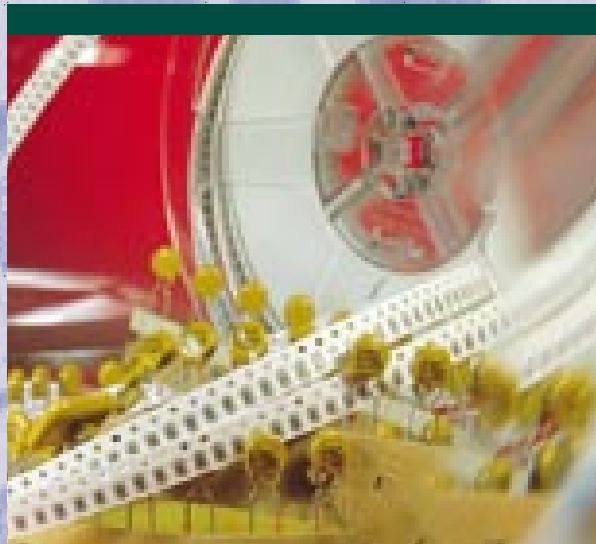


# Multilayer ceramic capacitors

## SMD - Dipped - Moulded



# Multilayer Ceramic Chip Capacitors

AgPdPt terminations

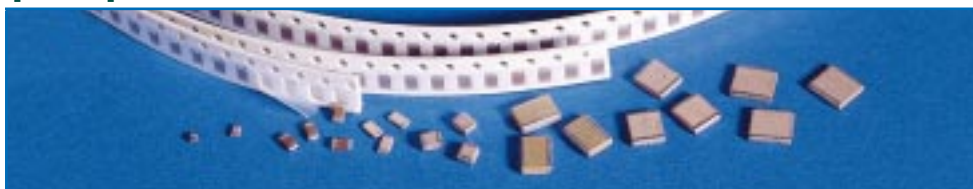


Dielectric type	Voltage (U <sub>r</sub> )	Capacitance Range	AC11 0504	AC12 0805	AC20 1206	AC13 1210	AC14 1812	AC15 2220	AC45 1825	AC43 2225
NPO	50	Min	0109	0109	0109	0100	0101	0471	0102	0102
		Max	0271	0152	0472	0103	0223	0473	0473	0563
	100	Min	0109	0109	0109	0100	0101	0471	0102	0102
		Max	0221	0681	0272	0682	0153	0273	0273	0333
200	Min	–	(1)	0100	0220	0470	0101	–	–	
	Max	–	(1)	0102	0222	0472	0103	–	–	
500	Min	–	(1)	0100	0100	0101	0471	–	–	
	Max	–	(1)	0681	0152	0222	0562	–	–	
X7R	50	Min	0272	0471	0102	0103	0473	0104	0104	0104
		Max	0682	0683	0154	0334	0684	0155	0125	0155
	100	Min	0221	0471	0102	0472	0103	0473	0104	0104
		Max	0222	0183	0683	0154	0394	0105	0684	0105
200	Min	–	(1)	0101	0471	0102	0472	–	–	
	Max	–	(1)	0473	0104	0184	0474	–	–	
500	Min	–	(1)	0101	0471	0102	0472	–	–	
	Max	–	(1)	0153	0273	0563	0104	–	–	
Z5U	50	Min	0682	0103	0103	0473	0104	0104	0104	0104
		Max	0103	0154	0334	0105	0225	0475	0475	0475
	100	Min	0152	0103	0103	0473	0104	0104	0104	0104
		Max	0472	0104	0224	0474	0105	0225	0155	0225
200	Min	–	(1)	0472	0103	0223	0473	–	–	
	Max	–	(1)	0104	0224	0474	0684	–	–	
500	Min	–	(1)	0472	0472	0103	0223	–	–	
	Max	–	(1)	0223	0473	0683	0154	–	–	

(1) 0805/200 and 500 V, please consult us.

