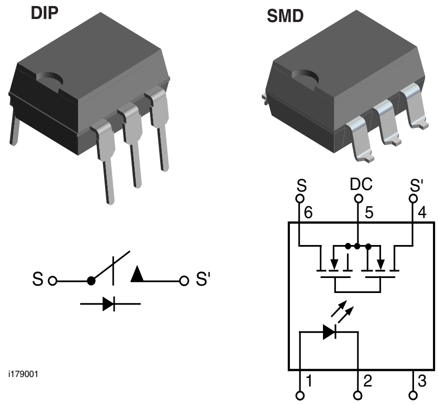
1 Form A Solid State Relay



Features

- Current Limit Protection
- Isolation Test Voltage 5300 V_{RMS}
- Typical R_{ON} 20 Ω
- Load Voltage 350 V
- Load Current 150 mA
- High Surge Capability
- Clean Bounce Free Switching
- Low Power Consumption
- High Reliability Monolithic output die
- 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
- FIMKO Approval

Applications

General Telecom Switching
- On/off Hook Control
- Ring Delay
- Dial Pulse
- Ground Start
- Ground Fault Protection
Instrumentation
Industrial Controls

See "Solid State Relays" (Application Note 56)

Description

The LH1500 is robust, ideal for telecom and ground fault applications. It is a SPST normally open switch (1 Form A) that replaces electromechanical relays in many applications. It is constructed using a GaAIAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry and MOSFET switches. In addition, it employs current-limiting circuitry which meets FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

Order Information

Part	Remarks
LH1500AT	Thru Hole, DIP-6
LH1500AAB	SMD-6
LH1500AABTR	Tape and Reel, SMD-6

Absolute Maximum Ratings, T_{amb} = 25 °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
SSR output power dissipation (continuous)		P_{diss}	550	mW
LED reverse voltage	$I_R \leq 10$ mA	V_R	8.0	V
LED continuous forward current		I_F	50	mA
DC or Peak AC load voltage	$I_L \leq 50$ mA	V_L	350	V
Continuous DC load current - bidirectional	T_{amb} = 25 °C	I_L	150	mA
Continuous DC load current - unidirectional	T_{amb} = 25 °C	I_L	250	mA
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Soldering temperature	t = 10 s max.	T_{sld}	260	°C
Isolation test voltage (for 1.0 s)		V_{ISO}	5300	V_{RMS}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω

Electrical Characteristics, T_{amb} = 25 °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, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}		0.9	2.0	mA
LED forward current, switch turn-off	$V_L = \pm 300$ V	I_{Foff}	0.2	0.8		mA
LED forward voltage	I_F = 10 mA	V_F	1.15	1.25	1.45	V

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
ON-resistance, ac/dc: Pin 4 (±) to 6 (±)	I_F = 5.0 mA, I_L = 50 mA	R_{ON}		20	25	Ω
ON-resistance, dc: Pin 4, 6 (+) to 5 (-)	I_F = 5.0 mA, I_L = 100 mA	R_{ON}	3.0	4.6	6.25	Ω
Off-resistance	I_F = 0 mA, $V_L = \pm 100$	R_{OFF}	0.5	300		GΩ
Current limit ac/dc: pin 4 (±) to 6 (±)	I_F = 5.0, t = 5.0 ms, $V_L = \pm 6.0$ V	I_{LMT}	230	255	370	mA
Off-state leakage current	I_F = 0 mA, $V_L = \pm 100$ V	I_O		0.32	200	nA
	I_F = 0 mA, $V_L = \pm 350$ V	I_O			1.0	µA
Output capacitance, Pin 4 to 6	I_F = 0 mA, V_L = 1.0 V	C_O		33		pF
	I_F = 0 mA, V_L = 50 V	C_O		10		pF
Switch offset	I_F = 5.0 mA	V_{OS}		0.2		µV

