

# DATA SHEET

## **BFG11W/X** NPN 2 GHz power transistor

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

1996 Jun 04

# NPN 2 GHz power transistor

# BFG11W/X

### FEATURES

- High power gain
- High efficiency
- Small size discrete power amplifier
- 1.9 GHz operating area
- Gold metallization ensures excellent reliability
- Linear and non-linear operation.

### APPLICATIONS

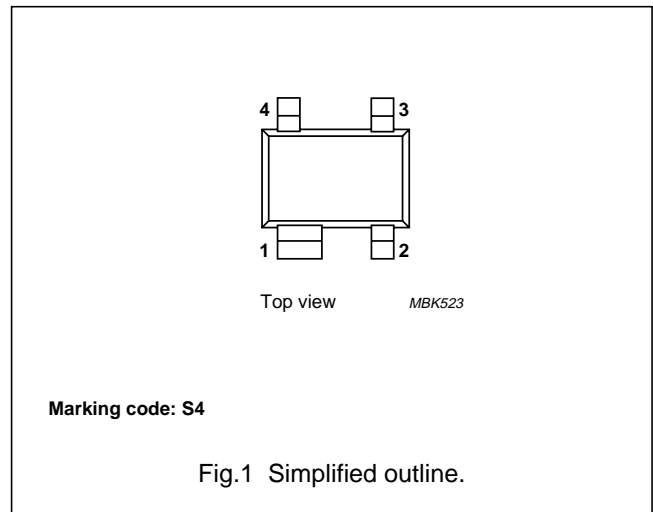
- Common emitter class-AB operation in handheld radio equipment at 1.9 GHz such as DECT, PHS.
- Driver for DCS 1800.

### DESCRIPTION

NPN silicon planar epitaxial transistor encapsulated in a plastic 4-pin dual-emitter SOT343 package.

### PINNING - SOT343

PIN	DESCRIPTION
1	collector
2	emitter
3	base
4	emitter



### QUICK REFERENCE DATA

RF performance at  $T_s \leq 60^\circ\text{C}$  in a common-emitter test circuit.

MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$P_L$ (mW)	$G_p$ (dB)	$\eta_c$ (%)
Pulsed, class-AB, $\delta < 1 : 2$ ; $t_p = 5$ ms	1.9	3.6	400	$\geq 6$	$\geq 60$

NPN 2 GHz power transistor

BFG11W/X

**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	–	8	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	2.5	V
I <sub>C</sub>	collector current (DC)		–	500	mA
P <sub>tot</sub>	total power dissipation	up to T <sub>s</sub> = 60 °C; note 1	–	760	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	175	°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> = 60 °C; P <sub>tot</sub> = 760 mW; note 1	150	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 tab.

