

NPN HIGH POWER SILICON TRANSISTOR

Qualified per MIL-PRF-19500/439

Devices

2N5038

2N5039

Qualified Level

JAN
JANTX
JANTXV

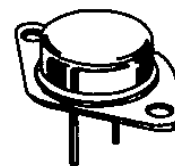
MAXIMUM RATINGS

Ratings	Symbol	2N5038	2N5039	Units
Collector-Emitter Voltage	V_{CEO}	90	75	Vdc
Collector-Base Voltage	V_{CBO}	150	125	Vdc
Emitter-Base Voltage	V_{EBO}	7.0		Vdc
Base Current	I_B	5.0		Adc
Collector Current	I_C	20		Adc
Total Power Dissipation @ $T_C = +25^{\circ}\text{C}$ ⁽¹⁾	P_T	140		W
Operating & Storage Temperature Range	T_{op}, T_{stg}	-65 to +200		$^{\circ}\text{C}$

THERMAL CHARACTERISTICS

Characteristics	Symbol	Max.	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.25	$^{\circ}\text{C/W}$

1) Derate linearly 800 mW/ $^{\circ}\text{C}$ for $T_C > +25^{\circ}\text{C}$



TO-3*
(TO-204AA)

*See appendix A for package outline

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

Characteristics	Symbol	Min.	Max.	Unit
-----------------	--------	------	------	------

OFF CHARACTERISTICS

Collector-Emitter Breakdown Voltage $I_C = 200 \text{ mAdc}$	2N5038 2N5039	$V_{(BR)CEO}$	90 75	Vdc
Emitter-Base Breakdown Voltage $I_E = 25 \text{ mAdc}$		$V_{(BR)EBO}$	7.0	Vdc
Collector-Base Cutoff Current $V_{CE} = 150 \text{ Vdc}$ $V_{CE} = 125 \text{ Vdc}$	2N5038 2N5039	I_{CBO}	1.0 1.0	μAdc
Collector-Base Cutoff Current $V_{CE} = 70 \text{ Vdc}$ $V_{CE} = 55 \text{ Vdc}$	2N5038 2N5039	I_{CEO}	1.0 1.0	μAdc
Emitter-Base Cutoff Current $V_{EB} = 5.0 \text{ Vdc}$		I_{EBO}	1.0	μAdc
Collector-Emitter Cutoff Current $V_{BE} = -1.5 \text{ Vdc } V_{CE} = 100 \text{ Vdc}$ $V_{BE} = -1.5 \text{ Vdc } V_{CE} = 85 \text{ Vdc}$	2N5038 2N5039	I_{CEX}	5.0 5.0	μAdc

2N5038, 2N5039, JAN SERIES

ELECTRICAL CHARACTERISTICS (con't)

Characteristics		Symbol	Min.	Max.	Unit
ON CHARACTERISTICS ⁽²⁾					
Forward-Current Transfer Ratio $I_C = 0.5 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038	h_{FE}	50		
	2N5039		30		
$I_C = 2.0 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038		50	200	
	2N5039		30	150	
$I_C = 12 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038		15		
$I_C = 10 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5039		15		
Collector-Emitter Saturation Voltage $I_C = 12 \text{ Adc}, I_B = 1.2 \text{ Adc}$	2N5038	$V_{CE(sat)}$		1.0	Vdc
$I_C = 10 \text{ Adc}, I_B = 1.0 \text{ Adc}$	2N5039			1.0	
$I_C = 20 \text{ Adc}, I_B = 5.0 \text{ Adc}$	Both			2.5	
Base-Emitter Saturation Voltage $I_C = 20 \text{ Adc}, I_B = 5.0 \text{ Adc}$		$V_{BE(sat)}$		3.3	Vdc
Base-Emitter Voltage $I_C = 12 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5038	V_{BE}		1.8	Vdc
$I_C = 10 \text{ Adc}, V_{CE} = 5.0 \text{ Vdc}$	2N5039			1.8	

DYNAMIC CHARACTERISTICS

Forward Current Transfer Ratio $I_C = 2.0 \text{ Adc}, V_{CE} = 10 \text{ Vdc}, f = 5.0 \text{ MHz}$		$ h_{FE} $	12	48	
Output Capacitance $V_{CB} = 10 \text{ Vdc}, I_E = 0, 100 \text{ kHz} \leq f \leq 1.0 \text{ MHz}$		C_{obo}		500	pF

SWITCHING CHARACTERISTICS

Turn-On Time $V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 12 \text{ Adc}; I_{B1} = 1.2 \text{ Adc}$	2N5038	t_{on}		0.5	μs
$V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 10 \text{ Adc}; I_{B1} = 1.0 \text{ Adc}$	2N5039				
Turn-Off Time $V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 12 \text{ Adc}; I_{B1} = -I_{B2} = 1.2 \text{ Adc}$	2N5038	t_{off}		2.0	μs
$V_{CC} = 30 \pm 2 \text{ Vdc}; I_C = 10 \text{ Adc}; I_{B1} = -I_{B2} = 1.0 \text{ Adc}$	2N5039				

SAFE OPERATING AREA

DC Tests					
$T_C = +25^\circ\text{C}, 1 \text{ Cycle}, t = 1.0 \text{ s}$					
Test 1					
$V_{CE} = 28 \text{ Vdc}, I_C = 5.0 \text{ Adc}$					
Test 2					
$V_{CE} = 45 \text{ Vdc}, I_C = 0.9 \text{ Adc}$					
Test 3					
$V_{CE} = 7.0 \text{ Vdc}, I_C = 20 \text{ Adc}$					
Test 4					
$V_{CE} = 90 \text{ Vdc}, I_C = 0.23 \text{ Adc}$	2N5038				
Test 4					
$V_{CE} = 75 \text{ Vdc}, I_C = 0.32 \text{ Adc}$	2N5039				

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