

## AC Line Rated Ceramic Disc Capacitors Class X1, 440 V<sub>AC</sub>, Class Y2, 300 V<sub>AC</sub>



### FEATURES

- Complying with IEC 60384-14 3<sup>rd</sup> edition
- High reliability
- Vertical (inline) kinked or straight leads
- Singlelayer AC disc safety capacitors
- Material categorization:  
for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

### APPLICATIONS

- X1, Y2 according to IEC 60384-14.3
- Across-the-line
- Line by-pass
- Antenna coupling

### DESIGN

The capacitor consists of a ceramic disc which is silver plated on both sides. Connection leads are made of tinned copper having a diameter of 0.6 mm.

The capacitors may be supplied with vertical (inline) kinked leads having a lead spacing of 5.0 mm, 7.5 mm, or 10.0 mm. Encapsulation is made of flame retardant epoxy resin in accordance with UL 94 V-0.

### CAPACITANCE RANGE

10 pF to 0.01 μF

### RATED VOLTAGE U<sub>R</sub>

IEC 60384-14 and UL60384-14:

(X1): 440 V<sub>AC</sub>, 50 Hz

(Y2): 300 V<sub>AC</sub>, 50 Hz

### TEST VOLTAGE

Component test (100 %):

2600 V<sub>AC</sub>, 50 Hz, 2 s

(2600 V<sub>AC</sub> for LS 7.5 mm and 10 mm)

(2200 V<sub>AC</sub> for LS 5.0 mm)

Random sampling test (destructive test):

2600 V<sub>AC</sub>, 50 Hz, 60 s

Voltage proof of coating (destructive test):

2600 V<sub>AC</sub>, 50 Hz, 60 s

### INSULATION RESISTANCE

≥ 10 000 MΩ

### CAPACITANCE TOLERANCE

± 20 % (code M); ± 10 % (code K)

### DISSIPATION FACTOR

Class 1: max. 0.5 % (1 MHz)

Class 2: max. 2.5 % (1 kHz)

QUICK REFERENCE DATA				
DESCRIPTION	VALUE			
Ceramic Class	1		2	
Ceramic Dielectric	N750		Y5S, Y5U	
Voltage (V <sub>AC</sub> )	300	440	300	440
Min. Capacitance (pF)	10		68	
Max. Capacitance (pF)	47		10 000	
Mounting	Radial			

### OPERATING TEMPERATURE RANGE

-40 °C to +125 °C

### TEMPERATURE CHARACTERISTICS

Class 1: N750 (U2J)

Class 2: Y5S, Y5U

### SECTIONAL SPECIFICATIONS

Climatic category (according to EN 60058-1)

