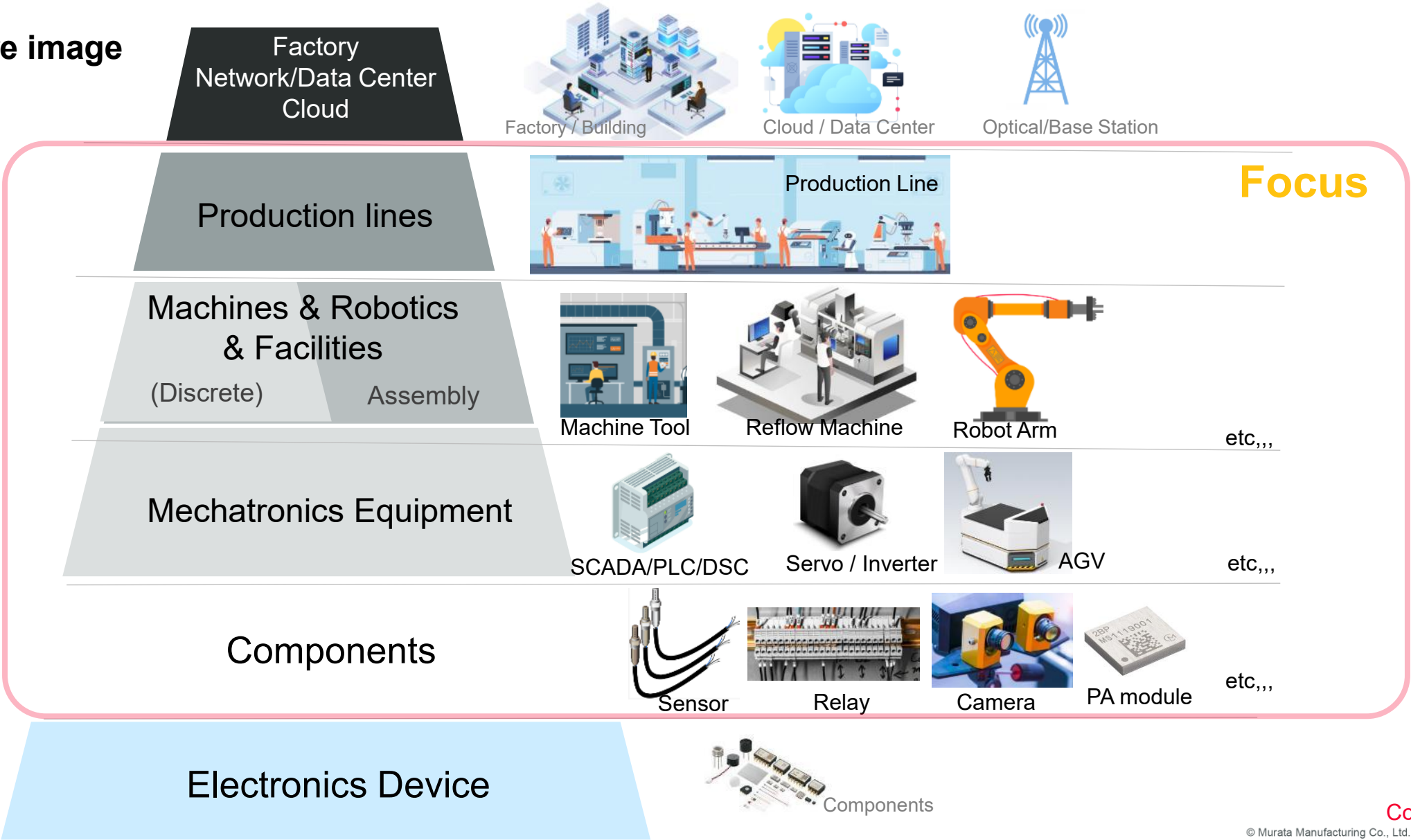


MLCC selection guide for Industry motor drive

