

World best Product

Key Components for IT & Energy industry based on advanced materials



Amotech EMC & MLCC solution for Automotive Application_R22

OCT. , 2018



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01

AMOTECH OVERVIEW

BUSINESS AREA

STRENGTH

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SITE LOCATION

EMC TECHNICAL SUPPORT

01

BUSINESS AREA

Global Leader

IT, Automotive, High Efficient Energy & Bio Technologies

AMO
A M O T E C H

Established in Oct, 1994
(Public since 2003')

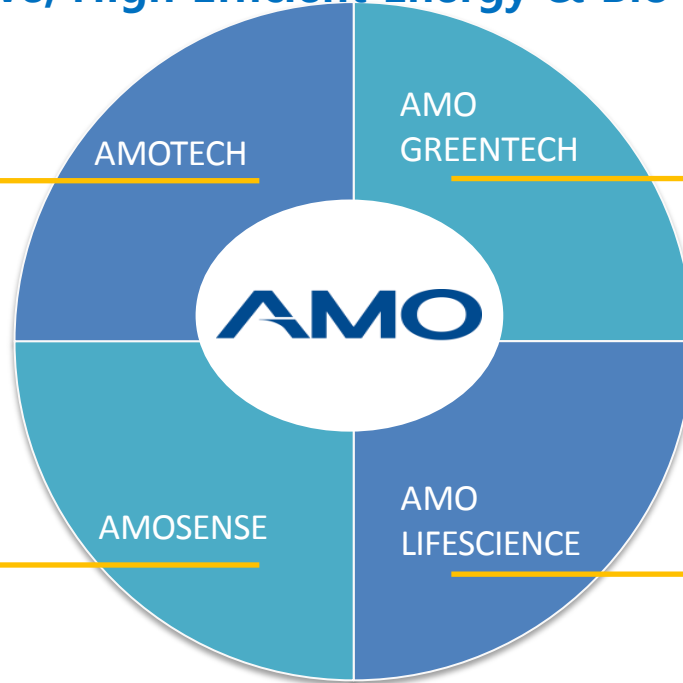
- EMC
(Varistor, EMI Filter, MLCC)
- Antenna
- BLDC Motor

※ Annual sales : \$300 Million

AMO
A M O S E N S E

Established in Nov, 2008

- Wireless Charging
- Ceramic Division
- Packaging Division
- Sensors
- Circuitry
- Integration S/W



AMO
A M O G R E E N T E C H

Established in Jan, 2004

- Amorphous Core
- Nano Fiber
- Thermal Plastic / Materials
- Flexible Battery
- Thin FPCB
- Water Filer

AMO
A M O L I F E S C I E N C E

Established in Sept, 2016

- Cell Culture
- Magnetic Beads
- Wound Patch
- Smart Skin
- E-Health Care Device

Annual sales of 4 affiliates : \$500 Million

01 STRENGTH

01 Material & Process

- Various material in-house system
- Ceramic, Varistor, Ferrite, etc.



01
Material &
Process

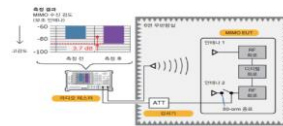
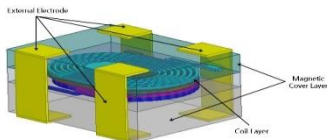
03 Technical support
- Customer-friendly
support

02 Design technology

- R,L,C design library
- Component integration

Customizing
available

03
Technical
support



01

PRODUCT HISTORY

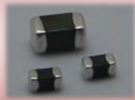
ESD solution

- Chip Varistor
- EMI ESD Filter

Complex solution

- Electric shock Capacitor (for RF)
- Contact Protector

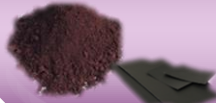
Varistor



Since 2000

Since 2008

Ferrite



Inductor solution

- Ferrite sheet
- Common mode filter

LTCC



Since 2014

Since 2018

MLCC



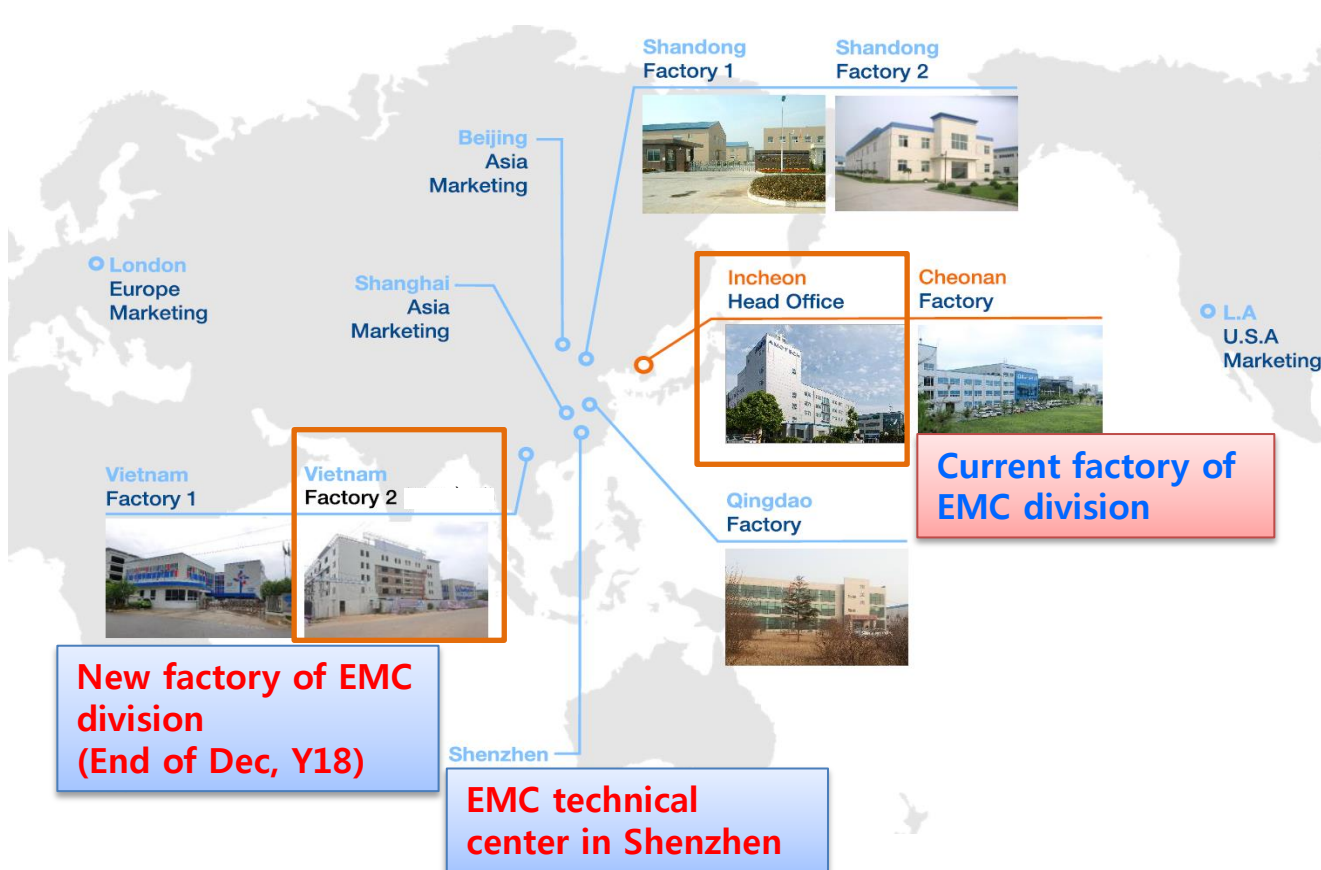
* MLCC

- C0G / X7R / X5R
- High Q / High Voltage / High capacitance



01

SITE LOCATION



EMC head office & factory

- ✓ Chip Varistor
- ✓ EMI ESD filter
- ✓ ESD capacitor
- ✓ MLCC (Small & Medium size)

Vietnam factory

- ✓ Common mode filter
- ✓ ESD Capacitor
- ✓ MLCC (Large size)

02

EMC PRODUCT

EMC PRODUCT LINE UP

APPLICATION MATRIX

KEY PROCESS TECHNOLOGY

DESIGN TECHNOLOGY

02 EMC PRODUCT LINE UP

General part (Pin to Pin)

◆ ESD Suppressor

- Size : 1.0X0.5mm / 1.6X0.8mm
- Part name : AIES
- **Strong point : Open mode, Ultra low cap (0.1pF ↓)**
- Application
 - I2C, UART, Audio, Video, USB line, RF circuit



