

# DATA SHEET

**BFT92W**

**PNP 4 GHz wideband transistor**

Product specification  
File under Discrete Semiconductors, SC14

May 1994

**Philips Semiconductors**



**PHILIPS**

# PNP 4 GHz wideband transistor

# BFT92W

### FEATURES

- High power gain
- Gold metallization ensures excellent reliability
- SOT323 (S-mini) package.

### APPLICATION

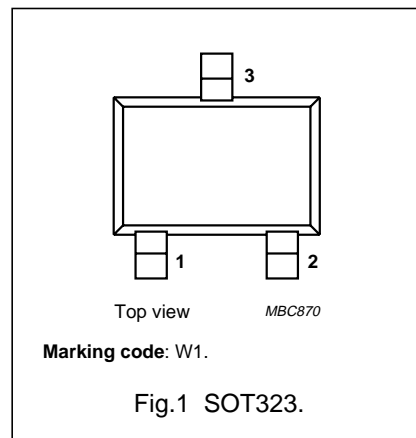
It is intended as a general purpose transistor for wideband applications up to 2 GHz.

### DESCRIPTION

Silicon PNP transistor in a plastic, SOT323 (S-mini) package. The BFT92W uses the same crystal as the SOT23 version, BFT92.

### PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$V_{CBO}$	collector-base voltage	open emitter	–	–	–20	V
$V_{CEO}$	collector-emitter voltage	open base	–	–	–15	V
$I_C$	collector current (DC)		–	–	–35	mA
$P_{tot}$	total power dissipation	up to $T_s = 93\text{ }^\circ\text{C}$ ; note 1	–	–	300	mW
$h_{FE}$	DC current gain	$I_C = -15\text{ mA}$ ; $V_{CE} = -10\text{ V}$	20	50	–	
$C_{re}$	feedback capacitance	$I_C = 0$ ; $V_{CB} = -10\text{ V}$ ; $f = 1\text{ MHz}$	–	0.5	–	pF
$f_T$	transition frequency	$I_C = -15\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$	–	4	–	GHz
$G_{UM}$	maximum unilateral power gain	$I_C = -15\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$ ; $T_{amb} = 25\text{ }^\circ\text{C}$	–	17	–	dB
F	noise figure	$I_C = -5\text{ mA}$ ; $V_{CE} = -10\text{ V}$ ; $f = 500\text{ MHz}$	–	2.5	–	dB
$T_j$	junction temperature		–	–	150	$^\circ\text{C}$

### Note

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

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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	–	–20	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	–15	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	–2	V
I <sub>C</sub>	collector current (DC)		–	–25	mA
P <sub>tot</sub>	total power dissipation	up to T <sub>s</sub> = 93 °C; note 1	–	300	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	150	°C

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th j-s</sub>	thermal resistance from junction to soldering point	up to T <sub>s</sub> = 93 °C; note 1	190	K/W

**Note to the “Limiting values” and “Thermal characteristics”**

1. T<sub>s</sub> is the temperature at the soldering point of the collector pin.

**CHARACTERISTICS**

T<sub>j</sub> = 25 °C (unless otherwise specified).

