AVX

CAPACITORS, FIXED, CHIPS,
CERAMIC DIELECTRIC, TYPE II,
BASED ON TYPE 0603,0805,1206,1210 and 1812
Termination Type: copper and silver loaded epoxy
Nickel barrier with Tin-Lead coating, near eutectic,minimum

COL/ESA/PI-03

ISSUE 3 Rev B

11/26/2012

[Type the abstract of the document here. The abstract is typically a short summary of the contents of the document. Type the abstract of the document here. The abstract is typically a short summary of the contents of the document.]

TABLE OF CONTENTS

TABLES **Page**

FIGURES

APPENDICES (Applicable to specific Manufacturers only)

1 GENERAL

1.1 SCOPE

This specification details, physical and electrical characteristics, test and inspection data for Base Metal Electrode Capacitors, Fixed, Chips, Ceramic Dielectric, Type II, based on Type 0603, 0805, 1206, 1210 and 1812. It shall be read in conjunction with ESCC Generic Specification No. 3009, the requirements of which are supplemented herein.

1.2 RANGE OF COMPONENTS

The range of capacitors covered by this specification is given in Table 1 (a).

1.3 MAXIMUM RATINGS

The Maximum ratings, which shall not be exceeded at any time during use or storage, applicable to the capacitors specified herein, are as scheduled in Table 1 (b).

1.4 PARAMETER DERATING INFORMATION (FIGURE 1)

Not applicable

1.5 PHYSICAL DIMENSIONS

The physical dimensions of the capacitor specified herein are shown in Figure 2.

1.6 FUNCTIONAL DIAGRAM

The functional diagram for the capacitors specified herein is shown in Figure 3.

TABLE 1 (A) – RANGE OF COMPONENTS

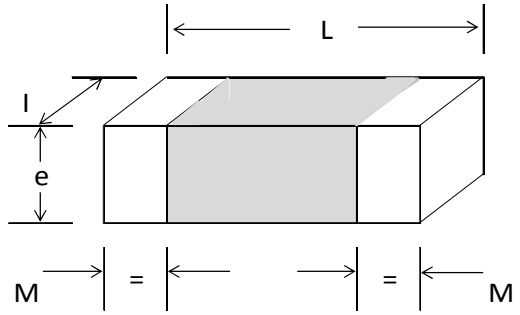
Variant	COMPONENT SIZE	CAPACITANCE RANGE (pf)	RATED VOLTAGE (U_R)	TOLERANCE (+/-) (%)	VALUE SERIES
01	0603	2200 to 18000	100	5, 10, 20	E12
01	0603	2200 to 150000	50	5, 10, 20	E12
01	0603	2200 to 180000	25	5, 10, 20	E12
01	0603	2200 to 180000	16	5, 10, 20	E12
02	0805	2200 to 100000	100	5, 10, 20	E12
02	0805	2200 to 470000	50	5, 10, 20	E12
02	0805	2200 to 1000000	25	5, 10, 20	E12
02	0805	2200 to 1000000	16	5, 10, 20	E12
03	1206	18000 to 390000	100	5, 10, 20	E12
03	1206	18000 to 1000000	50	5, 10, 20	E12
03	1206	18000 to 2200000	25	5, 10, 20	E12
03	1206	18000 to 2200000	16	5, 10, 20	E12
04	1210	47000 to 820000	100	5, 10, 20	E12
04	1210	47000 to 1000000	50	5, 10, 20	E12
04	1210	47000 to 1000000	25	5, 10, 20	E12
04	1210	47000 to 1000000	16	5, 10, 20	E12
05	1812	150000 to 2200000	100	5, 10, 20	E12
05	1812	150000 to 4700000	50	5, 10, 20	E12
05	1812	150000 to 8200000	25	5, 10, 20	E12
05	1812	150000 to 8200000	16	5, 10, 20	E12

TABLE 1 (b) – MAXIMUM RATINGS

No.	CHARACTERISTICS	SYMBOL	LIMITS		UNIT	REMARKS
			MIN.	MAX.		
1	Rated Voltage	U_R	See Table 1 (a)		V	-
2	Operating Temperature Range	T_{amb}	-55	+125	^{0}C	Without derating
3	Storage Temperature Range	T_{stg}	-55	+125	^{0}C	-
4	Maximum Soldering Temperature	T_{sol}	-	+260	^{0}C	Soldering time: T: <10 sec.

FIGURE 2 – PHYSICAL DIMENSIONS

VAR	SYMBOL	DIMENSIONS(mm)							
		L		l		M		e	
		MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
01	0603	1.45	1.75	0.65	0.95	0.20	0.50		1.00
02	0805	1.80	2.20	1.05	1.45	0.25	0.75		1.52
03	1206	3.00	3.40	1.40	1.80	0.25	0.75		1.80
04	1210	3.00	3.40	2.30	2.70	0.25	0.75		2.80
05	1812	4.20	4.80	3.00	3.40	0.25	0.95		2.80



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 for Capacitors, Fixed Chips, Ceramic Dielectric, Types I and II.

