



AUTOMOTIVE STANDARD PRODUCTS

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FAE & BDM

WÜRTH ELEKTRONIK MORE THAN YOU EXPECT

Requirements automotive components

- Why automotive parts
- Requirements for automotive parts
- PPAP
- IMDS
- IATF 16949
- AEC-Q 200

Documentation for WE ASP*

- TS 16949 or IATF 16949
(International Automotive Task Force)
Harmonized requirements to quality management (formerly known as ISO 9001)
- IMDS (International Material Data System)
global standardized exchange and administration system for material data for automotive industry
(used by approx. 35 OEMs and approx. 120.000 supplier)
IMDS material declarations contains all contents of materials (available for all WE automotive parts)
- AEC-Q 200 (Automotive Electronics Council - 200: passive components)
defines different tests for passive components
- PPAP (Production Part Approval Process)
Process of part submission warrant and release for components
Different levels available – contains all details of the component

* **A**utomotive **S**tandard **P**roducts

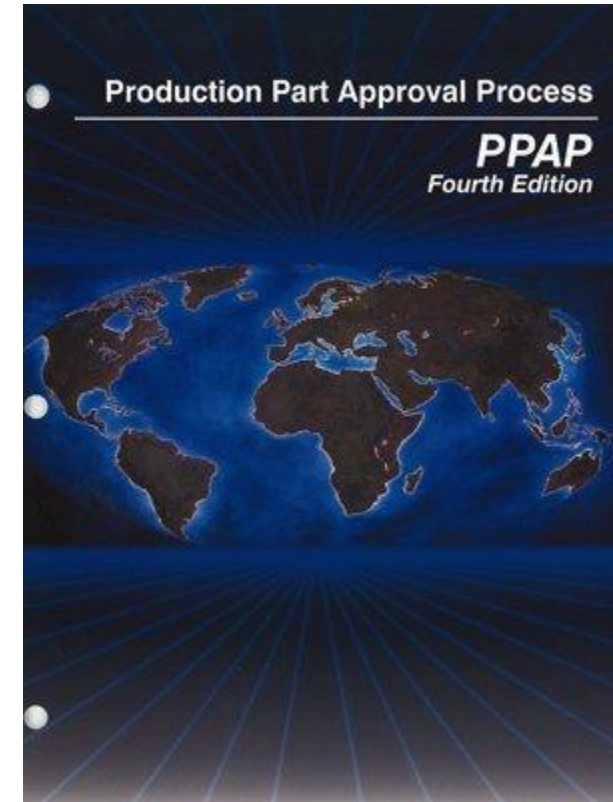
AEC - Q200 - Rev E
March 20, 2023

STRESS TEST QUALIFICATION FOR PASSIVE COMPONENTS

Automotive Electronics Council
Component Technical Committee

PPAP

- PPAP = production part approval process
- Standardized process to ensure quality of components
- Ensures, that components last clients demands and the production
- Production process is able to produce the according components
- PPAP knows 5 different levels
- PPAP-process requires different documents (supplied by the component supplier)
-
- Well known process in the automotive industry
- Goal: ensure quality while designing and producing the components



<http://www.aecouncil.com/AECDocuments.html>

PPAP content in detail

- PPAP Level 1

- PSW
- Data sheet
- REACH / RoHS documents

- PPAP Level 3

- PSW
- Data sheet
- Design-FMEA (failure mode and effects analysis)
- Process-FMEA
- Control plan
- Measurement system analysis studies (MSA)
- Process flow chart
- Test results
- Material, performance test results
- Initial process studies
- Sample product
- REACH / RoHS documents

PPAP (PSW) document

- Overview „PPAP package“
- confirmation, that all demands to the PPAP level are fulfilled and all necessary PPAP-documents are available.
- Approval by supplier and customer

11. PART SUBMISSION WARRANT (PSW)			
Part Name WE-PDA SMT Power Inductor		Customer Part Number	
Shown on Drawing No. 784778022		Organization Part Number 784778022	
Engineering Change Level Version 2		Dated 11/18	
Additional Engineering Changes		Dated	
Safety and/or Government Regulation ☐ Yes ☒ No		Purchase Order No. n/a Weight (g) 0,8400	
Checking Aid No.		Checking Aid Engineering Change Level Dated	
ORGANIZATION MANUFACTURING INFORMATION		CUSTOMER SUBMITTAL INFORMATION	
Würth Elektronik eiSos GmbH & Co.KG (VC:)		Customer Name	
Organization Name & Supplier/Vendor Code			
Max-Eyth-Str. 1		Buyer/Buyer Code	
Street Address			
Waldenburg 74838 DE		Non-safety automotive applications	
City Postal Code Country		Application	
MATERIALS REPORTING			
Has customer-required Substances of Concern information been reported? ☐ Yes ☐ No ☒ n/a			
Submitted by IMDS or other customer format: IMDS: 781306553 / 1			
Are polymeric parts identified with appropriate ISO marking codes? ☐ Yes ☐ No ☒ n/a			
REASON FOR SUBMISSION			
☒ Initial Submission ☐ Change to Optional Construction or Material			
☐ Engineering Change(s) ☐ Supplier or Material Source Change			
☐ Tooling: Transfer, Replacement, Refurbishment, or additional ☐ Change in Part Processing			
☐ Correction of Discrepancy ☐ Parts Produced at Additional Location			
☐ Tooling Inactive > than 1 year ☐ Other - please specify:			
REQUESTED SUBMISSION LEVEL			
☐ Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.			
☐ Level 2 - Warrant with product samples and limited supporting data submitted to customer.			
☒ Level 3 - Warrant with product samples and complete supporting data submitted to customer.			
☐ Level 4 - Warrant and other requirements as defined by customer.			
☐ Level 5 - Warrant with product samples and complete supporting data reviewed at organization's manufacturing location.			
SUBMISSION RESULTS			
The results for ☒ dimensional measurements ☐ material and functional tests ☐ appearance criteria ☐ statistical process package			
These results meet all drawing and specification requirements: ☒ Yes ☐ No ☐ n/a			
Mold / Cavity / Production Process:			
DECLARATION			
I hereby affirm that the samples represented by this warrant are representative of our parts which were made to the applicable Production Part Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the serial production. I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from the declaration below.			
EXPLANATION / COMMENTS: Please refer to attached information.			
Is each Customer Tool properly tagged and numbered? ☐ Yes ☐ No ☒ n/a			
Organization Authorized Signature <i>J. A. Sbrongk</i> Date: 28.01.2019			
Print Name J.A. Alina Sbrongk		Phone No. +49 7942 6450	
Title Quality Manager		E-Mail PPAP@we-online.com	
FOR CUSTOMER USE ONLY (IF APPLICABLE)			
Part Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other:			
Customer Signature		Date:	
Print Name		Customer Tracking Number (optional)	

Please send the PSW back!

PPAP19CU2467

IndPDA 7332

PPAP Level 3



(re)Qualification AEC-Q200 Test Overview

Wuerth Elektronik
eiSos GmbH & Co. KG

Match Code:	WE-PDA	Description:	SMD Power Inductor	Responsible PM:	Benjamin Moehrl	Responsible TQM:	Thomas Friemel
Lab	QDC_Asia	Reliability type	(re)Qualification AEC-Q200	Approved Date:	19.03.2014	Approved Date :	19.03.2014

Test Method Sample Info			MIL-STD-202 Method 108	JESD22 Method JA-104	MIL-STD-202 Method 103	MIL-PRF-27	MIL-STD-883 Method 2009	JESD22 Method JB-100	MIL-STD-202 Method 215	MIL-STD-202 Method 213	MIL-STD-202 Method 204	MIL-STD-202 Method 210	AEC-Q200-002 or ISO/DIS10605	J-STD-002	User Spec.	AEC-Q200-005	AEC-Q200-006
S/N	Size	Part No	High temperature Exposure	Temperature Cycling	Biased Humidity	Operational Life	External Visual	Physical Dimension	Resistance to Solvent	Mechanical Shock	Vibration	Resistance to Soldering Heat	ESD	Solderability	Electrical Characterization	Board Flex	Terminal Strength (SMD)
1	7332	784778102	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs
2	7345	784777151	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs
7	1260	784771101	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs
8	1260	784771102	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs
9	1210	7847709220	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs
10	1210	7847709221	0/77pcs	0/77pcs	0/77pcs	0/77pcs	OK	0/30pcs	0/5pcs	0/30pcs	0/30pcs	0/30pcs	0/15pcs	0/45pcs	0/77pcs	0/30pcs	0/30pcs

Comments:
- solvent might affect the product marking

Requirements: Sample size: according to AEC-Q200-D specification Table 1 Accept on number of failures: zero	Note: Green marked: Test passed Red marked: Test failed	0/30pcs = x/y pcs x = number failed y = quantity tested
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IMDS

- IMDS (International Material Data System)
- Used by 35 OEMs and approx. 120.000 supplier
- IMDS data contains all materials and their chemical contents

WILLKOMMEN IM INTERNATIONALEN MATERIAL DATEN SYSTEM

Das IMDS (Internationales MaterialDatenSystem) ist das Materialdaten-System der Automobilindustrie. Es ist eine gemeinsame Entwicklung von Audi, BMW, Daimler, DXC, Ford, Opel, Porsche, VW und Volvo. Weitere Hersteller sind dem Verbund inzwischen beigetreten, wodurch sich IMDS zum globalen Standard entwickelt hat, der von fast allen global agierenden OEMs genutzt wird. Außerdem werden mit weiteren Herstellern Gespräche über die Teilnahme im IMDS geführt. Im IMDS werden alle Werkstoffe, die bei der Herstellung von Autos verwendet werden, gesammelt, gepflegt, analysiert und archiviert. Durch die Nutzung des IMDS ist es möglich, die Verpflichtungen zu erfüllen, die Automobilherstellern und deren Zulieferern durch nationale und internationale Standards, Gesetze und Regelungen entstehen.



