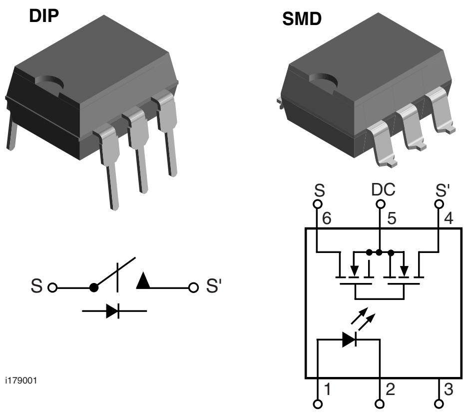
1 Form A Solid State Relay



FEATURES

- Current limit protection
- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 20 Ω, max. 25 Ω
- Load voltage 350 V
- Load current 120 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- High reliability monolithic detector
- SMD lead available on tape and reel
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

DESCRIPTION

The LH1540 is robust, ideal for telecom and ground fault applications. It is an SPST normally open switch (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.

APPLICATIONS

- General telecom switching
  - On/off hook control
  - Ring delay
  - Dial pulse
  - Ground start
  - Ground fault protection
- Instrumentation
- Industrial controls

Note
See "solid state relays" (application note 56)

AGENCY APPROVALS

UL1577:	file no. E52744 system code H or J, double protection
CSA:	certification no. 093751
BSI/BABT:	certification no. 7980
FIMKO:	approval

ORDER INFORMATION

PART	REMARKS	PACKAGE
LH1540AAB	SMD	SMD-6
LH1540AABTR	Tape and reel	SMD-6
LH1540AT	Thru hole	DIP-6

ABSOLUTE MAXIMUM RATINGS [1]				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
SSR				
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	350	V
Continuous DC load current-bidirectional operation		I_L	120	mA
Continuous DC load current-unidirectional operation		I_L	250	mA
Peak load current (single shot)	t = 100 ms	I_P	[2]	mA
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Pin soldering temperature [3]	t = 10 s max.	T_{sld}	260	°C
Input to output isolation voltage		V_{ISO}	5300	V_{RMS}
Output power dissipation (continuous)		P_{diss}	550	mW

Notes

[1] T_{amb} = 25 °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 current limit performance application note for a discussion on relay operation during transient currents.

[3] Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

ELECTRICAL CHARACTERISTICS						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}		1.0	2.0	mA
LED forward current, switch turn-off	$V_L = \pm 300$ V	I_{Foff}	0.2	0.9		mA
LED forward voltage	I_F = 10 mA	V_F	1.15	1.26	1.45	V
OUTPUT						
On-resistance AC/DC: pin 4 (±) to 6 (±)	I_F = 5.0 mA, I_L = 50 mA	R_{ON}	12	20	25	Ω
On-resistance DC: pin 4, 6 (+) to 5 (±)	I_F = 5.0 mA, I_L = 100 mA	R_{ON}	3.0	5.0	6.25	Ω
Off-resistance	I_F = 0 mA, $V_L = \pm 100$ V	R_{OFF}	0.5	5000		GΩ
Current limit AC/DC: pin 4 (±) to 6 (±)	I_F = 5.0 mA, $V_L = \pm 6.0$ V, t = 5.0 ms	I_{LMT}	175	210	250	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		55		pF
	I_F = 0 mA, V_L = 50 V	C_O		10		pF
Switch offset	I_F = 5.0 mA	V_{OS}		0.15		V
TRANSFER						
Capacitance (input to output)	V_{ISO} = 1.0 V	C_{IO}		0.8		pF
Turn-on time	I_F = 5.0 mA, I_L = 50 mA	t_{on}		1.2	2.0	ms
Turn-off time	I_F = 5.0 mA, I_L = 50 mA	t_{off}		0.5	2.0	ms

Note

T_{amb} = 25 °C, unless otherwise specified.
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.