Class 1 and class 2: 40/125/21

### COATING

According to UL 94 V-0

Epoxy resin, isolating, flame retardant

### APPROVALS

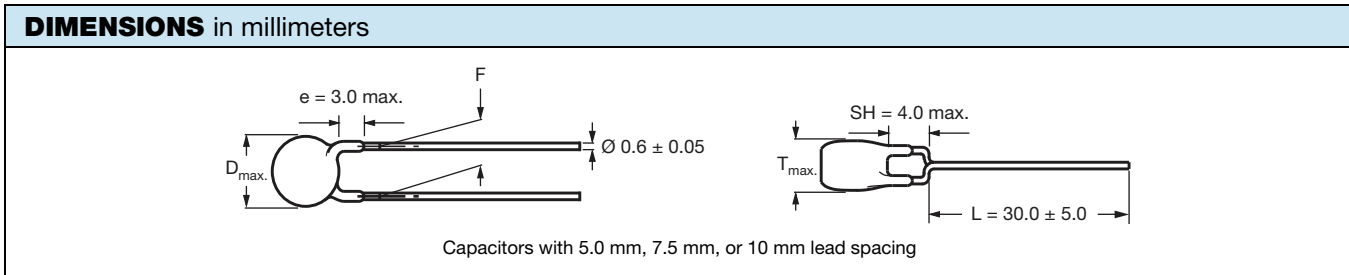
ENEC - VDE DE 1-30691

UL60384-14 file E183844

CSA 22.2

### PACKAGING

Bulk, tape and reel, taped ammpack



TECHNICAL DATA						
CAPACITANCE C (pF)	CAPACITANCE TOLERANCE (%)	BODY DIAMETER D <sub>max.</sub> (mm)	BODY THICKNESS T <sub>max.</sub> (mm)	LEAD SPACING <sup>(1)</sup> F (mm) ± 1 mm	PART NUMBER	
					MISSING DIGITS SEE ORDERING CODE BELOW	
					RoHS COMPLIANT	RoHS AND HALOGEN-FREE
<b>U2J (N750)</b>						
10	± 10	7.5	5.0	5.0, 7.5, or 10.0	VY2100K29U2JS6###	VY2100K29U2JG6###
15					VY2150K29U2JS6###	VY2150K29U2JG6###
22					VY2220K29U2JS6###	VY2220K29U2JG6###
33					VY2330K29U2JS6###	VY2330K29U2JG6###
47					VY2470K29U2JS6###	VY2470K29U2JG6###
<b>Y5S (2C3)</b>						
68	± 10	7.5	5.0	5.0, 7.5, or 10.0	VY2680K29Y5SS6###	VY2680K29Y5SG6###
100					VY2101K29Y5SS6###	VY2101K29Y5SG6###
150					VY2151K29Y5SS6###	VY2151K29Y5SG6###
220					VY2221K29Y5SS6###	VY2221K29Y5SG6###
330					VY2331K29Y5SS6###	VY2331K29Y5SG6###
470					VY2471K29Y5SS6###	VY2471K29Y5SG6###
<b>Y5U (2E3)</b>						
680	± 20	7.5	5.0	5.0, 7.5, or 10.0	VY2681M29Y5US6###	VY2681M29Y5UG6###
1000					VY2102M29Y5US6###	VY2102M29Y5UG6###
1500		8.0			VY2152M31Y5US6###	VY2152M31Y5UG6###
2200		9.0			VY2222M35Y5US6###	VY2222M35Y5UG6###
3300		10.5			VY2332M41Y5US6###	VY2332M41Y5UG6###
3900		11.0		VY2392M43Y5US6###	VY2392M43Y5UG6###	
4700		12.5		VY2472M49Y5US6###	VY2472M49Y5UG6###	
6800		14.5		VY2682M59Y5US63##	VY2682M59Y5UG63##	
10 000		16.0		VY2103M63Y5US63##	VY2103M63Y5UG63##	
					7.5 or 10.0	

**Notes**

- <sup>(1)</sup> Straight leads are available on request
- Coating extension DR valid for straight leads only

ORDERING CODE										
###	15 <sup>th</sup> to 17 <sup>th</sup> digit		Lead configuration			Available configurations see below				
<b>Example</b>	<b>VY2</b>	<b>221</b>	<b>K</b>	<b>29</b>	<b>Y5S</b>	<b>S</b>	<b>6</b>	<b>U</b>	<b>V</b>	<b>7</b>
	Series	Capacitance value	Tolerance code	Size code	Temperature coefficient	Rated voltage	Lead wire diameter	Packaging / lead length	Lead style	Lead spacing
						S = X1/Y2 300 V (AC)		3 = bulk T = tape and reel U = ammopack	L = straight V = inline kinked	5 = 5.0 7 = 7.5 0 = 10.0
						G = X1/Y2 300 V (AC) halogen-free				

**LEADSPACING 5.0 mm and 7.5 mm**

PACKAGING					
CAPACITANCE VALUE	SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES		
			BULK	REEL	AMMO
10 pF to 4700 pF	29 to 49	12.5	1000	1000	1000
6800 pF to 0.01 $\mu$ F	59 to 63	16.0	500	-	-

**LEADSPACING 10.0 mm**

PACKAGING					
CAPACITANCE VALUE	SIZE CODE	BODY DIAMETER $D_{max.}$ (mm)	PACKAGING QUANTITIES		
			BULK	REEL	AMMO
10 pF to 4700 pF	29 to 49	12.5	1000	500	750
6800 pF to 0.01 $\mu$ F	59 to 63	16.0	500	500	750

**Note**

- The capacitors are supplied in bulk packaging (cardboard boxes), in tape on reel in ammopack.

