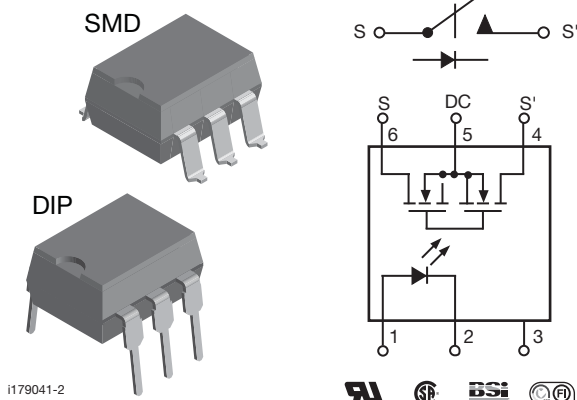


## 1 Form A Solid-State Relay



1179041-2

### DESCRIPTION

The LH1500 is robust, ideal for telecom and ground fault applications. It is an SPST normally open switch (1 form A) that replaces electromechanical relays in many applications. It 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 circuitry and MOSFET switches. In addition, it employs current-limiting circuitry which meets lightning surge testing as per ANSI/TIA-968-B and other regulatory voltage surge requirements when overvoltage protection is provided.

### FEATURES

- Current limit protection
- Isolation test voltage 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 20 Ω
- Load voltage 350 V
- Load current 150 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- SMD lead available on tape and reel
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


RoHS  
COMPLIANT

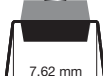
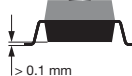
### APPLICATIONS

- General telecom switching
- Instrumentation
- Industrial controls

### AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection  
 CSA: certification 093751  
 BSI: no. 7979 and 7980  
 FIMKO: 25419

### ORDERING INFORMATION

<div><div><div>L</div><div>H</div><div>1</div><div>5</div><div>0</div><div>0</div></div><div>PART NUMBER</div></div> <div><div>#</div><div>#</div><div>#</div><div>ELECTR. VARIATION</div></div> <div><div>#</div><div>#</div><div>#</div><div>PACKAGE CONFIG.</div></div> <div><div>T</div><div>R</div><div>TAPE AND REEL</div></div> <div><div>DIP</div><div></div><div>7.62 mm</div></div> <div><div>SMD</div><div></div><div>&gt; 0.1 mm</div></div>												
PACKAGE						UL, CSA, BSI, FIMKO						
SMD-6						LH1500AAB						
SMD-6, tape and reel						LH1500AABTR						
DIP-6, thru hole						LH1500AT						



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
SSR output power dissipation (continuous)		$P_{diss}$	550	mW
LED reverse voltage	$I_R \leq 10\text{ mA}$	$V_R$	8	V
LED continuous forward current		$I_F$	50	mA
<b>OUTPUT</b>				
DC or peak AC load voltage	$I_L \leq 50\text{ mA}$	$V_L$	350	V
Continuous DC load current - bidirectional	$T_{amb} = 25\text{ }^{\circ}\text{C}$	$I_L$	150	mA
Continuous DC load current - unidirectional	$T_{amb} = 25\text{ }^{\circ}\text{C}$	$I_L$	250	mA
<b>SSR</b>				
Ambient temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 40 to + 150	$^{\circ}\text{C}$
Soldering temperature <sup>(1)</sup>	$t = 10\text{ s}$ maximum	$T_{sld}$	260	$^{\circ}\text{C}$
Isolation test voltage (for 1 s)		$V_{ISO}$	5300	$V_{RMS}$
Isolation resistance	$V_{IO} = 500\text{ V}$ , $T_{amb} = 25\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{12}$	$\Omega$
	$V_{IO} = 500\text{ V}$ , $T_{amb} = 100\text{ }^{\circ}\text{C}$	$R_{IO}$	$\geq 10^{11}$	$\Omega$

