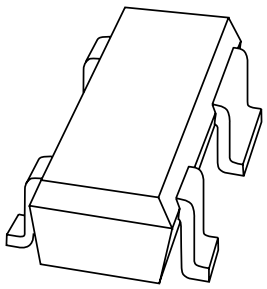
DATA SHEET



BFG21W
UHF power transistor

Product specification
Supersedes data of 1997 Nov 21
File under Discrete Semiconductors, SC14

1998 Jul 06

Philips
Semiconductors

PHILIPS

UHF power transistor BFG21W

FEATURES

- High power gain
- High efficiency
- 1.9 GHz operating area
- Linear and non-linear operation.

APPLICATIONS

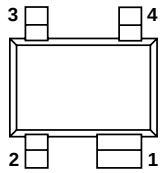
- Common emitter class-AB output stage in hand held radio equipment at 1.9 GHz such as DECT, PHS, etc.
- Driver for DCS1800, 1900.

DESCRIPTION

NPN double polysilicon bipolar power transistor with buried layer for low voltage medium power applications encapsulated in a plastic, 4-pin dual-emitter SOT343R package.

PINNING

PIN	DESCRIPTION
1, 3	emitter
2	base
4	collector



Top view MSB842

Marking code: P1.

Fig.1 Simplified outline SOT343R.

QUICK REFERENCE DATA

RF performance at $T_s \leq 60$ °C in a common emitter test circuit.

MODE OF OPERATION	f (GHz)	V_{CE} (V)	P_L (dBm)	G_p (dB)	η_C (%)
Pulsed class-AB; $\delta < 1 : 2$; $t_p = 5$ ms	1.9	3.6	26	≥10	typ.55

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	–	15	V
V_{CEO}	collector-emitter voltage	open base	–	4.5	V
V_{EBO}	emitter-base voltage	open collector	–	1	V
I_C	collector current (DC)		–	500	mA
P_{tot}	total power dissipation	$T_s \leq 60$ °C; note 1	–	600	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	operating junction temperature		–	150	°C

Note

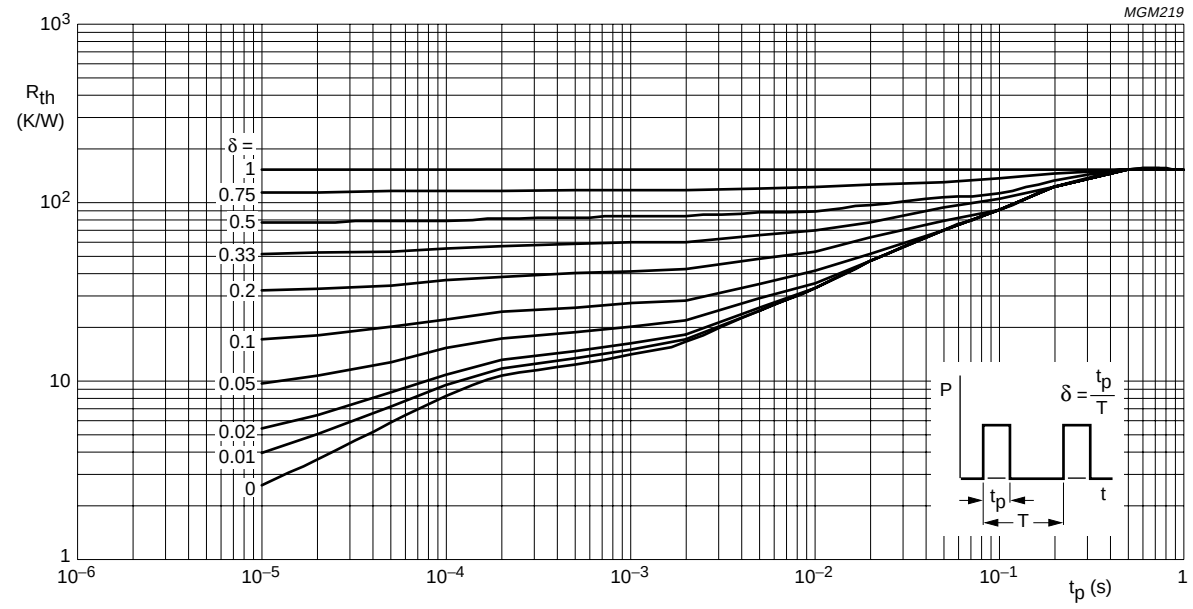
1. T_s is the temperature at the soldering point of the emitter pins.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	$T_s \leq 60$ °C; P_{tot} = 600 mW; note 1	150	K/W

Note

1. T_s is the temperature at the soldering point of the emitter pins.



At temperature stabilization solder point has been reached.

