

NPN POWER SILICON TRANSISTOR

Devices

2N4150
2N4150S

2N5237
2N5237S

2N5238
2N5238S

MAXIMUM RATINGS

Ratings	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 @ $T_A = +25^{\circ}\text{C}^{(1)}$ @ $T_C = +100^{\circ}\text{C}^{(2)}$	P_T	1.0 5.0			W
Operating & Storage Junction Temp. Range	T_J, T_{stg}	-65 to +200			$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.020	$^{\circ}\text{C}/\text{mW}$
Junction-to-Ambient	$R_{\theta JA}$	0.175	

- Derate linearly @ 5.7 mW/ $^{\circ}\text{C}$ for $T_A > +25^{\circ}\text{C}$
- Derate linearly @ 50 mW/ $^{\circ}\text{C}$ for $T_C > +25^{\circ}\text{C}$

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

Characteristics	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS				
Emitter-Base Breakdown Voltage $I_E = 10 \mu\text{Adc}$	$V_{(BR)EBO}$	7.0		Vdc
Collector-Emitter Breakdown Voltage $I_C = 0.1 \text{ Adc}$	$V_{(BR)CEO}$	70 120 170		Vdc
Collector-Emitter Cutoff Current $V_{EB} = 0.5 \text{ Vdc}, V_{CE} = 60 \text{ Vdc}$ $V_{EB} = 0.5 \text{ Vdc}, V_{CE} = 110 \text{ Vdc}$ $V_{EB} = 0.5 \text{ Vdc}, V_{CE} = 160 \text{ Vdc}$	I_{CEX}		10 10 10	μAdc



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



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

*See appendix A for
package outline

ELECTRICAL CHARACTERISTICS (con't)

Characteristics	Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS (con't)				
Collector-Base Cutoff Current $V_{CE} = 60 \text{ Vdc}$ 2N4150, 2N4150S $V_{CE} = 110 \text{ Vdc}$ 2N5237, 2N5237S $V_{CE} = 160 \text{ Vdc}$ 2N5238, 2N5238S	I_{CEO}		10 10 10	μAdc
Emitter-Base Cutoff Current $V_{BE} = 7.0 \text{ Vdc}$ $V_{BE} = 5.0 \text{ Vdc}$	I_{EBO}		10 0.1	μAdc
Collector-Base Cutoff Current $V_{CB} = 100 \text{ Vdc}$ 2N4150, 2N4150S $V_{CB} = 150 \text{ Vdc}$ 2N5237, 2N5237S $V_{CB} = 200 \text{ Vdc}$ 2N5238, 2N5238S $V_{CB} = 80 \text{ Vdc}$ 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 $I_C = 5.0 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$ All Types $I_C = 10 \text{ Adc}$, $V_{CE} = 5.0 \text{ Vdc}$ 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

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 $I_C = 50 \text{ mAdc}$, $V_{CE} = 5.0 \text{ Vdc}$, $f = 1.0 \text{ kHz}$ 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

Delay Time	$V_{CC} = 20 \text{ Vdc}$, $V_{BB} = 5.0 \text{ Vdc}$,	t_d		50	μs
Rise Time	$I_C = 5.0 \text{ Adc}$, $I_{B1} = 0.5 \text{ Adc}$	t_r		500	μs
Storage Time	$V_{CC} = 20 \text{ Vdc}$, $V_{BB} = 5.0 \text{ Vdc}$,	t_s		1.5	μs
Fall Time	$I_C = 5.0 \text{ Adc}$, $I_{B1} = -I_{B2} = 0.5 \text{ Adc}$	t_f		500	μs

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 $V_{CE} = 70 \text{ Vdc}$, $I_C = 90 \text{ mAdc}$				
Test 3 $V_{CE} = 120 \text{ Vdc}$, $I_C = 15 \text{ mAdc}$ 2N5237, 2N5237S $V_{CE} = 170 \text{ Vdc}$, $I_C = 3.5 \text{ mAdc}$ 2N5238, 2N5238S				

(3) Pulse Test: Pulse Width = 300 μs , Duty Cycle $\leq 2.0\%$.