**Notes**

- 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.
- <sup>(1)</sup> 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
LED forward current, switch turn-on	$I_L = 100\text{ mA}$ , $t = 10\text{ ms}$	$I_{Fon}$		0.9	2	mA
LED forward current, switch turn-off	$V_L = \pm 300\text{ V}$	$I_{Foff}$	0.2	0.8		mA
LED forward voltage	$I_F = 10\text{ mA}$	$V_F$	1.15	1.25	1.45	V
<b>OUTPUT</b>						
On-resistance, AC/DC: pin 4 ( $\pm$ ) to 6 ( $\pm$ )	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$R_{ON}$		20	25	$\Omega$
On-resistance, DC: pin 4, 6 (+) to 5 (-)	$I_F = 5\text{ mA}$ , $I_L = 100\text{ mA}$	$R_{ON}$	3	4.6	6.25	$\Omega$
Off-resistance	$I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$	$R_{OFF}$	0.5	300		$G\Omega$
Current limit AC <sup>(1)</sup> : pin 4 ( $\pm$ ) to 6 ( $\pm$ )	$I_F = 5\text{ mA}$ , $t = 5\text{ ms}$ , $V_L = \pm 6\text{ V}$	$I_{LMT}$	230	255	370	mA
Off-state leakage current	$I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$	$I_O$		0.32	200	nA
	$I_F = 0\text{ mA}$ , $V_L = \pm 350\text{ V}$	$I_O$			1	$\mu\text{A}$
Output capacitance, pin 4 to 6	$I_F = 0\text{ mA}$ , $V_L = 1\text{ V}$	$C_O$		33		pF
	$I_F = 0\text{ mA}$ , $V_L = 50\text{ V}$	$C_O$		10		pF
Switch offset	$I_F = 5\text{ mA}$	$V_{OS}$		0.2		$\mu\text{V}$
<b>TRANSFER</b>						
Capacitance (input to output)	$V_{ISO} = 1\text{ V}$	$C_{IO}$		0.71		pF

**Notes**

- 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.
- <sup>(1)</sup> No DC mode current limit available.

SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{on}$		0.3	2	ms
Turn-off time	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{off}$		0.6	2	ms

## TYPICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

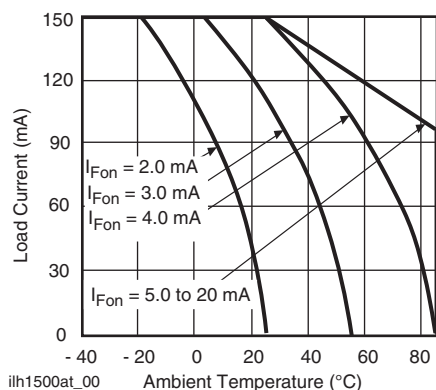


Fig. 1 - Recommended Operating Conditions

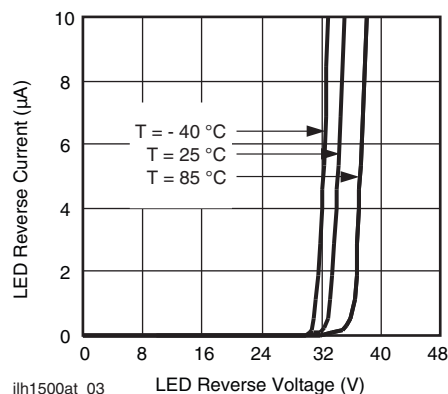


Fig. 4 - LED Reverse Current vs. LED Reverse Voltage

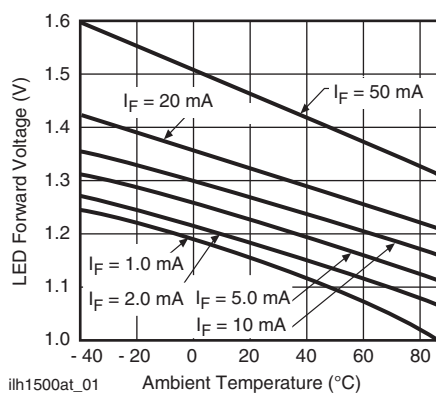


Fig. 2 - LED Voltage vs. Temperature

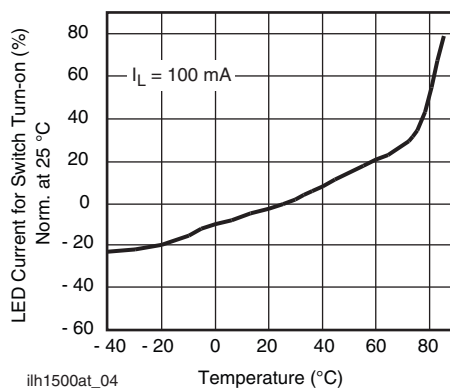


Fig. 5 - LED Current for Switch Turn-on vs. Temperature

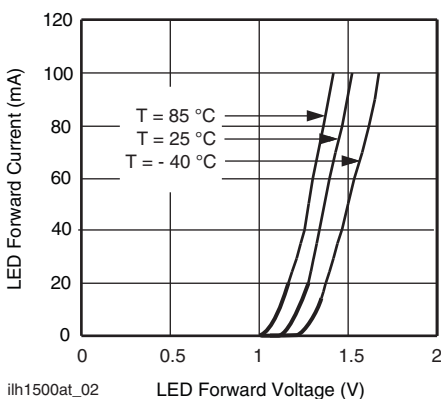


Fig. 3 - LED Forward Current vs. Forward Voltage

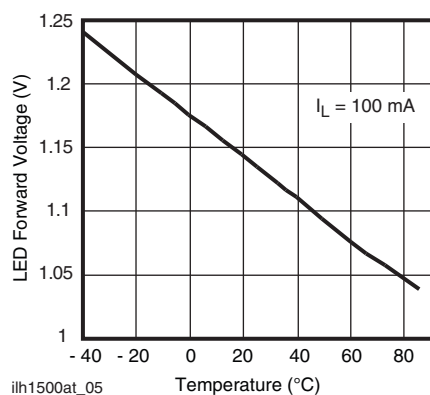


