CAPACITOR FILTERS, C-TYPE, FEEDTHROUGH, ELECTROMAGNETIC INTERFERENCE SUPPRESSION

BASED ON TYPE SFC030

ESCC Detail Specification No. 3008/020

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DOCUMENTATION CHANGE NOTICE

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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 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. 3008.
(b) MIL-STD-202, Test Methods for Electronic and Electrical Component Parts.

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: 300802001682MC

- Detail Specification Reference: 3008020
- Component Type Variant Number: 01 (as required)
- Characteristic code: Capacitance Value (6800pF): 682 (as required)
- Characteristic code: Capacitance Tolerance (±20%): M
- Rating code: Rated DC Voltage (50V): C (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 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) (pF)	Code
XX 10^1	XX1
XX 10^2	XX2
XX 10^3	XX3

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

Tolerance (± %)	Code Letter
20	M

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

Rated DC Voltage (U_R) (V)	Code Letter
50	C
100	E
200	G

1.4.2 Component Type Variants and Range of Components

The Component Type Variants applicable to this specification are as follows:

Type Variants (Note 1)	Case Description and Terminal Configuration (Note 2)
01 to 03	Steel feedthrough case, non-hermetically sealed at flange end and hermetically sealed at other end
04 to 06	Steel feedthrough case, hermetically sealed at flange end and non-hermetically sealed at other end
07 to 09	Kovar feedthrough case, non-hermetically sealed at flange end and hermetically sealed at other end, with a thermocompression-bondable IN lead (flange end)
10 to 12	Kovar feedthrough case, hermetically sealed at flange end and non-hermetically sealed at other end, with a thermocompression-bondable OUT lead (other end)

NOTES:

1. The available range of components and the Insertion Loss requirements for each available capacitance value are as follows:

Type Variant	Rated DC Voltage U_R (V) (at $T_{amb} \leq +85°C$)	Range of Capacitance Values C (pF) E6 Series Tolerance ±20%	Voltage Proof V_P (V)	Voltage Drop V_{dr} (V)	DC Resistance R_s (mΩ)	Rated Current I_R (A)	Weight Max. (g)
01	50	470 to 22000	125	0.05	5	5	1
02	100	470 to 6800	250	0.05	5	5	1
03	200	470 to 2200	500	0.05	5	5	1
04	50	470 to 22000	125	0.05	5	5	1
05	100	470 to 6800	250	0.05	5	5	1
06	200	470 to 2200	500	0.05	5	5	1
07	50	470 to 22000	125	0.1	10	1	1
08	100	470 to 6800	250	0.1	10	1	1
09	200	470 to 2200	500	0.1	10	1	1
10	50	470 to 22000	125	0.1	10	1	1
11	100	470 to 6800	250	0.1	10	1	1
12	200	470 to 2200	500	0.1	10	1	1

Capacitance Value C (pF) E6 Series	Insertion Loss I_L (dB)						
	10MHz	50MHz	100MHz	500MHz	1GHz	5GHz	10GHz
470	-	8	14	28	34	48	54
680	-	11	17	31	37	51	57
1000	-	15	21	35	41	55	61
1500	-	18	24	38	44	58	64
2200	-	21	27	41	48	61	68
3300	11	25	31	45	52	60	70
4700	14	28	34	48	54	68	70
6800	17	31	37	51	57	70	70
10000	21	35	41	55	61	70	70
15000	25	39	45	59	65	70	70
22000	28	42	48	54	68	70	70

2. See Para. 1.6 for physical dimensions.

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.

