

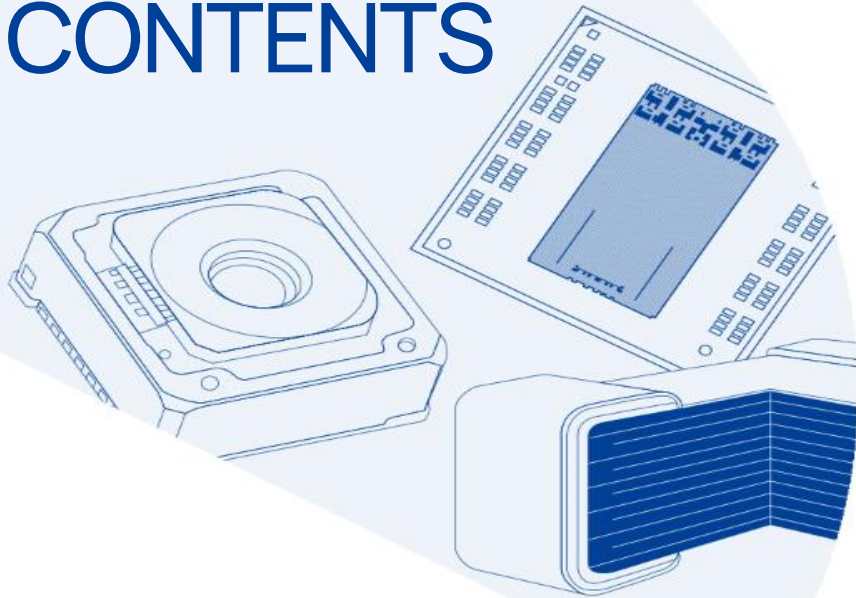
SAMSUNG

Electro-Mechanics

—
March, 2022



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- Part 1 Introduction
- Part 2 Market Trends
- Part 3 Product Proposal
- Part 4 Discussion



P a r t 1



Introduction

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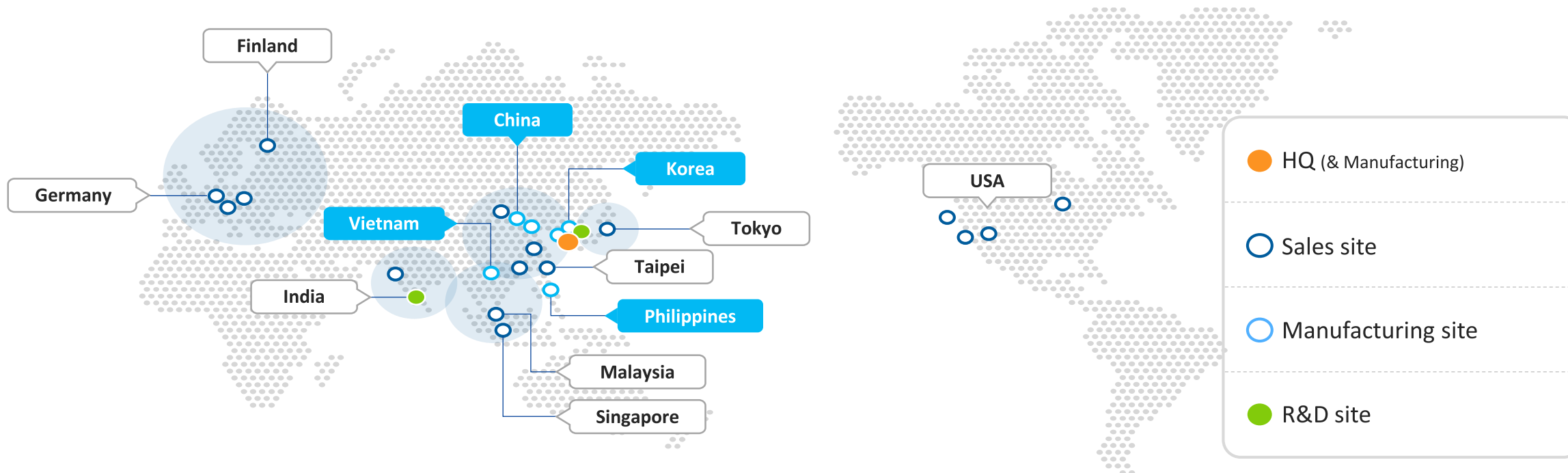
Quality Topics @ Rutronik and AE for S/P and direct customers

Company Overview

SEMCO

contributes to the advancement of the electronics industry

Foundation	HQ	Global	Employees	Revenue
1973	Suwon Korea	16 sales sites 7 manufacturing sites	36,000 [2020]	\$7.5B [2020]

