AMO
AMOGREENTECH

AMOGREENTECH

EMI FILTER MODULE & CURRENT SENSOR

First Mover in Materials and Parts Based on Nanotechnology

The high efficiency magnetic material

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AMO AMOGREENTECH

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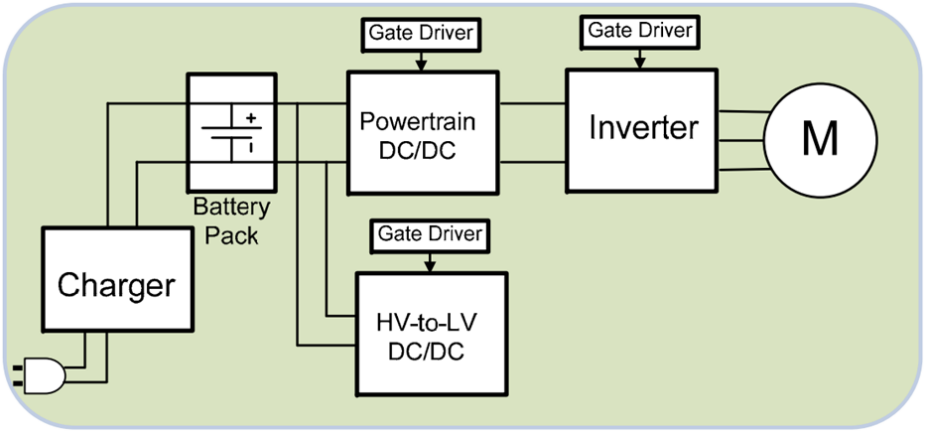
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

High Power Traction Inverter

- **Main Types of Magnetic Components**

Magnetic Components	Main Function	Application Location	Key Material / Characteristics
DC-Link Inductor (Choke)	Reduce DC link ripple current and smooth current	Between DC bus and inverter input	Ferrite, Nanocrystalline, Amorphous Core
Common Mode Choke (CMC)	Suppress common-mode noise and reduce EMI	Inverter output (between inverter and motor) or DC input side	Ferrite Core (MnZn, NiZn), Nanocrystalline
Output Filter Inductor	Suppress AC current ripple supplied to the motor	Inverter output stage	Ferrite, Iron Powder, Nanocrystalline, Amorphous
Transformer (Gate Drive/Isolation)	Provide isolation and power transfer for the gate driver circuit	Gate driver board	Ferrite Core (for high-frequency use)
Current Sensor Core (CT Core)	Current detection (Hall sensor or CT-based)	Inverter output stage and DC link	Silicon Steel, Ferrite
EMI Filter Inductor	Filter electromagnetic interference (EMI) on the input side	DC input section or AC mains interface	Combination of Common Mode and Differential Mode Chokes

