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

Silicon
Control Switch

PNPN
3N81,2

FEATURES:

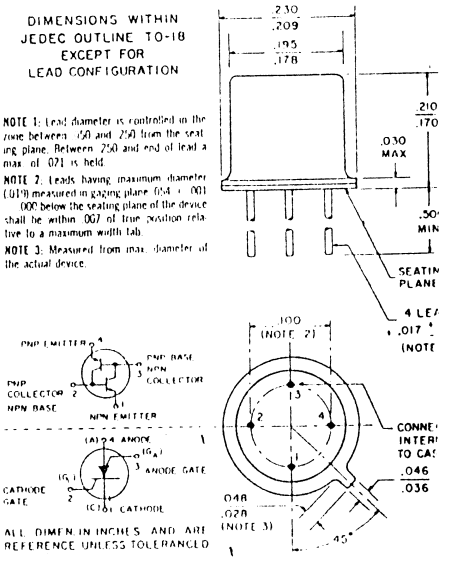
- Completely eliminates rate effect problems
- Dynamic and static breakover voltages are identical
- Extremely high triggering sensitivity
- Design parameters specified at worst-case temperatures
- Characterized for SCR and complementary SCR type applications
- Characterized as PNPN and also as transistor integrated pair
- All planar, completely oxide passivated
- Leads to all four semiconductor regions

absolute maximum ratings:[1] (25°C) (unless otherwise specified)

	3N81	3N82	
Voltage			
Anode to cathode forward and reverse	65	100	volts
Anode gate to anode reverse	65	100	volts
Cathode gate to cathode reverse	5	5	volts
Total Current			
Continuous DC forward[2]	200	200	ma
Peak recurrent forward ($T_A = 100°C$, 100 μsec. pulse width, 1% duty cycle)	1.0	1.0	amps
Peak non-recurrent forward (10 μsec. pulse width)	5.0	5.0	amps
Gate Current (Forward Bias)			
Continuous DC anode gate	100[2]	100[2]	ma
Peak anode gate ($T_A = 100°C$, 100 μsec. pulse width, 1% duty cycle)	200	200	ma
Peak cathode gate ($T_A = 100°C$, 100 μsec. pulse width, 1% duty cycle)	500	500	ma
Continuous DC cathode gate	20	20	ma
Dissipation			
Total power[2]	400	400	mw
Cathode gate power[2]	100	100	mw
Temperature			
Operating junction	−65 to +150		°C
Storage	−65 to +200		°C

NOTE 1: Symbols and nomenclature are defined below.

NOTE 2: Derate currents and power linearly to 150°C, the maximum rated temperature. The absolute maximum rating at any given temperature shall be in terms of the more conservative of the two parameters, i.e. current or power.



electrical characteristics:[1]

