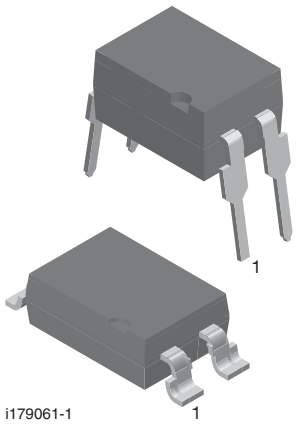
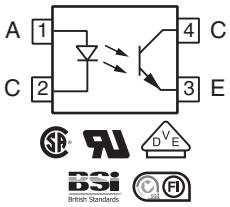
Optocoupler, Phototransistor Output, Low Input Current





FEATURES

- Good CTR linearity depending on forward current
- Low CTR degradation
- High collector emitter voltage, V_{CEO} = 55 V
- Isolation test voltage, 5300 V_{RMS}
- Low coupling capacitance
- End stackable, 0.100" (2.54 mm) spacing
- High common mode transient immunity
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

Pb-free

e3

RoHS COMPLIANT

APPLICATIONS

- Telecom
- Industrial controls
- Battery powered equipment
- Office machines

DESCRIPTION

The SFH618A (DIP) and SFH6186 (SMD) feature a high current transfer ratio, low coupling capacitance and high isolation voltage. These couplers have a GaAs infrared diode emitter, which is optically coupled to silicon planar phototransistor detector, and is incorporated in a plastic DIP-4 or SMD package.

The coupling devices are designed for signal transmission between two electrically separated circuits.The couplers are end-stackable with 2.54 mm lead spacing. Creepage and clearance distances of > 8 mm achieved with option 6.

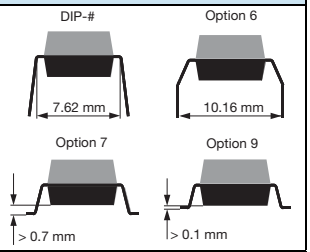
AGENCY APPROVALS

The safety application model number covering all products in this datasheet is SFH618A. This model number should be used when consulting safety agency documents.

- UL1577, file no. E52744 system code H or J, double protection
- CSA 93751
- DIN EN 60747-5-5 (VDE 0884-5) available with option 1
- BSI IEC 60950; IEC 60065
- FIMKO

ORDERING INFORMATION

S	F	H	6	1	8	#	-	#	X	0	#	#	T
PART NUMBER								CTR BIN	PACKAGE OPTION				TAPE AND REEL



AGENCY CERTIFIED/PACKAGE	CTR (%) 1 mA			
UL, CUL	**63 to 125**	**100 to 200**	**160 to 320**	**250 to 500**
DIP-4	SFH618A-2	SFH618A-3	SFH618A-4	SFH618A-5
DIP-4, 400 mil, option 6	-	SFH618A-3X006	-	-
SMD-4, option 7	-	-	-	SFH618A-5X007T (1)
SMD-4, option 9	SFH6186-2T (1)	SFH6186-3T (1), SFH6186-3T1 (2), SFH6186-3X002T (1)	SFH6186-4T (1)	SFH6186-5T (1), SFH6186-5T1 (2)
VDE, UL, CUL	**63 to 125**	**100 to 200**	**160 to 320**	**250 to 500**
DIP-4	-	SFH618A-3X001	SFH618A-4X001	-
DIP-4, 400 mil, option 6	-	SFH618A-3X016	SFH618A-4X016	SFH618A-5X016
SMD-4, option 7	-	SFH618A-3X017T (1)	-	SFH618A-5X017T (1)
SMD-4, option 9	-	SFH6186-3X001T (1)	SFH6186-4X001T	SFH6186-5X001T (1)

Notes

- Additional options may be possible, please contact sales office

(1) Also available in tubes, do not put T to the end

(2) Product is rotated 90° in tape and reel cavity

ABSOLUTE MAXIMUM RATINGS (T_{amb} = 25 °C, unless otherwise specified)				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
INPUT				
Reverse voltage		V_R	6	V
Power dissipation		P_{diss}	70	mW
Forward current		I_F	60	mA
OUTPUT				
Collector emitter voltage		V_{CEO}	55	V
Emitter collector voltage		V_{ECO}	7	V
Collector current		I_C	50	mA
	$t_p \leq 1$ ms	I_C	100	mA
Power dissipation		P_{diss}	150	mW
COUPLER				
Storage temperature range		T_{stg}	-55 to +150	°C
Ambient temperature range		T_{amb}	-55 to +100	°C
Junction temperature		T_j	125	°C
Soldering temperature [1]	max. 10 s, dip soldering distance to seating plane ≥ 1.5 mm	T_{sld}	260	°C

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) Refer to reflow profile for soldering conditions for surface mounted devices (SMD). Refer to wave profile for soldering conditions for through hole devices (DIP).

