CERAMIC CAPACITOR

Catalog

www.
holystone.
com.tw

www.
holystonecaps.
com

IHEC

Holy Stone Enterprise Co., Ltd.

You Should Know Holy Stone.

The Company

Holy Stone Enterprise Company Co., Ltd. (Holy Stone) is headquartered in the Nei Hu District of Taipei, Taiwan. The company was founded in June of 1981 by three engineers as a technology focused distributor of electronic components.

In 1999, with technology and cooperation from a Japanese partner, Holy Stone began manufacturing Multi-layer Ceramic Capacitors. Today, Holy Stone is recognized as an industry leader in application specific ceramic capacitors.

Holy Stone integrates active and passive component distribution with state-of-the-art Ceramic Capacitor manufacturing capabilities. Holy Stone's unique business model combines the service and inventory management strengths of a broad line distributor with the technical knowledge and world class pricing of a manufacturer.

Holy Stone maintains a focus on and a commitment to providing customers with innovative products and exceptional service. That unwavering commitment is evident in Holy Stone's phenomenal growth.

Holy Stone maintains a high profile on the Taiwan Stock Exchange, is ranked in the top 100 companies and is recognized as a leader among its peers.

Manufacturing Facilities

Holy Stone ceramic capacitors are produced in two modern factories located in Lungtan and Yilan, Taiwan. Holy Stone advanced materials research laboratory is located in Japan. The factory operating systems are certified to ISO-9001, IATF16949 and ISO-14001.

Sales and Support Locations

Holy Stone Headquarter and Corporate Sales are located in Taipei, Taiwan. Holy Stone also maintains sales and support offices in Shenzhen, Suzhou and Shanghai, China. Holy Stone Enterprise Company Co., Ltd. has subsidiary companies in North America and in Europe. "HolyStone International", located in Diamond Bar, California, U.S.A. covers sales and technical support in the America. "Holystone (Europe) Ltd.", located in Norwich, England is responsible for sales and technical support throughout Europe. "Holy Stone Holdings Pte., Ltd." located in Singapore provides sales and support in South and Southeast Asia. Holy Stone also has a global network of independent representatives, agents and distributors.

The Environment

Holy Stone is committed to achieving and maintaining a healthy environment. The factories are certified to ISO-14001 and all standard products are designed and produced in compliance to RoHS.

Our Employees

Holy Stone's success is measured by the satisfaction of our customers and share holders. Achieving that satisfaction is the result of the sum contribution of our employees. Holy Stone strives to maintain a work environment that stimulates creativity, encourages enthusiasm, recognizes and rewards results.

Contents

Product and Application Summary 3
ISO Certifications 4
Product Series - 5

General Purpose –

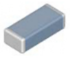
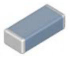
MVC Series – Middle Voltage X7R and NP0 (100Vdc to 630Vdc) 5
HVC Series – High Voltage X7R and NP0 (1KVdc to 5KVdc) 8
NCC Series – Normal Chip Capacitors (less than 1uF) 11
HCC Series – High Capacitance Capacitors (1uF and above) 13

Specific Purpose –

SCC Series – Safety Certified Capacitors 15
ACC Series – Automotive Grade Capacitors 17
AEC Series – AEC-Q200 Grade Capacitors 22

Technical Specification 27
Packing Information 41
General Information 44
Precautionary Information 46
Reducing Short Circuit Risks – Super Term 50
Coated Products for Surface Arc Prevention 52
RoHS Compliant 54

Component Quick Reference

Product Series		Application	Page
	MVC Series -- Middle Voltage Capacitors	General Purpose / 100Vdc to 630Vdc	5
	HVC Series -- High Voltage Capacitors	General Purpose / 1KVdc to 5KVdc	8
	NCC Series -- Normal Chip Capacitors	General Purpose / 2.5Vdc to 75Vdc / less than 1uF	11
	HCC Series -- High Capacitance Capacitors	General Purpose / 6.3Vdc to 50Vdc / 1uF and above	13
	SCC Series -- Safety Certified Capacitors	For Decoupling Circuits	15
	ACC Series – Automotive Grade Capacitors	For Automotive Markets or Automotive Grade Requirements for AEC-Q200 / IATF16949 Standard	17
	AEC Series – AEC-Q200 Grade Capacitors	For Automotive Markets or Automotive Grade Requirements for AEC-Q200 Standard	24

ISO Certification

Plant	Certificated	Date	Organization	Registration No.
Taipei HQ/Lung Tan Factory	ISO 9001:2015	20 March, 2002	BVC	TW006637
Lung Tan Factory	ISO 45001:2015	06 Jan, 2022	BVC	TW007656
Taipei HQ/Lung Tan Factory	ISO 14001:2015	29 May, 2003	BVC	TW007065
Taipei HQ/Lung Tan Factory	IATF16949:2016	27 September, 2016	BVC	TW005723/1-2-3
Taipei HQ/Lung Tan Factory	IECQ QC080000:2017	14 May, 2020	BVC	IECQ-H LCIE 20.0011

ISO 9001:2015

BUREAU VERITAS
Certification

HOLY STONE ENTERPRISE CO., LTD.

NO.56 , 61, 61-1, LN. 90, GONG 5TH RD., WU LIN VIL., LONGTAN DIST.,
32559-TAOYUAN CITY, TAIWAN/R.O.C.
This is a multi-site certificate, additional site(s) are listed on the next page(s)

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 9001:2015

Scope of certification

THE DESIGN, DEVELOPMENT, PRODUCTION, SALES AND SUPPLY OF MULTILAYER CERAMIC CAPACITOR, ELECTRONIC DEVICE, SUBSTRATE. THE DISTRIBUTION OF SEMICONDUCTOR, PASSIVE AND ACTIVE ELECTRONIC COMPONENT AND COMPUTER PERIPHERAL.

Original cycle start date:	20-March-2002
Expiry date of previous cycle:	NA
Certification / Recertification Audit date:	NA
Certification / Recertification cycle start date:	03-May-2020

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: **02-May-2023**

Certificate No.: TWN4523166Q ***Version: 01*** ***Revision date: 29-April-2020***

Andrew Lee

UKAS

0008

Certification body address: 6th Floor, 66 Prescot Street, London E1 8HG, United Kingdom
Local office: 3F-B, No.16, Nanjing E. Rd., Sec.4, Songshan District, Taipei 10553, Taiwan

Further clarifications regarding the scope of this certificate and the applicability of the management system requirements may be obtained by consulting the organisation.
To check this certificate validity please call: +886 2 2570 7655

1 / 2

ISO 14001:2015

Bureau Veritas **Certification**

HOLY STONE ENTERPRISE CO., LTD.

NO. 56, 61, 61-1, LN. 90, GONG 5TH RD., WU LIN VIL., LONGTAN DIST., 32559-TAOYUAN CITY TAIWAN/R.O.C

This is a multi-site certificate, additional site(s) are listed on the next page(s)

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 14001:2015

Scope of certification

THE DESIGN, DEVELOPMENT, PRODUCTION, SALES AND SUPPLY OF MULTILAYER CERAMIC CAPACITOR, ELECTRONIC DEVICE, SUBSTRATE.
THE DISTRIBUTION OF SEMICONDUCTOR, PASSIVE AND ACTIVE ELECTRONIC COMPONENT AND COMPUTER PERIPHERAL.

Original cycle start date:	29-05-2003
Expiry date of previous cycle:	19-12-2020
Certification / Recertification Audit date:	22-10-2020
Certification / Recertification cycle start date:	20-12-2020
Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on:	19-12-2023

Certificate No.: TW005163 Version: 1 Issue Date: 02-12-2020

Andrew Lee

UKAS MANAGEMENT SYSTEMS

0008

Certification Body Address: 5th Floor, 66 Prescot Street, London, E1 8HG, United Kingdom

Local Office: 3F-B, No. 16, Nanjing E. Rd., Sec. 4, Songshan Dist., Taipei 10553, Taiwan

1/2

ISO 45001:2018

Bureau Veritas **Certification**

HOLY STONE ENTERPRISE CO., LTD.

NO. 56, 61, 61-1, LN. 90, GONG 5TH RD., WU LIN VIL., LONGTAN DIST., 325019 TAOYUAN CITY ., TAIWAN(R.O.C).

Bureau Veritas Certification Holding SAS - UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 45001:2018

Scope of certification

THE DESIGN, DEVELOPMENT, PRODUCTION AND SUPPLY OF MULTILAYER CERAMIC CAPACITOR, ELECTRONIC DEVICE, SUBSTRATE.

Original cycle start date:	06-01-2022
Expiry date of previous cycle:	05-01-2025
Certification / Recertification Audit date:	17-10-2024
Certification / Recertification cycle start date:	12-12-2024
Subject to the continued satisfactory operation of the organisation's Management System, this certificate expires on:	05-01-2028

Certificate No.: TW007656 Version: 1 Issue date: 12-12-2024

UKAS MANAGEMENT SYSTEMS

0008

Signed on behalf of BVCH SAS UK Branch

Certification Body Address: 5th Floor, 100 Lower Thames Street, London, EC3R 6DL, United Kingdom

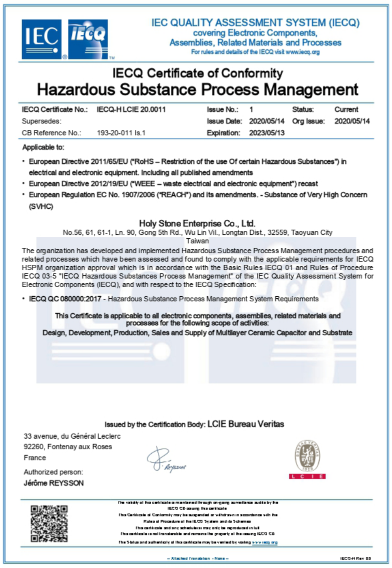
Local Office Address: 3F-B, No. 16, Nanjing E. Rd., Sec. 4, Songshan Dist., Taipei 105, Taiwan

Further clarifications regarding the scope and validity of this certificate, and the applicability of the management system requirements, please call: +886 2 2570 7655

UKAS Certificate Template Single Site Rev.4.2 30 Sep 2024

1/1

IECQ QC 080000:2017



IEC QUALITY ASSESSMENT SYSTEM (IECQ)
covering Electronic Components,
Assemblies, Related Materials and Processes
For rules and details of the IECQ visit www.iecq.org

IECQ Certificate of Conformity
Hazardous Substance Process Management

IECQ Certificate No.:	IECQ-H LCIE 20.0011	Issue No.:	1	Status:	Current
Supersedes:		Issue Date:	2020/05/14	Org Issue:	2020/05/14
CB Reference No.:	193-20-011 Is.1	Expiration:	2023/05/13		

Applicable to:

- **European Directive 2011/65/EU ("RoHS – Restriction of the use Of certain Hazardous Substances") in electrical and electronic equipment. Including all published amendments**
- **European Directive 2012/19/EU ("WEEE – waste electrical and electronic equipment") recast**
- **European Regulation EC No. 1907/2006 ("REACH") and its amendments. - Substance of Very High Concern (SVHC)**

Holy Stone Enterprise Co., Ltd.
No.56, 61, 61-1, Ln. 90, Gong 5th Rd., Wu Lin Vil., Longtan Dist., 32559, Taoyuan City
Taiwan

The organization has developed and implemented Hazardous Substance Process Management procedures and related processes which have been assessed and found to comply with the applicable requirements for IECQ HSPM organization approval which is in accordance with the Basic Rules IECQ 01 and Rules of Procedure IECQ 03-5 "IECQ Hazardous Substances Process Management" of the IEC Quality Assessment System for Electronic Components (IECQ), and with respect to the IECQ Specification:

- **IECQ QC 080000:2017** - Hazardous Substance Process Management System Requirements

This Certificate is applicable to all electronic components, assemblies, related materials and processes for the following scope of activities:
Design, Development, Production, Sales and Supply of Multilayer Ceramic Capacitor and Substrate

Issued by the Certification Body: LCIE Bureau Veritas

33 avenue, du Général Leclerc
92260, Fontenay aux Roses
France

Authorized person:
Jérôme REYSSON

Reysson

L C I E

The validity of this certificate is maintained through on-going surveillance audits by the IECQ CB issuing this certificate
This Certificate of Conformity may be suspended or withdrawn in accordance with the Rules of Procedure of the IECQ System and its Schemes
This certificate and any schedule(s) may only be reproduced in full
This certificate is not transferable and remains the property of the issuing IECQ CB
The Status and authenticity of this certificate may be verified by visiting www.iecq.org

-- Attached translation - None --

IECQ-H Rev 03

IATF16949: 2016

Bureau Veritas **Certification**

Certificate of Approval

Awarded to

HOLY STONE ENTERPRISE CO., LTD.

NO. 61, LN. 90, GONG 5TH RD., WU LIN VIL., LONGTAN DIST, TAOYUAN CITY, 32559, TAIWAN/ROC

Extended site(s) : Page 2 to 2

Bureau Veritas Certification certify that the Quality Management System of the above organisation has been audited and found to be in accordance with the requirements of

IATF 16949 – First Edition

and the applicable customer specific requirements

SCOPE

Design and manufacturing

PERMITTED EXCLUSION(S)

None

PRODUCT(S) DELIVERED

MULTILAYER CERAMIC CAPACITOR

Date Of Certification: 27-07-2021

Date Of Expiration: 26-07-2024

IATF Certificate N° : 414543

Bureau Veritas Certification Certificate N° : TW005723- IATF Revision:1

For Bureau Veritas Certification Holding, Le Triangle de l'Arche, 8 Cours du Triangle - 92800 Puteaux - France
(The official document is in English. Any translations of this document shall be used for reference only.)

1/3

Multilayer Ceramic Capacitors

[Middle Voltage Capacitors – NPO,X7R,100Vdc to 630Vdc]

MVC Series

Holy Stone high voltage products are designed and manufactured to meet the general requirements of international standards. The product offering is well suited for commercial and industrial applications and includes NP0 (C0G) and X7R characteristics in sizes 0402 to 2225 and with working voltages up to 630Vdc.

◆ Features

- ❑ Special internal electrode design offers the highest voltage rating
- ❑ Surface mount suitable for wave and reflow soldering
- ❑ High reliability
- ❑ RoHS compliant

◆ Applications

- ❑ Suitable for LAN/WLAN interface, Back-Lighting Inverter, DC-DC Converters, Ballast, Modems and Power Supplies.
- ❑ SiC & GaN systems, Snubber, Resonant Circuit (LLC, Wireless Charging, etc.)

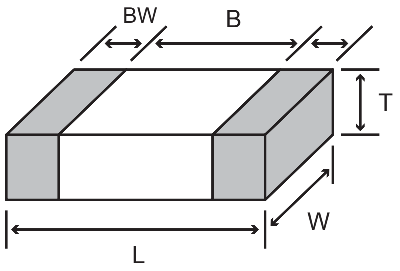
◆ Summary of Specifications

Operation Temperature	-55 ℃ to +125 ℃
Rated Voltage	100Vdc to 630Vdc
Temperature Coefficient	NP0 : ≤ ± 30ppm/ ℃ , -55 ℃ to +125 ℃ (EIA Class I)
	X7R : ≤ ± 15% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
Dissipation Factor	NP0 : More than 30pF ： Q ≧1000 30pF & Below ： Q≧400＋20C (C : Capacitance , pF) X7R : 100V ： 5% (C≧0.1uF) 100V ： 2.5% (C＜0.1uF) Other Voltage ： 2.5% max
Insulation Resistance	10GΩ or 500/CΩ, whichever is smaller
Aging	NP0 : 0% , X7R : Typically 1.0% per decade of time
Dielectric Strength	V=100V (Cap<10uF) : 250% Rated Voltage
	100V ≦ V < 500V ： 200% Rated Voltage
	500V ≦ V < 1000V ： 150% Rated Voltage
	1000V≦ V ： 120% Rated Voltage

◆ How To Order

C	1206	N	103	J	631	T	E	X	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Special Requirement (Optional)**	**Suffix Code**
C: MLCC (Multilayer Ceramic Capacitor)	Ex.: 0402 0603 0805 1206 1210 1808 1812 1825 2220 2225	Ex.: N: NP0 X: X7R	Ex.: 2R0:2.0pF 100:10×10^0 471:47×10^1 102:10×10^2	Ex.: C:+/-0.25pF D:+/-0.50pF J :+/- 5% K :+/-10% M:+/-20%	Ex.: 101: 100Vdc 251: 250Vdc 501: 500Vdc 631: 630Vdc	Ex. : T: T&R 7” R: T&R 13” B: Bulk	Ex: E:1.60±0.20 F:2.0±0.20	Ex.: O: Arc Prevention Coating X: Polymer Termination (Super Term) Z: Coating & Polymer Termination	Y

◆ Dimensions



Unit : mm [inches]

SIZE	L	W	T (max)	B (min)	BW (min)
0402	1.00±0.05 [.039±0.02]	0.5±0.05 [.020 ±0.02]	0.55 [.022]	0.30 [.012]	0.15 [.006]
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031 ±.004]	1.00 [.039]	0.40 [.016]	0.15 [.006]
0805	2.00±0.20 [.079±.012]	1.25±0.20 [.049±.012]	1.45 [.057]	0.70 [.028]	0.20 [.008]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.063±.012]	1.80 [.071]	1.50 [.059]	0.30 [.012]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.098±.012]	2.60 [.102]	1.60 [.059]	0.30 [.012]
1808	4.60±0.30 [.181±.012]	2.00±0.20 [.079±.008]	2.20 [.087]	2.50 [.098]	0.30 [.012]
1812	4.60±0.30 [.181±.012]	3.20±0.30 [.126±.012]	3.00 [.118]	2.50 [.098]	0.30 [.012]
1825	4.60±0.30 [.181±.012]	6.35±0.40 [.250±.016]	3.40 [.118]	2.50 [.098]	0.30 [.012]
2220	5.70±0.40 [.220±.016]	5.00±0.40 [.197±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]
2225	5.70±0.40 [.220±.016]	6.35±0.40 [.250±.016]	3.00 [.118]	3.50 [.137]	0.30 [.012]

◆ Capacitance Range – NP0 / 100Vdc to 630Vdc

Temperature Characteristic	Size	Rated Voltage	Capacitance Range																																																												
			1R0	1R2	1R5	1R8	2R2	2R7	3R3	3R9	4R7	5R6	6R8	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
NP0	0402	250V	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O																																
	0603	100V											B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B																	
		250V											B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B																								
	0805	100V													A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D											
		250V													A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D																
		500V													A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D																						
		630V													A	A	A	A	A	A	A	A	A	A	A	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D																	
	1206	100V					D	D	D	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	E	E	E	E	E	E	E	E
		250V					D	D	D	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	D	D	D	E	E								
		500V					D	D	D	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	E	E																	
		630V					D	D	D	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E													
	1210	100V													C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D	E	E	F	F	F	F
		250V													C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	E	E	E	F	F				
		500V													C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D	E	E	F	F	G											
		630V													C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	E	E	F	G	G	G						
	1808	500V					D	D	D	D	D	D	D	D	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E																		
	1812	100V												D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E
		250V												D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
		500V												D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F								
		630V												D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E						
	1825	250V																																											D	D	D	D	D	D	E	E	E	F	F	F	F	F	F	F	F	G
		500V																																															D	E	E	E	E	F	F	F	F	G	G	G	G	G
		630V																																																D	E	E	E	F	F	G	G	G				
	2220	100V																																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D							
		250V																																			D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	D	E	E						
		500V																																			D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	F	F							
		630V																																																			F	F							
	2225	100V																																											D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	
		250V																																											D	D	D	D	D	D	D	D	D	D	D	D						
		500V																																															E	E	F										

MVC Series - Middle Voltage Capacitors (100Vdc to 630Vdc)

◆ Capacitance Range – X7R / 100Vdc to 630Vdc

Temperature Characteristic	Size	Rated Voltage	Capacitance Range																																																													
			101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474	564	684	824	105	125	155	185	225	275	335	395	475	565	685	825	106
X7R	0201	100V					S	S			S				S																																																
	0402	100V																																																													
	0603	100V																									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B																				
		250V	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B																												
	0805	100V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	D												
		250V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D																				
		500V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D																														
		630V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	D	D	D	D																															
	1206	100V	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E								
		250V	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	D	D	E	E															
		500V	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	D	D	D	E	E	E																								
		630V	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	D	D	E	E																												
	1210	100V																									C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	F	F	F	F								
		250V																									C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D															
		500V																									C	C	C	C	C	C	C	C	C	C	D	D	E	E	F																						
		630V																									C	C	C	C	C	C	C	D	D	D	D	D	F	F	F																						
	1808	250V			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F															
		500V			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D																												
		630V			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D																												
	1812	100V					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	F	F	F	F	F	F	F				
		250V					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	F	F	F								
		500V					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	F	F	F	G	H																
		630V					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F	F	G	G																				
	2220	100V													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	F	F	F	G	G
		250V													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	G	G	G								
		500V													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	G	G												
		630V													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	G	G												
	1825	100V																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D												
		250V																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E												
		500V																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F																
		630V																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F	F	F																		
	2225	100V																	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E				
		250V																	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F								
		500V																	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	G													
		630V																	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D																								

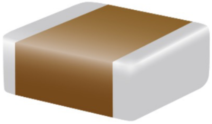
- ***The yellow indication denotes values that are under development. Please contact Holy Stone office for further details***
- ***Other dimensions, capacitance values and voltages ratings are available on request. Please contact Holy Stone.***

◆ Thickness Specification

Symbol Code	S	O	A	B	C	D	E	F	G	H	I
Thickness(mm)	0.3±0.03	0.5±0.05	0.6±0.1	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2	3.2±0.2

Multilayer Ceramic Capacitors

[High Voltage Capacitors – NPO, X7R 1KVdc to 5KVdc]



HVC Series

Holy Stone high voltage products are designed and manufactured to meet the general requirements of international standards. The product offering is well suited for commercial and industrial applications and includes NP0 (C0G) and X7R characteristics in sizes 0805 to 2225 and with working voltages from 1KV up to 5KV.