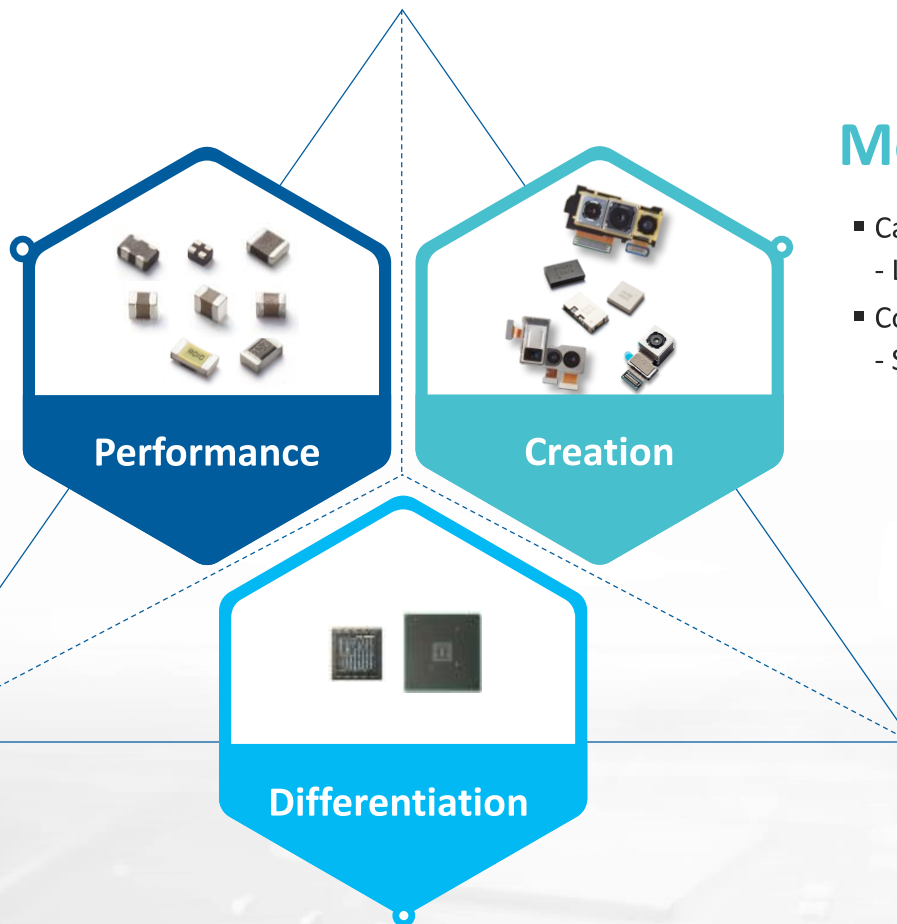
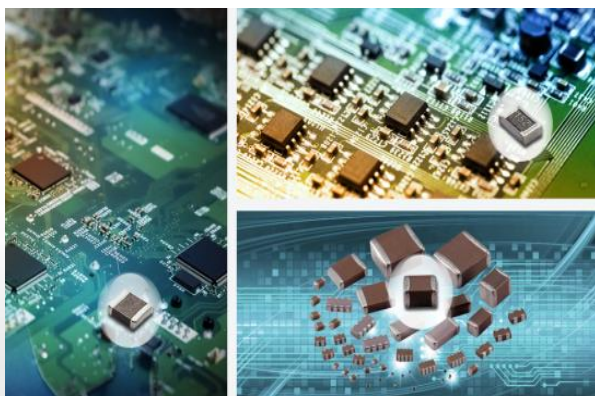


SEMCO Products

[Division]

Component Solution

- MLCC
- Inductor
- Chip Resistor
- Tantalum Capacitor



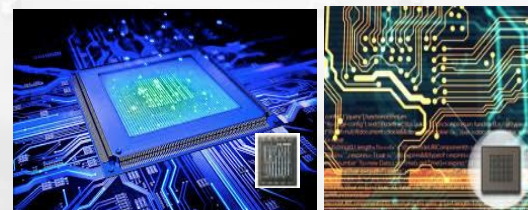
Module Solution

- Camera Module
 - Lens/Actuator
- Communication Module
 - Sub-6 FEM/mmW Ant/Keyless



