

## Dual 1 Form A Solid State Relay

### Features

- Two Independent Relays
  - Current Limit Protection
  - Isolation Test Voltage 5300 V<sub>RMS</sub>
  - Typical R<sub>ON</sub> 15 Ω
  - Load Voltage 250 V
  - Load Current 120 mA
  - High Surge Capability
  - Clean Bounce Free Switching
  - Low Power Consumption
  - High Reliability Monolithic Receptor
- SMD Lead Available on Tape and Reel
  - Lead-free component
  - Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

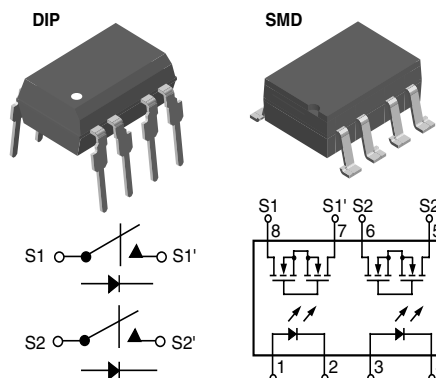
### Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA - Certification 093751
- BSI/BABT Cert. No. 7980
- DIN EN 60747-5-2 (VDE0884)
- DIN EN 60747-5-5 pending
- FIMKO Approval

### Applications

General Telecom Switching

- On/off Hook Control
- Ring Delay
- Dial Pulse
- Ground Start
- Ground Fault Protection



1179034



Instrumentation  
Industrial Controls

### Description

The LH1505 contains two normally open switches that can be used as two independent SPST relays or as one DPST relay. The relay is constructed using a GaAlAs LED for actuation control and integrated monolithic dies for the switch outputs. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry, and DMOS switches. In addition, the LH1505 relay employs current limiting circuitry, enabling it to pass FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

### Order Information

| Part        | Remarks              |
|-------------|----------------------|
| LH1505AAC   | Tubes, SMD-8         |
| LH1505AACTR | Tape and Reel, SMD-8 |
| LH1505AB    | Tubes, SMD-8         |

## Absolute Maximum Ratings, $T_{amb} = 25\text{ }^{\circ}\text{C}$

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 time can adversely affect reliability.

## SSR

| Parameter                                                                                          | Test condition                                             | Symbol     | Value         | Unit               |
|----------------------------------------------------------------------------------------------------|------------------------------------------------------------|------------|---------------|--------------------|
| LED continuous forward current                                                                     |                                                            | $I_F$      | 50            | mA                 |
| LED reverse voltage                                                                                | $I_R \leq 10\text{ }\mu\text{A}$                           | $V_R$      | 8.0           | V                  |
| DC or peak AC load voltage                                                                         | $I_L \leq 50\text{ }\mu\text{A}$                           | $V_L$      | 250           | V                  |
| Continuous DC load current ,<br>one pole operating                                                 |                                                            | $I_L$      | 130           | mA                 |
| Continuous DC load current ,<br>two poles operating                                                |                                                            | $I_L$      | 120           | mA                 |
| Peak load current (single shot),<br>Form B                                                         | $t = 100\text{ ms}$                                        | $I_P$      | 2)            |                    |
| Ambient operating temperature<br>range                                                             |                                                            | $T_{amb}$  | - 40 to + 85  | $^{\circ}\text{C}$ |
| Storage temperature range                                                                          |                                                            | $T_{stg}$  | - 40 to + 150 | $^{\circ}\text{C}$ |
| Pin soldering temperature                                                                          | $t = 10\text{ s max}$                                      | $T_{sld}$  | 260           | $^{\circ}\text{C}$ |
| Input/output isolation test<br>voltage                                                             | $t = 1.0\text{ s}$ , $I_{ISO} = 10\text{ }\mu\text{A max}$ | $V_{ISO}$  | 5300          | $V_{RMS}$          |
| Pole-to-pole isolation voltage<br>(S1 to S2) <sup>1)</sup> , (dry air, dust free,<br>at sea level) |                                                            |            | 1600          | V                  |
| Output power dissipation<br>(continuous)                                                           |                                                            | $P_{diss}$ | 600           | mW                 |

<sup>1)</sup> Breakdown occurs between the output pins external to the package.

<sup>2)</sup> Refer to Current Limit Performance Application Note for a discussion on relay operation during transient currents.

