



**CAPACITORS, FIXED, CHIPS, CERAMIC  
DIELECTRIC, TYPE I**

**BASED ON TYPE 0402**

**ESCC Detail Specification No. 3009/042**

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**DOCUMENTATION CHANGE NOTICE**

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DCR No.	CHANGE DESCRIPTION
1460	Specification upissued to incorporate changes per DCR.

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## 1 GENERAL

### 1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

### 1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

- (a) ESCC Generic Specification No. [3009](#).

### 1.3 TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. [21300](#) shall apply.

### 1.4 THE ESCC COMPONENT NUMBER AND COMPONENT TYPE VARIANTS

#### 1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 3009042031000KA

- Detail Specification Reference: 3009042
- Component Type Variant Number: 03 (as required)
- Characteristic code: Capacitance Value (100pF): 1000 (as required)
- Characteristic code: Capacitance Tolerance ( $\pm 10\%$ ): K (as required)
- Rating code: Rated Voltage (25V): A (as required)

#### 1.4.1.1 *Characteristics and Ratings Codes*

Characteristics and ratings to be codified as part of the ESCC Component Number shall be as follows:

- (a) Rated Capacitance Value,  $C_n$ , expressed by means of the following codes in accordance with ESCC Basic Specification No. [21700](#). The unit quantity shall be picofarad (pF).

Capacitance Value $C_n$ (pF)	Code
X.XX	XCXX
XX.X	XXCX
XXX	XXX0

- (b) Capacitance Tolerance expressed by the following codes in accordance with ESCC Basic Specification No. 21700:

Tolerance ( $\pm$ )	Code Letter	Remark
0.25pF	C	
0.5pF	D	
1pF	F	For $C_n < 10\text{pF}$
1%	F	For $C_n \geq 10\text{pF}$
2%	G	
5%	J	
10%	K	

- (c) Rated Voltage,  $U_R$ , expressed by the following codes:

Rated Voltage $U_R$ (V)	Code Letter
10	Y
16	X
25	A
50	C

1.4.2 Component Type Variants and Range of Components

The component type variants and range of components applicable to this specification are as follows:

Variant Number	Style	Capacitance Range, Tolerance, Rated Voltage	Terminal Material and Finish		Weight Max (g)
			End Terminations	Termination Finish	
03	0402	See Note 1	Ag/Pd/Pt	No finish (Note 2)	0.1
06	0402	See Note 1	Ag + Ni barrier	Sn/Pb plating (Note 3)	0.1
08	0402	See Note 1	Ag + Ni barrier	Au plating (Note 2)	0.1

**NOTES:**

1. Available rated voltages, capacitance values and tolerances are as follows :

Rated Voltage $U_R$ (V)	Capacitance Range $C_n$ (pF)		Tolerance ( $\pm$ )	Value Series
	Min	Max		
10	1	9.53	0.25pF	E48
		9.1	0.5pF	E24
		8.2	1pF	E12
	10	330	1%	E96
			2%	E48
			5%	E24
			10%	E12
16	1	9.53	0.25pF	E48
		9.1	0.5pF	E24
		8.2	1pF	E12
	10	120	1%	E96
			2%	E48
			5%	E24
			10%	E12
25	1	9.53	0.25pF	E48
		9.1	0.5pF	E24
		8.2	1pF	E12
	10	100	1%	E96
			2%	E48
			5%	E24
			10%	E12
50	1	9.53	0.25pF	E48
		9.1	0.5pF	E24
		8.2	1pF	E12
	10	82	1%	E96
			2%	E48
			5%	E24
			10%	E12

Any capacitance value in the capacitance range may be available on request.

2. Variants 03 and 08 are not suitable for solder assembly methods. They shall be assembled using glue or wire bond techniques
3. Sn/Pb plating with tin content of 50% minimum and 97% maximum, remainder lead.

1.5 MAXIMUM RATINGS

The maximum ratings shall not be exceeded at any time during use or storage.

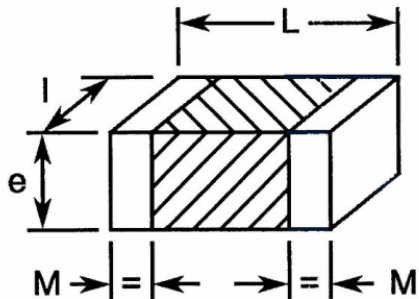
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Voltage	$U_R$	10, 16, 25, 50	V	Note 1
Operating Temperature Range	$T_{op}$	-55 to +125	°C	Without derating. $T_{amb}$
Storage Temperature Range	$T_{stg}$	-55 to +125	°C	
Soldering Temperature	$T_{sol}$	+260	°C	Note 2

**NOTES:**

1. As required; See Para. 1.4.2.
2. Duration 10 seconds maximum.

1.6 PHYSICAL DIMENSIONS



Symbols	Dimensions (mm)	
	Min	Max
L	0.9	1.1
l	0.4	0.6
e	-	0.6
M	0.1	0.3

1.7 FUNCTIONAL DIAGRAM





## 2 REQUIREMENTS

### 2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted deviations from the Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

#### 2.1.1 Deviations from the Generic Specification

##### 2.1.1.1 *Deviations from Qualification and Periodic Tests - Chart F4*

- (a) Solderability: not applicable to Variants 03 and 08.

### 2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. [21700](#) and as follows.

The information to be marked on the component or its primary package shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number (see Para. 1.4.1).
- (c) Traceability information.

