

PHE429 Series Single Metallized Polypropylene Film, Optimized for SMPS PFC Applications

Overview

The PHE429 Series is a metallized polypropylene film encapsulated with self-extinguishing resin in a box of material meeting the requirements of UL 94 V-0.

Applications

Typical applications include power factor correction and pulse applications.

Benefits

- Rated voltage: 420 – 630 VDC
- Rated voltage: 220 – 275 VAC
- Capacitance range: 0.047 – 0.47 μ F
- Lead spacing: 15 mm
- Capacitance tolerance: $\pm 10\%$, other tolerances on request
- Climatic category: 55/110/56, IEC 60068-1
- Tape and reel packaging in accordance with IEC 60286-2
- RoHS Compliant and lead-free terminations
- Category temperature range of -55°C to +110°C



Legacy Part Number System

PHE429	K	B	6100	K	R06
Series	Rated Voltage (VDC)	Lead Spacing (mm)	Capacitance Code (pF)	Capacitance Tolerance	Lead and Packaging Code
Metallized Polypropylene	K = 420 M = 630	B = 15.0	Digits 2 – 4 indicate the first three digits of the capacitance value. First digit indicates the number of zeros to be added.	K = $\pm 10\%$ Other tolerances on request	See Ordering Options Table

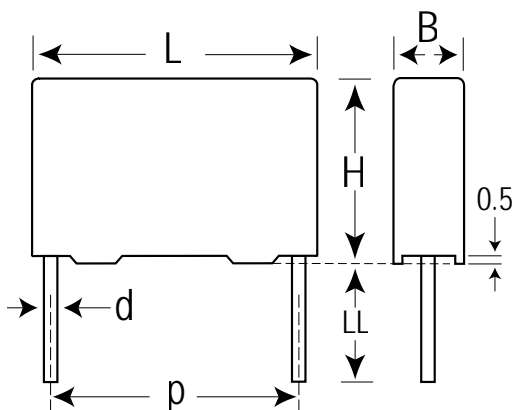
New KEMET Part Number System

F	429	B	D	104	K	420	C
Capacitor Class	Series	Lead Spacing (mm)	Size Code	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC)	Lead and Packaging Code
F = Film	Metallized Polypropylene	B = 15.0	See Dimension Table	First two digits indicate the two most significant digits of the capacitance value in picofarads. The third digit is the number of following zeros.	K = $\pm 10\%$ Other tolerances on request	420 = 420 630 = 630	See Ordering Options Table

Ordering Options Table

Lead Spacing Nominal (mm)	Type of Leads and Packaging	Lead Length (mm)	KEMET Lead and Packaging Code	Legacy Lead and Packaging Code
15	Standard Lead and Packaging Options			
	Bulk (Bag) – Short Leads	6 +0/-1	C	R06
	Bulk (Bag) – Max Length Leads	30 +5/-0	A	R30
	Other Lead and Packaging Options			
	Bulk (Bag) – Max Length Leads	30 +5/-0	ALW0L	R30
	Tape & Reel (Standard Reel)	$H_0 = 18.5 \pm 0.5$	L	R17T0
	Tape & Reel (Large Reel)	$H_0 = 18.5 \pm 0.5$	P	R17T1
Native 15 formed to 7.5	Ammo Pack	$H_0 = 16.5 \pm 0.5$	XLAF1	R25XA
	Tape & Reel (Standard Reel)	$H_0 = 16.5 \pm 0.5$	XLTF1	R25X2

