R S COMPONENTS LTD

RS data

Opto isolators and opto coupled SCR/triacs

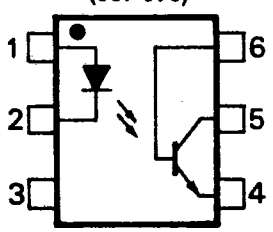
T-41-83
T-41-85
T-41-87

Four infra-red light emitting diode and silicon phototransistor couplers consisting of: (1) A single Opto Isolator in dual-in-line package suited for fast signal transfer and offering excellent noise immunity. (2) A single Opto Isolator also in a 6 pin dual-in-line package suited for fast signal transfer and offering a high transfer ratio and a darlington transistor output for greater drive capability which will respond to low power signal sources. (3) A dual Opto Isolator having two isolated light emitting diode-photo transistor couplers in one 8 pin dual-in-line Package. (4) A quad Opto Isolator having 4 isolated light emitting diode-photo transistor couplers in one 16 pin dual-in-line package. These last two items offer space and cost saving when multiple isolation is required. In addition an opto-coupled SCR and two opto-coupled triacs are available in 6-pin DIL packages. See pages 4 and 5. All of these couplers offer high voltage and AC isolation and are suited for interface applications in TTL and analogue circuits.

Phototransistor opto isolators

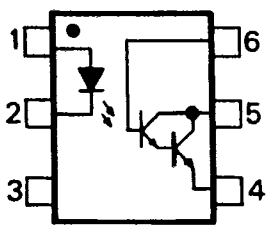
Pin configurations

Single Opto Isolator (307-979)



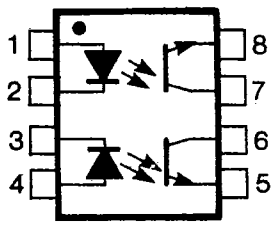
TOP VIEW

Darlington Opto Isolator (307-963)



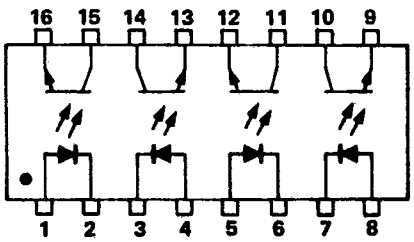
TOP VIEW

Dual Opto Isolator (308-613)



TOP VIEW

Quad Opto Isolator (307-064)



TOP VIEW

Ratings	Single Opto Isolator (307-979)	Darlington Opto Isolator (307-963)	Dual Opto Isolator (308-613)	Quad Opto Isolator (307-064)
Isolation voltage (dc)	±4000V	±4000V	±1500V	±1500V
V_{CE} (max) Transistor (dc)	30V	30V	30V	30V
I_F (max) Diode (dc)	60mA	60mA	100mA	100mA
DC Current transfer Ratio (min)	20%	300%	12.5%	12.5%
	6-pin DIL packages with transistor connection for biasing.		8-pin DIL package	16-pin DIL package

Absolute maximum ratings	Single Opto Isolator (307-979)	Darlington Opto Isolator (307-963)	Dual Opto Isolator (308-613)	Quad Opto Isolator (307-064)	Unit
T_A TEMPERATURE RANGE	−50 to +100	−50 to +100	−55 to +100	−55 to +100	°C
V I/O ISOLATION	±4000	±4000	±1500	±1500	V
I_F DIODE	60	60	100	100	mA
V_R DIODE	3	3	3	3	V
P_d DIODE					
derate at 1.33mW/°C>25°C	100	100	150	150	mW
V_{CEO}	30	30	30	30	V
V_{ECO}	5	5	7	7	V
P_d TRANSISTOR					
derate at 2.0mW/°C>25°C	150	150	150	150	mW
TOTAL PACKAGE DISSIPATION					
derate at 5.33mW/°C>25°C	—		400	—	mW
derate at 6.67mW/°C>25°C	—	—	—	500	mW