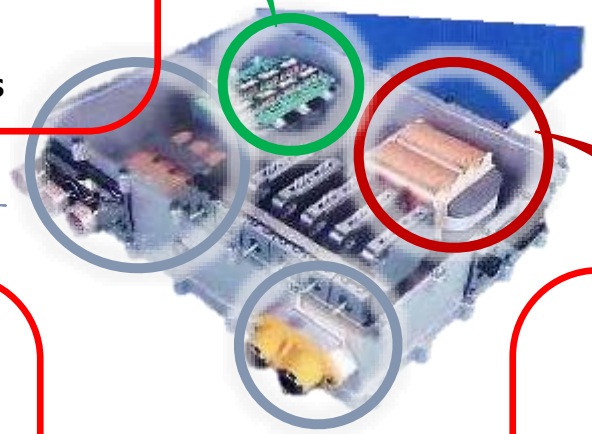


AMOGREENTECH Magnetic Products LINE UP for EV/HEV

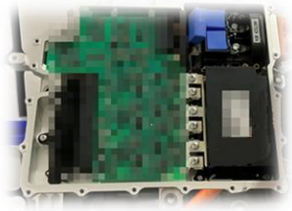
High Power Traction Inverter

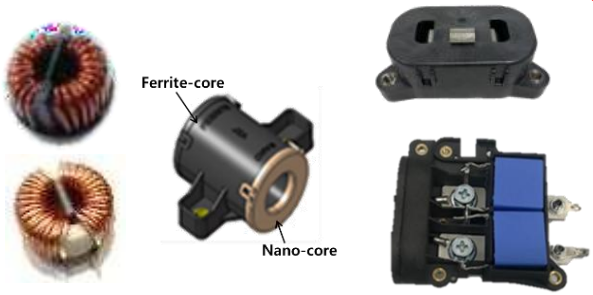
Hall current sensor
- AOLCT-XXA- Series

Reactor part
- Inductor core : ARBC, AMLB, AMCU, APH, APM
- Choke coil : AMC, AMCA



Noise reduction part (=EMI Filter)
- Common mode choke core : AMFN
- Choke coil : AMC, AMCA





Noise filter Module (=EMI Filter)
Common mode choke : ALF
Hybrid Filter : ALC, ALCM

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AMOGREENTECH Magnetic Products LINE UP for EV/HEV

EMI Filter 2 types LINE UP

Features

- High Attenuation
- Wideband Filtering
- Extremely Compact design & Thermal stability
- Operating Temperature: −40℃ to +150 ℃

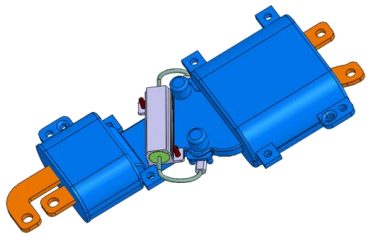
(General Type)

(Hybrid Type)

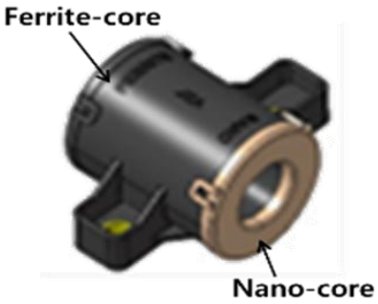
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Hybrid EMI Filter

