

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/369

### Devices

2N3441

### Qualified Level

JANTX

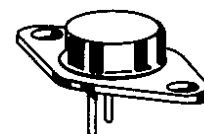
### MAXIMUM RATINGS

| Ratings                                                              | Symbol         | Value       | Units              |
|----------------------------------------------------------------------|----------------|-------------|--------------------|
| Collector-Emitter Voltage                                            | $V_{CEO}$      | 140         | Vdc                |
| Collector-Base Voltage                                               | $V_{CBO}$      | 160         | Vdc                |
| Collector-Emitter Voltage                                            | $V_{CER}$      | 150         | Vdc                |
| Emitter-Base Voltage                                                 | $V_{EBO}$      | 7.0         | Vdc                |
| Base Current                                                         | $I_B$          | 2.0         | Adc                |
| Collector Current                                                    | $I_C$          | 3.0         | Adc                |
| Total Power Dissipation @ $T_A = +25^{\circ}\text{C}$ <sup>(1)</sup> | $P_T$          | 3.0         | W                  |
| @ $T_C = +25^{\circ}\text{C}$ <sup>(2)</sup>                         |                | 25          | W                  |
| Operating & Storage Junction Temperature Range                       | $T_J, T_{stg}$ | -65 to +200 | $^{\circ}\text{C}$ |

### THERMAL CHARACTERISTICS

| Characteristics                      | Symbol          | Max. | Unit                 |
|--------------------------------------|-----------------|------|----------------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 7.0  | $^{\circ}\text{C/W}$ |
| Junction-to-Ambient                  | $R_{\theta JA}$ | 58.5 | $^{\circ}\text{C/W}$ |

- 1) Derate linearly @ 17.1 mW/ $^{\circ}\text{C}$  for  $T_A > +25^{\circ}\text{C}$
- 2) Derate linearly @ 143 mW/ $^{\circ}\text{C}$  for  $T_C > +25^{\circ}\text{C}$



TO-66\* (TO-213AA)

\*See Appendix A for Package Outline

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

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

### OFF CHARACTERISTICS

|                                                                                            |               |     |     |      |
|--------------------------------------------------------------------------------------------|---------------|-----|-----|------|
| Collector-Emitter Voltage<br>$I_C = 100 \text{ mAdc}$                                      | $V_{(BR)CEO}$ | 140 |     | Vdc  |
| Collector-Emitter Breakdown Voltage<br>$I_C = 100 \text{ mAdc}, R_{BE} = 100 \Omega$       | $V_{(BR)CER}$ | 150 |     | Vdc  |
| Collector-Emitter Breakdown Voltage<br>$I_C = 100 \text{ mAdc}, V_{BE} = -1.5 \text{ Vdc}$ | $V_{(BR)CEX}$ | 160 |     | Vdc  |
| Collector-Base Cutoff Current<br>$V_{CB} = 140 \text{ Vdc}, V_{BE} = -1.5 \text{ Vdc}$     | $I_{CEX}$     |     | 1.0 | mAdc |
| Emitter-Base Cutoff Current<br>$V_{EB} = 7.0 \text{ Vdc}$                                  | $I_{EBO}$     |     | 1.0 | mAdc |

**ELECTRICAL CHARACTERISTICS (con't)**

| Characteristics                                                                                                                                                                               | Symbol        | Min.           | Max. | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|------|------|
| <b>ON CHARACTERISTICS <sup>(3)</sup></b>                                                                                                                                                      |               |                |      |      |
| Forward-Current Transfer Ratio<br>$I_C = 50 \text{ mAdc}, V_{CE} = 4.0 \text{ Vdc}$<br>$I_C = 0.5 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$<br>$I_C = 1.0 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$ | $h_{FE}$      | 50<br>25<br>10 | 100  |      |
| Collector-Emitter Saturation Voltage<br>$I_C = 0.5 \text{ Adc}, I_B = 50 \text{ mAdc}$                                                                                                        | $V_{CE(sat)}$ |                | 1.0  | Vdc  |
| Base-Emitter Voltage<br>$I_C = 0.5 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$                                                                                                                     | $V_{BE(on)}$  |                | 1.7  | Vdc  |

**DYNAMIC CHARACTERISTICS**

|                                                                                                                                                                 |            |     |     |    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-----|----|
| Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C = 0.5 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}, f = 100 \text{ kHz}$ | $ h_{fe} $ | 4.0 | 40  |    |
| Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C = 0.5 \text{ Adc}, V_{CE} = 4.0 \text{ Vdc}$                                                  | $h_{fe}$   | 15  | 100 |    |
| Output Capacitance<br>$V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$                                                           | $C_{obo}$  |     | 300 | pF |

**SWITCHING CHARACTERISTICS**

|                                                                                                 |           |  |     |               |
|-------------------------------------------------------------------------------------------------|-----------|--|-----|---------------|
| Turn-On Time<br>$V_{CC} = 30 \text{ Vdc}; I_C = 0.5 \text{ Adc}; I_B = 50 \text{ mAdc}$         | $t_{on}$  |  | 8.0 | $\mu\text{s}$ |
| Turn-Off Time<br>$V_{CC} = 30 \text{ Vdc}; I_C = 0.5 \text{ Adc}; I_B = -I_B = 50 \text{ mAdc}$ | $t_{off}$ |  | 15  | $\mu\text{s}$ |

**SAFE OPERATING AREA**

|                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DC Tests</b><br>$T_C = +25^\circ\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$<br><b>Test 1</b><br>$V_{CE} = 8.33 \text{ Vdc}, I_C = 3.0 \text{ Adc}$<br><b>Test 2</b><br>$V_{CE} = 30 \text{ Vdc}, I_C = 833 \text{ mAdc}$<br><b>Test 3</b><br>$V_{CE} = 140 \text{ Vdc}, I_C = 178.5 \text{ mAdc}$ |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

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