2.3 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.3.1 Room Temperature Electrical Measurements

The measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

Characteristics	Symbols	Test Method and Conditions	Tolerance ( $\pm$ )	Limits		Units
				Min	Max	
Capacitance	$C_A$	ESCC No. <a href="#">3009</a>	0.25pF 0.5pF 1pF 1% 2% 5% 10%	$C_n - 0.25$ $C_n - 0.5$ $C_n - 1$ $0.99C_n$ $0.98C_n$ $0.95C_n$ $0.9C_n$	$C_n + 0.25$ $C_n + 0.5$ $C_n + 1$ $1.01C_n$ $1.02C_n$ $1.05C_n$ $1.1C_n$	pF
Tangent of Loss Angle	$tg\delta$	ESCC No. <a href="#">3009</a> For $C_n < 50\text{pF}$ For $C_n \geq 50\text{pF}$	All	- -	Note 1 $15 \times 10^{-4}$	-
Insulation Resistance	$R_i$	ESCC No. <a href="#">3009</a>	All	100	-	$G\Omega$
Voltage Proof	VP	ESCC No. <a href="#">3009</a>	All	$2.5U_R$	-	V

**NOTES:**

1. For  $C_n < 50\text{pF}$ ,  $tg\delta < 1.5 \times (150/C_n + 7) \times 10^{-4}$ , where the unit quantity for  $C_n$  is in pF.

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Insulation Resistance	$R_i$	ESCC No. <a href="#">3009</a> $T_{amb} = +125 \pm 2^{\circ}\text{C}$ Note 2	10	-	$G\Omega$
Temperature Coefficient	TC	ESCC No. <a href="#">3009</a> $T_{amb} = -55^{\circ}\text{C} \pm 2^{\circ}\text{C}, +20^{\circ}\text{C} \pm 2^{\circ}\text{C}, +125^{\circ}\text{C} \pm 2^{\circ}\text{C}$ Note 3 For $C_n > 20\text{pF}$ For $C_n \leq 20\text{pF}$	-30 Note 4	+30	$10^{-6}/^{\circ}\text{C}$

**NOTES:**

- The measurements shall be performed on a sample of 5 components from each manufacturing lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed.
- Guaranteed but not tested during Chart F3 of the Generic Specification; only tested in Temperature Characterisation during Chart F4 of the Generic Specification.
- In the case of a 100% inspection, a 1% total percent defective is allowed.
- Temperature Coefficient is not specified for  $C_n \leq 20\text{pF}$  due to test equipment limitations.

2.4 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at  $T_{amb} = +22 \pm 3^{\circ}\text{C}$ .

Unless otherwise specified the test methods and test conditions shall be as per the corresponding test defined in Para. 2.3.1 Room Temperature Electrical Measurements.

Test Reference per ESCC No. 3009	Characteristics	Symbols	Limits		Units
			Min	Max	
Mounting Final Measurements	Capacitance Tangent of Loss Angle Insulation Resistance	$C_A$ $\text{tg}\delta$ $R_I$	Record Values Note 1 100   -		$\text{G}\Omega$
Rapid Change of Temperature Initial Measurements Final Measurements	Capacitance Capacitance Change in Capacitance Tangent of Loss Angle	$C_A$ $C_A$ $\Delta C_A/C_A$ $\text{tg}\delta$	Notes 1, 2 Note 1 -1   +1 -1   +1 -   Note 4		pF or % (3)
Steady State Humidity (85/85) Initial Measurements Final Measurements (1000 hours)	Capacitance Capacitance Change in Capacitance Tangent of Loss Angle Insulation Resistance (Note 5)	$C_A$ $C_A$ $\Delta C_A/C_A$ $\text{tg}\delta$ $R_I$	Note 1 Note 1 -1   +1 -2   +2 -   Note 4 10   -		pF or % (3) $\text{G}\Omega$
Operating Life Initial Measurements Intermediate Measurements (1000 hours) (Note 6) Final Measurements (1000 or 2000 hours) (Note 7)	Capacitance Capacitance Change in Capacitance Insulation Resistance Capacitance Change in Capacitance Tangent of Loss Angle Insulation Resistance Voltage Proof	$C_A$ $C_A$ $\Delta C_A/C_A$ $R_I$ $C_A$ $\Delta C_A/C_A$ $\text{tg}\delta$ $R_I$ VP	Notes 1, 2 Note 1 -1   +1 -3   +3 10   - Note 1 -1   +1 -3   +3 Note 4 10   - 2.5U <sub>R</sub>   -		pF or % (3) $\text{G}\Omega$ pF or % (3) $\text{G}\Omega$ V

Test Reference per ESCC No. 3009	Characteristics	Symbols	Limits		Units
			Min	Max	
Temperature Characterisation	Insulation Resistance at $T_{amb} = +125 \pm 2^{\circ}\text{C}$	$R_I$	Note 8		
	Temperature Coefficient	TC	Note 8		
Robustness of Terminations Final Measurements	Capacitance	$C_A$	Note 1		

**NOTES:**

1. As specified in Para. 2.3.1 Room Temperature Electrical Measurements.
2. Capacitance values recorded during Mounting may be used as initial measurements.
3. Whichever is greater.
4. Twice the value specified in Para. 2.3.1 Room Temperature Electrical Measurements.
5. Test conditions for Insulation Resistance shall be as specified in Steady State Humidity in the ESCC Generic Specification.
6. Intermediate measurements are optional at the Manufacturer's discretion.
7. 1000 hours is applicable to Periodic Testing for extension of qualification. 2000 hours is applicable to Qualification Testing, and to Periodic Testing for renewal of qualification after lapse.
8. As specified in Para. 2.3.2 High and Low Temperatures Electrical Measurements.

2.5

**BURN-IN**

The requirements for Burn-in are specified in the ESCC Generic Specification. The following conditions shall also apply:

- After Burn-in, the components shall be removed from the chamber and allowed to cool under normal atmospheric conditions for recovery for 24 hours minimum.