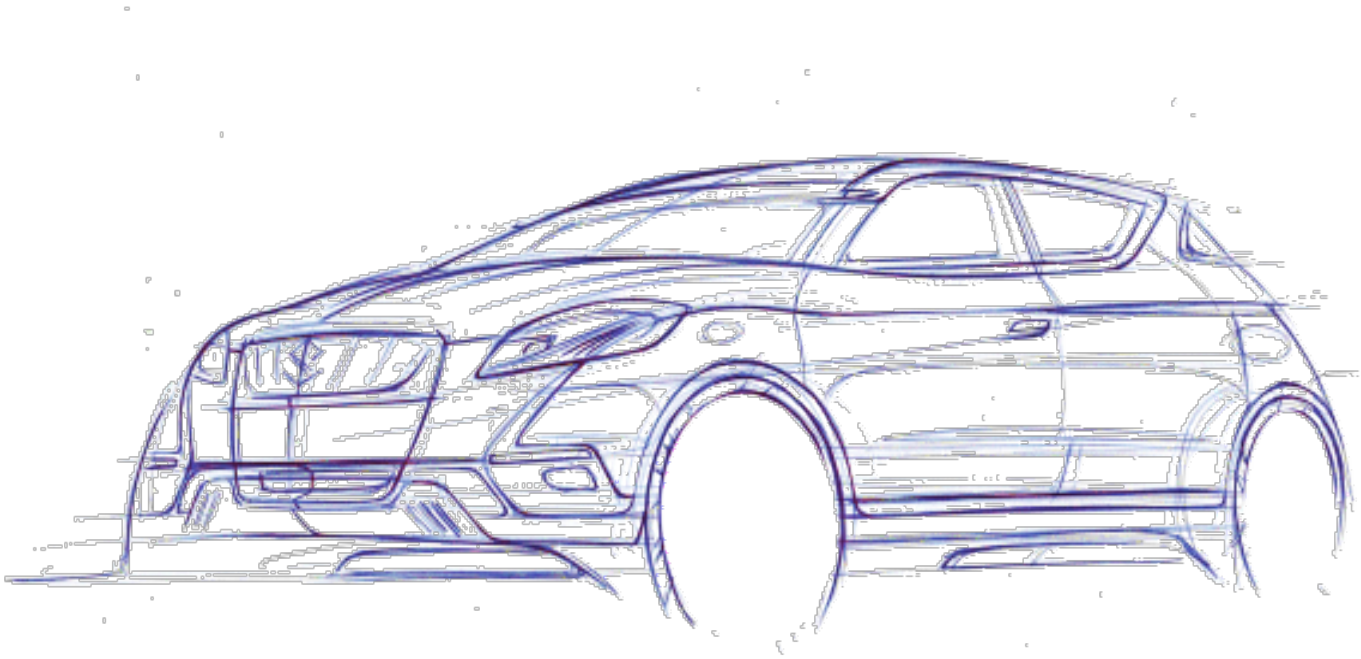
SAMSUNG ELECTRO-MECHANICS

Solutions for automotive MLCC



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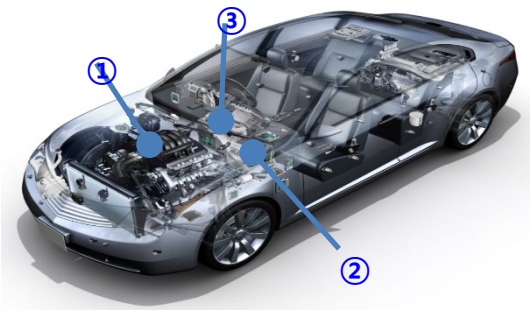
Global MLCC Market Trend

Impacting Number of MLCCs per vehicle by Electrification

[Unit: pcs]



※ PCU: Power Control Unit
BMS: Battery Management System,
OBC: On Board Charger
LDWS : Lane Departure Warning System
BCM: Body Control Module