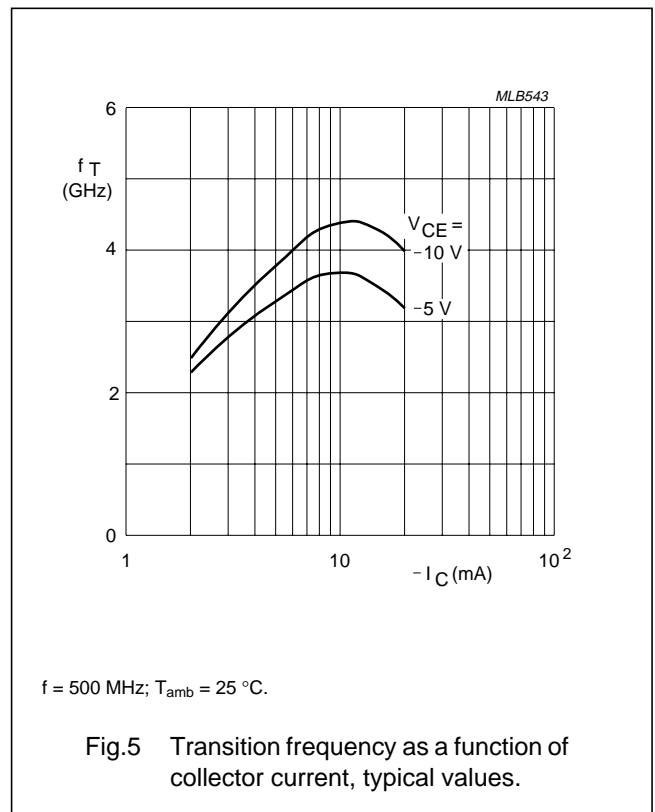
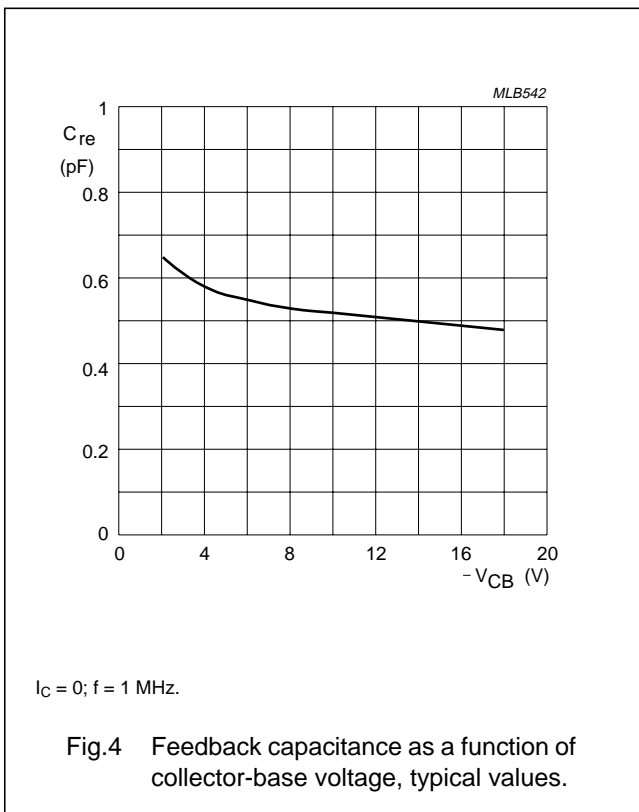
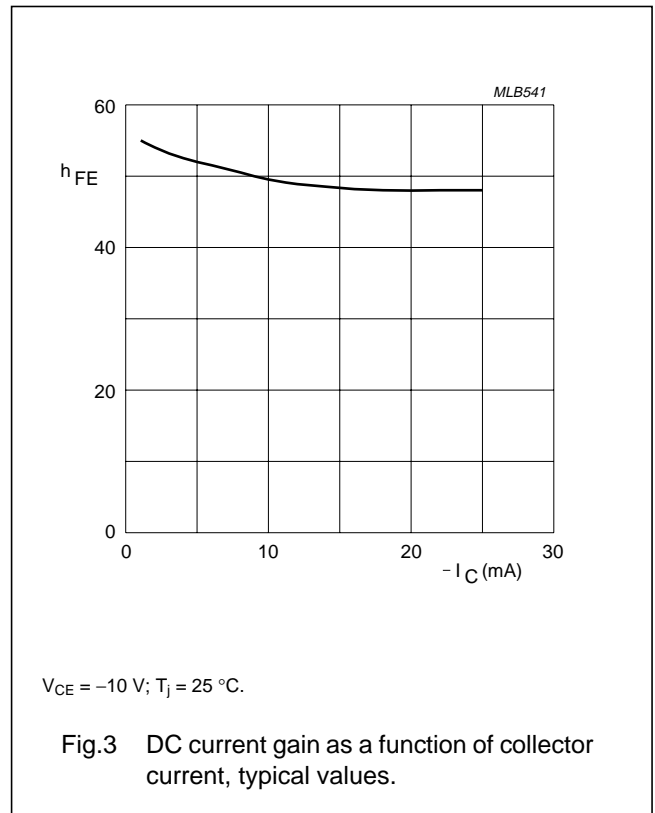
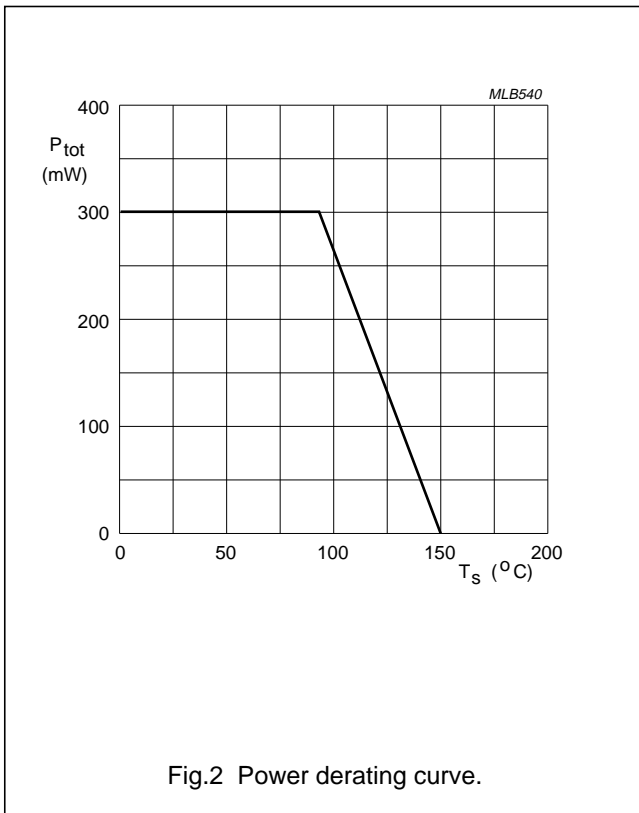
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I <sub>CBO</sub>	collector cut-off current	I <sub>E</sub> = 0; V <sub>CB</sub> = –10 V	–	–	–50	nA
h <sub>FE</sub>	DC current gain	I <sub>C</sub> = –15 mA; V <sub>CE</sub> = –10 V	20	50	–	
f <sub>T</sub>	transition frequency	I <sub>C</sub> = –15 mA; V <sub>CE</sub> = –10 V; f = 500 MHz; T <sub>amb</sub> = 25 °C	–	4	–	GHz
C <sub>c</sub>	collector capacitance	I <sub>E</sub> = i <sub>e</sub> = 0; V <sub>CB</sub> = –10 V; f = 1 MHz	–	0.65	–	pF
C <sub>e</sub>	emitter capacitance	I <sub>C</sub> = i <sub>c</sub> = 0; V <sub>EB</sub> = –0.5 V; f = 1 MHz	–	0.75	–	pF
C <sub>re</sub>	feedback capacitance	I <sub>C</sub> = 0; V <sub>CB</sub> = –10 V; f = 1 MHz	–	0.5	–	pF
G <sub>UM</sub>	maximum unilateral power gain; note 1	I <sub>C</sub> = –15 mA; V <sub>CE</sub> = –10 V; f = 500 MHz; T <sub>amb</sub> = 25 °C	–	17	–	dB
		I <sub>C</sub> = –15 mA; V <sub>CE</sub> = –10 V; f = 1 GHz; T <sub>amb</sub> = 25 °C	–	11	–	dB
F	noise figure	Γ <sub>s</sub> = Γ <sub>opt</sub> ; I <sub>C</sub> = –5 mA; V <sub>CE</sub> = –10 V; f = 500 MHz	–	2.5	–	dB
		Γ <sub>s</sub> = Γ <sub>opt</sub> ; I <sub>C</sub> = –5 mA; V <sub>CE</sub> = –10 V; f = 1 GHz	–	3	–	dB

**Note**

1. G<sub>UM</sub> is the maximum unilateral power gain, assuming s<sub>12</sub> is zero.  $G_{UM} = 10 \log \frac{|s_{21}|^2}{(1 - |s_{11}|^2)(1 - |s_{22}|^2)}$  dB.

