DATA SHEET

BLV2046
UHF power transistor

Product specification

1997 Aug 22

Philips
Semiconductors

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UHF power transistor BLV2046

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

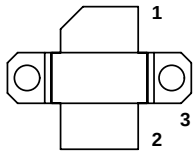
- Common emitter class-AB operation in PCN and PCS applications in the 1800 to 1990 MHz frequency range.

DESCRIPTION

NPN silicon planar transistor in a 2-lead SOT460A flange package with a ceramic cap. The emitter is connected to the flange.

PINNING - SOT460A

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



Top view MBK093

Fig.1 Simplified outline.

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	1990	26	50	≥7.5	≥40	–
2-tone, class-AB	f_1 = 1990.0; f_2 = 1990.1	26	50 (PEP)	typ. 8	typ. 33	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	–	27	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	collector current (DC)		–	12	A
$I_{C(AV)}$	average collector current		–	12	A
P_{tot}	total power dissipation	T_{mb} = 25 °C	–	195	W
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	200	°C

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	MAX.	UNIT
$R_{th\ j\text{-}mb}$	thermal resistance from junction to mounting-base	P_{dis} = 195 W; T_{mb} = 25 °C	0.9	K/W
$R_{th\ mb\text{-}h}$	thermal resistance from mounting-base to heatsink		0.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 20 mA; open emitter	65	–	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 60 mA; open base	27	–	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 20 mA; I_B = 30 mA; open collector	3.2	–	–	V
I_{CBO}	collector-base leakage current	V_{CB} = 40 V; I_E = 0	–	–	4	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 A	20	–	100	
C_c	collector capacitance	V_{CB} = 26 V; I_E = i_e = 0; f = 1 MHz; note 1	–	60	–	pF
C_{re}	feedback capacitance	V_{CE} = 26 V; I_C = 0; f = 1 MHz	–	40	–	pF

Note

1. Die only.

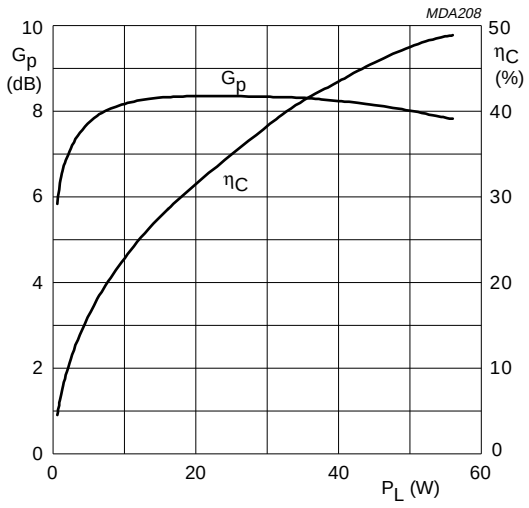
APPLICATION INFORMATION

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	1990	26	200	50	≥7.5	≥40	–
2-tone class-AB	f_1 = 1990.0; f_2 = 1990.1	26	200	50 (PEP)	typ. 8	typ. 33	typ. –30

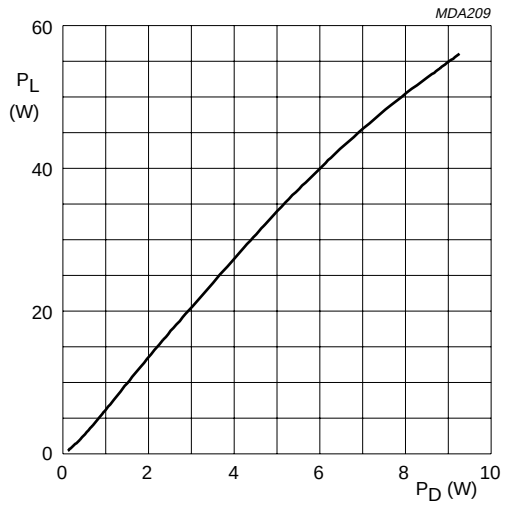
Ruggedness in class-AB operation

The BLV2046 is capable of withstanding a load mismatch corresponding to VSWR = 2:1 through all phases under the following conditions: f_1 = 1990.0 MHz; f_2 = 1990.1 MHz; V_{CE} = 26 V; I_{CQ} = 200 mA; P_L = 50 W (PEP) and T_h = 25 °C.