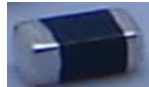
◆ CMF

- Size : 1.2X1.0mm(2ch) / 2.0X1.2mm (4ch)
- Part name : AHFE
- **Strong point : Small package, high attenuation**
- Application
 - HDMI, USB2.0, 3.0, LVDS, MIPI



◆ ESD Varistor

- Size : 1.0X0.5mm / 1.6X0.8mm
- Part name : AVMC
- **Strong point : High temperature – 125°C**
- Application
 - Battery line, Micom power line



Customized part

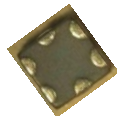
◆ Wideband EMI ESD filter

- Size : 1.6X0.8mm(1ch) / 2.0x1.2mm (4ch)
- Part name : ASF (1ch) ADF (4ch)
- **Strong point : High Performance , ESD protection**
- Application
 - RGB, Single clock, Audio, Ethernet , BT 656



◆ Differential line ESD filter

- Size : 1.2X1.0mm / 2.0X1.2mm
- Part name : AHFE (Common mode)
: ADMF (Differential mode)
- **Strong point : Small package, ESD protection**
- Application
 - HDMI, USB2.0, 3.0, LVDS, MIPI



02

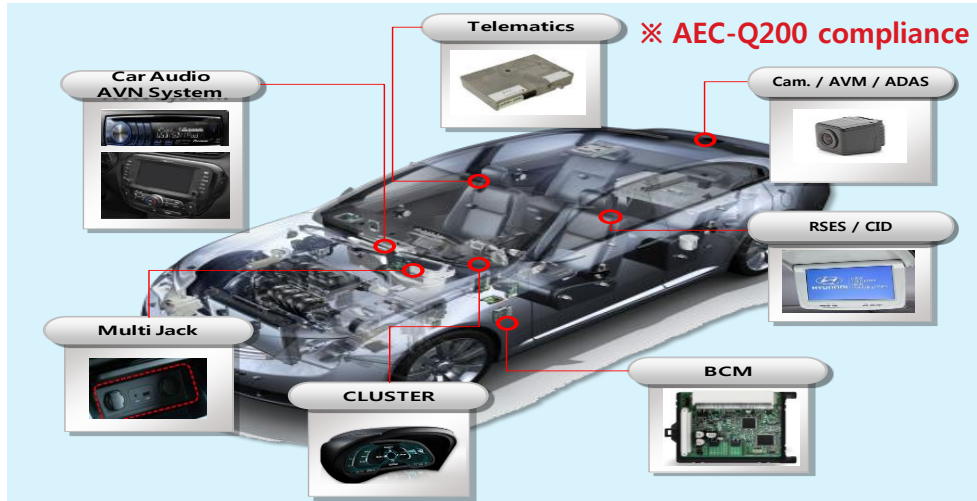
APPLICATION MATRIX

EMI & ESD Solution

Category	EMI / ESD Filter	EMI Single filter	CMF	DMF (Dual mode)
Series name	ADF series	ASF series	AHFE series	ADMF series
Size (mm)	1210/2012	1608	1210/2012	1210/2012

ESD / Surge Solution

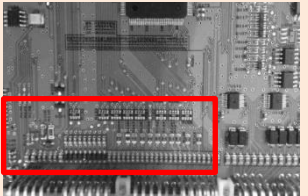
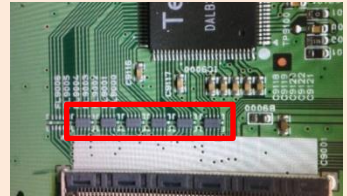
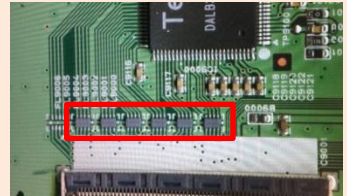
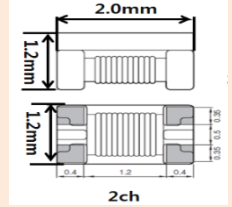
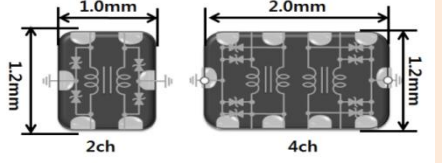
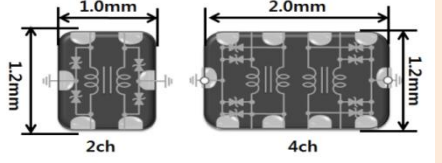
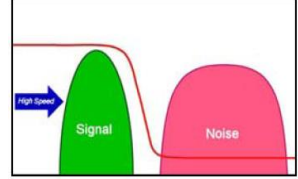
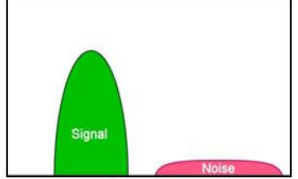
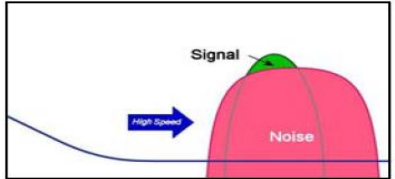
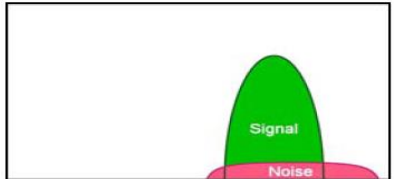
Category	Chip Varistor	ESD suppressor
Series name	AVMC series	AIES series
Size (mm)	1608/2012/	1005, 1608



Application	Function	ESD/EOS		EMI &ESD			
	Internal code	AVMC	AIES	ADF	ASF	ADMF	AHFE
	Type	Varistor	Suppressor	Array Type	Single Type	D.M C.M	C.M
Car Audio	RGB			●	●		
	I/O	●	●				
AVN	LVDS					●	●
	SD card			●		●	
	HDMI		●				●
Multi-jack	USB 2.0		●				●
	Aux	●					
Cluster	RGB			●			
	RMI (Ethernet)			●	●		●
Telematics	RMI (Ethernet)			●	●	●	●
	RGB			●	●		
RSES / CID	LVDS					●	●
	RGB			●	●		
Cam./ AVM / ADAS /	LVDS					●	
	CAN	●					

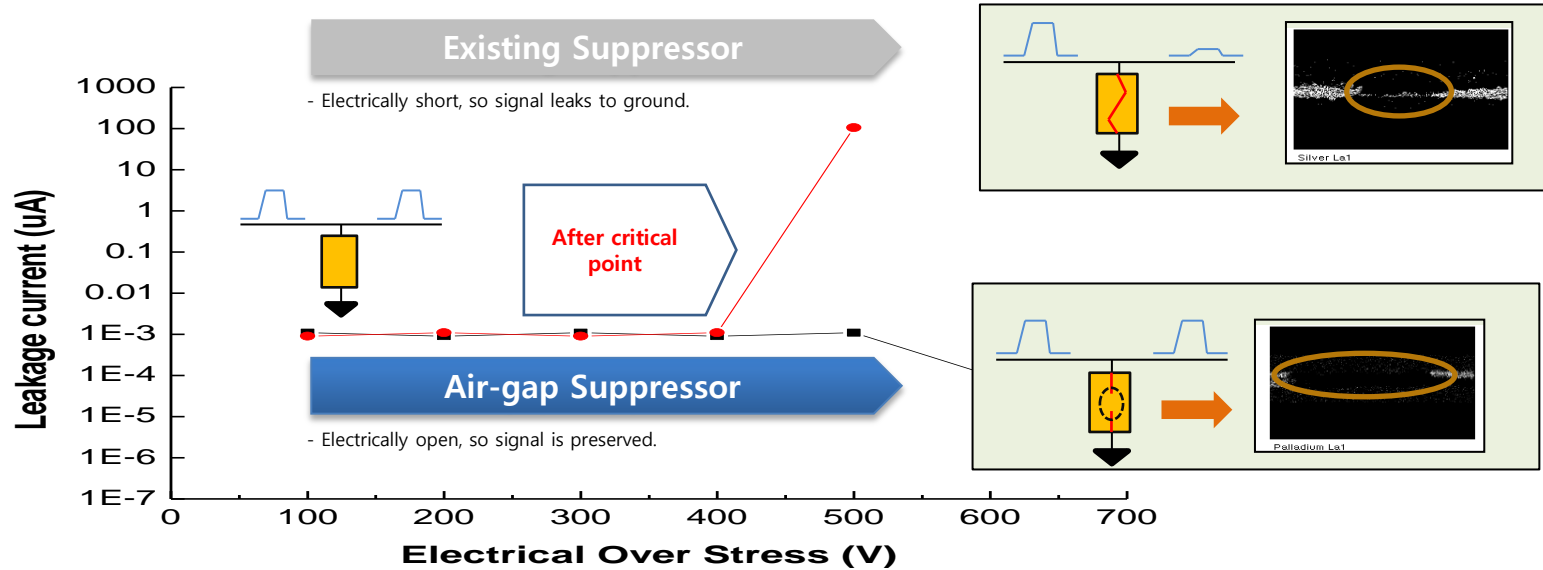
02

DESIGN TECHNOLOGY (High performance)

