

## 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

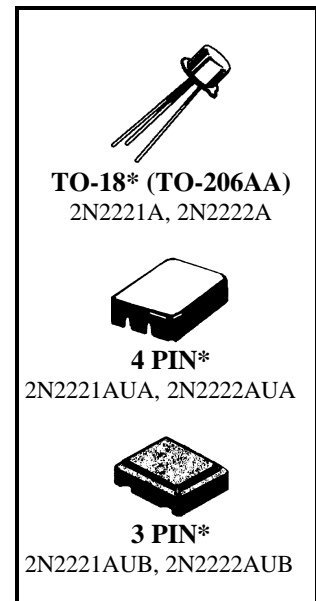
| Ratings  | Symbol            | All Types           | Unit               |
|--|-------------------|---------------------|--------------------|
| Collector-Emitter Voltage  | $V_{CEO}$         | 50                  | Vdc                |
| Collector-Base Voltage   | $V_{CBO}$         | 75                  | Vdc                |
| Emitter-Base Voltage   | $V_{EBO}$         | 6.0                 | Vdc                |
| Collector Current  | $I_C$             | 800                 | mAdc               |
| Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$<br>2N2221A, L; 2N2222A, L <sup>(1)</sup><br>2N2221AUA; 2N2222AUA <sup>(2)</sup><br>2N2221AUB; 2N2222AUB <sup>(1)</sup> | $P_T$             | 0.5<br>0.65<br>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<br>2N2221A, L; 2N2222A, L<br>2N2221AUA; 2N2222AUA<br>2N2221AUB; 2N2222AUB | $R_{\theta JA}$ | 325<br>210<br>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 |
|-----------------|--------|------|------|------|
|-----------------|--------|------|------|------|

### OFF CHARACTERISTICS

|   |               |    |          |                                     |
|---|---------------|----|----------|-------------------------------------|
| Collector-Emitter Breakdown Voltage<br>$I_C = 10 \text{ mAdc}$                          | $V_{(BR)CEO}$ | 50 |          | Vdc                                 |
| Collector-Base Cutoff Current<br>$V_{CB} = 75 \text{ Vdc}$<br>$V_{CB} = 60 \text{ Vdc}$ | $I_{CBO}$     |    | 10<br>10 | $\mu\text{Adc}$<br>$\eta\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 6.0 \text{ Vdc}$<br>$V_{EB} = 4.0 \text{ Vdc}$ | $I_{EBO}$     |    | 10<br>10 | $\mu\text{Adc}$<br>$\eta\text{Adc}$ |
| Collector-Base Cutoff Current<br>$V_{CE} = 50 \text{ Vdc}$                              | $I_{CES}$     |    | 50       | $\eta\text{Adc}$                    |

**ELECTRICAL CHARACTERISTICS (con't)**

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

**DYNAMIC CHARACTERISTICS**

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

**SWITCHING CHARACTERISTICS**

|  |           |  |     |          |
|--|-----------|--|-----|----------|
| Turn-On Time<br>See Figure 8 of MIL-PRF-19500/255  | $t_{on}$  |  | 35  | $\eta s$ |
| Turn-Off Time<br>See Figure 9 of MIL-PRF-19500/255 | $t_{off}$ |  | 300 | $\eta s$ |

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

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