# DATA SHEET

# PLB16004U
## Microwave power transistor

Product specification
Supersedes data of December 1994

1997 Feb 18

Philips
Semiconductors

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# Microwave power transistor PLB16004U

## FEATURES

- Diffused emitter ballasting resistors improve excellent current sharing and withstanding a high VSWR
- Interdigitated common-base structure provides high emitter efficiency
- Gold metallization with barrier realizes very stable characteristics and excellent lifetime
- Multicell geometry gives good balance of dissipated power and low thermal resistance
- Internal input and output prematching networks allow an easier design of circuits.

## APPLICATIONS

Intended for use in common-base class C power amplifiers at 1.6 GHz.

## DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT437A glued cap metal ceramic flange package, with base connected to flange.

## QUICK REFERENCE DATA

Microwave performance up to $T_{mb}$ = 25 °C in a common base class C narrowband amplifier.

| MODE OF OPERATION | f (GHz) | $V_{CC}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta_C$ (%) | $Z_i$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|
| Class C (CW) | 1.6 | 28 | >4.5 | >8.5 | >40 | see Figs 5 and 6 |

## PINNING - SOT437A

| PIN | DESCRIPTION |
|---|---|
| 1 | collector |
| 2 | emitter |
| 3 | base connected to flange |

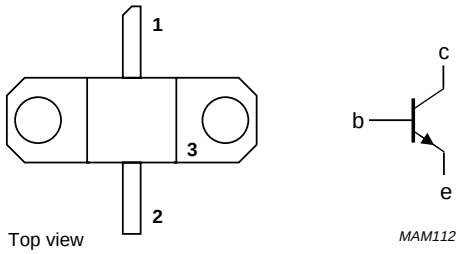



Fig.1 Simplified outline and symbol.

| WARNING |
|---|
| **Product and environmental safety - toxic materials** |
| This product contains beryllium oxide. The product is entirely safe provided that the BeO slab is not damaged. All persons who handle, use or dispose of this product should be aware of its nature and of the necessary safety precautions. After use, dispose of as chemical or special waste according to the regulations applying at the location of the user. It must never be thrown out with the general or domestic waste. |

**LIMITING VALUES**

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $V_{CBO}$ | collector-base voltage | open emitter | – | 40 | V |
| $V_{CES}$ | collector-emitter voltage | $R_{BE}$ = 0 | – | 40 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | – | 15 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | – | 3 | V |
| $I_C$ | DC collector current | | – | 0.5 | A |
| $P_{tot}$ | total power dissipation | $T_{mb}$ = 75 °C | – | 9 | W |
| $T_{stg}$ | storage temperature | | –65 | +150 | °C |
| $T_j$ | junction temperature | | – | 200 | °C |
| $T_{sld}$ | soldering temperature | t ≤ 10 s; note 1 | – | 235 | °C |

**Note**

1. Up to 0.3 mm from ceramic.

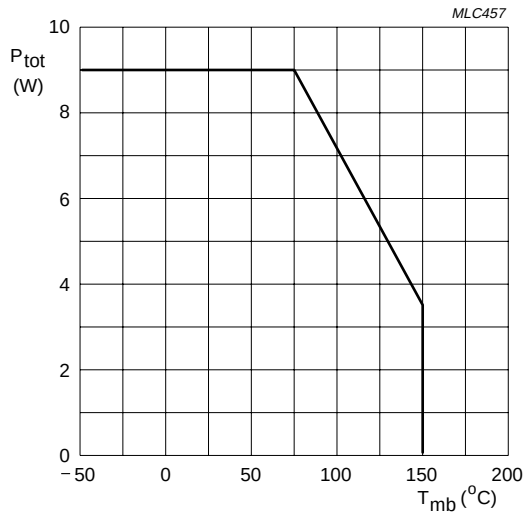



Fig.2 Power derating curve.

## THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | MAX. | UNIT |
|---|---|---|---|---|
| $R_{th\ j\text{-}mb}$ | thermal resistance from junction to mounting base | $T_j$ = 100 °C | 11 | K/W |
| $R_{th\ mb\text{-}h}$ | thermal resistance from mounting base to heatsink | note 1 | 0.3 | K/W |

**Note**

1. See *"Mounting recommendations in the General part of handbook SC19a".*

## CHARACTERISTICS

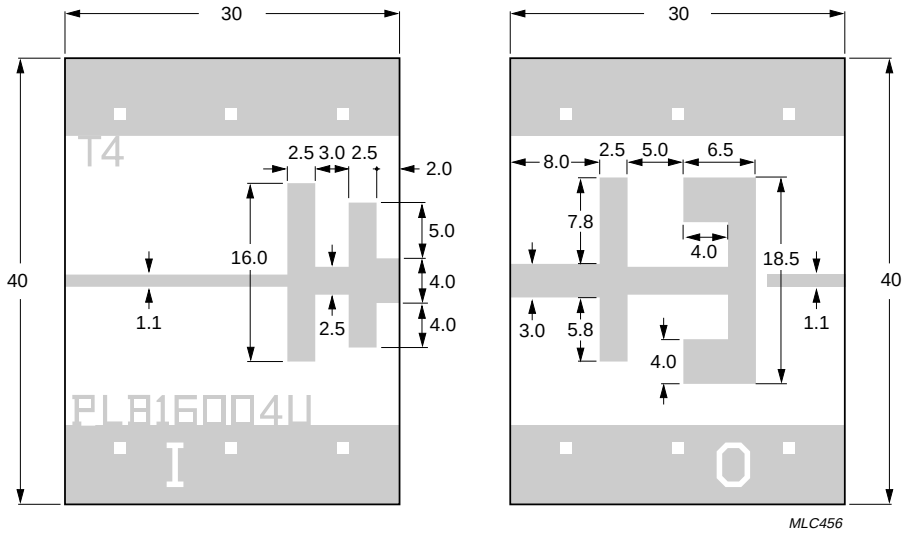
$T_{mb}$ = 25 °C unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|---|---|---|---|---|---|
| $I_{CES}$ | collector cut-off current | $R_{BE}$ = 0; $V_{CE}$ = 30 V | – | 200 | μA |
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C$ = 1 mA; $I_E$ = 0 | 40 | – | V |
| $V_{(BR)CES}$ | collector-emitter breakdown voltage | $I_C$ = 1 mA; $I_E$ = 0 | 40 | – | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_C$ = 1 mA; $I_E$ = 0 | 3 | – | V |
| $h_{FE}$ | DC current gain | $I_C$ = 300 mA; $V_{CE}$ = 5 V | 15 | 100 | |

## APPLICATION INFORMATION

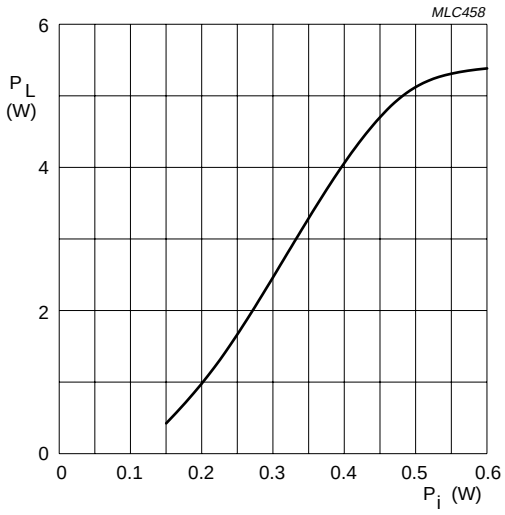
Microwave performance up to $T_{mb}$ = 25 °C in a common-base test circuit as shown in Fig.3.

| MODE OF OPERATION | f (GHz) | $V_{CC}$ (V) | $P_L$ (W) | $G_p$ (dB) | $\eta_C$ (%) | $Z_i$; $Z_L$ (Ω) |
|---|---|---|---|---|---|---|
| Class C (CW) | 1.6 | 28 | typ. 5 | typ. 10 | typ. 50 | see Figs 5 and 6 |