Transfer

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	V_{ISO} = 1.0 V	C_{IO}		0.71		pF
Turn-on time	I_F = 5.0 mA, I_L = 50 mA	t_{on}		0.3	2.0	ms
Turn-off time	I_F = 5.0 mA, I_L = 50 mA	t_{off}		0.6	2.0	ms

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

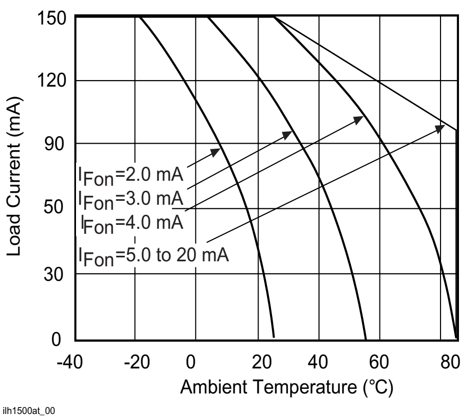


Figure 1. Recommended Operating Conditions

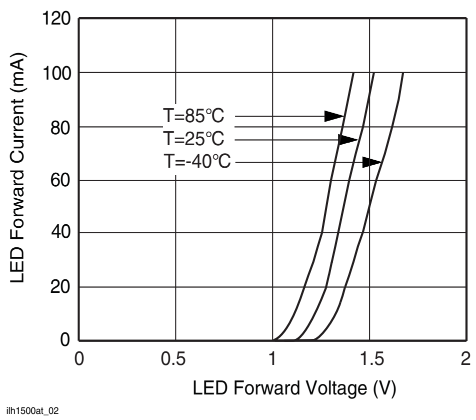


Figure 3. LED Forward Current vs.Forward Voltage

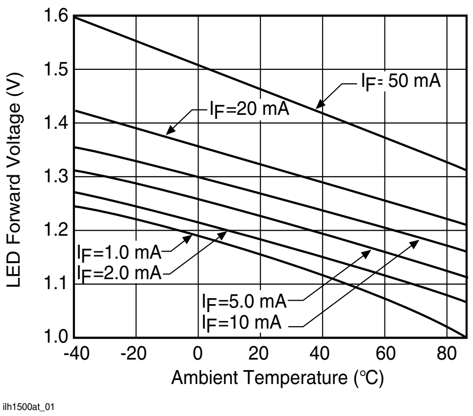


Figure 2. LED Voltage vs. Temperature

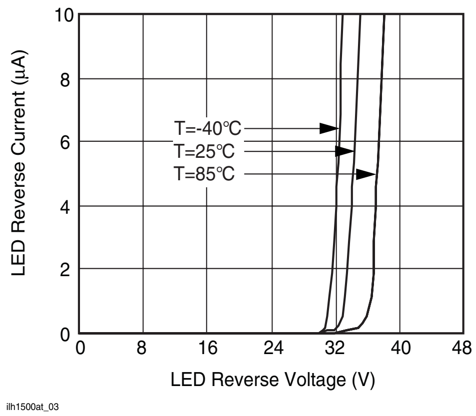