IMDS – WE-PDA

The screenshot displays the IMDS interface for the 'WE-PDA SMD Power Inductor'. The interface is divided into several sections:

- Top Navigation:** Includes tabs for 'MDB-/Modul-Suche', 'Inhaltsstoffe', 'Angaben zum Hersteller/Lieferanten', and 'Information Empfängerstatus'.
- Search and Filter:** A search bar with 'GADSL' entered and a filter icon.
- Material Tree (Left):** A hierarchical list of materials and their percentages:
 - WE-PDA SMD Power Inductor
 - 0,26832g Wire copper
 - 100,0% Wire copper
 - 95,65% Kupfer
 - 0,35% Phosphor
 - 4,0% Zinn
 - 0,01118g Wire lacquers
 - 100,0% Wire lacquers
 - 1,77418g Ferrite
 - 100,0% Ferrite
 - 10,0% Kupferoxid
 - 60,0% Dieisentrioxid
 - 10,0% Nickelmonoxid
 - 20,0% Zinkoxid
 - 0,04988g Glue
 - 100,0% Glue
 - 0,00473g Marking
 - 100,0% Marking
 - 0,12943g Base plastic
 - 0,301g Base copper
 - 1,76128g Shield Ring
- Details Panel (Right):** Contains information categorized under 'Allgemeine Informationen', 'Daten', and 'Anzahl und Gewichte'.
 - Allgemeine Informationen:**
 - Typ: Teil (eigenes MDB)
 - ID / Version: 522387471 / 0.01
 - Node-ID: 522387471
 - Anzahl der Knoten: 42
 - MDB-Lieferant: Würth Elektronik eiSos GmbH & Co. KG
 - Benennung: WE-PDA SMD Power Inductor
 - Teil-/Sach-Nr.: 784770152
 - Vorläufiges MDB: Nein
 - Daten:**
 - Erstellungsdatum: 25.02.2015
 - Prüf-/Freigabedatum: nicht verfügbar
 - Links to help icons and 'Richtlinien'.
 - Anzahl und Gewichte:**
 - Gemessenes Einzelgewicht: 4,3 g
 - Errechnetes Einzelgewicht: 4,3 g
 - Abweichung: 0,0%

IATF 16949

- IATF: International Automotive Task Force
- Definition for quality management systems
- Most automotive OEMs follow the IATF 16949 (01.10.2017)
- Suitable for the whole supply chain

AEC-Q 200

- Standard and definition for testing passive automotive parts (defined by the Automotive Electronics Council)
- Standard for automotive applications
- e.g.
 - AEC-Q200-001 Flame Retardance Test
 - AEC-Q200-002 ESD (Human Body Model) Test
 - AEC-Q200-003 Beam Load (Break Strength) Test
 - AEC-Q200-004 Polymeric Resettable Fuse Test
 - AEC-Q200-005 Board Flex Test
 - AEC-Q200-006 Measurement Methods for Resettable Fuses
 - AEC-Q200-007 Voltage Surge Test
 - AEC-Q005 Pb-Free Test Requirements

AEC-Q200 REV D
June 1, 2010

Automotive Electronics Council
Component Technical Committee

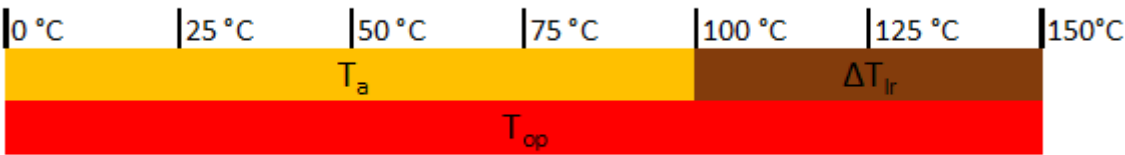
TABLE 1 - QUALIFICATION SAMPLE SIZE REQUIREMENTS					
Stress	NO.	Note	Sample Size Per Lot	Number of lots	Accept on Number failed
Pre-and Post-Stress Electrical Test	1	G	All qualification parts submitted for testing		0
High Temperature Exposure	3	DG	77 Note B	1	0
Temperature Cycling	4	DG	77 Note B	1	0
Destructive Physical Analysis	5	DG	10 Note B	1	0
Moisture Resistance	6	DG	77 Note B	1	0
Humidity Bias	7	DG	77 Note B	1	0
High Temperature Operating Life	8	DG	77 Note B	1	0
External Visual	9	NG	All qualification parts submitted		0
Physical Dimensions	10	NG	30	1	0
Terminal Strength	11	DGL	30	1	0
Resistance to Solvent	12	DG	5	1	0
Mechanical Shock	13	DG	30	1	0
Vibration	14	DG	Note B		
Resistance to Solder Heat	15	DG	30	1	0
Thermal Shock	16	DG	30	1	0
ESD	17	D	15	1	0

Temp. definition

Example: WE-CHSA 7843320100

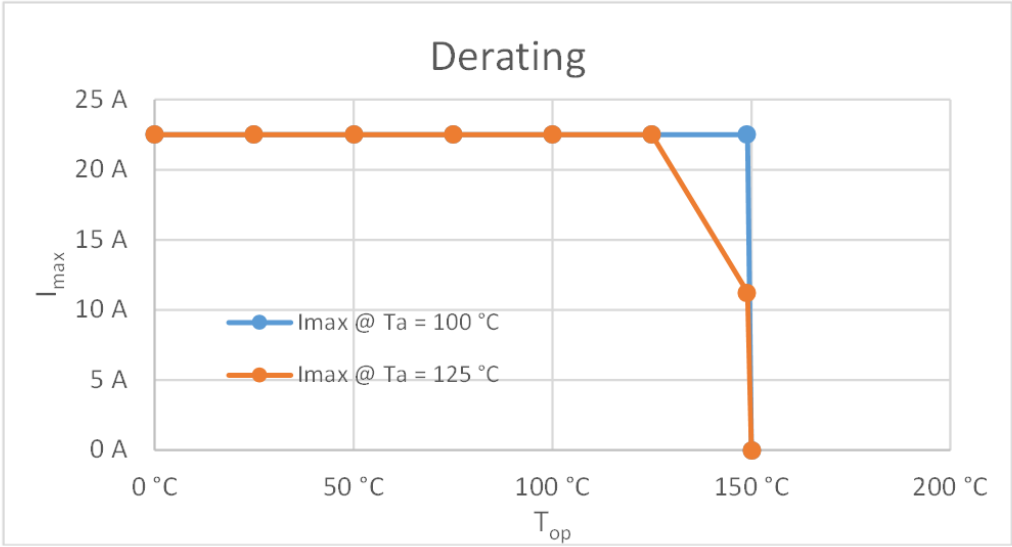
Electrical Properties:

Properties	Test conditions		Value	Unit	Tol.
Inductance	100 kHz/ 10 mA	L	1	μH	±20%
Rated Current	ΔT = 50 K	I _R	22.5	A	max.
Saturation Current	ΔL/L < 30 %	I _{SAT}	33.7	A	typ.
DC Resistance	@ 20 °C	R _{DC}	2	mΩ	typ.
DC Resistance	@ 20 °C	R _{DC}	2.4	mΩ	max.
Self Resonant Frequency		f _{res}	81	MHz	typ.



General Information:

It is recommended that the temperature of the component does not exceed +150°C under worst case conditions	
Ambient Temperature (referring to I _R)	-55 °C up to +100 °C
Storage Temperature (in original packaging)	-20°C up to +40°C, 75% RH max.
Operating Temperature	-55 °C up to +150 °C
AEC-Q200 qualified	
Test conditions of Electrical Properties: +20°C, 33% RH if not specified differently	



Automotive standard products (ASP) in detail

- EMC components
 - WE-TEMA Toroidal EMI MnZn Suppression Ferrite
 - WE-TEFA Toroidal EMI Suppression Ferrite
 - WE-AEFA Axial EMI Suppression Ferrite
 - WE-AENA Axial EMI Suppression Nano Crystalline
 - WE-CBA SMD EMI Suppression Ferrite Bead
 - WE-MPSA Multilayer Power Suppression Bead
 - WE-RCIT Rod Core Inductor THT
 - WE-RCIS Rod Core Inductor SMD

Automotive standard products (ASP) in detail

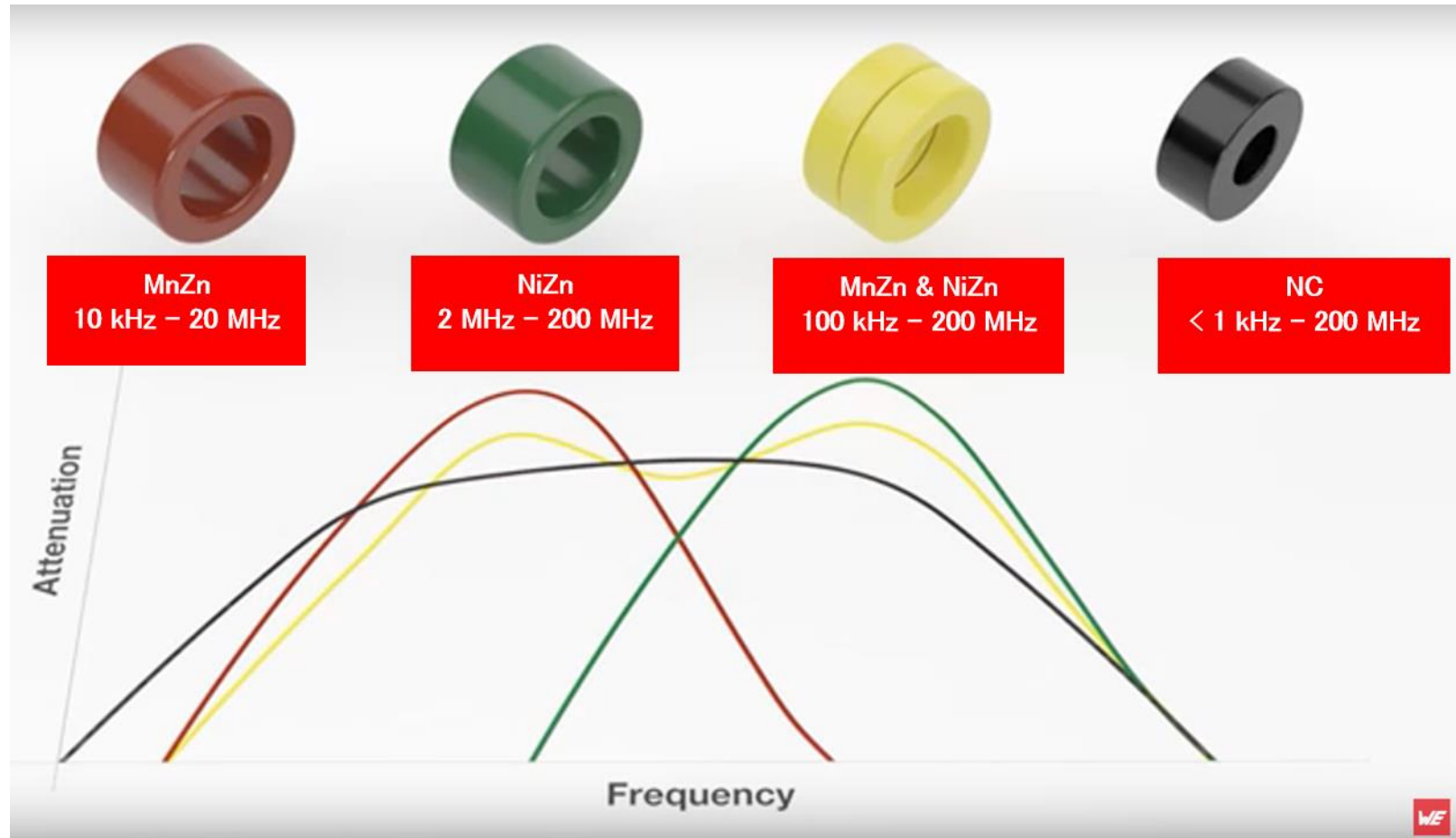
- Power magnetics
 - WE-MAIA SMD Metal Alloy Power Inductor
 - WE-PDA SMD Shielded Power Inductor
 - WE-PD SMT Shielded Power Inductor
 - WE-CHSA Cube High Current Suppression
 - WE-HCFA High Current Flat Wire Inductor
 - WE-HCIT High Current Inductor THT
 - WE-PD2SA SMD Shielded Power Inductor
 - WE-PD2A SMD Power Inductor
 - WE-MCI Multilayer Ceramic SMD Inductor

