

RADIATION HARDENED PNP POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/545

DEVICES

| | |
|-----------------|-----------------|
| 2N5151 | 2N5153 |
| 2N5151L | 2N5153L |
| 2N5151U3 | 2N5153U3 |

LEVELS

| |
|-------------------------------|
| JANSM – 3K Rads (Si) |
| JANSD – 10K Rads (Si) |
| JANSP – 30K Rads (Si) |
| JANSL – 50K Rads (Si) |
| JANSR – 100K Rads (Si) |
| JANSF – 300K Rads (Si) |

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

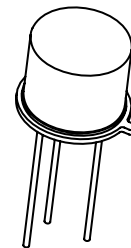
| Parameters / Test Conditions | Symbol | Value | Unit |
|---|-----------------|--------------------------|--------------------|
| Collector-Emitter Voltage | V_{CEO} | 80 | Vdc |
| Collector-Base Voltage | V_{CBO} | 100 | Vdc |
| Emitter-Base Voltage | V_{EBO} | 5.5 | Vdc |
| Collector Current | I_C | 2.0 | Adc |
| Total Power Dissipation 2N5151, 2N5153, L @ $T_A = +25^\circ\text{C}$ (1) 2N5151, 2N5153, L @ $T_C = +25^\circ\text{C}$ (2) 2N5151U3, 2N5153U3 @ $T_A = +25^\circ\text{C}$ (3) 2N5151U3, 2N5153U3 @ $T_C = +25^\circ\text{C}$ (4) | P_T | 1.0 10 1.16 100 | W |
| Operating & Storage Junction Temperature Range | T_J, T_{stg} | -65 to +200 | $^\circ\text{C}$ |
| Thermal Resistance, Junction-to Case | $R_{\theta JC}$ | 10 1.75 (U3) | $^\circ\text{C/W}$ |

Note:

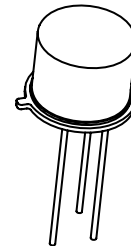
- 1) Derate linearly 5.7mW/ $^\circ\text{C}$ for $T_A > +25^\circ$
- 2) Derate linearly 66.7mW/ $^\circ\text{C}$ for $T_A > +25^\circ$
- 3) Derate linearly 6.63mW/ $^\circ\text{C}$ for $T_A > +25^\circ$
- 4) Derate linearly 571mW/ $^\circ\text{C}$ for $T_A > +25^\circ$

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

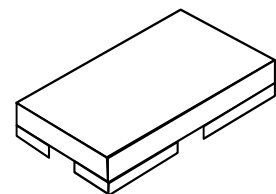
| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|---|---------------|------|------------|-------------------------|
| OFF CHARACTERISTICS | | | | |
| Collector-Emitter Breakdown Voltage $I_C = 100\text{mAdc}, I_B = 0$ | $V_{(BR)CEO}$ | 80 | | Vdc |
| Emitter-Base Cutoff Current $V_{EB} = 4.0\text{Vdc}, I_C = 0$ $V_{EB} = 5.5\text{Vdc}, I_C = 0$ | I_{EBO} | | 1.0 1.0 | μAdc mAdc |
| Collector-Emitter Cutoff Current $V_{CE} = 60\text{Vdc}, V_{BE} = 0$ $V_{CE} = 100\text{Vdc}, V_{BE} = 0$ | I_{CES} | | 1.0 1.0 | μAdc mAdc |
| Collector-Base Cutoff Current $V_{CE} = 40\text{Vdc}, I_B = 0$ | I_{CEO} | | 50 | μAdc |



TO-5
2N5151L, 2N5153L
 (See Figure 1)



