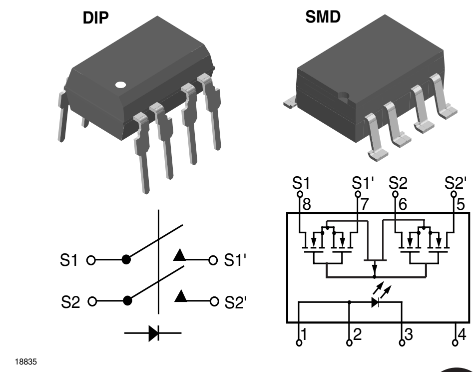
2 Form A Solid State Relay



Features

- Load Voltage, 15 V
- Load Current, 150 mA
- Isolation Test Voltage 5300 V_{RMS}
- Switching Capability up to 50 MHz
- Blocking Capability Dependent upon Signal dv/dt
- Low and Typical R_{ON} 5.0 Ω
- 1.0 ms Actuation Time
- Low Power Consumption
- Balanced Switching
- Clean, Bounce-free Switching

- Surface-mountable
- Lead-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC

Agency Approvals

- UL1577, File No. E52744 System Code H or J, Double Protection
- CSA - Certification 093751
- DIN EN 60747-5-2 (VDE0884)
  DIN EN 60747-5-5 pending

Applications

Protection Switching (T1 sparing)
- Digital Access Cross Connects
- D-type Channel Breaks
- Intraoffice Data Routing

Transmission Switching
- T1 Multiplexing
- DSO (64 Kbit/s)
- DS1 (1.544 Mbit/s)
- E1, DS1A (2.048 Mbit/s)
- DS1C (3.152 Mbit/s)
- DS2 (6.312 Mbit/s)

Instrumentation
- Scanners
- Testers
- Measurement Equipment

See T1 Switching with the LH1514 Solid State Relay (Appnote 67)

Description

The LH1514 is a DPST normally open (2 Form A) SSR that can be used in balanced high-frequency applications like T1 switching. With its low ON-resistance and high actuation rate, the LH1514 is also very attractive as a general-purpose 2 Form A SSR for balanced signals.

The relays are constructed using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die, fabricated in a dielectrically isolated Smart Power BiCMOS, is comprised of a photodiode array, switch control circuitry, and NMOS switches.

In balanced switching applications, internal circuitry shunts high-frequency signals between two poles when the SSR is off. This balanced T termination technique provides high isolation for the load.

Order Information

Part	Remarks
LH1514AAC	Gullwing, Tubes, SMD-8
LH1514AACTR	Gullwing, Tape and Reel, SMD-8
LH1514AB	Tubes, DIP-8

Absolute Maximum Ratings, T_{amb} = 25 °C

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 time can adversely affect reliability.

SSR

Parameter	Test condition	Symbol	Value	Unit
LED input ratings: continuous forward current		I_F	50	mA
LED input ratings: reverse voltage	$I_R \leq 10\ \mu A$	V_R	10	V
Output operation: dc or peak ac load voltage	$I_L \leq 1.0\ \mu A$	V_L	15	V
Output operation: continuous dc load current, each pole, two poles operating simultaneously		I_L	150	mA
Ambient operating temperature range		T_{amb}	- 40 to + 85	°C
Storage temperature range		T_{stg}	- 40 to + 150	°C
Pin soldering temperature	t = 10 s max	T_{sld}	260	°C
Input/output isolation voltage		V_{ISO}	5300	V_{RMS}
Power dissipation		P_{diss}	600	mW

Electrical Characteristics, T_{amb} = 25 °C

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.