Automotive standard products (ASP) in detail

- RF Inductors
 - WE-MCI Multilayer Ceramic SMD Inductor

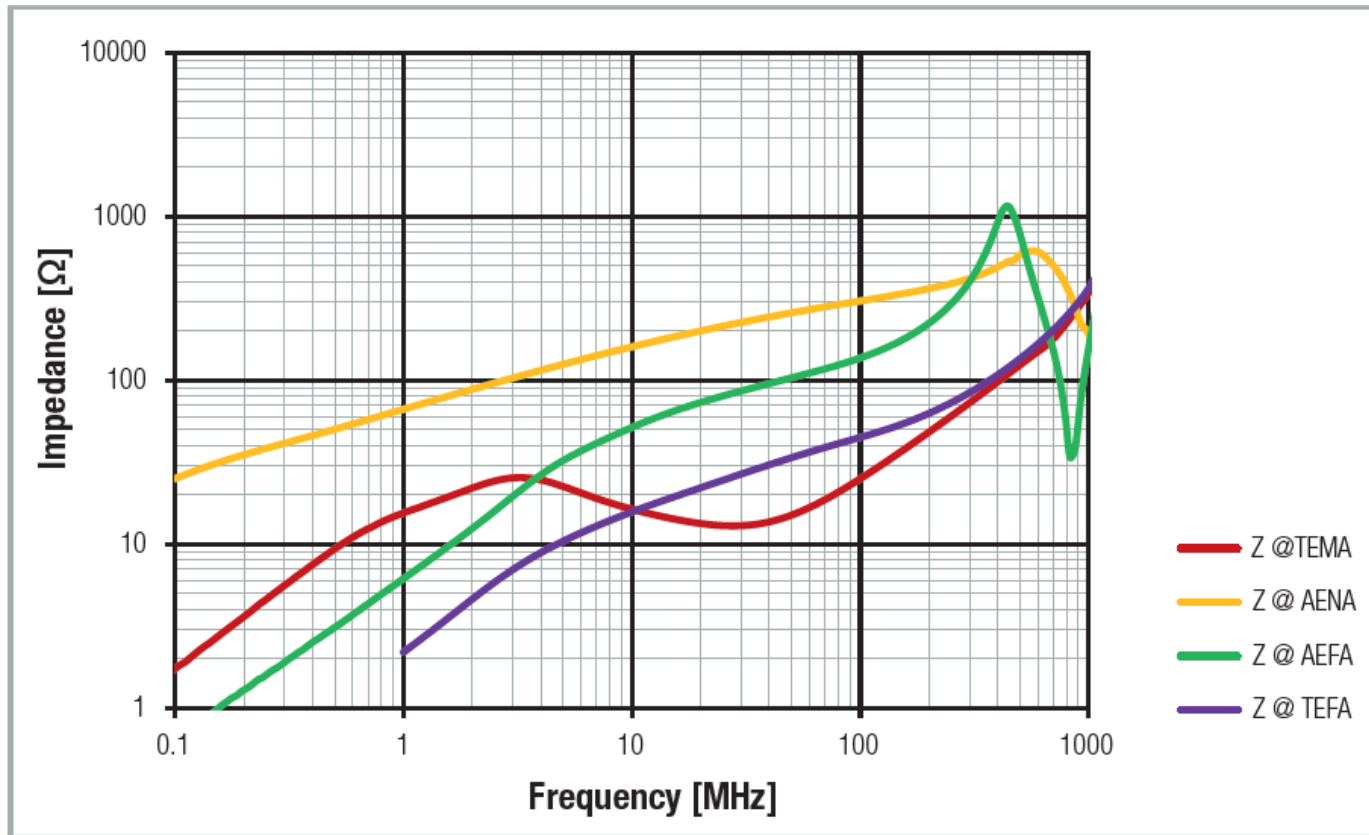
- SMT Spacer
 - WE-SMSA SMT Steel Spacer Automotive
 - WE-SCFA Soldered Contact Finger Automotive

Ferrite Materials overview



Impedance vs. Frequency @ different materials

Impedance vs. Frequency

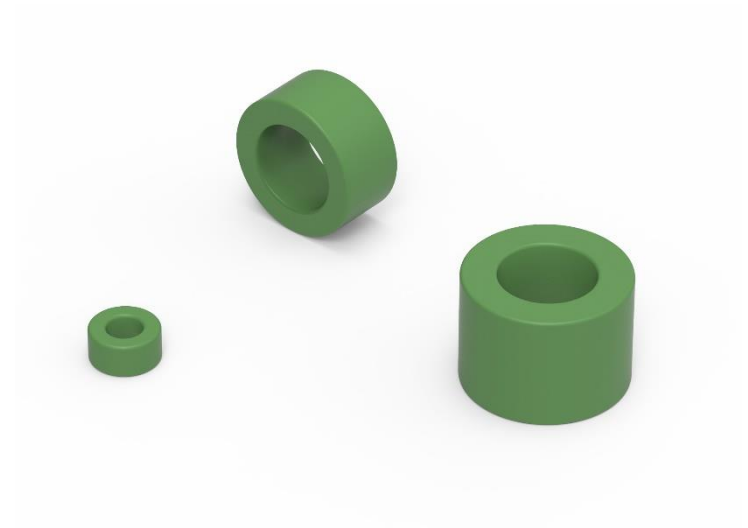


MgZn	Magnesium-Zinc
MnZn	Manganese-Zinc
NiZn	Nickel-Zinc
Nanocrystalline	Nanocrystalline

WE-TEMA overview

Toroidal EMI Suppression Ferrite

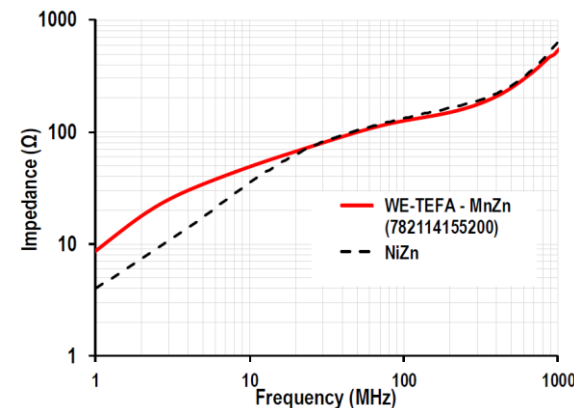
- Material: MnZn (UL Coated)
 - Operating temperature: -50°C up to 150 °C
 - Z @ 1 MHz up to 27,5 Ohm
 - Cable Ø 2,1 – 38,1 mm
 - AEC-Q200
-
- Applications
 - Automotive Wiring Harness
 - Data and Signal Lines
 - Multimedia Cable Interfaces



WE-TEFA overview

Toroidal EMI Suppression Ferrite

- Art. Nr 782 114 xxx xxx
- Material: MgZn (higher permeability than NiZn)
- Temp: -55 – 140°C
- Cable: Ø 7,5 – 15,5 mm
- AEC-Q 200
- Design Kit 782114
- Advantages
 - Up to 140 % higher impedance between 1 MHz & 10 MHz than NiZn-cores (@ same size)
- Application
 - Cables (wires, coaxial, twisted, multicore, etc.)
 - Data-/ signal cables
 - Multimedia cables



WE-AEFA overview

Axial EMI Suppression Ferrite

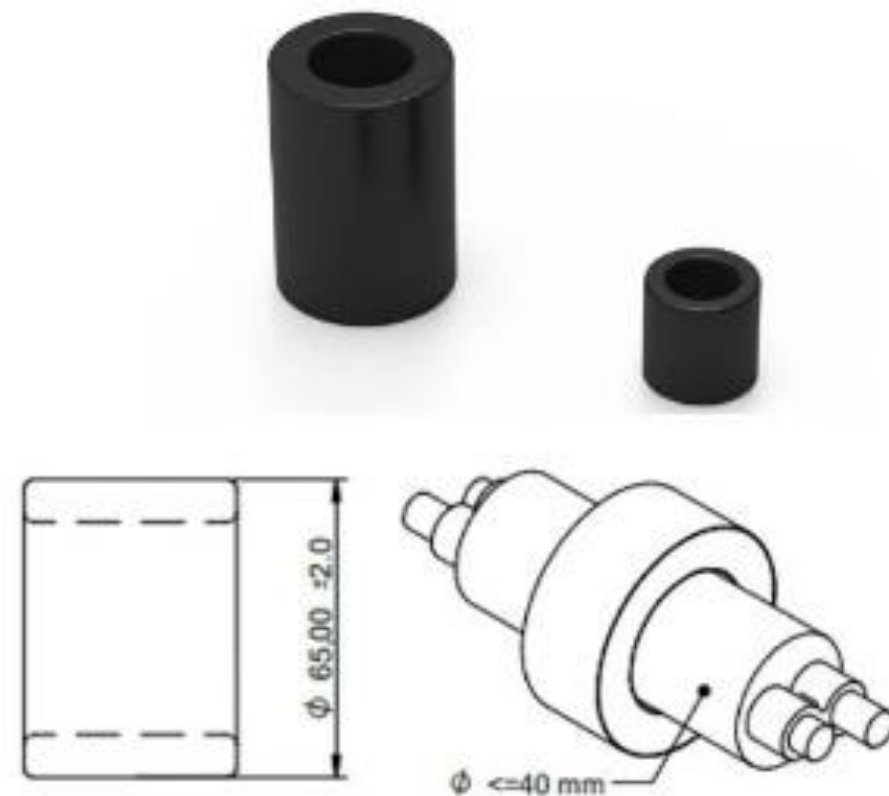
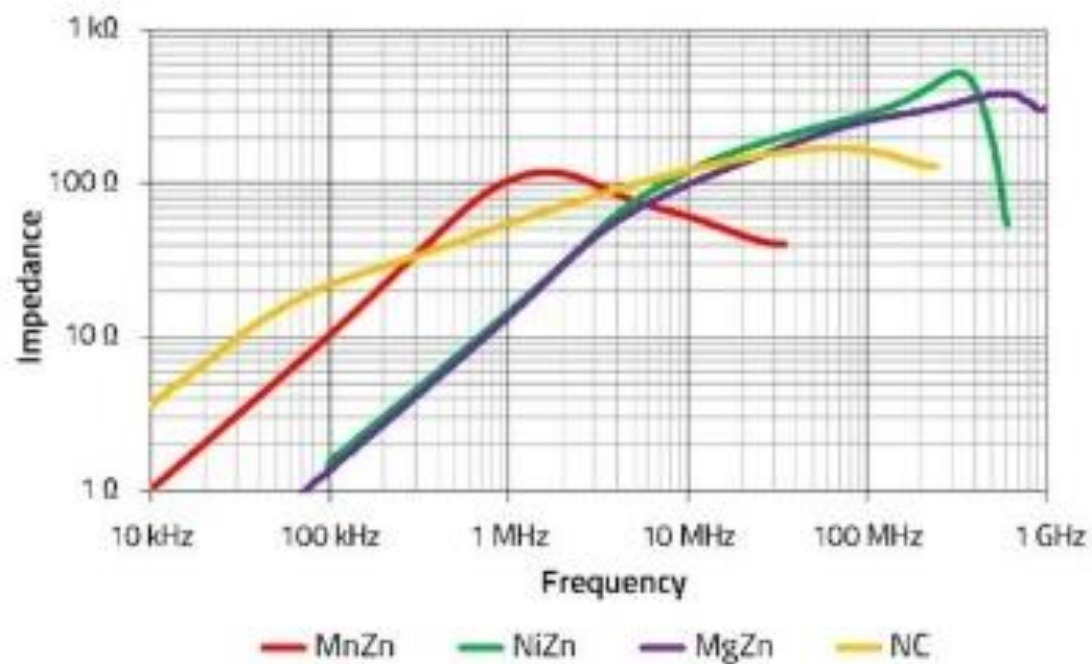
- Wide band filter
- Material: NiZn
- Cable: Ø 4,75 – 15,5 mm
- Temp: –55 °C up to +150 °C
- Sample kit: [782013](#)
- Applications
 - Common on wires, coaxial wires, twisted wires...
 - Data- & signal lines
 - Power supply cables
 - Interface cables



