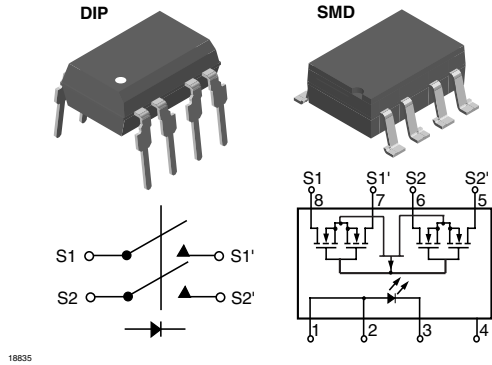


2 Form A Solid State Relay



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 (Pb)-free component
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



RoHS
COMPLIANT

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.

AGENCY APPROVALS

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

CSA : certification no. 093751

DIN EN: 60747-5-5 (VDE 0884)

APPLICATIONS

- Protection switching (T1 spring)
 - 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

Note

See T1 switching with the LH1514 solid state relay (apnote 67)

ORDER INFORMATION		
PART	REMARKS	PACKAGE
LH1514AAC	Gullwing, tubes	SMD-8
LH1514AACTR	Gullwing, tape and reel	SMD-8
LH1514AB	Tubes	DIP-8

ABSOLUTE MAXIMUM RATINGS (1)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
SSR				
LED input ratings: continuous forward current		I_F	50	mA
LED input ratings: reverse voltage	$I_R \leq 10 \mu\text{A}$	V_R	10	V
Output operation: DC or peak AC load voltage	$I_L \leq 1.0 \mu\text{A}$	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 (2)	$t = 10 \text{ s max.}$	T_{sld}	260	°C
Input to output isolation voltage		V_{ISO}	5300	V_{RMS}
Power dissipation		P_{diss}	600	mW

Notes

(1) $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$, 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.

(2) 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 (1)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT						
LED forward current switch turn-on	$I_L = 100 \text{ mA}, t = 10 \text{ ms}$	I_{Fon}		2.0	3.0	mA
LED forward current switch turn-off	$V_L = \pm 10 \text{ V}$	I_{Foff}	0.2	1.8		mA
LED forward voltage	$I_F = 10 \text{ mA}$	V_F	1.15	1.26	1.45	V
OUTPUT						
On-resistance	$I_F = 10 \text{ mA}, I_L = \pm 50 \text{ mA}$	R_{ON}	2.0	3.0	5.0	Ω
Pole-to-pole On-resistance matching (S1 to S2)	$I_F = 10 \text{ mA}, I_L = \pm 50 \text{ mA}$			0.2	1.0	$\Delta\Omega$
Output off-state bleed-through (2)	$f = 1.5 \text{ MHz square wave}$ $t_r/t_f = 5.0 \text{ ns}$ (see figure 13)			70	100	mV_{peak}
Output off-state leakage	$I_F = 0 \text{ mA}, V_L = \pm 5.0 \text{ V}$	I_O		3×10^{-12}	200×10^{-9}	A
	$I_F = 0 \text{ mA}, V_L = \pm 15 \text{ V}$	I_O		20×10^{-12}	1.0×10^{-6}	A
Output off-state leakage pole-to-pole	$I_F = 10 \text{ mA}, \text{Pins } 7, 8 \pm 3.0 \text{ V},$ $\text{Pins } 5, 6 \text{ Gnd}$	I_O		1.0	5.0	μA
	$\text{Pins } 7, 8 \pm 15 \text{ V}, \text{Pins } 5, 6 \text{ Gnd}$	I_O		2.0	50	μA
Output capacitance pins 5 to 6, 7 to 8	$I_F = 0 \text{ mA}, V_L = 0 \text{ V}$	C_O		20		pF
Pole-to-pole capacitance (S1 to S2)	$I_F = 0 \text{ mA}, V_L = 0 \text{ V}$			20		pF
	$I_F = 10 \text{ mA}, V_L = 0 \text{ V}$			50		pF
TRANSFER						
Turn-on time	$I_F = 10 \text{ mA}, I_L = 20 \text{ mA}$	t_{on}		0.4	1.0	ms
Turn-off time	$I_F = 10 \text{ mA}, I_L = 20 \text{ mA}$	t_{off}		0.6	1.0	ms

Notes

(1) $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$, 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.