Electrical characteristics Ta = 25°C

T-41-87

Parameter	Test conditions	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Units
DIODE														
V_F	I_F = 10mA		—				1.5		—			—		V
	I_F = 20mA			1.5		—			—			—		V
	I_F = 100mA		—			—			1.3			1.3		V
I_R	V_R = 3V			10			100		0.1			0.1		µA
TRANSISTOR														
BV_{CEO}	I_C = 1mA	30				—		10			10			V
	I_C = 100µA		—		30				—			—		V
BV_{ECO}	I_E = 10µA	5				—			—			—		V
	I_E = 100µA		—		5				—			—		V
BV_{CBO}	I_C = 10µA	70				30			—			—		V
I_{CEO} DARK CURRENT	V_{CE} = 5V I_F = 0		—			—			5	500		5	500	nA
	V_{CE} = 10V I_F = 0 H = 0		5	50			100		—			—		nA
I_{CBO}	V_{CE} = 10V I_E = 0			20			50		—			—		nA
h_{FE}	V_{CE} = 5V I_C = 100µA	100	200			20k			—			—		
C_{CE}	V_{CE} = 0		8			5			2			2		pF
COUPLED														
I_C/I_F DC CURRENT TRANSFER RATIO	I_F = 10mA V_{CE} = 2V	20			300				—			—		%
	I_F = 16mA V_{CE} = 5V	—	—			—		12.5	35		12.5	35		%
R_{ISO} ISOLATION RESISTANCE	V = 500V	10^{11}			10^{11}				10^{11}			10^{11}		Ω
$V_{CE(SAT)}$	I_F = 10mA I_C = 10mA		—			1			—			—		V
	I_F = 16mA I_C = 2mA			0.4		—			0.5				0.5	V
C I/O INPUT/OUTPUT CAPACITANCE			2			0.5			0.5			0.5		pF
t_r RISE TIME	V_{CE} = 10V, I_B = O, I_F = 10mA		2			—			—			—		µs
	V_{CE} = 10V, R_L = 100Ω, I_F = 10mA		—			3			—			—		µs
	V_{CE} = 10V, R_L = 100Ω. I_F = 8mA		—			—			2			2		µs
t_f FALL TIME	V_{CE} = 10V, I_B = 0, I_F = 10mA		2			—			—			—		µs
	V_{CE} = 10V, R_L = 100Ω, I_F = 10mA		—			25			—			—		µs
	V_{CE} = 10V, R_L = 100Ω, I_C = 8mA		—			—			2			2		µs

Figure 1
Response time vs base resistance for 307-979

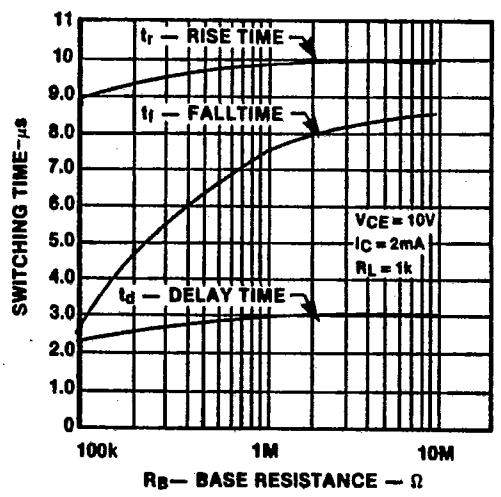
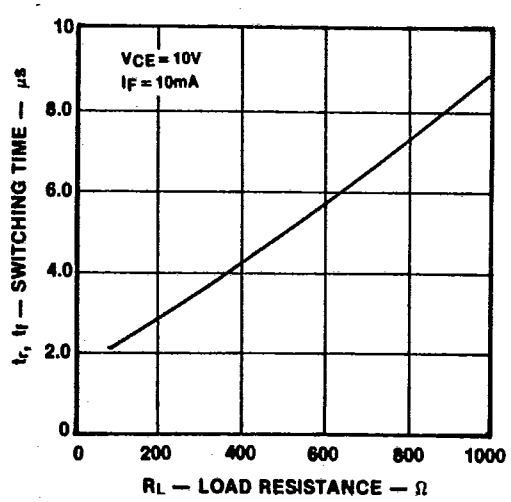
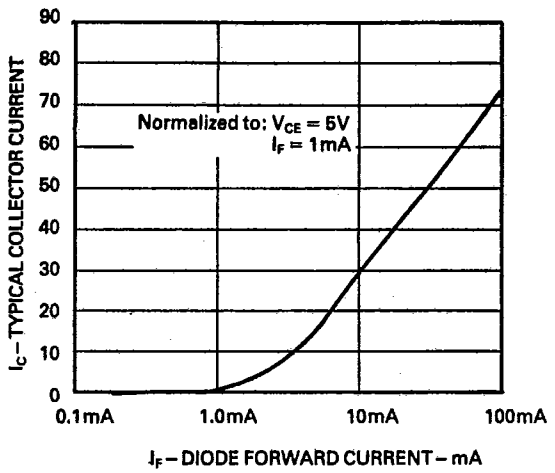


