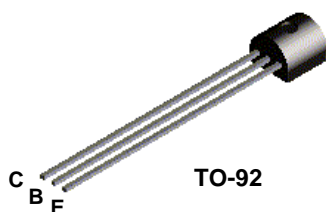
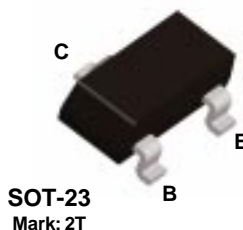


2N4403



MMBT4403



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	625	350	mW
	Derate above 25°C	5.0	2.8	mW/°C
R _{θJC}	Thermal Resistance, Junction to Case	83.3		°C/W
R _{θJA}	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)

2N4403 / MMBT4403

Electrical Characteristics

TA = 25°C unless otherwise noted

Symbol	Parameter	Test Conditions	Min	Max	Units
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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	$I_C = 0.1 \text{ mA}, I_E = 0$	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 0.1 \text{ A}, I_C = 0$	5.0		V
I_{BEX}	Base Cutoff Current	$V_{CE} = 35 \text{ V}, V_{EB} = 0.4 \text{ V}$		0.1	μA
I_{CEX}	Collector Cutoff Current	$V_{CE} = 35 \text{ V}, V_{BE} = 0.4 \text{ V}$		0.1	μA

ON CHARACTERISTICS

h_{FE}	DC Current Gain	$I_C = 0.1 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 1.0 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 10 \text{ mA}, V_{CE} = 1.0 \text{ V}$ $I_C = 150 \text{ mA}, V_{CE} = 2.0 \text{ V}^*$ $I_C = 500 \text{ mA}, V_{CE} = 2.0 \text{ V}^*$	30 60 100 100 20	300	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage*	$I_C = 150 \text{ mA}, I_B = 15 \text{ mA}$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$		0.4 0.75	V V
$V_{BE(sat)}$	Base-Emitter Saturation Voltage	$I_C = 150 \text{ mA}, I_B = 15 \text{ mA}^*$ $I_C = 500 \text{ mA}, I_B = 50 \text{ mA}$	0.75	0.95 1.3	V V

SMALL SIGNAL CHARACTERISTICS

f_T	Current Gain - Bandwidth Product	$I_C = 20 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 100 \text{ MHz}$	200		MHz
C_{cb}	Collector-Base Capacitance	$V_{CB} = 10 \text{ V}, I_E = 0,$ $f = 140 \text{ kHz}$		8.5	pF
C_{eb}	Emitter-Base Capacitance	$V_{BE} = 0.5 \text{ V}, I_C = 0,$ $f = 140 \text{ kHz}$		30	pF
h_{ie}	Input Impedance	$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 1.0 \text{ kHz}$	1.5	15	$k\Omega$
h_{re}	Voltage Feedback Ratio	$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 1.0 \text{ kHz}$	0.1	8.0	$\times 10^{-4}$
h_{fe}	Small-Signal Current Gain	$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 1.0 \text{ kHz}$	60	500	
h_{oe}	Output Admittance	$I_C = 1.0 \text{ mA}, V_{CE} = 10 \text{ V},$ $f = 1.0 \text{ kHz}$	1.0	100	μmhos

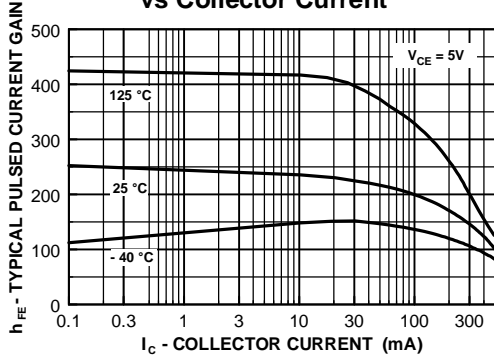
SWITCHING CHARACTERISTICS

t_d	Delay Time	$V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA},$		15	ns
t_r	Rise Time	$I_{B1} = 15 \text{ mA}$		20	ns
t_s	Storage Time	$V_{CC} = 30 \text{ V}, I_C = 150 \text{ mA}$		225	ns
t_f	Fall Time	$I_{B1} = I_{B2} = 15 \text{ mA}$		30	ns

