



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

BASED ON TYPE PM90S

ESCC Detail Specification No. 3006/020

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DCR No.	CHANGE DESCRIPTION
1712	Specification updated to incorporate changes per DCR.

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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 Component Type Variants and 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](#).

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 COMPONENT TYPE VARIANTS

1.4.1 The ESCC Component Number

The ESCC Component Number shall be constituted as follows:

Example: 300602001155KH

- Detail Specification Reference: 3006020
- Component Type Variant Number: 01 (as required)
- Characteristic code: Capacitance Value (1.5 μ F): 155 (as required)
- Characteristic code: Capacitance Tolerance ($\pm 10\%$): K (as required)
- Rating code: Rated Voltage (250V): H (as required)

1.4.1.1 *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 picofarads (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
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
250	H
400	K
630	Z

1.4.2 Component Type Variants and Range of Components

1.4.2.1 *Component Type Variants*

24 Component Type Variants are defined in this specification and three different package types are available, as follows:

- Radial lead package: Component Type Variants 01 to 08
- Surface mount package with bar-type terminations: Component Type Variants 09 to 16
- Surface mount package with tab-type terminations: Component Type Variants 17 to 24

Eight different sizes are therefore available for each package type. See Para. 1.6 for details.

1.4.2.2 *Range of Components*

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

DC Rated Voltage (U_R) Max (V)	Capacitance Value C (μ F) (Note 1)	AC Rated Current (I_{RA}) Max (Arms)	Available Type Variants (See Para 1.6)	Weight Max (g)
50	8.2	3.1	01, 09, 17	4.9
50	10	3.8	01, 09, 17	4.9
50	12	4	01, 09, 17	4.9
50	15	5	02, 10, 18	6
50	18	6.9	03, 11, 19	9.5
50	22	8.4	03, 11, 19	9.5
50	27	10.4	04, 12, 20	13.6
50	33	12.5	04, 12, 20	13.6
50	33	7.2	06, 14, 22	21.2
50	39	12.5	04, 12, 20	13.6
50	39	8.5	06, 14, 22	21.2

DC Rated Voltage (U _R) Max (V)	Capacitance Value C (μF) (Note 1)	AC Rated Current (I _{RA}) Max (Arms)	Available Type Variants (See Para 1.6)	Weight Max (g)
50	47	12.5	05, 13, 21	20.4
50	47	10.3	06, 14, 22	21.2
50	56	12.5	05, 13, 21	20.4
50	68	15	07, 15, 23	37.3
50	82	15	07, 15, 23	37.3
50	100	15	07, 15, 23	37.3
50	120	15	08, 16, 24	54.2
50	150	15	08, 16, 24	54.2
100	3.3	1.6	01, 09, 17	4.9
100	3.9	2	01, 09, 17	4.9
100	4.7	2.4	01, 09, 17	4.9
100	5.6	2.8	01, 09, 17	4.9
100	6.8	3.1	01, 09, 17	4.9
100	8.2	3.7	02, 10, 18	6
100	10	5.1	03, 11, 19	9.5
100	12	6.1	03, 11, 19	9.5
100	15	7.7	04, 12, 20	13.6
100	18	9.2	04, 12, 20	13.6
100	18	6.3	06, 14, 22	21.2
100	22	10.1	04, 12, 20	13.6
100	22	7.7	06, 14, 22	21.2
100	27	12.5	05, 13, 21	20.4
100	33	12.5	05, 13, 21	20.4
100	33	11.4	06, 14, 22	21.2
100	39	13.5	07, 15, 23	37.3
100	47	15	07, 15, 23	37.3
100	56	15	07, 15, 23	37.3
100	68	15	08, 16, 24	54.2
100	82	15	08, 16, 24	54.2
100	100	15	08, 16, 24	54.2
250	1	1.2	01, 09, 17	4.9
250	1.2	1.3	01, 09, 17	4.9
250	1.5	1.5	01, 09, 17	4.9
250	1.8	1.8	01, 09, 17	4.9
250	2.2	2.2	01, 09, 17	4.9
250	2.7	2.8	01, 09, 17	4.9

