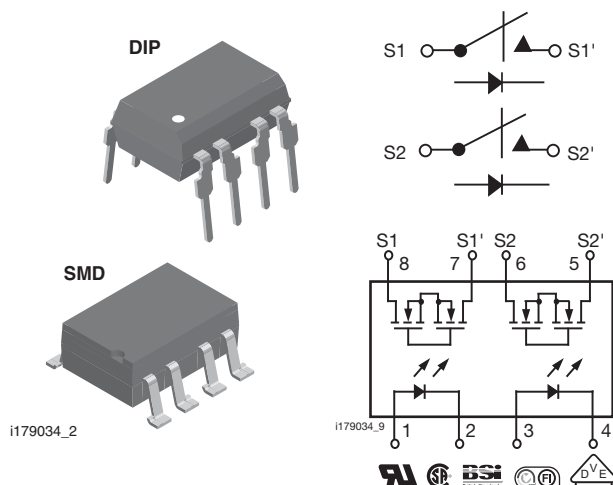


Dual 1 Form A Solid-State Relay



FEATURES

- Two independent relays
- Current limit protection
- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 15 Ω
- Load voltage 250 V
- Load current 120 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- High reliability monolithic receptor
- SMD lead available on tape and reel
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC



RoHS
COMPLIANT

DESCRIPTION

The LH1505 contains two normally open switches that can be used as two independent SPST relays or as one DPST relay. The relay is constructed using a GaAlAs LED for actuation control and integrated monolithic dies for the switch outputs. The die, fabricated in a high-voltage dielectrically isolated technology, is comprised of a photodiode array, switch control circuitry, and DMOS switches. In addition, the LH1505 relay employs current limiting circuitry, enabling it to pass lightning surge testing as per ANSI/TIA-968-B and other regulatory voltage surge requirements when overvoltage protection is provided.

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


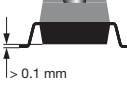
CSA: certification no. 093751

BSI/BABT: certification no. 7980

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

FIMKO: approval

ORDERING INFORMATION

| | | | | | | | | | | | | |
|----------------------|--------------|--------------|--------------|--------------|--------------|---------------------|--------------|-----------------|--------------|---------------|--|--|
| <div>L</div> | <div>H</div> | <div>1</div> | <div>5</div> | <div>0</div> | <div>5</div> | <div>A</div> | <div>#</div> | <div>#</div> | <div>T</div> | <div>R</div> | <div>DIP</div>  | <div>SMD</div>  |
| PART NUMBER | | | | | | ELECTR. VARIATION | | PACKAGE CONFIG. | | TAPE AND REEL | | |
| PACKAGE | | | | | | UL, CSA, BSI, FIMKO | | | | | | |
| SMD-8, tubes | | | | | | LH1505AAC | | | | | | |
| SMD-8, tape and reel | | | | | | LH1505AACTR | | | | | | |
| DIP-8, tubes | | | | | | LH1505AB | | | | | | |



| ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified) | | | | |
|--|--|------------|---------------|--------------------|
| PARAMETER | TEST CONDITION | SYMBOL | VALUE | UNIT |
| INPUT | | | | |
| LED continuous forward current | | I_F | 50 | mA |
| LED reverse voltage | $I_R \leq 10\text{ }\mu\text{A}$ | V_R | 8 | V |
| OUTPUT | | | | |
| DC or peak AC load voltage | $I_L \leq 50\text{ }\mu\text{A}$ | V_L | 250 | V |
| Continuous DC load current, one pole operating | | I_L | 130 | mA |
| Continuous DC load current, two poles operating | | I_L | 120 | mA |
| Peak load current (single shot), form B | $t = 100\text{ ms}$ | I_P | (3) | |
| SSR | | | | |
| Ambient operating temperature range | | T_{amb} | - 40 to + 85 | $^{\circ}\text{C}$ |
| Storage temperature range | | T_{stg} | - 40 to + 150 | $^{\circ}\text{C}$ |
| Pin soldering temperature ⁽¹⁾ | $t = 10\text{ s max.}$ | T_{sld} | 260 | $^{\circ}\text{C}$ |
| Input to output isolation test voltage | $t = 1\text{ s}, I_{ISO} = 10\text{ }\mu\text{A max.}$ | V_{ISO} | 5300 | V_{RMS} |
| Pole-to-pole isolation voltage (S1 to S2) ⁽²⁾ , (dry air, dust free, at sea level) | | | 1600 | V |
| Output power dissipation (continuous) | | P_{diss} | 600 | 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 reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).
- (2) Breakdown occurs between the output pins external to the package.
- (3) Refer to current limit performance application note for a discussion on relay operation during transient currents.

| ELECTRICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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} | | 1 | 2 | mA |
| LED forward current, switch turn-off | $V_L = \pm 200\text{ V}$ | I_{Foff} | 0.2 | 0.9 | | mA |
| LED forward voltage | $I_F = 10\text{ mA}$ | V_F | 1.15 | 1.26 | 1.45 | V |
| OUTPUT | | | | | | |
| On-resistance | $I_F = 5\text{ mA}, I_L = 50\text{ mA}$ | R_{ON} | 10 | 15 | 20 | Ω |
| Off-resistance | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$ | R_{OFF} | 0.5 | 5000 | | $G\Omega$ |
| Current limit | $I_F = 5\text{ mA}, t = 5\text{ ms}, V_L = \pm 6\text{ V}$ | I_{LMT} | 170 | 200 | 280 | mA |
| Off-state leakage current | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$ | I_O | | 0.02 | 200 | nA |
| | $I_F = 0\text{ mA}, V_L = \pm 250\text{ V}$ | I_O | | | 1 | μA |
| Output capacitance | $I_F = 0\text{ mA}, V_L = 1\text{ V}$ | C_O | | 55 | | pF |
| | $I_F = 0\text{ mA}, V_L = 50\text{ V}$ | C_O | | 10 | | pF |
| Pole-to-pole capacitance (S1 to S2) | $I_F = 5\text{ mA}$ | | | 0.5 | | pF |
| Switch offset | $I_F = 5\text{ mA}$ | V_{OS} | | 0.15 | | μV |
| TRANSFER | | | | | | |
| Capacitance (input to output) | $V_{ISO} = 1\text{ V}$ | 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 ($T_{amb} = 25\text{ }^{\circ}\text{C}$, 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} | | 1.4 ⁽¹⁾ | 4 ⁽¹⁾ | ms |
| Turn-off time | $I_F = 5\text{ mA}, I_L = 50\text{ mA}$ | t_{off} | | 0.7 ⁽¹⁾ | 4 ⁽¹⁾ | ms |

Note

- ⁽¹⁾ $I_L = 100\text{ mA}$.



