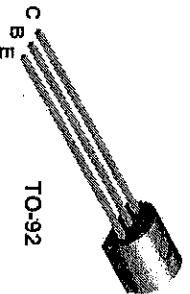


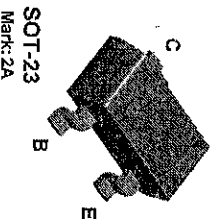
2N3906

MMBT3906

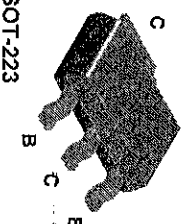
PZT3906



TO-92



SOT-23
Mark: 2A



SOT-223

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.

Absolute Maximum Ratings*

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Value	Units
V_{CE0}	Collector-Emitter Voltage	40	V
V_{CE0}	Collector-Base Voltage	40	V
V_{BE0}	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	$^\circ\text{C}$

*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.
- 3) All voltages (V) and currents (A) are negative polarity for PNP transistors.

Thermal Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Characteristic	Max			Units
		2N3906	*MMBT3906	**PZT3906	
P_D	Total Device Dissipation Derate above 25 $^\circ\text{C}$	625	360	1,000	mW
$R_{\theta JC}$	Thermal Resistance, Junction to Case	5.0	2.8	8.0	$\text{mW}/^\circ\text{C}$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	83.3			$^\circ\text{C}/\text{W}$
		200	357	125	$^\circ\text{C}/\text{W}$

* Device mounted on FR-4 PCB 1.6" X 1.6" X 0.062"

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

PNP General Purpose Amplifier (continued)

Electrical Characteristics

$T_A = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0\text{ mA}, I_E = 0$	40		V
$V_{(BR)CB}$	Collector-Base Breakdown Voltage	$I_C = 10\text{ }\mu\text{A}, I_E = 0$	40		V
$V_{(BR)EB}$	Emitter-Base Breakdown Voltage	$I_E = 10\text{ }\mu\text{A}, I_C = 0$	5.0		V
I_{B1}	Base Cutoff Current	$V_{CE} = 30\text{ V}, V_{BE} = 3.0\text{ V}$		50	nA
I_{B2}	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	
$V_{(CE)SAT}$	Collector-Emitter Saturation Voltage	$I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$ $I_C = 10\text{ mA}, I_B = 1.0\text{ mA}$ $I_C = 50\text{ mA}, I_B = 5.0\text{ mA}$		0.25 0.4	V
$V_{(BE)SAT}$	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	$V_{GS} = 5.0\text{ V}, I_E = 0,$ $f = 100\text{ KHz}$		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	$I_C = 100\text{ }\mu\text{A}, V_{CE} = 5.0\text{ V},$ $R_S = 1.0\text{ k}\Omega, f = 10\text{ Hz to }15.7\text{ KHz}$		4.0	dB

SWITCHING CHARACTERISTICS

t_d	Delay Time	$V_{CC} = 3.0\text{ V}, V_{BE} = 0.5\text{ V},$ $I_C = 10\text{ mA}, I_{B1} = 1.0\text{ mA}$		35	ns
t_r	Rise Time	$V_{CC} = 3.0\text{ V}, I_C = 10\text{ mA}$		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 $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$

NOTE: All voltages (V) and currents (A) are negative polarity for PNP transistors.

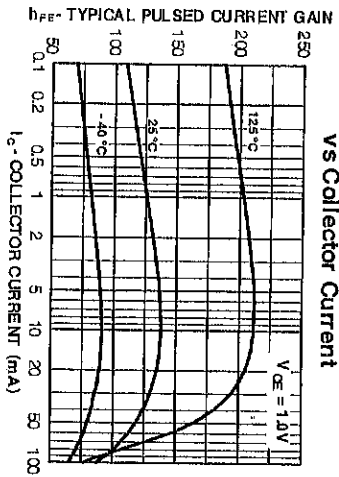
Spice Model

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=83.42n Tf=179.3p Ift=.4 Vft=4
Xtf=6 Rb=10)

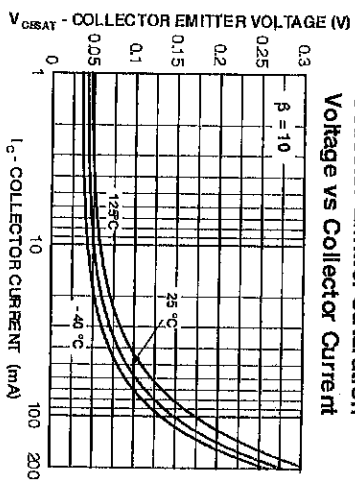
PNP General Purpose Amplifier (continued)

