 6 Power gain and efficiency as a function of frequency measured in a wideband test circuit. VSWR at input \( \leq 3 \).

Conditions for Figs 4, 5 and 6:
Typical values; class-B operation; \( V_{CE} = 24 \) V; \( T_{mb} = 25 \) °C.
Fig. 7 Input impedance as a function of frequency.

Fig. 8 Optimum load impedance as a function of frequency.

Conditions for Figs 7 and 8:
Typical values; class-B operation; $V_{CE} = 24 \text{ V}; T_{mb} = 25 \text{ °C}; Z_0 = 50 \Omega$. 
MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B power amplifier up to 4.2 GHz.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Local thick oxide and gold sandwich metallization realizing a very good stability of the characteristics and excellent lifetime
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (F0-83).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 ^\circ C$ in an unneutralized common-base class-B circuit.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B; c.w.</td>
<td>1</td>
<td>24</td>
<td>typ. 15</td>
<td>typ. 13</td>
<td>typ. 60</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>24</td>
<td>typ. 11</td>
<td>typ. 10</td>
<td>typ. 55</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>24</td>
<td>typ. 8</td>
<td>typ. 8</td>
<td>typ. 45</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>24</td>
<td>typ. 5</td>
<td>typ. 6</td>
<td>typ. 30</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-83 (see Fig. 1).

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-83.

Base connected to flange.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on nut: 0,4 Nm
Recommended screw: M2,5

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
VCBO max. 40 V

Collector-emitter voltage
open base
VCBO max. 40 V

Emitter-base voltage, open collector
VEBO max. 3,5 V

Collector current (d.c.)
IC max. 1 A

Total power dissipation up to Tmb = 75 °C
Prot max. 18 W

Storage temperature
Tstg −65 to 200 °C

Junction temperature
Tj max. 200 °C

Lead soldering temperature
at 0,1 mm from the case; tsld ≤ 10 s

THERMAL RESISTANCE
From junction to mounting base
Rth j-mb = 6,5 K/W

From mounting base to heatsink
Rth mb-h = 0,7 K/W
Fig. 2 Power derating curve versus mounting base temperature; $V_{CE} = 24 \text{ V}; f > 1 \text{ MHz}$.

CHARACTERISTICS
$T_{mb} = 25 \text{ °C}$ unless otherwise specified

Collector-emitter breakdown voltage
$I_C = 30 \text{ mA}; R_{BE} = 10 \Omega$

Emitter-base breakdown voltage
$I_C = 0; I_E = 0.5 \text{ mA}$

Collector cut-off current
$I_E = 0; V_{CB} = 24 \text{ V}$

Emitter cut-off current
$I_C = 0; V_{EB} = 1.5 \text{ V}$

Collector-base capacitance at $f = 1 \text{ MHz}$
$I_E = I_C = 0; V_{CB} = 24 \text{ V}; V_{EB} = 1.5 \text{ V}$

Collector-emitter capacitance at $f = 1 \text{ MHz}$
$I_E = I_C = 0; V_{CB} = 24 \text{ V}; V_{EB} = 1.5 \text{ V}$

Emitter-base capacitance at $f = 1 \text{ MHz}$
$I_E = I_C = 0; V_{CB} = 24 \text{ V}; V_{EB} = 1 \text{ V}$

<table>
<thead>
<tr>
<th>$f$ MHz</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>$4.5 + j15.5$</td>
<td>$2.5 + j2.5$</td>
</tr>
<tr>
<td>2.7</td>
<td>$6 + j19$</td>
<td>$2.5 + j0$</td>
</tr>
</tbody>
</table>

LARGE SIGNAL IMPEDANCES

V$_{(BR)\text{CER}} \geq 40 \text{ V}$

V$_{(BR)\text{EBO}} \geq 3.5 \text{ V}$

I$_{CBO} \leq 50 \text{ mA}$

I$_{EBO} \leq 1.5 \text{ mA}$

C$_{cb}$ typ. $50 \text{ pF}$

C$_{ce}$ typ. $1.2 \text{ pF}$

C$_{eb}$ typ. $30 \text{ pF}$
Fig. 3 Load power versus input power; $V_{CE} = 24\, V$. 
MICROWAVE POWER TRANSISTORS FOR BROADBAND

N-P-N transistors for use in common-base, class-B, wideband amplifiers under c.w. conditions in military and professional applications and intended to drive PZ1418B30U/PZ1721B25U/PZ2024B20U family.

Features
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope (F057C).

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B wideband amplifier (typical values).

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1418B15U</td>
<td>1,4 to 1,8</td>
<td>28</td>
<td>typ. 15</td>
<td>typ. 7,8</td>
<td>typ. 45</td>
<td>see Fig. 6</td>
<td>see Fig. 7</td>
</tr>
<tr>
<td>PZ1721B12U</td>
<td>1,7 to 2,1</td>
<td>28</td>
<td>typ. 16</td>
<td>typ. 8</td>
<td>typ. 45</td>
<td>see Fig. 11</td>
<td>see Fig. 12</td>
</tr>
<tr>
<td>PZ2024B10U</td>
<td>2,0 to 2,4</td>
<td>28</td>
<td>typ. 12</td>
<td>typ. 6,8</td>
<td>typ. 45</td>
<td>see Fig. 16</td>
<td>see Fig. 17</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

August 1985
Fig. 1 FO-57C.

Torque on screw: max. 0.5 Nm
Recommended screw: M3

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage
  open emitter

Collector-emitter voltage
  $R_{BE} = 10 \Omega$
  open base

Emitter-base voltage
  open collector

Collector current (d.c.)

Total power dissipation up to $T_{mb} = 75^\circ C$

Storage temperature

Junction temperature

Lead soldering temperature

THERMAL RESISTANCE

From junction to mounting base

$$R_{thj-mb} = 4 \text{ K/W}$$
CHARACTERISTICS

$$T_{mb} = 25 \, ^\circ C$$

Collector cut-off current
- $$I_E = 0; \, V_{CB} = 30 \, V$$
- $$I_E = 0; \, V_{CB} = 40 \, V$$
- $$R_{BE} = 10 \, \Omega; \, V_{CE} = 35 \, V$$

Emitter cut-off current
- $$I_C = 0; \, V_{EB} = 1.5 \, V$$
- $$I_C = 0; \, V_{EB} = 3 \, V$$

$$I_{CBO} < 2.5 \, mA$$
$$I_{CBO} < 5 \, mA$$
$$I_{CER} < 25 \, mA$$
$$I_{EBO} < 100 \, \mu A$$
$$I_{EBO} < 0.5 \, mA$$
APPLICATION INFORMATION (type PZ1418B15U)

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_{L}$ W</th>
<th>$G_{P}$ dB</th>
<th>$\eta_{C}$ %</th>
<th>$z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1418B15U</td>
<td>1,4 to 1,8</td>
<td>28</td>
<td>$&gt; 12,5$</td>
<td>$&gt; 7$</td>
<td>$&gt; 38$</td>
<td>see Fig. 6</td>
<td>see Fig. 7</td>
</tr>
</tbody>
</table>

Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\varepsilon_r = 10$.

Fig. 4 Load power vs. input power; typical values.

Fig. 5 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 2,5$ W.

Conditions for Figs 4 and 5:

$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25 \, ^\circ C$. 

April 1985
Microwave power transistors for broadband

Fig. 6 Input impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$.

Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$. 
APPLICATION INFORMATION (type PZ1721B12U)

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$Z_i$ ($\Omega$)</th>
<th>$Z_L$ ($\Omega$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1721B10U</td>
<td>1.7 to 2.1</td>
<td>28</td>
<td>&gt; 12</td>
<td>&gt; 6.8</td>
<td>&gt; 35</td>
<td>see Fig. 11</td>
<td>see Fig. 12</td>
</tr>
</tbody>
</table>

Fig. 8 Prematching test circuit boards for 1.7 to 2.1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0.635 mm; $\epsilon_r = 10$.

Fig. 9 Load power vs. input power; typical values.

Conditions for Figs 9 and 10:
$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25^\circ C$.
Microwave power transistors for broadband

Fig. 11 Input impedance vs. frequency; typical values; $Z_0 = 5 \Omega$.

Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \Omega$. 
APPLICATION INFORMATION (type PZ2024B10U)

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ2024B10U</td>
<td>2,0 to 2,4</td>
<td>28</td>
<td>&gt;9</td>
<td>&gt;5,6</td>
<td>&gt;30</td>
<td>see Fig. 16</td>
<td>see Fig. 17</td>
</tr>
</tbody>
</table>

Fig. 13 Prematching test circuit boards for 2,0 to 2,4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $e_r = 10$.

Fig. 14 Load power vs. input power. typical values.

Fig. 15 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 2,5$ W.

Conditions for Figs 14 and 15:
$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25^\circ C$. 

August 1985
Fig. 16 Input impedance vs. frequency; typical values; $Z_O = 5 \, \Omega$.

Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_O = 5 \, \Omega$. 
MICROWAVE POWER TRANSISTORS FOR WIDEBAND

N-P-N transistors for use in common-base, class-B, broadband amplifiers under c.w. conditions in military and professional applications.

Features
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realising a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistors are housed in a ceramic flange envelope.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-base class-B wideband amplifier (typical values).

