New Jersey Semi-Conductor Products, Inc.

20 STERN AVE.
SPRINGFIELD, NEW JERSEY 07081
U.S.A.

TELEPHONE: (973) 376-2922
(212) 227-6005
FAX: (973) 376-8960

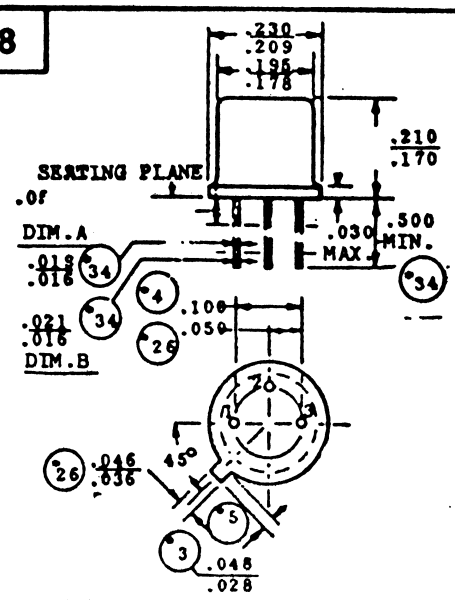
2N3959 (SILICON)
2N3960

NPN silicon annular transistors particularly well suited for high-speed current-mode logic switching applications.

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Collector-Base Voltage	V_{CB}	20	Vdc
Collector-Emitter Voltage (1 to 30 mA)	V_{CEO}	12	Vdc
Emitter-Base Voltage	V_{EB}	4.5	Vdc
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D	750 4.3	mW mW/°C
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	400 2.3	mW mW/°C
Thermal Resistance Junction to Case Junction to Ambient	 θ_{JC} θ_{JA}	 0.233 0.436	 °C/mW
Junction Operating Temperature Range	T_J	200	°C
Storage Temperature Range	T_{stg}	-65 to +200	°C

TO-18



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

Characteristic	Fig. No.	Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Collector-Base Breakdown Voltage (I_C = 10 μAdc, I_E = 0)		BV_{CBO}	20	—	Vdc
Collector-Emitter Breakdown Voltage (I_C = 10 mAdc, I_B = 0)		BV_{CEO}	12	—	Vdc
Emitter-Base Breakdown Voltage (I_E = 10 μAdc, I_C = 0)		BV_{EBO}	4.5	—	Vdc
Collector Reverse Current (V_{CE} = 10 Vdc, V_{EB} = 2 Vdc) (V_{CE} = 10 Vdc, V_{EB} = 2 Vdc, T_A = 150°C)	9	I_{CEX}	— —	.005 5	μAdc
Base Cutoff Current (V_{CE} = 10 Vdc, V_{EB} = 2 Vdc)	9	I_{BL}	—	.005	μAdc
Collector Forward Current (V_{CE} = 0 Vdc, V_{BE} = 0.4 Vdc)	9	I_{CEX}	—	0.10	μAdc

Characteristic	Fig. No.	Symbol	Min	Max	Unit
ON CHARACTERISTICS					
DC Current Gain (I_C = 1.0 mAdc, V_{CE} = 1 Vdc) (I_C = 10 mAdc, V_{CE} = 1 Vdc) (I_C = 30 mAdc, V_{CE} = 1 Vdc)	1	h_{FE}	 25 40 25	 — 200 —	—
Collector-Emitter Saturation Voltage (I_C = 1.0 mAdc, I_B = 0.1 mAdc) (I_C = 30 mAdc, I_B = 3 mAdc)	2, 3, 4	$V_{CE(sat)}$	 — —	 0.2 0.3	Vdc
Base-Emitter "ON" Voltage (I_C = 1.0 mAdc, V_{CE} = 1.0 Vdc) (I_C = 30 mAdc, V_{CE} = 1.0 Vdc)	3, 4	$V_{BE(ON)}$	 — —	 0.8 1.0	Vdc

TRANSIENT CHARACTERISTICS

Output Capacitance (V_{CB} = 4 Vdc, I_E = 0, f = 1 kHz)		8	C_{ob}	—	2.5	pF
Input Capacitance (V_{BE} = 0.5 Vdc, I_C = 0, f = 100 kHz)		8	C_{ib}	—	2.5	pF
High-Frequency Current Gain (I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	2N3959 2N3960		$\lvert h_{fe} \rvert$	13 16	— —	—
Current-Gain - Bandwidth Product		5	f_T			MHz
(I_C = 5 mAdc, V_{CE} = 4 Vdc, f = 100 MHz)	2N3959 2N3960			1000 1300	— —	
(I_C = 10 mAdc, V_{CE} = 10 Vdc, f = 100 MHz)	2N3959 2N3960			1300 1600	— —	
(I_C = 30 mAdc, V_{CE} = 4 Vdc, f = 100 MHz)	2N3959 2N3960			1000 1200	— —	
Collector-Base Time Constant		6	$r_b' C_c$			ps
(I_C = 5 mAdc, V_{CE} = 4 Vdc)	2N3959 2N3960			— —	30 50	
(I_C = 10 mAdc, V_{CE} = 10 Vdc)	2N3959 2N3960			— —	25 40	
(I_C = 30 mAdc, V_{CE} = 4 Vdc)	2N3959 2N3960			— —	30 50	

TYPICAL SWITCHING TIMES

				Typical Performance (v_{out} = 1 V)		
				@ 10 mA	@ 30 mA	
Turn-On Delay Time		7	$t_{on(delay)}$	2.4	2	ns
Rise Time	2N3959		t_r	3	2.2	ns
	2N3960			3	1.7	ns
Turn-Off Delay Time		7	$t_{off(delay)}$	1.6	1.6	ns
Fall-Time	2N3959		t_f	3.3	2.3	ns
	2N3960			3.3	1.9	ns