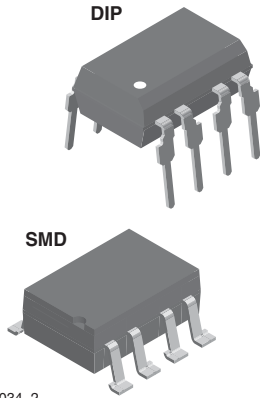
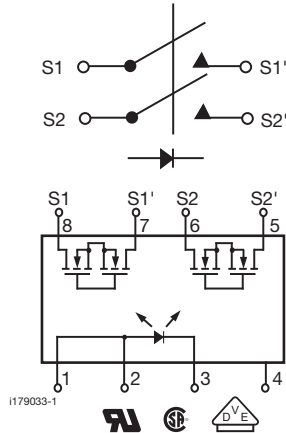


## 2 Form A Solid State Relay



i179034\_2



### FEATURES

- Current limit protection
- Isolation test voltage 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 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 FCC 68.302 and other regulatory voltage surge requirements when overvoltage protection is provided.

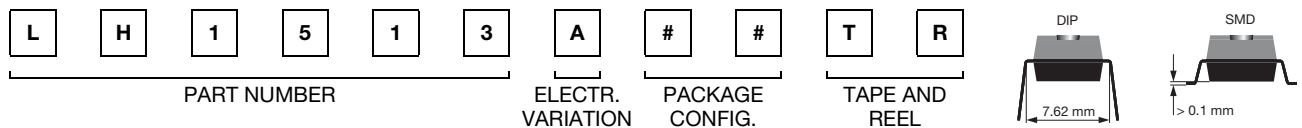
### APPLICATIONS

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

### 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, VDE
SMD-8, tubes	LH1513AAC
SMD-8, tape and reel	LH1513AACTR
DIP-8, tubes	LH1513AB

# LH1513AAC, LH1513AACTR, LH1513AB

Vishay Semiconductors

2 Form A Solid State Relay



ABSOLUTE MAXIMUM RATINGS (T <sub>amb</sub> = 25 °C, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
LED continuous forward current		I <sub>F</sub>	50	mA
LED reverse voltage	I <sub>R</sub> ≤ 10 μA	V <sub>R</sub>	8	V
<b>OUTPUT</b>				
DC or peak AC load voltage	I <sub>L</sub> ≤ 50 μA	V <sub>L</sub>	200	V
Continuous DC load current, one pole operating		I <sub>L</sub>	200	mA
Continuous DC load current two poles operating		I <sub>L</sub>	140	mA
Peak load current (single shot)	t = 100 ms	I <sub>P</sub>	(1)	
<b>SSR</b>				
Ambient temperature range		T <sub>amb</sub>	- 40 to + 85	°C
Storage temperature range		T <sub>stg</sub>	- 40 to + 150	°C
Pin soldering temperature (2)	t = 10 s max.	T <sub>sld</sub>	260	°C
Input to output isolation voltage		V <sub>ISO</sub>	5300	V <sub>RMS</sub>
Pole-to-pole isolation voltage (S1 to S2)			500	V
Output power dissipation (continuous)		P <sub>diss</sub>	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).