WE-AEFA

Axial EMI Suppression Ferrite

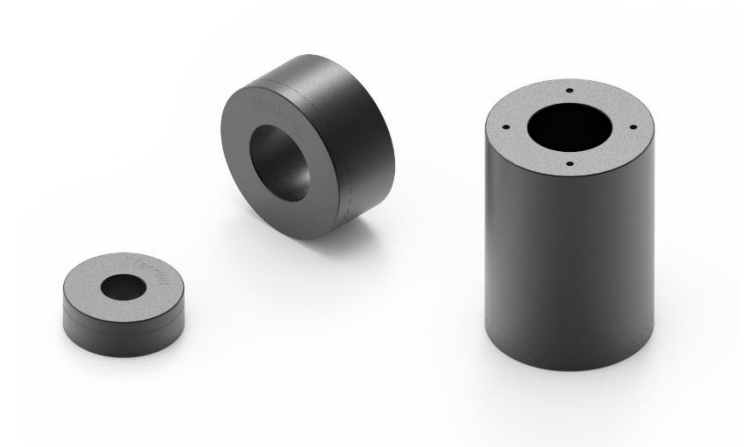
- New size: $\varnothing$ Cable max: 40 mm
- Material: NiZn
- Temp: -55°C - $+150^{\circ}\text{C}$
- AEC-Q200 (Grade 0)



WE-AENA overview

Axial EMI Suppression Nanocrystalline

- Material: Nanocrystalline
- Z @ 1 MHz: up to 52 Ohm
- Operating temperature: -40°C up to 125 °C
- Cable Ø 5,2 – 15,2 mm
- AEC-Q200
- Applications
 - In General: Wires, Coaxial cables, wirewrapping cables, multiconductor wires
 - Data and signal lines
 - On board power supply line
 - Multimedia cable interfaces



WE-CBA overview

SMD EMI Suppression Ferrite Beat

- Size: 0402 / 0603 / 0805 / 1206 / 1806 / 1812
- Impedance: 10 – 2200 Ohm
- NiSn electrodes
- Up to 8 A rated current
- Temp: –55 °C - +125 °C
- Applications:
Filtering data signals and power supplies
- High Speed:
lower impedances, lower suppression at higher frequencies e.g. USB 3.1, IEEE1394, LVDS
- Wide Band:
already high impedance at lower frequencies,
e.g. control signals, RS232, RS485, DC/DC converter
- High Current:
for high currents from 1 A
e.g. power supply, DC/DC converter
- [Sample Kit](#): 782 792



WE-CBA

3D CT scan



WE-MPSA overview

SMD EMI Multilayer Power Suppression Bead

- Multilayer Power Suppression Bead with specified peak current capability
- Size 0805, 1206, 1612, 1812, 2220, 3312
- Z: 56 – 600 Ω
- IR: 2,1 – 10 A
- RDC: 4 – 50 m Ω
- -55 °C – 125 °C
- AEC-Q200
- Design Kit 782001

- Applications:
 - Filter with high inrush current peaks
 - Motor interference suppression
 - EMI suppression of DC/DC converters and DC power supply



WE-RCIT overview

Rod Core Inductor THT

- Art. Nr. 784 71 xxx xxx
- L x Ø [mm]: 25 x 10, 23 x 7, 31 x 16, 26 x 6, 31 x 9, 30 x 10, 16 x 4...
- Core material: NiZn
- L: 2 µH – 10 µH
- IR: 2,5 A – 15 A
- ISAT: 5 – 56 A
- RDC: 1,7 mΩ – 33 mΩ
- T: - 40 – 150 °C
- AEC-Q200
- Design Kit: 784713

- Applications:
 - EMC Suppression in motor drive systems
 - All applications in Infotainment systems
 - Standard filter automotive applications



WE-RCIS overview

Rod Core Inductor SMD

- L: 1 – 10 μH
- I_r : 12 – 15 A
- I_s : 29 – 45 A
- RDC: 2 – 3,8 m Ω
- Operating temperature up to +150°C
- AEC-Q200
- Applications:
 - EMC Suppression in motor drive system
 - All applications in Infotainment systems
 - Standard filter automotive applications



WE-SCFA

Soldered Contact Finger Automotive

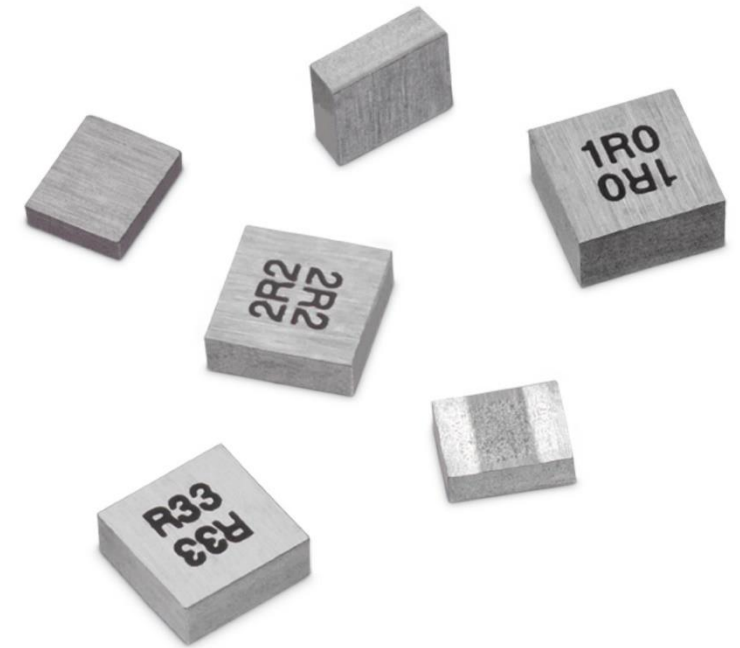
- Characteristics
 - Material: copper-beryllium (CuBe) gold-plated (Au) (corrossion-resistant)
 - Size: 17 Different types and sizes available
 - Wear-resistant
 - High temperatures and compression have no influence on the excellent connection properties
 - Suitable for Pick & Place
 - Reliable solderability
- Applications
 - Contact PCB's to ground and housing
 - Low impedance connection from grounding to PCBs
 - Grounding of cooling units for high frequencies
 - Connection between PCB's and external elements



WE-MAIA overview

SMD Metal Alloy Inductor Automotive

- Molded & shielded SMD power inductor (round wire)
- Sizes: **1610**, 2506, 2508, 2510, 2512, 3010, 3012, 3015, 3020, 4020, 4020HT, 4030, **5020**, **5030**
- L: 330 nH – 47 μ H
- I: up to ~ 10A
- Temp: -40 °C – 125 °C (**HT: 150°C**)
- Smallest power inductor with AEC-Q 200 from WE
- Core Material: Metal Alloy
- High saturation current, excellent shielding , reduced noise,
- Sample kit:
[7843832: WE-MAIA - 2506/ 2508/ 2510/ 2512](#)
[7843833: WE-MAIA - 3010/ 3012/ 3015/ 4020](#)
- Applications:
 - Car Entertainment
 - HMI / Infotainment
 - Displays
 - Car-Communication

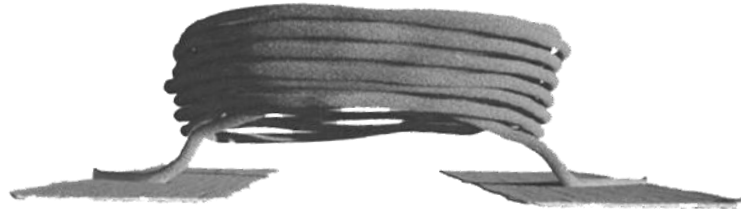


WE-MAIA

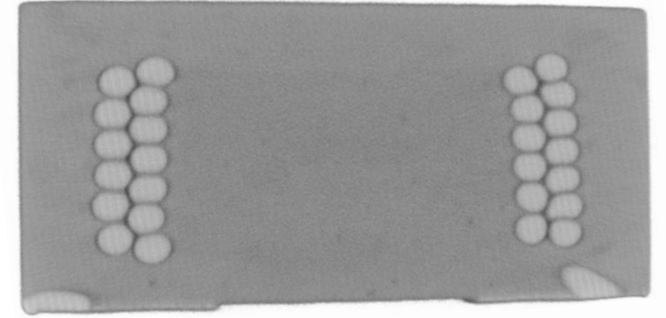
Design



WE-MAIA design



WE-MAIA 3D-CT



WE-MAIA CT

WE-PDA

SMD Shielded Power Inductor

- Characteristics
 - Magnetically shielded which results in a low leakage field
 - High Saturation currents up to 23 A
 - Wire connection: welding technology
 - Plastic base with better planarity
 - High mechanical stability
 - Core Material: NiZn
 - Operating Temperature -40 °C up to +125 °C
- Applications
 - Air Conditioning, climate control units, ventilation, fan controls
 - Small Motor drivers & wiper control systems
 - Car Infotainment
 - Switching Regulators / DC DC Converter with extremely high efficiency (>95%)