◆ Features

- ☐ Special internal electrode design offers the highest voltage rating
- ☐ Surface mount suitable for wave and reflow soldering
- ☐ High reliability
- ☐ RoHS compliant

◆ Applications

- ☐ Suitable for LAN/WLAN interface, Back-Lighting Inverter, DC-DC Converters, Ballast, Modems and Power Supplies.
- ☐SiC & GaN systems, Snubber, Resonant Circuit (LLC, Wireless Charging, etc.)

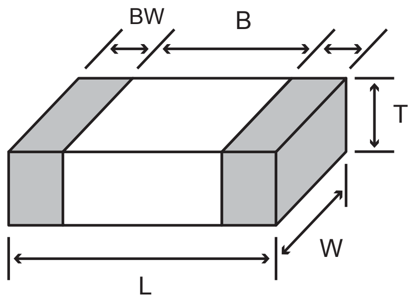
◆ Summary of Specifications

Operation Temperature	-55 ℃ to +125 ℃
Rated Voltage	1KVdc to 5KVdc
Temperature Coefficient	NP0 : ≤ ± 30ppm/ ℃ , -55 ℃ to +125 ℃ (EIA Class I)
	X7R : ≤ ± 15% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
Dissipation Factor	NP0 : More than 30pF : Q ≧1000 30pF & below : Q≧400＋20C (C : Capacitance , pF) X7R : D.F.≦ 2.5%
Insulation Resistance	10GΩ or 500/CΩ, whichever is smaller
Aging	NP0: 0% , X7R : Typically 1.0% per decade of time
Dielectric Strength	100V ≦ V < 500V : 200% Rated Voltage
	500V ≦ V < 1000V : 150% Rated Voltage
	1000V≦ V : 120% Rated Voltage

◆ How To Order

C	2220	N	333	J	102	T	I	X	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Special Requirement (Optional)**	**Suffix Code**
C: MLCC (Multilayer Ceramic Capacitor)	Ex.: 0805 1206 1210 1808 1812 1825 2220 2225	Ex.: N: NP0 X: X7R	Ex.: 2R0:2.0pF 100:10×10^0 471:47×10^1 102:10×10^2	Ex.: C: +/-0.25pF D: +/-0.50pF J: +/- 5% K: +/-10% M: +/-20%	Ex.: 102: 1000Vdc 202: 2000Vdc 302: 3000Vdc 402: 4000Vdc 502: 5000Vdc	Ex.: T: T&R 7” R: T&R 13” B: Bulk	Ex: E:1.60±0.20 F:2.0±0.20 I :3.2±0.20	Ex.: O: Arc Prevention Coating X: Polymer Termination (Super Term) Z: Coating & Polymer Termination	Y

◆ Dimensions



Unit : mm [inches]

SIZE	L	W	T (max)	B (min)	BW (min)
0805	2.00±0.20 [.079±.012]	1.25±0.20 [.049±.012]	1.45 [.057]	0.70 [.028]	0.20 [.008]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.063±.012]	1.80 [.071]	1.50 [.059]	0.30 [.012]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.098±.012]	2.60 [.102]	1.60 [.059]	0.30 [.012]
1808	4.60±0.30 [.181±.012]	2.00±0.20 [.079±.008]	2.20 [.087]	2.50 [.098]	0.30 [.012]
1812	4.60±0.30 [.181±.012]	3.20±0.30 [.126±.012]	3.00 [.118]	2.50 [.098]	0.30 [.012]
1825	4.60±0.30 [.181±.012]	6.35±0.40 [.250±.016]	3.00 [.118]	2.50 [.098]	0.30 [.012]
2220	5.70±0.40 [.220±.016]	5.00±0.40 [.197±.016]	3.40 [.118]	3.50 [.137]	0.30 [.012]
2225	5.70±0.40 [.220±.016]	6.35±0.40 [.250±.016]	3.40 [.118]	3.50 [.137]	0.30 [.012]

◆ Capacitance Range – NP0 / 1KVdc to 2KVdc

Temperature Characteristic	Size	Rated Voltage	2R2	2R7	3R3	3R9	4R7	5R6	6R8	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
NP0	0805	1KV									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D																						
	1206	1KV	D	D	D	C	C	C	C	C	C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	E	E	B	B	C	D	D	D																		
		2KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E																													
	1210	1KV													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	G	M	M	M								
		2KV													D	D	D	D	D	D	D	D	D																																				
	1808	1KV	D	D	D	D	D	D	D	D	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E																				
		2KV	D	D	D	D	D	D	D	D	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F																								
	1812	1KV								D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	G	G	G	G	G	G	G								
		2KV								D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	F	F	F	F	F																					
	2220	1KV																													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	G	G	G	G	G						
		2KV																													D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	G														
	2225	1KV																																														F	F	F										
		2KV																																										G	G	G	H	I											

◆ Capacitance Range – NP0 / 3KVdc to 5KVdc

Temperature Characteristic	Size	Rated Voltage	Capacitance Range																																				
			2R2	2R7	3R3	3R9	4R7	5R6	6R8	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332
NP0	1206	3KV	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E																						
	1808	3KV	D	D	D	D	D	D	D	D	C	C	C	C	C	C	C	C	C	C	D	D	D	E	E	F	F	F	F	F	F	F	F	F	F						
		5KV	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F																						
	1812	3KV								D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E	F	F	G	H					
		4KV								D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	G														
	2208	3KV	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F																							
	2211	3KV	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F																				
	2220	3KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	F	F	F	F		
		5KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E																
	2225	3KV																																				G	H	I	
		5KV																	D																						

- ***The yellow indication denotes values that are under development. Please contact Holy Stone office for further details***
- ***Other dimensions, capacitance values and voltages ratings are available on request. Please contact Holy Stone.***

◆ Thickness Specification

Symbol Code	B	C	D	E	F	G	H	I
Thickness(mm)	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2	3.2±0.2

◆ Capacitance Range – X7R / 1KVdc

Temperature Characteristic	Size	Rated Voltage	Capacitance Range																																												
			101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474	564	684
X7R	0805	1KV			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B																																		
	1206	1KV	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E																		
	1210	1KV					C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	D	D	D	D	D	E	F	F	G														
	1808	1KV			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E																
	1812	1KV					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F	F	G	G										
	2220	1KV													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F	F	G	G						
	1825	1KV																			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	G	G								
	2225	1KV																	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E										

◆ Capacitance Range – X7R / 1.5KV to 2.5KV

Temperature Characteristic	Size	Rated Voltage	Capacitance Range																																			
			101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
X7R	1206	1.5KV	C	C	B	B	B	B	B	B	B	B	B	B	B	C	C	C	C	C	C	C	D	D	E	E	E												
		2KV	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E																
		2.5KV	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E																
	1210	2KV					C	C	C	C	C	C	C	C	C	C	C	C	D	D	E	E	E																
		2.5KV					C	C	C	C	C	C	C	C	C	C	C	C	D	D	E	E	E																
	1808	1.5KV																	D	D	D	D	D																
		2KV			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E												
		2.5KV			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D															
	1812	2KV						D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	G	G						
		2.5KV						D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E										
	1825	1.5KV																			D	D	D	D	D	D	D	E	E	E	E	F	F	G	G				
		2KV																			D	D	D	D	D	D	D	E	E	E	E								
		2.5KV																			D	D	D	D	D	D	D	E	E	E	E								
	2220	2KV													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F				
		2.5KV													D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F					
	2225	1.5KV																																			F		
		2KV																	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E				
		2.5KV																	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E					

◆ Capacitance Range – X7R / 3KVdc to 5KVdc

Temperature Characteristic	Size	Rated Voltage	Capacitance Range (pF)																																			
			101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
X7R	1206	3KV	C	C	C	C	C	C	C	C	C	C	D	D	D																								
	1210	3KV					C	C	C	C	C	C	C	C	D	D	E	E	E																				
	1808	3KV			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F															
		4KV			D	D	D	D	D	E	E	E	F	F	F																								
		5KV			D	D	D	D	D	E	E	E	F	F	F																								
	1812	3KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F												
		5KV	D	D	D	D	D	D	D	D	D	E	E	E	F	F																							
	1825	3KV																D	D	D	D	D	D	D	D	E	E	F	F	G									
	2220	3KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	G									
		4KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	F	F	F	G	H												
		5KV	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F																
	2225	3KV																	D	D	D	D	D	D	D	D	D	D	E	E	E								
		4KV																	D	D	E	E	E																

◆ Thickness Specification

Symbol Code	B	C	D	E	F	G	H	I
Thickness(mm)	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2	3.2±0.2

■ **Specifications & Test Conditions please see P47~P50**

Multilayer Ceramic Capacitors

[Normal Chip Capacitors – less than 1uF]

NCC Series

Standard Multilayer Ceramic Capacitors are available in a full range of sizes and temperature coefficients, with voltage ratings from 2.5V to 75V.

◆ Features

- ❑ Surface mount suitable for wave and reflow soldering
- ❑ Small size and high reliability
- ❑ Excellent in high frequency characteristics
- ❑ RoHS compliant

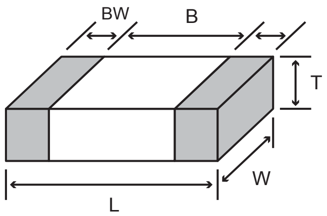
◆ Applications

- ❑ Suitable for general electronics circuit, telecomm2unication, personal computers and peripheral, power circuit, mobile application, etc.

◆ Summary of Specifications

Operation Temperature	NP0/X7R/X7S : -55 ℃ to +125 ℃ , X6R : -55 ℃ to +105 ℃, X5R : -55 ℃ to +85 ℃
Rated Voltage	6.3Vdc to 50Vdc
Temperature Coefficient	NP0 : ≤ ± 30ppm/ ℃ , -55 ℃ to +125 ℃ (EIA Class I)
	X7R : ≤ ± 15% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
	X7S : ≤ ± 22% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
	X6S : ≤ ± 22% , -55 ℃ to +105 ℃ (EIA Class Ⅱ)
	X5R : ≤ ± 15% , -55 ℃ to +85 ℃ (EIA Class Ⅱ)
Dissipation Factor	NP0 : More than 30pF : Q ≧1000 30pF & below : Q≧400＋20C (C : Capacitance , pF)
	X7R/X7S/X6S/X5R : 12.5% max
Insulation Resistance	10,000mΩ or 500/CΩ, whichever is smaller for rated voltage>10V and greater than 100/CΩ for rated voltage≤10V.
Aging	NP0 : 0% , X7R/X7S/X6S/X5R: typically 1.0%
Dielectric Strength	250% Rated Voltage

◆ Dimension



Unit : mm [inches]

SIZE	L	W	T (max)	B (min)	BW (min)
0201	0.60±0.09 [.024±.003]	0.30±0.09 [.011 ±.003]	0.39 [.015]	0.20 [.008]	0.10 [.004]
0402	1.00±0.05 [.039±.002]	0.50±0.05 [.020 ±.002]	0.55 [.022]	0.30 [.012]	0.15 [.006]
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031 ±.004]	1.00 [.039]	0.40 [.016]	0.15 [.006]
0805	2.00±0.20 [.079±.012]	1.25±0.20 [.049 ±.008]	1.45 [.057]	0.70 [.028]	0.20 [.008]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.063±.008]	1.80 [.071]	1.50 [.059]	0.30 [.012]

◆ How To Order

C	0201	R	104	K	010	T	S	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Suffix Code**
C: MLCC (Multilayer Ceramic Capacitor)	Ex.: 0201 0402 0603 0805 1206	Ex.: N : NP0 X : X7R R : X7S S : X6S B : X5R	Ex.: 102 : 10x10^2 103 : 10x10^3	Ex.: F : +/- 1% G : +/- 2% J : +/- 5% K : +/- 10% M : +/- 20%	Ex.: 004 : 4Vdc 007 :6.3Vdc 010 :10Vdc 016 :16Vdc 025 :25Vdc 035 :35Vdc 050 :50Vdc	Ex.: T: T&R 7” R: T&R 13” B: Bulk	Ex: E:1.6±0.20 F:2.0±0.20 S:0.3±0.03	Y

NCC Series – Normal Chip Capacitors

◆ Capacitance Range

Dielectric Characteristic	Size	Rated Voltage	Capacitance Range																																																												
			1R0	1R2	1R5	1R8	2R2	2R7	3R3	3R9	4R7	5R6	6R8	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	224	474
NPO	0201	25V	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S																																							
		50V	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S																																							
	0402	35V																																															O														
		50V	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O															
	0603	50V													B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B														
	0805	50V													B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D										
	1206	25V													C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B/C	B/D	B/D	B/D	E	E													E	E	E	E	E	E
		50V													C	C	C	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B/C	B/D	B/D	B/D	E	E													E	E	E	E	E	

Dielectric Characteristic	Size	Rated Voltage	Capacitance Range																																						
			101	121	151	181	221	271	331	391	471	561	681	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	154	224	334	474	684	824
X7R	0201	6.3V																																				S		S				
		10V																																				S						
		16V																																				S						
	0402	10V																																				O		O	T	T		
		16V																							O	O	O	O	O	O	O	O	O	O	O	O	O		O	T			
		25V																			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		O				
		50V	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O		O		O	O	O	O	O						
	0603	16V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	
		25V			B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
		50V	B		B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B		
	0805	16V									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	D	
		25V									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	D	
		50V									B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	D	
	1206	25V																																				B	C	D	E	D	E	
		50V																																				B	C	D	E	D	E	
X7S	0201	6.3V																																				S		S2				
		10V																																				S						
		16V																																				S						
X6S	0201	6.3V																																				S		S2				
		10V																																				S		S2				
		16V																																				S						
		25V																																				S						
X5R	0201	6.3V																																				S		S	S2	S2		
		10V																																				S		S2	S2	S2		
		16V																																				S		S2	S2			
		25V																																				S		S2	S2			
	0402	10V																																				O	O	O	O	O	O	
		16V																																				O	O	O	O	O	O	
		25V																																				O	O	O	T	T		
		50V																																				O	O	O	T	T		
	0603	16V																																				B		B	B	B		
		25V																																				B		B	B	B		
		50V																																				B		B	B	B		

- ***The yellow indication denotes values that are under development. Please contact Holy Stone office for further details***
- ***Other dimensions, capacitance values and voltages ratings are available on request. Please contact Holy Stone.***

◆ Thickness Specification

- **Specifications & Test Conditions please see P51~P55**

Symbol Code	S	S2	O	T	B	C	D	E
Thickness(mm)	0.3±0.03	0.3±0.09	0.5±0.05	0.5±0.1	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.2

Multilayer Ceramic Capacitors

[High Capacitance MLCCs – 1.0uF and above]

HCC Series

◆ Features

- ❑ Surface mount suitable for wave and reflow soldering
- ❑ High reliability
- ❑ Small size and high capacitance value
- ❑ Excellent high frequency characteristics
- ❑ RoHS compliant

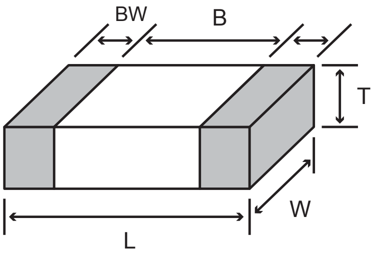
◆ Applications

- ❑ Ideal for smoothing and decoupling circuits
- ❑ Suitable for DC-DC converter, personal computer and peripherals, telecommunication and general electronic equipment

◆ Summary of Specifications

Operation Temperature	X7R / X7S : -55 ℃ to +125 ℃ , X6S : -55 ℃ to +105 ℃; X5R : -55 ℃ to +85 ℃
Rated Voltage	4.0Vdc to 50Vdc
Temperature Coefficient	X7R : ≤ ± 15% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
	X7S : ≤ ± 22% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
	X6S : ≤ ± 22% , -55 ℃ to +105 ℃ (EIA Class Ⅱ)
	X5R : ≤ ± 15% , -55 ℃ to +85 ℃ (EIA Class Ⅱ)
Dissipation Factor	X7R, X5R, X6S, X7S : 15% max
Insulation Resistance	10,000mΩ or 500/CΩ, whichever is smaller for rated voltage>10V and greater than 100/CΩ for rated voltage≤10V
Aging	X7S/X7R/X6S/X5R : typically 1.0%
Dielectric Strength	250% Rated Voltage

◆ Dimension



Unit : mm [inches]

SIZE	L	W	T (max)	B (min)	BW (min)
0201	0.60±0.09 [.024±.003]	0.30±0.09 [.011 ±.003]	0.55 [.022]	0.20 [.008]	0.10 [.004]
0402	1.00±0.05 [.039±.002]	0.50±0.05 [.020 ±.002]	0.95 [.037]	0.30 [.012]	0.15 [.006]
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031 ±.004]	1.00 [.039]	0.40 [.016]	0.15 [.006]
0805	2.00±0.20 [.079±.012]	1.25±0.20 [.049 ±.008]	1.45 [.057]	0.70 [.028]	0.20 [.008]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.126±.012]	1.90 [.074]	1.50 [.059]	0.30 [.012]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.098±.008]	2.80 [.110]	1.60 [.063]	0.30 [.012]

◆ How To Order

C	0402	B	105	K	025	T	O	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Suffix Code**
C: MLCC (Multilayer Ceramic Capacitor)	Ex.: 0201 0402 0603 0805 1206 1210	Ex.: N : NP0 X : X7R R : X7S S : X6S B : X5R	Ex.: 105 : 10x10^5 225 : 22x10^5 475 : 47x10^5 106 : 10x10^6 226 : 22x10^6	Ex.: F : +/- 1% G : +/- 2% J : +/- 5%	Ex.: 004 : 4Vdc 007 :6.3Vdc 010 :10Vdc 016 :16Vdc 025 :25Vdc 035 :35Vdc 050 :50Vdc	Ex.: T: T&R 7” R: T&R 13” B: Bulk	Ex: E:1.6±0.20 F:2.0±0.20 O:0.5±0.05	Y

◆ Capacitance Range

X7R (X) Series

Size	0402		0603						0805						1206						1210					
Code	6.3V	10V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V
105	O	O3	B	B5	B5	B5	B5	B4	D	D	D	D	D	D	D	D	D/E	E5	D/E	E5		D	D	D	D	E
225			B5	B5	B3	B3			D	D	D	D	D	D	E	E5	E5	E5	E5	E5		F	F	F	F	F
475			B3	B3	B3				D	D	D	D	D	D	E	E5	E5	E5	E5	E5		F	F	F	F	F
106			B3	B3					D	D	D	D			E5	E5	E5	E5	E5			F	F1	F1	F1/M	F1/M
226									D	D					E5	E5	E4					M	M	M		
476																					M	M				

X7S (R) Series

Size	0402				0603			0805			1206	1210
Code	6.3V	10V	16V	25V	10V	16V	25V	16V	25V	50V	16V	6.3V
105		O1	O3	O3								
225	O2	O2	O2			B	B					
475					B4	B3				D		
106					B3			D	D			
226											E4	
476												
107												N

X7T (T) Series

Size	0201		0402			0603		
Code	4V	6.3V	6.3V	10V	16V	2.5V	6.3V	10V
105		S3						
225	S3				O2			
475			O2	O2				
106							B3	B3
226						B3	B3	
476						B3		
107								

X 6S (S) Series

Size	0201				0402					0603							0805								1206							1210					
Code	2.5V	4V	6.3V	10V	4V	6.3V	10V	16V	25V	2.5V	4V	6.3V	10V	16V	25V	50V	2.5V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V
105		S	S2	S2		O	O	O	O3			B	B	B	B	B								D													
225		S2	S3			O	O3	O2	O2			B	B	B	B								D	D				E	E5	E	E				F	F	F
475	S3					O1	O2					B5	B5	B4	B3						D	D	D	D				E	E	E	E				F	F	F
106					O2	O2					B3	B3	B3	B3					D	D	D	D	D				E	E5	E5	E5			F	F1	F	F1/M	F/G
226					O4						B3	B3	B3					D	D	D	D	D				E5	E5	E	E4				G	G	G		
476										B3	B3							D	D						E5	E5	E4					G	G	G			
107										B3							D	D							E4	E4						N	N				
227																									E4							M6					

X5R (B) Series

Size	0201				0402						0603								0805							1206							1210					
Code	4V	6.3V	10V	16V	6.3V	10V	16V	25V	35V	50V	2.5V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	4V	6.3V	10V	16V	25V	35V	50V	6.3V	10V	16V	25V	35V	50V
105	S1	S1	S2	S2	O	O	O	O	O3	O3			B5	B5	B5	B5	B5	B5				D	D	D	D													
225	S2	S2	S2		O	O	O2	O2	O2				B5	B5	B5	B5	B5	B3				D	D	D	D							E						F
475	S3	S3			O3	O1	O2						B5	B5	B4	B4	B3					D	D	D	D			E5	E5	E5		E		F	F	F		F
106					O2	O2							B5	B4	B4	B3	B			D	D	D	D	D	D		E5	E5	E5	E5	E5	E5		F1	F1	F1	F1/M	F1/M
226					O4	O4							B3	B3	B3					D	D	D	D	D			E5	E5	E5	E5	E5		M	M	M	M	M	
476												B	B3						D	D	D						E5	E5	E4	E4			M	M	M	N		
107											B								D	D						E4	E4	E4					N	N	N			
227																										E4	E4						N					

- ***Other dimensions, capacitance values and voltages ratings are available on request. Please contact Holy Stone.***

◆ Thickness Dimensions

Symbol Code	S	S1	S2	S3	O	O1	O2	O3	O4
Thickness (mm)	0.3±0.03	0.3±0.05	0.3±0.09	0.5±0.05	0.5±0.05	0.5±0.15	0.5±0.20	0.5±0.10	0.8+0/-0.15

Symbol Code	B	B3	B4	B5	C	D	E	E4	E5
Thickness (mm)	0.85±0.15	0.8±0.20	0.8±0.15	0.8±0.1	1.0+0.1/-0.05	1.25±0.2	1.6±0.2	1.6±0.3	1.6±0.2

Symbol Code	F	F1	G	M	N
Thickness (mm)	2.0±0.2	2.0±0.2	2.4±0.2	2.5±0.2	2.5±0.3

Multilayer Ceramic Capacitors

[X2 and X1Y2 、X1Y1Safety Certified Capacitors]

SCC Series Rated up to 400Vac

The SCC series X2 and X1Y2 rated at 250Vrms and X2 rated at 305Vrms and X1Y1 rated at 250Vrms、300Vrms、400Vrms safety capacitors are designed specifically for use in modem, facsimile, telephone and other electronic equipment. These parts are compliant to IEC60384-14 , UL60950-1 and UL60384-14 standards. These capacitors are available in NP0 (C0G) and X7R dielectrics.

