

## FEATURES

- High Input Sensitivity  $I_{FT}=2$  mA
- Blocking Voltage, 600 V
- 300 mA On-State Current
- High Static  $dv/dt$  10,000 V/ $\mu$ s
- Inverse Parallel SCRs Provide Commutating  $dv/dt >2K$  V/ $\mu$ s
- Very Low Leakage  $<10$   $\mu$ A
- Isolation Test Voltage from Double Molded Package 5300 VAC<sub>RMS</sub>
- Small 6-Pin DIP Package
- Underwriters Lab File #E52744
- VDE 0884 Available with Option 1

## Maximum Ratings

### Emitter

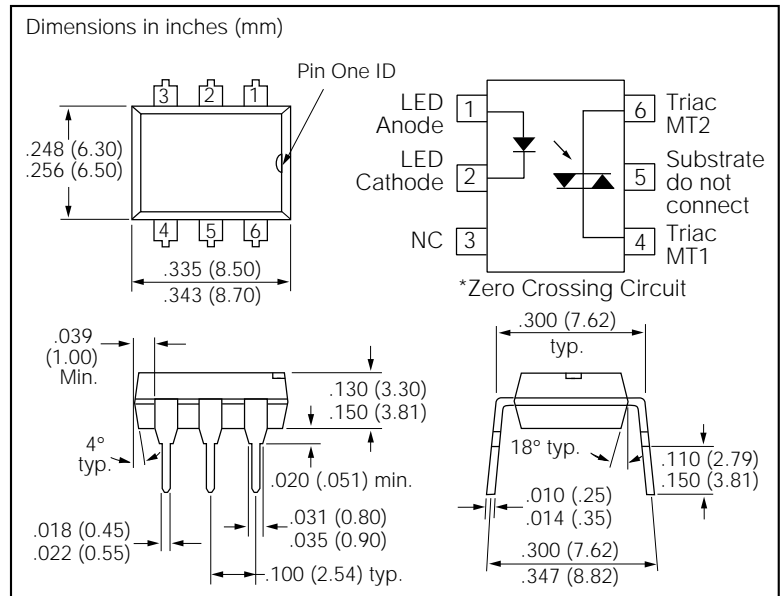
Reverse Voltage .....	6 V
Forward Current .....	60 mA
Surge Current.....	2.5 A
Power Dissipation.....	100 mW
Derate from 25°C .....	1.33 mW/°C
Thermal Resistance.....	750 °C/W

### Detector

Peak Off-State Voltage .....	600 V
Peak Reverse Voltage .....	600 V
RMS On-State Current.....	300 mA
Single Cycle Surge.....	3 A
Total Power Dissipation .....	500 mW
Derate from 25°C .....	6.6 mW/°C
Thermal Resistance.....	150°C/W

### Package

Storage Temperature.....	-55°C to +150°C
Operating Temperature .....	-55°C to +100°C
Lead Soldering Temperature.....	260°C/5 sec.
Isolation Test Voltage.....	5300 VAC <sub>RMS</sub>



## DESCRIPTION

The IL420 consists of a GaAs IRLED optically coupled to a photosensitive non-zero crossing TRIAC network. The TRIAC consists of two inverse parallel connected monolithic SCRs. These three semiconductors are assembled in a six pin 0.3 inch dual in-line package, using high insulation double molded, over/under leadframe construction.

High input sensitivity is achieved by using an emitter follower phototransistor and a cascaded SCR predriver resulting in an LED trigger current of less than 2 mA (DC).

The IL420 uses two discrete SCRs resulting in a commutating  $dv/dt$  of greater than 10KV/ms. The use of a proprietary  $dv/dt$  clamp results in a static  $dv/dt$  of greater than 10KV/ms. This clamp circuit has a MOSFET that is enhanced when high  $dv/dt$  spikes occur between MT1 and MT2 of the TRIAC. When conducting, the FET clamps the base of the phototransistor, disabling the first stage SCR predriver.

The 600 V blocking voltage permits control of off-line voltages up to 240 VAC, with a safety factor of more than two, and is sufficient for as much as 380 VAC.

The IL420 isolates low-voltage logic from 120, 240, and 380 VAC lines to control resistive, inductive, or capacitive loads including motors, solenoids, high current thyristors or TRIAC and relays.

Applications include solid-state relays, industrial controls, office equipment, and consumer appliances.