Figure 4. LED Reverse Current vs. LED Reverse Voltage

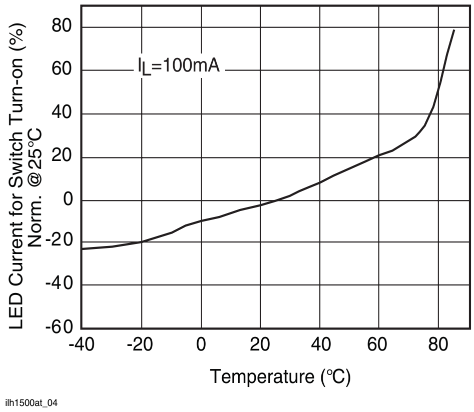


Figure 5. LED Current for Switch Turn-on vs. Temperature

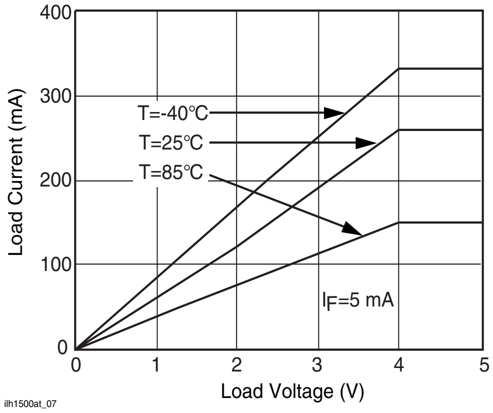


Figure 8. Load Current vs. Load Voltage

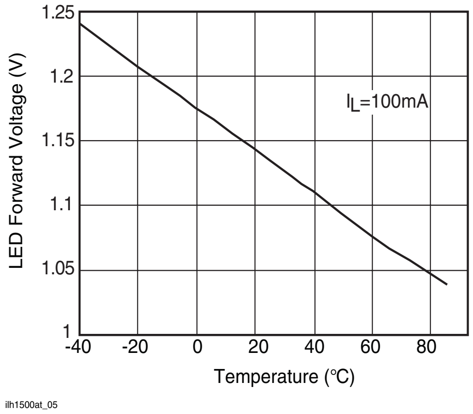


Figure 6. LED Dropout Voltage vs. Temperature

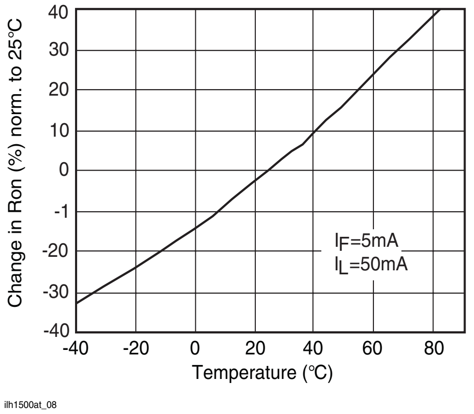


Figure 9. ON-Resistance vs. Temperature

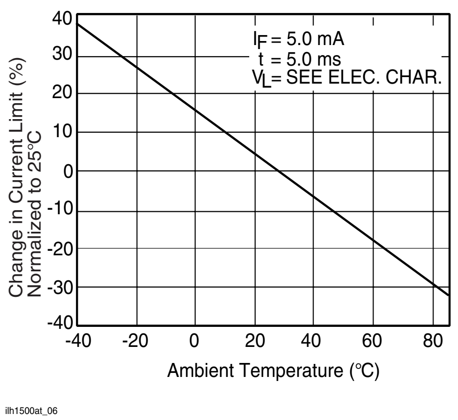


Figure 7. Current Limit vs. Temperature

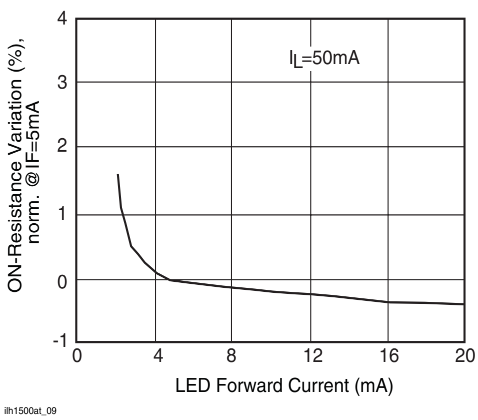


Figure 10. Variation in ON-Resistance vs. LED Current

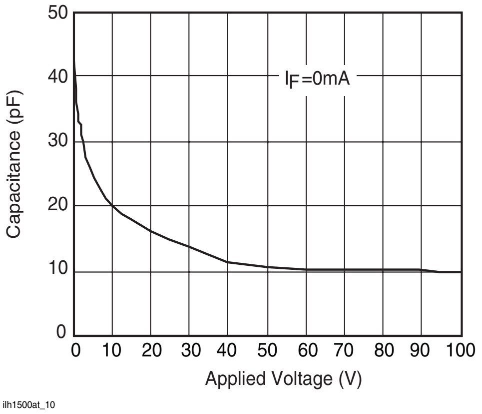


