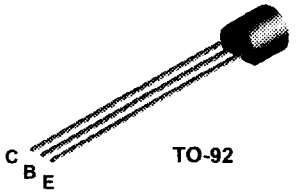
National Semiconductor™

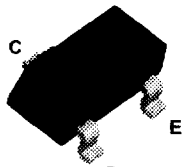
Discrete POWER & Signal Technologies

PN2907A



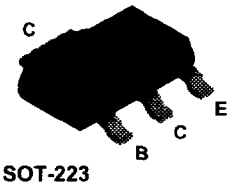
TO-92

MMBT2907A



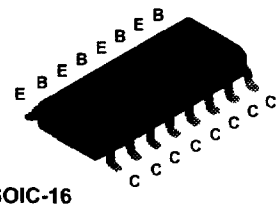
SOT-23
Mark: 2F

PZT2907A



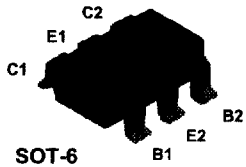
SOT-223

MMPQ2907



SOIC-16

NMT2907



SOT-6
Mark: .2B

PNP General Purpose Amplifier

This device is designed for use as a general purpose amplifier and switch requiring collector currents to 500 mA. Sourced from Process 63.

Absolute Maximum Ratings* TA = 25°C unless otherwise noted

Symbol	Parameter	Value	Units
V_{CEO}	Collector-Emitter Voltage	60	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	5.0	V
I_C	Collector Current - Continuous	800	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 = 10 mA, I_B = 0	60		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 10 µA, I_E = 0	60		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 10 µA, I_C = 0	5.0		V
I_B	Base Cutoff Current	V_{CB} = 30 V, V_{EB} = 0.5 V		50	nA
I_{CEX}	Collector Cutoff Current	V_{CE} = 30 V, V_{BE} = 0.5 V		50	nA
I_{CBO}	Collector Cutoff Current	V_{CB} = 50 V, I_E = 0 V_{CB} = 50 V, I_E = 0, T_A = 150°C		0.02 20	µA µA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 10 V I_C = 1.0 mA, V_{CE} = 10 V I_C = 10 mA, V_{CE} = 10 V I_C = 150 mA, V_{CE} = 10 V* I_C = 500 mA, V_{CE} = 10 V*	75 100 100 100 50	 300 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage*	I_C = 150 mA, I_B = 15 mA I_C = 500 mA, I_B = 50 mA		0.4 1.6	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	I_C = 150 mA, I_B = 15 mA* I_C = 500 mA, I_B = 50 mA		1.3 2.6	V V
SMALL SIGNAL CHARACTERISTICS (except MMPQ2907 and NMT2907)					
f_T	Current Gain - Bandwidth Product	I_C = 50 mA, V_{CE} = 20 V, f = 100 MHz	200		MHz
C_{obo}	Output Capacitance	V_{CB} = 10 V, I_E = 0, f = 100 kHz		8.0	pF
C_{ibo}	Input Capacitance	V_{EB} = 2.0 V, I_C = 0, f = 100 kHz		30	pF
SWITCHING CHARACTERISTICS (except MMPQ2907 and NMT2907)					
t_{on}	Turn-on Time	V_{CC} = 30 V, I_C = 150 mA, I_{B1} = 15 mA		45	ns
t_d	Delay Time			10	ns
t_r	Rise Time			40	ns
t_{off}	Turn-off Time	V_{CC} = 6.0 V, I_C = 150 mA, I_{B1} = I_{B2} = 15 mA		100	ns
t_s	Storage Time			80	ns
t_f	Fall Time			30	ns

*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

Spice Model

PNP (Is=650.6E-18 Xti=3 Eg=1.11 Vaf=115.7 Bf=231.7 Ne=1.829 Ise=54.81f Ikf=1.079 Xtb=1.5 Br=3.563 Nc=2 Isc=0 Ikr=0 Rc=.715 Cjc=14.76p Mjc=.5383 Vjc=.75 Fc=.5 Cje=19.82p Mje=.3357 Vje=.75 Tr=111.3n Tf=603.7p Itf=.65 Vtf=5 Xtf=1.7 Rb=10)

PNP General Purpose Amplifier
(continued)

Thermal Characteristics
TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		PN2907A	*PZT2907A	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	1,000 8.0	mW 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

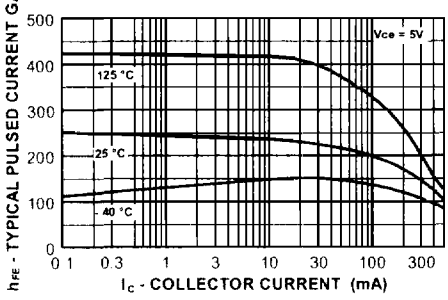
Symbol	Characteristic	Max		Units
		**MMBT2907A	MMPQ2907	
P_D	Total Device Dissipation Derate above 25°C	350 2.8	1,000 8.0	mW mW/°C
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient Effective 4 Die Each Die	357	 125 240	°C/W °C/W °C/W

*Device mounted on FR-4 PCB 36 mm X 18 mm X 1.5 mm; mounting pad for the collector lead min. 6 cm^2.

