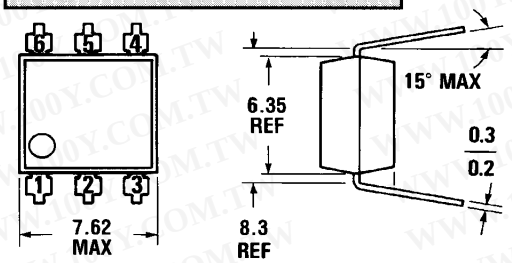
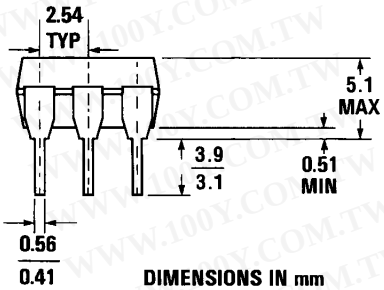
QT OPTOELECTRONICS

PHOTO SCR OPTOCOUPLERS

4N39 4N40

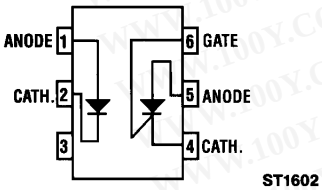
PACKAGE DIMENSIONS





DIMENSIONS IN mm
PACKAGE CODE E

ST1603



ST1602

Equivalent Circuit

DESCRIPTION

The 4N39 and 4N40 have a gallium-arsenide infrared emitting diode optically coupled with a light activated silicon controlled rectifier in a dual in-line package.

FEATURES & APPLICATIONS

- High efficiency, low degradation, liquid epitaxial LED
- 10 A, T²L compatible, solid state relay
- 25 W logic indicator lamp driver
- 400 V symmetrical transistor coupler
- Underwriters Laboratory (UL) recognized — File #E90700

ABSOLUTE MAXIMUM RATINGS

TOTAL PACKAGE

*Storage temperature ..... −55°C to 150°C
*Operating temperature ..... −55°C to 100°C
*Lead solder temperature ..... 260°C for 10 sec
*Total power dissipation (−55°C to 50°C) .. 450 mW
Derate linearly (above 50°C) ..... 9.0 mW/°C

INPUT DIODE

*Power dissipation (−55°C to 50°C) ..... 100 mW
Derate linearly (above 50°C) ..... 2 mW/°C
*Continuous forward current (−55°C to 50°C) 60 mA
*Peak forward current (−55°C to 50°C) ..... 1 A
*Reverse voltage (−55°C to 50°C) ..... 6 V

DETECTOR

*Power dissipation (−55°C to 50°C) ..... 400 mW
Derate linearly (above 50°C) ..... 8 mW/°C
*Off-state and reverse voltage 4N39 ..... 200 V
*(−55°C to +100°C) 4N40 ..... 400 V
*Peak reverse gate voltage(−55°C to 50°C) ..... 6 V
*Direct on-state current (−55°C to 50°C) .... 300 mA
*Surge on-state current (−55°C to 50°C) (100μS) 10 A
*Peak gate current (−55°C to 50°C) ..... 10 mA

*Indicates JEDEC Registered Data

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ELECTRICAL CHARACTERISTICS (T_A= 25° Unless Otherwise Specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

PARAMETER		SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
INPUT DIODE							
*Forward voltage		V_F		1.1	1.5	V	I_F=10 mA
*Reverse leakage current		I_R			10	μA	V_R=3 V
Capacitance		C_J		50		pF	V=0 V, f=1 MHz
OUTPUT DETECTOR							
*Peak off-state voltage	(4N39)	V_{DM}	200			V	R_{GK}=10 kΩ, T_A=100°C
	(4N40)	V_{DM}	400			V	R_{GK}=10 kΩ, T_A=100°C
*Peak reverse voltage	(4N39)	V_{RM}	200			V	T_A=100°C
	(4N40)	V_{RM}	400			V	T_A=100°C
*On-state voltage		V_T			1.3	V	I_T=300 mA
*Off-state current	(4N39)	I_{DM}			50	μA	V_{DM}=200 V, T_A=100°C, I_F=0, R_{GK}=10 KΩ
	(4N40)	I_{DM}			150	μA	V_{DM}=400 V, T_A=100°C, I_F=0, R_{GK}=10 KΩ
*Reverse current	(4N39)	I_R			50	μA	V_R=200 V, T_A=100°C, I_F=0
	(4N40)	I_R			150	μA	V_R=400 V, T_A=100°C, I_F=0
*Holding current		I_R			1.0	mA	V_{Fx}=50 V, R_{GK}=27 kΩ

