

Multilayer ferrites with in-rush current capability

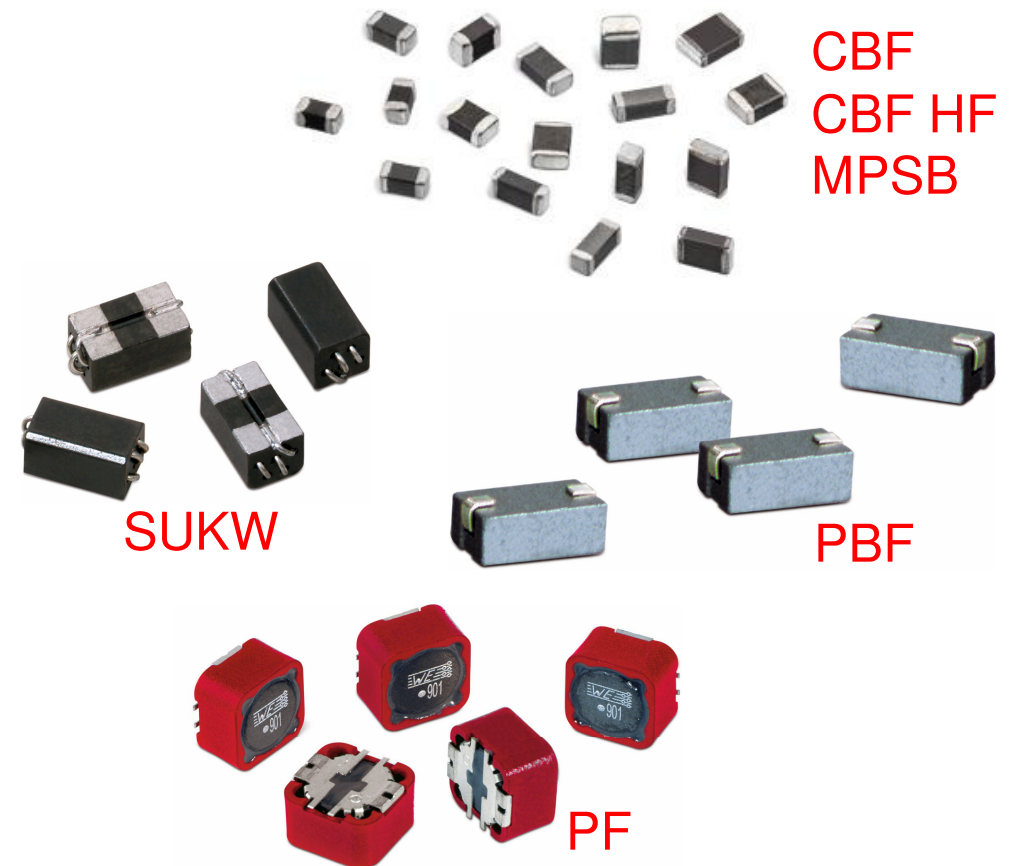


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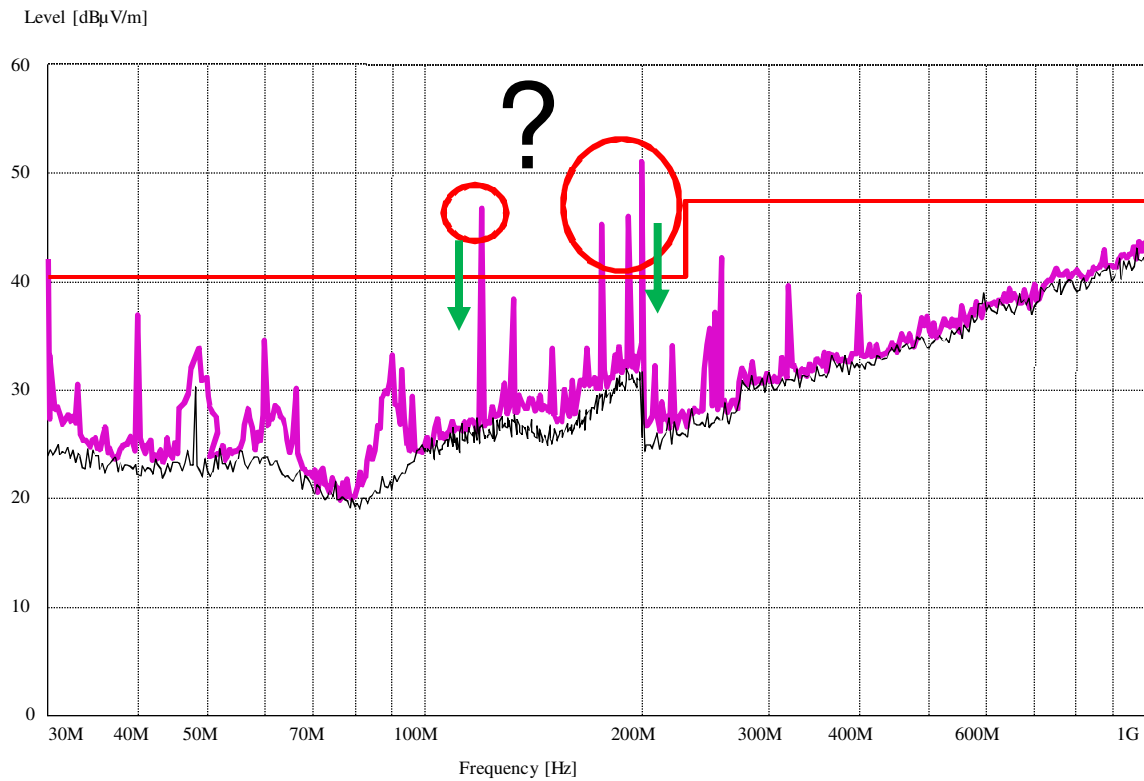
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AGENDA