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$Gp$ dB</th>
<th>$\eta_C$ %</th>
<th>$z_I$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1418B30U</td>
<td>1.4 to 1.8</td>
<td>28</td>
<td>typ. 35</td>
<td>typ. 8.4</td>
<td>typ. 45</td>
<td>see Fig. 6</td>
<td>see Fig. 7</td>
</tr>
<tr>
<td>PZ1721B25U</td>
<td>1.7 to 2.1</td>
<td>28</td>
<td>typ. 30</td>
<td>typ. 7.8</td>
<td>typ. 41</td>
<td>see Fig. 11</td>
<td>see Fig. 12</td>
</tr>
<tr>
<td>PZ2024B20U</td>
<td>2.0 to 2.4</td>
<td>28</td>
<td>typ. 26</td>
<td>typ. 7</td>
<td>typ. 42</td>
<td>see Fig. 16</td>
<td>see Fig. 17</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY  These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage
- open emitter
- Collector-emitter voltage
  \( R_{BE} = 10 \, \Omega \)
- open base
Emitter-base voltage
- open collector
Collector current (d.c.)
Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)
Storage temperature
Junction temperature
Lead soldering temperature

THERMAL RESISTANCE
From junction to mounting base

\[
R_{th, j-mb} = 2.2 \, K/W
\]
Microwave power transistors for wideband

\[ P_{\text{tot}} (\text{W}) \]

\[ T_{\text{mb}} (\text{°C}) \]

Fig. 2 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

\( T_{\text{mb}} = 25 \text{ °C} \)

**Collector cut-off current**

- \( I_E = 0; V_{\text{CB}} = 30 \text{ V} \)
- \( I_E = 0; V_{\text{CB}} = 40 \text{ V} \)
- \( R_{\text{BE}} = 10 \Omega; V_{\text{CE}} = 35 \text{ V} \)

**Emitter cut-off current**

- \( I_C = 0; V_{\text{EB}} = 1.5 \text{ V} \)
- \( I_C = 0; V_{\text{EB}} = 3 \text{ V} \)

\( I_{\text{CB0}} < 5 \text{ mA} \)
\( I_{\text{CBO}} < 10 \text{ mA} \)
\( I_{\text{CER}} < 50 \text{ mA} \)
\( I_{\text{EBO}} < 200 \mu\text{A} \)
\( I_{\text{EBO}} < 1 \text{ mA} \)

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APPLICATION INFORMATION (type PZ1418B30U)

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$Z_i$ (Ω)</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1418B30U</td>
<td>1,4 to 1,8</td>
<td>28</td>
<td>&gt;27</td>
<td>&gt;7,3</td>
<td>&gt;38</td>
<td>see Fig. 6</td>
<td>see Fig. 7</td>
</tr>
</tbody>
</table>

Fig. 3 Prematching test circuit boards for 1,4 to 1,8 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,635 mm; $\varepsilon_r = 10$.

Fig. 4 Load power versus input power; typical values.

Fig. 5 Load power, efficiency and VSWR versus frequency; typical values; $P_{in} = 5$ W.

Conditions for Figs 4 and 5:

$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25$ °C.
Microwave power transistors for wideband

Fig. 6 Input impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$.

Fig. 7 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$. 

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APPLICATION INFORMATION (type PZ1721B25U)

Microwave performance up to $T_{mb} = 25\, ^\circ\text{C}$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$Z_I$ Ω</th>
<th>$Z_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ1721B25U</td>
<td>1.7 to 2.1</td>
<td>28</td>
<td>$&gt;25$</td>
<td>$&gt;7$</td>
<td>$&gt;35$</td>
<td>see Fig. 11</td>
<td>see Fig. 12</td>
</tr>
</tbody>
</table>

Fig. 8 Prematching test circuit boards for 1.7 to 2.1 GHz (dimensions in mm); Epsilam p.c. board; thickness 0.635 mm; $\varepsilon_r = 10$.

Fig. 9 Load power vs. input power; typical values.

Fig. 10 Load power, efficiency and VSWR vs. frequency; typical values; $P_{in} = 5$ W.

Conditions for Figs 9 and 10:
$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25\, ^\circ\text{C}$.
Fig. 11 Input impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$.

Fig. 12 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$. 
APPLICATION INFORMATION (type PZ2024B20U)

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta_C$ %</th>
<th>$z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>PZ2024B20U</td>
<td>2.0 to 2.4</td>
<td>28</td>
<td>$&gt;20$</td>
<td>$&gt;6$</td>
<td>$&gt;35$</td>
<td>see Fig. 16</td>
<td>see Fig. 17</td>
</tr>
</tbody>
</table>

Fig. 13 Prematching test circuit boards for 2.0 to 2.4 GHz (dimensions in mm); Epsilam p.c. board; thickness 0.635 mm; $\varepsilon_r = 10$.

Fig. 14 Load power versus input power; typical values.

Fig. 15 Load power, efficiency and VSWR versus frequency; typical values; $P_{in} = 5$ W.

Conditions for Figs 14 and 15:

$V_{CC} = 28$ V; class-B operation; $T_{mb} = 25 \, ^\circ C$. 

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Fig. 16 Input impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$.

Fig. 17 Optimum load impedance vs. frequency; typical values; $Z_0 = 5 \, \Omega$. 
MICROWAVE POWER TRANSISTORS

N-P-N transistor for use in common-base, class-B, amplifier under c.w. conditions in military and professional applications up to 1.6 GHz.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent lifetime
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a ceramic flange envelope.

An input matching cell improves the input impedance and allows an easier design of wideband circuits.

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B selective amplifier.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Envelope</td>
<td>F057C</td>
</tr>
<tr>
<td>Mode of operation</td>
<td>c.w.; class-B</td>
</tr>
<tr>
<td>Frequency</td>
<td>$f$</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>$V_{CE}$ typ.</td>
</tr>
<tr>
<td>Load power</td>
<td>$P_L$ typ.</td>
</tr>
<tr>
<td>Power gain</td>
<td>$G_P$ typ.</td>
</tr>
<tr>
<td>Collector efficiency</td>
<td>$\eta_C$ typ.</td>
</tr>
<tr>
<td>Input impedance</td>
<td>$z_i$ typ.</td>
</tr>
<tr>
<td>Load impedance</td>
<td>$Z_L$ typ.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>1.55 GHz</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>28 V</td>
</tr>
<tr>
<td>Load power</td>
<td>38 W</td>
</tr>
<tr>
<td>Power gain</td>
<td>9.8 dB</td>
</tr>
<tr>
<td>Collector efficiency</td>
<td>50 %</td>
</tr>
<tr>
<td>Input impedance</td>
<td>$2 + j4.5 , \Omega$</td>
</tr>
<tr>
<td>Load impedance</td>
<td>$1.5 + jo , \Omega$</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
Fig. 1 FO-57C.
Torque on nut: max. 0.5 Nm
Recommended screw: M3

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage
open emitter

Collector-emitter voltage
\( R_{BE} = 10 \, \Omega \)
open base

Emitter-base voltage
open collector

Collector current (d.c.)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ \text{C} \)

Storage temperature

Junction temperature

Lead soldering temperature
\( > 0.1 \, \text{mm from flange}; t_{sld} < 10 \, \text{s} \)

THERMAL RESISTANCE
From junction to mounting base

\[
\begin{align*}
V_{CBO} & \quad \text{max.} \quad 40 \, \text{V} \\
V_{CER} & \quad \text{max.} \quad 35 \, \text{V} \\
V_{CEO} & \quad \text{max.} \quad 15 \, \text{V} \\
V_{EBO} & \quad \text{max.} \quad 3 \, \text{V} \\
I_{C} & \quad \text{max.} \quad 4 \, \text{A} \\
P_{\text{tot}} & \quad \text{max.} \quad 45 \, \text{W} \\
T_{\text{stg}} & \quad -65 \, \text{to} \, +200 \, \text{°C} \\
T_{j} & \quad \text{max.} \quad +200 \, \text{°C} \\
T_{sld} & \quad \text{max.} \quad +235 \, \text{°C} \\
R_{th \, j-mb} & \quad \text{max.} \quad 2.2 \, \text{K/W}
\end{align*}
\]
Fig. 2 Power derating curve versus mounting base temperature.

**CHARACTERISTICS**

\[ T_{mb} = 25 \, ^{\circ}C \text{ unless otherwise specified} \]

**Collector cut-off currents**

- \( V_{CB} = 40 \, \text{V}; I_E = 0 \)
- \( V_{CB} = 30 \, \text{V}; I_E = 0 \)
- \( V_{CER} = 35 \, \text{V}; R_{BE} = 10 \, \Omega \)

**Emitter cut-off currents**

- \( V_{EB} = 3 \, \text{V}; I_C = 0 \)
- \( V_{EB} = 1.5 \, \text{V}; I_C = 0 \)

**Collector-base capacitance**

- \( I_E = I_C = 0; V_{CB} = 28 \, \text{V} \)
- \( C_{cb} \text{ typ.} = 17 \, \text{pF} \)

- \( I_{CBO} \leq 10 \, \text{mA} \)
- \( I_{CBO} \leq 5 \, \text{mA} \)
- \( I_{CER} \leq 50 \, \text{mA} \)
- \( I_{EBO} \leq 1 \, \text{mA} \)
- \( I_{EBO} \leq 200 \, \mu\text{A} \)
APPLICATION INFORMATION

Microwave performance up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-base class-B selective amplifier.*

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta_C$ %</th>
<th>$z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>C.W. class-B</td>
<td>1,55</td>
<td>28</td>
<td>$&gt;35$</td>
<td>$&gt;8$</td>
<td>$&gt;45$</td>
<td>2 + j4,5</td>
<td>1,5 + j0</td>
</tr>
</tbody>
</table>

* Amplifier consists of pre-matching test circuit with complementary input and output slug tuners.

Fig. 3 Prematching test circuit boards, c.w., class-B at 1,55 GHz (dimensions in mm); Epsilam p.c. board; thickness 0,65 mm; $\varepsilon_r = 10$.

Fig. 4 Load power, efficiency and VSWR versus frequency: $V_{CE} = 28\, V$; $T_{mb} = 25\, ^\circ C$; class-B operation; typical values.
Fig. 5 Input impedance versus frequency; 
$P_L = 38 \text{ W}; Z_0 = 5 \, \Omega$; typical values.

