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

BASED ON TYPE T584

ESCC Detail Specification No. 3012/007

Issue 1	November 2018



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DCR No.	CHANGE DESCRIPTION



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1 <u>GENERAL</u>

1.1 <u>SCOPE</u>

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 T584. 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 <u>MAXIMUM RATINGS</u>

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 <u>FUNCTIONAL DIAGRAM</u>

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.



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Variant Number	Case Code (Style) (Note 1)	Capacitance Values C _n (μF) (Note 2)	Rated Voltage U _R (V)	Maximum Equivalent Series Resistance ESR (mΩ)	Weight Max (g)
01	Х	220	10	10, 12, 15	0.5
	(7343-43)	330	6.3	10, 12	
			10	10, 12, 15	
		470	6.3	10, 12	

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

NOTES:

- 1. See Figure 2.
- 2. The following Capacitance Tolerance is available:

• ±20% (M)



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			Ma in Dations	11.26	Describe
No.	Characteristics	Symbols	Maximum Ratings	Units	Remarks
1	Rated Voltage	UR	See Table 1(a)	V	Note 1,
					See Figure 1(a)
2	Surge Voltage	Us	1.3 x U _R	V	T _{amb} ≤ +85°C
3	Category Voltage	Uc	0.9 x U _R	V	See Figure 1(a)
4	Ripple Current	Iripple	See Note 2	A	f = 100kHz, Note 2, See Figure 1(b)
5	Operating Temperature Range	T _{op}	-55 to +105	°C	T _{amb}
6	Rated Temperature	T _R	+85	°C	
7	Upper Category Temperature	Tc	+105	°C	
8	Storage Temperature Range	T _{stg}	-55 to +105	°C	Note 3
9	Soldering Temperature	T _{sol}	+235	°C	Notes 3, 4

TABLE 1(b) - MAXIMUM RATINGS

NOTES:

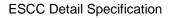
- 1. At $T_{amb} \le +85^{\circ}$ C. For derating at $T_{amb} > +85^{\circ}$ C, derate linearly to U_c at $T_{amb} = +105^{\circ}$ C.
- 2. Maximum I_{ripple}, which depends on C_n, U_R, and ESR, shall be as follows at T_{amb} \leq +45°C; derate linearly to 0.7I_{ripple} at T_{amb} = +85°C and to 0.47I_{ripple}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

Capacitance	Rated Voltage	Maximum Equivalent Series Resistance	Maximum Ripple Current
Cn (µF)	U _R (V)	ESR (mΩ)	Iripple (A)
220	10	10	5.196
220	10	12	4.743
220	10	15	4.243
330	6.3	10	5.196
330	6.3	12	4.743
330	10	10	5.196
330	10	12	4.743
330	10	15	4.243
470	6.3	10	5.196
470	6.3	12	4.743

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 $T_{amb} \leq +40^{\circ}C$ and relative humidity RH $\leq 90\%$.

These components have a floor life of 168 hours at $T_{amb} \le +30^{\circ}C$ and $RH \le 60\%$.

4. Duration 20 seconds maximum for reflow soldering.



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FIGURE 1 – PARAMETER DERATING INFORMATION

