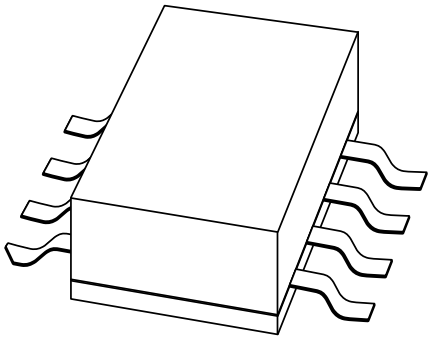
DATA SHEET



BLV909
UHF power transistor

Product specification
Supersedes data of 1996 Nov 04

1999 Jun 25

Philips
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UHF power transistor BLV909

FEATURES

- Emitter ballasting resistors for optimum temperature profile
- Gold metallization ensures excellent reliability
- Internal input matching to achieve high power gain and easy design of wideband circuits.

APPLICATIONS

- Common emitter class-AB operation in base stations in the 820 to 960 MHz frequency range.

DESCRIPTION

NPN silicon planar epitaxial transistor in an 8-lead SOT409B SMD package with a ceramic cap. All leads are isolated from the mounting base.

PINNING - SOT409B

PIN	SYMBOL	DESCRIPTION
1, 4, 5, 8	e	emitter
2, 3	b	base
6, 7	c	collector

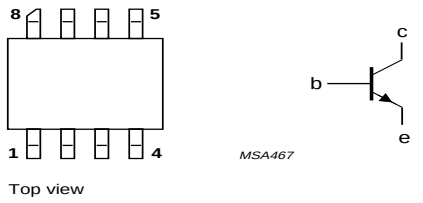


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_{mb} = 25 °C in a common emitter test circuit.

MODE OF OPERATION	f (MHz)	V_{CE} (V)	P_L (W)	G_p (dB)	η_C (%)	d_{im} (dBc)
CW, class-AB	960	26	9	≥9.5	≥50	–
2-tone, class-AB	f_1 = 960; f_2 = 960.1	26	9 (PEP)	≥9.5	≥35	typ. –30

LIMITING VALUES

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

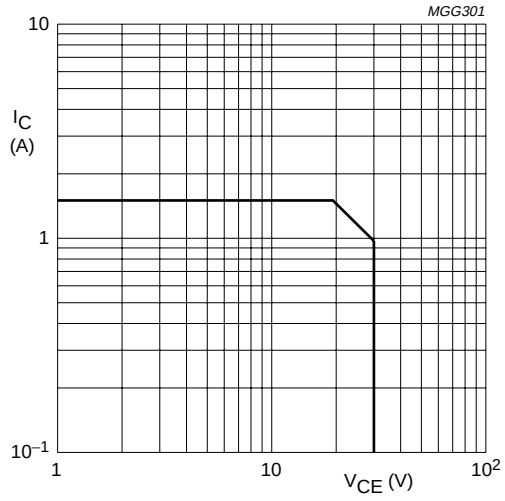
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	70	V
V_{CEO}	collector-emitter voltage	open base	–	30	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_C	collector current (DC)		–	1.5	A
$I_{C(AV)}$	average collector current		–	1.5	A
P_{tot}	total power dissipation	T_{mb} = 25 °C; note 1	–	29	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	P_{tot} = 29 W; T_{mb} = 25 °C; note 1	6	K/W

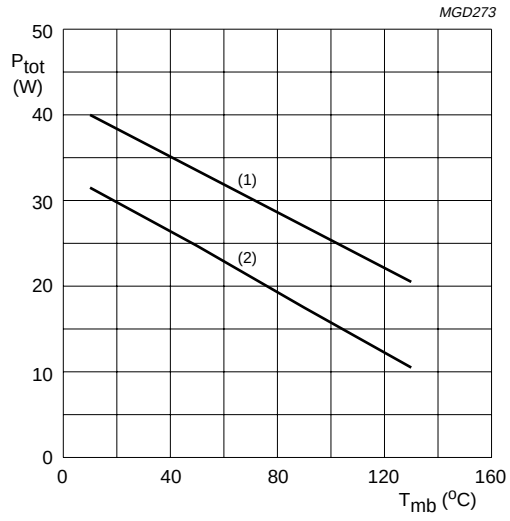
Note to the Limiting values and Thermal characteristics

1. Transistor with metallized ground plane mounted on a printed-circuit board, see *"Mounting and soldering section, Handbook SC19a."*



T_{mb} = 25 °C.