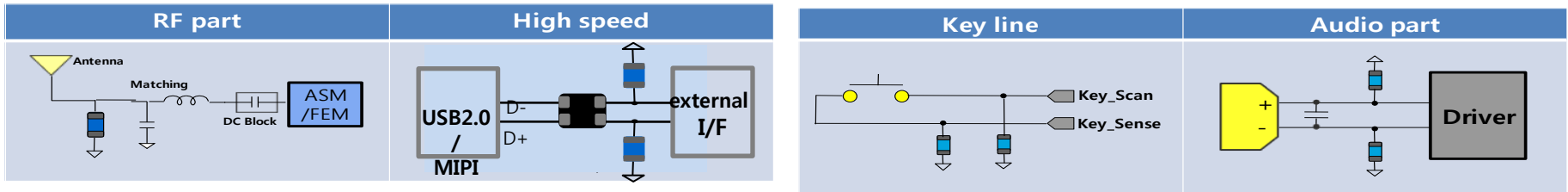
	Parallel – RGB, Single Clock,		Serial – LVDS, USB, HDMI, MIPI	
Amotech	ASF (1ch) ADF (4ch)		AHFE (CMF, 2ch, 4ch) ADMF (DMF, 2ch, 4ch)	
Strong point	<p>RLC solution</p>   <ol style="list-style-type: none"> 1) Small package 2) Wide band noise reduction 3) ESD protection 	<p>Amotech</p> 	<p>Choke coil CMF</p>   <ol style="list-style-type: none"> 1) Small package 2) High attenuation 3) ESD protection 	<p>Amotech</p> 
Feature	<ul style="list-style-type: none"> - High Voltage : 1.3 ~ 2.8 V per each line - When Data rate ↑, Data line ↑ - High EMI noise Radiation 		<ul style="list-style-type: none"> - Low voltage : 0.7 V per each line - When Data rate ↑, Data speed ↑ - Low EMI noise but Common mode noise issue. 	
Noise Solution	<ul style="list-style-type: none"> - EMI noise Filter (RC, LC, RLC filter)  		<ul style="list-style-type: none"> - Common mode noise Filter (CMF)  	

02

DESIGN TECHNOLOGY (ESD SUPPRESSOR)



* This product can be covered at various application.

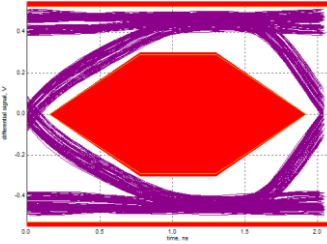
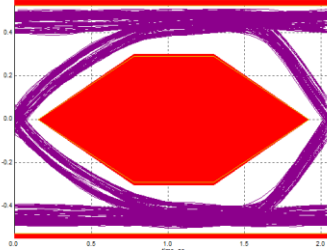
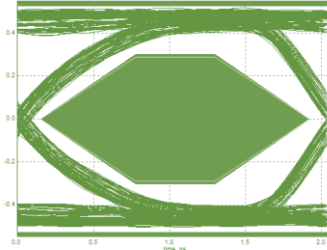
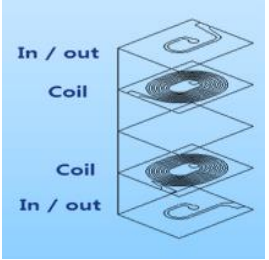
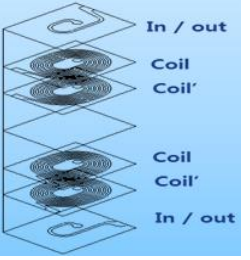



02

DESIGN TECHNOLOGY (4layer low loss CMF)

✓ Development background

- Coverage SI(eye-pattern and packet test) with long cable (1.0m ↑)
- Similar SI performance with choke coil CMF.

ITEM	AHFE 12D 900CL (Amotech old)	ALFL 12D 900ES (Amotech new)	DLW21HN900SQ2 (M : Choke coil)
Rdc [Ω]	5.0 Ω	0.5 Ω	0.3 Ω
EYE test			
Structure			

03 MLCC

MLCC LINE UP

KEY PROCESS TECHNOLOGY

DESIGN TECHNOLOGY

03

MLCC LINE UP

	BME (Ni, Cu base)			PME (AgPd base)	Customized (Multi-functional)
	Small	Medium	Large	High Q & High Voltage	
Size (mm)	0402 – 1005	1608-3225	4532-5750	-	-
Size (inch)	01005 – 0402	0603 – 1210	1812 - 2220	-	-

Spec.

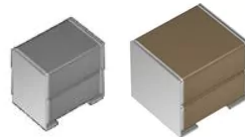
- C0G
- X7R
- Y5R



- C0G
- X7R
- X5R



- C0G



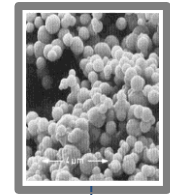
- C0G
- X7R

- ESD Cap (RF)
- Feed Thru Cap



03

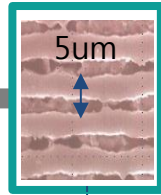
KEY PROCESS TECHNOLOGY



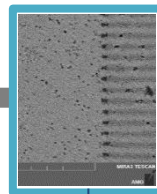
Dielectric Powder



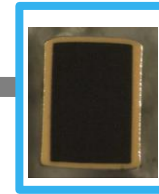
Sheet



Internal electrode



Stacking



Compression

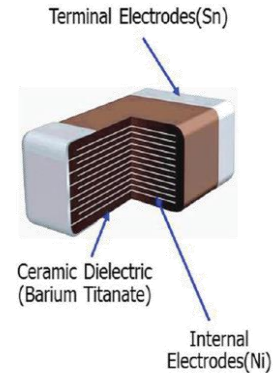


Binder Burnout



Sintering

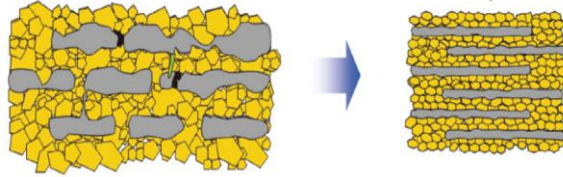
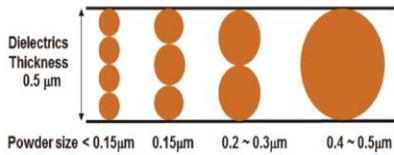
	MLCC	Varistor
Dielectric Powder	50nm	500nm
Sheet	0.5um	15um
Internal electrode	Ni, Cu – 0.5um	Ag, Ag/Pd - 4um
Stacking	400 layers	40 layers
Compression	120°C, 2000 atm	80°C, 400 atm
Binder Burnout	Carbon 10 ppm ↓	Carbon 200ppm
Sintering	300°C/min, Precise deoxidation atmosphere	10°C/min Oxidation atmosphere



