



Pages 1 to 15

**CAPACITORS, FIXED, TUBULAR, POROUS TANTALUM  
CATHODE AND ANODE, GELLED ELECTROLYTE,  
HERMETICALLY SEALED**

**BASED ON TYPE ST79**

**ESCC Detail Specification No. 3003/006**

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**TABLE OF CONTENTS**

<b>1.</b>	<b><u>GENERAL</u></b>	<b>5</b>
1.1	Scope	5
1.2	Range of Components	5
1.3	Maximum Ratings	5
1.4	Parameter Derating Information	5
1.5	Physical Dimensions	5
1.6	Functional Diagram	5
<b>2.</b>	<b><u>APPLICABLE DOCUMENTS</u></b>	<b>5</b>
<b>3.</b>	<b><u>TERMS, DEFINITIONS, ABBREVIATIONS, SYMBOLS AND UNITS</u></b>	<b>8</b>
<b>4.</b>	<b><u>REQUIREMENTS</u></b>	<b>8</b>
4.1	General	8
4.2	Deviations from Generic Specification	8
4.2.1	Deviations from Special In-process Controls	8
4.2.2	Deviations from Final Production Tests (Chart II)	8
4.2.3	Deviations from Burn-in and Electrical Measurements (Chart III)	8
4.2.4	Deviations from Qualification Tests (Chart IV)	8
4.2.5	Deviations from Lot Acceptance Tests (Chart V)	8
4.3	Mechanical Requirements	8
4.3.1	Dimension Check	8
4.3.2	Weight	8
4.3.3	Robustness of Terminations	8
4.4	Materials and Finishes	9
4.4.1	Case	9
4.4.2	Lead Material and Finish	9
4.4.3	Insulation Sleeving	9
4.5	Marking	9
4.5.1	General	9
4.5.2	The ESCC Component Number	9
4.5.3	Characteristics and Ratings	9
4.5.3.1	Capacitance Value	10
4.5.3.2	Tolerance	10
4.5.3.3	Rated Voltage	10
4.5.3.4	Polarity	11
4.5.4	Traceability Information	11
4.6	Electrical Measurements	11
4.6.1	Electrical Measurements at Room Temperature	11
4.6.2	Electrical Measurements at High and Low Temperatures	11
4.7	Burn-in Tests	11
4.7.1	Parameter Drift Values	11
4.7.2	Conditions for Burn-in	11
4.8	Environmental and Endurance Tests (Charts IV and V of ESCC Generic Specification No. 3003)	13
4.8.1	Measurements and Inspections on Completion of Environmental Tests	13
4.8.2	Measurements at Intermediate Points During Endurance Tests	13
4.8.3	Measurements and Inspections on Completion of Endurance Tests	13
4.8.4	Conditions for Operating Life	13

**1. GENERAL**

**1.1 SCOPE**

This specification details the ratings, physical and electrical characteristics, test and inspection data for a Capacitor, Fixed, Tubular, Porous Tantalum Cathode and Anode, Gelled Electrolyte, Hermetically Sealed, based on Type ST79. It shall be read in conjunction with ESCC Generic Specification No. 3003, the requirements of which are supplemented herein.

**1.2 RANGE OF COMPONENTS**

The range of components 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 components specified herein, are as scheduled in Table 1(b).

**1.4 PARAMETER DERATING INFORMATION**

The parameter derating information applicable to the components specified herein, is shown in Figure 1.

**1.5 PHYSICAL DIMENSIONS**

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

**1.6 FUNCTIONAL DIAGRAM**

The functional diagram of the components 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) ESCC Generic Specification No. 3003 for Capacitors, Fixed, Tantalum, Non-solid Electrolyte.

