DATA SHEET

BLV2045
UHF power transistor

Product specification
Supersedes data of 1996 Feb 09

1996 Nov 13

Philips
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UHF power transistor BLV2045

FEATURES

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

APPLICATIONS

- Common emitter class-AB operation in base station transmitters in the 1800 to 1990 MHz frequency range.

DESCRIPTION

NPN silicon planar transistor in a 2-lead SOT390A flange package with a ceramic cap. The emitter is connected to the flange.

PINNING - SOT390A

PIN	SYMBOL	DESCRIPTION
1	c	collector
2	b	base
3	e	emitter, connected to flange

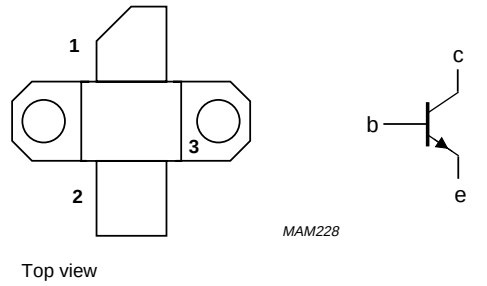


Fig.1 Simplified outline and symbol.

QUICK REFERENCE DATA

RF performance at T_h = 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	1950	26	30	≥8	≥40	–
CW, class-AB	1990	26	30	≥8	≥40	–
2-tone, class-AB	f_1 = 1950; f_2 = 1950.1	26	30 (PEP)	typ. 9	typ. 35	typ. –30

WARNING

Product and environmental safety - toxic materials

This product contains beryllium oxide. The product is entirely safe provided that the BeO disc 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.

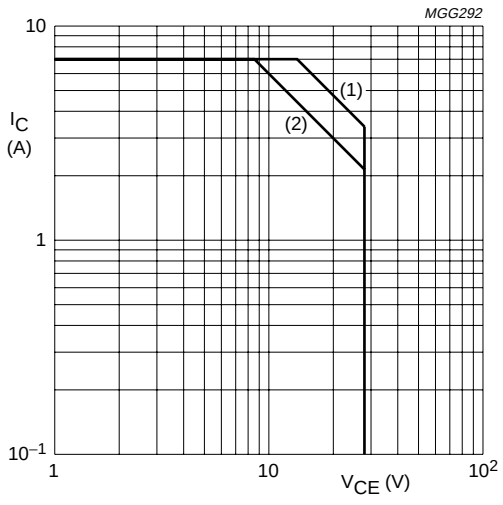
LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	28	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	7	A
$I_{C(AV)}$	average collector current		–	7	A
P_{tot}	total power dissipation	T_{mb} = 25 °C	–	100	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

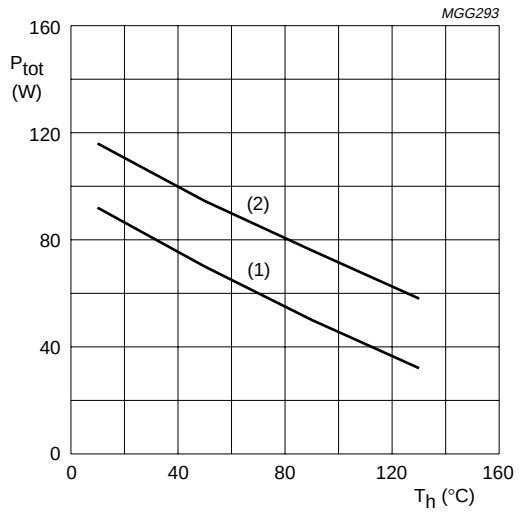
THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting base	P_{tot} = 100 W; T_{mb} = 25 °C	1.75	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting base to heatsink		0.4	K/W



(1) T_{mb} = 25 °C.
(2) T_h = 70 °C.

Fig.2 DC SOAR.



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

Fig.3 Power derating curves.

