

FEATURES

- **High-speed Operation**
- **1500 V_{RMS} I/O Isolation**
- **Current-limit Protection**
- **High Surge Capability**
- **Linear, ac/dc Operation**
- **Clean, Bounce-free Switching**
- **Extremely Low Power Consumption**
- **High-reliability Monolithic Receptor**
- **Surface-mountable**

AGENCY APPROVALS

- **UL – File No. E52744**
- **CSA – Certification 093751**
- **FIMKO Approval**

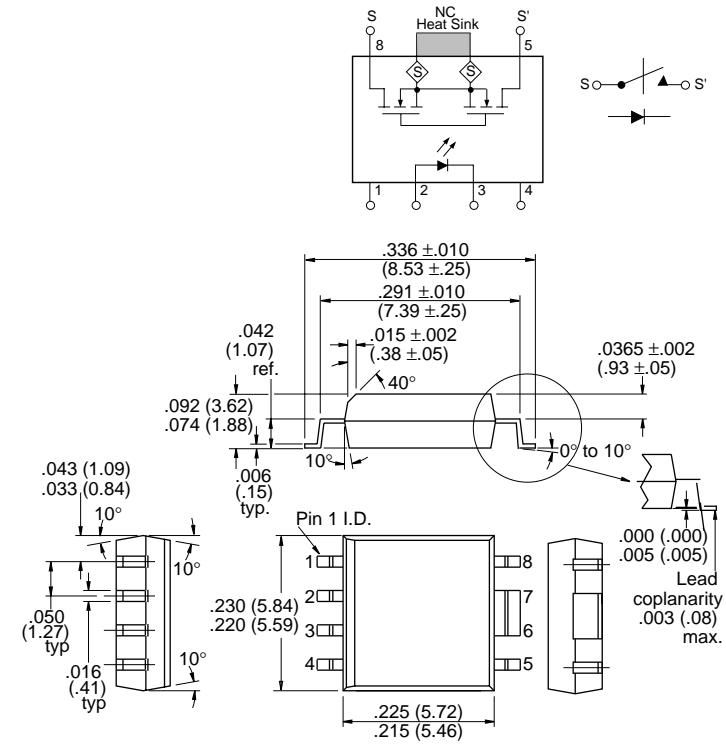
APPLICATIONS

- **PCMCIA Type 2 Cards**
- **Battery Powered Switch Applications**
- **General Telecom Switching**
- **Telephone Line Interface**
 - **On/off Hook**
 - **Ring Relay**
 - **Ground Start**
- **Programmable Controllers**
- **Instrumentation**

DESCRIPTION

The LH1540 relay is an SPST normally open switch (1 Form A and Dual 1 Form A respectively) in small-outline packages (SOP). They require a minimal amount of LED drive current to operate, making them ideal for battery powered and power consumption sensitive applications.

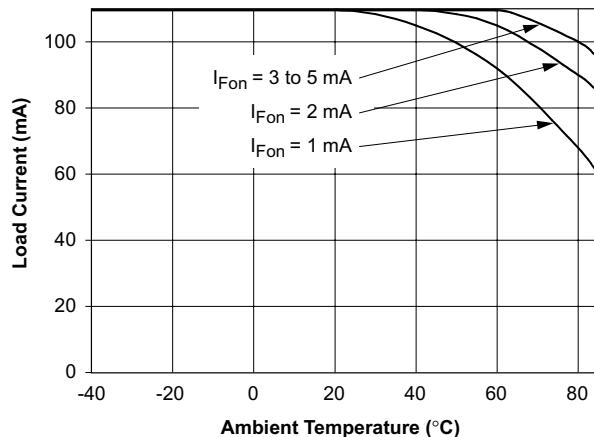
The relays are constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a high-voltage dielectrically isolated BCDMOS technology, is comprised of a photodiode array, switch-control circuitry, and MOSFET switches. In addition, the relays employ current-limiting circuitry enabling it to pass FCC 68.302 and other regulatory surge requirements when overvoltage protection is provided.