Product	ICE	xEV
① Power Train PCU, BMS, OBC, etc. High Capacitance High Reliability	~0.6k	~2.9k
② Safety & ADAS LDWS, Parking, Airbag, etc. High Capacitance High Reliability Fail-Operation	~1.6k	~5.0k
③ Comfort & Infotainment BCM, Head Lamp, Navigation, etc. High Capacitance	~2.0k	~6.7k
MLCC Total Q'ty	~4.2k	~14.6k

SEMCO Automotive MLCC General Properties

High Capacitance, High Reliability and Fail-Operation (AEC-Q200)

Increasing ECU Current → High Capacitance

Needs for High Life Durability in Battery Line→ High Reliability and Fail-Operation

- All automotive parts are fully AEC-Q200 qualified
- All actively promoted parts have been successfully tested according to VW80808-2

  RoHS & Reach Compliant
- Several Internal designs available

  : Standard -> (V Design), Open Mode -> (W Design), Series Mode -> (X Design)

CL MLCC	10 Size	B Dielectric	104 Cap.	K Tolerance	B Voltage	8 Thickness	W Design	P AEC-Q	N Bending	C Packaging
	03= 0201"	C= C0G	2	C= ±0.25pF	R= 4V	5= 0.50mm	Normal Mode	Automotive AEC-Q200	N= 3mm Board Flex	**Cardboard Tape**
	05= 0402"	B= X7R	significant	D= ±0.5pF	Q= 6.3V	6= 0.60mm	1= Cu /Ni/Sn			C= 7"Reel (standard for t<1mm)
	10= 0603"	Y= X7S	digits	F= ±1pF	P= 10V	8= 0.80mm	V= Cu-Epoxy/Ni/Sn		J= 5mm Board Flex	D/L= 13"Reel
	21= 0805"	Z= X7T	+	or ±1%	O= 16V	C= 0.85mm	Open Mode			**Embossed Plastic**
	31= 1206"	X= X6S	number	G= ±2%	A= 25V	P= 1.15mm	W= Cu-Epoxy/Ni/Sn		E= ESD MLCC 2mm Board Flex	E= 7" Reel (standard for t>1mm)
	32= 1210"		of zeros	J= ±5%	B= 50V	F= 1.25mm				F= 13"Reel
			use "R"	K= ±10%	C= 100V	H= 1.60mm	Series structure			
			denotes	M= ±20%		I= 2.00mm	X= Cu-Epoxy/Ni/Sn			
			decimal			J= 2.50mm				
			point							

*Blue color are preferred values

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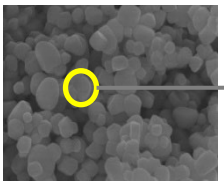
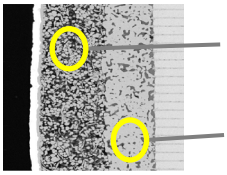
Three major core technologies of Samsung