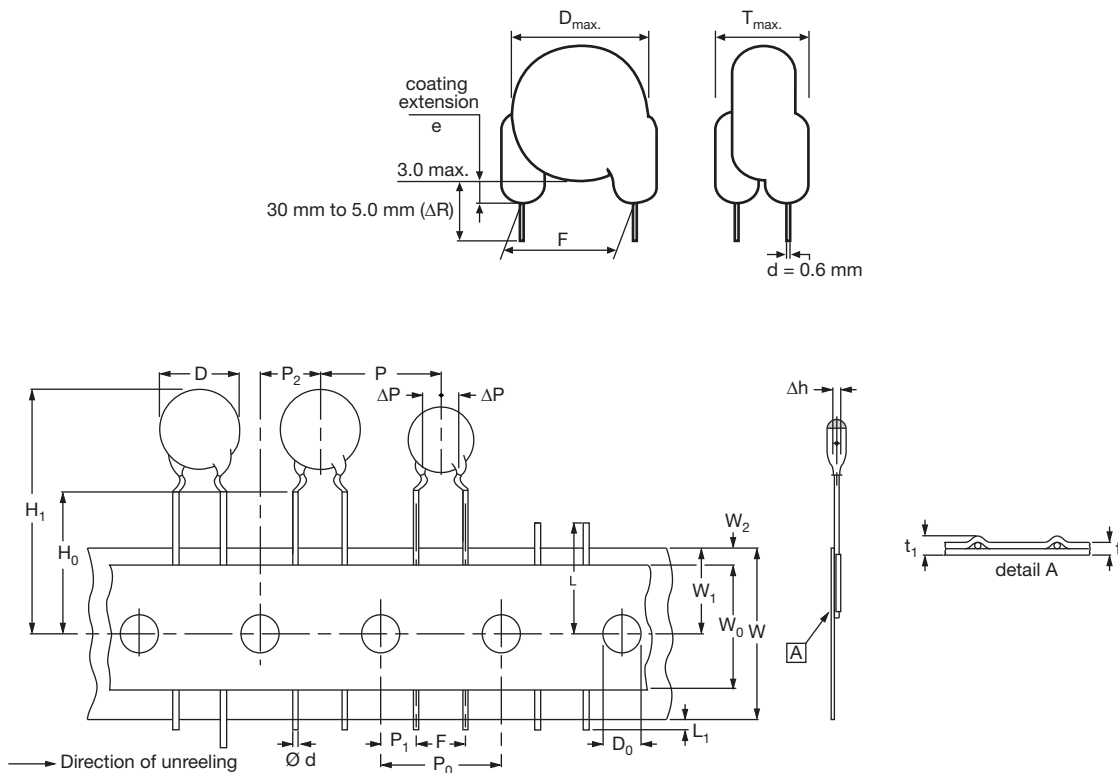
**STRAIGHT LEADS**


Fig. 1 - Kinked capacitors on tape, lead spacing 5.0 mm (0.2") and 7.5 mm (0.3")

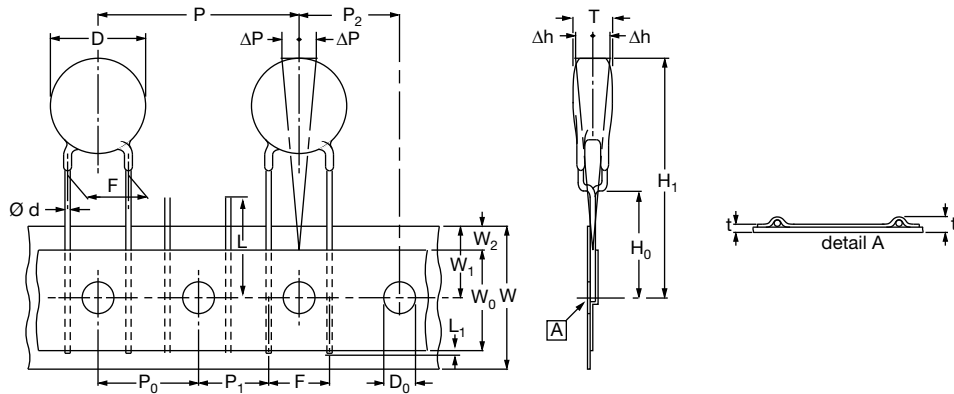
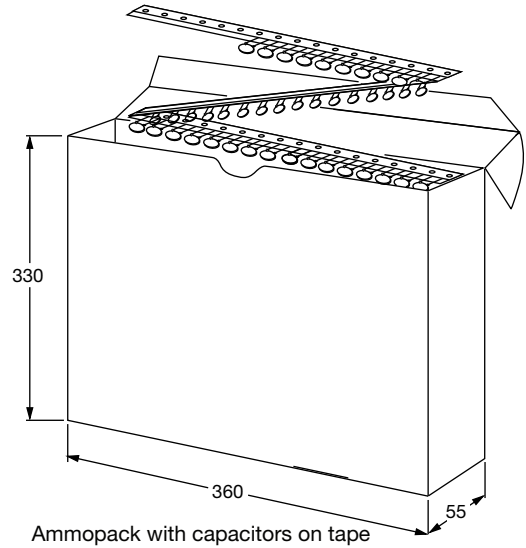
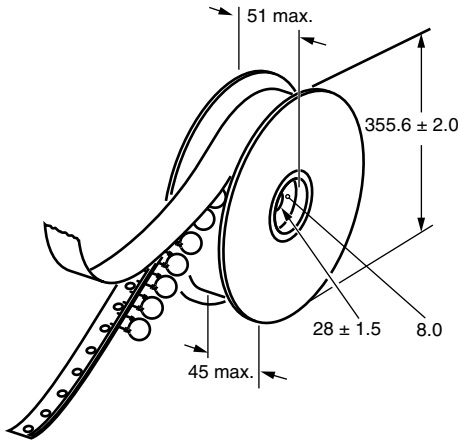


