Innovative Service Around the Globe YAGEO

DATA SHEET

SURFACE-MOUNT CERAMIC EMI FILTER CAPACITORS

X2Y® Series

6.3 V TO 100 V

Phycomp

Product Specification – September 30, 2016 V.15

Surface-mount ceramic EMI filter capacitors

X2Y® Series

DESCRIPTION

X2Y® series is a breakthrough in the design of ceramic multilayer products for decoupling and filtering in an IPD (integrated passive device).
X2Y® products comprise two identical Y-capacitors and one X-capacitor, integrated into a 4 terminal device, which is available in standard MLCC sizes. Thanks to the unique multilayer construction the device provides noise cancellation within the device, reducing ESL from nanohenry to picohenry levels.
Using the unique balance between the Y-capacitors and the shielded multilayer structure the X2Y® products offer superior decoupling and filtering.
The X2Y® device performs as a broadband filter enabling better EMC compliance for electrical equipment in a wide range of applications.

FEATURES

- **Broadband Filtering and Decoupling:** X2Y® is effective up to 10 GHz and frequencies beyond
- **Ultra Low ESL:** Noise cancellation within X2Y® makes ESL reducing from nanohenry to picohenry levels
- **Bypass:** Unlike feedthrough capacitors, X2Y® is in bypass, so no DC current limitations
- **Matched Y-caps:** Two tightly matched line to ground capacitors in one device
- **Superior Balance:** Temperature and voltage variations balanced of two Y-caps
- **Aging Reliability:** Aging effects are equal on two Y-caps

BENEFITS

- **Fewer Component in Filtering:** One X2Y® can replace multiple inductors and/or capacitors
- **Superior Performance in Filtering:** One X2Y® can eliminate both differential and common mode noises
- **Fewer Component in Decoupling:** Up to 1:7 replacement of MLCC in power delivering system bypass networks
- **Superior Performance in Decoupling:** Large or small, X2Y® components exhibit ultra low ESL
- **Total Cost Savings:** Assembly cost savings through reduced component count and placement costs
- **Board Level Design Advantages:** Dramatically reduces via drills, which blocks routing

APPLICATIONS

- EMI filtering on DC motors
- Filtered connectors (airbag connectors, RJ-45 connectors)
- High speed data-line filtering
- Decoupling of supply-lines in high speed digital circuits
- Broadband filtering.
- Amplifier decoupling and EMI suppression.
- IC Decoupling, on-package, on-PCB.
- DC power line filtering.
- Data line filtering.
- EMI suppression for DC motors.
- Sensors
- Audio

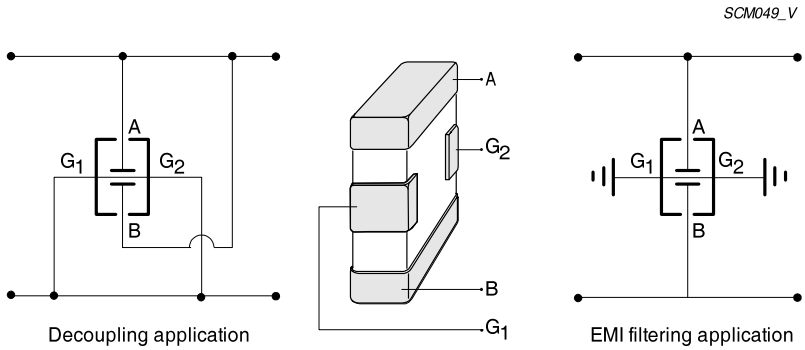

Fig.1 Circuit of typical applications

Surface-mount ceramic EMI filter capacitors

X2Y® Series

QUICK REFERENCE DATA

DESCRIPTION	VALUE
Materials	X7R / X5R
Rated voltage	
X7R	10 V, 16 V, 25 V, 50 V / 63 V, 100 V (IEC)
X5R	10 V
Capacitance range (Y-capacitor)	
X7R 0603 series	1 nF to 330 nF
0805 series	1 nF to 180 nF
1206 series	10 nF to 470 nF
1210 series	100 nF to 1 µF
X5R 0603 series	180 nF to 470 nF
Tolerance on capacitance	±20% (M)
Test voltage (DC) for 1 minute	$2.5 \times U_R$
Sectional specifications	IEC 60384-10, second edition 1989-04
Detailed specification	based on IEC 60384-10-1
Climatic category (IEC 60068)	X7R: 55 / 125 / 56