DC Rated Voltage (U_R) Max (V)	Capacitance Value C (μ F) (Note 1)	AC Rated Current (I_{RA}) Max (Arms)	Available Type Variants (See Para 1.6)	Weight Max (g)
250	3.3	3.4	02, 10, 18	6
250	3.9	4	02, 10, 18	6
250	4.7	4.8	03, 11, 19	9.5
250	5.6	5.8	03, 11, 19	9.5
250	6.8	7.5	04, 12, 20	13.6
250	6.8	4.6	06, 14, 22	21.2
250	8.2	8.5	04, 12, 20	13.6
250	10	10.3	04, 12, 20	13.6
250	10	6.7	06, 14, 22	21.2
250	12	12.4	05, 13, 21	20.4
250	12	8	06, 14, 22	21.2
250	15	12.5	05, 13, 21	20.4
250	18	12	07, 15, 23	37.3
250	22	15	07, 15, 23	37.3
250	27	15	07, 15, 23	37.3
250	33	15	08, 16, 24	54.2
250	39	15	08, 16, 24	54.2
400	0.39	1.1	01, 09, 17	4.9
400	0.47	1.3	01, 09, 17	4.9
400	0.56	1.3	01, 09, 17	4.9
400	0.68	1.6	01, 09, 17	4.9
400	0.82	1.9	01, 09, 17	4.9
400	1	2.4	02, 10, 18	6
400	1.2	2.9	02, 10, 18	6
400	1.5	3.6	03, 11, 19	9.5
400	1.8	4.3	03, 11, 19	9.5
400	2.2	5.3	04, 12, 20	13.6
400	2.2	3	06, 14, 22	21.2
400	2.7	6	04, 12, 20	13.6
400	3.3	7.9	04, 12, 20	13.6
400	3.3	4.5	06, 14, 22	21.2
400	3.9	9.4	05, 13, 21	20.4
400	4.7	11.3	05, 13, 21	20.4
400	4.7	6.4	06, 14, 22	21.2
400	5.6	7.6	07, 15, 23	37.3
400	6.8	9.3	07, 15, 23	37.3

DC Rated Voltage (U _R) Max (V)	Capacitance Value C (μF) (Note 1)	AC Rated Current (I _{RA}) Max (Arms)	Available Type Variants (See Para 1.6)	Weight Max (g)
400	8.2	11.5	07, 15, 23	37.3
400	10	14	07, 15, 23	37.3
400	12	15	08, 16, 24	54.2
400	15	15	08, 16, 24	54.2
630	0.22	0.9	01, 09, 17	4.9
630	0.27	1.1	01, 09, 17	4.9
630	0.33	1.3	02, 10, 18	6
630	0.39	1.6	02, 10, 18	6
630	0.47	1.9	03, 11, 19	9.5
630	0.56	2.3	03, 11, 19	9.5
630	0.68	2.8	03, 11, 19	9.5
630	0.82	3.3	04, 12, 20	13.6
630	1	4.1	04, 12, 20	13.6
630	1	2.2	06, 14, 22	21.2
630	1.2	5	04, 12, 20	13.6
630	1.5	6.1	05, 13, 21	20.4
630	1.5	3.3	06, 14, 22	21.2
630	1.8	7.3	05, 13, 21	20.4
630	1.8	4	06, 14, 22	21.2
630	2.2	4.9	07, 15, 23	37.3
630	2.7	6	07, 15, 23	37.3
630	3.3	7.3	07, 15, 23	37.3
630	3.9	8.7	07, 15, 23	37.3
630	4.7	10.3	08, 16, 24	54.2
630	5.6	12.5	08, 16, 24	54.2

NOTES:

1. All Capacitance Values are available with tolerances of ±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.

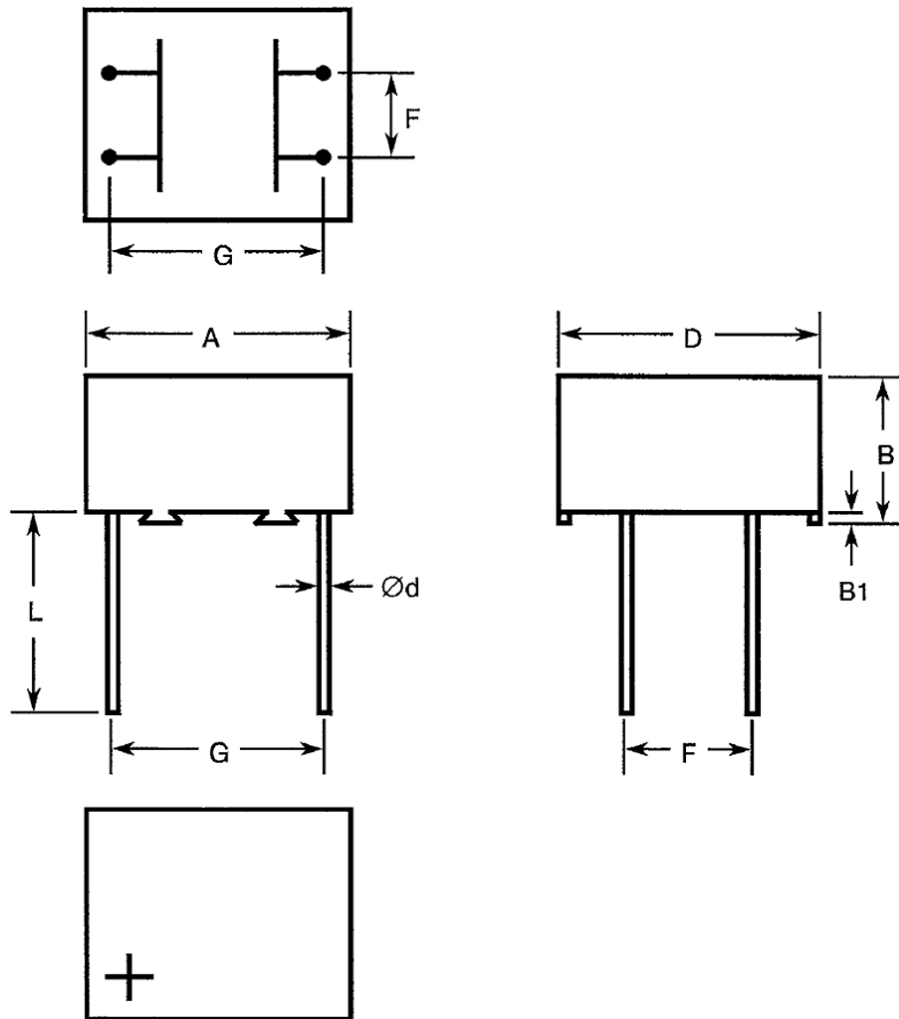
Characteristics	Symbols	Maximum Ratings	Units	Remarks
DC Rated Voltage	U_R	50, 100, 250, 400, 630	V	Notes 1, 2
DC Category Voltage	U_C	Note 2	V	Over T_{op}
AC Rated Voltage	U_A	$35\%U_R$	Vrms	50/60Hz
AC Rated Current	I_{RA}	See Para. 1.4.2.2	Arms	50/60Hz
Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
Storage Temperature Range	T_{stg}	-55 to +125	°C	
Soldering Temperature Variants 01 to 08 Variants 09 to 24	T_{sol}	+235 +260	°C	Note 3

NOTES:

- As required; See Para. 1.4.2.2.
- The DC Rated Voltage is also the DC Category Voltage when T_{op} is between -55°C (T_{amb}) and $+100^{\circ}\text{C}$ (T_{amb}). For $T_{op} > +100^{\circ}\text{C}$ (T_{amb}) only the DC Category Voltage applies, and derating must be observed as follows:
 - U_C derates linearly from $100\%U_C$ at $T_{amb} = +100^{\circ}\text{C}$ to $80\%U_C$ at $T_{amb} = +125^{\circ}\text{C}$.
- 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

