

# 2N4402

## PNP General Purpose Amplifier

### Features

- Halogen free available upon request by adding suffix "-HF"
- This device is designed for use as general purpose amplifiers and switches requiring collector currents to 500mA
- Epoxy meets UL 94 V-0 flammability rating
- Moisture Sensitivity Level 1
- Marking: Type number
- Lead Free Finish/Rohs Compliant ("P" Suffix designates Compliant. See ordering information)

### Maximum Ratings\*

Symbol	Rating	Rating	Unit
V <sub>CEO</sub>	Collector-Emitter Voltage	40	V
V <sub>CBO</sub>	Collector-Base Voltage	40	V
V <sub>EBO</sub>	Emitter-Base Voltage	5.0	V
I <sub>C</sub>	Collector Current, Continuous	600	mA
T <sub>J</sub>	Operating Junction Temperature	-55 to +150	°C
T <sub>STG</sub>	Storage Temperature	-55 to +150	°C

### Thermal Characteristics

Symbol	Rating	Max	Unit
P <sub>D</sub>	Total Device Dissipation Derate above 25°C	625 5.0	mW mW/°C
R <sub>JC</sub>	Thermal Resistance, Junction to Case	83.3	°C/W
R <sub>JA</sub>	Thermal Resistance, Junction to Ambient	200	°C/W

### Electrical Characteristics @ 25°C Unless Otherwise Specified

Symbol	Parameter	Min	Max	Units
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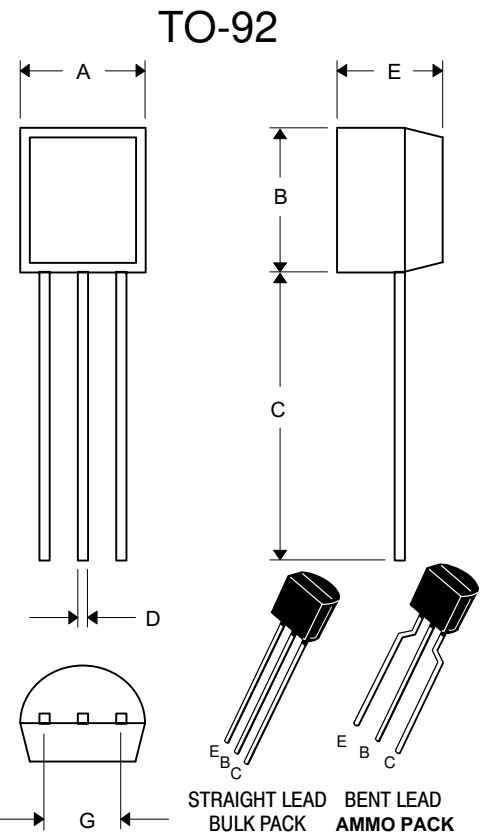
#### OFF CHARACTERISTICS

V <sub>(BR)CEO</sub>	Collector-Emitter Breakdown Voltage* (I <sub>C</sub> =1.0mA, I <sub>B</sub> =0)	40	---	Vdc
V <sub>(BR)CBO</sub>	Collector-Base Breakdown Voltage (I <sub>C</sub> =100iA, I <sub>E</sub> =0)	40	---	Vdc
V <sub>(BR)EBO</sub>	Emitter-Base Breakdown Voltage (I <sub>E</sub> =100iA, I <sub>C</sub> =0)	5.0	---	Vdc
I <sub>CEX</sub>	Collector Cutoff Current (V <sub>CE</sub> =35Vdc, V <sub>EB</sub> =0.4Vdc)	---	0.1	μA
I <sub>BL</sub>	Base Cutoff Current (V <sub>CE</sub> =35Vdc, V <sub>EB</sub> =0.4Vdc)	---	0.1	μA

\* 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.



#### DIMENSIONS

DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	.175	.185	4.45	4.70	
B	.175	.185	4.45	4.70	
C	.500	---	12.70	---	
D	.016	.020	0.41	0.63	
E	.135	.145	3.43	3.68	
G	.095	.105	2.42	2.67	Straight Lead
	.173	.220	4.40	5.60	Bent Lead

\* For ammo packing detailed specification, click here to visit our website of product packaging for details.