Substrate Solution

- BGA
- FCBGA



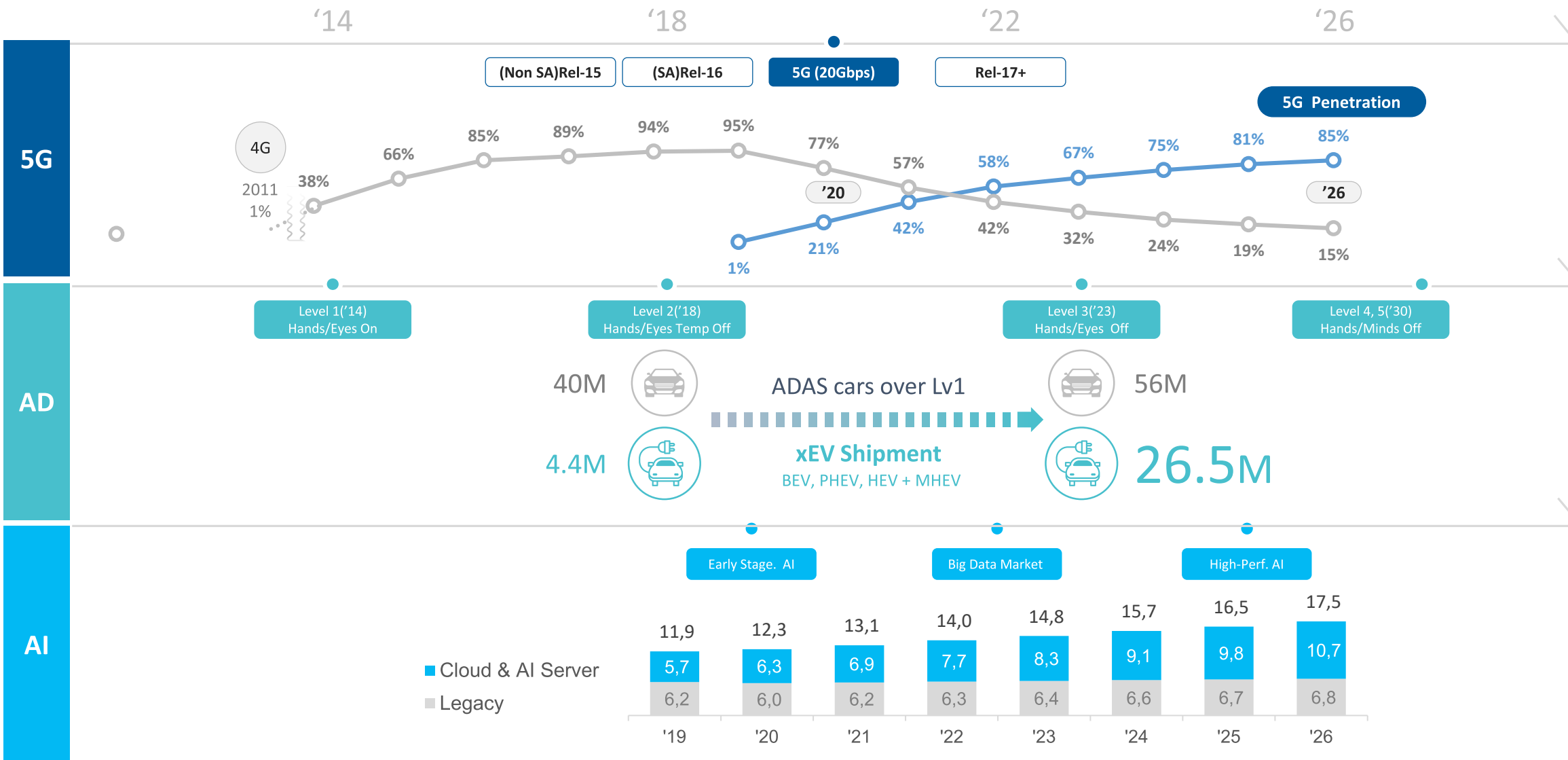


P a r t 2



Market Trends

Paradigm Shifting to 4th Industrial Revolution



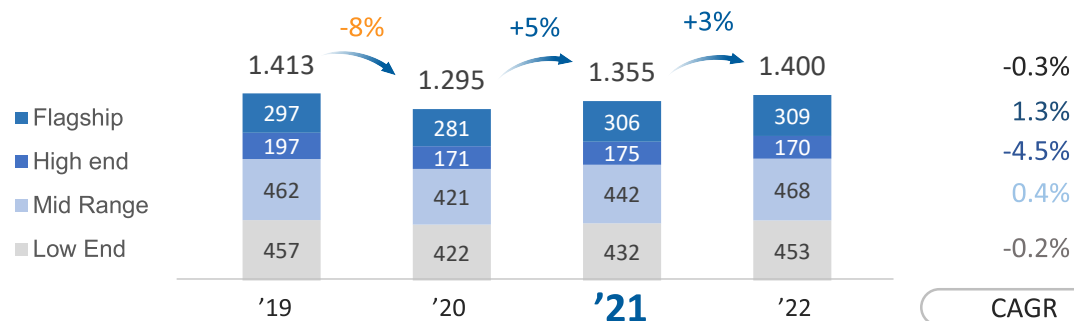
Market Outlook

[Mil Unit]

SMP



V-shaped recovery due to pent-up demand

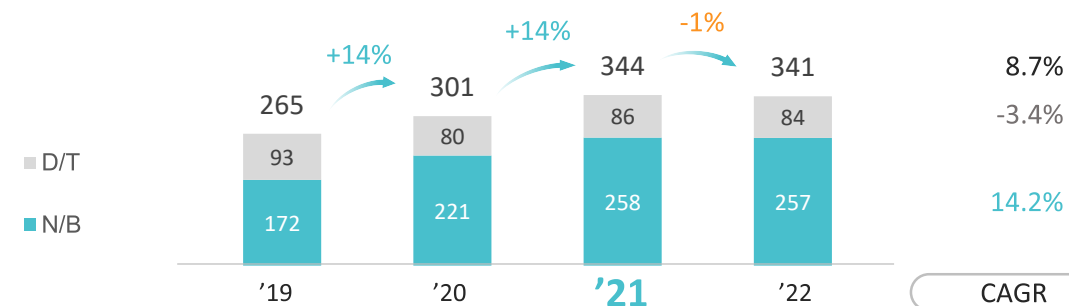


* Flagship : \$500↑, H/E : \$300~\$499, M/E : \$150~\$299, L/E : \$149↓

PC



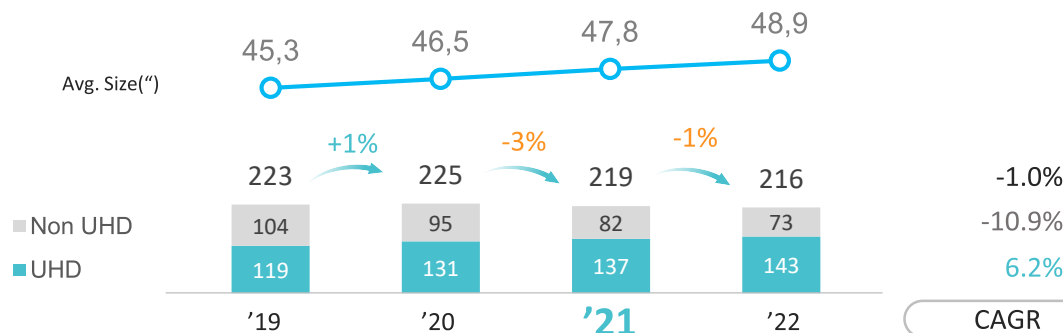
Low growth, High performance N/B



TV



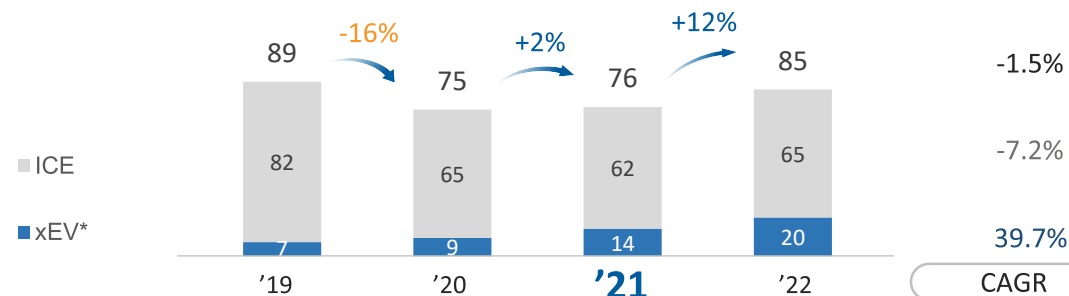
Moving to Larger & Higher Resolution



Auto



Global rebound, Y19 level expected in Y22



* xEV includes Battery, Plug in Hybrid, Hybrid, Mild Hybrid and Fuel Cell



P a r t 3



Product Proposal

(MLCC for Industrial & Network)