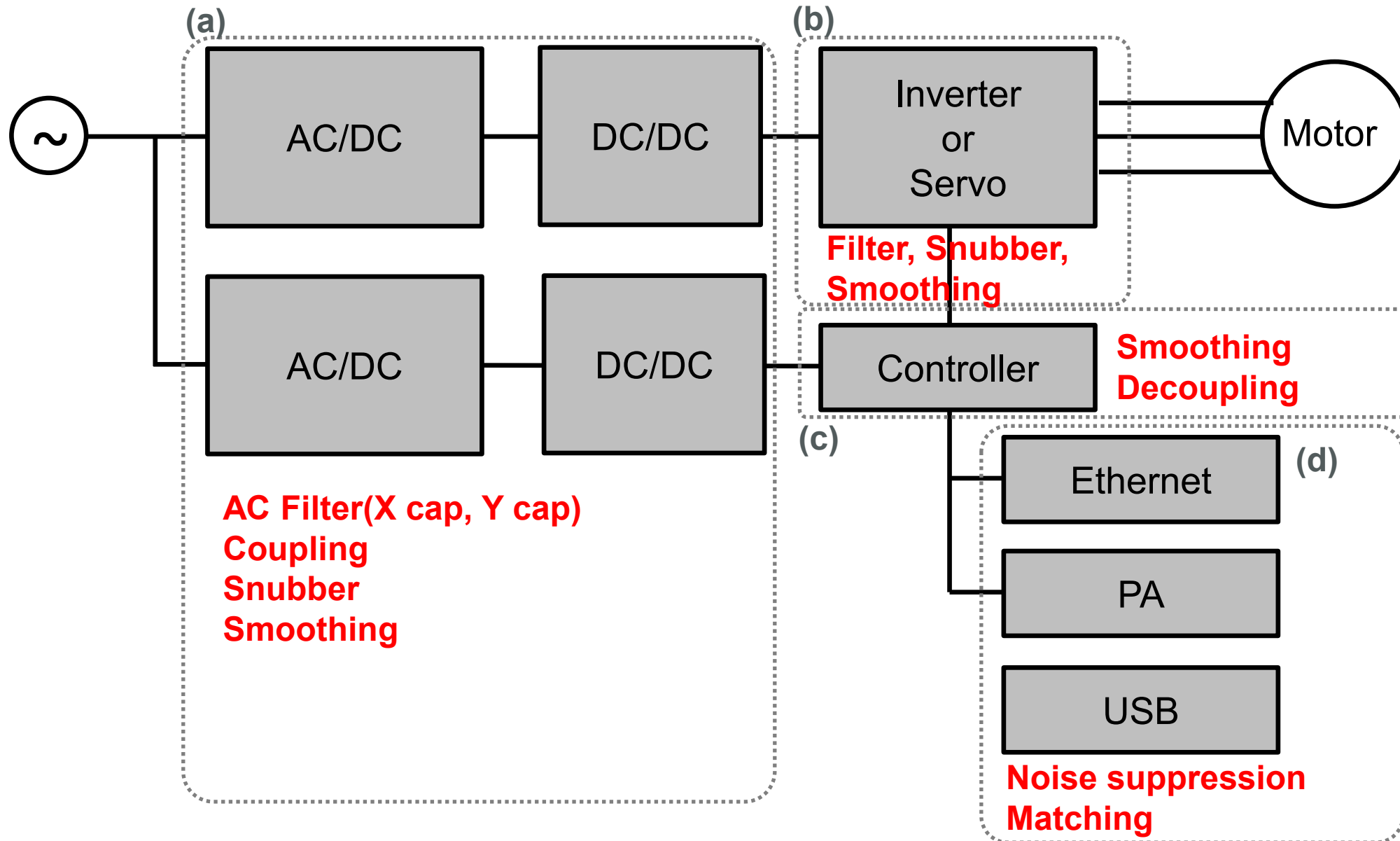
Murata Manufacturing. Co., Ltd.

