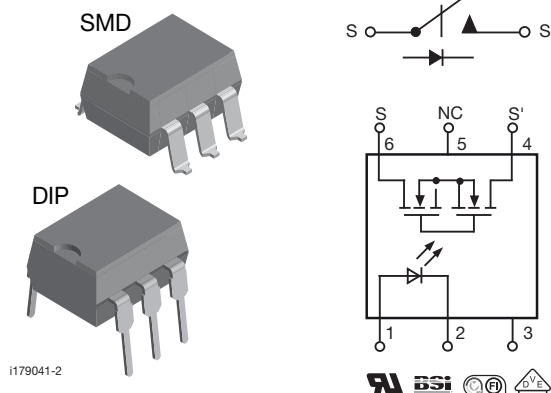




# 1 Form A High-Voltage Solid-State Relay

RoHS  
COMPLIANT

## FEATURES

- Current limit protection
- Isolation test voltage 5300 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 28 Ω
- Load voltage 350 V
- Load current 120 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- 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
- Instrumentation
- Industrial controls

## AGENCY APPROVALS

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

BSI: 7979/7980

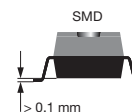
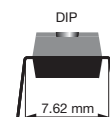
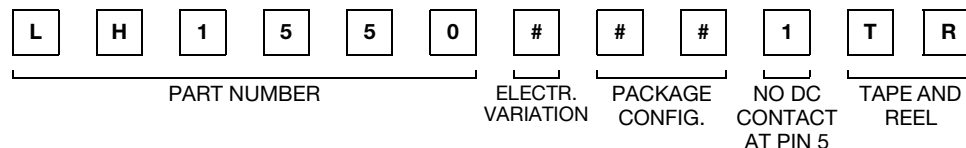
DIN EN: 60747-5-2 (VDE 0884)/60747-5-5 (pending),  
available with option 1

FIMKO: 25419

## DESCRIPTION

The LH1550 is robust, ideal for telecom and ground fault applications. It is an SPST normally open switch (1 form A) that replaces electromechanical relays in many applications. It is similar to the LH1540, but has a characteristically higher On resistance. It 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 circuitry and MOSFET switches. In addition, it employs current-limiting circuitry which meets lightning surge testing as per ANSI/TIA-968-B and other regulatory voltage surge requirements when overvoltage protection is provided.

## ORDERING INFORMATION



| PACKAGE              | UL, BSI, FIMKO |
|----------------------|----------------|
| SMD-6                | LH1550AAB1     |
| SMD-6, tape and reel | LH1550AAB1TR   |
| DIP-6, thru hole     | LH1550AT1      |

## 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> | 350   | V    |
| Continuous DC load current - bidirectional operation |                        | I <sub>L</sub> | 100   | mA   |
| Peak load current (single shot)                      | t = 100 ms             | I <sub>p</sub> | (1)   |      |