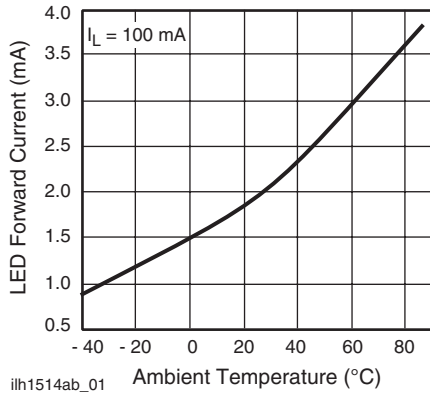
(2) Guaranteed by component measurement during wafer probe.

RECOMMENDED OPERATING CONDITIONS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
LED forward current, switch turn-on	$T_{\text{amb}} = - 40 \text{ }^\circ\text{C to } + 85 \text{ }^\circ\text{C}$	I_{Fon}	10		20	mA



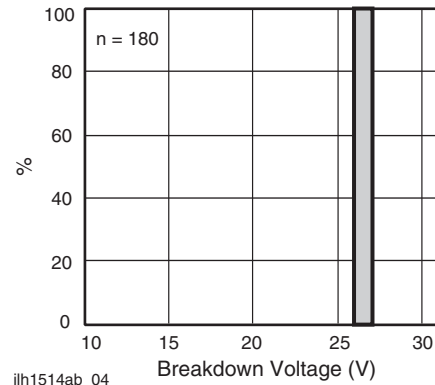
TYPICAL CHARACTERISTICS

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



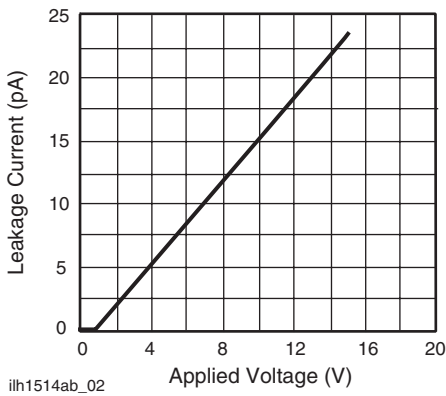
ih1514ab_01

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



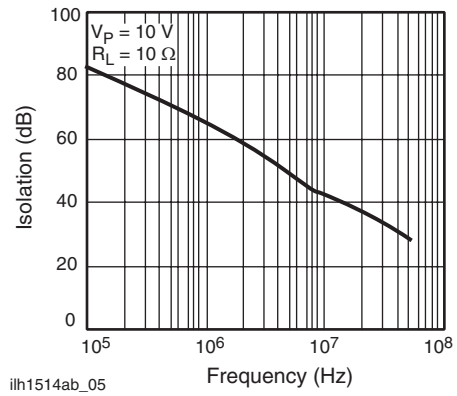
ih1514ab_04

Fig. 4 - Breakdown Voltage Distribution Typical



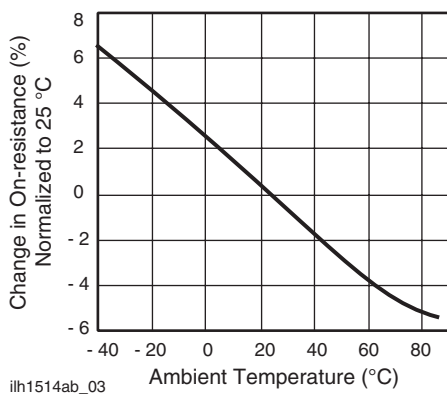
ih1514ab_02

Fig. 2 - Leakage Current vs. Applied Voltage