03

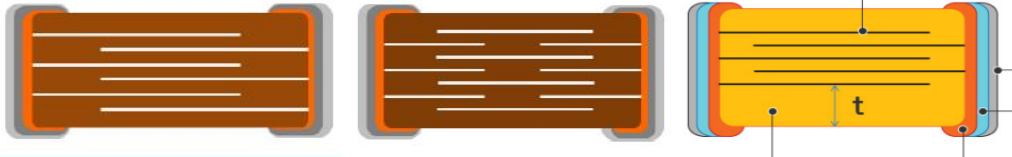
DESIGN TECHNOLOGY

✓ Fine Powder Technology ; Surface area ↓ -> ESR ↓



- DC Bias ↑
- Capacitance ↑
- Reliability ↑
- Short rate ↓

✓ Internal design library



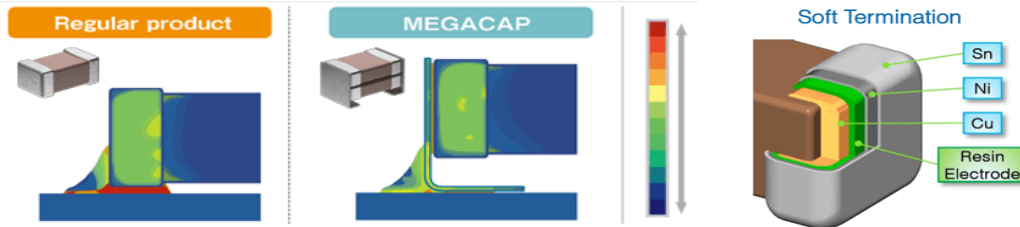
Open

Floating

Acoustic

- Crack rate ↓
- Withstand voltage ↑
- Piezo effect ↓

✓ Terminal Technology ; Metal Terminal, Soft Terminal



Regular product

MEGACAP

Soft Termination

Sn
Ni
Cu
Resin Electrode

- Bending strength ↑
- Chip strength ↑
- Capacitance ↑

04

PRODUCT LINE UP & MP HISTORY

WIDEBAND EMI ESD FILTER

CMF DMF

ESD PROTECTOR

04

WIDEBAND EMI ESD FILTER LINE UP & MP

RLC filter line up

ASF (1ch)	Application	Clock speed	Part No.	Size	DC Resistance	Capacitance @ 1MHz	Insulation Resistance	
	<ul style="list-style-type: none"> • RGB • Ethernet • RMI / RGMII 		70 MHz ↓	ASF 10S 03 065 EF5	1608	32Ω	32.5+32.5 pF	10 MΩ min.
			33MHz ↓	ASF 10S 03 065 EF1	1608	70Ω	32.5+32.5 pF	10 MΩ min.
			33MHz ↓	ASF 10S 03 100 EF1	1608	70Ω	50 + 50 pF	10 MΩ min.
			155MHz ↓	ASF 10S 03 033 F1B	1608	8.5Ω	16.5 + 16.5 pF	10 MΩ min.
			193MHz ↓	ASF 10S 03 025 F1B	1608	8.5Ω	12.5 + 12.5 pF	10 MΩ min.
			255MHz ↓	ASF 10S 03 025 F2B	1608	3Ω	12.5 + 12.5 pF	10 MΩ min.

ADF (4ch)	Application	Clock speed	Part No.	Size	DC Resistance	Capacitance @ 1MHz	Insulation Resistance	
	<ul style="list-style-type: none"> • RGB • Ethernet • RMI / RGMII 		33 MHz ↓	ADF 10S 05Q 080 EF2	2012 mm	80Ω	40 + 40 pF	1.0 MΩ min.
			33 MHz ↓	ADF 10S 05Q 100 EF2	2012 mm	70Ω	50 + 50 pF	1.0 MΩ min.
			65 MHz ↓	ADF 10S 05Q 050 EF1	2012 mm	30Ω	25 + 25 pF	1.0 MΩ min.
			65 MHz ↓	ADF 10S 05Q 050 EF2	2012 mm	20Ω	25 + 25 pF	1.0 MΩ min.

RLC filter MP

	Tier1	End customer	Application	Part No.
ASF	GNSD	Citroen / Mitsubishi / Nissan	AVN	ASF 10S 03 065 EF5
	GNSD	Nissan	POC camera	ASF 10S 03 025 F2B
	Delphi	Shanghai GM	Telematics box (RGMII)	ASF 10S 03 033 F1B
	Pioneer	-	AVN	ASF 10S 03 025 F1B
	LG	GM	Telematics box (MII)	ASF 10S 03 100 EF1
ADF	Hyundai	Hyundai	AVN Gen 4.0	ADF 10S 05Q 080 EF2
			AVN Gen 3.0	ADF 10S 05Q 080 EF2
	Toppower	Chery	AVN	ADF 10S 05Q 050 EF2
	GNSD	Jaguar / Landrover	AVN	ADF 10S 05Q 080 EF2
	HJ	Ssangyong/ Mitsubishi	AVN	ADF 10S 05Q 080 EF2
	Korea hitech	Mobis / Geely	Multi-jack	ADF 10S 05Q 080 EF2
	JC Hyun	Hyundai	Camera	ADF 10S 05Q 080 EF2
	HJ Automotive	Nissan / Mitsubishi / GM	AVN	ADF 10S 05Q 080EF2
	Digen	Mobis / SsangYong / Mahindra	AVN	ADF 10S 05Q 080 EF2
	GNSD	Citroen / Mitsubishi / Nissan	AVN	ADF 10S 05Q 050 EF1

04

CMF & DMF LINE UP & MP HISTORY

CMF / DMF line up

CMF	Application	Part No.	Size	Rated Voltage	Common Impedance @ 100 MHz	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
	<ul style="list-style-type: none"> HDMI USB2.0, 3.0 LVDS MIPI 	AHFE12D 350CL	1210	5 V	35 Ω	3 Ω max.	1.2 pF max.	10 MΩ min.
	AHFE12D 900CL	1210	5 V	90 Ω	5 Ω max.	1.7 pF max.	10 MΩ min.	
	AHFE12D 121CL	1210	5 V	120 Ω	5 Ω max.	1.7 pF max.	10 MΩ min.	
	AHFE20Q 101ES	2012	5 V	100 Ω	4 Ω max.	1.2 pF max.	10 MΩ min.	

DMF	Application	Part No.	Size	Rated Voltage	Varistor Voltage @ 1mA	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
	<ul style="list-style-type: none"> HDMI USB2.0, 3.0 LVDS MIPI 	ADMF 12D 065 F08	1210	10 V	25±5 V	14±5 Ω	65 pF±30%	10 MΩ min.
	ADMF 12D 022 F3B	1210	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.	
	ADMF 20Q 022 F3B	2012	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.	
	ADMF 16Q 022 F3B	1608	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.	

CMF MP

	Tier1	End customer	Application	Part No.
CMF	LGE VC	Geely	Digital Cluster	AHFE 20Q 101 EL
		Daimler / BMW	CID	AHFE 20Q 101 EL
		BMW / JAC / GEELY	HUD	AHFE 20Q 101 EL
	Daesung eltech	Honda	AVN	AFFE 12D 900 CL
		Alpine / Honda / Renault	AV, AVN, MONITOR, Multi-box	AHFE 20Q 101 ES
				AHFE 12D 900 CL
				AHFE 12D 350 CL
	HJ	Ssangyong / Mitsubishi	AVN	AHFE 12D900 CL
	Korea hitech	Mobis / Geely	Multi-jack	AHFE 12D 900 CL
	KET	Mobis	Multi-jack	AHFE 12D 900 CL
	JC HYUN	Hyundai	Camera	AHFE 12D 900 CL
	HJ Automotive	Nissan / Misubishi / GM	AVN	AHFE 12D 350 CL
BYD	BYD	AVN	AHFE 12D 900 CL	
Lanyou	Nissan	Telematics box	AHFE 12D 900 CL	

04

ESD PROTECTOR LINE UP & MP HISTORY

ESD protector line up

	Application	Part No.	Size	Rated Voltage	Clamping Voltage	Capacitance	Destruction mode
AIES	<ul style="list-style-type: none"> I²C UART Audio, video USB line RF circuit 	AIES 12U 02 AG1	1005 mm	12V	40V typ.	0.1 pF typ.	
		AIES 24U 02 CG2	1005 mm	24V	35 V typ.	0.1 pF typ.	
		AIES 24U 03 AG1	1608 mm	24V	45 V typ.	0.1 pF typ.	

