CAPACITORS, FIXED, MULTIPLE LAYER,

CERAMIC DIELECTRIC, TYPE I,

BASED ON TYPE SPT818

ESCC Detail Specification No. 3001/032

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space components
coordination group

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		SCCG Chairman	ESA Director General or his Deputy
Issue 2	May 1995		
Revision 'A'	November 1995		
Revision 'B'	May 1996		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 1 and incorporates all modifications defined in the following DCR's:-		
		Cover page		None
		DCN		None
		Table 1(a)	: Rated Voltage Unit corrected to read "V"	23719
			: "Lead Material and/or Finish" amended to "Lead Material and Finish"	23719
		Table 1(b)	: No. 1, Unit corrected to "V"	23719
			: No. 2, entry deleted and subsequent entries renumbered	23719
			: New No. 2, "T_{amb}" corrected to "T_{op}" in Symbol column and "T_{amb}" added in Remarks column	23719
			: New No. 4, in Characteristics, "Maximum" deleted	23719
			: Note 1, "case" changed to "device body"	23719
		Figure 2	: In Table, "(mm)" added following "DIMENSIONS"	23719
		Para. 2	: In first sentence, "for ..." corrected to "form ..."	23719
		Para. 4.1	: In second paragraph, third line, "requirements are ..." corrected to "requirements and ..."	23719
		Para. 4.2.3	: Title amended	23719
		Para. 4.3.2	: "capacitor" corrected to "capacitors"	23719
			: Weight amended to 9.0 grammes	221244
		Para. 4.4.1	: "milded" corrected to "moulded"	23719
		Para. 4.5.2	: Paragraph standardised	23719
		Para. 4.7.2	: Second paragraph deleted	23719
		Para. 4.7.3	: "Circuits" corrected to "Circuit"	23719
		Table 2	: New "Remarks" column added	23719
			: No. 1, "tgδ" corrected to "Tgδ"	23719
			: No. 3, Limit amended to 100GΩ min.	221244
			: No. 4, "- Dielectric" added to Characteristics", Symbol "V_T" corrected to "VP" and Unit changed to "V"	23719
			: No. 5, Symbol "V_{TB}" corrected to "VP_B" and reference to Note 1 moved	23719
			: Note 1 amended	23719
		Table 3	: No. 3, in Remarks, entry corrected to "Notes 1 and 2"	23719
			: No. 3, Limit amended to 10GΩ min.	221244
			: No. 6 amended to "6(i)" and "6(ii)" and, in Characteristics, "Notes 3 and 4" reference deleted	23719
			: Note 1, "level" amended to "Level"	23719
			: Note 4 amended	23719
		Table 4	: Spec. and/or Test Method and Test Conditions columns amended	23719
		Table 5	: Title amended and No. 3 deleted	23719
		Figure 5	: Title amended	23719
		Paras 4.8.1 to 4.8.3	: "... specified ..." changed to "... stated ..."	
		Table 6	: Format amended and corrected	23719
'A'	Nov. '95	P1. Cover page		None
		P2. DCN		None
		P6. Table 1(a)	: Temperature Coefficient corrected	23778

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'B'	May '96	P1. Cover page		None
		P2A. DCN	: Page added	None
		P12. Table 2	: No. 5, in Remarks, Note reference deleted	221286
			: Note 1 deleted	221286

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TABLES

FIGURES

APPENDICES (Applicable to specific Manufacturers only)

None.

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Multiple Layer, Ceramic Dielectric, Type I, based on Type SPT818. It shall be read in conjunction with ESA/SCC Generic Specification No. 3001, 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 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.

2. APPLICABLE DOCUMENTS

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

(a) ESA/SCC Generic Specification No. 3001 for Capacitors, Fixed, 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 ESA/SCC Basic Specification No. 21300 shall apply. In addition the following symbols are used:-

V_T = Test Voltage.

