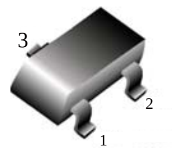
General Purpose Transistor

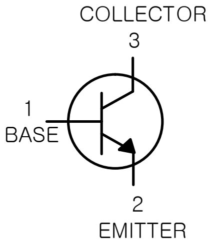
NPN Silicon


SOT–23

- We declare that the material of product compliance with RoHS requirements.

ORDERING INFORMATION

Device	Marking	Shipping†
2N2222AS	1P	3000 / Tape & Reel



MAXIMUM RATINGS (T_A = 25℃)

Rating	Symbol	Max	Unit
Collector−Emitter Voltage	V_{CEO}	40	Vdc
Collector−Base Voltage	V_{CBO}	75	Vdc
Emitter−Base Voltage	V_{EBO}	6.0	Vdc
Collector Current − Continuous	I_C	600	mAdc

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation (Note 1) T_A = 25℃	P_D	350	mW
Thermal Resistance, (Note 1) Junction−to−Ambient	$R_{\theta JA}$	357	℃/W
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−55 to +150	℃

ELECTRICAL CHARACTERISTICS (T_A = 25℃ unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
OFF CHARACTERISTICS				
Collector−Emitter Breakdown Voltage (Note 1) (I_C = 1.0 mAdc, I_B = 0)	$V_{(BR)CEO}$	40	−	Vdc
Collector−Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)	$V_{(BR)CBO}$	75	−	Vdc
Emitter−Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)	$V_{(BR)EBO}$	6.0	−	Vdc
Base Cutoff Current (V_{CE} = 60 Vdc, V_{EB} = 3.0 Vdc)	I_{BL}	−	20	nAdc
Collector Cutoff Current (V_{CE} = 60 Vdc, V_{EB} = 3.0 Vdc)	I_{CEX}	−	10	nAdc

ON CHARACTERISTICS (Note 2)

DC Current Gain	H_{FE}			–
(I_C = 0.1 mAdc, V_{CE} = 10 Vdc)		35	–	
(I_C = 1.0 mAdc, V_{CE} = 10 Vdc)		50	–	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)		75	–	
(I_C = 150 mAdc, V_{CE} = 10 Vdc)		100	300	
(I_C = 500 mAdc, V_{CE} = 10 Vdc)		40	–	
Collector−Emitter Saturation Voltage	$V_{CE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)		–	0.3	
(I_C = 500 mAdc, I_B = 50 mAdc)		–	1.0	
Base−Emitter Saturation Voltage	$V_{BE(sat)}$			Vdc
(I_C = 150 mAdc, I_B = 15 mAdc)		0.6	1.2	
(I_C = 500 mAdc, I_B = 50 mAdc)		–	2.0	

SMALL−SIGNAL CHARACTERISTICS

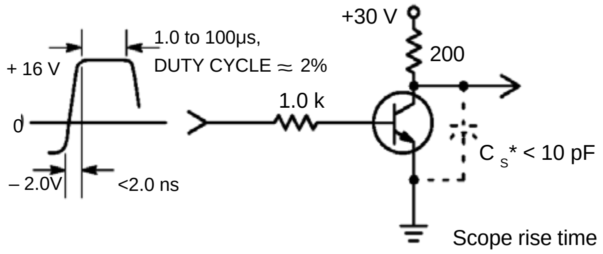
Current−Gain − Bandwidth Product (I_C = 20 mAdc, V_{CE} = 20 Vdc, f = 100 MHz)	f_T	300	–	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	C_{obo}	–	8.0	pF
Input Capacitance (V_{EB} = 0.5 Vdc, I_C = 0, f = 1.0 MHz)	C_{ibo}	–	25	pF
Input Impedance (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz)	h_{ie}	0.25	1.25	kΩ
Voltage Feedback Ratio (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz)	h_{re}	–	4.0	X 10^{-4}
Small−Signal Current Gain (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz)	h_{fe}	75	375	–
Output Admittance (V_{CE} = 10 Vdc, I_C = 10 mAdc, f = 1.0 kHz)	h_{oe}	25	200	μmhos
Noise Figure (V_{CE} = 10 Vdc, I_C = 100 μAdc, R_S = 1.0 k ohms, f = 1.0 kHz)	NF	–	4.0	dB