**Table 1(a) - RANGE OF COMPONENTS**

U <sub>R</sub> (V) (Note 3)	C (μF) (Note 2)	I <sub>L</sub> max (μA)		DF max (%) at 100Hz		ΔC/C max (%)			Z max (Ω) at 100Hz	Case Size (Note 1)	Weigh t max (g)
		+22°C	+22°C	+85°C/ 125°C	+22°C/ +85°C/ +125°C	-55°C	+85°C	+125°C C			
25	1800	4	25	81	353	+12	+20	-75	6	D	17.7
30	1500	5	30	81	396	+10	+20	-72	7	D	17.7
40	1000	8	65	40	440	+10	+20	-60	8	D	17.7
50	470	3	25	31	258	+8	+15	-50	10	C	11.6
50	680	5	40	43	256	+10	+20	-60	8	D	17.7
50	750	6	55	40	330	+10	+20	-60	8	D	17.7
60	390	3	25	31	276	+8	+15	-50	13	C	11.6

U <sub>R</sub> (V) (Note 3)	C (μF) (Note 2)	I <sub>L</sub> max (μA)		DF max (%) at 100Hz		ΔC/C max (%)			Z max (Ω) at 100Hz	Case Size (Note 1)	Weig ht max (g)
		+22°C	+22°C	+85°C/ 125°C	+22°C/ +85°C/ +125°C	-55°C	+85°C	+125° C			
60	560	5	40	40	281	+8	+15	-60	8	D	17.7
60	700	7	60	42	308	+10	+20	-60	8	D	17.7
63	500	5	40	40	251	+8	+15	-60	8	D	17.7
75	330	3	30	29	259	+10	+20	-50	12	C	11.6
75	470	5	50	38	266	+10	+20	-60	10	D	17.7
100	150	3	25	21	234	+6	+12	-38	22	C	11.6
100	220	5	50	23	207	+6	+12	-50	18	D	17.7
125	100	3	25	16	212	+5	+10	-25	35	C	11.6
125	150	5	50	21	245	+6	+12	-35	22	D	17.7

**NOTES:**

- (1) Refer to Figure 2 for Type Variant Number assigned to case size.
- (2) All capacitors are available with a tolerance of ±10% (K) and 20% (M).
- (3) For T<sub>amb</sub> ≤ +85°C (See Figure 1).