Fig.2 Transient thermal resistance as a function of pulse time; typical values.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)CBO}$	collector-base breakdown voltage	open emitter; I_C = 0.1 mA	15	–	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	open base; I_C = 10 mA	4.5	–	V
$V_{(BR)CER}$	collector-emitter breakdown voltage	R_{BE} < 1 kΩ, I_C = 10 mA	10	–	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	open collector; I_E = 0.1 mA	1	–	V
I_{CES}	collector leakage current	V_{CE} = 5 V; V_{BE} = 0	–	10	μA
h_{FE}	DC current gain	I_C = 200 mA; V_{CE} = 2 V	40	100	
C_c	collector capacitance	$I_E = i_e$= 0; V_{CB} = 3 V; f = 1 MHz	–	3	pF
C_{re}	feedback capacitance	I_C = 0; V_{CB} = 3.6 V; f = 1 MHz	–	1.5	pF
f_T	transition frequency	I_C = 200 mA; V_{CE} = 3.6 V; f = 700 MHz	18	–	GHz

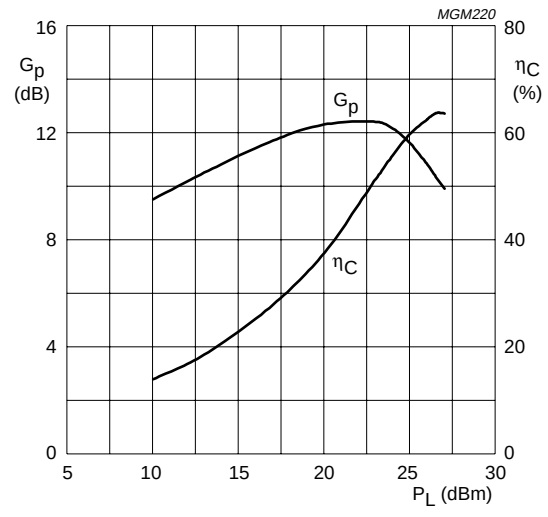
APPLICATION INFORMATION

RF performance at $T_s \leq 60$ °C in a common emitter test circuit (see Figs 4 and 5).

MODE OF OPERATION	f (GHz)	V_{CE} (V)	I_{CQ} (mA)	P_L (dBm)	G_p (dB)	η_C (%)
Pulsed; class-AB; δ < 1 : 2; t_p = 5 ms	1.9	3.6	1	26	≥10	typ. 55

Ruggedness in class-AB operation

The transistor is capable of withstanding a load mismatch corresponding to VSWR = 6 : 1 through all phases at 26 dBm output power under pulsed conditions: δ = 1 : 2; t_p = 5 ms; f = 1.9 GHz at V_{CE} = 4.5 V.



Pulsed, class-AB operation; δ < 1 : 2; t_p = 5 ms.
f = 1.9 GHz; V_{CE} = 3.6 V; I_{CQ} = 1 mA; tuned at P_L = 26 dBm.

Fig.3 Power gain and collector efficiency as a function of the load power; typical values.

