



Ceramic Capacitors *for Space Use*



www.exxelia.com



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Product catalog 131

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APPROVALS

Specifications are subject to change without notice. All statements, information and data given herein are presented without guarantee, warranty or responsibility of any kind, expressed or implied.

INTRODUCTION

EXXELIA is a worldwide group involved in high reliability passive components for markets such as aeronautics, medical, space or defence.

EXXELIA is composed of 8 companies (EUROFARAD, FIRADEC, SIC-SAFCO, MICROSPIRE, DEARBORN ELECTRONICS, ASTEMA, TEMEX CERAMICS and VERTURA) manufacturing :

- Ceramic capacitors
- Film capacitors
- Tantalum capacitors
- Electrolytic capacitors
- EMI/RFI & Energy filters
- Sensors, slip-rings and associated systems
- Wound magnetic components

EUROFARAD is a French manufacturer of passive components and has been manufacturing capacitors, filters, sensors, slip-rings and associated systems for space applications for more than 30 years.

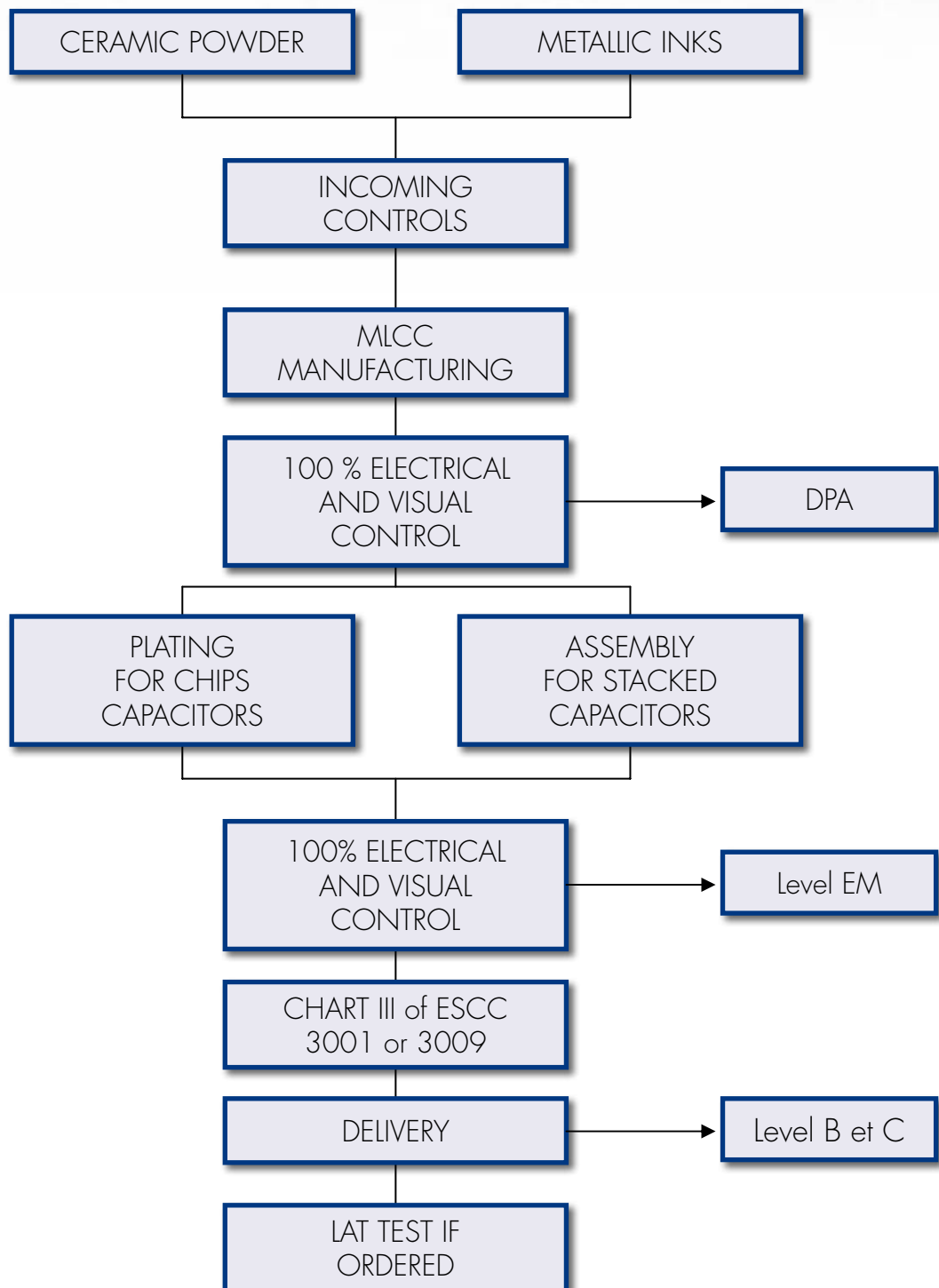
In this way, EUROFARAD has been working for years in strong partnership with **CNES (French space agency) and ESA (European Space Agency)** to evaluate and qualify their components.

That partnership led in 2011 to **4 ranges** of components in the Qualified Part List (**QPL**) and **11 ranges** of components in European Preferred Part List (**EPPL**) of ESA/ESCC system.

The purpose of this document is to present EUROFARAD portfolio for **ceramic capacitors for space applications**. Are also mentioned capacitance ranges, voltages as well as ESCC and EFD detail specifications associated to each component.

EUROFARAD can also propose custom design products, even for space applications. This catalog may also be considered as a source of examples. Our technical department will be glad to analyse all the specific requests you will have.

FLOW CHART



EVALUATION AND QUALIFICATION TESTS

Herebelow are examples of tests performed during evaluation or qualification of our components for space applications. Some of these tests, mainly for evaluation, are not mandatory and are adjusted to the type of capacitors in order to be the most relevant.

	TESTS	OBSERVATIONS	REFERENCE
EVALUATION	Damp Heat	1000 H 85°C 85% RH 1.5 V	Consult us
	Thermal Shocks	25 cycles -55°C +125°C extended to 1000 cycles	
	Voltage Step Stress	168 H step U_R , 1.5 U_R , 2 U_R ,...	
	Life tests	Specification required data : 2000 H 125°C 2 U_R for $U_R < 500$ V 1.5 U_R for $U_R = 500$ V	
		2000 H 150°C 2 U_R	
		2000 H 125°C >2 U_R	
QUALIFICATION	Damp Heat	56 days 40°C 93% RH	ESCC 3001 §9.14 ESCC 3009 §9.9
		56 days 40°C 93% RH U_R	ESCC 3001 §9.14
	Robustness of termination	–	ESCC 3001 §9.7
	Adhesion	–	ESCC 3009 §9.5
	Solderability	–	ESCC 3001 §9.9 ESCC 3009 §9.6
	Vibrations	10 Hz - 2000 Hz Acceleration to 2000 Hz : 20 g	ESCC 3001 §9.11
	Shocks	50 g 11 ms	ESCC 3001 §9.12
	Climatic sequence	*	ESCC 3001 §9.13 ESCC 3009 §9.8
	Life tests	2000 H 125°C 1.0 U_R , 1.3 U_R , 1.5 U_R , 2.0 U_R	ESCC 3001 §9.15 ESCC 3009 §9.10

* Dry heat : 2 h, 125°C. Damp heat accelerated, 1 cycle : 24 h, 55°C, 95 % RH
Cold test : 2 h, -55°C. Damp heat accelerated, 5 cycles : 24 h, 55°C, 95 % RH

HOW TO ORDER

As detail specifications (ESCC or EFD) can have different variants associated to the same type of finishes.

It is mandatory to specify the detail specification and the associated variant.

Chips capacitors :

ESCC 3009/003

Detail specification

0805

Case size

06

ESCC
variant

or

EFD 628.03.390

Detail specification

CEC2

Case size

02

EFD
variant

S

Space
Level

Chips capacitors Ceruflex version :

ESCC 3009/040

Detail specification

1206

Case size

03

ESCC
variant

EFD 764.10.390

Detail specification

CEC12

Case size

04

EFD
variant

S

Space
Level

CEC5X / CNC3X / CNC5X :

ESCC 3001/037

Detail specification

CNC32

Case size

10

ESCC
variant

or

EFD 635.03.390

Detail specification

CNC32

Case size

PL

Termin.