Fig.2 DC SOAR.



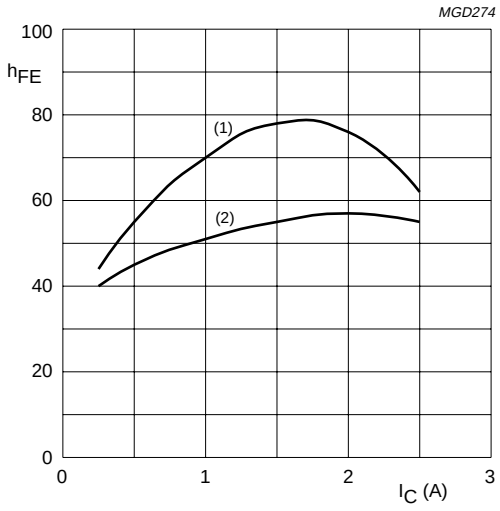
(1) Short-time operation during mismatch.
(2) Continuous operation.

Fig.3 Power derating curves.

CHARACTERISTICS

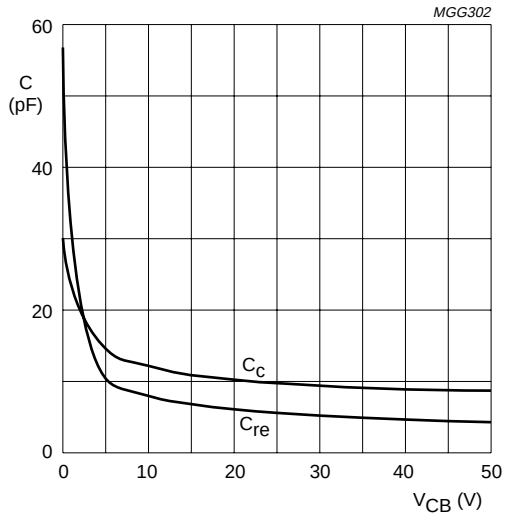
T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 5 mA	70	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 15 mA	30	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 0.3 mA	3	–	–	V
I_{CES}	collector leakage current	V_{CE} = 28 V; V_{BE} = 0	–	–	0.75	mA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 500 mA	30	–	120	
C_c	collector capacitance	V_{CB} = 26 V; $I_E = i_e$ = 0; f = 1 MHz	–	10	–	pF
C_{re}	feedback capacitance	V_{CE} = 26 V; I_C = 0; f = 1 MHz	–	6	–	pF



(1) V_{CE} = 26 V; t_p = 500 µs; δ ≤ 1 %.
(2) V_{CE} = 10 V.

Fig.4 DC current gain as a function of collector current; typical values.



f = 1 MHz.

Fig.5 Collector and feedback capacitance as a function of collector-base voltage; typical values.

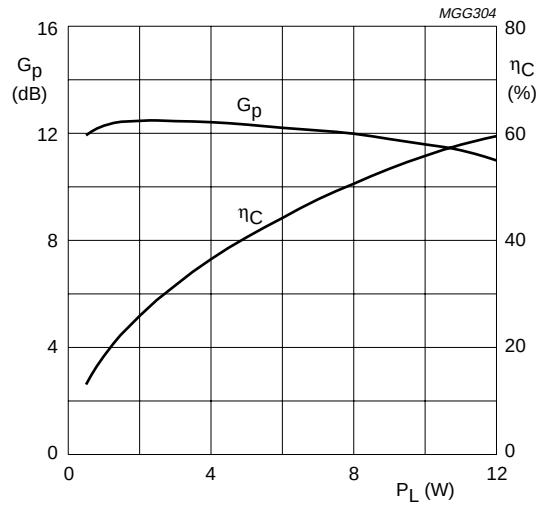
APPLICATION INFORMATION

RF performance at T_{mb} = 25 °C in a common emitter test circuit (see Figs 12 and 13).

MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η_C (%)	d_{im} (dBc)
CW, class-AB	960	26	25	9	≥9.5, typ. 11.5	≥50, typ. 55	–
2-tone, class-AB	f_1 = 960; f_2 = 960.1	26	25	9 (PEP)	≥9.5, typ. 11.5	≥35, typ. 40	typ. –30

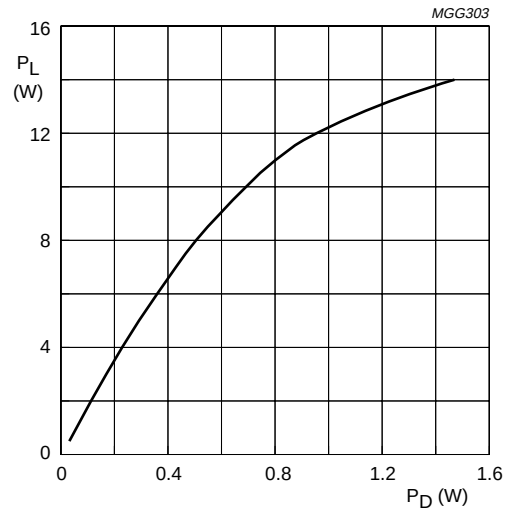
Ruggedness in class-AB operation

The BLV909 is capable of withstanding a load mismatch corresponding to VSWR = 20 : 1 through all phases under the following conditions: f = 960 MHz; V_{CE} = 26 V; I_{CQ} = 25 mA; T_{mb} = 25 °C.



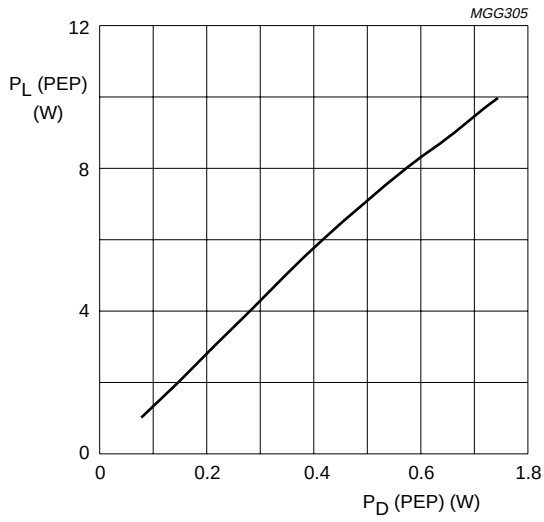
V_{CE} = 26 V; I_{CQ} = 25 mA; f = 960 MHz.

Fig.6 Power gain and collector efficiency as functions of load power; typical values.



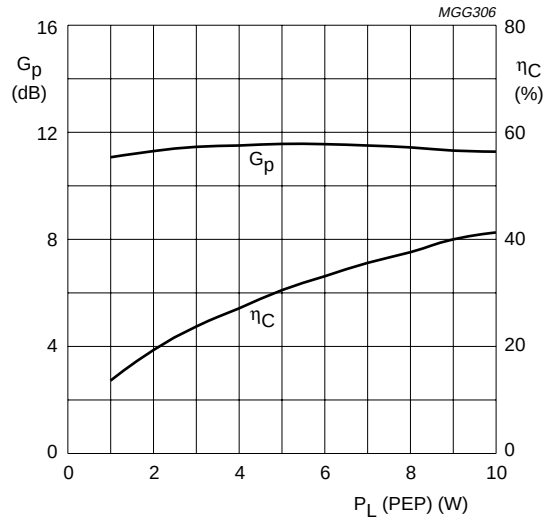
V_{CE} = 26 V; I_{CQ} = 25 mA; f = 960 MHz.

Fig.7 Load power as a function of drive power; typical values.



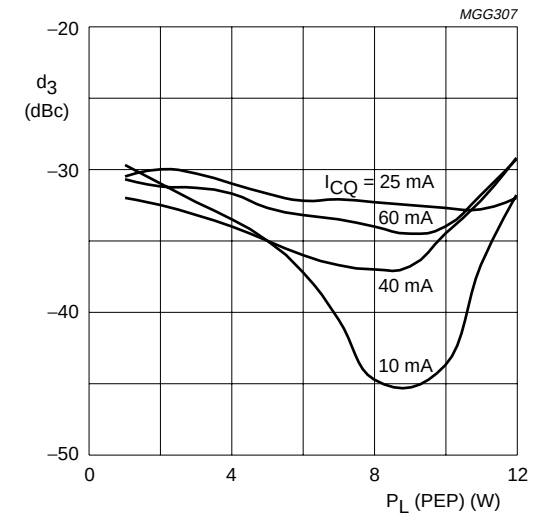
V_{CE} = 26 V; I_{CQ} = 25 mA; f_1 = 960 MHz; f_2 = 960.1 MHz.