Fig. 2 - Inline kink (V) leaded capacitors on tape, lead spacing 10 mm (0.40")

DIMENSION OF TAPE				
SYMBOL	PARAMETER	DIMENSIONS (mm)		
		FIG. 1 (5 mm)	FIG. 1 (7.5 mm)	FIG. 2 (10 mm)
D <sup>(1)</sup>	Body diameter	11.0 max.	14.0 max.	16.0 max.
d	Lead diameter	0.6 ± 0.05	0.6 ± 0.05	0.6 ± 0.05
P	Pitch of component	12.7 ± 1	15.0 ± 1	25.4 ± 1
P <sub>0</sub> <sup>(2)</sup>	Pitch of sprocket hole	12.7 ± 0.3	15.0 ± 0.3	12.7 ± 0.3
P <sub>1</sub> <sup>(3)</sup>	Distance, hole center to lead	3.85 ± 0.7	3.75 ± 0.7	7.7 ± 1.0
P <sub>2</sub> <sup>(3)</sup>	Distance, hole to center of component	6.35 ± 1.3	7.5 ± 1.5	12.7 ± 1.5
F	Lead spacing	5.0 (+ 0.6/- 0.4)	7.5 (+ 0.6/- 0.4)	10.0 (+ 0.6/- 0.4)
Δh	Average deviation across tape	± 1.0 max.	± 1.0 max.	± 1.0 max.
ΔP	Average deviation in direction of reeling	± 1.0 max.	± 1.0 max.	± 1.0 max.
W	Carrier tape width	18.0 + 1/- 0.5	18.0 + 1/- 0.5	18.0 + 1/- 0.5
W <sub>0</sub>	Hold-down tape width	5.0 min.	5.0 min.	5.0 min.
W <sub>1</sub>	Position of sprocket hole	9.0 + 0.75/- 0.5	9.0 + 0.75/- 0.5	9.0 + 0.75/- 0.5
W <sub>2</sub>	Distance of hold-down tape	3.0 max.	3.0 max.	3.0 max.
H <sub>1</sub>	Maximum component height	32	40	40
H <sub>0</sub>	Height to seating plane (for kinked leads)	16.0 ± 0.5	16.0 ± 0.5	16.0 ± 0.5
H <sub>0</sub>	Height to seating plane (for straight leads)	20.0 ± 0.5	20.0 ± 0.5	20.0 ± 0.5
L	Length of cut leads	11.0 max.	11.0 max.	11.0 max.
L <sub>1</sub>	Length of lead protrusion	1.0 max.	1.0 max.	1.0 max.
D <sub>0</sub>	Diameter of sprocket hole	4.0 ± 0.2	4.0 ± 0.2	4.0 ± 0.2
t	Total tape thickness	0.9 max.	0.9 max.	0.9 max.
t <sub>1</sub>	Maximum thickness of tape and wires	1.5 max.	1.5 max.	1.5 max.

**Notes**

- (1) See "Technical Data" table
- (2) Cumulative pitch error: ± 1 mm/20 pitches
- (3) Obliquity maximum 3°

