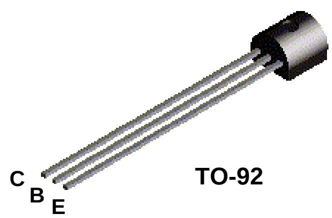
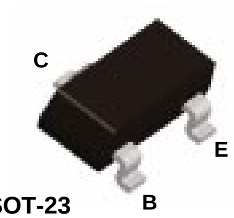
FAIRCHILD
SEMICONDUCTOR™

2N4403 MMBT4403



TO-92



SOT-23
Mark: 2T

PNP General Purpose Amplifier

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

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	600	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.

Thermal Characteristics

TA = 25°C unless otherwise noted

Symbol	Characteristic	Max		Units
		2N4403	*MMBT4403	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	350 2.8	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	357	°C/W

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

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 mA, I_B = 0	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	I_C = 0.1 mA, I_E = 0	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	I_E = 0.1 A, I_C = 0	5.0		V
I_{BEX}	Base Cutoff Current	V_{CE} = 35 V, V_{EB} = 0.4 V		0.1	µA
I_{CEX}	Collector Cutoff Current	V_{CE} = 35 V, V_{BE} = 0.4 V		0.1	µA
ON CHARACTERISTICS					
h_{FE}	DC Current Gain	I_C = 0.1 mA, V_{CE} = 1.0 V I_C = 1.0 mA, V_{CE} = 1.0 V I_C = 10 mA, V_{CE} = 1.0 V I_C = 150 mA, V_{CE} = 2.0 V* I_C = 500 mA, V_{CE} = 2.0 V*	30 60 100 100 20	 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 0.75	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	0.75	0.95 1.3	V V
SMALL SIGNAL CHARACTERISTICS					
f_T	Current Gain - Bandwidth Product	I_C = 20 mA, V_{CE} = 10 V, f = 100 MHz	200		MHz
C_{cb}	Collector-Base Capacitance	V_{CB} = 10 V, I_E = 0, f = 140 kHz		8.5	pF
C_{eb}	Emitter-Base Capacitance	V_{BE} = 0.5 V, I_C = 0, f = 140 kHz		30	pF
h_{ie}	Input Impedance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.5	15	kΩ
h_{re}	Voltage Feedback Ratio	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	0.1	8.0	$x\ 10^{-4}$
h_{fe}	Small-Signal Current Gain	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	60	500	
h_{oe}	Output Admittance	I_C = 1.0 mA, V_{CE} = 10 V, f = 1.0 kHz	1.0	100	µmhos
SWITCHING CHARACTERISTICS					
t_d	Delay Time	V_{CC} = 30 V, I_C = 150 mA,		15	ns
t_r	Rise Time	I_{B1} = 15 mA		20	ns
t_s	Storage Time	V_{CC} = 30 V, I_C = 150 mA		225	ns
t_f	Fall Time	I_{B1} = I_{B2} = 15 mA		30	ns

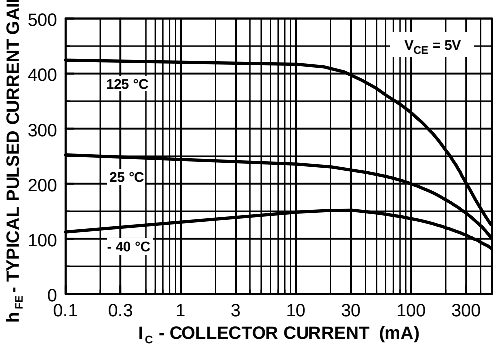
*Pulse Test: Pulse Width £ 300 ms, Duty Cycle £ 2.0%

PNP General Purpose Amplifier

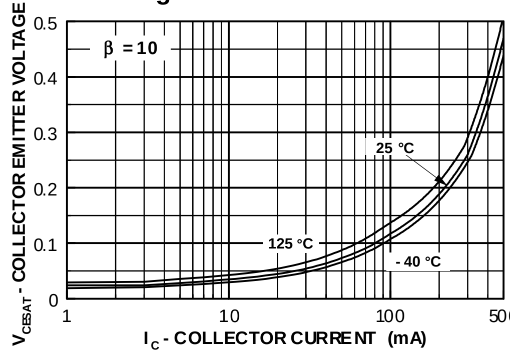
(continued)

Typical Characteristics

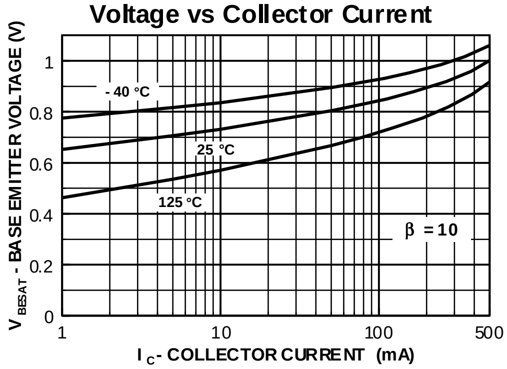
Typical Pulsed Current Gain vs Collector Current