**ABSOLUTE MAXIMUM RATINGS** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                                | TEST CONDITION                                             | SYMBOL     | VALUE         | UNIT               |
|------------------------------------------|------------------------------------------------------------|------------|---------------|--------------------|
| <b>SSR</b>                               |                                                            |            |               |                    |
| Ambient temperature range                |                                                            | $T_{amb}$  | - 40 to + 85  | $^{\circ}\text{C}$ |
| Storage temperature range                |                                                            | $T_{stg}$  | - 40 to + 150 | $^{\circ}\text{C}$ |
| Pin soldering temperature <sup>(2)</sup> | $t = 10\text{ s max.}$                                     | $T_{sld}$  | 260           | $^{\circ}\text{C}$ |
| Input to output isolation voltage        | $V_{RMS}\ t = 1\text{ s}, I_{ISO} = 10\text{ }\mu\text{A}$ | $V_{ISO}$  | 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** ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| PARAMETER                                                        | TEST CONDITION                                         | SYMBOL     | MIN.  | TYP. | MAX. | UNIT          |
|------------------------------------------------------------------|--------------------------------------------------------|------------|-------|------|------|---------------|
| <b>INPUT</b>                                                     |                                                        |            |       |      |      |               |
| LED forward current, switch turn-on                              | $I_L = 100\text{ mA}, t = 10\text{ ms}$                | $I_{Fon}$  |       | 1.1  | 2    | mA            |
| LED forward current, switch turn-off                             | $V_L = \pm 350\text{ V}$                               | $I_{Foff}$ | 0.001 | 1    |      | mA            |
| LED forward voltage                                              | $I_F = 10\text{ mA}$                                   | $V_F$      | 1.15  | 1.25 | 1.45 | V             |
| <b>OUTPUT</b>                                                    |                                                        |            |       |      |      |               |
| On-resistance, AC: pin 4 ( $\pm$ ) to 6 ( $\pm$ )                | $I_F = 5\text{ mA}, I_L = 50\text{ mA}$                | $R_{ON}$   |       | 28   | 50   | $\Omega$      |
| Off-resistance                                                   | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$            | $R_{OFF}$  | 0.5   | 300  |      | $G\Omega$     |
| Current limit AC <sup>(1)</sup> : pin 4 ( $\pm$ ) to 6 ( $\pm$ ) | $I_F = 5\text{ mA}, t = 5\text{ ms}, V_L = 6\text{ V}$ | $I_{LMT}$  | 170   | 210  | 250  | mA            |
| Off-state leakage current                                        | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$            | $I_O$      |       | 0.35 | 200  | nA            |
|                                                                  | $I_F = 0\text{ mA}, V_L = \pm 350\text{ V}$            | $I_O$      |       | 0.09 | 1    | $\mu\text{A}$ |
| Output capacitance pin 4 to 6                                    | $I_F = 0\text{ mA}, V_L = 1\text{ V}$                  | $C_O$      |       | 18   |      | pF            |
|                                                                  | $I_F = 0\text{ mA}, V_L = 50\text{ V}$                 | $C_O$      |       | 7    |      | pF            |
| Switch offset                                                    | $I_F = 5\text{ mA}$                                    | $V_{OS}$   |       | 0.3  |      | $\mu\text{V}$ |
| <b>TRANSFER</b>                                                  |                                                        |            |       |      |      |               |
| Capacitance (input to output)                                    | $V_{ISO} = 1\text{ V}$                                 | $C_{IO}$   |       | 0.7  |      | pF            |

**Notes**

- 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.
- (1) No DC mode current limit available.

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

| PARAMETER     | TEST CONDITION                          | SYMBOL    | MIN. | TYP. | MAX. | UNIT |
|---------------|-----------------------------------------|-----------|------|------|------|------|
| Turn-on time  | $I_F = 5\text{ mA}, I_L = 50\text{ mA}$ | $t_{on}$  |      | 1.1  | 3    | ms   |
| Turn-off time | $I_F = 5\text{ mA}, I_L = 50\text{ mA}$ | $t_{off}$ |      | 0.7  | 3    | ms   |

**SAFETY AND INSULATION RATINGS**

| 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                                                                | CTI        | 175            |            |
| Highest allowable overvoltage                                             | Transient overvoltage                                                                | $V_{IOTM}$ | 8000           | $V_{peak}$ |
| Max. working insulation voltage                                           | Recurring peak voltage                                                               | $V_{IORM}$ | 890            | $V_{peak}$ |
| Insulation resistance at 25 °C                                            | $V_{IO} = 500 V$                                                                     | $R_{IS}$   | $\geq 10^{12}$ | $\Omega$   |
| Insulation resistance at $T_S$                                            |                                                                                      | $R_{IS}$   | $\geq 10^9$    | $\Omega$   |
| Insulation resistance at 100 °C                                           |                                                                                      | $R_{IS}$   | $\geq 10^{11}$ | $\Omega$   |
| Partial discharge test voltage                                            | Methode a, $V_{pd} = V_{IORM} \times 1.875$                                          | $V_{pd}$   | 1669           | $V_{peak}$ |
| Safety limiting values - maximum values allowed in the event of a failure | Case temperature                                                                     | $T_{SI}$   | 175            | °C         |
|                                                                           | Input current                                                                        | $I_{SI}$   | 300            | mA         |
|                                                                           | Output power                                                                         | $P_{SO}$   | 700            | mW         |
| Minimum external air gap (clearance)                                      | Measured from input terminals to output terminals, shortest distance through air     |            | $\geq 7$       | mm         |
| Minimum external tracking (creepage)                                      | Measured from input terminals to output terminals, shortest distance path along body |            | $\geq 7$       | mm         |

