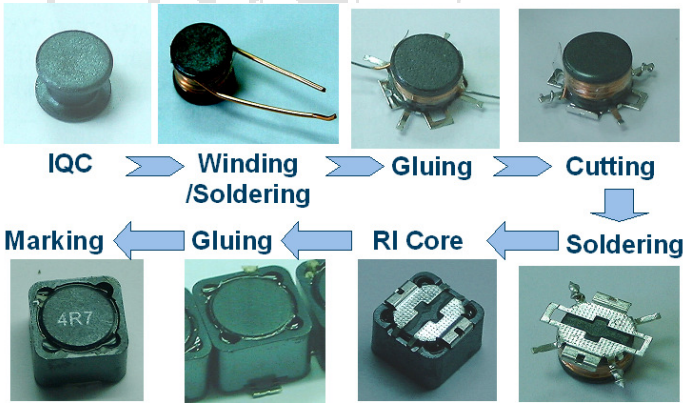
Chilisin Electronics Corp.

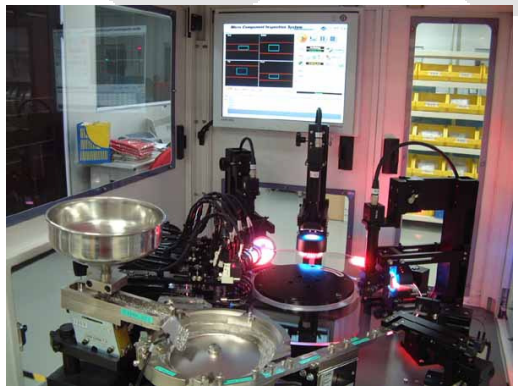
Product Overview 2012

Products Overview

Vertically Integrated

- In–house Powder Mixing
- In-house Ferrite and Ceramic core manufacturing.
- In-house Automated and Manual wire winding
- In-house Thick/Thin film capabilities
- In–house Metal Powder Molding



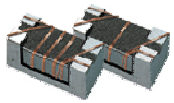


Core Technology

FAE/Design-in Capability **Materials/Formulation Technology**

- **Molding Technology**
  - **CPU Choke**
- **Wire Winding Technology**
  - **Power Inductor**
  - **HF Inductor**
  - **Common Mode Choke**
- **Multilayer Technology**
  - **HF Inductor**
  - **Power Inductor**
  - **Chip Bead**
- **Thin Film Technology**
- **Future Products**
  - **RF Inductor**





Comprehensive Product Range

SMD Series

- Multilayer Power Inductor
- Multilayer Chip Inductor
- Multilayer Chip Beads
- Thin Film RF Inductor
- 1210 USB3.0 CMM
- 0805 USB2.0 CMM
- 0805 HDMI CMM
- RF Chip Wound Inductor
- SMD Power Inductor, LVS/F
- SMD Molding Choke

Coil Series

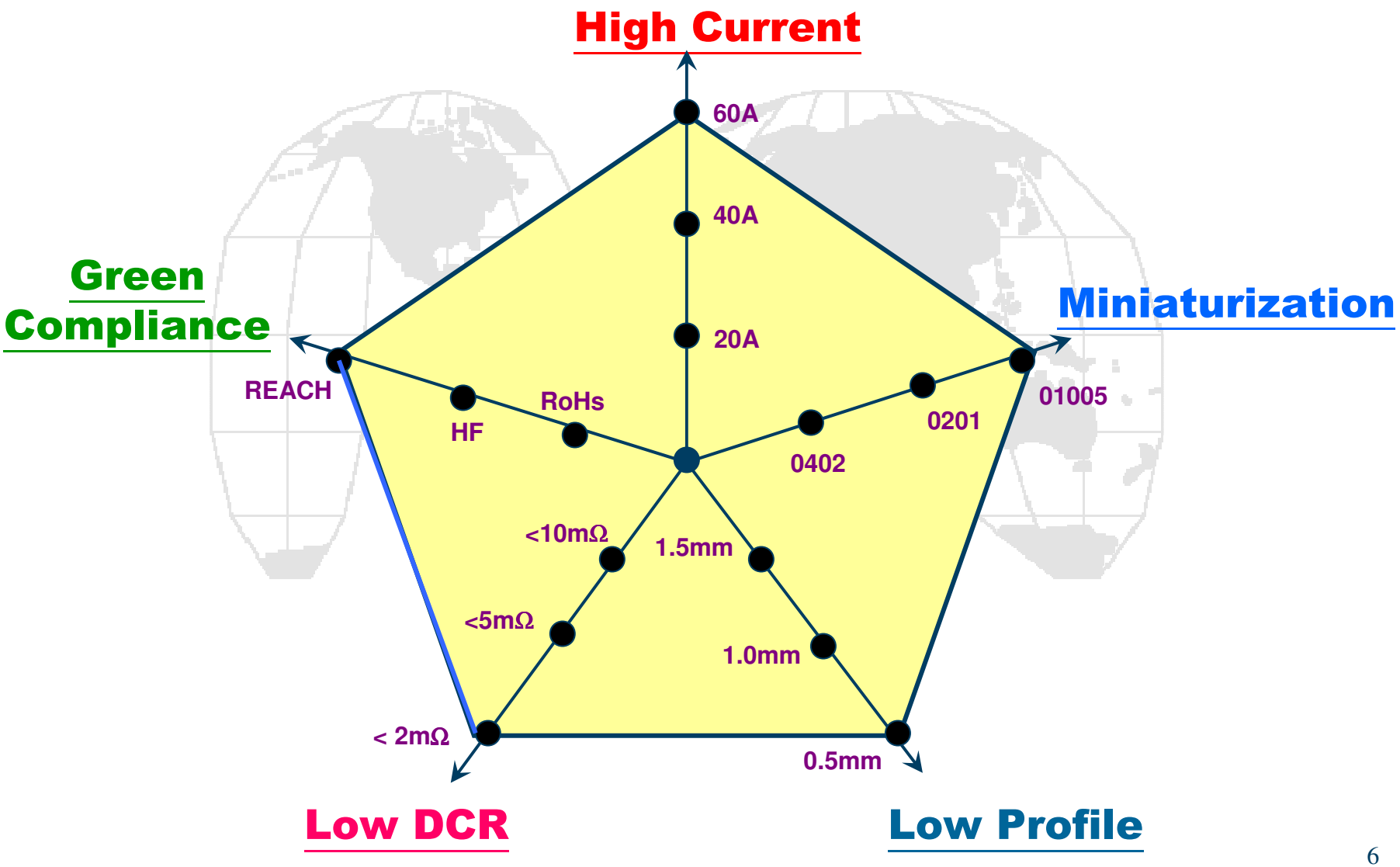
- Power Line EMI Filter
- Toroidal Series
- Leaded Power Inductor

Soft Ferrite Core Series

- Ni-Zn Series EMI Filter
- Iron/Ferrite Toroid
- In-House Ferrite Core

Comparable to Vishay, CoilCraft, Murata, TDK, Taiyo Yuden, Sumida….

Trend of Product Development



CHILISIN ELECTRONICS CORP.
Total Solution Provider for EMI, Power and RF.

One Stop Shop

Inductor turn-key solution : EMI, Power & RF components

EMI / EMC

Chip Beads

- General (<1GHz)
- Hi-Speed (~1GHz)
- GHz (>1GHz)
- Power (~6A)

Common Mode Choke

- USB2.0 (480 M bit/s)
- HDMI (3 G bit/s)
- USB3.0(5 G bit/s)

D-D Converter

Power Inductor

- Multilayer (500mA-1.5A)
- Magnetic Resin (1A-7A)
- Molded Design (2A-50A)

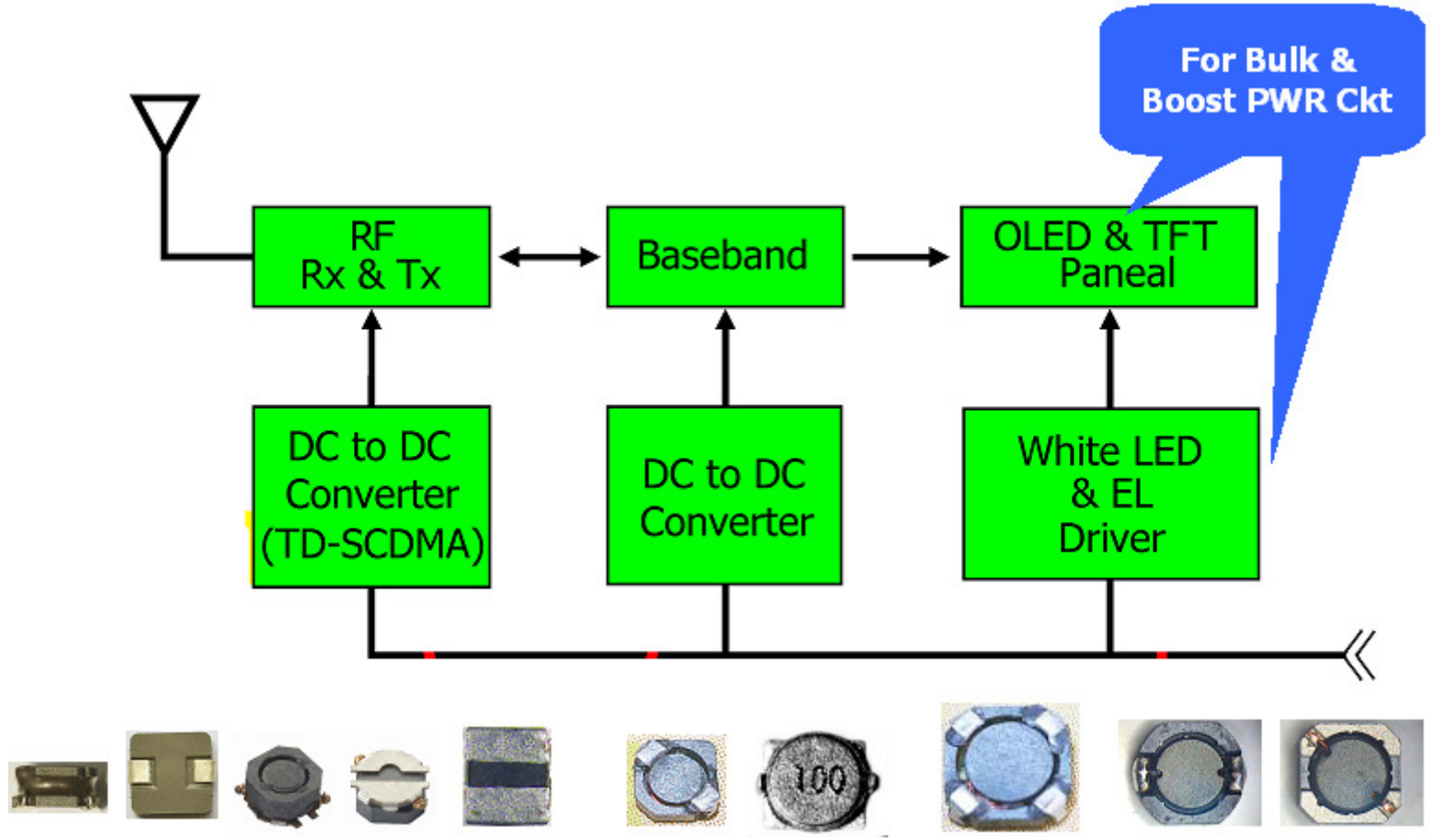
RF

HF Chip Inductor @500MHz

- **Wire Wound**
  (Q Up to 80, SRF Up to 18GHz)
- **Multilayer**
  (Q Up to 18, SRF Up to 10GHz)
- **Thin Film**
  (Q >12. SRF up to 6GHz)

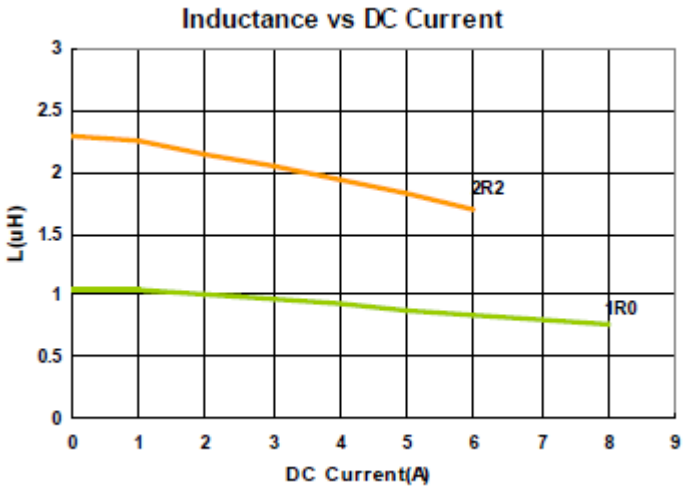
Power Solutions

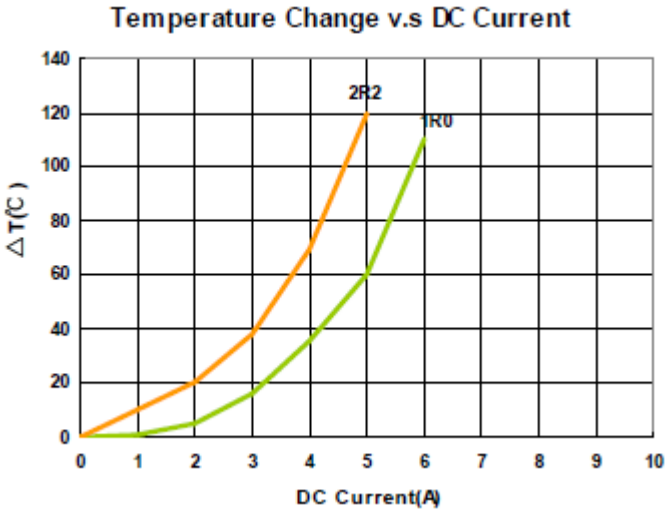
Power Solutions



Power Inductors

- Shielded and Unshielded
- Current ratings up to 50A
  - Irms – X° temp rise
  - Isat – X% drop in L
- 2.0 x 1.5 x 0.55 (MP) to 16 x 22 x 8 (SSL)
- RoHs and Halogen free
- Magnetic Resin, Molding technologies, & Multilayer





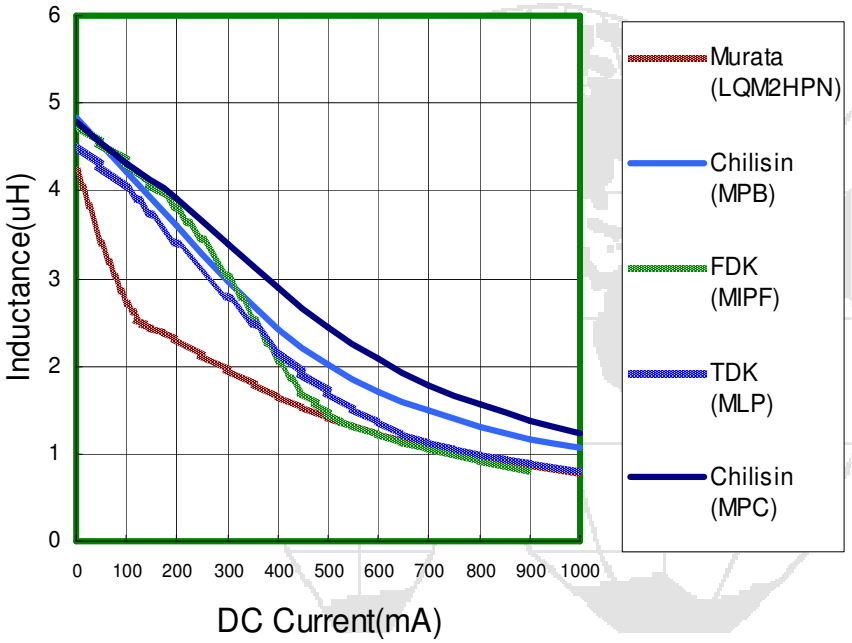
Miniature Mulitlayer Power Inductors

- MPA (initial series)
  - 1.6 x 0.8 x 0.8
  - 500mA – 700mA
  - 0.35 – 0.55 mOhms
- MPB (Low resistance, higher current ratings)
  - 1.6 x 0.8 x 0.8
  - 600mA – 1.8A
  - 0.04 - 0.40 mOhms
- MPC (High Sat Current, higher DCR)
  - 2.0 x 1.25 x 1.0
  - 600mA – 1.6A
  - 0.07 – 0.32 mOhms

