SIEMENS

IL420
600 V TRIAC DRIVER OPTOCOUPLER

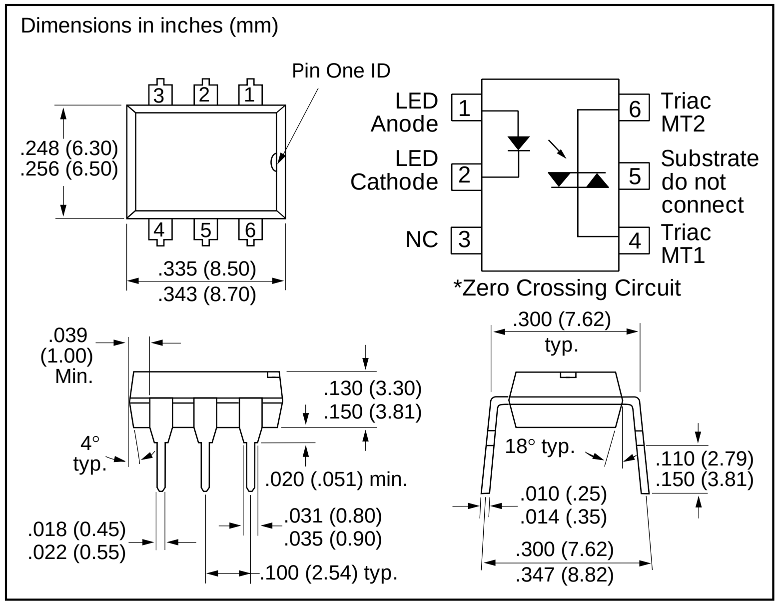
FEATURES
- **High Input Sensitivity I_{FT}=2 mA**
- **Blocking Voltage, 600 V**
- **300 mA On-State Current**
- **High Static dv/dt 10,000 V/µs**
- **Inverse Parallel SCRs Provide Commutating dv/dt >2K V/µs**
- **Very Low Leakage <10 µA**
- **Isolation Test Voltage from Double Molded Package 5300 VAC_{RMS}**
- **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 mA
Reverse Current	I_R		0.1	10	µA	V_R=6 V
Capacitance	C_O		40		pF	V_F=0 V, f=1 MHz
Thermal Resistance, Junction to Lead	R_{THJL}		750		°C/W	
Output Detector						
Off-State Voltage	$V_{D\ (RMS)}$	424	460		V	$I_{D(RMS)}$=70 µA
Reverse Voltage	V_R	424	460		V	$I_{R(RMS)}$=70 µA
Off-State Current	$I_{D\ (RMS)}$		10	100	µA	V_D=600 V, T_A=100°C
Reverse Current	$I_{R\ (RMS)}$		10	100	µA	V_R=600 V, T_A=100°C
On-State Voltage	V_{TM}		1.7	3	V	I_T=300 mA
On-State Current	I_{TM}			300	mA	PF=1.0, $V_{T(RMS)}$=1.7 V
Surge (Non-Repititive) On-State Current	I_{TSM}			3	A	f=50 Hz
Holding Current	I_H		65	500	µA	
Latching Current	I_L		5		mA	V_T=2.2 V
LED Trigger Current	I_{FT}		1	2	mA	V_{AK}=5 V
Turn-On Time	t_{ON}		35		µs	V_{RM}=V_{DM}=424 VAC
Turn-Off Time	t_{OFF}		50		µs	PF=1.0, I_T=300 mA
Critical State of Rise of Off-State Voltage	dv/dt_{cr} dv/dt_{cr}	10000 5000			V/µs V/µs	V_D=0.67 V_{DRM} T_j=25°C Tj=80°C
Critical Rate of Rise of Voltage at Current Commutation	dv/dt_{crq} dv/dt_{crq}	10000 5000			V/µs V/µs	V_D=0.67 V_{DRM}, di/dt_{crq}≤15 A/ms Tj=25°C T_j=80°C
Critical State of Rise of On-State Current	di/dt_{cr}			8	A/µs	
Thermal Resistance, Junction to Lead	R_{THJL}		150		°C/W	
Insulation and Isolation						
Critical Rate of Rise of Coupled Input/Output Voltage	$dv_{(IO)}/dt$		5000		V/µs	I_T=0 A, V_{RM}=V_{DM}=424 VAC
Common Mode Coupling Capacitor	C_{CM}		0.01		pF	
Package Capacitance	C_{IO}		0.8		pF	f=1 MHz, V_{IO}=0 V
Isolation Test Voltage, Input-Output	V_{ISO}	5300			VAC_{RMS}	Relative Humidity ≤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°C V_{IO}=500, T_A=100°C
Trigger Current Temperature Gradient	$\Delta I_{FT}/\Delta T_j$		7	14	µA/K	
Capacitance Between Input and Output Circuit	C_{IO}			2	pF	V_R=0, f=1 kHz

