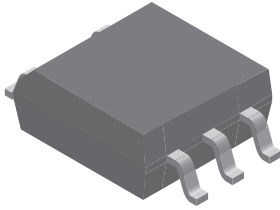
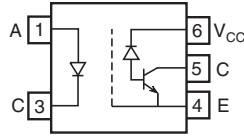




Analog High Speed Coupler, High Noise Immunity, 1 MBd, SOP-5 Package



20409-1



20409-2



DESCRIPTION

The VOM452T and VOM453T, high speed optocouplers, each consists of a GaAlAs infrared emitting diode, optically coupled with an integrated photo detector and a high speed transistor. The photo detector is junction isolated from the transistor to reduce miller capacitance effects. The open collector output function allows circuit designers to adjust the load conditions when interfacing with different logic systems such as TTL, CMOS, etc.

Because the VOM452T and VOM453T have a Faraday shield on the detector chip, it can also reject and minimize high input to output common mode transient voltages. There is no base connection, further reducing the potential electrical noise entering the package.

The VOM452T and VOM453T are packaged in industry standard SOP-5 packages and are suitable for surface mounting.

This an ideal solution for Industrial communication bus isolation, as well as isolated drive circuit applications such as IPM (intelligent power module) drivers.

FEATURES

- Surface mountable
- Industry standard SOP-5 footprint
- Compatible with infrared vapor phase reflow and wave soldering processes
- Isolation test voltage, 3750 V_{RMS}
- Very high common mode transient immunity: 15 000 V/μs at V_{CM} = 1500 V guaranteed (VOM453T)
- High speed: 1 MBd
- TTL compatible
- Open collector output
- Material categorization: For definitions of compliance please see www.vishay.com/doc?99912



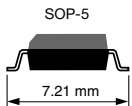
RoHS COMPLIANT

APPLICATIONS

- Fieldbus communication and control
- Logic ground isolation
- Analog signal ground isolation
- Replace pulse transformers
- IPM (intelligent power module) drivers

AGENCY APPROVALS

- UL1577, file no. E52744
- cUL - file no. E52744, equivalent to CSA bulletin 5A

ORDERING INFORMATION							
V	O	M	4	5	#	T	
PART NUMBER							
AGENCY CERTIFIED/PACKAGE		CMTI (kV/μs)					
UL, cUL		≥ 1		≥ 15			
SOP-5		VOM452T		VOM453T			

Notes

- For additional information on the available options refer to option information.
- The product is available only on tape and reel.



ABSOLUTE MAXIMUM RATINGS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)				
PARAMETER	TEST CONDITION	SYMBOL	VALUE	UNIT
INPUT				
Reverse voltage		V_R	3	V
DC forward current		I_F	25	mA
Surge forward current	$t_p \leq 1\text{ }\mu\text{s}$, 300 pulses/s	I_{FSM}	1	A
Power dissipation	$T_{amb} \leq 70\text{ }^{\circ}\text{C}$	P_{diss}	45	mW
OUTPUT				
Supply voltage		V_S	- 0.5 to 30	V
Output voltage		V_O	- 0.5 to 25	V
Output current		I_O	8	mA
Power dissipation	$T_{amb} \leq 70\text{ }^{\circ}\text{C}$	P_{diss}	100	mW
COUPLER				
Isolation test voltage between emitter and detector (refer to climate DIN 40046, part 2, Nov. 74)	$t = 1\text{ s}$	V_{ISO}	3750	V_{RMS}
Pollution degree (DIN VDE 0110)			2	
Creepage distance			≥ 5	mm
Clearance distance			≥ 5	mm
Comparative tracking index per DIN IEC 112/VDE 0303, part 1			175	
Isolation resistance	$V_{IO} = 500\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$, $R_{ISOL}^{(1)}$	R_{IO}	$\geq 10^{12}$	Ω
	$V_{IO} = 500\text{ V}$, $T_{amb} = 100\text{ }^{\circ}\text{C}$, $R_{ISOL}^{(1)}$	R_{IO}	$\geq 10^{11}$	Ω
Storage temperature range		T_{stg}	- 55 to + 125	$^{\circ}\text{C}$
Ambient temperature range		T_{amb}	- 55 to + 100	$^{\circ}\text{C}$
Junction temperature		T_j	100	$^{\circ}\text{C}$
Soldering temperature ⁽²⁾	$t < 10\text{ s max.}$		260	$^{\circ}\text{C}$

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⁾ Device considered a two-terminal device: pins 1, and 3 shorted together and pins 4, 5, and 6 shorted together.