Typical Characteristics

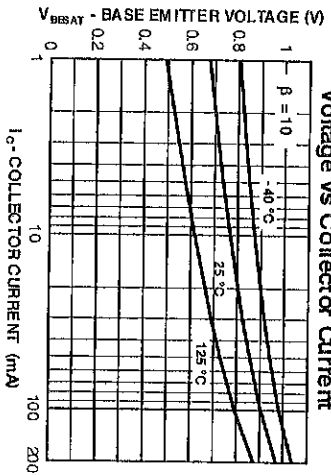
Typical Pulsed Current Gain
vs Collector Current



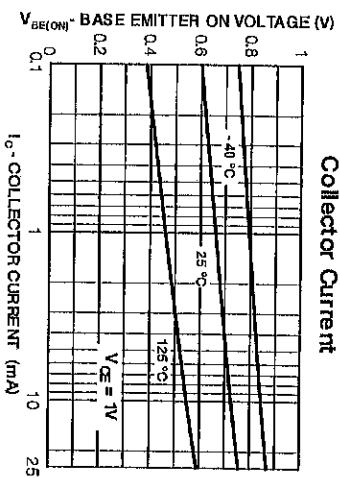
Collector-Emitter Saturation
Voltage vs Collector Current



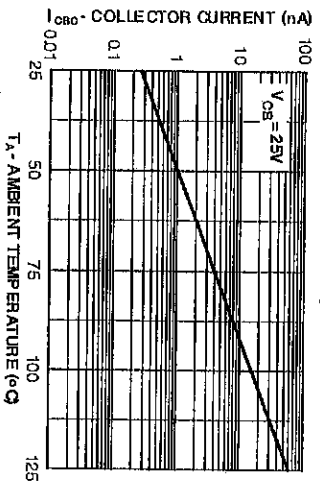
Base-Emitter Saturation
Voltage vs Collector Current



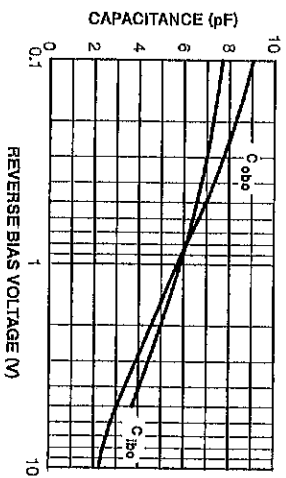
Base Emitter ON Voltage vs
Collector Current



Collector-Cutoff Current
vs Ambient Temperature



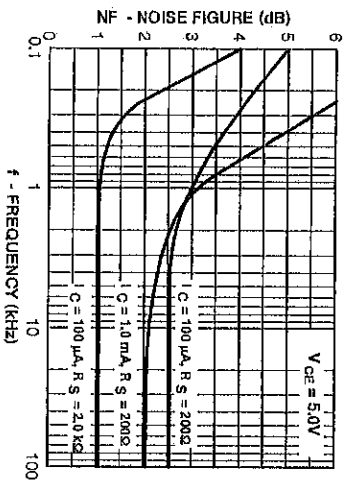
Common-Base Open Circuit
Input and Output Capacitance
vs Reverse Bias Voltage



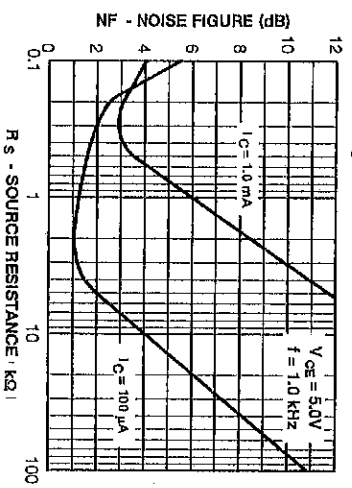
PNP General Purpose Amplifier (continued)

Typical Characteristics (continued)