Fig.8 Peak envelope load power as a function of drive power; typical values.



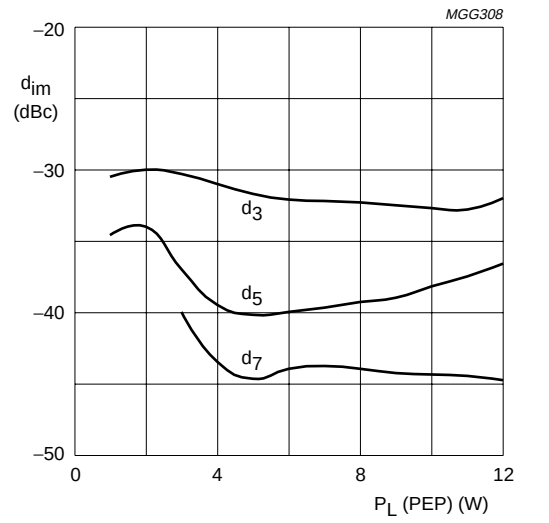
V_{CE} = 26 V; I_{CQ} = 25 mA; f_1 = 960 MHz; f_2 = 960.1 MHz.

Fig.9 Power gain and efficiency as functions of peak envelope load power; typical values.



V_{CE} = 26 V; f_1 = 960 MHz; f_2 = 960.1 MHz.

Fig.10 Third order intermodulation distortion as a function of peak envelope load power; typical values.



V_{CE} = 26 V; I_{CQ} = 25 mA; f_1 = 960 MHz; f_2 = 960.1 MHz.

Fig.11 Intermodulation distortion as a function of peak envelope load power; typical values.

Test circuit information

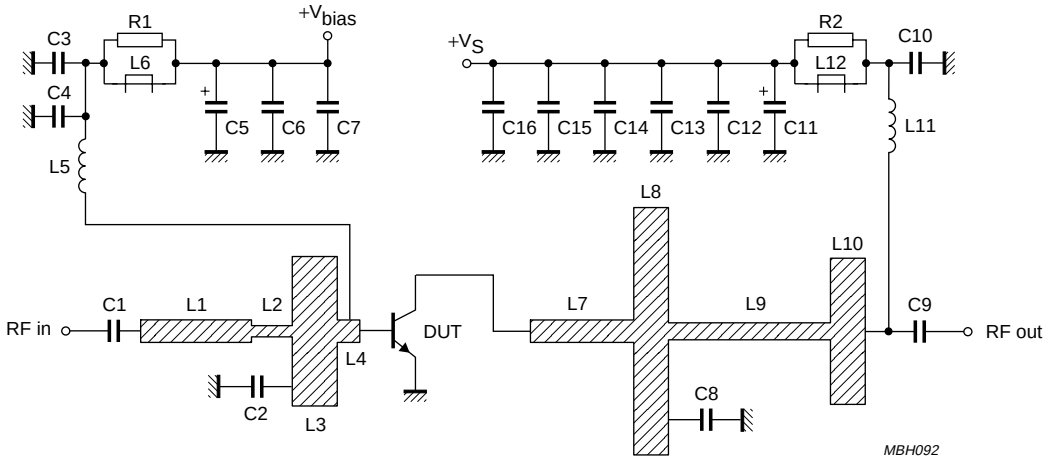


Fig.12 Common emitter test circuit for class-AB operation at 900-960 MHz.

Mounting recommendations

Both the metallized rear side and the leads of the device contribute to the heat flow. For the best results, it is recommended to mount the transistor on a grounded metallized area on the printed-circuit board, which is equipped with a large number of through metallized holes filled with solder.

