CAPACITORS, FIXED, METALLISED PLASTIC FILM, DIELECTRIC, HIGH VOLTAGE, BASED ON TYPE IEXXX

ESCC Detail Specification No. 3006/008

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Date: 25-11-80

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DOCUMENTATION CHANGE NOTICE

Rev. Letter	Rev. Date	CHANGE Reference / Item	Approved DCR No.
		This Issue incorporates all modifications agreed on the basis of Policy DCR 21016 for adaptation to new qualification requirements as well as those agreed on the basis of Policy DCR 21019.	
		This document has been transferred from hardcopy to electronic format. The content is unchanged but minor differences in presentation exist.	

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1. GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Fixed, Metallised Plastic Self-healing Dielectric, High Voltage, based on Type IEXXX.

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) - TYPE VARIANTS

(1) Dash No.	(2) Nominal Cap. Value (pF)	(3) Minimum Cap. Value (pF)	(4) Maximum Cap. Value (pF)	(5) Rated Voltage d.c. (kV)	(6) Rated Voltage a.c. (Vrms) (Note 1)	(7) Package Style (Note 2)
-01	10.00	8.00	12.00	20	2.75	A
-02	15 000	12 000	18 000	20	2.75	B
-03	100 000	80 000	120 000	5.6	1.00	C

NOTES

1. Standard frequency 50Hz.
2. For package style, see Figure 2.

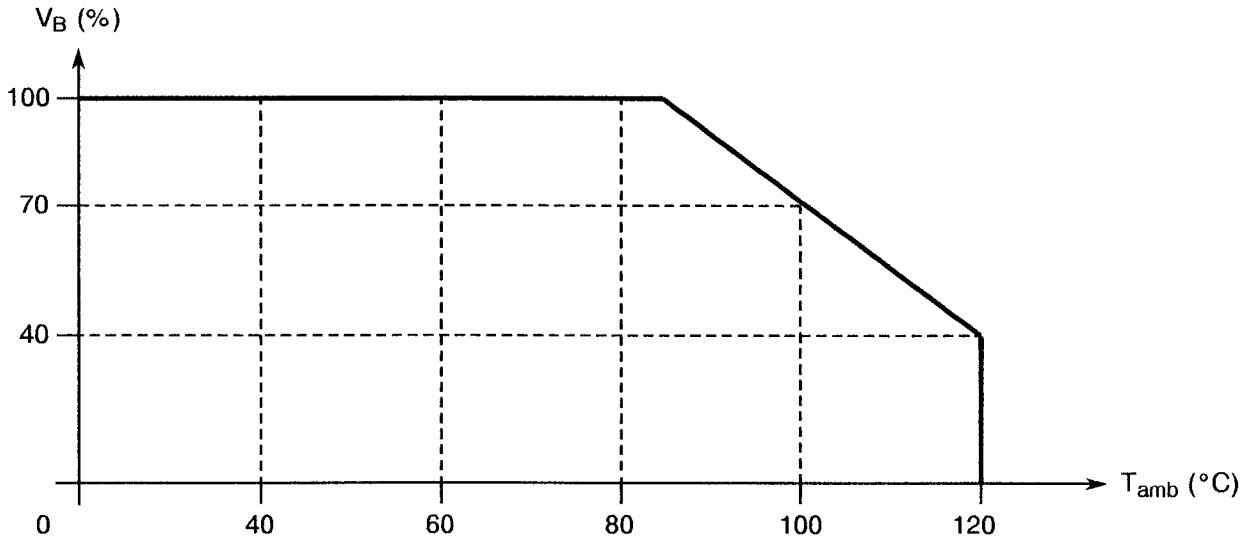
TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbol	Limit Ratings		Unit	Remarks
			Min.	Max.		
1	Rated Voltage d.c.	V_R	Note 1		V	
2	Rated Voltage a.c.	V_A	Note 2		Vrms	
3	Operating Temperature Range	T_{op}	−40	+85	°C	
4	Storage Temperature Range	T_{stg}	−40	+125	°C	Note 3
5	Max. Soldering Temp.	T_{sol}		+260	°C	Note 4

