

# Photon Coupled Isolator 4N39, 4N40

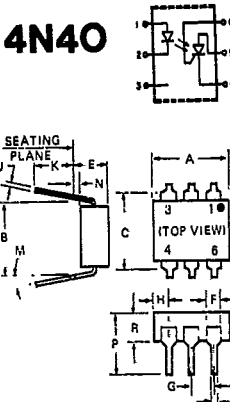
## Ga As Infrared Emitting Diode & Light Activated SCR

The GE Solid State 4N39 and 4N40 consist of a gallium arsenide, infrared emitting diode coupled with a light activated silicon controlled rectifier in a dual in-line package. These devices are also available in surface-mount packaging.

### absolute maximum ratings

INFRARED EMITTING DIODE		
† Power Dissipation (-55°C to 50°C)	*100	milliwatts
† Forward Current (Continuous) (-55°C to 50°C)	60	milliamps
† Forward Current (Peak) (-55°C to 50°C) (100 μsec 1% duty cycle)	1	ampere
† Reverse Voltage (-55°C to 50°C)	6	volts
*Derate 2.0mW/°C above 50°C.		

PHOTO-SCR		
† Off-State and Reverse Voltage (-55°C to +100°C)	4N39 200 4N40 400	volts
† Peak Reverse Gate Voltage (-55°C to 50°C)	6	volts
† Direct On-State Current (-55°C to 50°C)	300	milliamps
† Surge (non-rep) On-State Current (100 μsec) (-55°C to 50°C)	10	amps
† Peak Gate Current (-55°C to 50°C)	10	milliamps
† Output Power Dissipation (-55°C to 50°C)**	400	milliwatts
**Derate 8mW/°C above 50°C.		



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	8.38	8.89	.330	.360	1
B	7.82 REF.		.300 REF.		2
C		8.84		.340	1
D	.406	.508	.016	.020	3
E		8.09		.200	
F	1.01	1.78	.040	.070	
G	2.28	2.80	.090	.110	
H		2.16		.065	4
J	.203	.305	.008	.012	
K	2.54		.100		
M		15		16	
N	.381		.015		
P		9.53		375	
R	2.92	3.43	.116	.135	
S	6.10	6.86	.240	.270	

- NOTES:  
 1. INSTALLED POSITION LEAD CENTERS.  
 2. OVERALL INSTALLED DIMENSION  
 3. THESE MEASUREMENTS ARE MADE FROM THE SEATING PLANE.  
 4. FOUR PLACES.

TOTAL DEVICE	
† Storage Temperature Range	-55°C to 150°C
† Operating Temperature Range	-55°C to 100°C
† Normal Temperature Range (No Derating)	-55°C to 50°C
† Soldering Temperature (1/16" from case, 10 seconds)	260°C
† Total Device Dissipation (-55°C to 50°C)	450 milliwatts
† Linear Derating Factor (above 50°C)	9.0mW/°C
† Surge Isolation Voltage (Input to Output)	1500V <sub>(peak)</sub> 1060V <sub>(RMS)</sub>
† Steady-State Isolation Voltage (Input to Output)	950V <sub>(peak)</sub> 660V <sub>(RMS)</sub>

### Individual electrical characteristics (25°C) (unless otherwise specified)

INFRARED EMITTING DIODE	TYP.	MAX.	UNITS
† Forward Voltage V <sub>F</sub> (I <sub>F</sub> = 10mA)	1.1	1.5	volts
† Reverse Current I <sub>R</sub> (V <sub>R</sub> = 3V)	-	10	microamps
Capacitance (V = 0, f = 1MHz)	50	-	picofarads

