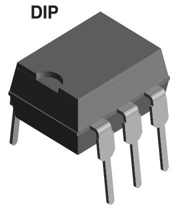
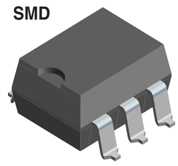
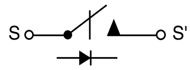
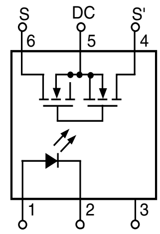
1 Form A Solid State Relay

Features
- Isolation Test Voltage 5300 V_{RMS}
- Current-limit Protection Built-in
- High-reliability Monolithic output die
- Low Power Consumption
- Clean, Bounce-free Switching
- High Surge Capability
- Surface Mountable
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC









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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
- Ring Relay/ Dial Pulse
- Ground Start/ Fault Protection

Instrumentation
- Automatic Tuning/Balancing
- Flying Capacitor
- Analog Multiplex

Industrial Controls
- Triac Predrivers
- Output Modules

Peripherals - Transducer Driver

Description
The LH1510 is a SPST normally open switch (1 Form A) that can replace electromechanical relays in many applications. The relay is constructed using a GaAlAs 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 circuity, and MOSFET switches. In addition, the relay employs current-limiting circuity enabling it to pass FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided. The LH1510 is the only relay in the family that provides current limiting for unidirectional dc applications.

Order Information

Part	Remarks
LH1510AAB	Tubes, SMD-6
LH1510AABTR	Tape and Reel, SMD-6
LH1510AT	Tubes, DIP-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
LED continuous forward current		I_F	50	mA
LED reverse voltage	$I_R \leq 10\ \mu A$	V_R	8.0	V
DC or peak AC load voltage	$I_L \leq 50\ \mu A$	V_L	200	V
Continuous DC load current - bidirectional operation		I_L	200	mA
Continuous DC load current - unidirectional operation		I_L	350	mA
Peak load current (single shot)	t = 100 ms	I_P	[1]	
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Pin soldering temperature	t = 10 s max	T_{sld}	260	°C
Input/output isolation voltage		V_{ISO}	5300	V_{RMS}
Output power dissipation (continuous)		P_{diss}	550	mW

[1] Refer to Current Limit Performance Application Note 58 for a discussion on relay operation during transient currents.

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}		0.95	2.0	mA
LED forward current, switch turn-off	V_L = ± 150 V	I_{Foff}	0.2	0.85		mA
LED forward voltage	I_F = 10 mA	V_F	1.15	1.27	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}	6.0	11.27	15	Ω
ON-resistance dc: Pin 4, 6 (+) to 5 (±)	I_F = 5.0 mA, I_L = 100 mA	R_{ON}	1.5	3.15	3.75	Ω
Off-resistance	I_F = 0 mA, V_L = ± 100 V	R_{OFF}	0.5	80		GΩ
Current limit ac/dc: Pin 4 (±) to 6 (±)	I_F = 5.0 mA, V_L = ± 5.0 V, t = 5.0 ms	I_{LMT}	300	368	450	mA
Current limit dc: Pin 4, 6 (+) to 5 (±)	I_F = 5.0 mA, V_L = 4.0 V, t = 5.0 ms	I_{LMT}	600	736	920	mA
Off-state leakage current	I_F = 0 mA, V_L = ± 100 V	I_O		2.36	200	nA
	I_F = 0 mA, V_L = ± 200 V	I_O		79.2	1.0	µA

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Output capacitance Pin 4 to 6	I_F = 0 mA, V_L = 1.0 V	C_O		27.75		pF
	I_F = 0 mA, V_L = 50 V	C_O		10.82		pF
Switch offset	I_F = 5.0 mA	V_{OS}		0.17		μV

Transfer

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Capacitance (input-output)	V_{ISO} = 1.0 V	C_{IO}		0.72		pF
Turn-on time	I_F = 5.0 mA, I_L = 50 mA	t_{on}		0.5	2.0	ms
Turn-off time	I_F = 5.0 mA, I_L = 50 mA	t_{off}		0.7	2.0	ms