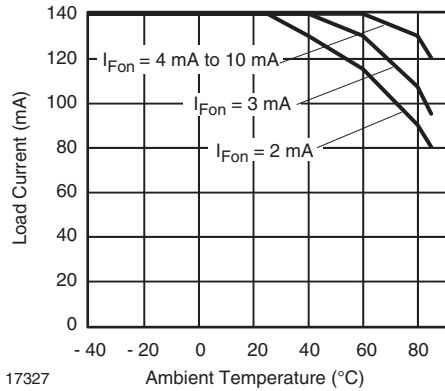
ELECTRICAL CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
LED forward current, switch turn-on	I <sub>L</sub> = 100 mA, t = 10 ms	I <sub>Fon</sub>		2	3	mA
LED forward current, switch turn-off	V <sub>L</sub> = ± 150 V	I <sub>Foff</sub>	0.2	0.8		mA
LED forward voltage	I <sub>F</sub> = 10 mA	V <sub>F</sub>	1.15	1.26	1.45	V
<b>OUTPUT</b>						
On-resistance	I <sub>F</sub> = 5 mA, I <sub>L</sub> = 50 mA	R <sub>ON</sub>	6	10	15	Ω
Pole-to-pole on-resistance matching (S1 to S2)	I <sub>F</sub> = 5 mA, I <sub>L</sub> = 50 mA			0.1	1	ΔΩ
Off-resistance	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V	R <sub>OFF</sub>	0.5	5000		GΩ
Current limit	I <sub>F</sub> = 5 mA, t = 5 ms, V <sub>L</sub> = ± 5 V	I <sub>LMT</sub>	300	360	460	mA
Off-state leakage current	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V	I <sub>O</sub>		0.02	200	nA
	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 200 V	I <sub>O</sub>			1	μA
Output capacitance	I <sub>F</sub> = 0 mA, V <sub>L</sub> = 1 V	C <sub>O</sub>		60		pF
	I <sub>F</sub> = 0 mA, V <sub>L</sub> = 50 V	C <sub>O</sub>		15		pF
Pole-to-pole capacitance (S1 to S2)	I <sub>F</sub> = 0 mA			3		pF
	I <sub>F</sub> = 5 mA			4		pF
Switch offset	I <sub>F</sub> = 5 mA	V <sub>OS</sub>		0.15		μV
<b>TRANSFER</b>						
Capacitance (input to output)	V <sub>ISO</sub> = 1 V	C <sub>IO</sub>		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.

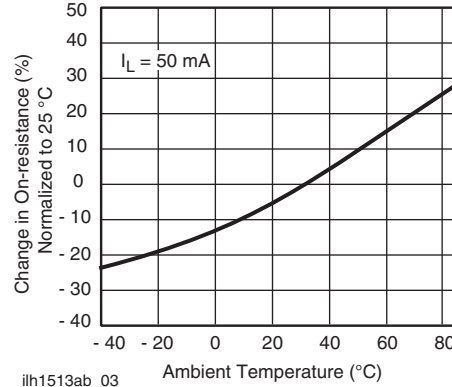
SWITCHING CHARACTERISTICS (T <sub>amb</sub> = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time (NO)	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA	t <sub>on</sub>		1.6	2.5	ms
Turn-off time (NO)	I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA	t <sub>off</sub>		0.65	2.5	ms

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



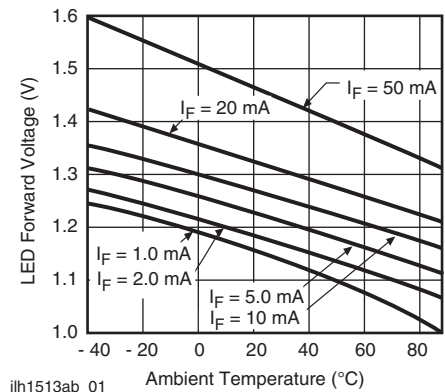
17327

Fig. 1 - Recommended Operating Conditions



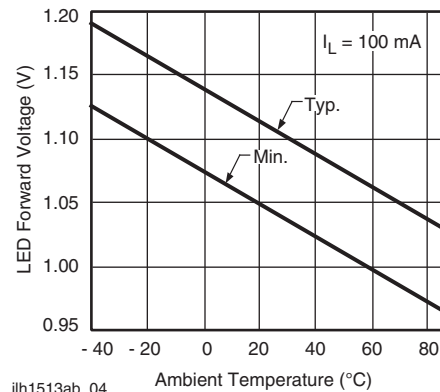
ih1513ab\_03

Fig. 4 - On-Resistance vs. Temperature



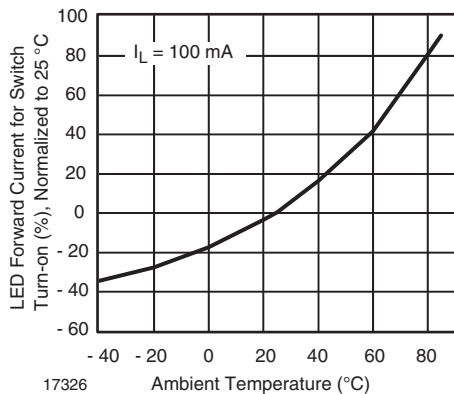
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Fig. 2 - LED Voltage vs. Temperature



