

**FEATURES**

- High Input Sensitivity  $I_{FT}=2.0$  mA
- 600/800 V Blocking Voltage
- 300 mA On-State Current
- High Static  $dv/dt$  10 kV/ $\mu$ s
- Inverse Parallel SCRs Provide Commutating  $dv/dt >10$  kV/ $\mu$ s
- Very Low Leakage  $<10$   $\mu$ A
- Isolation Test Voltage from Double Molded Package 5300 V<sub>RMS</sub>
- Small 6-Pin DIP Package
- Underwriters Lab File #E52744
- VDE Approval #0884 Available with Option 1

**Maximum Ratings**

**Emitter**

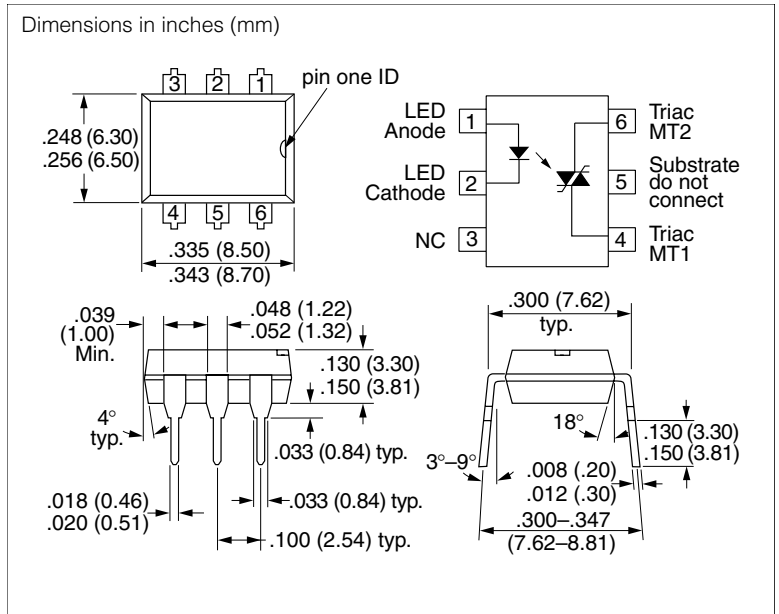
Reverse Voltage .....	6.0 V
Forward Current .....	60 mA
Surge Current .....	2.5 A
Power Dissipation .....	100 mW
Derate from 25°C .....	1.33 mW/°C

**Detector**

Peak Off-State Voltage	
IL420 .....	600 V
IL4208 .....	800 V
RMS On-State Current .....	300 mA
Single Cycle Surge Current .....	3.0 A
Total Power Dissipation .....	500 mW
Derate from 25°C .....	6.6 mW/°C

**Package**

Isolation Test Voltage (between emitter and detector, climate per DIN 50014, part 2, Nov. 74, t=1.0 sec.) .....	5300 V <sub>RMS</sub>
Pollution Degree (DIN VDE 0109) .....	2
Creepage Distance .....	$\geq 7.0$ mm
Clearance .....	$\geq 7.0$ mm
Comparative Tracking Index per DIN IEC 112/VDE 0303 part 1, Group IIIa per DIN VDE 6110 .....	$\geq 175$
Isolation Resistance	
$V_{IO}=500$ V, $T_A=25^\circ\text{C}$ .....	$\geq 10^{12}$ $\Omega$
$V_{IO}=500$ V, $T_A=100^\circ\text{C}$ .....	$\geq 10^{11}$ $\Omega$
Storage Temperature Range .....	-55°C to +150°C
Ambient Temperature Range .....	-55°C to +100°C
Soldering Temperature (max. $\leq 10$ sec.dip soldering $\geq 0.5$ mm from case bottom) .....	260°C



**DESCRIPTION**

The IL420/4208 consists of a GaAs IRLED optically coupled to a photo-sensitive 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 2.0 mA (DC).