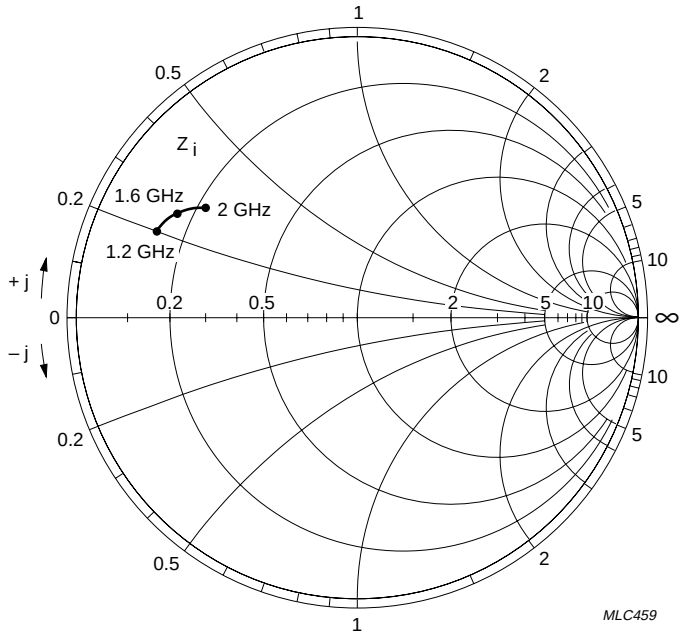

Dimensions in mm.
Substrate: Teflon fibre glass.
Thickness: 0.4 mm.
Permittivity: $\varepsilon_r$ = 2.55.

Fig.3 Narrowband test circuit.



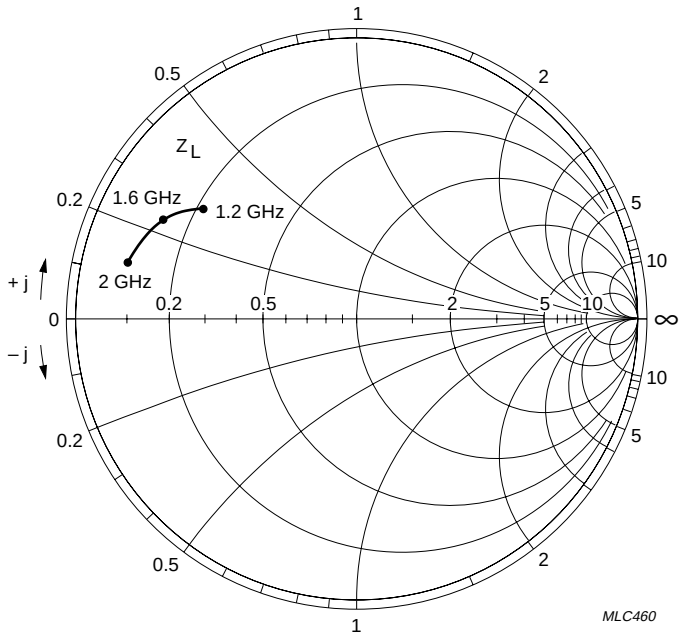

$V_{CC}$ = 28 V; f = 1.6 GHz.

Fig.4 Load power as a function of input power.




$V_{CC}$ = 28 V; $Z_o$ = 50 Ω.

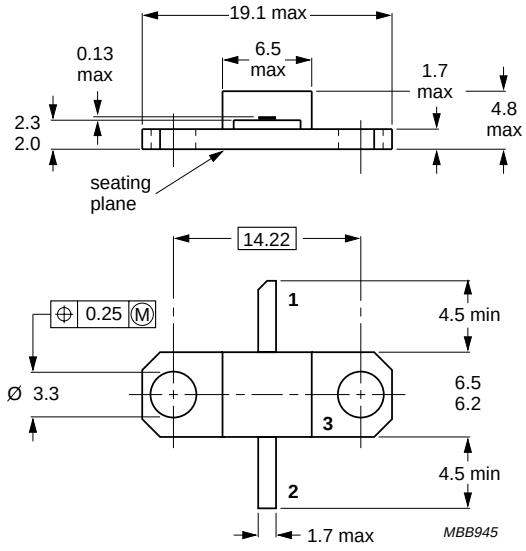
Fig.5 Input impedance as a function of frequency; typical values.




$V_{CC}$ = 28 V; $Z_o$ = 50 Ω.

Fig.6 Optimum load impedance as a function of frequency; typical values.

## PACKAGE OUTLINE




Dimensions in mm.
Torque on screws: max. 0.5 Nm.
Recommended screw: M3.
Recommended pitch for mounting screws: 19 mm.

Fig.7 SOT437A.

## 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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**NOTES**

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