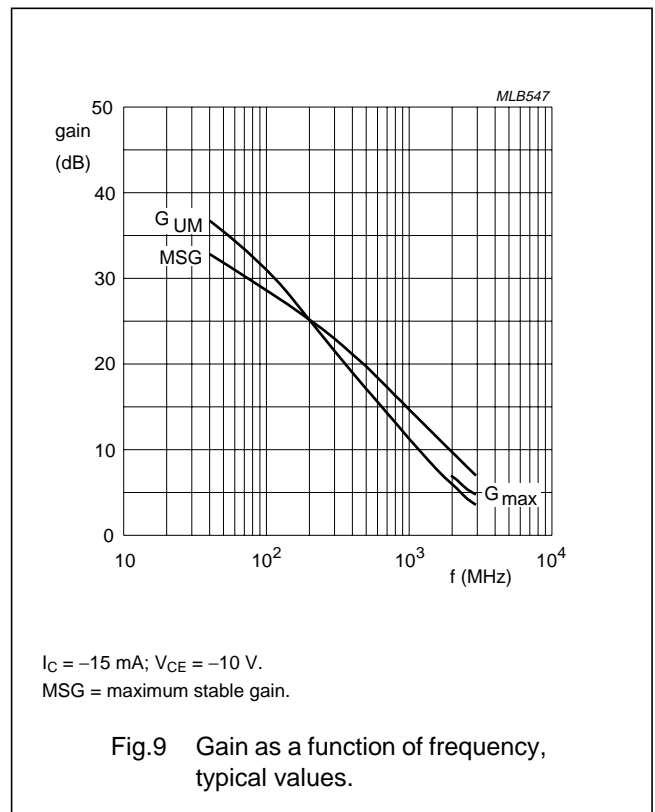
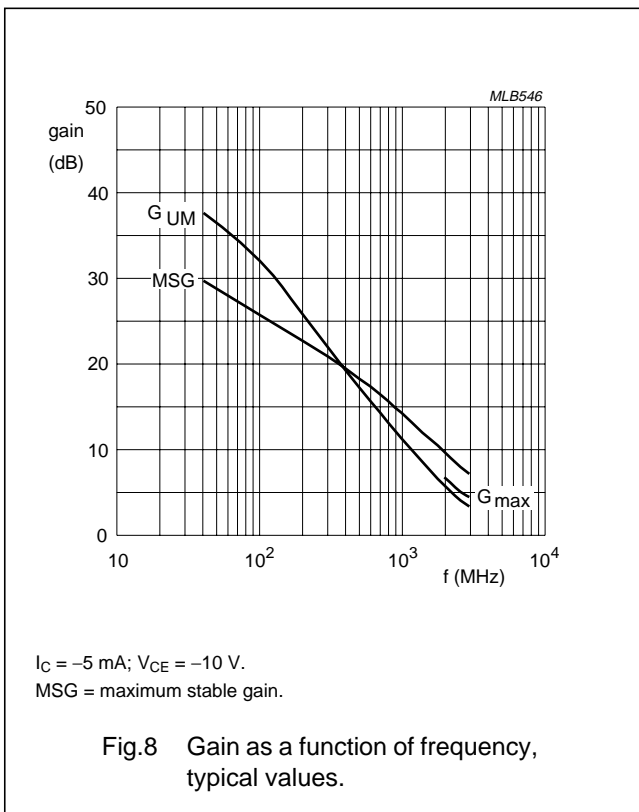
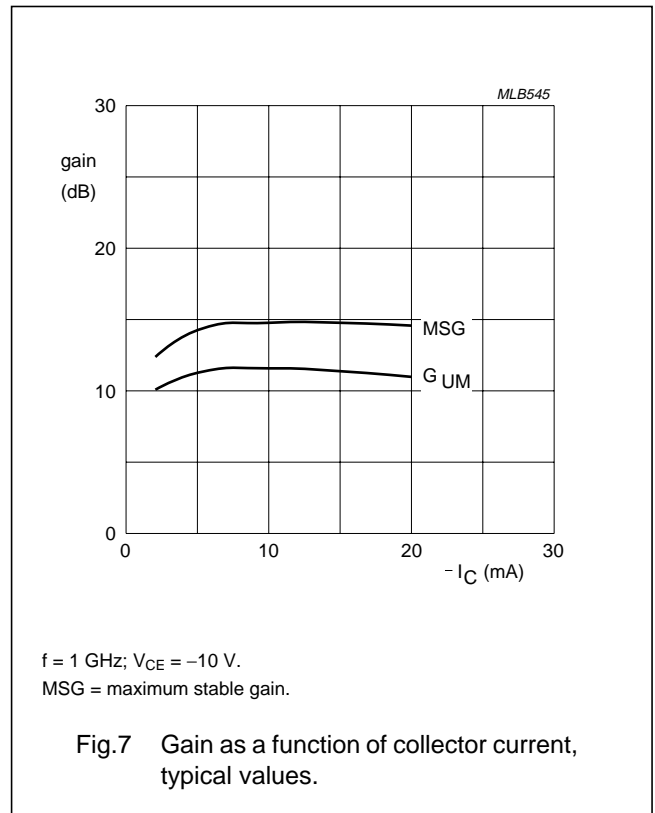
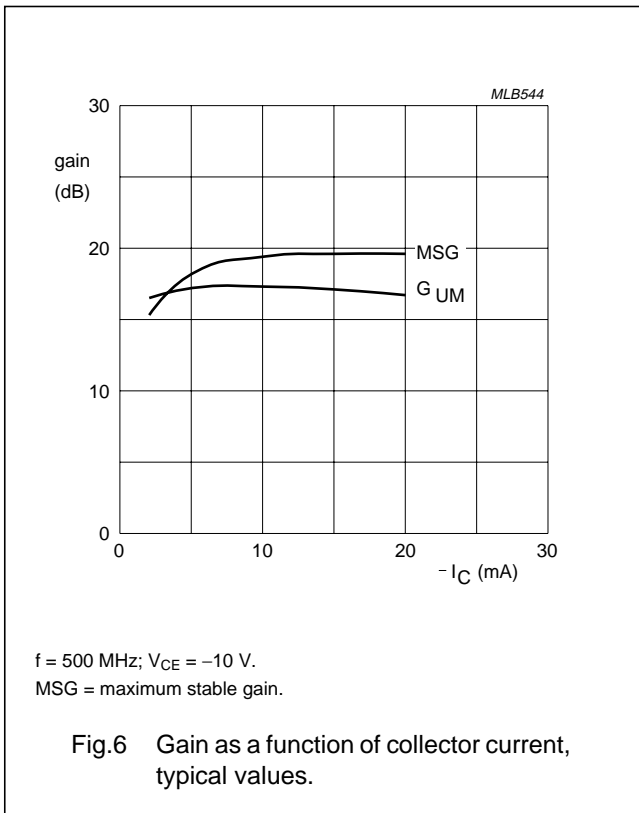