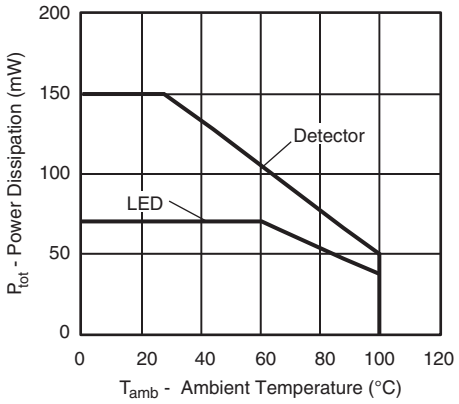


Fig. 1 - Permissible Power Dissipation vs. Ambient Temperature

ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
INPUT							
Forward voltage	I_F = 5 mA		V_F		1.1	1.5	V
Reverse current	V_R = 6 V		I_R		0.01	10	µA
Capacitance	V_R = 0 V, f = 1 MHz		C_O		25		pF
Thermal resistance			R_{thja}		1070		K/W
OUTPUT							
Collector emitter leakage current	V_{CE} = 10 V		I_{CEO}		10	200	nA
Collector emitter capacitance	V_{CE} = 5 V, f = 1 MHz		C_{CE}		7		pF
Thermal resistance			R_{thja}		500		K/W
COUPLER							
Collector emitter saturation voltage	I_C = 0.32 mA, I_F = 1 mA	SFH618A-2	V_{CEsat}		0.25	0.4	V
		SFH6186-2	V_{CEsat}		0.25	0.4	V
	I_C = 0.5 mA, I_F = 1 mA	SFH618A-3	V_{CEsat}		0.25	0.4	V
		SFH6186-3	V_{CEsat}		0.25	0.4	V
	I_C = 0.8 mA, I_F = 1 mA	SFH618A-4	V_{CEsat}		0.25	0.4	V
		SFH6186-4	V_{CEsat}		0.25	0.4	V
	I_C = 1.25 mA, I_F = 1 mA	SFH618A-5	V_{CEsat}		0.25	0.4	V
		SFH6186-5	V_{CEsat}		0.25	0.4	V
Coupling capacitance			C_C		0.25		pF

Note

- Minimum and maximum values are testing requirements. Typical values are characteristics of the device and are the result of engineering evaluation. Typical values are for information only and are not part of the testing requirements.

CURRENT TRANSFER RATIO (T_{amb} = 25 °C, unless otherwise specified)							
PARAMETER	**TEST CONDITION**	**PART**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
I_C/I_F	I_F = 1 mA, V_{CE} = 0.5 V	SFH618A-2	CTR	63		125	%
		SFH6186-2	CTR	63		125	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-2	CTR	32	75		%
		SFH6186-2	CTR	32	75		%
	I_F = 1 mA, V_{CE} = 0.5 V	SFH618A-3	CTR	100		200	%
		SFH6186-3	CTR	100		200	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-3	CTR	50	120		%
		SFH6186-3	CTR	50	120		%
	I_F = 1 mA, V_{CE} = 0.5 V	SFH618A-4	CTR	160		320	%
		SFH6186-4	CTR	160		320	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-4	CTR	80	200		%
		SFH6186-4	CTR	80	200		%
	I_F = 1 mA, V_{CE} = 0.5 V	SFH618A-5	CTR	250		500	%
		SFH6186-5	CTR	250		500	%
	I_F = 0.5 mA, V_{CE} = 1.5 V	SFH618A-5	CTR	125	300		%
		SFH6186-5	CTR	125	300		%

SWITCHING CHARACTERISTICS (T_{amb} = 25 °C, unless otherwise specified)						
PARAMETER	**TEST CONDITION**	**SYMBOL**	**MIN.**	**TYP.**	**MAX.**	**UNIT**
Turn on time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{on}		6		µs
Rise time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_r		3.5		µs
Turn off time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_{off}		5.5		µs
Fall time	V_{CC} = 5 V, I_C = 2 mA, R_L = 100 Ω	t_f		5		µs