High Capacitance

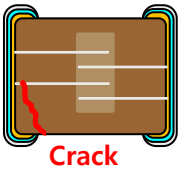


Dielectric ($BaTiO_3$)200㎚

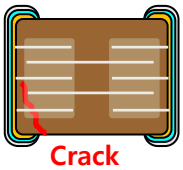
High Reliability



Fail-Operation



Open Structure



Series Structure

Fine Powder Technology

Under 300㎚ Sized Ceramic Powder for Excellent Electrical Performance

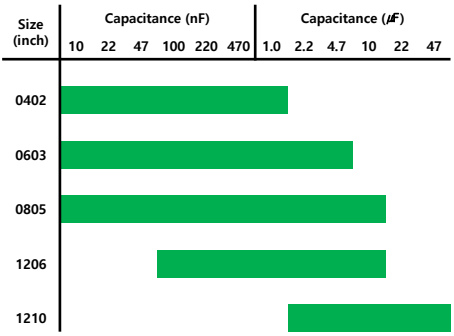
Metal-Epoxy Termination

Improving Mechanical Strength up to 5㎜ by Combination of Metal-Epoxy and Metal

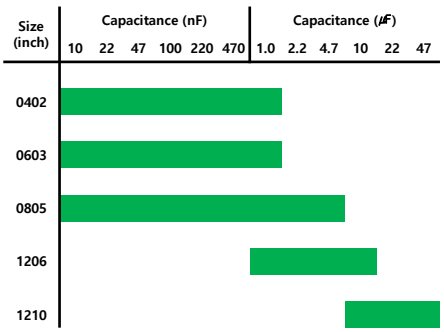
Operation-Guaranteed Design

Open or Series Structure (Low Cap) for Preventing Short Mode Crack

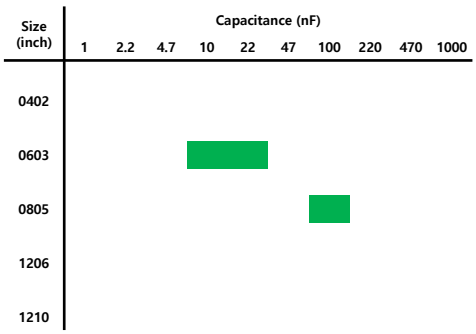
☐ PN Series



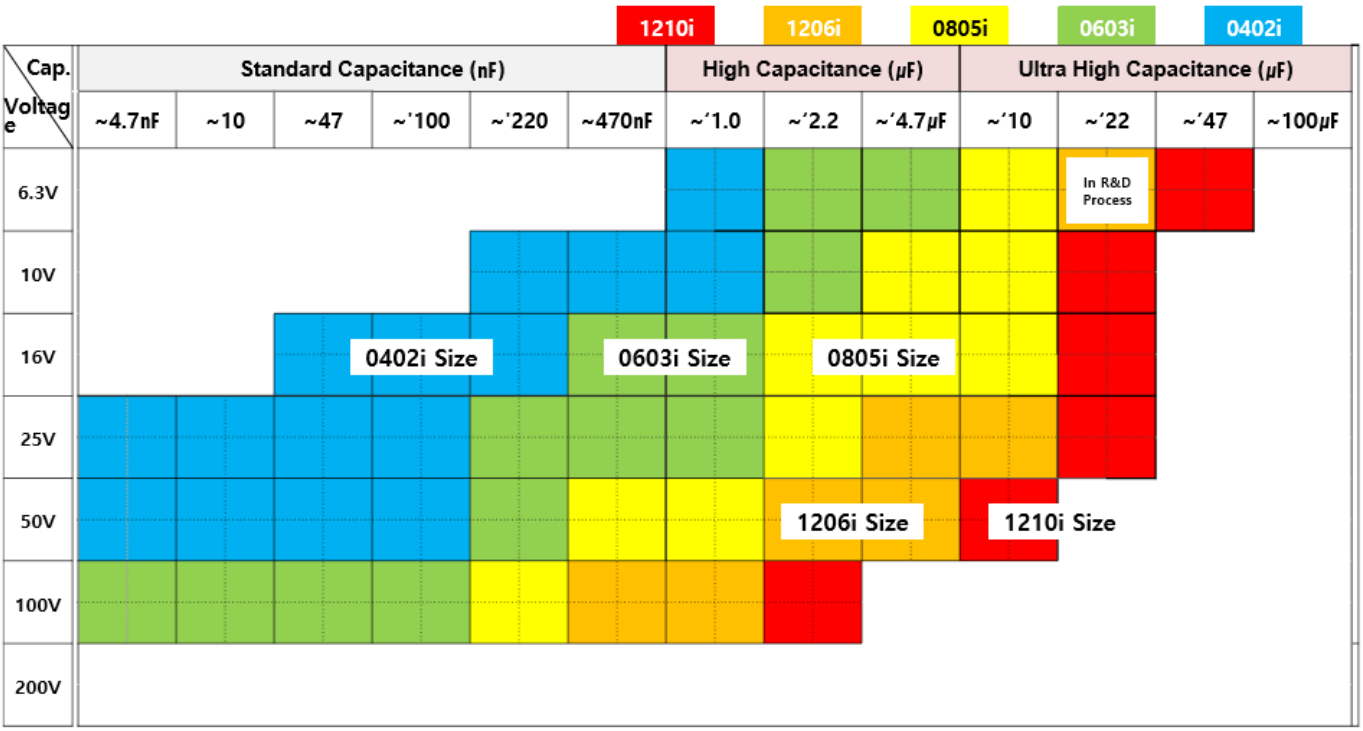
☐ PJ Series



☐ XPJ Series



Automotive MLCC Line-up & Recommendation



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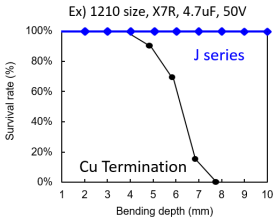
Automotive MLCC Special Series

☐ Safety Design - PJ Series

PJ series with soft termination meet 5mm bending strength & passed VW80808

➢ judged by capacitance change (+/- 10%)



➢ Typical failure mode

Ex) 1210 size, X7R, 4.7uF, 50V

