NPN 1 GHz wideband transistor

BFY90

DESCRIPTION

NPN transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case.

The transistor has very low noise over a wide current range, a very high power gain and excellent intermodulation properties.

It is primarily intended for channel and band aerial amplifiers for band I, II, III and IV/V (40 to 860 MHz), wideband aerial amplifiers (40 to 860 MHz), television distribution amplifiers and low noise wideband vertical amplifiers in high speed oscilloscopes.

It is also suitable for military and industrial applications, such as RF amplifiers and mixers for communication equipment, microwave telephony link systems, wideband IF amplifiers and large bandwidth radar IF amplifiers.

PINNING

PIN	DESCRIPTION
1	emitter
2	base
3	collector
4	shield lead (connected to case)

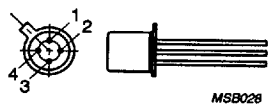


Fig.1 TO-72.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
I_{CM}	peak collector current	f > 1 MHz	–	50	mA
P_{tot}	total power dissipation	up to T_s = 25 °C (note 1)	–	200	mW
f_T	transition frequency	I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C	1.4	–	GHz
C_{re}	feedback capacitance	I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	0.6	–	pF
F	noise figure	I_C = 2 mA; V_{CE} = 5 V; Z_S = opt.; f = 800 MHz; T_{amb} = 25 °C	5.5	–	dB
G_p	power gain	I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	8	–	dB
P_O	output power	d_{im} = –30 dB; VSWR at output < 2; I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	12	–	mW

Note

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

LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	30	V
V_{CEO}	collector-emitter voltage	open base	–	15	V
V_{CER}	collector-emitter voltage	$R_{BE} \leq 50\ \Omega$	–	30	V
V_{EBO}	emitter-base voltage	open collector	–	2.5	V
I_C	DC collector current		–	25	mA
I_{CM}	peak collector current	f > 1 MHz	–	50	mA
P_{tot}	total power dissipation	up to T_s = 25 °C (note 1)	–	200	mW
T_{stg}	storage temperature		–65	200	°C
T_j	junction temperature		–	200	°C

THERMAL RESISTANCE

SYMBOL	PARAMETER	CONDITIONS	THERMAL RESISTANCE
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point	up to T_s = 25 °C (note 1)	580 K/W

Note

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

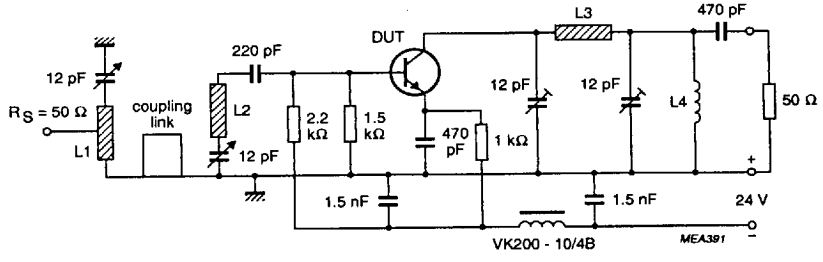
CHARACTERISTICS

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} = 15 V	10	–	–	nA
h_{FE}	DC current gain	I_C = 2 mA; V_{CE} = 1 V	25	150	–	
		I_C = 25 mA; V_{CE} = 1 V	20	125	–	
f_T	transition frequency	I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	1	1.1	–	GHz
		I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	1.3	1.4	–	GHz
C_c	collector capacitance	$I_E = I_e$ = 0; V_{CB} = 10 V; f = 1 MHz	–	–	1.5	pF
C_{re}	feedback capacitance	I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	–	0.6	0.8	pF
G_{UM}	maximum unilateral power gain (note 1)	I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	–	22	–	dB
F	noise figure	I_C = 2 mA; V_{CE} = 5 V; Z_S = opt.; f = 800 MHz; T_{amb} = 25 °C	–	5.5	–	dB
G_p	power gain	I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	–	8	–	dB
P_O	output power	note 2	–	12	–	mW

