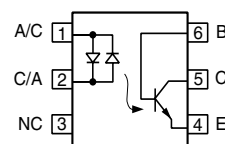
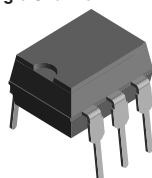


## Optocoupler, Phototransistor Output, AC Input, With Base Connection

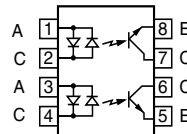
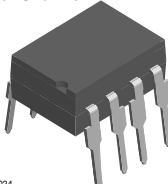
### Features

- AC or Polarity Insensitive Input
- Built-in Reverse Polarity Input Protection
- Improved CTR Symmetry
- Industry Standard DIP Package
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Single Channel



Dual Channel



1179024



### Agency Approvals

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

### Applications

Ideal for AC signal detection and monitoring.

### Description

The IL250/ 251/ 252/ ILD250/ 251/ 252 are bidirectional input optically coupled isolators consisting of two Gallium Arsenide infrared LEDs coupled to a silicon NPN phototransistor per channel.

The IL250/ ILD250 has a minimum CTR of 50 %, the IL251/ ILD251 has a minimum CTR of 20 %, and the IL252/ ILD252 has a minimum CTR of 100 %.

The IL250/ IL251/ IL252 are single channel optocouplers. The ILD250/ ILD251/ ILD252 has two isolated channels in a single DIP package.

### Order Information

| Part        | Remarks                                           |
|-------------|---------------------------------------------------|
| IL250       | CTR > 50 %, Single Channel DIP-6                  |
| IL251       | CTR > 20 %, Single Channel DIP-6                  |
| IL252       | CTR > 100 %, Single Channel DIP-6                 |
| ILD250      | CTR > 50 %, Dual Channel DIP-8                    |
| ILD251      | CTR > 20 %, Dual Channel DIP-8                    |
| ILD252      | CTR > 100 %, Dual Channel DIP-8                   |
| IL250-X007  | CTR > 50 %, Single Channel SMD-6 (option 7)       |
| IL250-X009  | CTR > 50 %, Single Channel SMD-6 (option 9)       |
| IL251-X009  | CTR > 20 %, Single Channel SMD-6 (option 9)       |
| IL252-X007  | CTR > 100 %, Single Channel SMD-6 (option 7)      |
| IL252-X009  | CTR > 100 %, Single Channel SMD-6 (option 9)      |
| ILD250-X009 | CTR > 50 %, Dual Channel SMD-6 (option 9)         |
| ILD251-X006 | CTR > 20 %, Dual Channel DIP-8 400 mil (option 6) |
| ILD251-X007 | CTR > 20 %, Dual Channel SMD-6 (option 7)         |
| ILD251-X009 | CTR > 20 %, Dual Channel SMD-6 (option 9)         |
| ILD252-X009 | CTR > 100 %, Dual Channel 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  |
|----------------------------|----------------|------------|-------|-------|
| Forward continuous current |                | $I_F$      | 60    | mA    |
| Power dissipation          |                | $P_{diss}$ | 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     |
| Emitter-base breakdown voltage            |                | $BV_{EBO}$ | 5.0   | V     |
| Collector-base breakdown voltage          |                | $BV_{CBO}$ | 70    | V     |
| Power dissipation single channel          |                | $P_{diss}$ | 200   | mW    |
| Power dissipation dual channel            |                | $P_{diss}$ | 150   | mW    |
| Derate linearly from 25 °C single channel |                |            | 2.6   | mW/°C |
| Derate linearly from 25 °C dual channel   |                |            | 2.0   | mW/°C |