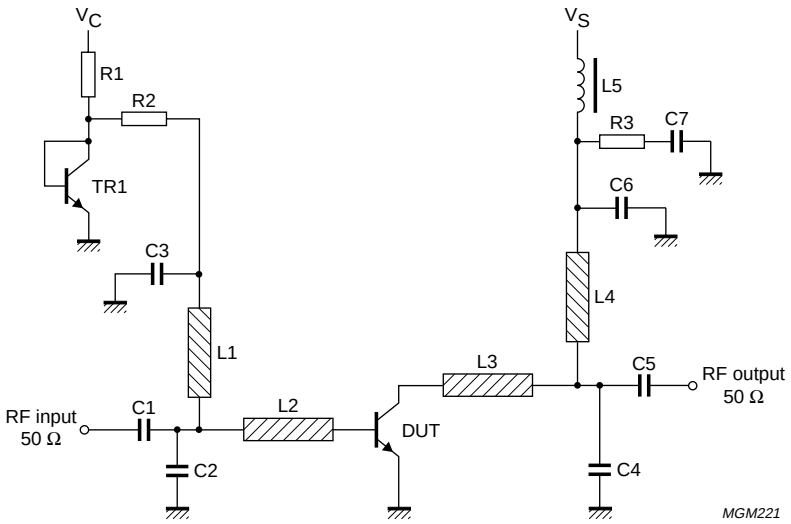


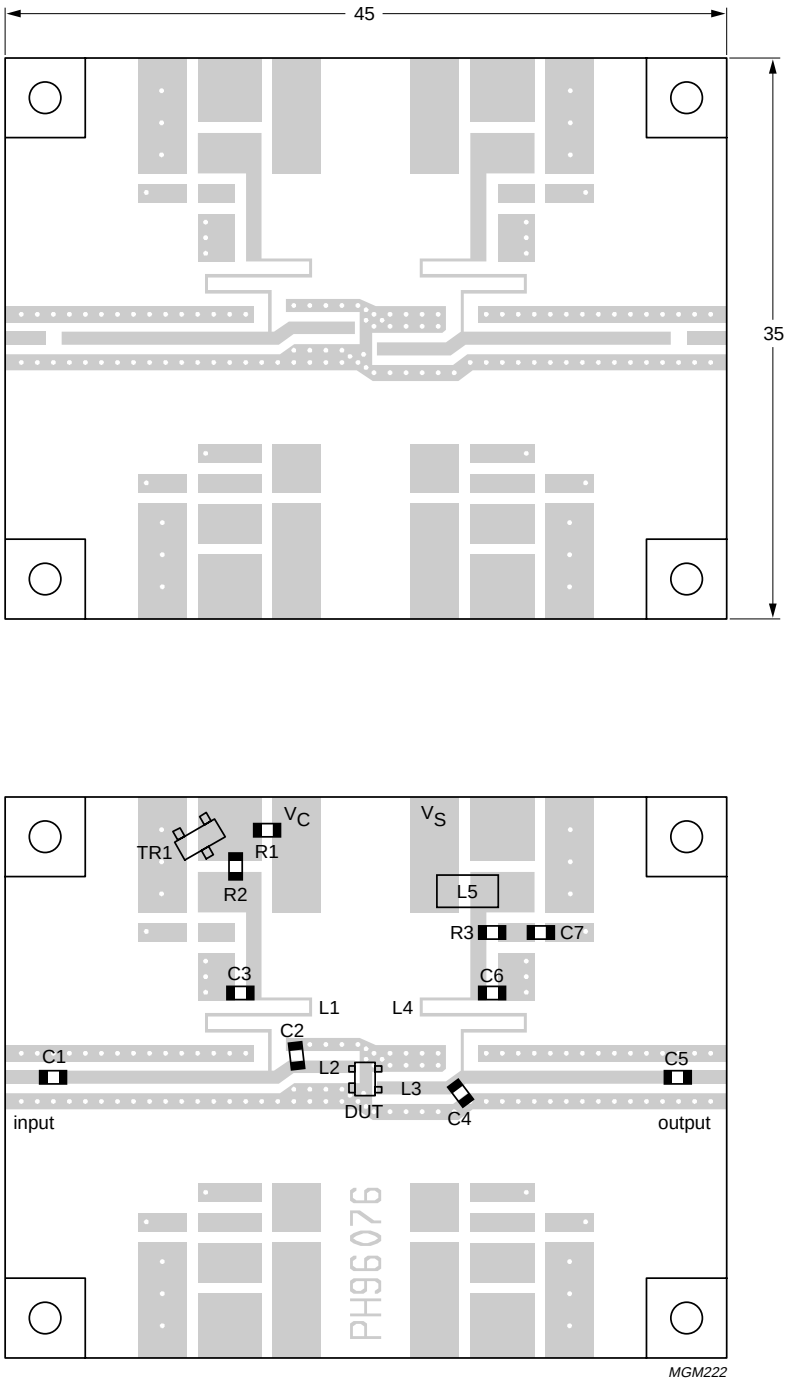
Fig.4 Common emitter test circuit for class-AB operation at 1.9 GHz.

