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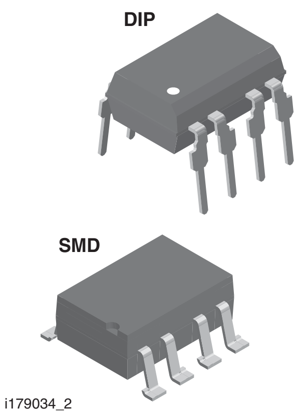
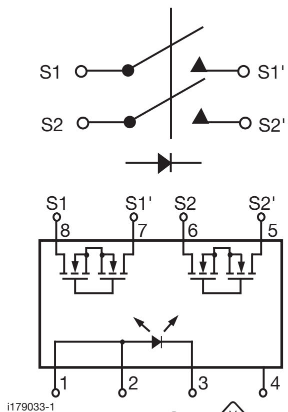
2 Form A Solid-State Relay





FEATURES

- Current limit protection
- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 20 Ω
- Load voltage 350 V
- Load current 110 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- High reliability monolithic receptor
- SMD lead available on tape and reel
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

Pb-free

e3 RoHS COMPLIANT

DESCRIPTION

The LH1503 relays are DPST normally open switches (2 form A) that can replace electromechanical relays in many applications. The relays are 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 DMOS switches. In addition, these relays employ current limiting circuity, enabling them to pass lightning surge testing as per ANSI/TIA-968-B 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

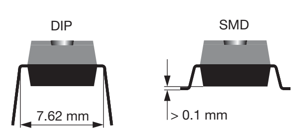
AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection
CSA: certification no. 093751
DIN EN: 60747-5-2 (VDE 0884)/60747-5-5 (pending), available with option 1

ORDERING INFORMATION

L H 1 5 0 3 A # # T R

PART NUMBER (L H 1 5 0 3) | ELECTR. VARIATION (A) | PACKAGE CONFIG. (# #) | TAPE AND REEL (T R)



PACKAGE	UL, CSA
SMD-8, tubes	LH1503AAC
SMD-8, tape and reel	LH1503AACTR
DIP-8, tubes	LH1503AB

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ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
LED continuous forward current		I_F	50	mA
LED reverse voltage	$I_R \leq 10$ µA	V_R	8	V
OUTPUT				
DC or peak AC load voltage	$I_L \leq 50$ µA	V_L	350	V
Continuous DC load current one pole operating		I_L	150	mA
Continuous DC load current two poles operating		I_L	110	mA
Peak load current (single shot)	t = 100 ms	I_P	(1)	
SSR				
Ambient temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Pin soldering temperature (2)	t = 10 s max.	T_{sld}	260	°C
Input to output isolation voltage		V_{ISO}	5300	V_{RMS}
Pole-to-pole isolation voltage (S1 to S2)			500	V
Output power dissipation (continuous)		P_{diss}	600	mW

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 current limit performance application note for a discussion on relay operation during transient currents.

(2) 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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
LED forward current, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}		2	3	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	1.26	1.45	V
OUTPUT						
On-resistance	I_F = 5 mA, I_L = 50 mA	R_{ON}	12	20	25	Ω
Pole-to-pole on-resistance matching (S1 to S2)	I_F = 5 mA, I_L = 50 mA			0.2	2	ΔΩ
Off-resistance	I_F = 0 mA, $V_L = \pm 100$ V	R_{OFF}	0.5	5000		GΩ
Current limit	I_F = 5 mA, t = 5 ms, $V_L = \pm 6$ V	I_{LMT}	230	270	370	mA
Off-state leakage current	I_F = 0 mA, $V_L = \pm 100$ V	I_O		0.02	200	nA
	I_F = 0 mA, $V_L = \pm 350$ V	I_O			1	µA
Output capacitance	I_F = 0 mA, V_L = 1 V	C_O		55		pF
	I_F = 0 mA, V_L = 50 V	C_O		10		pF
Pole-to-pole capacitance (S1 to S2)	I_F = 0 mA			3		pF
	I_F = 5 mA			4		pF
Switch offset	I_F = 5 mA	V_{OS}		0.15		µV
TRANSFER						
Capacitance (input to output)	V_{ISO}	C_{ISO}		1.1		pF

