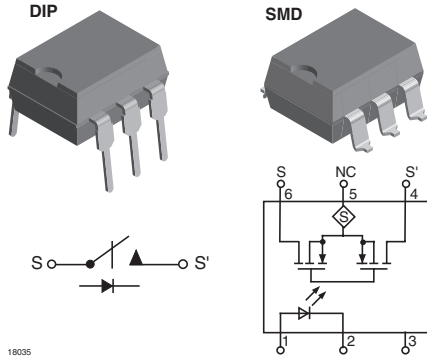


## 1 Form A Solid State Relay (Low Capacitance)



### FEATURES

- Low capacitance switch (5.0 pF)
- Isolation test voltage 5300 V<sub>RMS</sub>
- Extremely high off-resistance (100 GΩ)
- Load voltage 200 V
- Clean bounce free switching
- Low power consumption
- High reliability monolithic receptor
- Lead (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



**RoHS**  
COMPLIANT

### DESCRIPTION

These SSRs (LH1541, 1 form A) are SPST normally open switches which can replace electromechanical relays in many applications. The relays provide a low capacitance, high-voltage switch contact with high off resistance and low switch-offset voltage. These characteristics, combined with high-speed actuation, result in an SSR which is ideal for small signal and DC instrumentation applications.

The relays are constructed by using a GaAlAs LED for actuation control and an integrated monolithic die for the switch output. The die is comprised of a photodiode array, switch-control circuitry, and low-capacitance MOSFET switches.

### APPLICATIONS

- Instrumentation
  - Thermocouple switching
  - Analog multiplexing
- Reed relay replacement
- Programmable logic controllers
- Data acquisition
- Test equipment

### AGENCY APPROVALS

- UL1577: file no. E52744 system code H or J, double protection
- CSA: certification no. 093751
- BSI/BABT: certification no. 7980
- DIN EN: 60747-5-5 (VDE 0884)
- FIMKO: approval

ORDER INFORMATION		
PART	REMARKS	PACKAGE
LH1541AAB1	Tubes	SMD-6
LH1541AAB1TR	Tape and reel	SMD-6
LH1541AT1	Tubes	DIP-6

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>SSR</b>				
LED continuous forward current		I <sub>F</sub>	50	mA
LED reverse voltage	I <sub>R</sub> ≤ 10 μA	V <sub>R</sub>	8.0	V
DC or peak AC load voltage	I <sub>L</sub> ≤ 50 μA	V <sub>L</sub>	200	V
Continuous DC load current - bidirectional operation		I <sub>L</sub>	55	mA
Peak load current (single shot)	t = 100 ms	I <sub>P</sub>	100	mA
Ambient temperature range		T <sub>amb</sub>	- 40 to + 85	°C

# LH1541AAB1/LH1541AAB1TR/LH1541AT1



Vishay Semiconductors 1 Form A Solid State Relay (Low Capacitance)

ABSOLUTE MAXIMUM RATINGS <sup>(1)</sup>				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
<b>SSR</b>				
Storage temperature range		T <sub>stg</sub>	- 40 to + 150	°C
Pin soldering temperature <sup>(2)</sup>	t = 10 s max.	T <sub>sld</sub>	260	°C
Input to output isolation voltage		V <sub>ISO</sub>	5300	V <sub>RMS</sub>
Output power dissipation (continuous)		P <sub>diss</sub>	550	mW

## Notes

<sup>(1)</sup> T<sub>amb</sub> = 25 °C, unless otherwise specified.

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.