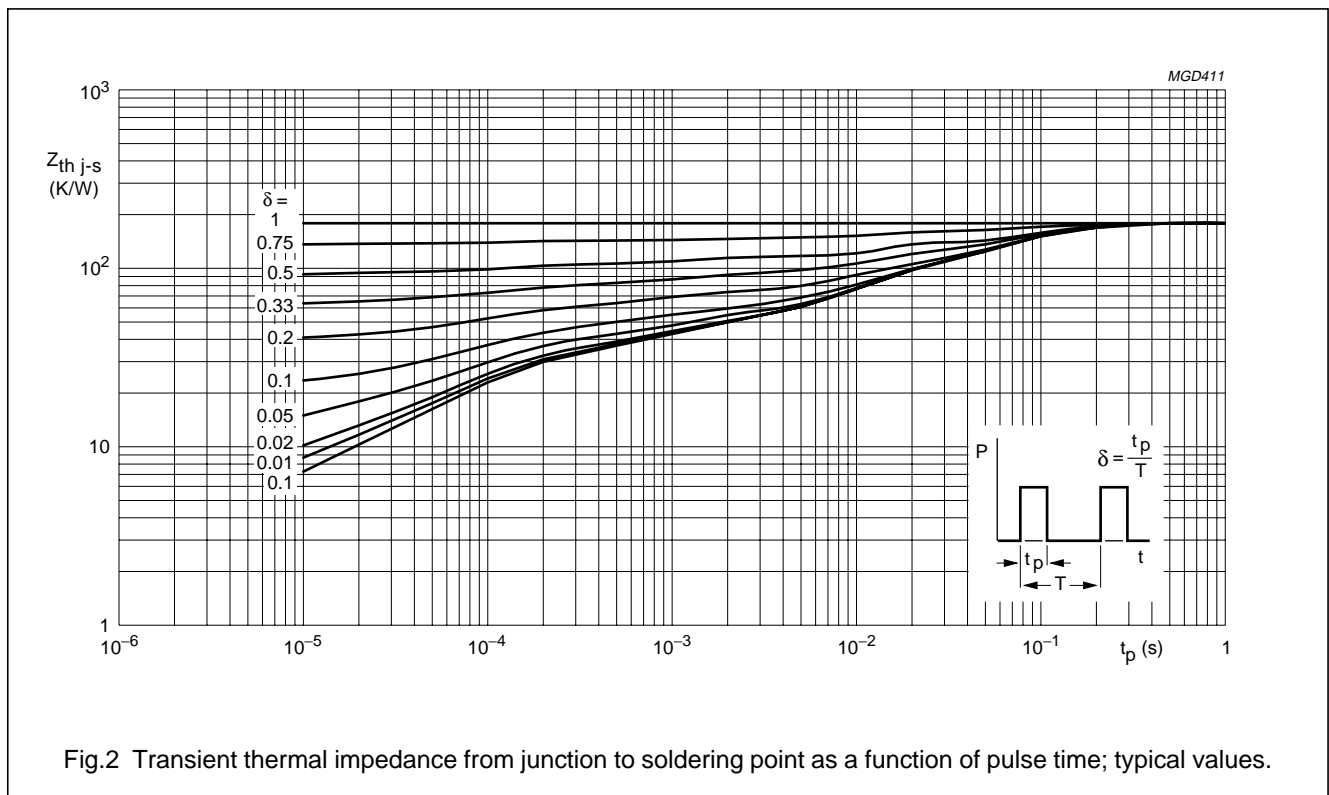


Fig.2 Transient thermal impedance from junction to soldering point as a function of pulse time; typical values.

NPN 2 GHz power transistor

BFG11W/X

**CHARACTERISTICS**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 0.1\text{ mA}$ ; open emitter	20	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\text{ mA}$ ; open base	8	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 0.1\text{ mA}$ ; open collector	2.5	–	V
$I_{CES}$	collector cut-off current	$V_{CE} = 8\text{ V}$ ; $V_{BE} = 0$	–	100	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}$ ; $I_C = 100\text{ mA}$	25	–	
$C_c$	collector capacitance	$V_{CB} = 3.6\text{ V}$ ; $I_E = i_e = 0$ ; $f = 1\text{ MHz}$	–	5	pF
$C_{re}$	feedback capacitance	$V_{CE} = 3.6\text{ V}$ ; $I_C = 0$ ; $f = 1\text{ MHz}$	–	4	pF