	Application	Part No.	Size [mm]	Varistor Voltage [V]	Capacitance @ 1kHz [pF]	Clamping Voltage @ 1A, 8/20us pulse [V]	I _{max} @ 8/20us pulse [A]
AVMC	Battery line	AVMC 18S 03 120	1608	24.5	120	40	30
		AVMC 18S 03 220		24.5	200	40	60
		AVMC 18S 05 400	2012	24.5	400	40	120
	Micom Power line	AVMC 5S 03 500	1608	12	500	25	30

ESD protector MP

	Tier1	End customer	Application	Part No.
AIES	Hyundai automotive	Hyundai automotive	USB 2.0 line AVN	AIES 24U 03 AG1
			GPS line AVN	AIES 24U 03 AG1
			FM line AVN	AIES 24U 03 AG1
			Mic line AVN	AIES 24U 03 AG1
			Speaker line AVN	AIES 24U 03 AG1
			LVDS line AVN	AIES 24U 03 AG1
	BYD	BYD	USB 2.0 line AVN	AIES 12U 02 AG1
Kaiue	Changhe	I ² C, UART, Audio, video, USB line, RF circuit	AIES 24U 03 AG1	
Lanyou	Nissan	Telematics box antenna	AIES 12U 02 AG1	
AVMC	Lanyou	Nissan	Telematics Canbus line	AVMC 18S 03 120

05

EMC TECHNICAL SUPPORT

TECHNICAL SUPPORT OVERVIEW

RE & CE CHAMBER SCHEDULE

SIGNAL INTEGRITY & COMPLIANCE TEST

TRANSIENT TEST

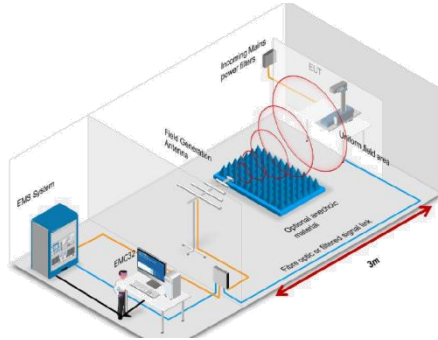
RE & CE test

NEAR FIELD SCAN TEST

05

TECHNICAL SUPPORT OVERVIEW

Signal integrity, ESD RE, CE
3rd party certification

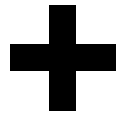


- Radiated & conducted emission test

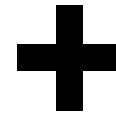


- Nearfield scanning test for debugging and analysis

Signal Integrity & Compliance Test






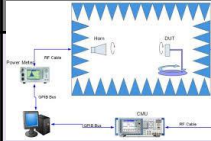
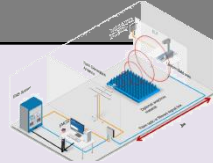

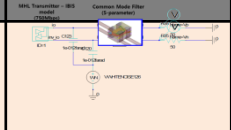
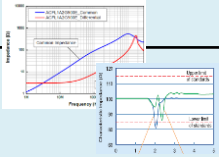
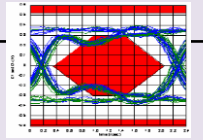
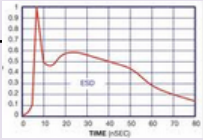

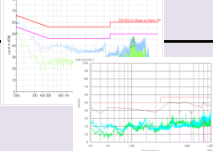
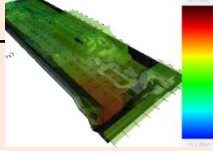
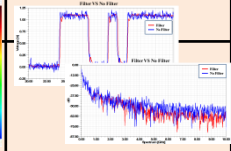
ESD Transient



RF test

05

TECHNICAL SUPPORT OVERVIEW

Test	Reference	Compliance & Certification				Debugging & Analysis	
Application	Component level	Signal Integrity & Compliance Test	Transient	RF	EMI (RE/ CE)	Near Field Noise Scan	EM Simulation
Configuration							
Result							
Instruments	<ul style="list-style-type: none"> ▪ Network Analyzer - 5071B/C ▪ Impedance Analyzer - E4991B, E4294A ▪ Oscilloscope - 86100C7 ▪ Generator 	<ul style="list-style-type: none"> ▪ Oscilloscope - DSA-X 91304A - DSO90804A ▪ Compliance test S/W - MIPI - HDMI 1.4 ~ 2.0 - USB 2.0 ~3.1 - eDP, MyDP 	<ul style="list-style-type: none"> ▪ ESD Simulator ▪ Surge Generator ▪ TLP Test System ▪ Impulse Noise Simulator 	<ul style="list-style-type: none"> ▪ Anechoic Chamber ▪ Communication Tester - MT8820C - CMU 200 	<ul style="list-style-type: none"> ▪ 3m EMI Chamber - CISPR13, 25, 14, 32 ▪ EMI Receiver ▪ Shield Room 	<ul style="list-style-type: none"> ▪ EMI Canner - APREL EMI sight - Denso 6 axis Robot ▪ Real Time Spectrum Analyzer - N9020A - RSA5106A 	<ul style="list-style-type: none"> ▪ EM Simulation - Ansys HFSS, Q3D - CST MWO ▪ 2D Simulation - Ansys Designer - Keysight ADS ▪ Cadence Allegro

05

RE & CE CHAMBER SCHEDULE

1. Supportable TEST List : Mobile/ Automotive RE, CE test
2. Chamber Standard :
 - Regular 3M chamber : CISPR25 Standard - Radiated Emission test
 - Shield Room : Conducted Emission test
3. Support available standard : CISPR13, 25, 14, 32


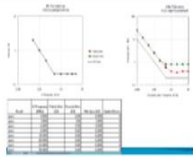


Standard	Contents	Remarks
CISPR 13	Sound and television broadcast receivers and associated equipment	
CISPR 25	Vehicles, boats and internal combustion engines	
CISPR 14	Requirements for household appliances, electric tools and similar apparatus	
CISPR 32	Electromagnetic compatibility of multimedia equipment	

4. Set-up Schedule


	Aug		Sep			
	4wk	5wk	1wk	2wk	3wk	4wk
Test instrument set up	→					
DATA correlation with 3rd party		→				
Test run					→	

05 SI & COMPLIANCE TEST

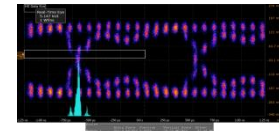
Transmission & receiver test

	Transmission Test (TX)	Receiver Test (RX)
Soft Ware	 <p>USB3.0 TX Compliance test</p>	 <p>USB3.0 RX Compliance test</p>
Hard Ware	 <p>Oscilloscope (13GHz) Test fixture & Accessory</p>	 <p>J-Bert (Jitter Injection) Test fixture & Accessory</p>

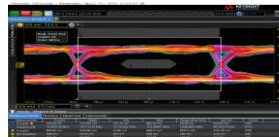
Support application



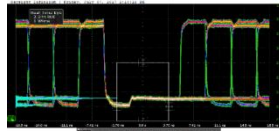
TDR



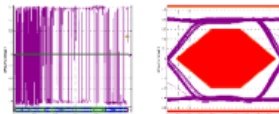
MIPI



LVDS



HDMI 1.4



USB EYE & Packet

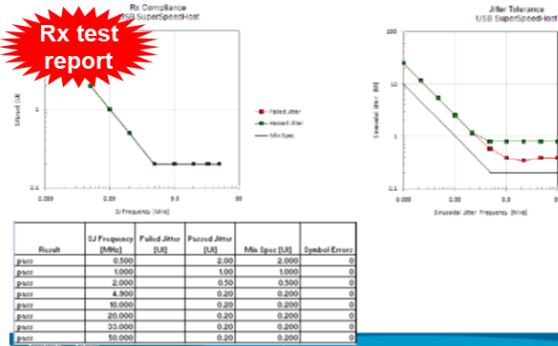
Tx test report

USB 3.0 Superspeed PHY Test Report

Overall Results: 2 of 14 Tests Failed

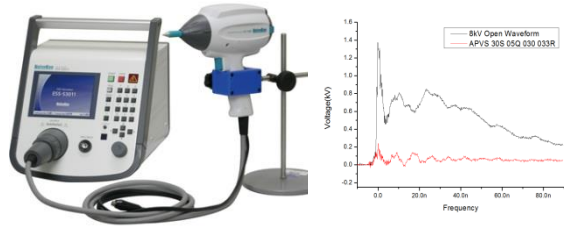
Pass #	Failed #	Trials	Test Name
✓	0	1	LFPS Peak-Peak Differential
✓	0	1	LFPS Period (Offsets)
✓	0	1	LFPS Burst Width (Bursts)
✓	0	1	LFPS Burst Time Interval
✓	0	1	LFPS Rise Time
✓	0	1	LFPS Fall Time
✓	0	1	LFPS Duty Cycle
✗	1	1	Link Interval (Link SSC)
✗	1	1	SSC Deviation
✓	0	1	Far End Connection Inter
✓	0	1	Far End Maximum Deterministic Inter
✓	0	1	Far End Total Inter at SSC=12
✓	0	1	Far End Termination Test

