Micro Commercial Components

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2N4400

NPN General Purpose Amplifier

Features

- Lead Free Finish/RoHS Compliant ("P" Suffix designates RoHS Compliant. See ordering information)
- 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
- Moisure Sensitivity Level 1
- Marking:Type number

Maximum Ratings*

Symbol	Rating	Rating	Unit
V_{CEO}	Collector-Emitter Voltage	40	V
V_{CBO}	Collector-Base Voltage	60	V
V_{EBO}	Emitter-Base Voltage	6.0	V
I_C	Collector Current, Continuous	600	mA
T_J	Operating Junction Temperature	-55 to +150	^{O}C
T_{STG}	Storage Temperature	-55 to +150	^{O}C

Thermal Characteristics

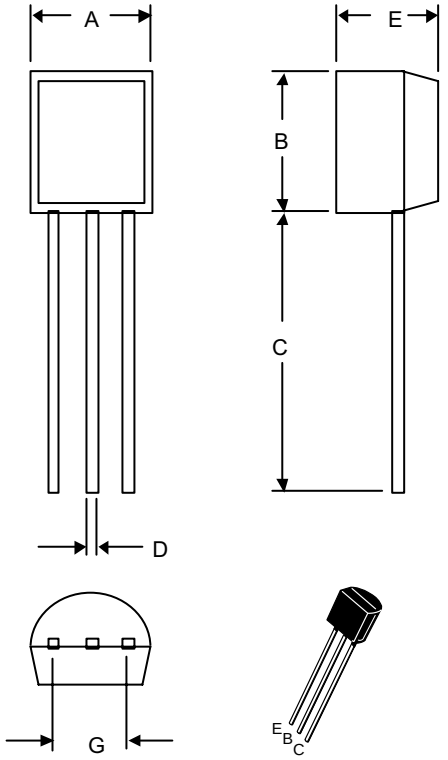
Symbol	Rating	Max	Unit
P_D	Total Device Dissipation Derate above 25^{O}C	625 5.0	mW mW/^{O}C
R_{JC}	Thermal Resistance, Junction to Case	83.3	^{O}C/W
R_{JA}	Thermal Resistance, Junction to Ambient	200	^{O}C/W

Electrical Characteristics @ 25^{O}C Unless Otherwise Specified

Symbol	Parameter	Min	Max	Units
OFF CHARACTERISTICS				
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage* (I_C=1.0mAdc, I_B=0)	40	---	Vdc
$V_{(BR)CBO}$	Collector-Base Breakdown Voltage (I_C=100i Adc, I_E=0)	60	---	Vdc
$V_{(BR)EBO}$	Emitter-Base Breakdown Voltage (I_E=100i Adc, I_C=0)	6.0	---	Vdc
I_{CEX}	Collector Cutoff Current (V_{CE}=35Vdc, V_{EB}=0.4Vdc)	---	0.1	uAdc
I_{BL}	Base Cutoff Current (V_{CE}=35Vdc, V_{EB}=0.4Vdc)	---	0.1	uAdc

* 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.

TO-92

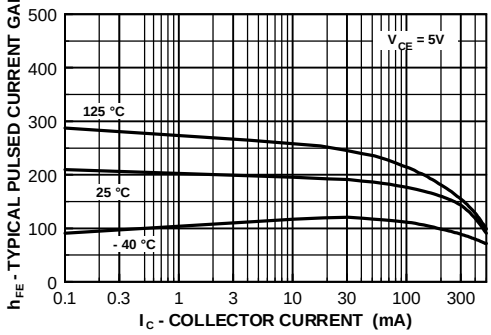


DIMENSIONS					
	INCHES		MM		
DIM	MIN	MAX	MIN	MAX	NOTE
A	.170	.190	4.33	4.83	
B	.170	.190	4.30	4.83	
C	.550	.590	13.97	14.97	
D	.010	.020	0.36	0.56	
E	.130	.160	3.30	3.96	
G	.096	.104	2.44	2.64	