List of components used in test circuit (see Figs 4 and 5)

COMPONENT	DESCRIPTION	VALUE	DIMENSIONS	CATALOGUE No.
C1, C5	multilayer ceramic chip capacitor; note 1	24 pF		
C2	multilayer ceramic chip capacitor; note 1	3.3 pF		
C3, C6	multilayer ceramic chip capacitor, note 1	15 pF		
C4	multilayer ceramic chip capacitor; note 1	2.4 pF		
C7	multilayer ceramic chip capacitor; note 1	1 nF		
L1, L4	stripline; note 2	100 Ω	18 × 0.2 mm	
L2	stripline; note 2	50 Ω	3.2 × 0.8 mm	
L3	stripline; note 2	50 Ω	4.6 × 0.8 mm	
L5	Grade 4S2 Ferroxcube chip bead			4330 030 36300
R1	metal film resistor	220 Ω; 0.4 W		
R2, R3	metal film resistor	10 Ω; 0.4 W		
TR1	NPN transistor	BC817		9335 895 20215

Notes

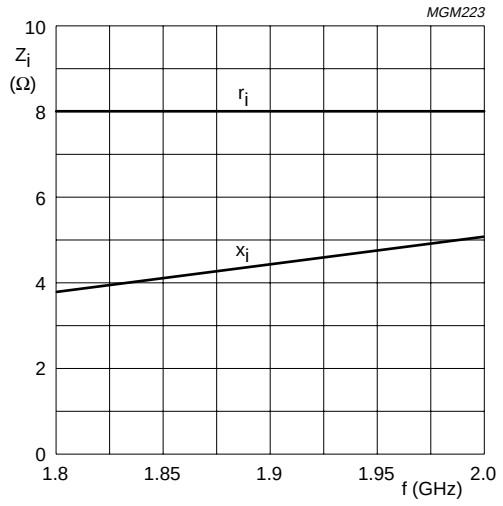
1. American Technical Ceramics type 100A or capacitor of same quality.
2. The striplines are on a double copper-clad printed-circuit board with PTFE fibre-glass dielectric (ε_r = 6.15, tan δ = 0.0019); thickness 0.64 mm, copper cladding = 35 μm.



Dimensions in mm.

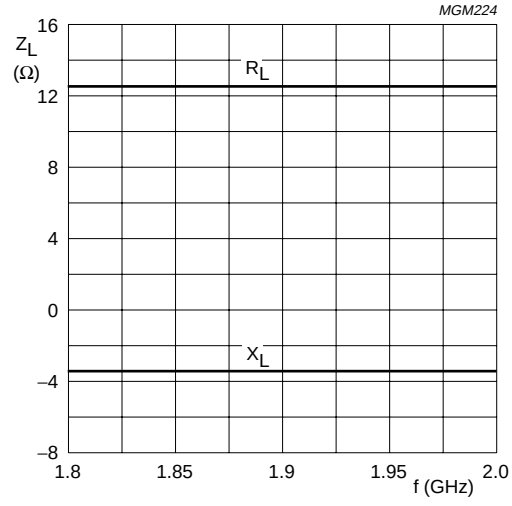
The components are situated on one side of the copper-clad PTFE fibre-glass board, the other side is unetched and serves as a ground plane. Earth connections from the component side to the ground plane are made by through metallization.

Fig.5 Printed-circuit board and component lay-out for 1.9 GHz class-AB test-circuit in Fig.4.



V_{CE} = 3.6 V; I_{CQ} = 1 mA; P_L = 26 dBm; $T_s \leq 60$ °C.

