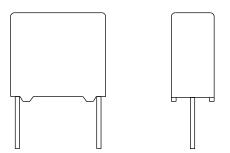


Vishay BCcomponents

# Interference Suppression Film Capacitors MKP Radial Potted Type



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### **FEATURES**

- 10 mm to 15 mm lead pitch
- Supplied loose in box, taped on reel
- Material categorization:
   For definitions of compliance please see <a href="https://www.vishay.com/doc?99912">www.vishay.com/doc?99912</a>





### **APPLICATIONS**

Y2 class

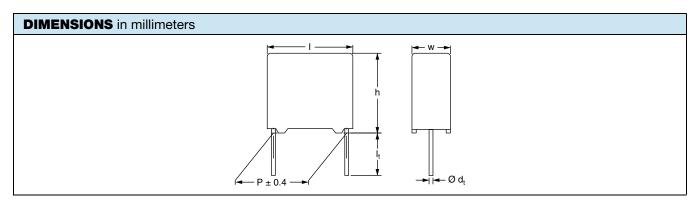
For Y2 electromagnetic interference suppression between line and ground applications (50 Hz/60 Hz) with a maximum mains voltage of 300  $V_{AC}.\,$ 

For application limitations refer to section "Application Notes".

QUICK REFERENCE DATA	
Capacitance range (E12 series)	0.001 μF to 0.047 μF (preferred values acc. to E6)
Capacitance tolerance	± 20 %; ± 10 %
Climatic testing class according to EN60068-1	$55/105/56/C$ for product volumes $\leq 1750 \text{ mm}^3$ $55/105/56/B$ for product volumes $> 1750 \text{ mm}^3$
Rated AC voltage	300 V <sub>AC</sub> ; 50 Hz to 60 Hz
Permissible DC voltage	1000 V <sub>DC</sub>
Maximum application temperature	105 °C
	IEC 60384-14 2 <sup>nd</sup> edition and EN132400
Reference standards	IEC 60065 requires, pass. flamm. class B for volumes > 1750 mm <sup>3</sup> UL 60384-14; ENEC
Dielectric	Polypropylene film
Electrodes	Metallized film
Construction	Series construction (for > 10 mm pitch)  Triple construction (for > 7.5 mm and 10 mm pitch)
Encapsulation	Plastic case, epoxy resin sealed, flame retardant UL-class 94 V-0
Leads	Tinned wire
Marking	C-value; tolerance; rated voltage; sub-class; manufacturer's type designation; code for dielectric material; manufacturer location; year and week

### Note

• For more detailed data and test requirements, contact: rfi@vishay.com





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BFC2 336 61...

BFC2 336 67...

BFC2 336 63...

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± 10 %

± 20 %

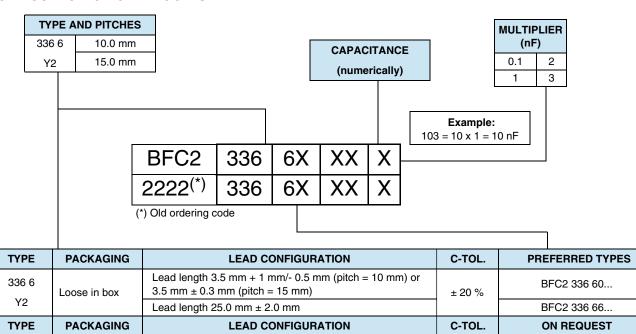
± 10 %

### **COMPOSITION OF CATALOG NUMBER**

Loose in box

Taped on reel (1)

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Lead length 3.5 mm + 1 mm/- 0.5 mm (pitch = 10 mm) or

#### Note

336 6

Y2

(1) For detailed tape specification refer to packaging information: <a href="https://www.vishay.com/doc?28139">www.vishay.com/doc?28139</a>

reel diameter 500 mm

 $3.5 \text{ mm} \pm 0.3 \text{ mm} \text{ (pitch} = 15 \text{ mm)}$ 

Lead length 25.0 mm ± 2.0 mm

H = 18.5 mm;  $P_0 = 12.7 \text{ mm}$ ;

