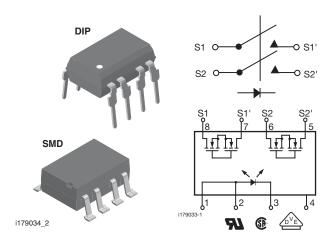


2 Form A Solid-State Relay



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 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.

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

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),

avilable with option 1

ORDERING INFORMATION					
L H 1 5 1 3 A PART NUMBER ELECTR. VARIATION	# # T R DIP SMD PACKAGE CONFIG. TAPE AND REEL 7.62 mm				
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	

Rev. 1.5, 25-Jul-11 Document Number: 83813

LH1513AAC, LH1513AACTR, LH1513AB

Vishay Semiconductors

600

 $\mathsf{P}_{\mathsf{diss}}$

mW

ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)					
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT	
OUTPUT					
DC or peak AC load voltage	I _L ≤ 50 μA	VL	200	V	
Continuous DC load current, one pole operating		lι	200	mA	
Continuous DC load current two poles operating		ΙL	140	mA	
Peak load current (single shot)	t = 100 ms	lР	(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	

Notes

Output power dissipation (continuous)

- 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 = ± 150 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	$I_F = 5 \text{ mA}, I_L = 50 \text{ mA}$	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	ΔΩ
Off-resistance	$I_F = 0 \text{ mA}, V_L = \pm 100 \text{ V}$	R _{OFF}	0.5	5000		GΩ
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 lookage ourrent	$I_F = 0 \text{ mA}, V_L = \pm 100 \text{ V}$	Io		0.02	200	nA
Off-state leakage current	$I_F = 0 \text{ mA}, V_L = \pm 200 \text{ V}$	Io			1	μΑ
Output capacitance	$I_F = 0 \text{ mA}, V_L = 1 \text{ V}$	Co		60		pF
	$I_F = 0 \text{ mA}, V_L = 50 \text{ V}$	Co		15		pF
Pole-to-pole capacitance	I _F = 0 mA			3		pF
(S1 to S2)	I _F = 5 mA			4		pF
Switch offset	I _F = 5 mA	V _{OS}		0.15		μV
TRANSFER						
Capacitance (input to output)	V _{ISO} = 1 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 °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 °C, unless otherwise specified)

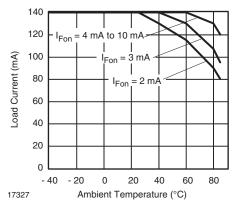


Fig. 1 - Recommended Operating Conditions

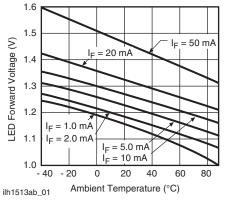


Fig. 2 - LED Voltage vs. Temperature

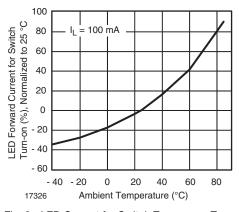


Fig. 3 - LED Current for Switch Turn-on vs. Temperature

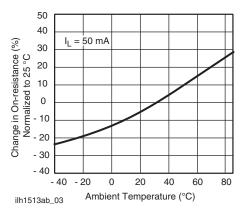


Fig. 4 - On-Resistance vs. Temperature

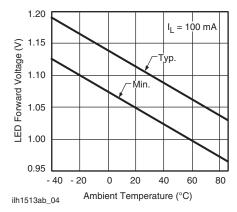


Fig. 5 - LED Dropout Voltage vs. Temperature

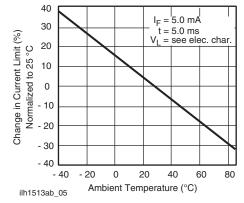


Fig. 6 - Current Limit vs. Temperature

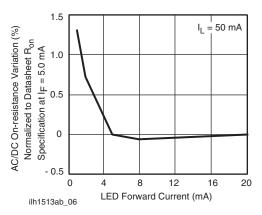


Fig. 7 - Variation in On-Resistance vs. LED Current

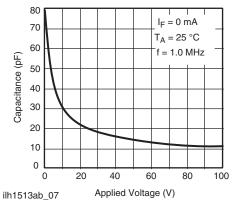


Fig. 8 - Switch Capacitance vs. Applied Voltage

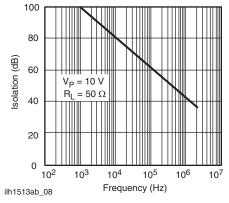


Fig. 9 - Output Isolation

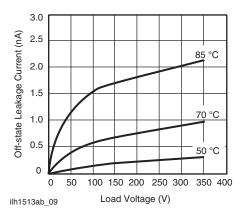


Fig. 10 - Leakage Current vs. Applied Voltage at Elevated Temperatures

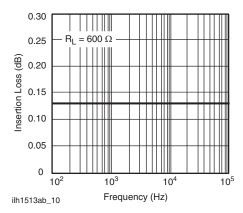


Fig. 11 - Insertion Loss vs. Frequency

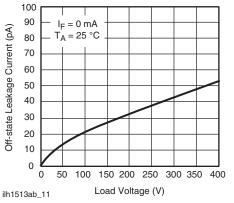


Fig. 12 - Leakage Current vs. Applied Voltage

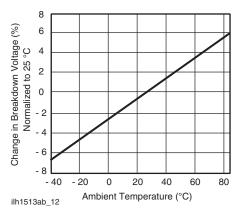


Fig. 13 - Switch Breakdown Voltage vs. Temperature

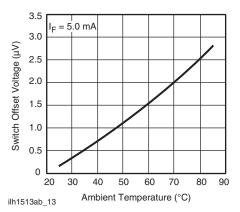


Fig. 14 - Switch Offset Voltage vs. Temperature

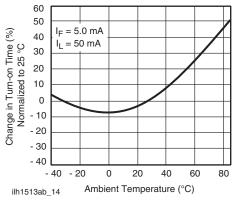


Fig. 15 - Turn-on Time vs. Temperature

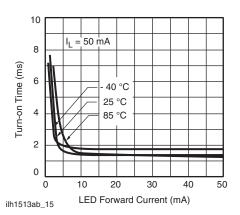


Fig. 16 - Turn-on Time vs. LED Current

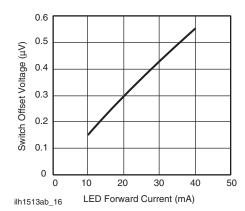


Fig. 17 - Switch Offset Voltage vs. LED Current

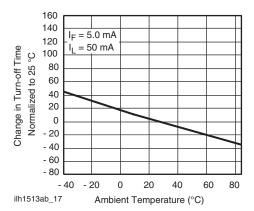


Fig. 18 - Turn-off Time vs. Temperature

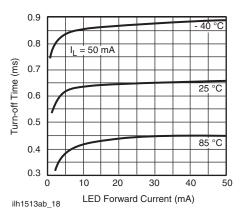
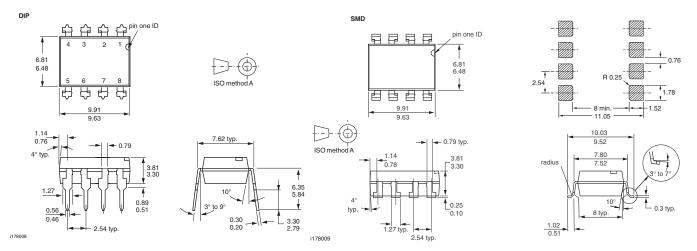


Fig. 19 - Turn-off Time vs. LED Current

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



Note

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



Legal Disclaimer Notice

Vishay

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.