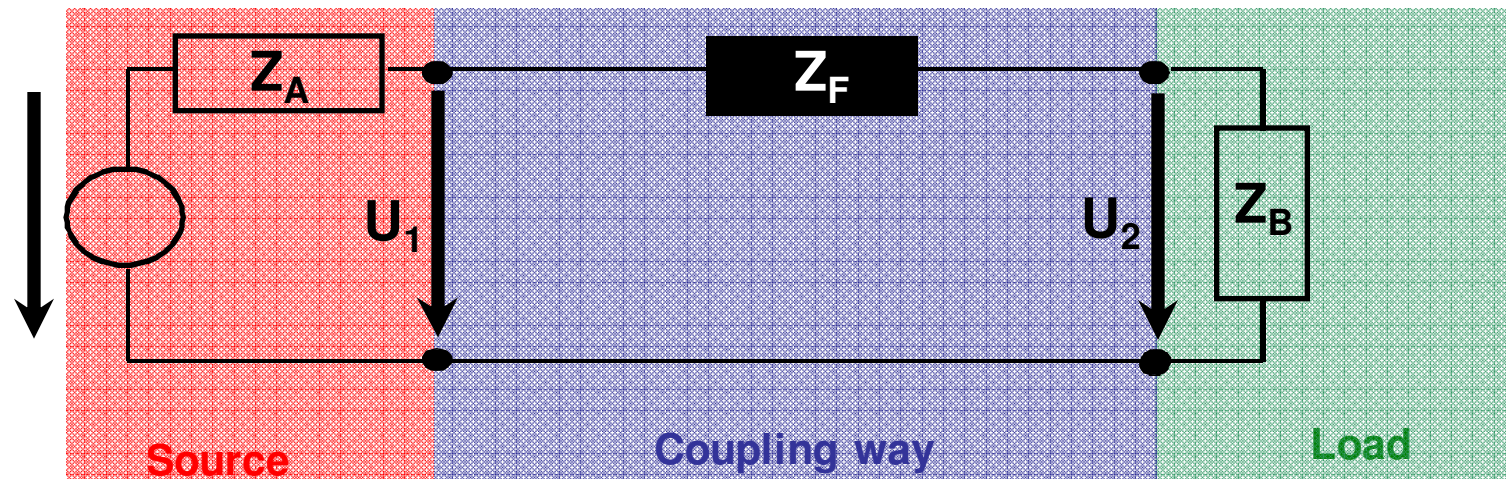
- **SMT chip bead ferrites**
 - Impedance
 - Application
- **Power line application**
 - Electrical parameter
 - In Rush Current
- **Tools REDEXPERT**



Attenuation vs Impedance



Attenuation vs Impedance



- System attenuation

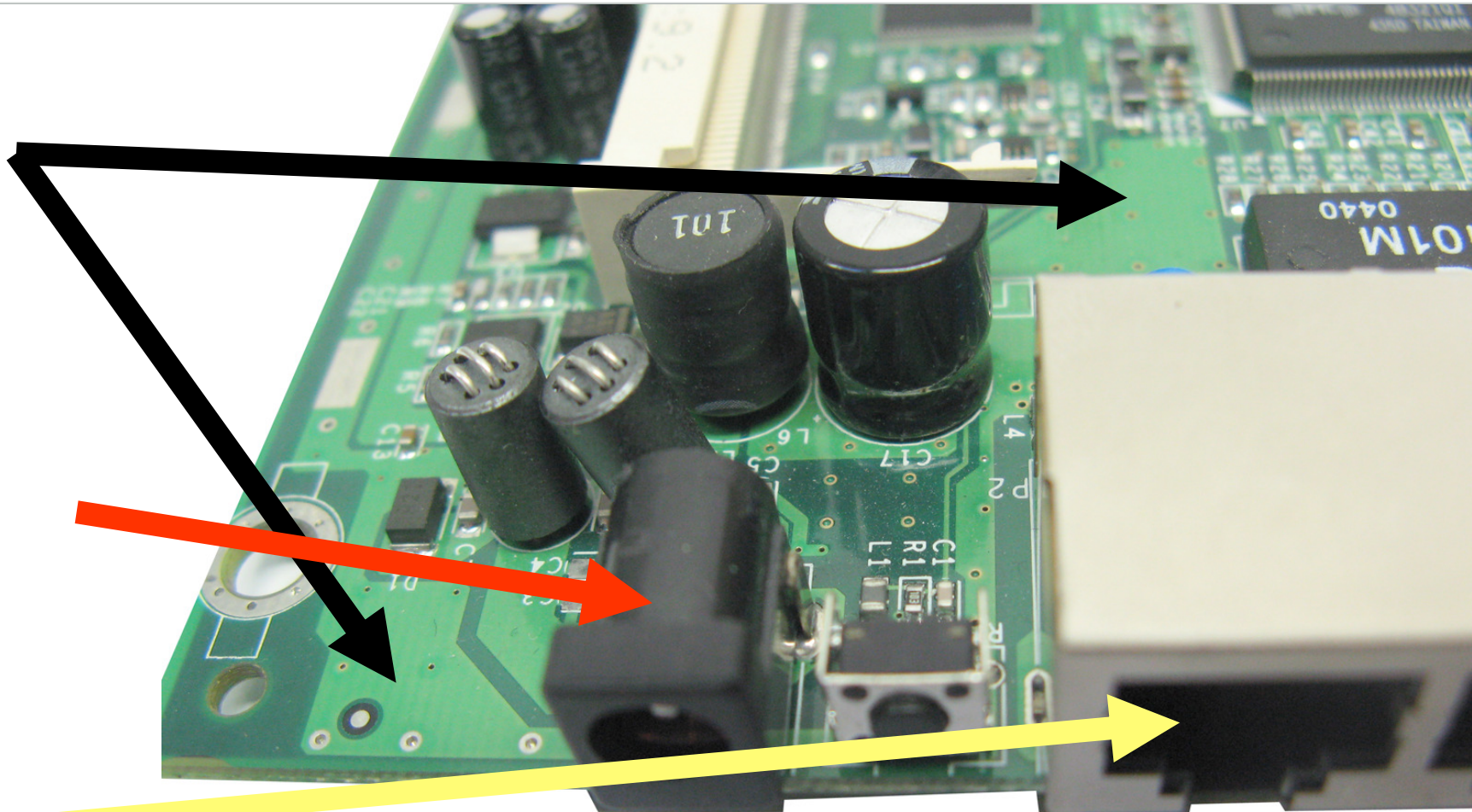
$$A = 20 \cdot \log \frac{Z_A + Z_F + Z_B}{Z_A + Z_B} \quad \text{in (dB)}$$

