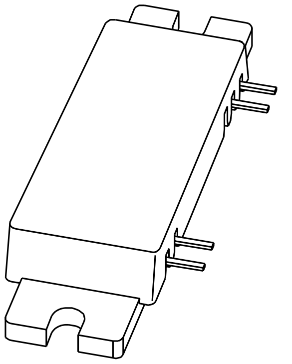
# DATA SHEET



# BGY925
## UHF amplifier module

Preliminary specification 1999 Nov 15

Philips Semiconductors

PHILIPS

## FEATURES

- 26 V nominal supply voltage
- 23 W output power into a load of 50 Ω with an RF drive power of 36 mW.

## APPLICATIONS

- Base station transmitting equipment operating in the 920 to 960 MHz frequency range.

## DESCRIPTION

The BGY925 is a three-stage UHF amplifier module in a SOT365A package. It consists of one NPN silicon planar transistor die and two silicon MOSFET dies mounted on a metallized ceramic AlN substrate, together with matching and bias circuitry.

## PINNING - SOT365A

| PIN | DESCRIPTION |
|---|---|
| 1 | RF input |
| 2 | $V_{S1}$ |
| 3 | $V_{S2}$ |
| 4 | RF output |
| Flange | ground |

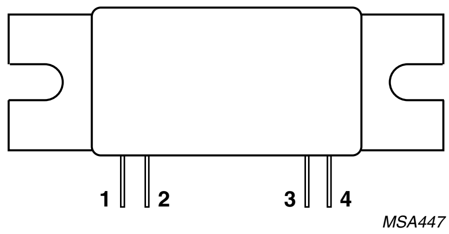



Fig.1 Simplified outline.

## QUICK REFERENCE DATA

RF performance at $T_{mb}$ = 25 °C.

| MODE OF OPERATION | f (MHz) | $V_{S1}$, $V_{S2}$ (V) | $P_L$ (W) | $G_p$ (dB) | η (%) (note 1) | $Z_S$, $Z_L$ (Ω) |
|---|---|---|---|---|---|---|
| CW | 920 to 960 | 26 | 23 | ≥28 | ≥30 | 50 |

### Note

1. At $P_L$ = 16 W.

## LIMITING VALUES

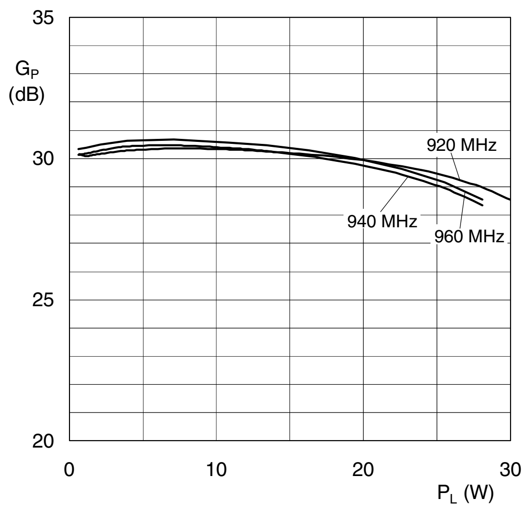
In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL | PARAMETER | MIN. | MAX. | UNIT |
|---|---|---|---|---|
| $V_{S1}$ | DC supply voltage | – | 28 | V |
| $V_{S2}$ | DC supply voltage | – | 28 | V |
| $P_D$ | input drive power | – | 80 | mW |
| $P_L$ | load power | – | 32 | W |
| $T_{stg}$ | storage temperature | –30 | +100 | °C |
| $T_{mb}$ | operating mounting-base temperature | –10 | +90 | °C |