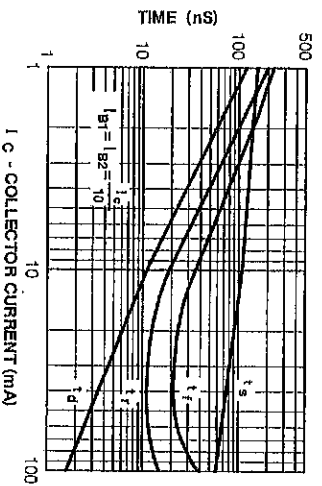
Noise Figure vs Frequency



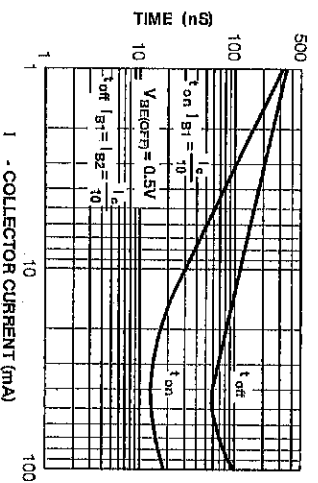
Noise Figure vs Source Resistance



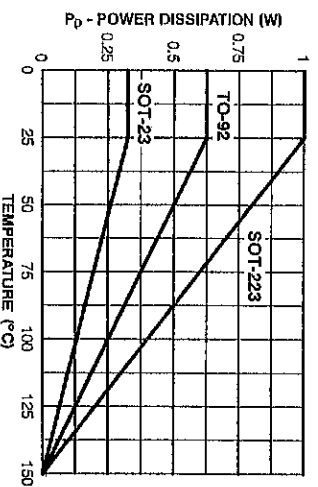
Switching Times
vs Collector Current



Turn On and Turn Off Times
vs Collector Current

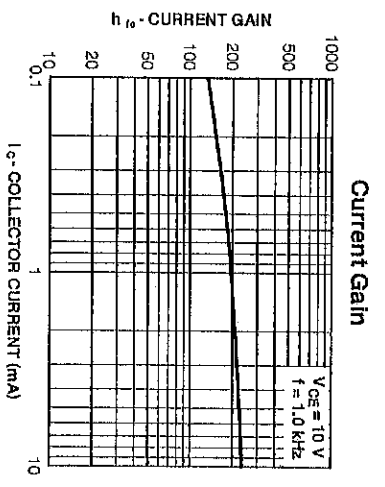
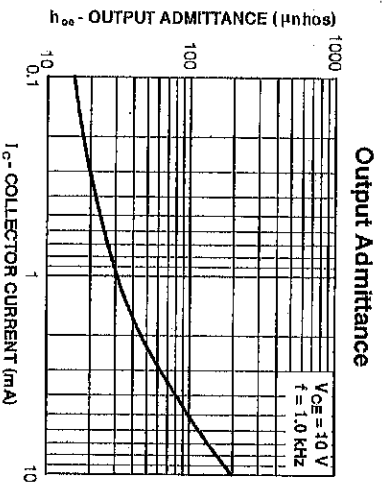
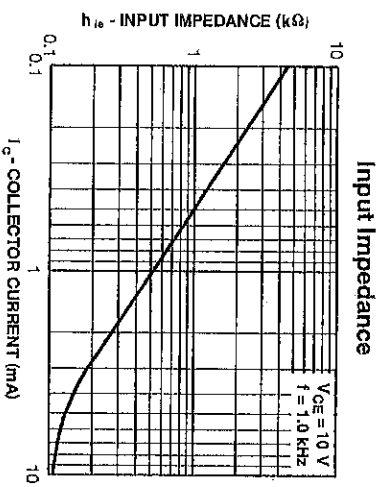
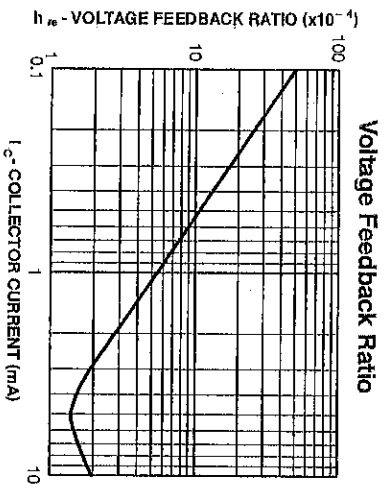


Power Dissipation vs
Ambient Temperature



PNP General Purpose Amplifier (continued)

Typical Characteristics (continued)



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