TO-39 (TO-205AD)
2N5151, 2N5153



U-3
2N5151U3, 2N5153U3

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ELECTRICAL CHARACTERISTICS

| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|--|------------------|----------|-------------|------|
| ON CHARACTERISTICS | | | | |
| Forward-Current Transfer Ratio $I_C = 50\text{mA}$, $V_{CE} = 5\text{Vdc}$ | 2N5151 2N5153 | 20 50 | | |
| $I_C = 2.5\text{A}$, $V_{CE} = 5\text{Vdc}$ | 2N5151 2N5153 | 30 70 | 90 200 | |
| $I_C = 5\text{A}$, $V_{CE} = 5\text{Vdc}$ | 2N5151 2N5153 | 20 40 | | |
| Collector-Emitter Saturation Voltage $I_C = 2.5\text{A}$, $I_B = 250\text{mA}$ $I_C = 5.0\text{A}$, $I_B = 500\text{mA}$ | $V_{CE(sat)}$ | | 0.75 1.5 | Vdc |
| Base-Emitter Voltage Non-Saturation $I_C = 2.5\text{A}$, $V_{CE} = 5\text{Vdc}$ | V_{BE} | | 1.45 | Vdc |
| Base-Emitter Saturation Voltage $I_C = 2.5\text{A}$, $I_B = 250\text{mA}$ $I_C = 5.0\text{A}$, $I_B = 500\text{mA}$ | $V_{BE(sat)}$ | | 1.45 2.2 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|------------------|------------|----------|----|
| Magnitude of Common Emitter Small-Signal Short-Circuit Forward Current Transfer Ratio $I_C = 500\text{mA}$, $V_{CE} = 5\text{Vdc}$, $f = 10\text{MHz}$ | 2N5151 2N5153 | $ h_{fe} $ | 6 7 | |
| Common-Emitter Small-Signal Short-Circuit Forward-Current Transfer Ratio $I_C = 100\text{mA}$, $V_{CE} = 5\text{Vdc}$, $f = 1\text{kHz}$ | 2N5151 2N5153 | h_{fe} | 20 50 | |
| Output Capacitance $V_{CB} = 10\text{Vdc}$, $I_E = 0$, $f = 1.0\text{MHz}$ | C_{obo} | | 250 | pF |

SWITCHING CHARACTERISTICS

| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|--|-----------|------|------|---------------|
| Turn-On Time $I_C = 5\text{A}$, $I_{B1} = 500\text{mA}$ $I_{B2} = -500\text{mA}$ $R_L = 6\Omega$ $V_{BE(OFF)} = 3.7\text{Vdc}$ | t_{on} | | 0.5 | μs |
| Turn-Off Time $I_C = 5\text{A}$, $I_{B1} = 500\text{mA}$ $I_{B2} = -500\text{mA}$ $R_L = 6\Omega$ $V_{BE(OFF)} = 3.7\text{Vdc}$ | t_{off} | | 1.5 | μs |

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SWITCHING CHARACTERISTICS (cont.)

| Parameters / Test Conditions | Symbol | Min. | Max. | Unit |
|---|--------|------|------|---------------|
| Storage Time $I_C = 5\text{Adc}$, $I_{B1} = 500\text{mAdc}$ $I_{B2} = -500\text{mAdc}$ | t_s | | 1.4 | μs |
| Fall Time $R_L = 6\Omega$ $V_{BE(OFF)} = 3.7\text{Vdc}$ | t_f | | 0.5 | μs |

SAFE OPERATING AREA

DC Tests

$T_C = +25^\circ\text{C}$, 1 Cycle, $t_p = 1.0\text{s}$

Test 1

$V_{CE} = 5.0\text{Vdc}$, $I_C = 2.0\text{Adc}$

Test 2

$V_{CE} = 32\text{Vdc}$, $I_C = 310\text{mAdc}$

Test 3

$V_{CE} = 80\text{Vdc}$, $I_C = 14.5\text{mAdc}$

**FIGURE 1 (TO-5, TO-39)
 PACKAGE DIMENSIONS**

| Symbol | Dimensions | | | | Notes |
|----------|------------------------|------|-------------|------|-------|
| | Inches | | Millimeters | | |
| | Min | Max | Min | Max | |
| CD | .305 | .335 | 7.75 | 8.51 | 6 |
| CH | .240 | .260 | 6.10 | 6.60 | |
| HD | .335 | .370 | 8.51 | 9.40 | |
| LC | .200 TP | | 5.08 TP | | 7 |
| LD | .016 | .021 | 0.41 | 0.53 | 8, 9 |
| LL | See notes 8, 9, 12, 13 | | | | |
| LU | .016 | .019 | 0.41 | 0.48 | 8, 9 |
| L1 | | .050 | | 1.27 | 8, 9 |
| L2 | .250 | | 6.35 | | 8, 9 |
| Q | | .050 | | 1.27 | 6 |
| TL | .029 | .045 | 0.74 | 1.14 | 4, 5 |
| TW | .028 | .034 | 0.71 | 0.86 | 3 |
| r | | .010 | | 0.25 | 11 |
| α | 45° TP | | 45° TP | | 7 |
| P | .100 | | 2.54 | | |