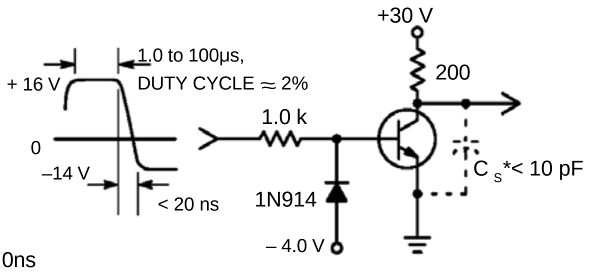
SWITCHING CHARACTERISTICS

Delay Time	(V_{CC} = 30 Vdc, V_{BE} = −0.5 Vdc, I_C = 150 mAdc, I_{B1} = 15 mAdc)	t_d	–	10	ns
Rise Time		t_r	–	25	
Storage Time	(V_{CC} = 30 Vdc, I_C = 150 mAdc, I_{B1} = I_{B2} = 15 mAdc)	t_s	–	225	ns
Fall Time		t_f	–	60	

1. Device mounted on FR-4 PCB 16*16*0.6mm or on 99.5% alumina 10*8*0.6mm
2. Pulse Test: Pulse Width ≤300 μs, Duty Cycle ≤2.0%.

SWITCHING TIME EQUIVALENT TEST CIRCUITS





Scope rise time < 4.0ns
*Total shunt capacitance of test jig, connectors, and oscilloscope.

