



**CAPACITORS, FIXED, MICA DIELECTRIC,  
BASED ON TYPE CMR04  
ESCC Detail Specification No. 3007/004**

**ISSUE 1  
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**CAPACITORS, FIXED, MICA DIELECTRIC,**

**BASED ON TYPE CMR04**

**ESA/SCC Detail Specification No. 3007/004**

**SCC**

**space components  
coordination group**

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		SCCG Chairman	ESA Director General or his Deputy
Issue 2	December 1995	<i>Pommes</i>	<i>Thorn</i>

**DOCUMENTATION CHANGE NOTICE**

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		Para. 3	: Second sentence added	23786
		Table 1(a)	: Column headings numbered	23786
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			: No. 2, Symbol corrected to 'U <sub>Rac</sub> '	23786
			: No. 3, Symbol corrected to I <sub>RF</sub> ' and 'Note 1' added to Remarks	23786
			: No. 4, Symbol corrected to 'T <sub>op</sub> ' and 'T <sub>amb</sub> ' added to Remarks	23786
			: No. 5, Symbol corrected to 'T <sub>stg</sub> '	23786
			: No. 4, Characteristic amended to 'Soldering Temperature', Symbol corrected to 'T <sub>sol</sub> ' and remarks moved to Note 2	23786
		Para. 4.1	: Second sentence added	21019
		Para. 4.2.2	: Wording amended	23786
		Para. 4.2.3	: Title and wording amended	23786
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		Para. 4.2.5	: Deviation added	23786
		Para. 4.3.1	: Wording amended	23786
		Para. 4.3.3	: Test conditions and method deleted	23786
		Para. 4.4.2	: Title and wording amended	21025
		Para. 4.5.1	: Wording amended	23786
		Para. 4.5.2	: Type Variant reference added	21021
			: Note added	23786
		Para. 4.5.3.2	: '±' moved to column heading	23786
		Para. 4.6	: Title amended	23786
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			: Nos. 1 and 2, Notes deleted	23786
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			: Note 2 added	23786
		Figure 4	: Entry added	23786
		Table 4	: Columns heading standardised	23786
			: Entries for 'Spec. and/or Test Method' and 'Test Condition' amended to 'As per Table 2'	23786
			: Characteristic amended to 'Capacitance Change'	23786
		Table 5	: Symbol corrected to 'VT'	23786
		Figure 5	: Paragraph added	23786
		Para. 4.8	: Title amended	23786

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**DOCUMENTATION CHANGE NOTICE**

Rev. Letter	Rev. Date	Reference	CHANGE Item	Approved DCR No.
		Para. 4.8.1	: Title and first sentence amended	23786
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		Para. 4.8.5	: New paragraph added	23786
		Table 6	: Format amended and corrected	23786



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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, Fixed, Mica Dielectric, based on Type CMR04. It shall be read in conjunction with ESA/SCC Generic Specification No. 3007, 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 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 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. 3007 for Capacitors, Fixed, Mica Dielectric.
- (b) MIL-C-39001, Capacitors, Fixed, Mica Dielectric.

**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 symbol is used:-

$V_T$  = Test Voltage.





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

(1) Item No.	(2) Capacitance (pF)	(3) Tolerance (±%)	(4) Temperature Coefficient (ppm/°C)	(5) Dimensions (mm)	(6) Max. Weight (g)
				C Max.	
01	11 000	1.0	0 to +70	8.5	7.0
02	12 000	1.0	0 to +70	8.5	7.0
03	13 000	1.0	0 to +70	8.5	7.0
04	15 000	1.0	0 to +70	8.5	7.0
05	16 000	1.0	0 to +70	8.5	7.0
06	18 000	1.0	0 to +70	8.5	7.0
07	20 000	1.0	0 to +70	8.5	7.0
08	22 000	1.0	0 to +70	11.8	8.0
09	24 000	1.0	0 to +70	11.8	8.0
10	27 000	1.0	0 to +70	11.8	8.0
11	30 000	1.0	0 to +70	11.8	8.0
12	33 000	1.0	0 to +70	11.8	8.0
13	36 000	1.0	0 to +70	11.8	8.0
14	39 000	1.0	0 to +70	11.8	8.0
15	43 000	1.0	0 to +70	11.8	8.0
16	47 000	1.0	0 to +70	11.8	8.0
17	51 000	1.0	0 to +70	11.8	8.0