## Characteristics

	Symbol	Min	Typ	Max	Unit	Condition
<b>Emitter</b>						
Forward Voltage	$V_F$		1.16	1.35	V	$I_F=10\text{ mA}$
Reverse Current	$I_R$		0.1	10	$\mu\text{A}$	$V_R=6\text{ V}$
Capacitance	$C_O$		40		pF	$V_F=0\text{ V}$ , $f=1\text{ MHz}$
Thermal Resistance, Junction to Lead	$R_{THJL}$		750		$^{\circ}\text{C/W}$	
<b>Output Detector</b>						
Off-State Voltage	$V_{D(RMS)}$	424	460		V	$I_{D(RMS)}=70\text{ }\mu\text{A}$
Reverse Voltage	$V_R$	424	460		V	$I_{R(RMS)}=70\text{ }\mu\text{A}$
Off-State Current	$I_{D(RMS)}$		10	100	$\mu\text{A}$	$V_D=600\text{ V}$ , $T_A=100^{\circ}\text{C}$
Reverse Current	$I_{R(RMS)}$		10	100	$\mu\text{A}$	$V_R=600\text{ V}$ , $T_A=100^{\circ}\text{C}$
On-State Voltage	$V_{TM}$		1.7	3	V	$I_T=300\text{ mA}$
On-State Current	$I_{TM}$			300	mA	$PF=1.0$ , $V_{T(RMS)}=1.7\text{ V}$
Surge (Non-Repetitive) On-State Current	$I_{TSM}$			3	A	$f=50\text{ Hz}$
Holding Current	$I_H$		65	500	$\mu\text{A}$	
Latching Current	$I_L$		5		mA	$V_T=2.2\text{ V}$
LED Trigger Current	$I_{FT}$		1	2	mA	$V_{AK}=5\text{ V}$
Turn-On Time	$t_{ON}$		35		$\mu\text{s}$	$V_{RM}=V_{DM}=424\text{ VAC}$
Turn-Off Time	$t_{OFF}$		50		$\mu\text{s}$	$PF=1.0$ , $I_T=300\text{ mA}$
Critical State of Rise of Off-State Voltage	$\frac{dv}{dt}_{cr}$ $\frac{dv}{dt}_{cr}$	10000 5000			V/ $\mu\text{s}$ V/ $\mu\text{s}$	$V_D=0.67 V_{DRM}$ $T_J=25^{\circ}\text{C}$ $T_J=80^{\circ}\text{C}$
Critical Rate of Rise of Voltage at Current Commutation	$\frac{dv}{dt}_{crq}$ $\frac{dv}{dt}_{crq}$	10000 5000			V/ $\mu\text{s}$ V/ $\mu\text{s}$	$V_D=0.67 V_{DRM}$ , $di/dt_{crq}\leq 15\text{ A/ms}$ $T_J=25^{\circ}\text{C}$ $T_J=80^{\circ}\text{C}$
Critical State of Rise of On-State Current	$di/dt_{cr}$			8	A/ $\mu\text{s}$	
Thermal Resistance, Junction to Lead	$R_{THJL}$		150		$^{\circ}\text{C/W}$	
<b>Insulation and Isolation</b>						
Critical Rate of Rise of Coupled Input/Output Voltage	$dv_{(IO)}/dt$		5000		V/ $\mu\text{s}$	$I_T=0\text{ A}$ , $V_{RM}=V_{DM}=424\text{ VAC}$
Common Mode Coupling Capacitor	$C_{CM}$		0.01		pF	
Package Capacitance	$C_{IO}$		0.8		pF	$f=1\text{ MHz}$ , $V_{IO}=0\text{ V}$
Isolation Test Voltage, Input-Output	$V_{ISO}$	5300			VAC <sub>RMS</sub>	Relative Humidity $\leq 50\%$
Creepage		$\geq 7$			mm	
Clearance		$\geq 7$			mm	
Creepage Tracking Resistance per DIN IEC 112/VDE 0303, Part 1 group IIIa per DIN VDE 0110		CTI		175		
Isolation Resistance	$R_{IS}$ $R_{IS}$		$\geq 10^{12}$ $\geq 10^{11}$		$\Omega$ $\Omega$	$V_{IO}=500$ , $T_A=25^{\circ}\text{C}$ $V_{IO}=500$ , $T_A=100^{\circ}\text{C}$
Trigger Current Temperature Gradient	$\Delta I_{FT}/\Delta T_j$		7	14	$\mu\text{A/K}$	
Capacitance Between Input and Output Circuit	$C_{IO}$			2	pF	$V_R=0$ , $f=1\text{ kHz}$