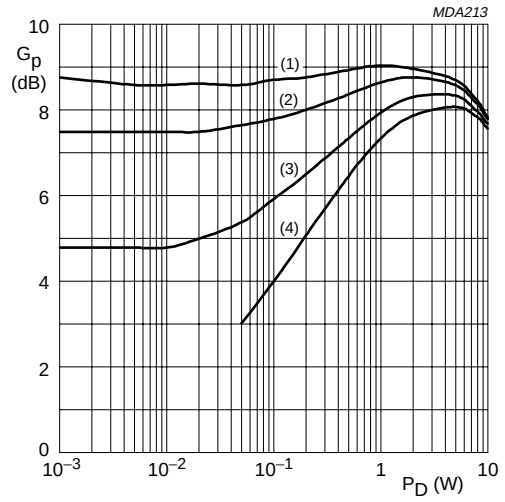
V_{CE} = 26 V; I_{CQ} = 200 mA; f = 1990 MHz.

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



V_{CE} = 26 V; I_{CQ} = 200 mA; f = 1990 MHz.

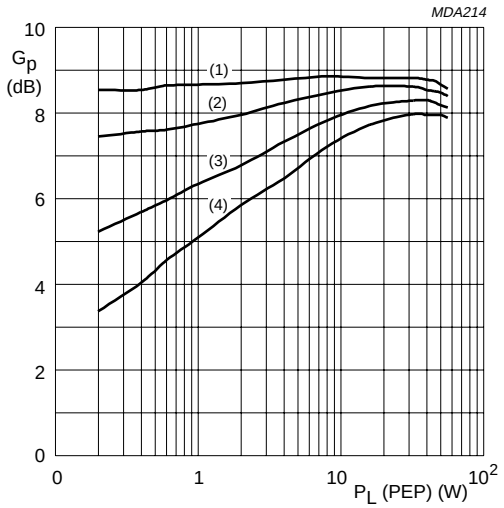
Fig.3 Load power as a function of drive power; typical values.



V_{CE} = 26 V; f = 1990 MHz.

(1) I_{CQ} = 600 mA.
(2) I_{CQ} = 400 mA.
(3) I_{CQ} = 200 mA.
(4) I_{CQ} = 100 mA.

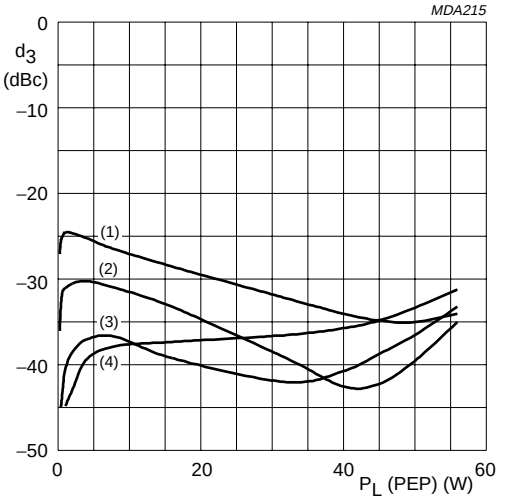
Fig.4 Power gain expansion as a function of drive power; typical values.



V_{CE} = 26 V; f_1 = 1990 MHz; f_2 = 1990.1 MHz.

(1) I_{CQ} = 600 mA.
(2) I_{CQ} = 400 mA.
(3) I_{CQ} = 200 mA.
(4) I_{CQ} = 100 mA.

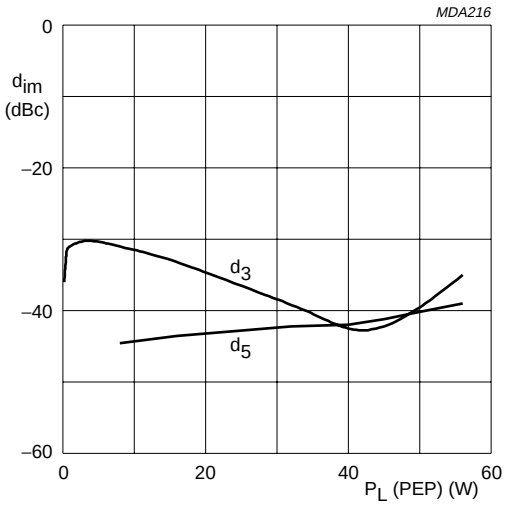
Fig.5 Power gain expansion as a function of load power; typical values.