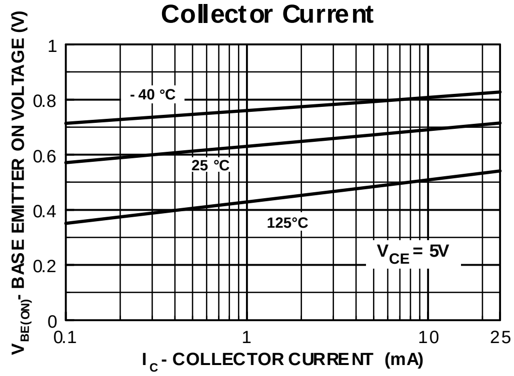
Collector-Emitter Saturation Voltage vs Collector Current



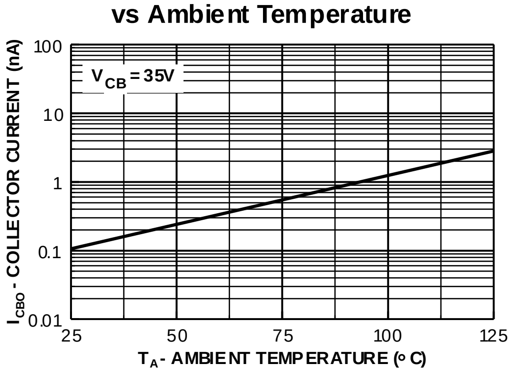
Base-Emitter Saturation Voltage vs Collector Current



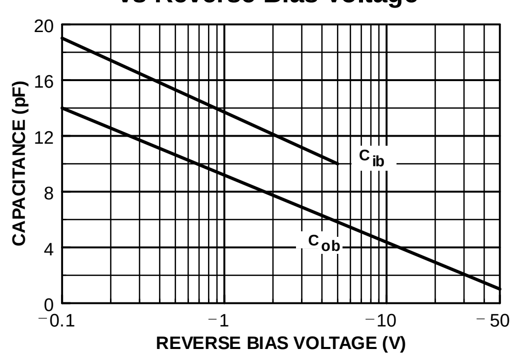
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

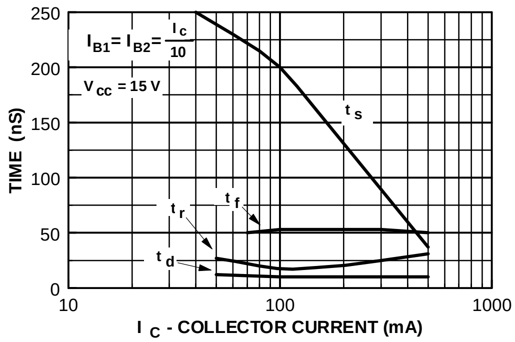


Input and Output Capacitance vs Reverse Bias Voltage

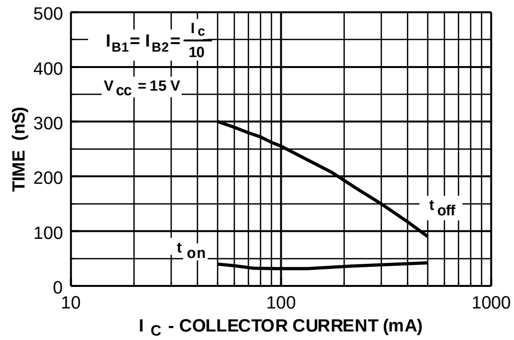


Typical Characteristics (continued)

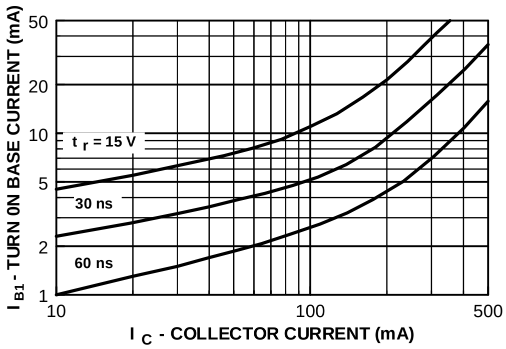
Switching Times vs Collector Current



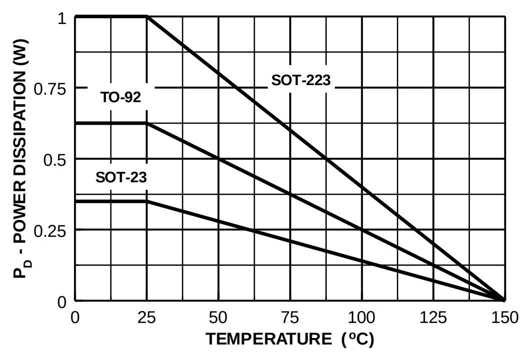
Turn On and Turn Off Times vs Collector Current



