

# DATA SHEET

**LAE4002S**

**NPN microwave power transistor**

Product specification  
Supersedes data of June 1992  
File under Discrete Semiconductors, SC15

1997 Feb 18

# NPN microwave power transistor

# LAE4002S

### FEATURES

- Diffused emitter ballasting resistors
- Self-aligned process entirely ion implanted and gold sandwich metallization
- Optimum temperature profile
- Excellent performance and reliability.

### APPLICATIONS

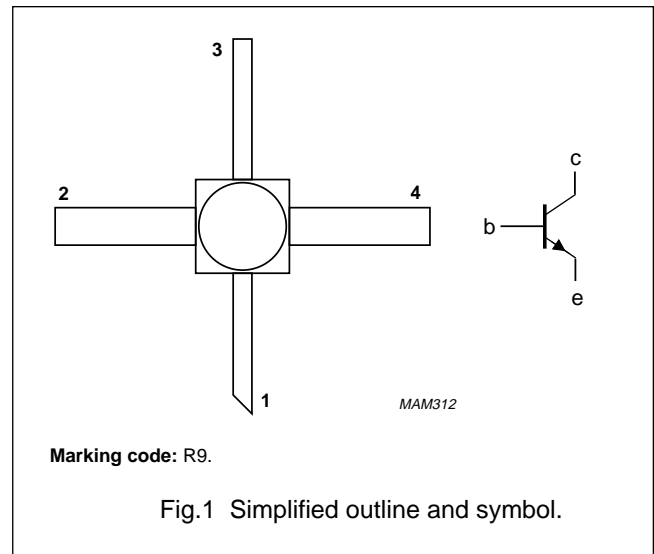
Common emitter class A linear power amplifiers up to 4 GHz.

### DESCRIPTION

NPN silicon planar epitaxial microwave power transistor in a SOT100 metal ceramic package with emitter connected to the metallized lid. A miniature ceramic encapsulation is used for compatibility with stripline microwave circuits.

### PINNING - SOT100

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter



### QUICK REFERENCE DATA

RF performance up to  $T_{case} = 25\text{ }^{\circ}\text{C}$  in a common emitter class A circuit.

MODE OF OPERATION	f (GHz)	V <sub>CE</sub> (V)	I <sub>C</sub> (mA)	P <sub>L1</sub> (mW)	G <sub>po</sub> (dB)	Z <sub>i</sub> (Ω)	Z <sub>L</sub> (Ω)
CW linear amplifier	4	18	30	>126	>7.5	typ. 4 + j23	typ. 6.5 + j32

