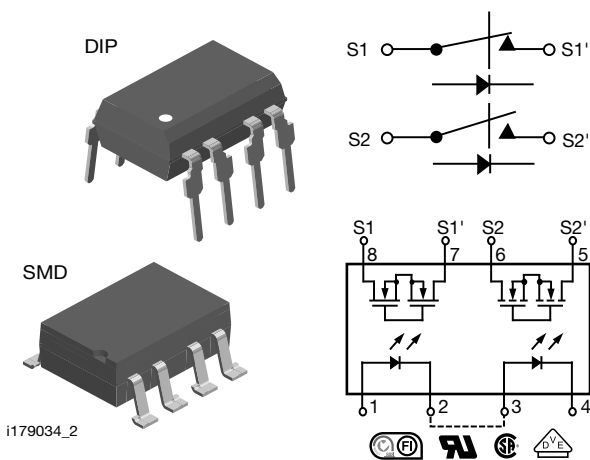


## Dual 1 Form A/B, C Solid-State Relay



### FEATURES

- Current limit protection
- Isolation test voltage 3750 V<sub>RMS</sub>
- Typical R<sub>ON</sub> 10 Ω
- Load voltage 200 V
- Load current 200 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

### LINKS TO ADDITIONAL RESOURCES



### DESCRIPTION

The LH1512 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 mult.-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.

### AGENCY APPROVALS

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

| ORDERING INFORMATION  |   |
|---|---|
| <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin: 2px;">L</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">H</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">1</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">5</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">1</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">2</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">B</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">#</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">T</div> <div style="border: 1px solid black; padding: 2px; margin: 2px;">R</div> </div> <p style="text-align: center;"> <span style="margin-right: 100px;">PART NUMBER</span> <span style="margin-right: 100px;">ELECTR. VARIATION</span> <span style="margin-right: 100px;">PACKAGE CONFIG.</span> <span style="margin-right: 100px;">TAPE AND REEL</span> </p> | <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <br/>                     DIP<br/>                     7.62 mm                 </div> <div style="text-align: center;"> <br/>                     SMD<br/>                     &gt; 0.1 mm                 </div> </div> |
| <b>PACKAGE</b>  | <b>UL, CSA, FIMKO</b>   |
| SMD-8, tubes  | LH1512BAC   |
| SMD-8, tape and reel  | LH1512BACTR   |
| DIP-8, tubes  | LH1512BB  |