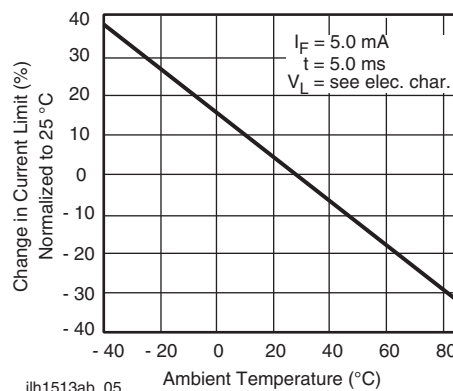
ih1513ab\_04

Fig. 5 - LED Dropout Voltage vs. Temperature



17326

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



ih1513ab\_05

Fig. 6 - Current Limit vs. Temperature

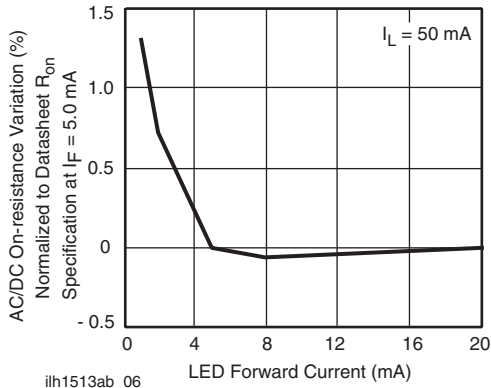


Fig. 7 - Variation in On-Resistance vs. LED Current

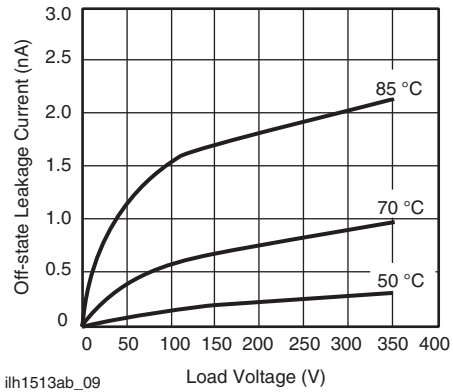


Fig. 10 - Leakage Current vs. Applied Voltage at Elevated Temperatures

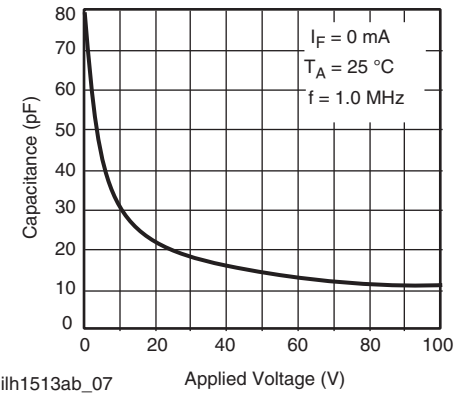


Fig. 8 - Switch Capacitance vs. Applied Voltage

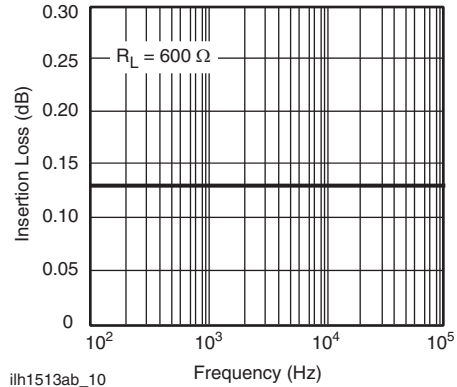


