DATA SHEET

BF747
NPN 1 GHz wideband transistor

Product specification
File under Discrete Semiconductors, SC14

September 1995

Philips
Semiconductors

PHILIPS

NPN 1 GHz wideband transistor BF747

FEATURES

- Stable oscillator operation
- High current gain
- Good thermal stability.

APPLICATIONS

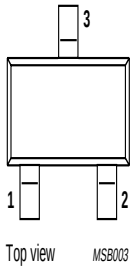
- It is intended for VHF and UHF TV-tuner applications and can be used as a mixer and/or oscillator.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

DESCRIPTION

Low cost NPN transistor in a plastic SOT23 package.



Marking code: E15.

Fig.1 SOT23.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	20	V
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_{CM}	peak collector current		–	50	mA
P_{tot}	total power dissipation	up to T_s = 70 °C; note 1	–	300	mW
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz	1.2	1.6	GHz

Note

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

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CEO}	collector-emitter voltage	open base	–	20	V
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{EBO}	emitter-base voltage	open collector	–	3	V
I_{CM}	peak collector current		–	50	mA
P_{tot}	total power dissipation	up to T_s = 70 °C; note 1	–	300	mW
T_{stg}	storage temperature		–55	+150	°C
T_j	junction temperature		–	150	°C

Note

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

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 70 °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 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 10 V	–	–	100	nA
h_{FE}	DC current gain	I_C = 2 mA; V_{CE} = 10 V	40	95	250	
f_T	transition frequency	I_C = 15 mA; V_{CE} = 10 V; f = 500 MHz	0.8	1.2	1.6	GHz
C_{re}	feedback capacitance	$I_E = i_e$ = 0; V_{CB} = 10 V; f = 1 MHz	–	0.5	–	pF
G_{UM}	maximum unilateral power gain; note 1	I_C = 15 mA; V_{CE} = 10 V; f = 100 MHz	–	20	–	dB

Note

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

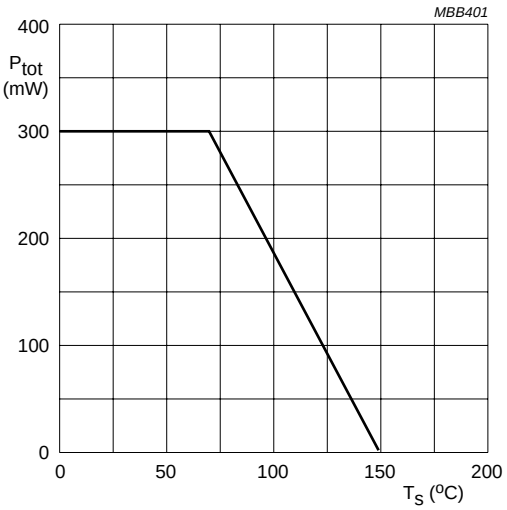
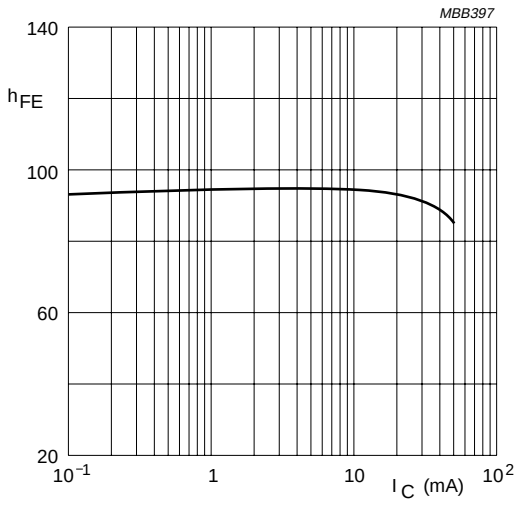
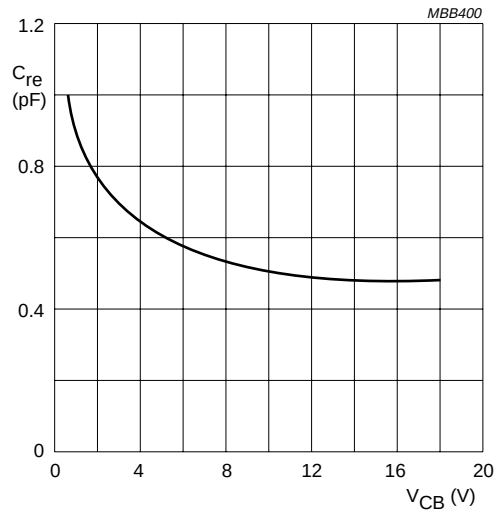


