

## RADIATION HARDENED PNP POWER SILICON TRANSISTOR

*Qualified per MIL-PRF-19500/545*

### DEVICES

<b>2N5151</b>	<b>2N5153</b>
<b>2N5151L</b>	<b>2N5153L</b>
<b>2N5151U3</b>	<b>2N5153U3</b>

### LEVELS

<b>JANSM – 3K Rads (Si)</b>
<b>JANSD – 10K Rads (Si)</b>
<b>JANSP – 30K Rads (Si)</b>
<b>JANSL – 50K Rads (Si)</b>
<b>JANSR – 100K Rads (Si)</b>
<b>JANSF – 300K Rads (Si)</b>

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

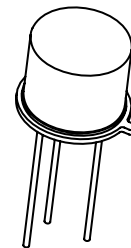
Parameters / Test Conditions	Symbol	Value	Unit
Collector-Emitter Voltage	$V_{CEO}$	80	Vdc
Collector-Base Voltage	$V_{CBO}$	100	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.5	Vdc
Collector Current	$I_C$	2.0	Adc
Total Power Dissipation 2N5151, 2N5153, L @ $T_A = +25^\circ\text{C}$ (1) 2N5151, 2N5153, L @ $T_C = +25^\circ\text{C}$ (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:**

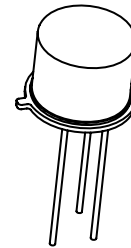
- 1) Derate linearly 5.7mW/ $^\circ\text{C}$  for  $T_A > +25^\circ$
- 2) Derate linearly 66.7mW/ $^\circ\text{C}$  for  $T_A > +25^\circ$
- 3) Derate linearly 6.63mW/ $^\circ\text{C}$  for  $T_A > +25^\circ$
- 4) Derate linearly 571mW/ $^\circ\text{C}$  for  $T_A > +25^\circ$

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

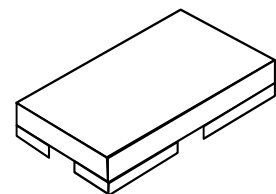
Parameters / Test Conditions	Symbol	Min.	Max.	Unit
<b>OFF CHARACTERISTICS</b>				
Collector-Emitter Breakdown Voltage $I_C = 100\text{mAdc}, I_B = 0$	$V_{(BR)CEO}$	80		Vdc
Emitter-Base Cutoff Current $V_{EB} = 4.0\text{Vdc}, I_C = 0$ $V_{EB} = 5.5\text{Vdc}, I_C = 0$	$I_{EBO}$		1.0 1.0	$\mu\text{Adc}$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



**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
<b>ON CHARACTERISTICS</b>				
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	$\mu\text{s}$
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	$\mu\text{s}$

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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	$\mu\text{s}$
Fall Time $R_L = 6\Omega$ $V_{BE(OFF)} = 3.7\text{Vdc}$	$t_f$		0.5	$\mu\text{s}$

### 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
$\alpha$	45° TP		45° TP		7
P	.100		2.54		

