

**2N3501**

## Features

- Meets MIL-S-19500/366
- Collector-Base Voltage 150V
- Collector Current: 500 mA
- Fast Switching 1265 nS

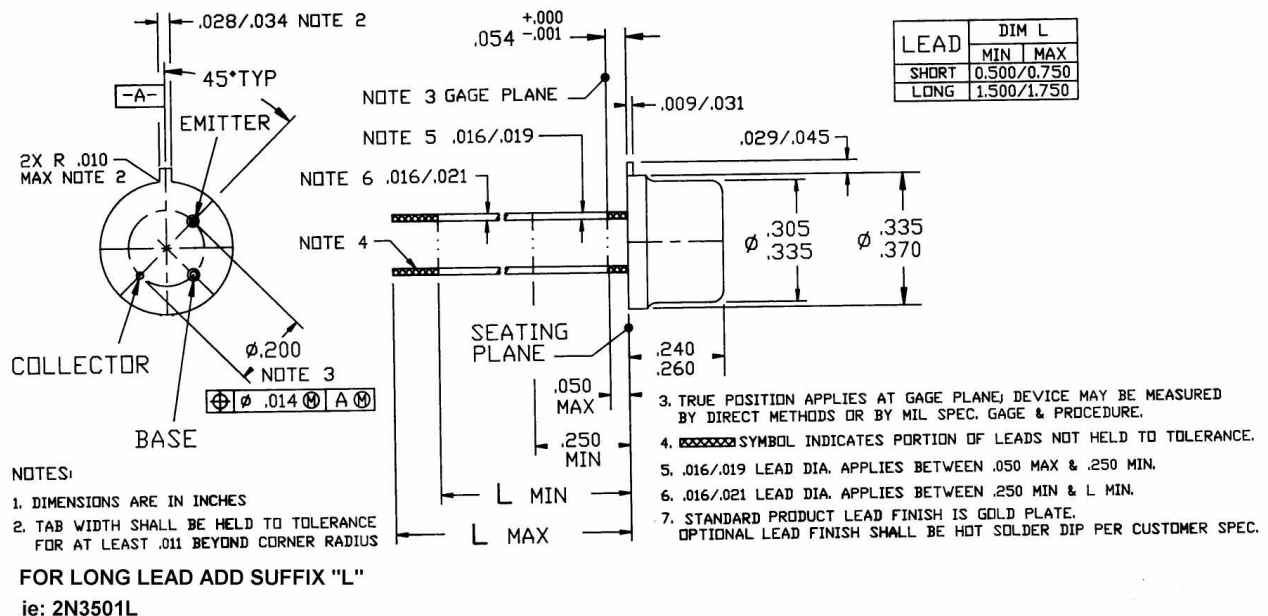
**150 Volts  
500mAmps**

**NPN  
BIPOLAR  
TRANSISTOR**

## Maximum Ratings

| RATING                                                                                    | SYMBOL          | MAX.           | UNIT                          |
|-------------------------------------------------------------------------------------------|-----------------|----------------|-------------------------------|
| Collector-Emitter Voltage                                                                 | $V_{CEO}$       | 150            | Vdc                           |
| Collector-Base Voltage                                                                    | $V_{CBO}$       | 150            | Vdc                           |
| Emitter-Base Voltage                                                                      | $V_{EBO}$       | 6.0            | Vdc                           |
| Collector Current—Continuous                                                              | $I_C$           | 300            | mAdc                          |
| Total Device Dissipation<br>@ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 1.0<br>5.71    | Watt<br>mW/ $^\circ\text{C}$  |
| Total Device Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$           | 5.0<br>28.6    | Watts<br>mW/ $^\circ\text{C}$ |
| Operating Temperature Range                                                               | $T_J$           | -55 to<br>+200 | $^\circ\text{C}$              |
| Storage Temperature Range                                                                 | $T_S$           | -55 to<br>+200 | $^\circ\text{C}$              |
| Thermal Resistance, Junction to Ambient                                                   | $R_{\theta JA}$ | 175            | $^\circ\text{C/W}$            |
| Thermal Resistance, Junction to Case                                                      | $R_{\theta JC}$ | 35             | $^\circ\text{C/W}$            |