| 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>    | 5           | V                |
| <b>OUTPUT</b>  |  |                   |             |                  |
| DC or peak AC load voltage   | I <sub>L</sub> ≤ 50 μA                 | V <sub>L</sub>    | 200         | V                |
| Continuous DC load current (form C operation)                                    |  | I <sub>L</sub>    | 200         | mA               |
| Peak load current, form A  | t = 100 ms                             | I <sub>P</sub>    | (2)         |                  |
| Peak load current (single shot), form B  |  | I <sub>P</sub>    | 400         | mA               |
| <b>SSR</b>   |  |                   |             |                  |
| Ambient operating temperature range  |  | T <sub>amb</sub>  | -40 to +85  | °C               |
| Storage temperature range  |  | T <sub>stg</sub>  | -40 to +125 | °C               |
| Pin soldering temperature (3)  | t = 10 s max.                          | T <sub>sld</sub>  | 260         | °C               |
| Input to output isolation test voltage   | t = 1 s, I <sub>ISO</sub> = 10 μA max. | V <sub>ISO</sub>  | 3750        | V <sub>RMS</sub> |
| Pole-to-pole isolation voltage (S1 to S2) (1) (dry air, dust free, at sea level) |  |                   | 1600        | V                |
| Output power dissipation (continuous)  |  | P <sub>diss</sub> | 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) Breakdown occurs between the output pins external to the package
- (2) Refer to current limit performance application note for a discussion on relay operation during transient currents
- (3) 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 <sub>amb</sub> = 25 °C, unless otherwise specified) |  |                   |      |      |      |      |  |
|---|--|-------------------|------|------|------|------|--|
| PARAMETER   | TEST CONDITION   | SYMBOL            | MIN. | TYP. | MAX. | UNIT |  |
| <b>INPUT</b>  |  |                   |      |      |      |      |  |
| LED forward current switch turn-on (NO)   | I <sub>L</sub> = 100 mA, t = 10 ms   | I <sub>Fon</sub>  | -    | 0.6  | 2    | mA   |  |
| LED forward current switch turn-off (NO)  | V <sub>L</sub> = ± 150 V   | I <sub>Foff</sub> | 0.2  | 0.5  | -    | mA   |  |
| LED forward current switch turn-on (NC)   | I <sub>L</sub> = 100 mA, t = 10 ms   | I <sub>Fon</sub>  | 0.2  | 0.9  | -    | mA   |  |
| LED forward current switch turn-off (NC)  | V <sub>L</sub> = ± 150 V   | I <sub>Foff</sub> | -    | 1    | 2    | mA   |  |
| LED forward voltage   | I <sub>F</sub> = 10 mA   | V <sub>F</sub>    | 1.15 | 1.26 | 1.45 | V    |  |
| <b>OUTPUT</b>   |  |                   |      |      |      |      |  |
| On-resistance: (NO, NC)   | I <sub>F</sub> = 5 mA (NO), I <sub>F</sub> = 0 (NC), I <sub>L</sub> = 50 mA (NC) | R <sub>ON</sub>   | -    | 10   | 15   | Ω    |  |
| Off-resistance: (NO)  | I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V                                  | R <sub>OFF</sub>  | 0.35 | 5000 | -    | GΩ   |  |
| Off-resistance: (NC)  | I <sub>F</sub> = 5 mA, V <sub>L</sub> = ± 100 V                                  | R <sub>OFF</sub>  | 0.1  | 1.4  | -    | GΩ   |  |
| Current limit: (NO)   | I <sub>F</sub> = 5 mA, t = 5 ms, V <sub>L</sub> = ± 5 V                          | I <sub>LMT</sub>  | 270  | 360  | 460  | mA   |  |
| Off-state leakage current: (NO)   | I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V                                  | I <sub>O</sub>    | -    | 0.02 | 1000 | nA   |  |
| Off-state leakage current: (NC)   | I <sub>F</sub> = 5 mA, V <sub>L</sub> = ± 100 V                                  | I <sub>O</sub>    | -    | 0.07 | 1    | μA   |  |
| Off-state leakage current: (NO, NC)   | I <sub>F</sub> = 0 mA (NO), I <sub>F</sub> = 5 mA, V <sub>L</sub> = ± 200 V      | I <sub>O</sub>    | -    |      | 1    | μA   |  |
| Output capacitance: (NO)  | I <sub>F</sub> = 0 mA, V <sub>L</sub> = 50 V                                     | C <sub>O</sub>    | -    | 60   | -    | pF   |  |
| Output capacitance: (NC)  | I <sub>F</sub> = 5 mA, V <sub>L</sub> = 50 V                                     | C <sub>O</sub>    | -    | 60   | -    | pF   |  |
| <b>TRANSFER</b>   |  |                   |      |      |      |      |  |
| Capacitance (input to output)   | V <sub>ISO</sub> = 1 V   | C <sub>IO</sub>   | -    | 3    | -    | 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 <sub>amb</sub> = 25 °C, unless otherwise specified) |  |                  |      |      |      |      |  |
|--|--|------------------|------|------|------|------|--|
| PARAMETER  | TEST CONDITION                                 | SYMBOL           | MIN. | TYP. | MAX. | UNIT |  |
| Turn-on time (NO)  | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA | t <sub>on</sub>  | -    | 1.4  | 3    | ms   |  |
| Turn-on time (NC)  | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA | t <sub>on</sub>  | -    | 1.2  | 3    | ms   |  |
| Turn-off time (NO)   | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA | t <sub>off</sub> | -    | 0.7  | 3    | ms   |  |
| Turn-off time (NC)   | I <sub>F</sub> = 10 mA, I <sub>L</sub> = 50 mA | t <sub>off</sub> | -    | 2    | 3    | ms   |  |