E

Space
Level

Testing
level
(B,C,EM)

Lev B

Capa.
value

220 pF

or

221*

* or 2200

Tolerance

10 %

or

K

Rated
voltage

50 V

or

C

According to the
detail specif. :

- 2 Sig. Digits +
Number of zeros
Use 9 for
1.0 - 9.9 pF
or
- 3 Sig. Digits +
Number of zeros

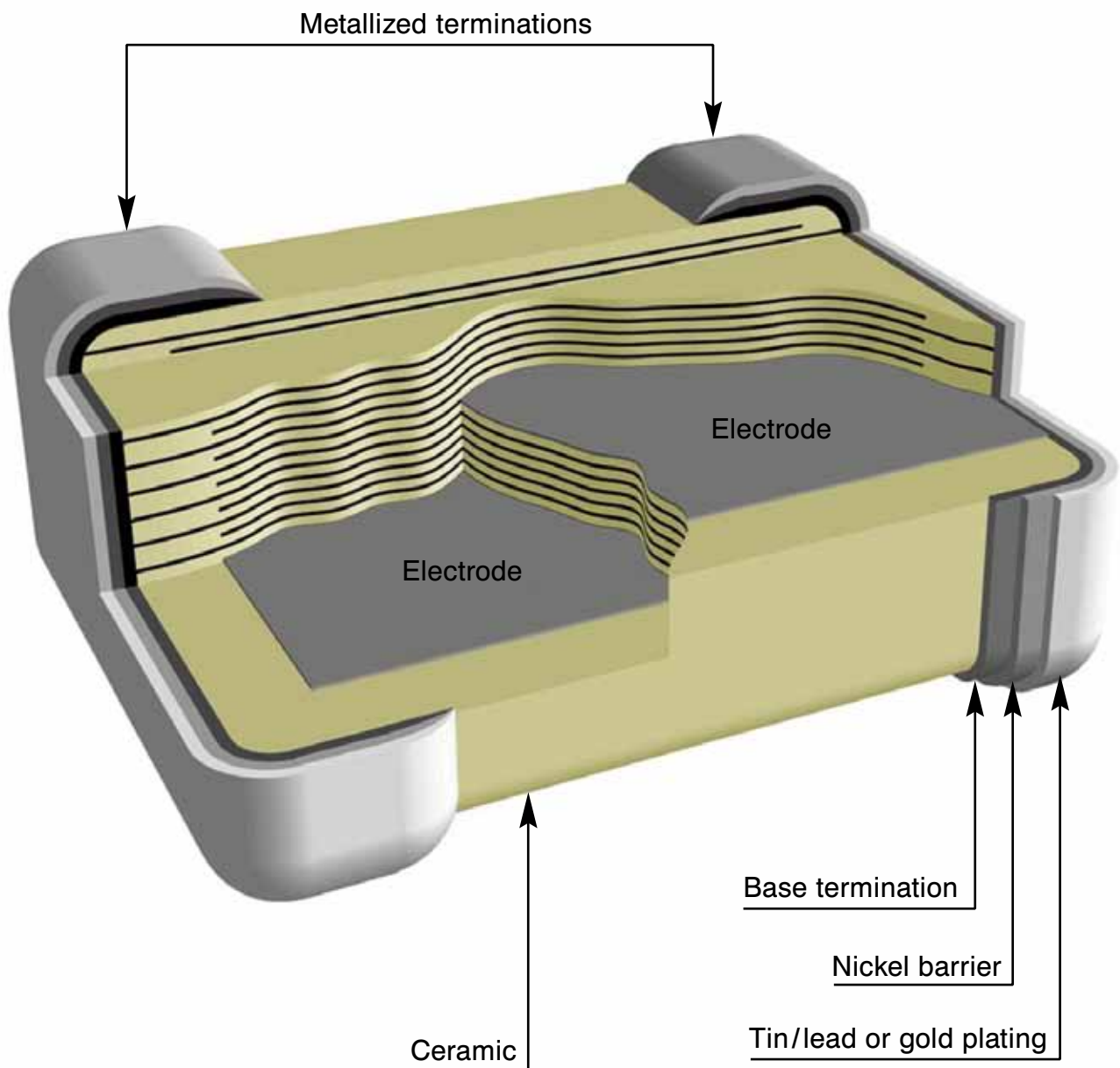
According to the
detail specif. :

16 V : X
25 V : A
50 V : C
100 V : E
200 V : G
500 V : L
1000 V : M

± 0,25 pF : C
± 0,5 pF : D
± 1 pF : F

± 1 % : F
± 2 % : G
± 5 % : J
± 10 % : K
± 20 % : M

Part 1 : CHIPS CAPACITORS



SMD CHIPS CAPACITORS

EUROFARAD offers for space market Multilayer Ceramic Chips Capacitors for SMD mounting.

Ranges are available from **0403 to 2220** from **16 V to 1000 V**. Dielectric are based either on very stable **NPO** type or **X7R** (2C1 or 2R1) type.

Other sizes, values and voltages are available in our standard catalog, there are often used for space applications and fully qualified by EUROFARAD but have not been integrated to ESA specification.

Electrical characteristics :

	NPO/COG	X7R
Operating temperature	-55°C +125°C	
TCC with no voltage applied	±30ppm/°C	±20%
TCC under rated voltage		2C1 : -30% +20% 2R1 : not specified
Dissipation factor	≤ 15.10 ⁻⁴	≤ 250.10 ⁻⁴
Insulation resistance	100 GΩ or 1000 MΩ.μF whichever is less	
Voltage proof	2,5 U _R	

TCC: thermal change of capacitance

All others characteristics are listed in detail specifications.

Available Terminations :

3 Terminations are proposed :

Type of finishes	Associated mounting process
Ag Pd Pt pads	Iron soldering or conductive epoxy bonding
Ni barrier + tin lead coating	Iron soldering, wave soldering, reflow soldering (vapour phase, IR, ...)
Ni barrier + Gold	All processes

How to order :

As detail specifications (ESCC or EFD) can have different variant associated to the same type of finishes , it is mandatory to specify the detail specification according to which parts are ordered.

See page 5

	0603*				0805*				1206*				1210*				1812*				2220*			
	CEC14*				CEC2*				CEC12*				CEC4*				CEC6*				CEC7*			
	Detail specifications																							
EFD	761.10.390				628.03.390				705.06.390				739.08.390				762.10.390				703.06.390			
ESCC	3009/037				3009/003				3009/022				3009/004				3009/005				3009/006			
	Dimensions in mm																							
L	1,6 ± 0,15				2 ± 0,3				3,2 ± 0,4				3,2 ± 0,25				4,5 ± 0,5				5,7 ± 0,5			
I	0,8 ± 0,15				1,25 ± 0,2				1,6 ± 0,3				2,5 ± 0,3				3,2 ± 0,4				5 ± 0,5			
e max	1				1,3				1,8				1,8				1,8				1,8			
M	0,1 - 0,7				0,1 - 0,75				0,2 - 0,75				0,2 - 0,75				0,2 - 0,75				0,2 - 0,75			
U _{rc} (V _{cc}) code	16	25	50	100	16	25	50	100	16	25	50	100	16	25	50	100	16	25	50	100	16	25	50	100
	X	A	C	E	X	A	C	E	X	A	C	E	X	A	C	E	X	A	C	E	X	A	C	E
1 pF																								
1,2																								
1,5																								
1,8																								
2,2																								
2,7																								
3,3																								
3,9																								
4,7																								
5,6																								
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330																								
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470																								
560																								
680																								
820																								
1 nF																								
1,2																								
1,5																								
1,8																								
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2,7																								
3,3																								
3,9																								
4,7																								
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6,8																								
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12																								
15																								
18																								
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39																								
47																								
56																								
68																								

ESA QPL

COG

A 3D perspective diagram of a rectangular surface-mount capacitor. The top surface is labeled 'L' for length. The side face is labeled 'I' for width. The height of the component is labeled 'e'. The distance from the bottom edge of the component to the center of the top surface is labeled 'M'.

±0,1 pF

±0,5 pF

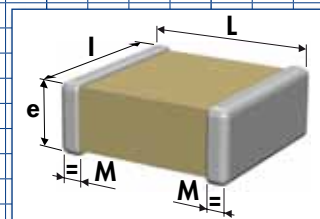
±0,25 pF

±10 % [E12]

±5 % [E24]

±2 % [E48]

