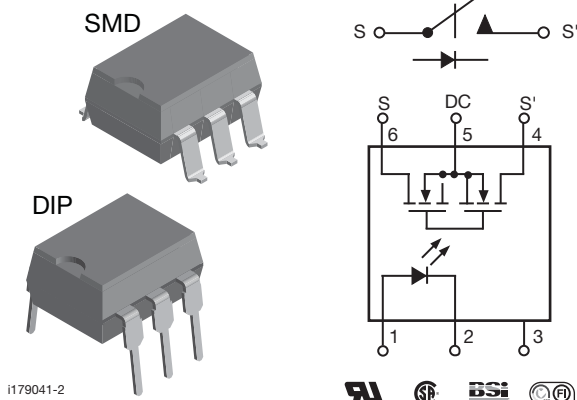


1 Form A Solid-State Relay



i179041-2

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_{RMS}
- Typical R_{ON} 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

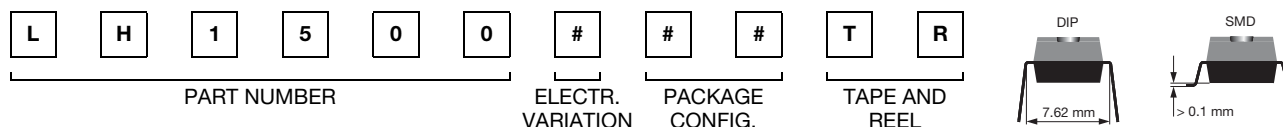
APPLICATIONS

- 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



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
INPUT				
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
OUTPUT				
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
SSR				
Ambient temperature range		T_{amb}	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	- 40 to + 150	$^{\circ}\text{C}$
Soldering temperature ⁽¹⁾	$t = 10\text{ s}$ 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}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}$, $T_{amb} = 100\text{ }^{\circ}\text{C}$	R_{IO}	$\geq 10^{11}$	Ω

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.
- ⁽¹⁾ 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
INPUT						
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
OUTPUT						
On-resistance, AC/DC: pin 4 ($\pm$) to 6 ($\pm$)	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$	R_{ON}		20	25	Ω
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	Ω
Off-resistance	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$	R_{OFF}	0.5	300		$G\Omega$
Current limit AC ⁽¹⁾ : 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	μA
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		μV
TRANSFER						
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.
- ⁽¹⁾ 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)

