Multi Layer Ceramic Capacitors

Introduction

SAMWHA's series of multilayer ceramic(MLC) chip capacitors is designed to meet a wide variety of need. Multilayer ceramic chip capacitors are available in both class I and class II formulations. Temperature compensation formulations are class I and temperature stable and general application formulations are classified at class II. The class I multilayer ceramic capacitors are COG with negligible dependence of electrical properties on temperature, voltage, frequency. The most of commonly used class II dielectric are X7R, X5R and Y5V. The X7R provides intermediate capacitance values which vary ±15% over the temperature range of -55℃ to 125℃. The X5R provides intermediate capacitance values which vary ±15% over the temperature range of -55℃ to 85℃. The Y5V provides the highest capacitance value which vary from 22% to -82% over the temperature range of -30℃ to 85℃. All class II capacitors vary in capacitance value under the influence of temperature, operating voltage and frequency. We offer a complete line of products for both class I and II.

Features

- Samwha's high density ceramic bodies offer superior performance and reliability
- Samwha offer various temperature characteristics, rated voltage and packing method
- Material with high dielectric constant and superior manufacturing technology allows very high values in a small size
- Solder coated terminals offer superior solderability

Applications

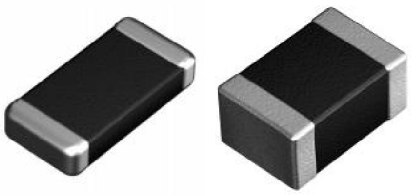
Wide applications throughout commercial and industrial market.

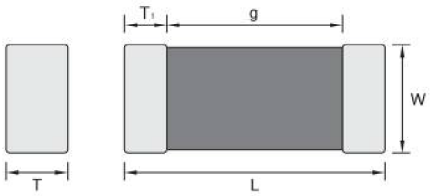
- Communication products like Cellular Phone, Pager, Codeless phone
- Multimedia products like DVD, CD-ROM, FDD, HDD, Game machine, Computer, Note book, Digital camera, LCD
- Audio visual products like TV, Camcorder, Minidisk, MP3 Player
- Communication products like Electronic tuner, Duplexer, VCXO, TCXO, Modem
- OA equipment products like Printer, Copy Machine, Fax Machine

※ special specification like a Automobile, Medical, Military, Aviation should be discuss with our sales representatives

SMD Type

Shape & Dimensions





(Unit : mm)

Code(inch)	Dimensions				
	Length		Width		T1(min)
	L	Tol(±)	W	Tol(±)	
0603(0201)	0.60	0.03	0.30	0.03	0.05
1005(0402)	1.00	0.05	0.50	0.05	0.05
1608(0603)	1.60	0.15	0.80	0.10	0.10
2012(0805)	2.00	0.20	1.25	0.15	0.10
3216(1206)	3.20	0.30	1.60	0.20	0.15
3225(1210)	3.20	0.40	2.50	0.25	0.15
4520(1808)	4.50	0.40	2.00	0.25	0.20
4532(1812)	4.50	0.40	3.20	0.30	0.20
5750(2220)	5.70	0.50	5.00	0.40	0.30

*1608 Size ≥ 10㎌ ⇒ W : 0.8±0.15, T : 0.8±0.15

How to Order(Product Identification)

CS 1608 X7R 104 K 160 N R B

1 2 3 4 5 6 7 8 9

1 Type

CS : SMD

SA : ARRAY

2 Size Code

This is expressed in tens of a millimeter.

The first two digits are the length, the last two digits are width.

Size(mm)	0603	1005	1608	2012	3216	3225	4520	4532	5750

3 Temperature Coefficient Code

Temperature Characteristice	Temperature Range	Capacitance Change or Temperature Coefficient	Operating Temperature Range
C0G	−55 to 125℃	0±30ppm/℃	−55 to 125℃
X7R	−55 to 125℃	±15%	−55 to 125℃
X5R	−55 to 85℃	±15%	−55 to 85℃
Y5V	−30 to 85℃	+22, −82%	−30 to 85℃

4 Capacitance Code(Pico Farads)

The nominal capacitance value in pF is expressed by three digit numbers.
The first two digits represents significant figures and the last digit denotes the number of zero
Ex.) 104 = 100000pF R denotes decimal 8R2 = 8.2pF

5 Capacitance Tolerance Code

Code	Tolerance	Code	Tolerance
B	±0.1pF	M	±20%
C	±0.25pF	P	+100, −0%
D	±0.5pF	Z	+80, −20%
F	±1.0%	H	+0.25/−0pF
G	±2.0%	I	+0/−0.25pF
J	±5%	U	+5/−0%
K	±10%	V	+0/−5%