<sup>(2)</sup> 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						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
<b>INPUT</b>						
LED forward current, switch turn-on	I <sub>L</sub> = 100 mA, t = 10 ms	I <sub>Fon</sub>		0.6	2.0	mA
LED forward current, switch turn-off	V <sub>L</sub> = ± 150 V	I <sub>Foff</sub>	0.1	0.5		mA
LED forward voltage	I <sub>F</sub> = 5.0 mA	V <sub>F</sub>	1.1	1.26	1.45	V
<b>OUTPUT</b>						
On-resistance, AC/DC, pin 4 (±) to 6 (±)	I <sub>F</sub> = 5.0 mA, I <sub>L</sub> = 50 mA	R <sub>ON</sub>	70	110	160	Ω
Off-resistance	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V	R <sub>OFF</sub>	0.5	250		GΩ
Off-state leakage current	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 100 V	I <sub>O</sub>		0.4	200	nA
	I <sub>F</sub> = 0 mA, V <sub>L</sub> = ± 200 V	I <sub>O</sub>			1.0	μA
Output capacitance pin 4 to 6	I <sub>F</sub> = 0 mA, V <sub>L</sub> = 1.0 V	C <sub>O</sub>		4.8		pF
	I <sub>F</sub> = 0 mA, V <sub>L</sub> = 50 V	C <sub>O</sub>		36		pF
Switch offset	I <sub>F</sub> = 5.0 mA	V <sub>OS</sub>		0.15		μV
<b>TRANSFER</b>						
Capacitance (input to output)	V <sub>ISO</sub> = 1.0 V	C <sub>IO</sub>		0.8		pF
Turn-on time	I <sub>F</sub> = 5.0 mA, I <sub>L</sub> = 50 mA	t <sub>on</sub>		0.2	0.5	ms
Turn-off time	I <sub>F</sub> = 5.0 mA, I <sub>L</sub> = 50 mA	t <sub>off</sub>		0.3	0.5	ms

## Note

T<sub>amb</sub> = 25 °C, unless otherwise specified.

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.