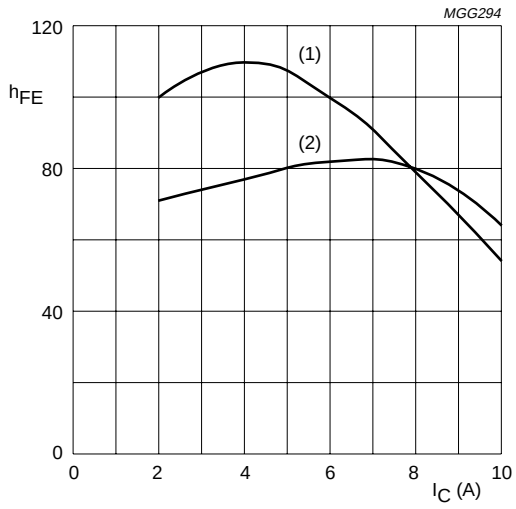
CHARACTERISTICS

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 = 40 mA	60	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 20 mA	28	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 1 mA	2.5	–	–	V
I_{CES}	collector leakage current	V_{CE} = 12.5 V; V_{BE} = 0	–	–	8	mA
h_{FE}	DC current gain	V_{CE} = 24 V; I_C = 2 A	45	60	–	
C_c	collector capacitance	V_{CB} = 26 V; I_E = i_e = 0; f = 1 MHz; note 1	–	32	–	pF
C_{re}	feedback capacitance	V_{CE} = 26 V; I_C = 0; f = 1 MHz	–	20	–	pF

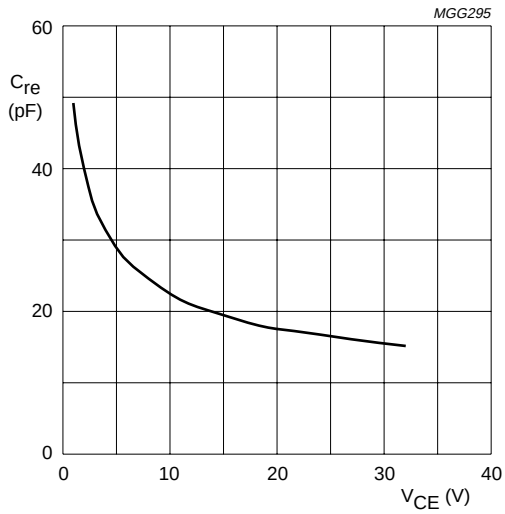
Note

1. Capacitance of die only.



(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 Feedback capacitance as a function of collector-emitter voltage; typical values.

APPLICATION INFORMATION

RF performance at T_h = 25 °C in a common emitter test circuit.

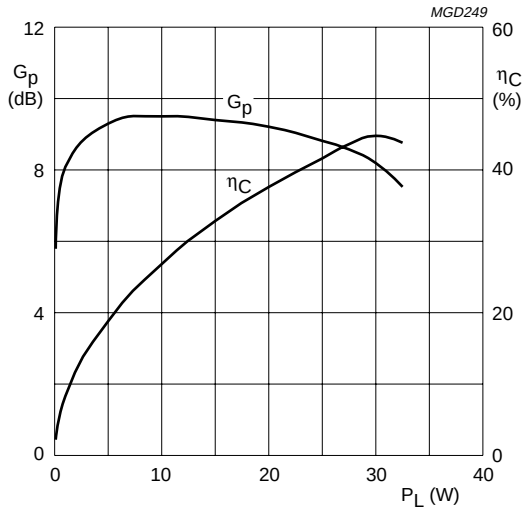
MODE OF OPERATION	f (MHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (W)	G_p (dB)	η_C (%)	d_{im} (dBc)
CW, class-AB	1950	26	80	30	≥8 typ. 8.5	≥40 typ. 45	–
CW, class-AB (note 1)	1990	26	80	30	≥8	≥40	–
2-tone, class-AB	f_1 = 1950; f_2 = 1950.1	26	80	30 (PEP)	typ. 9	typ. 35	typ. –30