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GENERAL SELECTION CHART

C	X7R				X5R
(pF)	0603	0805	1206	1210	0603
1,000	100V	100 V			
1,500					
2,200					
4,700					
5,600					
10,000	50 V		100 V		
15,000	25 V	50 V			
18,000					
22,000					
39,000	16 V	25 V	50 V		
47,000		16 V			
56,000					
100,000	10 V			50V	
180,000		10 V	16 V		10 V
220,000					
270,000					
330,000					
390,000					
470,000			10 V		
560,000					
820,000				16 V	
1,000,000					

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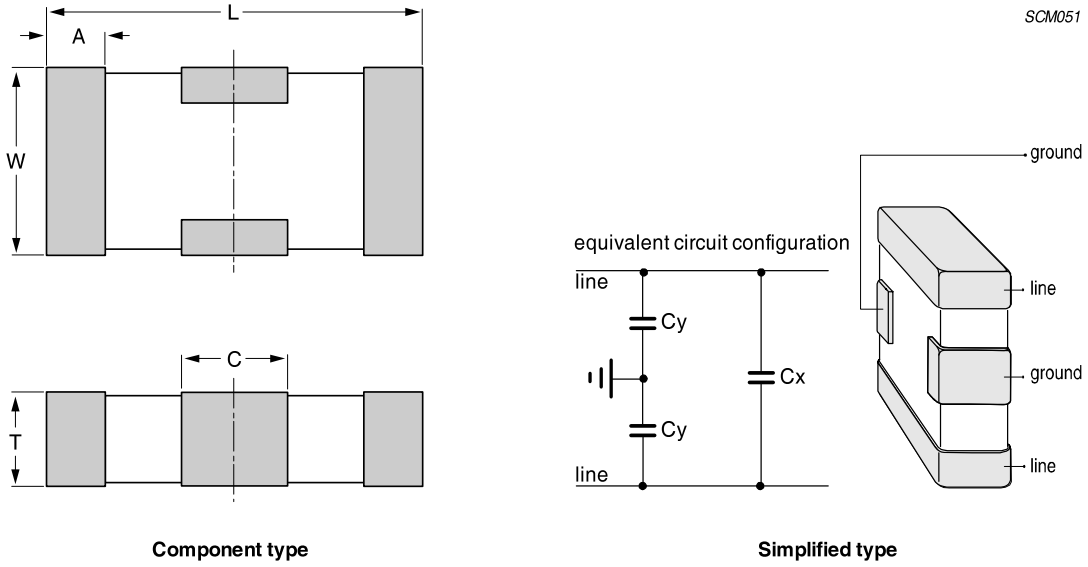
X2Y® Series

MECHANICAL DATA



For dimensions see Table 1.

Fig.2. Component outline & simplified outline

Physical dimensions

Table 1 Capacitor dimensions

CASE SIZE	L	W	T		A		C
			MIN.	MAX.	MIN.	MAX.	
Dimensions in millimetres							
0603	1.6 ±0.15	0.85 ±0.15	0.55	0.75	0.25	0.55	0.40 ±0.20
0805	2.0 ±0.15	1.25 ±0.15	0.75	0.95	0.25	0.55	0.70 ±0.20
1206	3.2 ±0.20	1.65 ±0.20	1.10	1.40	0.25	0.65	1.20 ±0.30
1210	3.2 ±0.20	2.5 ±0.20	1.10	1.70	0.25	0.65	1.20 ±0.30
Dimensions in inches							
0603	0.063 ±0.006	0.033 ±0.006	0.022	0.030	0.010	0.022	0.016 ±0.008
0805	0.079 ±0.006	0.049 ±0.006	0.030	0.037	0.010	0.022	0.028 ±0.008
1206	0.126 ±0.008	0.065 ±0.008	0.043	0.055	0.010	0.026	0.047 ±0.012
1210	0.126 ±0.008	0.098 ±0.008	0.043	0.067	0.010	0.026	0.047 ±0.012