6 Voltage Code

Code	6R3	100	160	250	500	101	201	251	631	302
Vol.	DC 6.3V	DC 10V	DC 16V	DC 25V	DC 50V	DC 100V	DC 200V	DC 250V	DC 630V	DC 3000V

7 Termination Code

Ex.) N : Ni-Sn(Nickel-Tin Plate)

8 Packing Code

Ex.) R : Reel Type B : Bulk Type

9 Thickness Option

Size(mm)	Thickness(mm)		Code	Size(mm)	Thickness(mm)		Code
	t	Tol(±)			t	Tol(±)	
0603/1005	0.3	0.03	Blank	3216	1.15	0.15	E
1005	0.5	0.05	Blank	3216/3225	1.6	0.2	I
2012	0.6	0.1	A	3225	1.8	0.2	J
1608	0.8	0.1	B	3225/4520/4532	2	0.25	K
2012/3216	0.85	0.15	B	3225/4520/4532	2.5	0.25	L

Typical Performance Characteristics

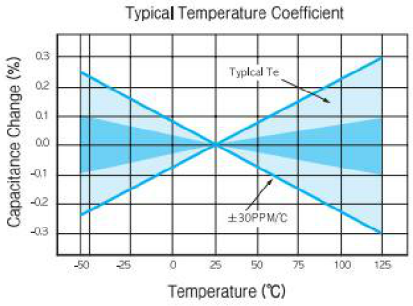
COG

Application

Suited for precision circuits, requiring stable dielectric characteristics, negligible dependence of capacitance and dissipation factor on time, voltage and frequency.

Dielectric Characteristics

Temperature Characteristic	0±30ppm/℃
Operating Temperature	−55~125℃
Capacitance Tolerance	>10pF : ±5%, ±10%,(±1%, ±2%, ±20%) ≤10pF : ±0.1pF, ±0.25pF, ±0.5pF
Dissipation Factor & Q	≥30pF : DF≤0.1%, Q≥1000 <30pF : Q≥400+20×C
Insulation Resistance	More than 10,000MΩ or 500ΩF (Whichever is smaller)
Dielectric Strength	>3×RVDC
Test Voltage	0.5 to 5Vrms(≤1000pF), 1±0.2Vrms(>1000pF)
Test Frequency	1±0.1MHz(≤1000pF), 1±0.1kHz(>1000pF)



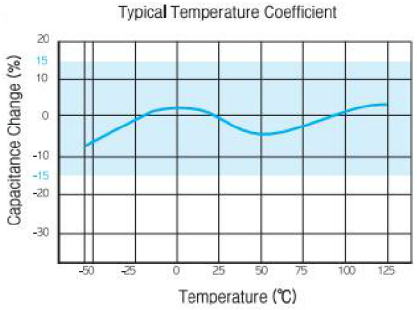
X7R

Application

Stable class II dielectric properties, suited for by-pass and coupling purposes, filtering, frequency discrimination, DC blockage, and as voltage transient suppression elements.

Dielectric Characteristics

Temperature Characteristic	±15%
Operating Temperature	−55~125℃
Capacitance Tolerance	±10%, ±20%,(±5%, +80~−20%)
Dissipation Factor & Q	50V Min. : 2.5% Max. 25V Min. : 3.0% Max. 16V Min. : 3.5% Max. 10V Min. : 5.0% Max. 6.3V Min. : 5.0% Max. Thin layer lange capacitors type 12.5% Max.
Insulation Resistance	More than 10,000MΩ or 500ΩF(Whichever is smaller) Thin layer lange capacitors type 50ΩF Min.
Dielectric Strength	>2.5×RVDC
Test Voltage	1±0.2Vrms(≤10μF) 0.5±0.1Vrms(>10μF)
Test Frequency	1±0.1kHz(≤10μF) 120±24Hz(>10μF)



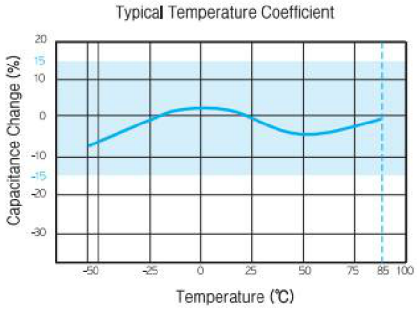
X5R

Application

Stable class II dielectric properties, suited for by-pass and coupling purposes, filtering, frequency discrimination, DC blockage, and as voltage transient suppression elements.

