

Pulse Detonation, High Voltage, High Temperature 200°C, C0G Dielectric, 500 – 2,000 VDC (Industrial Grade)

Overview

KEMET's Industrial Grade Pulse Detonation Series surface mount capacitors in C0G dielectric deliver reliable, high voltage and high temperature performance required for operation in harsh environments, specifically detonation circuitry. Constructed of a robust and proprietary base metal electrode (BME) dielectric system, these devices offer industry-leading performance relative to capacitance and case size. KEMET Pulse Detonation capacitors average greater than 30% higher breakdown voltage than competitive precious metal electrode (PME) devices with similar capacitance and voltage ratings.

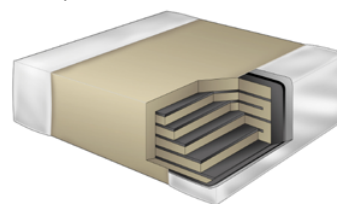
Designed for down-hole oil exploration and perforation, these devices feature a 200°C maximum operating temperature. The Electronics Industries Alliance (EIA) characterizes C0G dielectric

as a Class I material. Components of this classification are temperature compensating and are suited for resonant circuit applications or those where Q and stability of capacitance characteristics are required. Pulse Detonation Series capacitors in C0G dielectric exhibit no change in capacitance with respect to time and voltage and boast a negligible change in capacitance with reference to ambient temperature. These devices retain high insulation resistance with low dissipation factor at elevated temperatures up to 200°C.

KEMET's Pulse Detonation surface mount MLCCs are manufactured in state-of-the-art ISO/TS 16949:2002 certified facilities and are proven to function reliably in harsh, high temperature and high humidity down-hole environments.

Benefits

- -55°C to +200°C operating temperature range
- Pb-Free and RoHS Compliant
- Base metal technology
- High breakdown voltage capability up to +200°C
- Higher UVBD capability than competitive dielectric technologies
- Capacitance offerings ranging from 0.5 pF up to 0.15 µF
- Available capacitance tolerances of ±5%, ±10% or ±20%
- Extremely low ESR and ESL
- High thermal stability
- High ripple current capability
- No capacitance change with respect to applied rated DC voltage
- Negligible capacitance change with respect to temperature from -55°C to +200°C
- No capacitance decay with time
- Non-polar device, minimizing installation concerns
- 100% pure matte tin-plated termination finish allowing for excellent solderability



Ordering Information

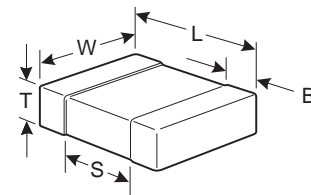
Contact KEMET for ordering information									
Ceramic	Case Size (L" x W")	Specification/ Series	Capacitance Code (pF)	Capacitance Tolerance	Rated Voltage (VDC) ¹	Dielectric	Failure Rate/ Design	Termination Finish ²	Packaging/Grade (C-Spec) ³
	2824 3040 3640 4040 4540	H= High Temp (200°C)	2 Sig. Digits + Number of Zeros.	J = ±5% K = ±10% M = ±20%	C = 500 V B = 630 V D = 1,000 V F = 1,500 V G = 2,000 V	G = C0G	W = Pulse Detonation	C = 100% Matte Sn	Contact KEMET for packaging availability and details

¹ For breakdown voltage (UVBD) values see Table 1, Pulse Detonation Series, Capacitance Range Waterfall.

² Additional termination finish options may be available. Contact KEMET for details.

³ Additional reeling or packaging options may be available. Contact KEMET for details.