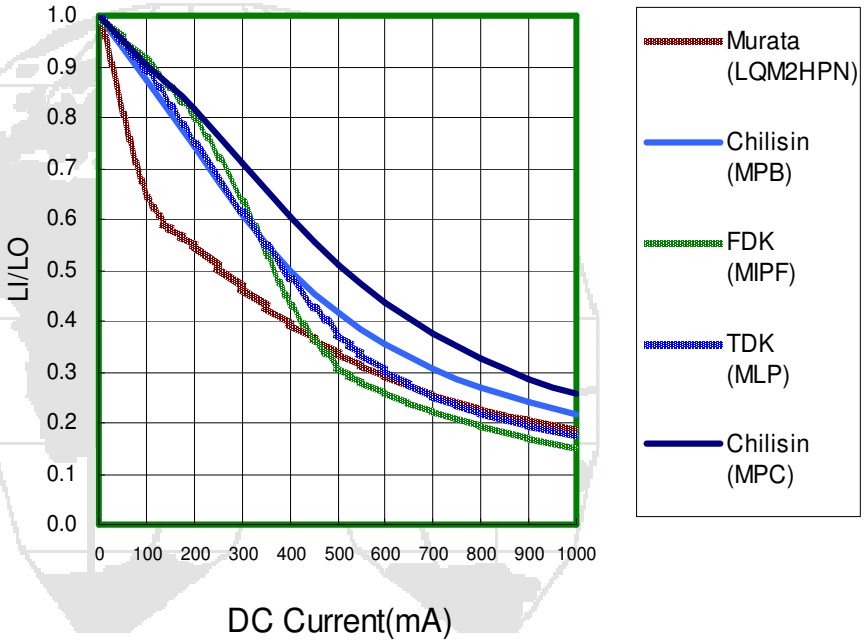
Characteristic Comparison

DC current characteristics

252010-4R7



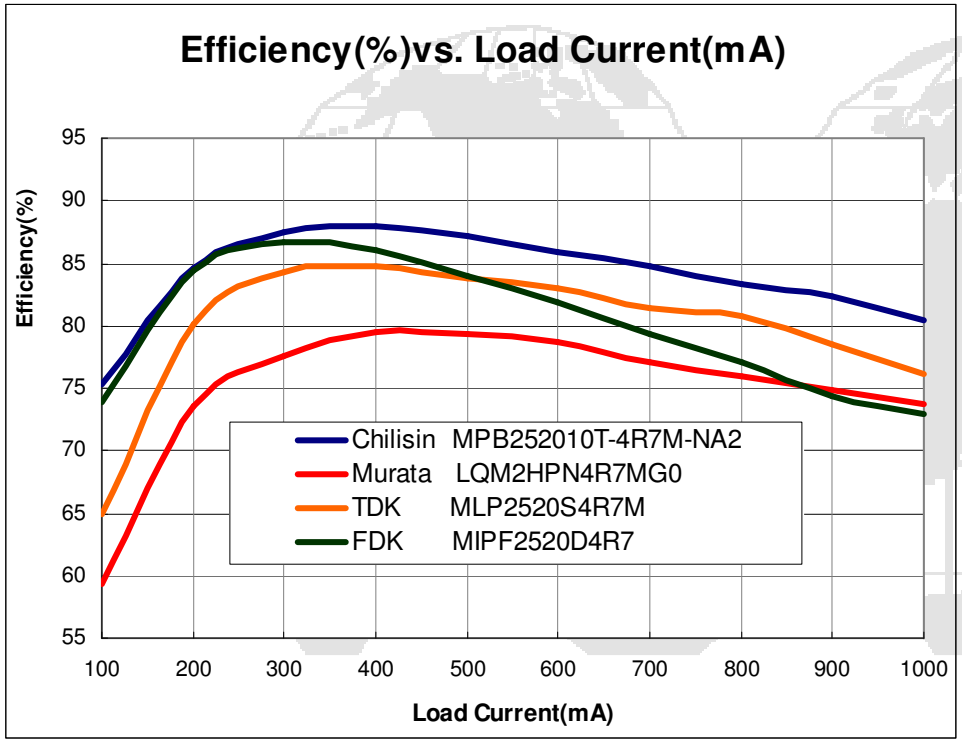
252010-4R7

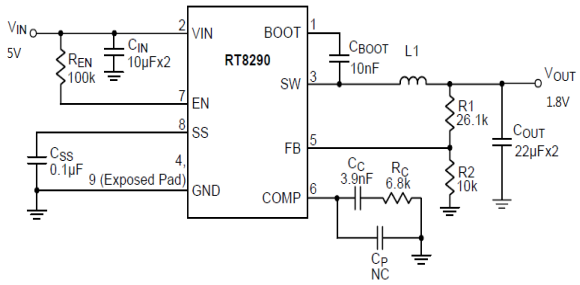


Our products still have better saturation current, especially for MPC series.

Characteristic Comparison

Efficiency Data





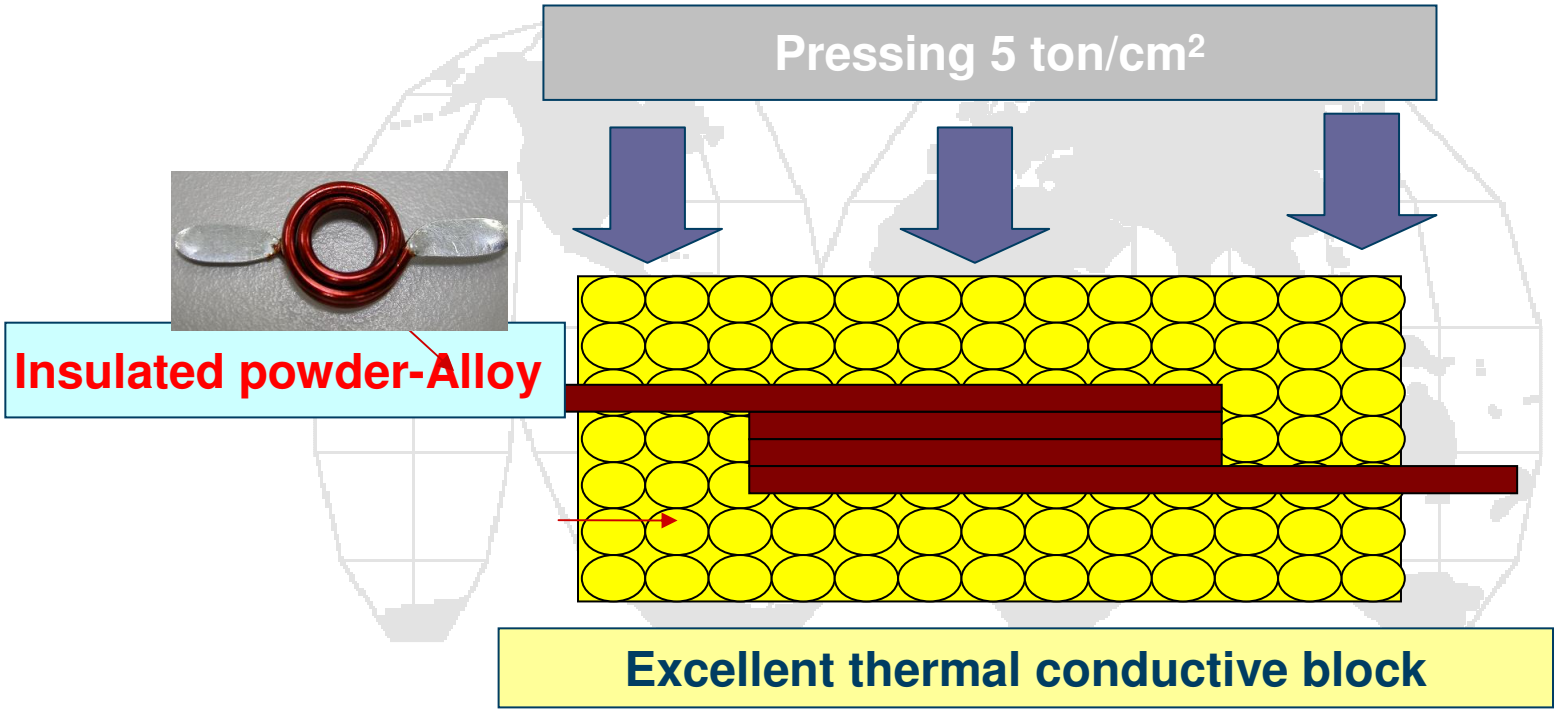
EVB:

Richtek RT8290 ,

Step Down Converter 5V To 1.8V

Our products still have better efficiency,

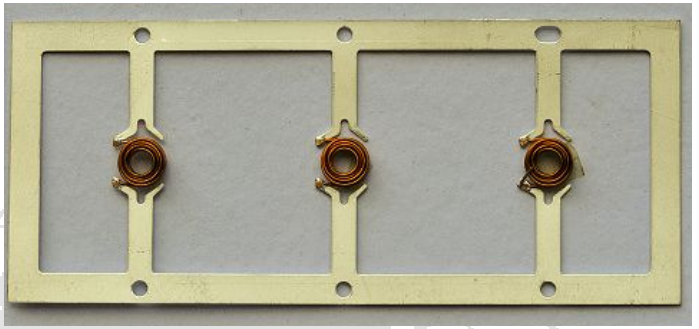
Ultra High Current Power Choke



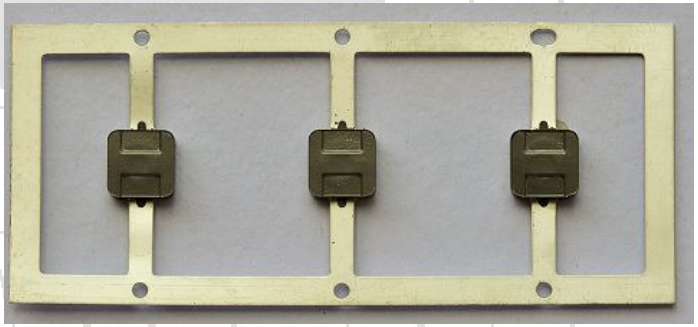
- Low core loss
- Minimize buzzing noise
- Shielded design
- No coating and rusty reliability issue
- Better body strength and thermal property
- Reliable automatic process for mass production
- 4.1 x 4.6 x 1.2
- Up to 37A

Process of Molding MHC/MHCI

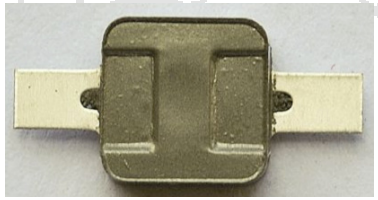
Coil Welding on Lead-frame



High Pressure Molding with Phosphorated Alloy Powder



Lead-frame Cutting

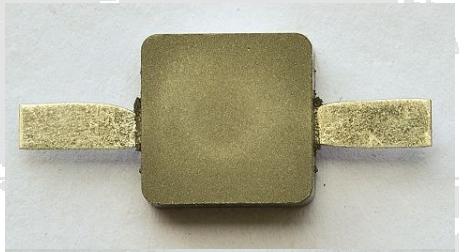


Automatic Pads Forming

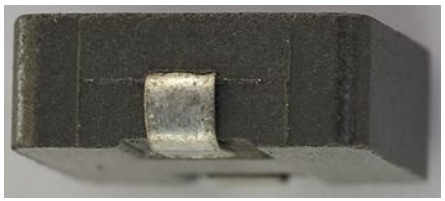
Process of Molding MHC/MHCI (Big Wire)

Coil Winding & Pads Soldering

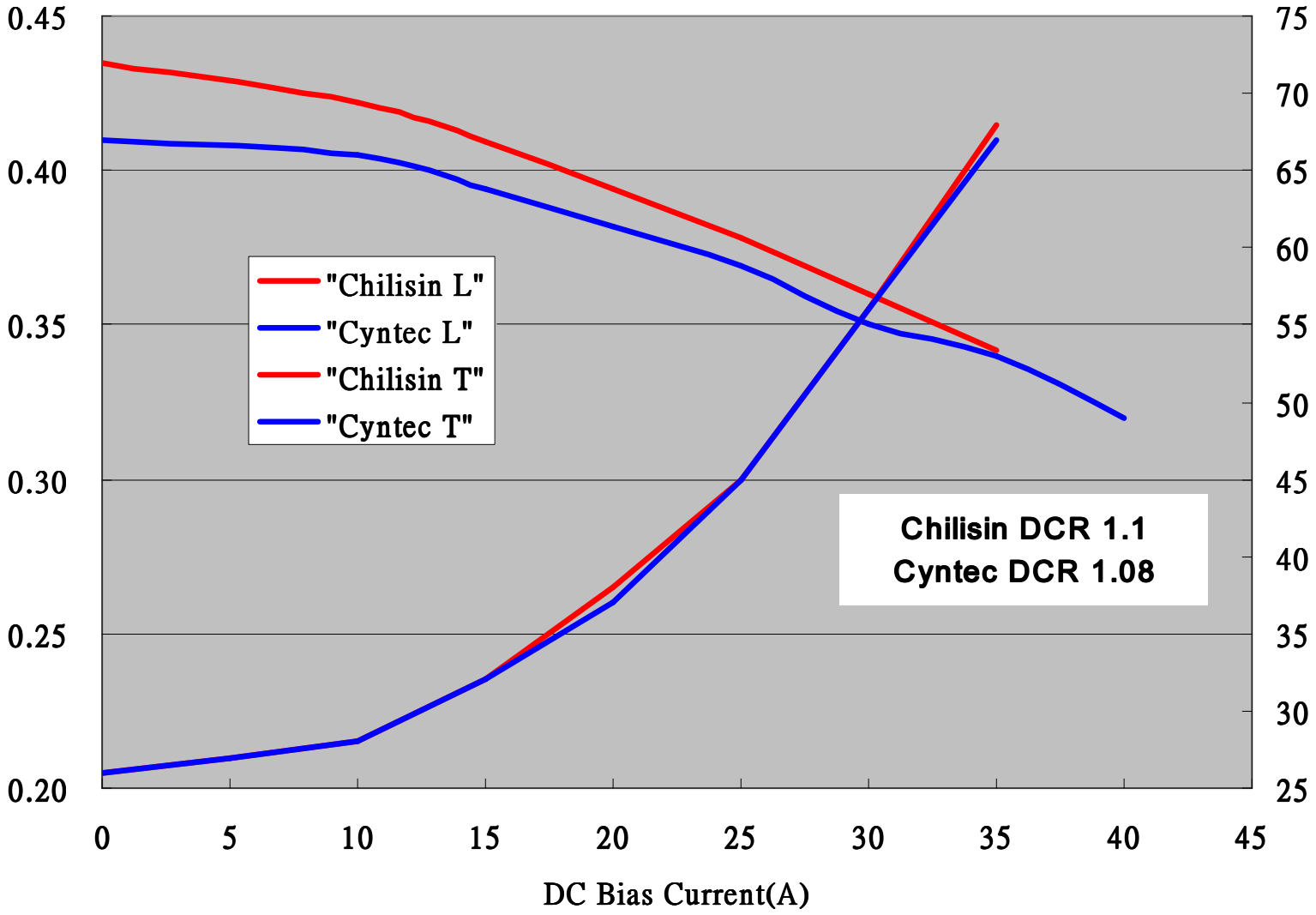
High Pressure Molding with Phosphorated Alloy Powder