Dimensions – Millimeters



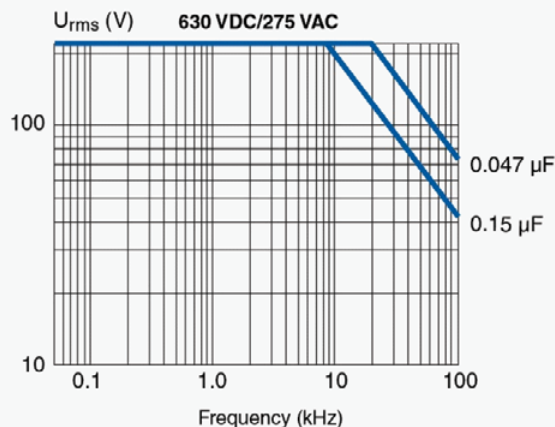
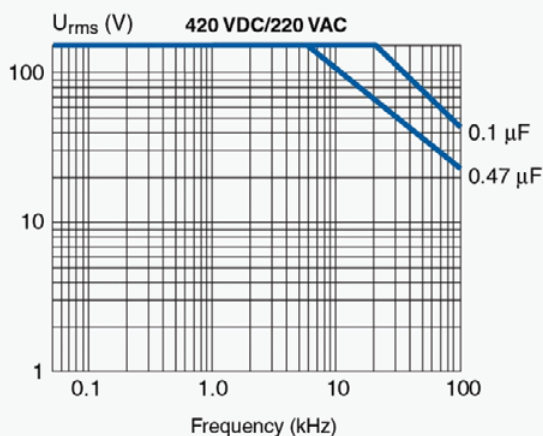
KEMET Size Code	Legacy Size Code	p		B		H		L		d	
		Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
BD	B04	15	+/-0.4	5.5	Maximum	10.5	Maximum	18	Maximum	0.8	+/-0.05
BG	B15	15	+/-0.4	6	Maximum	12	Maximum	18	Maximum	0.8	+/-0.05
BJ	B10	15	+/-0.4	6.5	Maximum	12.5	Maximum	18	Maximum	0.8	+/-0.05
BL	B06	15	+/-0.4	7.5	Maximum	14.5	Maximum	18	Maximum	0.8	+/-0.05
BM	B12	15	+/-0.4	8	Maximum	15	Maximum	18	Maximum	0.8	+/-0.05

Note: See Ordering Options Table for lead length (LL) options.

Performance Characteristics

Voltage Range (VDC)	420	630
Voltage Range (VAC)	220	275
Capacitance Range (μF)	0.1 – 0.47	0.047 – 0.15
Capacitance Tolerance	±10%, other tolerances on request	
Category Temperature Range	-55°C to +110°C	
Rated Temperature	+85°C	
Voltage Derating	The rated voltage is decreased with 1.3%/°C between +85°C and +110°C	
Climatic Category	IEC 60068–1, 55/110/56	
Maximum Pulse Steepness	dV/dt according to Table 1. For peak to peak voltages lower than rated voltage ($V_{PP} < V_R$), the specified dV/dt can be multiplied by the factor V_R/V_{PP} .	
Self-Inductance	Approximately 6 nH/cm for the total length of capacitor winding and the leads	
Dissipation Factor tanδ	Maximum Values at +23°C	
	1 kHz	0.001
Insulation Resistance	Measured at +23°C, 100 VDC 60 seconds for $V_R < 500$ VDC and at 500 VDC for $V_R \geq 500$ VDC	
	Minimum Values Between Terminals	
	$C \leq 0.33 \mu\text{F}$	$\geq 100,000 \text{ M}\Omega$
	$C > 0.33 \mu\text{F}$	$\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$
	Minimum Values Between Terminals and Case	
		$\geq 100,000 \text{ M}\Omega$

Derating of V_{rms} vs. Frequency, +85°C Ambient Temperature and 10°C Internal Heating, Typical Values