Fig. 11 - Insertion Loss vs. Frequency

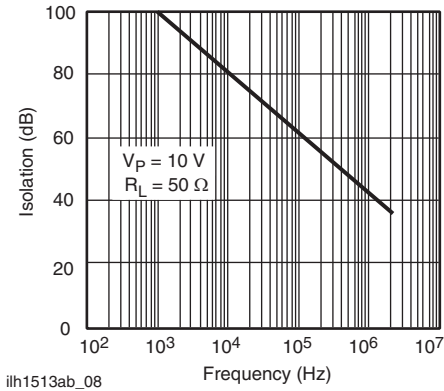


Fig. 9 - Output Isolation

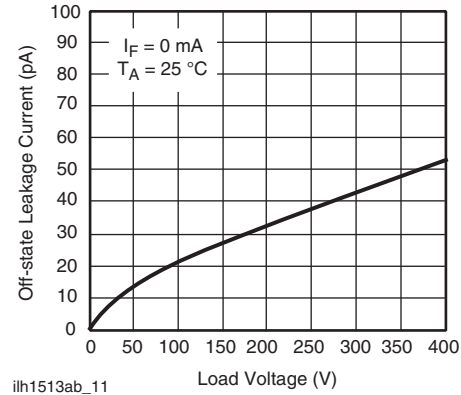


Fig. 12 - Leakage Current vs. Applied Voltage

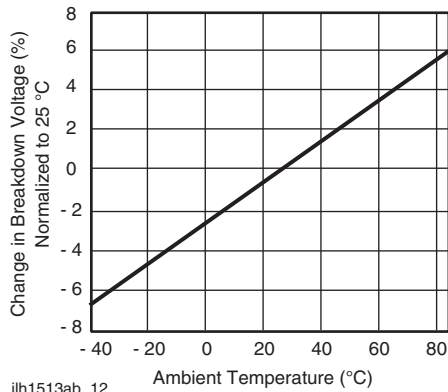


Fig. 13 - Switch Breakdown Voltage vs. Temperature

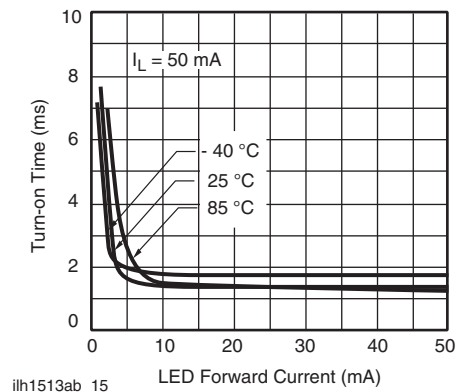


Fig. 16 - Turn-on Time vs. LED Current

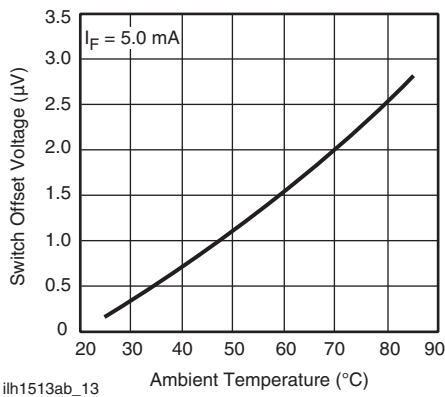


Fig. 14 - Switch Offset Voltage vs. Temperature

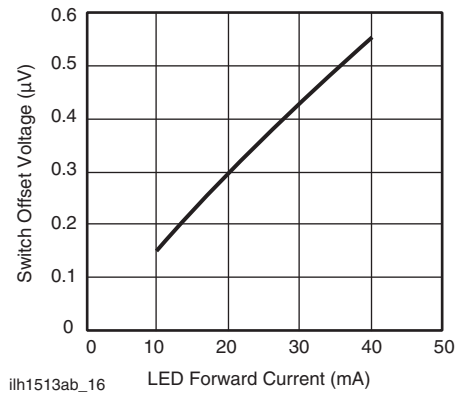