◆ Features

- ☐ Small size & high capacitance
- ☐ Suitable for reflow soldering
- ☐ Surface mount
- ☐ Safety standard approval by IEC60384-14 , UL 60950-1 and UL60384-14
- ☐ RoHS compliant and Lead(Pb) free option
- ☐ Certified to:
  TUV R50005234, R50103496 & UL E229738
  TUV R50162550 & R50556303 & UL E300818
  & UL E229738 for Lead(Pb) free
  & CQC 22001330979/22001331089/22001362296

◆ Applications

- ☐ The X2 and X1Y2 、X1Y1 and are specially designed for use in Modem, Facsimile, Telephone and other telecommunication equipment, electronic equipment for lighting and surge protection, EMI filtering and Isolation.

◆ Safety Details of Specifications

TUV ：IEC 6038414:2013+AMD1:2016	Meets the electrical requirements and certification for equipment requiring Class X1/Y1 and X1/Y2 and X2 devices.
TUV：EN 60384-14:2013+AMD1:2016	
UL： 60384-14：2014, 2nd Edition	Component certified for equipment requiring UL-60384-14 compliance
UL： 60950-1：2007, 2nd Edition	TNV/SELV isolation capacitors certified To UL 60950-1
CQC：IEC 60384-14：2013+AMD1:2016	Component certified for equipment requiring IEC-60384-14 compliance

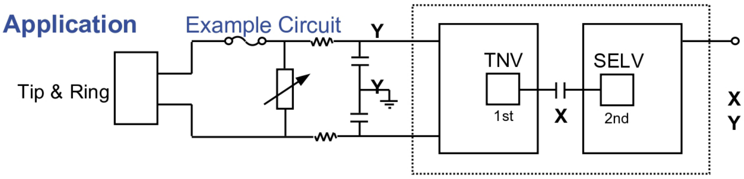
◆ How To Order

SCC	1808	X	102	K	502	T	S
Product Code SCC: Safety Certified MLCC	**Chip Size** Ex.: 1808 1812 2208 2211 2220 2825	**Dielectric** Ex.: N: NP0 X: X7R	**Capacitance Unit : pF** Ex.: 2R0:2.0pF 100:10×10^{0} 471:47×10^{1} 182:18×10^{2}	**Tolerance** Ex.: J :+/-5% K :+/-10% M :+/-20%	**Class** Ex.: 202: X2_250Vrms 252 :X2_305Vrms 502: X1/Y2_250Vrms 602: X1/Y2_250Vrms (for SCC22**/NP0) 8A2: X1/Y1_250Vrms 8B2: X1/Y1_300Vrms 8C2: X1/Y1_400Vrms	**Packaging** Ex.: T: T&R 7” R: T&R 13” B: Bulk	**Special Requirement** Ex.: S: Arc Prevention Coating X: Polymer Termination (Super Term) Z: Arc Prevention Coating & Polymer Termination (Super Term) G: Lead (Pb) Free

◆ Summary of Specifications

Rated Voltage	AC 250Vrms and 300Vrms and 305Vrms and 400Vrms
Temperature Coefficient	NP0 : < ±30ppm/ ℃ , -55 ℃ to +125 ℃ (EIA Class I)
	X7R : < ±15% , -55 ℃ to +125 ℃ (EIA Class Ⅱ)
Capacitance Range	X1/Y2 : 2.0pF ~ 4700pF、X1/Y1 : 10pF ~ 1800pF
	X2 – 250Vrms : 2pF ~ 56nF X2 – 305Vrms : 150pF ~ 33nF
Quality and Dissipation Factor	NP0 : Q≧1000 , X7R : D.F.≦2.5%
Climatic Category	55/125/21
Insulation Resistance	10GΩ
Voltage Proof	X Capacitor(4.3Ur), : Applied Voltage 1075Vdc,1290Vdc,1312Vdc,1720Vdc Y Capacitor : Applied Voltage 1500Vac,4000Vac
Impulse	X2 : 2.5KV , Y2 : 5KV, Y1 : 8KV for three times
Aging	NP0: 0 % , X7R: 1.0 % per decade hr., typically

◆ Application



X : Across the line (Ex.: SCC1808N151K202TG)
Y : Line by pass (Ex.: SCC2211X102K502TS)

◆ Capacitance Range

250Vrms

Class	Size	Temperature Characteristic	Rated Voltage	Certificate	Capacitance Range																																									
					360	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	153	183	223	273	333	393	473	563	683	823	104
X2	1808	X7R	250Vrms	TUV/UL									D	D	D	D	D	D	D	D	D	D	D	D	D	D	D																			
	1812	X7R	250Vrms	TUV/UL													D	D	D	D	D	D	D	D	D	D	D	D	D	E	E															
	2220	X7R	250Vrms	TUV/UL									D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	G	H			
	2825	X7R	250Vrms	UL																																						E	F			
X1Y2	1808	X7R	250Vrms	TUV/UL									D	D	D	D	D	E	E	E	F	F	F	F	F	F	F																			
	1812	X7R	250Vrms	TUV/UL									D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	F	G	G	H															
	2208	X7R	250Vrms	TUV/UL	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F																			
	2211	X7R	250Vrms	TUV/UL					D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	G	G	H	H	H	H	H													
	2220	X7R	250Vrms	TUV/UL							D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	G	G	G	G											
X1Y1	3906	X7R	250Vrms	TUV/UL							N	N	N	N	N	N	N	N	N																											
	4007	X7R	250Vrms	TUV/UL							F	F	F	F	F	F	F	F	F	F	F	F																								
	4012	X7R	250Vrms	TUV/UL							E	E	E	E	E	E	E	E	E	E	E	E	E	E	F	G																				

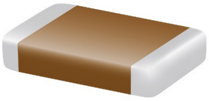
Class	Size	Temperature Characteristic	Rated Voltage	Certificate	Capacitance Range																																		
					1R8	2R2	2R7	3R3	3R9	4R7	5R6	6R8	8R2	100	120	150	180	220	270	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122
X2	1808	NPO	250Vrms	TUV/UL		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	F	F	
X1Y2	1808	NPO	250Vrms	TUV/UL	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F							
	1812	NPO	250Vrms	TUV/UL	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F			
	2208	NPO	250Vrms	TUV/UL		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	F	F	F	F	F	F	F							
	2211	NPO	250Vrms	TUV/UL		D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	F	F	G	H	
	2220	NPO	250Vrms	TUV/UL		D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E	F	F	F	F	F	F	F	F	F	F	F
X1Y1	3906	NPO	250Vrms	TUV/UL										N	N	N	N	N	N	N	N	N	N	N	N	N													

'X' denotes values that have been tested to a rated voltage of 305Vac. TUV test report number 28208004 dated on May 27th, 2010.

305Vrms

Class	Size	Temperature Characteristic	Rated Voltage	Certificated	Capacitance Range																																									
					360	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	153	183	223	273	333	393	473	563	683	823	104
X2	2220	X7R	305Vrms	TUV/UL									D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F						

Multilayer Ceramic Capacitors



[Automotive Grade MLCCs]

ACC Series

◆ Features

- ❑ AEC-Q200 & IATF16949 qualified.
- ❑ Suitable for harsh Automotive environments without additional qualification testing
- ❑ Available with Polymer Termination (Super Term) to prevent mechanical cracking
- ❑ High Reliability
- ❑ RoHS compliant
- ❑ 250Vac, X1/Y2 Safety capacitors available

◆ Applications

- ❑ Power supplies
- ❑ Lighting
- ❑ Isolation
- ❑ Powertrain
- ❑ Safety equipment
- ❑ Custom applications , BMS ,On board charger

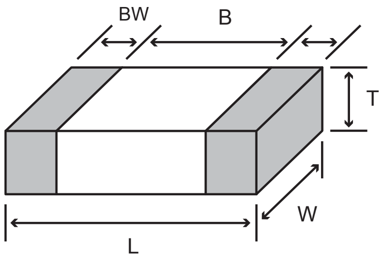
◆ Summary of Specifications

Operation Temperature	-55 ℃ to +125 ℃	
Rated Voltage	16Vdc ~ 1000Vdc ，250Vac X1/Y2 Safety capacitors	
Temperature Coefficient	NP0 ：≤ ± 30ppm/ ℃	-55 ℃ to +125 ℃ (EIA Class I)
	X7R ： ± 15%	-55 ℃ to +125 ℃ (EIA Class Ⅱ)
Capacitance Range	NP0 ：10pF ~ 47nF ；X7R : 330pF ~ 4.7uF	
Dissipation Factor	NP0 ： More than 30pF Q≧1000 ; 30pF & below Q≧400+20C X7R ： Range 2.5% to 10%	
Insulation Resistance	10GΩ or 500/C Ω, whichever is smaller (C in Farad)	
Aging	NP0 : 0% ； X7R : 2.5% per decade of time	
Dielectric Withstanding	V=100V (Cap<10uF)	250% rated voltage
	V ＜100V	250% rated voltage
	100V ≤ V ＜ 500V	200% rated voltage
	500V ≤ V ＜ 1000V	150% rated voltage
	1000V ≤ V	120% rated voltage

◆ How To Order

ACC	2220	N	333	K	102	T	I	X	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Special Requirement**	**Suffix Code**
ACC : Automotive Grade Capacitors	EX : 0805 1206 1210 1812 1825 2222	EX : N : NP0 X : X7R	EX : 100 : 10 x 10^{0} 221 : 22 x 10^{1} 332 : 33 x 10^{2} 473 : 47 x 10^{3} 684 : 68 x 10^{4}	Ex: J: +/- 5% K: +/-10% M: +/-20%	EX : 025 : 25Vdc 050 : 50Vdc 101 : 100Vdc 251 : 250Vdc 501 : 500Vdc 102 : 1000Vdc 202 : 2000Vdc	EX : T : T&R 7” R : T&R 13” B : Bulk	Ex: D: 1.25±0.20 E: 1.60±0.20 I : 3.2±0.20	EX: X: Polymer Termination (Super Term) O: Arc Prevention Coating Z: Coating & Polymer Termination	Y

◆ Dimensions



Unit : mm

SIZE	L	W	T (max)	B (min)	BW (min)
0402	1.00±0.05	0.50±0.05	0.70	0.30	0.15
0603	1.60±0.10	0.80±0.10	1.00	0.40	0.15
0805	2.00±0.20	1.25±0.20	1.55	0.70	0.20
1206	3.20±0.25	1.60±0.20	1.90	1.50	0.30
1210	3.20±0.25	2.50±0.20	3.00	1.60	0.30
1808	4.60±0.30	2.00±0.20	1.55	2.50	0.30
1812	4.60±0.30	3.20±0.30	3.10	2.50	0.30
1825	4.60±0.30	6.35±0.40	3.00	2.50	0.30
2220	5.70±0.40	5.00±0.40	3.10	3.50	0.30
2225	5.70±0.40	6.35±0.40	3.00	3.50	0.30

◆ Thickness Dimensions

Symbol Code	O	B	C	D	E	F	G	M	H	I
Thickness(mm)	0.50±0.05	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.20	2.0±0.20	2.4±0.20	2.50±0.20	2.8±0.20	3.20±0.20

- *Other dimensions, capacitance values and voltage ratings are available on request. Please contact Holy Stone.*
- *Specifications & Test Conditions for 0603 and larger sizes, please see P56~P60.*
- *Specifications & Test Conditions for 0402, please contact Holy Stone.*

◆ Capacitance Range: X7R 16V~3000V

Size	Voltage (v)	Capacitance Range (pF) - ACC Series - X7R																																																		
		101	151	221	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474	564	684	824	105	155	225	335	475	685	106	226
0402	16																																		O																			
	25																																		O																			
	50																																		O																			
0603	16																						B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B							
	25																						B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B							
	50		B	B	B	B	B	B	B	B	B												B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B															
	100		B	B	B	B	B	B	B	B	B												B	B	B	B	B	B	B	B	B	B	B	B	B																			
0805	10																												C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	16				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D							
	100																															B	B	B	B																			
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D																										
1206	10																																			E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	16																																			E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E							
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	D	D	E	E															
	500										C	C	C	C	C	C	C	C	C	C	C	D	D																															
	630										C	C	C	C	C	C	C	C	C	C	C	D	D	E	E	E	E																											
	1000	C	C	C	C	C	C	C	C	C	D	D	D	D	D	E	E	E	E	E	E	E	E	E	E	E	E																											
1210	16																																														F	F	F	F	F	F	G	
	25																																														F	F	F	F	F	F	G	
	50																																														F	F	F	F	F			
	100																																														F	F	F	F	F			
	100																																								D	D	D	D	D	E	F							
	250																													C	C	C	D	E	F	F	F	F	F															
	500																		C	C	C	D	D	D	D	D	D	E	F	F	G	D	D	D	E	E	F																	
	630																		C	C	C	D	D	D	D	D	D	E	F	F	G	D	D	D	E	E	F																	
	1000										C	C	C	C	C	D	D	D	D	D	D	E	E	E	E	F	F	F	F	F	G																							
	2000	C	C	C	C	C	C	C	C	C	D	D	E	E	E																																							
1808	1000	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F																									
	2000	D	D	D	D	D	D	D	D	D	D	D	D	D	D																																							
1812	25																																																	E	E	E	E	M
	50																																																	E	E			
	500			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F	G	G	G															
	630				D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E																															
	1000				D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E																															
	2000	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F																														
	3000	D	D	D	D	D	D	D	D	D	D																																											
2220	50																																															E	E	F	F	F	H	
	100																																															E	E	F	F	F	H	
	250																																						D	D	E	E	F	F	F	G	G							
	450																																						D	D	E	E	F	F	F	G	G							
	500																																						D	D	E	E	F	F	F	G	G							
	630																									D	D	D	D	D	D	D	D	E	F	F		D	D	E	E	F	F	F	G	G							
	1000														D	D	D	D	D	D	D	E	E	E	E	E	E	E	E	E	E	E	F	F																				
	2000										F	F	F	F	F	F	F	F	F	F	F	F	F	G	G	G	G																											

◆ **Capacitance Range: NPO 25V~2000KV**

Size	Voltage (v)	Capacitance Range (pF) - ACC Series-NPO																																																		
		100	120	150	180	200	220	270	300	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
0805	25	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	50	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	100	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	250	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D																	
1206	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D	E	E	E	E	E	E	E
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D	E	E	E	E	E	E	E
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	200				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E								
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E								
	500				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
	630				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
	1000				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E																								
1210	250																																							E	E	E	F	F	G	G	M	M				
	500															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M	M	M						
	630															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M	M	M						
	1000															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M								
1808	1000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
	2000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
	3000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
1812	50																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	100																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	250																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	1000																											E	E	F	F	F	F	F	F	F	G	G														
1825	500																																							D	E	E	E	F	F	F	F	G				
2220	500																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	G	G	H	H
	630																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	G	G	H	H
	1000																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	G	G	H	I						
	2000																						D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	G														

Multilayer Ceramic Capacitors

[Automotive Grade - X1/Y2 and X2 Safety Certified Capacitors]
Rated Voltage 250Vac

◆ Features

- ❑ Suitable for harsh Automotive environments without additional qualification testing
- ❑ Available with Polymer Termination (Super Term) to prevent mechanical cracking
- ❑ High Reliability
- ❑ IATF16949 & AEC-Q200 qualified
- ❑ RoHS compliant
- ❑ 250Vac, X1/Y2 and X2 Safety Capacitors available

◆ Applications

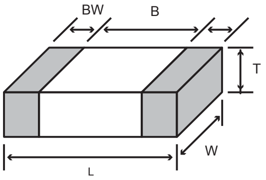
- ❑ CAN-Bus Isolation, On Board Charger
- ❑ Safety equipment
- ❑ Customized application

◆ Safety Details of Specifications

◆ How To Order :

SCC	2220	X	472	K	502	T	X	A
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Class**	**Packaging**	**Special Requirement**	**Suffix Code**
SCC: Safety Approved MLCC	Ex.: 1808 2208 2220	Ex.: X: X7R	Ex.: 100 : 10 x 10⁰ 221 : 22 x 10¹ 332 : 33 x 10²	Ex.: J :+/-5% K :+/-10% M :+/-20%	Ex.: 202: X2 502: X1/Y2	Ex.: T: T&R 7” R: T&R 13” B: Bulk	Ex.: X: Polymer Termination (Super Term)	EX: A : Automotive Grade

◆ Dimension



Unit : mm

SIZE	L	W	T (max)	BW (min)
1808	4.60±0.30	2.00±0.20	1.55	0.3
2208	5.70±0.50	2.00±0.20	2.2	0.3
2211	5.70±0.40	2.80±0.40	3	0.3
2220	5.80±0.50	5.00±0.50	3	0.3

◆ Capacitance Range

Capacitance Range (pF) - ACC Series - X7R

Size	Voltage (v)	100	120	150	180	220	330	360	390	400	420	470	560	680	820	101	121	131	151	181	201	221	271	301	331	361
1808	X2																		D	D		D	D		D	
1812	X1/Y2															D	D	D	D	D	D	D	D	D	D	D
2208	X1/Y2							E	E		E	E	E	E	E	F	F		F	F	F	F	F	F	F	F
2211	X1/Y2															E	E		E	E		E	E		E	
2220	X1/Y2															E	E	E	E			E	E		E	

Size	Voltage (v)	391	431	471	511	561	621	681	751	821	102	122	152	182	202	222	272	332	392	472	562	682	822	103	153	223
1808	X2	D		D		D		D		D	D															
1812	X1/Y2	D	D	D	D	D	D	D	D	D	D	D	D	E		E	F	F	G	H						
2208	X1/Y2	F		F		F		F		F	F															
2211	X1/Y2	E		E		E		E		E	F	F	F	F		H										
2220	X1/Y2	E		E		E		E		E	E		E			E	F	F		F	E	F	G	G		

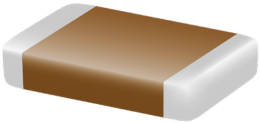
Symbol Code	D	E	F	G	H	I
Thickness(mm)	1.25±0.20	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2	3.2±0.2