⁽²⁾ Refer to reflow profile for soldering conditions for surface mounted devices.



ELECTRICAL CHARACTERISTICS ($T_{amb} = -40\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
INPUT							
Input forward voltage	$I_F = 16\text{ mA}$		V_F		1.4	1.8	V
Input reverse current	$V_R = 3\text{ V}$		I_R		0.5	10	μA
Input capacitance	$f = 1\text{ MHz}$, $V_F = 0\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		C_{IN}		75		pF
Temperature coefficient of forward voltage	$I_F = 16\text{ mA}$		$\Delta V_F / \Delta T_{amb}$		-1.7		mV/ $^{\circ}\text{C}$
OUTPUT							
Logic low supply current	$I_F = 16\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$		I_{CCL}		200		μA
Logic high supply current	$I_F = 0\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		I_{CCH}		0.001	1	μA
	$I_F = 0\text{ mA}$, $V_O = \text{open}$, $V_{CC} = 15\text{ V}$		I_{CCH}			2	μA
Logic low output voltage	$I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$, $I_O = 3\text{ mA}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		V_{OL}		0.15	0.4	V
	$I_F = 16\text{ mA}$, $V_{CC} = 15\text{ V}$, $I_O = 2.4\text{ mA}$		V_{OL}			0.5	V
Logic high output current	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 5.5\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		I_{OH}		0.003	0.5	μA
	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		I_{OH}		0.01	1	μA
	$I_F = 0\text{ mA}$, $V_O = V_{CC} = 15\text{ V}$		I_{OH}			50	μA
COUPLER							
Capacitance (input-output) ⁽¹⁾	$f = 1\text{ MHz}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		C_{IO}		0.4		pF

Notes

- 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. All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.
- (1) A 0.1 μF bypass capacitor connected between pins 4 and 6 is recommended.

CURRENT TRANSFER RATIO ($T_{amb} = -40\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Current transfer ratio ⁽¹⁾⁽²⁾	$V_O = 0.5\text{ V}$, $I_F = 16\text{ mA}$, $V_{CC} = 4.5\text{ V}$	CTR	15	30		%
	$V_O = 0.4\text{ V}$, $I_F = 16\text{ mA}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$		20		50	

Notes

- (1) Current transfer ratio in percent equals the ratio of output collector current (I_O) to the forward LED input current (I_F) times 100.
- (2) A 0.1 μF bypass capacitor connected between pins 4 and 6 is recommended. All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.

SWITCHING CHARACTERISTICS ($T_{amb} = -40\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$, unless otherwise specified)						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Propagation delay time to logic low at output (see fig. 1 and note 1)	$V_{CC} = 5\text{ V}$, $I_F = 16\text{ mA}$, $R_L = 1.9\text{ k}\Omega$	t_{PHL}		0.2	1	μs
Propagation delay time to logic high at output (see fig. 1 and note 1)	$V_{CC} = 5\text{ V}$, $I_F = 16\text{ mA}$, $R_L = 1.9\text{ k}\Omega$	t_{PLH}		0.5	1	μs

Note

- (1) The 1.9 k Ω load represents 1 TTL unit load of 1.6 mA and the 5.6 k Ω pull-up resistor. All typical values are measured at $T_{amb} = 25\text{ }^{\circ}\text{C}$.

