CAPACITORS, LEADLESS SURFACE MOUNTED, ORGANIC POLYMER TANTALUM, SOLID ELECTROLYTE, ENCLOSED ANODE CONNECTION

BASED ON TYPE T583

ESCC Detail Specification No. 3012/005

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DCR No.	CHANGE DESCRIPTION
1186 1239	Specification upissued to incorporate changes per DCR

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1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, test and inspection data for Capacitors, Leadless Surface Mounted, Organic Polymer Tantalum, Solid Electrolyte, Enclosed Anode Connection, based on Type T583. It shall be read in conjunction with ESCC Generic Specification No. 3012, the requirements of which are supplemented herein.

1.2 COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

The variants and the range of components covered by this specification are 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 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) ESCC Generic Specification No. 3012 for Capacitors, Leadless Surface Mounted, Tantalum, Solid Electrolyte, Enclosed Anode Connection

(b) IPC/JEDEC J-STD-020, Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices

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.

TABLE 1(a) – COMPONENT TYPE VARIANTS AND RANGE OF COMPONENTS

Variant Number	Case Code (Style) (Note 1)	Capacitance Range C_n (µF) (Notes 2, 3)	Rated Voltage U_R (V) (Note 2)	Maximum Equivalent Series Resistance ESR (mΩ) (Note 2)	Weight Max (g)
01	D (7343-31)	33 to 150	6.3, 10, 16	45 to 100	0.3

NOTES:

1. See Figure 2.
2. The following rated Capacitance (C_n), maximum Rated Voltage (U_R) and maximum Equivalent Series Resistance values (ESR) are available for Variant 01 (Case Code D) (numbers indicate maximum ESR in mΩ):

Capacitance C_n (µF)	Rated Voltage U_R		
	6.3V	10V	16V
33			60, 70
47			70
68		45, 60, 100	
100	45	55, 80	
150	45, 55		

3. The following Capacitance Tolerance is available:
   - ±20% (M)

TABLE 1(b) - MAXIMUM RATINGS

No.	Characteristics	Symbols	Maximum Ratings	Units	Remarks
1	Rated Voltage	U_R	See Table 1(a)	V	Note 1, See Figure 1
2	Surge Voltage	U_S	1.3 x U_R	V	$T_{amb} \leq +85°C$
3	Category Voltage For U_R = 6.3V, 10V: For U_R = 16V:	U_C	 0.9 x U_R 0.8 x U_R	V	See Figure 1
4	Ripple Current	I_{ripple}	See Note 2	mA	$T_{amb} \leq +45°C$, f = 100kHz, Note 2, See Figure 1
5	Operating Temperature Range	T_{op}	-55 to +105	°C	T_{amb}
6	Rated Temperature	T_R	+85	°C	
7	Upper Category Temperature	T_C	+105	°C	
8	Storage Temperature Range	T_{stg}	-55 to +105	°C	Note 3
9	Soldering Temperature	T_{sol}	+235	°C	Notes 3, 4

