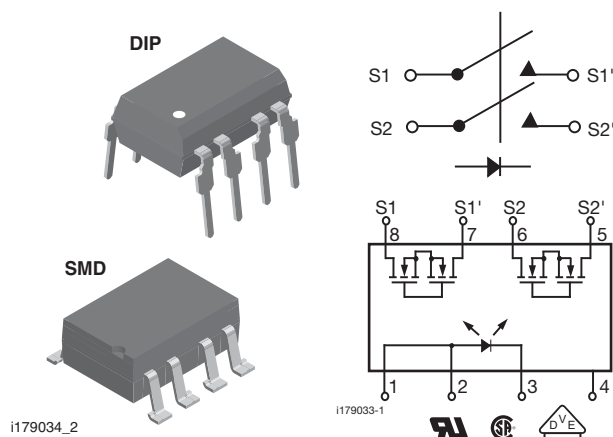


2 Form A Solid-State Relay



FEATURES

- Current limit protection
- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 10 Ω
- Load voltage 200 V
- Load current 140 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- High reliability monolithic output die
- SMD lead available on tape and reel
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


RoHS
COMPLIANT

DESCRIPTION

The LH1513 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 circuitry, and DMOS switches. In addition, these relays employ current-limiting circuitry, enabling them to pass lightning surge testing as per ANSI/TIA-968-B and other regulatory voltage surge requirements when overvoltage protection is provided.

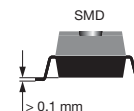
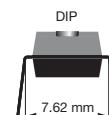
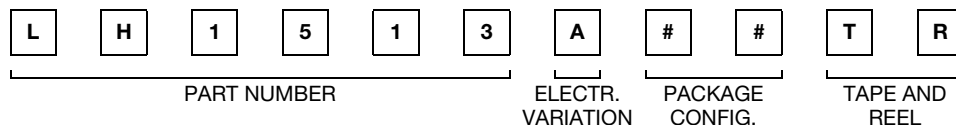
APPLICATIONS

- 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



PACKAGE	UL, CSA
SMD-8, tubes	LH1513AAC
SMD-8, tape and reel	LH1513AACTR
DIP-8, tubes	LH1513AB

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 ≤ 10 μA	V _R	8	V



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
OUTPUT				
DC or peak AC load voltage	$I_L \leq 50\text{ }\mu\text{A}$	V_L	200	V
Continuous DC load current, one pole operating		I_L	200	mA
Continuous DC load current two poles operating		I_L	140	mA
Peak load current (single shot)	$t = 100\text{ ms}$	I_p	(1)	
SSR				
Ambient temperature range		T_{amb}	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		T_{stg}	- 40 to + 150	$^{\circ}\text{C}$
Pin soldering temperature (2)	$t = 10\text{ s max.}$	T_{sld}	260	$^{\circ}\text{C}$
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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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}		2	3	mA
LED forward current, switch turn-off	$V_L = \pm 150\text{ V}$	I_{Foff}	0.2	0.8		mA
LED forward voltage	$I_F = 10\text{ mA}$	V_F	1.15	1.26	1.45	V
OUTPUT						
On-resistance	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$	R_{ON}	6	10	15	Ω
Pole-to-pole on-resistance matching (S1 to S2)	$I_F = 5\text{ mA}$, $I_L = 50\text{ mA}$			0.1	1	$\Delta\Omega$
Off-resistance	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$	R_{OFF}	0.5	5000		$G\Omega$
Current limit	$I_F = 5\text{ mA}$, $t = 5\text{ ms}$, $V_L = \pm 5\text{ V}$	I_{LMT}	300	360	460	mA
Off-state leakage current	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$	I_O		0.02	200	nA
	$I_F = 0\text{ mA}$, $V_L = \pm 200\text{ V}$	I_O			1	μA
Output capacitance	$I_F = 0\text{ mA}$, $V_L = 1\text{ V}$	C_O		60		pF
	$I_F = 0\text{ mA}$, $V_L = 50\text{ V}$	C_O		15		pF
Pole-to-pole capacitance (S1 to S2)	$I_F = 0\text{ mA}$			3		pF
	$I_F = 5\text{ mA}$			4		pF
Switch offset	$I_F = 5\text{ mA}$	V_{OS}		0.15		μV
TRANSFER						
Capacitance (input to output)	$V_{ISO} = 1\text{ V}$	C_{IO}		1.1		pF

Note

- 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.