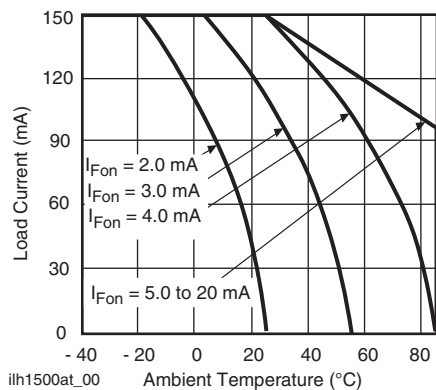


Fig. 1 - Recommended Operating Conditions

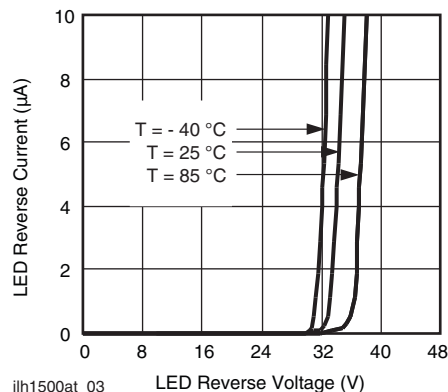


Fig. 4 - LED Reverse Current vs. LED Reverse Voltage

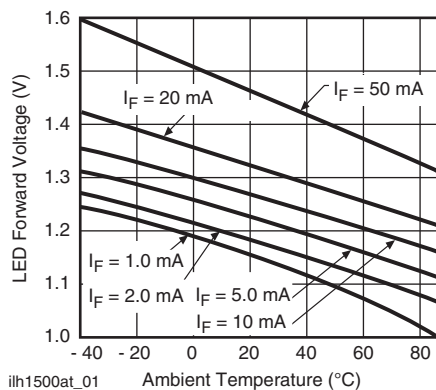


Fig. 2 - LED Voltage vs. Temperature

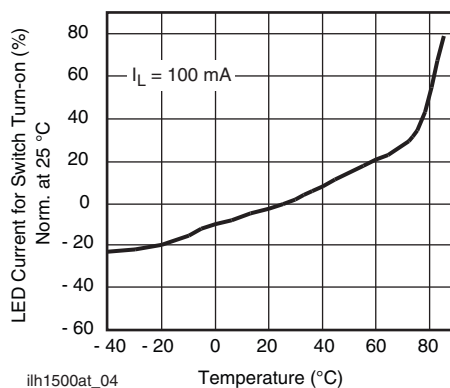


Fig. 5 - LED Current for Switch Turn-on vs. Temperature

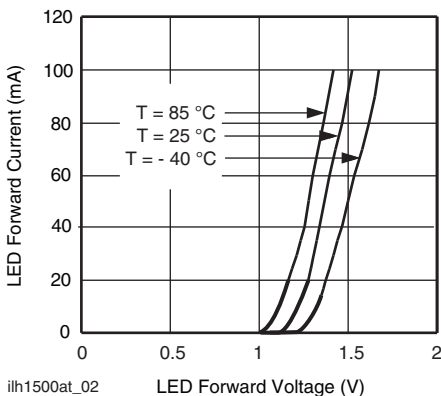


Fig. 3 - LED Forward Current vs. Forward Voltage

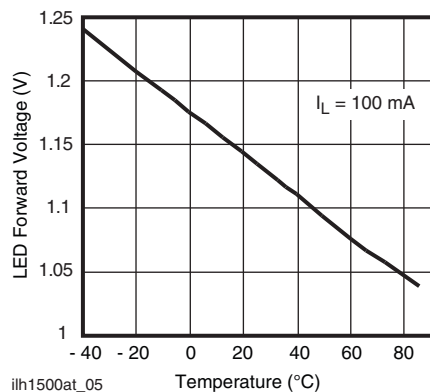


Fig. 6 - LED Dropout Voltage vs. Temperature

