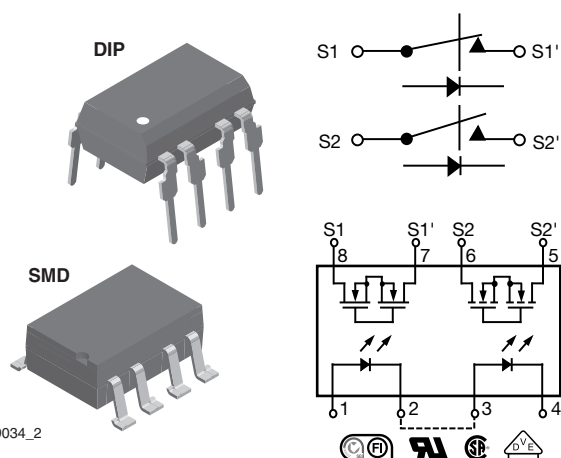


## Dual 1 Form A/B, C Solid State Relay



i179034\_2

### 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.

### 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
- Compliant to RoHS Directive 2002/95/EC and in accordance to WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### APPLICATIONS

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

### AGENCY APPROVALS

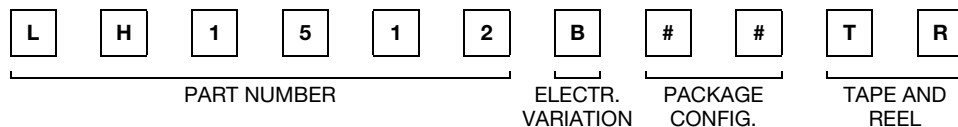
UL1577: file no. E52744 system code H, double protection

CSA: certification no. 093751

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

FIMKO: 25419

### ORDERING INFORMATION



| PACKAGE              | UL, CSA, FIMKO |
|----------------------|----------------|
| SMD-8, tubes         | LH1512BAC      |
| SMD-8, tape and reel | LH1512BACTR    |
| DIP-8, tubes         | LH1512BB       |



| ABSOLUTE MAXIMUM RATINGS ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) |                                                        |            |               |                    |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------|------------|---------------|--------------------|
| PARAMETER                                                                                       | TEST CONDITION                                         | SYMBOL     | VALUE         | UNIT               |
| <b>INPUT</b>                                                                                    |                                                        |            |               |                    |
| LED continuous forward current                                                                  |                                                        | $I_F$      | 50            | mA                 |
| LED reverse voltage                                                                             | $I_R \leq 10\text{ }\mu\text{A}$                       | $V_R$      | 5             | V                  |
| <b>OUTPUT</b>                                                                                   |                                                        |            |               |                    |
| DC or peak AC load voltage                                                                      | $I_L \leq 50\text{ }\mu\text{A}$                       | $V_L$      | 200           | V                  |
| Continuous DC load current (form C operation)                                                   |                                                        | $I_L$      | 200           | mA                 |
| Peak load current, form A                                                                       | $t = 100\text{ ms}$                                    | $I_P$      | (2)           |                    |
| Peak load current (single shot), form B                                                         |                                                        | $I_P$      | 400           | 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 (3)                                                                   | $t = 10\text{ s max.}$                                 | $T_{sld}$  | 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) (1)<br>(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.
- Breakdown occurs between the output pins external to the package.
- Refer to current limit performance application note for a discussion on relay operation during transient currents.
- 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 (NO)                                                           | $I_L = 100\text{ mA}, t = 10\text{ ms}$                                | $I_{Fon}$  |      | 0.6  | 2    | mA            |
| LED forward current switch turn-off (NO)                                                          | $V_L = \pm 150\text{ V}$                                               | $I_{Foff}$ | 0.2  | 0.5  |      | mA            |
| LED forward current switch turn-on (NC)                                                           | $I_L = 100\text{ mA}, t = 10\text{ ms}$                                | $I_{Fon}$  | 0.2  | 0.9  |      | mA            |
| LED forward current switch turn-off (NC)                                                          | $V_L = \pm 150\text{ V}$                                               | $I_{Foff}$ |      | 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)                                                                           | $I_F = 5\text{ mA (NO)}, I_F = 0\text{ (NC)}, I_L = 50\text{ mA (NC)}$ | $R_{ON}$   |      | 10   | 15   | $\Omega$      |
| 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  | 360  | 460  | 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)                                                               | $I_F = 0\text{ mA (NO)}, I_F = 5\text{ mA}, V_L = \pm 200\text{ V}$    | $I_O$      |      |      | 1    | $\mu\text{A}$ |
| Output capacitance: (NO)                                                                          | $I_F = 0\text{ mA}, V_L = 50\text{ V}$                                 | $C_O$      |      | 60   |      | pF            |
| Output capacitance: (NC)                                                                          | $I_F = 5\text{ mA}, V_L = 50\text{ V}$                                 | $C_O$      |      | 60   |      | 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 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 (NO)                                                                                | $I_F = 10\text{ mA}, I_L = 50\text{ mA}$ | $t_{on}$  |      | 1.4  | 3    | ms   |
| Turn-on time (NC)                                                                                | $I_F = 10\text{ mA}, I_L = 50\text{ mA}$ | $t_{on}$  |      | 1.2  | 3    | ms   |
| Turn-off time (NO)                                                                               | $I_F = 10\text{ mA}, I_L = 50\text{ mA}$ | $t_{off}$ |      | 0.7  | 3    | ms   |
| Turn-off time (NC)                                                                               | $I_F = 10\text{ mA}, I_L = 50\text{ mA}$ | $t_{off}$ |      | 2    | 3    | ms   |