- ■ *Other dimensions, capacitance values and voltage ratings are available on request. Please contact Holy Stone.*

Multilayer Ceramic Capacitors

[AEC-Q200 Grade MLCCs]

AEC Series



◆ Features

- ☐ AEC-Q200 qualified.
- ☐ Suitable for harsh Automotive environments without additional qualification testing
- ☐ Available with Polymer Termination (Super Term) to prevent mechanical cracking
- ☐ High Reliability
- ☐ RoHS compliant
- ☐ 250Vac, X1/Y2 Safety capacitors available

◆ Applications

- ☐ Power supplies
- ☐ Lighting
- ☐ Isolation
- ☐ Powertrain
- ☐ Safety equipment
- ☐ Custom applications , BMS ,On board charger

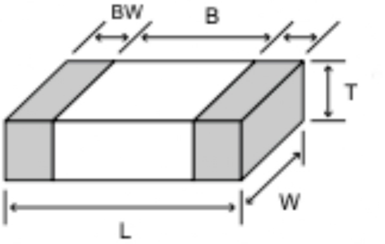
◆ Summary of Specifications

Operation Temperature	-55 ℃ to +125 ℃	
Rated Voltage	16Vdc ~ 1000Vdc , 250Vac X1/Y2 Safety capacitors	
Temperature Coefficient	NP0 : ≤ ± 30ppm/ ℃	-55 ℃ to +125 ℃ (EIA Class I)
	X7R : ± 15%	-55 ℃ to +125 ℃ (EIA Class Ⅱ)
Capacitance Range	NP0 : 10pF ~ 47nF ; X7R : 330pF ~ 4.7uF	
Dissipation Factor	NP0 : More than 30pF Q≧1000 ; 30pF & below Q≧400+20C X7R : Range 2.5% to 10%	
Insulation Resistance	10GΩ or 500/C Ω, whichever is smaller (C in Farad)	
Aging	NP0 : 0% ; X7R : 2.5% per decade of time	
Dielectric Withstanding	V=100V (Cap<10uF)	250% rated voltage
	V ＜100V	250% rated voltage
	100V ≤ V ＜ 500V	200% rated voltage
	500V ≤ V ＜ 1000V	150% rated voltage
	1000V ≤ V	120% rated voltage

◆ How To Order

ACC	2220	N	333	K	102	T	I	X	Y
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Rated Voltage**	**Packaging**	**Thickness (mm) (Optional)**	**Special Requirement**	**Suffix Code**
ACC : Automotive Grade Capacitors	EX : 0805 1206 1210 1812 1825 2222	EX : N : NP0 X : X7R	EX : 100 : 10 x 10^0 221 : 22 x 10^1 332 : 33 x 10^2 473 : 47 x 10^3 684 : 68 x 10^4	Ex: J: +/- 5% K: +/-10% M: +/-20%	EX : 025 : 25Vdc 050 : 50Vdc 101 : 100Vdc 251 : 250Vdc 501 : 500Vdc 102 : 1000Vdc 202 : 2000Vdc	EX : T : T&R 7" R : T&R 13" B : Bulk	Ex: D: 1.25±0.20 E: 1.60±0.20 I : 3.2±0.20	EX: X: Polymer Termination (Super Term) O: Arc Prevention Coating Z: Coating & Polymer Termination	Y

◆ Dimensions



Unit : mm

SIZE	L	W	T (max)	B (min)	BW (min)
0402	1.00±0.05	0.50±0.05	0.70	0.30	0.15
0603	1.60±0.10	0.80±0.10	1.00	0.40	0.15
0805	2.00±0.20	1.25±0.20	1.55	0.70	0.20
1206	3.20±0.25	1.60±0.20	1.90	1.50	0.30
1210	3.20±0.25	2.50±0.20	3.00	1.60	0.30
1808	4.60±0.30	2.00±0.20	1.55	2.50	0.30
1812	4.60±0.30	3.20±0.30	3.10	2.50	0.30
1825	4.60±0.30	6.35±0.40	3.00	2.50	0.30
2220	5.70±0.40	5.00±0.40	3.10	3.50	0.30
2225	5.70±0.40	6.35±0.40	3.00	3.50	0.30

◆ Thickness Dimensions

Symbol Code	O	B	C	D	E	F	G	M	H	I
Thickness(mm)	0.50±0.05	0.85±0.15	1.0+0.1/-0.05	1.25±0.20	1.6±0.20	2.0±0.20	2.4±0.20	2.50±0.20	2.8±0.20	3.20±0.20

- *Other dimensions, capacitance values and voltage ratings are available on request. Please contact Holy Stone.*
- *Specifications & Test Conditions for 0603 and larger sizes, please see P56~P60.*
- *Specifications & Test Conditions for 0402, please contact Holy Stone.*

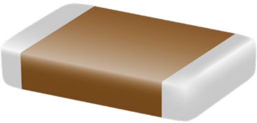
◆ Capacitance Range: X7R 16V~3000V

Size	Voltage (v)	Capacitance Range (pF) - AEC Series - X7R																																																		
		101	151	221	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104	124	154	184	224	274	334	394	474	564	684	824	105	155	225	335	475	685	106	226
0402	6.3																																														W							
	16																																	O																			
	25																																	O																			
	50																																	O																			
0603	10																																														B							
	16																										B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B							
	25																										B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B							
	50		B	B	B	B	B	B	B	B	B																B	B	B	B	B	B	B	B	B	B	B	B	B															
	100		B	B	B	B	B	B	B	B	B																B	B	B	B	B	B	B	B	B																			
0805	10																												C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	16				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D	D	D					
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	C	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	D	D	D							
	100																														B	B	B	B																			
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D																										
1206	10																																		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	16																																		E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E			
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	E	E	E	E	E	E	E	E	E	E	E	E	E	E					
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	D	D	E	E															
	500										C	C	C	C	C	C	C	C	C	C	C	D	D																															
	630										C	C	C	C	C	C	C	C	C	C	C	D	D	E	E	E	E																											
	1000	C	C	C	C	C	C	C	C	C	D	D	D	D	D	E	E	E	E	E	E	E	E	E	E	E	E																											
1210	16																																														F	F	F	F	F	F	G	
	25																																														F	F	F	F	F	F	G	
	50																																														F	F	F	F	F			
	100																																														F	F	F	F	F			
	100																																								D	D	D	D	D	E	F	F	F					
	250																													C	C	C	D	E	F	F	F	F	F															
	500																		C	C	C	D	D	D	D	D	D	E	F	F	G	D	D	D	E	E	F																	
	630																		C	C	C	D	D	D	D	D	D	E	F	F	G	D	D	D	E	E	F																	
	1000										C	C	C	C	C	D	D	D	D	D	D	E	E	E	E	F	F	F	F	F	G																							
	2000	C	C	C	C	C	C	C	C	C	D	D	E	E	E																																							
1808	1000	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F																									
	2000	D	D	D	D	D	D	D	D	D	D	D	D	D	D																																							
1812	25																																																	E	E	E	E	M
	50																																																	E	E			
	500			D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	F	G	G	G															
	630				D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E																															
	1000				D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E																															
	2000	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F																														
	3000	D	D	D	D	D	D	D	D	D	D																																											
2220	50																																															E	E	F	F	F	H	
	100																																															E	E	F	F	F	H	
	250																																						D	D	E	E	F	F	F	G	G							
	450																																						D	D	E	E	F	F	F	G	G							
	500																																						D	D	E	E	F	F	F	G	G							
	630																										D	D	D	D	D	D	D	D	E	F	F		D	D	E	E	F	F	F	G	G							

◆ Capacitance Range: NPO 25V~2000KV

Size	Voltage (v)	Capacitance Range (pF) - ACC Series-NPO																																																		
		100	120	150	180	200	220	270	300	330	390	470	560	680	820	101	121	151	181	221	271	331	391	471	561	681	821	102	122	152	182	222	272	332	392	472	562	682	822	103	123	153	183	223	273	333	393	473	563	683	823	104
0805	25	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	50	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	100	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D															
	250	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D																	
1206	25				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D	E	E	E	E	E	E	E
	50				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	D	D	D	D	D	E	E	E	E	E	E	E
	100				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E
	200				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E								
	250				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	D	D	E	E	E	E	E	E								
	500				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
	630				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E	E	E	E	E	E	E	E	E	E	E	E	E												
	1000				B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	C	C	C	D	D	E	E																								
1210	100																																							C	C	C	C	D	D	D	E	E				
	250																																							E	E	E	F	F	G	G	M	M				
	500															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M	M	M						
	630															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M	M	M						
	1000															D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	E	F	F	F	F	F	G	G	M	M	M	M	M								
1808	1000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
	2000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
	3000	C	C	C	C	C	C	D	D	D	D	D	D	D	D	D	E	E	F	F																																
1812	50																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	100																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	250																																	D	D	D	D	D	D	D	D	D	D	D	E	E	E	E	E	E	F	F
	1000																											E	E	F	F	F	F	F	F	F	G	G														
1825	500																																							D	E	E	E	F	F	F	F	G				
2220	500																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	G	G	H	H
	630																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	F	F	F	F	F	F	G	G	H	H
	1000																					D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E	E	F	F	G	G	H	I						

Multilayer Ceramic Capacitors



[AEC-Q200 Grade - X1/Y2 and X2 Safety Certified Capacitors]
Rated Voltage 250Vac

◆ Features

- ☐ Suitable for harsh Automotive environments without additional qualification testing
- ☐ Available with Polymer Termination (Super Term) to prevent mechanical cracking
- ☐ High Reliability
- ☐ AEC-Q200 qualified
- ☐ RoHS compliant
- ☐ 250Vac, X1/Y2 and X2 Safety Capacitors available

◆ Applications

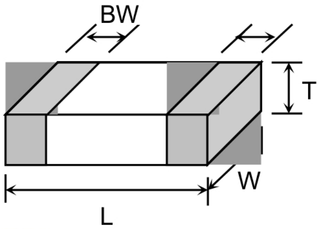
- ☐ CAN-Bus Isolation, On Board Charger
- ☐ Safety equipment
- ☐ Customized application

◆ Safety Details of Specifications

◆ How To Order :

SCC	2220	X	472	K	502	T	X	A
Product Code	**Chip Size**	**Dielectric**	**Capacitance Unit : pF**	**Tolerance**	**Class**	**Packaging**	**Special Requirement**	**Suffix Code**
SCC: Safety Approved MLCC	Ex.: 1808 2208 2220	Ex.: X: X7R	Ex.: 100 : 10 x 10^0 221 : 22 x 10^1 332 : 33 x 10^2	Ex.: J :+/-5% K :+/-10% M :+/-20%	Ex.: 202: X2 502: X1/Y2	Ex.: T: T&R 7” R: T&R 13” B: Bulk	Ex.: X: Polymer Termination (Super Term)	EX: A : Automotive Grade

◆ Dimension



Unit : mm

SIZE	L	W	T (max)	BW (min)
1808	4.60±0.30	2.00±0.20	1.55	0.3
2208	5.70±0.50	2.00±0.20	2.2	0.3
2211	5.70±0.40	2.80±0.40	3	0.3
2220	5.80±0.50	5.00±0.50	3	0.3

◆ Capacitance Range

Size	Voltage (v)	Capacitance Range (pF) - ACC Series - X7R																																																	
		100	120	150	180	220	330	360	390	400	420	470	560	680	820	101	121	131	151	181	201	221	271	301	331	361	391	431	471	511	561	621	681	751	821	102	122	152	182	202	222	272	332	392	472	562	682	822	103	153	223
1808	X2																		D	D		D	D		D		D		D		D		D		D	D															
1812	X1/Y2															D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	D	E		E	F	F	G	H						
2208	X1/Y2							E	E		E	E	E	E	E	F	F		F	F	F	F	F	F	F	F	F		F		F		F		F	F															
2211	X1/Y2															E	E		E	E		E	E		E		E		E		E		E		E	F	F	F	F		H										
2220	X1/Y2															E	E	E	E			E	E		E		E		E		E		E		E	E		E			E	F	F		F	E	F	G	G		

Symbol Code	D	E	F	G	H	I
Thickness(mm)	1.25±0.20	1.6±0.2	2.0±0.2	2.4±0.2	2.8±0.2	3.2±0.2

- *Other dimensions, capacitance values and voltage ratings are available on request. Please contact Holy Stone.*

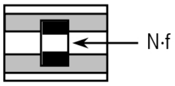
HVC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th colspan="2">Specification</th><th>Test Conditions</th></tr>
<tr><td>Visual</td><td colspan="2">No abnormal exterior appearance</td><td>Visual Inspection</td></tr>
<tr><td>Dimension</td><td colspan="2">See HVC Series</td><td>Visual Inspection</td></tr>
<tr><td>Insulation Resistance</td><td colspan="2">10,000MΩ or 500/C Ω, whichever is smaller</td><td>V≦500V, Rated Voltage
V＞500V, Applied 500Vdc
Charge Time：60 sec.
Current : Less than 50mA</td></tr>
<tr><td rowspan="2">Electrical Characterization</td><td>Capacitance</td><td>Class Ⅰ (NP0) :
Within the specified tolerance.

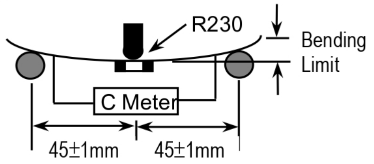
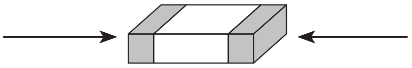
ClassⅡ (X7R) :
Within the specified tolerance.</td><td>Class Ⅰ (NP0) :
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>C≦ 1000pF</td><td>1MHz±10%</td><td>1.0±0.2Vrms</td></tr>
<tr><td>C＞1000pF</td><td>1KHz±10%</td><td>1.0±0.2Vrms</td></tr>
</table>
ClassⅡ :
<table>
<tr><th colspan="2">Frequency</th><th>Voltage</th></tr>
<tr><td>X7R</td><td>1KHz±10%</td><td>1.0±0.2Vrms</td></tr>
</table>
Perform a heat temperature at 150±5℃ for 30min, then place room temp. for 24±2 hours.</td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
More Than 30pF : Q ≧ 1000
30pF & Below : Q ≧ 400＋20C
(C : Capacitance , pF)

ClassⅡ(X7R) :
100V：5.0% (C≧0.1uF)
100V：2.5% (C＜0.1uF)
Other Voltage：2.5% max</td><td></td></tr>
<tr><td>Withstanding Voltage</td><td colspan="2">No dielectric breakdown or mechanical breakdown.</td><td>V=100V ： (Cap<10uF) 250% Rated Voltage
V＜500V : 200% Rated Voltage
500V≦V＜1000V : 150% Rated Voltage
1000≦V : 120% Rated Voltage
2.5KV : 100% Rated Voltage
Voltage ramp up rate≦500V/sec for 1~5 sec.
Charge/discharge current : less than 50mA

※ Withstanding voltage testing requires immersion of the element in an isolation fluid prevent arcing on the chip surface, at voltage over 1000Vdc.</td></tr>
<tr><td>Temperature Capacitance Coefficient</td><td colspan="2">
<table>
<tr><th>Char.</th><th>Temp. Range</th><th>Cap. Change</th></tr>
<tr><td>NP0(N)</td><td>-55˚C ~ +125˚C</td><td>±30ppm/˚C</td></tr>
<tr><td>X7R (X)</td><td>-55˚C ~ +125˚C</td><td>±15%</td></tr>
</table></td><td>Class Ⅰ :
[C2-C1/C1(T2-T1)] × 100%
ClassⅡ :
(C2-C1)/C1 × 100%
T1:Standard temperature(25℃)
T2:Test temperature
C1:Capacitance at standard temperature
C2:Capacitance at test temperature</td></tr>
<tr><td>Adhesive Strength of Termination</td><td colspan="2">No indication of peeling shall occur on the terminal electrode.</td><td>≦ 0603 size : 5N(≒ 0.5 Kg·f)
＞ 0603 size : 10N(≒1.0 Kg·f)

Pull force shall be applied for 10±1 sec.

 </td></tr>
</table>

HVC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th colspan="2">Specification</th><th>Test Conditions</th></tr>
<tr><td rowspan="2">Resistance to Flexure of Substrate</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="2">The board should bend 1.0mm with a rate of 1.0 mm/sec.
 </td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Char.</th><th>Cap. Change</th></tr><tr><td>NP0(N)</td><td>≤ ± 5.0%</td></tr><tr><td>X7R(X)</td><td>≤ ± 12.5%</td></tr></table></td></tr>
<tr><td>Solderability</td><td colspan="2">More than 90% of the termination surface should be soldered so the metal part does not come out or dissolve .
</td><td>Solder Temperature : 245±5℃
Dip Time : 5 ± 0.5 sec.
Immersing Speed : 25±10% mm/s
Solder : Lead Free Solder
Flux : Rosin
Preheat : At 80~120 ℃ For 10~30 sec.</td></tr>
<tr><td rowspan="6">Resistance to Soldering Heat</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="6">Class Ⅱ capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measuring.
Preheat : at 150±10°C for 60~120sec.
Dip : solder temperature of 260±5℃
Dip Time : 10 ± 1sec.
Immersing Speed : 25±10% mm/s
Flux : Rosin
Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Capacitance</td><td>Class Ⅰ(NP0):
Within ± 2.5% or ± 0.25pF, whichever is larger of initial value
Class Ⅱ:<table><tr><th>Char.</th><th>Cap. change</th></tr><tr><td>X7R(X)</td><td>Within ± 10%</td></tr></table></td></tr>
<tr><td>Q (Class Ⅰ)</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>D.F. (Class Ⅱ)</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>Withstand Voltage</td><td>To satisfy the specified initial value.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No mechanical damage shall occur</td><td rowspan="5">Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃ before initial measuring.
Capacitor shall be subjected to five cycles of the temperature cycle as following:<table><tr><th>Step</th><th>Temp.(℃)</th><th>Time(min)</th></tr><tr><td>1</td><td>Min. Rated Temp. +0/-3</td><td>30</td></tr><tr><td>2</td><td>25</td><td>3</td></tr><tr><td>3</td><td>Min. Rated Temp. +0/-3</td><td>30</td></tr><tr><td>4</td><td>25</td><td>3</td></tr></table>Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Capacitance</td><td>Class Ⅰ(NP0) :
Within 2.5% or ±0.25pF, whichever is larger of initial value
Class Ⅱ:<table><tr><th>Char.</th><th>Cap. change</th></tr><tr><td>X7R(X)</td><td>Within ± 7.5%</td></tr></table></td></tr>
<tr><td>Q (Class Ⅰ)</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>D.F. (Class Ⅱ)</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value.</td></tr>
</table>

HVC Series Specifications & Test Conditions

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>Test Conditions</th></tr>
<tr><td rowspan="4">**Humidity**</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="2">Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃before initial measure.
Temperature : 40± 2 ℃
Relative humidity : 90 ~95%RH
Test Time : 500 +12/-0 hr</td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Char.</th><th>Cap. Change</th></tr><tr><td>NP0(N)</td><td>Within ± 5.0% or ± 0.5pF, whichever is larger of initial value</td></tr><tr><td>X7R(X)</td><td>Within ± 15.0%</td></tr></table></td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
More Than 30pF : Q ≧ 350
30pF & Below : Q ≧ 275＋2.5xC
(C : Capacitance , pF)

ClassⅡ(X7R) :
100V：10.0% max. (C≧0.1uF)
100V：5.0% max. (C＜0.1uF)
Other Voltage：5.0% max.</td><td rowspan="2">Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Insulation Resistance</td><td>1000MΩ or 50/CΩ, whichever Is Smaller. (C in Farad)</td></tr>
<tr><td rowspan="4">**Humidity Load Only 100V**</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td></td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Char.</th><th>Cap. Change</th></tr><tr><td>NP0(N)</td><td>Within ± 5.0% or ± 0.5pF, whichever is larger of initial value</td></tr><tr><td>X7R(X)</td><td>Within ± 15.0%</td></tr></table></td><td>Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃before initial measure.</td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
30pF & Over : Q ≧350
ClassⅡ(X7R) :
100V：10.0% max. (C≧0.1uF)
100V：5.0% max. (C＜0.1uF)
Other Voltage：5.0% max.</td><td>Applied Voltage :Rated Voltage
Temperature : 40± 2℃
Relative Humidity : 90 ~ 95%RH
Test Time : 500 Hrs Max.
Current Applied : 50 mA Max.
Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours</td></tr>
<tr><td>Insulation Resistance</td><td>500MΩ or 25/C Ω, whichever is smaller for rated voltage>10V and greater

5/C Ω for rated voltage≤10V (C in Farad)</td><td>Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td rowspan="4">**High Temperature Load
(Life Test)
(100V-1KV)**</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">ClassⅡ capacitors applied DC voltage (following table) is applied for one hour at maximum operation temperature ±3℃ then shall be set for 48±4 hours at room temperature and the initial measurement shall be conducted.