3. TERMS, DEFINATIONS, ABBREVIATIONS, SYMBOLS AND UNTIS

For the purpose of this specification, the terms, definitions, abbreviations, symbols and units specified in ESCC Basic Specification No. 21300 shall apply. In addition, the following symbols are used:-

TCC = Temperature Characteristic.

V_T = Test Voltage.

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein shall be as stated in this specification and ESCC Generic Specification No. 3009 for Capacitors, Fixed, Chips, Ceramic Dielectric, Types I and II. Deviations from the Generic Specification, applicable to this specification only, are listed in Para 4.2.

Deviations from the applicable Generic Specification and this Detail Specification, formally agreed with specific Manufacturers on the basis that the alternative requirements are equivalent to the ESCC requirements and do not affect the components reliability, are listed in the appendices attached to this specification.

4.2 DEVIATIONS FROM GENERIC SPECIFICATION

4.2.1 Deviation from Special In-process Controls
None.

4.2.2 Deviations from Final Production Tests (Chart II)
None

4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)
None

4.2.4 Deviations from Qualification Tests (Chart IV)
None.

4.2.5 Deviations from Lot Acceptance Tests (Chart V)
None.

4.3 MECHANICAL REQURIEMENTS

4.3.1 Dimension Check
The dimensions of the capacitor specified herein shall be verified in accordance with the requirement set out in Para 9.3 of ESCC Generic Specification No. 3009 and shall conform to those shown in Figure 2 of this specification.

4.3.2 Weight
The Maximum weight of the capacitors specified herein shall be:

Chip Size	Weight (Grammes)
`0603	0.02
`0805	0.04
1206	0.08
1210	0.15
1812	0.3

4.3.3 Adhesion

The requirement for adhesion is specified in Para 9.5 of ESCC Generic Specification No. 3009.

4.4 **MATERIALS AND FINISHES**

The materials and finishes shall be specified herein. Where a definite material is not specified, a material which will enable the capacitors specified herein to meet the performance requirements of this specification shall be used. Acceptance or approval of any constituent material does not guarantee acceptance of the finished product.

4.4.1 Terminations

The capacitors shall be terminated with Termination: copper and silver loaded epoxy; Nickel barrier with coating tin-lead, near eutectic ,minimum.(Minimum10%Pb) This termination is suitable for Reflow soldering.

4.5 MARKING

4.5.1 General

The marking of all components delivered to this specification shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and the following paragraphs.

These components being too small to accommodate the marking as specified hereafter, the marking information in full shall accompany each component in its primary package. Such marking shall comprise:-

(a) The AVX Part Number
(b) Characteristics and Ratings.
(c) Traceability Information.

4.5.2 AVX Part number (How to Order)

0603	5	C	103	K	E	R	6	A	0
Component Size	Voltage	Dielectric	Cap. Code	Cap Tol	Failure Rate	Termination	Pack	Special Code	LAT code
0603 (var 01)	Y=16	C=X7R	2 Sig. Fig +	J=+/-5%	E=ESCC	R=Sn/Pb	6=waffle pack	A=standard	0 = No LAT
0805 (var 02)	3=25		No. Zeroes	K=+/-10%		(10%Pb min.)	contact factory	B = test level B	1 = LAT 1
1206 (var 03)	5=50		Examples.	M=+/-20%			for Tape and Reel	C = test level C	2 = LAT 2
1210 (var 04)	1=100		102=1,000pf						3 = LAT 3
1812 (var 05)			223=22,000pf						

Explanation of AVX Part Number	
Character #	Explanation
1 - 4	Case size – refer to Table 1(A)
5	Voltage rating – ref 4.5.3.3 below
6	Dielectric C = X7R
7 – 9	Capacitance Value – ref 4.5.3.1 below
10	Capacitance Tolerance - ref 4.5.3.2 below
11	AVX Character E = Space component
12	Termination code R= Sn/Pb (10%Pb min.) refer to 4.4.1
13	Packaging code
14	Special code – test levels B & C can be defined here
15	LAT code 0 = No LAT

4.5.3 Electrical Characteristics and Ratings

4.5.3.1 Capacitance Values

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads (pF).

CAPACITANCE VALUE	CODE
XX	XX0
XX10[1]	XX1
XX10[2]	XX2
XX10[3]	XX3
XX10[4]	XX4

4.5.3.2 Tolerances

The tolerances on capacitance values shall be indicated by the code letters specified hereafter.