2N4402



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Symbol	Parameter	Min	Max	Units
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**ON CHARACTERISTICS\***

$h_{FE}$	DC Current Gain ( $V_{CE}=1.0Vdc, I_C=1.0mA$ ) ( $V_{CE}=1.0Vdc, I_C=10mA$ ) ( $V_{CE}=2.0Vdc, I_C=150mA$ ) ( $V_{CE}=2.0Vdc, I_C=500mA$ )	30 50 50 20	150	---
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage ( $I_C=150mA, I_B=15mA$ ) ( $I_C=500mA, I_B=50mA$ )	--- ---	0.40 0.75	Vdc Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage ( $I_C=150mA, I_B=15mA$ ) ( $I_C=500mA, I_B=50mA$ )	0.75	0.95 1.30	Vdc Vdc

**SMALL-SIGNAL CHARACTERISTICS**

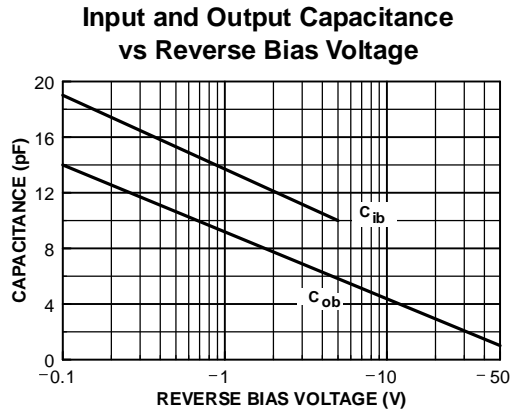
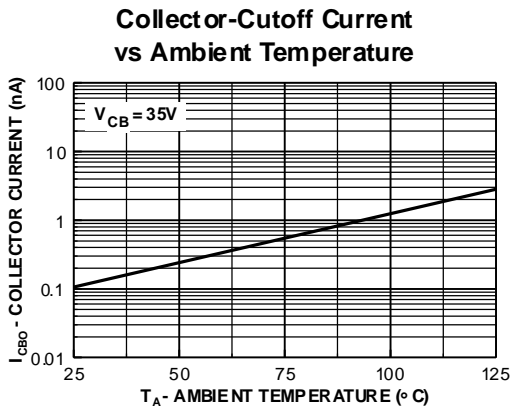
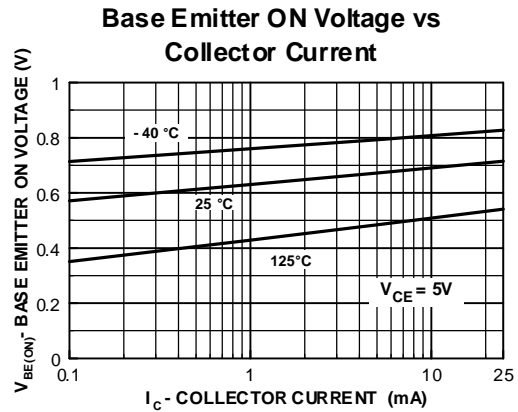
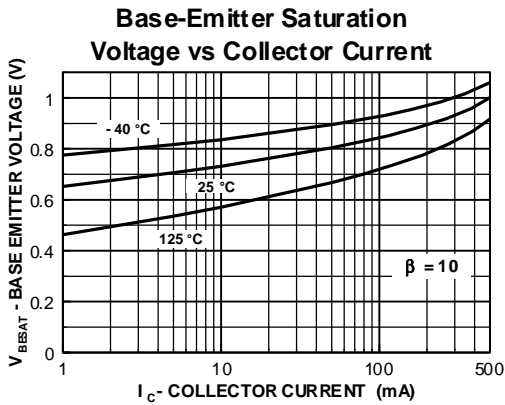
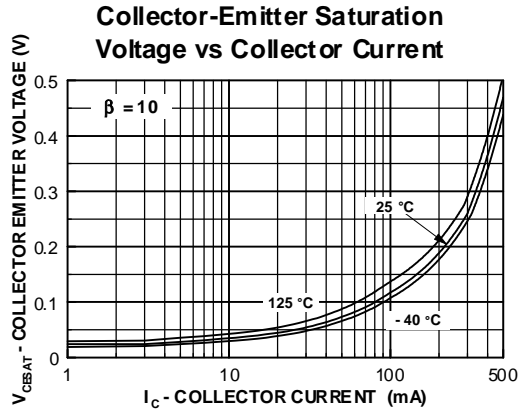
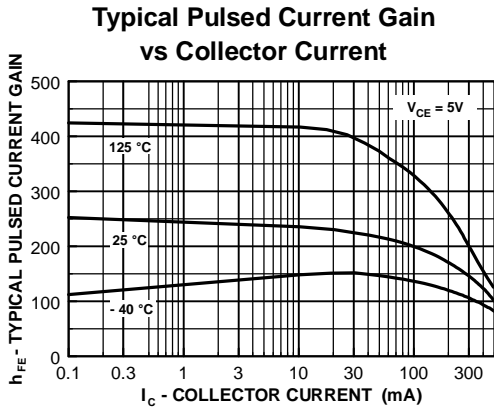
$C_{OB}$	Output Capacitance ( $V_{CB}=10Vdc, f=140KHz$ )	---	8.5	pF
$C_{IB}$	Input Capacitance ( $V_{EB}=0.5Vdc, f=140KHz$ )	---	30	pF
$h_{fe}$	Small-Signal Current Gain ( $I_C=20mA, V_{CE}=10Vdc, f=100MHz$ )	1.5	---	---
$h_{fe}$	Small-Signal Current Gain ( $I_C=1.0mA, V_{CE}=10Vdc, f=1.0KHz$ )	30	250	---
$h_{ie}$	Small-Signal Current Gain ( $I_C=1.0mA, V_{CE}=10Vdc, f=1.0KHz$ )	0.75	7.5	KOHM
$h_{re}$	Small-Signal Current Gain ( $I_C=1.0mA, V_{CE}=10Vdc, f=1.0KHz$ )	0.10	8.0	$\times 10^{-4}$
$h_{oe}$	Small-Signal Current Gain ( $I_C=1.0mA, V_{CE}=10Vdc, f=1.0KHz$ )	1.0	100	umhos