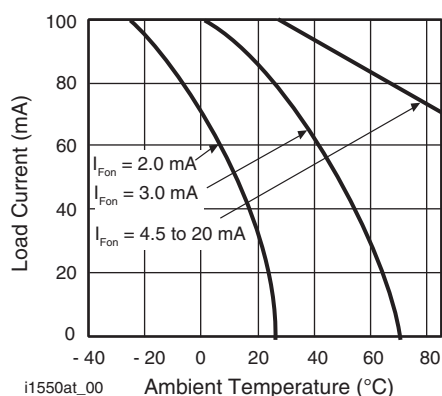
**TYPICAL CHARACTERISTICS** ( $T_{amb} = 25\text{ °C}$ , unless otherwise specified)

Fig. 1 - Recommended Operating Conditions

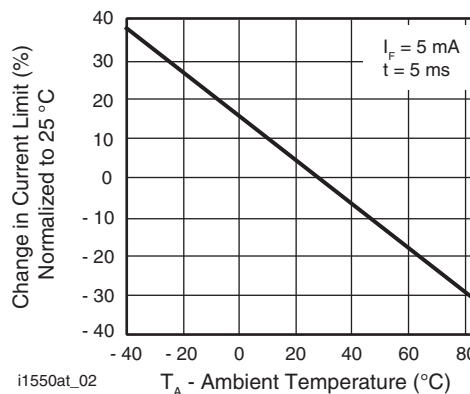


Fig. 3 - Current Limit vs. Temperature

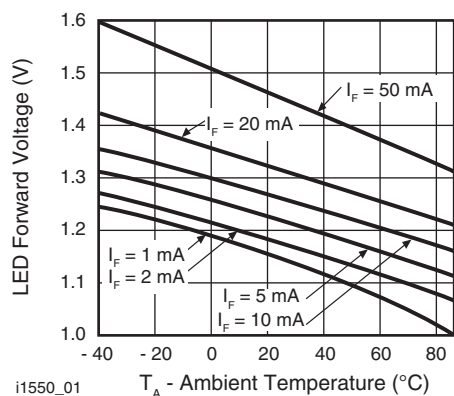


Fig. 2 - LED Voltage vs. Temperature

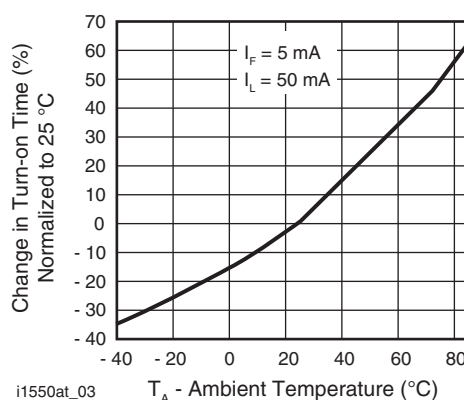


Fig. 4 - Turn-on Time vs. Temperature

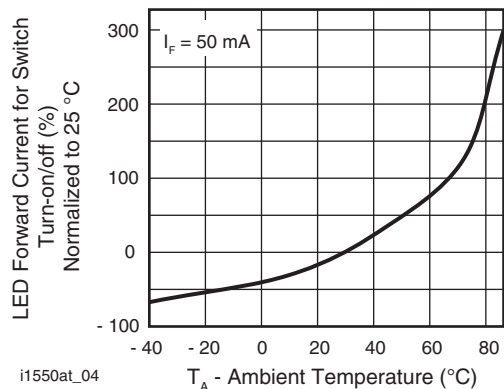


Fig. 5 - LED Current for Switch Turn-on vs. Temperature