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

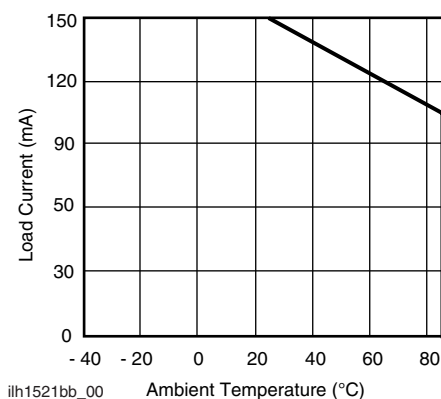


Fig. 1 - Recommended Operating Conditions

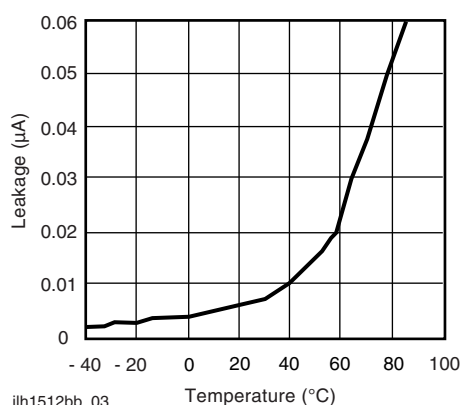


Fig. 4 - Typical Leakage vs. Temperature  
(Measured across Pin 5 and 6 or 7 and 8)

