

NPN SILICON TRANSISTOR

Qualified per MIL-PRF-19500/366

Devices

| | | | |
|---------|---------|---------|---------|
| 2N3498 | 2N3499 | 2N3500 | 2N3501 |
| 2N3498L | 2N3499L | 2N3500L | 2N3501L |

Qualified Level

JAN
JANTX
JANTXV
JANS

MAXIMUM RATINGS

| Ratings | Symbol | 2N3498* 2N3499* | 2N3500* 2N3501* | Unit |
|--|----------------|---------------------------|--------------------|-------------|
| Collector-Emitter Voltage | V_{CEO} | 100 | 150 | Vdc |
| Collector-Base Voltage | V_{CBO} | 100 | 150 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 6.0 | 6.0 | Vdc |
| Collector Current | I_C | 500 | 300 | mAdc |
| Total Power Dissipation | P_T | @ $T_A = 25^{\circ}C$ (1) | 1.0 | W |
| | | @ $T_C = 25^{\circ}C$ (2) | 5.0 | W |
| Operating & Storage Junction Temp. Range | T_J, T_{stg} | -55 to +200 | | $^{\circ}C$ |

THERMAL CHARACTERISTICS

| Characteristics | Symbol | Max. | Unit |
|--------------------------------------|-----------------|------|---------------|
| Thermal Resistance: Junction-to-Case | $R_{\theta JC}$ | 35 | $^{\circ}C/W$ |
| Junction-to-Ambient | $R_{\theta JA}$ | 175 | |

*Electrical characteristics for "L" suffix devices are identical to the "non L" corresponding devices

1) Derate linearly 5.71 W/ $^{\circ}C$ for $T_A > 25^{\circ}C$

2) Derate linearly 28.6 W/ $^{\circ}C$ for $T_C > 25^{\circ}C$



TO-5*
2N3498L, 2N3499L
2N3500L, 2N3501L



TO-39* (TO-205AD)
2N3498, 2N3499
2N3500, 2N3501

*See appendix A for package outline

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

| Characteristics | Symbol | Min. | Max. | Unit |
|-----------------|--------|------|------|------|
|-----------------|--------|------|------|------|

OFF CHARACTERISTICS

| | | | | |
|--|----------------------------------|---------------|------------|------------|
| Collector-Emitter Breakdown Voltage $I_C = 10$ mAdc | 2N3498, 2N3499 2N3500, 2N3501 | $V_{(BR)CEO}$ | 100 150 | Vdc |
| Collector-Base Cutoff Current $V_{CB} = 50$ Vdc | 2N3498, 2N3499 | I_{CBO} | 50 | η Adc |
| $V_{CB} = 75$ Vdc | 2N3500, 2N3501 | | 50 | η Adc |
| $V_{CB} = 100$ Vdc | 2N3498, 2N3499 | | 10 | μ Adc |
| $V_{CB} = 150$ Vdc | 2N3500, 2N3501 | | 10 | μ Adc |
| Emitter-Base Cutoff Current $V_{EB} = 4.0$ Vdc | | I_{EBO} | 25 | η Adc |
| $V_{EB} = 6.0$ Vdc | | | 10 | μ Adc |

ELECTRICAL CHARACTERISTICS (con't)

| Characteristics | | Symbol | Min. | Max. | Unit |
|---|----------------------------------|---------------|---------------|------------|------|
| ON CHARACTERISTICS ⁽³⁾ | | | | | |
| Forward-Current Transfer Ratio $I_C = 0.1 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3498, 2N3500 2N3499, 2N3501 | h_{FE} | 20 35 | | |
| $I_C = 1.0 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3498, 2N3500 2N3499, 2N3501 | | 25 50 | | |
| $I_C = 10 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3498, 2N3500 2N3499, 2N3501 | | 35 75 | | |
| $I_C = 150 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3498, 2N3500 2N3499, 2N3501 | | 40 100 | 120 300 | |
| $I_C = 300 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3500 2N3501 | | 15 20 | | |
| $I_C = 500 \text{ mA dc}, V_{CE} = 10 \text{ V dc}$ | 2N3498 2N3499 | | 15 20 | | |
| Collector-Emitter Saturation Voltage $I_C = 10 \text{ mA dc}, I_B = 1.0 \text{ mA dc}$ | All Types | | $V_{CE(sat)}$ | | 0.2 |
| $I_C = 300 \text{ mA dc}, I_B = 30 \text{ mA dc}$ | 2N3498, 2N349 | 0.6 | | | |
| $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}$ | 2N3500, 2N3501 | 0.4 | | | |
| Base-Emitter Saturation Voltage $I_C = 10 \text{ mA dc}, I_B = 1.0 \text{ mA dc}$ | All Types | $V_{BE(sat)}$ | | 0.8 | Vdc |
| $I_C = 300 \text{ mA dc}, I_B = 30 \text{ mA dc}$ | 2N3498, 2N3499 | | 1.4 | | |
| $I_C = 150 \text{ mA dc}, I_B = 15 \text{ mA dc}$ | 2N3500, 2N3501 | | 1.2 | | |

DYNAMIC CHARACTERISTICS

| | | | | | |
|--|----------------------------------|------------|-----|-----------|----|
| Forward Current Transfer Ratio, Magnitude $I_C = 20 \text{ mA dc}, V_{CE} = 20 \text{ V dc}, f = 100 \text{ MHz}$ | | $ h_{fe} $ | 1.5 | 8.0 | |
| Output Capacitance $V_{CB} = 10 \text{ V dc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$ | 2N3498, 2N3499 2N3500, 2N3501 | C_{obo} | | 10 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} | | 80 | pF |

SWITCHING CHARACTERISTICS

| | | | | | |
|---|--|-----------|--|------|----|
| Turn-On Time $V_{EB} = 5 \text{ V dc}; I_C = 150 \text{ mA dc}; I_{B1} = 15 \text{ mA dc}$ | | t_{on} | | 115 | ns |
| Turn-Off Time $I_C = 150 \text{ mA dc}; I_{B1} = I_{B2} = -15 \text{ mA dc}$ | | t_{off} | | 1150 | ns |

SAFE OPERATING AREA

| | | | | | |
|---|----------------|--|--|--|--|
| DC Tests | | | | | |
| $T_C = +25^\circ\text{C}, t_r \geq 10 \text{ ns}; 1 \text{ Cycle}, t = 1.0 \text{ s}$ | | | | | |
| Test 1 | | | | | |
| $V_{CE} = 10 \text{ V dc}, I_C = 500 \text{ mA dc}$ | 2N3498, 2N3499 | | | | |
| $V_{CE} = 16.67 \text{ V dc}, I_C = 300 \text{ mA dc}$ | 2N3500, 2N3501 | | | | |
| Test 2 | | | | | |
| $V_{CE} = 50 \text{ V dc}, I_C = 100 \text{ mA dc}$ | All Types | | | | |
| Test 3 | | | | | |
| $V_{CE} = 80 \text{ V dc}, I_C = 40 \text{ mA dc}$ | All Types | | | | |
| Clamped Switching | | | | | |
| $T_A = +25^\circ\text{C}$ | | | | | |
| Test 1 | | | | | |
| $I_B = 85 \text{ mA dc}, I_C = 500 \text{ mA dc}$ | 2N3498, 2N3499 | | | | |
| $I_B = 50 \text{ mA dc}, I_C = 300 \text{ mA dc}$ | 2N3500, 2N3501 | | | | |

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