Figure 2
Rise and fall time vs load resistance for 307-979



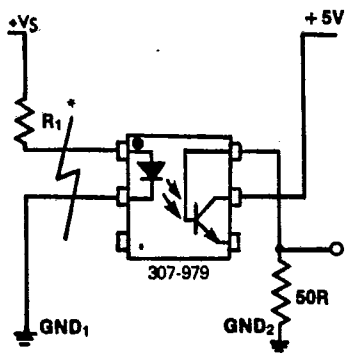
T-41-85
T-41-87

Figure 3 **Typical collector current vs diode forward current for 307 & 963**



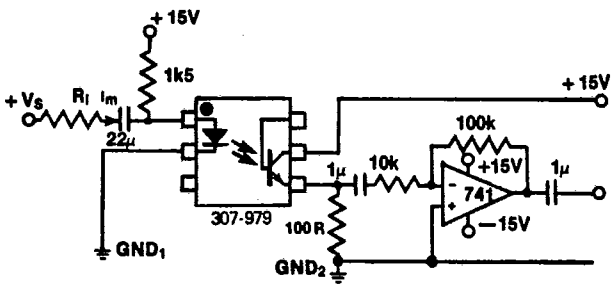
Applications

Figure 4 **Fast pulse transfer**



This mode of operation increases switching speed from about 2µs to about 100ns but reduces current transfer ratio to about 0.2%

Figure 5 **A.C. signal isolation**



Choose R_i, to limit modulating current (i_m) to 5mA max. Useful frequency range in the order of 20Hz to 20kHz

Figure 6 **Light activated solid state relay**

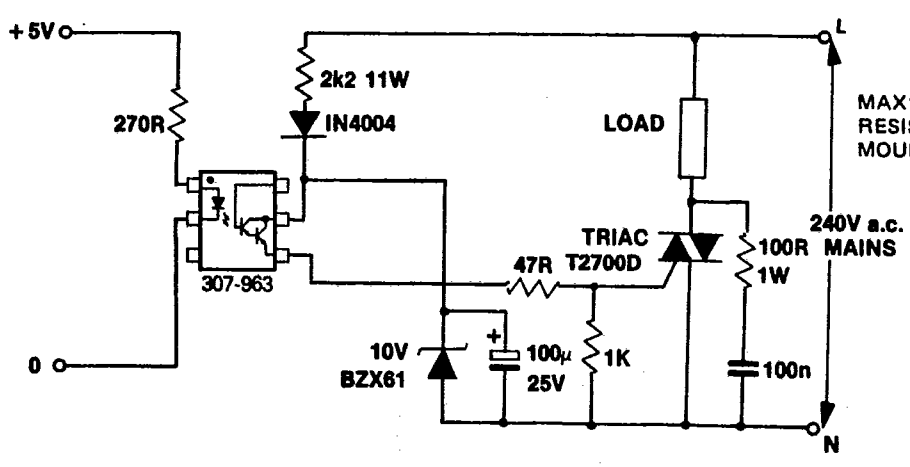


Figure 7 TTL interface

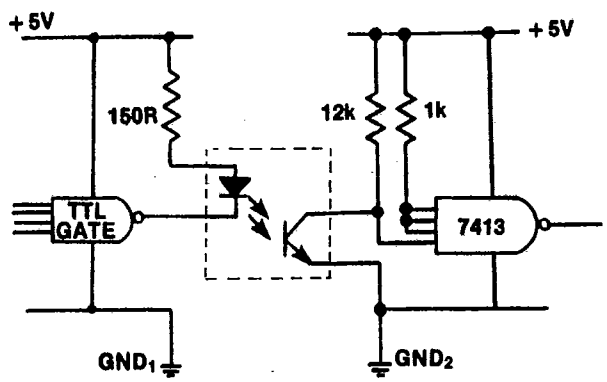
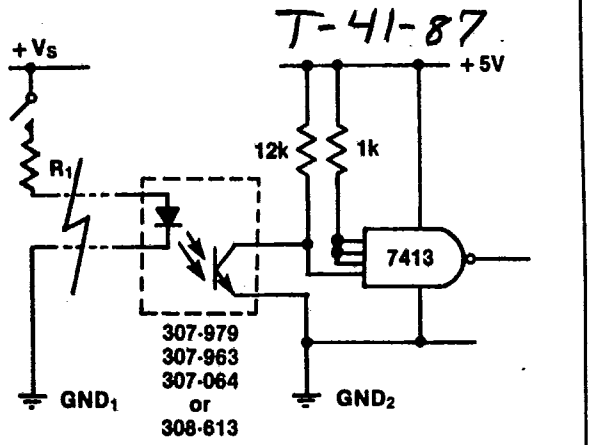