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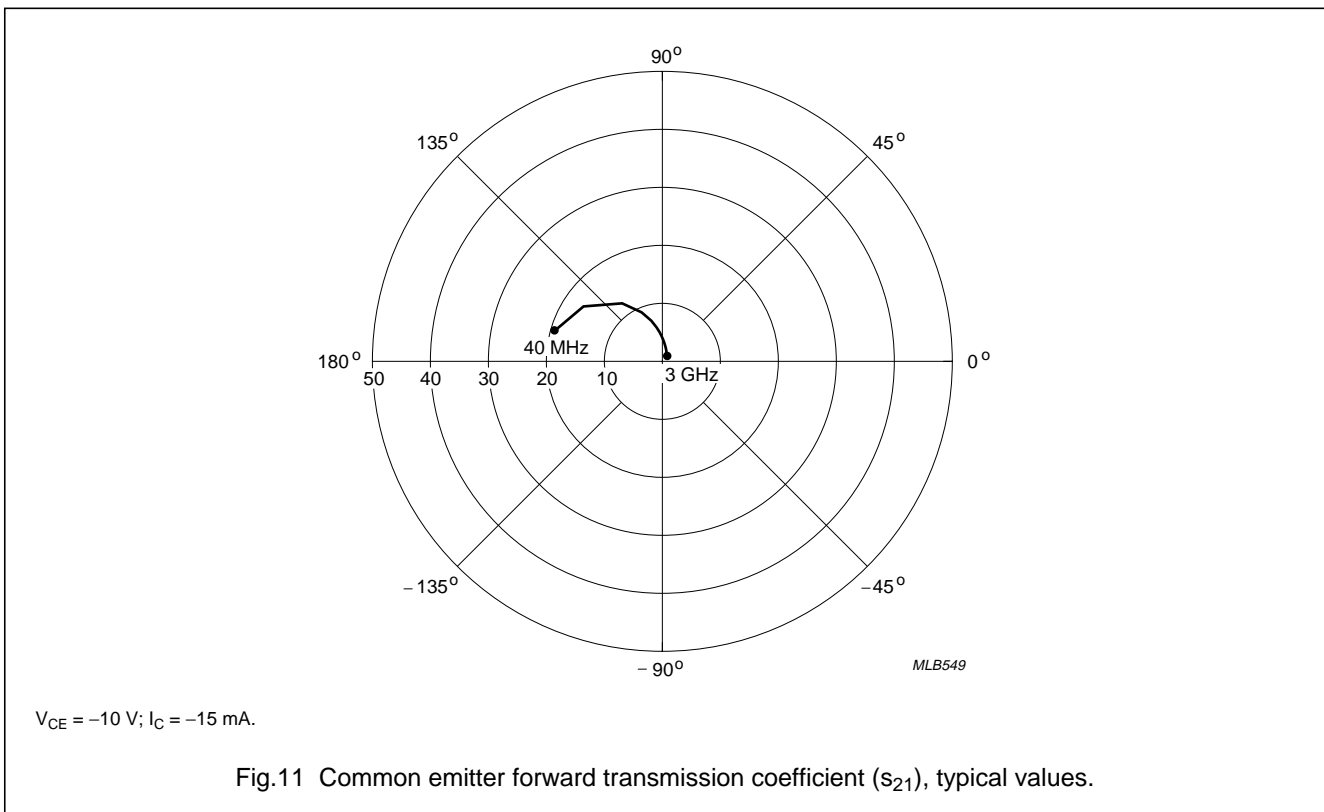
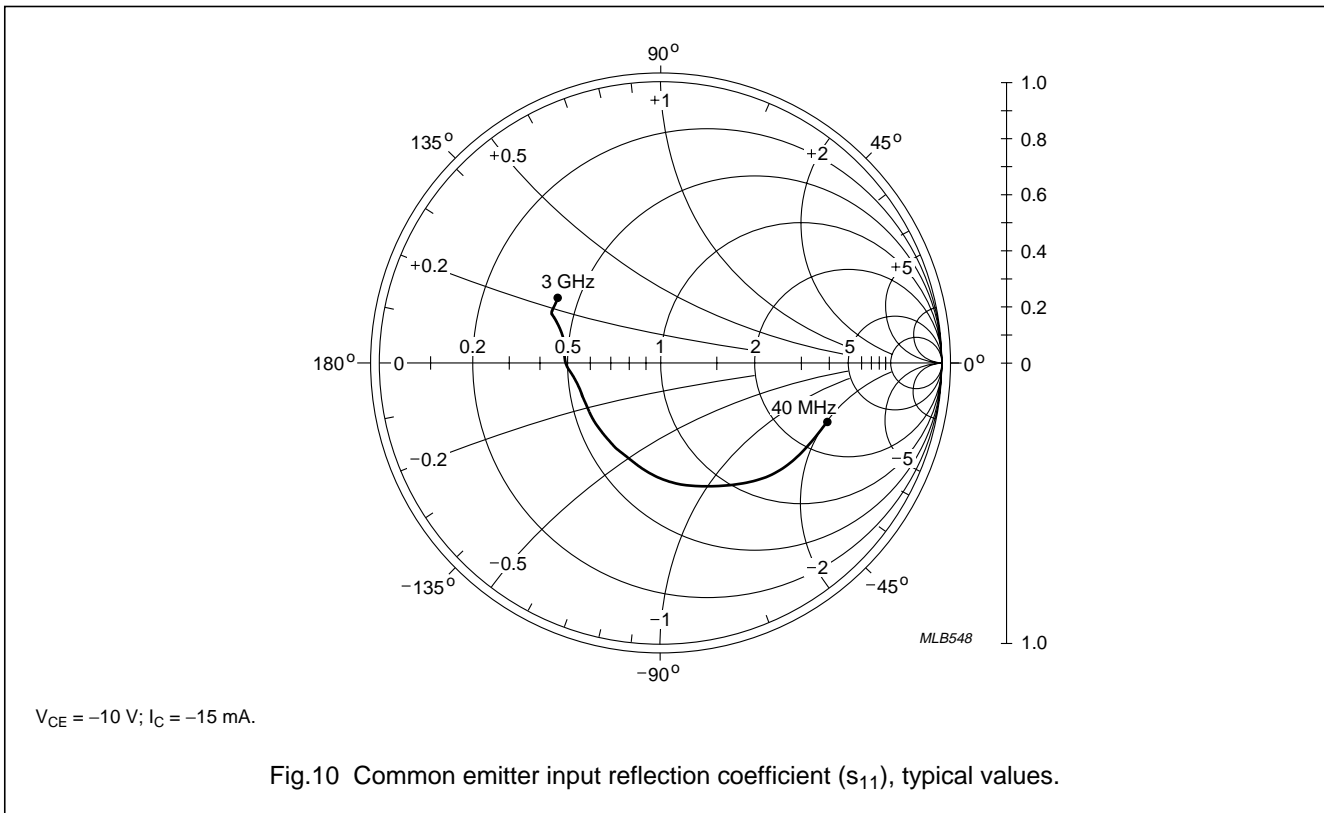
PNP 4 GHz wideband transistor