## Electrical Characteristics, $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

## Input

| Parameter                               | Test condition                             | Symbol     | Min  | Typ. | Max  | Unit |
|-----------------------------------------|--------------------------------------------|------------|------|------|------|------|
| LED forward current,<br>switch turn-on  | $I_L = 100\text{ mA}$ , $t = 10\text{ ms}$ | $I_{Fon}$  |      | 1.0  | 2.0  | mA   |
| LED forward current,<br>switch turn-off | $V_L = \pm 200\text{ V}$                   | $I_{Foff}$ | 0.2  | 0.9  |      | mA   |
| LED forward voltage                     | $I_F = 10\text{ mA}$                       | $V_F$      | 1.15 | 1.26 | 1.45 | V    |

## Output

| Parameter                 | Test condition                                                            | Symbol    | Min | Typ. | Max | Unit          |
|---------------------------|---------------------------------------------------------------------------|-----------|-----|------|-----|---------------|
| ON-resistance             | $I_F = 5.0\text{ mA}$ , $I_L = 50\text{ mA}$                              | $R_{ON}$  | 10  | 15   | 20  | $\Omega$      |
| OFF-resistance            | $I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$                            | $R_{OFF}$ | 0.5 | 5000 |     | $G\Omega$     |
| Current limit             | $I_F = 5.0\text{ mA}$ , $t = 5.0\text{ ms}$ ,<br>$V_L = \pm 6.0\text{ V}$ | $I_{LMT}$ | 170 | 200  | 280 | mA            |
| Off-state leakage current | $I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$                            | $I_O$     |     | 0.02 | 200 | nA            |
|                           | $I_F = 0\text{ mA}$ , $V_L = \pm 250\text{ V}$                            | $I_O$     |     |      | 1.0 | $\mu\text{A}$ |

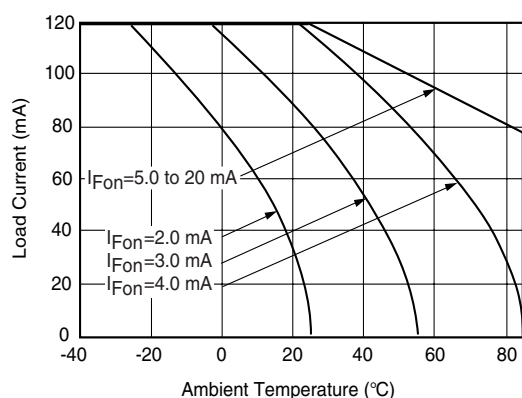
| Parameter                           | Test condition                               | Symbol   | Min | Typ. | Max | Unit |
|-------------------------------------|----------------------------------------------|----------|-----|------|-----|------|
| Output capacitance                  | $I_F = 0 \text{ mA}$ , $V_L = 1.0 \text{ V}$ | $C_O$    |     | 55   |     | pF   |
|                                     | $I_F = 0 \text{ mA}$ , $V_L = 50 \text{ V}$  | $C_O$    |     | 10   |     | pF   |
| Pole-to-pole capacitance (S1 to S2) | $I_F = 5.0 \text{ mA}$                       |          |     | 0.5  |     | pF   |
| Switch offset                       | $I_F = 5.0 \text{ mA}$                       | $V_{OS}$ |     | 0.15 |     | V    |

## Transfer

| Parameter                  | Test condition                                 | Symbol    | Min | Typ.              | Max               | Unit |
|----------------------------|------------------------------------------------|-----------|-----|-------------------|-------------------|------|
| Capacitance (input-output) | $V_{ISO} = 1.0 \text{ V}$                      | $C_{IO}$  |     | 1.1               |                   | pF   |
| Turn-on time               | $I_F = 5.0 \text{ mA}$ , $I_L = 50 \text{ mA}$ | $t_{on}$  |     | 1.4 <sup>1)</sup> | 4.0 <sup>1)</sup> | ms   |
| Turn-off time              | $I_F = 5.0 \text{ mA}$ , $I_L = 50 \text{ mA}$ | $t_{off}$ |     | 0.7 <sup>1)</sup> | 4.0 <sup>1)</sup> | ms   |