TYPICAL CHARACTERISTICS

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

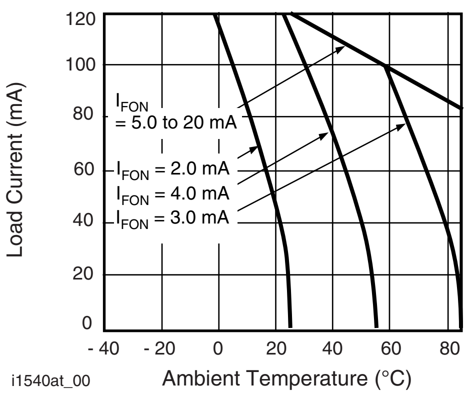


Fig. 1 - Recommended Operating Conditions

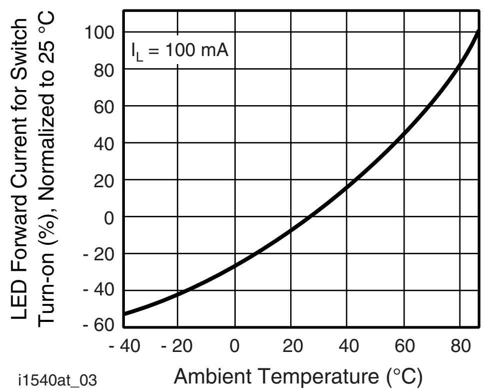


Fig. 4 - LED Current for Switch Turn-on vs. Temperature

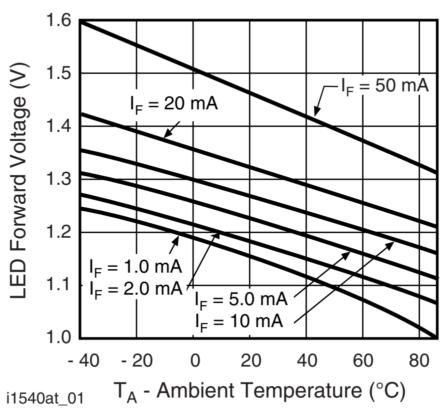


Fig. 2 - LED Voltage vs. Temperature

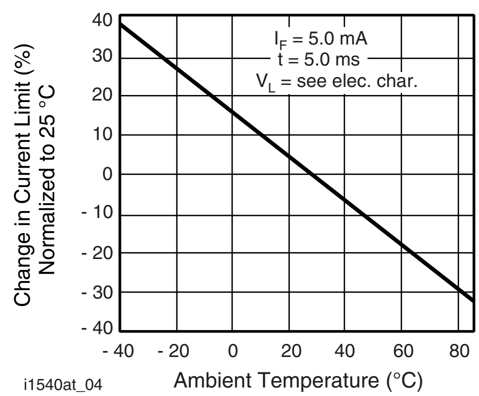


Fig. 5 - Current Limit vs. Temperature

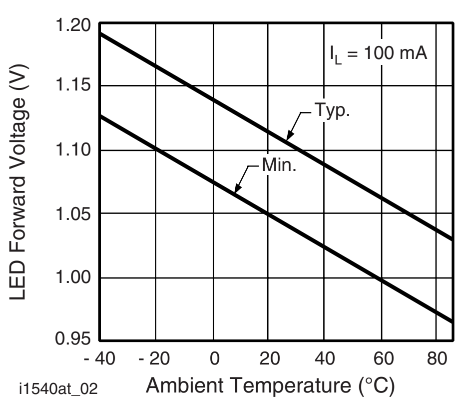


Fig. 3 - LED Dropout Voltage vs. Temperature

