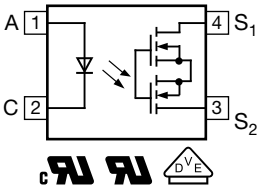
1 Form A Solid-State Relay (Normally Open)



FEATURES

- Isolation test voltage 5300 V_{RMS}
- Typical R_{ON} 22 Ω
- Load voltage 350 V
- Load current 120 mA
- Clean bounce free switching
- Current limit protection
- Low power consumption
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free
RoHS COMPLIANT
HALOGEN FREE
GREEN (5-2008)

LINKS TO ADDITIONAL RESOURCES

Product Page | Design Tools | SPICE Models

DESCRIPTION

The LH1546AD is a single channel solid state relay in a 4 pin SMD package. It is a SPST normally open switch (1 Form A) that replaces electromechanical relays in many applications. It is constructed using a GaAlAs LED for actuation control and MOSFET switches for the output. In addition, it employs current-limiting circuitry to provide overvoltage protection.

APPLICATIONS

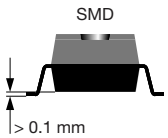
- General telecom switching
- Metering
- Security equipment
- Instrumentation
- Industrial controls
- Battery management systems
- Automatic test equipment

AGENCY APPROVALS

- UL
- cUL
- DIN EN 60747-5-5 (VDE0884-5) available with option 1

ORDERING INFORMATION

L	H	1	5	4	6	A	#	#	T	R
PART NUMBER						ELECTR. VARIATION	PACKAGE CONFIG.		TAPE AND REEL	



PACKAGE	UL
SMD-4, tubes	LH1546ADF
SMD-4, tape and reel	LH1546ADFTR

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
IRED continuous forward current		I_F	50	mA
IRED reverse voltage		V_R	5	V
Input power dissipation		P_{diss}	80	mW
OUTPUT				
DC or peak AC load voltage		V_L	350	V
Continuous DC load current at 25 °C, bidirectional		I_L	120	mA
SSR output power dissipation		P_{diss}	550	mW
SSR				
Ambient temperature range		T_{amb}	-40 to +85	°C
Storage temperature range		T_{stg}	-40 to +150	°C
Soldering temperature	t = 10 s max.	T_{sld}	260	°C

Note

- 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.

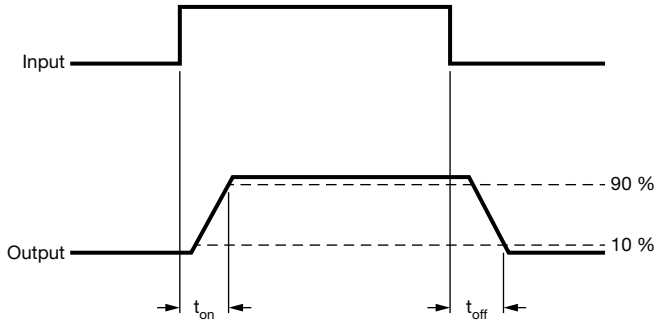
ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT						
IRED forward current, switch turn-on	I_L = 100 mA, t = 10 ms	I_{Fon}	-	0.25	2	mA
IRED forward current, switch turn-off	V_L = ± 350 V, I_L < 1 µA	I_{Foff}	0.05	0.15	-	mA
IRED forward voltage	I_F = 10 mA	V_F	-	1.36	1.45	V
IRED reverse current	V_R = 5 V	I_R	-	-	10	µA
OUTPUT						
On-resistance, AC/DC: pin 3 (±) to 4 (±)	I_F = 5 mA, I_L = 50 mA	R_{ON}	-	22	35	Ω
Off-resistance	I_F = 0 mA, V_L = ± 100 V	R_{OFF}	0.5	5000	-	GΩ
Off-state leakage current	I_F = 0 mA, V_L = ± 100 V	I_O	-	< 1	200	nA
	I_F = 0 mA, V_L = ± 350 V	I_O	-	6	500	nA
Output capacitance pin 3 to 4	I_F = 0 mA, V_L = 1 V, 1 MHz	C_O	-	39	-	pF
	I_F = 0 mA, V_L = 50 V, 1 MHz	C_O	-	6	-	pF
Current limit AC/DC	I_F = 5 mA, t = 5 ms, V_L = ± 6 V	I_{limit}	170	300	450	mA
TRANSFER						
Capacitance (input to output)	V_{IO} = 1 V	C_{IO}	-	1	-	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 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn-on time	I_F = 5 mA, I_L = 50 mA	t_{on}	-	0.13	3	ms
Turn-off time	I_F = 5 mA, I_L = 50 mA	t_{off}	-	0.05	3	ms

