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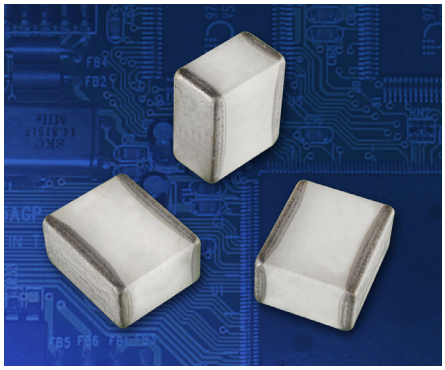
EIA 1111 High Power Capacitors (S42E Silver Series) Specification

1.0 Scope

This capacitor belongs to the Silver Series family and is based on SMD Multilayer Ceramic technology. JTI uses nearly pure Silver electrodes while our competitors use Palladium electrodes. Silver is a much superior conductor when compared to Palladium. JTI Silver Series provides customers with a significant performance improvement and a more competitive cost. This specification is an in-depth look at the JTI High-Q Silver Series MLCC product line for all authorized JTI personnel (this document is company confidential). This document will educate the reader on all important aspects of High-Q capacitor recognition, proper application and design utilization.



2.0 Applications

- Communications amplifiers
- Power converters
- Filter Networks
- Circuit Matching
- Amplitude modulators
- Antenna Matching, high power circuitry
- Decoupling, Bypass, & DC Block

2.1 Market Segments (Typical End Applications)

The Silver Series products are used to improve the performance of nearly all high frequency circuits. Below is a list of typical applications where Silver Series capacitors are widely used:

- High Power RF Systems
- High Voltage RF Systems
- Cellular Base Station Equipment
- Medical MRI (Non-Magnetic)
- RF Heater (Industrial) systems
- Teat Equipment (Power Amplifiers)
- Military Radar and Jamming Electronics

3.0 Features:

- Excellent temperature dissipation (for High Power Temp Rise)
- Excellent Power Handling Capabilities
- High stability dielectric (NPO)
- One of the best equivalent series resistance (ESR) of its kind due to newly-formulated internal electrodes and low loss dielectrics Industry leading High-Q/Low loss COG (NPO) performance
- Manufacturing controls that ensure consistency lot to lot and year to year
- Green and RoHS compliance
- Gold (Au), Non-Magnetic Copper (Cu), Tin (Sn and Sn/Pb and leaded terminations are available
- EIA Marking is available

4.0 Basic Construction

Magnetic (Ni) and Non-Magnetic (Cu) Barrier Termination

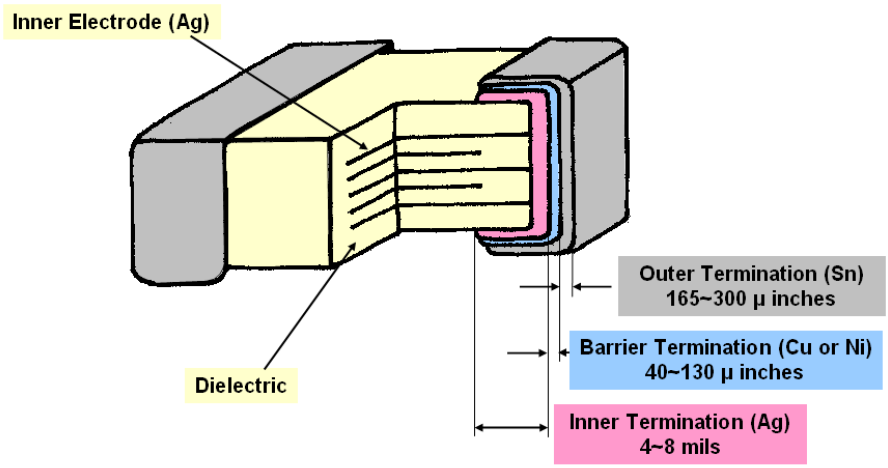


Figure 1 Termination Cross Section

5.0 Electrical Characteristics

Dielectric	NPO
Rated Voltage (VDC)	50 to 1000 Volts DC (See section 9.0 for details)
Capacitance Range (EIA)	0.2 to 1000 pF (See section 9.0 for details)
Capacitance Tolerance	A, B, C, D, F, G, J, K, M
Test Parameters	1 MHz ± 50 kHz @ 1.0 ± 0.2 VRMS, 25°C
Temperature Coefficient	0% ± 30 ppm/°C
Quality Factor	Q > 1,000 at 1 MHz ± 50 kHz, 25°C, 1.0 ± 0.2 VRMS
Insulation Resistance	1000 GΩ - 1pF-470pF 100GΩ - 510pF-1000pF
Operating Environment Range	-55 to 125°C
Storage Environment Range	Tape & Reel: -5 to 40°C & 15 to 75% RH
Breakdown Voltage	> 2.5 x WVDC Min., 25°C, 50 mA Max