V_{CE} = 26 V; f_1 = 1990 MHz; f_2 = 1990.1 MHz.

(1) I_{CQ} = 100 mA.
(2) I_{CQ} = 200 mA.
(3) I_{CQ} = 400 mA.
(4) I_{CQ} = 600 mA.

Fig.6 Intermodulation distortion as a function of load power; typical values.



V_{CE} = 26 V; I_{CQ} = 200 mA; f_1 = 1990 MHz; f_2 = 1990.1 MHz.

Fig.7 Intermodulation distortion as a function of load power; typical values.

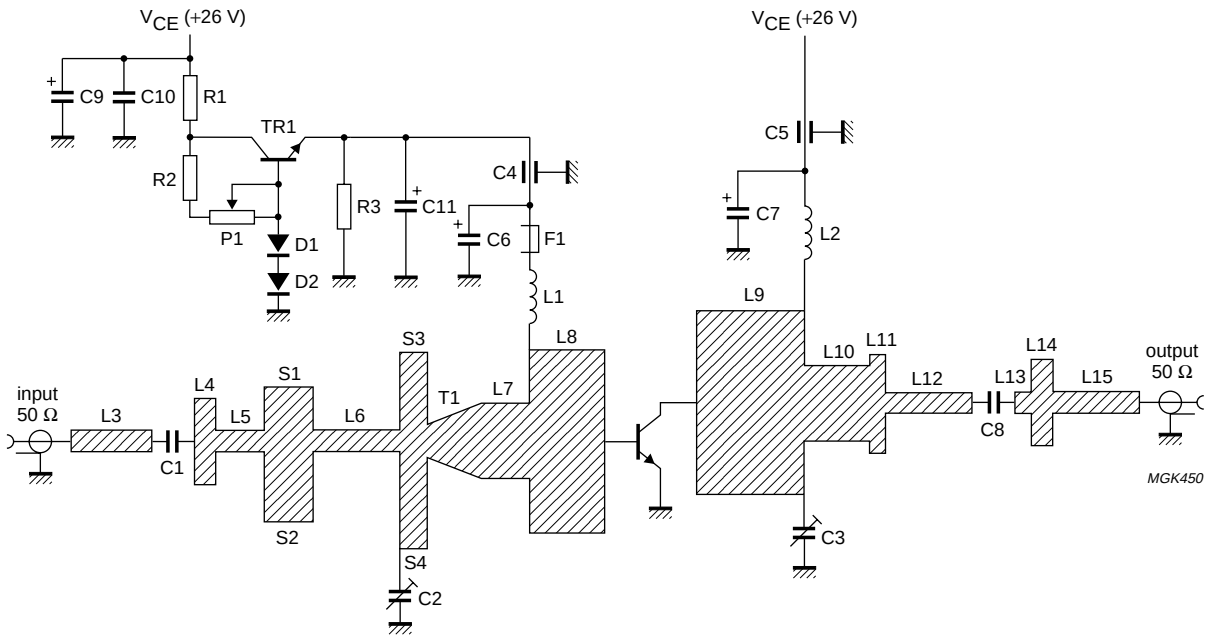


Fig.8 Class-AB test circuit for 1990 MHz.

