

DATA SHEET

BFR53

NPN 2 GHz wideband transistor

Product specification
Supersedes data of September 1995
File under Discrete Semiconductors, SC14

1997 Oct 28

NPN 2 GHz wideband transistor

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FEATURES

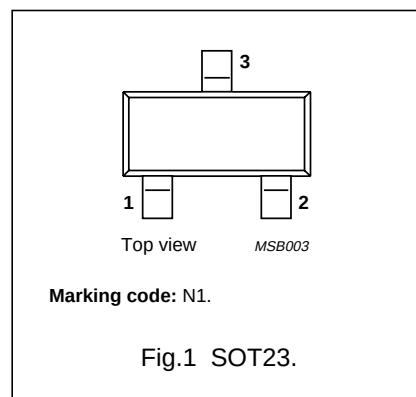
- Very low intermodulation distortion
- Very high power gain.

APPLICATIONS

- Thick and thin-film circuits.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



DESCRIPTION

NPN wideband transistor in a plastic SOT23 package.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	18	V
V_{CEO}	collector-emitter voltage	open base	—	10	V
I_{CM}	peak collector current	$f > 1$ MHz	—	100	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C	—	250	mW
C_{re}	feedback capacitance	$I_C = 2$ mA; $V_{CE} = 5$ V; $f = 1$ MHz; $T_{amb} = 25$ °C	0.9	—	pF
f_T	transition frequency	$I_C = 25$ mA; $V_{CE} = 5$ V; $f = 500$ MHz; $T_j = 25$ °C	2	—	GHz
G_{UM}	maximum unilateral power gain	$I_C = 30$ mA; $V_{CE} = 5$ V; $f = 800$ MHz; $T_{amb} = 25$ °C	10.5	—	dB

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	—	18	V
V_{CEO}	collector-emitter voltage	open base	—	10	V
V_{EBO}	emitter-base voltage	open collector	—	2.5	V
I_C	collector current (DC)		—	50	mA
I_{CM}	peak collector current	$f > 1$ MHz	—	100	mA
P_{tot}	total power dissipation	$T_s \leq 85$ °C (note 1)	—	250	mW
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		—	150	°C

Note

1. T_s is the temperature at the soldering point of the collector pin.

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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	$T_s \leq 85\text{ °C}$; note 1	260	K/W

Note

1. T_s is the temperature at the soldering point of the collector pin.

CHARACTERISTICS

$T_j = 25\text{ °C}$ unless otherwise specified.