Practical values

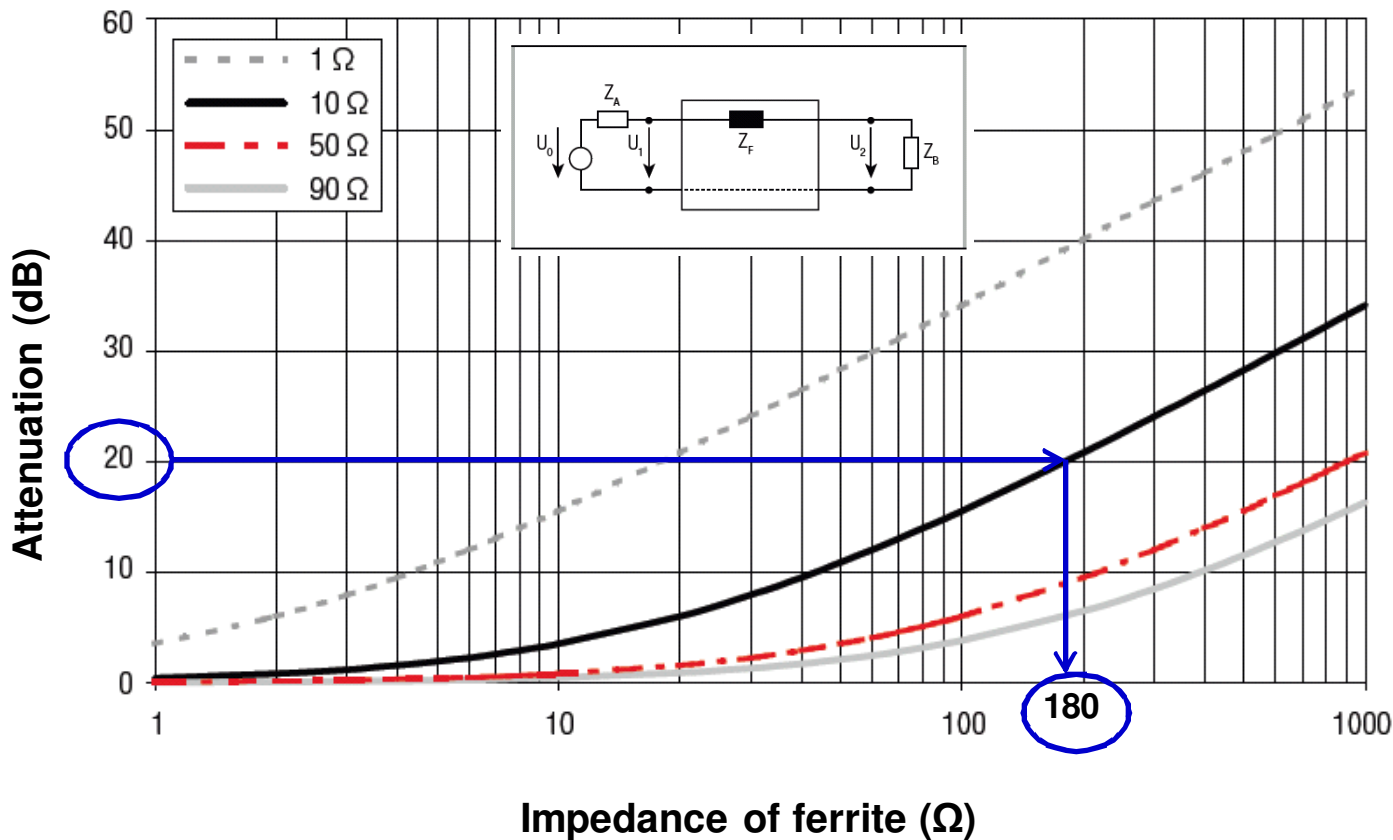
1 Ω

10 Ω

>90 Ω

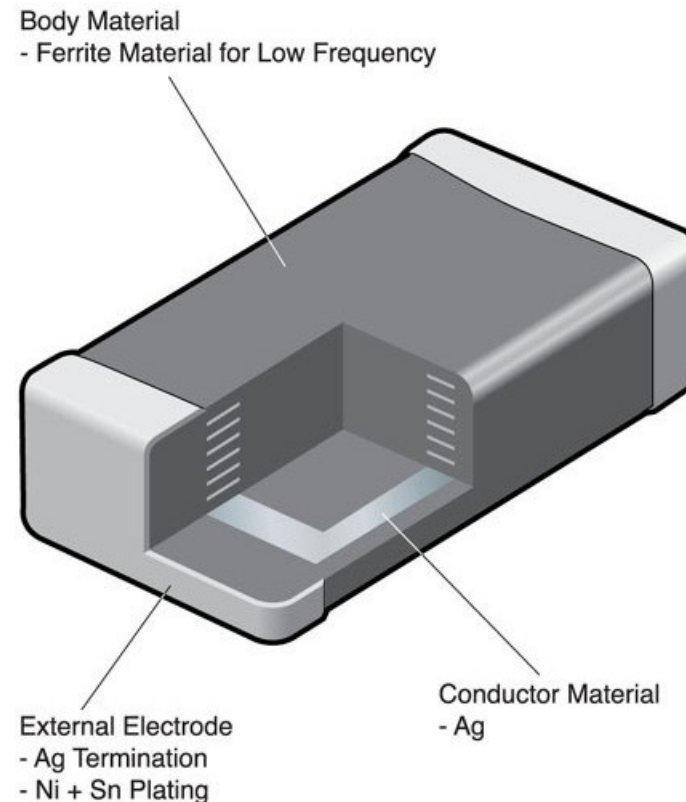


Attenuation vs Impedance



1. Require 20dB of attenuation between 100 and 200 MHz
 2. Know that it is a power cable
 3. Power port has 10 Ω impedance
- Result is a minimum impedance of 180 Ω

Multilayer ferrite bead : Internal Structure



- SMD-Ferrites are inductive components for pcb solutions in multilayer technology
- They are covered with NiZn and consist of a silver „coil“ inside



CBF series

SMD Ferrites

TMSB

Wide Band

CBF

Wide Band

High Speed

High Current

CBF HF

Wide Band

High Speed

High Current

MPSB

High Current
InR_{su}
Specified

Power Line Ferrite

CBF – High Current

D Electrical Properties:

742792040

Properties	Test conditions		Value	Unit	Tol.
Impedance @ 100 MHz	100 MHz	Z	600	Ω	$\pm 25\%$
Maximum impedance	150 MHz	Z	700	Ω	typ.
Rated current	$\Delta T = 40K$	I_R	2000	mA	max.
DC Resistance		R_{DC}	0.15	Ω	max.
Type			High Current		