### Coupler

| Parameter                                                                                                  | Test condition                                                 | Symbol    | Value         | Unit      |
|------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|-----------|---------------|-----------|
| Isolation test voltage (between emitter and detector referred to standard climate 23 °C/50 %RH, DIN 50014) |                                                                | $V_{ISO}$ | 5300          | $V_{RMS}$ |
| Creepage                                                                                                   |                                                                |           | $\geq 7.0$    | mm        |
| Clearance                                                                                                  |                                                                |           | $\geq 7.0$    | mm        |
| Isolation resistance                                                                                       | $V_{IO} = 500\text{ V}, T_{amb} = 25\text{ }^{\circ}\text{C}$  | $R_{IO}$  | $10^{12}$     | $\Omega$  |
|                                                                                                            | $V_{IO} = 500\text{ V}, T_{amb} = 100\text{ }^{\circ}\text{C}$ | $R_{IO}$  | $10^{11}$     | $\Omega$  |
| Total dissipation single channel                                                                           |                                                                | $P_{tot}$ | 250           | mW        |
| Total dissipation dual channel                                                                             |                                                                | $P_{tot}$ | 400           | mW        |
| Derate linearly from 25 °C single channel                                                                  |                                                                |           | 3.3           | mW/°C     |
| Derate linearly from 25 °C dual channel                                                                    |                                                                |           | 5.3           | 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.      |



## Electrical Characteristics

$T_{amb} = 25^{\circ}\text{C}$ , 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 | $I_F = \pm 10\text{ mA}$ | $V_F$  |     | 1.2  | 1.5 | V    |

## Output

| Parameter                           | Test condition                 | Symbol     | Min | Typ. | Max | Unit |
|-------------------------------------|--------------------------------|------------|-----|------|-----|------|
| Collector-emitter breakdown voltage | $I_C = 1.0\text{ mA}$          | $BV_{CEO}$ | 30  | 50   |     | V    |
| Emitter-base breakdown voltage      | $I_E = 100\text{ }\mu\text{A}$ | $BV_{EBO}$ | 7.0 | 10   |     | V    |
| Collector-base breakdown voltage    | $I_C = 10\text{ }\mu\text{A}$  | $BV_{CBO}$ | 70  | 90   |     | V    |
| Collector-emitter leakage current   | $V_{CE} = 10\text{ V}$         | $I_{CEO}$  |     | 5.0  | 50  | nA   |

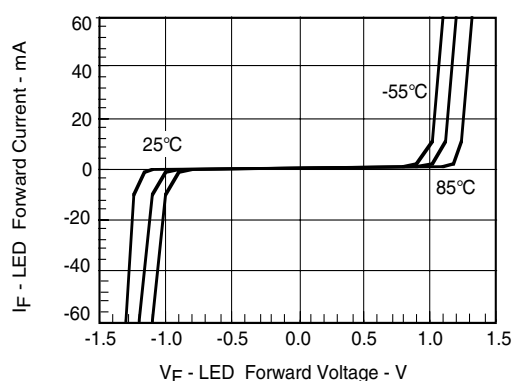
## Coupler

| Parameter                            | Test condition                                   | Symbol      | Min | Typ. | Max | Unit |
|--------------------------------------|--------------------------------------------------|-------------|-----|------|-----|------|
| Collector-emitter saturation voltage | $I_F = \pm 16\text{ mA}$ , $I_C = 2.0\text{ mA}$ | $V_{CEsat}$ |     |      | 0.4 | V    |

## Current Transfer Ratio

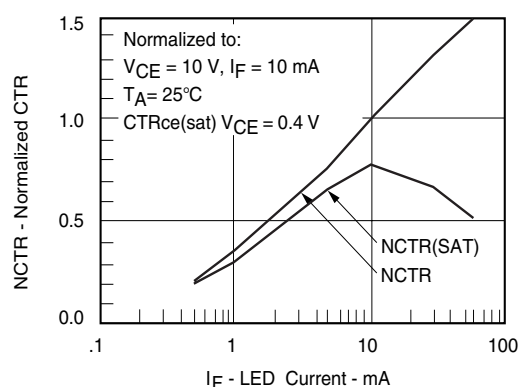
| Parameter                                  | Test condition                                    | Part         | Symbol     | Min  | Typ. | Max | Unit |
|--------------------------------------------|---------------------------------------------------|--------------|------------|------|------|-----|------|
| DC Current Transfer Ratio                  | $I_F = \pm 10\text{ mA}$ , $V_{CE} = 10\text{ V}$ | IL250/ILD250 | $CTR_{DC}$ | 50   |      |     | %    |
|                                            |                                                   | IL251/ILD251 | $CTR_{DC}$ | 20   |      |     | %    |
|                                            |                                                   | IL252/ILD252 | $CTR_{DC}$ | 100  |      |     | %    |
| Symmetry (CTR @ +10 mA)/<br>(CTR @ -10 mA) |                                                   |              |            | 0.50 | 1.0  | 2.0 |      |