Fig. 6 Optimum load impedance versus frequency; 
$P_L = 38 \text{ W}; Z_0 = 5 \, \Omega$; typical values.
MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B amplifier up to a frequency of 3 GHz in c.w. conditions in military and professional applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- New 5 GHz technology

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B selective amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.; class-B</td>
<td>1</td>
<td>28</td>
<td>typ. 70</td>
<td>typ. 10</td>
<td>typ. 62</td>
<td>see Fig. 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>28</td>
<td>typ. 40</td>
<td>typ. 7,8</td>
<td>typ. 48</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>28</td>
<td>typ. 22</td>
<td>typ. 5</td>
<td>typ. 25</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

July 1985
MECHANICAL DATA
Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0.5 Nm
Recommended screw: M3

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage, open emitter
  \[ V_{CBO} \text{ max. } 40 \text{ V} \]
- Collector-emitter voltage, open base
  \[ R_{BE} = 10 \Omega \]
- Emitter-base voltage, open collector
- Collector current (d.c.)
- Total power dissipation up to \( T_{mb} = 75 \text{ °C} \)
- Storage temperature
- Junction temperature
- Soldering temperature at 0.1 mm from case; \( t_{sld} \leq 10 \text{ s} \)

Dimensions in mm

- \( 0.12 \)
- \( 3.5 \)
- \( 2.9 \)
- \( 6.4 \text{ max} \)
- \( 1.7 \text{ max} \)
- \( 3.05 \)
- \( 3 \text{ min} \)
- \( 9.8 \text{ max} \)
- \( 10.6 \text{ max} \)
- \( 3.4 \)
- \( 3.2 \)
- \( 8.25 \)
- \( 16.5 \)

7285741 A
Microwave power transistor

**Microwave power transistor**

**PZB27020U**

---

**Fig. 2** Power derating curve versus mounting base temperature.

**THERMAL RESISTANCE**

From junction to mounting base

\[ R_{th \, j-mb} = 1.8 \, \text{K/W} \]

**CHARACTERISTICS**

\( T_{mb} = 25 \, ^\circ\text{C} \) unless otherwise specified

Collector cut-off currents

- \( V_{CB} = 40 \, \text{V}; \, I_E = 0 \)
- \( V_{CB} = 30 \, \text{V}; \, I_E = 0 \)
- \( V_{CER} = 35 \, \text{V}; \, R_{BE} = 10 \, \Omega \)

Emitter cut-off currents

- \( V_{EB} = 3 \, \text{V}; \, I_C = 0 \)
- \( V_{EB} = 1.5 \, \text{V}; \, I_C = 0 \)

Collector-base capacitance

- \( I_E = I_C = 0; \, V_{CB} = 28 \, \text{V} \)

\[ C_{cb} \, \text{typ.} = 23 \, \text{pF} \]

**APPLICATION INFORMATION**

Microwave performance at \( T_{mb} = 25 \, ^\circ\text{C} \) in an unneutralized common-base class-C selective circuit consisting of a test circuit p.c. board with complementary output slug tuner.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>( f , \text{GHz} )</th>
<th>( V_{CE} , \text{V} )</th>
<th>( P_L , \text{W} )</th>
<th>( G_P , \text{dB} )</th>
<th>( \eta_C , % )</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w. class-C</td>
<td>2.7</td>
<td>28</td>
<td>&gt; 19</td>
<td>&gt; 5</td>
<td>&gt; 20</td>
</tr>
</tbody>
</table>

---

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Fig. 3 Load power versus source power; $V_{CE} = 28$ V; c.w. conditions.

Fig. 4 Load power and gain versus frequency; $V_{CE} = 28$ V; $P_L = 7$ W; c.w. conditions.

Fig. 5 Input and optimum load impedances versus frequency; $Z_0 = 50$ Ω; typical values.
PULSED POWER TRANSISTOR FOR S-BAND RADAR

N-P-N transistor for use in common-base pulsed power amplifiers for S-band radar (3.1 to 3.5 GHz). Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained. Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25^\circ$C in an unneutralized wideband common-base class-B circuit under pulse conditions.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$t_{on}$ $\mu$s</th>
<th>$\delta$ %</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B</td>
<td>3.1 to 3.5</td>
<td>24</td>
<td>100</td>
<td>10</td>
<td>typ. 5.6</td>
<td>typ. 5.7</td>
<td>typ. 47</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-83.

Base connected to flange

Torque on nut: max. 0.5 Nm
Recommended screw: M3

PRODUCT SAFETY

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage
(open emitter)

Collector-emitter voltage
(RBE = 10 Ω)
(open base)

Emitter-base voltage
(open collector)

Collector current (d.c.)
(ton = 100 μs; δ = 10%)

Total power dissipation
up to Tmb = 75 °C
(ton = 100 μs; δ = 10%)

Storage temperature

Junction temperature

Lead soldering temperature
at 0,3 mm from the case

THERMAL RESISTANCE
From junction to mounting base
From mounting base to heatsink

CHARACTERISTICS

Tmb = 25 °C

Collector-base breakdown voltage
IC = 3 mA; open emitter

Collector-emitter breakdown voltage
RBE = 10 Ω; IC = 3 mA

Emitter-base breakdown voltage
IE = 0,5 mA; open collector

Collector cut-off current
IE = 0; VCB = 24 V

Emitter cut-off current
IC = 0; VEB = 1,5 V
APPLICATION INFORMATION

R.F. performance up to $T_{mb} = 25\,^\circ C$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

<table>
<thead>
<tr>
<th>Type number</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$t_{on}$ ($\mu$s)</th>
<th>$\delta$ (%)</th>
<th>$P_L$ (W)</th>
<th>$G_D$ (dB)</th>
<th>$\eta_C$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RV3135B5X</td>
<td>3.1 to 3.5</td>
<td>24</td>
<td>100</td>
<td>10</td>
<td>$&gt; 4$</td>
<td>$&gt; 4.3$</td>
<td>$&gt; 30$</td>
</tr>
</tbody>
</table>

Fig. 2 Prematching test circuit boards for 3.1 to 3.5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ($\varepsilon_r = 2.54$); thickness 0.8 mm.

Fig. 3 Power derating curve vs. mounting base temperature; $t_{on} = 100\,\mu$s; $\delta = 10\%$.

Fig. 4 Load power, collector efficiency and VSWR vs. frequency; $P_{in} = 1.5$ W.

Fig. 5 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50\,\Omega$; $T_{mb} = 25\,^\circ C$.  

May 1985
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features

- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ\text{C}$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B; $t_p = 150 , \mu s$; $\delta = 4%$</td>
<td>1,2 to 1,4</td>
<td>50</td>
<td>typ. 300</td>
<td>typ. 7</td>
<td>typ. 35</td>
</tr>
<tr>
<td>class-B; $t_p = 300 , \mu s$; $\delta = 10%$</td>
<td>1,2 to 1,4</td>
<td>50</td>
<td>typ. 300</td>
<td>typ. 7,5</td>
<td>typ. 30</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-91 (see Fig. 1).

Dimensions in mm
MECHANICAL DATA

Fig. 1 FO-91.

Pinning:
1 = collector
2 = emitter
3 = base

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
VCBO max. 60 V

Collector-emitter voltage, $R_{BE} \leq 10 \Omega$
VCER max. 60 V

Emitter-base voltage, open collector
VEBO max. 3 V

$\mathbf{I}_C$ max. 21 A

Total power dissipation up to $T_{mb} = 75 \degree C$
$P_{tot}$ max. 630 W

$t_p \leq 50 \mu s; \delta \leq 10 \%$

Storage temperature
$T_{stg}$ -65 to 200 \degree C

Junction temperature
$T_j$ max. 200 \degree C

Lead soldering temperature
at 0,1 mm from the case; $t_{slid} \leq 10 \, \text{s}$
$T_{slid}$ max. 235 \degree C

THERMAL RESISTANCE

From junction to mounting base

$R_{th\,\,j\,\,mb}$ max. 0,7 K/W

Transient thermal impedance, $t_p = 50 \mu s$,

$Z_{th}$ typ. 0,06 K/W

Dimensions in mm

[Diagram of dimensions]
Pulsed microwave power transistor

Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions: \( t_p = 50 \mu s \), \( \delta = 10 \% \).

**CHARACTERISTICS**

\( T_{mb} = 25^\circ C \) unless otherwise specified

Collector-base breakdown voltage

\( I_C = 14 \, mA; \, I_E = 0 \)

Collector-emitter breakdown voltage

\( I_C = 14 \, mA; \, R_{BE} = 10 \, \Omega \)

Emitter-base breakdown voltage

\( I_C = 0; \, I_E = 1,4 \, mA \)

Collector cut-off current

\( I_E = 0; \, V_{CB} = 50 \, V \)

Emitter cut-off current

\( I_C = 0; \, V_{EB} = 1,5 \, V \)

\( V_{(BR)CBO} \geq 60 \, V \)

\( V_{(BR)CER} \geq 60 \, V \)

\( V_{(BR)EBO} \geq 3 \, V \)

\( I_{CBO} \leq 7 \, mA \)

\( I_{EBO} \leq 0,5 \, mA \)

August 1985
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications. It operates in pulsed conditions only and is recommended for IFF applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-91).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ [GHz]</th>
<th>$V_{CE}$ [V]</th>
<th>$P_L$ [W]</th>
<th>$G_p$ [dB]</th>
<th>$\eta_C$ [%]</th>
<th>$\bar{z}_I$</th>
<th>$\bar{Z}_L$</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 100 , \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 350</td>
<td>typ. 7,8</td>
<td>typ. 38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 300 , \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 300</td>
<td>typ. 7,5</td>
<td>typ. 35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DABS (see Fig. 2)</td>
<td>1,09</td>
<td>50</td>
<td>typ. 300</td>
<td>typ. 7,8</td>
<td>typ. 38</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-91 (see Fig. 1)

Dimensions in mm

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-91.

Pinning:
1 = collector
2 = emitter
3 = base

Dimensions in mm

Torque on screw: max. 0.5 Nm
Recommended screw: M3

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)
Collector-base voltage, open emitter $V_{CBO}$ max. 60 V
Collector-emitter voltage, $R_{BE} = 10 \Omega$ $V_{CER}$ max. 60 V
Emitter-base voltage, open collector $V_{EBO}$ max. 3 V
Pulsed microwave power transistor

Collector current (d.c.)
\[ t_p = 50 \, \mu s, \, \delta \leq 10\% \]

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)
\[ t_p = 50 \, \mu s, \, \delta \leq 10\% \]

Storage temperature

Junction temperature

Soldering temperature
at 0.1 mm from the case, \( t_{sld} \leq 10 \, s \)

\[ I_C \] max. 21 A
\[ P_{tot} \] max. 630 W
\[ T_{stg} \] -65 to +200 \, ^\circ C
\[ T_j \] max. 200 \, ^\circ C
\[ T_{sld} \] max. 235 \, ^\circ C

Fig. 3 Power derating curve versus mounting base temperature;
\( t_p = 50 \, \mu s, \, \delta = 10\% \).