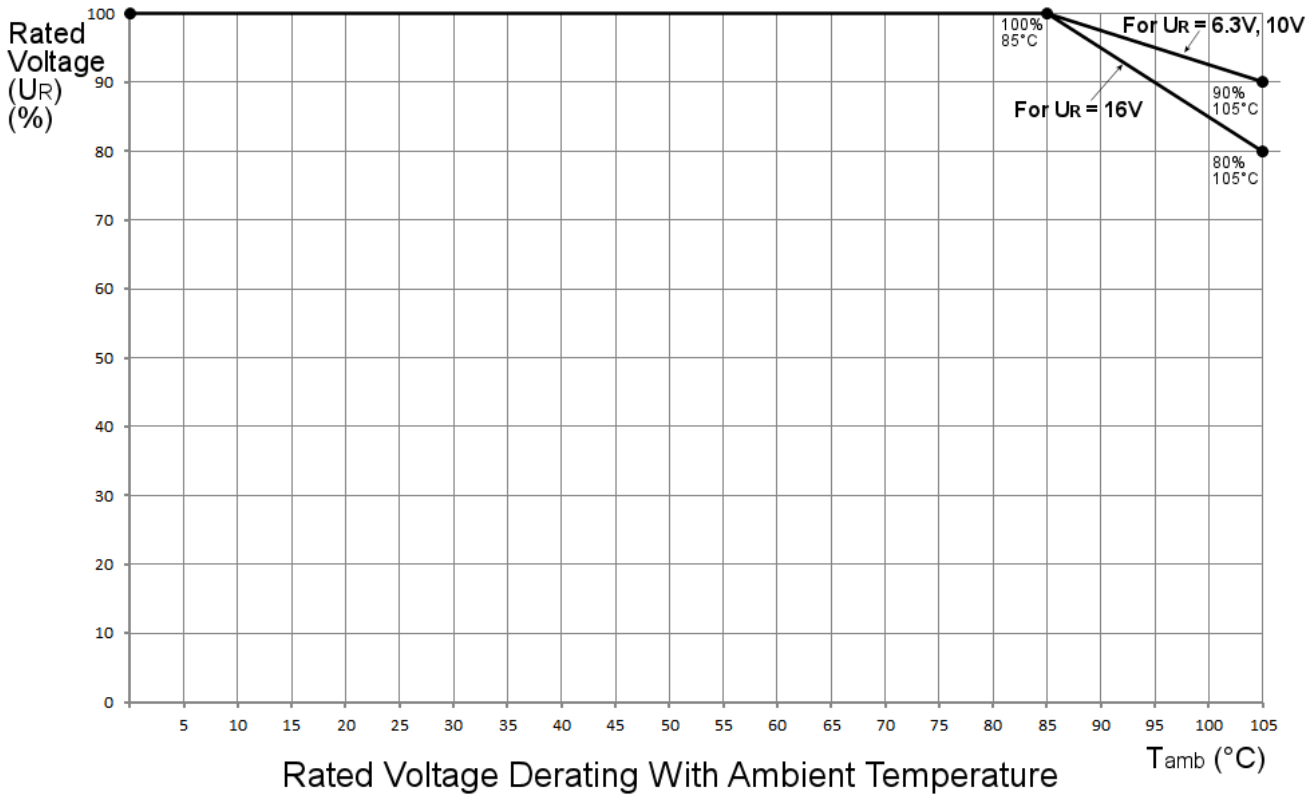
NOTES:

1. At $T_{amb} \leq +85°C$. For $T_{amb} > +85°C$, derate linearly to U_C at $T_{amb} = +105°C$.
2. Maximum I_{ripple}, which depends on C_n, U_R and ESR, shall be as follows at $T_{amb} \leq +45°C$ and f = 100kHz; derate linearly to 0.7I_{ripple} at $T_{amb} = +85°C$ and to 0.47I_{ripple} at $T_{amb} = +105°C$.