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



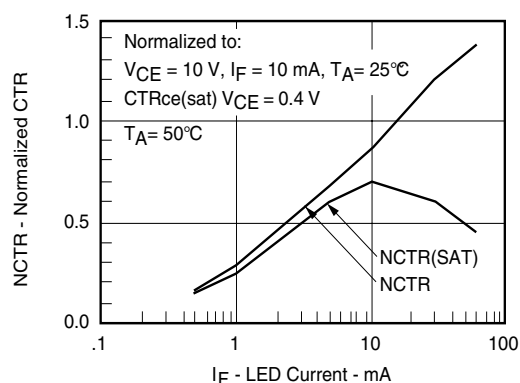
il250\_01

Figure 1. LED Forward Current vs. Forward Voltage



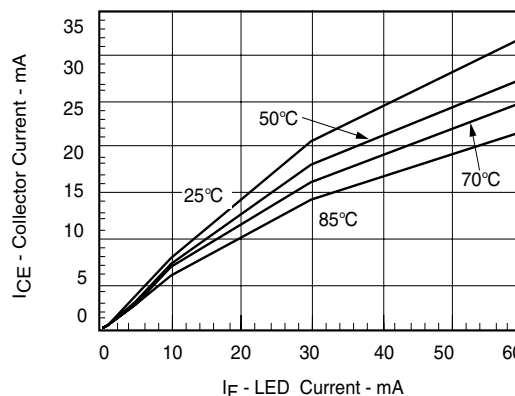
il250\_02

Figure 2. Normalized Non-Saturated and Saturated CTR vs. LED Current



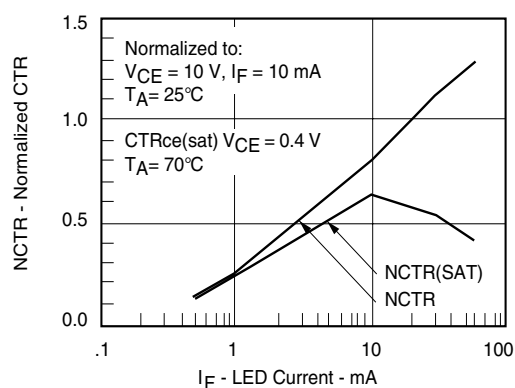
IL250\_03

Figure 3. Normalized Non-saturated and Saturated CTR vs. LED Current



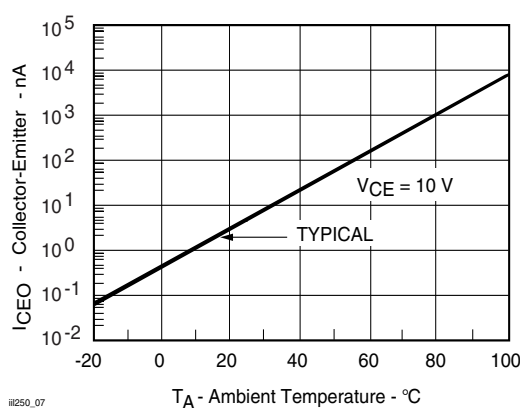
IL250\_06

Figure 6. Collector-Emitter Current vs. Temperature and LED Current



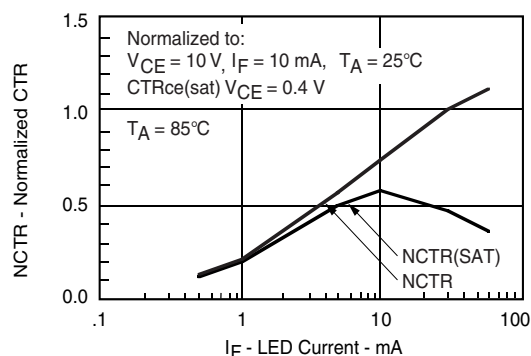
IL250\_04

Figure 4. Normalized Non-saturated and saturated CTR vs. LED Current



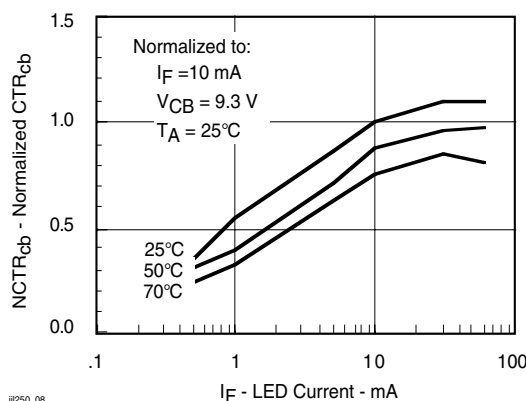
IL250\_07

Figure 7. Collector-Emitter Leakage Current vs. Temp.



