european space agency
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Pages 1 to 25

CAPACITORS, FIXED, METALLIZED

PLASTIC FILM DIELECTRIC

BASED ON TYPES CRH 01 THROUGH CRH 05

ESA/SCC Detail Specification No. 3006/001

space components
coordination group

Issue/Rev.	Date	Approved by	
		SCCG Chairman	ESA Director General or his Deputy
Issue 3	November 1982	-	-
Revision 'A'	June 1984	-	-
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Revision 'C'	August 1989	-	-
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Revision 'E'	June 1993	-	-
Revision 'F'	October 1994		

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		This Issue supersedes Issue 2 and incorporates all modifications agreed on the basis of the following DCR's:-		
		P1. Cover Page	: In Title, Capacitor Range extended - CRH01 added	22198
		P3. T of C	: Modification of page numbers	None
		P4. T of C	: Modification of page numbers	None
		P5. Para. 1.1	: Capacitor Range extended	22198
		P6. Table 1(a)	: V_{rms} modified, Length L modified, Length G added, Mean Weight added. Range of variants extended	22198
		P12. Figure 2	: Modified	22198
		P14. Para. 4.1	: Amended	21019
		P15. Para. 4.3.3	: Type Variant Numbers modified	22198
		P16. Para. 4.4.2	: Modified	22198
		P17. Para. 4.5.3	: Marking information modified	22198
		Para. 4.5.3.1	: Code modified	22198
		P18. Para. 4.5.3.3	: Rated Voltage Table modified	22198
		P20. Table 2	: Limit changes	22198
		Table 3	: Note (1) modified	22198
		P22. Table 4	: Limit changes, Note (1) added	22198
		Table 5	: Condition change	22198
'A'	Jun. '84	P1. Cover page		None
		P2. DCN		None
		P7. Table 1(a)	: Item No. 52, length 'G' max. changed to 25.73	23146
			: Item No. 49, length 'L' max. changed to 13.51	None
'B'	Jan. '88	P1. Cover page		None
		P2. DCN		None
		P12. Figure 2	: Existing Note numbered 1	22571
			: Notes 2 and 3 added	22571

DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'C'	Aug. '89	P1. Cover page		None
		P2A. DCN	: Page added	None
		P20. Table 2	: Test 3, change Min. Limit to 50	22697
		Table 3	: Test 1, change Min. Limit to 0.5	22697
			: Notes 1 and 2 changed	22697
		P25. Table 6	: Addition of Para. 9.15	22734
'D'	Jan. '93	P1. Cover page		None
		P2A. DCN		None
		P9. Table 1(a)	: In Notes, last two lines, wire diameters changed	22817
		P20. Table 2	: No. 1, U_R min. reduced	22817
			: No. 2, minimum Limit amended	22817
			: No. 4, insulation resistance min. amended	22817
		P24. Table 6	: Negative loss tangents deleted	22817
		P25. Table 6	: Negative loss tangents deleted	22817
'E'	Jun. '93	P1. Cover page		None
		P2A. DCN		None
		P17. Para. 4.5.3	: Numerical value corrected (µF)	23587
'F'	Oct. '94	P1. Cover page		None
		P2A. DCN		None
		P20. Table 2	: Reference to Notes made clearer, i.e. entry amended to "(Note ....)"	None
			: No. 3, in Characteristics, "(Between Terminals)" added	221103
			: No. 5, in Characteristics, word "Capacitance" corrected and "Note 5" added to Unit	221103
		Table 3	: Reference to Notes made clearer, i.e. entry amended to "(Note ....)"	None
			: No. 2, replaced by "Capacitance Change at $-55 \pm 3°C$"	221103
			: No. 3, added "Capacitance Change at $+125 \pm 3°C$"	221103
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.		

TABLE OF CONTENTS

1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Metallised Plastic Film Dielectric, based on Types CRH01 to CHR05.

It shall be read in conjunction with ESA/SCC Generic Specification No. 3006, the requirements of which are supplemented herein.