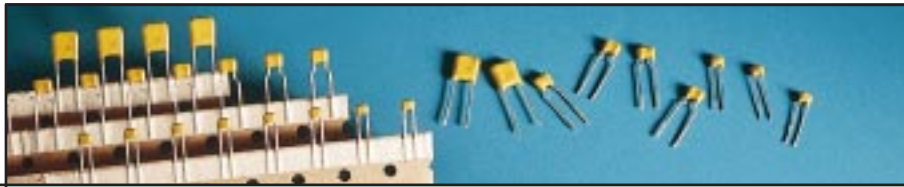
# Multilayer Ceramic Chip Capacitors

Nickel - barrier terminations



Dielectric type	Voltage (U <sub>r</sub> )	Capacitance Range	AN21 0603	AN12 0805	AN20 1206	AN13 1210	AN14 1812	AN15 2220	AN45 1825	AN43 2225
NPO	50	Min Max	0109 0471	0109 0152	0109 0332	0100 0682	0101 0153	0471 0333	0102 0333	0102 0393
	100	Min Max	- -	0109 0561	0109 0222	0100 0222	0101 0682	0471 0153	0102 0153	0102 0183
	200	Min Max	- -	(1) (1)	0100 0102	0220 0222	0470 0472	0101 0103	- -	- -
	500	Min Max	- -	(1) (1)	0100 0681	0100 0152	0101 0222	0471 0562	- -	- -
X7R	16	Min Max	0473 0104	0224 0474	0334 0105	(2)	(2)	(2)	- -	- -
	25	Min Max	0822 0473	0333 0224	0154 0474	(2)	(2)	(2)	- -	- -
	50	Min Max	0271 0103	0471 0683	0102 0154	0103 0334	0473 0684	0104 0155	0104 0125	0104 0155
	100	Min Max	- -	0471 0183	0102 0683	0472 0154	0103 0394	0473 0105	0104 0684	0104 0105
	200	Min Max	- -	(1) (1)	0101 0473	0471 0104	0102 0184	0472 0474	- -	- -
	500	Min Max	- -	(1) (1)	0101 0153	0471 0273	0102 0563	0472 0104	- -	- -
Z5U	50	Min Max	0472 0473	0103 0224	0103 0474	0473 0105	0104 0225	0104 0475	0104 0475	0104 0475
	100	Min Max	- -	0103 0104	0103 0224	0103 0474	0104 0105	0104 0225	0104 0155	0104 0225
	200	Min Max	- -	(1) (1)	0472 0104	0103 0224	0223 0474	0473 0684	- -	- -
	500	Min Max	- -	(1) (1)	0472 0223	0472 0473	0103 0683	0223 0154	- -	- -
Y5V	16	Min Max	0224 0224	0105 0105	0225 0225	- -	- -	- -	- -	- -
	25	Min Max	0473 0104	0104 0474	0105 0105	- -	- -	- -	- -	- -
	50	Min Max	0472 0473	0103 0334	0103 0474	- -	- -	- -	- -	- -
			(1) 0805/200 and 500 V, please consult us.							