Figure 1. Forward voltage versus forward current

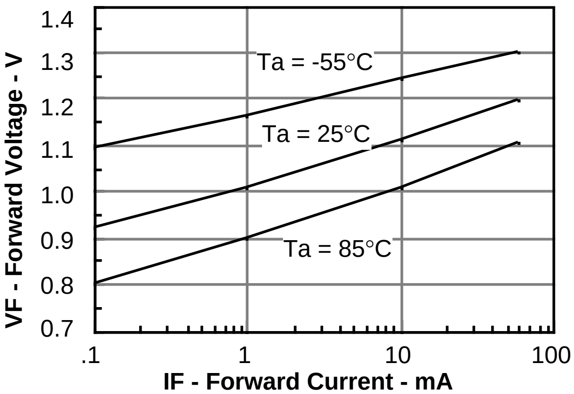


Figure 2. Peak LED current versus duty factor, Tau

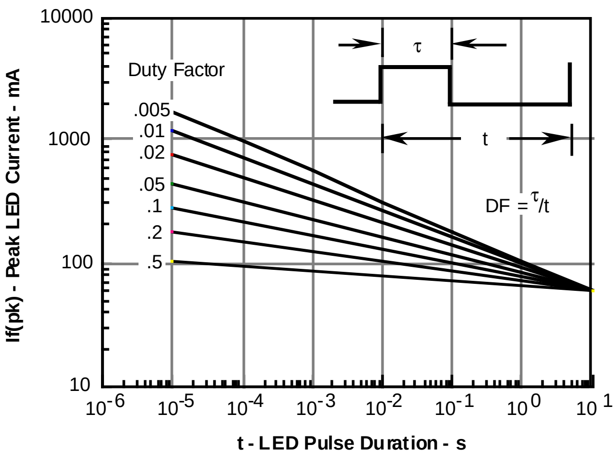


Figure 3. Maximum LED power dissipation

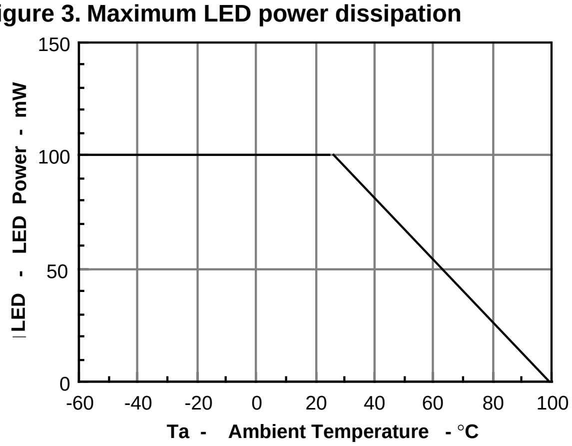


Figure 4. Typical output characteristics

I_T=f(V_t), parameter: T_j

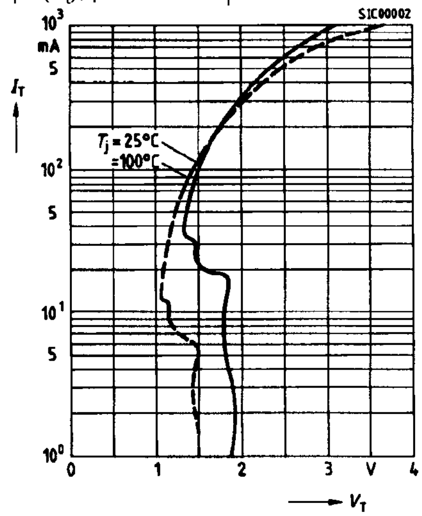


Figure 5. Current reduction

I_{TRMS}=f(T_A) R_{thJA}=125 K/W

Device switch is soldered in PCB or base plate

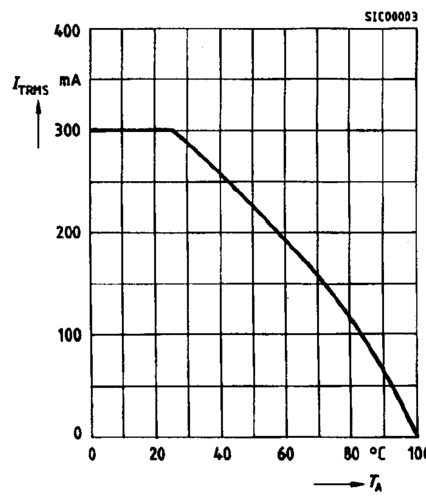


Figure 6. Current reduction

I_{TRMS}=f(T_{PIN5}), R_{thJ}=16.5 K/W