Package Dimensions in Inches (mm)

Part Identification

Part Number	Description
LH1540ACD	8-pin SOP, Tubes
LH1540ACDTR	8-pin SOP, Tape and Reel

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Min.	Typ.	Max.	Unit
LED Forward Current for Switch Turn-on ($T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$)	I_{Fon}	1.5	—	20	mA



Absolute Maximum Ratings, $T_A = 25^\circ\text{C}$

Stresses in excess of the absolute Maximum Ratings can cause permanent damage to the device. These are absolute stress ratings only. 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.

Ambient Operating Temperature Range, T_A -40°C to $+85^\circ\text{C}$

Storage Temperature Range, T_{stg} -55°C to $+150^\circ\text{C}$

Pin Soldering Temperature, $t=5.0\text{ s}$ max, T_S 260°C

Input/Output Isolation Voltage, V_{ISO} $1500\text{ V}_{\text{RMS}}$

LED Input Ratings:

Continuous Forward Current, I_F 50 mA

Reverse Voltage, V_R 5.0 V

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

Power Dissipation, P_{DISS} 550 mW

Thermal Resistance, Junction to Ambient, $R_{\Theta JA}$ 200 C/W

Electrical Characteristics, $T_A = 25^\circ\text{C}$

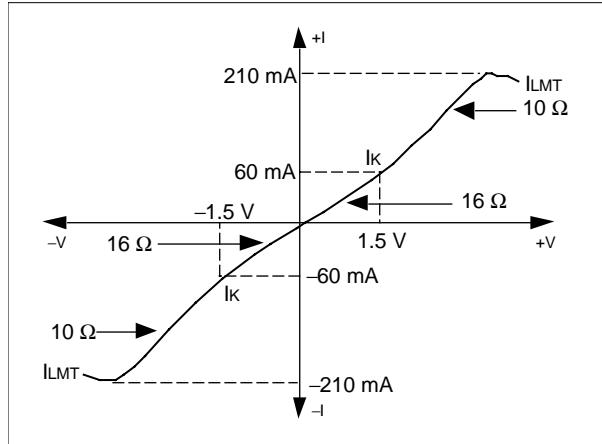
Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluations. Typical values are for information purposes only and are not part of the testing requirements.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Test Condition
LED Forward Current for Switch Turn-on	I_{Fon}	—	0.6	1.0	mA	$I_L = 100\text{ mA}$, $t = 10\text{ ms}$
LED Forward Current for Switch Turn-off	I_{Foff}	0.001	0.1	—	mA	$V_L = \pm 300\text{ V}$, $t = 100\text{ ms}$
LED Forward Voltage	V_F	0.80	1.15	1.40	V	$I_F = 1.5\text{ mA}$
ON-resistance: Pin 5 (\pm) to 8 (\pm)	R_{ON}	12	18	25	Ω	$I_F = 1.5\text{ mA}$, $I_L = \pm 50\text{ mA}$
Current Limit	I_{LMT}	170	210	270	mA	$I_F = 1.5\text{ mA}$, $t = 5.0\text{ ms}$, $V_L = 7.0\text{ V}$
Output Off-state Leakage Current	—	—	0.7	200	nA	$I_F = 0\text{ mA}$, $V_L = \pm 100\text{ V}$
	—	—	—	1.0	μA	$V_L = \pm 350\text{ V}$
Turn-on Time	t_{on}	—	0.6	—	ms	$I_F = 1.5\text{ mA}$, $I_L = 50\text{ mA}$
	—	—	0.3	1.0	ms	$I_F = 5.0\text{ mA}$, $I_L = 50\text{ mA}$
Turn-off Time	t_{off}	—	0.7	—	ms	$I_F = 1.5\text{ mA}$, $I_L = 50\text{ mA}$
	—	—	0.7	1.2	ms	$I_F = 5.0\text{ mA}$, $I_L = 50\text{ mA}$

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 foldback characteristic. When the overload is removed, the relay resumes its normal ON-resistance characteristic.

Figure 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.

Thermal Considerations

To minimize thermal resistance, pins 6 and 7 of the LH1525ACD are formed into a tab. This tab should be soldered to a printed circuit board land pattern of equal or greater size. **Do Not** run metal underneath the device or the input-to-output isolation could be jeopardized.

Figure 2. LED Current for Switch Turn-on vs. Temperature