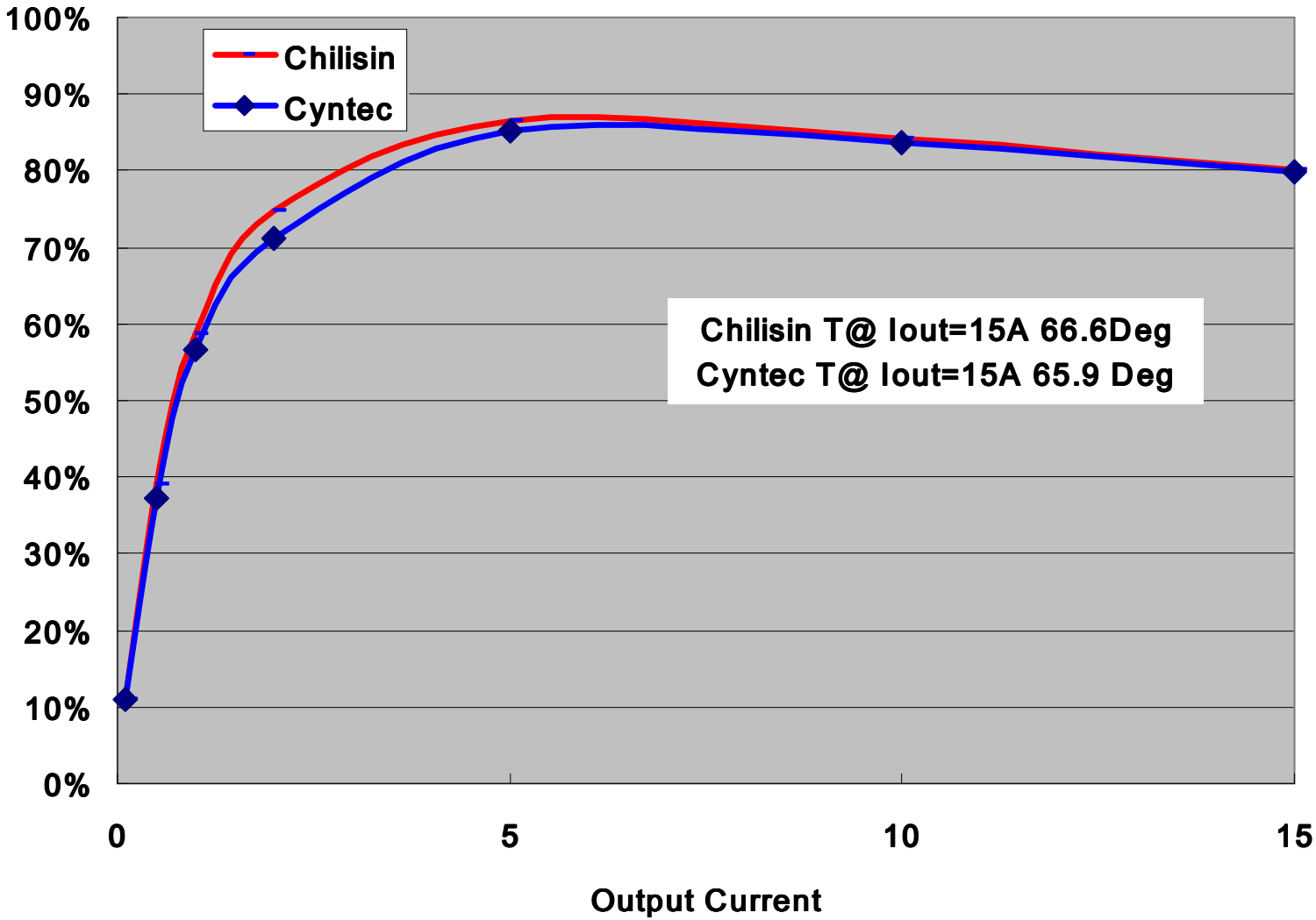
Automatic Pads Forming



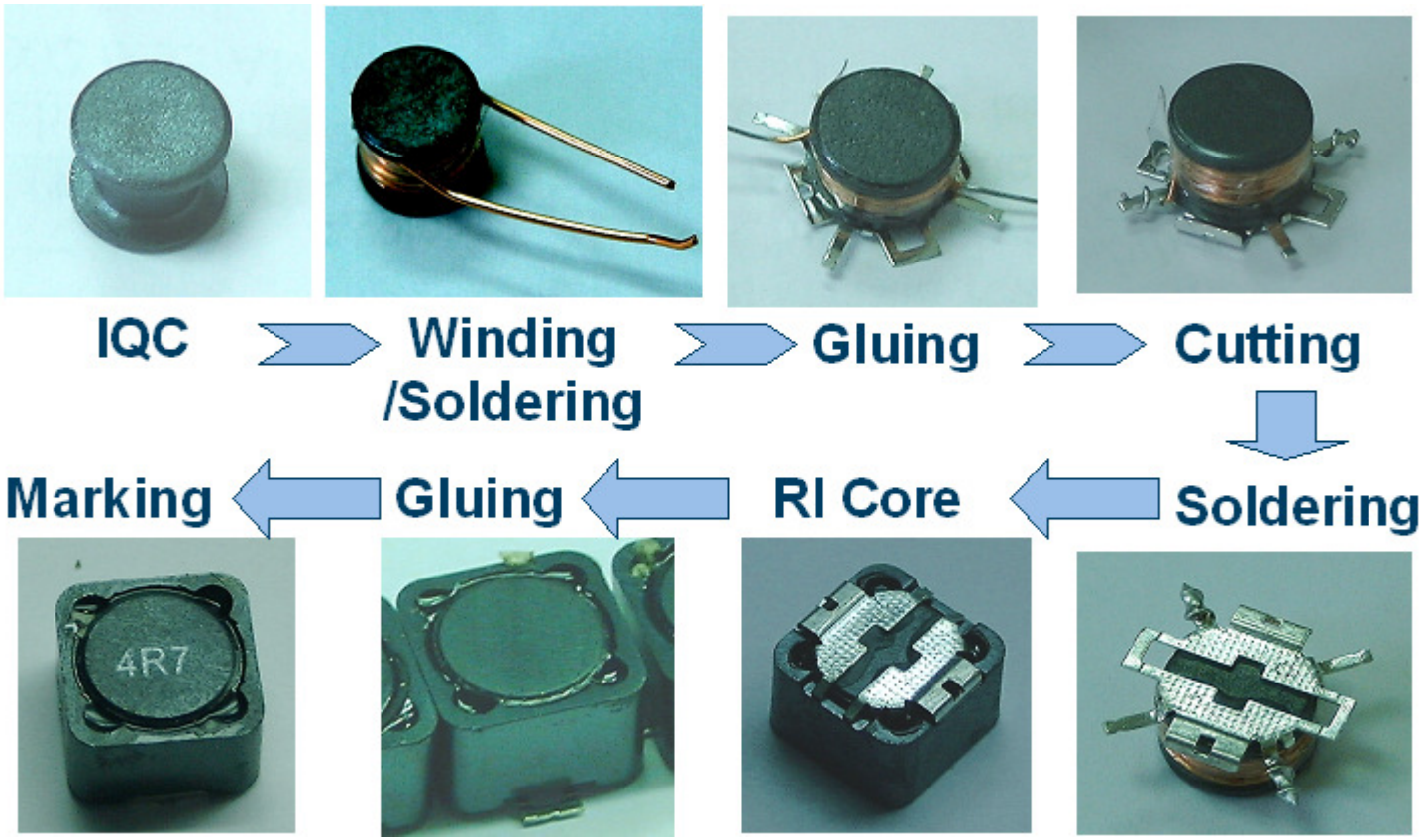
Performance of Chilisin MHCC



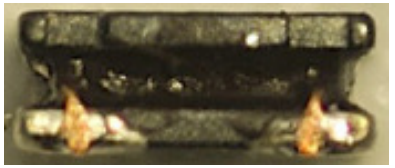
Performance of Chilisin MHCC

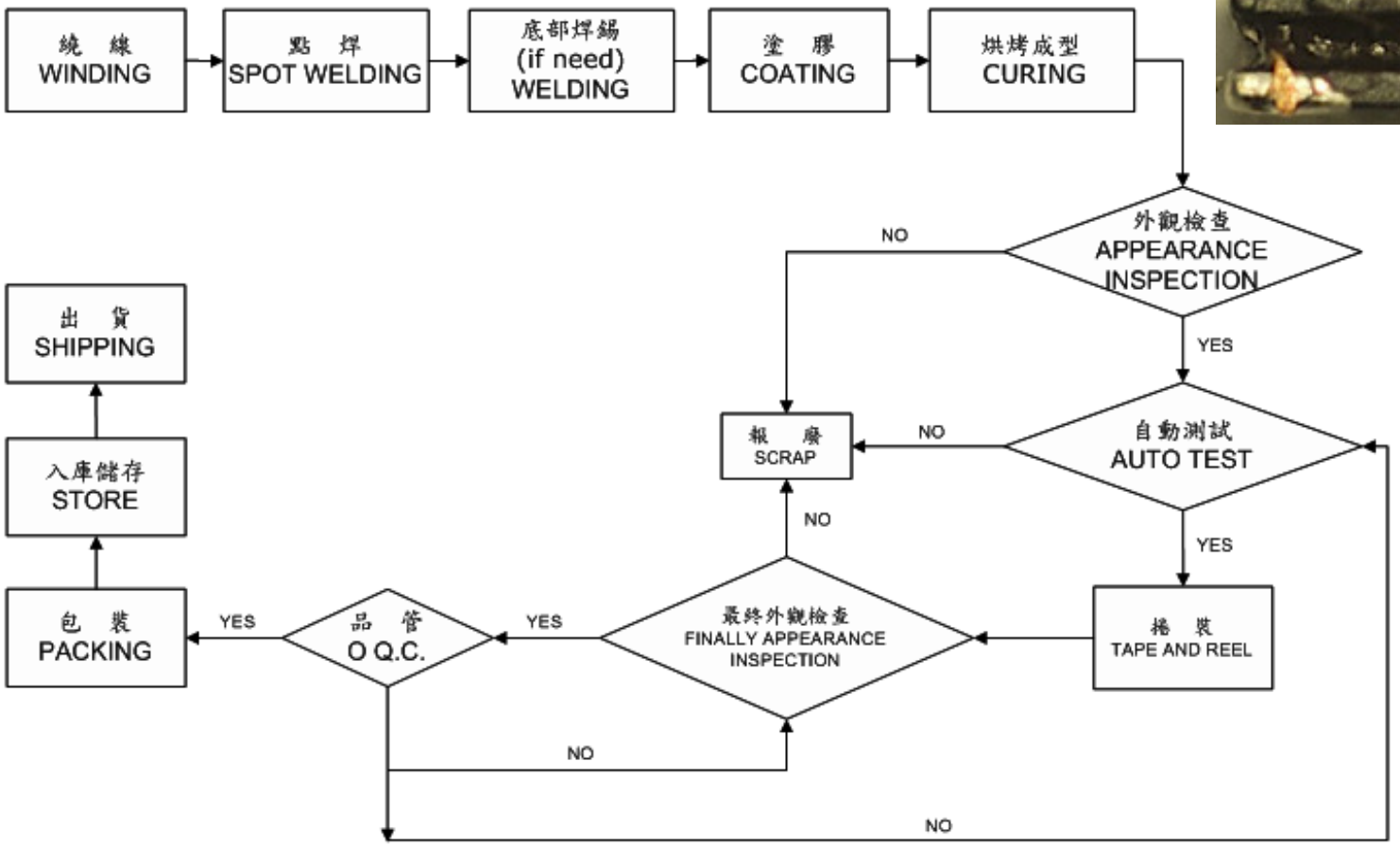


Conventional Manual Process

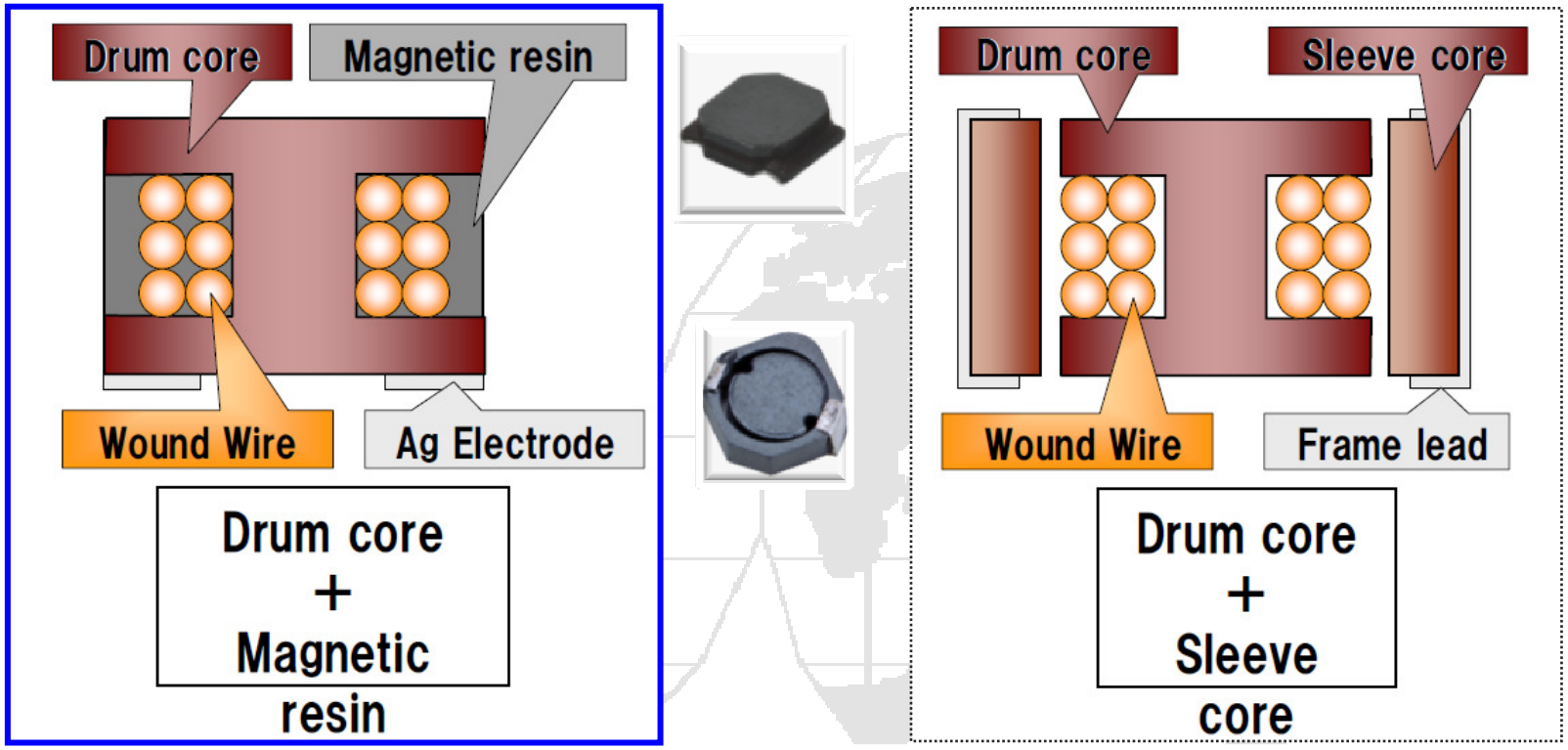


Fully Automatic Power Inductor Mass Production System





Magnetic Resin



Automatic Assembly

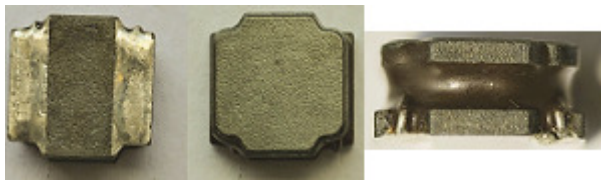
Semi -automatic Assembly

- Coil for DC/DC converters
- Ferrite resin carries out the role of the ferrite sleeve core and bring the cost reduction benefit.
- Large output of automatic assembly
- Sufficient dimensions range from 80*80*40(mm) to low profile 20*16*10(mm).
- Corresponds to high current, though it is the low profile and small.
- Achieved low Rdc and magnetically shielded construction by adopting the magnetic coat resin.

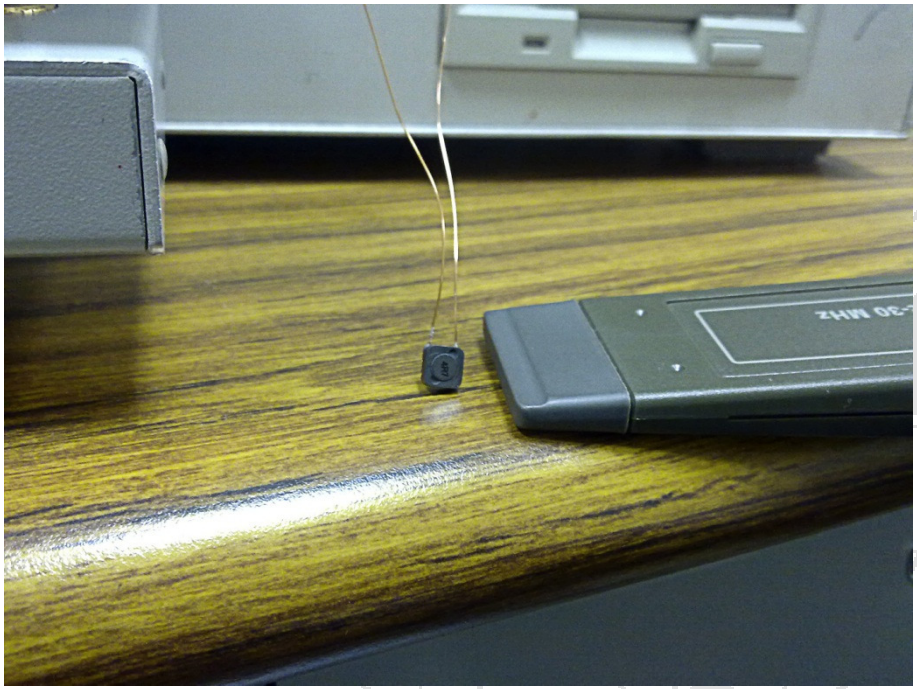
Advantages of LVS

	SCDS104R 4R7	LVS808040 4R7
Dimension (mm)	10*10*4	8.0*8.0*4
DCR (mOhm)	20	18
Irms (A)	5.5	5.5

- **Better Characteristics than RI-Core Based Power Inductor**
- **Saving the cost for Lead-frame and RI Cores**
- **Fully Automatic Process for Mass Production**
- **No Noise issue as Conventional Power Inductor**
- **No Wire damaged Issue**



Set-up for SCDS/LVS EMI Comparisons



Source: 5MHz 0.1V

Source: 5MHz 0.1V

Part #	SCDS62T 4R7	LVS606020 4R7
Dimension (mm)	6.2x6.2x3.0	6.0x6.0x2
DCR (mOhm)	80	65
Irms (A)	1.63	2.20