SPECIFIC REFERENCE DATA					
DESCRIPTION	VALUE				
Rated AC voltage (U <sub>RAC</sub> )	300 V				
Permissible DC voltage (U <sub>RDC</sub> )	1000 V				
Toward of loss and	at 10 kHz				
Tangent of loss angle	≤ 10 x 10 <sup>-4</sup>				
Rated voltage pulse slope (dU/dt) <sub>R</sub> at 420 V <sub>DC</sub>	200 V/μs				
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ				
R between leads and case; 100 V; 1 min	> 30 000 MΩ				
Withstanding (DC) voltage (cut off current 10 mA) <sup>(1)</sup> ; rise time ≤ 1000 V/s	3400 V; 1 min				
Withstanding (AC) voltage between leads and case	2100 V; 1 min				

#### Note

(1) See "Voltage Proof Test for Metalized Film Capacitors": <a href="https://www.vishay.com/doc?28169">www.vishay.com/doc?28169</a>



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# MKP336 6 Y2

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		DAL DATA AN		DERING CODE	G NUMB	ER BFC2 336 6 AND	PACK	CAGING										
	CAP. (μF)	DIMENSIONS		LOG	7 I AOI	REEL (500 mm) <sup>(1)(2)</sup>												
U <sub>RAC</sub> (V)		w x h x l (mm)	MASS (g) <sup>(3)</sup>	I <sub>t</sub> = 3.5 mm + 1 mm/- 0.5 mm (10 mm) OR 3.5 mm ± 0.3 mm (= 15 mm)		I <sub>t</sub> = 25.0 mm ± 2.0 mm		H = 18.5 mm; P <sub>0</sub> = 12.7 mm										
				LAST 5 DIGITS OF CATALOG NUMBER	SPQ	LAST 5 DIGITS OF CATALOG NUMBER	SPQ	LAST 5 DIGITS OF CATALOG NUMBER	SPQ									
			PIT	$CH = 10.0 \text{ mm} \pm 0.4 \text{ mm}; d_t = 0$	.6 mm ± (	0.06 mm; C-TOL. = ± 20	0 %											
	0.0010			60102		66102		63102										
	0.0015	4.0 x 10.0 x 12.5	0.6	60152		66152	1250	63152	1400									
	0.0022	4.0 X 10.0 X 12.5	0.0	60222	1000	66222	1230	63222	1400									
	0.0033			60332	1000	66332		63332										
	0.0047	50 110 105	0.00	60472		66472	1000	63472	4400									
	0.0068	5.0 x 11.0 x 12.5	0.82	60682		66682	1000	63682	1100									
			PIT	CH = 15.0 mm ± 0.4 mm; d <sub>t</sub> = 0	.6 mm ± 0	0.06 mm; C-TOL. = ± 20	0 %		1									
	0.0068			69005		69009		69006										
	0.010	5.0 x 11.0 x 17.5	1.0	60103	1000	66103	1000	63103	1100									
	0.015	6.0 x 12.0 x 17.5	1.4	60153	-	66153		63153	900									
	0.0.0	0.0 X 12.0 X 11.0		CH = 15.0 mm ± 0.4 mm; d <sub>t</sub> = 0	.8 mm + (		0 %	33.33	000									
	0.022	7.0 x 13.5 x 17.5	1.8	60223		66223	7.0	63223	800									
	0.033	8.5 x 15.0 x 17.5	2.4	60333	750	66333	500	63333	650									
	0.047	10.0 x 16.5 x 17.5	3.0	60473	500	66473	450	63473	600									
	0.047	10.0 X 16.5 X 17.5						03473	000									
	0.0010		PIII	CH = 10.0 mm ± 0.4 mm; d <sub>t</sub> = 0		· · · · · · · · · · · · · · · · · · ·	J %	04100										
	0.0010			61102	4	67102		64102										
	0.0012					61122	_	67122		64122	4							
	0.0015	4.0 x 10.0 x 12.5					61152 61182 1000	_	67152	_	64152							
300	0.0018		4.0 x 10.0 x 12.5	4.0 x 10.0 x 12.5	4.0 x 10.0 x 12.5	4.0 x 10.0 x 12.5 0.		0.6	0.6	0.6	0.6	0.6	0.6	0.6		1000	67182	1250
	0.0022		0.0	0.0	0.0	61222		67222		64222								
	0.0027			61272		67272		64272										
	0.0033			61332		67332		64332										
	0.0039			61392		67392		64392										
	0.0047	E 0 v 11 0 v 10 E		61472	1000	67472	1000	64472	1100									
	0.0056	5.0 x 11.0 x 12.5	1.1	61562	1000	67562	1000	64562	1100									
			PITC	$CH = 15.0 \text{ mm} \pm 0.4 \text{ mm}; d_t = 0.4 \text{ mm}$	80 mm ±	0.08 mm; C-TOL. = ± 1	0 %											
	0.0056			69001		69007		69003										
	0.0068	0068		61682		67682		64682										
	0.0082	5.0 x 11.0 x 17.5	1.0	61822		67822		64822	1100									
	0.010			61103	1000	67103	1000	64103										
	0.012			61123	1	67123	1.500	64123										
	0.015			61153	1	67153	1	61153										
	0.018	60 x 12 0 x 17 5 │ 1 4		61183	-	67183	-	64183	900									
	0.010		DITC	CH = 15.0 mm ± 0.4 mm; d <sub>t</sub> = 0.	80 mm ±		n %	0-100										
	0.022	7.0 x 13.5 x 17.5	1.8	61223	TIME	67223	J /0	64223	800									
		7.U X U.U X U.U	1.0		750		500		000									
	0.027	8.5 x 15.0 x 17.5	2.4	61273	750	67273		64273	650									
	0.033		-	61333		67333		64333										
	0.039	10.0 x 16.5 x 17.5	3.0	61393	500	67393	450	61393	600									
	0.047			61473		67473		64473										