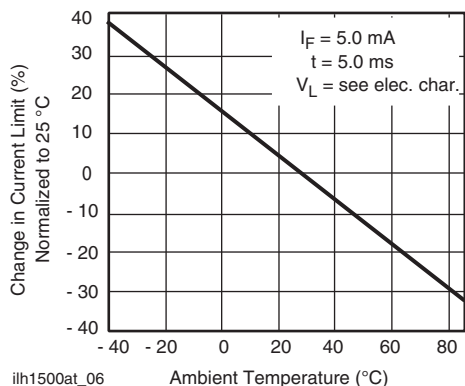


Fig. 7 - Current Limit vs. Temperature

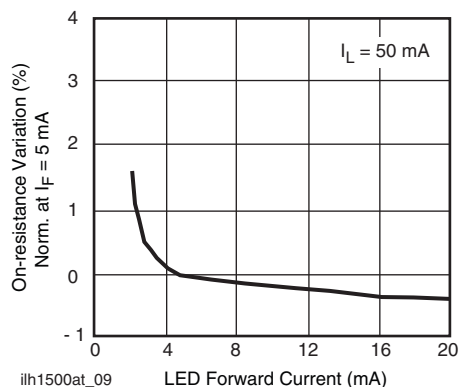


Fig. 10 - Variation in On-Resistance vs. LED Current

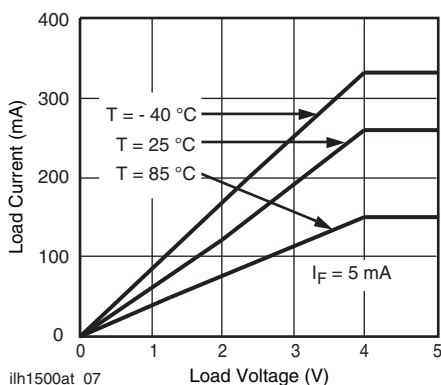


Fig. 8 - Load Current vs. Load Voltage

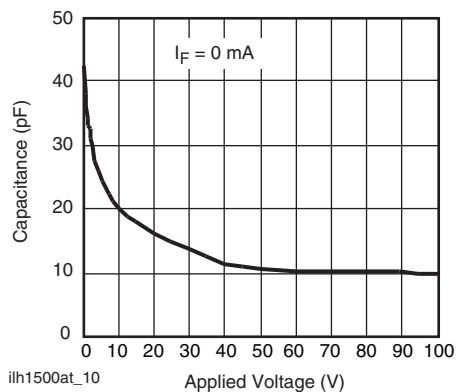


Fig. 11 - Switch Capacitance vs. Applied Voltage

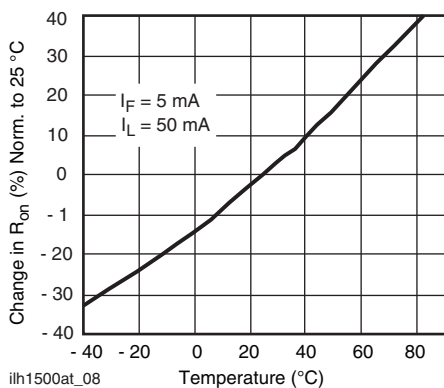


Fig. 9 - On-Resistance vs. Temperature

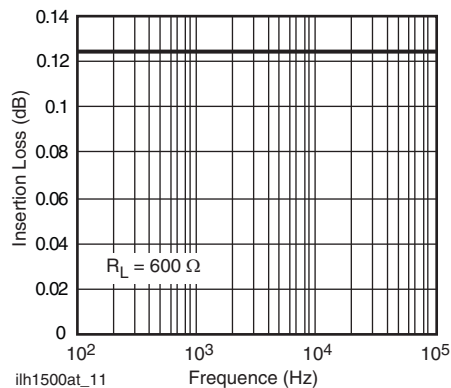


Fig. 12 - Insertion Loss vs. Frequency

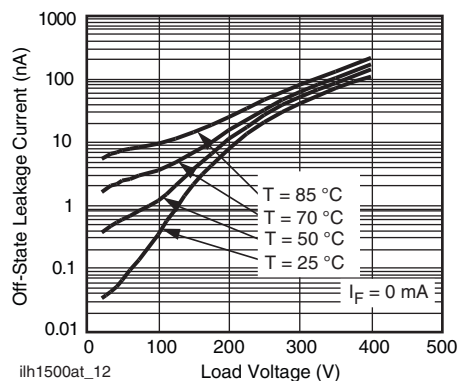