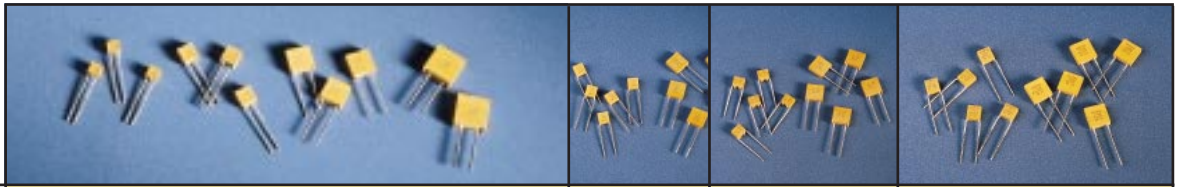
# Dipped Multilayer Ceramic Capacitors



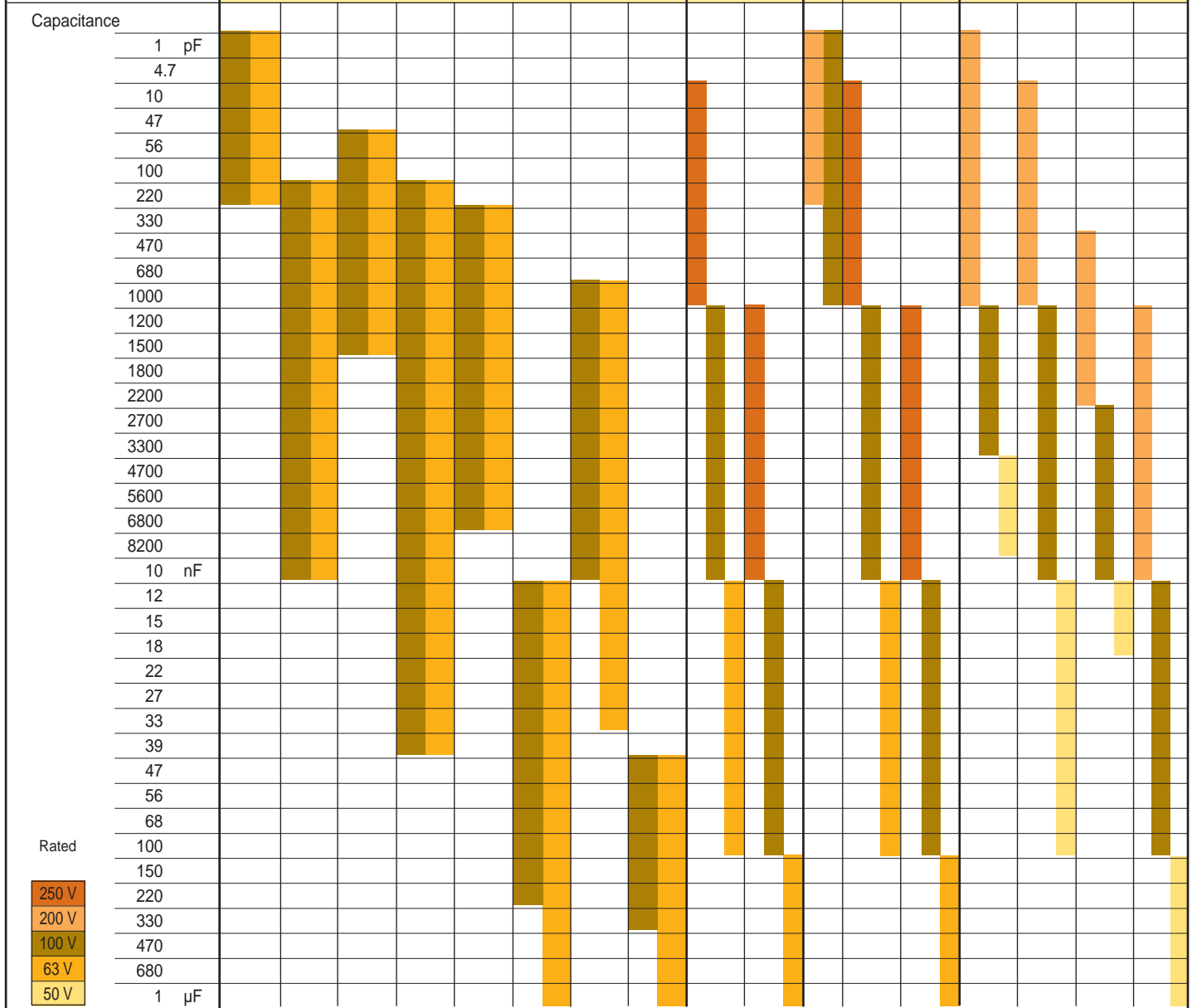
Type	Radial Dipped "EcoCaps" (1)															
Size	ECO4				ECO5				ECO8							
Dimensions (mm)	3.8 5.8 2.5 0.5 2.54 (2)				5.0 7.5 3.1 0.6 2.54 (2)				7.6 9.6 3.8 0.6 5.08							
Dielectric class	CECC/IEC EIA				1B COG				1B COG				2C1 COG			
CECC Standards	CE72 CE77				CN72 CN77				CE73 CE78				CN73 CN78			
Approvals (3)	30601 -015				30701 -031				30701 -045				30701 -044			
Voltage (U <sub>r</sub> )	200 100 50				200 100 50				200 100 50				200 100 50			
Capacitance																
4.7 pF	[Bar chart showing capacitance availability for various types and voltages]															
10	[Bar chart showing capacitance availability for various types and voltages]															
47	[Bar chart showing capacitance availability for various types and voltages]															
100	[Bar chart showing capacitance availability for various types and voltages]															
470	[Bar chart showing capacitance availability for various types and voltages]															
560	[Bar chart showing capacitance availability for various types and voltages]															
820	[Bar chart showing capacitance availability for various types and voltages]															
1000	[Bar chart showing capacitance availability for various types and voltages]															
1200	[Bar chart showing capacitance availability for various types and voltages]															
1800	[Bar chart showing capacitance availability for various types and voltages]															
2200	[Bar chart showing capacitance availability for various types and voltages]															
2700	[Bar chart showing capacitance availability for various types and voltages]															
3300	[Bar chart showing capacitance availability for various types and voltages]															
4700	[Bar chart showing capacitance availability for various types and voltages]															
6800	[Bar chart showing capacitance availability for various types and voltages]															
10 nF	[Bar chart showing capacitance availability for various types and voltages]															
15	[Bar chart showing capacitance availability for various types and voltages]															
22	[Bar chart showing capacitance availability for various types and voltages]															
33	[Bar chart showing capacitance availability for various types and voltages]															
47	[Bar chart showing capacitance availability for various types and voltages]															
68	[Bar chart showing capacitance availability for various types and voltages]															
100	[Bar chart showing capacitance availability for various types and voltages]															
150	[Bar chart showing capacitance availability for various types and voltages]															
220	[Bar chart showing capacitance availability for various types and voltages]															
330	[Bar chart showing capacitance availability for various types and voltages]															
470	[Bar chart showing capacitance availability for various types and voltages]															
680	[Bar chart showing capacitance availability for various types and voltages]															
1 μF	[Bar chart showing capacitance availability for various types and voltages]															
1.5	[Bar chart showing capacitance availability for various types and voltages]															
2.2	[Bar chart showing capacitance availability for various types and voltages]															
3.3	[Bar chart showing capacitance availability for various types and voltages]															
4.7	[Bar chart showing capacitance availability for various types and voltages]															
6.8	[Bar chart showing capacitance availability for various types and voltages]															