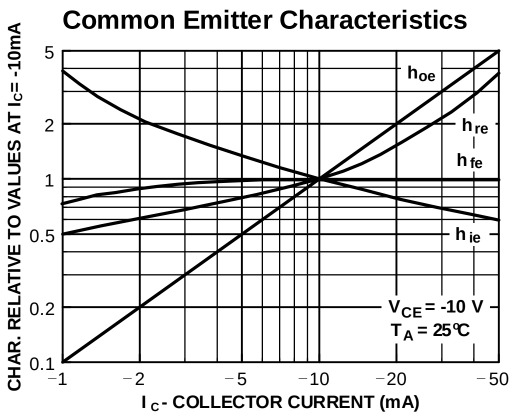
Rise Time vs Collector and Turn On Base Currents

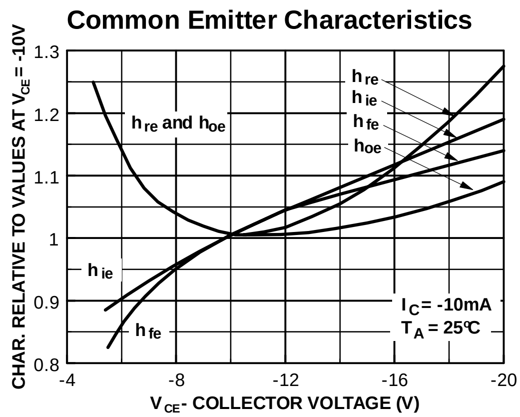


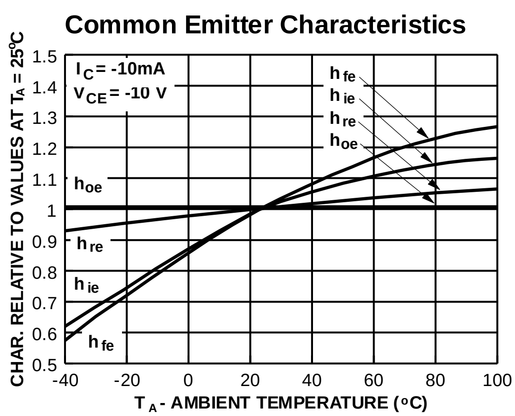
Power Dissipation vs Ambient Temperature



Typical Common Emitter Characteristics (f = 1.0kHz)







Test Circuits

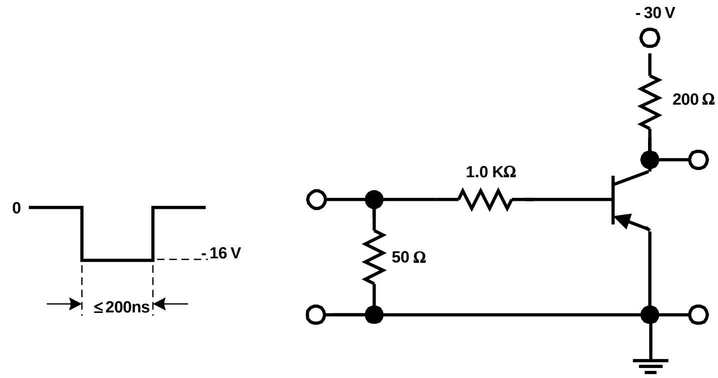


FIGURE 1: Saturated Turn-On Switching Time Test Circuit

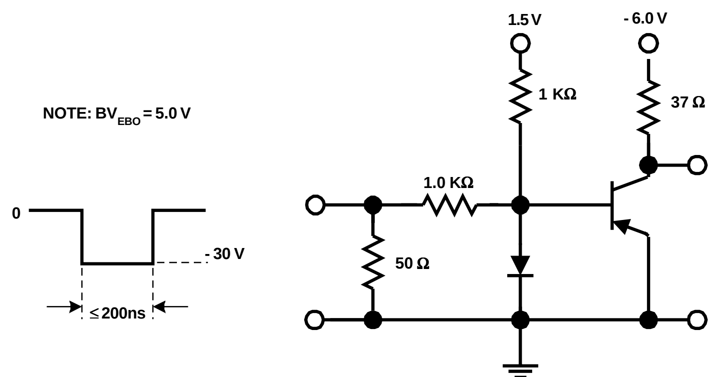


FIGURE 2: Saturated Turn-Off Switching Time Test Circuit

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