**REEL AND TAPE DATA** in millimeters

**STANDARD RECOGNITION**

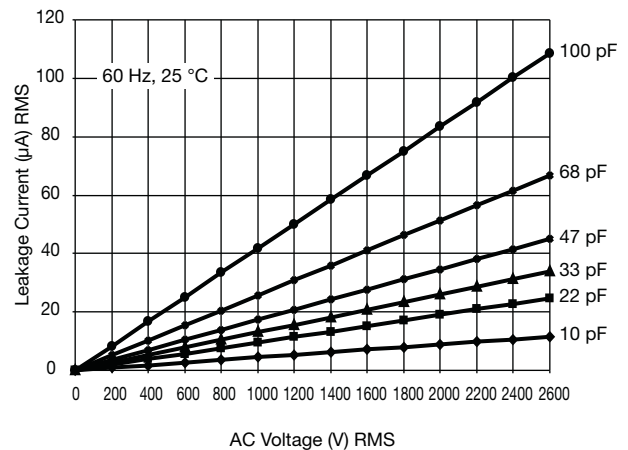
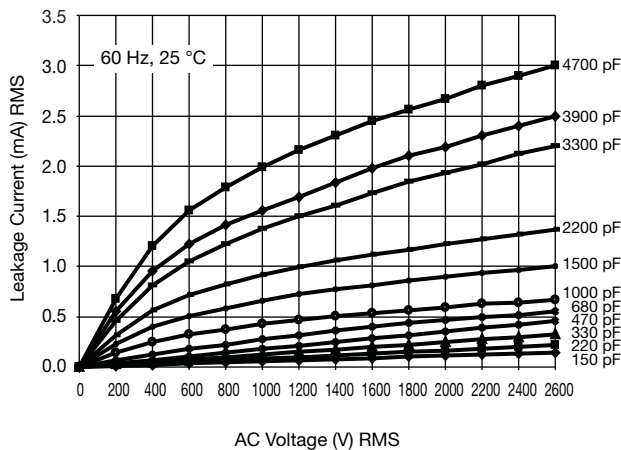
 IEC 60384 - 14/3<sup>rd</sup> issue (2005)- Safety Tests

UL60384-14 - Across-the-line, antenna-coupling and line-by-pass component

CQC - China Quality Certification Center-Safety Tests

<b>APPROVALS</b>				
IEC 60384-14.3 - Safety tests This approval together with CB test certificate substitutes all national approvals.				
<b>CB Certificate</b>				
Y2-capacitor: CB test certificate:	US-19599-A2-UL	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: CB test certificate:	US-19599-A2-UL	10 pF to 10 nF	440 V <sub>AC</sub>	
<b>VDE</b>				
Y2-capacitor: VDE marks approval:	40009669	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: VDE marks approval:	40009669	10 pF to 10 nF	440 V <sub>AC</sub>	
DIN EN 60384-14 VDE 0565-1-1:2006-04 - Safety tests				
<b>Underwriters Laboratories Inc. / Canadian Standards Association</b>				
Y2-capacitor: UL-test certificate:	E183844	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: UL-test certificate:	E183844	10 pF to 10 nF	440 V <sub>AC</sub>	
UL 60384-14.1, CSA E60384-1:03 2 <sup>nd</sup> edition, CSA E60384-14:09 2 <sup>nd</sup> edition Across-the-line, antenna-coupling, and line-by-pass component				
<b>CQC</b>				
Y2-capacitor: CQC test certificate:	CQC05001012316	10 pF to 10 nF	300 V <sub>AC</sub>	
X1-capacitor: CQC test certificate:	CQC05001012316	10 pF to 10 nF	440 V <sub>AC</sub>	

<b>MARKING</b>	
<p>Sample (2 sides)</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Front</p> </div> <div style="text-align: center;"> <p>Back</p> </div> </div>	<div style="text-align: center;"> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div> <p>PN: VY2331K29Y5SS6UV7 QTY: 1000 PO: SO:</p> </div> <div> <p>Lot1: 14Z549306 Lot2: Batch: 200601GN Region: 9520 Ser.No: 0601H72383</p> </div> <div> <p>DC1: 0601 DC2: SL: 0010</p> </div> </div> <div style="margin-top: 10px; text-align: center;"> </div> <p style="text-align: right; margin-top: 10px;">2/5</p>

**LEAKAGE CURRENT VS. VOLTAGE (Typical)**

**Note**

- The capacitors meet the essential requirements of EIA 198. Unless stated otherwise all electrical values apply at an ambient temperature of  $25\text{ °C} \pm 3\text{ °C}$ , at normal atmospheric conditions.

<b>RELATED DOCUMENTS</b>	
General Information	<a href="http://www.vishay.com/doc?28536">www.vishay.com/doc?28536</a>
CB Test Certificate	<a href="http://www.vishay.com/doc?22254">www.vishay.com/doc?22254</a>
VDE Marks Approval	<a href="http://www.vishay.com/doc?22256">www.vishay.com/doc?22256</a>
UL Test Certificate	<a href="http://www.vishay.com/doc?22253">www.vishay.com/doc?22253</a>
CQC Test Certificate	<a href="http://www.vishay.com/doc?22255">www.vishay.com/doc?22255</a>

<b>SAMPLE KIT</b>	
Part Number	VY21-KIT-HF
Link	<a href="http://www.vishay.com/doc?28554">www.vishay.com/doc?28554</a>



## 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.**