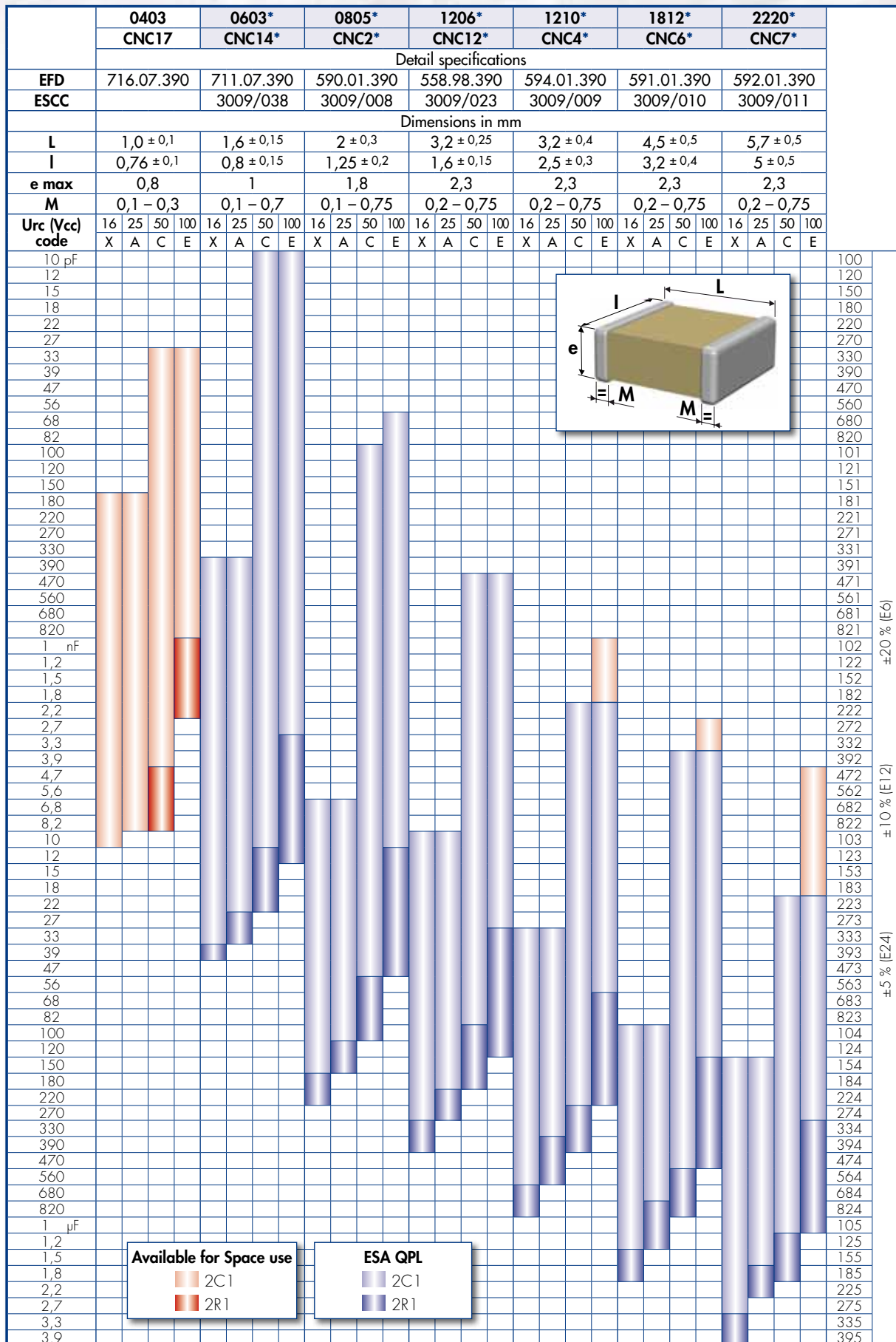
±1 % [E96]



ESA QPL
COG

* ESA qualified Capacitance value between those listed hereabove are also available (contact our Sales Department)

For information only. Please find the complete data in the relevant detail specifications.



* ESA qualified

Low capacitance values can be manufactured with a class 1 dielectric for technological reasons.

For information only. Please find the complete data in the relevant detail specifications.

NPO/COG 200 V - 1000 V

	0805		1206		1210		1812			2220			
	CEC2		CEC12		CEC4		CEC6			CEC7			
	Detail specifications												
EFD	628.03.390		705.06.390		739.08.390		762.10.390			703.06.390			
	Dimensions in mm												
L	2 ± 0,3		3,2 ± 0,25		3,2 ± 0,4		4,5 ± 0,5			5,7 ± 0,5			
I	1,25 ± 0,2		1,5 ± 0,15		2,5 ± 0,3		3,2 ± 0,4			5 ± 0,5			
e max	1,3		1,6		1,8		1,8			1,8			
M	0,1 – 0,75		0,2 – 1		0,1 – 1		0,2 – 1			0,2 – 1,2			
Urc (Vcc) code	200	500	200	500	200	500	200	500	1000	200	500	1000	
	G	L	G	L	G	L	G	L	M	G	L	M	
1 pF													109
1,2													129
1,5													159
1,8													189
2,2													229
2,7													279
3,3													339
3,9													399
4,7													479
5,6													569
6,8													689
8,2													829
10													100
12													120
15													150
18													180
22													220
27													270
33													330
39													390
47													470
56													560
68													680
82													820
100													101
120													121
150													151
180													181
220													221
270													271
330													331
390													391
470													471
560													561
680													681
820													821
1 nF													102
1,2													122
1,5													152
1,8													182
2,2													222
2,7													272
3,3													332
3,9													392
4,7													472
5,6													562
6,8													682
8,2													822
10													103
12													123
15													153
18													183
22													223

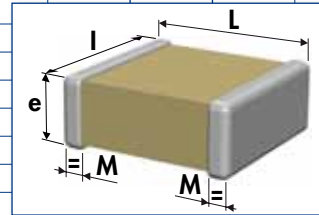
Available for Space use

COG

A 3D perspective diagram of a rectangular COG (Chip On Glass) capacitor. The dimensions are labeled: L is the length, I is the width, e is the height, and M is the thickness of the top and bottom glass layers.

±20 % (E6)

±10 % (E12)

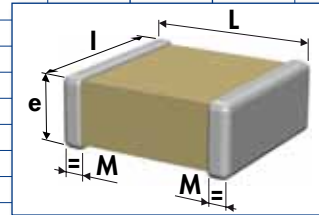


Available for Space use
COG

For information only. Please find the complete data in the relevant detail specifications.

X7R 200 V - 1000 V

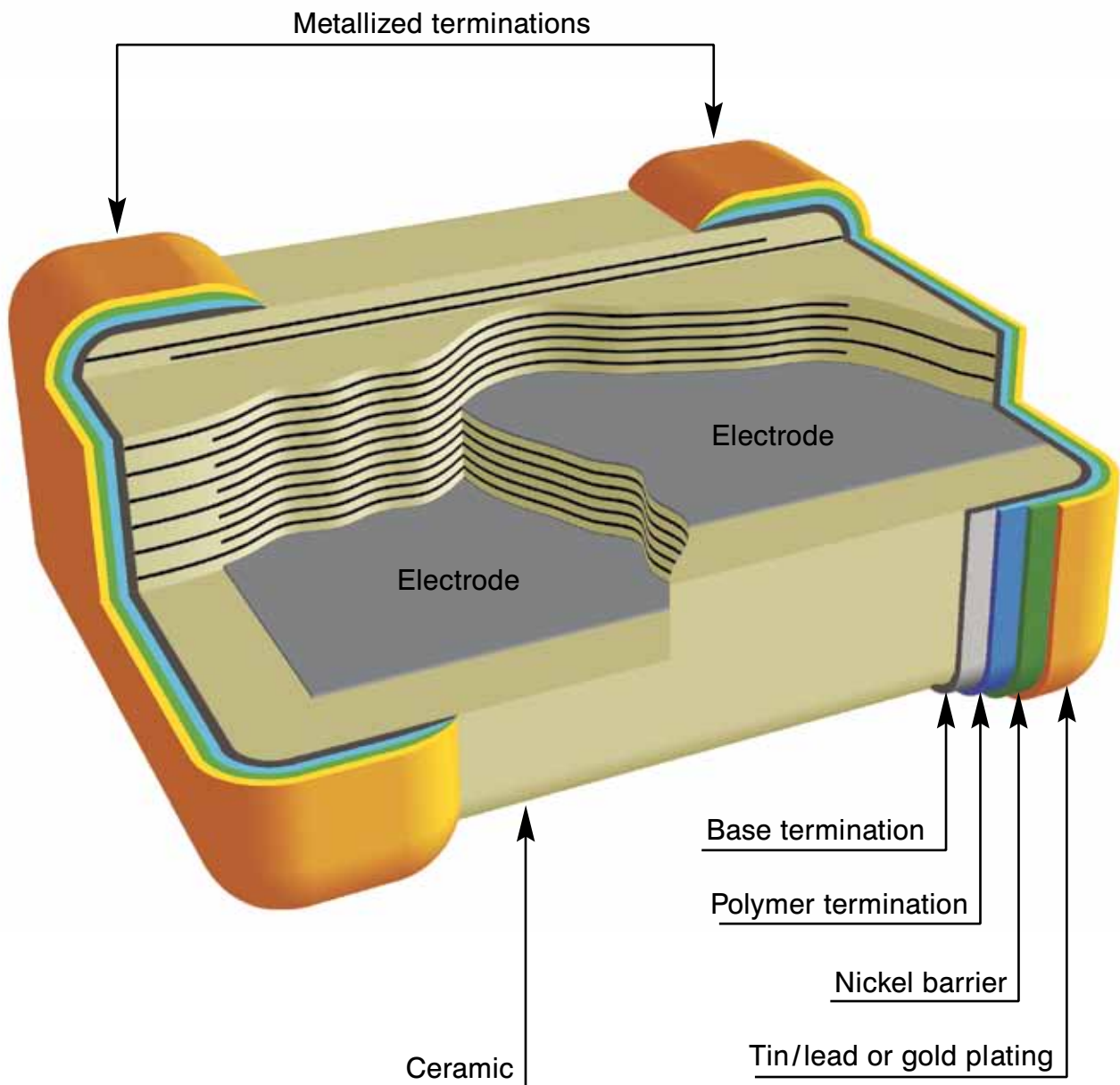
	0805		1206		1210		1812			2220		
	CNC2		CNC12		CNC4		CNC6			CNC7		
	Detail specifications											
EFD	590.01.390		558.98.390		594.01.390		591.01.390			592.01.390		
	Dimensions in mm											
L	2 ± 0,3		3,2 ± 0,4		3,2 ± 0,4		4,5 ± 0,5			5,7 ± 0,5		
I	1,25 ± 0,2		1,6 ± 0,3		2,5 ± 0,3		3,2 ± 0,4			5 ± 0,5		
e max	1,3		1,6		1,8		1,8			1,8		
M	0,1 – 0,75		0,2 – 0,75		0,2 – 0,75		0,2 – 0,75			0,2 – 0,75		
Urc (Vcc)	200	500	200	500	200	500	200	500	1000	200	500	1000
code	G	L	G	L	G	L	G	L	M	G	L	M
10 pF												100
12												120
15												150
18												180
22												220
27												270
33												330
39												390
47												470
56												560
68												680
82												820
100												101
120												121
150												151
180												181
220												221
270												271
330												331
390												391
470												471
560												561
680												681
820												821
1 nF												102
1,2												122
1,5												152
1,8												182
2,2												222
2,7												272
3,3												332
3,9												392
4,7												472
5,6												562
6,8												682
8,2												822
10												103
12												123
15												153
18												183
22												223
27												273
33												333
39												393
47												473
56												563
68												683
82												823
100												104
120												124
150												154
180												184
220												224
270												274
330												334
390												394
470												474



