

FEATURES

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

Maximum Ratings

Emitter

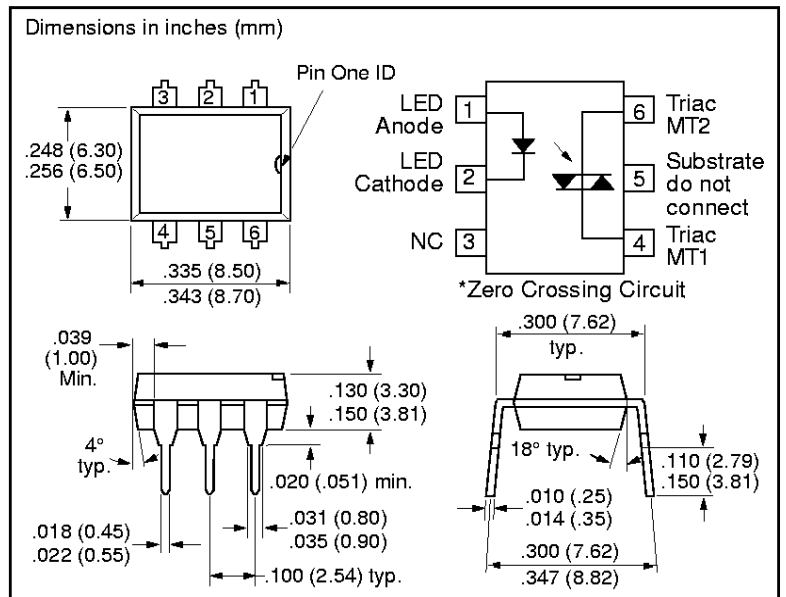
Reverse Voltage	6 V
Forward Current	60 mA
Surge Current	2.5 A
Power Dissipation	100 mW
Derate from 25°C	1.33 mW/°C
Thermal Resistance	750 °C/W

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 _{RMS}



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
Emitter						
Forward Voltage	V_F		1.16	1.35	V	$I_F=10\text{ mA}$
Reverse Current	I_R		0.1	10	μA	$V_R=6\text{ V}$
Capacitance	C_O		40		pF	$V_F=0\text{ V}$, $f=1\text{ MHz}$
Thermal Resistance, Junction to Lead	R_{THJL}		750		$^{\circ}\text{C/W}$	
Output Detector						
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	μA	$V_D=600\text{ V}$, $T_A=100^{\circ}\text{C}$
Reverse Current	$I_{R(RMS)}$		10	100	μA	$V_R=600\text{ V}$, $T_A=100^{\circ}\text{C}$
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	μA	
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		μs	$V_{RM}=V_{DM}=424\text{ VAC}$
Turn-Off Time	t_{OFF}		50		μs	$PF=1.0$, $I_T=300\text{ mA}$
Critical State of Rise of Off-State Voltage	$\frac{dv}{dt}_{cr}$ $\frac{dv}{dt}_{cr}$	10000 5000			V/ μs V/ μs	$V_D=0.67 V_{D(RM)}$ $T_j=25^{\circ}\text{C}$ $T_j=80^{\circ}\text{C}$
Critical Rate of Rise of Voltage at Current Commutation	$\frac{dv}{dt}_{crq}$ $\frac{dv}{dt}_{crq}$	10000 5000			V/ μs V/ μs	$V_D=0.67 V_{D(RM)}$, $di/dt_{crq}\leq 15\text{ A/ms}$ $T_j=25^{\circ}\text{C}$ $T_j=80^{\circ}\text{C}$
Critical State of Rise of On-State Current	di/dt_{cr}			8	A/ μs	
Thermal Resistance, Junction to Lead	R_{THJL}		150		$^{\circ}\text{C/W}$	
Insulation and Isolation						
Critical Rate of Rise of Coupled Input/Output Voltage	$dv_{(IO)}/dt$		5000		V/ μs	$I_T=0\text{ A}$, $V_{RM}=V_{DM}=424\text{ VAC}$
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 _{RMS}	Relative Humidity $\leq 50\%$
Creepage		≥ 7			mm	
Clearance		≥ 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}		$\geq 10^{12}$ $\geq 10^{11}$		Ω Ω	$V_{IO}=500$, $T_A=25^{\circ}\text{C}$ $V_{IO}=500$, $T_A=100^{\circ}\text{C}$
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