Fig. 13 - Leakage Current vs. Applied Voltage

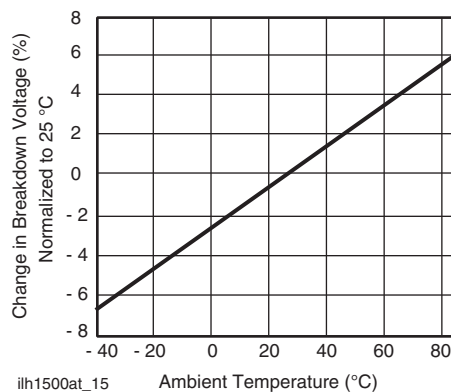


Fig. 16 - Switch Breakdown Voltage vs. Temperature

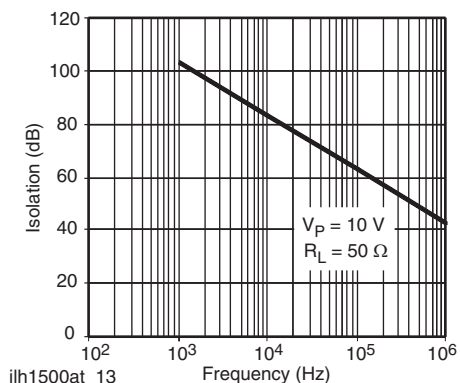


Fig. 14 - Output Isolation

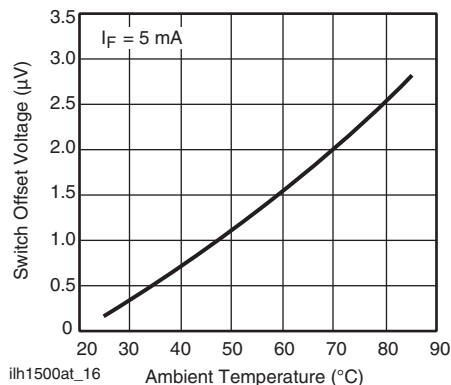


Fig. 17 - Switch Offset Voltage vs. Temperature

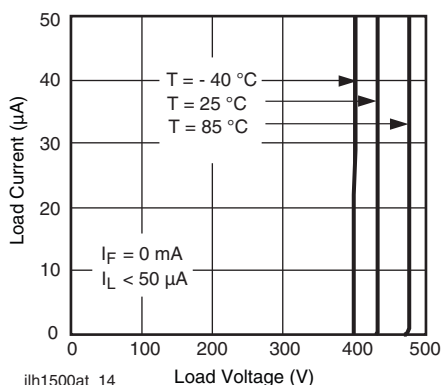


Fig. 15 - Switch Breakdown Voltage vs. Load Current

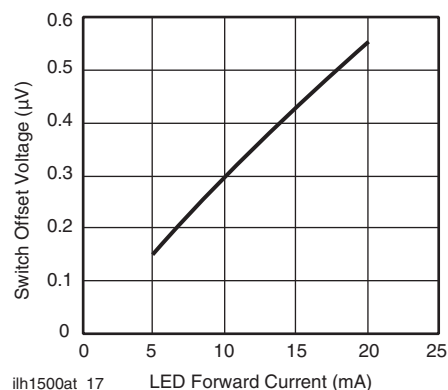


Fig. 18 - Switch Offset Voltage vs. LED Current

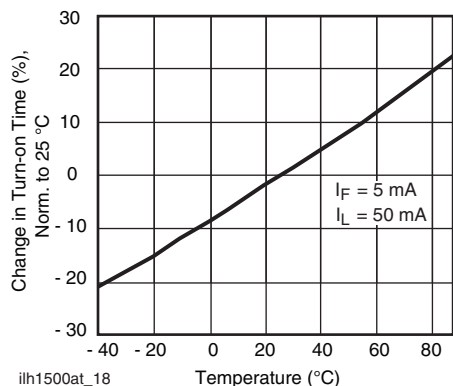


Fig. 19 - Turn-on Time vs. Temperature

