



**CAPACITORS, FIXED, CHIPS, CERAMIC DIELECTRIC,  
TYPE I  
BASED ON TYPE 2220  
ESCC Detail Specification No. 3009/006**

**DRAFT**

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**DOCUMENTATION CHANGE NOTICE**

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DCR No.	CHANGE DESCRIPTION
TBD	Specification updated to incorporate editorial and technical 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: 3009006012202JA

- Detail Specification Reference: 3009006
- Component Type Variant Number: 01 (as required)
- Characteristic code: Capacitance Value (22000pF): 2202 (as required)
- Characteristic code: Capacitance Tolerance ( $\pm 5\%$ ): J (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
XXX	XXX0
$XXX 10^1$	XXX1
$XXX 10^2$	XXX2
$XXX 10^3$	XXX3

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

Tolerance (±)	Code Letter
1%	F
2%	G
5%	J
10%	K

(c) Rated Voltage expressed by the following codes:

Rated Voltage (V)	Code Letter
16	X
25	A
50	C
100	E
200	G

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	Dimensions (mm) (Note 2)			Terminal Material and Finish		Weight Max (g)
			L Max	I Max	e Max	End Terminations	Termination Finish	
01	2220	See Note 1	6.2	5.5	1.8	Ag/Pd	No finish	0.3
02	2220	See Note 1	6.7	6	2.3	Ag/Pd	Sn62 solder	0.3
03	2220	See Note 1	6.2	5.5	1.8	Ag/Pd/Pt	No finish	0.3
04	2220	See Note 1	6.7	6	2.3	Ag/Pd/Pt	Sn62 solder	0.3
05	2220	See Note 1	6.7	6	2.3	Ag + Ni barrier	Sn62 solder	0.3
06	2220	See Note 1	6.2	5.5	1.8	Ag + Ni barrier	Sn/Pb coating (Note 3)	0.3

**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		
200	464	22100	1	E96
	464	21500	2	E48
	470	22000	5	E24
	470	22000	10	E12
100	464	46400	1	E96
	464	46400	2	E48
	470	47000	5	E24
	470	47000	10	E12
50	464	68100	1	E96
	464	68100	2	E48
	470	68000	5	E24
	470	68000	10	E12
25	464	100000	1	E96
	464	100000	2	E48
	470	100000	5	E24
	470	100000	10	E12
16	464	150000	1	E96
	464	147000	2	E48
	470	150000	5	E24
	470	150000	10	E12

2. See Physical Dimensions.

3. Sn/Pb coating, near eutectic with minimum 10% Pb.

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.

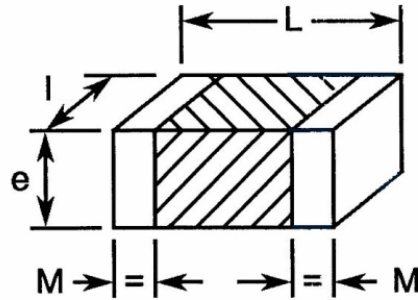
Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Voltage	$U_R$	16, 25, 50, 100, 200	V	Note 1
Operating Temperature Range	$T_{op}$	-55 to +125	$^{\circ}C$	Without derating. $T_{amb}$
Storage Temperature Range	$T_{stg}$	-55 to +125	$^{\circ}C$	
Soldering Temperature	$T_{sol}$	+260	$^{\circ}C$	Note 2

**NOTES:**

1. As required; See Component Type Variants and Range of Components.

2. Duration 10 seconds maximum.

1.6 PHYSICAL DIMENSIONS



Symbols	Dimensions (mm)	
	Min	Max
L	5.2	Note 1
I	4.5	Note 1
e	-	Note 1
M	0.2	0.75

**NOTES:**

1. See Component Type Variants and Range of Components for dimensions L Max, I Max, e Max.

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

None.