THERMAL RESISTANCE

From junction to mounting base

Transient thermal impedance, \( t_p = 50 \, \mu s \)

\[ R_{th \, j-mb} \] max. 0.7 K/W
\[ Z_{th} \] typ. 0.06 K/W

CHARACTERISTICS

\( T_{mb} = 25 \, ^\circ C \) unless otherwise specified

Breakdown voltages

- \( I_C = 14 \, mA; \, I_E = 0 \)
- \( I_C = 14 \, mA; \, R_{BE} = 10 \, \Omega \)
- \( I_C = 0; \, I_E = 1.4 \, mA \)

Collector cut-off current

- \( I_E = 0; \, V_{CB} = 50 \, V \)

Emitter cut-off current

- \( I_C = 0; \, V_{EB} = 1.5 \, V \)

\[ V(BR)_{CBO} \] \( \leq 60 \, V \)
\[ V(BR)_{CER} \] \( \leq 60 \, V \)
\[ V(BR)_{EBO} \] \( \leq 3 \, V \)
\[ I_{CBO} \] \( \leq 7 \, mA \)
\[ I_{EBO} \] \( \leq 0.5 \, mA \)

IMPEDANCES

\begin{align*}
\text{frequency} & \quad \text{input (} Z_I \text{)} & \quad \text{load (} Z_L \text{)} \\
\text{GHz} & \quad \Omega & \quad \Omega \\
1.03 & \quad 1.45 + j3.71 & \quad 0.72 - j1.09 \\
1.09 & \quad 1.7 + j3.93 & \quad 0.68 - j1.13 \\
\end{align*}

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PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\,^\circ\text{C}$ in an unneutralized common-base class-C wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$Z_i$ $\Omega$</th>
<th>$Z_L$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50,\mu s$; $\delta = 10,%$</td>
<td>1.2 to 1.4</td>
<td>42</td>
<td>typ. 40</td>
<td>typ. 7.8</td>
<td>typ. 40</td>
<td>see Fig. 6</td>
<td></td>
</tr>
<tr>
<td>class-C; $t_p = 300,\mu s$; $\delta = 10,%$</td>
<td>1.2 to 1.4</td>
<td>50</td>
<td>typ. 40</td>
<td>typ. 7</td>
<td>typ. 35</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA
FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3
Pulsed microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
VCBO max. 60 V

Collector-emitter voltage, $R_{BE} \leq 10 \Omega$
VCER max. 60 V

Emitter-base voltage, open collector
VEBO max. 3 V

Collector current (d.c.)
$IC \leq 50 \mu A; \delta \leq 10 \%$

Total power dissipation up to $T_{mb} = 75 \degree C$
$P_{tot} \leq 50 \mu A; \delta \leq 10 \%$

Storage temperature
$T_{stg} = -65 to 200 \degree C$

Junction temperature
$T_j \leq 200 \degree C$

Lead soldering temperature
at 0,1 mm from the case; $T_{sld} \leq 10 s$

$T_{sld} \leq 350 \degree C$

THERMAL RESISTANCE
From junction to mounting base
$R_{thj-mb} \leq 5,0 K/W$

Transient thermal impedance; $t_p = 50 \mu s$, single pulse
$Z_{th} \leq 0,6 K/W$

CHARACTERISTICS
$T_{mb} = 25 \degree C$ unless otherwise specified

Collector-base breakdown voltage
$V(BR)CBO \geq 60 V$

Collector-emitter breakdown voltage
$V(BR)CER \geq 60 V$

Emitter-base breakdown voltage
$V(BR)EBO \geq 3 V$

Collector cut-off current
$I_{CBO} \leq 1 mA$

Emitter cut-off current
$I_{EBO} \leq 50 \mu A$

Fig. 2 Power derating curve versus mounting base temperature
(under pulsed conditions: $t_p = 50 \mu s, \delta = 10 \%$).
Fig. 3 Wideband test circuit for 1.2 to 1.4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0.635 mm, $\varepsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_p$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$\overline{z_I}$ (Ω)</th>
<th>$\overline{z_L}$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50 \mu s$; $\delta = 10%$</td>
<td>1.2 to 1.4</td>
<td>42</td>
<td>&gt;35</td>
<td>&gt;7</td>
<td>&gt;35</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>
Pulsed microwave power transistor

Fig. 4 Transient thermal impedance.

Fig. 5 Load power, collector efficiency and VSWR versus frequency; $V_{CE} = 42 \, V$; $P_S = 7 \, W$.

Fig. 6 Input and optimum load impedances versus frequency; $Z_0 = 5 \, \Omega$.

Conditions for Fig. 6:
$V_{CE} = 42 \, V$; $P_L = 35 \, W$; $t_p = 50 \, \mu s$; $\delta = 10 \, \%$; class-C operation.
**PULSED MICROWAVE POWER TRANSISTORS FOR L-BAND RADAR**

N-P-N transistors for use in common-base, class-B, pulsed power amplifiers for L-band radar (1.2 to 1.4 GHz) in military and professional applications.

**Features:**
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and an excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance.

The transistors are housed in a ceramic flange envelope.

Internal input and output prematching ensures good stability and easy broadband use.

**QUICK REFERENCE DATA**

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B wideband amplifier under pulse conditions of $t_{on} = 100 \mu s$ and $\delta = 10\%$.

<table>
<thead>
<tr>
<th>Type Number</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ1214B60W</td>
<td>1.2 to 1.4</td>
<td>60</td>
<td>125</td>
<td>7.8</td>
<td>31</td>
</tr>
<tr>
<td>RZ1214B125W</td>
<td>1.2 to 1.4</td>
<td>42</td>
<td>125</td>
<td>6.2</td>
<td>29.5</td>
</tr>
</tbody>
</table>

**MECHANICAL DATA**

Dimensions in mm

FO-57C (see Fig. 1).

**PRODUCT SAFETY**

These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

August 1985
Base connected to flange.

Torque on nut: max. 0.5 Nm
Recommended screw: M3

Fig. 1 FO-57C.

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RZ1214B60W</th>
<th>RZ1214B125W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage (open emitter)</td>
<td>VCBO max.</td>
<td>50</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td>VCER max.</td>
<td>50</td>
</tr>
<tr>
<td>RBE ≤ 10 Ω</td>
<td>VCEO max.</td>
<td>35</td>
</tr>
<tr>
<td>open base</td>
<td>VEBO max.</td>
<td>3</td>
</tr>
<tr>
<td>Emitter-base voltage (open collector)</td>
<td>I C max.</td>
<td>7.5</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>Ptot max.</td>
<td>275</td>
</tr>
<tr>
<td>t_on ≤ 100 μs; δ ≤ 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total power dissipation up to Tmb = 75 °C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>t_on ≤ 100 μs; δ ≤ 10%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>Tstg</td>
<td>-65 to 200</td>
</tr>
<tr>
<td>Junction temperature</td>
<td>Tj max.</td>
<td>200</td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td>Tslid max.</td>
<td>235</td>
</tr>
<tr>
<td>at 0.1 mm from the case; tslid ≤ 10 s</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-B wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\overline{Z_i}$ $\Omega$</th>
<th>$\overline{Z_L}$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B; $t_p = 50 , \mu s$; $\delta = 10 %$</td>
<td>1.2 to 1.4</td>
<td>42</td>
<td>typ. 80</td>
<td>typ. 7</td>
<td>typ. 38</td>
<td>see Fig. 6</td>
<td></td>
</tr>
<tr>
<td>class-B; $t_p = 300 , \mu s$; $\delta = 10 %$</td>
<td>1.2 to 1.4</td>
<td>50</td>
<td>typ. 80</td>
<td>typ. 7</td>
<td>typ. 30</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0.5 Nm
Recommended screw: M3

Dimensions in mm
Pulsed microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
\[ V_{CBO} \text{ max.} 60 \text{ V} \]

Collector-emitter voltage, \( R_{BE} \leq 10 \Omega \)
\[ V_{CER} \text{ max.} 60 \text{ V} \]

Emitter-base voltage, open collector
\[ V_{EBO} \text{ max.} 3 \text{ V} \]

Collector current (d.c.)
\[ I_C \text{ max.} 6 \text{ A} \]

Total power dissipation up to \( T_{mb} = 75 \text{ ºC} \)
\[ P_{tot} \text{ max.} 180 \text{ W} \]

Storage temperature
\[ T_{stg} \text{ -65 to 200 ºC} \]

Junction temperature
\[ T_j \text{ max.} 200 \text{ ºC} \]

Lead soldering temperature
at 0,1 mm from the case; \( T_{sld} \leq 10 \text{ s} \)

THERMAL RESISTANCE
From junction to mounting base
\[ R_{th j-mb} \text{ max.} 2,5 \text{ K/W} \]

Transient thermal impedance, \( t_p = 50 \mu s \), (single pulse)
\[ Z_{th} \text{ typ.} 0,3 \text{ K/W} \]

Fig. 2 Power derating curve versus mounting base temperature (under pulsed conditions: \( t_p = 50 \mu s \), \( \delta = 10 \% \)).

CHARACTERISTICS
\( T_{mb} = 25 \text{ ºC} \) unless otherwise specified

Collector-base breakdown voltage
\[ I_C = 4 \text{ mA}; I_E = 0 \]
\[ V(BR)CBO \geq 60 \text{ V} \]

Collector-emitter breakdown voltage
\[ I_C = 4 \text{ mA}; R_{BE} = 10 \Omega \]
\[ V(BR)CER \geq 60 \text{ V} \]

Emitter-base breakdown voltage
\[ I_C = 0; I_E = 0,4 \text{ mA} \]
\[ V(BR)EBO \geq 3 \text{ V} \]

Collector cut-off current
\[ I_C = 0; V_{CB} = 50 \text{ V} \]
\[ I_CBO \leq 2 \text{ mA} \]

Emitter cut-off current
\[ I_C = 0; V_{EB} = 1,5 \text{ V} \]
\[ I_EBO \leq 100 \mu \text{A} \]

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The transistors are 100% tested on above test circuit and under the following conditions:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f GHz</th>
<th>VCE V</th>
<th>PL W</th>
<th>Gp dB</th>
<th>ηC %</th>
<th>Z_i Ω</th>
<th>Z_L Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; t_p = 50 µs; δ = 10 %</td>
<td>1,2 to 1,4</td>
<td>42</td>
<td>&gt; 65</td>
<td>&gt; 6</td>
<td>&gt; 32</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>
Pulsed microwave power transistor

Fig. 4 Transient thermal impedance.