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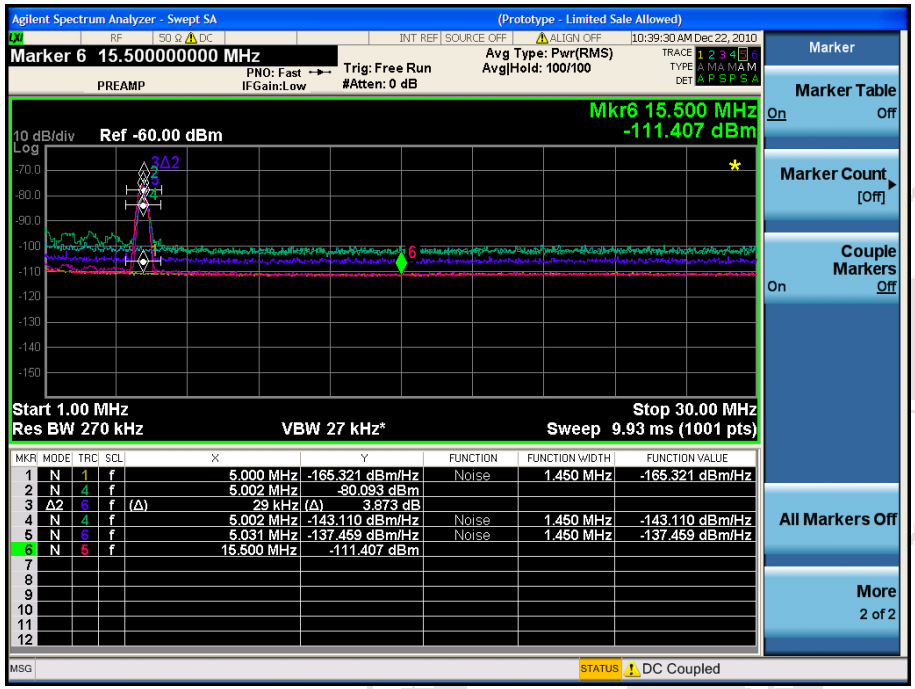
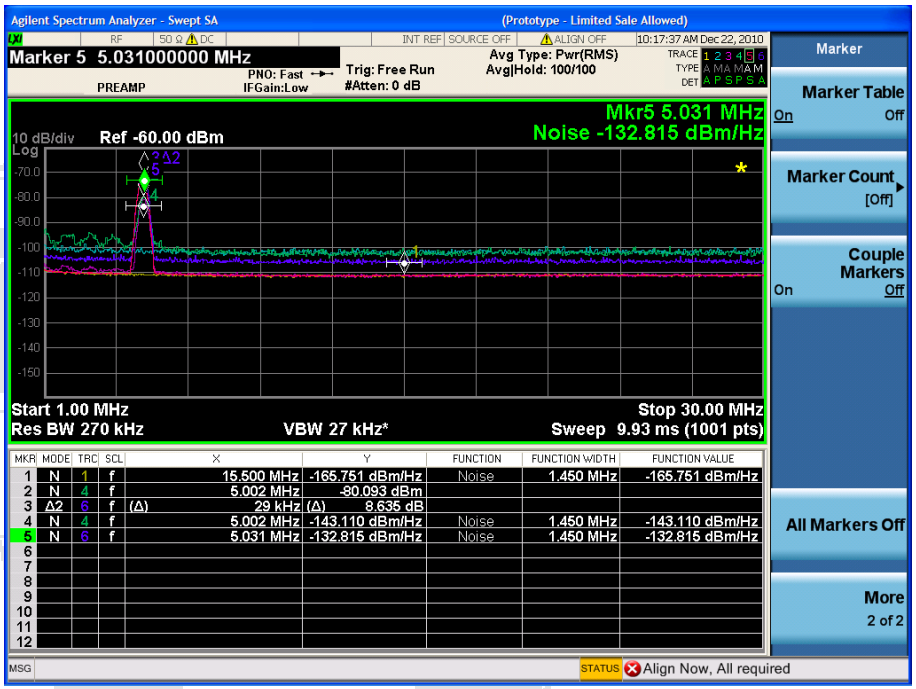
Total Solution Provider for EMI, Power and RF.

EMI Comparisons



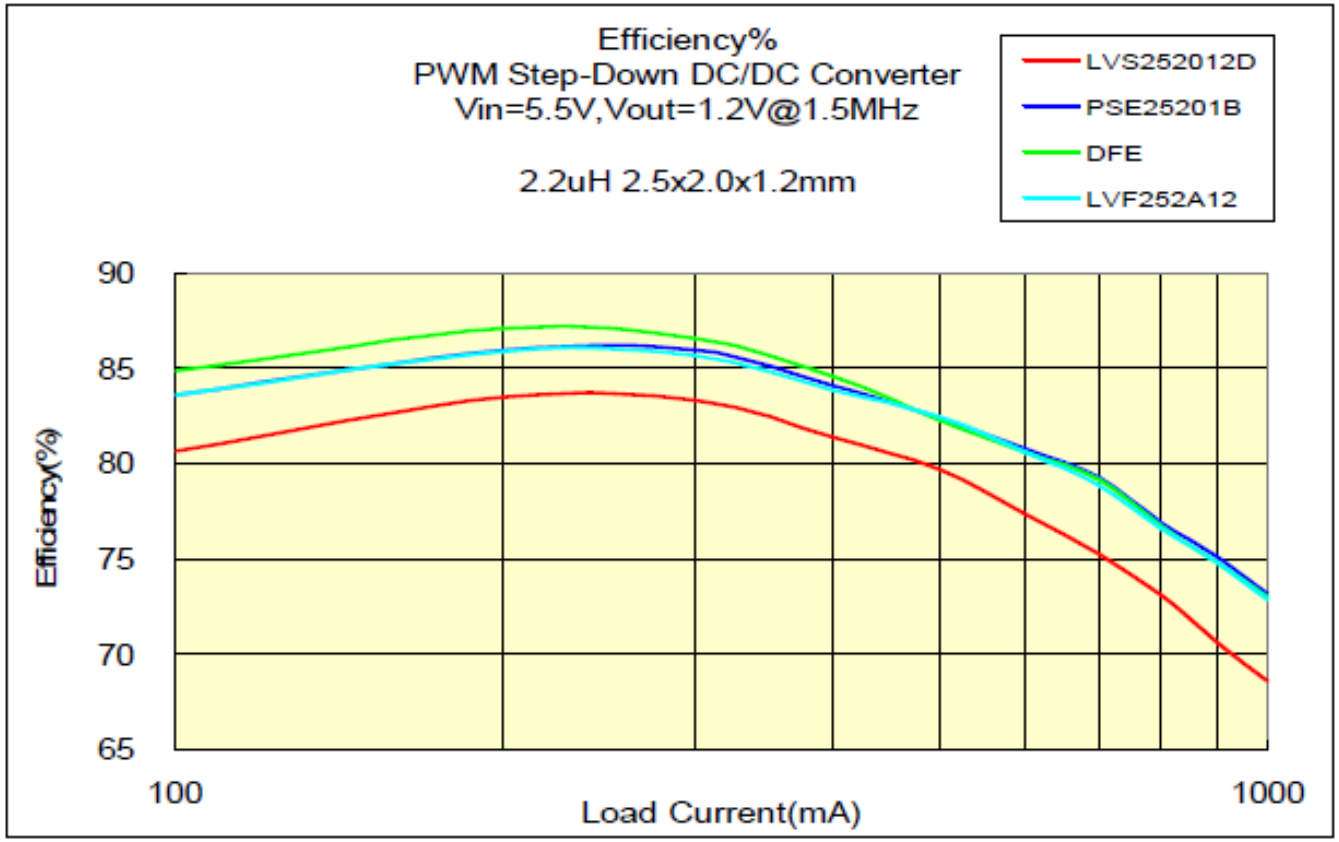
LVS606020 4R7



SCDS62T 4R7

Parts #	LVS606020 4R7	SCDS62T 4R7
EMI Emission	3.873dB	8.635dB

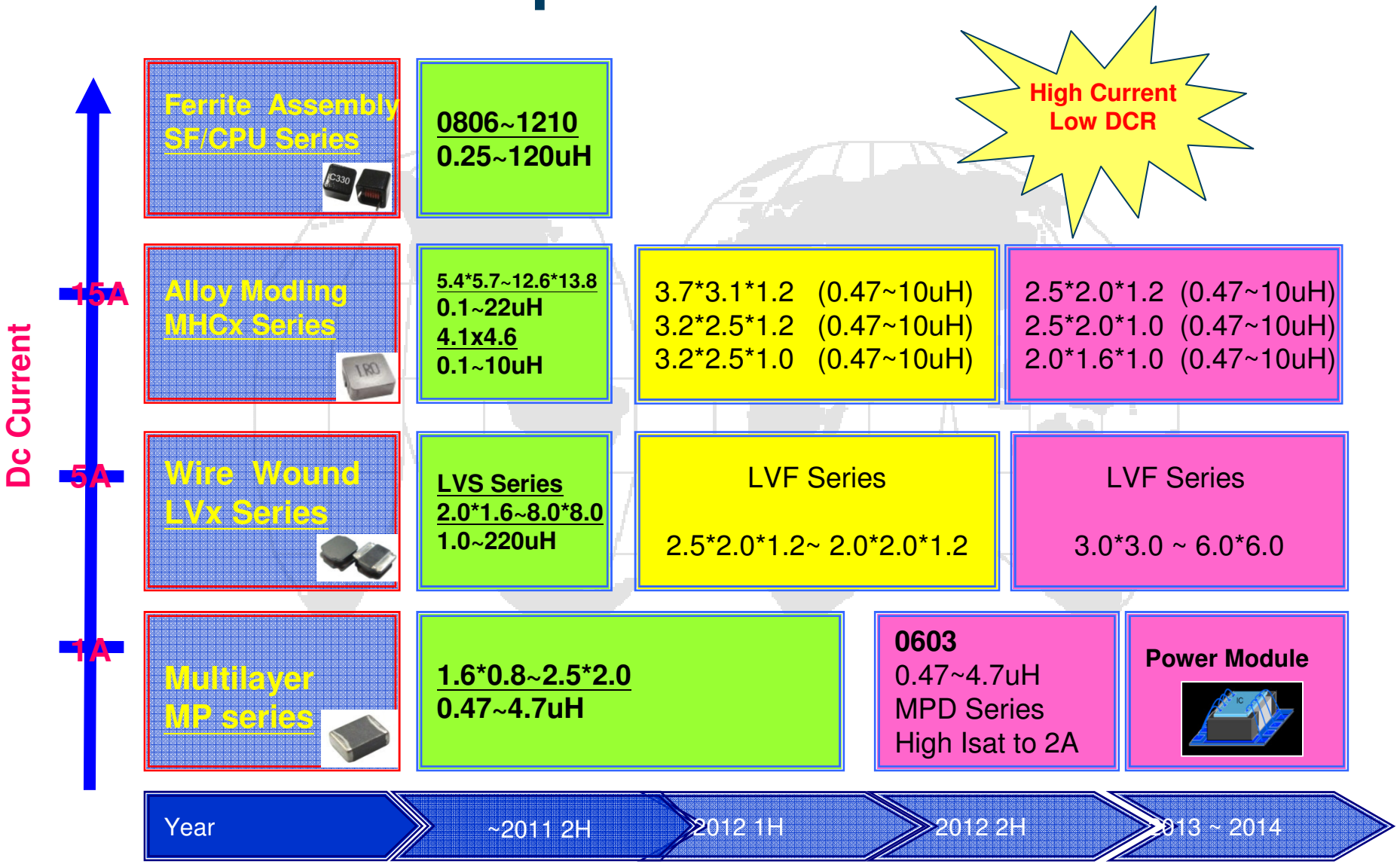
LVS Enhanced - LVF



Series	Inductance	RDC	Isat	Irms
LVS252012	2.2 uH	219 mOhm	1.8A	1.7A
LVF252A12	2.2 uH	80 mOhm	1.8A	1.8A

- Improved power loss
- Significant DCR reduction

Roadmap of Power Inductors



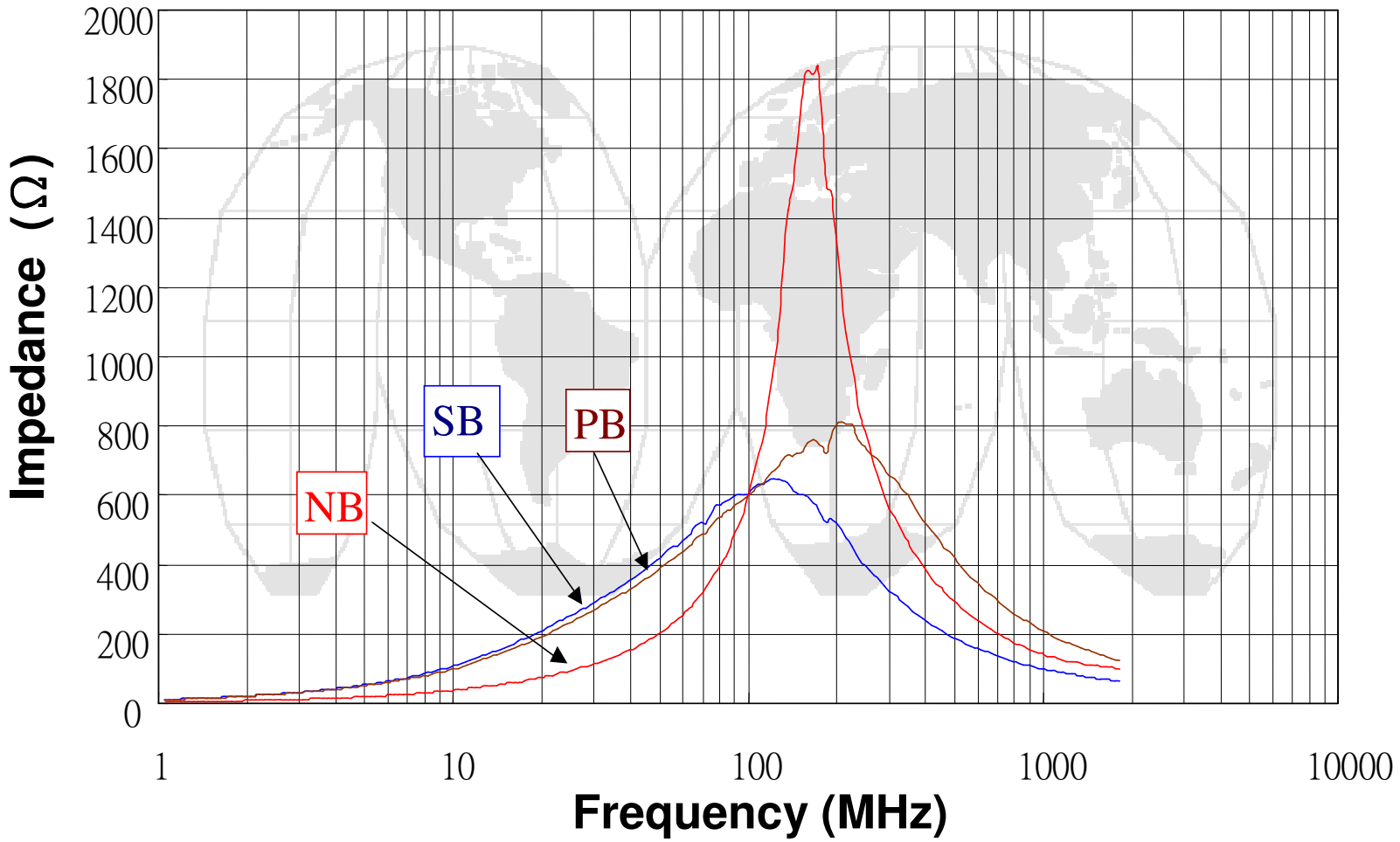
EMI / EMC

Chilisin Bead Series

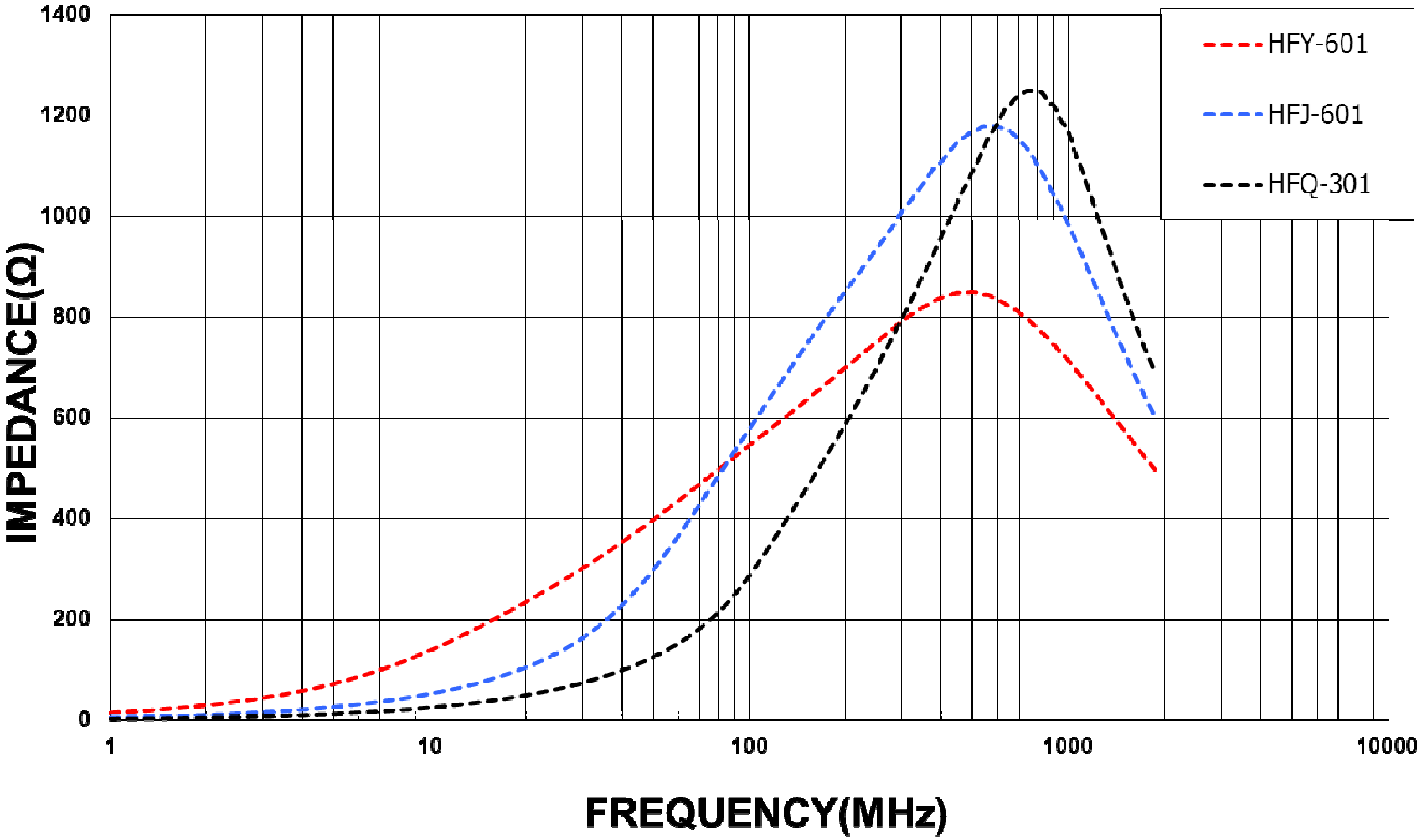
Spec. / Series	Description	Specifications
SB	General Purpose	I: 50-500mA Z: 5 – 2.7KΩ
GB	General Purpose	I: 100-1000mA Z: 7 – 2KΩ
NB	Digital signal	I: 50-500mA Z: 3 – 2.7KΩ
PB	High Current	I: 800-6000mA Z: 5 - 1.5KΩ
UPB	Ultra High Current	I: 4000-6000mA Z: 10 – 330Ω
HF/HP	Giga Band >GHz	I: 50-2000mA Z: 120 – 1.8KΩ