Product Proposal

SEMCO provides higher reliability MLCC for better performance

CL 21 Y 105 K C F V P J E
 (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11)

Reliability Test Item	General	Industrial		Automotive
	Consumer (NN)	High Level I (NW)	AEC-Q200 (PN)	AEC-Q200 + 5mm (PJ)
Application Example *1	Smartphone, TV, PC STB, Game, DSC Consumer Power (Lighting, Adapter) Wireless Modem	Server, Network (Switch, Router) Industrial Power Test Equipment Medical (Class 1~2)	Automotive Heavy Industry Solar PV	Automotive Constant High Power
Biased Humidity	40°C 95% RH 1Vr, 500hr	65°C 90% RH 1Vr, 500hr	85°C 85%RH 1Vr, 1000hr	85°C 85% RH 1Vr, 1000hr
High temp load test	Max temp, 1.0Vr,1000hr	Max temp, *2 1.5Vr, 1000hr	Max temp, *2 1.5Vr, 1000hr	Max temp, *2 1.5Vr, 1000hr
Board Flex	1mm	*3 1mm	3mm	5mm

*1 Application Guide can be changed by customer test condition or agreement

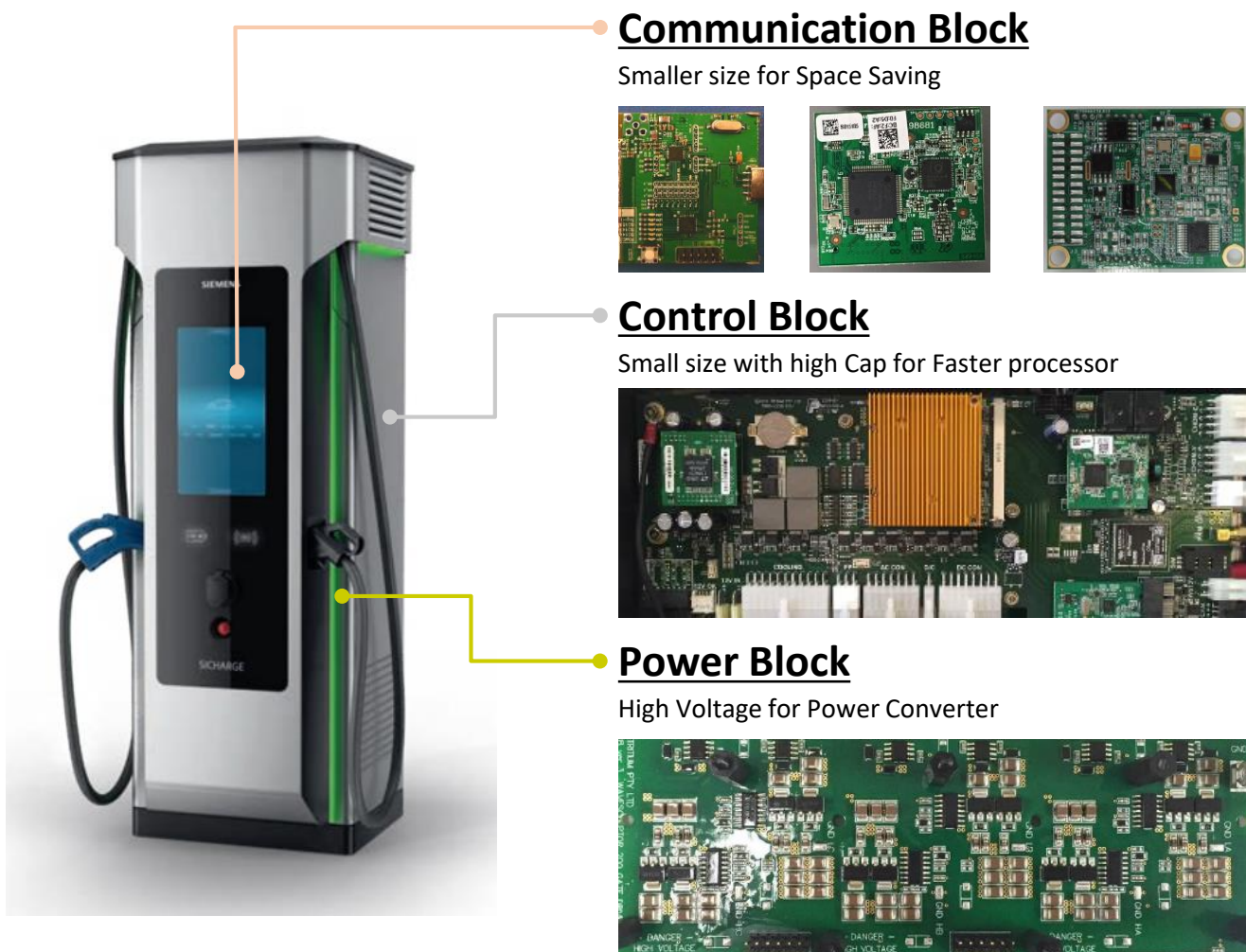
*2 The part marked 'derating' is less than 150% of rated voltage in the durability and operational life test