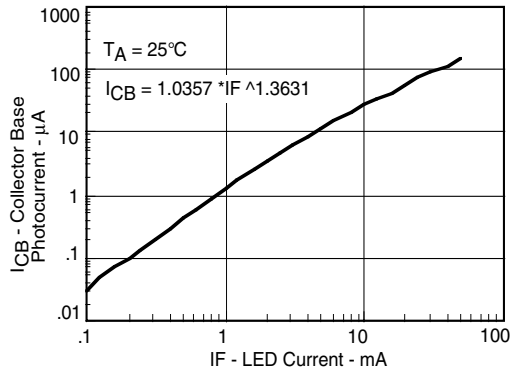
IL250\_05

Figure 5. Normalized Non-saturated and saturated CTR vs. LED Current



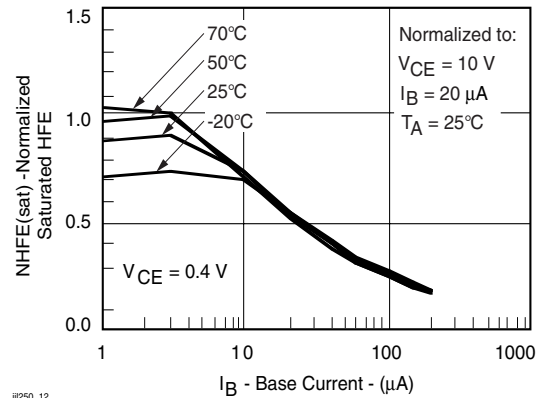
IL250\_08

Figure 8. Normalized  $CTR_{cb}$  vs. LED Current and Temperature



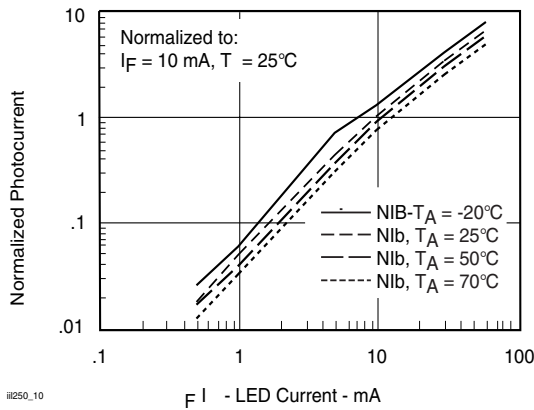
il250\_09

Figure 9. Collector-Base Photocurrent vs. LED Current



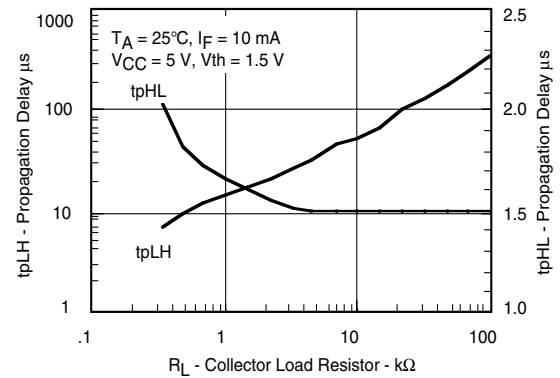
il250\_12

Figure 12. Normalized Saturated HFE vs. Base Current and Temperature



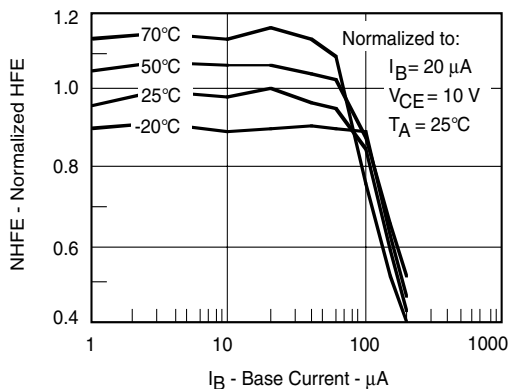
il250\_10

Figure 10. Normalized Photocurrent vs.  $I_F$  and Temp.



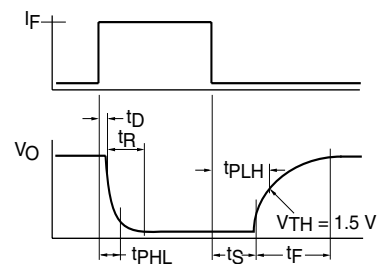
il250\_13

Figure 13. Propagation Delay vs. Collector Load Resistor



il250\_11

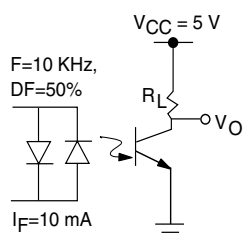
Figure 11. Normalized Non-saturated HFE vs. Base Current and Temperature



