

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

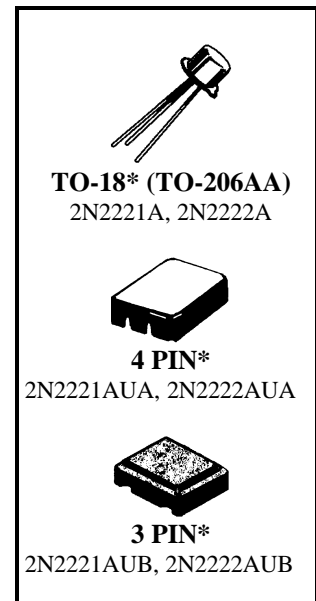
| Ratings | Symbol | All Types | Unit |
|--|-------------------|---------------------|--------------------|
| Collector-Emitter Voltage | V_{CEO} | 50 | Vdc |
| Collector-Base Voltage | V_{CBO} | 75 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 6.0 | Vdc |
| Collector Current | I_C | 800 | mAdc |
| Total 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 $T_A > +63.5^{\circ}\text{C}$



*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 $I_C = 10 \text{ mAdc}$ | $V_{(BR)CEO}$ | 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 $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ 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 | | |
| | | 40 | 120 | |
| 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 μ s, Duty Cycle \leq 2.0%.