## TYPICAL CHARACTERISTICS (T<sub>amb</sub> = 25 °C, unless otherwise specified)

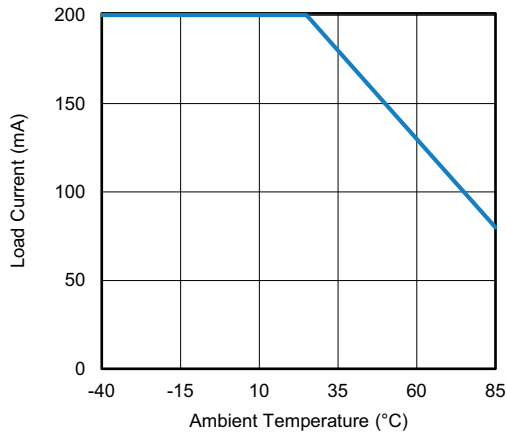


Fig. 1 - Maximum Load Current vs. Ambient Temperature

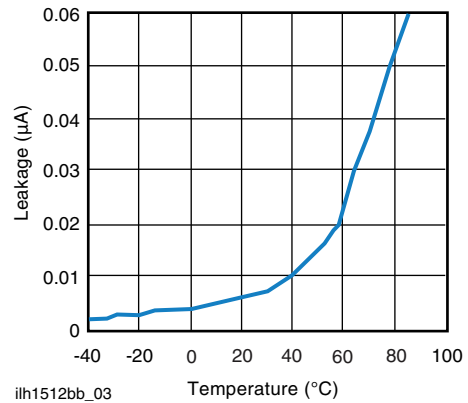


Fig. 4 - Typical Leakage vs. Temperature (Measured across Pin 5 and 6 or 7 and 8)