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

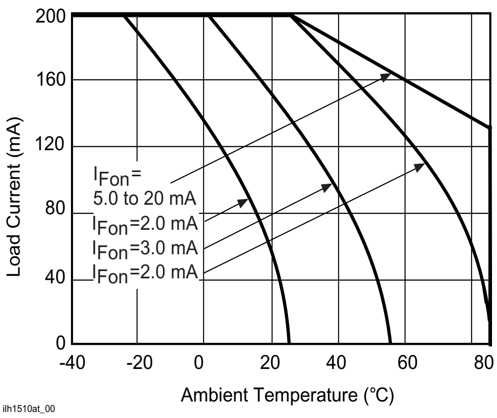


Figure 1. Recommended Operating Conditions

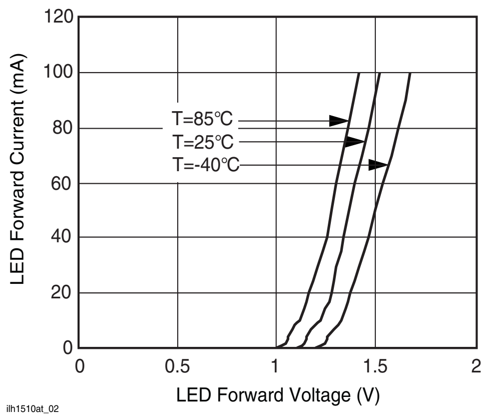


Figure 3. LED Forward Current vs. LED Forward Voltage

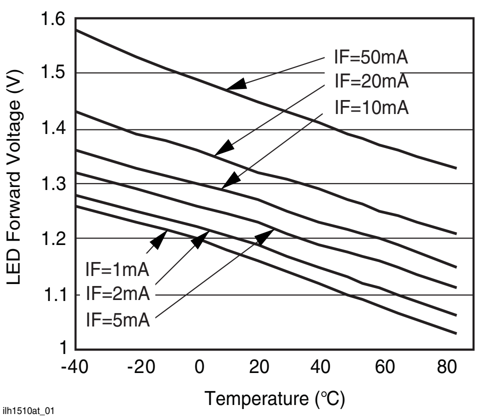


Figure 2. LED Voltage vs. Temperature

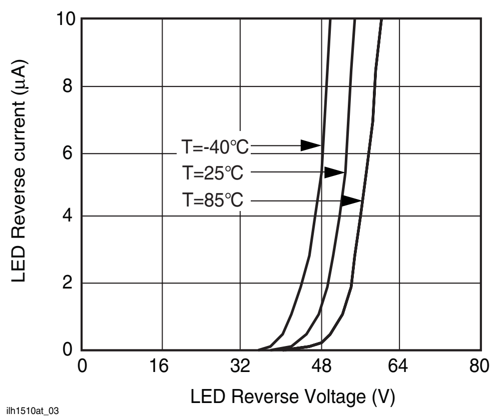


Figure 4. LED Reverse Current vs. LED Reverse Voltage

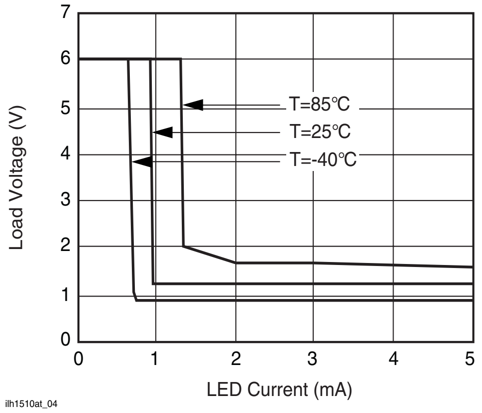


Figure 5. LED Current vs. Load Voltage