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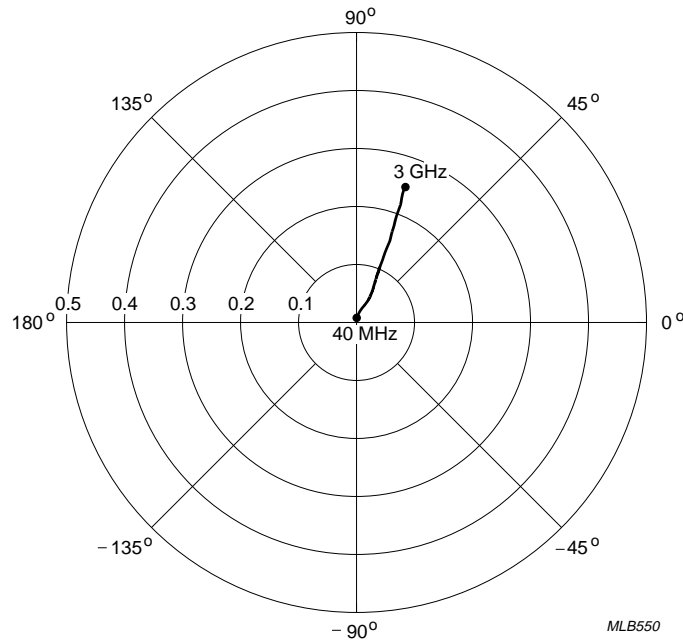
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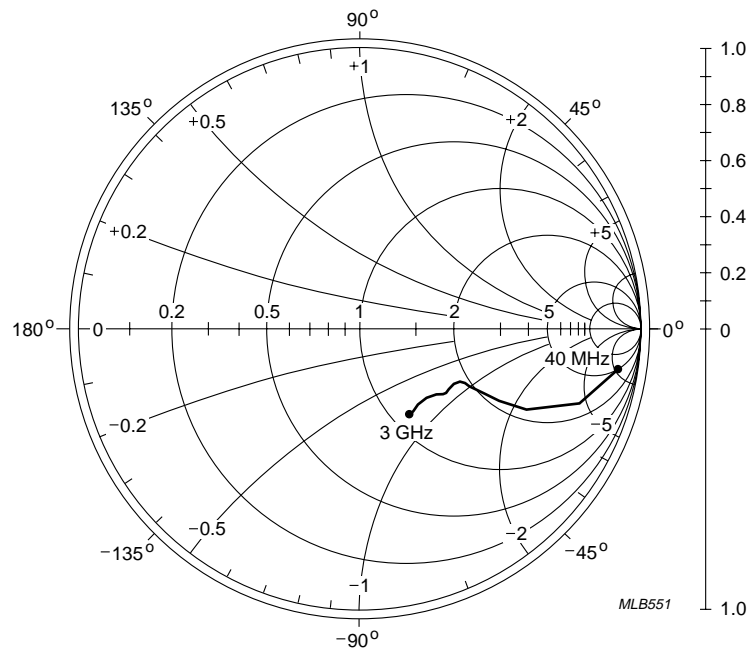
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$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$ .