Note

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_F = 10 mA, I_L = 50 mA	t_{on}		1.6	2.5	ms
Turn-off time	I_F = 10 mA, I_L = 50 mA	t_{off}		0.65	2.5	ms

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TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

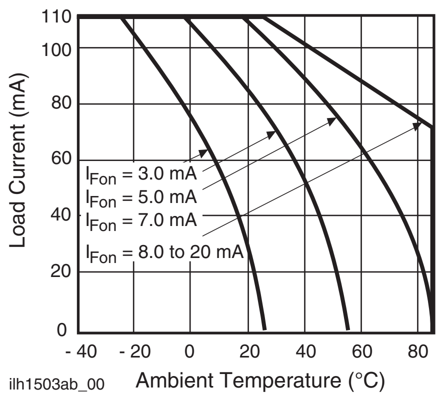

Fig. 1 - Recommended Operating Conditions

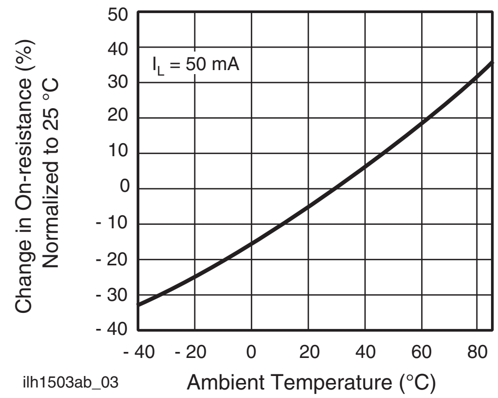

Fig. 4 - On-Resistance vs. Temperature

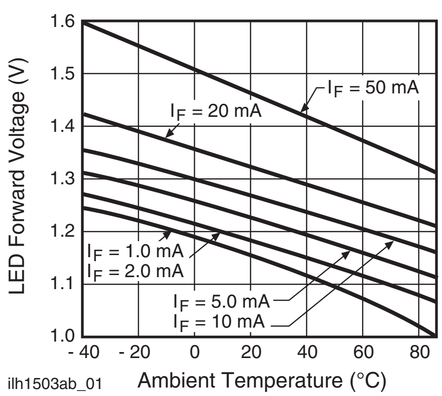

Fig. 2 - LED Voltage vs. Temperature

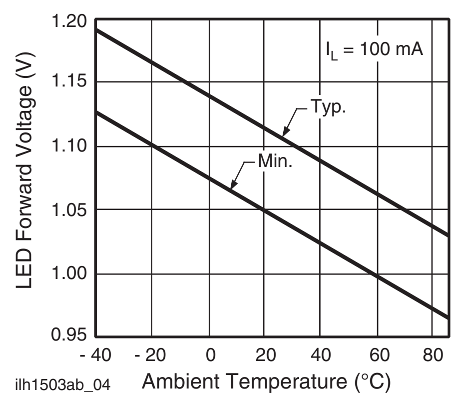

Fig. 5 - LED Dropout Voltage vs. Temperature

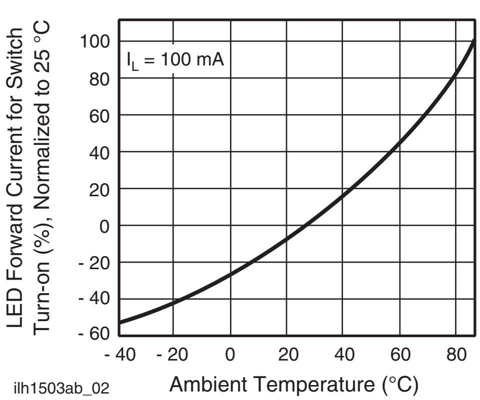

Fig. 3 - LED Current for Switch Turn-on vs. Temperature

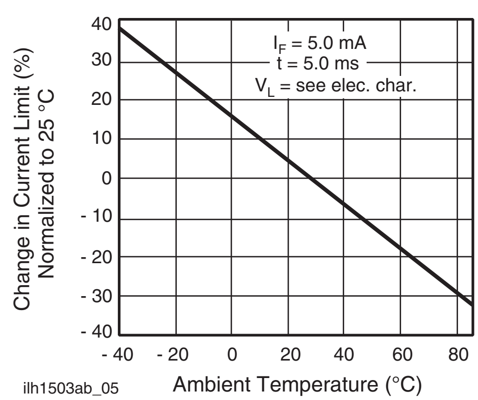

Fig. 6 - Current Limit vs. Temperature

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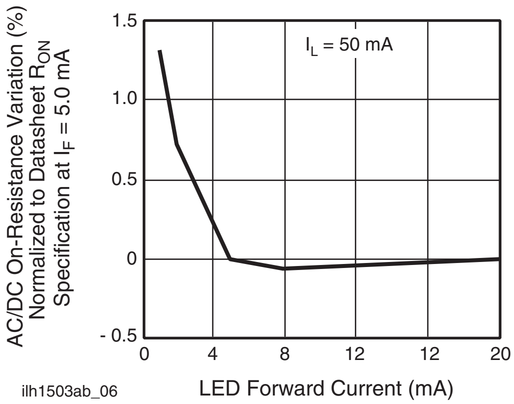