Figure 11. Switch Capacitance vs. Applied Voltage

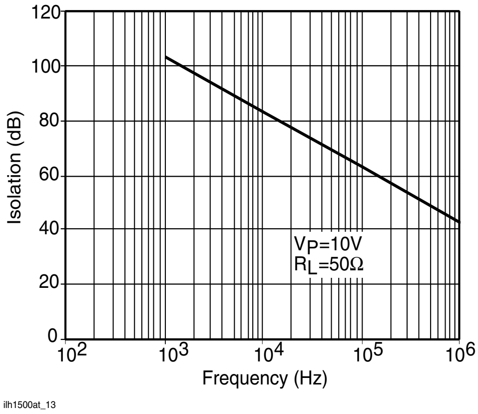


Figure 14. Output Isolation

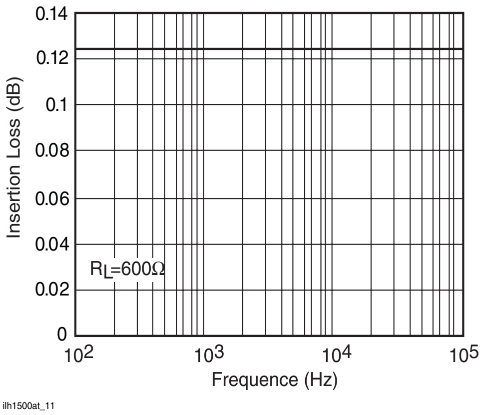


Figure 12. Insertion Loss vs. Frequency

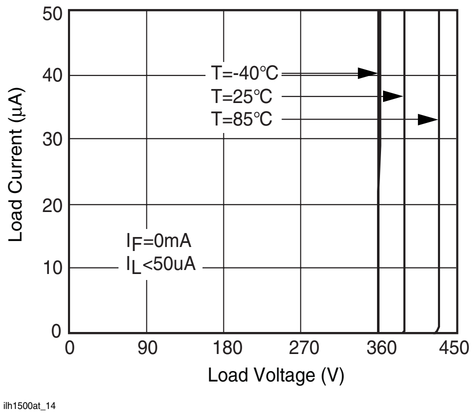


Figure 15. Switch Breakdown Voltage vs. Load Current

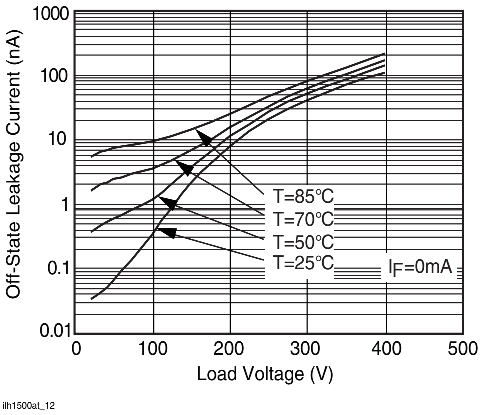


Figure 13. Leakage Current vs. Applied Voltage

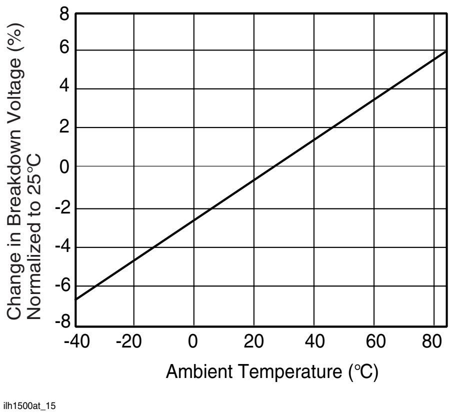


Figure 16. Switch Breakdown Voltage vs. Temperature

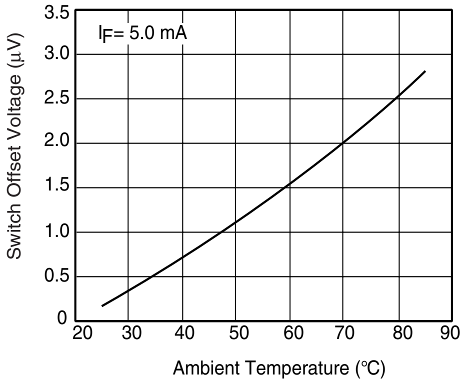


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Figure 17. Switch Offset Voltage vs. Temperature

