CAPACITORS, FIXED, CERAMIC DIELECTRIC, TYPE II, FOR SURFACE MOUNTING

BASED ON TYPES CNC82RE AND CNC83RE

ESCC Detail Specification No. 3001/028

Issue 2	October 2017

Document Custodian: European Space Agency – see https://escies.org

LEGAL DISCLAIMER AND COPYRIGHT

DOCUMENTATION CHANGE NOTICE

(Refer to https://escies.org for ESCC DCR content)

DCR No.	CHANGE DESCRIPTION
775	Specification updated to incorporate changes per DCR. Specification produced in MSWORD. Changes in presentation are possible.

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. 3001.

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: 300102801476KC

- Detail Specification Reference: 3001028
- Component Type Variant Number: 01 (see Note 1)
- Characteristic code: Capacitance Value (47µF): 476 (as required)
- Characteristic code: Capacitance Tolerance (±10%): K (as required)
- Rating code: Rated Voltage (50V): C (as required)

NOTES

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

Capacitance Value C_n (pF)	Code
XX 10^4	XX4
XX 10^5	XX5
XX 10^6	XX6

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

Tolerance (± %)	Code Letter
10	K
20	M

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

Rated Voltage U_R (V)	Code Letter
50	C
100	E
250	H
400	K

1.4.2 Range of Components

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

Based on Type	Capacitance Value (µF)	Capacitance Tolerance (± %)	Rated Voltage (U_R) (Vdc)	Case Size (Note 1)	Weight Max (g)
CNC82RE	1.5	10, 20	50	A	5
CNC82RE	1.8	10	50	A	5
CNC82RE	2.2	10, 20	50	A	5
CNC82RE	2.7	10	50	A	5
CNC82RE	3.3	10, 20	50	A	5
CNC82RE	3.9	10	50	B	7
CNC82RE	4.7	10, 20	50	B	7
CNC82RE	5.6	10	50	B	7
CNC82RE	6.8	10, 20	50	B	7
CNC82RE	8.2	10	50	B	7
CNC82RE	10	10, 20	50	C	9
CNC82RE	12	10	50	D	12
CNC82RE	15	10, 20	50	D	12
CNC82RE	18	10	50	E	15
CNC82RE	22	10, 20	50	E	15
CNC83RE	27	10	50	H	16
CNC83RE	33	10, 20	50	H	16
CNC83RE	39	10	50	I	25
CNC83RE	47	10, 20	50	I	25
CNC82RE	0.56	10	100	A	5

Based on Type	Capacitance Value (µF)	Capacitance Tolerance (± %)	Rated Voltage (U_R) (Vdc)	Case Size (Note 1)	Weight Max (g)
CNC82RE	0.68	10, 20	100	A	5
CNC82RE	0.82	10	100	A	5
CNC82RE	1	10, 20	100	A	5
CNC82RE	1.2	10	100	A	5
CNC82RE	1.5	10, 20	100	A	5
CNC82RE	1.8	10	100	A	5
CNC82RE	2.2	10, 20	100	B	7
CNC82RE	2.7	10	100	B	7
CNC82RE	3.3	10, 20	100	B	7
CNC82RE	3.9	10	100	C	9
CNC82RE	4.7	10, 20	100	C	9
CNC82RE	5.6	10	100	D	12
CNC82RE	6.8	10, 20	100	D	12
CNC82RE	8.2	10	100	E	15
CNC82RE	10	10, 20	100	E	15
CNC83RE	12	10	100	H	16
CNC83RE	15	10, 20	100	H	16
CNC83RE	18	10	100	I	25
CNC83RE	22	10, 20	100	I	25
CNC83RE	27	10	100	J	30
CNC83RE	33	10, 20	100	K	40
CNC82RE	0.33	10, 20	250	A	5
CNC82RE	0.39	10	250	A	5
CNC82RE	0.47	10, 20	250	A	5
CNC82RE	0.56	10	250	B	7
CNC82RE	0.68	10, 20	250	B	7
CNC82RE	0.82	10	250	B	7
CNC82RE	1	10, 20	250	B	7
CNC82RE	1.2	10	250	B	7
CNC82RE	1.5	10, 20	250	C	9
CNC82RE	1.8	10	250	D	12
CNC82RE	2.2	10, 20	250	D	12
CNC82RE	2.7	10	250	E	15
CNC82RE	3.3	10, 20	250	E	15
CNC83RE	3.9	10	250	H	16
CNC83RE	4.7	10, 20	250	H	16