**SWITCHING CHARACTERISTICS**

$T_d$	Delay Time	$V_{CC}=30Vdc, I_C=150mA,$ $I_{B1}=15mA, V_{BE(off)}=2.0Vdc$	---	15	ns
$t_r$	Rise Time		---	20	ns
$t_s$	Storage Time	$V_{CC}=30Vdc, I_C=150mA,$ $I_{B1}=I_{B2}=15mA$	---	225	ns
$t_f$	Fall Time		---	30	ns

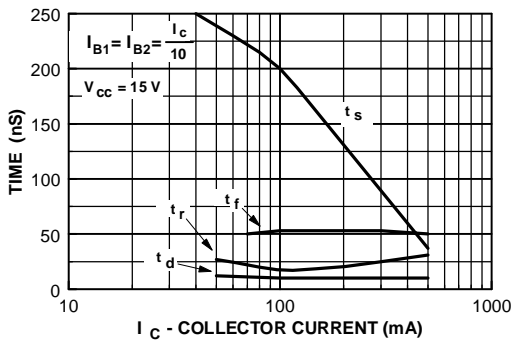
\* Pulse Test: Pulse Width&lt;300us, Duty Cycle&lt;2.0%



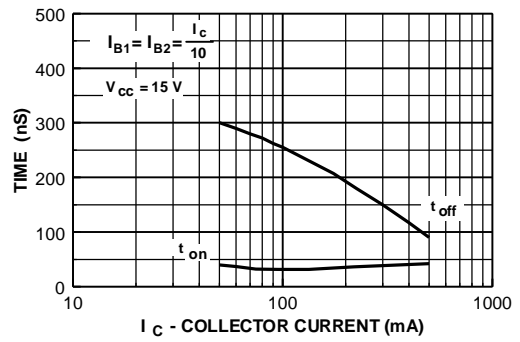


2N4402

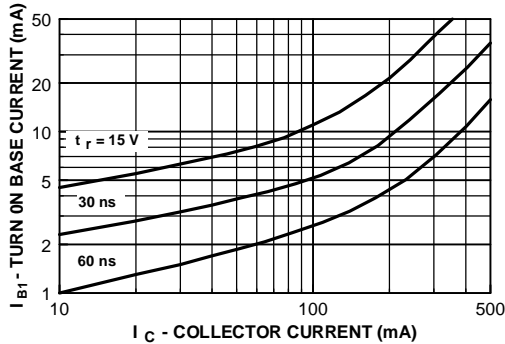
**Switching Times vs Collector Current**



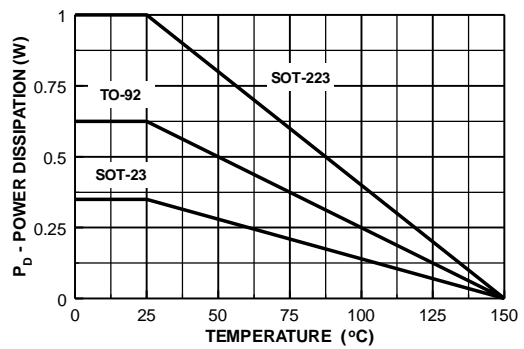
**Turn On and Turn Off Times vs Collector Current**



**Rise Time vs Collector and Turn On Base Currents**



**Power Dissipation vs Ambient Temperature**





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### Ordering Information :

Device	Packing
Part Number-AP	Ammo Packing: 20Kpcs/Carton
Part Number-BP	Bulk: 100Kpcs/Carton

Note : Adding "-HF" suffix for halogen free, eg. Part Number-AP-HF

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