Scope - Application Structure -

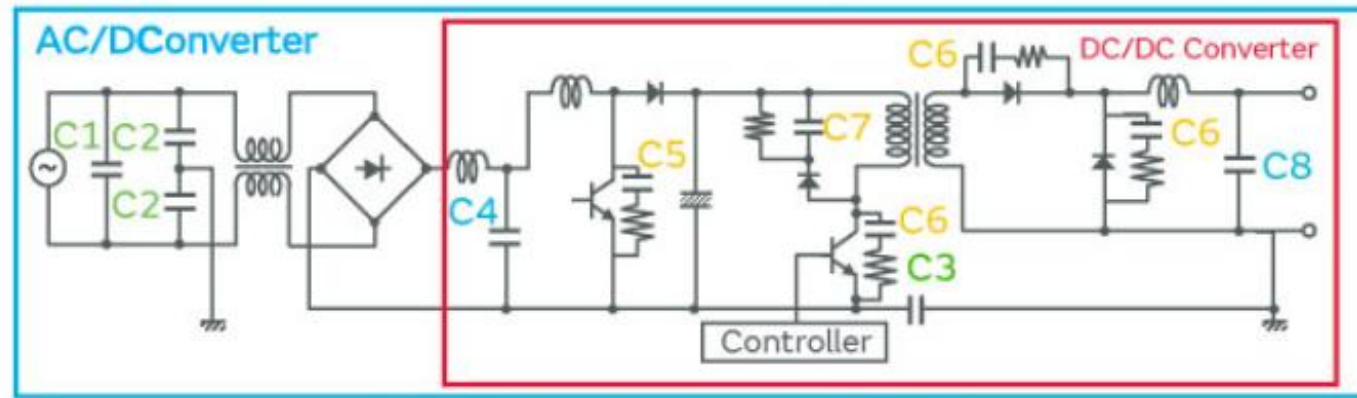
Hardware image



Industry block diagram



(a) AC/DC, DC/DC Converter



AC Line Filter

- C1 : AC Filter (X-CAP)
- C2 : AC Filter (Y-CAP)
- [DE1/DE2](#) Series
- [GA3](#) Series
- [DK1](#) Series
- [KCA](#) Series
- [EVA](#) Series



C3 : Coupling Capacitor

- [DE1/DE2](#) Series
- [GA3](#) Series
- [DK1](#) Series

Primary & Secondary Snubber

- C5 : PFC Snubber
- C6 : FET, Diode Snubber
- [GRM/C0G](#) Char.
- [RDE/C0G](#) Char.
- C7 : Leakage Snubber
- [GRM/X7R](#) Char.
- [RDE/X7R](#) Char.



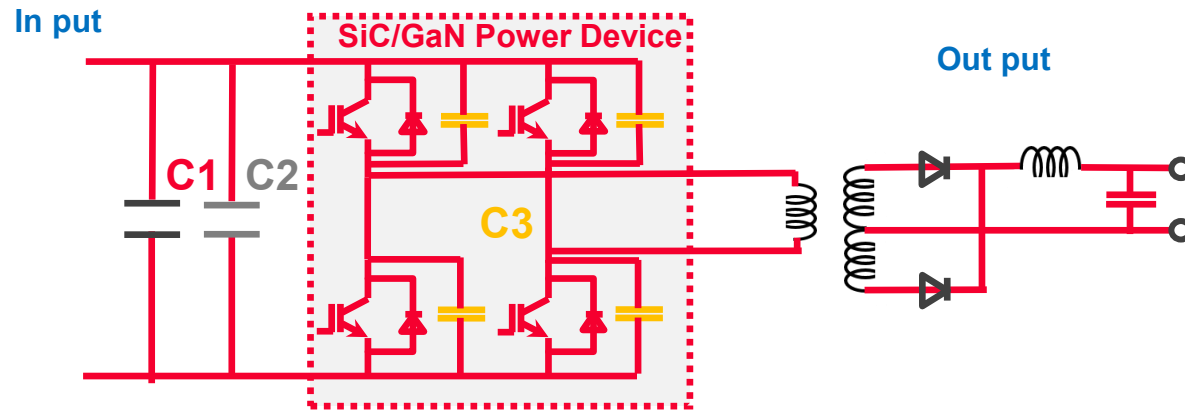
Primary & Secondary Smoothing

- C4 : Primary Smoothing
- C8 : Secondary Smoothing
- [KRM/X7R](#) Char.
- [RDE/X7R](#) Char.