Electrical characteristics CHARACTERISTICS FOR X7R

Class 2 capacitors; X7R dielectric; Ni/Sn terminations

DESCRIPTION	VALUE
Rated voltage U_R (DC)	10 V, 16 V, 25 V, 50 V/63 V ,100 V
Capacitance range	1 nF to 1 uF
Capacitance tolerance	±20%
Dissipation factor (D.F.); note 1 6.3 V 10 V 16 V ≧25 V	 6% 5% 3.5% 2.5%
Insulation resistance after 1 minute at UR (DC)	$R_{ins} \times C > 500$ seconds or $R_{ins} > 10G\Omega$, whichever is less
Maximum capacitance change as a function of temperature	±15%
Operating temperature range: X7R	 –55 °C to +125 °C
Aging	Typical 1% per time decade

Note

1. Measured at 20 °C, 1 V and 1 KHz, using a four-gauge method.

CHARACTERISTICS FOR X5R

Class 2 capacitors; X5R dielectric; Ni/Sn terminations

DESCRIPTION	VALUE
Rated voltage UR (DC)	6.3V,10 V
Capacitance range	180 nF to 470 nF
Capacitance tolerance	±20%
Dissipation factor (D.F.); note 1 6.3 V 10 V	 10% 10%
Insulation resistance after 1 minute at UR (DC)	$R_{ins} \times C > 500$ seconds or R_{ins} s > 10GΩ , whichever is less
Maximum capacitance change as a function of temperature	±15%
Operating temperature range: X5R	 –55 °C to +85 °C
Aging	Typical 1% per time decade

Note

1.Measured at 20 °C, 1 V and 1 KHz, using a four-gauge method.

Surface-mount ceramic EMI filter capacitors

X2Y® Series

SELECTION CHART FOR X7R SIZES 0603, 0805, 1206,1210 AND ORDERING INFORMATION

SIZE	Y-CAPACITOR		VOLTAGE RATING (V)	THICKNESS (mm)	CTC ORDERING CODE	QUANTITY PER REEL
	CAP. (nF)	TOLERANCE (%)				
0603	1	20%	100	0.65	CX0603MRX7R0BB102	4,000
	1	20%	50	0.65	CX0603MRX7R9BB102	4,000
	1	20%	16	0.65	CX0603MRX7R7BB102	4,000
	1.5	20%	100	0.65	CX0603MRX7R0BB152	4,000
	1.5	20%	50	0.65	CX0603MRX7R9BB152	4,000
	2.2	20%	100	0.65	CX0603MRX7R0BB222	4,000
	4.7	20%	100	0.65	CX0603MRX7R0BB472	4,000
	5.6	20%	100	0.65	CX0603MRX7R0BB562	4,000
	5.6	20%	50 / 63	0.65	CX0603MRX7R9BB562	4,000
	10	20%	50 / 63	0.65	CX0603MRX7R9BB103	4,000
	15	20%	25	0.65	CX0603MRX7R8BB153	4,000
	18	20%	25	0.65	CX0603MRX7R8BB183	4,000
	22	20%	25	0.65	CX0603MRX7R8BB223	4,000
	39	20%	16	0.65	CX0603MRX7R7BB393	4,000
	47	20%	16	0.65	CX0603MRX7R7BB473	4,000
	56	20%	16	0.65	CX0603MRX7R7BB563	4,000
	100	20%	10	0.65	CX0603MRX7R6BB104	4,000
	180	20%	10	0.65	CX0603MRX7R6BB184	4,000
	220	20%	10	0.65	CX0603MRX7R6BB224	4,000
	270	20%	10	0.65	CX0603MRX7R6BB274	4,000
	330	20%	10	0.65	CX0603MRX7R6BB334	4,000
0805	1	20%	100	0.85	CX0805MRX7R0BB102	4,000
	1	20%	50	0.85	CX0805MRX7R9BB102	4,000
	1.5	20%	100	0.85	CX0805MRX7R0BB152	4,000
	2.2	20%	100	0.85	CX0805MRX7R0BB222	4,000
	4.7	20%	100	0.85	CX0805MRX7R0BB472	4,000
	10	20%	100	0.85	CX0805MRX7R0BB103	4,000
	15	20%	50	0.85	CX0805MRX7R9BB153	4,000
	18	20%	50	0.85	CX0805MRX7R9BB183	4,000
	22	20%	50	0.85	CX0805MRX7R9BB223	4,000
	22	20%	50	0.85	CX0805MRX7R8BB223	4,000
	47	20%	16	0.85	CX0805MRX7R7BB473	4,000
	56	20%	16	0.85	CX0805MRX7R7BB563	4,000
	100	20%	16	0.85	CX0805MRX7R7BB104	4,000
	180	20%	10	0.85	CX0805MRX7R6BB184	4,000