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 shall be:

- (a) The ESCC qualified components symbol (for ESCC qualified components only).
- (b) The ESCC Component Number.
- (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  $T_{amb} = +22 \pm 3^{\circ}C$ .

Characteristics	Symbols	Test Method and Conditions	Tolerance ( $\pm$ %)	Limits		Units
				Min	Max	
Capacitance	$C_A$	ESCC No. 3009	1	$0.99C_n$	$1.01C_n$	pF
			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	$tg\delta$	ESCC No. 3009	All	-	$15 \times 10^{-4}$	-
Insulation Resistance	$R_i$	ESCC No. 3009	All	100	-	G $\Omega$
		For $C_n \leq 10000\text{pF}$				
Voltage Proof	VP	ESCC No. 3009	All	2.5 $U_R$	-	V

2.3.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Temperature Coefficient	TC	ESCC No. 3009 Note 2	-30	+30	$10^{-6}/^{\circ}C$

**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. In the case of a 100% inspection, a 1% total percent defective is allowed.

2.4 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

Unless otherwise specified the test methods and test conditions shall be as per the corresponding test defined in 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	$C_A$ $tg\delta$ $R_I$	Record Values Note 1 Note 1		
Robustness of Terminations Final Measurements	Capacitance	$C_A$	Note 1		
Climatic Test Sequence Initial Measurements	Capacitance	$C_A$	Notes 1, 2		
Final Measurements	Capacitance Change in Capacitance Tangent of Loss Angle Insulation Resistance: For $C_n \leq 10000pF$ For $C_n > 10000pF$	$C_A$ $\Delta C_A/C_A$ $tg\delta$ $R_I$ $R_I$	-2 - 10 100	+2 $30 \times 10^{-4}$ - -	%  GΩ MΩ.μF
Rapid Change of Temperature Initial Measurements	Capacitance	$C_A$	Notes 1, 2		
Final Measurements	Capacitance Change in Capacitance Tangent of Loss Angle	$C_A$ $\Delta C_A/C_A$ $tg\delta$	-1 -	+1 $30 \times 10^{-4}$	%
Damp Heat Steady State Initial Measurements	Capacitance	$C_A$	Notes 1, 2		
Final Measurements	Capacitance Change in Capacitance Tangent of Loss Angle Insulation Resistance: For $C_n \leq 10000pF$ For $C_n > 10000pF$	$C_A$ $\Delta C_A/C_A$ $tg\delta$ $R_I$ $R_I$	-2 - 10 100	+2 $30 \times 10^{-4}$ - -	%  GΩ MΩ.μF

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)	Capacitance	$C_A$	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-3	+3	%
	Insulation Resistance: For $C_n \leq 10000\text{pF}$	$R_I$	10	-	GΩ
	For $C_n > 10000\text{pF}$	$R_I$	100	-	MΩ.μF
Final Measurements (2000 hours)	Capacitance	$C_A$	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-3	+3	%
	Tangent of Loss Angle	$\text{tg}\delta$	-	$30 \times 10^{-4}$	
	Insulation Resistance: For $C_n \leq 10000\text{pF}$	$R_I$	10	-	GΩ
	For $C_n > 10000\text{pF}$	$R_I$	100	-	MΩ.μF
	Voltage Proof	VP	Note 1		
Capacitance-Temperature Characteristics	Temperature Coefficient	TC	Note 3		

**NOTES:**

1. As specified in Room Temperature Electrical Measurements.
2. Capacitance values recorded during Mounting may be used as initial measurements.
3. As specified in 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±2 hours.



**APPENDIX A**  
**AGREED DEVIATIONS FOR AVX/TPC (F)**

Items Affected	Description of Deviations
Deviations from Generic Specification: Screening Tests (Chart F3)	High and Low Temperatures Electrical Measurements: Temperature Coefficient may be replaced with data provided by the ceramic material supplier, using AVX/TPC documents 1A-220020BCR**AQ - 1A-220022DCR**AQ (issue as per PID).