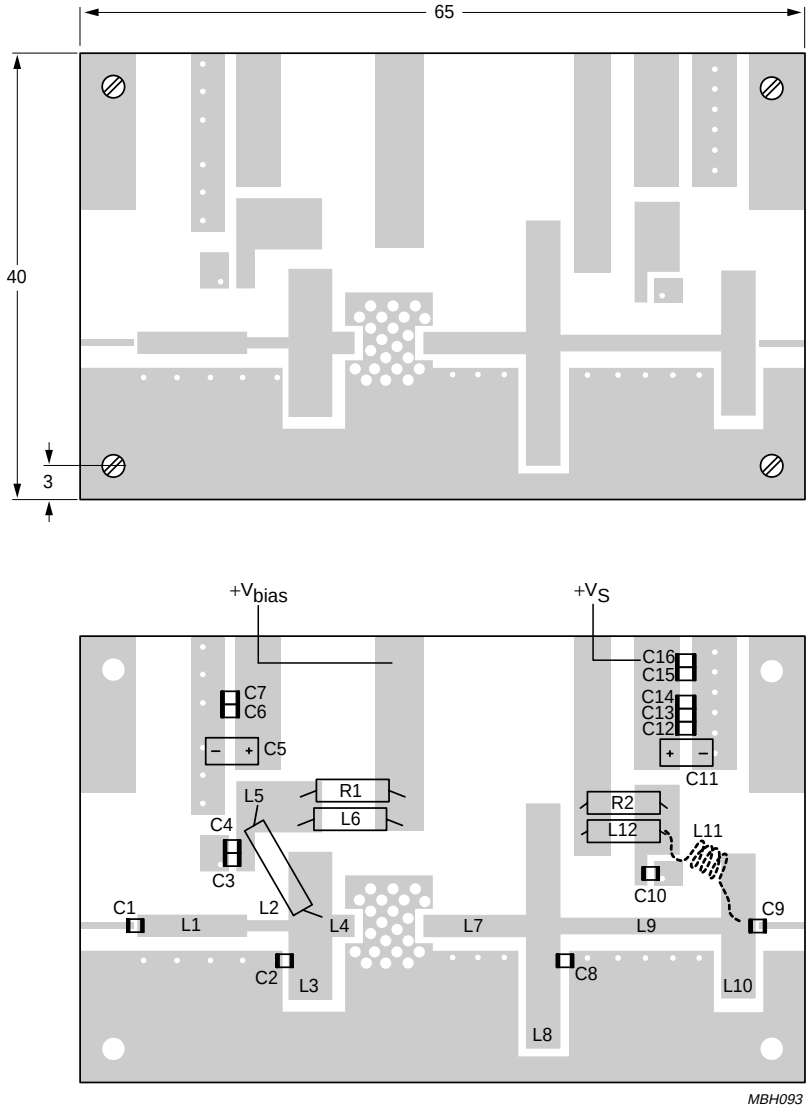
When the heatsink is mounted to the rear side of the printed-circuit board by means of heatsink compound, a thermal resistance between the mounting base and the heatsink of 0.9 K/W can be achieved.

List of components used in test circuit (see Figs 12 and 13)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C9	multilayer ceramic chip capacitor; note 1	24 pF		
C2	multilayer ceramic chip capacitor; notes 1 and 2	5.6 pF		
C3, C7, C10, C16	multilayer ceramic chip capacitor; note 3	110 pF		
C4, C15	multilayer ceramic chip capacitor; note 3	200 pF		
C5, C11	tantalum SMD capacitor	10 μF, 35 V		
C6, C12, C13, C14	ceramic chip capacitor	100 nF		2222 852 47104
C8	multilayer ceramic chip capacitor; note 1	8.2 pF		
L1	stripline; note 4	24.3 Ω	length 9.85 mm width 2 mm	
L2	stripline; note 4	37.5 Ω	length 3.63 mm width 1 mm	
L3	stripline; note 4	5.11 Ω	length 4.1 mm width 13.3 mm	
L4	stripline; note 4	24.3 Ω	length 2 mm width 2 mm	
L5	RF choke	0.22 μH		
L6, L12	grade 4S2 ferroxcube chip-bead			
L7	stripline; note 4	24.3 Ω	length 9.2 mm width 2 mm	
L8	stripline; note 4	3.2 Ω	length 3.1 mm width 22 mm	
L9	stripline; note 4	29.4 Ω	length 14.4 mm width 1.5 mm	
L10	stripline; note 4	5.22 Ω	length 3.2 mm width 13 mm	
L11	5 turns enamelled 1 mm copper wire	35 nH	pitch 1.23 mm int. dia. 3.2 mm	
R1, R2	metal film resistor	100 Ω, 0.4 W		