WE-PD overview

SMT Shielded Power Inductor

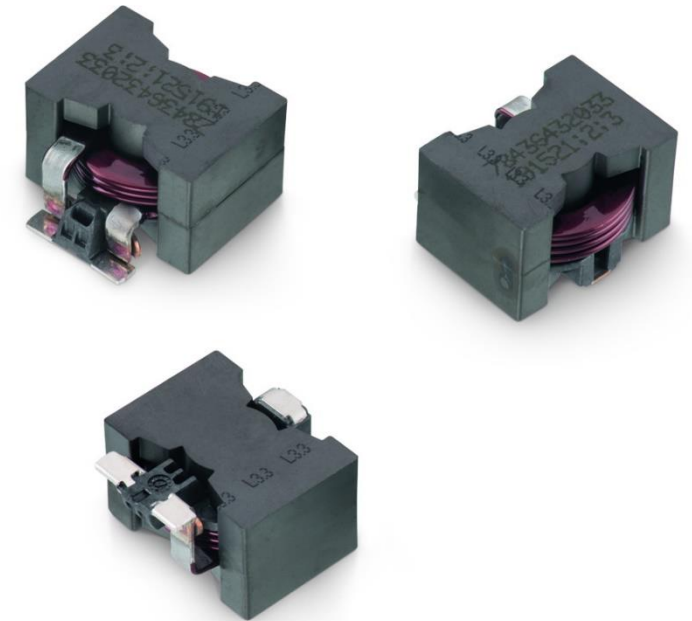
- Magnetically shielded power inductor
- Size: 7332, 7345, 1260, 1280, 1210
- Material: NiZn
- L: 0,47 – 2200 μ H
- RDC: 3 – 5570 mOhm
- Operating Temperature -40 °C up to +125 °C
- AEC-Q200
- Applications
 - Air Conditioning, climate control units, ventilation, fan controls
 - Small Motor drivers & wiper control systems
 - Car Infotainment
 - Switching Regulators / DC DC Converter with extremely high efficiency (>95%)



WE-HCFA overview

High Current Flat Wire Inductor

- L: 1 – 10 μ H
 - I_r: 38 – 47 A
 - I_s: 14 – 81 A
 - RDC: 0,6 – 1,1 m Ω
 - Size: 2818
 - Temp: -40°C - 150°C
 - AEC-Q200
-
- Applications:
 - E-Mobility
 - DC/DC converter
 - Filter in infotainment applications



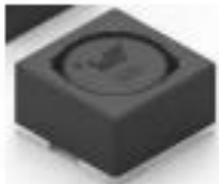
WE-HEPA

High Efficiency Power Choke

- Size 5030, 6030
- Shielded
- Temp: - 40°C - +150°C
- AECQ-200 Grade 1
- Inductance: 3,3 – 100 µH



50xx



60xx



70xx



10xx

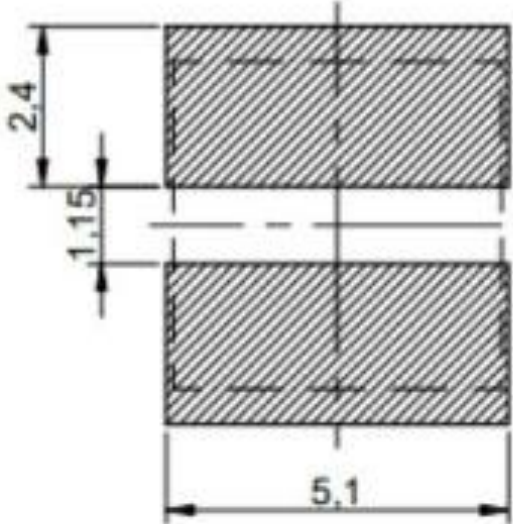
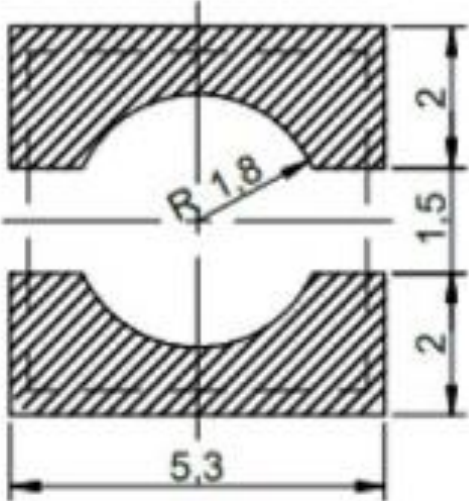


12xx



PCN WE-HEPA

78408053xxx; 78408063xxx: Effective Date: July 31, 2024

74408053xxx	
Before change	After change
	

WE-HCFAT

High Current Flat wire Automotive THT

- Size 3521 [31.5 x 35 x 24 mm]
 - 3 + 3 PN [1.5 to 3.3 μ H]
 - Saturation up to 175 A
 - Size 3540 [31.5 x 35 x 24 mm]
 - 6 + 2 PN [6.8 to 47.0 μ H]
 - Saturation up to 82.7 A
- Low loss version
- Standard version
- AEC-Q tested up to 150°C*
 - 10G vibration test passed with no extra fixation to PCB required
 - Laser Marking
 - Start of Winding marking for 3521 size
 - Standard material and Low loss material available

*In the last revision of the AEC-Q (revision E) Grades are not mentioned anymore.



3521



3540

WE-HCFAT

Standard vs. low loss material

- Both cores are made of MnZn
- Improved MnZn material shows approx 25% lower AC losses than standard MnZn
- But:
 - 3521 Low loss → Approx 20% more expensive
 - 3540 Low loss → Approx 10% more expensive



- Material:
 - Both cores are made of $\text{Mn}_x\text{Zn}_{(1-x)}\text{Fe}_2\text{O}_4$
 - There could be a small variation in the percentages of Mn & Zn, which causes high impact
 - Different powder particle size distribution
- Process:
 - Different pressure when pressing
 - Different time & temperature in the oven
- All these things can be done to adjust the core performance even with the same material. This is a trade secret of our core supplier and very well protected information from their side. But we can explain the customer that these techniques are used and that's why price varies.

WE-HCFAT

Applications

- As a power inductor
 - bidirectional DC DC converter between 12-48 [V]
 - Starter & generator
 - Traction inverter-low voltage
 - Mild-hybrid vehicles
- As power inductor for 48 V interfaces:
 - electric motor cycles
 - AC / heating



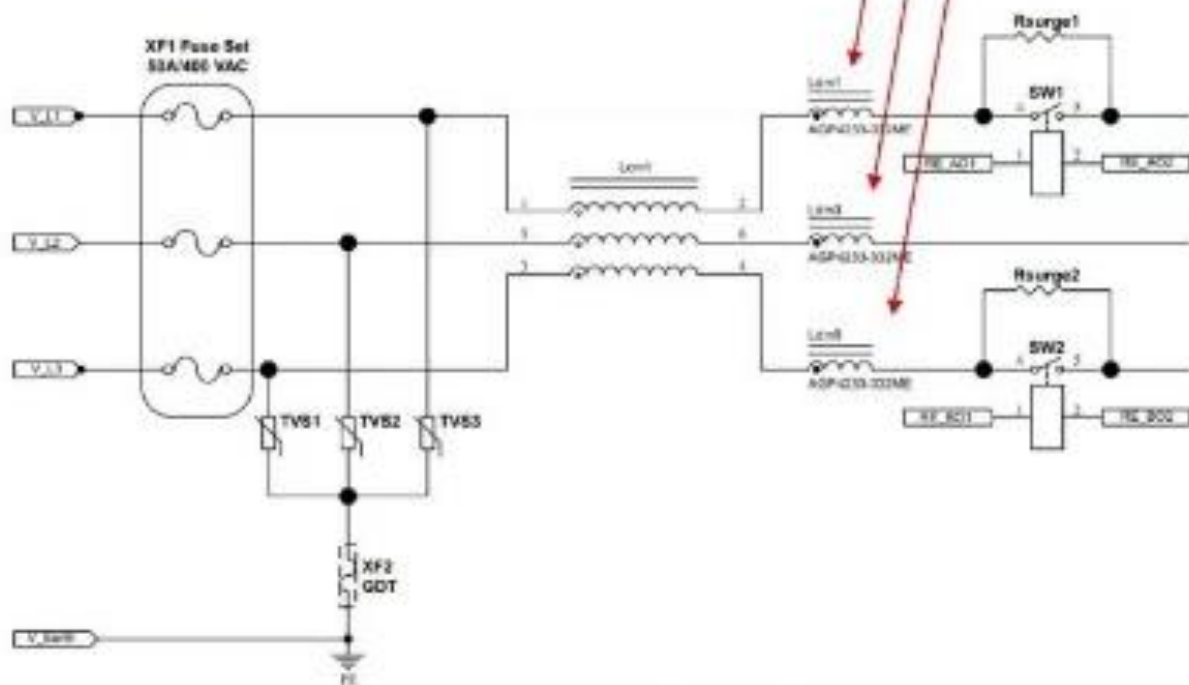
[PMP22396 2460-W bidirectional boost converter reference design for automotive applications](#)



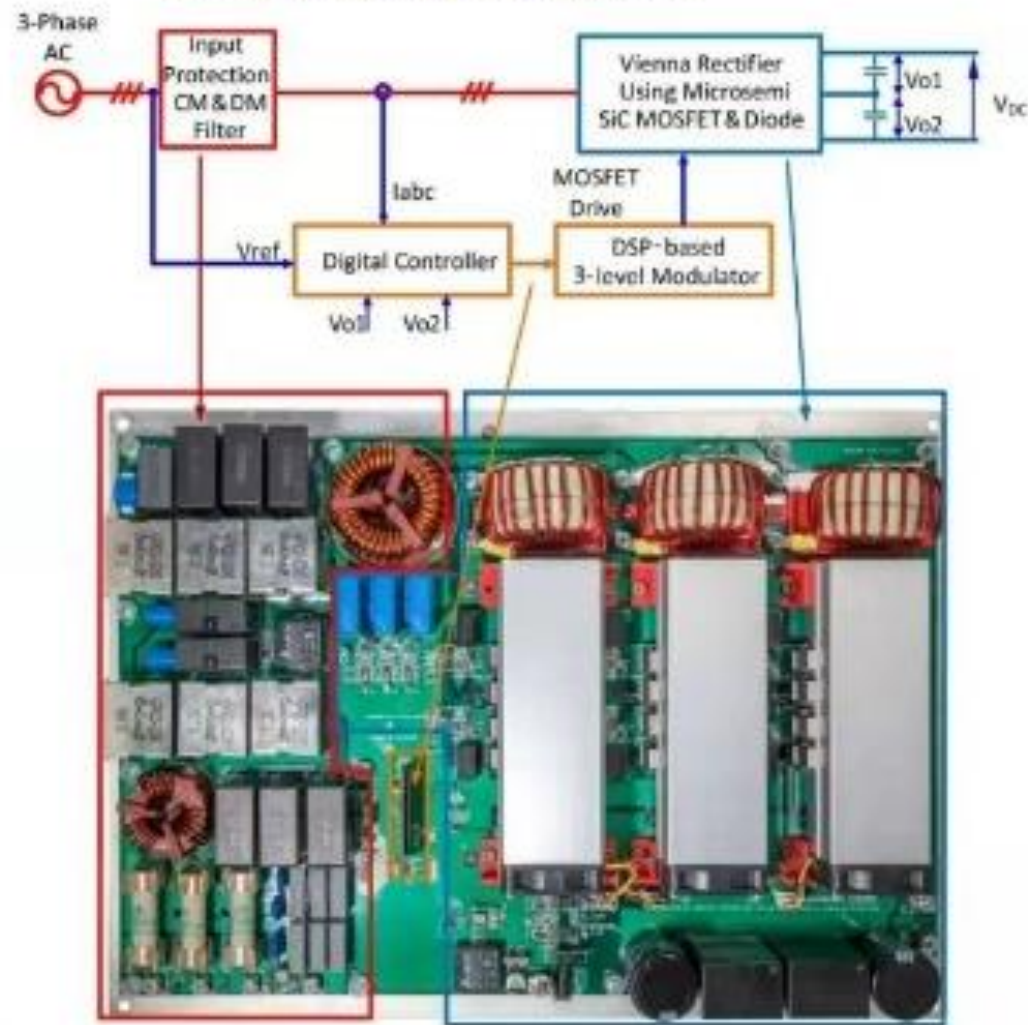
[LT8228 High Voltage, High Efficiency Bidirectional Synchronous Buck or Boost Converter](#)

WE-HCFAT

Application: Filtering



Microchip 3-Phase 30-kW Vienna PFC



WE-HCFAT

EXTRA INFO: What is the maximum voltage allowed for this inductor?...

