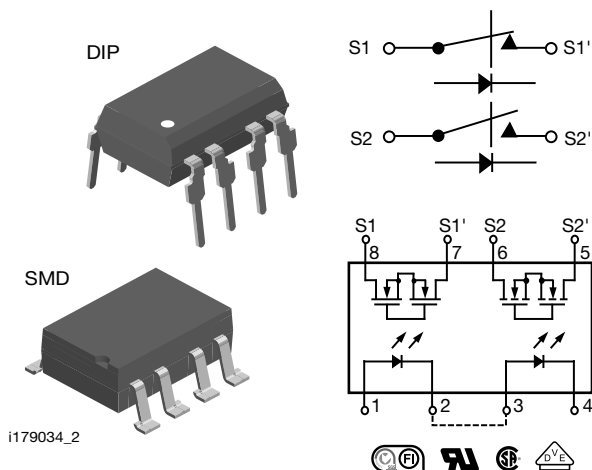


## Dual 1 Form A/B, C Solid-State Relay



### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The LH1502 relays contain normally open and normally closed switches that can be used independently as a 1 form A and 1 form B relay, or when used together, as a 1 form C relay. The relays are constructed as a multi-chip hybrid device. Actuation control is via an infrared LED. The output switch is a combination of a photodiode array with MOSFET switches and control circuitry.

### FEATURES

- Current limit protection
- Isolation test voltage 3750 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 20 Ω
- Load voltage 350 V
- Load current 150 mA
- High surge capability
- Clean bounce free switching
- Low power consumption
- SMD lead available on tape and reel
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### APPLICATIONS

- General telecom switching
  - On / off hook control
  - Ring delay
  - Dial pulse
  - Ground start
  - Ground fault protection
- Instrumentation
- Industrial controls

### AGENCY APPROVALS

- [UL](#)
- [VDE](#)
- [CQC](#)
- [FIMKO](#)

### ORDERING INFORMATION

L

H

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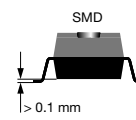
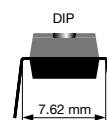
T

R

PART NUMBER

ELECTR.  
VARIATION

PACKAGE  
CONFIG.

TAPE AND  
REEL


#### PACKAGE

UL, CSA, FIMKO

SMD-8, tubes

LH1502BAC

SMD-8, tape and reel

LH1502BACTR

DIP-8, tubes

LH1502BB



| <b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                        |            |             |                    |
|--------------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------|-------------|--------------------|
| PARAMETER                                                                                              | TEST CONDITION                                         | SYMBOL     | VALUE       | UNIT               |
| <b>INPUT</b>                                                                                           |                                                        |            |             |                    |
| LED continuous forward current                                                                         |                                                        | $I_F$      | 50          | mA                 |
| LED reverse voltage                                                                                    | $I_R \leq 10\text{ }\mu\text{A}$                       | $V_R$      | 8           | V                  |
| <b>OUTPUT</b>                                                                                          |                                                        |            |             |                    |
| DC or peak AC load voltage                                                                             | $I_L \leq 50\text{ }\mu\text{A}$                       | $V_L$      | 350         | V                  |
| Continuous DC load current (form C operation)                                                          |                                                        | $I_L$      | 150         | mA                 |
| Peak load current, form A                                                                              | $t = 100\text{ ms}$                                    | $I_P$      | (3)         |                    |
| Peak load current (single shot), form B                                                                |                                                        | $I_P$      | 350         | mA                 |
| <b>SSR</b>                                                                                             |                                                        |            |             |                    |
| Ambient operating temperature range                                                                    |                                                        | $T_{amb}$  | -40 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range                                                                              |                                                        | $T_{stg}$  | -40 to +125 | $^{\circ}\text{C}$ |
| Pin soldering temperature (1)                                                                          | $t = 10\text{ s max.}$                                 | $T_{sld}$  | 260         | $^{\circ}\text{C}$ |
| Input to output isolation test voltage                                                                 | $t = 1\text{ s}, I_{ISO} = 10\text{ }\mu\text{A max.}$ | $V_{ISO}$  | 3750        | $V_{RMS}$          |
| 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