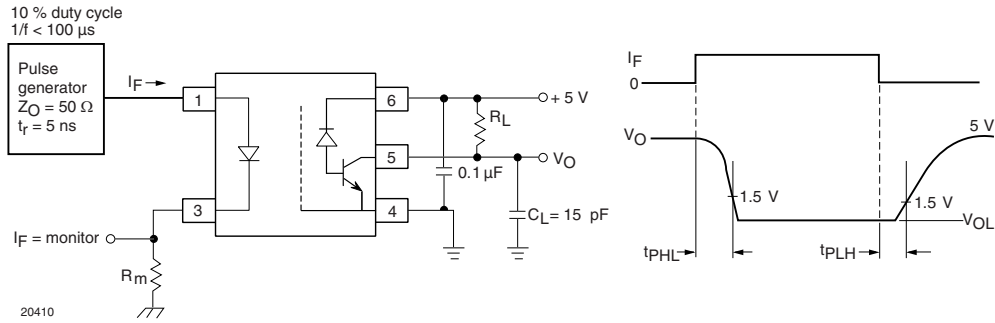


Fig. 1 - Test Circuit for Switching Times

COMMON MODE TRANSIENT IMMUNITY ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)							
PARAMETER	TEST CONDITION	PART	SYMBOL	MIN.	TYP.	MAX.	UNIT
Common mode transient immunity at logic high level output (see fig. 2 and notes 1, and 2)	$R_L = 1.9\text{ k}\Omega$, $I_F = 0\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$	VOM452T	$ CM_H $	1			kV/ μ s
	$R_L = 1.9\text{ k}\Omega$, $I_F = 0\text{ mA}$, $V_{CM} = 1500\text{ V}_{P-P}$	VOM453T	$ CM_H $	15			kV/ μ s
Common mode transient immunity at logic low level output (see fig. 2 and notes 1, and 2)	$R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$, $V_{CM} = 10\text{ V}_{P-P}$	VOM452T	$ CM_L $	1			kV/ μ s
	$R_L = 1.9\text{ k}\Omega$, $I_F = 16\text{ mA}$, $V_{CM} = 1500\text{ V}_{P-P}$	VOM453T	$ CM_L $	15			kV/ μ s

Notes

- (1) Common mode transient immunity in a logic high level is the maximum tolerable (positive) dV_{CM}/dt on the leading edge of the common mode pulse (V_{CM}) to assure that the output will remain in a logic high state (i.e., $V_O > 2\text{ V}$). Common mode transient immunity in a logic low level is the maximum tolerable (negative) dV_{CM}/dt on the trailing edge of the common mode pulse signal (V_{CM}) to assure that the output will remain in logic low state, i.e., $V_O > 0.8\text{ V}$.
- (2) The $1.9\text{ k}\Omega$ load represents 1 TTL unit load of 1.6 mA and the $5.6\text{ k}\Omega$ pull-up resistor.