Figure 1. Turn–On Time

Figure 2. Turn–Off Time

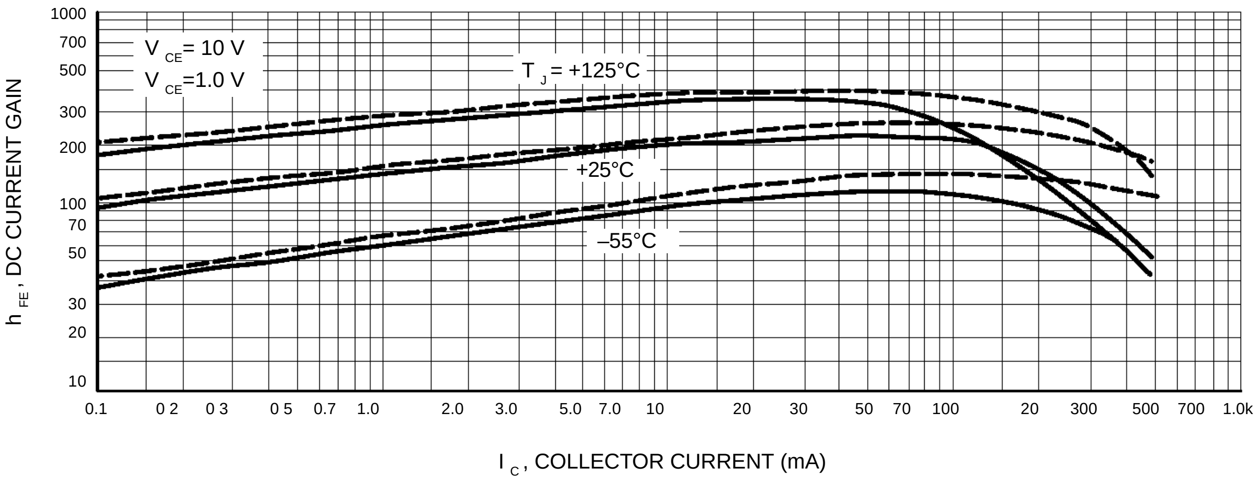


Figure 3. DC Current Gain

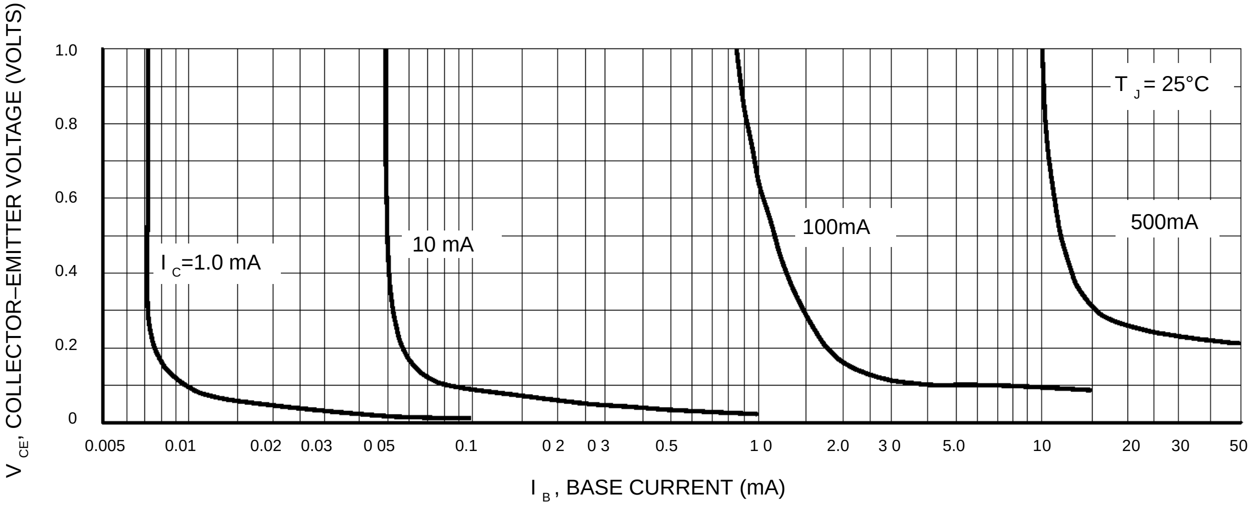


Figure 4. Collector Saturation Region

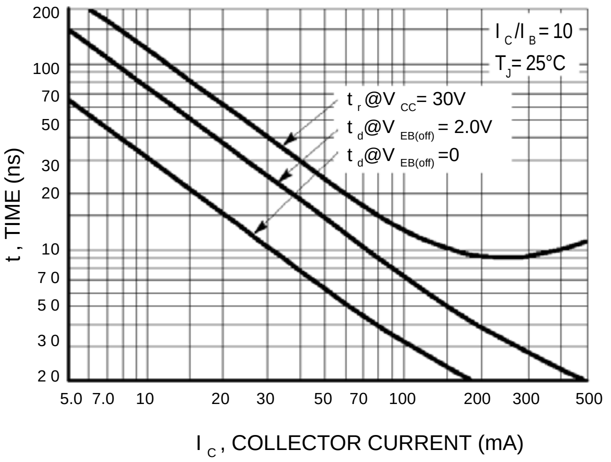


Figure 5. Turn–On Time

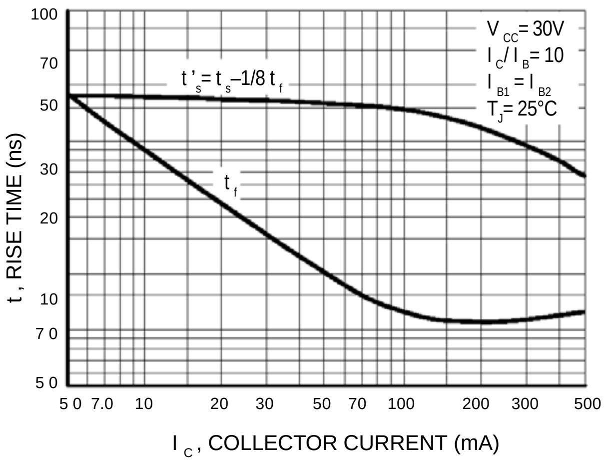


Figure 6. Turn - Off Time

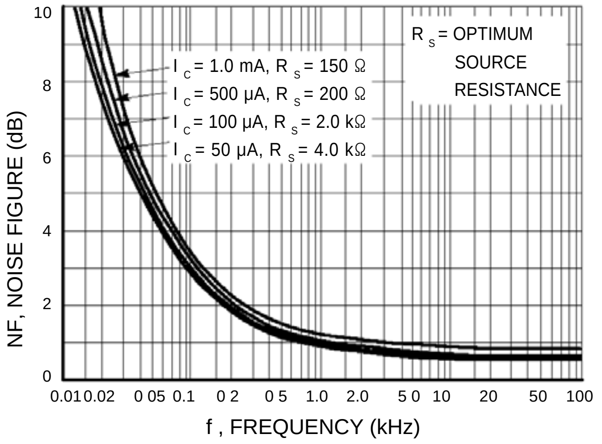


Figure 7. Frequency Effects

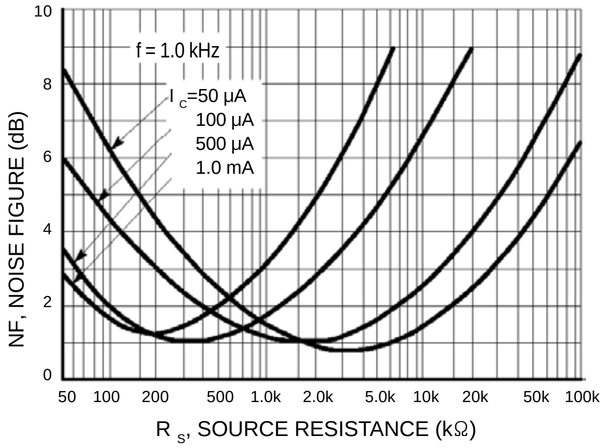


Figure 8. Source Resistance Effects

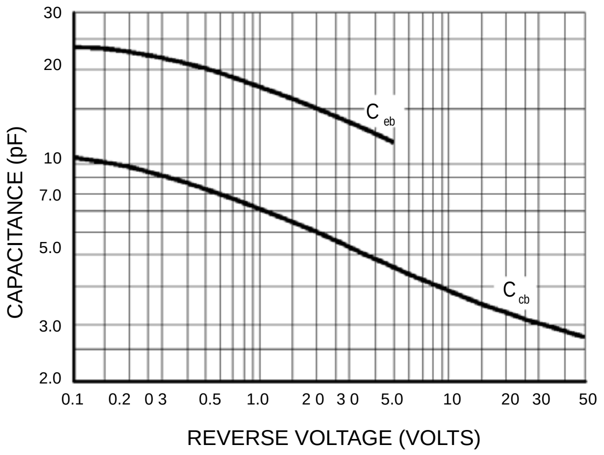