NOTES

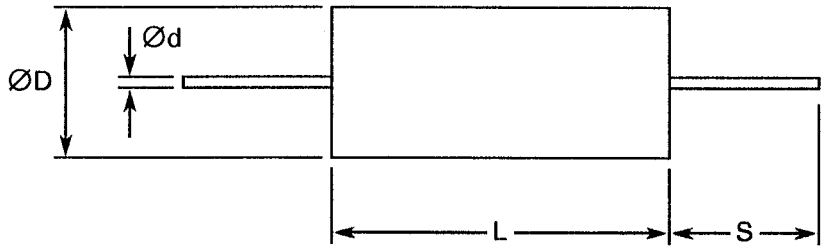
1. See Table 1, Column 5.
2. See Table 1, Column 6.
3. Maximum permitted relative humidity for storage is 55%.
4. Duration of soldering 15 seconds maximum at a distance of not less than 6.0mm from the case, and the same lead shall not be resoldered until 3 minutes have elapsed.

FIGURE 1 - PARAMETER DERATING INFORMATION



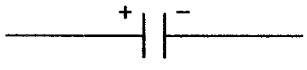
Rated Voltage versus Ambient Temperature

FIGURE 2 - PHYSICAL DIMENSIONS



SYMBOL	INCHES		MILLIMETRES		NOTES
	MIN.	MAX.	MIN.	MAX.	
Ød	-	0.04	-	1.0	
ØD	-	0.47	-	12.0	Package Style A
	-	1.34	-	34.0	Package Style B
	-	1.38	-	35.0	Package Style C
L	-	2.24	-	57.0	Package Style A
	-	4.41	-	112.0	Package Style B
	-	2.63	-	67.0	Package Style C
S	0.79	-	20.0	-	

FIGURE 3 - FUNCTIONAL DIAGRAM



NOTES

1. After burn-in, the positive terminal shall be marked with an indelible, non-outgassing red dot.

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-1276B, Leads, Weldable for Electronic Component Parts.

(c) MIL-STD-202E, Test Methods for Electronic and Electrical 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) of this specification.

4.3.2 Weight

The maximum weight of the capacitors specified herein shall be as follows:-

Package Style A: 16g.
Package Style B: 350g.
Package Style C: 250g.

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:-

Applied Force: 20 Newtons
Duration: 10 seconds.

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 an epoxy resin mould, and shall be covered with a non-fungus nutrient sleeving (cardboard shall not be used).

4.4.2 Leads

The capacitors shall be equipped with tinned copper leads according to Type 'C' of MIL-STD-1276.

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.

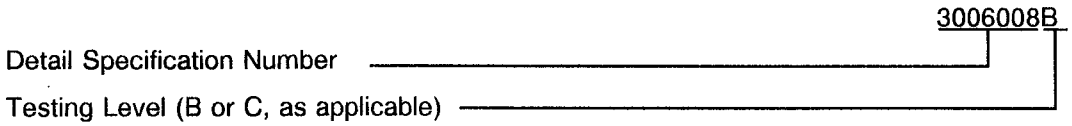
(a) The SCC Component Number.

(b) Characteristics and Ratings.

(c) Traceability Information.

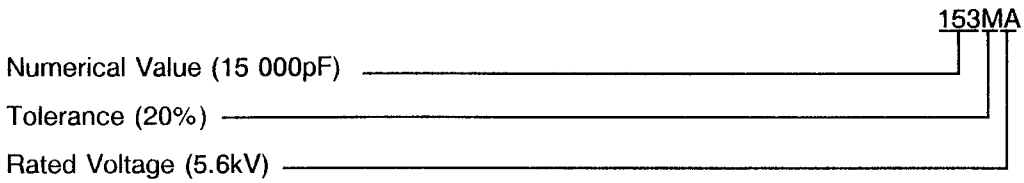
4.5.2 The SCC Component Number

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:-



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	XRX
XX	XX0
$XX10^1$	XX1
$XX10^2$	XX2
$XX10^3$	XX3
$XX10^4$	XX4

4.5.3.2 Tolerances

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

Tolerance (%)	Code Letter
± 10	K
± 20	M

4.5.3.3 Rated Voltage

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

Rated Voltage (kV)	Code Letter
5.6	A
20	B

4.5.4 Traceability Information

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

4.5.5 Polarity

Polarity shall be marked as specified in the Note to Figure 3.