Note

1. See application note BLV2045.

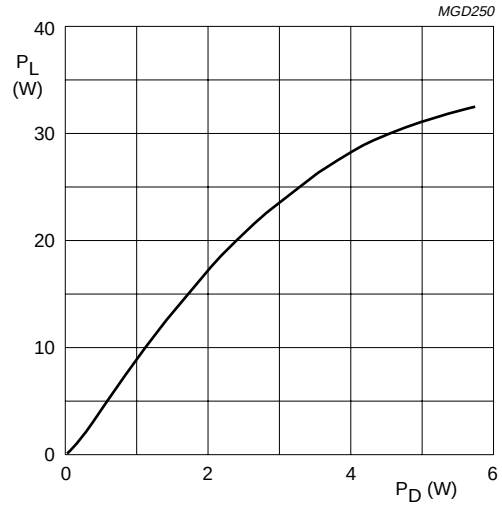
Ruggedness in class-AB operation

The BLV2045 is capable of withstanding a load mismatch corresponding to VSWR = 5 : 1 through all phases under the following conditions: f = 1950 MHz; V_{CE} = 26 V; I_{CQ} = 80 mA; P_L = 30 W; T_{mb} = 25 °C.



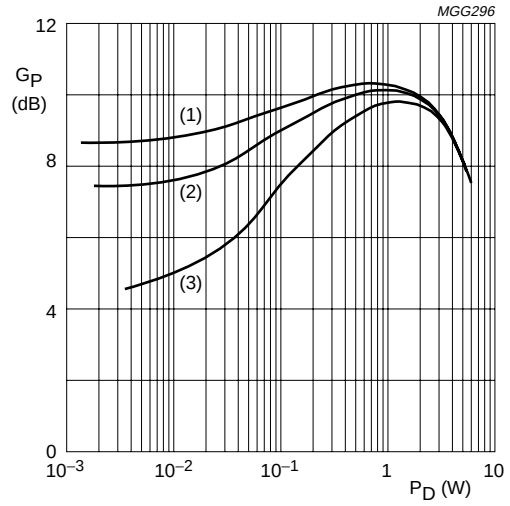
V_{CE} = 26 V; I_{CQ} = 80 mA; f = 1950 MHz.

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



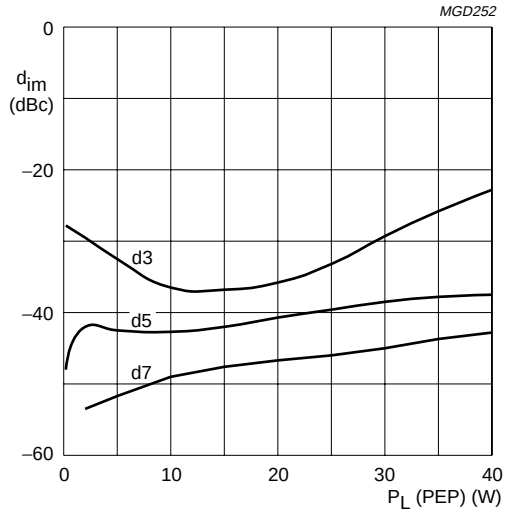
V_{CE} = 26 V; I_{CQ} = 80 mA; f = 1950 MHz.

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



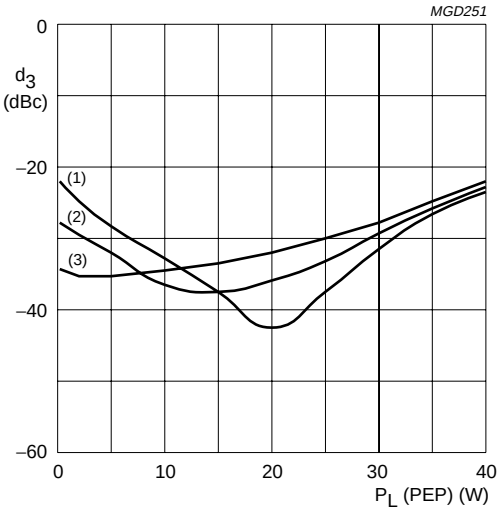
V_{CE} = 26 V; f = 1950 MHz.
(1) I_{CQ} = 240 mA. (2) I_{CQ} = 160 mA. (3) I_{CQ} = 80 mA.