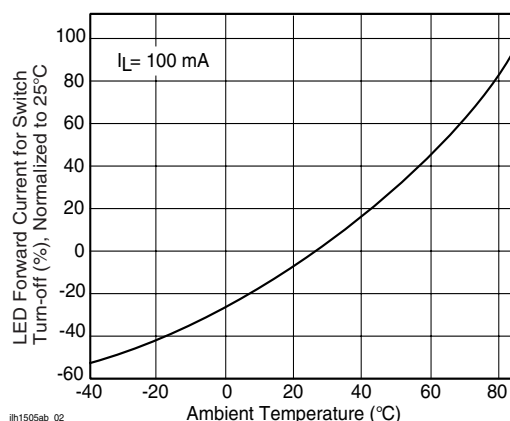
<sup>1)</sup>  $I_L = 100 \text{ mA}$

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



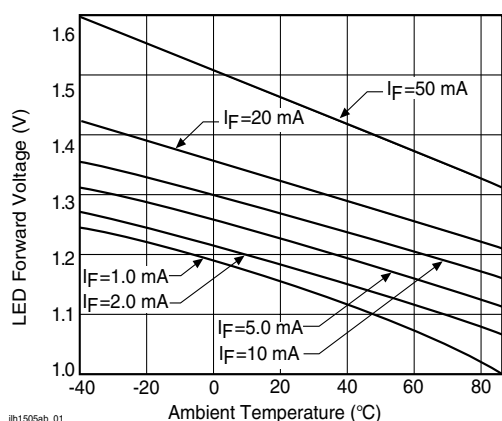
ih1505ab\_00

Figure 1. Recommended Operating Conditions



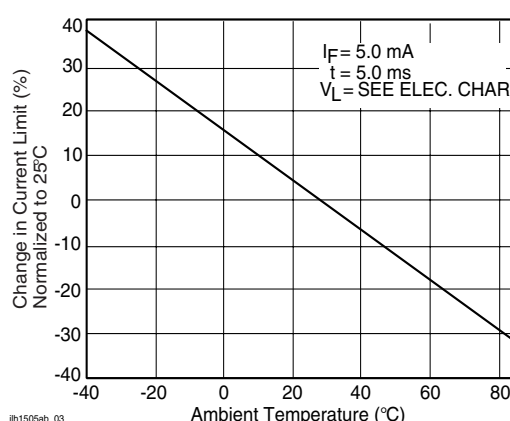
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Figure 3. LED Current for Switch Turn-on vs. Temperature