Fig.2 Power derating curve.



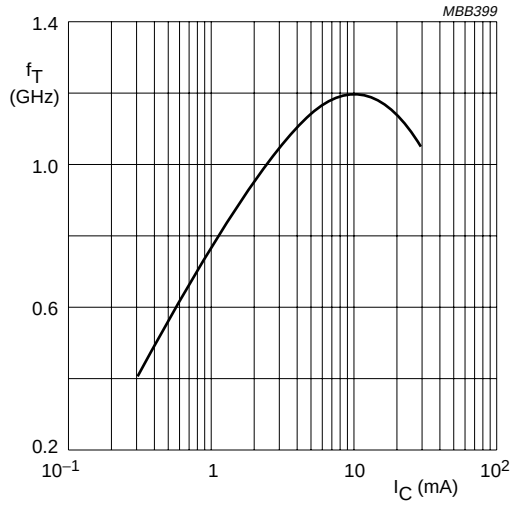
V_{CE} = 10 V.

Fig.3 DC current gain as a function of collector current.



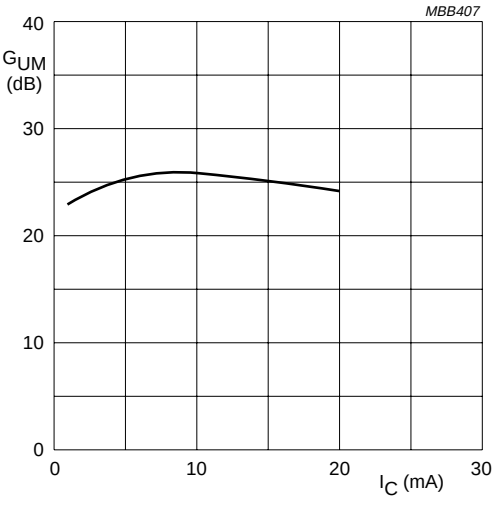
$I_E = i_e = 0$; f = 1 MHz.

Fig.4 Feedback capacitance as a function of collector-base voltage.



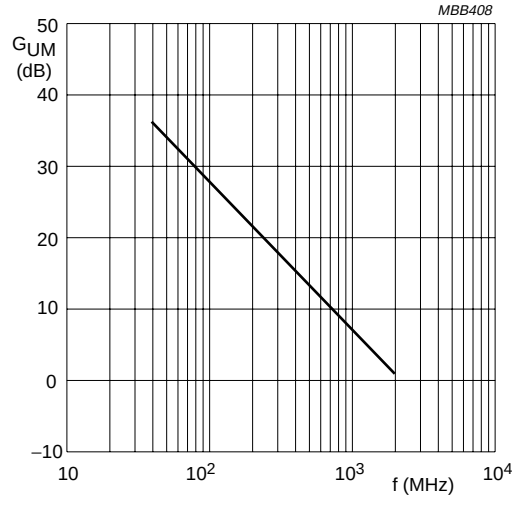
V_{CE} = 10 V; f = 500 MHz.

Fig.5 Transition frequency as a function of collector current.