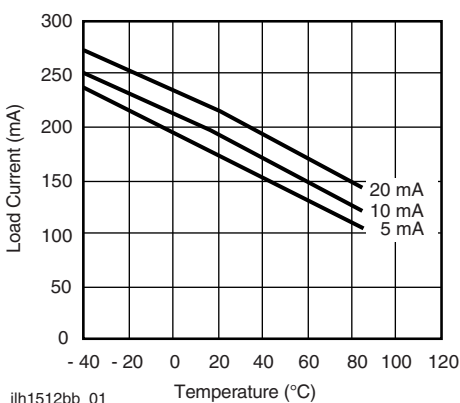


Fig. 2 - Form A Typical Load Current vs. Temperature

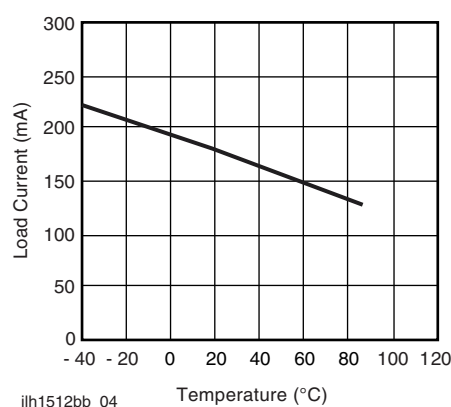


Fig. 5 - Form B Typical Load Current vs. Temperature

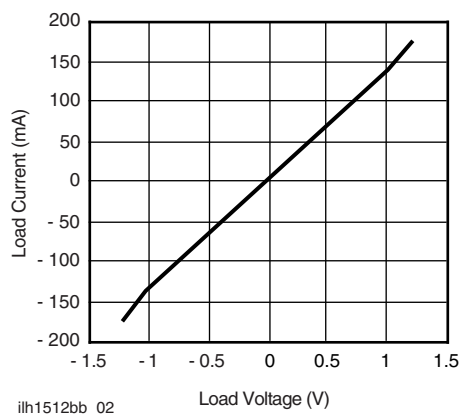


Fig. 3 - Form A Typical Load Current vs. Load Voltage

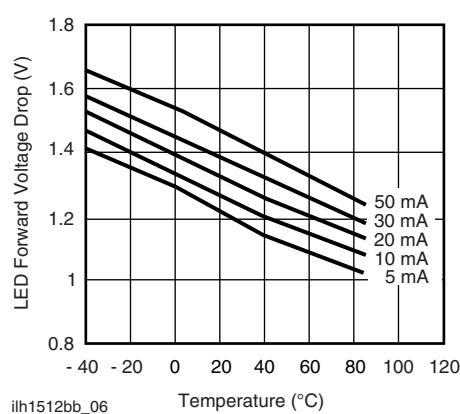


Fig. 6 - Typical LED Forward Voltage Drop vs. Temperature

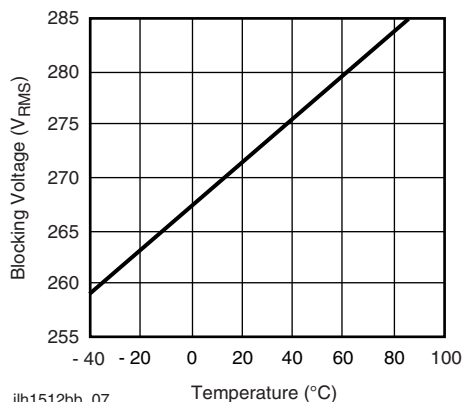


Fig. 7 - Form A Typical Blocking Voltage vs. Temperature

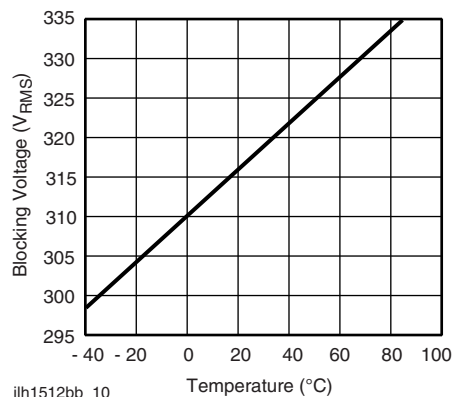