Fig. 5 Load power (at \( P_S = 16 \) W), and collector efficiency and VSWR (at \( P_L = 65 \) W) versus frequency; \( V_{CE} = 42 \) V.

Fig. 6 Input and optimum load impedance versus frequency; \( Z_0 = 5 \) \( \Omega \).

Conditions for Fig. 6:
\( V_{CE} = 42 \) V; \( P_L = 65 \) W; \( t_p = 50 \) \( \mu \)s; \( \delta = 10 \) %; class-C operation.
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-C wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{z}_i$ Ω</th>
<th>$\bar{Z}_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50 \mu s$; $\delta = 10 %$</td>
<td>1,2 to 1,4</td>
<td>42</td>
<td>typ. 150</td>
<td>typ. 7</td>
<td>typ. 38</td>
<td>see Fig. 7</td>
<td></td>
</tr>
<tr>
<td>class-C; $t_p = 300 \mu s$; $\delta = 10 %$</td>
<td>1,2 to 1,4</td>
<td>50</td>
<td>typ. 150</td>
<td>typ. 7</td>
<td>typ. 30</td>
<td>see Fig. 7</td>
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</table>

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0.5 Nm
Recommended screw: M3
Pulsed microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter \( V_{CBO} \) max. 60 V
Collector-emitter voltage, \( R_{BE} \leq 10 \, \Omega \) \( V_{CER} \) max. 60 V
Emitter-base voltage, open collector \( V_{EBO} \) max. 3 V

Collector current (d.c.) \( I_C \) max. 12 A
\( t_p \leq 50 \, \mu s; \delta \leq 10 \% \)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)
\( P_{tot} \) max. 360 W
\( t_p \leq 50 \, \mu s; \delta \leq 10 \% \)

Storage temperature \( T_{stg} \) 
-65 to 200 \( ^\circ C \)

Junction temperature \( T_j \) max. 200 \( ^\circ C \)

Lead soldering temperature 
at 0,1 mm from the case; \( t_{sld} \leq 10 \) s
\( T_{sld} \) max. 235 \( ^\circ C \)

THERMAL RESISTANCE
From junction to mounting base \( R_{th \ j-mb} \) max. 1,25 K/W

Transient thermal impedance, \( t_p = 50 \, \mu s \) single pulse \( Z_{th} \) typ. 0,15 K/W

Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions, \( t_p = 50 \, \mu s, \delta = 10 \% \).

CHARACTERISTICS
\( T_{mb} = 25 \, ^\circ C \) unless otherwise specified

Collector-base breakdown voltage \( I_C = 8 \, mA; I_E = 0 \) \( V(BR)_{CBO} \geq \) 60 V

Collector-emitter breakdown voltage \( I_C = 8 \, mA; R_{BE} = 10 \, \Omega \) \( V(BR)_{CER} \geq \) 60 V

Emitter-base breakdown voltage \( I_C = 0; I_E = 0,8 \, mA \) \( V(BR)_{EBO} \geq \) 3 V

Collector cut-off current \( I_C = 0; V_{CB} = 50 \, V \) \( I_{CBO} \leq \) 4 mA

Emitter cut-off current \( I_C = 0; V_{EB} = 1,5 \, V \) \( I_{EBO} \leq \) 200 \( \mu A \)
Fig. 3 Wideband test circuit for 1.2 to 1.4 GHz (dimensions in mm).
Epsilam p.c. board, thickness 0.635 mm, $\varepsilon_r = 10$.

The transistors are 100% tested on above test circuit and under the following conditions:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_C$ %</th>
<th>$\overline{Z_i}$ $\Omega$</th>
<th>$\overline{Z_L}$ $\Omega$</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50 \mu s$; $\delta = 10%$</td>
<td>1.2 to 1.4</td>
<td>42</td>
<td>$&gt;125$</td>
<td>$&gt;6$</td>
<td>38</td>
<td>see Fig. 7</td>
<td></td>
</tr>
</tbody>
</table>
Pulsed microwave power transistor

RZ1214B125Y

Fig. 4 Transient thermal impedance.

Fig. 5 Load power versus frequency; $P_S = 30$ W.

Fig. 6 Collector efficiency and VSWR versus frequency; $P_L = 125$ W.

Conditions for Figs 5 and 6:
$V_{CE} = 42$ V; $t_p = 50$ µs, $\delta = 10\%$.
Fig. 7 Input and optimum load impedance versus frequency; $Z_0 = 5 \, \Omega$.

Conditions for Fig. 7:
$V_{CE} = 42 \, V$; $P_L = 125 \, W$; $t_p = 50 \, \mu s$, $\delta = 10 \%$; class-C operation.
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits.

The transistor is housed in a metal ceramic flange envelope (FO 57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized common-base class-C wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{Z}_i$ Ω</th>
<th>$Z_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50 , \mu s$; $\delta = 10 , %$</td>
<td>1,2 to 1,4</td>
<td>42</td>
<td>typ. 200</td>
<td>typ. 7</td>
<td>typ. 38</td>
<td>see Fig. 6</td>
<td></td>
</tr>
<tr>
<td>class-C; $t_p = 300 , \mu s$; $\delta = 10 , %$</td>
<td>1,2 to 1,4</td>
<td>50</td>
<td>typ. 200</td>
<td>typ. 7</td>
<td>typ. 35</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0.5 Nm
Recommended screw: M3

Dimensions in mm

[Diagram showing mechanical dimensions and pinning details]
Pulsed microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter
Collector-emitter voltage, $R_{BE} \leq 10 \, \Omega$
Emitter-base voltage, open collector

Collector current (d.c.)
$\tau_p \leq 50 \, \mu s; \delta \leq 10 \, \%$

Total power dissipation up to $T_{mb} = 75 \, ^\circ\text{C}$
$\tau_p \leq 50 \, \mu s; \delta \leq 10 \, \%$

Storage temperature
Junction temperature
Lead soldering temperature
at 0,1 mm from the case; $t_{sld} \leq 10 \, s$

THERMAL RESISTANCE
From junction to mounting base
Transient thermal impedance, $\tau_p = 50 \, \mu s$ single pulse

THERMAL RESISTANCE DATA

DEVELOPMENT DATA

CHARACTERISTICS
$T_{mb} = 25 \, ^\circ\text{C}$ unless otherwise specified

Collector-base breakdown voltage
$\tau = 10 \, \text{mA}; I_E = 0$

Collector-emitter breakdown voltage
$\tau = 10 \, \text{mA}; R_{BE} = 10 \, \Omega$

Emitter-base breakdown voltage
$\tau = 0; I_E = 1 \, \text{mA}$

Collector cut-off current
$\tau = 0; V_{CB} = 50 \, \text{V}$

Emitter cut-off current
$\tau = 0; V_{EB} = 1,5 \, \text{V}$

$V_{(BR)CBO} \geq 60 \, \text{V}$
$V_{(BR)CER} \geq 60 \, \text{V}$
$V_{(BR)EBO} \geq 3 \, \text{V}$
$ICBO \leq 5 \, \text{mA}$
$IEBO \leq 0,25 \, \text{mA}$

August 1985
315
The transistors are 100% tested on above test circuit and under the following conditions:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f (GHz)</th>
<th>V_{CE} (V)</th>
<th>P_L (W)</th>
<th>G_{dp} (dB)</th>
<th>\eta_c (%)</th>
<th>\bar{z}_i (\Omega)</th>
<th>\bar{Z}_L (\Omega)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; t_p = 300 , \mu s; \delta = 10 %</td>
<td>1,2 to 1,4</td>
<td>50</td>
<td>&gt; 160</td>
<td>&gt; 6</td>
<td>&gt; 30</td>
<td>see Fig. 6</td>
<td></td>
</tr>
</tbody>
</table>
Pulsed microwave power transistor

Fig. 4 Transient thermal impedance.

Fig. 5 Load power versus frequency. 
$V_{CE} = 50\,\text{V}; t_{on} = 300\,\mu\text{s}, \delta = 10\%$. 

RZ1214B150Y
Fig. 6 Input and optimum load impedances versus frequency; $Z_0 = 5 \, \Omega$.

Conditions for Fig. 6:
$V_{CE} = 50 \, \text{V}; \, P_L = 150 \, \text{W}; \, t_p = 300 \, \mu\text{s}; \, \delta = 10 \, \%$. 
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in military and professional applications especially in radar amplifiers operating between 2.7 and 3.5 GHz.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- TiPtAu sandwich metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25$ °C in an unneutralized common-base class-B test circuit.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ (GHz)</th>
<th>$V_{CE}$ (V)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
<th>$z_i$</th>
<th>$Z_L$ (Ω)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 100 \mu s$, $\delta = 10%$</td>
<td>2.8 - 3.3</td>
<td>40</td>
<td>typ. 45</td>
<td>typ. 5.5</td>
<td>typ. 25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 50 \mu s$, $\delta = 5%$</td>
<td>2.7 - 3.1</td>
<td>40</td>
<td>typ. 55</td>
<td>typ. 6.5</td>
<td>typ. 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 50 \mu s$, $\delta = 5%$</td>
<td>2.9 - 3.1</td>
<td>42</td>
<td>typ. 65</td>
<td>typ. 7.0</td>
<td>typ. 30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

FO-57C (see Fig. 1)

PRODUCT SAFETY  This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 F0-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3

**RATINGS**

Limiting values in accordance with the Absolute Maximum System (IEC 134)

- Collector-base voltage, open emitter
  \[ V_{CBO} \text{ max.} 50 \text{ V} \]
- Collector-emitter voltage, open base
  \[ V_{CEO} \text{ max.} 20 \text{ V} \]
- Collector-emitter voltage, open collector
  \[ V_{CER} \text{ max.} 50 \text{ V} \]
- Emitter-base voltage, open collector
  \[ V_{EBO} \text{ max.} 3 \text{ V} \]
- Collector current; \( t_p = 100 \mu s \), \( \delta = 10\% \)
  \[ I_C \text{ max.} 6 \text{ A} \]
- Total power dissipation
  up to \( T_{mb} = 75 \text{ °C} \)
  \[ P_{tot} \text{ max.} 175 \text{ W} \]
- Storage temperature
  \[ T_{stg} \text{ -55 to +200 °C} \]
- Junction temperature
  \[ T_j \text{ max.} 200 \text{ °C} \]
- Soldering temperature
  at 0,1 mm from case; \( t_{sld} \leq 10 \text{ s} \)
  \[ T_{sld} \text{ max.} 235 \text{ °C} \]
Microwave power transistor

RZ2833B45W

Fig. 2 Power derating curve versus mounting base temperature 
\( t_p = 100 \mu s, \delta = 10\% \).