1.2 RANGE OF COMPONENTS

The range of capacitors covered by this specification is scheduled 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

Rated voltage versus temperature derating is shown in Figure 1.

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

Item No.	Capacitance Range (µF)	Rated Voltage		Dimensions (mm)					Mean Weight (g)
				Length (L)		Length (G)	Diameter (D)		
		(Vdc)	(Vrms)	Min.	Max.	Max.	Min.	Max.	
01	0.001 to 0.0068	50	36.0	11.94	13.46	17.78	4.32	4.83	1.0
02	0.0082 to 0.015	50	36.0	13.51	15.03	19.35	4.32	4.83	1.2
03	0.018 to 0.033	50	36.0	13.51	15.03	19.35	4.90	5.41	1.3
04	0.039 to 0.05	50	36.0	16.69	18.21	19.35	4.32	4.83	1.3
05	0.0056 to 0.068	50	36.0	16.69	18.21	22.53	4.90	5.41	1.3
06	0.082 and 0.1	50	36.0	19.89	21.41	22.53	4.90	5.41	1.4
07	0.12 and 0.15	50	36.0	16.69	18.21	25.73	5.97	6.48	1.6
08	0.18 to 0.22	50	36.0	19.89	21.41	25.73	5.97	6.48	1.8
09	0.27 and 0.33	50	36.0	16.69	18.21	22.53	7.92	8.43	2.5
10	0.39 to 0.50	50	36.0	19.89	21.41	25.73	7.92	8.43	2.7
11	0.56 and 0.68	50	36.0	19.89	21.41	25.73	10.16	10.67	4.0
12	0.82 to 1.8	50	36.0	26.24	27.76	32.08	10.16	10.67	4.0
13	2.0 and 2.2	50	36.0	27.82	29.34	33.66	12.70	13.21	8.0
14	2.7 to 3.3	50	36.0	34.17	35.69	40.01	12.70	13.21	9.0
15	3.9	50	36.0	34.17	35.69	40.01	14.27	14.78	13.0
16	4.7	50	31.0	34.17	35.69	40.01	17.02	17.53	18.0
17	5.0	50	29.0	34.17	35.69	40.01	17.02	17.53	18.0
18	5.6	50	26.0	34.17	35.69	40.01	17.02	17.53	18.0
19	6.8	50	21.2	46.87	48.39	40.01	17.02	17.53	21.5
20	8.0	50	18.0	46.87	48.39	52.71	17.02	17.53	21.5
21	8.2	50	17.6	46.87	48.39	52.71	17.02	17.53	21.5
22	10.0	50	14.4	46.87	48.39	52.71	17.02	17.53	21.5
23	0.001 to 0.0056	100	60.0	11.94	13.46	17.78	4.32	4.83	1.0
24	0.0068 and 0.0082	100	60.0	13.51	15.03	19.35	4.32	4.83	1.2
25	0.01 to 0.015	100	60.0	16.69	18.21	22.53	4.32	4.83	1.3
26	0.018 to 0.033	100	60.0	16.69	18.21	22.53	4.90	5.41	1.3
27	0.039 to 0.056	100	60.0	16.69	18.21	22.53	5.97	6.48	1.6
28	0.068	100	60.0	19.89	21.41	25.73	5.97	6.48	1.8
29	0.082 to 0.12	100	60.0	16.69	18.21	22.53	5.97	6.48	2.5

TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

Item No.	Capacitance Range (µF)	Rated Voltage		Dimensions (mm)					Mean Weight (g)
				Length (L)		Length (G)	Diameter (D)		
		(Vdc)	(Vrms)	Min.	Max.	Max.	Min.	Max.	
30	0.15 to 0.22	100	60.0	19.89	21.41	25.73	7.92	8.43	2.7
31	0.27 and 0.33	100	60.0	26.24	27.76	32.08	7.92	8.43	3.0
32	0.39 to 0.56	100	60.0	26.24	27.76	32.08	10.16	10.67	4.0
33	0.68 and 0.82	100	60.0	27.82	29.34	33.66	12.70	13.21	8.0
34	1.00 and 1.20	100	60.0	27.82	29.34	33.66	14.72	15.23	11.5
35	1.50	100	60.0	34.17	35.69	40.01	14.72	15.23	13.0
36	2.0 and 2.2	100	60.0	34.17	35.69	40.01	17.02	17.53	18.0
37	2.7 and 3.0	100	60.0	46.87	48.39	52.71	17.02	17.53	21.5
38	3.3	100	55.0	46.87	48.39	52.71	17.02	17.53	21.5
39	3.9	100	49.0	46.87	48.39	52.71	19.05	19.56	28.0
40	4.7	100	43.0	46.87	48.39	52.71	19.05	19.56	28.0
41	5.0	100	40.0	46.87	48.39	52.71	19.05	19.56	28.0
42	5.6	100	36.0	46.87	48.39	52.71	19.05	19.56	28.0
43	6.8	100	29.0	59.57	61.09	65.41	25.40	25.91	56.0
44	8.0	100	25.0	59.57	61.09	65.41	25.40	25.91	56.0
45	8.2	100	24.0	59.57	61.09	65.41	25.40	25.91	56.0
46	10.0	100	20.0	59.57	61.09	65.41	25.40	25.91	56.0
47	0.001 to 0.0068	200	120.0	13.51	15.03	19.35	4.32	4.83	1.2
48	0.0082 to 0.012	200	120.0	13.51	15.03	19.35	4.90	5.41	1.3
49	0.015	200	120.0	13.51	15.03	19.35	5.97	6.48	1.4
50	0.018 to 0.022	200	120.0	16.69	18.21	22.53	5.97	6.48	1.6
51	0.027 to 0.050	200	120.0	16.69	18.21	22.53	7.92	8.43	2.5
52	0.056 to 0.12	200	120.0	19.89	21.41	25.73	7.92	8.43	2.7
53	0.15	200	120.0	26.24	27.76	32.08	10.16	10.67	4.0
54	0.18 to 0.22	200	120.0	34.17	35.69	40.01	10.16	10.67	6.0
55	0.27 to 0.56	200	120.0	34.17	35.69	40.01	12.70	13.21	9.0
56	0.68	200	120.0	34.17	35.69	40.01	14.27	14.78	13.0
57	0.82 to 1.2	200	120.0	46.87	48.39	52.71	14.27	14.78	17.2
58	1.5	200	120.0	46.87	48.39	52.71	17.02	17.53	21.5

TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

Item No.	Capacitance Range (µF)	Rated Voltage		Dimensions (mm)					Mean Weight (g)
				Length (L)		Length (G)	Diameter (D)		
		(Vdc)	(Vrms)	Min.	Max.	Max.	Min.	Max.	
59	1.8	200	110.0	46.87	48.39	52.71	19.05	19.56	28.0
60	2.0	200	100.0	46.87	48.39	52.71	19.05	19.56	28.0
61	2.2	200	90.5	46.87	48.39	52.71	19.05	19.56	28.0
62	2.5	200	80.0	46.87	48.39	52.71	19.05	19.56	28.0
63	2.7	200	77.0	46.87	48.39	52.71	19.05	19.56	28.0
64	3.0	200	70.0	46.87	48.39	52.71	25.40	25.91	45.5
65	3.3	200	65.0	46.87	48.39	52.71	25.40	25.91	45.5
66	3.9	200	55.0	59.56	61.09	65.41	25.40	25.91	56.0
67	0.001 to 0.0022	400	240.0	13.51	15.03	19.35	4.90	5.41	1.3
68	0.0027 to 0.0056	400	240.0	13.51	15.03	19.35	5.97	6.48	1.4
69	0.0068 to 0.012	400	240.0	16.69	18.21	22.53	5.97	6.48	1.6
70	0.015	400	240.0	19.89	21.41	25.73	5.97	6.48	1.8
71	0.018 to 0.039	400	240.0	19.89	21.41	25.73	7.92	8.43	2.7
72	0.047 to 0.068	400	240.0	19.89	21.41	25.73	10.16	10.67	4.0
73	0.082 to 0.12	400	240.0	26.24	27.76	32.08	10.16	10.67	4.0
74	0.15	400	240.0	34.17	35.69	40.01	10.16	10.67	6.0
75	0.18 to 0.22	400	240.0	34.17	35.69	40.01	12.70	13.21	9.0
76	0.27 and 0.33	400	240.0	34.17	35.69	40.01	14.27	14.78	13.0
77	0.39 to 0.56	400	240.0	46.87	48.39	52.71	14.27	14.78	17.2
78	0.68	400	240.0	46.87	48.39	52.71	19.05	19.56	28.0
79	0.82	400	234.0	46.37	48.39	52.71	19.05	19.56	28.0
80	1.0	400	208.0	46.87	48.39	52.71	19.05	19.56	28.0
81	1.2	400	183.0	46.87	48.39	52.71	25.40	25.91	45.5
82	1.5	400	160.0	59.57	61.09	65.41	25.40	25.91	56.0
83	1.8	400	150.0	59.57	61.09	65.41	25.40	25.91	56.0
84	2.0	400	140.0	59.57	61.09	65.41	25.40	25.91	56.0