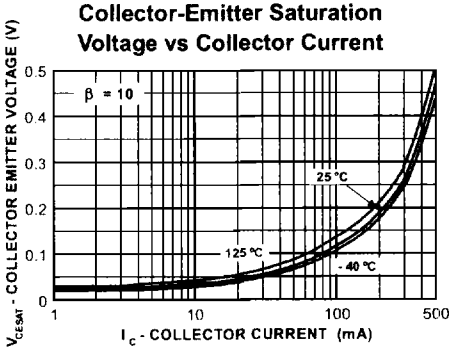
**Device mounted on FR-4 PCB 1.6" X 1.6" X 0.06."

DC Typical Characteristics

Typical Pulsed Current Gain vs Collector Current

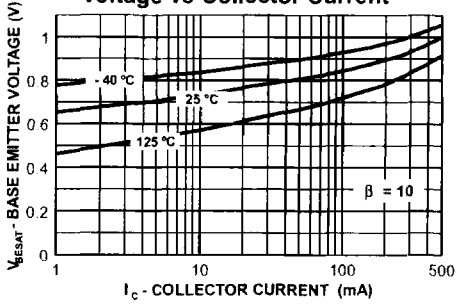


Collector-Emitter Saturation Voltage vs Collector Current

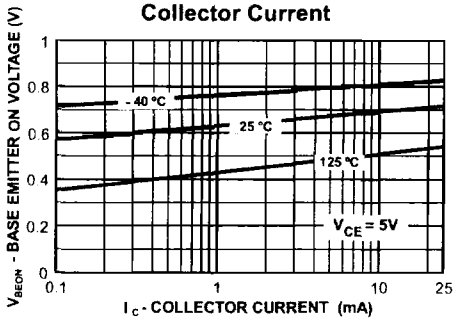


DC Typical Characteristics (continued)

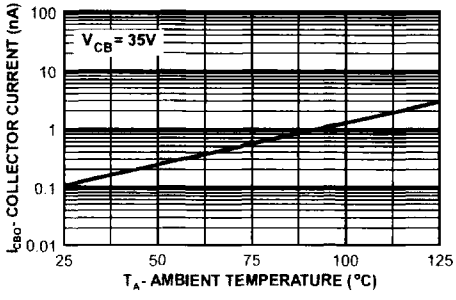
Base-Emitter Saturation Voltage vs Collector Current



Base Emitter ON Voltage vs Collector Current

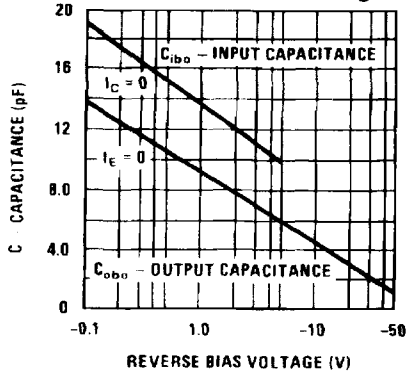


Collector-Cutoff Current vs. Ambient Temperature

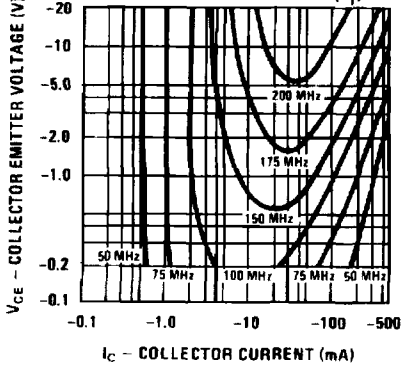


AC Typical Characteristics

Input / Output Capacitance vs. Reverse Bias Voltage



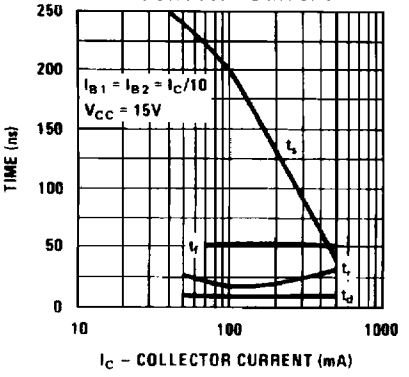
Contours of Constant Gain Bandwidth Product (f_T)



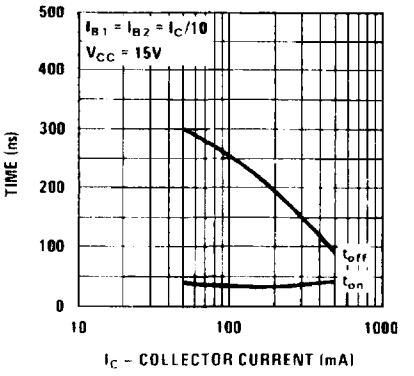
PNP General Purpose Amplifier
(continued)

AC Typical Characteristics (continued)