Fig. 7 - Variation in On-Resistance vs. LED Current

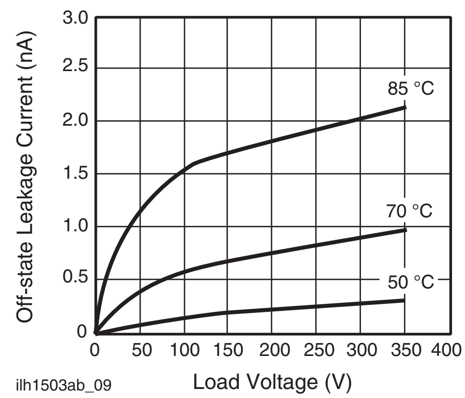

Fig. 10 - Leakage Current vs.
Applied Voltage at Elevated Temperatures

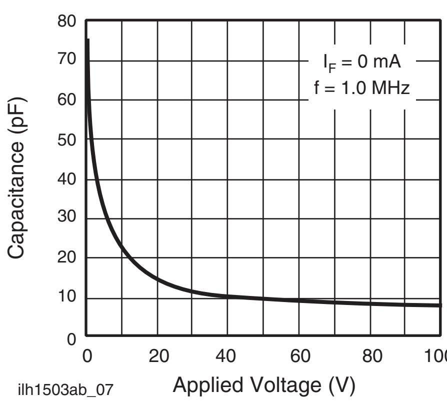

Fig. 8 - Switch Capacitance vs. Applied Voltage

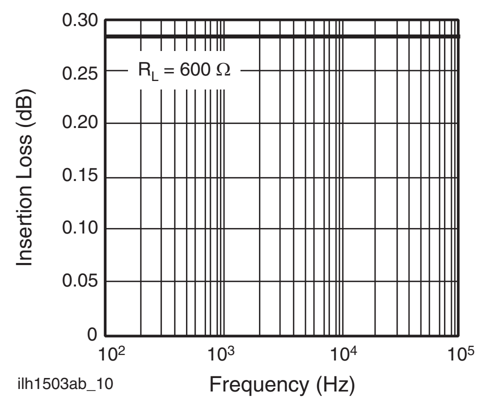

Fig. 11 - Insertion Loss vs. Frequency

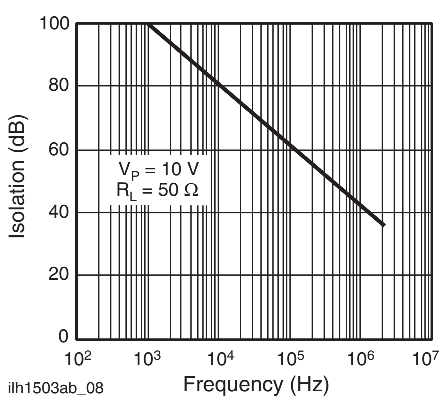

Fig. 9 - Output Isolation

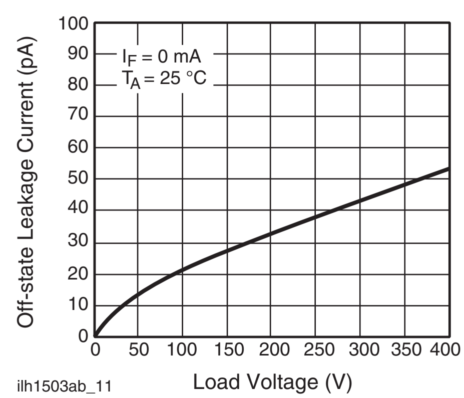

Fig. 12 - Leakage Current vs. Applied Voltage

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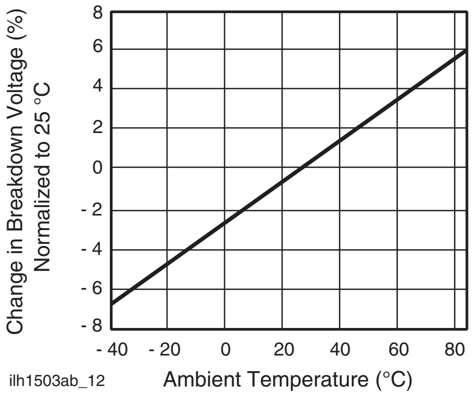

