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Pages 1 to 16

**CAPACITORS, CHIP, TANTALUM,  
SOLID ELECTROLYTE,  
BASED ON TYPE 1005**

**ESA/SCC Detail Specification No. 3011/001**



**space components  
coordination group**

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No. 3011/001

Rev. 'B'

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ISSUE 1

**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
'A'	Sept. '96	P1. Cover page P2. DCN P7. Figure 2 : In the Table, Variant Numbers adjusted P9. Para. 4.4.1 : Termination information clarified P11. Table 2 : Table reformatted Table 3 : Table reformatted and Item 2 limit for +85°C corrected		None None 221361 221361 221362 221362
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**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, Chip, Tantalum, Solid Electrolyte, based on Type 1005.

It shall be read in conjunction with ESA/SCC Generic Specification No. 3011, 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**

The parameter derating information applicable to the capacitors specified herein 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 of the capacitors specified herein is shown in Figure 3.

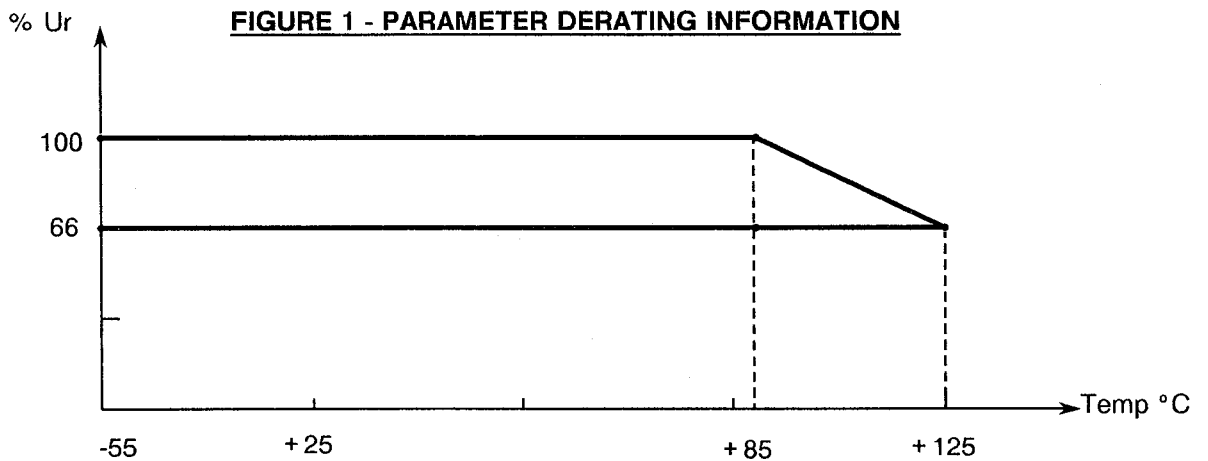
**TABLE 1(a) - RANGE OF COMPONENTS**

Capacitance Value ( $\mu$ F)	Tolerance (%)	RATED VOLTAGE (V)
0.1		50
0.15		50
0.22		40
0.33	10	25
0.47		20
0.68	and	16
1		10
1.5	20	6.3
2.2		4



