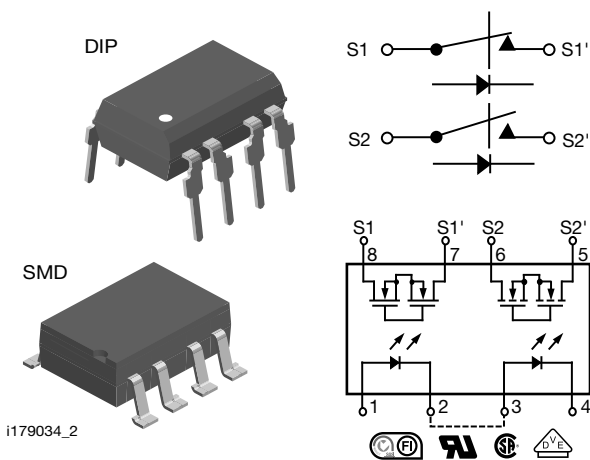


## Dual 1 Form A/B, C Solid-State Relay



### 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

### AGENCY APPROVALS

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

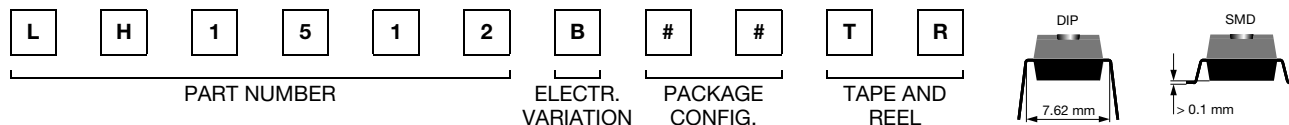
### LINKS TO ADDITIONAL RESOURCES



### 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.

### 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) (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) 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 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ , 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<sub>amb</sub> = 25 °C, unless otherwise specified)

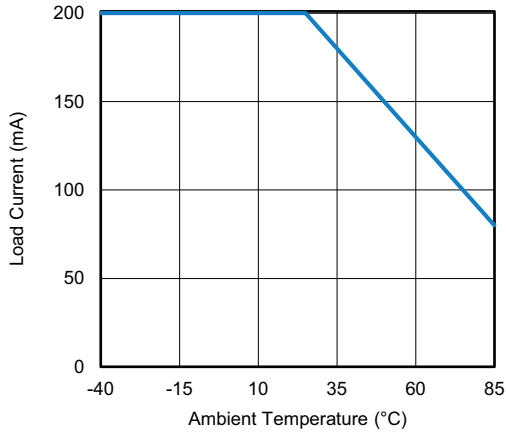


Fig. 1 - Maximum Load Current vs. Ambient Temperature

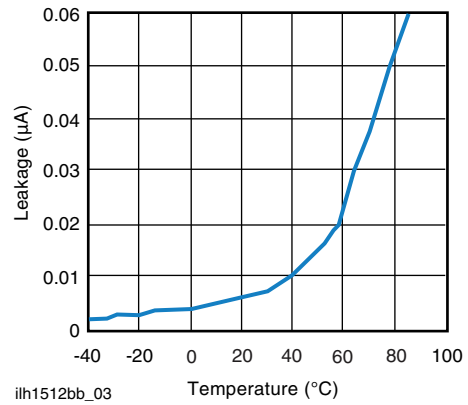


Fig. 4 - Typical Leakage vs. Temperature (Measured across Pin 5 and 6 or 7 and 8)