Applied Voltage :<table><tr><th>Rated Voltage</th><th>Applied Voltage</th></tr><tr><td>V＜250Vdc＜1.0uF</td><td>150%Rated Voltage</td></tr><tr><td>V≦250Vdc≧1.0 uF</td><td>100%Rated Voltage</td></tr><tr><td>250Vdc≦V≦500Vdc＜0.1 uF</td><td>120%Rated Voltage</td></tr><tr><td>250Vdc≦V≦500Vdc≧0.1 uF</td><td>100%Rated Voltage</td></tr><tr><td>Less Than 1KVdc</td><td>120%Rated Voltage</td></tr><tr><td>More Than 1KVdc (include 1KV)</td><td>100%Rated Voltage</td></tr></table>Test Temperature : max. operating temp.
Test Time : 1000 +12/-0 hours
Current Applied : 50 mA Max.

Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Char.</th><th>Cap. Change</th></tr><tr><td>NP0(N)</td><td>Within ± 3.0% or ± 0.3pF, whichever is larger of initial value</td></tr><tr><td>X7R(X)</td><td>Within ± 15%</td></tr></table></td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
More Than 30pF : Q ≧ 350
30pF & Below : Q ≧ 275＋2.5xC
(C : Capacitance , pF)

ClassⅡ(X7R) :
100V：10.0% max. (C≧0.1uF)
100V：5.0% max. (C＜0.1uF)
Other Voltage：5.0% max.</td></tr>
<tr><td>Insulation Resistance</td><td>1000MΩ or 50/CΩ, whichever Is Smaller</td></tr>
</table>

HVC Series Specifications & Test Conditions

Item		Specification	Test Conditions
High Temperature Load (Life Test) (1.5V-5KV)	Appearance	No mechanical damage shall occur.	Class Ⅱ capacitors applied DC voltage (following table) is applied for one hour at maximum operation temperature ±3℃ then shall be set for 48±4 hours at room temperature and the initial measurement shall be conducted. Voltage Conditioning : 100% Rated Voltage meet MIL-PRF-49467(Group A/B) Current Applied : 50 mA Max. Measure at room temperature after cooling for Class Ⅰ: 24 ± 2 Hours Class Ⅱ: 48 ± 4 Hours
	Capacitance	Char. Cap. Change NP0(N) Within ± 3.0% or ± 0.3pF, whichever is larger of initial value X7R(X) Within ± 15%	
	Q / D.F.	Class Ⅰ (NP0) : More Than 30pF : $Q \geqq 350$ 30pF & Below : $Q \geqq 275+2.5\times C$ (C : Capacitance , pF) Class Ⅱ(X7R) : 5.0% max.	
	Insulation Resistance	1000MΩ or 50/CΩ, whichever Is Smaller. (C in Farad)	
Vibration	Appearance	No mechanical damage shall occur	Solder the capacitor on P.C. Board shown in Fig 2. before testing. Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2 hours each in 3 perpendicular directions.
	Capacitance	Class Ⅰ (NP0) : Within 2.5% or ±0.25pF, whichever is larger of initial value Class Ⅱ: Char. Cap. Change X7R(X) Within ± 7.5%	
	Q (Class Ⅰ)	To satisfy the specified initial value.	
	D.F. (Class Ⅱ)	To satisfy the specified initial value.	
	Insulation Resistance	To satisfy the specified initial value.	

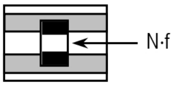
NCC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th>Specification</th><th>Test Conditions</th></tr>
<tr><td>Visual</td><td>No abnormal exterior appearance</td><td>Visual Inspection</td></tr>
<tr><td>Dimension</td><td>See NCC Series</td><td>Visual Inspection</td></tr>
<tr><td>Insulation Resistance</td><td>10,000MΩ or 500/C Ω, whichever is smaller for rated voltage>10V and greater than 100/C Ω for rated voltage≤10V</td><td>Applied Voltage: Rated Voltage
Charge Time : 60±5 sec.
Charge-Discharge current shall be less than 50mA current.</td></tr>
<tr><td>Electrical Characterization</td><td><table>
<tr><td>Capacitance</td><td>Class Ⅰ (NP0) :
Within the specified tolerance.

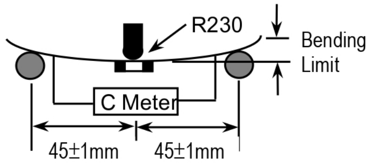
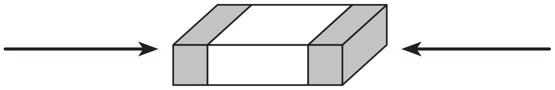
ClassⅡ (X7R/X7S/X6S/X5R) :
Within the specified tolerance.</td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
More Than 30pF : Q ≧ 1000
30pF & Below : Q ≧ 400＋20C
(C : Capacitance , pF)

ClassⅡ(X7R/X7S/X6S/X5R) :
Shell meet the value in Table 1.</td></tr>
</table></td><td>Class Ⅰ (NP0) :
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>C≦ 1000pF</td><td>1MHz±10%</td><td>1.0±0.2Vrms</td></tr>
<tr><td>C＞1000pF</td><td>1KHz±10%</td><td>1.0±0.2Vrms</td></tr>
</table>
ClassⅡ :
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>C≦10uF</td><td>1KHz±10%</td><td>*1.0±0.2Vrm or
0.5±0.2Vrms</td></tr>
<tr><td>C＞10uF</td><td>120Hz±20%</td><td>0.5±0.2Vrms</td></tr>
</table>
Perform a heat temperature at 150±5℃ for 30 minutes, then place room temp. for 24±2 hours.

* Depend on the individual parts.</td></tr>
<tr><td>Withstanding Voltage</td><td>No dielectric breakdown or mechanical breakdown.</td><td>250% of the rated voltage for 1~5 sec. charge / discharge current : less than 50mA</td></tr>
<tr><td>Temperature Capacitance Coefficient</td><td><table>
<tr><th>Char.</th><th>Temp. Range</th><th>Cap. Change</th></tr>
<tr><td>NP0(N)</td><td>-55˚C ~ +125˚C</td><td>±30ppm/˚C</td></tr>
<tr><td>X7R (X)</td><td>-55˚C ~ +125˚C</td><td>±15%</td></tr>
<tr><td>X7S (R)</td><td>-55˚C ~ +125˚C</td><td>±22%</td></tr>
<tr><td>X6S (S)</td><td>-55˚C ~ +105˚C</td><td>±22%</td></tr>
<tr><td>X5R (B)</td><td>-55˚C ~ +85˚C</td><td>±15%</td></tr>
</table></td><td>Class Ⅰ :
[C2-C1/C1(T2-T1)] x 100%
ClassⅡ :
(C2-C1)/C1 x 100%
T1:Standard temperature (25℃)
T2:Test temperature
C1:Capacitance at standard temperature (25℃)
C2:Capacitance at test temperature (T2)
Under 1.0Vrms.</td></tr>
<tr><td>Adhesive Strength of Termination</td><td>No indication of peeling shall occur on the terminal electrode.</td><td>0201 : 2N (≒ 0.2 Kg·f)
0402/0603 : 5N (≒ 0.5 Kg·f)
≧0805- : 10N (≒1.0 Kg·f)

Pull force shall be applied for 10±1 sec.
 </td></tr>
</table>

NCC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th colspan="2">Specification</th><th>Test Conditions</th></tr>
<tr><td rowspan="2">Resistance to Flexure of Substrate</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="2">The board should bend 1.0mm with a rate of 1.0 mm per sec.
The duration of the applied forces shall be 5 ± 1 sec.
 </td></tr>
<tr><td>Capacitance</td><td><table><tr><th>Char.</th><th>Cap. Change</th></tr><tr><td>NP0(N)</td><td>≤ ± 5.0%</td></tr><tr><td>X7R(X)</td><td>≤ ± 12.5%</td></tr><tr><td>X7S(R)</td><td>≤ ± 12.5%</td></tr><tr><td>X6S(S)</td><td>≤ ± 12.5%</td></tr><tr><td>X5R(B)</td><td>≤ ± 12.5%</td></tr></table></td></tr>
<tr><td>Solderability</td><td colspan="2">More than 90% of the termination surface should be soldered so the metal part does not come out or dissolve .
</td><td>Solder Temperature : 245±5℃
Dip Time : 5 ± 0.5 sec.
Immersing Speed : 25±10% mm/s
Solder : Lead Free Solder
Flux : Rosin
Preheat : At 80~120 ℃ For 10~30 sec.</td></tr>
<tr><td rowspan="5">Resistance to Soldering Heat</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="2">Class Ⅱ capacitor shall be set for 48± 4 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measuring.

Preheat : at 150±10°C for 60~120sec.
Dip : solder temperature of 260±5℃
Dip Time : 10 ± 1sec.
Immersing Speed : 25±10% mm/s
Flux : Rosin</td></tr>
<tr><td>Capacitance</td><td>Class Ⅰ(NP0):
Within ± 2.5% or ± 0.25pF, whichever is larger of initial value

Class Ⅱ (X7R/X7S/X6S/X5R) :
≤ ±7.5% of initial value</td></tr>
<tr><td>Q (Class Ⅰ)</td><td>To satisfy the specified initial value.</td><td rowspan="3">Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>D.F. (Class Ⅱ)</td><td>Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value.</td></tr>
<tr><td rowspan="5">Temperature Cycle</td><td>Appearance</td><td>No mechanical damage shall occur</td><td rowspan="5">Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃ before initial measuring.

Capacitor shall be subjected to five cycles of the temperature cycle as following:
<table><tr><th>Step</th><th>Temp.(℃)</th><th>Time(min)</th></tr><tr><td>1</td><td>Min. Rated Temp. +0/-3</td><td>30</td></tr><tr><td>2</td><td>25</td><td>3</td></tr><tr><td>3</td><td>Min. Rated Temp. +0/-3</td><td>30</td></tr><tr><td>4</td><td>25</td><td>3</td></tr></table>Measure at room temperature after cooling for
Class Ⅰ: 24 ± 2 Hours
Class Ⅱ: 48 ± 4 Hours</td></tr>
<tr><td>Capacitance</td><td>Class Ⅰ(NP0):
Within ± 2.5% or ± 0.25pF, whichever is larger of initial value

Class Ⅱ (X7R/X7S/X6S/X5R) :
≤ ±7.5% of initial value</td></tr>
<tr><td>Q (Class Ⅰ)</td><td>To satisfy the specified initial value.</td></tr>
<tr><td>D.F. (Class Ⅱ)</td><td>Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value.</td></tr>
</table>

NCC Series Specifications & Test Conditions

Item		Specification	Test Conditions
Humidity	Appearance	No mechanical damage shall occur.	Class Ⅱ capacitor shall be set for 48±4 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃before initial measure. Temperature : 40± 2 ℃ Relative humidity : 90 ~95%RH Test Time : Max. 500 hours Measure at room temperature after cooling for Class Ⅰ: 24 ± 2 Hours Class Ⅱ: 48 ± 4 Hours
	Capacitance	Char. Cap. Change NP0(N) Within ± 5.0% or ± 0.5pF, whichever is larger of initial value X7R(X) ≤ ± 12.5% X7S(R) ≤ ± 12.5% X6S(S) ≤ ± 12.5% X5R(B) ≤ ± 12.5%	
	Q / D.F.	Class Ⅰ (NP0) : 30pF & Over : Q ≧350 10 to 30pF : Q ≧275+2.5C 30pF & Below: Q ≧200+10C Class Ⅱ (X7R/X7S/X6S/X5R) : Shell meet the value in Table 1.	
	Insulation Resistance	1000MΩ or 50/C Ω, whichever is smaller for rated voltage>10V and greater than 10/C Ω for rated voltage≤10V (C in Farad)	
Humidity Load	Appearance	No mechanical damage shall occur.	Class Ⅱ capacitors applied DC voltage of the rated voltage is applied for one hour at maximum operation temperature then shall be set for 48± 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage :Rated Voltage Temperature : 40± 2℃ Relative Humidity : 90 ~ 95%RH Test Time : 500 Hrs Max. Current Applied : 50 mA Max. Measure at room temperature after cooling for Class Ⅰ: 24 ± 2 Hours Class Ⅱ capacitor for Cap≧103(10nF) shall be set for 24±2 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before final measure. Class Ⅱ capacitor for Cap＜103(10nF) Measure at room temperature after cooling for 48 ± 4 Hours.
	Capacitance	Char. Cap. Change NP0(N) Within ± 7.5% or ± 0.75pF, whichever is larger of initial value X7R(X) ≤ ± 12.5% X7S(R) ≤ ± 12.5% X6S(S) ≤ ± 12.5% X5R(B) ≤ ± 12.5%	
	Q / D.F.	Class Ⅰ (NP0) : 30pF & Over : Q ≧350 10 to 30pF : Q ≧275+2.5C 30pF & Below: Q ≧200+10C Class Ⅱ (X7R/X7S/X6S/X5R) : Shell meet the value in Table 1.	
	Insulation Resistance	500MΩ or 25/C Ω, whichever is smaller for rated voltage>10V and greater 5/C Ω for rated voltage≤10V (C in Farad)	

NCC Series Specifications & Test Conditions

Item		Specification	Test Conditions
High Temperature Load (Life Test)	Appearance	No mechanical damage shall occur.	The capacitors applied DC testing voltage is applied for one hour at maximum operation temperature then shell be set for 48± 4 hours at room temperature and the initial measurement shall be conducted. Applied Voltage : Rated Voltage The class Ⅰ applied voltage 200% of rated voltage. Temperature : max. operation temperature Test Time : Max 1000 hours. Current Applied : 50mA Max Measure at room temperature after cooling for Class Ⅰ: 24 ± 2 Hours Class Ⅱ capacitor for Cap≧103(10nF) shall be set for 24±2 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before final measure. Class Ⅱ capacitor for Cap＜103(10nF) Measure at room temperature after cooling for 48 ± 4 Hours.
	Capacitance	Char. Cap. Change NP0(N) Within ± 5.0% or ± 0.5pF, whichever is larger of initial value X7R(X) ≤ ± 12.5% X7S(R) ≤ ± 12.5% X6S(S) ≤ ± 12.5% X5R(B) ≤ ± 12.5%	
	Q / D.F.	Class Ⅰ (NP0) : 30pF & Over : Q ≧350 10 to 30pF : Q ≧275+2.5C 30pF & Below: Q ≧200+10C Class Ⅱ (X7R/X7S/X6S/X5R) : Shell meet the value in Table 1.	
	Insulation Resistance	1000MΩ or 50/C Ω, whichever is smaller for rated voltage>10V and greater than 10/C Ω for rated voltage≤10V (C in Farad)	
Vibration	Appearance	No mechanical damage shall occur.	Solder the capacitor on P.C. board. Vibrate the capacitor with amplitude of 1.5mm P-P changing the frequencies from 10Hz to 55Hz and back to 10Hz in about 1 min. Repeat this for 2 hours each in 3 perpendicular directions.
	Capacitance	Within the specified tolerance.	
	Q (Class Ⅰ)	To satisfy the specified initial value.	
	D.F. (Class Ⅱ)	Shell meet the value in Table 1.	

NCC Series Specifications & Test Conditions

Table 1

Temp char : X7R, X7S, X6S, X5R

Size	Rated Voltage	Capacitance Range	D.F.(MAX)	
			Initial Vibration Resistance to solder heat Temperature cycle	Humidity Humidity loading High temperature loading
0201	DC 4V	All Capacitance	10.0%	20.0%
	DC 6.3V		10.0%	20.0%
	DC 10V		10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 50V		10.0%	20.0%
0402	DC 4V	All Capacitance	10.0%	20.0%
	DC 6.3V	C＜22uF	10.0%	20.0%
		C=22uF	20.0%	30.0%
	DC 10V	All Capacitance	10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
0603	DC 6.3V	All Capacitance	10.0%	20.0%
	DC 10V		10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
0805	DC 4V	All Capacitance	10.0%	20.0%
	DC 6.3V		10.0%	20.0%
	DC 10V		10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
1206	DC 4V	C=22uF	15.0%	25.0%
	DC 6.3V	C＜10uF	10.0%	20.0%
		C≦100uF	15.0%	25.0%
	DC 10V	C＜10uF	10.0%	20.0%
		C≦100uF	15.0%	25.0%
	DC 16V	All Capacitance	10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
1210	DC 4V	All Capacitance	10.0%	20.0%
	DC 6.3V		10.0%	20.0%
	DC 10V		10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
1812	DC 6.3V	All Capacitance	10.0%	20.0%
	DC 10V		10.0%	20.0%
	DC 16V		10.0%	20.0%
	DC 25V		10.0%	20.0%
	DC 35V		10.0%	20.0%
	DC 50V		10.0%	20.0%
2220	DC 63V	All Capacitance	10.0%	20.0%

ACC Series Specifications & Test Conditions

<table>
<tr><th colspan="2">Item</th><th>Specification</th><th>AEC-Q200 Test Conditions</th></tr>
<tr><td colspan="2">Pre- and Post-
Stress Electrical Test</td><td>-</td><td>-</td></tr>
<tr><td rowspan="4">High Temperature Exposure (Storage)</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">Test Temperature : max. rated temperature.
Test Time : 1000+12/-0 hours

Measure at room temperature after cooling for 24±2 hours.</td></tr>
<tr><td>Capacitance</td><td>Char. Cap. Change
NP0(N) Within 2.5% or ±0.25pF, whichever is larger of initial value
X7R(X) ≤±10% of initial value</td></tr>
<tr><td>Q / D.F.</td><td>ClassⅠ(NP0) :
To satisfy the specified initial value

ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value</td></tr>
<tr><td rowspan="4">Temperature Cycle</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">ClassⅡ capacitor shall be set for 24± 2 hours at room temperature after one hour heat treatment at 150 +0/-10 ℃ before initial measure.

Capacitor shall be subjected to 1000 cycles of the temperature cycle as following:
<table>
<tr><th>Step</th><th>Temp.(℃)</th><th>Time(min)</th></tr>
<tr><td>1</td><td>-55+0/-3</td><td>15±3</td></tr>
<tr><td>2</td><td>Room Temp.</td><td>1</td></tr>
<tr><td>3</td><td>125+3/-0</td><td>15±3</td></tr>
<tr><td>4</td><td>Room Temp.</td><td>1</td></tr>
</table>
Measure at room temperature after cooling for 24±2 hours.

Solder the capacitor on P.C. board shown in Fig 2. before testing.</td></tr>
<tr><td>Capacitance</td><td>Char. Cap. Change
NP0(N) Within 2.5% or ±0.25pF, whichever is larger of initial value
X7R(X) ≤±10% of initial value</td></tr>
<tr><td>Q / D.F.</td><td>ClassⅠ(NP0) :
To satisfy the specified initial value

ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value</td></tr>
<tr><td colspan="2">Destructive Physical Analysis</td><td>No defects or abnormalities.</td><td>Per EIA-469</td></tr>
<tr><td rowspan="4">Biased Humidity</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">ClassⅡ capacitors applied DC voltage of the rated voltage is applied for one hour at maximum operation temperature ± 3℃, then shall be set for 24± 2 hours at room temperature and the initial measurement shall be conducted.

Applied Voltage : Rated voltage(500Vdc max.) and DC 1.3 to 1.5V. Add 100Kohm resistor.
Temperature : 85±3℃
Relative Humidity : 80 to 85 %RH
Test Time : 1000 +12/-0 hours
Current Applied : 50 mA Max.