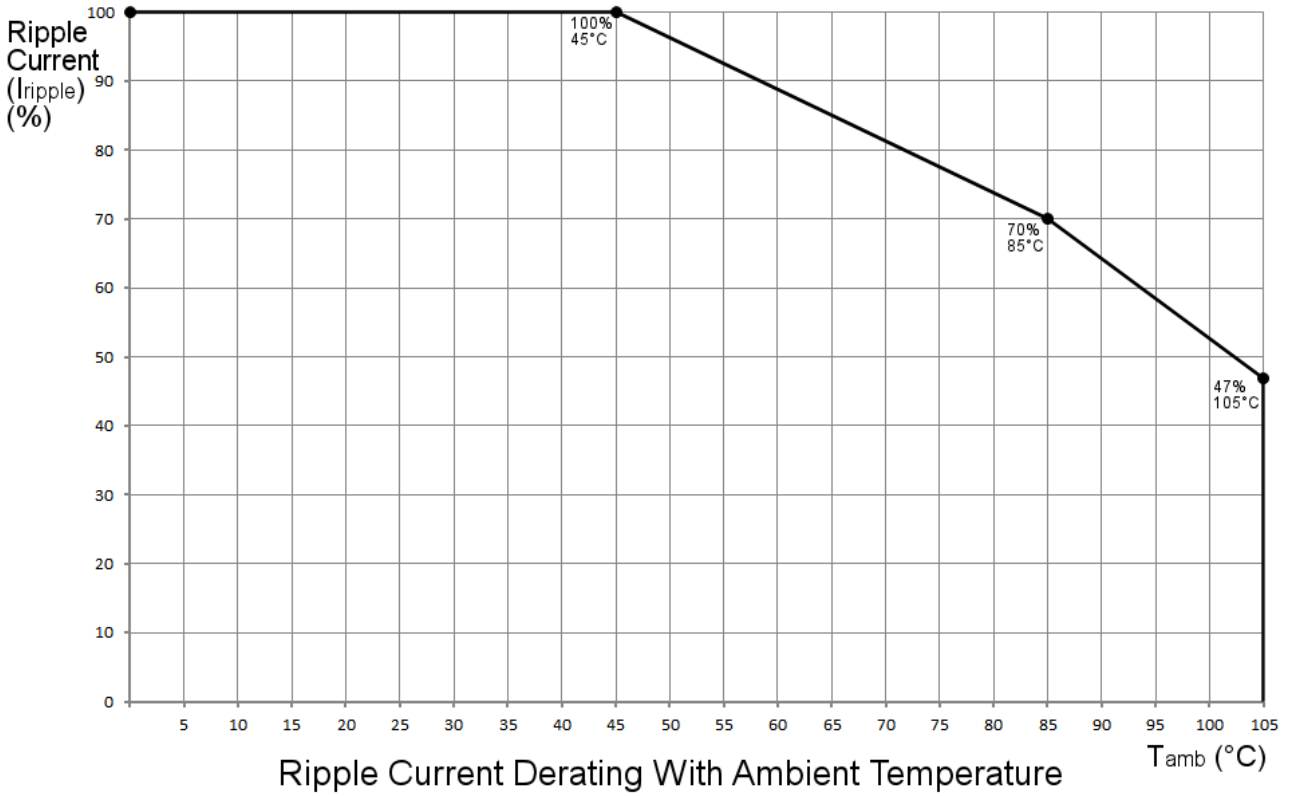
Capacitance C_n (µF)	Rated Voltage U_R (V)	Maximum Equivalent Series Resistance ESR (mΩ)	Maximum Ripple Current I_{ripple} (A)
100	6.3	45	2.2
150	6.3	45	2.2
150	6.3	55	2
68	10	45	2.2
68	10	60	1.9
68	10	100	1.5
100	10	55	2
100	10	80	1.7
33	16	60	1.9
33	16	70	1.8
47	16	70	1.8

3. These components are classified as Moisture Sensitivity Level 3 in accordance with J-STD-020. Components shall be delivered in moisture barrier bags with a desiccant and moisture indicator card. Components should be stored still contained within the moisture barrier bags in a non-condensating atmospheric environment of $T_{amb} \leq +40°C$ and relative humidity RH ≤ 90%.
   These components have a floor life of 168 hours at $T_{amb} \leq +30°C$ and RH ≤ 60%.
4. Duration 20 seconds maximum for reflow soldering.

FIGURE 1 – PARAMETER DERATING INFORMATION

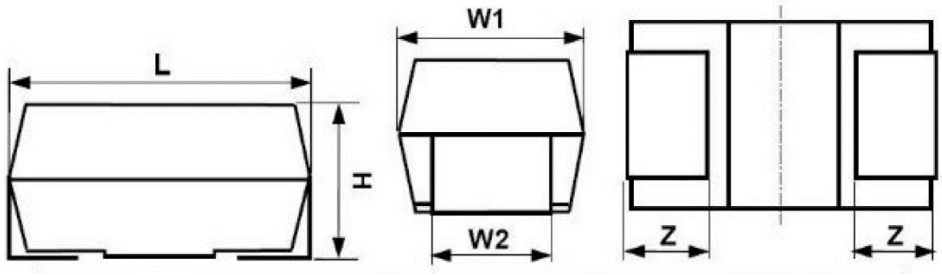


Rated Voltage Derating With Ambient Temperature



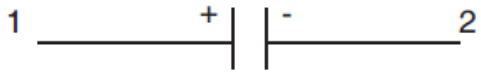
Ripple Current Derating With Ambient Temperature

FIGURE 2 - PHYSICAL DIMENSIONS



Variant Number	Case Code	Dimensions (mm)									
		L		H		W1		W2		Z	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
01	D	7	7.6	2.5	3.1	4	4.6	2.3	2.5	1	1.6

FIGURE 3 - FUNCTIONAL DIAGRAM



Terminal 1: Anode

Terminal 2: Cathode

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. 3012. 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

None.

4.2.2 Deviations from Final Production Tests - Chart II

(a) Para. 9.20, Surge Current Test: shall be performed both at high and room temperatures in the sequence as follows:

i. Surge Current Test in accordance with Para. 9.20 with a test temperature: T_{amb} = +105 (+0 -3)°C

ii. Whilst still at the high test temperature, DC Leakage Current shall be measured in accordance with Table 3 herein at T_{amb} = +105°C only.

iii. Surge Current Test in accordance with Para. 9.20 with a test temperature: T_{amb} = +25 ±5°C.