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

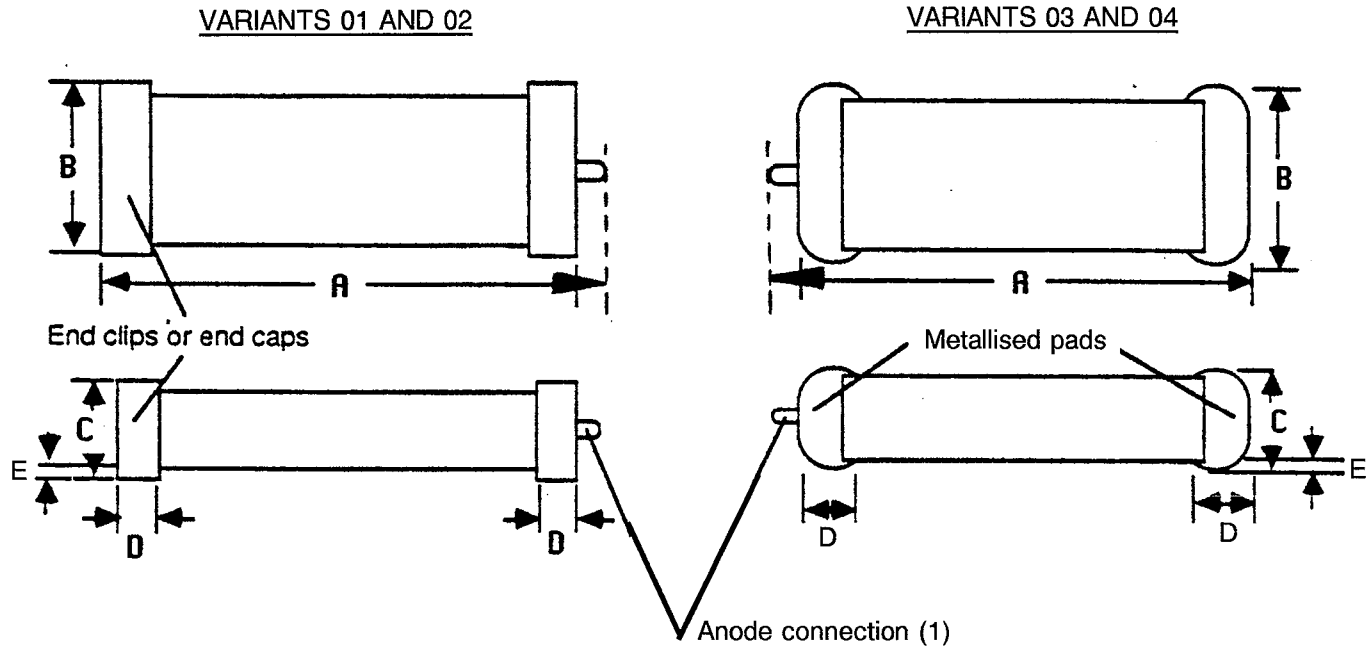
NO.	CHARACTERISTICS	SYMBOL	MAXIMUM RATINGS		UNITS	REMARKS
			MIN	MAX		
1	Rated Voltage	$U_r$	See Table 1(a)		Vdc	
2	Surge Voltage	$U_s$	-	1.30 $U_r$	Vdc	
3	Operating Temperature Range	$T_{op}$	-55	+125	°C	
4	Storage Temperature Range	$T_{stg}$	-55	+125	°C	
5	Soldering Temperature	$T_{sol}$	-	+260	°C	Soldering time: ≤ 10seconds



VOLTAGE VERSUS TEMPERATURE



**FIGURE 2 - PHYSICAL DIMENSIONS**

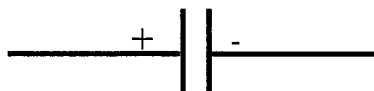


	DIMENSIONS (mm)									
	A		B		C		D		E	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Variants 01 & 02	2.1	2.9	0.9	1.7	0.9	1.7	0.5	1.0	-	0.15
Variants 03 & 04	2.1	3.3	0.9	2.1	0.9	2.1	0.5	1.0	-	0.35

**NOTES**

- The anode terminal shall be identified by the riser wire connection, which extends from the case size by 0.4mm max.

**FIGURE 3 - FUNCTIONAL DIAGRAM**





**2. APPLICABLE DOCUMENTS**

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

- ESA/SCC Generic Specification No. 3011 for Capacitor, Chip, Tantalum, Solid Electrolyte.

**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.

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#### 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. 3011. 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

The following deviations from ESA/SCC Generic Specification No. 3011 shall apply:-

###### 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 Tests (Chart III)

None.

###### 4.2.4 Deviations from Qualification, Environmental and Endurance 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 ESA/SCC Generic Specification No. 3011 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 0.030 grammes.

###### 4.3.3 Adhesion

The requirements for adhesion are specified in Para 9.3 of ESA/SCC Generic Specification No. 3011.

##### 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.





4.4.2 Terminations

The capacitors shall be terminated in accordance with the requirements of ESA/SCC Basic Specification No. 23500, as follows:-

(a) **Variant 01:**

With clips or end caps Type 'E' with Type '2' finish.

(b) **Variant 02:**

With clips or end caps Type 'E' with Type '3' finish.

(c) **Variant 03:**

With pads of Silver Loaded Epoxy Resin with Type '2' finish.