Environmental Test Data

Test	IEC Publication	Procedure	Requirements
Voltage Proof	60384-1 Clause 4.6	$1.6 \times V_R$ after 60 seconds	The capacitors must withstand the voltage without breakdowns or flashovers and without decreased insulation resistance below the value in each detail specification. No visible damage
	Clause 4.6 2.3	$2 \times V_R$ (minimum 400 VDC to case) after 60 seconds	As above
Vibration	60068-2-6 Test Fc	6 hours with 10 – 500 Hz and 0.75 mm amplitude or 98 m/s ² depending on frequency	No visible damage $\tan\delta \leq 1.2 \times \text{stated value at 100 kHz}$ $\Delta C/C \leq \pm 0.5\%$
Bump	60068-2-29 Test Eb	4,000 bumps with 390 m/s ² mounted on PCB	$\Delta C/C \leq \pm 0.5\%$ $\tan\delta \leq 1.2 \times \text{stated value at 100 kHz}$ Insulation resistance: $\geq 100,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$
Resistance to Soldering Heat	60068-2-20 Method 1A	Solder bath at $+260^\circ\text{C} \pm 5^\circ\text{C}$ with screening	Immersion of the terminations into the solder bath shall be completed in a time not exceeding 1 second and the terminations shall remain immersed to the specified depth for $10 + 1$ second and then be withdrawn. $\Delta C/C \leq \pm 1.0\%$ $\tan\delta \text{ increase} < 0.001$ No visible damage
Climatic Sequence	60384-1 Paragraph 4:21	60068-2.2 dry heat 16 hours 60068-2-34 damp heat, one cycle 60068-2-1 Test Aa 2 hours	Insulation resistance: $\geq 100,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$ $\Delta C/C \leq \pm 0.5\%$ $\tan\delta \leq 1.2 \times \text{stated value at 100 kHz}$
Damp Heat Steady State	60068-2-3 Test Ca	$+40^\circ\text{C}$ and 90 – 95% RH	56 days no visible damage Insulation resistance: $\geq 50,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 15,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$ $\Delta C/C \leq \pm 1\%$ $\tan\delta \leq 1.2 \times \text{stated value at 100 kHz}$
Endurance, AC		1,000 hours at $+85^\circ\text{C}$ and $1.25 \times V_R$ AC	No visible damage $\Delta C/C \leq \pm 3\%$ $\tan\delta \leq 1.5 \times \text{stated value at 100 kHz}$ Insulation resistance: $\geq 100,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 30,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$
Charge and Discharge	60384-17 Paragraph 4.13	10,000 pulses and with (2 x) dV/dt according to detail specification	$\tan\delta$ (100 kHz) $\leq 2 \times \text{stated value (100 kHz)}$ $\Delta C/C \leq \pm 0.5\%$ Insulation resistance: $\geq 50,000 \text{ M}\Omega$ for $C_R \leq 0.33 \mu\text{F}$ $\geq 15,000 \text{ M}\Omega \cdot \mu\text{F}$ for $C_R > 0.33 \mu\text{F}$

Environmental Compliance

All KEMET pulse capacitors are RoHS Compliant.



RoHS Compliant

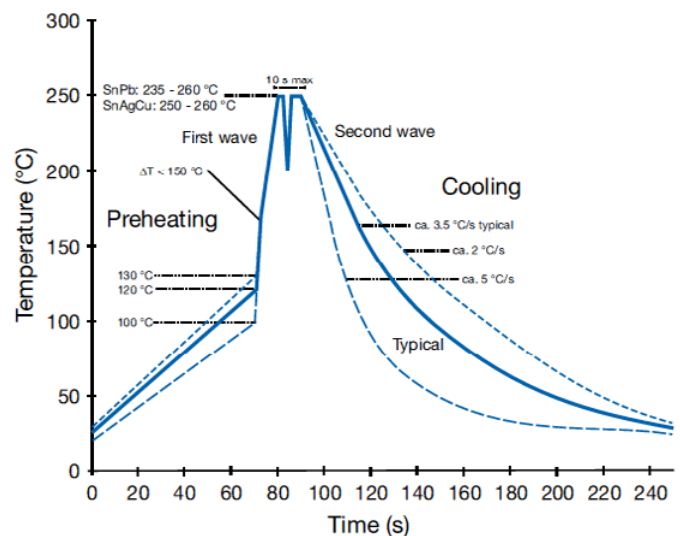
Table 1 – Ratings & Part Number Reference

VDC	VAC	Cap Value (μ F)	Dimensions in mm			Lead Space	dV/dt (V/ μ s)	Size Code (New/Legacy)	R_{thja} °C/W 85°C 0.2m/s	New Kemet Part Number	Legacy Part Number
			B	H	L						
420	220	0.10	5.5	10.5	18.0	15	150	BD/B04	99	F429BD104K420(1)	PHE429KB6100K(1)
420	220	0.15	5.5	10.5	18.0	15	150	BD/B04	99	F429BD154K420(1)	PHE429KB6150K(1)
420	220	0.22	6.0	12.0	18.0	15	150	BG/B15	83	F429BG224K420(1)	PHE429KB6220K(1)
420	220	0.33	7.5	14.5	18.0	15	150	BL/B06	74	F429BL334K420(1)	PHE429KB6330K(1)
420	220	0.47	8.0	15.0	18.0	15	150	BM/B12	71	F429BM474K420(1)	PHE429KB6470K(1)
630	275	0.047	5.5	10.5	18.0	15	250	BD/B04	99	F429BD473K630(1)	PHE429MB5470K(1)
630	275	0.068	5.5	10.5	18.0	15	250	BD/B04	99	F429BD683K630(1)	PHE429MB5680K(1)
630	275	0.10	5.5	10.5	18.0	15	250	BD/B04	99	F429BD104K630(1)	PHE429MB6100K(1)
630	275	0.15	6.5	12.5	18.0	15	250	BJ/B10	84	F429BJ154K630(1)	PHE429MB6150K(1)
VDC	VAC	Cap Value (μ F)	B (mm)	H (mm)	L (mm)	Lead Space	dV/dt (V/ μ s)	Size Code (New/Legacy)	R_{thja} °C/W 85°C 0.2m/s	New KEMET Part Number	Legacy Part Number