Fig. 13 - Switch Breakdown Voltage vs. Temperature

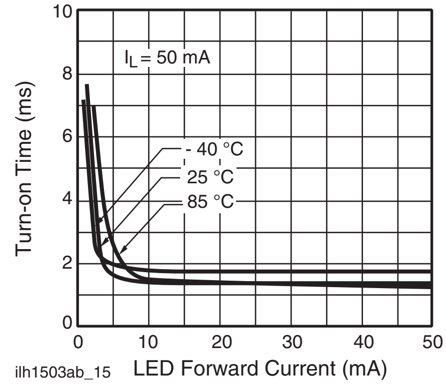

Fig. 16 - Turn-on Time vs. LED Current

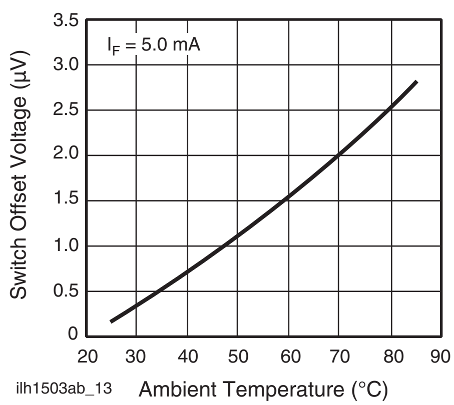

Fig. 14 - Switch Offset Voltage vs. Temperature

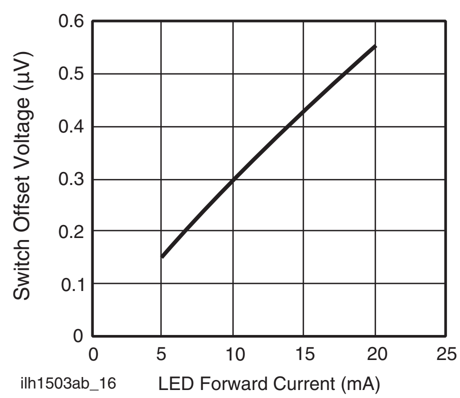

Fig. 17 - Switch Offset Voltage vs. LED Current

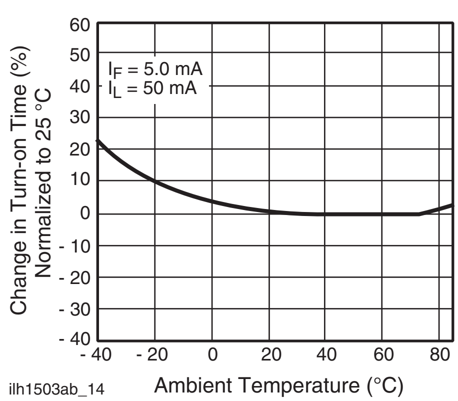

Fig. 15 - Turn-on Time vs. Temperature