*3 Perform 2mm bending outgoing test

Product Proposal - EV Charger

[Industrial MLCC]

Smaller size, Higher Cap value with High Temperature for Faster Charging



Size	Rated Volt	100nF	220nF	470nF	1uF
01005	2.5V			X7T (21.Q4)	
0201	6.3V				X7T (21.Q4)
	10V	X7R			
0402	6.3V				X7R
	25V		X7R		

Size	Rated Volt	100nF	1uF	2.2uF	10uF
0805	100V	X7R			
1206	100V			X7R	
	630V	10nF			
1210	630V	47nF			
	1kV	22μF			

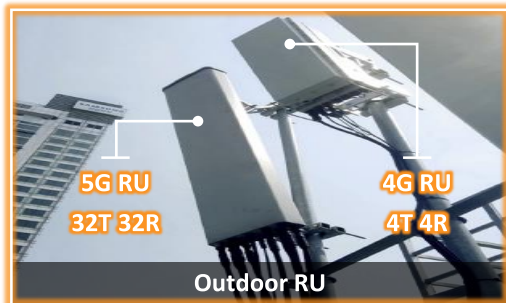
Product Proposal - Base Station

[Industrial MLCC]

Industrial MLCC has higher reliability level than IT MLCC and competitors

Needs

- ✓ Base stations stand in severe environment.
 - ✓ Base station warranty is longer than 10 years.
- Require High Reliability MLCC



Installation

- 1 RU (Outdoor)
- 2 DU (Indoor & Outdoor)

Need High Reliability

Value

'NW' has higher reliability level than competitors

Reliability Test Item	SEMCO			'M'Company
	'NN' Series (for IT)	'NW' Series (for industrial)	'PN' Series (AEC -Q200)	'GRM' Series
Biased Humidity	40°C95% RH 1Vr, 500hr	65°C90% RH 1Vr, 500hr	85°C85% RH 1Vr, 1000hr	40°C95% RH 1Vr, 500hr
High temp load test	Max temp, 1.0Vr, 1000hr	Max temp, *1 1.5Vr, 1000hr	Max temp, *1 1.5Vr, 1000hr	Max temp, 1~1.5Vr, 1000hr
Board Flex	1mm	*2 1mm (2mm Test)	3mm	1mm

*1) Basically, Only the Rated 1.5Vr is lineup

*2) Perform 2mm bending outgoing test

Product Proposal - Base Station

[Small & High Capacitance]

Small Size & High Capacitance MLCC to decrease mounting area on board

Needs

✓ Demands of MLCC increase dramatically by 5G
→ Require Small & High Capacitance MLCC

BASE STATION

RU * Radio Unit

DU * Digital Unit

	4G	5G
RU	MLCC 2,000 pcs/unit	6,000~10,000 pcs/unit (mmWave) (Sub 6GHz)
DU	MLCC 3,000 pcs/unit	5,000 pcs/unit

X3~5 (RU MLCC increase)
X1.7 (DU MLCC increase)

Value

✓ Space Saving with Small & High Capacitance MLCC

Complexity of 5G Circuit
↓
High cap MLCC MLCC downsizing
↓
Efficiency of PCB Design

* 4T4R(4G) Radio Unit of A Company

The adoption trend of MLCC downsized

Size(inch)	4G	5G(Sub-6G)	5G(mmWave)
0201	0%	0%	42%
0402	56%	65%	32%
0603	23%	9%	16%
0805	5%	9%	6%
1206	5%	1%	2%
1210	11%	7%	3%

* Source : B Company Radio Unit Bom

NW Series Product Documents



Product Search | Component Library

MLCC Power Inductor Tantalum Chip Resistor

FAQ



MLCC

Basic Search

Lineup Search

Cross Reference

Part Number ? Please enter the part number	Status ? <input type="checkbox"/> All <input type="checkbox"/> Mass Production <input type="checkbox"/> NRND	Use For ? <input type="checkbox"/> All <input type="checkbox"/> Automotive <input type="checkbox"/> General	Reliability Level ? <input type="checkbox"/> All <input type="checkbox"/> AEC-Q200 <input checked="" type="checkbox"/> High Level I <input type="checkbox"/> High Level II	Features ? <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> 3T(Low ESL) <input checked="" type="checkbox"/> 8T(Low ESL) <input checked="" type="checkbox"/> ANSC-B(Low Acoustic) <input type="checkbox"/> ESD Protection			
Capacitance Range Match from pF to pF	Tolerance <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> -20/+80% <input checked="" type="checkbox"/> ±0.1pF <input checked="" type="checkbox"/> ±0.25pF	Rated Vdc Range Match from Vdc to Vdc	TCC <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> C0G(-55 ~ +125) <input checked="" type="checkbox"/> X5R(-55 ~ +85) <input checked="" type="checkbox"/> X6S(-55 ~ +105)	Size Code(inch/mm) <input checked="" type="checkbox"/> 0503/1209 <input checked="" type="checkbox"/> 0603/1608 <input checked="" type="checkbox"/> 0805/2012 <input checked="" type="checkbox"/> 1206/3216 <input checked="" type="checkbox"/> 1210/3225	L Size <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> 0.25±0.013mm <input checked="" type="checkbox"/> 0.30±0.03mm <input checked="" type="checkbox"/> 0.40±0.02mm	W Size <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> 0.125±0.013mm <input checked="" type="checkbox"/> 0.20±0.02mm <input checked="" type="checkbox"/> 0.25±0.025mm	T Size <input checked="" type="checkbox"/> All <input checked="" type="checkbox"/> 0.095±0.015mm <input checked="" type="checkbox"/> 0.0975±0.0125mm <input checked="" type="checkbox"/> 0.125±0.013mm

