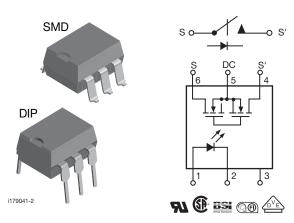
LH1510AAB, LH1510AABTR, LH1510AT

Vishay Semiconductors

1 Form A Solid-State Relay



DESCRIPTION

The LH1510 is an SPST normally open switch (1 form A) that can replace electromechanical relays in many applications. The relay 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 circuity, and MOSFET switches. In addition, the relay employs current-limiting circuity enabling it to pass lightning surge testing as per ANSI/TIA-968-B and other regulatory voltage surge requirements when overvoltage protection is provided. The LH1510 is the only relay in the family that provides current limiting for unidirectional DC applications.

FEATURES

- Isolation test voltage 5300 V_{RMS}
- · Current limit protection built in
- High reliability monolithic output die
- Low power consumption
- · Clean bounce free switching
- · High surge capability
- Surface mountable
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC

APPLICATIONS

- · General telecom switching
- Instrumentation
- · Industrial controls

AGENCY APPROVALS

UL1577: file no. E52744 system code H, double protection

CSA: certification no. 093751 BSI: certification no. 7979/7980

DIN EN: 60747-5-2 (VDE 0884)/60747-5-5 (pending),

available with option 1

FIMKO: 25419

ORDERING INFORMATION					
L H 1 5 1 0 # PART NUMBER ELECTR. VARIATION	# # T R PACKAGE TAPE AND REEL 7.62 mm				
PACKAGE	UL, CSA, BSI, FIMKO				
SMD-6, tubes	LH1510AAB				
SMD-6, tape and reel	LH1510AABTR				
DIP-6, tubes	LH1510AT				

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	$I_R \le 10 \ \mu A$	V_{R}	8	V			
OUTPUT							
DC or peak AC load voltage	$I_L \le 50 \ \mu A$	V_{L}	200	V			
Continuous DC load current - bidirectional operation		IL	200	mA			
Continuous DC load current - unidirectional operation		IL	350	mA			
Peak load current (single shot)	t = 100 ms	l _P	(1)				



LH1510AAB, LH1510AABTR, LH1510AT

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ABSOLUTE MAXIMUM RATINGS (T _{amb} = 25 °C, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT		
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}		
Output power dissipation (continuous)		P _{diss}	550	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 58 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	$I_L = 100 \text{ mA}, t = 10 \text{ ms}$	I_{Fon}		0.95	2	mA	
LED forward current, switch turn-off	$V_{L} = \pm 150 \text{ V}$	I _{Foff}	0.2	0.85		mA	
LED forward voltage	I _F = 10 mA	V_{F}	1.15	1.27	1.45	V	
OUTPUT							
ON-resistance AC/DC: pin 4 (±) to 6 (±)	$I_F = 5 \text{ mA}, I_L = 50 \text{ mA}$	R _{ON}	6	11.27	15	Ω	
ON-resistance DC: pin 4, 6 (+) to 5 (±)	$I_F = 5 \text{ mA}, I_L = 100 \text{ mA}$	R _{ON}	1.5	3.15	3.75	Ω	
Off-resistance	$I_F = 0 \text{ mA}, V_L = \pm 100 \text{ V}$	R _{OFF}	0.5	80		GΩ	
Current limit AC/DC: pin 4 (±) to 6 (±)	$I_F = 5 \text{ mA}, V_L = \pm 5 \text{ V}, t = 5 \text{ ms}$	I _{LMT}	300	368	450	mA	
Current limit DC: pin 4, 6 (+) to 5 (±)	$I_F = 5 \text{ mA}, V_L = \pm 4 \text{ V}, t = 5 \text{ ms}$	I_{LMT}	600	736	920	mA	
Off state leakens assument	$I_F = 0 \text{ mA}, V_L = \pm 100 \text{ V}$	Io		2.36	200	nA	
Off-state leakage current	$I_F = 0 \text{ mA}, V_L = \pm 200 \text{ V}$	I _O		79.2	1	μA	
Output agraeitance sin 4 to C	$I_F = 0 \text{ mA}, V_L = 1 \text{ V}$	Co		27.75		pF	
Output capacitance pin 4 to 6	$I_F = 0 \text{ mA}, V_L = 50 \text{ V}$	Co		10.82		pF	
Switch offset	I _F = 5 mA	Vos		0.17		μV	
TRANSFER							
Capacitance (input to output)	V _{ISO} = 1 V	C _{IO}		0.72		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	$I_F = 5 \text{ mA}, I_L = 50 \text{ mA}$	t _{on}		0.5	2	ms
Turn-off time	$I_F = 5 \text{ mA}, I_L = 50 \text{ mA}$	t _{off}		0.7	2	ms