6.0 Material and Physical Specifications

No	Item		Performance	Test Condition
1	Appearance		No abnormal exterior appearance.	Through Microscope (30x) or Automatic Vision Inspection System
2	PCB Deflection		Visual Criteria – No mechanical damage shall occur	Glass Epoxy PCB ➔ 0.5 mm Deflection
3	Soldearbility MIL-STD-202 J-STD-002		More than 90% of the terminal surface is to be soldered newly so the metal parts do not come out or dissolve.	Solder Temperature: 240 ± 5°C Dip Time: 5 seconds
			Wetting force of 2/3 F_{max} must be achieved in 1.0 s or less.	Solder: SN 62 Flux: Rosin Pre-heating: 120 to 150°C for 60 seconds Flux: Actiec 5 or equivalent
			Capacitance Change Criteria – Change of capacitance within ± 2% or ± 0.5 pF whichever is larger.	Solder Temperature: 235 °C
4	Adhesive Strength of Termination MIL-STD-202		Termination should not pull off and ceramic should remain undamaged	Linear pull force exerted on axial leads soldered to each terminal. 5 lbs. Minimum
5	Resistance to soldering heat MIL-STD-202G METHOD 210F	Appearance	No Mechanical Damage	Solder Dip Criteria: Solder Temperature of 260 ± 5°C Solder dip duration: 10 ± 1 Second

No	Item		Performance	Test Condition
	Resistance to soldering heat MIL-STD-202G METHOD 210F	Appearance	No Mechanical Damage	Each termination shall be fully preheated and immersed as follows: Step 1.) 80 – 100°C for 60 Seconds Step 2.) 150 – 180°C for 60 Seconds Measurements are completed at room temp. after cooling for 24±2 Hrs
		Capacitance	Capacitance change within ± 2.5 % or ± 0.25pF whichever is larger	
		Q	Q > 500	
		Insulation resistance	1000 GΩ-1pF-470pF 100GΩ-510pF-1000pF	
		Breakdown Voltage	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
6	Vibration Test MIL-STD-202G METHOD 201A	Appearance	No Mechanical Damage	The capacitor shall be subjected to a harmonic motion having a total amplitude of 1.5 mm. The entire frequency range from 10 to 55 Hz and a return to 10 Hz shall be traversed in one minute. The cycle shall be performed for 2 hours in each perpendicular direction for a total of 6 hours.
		Capacitance	Within ± 2.5% or ± 0.25pF whichever is larger	
		Q	Q > 1000	
		Insulation Resistance	1000 GΩ-1pF-470pF 100GΩ-510pF-1000pF	
		Voltage Breakdown	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
7	Humidity (Steady State) MIL-STD-202 METHOD 103A	Appearance	No Mechanical Damage	Temperature: 40 ± 2°C Relative Humidity: 90 to 95 % Test Time: 500 +12 / -0 Hr.
		Capacitance	Within ± 5% or ± 0.5pF whichever is larger	
		Q	Q > 300	