SWITCHING CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time (NO)	$I_F = 10\text{ mA}$, $I_L = 50\text{ mA}$	t_{on}		1.6	2.5	ms
Turn-off time (NO)	$I_F = 10\text{ mA}$, $I_L = 50\text{ mA}$	t_{off}		0.65	2.5	ms



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

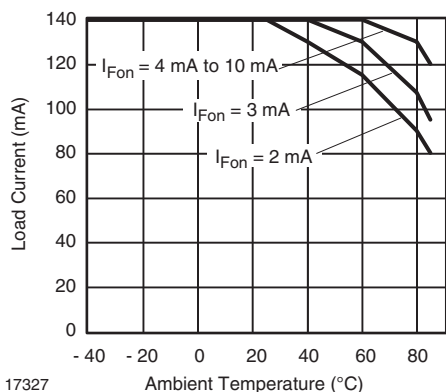


Fig. 1 - Recommended Operating Conditions

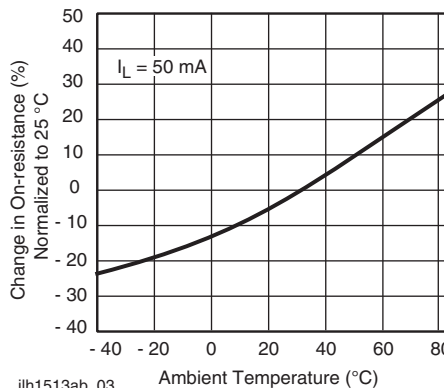


Fig. 4 - On-Resistance vs. Temperature

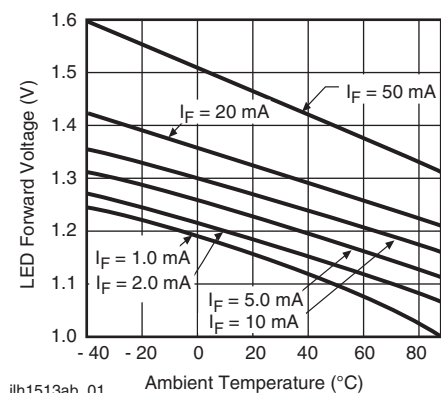


Fig. 2 - LED Voltage vs. Temperature

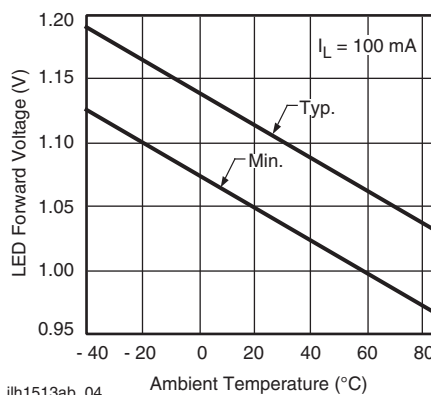


Fig. 5 - LED Dropout Voltage vs. Temperature