Nanocrystalline + Amorphous

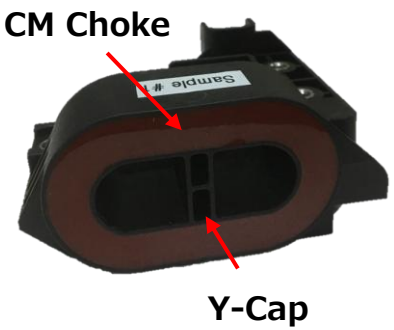


Active EMI FIlter

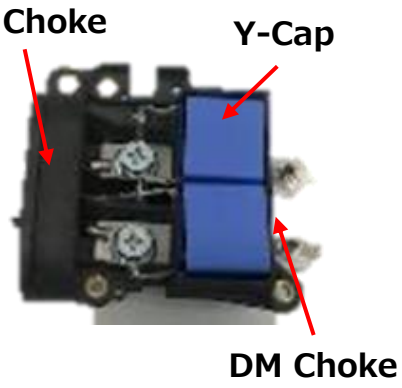


Metal + Ferrite

CM + DM



CM Choke + Y-Capacitor



CM Choke + Capacitor + Busbar + Thermal Plastic

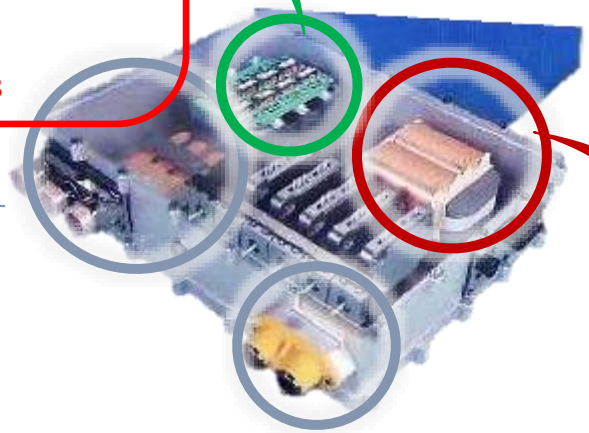
Contents

AMOGREENTECH Magnetic Products LINE UP for EV/HEV

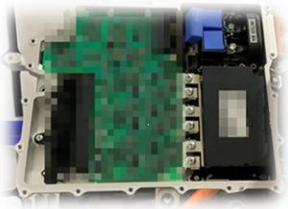
Current Transducer

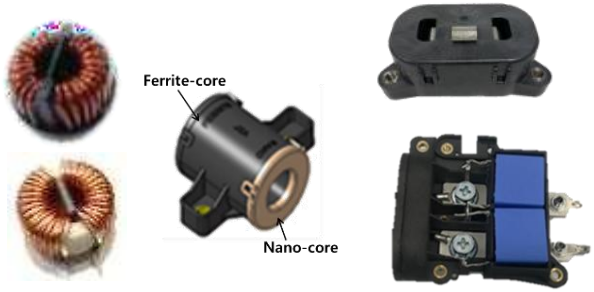
Hall current sensor
- AOLCT-XXA- Series

Reactor part
- Inductor core : ARBC, AMLB, AMCU, APH, APM
- Choke coil : AMC, AMCA



Noise reduction part (=EMI Filter)
- Common mode choke core : AMFN
- Choke coil : AMC, AMCA





Noise filter Module (=EMI Filter)
Common mode choke : ALF
Hybrid Filter : ALC, ALCM

AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Current Transducer LINE UP





Parameter	AOLCT-200A-2C-B	AOLCT-500A-2CD-B	AOLCT-800A-3C-B	AOLCT-1200A-3C-B	AOLCT-1500A-3C-B
Application	Pump Control	BMS	Inverter	Inverter	Inverter
Primary current measuring range	±200A	±20A - ±500A	±800A	±1200A	±1500A
Supply voltage	+5V	+5V	+5V	+5V	+5V
Overall Accuracy	±3.5%	±2.5%	±3.5%	±3.5%	±3.5%
Output	Voltage	Voltage Dual	Voltage	Voltage	Voltage
Frequency bandwidth	30 kHz	70 Hz	40 kHz	40 kHz	40 kHz
Operating temperature	-40℃~125 ℃	-40℃~125 ℃	40℃~150 ℃	-40℃~150 ℃	-40℃~150 ℃

AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Current Transducer LINE UP

SUPPLY CHAIN MANAGEMENT

Allegro and Melexis, Hall IC suppliers, have long-standing relationships and have a stable supply chain. In addition, AMO has its own production system for magnetic cores and PCBs.

