

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/394

### DEVICES

|                |                |                |
|----------------|----------------|----------------|
| <b>2N4150</b>  | <b>2N5237</b>  | <b>2N5238</b>  |
| <b>2N4150S</b> | <b>2N5237S</b> | <b>2N5238S</b> |

### LEVELS

**JAN**  
**JANTX**  
**JANTXV**  
**JANS**

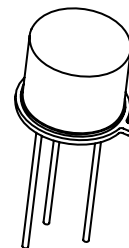
### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

| Parameters / Test Conditions                                                                                        | Symbol                             | 2N4150<br>2N4150S | 2N5237<br>2N5237S | 2N5238<br>2N5238S | Unit               |
|---------------------------------------------------------------------------------------------------------------------|------------------------------------|-------------------|-------------------|-------------------|--------------------|
| Collector-Emitter Voltage                                                                                           | $V_{CEO}$                          | 70                | 120               | 170               | Vdc                |
| Collector-Base Voltage                                                                                              | $V_{CBO}$                          | 100               | 150               | 200               | Vdc                |
| Emitter-Base Voltage                                                                                                | $V_{EBO}$                          | 10                |                   |                   | Vdc                |
| Collector Current                                                                                                   | $I_C$                              | 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> | $P_T$                              | 1.0<br>15         |                   |                   | W                  |
| Operating & Storage Junction Temperature Range                                                                      | $T_j, T_{stg}$                     | -65 to +200       |                   |                   | $^\circ\text{C}$   |
| Thermal Resistance, Junction-to Case<br>Junction- to Ambient                                                        | $R_{\theta JC}$<br>$R_{\theta JA}$ | 10<br>175         |                   |                   | $^\circ\text{C/W}$ |

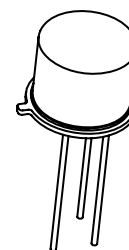
- 1) Derate linearly @ 5.7mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$   
2) Derate linearly @ 100mW/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$

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

| Parameters / Test Conditions                                                                                                                                                                | Symbol        | Min.             | Max.           | Unit            |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|------------------|----------------|-----------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                  |               |                  |                |                 |
| Collector-Emitter Breakdown Voltage<br>$I_C = 0.1\text{mA}$                                                                                                                                 | $V_{(BR)CEO}$ | 70<br>120<br>170 |                | Vdc             |
| Collector-Emitter Cutoff Current<br>$V_{BE} = 0.5\text{Vdc}, V_{CE} = 60\text{Vdc}$<br>$V_{BE} = 0.5\text{Vdc}, V_{CE} = 110\text{Vdc}$<br>$V_{BE} = 0.5\text{Vdc}, V_{CE} = 160\text{Vdc}$ | $I_{CEX}$     |                  | 10<br>10<br>10 | $\mu\text{Adc}$ |
| Collector-Emitter Cutoff Current<br>$V_{CE} = 60\text{Vdc}$<br>$V_{CE} = 110\text{Vdc}$<br>$V_{CE} = 160\text{Vdc}$                                                                         | $I_{CEO}$     |                  | 10<br>10<br>10 | $\mu\text{Adc}$ |
| Emitter-Base Cutoff Current<br>$V_{EB} = 7.0\text{Vdc}$<br>$V_{EB} = 5.0\text{Vdc}$                                                                                                         | $I_{EBO}$     |                  | 10<br>0.1      | $\mu\text{Adc}$ |



**TO-5**  
2N4150, 2N5237, 2N5238



**TO-39**  
**(TO-205AD)**  
2N4150S, 2N5237S, 2N5238S



6 Lake Street, Lawrence, MA 01841  
1-800-446-1158 / (978) 620-2600 / Fax: (978) 689-0803  
Website: <http://www.microsemi.com>