- (1) For larger capacitance values, please consult our catalogue "Ceramic capacitors for professional applications" for EC61 to EC64 types
- (2) ECO4 and ECO5 types are also available with leadspacing E = 5.08 mm. For ordering, use suffix HB (bulk) or D. (tape)
- (3) CE77, CE78, CE79, CN77, CN78, CN79 (class 2C1) are registered in "GAM-T1" list  
CE72, CE73, CE74, CN72, CN73, CN74 are registered in "LNZ" list.

# Radial Moulded Multilayer Ceramic Capacitors (1)



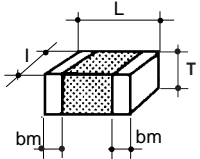
Type	MC								MJ		MQ			MK			
Size	MC04		MC05		MC08		MC10		MJ05	MJ08	MQ05	MQ06	MK05		MK06		
Dimensions (mm)	L	3.5 ± 0.5	5.0 ± 0.5	7.5 ± 0.5	10 ± 0.5	4.8 ± 0.2	7.4 ± 0.2	5 ± 0.2	7.5 ± 0.2	4.8 ± 0.2	7.4 ± 0.2	4.8 ± 0.2	7.4 ± 0.2	4.8 ± 0.2	7.4 ± 0.2		
	Hmax	4.5	6.0	8.5	11	4.8 ± 0.2	7.4 ± 0.2	5	7.5	4.8 ± 0.2	7.4 ± 0.2	4.8 ± 0.2	7.4 ± 0.2	4.8 ± 0.2	7.4 ± 0.2		
	h	3.5 ± 0.5	5.0 ± 0.5	7.5 ± 0.5	10 ± 0.5	3.8 ± 0.2	7.1 ± 0.2	3.8 ± 0.2	7.1 ± 0.2	3.8 ± 0.2	7.1 ± 0.2	3.8 ± 0.2	7.1 ± 0.2	3.8 ± 0.2	7.1 ± 0.2		
	T ± 0.2	2.5	2.5	2.5	3.5	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3		
	d ± 5 %	0.6	0.6	0.6	0.8	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6		
E ± 0.2	2.54 (2)	2.54 (2)	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08	5.08			
Dielectric class	NPO 2C1		NPO 2C1		NPO 2C1		NPO 2C1		2C1		NPO 2C1	2C1	NPO BX	NPO BX	NPO BX		
Voltage (U <sub>r</sub> )	100 63	100 63	100 63	100 63	100 63	100 63	100 63	100 63	250 100 63	250 100 63	200 250 100 63	250 100 63	200 100 50	200 100 50	200 100 50		
CECC standards Other standards (3) Approvals	CE13 CE61 CN31 CN61 CE13 CE62 CN31 CN62 CE13 CE63 CN31 CN30 CE13 CE64 CN31 CN30 CE11 CN64								CN19		CN50 CN60			CC05		CK05 CC06 CK06	
QPL	CECC 30601-001 (NPO / 100 V - 63 V) and CECC 30701-011 (2C1 / 100 V - 63 V) (CE11-CE13) (CN30-CN31) ESA/LNZ/GAM-T1								30701 -016 LNZ		30701-016 GAM-T1			ESA			