No	Item		Performance	Test Condition
7	Humidity (Steady State) MIL-STD-202 METHOD 103B	Insulation Resistance	> 10 GΩ	Measured at room temperature after cooling for 24 ± 2 Hr.
		Voltage Breakdown	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
8	Moisture Resistance MIL-STD-202	Appearance	No Mechanical Damage	Applied Voltage: 1.5 Volts Temperature: 85 ± 2°C Relative Humidity: 85 % Test Time: 240 +12 / -0 Hr. Current Applied: 50 mA max. Measured at room temperature after cooling for 24 ± 2 Hr.
		Capacitance	Within ± 7.5% or ± 0.75 pF whichever is larger	
		Q	Q > 300	
		Insulation Resistance	Minimum Insulation Resistance: 1 Ω	
		Voltage Breakdown	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
9	High Temperature Resistance (Life) MIL-STD-202 METHOD 108 Condition D	Appearance	No Mechanical Damage	Applied Voltage: 200% of Rated Voltage Test Time: 1000 +48 / -0 Hr. Current Applied: 50 mA MAX. Temperature: 125 ± 3°C
		Capacitance	Within ± 3% or ± 0.3pF Whichever is larger	
		Q	Q > 500	
		Insulation Resistance	Minimum Insulation Resistance: 1 GΩ	
		Voltage Breakdown	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
10	Temperature Cycling MIL-STD-202	Appearance	No Mechanical Damage	Capacitors shall be subjected to five (5) cycles of temp cycle profile: *Step 1.)* Minimum rated temperature +0 / -3°C for 30 minutes

No	Item		Performance	Test Condition
10	Temperature Cycling MIL-STD-202	Appearance	No Mechanical Damage	*Step 2.)* 25°C for 2-3 minutes *Step 3.)* Maximum rated temperature +3/ -0° for 30 minutes *Step 4.)* 25°C for 2-3 minutes Measurements shall be made after the capacitors cool for 24 ± 2 hours.
		Capacitance	Within ± 2.5% or ± 0.25 pF whichever is larger	
		Q	Q > 1000	
		Insulation Resistance	To satisfy the initial criteria	
		Voltage Breakdown	> 2.5 x WVDC Min., 25°C, 50 mA Maximum	
11	Reflow soldering requirement		To withstand the reflow soldering profile 3-times and meet sec. 1 - 5 & 13	See reflow soldering profile and specifications (3x).
12	Underfiller curing profile		To withstand the reflow soldering profile 2 times (2x) followed by a minimum of 5 minutes at temperature, and meet sec. 1 - 5 & 13	See reflow soldering profile and specifications (2x). Temperature: 150 ± 10°C Time at temp.: 5 min
13	Manual hot gas soldering requirement		To withstand hot gas soldering for rework at the specified temperature, air velocity, and time, and, meet the requirements of sec. 1 - 5 & 13	Max Air Temperature: 260 °C Max Air Velocity: 10 m/s Max Exposure Time: 30 s
14	Manual soldering using soldering iron requirement		To withstand manual soldering using soldering iron for rework at the specified temperature and time, and, meet the requirements of sec. 1 - 5 & 13	Tip Diameter: To fit application Max Tip Temperature: 260 ± 10°C Max Exposure Time: 3 seconds

7.0 Part Number Code

501 S42 E 1R0 C V 4 T

VOLTAGE CODE
1st 2 digits are significant;
3rd digit denotes the number of zeros to follow.
eg: 500 = 50 VDCW
R denotes decimal

Standard Voltages
500 = 50 VDCW
101 = 100 VDCW
201 = 200 VDCW
301 = 300 VDCW
501 = 500 VDCW
102 = 1000 VDCW
252 = 2500 VDCW
362 = 3600 VDCW
722 = 7200 VDCW

PART SIZE / EIA EQUIV
S42 — 1111
S48 — 2525
S58 — 3838

DIELECTRIC CODE
E = Low Loss NPO
±30 ppm, -55 TO +125°C

CAPACITANCE CODE:
1st 2 digits are significant;
3rd digit denotes the number of zeros to follow
eg: 331 = 330 pF
R denotes decimal
eg: 1R0 = 1.0 pF

TOLERANCE CODE:
**A = ± 0.05 pF
*B = ± 0.1pF
*C = ± .25 pF
*D = ± .50 pF
F = ± 1.0%
G = ± 2.0 %
J = ± 5.0 %

For Values:
* <10pF Only
** < 5pF Only

TERMINATION CODE
Nickel Barrier
V = Ni/Sn (Green)
T = Ni/SnPb
G = Ni/Au (Green)

Non-Mag
S = Cu/Sn (Green)
C = Cu/SnPb

Leaded (All Non-Mag)
1 = Microstrip
2 = Axial Ribbon
3 = Axial Wire
4 = Radial Ribbon
5 = Radial Wire