- Until today we don't have and standard operating procedure to measure, define and test the maximum voltage allowed
- Each competitor defines it in different ways:
 - TDK:

High voltage: N1 - core	200 V DC, 1 s
-------------------------	---------------
 - Vishay: Isolation voltage, coil to core: 350 V_{DC}, 60 s, 5 mA max.
Dielectric Withstand Voltage -
Terminal to Core 300 VDC 5 mA max.
 - Bourns:
- We will find our definition in a similar way our competitors do to support our customers. The release date of these definition needs to be define yet.
- What we can say at the moment:
 - breakdown voltage for our wire insulation is over 700V
 - We can not give any written warrantee on this parameter
 - we shall not expect any issue using the part at several hundred of volts
 - in any case the customer needs to validate in their design



WE-PD2SA overview

SMD Shielded Power Inductor

- shielded SMD power inductor (round wire)
- Size: 7850 (same pad size as WE-PD2A)
- Inductance: 1,2 μ H...220 μ H
- Temp: -40°C...150°C
- Current: 0,67A...4,85A
- Saturation current: 0,58A...6A
- Core material: NiZn (fsw < 10MHz)
- AEC-Q200
- Sample kit [784787](#)
- Applications:
 - Power inductor DC/DC converter
 - Filter inductor



WE-PD2A overview

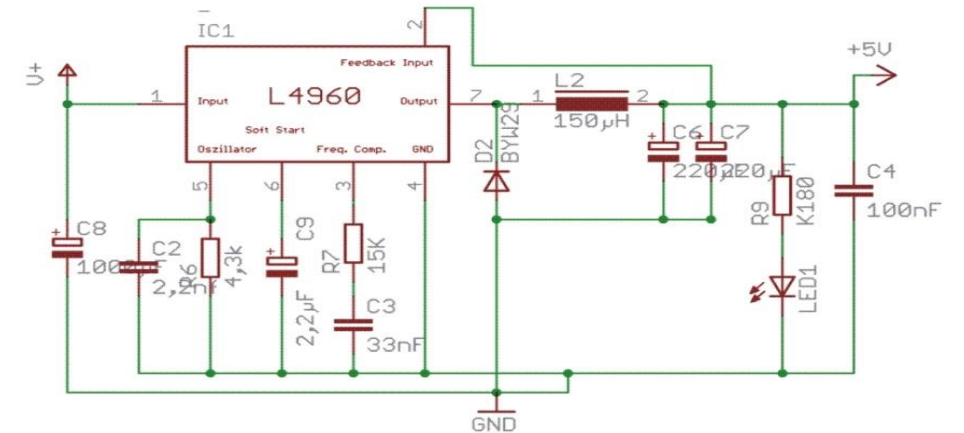
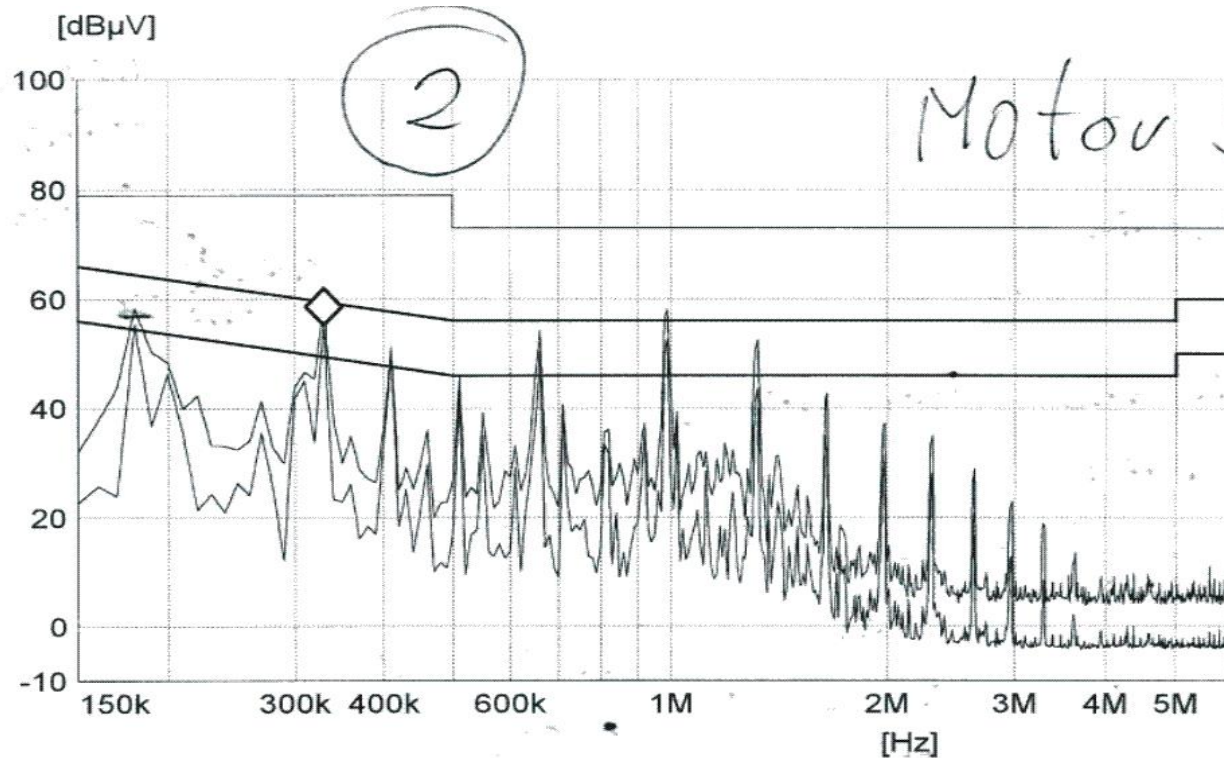
SMD Power Inductor

- Unshielded SMD power inductor
- Size: 4532, 5848, 7850, 1054
- Inductance: 330 nH – 470 µH
- Temp: - 40 °C - +125 °C
- Core Material: NiZn
- Saturation current: up to 15 A
- Low tolerances
- AEC-Q200
- Design Kits:
 - [WE-PD2A - 4532/ 5848: 784773](#)
 - [WE-PD2A - 7850/ 1054: 784775](#)
- Applications
 - Power inductor for DC/DC converter
 - Filter



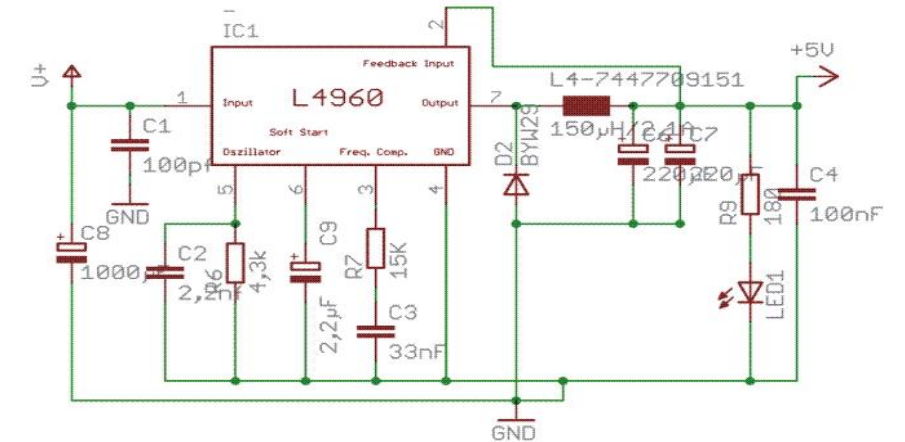
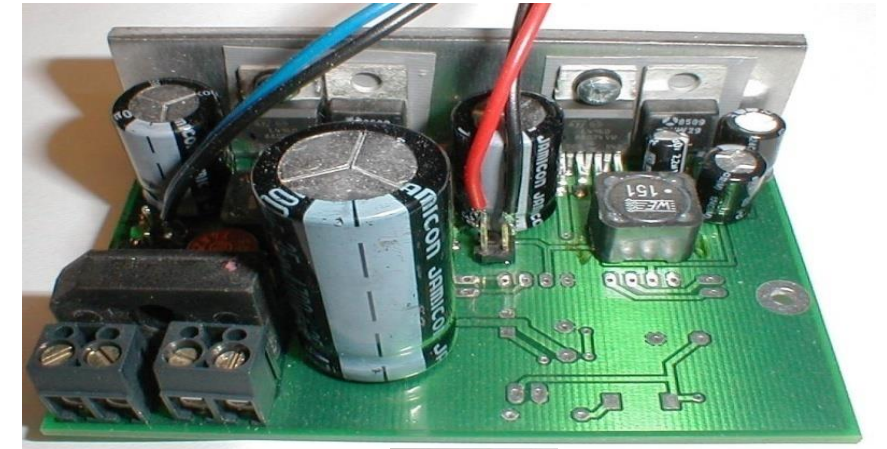
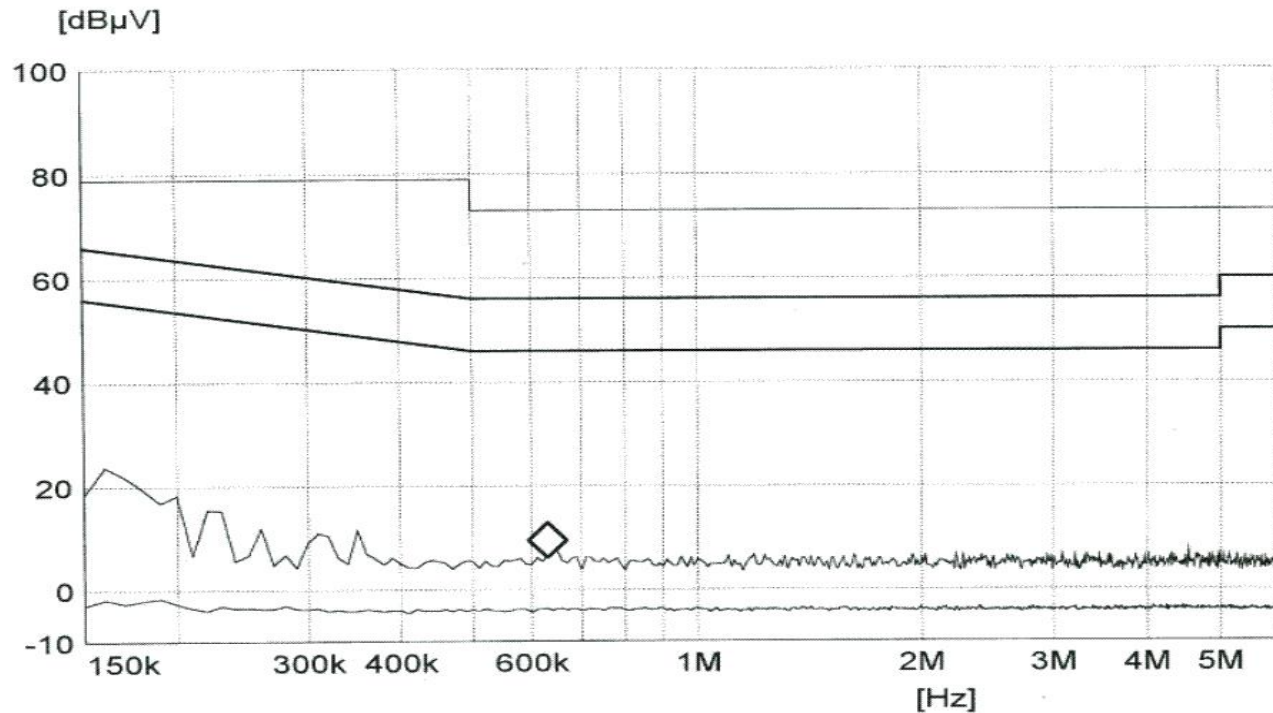
Magnetic Fields – Conducted Emission Measurement