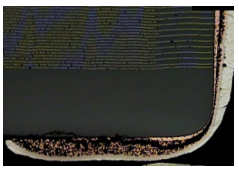


Fig. DPA results after bending test

➢ Spec.

	Samsung
Part Number	CLxxxxxxxxxPJx
Board Flex spec.	5mm

➢ Line up

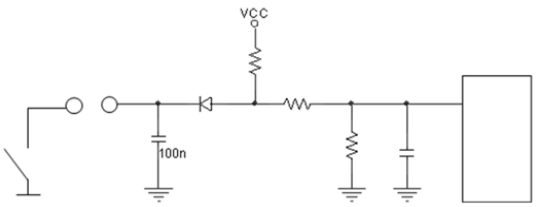
PJ Series	Design Rule
VPJ	Normal Design + 5mm guarantee
WPJ	Open Design + 5mm guarantee
XPJ	Series Design + 5mm guarantee

☐ ESD Protection MLCC - PE Series

➢ Background

- MLCC for ESD Protection in Power /or CAN BUS Line should be used.

(e.g. Engine Control Unit in case of High level ESD requirement from Car Makers)



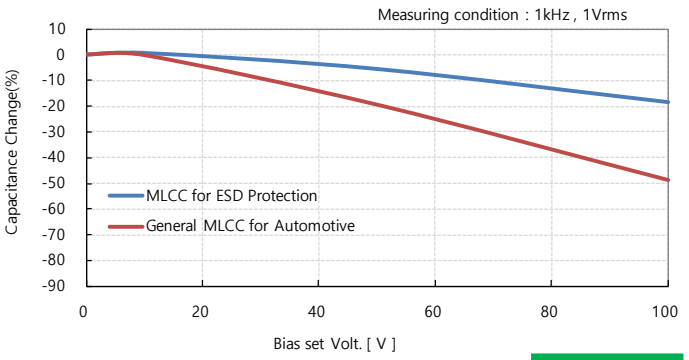
➢ Features & Benefits

- PE series meet IEC 61000-4-2 standard (ESD immunity (150pF, 330Ω)
- Improved ESD performance of Class II: Enhanced Breakdown Voltage & DC-Bias stability

Example P/N: CL10B103KC84**PE***

➢ Improved DC-Bias Stability (Class II)

0603 (inch), X7R, 10.0nF, 100V



MP

➢ *Current Line up*

Size (mm)	TC	Rated Vol. (V)	Capacitance (nF)	ESD Level (kV)
0603 (1608)	X7R	100	1	20
			2.2	20
			3.3	20
			4.7	20
			6.8	20
			10	22

□ *Coming soon:*

- High Temperature Items >125°C

- High Voltage Items >100V

- 0201" Case size