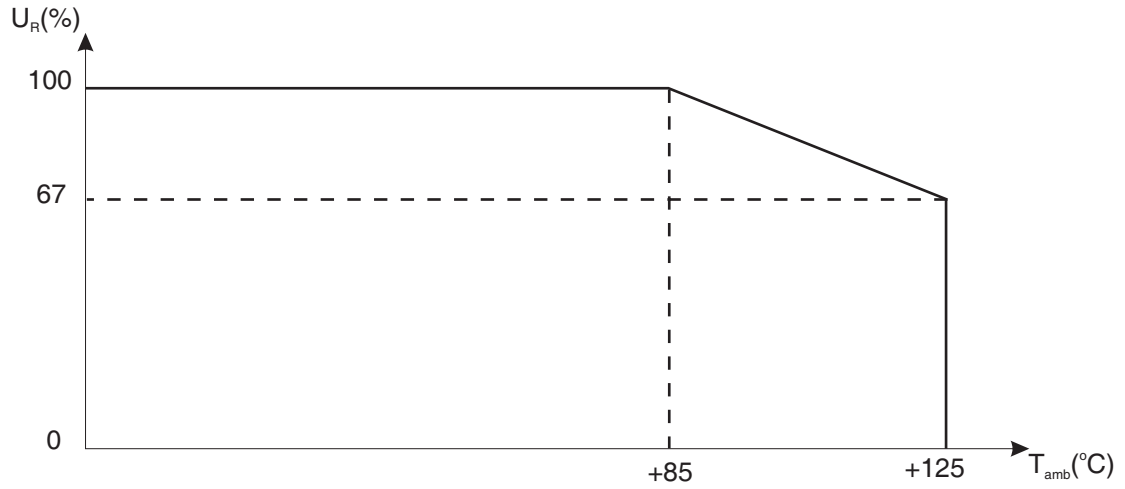
**Table 1(b) - MAXIMUM RATINGS**

No.	Characteristics	Symbols	Maximum Ratings	Units	Remarks
1	Rated Voltage	U <sub>R</sub>	See Table 1(a)	V	For derating see Figure 1
2	Surge Voltage	U <sub>S</sub>	1.15U <sub>R</sub>	V	-
3	Operating Temperature Range	T <sub>op</sub>	-55 to +125	°C	T <sub>amb</sub> For derating see Figure 1
4	Storage Temperature Range	T <sub>stg</sub>	-55 to +125	°C	T <sub>amb</sub>
5	Maximum Soldering Temperature	T <sub>L</sub>	+260	°C	Soldering time: t <sub>L</sub> ≤ 5 seconds (Note 1)

**NOTES:**

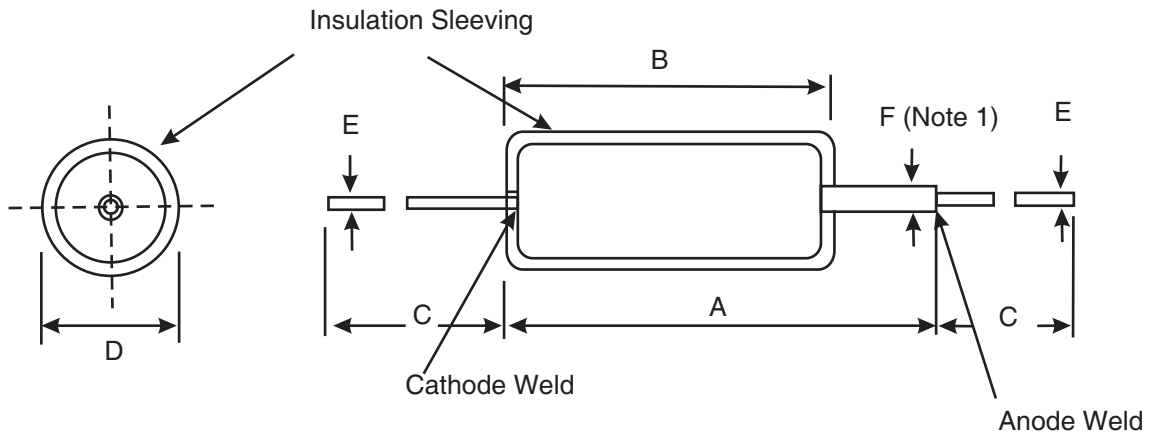
1. ≥ 3mm from body on cathode side and ≥ 3mm from weld on anode side.

**Figure 1 - PARAMETER DERATING INFORMATION**



Rated Voltage Versus Ambient Temperature (see Table 1(b))

**Figure 2- PHYSICAL DIMENSIONS**

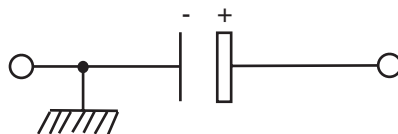


Variant	Case Size	Dimensions (mm)						
		A Max	B Max	C Min	D Max	E		F Max
						Min	Max	
04	C	26	20.4	30	10	0.59	0.7	1.6
05	D	34	27.9	30	10	0.59	0.7	1.6

**NOTES:**

- The anode lead-out stub must not be bent.

**Figure 3 - FUNCTIONAL DIAGRAM**



### 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.

### 4. **REQUIREMENTS**

#### 4.1 **GENERAL**

The complete requirements for procurement of the components specified herein are stated in this specification and ESCC Generic Specification No. 3003. Deviations from the Generic Specification, applicable to this specification only, are detailed in Para. 4.2

Deviations from the 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**

Not Applicable.

##### 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 components specified herein shall be verified in accordance with the requirements set out in Para. 9.4 of ESCC Generic Specification No. 3003 and they shall conform to those shown in Figure 2 of this specification.

#### 4.3.2 **Weight**

The maximum weight of the components specified herein shall be as specified in Table 1(a).

#### 4.3.3 **Robustness of Terminations**

The requirements and test conditions for the robustness of terminations tests are specified in Para. 9.9



of ESCC Generic Specification No. 3003.