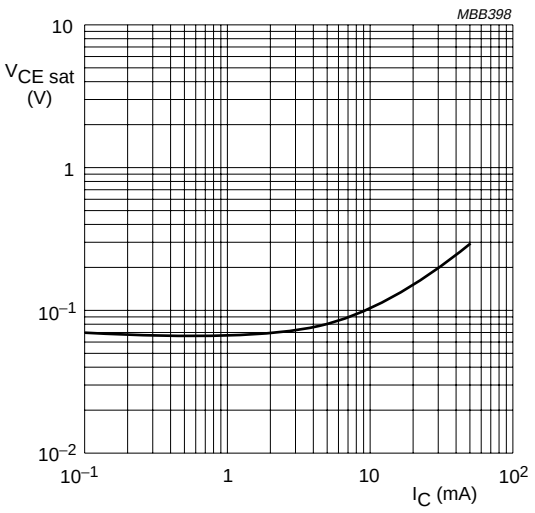
V_{CE} = 10 V; f = 100 MHz.

Fig.6 Maximum unilateral power gain as a function of collector current.



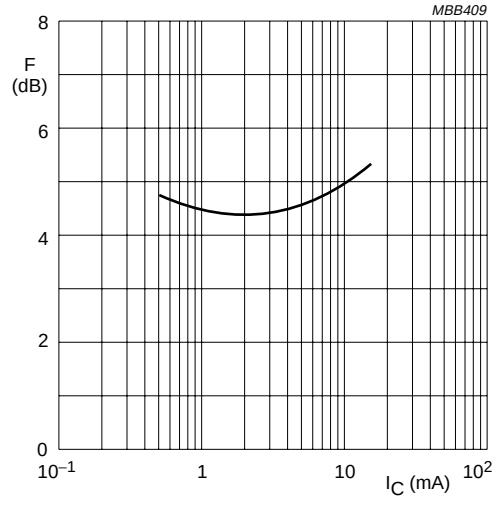
I_C = 15 mA; V_{CE} = 10 V.

Fig.7 Maximum unilateral power gain as a function of frequency.



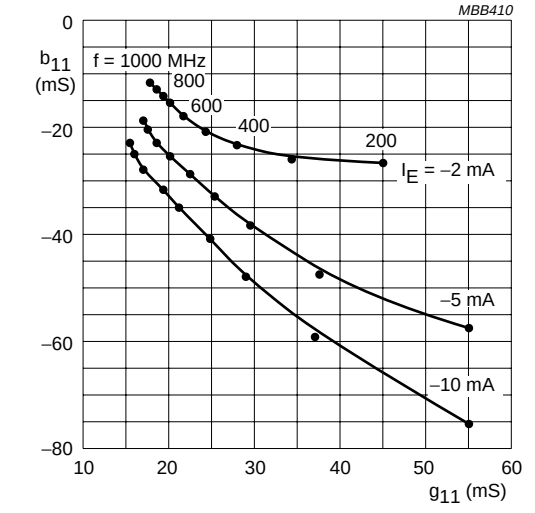
$I_C/I_B = 10$.

Fig.8 Collector-emitter saturation voltage as a function of collector current.



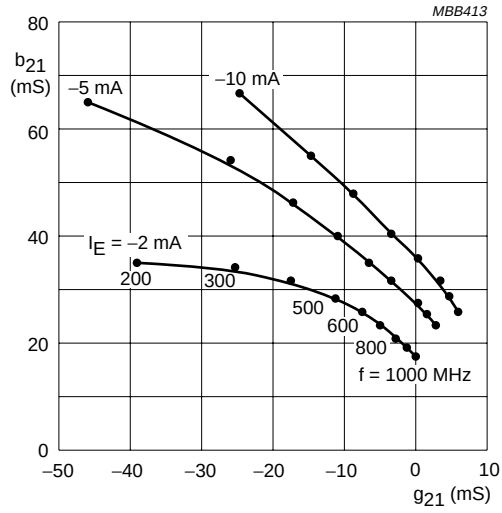
$V_{CE} = 10$ V; $Z_S = Z_L = 50\ \Omega$.; f = 100 MHz.