TABLE 1(a) - RANGE OF COMPONENTS (CONTINUED)

Item No.	Capacitance Range (µF)	Rated Voltage		Dimensions (mm)					Mean Weight (g)
				Length (L)		Length (G)	Diameter (D)		
		(Vdc)	(Vrms)	Min.	Max.	Max.	Min.	Max.	
85	0.001 to 0.022	30	22.0	11.94	13.46	17.78	4.32	4.83	1.0
86	0.027 to 0.056	30	22.0	13.51	15.03	19.35	4.32	4.83	1.2
87	0.068 and 0.082	30	22.0	16.69	18.21	22.53	4.32	4.83	1.3
88	0.1 and 0.12	30	22.0	16.69	18.21	22.53	4.90	5.41	1.3
89	0.15	30	22.0	13.51	15.03	19.35	5.97	6.48	1.4
90	0.18 to 0.39	30	22.0	16.69	18.21	22.53	5.97	6.48	1.6
91	0.47 to 0.68	30	22.0	16.69	18.21	22.53	7.92	8.43	2.5
92	0.82 to 1.2	30	22.0	19.89	21.41	25.73	7.92	8.43	2.7
93	1.5 to 2.2	30	22.0	19.89	21.41	25.73	10.16	10.67	4.0
94	2.7 to 3.3	30	22.0	26.24	27.76	32.08	10.16	10.67	4.0
95	3.9	30	22.0	34.17	35.69	40.01	10.16	10.67	6.0
96	4.7	30	18.7	34.17	35.69	40.01	12.70	13.21	9.0
97	5.0	30	17.6	34.17	35.69	40.01	12.70	13.21	9.0
98	5.6	30	15.6	34.17	35.69	40.01	12.70	13.21	9.0
99	6.8	30	13.0	34.17	35.69	40.01	14.27	14.78	13.0
100	8.0	30	11.0	34.17	35.69	40.01	14.27	14.78	13.0
101	8.2	30	10.7	34.17	35.69	40.01	14.27	14.78	13.0
102	10.0	30	8.8	34.17	35.69	40.01	14.27	14.78	13.0
103	12.0	30	7.3	46.87	48.39	52.71	14.27	14.78	17.2
104	15.0	30	5.9	46.87	48.39	52.71	14.27	14.78	17.2
105	20.0	30	4.4	46.87	48.39	52.71	17.02	17.53	21.5
106	22.0	30	4.0	46.87	48.39	52.71	17.02	17.53	21.5

NOTES

1. Wire diameters (∅) shall be as follows:
   - For D < 7.92mm: 0.54mm (min.) and 0.66mm (max.).
   - For 7.92mm ≤ D < 14.27mm: 0.72mm (min.) and 0.88mm (max.).
   - For D ≥ 14.27mm: 0.90mm (min.) and 1.10mm (max.).