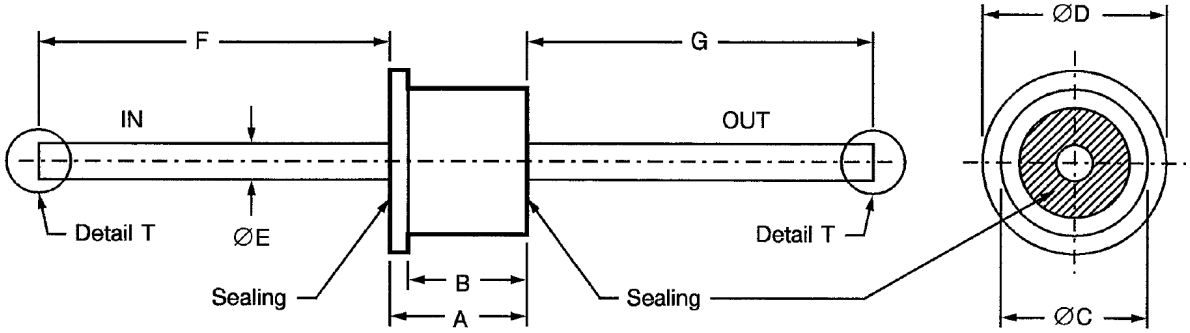
Characteristics	Symbols	Maximum Ratings	Units	Remarks
Rated DC Voltage	U_R	See Note 1 of Para. 1.4.2	V	Notes 1, 2
Voltage Drop	V_{dr}	See Note 1 of Para. 1.4.2	V	
DC Resistance	R_s	See Note 1 of Para. 1.4.2	mΩ	
Rated Current	I_R	See Note 1 of Para. 1.4.2	A	DC and Low Frequency
Operating Temperature Range	T_{op}	-55 to +125	°C	T_{amb}
Storage Temperature Range	T_{stg}	-55 to +125	°C	
Soldering Temperature Leads Case	T_{sol}	 +275 +205	°C	 Note 3 Note 4

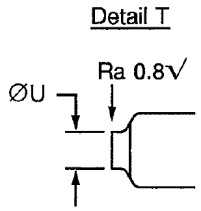
NOTES:

1. At $T_{amb} \leq +85°C$. For $T_{amb} > +85°C$, the following derating shall apply:
   - For Variants with $U_R = 50V$ at $T_{amb} \leq +85°C$, derate linearly to 25V at $T_{amb} = +125°C$.
   - For Variants with $U_R = 100V$ at $T_{amb} \leq +85°C$, derate linearly to 70V at $T_{amb} = +125°C$.
   - For Variants with $U_R = 200V$ at $T_{amb} \leq +85°C$, derate linearly to 100V at $T_{amb} = +125°C$.

2. The DC applied voltage plus the ripple voltage shall never exceed the maximum rated DC voltage.
3. Duration 6 seconds maximum at a distance of not less than 2mm from the body and the same lead shall not be resoldered until 3 minutes have elapsed.
4. Duration 4 seconds maximum.

1.6 PHYSICAL DIMENSIONS



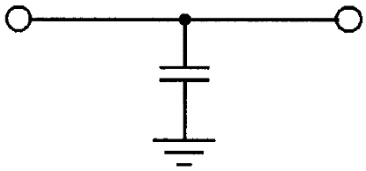


Symbols	Dimensions (mm)					
	Variants 01 to 06		Variants 07 to 09		Variants 10 to 12	
	Min	Max	Min	Max	Min	Max
A	2.7	2.9	2.7	2.9	2.7	2.9
B	2.2	2.4	2.2	2.4	2.2	2.4
ØC	3.1	3.3	3.1	3.3	3.1	3.3
ØD	3.9	4.1	3.9	4.1	3.9	4.1
ØE (Notes 1, 2)	0.75	0.88	0.75	0.88	0.75	0.88
F	6	7	1	2	6	7
G	6	7	6	7	1	2
∅U (Note 3)	N/A	N/A	0.4	-	0.4	-

NOTES:

1. Lead finish shall commence not more than 1.5mm from encapsulant.
2. Applies to both leads.
3. This dimension applies to Variants 07 to 12, where Detail T defines the specific area for thermocompression bonding at the end of the lead. See Para. 1.4.2 for details of the terminals concerned.

1.7 FUNCTIONAL DIAGRAM



1.8 MATERIALS AND FINISHES

1.8.1 Case

The case shall be either gold plated steel or kovar, hermetically sealed with a hard glass seal at one end and potting encapsulant sealing the filter element at the other end. See Para. 1.4.2.

1.8.2 Lead Material and Finish

1.8.2.1 Variants 01 to 06

The lead material shall be Type H with Type 7 finish in accordance with the requirements of ESCC Basic Specification No. 23500.

1.8.2.2 Variants 07 to 12

The lead material shall be Type D with Type 7 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 Screening Tests - Chart F3

(a) Rapid Change of Temperature: The components need not be mounted.

(b) Vibration: Shall not be performed.

(c) Seal (Fine and Gross Leak): Shall only be performed on the hermetically sealed side of the component.

2.1.1.2 Deviations from Qualification and Periodic Tests – Charts F4A and F4B

(a) Seal (Fine and Gross Leak): Shall only be performed on the hermetically sealed side of the component.

(b) Damp Heat: Shall only be performed on the non-hermetically sealed side of the component.