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                                           |            |      |      |      |               |
|----------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|------------|------|------|------|---------------|
| PARAMETER                                                                                                | TEST CONDITION                                                            | SYMBOL     | MIN. | TYP. | MAX. | UNIT          |
| <b>INPUT</b>                                                                                             |                                                                           |            |      |      |      |               |
| LED forward current, switch turn-on (NO)                                                                 | $I_L = 100\text{ mA}, t = 10\text{ ms}$                                   | $I_{Fon}$  | -    | 0.6  | 2    | mA            |
| LED forward current, switch turn-off (NO)                                                                | $V_L = \pm 300\text{ V}$                                                  | $I_{Foff}$ | 0.4  | 0.5  | -    | mA            |
| LED forward current, switch turn-on (NC)                                                                 | $I_L = 300\text{ mA}, t = 10\text{ ms}$                                   | $I_{Fon}$  | 0.2  | 0.9  | -    | mA            |
| LED forward current, switch turn-off (NC)                                                                | $V_L = \pm 300\text{ V}$                                                  | $I_{Foff}$ | -    | 1    | 2    | mA            |
| LED forward voltage                                                                                      | $I_F = 10\text{ mA}$                                                      | $V_F$      | 1.15 | 1.26 | 1.45 | V             |
| <b>OUTPUT</b>                                                                                            |                                                                           |            |      |      |      |               |
| On-resistance (NO, NC)                                                                                   | $I_F = 5\text{ mA (NO)}, I_F = 0\text{ mA (NC)}, I_L = 50\text{ mA (NC)}$ | $R_{ON}$   | 12   | 20   | 25   | $\Omega$      |
| Off-resistance (NO)                                                                                      | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$                               | $R_{OFF}$  | 0.35 | 5000 | -    | $G\Omega$     |
| Off-resistance (NC)                                                                                      | $I_F = 5\text{ mA}, V_L = \pm 100\text{ V}$                               | $R_{OFF}$  | 0.1  | 1.4  | -    | $G\Omega$     |
| Current limit (NO)                                                                                       | $I_F = 5\text{ mA}, t = 5\text{ ms}, V_L = \pm 5\text{ V}$                | $I_{LMT}$  | 270  | 290  | 380  | mA            |
| Off-state leakage current (NO)                                                                           | $I_F = 0\text{ mA}, V_L = \pm 100\text{ V}$                               | $I_O$      | -    | 0.02 | 1000 | nA            |
| Off-state leakage current (NC)                                                                           | $I_F = 5\text{ mA}, V_L = \pm 100\text{ V}$                               | $I_O$      | -    | 0.07 | 1    | $\mu\text{A}$ |
| Off-state leakage current (NO, NC)                                                                       | $I_F = 0\text{ mA (NO)}, I_F = 5\text{ mA (NC)}, V_L = \pm 200\text{ V}$  | $I_O$      | -    | -    | 1    | $\mu\text{A}$ |
| Output capacitance (NO)                                                                                  | $I_F = 0\text{ mA}, V_L = 50\text{ V}$                                    | $C_O$      | -    | 50   | -    | pF            |
| Output capacitance (NC)                                                                                  | $I_F = 5\text{ mA}, V_L = 50\text{ V}$                                    | $C_O$      | -    | 50   | -    | pF            |
| <b>TRANSFER</b>                                                                                          |                                                                           |            |      |      |      |               |
| Capacitance (input to output)                                                                            | $V_{ISO} = 1\text{ V}$                                                    | $C_{IO}$   | -    | 3    | -    | pF            |

**Note**

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. 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 |
| TRANSFER                                                                                         |                                                                         |           |      |      |      |      |
| Turn-on time (NO)                                                                                | $I_F = 10\text{ mA}$ , $I_L = 37.5\text{ mA}$ ,<br>$V_L = 150\text{ V}$ | $t_{on}$  | 0.2  | 3.2  | 6    | ms   |
| Turn-on time (NC)                                                                                | $I_F = 10\text{ mA}$ , $I_L = 37.5\text{ mA}$ ,<br>$V_L = 150\text{ V}$ | $t_{on}$  | 0.2  | 3.8  | 6    | ms   |
| Turn-off time (NO)                                                                               | $I_F = 10\text{ mA}$ , $I_L = 37.5\text{ mA}$ ,<br>$V_L = 150\text{ V}$ | $t_{off}$ | -    | 1.6  | 3    | ms   |
| Turn-off time (NC)                                                                               | $I_F = 10\text{ mA}$ , $I_L = 37.5\text{ mA}$ ,<br>$V_L = 150\text{ V}$ | $t_{off}$ | -    | 0.8  | 3    | ms   |