Notes

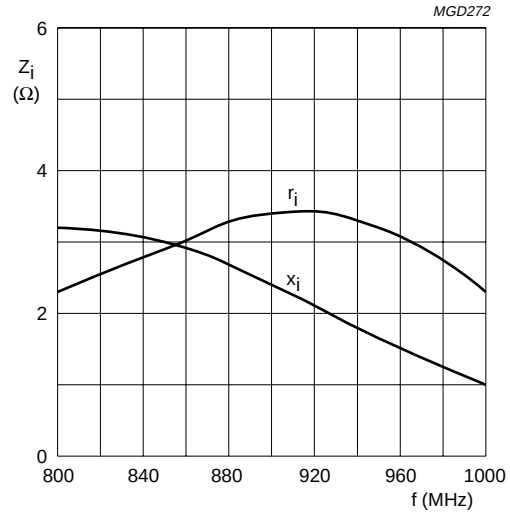
1. American Technical Ceramics type 100A or capacitor of same quality.
2. For operation at 820 to 900 MHz: C2 = 6.2 pF.
3. American Technical Ceramics type 100B or capacitor of same quality.
4. The striplines are on a double copper-clad printed-circuit board, with PTFE fibre-glass dielectric (ε_r = 10.2); thickness 0.64 mm.



Dimensions in mm.

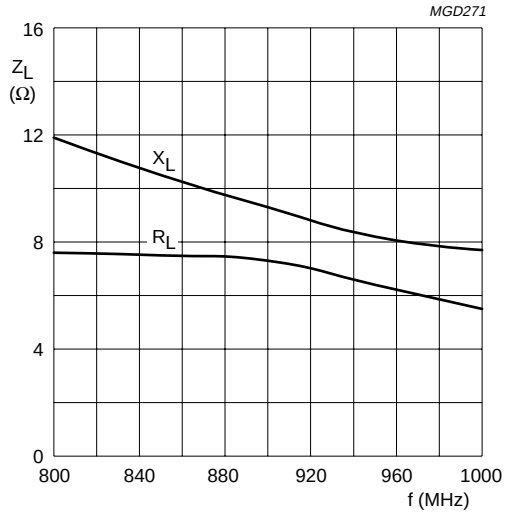
The components are situated on one side of the copper-clad PCB, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.13 Component layout and printed-circuit board and component lay-out for 900 to 960 MHz class-AB test circuit.



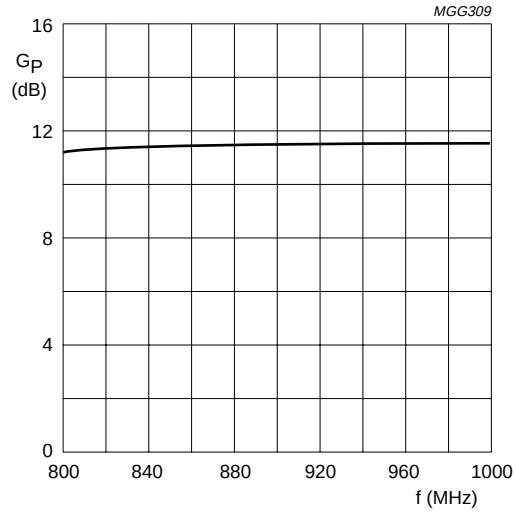
V_{CE} = 26 V; I_{CQ} = 25 mA; P_L = 9 W; T_{mb} = 25 °C.

Fig.14 Input impedance as a function of frequency (series components); typical values.



V_{CE} = 26 V; I_{CQ} = 25 mA; P_L = 9 W; T_{mb} = 25 °C.

Fig.15 Load impedance as a function of frequency (series components); typical values.



V_{CE} = 26 V; I_{CQ} = 25 mA; P_L = 9 W; T_{mb} = 25 °C.

