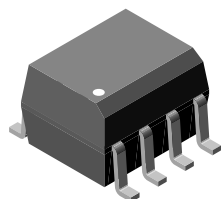
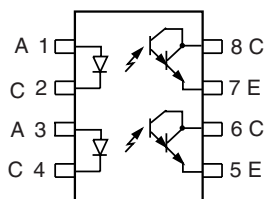


# Optocoupler, Photodarlington Output, Dual Channel, SOIC-8 Package



1179042



## FEATURES

- Two channel optocoupler
- High current transfer ratio at  $I_F = 1.0 \text{ mA}$ , 500 % minimum
- Isolation test voltage, 4000  $V_{RMS}$
- Electrical specifications similar to standard 6-pin coupler
- Compatible with dual wave, vapor phase and IR reflow soldering
- SOIC-8 surface mountable package
- Standard lead spacing, 0.05"
- Available only on tape and reel (conforms to EIA standard 481-2)
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS**  
COMPLIANT

## DESCRIPTION

The ILD223T is a high current transfer ratio (CTR) optocoupler. It has a gallium arsenide infrared LED emitter and silicon NPN photodarlington transistor detector.

This device has CTRs tested at an LED current of 1.0 mA. This low drive current permits easy interfacing from CMOS to LSTTL or TTL.

The ILD223T is constructed in a standard SOIC-8 foot print which makes it ideally suited for high density applications. In addition to eliminating through hole requirements, this package conforms to standards for surface mounted devices.

## AGENCY APPROVALS

- UL1577, file no. E52744 system code Y
- CUL - file no. E52744, equivalent to CSA bulletin 5A
- DIN EN 60747-5-2 (VDE 0884) available with option 1

## ORDER INFORMATION

| PART    | REMARKS             |
|---------|---------------------|
| ILD223T | CTR > 500 %, SOIC-8 |

## ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>

| PARAMETER                              | TEST CONDITION              | SYMBOL     | VALUE | UNIT  |
|----------------------------------------|-----------------------------|------------|-------|-------|
| <b>INPUT</b>                           |                             |            |       |       |
| Peak reverse voltage                   |                             | $V_R$      | 6.0   | V     |
| Peak pulsed current                    | 1.0 $\mu\text{s}$ , 300 pps |            | 3.0   | A     |
| Continuous forward current per channel |                             |            | 30    | mA    |
| Power dissipation                      |                             | $P_{diss}$ | 45    | mW    |
| Derate linearly from 25 °C             |                             |            | 0.4   | mW/°C |
| <b>OUTPUT</b>                          |                             |            |       |       |
| Collector emitter breakdown voltage    |                             | $BV_{CEO}$ | 30    | V     |
| Emitter collector breakdown voltage    |                             | $BV_{ECO}$ | 5.0   | V     |
| Power dissipation per channel          |                             | $P_{diss}$ | 75    | mW    |
| Derate linearly from 25 °C             |                             |            | 3.1   | mW/°C |

**ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>**

| PARAMETER                                                         | TEST CONDITION      | SYMBOL            | VALUE         | UNIT             |
|-------------------------------------------------------------------|---------------------|-------------------|---------------|------------------|
| <b>COUPLER</b>                                                    |                     |                   |               |                  |
| Isolation test voltage                                            | $t = 1.0 \text{ s}$ | $V_{\text{ISO}}$  | 4000          | $V_{\text{RMS}}$ |
| Total package dissipation<br>(2 LEDs and 2 detectors, 2 channels) |                     | $P_{\text{tot}}$  | 250           | mW               |
| Derate linearly from 25 °C                                        |                     |                   | 2.0           | mW/°C            |
| Storage temperature                                               |                     | $T_{\text{stg}}$  | - 55 to + 150 | °C               |
| Operating temperature                                             |                     | $T_{\text{amb}}$  | - 55 to + 100 | °C               |
| Soldering temperature <sup>(2)</sup>                              |                     | $T_{\text{slid}}$ | 260           | °C               |

**Notes**(1)  $T_{\text{amb}} = 25 \text{ °C}$ , 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) Refer to reflow profile for soldering conditions for surface mounted devices (SOP/SOIC).