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SIZE	Y-CAPACITOR		VOLTAGE RATING (V)	THICKNESS (mm)	CTC ORDERING CODE	QUANTITY PER REEL
	CAP. (nF)	TOLERANCE (%)				
1206	10	20%	100	1.2	CX1206MKX7R0BB103	3,000
	15	20%	100	1.2	CX1206MKX7R0BB153	3,000
	15	20%	50	1.2	CX1206MKX7R9BB153	3,000
	18	20%	100	1.2	CX1206MKX7R0BB183	3,000
	22	20%	100	1.2	CX1206MKX7R0BB223	3,000
	33	20%	100	1.2	CX1206MKX7R0BB333	3,000
	39	20%	50	1.2	CX1206MKX7R9BB393	3,000
	47	20%	50	1.2	CX1206MKX7R9BB473	3,000
	56	20%	50	1.2	CX1206MKX7R9BB563	3,000
	100	20%	50	1.2	CX1206MKX7R9BB104	3,000
	180	20%	16	1.2	CX1206MKX7R7BB184	3,000
	220	20%	16	1.2	CX1206MKX7R7BB224	3,000
	270	20%	16	1.2	CX1206MKX7R7BB274	3,000
	330	20%	16	1.2	CX1206MKX7R7BB334	3,000
	390	20%	16	1.2	CX1206MKX7R7BB394	3,000
	470	20%	10	1.2	CX1206MKX7R6BB474	3,000
1210	100	20%	50	1.6	CX1210MKX7R9BB104	2,000
	180	20%	50	1.6	CX1210MKX7R9BB184	2,000
	220	20%	50	1.6	CX1210MKX7R9BB224	2,000
	270	20%	50	1.6	CX1210MKX7R9BB274	2,000
	330	20%	50	1.6	CX1210MKX7R9BB334	2,000
	390	20%	50	1.6	CX1210MKX7R9BB394	2,000
	470	20%	50	1.6	CX1210MKX7R9BB474	2,000
	470	20%	25	1.6	CX1210MKX7R8BB474	2,000
	560	20%	50	1.6	CX1210MKX7R9BB564	2,000
	560	20%	25	1.6	CX1210MKX7R8BB564	2,000
	820	20%	16	1.6	CX1210MKX7R7BB824	2,000
	1000	20%	16	1.6	CX1210MKX7R7BB105	2,000

SELECTION CHART FOR X5R SIZES 0603 (1)

SIZE	Y-CAPACITOR		VOLTAGE RATING (V)	THICKNESS (mm)	CTC ORDERING CODE	QUANTITY PER REEL
	CAP. (nF)	TOLERANCE (%)				
0603	180	20%	10	0.65	CX0603MRX5R6BB184	4,000
	220	20%	10	0.65	CX0603MRX5R6BB224	4,000
	270	20%	10	0.65	CX0603MRX5R6BB274	4,000
	330	20%	10	0.65	CX0603MRX5R6BB334	4,000
	390	20%	10	0.65	CX0603MRX5R6BB394	4,000
	470	20%	10	0.65	CX0603MRX5R6BB474	4,000
	470	20%	10	0.65	CX0603MRX5R5BB474	4,000

Notes

1. Other values are available on request.

THICKNESS CLASSIFICATION AND PACKING QUANTITIES FOR X7R

THICKNESS CLASSIFICATION (mm)	QUANTITY PER REEL			
	8 mm TAPE WIDTH			
	⌀ 180 mm; 7"		⌀ 330 mm; 13"	
	0603 - 1210			
	PAPER	BLISTER	PAPER	BLISTER
0.65 ±0.1	4,000			
0.85 ±0.1	4,000			
1.2 ±0.15	–	3,000		
1.6 ±0.15	–	2,000		

