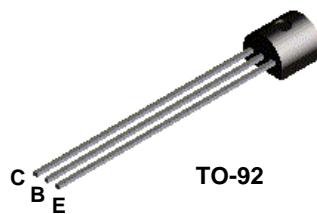
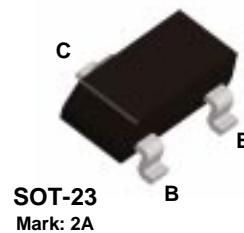
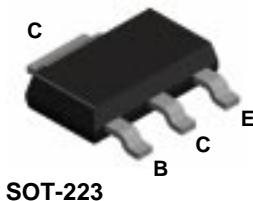


**2N3906****MMBT3906****PZT3906****PNP General Purpose Amplifier**

This device is designed for general purpose amplifier and switching applications at collector currents of 10 μ A 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

(continued)

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0 \text{ mA}, I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 10 \mu\text{A}, I_E = 0$	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 10 \mu\text{A}, I_C = 0$	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

ON CHARACTERISTICS

h_{FE}	DC Current Gain *	$I_C = 0.1 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 1.0 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 50 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 100 \text{ mA}, V_{CE} = 1.0 \text{ V}$	60 80 100 60 30	300	
$V_{CE(\text{sat})}$	Collector-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$		0.25 0.4	V
$V_{BE(\text{sat})}$	Base-Emitter Saturation Voltage	$I_C = 10 \text{ mA}, I_B = 1.0 \text{ mA}$ $I_C = 50 \text{ mA}, I_B = 5.0 \text{ mA}$	0.65	0.85 0.95	V

SMALL SIGNAL CHARACTERISTICS

f_T	Current Gain - Bandwidth Product	$I_C = 10 \text{ mA}, V_{CE} = 20 \text{ V}, f = 100 \text{ MHz}$	250		MHz
C_{obo}	Output Capacitance	$V_{CB} = 5.0 \text{ V}, I_E = 0, f = 100 \text{ kHz}$		4.5	pF
C_{ibo}	Input Capacitance	$V_{EB} = 0.5 \text{ V}, I_C = 0, f = 100 \text{ kHz}$		10.0	pF
NF	Noise Figure (except MMPQ3906)	$I_C = 100 \mu\text{A}, V_{CE} = 5.0 \text{ V}, R_S = 1.0 \text{k}\Omega, f = 10 \text{ Hz to } 15.7 \text{ kHz}$		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
t_s	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 $\leq 300 \mu\text{s}$, Duty Cycle $\leq 2.0\%$

Spice Model

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PNP (Is=1.41f Xti=3 Eg=1.11 Vaf=18.7 Bf=180.7 Ne=1.5 Ise=0 Ikf=80m Xtb=1.5 Br=4.977 Nc=2 Isc=0 Ikr=0
Rc=2.5 Cjc=9.728p Mjc=.5776 Vjc=.75 Fc=.5 Cje=8.063p Mje=.3677 Vje=.75 Tr=33.42n Tf=179.3p Itf=.4
Vtf=4 Xtf=6 Rb=10)

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PNP General Purpose Amplifier

(continued)

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N3906	*PZT3906	
P _D	Total Device Dissipation Derate above 25°C	625 5.0	1,000 8.0	mW mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3		°C/W
R _{θJA}	Thermal Resistance, Junction to Ambient	200	125	°C/W

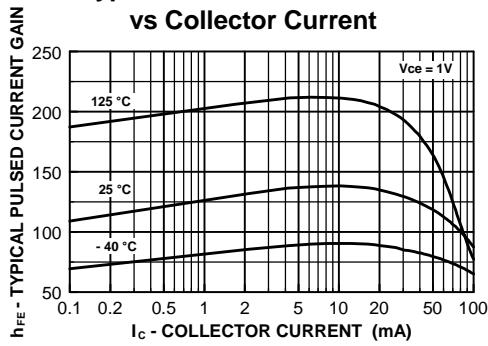
Symbol	Characteristic	Max		Units
		**MMBT3906	MMQP3906	
P _D	Total Device Dissipation Derate above 25°C	350 2.8	1,000 8.0	mW mW/°C
R _{θJA}	Thermal Resistance, Junction to Ambient Effective 4 Die Each Die	357	125 240	°C/W °C/W °C/W

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

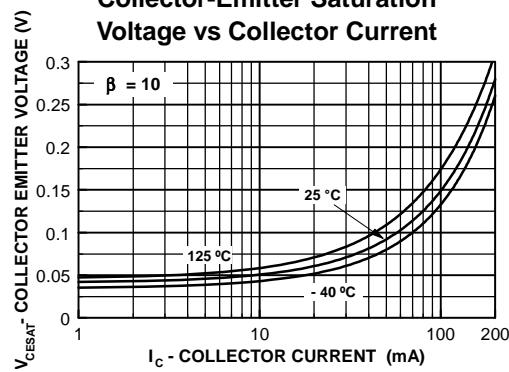
** Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

Typical Characteristics

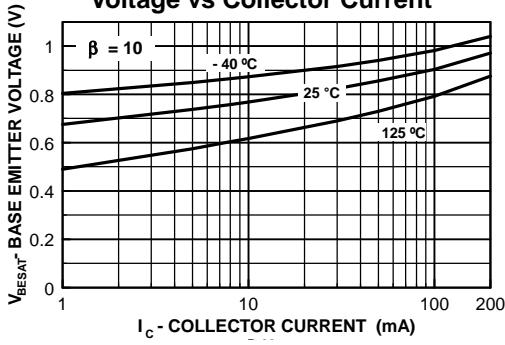
Typical Pulsed Current Gain vs Collector Current