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000



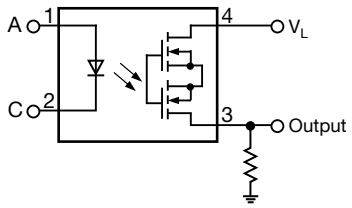


Fig. 1 - Timing Schematic

SAFETY AND INSULATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		40 / 100 / 21	
Pollution degree	According to DIN VDE 0109		2	
Comparative tracking index	Insulation group IIIa	CTI	175	
Maximum rated withstanding isolation voltage	According to UL1577, t = 1 min	V_{ISO}	5300	V_{RMS}
Maximum transient isolation voltage	According to DIN EN 60747-5-5	V_{IOTM}	8000	V_{peak}
Maximum repetitive peak isolation voltage	According to DIN EN 60747-5-5	V_{IORM}	890	V_{peak}
Isolation resistance	V_{IO} = 500 V, T_{amb} = 25 °C	R_{IO}	$\geq 10^{12}$	Ω
	V_{IO} = 500 V, T_{amb} = 100 °C	R_{IO}	$\geq 10^{11}$	Ω
Output safety power		P_{SO}	600	mW
Input safety current		I_{SI}	240	mA
Safety temperature		T_S	175	°C
Creepage distance			≥ 8	mm
Clearance distance			≥ 8	mm
Insulation thickness		DTI	≥ 0.4	mm
Input to output test voltage, method B	V_{IORM} x 1.875 = V_{PR}, 100 % production test with t_M = 1 s, partial discharge < 5 pC	V_{PR}	1669	V_{peak}
Input to output test voltage, method A	V_{IORM} x 1.6 = V_{PR}, 100 % sample test with t_M = 10 s, partial discharge < 5 pC	V_{PR}	1424	V_{peak}

Note

- As per IEC 60747-5-5, § 7.4.3.8.2, this optocoupler is suitable for “safe electrical insulation” only within the safety ratings. Compliance with the safety ratings shall be ensured by means of protective circuits.

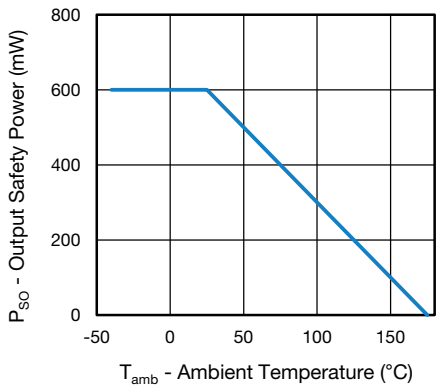


Fig. 2 - Safety Power Dissipation vs. Ambient Temperature

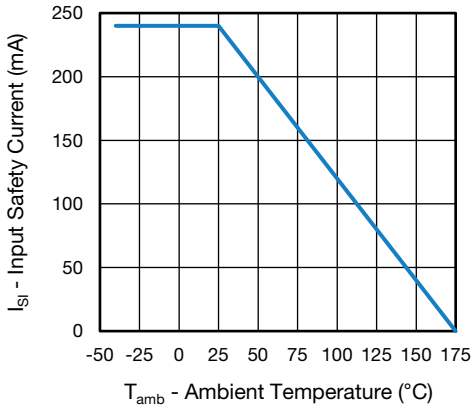


Fig. 3 - Safety Input Current vs. Ambient Temperature

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

TYPICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)

