

NPN SILICON SWITCHING TRANSISTOR

Qualified per MIL-PRF-19500/255

Devices

2N2221A	2N2222A
2N2221AL	2N2222AL
2N2221AUA	2N2222AUA
2N2221AUB	2N2222AUB

Qualified Level

JAN
JANTX
JANTXV
JANS
JANHC

MAXIMUM RATINGS

Ratings	Symbol	All Types	Unit
Collector-Emitter Voltage	V_{CEO}	50	Vdc
Collector-Base Voltage	V_{CBO}	75	Vdc
Emitter-Base Voltage	V_{EBO}	6.0	Vdc
Collector Current	I_C	800	mAdc
Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ 2N2221A, L; 2N2222A, L ⁽¹⁾ 2N2221AUA; 2N2222AUA ⁽²⁾ 2N2221AUB; 2N2222AUB ⁽¹⁾	P_T	0.5 0.65 0.50	W
Operating & Storage Junction Temperature Range	T_{op}, T_{stg}	-65 to +200	$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Ambient 2N2221A, L; 2N2222A, L 2N2221AUA; 2N2222AUA 2N2221AUB; 2N2222AUB	$R_{\theta JA}$	325 210 325	$^{\circ}\text{C/W}$

1) Derate linearly 3.08 mW/ $^{\circ}\text{C}$ above $T_A > +37.5^{\circ}\text{C}$

2) Derate linearly 4.76 mW/ $^{\circ}\text{C}$ above $T_A > +63.5^{\circ}\text{C}$



TO-18* (TO-206AA)
2N2221A, 2N2222A



4 PIN*
2N2221AUA, 2N2222AUA



3 PIN*
2N2221AUB, 2N2222AUB

*See appendix A for package outline

ELECTRICAL CHARACTERISTICS ($T_A = 25^{\circ}\text{C}$ unless otherwise noted)

Characteristics	Symbol	Min.	Max.	Unit
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OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 10 \text{ mAdc}$	$V_{(BR)CEO}$	50		Vdc
Collector-Base Cutoff Current $V_{CB} = 75 \text{ Vdc}$ $V_{CB} = 60 \text{ Vdc}$	I_{CBO}		10 10	μAdc ηAdc
Emitter-Base Cutoff Current $V_{EB} = 6.0 \text{ Vdc}$ $V_{EB} = 4.0 \text{ Vdc}$	I_{EBO}		10 10	μAdc ηAdc
Collector-Base Cutoff Current $V_{CE} = 50 \text{ Vdc}$	I_{CES}		50	ηAdc

ELECTRICAL CHARACTERISTICS (con't)

Characteristics	Symbol	Min.	Max.	Unit
ON CHARACTERISTICS ⁽³⁾				
Forward-Current Transfer Ratio I _C = 0.1 mAdc, V _{CE} = 10 Vdc 2N2221A, L, UA, UB 2N2222A, L, UA, UB I _C = 1.0 mAdc, V _{CE} = 10 Vdc 2N2221A, L, UA, UB 2N2222A, L, UA, UB I _C = 10 mAdc, V _{CE} = 10 Vdc 2N2221A, L, UA, UB 2N2222A, L, UA, UB I _C = 150 mAdc, V _{CE} = 10 Vdc 2N2221A, L, UA, UB 2N2222A, L, UA, UB I _C = 500 mAdc, V _{CE} = 10 Vdc 2N2221A, L, UA, UB 2N2222A, L, UA, UB	h _{FE}	30 50 35 75 40 100 40 100 20 30	150 325 120 300	
Collector-Emitter Saturation Voltage I _C = 150 mAdc, I _B = 15 mAdc I _C = 500 mAdc, I _B = 50 mAdc	V _{CE(sat)}		0.3 1.0	Vdc
Base-Emitter Voltage I _C = 150 mAdc, I _B = 15 mAdc I _C = 500 mAdc, I _B = 50 mAdc	V _{BE(sat)}	0.6	1.2 2.0	Vdc

DYNAMIC CHARACTERISTICS

Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0 \text{ mAdc}, V_{CE} = 10 \text{ Vdc}, f = 1.0 \text{ kHz}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB	h_{fe}		30 50	
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 20 \text{ mAdc}, V_{CE} = 20 \text{ Vdc}, f = 100 \text{ MHz}$	$ h_{fe} $		2.5	
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	C_{obo}		8.0	pF
Input Capacitance $V_{EB} = 0.5 \text{ Vdc}, I_C = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	C_{ibo}		25	pF

SWITCHING CHARACTERISTICS

Turn-On Time See Figure 8 of MIL-PRF-19500/255	t_{on}		35	ns
Turn-Off Time See Figure 9 of MIL-PRF-19500/255	t_{off}		300	ns

(3) Pulse Test: Pulse Width = 300 μ s, Duty Cycle $\leq$ 2.0%.