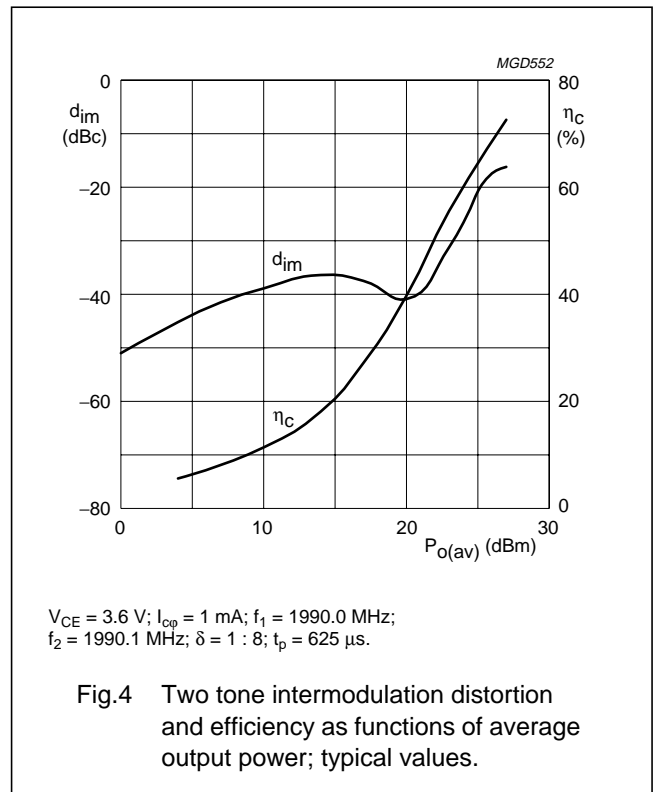
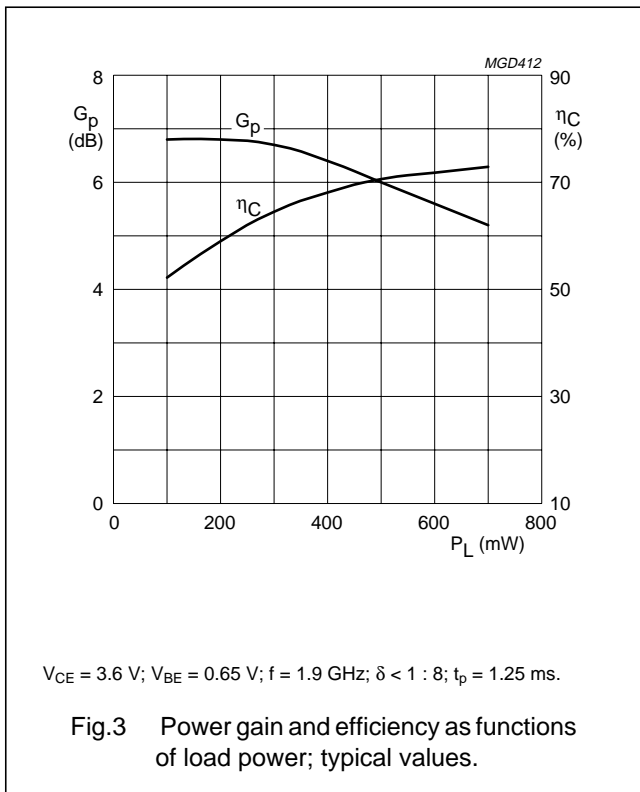
**APPLICATION INFORMATION**

RF performance at  $T_s \leq 60\text{ }^\circ\text{C}$  in a common-emitter test circuit.

MODE OF OPERATION	f (GHz)	$V_{CE}$ (V)	$I_{CQ}$ (mA)	$P_L$ (mW)	$G_p$ (dB)	$\eta_c$ (%)
Pulsed, class-AB, $\delta < 1 : 2$ ; $t_p = 5\text{ ms}$	1.9	3.6	1	400	$\geq 6$	$\geq 60$

**Ruggedness in class-AB operation**

The transistors are capable of withstanding a load mismatch corresponding to  $VSWR = 8 : 1$  through all phases, at rated output power under pulsed conditions at  $f = 1.9\text{ GHz}$ :  $t_p = 1.25\text{ ms}$ ,  $\delta = 1 : 8$  at  $V_{CE} = 7\text{ V}$  and  $t_p = 5\text{ ms}$ ,  $\delta = 1 : 2$  at  $V_{CE} = 4.5\text{ V}$ .