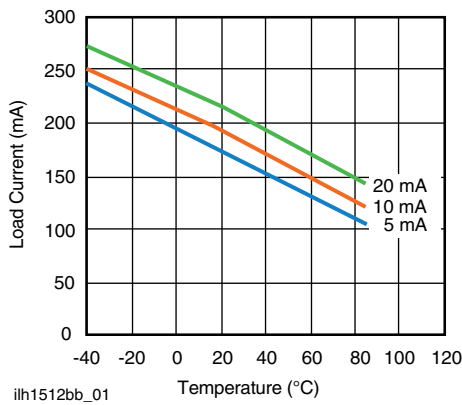


Fig. 2 - Form A Typical Load Current vs. Temperature

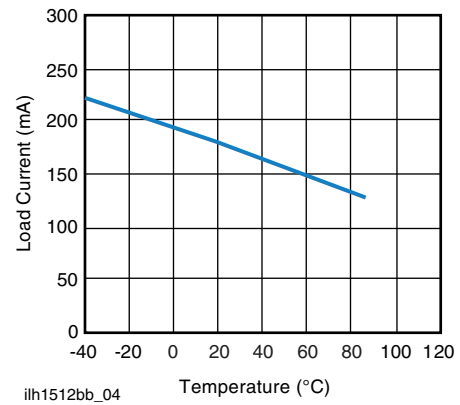


Fig. 5 - Form B Typical Load Current vs. Temperature

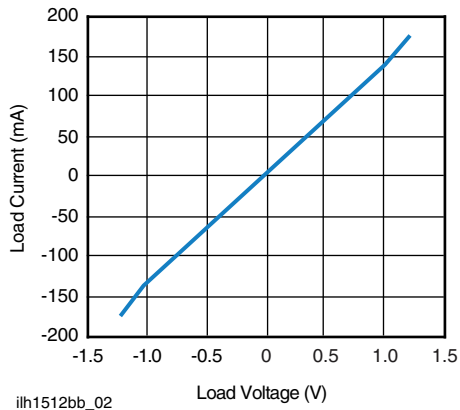


Fig. 3 - Form A Typical Load Current vs. Load Voltage

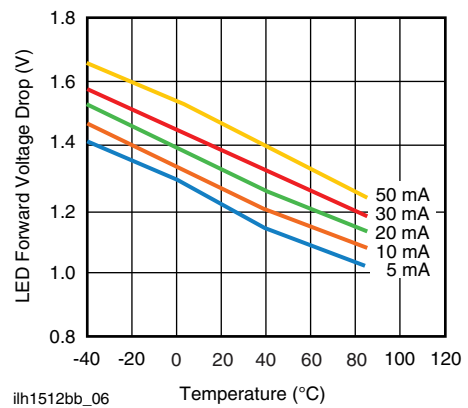


Fig. 6 - Typical LED Forward Voltage Drop vs. Temperature

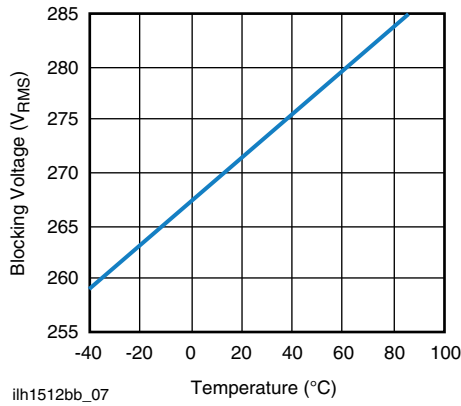


Fig. 7 - Form A Typical Blocking Voltage vs. Temperature

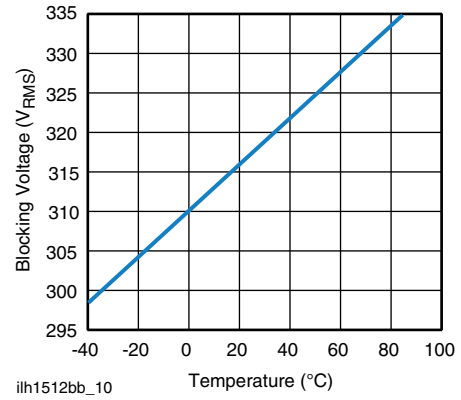