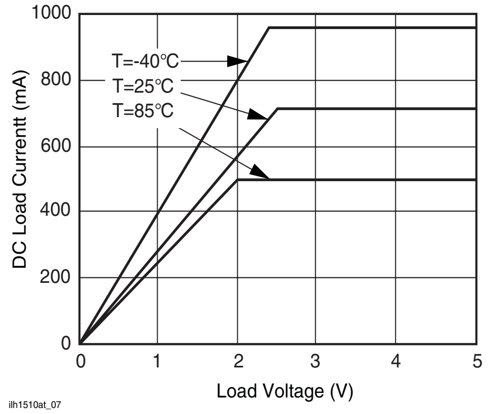


Figure 8. DC Load Current vs. Load Voltage

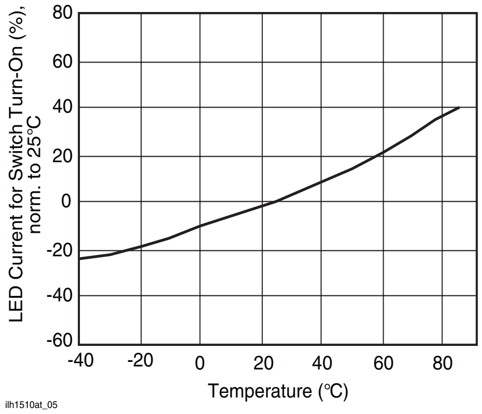


Figure 6. LED Current for Switch Turn-on vs. Temperature

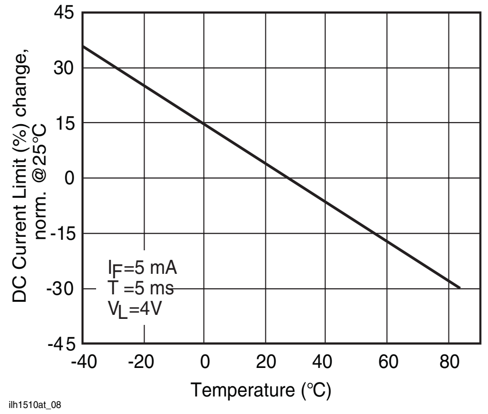


Figure 9. DC Current Limit vs. Temperature

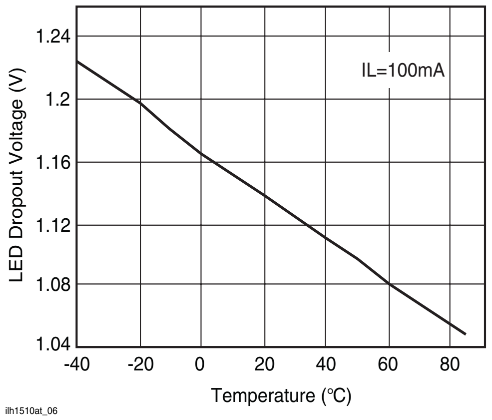


Figure 7. LED Dropout Voltage vs. Temperature

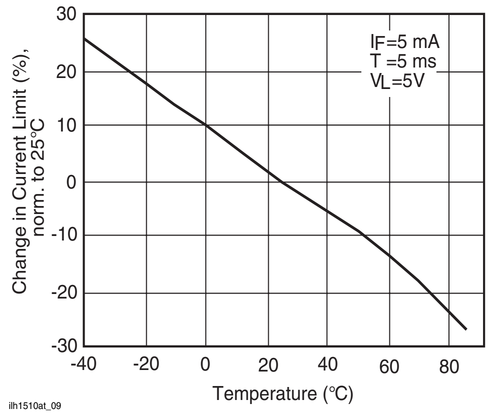


Figure 10. Current Limit vs. Temperature

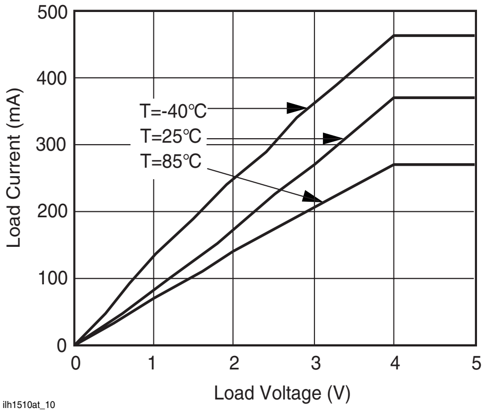


Figure 11. Load Current vs. Load Voltage