MARKING CODES:
3 = Cap Code & Tol
4 = Not marked
6 = EIA Marking

PACKAGING CODE
E = Embossed 7" reel
Z = Embossed 5" reel
U = Embossed 13" Reel

8.0 Dimensions

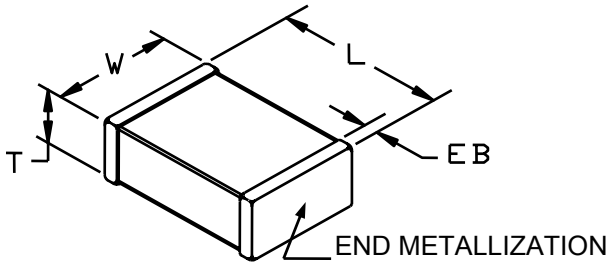


Figure 2 Basic Construction

Component Size in mm

		S42
Length	Min.	2.54
	Max	3.3
End-band	Min.	0.33
	Max	0.43
Width	Min.	2.28
	Max	3.3
Thickness	Max	2.59

Component Size in Inches

		S42
Length	Min.	0.100
	Max	0.130
End-band	Min.	0.013
	Max	0.017
Width	Min.	0.090
	Max	0.130
Thickness	Max	0.102

9.0 Capacitance Range

pF	Cap Code	Tolerance	Standard Voltage	Extended Voltage	pF	Cap Code	Tolerance	Standard Voltage	Extended Voltage
0.5	0R5		500V	1500V	36	360		500V	1500V
0.6	0R6		500V	1500V	39	390		500V	1500V
0.7	0R7		500V	1500V	43	430		500V	1500V
0.8	0R8		500V	1500V	47	470		500V	1500V
0.9	0R9		500V	1500V	51	510		500V	1000V
1	1R0	A	500V	1500V	56	560		500V	1000V
1.1	1R1	B	500V	1500V	62	620		500V	1000V
1.2	1R2	C	500V	1500V	68	680		500V	1000V
1.3	1R3	D	500V	1500V	75	750		500V	1000V
1.4	1R4		500V	1500V	82	820		500V	1000V
1.5	1R5		500V	1500V	91	910		500V	1000V
1.6	1R6		500V	1500V	100	101		500V	1000V
1.7	1R7		500V	1500V	110	111	F	300V	1000V
1.8	1R8		500V	1500V	120	121	G	300V	1000V
1.9	1R9		500V	1500V	130	131	J	300V	1000V
2	2R0		500V	1500V	150	151	K	300V	1000V
2.1	2R1		500V	1500V	160	161	M	300V	1000V
2.2	2R2		500V	1500V	180	181		300V	1000V
2.4	2R4		500V	1500V	200	201		300V	1000V
2.7	2R7		500V	1500V	220	221		200V	N/A
3	3R0		500V	1500V	240	241		200V	N/A
3.3	3R3		500V	1500V	270	271		200V	N/A
3.6	3R6		500V	1500V	300	301		200V	N/A
3.9	3R9		500V	1500V	330	331		200V	N/A
4.3	4R3		500V	1500V	360	361		200V	N/A
4.7	4R7		500V	1500V	390	391		200V	N/A
5.1	5R1		500V	1500V	430	431		200V	N/A
5.6	5R6	B	500V	1500V	470	471		200V	N/A
6.2	6R2	C	500V	1500V	510	511		100V	N/A
6.8	6R8	D	500V	1500V	560	561		100V	N/A
7.5	7R5		500V	1500V	620	621		100V	N/A
8.2	8R2		500V	1500V	680	681		50V	N/A
9.1	9R1		500V	1500V	750	751		50V	N/A
10	100		500V	1500V	820	821		50V	N/A
12	120		500V	1500V	910	911		50V	N/A
13	130		500V	1500V	1000	102		50V	N/A
15	150	F	500V	1500V					
16	160	G	500V	1500V					
18	180	J	500V	1500V					
20	200	K	500V	1500V					
22	220	M	500V	1500V					
24	240		500V	1500V					
27	270		500V	1500V					
30	300		500V	1500V					
33	330		500V	1500V					

10.0 Electrical Testing

All parts are 100% tested for capacitance, insulation resistance, dissipation factor.

11.0 Green and RoHS Compliance

Johanson Technology, Inc. (JTI) is committed to reducing the lead content in all its product lines in an environmentally responsible, technologically feasible, and cost-effective manner without sacrificing the current high levels of performance, quality, and reliability. As a result, JTI has initiated lead-free research and development programs to identify and evaluate possible lead-tin solder substitutes, while working with suppliers and other companies to establish lead-free standards and testing requirements.