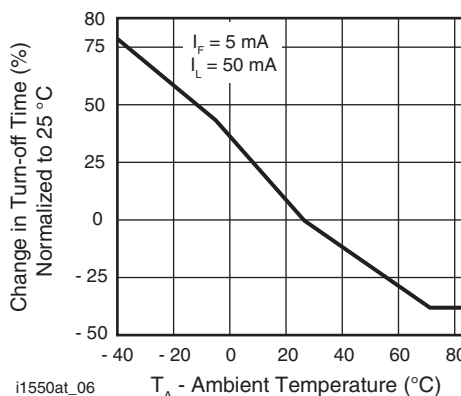


Fig. 7 - Turn-off Time vs. Temperature

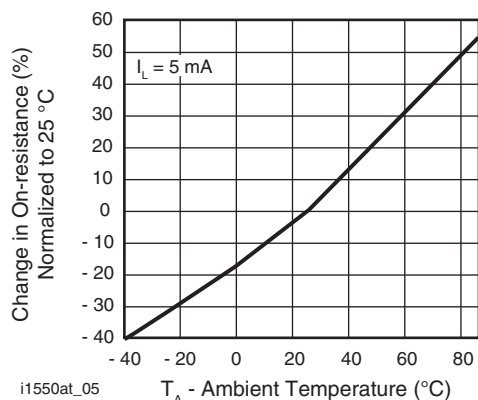
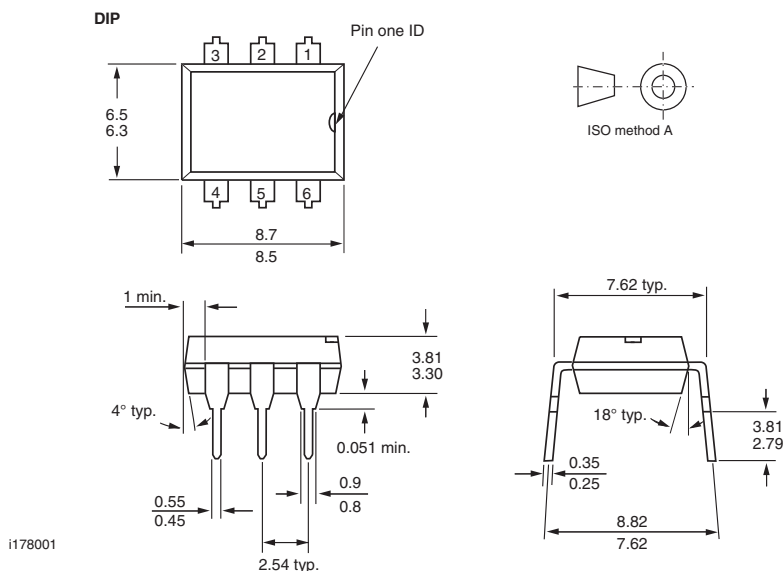
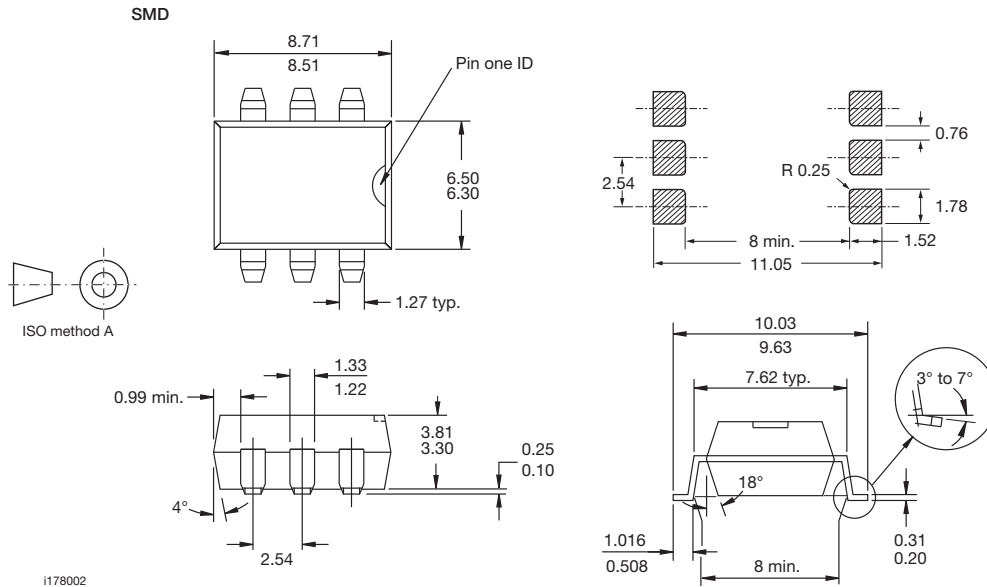


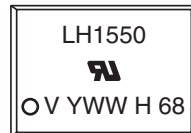
Fig. 6 - On-resistance vs. Temperature

## PACKAGE DIMENSIONS in millimeters





## PACKAGE MARKING



### Note

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



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