Fig. 10 - Form B Typical Blocking Voltage vs. Temperature

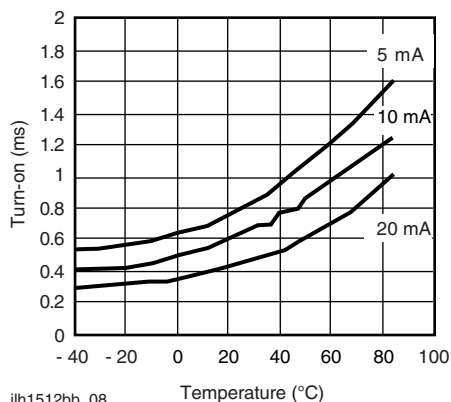


Fig. 8 - Form A Typical Turn-On vs. Temperature

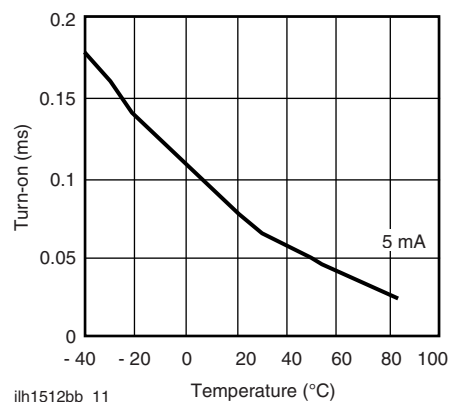


Fig. 11 - Form B Typical Turn-On vs. Temperature

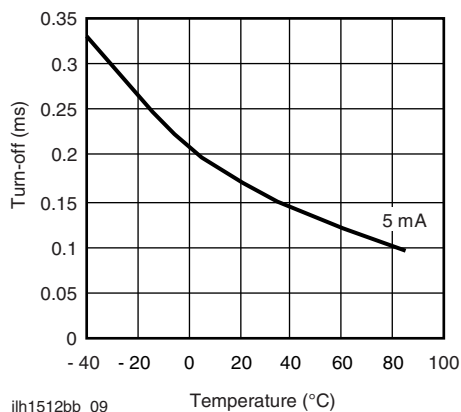


Fig. 9 - Form A Typical Turn-Off vs. Temperature

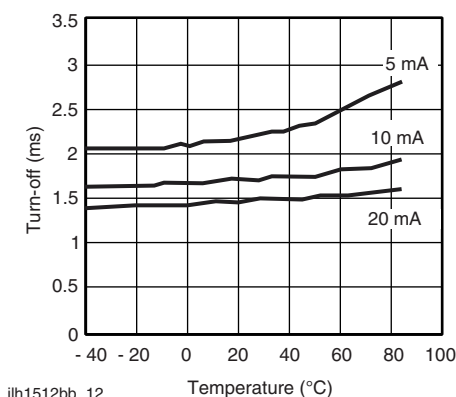
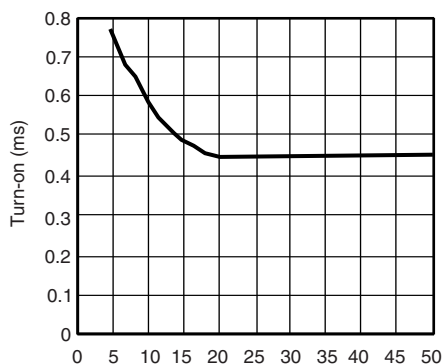
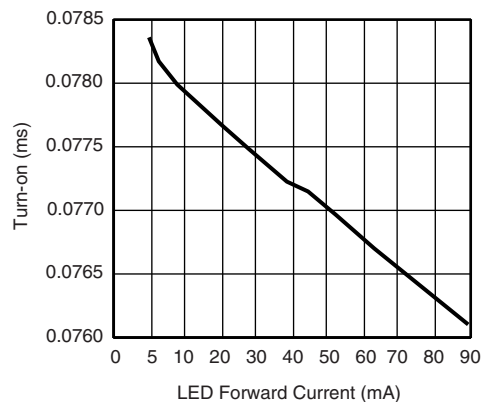


Fig. 12 - Form B Typical Turn-Off vs. Temperature



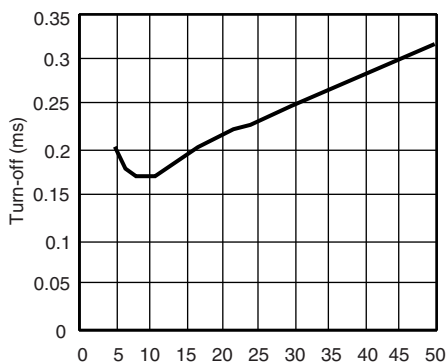
ilh1512bb\_13 LED Forward Current (mA)

