Axial Through-Hole Multilayer Ceramic Capacitors

SCA Series, Axial, C³ Technology, C0G Dielectric, 50 – 200 VDC (Commercial Grade)

Electronic Components
KEMET CHARGED.

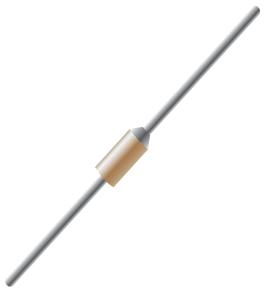
Overview

KEMET's SCA Series axial through-hole ceramic capacitors in C0G dielectric feature proprietary Ceramic Cased Capacitor (C^3) Technology and are designed to meet the needs of critical, high reliability and higher temperature applications. C^3 Technology features a unique lead attach configuration with direct internal connection to the Multilayer Ceramic Capacitor (MLCC) electrode system. This configuration promotes superior "pull away" performance and uniform coefficient of linear expansion characteristics at elevated temperatures when compared to conventional through-hole technologies. Design details are outlined in U.S. Patent Number 4931899.

C0G dielectric features a 125°C maximum operating temperature and is considered "stable." 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. C0G exhibits no change in capacitance with respect to time and voltage and boasts a negligible change in capacitance with reference to ambient temperature. Capacitance change is limited to ±30 ppm/°C from −55°C to +125°C.

Benefits

- Axial through-hole form factor
- Non-encapsulated
- Proprietary and robust C^3 Technology design
- −55°C to +125°C operating temperature range
- DC voltage ratings of 50 V, 100 V and 200 V
- Capacitance offerings ranging from 10 pF up to 0.1 µF
- Available capacitance tolerances of ±5%, ±10% and ±20%



Ordering Information

S	C	A	69	B	104	J	W	S	
Specification/ Series	Dielectric	Lead Configuration	Style /Size	Rated Voltage (VDC)	Capacitance Code (pF)	Capacitance Tolerance[1]	Lead Finish[2]	Screening Option	Packaging/ Grade (C-Spec)
S=Standard	C = C0G	A = Axial	16 25 39 50 69	B = 50 D = 100 F = 200	Two significant digits and number of zeros Use 9 for 1.0 – 9.9 pF Use 8 for 0.5 – .99 pF ex. 2.2 pF = 229 ex. 0.5 pF = 508	J = ±5% K = ±10% M = ±20%	W = SnPb (60/40) G = Au	S = Standard A = Group A (MIL–PRF–20)	Blank = Tray

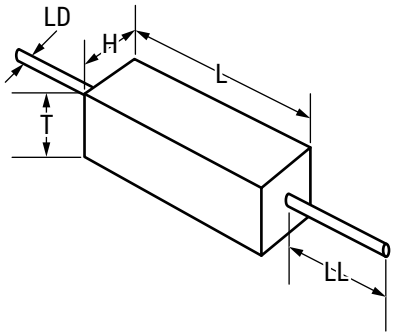
[1] *Additional capacitance tolerance offerings may be available. Contact KEMET for details.*

[2] *Lead materials:*

Standard: 60% tin (Sn)/40% lead (Pb) finish with 100% copper core ("C" designation).

Alternative lead materials and finishes may be available. Contact KEMET for details.

Dimensions – Inches (Millimeters)



Series	Style/Size	L Length Maximum	H Height Maximum	T Thickness Maximum	LD Lead Diameter	LL Lead Length Minimum
SCA	16	0.170 (4.32)	0.080 (2.03)	0.080 (2.03)	0.020±0.002 (0.508±0.051)	1.25 (31.75)
	25	0.270 (6. 86)	0.100 (2.54)	0.100 (2.54)		
	39	0.400 (10.16)	0.150 (3.81)	0.150 (3.81)	0.025±0.002 (0.635±0.051)	
	50	0.520 (13.21)	0.265 (6.73)	0.160 (4.06)		
	69	0.720 (18.29)	0.370 (9.40)	0.160 (4.06)		

Benefits cont'd

- No piezoelectric noise
- 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 +125°C
- No capacitance decay with time
- Non-polar device, minimizing installation concerns
- SnPb-coated lead finish (60/40)
- Gold-plated lead finish option available upon request (RoHS)

Applications

Typical applications include critical timing, tuning, circuits requiring low loss, circuits with pulse, high current, decoupling, bypass, filtering, transient voltage suppression, blocking and energy storage.

Qualification/Certification

Commercial Grade products are subject to internal qualification. Details regarding test methods and conditions are referenced in Table 2, Performance & Reliability.

Environmental Compliance

Devices with standard lead finish option of 60% tin (Sn)/40% lead (Pb) do not meet RoHS criteria.
Devices with gold (AU) lead finish option are RoHS Compliant.