## Mechanical Outline



## Electrical Parameters (T<sub>A</sub> @ 25°C unless otherwise specified)

| CHARACTERISTICS                                                                                                                                                                                                                                                                                                                                                                      | SYMBOL               | MIN.                              | TYP.                             | MAX.                              | UNIT |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------|----------------------------------|-----------------------------------|------|
| <b>Off Characteristics</b>                                                                                                                                                                                                                                                                                                                                                           |                      |                                   |                                  |                                   |      |
| Collector-Emitter Breakdown Voltage(1)<br>(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 0)                                                                                                                                                                                                                                                                                             | BV <sub>CEO</sub>    | 150                               | --                               | --                                | Vdc  |
| Collector-Base Breakdown Voltage<br>(I <sub>C</sub> = 10 μAdc, I <sub>E</sub> = 0)                                                                                                                                                                                                                                                                                                   | BV <sub>CBO</sub>    | 150                               | --                               | --                                | Vdc  |
| Emitter-Base Breakdown Voltage<br>(I <sub>E</sub> = 10 μAdc, I <sub>C</sub> = 0)                                                                                                                                                                                                                                                                                                     | BV <sub>EBO</sub>    | 6.0                               | --                               | --                                | Vdc  |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 75 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 75 Vdc, I <sub>E</sub> = 0, T <sub>A</sub> = 150°C)                                                                                                                                                                                                                                 | I <sub>CBO</sub>     | --<br>--                          | --<br>--                         | 0.05<br>50                        | μAdc |
| Emitter Cutoff Current<br>(V <sub>EB(off)</sub> = 4.0 Vdc, I <sub>C</sub> = 0)                                                                                                                                                                                                                                                                                                       | I <sub>EBO</sub>     | --                                | --                               | 25                                | nAdc |
| D.C. Current Gain<br>(I <sub>C</sub> = 0.1 mAdc, V <sub>CE</sub> = 10 Vdc)<br>(I <sub>C</sub> = 1.0 mAdc, V <sub>CE</sub> = 10 Vdc)<br>(I <sub>C</sub> = 10 mAdc, V <sub>CE</sub> = 10 Vdc)(1)<br>(I <sub>C</sub> = 150 mAdc, V <sub>CE</sub> = 10 Vdc)(1)<br>(I <sub>C</sub> = 150 mAdc, V <sub>CE</sub> = 10Vdc) @ 55C<br>(I <sub>C</sub> = 300 mAdc, V <sub>CE</sub> = 10 Vdc)(1) | h <sub>FE</sub>      | 35<br>50<br>75<br>100<br>45<br>20 | --<br>--<br>--<br>--<br>--<br>-- | --<br>--<br>--<br>300<br>--<br>-- | --   |
| Collector-Emitter Saturation Voltage(1)<br>(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc)<br>(I <sub>C</sub> = 150 mAdc, I <sub>B</sub> = 15 mAdc)                                                                                                                                                                                                                            | V <sub>CE(Sat)</sub> | --<br>--                          | --<br>--                         | 0.2<br>0.4                        | Vdc  |
| Base-Emitter Saturation Voltage(1)<br>(I <sub>C</sub> = 10 mAdc, I <sub>B</sub> = 1.0 mAdc)<br>(I <sub>C</sub> = 150 mAdc, I <sub>B</sub> = 15 mAdc)                                                                                                                                                                                                                                 | V <sub>BE(Sat)</sub> | --<br>--                          | --<br>--                         | 0.8<br>1.2                        | Vdc  |
| Magnitude of common emitter small-signal short-circuit forward current transfer ratio<br>(V <sub>CE</sub> = 20 Vdc, I <sub>C</sub> = 20 mAdc, f = 100 MHz)                                                                                                                                                                                                                           | h <sub>fe</sub>      | 1.5                               | --                               | 8<br>--                           |      |
| Output Capacitance<br>(V <sub>CB</sub> = 10 Vdc, I <sub>E</sub> = 0, 100kHz ≤ f ≤ 1MHz)                                                                                                                                                                                                                                                                                              | C <sub>OBO</sub>     | --                                | --                               | 8.0                               | pf   |
| Input Capacitance<br>(V <sub>EB</sub> = 0.5 Vdc, I <sub>C</sub> = 0, 100kHz ≤ f ≤ 100MHz)                                                                                                                                                                                                                                                                                            | C <sub>IBo</sub>     | --                                | --                               | 80                                | pf   |
| Small -signal Current Gain<br>(I <sub>C</sub> = 10mAdc, V <sub>CE</sub> = 10Vdc, f = 1.0 kHz)                                                                                                                                                                                                                                                                                        | h <sub>fe</sub>      | 75                                | --                               | 300                               |      |
| Noise figure<br>(V <sub>CE</sub> = 10Vdc, I <sub>C</sub> = 0.5mAdc; R <sub>g</sub> = 1kohms, f = 1MHz)                                                                                                                                                                                                                                                                               | NF                   |                                   |                                  | 16                                | dB   |
| Noise figure<br>(V <sub>CE</sub> = 10Vdc, I <sub>C</sub> = 0.5mAdc; R <sub>g</sub> = 1kohms, f = 1MHz)                                                                                                                                                                                                                                                                               | NF                   |                                   |                                  | 6                                 | dB   |
| Turn - on time<br>(V <sub>EB</sub> = 12Vdc, I <sub>C</sub> = 150mAdc, I <sub>B1</sub> = 15mAdc)                                                                                                                                                                                                                                                                                      | t <sub>on</sub>      |                                   |                                  | 115                               | nS   |
| Turn - off time<br>(I <sub>C</sub> = 150mAdc, I <sub>B1</sub> = I <sub>B2</sub> = -15mAdc)                                                                                                                                                                                                                                                                                           | t <sub>off</sub>     |                                   |                                  | 1150                              | nS   |
|                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                   |                                  |                                   |      |
|                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                   |                                  |                                   |      |
|                                                                                                                                                                                                                                                                                                                                                                                      |                      |                                   |                                  |                                   |      |

(1) Pulse Test: Pulse Width ≤ 300 ms, Duty Cycle ≤ 2.0%