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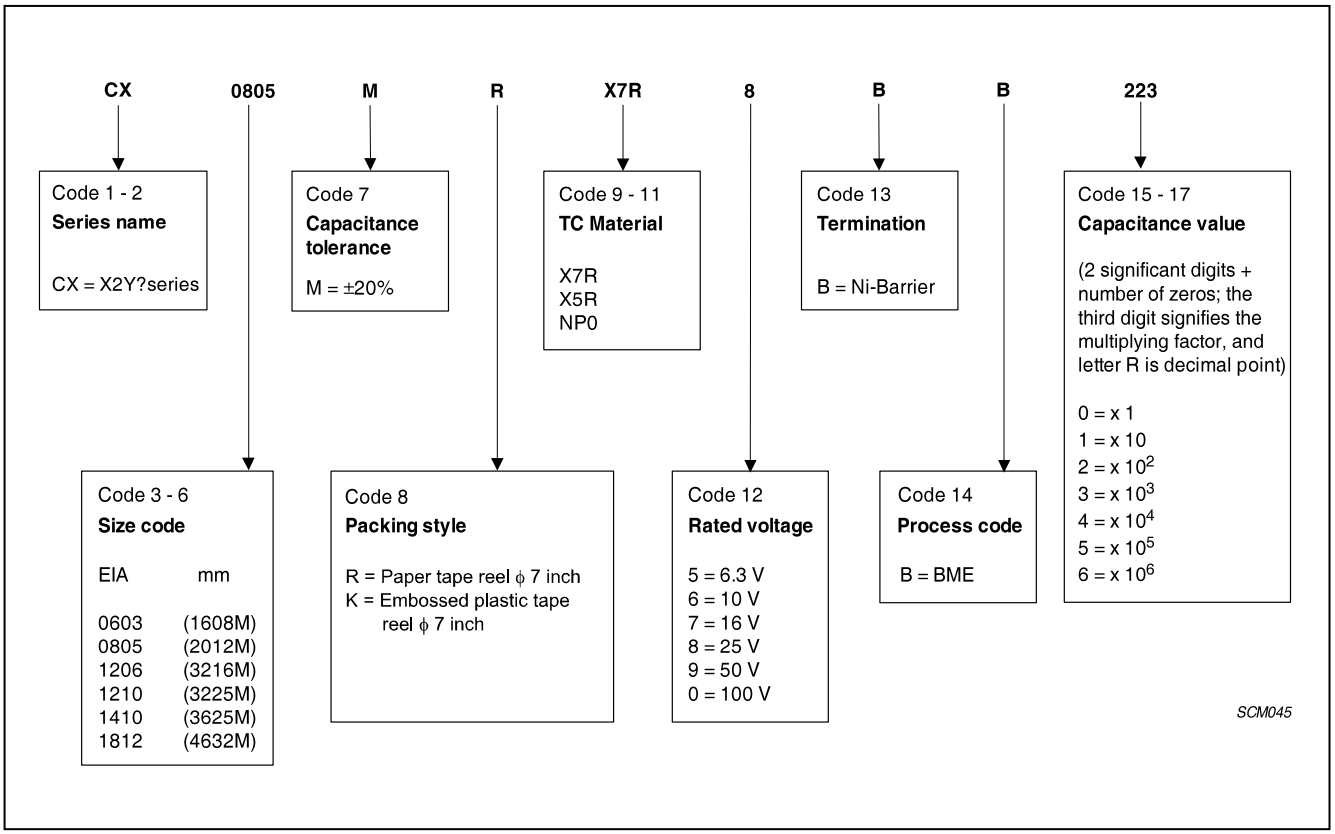
X2Y® Series

ORDERING INFORMATION

Components may be ordered by using either a Yageo part number or Phycomp's unique 12NC.

Ordering code: Yageo part number

Example: CX0805MRX7R8BB223



RECOMMENDED DIMENSIONS OF SOLDER LANDS

Table 3 Reflow soldering

CASE SIZE (EIA)	Footprint dimensions (mm)					Placement Accuracy (mm)
	A	B	C	D	E	
0603	2.30	0.76	0.64	0.51	1.52	±0.20
0805	3.05	1.27	0.89	0.56	2.03	±0.20
1206	4.06	1.65	1.00	1.02	3.05	±0.25
1210	4.57	2.55	1.00	1.14	4.06	±0.25