MAINTENANCE TYPE - NOT RECOMMENDED FOR NEW DESIGNS; SEE INDEX SECTION OF SC15

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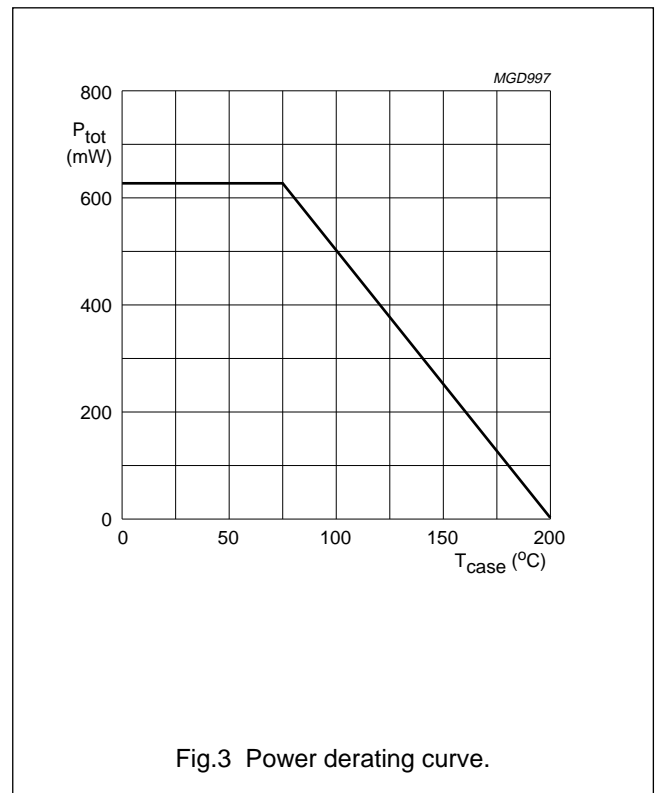
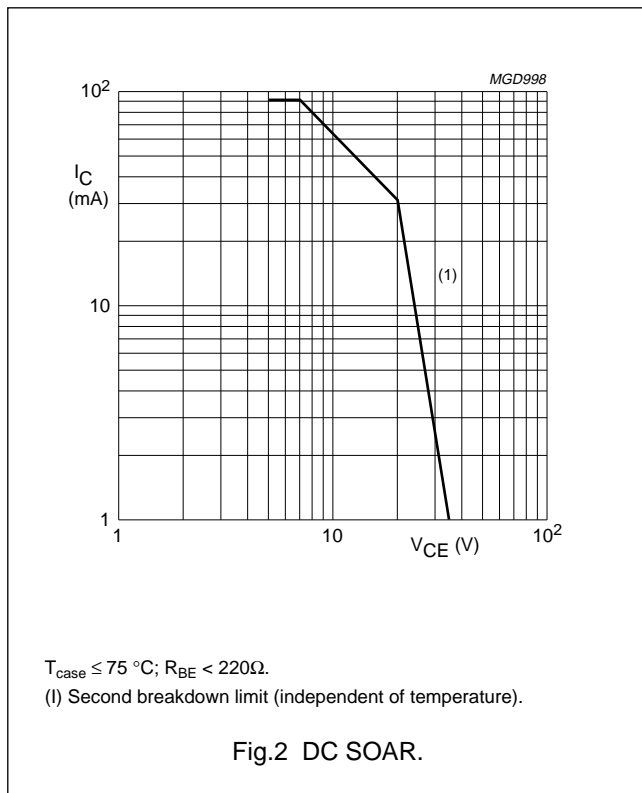
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V <sub>CBO</sub>	collector-base voltage	open emitter	–	40	V
V <sub>CER</sub>	collector-emitter voltage	R <sub>BE</sub> = 220 Ω	–	35	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	16	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	3	V
I <sub>C</sub>	collector current (DC)		–	90	mA
P <sub>tot</sub>	total power dissipation	T <sub>case</sub> ≤ 75 °C	–	625	mW
T <sub>stg</sub>	storage temperature		–65	+200	°C
T <sub>j</sub>	junction temperature		–	200	°C
T <sub>slid</sub>	soldering temperature	t ≤ 10 s; note 1	–	235	°C

**Note**

- Up to 0.1 mm from ceramic.



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j-c}$	thermal resistance from junction to case	$T_j = 75\text{ }^\circ\text{C}$	200	K/W

## CHARACTERISTICS

$T_{case} = 25\text{ }^\circ\text{C}$  unless otherwise specified.