Electrical Parameters/Characteristics

Item	Parameters/Characteristics
Operating Temperature Range	−55°C to +125°C
Capacitance Change with Reference to +25°C and 0 VDC Applied (TCC)	±30 ppm/°C
Aging Rate (Maximum % Cap Loss/Decade Hour)	0%
Dielectric Withstanding Voltage	250% of rated voltage (5±1 second and charge/discharge not exceeding 50 mA)
Dissipation Factor (DF) Maximum Limit at 25°C	0.1%
Insulation Resistance (IR) Limit at 25°C	1,000 megohm microfarads or 100 GΩ (Rated voltage applied for 120±5 seconds at 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 V_{rms} ±0.2V if capacitance ≤ 1,000 pF

1 kHz ±50Hz and 1.0 V_{rms} ±0.2V 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 (%)	Capacitance Shift
C0G	All	All	0.5	0.3% or ±0.25 pF

Table 1A – SCA16 Style/Size (0.080" Square x 0.170" L), Capacitance Range Waterfall

SCA16 Style/Size (0.080" Square x 0.170" L)				
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**
Capacitance	**Capacitance Tolerance**	**Capacitance Code (Available Capacitance)**		
10pF	J = ±5% K = ±10% M = ±20%	100	100	100
12pF		120	120	120
15pF		150	150	150
18pF		180	180	180
22pF		220	220	220
27pF		270	270	270
33pF		330	330	330
39pF		390	390	390
47pF		470	470	470
56pF		560	560	560
68pF		680	680	680
82pF		820	820	820
100pF		101	101	101
120pF		121	121	121
150pF		151	151	151
180pF		181	181	181
220pF		221	221	221
270pF		271	271	
330pF		331	331	
390pF		391	391	
470pF		471	471	
560pF		561	561	
680pF		681	681	
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**

These products are protected under U.S. Patent 4931899, other patents pending, and any foreign counterparts.

Table 1B – SCA25 Style/Size (0.100" Square x 0.270" L), Capacitance Range Waterfall

SCA25 Style/Size (0.100" Square x 0.270" L)				
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**
Capacitance	**Capacitance Tolerance**	**Capacitance Code (Available Capacitance)**		
56pF	J = ±5% K = ±10% M = ±20%	560	560	560
68pF		680	680	680
82pF		820	820	820
100pF		101	101	101
120pF		121	121	121
150pF		151	151	151
180pF		181	181	181
220pF		221	221	221
270pF		271	271	271
330pF		331	331	331
390pF		391	391	391
470pF		471	471	471
560pF		561	561	561
680pF		681	681	681
820pF		821	821	821
1000pF		102	102	102
1200pF		122	122	122
1500pF		152	152	
1800pF		182	182	
2200pF		222	222	
2700pF		272	272	
3300pF		332	332	
2700pF		272	272	
3300pF		332	332	
3900pF		392	392	
4700pF		472	472	
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**

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Table 1C – SCA39 Style/Size (0.150" Square x 0.400" L), Capacitance Range Waterfall

SCA39 Style/Size (0.150" Square x 0.400" L)				
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**
Capacitance	**Capacitance Tolerance**	**Capacitance Code (Available Capacitance)**		
270pF	J = ±5% K = ±10% M = ±20%	271	271	271
330pF		331	331	331
390pF		391	391	391
470pF		471	471	471
560pF		561	561	561
680pF		681	681	681
820pF		821	821	821
1000pF		102	102	102
1200pF		122	122	122
1500pF		152	152	152
1800pF		182	182	182
2200pF		222	222	222
2700pF		272	272	272
3300pF		332	332	332
2700pF		272	272	272
3300pF		332	332	332
3900pF		392	392	392
4700pF		472	472	472
5600pF		562	562	562
6800pF		682	682	682
8200pF		822	822	822
0.01µF		103	103	
0.012µF		123	123	
0.015µF		153	153	
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**

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Table 1D – SCA50 Style/Size (0.265" H x 0.160" T x 0.520" L), Capacitance Range Waterfall

SCA50 Style/Size (0.265" H x 0.160" T x 0.520" L)				
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**
Capacitance	**Capacitance Tolerance**	**Capacitance Code (Available Capacitance)**		
680pF	J = ±5% K = ±10% M = ±20%	681	681	681
820pF		821	821	821
1000pF		102	102	102
1200pF		122	122	122
1500pF		152	152	152
1800pF		182	182	182
2200pF		222	222	222
2700pF		272	272	272
3300pF		332	332	332
2700pF		272	272	272
3300pF		332	332	332
3900pF		392	392	392
4700pF		472	472	472
5600pF		562	562	562
6800pF		682	682	682
8200pF		822	822	822
0.01µF		103	103	103
0.012µF		123	123	123
0.015µF		153	153	153
0.018µF		183	183	183
0.022µF		223	223	223
0.027µF		273	273	
0.033µF		333	333	
0.039µF		393	393	
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**

These products are protected under U.S. Patent 4931899, other patents pending, and any foreign counterparts.