Fig. 10 - Form B Typical Blocking Voltage vs. Temperature

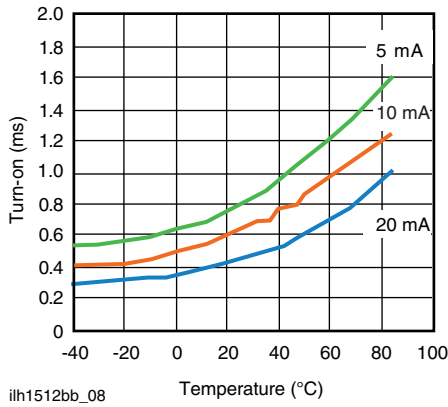


Fig. 8 - Form A Typical Turn-On vs. Temperature

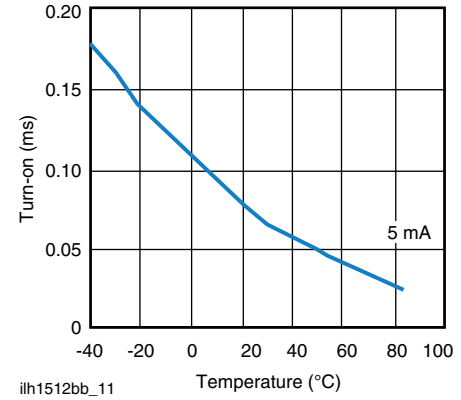


Fig. 11 - Form B Typical Turn-On vs. Temperature

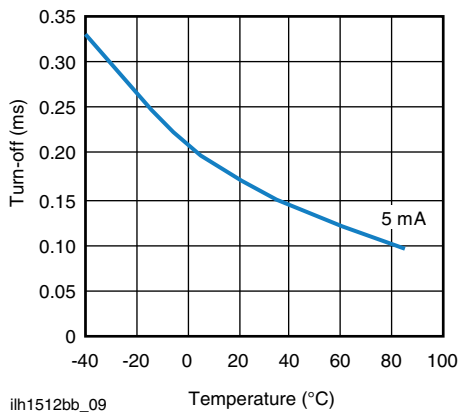


Fig. 9 - Form A Typical Turn-Off vs. Temperature

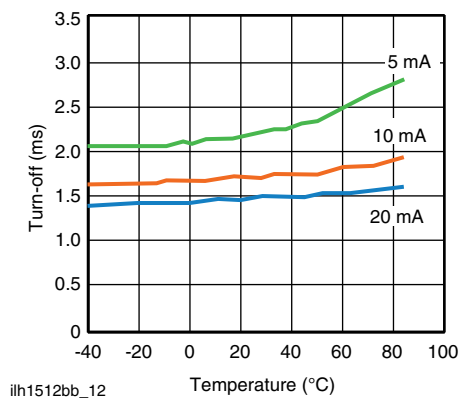


Fig. 12 - Form B Typical Turn-Off vs. Temperature

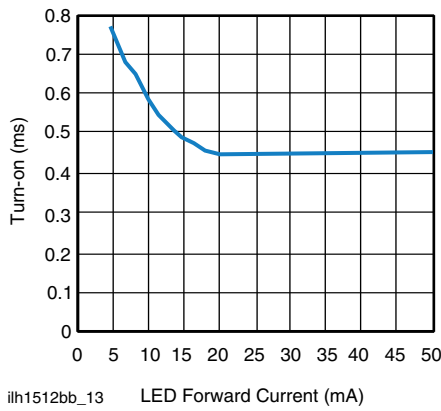