Different In-house Powder to Design and Modify Performance of Beads

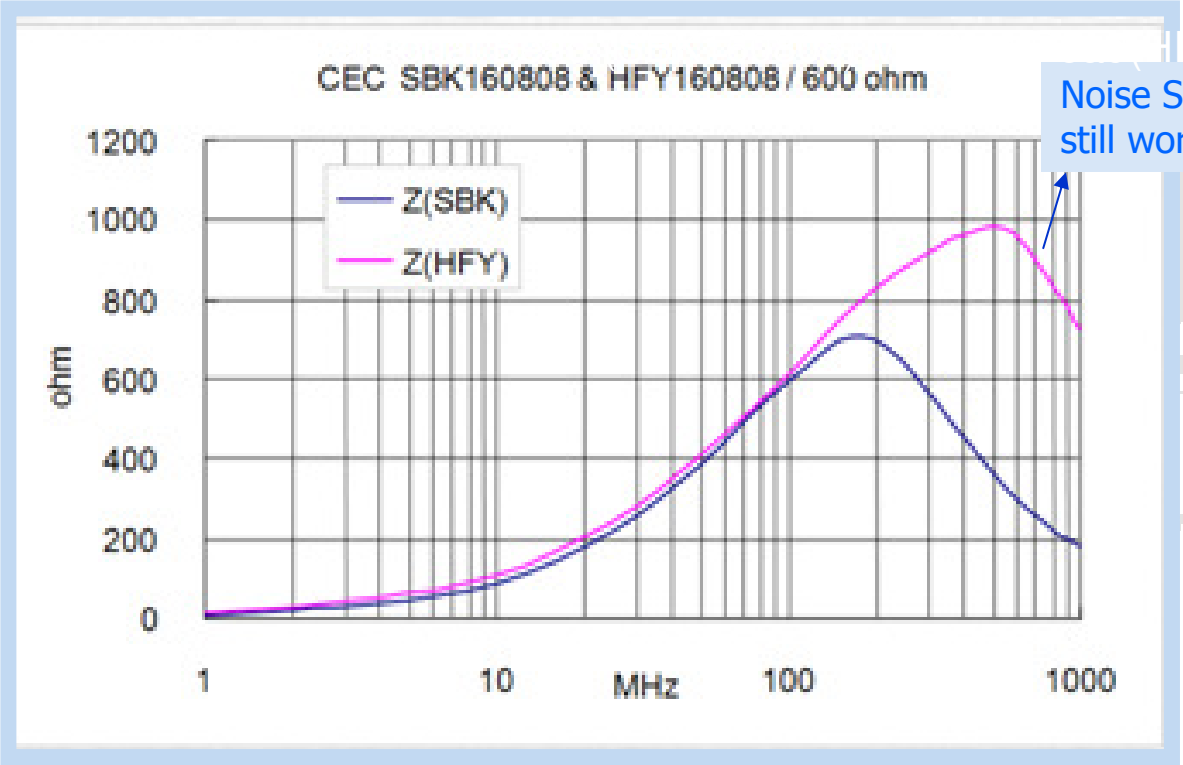
Bead Characteristics < 1GHz



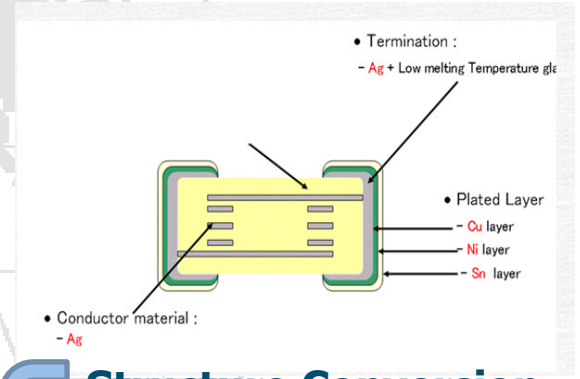
Bead Characteristics > 1GHz



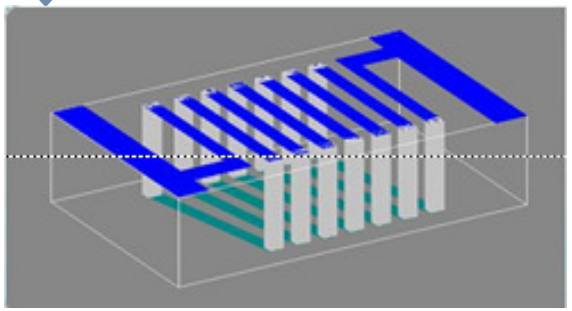
GHz Chip Bead



Noise Suppression
still working at GHZ band

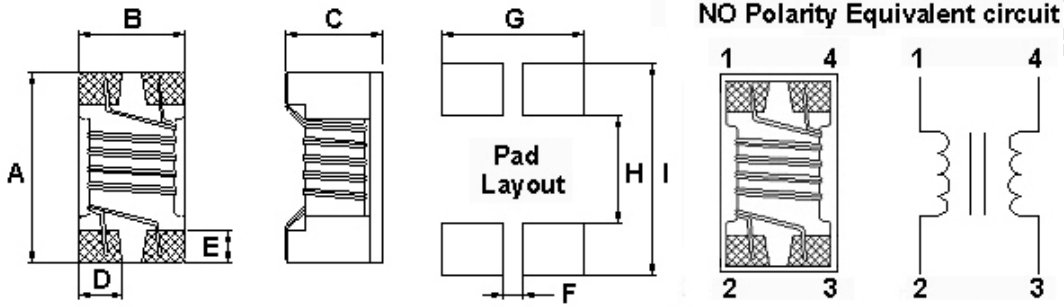


Structure Conversion



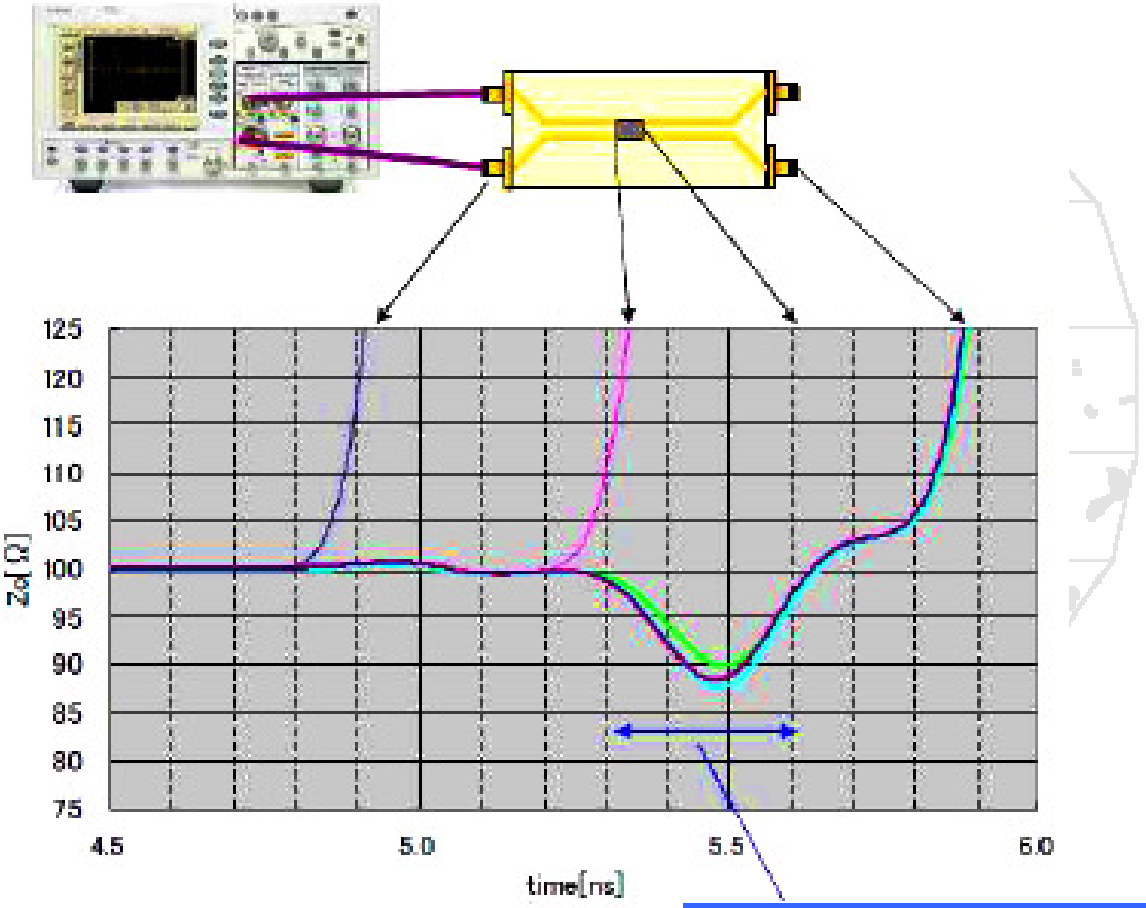
Chilisin Common Mode Choke

Spec. / Series	Application	Specifications
CMM11	USB 3.0 5 G bit/s	I: ~300mA Z: 60 – 160Ω
CMHD21	HDMI 3 G bit/s	I: ~400mA Z: 67 – 120Ω
CMM21	USB2.0 480 M bit/s	I: ~450mA Z: 30 – 900Ω



TYPE	A m/m	B m/m	C m/m	D m/m	E m/m	F m/m	G m/m	H m/m	I m/m
CMM11	1.25±0.2	1.0±0.2	0.9±0.2	0.32	0.33	0.36	1.0	0.59	1.75

TDR Measurement on HDMI CMM



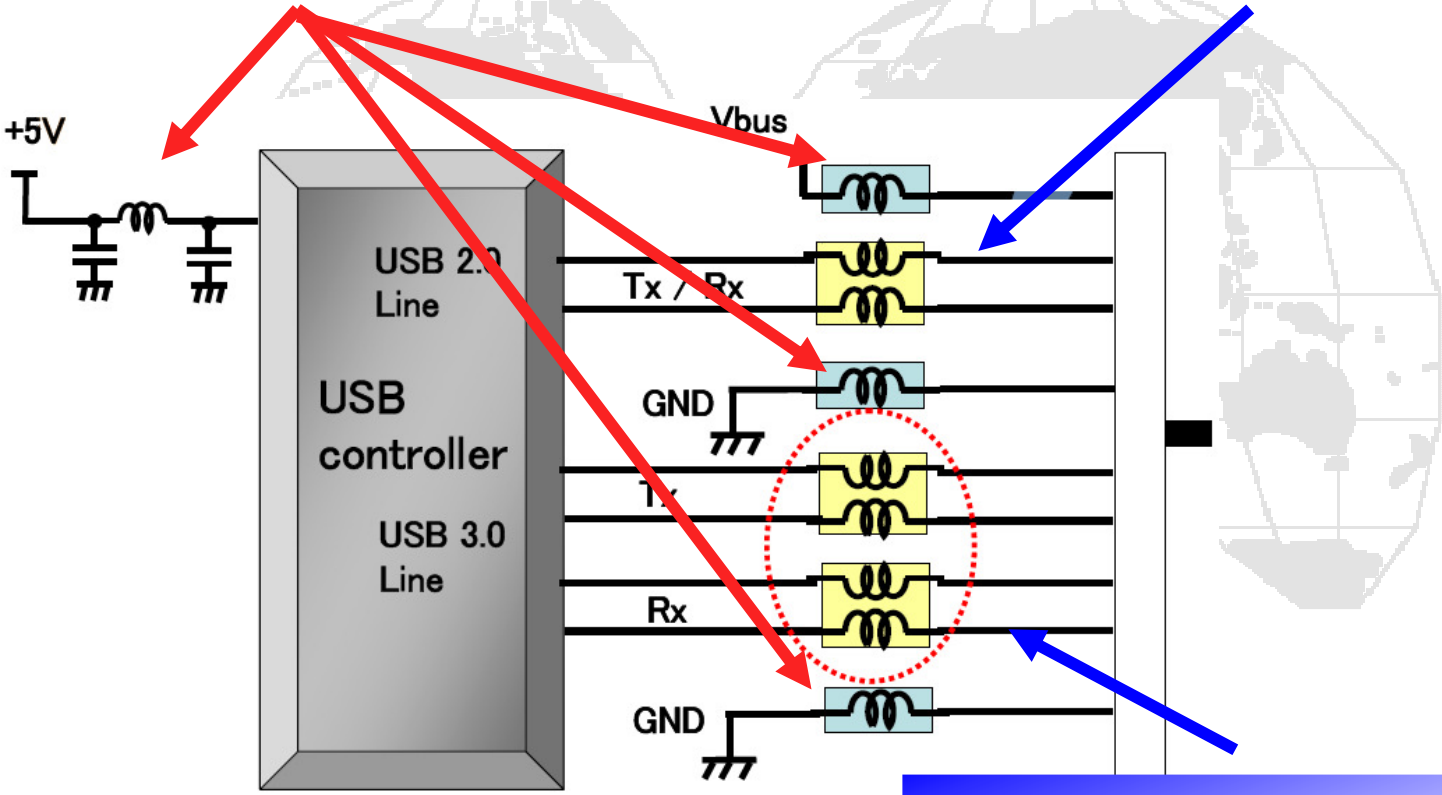
Above the Limits of 85Ω

USB 3.0

Chip ferrite beads

Common mode choke coil:

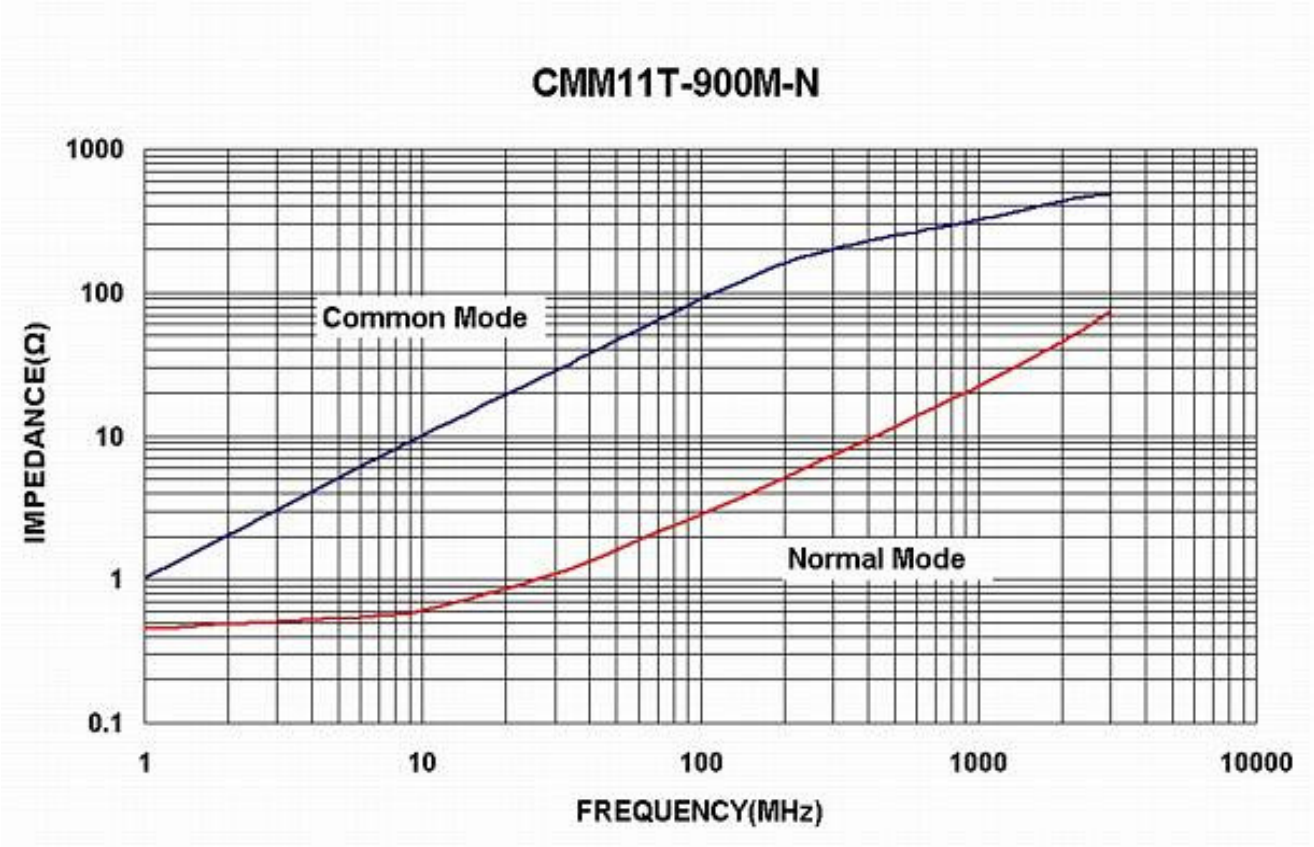
CMM21T-900M
CMM11T-900M

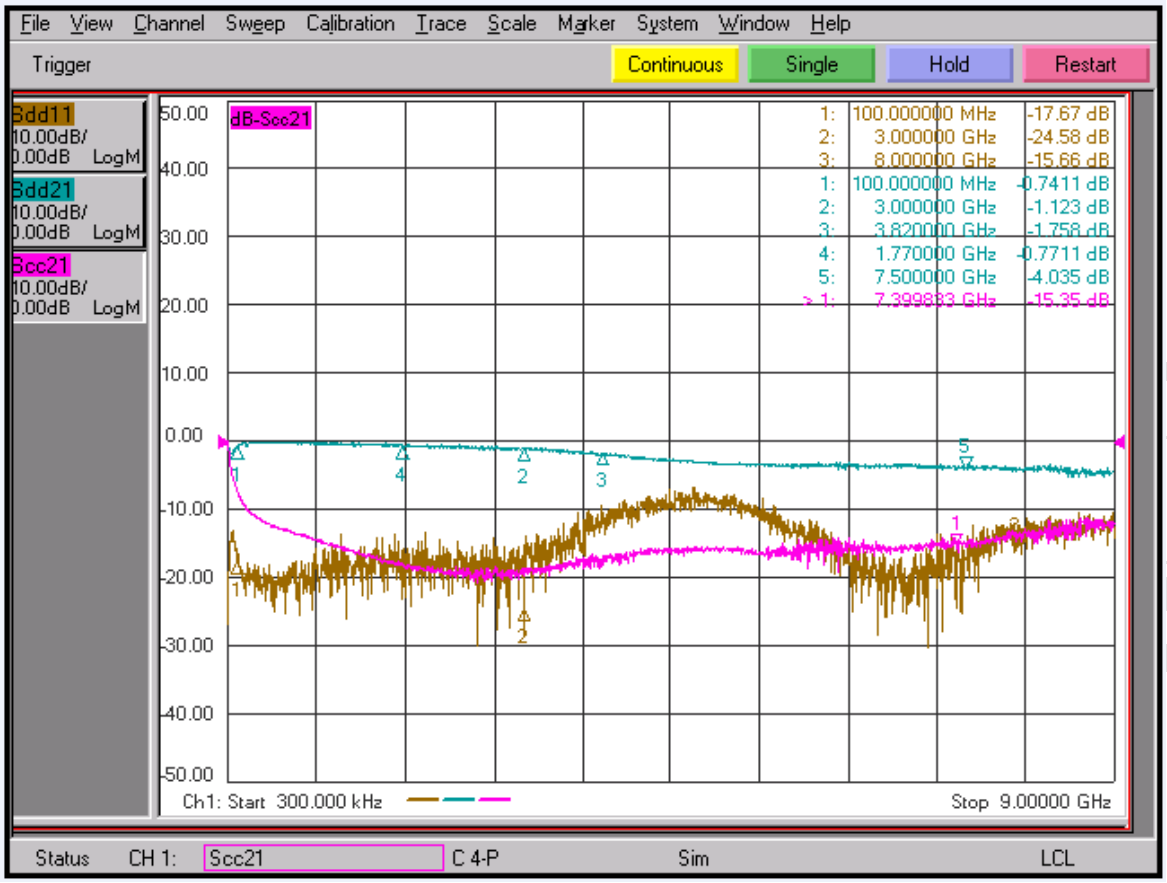
Common mode choke coil:

CMHD21T-670M
CMM11T-670M


Common Mode Choke Performance

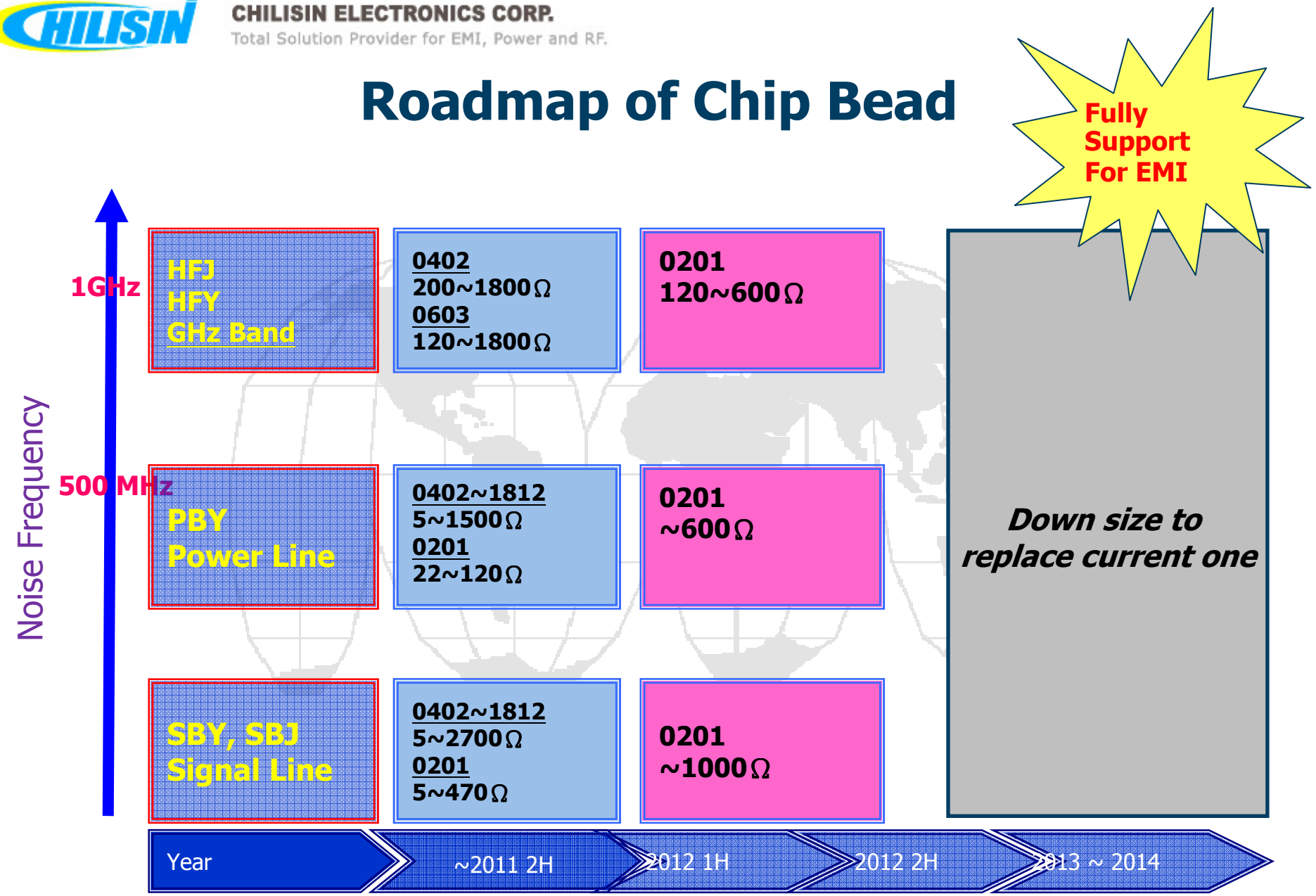


CMHD21T-750M Insertion loss



Insertion Loss	2.5GHz, -1.7dB	5.0GHz, -3.5dB	7.5GHz, -5dB
CMHD21T-670M	-1.7dB	-3.32dB	-4.23dB

Roadmap of Chip Bead

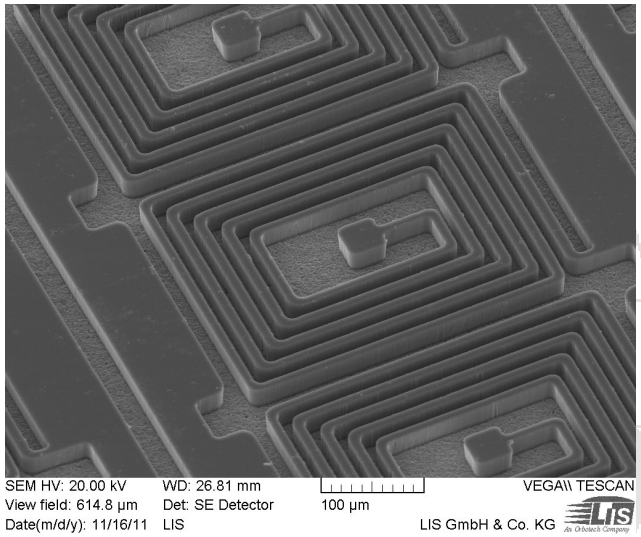


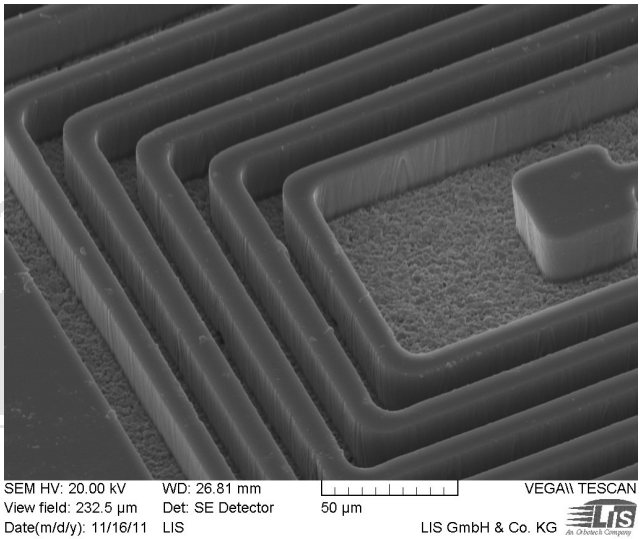
RF Solution

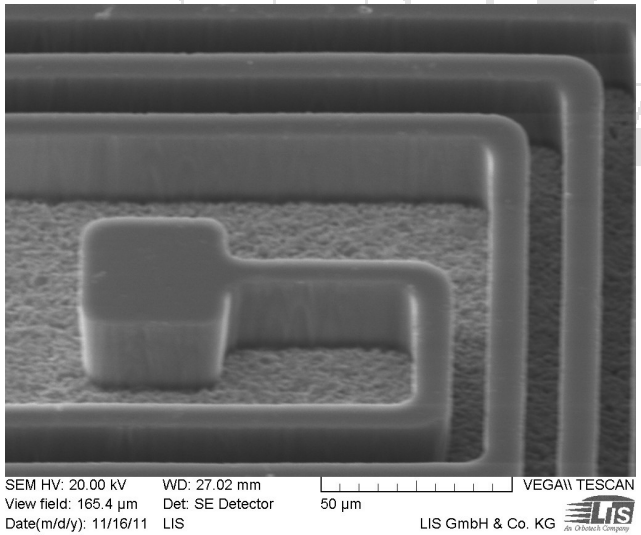
Hi-Freq Chip Inductors

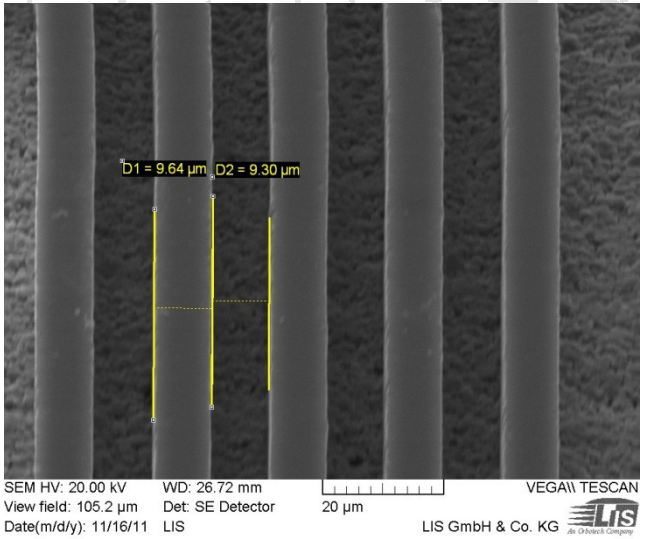
Spec. / Series	Structure	Specifications
CLH	Multilayer	Miniature: 0.6 x 0.3 x 0.3 Q up to 20 SRF up to 10GHz
CS	Wirewound	Q up to 80 SRF up to 12GHz
CM	Wirewound	Q up to 40 SRF up to 18GHz
TFL	Thin Film	Miniature: 0.6 x 0.3 x 0.25 Q >12 SRF up to 6GHz

Thin Film Inductor Process

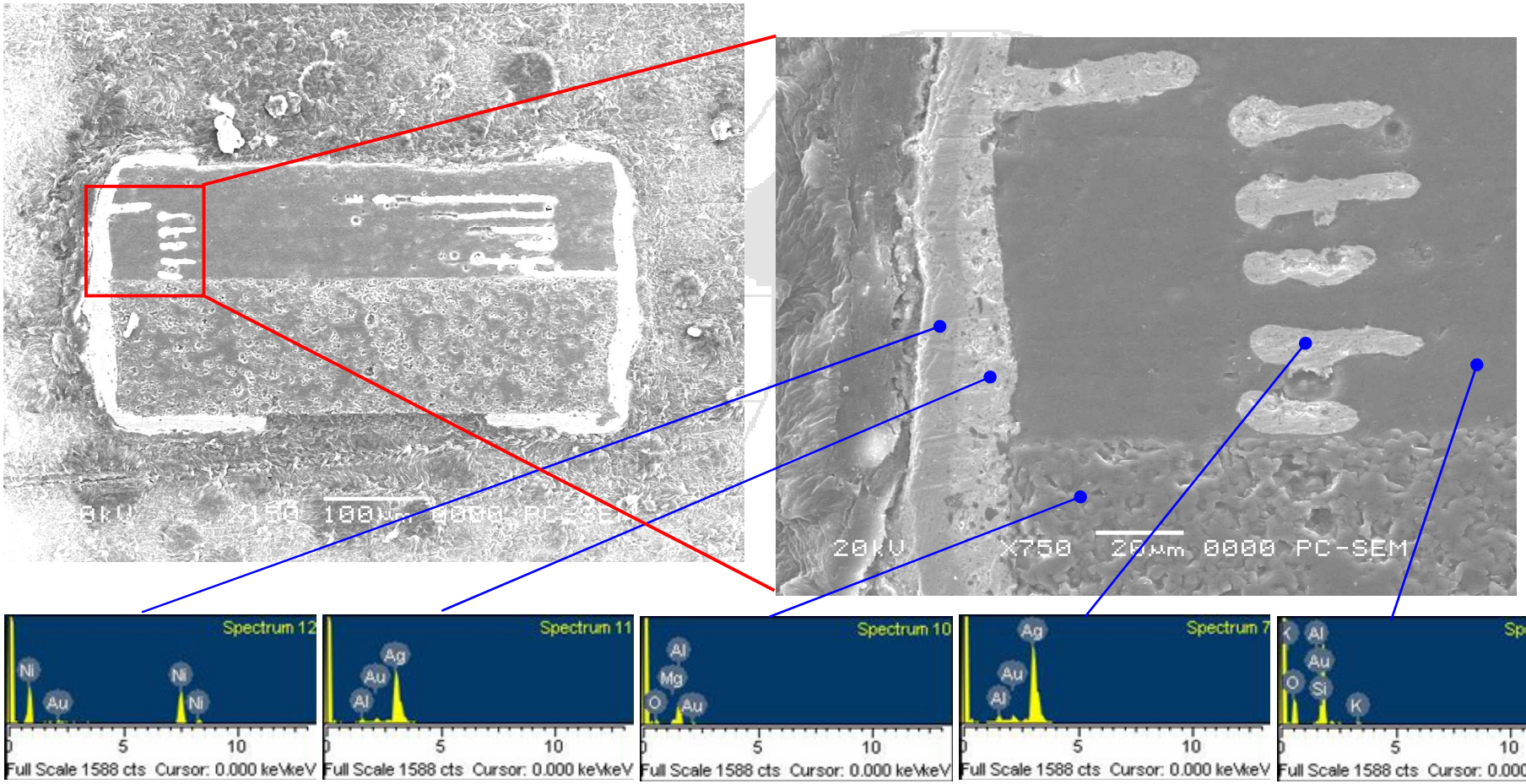






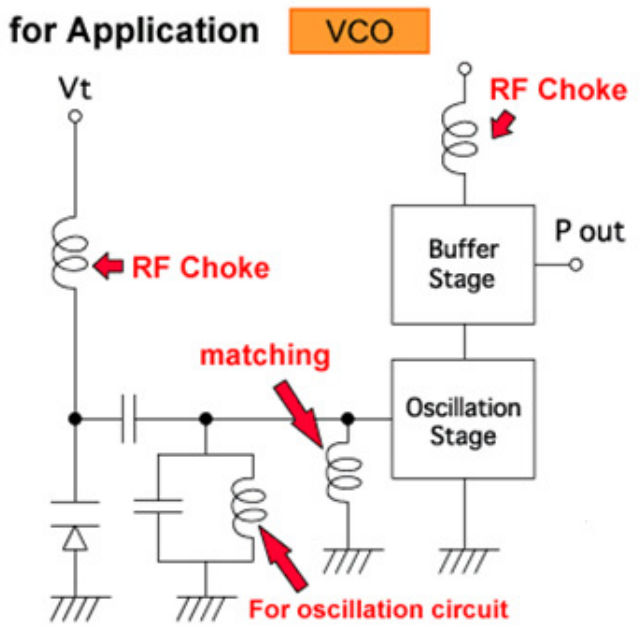


Thin Film Inductor Process



Multilayer VS Thin Film

P/N	Inductance (nH)	Q	SRF (GHz)	DCR(ohm)	IDC(mA)	Tolerance
CLH0603T-3N3S-S	3.3	4	9.2	0.12	200	±0.3nH
TFL0603T-3N3B-S	3.3	12	6	0.25	450	**±0.1nH** ★



* An example of the matching circuit

Matching coil

The matching coil should be a high-Q type or tight inductance tolerance type coil for stable oscillation and signal quality.