TRANSFER CHARACTERISTICS

CHARACTERISTIC		SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
*Input current to trigger	(4N39, 4N40)	I_{FT}			30	mA	V_{AK}=50 V, R_{GK}=10 kΩ
	(4N39, 4N40)	I_{FT}			14	mA	V_{AK}=100 V, R_{GK}=27 kΩ
*Turn-on time		t_{on}			50	μs	V_{AK}=50 V, I_F=30 mA, R_{GK}=10 kΩ, RL=200 Ω
Package capacitance (input to output)					2	pF	Input to putput voltage=0 f=1 MHz
Coupled dv/dt, input to output (figure 13)			500			V/μs	

ISOLATION CHARACTERISTICS

CHARACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNITS	TEST CONDITIONS
Surge isolation voltage	V_{ISO}	7500			V	1 Minute
Isolation voltage	V_{ISO}	5300			V	1 Minute
*Isolation resistance	R_{ISO}	10^{11}			ohms	V_{I-O}=500 VDC

*Indicates JEDEC Registered Data

TYPICAL CHARACTERISTICS OF OUTPUT (SCR)

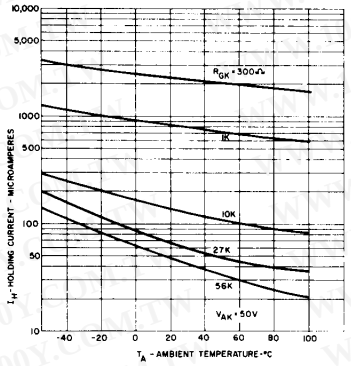

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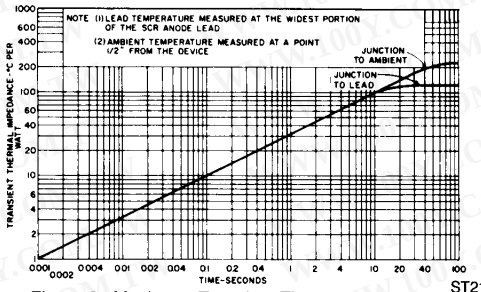
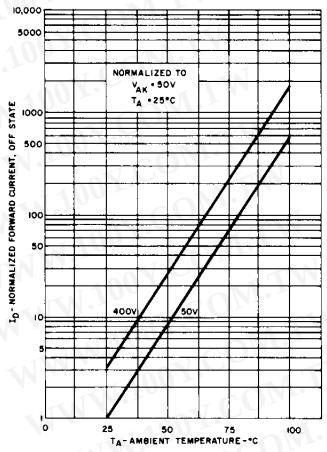
Figure 7. Holding Current vs. Temperature



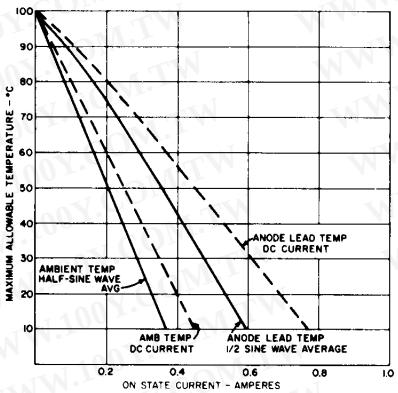
ST2112

Figure 8. Maximum Transient Thermal Impedance



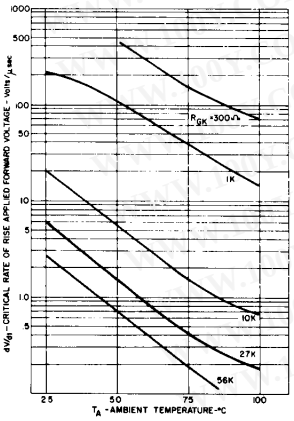
ST2113

Figure 9. Off-State Forward Current vs. Temperature



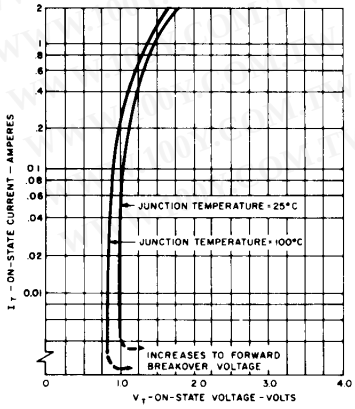
ST2114

Figure 10. On-State Current vs Maximum Allowable Temperature



ST2115

Figure 11. dv/dt vs. Temperature



ST2116

Figure 12. On-State Characteristics

TYPICAL ELECTRO-OPTICAL CHARACTERISTICS
(T_A=0°C to 70°C Unless Otherwise Specified)