Search Result

Matching Parts 448 / Total Parts 2621

List Download

Part Number	Status	Buy	Characteristics	Features	Capacitance	Tolerance	Rated Vdc	TCC	Size Code (inch/mm)	L Size	W Size	T Size	Spec / Datasheet	Simulation	Inquiry
CL03A474MQ3NNW#	Mass Production	Buy Now	General High Level I Normal 85°C	Normal	470nF	±20%	6.3Vdc	X5R	0201/0603	0.60±0.03mm	0.30±0.03mm	0.30±0.03mm	Spec Data		

<http://product.samsungsem.com/mlcc/basic-search.do>

Product Proposal – Solar Inverter

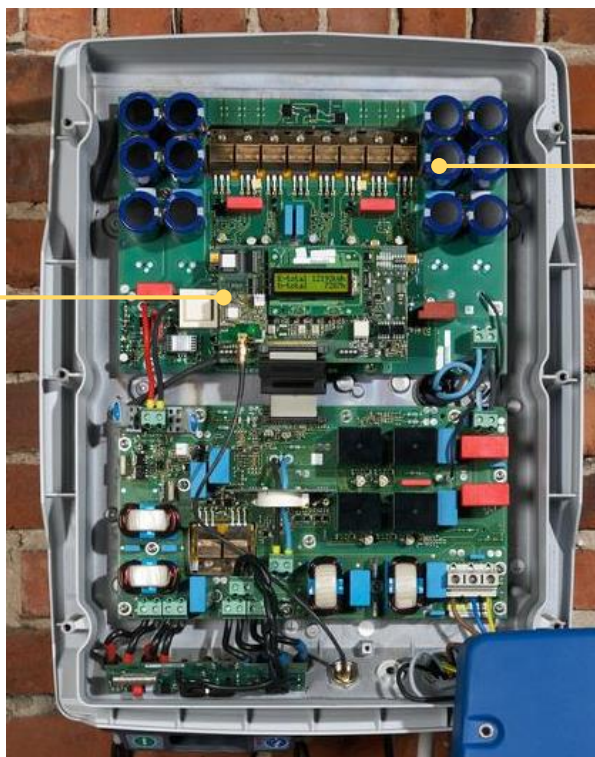
[Industrial MLCC]

■ Highest industrial requirements

- Long lifetime >10 years
- Highest load @ hottest day time
- PN Series recommended

Control Block

Low Voltage High Caps



DC → AC conversion Block

High Voltage & High Reliability



Product Proposal – 48V Systems

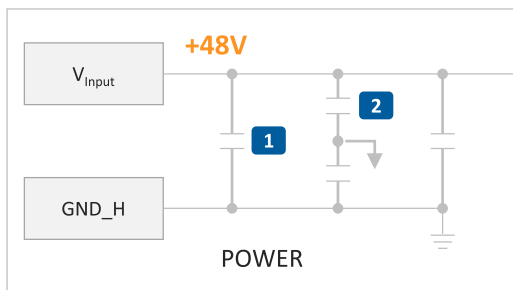
[High Voltage (100V↑)]

❏ Demand increases for High Voltage MLCC of Power and Amplifier Blocks

Needs

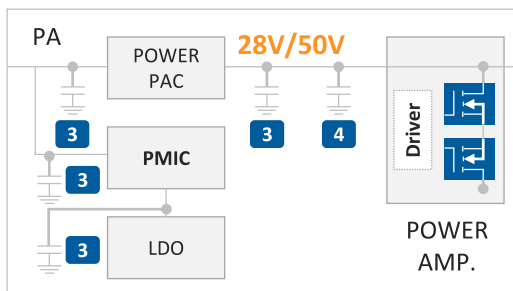
- ✓ The number of Power Amplifiers increases continuously
→ Demand of High Voltage MLCC grows

Power Block



- 1 Input Voltage : 48V
→ 100V MLCC
- 2 Surge Protection
→ 1~2kV MLCC

PA Block



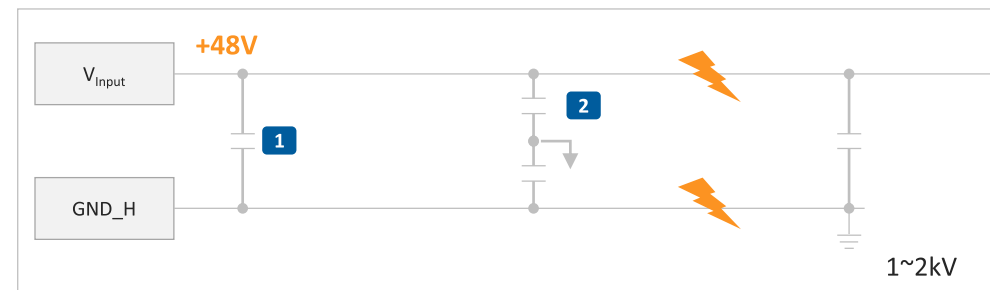
- 1 PA Voltage: 28/50V
→ 50/100V MLCC
- 2 Increase RF Channel
→ 64T64R(5G)
4G(4T4R, 4Channel)

Value

- ✓ Surge Stress reduction with High Voltage MLCC

(1~2kV)

Location of Applying Surge Protection MLCC

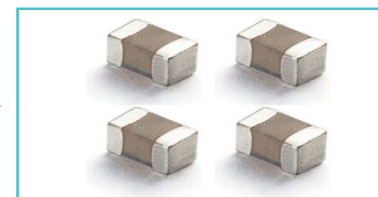


- ✓ MLCC is a better choice than Al-Cap.