Fig. 6 - LED Dropout Voltage vs. Temperature

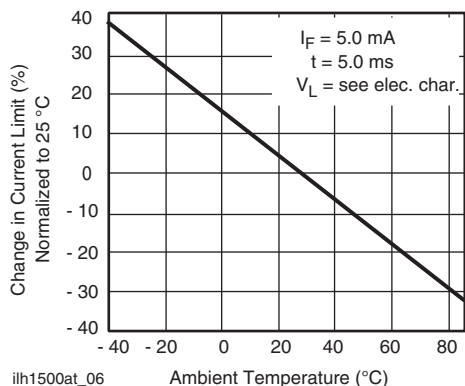


Fig. 7 - Current Limit vs. Temperature

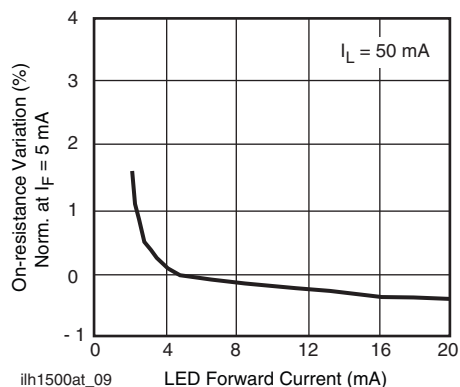


Fig. 10 - Variation in On-Resistance vs. LED Current

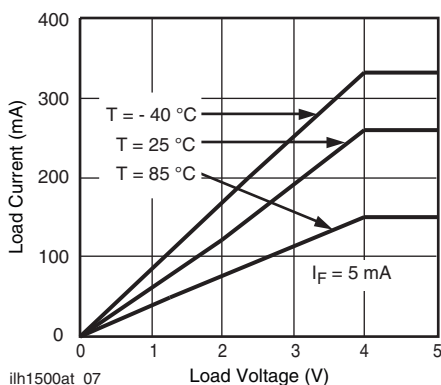


Fig. 8 - Load Current vs. Load Voltage

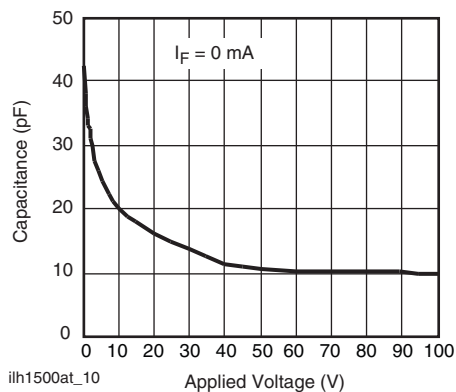


Fig. 11 - Switch Capacitance vs. Applied Voltage

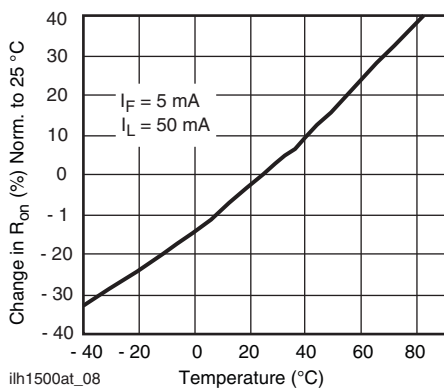


Fig. 9 - On-Resistance vs. Temperature

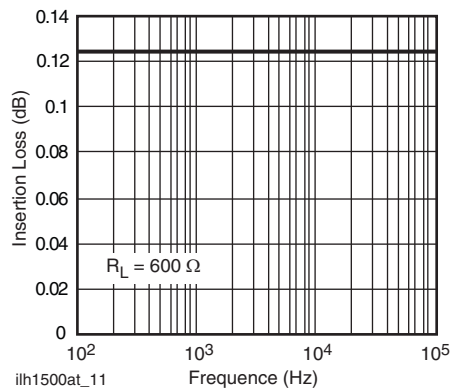


Fig. 12 - Insertion Loss vs. Frequency

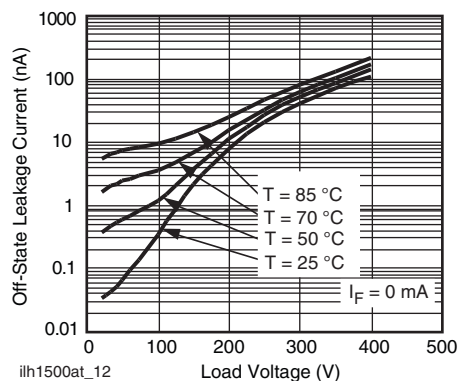