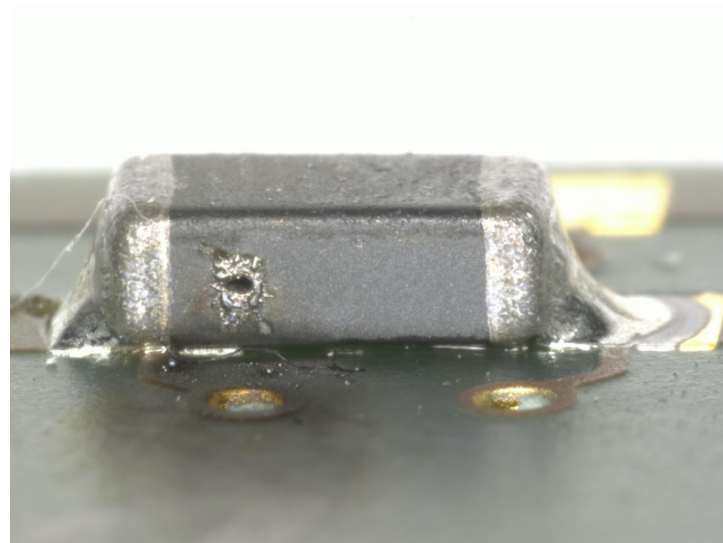
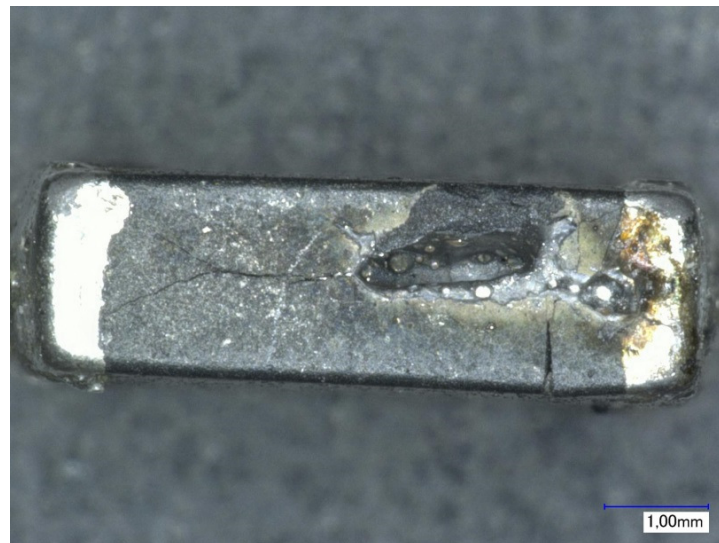
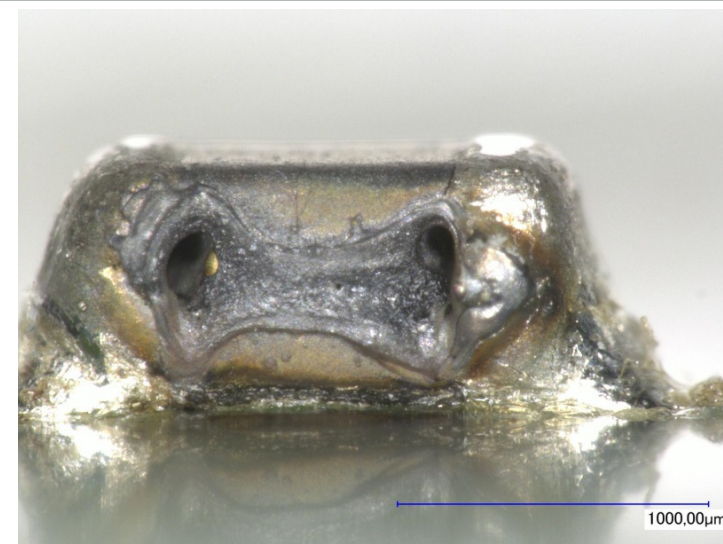
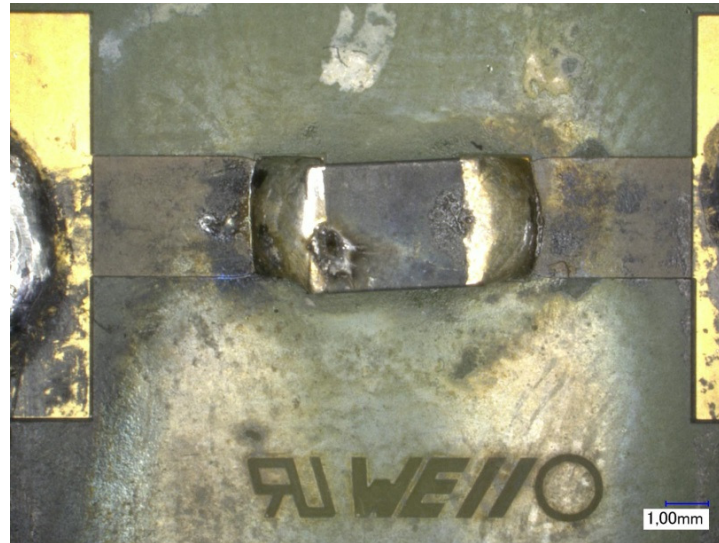
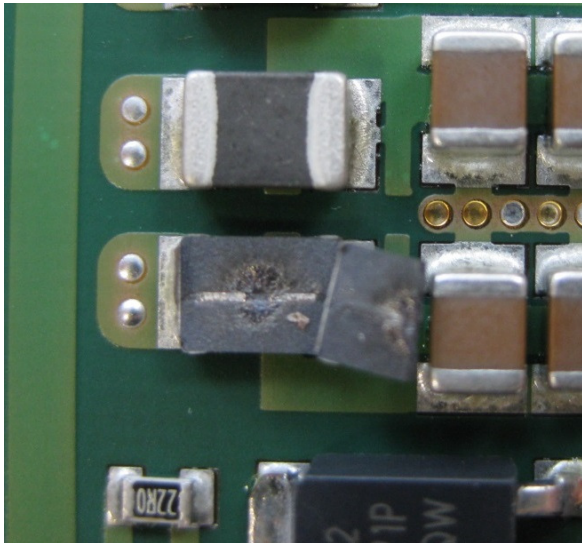