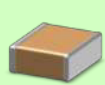


(a) DC/DC Converter

Phase Shift Full Bridge



C2 : Smoothing capacitor (Class2)



GRM Series

High Voltage up to 1,250V

GR3 Series

High Ripple Current

GRJ Series

Soft termination



KRM Series

Metal Termination with GRM

KR3 Series

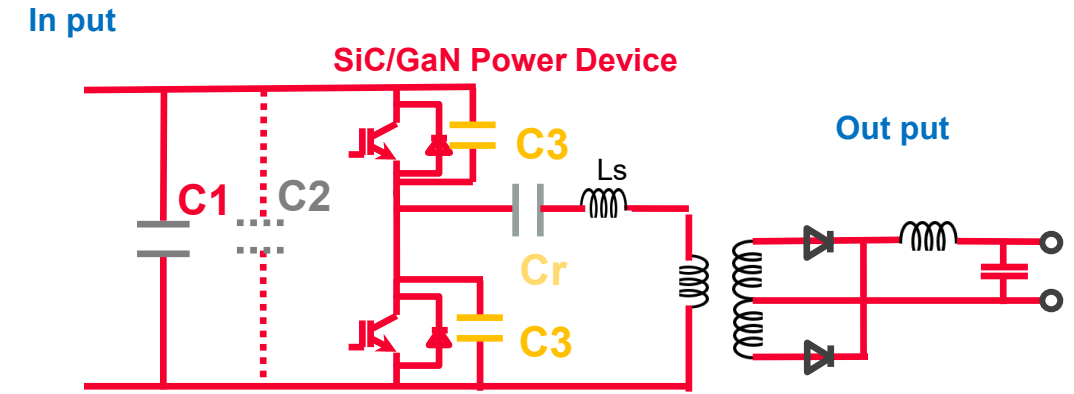
Metal Termination with GR3



RDE Series

Epoxy Coating with Lead

LLC



C3 : Snubber, Cr: Resonance capacitor



GRM Series

High Voltage up to 1kV(C0G,U2J char)



KRM Series

High Voltage up to 1kV (C0G,U2J char)