PHOTO-SCR	MIN.	MAX.	UNITS
† Peak Off-State Voltage - V <sub>DM</sub> (R <sub>GK</sub> = 10KΩ, T <sub>A</sub> = 100°C)	4N39 200 4N40 400	-	volts
† Peak Reverse Voltage - V <sub>RM</sub> (T <sub>A</sub> = 100°C)	4N39 200 4N40 400	-	volts
† On-State Voltage - V <sub>T</sub> (I <sub>T</sub> = 300mA)	-	1.3	volts
† Off-State Current - I <sub>D</sub> (V <sub>D</sub> = 200V, T <sub>A</sub> = 100°C, I <sub>F</sub> = 0, R <sub>GK</sub> = 10K)	4N39 -	50	microamps
† Off-State Current - I <sub>D</sub> (V <sub>D</sub> = 400V, T <sub>A</sub> = 100°C, I <sub>F</sub> = 0, R <sub>GK</sub> = 10K)	4N40 -	150	microamps
† Reverse Current - I <sub>R</sub> (V <sub>R</sub> = 200V, T <sub>A</sub> = 100°C, I <sub>F</sub> = 0)	4N39 -	50	microamps
† Reverse Current - I <sub>R</sub> (V <sub>R</sub> = 400V, T <sub>A</sub> = 100°C, I <sub>F</sub> = 0)	4N40 -	150	microamps
† Holding Current - I <sub>H</sub> (V <sub>FX</sub> = 50V, R <sub>GK</sub> = 27KΩ)	-	1.0	milliamps

### coupled electrical characteristics (25°C)

	MIN.	MAX.	UNITS
† Input Current to Trigger (V <sub>AK</sub> = 50V, R <sub>GK</sub> = 10KΩ)	-	30	milliamps
(V <sub>AK</sub> = 100V, R <sub>GK</sub> = 27KΩ)	-	14	milliamps
† Isolation Resistance (Input to Output) (V <sub>io</sub> = 500V <sub>DC</sub> )	100	-	gigaohms
† Turn-On Time - V <sub>AK</sub> = 50V, I <sub>F</sub> = 30mA, R <sub>GK</sub> = 10KΩ, R <sub>L</sub> = 200Ω	-	50	microseconds
Coupled dv/dt, Input to Output (See Figure 13)	500	-	volts/microsec.
Input to Output Capacitance (Input to Output Voltage = 0, f = 1MHz)	-	2	picofarads

† Indicates JEDEC Registered Values. Covered under U.L. component recognition program, reference file E51868  
 VDE Approved to 0883/6.80 0110b Certificate # 35025