## CHARACTERISTICS

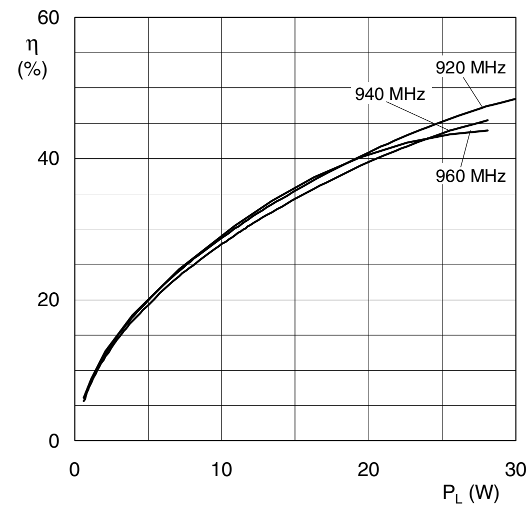
$Z_S = Z_L = 50\ \Omega$; $P_L = 23$ W; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---|---|---|---|---|---|---|
| f | frequency range | | 920 | – | 960 | MHz |
| $I_{S1}$ | supply current | | – | 50 | – | mA |
| $I_{S2}$ | supply current | $P_D < -60$ dBm | – | 500 | – | mA |
| $P_L$ | load power | | 23 | – | – | W |
| $G_p$ | power gain | 160 mW $\leq P_L <$ 2 W | 28 | 30 | 34 | dB |
| | | 2 W $\leq P_L \leq$ 23 W | 28 | 30 | 32 | dB |
| $\eta$ | efficiency | $P_L = 16$ W | 30 | – | – | % |
| $H_2$ | second harmonic | $P_L = 16$ W | – | – | –35 | dBc |
| $H_3$ | third harmonic | $P_L = 16$ W | – | – | –40 | dBc |
| $VSWR_{in}$ | input VSWR | | – | – | 2:1 | |
| | stability | VSWR ≤ 3 : 1 through all phases; $V_{S2} = 26$ to 27 V; $P_L = 23$ W | – | – | –60 | dBc |
| | reverse intermodulation | $P_{carrier} = 16$ W; $P_{interference} = 1.6$ µW; $f_i = f_c \pm 600$ kHz | – | –80 | – | dBc |
| | direct intermodulation | $P_{carrier} = 16$ W; $P_{interference} = 1.6$ mW; $f_i = f_c + 270$ kHz | – | –55 | – | dBc |
| NF | noise figure | | | | 8 | dBc |
| B | AM bandwidth | corner frequency = 3 dB; $P_{carrier} = 16$ W; modulation = 20% | 2 | – | – | MHz |
| | ruggedness | VSWR ≤ 5 : 1 through all phases; $V_{S2} = 26$ V; $P_L = 23$ W | no degradation | | | |



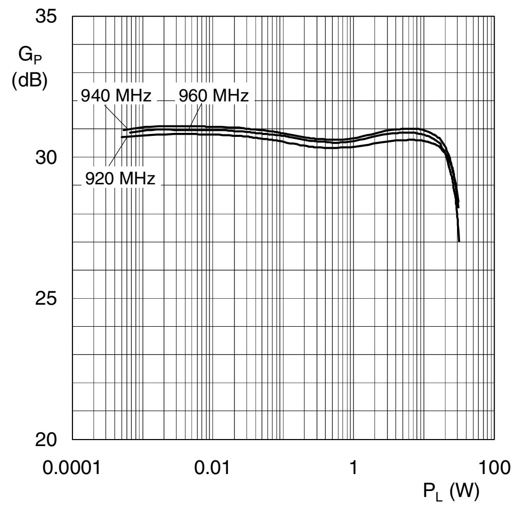

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

Fig.2 Power gain as a function of load power; typical values.



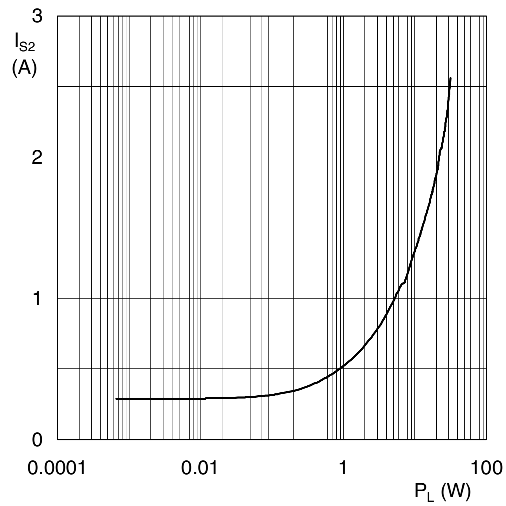

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

Fig.3 Efficiency as a function of load power; typical values.