1.6.1 Component Type Variants 01 to 08

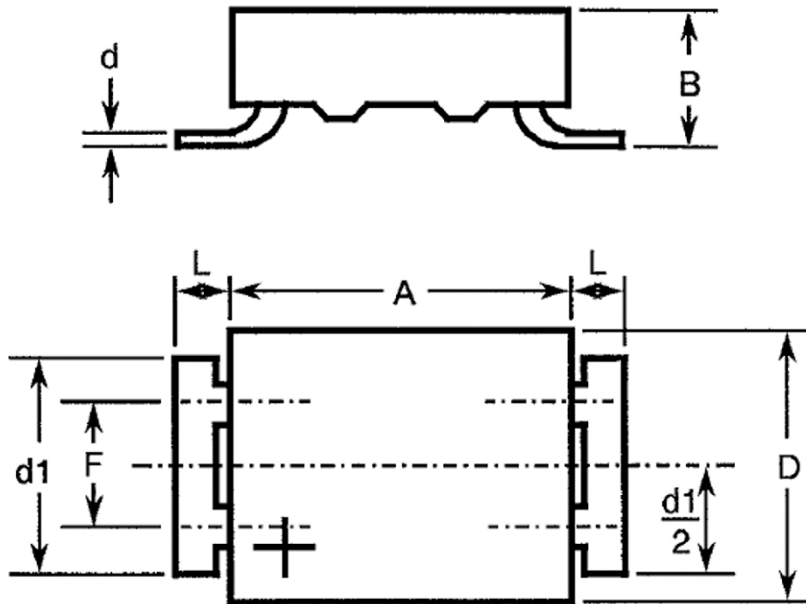


Type Variant	Dimensions (mm)												
	A		B	B1	D		Ød		F		G		L Min.
	Min.	Max.	Max.	Min.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
01	19.5	20.5	6.5	0.25	19.5	20.5	0.95	1.1	9.66	10.66	17.3	18.3	20
02	19.5	20.5	8	0.25	19.5	20.5	0.95	1.1	9.66	10.66	17.3	18.3	20
03	19.5	20.5	12.5	0.25	19.5	20.5	0.95	1.1	9.66	10.66	17.3	18.3	20
04	19.5	20.5	20	0.25	19.5	20.5	0.95	1.1	9.66	10.66	17.3	18.3	20
05	19.5	20.5	30	0.25	19.5	20.5	0.95	1.1	9.66	10.66	17.3	18.3	20
06	30.5	31.5	12.5	0.4	31.5	32.5	0.95	1.1	14.74	15.74	27.44	28.44	20
07	30.5	31.5	22	0.4	31.5	32.5	0.95	1.1	14.74	15.74	27.44	28.44	20
08	30.5	31.5	32	0.4	31.5	32.5	0.95	1.1	14.74	15.74	27.44	28.44	20

NOTES:

- Terminal identification: A voltage polarity symbol shall be marked on the top of the body, as shown, to indicate the row of terminals which should be connected to the highest potential.

