CAPACITORS, FIXED, DC SELF-HEALING, METALLISED POLYESTER FILM DIELECTRIC

BASED ON TYPE MKT

ESCC Detail Specification No. 3006/019

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DOCUMENTATION CHANGE NOTICE

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DCR No.	CHANGE DESCRIPTION
1521, 1522	Specification updated to incorporate changes per DCR.

TABLE OF CONTENTS

1 GENERAL

1.1 SCOPE

This specification details the ratings, physical and electrical characteristics, and test and inspection data for the component type variants and/or the range of components specified below. It supplements the requirements of, and shall be read in conjunction with, the ESCC Generic Specification listed under Applicable Documents.

1.2 APPLICABLE DOCUMENTS

The following documents form part of this specification and shall be read in conjunction with it:

(a) ESCC Generic Specification No. 3006.

(b) MIL-PRF-87217, Capacitors, Fixed, Supermetallized Plastic Film Dielectric, DC for Low Energy, High Impedance Applications.

1.3 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.

1.4 THE ESCC COMPONENT NUMBER AND RANGE OF COMPONENTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 300601901155KH

- Detail Specification Reference: 3006019
- Component Type Variant Number: 01 (See Note 1)
- Characteristic code: Capacitance Value (1.5µF): 155 (as required)
- Characteristic code: Capacitance Tolerance (±10%): K (as required)
- Rating code: Rated Voltage (250V): H (as required)

NOTES:

1. Marking of the Component Type Variant Number is mandatory. No further reference to type variant number is made in this specification.

1.4.1.2 Characteristics and Ratings Codes

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

(a) Capacitance Value, C, expressed by means of the following codes in accordance with ESCC Basic Specification No. 21700. The unit quantity shall be picrofarads (pF).

Capacitance Value C (pF)	Code
XX 10^3	XX3
XX 10^4	XX4
XX 10^5	XX5
XX 10^6	XX6
XX 10^7	XX7

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

Tolerance (±)	Code Letter
5%	J
10%	K
20%	M

(c) DC Rated Voltage, U_R, expressed by the following codes:

DC Rated Voltage U_R (V)	Code Letter
50	C
100	E
160	F
250	H
630	Z

1.4.2 Range of Components

The range of components applicable to this specification are as follows:

Capacitance Value (C) (µF) (Note 1)	DC Rated Voltage (U_R) Max (V)	Dimensions (mm) (See Para. 1.6)		Weight Max (g)
		ØA Max	B Max	
0.47	50	7.4	18.5	1.6
0.68	50	7.4	18.5	1.6
1	50	8.4	18.5	2.2
1	50	9.4	18.5	2.6
1.5	50	9.4	18.5	2.6
2.2	50	9.4	21	2.6
3.3	50	10.7	21	2.9
4.7	50	10.7	21	2.9
6.8	50	12.7	21	4.1
10	50	13.7	21	6
0.1	100	7.4	18.5	1.6
0.15	100	7.4	18.5	1.6
0.22	100	8.4	18.5	2.2
0.33	100	8.4	18.5	2.2
0.47	100	8.4	18.5	2.2
0.68	100	8.4	18.5	2.2
1	100	8.4	21	2.5
1.5	100	8.4	21	2.5

Capacitance Value (C) (µF) (Note 1)	DC Rated Voltage (U_R) Max (V)	Dimensions (mm) (See Para. 1.6)		Weight Max (g)
		ØA Max	B Max	
2.2	100	9.4	21	2.9
3.3	100	10.7	21	3.3
4.7	100	11.7	21	3.6
6.8	100	10.7	34	5.4
10	100	12.7	34	8
22	100	15.7	34	11
47	100	21.7	34	23
100	100	29.7	34	30
0.1	160	7.4	18.5	2.2
0.15	160	7.4	18.5	2.2
0.22	160	8.4	18.5	2.6
0.33	160	8.4	18.5	2.6
0.47	160	8.4	21	2.9
0.68	160	9.4	21	3.6
1	160	10.7	21	4.8
1.5	160	11.7	21	5.1
2.2	160	12.7	21	5.8
3.3	160	11.7	34	9.5
4.7	160	12.7	34	11
6.8	160	14.7	34	17
10	160	16.7	34	19
0.1	250	8.4	18.5	2.2
0.15	250	8.4	18.5	2.2
0.22	250	9.4	18.5	2.6
0.33	250	9.4	21	3.3
0.47	250	9.4	21	3.3
0.68	250	10.7	21	4.1
1	250	11.7	21	4.7
1.5	250	13.7	21	5.8
2.2	250	15.7	21	6.3
3.3	250	14.7	34	11
4.7	250	16.7	34	14
6.8	250	18.7	34	20
10	250	21.7	34	30
0.033	630	8.4	18.5	2.2