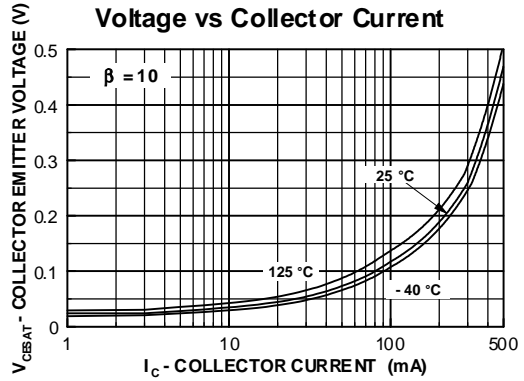
*Pulse Test: Pulse Width $\leq 300 \text{ ms}$, Duty Cycle $\leq 2.0\%$

Typical Characteristics

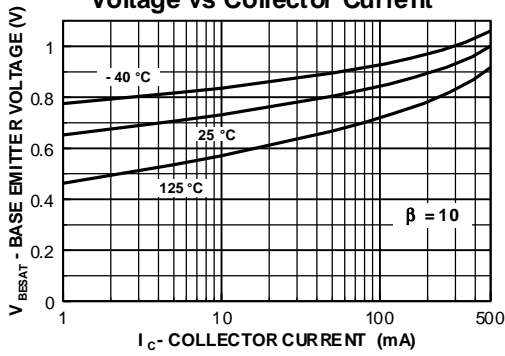
Typical Pulsed Current Gain vs Collector Current



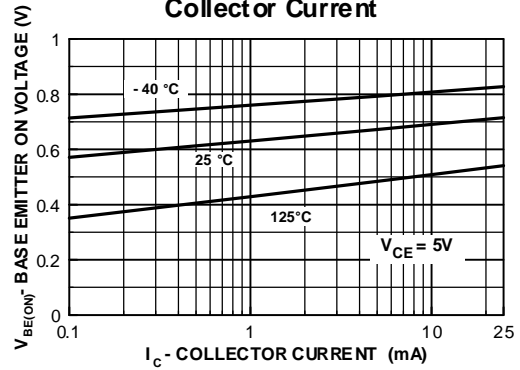
Collector-Emitter Saturation Voltage vs Collector Current



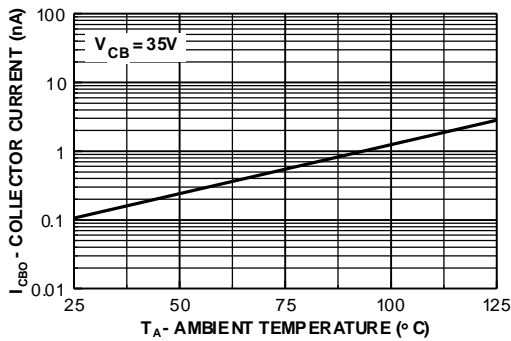
Base-Emitter Saturation Voltage vs Collector Current



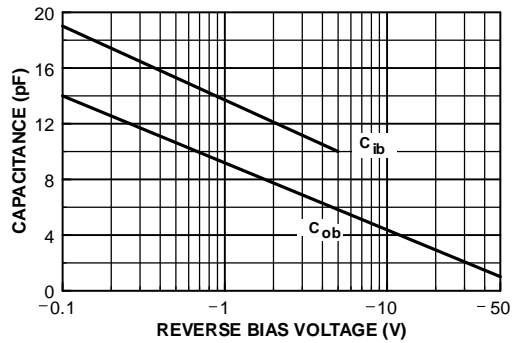
Base Emitter ON Voltage vs Collector Current



