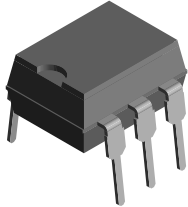
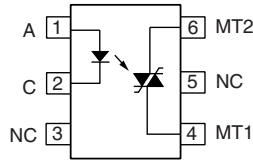


## Optocoupler, Phototriac Output, High dV/dt, Low Input Current



I179035



### DESCRIPTION

The IL420/IL4208 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 dual in-line package.

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/IL4208 used two discrete SCRs resulting in a commutating dV/dt of greater than 10 kV/μs. The use of a proprietary dV/dt clam results in a static dV/dt of greater than 10 kV/μs. 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 phototransistors, disabling the first stage SCR predriver.

The 600/800 V blocking voltage permits control of offline voltages up to 240 VAC, with a safety factor of more than two, and is sufficient for as much as 380 VAC.

The IL420/IL4208 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.

### 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/μs
- Inverse parallel SCRs provide commutating dV/dt > 10 kV/μs
- Very low leakage < 10 μA
- Isolation test voltage 5300 V<sub>RMS</sub>
- Small 6-pin DIP package
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

- Solid state relays
- Industrial controls
- Office equipment
- Consumer appliances

### AGENCY APPROVALS

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- FIMKO and BSI IEC 60950; IEC 60065 only for IL4208
- DIN EN 60747-5-2 (VDE 0884)/DIN EN 60747-5-5 pending available with option 1

### ORDER INFORMATION

PART	REMARKS
IL420	600 V V <sub>DRM</sub> , DIP-6
IL4208	800 V V <sub>DRM</sub> , DIP-6
IL420-X006	600 V V <sub>DRM</sub> , DIP-6 400 mil (option 6)
IL420-X007	600 V V <sub>DRM</sub> , SMD-6 (option 7)
IL420-X009	600 V V <sub>DRM</sub> , SMD-6 (option 9)
IL4208-X007	800 V V <sub>DRM</sub> , SMD-6 (option 7)
IL4208-X009	800 V V <sub>DRM</sub> , SMD-6 (option 9)

#### Note

For additional information on the available options refer to option information.

ABSOLUTE MAXIMUM RATINGS (1)					
PARAMETER	TEST CONDITION	PART	SYMBOL	VALUE	UNIT
<b>INPUT</b>					
Reverse voltage			$V_R$	6.0	V
Forward current			$I_F$	60	mA
Surge current			$I_{FSM}$	2.5	A
Power dissipation			$P_{diss}$	100	mW
Derate from 25 °C				1.33	mW/°C
<b>OUTPUT</b>					
Peak off-state voltage		IL420	$V_{DRM}$	600	V
		IL4208	$V_{DRM}$	800	V
RMS on-state current			$I_{TM}$	300	mA
Single cycle surge current			$I_{TSM}$	3.0	A
Power dissipation			$P_{diss}$	500	mW
Derate from 25 °C				6.6	mW/°C
<b>COUPLER</b>					
Isolation test voltage (2)	t = 1.0 s		$V_{ISO}$	5300	$V_{RMS}$
Pollution degree (DIN VDE 0109)				2	
Creepage distance				≥ 7.0	mm
Clearance distance				≥ 7.0	mm
Comparative tracking (3)				≥ 175	
Isolation resistance	$V_{IO} = 500\text{ V}, T_{amb} = 25\text{ °C}$		$R_{IO}$	≥ $10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}, T_{amb} = 100\text{ °C}$		$R_{IO}$	≥ $10^{11}$	$\Omega$
Storage temperature range			$T_{stg}$	- 55 to + 150	°C
Ambient temperature range			$T_{amb}$	- 55 to + 100	°C
Soldering temperature (4)	max. ≤ 10 s dip soldering ≥ 0.5 mm from case bottom		$T_{sld}$	260	°C

**Notes**

(1)  $T_{amb} = 25\text{ °C}$ , unless otherwise specified.

