ESCC
European Space Components Coordination

Pages 1 to 18

CAPACITORS, FIXED, CHIPS,

CERAMIC DIELECTRIC, TYPE I,

BASED ON TYPE 2220

ESCC Detail Specification No. 3009/006

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
605	Specification upissued to incorporate technical and editorial changes per DCR.

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APPENDICES (Applicable to specific Manufacturers only)

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Chips, Ceramic Dielectric, Type I, based on Type 2220. 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 capacitors 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

CAPACITANCE RANGE (pF)	TOLERANCE (±) (%)	VALUES SERIES	RATED VOLTAGE (U_R) (V)
464 to 33200	1.0	E 96	100
464 to 33200	2.0	E 48	100
470 to 33000	5.0	E 24	100
470 to 33000	10	E 12	100
464 to 47500	1.0	E 96	50
464 to 48700	2.0	E 48	50
470 to 47000	5.0	E 24	50
470 to 47000	10	E 12	50
464 to 56200	1.0	E 96	25
464 to 56200	2.0	E 48	25
470 to 56000	5.0	E 24	25
470 to 56000	10	E 12	25
464 to 68100	1.0	E 96	16
464 to 68100	2.0	E 48	16
470 to 68000	5.0	E 24	16
470 to 68000	10	E 12	16

NOTES

1. As specified in Para. 4.4.1 and Figure 2, these ranges are available in 6 variants.

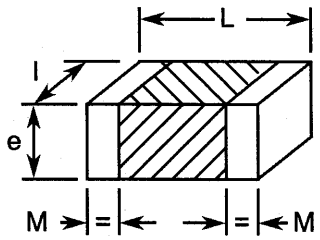
TABLE 1(b) - MAXIMUM RATINGS

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	°C	Without derating
3	Storage Temperature Range	T_{stg}	−55	+125	°C	-
4	Maximum Soldering Temperature	T_{sol}	-	+260	°C	Soldering time: t: <10 sec.

FIGURE 1 - PARAMETER DERATING INFORMATION

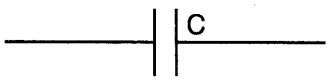
Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	DIMENSIONS (mm)			
	VARIANTS 01, 03, 06		VARIANTS 02, 04, 05	
	MIN.	MAX.	MIN.	MAX.
L	5.2	6.2	5.2	6.7
l	4.5	5.5	4.5	6.0
e	-	1.8	-	2.3
M	0.2	0.75	0.2	0.75

FIGURE 3 - FUNCTIONAL DIAGRAM



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, 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. In addition, the following symbols are used:-

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 Deviations from Special In-process Controls

None.

4.2.2 Deviations from Final Production Tests (Chart II)

(a) Para. 9.2.1, Drying: Shall not be performed.

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 REQUIREMENTS

4.3.1 Dimension Check

The dimensions of the capacitors specified herein shall be verified in accordance with the requirements 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 0.3 grammes.

4.3.3 Adhesion

The requirements for adhesion are specified in Para. 9.5 of ESCC Generic Specification No. 3009.

4.4 MATERIALS AND FINISHES

The materials and finishes shall be as 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

- Variant 01: The capacitors shall be terminated with AgPd pads.
- Variant 02: The capacitors shall be terminated with AgPd with solder coating, 62 Sn, 36 Pb, 2.0 Ag %, +188°C.
- Variant 03: The capacitors shall be terminated with AgPdPt pads.
- Variant 04: The capacitors shall be terminated with AgPdPt with solder coating, 62 Sn, 36 Pb, 2.0 Ag %, +188°C.
- Variant 05: The capacitors shall be terminated with Ag, Ni barrier with solder coating, 62 Sn, 36Pb, 2.0 Ag %, +188°C.
- Variant 06: The capacitors shall be terminated with Ag, Ni barrier with coating tin-lead, near eutectic, minimum 10% lead.

All the above Variants are suitable for reflow soldering.

N.B.
Variant 06 is the preferred termination finish for the specified chip size (see Figure 2).