Figure 8 **Switched input isolation offering good noise immunity**

T-41-87



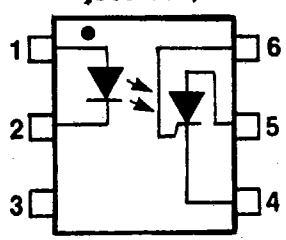
NOTE: *R_1 is chosen to limit I_F, $R_1 = \frac{V_S - V_F}{I_F}$ Where V_F—forward volts drop of diode
I_F—forward diode current
V_S—supply voltage

Opto-coupled SCR and Triacs

A gallium arsenide infra-red light emitting diode coupled with a light activated silicon controlled rectifier or triac in a 6 pin dual-in-line package.

OE28 1100

Opto-Coupled SCR H11C4 (308-001)

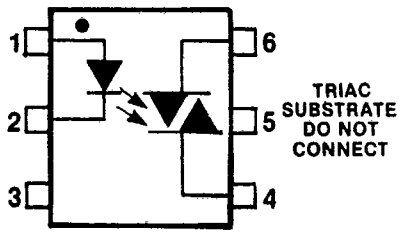


TOP VIEW

CD1

OE28 1200

Opto-Coupled Triac 3020 (308-196)

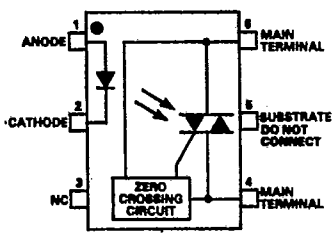


TOP VIEW

CD3

GE28 1200

Zero Voltage Crossing Opto-Coupled Triac 3041 (301-628)



TOP VIEW

CD8

Electrical characteristics T_A = 25°C unless otherwise stated

	308-001			308-196			301-628			
LED	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Units**
V_F (at I_F = 10mA)	–	1.2	1.5	–	1.2	1.5	–	1.2	1.5	V
I_R (at V_R = 3V)	–	–	10	–	0.05	100	–	–	100	µA
Output switch (SCR or triac)										
V_{DRM}	400	–	–	400	–	–	400	–	–	V
V_{RRM}	400	–	–	400	–	–	400	–	–	V
V_{TM}	–	1.1 (I_{TM} = 0.3A)	1.3	–	2.5 (I_{TM} = 0.1A)	3.0	–	1.75	3.0	V
I_{DRM} (at 400V V_{DRM})	–	–	150 (T_A = 100°C)	–	0.01	0.1	–	0.01	0.1	µA
I_H	–	100 (R_{GK} = 10kΩ, V_{AK} = 50V)	–	–	100 (V_{AK} = 3V)	–	–	200	–	µA
dV/dt		20 (R_{GK} = 10kΩ)			2		–	100	–	V/µs
Total device										
LED current to latch O/P switch	–	–	20 (V_{AK} = 50V, R_{GK} = 10kΩ)	–	8	15				mA
	–	–	11 (V_{AK} = 100V, R_{GK} = 27kΩ)	(V_{AK} = 3.0V, 10mA LED Drive)						
Isolation				Surge voltage (5s) 7,500V Peak						

Absolute maximum ratings

L.E.D.	**308-001**	**308-196**	**301-628**
Continuous forward current	60mA	50mA	50mA
Reverse voltage	6V	3V	6V
Output switch (SCR or triac)			
V_{DRM}	400V	400V	400V
V_{RRM}	400V	400V	400V
$I_{T(RMS)}$	300mA	100mA	50mA
I_{TSM}	5A [100µs pulse 1% duty cycle]	1.2A [10µs pulse 10% duty cycle]	1.2A [10ms pulse 10% duty cycle]
P_D at T_A = 25°C	400mW [Derate 5.3 mW/°C above 25°C]	300mW [Derate 4 mW/°C above 25°C]	330mW [Derate 4.4 mW/°C above 25°C]