Collector-Cutoff Current vs Ambient Temperature

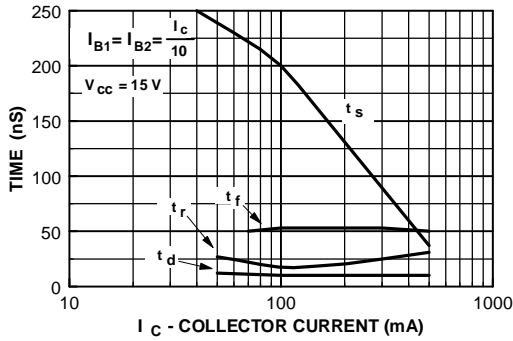


Input and Output Capacitance vs Reverse Bias Voltage

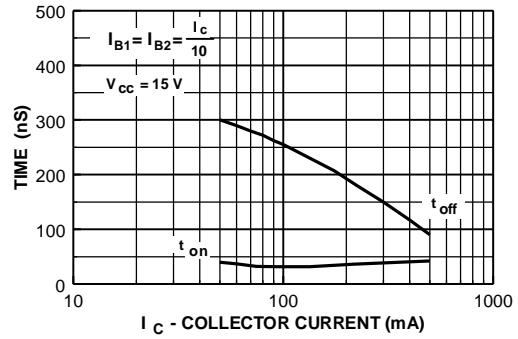


Typical Characteristics (continued)

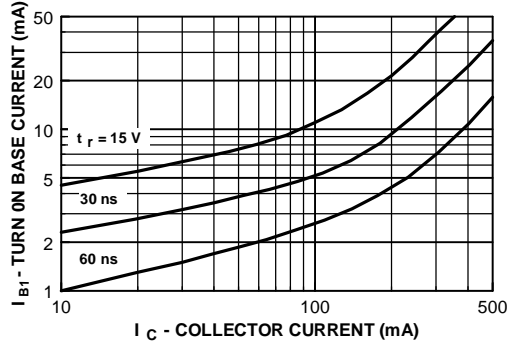
Switching Times vs Collector Current



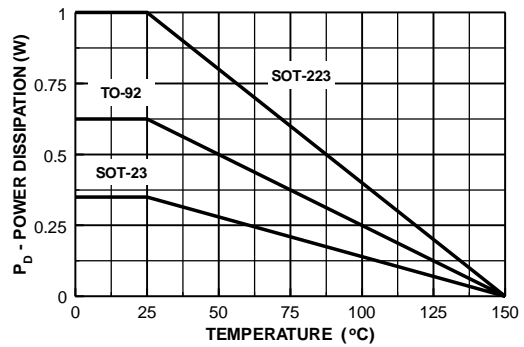
Turn On and Turn Off Times vs Collector Current



Rise Time vs Collector and Turn On Base Currents



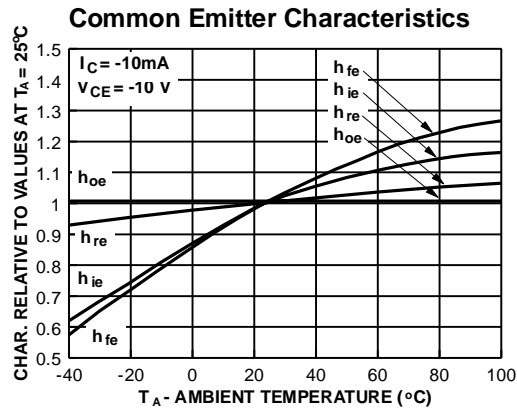
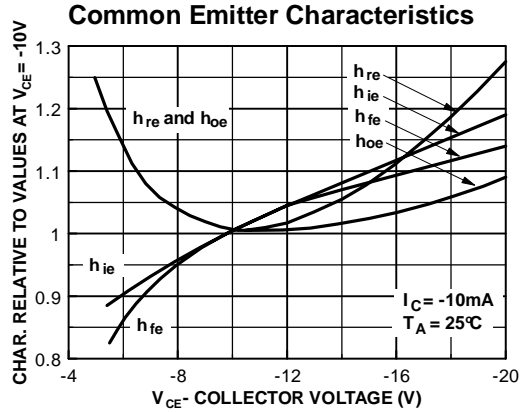
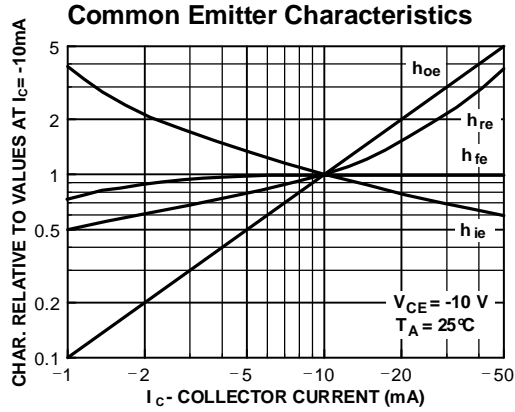
Power Dissipation vs Ambient Temperature