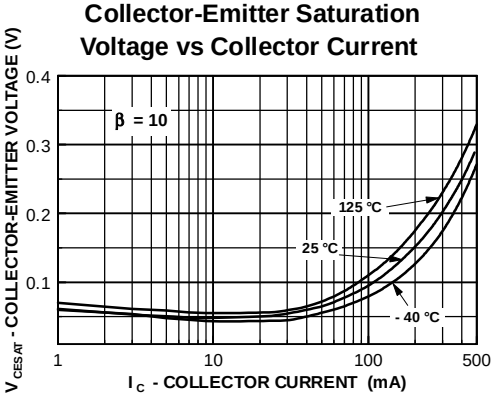
Symbol	Parameter	Min	Max	Units
ON CHARACTERISTICS				
h_{FE}	DC Current Gain			
	(V_{CE}=1.0Vdc, I_C=1.0mAdc)	40		
	(V_{CE}=1.0Vdc, I_C=10mAdc)	40		---
	(V_{CE}=1.0Vdc, I_C=150mAdc)	50	150	
	(V_{CE}=2.0Vdc, I_C=500mAdc)	20		
$V_{CE(sat)}$	Collector-Emitter Saturation Voltage			
	(I_C=150mAdc, I_B=15mAdc)	---	0.40	Vdc
	(I_C=500mAdc, I_B=50mAdc)	---	0.75	Vdc
$V_{BE(sat)}$	Base-Emitter Saturation Voltage			
	(I_C=150mAdc, I_B=15mAdc)	0.75	0.95	Vdc
	(I_C=500mAdc, I_B=50mAdc)		1.20	Vdc
SMALL-SIGNAL CHARACTERISTICS				
C_{OB}	Output Capacitance (V_{CB}=5.0Vdc, f=140KHz)	---	6.5	pF
C_{IB}	Input Capacitance (V_{EB}=0.5Vdc, f=140KHz)	---	30	pF
h_{fe}	Small-Signal Current Gain (I_C=20mAdc, V_{CE}=10Vdc, f=100MHz)	2.0	---	---
h_{fe}	Small-Signal Current Gain (I_C=1.0mAdc, V_{CE}=10Vdc, f=1.0KHz)	150	200	---
h_{ie}	Small-Signal Current Gain (I_C=1.0mAdc, V_{CE}=10Vdc, f=1.0KHz)	0.5	7.5	KOHM
h_{re}	Small-Signal Current Gain (I_C=1.0mAdc, V_{CE}=10Vdc, f=1.0KHz)	0.10	8.0	X 10^{-4}
h_{oe}	Small-Signal Current Gain (I_C=1.0mAdc, V_{CE}=10Vdc, f=1.0KHz)	1.0	30	umhos
SWITCHING CHARACTERISTICS				
T_d	Delay Time	V_{CC}=30Vdc, I_C=150mAdc, I_{B1}=15mAdc, $V_{BE(off)}$=2.0Vdc	---	15	ns
t_r	Rise Time		---	20	ns
t_s	Storage Time	V_{CC}=30Vdc, I_C=150mAdc, I_{B1}=I_{B2}=15mAdc	---	225	ns
t_f	Fall Time		---	30	ns

* Pulse Test: Pulse Width<300us, Duty Cycle<2.0%

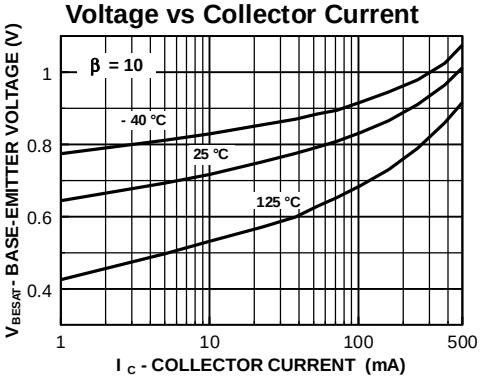
Typical Pulsed Current Gain vs Collector Current