ih1505ab\_01

Figure 2. LED Voltage vs. Temperature



ih1505ab\_03

Figure 4. Current Limit vs. Temperature

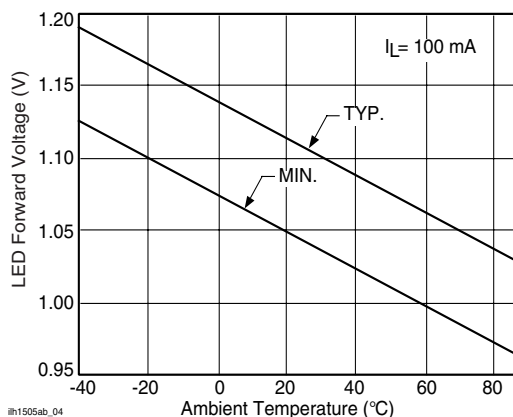


Figure 5. LED Dropout Voltage vs. Temperature

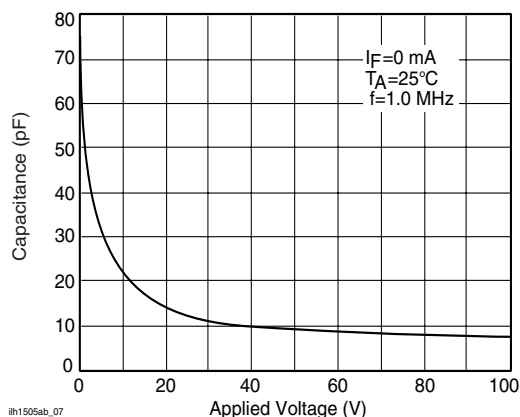


Figure 8. Switch Capacitance vs. Applied Voltage

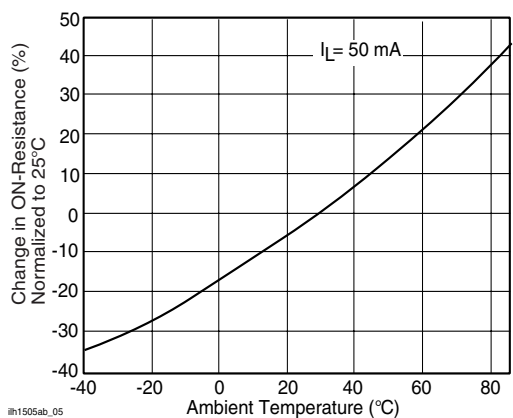


Figure 6. ON-Resistance vs. Temperature

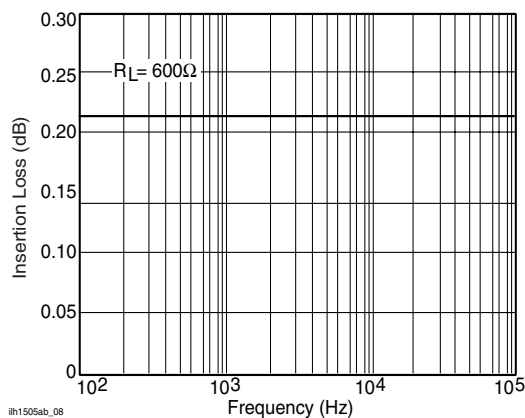


Figure 9. Insertion Loss vs. Frequency

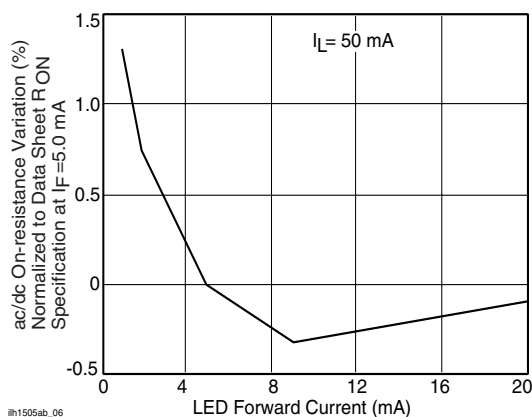


Figure 7. Variation in ON-Resistance vs. LED Current

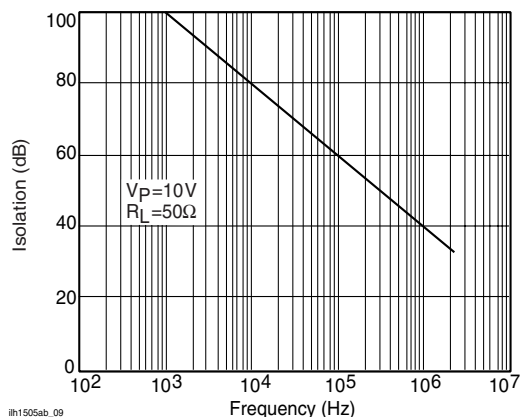