(c) Resistance to Soldering Heat: May be performed prior to Vibration.

(d) Immersion: Shall only be performed on the hermetically sealed side of the component.

(e) Operating Life, Intermediate and Final Measurements: Insertion Loss measurements shall not be performed.

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 its primary package shall be:

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

2.3 SEAL (FINE AND GROSS LEAK)

The test conditions for Fine and Gross Leak shall be as specified in the ESCC Generic Specification.

The limit for Fine Leak shall be 5×10^{-3} Pa.cm^3/s

2.4 SOLDERABILITY

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

- Test Method 1. Terminals shall be immersed up to 2mm from sealing.
- A 1.6mm thermal screen may be used.

2.5 ROBUSTNESS OF TERMINATIONS

The leads of the components are rigid.

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

- Test Ua_1, tensile, with an applied force of 10N and a duration of 10 ±1 seconds.

2.6 ELECTRICAL MEASUREMENTS AT ROOM, HIGH AND LOW TEMPERATURES

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

2.6.1 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	
Voltage Drop	V_{dr}	ESCC No. 3008	-	Note 1	V
Voltage Proof	V_P	ESCC No. 3008 2.5 × U_R	Note 1	-	V
Insulation Resistance	R_i	ESCC No. 3008	10^4	-	MΩ
Insertion Loss		ESCC No. 3008			
	I_{L1}	f = 10MHz (Notes 2, 3)	Note 1	-	dB
	I_{L2}	f = 50MHz (Notes 2, 4)	Note 1	-	dB
	I_{L3}	f = 100MHz (Notes 2, 3)	Note 1	-	dB
	I_{L4}	f = 500MHz (Notes 2, 4)	Note 1	-	dB
	I_{L5}	f = 1GHz (Notes 2, 3)	Note 1	-	dB
	I_{L6}	f = 5GHz (Notes 2, 4)	Note 1	-	dB
	I_{L7}	f = 10GHz (Notes 2, 4)	Note 1	-	dB
Capacitance	C	ESCC No. 3008	Note 1		pF

NOTES:

1. See Note 1 of Para. 1.4.2.
2. For Qualification Testing and Periodic Testing for renewal of qualification after lapse, measurements shall be made with a load current of zero and, during either Subgroup 1B or Subgroup 1C of Chart F4A in the Generic Specification, measurements shall also be made at the rated current specified in Note 1 of Para. 1.4.2.
3. For Screening and Periodic Testing for extension of qualification, I_{L1}, I_{L3} and I_{L5} shall be measured with no load current applied.
4. For Screening and Periodic Testing for extension of qualification, I_{L2}, I_{L4}, I_{L6} and I_{L7} are guaranteed but not tested.

2.6.2 High and Low Temperatures Electrical Measurements

Characteristics	Symbols	Test Method and Conditions (Note 1)	Limits		Units
			Min	Max	
Insulation Resistance	R_i	ESCC No. 3008 T_{amb} = +125 (+0 -3)°C	10^3	-	MΩ
Change in Capacitance	ΔC/C	ESCC No. 3008 T_{amb} = +125 (+0 -3)°C and T_{amb} = -55 (+3 -0)°C	-20	+20	% (Note 2)

NOTES:

1. Measurements shall be performed on a sample of 5 components. In the event of any failure a 100% inspection shall be performed.
2. With respect to the room temperature measurement. See Para. 2.6.1.

2.7 PARAMETER DRIFT VALUES

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

The test methods and test conditions shall be as per the corresponding test defined in Para. 2.6.1, Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Characteristics	Symbols	Drift Value Δ	Units
Change in Capacitance	ΔC/C	±10	%

2.8 INTERMEDIATE AND END-POINT ELECTRICAL MEASUREMENTS

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

Unless otherwise specified, test methods and test conditions shall be as per the corresponding test defined in Para. 2.6.1, Room Temperature Electrical Measurements.

The drift values (Δ) shall not be exceeded for each characteristic where specified. The corresponding absolute limit values for each characteristic shall not be exceeded.

