CAPACITORS, FIXED, CHIPS, CERAMIC DIELECTRIC, TYPE I, WITH FLEXIBLE TERMINATIONS

BASED ON TYPES 0402 TO 2220

ESCC Detail Specification No. 3009/040

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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: 3009040011000KC

- Detail Specification Reference: 3009040
- Component Type Variant Number: 01 (as required)
- Characteristic code: Capacitance Value (100pF): 1000 (as required)
- Characteristic code: Capacitance Tolerance (±10%): K (as required)
- Rating code: Rated Voltage (50V): C (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
XXX 10^1	XXX1
XXX 10^2	XXX2

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

Tolerance (±)	Code Letter	Remark
0.25pF	C	
0.5pF	D	
1pF	F	For $C_n \leq 8.2$pF
1%	F	For $C_n \geq 27.4$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
100	E
200	G
500	L
1000	M

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 (Note 4)	Capacitance Range, Tolerance, Rated Voltage	Terminal Material and Finish		Weight Max (g)
			End Terminations	Termination Finish	
01	0603	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.1
02	0805	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.1
03	1206	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.15
04	1210	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.15
05	1812	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.2
06	2220	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.3
07	0603	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.1
08	0805	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.1
09	1206	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.15
10	1210	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.15
11	1812	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.2
12	2220	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.3
13	0402	See Note 1	Flexible + Ni barrier	Sn/Pb plating (Note 3)	0.1
14	0402	See Note 1	Flexible + Ni barrier	Au plating (Note 2)	0.1

NOTES:

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

Variant Number	Style (Note 4)	Capacitance Range C_n (pF)		Rated Voltage U_R (V)
		Min	Max	
05, 11	1812	47	1800	1000
06, 12	2220	100	4700	
02, 08	0805	1	270	500
03, 09	1206	4.7	1500	
04, 10	1210	10	1800	
05, 11	1812	47	3900	
06, 12	2220	100	10000	
02, 08	0805	1	680	200
03, 09	1206	4.7	3300	
04, 10	1210	10	4700	
05, 11	1812	47	10000	
06, 12	2220	100	22000	
01, 07	0603	1	330	100
02, 08	0805	1	1200	
03, 09	1206	1	3900	
04, 10	1210	10	6800	
05, 11	1812	100	12000	
06, 12	2220	470	27000	
13, 14	0402	1	100	50
01, 07	0603	1	560	
02, 08	0805	1	1800	
03, 09	1206	1	5600	
04, 10	1210	10	12000	
05, 11	1812	100	22000	
06, 12	2220	470	47000	
13, 14	0402	1	100	25
01, 07	0603	1	680	
02, 08	0805	1	2200	
03, 09	1206	1	5600	
04, 10	1210	10	12000	
05, 11	1812	100	27000	
06, 12	2220	470	56000	
13, 14	0402	1	120	16
01, 07	0603	1	1000	
02, 08	0805	1	2700	
03, 09	1206	1	6800	
04, 10	1210	10	15000	
05, 11	1812	100	33000	
06, 12	2220	470	68000	

Variant Number	Style (Note 4)	Capacitance Range C_n (pF)		Rated Voltage U_R (V)
		Min	Max	
13, 14	0402	1	330	10
01, 07	0603	1	2200	
02, 08	0805	1	10000	
03, 09	1206	1	27000	
04, 10	1210	10	68000	

Available Capacitance values for each Rated Voltage are as defined by the E12 to E96 series; however, any capacitance value within each specified capacitance range may be available on request.

Capacitance tolerances available are:

- for C_n < 10pf: 0.25pF, 0.5pF
- for C_n ≥ 10pf: 1% 2% 5% 10%

2. Variants 07 to 12 and 14 are not suitable for solder assembly methods. They shall be assembled using glue or wire bond techniques.
3. Sn/Pb plating with typically 60% Sn, 40% Pb.
4. See Para. 1.6.

1.5 MAXIMUM RATINGS

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

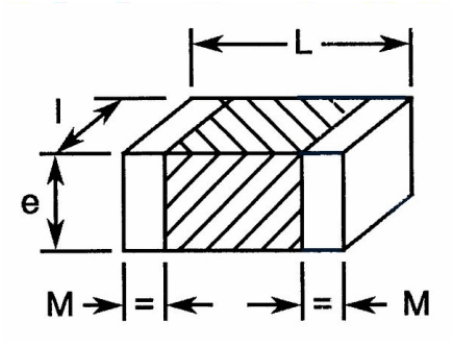
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Voltage	U_R	10, 16, 25, 50, 100	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)													
	Style 0402 Variants 13, 14		Style 0603 Variants 01, 07		Style 0805 Variants 02, 08		Style 1206 Variants 03, 09		Style 1210 Variants 04, 10		Style 1812 Variants 05, 11		Style 2220 Variants 06, 12	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
L	0.9	1.1	1.4	1.8	1.7	2.3	2.95	3.45	2.8	3.6	4	5	5.2	6.2
l	0.4	0.6	0.6	1	1.05	1.45	1.45	1.75	2.2	2.8	2.8	3.6	4.5	5.5
e	-	0.6	-	1	-	1.8	-	2.3	-	2.3	-	2.8	-	2.8
M	0.1	0.3	0.1	0.5	0.1	0.75	0.2	0.75	0.2	1	0.2	1	0.2	1

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 07 to 12 and 14.