1 80V, 100μF



2 100V, 2.2~10μF



Space Saving & Higher Reliability

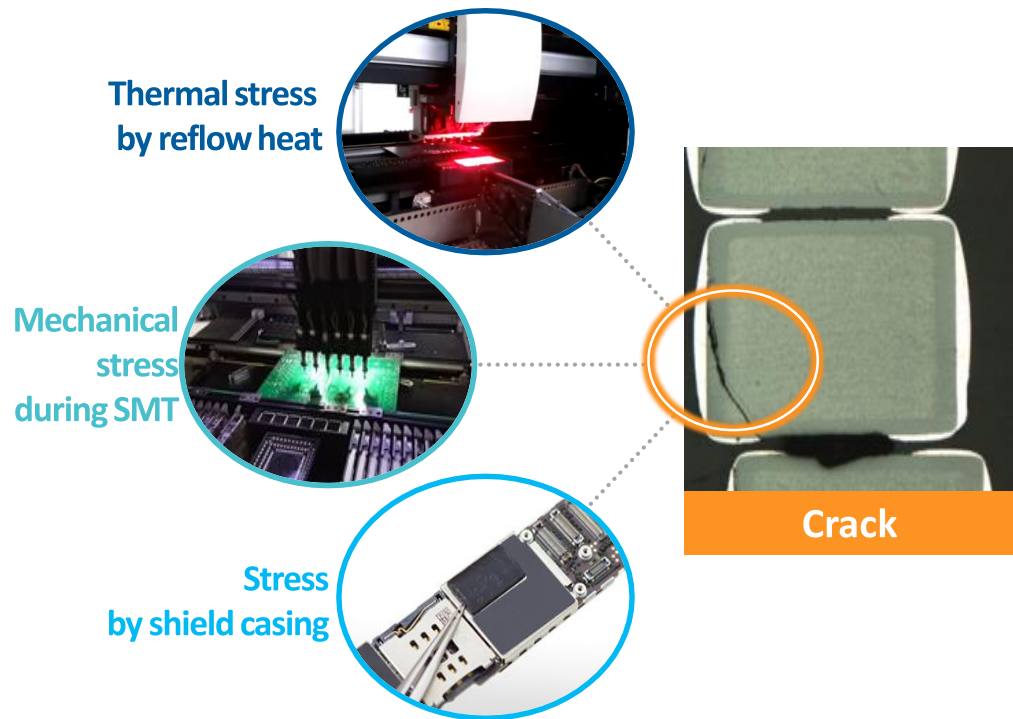
Product Proposal – Crack Prevention

[Soft Termination]

Soft-termination MLCC to Prevent Bending Crack

Needs

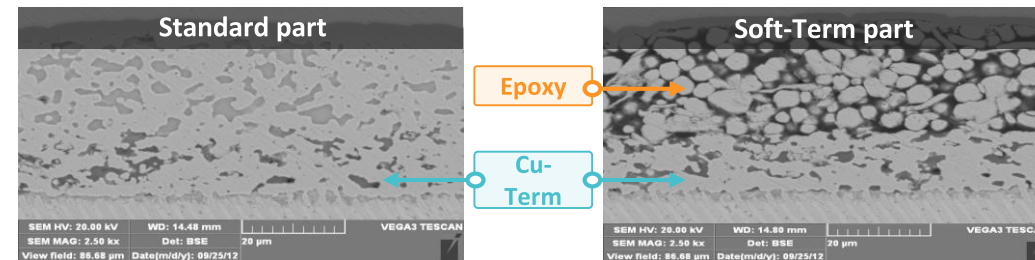
- ✓ Mechanical and thermal risk appear in electronic device.
- ✓ Crack prevention with the adoption of Soft-Term.



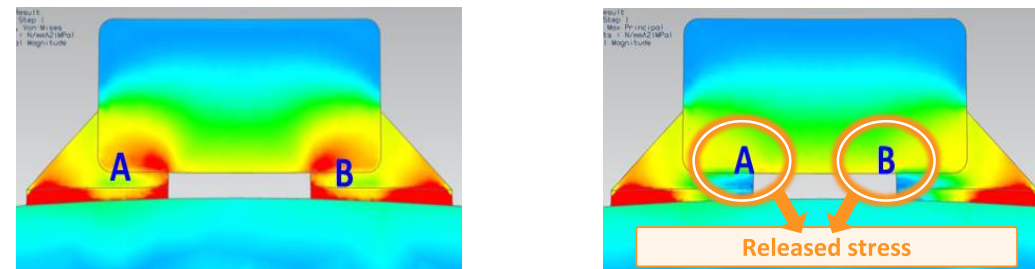
Value

- ✓ Higher Bending Strength compared to Standard

Structure of Soft Termination



Bending Stress Simulation



Higher Bending Strength (1mm → 3mm)

Market - Demand and supply map outlook

	1uF Below	1uF Above			10uF Above				
		1.0 μ F	2.2 μ F	4.7 μ F	10 μ F	22 μ F	47 μ F	100 μ F	220 μ F
0201	Zone 3								
0402						Zone 1			
0603									
0805	Zone 4								
1206						Zone 2			
1210									
		Zone 1 Small size and High Cap		Zone 2 Big size and High Cap		Zone 3 Small size and Low Cap		Zone 4 Big size and Low Cap	
Demand		Demand $\uparrow\uparrow\uparrow$ by Space Constraint		Demand $\uparrow\uparrow$ by Network, Industrial		Demand \uparrow by Migration In		Demand Stable by Migration Out	
Supply		only 3 Suppliers available		conservative supply		Enough suppliers		EOL from some suppliers	
Supplier	SEMCO	Technology	Supply	Technology	Supply	Technology	Supply	Technology	Supply
	A	Technology	Supply	Technology	Supply (Conservative)	Technology	Supply	Technology	Supply (EOL)
	Others	Technology	Supply	Technology	Supply	Technology	Supply	Technology	Supply

