DIGITRON Semiconductors

High-reliability discrete products
and engineering services since 1977

2N3902, 2N5157

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	2N3902	2N5157	Units
Collector-Emitter Voltage	V_{CEO}	400	500	Vdc
Emitter-Base Voltage	V_{EBO}	5.0	6.0	Vdc
Collector-Base Voltage	V_{CBO}	700		Vdc
Collector Current	I_C	3.5		Adc
Base Current	I_B	2.0		Adc
Total Power Dissipation @ T_A = 25°C (1) **@ T_A = 100°C**(2)	P_T	5.0 100		W W
Operating & Storage Junction Temperature Range	T_J, T_{stg}	-65 to +200		°C
THERMAL CHARACTERISTICS				
Characteristics	**Symbol**	**Max.**		**Unit**
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.17		°C/W

1. Derate linearly 29 mW/°C for T_A > 25°C
2. Derate linearly 0.8 W/°C for T_C > 75°C

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

Characteristics		Symbol	Min.	Max.	Unit
OFF CHARACTERISTICS					
Collector-Emitter Cutoff Current (V_{CE} = 325V) (V_{CE} = 400V)	 2N3902 2N5157	$I_{(CEO)}$	 - -	 250 250	µAdc
Collector-Emitter Cutoff Current (V_{BE} = 1.5V, V_{CE} = 700V)		I_{CEX}		500	µAdc
Emitter-Base Cutoff Current (V_{EB} = 5.0) (V_{EB} = 6.0)	 2N3902 2N5157	I_{EBO}	 - -	 200 200	µAdc
ON-CHARACTERISTICS(3)					
Base-Emitter Saturation Voltage (I_C = 1.0A, I_B = 0.1A) (I_C = 3.5A, I_B = 0.7A)		$V_{BE(sat)}$	 - -	 1.5 2.0	Vdc
Collector-Emitter Saturation Voltage (I_C = 1.0A, I_B = 0.1A) (I_C = 3.5A, I_B = 0.7A)		$V_{CE(sat)}$	 - -	 0.8 2.5	Vdc
Forward Current Transfer Ratio (I_C = 0.5A, V_{CE} = 5.0V) (I_C = 1.0A, V_{CE} = 5.0V) (I_C = 2.5A, V_{CE} = 5.0V) (I_C = 3.5A, V_{CE} = 5.0V)		h_{FE}	 25 30 10 5	 - 90 - -	-
Collector-Emitter Sustaining Voltage (I_C = 100mA)	2N3902 2N5157	$V_{CEO(sus)}$	325 400	- -	Vdc

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Characteristics	Symbol	Min.	Max.	Unit
DYNAMIC CHARACTERISTICS				
Small Signal Short Circuit Forward Current Transfer Ratio (I_C = 0.2A, V_{CE} = 10 V, f = 1 MHz)	$\lvert h_{fe} \rvert$	2.5	25	-
Output Capacitance **(V_{CB} = 10V, I_E = 0, 100kHz ≤ f ≤ 1 MHz)**	C_{obo}	-	250	pF
SWITCHING CHARACTERISTICS				
Turn-On Time (V_{CC} = 125V, I_C = 1.0A, I_{B1} = 0.1A)	t_{on}	-	0.8	µs
Turn-Off Time (V_{CC} = 125V, I_C = 1.0A, I_{B1} = 0.1A, -I_{B2} = 0.5A)	t_{off}	-	1.7	µs
SAFE OPERATING AREA				
DC Tests (continuous) T_C = 25°C, t ≥ 1.0s **Test 1** V_{CE} = 28.6V, I_C = 3.5A **Test 2** V_{CE} = 70V, I_C = 1.43A **Test 3** V_{CE} = 325V, I_C = 55A (2N3902) V_{CE} = 400V, I_C = 35A (2N5157) **Switching Tests** **Load Condition C (unclamped inductive load)** T_C = 25°C, duty cycle ≤ 10%, R_S = 0.1Ω **Test 1** t_p = approximately 3ms(vary to obtain I_C), R_{BB1} = 20Ω, V_{BB1} = 10V, R_{BB2} = 3kΩ, V_{BB2} = 1.5V, V_{CC} = 50V, I_C = 3.5A, L = 60mH, R = 3Ω, R_L ≤ 14Ω **Test 2** t_p = approximately 3ms(vary to obtain I_C), R_{BB1} = 100Ω, V_{BB1} = 10V, R_{BB2} = 3kΩ, V_{BB2} = 1.5V, V_{CC} = 50V, I_C = 0.6A, L = 200mH, R = 8Ω, R_L ≤ 83Ω **Switching Tests** **Load Condition C (clamped inductive load)** T_C = 25°C, duty cycle ≤ 10% **Test 1** t_p = approximately 30ms(vary to obtain I_C), R_S = 0.1Ω, R_{BB1} = 20Ω, V_{BB1} = 10V, R_{BB2} = 100Ω, V_{BB2} = 1.5V, V_{CC} = 50V, I_C = 3.5A, L = 60mH, R = 3Ω, R_L ≤ 0Ω (A suitable clamping circuit or diode can be used) Clamp voltage = 400+0, -5V (2N3902) Clamp voltage = 500+0, -5V (2N5157) Clamped voltage must be reached				

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

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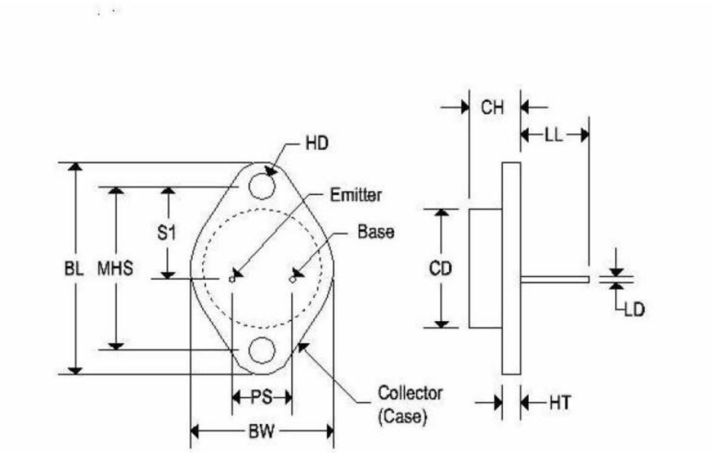
MECHANICAL CHARACTERISTICS

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