Power supply V 1.0

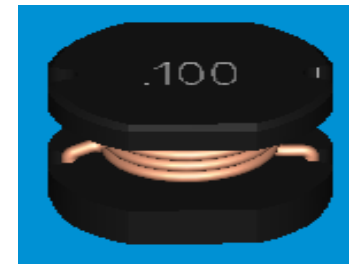
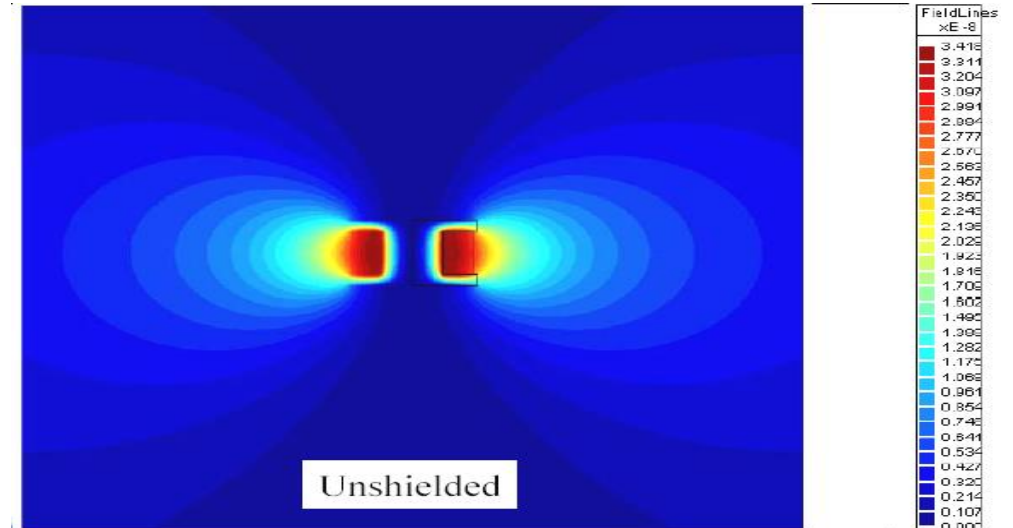
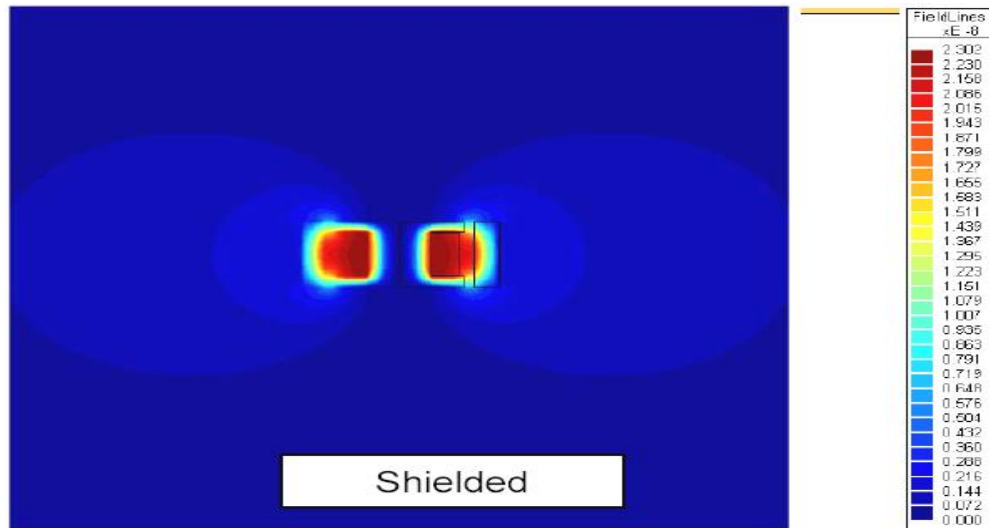


