

## Optocoupler, Phototriac Output, Low Input Current

### Features

- 400 and 600 V Blocking Voltage
- 5.0 mA Maximum Trigger Current
- Isolation Test Voltage, 5300 V<sub>RMS</sub>, t = 1.0 sec.
- Isolation Materials per UL94
- Pin Compatible with Optocouplers  
IL440-1 MOC 3051  
IL440-2 MOC 3052  
IL440-3 MOC3053  
IL440-4 MOC 3021  
IL440-5 MOC 3022  
IL440-6 MOC 3023
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

### Agency Approvals

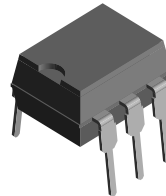
- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA 93751
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
Available with Option 1
- BABT/ BSI IEC60950 IEC60065

### Applications

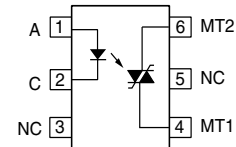
High Current Triac Driver  
Solid State Relay  
Switch Small AC Loads

### Description

The IL440 consists of a GaAs infrared emitter optically coupled to a silicon planar triac chip with a non-zero crossing network. The two semiconductors are assembled in a 6 pin dual-in-line plastic package. The output detector IL440-1, 2, 3 is capable of blocking up to 600 volts which permits control of off-line voltages up to 240 VAC. The IL440 can handle currents up to 100 mA RMS.



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### Order Information

| Part        | Remarks                                                                    |
|-------------|----------------------------------------------------------------------------|
| IL440-1     | 15 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , DIP-6                     |
| IL440-2     | 10 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , DIP-6                     |
| IL440-3     | 5.0 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , DIP-6                    |
| IL440-4     | 15 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , DIP-6                     |
| IL440-5     | 10 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , DIP-6                     |
| IL440-6     | 5.0 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , DIP-6                    |
| IL440-1X009 | 15 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , SMD-6 (option 9)          |
| IL440-2X006 | 10 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , DIP-6 400 mil (option 6)  |
| IL440-3X007 | 5.0 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , SMD-6 (option 7)         |
| IL440-3X009 | 5.0 mA I <sub>FT</sub> , 600 V V <sub>DRM</sub> , SMD-6 (option 9)         |
| IL440-4X007 | 15 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , SMD-6 (option 7)          |
| IL440-4X009 | 15 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , SMD-6 (option 9)          |
| IL440-5X006 | 10 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , DIP-6 400 mil (option 6)  |
| IL440-5X009 | 10 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , SMD-6 (option 9)          |
| IL440-6X006 | 5.0 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , DIP-6 400 mil (option 6) |
| IL440-6X007 | 5.0 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , SMD-6 (option 7)         |
| IL440-6X009 | 5.0 mA I <sub>FT</sub> , 400 V V <sub>DRM</sub> , SMD-6 (option 9)         |

For additional information on the available options refer to Option Information.

## Absolute Maximum Ratings

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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 Rating for extended periods of the time can adversely affect reliability.

## Input

| Parameter            | Test condition          | Symbol     | Value | Unit               |
|----------------------|-------------------------|------------|-------|--------------------|
| Reverse voltage      |                         | $V_R$      | 5.0   | V                  |
| Forward current      |                         | $I_F$      | 60    | mA                 |
| Surge current        | P.W. < 10 $\mu\text{s}$ | $I_{FSM}$  | 3.0   | A                  |
| Power dissipation    |                         | $P_{diss}$ | 100   | mW                 |
| Junction temperature |                         | $T_j$      | 100   | $^{\circ}\text{C}$ |

## Output

| Parameter              | Test condition                             | Part    | Symbol       | Value | Unit               |
|------------------------|--------------------------------------------|---------|--------------|-------|--------------------|
| Peak off-state voltage |                                            | IL440-1 | $V_{DRM}$    | 600   | V                  |
|                        |                                            | IL440-2 | $V_{DRM}$    | 600   | V                  |
|                        |                                            | IL440-3 | $V_{DRM}$    | 600   | V                  |
|                        |                                            | IL440-4 | $V_{DRM}$    | 400   | V                  |
|                        |                                            | IL440-5 | $V_{DRM}$    | 400   | V                  |
|                        |                                            | IL440-6 | $V_{DRM}$    | 400   | V                  |
| On-state RMS current   |                                            |         | $I_{D(RMS)}$ | 100   | mA                 |
| Peak surge current     | $t_p \leq 10\text{ ms}$                    |         | $I_{FSM}$    | 1.2   | A                  |
| Peak on-state current  | $t_p/T = 0.01 \leq 100\text{ }\mu\text{s}$ |         | $I_{DRM}$    | 2.0   | A                  |
| Power dissipation      |                                            |         | $P_{diss}$   | 300   | mW                 |
| Junction temperature   |                                            |         | $T_j$        | 125   | $^{\circ}\text{C}$ |

