

2N3906



MMBT3906



PZT3906



PNP General Purpose Amplifier

This device is designed for general purpose amplifier and switching applications at collector currents of 10 μA to 100 mA. Sourced from Process 66.

Absolute Maximum Ratings*

TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V _{CEO}	Collector-Emitter Voltage	40	V
V _{CBO}	Collector-Base Voltage	40	V
V _{EBO}	Emitter-Base Voltage	5.0	V
I _C	Collector Current - Continuous	200	mA
T _J , T _{stg}	Operating and Storage Junction Temperature Range	-55 to +150	°C

^{*}These ratings are limiting values above which the serviceability of any semiconductor device may be impaired.

- NOTES:

 1) These ratings are based on a maximum junction temperature of 150 degrees C.

 2) These are steady state limits. The factory should be consulted on applications involving pulsed or low duty cycle operations.

PNP General Purpose Amplifier

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TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0 \text{ mA}, I_B = 0$	40		V
V _{(BR)CBO}	Collector-Base Breakdown Voltage	$I_C = 10 \mu A, I_E = 0$	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu A, I_C = 0$	5.0		V
I _{BL}	Base Cutoff Current	$V_{CE} = 30 \text{ V}, V_{BE} = 3.0 \text{ V}$		50	nA
I _{CEX}	Collector Cutoff Current	$V_{CE} = 30 \text{ V}, V_{BE} = 3.0 \text{ V}$		50	nA
	RACTERISTICS				
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h _{FE}	DC Current Gain *	$I_C = 0.1 \text{ mA}, V_{CE} = 1.0 \text{ V}$	60		
		$I_C = 1.0 \text{ mA}, V_{CE} = 1.0 \text{ V}$	80		
		$I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$	100	300	
		$I_C = 50 \text{ mA}, V_{CE} = 1.0 \text{ V}$	60		
		$I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$	30		
V _{CE(sat)}	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$		0.25	V
		$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$		0.4	V
V _{BE(sat)}	Base-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$	0.65	0.85	V
		$I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$		0.95	V

SMALL SIGNAL CHARACTERISTICS

f _T	Current Gain - Bandwidth Product	$I_C = 10 \text{ mA}, V_{CE} = 20 \text{ V},$ f = 100 MHz	250		MHz
C _{obo}	Output Capacitance	$V_{CB} = 5.0 \text{ V}, I_{E} = 0,$ f = 100 kHz		4.5	pF
C _{ibo}	Input Capacitance	$V_{EB} = 0.5 \text{ V}, I_{C} = 0,$ f = 100 kHz		10.0	pF
NF	Noise Figure (except MMPQ3906)	$I_C = 100 \mu A$, $V_{CE} = 5.0 V$, $R_S = 1.0 kΩ$, $f = 10 Hz$ to 15.7 kHz		4.0	dB

SWITCHING CHARACTERISTICS (except MMPQ3906)

t _d	Delay Time	$V_{CC} = 3.0 \text{ V}, V_{BE} = 0.5 \text{ V},$	35	ns
t _r	Rise Time	$I_C = 10 \text{ mA}, I_{B1} = 1.0 \text{ mA}$	35	ns
ts	Storage Time	$V_{CC} = 3.0 \text{ V}, I_{C} = 10 \text{mA}$	225	ns
t _f	Fall Time	$I_{B1} = I_{B2} = 1.0 \text{ mA}$	75	ns

^{*}Pulse Test: Pulse Width \leq 300 μ s, Duty Cycle \leq 2.0%

Spice Model

PNP General Purpose Amplifier

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Thermal Characteristics

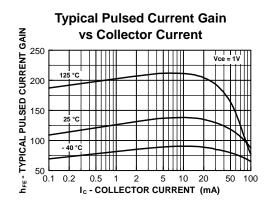
TA = 25°C unless otherwise noted

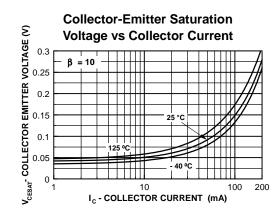
Symbol	Characteristic	Max		Units
		2N3906	*PZT3906	
P _D	Total Device Dissipation	625	1,000	mW
	Derate above 25°C	5.0	8.0	mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	125	°C/W

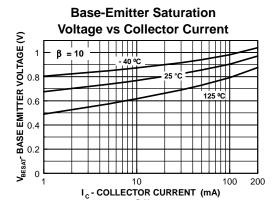
Symbol	Characteristic	Ma	Max	
		**MMBT3906	MMPQ3906	
P_{D}	Total Device Dissipation	350	1,000	mW
	Derate above 25°C	2.8	8.0	mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	357		°C/W
	Effective 4 Die		125	°C/W
	Each Die		240	°C/W

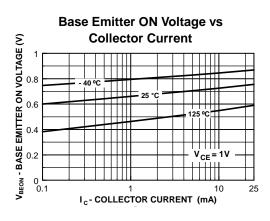
^{*}Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm².

Typical Characteristics







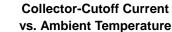


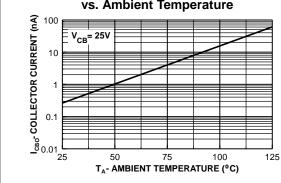
^{**}Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

PNP General Purpose Amplifier

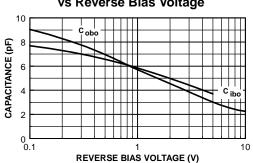
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Typical Characteristics (continued)

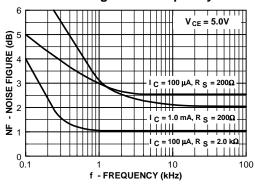




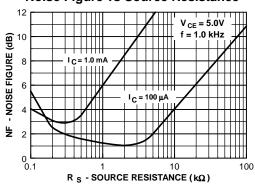
Common-Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage



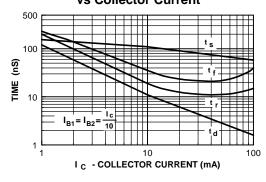
Noise Figure vs Frequency



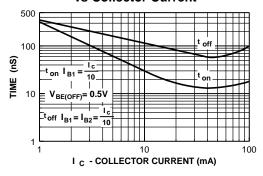
Noise Figure vs Source Resistance



Switching Times vs Collector Current



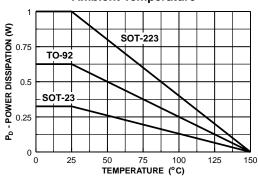
Turn On and Turn Off Times vs Collector Current



PNP General Purpose Amplifier (continued)

Typical Characteristics (continued)





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