4.2.3 Deviations from Burn-in and Electrical Measurements - Chart III

None

4.2.4 Deviations from Qualification Tests - Chart IV

(a) Para. 9.17.1, Operating Life during Qualification Testing: for the Intermediate Data Points, DC Leakage Current shall be measured at T_{amb} = +25 ±5°C as specified in Table 6.

4.2.5 Deviations from Lot Acceptance Tests - Chart V

(a) Para. 9.17.2, Operating Life during Lot Acceptance Testing: for the Intermediate Data Points, DC Leakage Current shall be measured at T_{amb} = +25 ±5°C as specified in Table 6.

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. 9.6 of ESCC Generic Specification No. 3012 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 given in Table 1(a).

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 Terminal Material and Finish

Terminal material shall be nickel plated copper alloy, and finish shall be as type 15 in accordance with the requirements of ESCC Basic Specification No. 23500.

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 each component in its primary package.

The information to be marked and the order of precedence, shall be as follows:

(a) Polarity Identification
(b) The ESCC qualified components symbol (for ESCC qualified components only).
(c) The ESCC Component Number.
(d) Traceability Information.

4.5.2 Polarity Identification

The anode terminal shall be indicated by a polarity stripe marked on the top surface of the component.

4.5.3 The ESCC Component Number

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

Example: 301200501B336MCE060

- Detail Specification Reference: 3012005
- Component Type Variant Number: 01 (as required)
- Testing Level: B (B or C, as required)
- Characteristic code: Rated Capacitance Value (33µF): 336 (as required)
- Characteristic code: Capacitance Tolerance (±20%): M
- Rating code: Rated Voltage (16V): C (as required)
- Characteristic code: Maximum Equivalent Series Resistance (60mΩ): E060 (as required)

4.5.3.1 Characteristics and Ratings Codes

Characteristics and ratings to be codified as part of the ESCC Component Number shall be as follows:

(a) Rated Capacitance, C_n, expressed by the following codes in accordance with ESCC Basic Specification No. 21700. The unit quantity shall be picofarad (pF).

Capacitance C_n (pF)	Code
$XX10^6$	XX6
$XX10^7$	XX7

(b) Capacitance Tolerance expressed by the following code in accordance with ESCC Basic Specification No. 21700:

Tolerance (± %)	Code
20	M

(c) Rated Voltage expressed by the following codes:

Rated Voltage U_R (V)	Code
6.3	J
10	A
16	C

(d) Equivalent Series Resistance maximum value expressed by the following codes. The unit quantity shall be milliohm (mΩ):

Equivalent Series Resistance ESR (mΩ)	Code
XX	E0XX
XXX	EXXX

4.5.4 Traceability Information

Traceability information shall be marked 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 the measurements shall be performed at T_{amb} = +25 ±5°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.

4.6.3 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 as specified in Table 4 of this specification. Unless otherwise stated, measurements shall be performed at T_{amb} = +25 ±5°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 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. 3012. 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	Symbols	ESCC 3012 Test Method	Tolerance	Limits		Units
					Min	Max	
1	Capacitance	C	Para. 9.4.1.1	±20%	$0.8C_n$	$1.2C_n$	µF
2	DC Leakage Current	I_L	Para. 9.4.1.2	±20%	-	$0.1C_n$ x U_R	µA
3	Dissipation Factor	DF	Para. 9.4.1.3 f = 120Hz	±20%	-	10	%
4	Equivalent Series Resistance	ESR	Para. 9.4.1.4	±20%	-	See Table 1(a)	mΩ

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbols	ESCC 3012 Test Method	Test Conditions	Limits		Units
					Min	Max	
1	Capacitance Change	ΔC/C	Para. 9.4.1.1	T_{amb} = -55 (+3 -0)°C	-	±20	% (Note 1)
				T_{amb} = +85 ±3°C	-	±20	
				T_{amb} = +105 (+0 -3)°C	-	±30	
2	DC Leakage Current	I_L	Para. 9.4.1.2	T_{amb} = +85 ±3°C V = U_R	-	C_n x U_R	µA
				T_{amb} = +105 (+0 -3)°C V = U_C	-	C_n x U_R	
3	Dissipation Factor	DF	Para. 9.4.1.3 f = 120Hz	T_{amb} = -55 (+3 -0)°C	-	10	%
				T_{amb} = +85 ±3°C	-	12	
				T_{amb} = +105 (+0 -3)°C	-	15	

NOTES:

1. Related to the value measured in Table 2 (during Electrical Measurements at Room Temperature in Chart II of Generic Specification No. 3012).