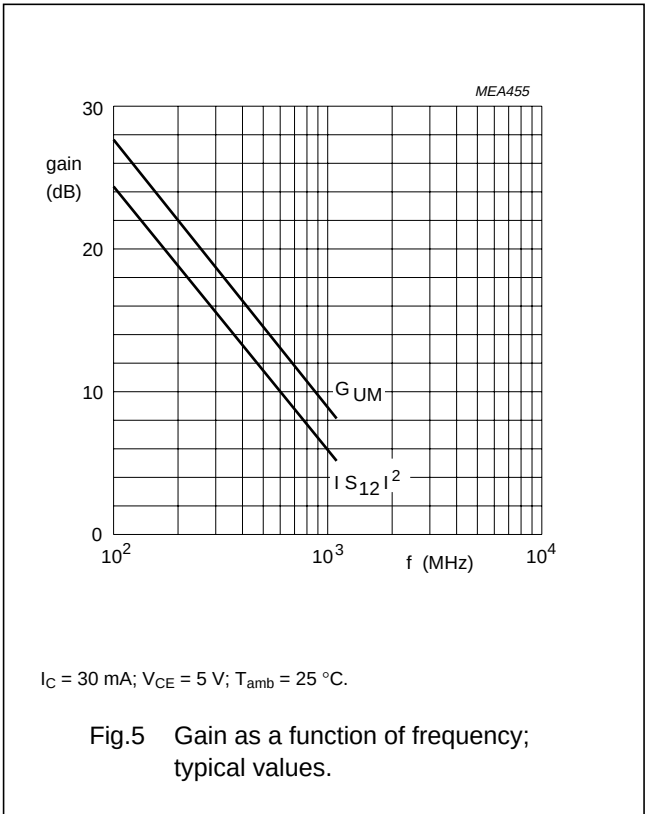
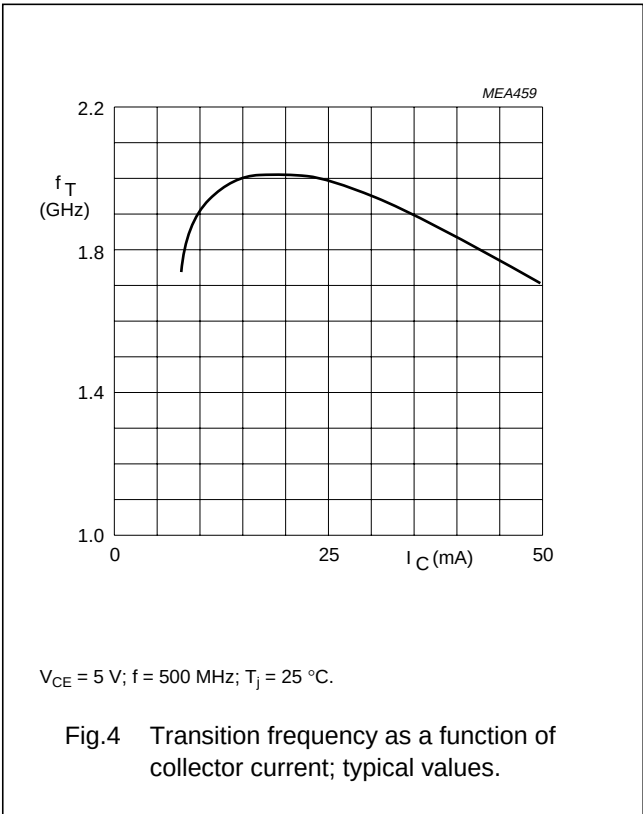
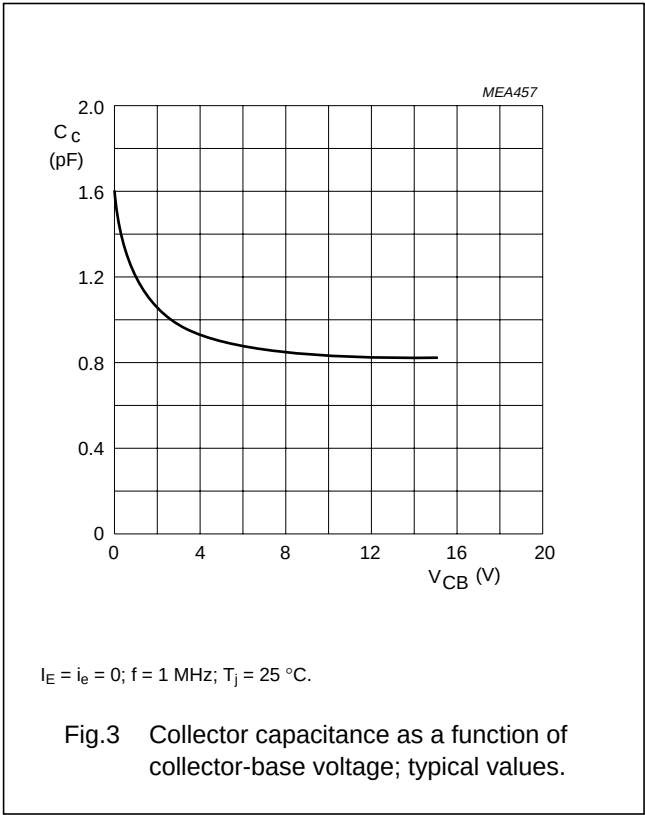
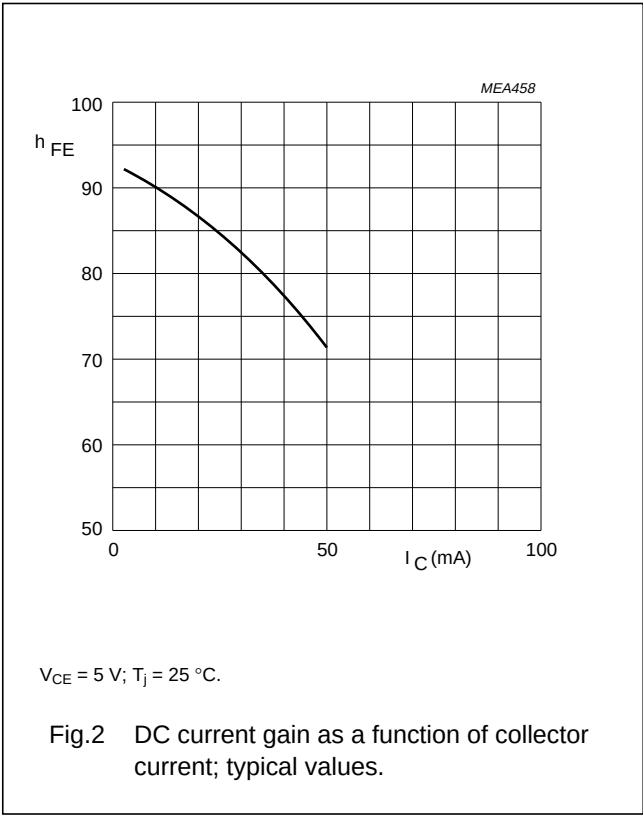
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 10\text{ V}$	–	–	50	nA
h_{FE}	DC current gain	$I_C = 25\text{ mA}$; $V_{CE} = 5\text{ V}$; see Fig.2	25	–	–	
		$I_C = 50\text{ mA}$; $V_{CE} = 5\text{ V}$; see Fig.2	25	–	–	
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$; see Fig.3	–	0.9	–	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 0.5\text{ V}$; $f = 1\text{ MHz}$	–	1.5	–	pF
C_{re}	feedback capacitance	$I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$	–	0.9	–	pF
f_T	transition frequency	$I_C = 25\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; see Fig.4	–	2	–	GHz
G_{UM}	maximum unilateral power gain (note 1)	$I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 800\text{ MHz}$; $T_{amb} = 25\text{ °C}$; see Fig.5	–	10.5	–	dB
F	noise figure	$I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ °C}$; see Fig.6	–	–	5	dB