Dimensions – Millimeters (Inches)



Size Code	L Length	W Width	T Thickness Max	B Bandwidth	S Separation Min.	Mounting Technique
2824	7.10 ± 0.40 (0.280 ± 0.016)	6.10 ± 0.40 (0.240 ± 0.016)	2.5 (.098)	0.76 ± 0.40 (0.030 ± 0.016)	N/A	Solder Reflow Only
3040	7.60 ± 0.40 (0.300 ± 0.016)	10.20 ± 0.40 (0.402 ± 0.016)				
3640	9.10 ± 0.40 (0.358 ± 0.016)	10.20 ± 0.40 (0.402 ± 0.016)				
4040	10.20 ± 0.40 (0.402 ± 0.016)	10.20 ± 0.40 (0.402 ± 0.016)				
4540	11.40 ± 0.40 (0.449 ± 0.016)	10.20 ± 0.40 (0.402 ± 0.016)				

Applications

Typical applications include high temperature detonation circuits for down-hole oil exploration and perforation.

Qualification/Certification

Industrial Grade pulse detonation products are designed to meet customer-specific testing requirements.

Environmental Compliance

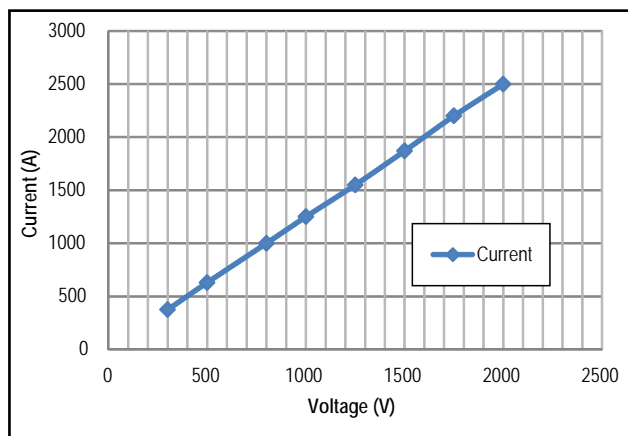
Pb-Free and RoHS Compliant.



RoHS Compliant

Electrical Characteristics

Current vs. Voltage



Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	-55°C to +200°C
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	±30 ppm/°C
Aging Rate (Max % Cap Loss/Decade Hour)	0%
Dielectric Withstanding Voltage (DWV)	150% of rated voltage for voltage rating of < 1,000 V 120% of rated voltage for voltage rating of ≥ 1,000 V (5 ±1 seconds and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit @ 25°C	0.1%
Insulation Resistance (IR) Limit @ 25°C	1,000 MΩ microfarads or 100 GΩ (500 VDC applied for 120 ±5 seconds @ 25°C)

To obtain IR limit, divide MΩ-μF value by the capacitance and compare to GΩ limit. Select the lower of the two limits.

Capacitance and dissipation factor (DF) measured under the following conditions:

1 MHz ±100 kHz and 1.0 Vrms ±0.2 V if capacitance ≤ 1,000 pF

1 kHz ±50 Hz and 1.0 Vrms ±0.2 V if capacitance > 1,000 pF

Note: When measuring capacitance it is important to ensure the set voltage level is held constant. The HP4284 and Agilent E4980 have a feature known as Automatic Level Control (ALC). The ALC feature should be switched to "ON."

Post Environmental Limits

High Temperature Life, Biased Humidity, Moisture Resistance					
Dielectric	Rated DC Voltage	Capacitance Value	DF (%)	Cap Shift	IR
COG	All	All	0.5	0.3% or ±0.25 pF	10% of Initial Limit

Ultimate Voltage Breakdown (UVBD) – Typical Mean Breakdown Voltage Ratings

Rated Voltage (VDC)	Breakdown Voltage/UVBD (VDC)
500	3X Rated
630	3X Rated
1000	2.5X Rated
1500	2.3X Rated
2000	2X Rated