TABLE 4 - PARAMETER DRIFT VALUES

No.	Characteristics	Symbols	Test Method and Conditions	Change Limits (Δ)	Units
1	Capacitance Change	ΔC/C	As per Table 2	+10 -20	%
2	DC Leakage Current Change	ΔI_L	As per Table 2	+25 (1)	%

NOTES:
1. Leakage currents < 1μA shall be considered as a 1μA value.

TABLE 5(a) – CONDITIONS FOR BURN-IN

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

NOTES:
1. After exposure, the components shall be allowed to cool from elevated temperature to T_{amb} = +25 ±5°C, under normal atmospheric conditions for 1 to 2 hours whilst maintaining the applied voltage. After cooling, the components shall be discharged for a minimum of 5 minutes.

TABLE 5(b) – CONDITIONS FOR OPERATING LIFE

No.	Characteristics	Symbols	Conditions	Units
1	Ambient Temperature 1	T_1	+85 (+0 -3)	°C
2	Test Voltage 1	V_{T1}	U_R	V
3	Ambient Temperature 2	T_2	+105 (+0 -3)	°C
4	Test Voltage 2	V_{T2}	U_C	V

NOTES:
1. After each exposure, the components shall be allowed to cool from elevated temperature to T_{amb} = +25 ±5°C, under normal atmospheric conditions for 1 to 2 hours whilst maintaining the applied voltage. After cooling, the components shall be discharged for a minimum of 5 minutes.

4.8 ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC SPECIFICATION No. 3012)

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} = +25 ±5°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} = +25 ±5°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} = +25 ±5°C.

4.8.4 Conditions for Operating Life (Part of Endurance Testing)
The requirements for Operating Life testing are specified in Section 9 of ESCC Generic Specification No. 3012. The conditions for Operating Life testing shall be as specified in Table 5(b) of this specification.

4.8.5 Electrical Circuit for Operating Life Tests (Figure 5)
Not applicable.

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. 3012		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
01	Mounting	Para. 9.9	**Final Examination**					
			Terminals	Good tinning	-	-	-	-
			Final Measurements					
			Capacitance	Table 2	C	Table 2		µF
			DC Leakage Current	Table 2	I_L	Table 2		µA
			Dissipation Factor	Table 2	DF	Table 2		%
			Equivalent Series Resistance	Table 2	ESR	Table 2		mΩ

No.	ESCC Generic Spec. No. 3012		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
02	Rapid Change of Temperature	Para. 9.3.2	**Initial Measurements**					
			Capacitance	Value recorded during Mounting	C	Table 2		µF
			Final Measurements	Recovery period of 4h min.				
			Visual Examination	No corrosion, no damage or obliteration of marking	-	-	-	-
			Capacitance Change	Table 2	ΔC/C	-10	+10	% (2)
			DC Leakage Current	Table 2	I_L	Table 2		µA
			Dissipation Factor	Table 2	DF	Table 2		%
			Equivalent Series Resistance	Table 2	ESR	Table 2		mΩ
03	External Visual Inspection	Para. 9.5	**Final Inspection**					
			External Visual Inspection	ESCC No. 20500	-	-	-	
04	Adhesion	Para. 9.10	**Initial Measurements**					
			Capacitance	Value recorded during Mounting	C	Table 2		µF
			Final Measurements					
			Visual Examination	No damage or loosing from the substrate	-	-	-	-
			Capacitance Change	Table 2 Item 1	ΔC/C	-10	+10	% (2)
05	Vibration	Para. 9.11	**Measurements during test**	During Last Cycle				
				No intermittent Contact >0.5ms, arcing or open or shorts	-	-	-	-
			Final Examination					
			Visual Examination	No damage	-	-	-	-
06	Shock or Bump	Para. 9.12	**Final Examination**					
			Visual Examination	No damage	-	-	-	-
07	Climatic Sequence	Para. 9.13	**Initial Measurements**					
			Capacitance	Value recorded during Mounting	C	Table 2		µF
			Intermediate Measurements	During Dry Heat				
			DC Leakage Current (at T_{amb} = +105°C)	Table 3	I_L	Table 3		µA
			Final Measurements	After recovery of 1h to 24h				
			External Visual Inspection	ESCC No. 20500	-	-	-	-
			Capacitance Change	Table 2	ΔC/C	-5	+5	% (2)
			DC Leakage Current	Table 2	I_L	Table 2		µA
			Dissipation Factor	Table 2	DF	2 x Table 2		%
			Equivalent Series Resistance	Table 2	ESR	2 x Table 2		mΩ
08	High and Low Temperature Stability	Para. 9.14	**Measurements during test**					
			Electrical Measurements	Tables 2 & 3		Tables 2 & 3		