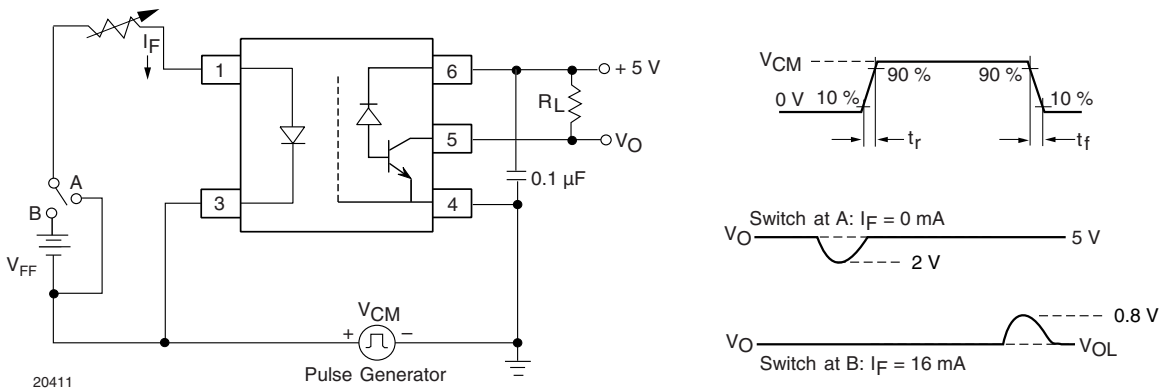


Fig. 2 - Test Circuit for Transient Immunity and Typical Waveforms

SAFETY AND INSULATION RATINGS						
PARAMETER	TEST CONDITION	SYMBOL	MIN.	TYP.	MAX.	UNIT
Climatic classification (according to IEC 68 part 1)				55/100/21		
Comparative tracking index		CTI	175		399	
Peak transient overvoltage		V_{IOTM}	6000			V
Peak insulation voltage		V_{IORM}	707			V
Safety rating - power output		P_{SO}			350	mW
Safety rating - input current		I_{SI}			150	mA
Safety rating - temperature		T_{SI}			175	°C
Creepage distance			5			mm
Clearance distance			5			mm

Note

- As per IEC 60747-5-5, § 7.4.3.8.1, 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.

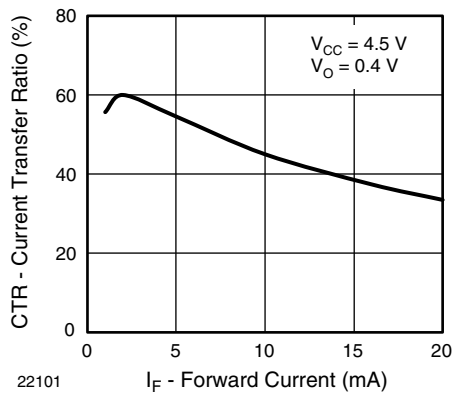
TYPICAL CHARACTERISTICS ($T_{amb} = 25\text{ }^{\circ}\text{C}$, unless otherwise specified)