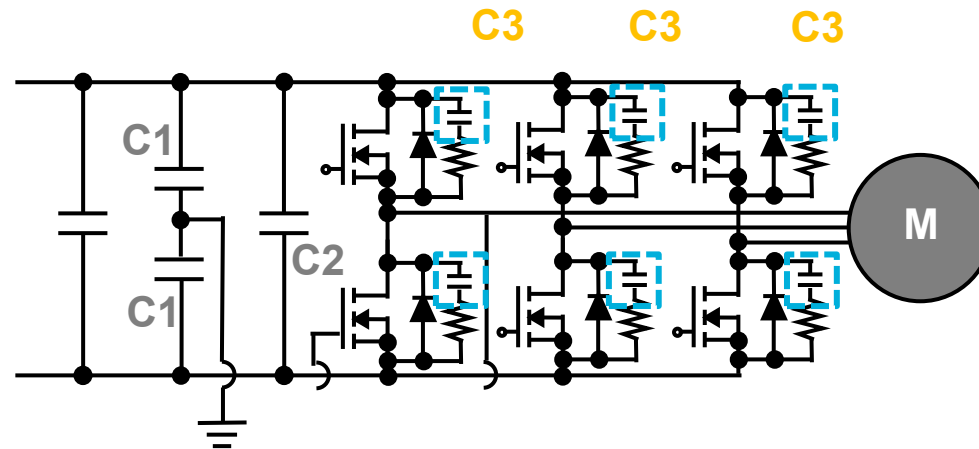
Film capacitor



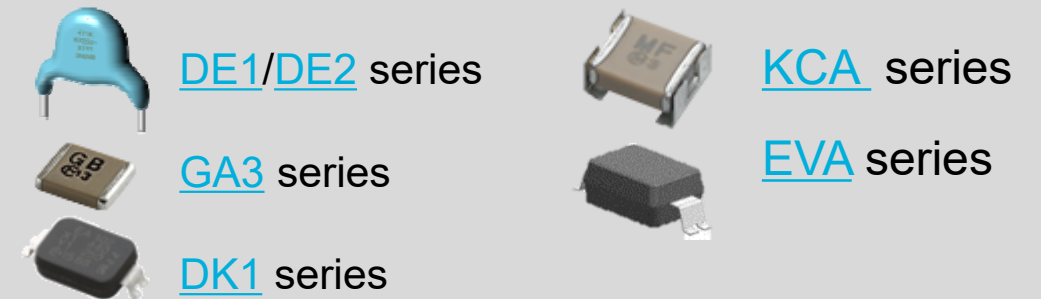
MLCC



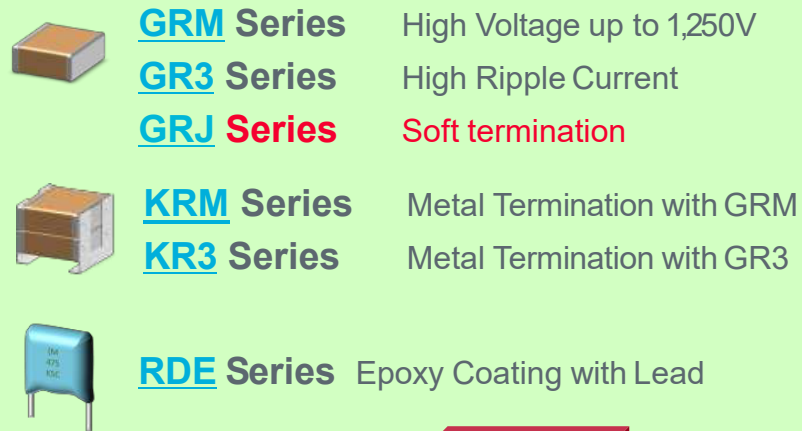
(b) Inverter, Servo



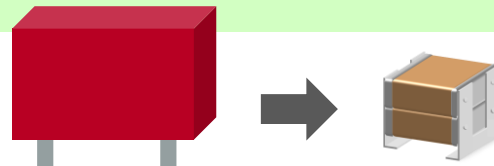
C1 : For Common mode noise (Safety Certificated)



C2 : Smoothing capacitor (Class2)