**ELECTRICAL CHARACTERISTICS**

| PARAMETER                             | TEST CONDITION                                            | PART    | SYMBOL             | MIN. | TYP. | MAX. | UNIT          |
|---------------------------------------|-----------------------------------------------------------|---------|--------------------|------|------|------|---------------|
| <b>INPUT</b>                          |                                                           |         |                    |      |      |      |               |
| Forward voltage                       | $I_F = 10 \text{ mA}$                                     |         | $V_F$              |      |      | 1.3  | V             |
| Reverse current                       | $V_R = 6.0 \text{ V}$                                     |         | $I_R$              |      | 0.1  | 100  | $\mu\text{A}$ |
| Capacitance                           | $V_F = 0 \text{ V}$ , $f = 1.0 \text{ MHz}$               |         | $C_O$              |      | 25   |      | pF            |
| <b>OUTPUT</b>                         |                                                           |         |                    |      |      |      |               |
| Collector emitter breakdown voltage   | $I_C = 10 \text{ }\mu\text{A}$                            |         | $BV_{\text{CEO}}$  | 30   |      |      | V             |
| Emitter collector breakdown voltage   | $I_C = 10 \text{ }\mu\text{A}$                            |         | $BV_{\text{CEO}}$  | 5.0  |      |      | V             |
| Collector emitter leakage current     | $V_{\text{CE}} = 50 \text{ V}$ , $I_F = 0 \text{ A}$      |         | $I_{\text{CEO}}$   |      |      | 50   | nA            |
| Collector emitter capacitance         | $V_{\text{CE}} = 5.0 \text{ V}$                           |         | $C_{\text{CE}}$    |      | 3.4  |      | pF            |
| <b>COUPLER</b>                        |                                                           |         |                    |      |      |      |               |
| Capacitance (input to output)         |                                                           | ILD223T | $C_{\text{IO}}$    | 0.5  |      |      | pF            |
| Saturation voltage, collector emitter | $I_F = 1.0 \text{ mA}$ , $I_{\text{CE}} = 0.5 \text{ mA}$ | ILD223T | $V_{\text{CEsat}}$ |      |      | 1.0  | V             |
| Resistance, input to output           |                                                           | ILD223T | $C_{\text{IO}}$    | 100  |      |      | G $\Omega$    |

**Note** $T_{\text{amb}} = 25 \text{ °C}$ , 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.

**CURRENT TRANSFER RATIO**

| PARAMETER                 | TEST CONDITION                                           | SYMBOL                   | MIN. | TYP. | MAX. | UNIT |
|---------------------------|----------------------------------------------------------|--------------------------|------|------|------|------|
| DC current transfer ratio | $I_F = 1.0 \text{ mA}$ , $V_{\text{CE}} = 5.0 \text{ V}$ | $\text{CTR}_{\text{DC}}$ | 500  |      |      | %    |

**SWITCHING CHARACTERISTICS**

| PARAMETER     | TEST CONDITION                                                                       | PART    | SYMBOL           | MIN. | TYP. | MAX. | UNIT          |
|---------------|--------------------------------------------------------------------------------------|---------|------------------|------|------|------|---------------|
| Turn-on time  | $V_{\text{CC}} = 10 \text{ V}$ , $R_L = 100 \text{ }\Omega$ , $I_F = 5.0 \text{ mA}$ | ILD223T | $t_{\text{on}}$  | 15   |      |      | $\mu\text{s}$ |
| Turn-off time | $V_{\text{CC}} = 10 \text{ V}$ , $R_L = 100 \text{ }\Omega$ , $I_F = 5.0 \text{ mA}$ | ILD223T | $t_{\text{off}}$ | 30   |      |      | $\mu\text{s}$ |



Optocoupler, Photodarlington Output,  
Dual Channel,  
SOIC-8 Package

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**SAFETY AND INSULATION RATINGS**