il250\_14

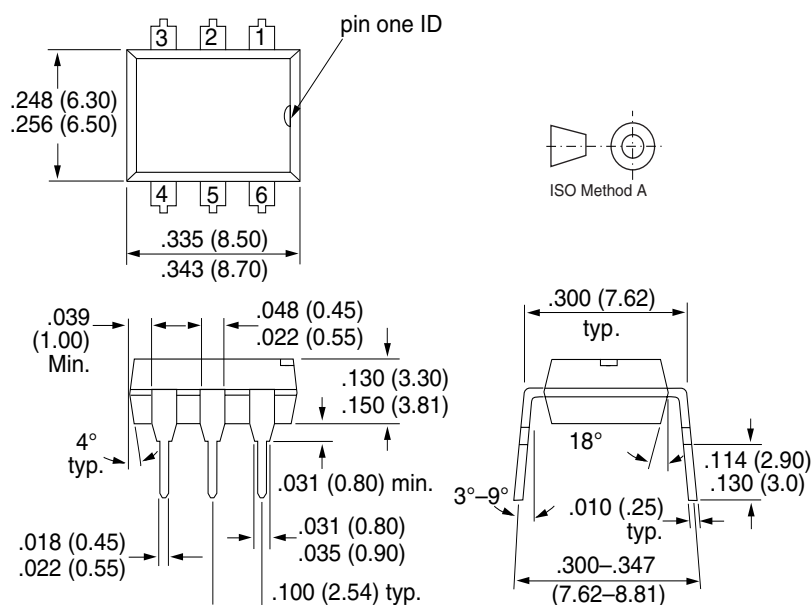
Figure 14. Switching Timing

Figure 15. Switching Schematic



il250\_15

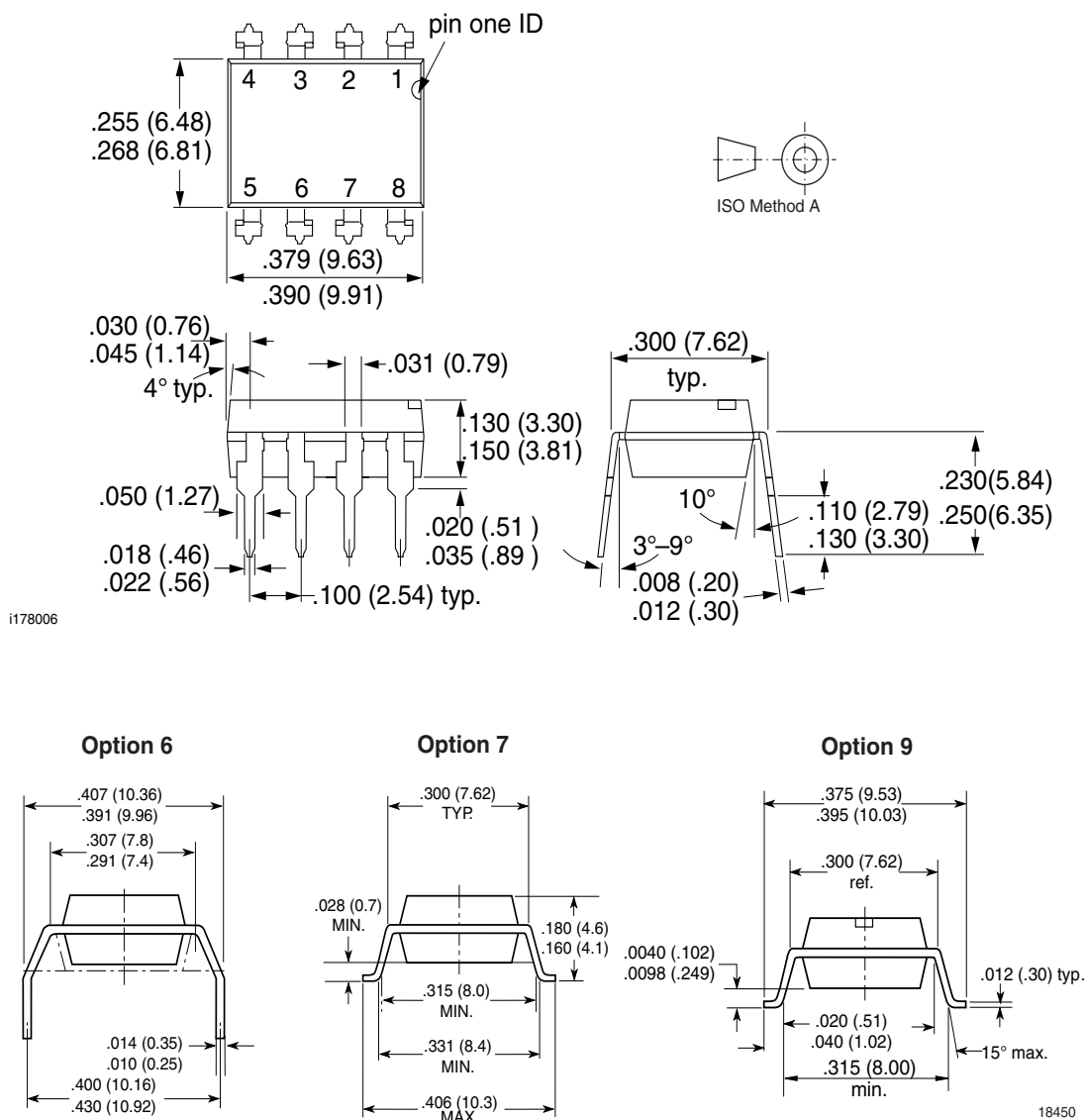
## Package Dimensions in Inches (mm)



i178004



## Package Dimensions in Inches (mm)



### 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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