Thermocouple measurement must be performed potentially separated to A1 and A2. Measuring junction to be as near as possible at case.

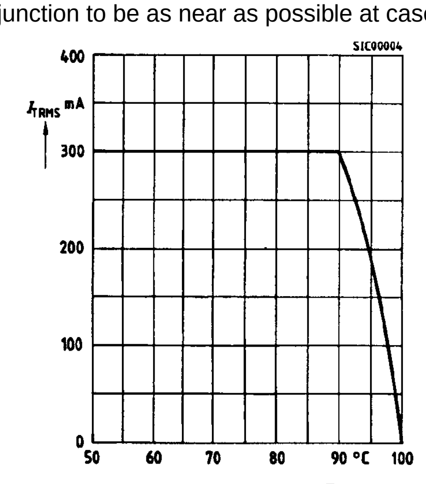


Figure 7. Typical trigger delay time
tgd=f($I_F/I_{FT25°C}$), V_D=200 V, parameter: T_j

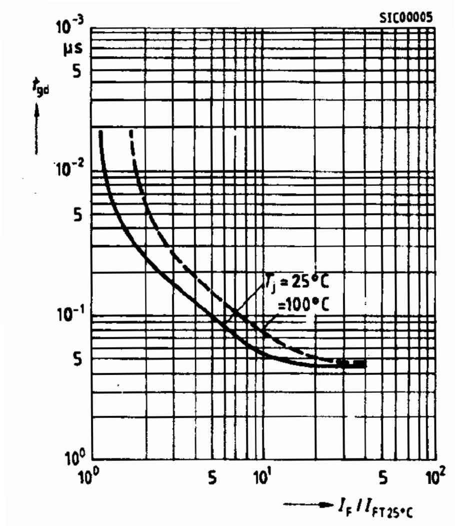


Figure 8. Typical off-state current
I_D=f(T_j), V_D=800 V, parameter: T_j

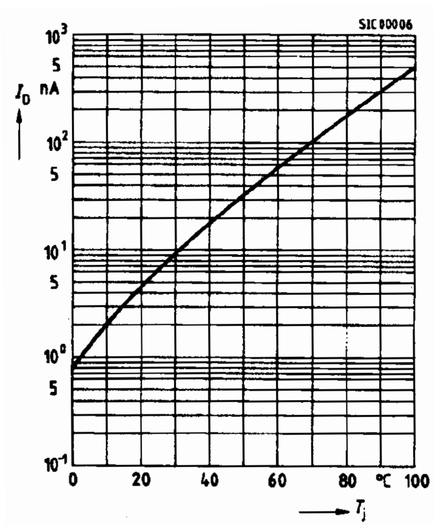


Figure 9. Power dissipation
for 40 to 60 Hz line operation, P_{TOT}=f(I_{TRMS})

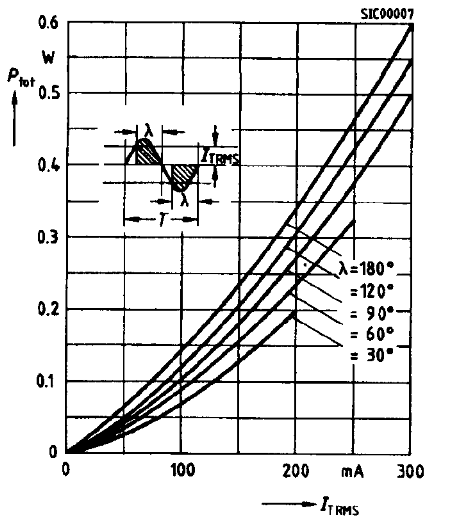


Figure 10. Pulse trigger current
I_{FTN}=f(t_{pIF})I_{FTN} normalized to I_{FT}, referring to t_{pIF}≥1ms, V_{OP}=200 V, f=40 to 60 Hz typ.