Input

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
LED forward current, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}		2.0	3.0	mA
LED forward current, switch turn-off	V_L = ± 10 V	I_{Foff}	0.2	1.8		mA
LED Forward voltage	I_F = 10 mA	V_F	1.15	1.26	1.45	V

Output

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
ON-resistance	I_F = 10 mA, I_L = ± 50 mA	R_{ON}	2.0	3.0	5.0	Ω
Pole-to-pole ON-resistance matching (S1 to S2)	I_F = 10 mA, I_L = ± 50 mA			0.2	1.0	DΩ
Output off-state bleed-through[1)]	f = 1.5 MHz square wave t_r/t_f = 5.0 ns (see Figure 13.)			70	100	mV_{peak}
Output off-state leakage	I_F = 0 mA, V_L = ± 5.0 V	I_O		3×10^{-12}	200×10^{-9}	A
	I_F = 0 mA, V_L = ± 15 V	I_O		20×10^{-12}	1.0×10^{-6}	A
Output off-state leakage pole-to-pole	I_F = 10 mA, Pins 7, 8 ± 3.0 V, Pins 5, 6 Gnd	I_O		1.0	5.0	µA
	Pins 7, 8 ± 15 V, Pins 5, 6 Gnd	I_O		2.0	50	µA
Output capacitance Pins 5 to 6, 7 to 8	I_F = 0 mA, V_L = 0 V	C_O		20		pF
Pole-to-pole capacitance (S1 to S2)	I_F = 0 mA, V_L = 0 V			20		pF
	I_F = 10 mA, V_L = 0 V			50		pF

1) Guaranteed by component measurement during wafer probe.

Transfer

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
Turn-on time	I_F = 10 mA, I_L = 20 mA	t_{on}		0.4	1.0	ms
Turn-off time	I_F = 10 mA, I_L = 20 mA	t_{off}		0.6	1.0	ms

Recommended Operating Conditions

Parameter	Test condition	Symbol	Min	Typ.	Max	Unit
LED forward current for switch turn-on	T_{amb} = - 40 °C to + 85 °C	I_{Fon}	10		20	mA

Typical Characteristics (Tamb = 25 °C unless otherwise specified)