Figure 10. Output Isolation

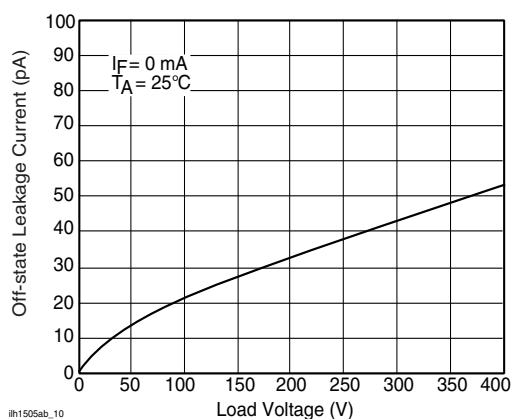


Figure 11. Leakage Current vs. Applied Voltage

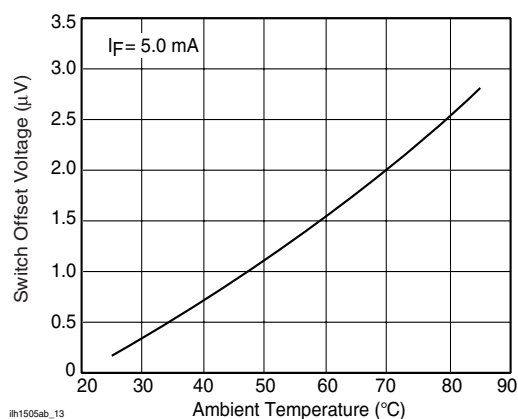


Figure 14. Switch Offset Voltage vs. Temperature

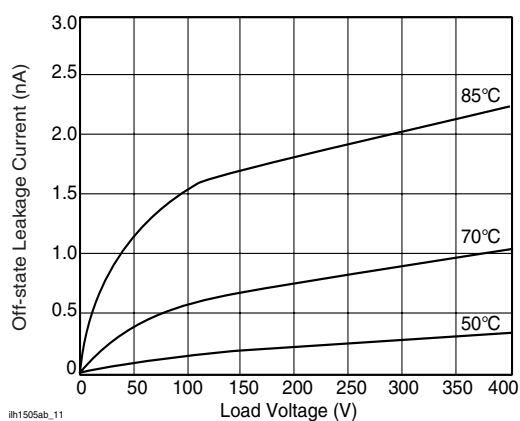


Figure 12. Leakage Current vs. Applied Voltage at Elevated Temperatures

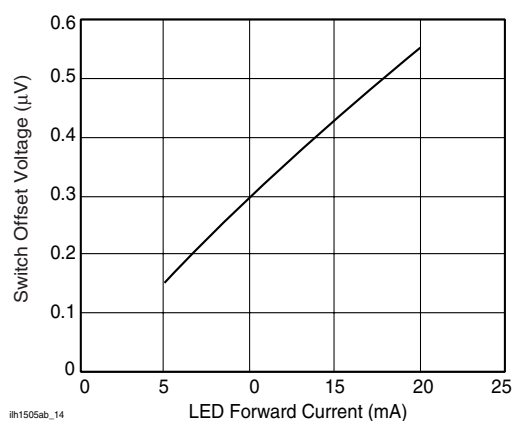


Figure 15. Switch Offset Voltage vs. LED Current

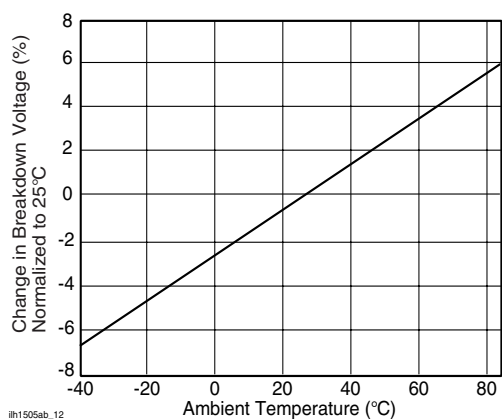


Figure 13. Switch Breakdown Voltage vs. Temperature

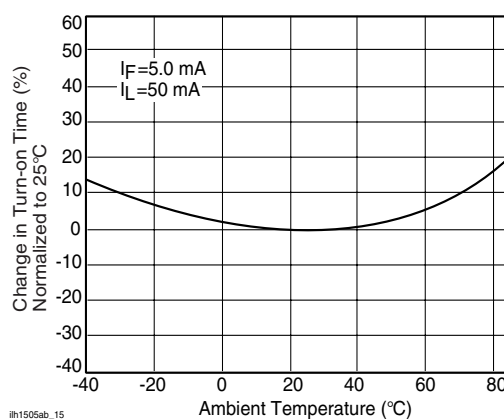