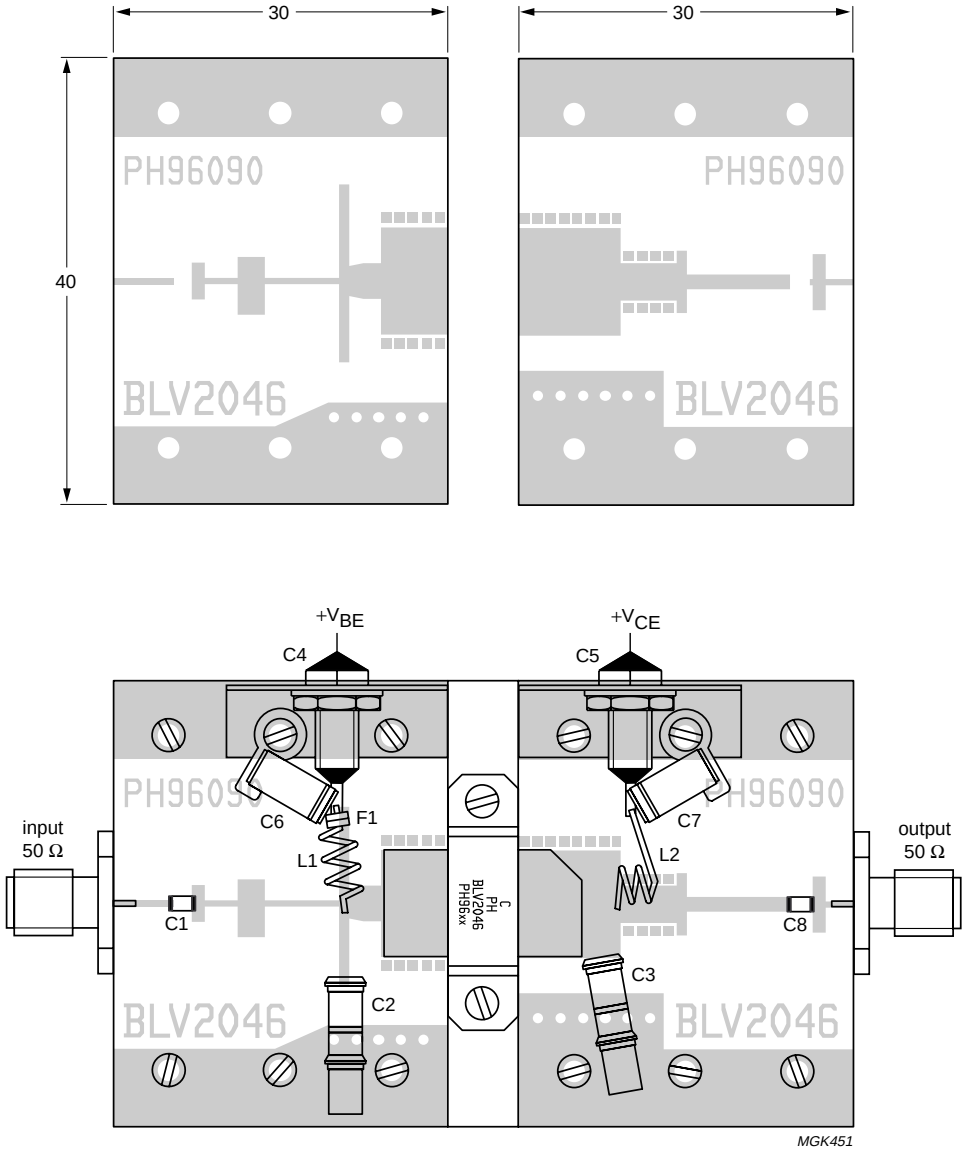
List of components

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C8	multilayer ceramic chip capacitor; note 1	30 pF		
C2, C3	trimmer capacitor	0.4 to 2.5 pF		
C4, C5	feedthrough bypass capacitor	1500 pF		
C6, C7	tantal SMD capacitor	10 μF; 35 V		
C9	electrolytic capacitor	10 μF; 100 V		
C10	multilayer ceramic chip capacitor	22 nF		2222 629 08223
C11	electrolytic capacitor	10 μF; 63 V		
L1	5 turns enamelled 0.5 mm copper wire		int. dia. = 4 mm; length = 6.7 mm	
L2	2 turns enamelled 0.5 mm copper wire		int. dia. = 4 mm; length = 2.7 mm	
L3	stripline; note 2	48.8 Ω	5.34 × 0.59 mm	
L4	stripline; note 2	17 Ω	1.2 × 3.23 mm	
L5	stripline; note 2	48.8 Ω	2.93 × 0.59 mm	