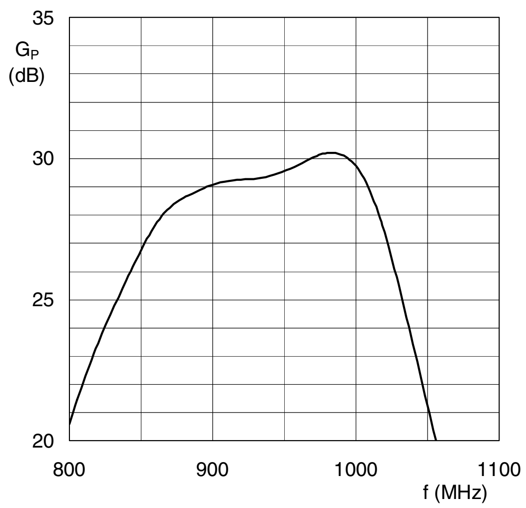

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

Fig.4 Power gain as a function of load power; typical values.



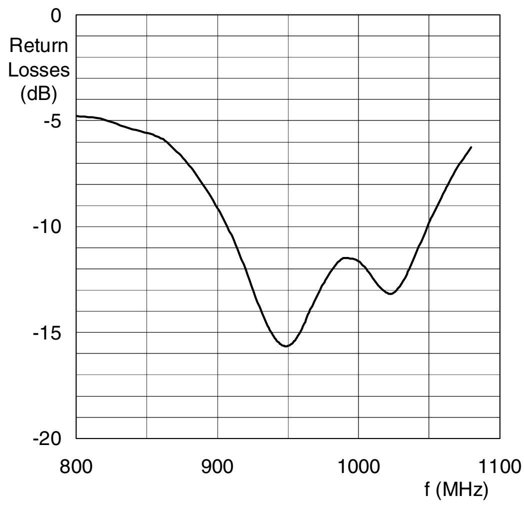

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C;
f = 920 up to 960 MHz

Fig.5 Supply current as a function of load power; typical values.



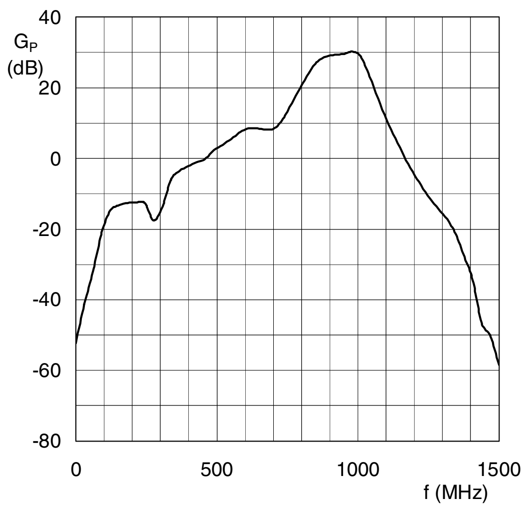

$Z_S = Z_L = 50\ \Omega$; $P_D = -30$ dBm; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

Fig.6 Small signal in band power gain as a function of frequency; typical values.



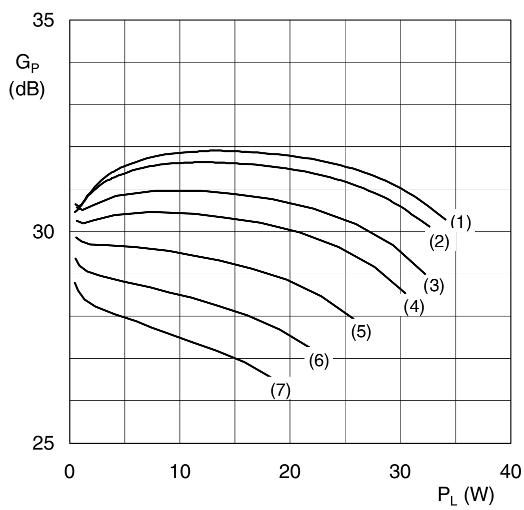

$Z_S = Z_L = 50\ \Omega$; $P_D = -30$ dBm; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

Fig.7 Small signal in band input return losses as a function of frequency; typical values.