## NPN 2 GHz power transistor

BFG11W/X

## List of components used in test circuit (see Figs 5 and 6)

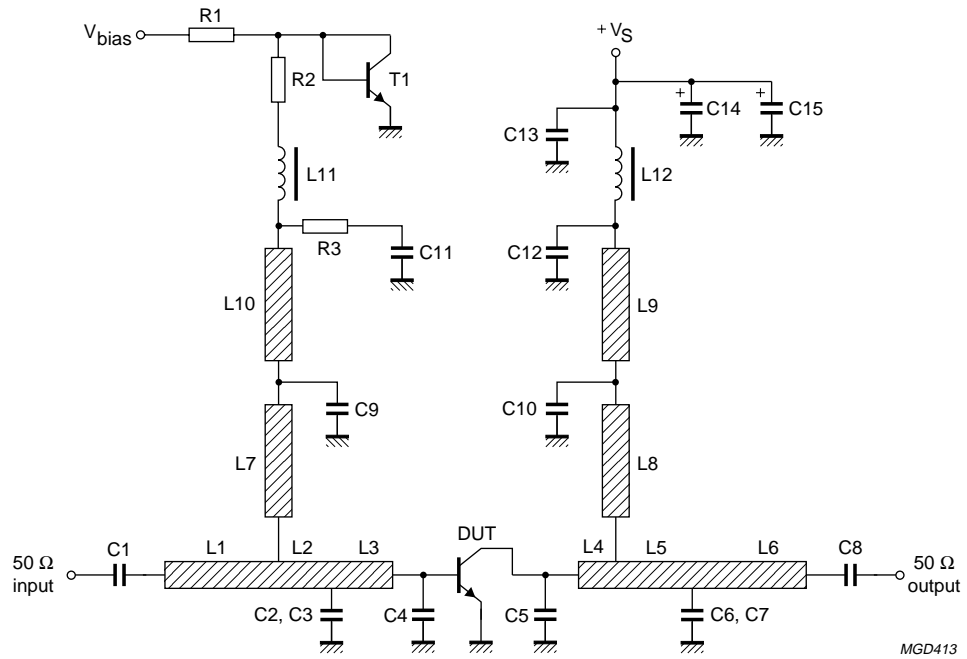
COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE NO.
C1, C8, C9, C10	multilayer ceramic chip capacitor; note 1	24 pF		
C2, C3	multilayer ceramic chip capacitor; note 1	2 pF		
C4	multilayer ceramic chip capacitor; note 1	1.2 pF		
C5	multilayer ceramic chip capacitor; note 1	0.2 pF		
C6, C7,	multilayer ceramic chip capacitor; note 1	1.3 pF		
C11, C12, C13	multilayer ceramic chip capacitor; note 1	10 nF		
C14, C15	electrolytic capacitor	470 $\mu$ F; 10 V		2222 032 14152
L1	stripline; note 2		length 22.5 mm width 0.9 mm	
L2	stripline; note 2		length 6 mm width 0.9 mm	
L3	stripline; note 2		length 1 mm width 0.9 mm	
L4	stripline; note 2		length 2.5 mm width 0.9 mm	
L5	stripline; note 2		length 4.5 mm width 0.9 mm	
L6	stripline; note 2		length 24.5 mm width 0.9 mm	
L7	stripline; note 2		length 20 mm width 0.9 mm	
L8	stripline; note 2		length 10.5 mm width 0.9 mm	
L9	stripline; note 2		length 4.4 mm width 0.4 mm	
L10	stripline; note 2		length 19.7 mm width 0.4 mm	
L11, L12	RF choke	1 $\mu$ H		4330 030 36301
R1	metal film resistor	78.7 $\Omega$ ; 0.4 W		
R2	metal film resistor	38.3 $\Omega$ ; 0.4 W		
R3	metal film resistor	10 $\Omega$ ; 0.4 W		
T1	bias transistor	BC548; note 3		

## Notes

- American Technical Ceramics (ATC) capacitor, type 100A or other capacitor of the same quality.
- The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric  $\epsilon_r = 6.15$ ;  $\tan \delta = 0.0019$ ; thickness = 0.64 mm; copper cladding = 35  $\mu$ m.
- Or equivalent ( $V_{BE} = 0.65$  V at  $T_{amb} = 25$  °C).