- (1) For higher capacitance values or higher voltages, please consult our catalogue "Ceramic capacitors for professional applications"
- (2) MC04 and MC05 types are also available with leadspacing E = 5.08 mm. For ordering, use suffix HB or D.
- (3) MC, MJ and MK types are available as High Reliability products. MC and MK types are "ESA" approved, according to ESA/SCC 3001 (CLC, CCR and CKR types).

# MULTILAYER CERAMIC CHIP CAPACITORS

## Styles and dimensions

IEC40 Types	0504	0603	0805	1206	1210	1812	2220	1825	2225																																			
CECC Types	CEC1		CEC2	CEC12	CEC4	CEC6	CEC7																																					
TPC Codes - Nickel-barrier terminations		AN21	AN12	AN20	AN13	AN14	AN15	AN45	AN43																																			
TPC Codes - Silver-palladium-platinum terminations	AC11		AC12	AC20	AC13	AC14	AC15	AC45	AC43																																			
	Length (L)	1.25 ± 0.20	1.60 ± 0.15	2.00 ± 0.2	3.2 ± 0.2	3.2 ± 0.3	4.5 ± 0.4	5.7 ± 0.4	4.5 ± 0.4	5.7 ± 0.4																																		
	Width (l)	1.00 ± 0.20	0.80 ± 0.15	1.25 ± 0.25	1.6 ± 0.2	2.5 ± 0.3	3.2 ± 0.3	5.0 ± 0.4	6.3 ± 0.4	6.3 ± 0.4																																		
	Thickness (T)	Depending on voltage and capacitance value																																										
	bm mini	0.15	0.15	0.3	0.3	0.3	0.3	0.3	0.3	0.3																																		
Standards	All ceramic chips capacitors are made according to CECC standards and IEC 286 for packaging.			Available capacitance values and tolerances :																																								
Approvals	CEC 2/4/6/7/12 types (NPO and X7R classes) are approved according to CECC 32101-801 standard.			<table border="1"> <thead> <tr> <th rowspan="2">Dielectric</th> <th colspan="2">Tolerance (%)</th> <th rowspan="2">Cap. value series</th> </tr> <tr> <th>C &lt; 10 pF</th> <th>C ≥ 10 pF</th> </tr> </thead> <tbody> <tr> <td rowspan="3">NPO</td> <td>± 1 pF</td> <td>± 10 %</td> <td>E12</td> </tr> <tr> <td>± 0.5 pF</td> <td>± 5 %</td> <td>E12</td> </tr> <tr> <td>± 0.25 pF</td> <td>± 2 %</td> <td>E24 (upon request)</td> </tr> <tr> <td></td> <td></td> <td>± 1 %</td> <td>E24 (upon request)</td> </tr> <tr> <td rowspan="2">X7R</td> <td></td> <td>± 20 %</td> <td>E6</td> </tr> <tr> <td></td> <td>± 10 %</td> <td>E12</td> </tr> <tr> <td>Z5U</td> <td></td> <td>-20 + 80 %</td> <td>E3</td> </tr> <tr> <td></td> <td></td> <td>± 20 %</td> <td>E6</td> </tr> </tbody> </table>						Dielectric	Tolerance (%)		Cap. value series	C < 10 pF	C ≥ 10 pF	NPO	± 1 pF	± 10 %	E12	± 0.5 pF	± 5 %	E12	± 0.25 pF	± 2 %	E24 (upon request)			± 1 %	E24 (upon request)	X7R		± 20 %	E6		± 10 %	E12	Z5U		-20 + 80 %	E3			± 20 %	E6
Dielectric	Tolerance (%)		Cap. value series																																									
	C < 10 pF	C ≥ 10 pF																																										
NPO	± 1 pF	± 10 %	E12																																									
	± 0.5 pF	± 5 %	E12																																									
	± 0.25 pF	± 2 %	E24 (upon request)																																									
		± 1 %	E24 (upon request)																																									
X7R		± 20 %	E6																																									
		± 10 %	E12																																									
Z5U		-20 + 80 %	E3																																									
		± 20 %	E6																																									
Other types	For other sizes : 1005 (AC16), 1808 (AC19), please consult us.																																											
Other voltages	For ceramic chips with rated voltage of 1 kV or more, please consult our catalogue "ceramic capacitors for professional applications".																																											
High reliability	High reliability products from the ESA Qualified Parts List are available upon request.																																											