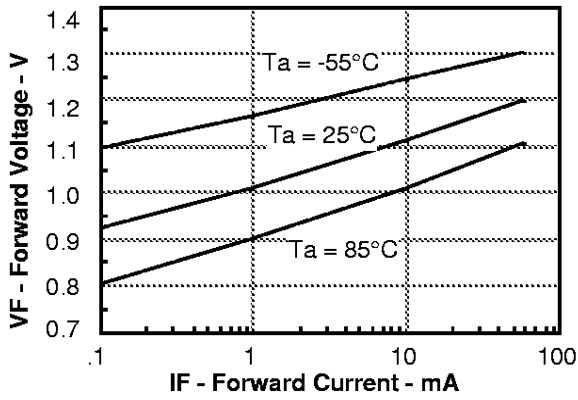


Figure 2. Peak LED current versus duty factor, Tau

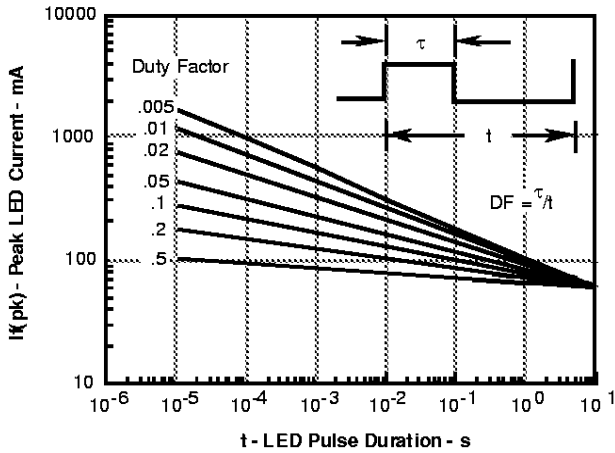


Figure 3. Maximum LED power dissipation

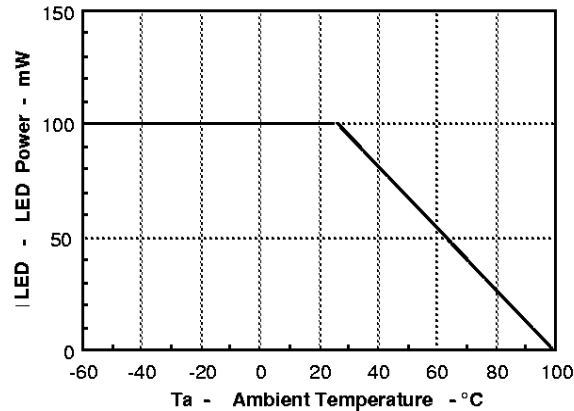


Figure 4. Typical output characteristics

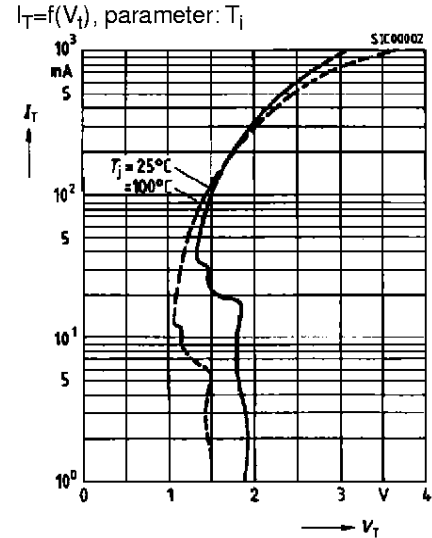


Figure 5. Current reduction

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

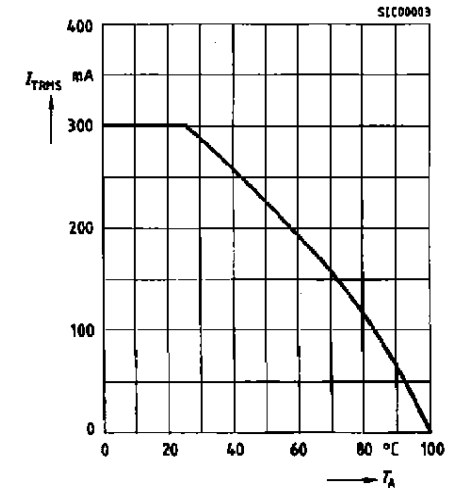


Figure 6. Current reduction

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

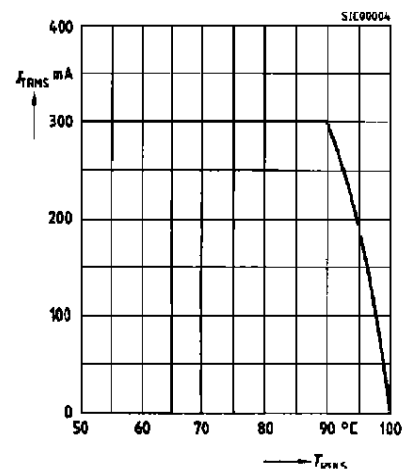