THERMAL RESISTANCE

From junction to mounting base 
Transient thermal impedance; \( t_p = 100 \mu s \)

\[
\begin{align*}
R_{th\ j-mb} & \quad \text{max.} \quad 2 \text{ K/W} \\
Z_{th} & \quad \text{typ.} \quad 0.3 \text{ K/W}
\end{align*}
\]

CHARACTERISTICS

\( T_{mb} = 25 \, ^\circ C \) unless otherwise specified

Collector-base breakdown voltages
\( I_C = 5 \, mA, \) open emitter
\( I_C = 1 \, mA, \) open emitter

Collector-emitter breakdown voltage
\( I_C = 10 \, mA, \) open base

Emitter cut-off current
\( V_{EB} = 3 \, V; \) \( I_E = 0 \)

Collector cut-off current
\( V_{CB} = 40 \, V; \) \( I_C = 0 \)

\[
\begin{align*}
V_{(BR)CBO} & \geq 50 \, V \\
V_{(BR)CEO} & \geq 20 \, V \\
I_{EBO} & \leq 1 \, mA \\
I_{CBO} & \leq 1 \, mA
\end{align*}
\]

Fig. 3 Wideband test circuit board for 2.7 – 3.1 GHz and for 2.9 – 3.3 GHz.
Teflon fibreglass p.c. board; thickness 0.4 mm (all dimensions in mm).
Fig. 4 Wideband test circuit board for 2.8 – 3.3 GHz. Teflon fibreglass p.c. board; thickness 0.4 mm (all dimensions in mm).

Fig. 5 Input and optimum load impedances versus frequency; $Z_0 = 50 \, \Omega$; typical values.
PULSED POWER TRANSISTORS FOR S-BAND RADAR

N-P-N transistors for use in common-base pulsed power amplifiers for S-band radar (3.1 to 3.5 GHz).

Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.

Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25$ °C in an unneutralized wideband common-base class-B circuit under pulse conditions

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$t_{on}$ $\mu$s</th>
<th>$\delta$ %</th>
<th>$P_L$ W</th>
<th>$G_D$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ3135B15U</td>
<td>3,1 to 3,5</td>
<td>30</td>
<td>100</td>
<td>10</td>
<td>typ. 13</td>
<td>typ. 36</td>
<td></td>
</tr>
<tr>
<td>RZ3135B25U</td>
<td>3,1 to 3,5</td>
<td>30</td>
<td>100</td>
<td>10</td>
<td>typ. 28</td>
<td>typ. 4,4</td>
<td>typ. 39</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-57C.

Dimensions in mm

Torque on nut: max. 0.5 Nm

Recommended screw: M3
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RZ3135B15U</th>
<th>RZ3135B25U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter</td>
<td>V_CBO</td>
<td>max. 40</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 10 \Omega$</td>
<td>V_CER</td>
<td>max. 40</td>
</tr>
<tr>
<td>open base</td>
<td>V_CEO</td>
<td>max. 25</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector</td>
<td>V_EBO</td>
<td>max. 2</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>I_C</td>
<td>max. 2</td>
</tr>
<tr>
<td>$t_{on} = 100 \mu s; \delta = 10%$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total power dissipation</td>
<td>P_tot</td>
<td>max. 53</td>
</tr>
<tr>
<td>up to $T_{mb} = 75 \degree C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{on} = 100 \mu s; \delta = 10%$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage temperature</td>
<td>T_stg</td>
<td></td>
</tr>
<tr>
<td>Junction temperature</td>
<td>T_j</td>
<td>max. 200 C</td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 0,3 mm from the case</td>
<td>T_slid</td>
<td>max. 235 C</td>
</tr>
<tr>
<td>$t_{slid} \leq 10 s$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RZ3135B15U</th>
<th>RZ3135B25U</th>
</tr>
</thead>
<tbody>
<tr>
<td>From junction to mounting base</td>
<td>R_th j-mb</td>
<td>max. 3,5</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td>R_th mb-h</td>
<td>max. 0,3</td>
</tr>
</tbody>
</table>

CHARACTERISTICS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RZ3135B15U</th>
<th>RZ3135B25U</th>
</tr>
</thead>
<tbody>
<tr>
<td>$T_{mb} = 25 \degree C$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collector-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter; $I_C = 5 mA$</td>
<td>V(BR)CBO</td>
<td>$\leq 40$</td>
</tr>
<tr>
<td>open emitter; $I_C = 10 mA$</td>
<td>V(BR)CBO</td>
<td>$\leq 40$</td>
</tr>
<tr>
<td>Collector-emitter breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$R_{BE} = 10 \Omega; I_C = 5 mA$</td>
<td>V(BR)CER</td>
<td>$\leq 40$</td>
</tr>
<tr>
<td>$R_{BE} = 10 \Omega; I_C = 10 mA$</td>
<td>V(BR)CER</td>
<td>$\leq 40$</td>
</tr>
<tr>
<td>Emitter-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector; $I_E = 0,5 mA$</td>
<td>V(BR)EBO</td>
<td>$\leq 2$</td>
</tr>
<tr>
<td>open collector; $I_E = 1 mA$</td>
<td>V(BR)EBO</td>
<td>$\leq 2$</td>
</tr>
<tr>
<td>Collector cut-off current</td>
<td>I_CBO</td>
<td>$\leq 0,5$</td>
</tr>
<tr>
<td>$I_E = 0; V_{CB} = 30 V$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emitter cut-off current</td>
<td>I_EBO</td>
<td>$\leq 100$</td>
</tr>
<tr>
<td>$I_C = 0; V_{EB} = 1,5 V$</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PULSED POWER TRANSISTORS FOR S-BAND RADAR

N-P-N transistors for use in common-base pulsed power amplifiers for S-band radar (3,1 to 3,5 GHz).
Diffused emitter ballasting resistors, interdigitated structure, multicell geometry and gold sandwich metallization ensure an optimum temperature profile and reliability. Owing to the entirely ion-implanted, self-aligning process an excellent wideband performance is obtained.
Internal input and output prematching ensures good stability and easy broadband use.

QUICK REFERENCE DATA

R.F. performance up to $T_{mb} = 25\,^\circ C$ in an unneutralized wideband common-base class-B circuit under pulse conditions

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$t_{on}$ $\mu$s</th>
<th>$\delta$ %</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ3135B15W</td>
<td>3,1 to 3,5</td>
<td>42</td>
<td>100</td>
<td>10</td>
<td>typ. 18</td>
<td>typ. 5,5</td>
<td>typ. 33</td>
</tr>
<tr>
<td>RZ3135B30W</td>
<td>3,1 to 3,5</td>
<td>42</td>
<td>100</td>
<td>10</td>
<td>typ. 34</td>
<td>typ. 5,5</td>
<td>typ. 33</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Fig. 1 FO-57C.

Torque on nut: max. 0,5 Nm
Recommended screw: M3
RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

<table>
<thead>
<tr>
<th></th>
<th>RZ3135B15W</th>
<th>RZ3135B30W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter</td>
<td>VCBO</td>
<td>max. 50 V</td>
</tr>
<tr>
<td>Collector-emitter voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{BE} = 10 \ \Omega )</td>
<td>VCER</td>
<td>max. 50 V</td>
</tr>
<tr>
<td>open base</td>
<td>VCEO</td>
<td>max. 20 V</td>
</tr>
<tr>
<td>Emitter-base voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector</td>
<td>VEBO</td>
<td>max. 2 V</td>
</tr>
<tr>
<td>Collector current (d.c.)</td>
<td>( I_C )</td>
<td>max. 2 A</td>
</tr>
<tr>
<td>( t_{on} = 100 \ \mu s; \ \delta = 10% )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total power dissipation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>up to ( T_{mb} = 75 \ ^\circ C )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_{on} = 100 \ \mu s; \ \delta = 10% )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( P_{tot} ) max.</td>
<td></td>
<td>53 W</td>
</tr>
<tr>
<td>Storage temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{stg} )</td>
<td></td>
<td>-65 to +200 \ ^\circ C</td>
</tr>
<tr>
<td>Junction temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_j ) max.</td>
<td></td>
<td>200 \ ^\circ C</td>
</tr>
<tr>
<td>Lead soldering temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>at 0,3 mm from the case</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( t_{sld} \leq 10 \ \mu s )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( T_{sld} ) max.</td>
<td></td>
<td>235 \ ^\circ C</td>
</tr>
</tbody>
</table>

THERMAL RESISTANCE

<table>
<thead>
<tr>
<th></th>
<th>RZ3135B15W</th>
<th>RZ3135B30W</th>
</tr>
</thead>
<tbody>
<tr>
<td>From junction to mounting base</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{th \ j-mb} ) max.</td>
<td>3,5</td>
<td>1,75 K/W</td>
</tr>
<tr>
<td>From mounting base to heatsink</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{th \ mb-h} ) max.</td>
<td>0,3</td>
<td>0,3 K/W</td>
</tr>
</tbody>
</table>

CHARACTERISTICS

\( T_{mb} = 25 \ ^\circ C \)