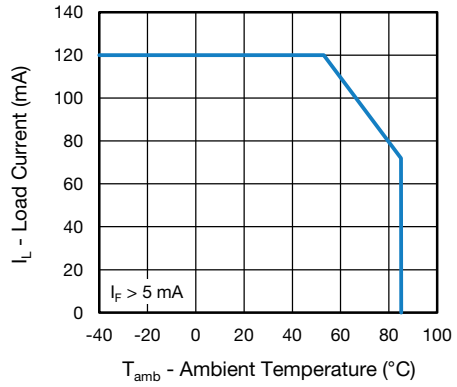


Fig. 4 - Maximum Load Current vs. Ambient Temperature

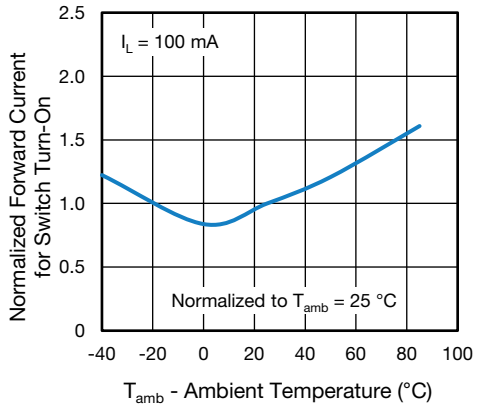


Fig. 7 - Normalized Forward Current for Switch Turn-On vs. Ambient Temperature

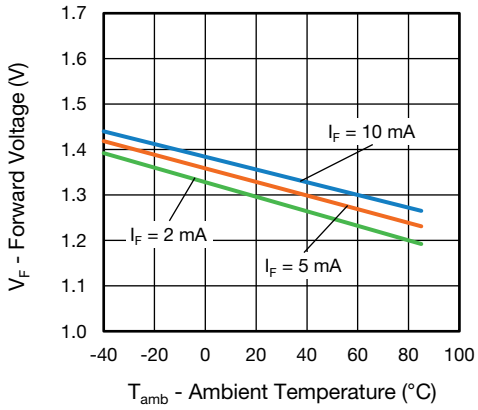


Fig. 5 - Forward Voltage vs. Ambient Temperature

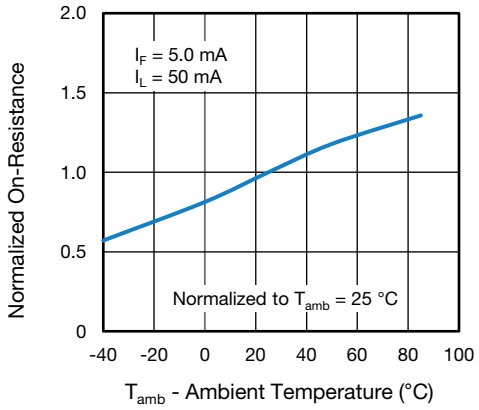


Fig. 8 - Normalized On-Resistance vs. Ambient Temperature

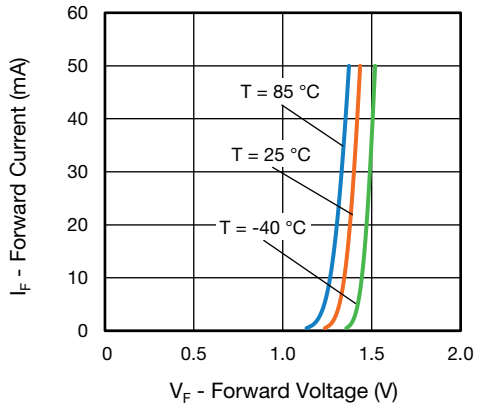


Fig. 6 - Forward Current vs. Forward Voltage