TABLE 1(a) - RANGE OF COMPONENTS

Capacitance Range (nF)	Capacitance Tolerance (±%)	Temperature Coefficient 10^{-6}/°C	Rated Voltage (U_R) (V)	Value Series	Lead Material and Finish
1.0 to 100	5.0	±15	63	E24	A4
1.0 to 100	10	±15	63	E12	A4

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Limits		Unit	Remarks
			Min.	Max.		
1	Rated Voltage	U_R	-	63	V	
2	Operating Temperature Range	T_{op}	−55	+125	°C	T_{amb}
3	Storage Temperature Range	T_{stg}	−55	+125	°C	
4	Soldering Temperature	T_{sol}	-	+260	°C	Note 1

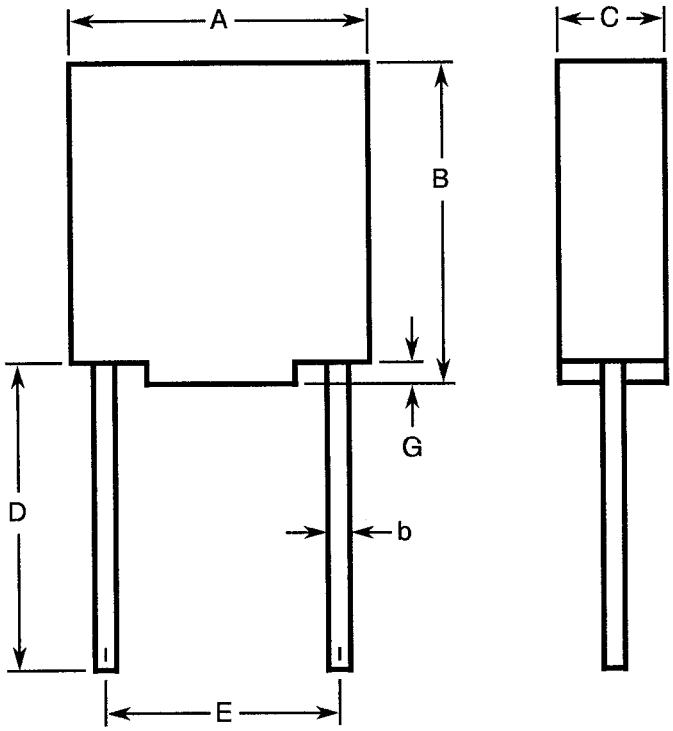
NOTES

1. Duration 5 seconds maximum at a distance of not less than 1.5mm from the device body and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION

Not applicable.

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	DIMENSIONS (mm)	
	MIN.	MAX.
A	19.5	20.5
B	18.5	19.5
C	-	6.5
D	30.0	-
E	17.3	18.3
F	0.9	1.1
G	0.2	0.6

NOTES

1. The leads are defined as "rigid".

FIGURE 3 - FUNCTIONAL DIAGRAM

4. REQUIREMENTS

4.1 GENERAL

The complete requirements for procurement of the capacitors specified herein are stated in this specification and ESA/SCC Generic Specification No. 3001 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 ESA/SCC 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)

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 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. 9.4 of ESA/SCC Generic Specification No. 3001 and they 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 9.0 grammes.

4.3.3 Robustness of Terminations

The requirements for robustness of terminations are specified in Para. 9.7 of ESA/SCC Generic Specification No. 3001.

Only the test 'Ua' shall be performed. The test conditions shall be as follows:-

(a) **Applied Force:** 20N, tensile.

(b) **Duration:** 10s.

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 Case

The ceramic body is moulded with thermo-setting resin.

4.4.2 Lead Material and Finish

The lead material shall be Type 'A' with Type '4' finish in accordance with the requirements of ESA/SCC Basic Specification No. 23500.

4.5 MARKING

4.5.1 General

The marking of components delivered to this specification shall be in accordance with the requirements of ESA/SCC Basic Specification No. 21700 and the following paragraphs. When the component is too small to accommodate all of the marking specified, as much as space permits shall be marked and the marking information, in full, shall accompany the component in its primary package.

The information to be marked and the order of precedence, shall be as follows:-

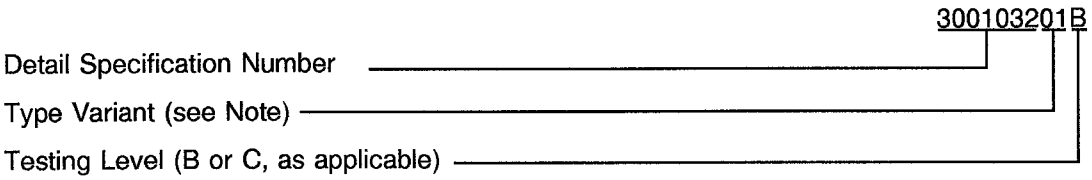
(a) The SCC Component Number.