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Item No.	Symbol	Maximum Ratings	Unit	Remarks
1	Rated Voltage d.c.	All	U_R	See Table 1(a)	Vdc	
2	Rated Voltage a.c.	All	U_A	See Table 1(a)	Vrms	Note 1
3	Operating Temperature Range	All	T_{amb}	−55 to +125	°C	
4	Storage Temperature Range	All	T_{stg}	−55 to +125	°C	
5	Maximum Soldering Temperature	All	T_{sol}	260	°C	Note 2

NOTES

1. All frequencies to 4.0kHz without derating.
2. Soldering time: $T_{sol} \leq 5.0$ seconds at 6.0mm from the body.

FIGURE 1 - PARAMETER DERATING INFORMATION

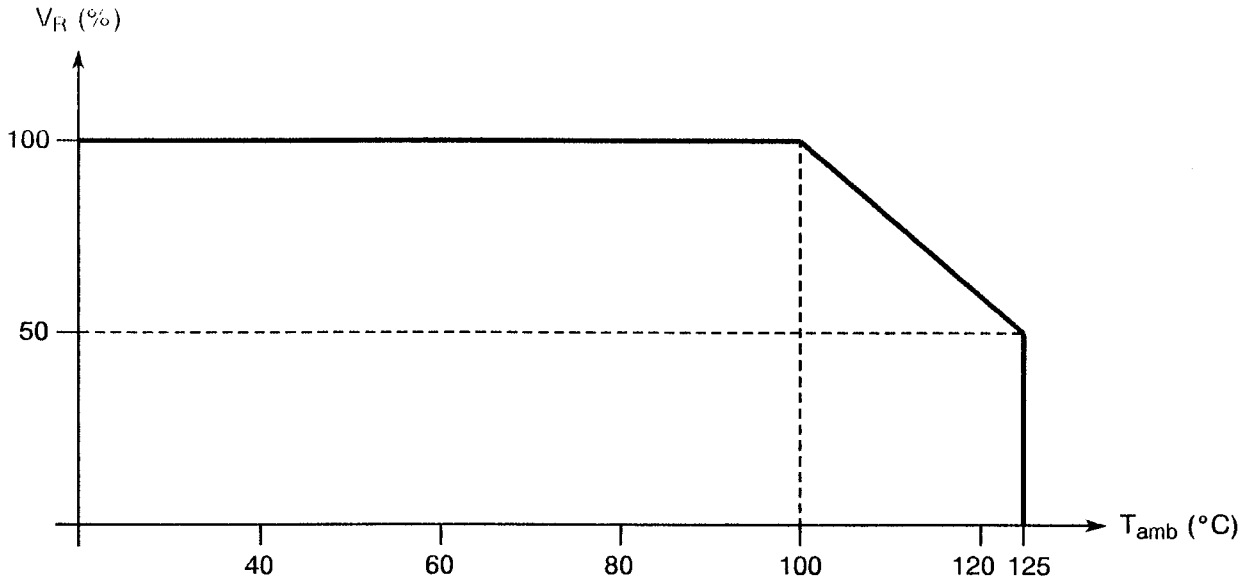
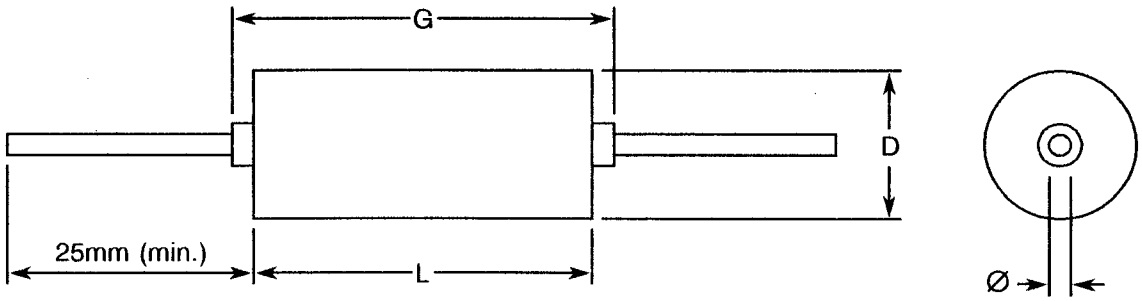


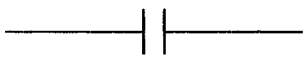
FIGURE 2 - PHYSICAL DIMENSIONS



NOTES

1. See Table 1(a) for Dimensions.
2. L and D are bare case Dimensions.
3. Insulating sleeve thickness shall not exceed 0.13mm.