The IL420/4208 uses two discrete SCRs resulting in a commutating  $dv/dt$  of greater than 10 kV/ $\mu$ s. The use of a proprietary  $dv/dt$  clamp results in a static  $dv/dt$  of greater than 10 kV/ $\mu$ s. 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 600/800 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 IL420/4208 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

Parameter	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	$\mu\text{A}$	$V_R=6.0\text{ V}$	
Capacitance	$C_O$	—	40	—	pF	$V_F=0\text{ V}$ , $f=1.0\text{ MHz}$	
Thermal Resistance, Junction to Ambient	$R_{THJA}$	—	750	—	K/W	—	
<b>Detector</b>							
Off-State Voltage	IL420	$V_{D(RMS)}$	424	460	—	V	$I_{D(RMS)}=70\text{ }\mu\text{A}$
	IL4208		565	—			
Repetitive Peak Off-State Voltage	IL420	$V_{DRM}$	600	—	—	V	$I_{DRM}=100\text{ }\mu\text{s}$
	IL4208		800	—	—		
Off-State Current	$I_{D(RMS)}$	—	10	100	$\mu\text{A}$	$V_D=V_{DRM}$ , $T_A=100^\circ\text{C}$	
On-State Voltage	$V_{TM}$	—	1.7	3.0	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	$I_{TSM}$	—	—	3.0	A	$f=50\text{ Hz}$	
Holding Current	$I_H$	—	65	500	$\mu\text{A}$	—	
Latching Current	$I_L$	—	5.0	—	mA	$V_T=2.2\text{ V}$	
LED Trigger Current	$I_{FT}$	—	1.0	2.0	mA	$V_{AK}=5.0\text{ V}$	
Trigger Current Temperature Gradient	$\Delta I_{FT}/\Delta T_j$	—	7.0	14	$\mu\text{A/K}$	—	
Turn-On Time	$t_{ON}$	—	35	—	$\mu\text{s}$	$V_{RM}=V_{DM}=V_{D(RMS)}$	
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	$dv/dt_{cr}$		10000	—	—	V/ $\mu\text{s}$	$V_D=0.67 V_{DRM}$ , $T_j=25^\circ\text{C}$
			5000	—	—		$V_D=0.67 V_{DRM}$ , $T_j=80^\circ\text{C}$
Critical Rate of Rise of Voltage at Current Commutation	$dv/dt_{crq}$		10000	—	—	V/ $\mu\text{s}$	$V_D=0.67 V_{DRM}$ , $di/dt_{crq}\leq 15\text{ A/ms}$ , $T_j=25^\circ\text{C}$
			5000	—	—		$V_D=0.67 V_{DRM}$ , $di/dt_{crq}\leq 15\text{ A/ms}$ , $T_j=80^\circ\text{C}$
Critical State of Rise of On-State Current	$di/dt_{cr}$	8.0	—	—	A/ $\mu\text{s}$	—	
Thermal Resistance, Junction to Ambient	$R_{THJA}$	—	150	—	K/W	—	
<b>Package</b>							
Critical Rate of Rise of Coupled Input/Output Voltage	$dv_{(IO)}/dt$	—	5000	—	V/ $\mu\text{s}$	$I_T=0\text{ A}$ , $V_{RM}=V_{DM}=V_{D(RMS)}$	
Package Capacitance	$C_{IO}$	—	0.8	—	pF	$f=1.0\text{ MHz}$ , $V_{IO}=0\text{ V}$	
Common Mode Coupling Capacitance	$C_{CM}$	—	0.01	—	pF	—	
Isolation Resistance	$R_{is}$		$\geq 10^{12}$	—	—	$\Omega$	$V_{IO}=500$ , $T_A=25^\circ\text{C}$
			$\geq 10^{11}$	—	—		$V_{IO}=500$ , $T_A=100^\circ\text{C}$