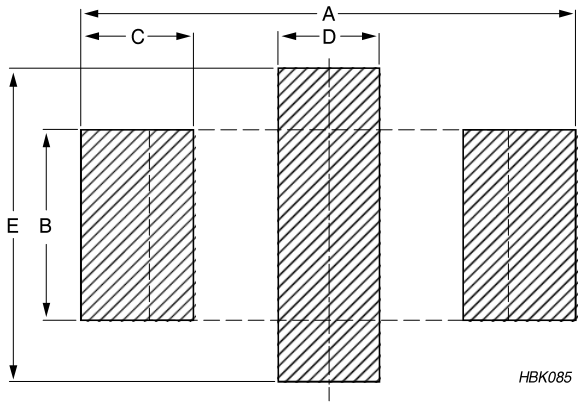


Fig.3 Recommended dimensions of solder lands

MEASUREMENT SETUP

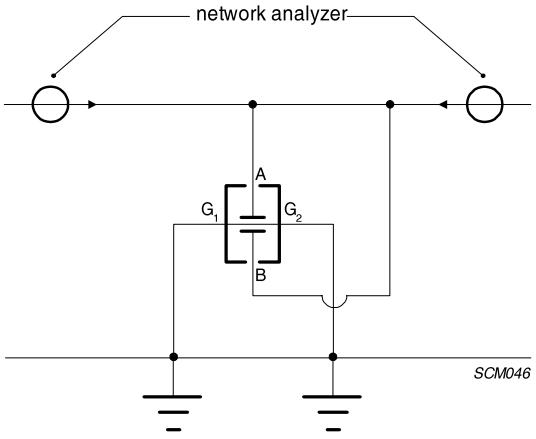
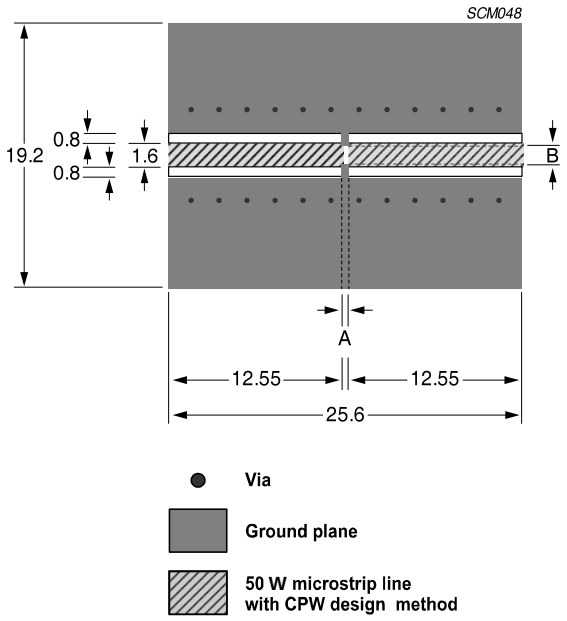


Fig.4 X2Y® series through measurement

- X2Y® are soldered on a printed circuit board
- PCB: FR-4 substrate, with 50 Ω microstrip line
- Network Analyzer: Agilent E5071b
- Calibration: full 2-port calibration with 85033E kit



Size 0603: A=0.5 mm, B=1.2 mm

For other dimensions see Table 4

Fig.5 Testing board for measurement

Table 4 Recommended dimensions of measurement

CASE SIZE	A (mm)	B (mm)
0603	0.5 ±0.10	1.2 ±0.10
0805	0.8 ±0.10	1.6 ±0.10
1206	1.2 ±0.10	2.8 ±0.15
1210	2.1 ±0.15	2.8 ±0.15

TESTS AND REQUIREMENTS

Table 5 Test procedures and requirements

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.4		mounting	the capacitors may be mounted on printed-circuit boards or ceramic substrates by applying reflow soldering (including vapor phase soldering) or conductive adhesive	no visible damage
4.5		visual inspection and dimension check	any applicable method using ×10 magnification	in accordance with specification
4.6.1		capacitance	Class 1: ≤1000 pF; f = 1 MHz >1000 pF; f = 1 kHz NP0: measuring voltage 1 V at 20 °C Class 2: For all capacitors f = 1 kHz X7R: measuring voltage 1 V at 20 °C Y5V: measuring voltage 1 V at 25 °C	within specified tolerance
4.6.2		tan δ	Class 1: ≤1000 pF; f = 1 MHz >1000 pF; f = 1 kHz NP0: measuring voltage 1 V at 20 °C Class 2: For all capacitors f = 1 kHz X7R: measuring voltage 1 V at 20 °C Y5V: measuring voltage 1 V at 25 °C	in accordance with specifications
4.6.3		insulation resistance	at UR (DC) for 1 minute	in accordance with specification
4.6.4		voltage proof	2.5 × UR for 1 minute	no breakdown or flashover
4.7.1		temperature characteristic	Between minimum and maximum temperature	in accordance with specification
4.8		adhesion	a force of 5 N applied for 10 s to the line joining the terminations and in a plane parallel to the substrate	no visible damage