The S42E Silver Series Capacitor meets Green standards and accordingly, meets the Restriction of Hazardous Substances directive 2002/95/EC commonly referred to as RoHS. This family has lead free, 100% tin plated terminations, which does meet the RoHS directive. This does not include the optional termination code "T" which signifies tin-lead terminations.

12.0 Termination Types

The Silver Series product line is available in ten different termination types. These can be grouped into Nickel Barrier, Copper Barrier (Non-Magnetic) and Leaded termination types. The standard offering is a 100% matte Tin (Sn) with a Nickel barrier. Below is a summary of specific termination types:

Nickel Barrier

Code	Termination Type
V	100% Matte Tin (Sn) over Nickel Barrier
T	Tin Lead (SnPb) over Nickel Barrier
G	Gold (Au) over Nickel Barrier

Copper Barrier

Code	Termination Type
S	100% Matte Tin (Sn) over Copper Barrier, Non-Magnetic
C	Tin Lead (SnPb) over Copper Barrier, Non-Magnetic

Leaded

Code	Termination Type	
1	Microstrip	All Non-Magnetic
2	Axial Ribbon	All Non-Magnetic
3	Axial Wire	All Non-Magnetic
4	Radial Ribbon	All Non-Magnetic
5	Radial Wire	All Non-Magnetic

13.0 Storage Life

Chip component terminations should generally be protected from moisture

All chip components including tape and reel, should be kept in an area where the temperature is between -5°C and 40°C and where the humidity is 15% to 75%.
The chip components should be used within one year.
The solderability of the chip components should be rechecked in the event that they are not used in 6 months.
Peel strength and shelf life of tape will remain within specification up to 1 year when stored.

14.0 Packaging Specifications

Chip capacitors are packaged in tape and reel, sealed in plastic bags, and placed in cardboard boxes filled with protective fluffs.
Tape and Reel Standard: EIA 481

14.1 Tape dimension specifications:

- Tape size, material and type: 8 mm, Plastic embossed tape.
- Sprocket hole pitch: 4.0 ± 0.1 mm.
- Component pitch: 4 ± 0.05 mm

14.2 Leader section (empty carrier & tape): 280 mm min.
14.3 Trailer section (empty carrier & tape): 280 mm min
14.4 Tape functional specifications:

- Tape break force: 10 N min.
- Top cover tape strength: 10 N min.
- Top cover peel force & angle: 0.1 - 1.0 N at 165 -180°

14.5 Reel specifications:

- Reel diameter size: 7 in (2000 pieces)
- Optional Reel diameter size: 5 inch and 13 inch.

15.0 Recommended Land Pattern

Appropriate pad design, solder application, and component orientation are all ingredients of a quality, defect-free soldering process. The Institute for Interconnecting and Packaging Electronic Circuits (IPC) through IPC-7351A has endorsed Land Pattern Calculator program from PCB Matrix. (This land pattern calculator can be downloaded at: http://www.pcbmatrix.com/Products/LPSoftware/LPCalculator/)
The following recommended land patterns are directly from this program. This standard presents industry consensus on optimum dimensions based on empirical knowledge of fabricated land patterns. The standard also contains an excellent analysis of solder joints and their relation to component, PCB, and placement tolerances. (http://www.ipc.org).

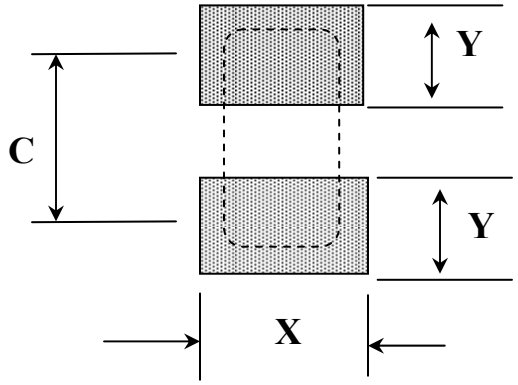


Figure 3 Land Pattern

JTI Size Code	Chip Size EIA		C min	C max	Land X min	Land X max	Land Y min	Land Y max
S42	1111	Inches	0.008	0.014	0.008	0.016	0.008	0.012
		(mm)	0.20	0.35	0.20	0.40	0.20	0.30

Competitive Analysis

The key competitors for Silver Series are American Technical Ceramics (ATC), AVX, Dielectric Laboratories (DLI) and Murata.