(1) Insert lead and packaging code. See Ordering Options Table for available options.

Soldering Process

The implementation of the RoHS Directive has required the selection SnAuCu (SAC) alloys or SnCu alloys as primary solder. This has increased the liquidus temperature from that of 183°C for SnPb eutectic alloy to 217°C – 221°C for the new alloys. As a result, the heat stress to components, even in wave soldering, has increased considerably due to higher pre-heat and wave temperatures. Polypropylene capacitors are especially sensitive to heat (melting point of polypropylene is 160°C – 170°C). Wave soldering can be destructive especially for mechanically small polypropylene capacitors and great care must be taken during soldering. The solder profiles from KEMET are highly recommended. You may also refer to the wave soldering curve from IEC Publication 61760–1 Edition 2. Please consult KEMET with any questions.



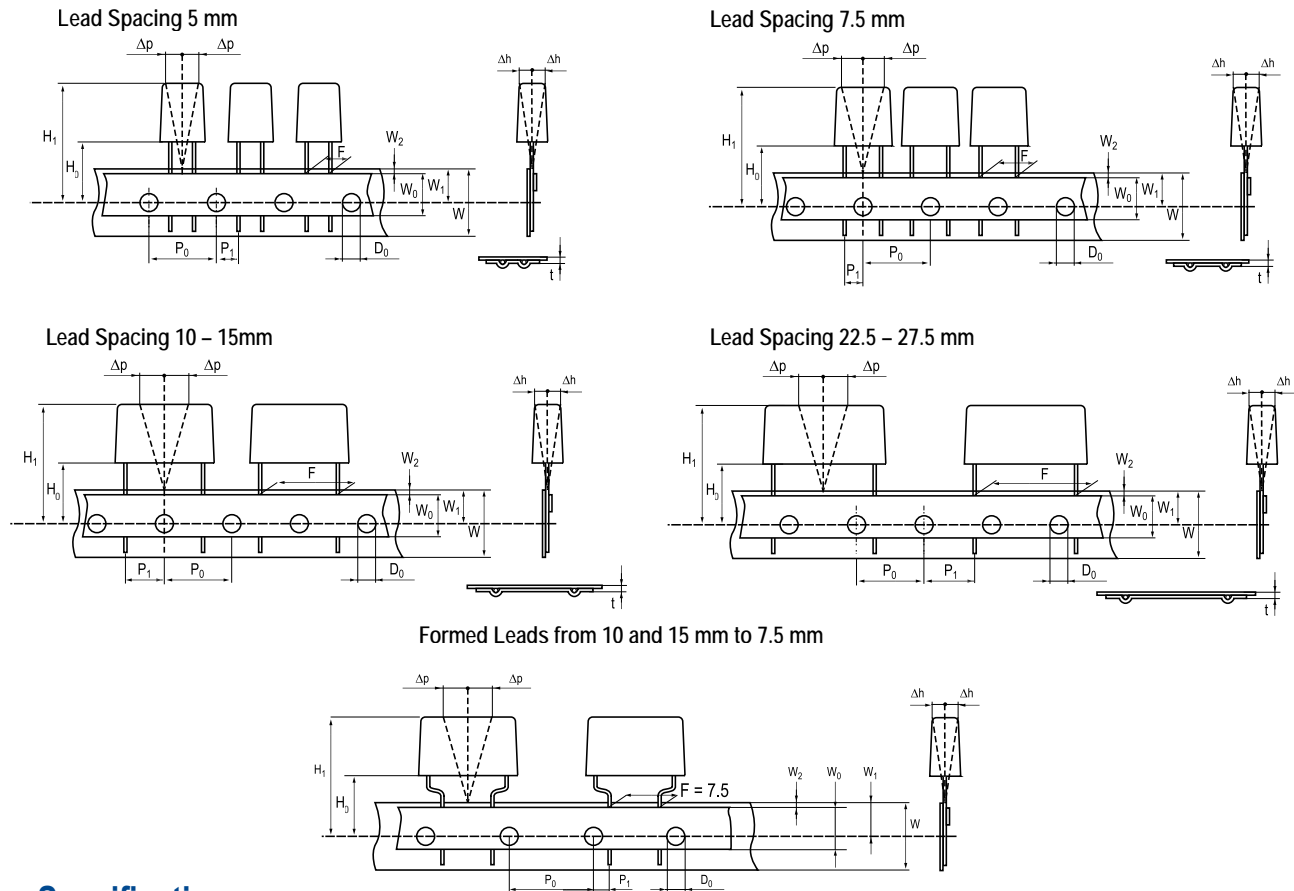
Marking

- KEMET's logo
- Series
- Capacitance
- Capacitance tolerance
- Rated DC voltage
- Manufacturing date code

Packaging Quantities

KEMET Size Code	Legacy Size Code	Lead Spacing	Thickness (mm)	Height (mm)	Length (mm)	Bulk Short Leads	Bulk Long Leads	Standard Reel ø 360 mm	Large Reel ø 500 mm	Standard Reel Formed	Ammo Formed
BD	B04	15	5.5	10.5	18	1000	800	600	1200	550	570
BE	B05		5.5	12.5	18	1000	800	600	1200	550	570
BL	B06		7.5	14.5	18	800	400	400	800	350	378