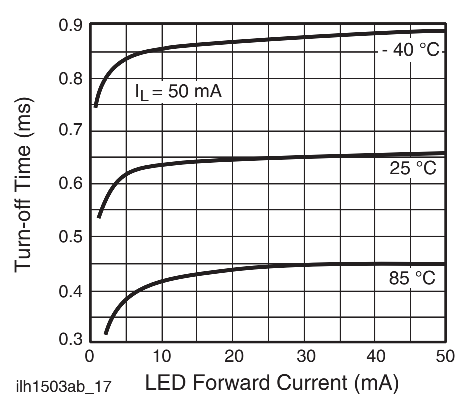

Fig. 18 - Turn-off Time vs. Temperature

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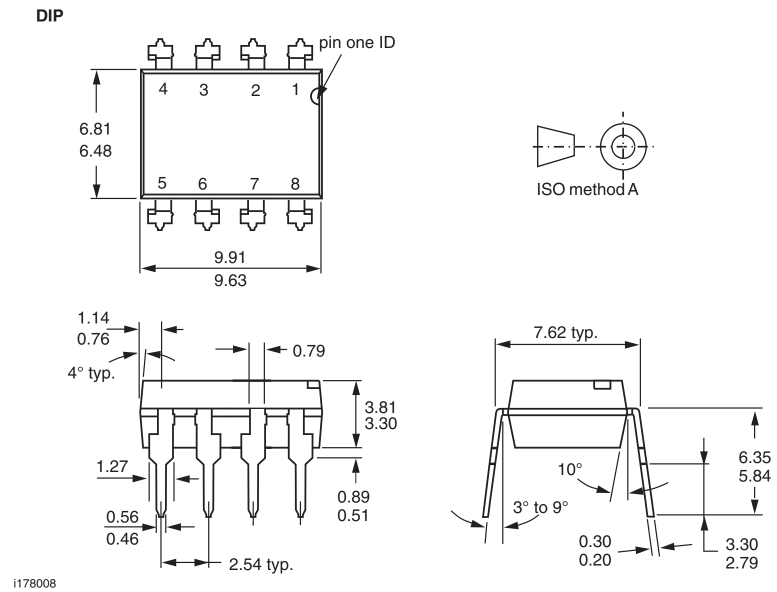
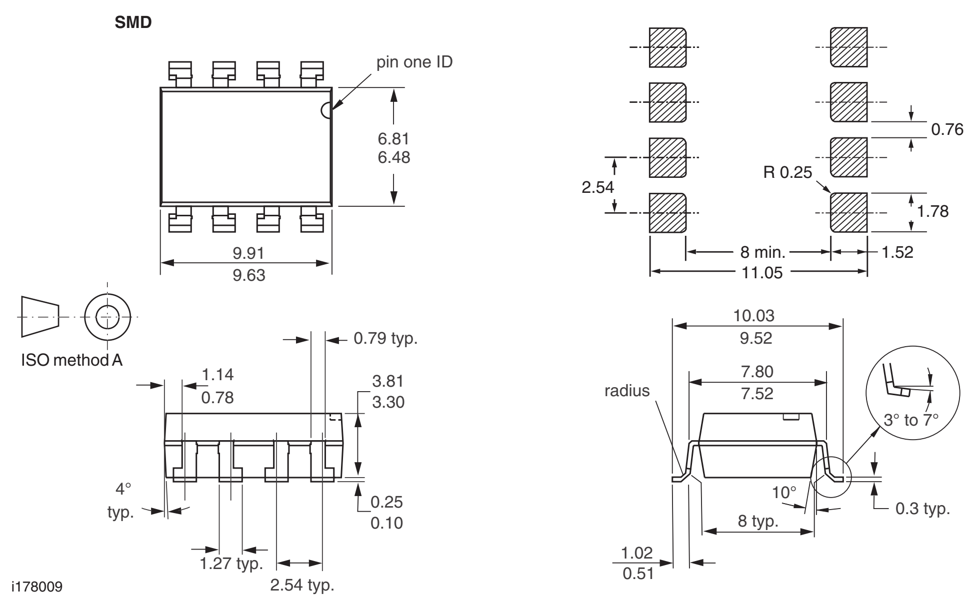
PACKAGE DIMENSIONS in millimeters





PACKAGE MARKING (example)

LH1503

O V YWW H 68

Note

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

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