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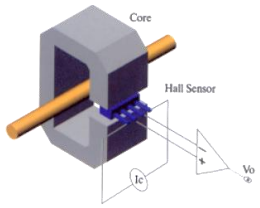
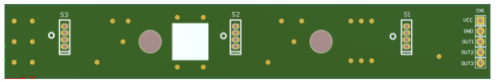
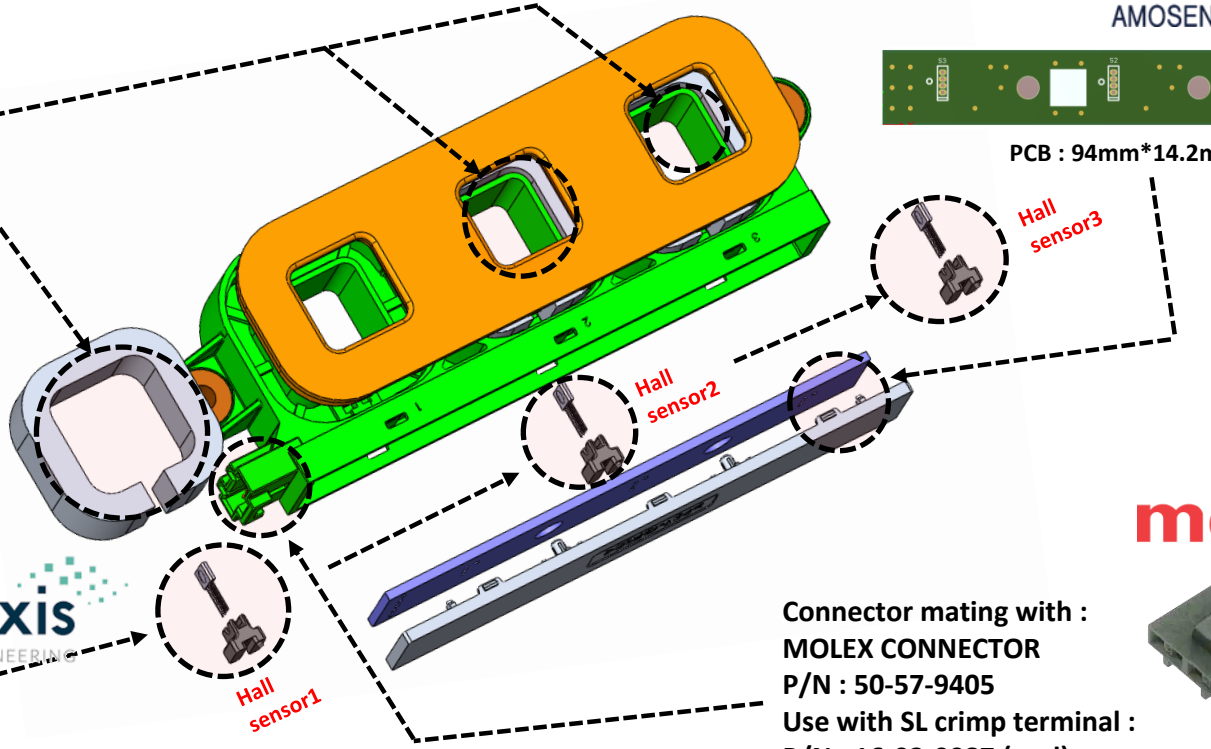
Fe-Si Core 3EA



AMO AMOSENSE



PCB : 94mm*14.2mm 1.6T



ALLEGRO microsystems

Melexis INSPIRED ENGINEERING

ACS70310 - Allegro
MLX91217 - Melexis
Hall sensor 3EA

molex

Connector mating with :
MOLEX CONNECTOR
P/N : 50-57-9405
Use with SL crimp terminal :
P/N : 16-02-0087 (reel)
P/N : 16-02-0103 (bag)

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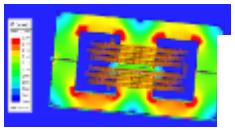
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

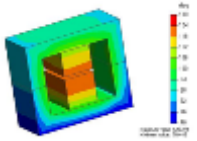
AMO's Key Technologies

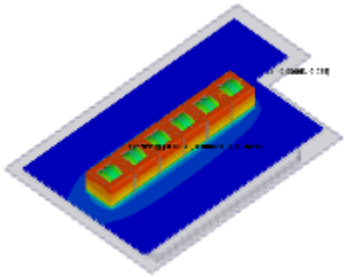
Heat Treatment Know-how (Various materials)

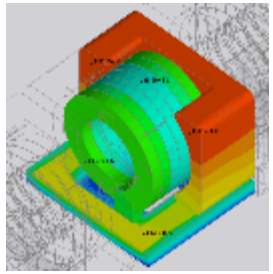
Ribbon Grade	Permeability, μ @100kHz
SS	18,000
SA	23,000
SH	28,000
SU	35,000
SR (under development)	42,000
SL (Low perm.)	20,000

Magnetic and thermal analysis (High efficiency, heat dissipation)

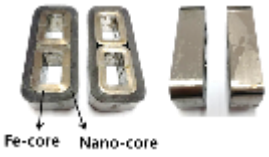








Composite Material / Function Hybrid (Product Responsiveness)