Note

1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1 - |S_{11}|^2)(1 - |S_{22}|^2)} \text{ dB}$.

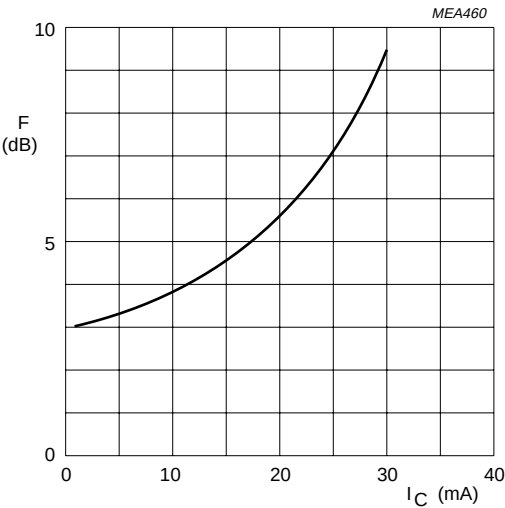
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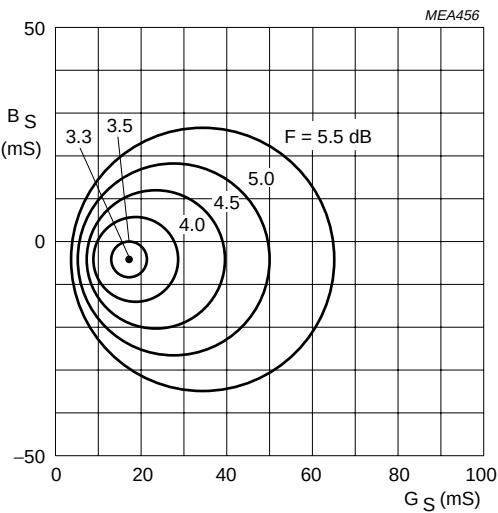
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$V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $G_S = 20\text{ mS}$; B_S is tuned; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.6 Minimum noise figure as a function of collector current; typical values.

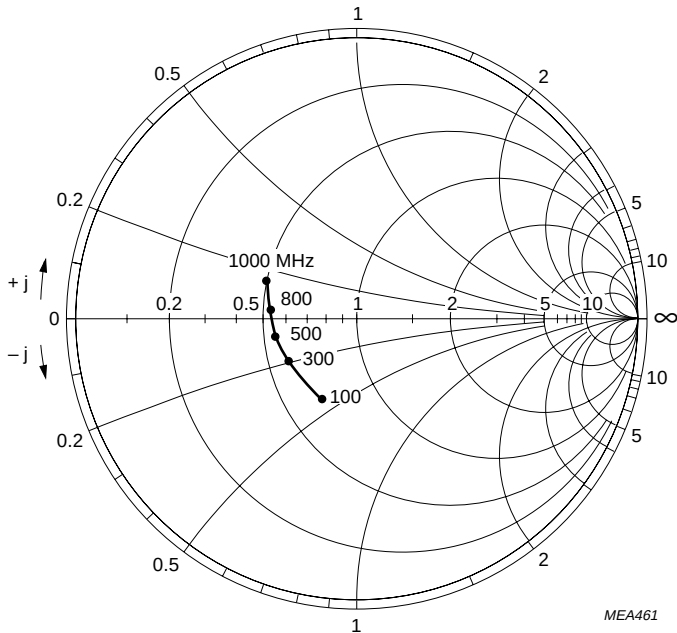


$I_C = 2\text{ mA}$; $V_{CE} = 5\text{ V}$; $f = 500\text{ MHz}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.7 Circles of constant noise figure; typical values.