Table 5 Test procedures and requirements (continued)

IEC 60384-10/ CECC 32 100 CLAUSE	IEC 60068-2 TEST METHOD	TEST	PROCEDURE	REQUIREMENTS
4.9		bond strength of plating on end face	mounted in accordance with CECC 32 100, paragraph 4.4	no visible damage
			conditions: bending 1 mm at a rate of 1 mm/s, radius jig 340 mm	ΔC/C: class 1: within ±10% class 2, X7R: within ±10% class 2, Y5V: within ±30%
4.10	Tb	resistance to soldering heat	Precondition: 120 to 150 °C for 1 minute; 260 ±5 °C for 10 ±0.5 s in a static solder bath	the terminations shall be well tinned after recovery ΔC/C: class 1: within ±0.5% or 0.5 pF whichever is greater class 2, X7R: >−5% and ≤10% class 2, Y5V: >−10% and ≤20%
		resistance to leaching	260 ±5 °C for 30 ±1 s in a static solder bath	using visual enlargement of ×10, dissolution of the terminations shall not exceed 10%
4.11	Ta	solderability	zero hour test, and test after storage (20 to 24 months) in original packing in normal atmosphere; unmounted chips completely immersed for 2 ±0.5 s in a solder bath at 235 ±5 °C	the terminations shall be well tinned
4.12	Na	rapid change of temperature	Preconditioning, class 2 only; NP0 / X7R: −55 to +125 °C; 5 cycles Y5V: −25 to +85 °C; 5 cycles	no visual damage after 48 hours recovery; ΔC/C: class 1: within ±1% or 1 pF class 2, X7R: within ±15% class 2, Y5V: within ±20%
4.15		Endurance	Pre-conditioning, class 2 only: 1000 hours at upper category temperature at: 1.5 × UR	no visual damage after 24 hours recovery: ΔC/C: class 1: within ±2% or 1 pF, whichever is greater class 2, X7R: within ±20% class 2, Y5V: within +30/−40% tan δ : class 1: ≤2 × specified value class 2: X7R: ≤7% class 2: Y5V: ≤15% Rins: class 1: 4000 MΩ or Rins × CR ≥ 40 s, whichever is less class 2: 2000 MΩ or Rins × CR ≥ 50 s, whichever is less

REVISION HISTORY

Revision	Date	Change Notification	Description
Rev.5	2001 Sep 25	-	- Published on web
Rev.6	2002 Jul 10	-	- Product range extended in all materials and sizes; - Insertion loss measurements added.
Rev.7	2003 Apr 02	-	- Updated company logo
Rev.8	2003 Jul 23	-	- Cover page revised
Rev.9	2003 Sep 09	-	- Cover page corrected
Rev.10	2004 Apr 21	-	- Product range updated - NP0, Y5V and size 1812 removed.
Rev.11	2006 Nov 21	-	- Size 1410 extended - Product applications, features and benefits update - Measurement setup added - Updated tests and requirements
Rev.12	2006 Dec 22	-	- 12 NC revised
Rev.13	2008 Nov 10	-	- Product range extended in materials of NP0 and X5R
Rev. 14	2013 June 27		- Rev.14 : Product range extended on NPO 0606 and 0805
Rev. 15	2016 July 25		- Product range extended on X7R

Mouser Electronics

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Yageo:

CX1206MKX7R6BB474 CX1210MKX7R7BB105 CX0603MRX7R6BB104 CX0603MRX7R0BB102 CX0805MRX7R0BB102 CX0603MRX5R6BB224 CX0603MRX7R7BB473 CX0805MRX7R0BB103 CX0603MRX5R6BB474

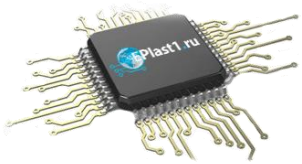
Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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