CBF high Current : Ferrite with current higher 1A

For power Line (CBF, MPSB) the Rated Current is defined for 40K

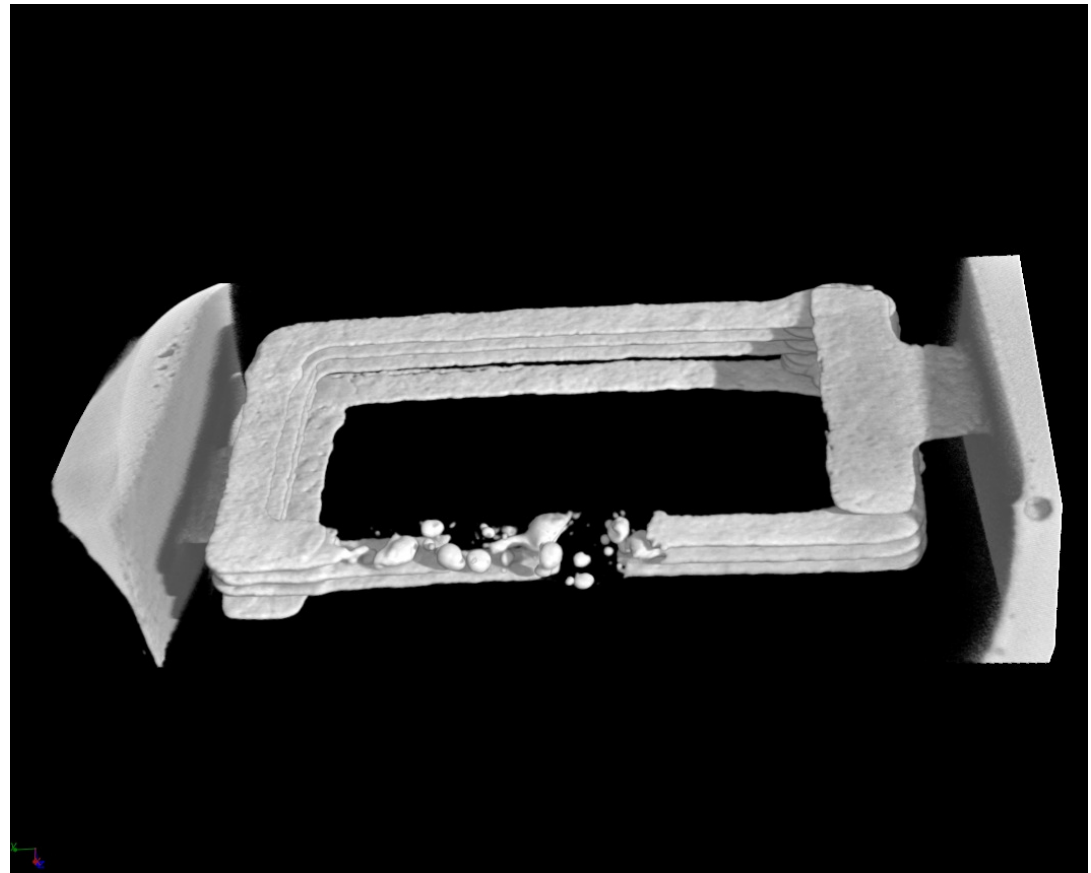
Effect of current and Temperature

Pulse peak after switch on

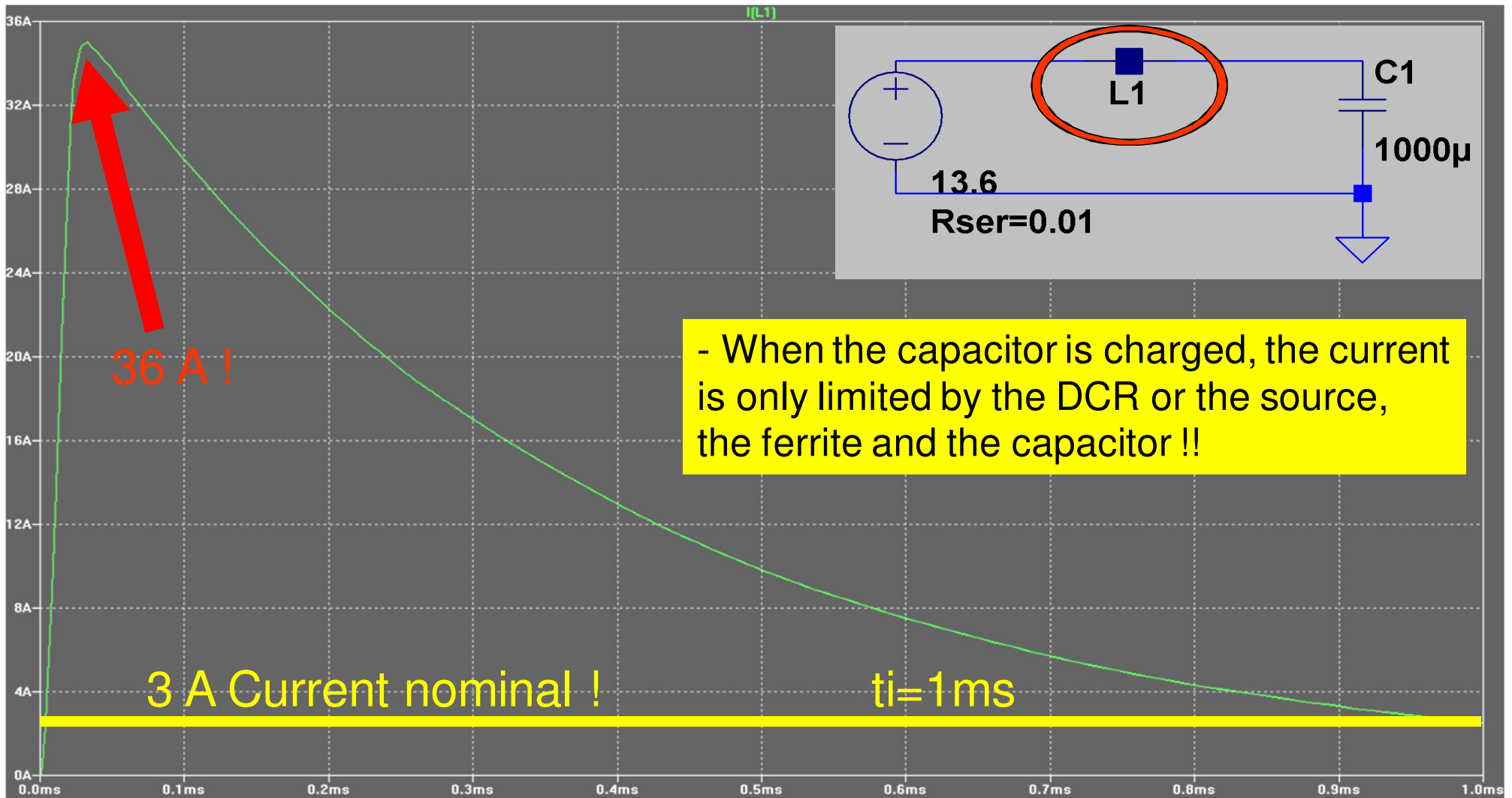


In-Rush Current

- **Multilayer Ferrite (0805)**
- **Destruction at a pulse of 1ms with max. 40A pulse current**



INRUSH Currents : Simulations

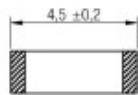
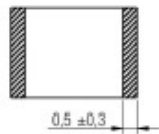


- When the capacitor is charged, the current is only limited by the DCR or the source, the ferrite and the capacitor !!