(b) Electrical Characteristics and Ratings.

(c) Traceability Information.

4.5.2 The SCC Component Number

The SCC Component Number shall be constituted and marked as follows:-



N.B.
Marking of the Type Variant Number is mandatory. No further reference to type variants is made in this specification.

4.5.3 Electrical Characteristics and Ratings

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

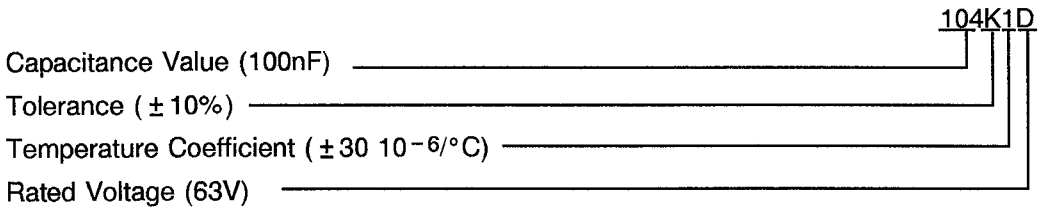
(a) Capacitance Value.

(b) Tolerance.

(c) Temperature Coefficient.

(d) 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 in picofarads.

Capacitance Value	Code
$XX10^2$	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

4.5.3.3 Temperature Coefficient

The temperature coefficient shall be indicated by the code numbers specified hereafter.

Temp. Coefficient (10^{-6}/°C)	Code Number
±30	1

4.5.3.4 Rated Voltage

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

Rated Voltage (U_R)	Code Letter
63V	D

4.5.4 Traceability Information

Traceability information shall be marked in accordance with the requirements of ESA/SCC Basic Specification No. 21700.

(a) Manufacturing Date Code.

(b) Serial Number.

(c) 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, 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 ESA/SCC Generic Specification No. 3001.

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 parameters scheduled 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 ESA/SCC Generic Specification No. 3001. The conditions for burn-in shall be as specified in Table 5 of this specification.

4.7.3 Electrical Circuit for Burn-in (Figure 5)

Not applicable.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	Characteristics	Symbol	ESA/SCC 3001 Test Conditions	Limits		Unit	Remarks
				Min	Max		
1	Capacitance	C	Para. 9.5.1.1	See Table 1(a)		nF	
2	Tangent of Loss Angle	Tgδ	Para. 9.5.1.2	-	15	10^{-4}	
3	Insulation Resistance	Ri	Para. 9.5.1.3	100	-	GΩ	
4	Voltage Proof Dielectric	VP	Para. 9.5.1.4	160	-	V	
5	Voltage Proof Body Insulation	VP_B	Para. 9.5.1.4	1300	-	V	

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	ESA/SCC 3001 Test Conditions	Limits		Unit	Remarks
				Min	Max		
3	Insulation Resistance at T_{amb} = +125 ± 3 °C	Ri	Para. 9.5.1.3	10	-	GΩ	Notes 1 and 2
6(i)	Temperature Coefficient	TC	Para. 9.16 Between −55 and +20 ± 2 °C Between +20 ± 2 and +125 ± 2 °C	 −30 −30	 +30 +30	10^{-6}/°C	5 parts for each capacitance value Notes 2 and 4
6(ii)	Temperature Coefficient	TC	Para. 9.16 Between +20 ± 2 and +125 ± 2 °C	−30	+30	10^{-6}/°C	5 parts for each fired ceramic lot Notes 3 and 4

NOTES

1. Single sample. Inspection Level 2, AQL 1%.
2. Applicable to Level 'B' only.
3. Applicable to Level 'C' only.
4. If 1 failure occurs out of 5 parts, then test 100%. 1% reject maximum allowed in the case of 100% testing.

FIGURE 4 - CIRCUITS FOR ELECTRICAL MEASUREMENTS

Not applicable.

TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions	Change Limits (Δ)	Unit
1	Capacitance Change	$\frac{\Delta C}{C}$	As per Table 2	As per Table 2	±1.0	%

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

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+125(+0−5)	°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 ESA/SCC GENERIC SPECIFICATION NO. 3001)

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 testing 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 Tests (Part of Endurance Testing)

The requirements for operating life testing are specified in Section 9 of ESA/SCC Generic Specification No. 3001. 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 Tests (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.	ESA/SCC GENERIC SPEC. NO. 3001		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Robustness of Terminations	Para. 9.7 and Para. 4.3.3 of this specification	Visual Examination	-	-	-	-	-
02	Resistance to Soldering Heat	Para. 9.8	**Initial Measurements** Capacitance	Table 2 Item 1	C	Table 2 Item 1		nF
			Final Measurements	After a recovery period of 24 ± 2 hrs				
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
			Insulation Resistance	Table 2 Item 3	Ri	Table 2 Item 3		GΩ
03	Solderability	Para. 9.9	Visual Examination	-	-	-	-	-
04	Rapid Change of Temperature	Para. 9.10	**Initial Measurements** Capacitance	Table 2 Item 1	C	Table 2 Item 1		nF
			Final Measurements	After a recovery period of 24 ± 2 hrs				
			Visual Examination	-	-	-	-	-
			Capacitance Change	Table 2 Item 1	ΔC/C	−5.0	+5.0	%
			Tangent of Loss Angle	Table 2 Item 2	Tgδ	-	30	10^{-4}
05	Vibration	Para. 9.11	**During Last Cycle** Intermittent Contact	Para. 9.11.3 Open or Shorts	-	-	-	-
			After Test Visual Examination	-	-	-	-	-
06	Shock or Bump	Para. 9.12	Visual Examination	-	-	-	-	-
07	Climatic Sequence	Para. 9.13	**Initial Measurements** Capacitance	Table 2 Item 1	C	Table 2 Item 1		nF
			Final Measurements	After a recovery period of 1 to 24 hrs				
			External Visual Inspection	Para. 9.3 of ESA/SCC 3001	-	-	-	-
			Capacitance Change	Table 2 Item 1	ΔC/C	−2.0	+2.0	%
			Tangent of Loss Angle	Table 2 Item 2	Tgδ	-	30	10^{-4}
			Insulation Resistance	Table 2 Item 3	Ri	(2)	-	GΩ
			Voltage Proof - Body Insulation	Table 2 Item 5	VP_B	1300	-	V

NOTES

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. One third of the values specified in Table 2 of this specification.

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

NO.	ESA/SCC GENERIC SPEC. NO. 3001		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
08	Damp Heat, Steady State	Para. 9.14	**Initial Measurements**					
			Capacitance	Table 2 Item 1	C	Table 2 Item 1		nF
			Final Measurements	After a recovery period of 6 to 24 hrs				
			Visual Examination	-	-	-	-	-
			Capacitance Change	Table 2 Item 1	ΔC/C	−2.0	+2.0	%
			Tangent of Loss Angle	Table 2 Item 2	Tgδ	-	30	10^{-4}
			Insulation Resistance	Table 2 Item 3	Ri	(2)	-	GΩ
			Voltage Proof - Body Insulation	Table 2 Item 5	VP_B	1300	-	V
09	Operating Life	Para. 9.15 Change limits relate to initial (0- hour) measurements	**Initial Measurements**					
			Capacitance	Table 2 Item 1	C	Table 2 Item 1		nF
			Intermediate Measurements	After a recovery period of 1 hr min.				
			Capacitance Change	Table 2 Item 1	ΔC/C	−3.0	+3.0	%
			Insulation Resistance	Table 2 Item 3	Ri	Table 2 Item 3		GΩ
			Final Measurements	After a recovery period of 24 ± 2 hrs				
			Capacitance Change	Table 2 Item 1	ΔC/C	−3.0	+3.0	%
			Tangent of Loss Angle	Table 2 Item 2	Tgδ	-	30	10^{-4}
			Insulation Resistance	Table 2 Item 3	Ri	Table 2 Item 3		GΩ
			Voltage Proof Dielectric	Table 2 Item 4	VP	160	-	V
			Voltage Proof - Body Insulation	Table 2 Item 5	VP_B	1300	-	V
10	Temperature Coefficient	Para. 9.16	Temperature Coefficient	Table 3 Item 6(i) or 6(ii)	TC	−30	+30	10^{-6}/°C

NOTES: See Page 15.