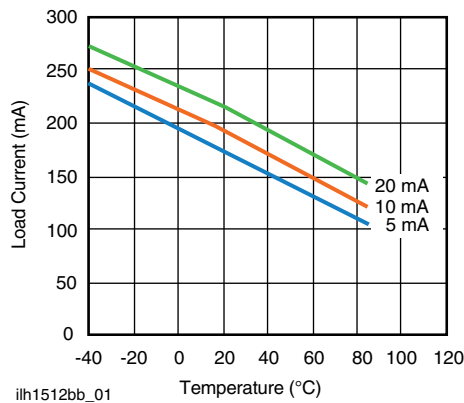


Fig. 2 - Form A Typical Load Current vs. Temperature

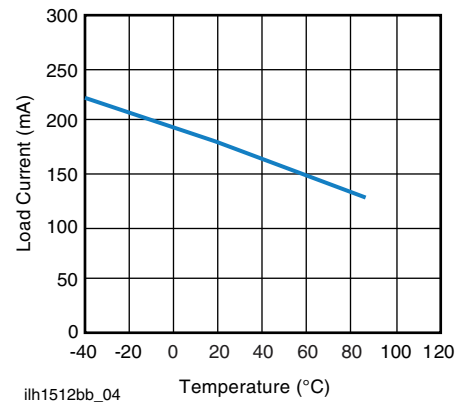


Fig. 5 - Form B Typical Load Current vs. Temperature

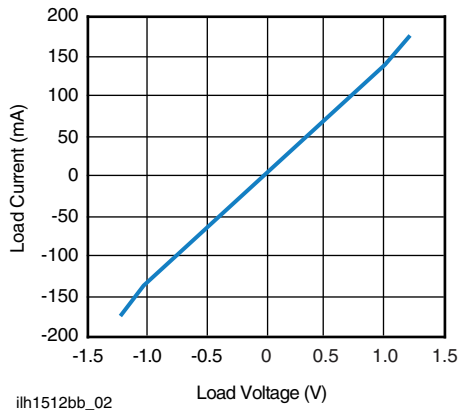


Fig. 3 - Form A Typical Load Current vs. Load Voltage

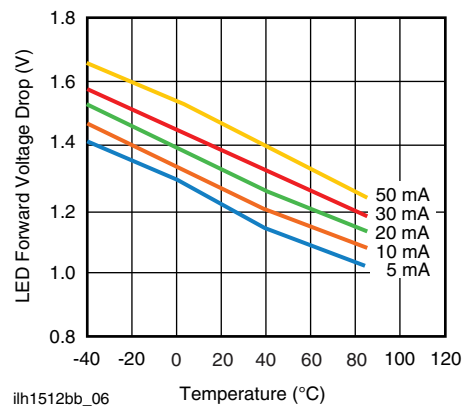


Fig. 6 - Typical LED Forward Voltage Drop vs. Temperature

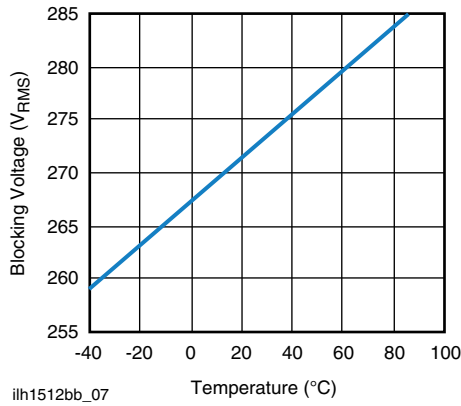


Fig. 7 - Form A Typical Blocking Voltage vs. Temperature

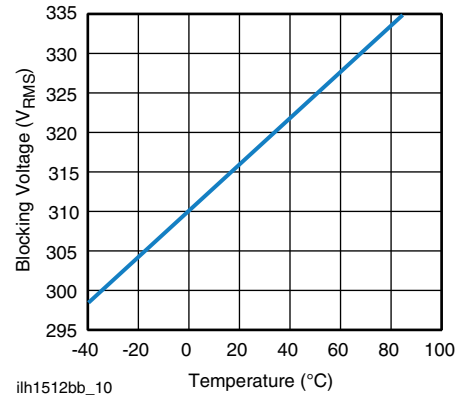


Fig. 10 - Form B Typical Blocking Voltage vs. Temperature

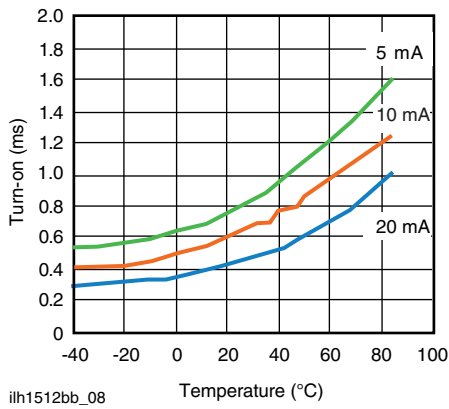


Fig. 8 - Form A Typical Turn-On vs. Temperature

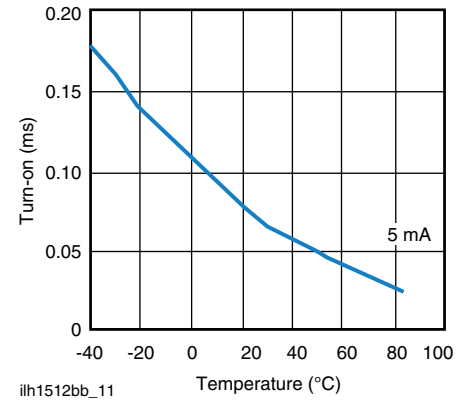


Fig. 11 - Form B Typical Turn-On vs. Temperature