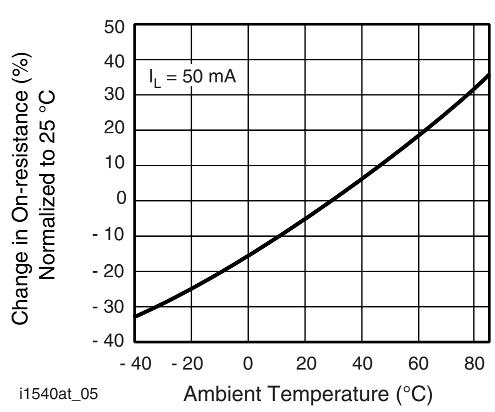


Fig. 6 - On-resistance vs. Temperature

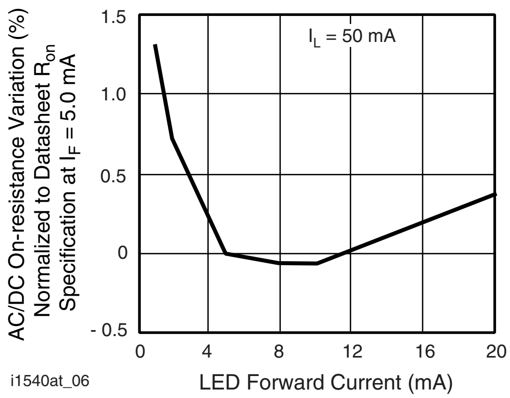


Fig. 7 - Variation in On-resistance vs. LED Current

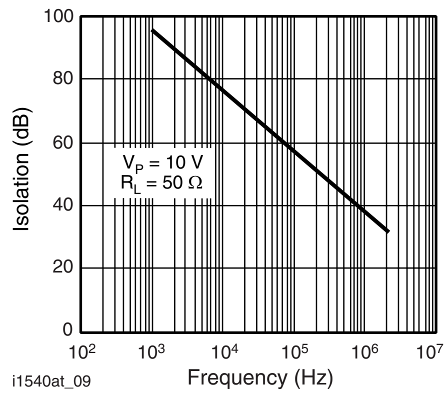


Fig. 10 - Output Isolation

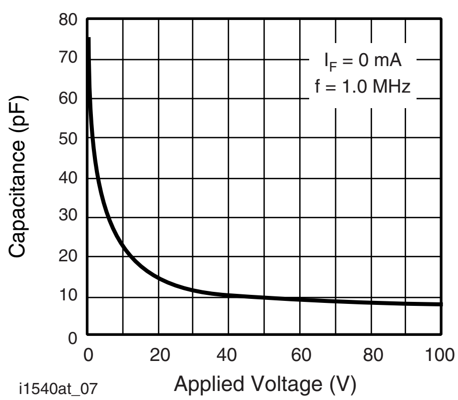


Fig. 8 - Switch Capacitance vs. Applied Voltage

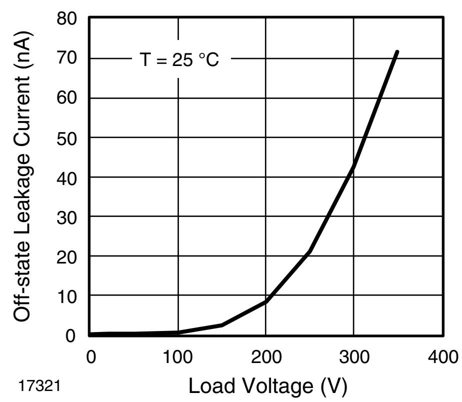


Fig. 11 - Leakage Current vs. Applied Voltage

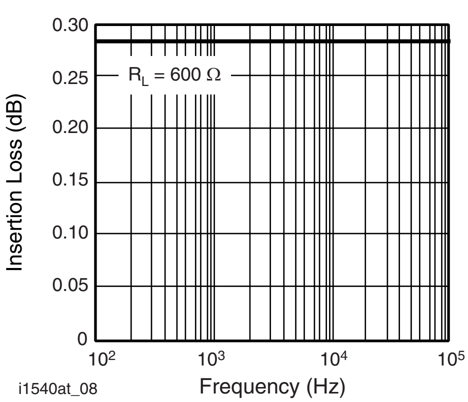


Fig. 9 - Insertion Loss vs. Frequency

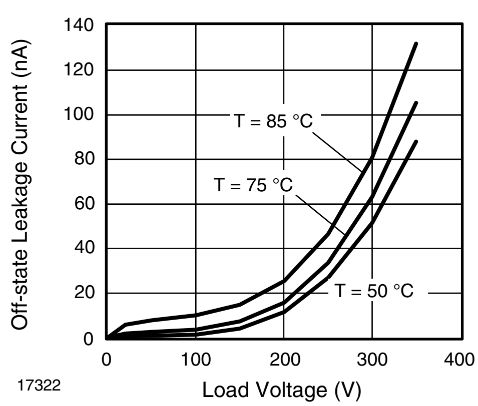