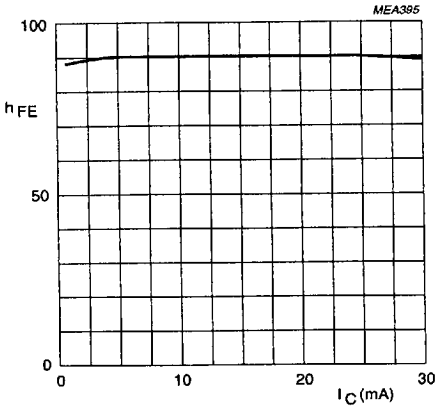
Notes

1. G_{UM} is the maximum unilateral power gain, assuming S_{12} is zero and $G_{UM} = 10 \log \frac{|S_{21}|^2}{(1-|S_{11}|^2)(1-|S_{22}|^2)}$ dB.
2. I_C = 14 mA; V_{CE} = 10 V; VSWR at output < 2; T_{amb} = 25 °C; f = 800 MHz; d_{im} = −30 dB; f_p = 798 MHz; f_q = 802 MHz; measured at $f_{(2p-q)}$ = 806 MHz (Channel 62).



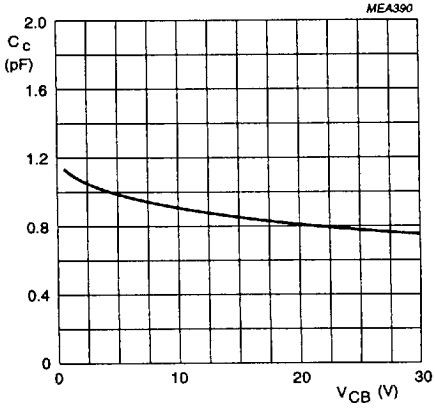
L1 = 24 mm x 6 mm x 0.5 mm silver plated copper strip. Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated copper strip.
L3 = 20 mm x 8 mm x 0.5 mm silver plated copper strip.
L4 = 4 turns enamelled 0.5 mm copper wire; winding pitch 1.5 mm; internal diameter 4 mm.
Coupling link: 42 mm silver plated 1 mm copper wire.

Fig.2 Intermodulation distortion test circuit.



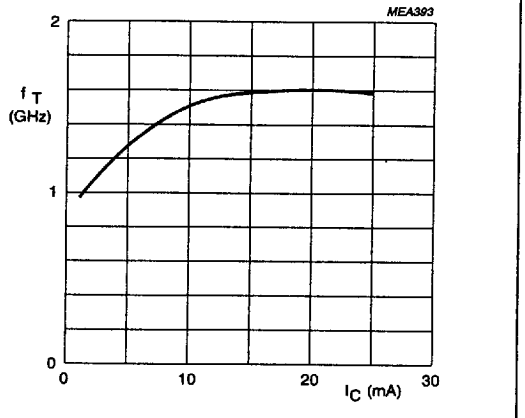
V_{CE} = 1 V; T_j = 25 °C.

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



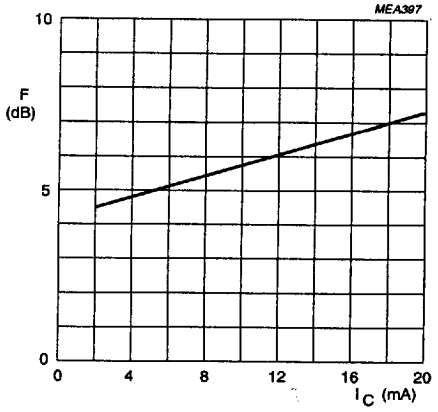
$I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

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



V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

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



V_{CE} = 5 V; Z_S = 50 Ω; f = 500 MHz; T_{amb} = 25 °C.

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