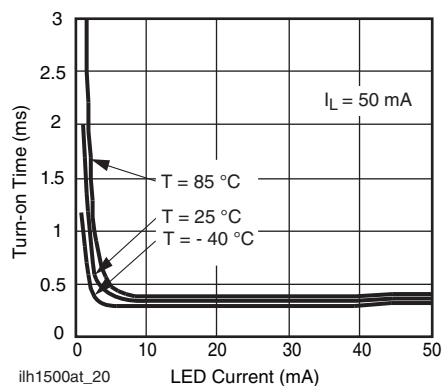


Fig. 21 - Turn-on Time vs. LED Current

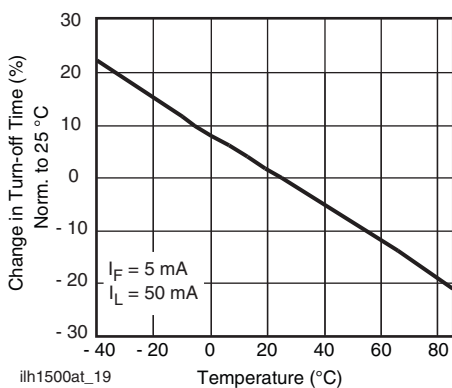


Fig. 20 - Turn-off Time vs. Temperature

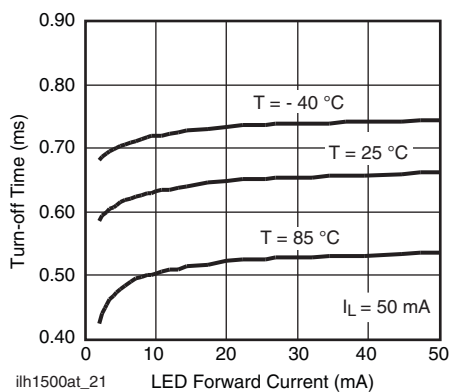
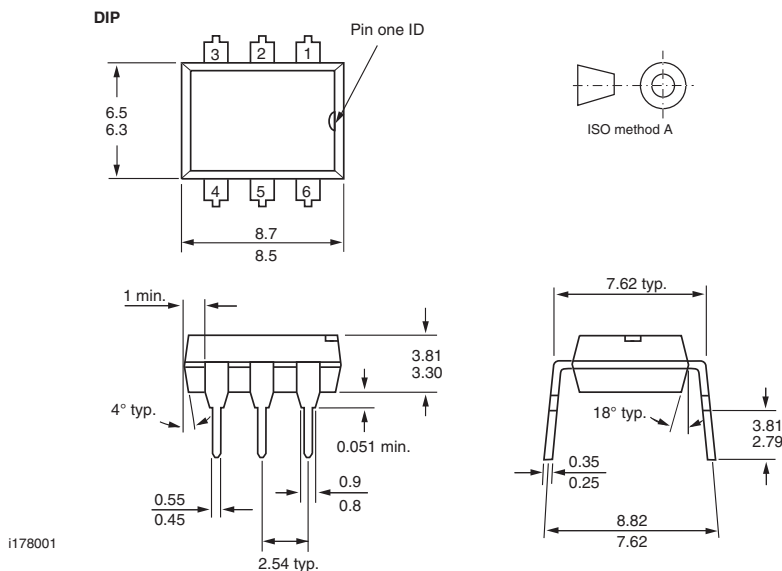
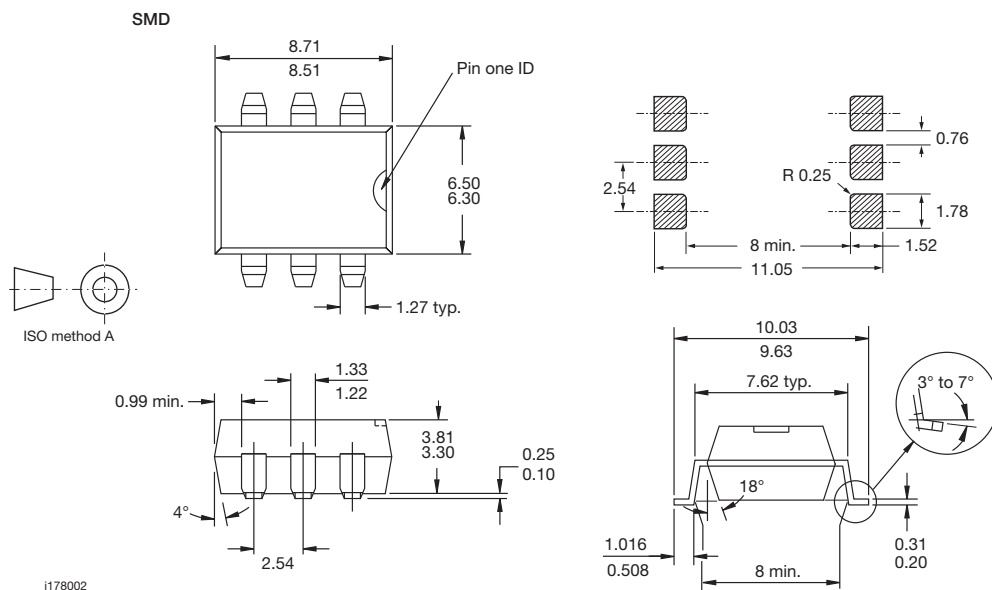


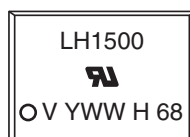
Fig. 22 - Turn-off Time vs. LED Current

PACKAGE DIMENSIONS in millimeters





PACKAGE MARKING



Note

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



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