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

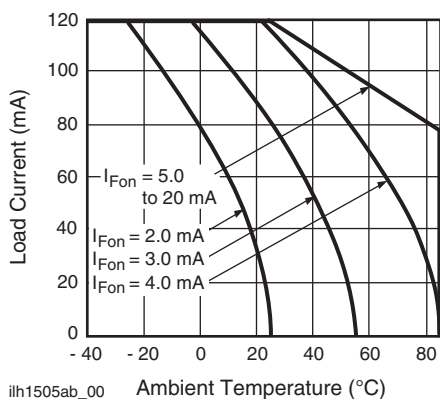


Fig. 1 - Recommended Operating Conditions

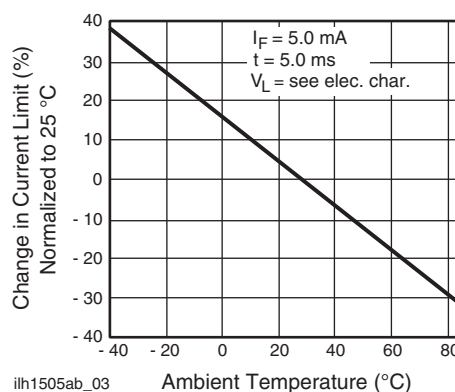


Fig. 4 - Current Limit vs. Temperature

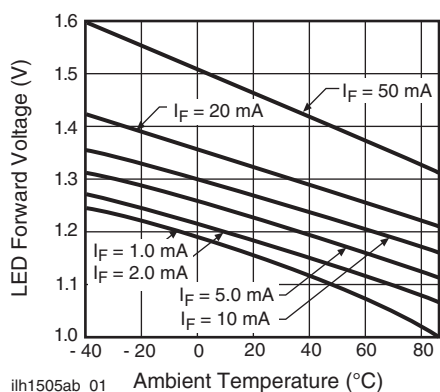


Fig. 2 - LED Voltage vs. Temperature

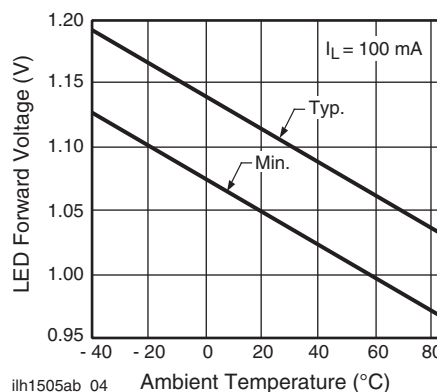


Fig. 5 - LED Dropout Voltage vs. Temperature

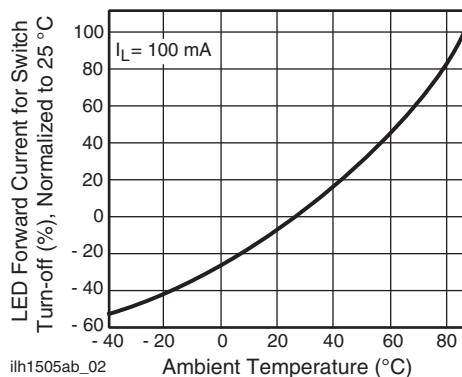


Fig. 3 - LED Current for Switch Turn-on vs. Temperature

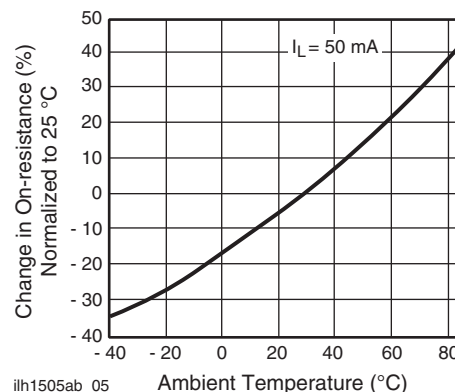


Fig. 6 - On-Resistance vs. Temperature

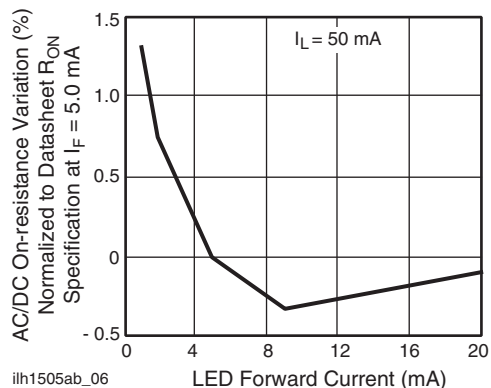


Fig. 7 - Variation in On-Resistance vs. LED Current