PARAMETER		TEST CONDITION	SYMBOL	VALUE	UNIT
Climatic classification		IEC 68 part 1		40/85/21	
Pollution degree		DIN VDE 0109		2	
Tracking resistance (comparative tracking index)		Insulation group IIIa	СТІ	175	
Highest allowable overvolta	ge	Transient overvoltage	V _{IOTM}	8000	V _{peak}
Max. working insulation voltage		Recurring peak voltage	V_{IORM}	890	V _{peak}
Insulation resistance at 25 °C			R _{IS}	≥ 10 ¹²	Ω
Insulation resistance at T _S Insulation resistance at 100 °C		V _{IO} = 500 V	R _{IS}	≥ 10 ⁹	Ω
			R _{IS}	≥ 10 ¹¹	Ω
Partial discharge test voltage		Methode a, V _{pd} = V _{IORM} x 1.875	V_{pd}	1669	V _{peak}
Safety limiting values -	Case temperature		T _{SI}	175	°C
maximum values allowed	Input current		I _{SI}	300	mA
in the event of a failure	Output power		P _{SO}	700	mW
Minimum external air gap (clearance)		Measured from input terminals to output terminals, shortest distance through air		≥ 7	mm
Minimum external tracking (creepage)		Measured from input terminals to output terminals, shortest distance path along body		≥ 7	mm