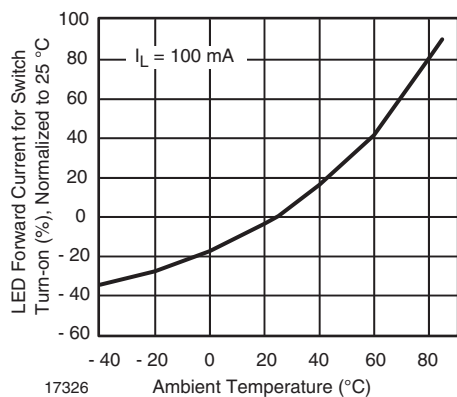


Fig. 3 - LED Current for Switch Turn-on vs. Temperature

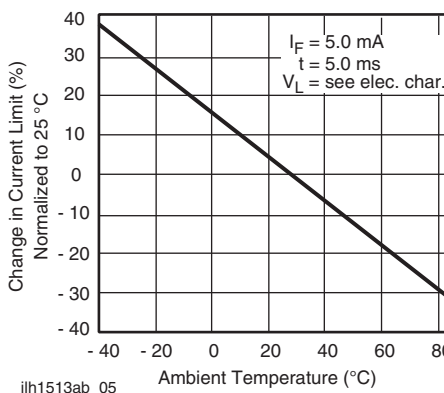


Fig. 6 - Current Limit vs. Temperature

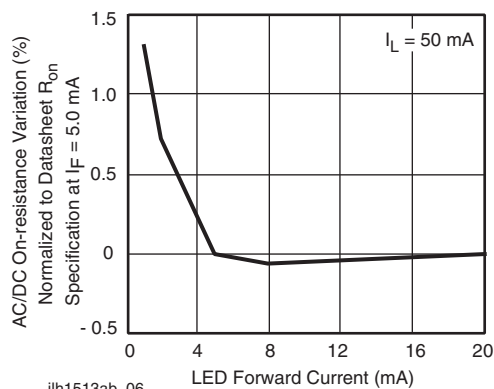


Fig. 7 - Variation in On-Resistance vs. LED Current

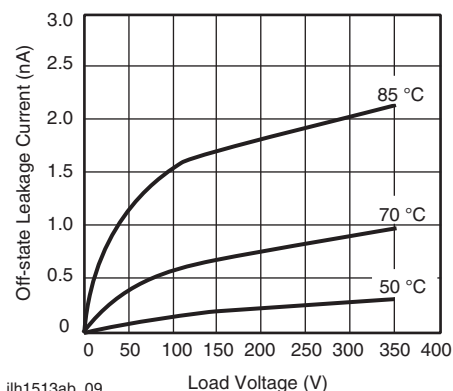


Fig. 10 - Leakage Current vs. Applied Voltage at Elevated Temperatures

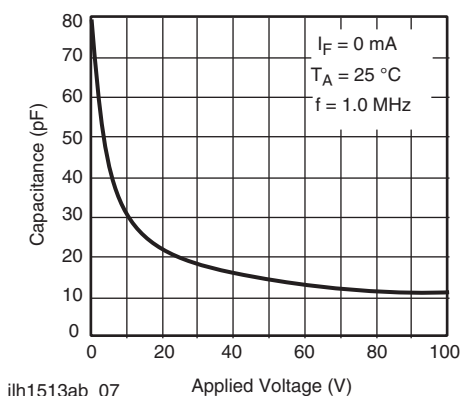


Fig. 8 - Switch Capacitance vs. Applied Voltage

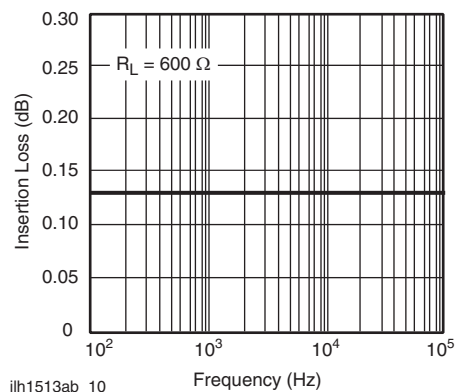


Fig. 11 - Insertion Loss vs. Frequency

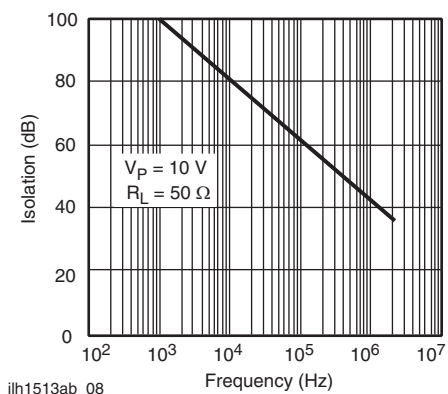