$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $P_D = -30$ dBm; $T_{mb} = 25$ °C.

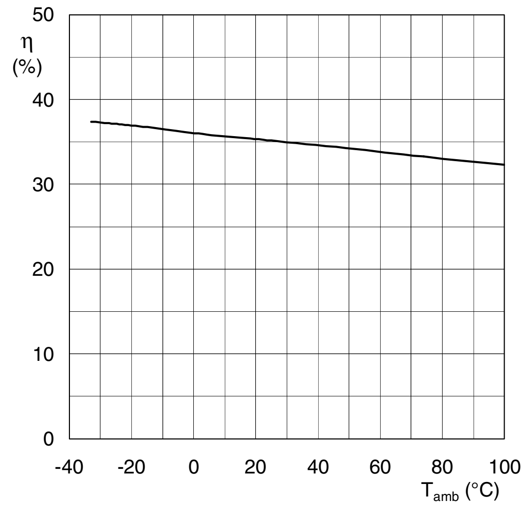
Fig.8 Small signal out band power gain as a function frequency; typical values.




$Z_S = Z_L = 50\ \Omega$ ; $V_{S1} = V_{S2} = 26$ V; $T_{mb} = 25$ °C.

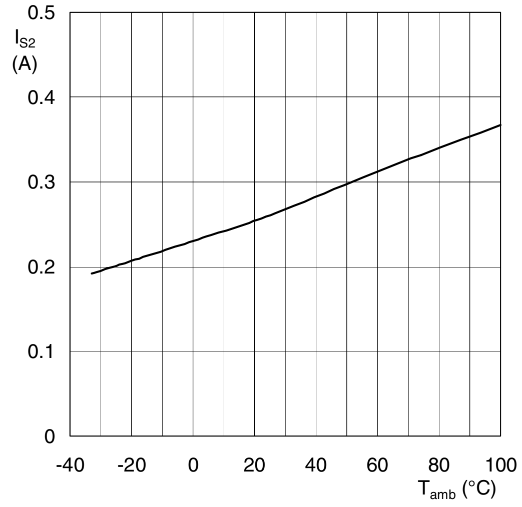
(1) $T_{amb} = -33$ °C
(2) $T_{amb} = -20$ °C
(3) $T_{amb} = 3$ °C
(4) $T_{amb} = 25$ °C
(5) $T_{amb} = 50$ °C
(6) $T_{amb} = 75$ °C
(7) $T_{amb} = 100$ °C

Fig.9 Power gain as a function of load power; typical values.



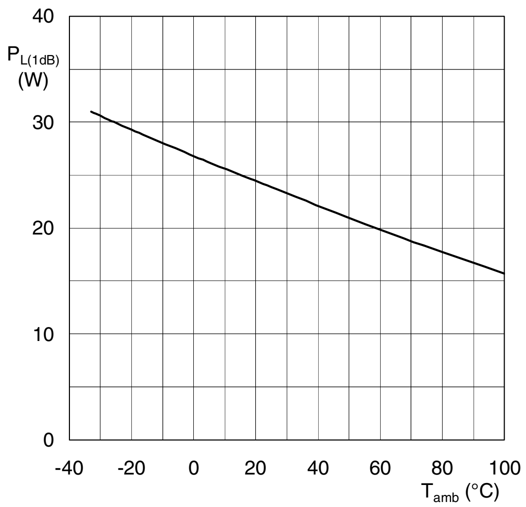

$Z_S = Z_L = 50\ \Omega$; $P_L = 16$ W; $V_{S1} = V_{S2} = 26$ V.