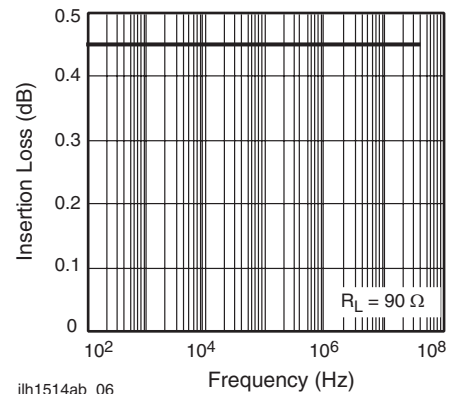
ih1514ab_05

Fig. 5 - Output Isolation



ih1514ab_03

Fig. 3 - On-Resistance vs. Temperature



ih1514ab_06

Fig. 6 - Insertion Loss (per Pole) vs. Frequency

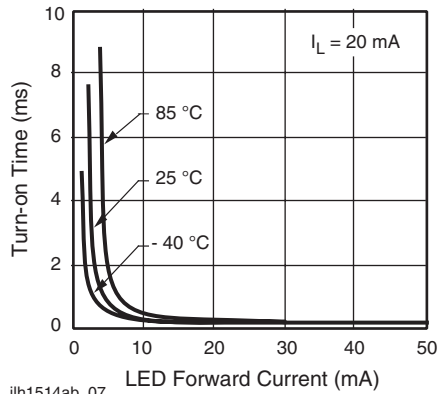


Fig. 7 - t_{on} vs. LED Forward Current

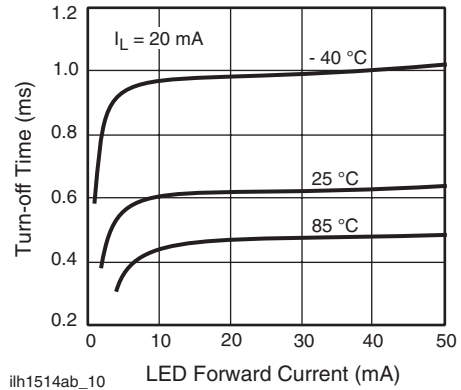


Fig. 10 - t_{off} vs. LED Forward Current

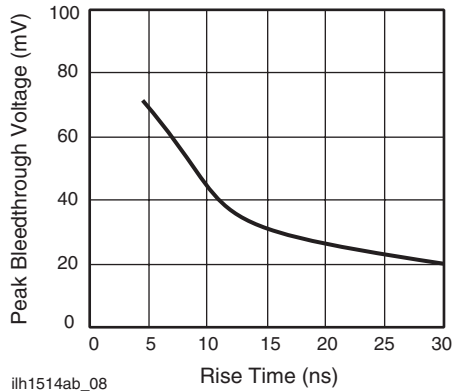


Fig. 8 - Bleed-through Voltage vs. Rise Time

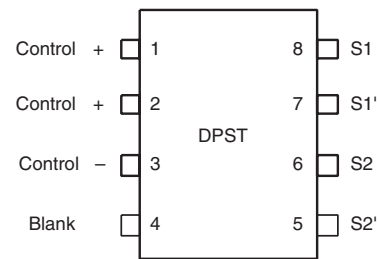


Fig. 11 - Pin Diagram and Pin Outs

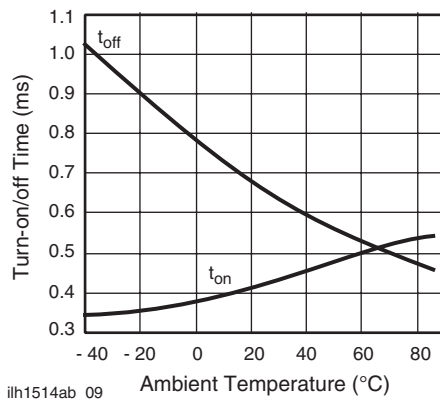


Fig. 9 - t_{on}/t_{off} vs. Temperature

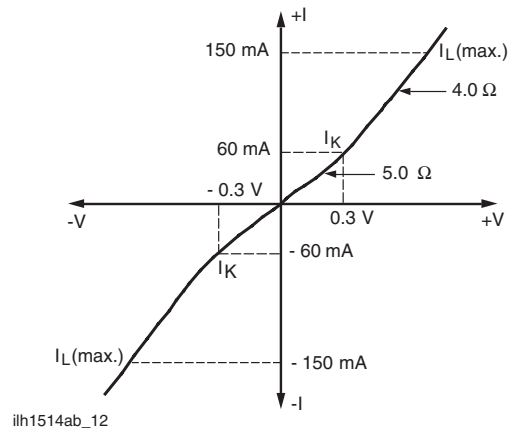
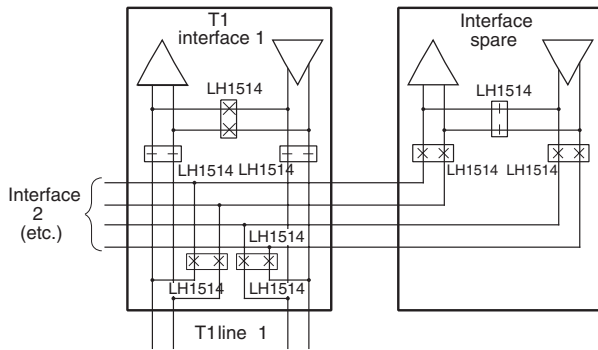
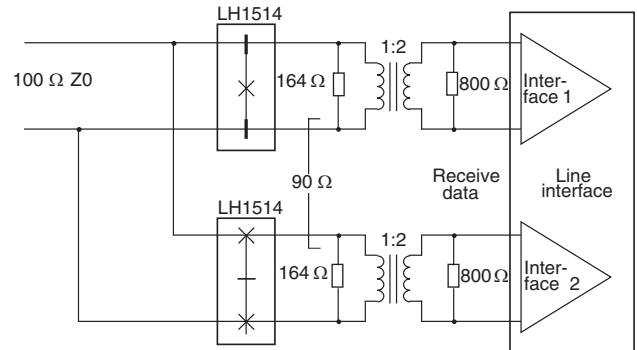