### TYPICAL CHARACTERISTICS

$T_{amb} = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified

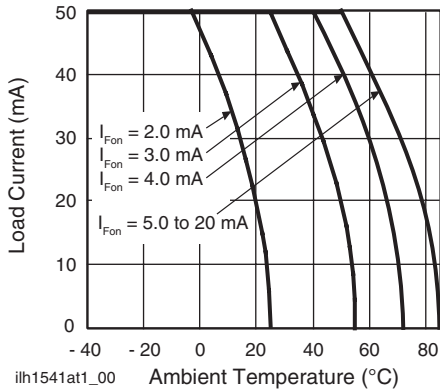


Fig. 1 - Recommended Operating Conditions

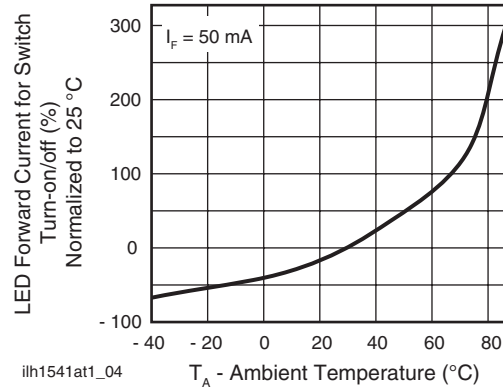


Fig. 4 - LED Current for Switch Turn-on vs. Temperature

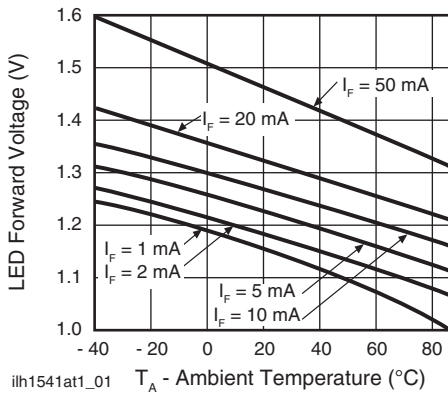


Fig. 2 - LED Voltage vs. Temperature

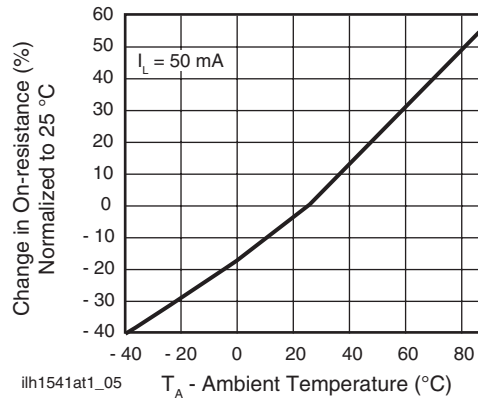


Fig. 5 - On-resistance vs. Temperature

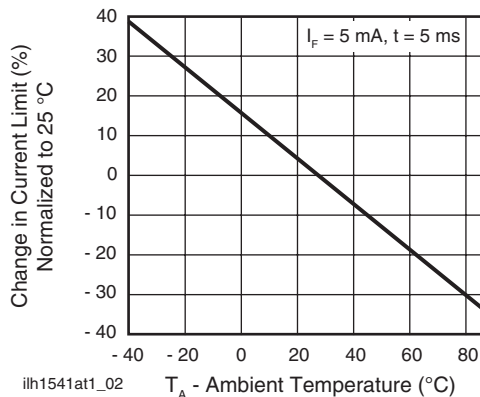


Fig. 3 - Current Limit vs. Temperature

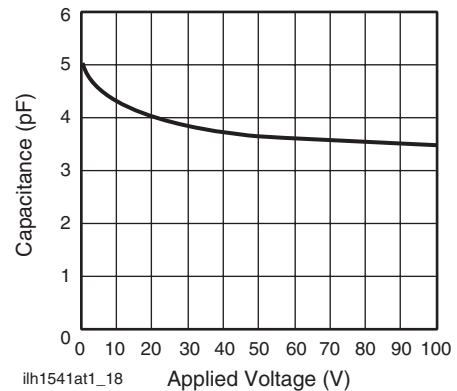


Fig. 6 - Switch Capacitance vs. Applied Voltage

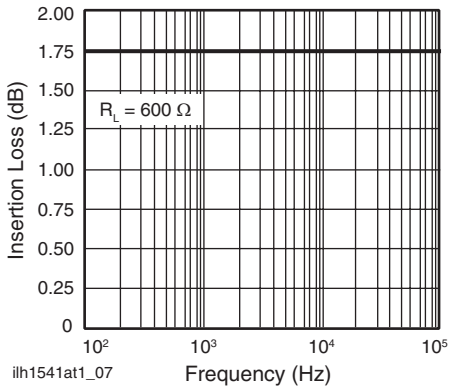


Fig. 7 - Insertion Loss vs. Frequency

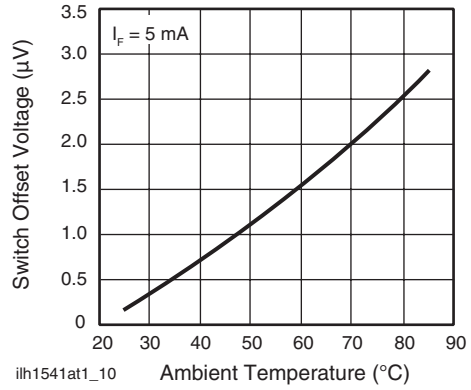


Fig. 10 - Switch Offset Voltage vs. Temperature

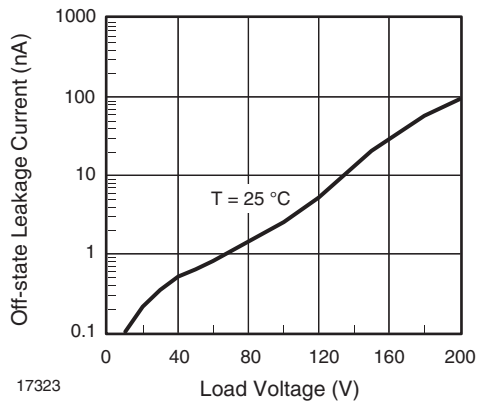