Fig.10 Efficiency as a function of ambient temperature; typical values.



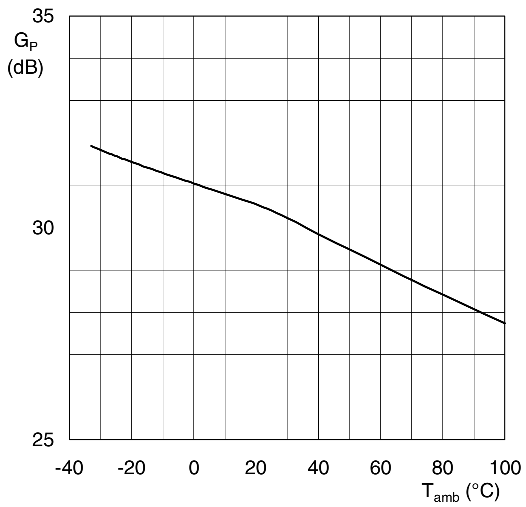

$Z_S = Z_L = 50\ \Omega$; $V_{S1} = V_{S2} = 26$ V; $P_D = 0$.

Fig.11 Quiescent current as a function of ambient temperature; typical values.




$Z_S = Z_L = 50\ \Omega$; $P_{ref} = 5$ W; $V_{S1} = V_{S2} = 26$ V.

Fig.12 Power gain at −1 dB gain as a function of ambient temperature; typical values.




$Z_S = Z_L = 50\ \Omega$; $P_L = 5$ W; $V_{S1} = V_{S2} = 26$ V.

Fig.13 Power gain as a function of ambient temperature; typical values.

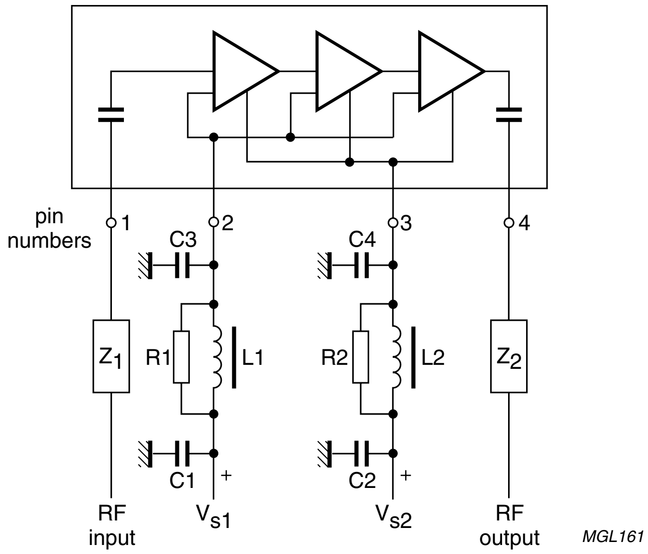
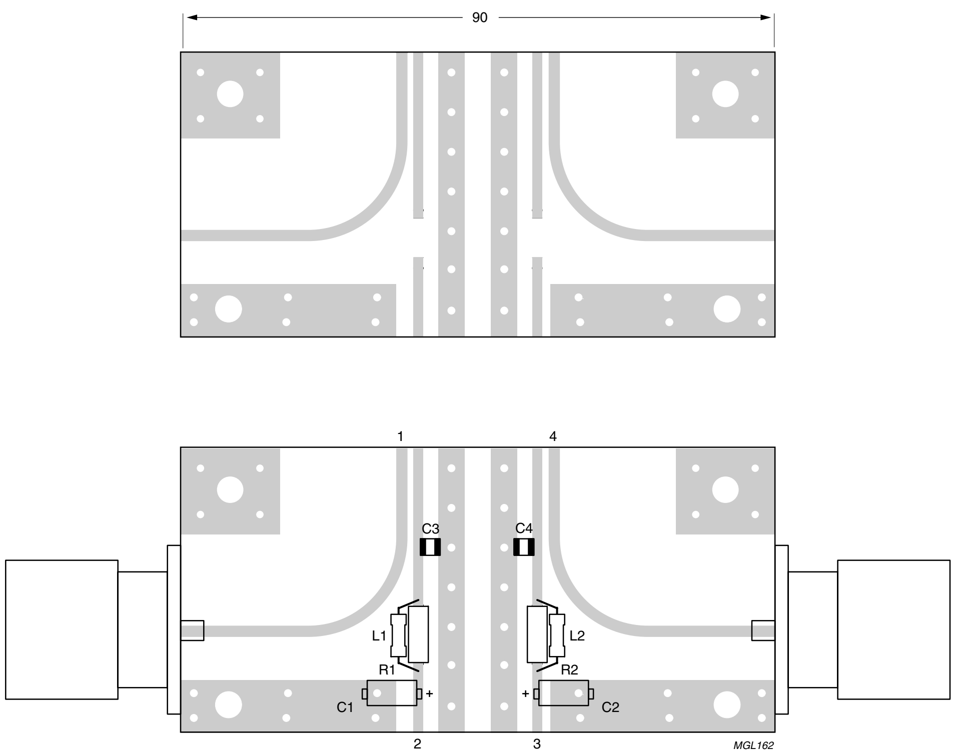