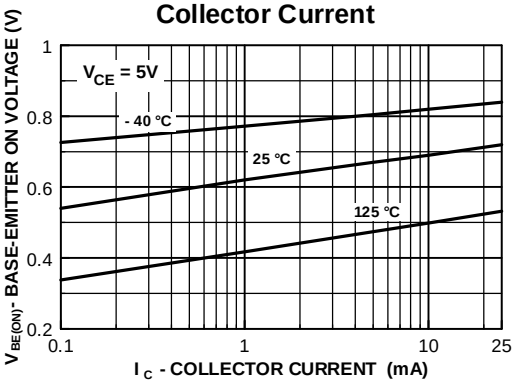
Collector-Emitter Saturation Voltage vs Collector Current



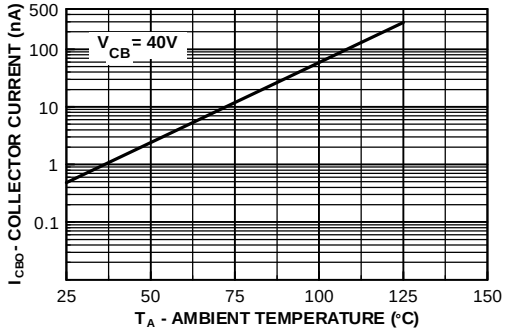
Base-Emitter Saturation Voltage vs Collector Current



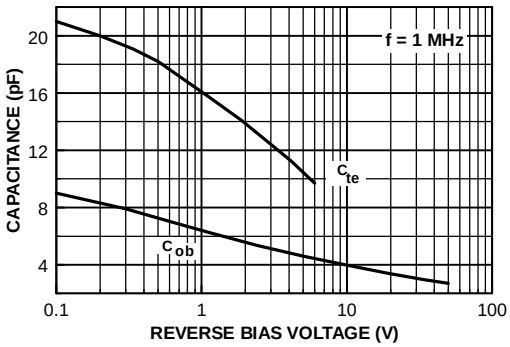
Base-Emitter ON Voltage vs Collector Current



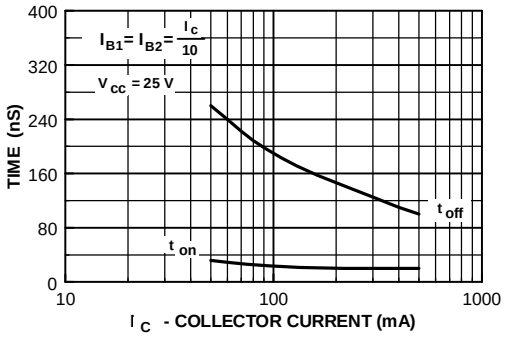
Collector-Cutoff Current vs Ambient Temperature



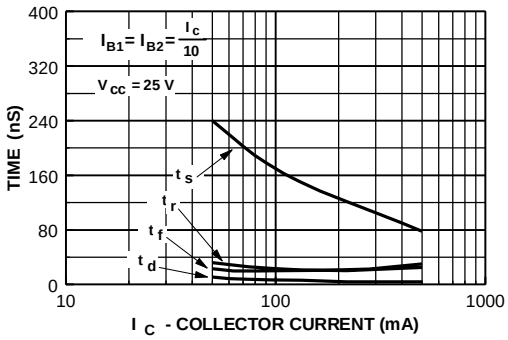
Emitter Transition and Output Capacitance vs Reverse Bias Voltage