Fig. 8 - Leakage Current vs. Applied Voltage

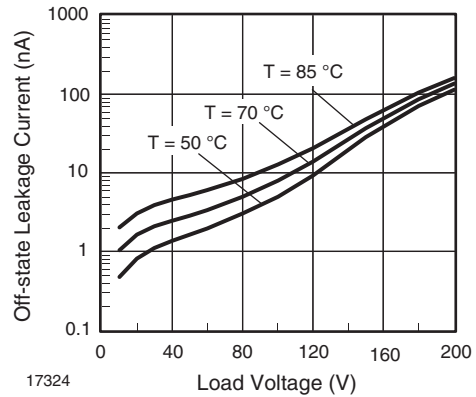


Fig. 11 - Leakage Current vs. Applied Voltage at Elevated Temperatures

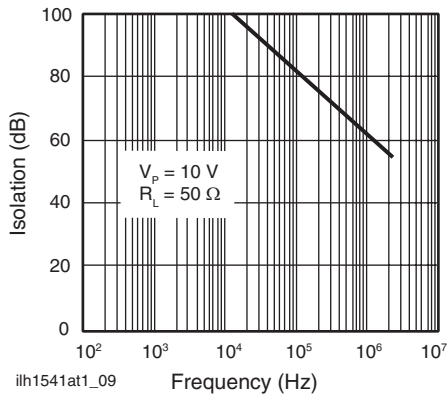


Fig. 9 - Output Isolation

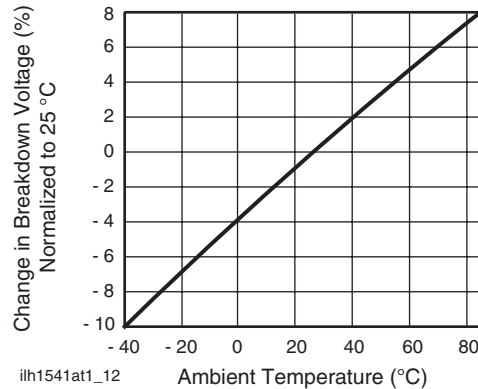


Fig. 12 - Switch Breakdown Voltage vs. Temperature



# LH1541AAB1/LH1541AAB1TR/LH1541AT1

1 Form A Solid State Relay (Low Capacitance)

Vishay Semiconductors

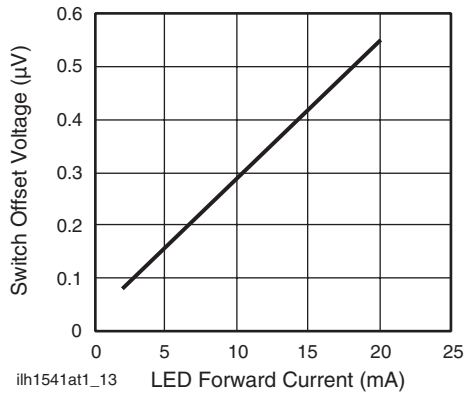


Fig. 13 - Switch Offset Voltage vs. LED Current

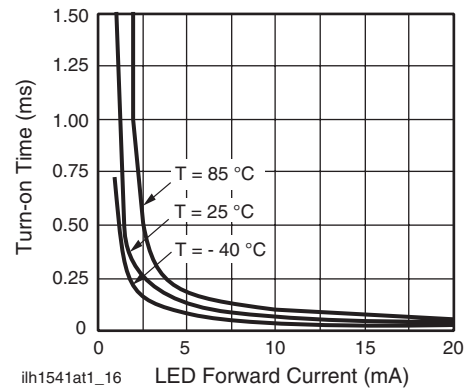


Fig. 16 - Turn-on Time vs. LED Current

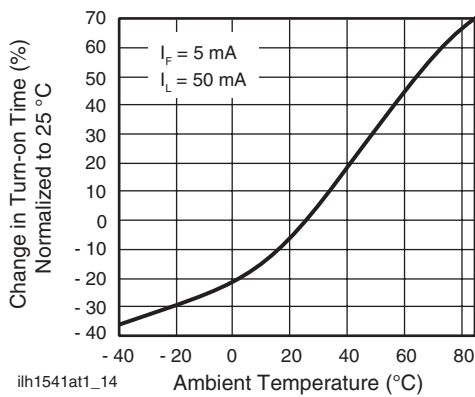


Fig. 14 - Turn-on Time vs. Temperature

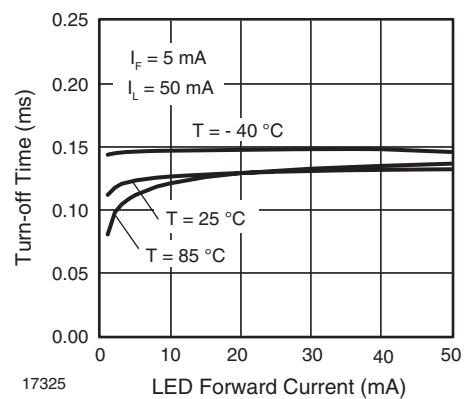


Fig. 17 - Turn-off Time vs. LED Current

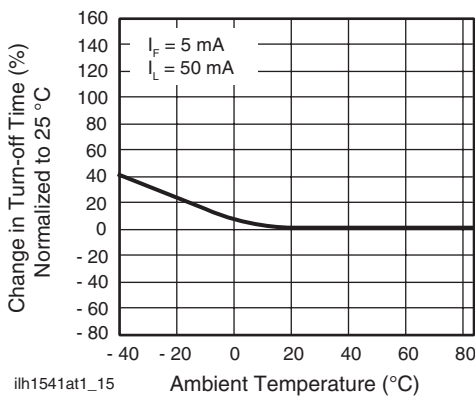


