

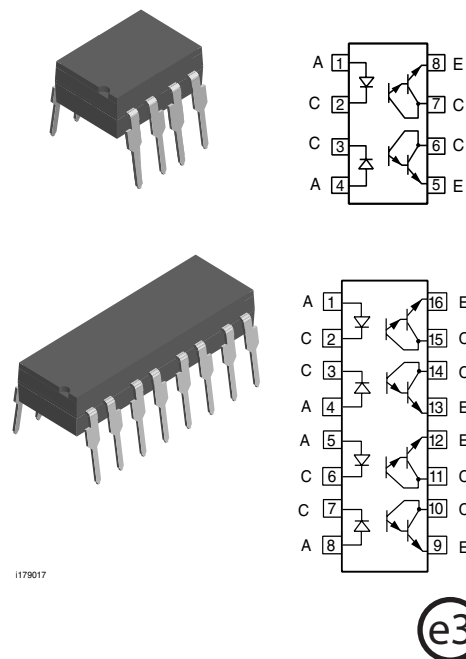
## Optocoupler, Photodarlington Output, High Gain (Dual, Quad Channel)

### Features

- Isolation Test Voltage, 5300 V<sub>RMS</sub>
- High Isolation Resistance, 10<sup>11</sup> Ω Typical
- Low Coupling Capacitance
- Standard Plastic DIP Package
- 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
- DIN EN 60747-5-2 (VDE0884)  
DIN EN 60747-5-5 pending  
Available with Option 1



### Description

The ILD32/ ILQ32 are optically coupled isolators with a gallium arsenide infrared LED and a silicon photodarlington sensor. Switching can be achieved while maintaining a high degree of isolation between driving and load circuits.

These optocouplers can be used to replace reed and mercury relays with advantages of long life, high speed switching and elimination of magnetic fields.

### Order Information

| Part       | Remarks                               |
|------------|---------------------------------------|
| ILD32      | CTR > 500 %, DIP-8                    |
| ILQ32      | CTR > 500 %, DIP-16                   |
| ILD32-X006 | CTR > 500 %, DIP-8 400 mil (option 6) |
| ILD32-X007 | CTR > 500 %, SMD-8 (option 7)         |
| ILD32-X009 | CTR > 500 %, SMD-8 (option 9)         |
| ILQ32-X007 | CTR > 500 %, SMD-8 (option 7)         |
| ILQ32-X009 | CTR > 500 %, SMD-8 (option 9)         |

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

### Absolute Maximum Ratings

T<sub>amb</sub> = 25 °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  |
|----------------------------|----------------|-------------------|-------|-------|
| Peak reverse voltage       |                | V <sub>R</sub>    | 3.0   | V     |
| Forward continuous current |                | I <sub>F</sub>    | 60    | mA    |
| Power dissipation          |                | P <sub>diss</sub> | 100   | mW    |
| Derate linearly from 25°C  |                |                   | 1.33  | mW/°C |

### Output

| Parameter                           | Test condition | Symbol     | Value | Unit  |
|-------------------------------------|----------------|------------|-------|-------|
| Collector-emitter breakdown voltage |                | $BV_{CEO}$ | 30    | V     |
| Collector (load) current            |                | $I_C$      | 125   | mA    |
| Power dissipation                   |                | $P_{diss}$ | 150   | mW    |
| Derate linearly from 25 °C          |                |            | 2.0   | mW/°C |

### Coupler

| Parameter                                                 | Test condition                                     | Part  | Symbol    | Value         | Unit      |
|-----------------------------------------------------------|----------------------------------------------------|-------|-----------|---------------|-----------|
| Isolation test voltage <sup>1)</sup>                      | $t = 1.0 \text{ sec.}$                             |       | $V_{ISO}$ | 5300          | $V_{RMS}$ |
| Creepage                                                  |                                                    |       |           | $\geq 7$      | mm        |
| Clearance                                                 |                                                    |       |           | $\geq 7$      | mm        |
| Comparative tracking index per DIN IEC 112/VDE303, part 1 |                                                    |       |           | $\geq 175$    |           |
| Isolation resistance                                      | $V_{IO} = 500 \text{ V}, T_{amb} = 25 \text{ °C}$  |       | $R_{IO}$  | $10^{12}$     | $\Omega$  |
|                                                           | $V_{IO} = 500 \text{ V}, T_{amb} = 100 \text{ °C}$ |       | $R_{IO}$  | $10^{11}$     | $\Omega$  |
| Total dissipation                                         |                                                    | ILD32 | $P_{tot}$ | 400           | mW        |
|                                                           |                                                    | ILQ32 | $P_{tot}$ | 500           | mW        |
| Derate linearly from 25 °C                                |                                                    | ILD32 |           | 5.33          | mW/°C     |
|                                                           |                                                    | ILQ32 |           | 6.67          | mW/°C     |
| Storage temperature                                       |                                                    |       | $T_{stg}$ | - 55 to + 150 | °C        |
| Operating temperature                                     |                                                    |       | $T_{amb}$ | - 55 to + 100 | °C        |
| Lead soldering time at 260 °C                             |                                                    |       |           | 10            | sec.      |