Dielectric Characteristics

Temperature Characteristic	±15%
Operating Temperature	−55~85℃
Capacitance Tolerance	±10%, ±20%,(±5%, +80~−20%)
Dissipation Factor & Q	50V Min. : 2.5% Max. 25V Min. : 3.0% Max. 16V Min. : 3.5% Max. 10V Min. : 5.0% Max. 6.3V Min. : 5.0% Max. Thin layer lange capacitors type 12.5% Max.
Insulation Resistance	More than 10,000MΩ or 500ΩF (Whichever is smaller) Thin layer lange capacitors type 50ΩF Min.
Dielectric Strength	>2.5×RVDC
Test Voltage	1±0.2Vrms(≤10μF) 0.5±0.1Vrms(>10μF)
Test Frequency	1±0.1kHz(≤10μF) 120±24Hz(>10μF)



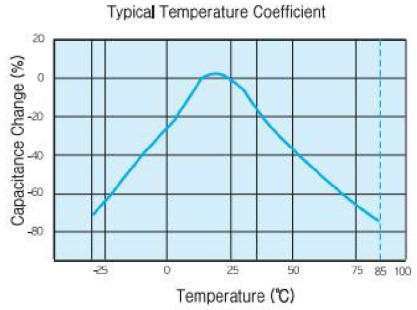
Y5V

Application

The Hi-K(Y5V) dielectrics deliver high capacitance density and are ideally suited for applications where space is at a premium, or as replacement for tantalum capacitors. Typically applications include use as by-pass or decoupling elements. Best performance is obtained at or near room temperature, with low DC bias.

Dielectric Characteristics

Temperature Characteristic	+22%~−82%
Operating Temperature	−30~85℃
Capacitance Tolerance	−20~+80%(±20%)
Dissipation Factor & Q	50V Min. : 5% Max. 25V Min. : 7% Max. 16V Min. : 9% Max. 10V Min. : 12.5% Max. 6.3V Min. : 15% Max. Thin layer lange capacitors type 20% Max.
Insulation Resistance	More than 10,000MΩ or 500ΩF(Whichever is smaller) Thin layer lange capacitors type 50ΩF Min.
Dielectric Strength	>2.5×RVDC
Test Voltage	1±0.2Vrms(≤10μF) 0.5±0.1Vrms(>10μF)
Test Frequency	1±0.1kHz(≤10μF) 120±24Hz(>10μF)



Appendix |

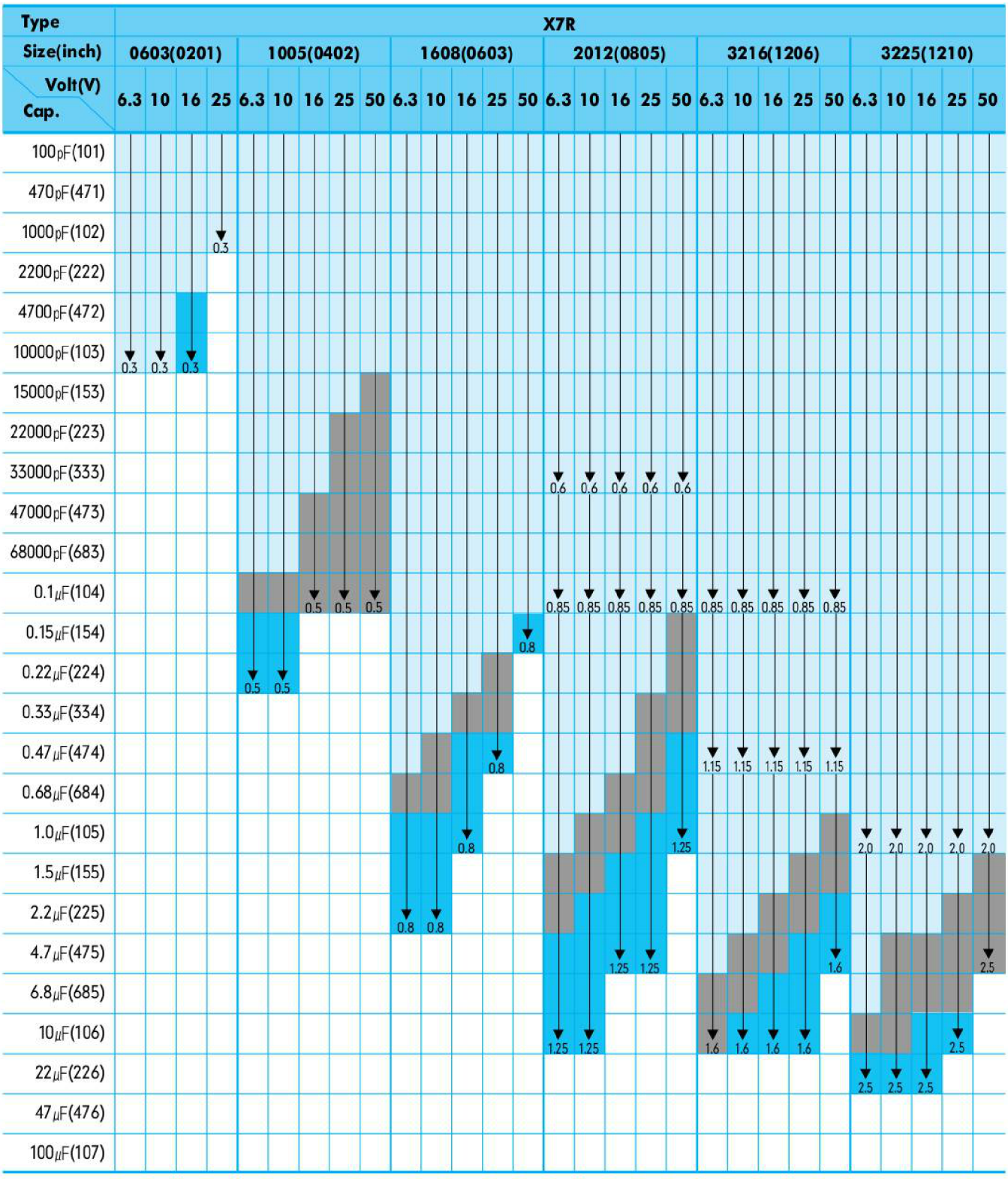
C0G-Temperature Compensating Type(0603~3216)