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 ±3°C.

Characteristics	Symbols	Test Method and Conditions	Tolerance (±)	Limits		Units
				Min	Max	
Capacitance	C_A	ESCC No. 3009				pF
			0.25pF	C_n -0.25	C_n +0.25	
			0.5pF	C_n -0.5	C_n +0.5	
			1pF	C_n -1	C_n +1	
			1%	0.99C_n	1.01C_n	
			2%	0.98C_n	1.02C_n	
			5%	0.95C_n	1.05C_n	
			10%	0.9C_n	1.1C_n	
Tangent of Loss Angle	tgδ	ESCC No. 3009	All			
		For C_n < 50pF		-	Note 1	
		For C_n ≥ 50pF		-	15 x10^{-4}	-
Insulation Resistance	R_I	ESCC No. 3009	All			
		For C_n ≤ 10000pF		100	-	GΩ
		For C_n > 10000pF		1000	-	GΩ.nF
Voltage Proof	VP	ESCC No. 3009	All	2.5U_R	-	V

NOTES:

1. For C_n < 50pF, tgδ < 1.5 x (150/C_n + 7) x10^{-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. 3009 T_{amb} = +125 ±2°C Note 2			
		For $C_n \leq 10000pF$	10	-	GΩ
		For $C_n > 10000pF$	100	-	GΩ.nF
Temperature Coefficient	TC	ESCC No. 3009 T_{amb} = -55 ±2°C, +20 ±2°C, +125 ±2°C Note 3			10^{-6}/°C
		For $C_n > 20pF$	-30	+30	
		For $C_n \leq 20pF$	Note 4		

NOTES:

1. 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.
2. Guaranteed but not tested during Chart F3 of the Generic Specification; only tested in Temperature Characterisation during Chart F4 of the Generic Specification.
3. In the case of a 100% inspection, a 1% total percent defective is allowed.
4. Temperature Coefficient is not specified for $C_n \leq 20pF$ 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 ±3°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	C_A	Record Values		
	Tangent of Loss Angle	tgδ	Note 1		
	Insulation Resistance:				
	For $C_n \leq$ 10000pF	R_I	100	-	GΩ
	For $C_n >$ 10000pF	R_I	1000	-	GΩ.nF
Rapid Change of Temperature					
Initial Measurements	Capacitance	C_A	Notes 1, 2		
Final Measurements	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-1	+1	pF or
			-1	+1	% (3)
	Tangent of Loss Angle	tgδ	Note 4		
Steady State Humidity (85/85)					
Initial Measurements	Capacitance	C_A	Note 1		
Final Measurements (1000 hours)	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-1	+1	pF or
			-2	+2	% (3)
	Tangent of Loss Angle	tgδ	Note 4		
	Insulation Resistance (Note 5):				
	For $C_n \leq$ 10000pF	R_I	10	-	GΩ
	For $C_n >$ 10000pF	R_I	100	-	GΩ.nF

Test Reference per ESCC No. 3009	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life					
Initial Measurements	Capacitance	C_A	Notes 1, 2		
Intermediate Measurements (1000 hours) (Note 6)	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-1	+1	pF or
			-3	+3	% (3)
	Insulation Resistance:				
	For $C_n \leq 10000$pF	R_I	10	-	GΩ
	For $C_n > 10000$pF	R_I	100	-	GΩ.nF
Final Measurements (1000 or 2000 hours) (Note 7)	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-1	+1	pF or
			-3	+3	% (3)
	Tangent of Loss Angle	tgδ	Note 4		
	Insulation Resistance:				
	For $C_n \leq 10000$pF	R_I	10	-	GΩ
	For $C_n > 10000$pF	R_I	100	-	GΩ.nF
	Voltage Proof	VP	$2.5U_R$	-	V
Temperature Characterisation	Insulation Resistance at T_{amb} = +125 ±2°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.

APPENDIX A

AGREED DEVIATIONS FOR EXXELIA TECHNOLOGIES (F)

Items Affected	Description of Deviations
Para. 2.1.1 Deviations from the Generic Specification: Screening Tests - Chart F3	Burn-in: Due to the use of components of varying designs to cover the available range of components as listed in REP005 (ESCC QPL), for any particular component, the Applied Voltage for Burn-in shall be as specified in the PID as agreed with the ESCC Executive, with a minimum value of 2 times the Rated Voltage (DC).