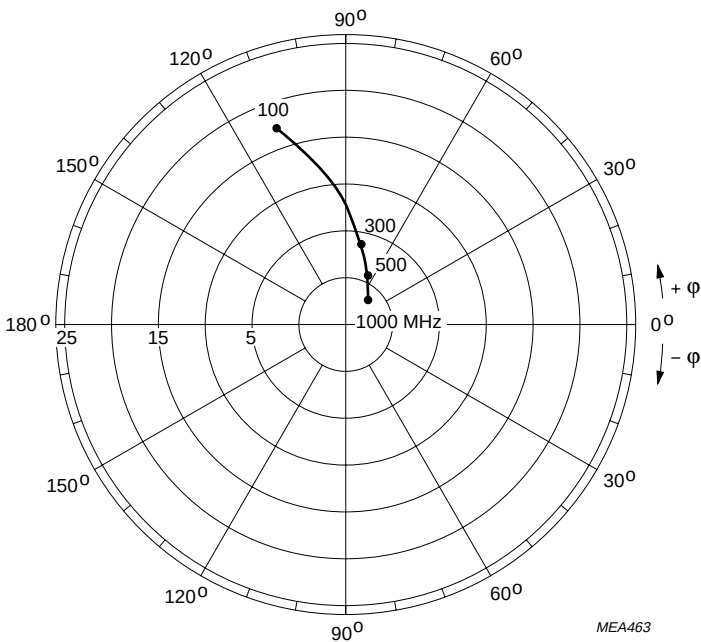
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$I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $Z_0 = 50\text{ }\Omega$; $T_{amb} = 25\text{ }^\circ\text{C}$.

Fig.8 Common emitter input reflection coefficient (S_{11}).

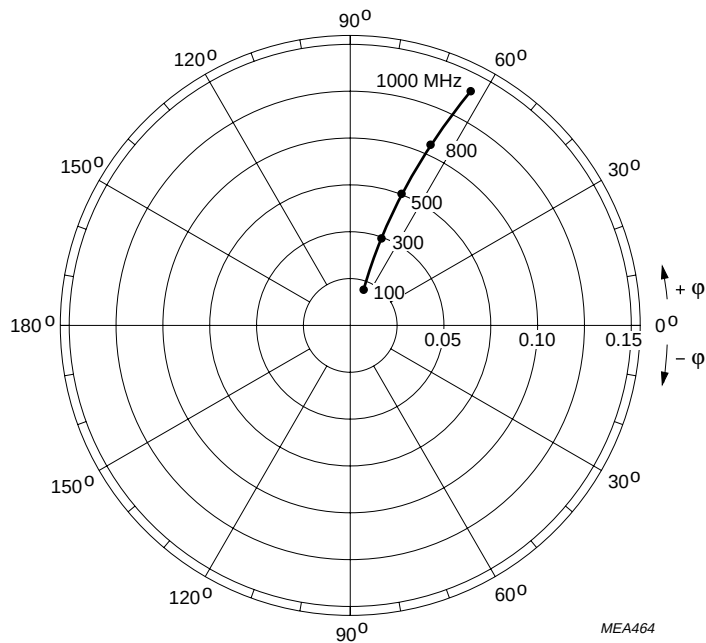


$I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^\circ\text{C}$.

Fig.9 Common emitter forward transmission coefficient (S_{21}).