## CLASSIFICATION AND CHARACTERISTICS OF THE DIELECTRICS

Type	1	2			
TPC code	C	Z	G	W	X
Classification IEC/CECC EIA DIN MIL	1B COG NPO	(2R1) X7R	2C1  (BX)	(2F4) Z5U	Y5V
Capacitance Change With temperature	0 ± 30 ppm/°C	± 15 % (Um = 0)	± 20 % (Um = 0) + 20, - 30 % (Um = Ur)	+ 22, - 56 % (Um = 0)	+ 22, - 82 % (Um = 0)
Typical ageing (%/dec.)	0	1	1	4.5	2.5
Reference temperature	25°C ± 2°C	20°C ± 2°C			25°C ± 2°C
Capacitance and D.F. measurement Frequency Voltage	C 1000 pF F = 1 MHz C > 1000 pF F = 1 kHz Um = 1 Vrms	C 1000 pF F = 1 MHz C > 1000 pF F = 1 kHz Um = 1 Vrms Um = 0.5 Vrms			
Dissipation factor (Tgδ)	C 50 pF Tgδ < 1.5 (150/Cr + 7).10 <sup>-4</sup> C > 50 pF Tgδ < 15.10 <sup>-4</sup>	Tgδ < 250.10 <sup>-4</sup>		Tgδ < 300.10 <sup>-4</sup>	Tgδ < 500.10 <sup>-4</sup>
Insulation resistance under Ur/1 mn	Ri > 100 G or Ri x Cr > 1000 s	Ri > 100 G or Ri x Cr > 1000 s		Ri > 10 G or Ri x Cr > 100 s	
Test voltage	2.5 UR for UR < 500 V 1000 V for UR = 500 V	2.5 UR for UR < 500 V 1000 V for UR = 500 V			
Advantages	Stability in temperature and voltage Low losses	High values of capacitance in a reduced size			
Applications	Tuning, coupling ...	Decoupling, filtering, energy storage ...			

# DIPPED AND MOULDED PRODUCTS - KINKING/TAPING/PACKAGING CHARACTERISTICS

Leads shape		Types of Products	Packaging	Min lead length (bulk) or Taping height Ho	Suffix for Lead spacing E = 2.54 mm	Suffix for Lead spacing E = 5.08 mm
Straight		MC04/05	Bulk	12	--	
		EC04	Ammopack reel	16	CA	
		EC05	Ammopack reel	19.5	CB	
		MJ05/MK05	Bulk	12		--
		MC08/MJ08/MK06	Ammopack reel	16		DA
		EC08	Ammopack reel	19.5		DB
Kinked		EC04 EC05	Bulk	12		HB
			Ammopack reel	16		DQ
			Ammopack reel	19.5		DR
		EC08	Bulk	12		DS
			Ammopack reel	16		DT
			Ammopack reel	19.5		HL
		EC04	Bulk	12	HE	HK
			Ammopack reel	16	CE	DE
			Ammopack reel	16	CF	DF
Snap-in		EC04 EC05 EC08	Bulk	12	HG *	HH
			Ammopack reel	16	CG *	DG
			Ammopack reel	16	CH *	DH
Flat		EC04 EC05 EC08	Bulk			
			Ammopack reel	16	CJ *	DZ
			Ammopack reel	19.5	CK *	D1
			Ammopack reel		CL *	D2
			Ammopack reel		CM *	D3