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of this document. Exposure to absolute maximum ratings for extended periods of the time can adversely affect reliability.

(2) Between emitter and detector, climate per DIN 50014, part 2, Nov. 74.

(3) Index per DIN IEC 60112/VDE 0303 part 1, group IIIa per DIN VDE 6110.

(4) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).



ELECTRICAL CHARACTERISTICS							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>							
Forward voltage	$I_F = 10 \text{ mA}$		$V_F$		1.16	1.35	V
Reverse current	$V_R = 6.0 \text{ V}$		$I_R$		0.1	10	$\mu\text{A}$
Input capacitance	$V_F = 0 \text{ V}, f = 1.0 \text{ MHz}$		$C_{IN}$		40		pF
Thermal resistance, junction to ambient			$R_{thja}$		750		$^{\circ}\text{C/W}$
<b>OUTPUT</b>							
Off-state voltage	$I_{D(RMS)} = 70 \mu\text{A}$	IL420	$V_{D(RMS)}$	424	460		V
		IL4208	$V_{D(RMS)}$	565			V
Repetitive peak off-state voltage	$I_{DRM} = 100 \mu\text{A}$	IL420	$V_{DRM}$	600			V
		IL4208	$V_{DRM}$	800			V
Off-state current	$V_D = V_{DRM}, T_{amb} = 100 \text{ }^{\circ}\text{C}$		$I_{BD}$		10	100	$\mu\text{A}$
On-state voltage	$I_T = 300 \text{ mA}$		$V_{TM}$		1.7	3.0	V
On-current	$PF = 1.0, V_{T(RMS)} = 1.7 \text{ V}$		$I_{TM}$			300	mA
Surge (non-repetitive), on-state current	$f = 50 \text{ Hz}$		$I_{TSM}$			3.0	A
Holding current			$I_H$		65	500	$\mu\text{A}$
Latching current	$V_T = 2.2 \text{ V}$		$I_L$		5.0		mA
LED trigger current	$V_{AK} = 5.0 \text{ V}$		$I_{FT}$		1.0	2.0	
Trigger current temperature gradient			$\Delta I_{FT}/\Delta T_j$		7.0	14	$\mu\text{A}/^{\circ}\text{C}$
Critical rate of rise off-state voltage	$V_D = 0.67 V_{DRM}, T_j = 25 \text{ }^{\circ}\text{C}$		$dV/dt_{cr}$	10000			V/ $\mu\text{s}$
	$V_D = 0.67 V_{DRM}, T_j = 80 \text{ }^{\circ}\text{C}$		$dV/dt_{cr}$	5000			V/ $\mu\text{s}$
Critical rate of rise of voltage at current commutation	$V_D = 0.67 V_{DRM}, dl/dt_{crq} \leq 15 \text{ A/ms}, T_j = 25 \text{ }^{\circ}\text{C}$		$dV/dt_{crq}$	10000			V/ $\mu\text{s}$
	$V_D = 0.67 V_{DRM}, dl/dt_{crq} \leq 15 \text{ A/ms}, T_j = 80 \text{ }^{\circ}\text{C}$		$dV/dt_{crq}$	5000			V/ $\mu\text{s}$
Critical rate of rise of on-state			$dl/dt_{cr}$	8.0			A/ $\mu\text{s}$
Thermal resistance, junction to ambient			$R_{thja}$		150		$^{\circ}\text{C/W}$
<b>COUPLER</b>							
Critical rate of rise of coupled input/output voltage	$I_T = 0 \text{ A}, V_{RM} = V_{DM} = V_{D(RMS)}$		$dV/dt$		5000		V/ $\mu\text{s}$
Capacitance (input to output)	$f = 1.0 \text{ MHz}, V_{IO} = 0 \text{ V}$		$C_{IO}$		0.8		pF
Isolation resistance	$V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ }^{\circ}\text{C}$		$R_{IO}$	$\geq 10^{12}$			$\Omega$
	$V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ }^{\circ}\text{C}$		$R_{IO}$	$\geq 10^{11}$			$\Omega$

**Note**

$T_{amb} = 25 \text{ }^{\circ}\text{C}$ , unless otherwise specified.

Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

SWITCHING CHARACTERISTICS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$V_{RM} = V_{DM} = V_{D(RMS)}$	$t_{on}$		35		$\mu\text{s}$
	$PF = 1.0, I_T = 300 \text{ mA}$	$t_{off}$		50		$\mu\text{s}$

SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
$V_{IOTM}$			8000			V
$V_{IORM}$			630			V
$P_{SO}$					500	mW
$I_{SI}$					250	mA
$T_{SI}$					175	°C
Creepage distance	standard DIP-8		7			mm
Clearance distance	standard DIP-8		7			mm
Creepage distance	400 mil DIP-8		8			mm
Clearance distance	400 mil DIP-8		8			mm
Insulation thickness	for IL4208 only		0.4			mm

**Note**

As per IEC 60747-5-2, § 7.4.3.8.1, this optocoupler is suitable for "safe electrical insulation" only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

**TYPICAL CHARACTERISTICS**

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

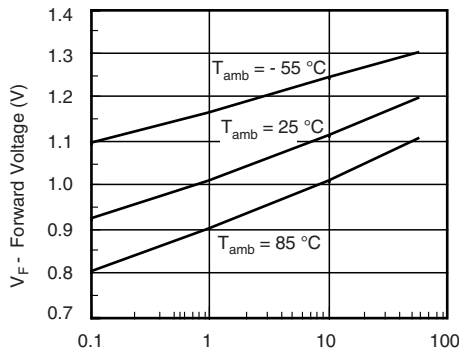


Fig. 1 - Forward Voltage vs. Forward Current

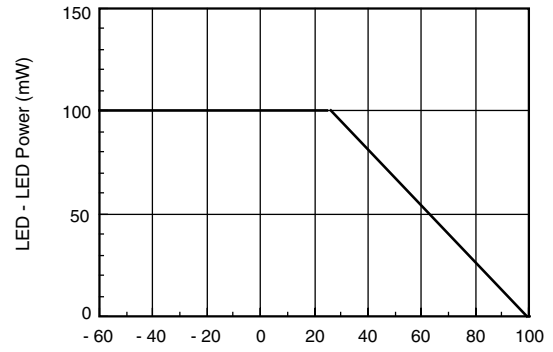


Fig. 3 - Maximum LED Power Dissipation

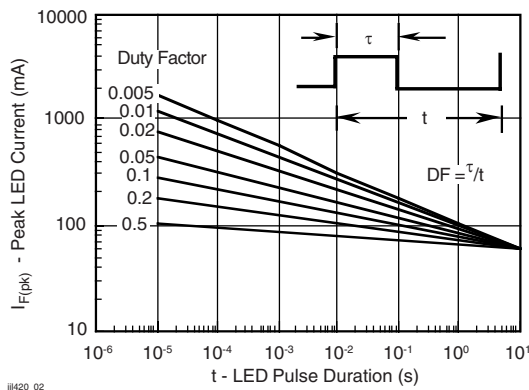


Fig. 2 - Peak LED Current vs. Duty Factor,  $\tau$

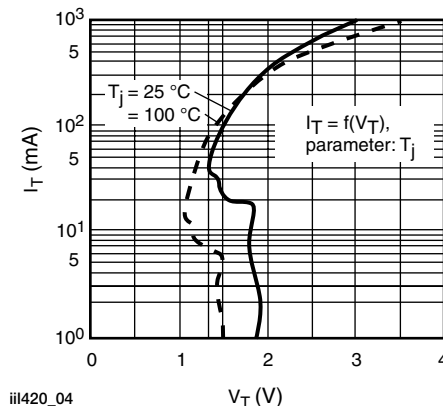


Fig. 4 - Typical Output Characteristics

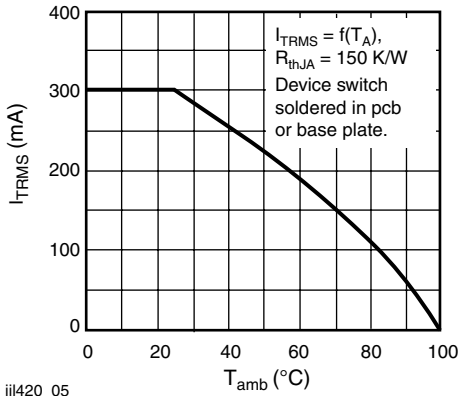


Fig. 5 - Current Reduction

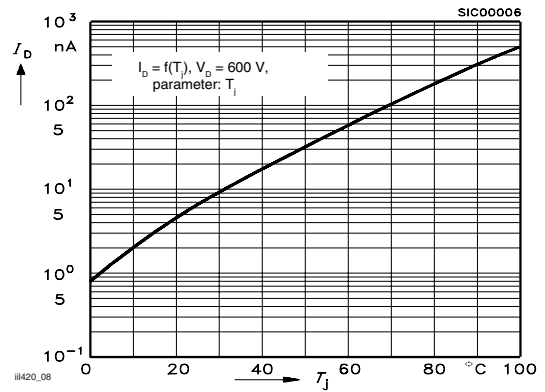


Fig. 8 - Typical Off-State Current

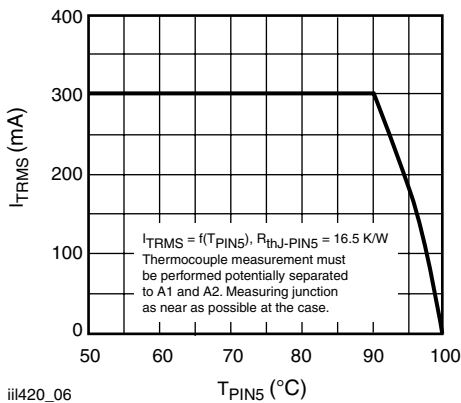


Fig. 6 - Current Reduction

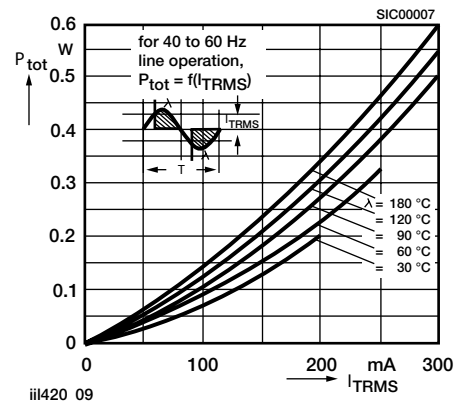


Fig. 9 - Power Dissipation

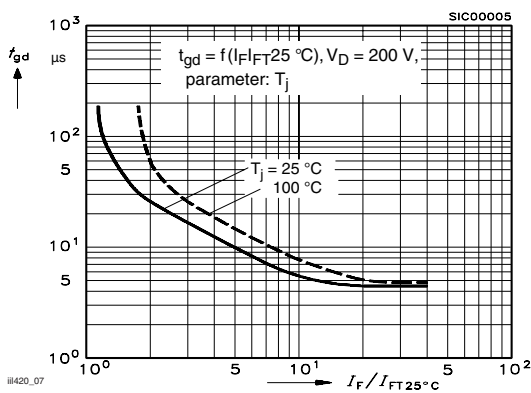


Fig. 7 - Typical Trigger Delay Time

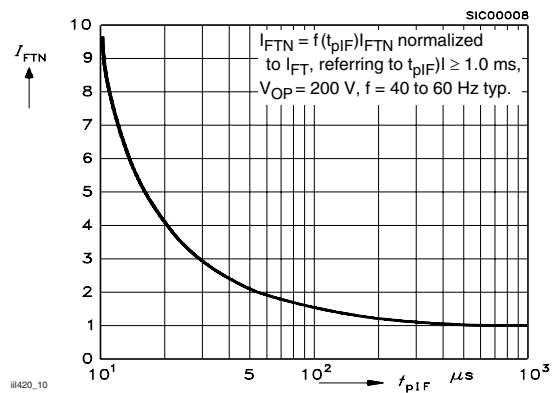


Fig. 10 - Pulse Trigger Current

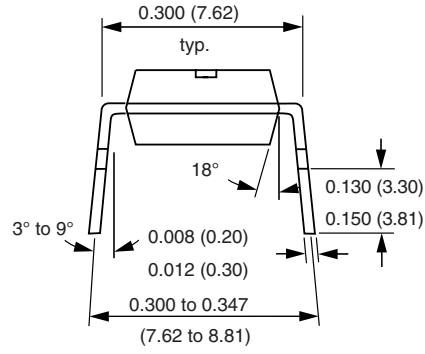