Fig. 17 - Switch Offset Voltage vs. LED Current

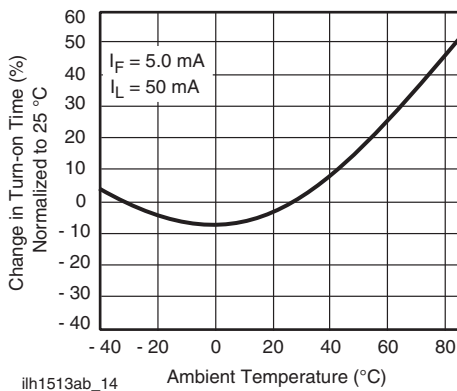


Fig. 15 - Turn-on Time vs. Temperature

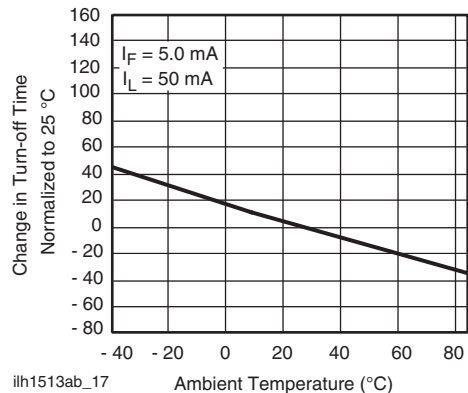


Fig. 18 - Turn-off Time vs. Temperature

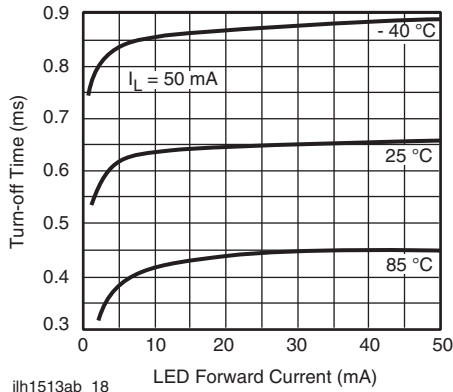
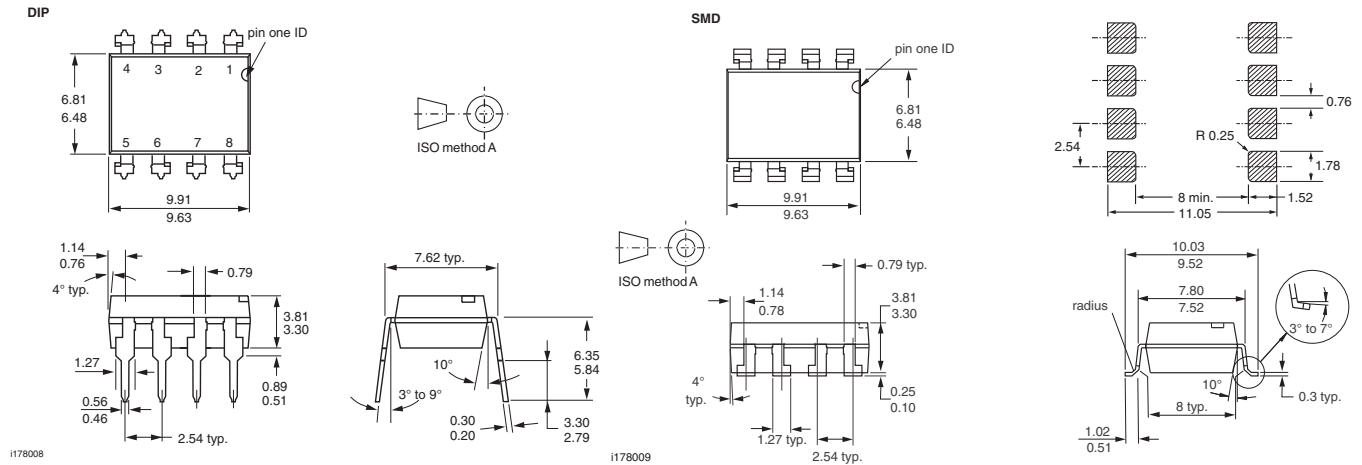
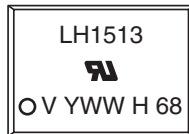


Fig. 19 - Turn-off Time vs. LED Current

## PACKAGE DIMENSIONS in millimeters



## PACKAGE MARKING (example)



### Note

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



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