Rx test report



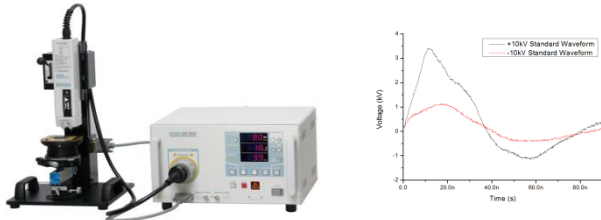
05 TRANSIENT TEST

■ ESD (HBM mode)



- ESD Generator + Scope

■ ESD (HBM / MM mode)

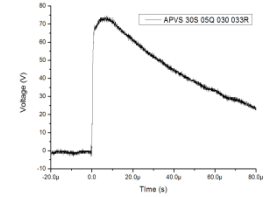


- ESD Generator + Scope

ESD mode

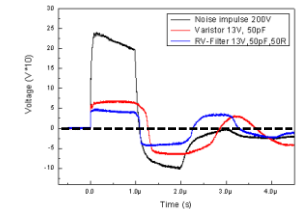


■ Surge immunity



- Surge Generator + DUT + Scope

■ Noise immunity

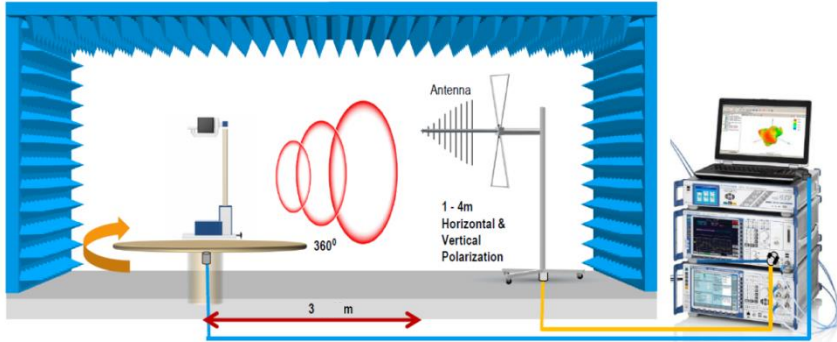


- Noise impulse Simulator + Scope

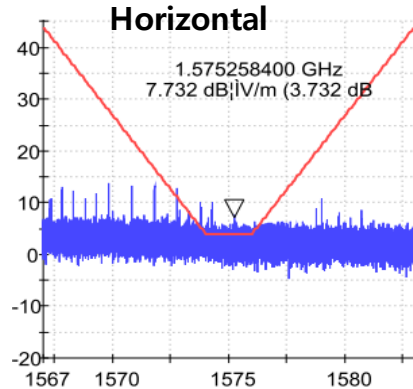
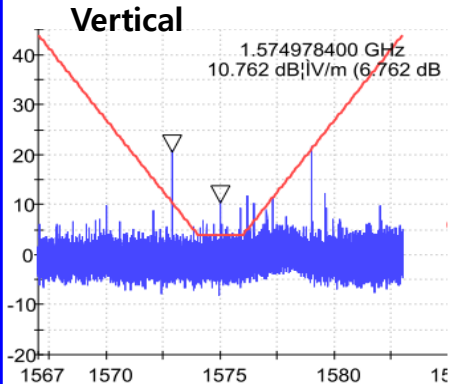
05

RE & CE TEST

■ Radiated emission test



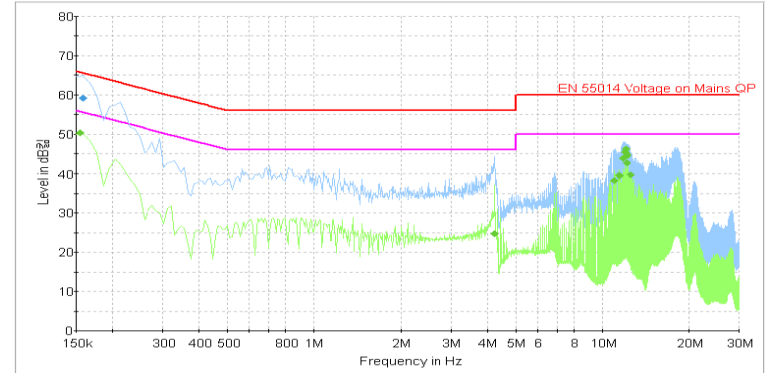
■ Test report



■ Conducted Emission



■ Test report



05 NEAR FIELD SCAN TEST

■ Near field scan for debugging

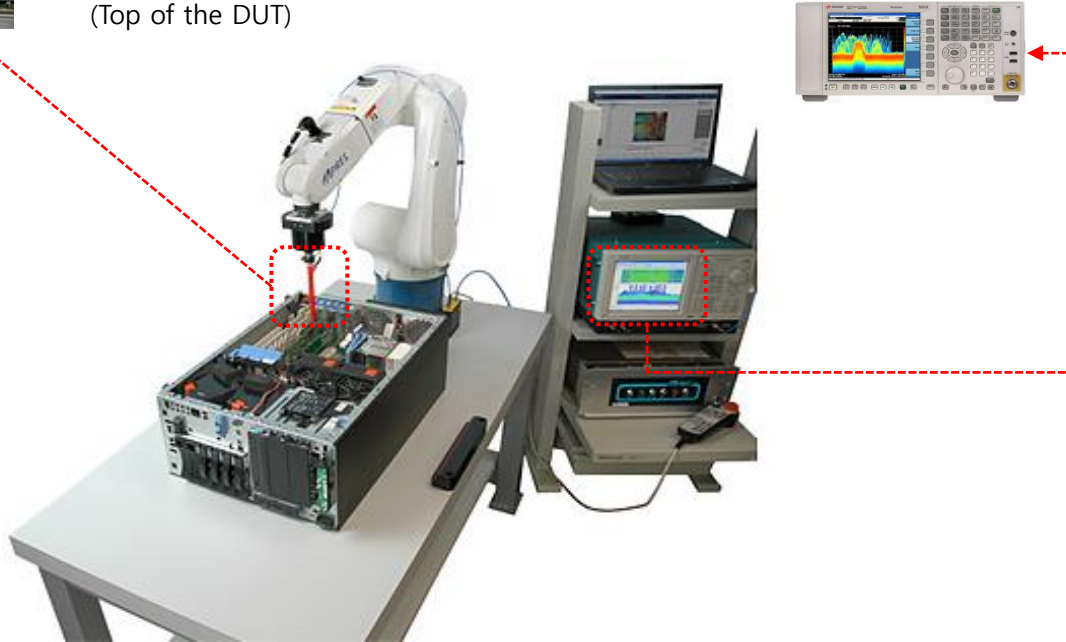


Probe Measuring System

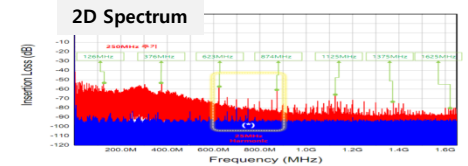
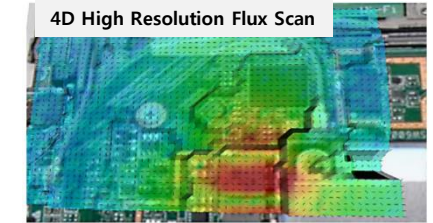
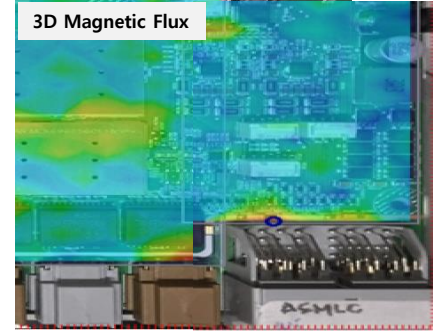
- Automatic height recognition
- X, Y, Z Electric & Magnetic Probe
- Measure 1mm above the floor (Top of the DUT)

Keysight N9020A-Real Time (2kHz ~ 8GHz)

- Fastest Measurement system
- Real time Spectrum Analysis



■ Test type



06 Appendix

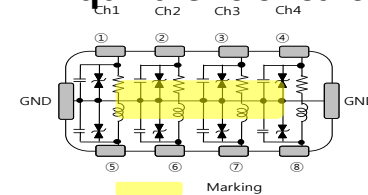
Product line-up (ADF series)