#### 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 components 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

Tantalum, hermetically sealed.

##### 4.4.2 Lead Material and Finish

Leads shall be Type E with Type 3 finish in accordance with the requirements of ESCC Basic Specification No. 23500. Leads shall be electrically welded to the case and shall be free from non-conductive and foreign materials.

##### 4.4.3 Insulation Sleeving

Insulation Sleeving shall be of a non-fungus-nutrient material (cardboard shall not be used). The material shall not soften, creep or shrink to the extent that it causes any part of the cylindrical case to become uncovered at any test temperature specified herein. At any cross section, the maximum thickness of the sleeving shall not exceed twice the minimum thickness.

#### 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. 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 ESCC Component Number.
- (b) Characteristics and Ratings.
- (c) Traceability Information.

##### 4.5.2 The ESCC Component Number

The ESCC Component Number shall be constituted and marked as follows:

Example: 300300604B

- Detail Specification Reference: 3003006
- Component Type Variant Number: 04 (as required, see Figure 2)
- Testing Level (B or C, as applicable)

##### 4.5.3 Characteristics and Ratings

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

- (a) Capacitance Value.
- (b) Tolerance.
- (c) Rated Voltage.
- (d) Polarity.

The information (a), (b) and (c) shall be constituted and marked as follows:

Example: 567KM

- Capacitance Value (560 $\mu$ F) : 567
- Tolerance ( $\pm 10\%$ ) : K
- Rated Voltage (60V) : M

#### 4.5.3.1 *Capacitance Value*

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

Capacitance Value (pF)	Code
XX 10 <sup>7</sup>	XX7
XX 10 <sup>8</sup>	XX8

#### 4.5.3.2 *Tolerance*

The tolerance on capacitance value shall be indicated by the code letters specified hereafter.

Tolerance ( $\pm \%$ )	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 (V)	Code Letter
25	F
30	H
40	J
50	K
60	M
63	L
75	P

Rated Voltage (V)	Code Letter
100	Q
125	R

4.5.3.4 Polarity

Polarity shall be indicated by a + symbol on the anode end of the case.

4.5.4 Traceability Information

Each component shall be marked in respect of traceability information in accordance with the requirements of ESCC 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. Unless otherwise specified, measurements shall be performed at  $T_{amb}=+22\pm3^{\circ}C$ .

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.

4.7 BURN-IN TESTS

4.7.1 Parameter Drift Values

The parameter drift values applicable to Burn-in are as specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at  $T_{amb}=+22\pm3^{\circ}C$ . The parameter drift values ( $\Delta$ ) applicable to the parameters scheduled shall not be exceeded. In addition to these drift value requirements for a given parameter, the appropriate limit values 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. 3003. The conditions for Burn-in shall be as specified in Table 5 of this specification. Upon completion of burn-in, a recovery period of  $24 \pm 2$  hours is necessary before the end-measurements.

**Table 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE (see Note 1)**

No.	Characteristics	Symbols	ESCC 3003 Test Conditions	Limits		Units
				Min	Max	
1	d.c. Leakage	$I_L$	Para. 9.2.1.1	See Table 1(a)		$\mu A$
2	Capacitance	C	Para. 9.2.1.2	See Table 1(a)		$\mu F$
3	Dissipation Factor	DF	Para. 9.2.1.3	See Table 1(a)		%

**NOTES:**

- Measurements shall be made in the order shown. Upon completion of electrical measurements of Chart III and LAT3 each capacitor shall be discharged through a  $470\Omega$  resistor for 5 seconds followed by short circuit for 2 minutes.