#### Notes

- SPQ = Standard packing quantity
- (1) H = In-tape height; P<sub>0</sub> = Sprocket hole distance; for detailed specifications refer to packaging information: <u>www.vishay.com/doc?28139</u>
- (2) Reel diameter = 365 mm is available on request
- (3) Weight for short lead product only



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APPROVALS								
SAFETY APPROVALS Y2	VOLTAGE	VALUE	FILE NUMBERS					
EN132400	300 V <sub>AC</sub>	1 nF to 47 nF	FI 2008059					
UL 60384-14	300 V <sub>AC</sub>	1 nF to 47 nF	E354331					
CSA-E384-14	300 V <sub>AC</sub>	1 nF to 47 nF	E354331					
CB-test-certificate	300 V <sub>AC</sub>	1 nF to 47 nF	FI 5255 A2					

The ENEC-approval together with the CB-certificate replace all national marks of the following countries (they have already signed the ENEC-agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Switzerland and United Kingdom.





#### MOUNTING

#### **Normal Use**

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to packaging information: www.vishav.com/doc?28139

### **Specific Method of Mounting to Withstand Vibration and Shock**

In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

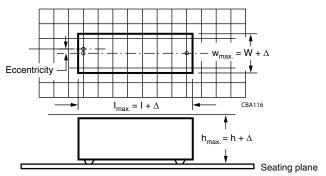
• The capacitors shall be mechanically fixed by the leads

### **Space Requirements on Printed Circuit Board**

The maximum space for length (I<sub>max.</sub>), width (w<sub>max.</sub>) and height (h<sub>max.</sub>) of film capacitors to take in account on the printed circuit board is shown in the drawings.

• For products with pitch  $\leq$  15 mm,  $\Delta w = \Delta l = 0.3$  mm;  $\Delta h = 0.1$  mm

Eccentricity defined as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.



### **SOLDERING CONDITIONS**

For general soldering conditions and wave soldering profile, we refer to the application note:

"Soldering Guidelines for Film Capacitors": www.vishay.com/doc?28171

#### **Storage Temperature**

T<sub>sta</sub> = - 25 °C to + 35 °C with RH maximum 75 % without condensation

#### **Ratings and Characteristics Reference Conditions**

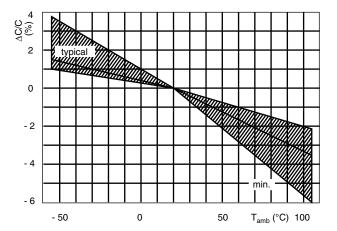
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 %  $\pm$  2 %.