FIGURE 3 - FUNCTIONAL DIAGRAM



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. 3006 for Capacitors, Fixed, Metallised Plastic Dielectric, Hermetically Sealed in Metal Cases.

(b) MIL-STD-1276, Leads, Weldable for Electronic Component Parts.

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.

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. 3006 for Capacitors, Fixed, Metallised Plastic Dielectric, Hermetically Sealed in Metal Cases. 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 checked. They shall conform to those shown in Figure 2 and Table 1(a).

4.3.2 Weight

The maximum weight of the capacitors specified herein shall be 1.2 times the mean weight specified in Table 1(a).

4.3.3 Robustness of Terminations

The requirements for robustness of terminations are specified in Section 9 of ESA/SCC Generic Specification No. 3006. The test conditions shall be as follows:-

(a) For Item Nos. 01 to 08, 23 to 28, 47 to 50, 67 to 70 and 85 to 90 inclusive

Applied Force: 10 Newtons

(b) For All Other Item Numbers

Applied Force: 20 Newtons

The force shall be applied gradually to the terminal and then maintained for a period of 5 to 10 seconds. After this test, the capacitors shall be examined for evidence of breaking and loosening of terminals.

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 case material shall be non-magnetic metal and hermetically sealed, and covered with an insulating sleeve.

4.4.2 Leads

The capacitors with a diameter above 14.27mm shall be equipped with tinned copper leads according to Type 'C' of MIL-STD-1276. Those having a diameter less than 14.27mm shall be equipped with tinned copper clad steel leads according to Type 'W' of MIL-STD-1276. The leads shall be free from non-conductive and foreign materials beyond the maximum specified "clean lead to clean lead" body dimension. At any cross-section, the maximum thickness of the sheath shall not exceed twice the minimum thickness of the sheath.

4.5 MARKING

4.5.1 General

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

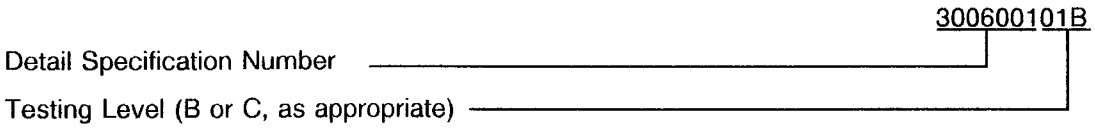
(a) The SCC Component Number.

(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:-



4.5.3 Electrical Characteristics and Ratings

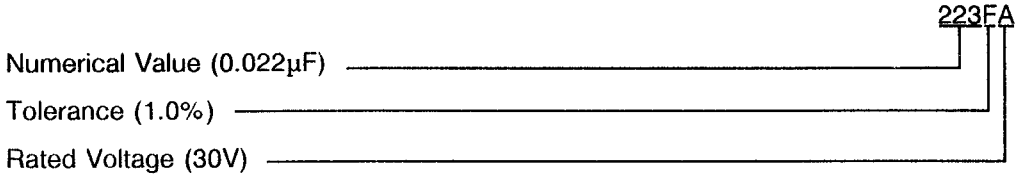
The electrical characteristics and ratings to be marked in the following order of precedence are:-

(a) Numerical Value.

(b) Tolerance.

(c) Rated Voltage.

The information shall be constituted and marked as follows:-



4.5.3.1 Numerical Values

Numerical values shall be coded as follows. The unit quantity for marking shall be picofarads.

Numerical Value	Code
X.X	XCX
XX	XX0
$XX10^1$	XX1
$XX10^2$	XX2
$XX10^3$	XX3
$XX10^4$	XX4
$XX10^5$	XX5
$XX10^6$	XX6
$XX10^7$	XX7

4.5.3.2 Tolerance

The tolerance on numerical values shall be indicated by the letter code specified hereafter.