Fig. 12 - Leakage Current vs.
Applied Voltage at Elevated Temperatures

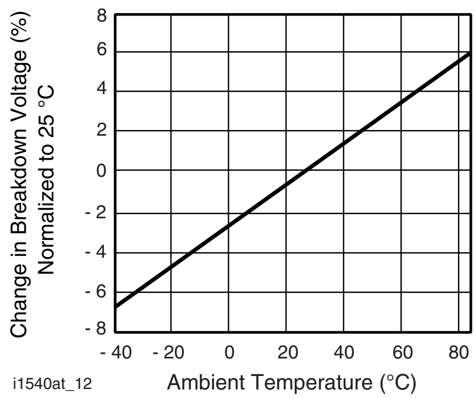


Fig. 13 - Switch Breakdown Voltage vs. Temperature

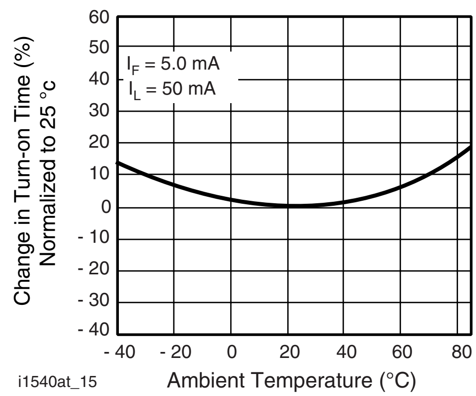


Fig. 16 - Turn-on Time vs. Temperature

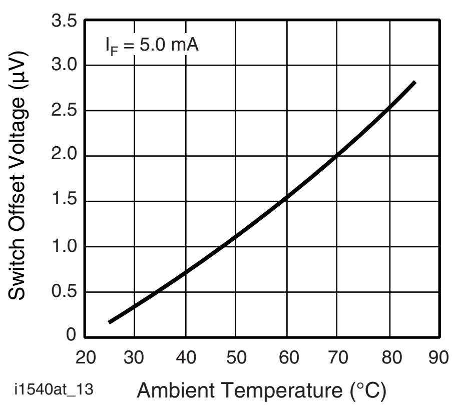


Fig. 14 - Switch Offset Voltage vs. Temperature

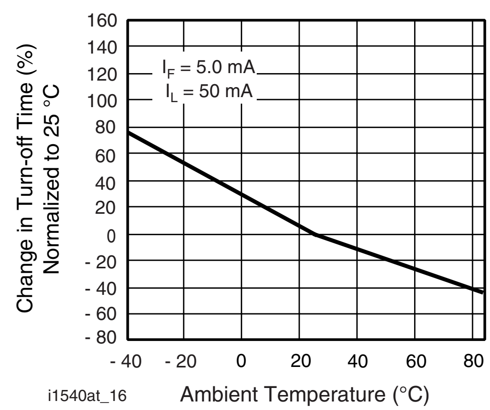


Fig. 17 - Turn-off Time vs. Temperature

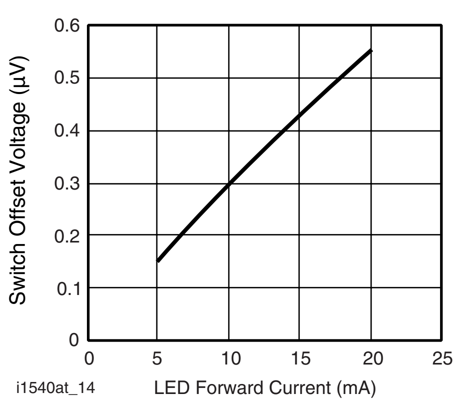


Fig. 15 - Switch Offset Voltage vs. LED Current