Fig.9 Common emitter noise figure as a function of collector current.



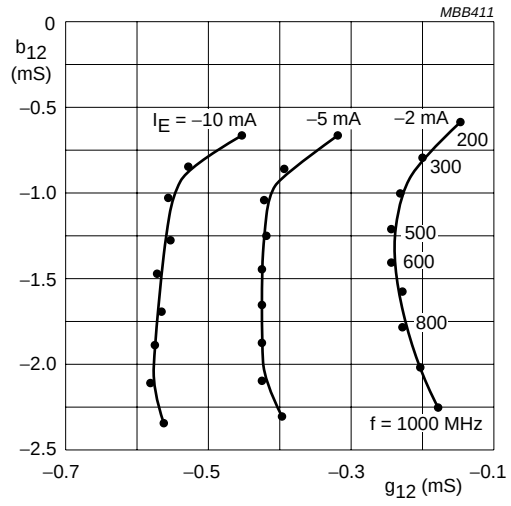
$V_{CB} = 10$ V.

Fig.10 Common base input admittance (Y_{11}).



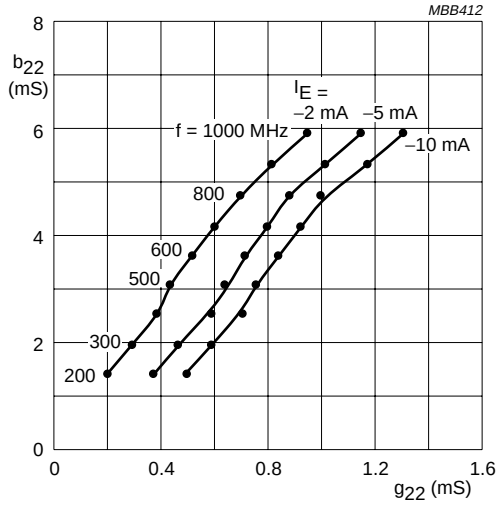
$V_{CB} = 10$ V.

Fig.11 Common base forward admittance (Y_{21}).



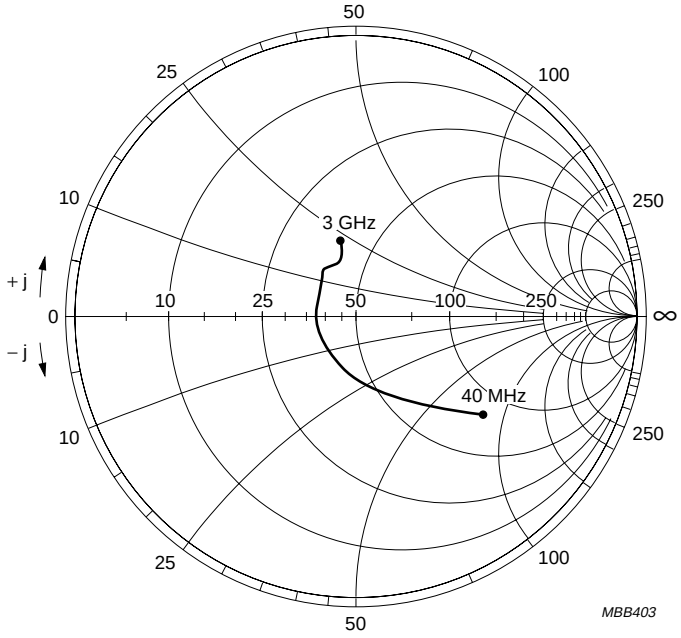
V_{CB} = 10 V.

Fig.12 Common base reverse admittance (Y_{12}).