Fig. 13 - Form A Typical Turn-On vs. LED Forward Current

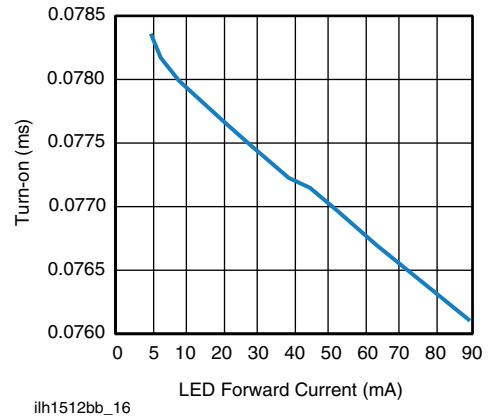


Fig. 16 - Form B Typical Turn-On vs. LED Forward Current

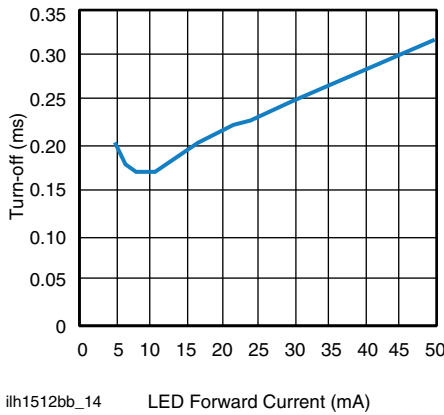


Fig. 14 - Form A Typical Turn-Off vs. LED Forward Current

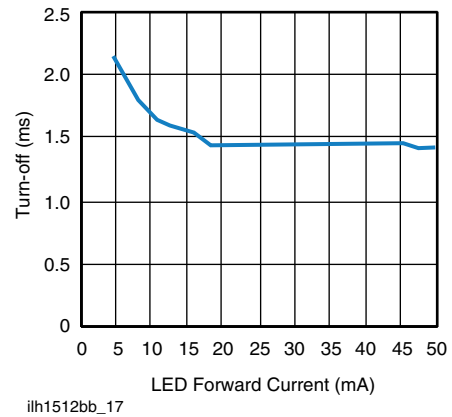


Fig. 17 - Form B Typical Turn-Off vs. LED Forward Current

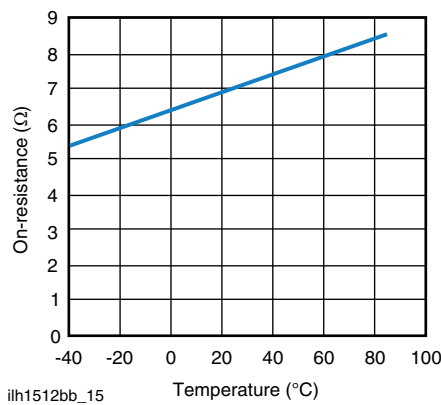


Fig. 15 - Form A Typical On-Resistance vs. Temperature

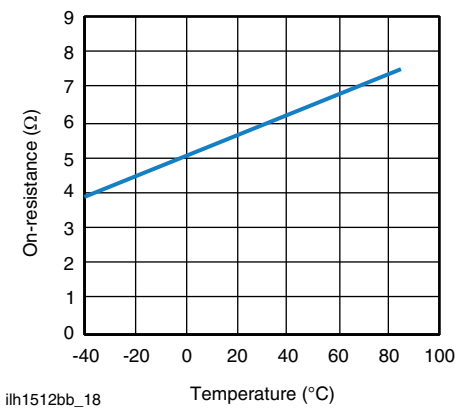
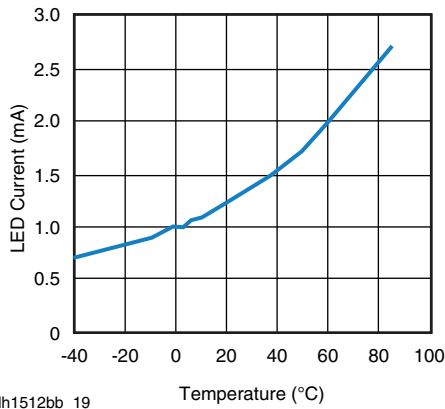