Pi type R,L,C network

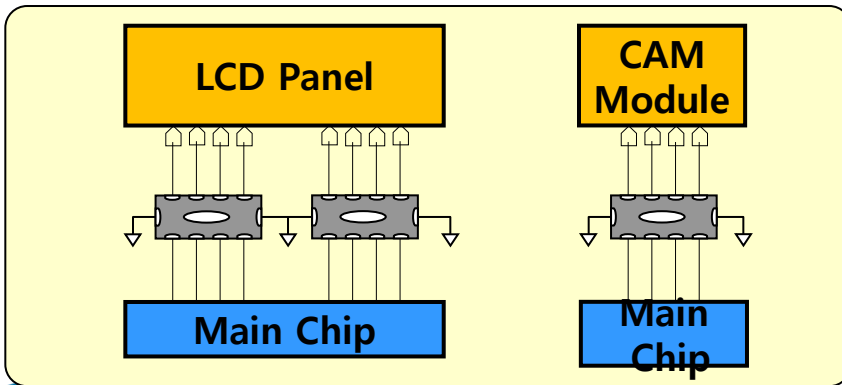
High EMI/ESD performance

Wide band attenuation

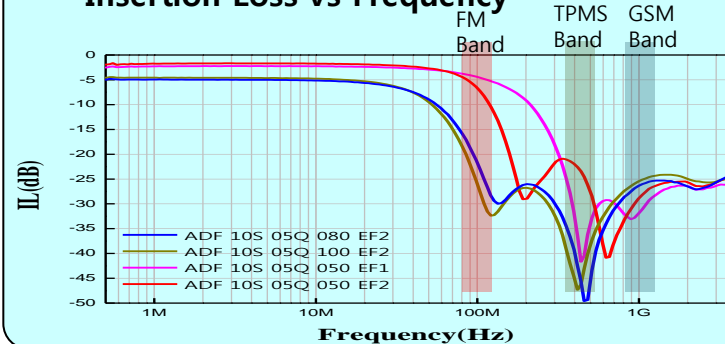
✓ Equivalent circuit



Application	Clock speed	Part No.	Size	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
<ul style="list-style-type: none"> • RGB • Ethernet • RMII 	33 MHz ↓	ADF 10S 05Q 080 EF2	2012 mm	80Ω	40 + 40 pF	1.0 MΩ min.
	33 MHz ↓	ADF 10S 05Q 100 EF2	2012 mm	70Ω	50 + 50 pF	1.0 MΩ min.
	65 MHz ↓	ADF 10S 05Q 050 EF1	2012 mm	30Ω	25 + 25 pF	1.0 MΩ min.
	65 MHz ↓	ADF 10S 05Q 050 EF2	2012 mm	20Ω	25 + 25 pF	1.0 MΩ min.



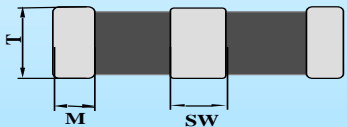
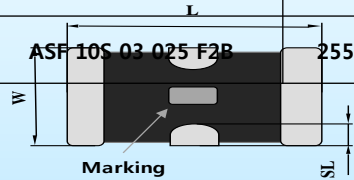
Insertion Loss vs Frequency



Product line-up (ASF series)

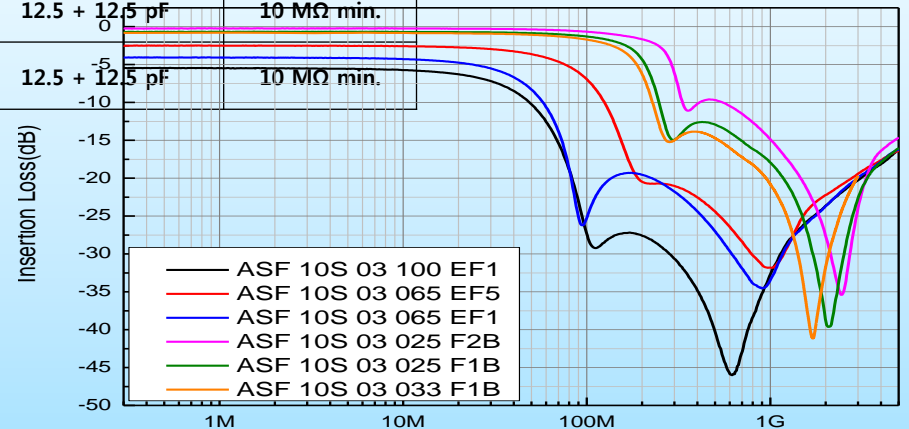
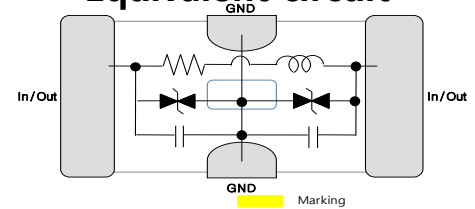
Single Clock solution (around Main IC)

Part No.	Clock speed	Size	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
ASF 10S 03 100 EF1	33MHz ↓	1608 mm – 1ch	70Ω	50 + 50 pF	10 MΩ min.
ASF 10S 03 065 EF5	70 MHz ↓	1608 mm – 1ch	32Ω	32.5+32.5 pF	10 MΩ min.
ASF 10S 03 065 EF1	33MHz ↓	1608 mm – 1ch	70Ω	32.5+32.5 pF	10 MΩ min.
ASF 10S 03 033 F1B	155 MHz ↓	1608 mm – 1ch	8.5Ω	16.5 + 16.5 pF	10 MΩ min.
ASF 10S 03 025 F1B	193 MHz ↓	1608 mm – 1ch	8.5Ω	12.5 + 12.5 pF	10 MΩ min.
ASF 10S 03 025 F2B	255 MHz ↓	1608 mm – 1ch	3Ω	12.5 + 12.5 pF	10 MΩ min.



Item	Size (mm)
L	1.6±0.10
W	0.8±0.10
T	0.6±0.10
M	0.2±0.10
SW	0.3±0.10
SL	0.15±0.05

✓ Equivalent circuit

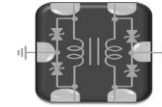


Product line-up (AHFE series)

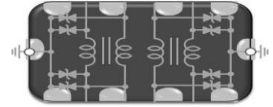
High attenuation under 1GHz

Stable ESD performance

✓ Equivalent circuit

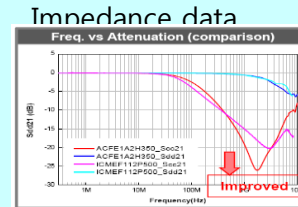
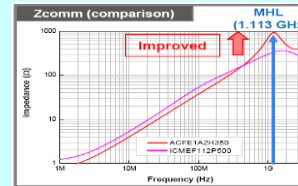
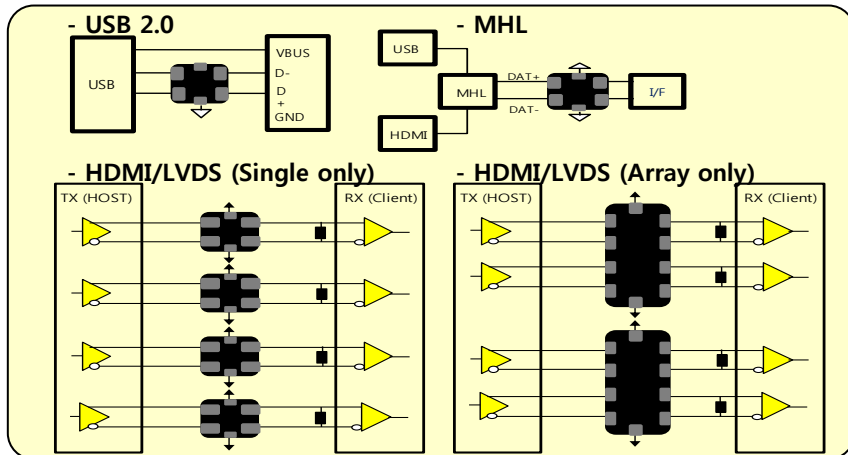


1210 mm – 1pole

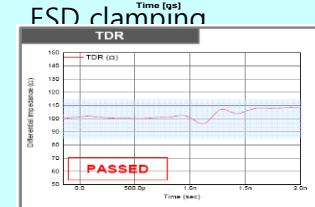
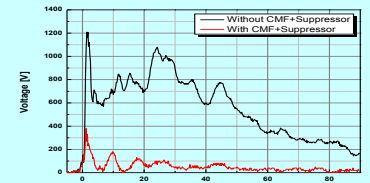


2012 mm – 2pole

Application	Part No.	Size	Rated Voltage	Common Impedance @ 100 MHz	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
LVDS, USB 2.0, up to HDMI 1.4b	AHFE12D 350CL	1210mm	5 V	35 Ω	3 Ω max.	1.2 pF max.	10 MΩ min.
LVDS, USB 2.0, up to HDMI 1.4a	AHFE12D 900CL	1210mm	5 V	90 Ω	5 Ω max.	1.7 pF max.	10 MΩ min.
LVDS, USB 2.0, up to HDMI 1.4a	AHFE12D 121CL	1210mm	5 V	120 Ω	5 Ω max.	1.7 pF max.	10 MΩ min.
LVDS, USB 2.0, up to HDMI 1.4a	AHFE20Q 101ES	2012mm (Array)	5 V	100 Ω	4 Ω max.	1.2 pF max.	10 MΩ min.