Tolerance (%)	Code Letter
±1.0	F
±2.0	G

4.5.3.3 Rated Voltage

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

Rated Voltage (V)	Code Letter
30	A
50	C
100	E
200	G
400	K

4.5.4 Traceability Information

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

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. 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. The AQL shall be 2.5% for each capacitance value. Each capacitance value shall be considered as constituting a complete lot. For qualification or lot acceptance testing, the sample size shall be as specified in ESA/SCC Generic Specification No. 3006.

4.6.3 Circuits for Electrical Measurements

The circuit for use in performing the electrical measurements listed in Tables 2 and 3 of this specification is shown in Figure 4.

4.7 SELECTIVE LEVEL TESTING

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. 3006. 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 the end-measurements.

TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

No.	Characteristics	Symbol	Specification	Test Condition	Limits		Unit
					Min.	Max.	
1	Voltage Proof (Between Terminals)	U_{proof1}	ESA/SCC 3006	Para. 9.6.1.1	$1.6U_R$	-	V
2	Voltage Proof (Terminal-to-Case)	U_{proof2}	ESA/SCC 3006	Para. 9.6.1.1 (Note 4)	$2.0U_R$	-	V
3	Insulation Resistance (Between Terminals)	$R_{i(1)}$	ESA/SCC 3006	Para. 9.6.1.4 (Note 1)	50	-	GΩ
4	Insulation Resistance (Terminal-to-Case)	$R_{i(2)}$	ESA/SCC 3006	Para. 9.6.1.4	50	-	GΩ
5	Capacitance	C	ESA/SCC 3006	Para. 9.6.1.2	C_n −1.0 −2.0	C_n +1.0 +2.0	(5)%
6	Tangent of Loss Angle	tgδ	ESA/SCC 3006	Para. 9.6.1.3 (Note 3)	-	0.15	%

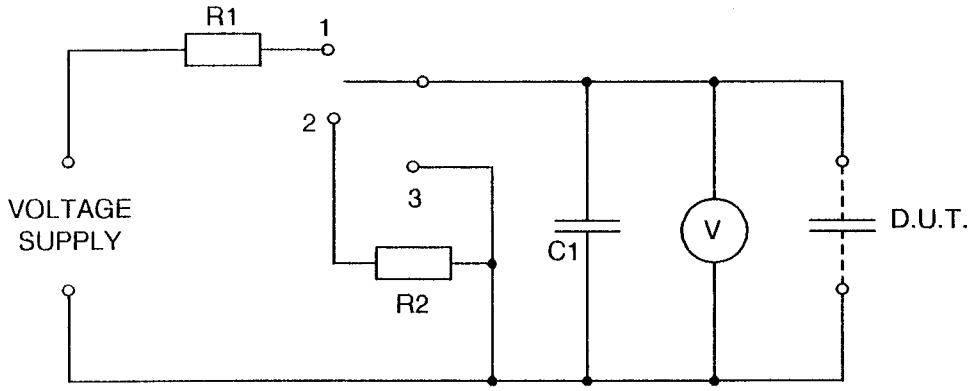
TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbol	Specification	Test Condition	Limits		Unit
					Min.	Max.	
1	Insulation Resistance at +125±3°C (Between Terminals)	$R_{i(1)}$	ESA/SCC 3006	Para. 9.6.1.4 (Note 2)	0.5	-	GΩ
2	Capacitance Change at −55±3°C	$\frac{\Delta C}{C}$	ESA/SCC 3006	Para. 9.6.1.2	−2.5	−0.5	%
3	Capacitance Change at +125±3°C	$\frac{\Delta C}{C}$	ESA/SCC 3006	Para. 9.6.1.2	−1.0	−1.2	%

NOTES

1. RC ≥ 10^4 seconds for C > 0.22µF.
2. RC ≥ 10^2 seconds for C > 0.22µF.
3. For values less than or equal to 1.0µF, measure at 1.0kHz.
   For values greater than 1.0µF, measure at 0.1kHz.
4. With a minimum of 200V.
5. Depends on tolerance code (see Para. 4.5.3.2): F = ±10% and G = ±2.0%.