Figure 7. Typical trigger delay time
 $t_{gd}=f(I_F/I_{FT25^\circ C})$, $V_D=200$ V, parameter: T_j

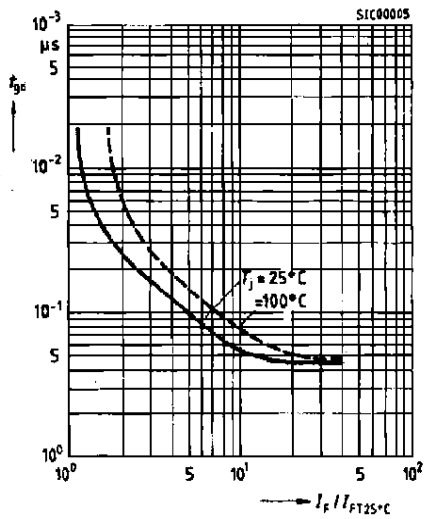


Figure 9. Power dissipation
 for 40 to 60 Hz line operation, $P_{TOT}=f(I_{TRMS})$

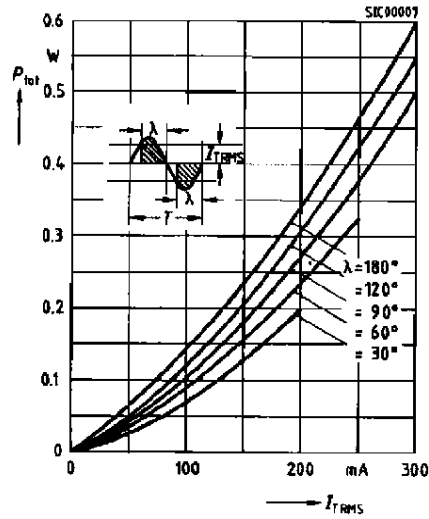


Figure 8. Typical off-state current
 $I_D=f(T_j)$, $V_D=800$ V, parameter: T_j

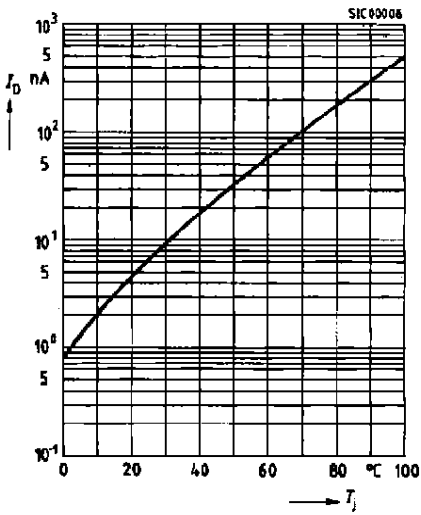


Figure 10. Pulse trigger current
 $I_{FTN}=f(t_{pIF}) I_{FTN}$ normalized to I_{FT} , referring to $t_{pIF} \ge 1$ ms, $V_{OP}=200$ V, $f=40$ to 60 Hz typ.