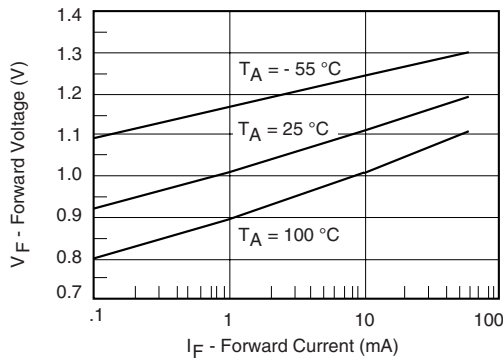
| PARAMETER                                            | TEST CONDITION         | SYMBOL | MIN. | TYP.      | MAX. | UNIT |
|------------------------------------------------------|------------------------|--------|------|-----------|------|------|
| Climatic classification (according to IEC 68 part 1) |                        |        |      | 55/100/21 |      |      |
| Comparative tracking index                           |                        | CTI    | 175  |           | 399  |      |
| $V_{IOTM}$                                           |                        |        | 6000 |           |      | V    |
| $V_{IORM}$                                           |                        |        | 560  |           |      | V    |
| $P_{SO}$                                             |                        |        |      |           | 350  | mW   |
| $I_{SI}$                                             |                        |        |      |           | 150  | mA   |
| $T_{SI}$                                             |                        |        |      |           | 165  | °C   |
| Creepage distance                                    |                        |        | 4    |           |      | mm   |
| Clearance distance                                   |                        |        | 4    |           |      | mm   |
| Insulation thickness, reinforced rated               | per IEC 60950 2.10.5.1 |        | 0.2  |           |      | 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.

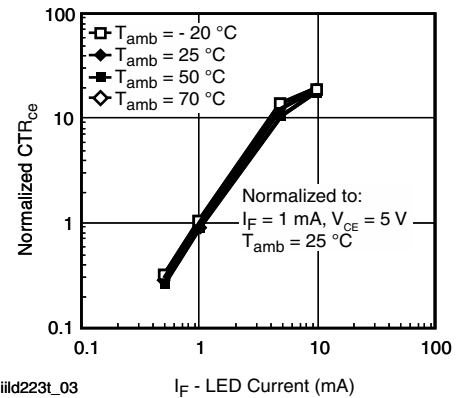
**TYPICAL CHARACTERISTICS**

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

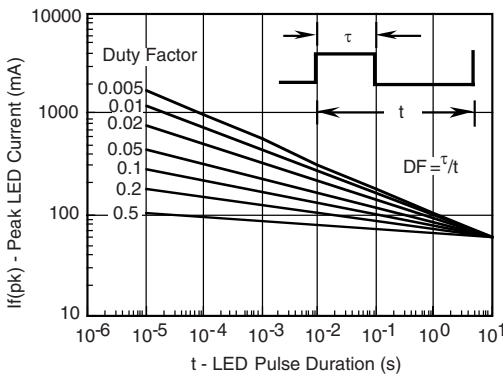


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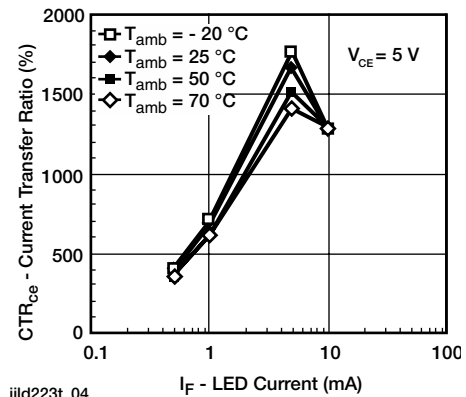
Fig. 3 - Forward Voltage vs. Forward Current