Capacitance Value (C) (µF) (Note 1)	DC Rated Voltage (U_R) Max (V)	Dimensions (mm) (See Para. 1.6)		Weight Max (g)
		ØA Max	B Max	
0.047	630	9.4	18.5	2.8
0.068	630	8.4	21	2.6
0.1	630	9.4	21	2.8
0.15	630	10.7	21	2.9
0.22	630	11.7	21	3.6
0.22	630	12.7	18.5	3.8
0.33	630	13.7	21	5.8
0.47	630	12.7	25	4.8
0.47	630	15.7	21	6
0.68	630	13.7	34	9
1	630	15.7	34	11
1.5	630	18.7	34	14.5
2.2	630	21.7	34	19
3.3	630	25.7	34	25
4.7	630	29.7	34	30

NOTES:
1. All Capacitance Values are available with tolerances of ±5%, ±10% and ±20%.

1.5 MAXIMUM RATINGS

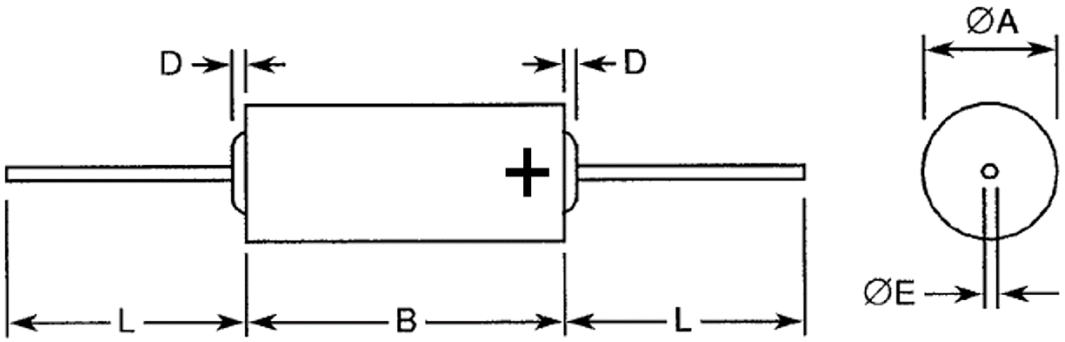
The maximum ratings shall not be exceeded at any time during use or storage.

Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
DC Rated Voltage	U_R	50, 100, 160, 250, 630	V	Notes 1, 2
AC Rated Voltage	U_A	35%U_R	Vrms	50/60Hz
Operating Temperature Range	T_{op}	-55 to +100	°C	T_{amb}
Storage Temperature Range	T_{stg}	-55 to +100	°C	
Soldering Temperature	T_{sol}	+235	°C	Note 3

NOTES:
1. As required; See Para. 1.4.2.
2. At $T_{amb} \leq +85°C$. For $T_{amb} > 85°C$, derate linearly to 80%U_R at $T_{amb} = +100°C$.
3. Duration 5 seconds maximum at a distance of not less than 6mm from the case and the same lead shall not be resoldered until 3 minutes have elapsed.

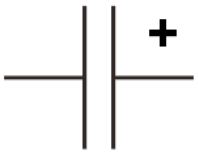
1.6 PHYSICAL DIMENSIONS AND TERMINAL IDENTIFICATION



Symbols	Dimensions (mm)	
	Min	Max
D	-	1.5
ØE (ØA < 8.5mm)	0.59	0.65
ØE (8.5mm ≤ ØA ≤ 15mm)	0.75	0.88
ØE (ØA > 15mm)	0.95	1.05
L	35	45

NOTES:
1. The limits of Dimensions ØA and B are defined in Para. 1.4.2.
2. Terminal identification: A voltage polarity symbol shall be marked on the body, as shown, adjacent to the lead which should be connected to the highest potential.

1.7 FUNCTIONAL DIAGRAM



NOTES:
1. These capacitors are not polarised; however, marking includes the voltage polarity symbol (see Para. 1.6) which should be respected in use.

1.8 MATERIALS AND FINISHES

1.8.1 Lead Material
The lead material shall be Type A in accordance with the requirements of ESCC Basic Specification No. 23500.