Metal + Ferrite | **CM + DM** | **Choke + Capacitor**

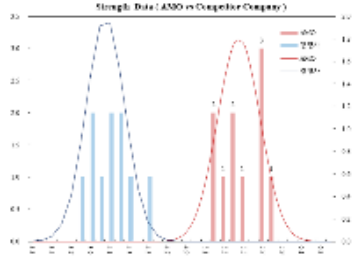
High-temperature reliable Manufacture (high-temperature solidifiers)

Deformation even with a small force

Fragile

Solidified High Strength Core

Sample	AMO 고화제	경쟁사 고화제
1	5.67	3.88
2	5.73	4.47
3	5.18	4.05
4	5.23	4.11
5	5.67	3.95
6	5.42	3.87
7	5.37	4.05
8	5.39	3.79
9	5.63	4.17
10	5.13	4.22
X	5.416	4.075
S	0.219	0.202
Min	5.13	3.79
Max	5.73	4.47

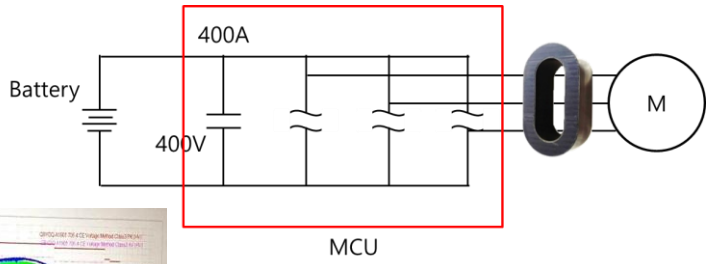


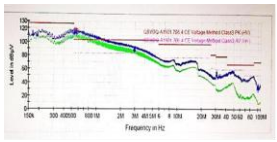
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Why AMO ? ①

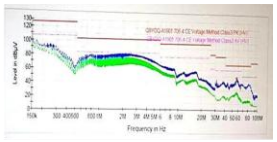
- **Needs and Response about EMI components for EV**

• Higher Output Power • Smaller Size • Higher reliability	→	• Unbalanced Current • Higher Frequency • Bus bar	→	• High DCB CMC • High Perm. • High Impedance

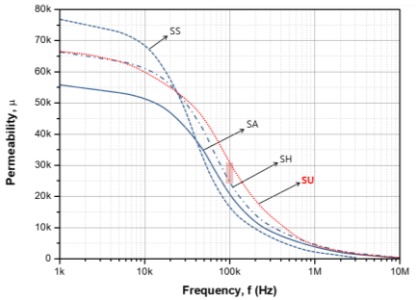


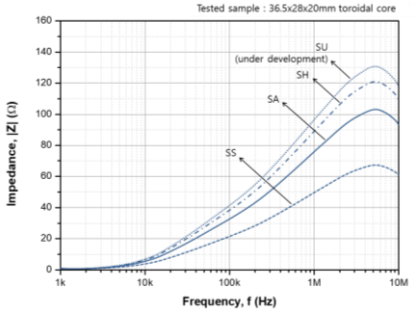


Before



After





- **CMC response to remove EMI without saturation with unbalanced current**
- **SR Grade (permeability over 42,000) high permeability, high impedance**
- **Development of Process Technology with the same characteristics as Toroid in Track Type**