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:-

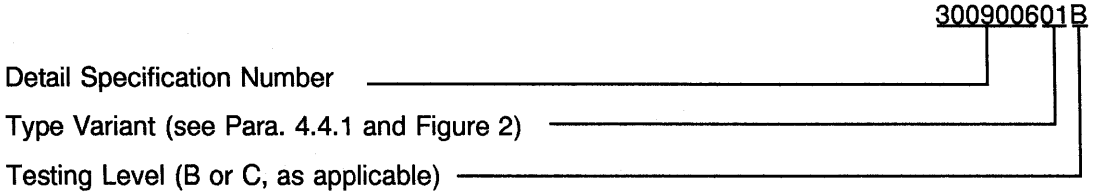
(a) The ESCC Component Number.

(b) Characteristics and Ratings.

(c) Traceability Information.

4.5.2 The ESCC Component Number

Each component shall bear the ESCC Component Number which shall be constituted and marked as follows:



4.5.3 Electrical Characteristics and Ratings

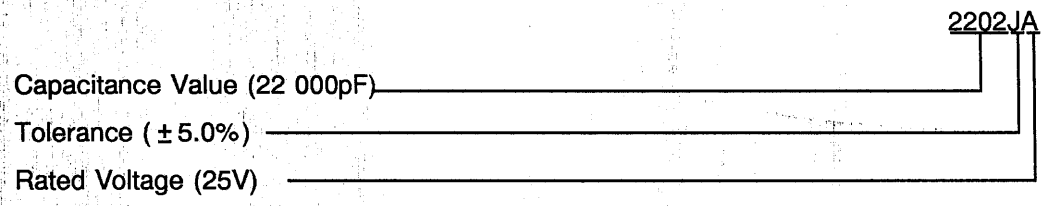
The electrical characteristics and ratings to be marked in the following order of precedence are:-

(a) Capacitance Value.

(b) Tolerance.

(c) Rated Voltage.

The information shall be constituted and marked as follows:-



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
XXX	XXX0
$XXX10^1$	XXX1
$XXX10^2$	XXX2

4.5.3.2 Tolerances

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

TOLERANCE (%)	CODE LETTER
±1.0	F
±2.0	G
±5.0	J
±10	K

4.5.3.3 Rated Voltage

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

RATED VOLTAGE (U_R) (V)	CODE LETTER
16	X
25	A
50	C
100	E

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 $T_{amb} = +22 \pm 3$ °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 $T_{amb} = +22 \pm 3$ °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 as 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	See Table 1(a)		-
2	Tangent of Loss Angle	$T_{g\delta}$	Para. 9.4.1.2	-	15	10^{-4}
3	Insulation Resistance	R_i	Para. 9.4.1.3	100(1)	-	GΩ
4	Voltage Proof	VP	Para. 9.4.1.4	$2.5U_R$	-	Vdc

NOTES

1. For C equal to, or less than 10 000pF.

   For C greater than 10 000pF, $R_i \times C = 1\,000$ seconds minimum.

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	Para. 9.4.1.3	10 000	-	MΩ	Notes 1, 2 and 4
5(i)	Temperature Coefficient	TC	Para. 9.11 Between −55 and +20 ± 2°C Between +20 ± 2 and +125°C	−30 −30	+30 +30	10^{-6}/°C	5 parts for each capacitance value. Notes 2 and 5
5(ii)	Temperature Coefficient	TC	Para. 9.11 Between +20 ± 2 and +125°C	−30	+30	10^{-6}/°C	5 parts for each dielectric lot. Notes 3 and 5

NOTES

1. Single sample; Inspection Level S3; AQL = 2.5%.
2. Applicable to Level 'B' only.
3. Applicable to Level 'C' only.
4. For C equal to, or less than 10 000pF.

   For C greater than 10 000pF, $R_i \times C = 100$ seconds minimum.
5. If 1 failure out of 5 parts, then test 100%.

   1.0% rejects maximum allowed in case of 100% testing.

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	± 1.0	%

FIGURE 4 - TEST CIRCUITS

Not applicable.

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

No.	CHARACTERISTIC	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	T_{amb}	+ 125	°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 ENDURANCE 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 tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at $T_{amb} = +22 \pm 3°C$.

4.8.2 Measurements and Inspections at Intermediate Points during Endurance Tests

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 $T_{amb} = +22 \pm 3°C$.

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 $T_{amb} = +22 \pm 3°C$.

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

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.