Type	C0G									
Size(inch)	0603(0201)	1005(0402)		1608(0603)		2012(0805)		3216(1206)	
Volt(V) / Cap.	25	25	50	25	50	25	50	25	50
0.5pF(0R5)									
1pF(010)									
2pF(020)									
3pF(030)									
4pF(040)									
5pF(050)									
6pF(060)									
7pF(070)									
8pF(080)									
9pF(090)									
10pF(100)									
12pF(120)									
15pF(150)									
18pF(180)									
22pF(220)									
27pF(270)									
33pF(330)									
39pF(390)									
47pF(470)									
56pF(560)									
68pF(680)									
82pF(820)									
100pF(101)	0.3								
120pF(121)									
150pF(151)									
180pF(181)									
220pF(221)									
270pF(271)									
330pF(331)									
390pF(391)									
470pF(471)									
560pF(561)									
680pF(681)									
820pF(821)									
1000pF(102)		0.5	0.5						
1200pF(122)									
1500pF(152)								1.15	1.15
1800pF(182)									
2200pF(222)						0.6	0.6		
2700pF(272)				0.8	0.8				
3300pF(332)									
3900pF(392)									
4700pF(472)									
5600pF(562)									
6800pF(682)									
8200pF(822)									
10000pF(103)						1.25	1.25		
12000pF(123)									
15000pF(153)									
18000pF(183)									
22000pF(223)									
27000pF(273)									
33000pF(333)									
47000pF(473)									
56000pF(563)								1.60	1.60
68000pF(683)									
82000pF(823)									
0.1μF(104)									

Temperature Compensating Type : Dissipation Factor Page 22 (No.5)