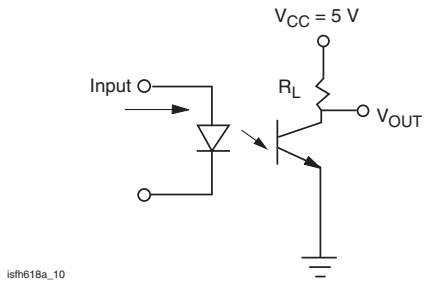


Fig. 2 - Test Circuit

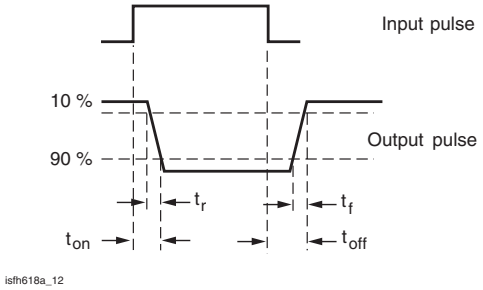


Fig. 3 - Test Circuit and Waveforms

SAFETY AND INSURATION RATINGS				
PARAMETER	**TEST CONDITION**	**SYMBOL**	**VALUE**	**UNIT**
Climatic classification	According to IEC 68 part 1		55/115/21	
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}	4470	V_{RMS}
Tested withstanding isolation voltage	According to UL1577, t = 1 s	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	T_{amb} = 25 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{12}	Ω
	T_{amb} = 100 °C, V_{IO} = 500 V	R_{IO}	≥ 10^{11}	Ω
Output safety power		P_{SO}	700	mW
Input safety current		I_{SI}	400	mA
Input safety temperature		T_S	175	°C
Creepage distance	DIP-4		≥ 7	mm
Clearance distance	DIP-4		≥ 7	mm
Creepage distance	DIP-4, 400 mil, option 6		≥ 8	mm
Clearance distance	DIP-4, 400 mil, option 6		≥ 8	mm
Creepage distance	SMD-4, option 7 and option 9		≥ 7	mm
Clearance distance	SMD-4, option 7 and option 9		≥ 7	mm
Insulation thickness		DTI	≥ 0.4	mm

Note

- As per DIN EN 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.

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

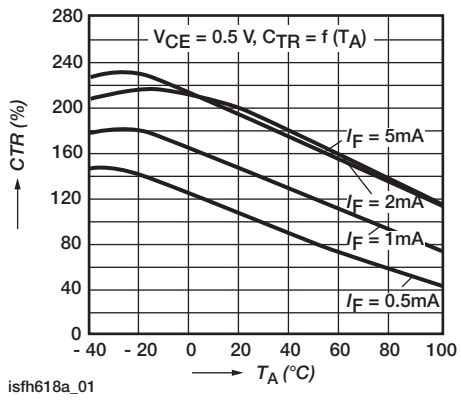


Fig. 4 - Current Transfer Ratio (typ.)

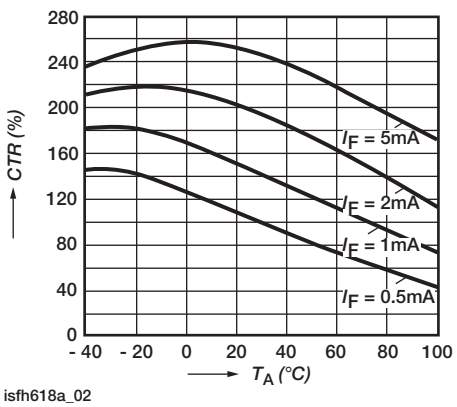


Fig. 5 - Current Transfer Ratio (typ.)

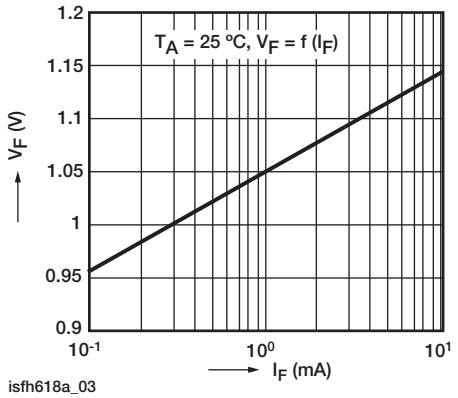


Fig. 6 - Diode Forward Voltage (typ.)