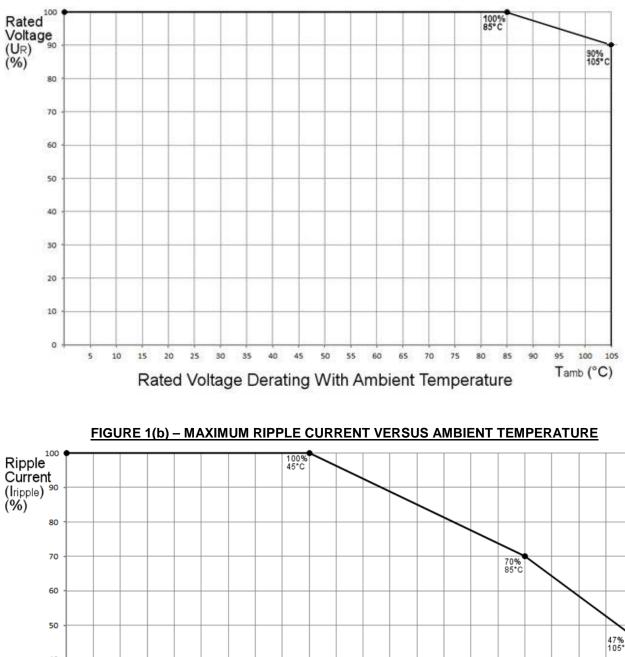


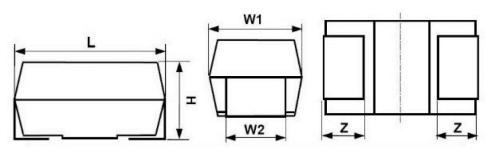
FIGURE 1(a) – RATED VOLTAGE VERSUS AMBIENT TEMPERATURE

47% 105°C Tamb (°C) **Ripple Current Derating With Ambient Temperature**



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FIGURE 2 - PHYSICAL DIMENSIONS



Variant Number	Case Code		Dimensions (mm)								
Number	Code	L H		W1		W2		Z			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
01	Х	7	7.6	3.8	4.4	4	4.6	2.3	2.5	1	1.6

FIGURE 3 - FUNCTIONAL DIAGRAM



Terminal 1: Anode

Terminal 2: Cathode



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4 **REQUIREMENTS**

4.1 <u>GENERAL</u>

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 <u>Deviations from Special In-Process Controls</u> None.
- 4.2.2 <u>Deviations from Final Production Tests Chart II</u>
 - (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 ($T_{amb} = +105^{\circ}C$ only).
 - iii. Surge Current Test in accordance with Para. 9.20 with a test temperature: $T_{amb} = +25 \pm 5^{\circ}C$.
- 4.2.3 <u>Deviations from Burn-in and Electrical Measurements Chart III</u> 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 $T_{amb} = +25 \pm 5^{\circ}C$ 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 $T_{amb} = +25 \pm 5^{\circ}$ 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).



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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 <u>Terminal Material and Finish</u>

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 <u>MARKING</u>

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: 301200701B337MAE010

- Detail Specification Reference: 3012007
- Component Type Variant Number: 01 (as required)
- Testing Level: B (B or C, as required)
- Characteristic code: Rated Capacitance (330µF): 337 (as required)
- Characteristic code: Capacitance Tolerance (±20%): M
- Rating code: Rated Voltage (10V): A (as required)
- Characteristic code: Maximum Equivalent Series Resistance (10mΩ): E010 (as required)



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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 Cn (pF)	Code
XX10 ⁷	XX7

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

Tolerance (± %)	Code
20	М

(c) Rated Voltage expressed by the following codes:

Rated Voltage U _R (V)	Code
6.3	J
10	А

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

Equivalent Series Resistance ESR (mΩ)	Code
XX	E0XX

4.5.4 <u>Traceability Information</u>

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

4.6 ELECTRICAL MEASUREMENTS

- 4.6.1 <u>Electrical Measurements at Room Temperature</u> The parameters to be measured at room temperature are scheduled in Table 2. Unless otherwise specified the measurements shall be performed at $T_{amb} = +25 \pm 5^{\circ}C$.
- 4.6.2 <u>Electrical Measurements at High and Low Temperatures</u> The parameters to be measured at high and low temperatures are scheduled in Table 3.
- 4.6.3 <u>Circuits for Electrical Measurements (Figure 4)</u> Not applicable.



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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 $T_{amb} = +25 \pm 5^{\circ}$ 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 <u>Electrical Circuit for Burn-in (Figure 5)</u> Not applicable

No.	Characteristics	Symbols	ESCC 3012 Test Method	Tolerance	L	imits	Units
			Test Method		Min	Max	
1	Capacitance	С	Para. 9.4.1.1	±20%	0.8Cn	1.2C _n	μF
2	DC Leakage Current	١L	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 2 – ELECTRICAL MEASUREMENTS AT ROOM TEMPERATURE