**Table 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES (see Notes 1, 2)**

No.	Characteristics	Symbols	ESCC 3003 Test Conditions	Test Temperature (T <sub>amb</sub> )	Limits		Units
					Min	Max	
1 2 3	d.c. Leakage Capacitance Dissipation Factor (see Note 3)	I <sub>L</sub> C DF	Para. 9.2.1.1 Para. 9.2.1.2 Para. 9.2.1.3	+22 ±3°C	See Table 1 (a)		μA μF %
4 5 6	Impedance Capacitance Dissipation Factor (See Note 3)	Z C DF	- Para. 9.2.1.2 Para. 9.2.1.3	-55(+0 -3)°C	See Table 1 (a)		Ω μF %
7 8 9	d.c. Leakage Capacitance Dissipation Factor (see Note 3)	I <sub>L</sub> C DF	Para. 9.2.1.1 Para. 9.2.1.2 Para. 9.2.1.3	+22 ±3°C	See Table 1 (a)		μA μF %
10 11 12	d.c. Leakage Capacitance Dissipation Factor	I <sub>L</sub> C DF	Para. 9.2.1.1 Para. 9.2.1.2 Para. 9.2.1.3	+85(+3 -0)°C	See Table 1 (a)		μA μF %
13 14 15	d.c. Leakage (see Note 4) Capacitance Dissipation Factor	I <sub>L</sub> C DF	Para. 9.2.1.1 Para. 9.2.1.2 Para. 9.2.1.3	+125(+3 -0)°C	See Table 1 (a)		μA μF %
16 17 18	d.c. Leakage Capacitance Dissipation Factor	I <sub>L</sub> C DF	Para. 9.2.1.1 Para. 9.2.1.2 Para. 9.2.1.3	+22 ±3°C	See Table 1 (a)		μA μF %

**NOTES:**

1. Measurements shall be made in the order shown. Capacitors shall be brought to thermal stability before the measurements are made. Thermal stability will have been reached when no further change in capacitance is observed between two successive measurements made at 15 minutes intervals.
2. Inspection Level II, single sampling, AQL = 2.5%, for each capacitance value. Each capacitance value shall be considered as constituting a complete lot.
3. Measurements 1, 2, 3 and 7, 8, 9 shall not be performed during Chart III.
4. Derated voltage, 0.67U<sub>R</sub>, shall be applied for d.c. Leakage at +125°C.

**Table 4 - PARAMETER DRIFT VALUES**

No.	Characteristics	Symbols	ESCC 3003 Test Conditions	Change Limits (Δ)	Units
1	d.c. Leakage Change	ΔI <sub>L</sub> /I <sub>L</sub>	Para. 9.2.1.1	(+200 -100)% of measured value or (Note 1) +(25% +0.05μA) of limit value (Note 2)	-
2	Capacitance Change	ΔC/C	Para. 9.2.1.2	± 5	%

**NOTES:**

1. Whichever is smaller.
2. d.c. Leakage need not be recorded when less than, or equal to:  
0.8μA for case size C.  
1.4μA for case size D.

**Table 5 - CONDITIONS FOR BURN-IN AND OPERATING LIFE**

No.	Characteristics	Symbols	Conditions	Units
1	Ambient Temperature	$T_{amb}$	+85(+0 -3)	°C
2	Test Voltage	$V_T$	$U_R$ (Note 1)	V

**NOTES:**

1. See Table 1(a)

**4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION NO. 3003)**

**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  $T_{amb}=+22\pm3^{\circ}C$ .

**4.8.2 Measurements at Intermediate Points During Endurance Tests**

The parameters to be measured at intermediate points during endurance tests are scheduled in Table 6. Unless otherwise stated, the measurements shall be performed at  $T_{amb}=+22\pm3^{\circ}C$ .

**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  $T_{amb}=+22\pm3^{\circ}C$ .

**4.8.4 Conditions for Operating Life**

The requirements for operating life test are specified in Section 9 of ESCC Generic Specification No. 3003. The conditions for operating life testing shall be as specified in Table 5 of this specification.