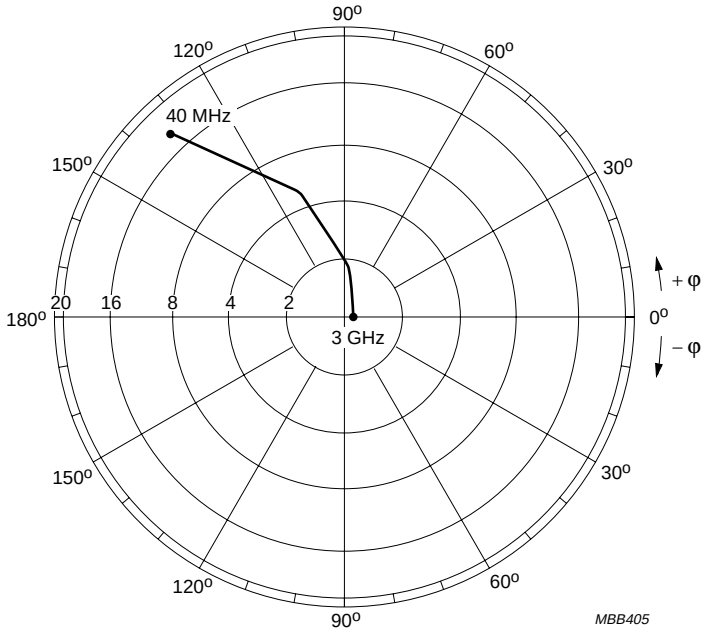
V_{CB} = 10 V.

Fig.13 Common base output admittance (Y_{22}).



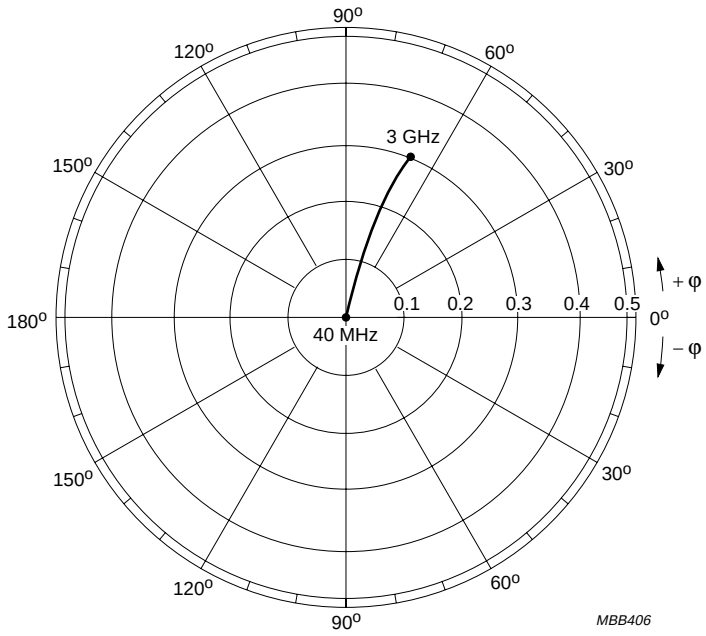
I_C = 15 mA; V_{CE} = 10 V; Z_O = 50 Ω..

Fig.14 Common emitter input reflection coefficient (S_{11}).