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TYPICAL CHARACTERISTICS

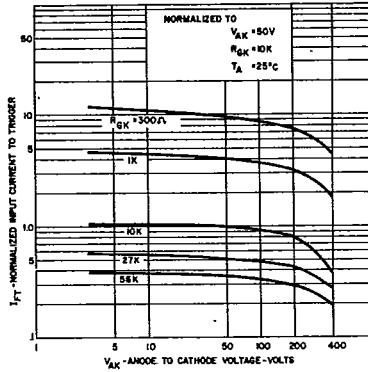


FIGURE 1. INPUT CURRENT TO TRIGGER VS. ANODE-CATHODE VOLTAGE

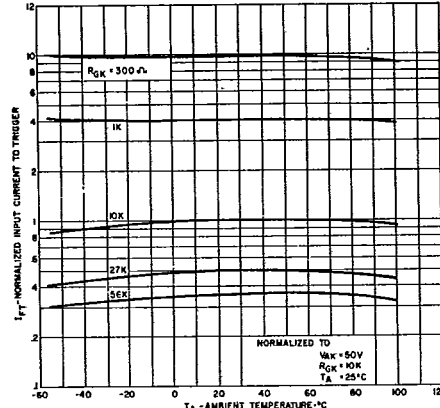


FIGURE 2. INPUT CURRENT TO TRIGGER VS. TEMPERATURE

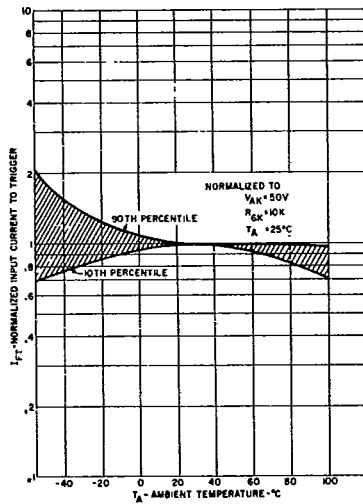


FIGURE 3. INPUT CURRENT TO TRIGGER DISTRIBUTION VS. TEMPERATURE

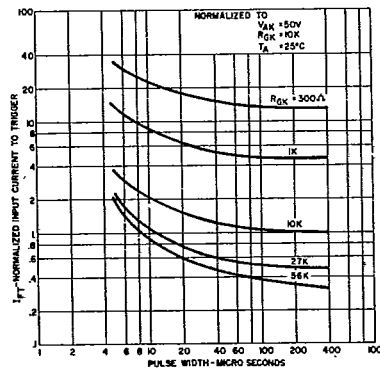


FIGURE 4. INPUT CURRENT TO TRIGGER VS. PULSE WIDTH

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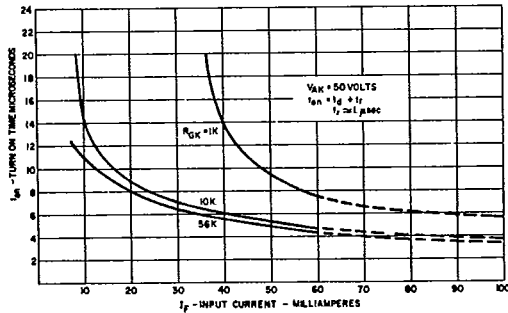


FIGURE 5. TURN-ON TIME VS. INPUT CURRENT

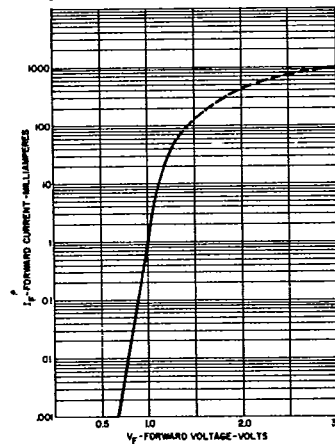


FIGURE 6. INPUT CHARACTERISTICS I\_F VS. V\_F

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TYPICAL CHARACTERISTICS OF OUTPUT (SCR)