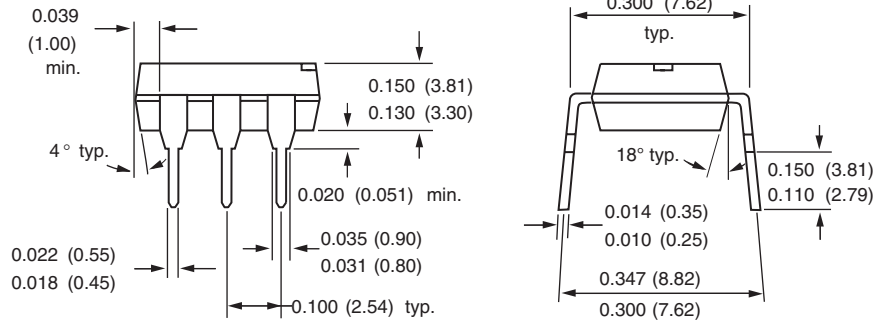
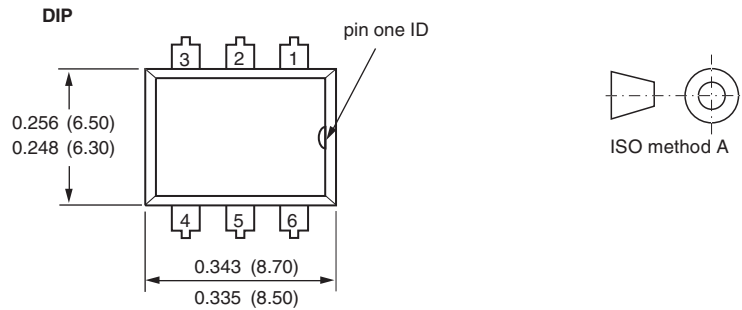
Fig. 15 - Turn-off Time vs. Temperature

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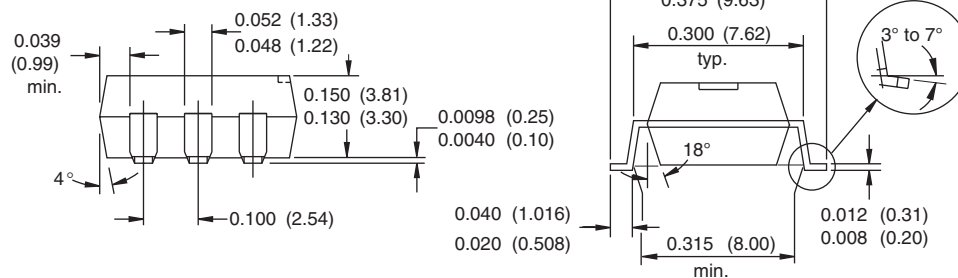
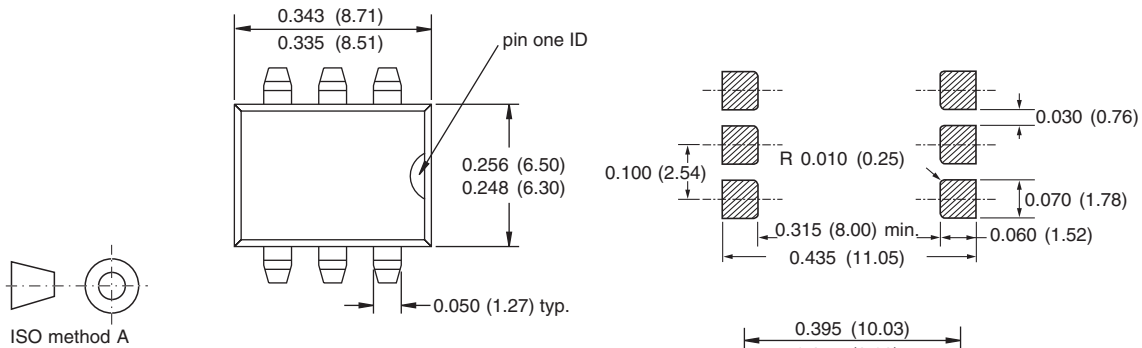
Vishay Semiconductors 1 Form A Solid State Relay (Low Capacitance)

## PACKAGE DIMENSIONS in inches (millimeters)



i178001

## SMD



i178002



## 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 operating systems 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.

We reserve the right to make changes to improve technical design  
and may do so without further notice.

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Vishay Semiconductor GmbH, P.O.B. 3535, D-74025 Heilbronn, Germany



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