Fig.8 Power gain as a function of drive power; typical values.



V_{CE} = 26 V; I_{CQ} = 80 mA; f_1 = 1950 MHz; f_2 = 1950.1 MHz.

Fig.9 Intermodulation distortion as a function of peak envelope load power; typical values.



V_{CE} = 26 V; f_1 = 1950 MHz; f_2 = 1950.1 MHz.
(1) I_{CQ} = 40 mA. (2) I_{CQ} = 80 mA. (3) I_{CQ} = 120 mA.

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

Test circuit information

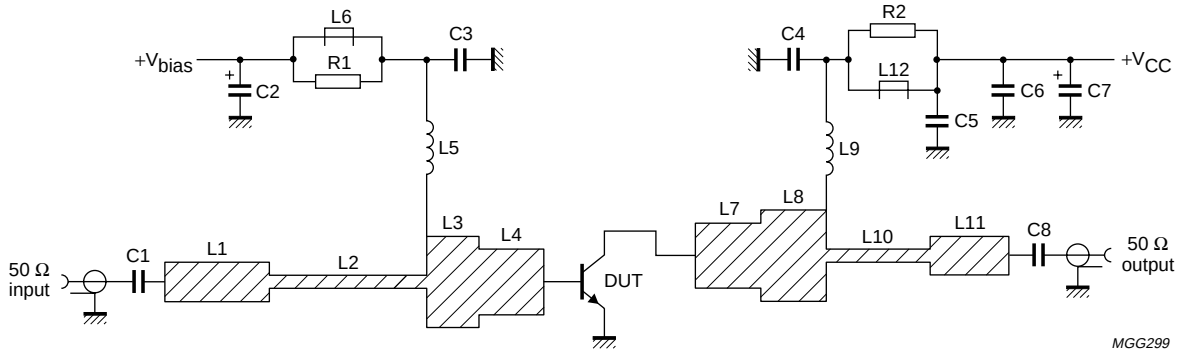


Fig.11 Class-AB test circuit for 1.8 to 2 GHz.