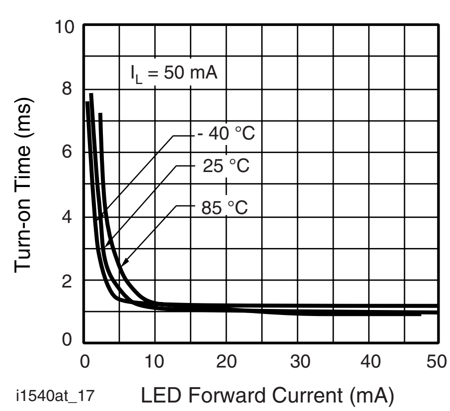


Fig. 18 - Turn-on Time vs. LED Current

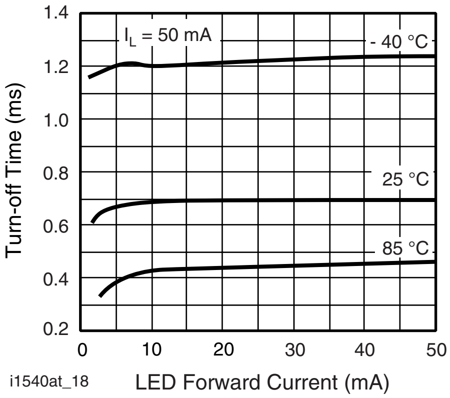
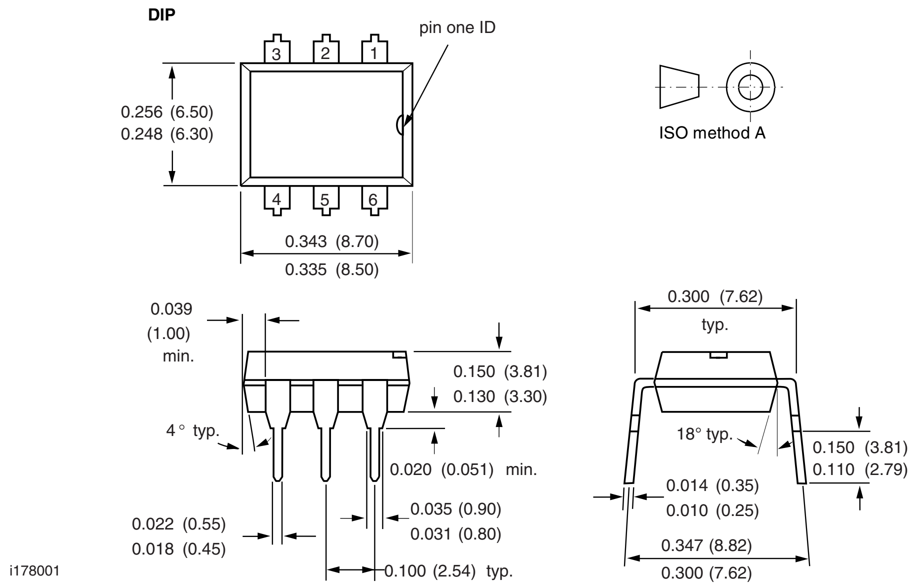
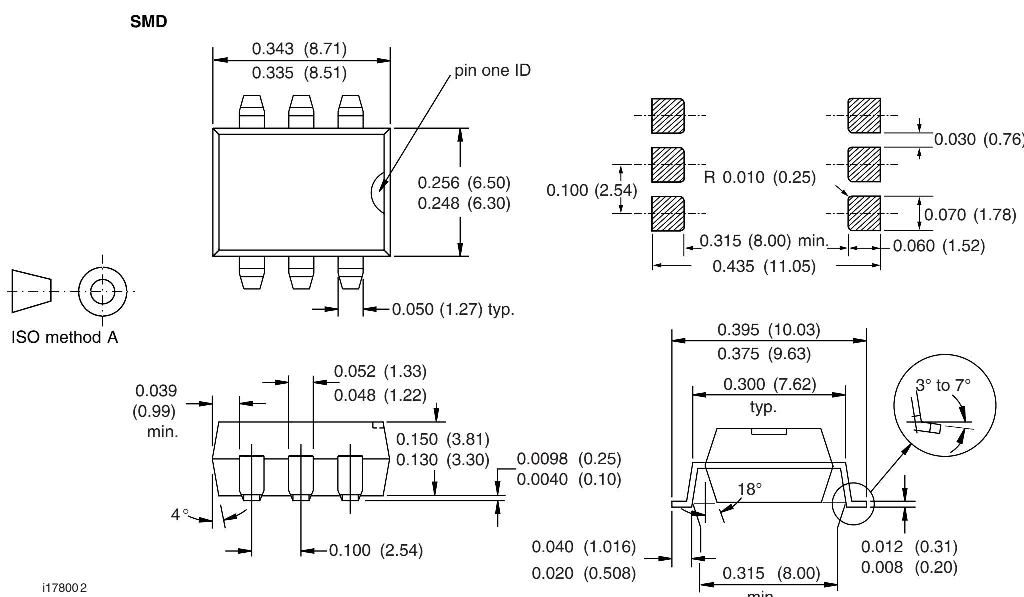


Fig. 19 - Turn-off Time vs. LED Current

PACKAGE DIMENSIONS in inches (millimeters)





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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.

Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany

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