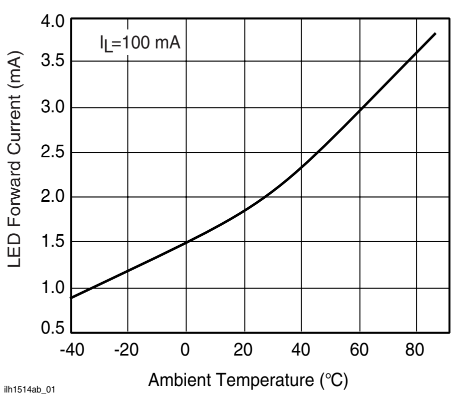


Figure 1. LED Forward Current for Switch Turn-on/off

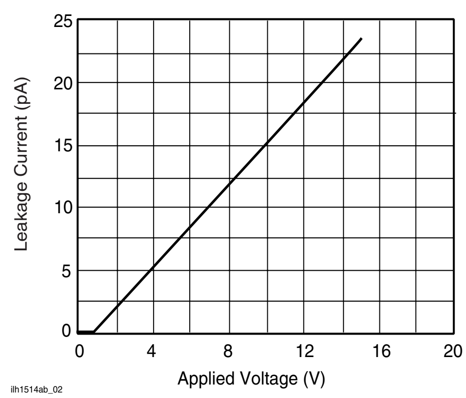


Figure 2. Leakage Current vs. Applied Voltage

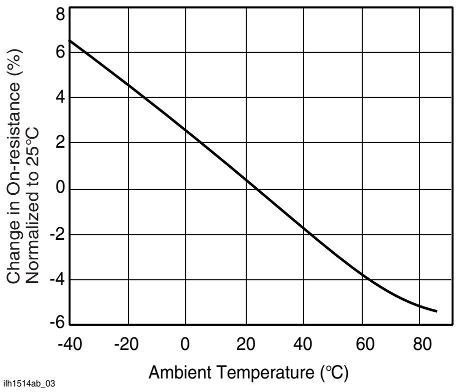


Figure 3. ON-Resistance vs. Temperature

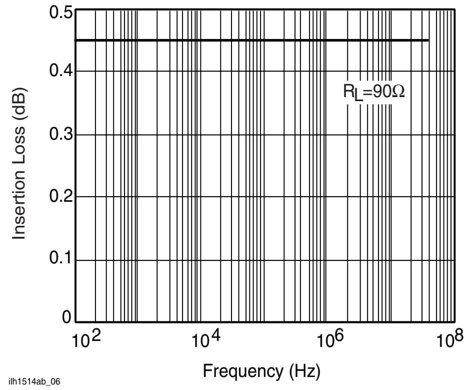


Figure 6. Insertion Loss (per Pole) vs. Frequency

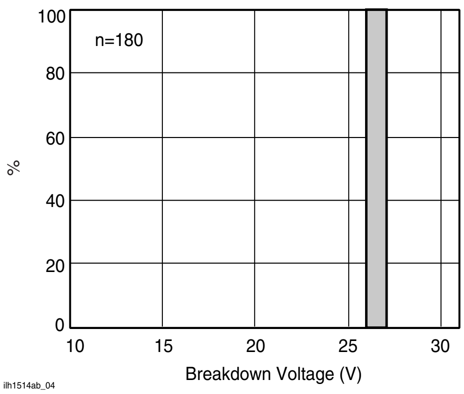


Figure 4. Breakdown Voltage Distribution Typical

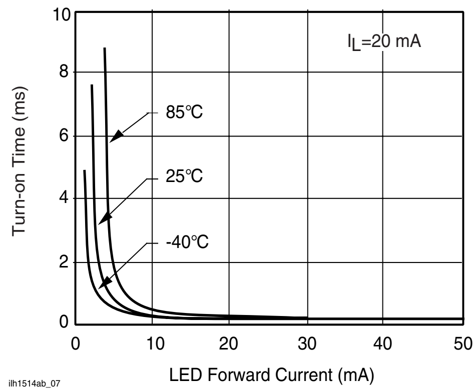


Figure 7. t_{on} vs. LED Forward Current

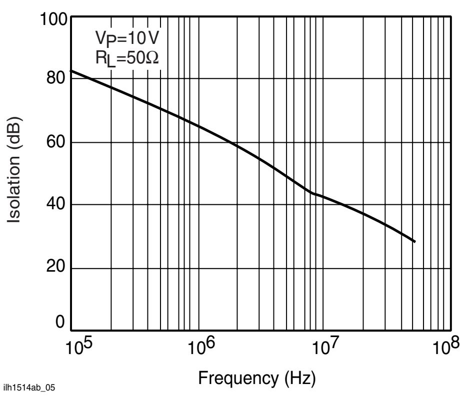


Figure 5. Output Isolation

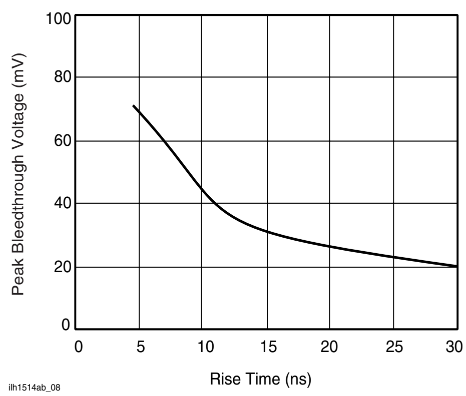


Figure 8. Bleed-through Voltage vs. Rise Time