Fig.6 Input impedance as function of frequency (series components); typical values.

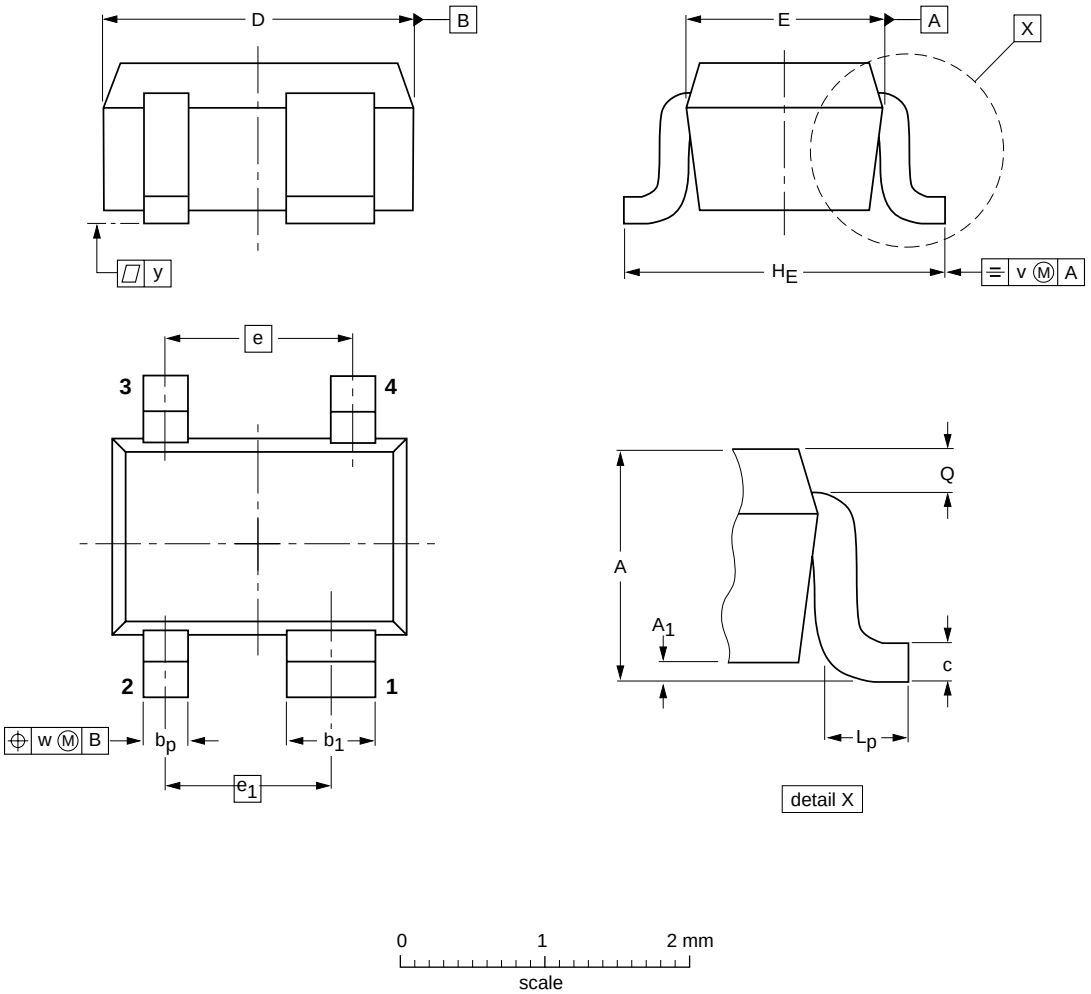


V_{CE} = 3.6 V; I_{CQ} = 1 mA; P_L = 26 dBm; $T_s \leq 60$ °C.

Fig.7 Load impedance as a function of frequency (series components); typical values.

PACKAGE OUTLINE

Plastic surface mounted package; reverse pinning; 4 leads **SOT343R**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.4 0.3	0.7 0.5	0.25 0.10	2.2 1.8	1.35 1.15	1.3	1.15	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT343R						97-05-21

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.	
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