1.6.2 Component Type Variants 09 to 16

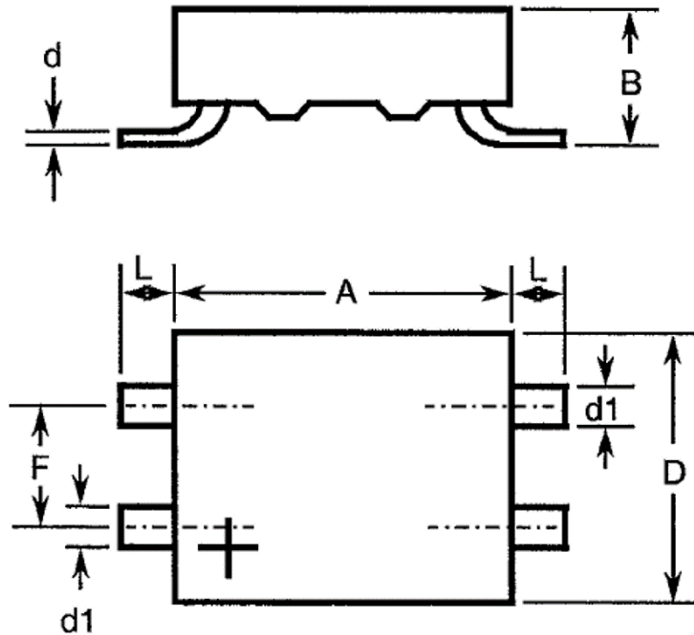


Type Variant	Dimensions (mm)												
	A		B		D		d Max.	d1		F		L	
	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.	Min.	Max.
09	19.5	20.5	6.5	7.5	19.5	20.5	0.3	14.5	15.5	9.5	10.5	2.75	3.25
10	19.5	20.5	8	9	19.5	20.5	0.3	14.5	15.5	9.5	10.5	2.75	3.25
11	19.5	20.5	12.5	13.5	19.5	20.5	0.3	14.5	15.5	9.5	10.5	2.75	3.25
12	19.5	20.5	20	21	19.5	20.5	0.3	14.5	15.5	9.5	10.5	2.75	3.25
13	19.5	20.5	30	31	19.5	20.5	0.3	14.5	15.5	9.5	10.5	2.75	3.25
14	30.5	31.5	12.5	13.5	31.5	32.5	0.3	23.5	24.5	14.5	15.5	2.75	3.25
15	30.5	31.5	22	23	31.5	32.5	0.3	23.5	24.5	14.5	15.5	2.75	3.25
16	30.5	31.5	32	33	31.5	32.5	0.3	23.5	24.5	14.5	15.5	2.75	3.25

NOTES:

1. Terminal identification: A voltage polarity symbol shall be marked on the top of the body, as shown, to indicate the row of terminals which should be connected to the highest potential.

1.6.3 Component Type Variants 17 to 24

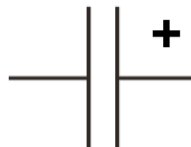


Type Variant	Dimensions (mm)												
	A		B		D		d Max.	d1		F		L	
	Min.	Max.	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.	Min.	Max.
17	19.5	20.5	6.5	7.5	19.5	20.5	0.3	2	3	9.5	10.5	2.75	3.25
18	19.5	20.5	8	9	19.5	20.5	0.3	2	3	9.5	10.5	2.75	3.25
19	19.5	20.5	12.5	13.5	19.5	20.5	0.3	2	3	9.5	10.5	2.75	3.25
20	19.5	20.5	20	21	19.5	20.5	0.3	2	3	9.5	10.5	2.75	3.25
21	19.5	20.5	30	31	19.5	20.5	0.3	2	3	9.5	10.5	2.75	3.25
22	30.5	31.5	12.5	13.5	31.5	32.5	0.3	2	3	9.5	10.5	2.75	3.25
23	30.5	31.5	22	23	31.5	32.5	0.3	2	3	9.5	10.5	2.75	3.25
24	30.5	31.5	32	33	31.5	32.5	0.3	2	3	9.5	10.5	2.75	3.25

NOTES:

1. Terminal identification: A voltage polarity symbol shall be marked on the top of the body, as shown, to indicate the row of terminals 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.
2. For Component Type Variants 01 to 08 and 17 to 24, each row of terminals is connected internally to a single electrode.

1.8 MATERIALS AND FINISHES

1.8.1 Lead/Terminal Material

The lead/terminal material shall be Type A in accordance with the requirements of ESCC Basic Specification No. [23500](#).

1.8.2 Lead/Terminal Finish

The lead/terminal finishes shall be as follows:

- Variants 01 to 08: Type 19 in accordance with the requirements of ESCC Basic Specification No. [23500](#).
- Variants 09 to 24: Type 3 or Type 4 in accordance with the requirements of ESCC Basic Specification No. [23500](#).

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 (c), Applied voltage: $1.25 \times U_c$, where U_c is the applicable Category Voltage per Paras. 1.5 and 1.4.2.2.

(b) Robustness of Terminations: for Component Type Variants 09 to 24 Robustness of Terminations shall be performed as follows:

The components shall be mounted on a suitable substrate. After mounting, examination shall be made for good tinning as evidenced by flowing of the solder with wetting of the terminations. A force of 10N shall be applied normal to the line joining the terminals and in a plane parallel to the substrate, for a duration of $10 \pm 1s$. The components shall then be examined and there shall be no evidence of damage or loosening of the components from the substrate.

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 terminals of the components are rigid.

For Component Type Variants 01 to 08 the test conditions for Robustness of Terminations shall be as specified in the ESCC Generic Specification and as follows:

- Test U_a, tensile, with an applied force of 20N and a duration of 7.5 ±2.5s

All 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; U _R ≤ 100V	3750	-	MΩ
		U _R > 100V	7500	-	MΩ
		C > 0.33µF; U _R ≤ 100V	1250	-	MΩ.µF
		U _R > 100V (Note 3)	2500	-	MΩ.µF
Voltage Proof, Terminal-to-Terminal	VP	ESCC No. 3006	1.6×U _R (Note 3)	-	V

NOTES:

1. Capacitance Value of the component minus the applicable Tolerance (see Para. 1.4.2.2).
2. Capacitance Value of the component plus the applicable Tolerance (see Para. 1.4.2.2).
3. For the applicable Rated Voltage (U_R) see Para. 1.4.2.2.