Fig.14 Test circuit.




Dimensions in mm.

Fig.15 Printed-circuit board component layout.

**List of components (See Figs 14 and 15)**

| COMPONENT | DESCRIPTION | VALUE | CATALOGUE NO. |
|---|---|---|---|
| C1, C2 | electrolytic capacitor | 10 μF; 35 V | |
| C3, C4 | multilayer ceramic chip capacitor | 100 nF; 50 V | |
| L1, L2 | Grade 4S2 Ferroxcube bead | | 4330 030 36300 |
| R1, R2 | metal film resistor | 10 Ω; 0.4 W | 2322 195 13109 |
| $Z_1$, $Z_2$ | stripline; note 1 | 50 Ω | |

**Note**

1. The striplines are on a double copper-clad printed-circuit board with epoxy dielectric ($\varepsilon_r$ = 4.5); thickness = 1 mm.

## MOUNTING RECOMMENDATIONS

To ensure a good thermal contact and to prevent mechanical stress when bolted down, the flatness of the mounting base is designed to be typically better than 0.1 mm. The mounting area of the heatsink should be flat and free from burrs and loose particles. The heatsink should be rigid and not prone to bowing under thermal cycling conditions. The thickness of a solid heatsink should be not less than 5 mm to ensure a rigid assembly.

A thin, even layer of thermal compound should be applied between the mounting base and the heatsink to achieve the best possible thermal contact resistance. Excessive use of thermal compound will result in an increase in thermal resistance and possible bowing of the mounting-base; too little will also result in poor thermal conduction.