Fig.12 Common emitter reverse transmission coefficient ( $s_{12}$ ), typical values.

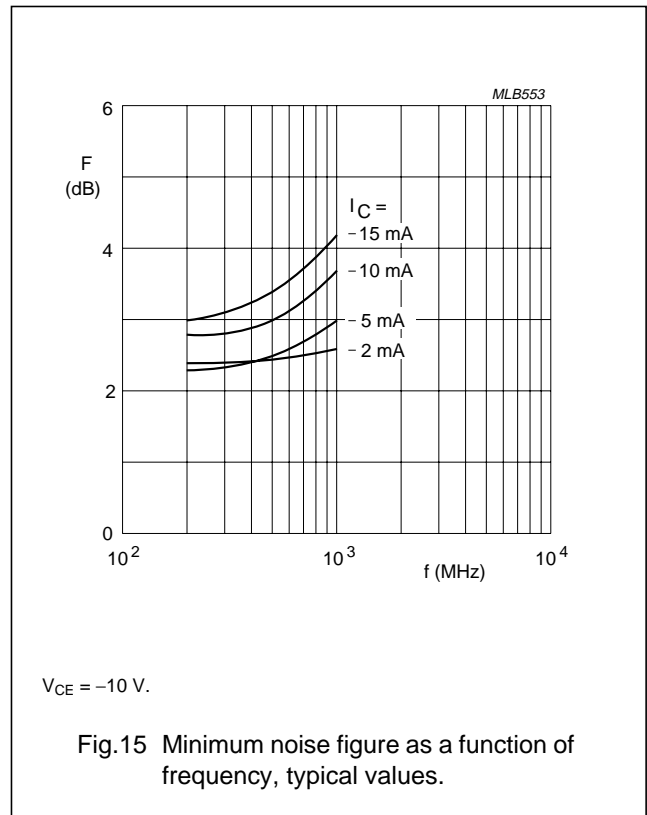
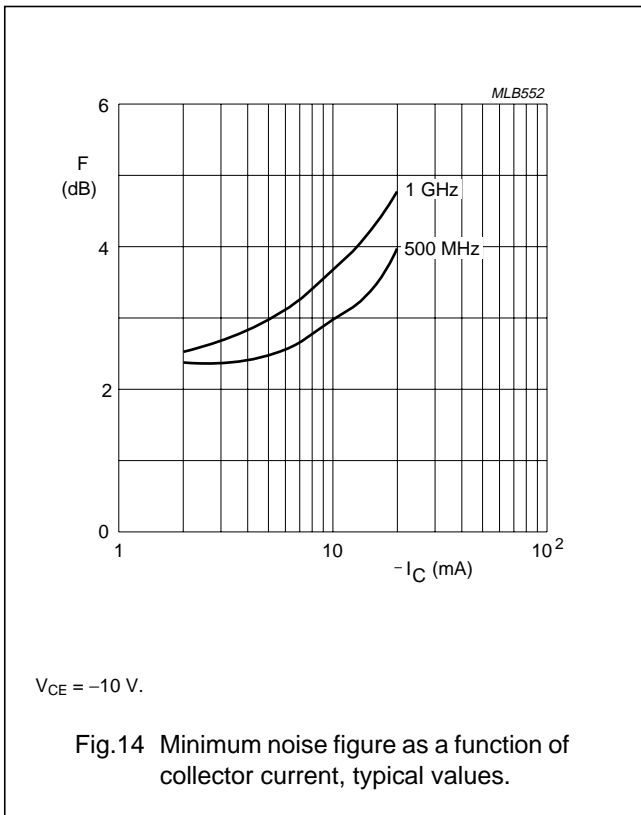


$V_{CE} = -10\text{ V}; I_C = -15\text{ mA}$ .

Fig.13 Common emitter output reflection coefficient ( $s_{22}$ ), typical values.