1.8.2 Lead Finish
The lead finish shall be 95% tin, remainder lead.

2 REQUIREMENTS

2.1 GENERAL

The complete requirements for procurement of the components specified herein are as stated in this specification and the ESCC Generic Specification. Permitted deviations from the Generic Specification, applicable to this specification only, are listed below.

Permitted 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 requirement and do not affect the component's reliability, are listed in the appendices attached to this specification.

2.1.1 Deviations from the Generic Specification

2.1.1.1 Deviations from Qualification and Periodic Tests – Chart F4

(a) Operating Life:
- Test Condition (b), Temperature: +85 (+0 -5)°C
- Test Condition (c), Applied voltage: 1.25×U_R

(b) A new Subgroup 4, Electrical Subgroup, sample size 10 components and consisting of a Voltage Ramp test shall be added to Chart F4. No failures are permitted.
The test shall be performed in accordance with Para. 4.7.4 of MIL-PRF-87217 and the following test conditions shall apply:
- Upper temperature extreme: +90°C
- Lower temperature extreme: -50°C
- Test voltage: 0 to 30VDC
- Charge time: 2V/minute

The Leakage Current of the components shall be measured during the test. The following Leakage Current limits apply:
- For $U_R \leq 250V$ and $C \leq 1\mu F$: 0.5µA
- For $U_R \leq 250V$ and $C > 1\mu F$: 0.5µA × C (in µF)
- For $U_R = 630V$ and $C \leq 1\mu F$: 0.05µA
- For $U_R = 630V$ and $C > 1\mu F$: 0.05µA × C (in µF)

2.2 MARKING

The marking shall be in accordance with the requirements of ESCC Basic Specification No. 21700 and as follows.

The information to be marked on the component shall be:

(a) Terminal Identification (see Para. 1.6).
(b) The ESCC qualified components symbol (for ESCC qualified components only).
(c) The ESCC Component Number (see Para. 1.4.1).
(d) Traceability information.

2.3 ROBUSTNESS OF TERMINATIONS

The test conditions for Robustness of Terminations shall be as specified in the ESCC Generic Specification and as follows:

- Test Ua, with an applied force of 10N and a duration of 7.5 ±2.5s.

Both leads of the component shall be tested.

2.4 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

Electrical measurements shall be performed at room, high and low temperatures.

2.4.1 Room Temperature Electrical Measurements

The measurements shall be performed at T_{amb} = +22 ±3°C.

Characteristics	Symbols	Test Method and Conditions	Limits		Units
			Min	Max	
Capacitance	C	ESCC No. 3006 Test Frequency = 1kHz	Note 1	Note 2	µF
Tangent of Loss Angle	tgδ	ESCC No. 3006 Test Frequency = 1kHz	-	10×10^{-3}	-
Insulation Resistance, Dielectric	R_I	ESCC No. 3006 C ≤ 0.33µF C > 0.33µF	 15 5000	 - -	 GΩ GΩ.nF
Insulation Resistance, Body Insulation	R_{IB}	ESCC No. 3006	15	-	GΩ
Voltage Proof, Terminal-to-Terminal	VP	ESCC No. 3006	$1.6\times U_R$ (Note 3)	-	V
Voltage Proof, Terminal-to-Case	VP_B	ESCC No. 3006 U_R = 50V $U_R \geq$ 100V (Note 3)	 200 $2\times U_R$ (Note 3)	 - -	 V V

NOTES:

1. Capacitance Value of the component minus the applicable Tolerance (see Para. 1.4.2).
2. Capacitance Value of the component plus the applicable Tolerance (see Para. 1.4.2).
3. For the applicable Rated Voltage (U_R) see Para. 1.4.2.

2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Temperature Coefficient	ΔC/C	ESCC No. 3006 Test Frequency = 1kHz T_{amb} = -55 ±2°C T_{amb} = +100 ±2°C	 - -	 -15 (Note 2) +8 (Note 2)	 % %

NOTES:

1. The measurements shall be performed on a sample of 6 components from each manufacturing lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed.
2. The Temperature Coefficient limits are with respect to the capacitance at +22 ±2°C (reference point temperature).

2.5 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

Unless otherwise specified, the measurements shall be performed at T_{amb} = +22 ±3°C.

Unless otherwise specified the test methods and test conditions shall be as per the corresponding test defined in Para. 2.4.1, Room Temperature Electrical Measurements.