2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Temperature Coefficient	$\Delta C/C$	ESCC No. 3006 Test Frequency = 1kHz $T_{amb} = -55 (+3 -0)^{\circ}C$	-	-10 (Note 2)	%
		$T_{amb} = +125 (+0 -3)^{\circ}C$	-	+18 (Note 2)	%

NOTES:

- 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.
- The Temperature Coefficient limits are with respect to the capacitance at $+22 \pm 2^{\circ}C$ (reference point temperature).

2.5 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

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 Final Measurements	Capacitance	C	Note 1		μF
	Capacitance	C	Note 1		μF
	Change in Capacitance	$\Delta C/C$	-3	+3	%
	Insulation Resistance, Dielectric $C \leq 0.33\mu F; U_R \leq 100V$ $U_R > 100V$ $C > 0.33\mu F; U_R \leq 100V$ $U_R > 100V$	R_i	Note 1	-	$M\Omega$
			Note 1	-	$M\Omega$
			Note 1	-	$M\Omega.\mu F$
			Note 1	-	$M\Omega.\mu F$
Tangent of Loss Angle	$tg\delta$	-	Note 1	-	
Temperature Coefficient	Temperature Coefficient (Note 2)	$\Delta C/C$	Note 3		%
Rapid Change of Temperature Initial Measurements Final Measurements	Capacitance	C	Note 1		μF
	Capacitance	C	Note 1		μF
	Change in Capacitance	$\Delta C/C$	-3	+3	%
	Tangent of Loss Angle	$tg\delta$	-	Note 1	-

Test Reference per ESCC No. 3006	Characteristics	Symbols	Limits		Units
			Min	Max	
Climatic Sequence Initial Measurements Final Measurements	Capacitance	C	Note 1		μF
	Capacitance	C	Note 1		μF
	Change in Capacitance	ΔC/C	-3	+3	%
	Tangent of Loss Angle	tgδ	-	Note 4	-
	Voltage Proof, Terminal-to-Terminal	VP	Note 1	-	V
	Insulation Resistance, Dielectric	R _i			
	C ≤ 0.33μF; U _R ≤ 100V		Note 5	-	MΩ
	U _R > 100V		Note 5	-	MΩ
	C > 0.33μF; U _R ≤ 100V		Note 5	-	MΩ.μF
	U _R > 100V		Note 5	-	MΩ.μF
Operating Life Initial Measurements Intermediate Measurements (1000 hours) Final Measurements (1000 or 2000 hours) (Note 6)	Capacitance	C	Note 1		μF
	Capacitance	C	Note 1		μF
	Change in Capacitance	ΔC/C	-5	+5	%
	Capacitance	C	Note 1		μF
	Change in Capacitance	ΔC/C	-5	+5	%
	Tangent of Loss Angle	tgδ	-	Note 4	-
	Insulation Resistance, Dielectric	R _i			
	C ≤ 0.33μF; U _R ≤ 100V		Note 5	-	MΩ
	U _R > 100V		Note 5	-	MΩ
	C > 0.33μF; U _R ≤ 100V		Note 5	-	MΩ.μF
U _R > 100V		Note 5	-	MΩ.μF	

NOTES:

- As specified in Para. 2.4.1.
- The test method and test conditions shall be as specified in Para. 2.4.2.
- As specified in Para. 2.4.2.
- 1.5× the limit specified in Para. 2.4.1.
- 50% of the limit specified in Para. 2.4.1.
- 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.

2.6

BURN-IN CONDITIONS

Characteristics	Symbols	Conditions (Note 1)	Units
Ambient Temperature	T_{amb}	+125 (+0 -3)	°C
Test Voltage	V_T	$1.25 \times U_C$ (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. U_C is the applicable Category Voltage; see Paras. 1.5 and 1.4.2.2.

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.