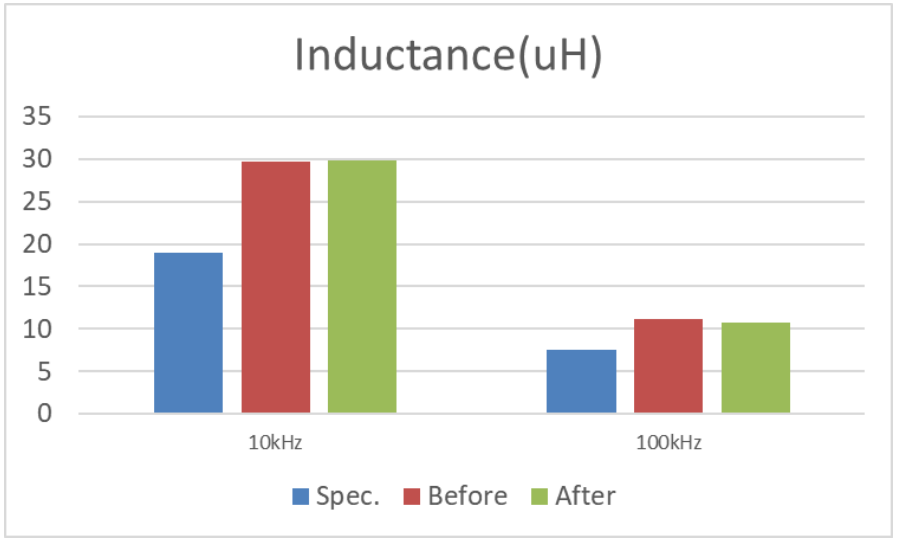
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Why AMO ? ②

- **Passed the high reliability requirements of advanced OEM**

❖ High Temperature Exposure Test

1. Measurement Equipment :	Inductance & Impedance at E4980AL		
2. Condition :	a) Temp : 125°C	b) Test time : 1000 hrs	
3. Spec :	① Inductance L :	>18.92 (uH)	@ f = 10kHz, 0.1V
		> 7.5 (uH)	@ f = 100kHz, 0.1V
	② Impedance Z :	> 6.6 (Ω)	@ f = 100kHz, 0.1V
		> 14.0 (Ω)	@ f = 1MHz, 0.1V
		> 24.9 (Ω)	@ f = 10MHz, 0.1V
4. Evaluation Criteria :	① Inductance L :	>18.92 (uH)	@ f = 10kHz, 0.1V
		> 7.5 (uH)	@ f = 100kHz, 0.1V
	② Impedance Z :	> 6.6 (Ω)	@ f = 100kHz, 0.1V
		> 14.0 (Ω)	@ f = 1MHz, 0.1V
		> 24.9 (Ω)	@ f = 10MHz, 0.1V



❖ Temperature Cycling Test

1. Measurement Equipment :	Inductance & Impedance at E4980AL		
2. Condition :	a) Temp : -40°C ~120°C / 1 cycle		b) Test time : 1000 cycle
3. Spec :	① Inductance L :	>18.92 (uH)	@ f = 10kHz, 0.1V
		> 7.5 (uH)	@ f = 100kHz, 0.1V
	② Impedance Z :	> 6.6 (Ω)	@ f = 100kHz, 0.1V
		> 14.0 (Ω)	@ f = 1MHz, 0.1V
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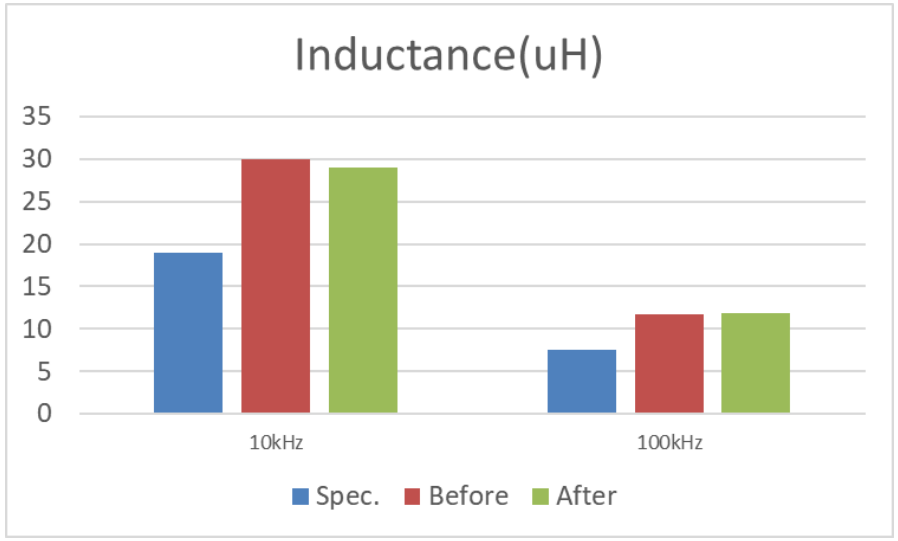
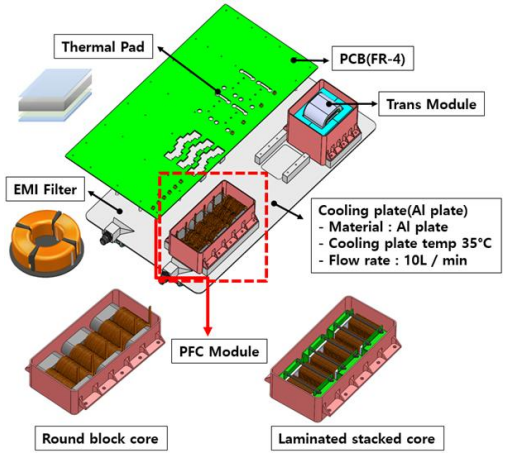
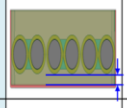
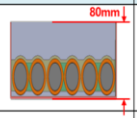
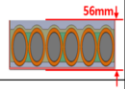
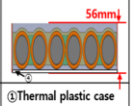