Table 1 – Pulse Detonation Series, Capacitance Range Waterfall

Case Size (in.)		2824					3040					3640					4040					4540					
Length	mm	7.10 ± 0.40					7.60 ± 0.40					9.10 ± 0.40					10.20 ± 0.40					11.40 ± 0.40					
	(in.)	(0.280 ± 0.016)					(0.300 ± 0.016)					(0.358 ± 0.016)					(0.402 ± 0.016)					(0.449 ± 0.016)					
Width	mm	6.10 ± 0.40					10.20 ± 0.40					10.20 ± 0.40					10.20 ± 0.40					10.20 ± 0.40					
	(in.)	(0.240 ± 0.016)					(0.402 ± 0.016)					(0.402 ± 0.016)					(0.402 ± 0.016)					(0.402 ± 0.016)					
Thickness Max.	mm	2.5					2.5					2.5					2.5					2.5					
	(in.)	(0.098)					(0.098)					(0.098)					(0.098)					(0.098)					
Bandwidth	mm	0.76 ± 0.40					0.76 ± 0.40					0.76 ± 0.40					0.76 ± 0.40					0.76 ± 0.40					
	(in.)	(0.030 ± 0.016)					(0.030 ± 0.016)					(0.030 ± 0.016)					(0.030 ± 0.016)					(0.030 ± 0.016)					
Rated Voltage (VDC)		500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	
Voltage Code		C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	
Breakdown Voltage (VDC)		1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	
Capacitance	Capacitance Tolerance	Capacitance Code (Available Maximum Capacitance) ¹																									
5,600pF	J = ±5% K = ±10% M = ±20%					562																					
6,800pF						682																					
8,200pF																											
0.01µF																103											
0.012µF																											
0.015µF																											
0.018µF																											
0.022µF																											
0.027µF																											
0.033µF																											
0.039µF																											
0.047µF																											
0.056µF																											
0.062µF																											
0.068µF																											
0.072µF																											
0.082µF																											
0.1µF																											
0.12µF																											
0.15µF																											
Rated Voltage (VDC)		500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	500	630	1K	1.5K	2K	
Voltage Code		C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	C	B	D	F	G	
Breakdown Voltage (VDC)		1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	1.5K	1.8K	2.5K	3.5K	4K	

¹ Only maximum available CV (capacitance / voltage) values are highlighted. Lower CV values are available upon request. Please contact KEMET to discuss your specific CV requirement.

These products are protected under US Patents 7,172,985 and 7,670,981, other patents pending, and any foreign counterparts.

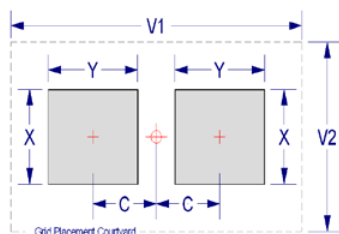
Table 2 – Chip Capacitor Land Pattern Design Recommendations per IPC–7351

Size Code (in)	Density Level A: Maximum (Most) Land Protrusion (mm)					Density Level B: Median (Nominal) Land Protrusion (mm)					Density Level C: Minimum (Least) Land Protrusion (mm)				
	C	Y	X	V1	V2	C	Y	X	V1	V2	C	Y	X	V1	V2
2824	3.45	1.70	6.60	9.60	7.60	3.35	1.50	6.50	8.70	7.00	3.25	1.30	6.40	8.00	6.70
3040	3.70	1.70	10.70	10.10	11.70	3.60	1.50	10.60	9.20	11.10	3.50	1.30	10.50	8.50	10.80
3640	4.45	1.70	10.70	11.60	11.70	4.35	1.50	10.60	10.70	11.10	4.25	1.30	10.50	10.00	10.80
4040	5.00	1.70	10.70	12.70	11.70	4.90	1.50	10.60	11.80	11.10	4.80	1.30	10.50	11.10	10.80
4540	5.60	1.70	10.70	13.90	11.70	5.50	1.50	10.60	13.00	11.10	5.40	1.30	10.50	12.30	10.80

Density Level A: For low-density product applications. Provides a wider process window for reflow solder processes.

