DIGITRON™ Semiconductors

High-reliability discrete products
and engineering services since 1977

2N5038, 2N5039

NPN HIGH POWER SILICON TRANSISTORS

FEATURES

- Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.
- Available as non-RoHS (Sn/Pb plating), standard, and as RoHS by adding "-PBF" suffix.

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°C (1)	P_T	140		W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C
Maximum Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25		°C/W

Note 1: Derate linearly 800mW/°C for T_C > 25°C

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise specified)

Characteristics		Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Breakdown Voltage	2N5038	$V_{(BR)CEO}$	90	-	Vdc
(I_C = 200mA)	2N5039		75	-	
Emitter-Base Breakdown Voltage		$V_{(BR)EBO}$			Vdc
(I_E = 25mA)			7.0	-	
Collector-Base Cutoff Current					
(V_{CE} = 70V)	2N5038	$I_{(CBO)}$	-	1.0	µAdc
(V_{CE} = 55V)	2N5039		-	1.0	
Collector-Base Cutoff Current					
(V_{CE} = 150V)	2N5038	I_{CEO}	-	1.0	mA
(V_{CE} = 125V)	2N5039		-	1.0	
Emitter-Base Cutoff Current		I_{EBO}			mA
(V_{EB} = 5.0)			-	1.0	
Collector-Emitter Cutoff Current					
(V_{BE} = -1.5V, V_{CE} = 100V)	2N5038	I_{CEX}	-	5.0	mA
(V_{BE} = -1.5V, V_{CE} = 85V)	2N5039		-	5.0	
ON-CHARACTERISTICS(2)					
DC Current Gain					
(I_C = 0.5A, V_{CE} = 5.0V)	2N5038		50	-	
	2N5039		30	-	
(I_C = 2.0A, V_{CE} = 5.0V)	2N5038	h_{FE}	50	200	-
	2N5039		30	150	
(I_C = 12A, V_{CE} = 5.0V)	2N5038		15	-	
(I_C = 10A, V_{CE} = 5.0V)	2N5039		15	-	
Collector-Emitter Saturation Voltage					
(I_C = 12.0A, I_B = 1.2A)	2N5038	$V_{CE(sat)}$	-	1.0	Vdc
(I_C = 10.0A, I_B = 1.0A)	2N5039		-	1.0	
(I_C = 10A, I_B = 2.0A)	Both		-	2.5	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$			Vdc
(I_C = 20A, I_B = 5.0A)			-	3.3	
Base-Emitter On-Voltage			.		
(I_C = 12A, V_{CE} = 5.0A)	2N5038	V_{BE}	-	1.8	Vdc
(I_C = 10A, V_{CE} = 5.0A)	2N5039		-	1.8	

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Characteristics		Symbol	Min.	Max.	Unit
DYNAMIC CHARACTERISTICS					
Forward Current Transfer Ratio (I_C = 2.0A, V_{CE} = 10 V, f = 5.0 MHz)		$\lvert h_{fe} \rvert$	12	48	-
Output Capacitance V_{CB} = 10V, I_E = 0, 100kHz ≤ f ≤ 1.0MHz		C_{obo}	-	500	pF
SWITCHING CHARACTERISTICS					
Turn-On Time					
V_{CC} = 30 ± 2V, I_C = 12A, I_{B1} = 1.2A	2N5038	t_{on}	-	0.5	µs
V_{CC} = 30 ± 2V, I_C = 10A, I_{B1} = 1.0A	2N5039		-	-	
Turn-Off Time					
V_{CC} = 30 ± 2V, I_C = 12A, $-I_{B1}$ = 1.2A	2N5038	t_{off}	-	2.0	µs
V_{CC} = 30 ± 2V, I_C = 10A, $-I_{B1}$ = 1.0A	2N5039		-	-	
SAFE OPERATING AREA					
DC Tests T_C = 25°C, 1 Cycle, t = 1.0s **Test 1** V_{CE} = 28V, I_C = 5.0A **Test 2** V_{CE} = 45V, I_C = 0.9A **Test 3** V_{CE} = 7.0V, I_C = 20A **Test 4 (2N5038)** V_{CE} = 90V, I_C = 0.23A **Test 4 (2N5039)** V_{CE} = 75V, I_C = 0.32A					

1. Pulse Test : Pulse Width = 300 µs, Duty Cycle ≤ 2.0%

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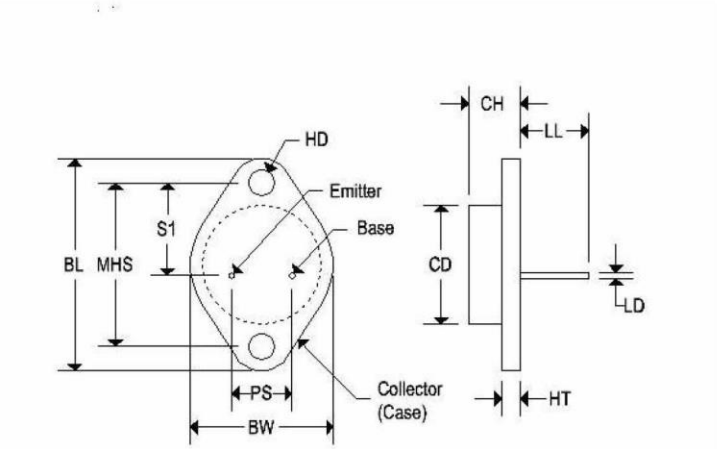
MECHANICAL CHARACTERISTICS

Case:	TO-3
Marking:	Alpha-Numeric
Polarity:	See below



	TO-3			
	Inches		Millimeters	
	Min	Max	Min	Max
CD	-	0.875	-	22.220
CH	0.250	0.380	6.860	9.650
HT	0.060	0.135	1.520	3.430
BW	-	1.050	-	26.670
HD	0.131	0.188	3.330	4.780
LD	0.038	0.043	0.970	1.090
LL	0.312	0.500	7.920	12.700
BL	1.550 REF		39.370 REF	
MHS	1.177	1.197	29.900	30.400
PS	0.420	0.440	10.670	11.180
S1	0.655	0.675	16.640	17.150