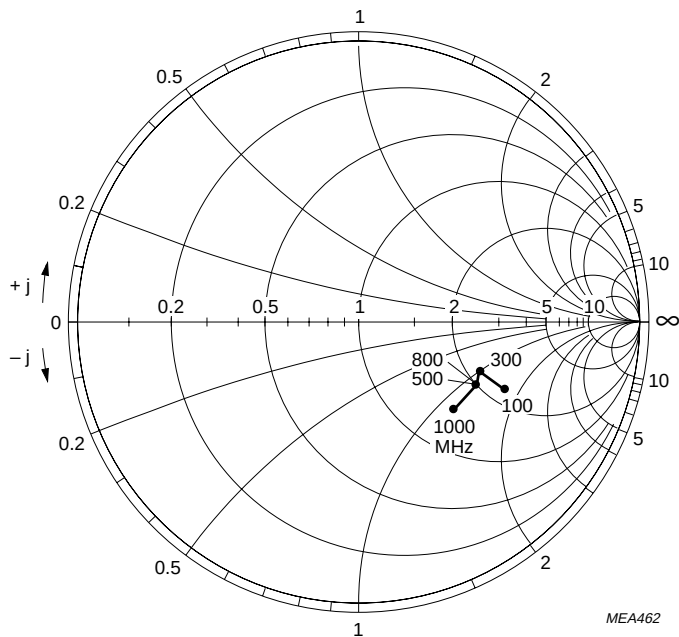
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$I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.10 Common emitter reverse transmission coefficient (S_{12}).



$I_C = 30\text{ mA}$; $V_{CE} = 5\text{ V}$; $Z_0 = 50\text{ }\Omega$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.11 Common emitter output reflection coefficient (S_{22}).

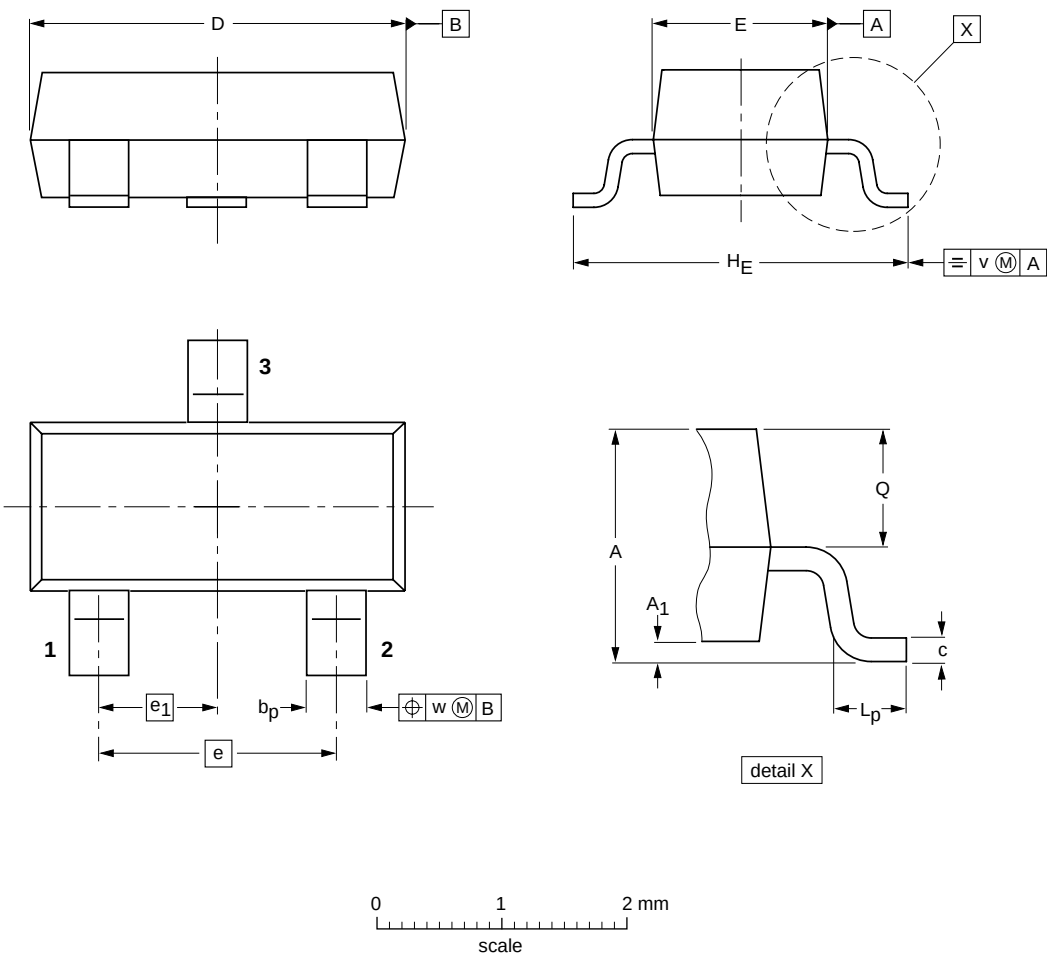
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PACKAGE OUTLINES

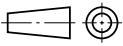
Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max.	b _p	c	D	E	e	e ₁	H _E	L _p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23						97-02-28

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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.
Short-form specification	The data in this specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.
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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