BJ	B10		6.5	12.5	18	1000	600	500	1000	450	480
BQ	B11		8.5	16	18	600	400	400	800	350	324
BM	B12		8	15	18	600	400	400	800	350	351
BV	B14		9.5	17.5	18	500	300	350	700	250	297
BG	B15		6	12	18	1000	800	500	1000	450	520
BY	B16		11	19	18	450	250	300	600	250	252
BU	B17		13	12.5	18	400	300	250	500	200	216

Lead Taping & Packaging (IEC 60286-2)



Taping Specification

Dimensions in mm										Standard IEC 60286-2
Lead spacing	+6/-0.1	F	5	7.5	Formed 7.5	10	15	22.5	27.5	F
Carrier tape width	+/-0.5	W	18	18	18	18	18	18	18	18 ^{+1/-0.5}
Hold-down tape width	+/-0.3	W ₀	9	9	9	12	12	12	12	
Position of sprocket hole	+/-0.5	W ₁	9	9	9	9	9	9	9	9 ^{+0.75/-0.5}
Distance between tapes	Maximum	W ₂	3	3	3	3	3	3	3	3
Sprocket hole diameter	+/-0.2	D ₀	4	4	4	4	4	4	4	4
Feed hole lead spacing	+/-0.3	P ₀ ⁽¹⁾	12.7	12.7	12.7 ⁽⁴⁾	12.7	12.7	12.7	12.7	12.7
Distance lead – feed hole	+/-0.7	P ₁	3.85	3.75	3.75	7.7	5.2	5.3	5.3	P ¹
Deviation tape – plane	Maximum	Δp	1.3	1.3	1.3	1.3	1.3	1.3	1.3	1.3
Lateral deviation	Maximum	Δh	2	2	2	2	2	2	2	2
Total thickness	+/-0.2	t	0.7	0.7	0.7	0.7	0.7	0.9 ^{MAX}	0.9 ^{MAX}	0.9 ^{MAX}
Sprocket hole/cap body	Nominal	H ₀ ⁽²⁾	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18.5 ^{+/-0.5}	18 ^{+2/-0}
Sprocket hole/top of cap body	Maximum	H ₁ ⁽³⁾	32	31	43	43	43	58	58	58 ^{MAX}

(1) Maximum cumulative feed hole error, 1 mm per 20 parts.

(2) 16.5 mm available on request.

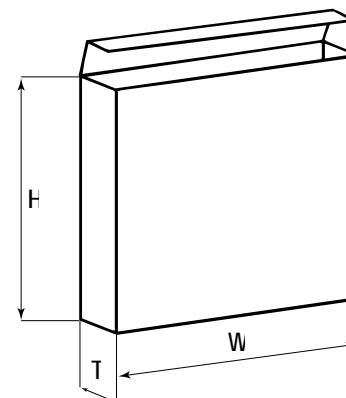
(3) Depending on case size.