<sup>1)</sup> between emitter and detector refer to standard climate 23 °C/50 %RH; DIN 50014

### Electrical Characteristics

$T_{amb} = 25 \text{ °C}$ , 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 | $I_F = 10 \text{ mA}$ | $V_F$  |     | 1.25 | 1.5 | V    |
| Reverse current | $V_R = 3.0 \text{ V}$ | $I_R$  |     | 0.1  | 100 | pF   |
| Capacitance     | $V_R = 0 \text{ V}$   | $C_O$  |     | 25   |     | pF   |

### Output

| Parameter                           | Test condition                           | Symbol     | Min | Typ. | Max | Unit |
|-------------------------------------|------------------------------------------|------------|-----|------|-----|------|
| Collector-emitter breakdown voltage | $I_C = 100 \text{ }\mu\text{A}, I_F = 0$ | $BV_{CEO}$ | 30  |      |     | V    |
| Breakdown voltage emitter-collector | $I_E = 100 \text{ }\mu\text{A}$          | $BC_{ECO}$ | 5.0 | 10   |     | nA   |
| Collector-emitter leakage current   | $V_{CE} = 10 \text{ V}, I_F = 0$         | $I_{CEO}$  |     | 1.0  | 100 | nA   |

## Coupler

| Parameter                  | Test condition                                  | Symbol      | Min | Typ. | Max | Unit |
|----------------------------|-------------------------------------------------|-------------|-----|------|-----|------|
| Collector emitter          | $I_C = 2.0 \text{ mA}$ , $I_F = 8.0 \text{ mA}$ | $V_{CEsat}$ |     |      | 1.0 | V    |
| Capacitance (input-output) |                                                 | $C_{IO}$    |     | 0.5  |     | pF   |

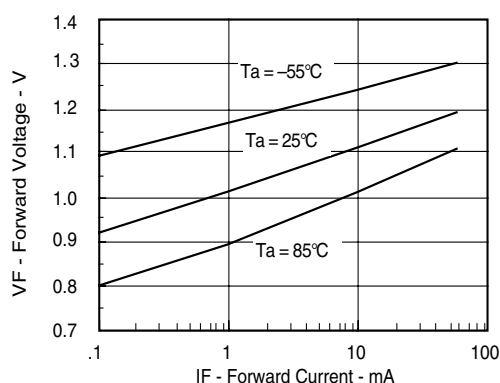
## Current Transfer Ratio

| Parameter              | Test condition                                  | Symbol | Min | Typ. | Max | Unit |
|------------------------|-------------------------------------------------|--------|-----|------|-----|------|
| Current Transfer Ratio | $I_F = 10 \text{ mA}$ , $V_{CE} = 10 \text{ V}$ | CTR    | 500 |      |     | %    |

## Switching Characteristics

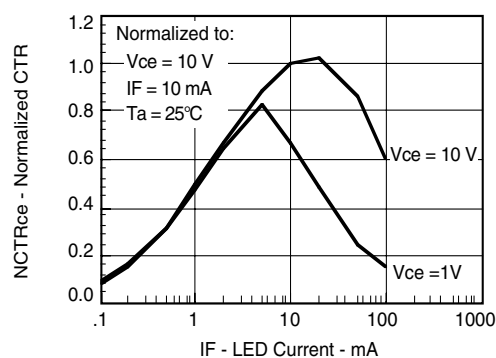
| Parameter     | Test condition                                                             | Symbol    | Min | Typ. | Max | Unit          |
|---------------|----------------------------------------------------------------------------|-----------|-----|------|-----|---------------|
| Turn-on time  | $V_{CC} = 10 \text{ V}$ , $I_F = 5.0 \text{ mA}$ ,<br>$R_L = 100 \ \Omega$ | $t_{on}$  |     | 15   |     | $\mu\text{s}$ |
| Turn-off time | $V_{CC} = 10 \text{ V}$ , $I_F = 5.0 \text{ mA}$ ,<br>$R_L = 100 \ \Omega$ | $t_{off}$ |     | 30   |     | $\mu\text{s}$ |