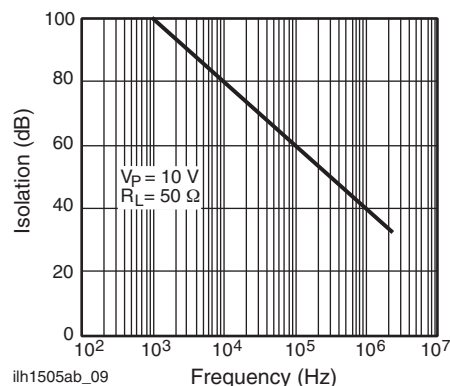


Fig. 10 - Output Isolation

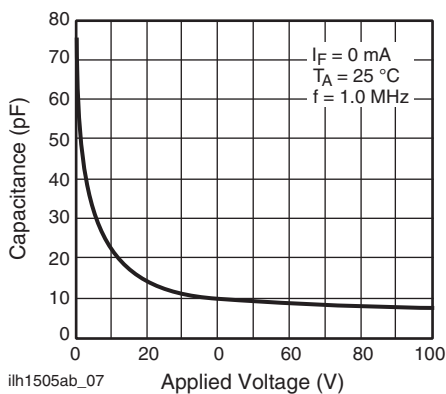


Fig. 8 - Switch Capacitance vs. Applied Voltage

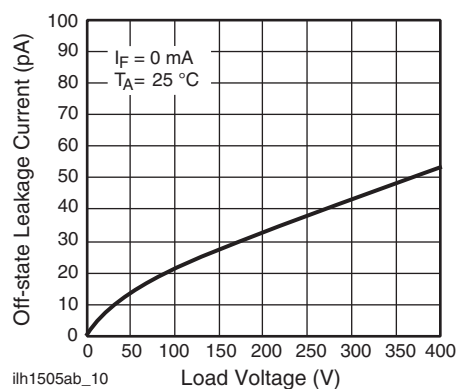


Fig. 11 - Leakage Current vs. Applied Voltage

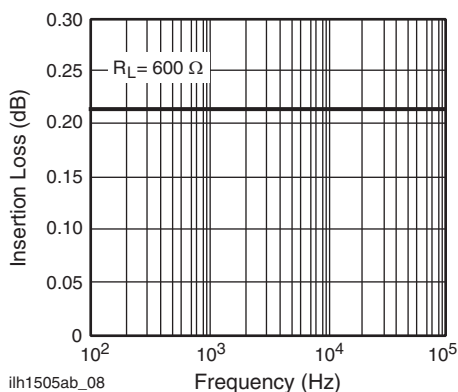


Fig. 9 - Insertion Loss vs. Frequency

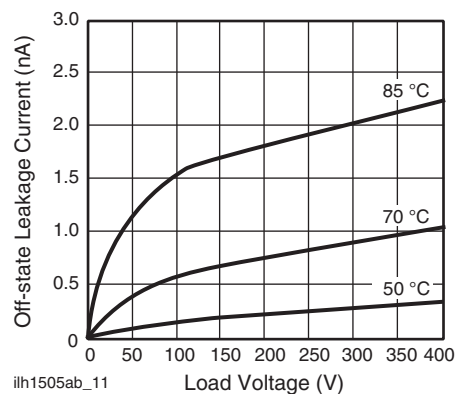


Fig. 12 - Leakage Current vs. Applied Voltage at Elevated Temperatures

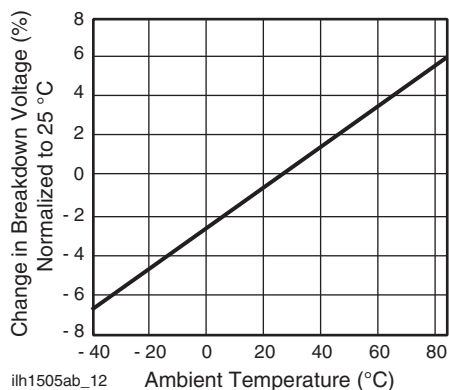


Fig. 13 - Switch Breakdown Voltage vs. Temperature

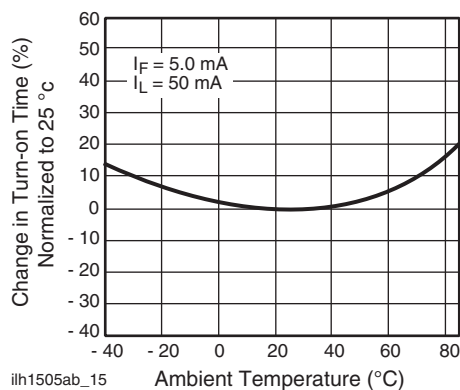


Fig. 16 - Turn-on Time vs. Temperature

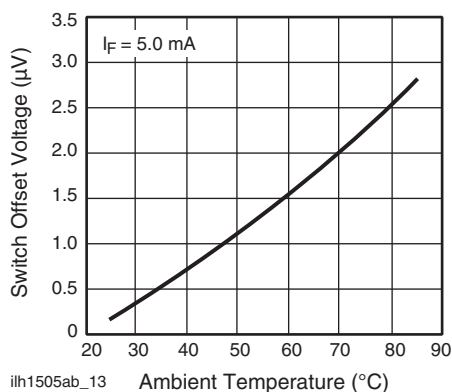