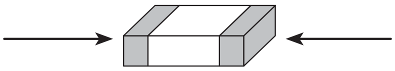
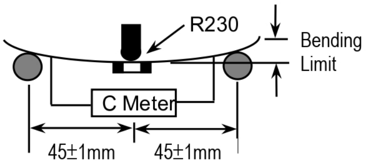
Measure at room temperature after cooling for 24±2 hours.</td></tr>
<tr><td>Capacitance</td><td>Char. Cap. Change
NP0(N) Within ± 7.5% or ±0.75pF, whichever is larger of initial value
X7R(X) ≤±12.5% of initial value</td></tr>
<tr><td>Q / D.F.</td><td>ClassⅠ(NP0) :
More Than 30pF : Q ≧ 350
30pF & Below : Q ≧ 275＋2.5×C
(C : Capacitance , pF)

ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>500MΩ or 25/CΩ, whichever Is Smaller</td></tr>
</table>

ACC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th></th><th>Specification</th><th>AEC-Q200 Test Conditions</th></tr>
<tr><td>Operational Life</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">ClassⅡ capacitors applied DC voltage (following table) is applied for one hour at maximum operation temperature ±3℃ then shall be set for 24±2 hours at room temperature and the initial measurement shall be conducted.
Applied Voltage :
<table>
<tr><th>Rated Voltage</th><th>Applied Voltage</th></tr>
<tr><td>V<100Vdc, ClassⅠ</td><td>200%Rated Voltage</td></tr>
<tr><td>V<100Vdc, ClassⅡ</td><td>100%Rated Voltage</td></tr>
<tr><td>V＜250Vdc＜1.0uF</td><td>150%Rated Voltage</td></tr>
<tr><td>V≦250Vdc≧1.0 uF</td><td>100%Rated Voltage</td></tr>
<tr><td>250Vdc≦V≦500Vdc＜0.1 uF</td><td>120%Rated Voltage</td></tr>
<tr><td>250Vdc≦V≦500Vdc≧0.1 uF</td><td>100%Rated Voltage</td></tr>
<tr><td>Less Than 1KVdc</td><td>120%Rated Voltage</td></tr>
<tr><td>More Than 1KVdc (include 1KV)</td><td>100%Rated Voltage</td></tr>
</table>
(C : Capacitance)
Test Temperature : 125±3℃
Test Time : 1000 +12/-0 hours
Current Applied : 50 mA Max.
Measure at room temperature after cooling for 24±2 hours.</td></tr>
<tr><td></td><td>Capacitance</td><td>
<table>
<tr><th>Char.</th><th>Cap. Change</th></tr>
<tr><td>NP0(N)</td><td>Within ± 5% or ±0.5pF, whichever is larger of initial value</td></tr>
<tr><td>X7R(X)</td><td>≤ ±15% of initial value</td></tr>
</table></td></tr>
<tr><td></td><td>Q / D.F.</td><td>ClassⅠ(NP0) :
More Than 30pF : Q ≧ 350
30pF & Below:Q ≧ 275＋2.5xC
(C : Capacitance , pF)
ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td></td><td>Insulation Resistance</td><td>1000MΩ or 50/CΩ, whichever Is Smaller</td></tr>
<tr><td>External Visual</td><td></td><td>No defects or abnormalities.</td><td>Visual Inspection</td></tr>
<tr><td>Physical Dimension</td><td></td><td>Within The Specified Dimensions</td><td>Using Calipers</td></tr>
<tr><td>Resistance to Solvents</td><td>Appearance</td><td>No marking defects.</td><td rowspan="4">It is applicable to marked and/or coated components.
Per MIL-STD-202 Method 215.
Solvent 1:
1 part (by volume) of isopropyl alcohol
3 parts (by volume) of mineral spirits, or three parts (by volume) of a mixture of 80% (by volume) of kerosene and 20%(by volume) ethylbenzene.
Solvent 4:
42 parts (by volume) of water
1 part (by volume) of propylene glycol monomethyl ether
1 part (by volume) of monoethanolamine</td></tr>
<tr><td></td><td>Capacitance</td><td>Within The Specified Tolerance</td></tr>
<tr><td></td><td>Q / D.F.</td><td>ClassⅠ(NP0) :
To satisfy the specified initial value.
ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td></td><td>Insulation Resistance</td><td>To satisfy the specified initial value</td></tr>
<tr><td>Mechanical Shock</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">Solder the capacitor on P.C. Board shown in Fig 2. before testing.
Three shocks in each direction should be applied along 3 mutually perpendicular axes of the test specimen (18 shocks).
The specified test pulse should be Half-sine and should have a duration: 0.5ms, peak value: 1500g and velocity change: 15.4 ft/sec.</td></tr>
<tr><td></td><td>Capacitance</td><td>Within The Specified Tolerance</td></tr>
<tr><td></td><td>Q / D.F.</td><td>ClassⅠ(NP0) :
To satisfy the specified initial value.
ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td></td><td>Insulation Resistance</td><td>To satisfy the specified initial value</td></tr>
</table>

ACC Series Specifications & Test Conditions

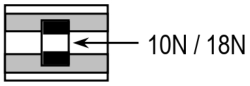
Item	Specification		AEC-Q200 Test Conditions
Vibration	**Appearance**	No mechanical damage shall occur.	Solder the capacitor on P.C. Board shown in Fig 2. before testing. Perform 12 cycles in each of the 3 mutually perpendicular axes of the capacitor (in total 36 cycles). Subject the capacitor to a simple harmonic motion varying the frequency logarithmically between 10 and 2000 Hz and return to 10 Hz (duration approx. 20 min) with an amplitude of 1.5 mm
	Capacitance	Within The Specified Tolerance	
	Q / D.F.	Class Ⅰ (NP0) : To satisfy the specified initial value. ClassⅡ(X7R) : Shell meet the value in Table 1.	
	Insulation Resistance	To satisfy the specified initial value	
Resistance to Soldering Heat	**Appearance**	No mechanical damage shall occur.	ClassⅡ capacitor shall be set for 24±2 hours at room temperature after one hour heat treatment at 150 +0/-10℃ before initial measure. Preheat : At 150± 10℃ For 60~120sec Dip : Solder Temperature of 260± 5℃ Dip Time : 10 ± 1sec. Measure at room temperature after cooling for 24±2 hours.
	Capacitance	Char. — Cap. Change NP0(N) — Within 2.5% or ±0.25pF, whichever is larger of initial value X7R(X) — ≤ ±10% of initial value	
	Q / D.F.	Class Ⅰ (NP0) : To satisfy the specified initial value. ClassⅡ(X7R) : Shell meet the value in Table 1.	
	Insulation Resistance	To satisfy the specified initial value	
ESD	**Appearance**	No mechanical damage shall occur.	Per AEC-Q200-002
	Capacitance	Within The Specified Tolerance	
	Q / D.F.	Class Ⅰ (NP0) : To satisfy the specified initial value. ClassⅡ(X7R) : Shell meet the value in Table 1.	
	Insulation Resistance	To satisfy the specified initial value	
Solderability	More than 95% of the termination surface should be soldered so the metal part does not come out or dissolve. 		(a)Preheat at 155°C for 4 hours, immerse the capacitor in flux. Immerse in solder bath for 5+0/-0.5 sec. at 245±5℃ (b)Should be placed into steam aging for 8 hours 15 minutes. After preheating, immerse the capacitor in flux. Immerse in solder bath for 5+0/-0.5 sec. at 245±5℃ (c) Should be placed into steam aging for 8 hours 15 minutes. After preheating, immerse the capacitor in flux. Immerse in solder bath for 120±5 sec. at 260±5℃
Board Flex	**Appearance**	No mechanical damage shall occur.	Bending shall be applied to the 3.0 mm for X7R and 3mm for NP0 with rate of 1.0mm/sec. The duration of the applied forces shall be 60 sec. 
	Capacitance	Char. — Cap. Change NP0(N) — ≤ ±5% of initial value X7R(X) — ≤ ±12.5% of initial value	

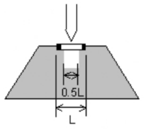
ACC Series Specifications & Test Conditions

<table>
<tr><th>Item</th><th colspan="2">Specification</th><th>AEC-Q200 Test Conditions</th></tr>
<tr><td rowspan="5">Electrical Characterization</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td>Visual Inspection</td></tr>
<tr><td>Capacitance</td><td>Within The Specified Tolerance</td><td rowspan="2">Class Ⅰ (NP0) :
<table>
<tr><th>Capacitance</th><th>Frequency</th><th>Voltage</th></tr>
<tr><td>C<1000pF</td><td>1MHz±10%</td><td>1.0±0.2Vrms</td></tr>
<tr><td>C≧1000pF</td><td>1KHz±10%</td><td>1.0±0.2Vrms</td></tr>
</table>
ClassⅡ(X7R) :
<table>
<tr><th colspan="2">Frequency</th><th>Voltage</th></tr>
<tr><td>X7R</td><td>1KHz±10%</td><td>1.0±0.2Vrms</td></tr>
</table>
Perform a heat temperature at 150±3℃ for 30min, then place room temp. for 24±2 hours.</td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
More Than 30pF : Q ≧ 1000
30pF & Below : Q ≧ 400＋20C
(C : Capacitance , pF)

ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>1000MΩ or 50/CΩ, whichever Is Smaller</td><td>V≦500V, Rated Voltage
V>500V, Applied 500Vdc
Charge Time：120sec.
Is applied less than 50mA current.</td></tr>
<tr><td>Withstanding Voltage</td><td>No dielectric breakdown or mechanical breakdown</td><td>V=100V(Cap<10uF):250% Rated Voltage
V<100V : 250% Rated Voltage
100V≦V<500V: 200% Rated Voltage
500V≦V<1000V: 150% Rated Voltage
1000V≦V: 120% Rated Voltage
for 1~5 sec. Current is limited to less than 50mA.</td></tr>
<tr><td rowspan="4">Terminal Strength</td><td>Appearance</td><td>No mechanical damage shall occur.</td><td rowspan="4">Apply a 18N force in parallel with the test jig for 60 sec.

Chip Size 0603 Apply a 10N force in parallel with the test jig for 10 sec.


</td></tr>
<tr><td>Capacitance</td><td>Within The Specified Tolerance</td></tr>
<tr><td>Q / D.F.</td><td>Class Ⅰ (NP0) :
To satisfy the specified initial value.

ClassⅡ(X7R) :
Shell meet the value in Table 1.</td></tr>
<tr><td>Insulation Resistance</td><td>To satisfy the specified initial value</td></tr>
<tr><td>Beam Load Test</td><td colspan="2">The chip endures following force :
<table>
<tr><th>Chip Length</th><th>Chip Thickness</th><th>Force Min.</th></tr>
<tr><td>≦2.5mm</td><td>>0.5mm</td><td>20N</td></tr>
<tr><td rowspan="2">≧3.2mm</td><td><1.25mm</td><td>15N</td></tr>
<tr><td>≧1.25mm</td><td>54.5N</td></tr>
</table></td><td>Place the capacitor in the beam load fixture. Apply a force.


Speed supplied the Stress Load: 2.5mm / sec.</td></tr>
</table>

ACC Series Specifications & Test Conditions

Table 1

Temp char : X7R

Size	Rated Voltage	Capacitance Range	D.F.(MAX)	
			High Temperature Exposure Temperature cycle Resistance to Solvents Mechanical Shock Vibration Resistance to solder heat ESD Initial Terminal Strength	Biased Humidity Operational Life
0603	DC 16V	All Capacitance	10.0%	20.0%
	DC 25V	All Capacitance	10.0%	20.0%
	DC 50V	All Capacitance	10.0%	20.0%
0805	DC 16V	All Capacitance	10.0%	20.0%
	DC 25V	All Capacitance	10.0%	20.0%
	DC 50V	All Capacitance	10.0%	20.0%
	DC 100V	C≧0.1uF	5.0%	10.0%
		C＜0.1uF	2.5%	5.0%
	>DC 100V	All Capacitance	2.5%	5.0%
1206	DC 25V	All Capacitance	10.0%	20.0%
	DC 50V	All Capacitance	10.0%	20.0%
	DC 100V	C≧0.1uF	5.0%	10.0%
		C＜0.1uF	2.5%	5.0%
	>DC 100V	All Capacitance	2.5%	5.0%
1210	DC 50V	All Capacitance	10.0%	20.0%
	DC 100V	C≧0.1uF	5.0%	10.0%
		C＜0.1uF	2.5%	5.0%
	>DC 100V	All Capacitance	2.5%	5.0%
1812	DC 50V	All Capacitance	10.0%	20.0%
	DC 100V	C≧0.1uF	5.0%	10.0%
		C＜0.1uF	2.5%	5.0%
	>DC 100V	All Capacitance	2.5%	5.0%
2220	DC 50V	All Capacitance	10.0%	20.0%
	DC 100V	C≧0.1uF	5.0%	10.0%
		C＜0.1uF	2.5%	5.0%
	>DC 100V	All Capacitance	2.5%	5.0%

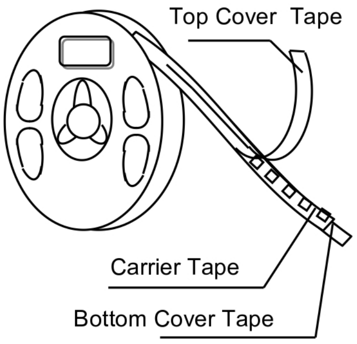
◆ Multilayer Ceramic Chip Capacitor

● Bulk Packing

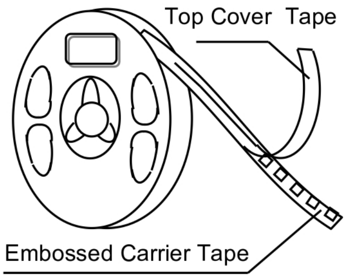
Standard packing 10Kpcs/pack, others according to customers’ request.

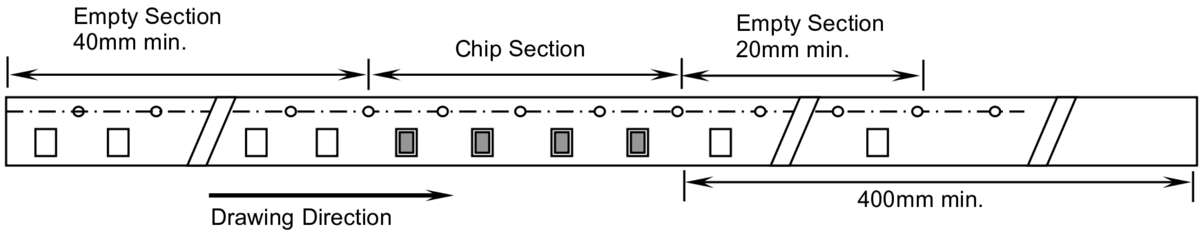
● Tape Packing

Paper Tape



Embossed Tape



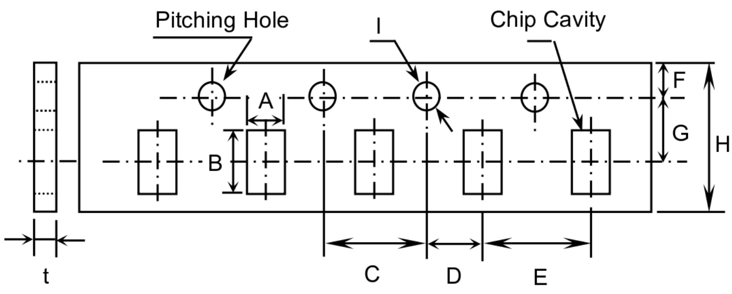


Material And Quantity (¢180mm)

Chip Size (EIA Code)	Dimension (mm)			¢180mm reel	
	L	W	T	Paper Tape	Plastic Tape
0201	0.6	0.3	T≤0.39	15,000 pcs/reel	N/A
0402	1	0.5	T≤0.70	10,000 pcs/reel	N/A
0603	1.6	0.8	T≤1.00	4,000 pcs/reel	N/A
0805	2	1.25	T≤1.00	4,000 pcs/reel	N/A
			T>1.00	N/A	3,000 pcs/reel
1206	3.2	1.6	T≤1.00	4,000 pcs/reel	N/A
			1.00<T≤1.25	N/A	3,000 pcs/reel
			T>1.25	N/A	2,000 pcs/reel
1210	3.2	2.5	T≤1.25	N/A	3,000 pcs/reel , 2,000 pcs/reel
			1.25<T≤2.40	N/A	2,000 pcs/reel , 1,000 pcs/reel
			T>2.40	N/A	500 pcs/reel , 1,000 pcs/reel
1808	4.6	2	T≤1.25	N/A	3,000 pcs/reel , 2,000 pcs/reel
			1.25<T≤2.40	N/A	2,000 pcs/reel , 1,000 pcs/reel
			T>2.40	N/A	500 pcs/reel , 1,000 pcs/reel
1812	4.6	3.2	T≤2.20	N/A	1,000 pcs/reel
			T>2.20	N/A	700 pcs/reel
1825	4.6	6.35	T≤2.20	N/A	700 pcs/reel
			T>2.20	N/A	400 pcs/reel
2208	5.7	2	T≤2.20	N/A	1,000 pcs/reel
2211	5.7	2.8	T≤2.20	N/A	1,000 pcs/reel
			T>2.20	N/A	700 pcs/reel
2220	5.7	5	T≤2.20	N/A	1,000 pcs/reel
			T>2.20	N/A	700 pcs/reel
2225	5.7	6.35	T≤2.20	N/A	700 pcs/reel
			T>2.20	N/A	400 pcs/reel

Tape Dimensions and Specifications

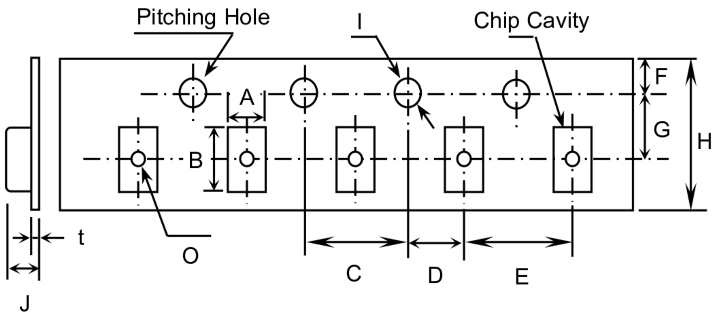
Paper Tape



Unit：mm

	0201	0402	0603	0805	1206	1210
A	0.37±0.1	0.61±0.1	1.10±0.2	1.50±0.2	1.90±0.2	2.90±0.2
B	0.67±0.1	1.20±0.1	1.90±0.2	2.30±0.2	3.50±0.2	3.60±0.2
C	4.00±0.1	-- -->				
D	2.0±0.05	-- -->				
E	2.00±0.1	-- -->	4.00±0.1	-- -->		
F	1.75±0.1	-- -->				
G	3.5±0.05	-- -->				
H	8.00±0.3	-- -->				
I	¢1.5+0.1/-0	-- -->				
t	1.1 max.	-- -->				

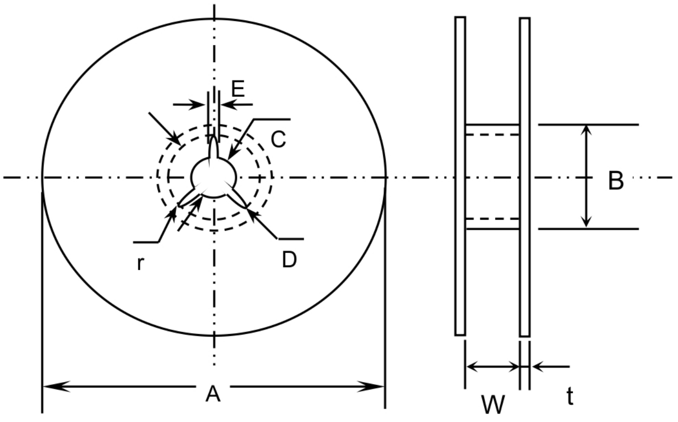
Embossed Tape



Unit：mm

	0805	1206	1210	1808	2208	1812	1825	2211	2220	2225
A	1.5±0.2	1.9±0.2	2.9±0.2	2.5±0.2	2.5±0.2	3.6±0.2	6.9±0.2	3.2±0.2	5.4±0.2	6.9±0.2
B	2.3±0.2	3.5±0.2	3.6±0.2	4.9±0.2	6.1±0.2	4.9±0.2	4.9±0.2	6.1±0.2	6.1±0.2	6.1±0.2
C	4.0±0.1	→								
D	2.0±0.05.	→								
E	4.0±0.1	→				8.0±0.1	→			
F	1.75±0.1	→								
G	3.5±0.05.	→		5.5±0.05	→					
H	8.0±0.3	→		12.0±0.3	→					
I	¢1.5+0.1/-0	→								
J	3.0 max.	→		4.0 max.	→					
t	0.3 max.	→								
O	1.0±0.1	→		1.5±0.1	→					

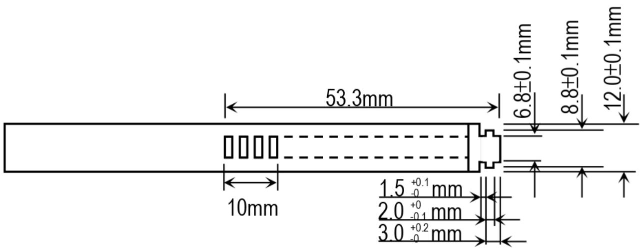
Reel Dimensions



Unit：mm

	0402 to 1210	1808 to 2220
A	¢ 382 max.	¢ 178±2.0
B	¢ 50 min.	¢ 60±0.2
C	¢ 13±0.5	¢ 13±0.5
D	¢ 21±0.8	¢ 21±0.8
E	¢ 2.0±0.5	¢ 2.0±0.5
W	10±0.15	13±0.3
t	2.0±0.5	17±1.4
r	1.0	1.0

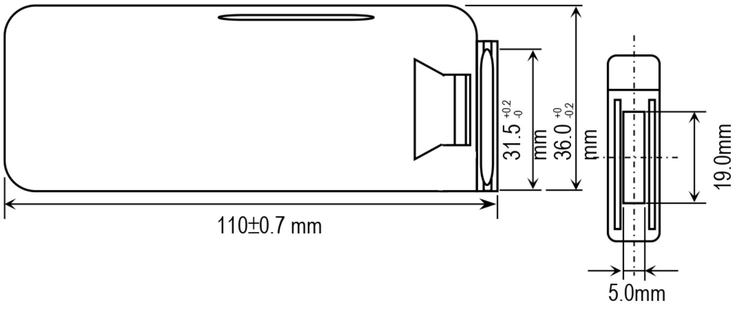
Bulk Cassette Packing



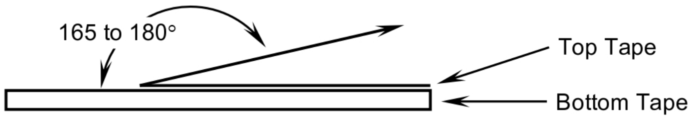
Cassette Packing

Unit：mm

Chip Size	0402	0603	2012
Length	1.00±0.05	1.60±0.10	2.00±0.20
Width	0.50±0.05	0.80±0.10	1.25±0.20
Thickness	0.50±0.05	0.80±0.10	0.60±0.10
Quantity	50,000pcs	15,000pcs	10,000pcs



- **Cover Tape Peel Force**



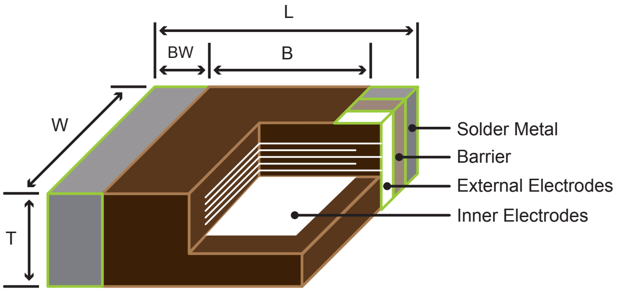
The peel force of cover tape is 5 to 70 grams in the direction of arrow.