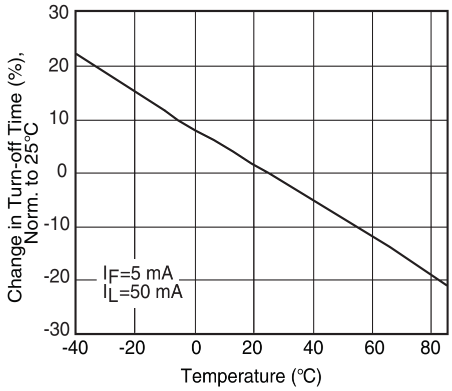

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Figure 20. Turn-off Time vs. Temperature

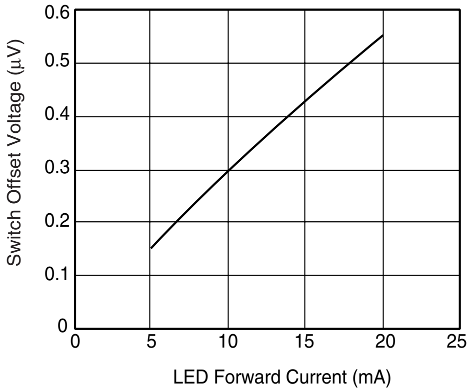

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Figure 18. Switch Offset Voltage vs. LED Current

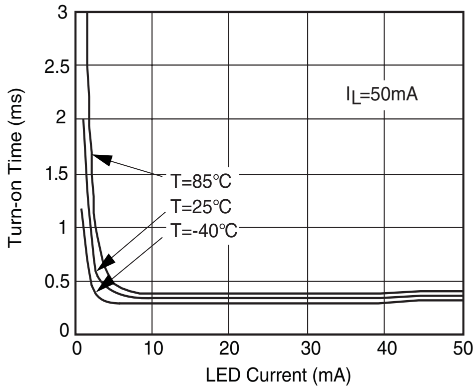

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Figure 21. Turn-on Time vs. LED Current

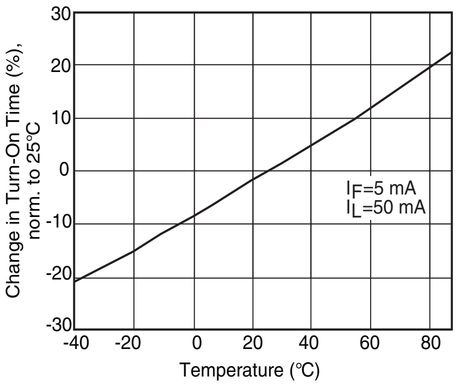

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Figure 19. Turn-on Time vs. Temperature