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 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. 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	Test Method MIL-STD-202	Test Fig.	Test Conditions	Limits		Unit
						Min.	Max.	
1	Voltage Proof (Between Terminals)	V_{proof1}	301	4	t = 5.0 secs	1.25V_R (1)	-	kV
2	Voltage Proof (Terminal-to-Case)	V_{proof2}	301	4	t = 5.0 secs	1.25V_R (1)	-	kV
3	Insulation Resistance	R_i	302A	-	-	25	-	GΩ
4	Capacitance	C	305	-	C < 1000pF f = 1.0 ± 0.1 MHz C > 1000pF f = 1.0 ± 0.1 kHz	(2)	(3)	-
5	Dissipation Factor	tgδ	306	-	f = 1000Hz	-	100	10^{-4}

NOTES

1. See Table 1(a), Column 5.
2. See Table 1(a), Column 3.
3. See Table 1(a), Column 4.

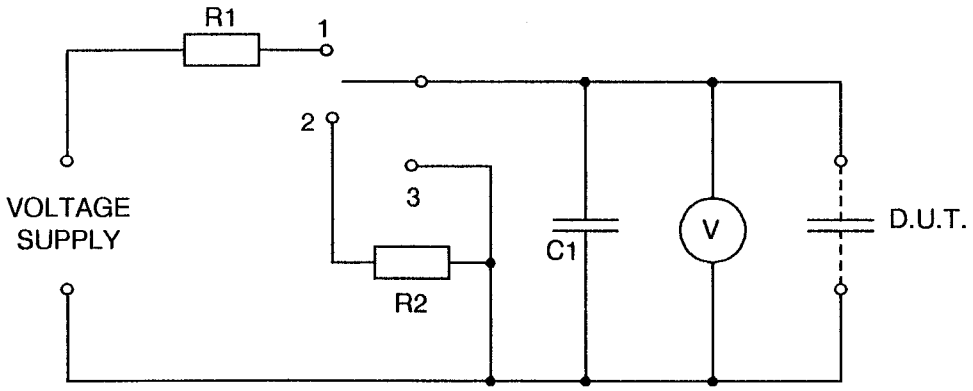
TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES, +85(+0-5) °C, -40(+5-0) °C

No.	Characteristics	Symbol	Test Method MIL-STD-202	Test Fig.	Test Conditions	Limits		Unit
						Min.	Max.	
3	Insulation Resistance	R_i	302A	-	t = 85°C	2.5	-	GΩ
4	Capacitance	$\frac{\Delta C}{C}$	305	-	C < 1000pF f = 1.0 ± 0.1 MHz C > 1000pF f = 1.0 ± 0.1 kHz	-5.0 Note 1	+10	%

NOTES

1. Related to the specific device capacitance value at 25 ± 3°C.

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 the 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
4	Capacitance	C	As per Table 2	As per Table 2	±3.0	%
5	Dissipation Factor	tgδ	As per Table 2	As per Table 2	±15	%

TABLE 5 - CONDITIONS FOR BURN-IN

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	T_{amb}	+85	°C
2	Test Voltage	V_T	Note 1	V

NOTES

1. See Table 1(a), Column 5.

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 V_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	+0.15	%
		R_i	Insulation Resistance	9.6.1.4	50% of Table 2	-	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	+0.15	%
		R_i	Insulation Resistance	9.6.1.4	50% of Table 2	-	GΩ
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	+0.25	%
		R_i	Insulation Resistance	9.6.1.4	33.3% of Table 2 Values	-	GΩ