CBF Rated Current

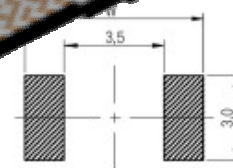


A Dimensions: [mm]



1.5 ± 0.2

B Recommended



WIDE BAND / HIGH SPEED: W = 6,3
HIGH CURRENT: W = 7,3

Scale - 5:1

C Schematic:



D Electrical Properties:

Properties	Test conditions	Value	Unit	Tol.
Impedance @ 100 MHz	100 MHz		Ω	±25%
Maximum impedance	800 MHz	Z _{max}	Ω	typ.
Rated current	ΔT = 20K	I _R	mA	max.
DC Resistance	R _{DC}		Ω	max.
Type				

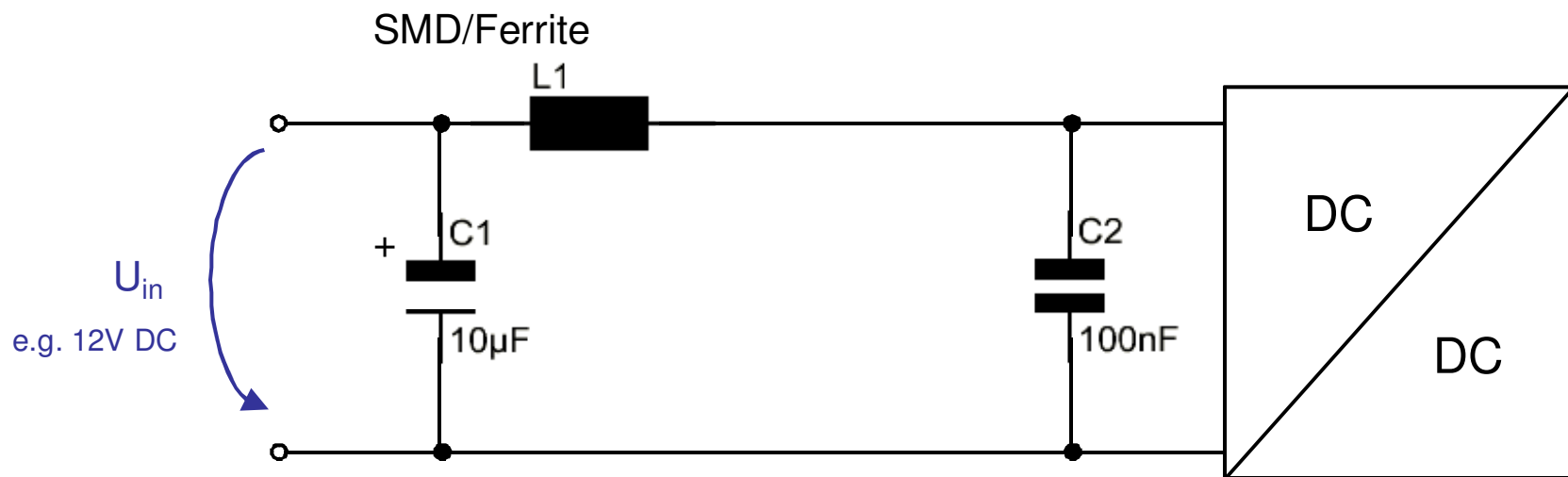
E General information:

Do not use this part beyond the Rated Current, as this will create excessive heat and can harm the component

- Storage Temperature (on Tape & Reel): -20°C to 60°C

Rev.	Date	SS1	SS2	Projection	DESCRIPTION
5,7	2014-06-05	SS1	SS2		Würth Elektronik eSoc GmbH & Co. KG EMC & Inductive Solutions Max Eyth-Str. 1 74638 Waldenburg Germany Tel. +49 7141 34-100
5,6	2013-12-18	SS1	SS2		
5,5	2013-04-17	SS1	SS2		
5,4	2012-11-28	SS1	SS2		
5,3	2012-10-23	SS1	SMu		
5,2	2012-09-26	SS1	SMu		

How to protect ferrite

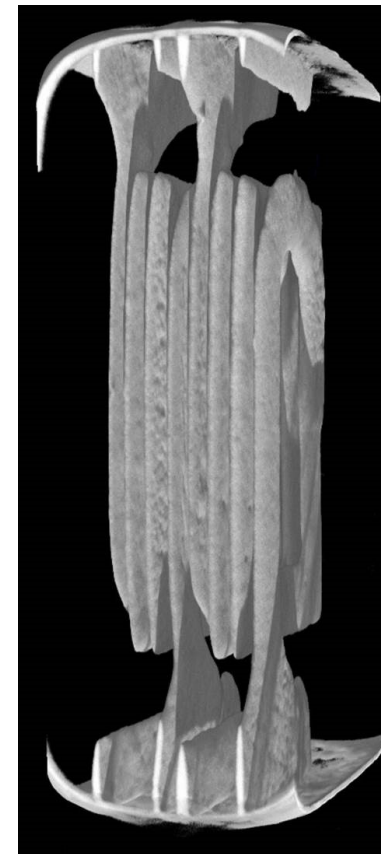
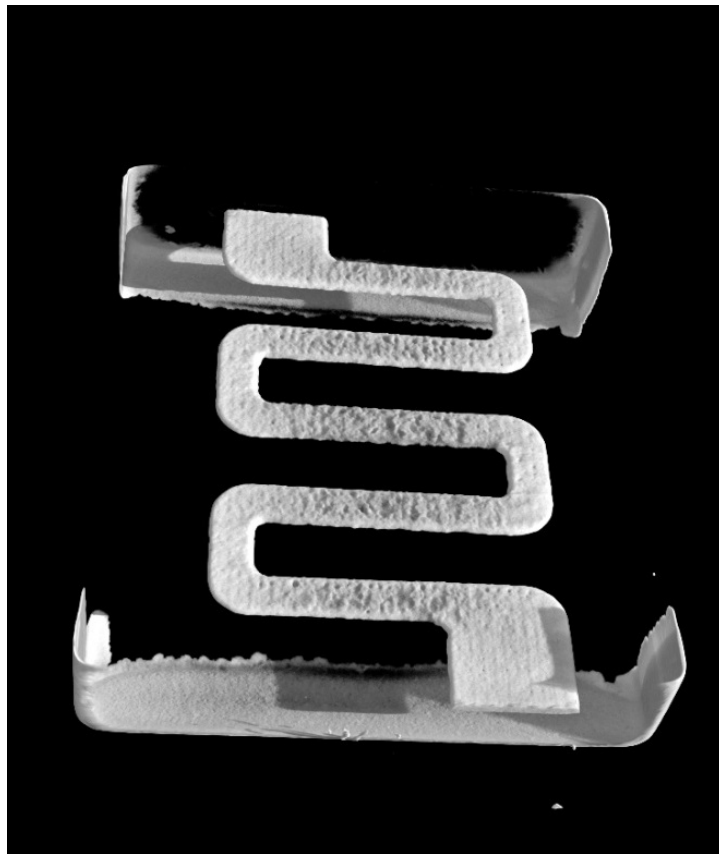


- Protect ferrite from In Rush current during :
 - Power up
 - Hot plugging
 - Line Transient
 - Surge
 - Load dump
 - Safety for SMD ferrite against In-Rush current (load dump) current