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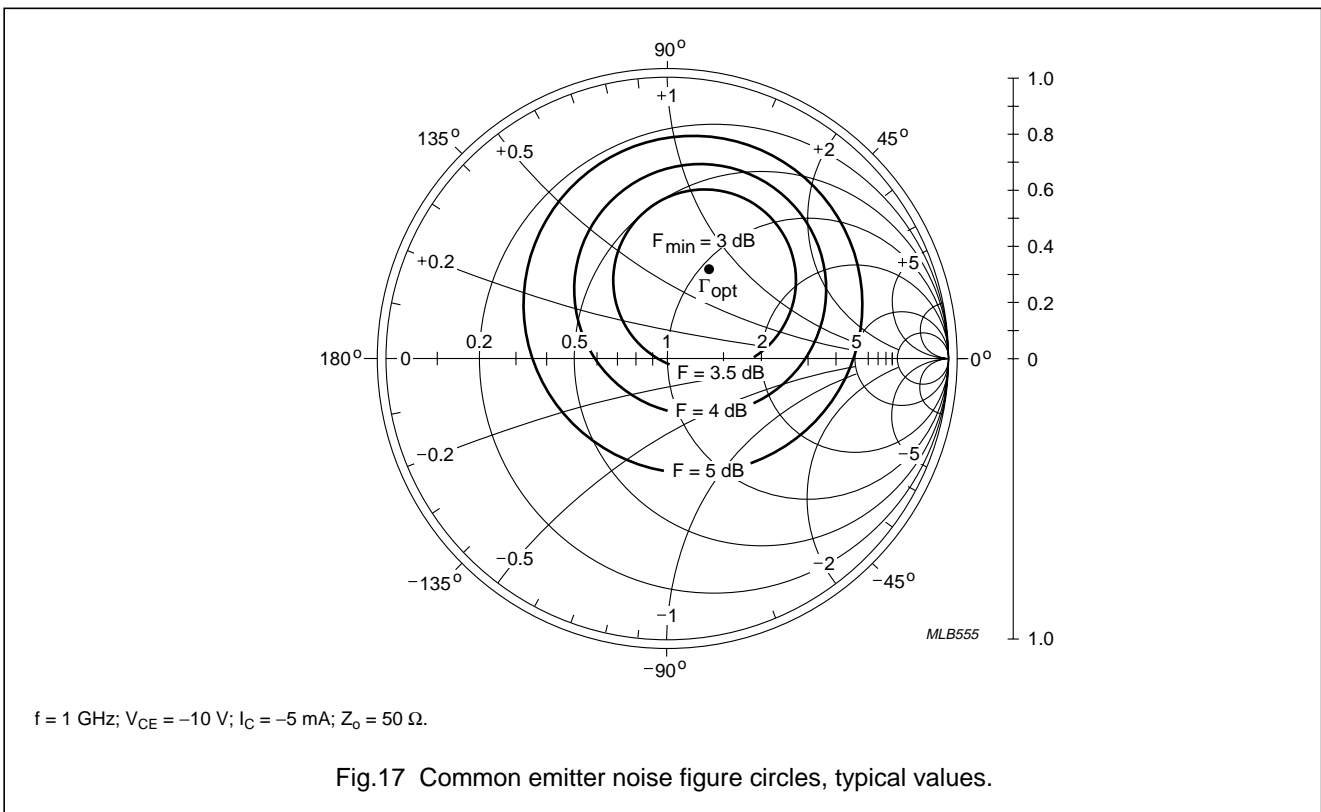
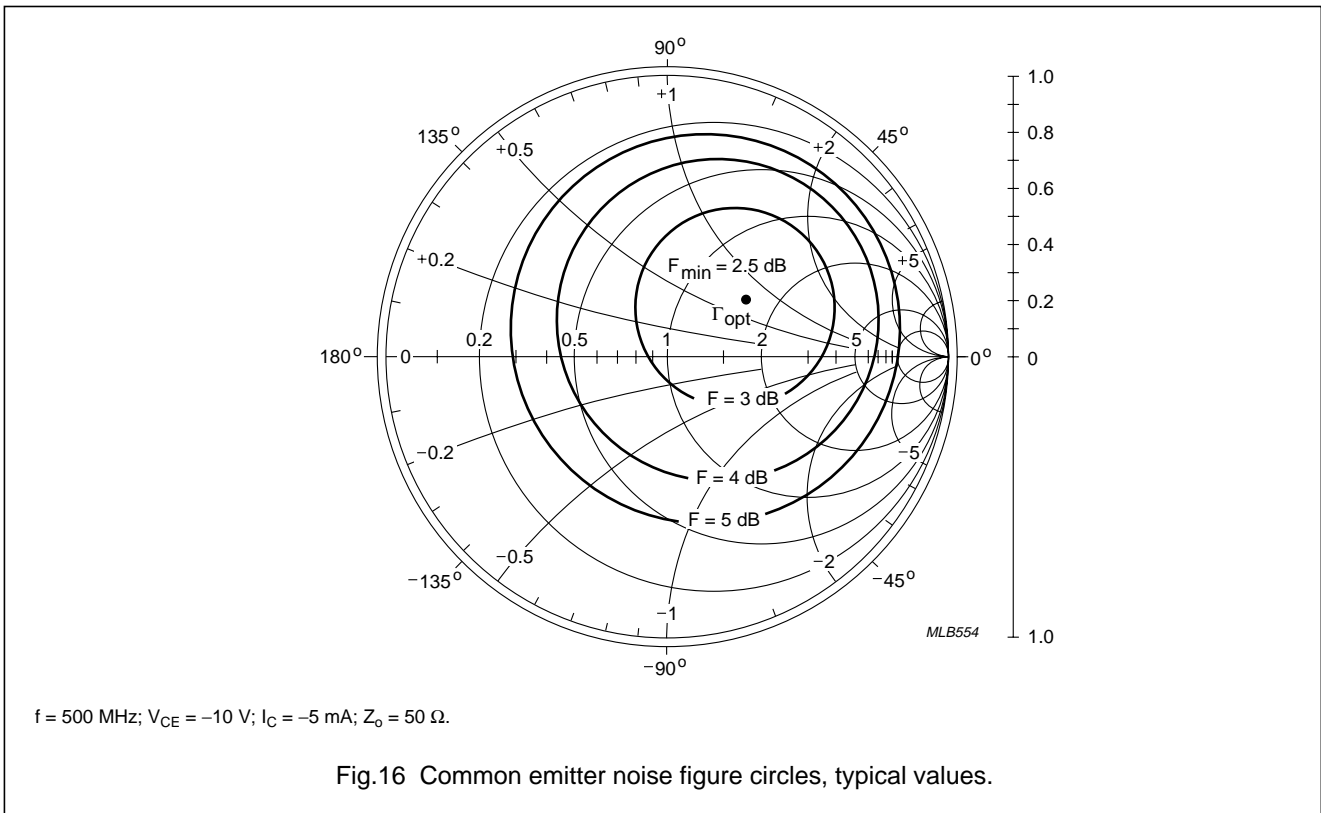
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SPICE parameters for the BFT92W crystal

SEQUENCE No.	PARAMETER	VALUE	UNIT
1	IS	437.5	aA
2	BF	33.58	–
3	NF	1.009	–
4	VAF	23.39	V
5	IKF	99.53	mA
6	ISE	87.05	fA
7	NE	1.943	–
8	BR	4.947	–
9	NR	1.002	–
10	VAR	3.903	V
11	IKR	5.281	mA
12	ISC	35.88	fA
13	NC	1.393	–
14	RB	5.000	Ω
15	IRB	1.000	μA
16	RBM	5.000	Ω
17	RE	1.000	Ω
18	RC	10.00	Ω
19 <sup>(1)</sup>	XTB	0.000	–
20 <sup>(1)</sup>	EG	1.110	eV
21 <sup>(1)</sup>	XTI	3.000	–
22	CJE	746.6	fF
23	VJE	600.0	mV
24	MJE	0.357	–
25	TF	17.49	ps
26	XTF	1.354	–
27	VTF	155.6	mV
28	ITF	1.000	mA
29	PTF	45.00	deg
30	CJC	937.1	fF
31	VJC	396.4	mV
32	MJC	0.200	–
33	XCJC	0.106	–
34	TR	8.422	ns
35 <sup>(1)</sup>	CJS	0.000	F

