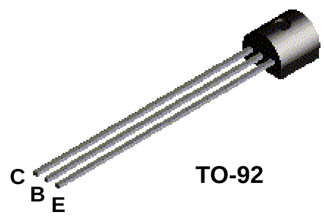
FAIRCHILD
SEMICONDUCTOR™

2N4402



PNP General Purpose Amplifier

This device is designed for use as general purpose amplifiers and switches 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
		2N4402	
P_D	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
$R_{\theta JC}$	Thermal Resistance, Junction to Case	83.3	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient	200	°C/W

PNP General Purpose Amplifier
(continued)

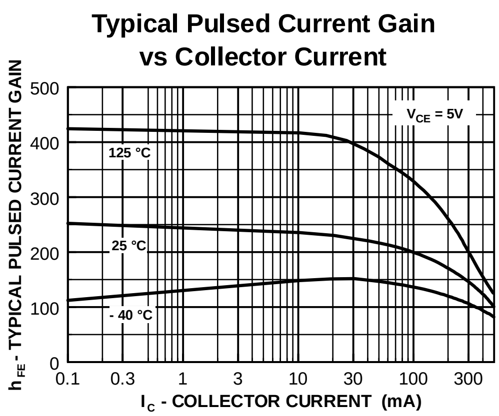
Electrical Characteristics

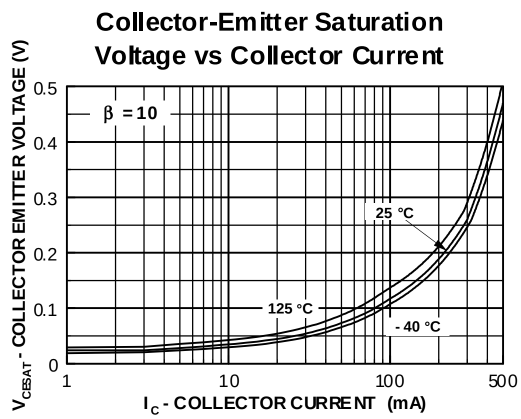
TA = 25°C unless otherwise noted

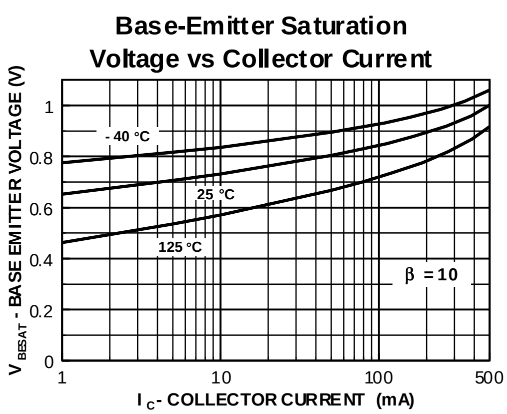
Symbol	Parameter	Test Conditions	Min	Max	Units
OFF CHARACTERISTICS					
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage*	$I_C = 1.0$ mA, $I_B = 0$	40		V
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage	$I_C = 100$ µA, $I_E = 0$	40		V
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage	$I_E = 100$ µA, $I_C = 0$	5.0		V
I_{CEX}	Collector Cutoff Current	$V_{CE} = 35$ V, $V_{EB} = 0.4$ V		0.1	µA
I_{BL}	Base Cutoff Current	$V_{CE} = 35$ V, $V_{EB} = 0.4$ V		0.1	µA
ON CHARACTERISTICS*					
h_{FE}	DC Current Gain	$V_{CE} = 1.0$ V, $I_C = 1.0$ mA $V_{CE} = 1.0$ V, $I_C = 10$ mA $V_{CE} = 2.0$ V, $I_C = 150$ mA $V_{CE} = 2.0$ V, $I_C = 500$ mA	30 50 50 20	 150 	
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage	$I_C = 150$ mA, $I_B = 15$ mA $I_C = 500$ mA, $I_B = 50$ mA		0.40 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 1.30	V V
SMALL SIGNAL CHARACTERISTICS					
C_{ob}	Output Capacitance	$V_{CB} = 10$ V, f = 140 kHz		8.5	pF
C_{ib}	Input Capacitance	$V_{EB} = 0.5$ V, f = 140 kHz		30	pF
h_{fe}	Small-Signal Current Gain	$I_C = 20$ mA, $V_{CE} = 10$ V, f = 100 MHz	1.5		
h_{fe}	Small-Signal Current Gain	$I_C = 1.0$ mA, $V_{CE} = 10$ V,	30	250	
h_{ie}	Input Impedance	f = 1.0 kHz	0.75	7.5	kΩ
h_{re}	Voltage Feedback Ratio		0.10	8.0	$x10^{-4}$
h_{oe}	Output Admittance		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, $V_{BE(off)} = 2.0$ V		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