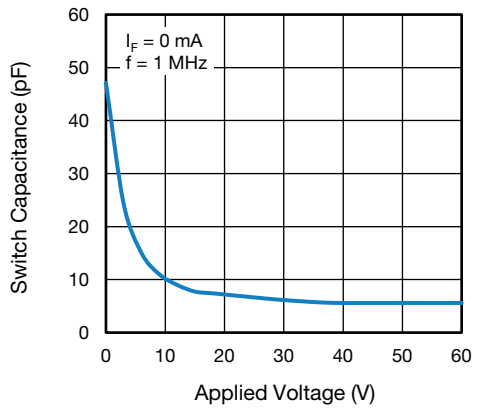


Fig. 9 - Switch Capacitance vs. Applied Voltage

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

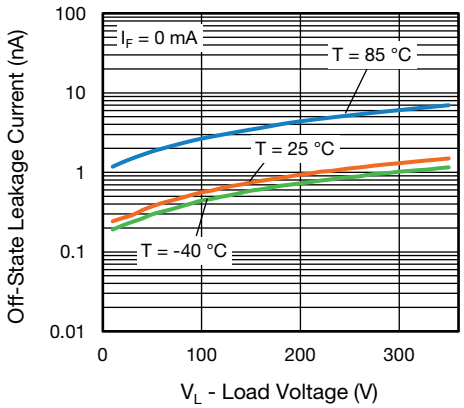


Fig. 10 - Off-State Leakage Current vs. Load Voltage

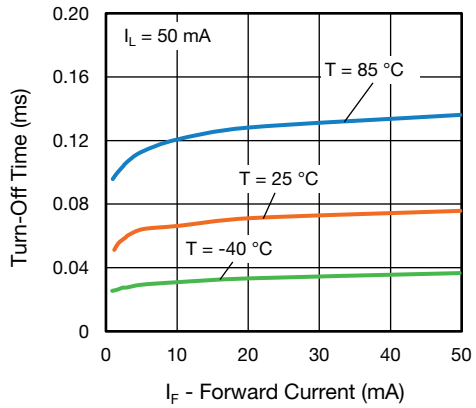


Fig. 13 - Turn-Off Time vs. Forward Current

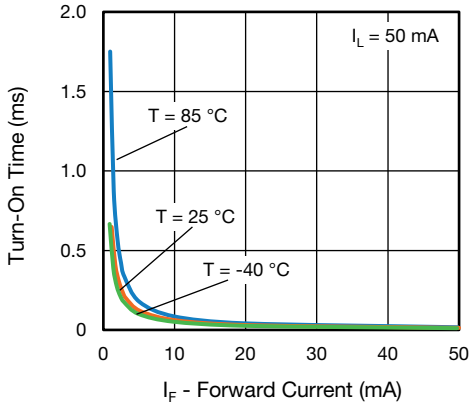


Fig. 11 - Turn-On Time vs. Forward Current

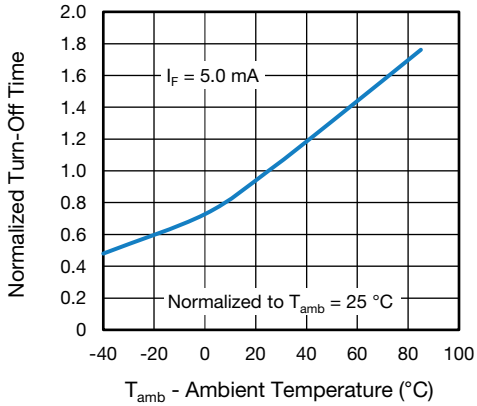


Fig. 14 - Normalized Turn-Off Time vs. Ambient Temperature