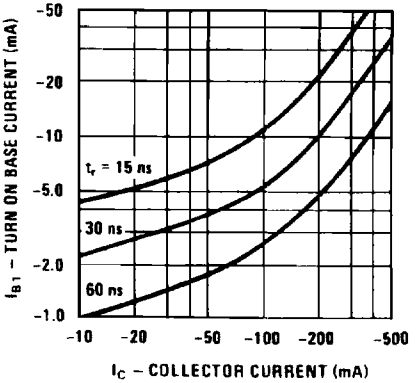
Switching Times vs. Collector Current



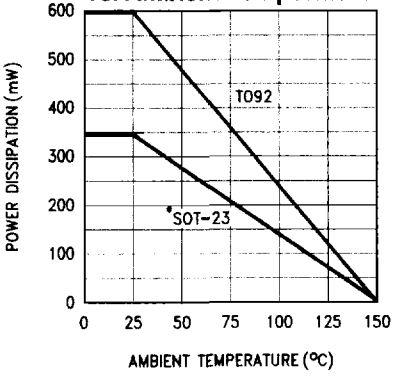
Turn On / Turn Off Time vs. Collector Current



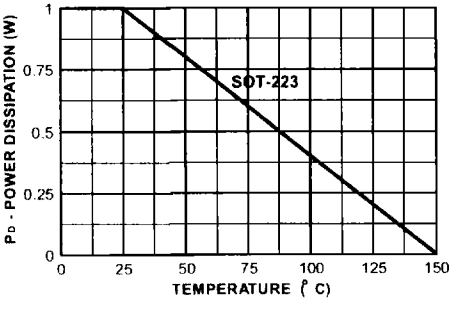
Rise Time vs. Collector and Turn On Base Currents



Maximum Power Dissipation vs. Ambient Temperature

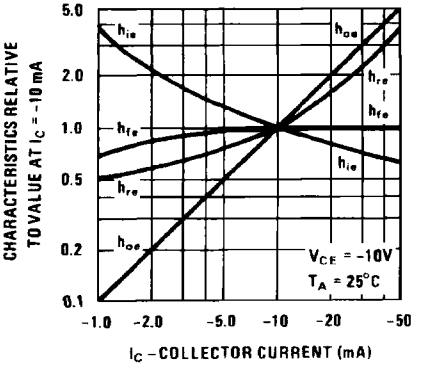


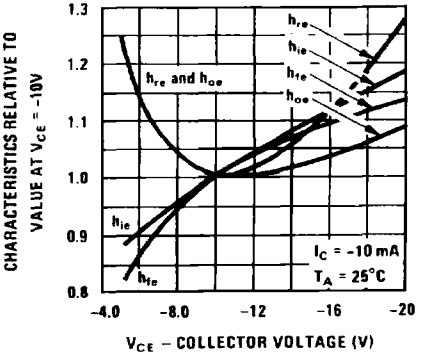
POWER DISSIPATION vs AMBIENT TEMPERATURE

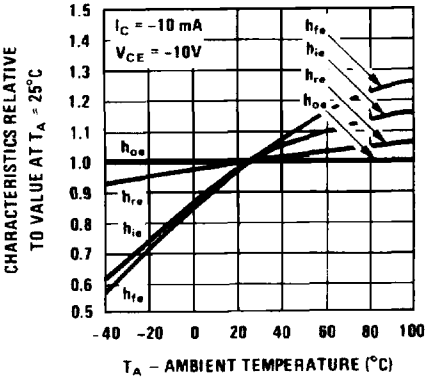


PNP General Purpose Amplifier
(continued)

Typical Common Emitter Characteristics







PNP General Purpose Amplifier
(continued)

Test Circuits

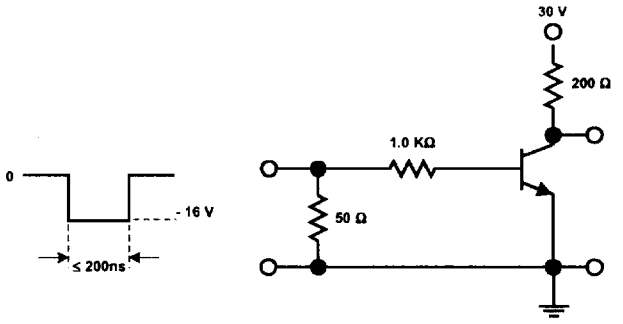


FIGURE 1: Saturated Turn-On Switching Time Test Circuit

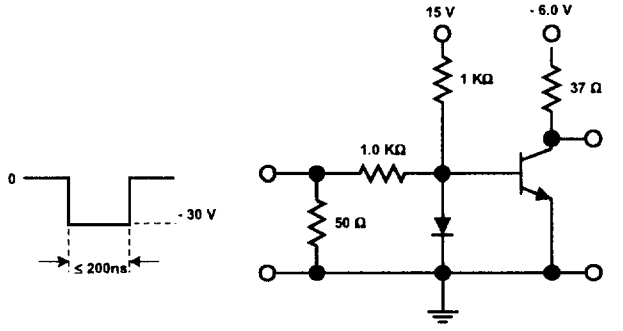


FIGURE 2: Saturated Turn-Off Switching Time Test Circuit