TOLERANCE (%)	CODE LETTER
± 5.0	J
± 10	K
± 20	M

4.5.3.3 Rated Voltage

The rated voltages shall be indicated by the code letters specified hereafter.

RATED VOLTAGE (U_R) (V)	CODE
16	Y
25	3
50	5
100	1

4.5.4 Traceability Information

Traceability Information shall be marked in accordance with the requirements of ESCC Basic Specification No. 21700.

(a) Manufacturing Date Code.

(b) Manufacturer's Name.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified, the measurements shall be performed at T_{amb} = + 22 ± 3 ^{0}C.

4.6.2 Electrical Measurements at High and Low Temperatures

The parameters to be measured at high and low temperatures are scheduled in Table 3.

4.6.3 Circuits for Electrical Measurements

A circuit for use in performing the electrical measurements listed in Table 2 of this specification is shown in ESCC Generic Specification No. 3009.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = + 22 ± 3 ^{0}C. The parameter drift values (Δ) applicable to the scheduled parameters shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit value specified in Table 2 shall not be exceeded.

4.7.2 Conditions for Burn-in

The requirements for burn-in are specified in Section 7 of ESCC Generic Specification No. 3009. The conditions for burn-in shall be specified in Table 5 of this specification.

On completion of burn-in, a recovery period of 24 ± 2 hours is necessary before performance of the end-measurements.

4.7.3 Electrical Circuit for Burn-in (Figure 5)

Not applicable.

TABLE 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	CHARACTERISTICS	SYMBOL	ESCC 3009 TEST CONDITIONS	LIMITS		UNIT
				MIN.	MAX.	
1	Capacitance	C	Para. 9.4.1.1	-5.0 -10 -20	+5.0 +10 +20	%
2	Tangent of Loss Angle	$T_{g\delta}$	Para 9.4.1.2	-	250 (1)	10^{-4}
3	Insulation Resistance	R_i R_ixC	Para. 9.4.1.3 C≤10 000pf C>10 000pf	100 1000	-	GΩ sec
4	Voltage Proof	VP	Para. 9.4.1.4	2.5 U_R	-	V

NOTES

1. 300 max for 16 volt and 25 volt rated components

TABLE 3 – ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	CHARACTERISTICS	SYMBOL	ESCC 3009 TEST CONDITIONS	LIMITS		UNIT	REMARKS
				MIN.	MAX.		
3	Insulation Resistance At + 125 ± 3°C	R_i R_ixC	Para. 9.4.1.3 C≤10 000pf C>10 000pf	100 1000	-	GΩ sec	Notes 1, and 2
5	Temperature Characteristic $\frac{\Delta C}{C}$ = f(T)	TCC	Para 9.12 V_T -0	-15	+15	%	5 parts for each capacitance Value. Notes 2 and 3

NOTES

1. Single Sample; Inspection Level S3; AQL = 2.5%
2. If 1 failure out of 5 parts, then test 100%.
   1.0% rejects maximum allowed in case of 100% testing.
3. X7R dielectric. Delta C/C at Ur is typically -60% for this dielectric type.

TABLE 4 – PARAMETER DRIFT VALUES

No.	CHARACTERISTICS	SYMBOL	SPEC. AND/OR TEST METHOD	TEST CONDITIONS	CHANGE LIMITS (Δ)	UNIT
1	Capacitance Change	$\frac{\Delta C}{C}$	ESCC Gen. Spec 3009	Para's. 9.4.2 and 9.4.1.1	$\pm$ 15	%

FIGURE 4 – TEST CIRCUITS

Not applicable.

TABLE 5 – CONDITIONS FOR BURN-IN AND OPERATING LIFE TESTS

No.	CHARACTERISTICS	SYMBOL	CONDITIONS	UNIT
1	Ambient Temperature	T_{amb}	+125	^{0}C
2	Test Voltage	V_T	$2.0U_R$	V

FIGURE 5 – ELECTRICAL CIRCUIT FOR BURN-IN AND OPERATING LIFE TESTS

Not applicable.

4.8 ENVIRONMENTAL AND ENDUREANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION No. 3009)

4.8.1 Measurements and Inspections on Completion of Environmental Tests

The parameters to be measured and inspections to be performed on completion of environmental test are scheduled in Table 6. Unless otherwise stated, the measurement shall be performed at $T_{amb} = +22 \pm 3^0C$.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Test

The parameters to be measured and inspections to be performed at intermediate points during endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3^0C$.

4.8.3 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3^0C$.

4.8.4 Conditions for Operating Life Test (Part of Endurance Test)

The requirements for operating life testing are specified in Section 9 of ESCC Generic Specification No. 3009. The conditions for operating life testing shall be as specified in Table 5 for the Burn-in test.