General Introduction

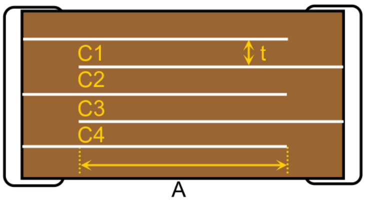
The Multilayer Ceramic Chip Capacitors supplied in bulk, cassette or taped & reel package are ideally suitable for thick-film Hybrid circuits and automatic surface mounting on printed circuit boards.

Mainly used in electric circuit for by-pass, filtering and smoothing circuit.

◆ Shapes and Dimensions



Cross Section



$$C = \varepsilon_0 \cdot \varepsilon \frac{A \cdot N}{t}$$

C : Capacitance
ε_0 : Dielectric constant in the air
ε : Proportional dielectric constant
A : Overlap Area
t : Dielectric Thickness
N : Layers

Dimension (mm) [inches]

EIA style	L	W	Tmax.	BWmin	Bmin.
0201	0.60±0.03 [.024±.002]	0.30±0.03 [.011±.002]	0.33 [.013]	0.10 [.004]	0.20 [.008]
0402	1.00±0.05 [.039±.002]	0.50±0.05 [.020±.002]	0.55 [.022]	0.15 [.006]	0.30 [.012]
0603	1.60±0.10 [.063±.004]	0.80±0.10 [.031±.004]	1.00 [.039]	0.15 [.006]	0.40 [.016]
0805	2.00±0.20 [.079±.008]	1.25±0.20 [.049±.008]	1.45 [.057]	0.20 [.008]	0.70 [.028]
1206	3.20±0.30 [.126±.012]	1.60±0.20 [.063±.008]	1.80 [.071]	0.30 [.012]	1.50 [.059]
1210	3.20±0.30 [.126±.012]	2.50±0.20 [.098±.008]	2.60 [.102]	0.30 [.012]	1.60 [.063]
1808	4.60±0.30 [.181±.012]	2.00±0.20 [.079±.008]	2.20 [.087]	0.30 [.012]	2.50 [.098]
1812	4.60±0.30 [.181±.012]	3.20±0.30 [.126±.012]	3.00 [.118]	0.30 [.012]	2.50 [.098]
1825	4.60±0.30 [.181±.012]	6.35±0.40 [.250±.016]	3.40 [.118]	0.30 [.012]	2.50 [.098]
2208	5.70±0.40 [.220±.016]	2.00±0.20 [.197±.008]	2.20 [.087]	0.30 [.012]	3.50 [.137]
2211	5.70±0.40 [.220±.016]	2.80±0.40 [.110±.016]	3.00 [.118]	0.30 [.012]	3.50 [.137]
2220	5.70±0.40 [.220±.016]	5.00±0.40 [.197±.016]	3.40 [.133]	0.30 [.012]	3.50 [.137]
2225	5.70±0.40 [.220±.016]	6.35±0.40 [.250±.016]	3.40 [.133]	0.30 [.012]	3.50 [.137]

◆ Nominal Capacitance and Tolerance

1. Standard Combination of Nominal Capacitance and Tolerance

Class	EIA Symbol	Tolerance	Nominal Capacitor
I	NP0	J (±5%),K (±10%)	E-12
Π	X7R	K(±10%), M(±20%)	E-3,E-6 E-12 Series
	X7T	K(±10%), M(±20%)	E-3,E-6 Series
	X7P	K(±10%), M(±20%)	E-3,E-6 Series
	X6S	K(±10%), M(±20%)	E-3,E-6 Series
	X5R	K(±10%), M(±20%)	E-3,E-6 Series

2. E Series (Standard Number)

E-Series	Application Capacitance
E-3	1.0 2.2 4.7
E-6	1.0 1.5 2.2 3.3 4.7 6.8
E12	1.0 1.2 1.5 1.8 2.2 2.7 3.3 3.9 4.7 5.6 6.8 8.2

◆EIA Designations

For Class I Dielectrics

Coefficient of capacitance (ppm/ ℃)		Multiplier applicable to column		Tolerance of temp. coeff.(ppm/ ℃)	
0.0	C	-1.0	0	30	G
1.0	M	-10	1	60	H
1.5	P	-100	2	120	J
2.2	R	-1000	3	250	K
3.3	S	-10000	4	500	L
4.7	T	+1	5	1000	M
7.5	U	+10	6	2500	N
		+100	7		
		+1000	8		
		+10000	9		

Ex.: C0G Negative 0±30ppm/ ℃
U2J Negative 750±120ppm/ ℃

For Class Π Dielectrics

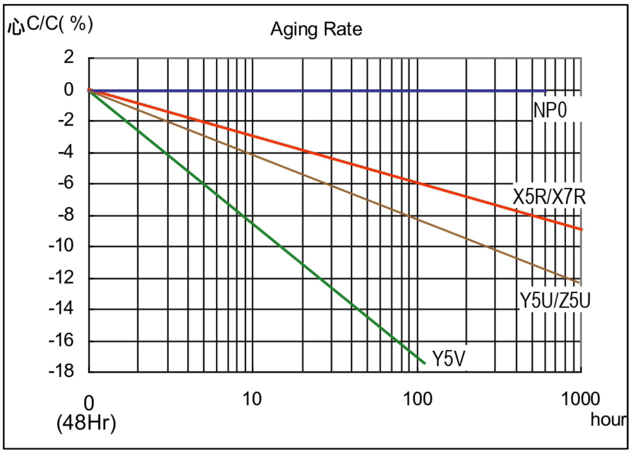
Low Temp. Symbol		High Temp. Symbol		Max. %△C Symbol	
-55℃	X	+45℃	3	±1.0%	A
-30℃	Y	+65℃	4	±1.2%	B
+10℃	Z	+85℃	5	±2.2%	C
		+105℃	6	±3.3%	D
		+125℃	7	±4.7%	E
		+150 ℃	8	±7.5%	F
		+200 ℃	9	±10.0%	P
				±15.0%	R
				±22.0%	S
				+22% /-33%	T
				+22% /-56%	U
				+22% /-82%	V

Ex.: X7R -55 ~ +125 ℃ ±15%
Y5V -30 ~ +85 ℃ +22%/-82%

◆Operating Temperature Range

Class	EIA Symbol	Dielectric Code	Temperature Range(℃)	Capacitance Change	Reference Temperature
I	NP0	N	-55℃ ~ +125 ℃	0±30 ppm/℃	25℃
	SL	L	-25℃ ~ +85 ℃	+350/-1000 ppm/℃	25℃
Π	X7R	X	-55℃ ~ +125℃	±15%	25℃
	X6S	S	-55℃ ~ +105℃	±22%	25℃
	X7P	P	-55℃ ~ +125℃	±10%	25℃
	X7T	T	-55℃ ~ +125℃	+22% /-33%	25℃
	X7S	R	-55℃ ~ +125℃	±22%	25℃
	X5R	B	-55℃ ~ +85℃	±15%	25℃

◆ Dielectric Material – Aging Rate

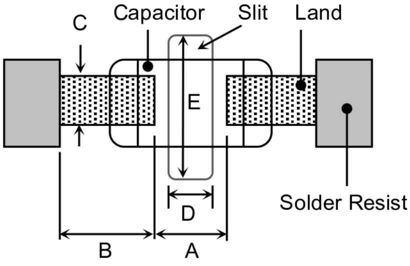


Aging Rate
NP0: 0
X7R/X5R : 1 ~ 4 % / decade
Y5U/Z5U : 4~6% / decade
Y5V : 6~10 % / decade
After performing De-Aging at 150±5 ℃ for 30 minutes and Placement at room temperature for 48 hours.

◆ Construction of Board Pattern

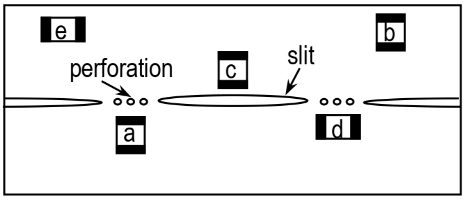
Improper circuit layout and pad/land size may cause poor solder joints between the component and the PC board. Insufficient solder may create a weak joint, and excessive solder may increase the potential for mechanical or thermal cracks in the ceramic capacitor. Therefore we recommend the solder pad/land size to be as shown in the following table:

1. Size and recommend land dimensions for reflow soldering



EIA Code	Chip (mm)		Land (mm)				
	L	W	A	B	C	D	E
0201	0.60	0.30	0.2~0.3	0.2~0.4	0.2~0.4	--	--
0402	1.00	0.50	0.3~0.5	0.3~0.5	0.4~0.6	--	--
0603	1.60	0.80	0.4~0.6	0.6~0.7	0.6~0.8	--	--
0805	2.00	1.25	0.7~0.9	0.6~0.8	0.8~1.1	--	--
1206	3.20	1.60	2.2~2.4	0.8~0.9	1.0~1.4	1.0~2.0	3.2~3.7
1210	3.20	2.50	2.2~2.4	1.0~1.2	1.8~2.3	1.0~2.0	4.1~4.6
1808	4.60	2.00	2.8~3.4	1.8~2.0	1.5~1.8	1.0~2.8	3.6~4.1
1812	4.60	3.20	2.8~3.4	1.8~2.0	2.3~3.0	1.0~2.8	4.8~5.3
1825	4.60	6.35	2.8~3.4	1.8~2.0	5.1~5.8	1.0~4.0	7.1~8.3
2208	5.70	2.00	4.0~4.6	2.0~2.2	1.5~1.8	1.0~4.0	3.6~4.1
2211	5.70	2.80	4.0~4.6	2.0~2.2	2.0~2.6	1.0~4.0	4.4~4.9
2220	5.70	5.00	4.0~4.6	2.0~2.2	3.5~4.8	1.0~4.0	6.6~7.1
2225	5.70	6.35	4.0~4.6	2.0~2.2	5.1~5.8	1.0~4.0	7.1~8.3

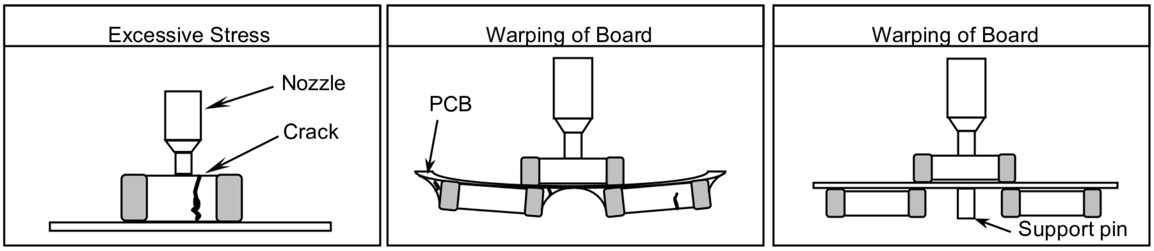
2. Mechanical strength varies according to location of chip capacitors on the P.C. board.
   Design the layout of components on the PC board in such a way to minimize the stress imposed on the components, upon flexure of the boards in depanelization or other processes.



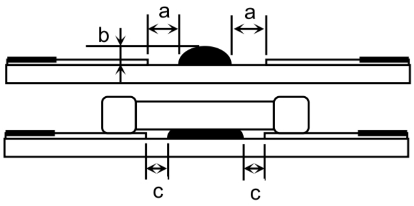
Component layout close to the edge of the board or the “depanelization line” is not recommended.
Susceptibility to stress is in the order of: a>b>c and d>e

◆ Mounting

1. Sometimes cracking can be caused by the impact load of the pick and place nozzle.
   In the pick and place operation, if the low dead point is too low, excessive stress is applied to component. This may cause cracks in the ceramic capacitor, therefore it is required to move the low dead point of the nozzle to the higher level to minimize the board warpage and stress on the components. Nozzle pressure should be adjusted to 1N to 3N (static load) during the pick and place operation.



2. Amount of Adhesive

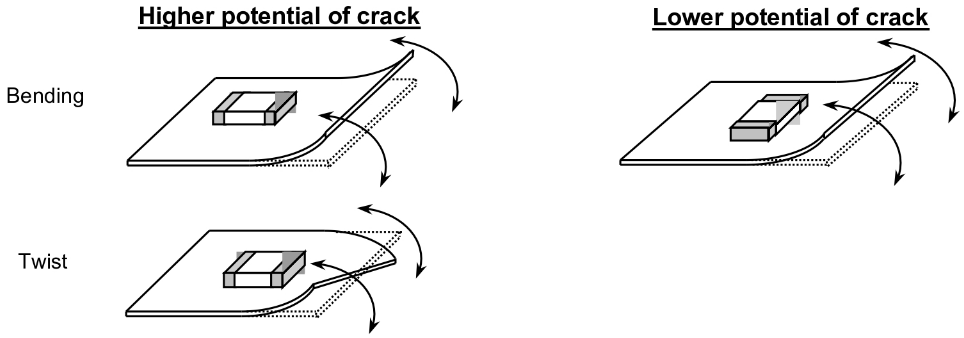


Example : 0805 & 1206

a	0.2mm min.
b	70 ~ 100 μm
c	Do not touch the solder land

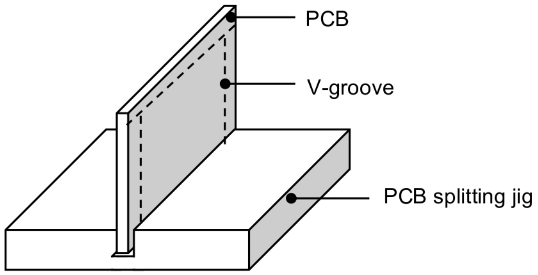
◆ Handling after chip mounted

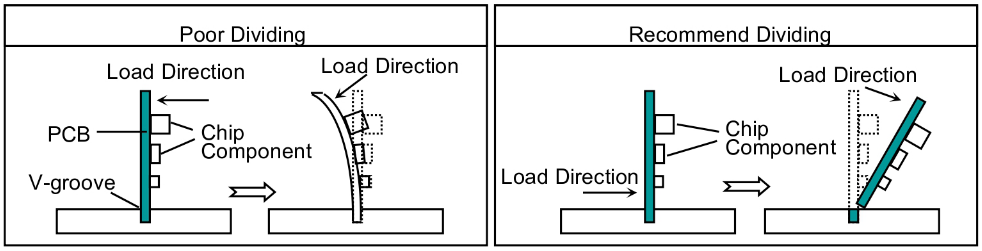
1. Proper handling of the PCB is recommended since excessive bending and twisting of the PC board may induce mechanical stress and cause internal cracking of the capacitor.



2. There is a potential of cracking if board is warped due to excessive load from the check pin.

3. Examples of PCB de-panelization jigs:
   The outline of PCB breaking jig is shown below. It is recommended when dividing or breaking PCB that they are held near the jig where no bending will occur, this way there will be no compressive stress is applied to the capacitors on the PCB. Do not hold the PCB at a position which is far away from the jig, tensile stress to the capacitors may cause them to crack.

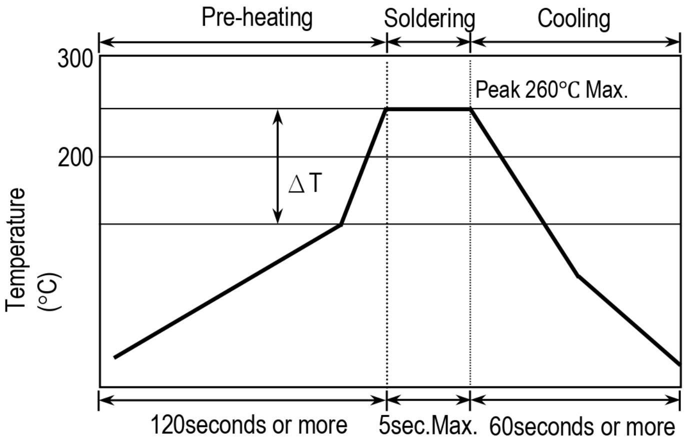




◆Soldering

1. Wave Soldering

Most of components are wave soldered with solder at Peak Temperature. Adequate care must be taken to prevent the potential of thermal cracks on the ceramic capacitors. Refer to the soldering methods below for optimum soldering benefits.



Soldering Method	Peak Temp.(℃) / Duration (sec)
1206/0805/0603	ΔT ≤ 100~150℃ max.
Pb-Sn Solder	250℃(max.) / 3sec(max.)
Lead Free Solder	260℃(max.) / 5sec(max.)

Recommended solder compositions
Sn-37Pb (Pb - Sn Solder)
Sn-3.0Ag-0.5Cu (Lead Free Solder)

Wave Soldering is not recommended For Coating Products

To optimize the result of soldering, proper preheating is essential:

1) Preheat temperature is too low
   - a. Flux flows to easily
   - b. Possibility of thermal cracks
2) Preheat temperature is too high
   - a. Flux deteriorates even when oxide film is removed
   - b. Causes warping of circuit board
   - c. Loss of reliability in chip and other components

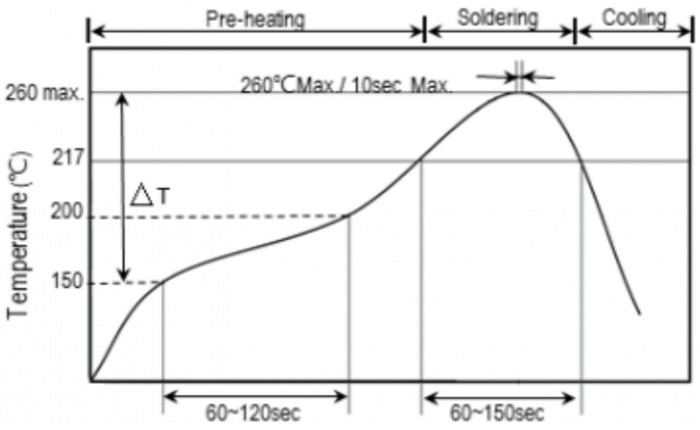
Cooling Condition:

Natural cooling in air is recommended. Forced cooling should be avoided, however if the chips are dipped into a solvent for cleaning, the temperature difference (ΔT) between the solvent and the chips must be less than 100°C.

2. Reflow Soldering

Preheat and gradual increase in temperature to the reflow temperature is recommended to decrease the potential of thermal crack on the components. The recommended heating rate depends on the size of component, however it should not exceed 3°C/Sec.

Recommend reflow profile for Lead-Free soldering temperature Profile (J-STD-020E)



Soldering Method	Change in Temp.(℃)
1206 and Under	ΔT ≤190℃
1210 and Over	ΔT ≤130℃

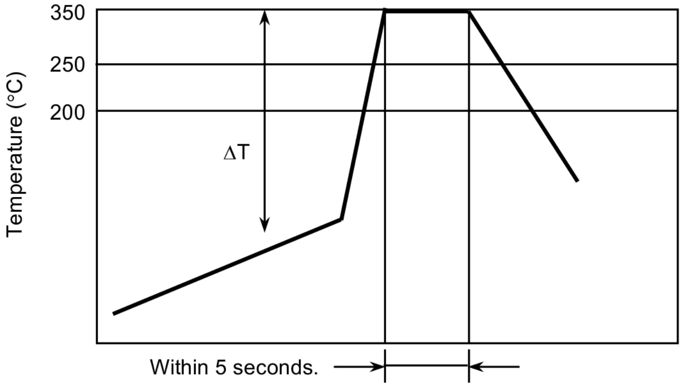
※ The cycles of soldering : Three times (max.)