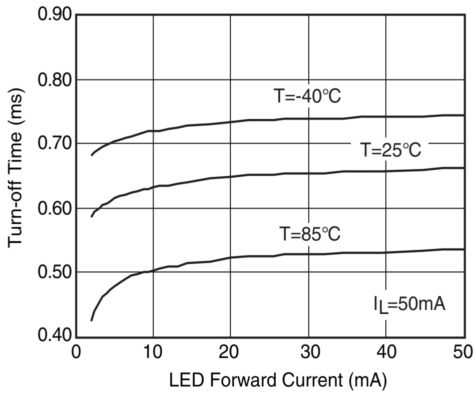

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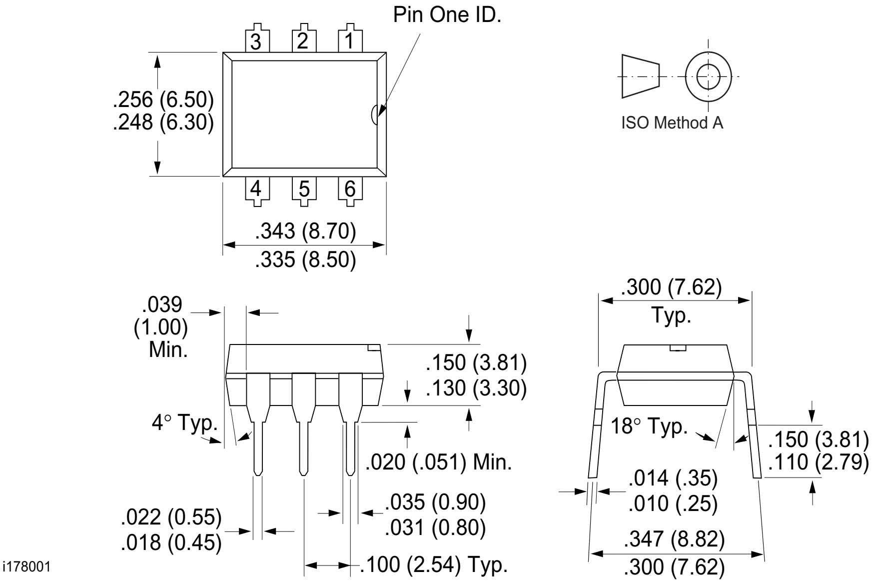
Figure 22. Turn-off Time vs. LED Current

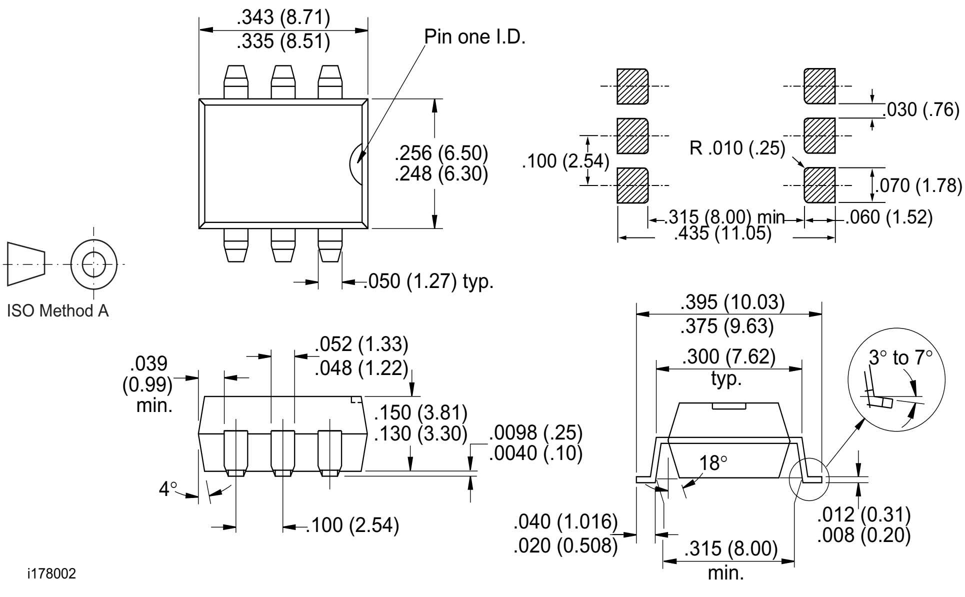
Package Dimensions in Inches (mm)

DIP



Package Dimensions in Inches (mm)

SMD



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 operatingsystems 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.

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