

## 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**

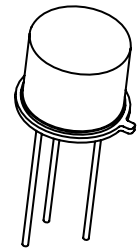
### ABSOLUTE MAXIMUM RATINGS ( $T_C = +25^\circ\text{C}$ unless otherwise noted)

Parameters / Test Conditions	Symbol	2N4150 2N4150S	2N5237 2N5237S	2N5238 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 @ $T_A = +25^\circ\text{C}$ (1) @ $T_C = +25^\circ\text{C}$ (2)	$P_T$	1.0 15			W
Operating & Storage Junction Temperature Range	$T_j, T_{stg}$	-65 to +200			$^\circ\text{C}$
Thermal Resistance, Junction-to Case Junction- to Ambient	$R_{\theta JC}$ $R_{\theta JA}$	10 175			$^\circ\text{C/W}$

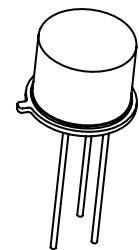
- 1) Derate linearly @ 5.7mW/ $^\circ\text{C}$  for  $T_A > +25^\circ\text{C}$
- 2) Derate linearly @ 100mW/ $^\circ\text{C}$  for  $T_C > +25^\circ\text{C}$

### 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 $I_C = 0.1\text{mA}$	2N4150, 2N4150S 2N5237, 2N5237S 2N5238, 2N5238S	$V_{(BR)CEO}$	70 120 170	Vdc
Collector-Emitter Cutoff Current $V_{BE} = 0.5\text{Vdc}, V_{CE} = 60\text{Vdc}$ $V_{BE} = 0.5\text{Vdc}, V_{CE} = 110\text{Vdc}$ $V_{BE} = 0.5\text{Vdc}, V_{CE} = 160\text{Vdc}$	2N4150, 2N4150S 2N5237, 2N5237S 2N5238, 2N5238S	$I_{CEX}$	10 10 10	$\mu\text{Adc}$
Collector-Emitter Cutoff Current $V_{CE} = 60\text{Vdc}$ $V_{CE} = 110\text{Vdc}$ $V_{CE} = 160\text{Vdc}$	2N4150, 2N4150S 2N5237, 2N5237S 2N5238, 2N5238S	$I_{CEO}$	10 10 10	$\mu\text{Adc}$
Emitter-Base Cutoff Current $V_{EB} = 7.0\text{Vdc}$ $V_{EB} = 5.0\text{Vdc}$		$I_{EBO}$	10 0.1	$\mu\text{Adc}$



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



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

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

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

### DYNAMIC CHARACTERISTICS

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

### SWITCHING CHARACTERISTICS

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

### SAFE OPERATING AREA

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

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