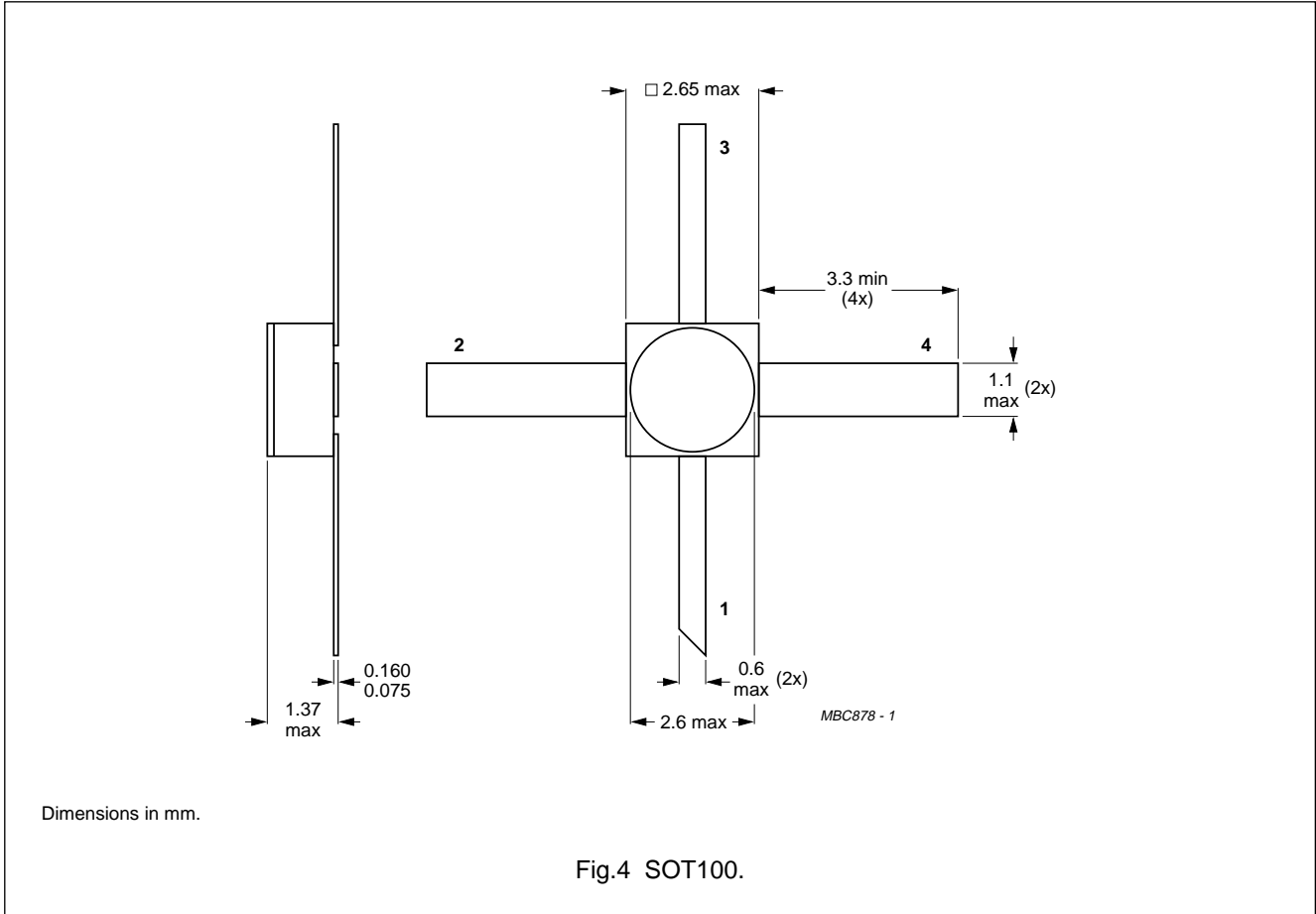
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$I_{CBO}$	collector cut-off current	$V_{CB} = 20\text{ V}; I_E = 0$	–	–	100	nA
		$V_{CB} = 40\text{ V}; I_E = 0$	–	–	150	$\mu\text{A}$
$I_{CER}$	collector cut-off current	$V_{CB} = 35\text{ V}; R_{BE} = 220\ \Omega$	–	–	500	$\mu\text{A}$
$I_{EBO}$	emitter cut-off current	$I_C = 0\text{ V}; V_{EB} = 1.5\text{ V}$	–	–	50	nA
$C_{cb}$	collector-base capacitance	$I_E = I_C = 0; V_{CB} = 18\text{ V}; V_{EB} = 1.5\text{ V}; f = 1\text{ MHz}$	–	0.3	–	pF
$C_{ce}$	collector-base capacitance	$I_E = I_C = 0; V_{CE} = 18\text{ V}; V_{EB} = 1.5\text{ V}; f = 1\text{ MHz}$	–	0.55	–	pF
$C_{eb}$	collector-base capacitance	$I_E = I_C = 0; V_{EB} = 1.0\text{ V}; V_{CB} = 18\text{ V}; f = 1\text{ MHz}$	–	1.8	–	pF
$ S_{fe} ^2$	forward power gain	$I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$	–	8.8	–	dB
		$I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 4\text{ GHz}$	–	2.8	–	dB
$G_{AM}$	maximum available gain	$I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 2\text{ GHz}$	–	14	–	dB
		$I_C = 30\text{ mA}; V_{CE} = 18\text{ V}; f = 3\text{ GHz}$	–	11	–	dB
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 30\text{ mA}$	15	–	150	

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PACKAGE OUTLINE



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**DEFINITIONS**

<b>Data Sheet Status</b>	
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.
<b>Limiting values</b>	
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.	
<b>Application information</b>	
Where application information is given, it is advisory and does not form part of the specification.	

**LIFE SUPPORT APPLICATIONS**

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.

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Printed in The Netherlands

127147/00/02/pp8

Date of release: 1997 Feb 18

Document order number: 9397 750 01705

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