Each company will be discussed in detail below:

ATC (www.atceramics.com)

- Competitive Products – ATC 100 Series (and 800 Series which is not fully released)
- ATC is strong in the medium and small volume high performance business.
- The 100 series provides lower ESR performance at frequencies above 150MHz, roughly the same from 75 to 150 MHz as the JTI Silver Series products.
- JTI Silver Series product is competitively priced (15% to 25%) lower than the ATC 100 series products
- The ATC part numbers break down as follows:

ATC: Example - 100B511JW100XT **Johanson Technology: 101S42E511JT6E**

100	B	511	J	W	100	X	T
ATC Model # 100 800	**Size (EIA)** B (1111) C (2525) E (3838)	**Capacitance** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Termination** W = SnPb over Ni P = SnPb Coat over Ni T = Sn over Ni CA = Au over Ni MS = Microstrip Leaded AR = Axial Ribbon Leaded RR = Radial Ribbon Leaded RW = Radial Wire Leaded AW = Axial Wire Leaded **Non-Magnetic Terms** WN = SnPb Non Mag PN = SnPb Coat Non Mag TN = Sn Non Mag MN = Microstrip Non Mag AN = Axial Ribbon Non Mag FN = Radial Ribbon Non Mag RN = Radial Wire Non Mag BN = Axial Wire Non Mag	**Voltage** 50 = 50V 100 = 100V 200 = 200V 1000 = 1000V	**Marking** Laser Marking	**Packaging** T = Tape and Reel 1000 pc qty C = Chip Pac 100 pc Qty I = Special Packaging

AVX (www.avx.com)

- Competitive Products → Accu-P, Accu-F and U-Series
- We see AVX at larger volume accounts and rarely at small accounts.
- The Accu-P and Accu-F are a thin film capacitor – not MLCC. The performance is very good but the accu-Fs had a cracking problem a few years ago. The Accu-P and Accu-F are high cost.
- The U-Series is a low performance product when compared to the Silver Series. Price is also low. We need to be very aggressive on pricing to take U-Series business.
- It is important to have a competitive part number when competing with AVX products.
- The AVX part numbers break down as follows:

AVX Example: HQCCAA271JAT1A — **Johanson Technology: 102S42E271JT4E**

HQC	C	A	A	271	J	A	T	1	A
AVX Style High-Q Capacitor	**Size (EIA)** C (2525) E (3838)	**Voltage** 600V/630V = C 1000V = A 1500V = S 2000V = G 2500V = W 3000V = H 4000V = J 5000V = K 7200V = M	**Temperature Coefficient** C0G = A	**Capacitance Code** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Test Level** A = Standard	**Termination** 1 = Pd/Ag T = Plated Sn on Ni (RoHS Compliant) J = 5% Min Pb	**Packaging** 1 = 7" Reel 3 = 13" Reel 9 = Bulk	**Special Code** A = Standard

Notes:
No Marking offered

AVX Example: AQ13EA100JA1ME — **Johanson Technology: 102S42E271JC4E**

AQ	13	E	A	271	J	A	T	1
AVX Style High-Q Capacitor	**Size (EIA)** 13 (2525) 14 (2525)	**Voltage** 5 = 50V 1 = 100V E = 150V 2 = 200V 9 = 300V 7 = 500V	**Temperature Coefficient** M = +90±20ppm/°C (AQ11/12/13/14) A = 0±30ppm/°C (AQ11/12/13/14) C = 15% ("J" Termin only) (AQ14)	**Capacitance Code** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% N = ±30%	**Failure Rate Code** A=Not Applicable	**Termination** 1 = Pd/Ag (AQ11/13 only) 7 = Ag/Ni/Au (AQ11/13 only) J = Nickel Barrier Sn/Pb (60/40) - (AQ12/14 only) T = 100% Tin (AQ12/14 only)	**Packaging** 3A = 13" Reel ME = 7" Reel RE = 13" Reel WE = Waffle Pack