Available for Space use
X7R

For information only. Please find the complete data in the relevant detail specifications.

Part 2 : CHIPS CAPACITORS CERUFLEX VERSION



SMD CHIPS CAPACITORS CERUFLEX VERSION

EUROFARAD offers for space market Multilayer Ceramic Chips Capacitors for SMD mounting.

Ranges are available from **0403 to 2220** from **16 V to 100 V**. Dielectric are based either on very stable **NPO** type or **X7R** (2C1 or 2R1) type.

Other sizes, values and voltages are available in our standard catalog, there are often used for space applications and fully qualified by EUROFARAD but have not been integrated to ESA specification.

	NPO/COG	X7R
Operating temperature	-55°C +125°C	
TCC with no voltage applied	±30ppm/°C	±20%
TCC under rated voltage		2C1 : -30% +20% 2R1 : not specified
Dissipation factor	≤ 15.10 ⁻⁴	≤ 250.10 ⁻⁴
Insulation resistance	100 GΩ or 1000 MΩ.μF whichever is less	
Voltage proof	2,5 U _R	

TCC: thermal change of capacitance

All others characteristics are listed in detail specifications.

Available Terminations :

Type of finishes	Associated mounting process
Polymer/Ni barrier + tin lead coating	Iron soldering, wave soldering, reflow soldering (vapour phase, IR, ...)
Polymer/Ni barrier + Gold	All processes

How to order :

As detail specifications (ESCC or EFD) can have different variant associated to the same type of finishes , it is mandatory to specify the detail specification according to which parts are ordered.

See page 5

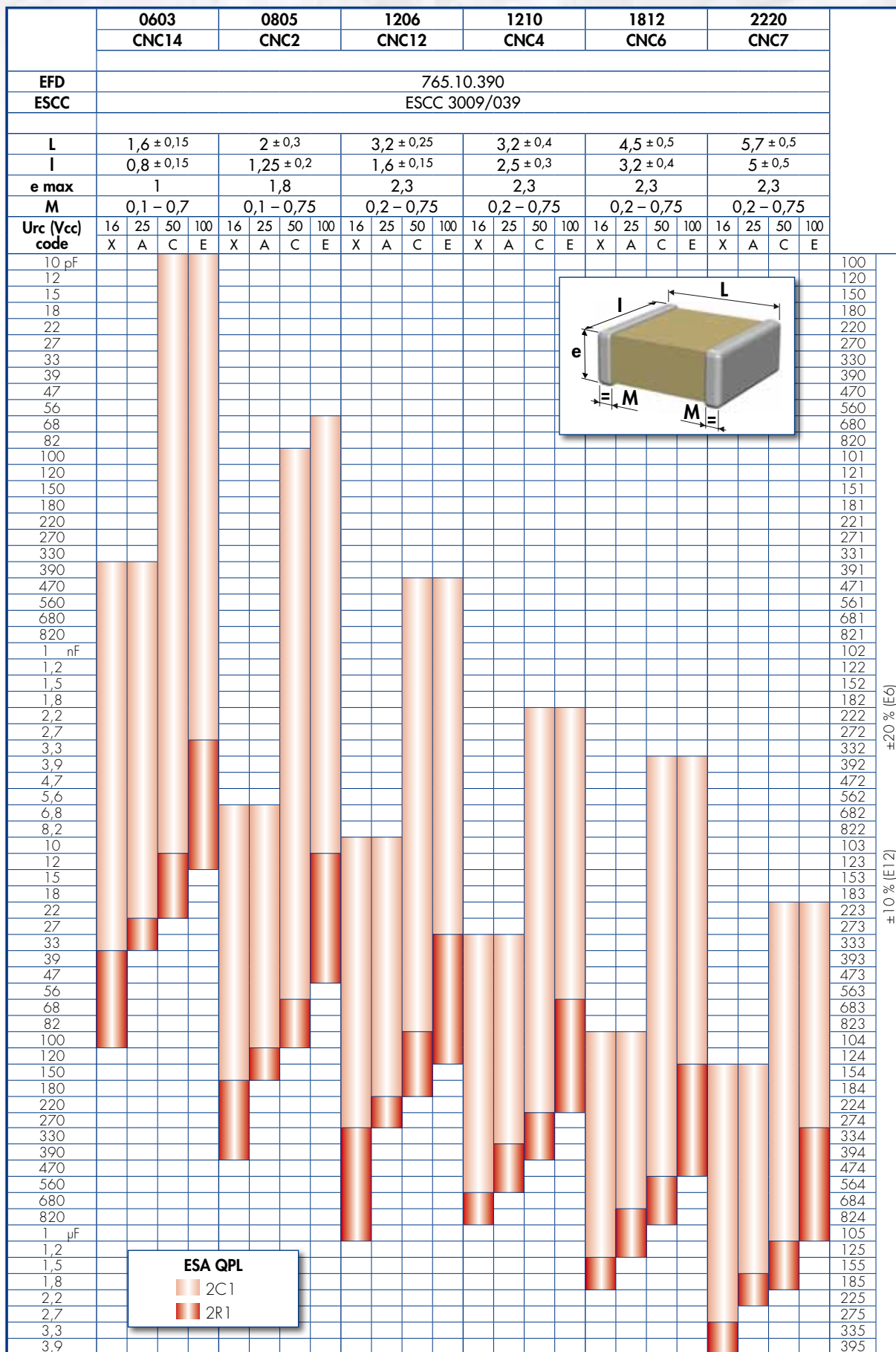
NPO 16 V - 100 V CERUFLEX VERSION

[illegible]

Low capacitance values can be manufactured with a class 1 dielectric for technological reasons.

For information only. Please find the complete data in the relevant detail specifications.