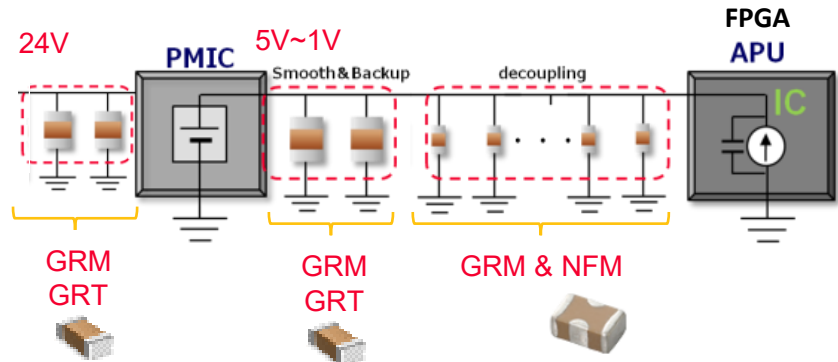
C3 : Snubber, Cr: Resonance capacitor



We have some success case to replace Film cap

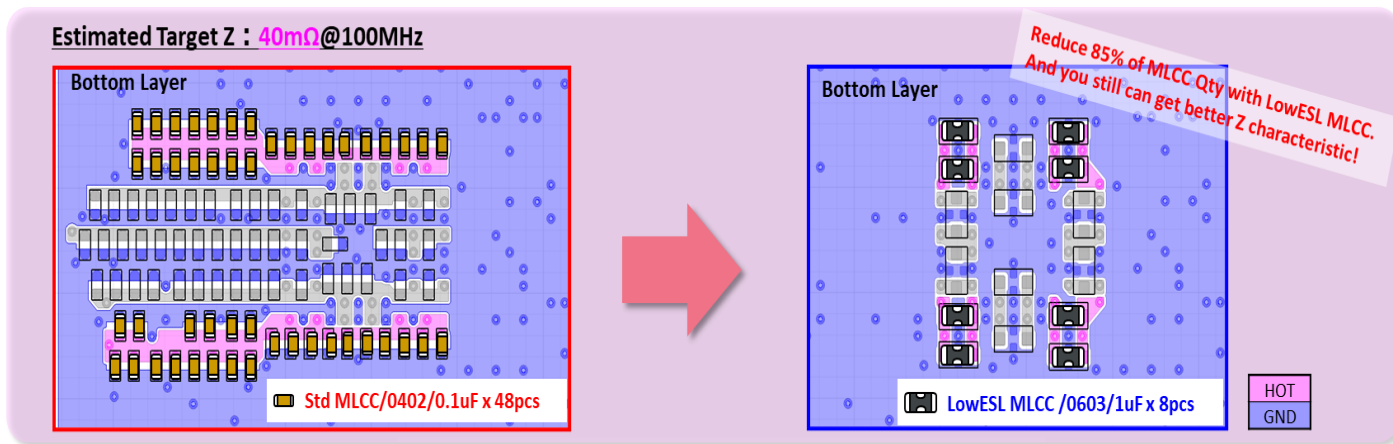
(c) Controller / PLC, DSC, CNC, SCADA

APU Power Line

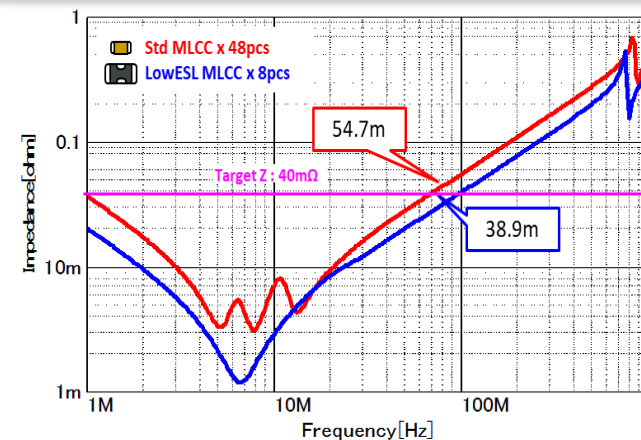


C : Smoothing, Backup, decoupling

	GRM Series	Normal MLCC
	GRT Series	High Reliability MLCC
	NFM Series	3 Terminals Low ESL MLCC



✓ No area for low Z.
↓
✓ No further Z improvement by increasing Std MLCCs qty.



✓ Enough area for low Z.
↓
✓ Large Z improvement by increase LowESL MLCC qty.