(d) **Variant 04:**

With pads of Silver Loaded Epoxy Resin with Type '3' finish.

4.5 MARKING

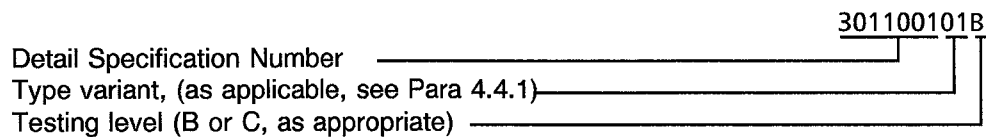
4.5.1 General

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 subparagraphs. 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 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:-

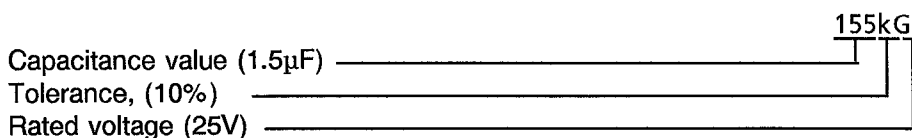


4.5.3 Electrical Characteristics and Ratings

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 Capacitances

The capacitance values shall be expressed by means of the following codes. The unit quantity for marking shall be picofarads.

Numerical Value (%)	Code
XX10 <sup>4</sup>	XX4
XX10 <sup>5</sup>	XX5
XX10 <sup>6</sup>	XX6

4.5.3.2 Tolerances

The tolerance 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 letter specified hereafter.

Rated Voltage (V)	Code letter
50	K
40	J
25	G
20	F
16	E
10	D
6.3	A
4	M

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) Manufacturer's name.

4.6 ELECTRICAL MEASUREMENTS

4.6.1 Electrical Measurements at Room Temperature

The parameters to be measured in respect of electrical characteristics are scheduled in Table 2. Unless otherwise specified, these measurements shall be performed at T<sub>amb</sub> = +22 ± 3 °C.

4.6.2 Electrical Measurements at High and Low Temperatures (Table 3)

The parameters to be measured at high and low temperatures are scheduled in Table 3.



4.6.3 Circuit for Electrical Measurements

Not applicable.

**TABLE 2 - ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE**

No.	Characteristics	Symbol	ESA/SCC 3011 Test Method	Test Conditions	Limits		Unit	Remarks
					Min.	Max.		
1	Capacitance	$C_n$	Para. 9.4.1.1	$V_T \leq 0.5V_{rms}$ $V_P = 2.1$ to $2.5V$ $f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$	$C_n$ -10 -20	$C_n$ +10 +20	$\mu F$ % %	See Table 1(a)
2	D.C. Leakage Current	$I_L$	Para. 9.4.1.2	$V_T = U_R \pm 2\%$ Series Resistor = $1k\Omega$	-	(Note1)	$\mu A$	
3	Dissipation Factor	DF	Para. 9.4.1.3	$f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$	-	6	%	

**NOTES**

1.  $0.01C \times U_R$  or 1.0, whichever is the greater.

**TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES**

No.	Characteristics	Symbol	ESA/SCC 3011 Test Method	Test Conditions (Note 1)	Limits		Unit	Remarks
					Min.	Max.		
1	Capacitance	$C_n$	Para. 9.4.1.1	$V_T \leq 0.5V_{rms}$ $V_P = 2.1$ to $2.5V$ $f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$ - $55^\circ C$ , $+85^\circ C$ $+125^\circ C$	$C_n$ -10 -15	$C_n$ +10 +15	$\mu F$ % %	See Table 1(a)
2	D.C. Leakage Current	$I_L$	Para. 9.4.1.2	$V_T = U_R \pm 2\%$ Series Resistor = $1k\Omega$ $+85^\circ C$ $+125^\circ C$	- -	(Note 2) (Note 3)	$\mu A$	
3	Dissipation Factor	DF	Para. 9.4.1.3	$f = 100 \pm 5Hz$ or $f = 120 \pm 5Hz$ - $55^\circ C$ , $+85^\circ C$ , $+125^\circ C$	-	8	%	

**NOTES**

1. Inspection Level II, Single Sampling, AQL 2.5% for each capacitance value. Each capacitance value shall be considered as constituting a complete lot.
2.  $0.1C \times U_R$  or 10, whichever is the greater.
3.  $0.12C \times U_R$  or 12, whichever is the greater.