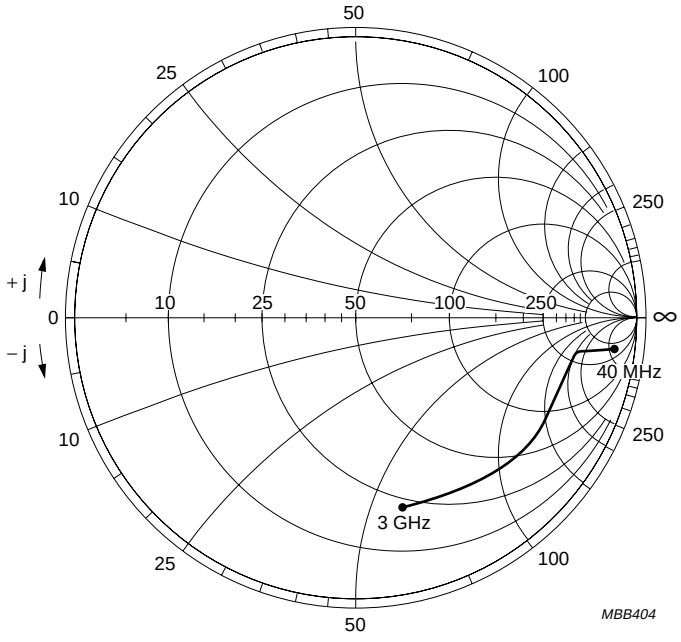
I_C = 15 mA; V_{CE} = 10 V.

Fig.15 Common emitter forward transmission coefficient (S_{21}).



I_C = 15 mA; V_{CE} = 10 V.

Fig.16 Common emitter reverse transmission coefficient (S_{12}).



I_C = 15 mA; V_{CE} = 10 V; Z_O = 50 Ω..

Fig.17 Common emitter output reflection coefficient (S_{22}).

Table 1 Common base Y-parameters, I_E = –2 mA; V_{CB} = 10 V, typical values.

f (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)
40	69.0	–10.2	–68.0	12.3	–0.02	–0.1	–0.01	0.3
100	60.4	–20.6	–58.0	25.6	–0.06	–0.3	–0.08	0.7
200	45.0	–27.4	–39.1	34.5	–0.10	–0.6	0.19	1.4
300	34.3	–26.4	–25.4	34.0	–0.20	–0.8	0.29	1.9
400	27.7	–23.3	–17.2	31.1	–0.20	–1.0	0.37	2.5
500	24.0	–20.4	–11.7	27.6	–0.20	–1.2	0.45	3.0
600	21.5	–18.0	–7.8	25.0	–0.20	–1.4	0.53	3.6
700	20.0	–15.6	–5.3	22.6	–0.20	–1.6	0.60	4.2
800	18.6	–14.0	–3.0	20.2	–0.20	–1.8	0.69	4.7
900	18.3	–12.8	–1.3	18.7	–0.20	–2.0	0.82	5.3
1000	17.8	–11.7	–0.1	17.1	–0.20	–2.2	0.95	5.9

Table 2 Common base Y-parameters, I_E = –5 mA; V_{CB} = 10 V, typical values.

f (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)
40	132.6	–35.7	–130.5	38.8	–0.06	–0.2	–0.06	0.4
100	96.3	–62.0	–91.1	67.9	–0.20	–0.5	0.21	0.8
200	54.7	–57.8	–46.0	64.7	–0.30	–0.7	0.38	1.4
300	37.5	–46.9	–26.4	53.8	–0.40	–0.8	0.47	2.0
400	29.2	–38.6	–16.6	45.8	–0.40	–1.0	0.58	2.5
500	25.3	–32.8	–11.0	39.8	–0.40	–1.3	0.63	3.1
600	22.0	–28.4	–6.3	35.0	–0.40	–1.4	0.71	3.6
700	20.3	–25.2	–3.3	31.4	–0.40	–1.6	0.80	4.2
800	18.7	–22.6	–0.6	27.6	–0.40	–1.9	0.88	4.7
900	17.8	–20.7	1.4	25.2	–0.40	–2.1	1.01	5.3
1000	17.3	–19.1	3.0	23.0	–0.40	–2.3	1.15	6.0