Fig. 13 - Leakage Current vs. Applied Voltage

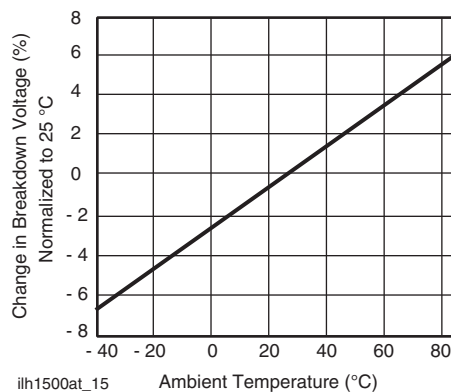


Fig. 16 - Switch Breakdown Voltage vs. Temperature

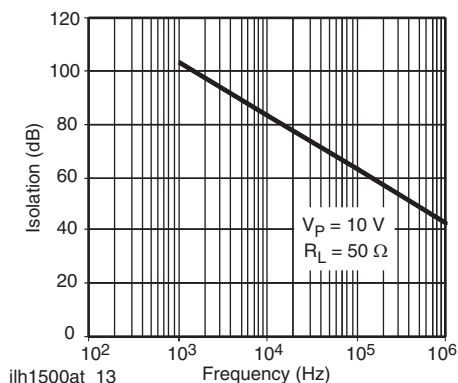


Fig. 14 - Output Isolation

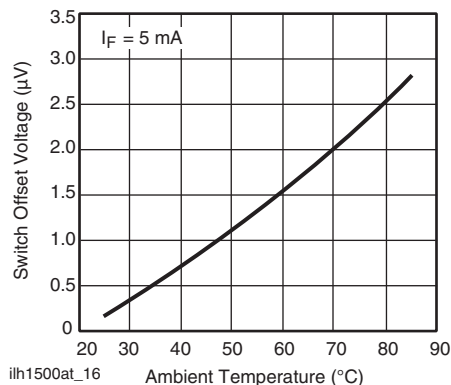


Fig. 17 - Switch Offset Voltage vs. Temperature

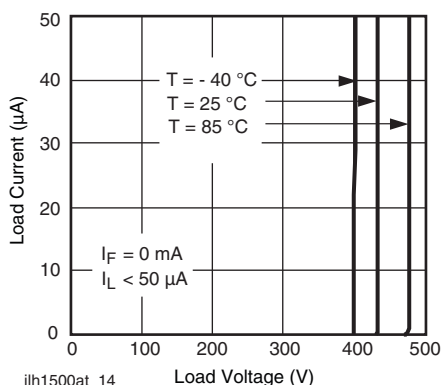


Fig. 15 - Switch Breakdown Voltage vs. Load Current

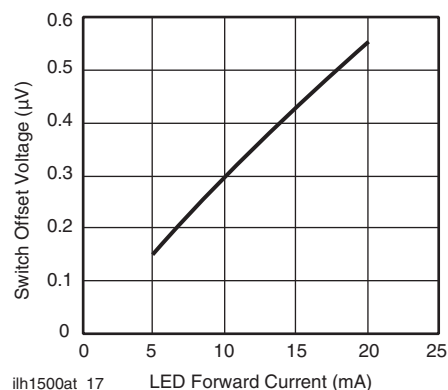


Fig. 18 - Switch Offset Voltage vs. LED Current

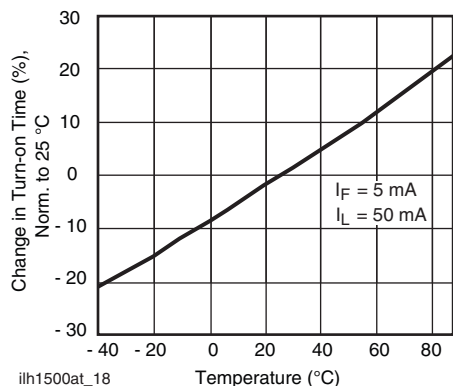


Fig. 19 - Turn-on Time vs. Temperature