<table>
<thead>
<tr>
<th></th>
<th>RZ3135B15W</th>
<th>RZ3135B30W</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collector-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open emitter; ( I_C = 5 \ mA )</td>
<td>( V(BR)CBO )</td>
<td>\geq 50 V</td>
</tr>
<tr>
<td>open emitter; ( I_C = 10 \ mA )</td>
<td>( V(BR)CBO )</td>
<td>\geq 50 V</td>
</tr>
<tr>
<td>Collector-emitter breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( R_{BE} = 10 \ \Omega ); ( I_C = 5 \ mA )</td>
<td>( V(BR)CER )</td>
<td>\geq 50 V</td>
</tr>
<tr>
<td>( R_{BE} = 10 \ \Omega ); ( I_C = 10 \ mA )</td>
<td>( V(BR)CER )</td>
<td>\geq 50 V</td>
</tr>
<tr>
<td>Emitter-base breakdown voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>open collector; ( I_E = 0,5 \ mA )</td>
<td>( V(BR)EBO )</td>
<td>\geq 2 V</td>
</tr>
<tr>
<td>open collector; ( I_E = 1 \ mA )</td>
<td>( V(BR)EBO )</td>
<td>\geq 2 V</td>
</tr>
<tr>
<td>Collector cut-off current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_E = 0; V_CB = 30 \ V )</td>
<td>( I_{CBO} )</td>
<td>\leq 0,5 mA</td>
</tr>
<tr>
<td>Emitter cut-off current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( I_C = 0; V_{EB} = 1,5 \ V )</td>
<td>( I_{EBO} )</td>
<td>\leq 100</td>
</tr>
</tbody>
</table>

326 Moy 1985
Pulsed power transistors for S-band radar

RZ3135B15W

APPLICATION INFORMATION (type RZ3135B15W)

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ (GHz)</th>
<th>$V_{CC}$ (V)</th>
<th>$t_\text{on}$ (µs)</th>
<th>$\delta$ (%)</th>
<th>$P_L$ (W)</th>
<th>$G_P$ (dB)</th>
<th>$\eta_C$ (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ3135B15W</td>
<td>3,1 to 3,5</td>
<td>42</td>
<td>100</td>
<td>10</td>
<td>&gt; 15</td>
<td>&gt; 5</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

Fig. 2 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ($\varepsilon_r = 2,54$); thickness 0,8 mm.

Fig. 3 Power derating curve vs. mounting base temperature; $t_\text{on} = 100 \, \mu\text{s}$; $\delta = 10\%$.

Fig. 4 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50 \, \Omega$; $T_{mb} = 25 \, ^\circ C$. 

May 1985
APPLICATION INFORMATION (type RZ3135B30W)

R.F. performance up to $T_{mb} = 25 \, ^\circ C$ in an unneutralized wideband common-base class-B circuit under pulse conditions.

<table>
<thead>
<tr>
<th>type number</th>
<th>$f$ GHz</th>
<th>$V_{CC}$ V</th>
<th>$t_{on}$ µs</th>
<th>$\delta$ %</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ3135B30W</td>
<td>3,1 to 3,5</td>
<td>42</td>
<td>100</td>
<td>10</td>
<td>&gt; 30</td>
<td>&gt; 5</td>
<td>&gt; 30</td>
</tr>
</tbody>
</table>

---

Fig. 5 Prematching test circuit boards for 3,1 to 3,5 GHz (dimensions in mm); striplines on a double Cu-clad p.c. board with PTFE fibre-glass dielectric ($e_r = 2,54$); thickness 0,8 mm.

---

Fig. 6 Power derating curve vs. mounting base temperature; $t_{on} = 100 \, \mu s$; $\delta = 10\%$.

---

Fig. 7 Input and optimum load impedance vs. frequency; typical values; $Z_0 = 50 \, \Omega$; $T_{mb} = 25 \, ^\circ C$. 

---

May 1985
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (FO-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\, ^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{Z}_i$ $\Omega$</th>
<th>$\bar{Z}_L$ $\Omega$</th>
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<tbody>
<tr>
<td>class-B</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 100, \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 100</td>
<td>typ. 10</td>
<td>typ. 45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_p = 300, \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 100</td>
<td>typ. 10</td>
<td>typ. 40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DABS (see Fig. 2)</td>
<td>1,09</td>
<td>50</td>
<td>typ. 100</td>
<td>typ. 9</td>
<td>typ. 40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA

Fig. 1 FO-57C.

Dimensions in mm

Pinning:
1 = collector
2 = emitter
3 = base

Torque on screw: max. 0.5 Nm
Recommended screw: M3

Fig. 2 DABS pulse definition.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

VCBO max. 60 V

Collector-emitter voltage,

VCER max. 60 V

Emitter-base voltage, open collector

VEBO max. 3 V
Collector current (d.c.)
\( t_p = 50 \, \mu s \), \( \delta \leq 10\% \)

Total power dissipation up to \( T_{mb} = 75 \, ^\circ C \)
\( t_p = 50 \, \mu s \), \( \delta \leq 10\% \)

Storage temperature

Junction temperature

Soldering temperature

at 0,1 mm from the case, \( t_{sld} \leq 10 \, s \)

\[ P_{tot} \]

\[ \text{max.} \quad 180 \, \text{W} \]

\[ T_{stg} \]

\[ -65 \, \text{to} +200 \, ^\circ C \]

\[ T_j \]

\[ \text{max.} \quad 200 \, ^\circ C \]

\[ T_{sld} \]

\[ \text{max.} \quad 235 \, ^\circ C \]

Fig. 3 Power derating curve versus mounting base temperature;
\( t_p = 50 \, \mu s \), \( \delta = 10\% \).

**THERMAL RESISTANCE**

From junction to mounting base

Transient thermal impedance, \( t_p = 50 \, \mu s \)

\[ R_{th \, j-mb} \]

\[ \text{max.} \quad 2.5 \, \text{K/W} \]

\[ Z_{th} \]

\[ \text{typ.} \quad 0.3 \, \text{K/W} \]

**CHARACTERISTICS**

\( T_{mb} = 25 \, ^\circ C \) unless otherwise specified

**Breakdown voltages**

\[ I_C = 4 \, mA; \, I_E = 0 \]

\[ I_C = 4 \, mA; \, R_{BE} = 10 \, \Omega \]

\[ I_C = 0; \, I_E = 0.4 \, mA \]

\[ V(BR)CBO \]

\[ \geq \quad 60 \, V \]

\[ V(BR)CER \]

\[ \leq \quad 60 \, V \]

\[ V(BR)EBO \]

\[ \geq \quad 3 \, V \]

**Collector cut-off current**

\[ I_E = 0; \, V_{CB} = 60 \, V \]

\[ I_{CBO} \]

\[ \leq \quad 2 \, mA \]

**Emitter cut-off current**

\[ I_C = 0; \, V_{EB} = 1.5 \, V \]

\[ I_{EBO} \]

\[ \leq \quad 100 \, \mu A \]

**IMPEDEANCES**

<table>
<thead>
<tr>
<th>frequency</th>
<th>input ((\bar{Z}_i))</th>
<th>load ((\bar{Z}_L))</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHz</td>
<td>(\Omega)</td>
<td>(\Omega)</td>
</tr>
<tr>
<td>1.03</td>
<td>3.5 + j4.5</td>
<td>2.6 + j1.75</td>
</tr>
<tr>
<td>1.09</td>
<td>4.2 + j4.5</td>
<td>1.9 - j0.9</td>
</tr>
</tbody>
</table>
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon power transistor for use in a common-base, class-B wideband amplifier in military and professional applications.

It operates in pulsed conditions only and is recommended for IFF applications.

Features:
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistors providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multicell geometry giving good balance of dissipated power and low thermal resistance

The transistor is housed in a metal ceramic flange envelope (F0-57C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25^\circ C$ in an unneutralized common-base class-B wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_p$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{z}_i$ Ω</th>
<th>$\bar{Z}_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-B</td>
<td>1,09</td>
<td>50</td>
<td>typ. 250</td>
<td>typ. 7,5</td>
<td>typ. 25</td>
<td>see table</td>
<td></td>
</tr>
<tr>
<td>$t_{p} = 100 \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 200</td>
<td>typ. 7,0</td>
<td>typ. 30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$t_{p} = 300 \mu s$, $\delta = 10%$</td>
<td>1,09</td>
<td>50</td>
<td>typ. 200</td>
<td>typ. 7,0</td>
<td>typ. 30</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MECHANICAL DATA

Dimensions in mm

FO-57C (see Fig. 1)

PRODUCT SAFETY. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.
MECHANICAL DATA
Fig. 1 FO-57C.

Pinning:
1 = collector
2 = emitter
3 = base

Dimensions in mm

Torque on screw: max. 0.5 Nm
Recommended screw: M3

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

\[ V_{CBO} \text{ max. } 60 \text{ V} \]

Collector-emitter voltage,
\[ R_{BE} = 10 \Omega \]

\[ V_{CER} \text{ max. } 60 \text{ V} \]

Emitter-base voltage, open collector

\[ V_{EBO} \text{ max. } 3 \text{ V} \]
Collector current (d.c.)

\[ t_p = 50 \mu s, \delta \leq 10\% \]

Total power dissipation up to \( T_{mb} = 75 \degree C \)

\[ t_p = 50 \mu s, \delta \leq 10\% \]

Storage temperature

Junction temperature

Soldering temperature

at 0,1 mm from the case. \( t_{slid} \leq 10 \text{s} \)

\[ I_C \quad \text{max.} \quad 15 \text{A} \]

\[ P_{tot} \quad \text{max.} \quad 450 \text{W} \]

\[ T_{stg} \quad -65 \text{ to } +200 \degree C \]

\[ T_j \quad \text{max.} \quad 200 \degree C \]

\[ T_{slid} \quad \text{max.} \quad 235 \degree C \]

Fig. 3 Power derating curve versus mounting base temperature;
\( t_p = 50 \mu s, \delta = 10\% \).