Figure 1. Forward voltage versus forward current

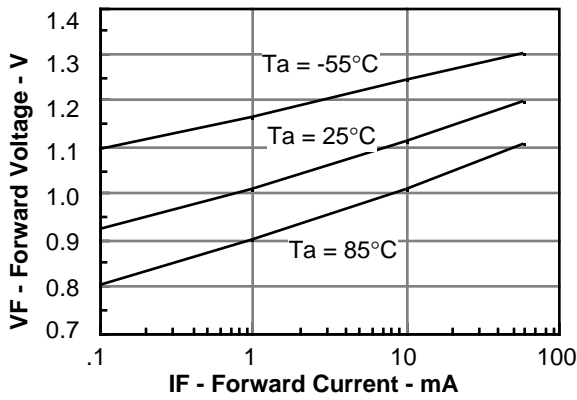


Figure 2. Peak LED current versus duty factor, Tau

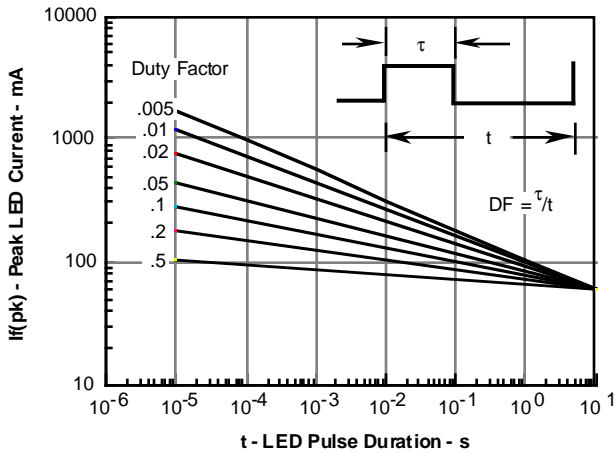


Figure 3. Maximum LED power dissipation

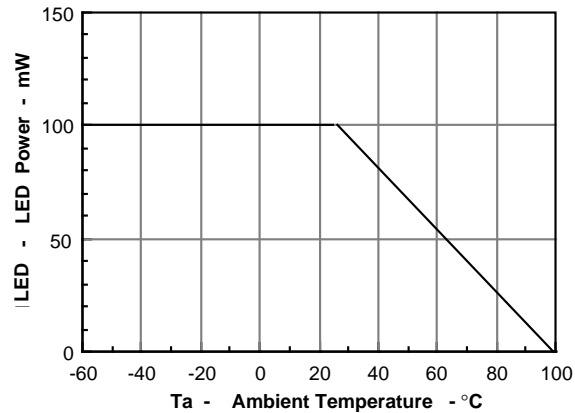


Figure 4. Typical output characteristics

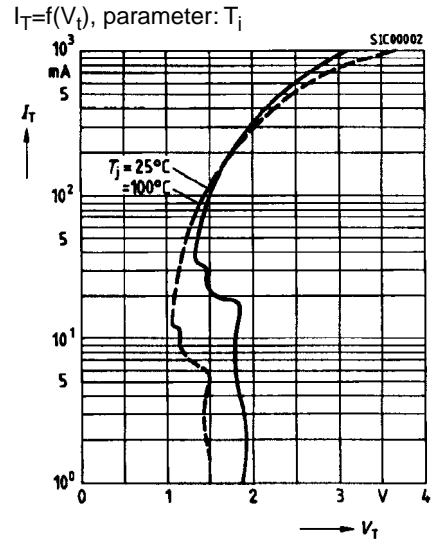


Figure 5. Current reduction

$I_{\text{TRMS}} = f(T_A)$ ,  $R_{\text{thJA}} = 125 \text{ K/W}$   
Device switch is soldered in PCB or base plate