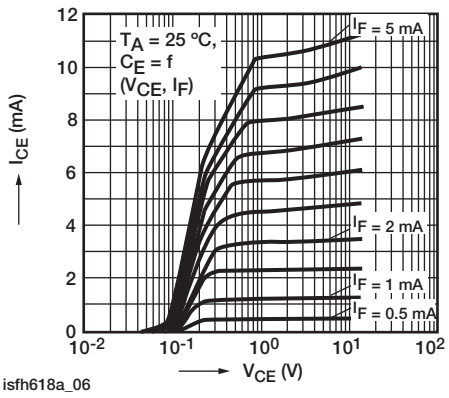


Fig. 9 - Output Characteristics

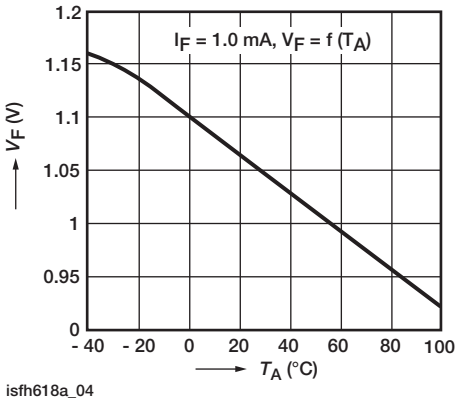


Fig. 7 - Diode Forward Voltage (typ.)

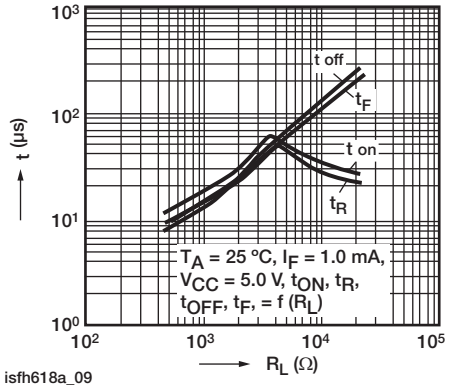


Fig. 10 - Switching Times (typ.)

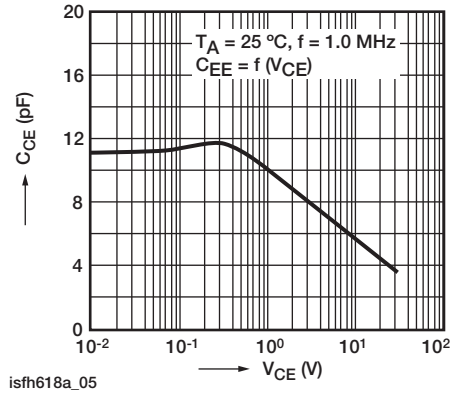
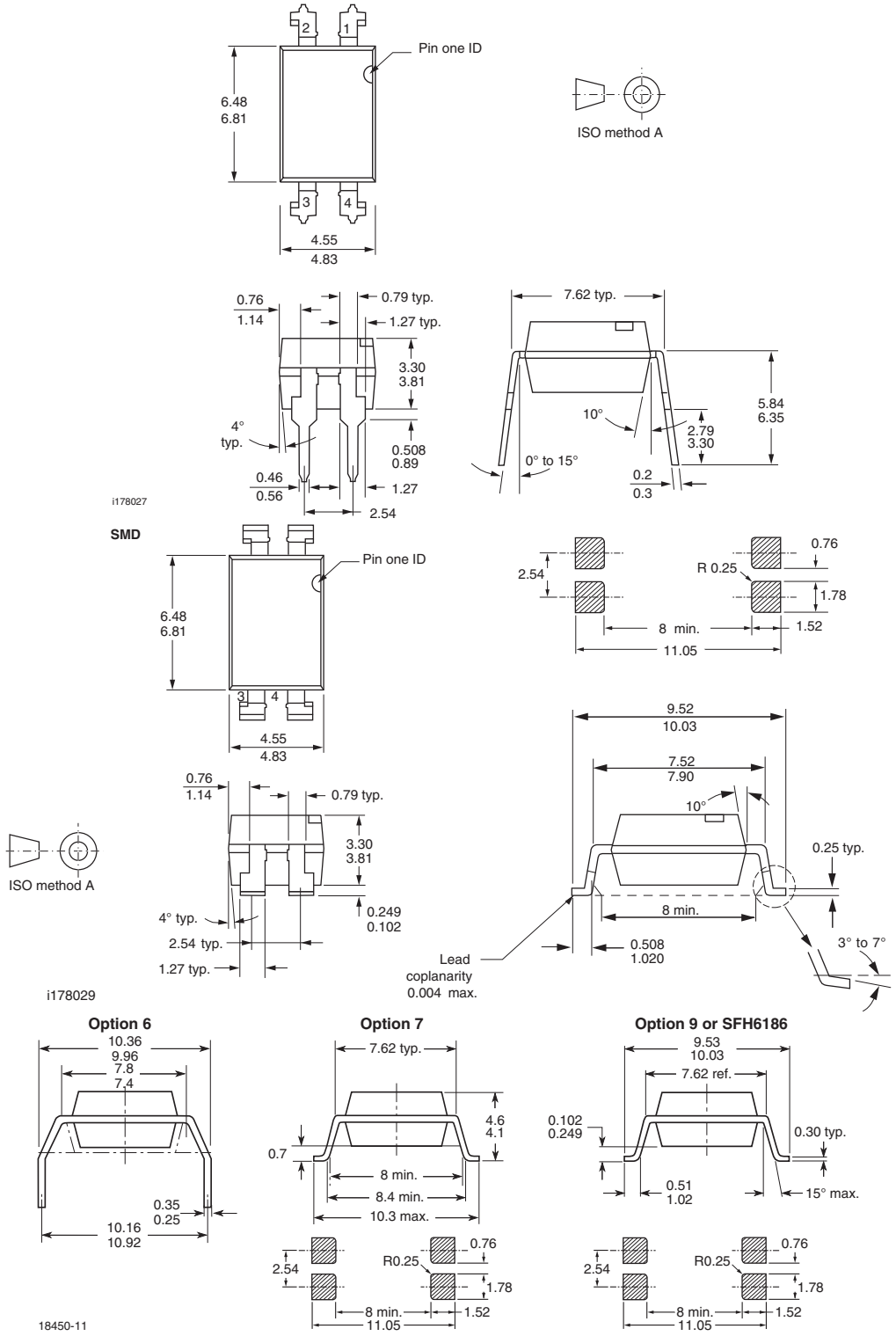
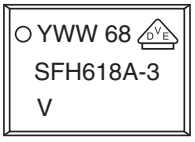