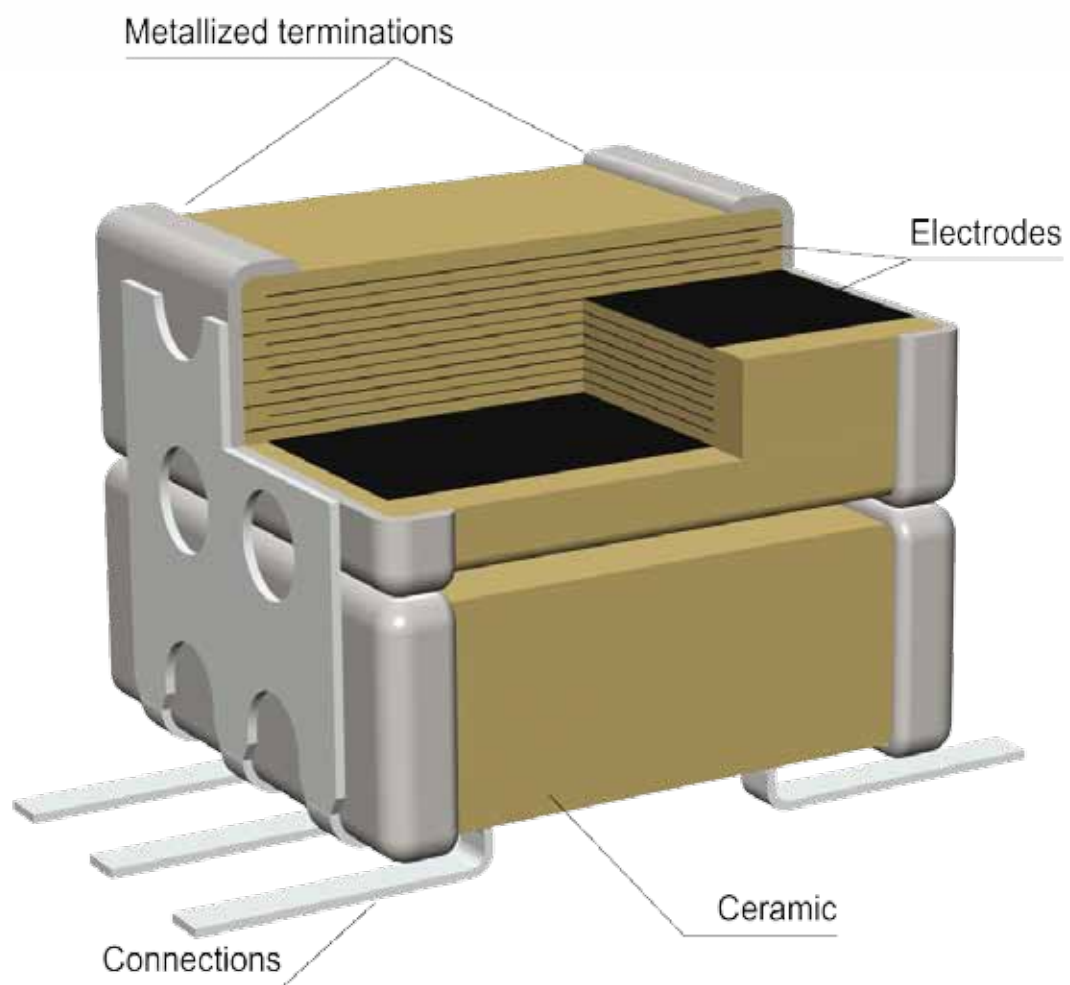
X7R 16 V - 100 V CERUFLEX VERSION



Low capacitance values can be manufactured with a class 1 dielectric for technological reasons.

For information only. Please find the complete data in the relevant detail specifications.

Part 3 : SWITCH MODE POWER SUPPLY



SWITCH MODE POWER SUPPLY

EUROFARAD is providing a large offer for high capacitance stacked capacitors for Switch Mode Power Supply, DC-DC converters,...

- CEC 5X for voltages from 63 V to 500 V

Two ranges are available and ESA qualified :

- CNC 3X for voltages from 16 V to 25 V : in ESA QPL
- CNC 5X for voltages from 50 V to 500 V : in ESA QPL

Electrical characteristics :

	CNC3X	CNC5X
Operating temperature	- 55°C +125°C	
TCC with no voltage applied	± 20%	
TCC under rated voltage	- 50 % + 30 %	
Dissipation factor	$\leq 250 \cdot 10^{-4}$	
Insulation resistance	$\geq 1000 \text{ M}\Omega \cdot \mu\text{F}$	
Voltage proof	$2,5 U_R$	$2,5 U_R$ for $U_R \leq 200 \text{ V}$ $2 U_R$ for $U_R = 500 \text{ V}$

TCC: thermal change of capacitance

All others characteristics are listed in detail specifications.

Available Terminations :

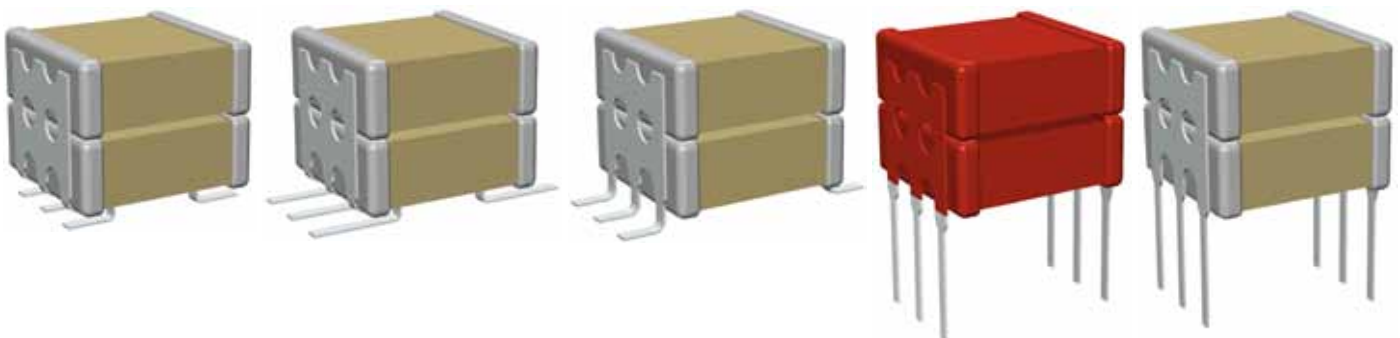
PE

PLE

LE

NE

NUE



How to order :

As detail specifications (ESCC or EFD) can have different variant associated to the same type of finishing, it is mandatory to specify the detail specification according to which parts are ordered.

See page 5

CEC 5X 63 V - 500 V

	3033	3740	5550	6080	8060	40140	80150	
	CEC53	CEC54	CEC55	CEC56	CEC65	CEC57	CEC58	
	Detail specifications							
EFD	811.12.390							
	Dimensions in mm							
B max.	9	12	14,9	16,8	21,6	12	24	
A / E max.	9,2	11,5	13,6	21,6	16,6	38,2	40,6	
h max.	4 8 12 16	4 8 12 16	4 8 12 16	4 8 12 16	4 8 12 16	4 8 12 16	4 8 12 16	
Nb of Pins	3 per side	4 per side	5 per side	7 per side	6 per side	14 per side	14 per side	
U _{rc} (V _{cc})	50 100 200 500	50 100 200 500	50 100 200 500	50 100 200 500	50 100 200 500	50 100 200 500	50 100 200 500	
code	C E G L	C E G L	C E G L	C E G L	C E G L	C E G L	C E G L	
0,01 μ F								103
0,012								123
0,015								153
0,018								183
0,022								223
0,027								273
0,033								333
0,039								393
0,047								473
0,056								563
0,068								683
0,082								823
0,1								104
0,12								124
0,15								154
0,18								184
0,22								224
0,27								274
0,33								334
0,39								394
0,47								474
0,56								564
0,68								684
0,82								824
1								105
1,2								125
1,5								155
1,8								185
2,2								225
2,7								275
3,3								335
3,9								395
4,7								475
5,6								565
6,8								685
8,2								825
10								106
12								126
15								156
18								186
22								226

Available for Space use

Others characteristics in detail specifications.

For information only. Please find the complete data in the relevant detail specifications.

	2220*		2528*		3333*		4040*				
	CNC31*		CNC32*		CNC33*		CNC34*				
	Detail specifications										
EFD	635.03.390										
ESCC	ESCC 3001/037										
	Dimensions in mm										
B max.	7,5		8		10		12,5				
A / E max.	6		8		9,2		12				
h max.	2,5	5	7,5	2,5	5	7,5	10	2,5	5	7,5	10
Nb of Pins	2 per side		3 per side		3 per side		4 per side				
Urc (Vcc) code	16	25	16	25	16	25	16	25			
	X	A	X	A	X	A	X	A			
1,2 μF											125
1,5											155
1,8											185
2,2											225
2,7											275
3,3											335
3,9											395
4,7											475
5,6											565
6,8											685
8,2											825
10											106
12											126
15											156
18											186
22											226
27											276
33											336
39											396
47											476
56											566
68											686
82											826
100											107
120											127

Diagram illustrating the dimensions of the capacitor package:

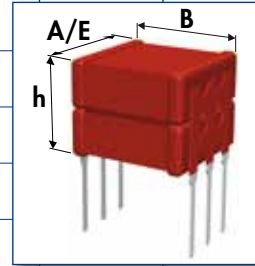
The diagram shows a red rectangular capacitor package with four pins. The dimensions are labeled as follows:

- A/E**: Width of the package.
- B**: Height of the package.
- h**: Thickness of the package.