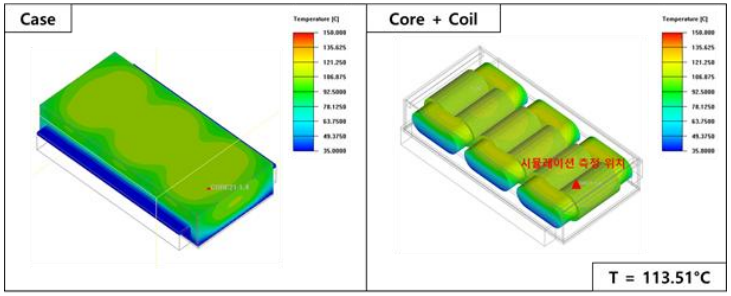
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

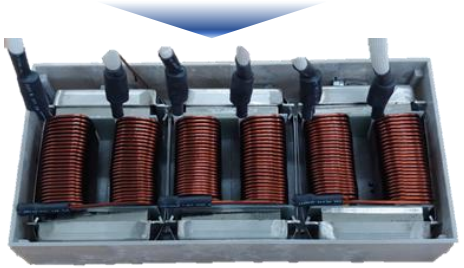
Why AMO ? ③

- Can be **volume down 40%** with Thermal plastic case than Al case because of no need clearance.
- **Reduced the temperature from 734℃ to 113℃** by short distance between coolant and reactor.



	Default	AMO 1	AMO 2	AMO 3
Cross section				
Composition	①Al Case (Emissivity 0.3, 100W/mK) ②Sil gel (0.25W/mK, 100% fill)	①Thermal plastic case (Emissivity 0.8, 3W/mK) ②AMO Sil gel (2.5W/mK, 30% fill) ③Core guide (Thermal plastic, 3W/mK)	①Thermal plastic case (Emissivity 0.8, 3W/mK) ②AMO Sil gel (2.5W/mK, 30% fill) ③Core guide (Thermal plastic, 3W/mK)	①Thermal plastic case (Emissivity 0.8, 3W/mK) ②AMO Sil gel (2.5W/mK, 30% fill) ③Core guide (Thermal plastic, 3W/mK) ④Al plate insert (1.5T, 200W/mK)
Distance core – case	6.0mm	0.5mm	0.5mm	0.5mm
Weight(g) Without Core+Coil	4282.5	5917.5	4142.2	4311.9
Result(°C)	732.24	134.34(-597.9)	136.14(-596.1)	113.51(-618.73)