Fig.16 Power gain as a function of frequency; typical values.

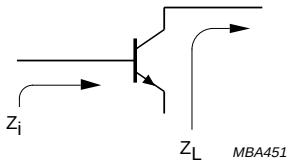
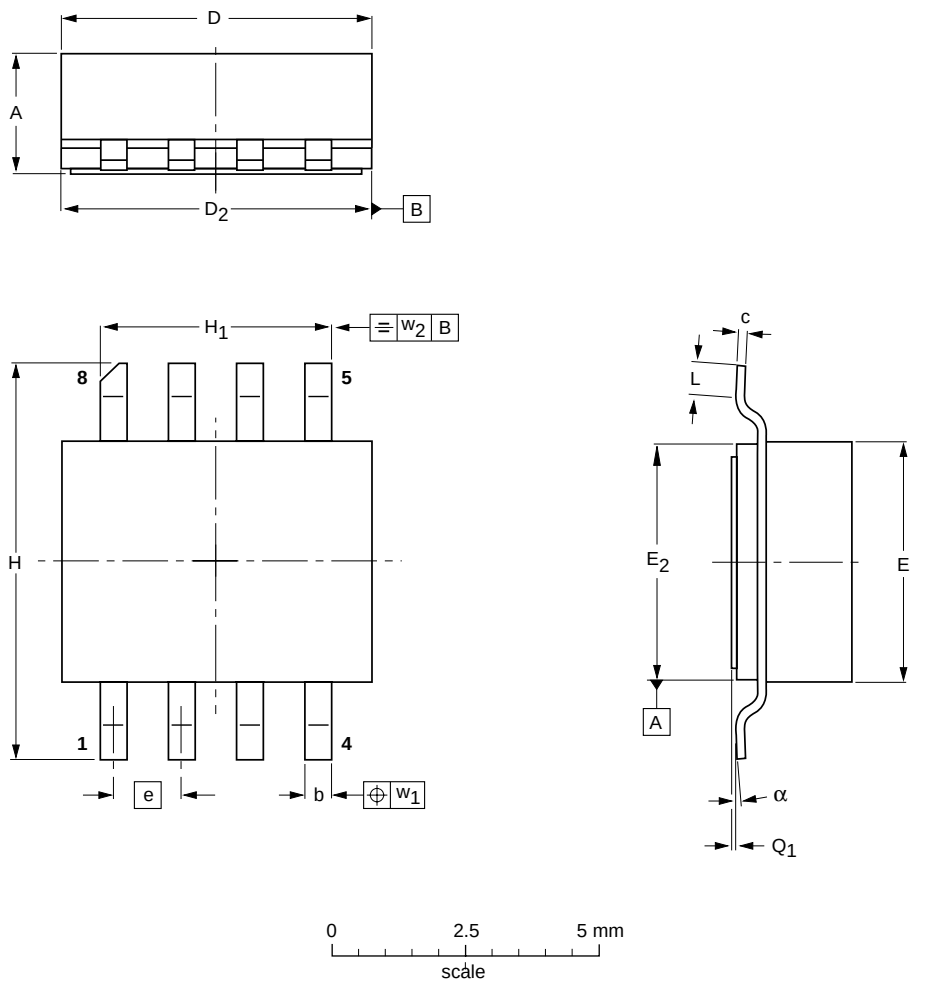


Fig.17 Definition of transistor impedance.

PACKAGE OUTLINE

Ceramic surface mounted package; 8 leads **SOT409B**



DIMENSIONS (millimetre dimensions are derived from the original inch dimensions)

UNIT	A	b	c	D	D_2	E	E_2	e	H	H_1	L	Q_1	w_1	w_2	α
mm	2.36 2.06	0.58 0.43	0.15 0.10	5.94 5.03	5.16 5.00	4.93 4.01	4.14 3.99	1.27	7.47 7.26	4.39 4.24	0.84 0.69	0.10 0.00	0.25	0.25	2° 0°
inches	0.093 0.081	0.023 0.017	0.006 0.004	0.234 0.198	0.203 0.197	0.194 0.158	0.163 0.157	0.050	0.294 0.286	0.173 0.167	0.033 0.027	0.004 0.000	0.010	0.010	2° 0°

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT409B						98-01-27

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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