

## 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

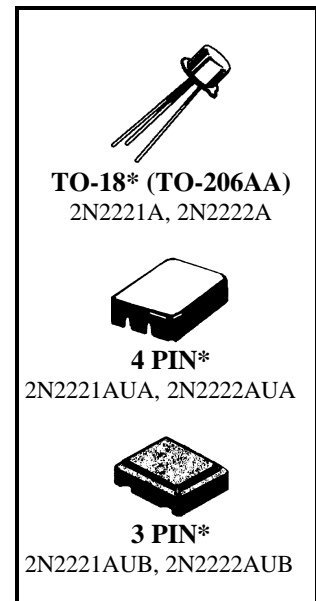
Ratings	Symbol	All Types	Unit
Collector-Emitter Voltage	$V_{CEO}$	50	Vdc
Collector-Base Voltage	$V_{CBO}$	75	Vdc
Emitter-Base Voltage	$V_{EBO}$	6.0	Vdc
Collector Current	$I_C$	800	mAdc
Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ 2N2221A, L; 2N2222A, L <sup>(1)</sup> 2N2221AUA; 2N2222AUA <sup>(2)</sup> 2N2221AUB; 2N2222AUB <sup>(1)</sup>	$P_T$	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	$^{\circ}\text{C}/\text{W}$

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  $T_A > +63.5^{\circ}\text{C}$



\*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	$\mu\text{Adc}$ $\eta\text{Adc}$
Emitter-Base Cutoff Current $V_{EB} = 6.0 \text{ Vdc}$ $V_{EB} = 4.0 \text{ Vdc}$	$I_{EBO}$		10 10	$\mu\text{Adc}$ $\eta\text{Adc}$
Collector-Base Cutoff Current $V_{CE} = 50 \text{ Vdc}$	$I_{CES}$		50	$\eta\text{Adc}$

**ELECTRICAL CHARACTERISTICS (con't)**

Characteristics	Symbol	Min.	Max.	Unit
<b>ON CHARACTERISTICS <sup>(3)</sup></b>				
Forward-Current Transfer Ratio $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB	$h_{FE}$	30		
$I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB		50	150	
$I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB		35	325	
$I_C = 150 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB		40		
$I_C = 500 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB		100	120	
		40	300	
Collector-Emitter Saturation Voltage $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}$ $I_C = 500 \text{ mA dc}, I_B = 50 \text{ mA dc}$	$V_{CE(sat)}$		0.3 1.0	Vdc
Base-Emitter Voltage $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}$ $I_C = 500 \text{ mA dc}, I_B = 50 \text{ mA dc}$	$V_{BE(sat)}$	0.6	1.2 2.0	Vdc

**DYNAMIC CHARACTERISTICS**

Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ V dc}, f = 1.0 \text{ kHz}$ 2N2221A, L, UA, UB 2N2222A, L, UA, UB	$h_{fe}$		30 50	
Magnitude of Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 20 \text{ mA dc}, V_{CE} = 20 \text{ V dc}, f = 100 \text{ MHz}$	$ h_{fe} $		2.5	
Output Capacitance $V_{CB} = 10 \text{ V dc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{obo}$		8.0	pF
Input Capacitance $V_{EB} = 0.5 \text{ V dc}, I_C = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$	$C_{ibo}$		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 $\mu$ s, Duty Cycle  $\leq$  2.0%.