4.8.5 Electrical Circuit for Operating Life Test (Figure 5)

Not applicable.

4.8.6 Conditions for Steady State Humidity (85/85)

The requirements for 85/85 are specified in Section 5.2.2 of ESCC Generic Specification 3009.

TABLE 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	ESCC GENERIC SPECIFICATION No. 3009		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UN-IT
	ENVIROMENTAL AND ENDURANCE TESTS (1)	TEST METHODS AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Mounting	Para 9.15	Final Examination Terminals	Good Tinning	-	-	-	-
			Final Measurements Capacitance Tangent of Loss Angle Insulation Resistance	Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C $T_g\delta$ Ri	Record Values Table 2 Item 2 Table 2 Item 3		pF 10^{-4} GΩ
02	Adhesion	Para 9.5	Final Examination Visual Examination Capacitance	 Damage or loosening Table 2 Item 1	 - C	 - Table 2 Item 1	 -	 - pF
03	Solderability	Para 9.5	Final Examination Visual Examination	 Para 9.6	 -	 -	 -	 -
04	Rapid Change of Temperature	Para 9.7	Initial Measurements Capacitance Final Measurements Visual Examination Capacitance Change Tangent of Loss Angle	 Table 2 Item 1 Recovery Period 25 ± 2 hours No damage Table 2 Item 1 Table 2 Item 2	 C $\frac{\Delta C}{C}$ $T_g\delta$	 Item 01 Value - -10 -	 - +10 (2)	 pF - % 10^{-4}
05	Climatic Test Sequence	Para 9.8	Initial Measurements Capacitance Final Measurements Visual Examination Capacitance Change Tangent of Loss Angle Insulation Resistance	 Table 2 Item 1 Recovery Period 1 – 24 hrs Para 9.8.7 Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	 C - $\frac{\Delta C}{C}$ $T_g\delta$ Ri	 Item 01 Value - -10 - 3.0 (3)	 - +10 (2) -	 pF - % 10^{-4} GΩ
06	Damp Heat Steady State	Para 9.9	Initial Measurements Capacitance Final Measurements Visual Examination Capacitance Change Tangent of Loss Angle Insulation Resistance	 Table 2 Item 1 Recovery period 6 – 24 hrs No Damage Table 2 Item 1 Table 2 Item 1 Table 2 Item 3	 C - $\frac{\Delta C}{C}$ $T_g\delta$ Ri	 Item 01 Value - -10 - 3.0 (3)	 - +10 (2) -	 pF - % 10^{-4} GΩ

NOTES

1. The test in this table refers to either Chart IV or V and shall be used as applicable.
2. Twice the values specified in Table 2 of this specification.
3. Or 30 seconds for C > 10 000pF
4. Or 100 seconds for C > 10 000pF.

TABLE 6 – MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

No.	ESCC GENERIC SPECIFICATION No. 3009		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UN-IT
	ENVIROMENTAL AND ENDURANCE TESTS (1)	TEST METHODS AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
07	Operating Life	Para 9.10	Initial Measurements Capacitance	Table 2 Item 1	C	Item 01 Value		pF
			Intermediate Measurements To be performed at 1000 hrs (Chart IV)	Recovery Period 24 ± 2 hours				
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	-15	-15	%
			Insulation Resistance	Table 2 Item 3	R_i			
			Final Measurement	Recovery Period 24 ± 2 hours				
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	-15	+15	%
			Tangent of Loss Angle	Table 2 Item 1	Tgδ	-	(2)	10^{-4}
			Insulation Resistance	Table 2 Item 1	R	10 (4)		
			Voltage Proof	Table 2 Item 1	VP	Table 2 Item 4		V
			Visual Examination	No Damage	-	-	-	-
08	Temperature Characteristic	Para 9.12	Capacitance Changes	Table 3 Item 5 (i) or 5 (ii)	TCC	Table 3 Item 5(i) or 5 (ii)		%
09	Steady State Humidity Test	Para 5.2.2 85^0C /85 RH 1.5Vdc	Initial Measurements Capacitance Tangent of Loss Angle Insulation Resistance	As per Table 2	C Tgδ Ri	Item 01 Value		pF 10^{-4}
			Final Measurement After 240 hrs test duration	Recovery period 3 – 4hrs				
			Capacitance Change Tangent of Loss Angle Insulation Resistance	As per Table 2	C Tgδ Ri	Item 01 Value		pF 10^{-4}
			Visual Examination	No Damage				

NOTES

1. The tests in this table refer to Chart IV or V and shall be used as applicable.
2. Twice the values specified in Table 2 of this specification.
3. Or 30 seconds for C > 10 000pF.
4. Or 100 seconds for C >10 000pF.