Notes:
No Marking offered

AVX Example: SQCB7M100JAT1A — **Johanson Technology: 102S42E271JT4E**

HQ	CC	A	A	271	J	A	T	1
AVX Style High-Q	**Size (EIA)** CB (1111)	**Voltage** 5 = 50V 1 = 100V E = 150V 2 = 200V V = 250V 9 = 300V 7 = 500V	**Temperature Coefficient** Coefficient Code M = +90±20ppm/°C A = 0±30ppm/°C C = 15% ("J" Termination only)	**Capacitance Code** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Failure Rate Code** A=Not Applicable	**Termination** **1 = Pd/Ag **7 = Ag/Ni/Au J = Nickel Barrier Sn/Pb (60/40) **T = 100% Tin **RoHS Compliant	**Packaging** 1A = 7" Reel Unmarked 6A = Waffle Pack Unmarked ME = 7" Reel Marked WE = Waffle Pack Unmarked * Vertical T&R available * 500 piece reels available

Notes:

No Marking offered

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AVX Example: HQLCAA271JAA — **Johanson Technology: 102S42E271J24**

HQL	C	A	A	271	J	A	A
AVX Style HQ Leaded	**Size (EIA)** C (2325) E (3838)	**Voltage** 600V/630V = C 1000V = A 1500V = S 2000V = G 2500V = W 3000V = H 4000V = J 5000V = K 7200V = M	**Temperature Coefficient** C0G = A	**Capacitance Code** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Test Level** A = Standard	**Lead Type** A = Axial Ribbon M = Microstrip

Notes:
Non-Magnetic
No Marking offered
No Packaging Specified

AVX Example: CDR13BP101AKNS — **Johanson Technology: 101S42E511KG4**

CDR	13	BP	101	A	K	N	M
AVX MIL STYLE CDR	**Size (EIA)** 13 (1111) 14 (1111)	**Dielectric Type** BG = P90 BP = NPO	**Capacitance** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Voltage** A = 50V B = 100V C = 200V D = 300V E = 500V	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Termination** M = Palladium/Silver (CDR11 & 13 only) N = Silver, Nickel, Gold (CDR11 & 13 only) S = Solder Coated, Final (CDR12 & 14 only) U = Base Metallization, Barrier Metal, Solder Coated. (Solder M.P. 200°C or less) (CDR12 & 14 only) W = Base Metallization, Barrier Metal, Tinned (Tin or Tin/Lead Alloy) (CDR12 & 14 only) Y = 100% Tin Z = Base Metallization, Barrier Metal (TIn Lead Alloy With 4% Lead Min.)	**Failure Rate Level** M = 1.0% P = .1% R = .01% S = .001%

Notes:
JTI is COTS equivalent
No Marking offered
No Packaging Specified
Failure Rate Level not specified on JTI products

DLI (www.dilabs.com)

- Competitive Products → C04 (0402), C06 (0603) and C08 (0805)
- Performance is good but production capacity is limited and cost is high.
- It is rare that we see DLI in large volume accounts
- The DLI part numbers break down as follows:

EIA 1111 High Power Capacitors (S42E Silver Series) Specification

DLI (Old System) Example: C17CF101J4UX-T — **Johanson Technology: 101S42E101JT4E**

C	17	AH	101	J	4	U	X	-	T
Product Type Miltilayer Cap	**Size (EIA)** 17 (1111) 18 (1111) 22 (2225) 40 (3838)	**Material** AH = P90 CF = NPO High-Q MS = NPO High-Q UL = Ultra Low ESR BL = DC Blocking	**Capacitance** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% X = GMV	**Voltage** 5 = 50 V 1 = 100 V 8 = 150 V 6 = 200 V 9 = 250 V 3 = 300 V 4 = 500 V 7 = 1000 V A = 1500 V B = 2500 V D = 3600 V H = 7200 V	**Termination** U = Ni Barrier, Solder Plate P = Ag Barrier, Palladium Flash Z = Lead Free Ni Barrier, Sn Plate S = Ni Barrier, Au Flash	**Test Level** X = Standard Level 2 A = Mil-PRF-55681 Group A C = Mil-PRF-55681 Group C D = Per Customer Dwg	**Marking** - = No Laser Mark L = Single Side Mark D = Double Side Mark V = Vertical only MS and UL Parts cannot be Laser Market	**Packaging** T = Tape Horizontal V = Tape Vertical W = Waffle Pack B = Bulk