NPN 2 GHz power transistor

BFG11W/X

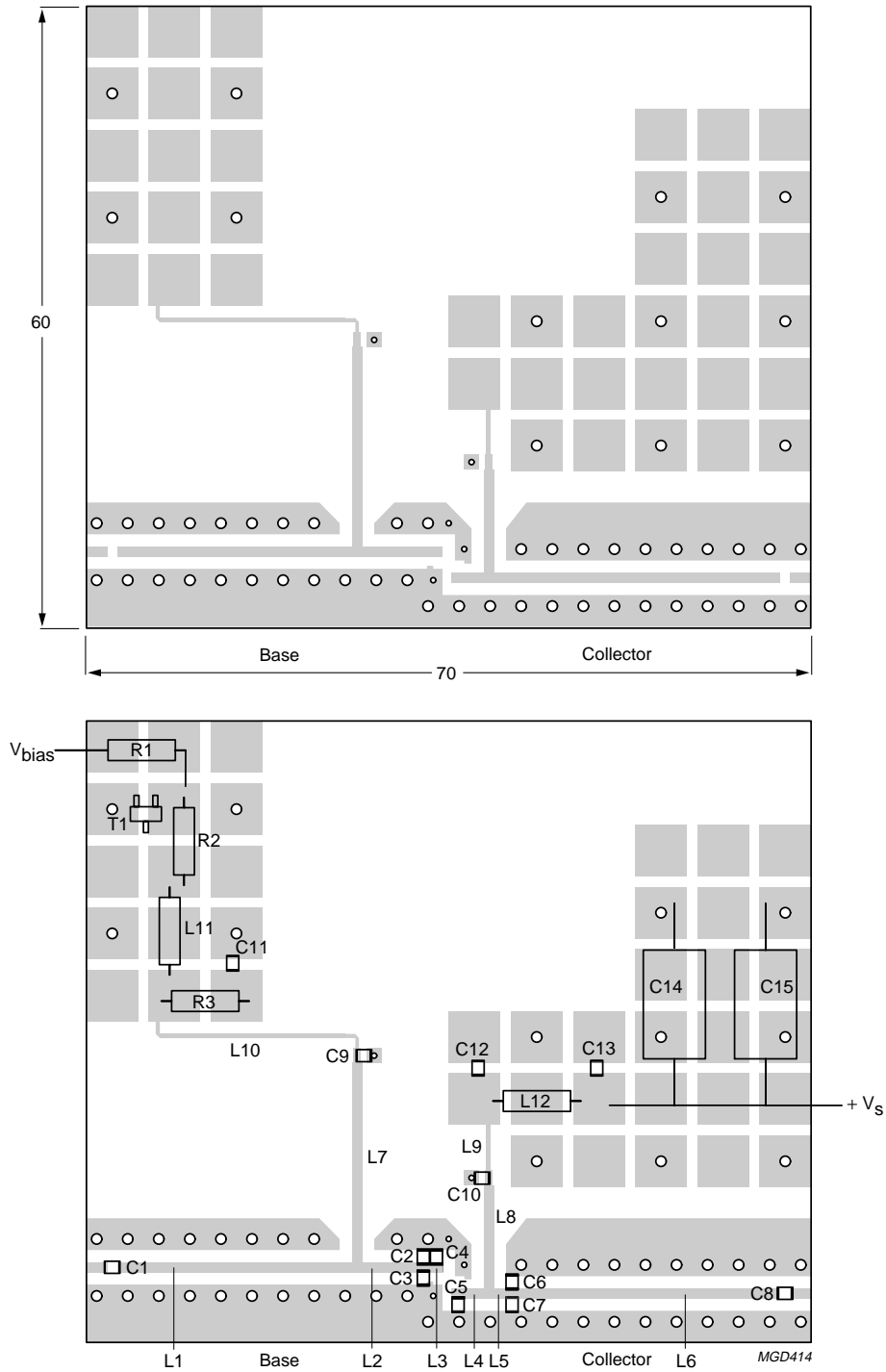


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Fig.5 Common-emitter test circuit for class-AB operation at 1.9 GHz.