S- Parameter



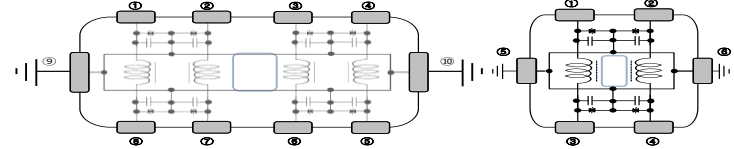
TDR Parameter

Product line up (ADMF Series)

D.M & C.M noise reduction

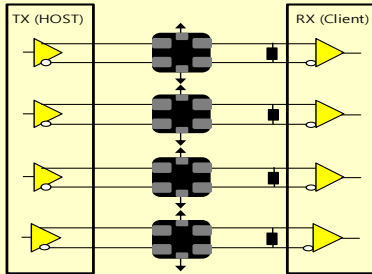
High cut-off Frequency

✓ Equivalent circuit

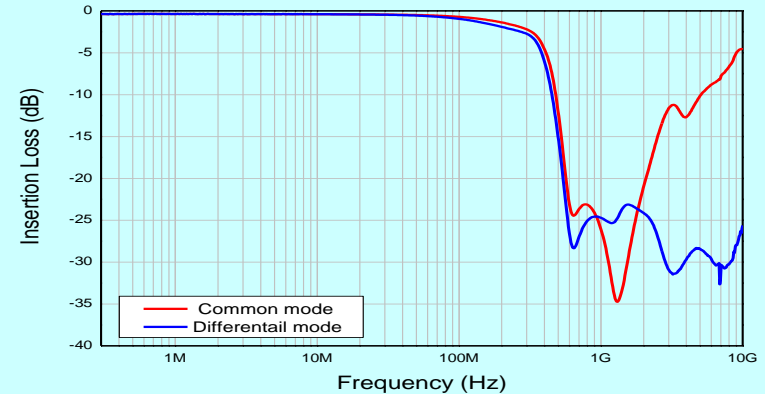
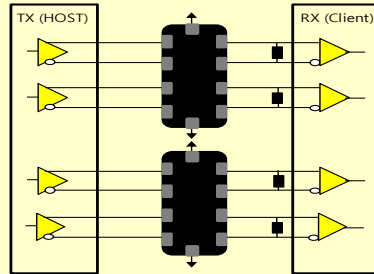


Application	Clock speed	Part No.	Size	Rated Voltage	Varistor Voltage @ 1mA	DC Resistance	Capacitance @ 1MHz	Insulation Resistance
LVDS	80 MHz ↓	ADMF 12D 065 F08	1210 mm	10 V	25±5 V	14±5 Ω	65 pF±30%	10 MΩ min.
	200 MHz ↓	ADMF 12D 022 F3B	1210 mm	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.
	200 MHz ↓	ADMF 20Q 022 F3B	2012 mm	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.
	200 MHz ↓	ADMF 16Q 022 F3B	1608 mm	10 V	25±5 V	4±2 Ω	22 pF±30%	10 MΩ min.

- LVDS (Single type)



- LVDS (Array type)

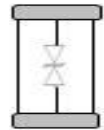


AIES Series - ESD solution for High Speed

Ultra low capacitance (0.1pF)

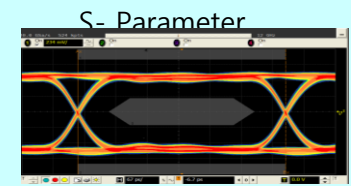
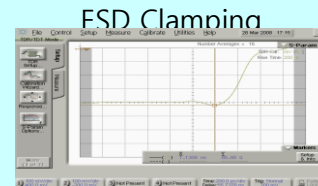
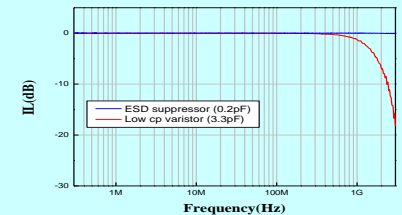
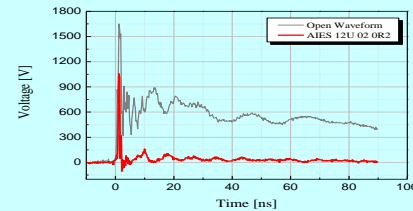
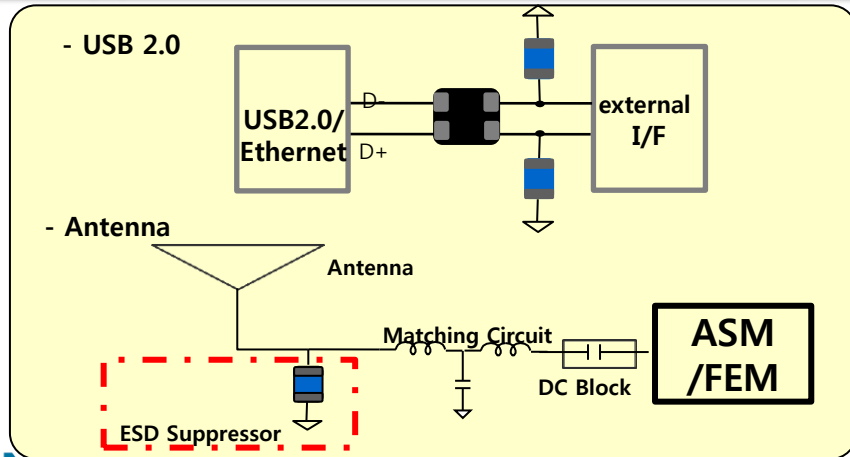
Destruction mode is open type

- Application : Touch Key, USB2.0, RF circuit



Part No.	Size	Rated Voltage	Clamping Voltage	Capacitance	Destruction mode
AIES 12U 02 AG1	1005 mm	12V	40V typ.	0.1 pF typ.	
AIES 24U 02 CG2	1005 mm	24V	35 V typ.	0.1 pF typ.	
AIES 24U 03 AG1	1608 mm	24V	45 V typ.	0.1 pF typ.	

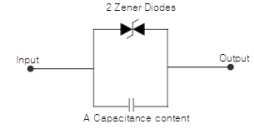
※ Key point : Excellent ESD reduction with low capacitance.



AVMC Series – General ESD solution

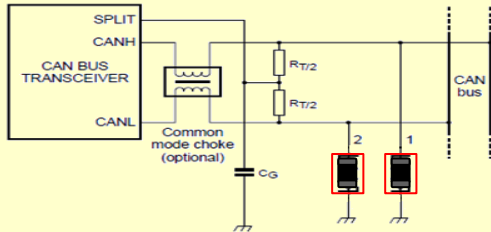
Stable protection level

Customizable ESD + EOS

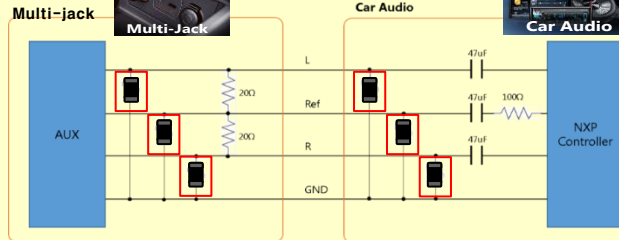


Application	Part No.	Size [mm]	Varistor Voltage [V]	Capacitance @ 1kHz [pF]	Clamping Voltage @ 1A, 8/20us pulse [V]	Imax @ 8/20us pulse [A]
Battery line	AVMC 18S 03 120	1608	24.5	120	40	30
	AVMC 18S 03 220		24.5	200	40	60
	AVMC 18S 05 400	2012	24.5	400	40	120
Micom Power line	AVMC 5S 03 500	1608	12	500	25	30

- CAN BUS



- AUX



▪ ESD Waveform