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

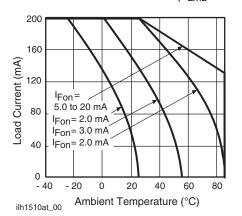


Fig. 1 - Recommended Operating Conditions

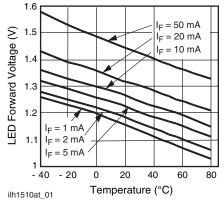


Fig. 2 - LED Voltage vs. Temperature

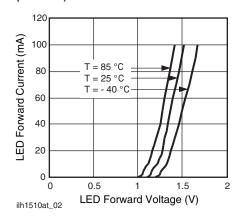


Fig. 3 - LED Forward Current vs. LED Forward Voltage

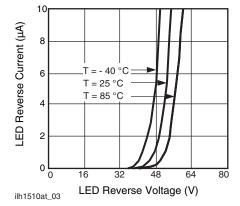


Fig. 4 - LED Reverse Current vs. LED Reverse Voltage

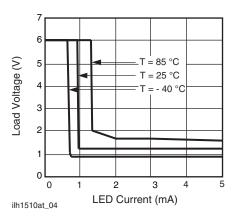


Fig. 5 - LED Current vs. Load Voltage

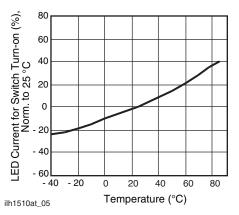


Fig. 6 - LED Current for Switch Turn-on vs. Temperature

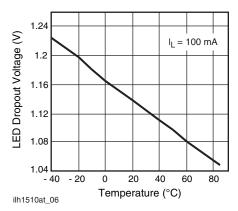


Fig. 7 - LED Dropout Voltage vs. Temperature

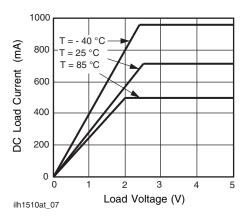


Fig. 8 - DC Load Current vs. Load Voltage

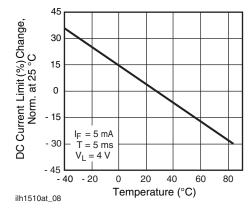


Fig. 9 - DC Current Limit vs. Temperature

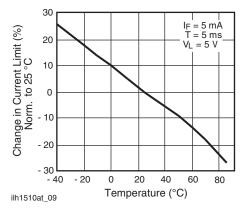


Fig. 10 - Current Limit vs. Temperature

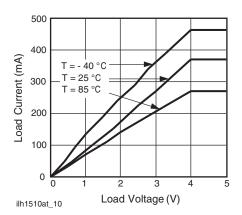


Fig. 11 - Load Current vs. Load Voltage

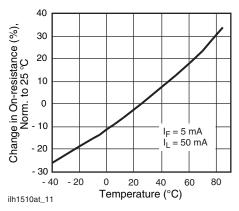


Fig. 12 - On-Resistance vs. Temperature

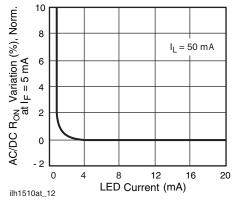


Fig. 13 - Variation in On-Resistance vs. LED Current

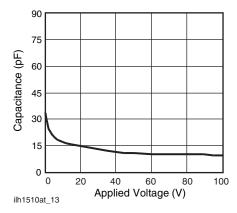


Fig. 14 - Switch Terminal Capacitance vs. Applied Voltage

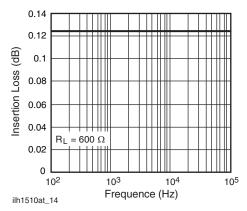


Fig. 15 - Insertion Loss vs. Frequency

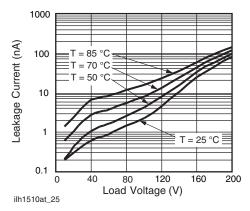


Fig. 16 - Leakage Current vs. Applied Voltage

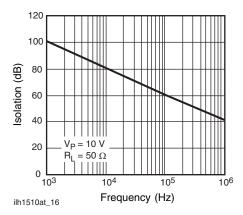


Fig. 17 - Output Isolation

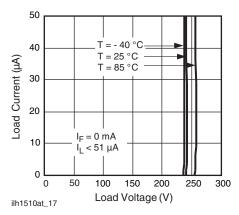


Fig. 18 - Switch Breakdown Voltage vs. Load Current

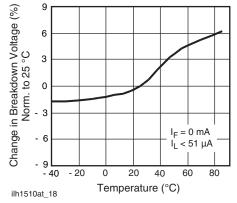


Fig. 19 - Switch Breakdown Voltage vs. Temperature

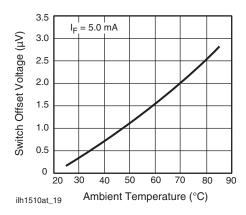


Fig. 20 - Switch Offset Voltage vs. Temperature

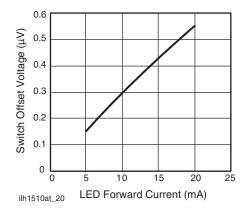


Fig. 21 - Switch Offset Voltage vs. LED Current

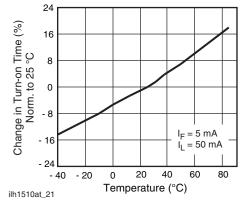


Fig. 22 - Turn-on Time vs. Temperature

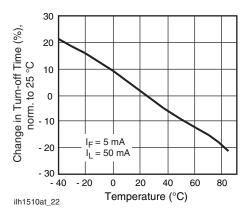


Fig. 23 - Turn-off Time vs. Temperature

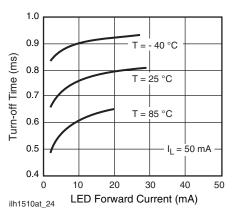


Fig. 25 - Turn-off Time vs. LED Current

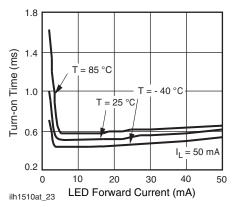
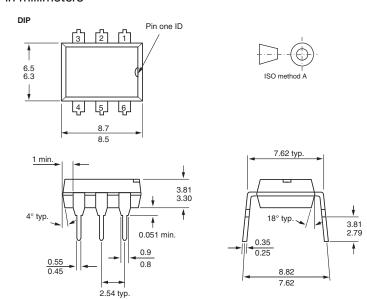


Fig. 24 - Turn-on Time vs. LED Current

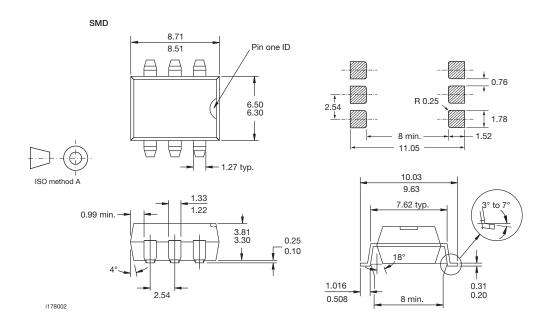
i178001

PACKAGE DIMENSIONS in millimeters



LH1510AAB, LH1510AABTR, LH1510AT

Vishay Semiconductors



PACKAGE MARKING



Note

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



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