Density Level B: For products with a moderate level of component density. Provides a robust solder attachment condition for reflow solder processes.

Density Level C: For high component density product applications. Before adapting the minimum land pattern variations, the user should perform qualification testing based on the conditions outlined in IPC Standard 7351 (IPC–7351).



Soldering Process

Recommended Soldering Technique:

- Solder reflow only

Recommended Soldering Profile:

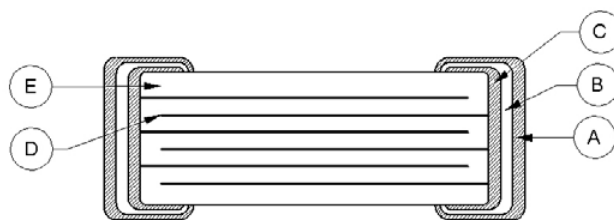
- KEMET recommends following the guidelines outlined in IPC/JEDEC J-STD-020

Storage and Handling

Ceramic chip capacitors should be stored in normal working environments. While the chips themselves are quite robust in other environments, solderability will be degraded by exposure to high temperatures, high humidity, corrosive atmospheres, and long term storage. In addition, packaging materials will be degraded by high temperature-reels may soften or warp, and tape peel force may increase. KEMET recommends that maximum storage temperature not exceed 40°C, and maximum storage humidity not exceed 70% relative humidity. Temperature fluctuations should be minimized to avoid condensation on the parts, and atmospheres should be free of chlorine and sulfur bearing compounds. For optimized solderability, chip stock should be used promptly, preferably within 1.5 years of receipt.

Construction

Reference	Item	Material
A	Termination System	Finish
B		Barrier Layer
C		Base Metal
D	Inner Electrode	Ni
E	Dielectric Material	CaZrO ₃



Note: Image is exaggerated in order to clearly identify all components of construction.

Packaging

Please contact KEMET for details regarding available packaging options.

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Tel: 954-766-2800

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Southeast

Lake Mary, FL
Tel: 407-855-8886

Northeast

Wilmington, MA
Tel: 978-658-1663

West Chester, PA
Tel: 610-692-4642

Central

Novi, MI
Tel: 248-994-1030

Carmel, IN
Tel: 317-706-6742

West

Milpitas, CA
Tel: 408-433-9950

Mexico

Zapopan, Jalisco
Tel: 52-33-3123-2141

Europe

Southern Europe

Geneva, Switzerland
Tel: 41-22-715-0100

Paris, France
Tel: 33-1-4646-1009

Sasso Marconi, Italy
Tel: 39-051-939111

Milan, Italy
Tel: 39-02-57518176

Rome, Italy
Tel: 39-06-23231718

Madrid, Spain
Tel: 34-91-804-4303

Central Europe

Landsberg, Germany
Tel: 49-8191-3350800

Dortmund, Germany
Tel: 49-2307-3619672

Kwidzyn, Poland
Tel: 48-55-279-7025

Northern Europe

Bishop's Stortford, United Kingdom
Tel: 44-1279-757201

Weymouth, United Kingdom
Tel: 44-1305-830747

Coatbridge, Scotland
Tel: 44-1236-434455

Färjestaden, Sweden
Tel: 46-485-563934

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

Asia

Northeast Asia

Hong Kong
Tel: 852-2305-1168

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

Note: KEMET reserves the right to modify minor details of internal and external construction at any time in the interest of product improvement. KEMET does not assume any responsibility for infringement that might result from the use of KEMET Capacitors in potential circuit designs. KEMET is a registered trademark of KEMET Electronics Corporation.

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

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 we design and manufacture our products to the most stringent quality and safety standards, given the current state of the art, isolated component failures may still occur. Accordingly, customer applications which require a high degree of reliability or safety should employ suitable designs or other safeguards (such as installation of protective circuitry or redundancies) in order to ensure that the failure of an electrical component does not result in a risk of personal injury or property damage.

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.