## Typical Characteristics ( $T_{amb} = 25^\circ\text{C}$ unless otherwise specified)



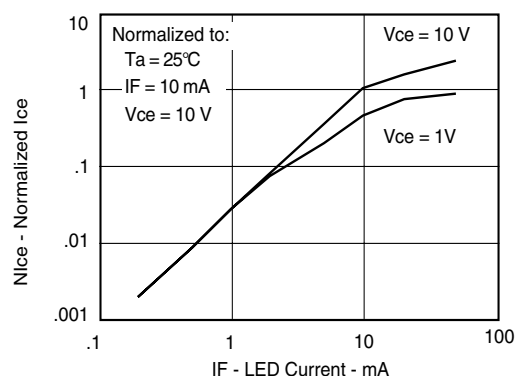
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Figure 1. Forward Voltage vs. Forward Current



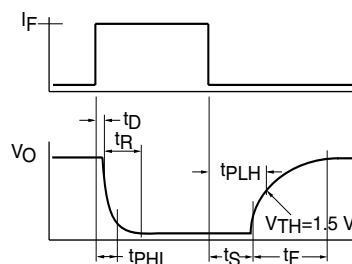
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Figure 2. Normalized Non-saturated and Saturated  $CTR_{CE}$  vs. LED Current



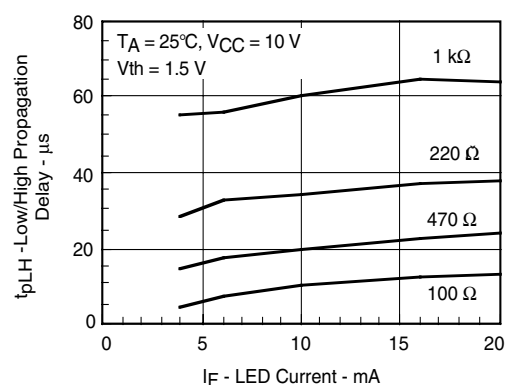
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Figure 3. Normalized Non-Saturated and Saturated Collector-Emitter Current vs. LED Current



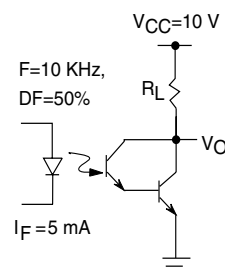
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Figure 6. Switching Timing



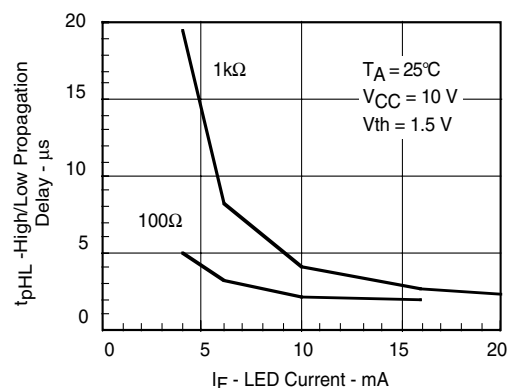
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Figure 4. Low to High Propagation Delay vs. Collector Load Resistance and LED Current



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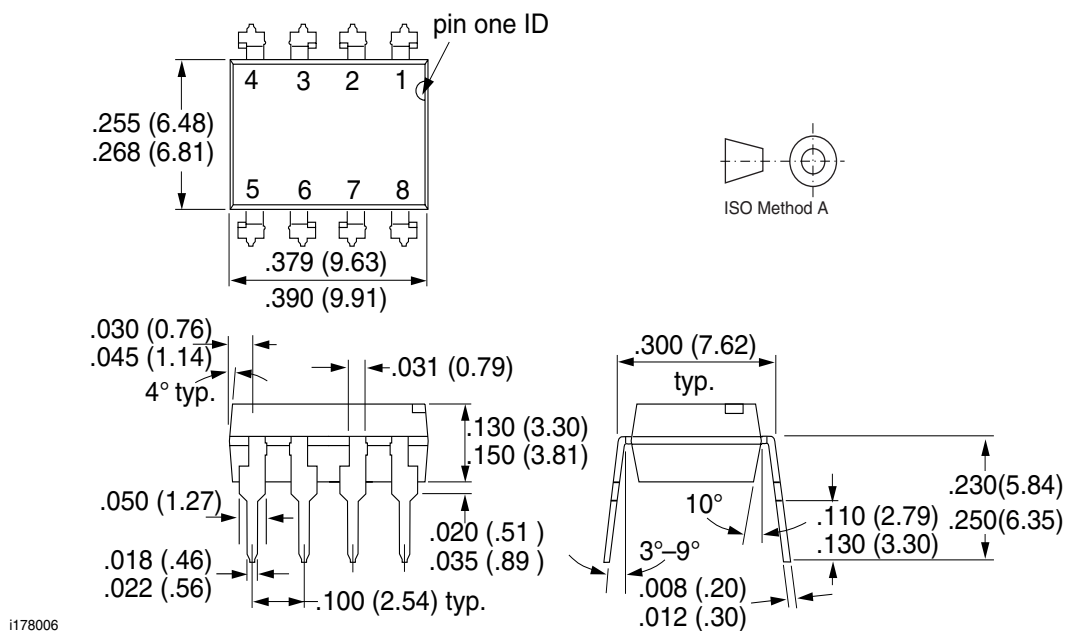
Figure 7. Switching Schematic