(c) Controller / PLC, DSC, CNC, SCADA

Set Trend

Controller become high performance & smaller size

Size Trend

FPGA, APU larger

-> the number of MLCC is increased

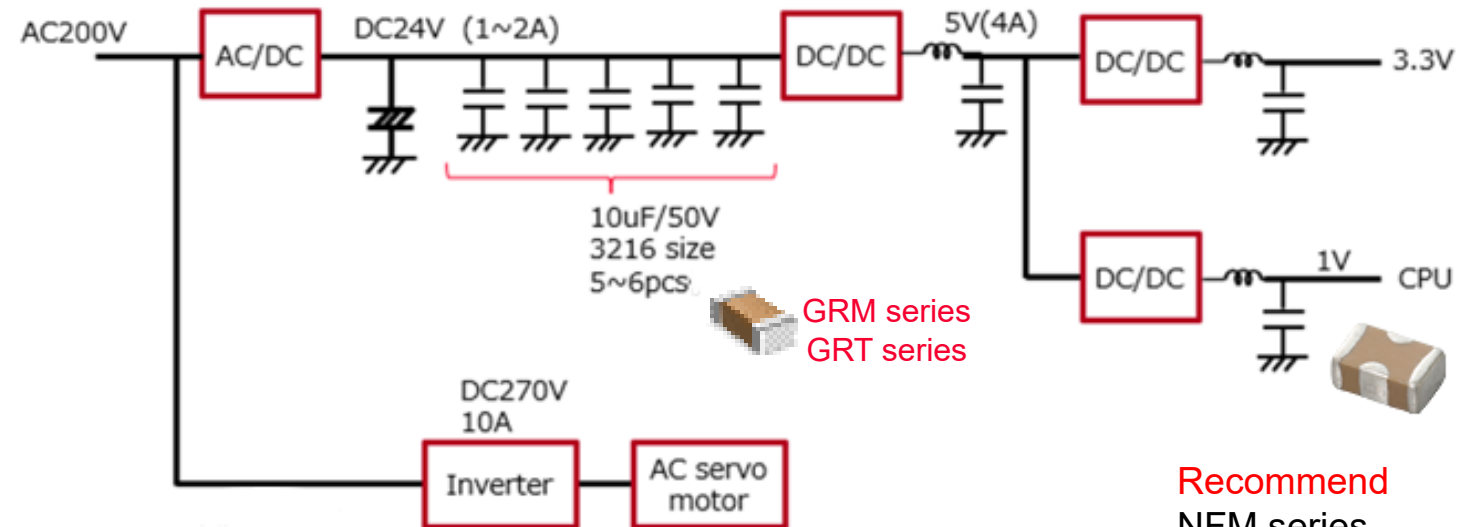
Substrate smaller

-> Mounting space limited

MLCC Needs

- ✓ Higher capacitance,
- ✓ Smaller case size,
- ✓ Low ESL type required(NFM series)

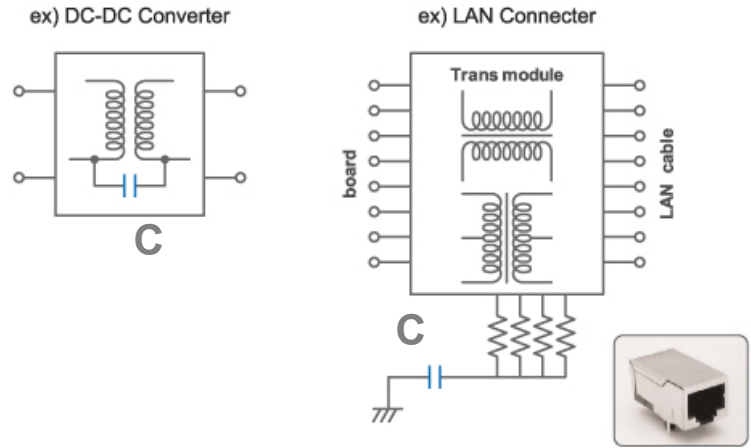
Typical Circuit



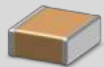
Recommend
NFM series
3 terminal cap
Low ESL

(d) Ethernet, PA

Ethernet

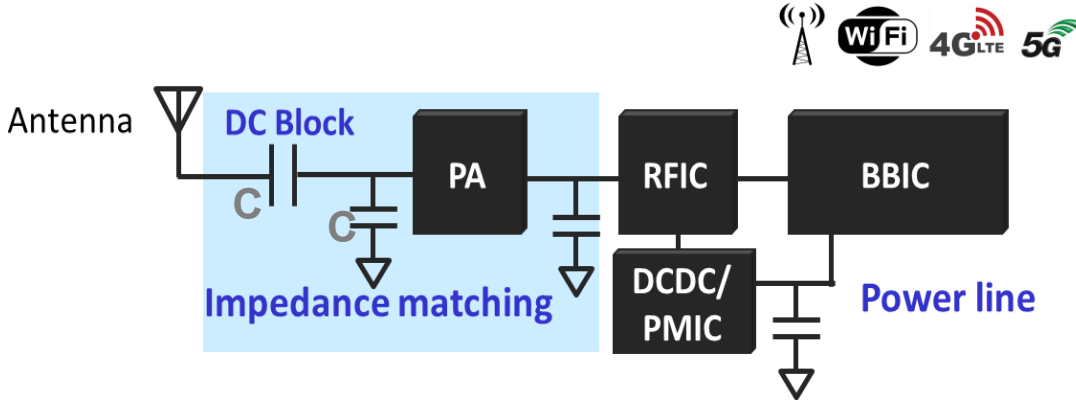


C : secondary coupling

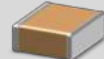


GR4 Series for Ethernet LAN and primary-secondary coupling of DC-DC converters

PA



C : DC-Cutting and Matching



GJM Series

- Reduction of Reflection loss -> Tight tolerance
- Reduction of Insertion loss -> Low ESR / High Q
- Hi-Q capacitor can reduce the loss.

Thank you very much for your attention !!

