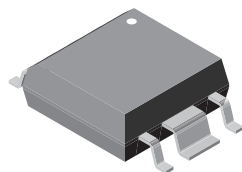
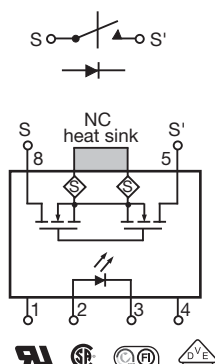


# 1 Form A SOP Solid-State Relay



i179047



## DESCRIPTION

The LH1540 relay is an SPST normally open switch (1 form A) in small-outline packages (SOP). It requires a minimal amount of LED drive current to operate, making them ideal for battery powered and power consumption sensitive 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 BCDMOS technology, is comprised of a photodiode array, switch-control circuitry, and MOSFET switches. In addition, the relays employ current-limiting circuitry enabling it to pass lightning surge testing as per ANSI/TIA-968-B and other regulatory surge requirements when overvoltage protection is provided.

## FEATURES

- High-speed operation
- Isolation test voltage 2500 V<sub>RMS</sub>
- Current-limit protection
- High surge capability
- Clean, bounce-free switching
- Extremely low power consumption
- High-reliability monolithic detector
- Surface-mountable
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



**RoHS**  
COMPLIANT

## APPLICATIONS

- PCMCIA type 2 cards
- Battery powered switch applications
- General telecom switching
- Telephone line interface
  - On/off hook
  - Ring relay
  - Ground start
- Programmable controllers
- Instrumentation

## AGENCY APPROVALS


UL1577: file no. E52744 system code S

CSA: certification 093751

DIN EN: 60747-5-2 (VDE 0884)/60747-5-5 (pending),  
available with option 1

FIMKO: approval

## ORDERING INFORMATION

<div> <div> <div>L</div> <div>H</div> <div>1</div> <div>5</div> <div>4</div> <div>0</div> </div> <div> <div>A</div> <div>C</div> <div>D</div> </div> <div> <div>T</div> <div>R</div> </div> <div> <div>SOP-#</div>  </div> </div> <div> <div>PART NUMBER</div> <div>ELECTR. VARIATION</div> <div>PACKAGE CONFIG.</div> <div>TAPE AND REEL</div> </div>										
PACKAGE	UL, CSA, FIMKO									
SOP-8, tubes	LH1540ACD									
SOP-8, tape and reel	LH1540ACDTR									



ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>INPUT</b>				
LED input ratings: continuous forward current		$I_F$	50	mA
LED input ratings: reverse voltage		$V_R$	5	V
<b>OUTPUT</b>				
Output operation: DC or peak ac load voltage	$I_L \leq 50\text{ }\mu\text{A}$	$V_L$	350	V
Continuous DC load current: one pole operating		$I_L$	110	mA
<b>SSR</b>				
Ambient operating temperature range		$T_{amb}$	- 40 to + 85	$^{\circ}\text{C}$
Storage temperature range		$T_{stg}$	- 55 to + 150	$^{\circ}\text{C}$
Pin soldering temperature	$t = 5\text{ s max}$	$T_{sld}$	260	$^{\circ}\text{C}$
Input/output isolation voltage		$V_{ISO}$	2500	$V_{RMS}$
Power dissipation		$P_{diss}$	550	mW
Thermal resistance, junction to ambient		$R_{thja}$	200	C/W

**Note**

- 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 time can adversely affect reliability.

ELECTRICAL CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
LED forward current for switch turn-on	$I_L = 100\text{ mA}$ , $t = 10\text{ ms}$	$I_{Fon}$		0.6	1	mA
LED forward current for switch turn-off	$V_L = \pm 300\text{ V}$ , $t = 100\text{ ms}$	$I_{Foff}$	0.001	0.1		mA
LED forward voltage	$I_F = 1.5\text{ mA}$	$V_F$	0.80	1.15	1.40	V
<b>OUTPUT</b>						
On-resistance: pin 5 ( $\pm$ ) to 8 ( $\pm$ )	$I_F = 1.5\text{ mA}$ , $I_L = \pm 50\text{ mA}$	$R_{ON}$	12	18	25	$\Omega$
Current limit	$I_F = 1.5\text{ mA}$ , $t = 5\text{ ms}$ , $V_L = 7\text{ V}$	$I_{LMT}$	170	210	270	mA
Output off-state leakage current	$I_F = 0\text{ mA}$ , $V_L = \pm 100\text{ V}$			0.7	200	nA
	$I_F = 0\text{ mA}$ , $V_L = \pm 350\text{ V}$				1	$\mu\text{A}$