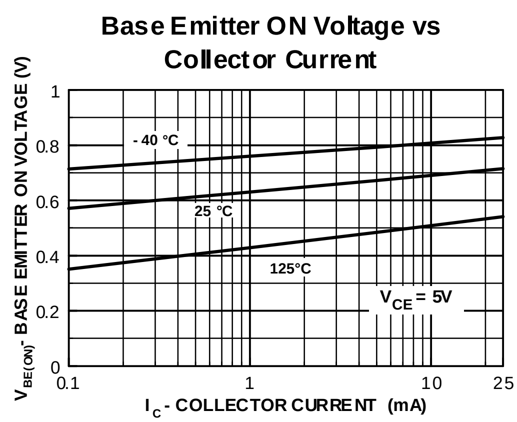
*Pulse Test: Pulse Width ≤ 300 µs, Duty Cycle ≤ 2.0%

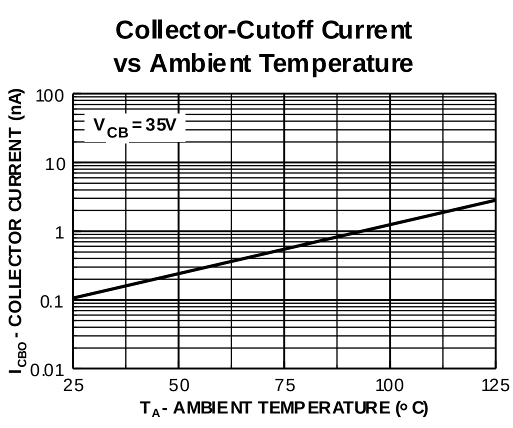
Typical Characteristics

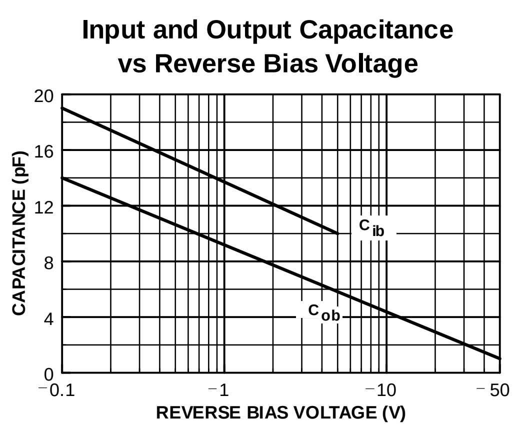






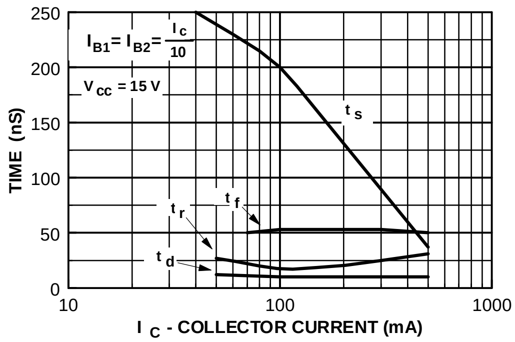




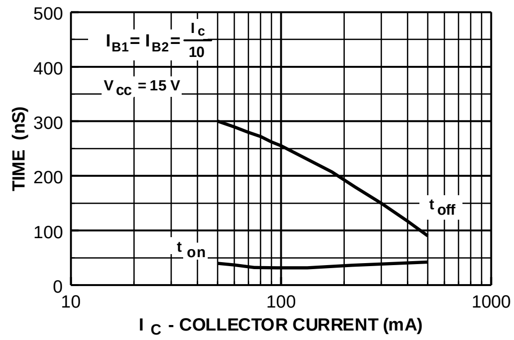


Typical Characteristics (continued)

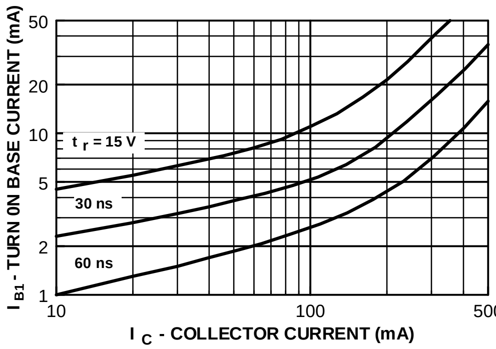
Switching Times vs Collector Current



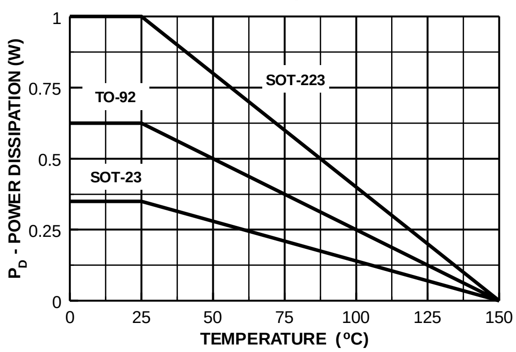
Turn On and Turn Off Times vs Collector Current