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

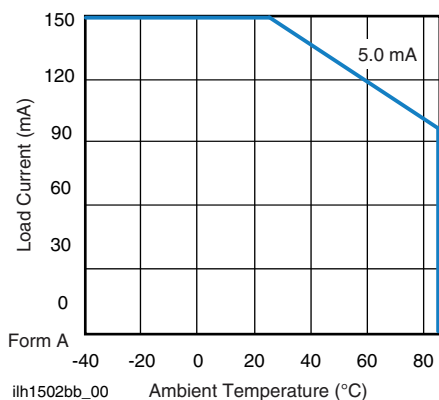


Fig. 1 - Maximum Load Current vs. Ambient Temperature

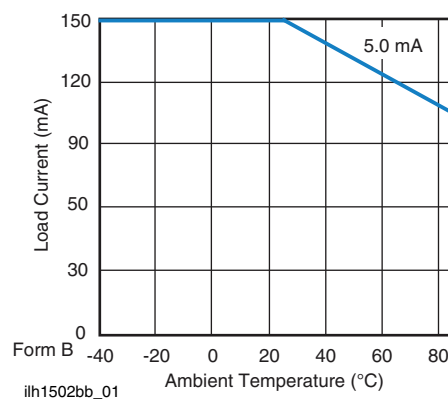
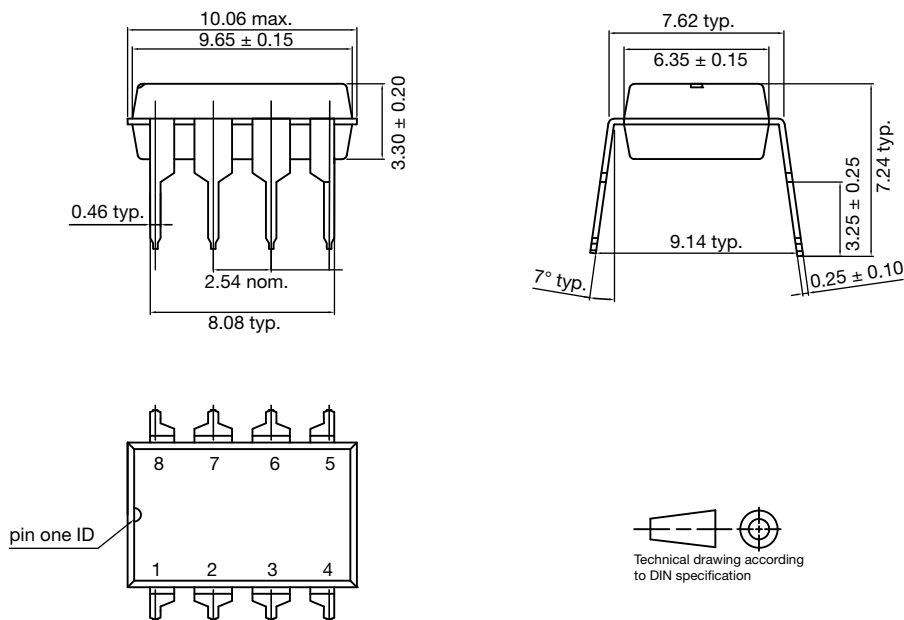