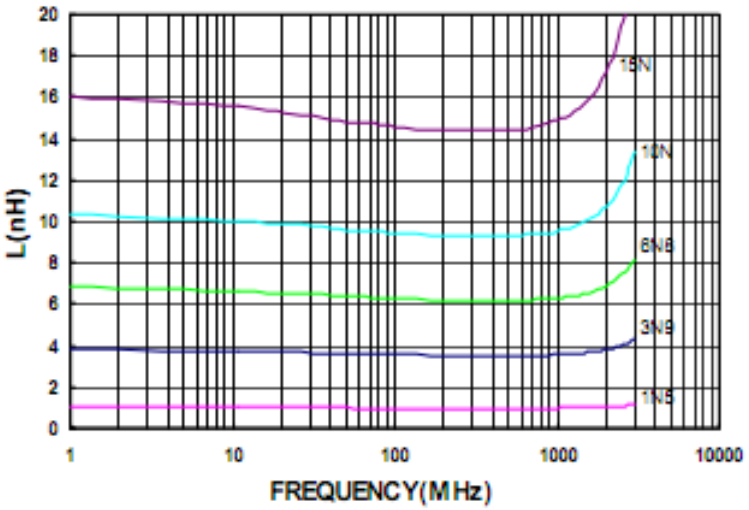
A film type coil is suitable if tight inductance tolerance is required.

Multilayer VS Wirewound

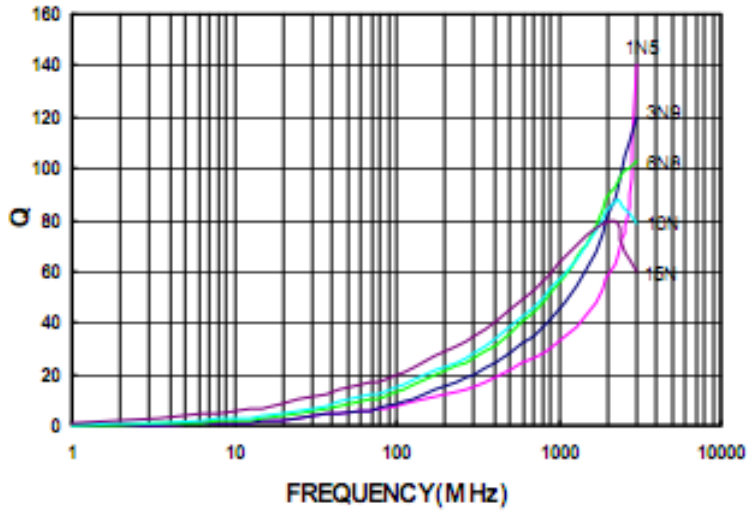
P/N	Inductance (nH)	Q	SRF (GHz)	DCR(ohm)	IDC(mA)	Tolerance
CLH1005T-3N9S-S	3.9	8	6.3	0.15	400	±0.3nH
CS0402-3N9J-S	3.9	19	7	0.066	840	±5%
★CM0402-3N3J-S	3.9	25	10	0.07	750	±5%

Typical L vs. Frequency

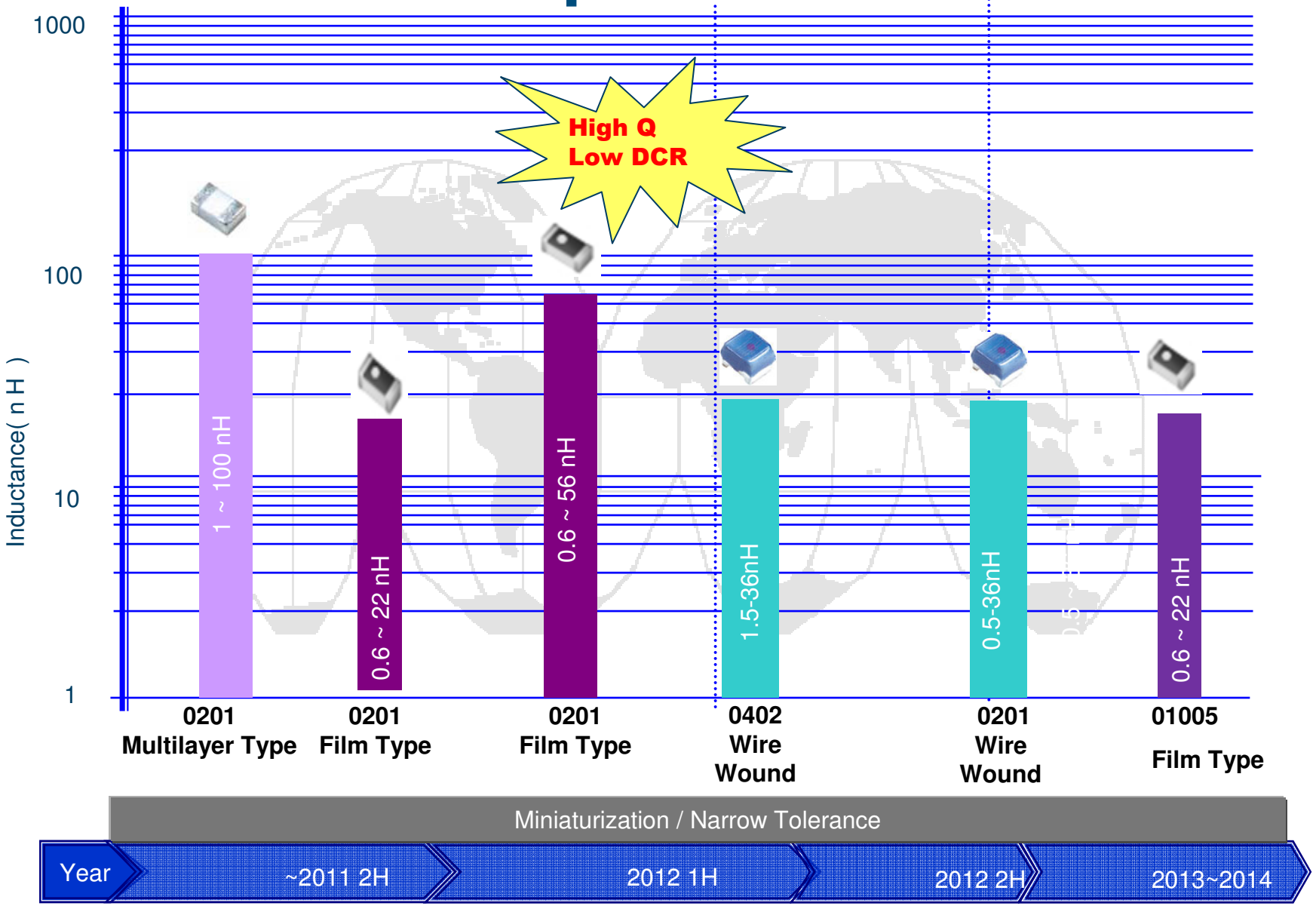
CM0402



Typical Q vs. Frequency

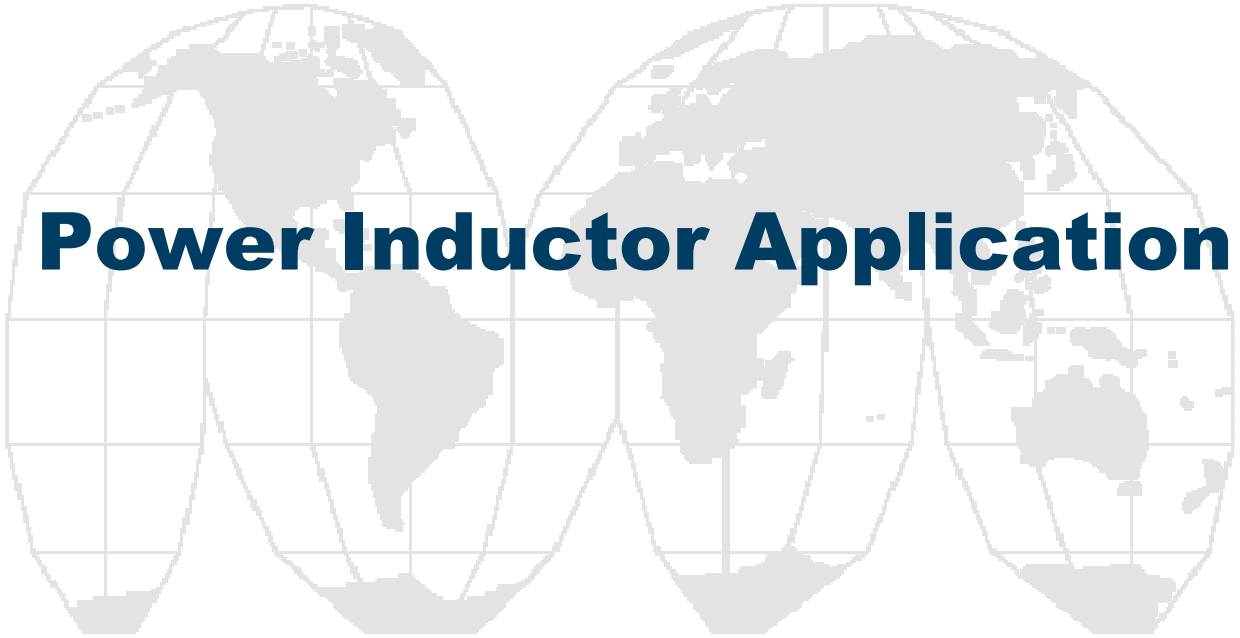


Road Map of RF Inductors



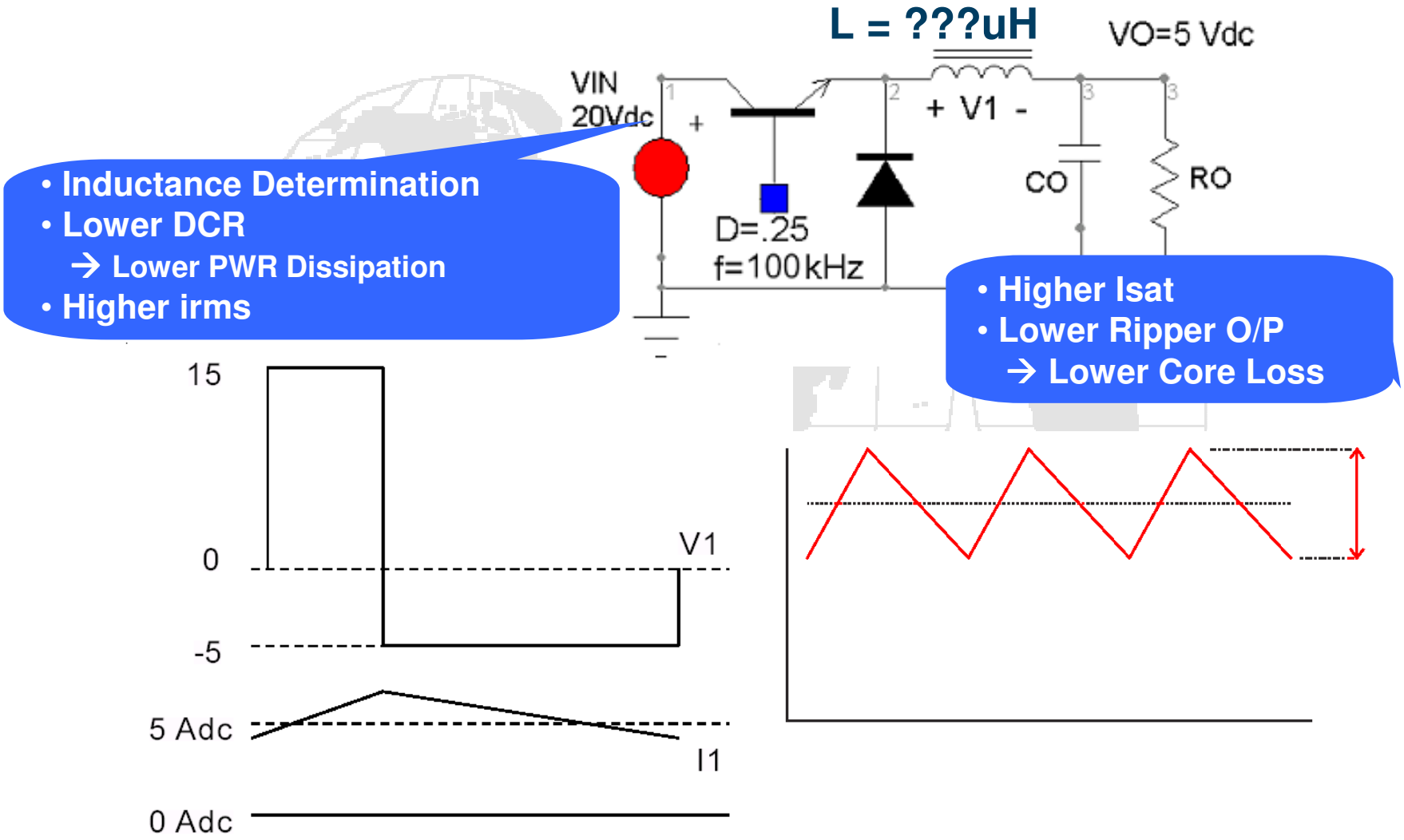
Product Comparison Sheet

Product / Supplier	Chilisin	TDK	Murata	T-Yuden	Vishay	Coilcraft
Multilayer Bead	v	v	v	v	v	
Multilayer Power Inductor	v	v	v	v		
Multilayer Ceramic RF Inductor	v	v	v	v	v	
Wire-wound Ceramic RF Inductor	v		v	v	v	v
Common Mode Choke	v	v	v	v	v	v
Power Inductor	v	v	v	v	v	v
Molding Power Inductor	v	v			v	v