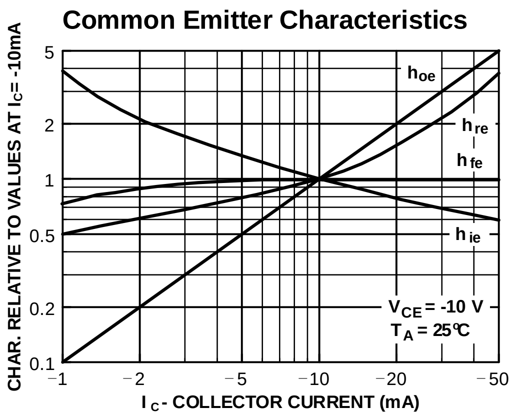
Rise Time vs Collector and Turn On Base Currents

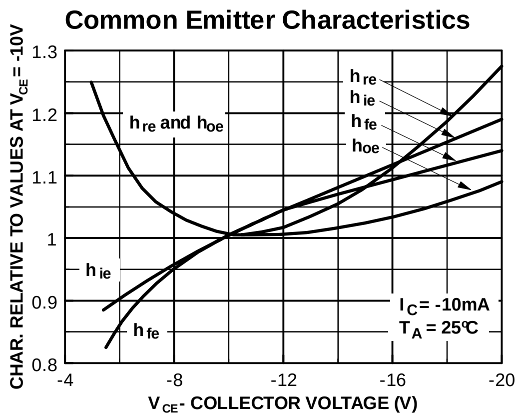


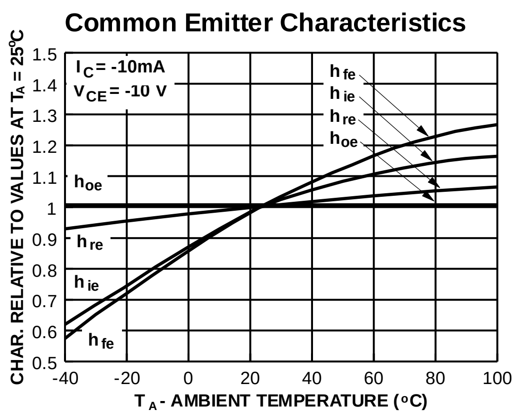
Power Dissipation vs Ambient Temperature



Typical Common Emitter Characteristics (f = 1.0kHz)







Test Circuits

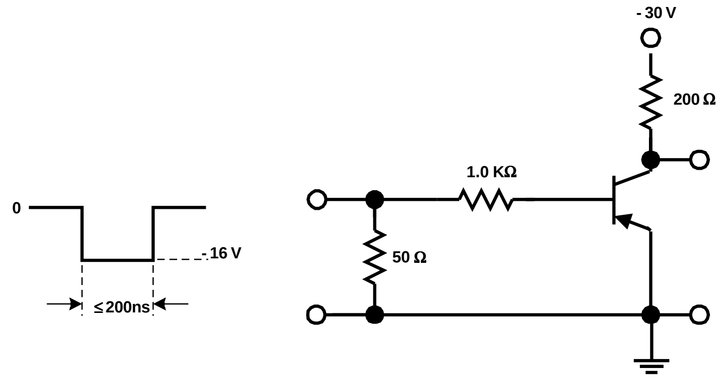


FIGURE 1: Saturated Turn-On Switching Time Test Circuit

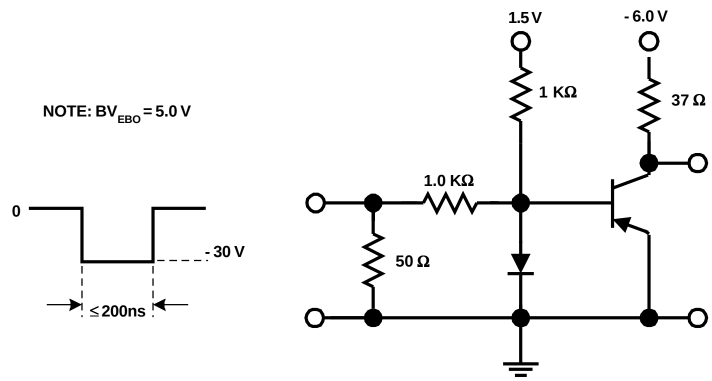


FIGURE 2: Saturated Turn-Off Switching Time Test Circuit

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DOME™	ISOPLANAR™	Quiet Series™	
E²CMOS™	MICROWIRE™	SILENT SWITCHER®	
EnSigna™	OPTOLOGIC™	SMART START™	
FACT™	OPTOPLANAR™	SuperSOT™-3	
FACT Quiet Series™	PACMAN™	SuperSOT™-6	
FAST®	POP™	SuperSOT™-8	

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