# TECHNICAL DATA SHEET

## NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/394

### ELECTRICAL CHARACTERISTICS ( $T_A = +25^\circ\text{C}$ , unless otherwise noted) (CONT.)

| Parameters / Test Conditions                                                                                                                                                                                                                                           | Symbol        | Min.                       | Max.                          | Unit             |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------|-------------------------------|------------------|
| Collector-Base Cutoff Current<br>$V_{CB} = 100\text{Vdc}$ 2N4150, 2N4150S<br>$V_{CB} = 150\text{Vdc}$ 2N5237, 2N5237S<br>$V_{CB} = 200\text{Vdc}$ 2N5238, 2N5238S<br>$V_{CB} = 80\text{Vdc}$ All Types                                                                 | $I_{CBO}$     |                            | 10<br>10<br>10<br>0.1         | $\mu\text{A dc}$ |
| <b>ON CHARACTERISTICS <sup>(3)</sup></b>                                                                                                                                                                                                                               |               |                            |                               |                  |
| Forward-Current Transfer Ratio<br>$I_C = 1.0\text{A dc}$ , $V_{CE} = 5.0\text{Vdc}$ 2N4150, 2N4150S<br>2N5237, 2N5237S<br>2N5238, 2N5238S<br>$I_C = 5.0\text{A dc}$ , $V_{CE} = 5.0\text{Vdc}$ All Types<br>$I_C = 10\text{A dc}$ , $V_{CE} = 5.0\text{Vdc}$ All Types | $h_{FE}$      | 50<br>50<br>50<br>40<br>10 | 200<br>225<br>225<br>120<br>- |                  |
| Collector-Emitter Saturation Voltage<br>$I_C = 5.0\text{A dc}$ , $I_B = 0.5\text{A dc}$<br>$I_C = 10\text{A dc}$ , $I_B = 1.0\text{A dc}$                                                                                                                              | $V_{CE(sat)}$ |                            | 0.6<br>2.5                    | Vdc              |
| Base-Emitter Saturation Voltage<br>$I_C = 5.0\text{A dc}$ , $I_B = 0.5\text{A dc}$<br>$I_C = 10\text{A dc}$ , $I_B = 1.0\text{A dc}$                                                                                                                                   | $V_{BE(sat)}$ |                            | 1.5<br>25                     | Vdc              |

### DYNAMIC CHARACTERISTICS

| Parameters / Test Conditions                                                                                                                                   | Symbol     | Min.           | Max.              | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|----------------|-------------------|------|
| Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio<br>$I_C = 0.2\text{A dc}$ , $V_{CE} = 10\text{Vdc}$ , $f = 10\text{MHz}$ | $ h_{fe} $ | 1.5            | 7.5               |      |
| Forward Current Transfer Ratio<br>$I_C = 50\text{mA dc}$ , $V_{CE} = 5.0\text{V}$ , $f = 1.0\text{kHz}$ 2N4150, 2N4150S<br>2N5237, 2N5237S<br>2N5238, 2N5238S  | $h_{fe}$   | 40<br>40<br>40 | 160<br>160<br>250 |      |
| Output Capacitance<br>$V_{CB} = 10\text{Vdc}$ , $I_E = 0$ , $100\text{kHz} \leq f \leq 1.0\text{MHz}$                                                          | $C_{obo}$  |                | 350               | pF   |

### SWITCHING CHARACTERISTICS

| Parameters / Test Conditions                                               | Symbol | Min. | Max. | Unit          |
|----------------------------------------------------------------------------|--------|------|------|---------------|
| Delay Time<br>$V_{CC} = 20\text{Vdc}$ , $V_{BB} = 5.0\text{Vdc}$           | $t_d$  |      | 50   | ns            |
| Rise Time<br>$I_C = 5.0\text{A dc}$ , $I_{B1} = 0.5\text{A dc}$            | $t_r$  |      | 500  | ns            |
| Storage Time<br>$V_{CC} = 20\text{Vdc}$ , $V_{BB} = 5.0\text{Vdc}$         | $t_s$  |      | 1.5  | $\mu\text{s}$ |
| Fall Time<br>$I_C = 5.0\text{A dc}$ , $I_{B1} = -I_{B2} = -0.5\text{A dc}$ | $t_f$  |      | 500  | ns            |

### SAFE OPERATING AREA

|                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| <b>DC Tests</b><br>$T_C = +25^\circ\text{C}$ , 1 Cycle, $t = 1.0\text{s}$<br><b>Test 1</b><br>$V_{CE} = 40\text{Vdc}$ , $I_C = 0.22\text{A dc}$<br><b>Test 2</b><br>$V_{CE} = 70\text{Vdc}$ , $I_C = 90\text{mA dc}$<br><b>Test 3</b><br>$V_{CE} = 120\text{Vdc}$ , $I_C = 15\text{mA dc}$ 2N5237, 2N5237S<br>$V_{CE} = 170\text{Vdc}$ , $I_C = 3.5\text{mA dc}$ 2N5238, 2N5238S |  |  |  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|

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