NPN 2 GHz power transistor

BFG11W/X

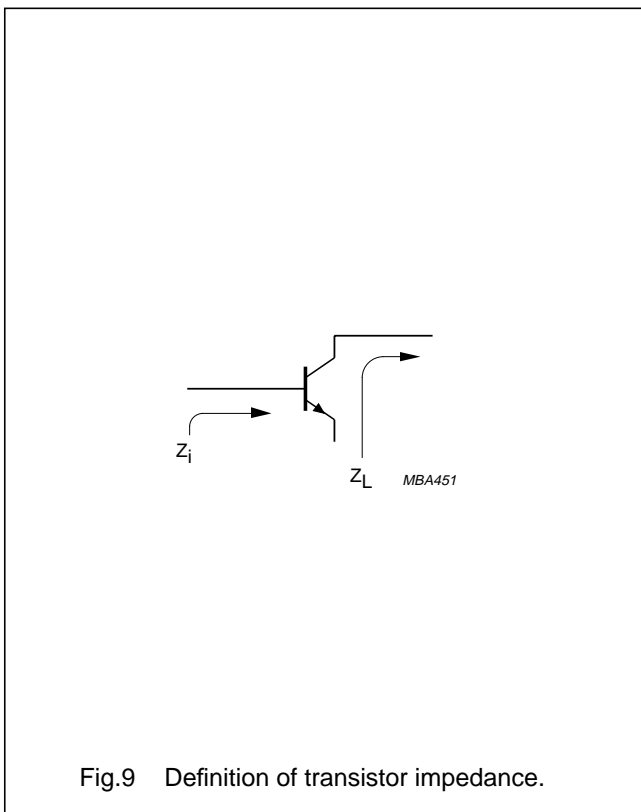
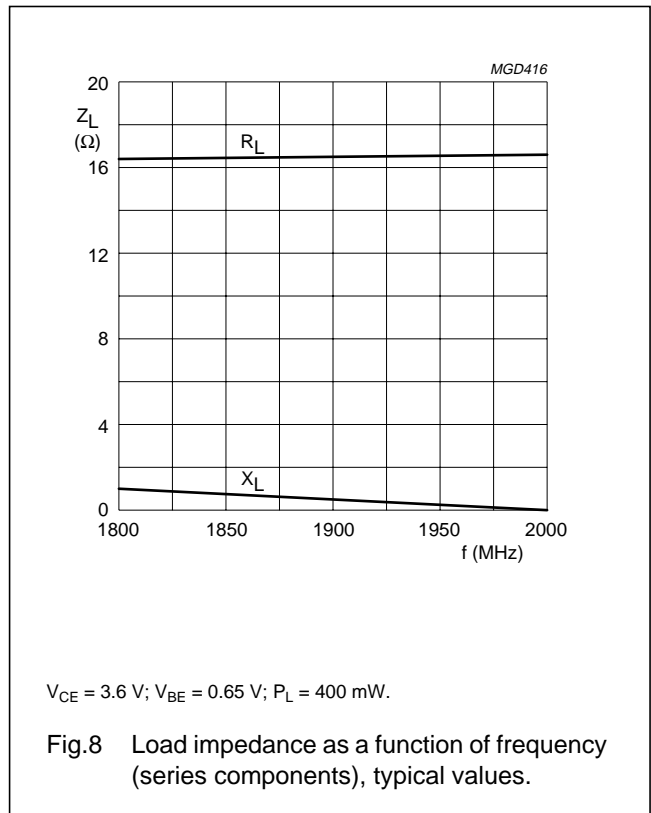
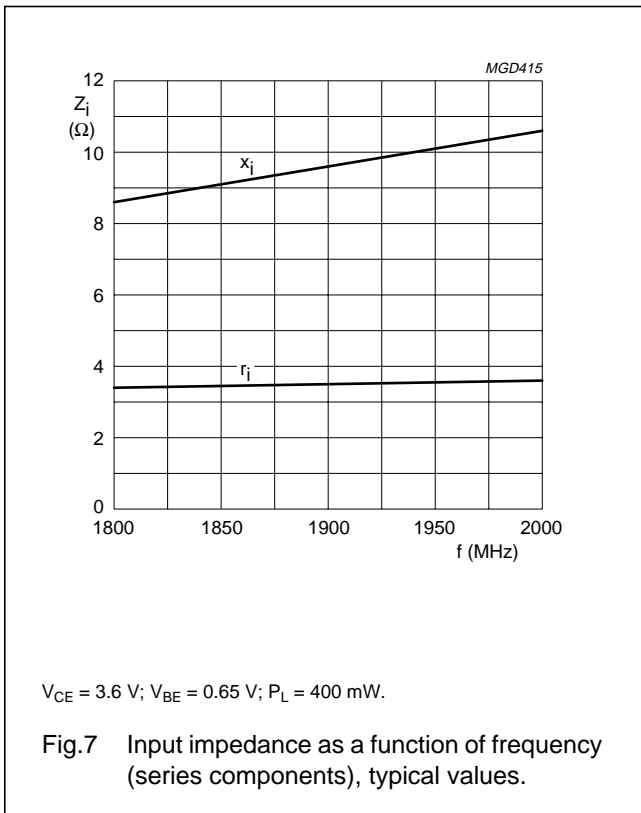