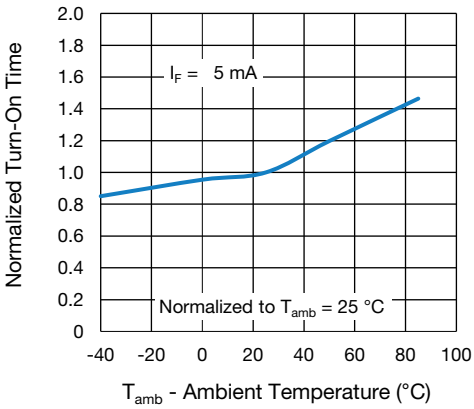
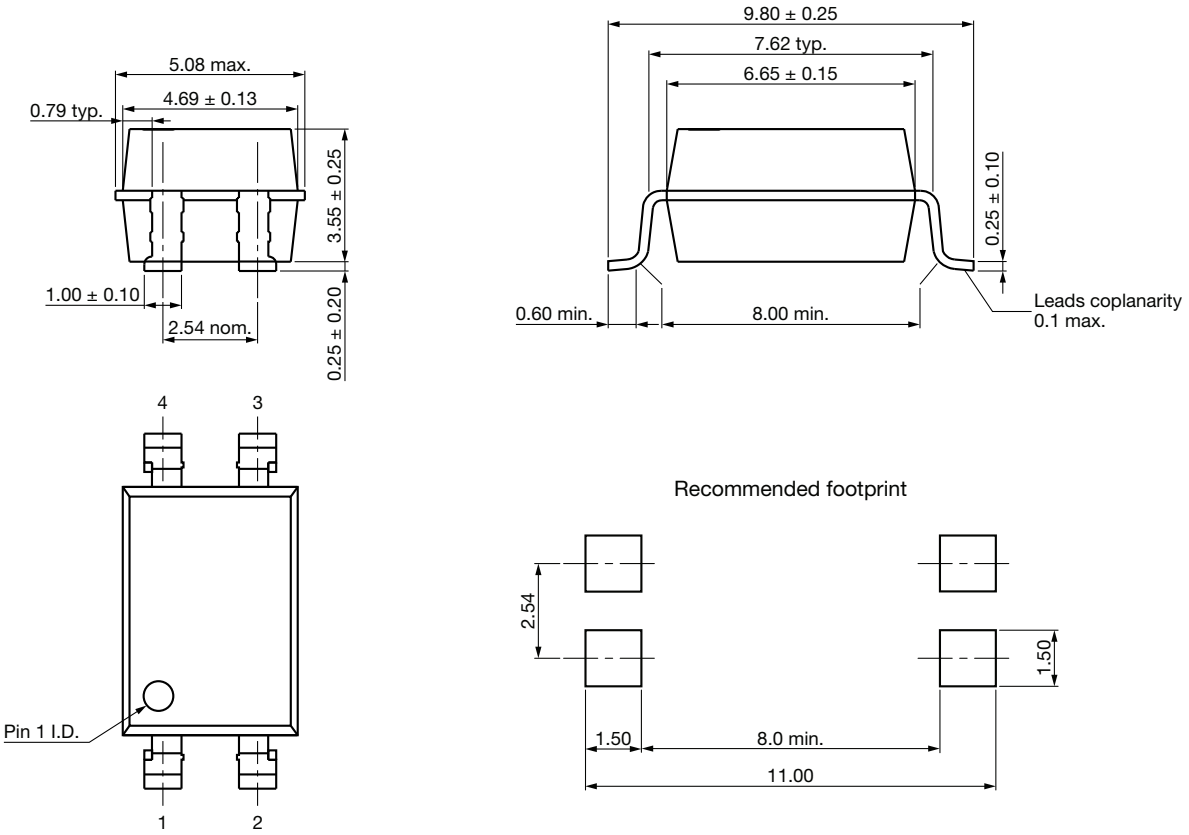


Fig. 12 - Normalized Turn-On Time vs. Ambient Temperature

THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

PACKAGE DIMENSIONS in millimeters

SMD-4



PACKAGE MARKING (example)

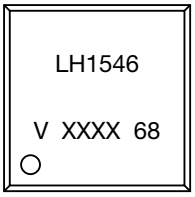


Fig. 15 - LH1546

Notes

- XXXX = LMC (lot marking code)
- Tape and reel suffix (TR) is not part of the package marking

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

PACKING INFORMATION (in millimeters)