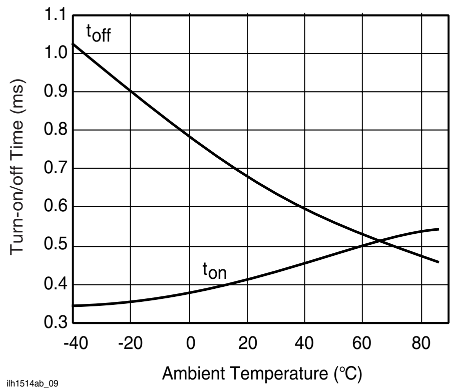


Figure 9. t_{on}/t_{off} vs. Temperature

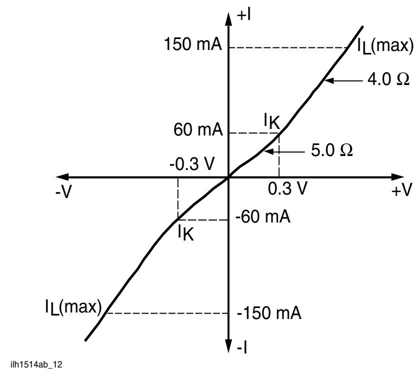


Figure 12. Typical ON Characteristics

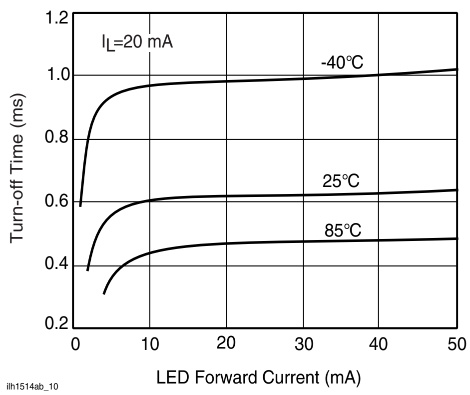


Figure 10. t_{off} vs. LED Forward Current

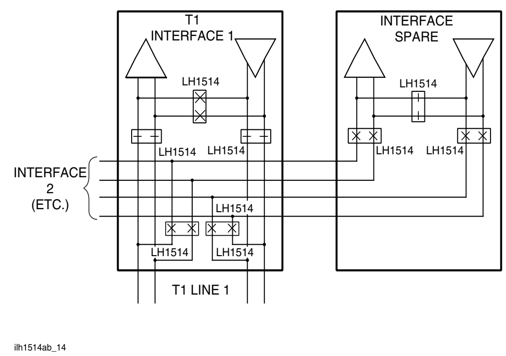


Figure 13. Protection Switching Application: T1 Interface Operating; Spare in Test Loopback Mode

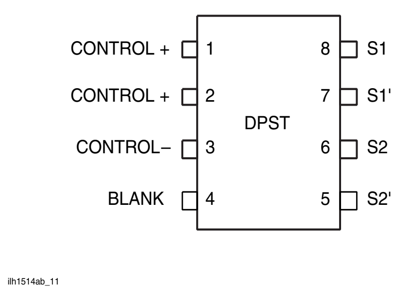


Figure 11. Pin Diagram and Pin Outs

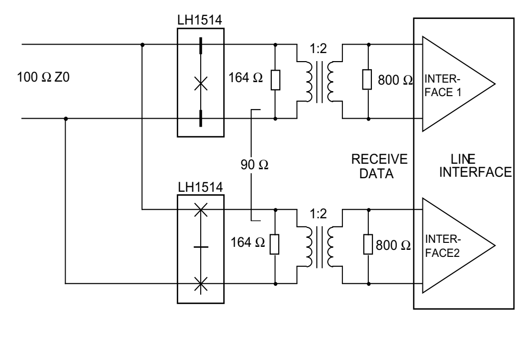
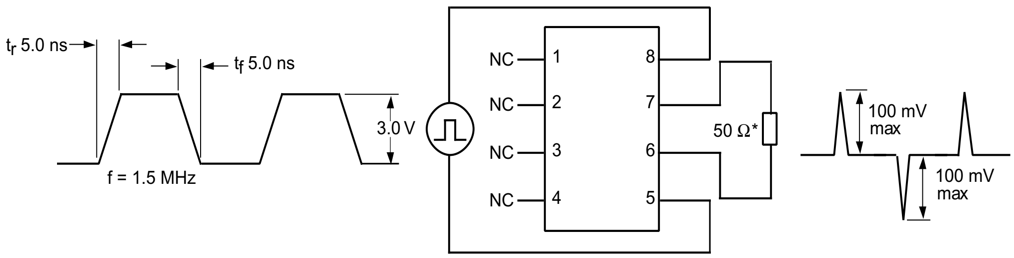


Figure 14. Multiplex Receive Data (Interface 1, Operating) Features



* 50 Ω load is derived from T1 applications wher e a 100 Ω load is paralleled with a 100 Ω line.