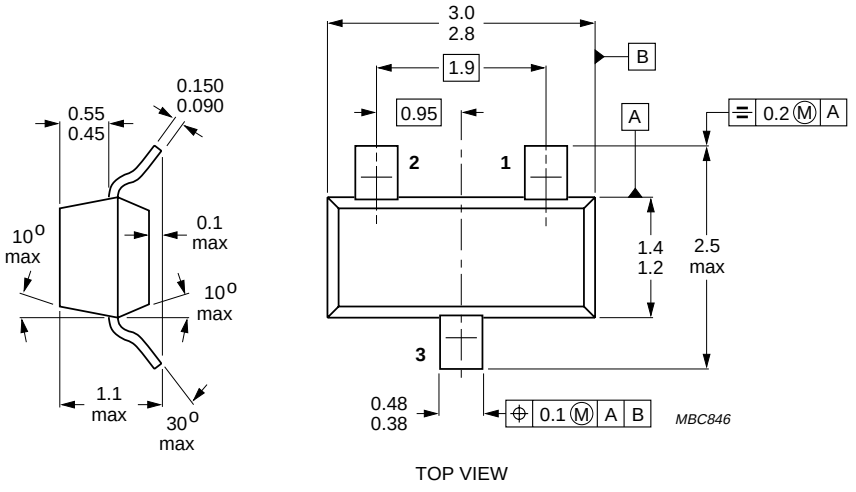
Table 3 Common base Y-parameters, I_E = –10 mA; V_{CB} = 10 V, typical values.

f (MHZ)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)
40	189.0	–79.6	–185.5	83.0	–0.10	–0.3	–0.09	0.4
100	108.5	–99.0	–101.4	105.4	–0.30	–0.5	0.30	0.9
200	55.2	–76.2	–44.6	82.8	–0.50	–0.7	0.44	1.4
300	37.1	–59.0	–24.3	65.7	–0.50	–0.9	0.60	2.0
400	28.8	–47.6	–14.6	54.4	–0.60	–1.0	0.69	2.5
500	24.7	–40.2	–8.6	46.7	–0.60	–1.3	0.75	3.1
600	21.2	–35.0	–3.4	40.8	–0.60	–1.5	0.84	3.6
700	19.3	–31.0	–0.2	36.2	–0.60	–1.7	0.93	4.2
800	17.2	–27.5	2.6	31.1	–0.60	–1.9	1.00	4.7
900	16.4	–25.2	4.6	28.3	–0.60	–2.1	1.15	5.3
1000	15.8	–23.0	6.0	25.5	–0.60	–2.3	1.31	6.0

Table 4 Common base Y-parameters, I_E = –15 mA; V_{CB} = 10 V, typical values.

f (MHz)	Y_{11}		Y_{21}		Y_{12}		Y_{22}	
	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)	REAL (mS)	IMAG. (mS)
40	206.5	–113.8	–202.6	118.1	–0.20	–0.3	0.2	0.5
100	104.3	–114.0	–96.4	120.1	–0.40	–0.5	0.4	0.9
200	53.1	–81.1	–41.7	87.7	–0.50	–0.7	0.6	1.4
300	35.9	–62.1	–22.0	68.6	–0.60	–0.8	0.7	2.0
400	28.1	–50.0	–12.5	56.9	–0.60	–1.1	0.8	2.5
500	23.4	–42.3	–6.1	48.2	–0.60	–1.3	0.8	3.1
600	20.1	–36.4	–1.2	41.6	–0.60	–1.5	0.9	3.6
700	18.2	–32.0	2.0	36.7	–0.60	–1.7	1.0	4.2
800	16.2	–28.2	4.5	31.3	–0.60	–1.9	1.1	4.7
900	15.5	–25.7	6.5	28.1	–0.60	–2.1	1.3	5.3
1000	14.7	–23.5	7.9	24.9	–0.60	–2.3	1.4	5.9

PACKAGE OUTLINE



Dimensions in mm.

Fig.18 SOT23.

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.	

LIFE SUPPORT APPLICATIONS

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微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件： 晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子元器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适 配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

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北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL：010-81159046 82615020 13501189838 FAX：010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL：021-28311762 56703037 13701955389 FAX：021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL：029-81022619 13072977981 FAX:029-88789382