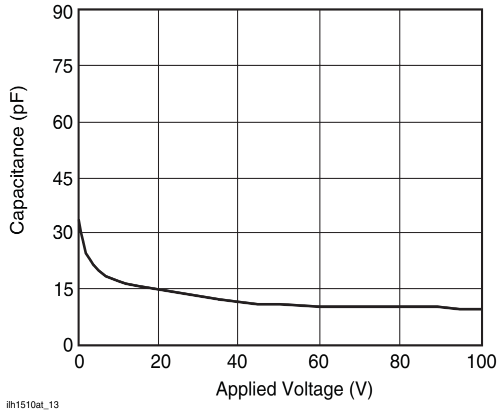


Figure 14. Switch Terminal Capacitance vs. Applied Voltage

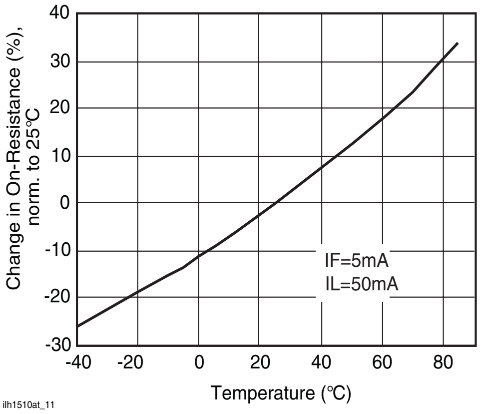


Figure 12. ON-Resistance vs. Temperature

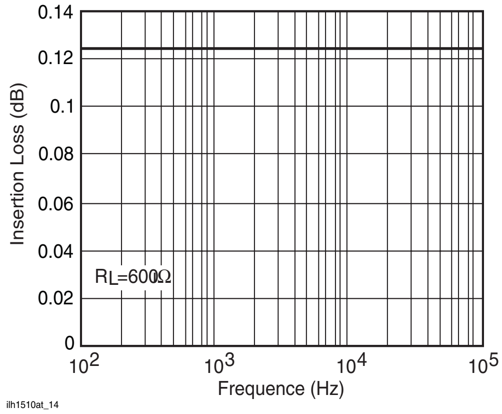


Figure 15. Insertion Loss vs. Frequency

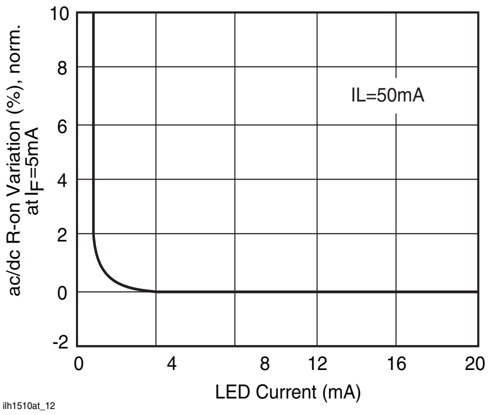


Figure 13. Variation in ON-Resistance vs. LED Current

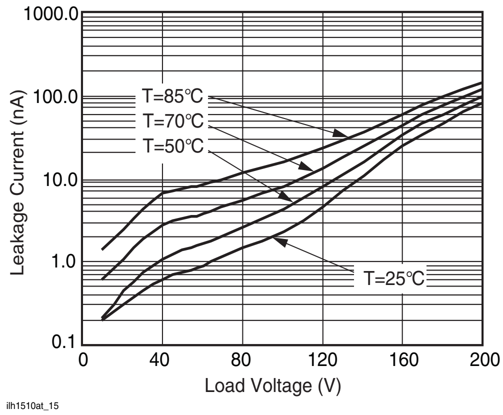


Figure 16. Leakage Current vs. Applied Voltage

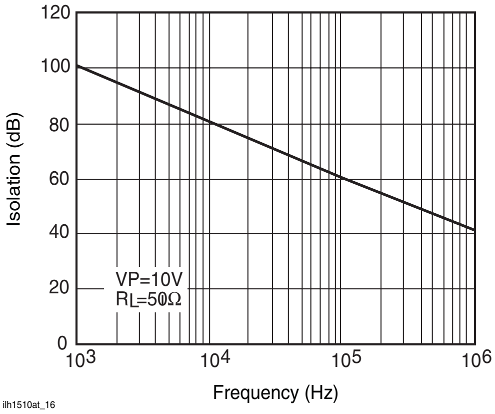