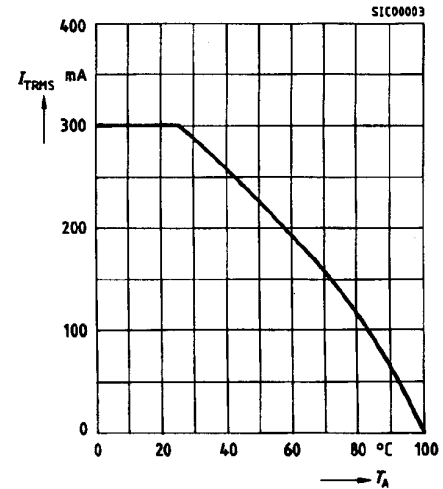
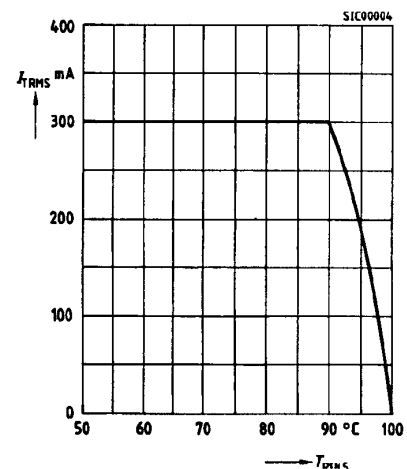
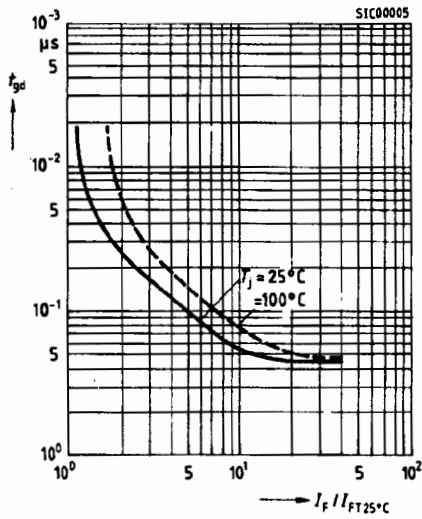


Figure 6. Current reduction

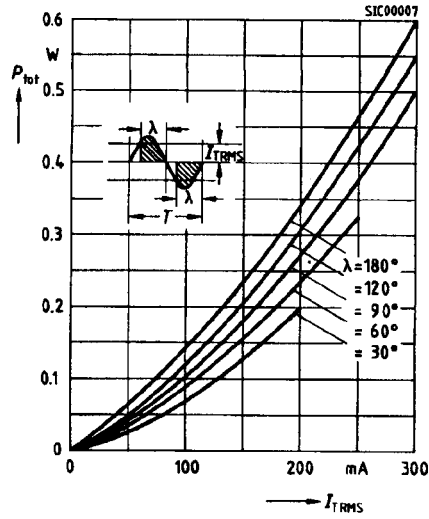
$I_{\text{TRMS}} = f(T_{\text{PIN5}})$ ,  $R_{\text{thJ}} = 16.5 \text{ K/W}$   
Thermocouple measurement must be performed potentially separated to A1 and A2. Measuring junction to be as near as possible at case.



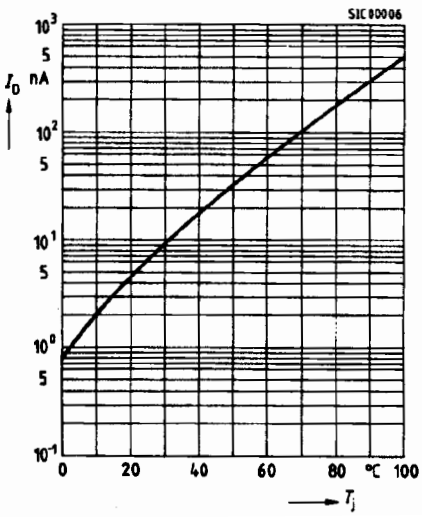
**Figure 7. Typical trigger delay time**  
 $t_{gd} = f(I_F / I_{FT25^\circ C})$ ,  $V_D = 200$  V, parameter:  $T_j$



**Figure 9. Power dissipation**  
 for 40 to 60 Hz line operation,  $P_{TOT} = f(I_{TRMS})$



**Figure 8. Typical off-state current**  
 $I_D = f(T_j)$ ,  $V_D = 800$  V, parameter:  $T_j$



**Figure 10. Pulse trigger current**  
 $I_{FTN} = f(t_{pIF}) I_{FTN}$  normalized to  $I_{FT}$ , referring to  $t_{pIF} \geq 1$  ms,  $V_{OP} = 200$  V,  $f = 40$  to  $60$  Hz typ.