**Note**

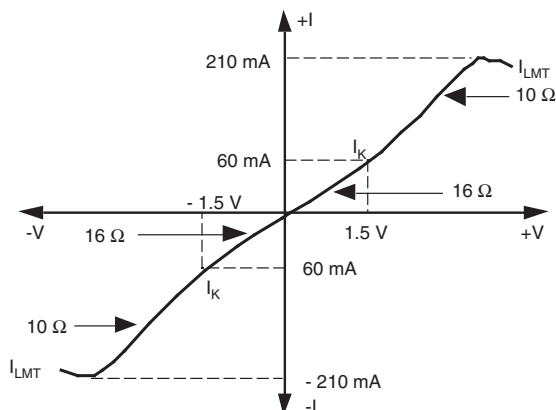
- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information only and are not part of the testing requirements.

SWITCHING CHARACTERISTICS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Turn-on time	$I_F = 1.5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{on}$		0.6		ms
	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{on}$		0.3	1	ms
Turn-off time	$I_F = 1.5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{off}$		0.7		ms
	$I_F = 5\text{ mA}$ , $I_L = 50\text{ mA}$	$t_{off}$		0.7	1.2	ms

RECOMMENDED OPERATING CONDITIONS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
LED forward current for switch turn-on	$T_{amb} = - 40\text{ }^{\circ}\text{C}$ to + 85 $^{\circ}\text{C}$	$I_{Fon}$	1.5		20	mA

## FUNCTIONAL DESCRIPTION

Figure 1 shows the switch characteristics of the relays. The relay exhibits an on-resistance that is exceptionally linear through the origin and up to the knee current ( $I_K$ ). Beyond  $I_K$ , the incremental resistance decreases, minimizing internal power dissipation. Overload currents are clamped at  $I_{LMT}$  by the internal current-limit circuitry. The current-limiting circuitry exhibits a negative temperature coefficient, thereby reducing the current-limit value when relay temperature is increased. An extended clamp condition, which increases relay temperature, decreases the current-limit value, resulting in a current fold back characteristic. When the overload is removed, the relay resumes its normal on-resistance characteristic.

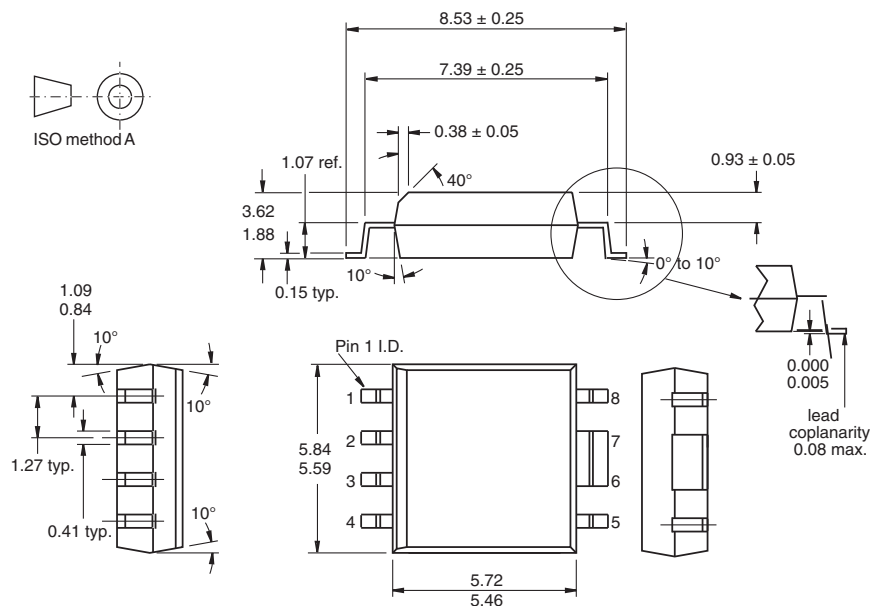


ilh1540acd\_01

Fig. 1 - Typical AC/DC on Characteristics

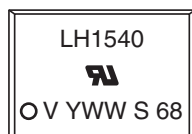
In a 1 form A relay, to turn the relay on, forward current is applied to the LED. The amount of current applied determines the amount of light produced for the photodiode array. This photodiode array develops a drive voltage for the MOSFET switch outputs. For high temperature or high-load current operations, more LED current is required.

## PACKAGE DIMENSIONS in millimeters



i178023

## PACKAGE MARKING (example)



### Note

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



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