3958
Opto-coupled SCR

Figure 9 **On-state current vs maximum allowable temperature**

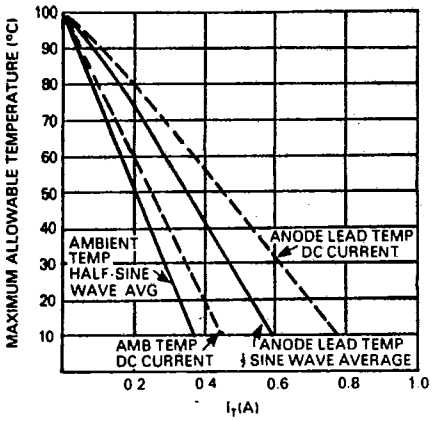
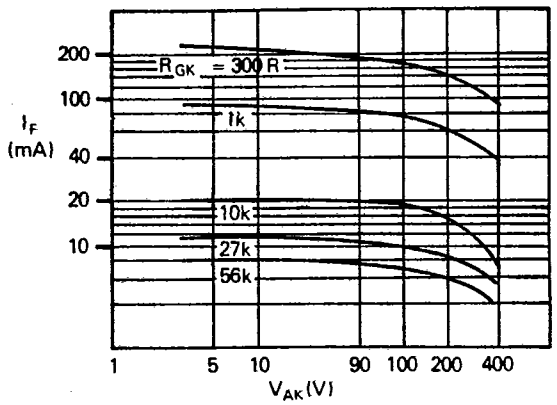


Figure 10 **Input current to trigger vs anode-cathode voltage**



RGK = GATE — CATHODE RESISTOR

Applications

Figure 11 **Lamp driver with TTL input**

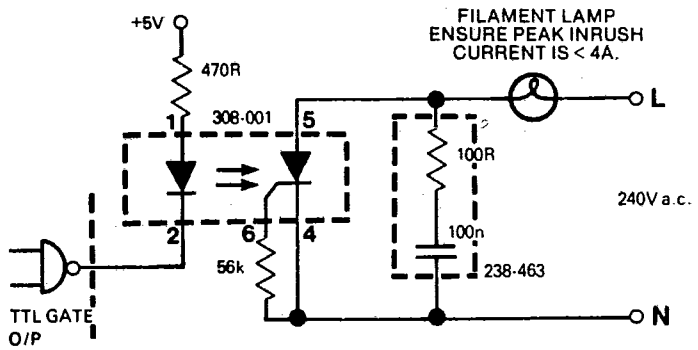
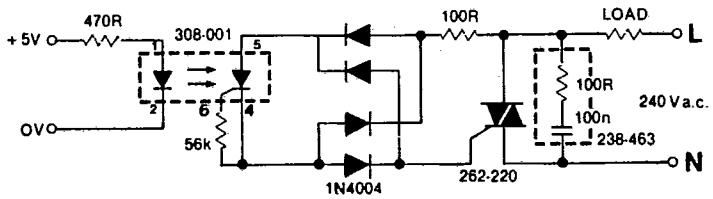


Figure 12 **Solid state relay**



Opto-coupled triac

Figure 13 **On-state characteristics**

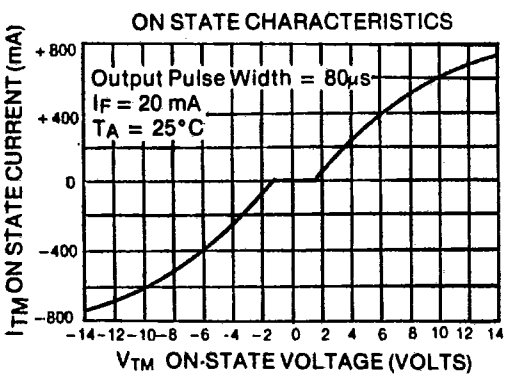
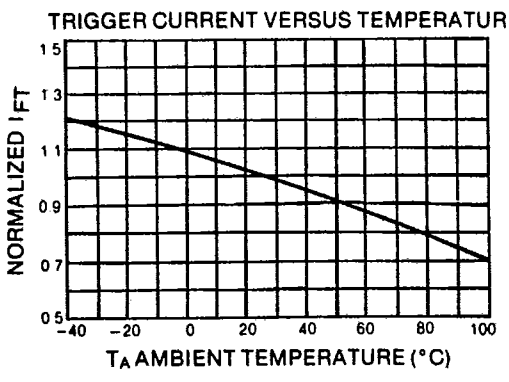