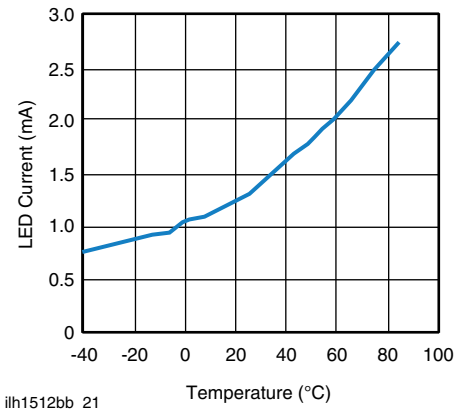
Fig. 18 - Form B Typical On-Resistance vs. Temperature



ilh1512bb\_19

Temperature (°C)

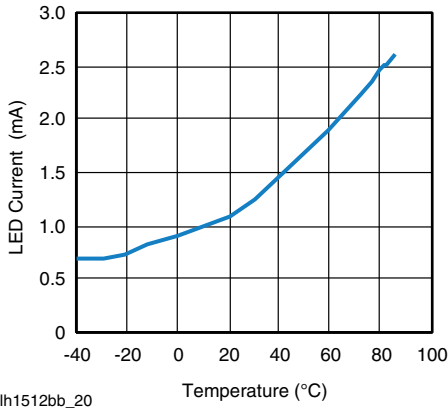
Fig. 19 - Form A Typical  $I_F$  for Switch Operation vs. Temperature



ilh1512bb\_21

Temperature (°C)

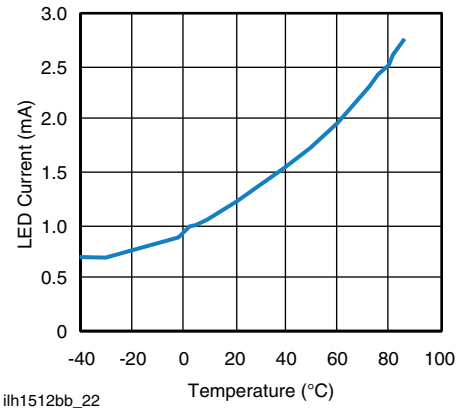
Fig. 21 - Form B Typical  $I_F$  for Switch Operation vs. Temperature



ilh1512bb\_20

Temperature (°C)

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



ilh1512bb\_22

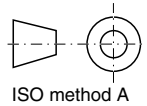
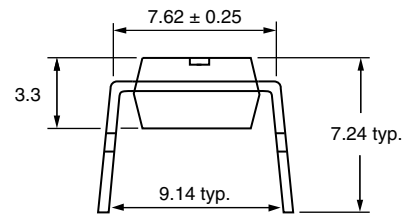
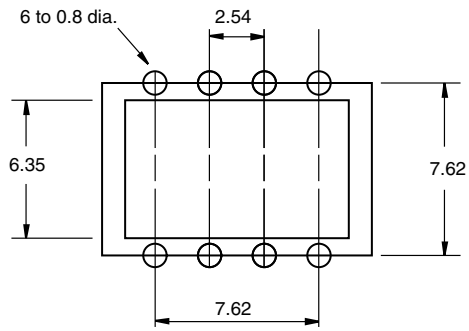
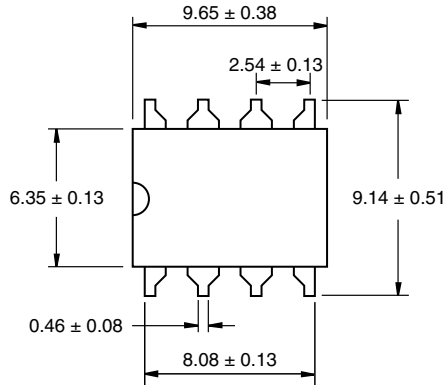
Temperature (°C)