Table 1E – SCA69 Style/Size (0.370" H x 0.160" T x 0.720" L), Capacitance Range Waterfall

SCA69 Style/Size (0.370" H x 0.160" T x 0.720" L)				
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**
Capacitance	**Capacitance Tolerance**	**Capacitance Code (Available Capacitance)**		
1800pF	J = ±5% K = ±10% M = ±20%	182	182	182
2200pF		222	222	222
2700pF		272	272	272
3300pF		332	332	332
2700pF		272	272	272
3300pF		332	332	332
3900pF		392	392	392
4700pF		472	472	472
5600pF		562	562	562
6800pF		682	682	682
8200pF		822	822	822
0.01µF		103	103	103
0.012µF		123	123	123
0.015µF		153	153	153
0.018µF		183	183	183
0.022µF		223	223	223
0.027µF		273	273	273
0.033µF		333	333	333
0.039µF		393	393	393
0.047µF		473	473	473
0.056µF		563	563	563
0.068µF		683	683	
0.082µF		823	823	
0.1µF		104	104	
Rated Voltage (VDC)		**50**	**100**	**200**
Voltage Code		**B**	**D**	**F**

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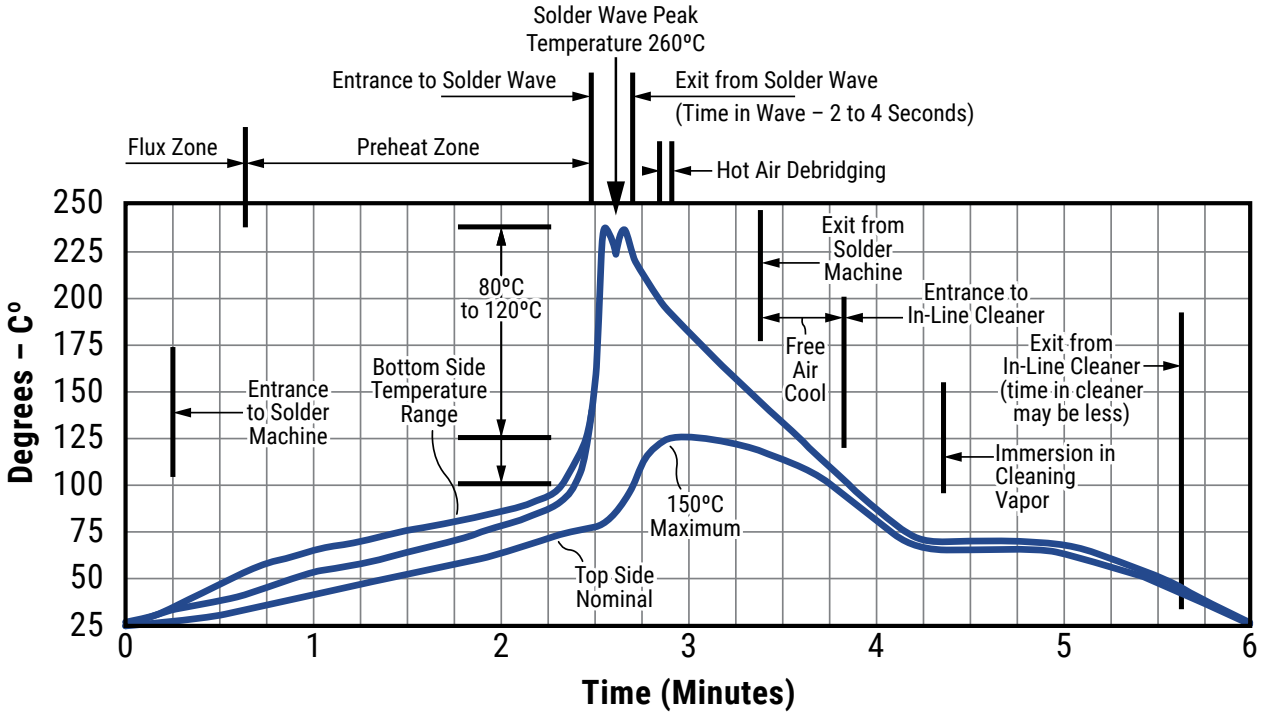
Soldering Process

Recommended Soldering Technique:

- Solder Wave
- Hand Soldering (Manual)