Figure 1. Forward voltage versus forward current

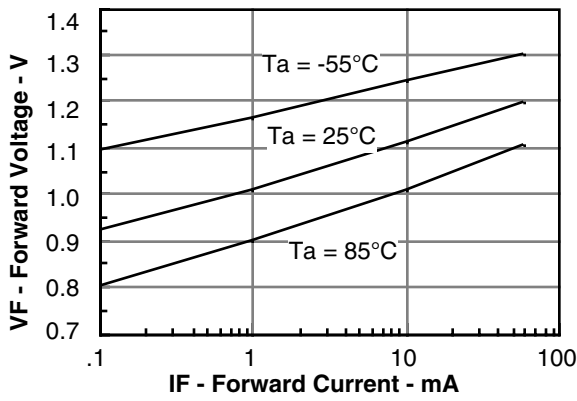


Figure 2. Peak LED current versus duty factor, Tau

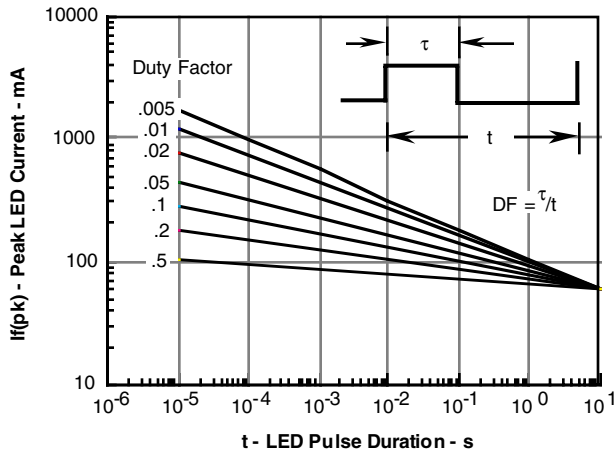


Figure 3. Maximum LED power dissipation

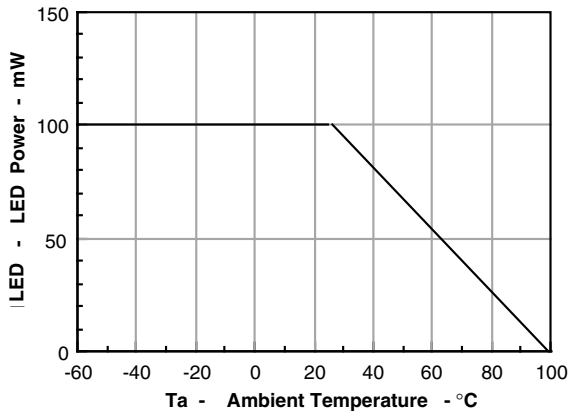


Figure 4. Typical output characteristics

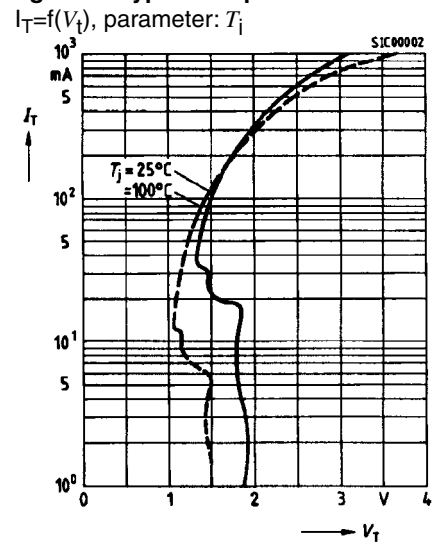


Figure 5. Current reduction

$I_{TRMS} = f(T_A)$   $R_{thJA} = 150 \text{ K/W}$   
 Device switch is soldered in PCB or base plate