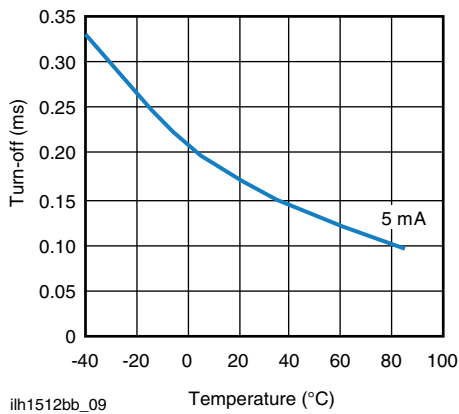


Fig. 9 - Form A Typical Turn-Off vs. Temperature

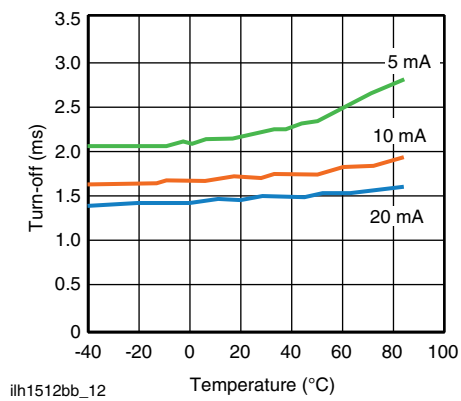


Fig. 12 - Form B Typical Turn-Off vs. Temperature

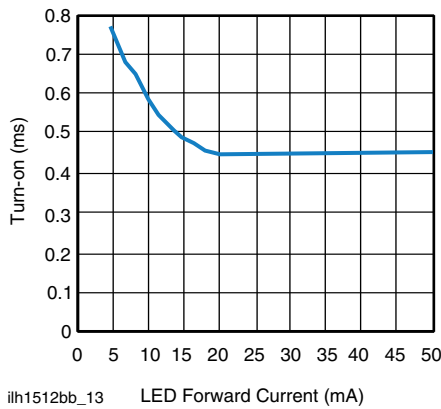


Fig. 13 - Form A Typical Turn-On vs. LED Forward Current

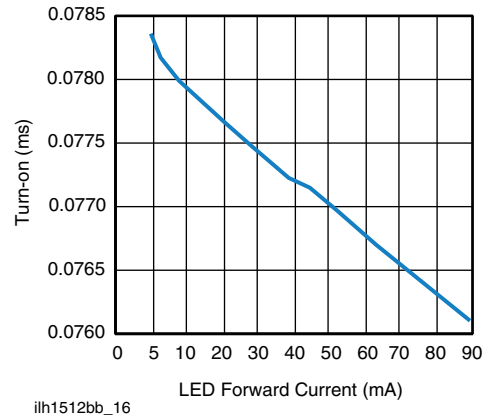


Fig. 16 - Form B Typical Turn-On vs. LED Forward Current

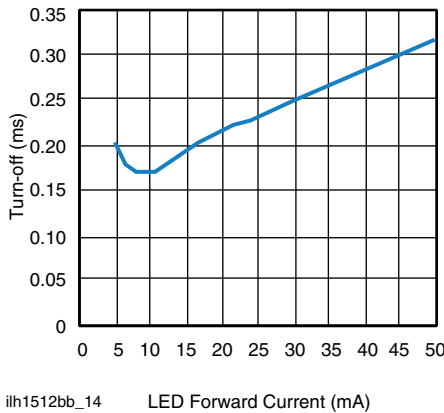


Fig. 14 - Form A Typical Turn-Off vs. LED Forward Current

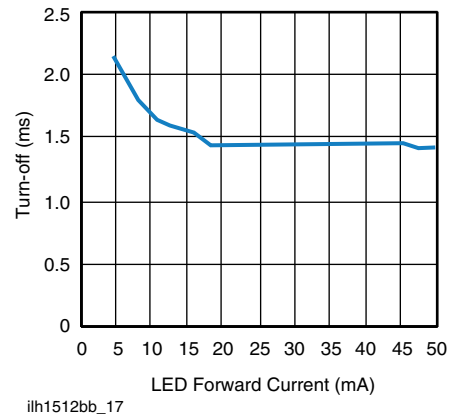


Fig. 17 - Form B Typical Turn-Off vs. LED Forward Current

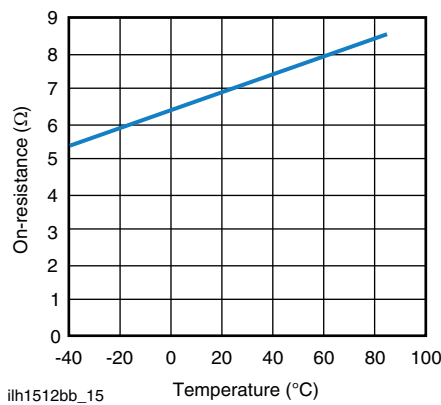


Fig. 15 - Form A Typical On-Resistance vs. Temperature

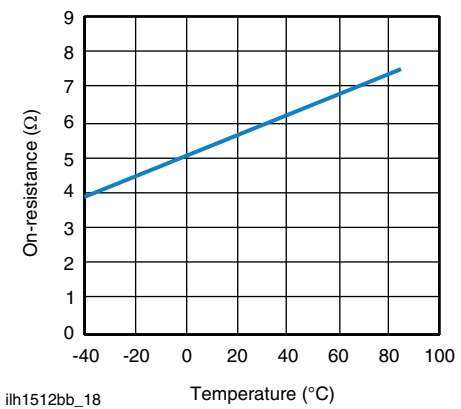
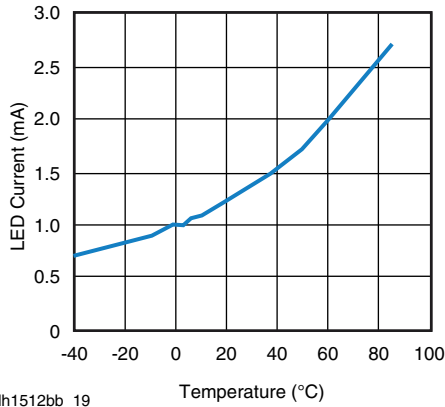
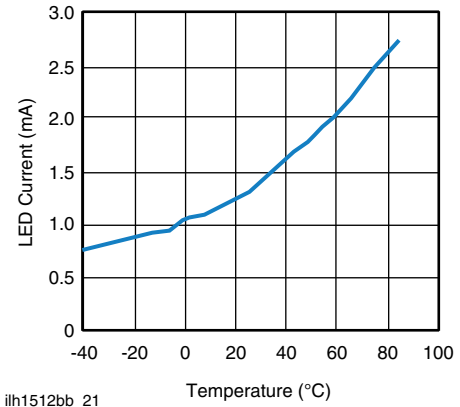