For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

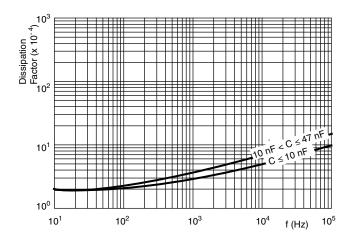


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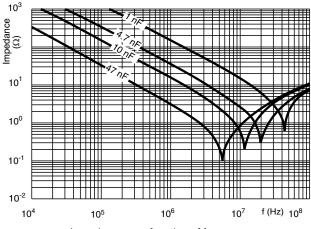
### **CHARACTERISTICS**



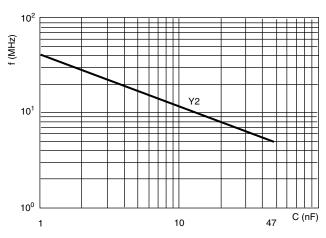
Capacitance as a function of ambient temperature (typical curve)



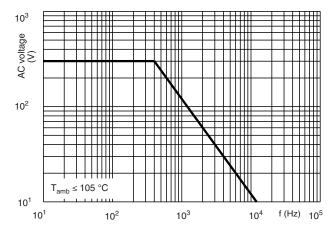
Tangent of loss angle as a function of frequency (typical curve)



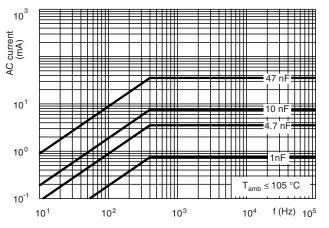
Impedance as a function of frequency (typical curve)



Resonant frequency as a function of capacitance (typical curve)



Max. RMS voltage as a function of frequency

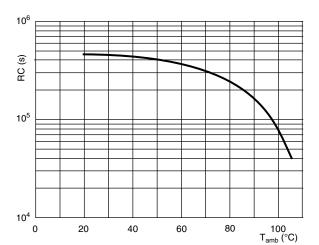


Max. RMS current as a function of frequency

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### MKP336 6 Y2

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Insulation resistance as a function of ambient temperature (typical curve)

#### **APPLICATION NOTES**

- For Y2 electromagnetic interference suppression between line and ground (50 Hz/60 Hz) with a maximum mains voltage of 300 V<sub>AC</sub> ± 10 % instability.
- For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact: <a href="mailto:rfi@vishav.com">rfi@vishav.com</a>.
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse program must be used.
- $\bullet$  The maximum ambient temperature must not exceed 105 °C.
- Rated voltage pulse slope:
   If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 420 V<sub>DC</sub> and divided by the applied voltage.



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### **INSPECTION REQUIREMENTS**

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### **General Notes**

- 1. Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, IEC-Publication EN132400 (IEC 60384-14) and section one of this specification".
- 2. In this table: D = Destructive ND = Non destructive

GROUP C INSPECTION REQU	IREM	ENTS	
SUB-CLAUSE NUMBER AND TEST	D OR ND	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1	D		
4.1 Dimensions (detail)			As specified in chapters "General data" of this specification
Initial measurements		Capacitance Tangent of loss angle at 10 kHz	
4.3 Robustness of terminations		Tensile: Load 10 N; 10 s Bending: Load 5 N; 4 x 90°	No visible damage
4.4 Resistance to soldering heat		No pre-drying Method: 1A Solder bath: 260 °C Duration: 10 s	
4.19 Component solvent resistance		Isopropylalcohol at room temperature Method: 2 Immersion time: 5 min ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements		Visual examination	No visible damage Legible marking
		Capacitance	$ \Delta C/C  \le 5$ % of the value measured initially
		Tangent of loss angle	Increase of tan δ:≤ 0.008 Compared to values measured initially
		Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1	D		
Initial measurements		Capacitance Tangent of loss angle at 10 kHz	
4.20 Solvent resistance of the marking		Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 min ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature		θA = - 55 °C θB = + 105 °C 5 cycles	
4.6.1 Inspection		Duration t = 30 min	



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GROUP C INSPECTION REQU	1	ENTS	
SUB-CLAUSE NUMBER AND TEST	D OR ND	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1	D		
4.7 Vibration		Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz. Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection		Visual examination	No visible damage
4.9 Shock		Mounting: See section "Mounting" for more information Pulse shape: Half sine Acceleration: 490 m/s <sup>2</sup> Duration of pulse: 11 ms	
4.9.2 Final measurements		Visual examination	No visible damage
		Capacitance	$ \Delta C/C  \le 5$ % of the value measured initially
		Tangent of loss angle	
		Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B	D		
4.11 Climatic sequence			
4.11.1 Initial measurements		Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B	
4.11.2 Dry heat		Temperature: 105 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle			
4.11.4 Cold		Temperature: - 55 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db remaining cycles			