WE-MPSB Multilayer Power Suppression Bead



- High pulse peak possible caused of special internal layer design

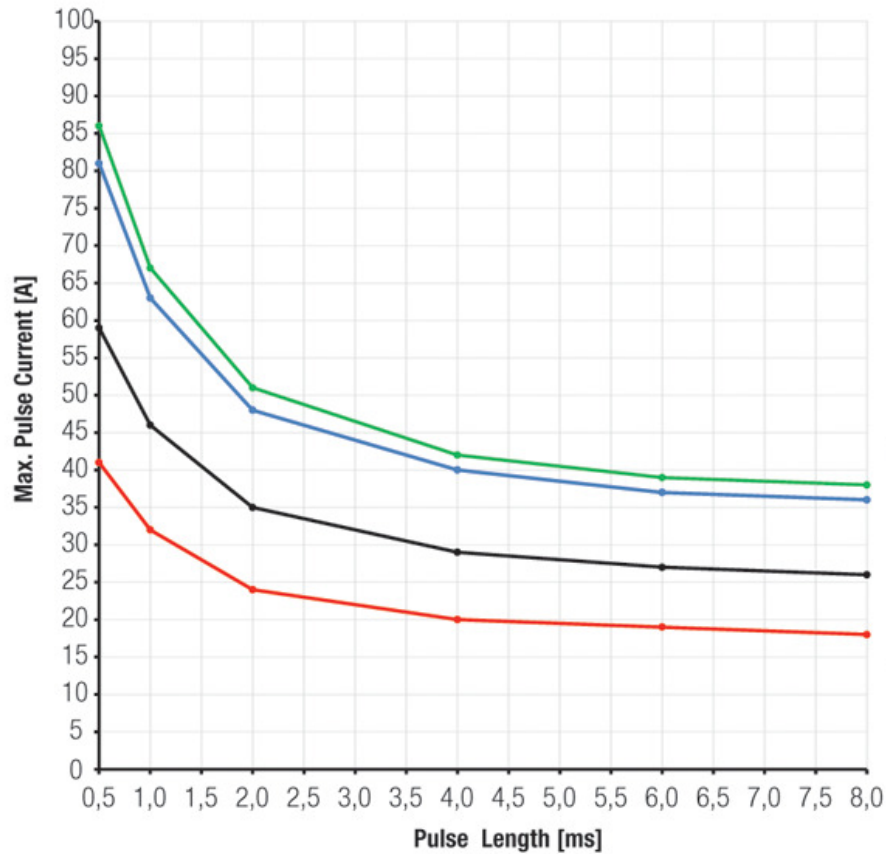


Size 0805

WE-MPSB Multilayer Power Suppression Bead



Current vs Pulse Length – Single Pulse – Size 0805



20 Times Higher Peak Current Rating



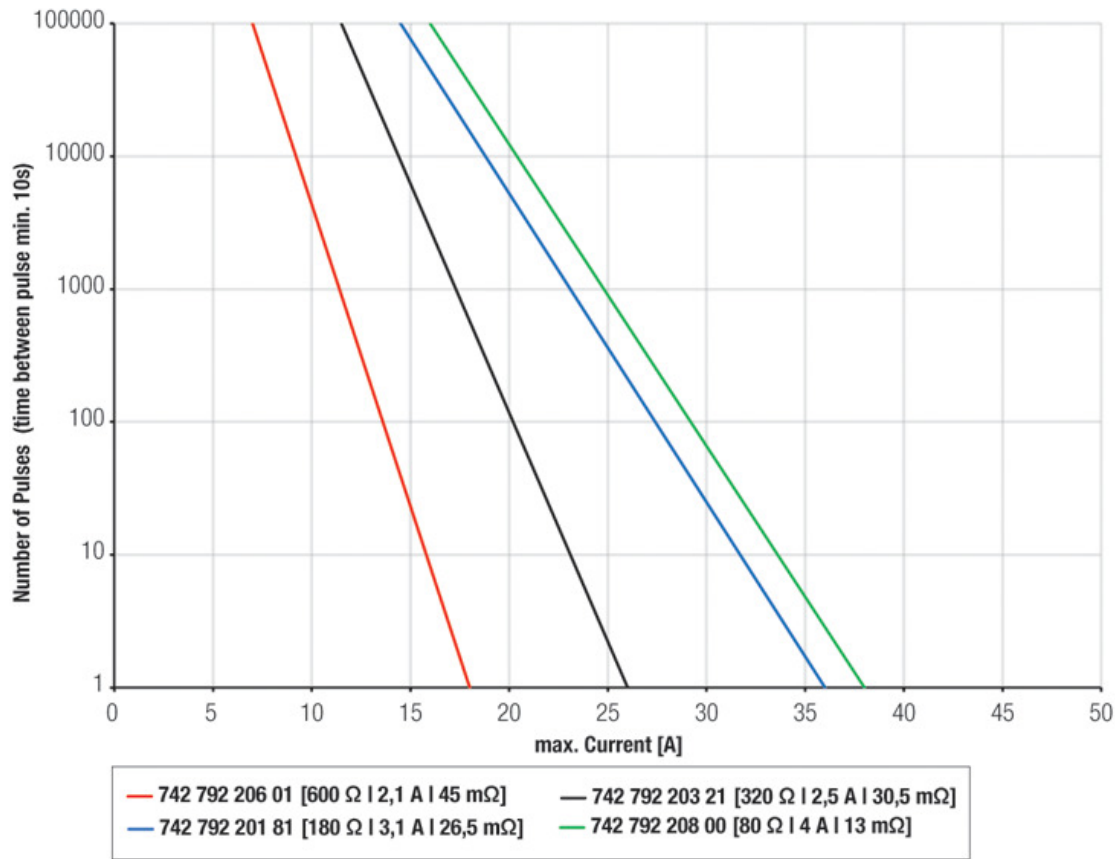
- 742 792 208 00 [80 Ω | 4 A | 13 mΩ]
- 742 792 201 81 [180 Ω | 3,1 A | 26,5 mΩ]
- 742 792 203 21 [320 Ω | 2,5 A | 30,5 mΩ]
- 742 792 206 01 [600 Ω | 2,1 A | 45 mΩ]