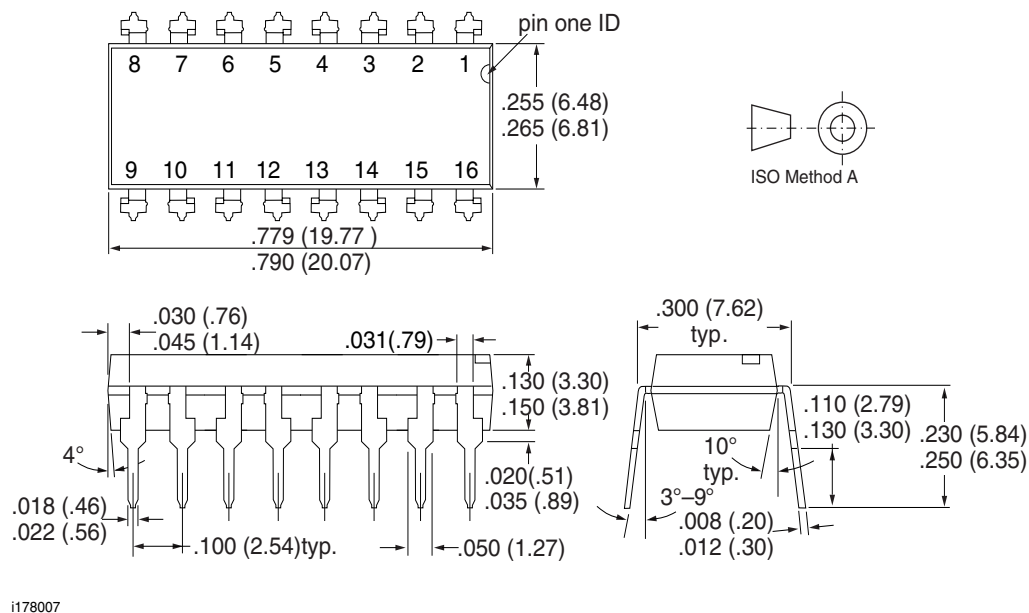
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Figure 5. High to low Propagation Delay vs. Collector Load Resistance and LED Current

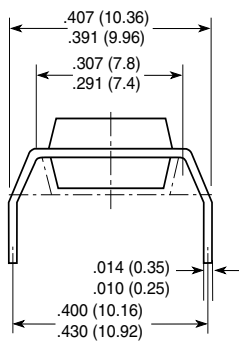
## Package Dimensions in Inches (mm)



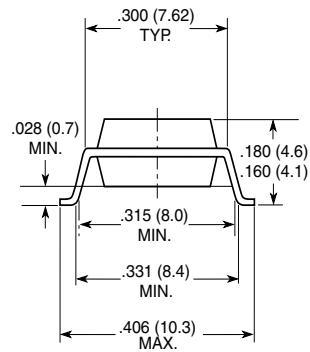
## Package Dimensions in Inches (mm)



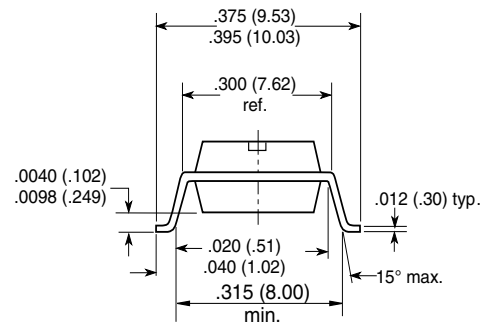
Option 6



Option 7



Option 9



18450



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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.

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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.

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