\* Not available in EC08

## CODIFICATION - HOW TO ORDER

Ordering example	AC	12	C	D	0101	J	--
Codification	Type	Size	Class	Voltage	Cap. value	Tolerance	Suffix
<b>CHIPS</b>			<b>TYPE 1</b>	<b>In volts</b>	<b>Capacitance value in 4 digits EIA code</b>	<b>Capacit. &lt; 10 pF</b>	-- Bulk
AgPdPt terminations	AC	11/12/20/13/14/15/45/43	C : NPO	B : 16		B : ± 0.10 pF	B. Chips taping
Nickel-barrier term.	AN	21/12/20/13/14/15/45/43		C : 25		C : ± 0.25 pF	C. Leaded types taping (E = 2.54)
			<b>TYPE 2</b>	D : 50/63	Example :	D : ± 0.50 pF	D. Leaded types taping (E = 5.08)
<b>ECOCAPS</b>			Z : X7R	E : 100	100 pF : 0101	F : ± 1 pF	H. Leaded types bulk – Non standard "E" value
Radial-leaded/dipped	EC	04/05/08	G : 2C1	F : 200	820 pF : 0821	G : ± 2 pF	
<b>MOULDED</b>			W : Z5U	G : 250	8.2 pF : 0829		
CE 11/13-CN 61..64 and CN 30/31	MC	04/05/08/10	X : Y5V	J : 500	196 pF : 1960	<b>Capacit. 10 pF</b>	
CN 19	MJ	05/08			8.28 pF : 8288	F : ± 1 %	
CN 50/60	MQ	05/06				G : ± 2 %	
CCR 05/06 - CKR 05/06	MK	05/06				J : ± 5 %	
						K : ± 10 %	
						M : ± 20 %	
						Z : -20/+80 %	

## Worldwide sales offices

### AMERICAS

#### BRAZIL

THOMSON-CSF PASSIVE COMPONENTS BRAZIL Ltda  
 Av. Prof. Vicente Rao, 1620  
 CEP 0436-001  
 SAO PAULO - BRASIL  
 Tel. : (5511) 5247713  
 Fax : (5511) 2473059

#### USA

THOMSON-CSF PASSIVE COMPONENTS U.S.  
 2211 - H Distribution Center Drive  
 CHARLOTTE NC 28269  
 Tel. : (1 704) 597 0766  
 Fax : (1 704) 597 0553

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#### BENELUX

THOMSON-CSF PASSIVE COMPONENTS BENELUX  
 Avenue Louise 363 - B 10  
 B-1050 BRUXELLES  
 Tel. : (32 2) 627 03 45  
 Fax : (32 2) 627 03 33

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 THOMSON-CSF PASSIVE COMPONENTS  
 29, avenue Carnot  
 91349 MASSY Cedex France  
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 Fax : (33) 1 69 93 42 90

#### GERMANY

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 D-81379 MUNCHEN 70  
 Tel. : (49 89) 78 79 0  
 Fax : (49 89) 78 79 145

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 20092 CINISELLO BALSAMO (MILANO)  
 Tel. : (39 2) 660 15 510  
 Fax : (39 2) 660 15 677

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 C/Principe de Vergara, 204 - 1° B  
 28002 MADRID  
 Tel. : (34) 1 564 02 72  
 Fax : (34) 1 564 19 40

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 Basingstoke, Hants RG 24 0UG  
 Tel. : (44) 1256 84 33 23  
 Fax : (44) 1256 23 172

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 C 310 blue cross chambers  
 Infantry road cross  
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 Shanghai 200030  
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 Fax : (8621) 6481 4544

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 12 F n° 149-16, Sec. 2  
 Keelung Road, Taipei 110  
 TAIWAN ROC  
 Tel. : (8862) 378 6792  
 Fax : (8862) 736 2142

## Power capacitors



## Film capacitors



## Soft ferrite



## Non linear resistors



**THOMSON-CSF**  
 PASSIVE COMPONENTS