New Jersey Semi-Conductor Products, Inc.

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2N3439, 2N3440 NPN
2N5415, 2N5416 PNP

JAN, JTX, JTXV AVAILABLE
CASE 79-02, STYLE 1
TO-39 (TO-205AD)

MAXIMUM RATINGS

Rating	Symbol	PNP 2N5415	PNP 2N5416	NPN 2N3439	NPN 2N3440	Unit
Collector-Emitter Voltage	V_{CEO}	200	300	350	250	Vdc
Collector-Base Voltage	V_{CBO}	200	350	450	300	Vdc
Emitter-Base Voltage	V_{EBO}	4.0	6.0	7.0	7.0	Vdc
Base Current	I_B	0.5				Adc
Collector Current — Continuous	I_C	1.0				Adc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	— —		1.0 5.7		Watts mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	10 57		5.0 28.6		Watts mW/°C
Total Device Dissipation @ T_A = 50°C Derate above 50°C	P_D	1.0 6.7		— —		Watts mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +200				°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	2N5415 2N5416	2N3439 2N3440	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	17.5	35	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	150	175	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Emitter Sustaining Voltage(1) (I_C = 50 mAdc, I_B = 0)	2N5415 2N5416 2N3439 2N3440	$V_{CEO(sus)}$	 200 300 350 250	 — — — —	Vdc
*Collector Cutoff Current (V_{CE} = 300 Vdc, I_B = 0) (V_{CE} = 200 Vdc, I_B = 0)	 2N3439 2N3440	I_{CEO}	 — —	 20 50	μAdc
*Collector Cutoff Current (V_{CE} = 450 Vdc, V_{BE} = 1.5 Vdc) (V_{CE} = 300 Vdc, V_{BE} = 1.5 Vdc)	 2N3439 2N3440	I_{CEX}	 — —	 500 500	μAdc
Collector Cutoff Current (V_{CB} = 175 Vdc, I_E = 0) (V_{CB} = 280 Vdc, I_E = 0) (V_{CB} = 360 Vdc, I_E = 0) (V_{CB} = 250 Vdc, I_E = 0)	 2N5415 2N5416 2N3439 2N3440	I_{CBO}	 — — — —	 50 50 20 20	μAdc
Emitter Cutoff Current (V_{EB} = 4.0 Vdc, I_C = 0) (V_{EB} = 6.0 Vdc, I_C = 0)	 2N5415 2N5416, 2N3439, 2N3440	I_{EBO}	 — —	 20 20	μAdc
ON CHARACTERISTICS(1)					
DC Current Gain (I_C = 2.0 mAdc, V_{CE} = 10 Vdc) *(I_C = 20 mAdc, V_{CE} = 10 Vdc) *(I_C = 50 mAdc, V_{CE} = 10 Vdc)	 2N3439 2N3439, 2N3440 2N5415 2N5416	h_{FE}	 30 40 30 30	 — 160 150 120	—
Collector-Emitter Saturation Voltage (I_C = 50 mAdc, I_B = 4.0 mAdc)	2N3439, 2N3440	$V_{CE(sat)}$	—	0.5	Vdc
Base-Emitter Saturation Voltage (I_C = 50 mAdc, I_B = 4.0 mAdc)	2N3439, 2N3440	$V_{BE(sat)}$	—	1.3	Vdc

*Indicates Data in Addition to JEDEC Requirements.

Quality Semi-Conductors

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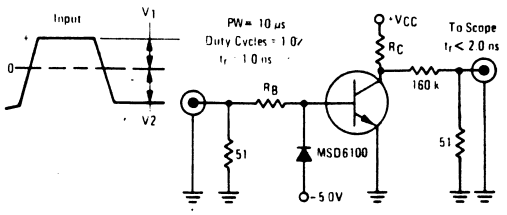
ELECTRICAL CHARACTERISTICS (continued) (T_A = 25°C unless otherwise noted.)

Characteristic		Symbol	Min	Max	Unit
SMALL-SIGNAL CHARACTERISTICS					
Current-Gain — Bandwidth Product (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 50 MHz)	2N3439, 2N3440	f_T	15	—	MHz
Output Capacitance (V_{CB} = 10 Vdc, I_E = 0, f = 1.0 MHz)	2N5415, 2N5416, 2N3439, 2N3440	C_{obo}	— —	15 10	pF
Input Capacitance (V_{EB} = 5.0 Vdc, I_C = 0, f = 1.0 MHz)		C_{ibo}	—	75	pF
Small-Signal Current Gain (I_C = 5.0 mAdc, V_{CE} = 10 Vdc, f = 1.0 kHz) (I_C = 10.0 mAdc, V_{CE} = 10 Vdc, f = 5.0 MHz)	2N5415, 2N5416	h_{fe}	25	—	—
Real Part of Input Impedance (V_{CE} = 10 Vdc, I_C = 5.0 mAdc, f = 1.0 MHz)		$Re(h_{ie})$	—	300	Ohms

(1) Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.
CAUTION: The sustaining voltage *must not* be measured on a curve tracer. (See Fig. 15.)

FIGURE 1 – SWITCHING TIMES TEST CIRCUIT



NOTE: V_{CC} and R_C adjusted for $V_{CE(off)}$ = 150 V and I_C as desired, R_B chosen for desired I_{B1}, $V_1 \approx 10$ V, $V_2 \approx 8.0$ V

For t_d and t_r, D1 is disconnected and V_2 = 2.0 V

For PNP test circuit, reverse all polarities.