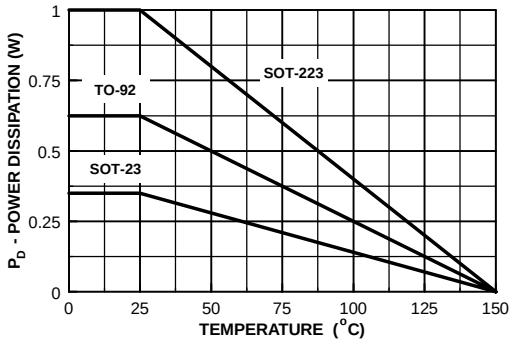
Turn On and Turn Off Times vs Collector Current

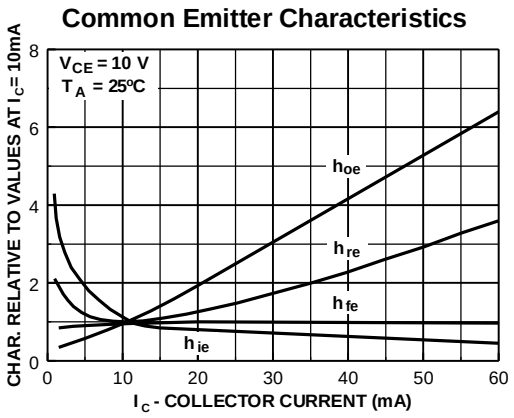


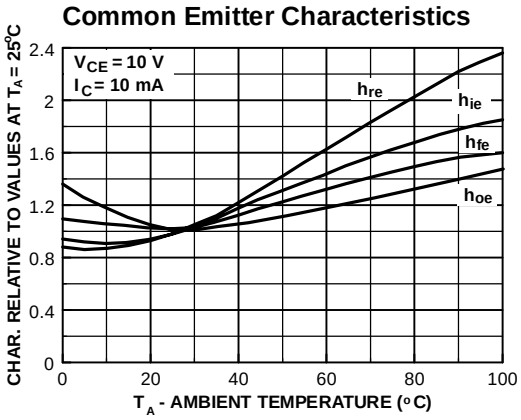
Switching Times vs Collector Current

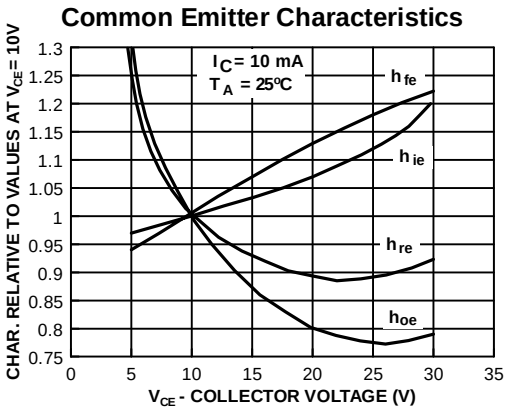


Power Dissipation vs Ambient Temperature




Common Emitter Characteristics
CHAR. RELATIVE TO VALUES AT I_C= 10mA
V_CE = 10 V
T_A = 25°C
h_oe
h_re
h_fe
h_ie
0
2
4
6
8
0
10
20
30
40
50
60
I_C - COLLECTOR CURRENT (mA)


Common Emitter Characteristics
CHAR. RELATIVE TO VALUES AT T_A = 25°C
V_CE = 10 V
I_C = 10 mA
h_re
h_ie
h_fe
h_oe
0
0.4
0.8
1.2
1.6
2
2.4
0
20
40
60
80
100
T_A - AMBIENT TEMPERATURE (°C)


Common Emitter Characteristics
CHAR. RELATIVE TO VALUES AT V_CE = 10V
I_C = 10 mA
T_A = 25°C
h_fe
h_ie
h_re
h_oe
0.75
0.8
0.85
0.9
0.95
1
1.05
1.1
1.15
1.2
1.25
1.3
0
5
10
15
20
25
30
35
V_CE - COLLECTOR VOLTAGE (V)

Ordering Information :

Device	Packing
Part Number-AP	Ammo Packing: 2Kpcs/Ammo Box
Part Number-BP	Bulk: 100Kpcs/Carton

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