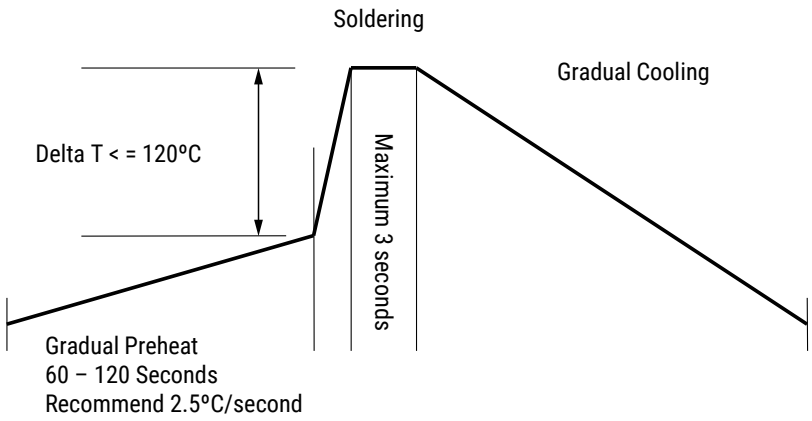
Recommended Soldering Profile:

- Optimum Wave Solder Profile



- Hand Soldering (Manual)

Manual Solder Profile with Pre-heating



KEMET recommends following the guidelines and techniques outlined in technical bulletins F2103 and F9207.

Table 2 – Performance & Reliability: Test Methods and Conditions

Stress	Reference	Test or Inspection Method
Solderability	J–STD–002	Magnification 50 X. Conditions:
		a) Method B, 4 hours at 155°C, dry heat at 235°C
		b) Method B at 215°C category 3
		c) Method D, category 3 at 260°C
Temperature Cycling	JESD22 Method JA–104	1,000 cycles (–55°C to +125°C), Measurement at 24 hours. +/–2 hours after test conclusion.
Biased Humidity	MIL–STD–202 Method 103	Load Humidity: 1,000 hours 85°C/85% RH and Rated Voltage. Add 100 K ohm resistor. Measurement at 24 hours. +/–2 hours after test conclusion.
		Low Volt Humidity: 1,000 hours 85°C/85% RH and 1.5 V. Add 100 K ohm resistor. Measurement at 24 hours. +/–2 hours after test conclusion.
Moisture Resistance	MIL–STD–202 Method 106	t = 24 hours/cycle. Steps 7a and 7b not required. Unpowered. Measurement at 24 hours. +/–2 hours after test conclusion.
Thermal Shock	MIL–STD–202 Method 107	–55°C/+125°C. Note: Number of cycles required – 300. Maximum transfer time – 20 seconds. Dwell time – 15 minutes. Air – Air.
High Temperature Life	MIL–STD–202 Method 108 /EIA–198	1,000 hours at 125°C (85°C for X5R, Z5U and Y5V) with 2 X rated voltage applied.
Storage Life	MIL–STD–202 Method 108	150°C, 0 VDC, for 1,000 hours.
Vibration	MIL–STD–202 Method 204	5 g for 20 minutes, 12 cycles each of 3 orientations. Note: Use 8"X5" PCB .031" thick 7 secure points on one long side and 2 secure points at corners of opposite sides. Parts mounted within 2" from any secure point. Test from 10–2,000 Hz.
Resistance to Soldering Heat	MIL–STD–202 Method 210	Condition B. No pre-heat of samples. Note: single wave solder - procedure 2.
Terminal Strength	MIL–STD–202 Method 211	Conditions A (2.3kg or 5 lbs)
Mechanical Shock	MIL–STD–202 Method 213	Figure 1 of Method 213, Condition F.
Resistance to Solvents	MIL–STD–202 Method 215	Add aqueous wash chemical, OKEM Clean or equivalent.

Storage & 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.

Packaging Details

Lead Spacing	Component Pitch (P1)
0.100 (2.54)	5.08
0.200 (5.08)	3.81
0.400 (10.16)	7.62
0.170 (4.32)	
0.220 (5.59)	
0.275 (6.98)	
0.300 (7.62)	
0.375 (9.52)	
0.475 (12.06)	
0.575 (14.60)	
0.675 (17.14)	

Packaging Quantities

Series	Style/Size	Tray Quantity Minimum[1]	Tray Quantity Maximum[1]
SCA	16	1	25
	25		
	39		
	50		
	69		

[1] *Minimum order value applies. Contact KEMET for details.*

Marking

Manufacturer's ID	KEC
Capacitance	106J
Voltage	50V
Date Code	123

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Although KEMET designs and manufactures its 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 indicted or that other measures may not be required.