Fig. 18 - Form B Typical On-Resistance vs. Temperature



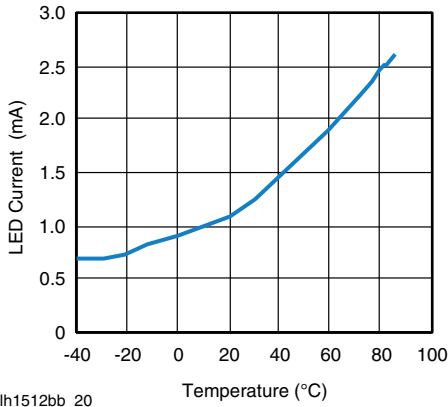
ilh1512bb\_19

Fig. 19 - Form A Typical  $I_F$  for Switch Operation vs. Temperature



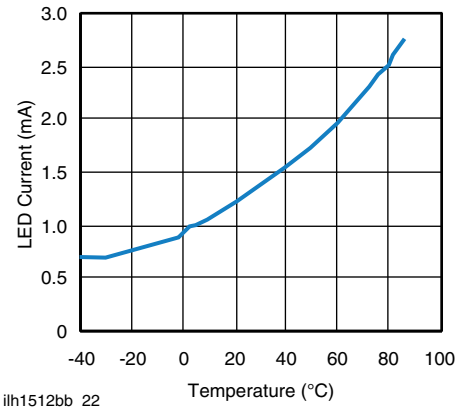
ilh1512bb\_21

Fig. 21 - Form B Typical  $I_F$  for Switch Operation vs. Temperature



ilh1512bb\_20

Fig. 20 - Form A Typical  $I_F$  for Switch Dropout vs. Temperature



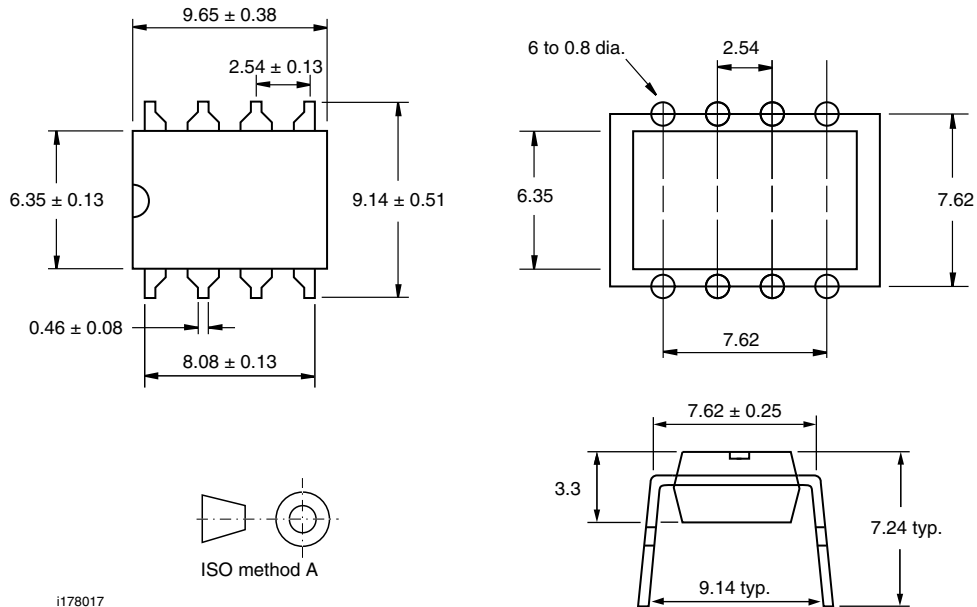
ilh1512bb\_22

Fig. 22 - Form B Typical  $I_F$  for Switch Dropout vs. Temperature

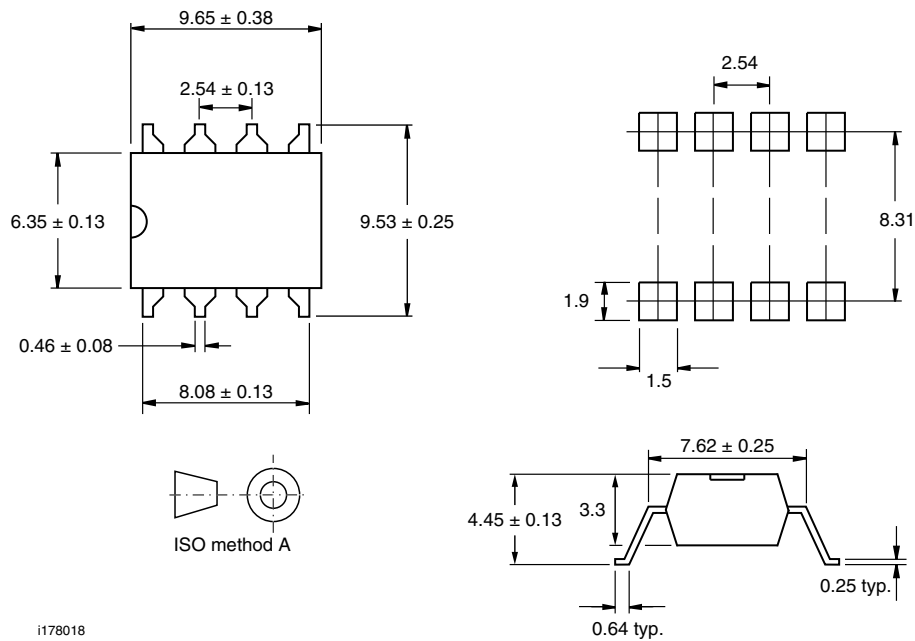


## PACKAGE DIMENSIONS in millimeters

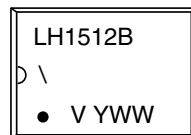
### DIP



### SMD



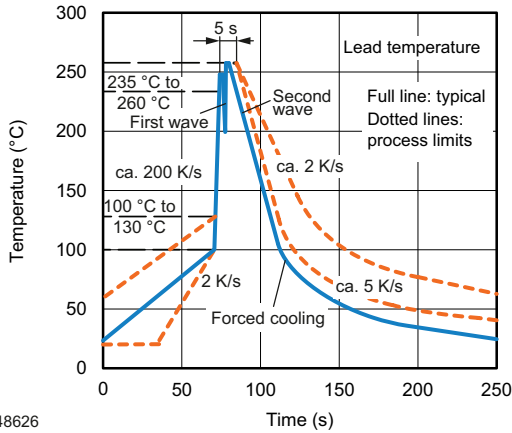
## PACKAGE MARKING (example)



### Note

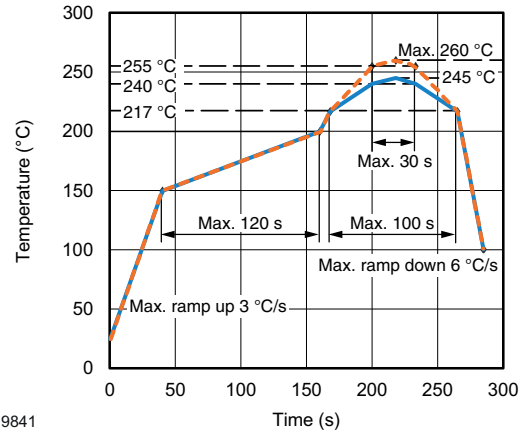
- Tape and reel suffix (TR) is not part of the package marking

## SOLDER PROFILES



948626

Fig. 23 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP Devices



19841

Fig. 24 - 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 LH1512BAC, LH1512BACTR, LH1512BB

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  |
|-------------|--|
| LH1512BAC   | <a href="http://www.snapeda.com/parts/LH1512BAC/Vishay/view-part">www.snapeda.com/parts/LH1512BAC/Vishay/view-part</a>     |
| LH1512BACTR | <a href="http://www.snapeda.com/parts/LH1512BACTR/Vishay/view-part">www.snapeda.com/parts/LH1512BACTR/Vishay/view-part</a> |
| LH1512BB    | <a href="http://www.snapeda.com/parts/LH1512BB/Vishay/view-part">www.snapeda.com/parts/LH1512BB/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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