ESA QPL

The color-coded bar represents the following values:

- 2,5
- 5
- 7,5
- 10



ESA QPL



* ESA Qualified

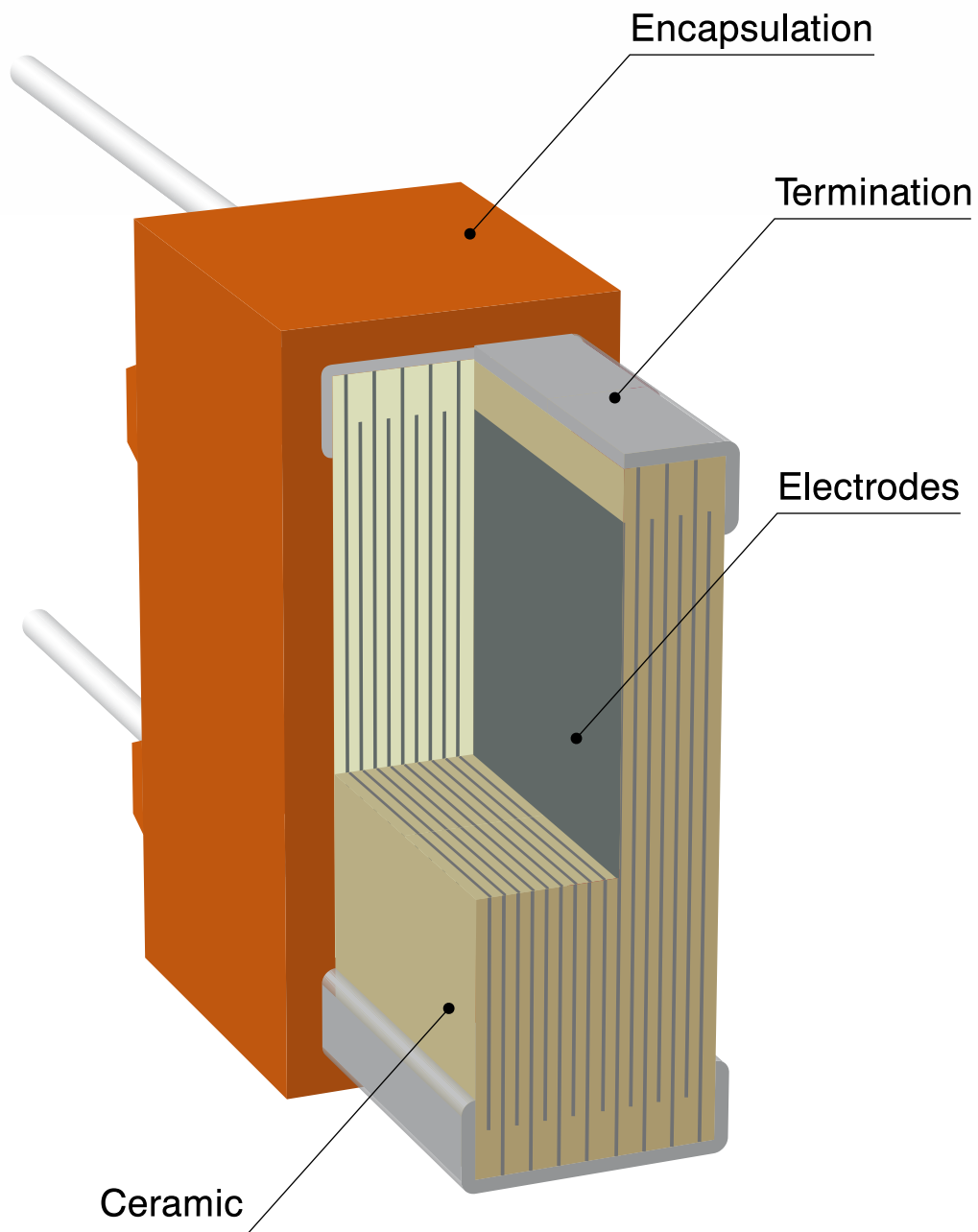
Others characteristics in detail specifications.

For information only. Please find the complete data in the relevant detail specifications.

 ESA Qualified
 Others characteristics in detail specifications.

20

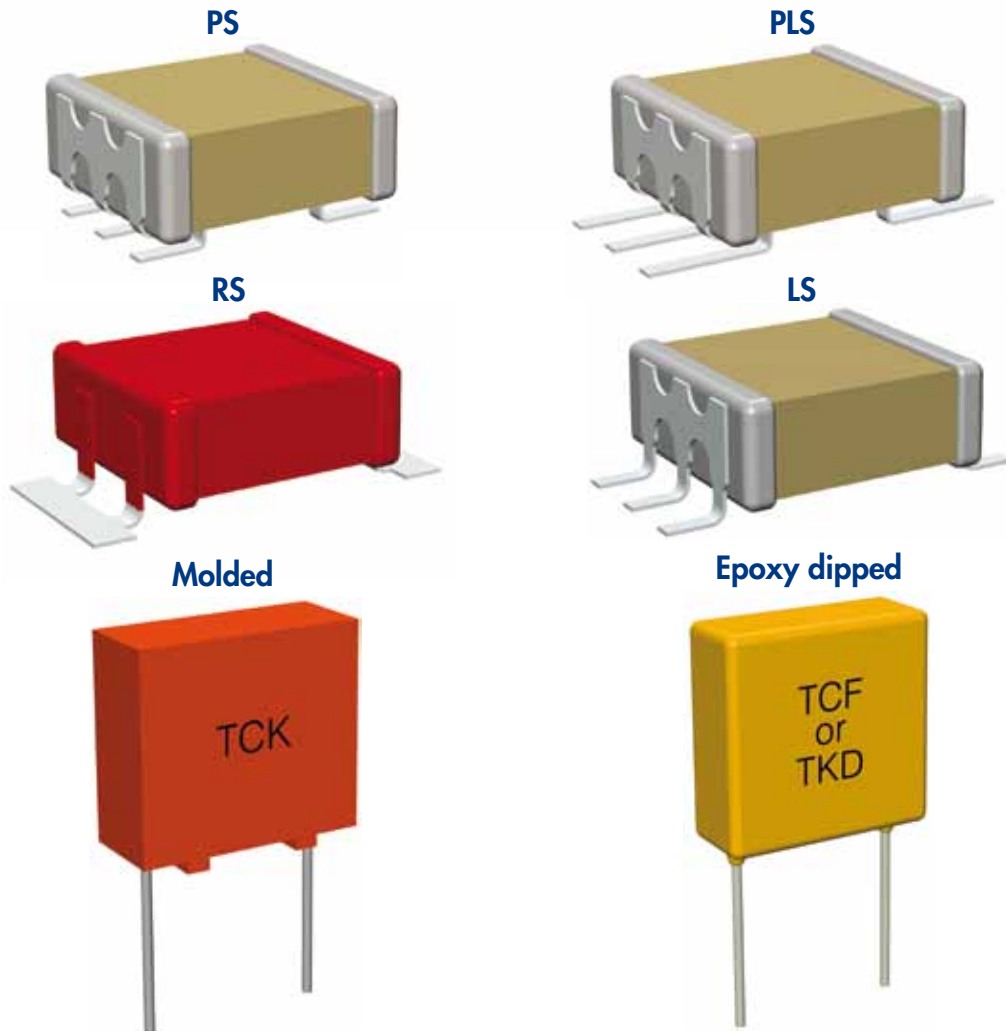
Part 4 : HIGH VOLTAGE



HIGH VOLTAGE CAPACITORS

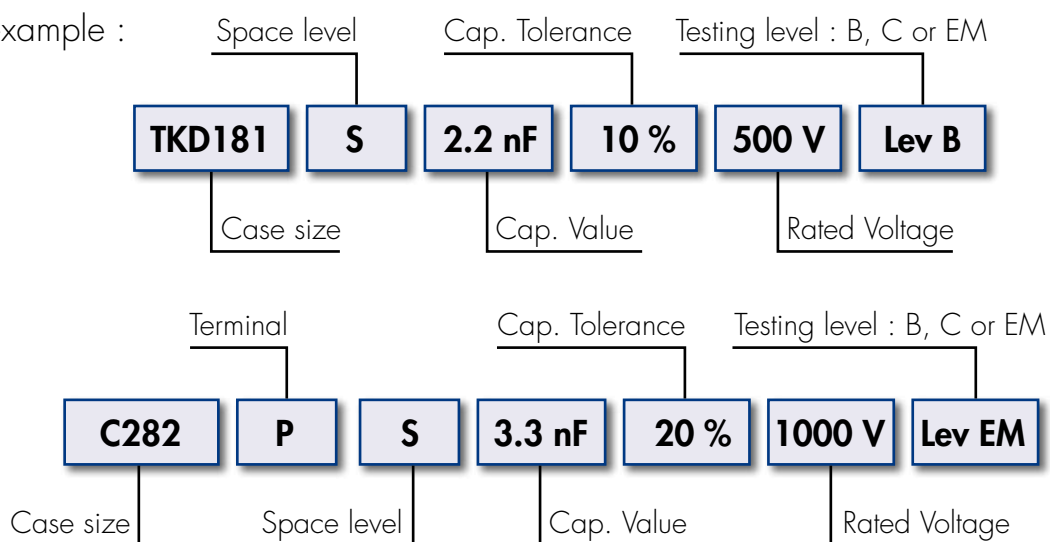
EUROFARAD provides a wide range of high voltage capacitors for space applications. Both dielectrics NPO/COG, very stable, and X7R (high volumic capacitance) are available.