Fig. 2 - Maximum Load Current vs. Ambient Temperature

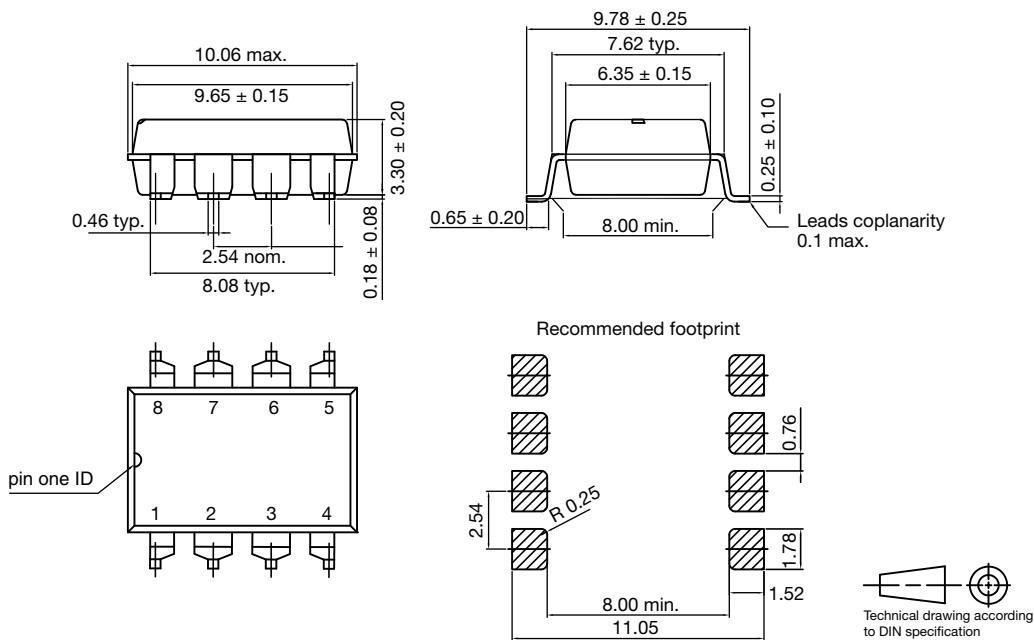


## PACKAGE DIMENSIONS (in millimeters)

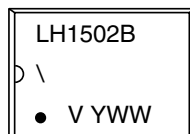
### DIP-8



### SMD-8



## PACKAGE MARKING (example)



### Note

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



## SOLDER PROFILES

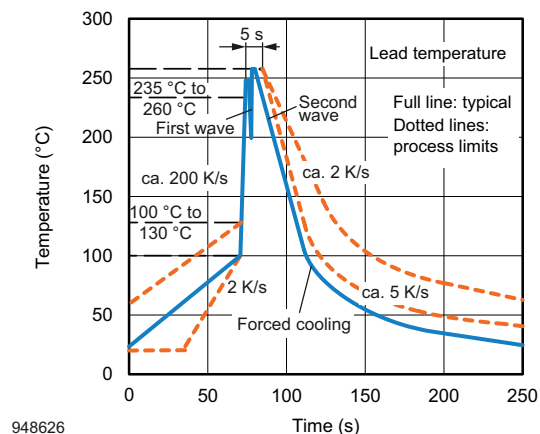


Fig. 3 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices

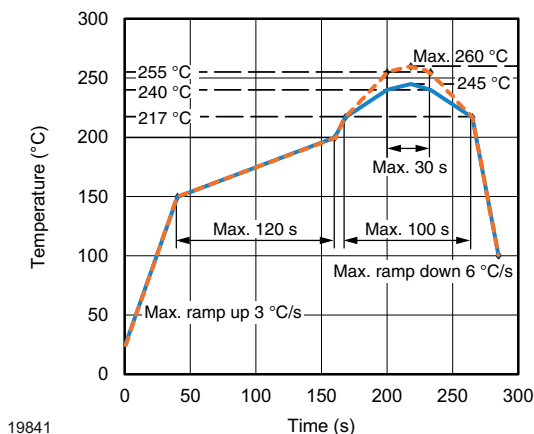


Fig. 4 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

## HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions:  $T_{amb} < 30\text{ °C}$ , RH < 85 %

Moisture sensitivity level 1, according to J-STD-020



## Footprint and Schematic Information for LH1502BAC, LH1502BACTR, LH1502BB

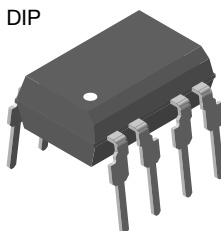
The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

Note that the 3D models for these parts can be found on the Vishay product page.

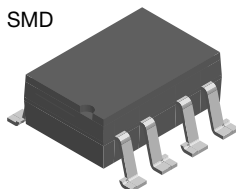
| PART NUMBER | FOOTPRINT / SCHEMATIC                                                                                                      |
|-------------|----------------------------------------------------------------------------------------------------------------------------|
| LH1502BAC   | <a href="http://www.snapeda.com/parts/LH1502BAC/Vishay/view-part">www.snapeda.com/parts/LH1502BAC/Vishay/view-part</a>     |
| LH1502BACTR | <a href="http://www.snapeda.com/parts/LH1502BACTR/Vishay/view-part">www.snapeda.com/parts/LH1502BACTR/Vishay/view-part</a> |
| LH1502BB    | <a href="http://www.snapeda.com/parts/LH1502BB/Vishay/view-part">www.snapeda.com/parts/LH1502BB/Vishay/view-part</a>       |

For technical issues and product support, please contact [optocoupleranswers@vishay.com](mailto:optocoupleranswers@vishay.com).

DIP



SMD



i179034\_2



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