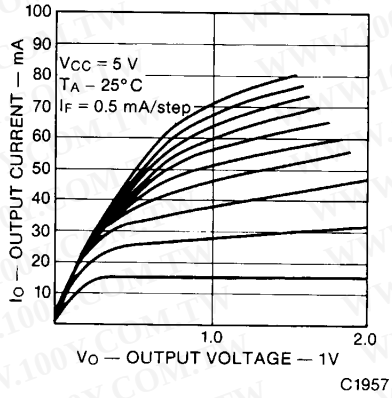


Fig. 1. DC Transfer Characteristics

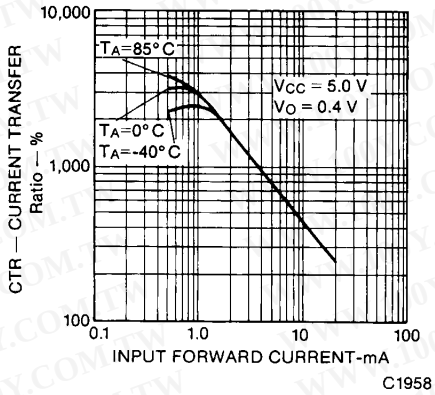


Fig. 2. Current Transfer Ratio vs. Input Forward Current

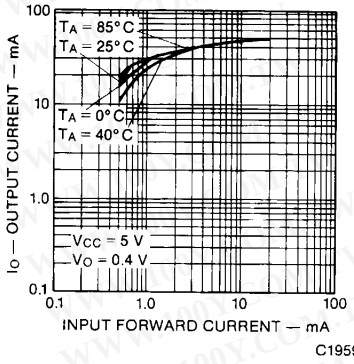


Fig. 3. Output Current vs. Input Forward Current

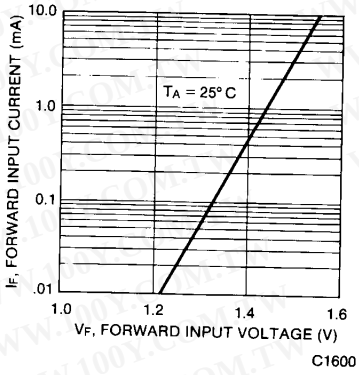


Fig. 4. Forward Input Current vs. Forward Input Voltage

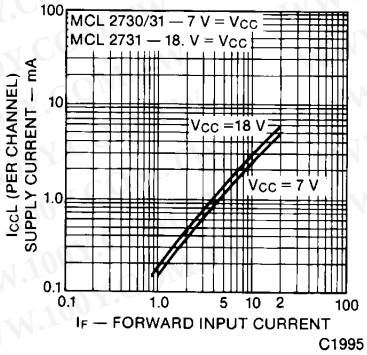


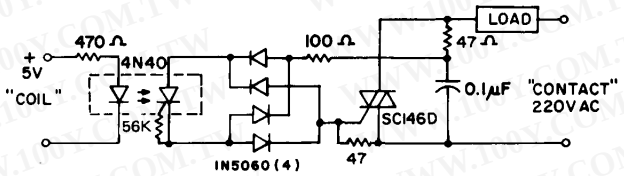
Fig. 5. Supply Current Per Channel vs. Input Forward Current

QT OPTOELECTRONICS

TYPICAL APPLICATIONS

10A, T²L COMPATIBLE, SOLID STATE RELAY

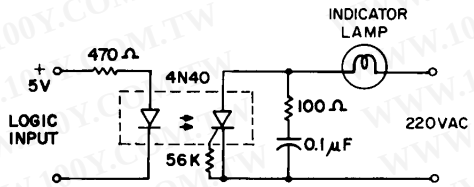
Use of the 4N40 for high sensitivity, 5300V isolation capability, provides this highly reliable solid state relay design. This design is compatible with 74, 74S and 74H series T²L logic systems inputs and 220V AC loads up to 10A.



ST2117

25W, LOGIC INDICATOR LAMP DRIVER

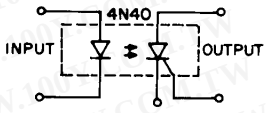
The high surge capability and non-reactive input characteristics of the 4N40 allow it to directly couple, without buffers, T²L and DTL logic to indicator alarm devices, without danger of introducing noise and logic glitches.



ST2118

400V SYMMECTRICAL TRANSISTOR COUPLER

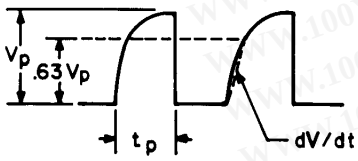
Use of the high voltage PNP portion of the 4N40 provides a 400V transistor capable of conducting positive and negative signals with current transfer ratios of over 1%. This function is useful in remote instrumentation, high voltage power supplies and test equipment. Care should be taken not to exceed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

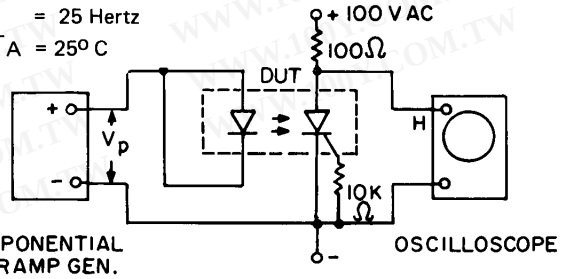


ST2119

FIGURE 13
COUPLED dv/dt – TEST CIRCUIT

V_p = 800 Volts
t_p = .010 Seconds
f = 25 Hertz
T_A = 25° C





ST2120