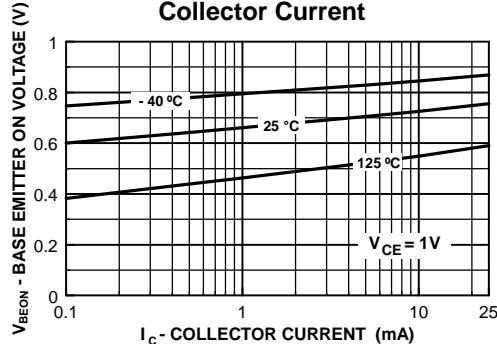
Collector-Emitter Saturation Voltage vs Collector Current



Base-Emitter Saturation Voltage vs Collector Current



Base Emitter ON Voltage vs Collector Current

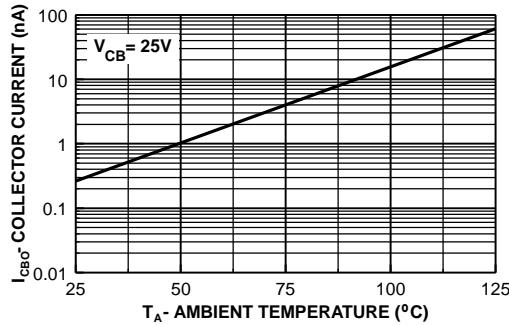


PNP General Purpose Amplifier

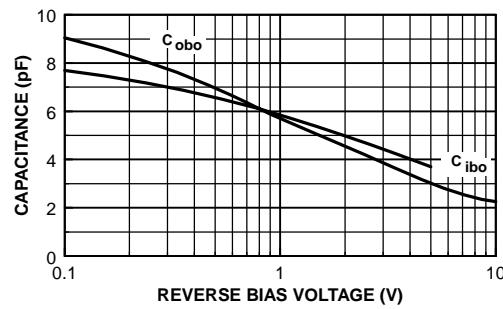
(continued)

Typical Characteristics (continued)

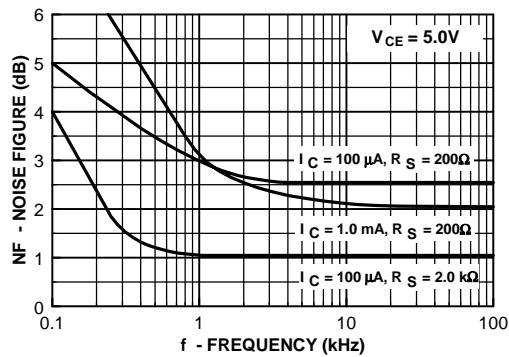
Collector-Cutoff Current vs. Ambient Temperature



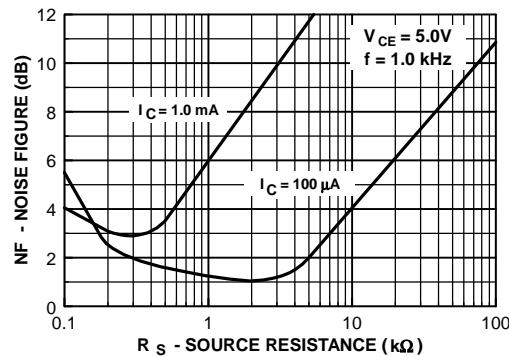
Common-Base Open Circuit Input and Output Capacitance vs Reverse Bias Voltage



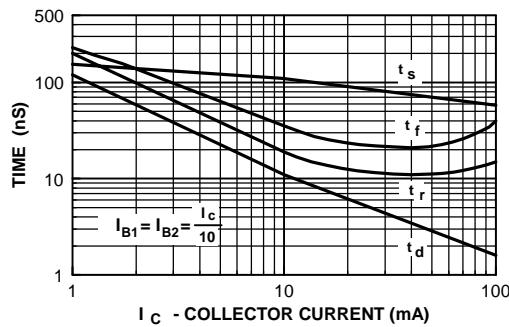
Noise Figure vs Frequency



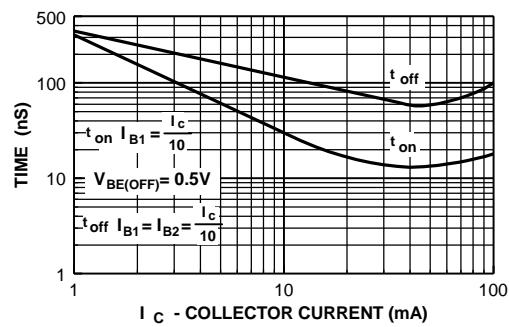
Noise Figure vs Source Resistance



Switching Times vs Collector Current



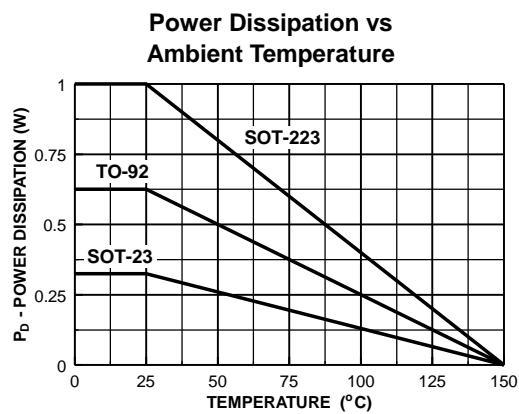
Turn On and Turn Off Times vs Collector Current



PNP General Purpose Amplifier

(continued)

Typical Characteristics (continued)



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