WE-MPSB Multilayer Power Suppression Bead



▪ **Current Load Measurements :**

No. of Pulse vs Current – 8 ms Pulse – Size 0805



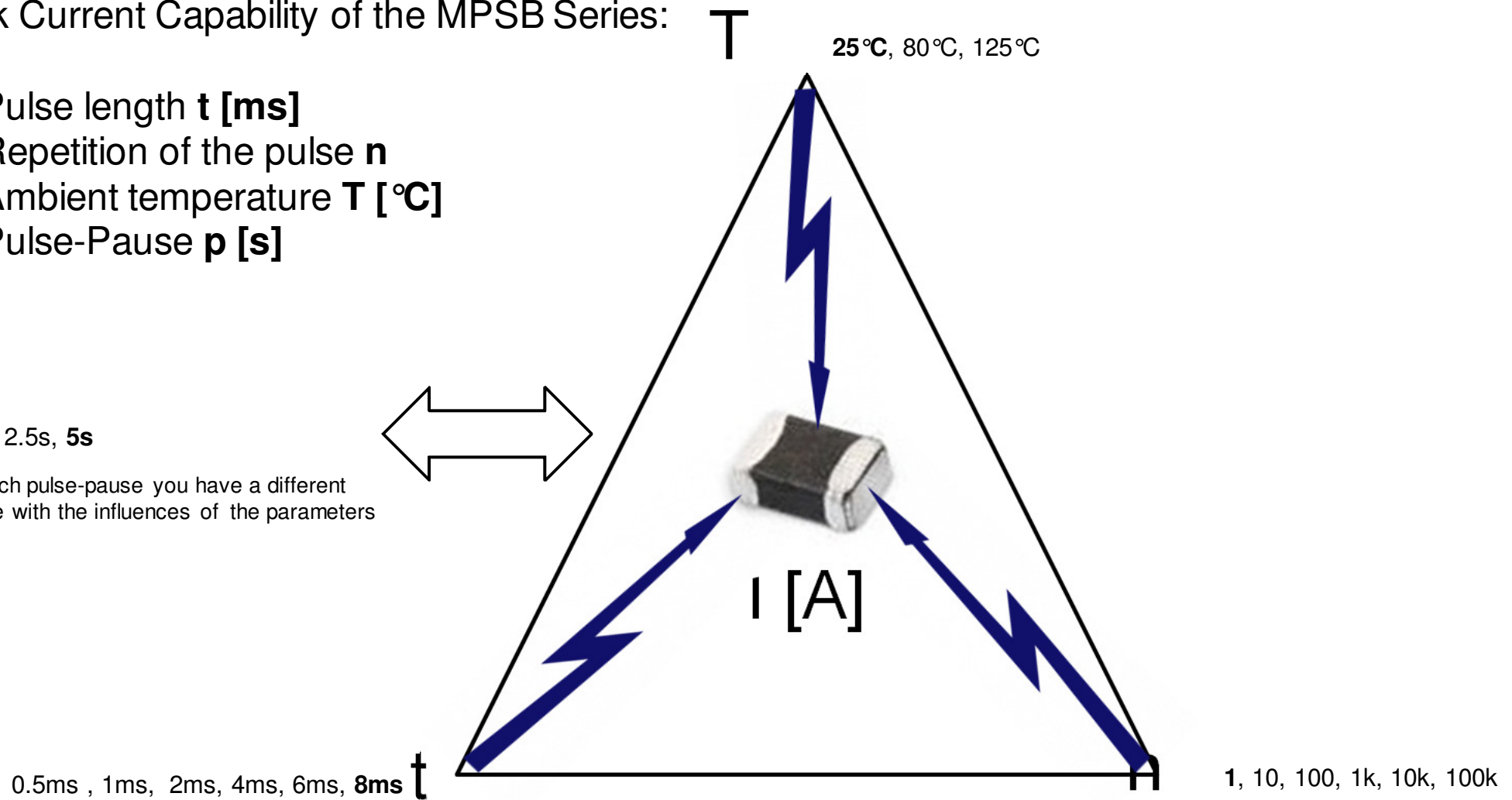
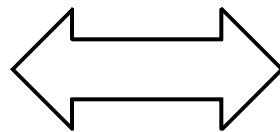
WE-MPSB T-n-t Triangle

Peak Current Capability of the MPSB Series:

- Pulse length **t** [ms]
- Repetition of the pulse **n**
- Ambient temperature **T** [°C]
- Pulse-Pause **p** [s]

p
1s, 2.5s, 5s

For each pulse-pause you have a different triangle with the influences of the parameters T-n-t





MPSB Rated Current



A Dimensions: [mm]

B Recommended land pattern: [mm]

WIDE BAND / HIGH SPEED:
W = 3.0
HIGH CURRENT:
W = 4.0

Scale - 10:1

D Electrical Properties

Properties	Value	Unit	Tol.
Impedance @ 100 MHz	180	Ω	±25%
Maximum impedance	202	Ω	typ.
Rated current	3100	mA	max.
DC Resistance	26.5	mΩ	typ.
DC Resistance	37.0	mΩ	max.
Type of application	High Current		

C Schematic:

Scale - 10:1

Do not use this part constantly beyond the Rated Current, as excessive heat will create excessive heat and can harm the component.

REV	DATE	BY	CHECKED
1.1	2015-01-07	SSI	MBB
1.0	2014-11-06	SSI	MBB

Projection

Würth Elektronik eSico GmbH
EMC & Inductive Solutions
Max Eyth-Str. 1
74630 Waldenburg
Germany
Tel. +49 (0)
www.wuerth-el.com

EMC Filter
Impedance Bead

4279220181

Size: 0805

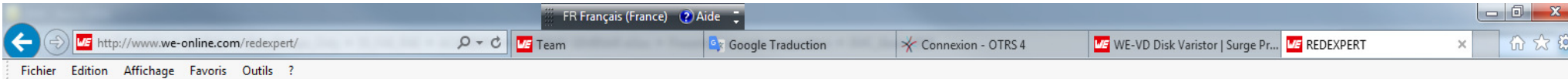
COMPLIANT
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Overview EMC Ferrites



REDEXPERT



Würth Elektronik Group Sébastien English more than you expect

EMC & Inductive Solutions **REDEXPERT**

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EMC Components

- Ferrites for PCB Assembly
- Ferrites for Cable Assembly
- Common Mode Chokes for Power Lines
- Common Mode Chokes for Data and Signal Lines

Power Products

Enter your input parameter

PARAMETERS					EDIT
Input	Output	Switch	Inductor	Diode	
12.0 V 10.0-15.0 V	5.00 V 2.00 A	500 kHz	40 % Single	0.30 V	

START SIMULATION

- Power Inductors
- Wireless Power Transmission
- MagI²C Power Module

Signal & Communications

- RF
- RJ45
- LAI

Capacitors

- Interference Suppression capacitors
- MLCC's
- Capacitors
- ic

Sink / Source System

PARAMETERS

Applications Hints

- Long Datasignal Lines: 120 Ω
- Datasignal Lines/Clock/Video/USB: 70 Ω
- Supply Voltage Lines (V_{CC}): 15 Ω
- Ground Planes (GND): 1 Ω
- User defined

Noise attenuation

Att 15 dB f 250 MHz

Source (Z_A)

Z 1 Ω

Sink (Z_B)

Z 1 Ω

Display details



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Thank you for your attention



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