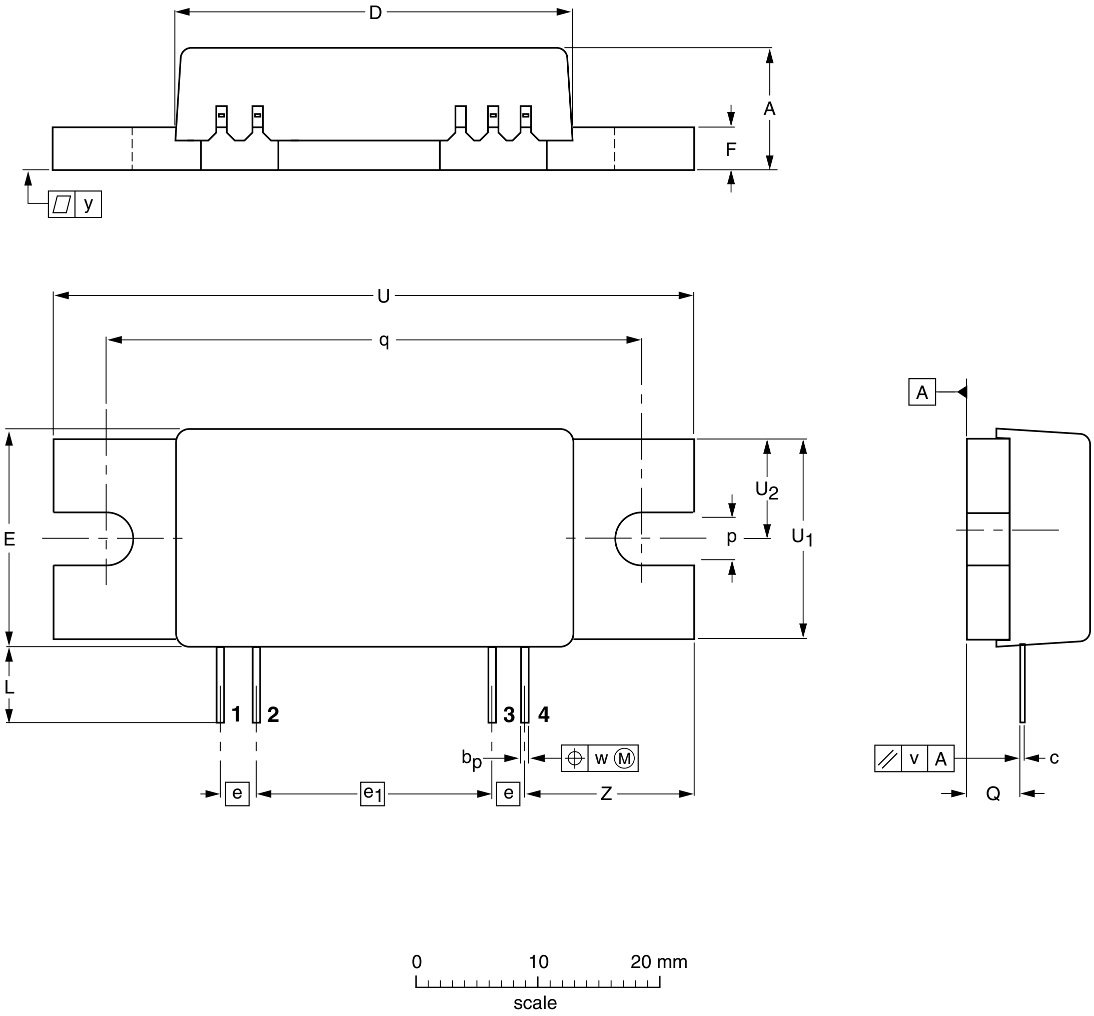
The module should be mounted to the heatsink using 3 mm bolts with flat washers. The bolts should first be tightened to “finger tight” and then further tightened in alternating steps to a maximum torque of 0.4 to 0.6 Nm.

Once mounted on the heatsink, the module leads can be soldered to the printed-circuit board. A soldering iron may be used up to a temperature of 250 °C for a maximum of 10 seconds at a distance of 2 mm from the plastic cap.

ESD precautions must be taken to protect the device from electrostatic damage.

## PACKAGE OUTLINE

**Plastic rectangular single-ended flat package; flange mounted; 2 mounting holes; 4 in-line leads SOT365A**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $b_p$ | c | D | E | e | $e_1$ | F | L | p | Q | q | U | $U_1$ | $U_2$ | v | w | y | Z |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 9.5<br>9.0 | 0.56<br>0.46 | 0.3<br>0.2 | 30.1<br>29.9 | 18.6<br>18.4 | 2.54 | 17.78 | 3.25<br>3.15 | 6.5<br>6.1 | 4.1<br>3.9 | 4.0<br>3.8 | 40.74<br>40.54 | 48.0<br>48.4 | 15.4<br>15.2 | 7.75<br>7.55 | 0.3 | 0.25 | 0.1 | 12.8<br>12.6 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT365A | | | | | | 99-02-06 |

## DEFINITIONS

| Data Sheet Status | |
|---|---|
| Objective specification | This data sheet contains target or goal specifications for product development. |
| Preliminary specification | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification | This data sheet contains final product specifications. |
| **Limiting values** | |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. | |
| **Application information** | |
| Where application information is given, it is advisory and does not form part of the specification. | |

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