Fig. 14 - Switch Offset Voltage vs. Temperature

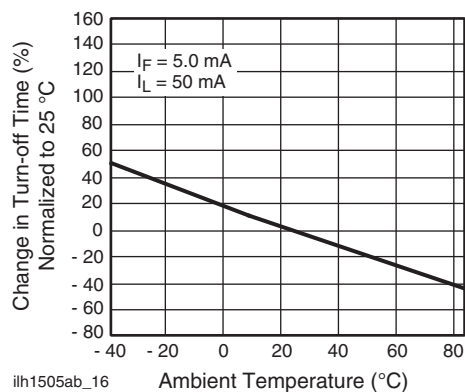


Fig. 17 - Turn-off Time vs. Temperature

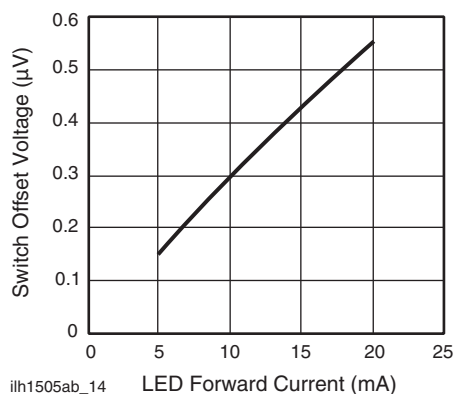


Fig. 15 - Switch Offset Voltage vs. LED Current

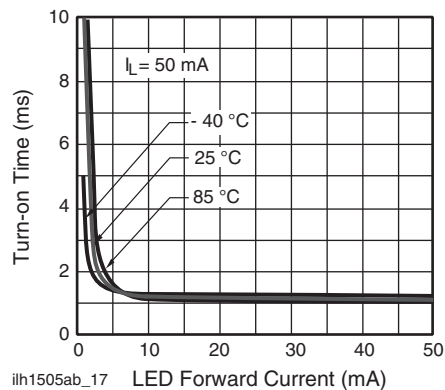


Fig. 18 - Turn-on Time vs. LED Current

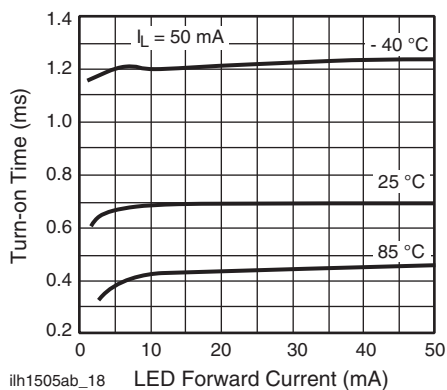
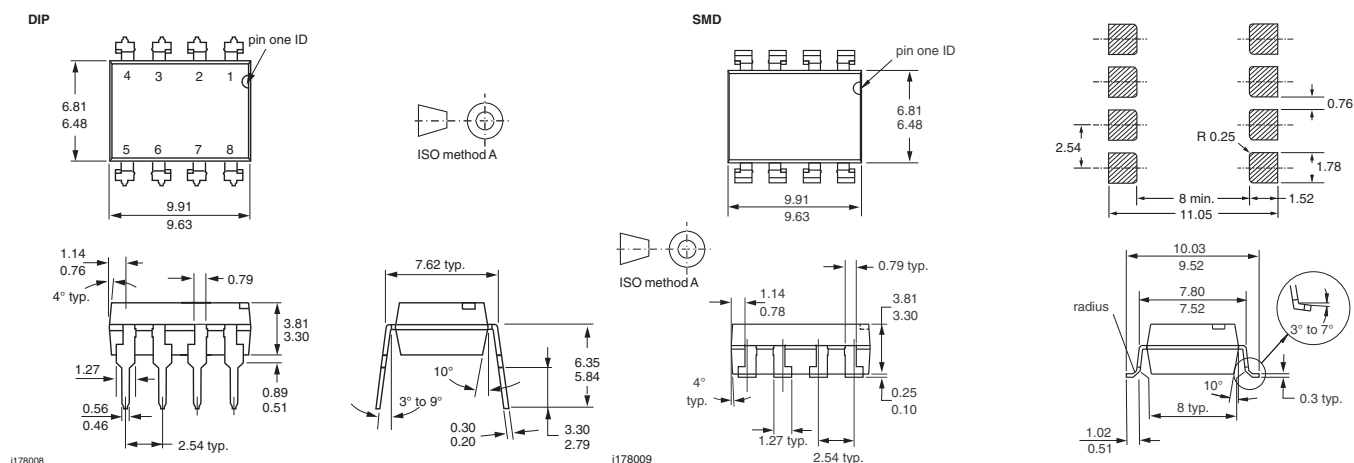
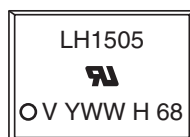


Fig. 19 - Turn-off Time vs. LED Current

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



Note

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



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