Based on Type	Capacitance Value (µF)	Capacitance Tolerance (± %)	Rated Voltage (U_R) (Vdc)	Case Size (Note 1)	Weight Max (g)
CNC83RE	5.6	10	250	I	25
CNC83RE	6.8	10, 20	250	I	25
CNC83RE	8.2	10	250	J	30
CNC83RE	10	10, 20	250	K	40
CNC82RE	0.22	10, 20	400	A	5
CNC82RE	0.27	10	400	A	5
CNC82RE	0.33	10, 20	400	A	5
CNC82RE	0.39	10	400	B	7
CNC82RE	0.47	10, 20	400	B	7
CNC82RE	0.56	10	400	B	7
CNC82RE	0.68	10, 20	400	B	7
CNC82RE	0.82	10	400	C	9
CNC82RE	1	10, 20	400	C	9
CNC82RE	1.2	10	400	D	12
CNC82RE	1.5	10, 20	400	D	12
CNC82RE	1.8	10	400	E	15
CNC82RE	2.2	10, 20	400	E	15
CNC83RE	2.7	10	400	I	25
CNC83RE	3.3	10, 20	400	I	25
CNC83RE	3.9	10	400	J	30
CNC83RE	4.7	10, 20	400	J	30
CNC83RE	5.6	10	400	K	40
CNC83RE	6.8	10, 20	400	K	40

NOTES:
1. See Para. 1.6.

1.5 MAXIMUM RATINGS

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

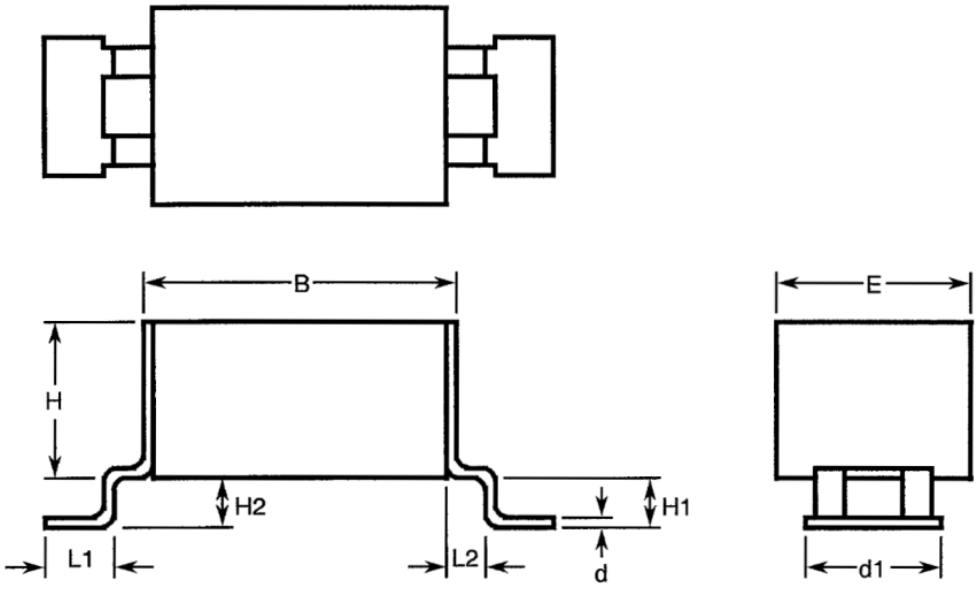
Maximum ratings shall only be exceeded during testing to the extent specified in this specification and when stipulated in Test Methods and Procedures of the ESCC Generic Specification.

Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated Voltage	U_R	50, 100, 250, 400	V	Note 1
Operating Temperature Range	T_{op}	-55 to +125	°C	Without derating. T_{amb}
Storage Temperature Range	T_{stg}	-55 to +125	°C	
Soldering Temperature	T_{sol}	+260	°C	Note 2

NOTES:

1. As required; See Para. 1.4.2.
2. Duration 5 seconds maximum at a distance of ≥ 1.5mm from the case and the same lead shall not be resoldered until 3 minutes have elapsed.

1.6 PHYSICAL DIMENSIONS



Symbol	Dimensions (mm)		Notes
	Min	Max	
B	-	15.5	Based on Type: CNC82RE
	-	18.5	Based on Type: CNC83RE
d	-	0.25	
d1	7.5	8.5	Based on Type: CNC82RE
	14.5	15.5	Based on Type: CNC83RE
E	-	11.5	Based on Type: CNC82RE
	-	17	Based on Type: CNC83RE
H	-	2.5	Case size: A
	-	4.5	Case size: B
	-	6	Case size: C
	-	9	Case size: D
	-	12	Case size: E
	-	10	Case size: H
	-	15	Case size: I
	-	18	Case size: J
	-	26	Case size: K

Symbol	Dimensions (mm)		Notes
	Min	Max	
H1	2	2.4	
H2	1.4	1.8	Case size: A
	1.4	1.8	Case size: B
	1.4	1.8	Case size: C
	0.6	0.8	Case size: D
	0.6	0.8	Case size: E
	0.6	0.8	Case size: H
	0.6	0.8	Case size: I
	0.6	0.8	Case size: J
	0.6	0.8	Case size: K
L1	3.3	3.7	
L2	1.3	1.7	

1.7 FUNCTIONAL DIAGRAM

1.8 MATERIALS AND FINISHES

1.8.1 Case
Varnished chips.

1.8.2 Terminals
The terminal material shall be brass, with type 4 finish 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) Resistance to Soldering Heat and Solderability: Only the part of the terminals designed to be soldered shall be tested.

(b) Vibration: Prior to Vibration, the samples shall be mounted and glued on to a suitable substrate in order to avoid any stress. The samples shall be maintained on the substrate for all subsequent tests in the subgroup test sequence.

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 or the primary package shall be:

(a) The ESCC qualified components symbol (for ESCC qualified components only).
(b) The ESCC Component Number.
(c) Traceability information.

2.3 ROBUSTNESS OF TERMINATIONS
The terminations of these devices are classified as rigid. The test conditions for Robustness of Terminations shall be as specified in the ESCC Generic Specification and as follows:

- Applicable tests: Ue3 (shear) only.
- Pushing force: 10N for 10s
- After each test, the capacitors shall be examined for evidence of breaking or loosening of terminals.

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	Tolerance (± %)	Limits		Units
				Min	Max	
Capacitance (Note 1)	C_A	ESCC No. 3001				µF
			10	$0.9C_n$	$1.1C_n$	
			20	$0.8C_n$	$1.2C_n$	
Tangent of Loss Angle	tgδ	ESCC No. 3001	All	-	250×10^{-4}	-
Insulation Resistance (Dielectric)	R_{ID}	ESCC No. 3001	All	1000	-	GΩ.nF
Insulation Resistance (Body Insulation)	R_{IB}	ESCC No. 3001 Note 2	All	1000	-	GΩ.nF
Voltage Proof (Dielectric)	VP_D	ESCC No. 3001	All	$2.5U_R$	-	V

NOTES:

1. Capacitance limits may be adjusted to take into account capacitance ageing, as specified in the Generic Specification.
2. The measurements shall be performed on a sample of 5 components from each manufacturing lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed. In the case of a 100% inspection, a 1% total percent defective is allowed.

2.4.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Temperature Characteristic	TC	ESCC No. 3001 T_{amb} = -55 ±2°C, +20 ±2°C, +125 ±2°C Note 2			%
		For V_T = no voltage applied	-20	+20	
		For $V_T = U_R$ = 50V	-30	+20	
		For $V_T = U_R$ = 100V	-30	+20	
		For $V_T = U_R$ = 250V	-40	+20	
		For $V_T = U_R$ = 400V	-50	+20	

NOTES:

1. The measurements shall be performed on a sample of 5 components from each manufacturing lot with 0 failures allowed. In the event of any failure a 100% inspection may be performed.
2. In the case of a 100% inspection, a 1% total percent defective is allowed.