Figure 14 **Trigger current vs temperature**



Applications

Figure 15 **Resistive load with TTL input**

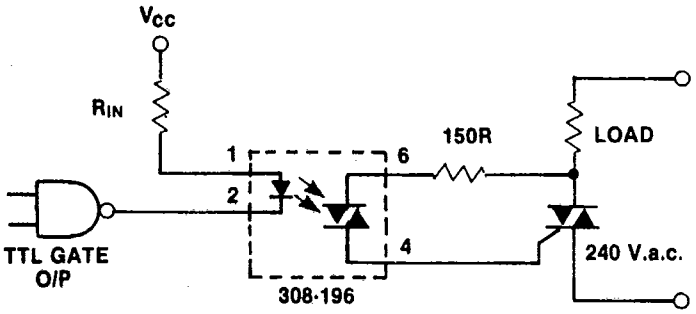
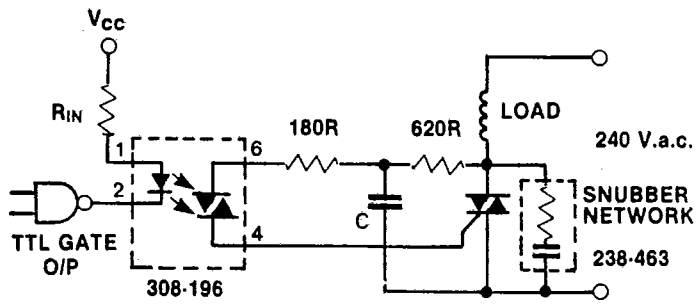
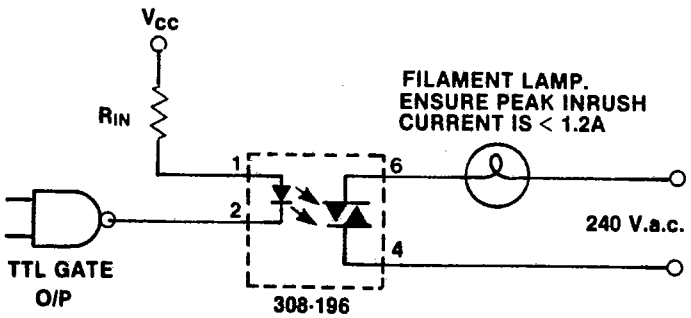


Figure 16 **Inductive load with TTL input**



C	LOAD POWER FACTOR
220n	0.75
330n	0.5

Figure 17 **Low power filament lamp driver with TTL input**



RS data

Zero voltage crossing opto-coupled triac

Figure 18 **Trigger current vs temperature**

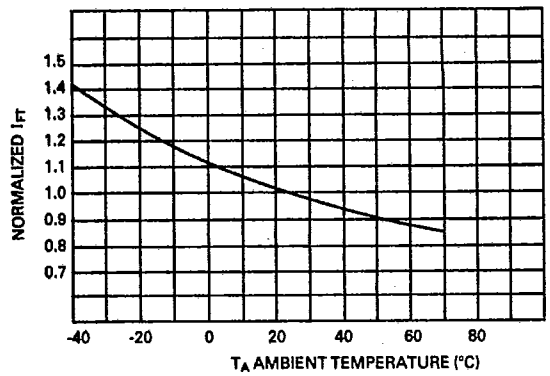
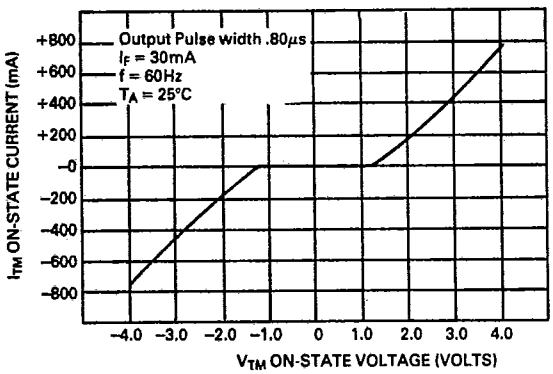


Figure 19 **On-state characteristics**



Applications

Figure 20 **Mains switching**

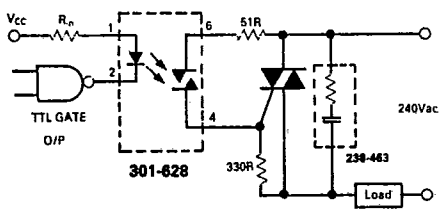


Figure 21 **Inverse – parallel SCR driver circuit**