4.7 SELECTIVE LEVEL TESTING

4.7.1 Parameter Drift Value

The parameter drift values applicable to burn-in are specified in Table 4 of this specification. Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .

The parameter drift value ( $\Delta$ ) applicable to the parameter 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. 3011. 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 performance of the end measurements.

4.7.3 Electrical Circuit for Burn-in

Not applicable.

**TABLE 4 - PARAMETER DRIFT VALUES**

No	CHARACTERISTICS	SYMBOL	TEST METHOD AND CONDITION	LIMITS	UNIT
1	Capacitance Change	$\Delta C/C$	ESA/SCC No. 3011 Paras 9.4.2 & 9.4.1.1	$\pm 5$	%
2	DC Leakage Change	$\Delta I_L/I_L$	ESA/SCC No. 3011 Para 9.4.1.2.	(1) + 200% of initial value measured or + (25% + $0.05\mu\text{A}$ ) of limit value whichever is smaller	%

**NOTES**

1. Leakage current  $\leq 0.1\mu\text{A}$  are considered as a  $0.1\mu\text{A}$  value.

**FIGURE 4 - TEST CIRCUIT** (Not applicable)

**TABLE 5 - CONDITIONS FOR BURN-IN**

No	CHARACTERISTICS	SYMBOL	LIMITS	UNIT
1	Ambient Temperature	$T_{amb}$	+ 125	$^\circ\text{C}$
2	Test Voltage	VT	0.66Ur	V
3	Duration	t	168	Hours

**FIGURE 5 - ELECTRICAL CIRCUIT FOR BURN-IN** (Not applicable)



#### 4.8 ENVIRONMENTAL AND ENDURANCE TESTS

##### 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 testing shall be those specified in Table 6.

Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^{\circ}\text{C}$ .

##### 4.8.2 Measurements and Inspections 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 Measurements and Inspections on Completion of Endurance Tests

The parameters to be measured and inspections to be performed on completion of endurance tests shall be those specified in Table 6. Unless otherwise specified, these measurements shall be performed at  $T_{amb} = +22 \pm 3 \text{ }^{\circ}\text{C}$ .

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

The requirements for operating life test are specified in Section 9 of ESA/SCC Generic Specification No. 3011. The conditions for operating life test shall be as specified in Table 7 of this specification.

##### 4.8.5 Electrical Circuit for Operating Life Test

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. 3011		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Visual Inspection	Para. 9.1	Visual Inspection	ESA/SCC No. 20400	-	-	-	-
02	Mounting on Substrates	Para. 9.2	<b>Final Measurements</b> Capacitance D.C. Leakage Current Dissipation Factor Visual Examination	Table 2 Item 1 Table 2 Item 2 Table 3 Item 3 Good Tinning	C I <sub>L</sub> DF -	Table 2 Item 1 (2) Table 2 Item 2 Table 2 Item 3 -	-	-
03	Adhesion	Para. 9.5	<b>Final Examination</b> Visual Examination  Capacitance	No damage or loosening from substrate  Table 2 Item 1	-  C	-  Table 2 Item 1	-	-
04	Solderability	Para. 9.6	Visual Examination	No damage	-	-	-	-
05	Rapid Change of Temperature	Para. 9.7	<b>Initial Measurements</b> Capacitance  <b>Final Measurements</b>  Visual Examination  Capacitance Change D.C. Leakage Current Dissipation Factor	Table 2 Item 1 or value recorded in 02 After 4 hours minimum recovery  No corrosion, mechanical damage or obliteration of marking Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C  -  ΔC/C I <sub>L</sub> DF	Table 2 Item 1  -  -5.0 Table 2 Item 2 Table 2 Item 3	+5.0  -	%
06	Vibration	Para. 9.8	<b>Intermediate Measurements</b> Electrical Measurements  <b>Final Examination</b> Visual Examination	During last cycle Intermittent operation, intermittent contact, arcing, open or shorts  No damage	-  -	-  -	-	-
07	Shock or Bump	Para. 9.9	<b>Final Examination</b> Visual Examination	No damage	-	-	-	-
08	Climatic Sequence Dry Heat  Cold Test  Damp Heat	Para. 9.10 Para. 9.10.2  Para. 9.10.4  Para. 9.10.6	<b>Initial Measurements</b> Capacitance  <b>Intermediate Measurements</b> Capacitance Change D.C. Leakage Current  <b>Intermediate Measurements</b> Capacitance Change  <b>Final Measurements</b>  Visual Inspection Capacitance Change D.C. Leakage Current Dissipation Factor	Value recorded in 02 At High Temperature Table 3 Item 1 Table 3 Item 2 At Low Temperature Table 3 Item 1 Recovery Period 1 to 24 hours Gen. 3011, Para. 9.10.7 Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C  ΔC/C I <sub>L</sub>  ΔC/C  - ΔC/C I <sub>L</sub> DF	Table 2 Item 1  Table 3 Item 1 Table 3 Item 2  Table 3 Item 1  - -10 Table 2 Item 2 -	+5.0  -	%