PNP General Purpose Amplifier
(continued)

2N4403 / MMBT4403

Typical Common Emitter Characteristics (f = 1.0kHz)



Test Circuits

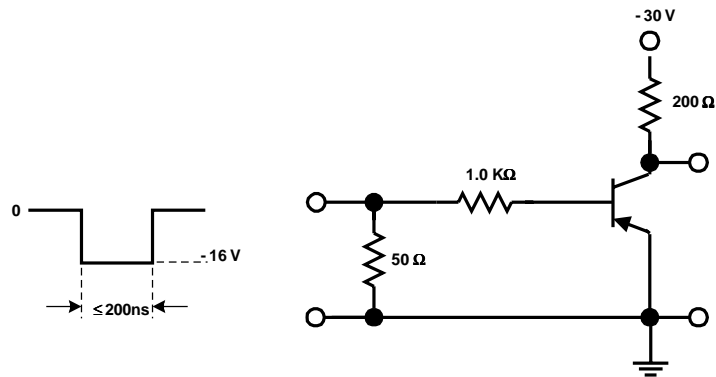


FIGURE 1: Saturated Turn-On Switching Time Test Circuit

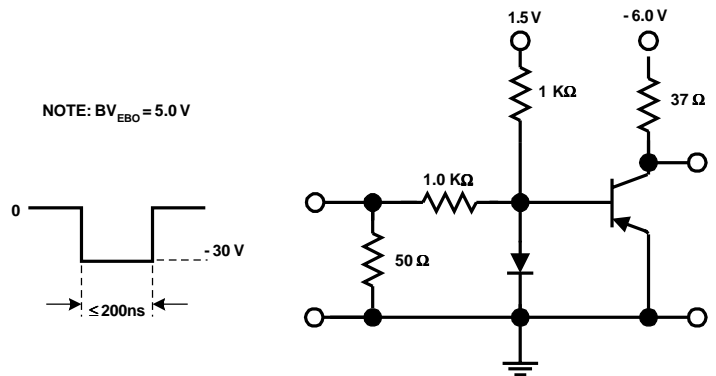


FIGURE 2: Saturated Turn-Off Switching Time Test Circuit

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2N4403

PNP General Purpose Amplifier

Contents

[General description](#) | [Product status/pricing/packaging](#) | [Models](#) | [Application notes](#)

General description

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

[back to top](#)

Product status/pricing/packaging

Product	Product status	Pricing*	Package type	Leads	Package marking	Packing method
2N4403BU	Full Production	\$0.05	TO-92	3	N/A	BULK
2N4403TF	Full Production	\$0.05	TO-92	3	N/A	TAPE REEL
2N4403RM	Full Production	\$0.078	TO-92	3	\$Y&3 2N 4403	AMMO
2N4403	Full Production	\$0.078	TO-92	3	\$Y&3 2N 4403	BULK
2N4403TA	Full Production	\$0.05	TO-92	3	N/A	TAPE REEL
2N4403IUTA	Full Production	\$0.05	TO-92	3	N/A	TAPE REEL
2N4403RP	Full Production	\$0.078	TO-92	3	\$Y&3 2N 4403	AMMO
2N4403RA	Full Production	\$0.078	TO-92	3	\$Y&3 2N 4403	TAPE REEL

* 1,000 piece Budgetary Pricing

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Models

Package & leads	Condition	Temperature range	Software version	Revision date
PSPICE				
TO-92-3	Electrical	25°C	N/A	N/A

[back to top](#)

Application notes

[AN-9006: AN-9006 IGBT Application Note for Camera Strobe](#) (146 K)

Jul 19, 2002

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