Power Inductor Application

Keys to the DC to DC Applications



DC Choke Design for Buck Converter

Parameters	Specification
Input, Vin	12V
Output, Vout	5V
Load current	4.5A
Ripple current	20%
Operating frequency	600KHz

$$(V_{In} - V_{Out}) = L \times \Delta I / \Delta T$$

$$(V_{In} - V_{Out}) = (12 - 5)$$

$$\Delta T = \frac{V_{Out}}{V_{In}} \times Cycle \quad time$$

$$= \frac{5}{12} \times 1/600K$$

$$\Delta I = 4.5A \times 20\%$$

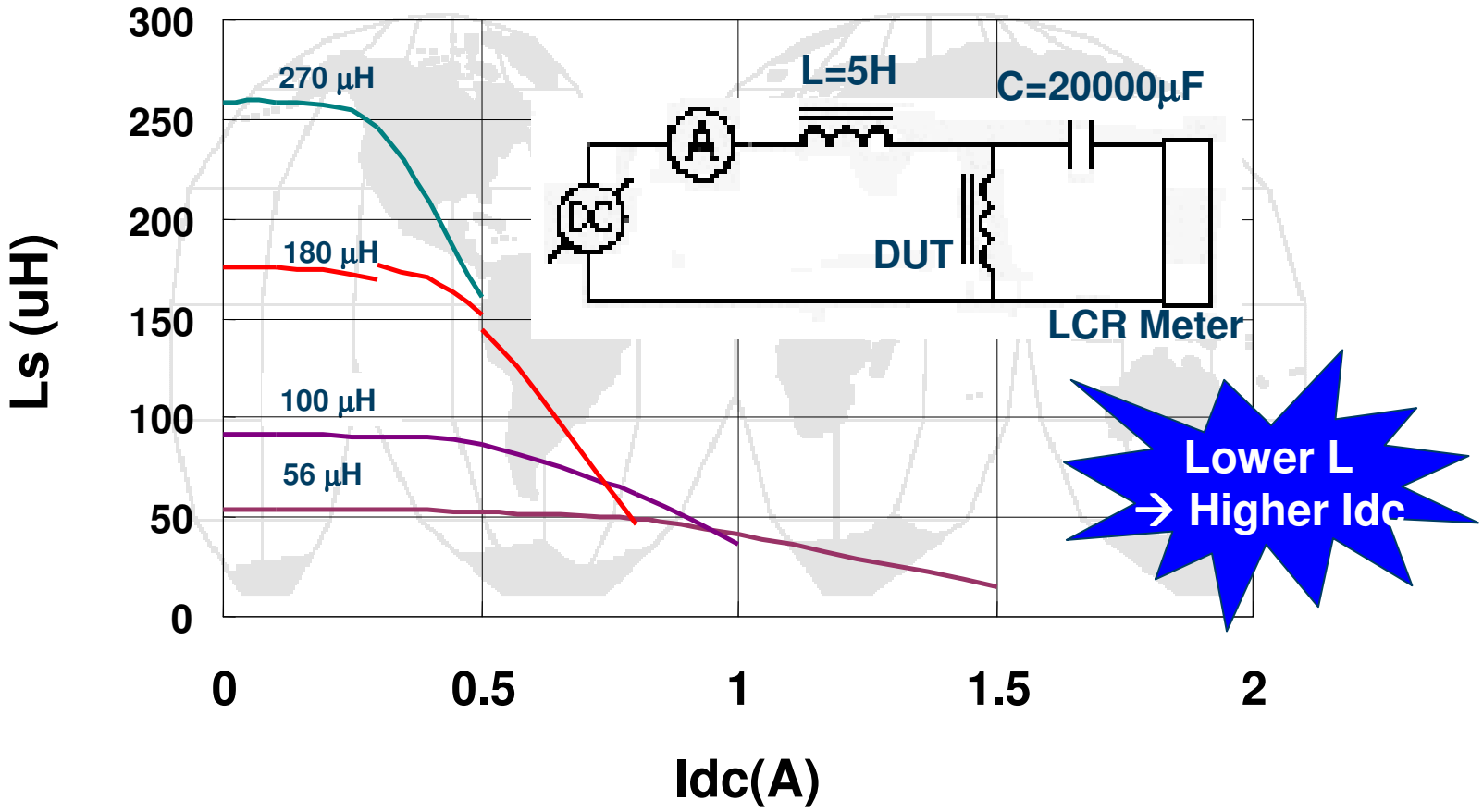
$$L = (V_{In} - V_{Out}) \div \Delta I / \Delta T$$

$$= (12 - 5) \div \frac{(4.5 \times 0.2)}{(\frac{5}{12} \times 1/600K)}$$

$$= 5.4\mu H \Rightarrow 5.6\mu H \rightarrow 19.3\% \quad Ripple$$

$L \& Temperature \quad Rise = ???$

Idc Measurement



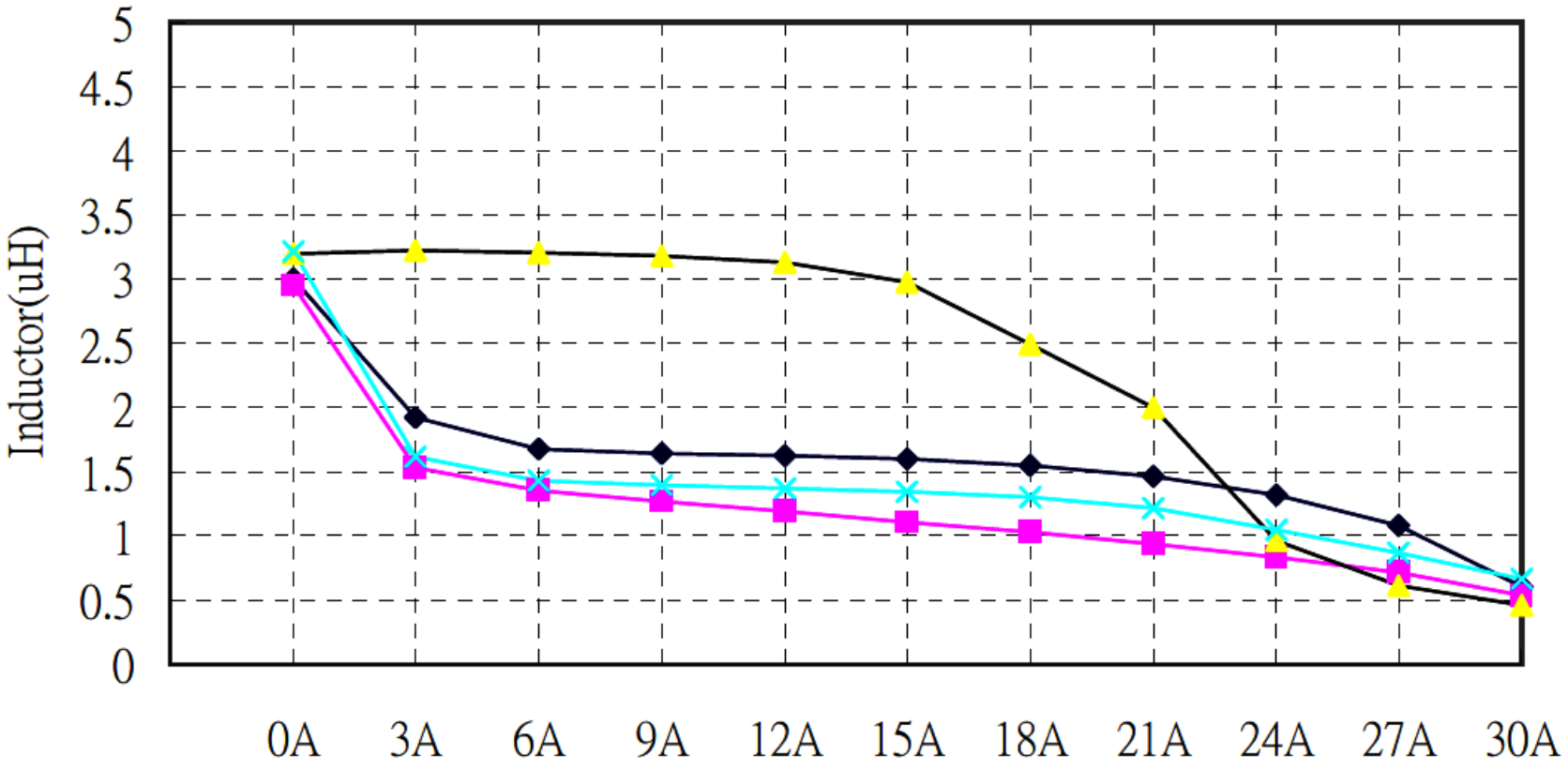
Saturated & Rated Current, Idc/Irms

Idc : 10% drop in Inductance under DC bias
: Same as Isat
: Dynamic or transient measurement

Irms : body temperature increasing in $\Delta T < 40°C$ under rated current for 2Hrs.

SCDS 127 1R0	CEC (-10%)	Sumida (-70%)
Idc	5.4 A	14 A

Designing the Desired Inductance with Loading



Cross Reference

Multilayer Chip Beads

Multilayer	Category		Chilisin	Murata	TDK	Taiyoyuden	NIC
Chip Beads	For Digital Interface		SBR	BLMxxRK	MMZxxxxR		
	General Signal	Standard	SBY/SBK	BLMxxAG	MMZxxxxS	BKxxxxHS/HM	
		Low DC Resistance	GBY/GBK	BLMxxAG			
	For High Speed Signal (Sharp impedance)		SBJ	BLMxxBD	MMZxxxxY	BKxxxxLM/HM	
			NBQ	BLMxxBB	MMZxxxxD	BKxxxxLL	
			NBI	BLMxxBA/BC	MMZxxxxF		
	GHz Band	Standard	HFY	BLMxxHG	MMZxxxxA-Z		
		For High Speed Signal	HFV	BLMxxHE		FBMHxxxxHM	
			HFJ	BLMxxHD	MMZxxxxA-Z		
			HFQ	BLMxxHB		FBMHxxxxHL	
		Low DC Resistance	HPY	BLMxxEG		FBMJxxxxHS	

Multilayer Chip Beads & Inductor

Multilayer	Category		Chilisin	Murata	TDK	Taiyoyuden	NIC
Chip Beads	Large Current	Standard	UPB	BLMxxPG	MPZxxxxR	FBMHxxxHS	
			PBY/GBK	BLMxxPG	MPZxxxxS	BKPxxxxHS	
			PBJ	BLMxxPD			
		High Speed Signal	NBP		MPZxxxxD		
		Low DC Resistance	UPB	BLMxxSG		FBMJxxxxHS	
Multilayer Inductor	Standard		CL	LQMxxxx	MLFxxxx	LKxxxx	
	High Frequency		CLH	LQGxx-HN	MLKxxxx MLGxxxx	HKxxxx	
	Power Inductor		MPA/MPB/MPC	LQMxx-PN	MLPxxxx	CKPxxxx	
Thin Film	Standard		TFL	LQPxxM-0x			

Wire Wound Inductor

Wire Wound	Category	Chilisin	Murata	TDK	T.Y.	Coil Craft	TOKO	NIC
Common Mode Choke	USB 2.0	CMM21	DLW21S---SQ	ACM2012		0805USB	NT2012	
		CMM31	DLW31S---SQ			1206USB		
	USB3.0	CMM11			CM01S(H)(U)			
	HDMI	CMHD21	DLW21S-HQ	ACM2012H ACM2012D				
Chip Inductor	General Signal Line	NL				1206CS		
		LS				----LS		
		PS				----PS		
		SQV	LQH--M					
		SQC	LQH--C LQH--D					
	High Frequency	CS	LQW--A			----CS		
		CM	LQW15A _00 LQW18A_00					
		HC				----HC		
		HQ				----HQ		

Wire Wound Inductor

Wire Wound	Category	Chilisin	Murata	TDK	T.Y.	Coil Craft	Cyntec	Vishay	Sumida	NIC
Power Inductor	Shielded	MHCC/MHCI		SPM		XFL	PCMB	IHLP	CDMC	
		LVS	LQH--P	VLS	NRXX		PS/PSI/PL/ PLR/PHI	IFSC		
		LVF		VLS			PSE----- PHE----			
		SLPS		VLCF		LPS				
		SCDS				MSS			CDRH	
		SLF		SLF	NS					
	Unshield	SCD						IDCP	CD	
		SSL				DO		IDC		
		SSL-HC				DO----H				
		SDT				DT				
		SDS				DS		IDSC		

Application Guide

Application - Smart Phone

RF Circuit
(CLH)  **(NBQ,SBJ,HFJ)** 

Analog TV Circuit
(CLH)  **(CS)**  **(CM)** 

(LD)  **(CMM11)** 

Camera Unit
(SBY,CL,MPB) 

DC-DC Converter
(LVS)  **(MPB)** 

(LVF) 

Application – Tablet PC

WiFi / Bluetooth
(CLH)  (NBQ,SBJ,HFJ) 

Camera Unit
(SBY,CL,MPB) 

3G
(CS)  (CLH) 

DC-DC Converter
(PBY)  (CMM) 

(LVS)  (MHCC) 

(LVF) 

Back Lighting
(LVS) 

(LVF)  (MPB) 

Application – Laptop

LCD Back Lighting
(LVF) 
(LVS)  (SCDS) 

LVDS Transceiver (CMM) 

HDMI/DVI/ Analog RGB (CMM) 

CPU (PBY) 

Video Chip (PBY) 

North Bridge (PBY) 

South Bridge (PBY) 

DC-DC Converter
(PBY)  (CMM) 
(SCD)  (MHCC) 

USB/IEEE1394/LAN Interface
(PBY)  (CMM) 

Wireless LAN (NBQ,CL,MPB) 
(CS)  (CLH) 

Application – All in One

LCD Back Lighting
(LVS) (SCDS)
(LVF)

HDMI/DVI/Analog RGB
(CMM)

Video Chip
(CLH) (PBY)
(CPU) (MHCC)

CPU
(PBY)

USB/IEEE1394 /LAN Interface
(PBY) (CMM)

DC-DC Converter
(PBY) (CPU) (MHCC)

Application - Mother Board

CPU (PBY)

North Bridge (PBY)

South Bridge (CP, PBY)

HDMI/DVI/Analog RGB (CMM)

USB/IEEE1394/ LAN Interface

(PBY) (CMM)

DC-DC Converter

(PBY) (CMM)

(DMI) (CPU)

(MHCC)

Video Chip

(CLH) (PBY)

(DMI) (CPU)

(MHCC)

AC Adapter

(RH) (TFU)

(ET/UT)

Application - STB

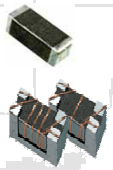
Tuner
(NBI, CL)
(CLH)
(CS, LCN)
(SQV)

LCD Panel
(LVS)
(LVF)

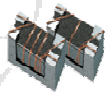
DSP
(NBI, CL)
(BA)
(LVS)
(LVF)
(SQV)

AV Decoder
(BA)
(NBI, PBY)
(SQV)

USB/IEEE1394
(PBY)
(CMM)

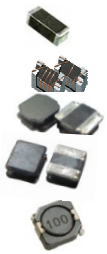


HDMI/DVI/Interface
(CMM,CMHD)



AC Adapter
(RH)
(TFU)
(ET/UT)

DC-DC Converter
(PBY)
(CMM)
(LVS)
(LVF)
(SCDS)



Application - DSC

Analog Front End
(NBI, PBY)
(BA)

Lens Motor
(NBI)

Speaker
/Microphone
(BA)

USB/HDMI
(PBY)
(CMM)

Image
Processing IC
(NBI)
(BA)

Power Supply Unit
(CL)
(LVS)
(LVF)
(SCDS)

LCD Panel
(LVS)
(LVF)

AC Adapter
(RH) **(TFU)** **(ET/UT)**

Strobe Light
(NBI)

Application - DVD Player

Pickup unit (NBI)

(LVS)

(LVF)

(SQV,SQC)

Front-end Processor (BA)

(NBI, PBY)

(SQV)

System Controller

(NBI)

AV Decoder (BA)

(NBI, PBY)

(SQV)

MPEG2 Encoder (BA)

(NBI, PBY)

(SQV)

HDMI/DVI/Interface

(CMM)

AC Adapter (RH)

(TFU)

(ET/UT)

DC-DC Converter

(PBY)

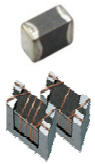
(SCDS)

(CMM)

USB/IEEE1394

(PBY)

(CMM)



Application - Game Console

CPU

(PBY)

Controller I/F

(NBI)

USB/1394/LAN/HDD Interface

(PBY) (CMM)

Controller
(NBI)
(CMM)
(SLF)
(SCDS)
(LVS)
(RH)
(LVF)

Wireless LAN
(NBQ)
(CLH)
(CL)
(CS,LCN)
(BPF)
(Balun)

AC Adapter
(RH)
(TFU)
(ET/UT)

Graphic Processing
(MHCC)
(NBI,NBQ)

DC-DC Converter
(PBY)
(CMM)
(SCDS)

Blu-ray Disc/DVD
(BA)
(NBI)
(SQV)

Application - Base Station

Power Management
(PBY)
(SQV)
(SCD,SCDS)
(LVS)
(MHCC)
(LVF)

Base Band Processing
(CMM)
(CS)
(NBI)
(LVS)
(LVF)

Remote Radio
(CS)
(CLH)
(LVS)
(LVF)

Control and Clock
(NBI)
(LVS)
(LVF)

AC Adapter
(SCD)
(TFU)

Filter Switch
(CLH)
(CS)
(LVS)
(LVF)

Application - LCD TV

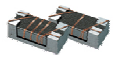
Tuner

(NBI, CL) 
(CLH) 
(SQV) 
(CS, LCN) 

DSP

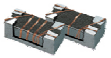
(NBI,CL) 
(BA) 
(SQV) 
(LVS) 
(LVF) 

USB/1394/HDMI Interface

(PBY) 
(CMM) 

AC Adapter
(RH) 
(TFU) 
(ET/UT) 

Clock
(NBI) 

Memory Card Interface
(NBI) 
(CMM) 

LCD Back Lighting
(LVF) 
(LVS) 
(SCDS) 

DC-DC Converter
(PBY) 
(SCDS) 
(CMM) 

Audio
(LVS) 
(LVF) 
(SCDS) 

WiFi
(MPB) 

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