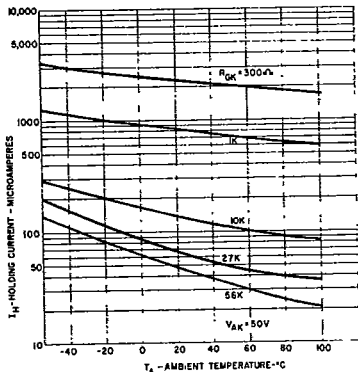


FIGURE 7. HOLDING CURRENT VS. TEMPERATURE

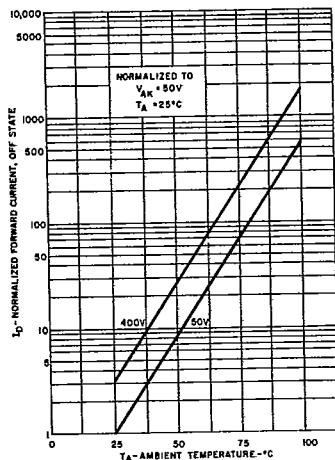


FIGURE 9. OFF-STATE FORWARD CURRENT VS. TEMPERATURE

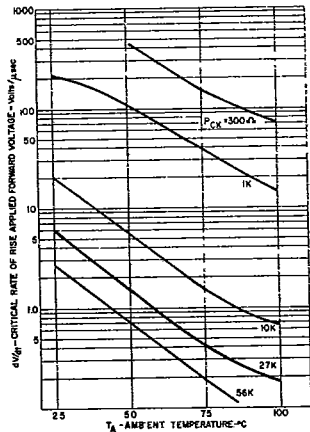


FIGURE 11. dv/dt VS. TEMPERATURE

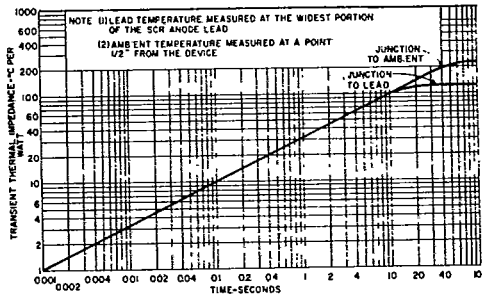


FIGURE 8. MAXIMUM TRANSIENT THERMAL IMPEDANCE

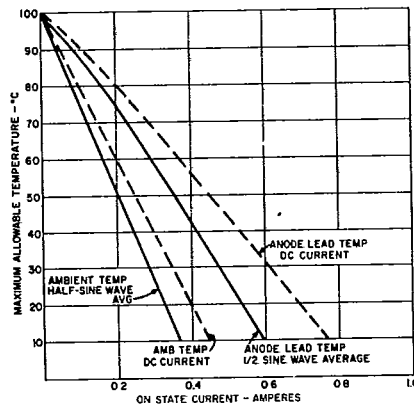


FIGURE 10. ON-STATE CURRENT VS. MAXIMUM ALLOWABLE TEMPERATURE

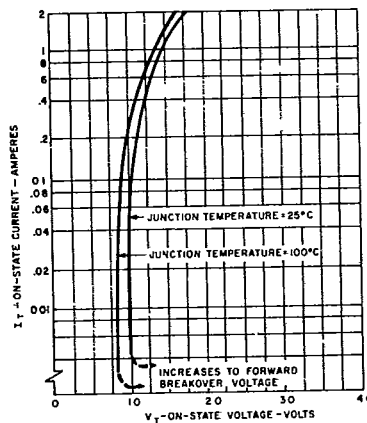


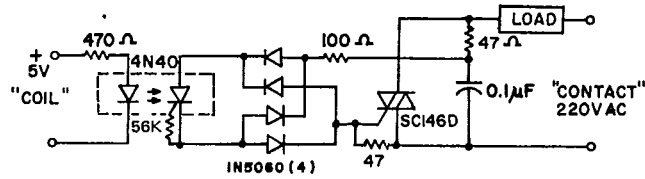
FIGURE 12. ON-STATE CHARACTERISTICS

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TYPICAL APPLICATIONS

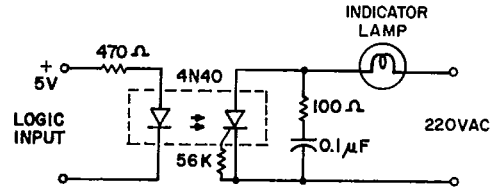
10A, T<sup>2</sup>L COMPATIBLE, SOLID STATE RELAY

Use of the 4N40 for high sensitivity, 2500V isolation capability, provides this highly reliable solid state relay design. This design is compatible with 74, 74S and 74H series T<sup>2</sup>L logic systems inputs and 220V AC loads up to 10A.



25W LOGIC INDICATOR LAMP DRIVER

The high surge capability and non-reactive input characteristics of the 4N40 allow it to directly couple, without buffers, T<sup>2</sup>L and DTL logic to indicator and alarm devices, without danger of introducing noise and logic glitches.



400V SYMMETRICAL TRANSISTOR COUPLER

Use of the high voltage PNP portion of the 4N40 provides a 400V transistor capable of conducting positive and negative signals with current transfer ratios of over 1%. This function is useful in remote instrumentation, high voltage power supplies and test equipment. Care should be taken not to exceed the 400 mW power dissipation rating when used at high voltages.

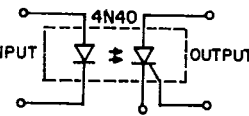
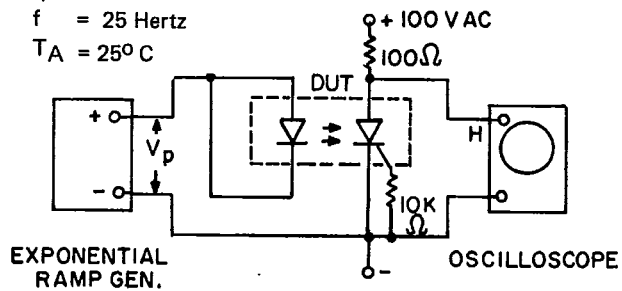
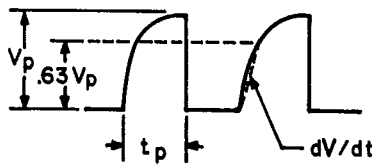


FIGURE 13  
COUPLED dv/dt - TEST CIRCUIT

$V_p = 800$  Volts  
 $t_p = .010$  Seconds  
 $f = 25$  Hertz  
 $T_A = 25^\circ$  C



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