U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor: for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13.5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16.5 V. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

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

<table>
<thead>
<tr>
<th>mode of operation</th>
<th>$V_{CE}$</th>
<th>$f$ MHz</th>
<th>$P_S$ W</th>
<th>$P_L$ W</th>
<th>$I_C$ A</th>
<th>$G_p$ dB</th>
<th>$\eta$ %</th>
<th>$\Sigma$ $\Omega$</th>
<th>$V_L$ mS</th>
</tr>
</thead>
<tbody>
<tr>
<td>c.w.</td>
<td>13.5</td>
<td>470</td>
<td>&lt; 8.0</td>
<td>20</td>
<td>&lt; 2.28</td>
<td>&gt; 4</td>
<td>&gt; 85</td>
<td>1.2 + i 4.5</td>
<td>163 - 38</td>
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<td>c.w.</td>
<td>12.5</td>
<td>470</td>
<td>&lt; 6.8</td>
<td>17</td>
<td>&lt; 2.09</td>
<td>&gt; 4</td>
<td>&gt; 85</td>
<td>-</td>
<td>-</td>
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MECHANICAL DATA

Dimensions in mm

Torque on nut: min. 0.76 Nm (7.5 kg cm)
max. 0.86 Nm (8.5 kg cm)

Diameter of clearance hole in heatsink: max. 4.2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

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)

Volatges
- Collector-base voltage (open emitter) peak value
  \( V_{CBOM} \) max. 36 V
- Collector-emitter voltage (open base)
  \( V_{CEO} \) max. 18 V
- Emitter-base voltage (open collector)
  \( V_{EBO} \) max. 4 V

Currents
- Collector current (average)
  \( I_{CAV} \) max. 3.5 A
- Collector current (peak value) \( f > 1 \) MHz
  \( I_{CM} \) max. 10 A

Power dissipation
- Total power dissipation up to \( T_{h} = 25^\circ C \)
  \( f \geq 1 MHz \)
  \( P_{Tot} \) max. 50 W

Temperatures
- Storage temperature
  \( T_{stg} \) -65 to +200 \(^\circ C\)
- Junction temperature
  \( T_{j} \) max. 200 \(^\circ C\)

THERMAL RESISTANCE
- From junction to mounting base
  \( R_{th j-mb} = 2.9 \) K/W
- From mounting base to heatsink
  \( R_{th mb-h} = 0.6 \) K/W
CHARACTERISTICS

T_J = 25 °C unless otherwise specified

Breakdown voltages

Collector-base voltage
open emitter: I_C = 25 mA
V_(BR)CBO > 36 V

Collector-emitter voltage
open base: I_C = 25 mA
V_(BR)CEO > 18 V

Emitter-base voltage
open collector: I_E = 10 mA
V_(BR)EBO > 4 V

Transient energy
L = 25 mH; f = 50 Hz
\[ \text{open base} \]
\[ V_{BE} = 1.5 \text{ V}; R_{RR} = 33 \Omega \]
\[ R > 3.1 \text{ mWs} \]

D.C. current gain
I_C = 1 A; V_{CE} = 5 V
h_{FE} > 10 typ. 30

Transition frequency
I_C = 2 A; V_{CE} = 10 V
f_T typ. 1.0 GHz

Collector capacitance at f = 1 MHz
I_E = I_C = 0; V_{CE} = 15 V
C_C typ. 55 pF

Feedback capacitance
I_C = 100 mA; V_{CE} = 15 V
C_re typ. 32 pF
C_cs typ. 2 pF

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APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

\[ f \text{ (MHz)} \quad V_{CE} \text{ (V)} \quad P_s \text{ (W)} \quad P_L \text{ (W)} \quad I_C \text{ (A)} \quad G_p \text{ (dB)} \quad \eta \text{ (%)} \quad Z_L \text{ (Ω)} \quad \bar{V}_L \text{ (mS)} \]

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<th>( f ) MHz</th>
<th>( V_{CE} )</th>
<th>( P_s )</th>
<th>( P_L )</th>
<th>( I_C )</th>
<th>( G_p )</th>
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<th>( \bar{V}_L )</th>
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<td>470</td>
<td>13,5</td>
<td>&lt; 8,00</td>
<td>20</td>
<td>&lt; 2,28</td>
<td>&gt; 4</td>
<td>&gt; 65</td>
<td>1,2 + j4,5</td>
<td>163 - j35</td>
</tr>
<tr>
<td>470</td>
<td>12,5</td>
<td>&lt; 7,60</td>
<td>17</td>
<td>&lt; 2,09</td>
<td>&gt; 4</td>
<td>&gt; 65</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>175</td>
<td>12,5</td>
<td>typ. 1,35</td>
<td>17</td>
<td>typ. 2,30</td>
<td>typ. 11</td>
<td>typ. 60</td>
<td>-</td>
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</tr>
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Test circuit: 470 MHz; c.w. class-B.

List of components:

- \( C_1 = C_2 = C_7 = C_8 = \) 2.0 to 9.0 pF film dielectric trimmer (cat. no. 2222 809 09002)
- \( C_3 = C_4 = \) 15 pF chip capacitor
- \( C_5 = \) 100 pF feed-through capacitor
- \( C_6 = \) 33 nF polyester capacitor
- \( R_1 = \) 1 Ω carbon resistor
- \( R_2 = \) 10 Ω carbon resistor
- \( L_1 = \) stripline (41.1 mm x 5.0 mm)
- \( L_2 = \) 13 turns closely wound enamelled Cu wire (0.5 mm); int. dia. 4.0 mm (0.32 μH)
- \( L_3 = \) 2 turns Cu wire (1 mm); winding pitch 1.5 mm; int. dia. 4 mm; leads 2 x 5 mm
- \( L_4 = \) stripline (52.7 mm x 5.0 mm)
- \( L_5 = \) Ferroxcube choke coil. Z (et \( f \) = 50 MHz) = 750 Ω ± 20% (cat. no. 4312 020 36640)

\( L_1 \) and \( L_4 \) are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric.

\( \varepsilon_r = 2.74 \); thickness 1.48 mm.
APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph above for safe operation at supply voltages other than the nominal. The graph shows the allowable output power, under nominal conditions, as a function of the supply overvoltage ratio, with VSWR as parameter.

The graph applies to the situation in which the drive (Pd/Pnom) increases linearly with the supply overvoltage ratio.

The horizontal line at 20 W applies at VCCnom = 13.5 V.
For VCCnom = 12.5 V, Pd should be derated to 17 W.