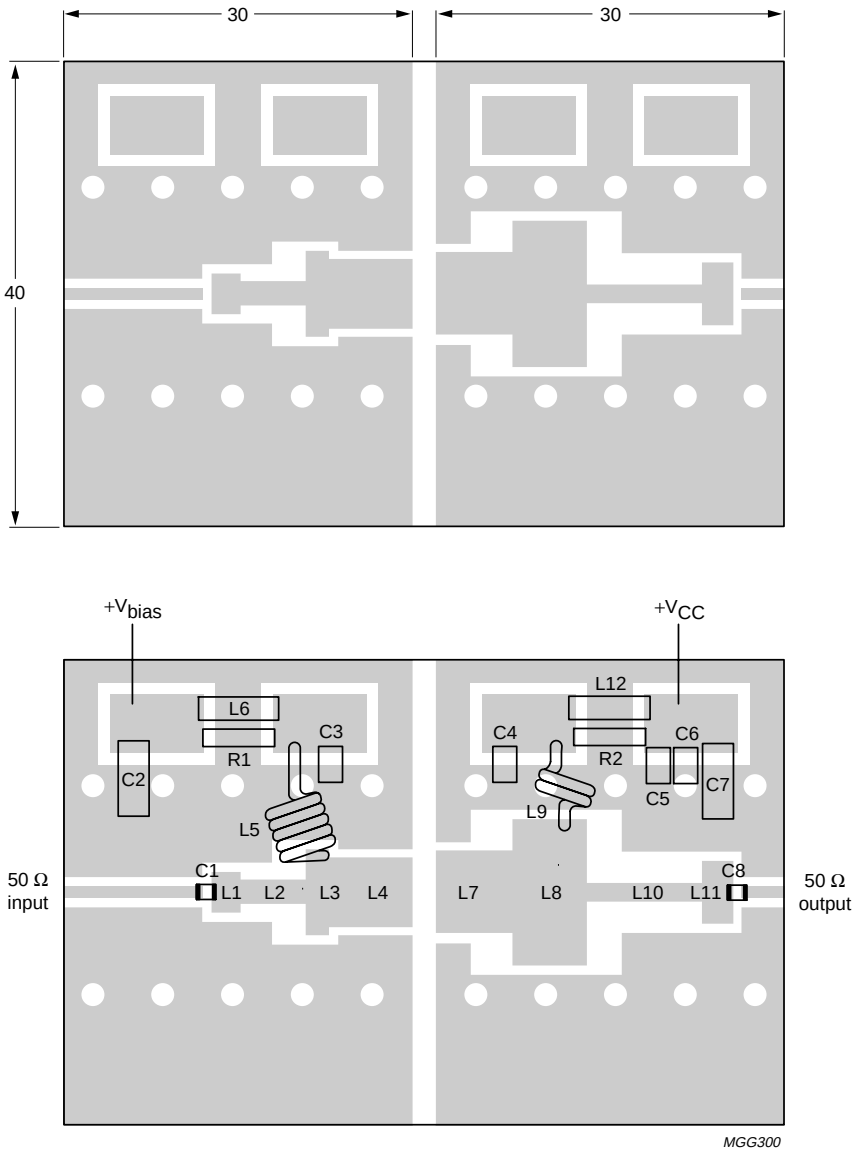
List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C8	multilayer ceramic chip capacitor; note 1	30 pF		
C2, C7	tantalum SMD capacitor	10 μF; 35 V		
C3, C4	multilayer ceramic chip capacitor; note 2	20 pF		
C5	multilayer ceramic chip capacitor	22 nF		2222 629 08223
C6	multilayer ceramic chip capacitor	100 nF		2222 852 47104
L1	stripline; note 3	20.5 Ω	length 2.5 mm width 3.5 mm	
L2	stripline; note 3	29.8 Ω	length 5.6 mm width 2.1 mm	
L3	stripline; note 3	11 Ω	length 2 mm width 7.4 mm	
L4	stripline; note 3	13.2 Ω	length 7.2 mm width 6 mm	
L5	5 turns enamelled 1 mm copper wire	38 nH	length 8 mm int. dia. 3 mm	
L6, L12	grade 4S2 ferroxcube chip-bead			4330 030 36301
L7	stripline; note 3	11.5 Ω	length 6.6 mm width 7.1 mm	
L8	stripline; note 3	6.9 Ω	length 6.4 mm width 12.6 mm	
L9	2 turns enamelled 1 mm copper wire	9 nH	length 4 mm int. dia. 3 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L10	stripline; note 3	35.8 Ω	length 9.9 mm width 1.6 mm	
L11	stripline; note 3	14.4 Ω	length 2.7 mm width 5.4 mm	
R1, R2	metal film resistor	10 Ω; 0.4 W		2311 153 51009

Notes

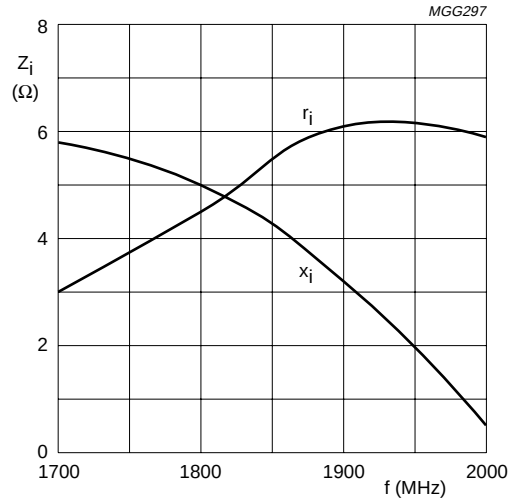
1. American Technical Ceramics type 100A or capacitor of the same quality.
2. American Technical Ceramics type 100B or capacitor of the same quality.
3. The striplines are on a double copper-clad printed-circuit board with epoxy fibre-glass dielectric (ε_r = 6.15); thickness 0.64 mm.



Dimensions in mm.