Fig. 9 - Output Isolation

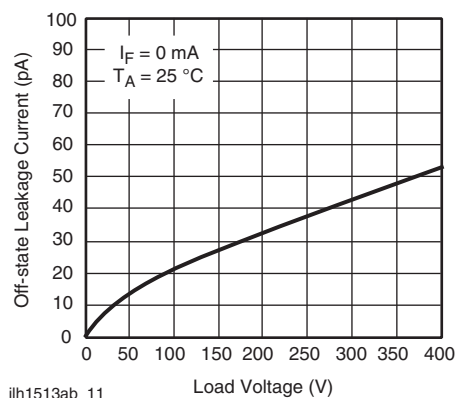
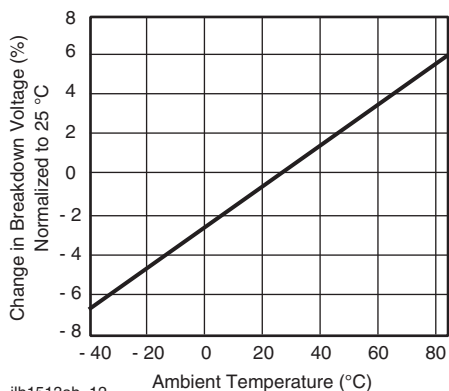
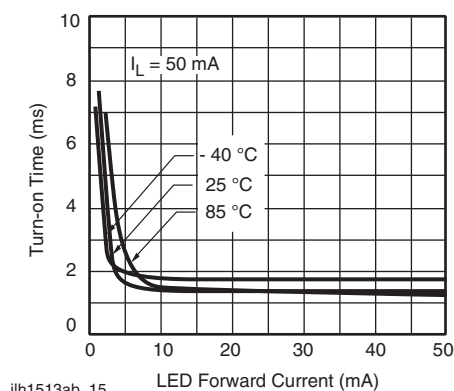


Fig. 12 - Leakage Current vs. Applied Voltage



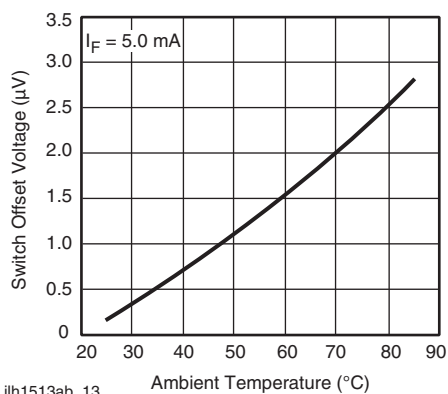
ilh1513ab_12

Fig. 13 - Switch Breakdown Voltage vs. Temperature



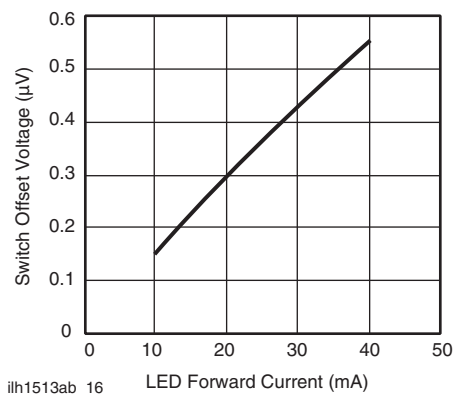
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Fig. 16 - Turn-on Time vs. LED Current



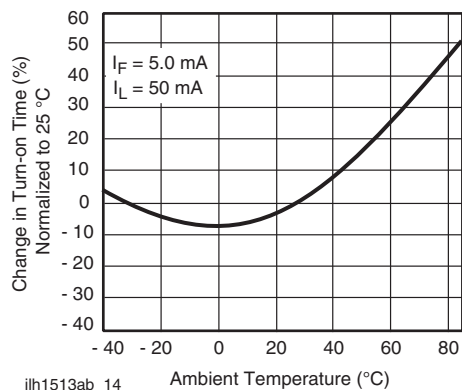
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Fig. 14 - Switch Offset Voltage vs. Temperature