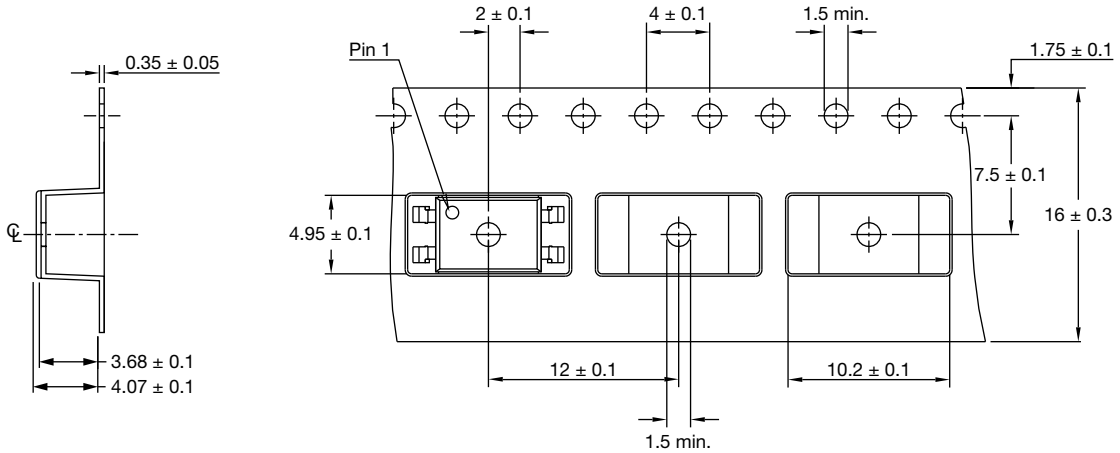


Fig. 16 - Tape and Reel Packing

TAPE AND REEL PACKING	
TYPE	UNITS/REEL
SMD-4	1000

TUBE PACKING			
TYPE	UNITS/TUBE	TUBES/BOX	UNITS/BOX
SMD-4	100	20	2000

SOLDER PROFILES

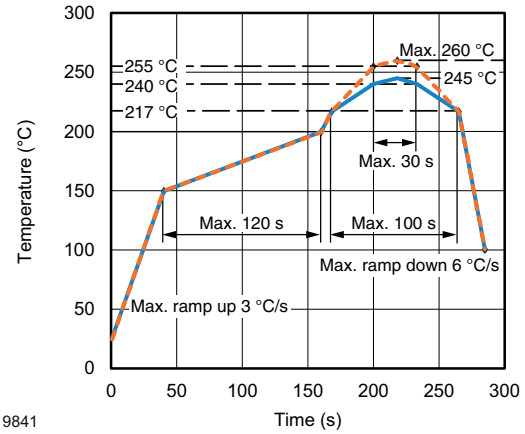


Fig. 17 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 60 %

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

For technical questions, contact: optocoupleranswers@vishay.com
THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

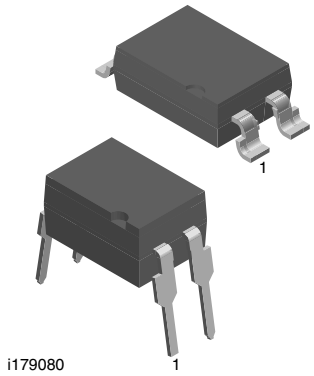
Footprint and Schematic Information for LH1546

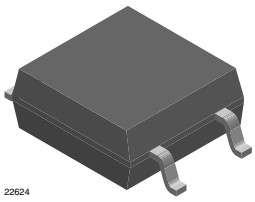
The footprint and schematic symbols for the following parts can be accessed using the associated links. They are available in Eagle, Altium, KiCad, OrCAD / Allegro, Pulsonix, and PADS.

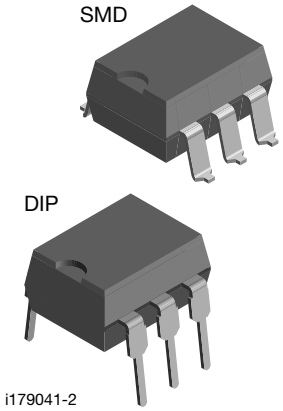
Note that the 3D models for these parts can be found on the Vishay product page.

PART NUMBER	FOOTPRINT / SCHEMATIC
LH1546AAB	www.snapeda.com/parts/LH1546AAB/Vishay/view-part
LH1546AABTR	www.snapeda.com/parts/LH1546AABTR/Vishay/view-part
LH1546AD	www.snapeda.com/parts/LH1546AD/Vishay/view-part
LH1546ADF	www.snapeda.com/parts/LH1546ADF/Vishay/view-part
LH1546ADFTR	www.snapeda.com/parts/LH1546ADFTR/Vishay/view-part
LH1546AEF	www.snapeda.com/parts/LH1546AEF/Vishay/view-part
LH1546AEFT2	www.snapeda.com/parts/LH1546AEFT2/Vishay/view-part
LH1546AEFTR	www.snapeda.com/parts/LH1546AEFTR/Vishay/view-part
LH1546AT	www.snapeda.com/parts/LH1546AT/Vishay/view-part

For technical issues and product support, please contact optocoupleranswers@vishay.com.







THIS DOCUMENT IS SUBJECT TO CHANGE WITHOUT NOTICE. THE PRODUCTS DESCRIBED HEREIN AND THIS DOCUMENT ARE SUBJECT TO SPECIFIC DISCLAIMERS, SET FORTH AT www.vishay.com/doc?91000

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.

© 2023 VISHAY INTERTECHNOLOGY, INC. ALL RIGHTS RESERVED