Those components are available as MLCC with a nickel barrier and a tin/lead coating. Or, as shown herebelow, with a wide range of connexions and coatings :

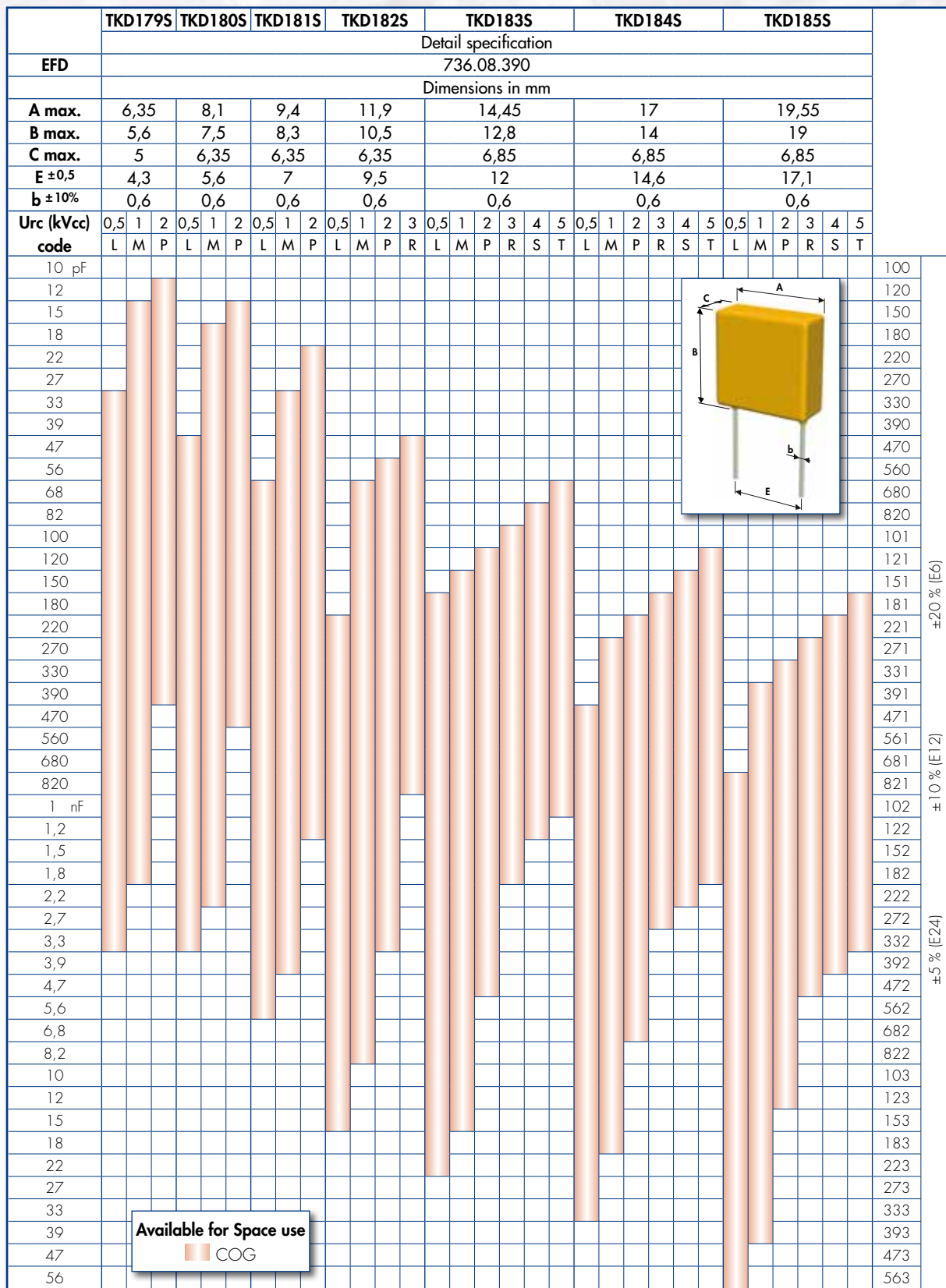


How to order :

For example :



NPO / COG HIGH VOLTAGE



For C < 50 pF : $\text{tg } \delta \leq 1,5 (150/C_R + 7) \cdot 10^{-4}$

For C ≥ 50 pF : $\text{tg } \delta \leq 15 \cdot 10^{-4}$

Insulation resistance : ≥ 100 GΩ or 1000 MΩ.μF
whichever is less

Others characteristics in detail specifications.

Voltage proof Dielectric : $U_R < 500 \text{ V}$ 2,5 U_R

$U_R = 500 \text{ V}$ 2 U_R

$U_R = 1000 \text{ V}$ 1,5 U_R

$U_R > 1000 \text{ V}$ 1,3 U_R

For information only. Please find the complete data in the relevant detail specifications.

NPO / COG HIGH VOLTAGE

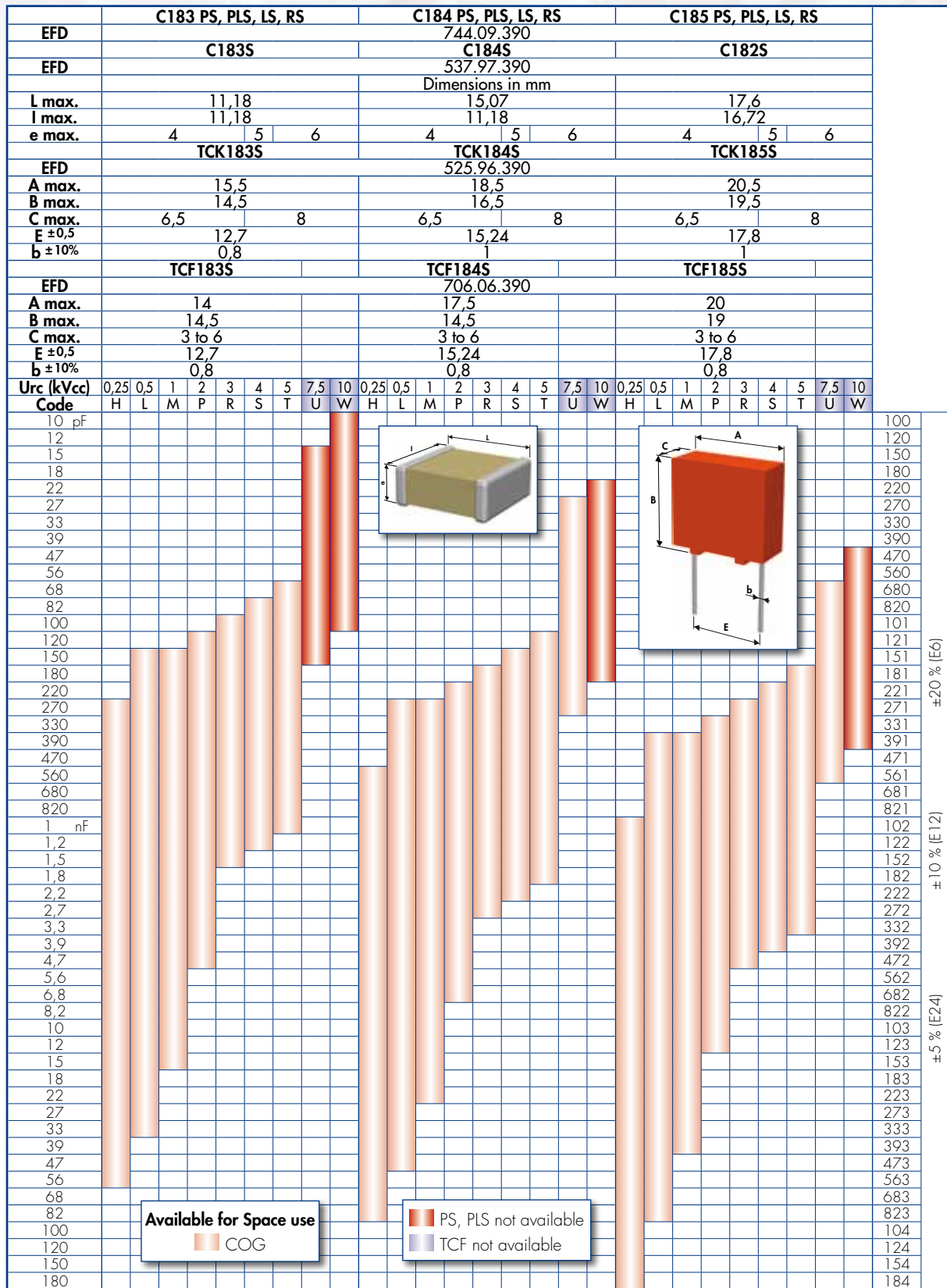
EFD		C180 PS, PLS, LS, RS										C181 PS, PLS, LS, RS										C182 PS, PLS, LS, RS									
		C179S					C180S					C181S					C182S														
EFD		537.97.390																													
		Dimensions in mm																													
L max.	5						6,27					7,7					9,24														
l max.	3,7						5,5					6,98					9,24														
e max.	4						3,5		4,3			4,5			5,5		6,5			4		5		6							
EFD		TCK179S					TCK180S					TCK181S					TCK182S														
		525.96.390																													
A max.	7,7						8,5					11					13,5														
B max.	7,5						8,5					9,5					12,5														
C max.	5						3		5			6,5			8		6,5		8												
E ±0,5	5,08						5,08					7,62					10,16														
b ±10%	0,6						0,6					0,8					0,8														
EFD		TCF179S					TCF180S					TCF181S					TCF182S														
		706.06.390																													
A max.	6,5						8					10					10,5														
B max.	6						9					8,9					11,5														
C	5						3 to 5					3 to 6					3 to 7														
E ±0,5	5,08						5,08					7,62					10,16														
b ±10%	0,6						0,6					0,8					0,8														
Urc (kVcc)	0,25	0,5	1	2	3	4	0,25	0,5	1	2	3	4	5	0,25	0,5	1	2	3	4	5	0,25	0,5	1	2	3	4	5				
Code	H	L	M	P	R	S	H	L	M	P	R	S	T	H	L	M	P	R	S	T	H	L	M	P	R	S	T				
10 pF																											100				
12																											120				
15																											150				
18																											180				
22																											220				
27																											270				
33																											330				
39																											390				
47																											470				
56																											560				
68																											680				
82																											820				
100																											101				
120																											121				
150																											151				
180																											181				
220																											221				
270																											271				
330																											331				
390																											391				
470																											471				
560																											561				
680																											681				
820																											821				
1 nF																											102				
1,2																											122				
1,5																											152				
1,8																											182				
2,2																											222				
2,7																											272				
3,3																											332				
3,9																											392				
4,7																											472				
5,6																											562				
6,8																											682				
8,2																											822				
10																											103				
12																											123				
15																											153				
18																											183				
22																											223				
27																											273				
33																											333				
39																											393				
47																											473				
56																											563				
68																											683				
82																											823				
100																											104				
120																											124				
150																											154				
180																											184				