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
L6	stripline; note 2	48.8 Ω	6.63 × 0.59 mm	
L7	stripline; note 2	17.1 Ω	1.6 × 3.2 mm	
L8	stripline; note 2	6.8 Ω	6 × 9.6 mm	
L9	stripline; note 2	6.8 Ω	9.11 × 9.6 mm	
L10	stripline; note 2	16.6 Ω	5.09 × 3.32 mm	
L11	stripline; note 2	10.9 Ω	0.85 × 5.59 mm	
L12	stripline; note 2	31.9 Ω	9.26 × 1.3 mm	
L13	stripline; note 2	48.8 Ω	0.24 × 0.59 mm	
L14	stripline; note 2	11.9 Ω	1.15 × 5.04 mm	
L15	stripline; note 2	48.8 Ω	2.5 × 0.59 mm	
S1	stub; note 2		2.4 × 2.17 mm	
S2	stub; note 2		2.4 × 3.04 mm	
S3	stub; note 2		0.9 × 8.63 mm	
S4	stub; note 2		0.9 × 7.29 mm	
T1	taper; note 2		1.3 × 2.7 / 3.2 mm	
F1	grade 4B1 ferrite bead			4330 030 43081
P1	linear potentiometer	5 kΩ		
R1	resistor	100 Ω, 3 W		
R2	resistor	1 kΩ, 0.25 W		
R3	resistor	56 Ω, 3 W		
TR1	transistor	BD241C		
D1	diode, note 3	BY239		
D2	diode, note 4	BY239		

Notes

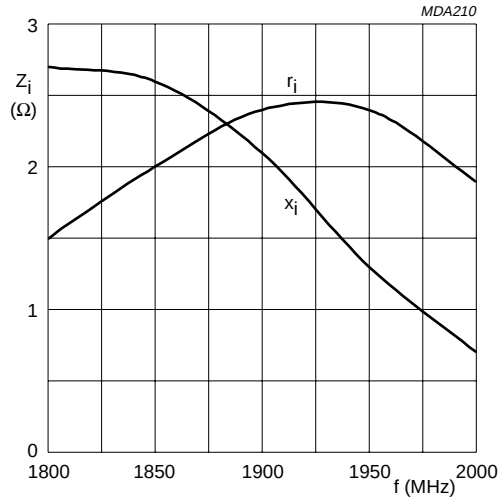
1. American Technical Ceramics type 100A (C1), type 100B (C8) or capacitor of same quality.
2. The striplines are on a double copper-clad PCB with duroid 6 010 dielectric (ε_r = 10.2); thickness 0.635 mm.
3. In thermal contact with TR1.
4. In thermal contact with DUT.



Dimensions in mm.

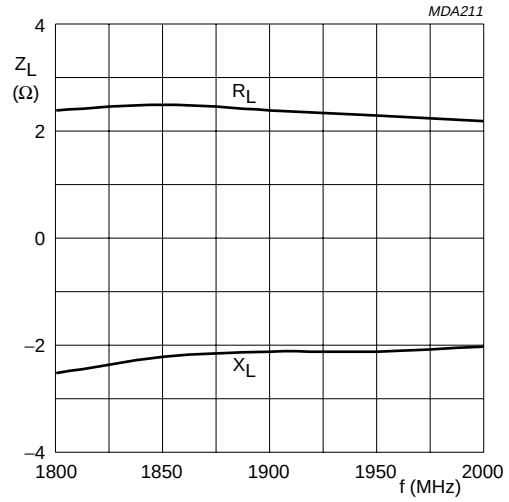
The components are situated on one side of the copper-clad board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.9 Component layout and printed-circuit board for 1990 MHz class-AB test circuit.



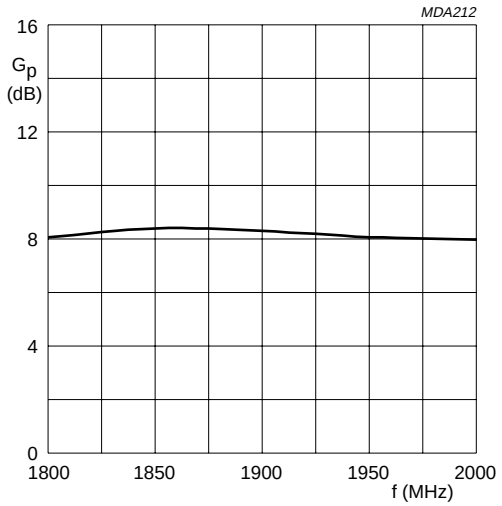
V_{CE} = 26 V; I_{CQ} = 400 mA; P_L = 50 W; T_{mb} = 25 °C.

Fig.10 Input impedance as function of the frequency (series components); typical values.



V_{CE} = 26 V; I_{CQ} = 400 mA; P_L = 50 W; T_{mb} = 25 °C.

Fig.11 Load impedance as a function of the frequency (series components); typical values.