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



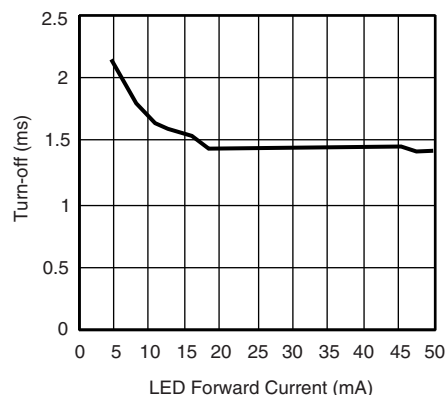
ilh1512bb\_16

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



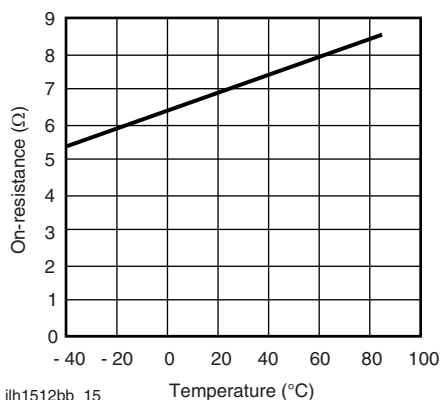
ilh1512bb\_14 LED Forward Current (mA)