Fig. 3 - Current Transfer Ratio vs. Forward Current

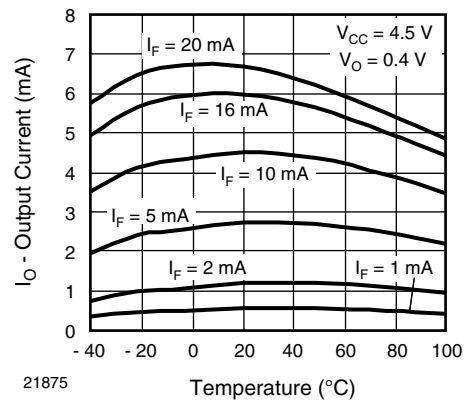


Fig. 5 - Output Current vs. Temperature

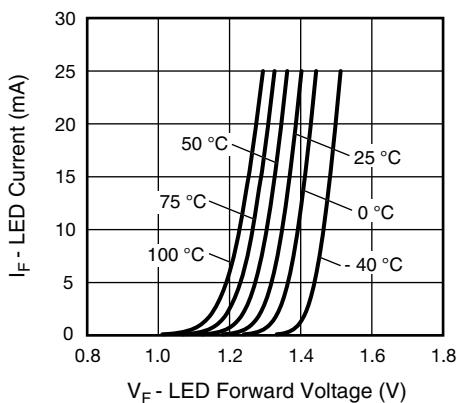


Fig. 4 - LED Current vs. LED Forward Voltage

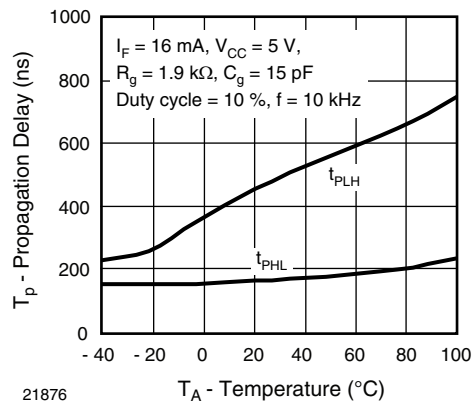


Fig. 6 - Propagation Delay vs. Temperature

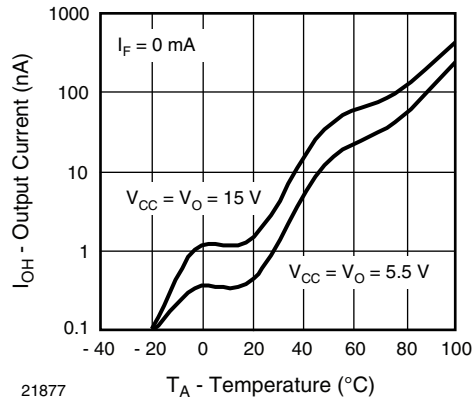


Fig. 7 - Logic High Output Current vs. Temperature

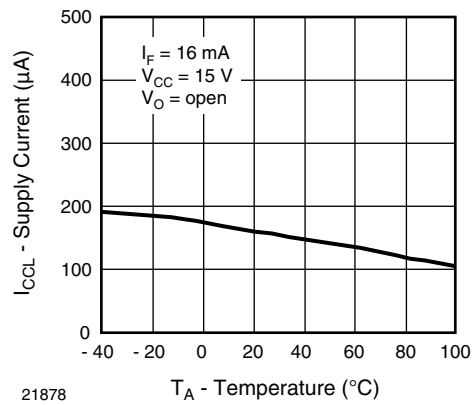


Fig. 8 - Supply Current vs. Temperature

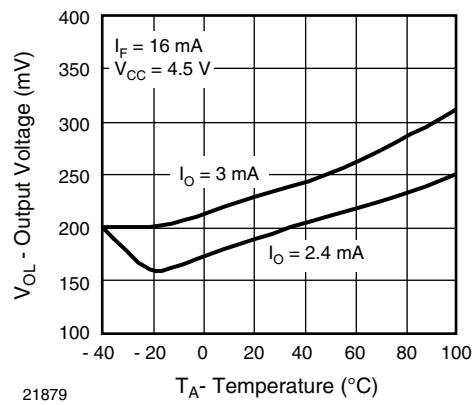
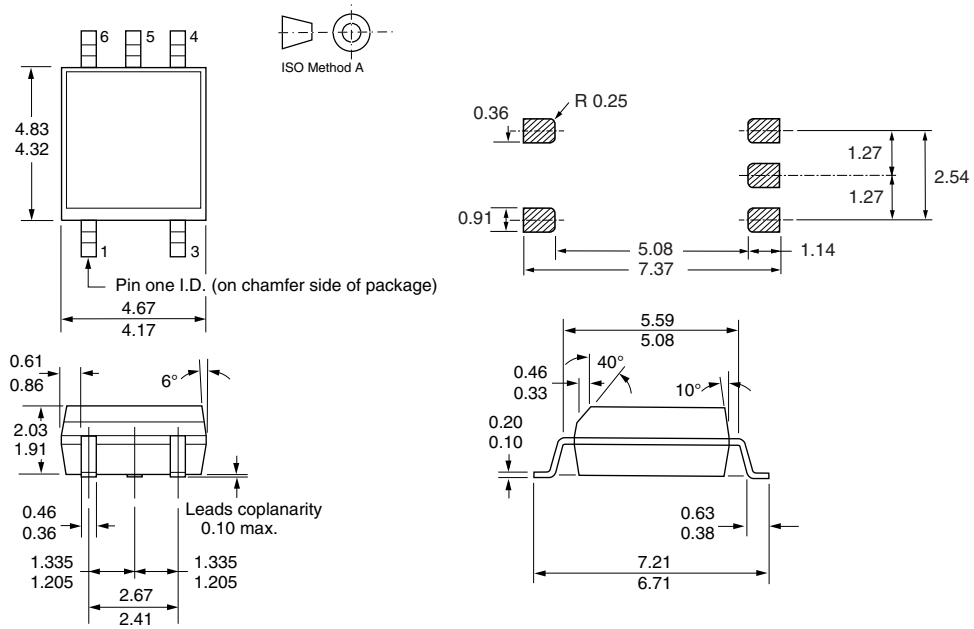


Fig. 9 - Logic Low Output Voltage vs. Temperature

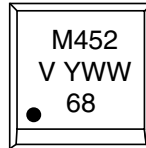


PACKAGE DIMENSIONS in millimeters



20643

PACKAGE MARKING (example)





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.