## Coupler

| Parameter                                                                                          | Test condition                                                 | Symbol    | Value          | Unit               |
|----------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------|----------------|--------------------|
| Isolation voltage, 1.0 sec., per Standard Climate 23 $^{\circ}\text{C}/50\text{ }\%$ RH, DIN 50014 |                                                                | $V_{ISO}$ | 5300           | $V_{RMS}$          |
| Creepage                                                                                           |                                                                |           | $\geq 7.0$     | mm                 |
| Clearance                                                                                          |                                                                |           | $\geq 7.0$     | mm                 |
| Isolation resistance                                                                               | $V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$  | $R_{IO}$  | $\geq 10^{12}$ | $\Omega$           |
|                                                                                                    | $V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$ | $R_{IO}$  | $\geq 10^{11}$ | $\Omega$           |
| Total power dissipation                                                                            |                                                                | $P_{tot}$ | 330            | mW                 |
| Storage temperature range                                                                          |                                                                | $T_{stg}$ | - 55 to + 125  | $^{\circ}\text{C}$ |
| Ambient temperature                                                                                |                                                                | $T_{amb}$ | - 40 to + 100  | $^{\circ}\text{C}$ |
| Junction temperature                                                                               |                                                                | $T_j$     | 100            | $^{\circ}\text{C}$ |
| Lead soldering temperature                                                                         | 2.0 mm from case, $t < 10\text{ s}$                            | $T_{sld}$ | 260            | $^{\circ}\text{C}$ |

### Electrical Characteristics

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

### Input

| Parameter            | Test condition                            | Symbol | Min | Typ. | Max | Unit |
|----------------------|-------------------------------------------|--------|-----|------|-----|------|
| Forward voltage      | $I_F = 50\text{ mA}$                      | $V_F$  |     | 1.25 |     | V    |
| Reverse voltage      | $I_R = 10\text{ }\mu\text{A}$             | $V_R$  | 5.0 |      |     | V    |
| Junction capacitance | $V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$ | $C_j$  |     | 50   |     | pF   |

### Output

Off- state output terminal voltage (see Table 1.)

| Parameter                                  | Test condition                                     | Symbol        | Min  | Typ. | Max | Unit             |
|--------------------------------------------|----------------------------------------------------|---------------|------|------|-----|------------------|
| Peak on-state voltage                      | $I_{TM} = 100\text{ mA}$ , $I_{FT} = 30\text{ mA}$ | $V_{TM}$      |      | 1.5  | 3.0 | V                |
| Critical rate of rise of off-state voltage | $I_F = 0$ , $V_S = 240\text{ V}_{RMS}$             | $dV_{cr}/dt$  |      | 50   |     | V/ $\mu\text{s}$ |
|                                            | $I_F = 30\text{ mA}$ , $V_S = 60\text{ V}_{RMS}$   | $dV_{crq}/dt$ | 0.13 | 0.25 |     | V/ $\mu\text{s}$ |

### $I_{FT}$ and Blocking Voltage Selection<sup>1)</sup>

| Bin number | BV (Volts) Max @ $I_{DRM} = 500\text{ nA}$ | $I_{FT}$ Max @ $V_T = 6\text{ V}$ , $R_L = 150\text{ }\Omega$ |
|------------|--------------------------------------------|---------------------------------------------------------------|
| IL440-1    | 600                                        | 15                                                            |
| IL440-2    | 600                                        | 10                                                            |
| IL440-3    | 600                                        | 5.0                                                           |
| IL440-4    | 400                                        | 15                                                            |
| IL440-5    | 400                                        | 10                                                            |
| IL440-6    | 400                                        | 5.0                                                           |

<sup>1)</sup> Test voltage must be applied within  $dV/dt$  rating of  $0.13\text{ V}/\mu\text{sec}$ .