THERMAL RESISTANCE

From junction to mounting base

\[ R_{th j-mb} \quad \text{max.} \quad 1 \text{K/W} \]

\[ Z_{th} \quad \text{typ.} \quad 0,1 \text{K/W} \]

CHARACTERISTICS

\( T_{mb} = 25 \degree C \) unless otherwise specified

Breakdown voltages

\[ I_C = 10 \text{ mA}; I_E = 0 \]

\[ I_C = 10 \text{ mA}; R_{BE} = 10 \Omega \]

\[ I_C = 0; I_E = 1 \text{ mA} \]

Collector cut-off current

\[ I_E = 0; V_{CB} = 50 \text{ V} \]

Emitter cut-off current

\[ I_C = 0; V_{EB} = 1,5 \text{ V} \]

\[ V(BR)CBO \quad \text{typ.} \quad 60 \text{V} \]

\[ V(BR)CER \quad \text{typ.} \quad 60 \text{V} \]

\[ V(BR)EBO \quad \text{typ.} \quad 3 \text{V} \]

\[ I_{CBO} \quad \text{typ.} \quad 5 \text{mA} \]

\[ I_{EBO} \quad \text{typ.} \quad 0,25 \text{mA} \]

**IMPEDANCES**

<table>
<thead>
<tr>
<th>frequency (GHz)</th>
<th>input ( Z_i )</th>
<th>load ( Z_L )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,03</td>
<td>1,9 + j4</td>
<td>1,3 - j1</td>
</tr>
<tr>
<td>1,09</td>
<td>2,3 + j4,5</td>
<td>1,1 - j1,8</td>
</tr>
</tbody>
</table>

August 1985 335
PULSED MICROWAVE POWER TRANSISTOR

N-P-N silicon microwave power transistor for use in a common-base, class-C wideband amplifier and operating under pulsed conditions in L-band radar applications.

Features
- Interdigitated structure giving a high emitter efficiency
- Diffused emitter ballasting resistor providing excellent current sharing and withstanding a high VSWR
- Gold metallization realizing a very good stability of the characteristics and excellent life-time
- Multi-cell geometry giving good balance of dissipated power and low thermal resistance
- Internal input and output matching ensuring a good stability and allowing an easier design of wideband circuits

The transistor is housed in a metal ceramic flange envelope (2F057C).

QUICK REFERENCE DATA

Microwave performance up to $T_{mb} = 25\, ^\circ\text{C}$ in an unneutralized common-base class-C wideband amplifier.

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$f$ GHz</th>
<th>$V_{CE}$ V</th>
<th>$P_L$ W</th>
<th>$G_P$ dB</th>
<th>$\eta_C$ %</th>
<th>$\bar{z}_I$ Ω</th>
<th>$Z_L$ Ω</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; $t_p = 50, \mu s$; $\delta = 10%$</td>
<td>1,2</td>
<td>to</td>
<td>42</td>
<td>typ. 380</td>
<td>typ. 7</td>
<td>typ. 40</td>
<td>see Fig. 7</td>
</tr>
<tr>
<td>class-C; $t_p = 300, \mu s$; $\delta = 10%$</td>
<td>1,2</td>
<td>to</td>
<td>50</td>
<td>typ. 380</td>
<td>typ. 7,5</td>
<td>typ. 35</td>
<td>see Fig. 7</td>
</tr>
</tbody>
</table>

MECHANICAL DATA

2FO-57C (see Fig. 1)
MECHANICAL DATA

Fig. 1 2FO-57C.
Base and metallic cap connected to flange;

Pinning:
1 = collector
2 = emitter
3 = collector
4 = emitter
5 = base

Torque on screw: max. 0,5 Nm
Recommended screw: M3

Dimensions in mm
Pulsed microwave power transistor

RATINGS
Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter

Collector-emitter voltage, $R_{BE} \leq 10 \Omega$

Emitter-base voltage, open collector

Collector current (d.c.), per transistor section

\[ t_p \leq 50 \mu s; \delta \leq 10\% \]

Total power dissipation up to $T_{mb} = 75^\circ C$

\[ t_p \leq 50 \mu s; \delta \leq 10\% \]

Storage temperature

Junction temperature

Lead soldering temperature

at 0,1 mm from the case; $t_{slid} \leq 10 \text{s}$

THERMAL RESISTANCE *

From junction to mounting base

\[ R_{th j-mb} \text{ max.} 0,5 \text{ K/W} \]

Transient thermal impedance, $t_p = 50 \mu s$, single pulse

\[ Z_{th} \text{ max.} 0,05 \text{ K/W} \]

* Dissipation of either transistor section shall not exceed half rated power.

\[ V_{CBO} \text{ max.} 60 \text{ V} \]

\[ V_{CER} \text{ max.} 60 \text{ V} \]

\[ V_{EBO} \text{ max.} 3 \text{ V} \]

\[ I_C \text{ max.} 15 \text{ A} \]

\[ P_{tot} \text{ max.} 2 \times 450 \text{ W} \]

\[ T_{stg} \text{ -65 to 200 } ^\circ C \]

\[ T_j \text{ max.} 200 ^\circ C \]

\[ T_{slid} \text{ max.} 235 ^\circ C \]

Fig. 2 Power derating curve versus mounting base temperature; pulsed conditions: $t_p = 50 \mu s, \delta = 10\%$.

CHARACTERISTICS (per transistor section)

$T_{mb} = 25 ^\circ C$ unless otherwise specified

Collector-base breakdown voltage

\[ I_C = 10 \text{ mA}; I_E = 0 \]

Collector-emitter breakdown voltage

\[ I_C = 10 \text{ mA}; R_{BE} = 10 \Omega \]

Emitter-base breakdown voltage

\[ I_C = 0; I_E = 1 \text{ mA} \]

Collector cut-off current

\[ I_E = 0; V_{CB} = 50 \text{ V} \]

Emitter cut-off current

\[ I_C = 0; V_{EB} = 1,5 \text{ V} \]

\[ V_{(BR)CBO} \geq 60 \text{ V} \]

\[ V_{(BR)CER} \geq 60 \text{ V} \]

\[ V_{(BR)EBO} \geq 3 \text{ V} \]

\[ I_{CBO} \leq 5 \text{ mA} \]

\[ I_{EBO} \leq 250 \text{ } \mu\text{A} \]

August 1985
Fig. 3 Wideband test circuit.

The transistors are 100% tested on above test circuit and under the following conditions:

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>f (GHz)</th>
<th>V_{CE} (V)</th>
<th>P_L (W)</th>
<th>G_P (dB)</th>
<th>\eta_C (%)</th>
<th>\bar{z}_i (\Omega)</th>
<th>\bar{Z}_L (\Omega)</th>
</tr>
</thead>
<tbody>
<tr>
<td>class-C; \ t_p = 300 \mu s; \ \delta = 10%</td>
<td>1.2 to 1.4</td>
<td>50</td>
<td>\geq 300</td>
<td>\geq 6.5</td>
<td>\geq 30</td>
<td>see Fig. 7</td>
<td></td>
</tr>
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</table>

Fig. 4 Transient thermal impedance. (per transistor section)
Fig. 5 Load power versus frequency.

Fig. 6 Collector efficiency versus frequency.

Fig. 7 Input and optimum load impedance versus frequency per transistor section. $V_{CE} = 50$ V; $P_L = 300$ W; $t_p = 300 \mu s$, $\delta = 10\%$; class-C operation; $Z_o = 5 \Omega$. 
MECHANICAL DATA

Dimensions in mm

ENVELOPES
ENVELOPES

MECHANICAL DATA

Dimensions in mm

SOT-100

F.O.96

352 J"" 1985

June 1985
MECHANICAL DATA

ENVELOPES

Dimensions in mm

FO-102.

2.7

1.45

max

0.7

max

seating plane

0.58

1.02

3.4

1.02

8.58
The inclusion of a type number in this publication does not necessarily imply its availability.

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<thead>
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<th>type no.</th>
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<th>section</th>
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<td>SD</td>
<td>BAS29</td>
<td>S7/S1</td>
<td>Mm/SD</td>
</tr>
<tr>
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<td>Mm/SD</td>
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<td>BAS35</td>
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<td>S1</td>
<td>T</td>
<td>BAT83</td>
<td>S1</td>
<td>T</td>
</tr>
<tr>
<td>BA483</td>
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<td>T</td>
<td>BAT85</td>
<td>S1</td>
<td>T</td>
</tr>
<tr>
<td>BA484</td>
<td>S1</td>
<td>T</td>
<td>BAT96</td>
<td>S1</td>
<td>T</td>
</tr>
<tr>
<td>BA682</td>
<td>S1</td>
<td>T</td>
<td>BAV10</td>
<td>S1</td>
<td>SD</td>
</tr>
<tr>
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<td>T</td>
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Mm = Microminiature semiconductors for hybrid circuits  
SD = Small-signal diodes

Sp = Special diodes  
T = Tuner diodes  
Vrg = Voltage regulator diodes  
Sm = Small-signal transistors
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FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
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FET = Field-effect transistors
HVP = High-voltage power transistors
P = Low-frequency power transistors
Sm = Small-signal transistors
Mm = Microminiature semiconductors
WBT = Wideband transistors
for hybrid circuits
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* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor modules
WBM = Wideband hybrid IC modules
WBT = Wideband transistors
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FET = Field-effect transistors  
PDT = Photodiodes or transistors  
Mm = Microminiature semiconductors for hybrid circuits  
Sm = Small-signal transistors  
Th = Thyristors  
Tri = Triacs
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PM = Power MOS transistors
R = Rectifier diodes
SP = Low-frequency switching power transistors

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Mm = Microminiature semiconductors for hybrid circuits
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes
R = Rectifier diodes
TS = Transient suppressor diodes
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* = series  
D = Displays  
LED = Light-emitting diodes  
M = Microwave transistors  
Ph = Photoconductive devices  
PhC = Photocouplers  
Vrg = Voltage regulator diodes
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FET = Field-effect transistors  
M = Microwave transistors  
P = Low-frequency power transistors  
Ph = Photoconductive devices  
R = Rectifier diodes  
SEN = Sensors  
Sm = Small-signal transistors  
St = Rectifier stacks  
WBM = Wideband hybrid IC modules

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* = series

FET = Field-effect transistors
I = Infrared devices
M = Microwave transistors
Ph = Photoconductive devices
R = Rectifier diodes

RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
Vrf = Voltage reference diodes
WBT = Wideband transistors

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A = Accessories
FET = Field-effect transistors
Ph = Photoconductive devices
I = Infrared devices
Sm = Small-signal transistors
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