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



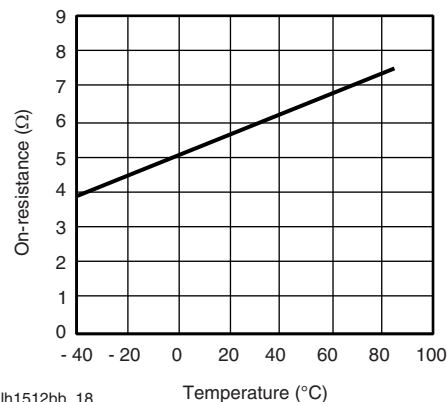
ilh1512bb\_17

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



ilh1512bb\_15

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



ilh1512bb\_18

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

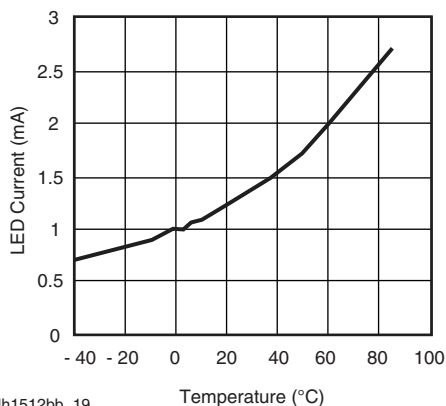


Fig. 19 - Form A Typical  $I_F$  for Switch Operation vs. Temperature

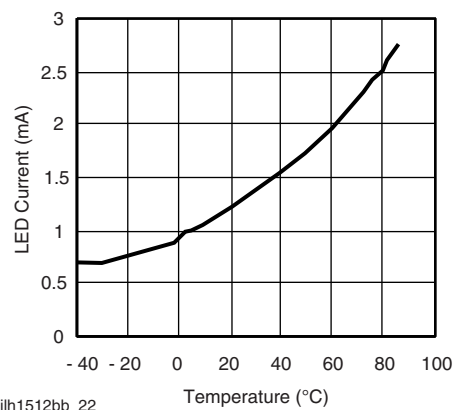


Fig. 22 - Form B Typical  $I_F$  for Switch Dropout vs. Temperature

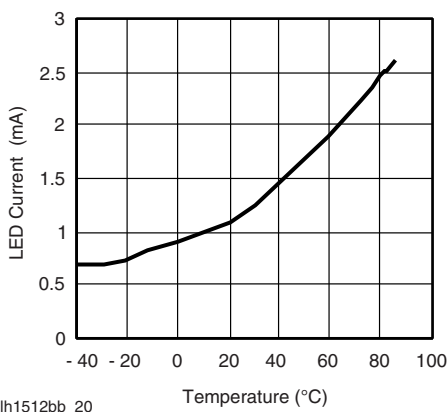


Fig. 20 - Form A Typical  $I_F$  for Switch Dropout vs. Temperature

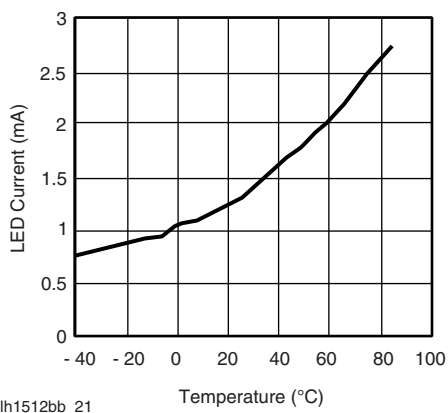
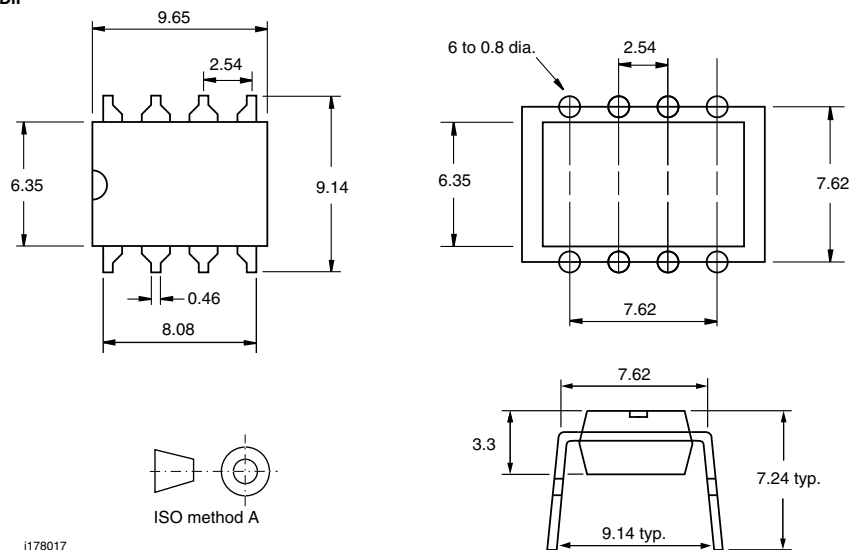


Fig. 21 - Form B Typical  $I_F$  for Switch Operation vs. Temperature

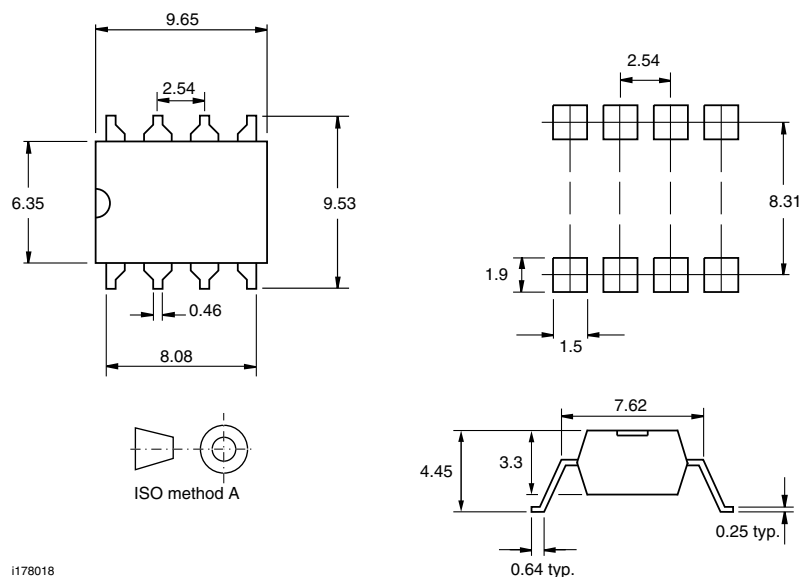


## PACKAGE DIMENSIONS in millimeters

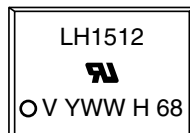
### DIP



### SMD



## PACKAGE MARKING (example)



### Note

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



## Disclaimer

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