Test Reference per ESCC No. 3006	Characteristics	Symbols	Limits		Units
			Min	Max	
Resistance to Soldering Heat					
Initial Measurements	Capacitance	C	Note 1		µF
Final Measurements	Capacitance	C	Note 1		µF
	Change in Capacitance	ΔC/C	-5	+15	%
	Insulation Resistance, Dielectric	R_I			
	C ≤ 0.33µF		Note 1	-	GΩ
	C > 0.33µF		Note 1	-	GΩ.nF
	Tangent of Loss Angle	tgδ	-	Note 1	-
Temperature Coefficient	Temperature Coefficient (Note 2)	ΔC/C	Note 3		%
Rapid Change of Temperature					
Initial Measurements	Capacitance	C	Note 1		µF
Final Measurements	Capacitance	C	Note 1		µF
	Change in Capacitance	ΔC/C	-5	+15	%
	Tangent of Loss Angle	tgδ	-	Note 4	-
Climatic Sequence					
Initial Measurements	Capacitance	C	Note 1		µF
Final Measurements	Voltage Proof (Sleeve)	VP_S	4	-	kV
	Insulation Resistance (Sleeve)	R_{IS}	10	-	GΩ
	Capacitance	C	Note 1		µF
	Change in Capacitance	ΔC/C	-5	+15	%
	Tangent of Loss Angle	tgδ	-	Note 4	-
	Voltage Proof, Terminal-to-Terminal	VP	$2\times U_R$ (Note 5)	-	V
	Voltage Proof, Terminal-to-Case	VP_B			V
	U_R = 50V		Note 1	-	
	U_R ≥ 100V		Note 1	-	
	Insulation Resistance, Dielectric	R_I			
	C ≤ 0.33µF		150	-	MΩ
	C > 0.33µF		50	-	MΩ.µF
	Insulation Resistance, Body Insulation	R_{IB}	5	-	GΩ

Test Reference per ESCC No. 3006	Characteristics	Symbols	Limits		Units
			Min	Max	
Operating Life					
Initial Measurements	Capacitance	C	Note 1		µF
Intermediate Measurements (1000 hours)	Capacitance	C	Note 1		µF
	Change in Capacitance	ΔC/C	-5	+15	%
Final Measurements (1000 or 2000 hours) (Note 6)	Capacitance	C	Note 1		µF
	Change in Capacitance	ΔC/C	-5	+15	%
	Tangent of Loss Angle	tgδ	-	Note 4	-
	Insulation Resistance, Dielectric	R_I			
	C ≤ 0.33µF		Note 7	-	GΩ
	C > 0.33µF		Note 7	-	GΩ.nF
	Insulation Resistance, Body Insulation	R_{IB}	5	-	GΩ

NOTES:

1. As specified in Para. 2.4.1.
2. The test method and test conditions shall be as specified in Para. 2.4.2.
3. As specified in Para. 2.4.2.
4. 1.5× the limit specified in Para. 2.4.1.
5. For the applicable Rated Voltage (U_R) see Para. 1.4.2.
6. 1000 hours is applicable to Periodic Testing for extension of qualification. 2000 hours is applicable to Qualification Testing, and to Periodic Testing for renewal of qualification after lapse.
7. 50% of the limit specified in Para. 2.4.1.

2.6 BURN-IN CONDITIONS

Characteristics	Symbols	Conditions (Note 1)	Units
Ambient Temperature	T_{amb}	+85 (+0 -5)	°C
Test Voltage	V_T	1.25×U_R (Note 2)	V

NOTES:

1. On completion of Burn-in the components shall be removed from the burn-in chamber and allowed to cool, under normal atmospheric conditions, for recovery for 24 ±2 hours.
2. For the applicable Rated Voltage (U_R) see Para. 1.4.2.

APPENDIX 'A'

AGREED DEVIATIONS FOR EXXELIA TECHNOLOGIES (F)

Items Affected	Description of Deviations
Para. 2.1.1, Deviations from the Generic Specification: Deviations from Screening Tests – Chart F3	If a particular lot is required to undergo testing in accordance with Chart F4 then the results of the Temperature Coefficient measurements, made during High and Low Temperatures Electrical Measurements on a sample of 6 randomly-selected capacitors, shall be recorded.
Para. 2.1.1.1, Deviations from Qualification and Periodic Tests – Chart F4	The Temperature Coefficient measurements recorded during Screening Tests may be used in lieu of the performance of the Temperature Coefficient test as specified in Subgroup 2B of Chart F4.