Test Reference per ESCC No. 3008	Characteristics	Symbols	Limits		Units
			Min	Max	
Overload	Insulation Resistance	R_i	Note 1	-	MΩ
	Voltage Drop	V_{dr}	-	Note 2	V
Low Air Pressure	Voltage Proof	V_P	125% U_R	-	V
Damp Heat	Insulation Resistance	R_i	Note 3	-	MΩ
Resistance to Soldering Heat	Insulation Resistance	R_i	Note 1	-	MΩ
	Insertion Loss	I_L	Note 2	-	dB
Shock	Insertion Loss	I_L	Note 2	-	dB

Test Reference per ESCC No. 3008	Characteristics	Symbols	Limits		Units
			Min	Max	
Vibration	Insertion Loss	I_L	Note 2	-	dB
Immersion	Voltage Proof	V_P	90% U_R	-	V
	Insulation Resistance	R_i	Note 1	-	MΩ
	Insertion Loss	I_L	Note 2	-	dB
Accelerated Damp Heat	Voltage Proof	V_P	90% U_R	-	V
	Insulation Resistance	R_i	Note 5	-	MΩ
	Insertion Loss	I_L	Note 2	-	dB
Operating Life					
Initial Measurements	Capacitance	C	Note 2		pF
Intermediate Measurements (at 500 hours (Note 6)) / (at 1000 hours (Note 7))	Insulation Resistance at +125 (+0 -3)°C	R_i	Note 4	-	MΩ
	After recovery:				
	Capacitance	C	Note 2		pF
	Change in Capacitance	ΔC/C	-	±10	%
	Voltage Proof	V_P	90% U_R	-	V
	Insulation Resistance	R_i	Note 5	-	MΩ
Final Measurements (at 1000 or 2000 hours (Note 8))	Insulation Resistance at +125 (+0 -3)°C	R_i	Note 4	-	MΩ
	After recovery:				
	Capacitance	C	Note 2		pF
	Change in Capacitance	ΔC/C	-	±10	%
	Voltage Proof	V_P	90% U_R	-	V
	Insulation Resistance	R_i	Note 5	-	MΩ
Robustness of Terminations	Voltage Drop	V_{dr}	-	Note 2	V

NOTES:

1. See Para. 2.6.1.
2. See Note 1 of Para. 1.4.2.
3. > 10% of the value given in Para. 2.6.1.
4. See Para. 2.6.2.
5. > 50% of the value given in Para. 2.6.1.
6. 500 hours is applicable to Qualification Testing, Periodic Testing for extension of qualification and to Periodic Testing for renewal of qualification after lapse.
7. 1000 hours is applicable to Qualification Testing, and to Periodic Testing for renewal of qualification after lapse.
8. 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.

2.9 BURN-IN CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+125 (+0 -3)	°C
Applied Voltage	U_A		V
Variants 03, 06, 09, 12		300 (Note 1)	
Variants 02, 05, 08, 11		150 (Note 1)	
Variants 01, 04, 07, 10		50 (Note 1)	

NOTES:
1. Between one terminal and the case.

2.10 OPERATING LIFE CONDITIONS

Characteristics	Symbols	Test Conditions	Units
Ambient Temperature	T_{amb}	+125 (+0 -3)	°C
Applied Voltage	U_A		V
Variants 03, 06, 09, 12		300 (Note 1)	
Variants 02, 05, 08, 11		150 (Note 1)	
Variants 01, 04, 07, 10		50 (Note 1)	
Rated Current	I_R	Note 2	A

NOTES:
1. Between one terminal and the case.
2. Current to flow between the terminals. For the applicable Rated Current, see Note 1 of Para. 1.4.2.

APPENDIX 'A'

AGREED DEVIATIONS FOR EXXELIA TECHNOLOGIES (F)

Item Affected	Description of Deviations
Para. 2.1.1.1, Deviations from Screening Tests – Chart F3	Room Temperature Electrical Measurements: • The Voltage Drop measurements may be replaced by DC Resistance measurements in accordance with MIL-STD-202, Test Method 303. The applicable DC Resistance value specified in Note 1 of Para. 1.4.2 shall not be exceeded. • Insertion Loss may be performed on a sample of 5 components. In the event of any failure a 100% inspection shall be performed. Seal (Fine and Gross Leak): Shall not be performed.
Para. 2.1.1.2, Deviations from Qualification and Periodic Tests – Chart F4A and F4B	Overload and Robustness of Terminations (Intermediate and End-Point Electrical Measurements): The Voltage Drop measurements may be replaced by DC Resistance measurements in accordance with MIL-STD-202, Test Method 303. The applicable DC Resistance value specified in Note 1 of Para. 1.4.2 shall not be exceeded.
Para. 2.1.1.2, Deviations from Qualification and Periodic Tests – Chart F4A	Rapid Change of Temperature: Shall not be performed during Subgroup 1B. Seal (Fine and Gross Leak): Shall not be performed. Immersion: Shall not be performed.