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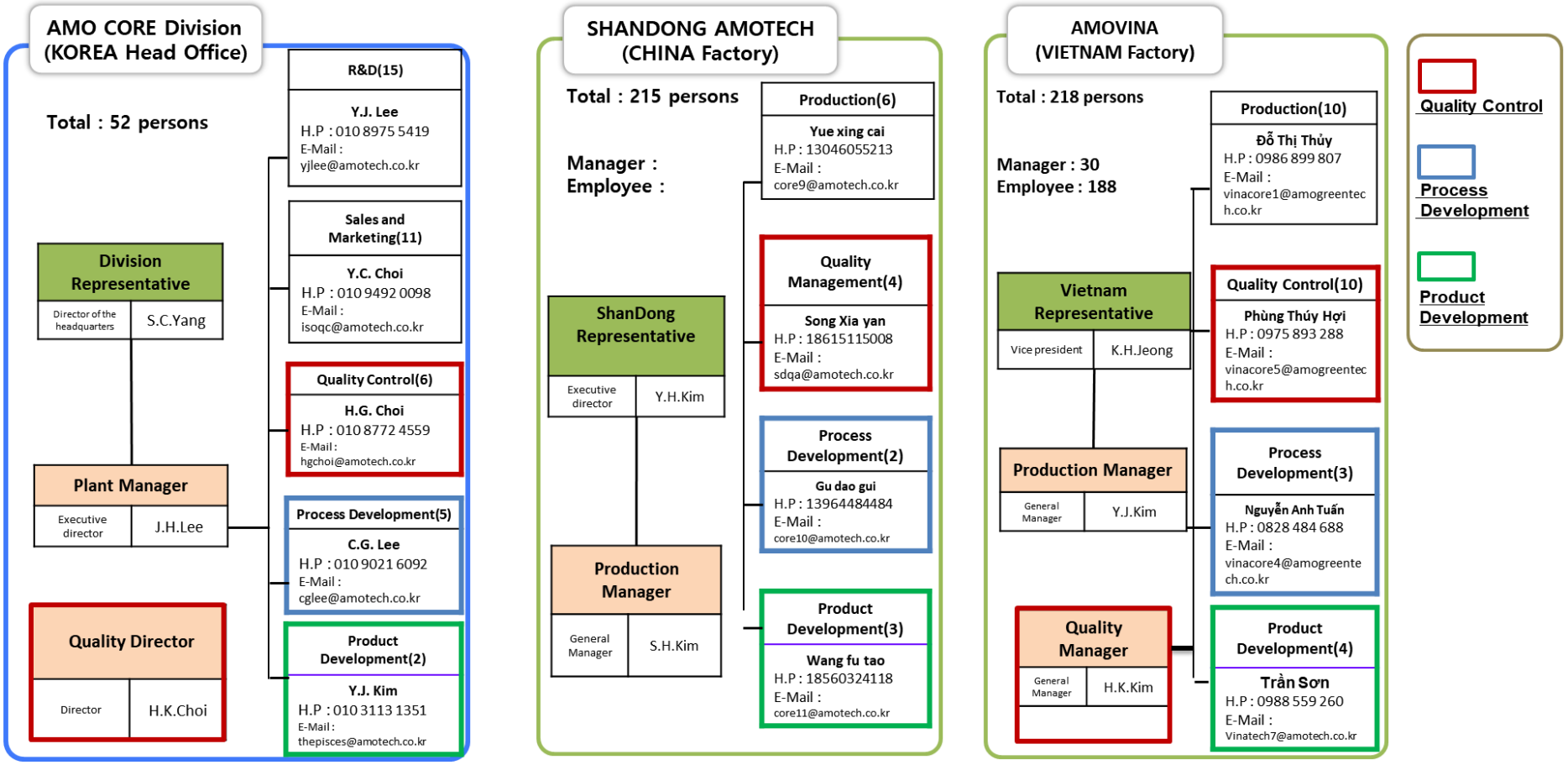
AMOGREENTECH Magnetic Products LINE UP for EV/HEV

Support Organization

- 3 Way Support System



Thank you