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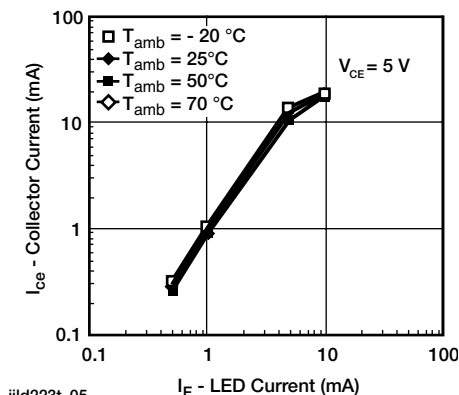
Fig. 5 - Normalized CTR<sub>CE</sub> vs. LED Current

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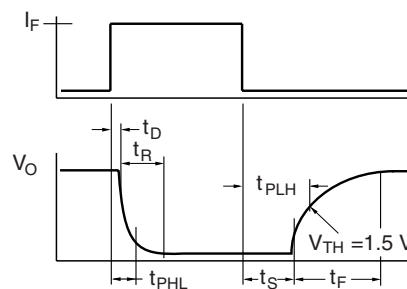
Fig. 4 - Peak LED Current vs. Duty Factor,  $\tau$ 

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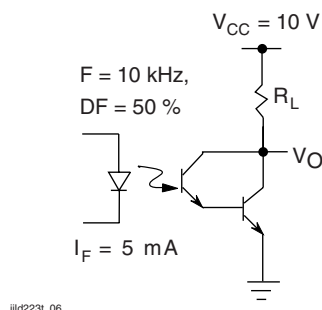
Fig. 6 - CTR vs. LED Current



ild223t\_05



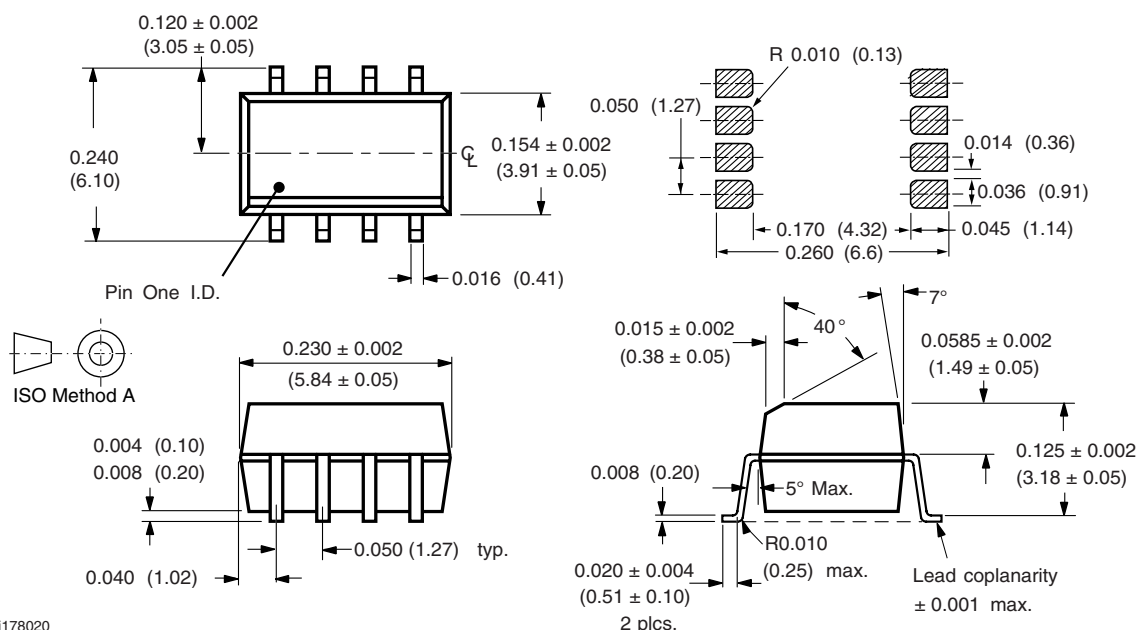
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ild223t\_06

Fig. 8 - Switching Schematic

## PACKAGE DIMENSIONS in inches (millimeters)



i178020



Optocoupler, Photodarlington Output,  
Dual Channel,  
SOIC-8 Package

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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.

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