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



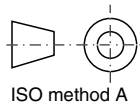
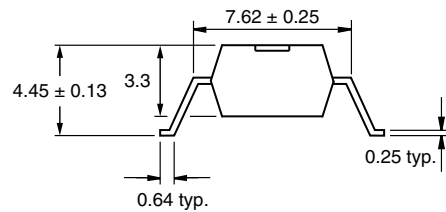
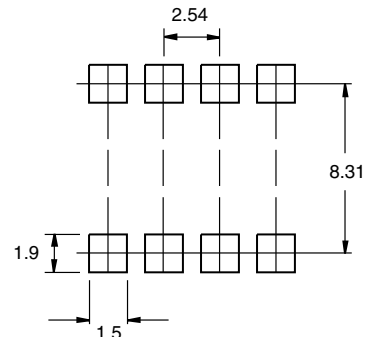
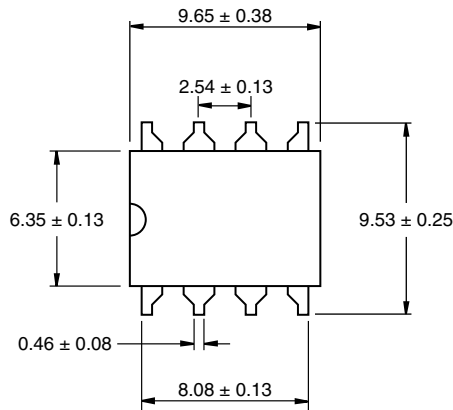
## PACKAGE DIMENSIONS in millimeters

### DIP



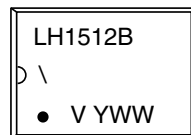
i178017

### SMD



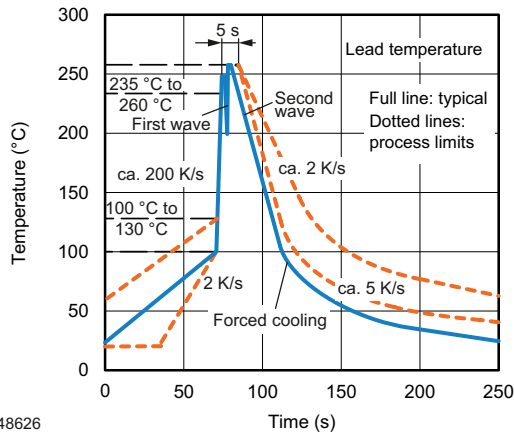
i178018

## PACKAGE MARKING (example)



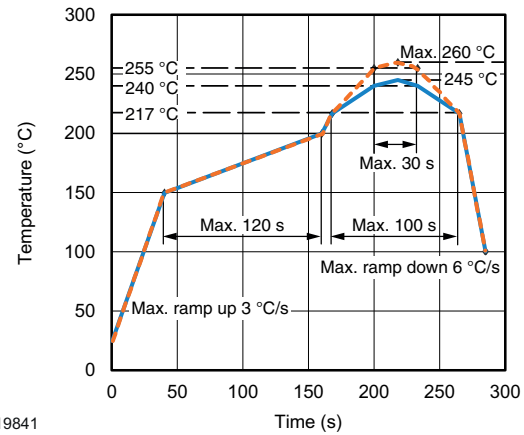
### Note

- 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:  $T_{amb} < 30\text{ }^{\circ}\text{C}$ , RH < 85 %

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





## Footprint and Schematic Information for LH1512BAC, LH1512BACTR, LH1512BB

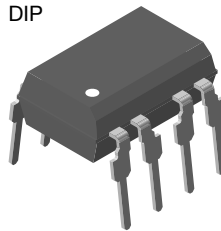
The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

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

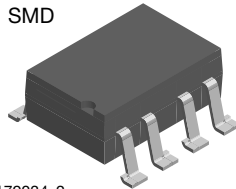
PART NUMBER	FOOTPRINT / SCHEMATIC
LH1512BAC	<a href="http://www.snapeda.com/parts/LH1512BAC/Vishay/view-part">www.snapeda.com/parts/LH1512BAC/Vishay/view-part</a>
LH1512BACTR	<a href="http://www.snapeda.com/parts/LH1512BACTR/Vishay/view-part">www.snapeda.com/parts/LH1512BACTR/Vishay/view-part</a>
LH1512BB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