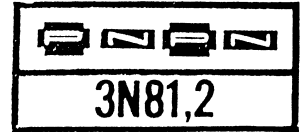


# Silicon Control Switch



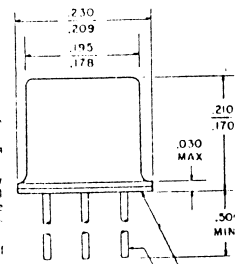
**FEATURES:**

- 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 PNP and also as transistor integrated pair
- All planar, completely oxide passivated
- Leads to all four semiconductor regions

absolute maximum ratings:<sup>(1)</sup> (25°C) (unless otherwise specified)

	3N81	3N82	
<b>Voltage</b>			
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
<b>Total Current</b>			
Continuous DC forward <sup>(2)</sup>	200	200	ma
Peak recurrent forward (T <sub>A</sub> = 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
<b>Gate Current (Forward Bias)</b>			
Continuous DC anode gate	100 <sup>(2)</sup>	100 <sup>(2)</sup>	ma
Peak anode gate (T <sub>A</sub> = 100°C, 100 μsec. pulse width, 1% duty cycle)	200	200	ma
Peak cathode gate (T <sub>A</sub> = 100°C, 100 μsec. pulse width, 1% duty cycle)	500	500	ma
Continuous DC cathode gate	20	20	ma
<b>Dissipation</b>			
Total power <sup>(2)</sup>	400	400	mw
Cathode gate power <sup>(2)</sup>	100	100	mw
<b>Temperature</b>			
Operating junction	-65 to +150		°C
Storage	-65 to +200		°C

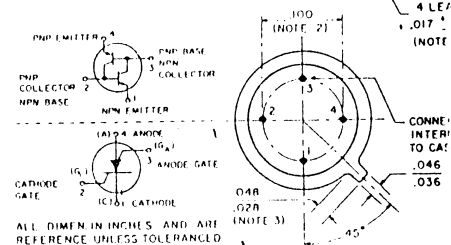
DIMENSIONS WITHIN JEDEC OUTLINE TO-18 EXCEPT FOR LEAD CONFIGURATION



NOTE 1: Lead diameter is controlled in the zone between .50 and .750 from the seating plane. Between .250 and end of lead a max. of .021 is held.

NOTE 2: Leads having maximum diameter (.019) measured in seating plane (.04 ± .001) below the seating plane of the device shall be within .007 of true position relative to a maximum width tab.

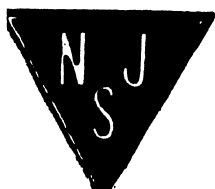
NOTE 3: Measured from max. diameter of the actual device.



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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.



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electrical characteristics:<sup>(1)</sup>

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

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 re-

quire opposite polarities 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<sup>(1)</sup>

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

DC CHARACTERISTICS	3N81				3N82				Typical Curves Fig. #	
	PNP <sup>1</sup>		NPN <sup>1</sup>		PNP <sup>1</sup>		NPN <sup>1</sup>			
Collector to Base Breakdown Voltage ( $I_C = [\pm]^{(1)} 1.0\mu\text{a}, I_E = 0$ )	$BV_{CBO}$	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	volts
Emitter to Base Breakdown Voltage ( $I_C = 0, I_E \text{ [NPN]} = 20\mu\text{a}, I_E \text{ [PNP]} = -1\mu\text{a}$ )	$BV_{EBO}$	-65		5		-100		5		volts
Collector Saturation Voltage ( $I_C = 50\text{ma}, I_B = 5\text{ma}$ )	$V_{CESAT}$				2				2	volts
Base Saturation Voltage ( $I_B = 1\text{ma}, I_C = 5\text{ma}$ )	$V_{BESAT}$				0.9				0.9	volts
Forward Current Transfer Ratio ( $V_{CE} = 0.5V, I_C = 3\text{ma}$ )	$h_{FE}$			15				15		
Forward Current Transfer Ratio ( $V_{CE} = -2.0V, I_C = -1\text{ma}$ )	$h_{FE}$	0.1				0.1				
CUTOFF CHARACTERISTICS (3N81 at 65 volts; 3N82 at 100 volts)										
Collector to Emitter Leakage Current ( $T_A = 150^\circ\text{C}$ ) ( $R_B = 10K \Omega, T_A = 150^\circ\text{C}$ )	$I_{CEO}$ $I_{CER}$		-20				-20			$\mu\text{a}$ $\mu\text{a}$
Collector to Base Leakage Current ( $I_E = 0, T_A = 150^\circ\text{C}$ )	$I_{CBO}$		-20		20		-20		20	$\mu\text{a}$
Emitter to Base Leakage Current ( $I_C = 0, T_A = 150^\circ\text{C}$ ) ( $V_{EB} = 5V\text{dc}, I_C = 0$ )	$I_{EBO}$ $I_{EBO}$		-20				-20			$\mu\text{a}$ $\mu\text{a}$
TRANSIENT CHARACTERISTICS										
Collector Capacitance ( $I_E = 0, V_{CB} = [\pm]^{(1)} 20V$ )	$C_{ob}$		15		15		15		15	pf
Gain Bandwidth Product	$f_T$				75				75	mc