Figure 17. Output Isolation

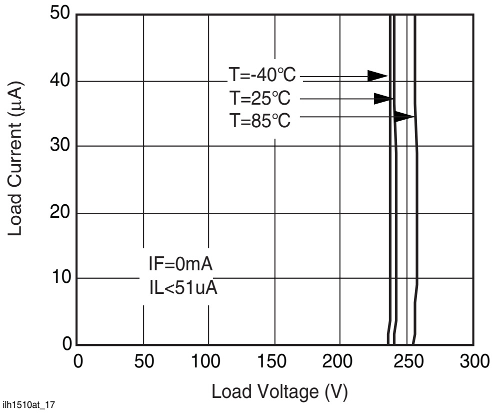


Figure 18. Switch Breakdown Voltage vs. Load Current

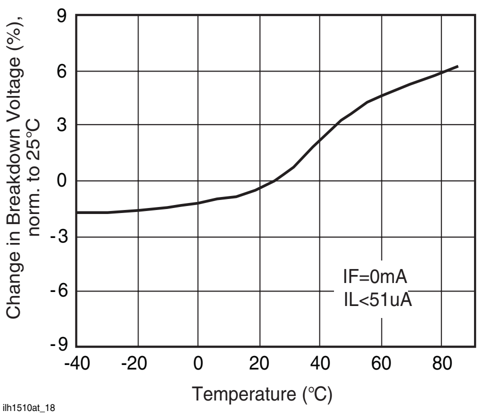


Figure 19. Switch Breakdown Voltage vs. Temperature

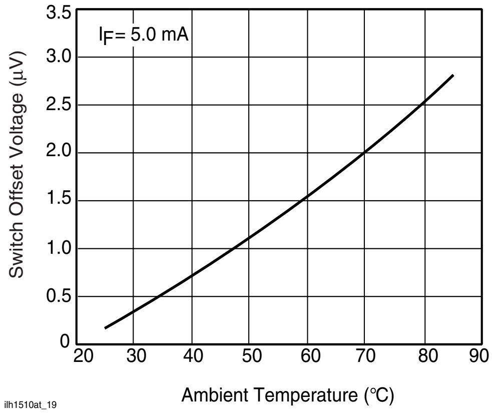


Figure 20. Switch Offset Voltage vs. Temperature

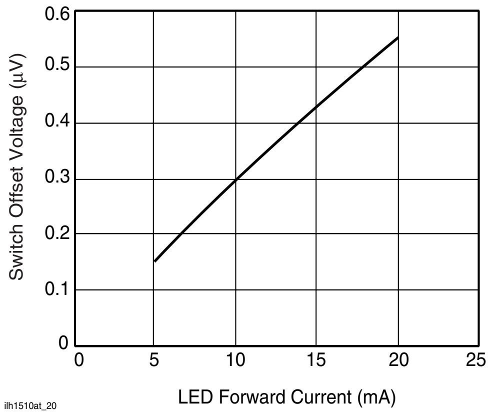


Figure 21. Switch Offset Voltage vs. LED Current

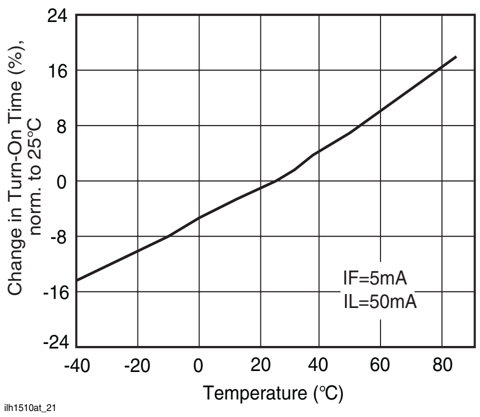


Figure 22. Turn-on Time vs. Temperature