Appendix II

X7R-High Dielectric Constant Type(0603~3225) & Thin Layer Large-Capacitance Type

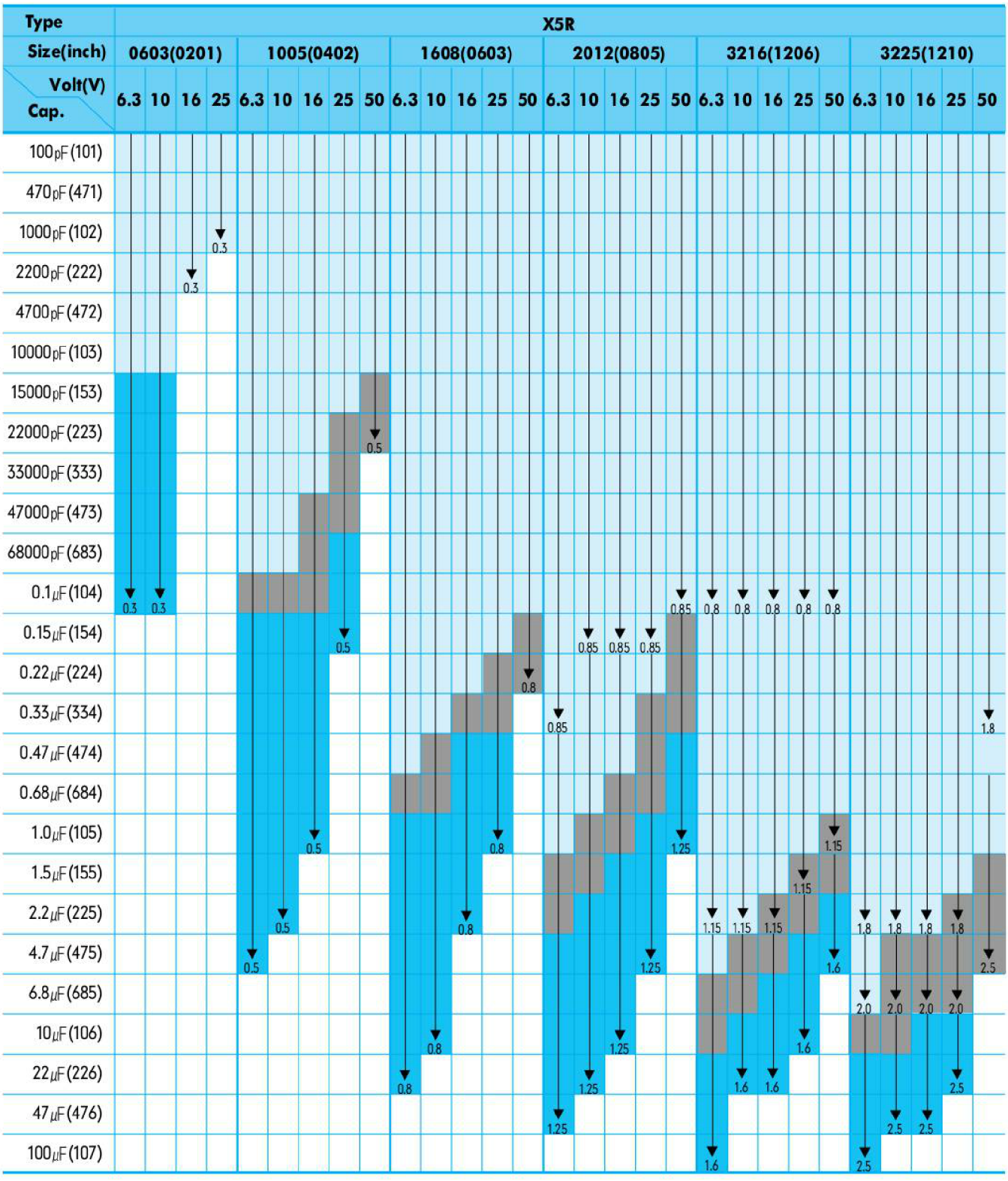


General Type : Dissipation Factor Page 22(No.5)

∗General Type : Dissipation Factor Page 22(No.5)

Thin Layer Large-Capacitance Type : Dissipation Factor Page 22(No.5)