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. 3001	Characteristics	Symbols	Limits		Units
			Min	Max	
Rapid Change of Temperature					
Initial Measurements	Capacitance	C_A	Note 1		
Final Measurements	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-10	+10	%
	Tangent of Loss Angle	tgδ	-	250×10^{-4}	-
Steady State Humidity					
Initial Measurements	Capacitance	C_A	Note 1		
Final Measurements	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-10	+10	%
	Tangent of Loss Angle	tgδ	-	250×10^{-4}	-
	Insulation Resistance (Dielectric) (Note 2)	R_{ID}	50	-	GΩ.nF
	Insulation Resistance (Body Insulation) (Note 2)	R_{IB}	50	-	GΩ.nF
Operating Life					
Initial Measurements	Capacitance	C_A	Note 1		
Intermediate Measurements (1000 hours) (Note 3)	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-15	+15	%
	Insulation Resistance (Dielectric)	R_{ID}	250	-	GΩ.nF
	Insulation Resistance (Body Insulation)	R_{IB}	250	-	GΩ.nF
Final Measurements (1000 or 2000 hours) (Note 4)	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-20	+20	%
	Tangent of Loss Angle	tgδ	-	250×10^{-4}	-
	Insulation Resistance (Dielectric)	R_{ID}	100	-	GΩ.nF
	Insulation Resistance (Body Insulation)	R_{IB}	100	-	GΩ.nF
	Voltage Proof (Dielectric)	VP_D	$2.5U_R$	-	V
Capacitance-Temperature Characteristics	Temperature Characteristic	TC	Note 5		

Test Reference per ESCC No. 3001	Characteristics	Symbols	Limits		Units
			Min	Max	
Resistance to Soldering Heat					
Initial Measurements	Capacitance	C_A	Note 1		
Final Measurements	Capacitance	C_A	Note 1		
	Change in Capacitance	$\Delta C_A/C_A$	-10	+20	%
	Insulation Resistance (Dielectric)	R_{ID}	1000	-	GΩ.nF
	Insulation Resistance (Body Insulation)	R_{IB}	1000	-	GΩ.nF

NOTES:

1. As specified in Para. 2.4.1.
2. Test conditions for Insulation Resistance shall be as specified in Steady State Humidity in the ESCC Generic Specification.
3. Intermediate measurements are optional at the Manufacturer's discretion.
4. 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.
5. As specified in Para. 2.4.2.

2.6 BURN-IN

The requirements for Burn-in are specified in the ESCC Generic Specification. The following conditions shall also apply:

- After Burn-in, the components shall be removed from the chamber and allowed to cool under normal atmospheric conditions for recovery for 24 hours minimum.

APPENDIX A

AGREED DEVIATIONS FOR EXXELIA TECHNOLOGIES (F)

<table>
<tr><th>Items Affected</th><th>Description of Deviations</th></tr>
<tr><td>Para. 2.4.2
High and Low Temperatures Electrical Measurements</td><td>Temperature Characteristic measurement with voltage applied may be performed with applied voltages and limits as follows:
<table>
<tr><th rowspan="2">Characteristics</th><th rowspan="2">Symbols</th><th rowspan="2">Test Method and Conditions</th><th colspan="2">Limits</th><th rowspan="2">Units</th></tr>
<tr><th>Min</th><th>Max</th></tr>
<tr><td rowspan="5">Temperature Characteristic</td><td rowspan="5">TC</td><td>ESCC No. 3001</td><td></td><td></td><td>%</td></tr>
<tr><td>For U_R = 50V: V_T = 50V</td><td>-30</td><td>+20</td><td></td></tr>
<tr><td>For U_R = 100V: V_T = 100V</td><td>-30</td><td>+20</td><td></td></tr>
<tr><td>For U_R = 250V: V_T = 200V</td><td>-35</td><td>+20</td><td></td></tr>
<tr><td>For U_R = 400V: V_T = 200V</td><td>-30</td><td>+20</td><td></td></tr>
</table></td></tr>
</table>