**NOTES:** See Page 15.



**TABLE 6 - MEASUREMENTS AND INSPECTIONS ON COMPLETION OF ENVIRONMENTAL TESTS AND AT INTERMEDIATE POINTS AND ON COMPLETION OF ENDURANCE TESTING (CONTINUED)**

No.	ESA/SCC GENERIC SPEC. No. 3011		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
09	Damp Heat (Steady-State)	Para. 9.11 During 56 days	<b>Initial Measurements</b> Capacitance <b>Final Measurements</b>  Visual Examination Capacitance Change D.C. Leakage Current Dissipation Factor	Value recorded in 02 Recovery Period 6 to 24 ± 2 hours No damage Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C  - ΔC/C I <sub>L</sub> DF	Table 2 Item 1  - -10 Table 2 Item 2 -	-  - +10 Note 3	-  -%
10	High and Low Temperature Stability	Para. 9.12	Capacitance Change D.C. Leakage Current at all but Step 2 Dissipation Factor	Table 3 Item 1 Table 3 Item 2 Table 3 Item 3	ΔC/C I <sub>L</sub> DF	Table 3 Item 1 Table 3 Item 2 Table 3 Item 3		
11	Surge Voltage	Para. 9.13	<b>Final Measurements</b>  Capacitance D.C. Leakage Current Dissipation Factor	After temperature stabilisation Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C I <sub>L</sub> DF	Table 2 Item 1 Table 2 Item 2 Table 2 Item 3		
12	Operating Life	Para. 9.15	<b>Initial Measurements</b> Capacitance D.C. Leakage Current Dissipation Factor <b>Intermediate Measurements</b>  D.C. Leakage Current <b>Final Measurements</b>  Capacitance Change D.C. Leakage Current  Dissipation Factor Visual Examination	Value recorded in 02 Table 2 Item 2 Table 2 Item 3 At 250 and 1000 hours At High Temperature Table 3 Item 2 At 1000 and 2000 hours and after 24 hours recovery Table 2 Item 1 Table 2 Item 2 At +25°C At +85°C At +125°C Table 2 Item 3 No damage	C I <sub>L</sub> DF  I <sub>L</sub>  ΔC/C I <sub>L</sub>  DF -	Table 2 Item 1 Table 2 Item 2 Table 2 Item 3  Table 3 Item 2  -5.0 +5.0 Table 2 Item 2 Table 3 Item 2 Table 3 Item 2 Table 2 Item 3	-  -	%  -
13	Permanence of Marking	Para. 9.17	<b>Final Examination</b> Visual Examination	ESA/SCC No. 24800	-	-	-	-

**NOTES**

- The tests in this Table refer to either Chart IV or V and shall be used as applicable.
- Value to be recorded.
- 1.2 x value specified in Table 2 Item 3.

**TABLE 7 - CONDITIONS FOR OPERATING LIFE**

No	CHARACTERISTICS	SYMBOL	CONDITION	UNIT
1	Ambient Temperature	$T_{amb}$	+85°C +125°C	°C
2	Test Voltage	$U_r$	Rated Voltage (1) Derated Voltage	Vdc

**NOTES**

1. The test voltage shall be the rated voltage (see Table 1(a)) for +85°C ambient temperature and the derated voltage (see Figure 1) for +125°C ambient temperature.