(4) 15 mm available on request.

Lead Taping & Packaging (IEC 60286–2) cont'd

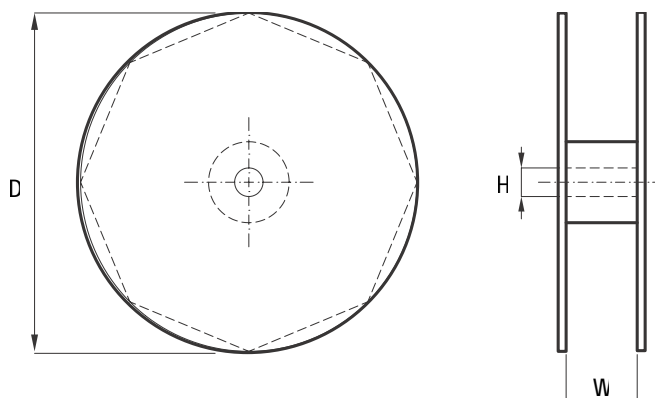
Ammo Specifications

Series	Dimensions (mm)		
	H	W	T
R4x, R4x+R, R7x, RSB	360	340	59
F5A, F5B, F5D			
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx, SMR & PFR	330	330	50



Reel Specifications

Series	Dimensions (mm)		
	D	H	W
R4x, R4x+R, R7x, RSB	355 500	30	55 (Max)
F5A, F5B, F5D		25	
F6xx, F8xx			
PHExxx, PMExxx, PMRxxx, SMR & PFR	360 500	30	46 (Max)



Manufacturing Date Code (IEC–60062)

Y = Year, Z = Month			
Year	Code	Month	Code
2000	M	January	1
2001	N	February	2
2002	P	March	3
2003	R	April	4
2004	S	May	5
2005	T	June	6
2006	U	July	7
2007	V	August	8
2008	W	September	9
2009	X	October	O
2010	A	November	N
2011	B	December	D
2012	C		
2013	D		
2014	E		
2015	F		
2016	H		
2017	J		
2018	K		
2019	L		
2020	M		

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Milpitas, CA
Tel: 408-433-9950

Mexico

Guadalajara, Jalisco
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Europe

Southern Europe

Paris, France
Tel: 33-1-4646-1006

Sasso Marconi, Italy
Tel: 39-051-939111

Central Europe

Landsberg, Germany
Tel: 49-8191-3350800

Kamen, Germany
Tel: 49-2307-438110

Northern Europe

Bishop's Stortford, United Kingdom
Tel: 44-1279-460122

Espoo, Finland
Tel: 358-9-5406-5000

Asia

Northeast Asia

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Shenzhen, China
Tel: 86-755-2518-1306

Beijing, China
Tel: 86-10-5829-1711

Shanghai, China
Tel: 86-21-6447-0707

Taipei, Taiwan
Tel: 886-2-27528585

Southeast Asia

Singapore
Tel: 65-6586-1900

Penang, Malaysia
Tel: 60-4-6430200

Bangalore, India
Tel: 91-806-53-76817

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Other KEMET Resources

Tools	
Resource	Location
Configure A Part: CapEdge	http://capacitoredge.kemet.com
SPICE & FIT Software	http://www.kemet.com/spice
Search Our FAQs: KnowledgeEdge	http://www.kemet.com/keask
Electrolytic LifeCalculator	http://www.kemet.com:8080/elc

Product Information	
Resource	Location
Products	http://www.kemet.com/products
Technical Resources (Including Soldering Techniques)	http://www.kemet.com/technicalpapers
RoHS Statement	http://www.kemet.com/rohs
Quality Documents	http://www.kemet.com/qualitydocuments

Product Request	
Resource	Location
Sample Request	http://www.kemet.com/sample
Engineering Kit Request	http://www.kemet.com/kits

Contact	
Resource	Location
Website	www.kemet.com
Contact Us	http://www.kemet.com/contact
Investor Relations	http://www.kemet.com/ir
Call Us	1-877-MyKEMET
Twitter	http://twitter.com/kemetcapacitors

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Although all product-related warnings, cautions and notes must be observed, the customer should not assume that all safety measures are indicated or that other measures may not be required.