Notes:
Test Level offered as a special at JTI
Vertical Tape and Reel offered as a special at JTI

DLI New System Example: C17AH101J-7UN-X0T — **Johanson Technology: 102S42E101JT6E**

C	17	CF	101	J	-	7	U	N	-	X	0	T
Product Type Miltilayer Capacitor	**Size (EIA)** 17 (1111) 18 (1111) 22 (2225) 40 (3838)	**Material** AH = P90 CF = NPO High-Q MS = NPO High-Q UL=Ultra Low ESR BL = DC Blocking	**Capacitance** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20% X = GMV		**Voltage** 5 = 50 V 1 = 100 V 8 = 150 V 6 = 200 V 9 = 250 V 3 = 300 V 4 = 500 V 7 = 1000 V A = 1500 V B = 2500 V D = 3600 V H = 7200 V	**Termination** T = Ag Termination, Ni Barrier Layer, Heavy SnPb Plated Solder P = AgPd Termination RoHS R = Ag Termination, Cu Barrier Layer, Heavy SnPb Plated Solder V = Ag Termination, Cu Barrier Layer, SnPb Plated Solder W = Ag Termination, Cu Barrier Layer, Sn Plated Solder RoHS M = Polymer Termination, Cu Barrier Layer, Sn Plated Solder RoHS Z = Ag Termination, Ni Barrier Layer, Sn Plated Solder RoHS S = Ag Termination, Ni Barrier Layer, Gold Flash RoHS U = Ag Termination, Ni Barrier Layer, SnPb Plated Solder	**Leading Code** A = Axial Ribbon F = Radial Wire E = Axial Wire D = Custom C = Center Ribbon B = Radial Ribbon N = None		**Test Level** X = Standard Level 2 Y = Reduced Visual A = Mil-PRF-55681 Group A C = Mil-PRF-55681 Group C D = Per Customer Dwg	**Laser Marking** 0 = No Laser 1 = Single Side 2 = Double Side 3=Large Single Side 4=Large Double Side 5 = Vertical Edge 9 = Custom	**Packaging** T=Tape and Reel Horizontal V = Tape and Reel Vertical W = Waffle Pack B = Bulk P = Plastic Box R = Tube (Rail) S = Custom

Notes:
Test Level offered as a special at JTI
Vertical Tape and Reel offered as a special at JTI

Temex Ceramics (www.temex-ceramics.com)

- Competitive Products → CPX, CPE, CLX, CLE Series products
- Temex is a strong competitor particularly in Europe.
- Temex parts perform well and are priced similar to ATC.
- The Temex part numbers break down as follows:

Temex Example: 362CPX100GC1L **Johanson Technology: 362S42E100G16**

362	CP	X	100	G	C	1		L	
Voltage 301=300V 501=500V 122=1.2KV 152=1.5KV 252=2.5KV 362=3.6KV	**Dielectric** CP = High-Q P100 Dielectric CL = High-Q NPO Dielectric	**Case Size** X (1111) E (3838)	**Capacitance** 1st two digits are significant, third digit denotes number of zeros. R = decimal point. 1R0 = 1.0 pF 330 = 33 pF 471 = 470 pF	**Tolerance** A = ±0.05pF B = ±0.1pF C = ±0.25pF D = ±0.5pF F = ±1% G = ±2% J = ±5% K = ±10% M = ±20%	**Termination** S = Standard Sn Plated Nickel C = Sn Plated Copper Non-Mag	**Lead Code** 1 = MicroStrip Ribbon 1S=Short Strip Ribbon 2 = Axial Ribbon 6 = Radial Wire 7 = Axial Wire leave blank if no mechanical requested	**Coating Code** "H" means coating requested leave blank if no coating requested	**Laser Marking** "L" means laser marking requested leave blank if no marking requested	**Packaging** 500 pc /reel "E" means horizontal orientation leave blank if no tape and reel requested

Notes:
Coating not offered at JTI
Packaging not specified on the part shown

Cross Reference Guide

As stated above, the key competitors for Silver Series are American Technical Ceramics (ATC), AVX, Dielectric Laboratories (DLI), and Temex.

The above cross reference information can be found at: www.johansontechnology.com/crossreference/cap.

For other competitors or new product lines from existing competitors, please contact the factory using the below contact near the end of this document.