Dimensions in mm.

Fig.6 Component layout for common-emitter test circuit.

NPN 2 GHz power transistor

BFG11W/X

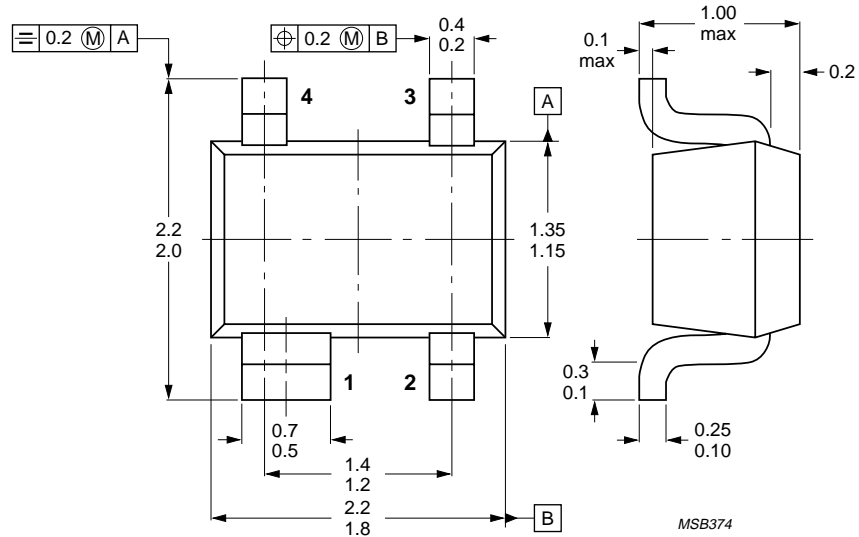




NPN 2 GHz power transistor

BFG11W/X

PACKAGE OUTLINE



Dimensions in mm.

Fig.10 SOT343.

## NPN 2 GHz power transistor

BFG11W/X

**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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NPN 2 GHz power transistor

BFG11W/X

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