SEMCO remains reliable MLCC partner across all zones

Line-up – NW Series

Size	Voltage	1p	10p	22p	47p	100p	220p	470p	1n	2.2n	4.7n	10n	22n	47n	100n	220n	470n	1u	2.2u	4.7u	10u	22u	47u	100u	Voltage	Size													
1210"	630V	<div style="display: flex; align-items: center; justify-content: center;"> <div> <p>Industrial MLCC</p> <p>65°C/90% RH, 1Vr, 500hr</p> <p>1mm bending guarantee</p> </div> </div>																								X7R												630V	1210"
	100V																																					100V	
	50V																																					50V	
	25V																																					25V	
	6.3V																																					6.3V	
1206"	630V																										630V	1206"											
	100V																										100V												
	50V																										50V												
	16V																										16V												
	6.3V																										6.3V												
0805"	100V																										100V	0805"											
	50V																										50V												
	25V																										25V												
	16V																										16V												
	6.3V																										6.3V												
0603"	100V																										100V	0603"											
	50V																										50V												
	25V																										25V												
	16V																										16V												
	10V																										10V												
0402"	50V																										50V	0402"											
	25V																										25V												
	16V																										16V												
	6.3V																										6.3V												
0201"	50V																										50V	0201"											
	25V																										25V												
	16V																										16V												
	6.3V																										6.3V												

X7R | X7S | X7T

- 10% tolerance is standard
- 6.3V | 16V | 50V | 100V in focus
- E3 is recommended

1 | 2.2 | 4.7

COG

- 5% tolerance is standard
- 50V & 100V are most used
- E6 is recommended

1 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8

R&D
Recommended
Smaller / Higher V available
NRND

Line-up – PN Series

Size	Voltage	<10p	<100p	100p	220p	470p	1n	2.2n	4.7n	10n	22n	47n	100n	220n	470n	1μ	2.2μ	4.7μ	10μ	22μ	47μ	100μ	220μ	Voltage
1210"	100V																X7R	X7S						100V
	50V																		X7S					50V
	25V																			X7S				25V
	16V																			X7R				16V
	6.3V																				X7R	'22		6.3V
	4V																					X7T	'23	4V
1206"	100V															X7R	X7S	'23						100V
	50V																	X7R	X7S					50V
	25V																		X7R					25V
	16V																			X7R				16V
	10V																			X7R				10V
	6.3V																			X7R	X7T			6.3V
4V																				X7T			4V	
0805"	100V									COG						X7S	'22							100V
	50V																X7R	X7S	'22					50V
	25V																		X7S					25V
	16V																		X7S					16V
	6.3V																				'22			6.3V
0603"	100V									COG			X7R											100V
	50V															X7R								50V
	25V																			'22				25V
	16V																							16V
	10V																							10V
6.3V																					'22		6.3V	
0402"	100V									COG			X7R											100V
	50V									COG		X7R												50V
	25V																						X7R	25V
	16V																						'22	16V
	10V																						X7S	10V
6.3V																						X7S	6.3V	
0201"	25V																							25V
	16V																							16V
	6.3V																							6.3V

Automotive & Industrial High Power

COG

- 5% tolerance is standard
- 50V & 100V are most used
- E6 is recommended

1 | 1.5 | 2.2 | 3.3 | 4.7 | 6.8

X7R | X7S | X7T

- 10% tolerance is standard
- 6.3V | 16V | 50V | 100V in focus
- E3 is recommended

1 | 2.2 | 4.7

3mm bending guarantee

R&D

Recommended

Smaller / Higher V available

NRND

High Voltage Automotive & Industrial High Power

3mm bending guarantee

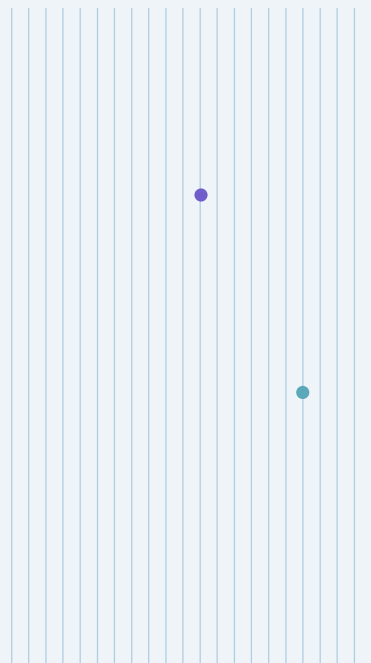
High Voltage X7R Roadmap										Development Stage							
										Development Plan				AEC-Q200			
L×W Size (mm)	Rated Voltage (V)	Capacitance (nF)															
		1	1.5	2.2	3.3	4.7	10	15	22	33	47	100	150	220	330	470	1000
0805 inch (2012)	250																
	630																
1206 inch (3216)	250																
	630																
	1kv																
1210 inch (3225)	250																
	630																
	1kv																

High Voltage COG Roadmap										Development Stage							
										Development Plan				AEC-Q200			
L×W Size (mm)	Rated Voltage (V)	Capacitance (pF)						Capacitance (nF)									
		10	22	47	100	220	470	1	1.5	2.2	3.3	4.7	6.8	10	15	22	33
0805 inch (2012)	250																
	630																
1206 inch (3216)	250																
	630																
	1kv																
1210 inch (3225)	630																
	1kv																



Part 4

Discussion





THANK YOU

—
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