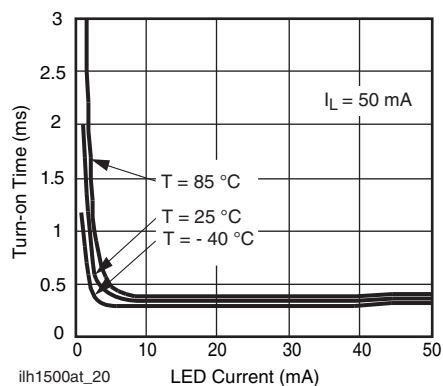


Fig. 21 - Turn-on Time vs. LED Current

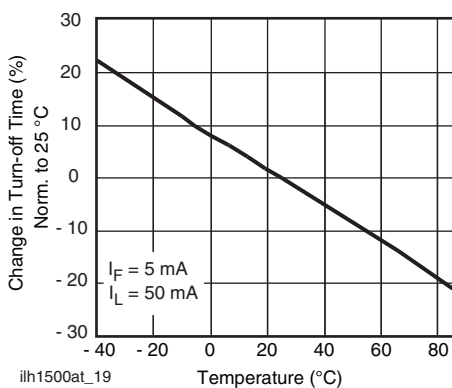


Fig. 20 - Turn-off Time vs. Temperature

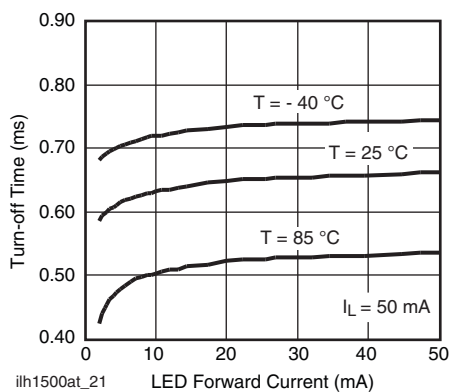
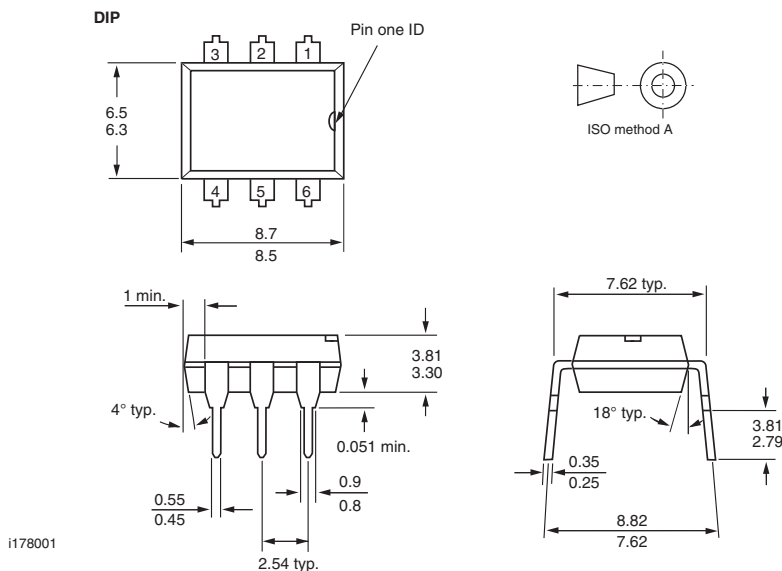
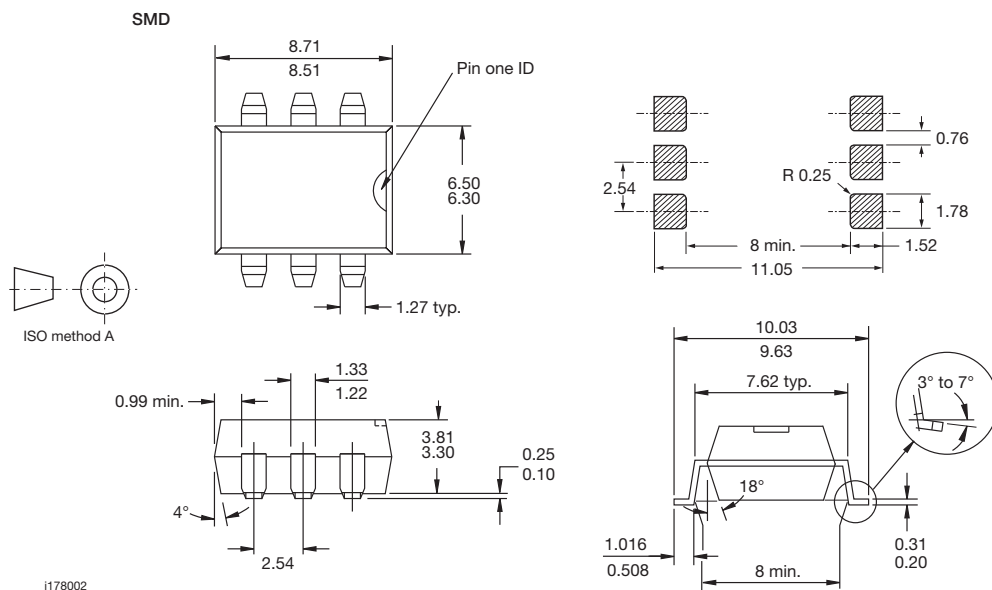


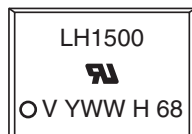
Fig. 22 - Turn-off Time vs. LED Current

## PACKAGE DIMENSIONS in millimeters





## PACKAGE MARKING



### Note

- Tape and reel suffix (TR) is not part of the package marking.



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