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SUB-CLAUSE NUMBER AND TEST	D OR	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B	ND D		
4.11.6 Final measurements		Visual examination	No visible damage Legible marking
		Capacitance	$ \Delta C/C  \le 5$ % of the value measured in 4.11.1.
		Tangent of loss angle	Increase of tan $\delta$ : $\leq$ 0.008 Compared to values measured in 4.11.
		Voltage proof 2250 V <sub>DC</sub> ; 1 min between term.	No permanent breakdown or flash-over
		Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification
SUB-GROUP C2	D		
4.12 Damp heat steady state		56 days, 40 °C, 90 % to 95 % RH no load capacitance	
4.12.1 Initial measurements		Capacitance Tangent of loss angle at 10 kHz	
4.12.3 Final measurements		Visual examination	No visible damage Legible marking
		Capacitance	$ \Delta C/C  \le 5$ % of the value measured in 4.12.1.
		Tangent of loss angle	Increase of tan $\delta$ : $\leq 0.007$ Compared to values measured in 4.12.
		Voltage proof 2250 V <sub>DC</sub> ; 1 min between term.	No permanent breakdown or flash-over
		Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification
SUB-GROUP C3	D		,
4.13.1 Initial measurements		Capacitance Tangent of loss angle at 10 kHz	
4.13 Impulse voltage		3 successive impulses, full wave, peak voltage: 5 kV Max. 24 pulses	No selfhealing breakdowns or flashover
4.14 Endurance		Duration: 1000 h 1.7 $U_{RAC}$ at 105 °C Once in every hour the voltage is increased to 1000 $V_{RMS}$ for 0.1 s via resistor of 47 $\Omega$ ± 5 %	



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GROUP C INSPECTION REQUIREMENTS					
SUB-CLAUSE NUMBER AND TEST	D OR ND	CONDITIONS	PERFORMANCE REQUIREMENTS		
SUB-GROUP C3	D				
4.14.7 Final measurements		Visual examination	No visible damage Legible marking		
		Capacitance	$ \Delta C/C  \le 10$ % compared to values measured in 4.13.1.		
		Tangent of loss angle	Increase of tan $\delta$ : $\leq 0.007$ Compared to values measured in 4.13.1.		
		Voltage proof 2250 V <sub>DC</sub> ; 1 min between terminations	No permanent breakdown or flash-over		
		Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification		
SUB-GROUP C4	D				
4.15 Charge and discharge		$ \begin{array}{l} 10000\text{cycles} \\ (50\text{c/s})\text{charge to}U_R\text{half sinewave} \\ \text{Duration:}5\text{ms} \\ \text{Discharge resistance:} \\ R = \frac{420V_{DC}}{1.5xC((\text{dU})/(\text{dt}))} \\ R_{\text{min.}} = 2.2\Omega \end{array} $			
4.15.1 Initial measurements		Capacitance Tangent of loss angle at 10 kHz			
4.15.3 Final measurements		Capacitance	$ \Delta C/C  \le 10$ % compared to values measured in 4.15.1.		
		Tangent of loss angle	Increase of tan $\delta$ : $\leq 0.008$ Compared to values measured in 4.15.1.		
		Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification		
SUB-GROUP C5	D				
4.16 Radio frequency characteristic		Resonance frequency	As specified in section "Resonant frequency" of this specification. ± 10 %		



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GROUP C INSPECTION REQU	IREM	ENTS	
SUB-CLAUSE NUMBER AND TEST	D OR ND	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C6	D		
4.17 Passive flammability Class B		Bore of gas jet: Ø 0.5 mm Fuel: Butane Test duration for actual volume V in mm³: $V \le 250$ : 10 s $250 < V \le 500$ : 20 s $500 < V \le 1750$ : 30 s $V > 1750$ : 60 s One flame application	After removing test flame from capacitor, the capacitor must not continue to burn for more than 10 s. No burning particle must drop from the sample.
SUB-GROUP C7	D		
4.18 Active flammability		$20x5kV$ discharges on the test capacitor connected to $U_R$	The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.



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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.

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Revision: 02-Oct-12 Document Number: 91000

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BFC233666332	BFC233667332	BFC233661103	BFC233663223	BFC233667222	BFC233663222	BFC233667152
BFC233661152	BFC233666682	BFC233667223	BFC233667472	BFC233663332	BFC233661332	BFC233664102
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