### Coupler

| Parameter       | Test condition                                    | Symbol | Min | Typ. | Max | Unit |
|-----------------|---------------------------------------------------|--------|-----|------|-----|------|
| Holding current | $I_F \geq 10\text{ mA}$ , $V_S \geq 3.0\text{ V}$ | $I_H$  |     | 1.0  |     | mA   |

### Maximum Safety Ratings

(according to DIN EN 60747-5-2(VDE0884)/ DIN EN 60747-5-5 pending) see figure 1

This optocoupler is suitable for safe electrical isolation only within the safety ratings.

Compliance with the safety ratings shall be ensured by means of suitable protective circuits.

### Input

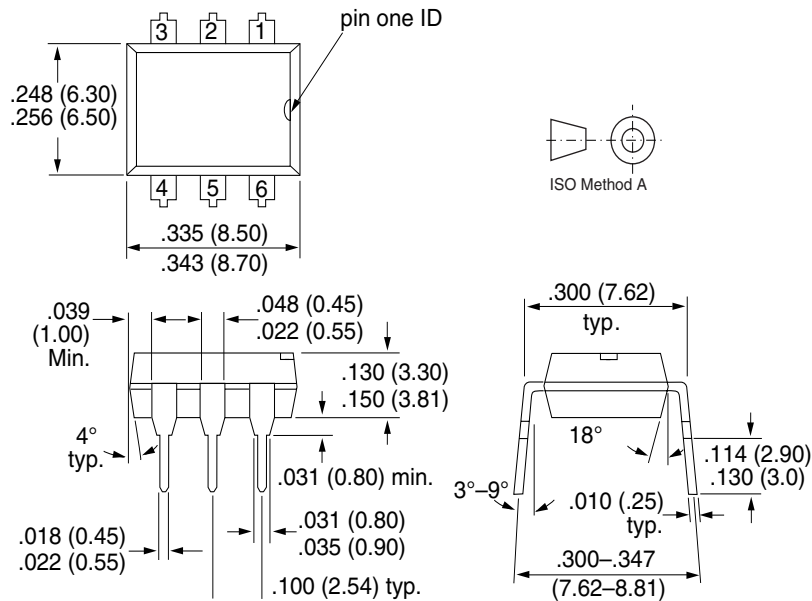
The device is used for protective separation against electrical shock within the maximum safety ratings. This must be ensured by protective circuits in the applications.

| Parameter       | Test condition | Symbol         | Min | Typ. | Max | Unit |
|-----------------|----------------|----------------|-----|------|-----|------|
| Forward voltage |                | $I_{S, INPUT}$ |     |      | 130 | mA   |

### Output

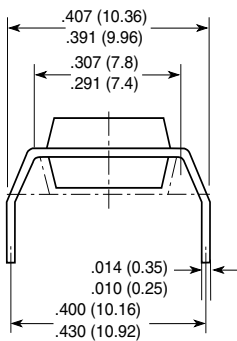
| Parameter         | Test condition | Symbol          | Min | Typ. | Max | Unit |
|-------------------|----------------|-----------------|-----|------|-----|------|
| Power dissipation |                | $P_{S, OUTPUT}$ |     |      | 300 | mW   |

## Package Dimensions in Inches (mm)

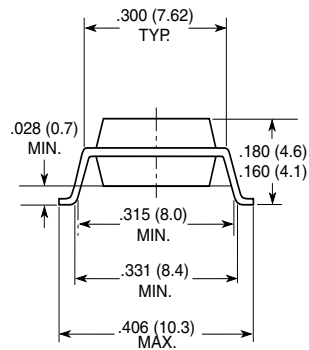


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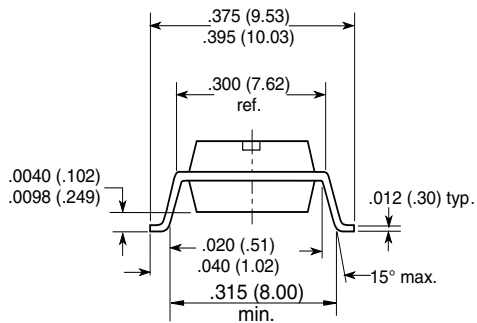
Option 6



Option 7



Option 9



18450

## **Ozone Depleting Substances Policy Statement**

It is the policy of Vishay Semiconductor GmbH to

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.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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