TABLE 3 - ELECTRICAL MEASUREMENTS AT HIGH AND LOW TEMPERATURES

No.	Characteristics	Symbols	ESCC 3012	Test Conditions	Limits		Units
	Test Method			Min	Max		
1	Capacitance	∆C/C	Para. 9.4.1.1	T _{amb} = -55 (+3 -0)°C	-	±20	%
	Change			$T_{amb} = +85 \pm 3^{\circ}C$	-	±20	(Note 1)
				T _{amb} = +105 (+0 -3)°C	-	±30	
2	DC Leakage Current	١L	Para. 9.4.1.2	T_{amb} = +85 ±3°C V = U _R	-	C _n x U _R	μA
				$T_{amb} = +105 (+0 -3)^{\circ}C$ V = U _C	-	C _n x U _R	
3	Dissipation Factor	DF		T _{amb} = -55 (+3 -0)°C	-	10	%
			f = 120Hz	$T_{amb} = +85 \pm 3^{\circ}C$	-	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	$\Delta C/C$	As per Table 2	+10, -20	%
2	DC Leakage Current Change	Δll	As per Table 2	+25 (1)	%

NOTES:

1. Leakage currents < 1μ A shall be considered as a 1μ A 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	VT	U _R	V

NOTES:

1. After exposure, the components shall be allowed to cool from elevated temperature to $T_{amb} = +25 \pm 5^{\circ}C$, 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.

No.	Characteristics	Symbols	Conditions	Units
1	Ambient Temperature 1	T ₁	+85 (+0 -3)	°C
2	Test Voltage 1	V _{T1}	Ur	V
3	Ambient Temperature 2	T ₂	+105 (+0 -3)	°C
4	Test Voltage 2	V_{T2}	Uc	V

TABLE 5(b) - CONDITIONS FOR OPERATING LIFE

NOTES:

1. After each exposure, the components shall be allowed to cool from elevated temperature to $T_{amb} = +25 \pm 5^{\circ}C$, 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 <u>ENVIRONMENTAL AND ENDURANCE TESTS (CHARTS IV AND V OF ESCC GENERIC</u> <u>SPECIFICATION No. 3012)</u>
- 4.8.1 <u>Measurements and Inspections on Completion of Environmental Tests</u> 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 $T_{amb} = +25 \pm 5^{\circ}C.$
- 4.8.2 <u>Measurements and Inspections at Intermediate Points During Endurance Tests</u> 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 $T_{amb} = +25 \pm 5^{\circ}C$.
- 4.8.3 <u>Measurements and Inspections on Completion of Endurance Tests</u> 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 $T_{amb} = +25 \pm 5^{\circ}C.$
- 4.8.4 <u>Conditions for Operating Life (Part of Endurance Testing)</u> 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 <u>Electrical Circuit for Operating Life Tests (Figure 5)</u> 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 Spe	ec. No. 3012	Measurements a	nd 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 Final Measurements	Good tinning	-	-	-	-
			Capacitance DC Leakage Current Dissipation Factor Equivalent Series Resistance	Table 2 Table 2 Table 2 Table 2	C I∟ DF ESR	Tab Tab	i ble 2 ble 2 ble 2 ble 2	μF μA % mΩ