Fig. 12 - Typical On Characteristics



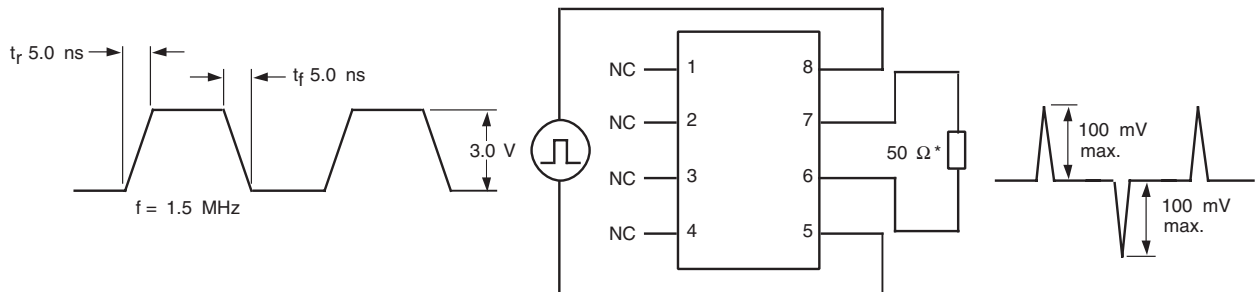
ilh1514ab_14

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



ilh1514ab_15

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



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

ilh1514ab_13

Fig. 15 - Off-state Bleed-through

LH1514AB/LH1514AAC/LH1514AACTR

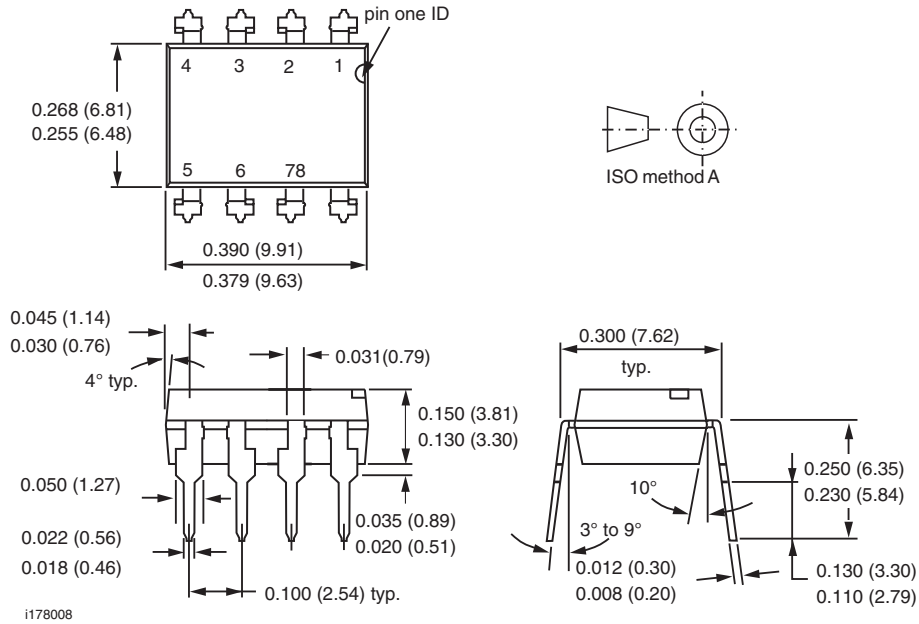
Vishay Semiconductors

2 Form A Solid State Relay



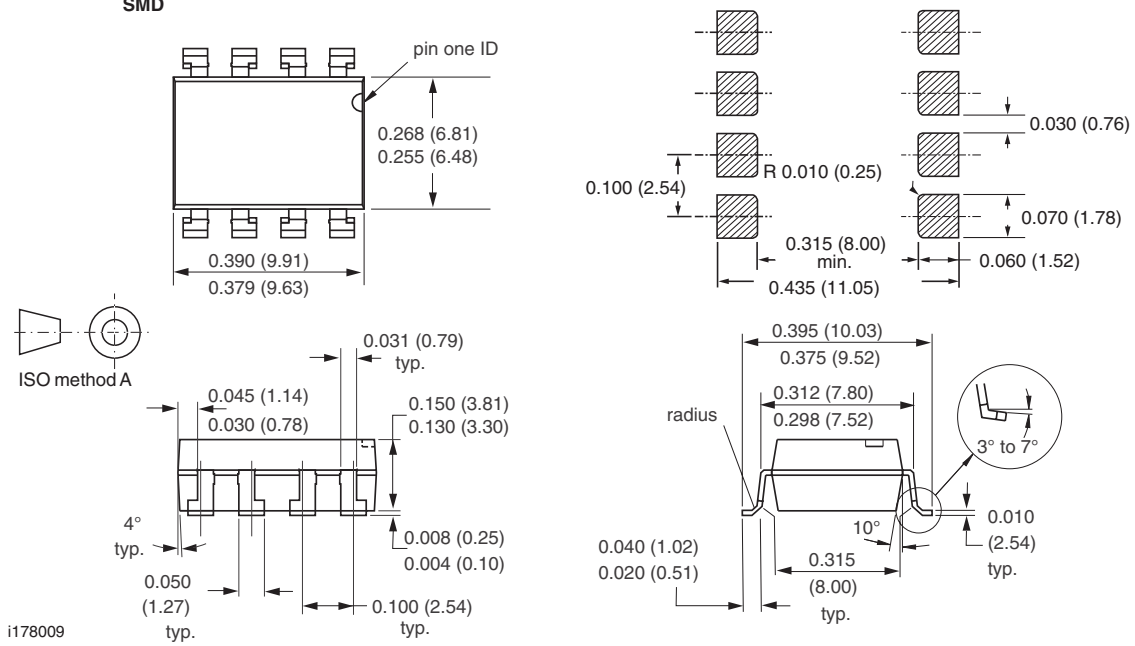
PACKAGE DIMENSIONS in inches (millimeters)

DIP



i178008

SMD



i178009



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.

Parameters can vary in different applications. All operating parameters must be validated for each customer application by the customer. Should the buyer use Vishay Semiconductors products for any unintended or unauthorized application, the buyer shall indemnify Vishay Semiconductors against all claims, costs, damages, and expenses, arising out of, directly or indirectly, any claim of personal damage, injury or death associated with such unintended or unauthorized use.

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



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.

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 and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. 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.