V_{CE} = 26 V; I_{CQ} = 200 mA; P_L = 50 W; T_{mb} = 25 °C.

Fig.12 Gain as a function of the frequency; typical values.

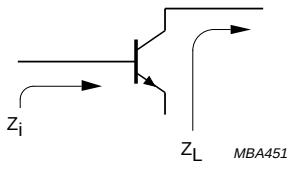
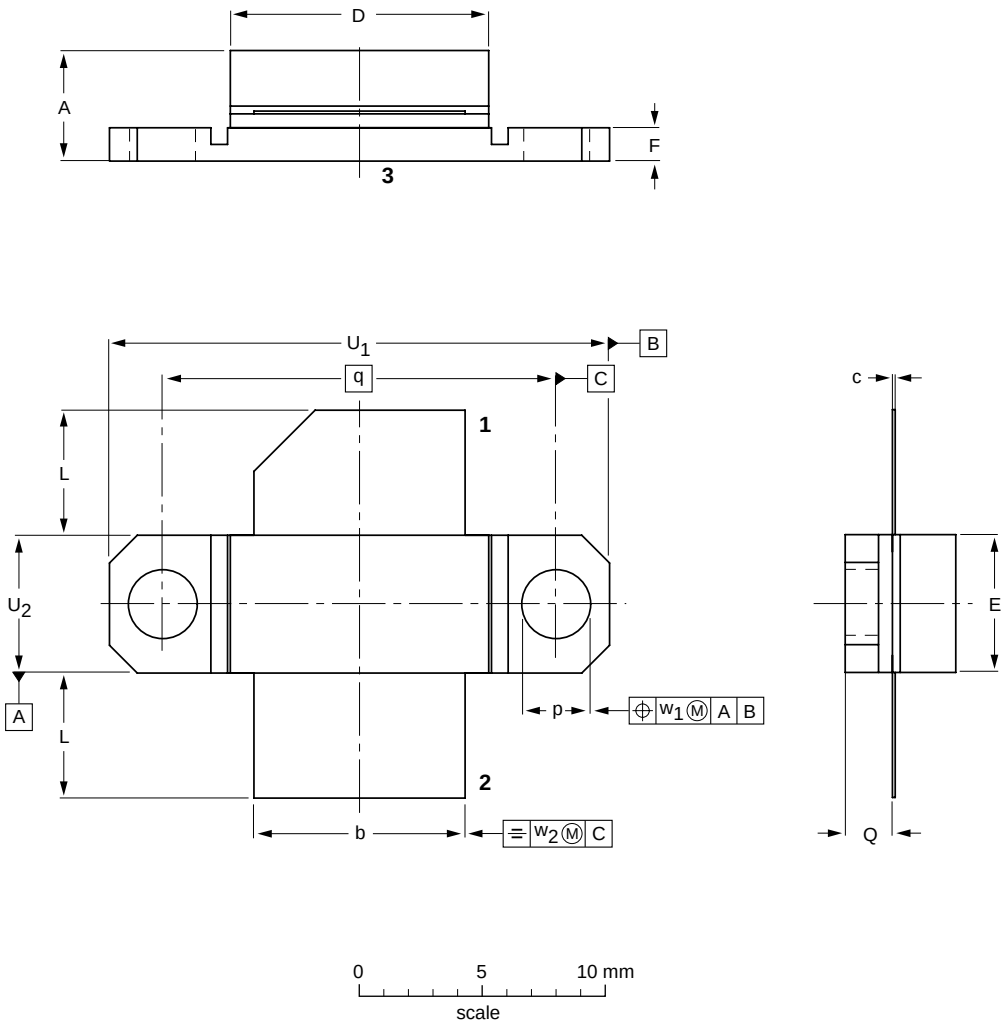


Fig.13 Definition of transistor impedance.

PACKAGE OUTLINE

Flanged hermetic ceramic package; 2 mounting holes; 2 leads **SOT460A**



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

UNIT	A	b	c	D	E	F	L	p	Q	q	U_1	U_2	w_1	w_2
mm	5.39 4.49	9.78 9.52	0.16 0.07	12.45 11.68	6.94 6.22	1.66 1.39	6.10 5.33	3.28 3.02	2.37 1.95	17.98	22.99 22.73	6.43 6.17	0.51	1.02

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT460A						97-05-23

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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