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No.	ESCC Generic Spe	ec. No. 3012			Symbols	ymbols Limits		
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification			Min	Max	
02	Rapid Change of	Para. 9.3.2	Initial Measurements					
	Temperature		Capacitance	Value recorded during Mounting	С	Tab	le 2	μF
			Final Measurements	Recovery period of 4h min.				
			Visual Examination	No corrosion, no damage or obliteration of marking	-	-	-	-
			Capacitance Change	Table 2	$\Delta C/C$	-10	+10	% (2)
			DC Leakage Current	Table 2	١L	Tab	le 2	μA
			Dissipation Factor	Table 2	DF	Tab	le 2	%
			Equivalent Series Resistance	Table 2	ESR	Tab	le 2	mΩ
03	External Visual	Para. 9.5	Final Inspection					
	Inspection		External Visual Inspection	ESCC No. 20500	-	-	-	
04	Adhesion	Para. 9.10	Initial Measurements					
			Capacitance Value recorded during C Table 2 Mounting		le 2	μF		
			Final Measurements					
			Visual Examination	No damage or loosing from the substrate	-	-	-	-
			Capacitance Change	Table 2 Item 1	∆C/C	-10	+10	% (2)
05	Vibration	Para. 9.11	Measurements during	During Last Cycle				
			test	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	С	Tab	le 2	μF
			Intermediate Measurements	During Dry Heat				
			DC Leakage Current (at T _{amb} = +105°C)	Table 3	۱L	Tab	le 3	μA
			Final Measurements	After recovery of 1h to 24h				
			External Visual Inspection	ESCC No. 20500	-	-	-	-
			Capacitance Change	Table 2	$\Delta C/C$	-5	+5	% (2)
			DC Leakage Current	Table 2	١L	Tab	le 2	μA
			Dissipation Factor	Table 2	DF	2 x Ta	able 2	%
			Equivalent Series Resistance	Table 2	ESR	2 x Ta	able 2	mΩ

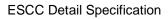


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No.	ESCC Generic Spec. No. 3012		Measurements a	nd Inspections	Symbols	Limits		Units
	Environmental and Endurance Tests (Note 1)	Test Methods and Conditions	Identification	Conditions		Min	Max	
08	High and Low Temperature	Para. 9.14	Measurements during test					
	Stability		Electrical Measurements	Tables 2 & 3		Tables	\$2&3	
09	Surge Voltage	Para. 9.15	Initial Measurements Capacitance	Table 2 (Note 3)	С	Tab	le 2	μF
			Final Measurements					
			Capacitance Change	Table 2	∆C/C	-20	+5	% (2)
			DC Leakage Current	Table 2	١L	Tab	le 2	μA
			Dissipation Factor	Table 2	DF	Tab	le 2	%
			Equivalent Series Resistance	Table 2	ESR	Tab	le 2	mΩ
10	Damp Heat	Para. 9.16	Initial Measurements					
	Steady State		Capacitance	Value recorded during Mounting	С	Tab	le 2	μF
			Final Measurements	After recovery of 1h to 2h				
			Visual Examination	No damage	-	-	-	-
			Capacitance Change	Table 2	∆C/C	-5	+35	% (2)
			DC Leakage Current	Table 2	١L	5 x Ta	able 2	μA
			Dissipation Factor	Table 2	DF	2 x Ta	able 2	%
			Equivalent Series Resistance	Table 2	ESR	2 x Ta	able 2	mΩ
11	Operating Life	Para. 9.17	Initial Measurements					
			Capacitance	Value recorded during Mounting	С	Tab	le 2	μF
	(250h & 1000h)		Intermediate Measurements	After recovery of 1h to 2h				
			DC Leakage Current (at T _{amb} = +25°C)	Table 2	١L	1.25 x ⁻	Table 2	μA
	(1000h & 2000h)		Final Measurements	After recovery of 1h to 2h				
			Capacitance Change	Table 2	∆C/C	-20	+10	% (2)
			DC Leakage Current	Table 2	١L		Table 2	μA
			Dissipation Factor	Table 2	DF		able 2	%
			Equivalent Series Resistance	Table 2	ESR	2 x Ta	able 2	mΩ
		_	Visual Examination	No damage	-	-	-	-
12	Permanence of Marking	Para. 9.18	Final Examination					
40	-	Date: 0.40	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 initial measurement.
- 3. Value recorded during the previous test may be used, if available.





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APPENDIX A AGREED DEVIATIONS FOR KEMET (P)

Items Affected	Description of Deviations				
Para. 4.2.4 Deviations from Qualification Tests – Chart IV	Para. 9.18, Permanence of Marking: Not applicable.				
Para. 4.2.5 Deviations from Lot Acceptance Tests – Chart V	Para. 9.18, Permanence of Marking: Not applicable.				
Para. 4.5.3.1(c), Marking of Rated Voltage	Rated Voltage may be marked using the actual numeric value instead of the specified code letter, as follows:For case code X:				
		Rated Voltage U _R (V)	Code		
		6.3	6V		
		10	10V		