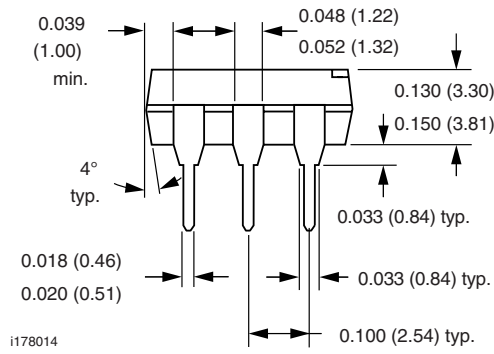
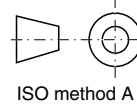
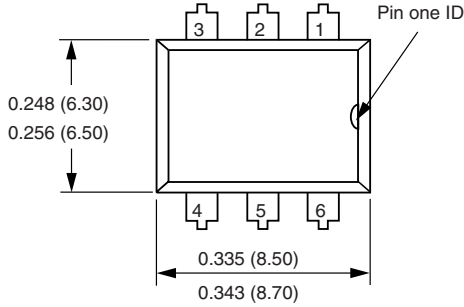
# IL420/IL4208

Vishay Semiconductors

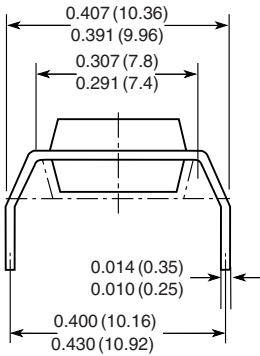
Optocoupler, Phototriac Output,  
High dV/dt, Low Input Current



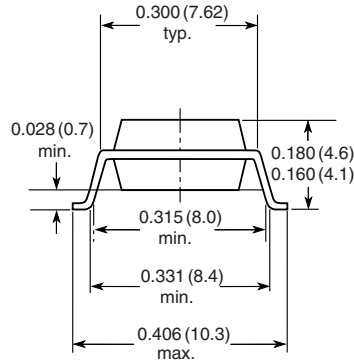
## PACKAGE DIMENSIONS in inches (millimeters)



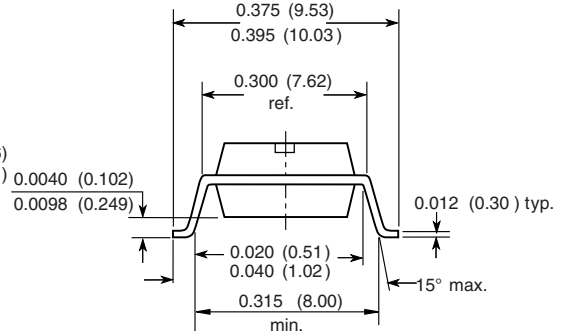
### Option 6



### Option 7



### Option 9



18450

**OZONE DEPLETING SUBSTANCES POLICY STATEMENT**

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1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operating systems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively.
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA.
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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