	Symbol[1]	Temp.	3N81	3N82		Typical Curves Fig. #
CUTOFF CHARACTERISTICS						
Forward Blocking Current (R_{GC} = 10K, V_{AC} = Rated Voltage)	$I_{R\ max}$	@ 25°C	1.0		μa max	14
		@ 150°C	20		μa max	
Reverse Blocking Current (R_{GC} = 10K, V_{CA} = Rated Voltage)	$I_{R\ max}$	@ 25°C	1.0		μa max	20
		@ 150°C	20		μa max	
Cathode Gate Reverse Cutoff Current (at Rated Voltage)	I_{GC}	@ 25°C	20		μa max	
Anode Gate Reverse Cutoff Current (at Rated Voltage)	I_{GA}	@ 25°C	1.0		μa max	
CONDUCTING CHARACTERISTICS						
Forward Voltage (at 200 ma Anode current R_{GC} = 10K)	$V_{F\ max}$	@ 25°C	2.0	2.0	V max	15, 16
		@ −65°C	2.5	2.5	V max	
Holding Current (R_{GC} = 10K)	$I_{H\ max}$	@ 25°C	1.5	1.5	ma max	11, 12, 13
		@ −65°C	6.0	6.0	ma max	
Saturation Voltage (G_A to C) (I_{GC} = 5ma, I_{GA} = 50ma, I_A = 0)	$V_{CE_{SAT}\ NPN}$	@ 25°C	2.0	2.0	V max	22, 23, 25
TRIGGERING CHARACTERISTICS						
Cathode Gate Current to Trigger (I_{GTC} from current source, V_{AC} = 40V, R_A = 800Ω)	$I_{GTC\ max}$	@ 25°C	1.0	1.0	μa max	4
		@ −65°C	50	50	μa max	
Cathode Gate Voltage to Trigger (V_{AC} = 40V, R_A = 800Ω, R_{GC} = 10K, R_{GA} = ∞, I_{GTC} from current source)	$V_{GTC\ max}$	@ 25°C	.65	.65	V max	5
		@ −65°C	1.0	1.0	V max	
	$V_{GTC\ min}$	@ 25°C	0.4	0.4	V min	
		@ 150°C	0.15	0.15	V min	
Anode Gate Current to Trigger (I_{GTA} from current source, V_{AC} = 40V, R_C = 800Ω, R_{GC} = 10K)	$I_{GTA\ max}$	@ 25°C	1.0	1.0	ma max	3
		@ −65°C	3.0	3.0	ma max	
Anode Gate Voltage to Trigger (I_{GTA} from current source, V_{AC} = 40V, R_C = 800Ω, R_{GC} = 10K, R_{GA} = 1K)	$V_{GTA\ max}$	@ 25°C	0.8	0.8	V max	6
		@ −65°C	1.0	1.0	V max	
	$V_{GTA\ min}$	@ 25°C	0.4	0.4	V min	
		@ 150°C	0.2	0.2	V min	
TRANSIENT CHARACTERISTICS						
Turn-On Time (V_{AC} = 20V, I_A = 100 ma, I_{GC} = 100 μa) (See circuits Fig. 9 and 10)	$t_{on\ max}$	@ 25°C	1.5	1.5	μs max	7, 8
		@ −65°C	2.0	2.0	μs max	
Recovery Time (V_{AC} = 20V, I_A = 100ma, R_{GC} = 10K) (See circuit Fig. 17)	$t_{rec\ max}$	@ 25°C	15	15	μs max	18, 19
		@ 150°C	25	25	μs max	
Collector Capacitance Voltage Gate to Gate = 20V	$C_{ob\ max}$	@ 25°C	15	15	pf	26
Rate of Rise of Forward Blocking Voltage	dv/dt max	@ 25°C	See Note 5		V/μs max	

NOTE 3: The transistor characterization is essentially a restatement of the SCS characterization and is meant to facilitate using the SCS as a complementary PNP-NPN integrated transistor pair.

NOTE 4: The [±] sign indicates that the PNP and NPN transistors require opposite polarites as identified by the test conditions.

NOTE 5: The dv/dt rating is unlimited when the anode gate lead is returned to the anode voltage through a current limiting resistor. An example of this technique is shown in Figure 33

TRANSISTOR CHARACTERIZATION[2]

electrical characteristics: (25°C) (unless otherwise specified)

		3N81				3N82				Typical Curves
		PNP[1]		NPN[1]		PNP[1]		NPN[1]		
DC CHARACTERISTICS		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Fig. #
Collector to Base Breakdown Voltage (I_C = [±][4] 1.0μa, I_E = 0)	BV_{CBO}	−65		65		−100		100		volts
Emitter to Base Breakdown Voltage (I_C = 0, I_E [NPN] = 20μa, I_E [PNP] = −1μa)	BV_{EBO}	−65		5		−100		5		volts
Collector Saturation Voltage (I_C = 50ma, I_B = 5ma)	$V_{CE_{SAT}}$				2				2	volts 22, 23, 2
Base Saturation Voltage (I_B = 1ma, I_C = 5ma)	$V_{BE_{SAT}}$				0.9				0.9	volts
Forward Current Transfer Ratio (V_{CE} = 0.5V, I_C = 3ma)	h_{FE}			15				15		21
Forward Current Transfer Ratio (V_{CE} = −2.0V, I_C = −1ma)	h_{FE}	0.1				.01				24
CUTOFF CHARACTERISTICS (3N81 at 65 volts; 3N82 at 100 volts)										
Collector to Emitter Leakage Current (T_A = 150°C)	I_{CEO}		−20				−20			μa
(R_B = 10K Ω T_A = 150°C)	I_{CER}				20				20	μa
Collector to Base Leakage Current (I_E = 0, T_A = 150°C)	I_{CBO}		−20		20		−20		20	μa
Emitter to Base Leakage Current (I_C = 0, T_A = 150°C)	I_{EBO}		−20				−20			μa
(V_{EB} = 5Vdc, I_C = 0)	I_{EBO}				20				20	μa
TRANSIENT CHARACTERISTICS										
Collector Capacitance (I_E = 0, V_{CB} = [±][4] 20V)	C_{ob}		15		15		15		15	pf 26
Gain Bandwidth Product	f_T			75				75		mc