SEQUENCE No.	PARAMETER	VALUE	UNIT
36 <sup>(1)</sup>	VJS	750.0	mV
37 <sup>(1)</sup>	MJS	0.000	–
38	FC	0.768	–

Note

1. These parameters have not been extracted, the default values are shown.

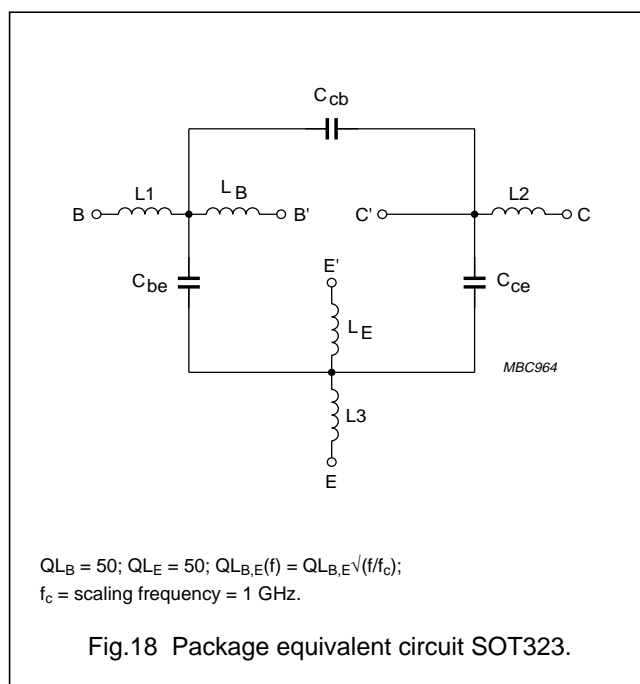


Fig.18 Package equivalent circuit SOT323.

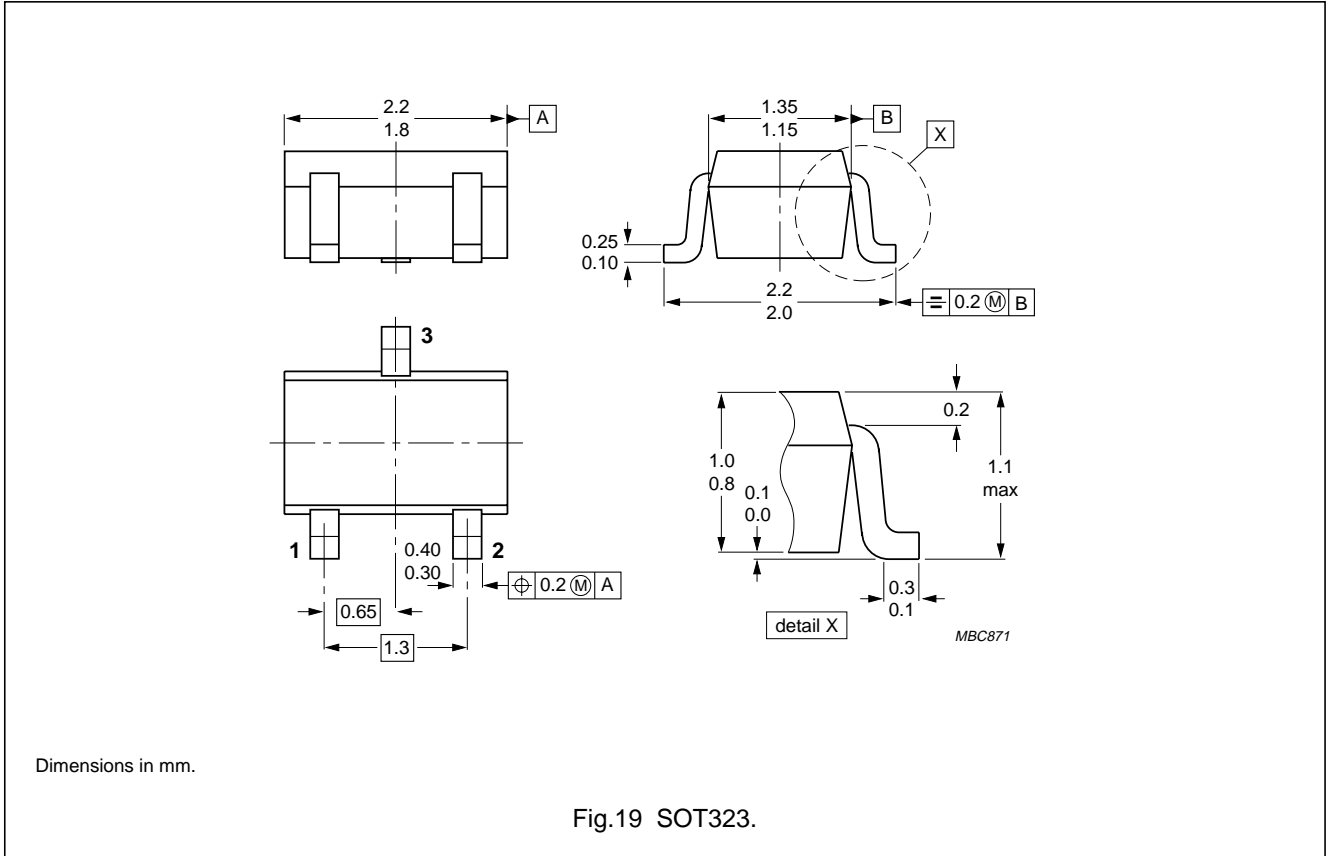
List of components (see Fig.18)

DESIGNATION	VALUE	UNIT
C <sub>be</sub>	2	fF
C <sub>cb</sub>	100	fF
C <sub>ce</sub>	100	fF
L1	0.34	nH
L2	0.10	nH
L3	0.34	nH
L <sub>B</sub>	0.60	nH
L <sub>E</sub>	0.60	nH

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PACKAGE OUTLINE



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.	

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