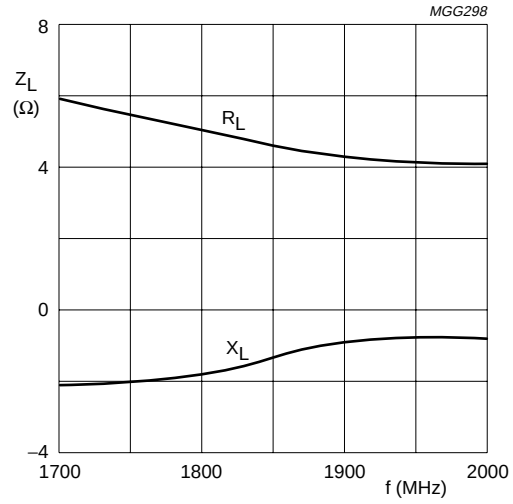
The components are situated on one side of the copper-clad epoxy fibre-glass board, the other side is not etched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.12 Component layout and printed-circuit board for 1.8 to 2 GHz class-AB test circuit.



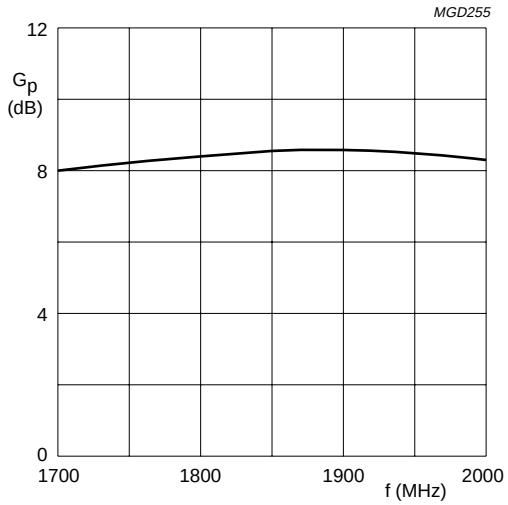
V_{CE} = 26 V; I_{CQ} = 80 mA; P_L = 30 W; T_{mb} = 25 °C.

Fig.13 Input impedance as a function of frequency (series components); typical values.



V_{CE} = 26 V; I_{CQ} = 80 mA; P_L = 30 W; T_{mb} = 25 °C.

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



V_{CE} = 26 V; I_{CQ} = 80 mA; P_L = 30 W; T_{mb} = 25 °C.

Fig.15 Power gain as a function of frequency; typical values.

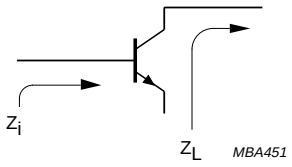
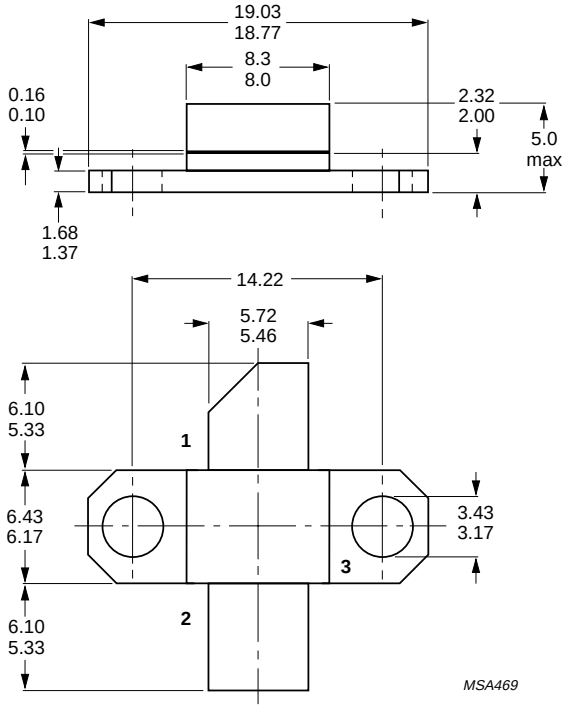


Fig.16 Definition of transistor impedance.

PACKAGE OUTLINE



Dimensions in mm.
Recommended screw: M3.
Torque on screws: max. 0.5 Nm.

Fig.17 SOT390A.

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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