FIGURE 4 - TEST CIRCUIT FOR VOLTAGE PROOF



NOTES

1. The resistance of the Voltmeter shall be not less than 10 000Ω/V. The capacitance of C shall be at least 10 times that of D.U.T.
2. The resistances of R1 and R2 shall be such that the initial charging and discharging current does not exceed 0.05A at the highest test voltage.

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	± 0.25	%
2	Tangent of Loss Angle	tgδ	As per Table 2	As per Table 2	Note 1	%

NOTES

1. For values less than or equal to 1.0μF, measure at 1.0kHz. For values greater than 1.0μF, measure at 0.1kHz. The measured value shall not exceed 0.15%.

TABLE 5 - CONDITIONS FOR BURN-IN

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+ 125	°C
2	Test Voltage	U_T	$1.4U_R$ of derated voltage	V

4.8 ENVIRONMENTAL AND ENDURANCE TESTS

4.8.1 Electrical Measurements on Completion of Environmental Tests

The parameters to be measured 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 Electrical Measurements at Intermediate Points during Endurance Tests

The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6.

4.8.3 Electrical Measurements on Completion of Endurance Tests

The parameters to be measured 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. 3006. The conditions for operating life testing shall be as specified in Table 5 of this specification.

TABLE 6 - ELECTRICAL MEASUREMENTS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING

ESA/SCC 3006 Paragraph	Characteristic	Symbol	Measurement	Condition ESA/SCC 3006 Paragraph	Limits		Unit
					Min.	Max.	
9.8	Damp Heat Steady State (Duration: 56 Days)	U_T	Voltage Proof	9.6.1.1	1.0 U_R	-	V
		$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.25	+0.25	%
		tgδ	Tangent of Loss Angle	9.6.1.3	-	+0.15	%
		$R_{i\ (1)}$	Insulation Resistance (between terminals)	9.6.1.4	50% of Table 2	-	GΩ
		$R_{i\ (2)}$	Insulation Resistance (terminal-to-case)	9.6.1.4	5.0	-	GΩ
9.9	Robustness of Terminations			External Visual Inspection			
9.10	Resistance to Soldering Heat	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.25	+0.25	%
9.11	Solderability		External Visual Inspection	Solder Globule Method			
9.3	Rapid Change in Temperature	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.5	+0.5	%
		tgδ	Tangent of Loss Angle	9.6.1.3	-	10	10^{-4}
9.12	Vibration			External Visual Inspection			
9.13.1	Bump	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.5	+0.5	%
9.13.2	Shock	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.5	+0.5	%
9.14	Climatic Sequence	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−0.25	+0.25	%
		tgδ	Tangent of Loss Angle	9.6.1.3	-	+0.15	
		$R_{i\ (1)}$	Insulation Resistance (between terminals)	9.6.1.4	50% of Table 2	-	GΩ
		$R_{i\ (2)}$	Insulation Resistance (terminal-to-case)	9.6.1.4	5.0	-	GΩ

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

ESA/SCC 3006 Paragraph	Characteristic	Symbol	Measurement	Condition ESA/SCC 3006 Paragraph	Limits		Unit
					Min.	Max.	
9.15	High and Low Temperature Stability	$\frac{\Delta C}{C}$	Capacitance Change	9.15	−2.0	+2.0	%
9.16	Operating Life	$\frac{\Delta C}{C}$	Capacitance Change	9.6.1.2	−2.0	+2.0	%
		tgδ	Tangent of Loss Angle	9.6.1.3	-	+0.25	%
		$R_{i\ (1)}$	Insulation Resistance (between terminals)	9.6.1.4	33.3% of Table 2 Values	-	GΩ
		$R_{i\ (2)}$	Insulation Resistance (terminal-to-case)	9.6.1.4	5.0	-	GΩ