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		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Mounting	Para. 9.15	**Final Examination**					
			Terminals	Good Tinning	-	-	-	-
			Final Measurements					
			Capacitance	Table 2 Item 1	C	Record Values		pF
			Tangent of Loss Angle	Table 2 Item 2	$T_{g\delta}$	Table 2 Item 2		10^{-4}
			Insulation Resistance	Table 2 Item 3	R_i	Table 2 Item 3		GΩ
02	Adhesion	Para. 9.5	**Final Examination**					
			Visual Examination	Damage or loosening	-	-	-	-
			Capacitance	Table 2 Item 1	C	Table 2 Item 1		pF
03	Solderability	Para. 9.6	**Final Examination**					
			Visual Examination	Para. 9.6	-	-	-	-
04	Rapid Change of Temperature	Para. 9.7	**Initial Measurements**					
			Capacitance	Table 2 Item 1	C	Item 01 Value		pF
			Final Measurements	Recovery period 24 ± 2 hours				
			Visual Examination	No damage	-	-	-	-
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	−1.0	+1.0	%
			Tangent of Loss Angle	Table 2 Item 2	$T_{g\delta}$	-	(2)	10^{-4}
05	Climatic Test Sequence	Para. 9.8	**Initial Measurements**					
			Capacitance	Table 2 Item 1	C	Item 01 Value		pF
			Final Measurements	Recovery Period 1 -24 hrs				
			Visual Inspection	Para. 9.8.7	-	-	-	-
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	−2.0	+2.0	%
			Tangent of Loss Angle	Table 2 Item 2	$T_{g\delta}$	-	(2)	10^{-4}
			Insulation Resistance	Table 2 Item 3	R_i	10 (3)	-	GΩ
06	Damp Heat Steady State	Para. 9.9	**Initial Measurements**					
			Capacitance	Table 2 Item 1	C	Item 01 Value		pF
			Final Measurements	Recovery Period 6 - 24 hrs				
			Visual Examination	No damage	-	-	-	-
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	−2.0	+2.0	%
			Tangent of Loss Angle	Table 2 Item 2	$T_{g\delta}$	-	(2)	10^{-4}
			Insulation Resistance	Table 2 Item 3	R_i	10 (3)	-	GΩ

NOTES

1. The tests in this table refer to either Chart IV or V and shall be used as applicable.
2. Twice the values specified in Table 2 of this specification.
3. For C ≤ 10 000pF;
   For C > 10 000pF, $R_i \times C = 100$ seconds minimum.

TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONT'D)

NO.	ESCC GENERIC SPECIFICATION NO. 3009		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD 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 1 hour min				
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	−3.0	+3.0	%
			Insulation Resistance	Table 2 Item 3	R_i	10 (3)	-	GΩ
			Final Measurements	Recovery period 24 ± 2 hours				
			Capacitance Change	Table 2 Item 1	$\frac{\Delta C}{C}$	−3.0	+3.0	%
			Tangent of Loss Angle	Table 2 Item 2	$T_{g\delta}$	-	(2)	10^{-4}
			Insulation Resistance	Table 2 Item 3	R_i	10 (3)	-	GΩ
			Voltage Proof	Table 2 Item 4	VP	Table 2 Item 4		V
			Visual Examination	No damage	-	-	-	-
08	Temperature Coefficient	Para. 9.11	Capacitance Changes	Table 3 Item 5(i) or 5(ii)	TC	Table 3 Item 5(i) or 5(ii)		10^{-6}/°C

NOTES

1. The tests in this table refer to either Chart IV or V and shall be used as applicable.
2. Twice the values specified in Table 2 of this specification.
3. For C ≤ 10 000pF;
   For C > 10 000pF, $R_i \times C = 100$ seconds minimum.

APPENDIX 'A'

AGREED DEVIATIONS FOR VITRAMON LTD. (UK)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.1	Microsectioning may be performed using Vitramon document QCN-020 (Issue as per P.I.D.).

APPENDIX 'B'

AGREED DEVIATIONS FOR AVX (F)

ITEMS AFFECTED	DESCRIPTION OF DEVIATIONS
Para. 4.2.3	During Chart III, Para. 9.4.3, Table 3 Temperature Coefficient may be replaced with data provided by the ceramic material supplier, using AVX/TPC documents (issue as per PID) 1A-220020BCR**AQ - 1A-220022DCR**AQ.