Maximum Ramp-up = 3°C/Sec.

Maximum Ramp-down Rate = 6°C/Sec.

3. Hand Soldering

Sudden temperature changes in ceramic capacitors will result in a temperature gradient within the component and therefore may cause internal thermal cracking. In general a hand soldering method is not recommended unless proper preheating and handling practices have been taken. Care must also be taken not to touch the ceramic body of the capacitor with the tip of solder Iron. The soldering iron tip should always be placed on to the solder pad.



Soldering Method	Change in Temp.(℃)
1206 and Under	ΔT ≤150℃
1210 and Over	ΔT ≤130℃

How to Solder Repair by Solder Iron

1) Selection of the soldering iron tip

The required temperature of soldering iron for any type of repair depends on the type of the tip, the substrate material, and the solder land size.

2) recommended solder iron condition

a.) Preheating Condition：Board and components should be preheated sufficiently at 150°C or over, and soldering should be conducted with soldering iron as boards and components are maintained at sufficient temperatures

b.) Soldering iron power shall not exceed 30 W.

c.) Soldering iron tip diameter shall not exceed 3mm.

d.) Temperature of the iron tip shall not exceed 350°C, and the process should be finished within 5 seconds. **(refer to MIL-STD-202G)**

e.) Do not touch the ceramic body with the tip of solder iron. Direct contact of the soldering iron tip to ceramic body may cause thermal cracks.

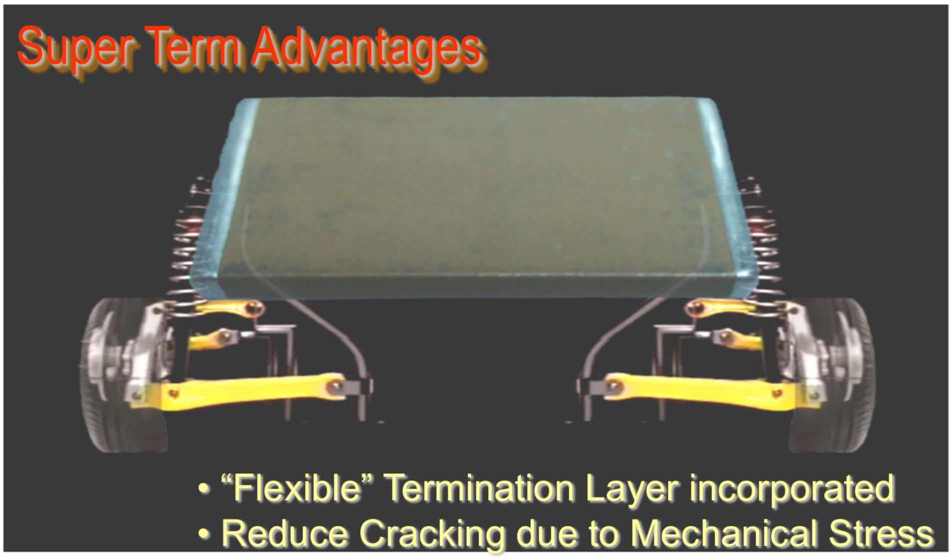
f.) After soldering operation, let the products should be allowed to cool down naturally in air.

◆Storage

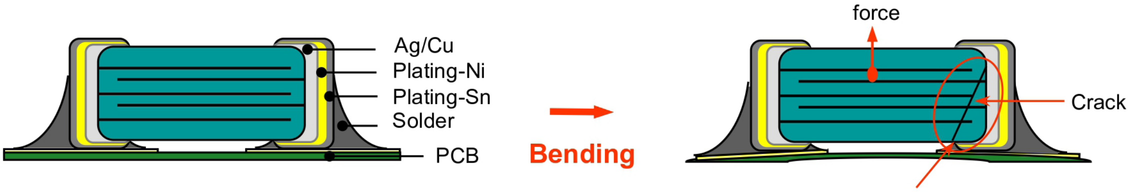
Store the capacitors where the temperature and relative humidity do not exceed 40°C and 70%RH. We recommend that the capacitors be used within 12 months from the date of manufacturing. Store the products in the original package and do not open the outer polyethylene bag until just before usage. If it is open, seal it as soon as possible or keep it in a desiccant with a desiccation agent.

Reducing Short Circuit Risks – Super Term

Internal MLCC cracking can result in serious failure modes. If ceramic capacitors are subjected to severe mechanical stress, a bending crack may occur. This crack can run through two or more electrodes of opposing polarity and result in a short circuit. Typical bending cracks are shown below. In the worst-case scenario, these short circuits may lead to the MLCC overheating and catastrophic failure.



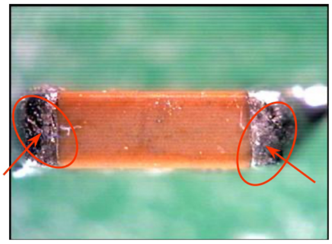
Typical Applications are power circuit input and output filtering, smoothing…



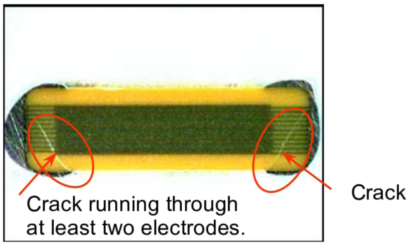
Standard termination construction may result in cracking during PCB bending, vibration, Depanelizing, etc.

Actual Examples:

Failure Mode Type 1



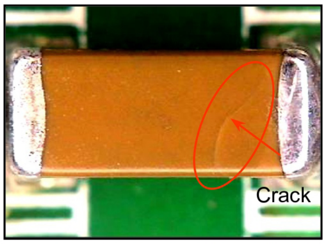
Surface View



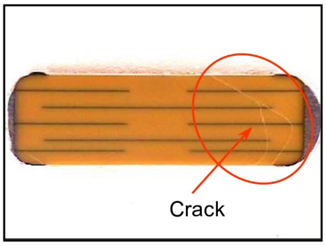
Cross Section View

The failure mode results from PCB bending forces. These cracks may not be visible on the MLCC surface. Cross sectional analysis is required to determine these internal cracks.

Failure Mode Type 2 (wetting greater than 2/3 of thickness)



Top View



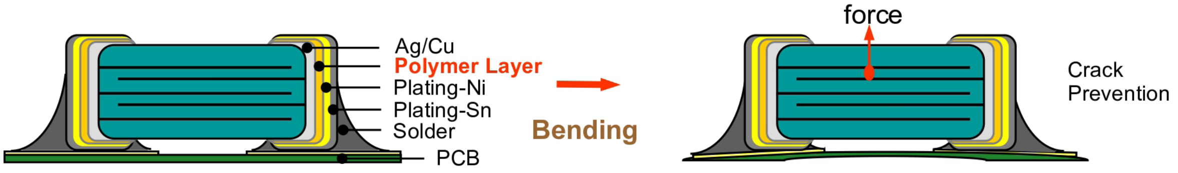
Cross Section View

MLCC cracking frequently occurs during the circuit board depanelizing process. The root cause is knife (blade) vibration during the process.

Reducing Short Circuit Risks – Super Term

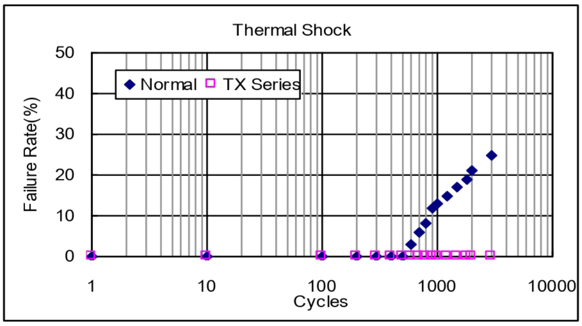
Holy Stone has developed the **"Super Term" Series (TX suffix in the part number),** which incorporates a "polymer layer" in the termination structure. This construction effectively absorbs external forces, reduces the incidence of cracking and improves overall product reliability. The Super Term product design is suitable for the applications including: high temperature automotive, power circuits and other critical end products with extreme processing conditions.

TX Product



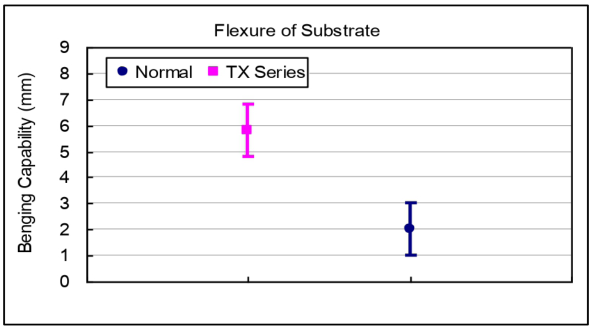
Reliability/Durability Comparison

(a) Thermal Shock Comparison (0805/X7R)

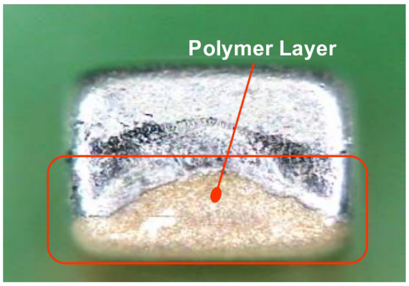


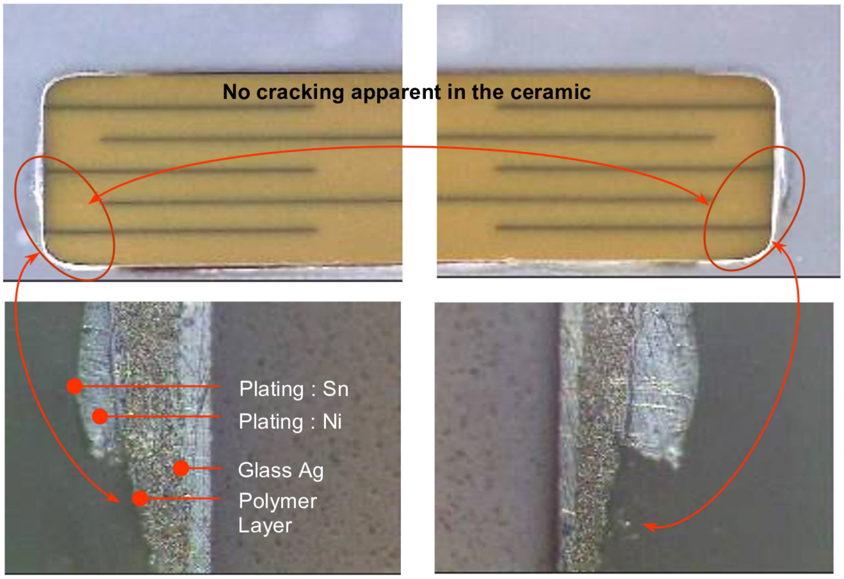
Thermal shock test on standard termination results in inception of failure at 500 cycles. Super Term TX Series reliability improves to over 3000 cycles.

(b) Substrate Flexure Comparison (0805/X7R)



Bending test on Super Term shows an improvement of about 5.0 mm bend vs. an average of about 2.0 mm. for standard termination.





During destructive bending test, the PCB is subjected to bending until capacitor failure. With Super Term there is no cracking damage in the ceramic. Super Term effectively prevents ceramic body cracking during extreme mechanical stress as simulated by this test.

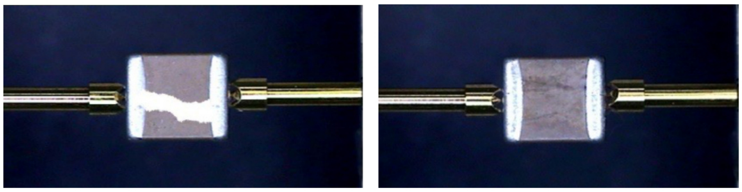
Super Term failures resulting from destructive bending test tend to occur in the OPEN mode and not short circuit mode typical of standard termination failures. The Super Term (polymer layer) design is a polymer material and can be seen in the above photo.

MLCC Arc Prevention – for Hi-Pot Testing

Due to the open and porous nature of the surface of the X7R dielectric, moisture and/or dirt which will have a lower resistance than the dielectric grains, can become entrapped in the surface. Dirt can also include any flux residues as a result of the soldering process. This dirt/flux as well as becoming entrapped into the surface will, in itself, attract additional moisture onto the surface thus reducing the surface resistance and the voltage at which arcing occurs. Surface arcing or flashover at worst can cause equipment failure during isolation testing and, in addition, will leave a carbon track on the surface which can lead to eventual failure of the capacitor.

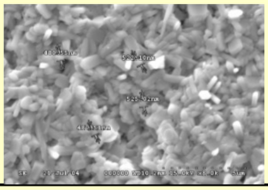
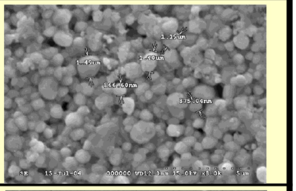
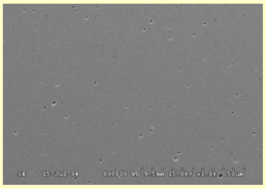
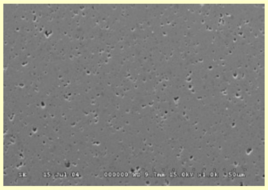
Typical Applications for telecommunication devices(IEEE802.3) in LAN interface, Ballast…

Holy Stone has developed an Arc Prevention coating process that coats the surface of the dielectric without encroaching onto the termination material. This coating makes the surface of the dielectric non porous and prevents moisture and dirt becoming trapped thus reducing the surface resistance and the arcing voltage of the capacitor. It has been shown that the arcing voltage can be increased by up to 65% on soldered parts by using the **Holy Stone** Arc Prevention Coating.



Typical surface arcing on X7R MLCC is from termination-to-termination (shown in polarized light)

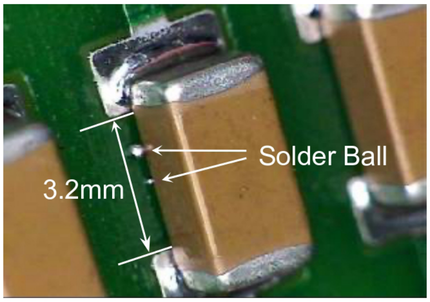
NP0 & X7R Material Characteristic Comparison

Item	NP0	X7R
Dielectric Constant	**30 ~ 100**	**2000 ~ 4000**
I. Resistance	**>10^{13} Ω**	**>10^{11} Ω**
B.D. Voltage	**70~80 Vdc/um**	**40~50 Vdc/um**
Grain Size	**< 500nm**	**900nm ~ 1500nm**
Grain Size (x8000)		
Porosity (x1000)		

- The different grain shape and size will lead to different grain density after sintering.
- The grain size of NP0 dielectric is smaller than that of X7R resulting a denser and less porous structure.
- Surface porosity will trap dirt, flux and moisture causing the surface resistance to dramatically decrease.
- Low surface resistance will cause the arcing voltage to reduce, possibly leading to failure of the capacitor or equipment during isolation testing.
- Using the **Holy Stone** Arc Prevention coating effectively makes the surface of X7R dielectric similar to that of NP0.

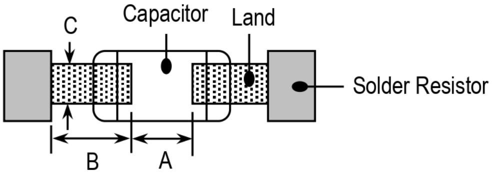
Coated Products for Surface Arc Prevention

Creepage distance v.s. Arcing Voltage



Solder balls reduce the creepage distance between terminations and thus reduce the arcing voltage

Recommended Solder Pad Design



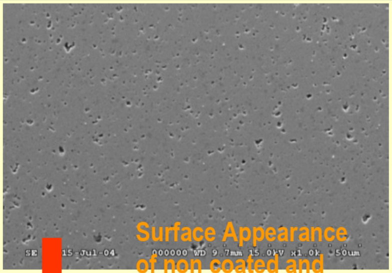
EIA Code	Chip (mm)		Land (mm)		
	L	W	A	B	C
1808	4.6±0.3	2.0 ±0.2	3.2~3.6	1.2~2.4	1.5~1.8
1812	4.6±0.3	3.2 ±0.2	3.2~3.6	1.2~2.4	2.3~3.0
2208	5.7±0.4	2.0 ±0.2	4.0~4.6	1.2~2.4	1.5~1.8
2211	5.7±0.4	2.0 ±0.3	4.0~4.6	1.2~2.4	2.0~2.6
2220	5.7±0.4	5.0 ±0.4	4.0~4.6	1.2~2.4	3.5~4.8

The distance between terminations also has a direct effect on the arcing voltage. The greater the distance (chip size) the higher this voltage will be. Solder pad design will have a significant effect on the arcing of high voltage capacitors. Above is our recommended solder pad land design or each chip size.

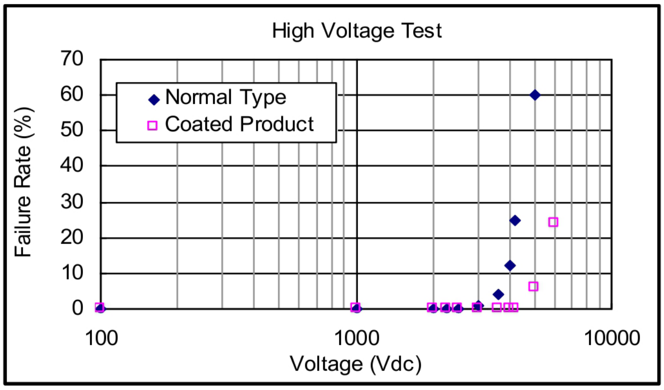
Arc Prevention Coating

The application of the Arc Prevention coating, which is a high insulation resistance material, coats the surface of the dielectric with a smooth and non porous layer that prevents moisture entering the surface pours and also aids cleaning post soldering. The following diagrams show the difference between coated and non coated X7R components.

Surface Comparison

Item	Porosity (x1000)
Before	
After	

High Voltage Test Comparison



- The coating reduces the porosity of the X7R surface and provides a smooth surface which help prevent surface arcing.
- The maximum Hi-pot test level will be increased by >1000Vdc after coating with both unsoldered and soldered components.

Using the Holy Stone Arc Prevention coating increases the surface arcing voltage of X7R capacitors to almost that of an equivalent NP0 part. However, the higher dielectric constant of X7R allows for higher capacitance values to be achieved in any given case size.

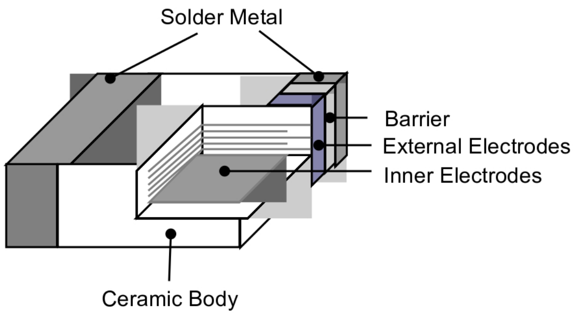
The Holy Stone Arc Prevention coating provides a total solution to the harmful effects of surface arcing.

● Description:

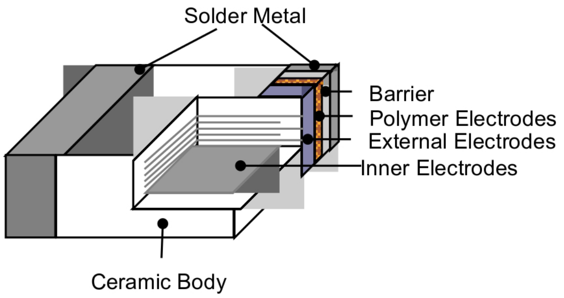
MLCC : NP0, X7R, X7S, X5R, X7P, X7T, X6S dielectrics.

● Basic Construction/Homogenous Material :

(a) Standard Type



(b) “X” Type: Super Termination (Option)



- Multi-layer Ceramic Chip capacitors are Homogenous devices manufactured from materials that cannot be mechanically disjointed into different materials.

- Multi-layer Ceramic Chip products : Standard sizes are fully RoHS compliant.

RoHS Status	**Lead-Free Status / MSL level**
※ External plating : 100% Matte Sn as Standard	※ Pb-free Reflow & Wave Solder compliant, MSL=1 Reflow : 260℃ max recommended Wave : 260℃ max recommended Wave & Reflow profile refer to IHHEC recommended solder profile.

Part Number Designation:
(Generally no change to P/N, but available as P/N prefix at customer request)

RoHS Compliant : No Change to P/N
Pb-Free : No Change to P/N

Product Marking :
(available at customer request, highlighted or marked on reel and container)

Pb free : Pb free

refer to JEDEC&IPC Std.

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