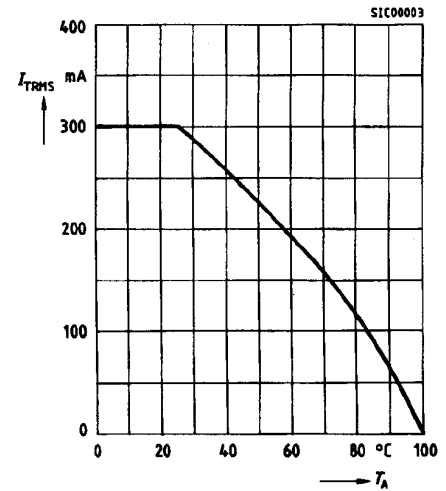
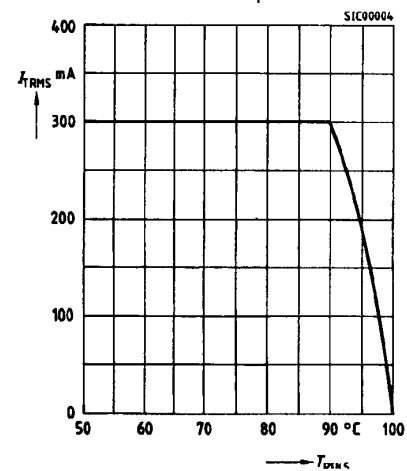


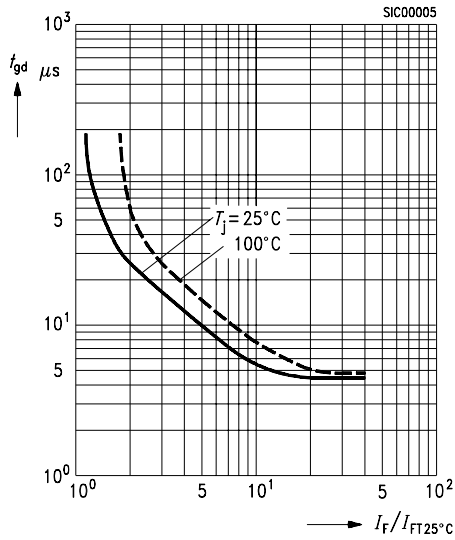
Figure 6. Current reduction

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



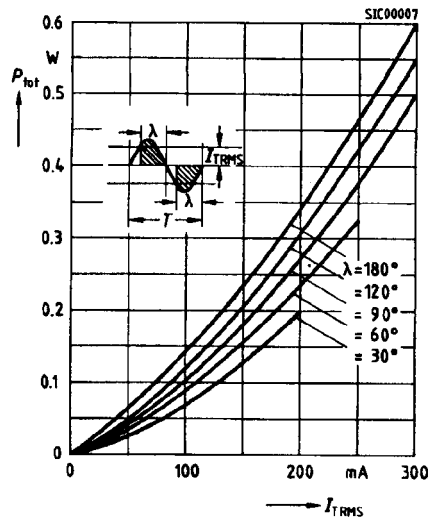
**Figure 7. Typical trigger delay time**

$t_{gd}=f(I_F/I_{FT25^\circ C})$ ,  $V_D=200$  V, parameter:  $T_j$



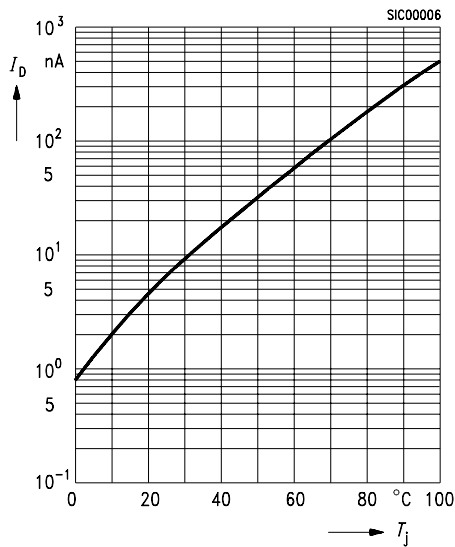
**Figure 9. Power dissipation**

for 40 to 60 Hz line operation,  $P_{tot}=f(I_{TRMS})$



**Figure 8. Typical off-state current**

$I_D=f(T_j)$ ,  $V_D=600$  V, parameter:  $T_j$



**Figure 10. Pulse trigger current**

$I_{FTN}=f(t_{pIF})I_{FTN}$  normalized to  $I_{FT}$ , referring to  $t_{pIF} \geq 1.0$  ms,  $V_{OP}=200$  V,  $f=40$  to  $60$  Hz typ.