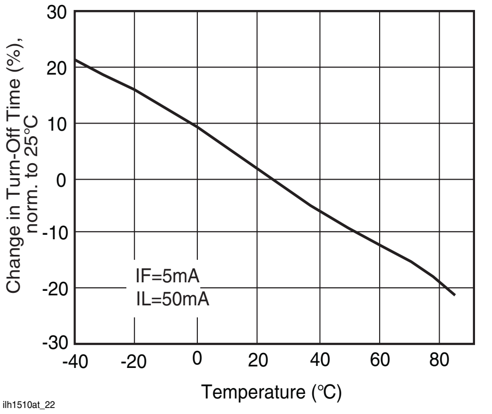


Figure 23. Turn-off Time vs. Temperature

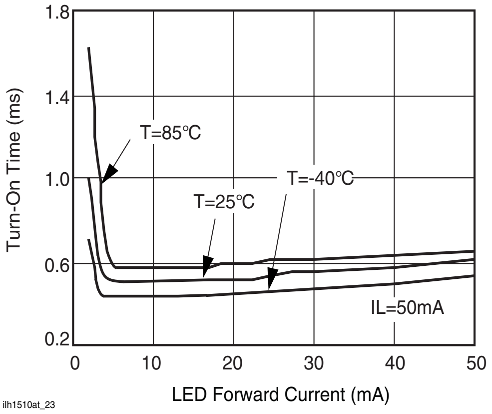


Figure 24. Turn-on Time vs. LED Current

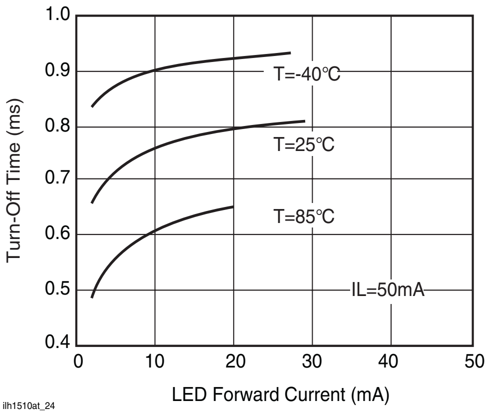
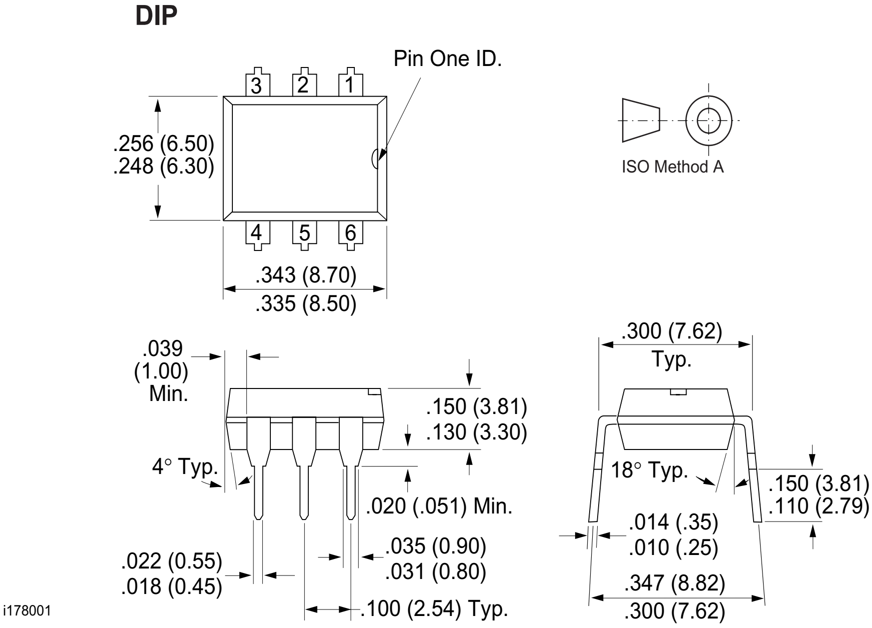
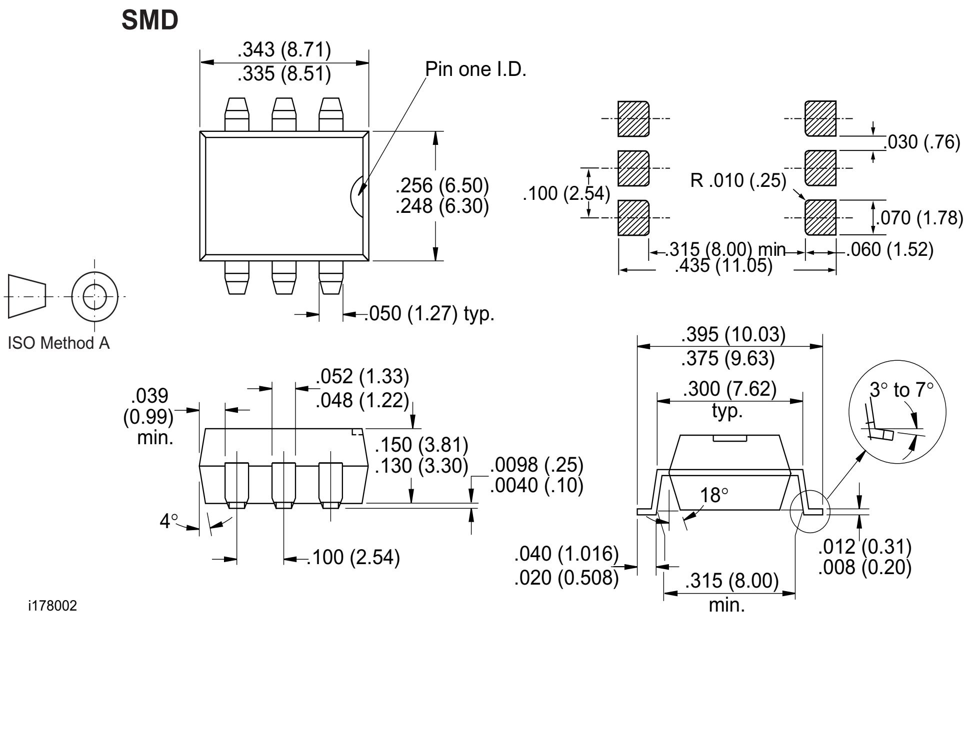


Figure 25. Turn-off Time vs. LED Current

Package Dimensions in Inches (mm)



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 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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