Figure 16. Turn-on Time vs. Temperature

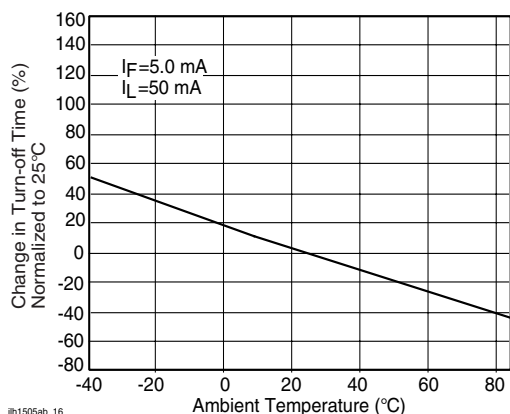


Figure 17. Turn-off Time vs. Temperature

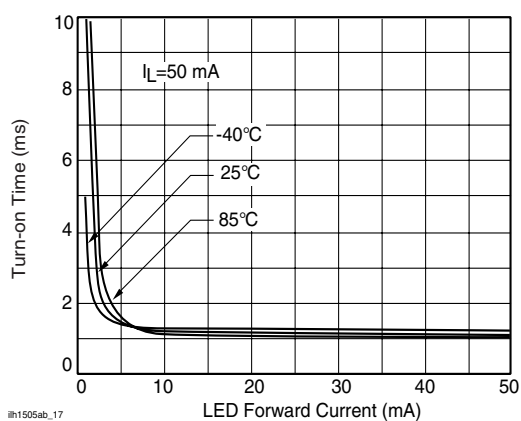


Figure 18. Turn-on Time vs. LED Current

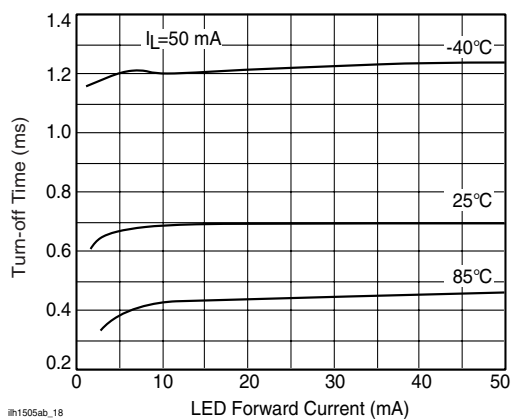
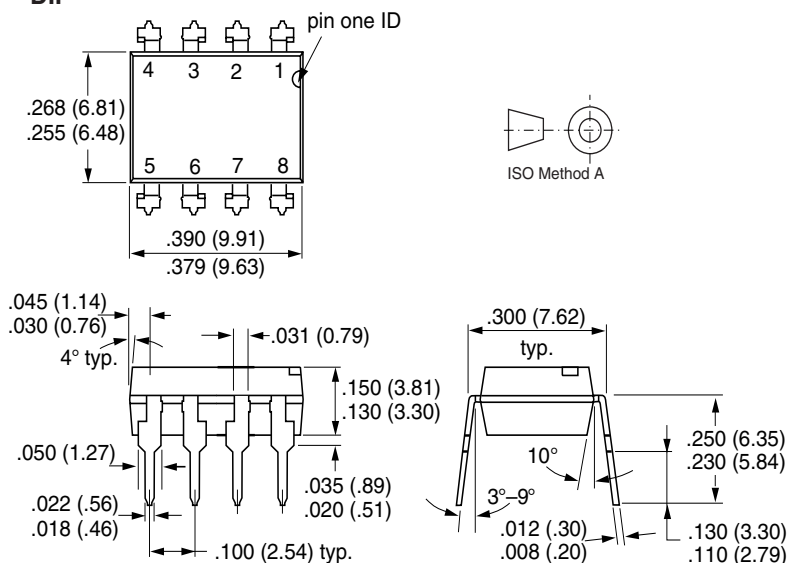


Figure 19. Turn-off Time vs. LED Current

## Package Dimensions in Inches (mm)

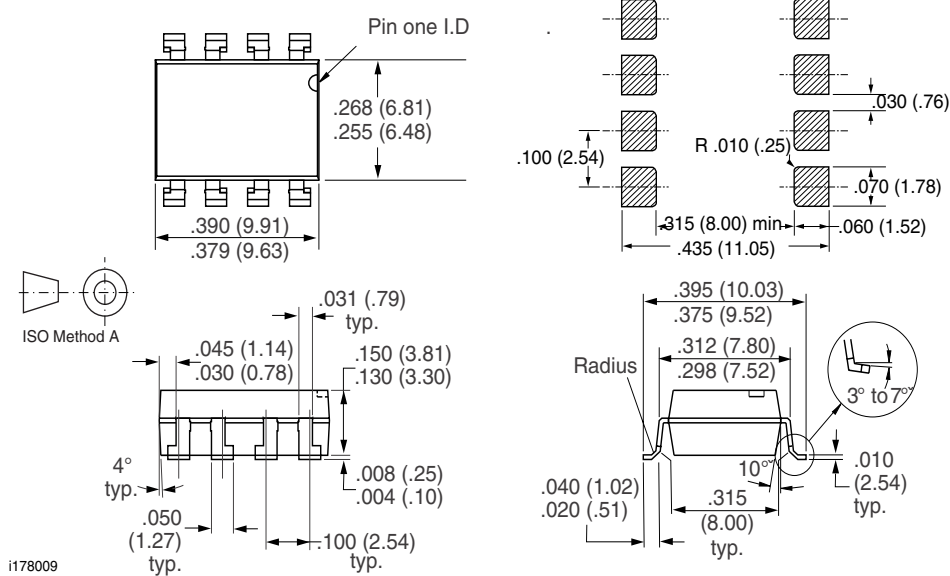
### DIP



i178008

## Package Dimensions in Inches (mm)

### SMD



i178009

## 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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