

## PNP POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/535

### Devices

2N5003

2N5005

### Qualified Level

JAN  
JANTX  
JANTXV

### MAXIMUM RATINGS

| Ratings                                                                                                                 | Symbol               | Value       | Unit               |
|-------------------------------------------------------------------------------------------------------------------------|----------------------|-------------|--------------------|
| Collector-Emitter Voltage                                                                                               | $V_{CEO}$            | 80          | Vdc                |
| Collector-Base Voltage                                                                                                  | $V_{CBO}$            | 100         | Vdc                |
| Emitter-Base Voltage                                                                                                    | $V_{EBO}$            | 5.5         | Vdc                |
| Collector Current                                                                                                       | $I_C$<br>$I_C^{(3)}$ | 5.0<br>10   | Adc                |
| Total Power Dissipation<br>@ $T_A = +25^{\circ}\text{C}$ <sup>(1)</sup><br>@ $T_C = +25^{\circ}\text{C}$ <sup>(2)</sup> | $P_T$                | 2.0<br>58   | 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    | $R_{\theta JC}$ | 3.0  | $^{\circ}\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$ | 88   | $^{\circ}\text{C}/\text{W}$ |

1) Derate linearly 11.4 mW/ $^{\circ}\text{C}$  for  $T_A > +25^{\circ}\text{C}$

2) Derate linearly 331 mW/ $^{\circ}\text{C}$  for  $T_C > +25^{\circ}\text{C}$

3) This value applies for  $P_W \leq 8.3$  ms, duty cycle  $\leq 1\%$



TO-59

\*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 Breakdown Voltage<br>$I_C = 100$ mAdc,                                                | $V_{(BR)CEO}$ | 80 |            | Vdc                     |
| Collector-Emitter Cutoff Current<br>$V_{CE} = 40$ Vdc, $I_B = 0$                                        | $I_{CEO}$     |    | 50         | $\mu\text{Adc}$         |
| Collector-Emitter Cutoff Current<br>$V_{CE} = 60$ Vdc, $V_{BE} = 0$<br>$V_{CE} = 100$ Vdc, $V_{BE} = 0$ | $I_{CES}$     |    | 1.0<br>1.0 | $\mu\text{Adc}$<br>mAdc |
| Emitter-Base Cutoff Current<br>$V_{BE} = 4.0$ Vdc, $I_C = 0$<br>$V_{BE} = 5.5$ Vdc, $I_C = 0$           | $I_{EBO}$     |    | 1.0<br>1.0 | MAdc<br>MAdc            |

# 2N5003, 2N5005 JAN SERIES

## ELECTRICAL CHARACTERISTICS (Con't)

| Characteristics                                                                                                                                                                               | Symbol        | Min.           | Max.        | Unit |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------|-------------|------|
| <b>ON CHARACTERISTICS</b>                                                                                                                                                                     |               |                |             |      |
| Forward-Current Transfer Ratio<br>$I_C = 50 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$<br>$I_C = 2.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$<br>$I_C = 5.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$ | 2N5003        | 20<br>30<br>20 | 90          |      |
| $I_C = 50 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}$<br>$I_C = 2.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$<br>$I_C = 5.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$                                   | 2N5005        | 50<br>70<br>40 | 200         |      |
| Base-Emitter Voltage Non-saturated<br>$V_{CE} = 5.0 \text{ Adc}, I_C = 2.5 \text{ Adc}$                                                                                                       | $V_{BE}$      |                | 1.45        | Vdc  |
| Collector-Emitter Saturation Voltage<br>$I_C = 2.5 \text{ Adc}, I_B = 250 \text{ mAdc}$<br>$I_C = 5.0 \text{ Adc}, I_B = 500 \text{ mAdc}$                                                    | $V_{CE(sat)}$ |                | 0.75<br>1.5 | Vdc  |
| Base-Emitter Saturation Voltage<br>$I_C = 2.5 \text{ Adc}, I_B = 250 \text{ mAdc}$<br>$I_C = 5.0 \text{ Adc}, I_B = 500 \text{ mAdc}$                                                         | $V_{BE(sat)}$ |                | 1.45<br>2.2 | Vdc  |

## DYNAMIC CHARACTERISTICS

|                                                                                                                                                                              |           |          |            |    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|----------|------------|----|
| Magnitude of Common Emitter Small-Signal Short-Circuit<br>Forward Current Transfer Ratio<br>2N5003<br>$I_C = 100 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}, f = 10 \text{ MHz}$ | 2N5005    | $h_{fe}$ | 2.0<br>50  |    |
| Common Emitter Small-Signal Short-Circuit<br>Forward Current Transfer Ratio<br>2N5003<br>$I_C = 500 \text{ mAdc}, V_{CE} = 5.0 \text{ Vdc}, f = 10 \text{ MHz}$              | 2N5005    | $h_{fe}$ | 6.0<br>7.0 |    |
| Output Capacitance<br>$V_{CB} = 10 \text{ Vdc}, I_E = 0, f = 1 \text{ MHz}$                                                                                                  | $C_{obo}$ |          | 250        | PF |

## SWITCHING CHARACTERISTICS

|                                                                  |           |  |     |         |
|------------------------------------------------------------------|-----------|--|-----|---------|
| Turn-On Time<br>$I_C = 5 \text{ Adc}; I_{B1} = 500 \text{ mAdc}$ | $t_{on}$  |  | 0.5 | $\mu s$ |
| Storage Time<br>$I_{B2} = -500 \text{ mAdc}$                     | $t_s$     |  | 1.4 | $\mu s$ |
| Fall Time<br>$V_{BE(OFF)} = 3.7 \text{ Vdc}$                     | $t_f$     |  | 0.5 | $\mu s$ |
| Turn-Off Time<br>$R_L = 6 \Omega$                                | $t_{off}$ |  | 1.5 | $\mu s$ |

## SAFE OPERATING AREA

|                                                                                                                                                                                                                                                                                                  |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>DC Tests</b><br>$T_C = +25^\circ C, V_{CE} = 0, t_p = 1 \text{ second 1 Cycle}$<br><b>Test 1</b><br>$V_{CE} = 12 \text{ Vdc}, I_C = 5 \text{ Adc}$<br><b>Test 2</b><br>$V_{CE} = 32 \text{ Vdc}, I_C = 1.7 \text{ Adc}$<br><b>Test 3</b><br>$V_{CE} = 80 \text{ Vdc}, I_C = 100 \text{ mAdc}$ |  |  |  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|