**Table 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING**

No.	ESCC Generic Spec. No. 3003		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
01	Rapid Change of Temperature	Para. 9.5	d.c. Leakage	Table 2, Item 1	$I_L$	2.5 x Limit Table 1(a)		μA
			Capacitance Change	Table 2, Item 2	$\Delta C/C$	-15	+15	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		%
			Visual Examination	No leakage of electrolyte	-	-	-	-
02	Vibration	Para. 9.6	Visual Examination	No damage or leakage of electrolyte	-	-	-	-
03	Shock	Para. 9.7	Visual Examination	No breakdown, arcing, damage or leakage of electrolyte	-	-	-	-
04	Climatic Sequence	Para. 9.17	d.c. Leakage	Table 2, Item 1	$I_L$	2.5 x Limit Table 1(a)		μA

No.	ESCC Generic Spec. No. 3003		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
			Capacitance Change	Table 2, Item 2	$\Delta C/C$	-15	+15	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		%
			Visual Examination	No damage or leakage of electrolyte	-	-	-	-
05	Seal Test	Para. 9.1.2	-	-	-	-	-	-
06	External Visual Inspection	Para 9.3	-	-	-	-	-	-
07	Solderability	Para. 9.8	-	-	-	-	-	-
08	Robustness of Terminations	Para. 9.9	Visual Examination	No damage or leakage of electrolyte	-	-	-	-
09	Resistance of Soldering Heat	Para. 9.10	Visual Examination	No damage or leakage of electrolyte	-	-	-	-
10	Damp Heat Steady State	Para. 9.11	d.c. Leakage	Table 2, Item 1	$I_L$	2 x Limit Table 1(a)		$\mu A$
			Capacitance Change	Table 2, Item 2	$\Delta C/C$	-10	+10	%
			Dissipation Factor	Table 2, Item 3	DF	1.5 x Limit Table 1(a)		%
			Insulation Resistance	Gen. 3003, Para. 9.2.1.4	$R_I$	100	-	$M\Omega$
11	Cold Test	Para. 9.12	d.c. Leakage	Table 2, item 1	$I_L$	2 x Limit Table 1(a)		$\mu A$
			Capacitance Change	Table 2, item 2	$\Delta C/C$	-5	+5	%
			Dissipation Factor	Table 2, item 3	DF	1.5 x Limit Table 1(a)		%
			Visual Examination	No leakage of electrolyte	-	-	-	-
12	Low Air Pressure	Para. 9.13	Visual Examination	No breakdown, arcing, damage or leakage of electrolyte	-	-	-	-
13	Surge Voltage	Para. 9.14	Visual Examination	No damage or leakage of electrolyte	-	-	-	-
14	Reverse Voltage	Para. 9.15	d.c. Leakage	Table 2, item 1	$I_L$	2 x Limit Table 1(a)		$\mu A$
			Capacitance Change	Table 2, item 2	$\Delta C/C$	-10	+10	%
			Dissipation Factor	Table 2, item 3	DF	1.5 x Limit Table 1(a)		%
15	Life Test	Para 9.16		At 500, 1000 & 2000 hours and after 24 hours recovery				
			d.c. Leakage	Table 2, item 1	$I_L$	2 x Limit Table 1(a)		$\mu A$
			Capacitance Change	Table 2, item 2	$\Delta C/C$	-10	+10	%
			Dissipation Factor	Table 2, item 3	DF	1.5 x Limit Table 1(a)		%
			Insulation Resistance	Gen. 3003 Para. 9.2.1.4	$R_I$	100	-	$M\Omega$
16	High and Low Temperature Measurements	Para. 9.2.3	d.c. Leakage Capacitance Dissipation Factor Impedance	Table 3, Items 1 to 18	$I_L$ $C$ DF Z	see Table 3		$\mu A$ $\mu F$ % $\Omega$

No.	ESCC Generic Spec. No. 3003		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
17	Electrical Measurements	Para. 9.2.4	d.c. Leakage	Table 2, item 1	I <sub>L</sub>	See Table 2		μA
			Capacitance	Table 2, item 2	C	See Table 2		μF
			Dissipation Factor	Table 2, item 3	DF	See Table 2		%
18	Permanence of Marking	Para. 9.18	-	-	-	-	-	-

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.