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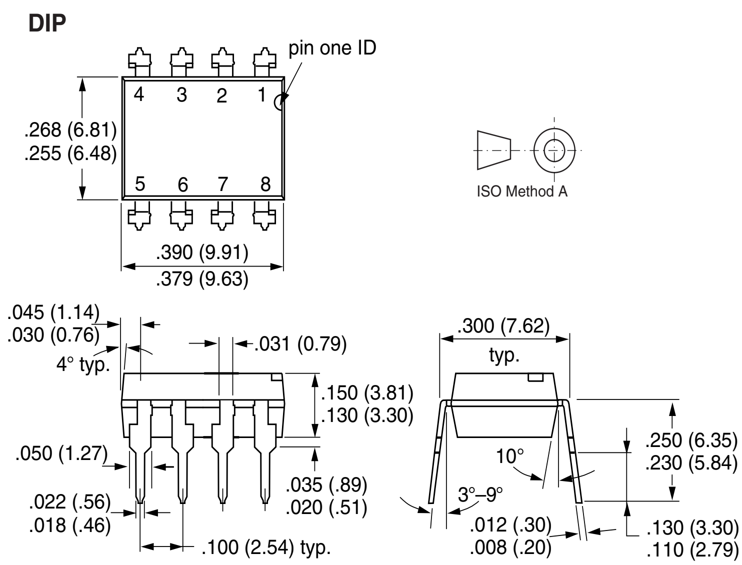
Figure 15. Off-state Bleed-through

Package Dimensions in Inches (mm)



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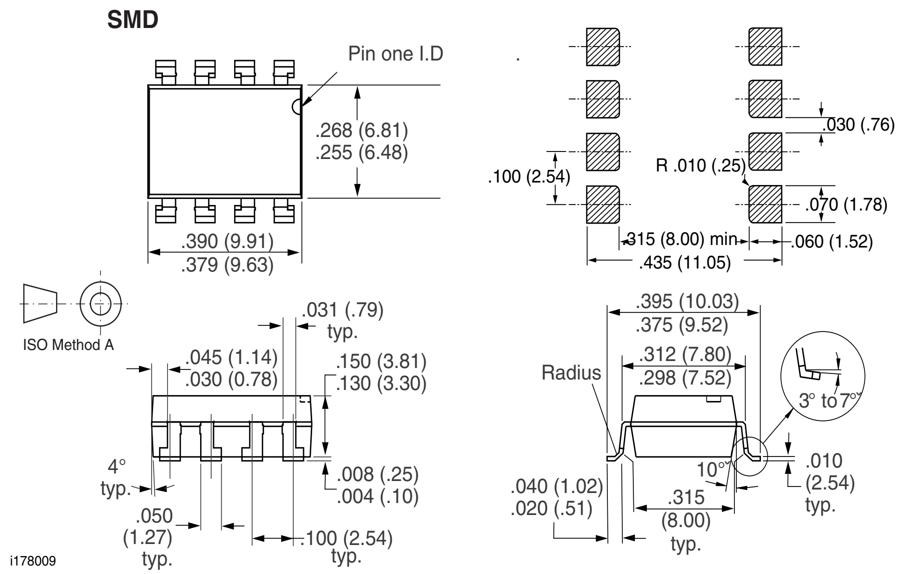
Package Dimensions in Inches (mm)



Ozone Depleting Substances Policy Statement

It is the policy of Vishay Semiconductor GmbH to

1. Meet all present and future national and international statutory requirements.
2. Regularly and continuously improve the performance of our products, processes, distribution and operatingsystems with respect to their impact on the health and safety of our employees and the public, as well as their impact on the environment.

It is particular concern to control or eliminate releases of those substances into the atmosphere which are known as ozone depleting substances (ODSs).

The Montreal Protocol (1987) and its London Amendments (1990) intend to severely restrict the use of ODSs and forbid their use within the next ten years. Various national and international initiatives are pressing for an earlier ban on these substances.

Vishay Semiconductor GmbH has been able to use its policy of continuous improvements to eliminate the use of ODSs listed in the following documents.

1. Annex A, B and list of transitional substances of the Montreal Protocol and the London Amendments respectively
2. Class I and II ozone depleting substances in the Clean Air Act Amendments of 1990 by the Environmental Protection Agency (EPA) in the USA
3. Council Decision 88/540/EEC and 91/690/EEC Annex A, B and C (transitional substances) respectively.

Vishay Semiconductor GmbH can certify that our semiconductors are not manufactured with ozone depleting substances and do not contain such substances.

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