Figure 9. Capacitance

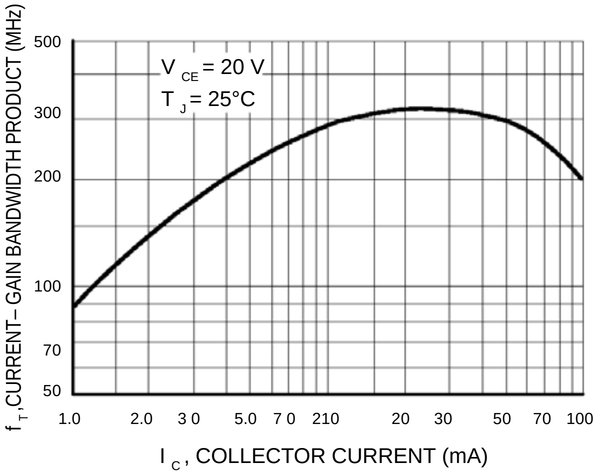


Figure 10. Current– Gain Bandwidth Product

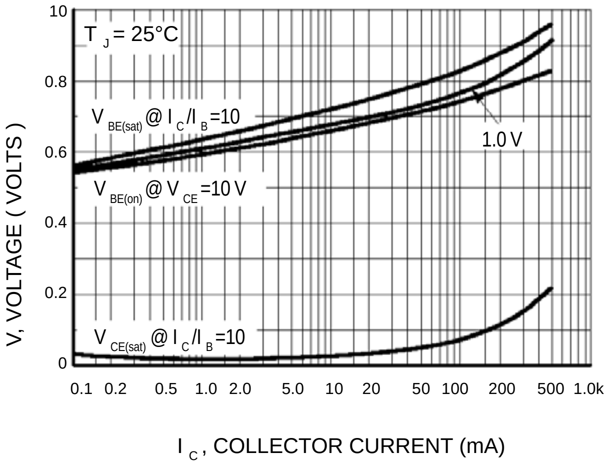


Figure 11. “On” Voltages

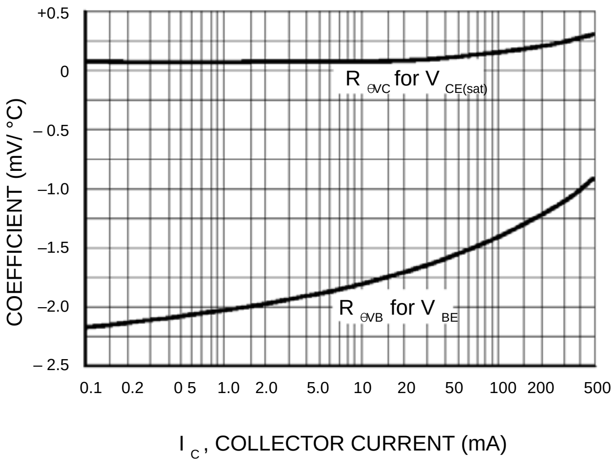


Figure 12. Temperature Coefficients

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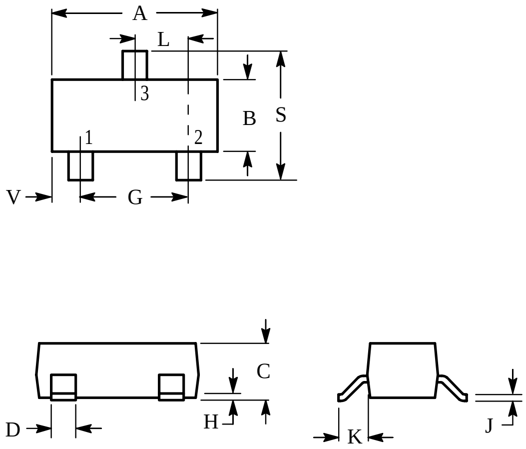

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M,1982
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

PIN 1 BASE
2 EMITTER
3 COLLECTOR