Available for Space use

COG

PS, PLS not available

NPO / COG HIGH VOLTAGE



For C < 50 pF : $tg \delta \leq 1,5 (150/C_R + 7) 10^{-4}$ Voltage proof Dielectric : $U_R < 500 V$ 2,5 U_R
 For C ≥ 50 pF : $tg \delta \leq 15 \cdot 10^{-4}$ $U_R = 500 V$ 2 U_R
 Insulation resistance : ≥ 100 GΩ or 1000 MΩ.μF $U_R = 1000 V$ 1,5 U_R
 whichever is less $U_R > 1000 V$ 1,3 U_R

Others characteristics in detail specifications.

For information only. Please find the complete data in the relevant detail specifications.

Insulation resistance : $\geq 20 \text{ G}\Omega$ or $500 \text{ M}\Omega \cdot \mu\text{F}$	Voltage proof Dielectric :	$U_R < 500 \text{ V}$	2,5 U_p
whichever is less		$U_R = 500 \text{ V}$	2 U_p
$\text{tg } \delta \leq 250 \cdot 10^{-4}$		$U_R = 1000 \text{ V}$	1,5 U_p
		$U_R > 1000 \text{ V}$	1,3 U_p

For information only. Please find the complete data in the relevant detail specifications.

X7R HIGH VOLTAGE

[illegible]

Insulation resistance : $\geq 20 \text{ G}\Omega$ or $500 \text{ M}\Omega \cdot \mu\text{F}$
whichever is less

$$\operatorname{tg} \delta \leq 250 \cdot 10^{-4}$$

Voltage proof Dielectric :

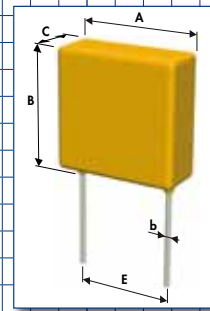
$U_R < 500 \text{ V}$	2,5 U_R
$U_R = 500 \text{ V}$	2 U_R
$U_R = 1000 \text{ V}$	1,5 U_R
$U_R > 1000 \text{ V}$	1,3 U_R

Others characteristics in detail specifications.

For information only. Please find the complete data in the relevant detail specifications.

X7R HIGH VOLTAGE

	TKD279S			TKD280S			TKD281S			TKD282S			TKD283S			TKD284S			TKD285S										
	Detail specification																												
EFD	605.02.390																												
	Dimensions in mm																												
A max.	6,35			8,1			9,4			11,9			14,45			17			19,55										
B max.	5,6			7,5			8,3			10,5			12,8			14			19										
C max.	5			6,35			6,35			6,35			6,85			6,85			6,85										
E ±0,5	4,3			5,6			7			9,5			12			14,6			17,1										
b ±10%	0,6			0,6			0,6			0,6			0,6			0,6			0,6										
U _{rc} (kVcc)	0,5	1	2	0,5	1	2	0,12	0,25	0,5	1	2	0,25	0,5	1	2	3	4	0,5	1	2	3	4	5	0,5	1	2	3	4	5
Code	L	M	P	L	M	P	H	L	M	P	R	H	L	M	P	R	S	L	M	P	R	S	T	L	M	P	R	S	T
100 pF																													101
120																													121
150																													151
180																													181
220																													221
270																													271
330																													331
390																													391
470																													471
560																													561
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1 nF																													102
1,2																													122
1,5																													152
1,8																													182
2,2																													222
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3,9																													392
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82																													823
100																													104
120																													124
150																													154
180																													184
220																													224
270																													274
330																													334
390																													394
470																													474
560																													564
680																													684
820																													824
1 μF																													105
1,2																													125



Available for Space use
X7R

Insulation resistance : $\geq 20 \text{ G}\Omega$ or $500 \text{ M}\Omega \cdot \mu\text{F}$
whichever is less

$\text{tg } \delta \leq 250 \cdot 10^{-4}$

Voltage proof Dielectric : $U_R < 500 \text{ V}$ 2,5 U_R
 $U_R = 500 \text{ V}$ 2 U_R
 $U_R = 1000 \text{ V}$ 1,5 U_R
 $U_R > 1000 \text{ V}$ 1,3 U_R

Others characteristics in detail specifications.

For information only. Please find the complete data in the relevant detail specifications.

APPROVALS



European Space Agency
Agence spatiale européenne

Certificate of Qualification No. 306

This is to certify that EUROFARAD, Chanteloup en Brie, France has been qualified by ESA for the supply of Capacitors, Ceramic, Type II, 50V to 500V, based on Types CNC53 to CNC56 for use in ESA space programmes, according to ESCC Generic Specification 3001 and associated Detail Specification 3001/038 as recommended by the Space Components Steering Board.

This certificate is valid until March 2013.

Head of Product Assurance
and Safety Department

Date
17 March 2011



European Space Agency
Agence spatiale européenne

Certificate of Qualification No. 315

This is to certify that EUROFARAD, Chanteloup en Brie, France has been qualified by ESA for the supply of Capacitors, Ceramic, Type II, Multiple Layers, based on Types CNC 31 to 34, NE, PE and PLE for use in ESA space programmes, according to ESCC Generic Specification 3001 and associated Detail Specification 3001/037 as recommended by the Space Components Steering Board.

This certificate is valid until November 2013.

Head of Product Assurance
and Safety Department

Date
15 November 2011



European Space Agency
Agence spatiale européenne

Certificate of Qualification No. 323

This is to certify that EUROFARAD, Chanteloup-en-Brie, France has been qualified by ESA for the supply of Capacitors, Ceramic, Fixed, Chip, Type I for use in ESA space programmes, according to ESCC Generic Specification 3009 and associated Detail Specifications (Please see QPL sheet) as recommended by the Space Components Steering Board.

This certificate is valid until October 2014.

Head of the Product Assurance
and Safety Department

Date
24 October 2012



European Space Agency
Agence spatiale européenne

Certificate of Qualification No. 324

This is to certify that EUROFARAD, Chanteloup-en-Brie, France has been qualified by ESA for the supply of Capacitors, Ceramic, Fixed, Chip, Type II for use in ESA space programmes, according to ESCC Generic Specification 3009 and associated Detail Specifications (Please see QPL sheet) as recommended by the Space Components Steering Board.

This certificate is valid until October 2014.

Head of the Product Assurance
and Safety Department

Date
24 October 2012



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