

NPN POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/394

DEVICES

2N4150	2N5237	2N5238
2N4150S	2N5237S	2N5238S

LEVELS

JAN
JANTX
JANTXV
JANS

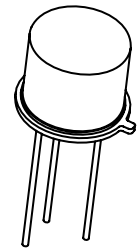
ABSOLUTE MAXIMUM RATINGS ($T_C = +25^\circ\text{C}$ unless otherwise noted)

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			$^\circ\text{C/W}$

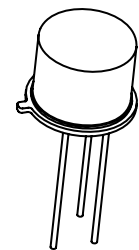
- 1) Derate linearly @ 5.7mW/ $^\circ\text{C}$ for $T_A > +25^\circ\text{C}$
- 2) Derate linearly @ 100mW/ $^\circ\text{C}$ for $T_C > +25^\circ\text{C}$

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

Parameters / Test Conditions	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
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	μAdc
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	μAdc
Emitter-Base Cutoff Current $V_{EB} = 7.0\text{Vdc}$ $V_{EB} = 5.0\text{Vdc}$		I_{EBO}	10 0.1	μAdc



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	μAdc
ON CHARACTERISTICS ⁽³⁾				
Forward-Current Transfer Ratio $I_C = 1.0\text{Adc}$, $V_{CE} = 5.0\text{Vdc}$	2N4150, 2N4150S 2N5237, 2N5237S 2N5238, 2N5238S	h_{FE}	50 50 50	200 225 225
$I_C = 5.0\text{Adc}$, $V_{CE} = 5.0\text{Vdc}$ $I_C = 10\text{Adc}$, $V_{CE} = 5.0\text{Vdc}$	All Types All Types		40 10	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 $I_C = 50\text{mA}$, $V_{CE} = 5.0\text{V}$, $f = 1.0\text{kHz}$	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	μs
Fall Time		t_f	500	ns

SAFE OPERATING AREA

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

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

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