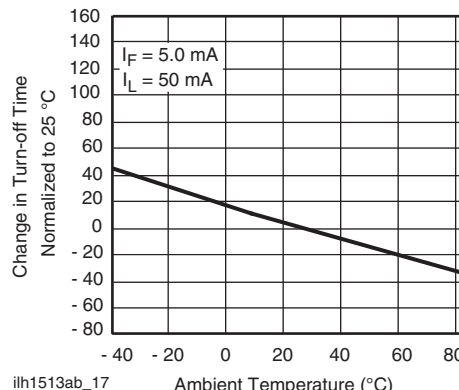
ilh1513ab_16

Fig. 17 - Switch Offset Voltage vs. LED Current



ilh1513ab_14

Fig. 15 - Turn-on Time vs. Temperature



ilh1513ab_17

Fig. 18 - Turn-off Time vs. Temperature

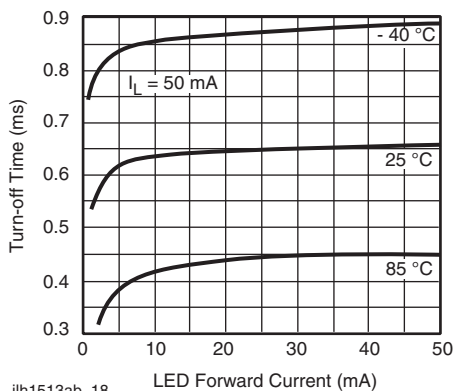
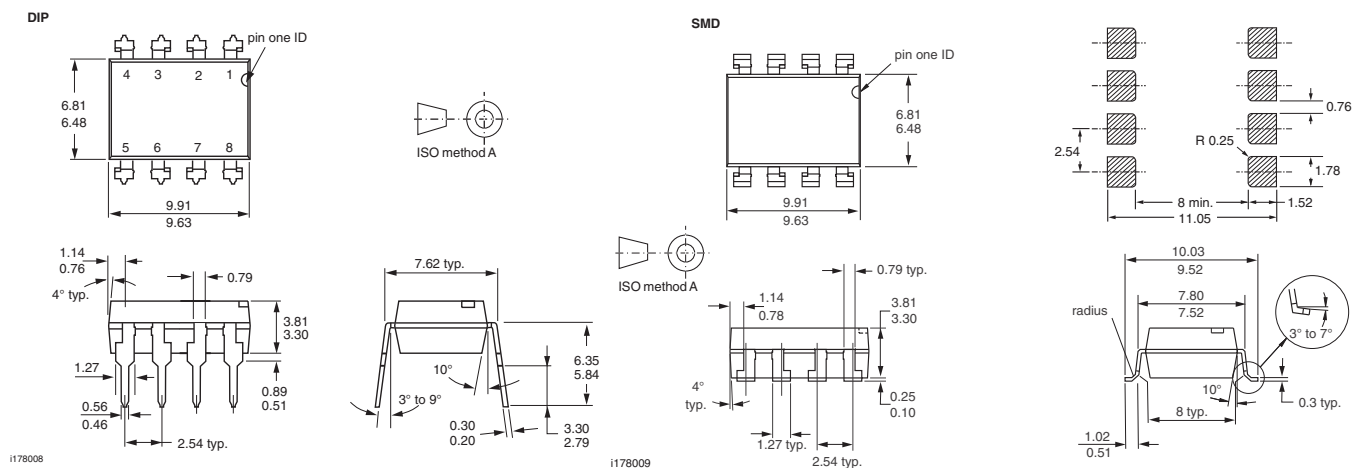
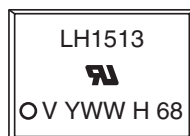


Fig. 19 - Turn-off Time vs. LED Current

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



Note

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



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