Fig. 8 - Transistor Capacitance

PACKAGE DIMENSIONS in millimeters



PACKAGE MARKING (example)



SOLDER PROFILES

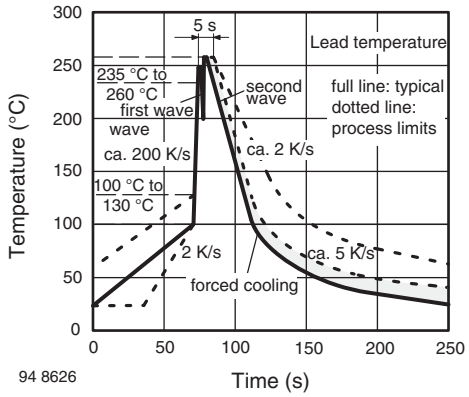


Fig. 11 - Wave Soldering Double Wave Profile According to J-STD-020 for DIP-8 Devices

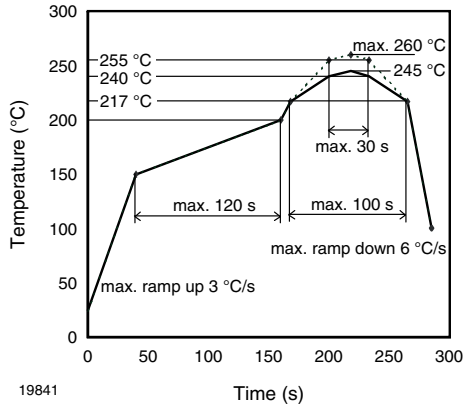


Fig. 12 - Lead (Pb)-free Reflow Solder Profile According to J-STD-020 for SMD-8 Devices

HANDLING AND STORAGE CONDITIONS

ESD level: HBM class 2

Floor life: unlimited

Conditions: T_{amb} < 30 °C, RH < 85 %

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

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. 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.

Material Category Policy

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.

Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.

Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as Halogen-Free follow Halogen-Free requirements as per JEDEC JS709A standards. Please note that some Vishay documentation may still make reference to the IEC 61249-2-21 definition. We confirm that all the products identified as being compliant to IEC 61249-2-21 conform to JEDEC JS709A standards.