No.	ESCC Generic Spec. No. 3012		Measurements and Inspections		Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
09	Surge Voltage	Para. 9.15	**Initial Measurements**					
			Capacitance	Table 2 (Note 3)	C	Table 2		µF
			Final Measurements					
			Capacitance Change	Table 2	ΔC/C	-20	+5	% (2)
			DC Leakage Current	Table 2	I_L	Table 2		µA
			Dissipation Factor	Table 2	DF	Table 2		%
			Equivalent Series Resistance	Table 2	ESR	Table 2		mΩ
10	Damp Heat Steady State	Para. 9.16	**Initial Measurements**					
			Capacitance	Value recorded during Mounting	C	Table 2		µF
			Final Measurements	After recovery of 1h to 2h				
			Visual Examination	No damage	-	-	-	-
			Capacitance Change	Table 2	ΔC/C	-5	+35	% (2)
			DC Leakage Current	Table 2	I_L	5 x Table 2		µA
			Dissipation Factor	Table 2	DF	2 x Table 2		%
			Equivalent Series Resistance	Table 2	ESR	2 x Table 2		mΩ
11	Operating Life	Para. 9.17	**Initial Measurements**					
			Capacitance	Value recorded during Mounting	C	Table 2		µF
	(250h & 1000h)		**Intermediate Measurements**	After recovery of 1h to 2h				
			DC Leakage Current (at T_{amb} = +25°C)	Table 2	I_L	1.25 x Table 2		µA
	(1000h & 2000h)		**Final Measurements**	After recovery of 1h to 2h				
			Capacitance Change	Table 2	ΔC/C	-20	+10	% (2)
			DC Leakage Current	Table 2	I_L	1.25 x Table 2		µA
			Dissipation Factor	Table 2	DF	2 x Table 2		%
			Equivalent Series Resistance	Table 2	ESR	2 x Table 2		mΩ
			Visual Examination	No damage	-	-	-	-
12	Permanence of Marking	Para. 9.18	**Final Examination**					
			Visual Examination	ESCC No. 24800	-	-	-	-
13	Solderability	Para. 9.19	**Final Examination**					
			Visual Examination	ESCC No. 3012 Para. 9.13.3 and no damage	-	-	-	-

NOTES:

1. The tests in this Table refer to either Chart IV or V and shall be used as applicable.
2. Referred to the intial measurement.
3. Value recorded during the previous test may be used, if available.

APPENDIX A

AGREED DEVIATIONS FOR KEMET (P)

<table>
<tr><th>Items Affected</th><th>Description of Deviations</th></tr>
<tr><td>Para. 4.2.4 Deviations from Qualification Tests – Chart IV</td><td>Para. 9.18, Permanence of Marking: Not applicable.</td></tr>
<tr><td>Para. 4.2.5 Deviations from Lot Acceptance Tests – Chart V</td><td>Para. 9.18, Permanence of Marking: Not applicable.</td></tr>
<tr><td>Paras 4.5.3, 4.5.3.1 Marking of Rated Voltage</td><td>Rated Voltage may be marked using the actual numeric value instead of the specified code letter, as follows:
• For case code D:
<table>
<tr><th>Rated Voltage U_R (V)</th><th>Code</th></tr>
<tr><td>6.3</td><td>6V</td></tr>
<tr><td>10</td><td>10V</td></tr>
<tr><td>16</td><td>16V</td></tr>
</table>
</td></tr>
</table>

ADDITIONAL DATA – KEMET (P)

(a) KEMET Recommended Soldering Process

See KEMET datasheet for T583 Polymer Electrolytic for Space Applications:
https://content.kemet.com/datasheets/KEM_T2083_T583_SPACE.pdf