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

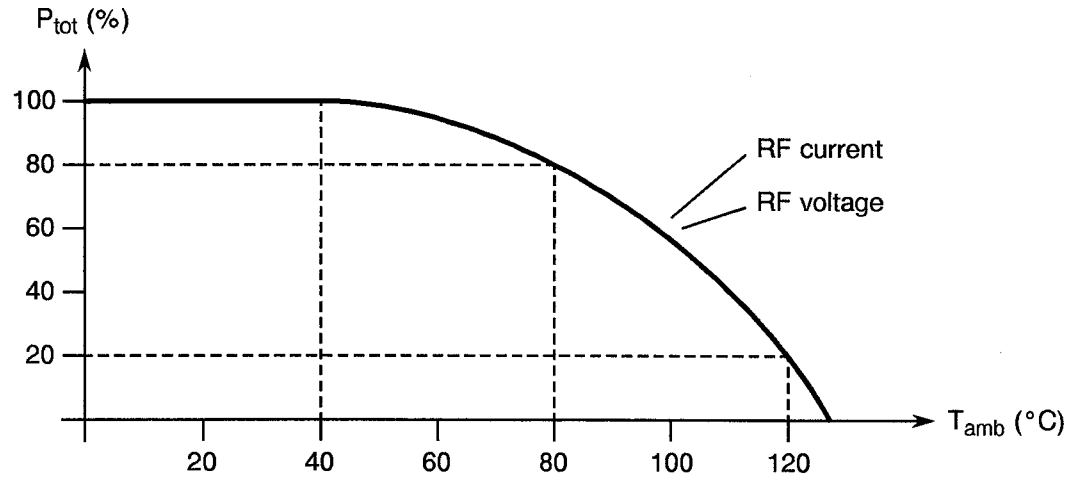
No.	Characteristics	Symbol	Maximum Ratings	Unit	Remarks
1	Rated Voltage d.c.	$U_R$	300	V	
2	Rated Voltage a.c.	$U_{Rac}$	150	V <sub>rms</sub>	(50/60Hz)
3	R.F. Current	$I_{RF}$	4.0	A <sub>rms</sub>	Note 1
4	Operating Temperature Range	$T_{op}$	-55 to +125	°C	$T_{amb}$
5	Storage Temperature Range	$T_{stg}$	-65 to +150	°C	
6	Soldering Temperature	$T_{sol}$	+245	°C	Note 2

**NOTES**

1. At  $T_{amb} \leq +40^\circ\text{C}$ . For derating at  $T_{amb} > +40^\circ\text{C}$ , see Figure 1.
2. Duration 10 seconds maximum at a distance of not less than 1.5mm from the device body.

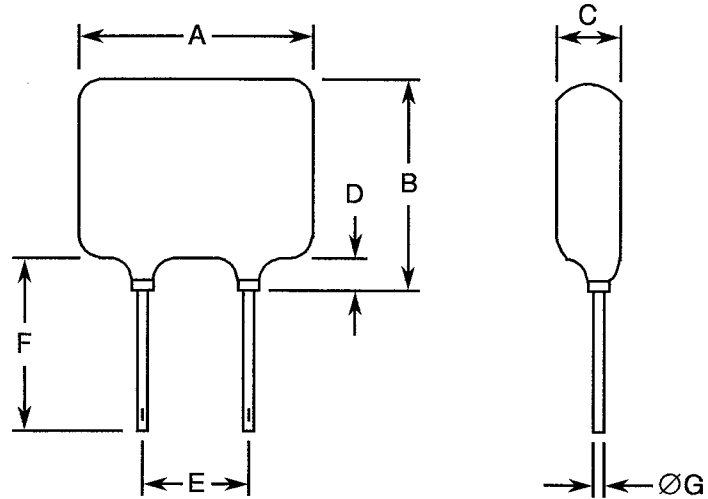


**FIGURE 1 - PARAMETER DERATING INFORMATION**



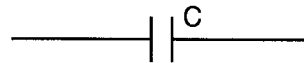


**FIGURE 2 - PHYSICAL DIMENSIONS**



Symbol	Millimetres	
	Min.	Max.
A	-	20.5
B	-	24
C	See Table 1(a)	
D	-	4.5
E	9.5	10.5
F	30	-
ØG	0.9	1.1

**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. 3007 for Capacitors, Fixed, Mica Dielectric. 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)

(a) The Temperature Coefficient Measurement shall be performed during Final Production Tests.

###### 4.2.3 Deviations from Burn-in and Electrical Measurements (Chart III)

(a) Para. 9.3.3, Electrical Measurements at High and Low Temperatures: Not applicable.

###### 4.2.4 Deviations from Qualification Tests (Chart IV)

(a) Para. 9.14, Terminal Strength: Applied Force = 23N.

###### 4.2.5 Deviations from Lot Acceptance Tests (Chart V)

(a) Para. 9.14, Terminal Strength: Applied Force = 23N.

##### 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. 9.5 of ESA/SCC Generic Specification No. 3007 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 as specified in Table 1(a).

###### 4.3.3 Terminal Strength

The requirements for terminal strength testing are specified in Section 9 of ESA/SCC Generic Specification No. 3007.



#### 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

Phenolic resin-dipped and epoxy impregnating.

##### 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 as 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:-

300700401B

Detail Specification Number \_\_\_\_\_

Type Variant (see Note) \_\_\_\_\_

Testing Level (B or C, as applicable) \_\_\_\_\_

#### **N.B.**

Marking of the Type Variant Number is mandatory. No further reference to Type Variants is made in this specification.

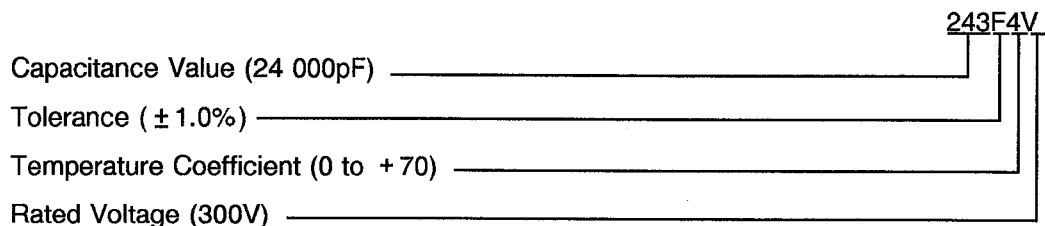


4.5.3 Electrical Characteristics and Ratings

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

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

Capacitance Value	Code
XX10 <sup>3</sup>	XX3

4.5.3.2 Tolerances

The tolerances on capacitance values shall be indicated by the code letters specified hereafter.

Tolerance (± %)	Code Letter
1.0	F

4.5.3.3 Temperature Coefficient

The temperature coefficient shall be indicated by the code specified hereafter:-

Temperature Coefficient (ppm/°C)	Code
0 to +70	4

4.5.3.4 Rated Voltage

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

Rated Voltage (U <sub>R</sub> ) (V)	Code Letter
300	V



#### 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. Unless otherwise specified, 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 temperature coefficient measurement shall be performed only once during final production tests.

##### 4.6.3 Circuits for Electrical Measurements (Figure 4)

Not applicable.

#### 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 ( $\Delta$ ) 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. 3007. 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 3007 Test Method	Limits		Unit
				Min.	Max.	
1	Capacitance	C	Para. 9.3.1.1	Note 1		pF
2	Dissipation Factor	DF	Para. 9.3.1.2	-	6.0	10 <sup>-4</sup>
3	Insulation Resistance	Ri	Para. 9.3.1.3	10 <sup>5</sup>	-	MΩ
4	Dielectric Withstanding Voltage	VP	Para. 9.3.1.4	2.0U <sub>R</sub>	-	V

**NOTES**

1. See Columns 2 and 3 of Table 1(a).

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

No.	Characteristics	Symbol	Spec. and/or Test Method	Test Conditions (Note 1)	Limits		Unit
					Min.	Max.	
5	Temperature Coefficient	TC	MIL-C-39001	+25 to +85 °C	Note 2		ppm/°C

**NOTES**

1. This measurement shall be performed only once during the final production tests on 20% of the lot, or 20 components, whichever is less.
2. See Column 4 of Table 1(a).



**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 ( $\Delta$ )	Unit
1	Capacitance Change	$\frac{\Delta C}{C}$	As per Table 2	As per Table 2	$\pm 0.05$ or (1) $\pm 0.1$	%  pF

**NOTES**

1. Whichever is greater.

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

No.	Characteristic	Symbol	Condition	Unit
1	Ambient Temperature	$T_{amb}$	$+ 125(+ 0 - 3)$	$^{\circ}C$
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. 3007)
- 4.8.1 Electrical Measurements 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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 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  $T_{amb} = +22 \pm 3 \text{ }^\circ\text{C}$ .
- 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. 3007. The conditions for operating life testing shall be as specified in Table 5 of this specification.
- 4.8.5 Electrical Circuit for Operating Life Tests (Figure 5)  
Not applicable.



**ESASCC**

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**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. 3007		MEASUREMENTS AND INSPECTIONS		SYMBOL	LIMITS		UNIT
	ENVIRONMENTAL AND ENDURANCE TESTS (1)	TEST METHOD AND CONDITIONS	IDENTIFICATION	CONDITIONS		MIN.	MAX.	
01	Solderability	Para. 9.7	Visual Examination	MIL-STD-202, Method 208, Solid Wire Termination Criteria	-	-	-	-
02	Resistance to Soldering Heat	Para. 9.8	<b>Final Measurements</b> Capacitance Dissipation Factor Insulation Resistance	After a cooling period of 10 ± 1 mins Table 2 Item 1 Table 2 Item 2 Table 2 Item 3	C DF Ri	Table 2 Item 1 Table 2 Item 2 Table 2 Item 3		pF 10 <sup>-4</sup> MΩ
03	Vibration	Para. 9.9	<b>During Last Cycle</b> Intermittent Contact	Open or Shorts	-	-	-	-
04	Thermal Shock	Para. 9.10	<b>Before Test</b> Capacitance	Table 2 Item 1	C	Table 2 Item 1		pF
05	Immersion	Para. 9.11	<b>Initial Measurements</b> Capacitance <b>Final Measurements</b> Capacitance Change  Dissipation Factor Insulation Resistance Dielectric Withstanding	Item 04  Table 2 Item 1  Table 2 Item 2 Table 2 Item 3 Table 2 Item 4	C  ΔC/C DF Ri VP	Item 04  - 1.0    + 1.0 - 1.0    + 1.0 -        9.0 0.3 × 10 <sup>5</sup> - Table 2 Item 4		pF  % or pF (2) 10 <sup>-4</sup> MΩ V
06	Barometric Pressure	Para. 9.12 1.5U <sub>R</sub>	Surge Current	Para. 9.12 of ESA/SCC 3007	I <sub>s</sub>	-	50	mA
07	Shock (Specified Pulse)	Para. 9.13	<b>During Last Shock</b> Intermittent Contact	Open or Shorts	-	-	-	-
08	Terminal Strength	Para. 9.14 and Para's 4.2.4, 4.2.5 of this spec.	Visual Examination	Evidence of breaking or loosening of terminals	-	-	-	-
09	Moisture Resistance	Para. 9.15 Prior to testing condition as per Para. 9.10	<b>Initial Measurements</b> Capacitance <b>Final Measurements</b>  Capacitance Change  Dissipation Factor Insulation Resistance Dielectric Withstanding	Table 2 Item 1 After completion of Step 6, maintain at + 25 ± 5 °C and 50 ± 5% relative humidity for 4 to 24 hours Table 2 Item 1  Table 2 Item 2 Table 2 Item 3 Table 2 Item 4	C  ΔC/C DF Ri VP	Table 2 Item 1  - 1.0    + 1.0 - 1.0    + 1.0 -        9.0 0.25 × 10 <sup>5</sup> - Table 2 Item 4		pF  % or pF (2) 10 <sup>-4</sup> MΩ V
10	Operating Life	Para. 9.16	<b>Initial Measurements</b> Capacitance <b>Intermediate Measurements</b> Capacitance Change  Dissipation Factor Insulation Resistance Dielectric Withstanding <b>Final Measurements</b> Capacitance Change  Dissipation Factor Insulation Resistance Dielectric Withstanding	Table 2 Item 1  Table 2 Item 1  Table 2 Item 2 Table 2 Item 3 Table 2 Item 4  Table 2 Item 1  Table 2 Item 2 Table 2 Item 3 Table 2 Item 4	C  ΔC/C DF Ri VP  ΔC/C DF Ri VP	Table 2 Item 1  - 1.0    + 1.0 - 1.0    + 1.0 -        9.0 Table 2 Item 3 Table 2 Item 4  - 1.0    + 1.0 - 1.0    + 1.0 -        9.0 Table 2 Item 3 Table 2 Item 4		pF  % or pF (2) 10 <sup>-4</sup> MΩ V  % or pF (2) 10 <sup>-4</sup> MΩ V

**NOTES**

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