X5R-High Dielectric Constant Type(0603~3225) & Thin Layer Large-Capacitance Type

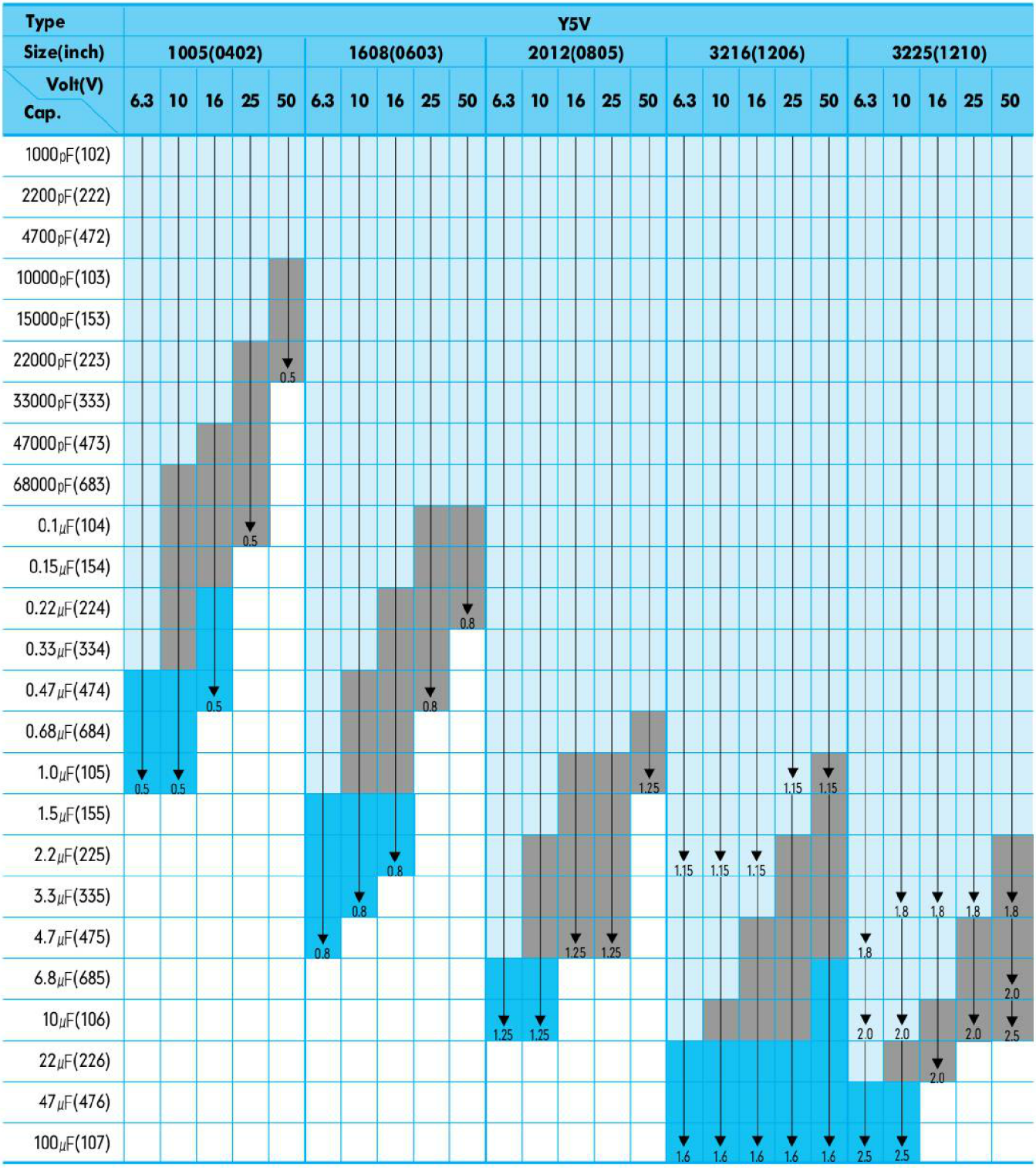


General Type : Dissipation Factor Page 22(No.5)

∗General Type : Dissipation Factor Page 22(No.5)

Thin Layer Large-Capacitance Type : Dissipation Factor Page 22(No.5)

Y5V-High Dielectric Constant Type(0603~3225) & Thin Layer Large-Capacitance Type



General Type : Dissipation Factor Page 22(No.5)

∗General Type : Dissipation Factor Page 22(No.5)

Thin Layer Large-Capacitance Type : Dissipation Factor Page 22(No.5)

SMD Type-High Voltage

Product Offering

SAMWHA high voltage MLCC products with the temperature characteristics of C0G and X7R are designed for commercial and industrial applications. The products are applied to DC-DC converters and ballast circuit to reduce ripple noise and diverting potentially unsafe transients in various sizes with working voltage up to DC 7kV. These high voltage capacitors feature a special internal electrode design which has capacitor network to reduce voltage concentrations by distributing voltage throughout the entire capacitor.

Features

- High reliability
- The highest voltage rating by the special internal electrode design
- Wide voltage level : from $100V_{DC}$ to $7,000V_{DC}$
- Surface mount suited for wave and reflow soldering
- RoHS compliant

Applications

- DC-DC Converters
- Network Equipments
- Back-Lighting Inverter
- Lighting Ballast
- Modem & Power Supply
- LAN/WLAN Interface

※ special specification like a Automobile, Medical, Military, Aviation should be discuss with our sales representatives

Special Options for the Safety

- Inset electrode margins to prevent short mode failure resulted from the crack by mechanical bending stress
- Soft termination is optionally available to reduce possibility for the crack of MLCCs by mechanical bending stress