Magnetic Fields – Conducted Emission Measurement

Power supply V 1.1



Magnetic field leakage

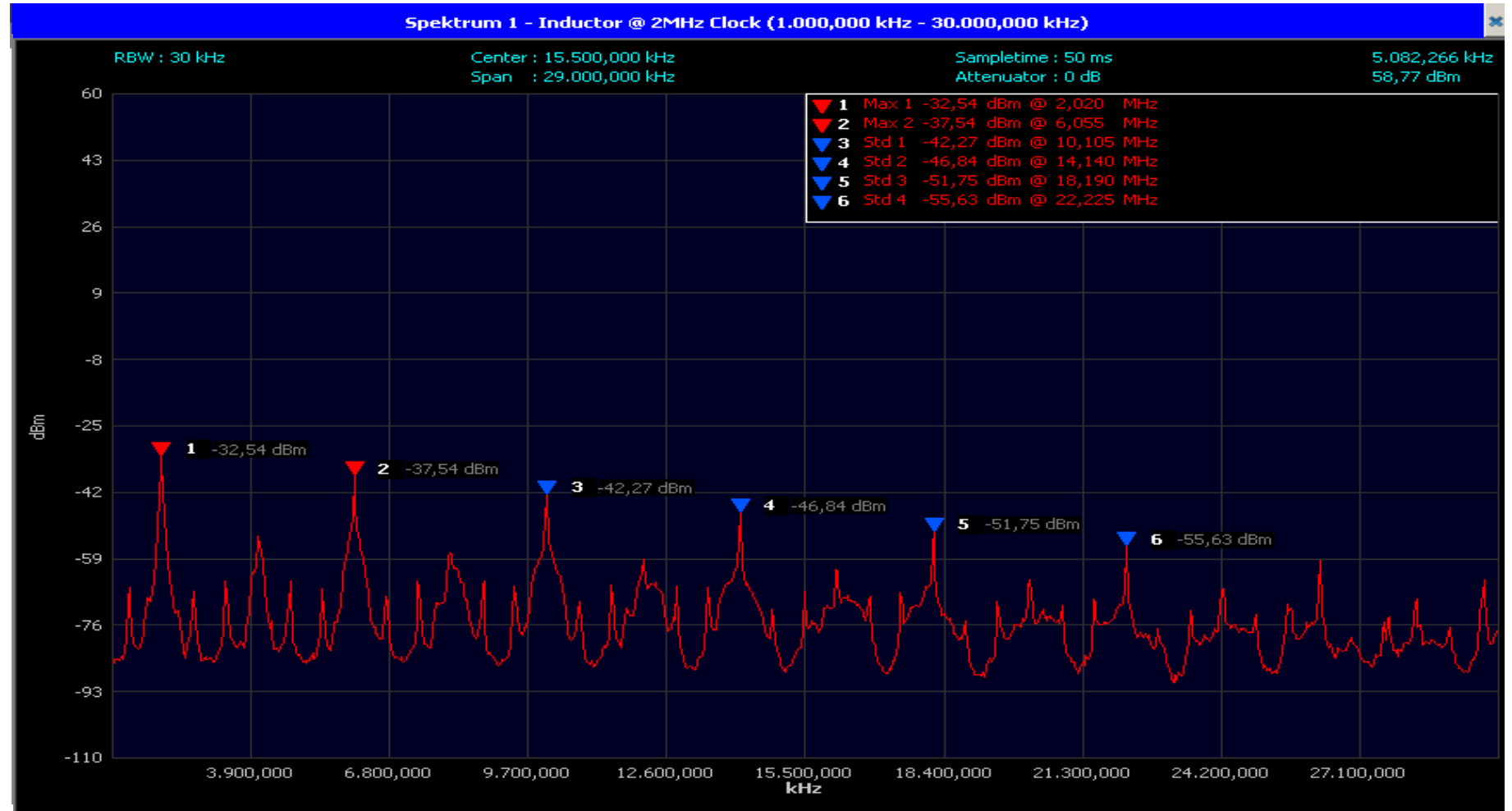


Radiation by inductor

- WE - PD2 unshielded
- 10 μ H, 2MHz Clock, 1A

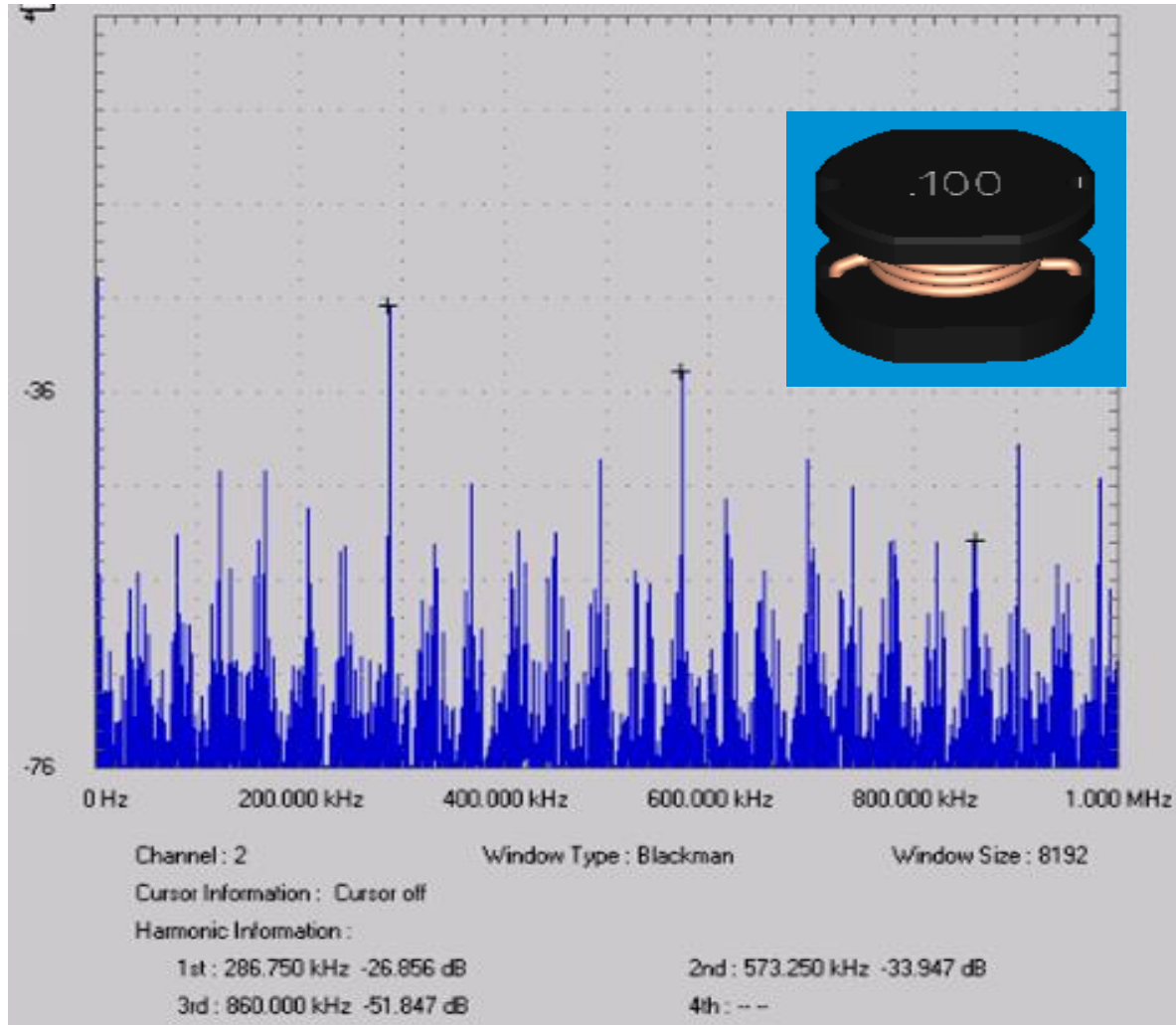


- WE – PD shielded
 - 10 μ H, 2MHz Clock, 1A
- 19dBm difference**

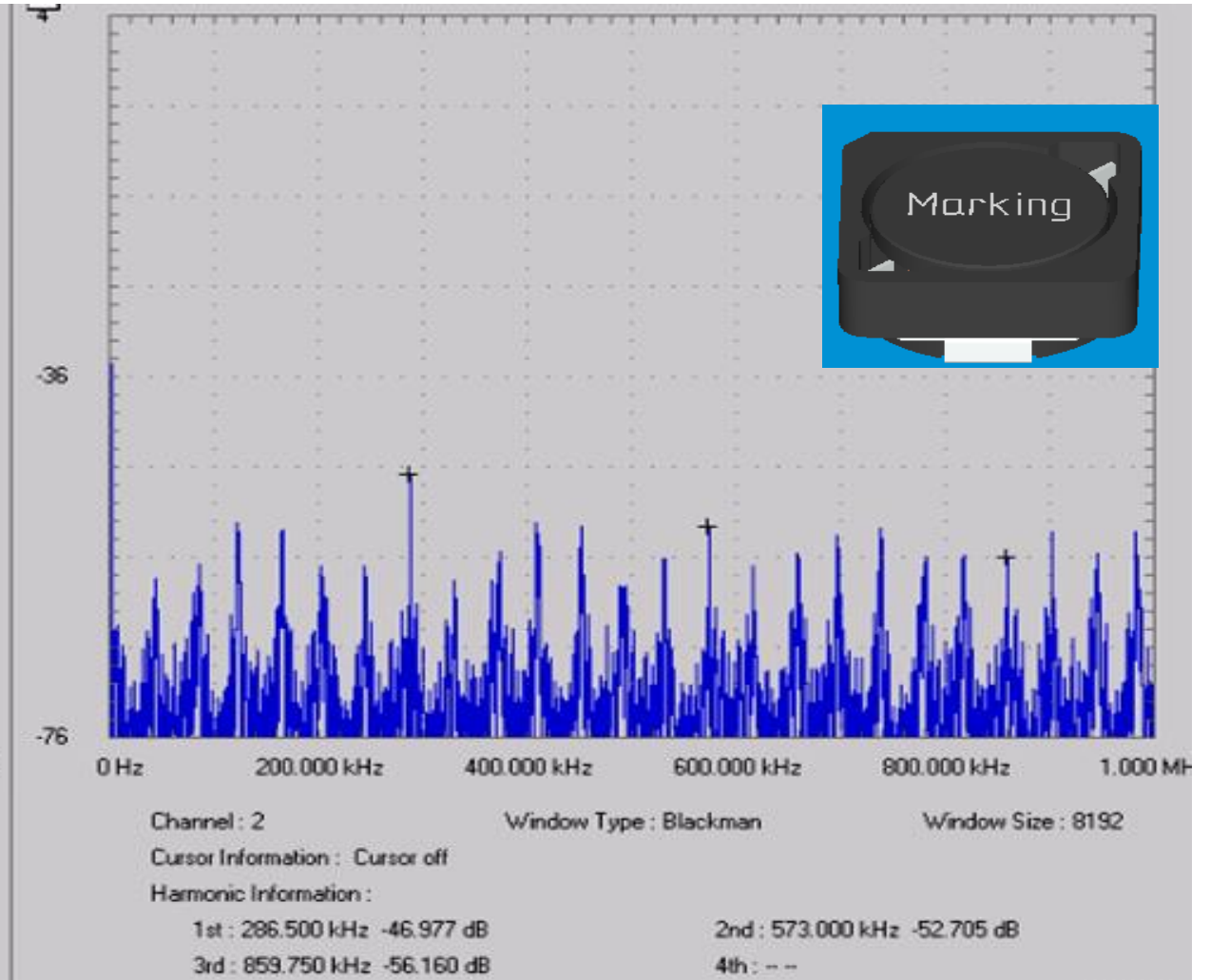


Magnetic leakage shielded vs. unshielded

unshielded



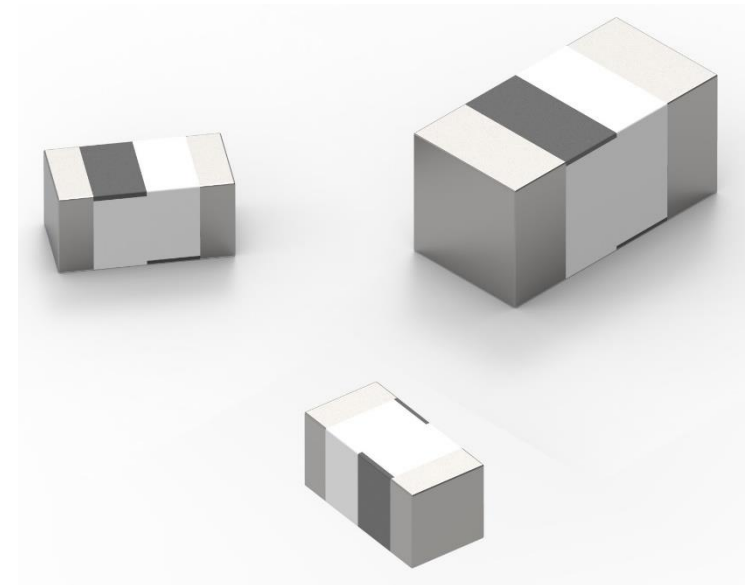
shielded



WE-MCI overview

Multilayer Ceramic SMD Inductor

- Size: 0402, 0603
- L: 1 nH – 470 nH
- I_r: 110 – 300 mA
- RDC: 0,05 – 4,9 Ω
- Q-factor: 8 - 12
- SRF: 300 MHz – 10000 MHz
- Applications
 - Infotainment
 - Key-less Entry
 - Filter circuits
 - High frequency circuits
 - Bluetooth



WE-SMSA

SMT Steel Spacer through-hole

- Characteristics
 - Material: Steel
 - Surface: Tin
 - For distances from 1 to 15mm
 - Full automation for fast and precise process
 - High holding forces and torques
 - Highest process reliability
 - Instant removable polyamid tape
- Applications
 - Assembling of PCBs to housing and to other PCBs



WE-SMSA

SMT Steel Spacer internal Thread

- Characteristics
 - Size M3
 - Material: Steel
 - Surface: Tin
 - For distances from 1 to 15mm
 - Full automation for fast and precise process
 - High holding forces and torques
 - Highest process reliability
 - Instant removable polyamid tape
- Applications
 - Assembling of PCBs to housing and to other PCBs



Automotive Design Kits

▪ WE-TEFA	Toroidal EMI Suppression Ferrite	782114
▪ WE-AEFA	Axial EMI Suppression Ferrite	782013
▪ WE-CBA	SMD EMI Suppression Ferrite Bead	782792
▪ WE-MPSA	Multilayer Power Suppression Bead Automotive	782001
▪ WE-RCIT	Rodcore Inductor THT	784713
▪ WE-MAIA	SMD Power Inductor	
▪ sizes 25xx, 30xx, 40xx		7843833
▪ sizes 25xx		7843832
▪ sizes 30xx, 40xx		7843833
▪ WE-PDA	SMD Power Inductors	
▪ sizes 73xx		784778
▪ sizes 12xx		784770
▪ sizes 73xx / 12xx		784 771
▪ WE-PD	SMD Power Inductor	
▪ sizes 1280 / 1210		744 770
▪ WE-CHSA	SMD High Current Inductor	784330
▪ WE-PD2SA	SMD Shielded Power Inductor	784787
▪ WE-PD2A & WE-PD2SA		
▪ sizes 4532 / 5848 / 7850 / 1054		784 701
▪ WE-PD2A	SMD Power Inductor	
▪ sizes 4532 / 5848		784773
▪ sizes 7850 / 1054		784775
▪ WE-MCI		
▪ size 0603	Multilayer Ceramic SMT Inductor	784 781
▪ WE-SMSA	SMT Steel Spacer	786 140
▪ WE-SCFA	Soldered Contact Finger Automotive	331 003



Alpha-Rack

Automotive Standard Products



Module 14

Automotive Standard Products 742707014



Module 16

Automotive Rack for EMC Labs 742707016



Empty module

for individual composition 742707310

ASP Catalogues

Catalogue : P/N 9999659

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MORE THAN YOU EXPECT

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Now is your turn to ask questions:

