



# Electronic Components

2018/2019

Passive Components  
Optoelectronics  
Power Modules





Green,  
smart and  
more than  
you expect.  
Saves  
522t CO<sub>2</sub>



Download the Catalog App of Würth Elektronik to  
access all product information on your mobile device:  
[www.we-online.com/app](http://www.we-online.com/app)





## 1 PASSIVE COMPONENTS



EMC Components **17**



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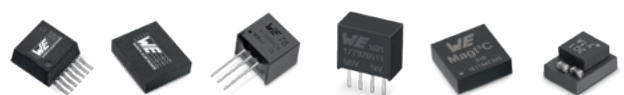
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Information in this publication is subject to change. The process of continually improving our product range leads to changes in content. For new designs please refer to the latest data sheets on [www.we-online.com](http://www.we-online.com) or contact our technical field staff.



# The Würth Elektronik eiSos Group



The Würth Elektronik Group

Sales: 926 million €  
Employees: 8.300  
\* 2017

## Würth Elektronik eiSos Group



Printed Circuit Boards

Intelligent Power and Control Systems

### Passive Components



Würth Elektronik eiSos GmbH & Co. KG

Würth Electronics Midcom Inc.

IQD Frequency Products Ltd.

### Power Modules & Optoelectronics



Würth Elektronik eiSos GmbH & Co. KG

### Electromechanics



Würth Elektronik eiCan

Würth Elektronik Stelvio Kontek S.p.A.

### Automotive & eMobility



Würth Elektronik eiSos GmbH & Co. KG

Würth Elektronik iBE GmbH

Erwin Büchele GmbH & Co. KG

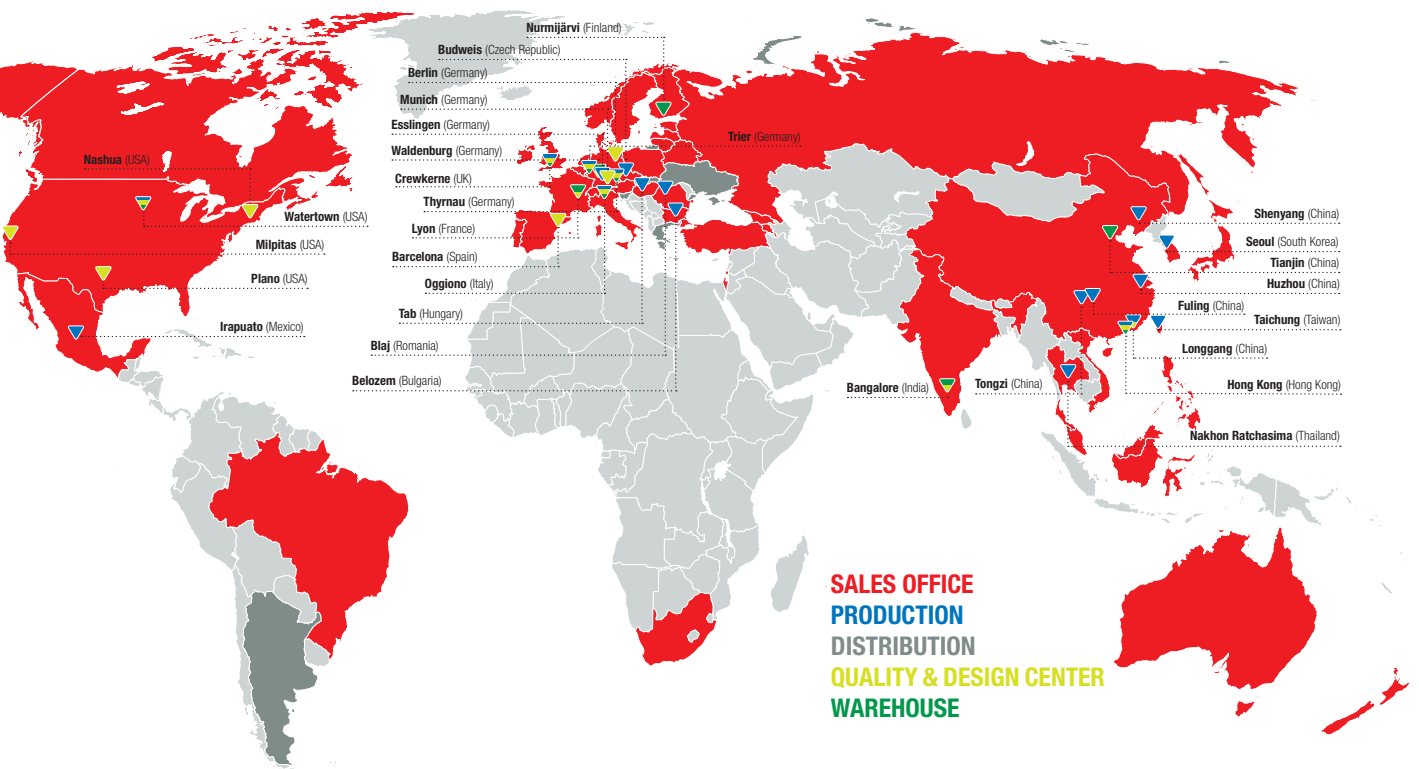
### Wireless Connectivity & Sensors



Würth Elektronik eiSos GmbH & Co. KG

(former AMBER wireless GmbH)

## Globally available. Locally present.





# More than you expect



**SAY YES TO OUR FAST AND COST-FREE  
DESIGN-IN SUPPORT**



**WE TAILOR THE  
QUANTITIES TO YOUR NEEDS**



**ALL CATALOGUE PRODUCTS  
AVAILABLE EX STOCK**



**RE-REELING  
SERVICE**



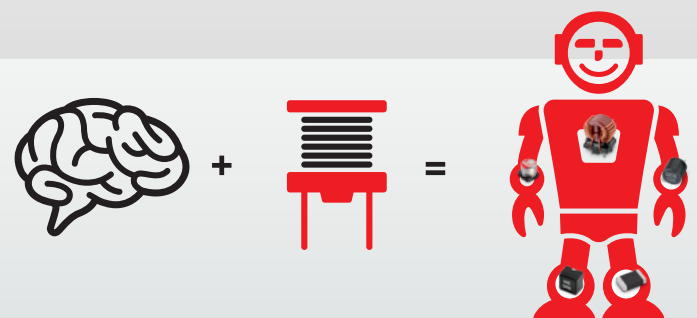
**DESIGN SEMINARS AND  
WEBINARS FREE OF CHARGE**



**ONLINE PLATFORM FOR COMPONENT  
SELECTION & SIMULATION**



**DESIGN KITS WITH LIFELONG  
FREE REFILL**



**REFERENCE DESIGNS OF  
LEADING IC MANUFACTURERS**



# eMobility: Formula E as a driving innovative force



**TEAM WORLD  
CHAMPION**

**FIA FORMULA E  
2017/2018**



***WE speed up***

***the future***

**.com**

Würth Elektronik eiSos, one of the leading manufacturers of electronic and electromechanical components for the electronics industry, congratulates Audi Sport ABT Schaeffler to the Team World Champion Title in season 4 of the 100% electric World Championship in the ABB FIA Formula E Race Series. This is another great milestone after the World Champion Title of Lucas di Grassi in season 3. WE are proud to be technology partner from the very beginning.

[www.we-speed-up-the-future.com](http://www.we-speed-up-the-future.com)



# REDEXPERT | Online Platform for Component Selection



One platform, many uses. Select and compare components, view precise DC- and AC-losses by simulating switching regulators, simulate filter circuits, request samples, share circuits and more with **REDEXPERT**.



Determine the needed  
impedance in REDEXPERT  
[www.we-online.com/redexpert](http://www.we-online.com/redexpert)



# Total Quality Management

## Our environment is important to us!

As one of the leading manufacturers of electronic components worldwide, we are fully conscious of our responsibility for the environment and its protection.

### Directives

We are thus pleased to confirm that all homogenous subcomponents manufactured by Würth Elektronik eiSos GmbH & Co. KG are in full compliance with the following directives:

- 2011/65/EU and 2002/95/EU of the European Parliament regarding the restriction of the use of defined hazardous substances in electrical and electronic devices (RoHS Directive)
- 2010/571/EU, which supersedes the Annex to Directive 2002/95/EG
- article 33, paragraph 1 of the European REACH regulation No. 1907/2006. All components and homogeneous subcomponents are tested according to the current version of the "list of candidates" of the substances of very high concern (SVHC)
- "Halogen free" according to JEDEC 709B & IEC 61249-2-21

The components count as compliant when they conform to the definitions of Directive 2011/65/EU and China RoHS ACPEIP (Administrative Measure on the Control of Pollution Caused by Electronic Information Products).

### No ozone-depleting substances

We also confirm that we do not use ozone-depleting substances without CFCs (chlorofluorocarbons) as per the Montreal Protocol in our products.

This concerns halogenated organic compounds such as

- PCBs (polychlorinated biphenyls)
- PBDEs (polybrominated diphenyl ethers)
- PBBs (polybrominated biphenyls)
- PCN (polychlorinated naphthalene)
- Deca-BDE (decabromodiphenyl ether)



**RoHS**  
COMPLIANT

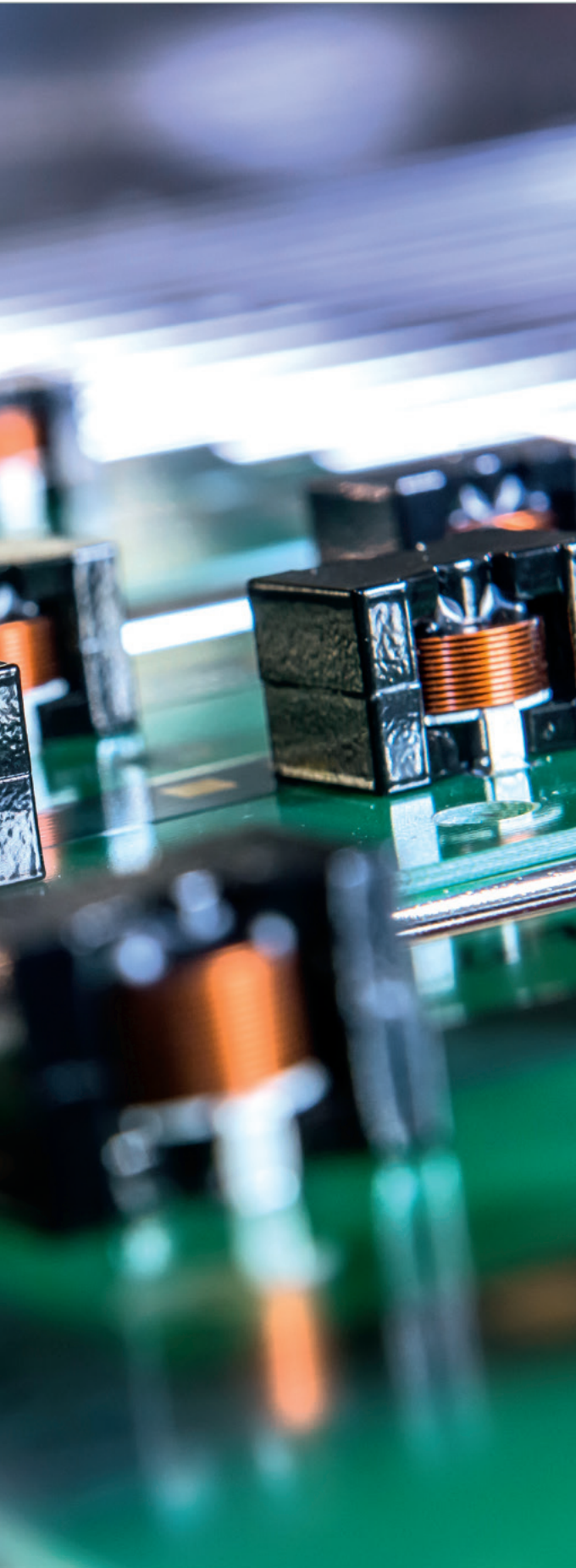


**REACH**  
COMPLIANT



**HALOGEN**  
FREE





## State-of-the-art Equipment

### Four Quality Centers

- Germany (Waldenburg)
- France (Lyon)
- China (Shenzhen)
- USA (Watertown)

### Measurement Lab

- Network/Spectrum/Impedance Analyzers
- RF Impedance/Material Analyzer
- LCR Bridges with High Current Capability
- Precision LCRs
- Modular Impulse Generators
- Varistor Testers
- Winding Testers
- ESD Testers
- Dielectric and Insulation Resistance Testers
- 1000 W Power Supply
- 300 W Electronic Loads

### Environmental Lab

- Shock and Vibration
- Temperature Cycling
- Thermal Shock
- Combined Shock and Vibration with Temperature Cycling
- Steam Aging

### Analysis Lab

- Microscopic Analysis
- Cross Sectioning and Polishing
- Terminal Strength
- Packaging MSL Level Testing
- Wetting Balance
- RoHS Reflow Profile
- Computer Tomography
- Hot Air Reflow
- Vapor Phase
- Wave Soldering
- XRF X-Ray
- Automatic Pick & Place

**According to**  
DIN EN ISO 9001, DIN EN ISO 14001, DIN EN ISO 50001



# Outstanding Design Support

## Trilogy of Magnetics 5<sup>th</sup> Edition **New edition!**

Completely revised and newly structured. The new Trilogy covers a multitude of new components and applications. Over 200 practical examples for audio, filter and video circuits, interfaces, motor control units, SMPS, line filter and power supply.

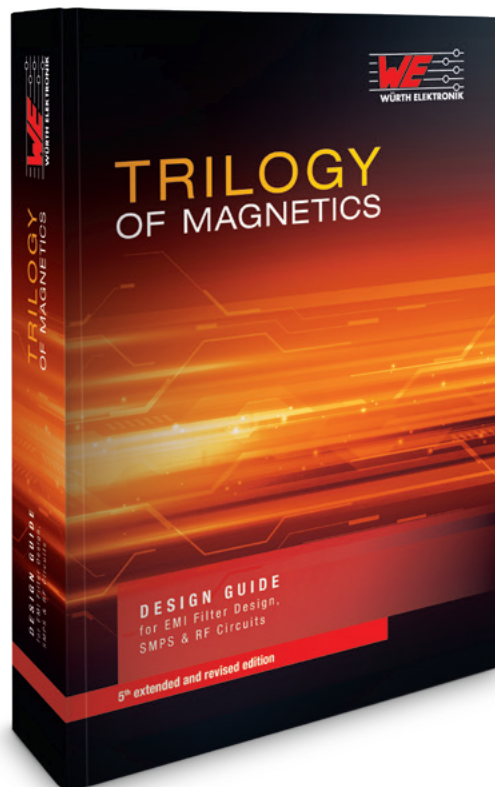
### Order Code:

English version: **744 006**

German version: **744 005 (available 2019)**

Further information and  
free extracts on

[www.we-online.com/trilogy](http://www.we-online.com/trilogy)



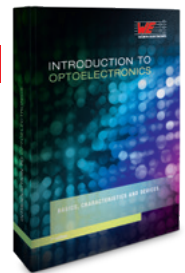
## Introduction to Optoelectronics

### 1<sup>st</sup> Edition: Basics, Characteristics and Devices

### Order Code:

English version: **744 017**

**NEW! Available 2019**



## Abc of Capacitors

### Extended and completely revised Edition: Basic Principles, Characteristics and Capacitor Types

### Order Code:

English version: **744 013**

German version: **744 012**

**Extended and  
completely revised  
edition  
available 2019**



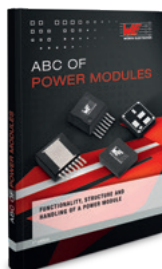
## Abc of Power Modules

### 1<sup>st</sup> Edition: Functionality, Structure and Handling of a Power Module

### Order Code:

English version: **744 016**

German version: **744 014**



## The LT Spice IV Simulator

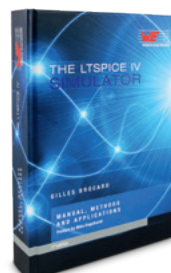
### 1<sup>st</sup> Edition: Manual, Methods and Applications

### Order Code:

English version: **744 010**

German version: **744 011**

**Part II available 2019**



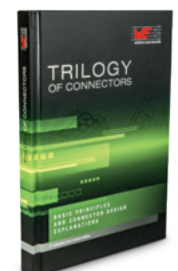
## Trilogy of Connectors

### 3rd Edition: Trilogy of Connectors Basic Principles and Connector Design Explanations

### Order Code:

English version: **699 004**

German version: **699 005**



## Application Notes

Find helpful and comprehensive application notes about DC/DC converters, interfaces, filter design and on how to use inductors, ferrites, wireless power transfer coils, shielding material, power modules, electromechanical components, capacitors and LEDs on [www.we-online.com/appnotes](http://www.we-online.com/appnotes)



## Newsletter

Stay in touch about new products, technologies, services, seminars, webinars and many more. Subscribe to our monthly newsletter on [www.we-online.com/newsletter](http://www.we-online.com/newsletter)



## Seminars, Webinars & Tutorials

We offer web-based seminars as a supplement to our long-standing stationary seminars. Our experts will shine a light on interesting topics regarding electronic & electromechanical components.

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## askLorandt

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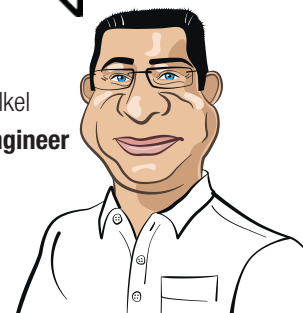
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 [we-online.com/askLorandt](mailto:we-online.com/askLorandt)



Lorandt Fölkel  
**Design Engineer  
at heart**



or contact me directly:

[askLorandt@we-online.com](mailto:askLorandt@we-online.com)

## Toolbox

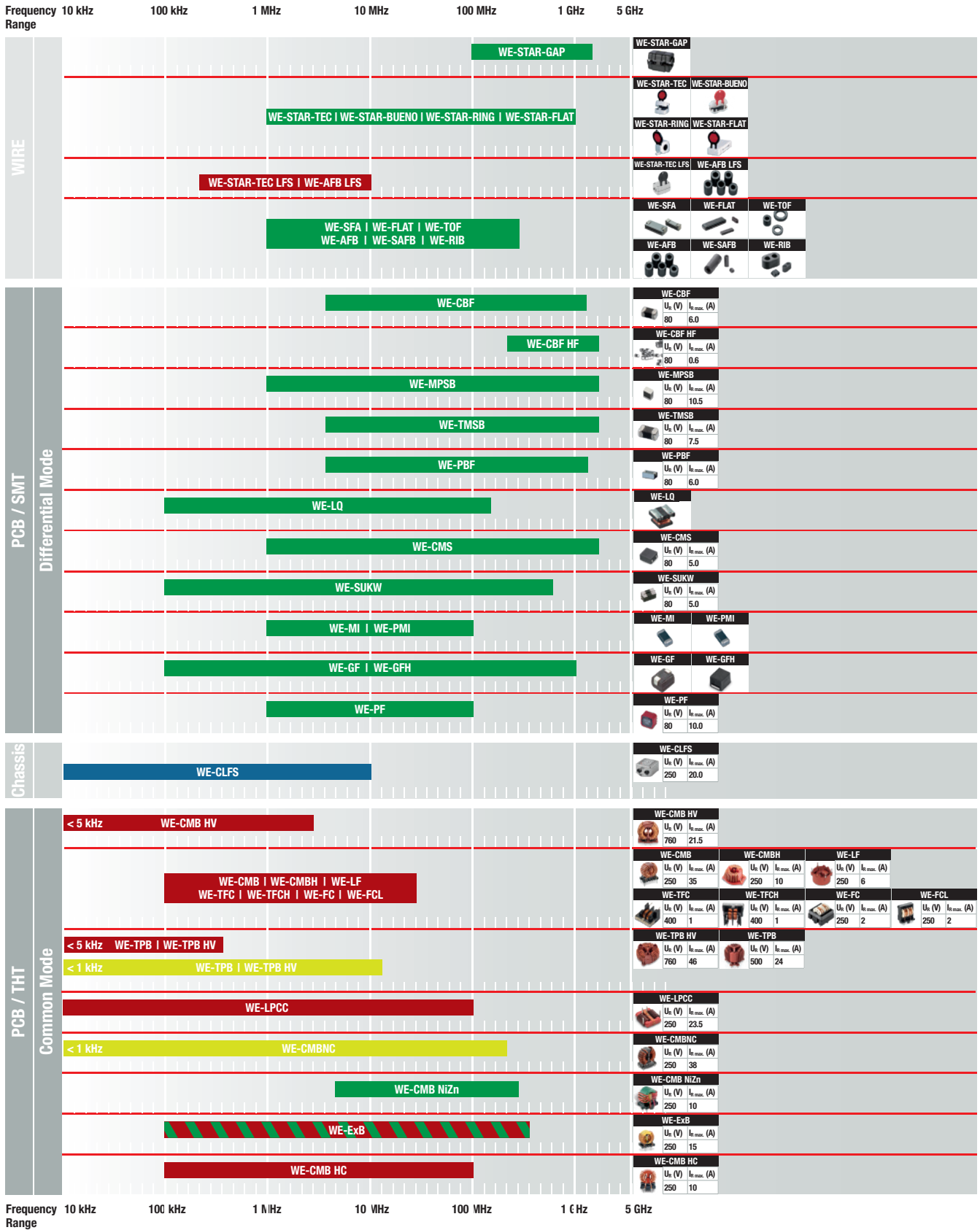
Helpful design tools for engineers available



[www.we-online.com/toolbox](http://www.we-online.com/toolbox)

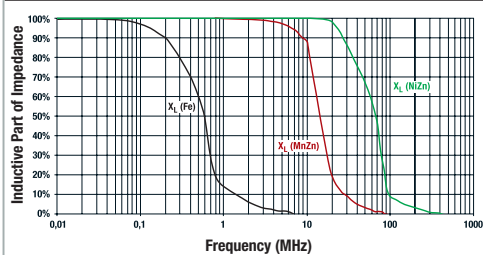


# Filter Applications: EMI Suppression

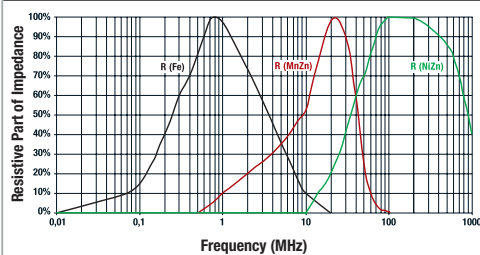




Inductive Part of Impedance



Resistive Part of Impedance



- Fe Iron Powder
- MnZn Manganese-Zinc
- NiZn Nickel-Zinc
- Ceramic Ceramic
- Air Coil Air Coil
- Nanocrystalline Nanocrystalline
- NiZn / MnZn Nickel-Zinc / Manganese-Zinc



# Storage Applications: Power Inductors for SMPS

	Frequency 10 kHz Range	100 kHz	1 MHz	10 MHz	100 MHz	$I_r$ max. (A)	min. $R_{DC}$ (m $\Omega$ )	Smallest size L x W x H (mm)	Inductance ( $\mu$ H)
THT		WE-FI				5	10	9.5 x 4.5 x 15	8.2 ~ 860
		WE-SI				5	8	15.0 x 8.0 x 12.0	8 ~ 1000
		WE-FAMI				14.5	3.8	8.0 x 8.0 x 10.0	3 ~ 22
		WE-TI				8.5	6	6.0 x 6.0 x 8.5	1 ~ 68000
		WE-TIF				2.6	90	10.0 x 10.0 x 14.0	100 ~ 10000
		WE-TIS				8.5	7	7.8 x 7.8 x 7.5	1.3 ~ 8200
		WE-TI HV				0.90	600	7.8 x 7.8 x 9.5	220 ~ 2200
SMT		WE-PMI				4.0	7	1.6 x 0.8 x 0.5	0.47 ~ 10
		WE-PMCI				3.6	19	1.6 x 0.8 x 0.8	0.24 ~ 2.2
		WE-LQS				6.85	6	2.0 x 1.6 x 1.0	0.16 ~ 10000
		WE-LQSH				6.4	18	2.0 x 1.6 x 1.0	0.47 ~ 33
		WE-MAPI				4.8	13.2	1.6 x 1.6 x 1.0	0.33 ~ 47
					WE-PMMI	11	9	2.0 x 1.6 x 0.5	0.04 ~ 1.5
		WE-SPC				5.3	14	4.8 x 4.8 x 1.8	0.22 ~ 100
		WE-LQFS				4.47	18	3.8 x 3.8 x 1.8	1.0 ~ 1000
		WE-TPC				8.5	3.5	2.8 x 2.8 x 1.1	0.056 ~ 1500
		WE-PD				23.5	3	6.2 x 5.9 x 3.3	0.47 ~ 1500
		WE-PD2SR				4.85	8.5	7.0 x 7.8 x 5.0	1.2 ~ 220
		WE-PD2				10	2.5	4.0 x 4.5 x 3.2	0.12 ~ 820
		WE-PD HV				1.30	350	7.3 x 7.3 x 4.2	220 ~ 3300
		WE-PD2 HV				0.41	1770	7.0 x 7.8 x 5.0	560 ~ 2200

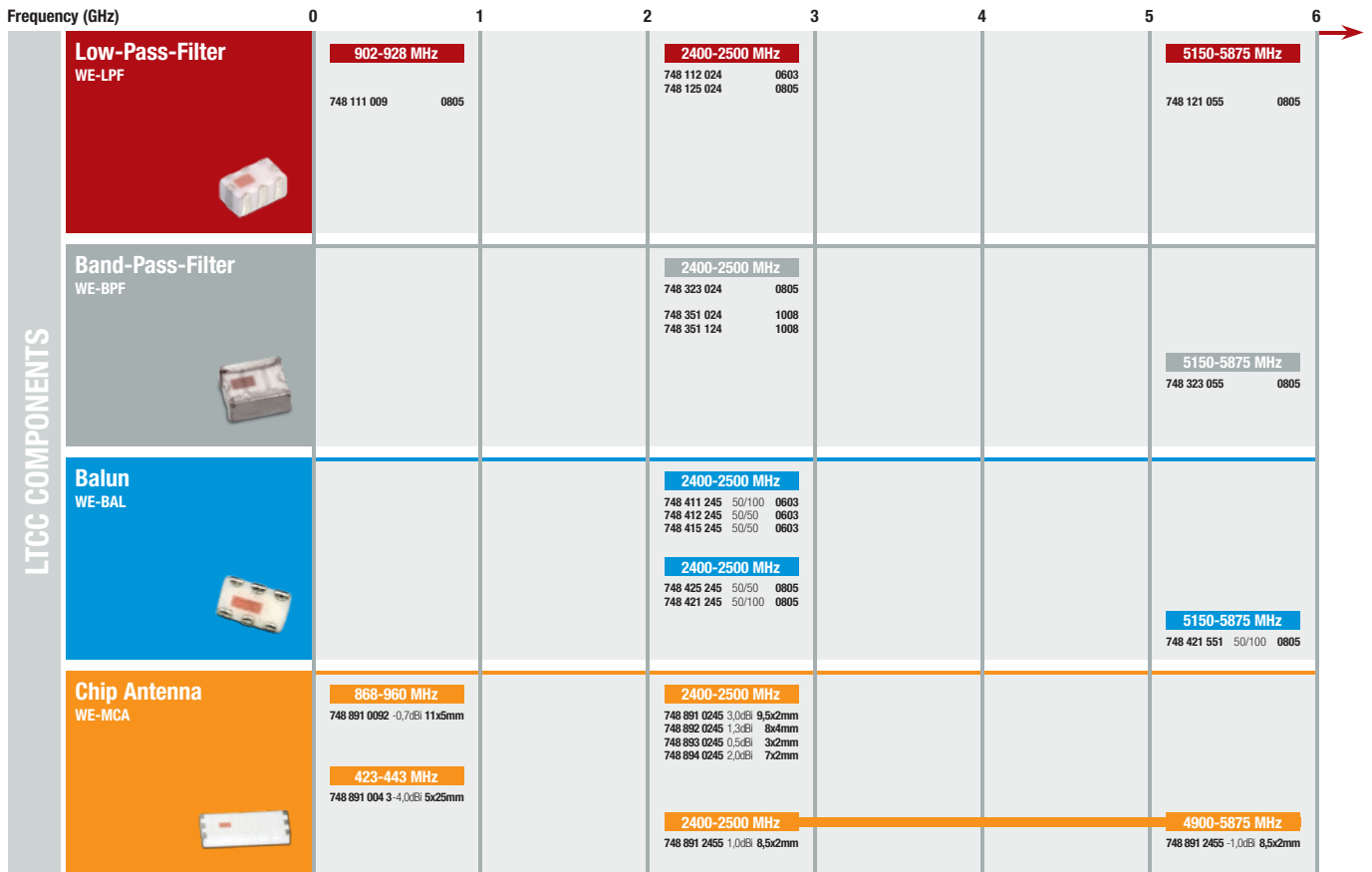
Frequency Range	10 kHz	1 MHz	10 MHz	100 MHz	$I_r$ max. (A)	$R_{DC}$ min. (mΩ)	Smallest size L x W x H (mm)	Inductance (μH)
SMT		WE-PD3		WE-PD3	3.9	14	6.6 x 4.45 x 2.92	1 ~ 1000
		WE-PD4		WE-PD4	18	1.3	6.6 x 4.45 x 2.92	0.47 ~ 10000
		WE-HCI		WE-HCI	25	0.51	5.6 x 5.3 x 4.0	0.13 ~ 16
		WE-HCC		WE-HCC	27	0.51	12.1 x 11.4 x 9.5	0.22 ~ 4.7
		WE-HCC		WE-HCC	27	0.53	8.4 x 7.9 x 7.2	0.22 ~ 10
		WE-HCI		WE-HCI	41.5	0.35	10.5 x 10.2 x 4.0	0.15 ~ 33
		WE-HCI		WE-HCI	29	1,7	18.3 x 18.2 x 8.9	3.3 ~ 82
		WE-HCFT		WE-HCFT	75	0.34	21.5 x 36.0 x 35.0	1.5 ~ 65
		WE-HCF		WE-HCF	56	0.44	21.8 x 21.5 x 14.5	0.7 ~ 680
		WE-HCM		WE-HCM	47.5	0.155	7.15 x 7.0 x 5.0	0.072 ~ 0.47
		WE-XHMI		WE-XHMI	10.0	2.1	8.3 x 8.8 x 7.8	1 ~ 10
		WE-LHMI		WE-LHMI	25	0.75	4.0 x 4.0 x 1.0	0.1 ~ 22
Coupled SMT		WE-EHPI		WE-EHPI	1.9	0.085	6.0 x 6.0 x 4.0	7.5 ~ 25.0
		WE-TDC		WE-TDC	4.5	11.6	7.3 x 7.3 x 4.0	0.33-22.0
		WE-DD		WE-DD	8.6	11	7.3 x 7.3 x 4.0	1.3 ~ 220
		WE-DCT		WE-DCT	14.5	2.8	23.3 x 19.6 x 11.5	0.091 ~ 100
		WE-CFWI		WE-CFWI	22	1.6	13.2 x 15.5 x 10.5	0.08 ~ 4.40
		WE-MCRI		WE-MCRI	17	4.5	11.5 x 10.0 x 9.0	1 ~ 47
		WE-CPIB HV		WE-CPIB HV	1.45	105	5.0 x 5.0 x 3.0	4.7 ~ 47
		WE-MTCI		WE-MTCI	0.95	349	5.2 x 5.2 x 3.1	10 ~ 33
		WE-TDC HV		WE-TDC HV	2.45	85	8.0 x 8.0 x 1.8	4.7 ~ 33

	Iron Powder
	Nickel-Zinc
	Superflux
	Metal Alloy
	WE-PERM®
	Manganese-Zinc
	Nickel-Zinc / Manganese-Zinc
	Hyperflux®
	Nickel-Zinc / Manganese-Zinc / Metal Alloy

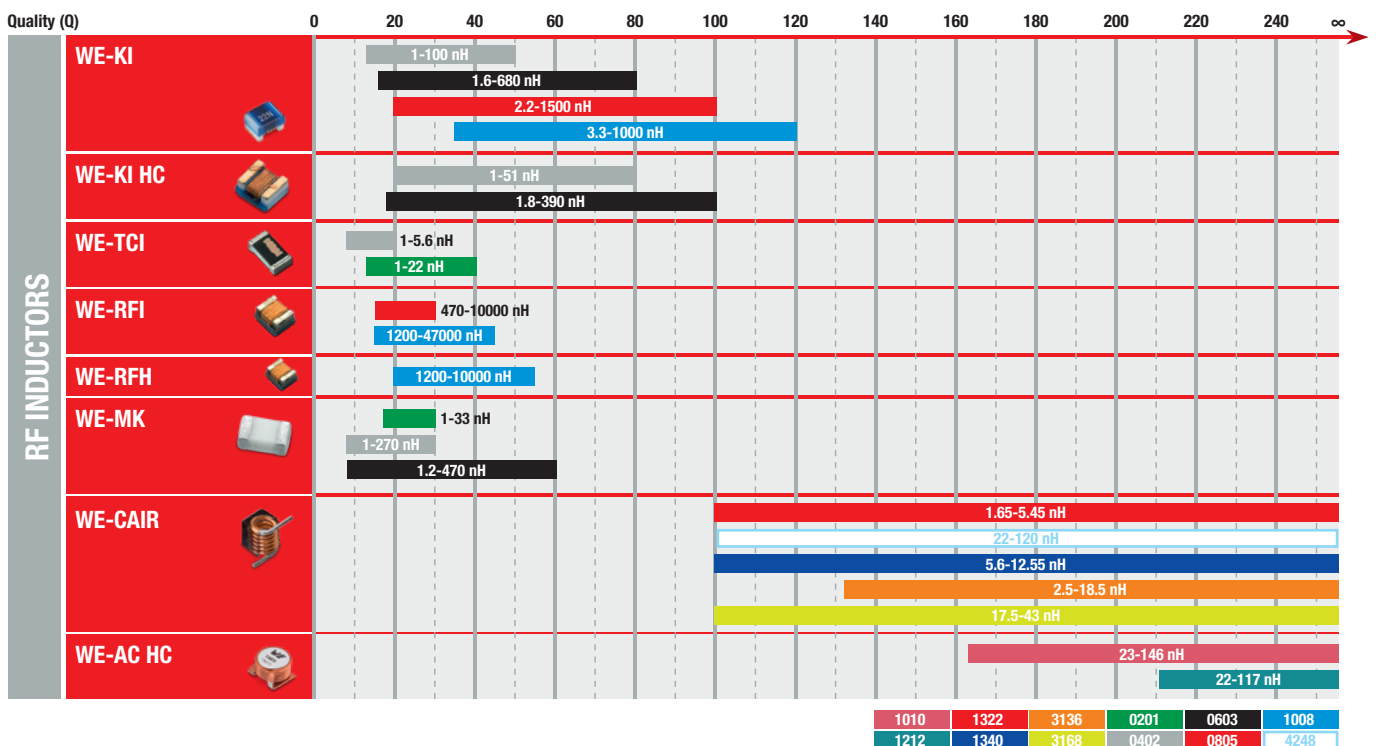
© Registered European Trademark



# RF Product Finder



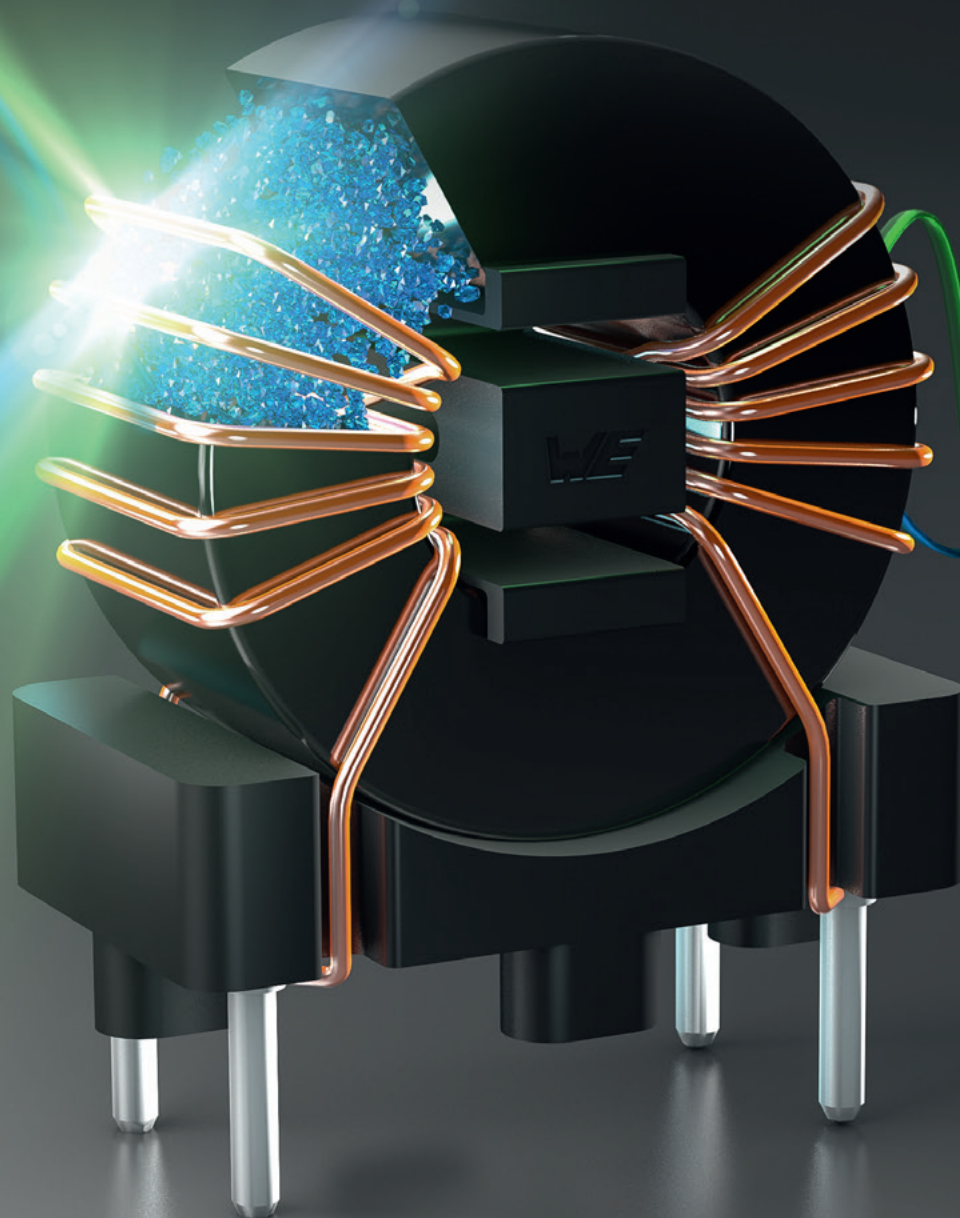
Frequency bands:	ISM	ZigBEE EU	ZigBEE USA	Mobil-DB	GSM	T-DAB	GPS	DCS	GSM	1452/1479 MHz	1559/1610 MHz	1710/1785 MHz	1805/1880 MHz	1880/1980 MHz	1880/1930 MHz	WLAN	ZigBEE	Bluetooth	HomeRF	2400/2483 MHz	2402/2480 MHz	2402/2480 MHz	WIMAX	3410/3594 MHz	WLAN	5150/5250 MHz	5250/5350 MHz	5470/5725 MHz	5725/5825 MHz	5725/5825 MHz		
	433/868 MHz	868 MHz	915 MHz	878/880 MHz	890/914 MHz	935/959 MHz																										



1010	1322	3136	0201	0603	1008
1212	1340	3168	0402	0805	4248

# **1** PASSIVE COMPONENTS

## EMC Components



<b>Product Overview</b>	<b>18</b>
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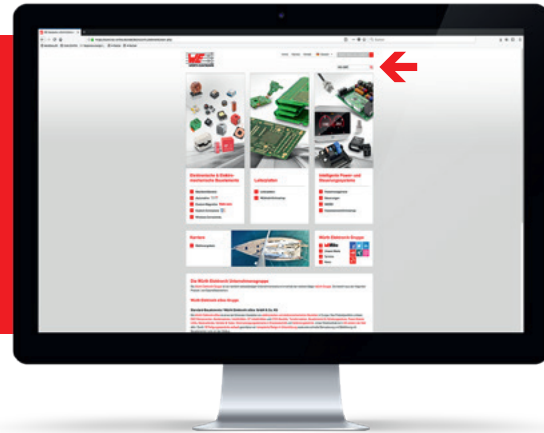


# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WE-CBF



### Ferrites for PCB Assembly

EXTENDED

#### WE-TMSB

Z @ 100 MHz: 10 ~ 2100 Ω  
 $I_{\text{eff}}$ : 150 ~ 7500 mA  
 $R_{\text{DC}}$ : 0.09 ~ 2.1 Ω  
 Frequency Range: 6 ~ 3000 MHz



#### WE-CBF

Z @ 100 MHz: 5 ~ 2700 Ω  
 $I_{\text{eff}}$ : 50 ~ 6000 mA  
 $R_{\text{DC}}$ : 0.008 ~ 1.5 Ω  
 Frequency Range: 6 ~ 2000 MHz



EXTENDED

#### WE-CBF HF

Z @ 1 GHz: 244 ~ 2005 Ω  
 $I_{\text{eff}}$ : 50 ~ 600 mA  
 $R_{\text{DC}}$ : 0.25 ~ 1.8 Ω  
 Frequency Range: 300 ~ 3000 MHz



#### WE-MPSB

Z @ 100 MHz: 8 ~ 600 Ω  
 $I_{\text{eff}}$ : 2100 ~ 10.500 mA  
 $R_{\text{DC}}$ : 1.0 ~ 80.0 mΩ  
 Frequency Range: 1 ~ 3000 MHz



EXTENDED

#### WE-PBF

Z @ 100 MHz: 42 ~ 98 Ω  
 $I_{\text{eff}}$ : 6 A  
 $R_{\text{DC}}$ : 0.6 ~ 0.9 mΩ  
 Frequency Range: 6 ~ 2000 MHz



#### WE-PF

$I_{\text{eff}}$ : 4.5 ~ 10 A  
 $R_{\text{DC}}$ : 9 ~ 30 mΩ  
 Frequency Range: 1 ~ 100 MHz



EXTENDED

#### WE-CMS

Z @ 25 MHz: 20 ~ 34 Ω  
 Z @ 200 MHz: 30 ~ 52 Ω  
 $I_{\text{eff}}$ : 5 A  
 Frequency Range: 1 ~ 3000 MHz



#### WE-SUKW

Z @ 25 MHz: 272 ~ 425 Ω  
 Z @ 100 MHz: 416 ~ 580 Ω  
 Frequency Range: 0.1 ~ 800 MHz



### Ferrites for PCB Assembly

#### WE-UKW

Z @ 25 MHz: 145 ~ 920 Ω  
 Z @ 100 MHz: 230 ~ 1240 Ω  
 Frequency Range: 0.1 ~ 500 MHz



#### WE-MLS

Z @ 25 MHz: 115 ~ 292 Ω  
 Z @ 100 MHz: 150 ~ 334 Ω  
 Frequency Range: 10 ~ 800 MHz



#### WE-WAFB

Z @ 10 MHz: 28 ~ 65 Ω  
 Z @ 100 MHz: 70 ~ 130 Ω  
 Frequency Range: 1 ~ 1000 MHz



### Ferrites for Cable Assembly

#### WE-STAR-BUENO

Z @ 25 MHz 1 turn: 100 ~ 180 Ω  
 Z @ 100 MHz 1 turn: 150 ~ 250 Ω  
 Cable diameter: 2.5 ~ 8.5 mm  
 Frequency Range: 1 ~ 1000 MHz



NEW

#### WE-STAR-TEC LFS

Z @ 1 MHz 1 turn: 20 ~ 94 Ω  
 Z @ 10 MHz 1 turn: 32 ~ 65 Ω  
 Cable diameter: 3.5 ~ 21 mm  
 Frequency Range: 300kHz ~ 30 MHz



#### WE-STAR-TEC

Z @ 25 MHz 1 turn: 98 ~ 306 Ω  
 Z @ 100 MHz 1 turn: 182 ~ 525 Ω  
 Cable diameter: 3.5 ~ 25 mm  
 Frequency Range: 1 ~ 1000 MHz



#### WE-STAR-GAP

Z @ 25 MHz 1 turn: 28 ~ 35 Ω  
 Z @ 500 MHz 1 turn: 345 ~ 400 Ω  
 Cable diameter: 4.5 ~ 12.5 mm  
 Frequency Range: 100 ~ 2000 MHz



### Ferrites for Cable Assembly

#### WE-STAR-RING

Z @ 25 MHz 1 turn: 64 ~ 142 Ω  
 Z @ 100 MHz 1 turn: 119 ~ 327 Ω  
 Cable diameter: 8 ~ 27 mm  
 Frequency Range: 1 ~ 1000 MHz



#### WE-STAR-FLAT

Z @ 25 MHz 1 turn: 42 ~ 97 Ω  
 Z @ 100 MHz 1 turn: 101 ~ 194 Ω  
 No. of Pins: 26 ~ 50  
 Frequency Range: 1 ~ 1000 MHz



#### WE-STAR-CLIP

Especially for the fixation of STAR-TEC and STAR-FIX Snap Ferrites



#### WE-NCF

Z @ 25 MHz 1 turn: 48 ~ 100 Ω  
 Z @ 100 MHz 1 turn: 93 ~ 200 Ω  
 Cable diameter:  $\leq 7.8 \leq 26.5$  mm  
 Frequency Range: 1 ~ 1000 MHz



#### WE-SPLITRING

Z @ 25 MHz 1 turn: 48 ~ 100 Ω  
 Z @ 100 MHz 1 turn: 93 ~ 200 Ω  
 Cable diameter:  $\leq 7.8 \leq 26.5$  mm  
 Frequency Range: 1 ~ 1000 MHz



#### WE-SFA

Z @ 25 MHz 1 turn: 27 ~ 148 Ω  
 Z @ 100 MHz 1 turn: 57 ~ 267 Ω  
 No. of Pins: 10 ~ 64  
 Frequency Range: 1 ~ 1000 MHz



#### WE-FLAT

Z @ 25 MHz 1 turn: 1 ~ 90 Ω  
 Z @ 100 MHz 1 turn: 42 ~ 166 Ω  
 Types: round, square, edged  
 Frequency Range: 1 ~ 1000 MHz





#### WE-FLAT Ferrite for Flexible Printed Circuit Boards


Z @ 25 MHz 1 turn: 7 ~ 71 Ω  
 Z @ 100 MHz 1 turn: 19 ~ 130 Ω  
 Types: round, square  
 Frequency Range: 1 ~ 1000 MHz




## Ferrites for Cable Assembly


	<b>WE-FCAC</b>	Easy fixation for flat cores on ribbon cables
	Max. No. of Poles:	16 ~ 40
	Frequency Range:	1 ~ 1000 MHz

	<b>WE-TOF</b>	
	Z @ 25 MHz 1 turn:	25 ~ 110 Ω
	Z @ 100 MHz 1 turn:	37 ~ 200 Ω
	Cable diameter:	3.0 ~ 33.4 mm

	<b>WE-AFB LFS</b>	
	Z @ 25 MHz 1 turn:	46 ~ 300 Ω
	Z @ 100 MHz 1 turn:	70 ~ 451 Ω
	Cable diameter:	3.3 ~ 17.5 mm

	<b>WE-AFB</b>	
	Z @ 1 MHz 1 turn:	30 ~ 130 Ω
	Z @ 10 MHz 1 turn:	40 ~ 100 Ω
	Cable diameter:	4.55 ~ 12.5 mm

	<b>WE-SAFB</b>	
	Z @ 25 MHz 1 turn:	20 ~ 144 Ω
	Z @ 100 MHz 1 turn:	40 ~ 278 Ω
	Cable diameter:	0.55 ~ 4 mm

	<b>WE-RIB</b>	
	Z @ 25 MHz 1 turn:	20 ~ 101 Ω
	Z @ 100 MHz 1 turn:	45 ~ 176 Ω
	Cable diameter:	0.8 ~ 3.5 mm

## Filter Chokes


	<b>WE-MI</b>	
	L:	0.047 ~ 10 μH
	I <sub>g</sub> :	3 ~ 300 mA
	R <sub>DC</sub> :	0.15 ~ 2.1 Ω


	<b>WE-SD</b>	
	L:	2 ~ 10 μH
	I <sub>g</sub> :	2.5 ~ 15 A
	R <sub>DC</sub> :	1.7 ~ 33 mΩ


	<b>WE-FI</b>	
	L:	8.2 ~ 860 μH
	I <sub>g</sub> :	0.4 ~ 5 A
	R <sub>DC</sub> :	0.01 ~ 0.45 Ω


## Common Mode Chokes Power Lines


	<b>WE-CMB</b>	
	L:	0.5 ~ 39 mH
	I <sub>g</sub> :	0.3 ~ 35 A
	R <sub>DC</sub> :	1.7 ~ 3000 mΩ

	<b>EXTENDED WE-CMBNC</b>	
	L:	0.4 ~ 190 mH
	I <sub>g</sub> :	0.9 ~ 32 A
	R <sub>DC</sub> :	1.1 ~ 430 mΩ

	<b>WE-CMB HC</b>	
	L:	0.175 ~ 0.7 mH
	I <sub>g</sub> :	5 ~ 10 mA
	R <sub>DC</sub> :	2.7 ~ 13 Ω

	<b>WE-CMB HV</b>	
	L:	0.7 ~ 4.7 mH
	I <sub>g</sub> :	6.8 ~ 21.5 A
	R <sub>DC</sub> :	3.5 ~ 44 mΩ

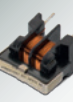
	<b>WE-CMB NiZn</b>	
	L:	14 ~ 110 μH
	I <sub>g</sub> :	1.5 ~ 10 A
	R <sub>DC</sub> :	2.7 ~ 80 mΩ

	<b>WE-ExB</b>	
	L:	47 ~ 1000 μH
	I <sub>g</sub> :	4.5 ~ 15 A
	R <sub>DC</sub> :	4.6 ~ 42 mΩ

	<b>WE-CMBH</b>	
	L:	1 ~ 7 mH
	I <sub>g</sub> :	3.5 ~ 10 A
	R <sub>DC</sub> :	12.5 ~ 80 mΩ


	<b>WE-LF</b>	
	L:	0.4 ~ 50 mH
	I <sub>g</sub> :	0.3 ~ 6 A
	R <sub>DC</sub> :	0.02 ~ 2.6 Ω

	<b>WE-LF SMD</b>	
	L:	0.7 ~ 47 mH
	I <sub>g</sub> :	0.3 ~ 5.25 A
	R <sub>DC</sub> :	0.03 ~ 2.6 Ω


	<b>WE-TFC</b>	
	L:	1.8 ~ 25 mH
	I <sub>g</sub> :	0.25 ~ 1.0 A
	R <sub>DC</sub> :	0.31 ~ 3.60 Ω


	<b>WE-TFCH</b>	
	L:	1.8 ~ 25 mH
	I <sub>g</sub> :	0.25 ~ 1.0 A
	R <sub>DC</sub> :	0.31 ~ 3.60 Ω


## Common Mode Chokes Power Lines

	<b>WE-FC</b>	
	L:	0.82 ~ 33 mH
	I <sub>g</sub> :	1.25 ~ 5 A
	R <sub>DC</sub> :	0.065 ~ 2.5 mΩ

	<b>WE-FCL</b>	
	L:	3.9 ~ 100 mH
	I <sub>g</sub> :	1.25 ~ 6.0 A
	R <sub>DC</sub> :	50 ~ 900 Ω

	<b>WE-LPCC</b>	
	L:	120 ~ 450 μH
	I <sub>g</sub> :	10 ~ 23.5 A
	R <sub>DC</sub> :	1.4 ~ 9.6 mΩ

	<b>NEW WE-TPB</b>	
	L:	0.52 ~ 12 mH
	I <sub>g</sub> :	6 ~ 24 A
	R <sub>DC</sub> :	3 ~ 65 mΩ


	<b>WE-TPB HV</b>	
	L:	0.2 ~ 208 mH
	I <sub>g</sub> :	7.2 ~ 46 A
	R <sub>DC</sub> :	1.6 ~ 85 mΩ


## Common Mode Chokes Signal Lines

	<b>WE-CNSW</b>	
	Z @ 100 MHz:	45 ~ 10000 Ω
	I <sub>g</sub> :	90 ~ 2000 mA
	R <sub>DC</sub> :	0.05 ~ 8.0 Ω

	<b>WE-CNSW HF</b>	
	Z @ 100 MHz:	60 ~ 120 Ω
	I <sub>g</sub> :	280 ~ 600 mA
	R <sub>DC</sub> :	0.22 ~ 0.30 Ω

	<b>WE-SLM</b>	
	L:	11 ~ 470 μH
	I <sub>g</sub> :	300 ~ 400 mA
	R <sub>DC</sub> :	0.18 ~ 0.58 Ω

	<b>WE-SL1</b>	
	L:	10 ~ 330 μH
	I <sub>g</sub> :	300 mA
	R <sub>DC</sub> :	0.16 ~ 0.3 Ω


	<b>WE-SL2</b>	
	L:	10 ~ 20000 μH
	I <sub>g</sub> :	0.2 ~ 1.6 A
	R <sub>DC</sub> :	0.08 ~ 2.6 Ω



# Product Overview


## Common Mode Chokes Signal Lines

**WE-SL3**




L: 20 ~ 100 µH  
 $I_{DC}$ : 450 ~ 700 mA  
 $R_{DC}$ : 0.14 ~ 0.45 Ω  
 Frequency Range: 9 ~ 600 MHz  
 Number of Windings: 2 ~ 3

**WE-SL5**




L: 120 ~ 4700 µH  
 $I_{DC}$ : 350 ~ 2500 mA  
 $R_{DC}$ : 0.025 ~ 0.72 Ω  
 Frequency Range: 9 ~ 600 MHz  
 Number of Windings: 2

**WE-SL5 HC**



L: 5 ~ 30 µH  
 $I_{DC}$ : 1.2 ~ 5 A  
 $R_{DC}$ : 0.0055 ~ 0.06 Ω  
 Frequency Range: 1.4 ~ 300 MHz  
 Number of Windings: 2

**WE-SL**




L: 35 ~ 4700 µH  
 $I_{DC}$ : 0.2 ~ 2.7 A  
 $R_{DC}$ : 0.035 ~ 0.85 Ω  
 Frequency Range: 0.01 ~ 600 MHz  
 Number of Windings: 2 ~ 4

**WE-SCC**



L: 1 ~ 1000 µH  
 $I_{DC}$ : 150 ~ 4750 mA  
 $R_{DC}$ : 0.01 ~ 4.30 Ω  
 Frequency Range: 0.1 ~ 300 MHz  
 Number of Windings: 2


**WE-UCF**



L: 0.013 ~ 100 mH  
 $I_{DC}$ : 0.15 ~ 10 A  
 $R_{DC}$ : 0.0027 ~ 8.5 Ω  
 Frequency Range: 0.01 ~ 400 MHz  
 Number of Windings: 2 ~ 4

## ESD and Surge Protection

**EXTENDED WE-TVS**



Operating Voltage: 1.2 ~ 20 V<sub>DC</sub>  
 $C_{TVS}$ : 0.18 ~ 830 pF  
 Channels: 1 ~ 8 (+VDD)  
 Uni/Bidirectional, Rail-to-Rail

**WE-VE/WE-VEA**




Operating Voltage: 5 ~ 24 V<sub>DC</sub>  
 $C_{TVS}$ : 0.2 ~ 120 pF  
 $I_{TVS}$  Size: 0201 ~ 0805/0508 ~ 0612

**WE-TVSP**




Operating Voltage: 5 ~ 100 V<sub>DC</sub>  
 $I_{max}$ : 2.5 ~ 326.1 A  
 $V_{clamp}$ : 9.2 ~ 162 V  
 Size: SMAJ, SMBJ, SMCJ, SMDJ

**WE-VS**



Operating Voltage: 5.5 ~ 56 V<sub>DC</sub>  
 $I_{max}$ : 10 ~ 200 A  
 $W_{max}$ : 0.02 ~ 1.1 J  
 $C_{TVS}$ : 70 ~ 3600 pF  
 Size: 0402 ~ 1206

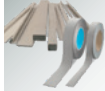
**WE-VD**



Operating Voltage: 18 ~ 1465 V<sub>DC</sub>  
 $I_{max}$ : 0.1 ~ 10 kA  
 $W_{max}$ : 0.7 ~ 496 J  
 Diameters: 5 ~ 20 mm  
 Reference for cURus/CQC/VDE

## EMI Shielding Material

**EMI Shielding Material**



Fabric over foam gaskets, Copper Tape, Aluminum Tape, Conductive Foam, Conductive Fabric

**EMI Board Level Shielding WE-SHC, ShieldiY**




Metal cabinets for board level shielding, SMD & THT, Frame & Cover  
 One piece solution

**EMI grounding contacts WE-SECF, WE-EEL, WE-ST**



SMD contacts, Metal Clips, Grounding Cables

**NEW EMI Magnetic Shielding WE-FAS, WE-FSFS, WE-CPU**



Absorber Sheets, Thermal Absorber Sheets, Flexible Ferrite Sheets, Ferrite Plates

## D-SUB Filter Connectors

**D-SUB Filter Connectors**



Bent 90°, solder cup, solder pin straight, filter adapter

## EMC Filters

**NEW WE-CLFS Line Filter**



$I_{DC}$ : 1.5 ~ 20 A  
 $I_{Leak}$ : 0.173 ~ 0.785 mA  
 $R_{DC}$ : 15 ~ 300 mΩ

All EMC Components at a glance  
[www.we-online.com/emc-components](http://www.we-online.com/emc-components)



Explore our Application Notes for EMC Components  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)



Component Libraries available for:

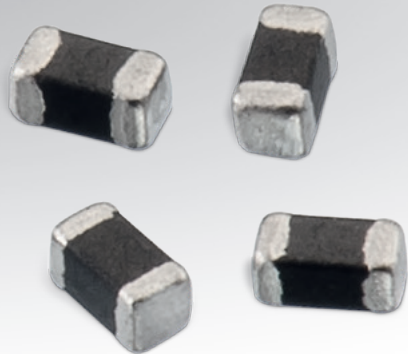
- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics

[www.we-online.com/library](http://www.we-online.com/library)



# WE-TMSB

## SMT EMI Suppression Ferrite Bead



### Characteristics:

- Perfect for Miniaturization of EMI solutions
- Wide Impedance range from 10 - up to 2100Ω
- Operating Temperature: -55°C - +125°C
- Extended measurement range up to 8GHz
- Improved processes for achieving higher impedances and currents

### Applications:

- General Signal & low Power Lines
- Audio- / Video- / Clocklines
- Small handheld devices
- High Frequency Noise suppression

NEW PRODUCTS

### Size 0402

Technical Data:							
Order Code	Z @ 100 MHz (Ω)	Z @ 1 GHz (Ω)	Z <sub>max</sub> (Ω)	TC Z <sub>max</sub>	I <sub>R</sub> (mA)	R <sub>DC max.</sub> (Ω)	Type
74269241601	600	218	720	211 MHz	850	0.25	Wide Band
74269241102	1000	216	1157	129 MHz	480	0.48	
74269241152	1500	224	1533	118 MHz	500	0.5	

Z @ 100 MHz: Impedance @ 100 MHz; Z @ 1 GHz: Impedance @ 1 GHz; Z<sub>max</sub>: Maximum Impedance; TC Z<sub>max</sub>: Maximum Impedance (Test cond.); I<sub>R</sub>: Rated Current; R<sub>DC max.</sub>: DC Resistance

### Size 0603

Technical Data:							
Order Code	Z @ 100 MHz (Ω)	Z @ 1 GHz (Ω)	Z <sub>max</sub> (Ω)	TC Z <sub>max</sub>	I <sub>R</sub> (mA)	R <sub>DC max.</sub> (Ω)	Type
7426926222	22	38	41	1660 MHz	7500	0.004	High Current
74269262601	600	170	634	184 MHz	1500	0.1	

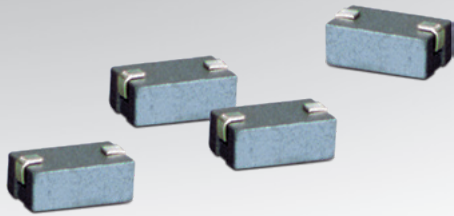
Z @ 100 MHz: Impedance @ 100 MHz; Z @ 1 GHz: Impedance @ 1 GHz; Z<sub>max</sub>: Maximum Impedance; TC Z<sub>max</sub>: Maximum Impedance (Test cond.); I<sub>R</sub>: Rated Current; R<sub>DC max.</sub>: DC Resistance

[www.we-online.com/WE-TMSB](http://www.we-online.com/WE-TMSB)

# WE-PBF

## Flat Wire High Current SMT Ferrite Bead

NEW PRODUCTS



### Characteristics:

- Flat wire
- Suitable for applications with high currents up to 6 A
- Operating temperature: -55 °C to +125 °C
- Specified Peak Current Capability
- Compatible with land pattern 1206 | 1210 | 1612 of the WE-CBF series

### Applications:

- Voltage supply for high load current
- Filter with high inrush current peaks

[www.we-online.com/WE-PBF](http://www.we-online.com/WE-PBF)



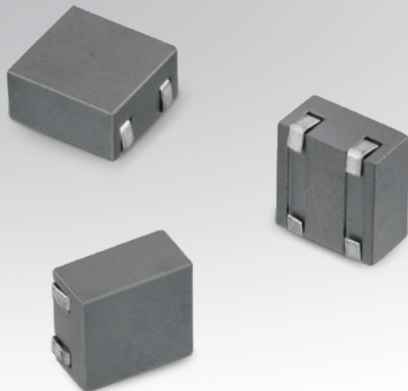
### Technical Data:

Order Code	Z @ 25 MHz (Ω)	Z @ 100 MHz (Ω)	I <sub>R</sub> (A)	R <sub>DC max.</sub> (mΩ)	L (mm)	W (mm)	H (mm)
7427933	23	39	6	0.6	3.1	2.9	2.41
7427934	28	42		0.4	4.8	3	2.5

Z @ 25 MHz: Impedance @ 25 MHz; Z @ 100 MHz: Impedance @ 100 MHz; I<sub>R</sub>: Rated Current; R<sub>DC max.</sub>: DC Resistance; L: Length; W: Width; H: Height

# WE-CMS

## Common Mode SMT Bead



### Characteristics:

- Maximum current capability up to 5 A
- Low DC resistance
- Impedance up to 200 Ω
- Operating temperature: -40 °C to +125 °C

### Applications:

- Power supply systems
- Symmetric data lines
- Common mode interference
- Power electronics

[www.we-online.com/WE-CMS](http://www.we-online.com/WE-CMS)



### Technical Data:

Order Code	Z @ 25 MHz (Ω)	Z @ 25 MHz 2 turns (Ω)	Z @ 100 MHz (Ω)	Z @ 100 MHz 2 turns (Ω)	I <sub>R</sub> (A)	R <sub>DC max.</sub> (mΩ)	Material	L (mm)	W (mm)	H (mm)
7427523	54	206	83	319	5	3	NiZn	9.3	8.5	4.8

Z @ 25 MHz: Impedance @ 25 MHz; Z @ 25 MHz 2 turns: Impedance @ 25 MHz 2 turns; Z @ 100 MHz: Impedance @ 100 MHz; Z @ 100 MHz 2 turns: Impedance @ 100 MHz 2 turns; I<sub>R</sub>: Rated Current; R<sub>DC max.</sub>: DC Resistance; L: Length; W: Width; H: Height



# STAR-TEC LFS

## Snap Ferrite with safety key technology



### Characteristics:

- Prefixing cable system facilitates the cable assembling process
- Cable clamping protection
- Internal security locking system with patented key technology (STAR-TEC key) prevents unauthorized removing from the cable
- One key in each packaging unit
- Classification of the plastic housing: UL94 V-0
- Operating temperature: -25 °C to +105 °C
- Core material: MnZn

### Applications:

- Especially for applications in the low frequency range from 300 kHz to 30 MHz
- Perfect for applications with varying cable diameter
- Reusable because of the key technology therefore perfect for test and measuring purposes and cables with difficult access
- Suppression of electronic ballasts (i.e. neon tube) in the lighting industry

NEW PRODUCTS

### Technical Data:

Order Code	Ø Cable (mm)	L (mm)	W (mm)	H (mm)	Color	Z @ 10 MHz 1 turn (Ω)	Z @ 10 MHz 2 turns (Ω)	Z @ 300 kHz 1 turn (Ω)	Z @ 300 kHz 2 turns (Ω)	Material	STAR-CLIP Fixation	Safety Key
74272142	3.5 - 5	32.5	18.8	13.2	Grey	65	252	5	40	8 W 5000	-	74271
74272131	6 - 7.5	40.5	24.5	21		62	252	10	40		7427713	
74272132	7 - 8.5	40.5	24.5	21		62	252	10	40		7427713	
74272221	8.5 - 10.5	42.2	33.6	29.5		40	165	12	48		7427722	
74272222	10.5 - 12.5	42.2	33.5	28.8		40	165	12	48		7427722	
74272151	12 - 15	49	39	35		33	133	17	65		-	
74272211	17 - 21	56	47	43		34	138	19	78		-	
74272251	22 - 25	62	60	55		32	135	27	107		-	

Ø Cable: Cable Diameter; L: Length; W: Width; H: Height; Color: Plastic Housing Color; Z @ 10 MHz 1 turn: Impedance @ 10 MHz 1 turn; Z @ 10 MHz 2 turns: Impedance @ 10 MHz 2 turns; Z @ 300 kHz 1 turn: Impedance @ 300 kHz 1 turn; Z @ 300 kHz 2 turns: Impedance @ 300 kHz 2 turns; Safety Key: Safety Key to unlock

[www.we-online.com/we-star-tec\\_lfs](http://www.we-online.com/we-star-tec_lfs)



# WE-FAS EMI

## Flexible Absorber Sheet

NEW PRODUCTS



### Characteristics:

- High Permeability
- Wide frequency range 1MHz up to 3GHz
- Thickness from 0.05 mm
- Operating temperature: -20 °C to +90 °C
- High Surface Resistance
- Include adhesive backing for easy installation
- Material: UL94-V0
- Easy to process
- Extremely flexible
- Custom designs on request

### Applications:

- EMC noise suppression
- EMC shielding
- SAR reduction
- Blocking undesired magnetic coupling
- Avoiding cavity resonances
- Prevention of Electro Static Discharge
- Housing and openings between PCB's, on IC's, processors and controllers, on cables which need high flexibility and LCD/LED monitors.
- Useful for digital devices: laptops, IoT devices, digital cameras, handhelds, mobiles, GPS receivers and many more.

### Technical Data:

Order Code	L (mm)	W (mm)	H (mm)	$\mu'$ @ 1 MHz	$R_s$ (M $\Omega$ /square)
34411	297	210	0.1	200	10
34412			0.2		
34413			0.3		
34415			0.5		

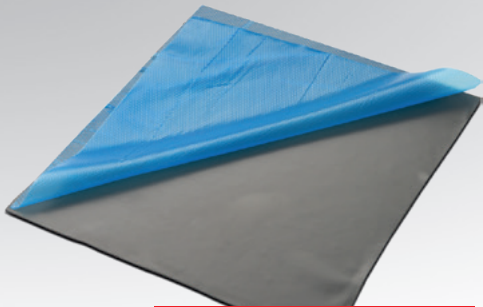
L: Length; W: Width; H: Height;  $\mu'$  @ 1 MHz: Complex Permeability;  $R_s$ : Surface Resistance

[www.we-online.com/we-fasemi](http://www.we-online.com/we-fasemi)



# WE-FAS Thermal

## Thermal Conductive and EMI Absorber



Custom design possible

### Characteristics:

- High Thermal Conductivity material
- Wide range working temperature: -40-160°C
- Wide frequency range 1MHz up to 3GHz
- High Surface Resistance
- Extremely flexible
- Thickness since 1 mm
- Adhesive surface for easy installation
- Easy to process
- Custom designs on request

### Applications:

- Thermal conductive interface
- EMC noise suppression
- EMC shielding
- Blocking undesired magnetic coupling
- Prevention of Electro Static Discharge
- Specially useful for using on hot surfaces/devices, top of IC's, processors and controllers

[www.we-online.com/we-fasthermal](http://www.we-online.com/we-fasthermal)



NEW PRODUCTS

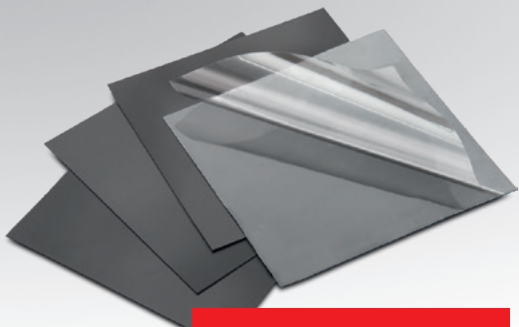
### Technical Data:

Order Code	L (mm)	W (mm)	H (mm)	$\kappa$ (W/(m*K))	$\mu'$ @ 1 MHz	$R_s$ (G $\Omega$ )
39410	300	300	1	1.4	7	6
39420			2			
39430			3			

L: Length; W: Width; H: Height;  $\kappa$ : Thermal Conductivity;  $\mu'$  @ 1 MHz: Complex Permeability;  $R_s$ : Surface Resistance

# WE-FSFS NFC/RFID

## Flexible Sintered Ferrite Sheet



Custom design possible

### Characteristics:

- Flexible ferrite sheet with adhesive tape
- High Permeability
- Low losses at communication frequency
- Operating temperature: -40 °C to +85 °C
- Thickness since 0.14 mm
- Easy to process
- Custom designs on request

### Applications:

- Improves performance of NFC and RFID Communication systems
- EMI Suppression
- Magnetic Shielding
- Blocking undesired magnetic coupling

[www.we-online.com/fsfs-nfc](http://www.we-online.com/fsfs-nfc)



### Technical Data:

Order Code	L (mm)	W (mm)	H (mm)	$\mu'$ @ 1 MHz	$\mu''$ @ 1 MHz	$\mu'$ @ 13.56 MHz	$\mu''$ @ 13.56 MHz	$R_s$ (G $\Omega$ )
3641014	60	60	0.14	150	3	150	3	1
364103			0.3					
364104			0.4					
364105			0.5					

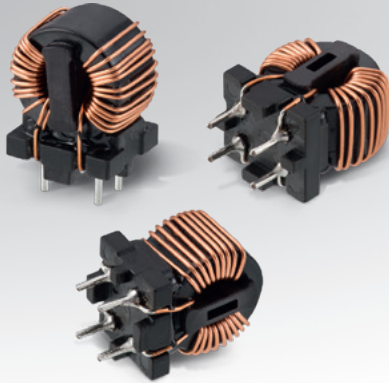
L: Length; W: Width; H: Height;  $\mu'$  @ 1 MHz: Complex Permeability;  $\mu''$  @ 1 MHz: Complex Permeability;  $\mu'$  @ 13.56 MHz: Complex Permeability;  $\mu''$  @ 13.56 MHz: Complex Permeability;  $R_s$ : Surface Resistance



# WE-CMBNC

## Common Mode Power Line Choke Nanocrystalline

NEW PRODUCTS



### Characteristics:

- Very high permeability nanocrystalline core material
- Improved isolation through plastic case and winding spacer
- High and stable inductance values up to 150 °C
- High rated currents
- Broadband suppression
- Small size
- Frequency range: 1 kHz - 300 MHz
- Operating temperature: -40°C to +125°C
- Flammability corresponding to UL 94 V-0
- Climatic category: 40/125/21

### Applications:

- Power electronics
- Power line in- and output filter
- Radio interference suppression in motors
- Suppression for common mode noise

### Type S

#### Technical Data:

Order Code	L (mH)	I <sub>R</sub> (A)	R <sub>DC max.</sub> (mΩ)	U <sub>R</sub> (V (AC))	U <sub>T</sub> (V (AC))	L (mm)	W (mm)	H (mm)
7448027001	1	7	6	250	1500	18	14	22
7448026002	1.5	6	8					
7448025003	2.5	5	15					
7448024503	3	4.5	22					
7448023005	5	3	40					
7448022010	10	2	85					
7448021230	30	1.2	280					
7448020680	80	0.6	1000					

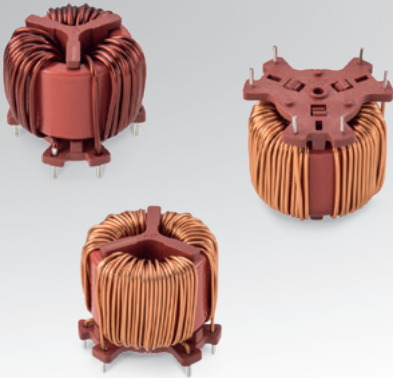
L: Inductance; I<sub>R</sub>: Rated Current; R<sub>DC max.</sub>: DC Resistance; U<sub>R</sub>: Rated Voltage; U<sub>T</sub>: Insulation Test Voltage; L: Length; W: Width; H: Height

[www.we-online.com/WE-CMBNC](http://www.we-online.com/WE-CMBNC)



# WE-TPB

## Three Phase Common Mode Power Line Choke



### Characteristics:

- Applications up to 500 VAC
- High permeability MnZn Ferrite core material
- Insulation through winding spacer
- Specification according to EN 60938-2: Air and creepage distances  $\geq 5$  mm
- Up to 24 A rated current
- Operating temperature:  $-40$  °C to  $+125$  °C
- Flammability corresponding to UL 94 V-0
- Climatic category 40/125/21

### Applications:

- Power electronics
- Power line input filter
- Radio interference suppression in motors
- Suppression for common mode noise
- Frequency converter
- Power supplies
- Charging stations

NEW PRODUCTS

### Type 3XL

Technical Data:							
Order Code	L (mH)	I <sub>R</sub> (A)	R <sub>DC max.</sub> (mΩ)	U <sub>R</sub> (V (AC))	U <sub>T</sub> (V (AC))	H (mm)	Ø OD (mm)
744833005240	0.52	24	3	500	2500	39	47
744833011180	1.1	18	7				
744833027110	2.7	11	18				
744833052100	5.2	10	27				
744833084075	8.4	7.5	50				
744833120060	12	6	65				

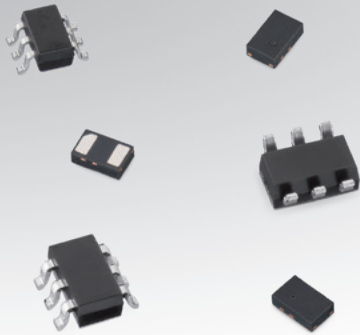
L: Inductance ; I<sub>R</sub>: Rated Current ; R<sub>DC max.</sub>: DC Resistance ; U<sub>R</sub>: Rated Voltage; U<sub>T</sub>: Insulation Test Voltage; H: Height; Ø OD: Outer Diameter

[www.we-online.com/WE-TPB](http://www.we-online.com/WE-TPB)

# WE-TVS

## TVS Diode – Standard Series

NEW PRODUCTS



### Characteristics:

- Fast turn-on
- Low clamping voltage
- High ESD withstand voltage
- Uni- or bidirectional protection
- Small package
- Epoxy flame resistant UL94 V-0

### Applications:

- DC power supply
- USB Power Delivery (PD)
- Headsets and accessories
- PDAs
- Digital cameras
- MP3-Player
- Touch Panels
- Notebooks
- ESD, EFT and Surge Protection
- ESD protection in accordance with EN 61000-4-2
  - 8 kV contact discharge
  - 15 kV air discharge

### Size SOT23-3L

#### Technical Data:

Order Code	Channels	V <sub>Ch max.</sub> (V)	V <sub>BR min.</sub> (V)	C <sub>Ch typ.</sub> (pF)	I <sub>Peak</sub> (A)	V <sub>Ch Clamp ESD typ.</sub> (V)	V <sub>ESD Contact</sub> (kV)	V <sub>ESD Air</sub> (kV)	L (mm)	W (mm)	H (mm)
824098024	2	24	26.2	35	6	32.5	30	30	2.9	2.4	1.04

V<sub>Ch max.</sub>: Channel Operating Voltage [max.]; V<sub>BR min.</sub>: (Reverse) Breakdown Voltage [min.]; C<sub>Ch typ.</sub>: (Channel) Input Capacitance [typ.]; I<sub>Peak</sub>: (Reverse) Peak Pulse Current; V<sub>Ch Clamp ESD typ.</sub>: Channel ESD Clamping Voltage [typ.]; V<sub>ESD Contact</sub>: ESD Contact Discharge Capability; V<sub>ESD Air</sub>: ESD Air Discharge Capability; L: Length; W: Width; H: Height

### Size DFN1610-2L

#### Technical Data:

Order Code	Channels	V <sub>Ch max.</sub> (V)	V <sub>BR min.</sub> (V)	C <sub>Ch typ.</sub> (pF)	I <sub>Peak</sub> (A)	V <sub>Ch Clamp ESD typ.</sub> (V)	V <sub>ESD Contact</sub> (kV)	V <sub>ESD Air</sub> (kV)	L (mm)	W (mm)	H (mm)
824032813	1	3.3	4	280	180	4	30	30	1.6	1	0.5
824032815		5	6	140	100	6					
824031815		5	6	250	80	6					

V<sub>Ch max.</sub>: Channel Operating Voltage [max.]; V<sub>BR min.</sub>: (Reverse) Breakdown Voltage [min.]; C<sub>Ch typ.</sub>: (Channel) Input Capacitance [typ.]; I<sub>Peak</sub>: (Reverse) Peak Pulse Current; V<sub>Ch Clamp ESD typ.</sub>: Channel ESD Clamping Voltage [typ.]; V<sub>ESD Contact</sub>: ESD Contact Discharge Capability; V<sub>ESD Air</sub>: ESD Air Discharge Capability; L: Length; W: Width; H: Height

### Size DFN2020-2L

#### Technical Data:

Order Code	Channels	V <sub>Ch max.</sub> (V)	V <sub>BR min.</sub> (V)	C <sub>Ch typ.</sub> (nF)	I <sub>Peak</sub> (A)	V <sub>Ch Clamp ESD typ.</sub> (V)	V <sub>ESD Contact</sub> (kV)	V <sub>ESD Air</sub> (kV)	L (mm)	W (mm)	H (mm)
824043817	1	7	7.8	1.65	180	9.5	30	30	2	2	0.5
824043810		10	11.2	0.95	150	13					

V<sub>Ch max.</sub>: Channel Operating Voltage [max.]; V<sub>BR min.</sub>: (Reverse) Breakdown Voltage [min.]; C<sub>Ch typ.</sub>: (Channel) Input Capacitance [typ.]; I<sub>Peak</sub>: (Reverse) Peak Pulse Current; V<sub>Ch Clamp ESD typ.</sub>: Channel ESD Clamping Voltage [typ.]; V<sub>ESD Contact</sub>: ESD Contact Discharge Capability; V<sub>ESD Air</sub>: ESD Air Discharge Capability; L: Length; W: Width; H: Height

[www.we-online.com/WE-TVS](http://www.we-online.com/WE-TVS)





# WE-CLFS

## Line Filter



### Characteristics:

- Single-phase filter
- Broadband noise suppression in common and differential mode
- Easy assembly through faston connectors
- Fast chassis mounting
- Flammability corresponding to UL 94 V-0
- Climatic category: 25/100/21
- Approvals: cULus (UL 1283, CSA 22.2 No. 8 1986), VDE (IEC/EN 60939-2)
- Single-Stage: Very compact design
- Single-Stage Advanced: Improved differential mode noise attenuation
- Two-Stage: Extreme differential and common mode noise attenuation

### Applications:

- Industrial electronics
- Switched-mode power supplies
- Telecommunications
- Household goods
- DC applications

[www.we-online.com/WE-CLFS](http://www.we-online.com/WE-CLFS)

NEW PRODUCTS

### Type Single-Stage

Technical Data:										
Order Code	U <sub>R</sub> (V)	I <sub>R</sub> (A)	I <sub>Leak</sub> (mA)	L (mH)	C <sub>X</sub> (μF)	C <sub>Y</sub> (nF)	R (kΩ)	L (mm)	W (mm)	H (mm)
810911001	250	1.5	0.173	20	0.1	2.2	1000	64	35	29
810911003		3	0.173	10	0.22	2.2				
810911006		6	0.369	2.2	0.47	4.7				
810911008		8	0.369	2.2	0.47	4.7				
810911010		10	0.534	1	0.68	6.8				

U<sub>R</sub>: Rated Voltage; I<sub>R</sub>: Rated Current; I<sub>Leak</sub>: Leakage Current; L: Inductance; C<sub>X</sub>: X2-Capacitance; C<sub>Y</sub>: Y2-Capacitance; R: Discharge Resistance; W: Width; H: Height

### Type Single-Stage-Advanced

Technical Data:										
Order Code	U <sub>R</sub> (V)	I <sub>R</sub> (A)	I <sub>Leak</sub> (mA)	L (mH)	C <sub>X</sub> (μF)	C <sub>Y</sub> (nF)	R (kΩ)	L (mm)	W (mm)	H (mm)
810912001	250	1.5	0.173	20	0.22	2.2	1000	75	51.8	29
810912003		3	0.259	10	0.33	3.3	1000			
810912006		6	0.259	10	0.33	3.3	1000			
810912008		8	0.369	6	0.47	4.7	680			
810912010		10	0.369	6	0.47	4.7	680			
810912012		12	0.534	2.2	0.68	6.8	470			
810912014		14	0.534	2.2	0.68	6.8	470			
810912020		20	0.785	1	1	10	330			

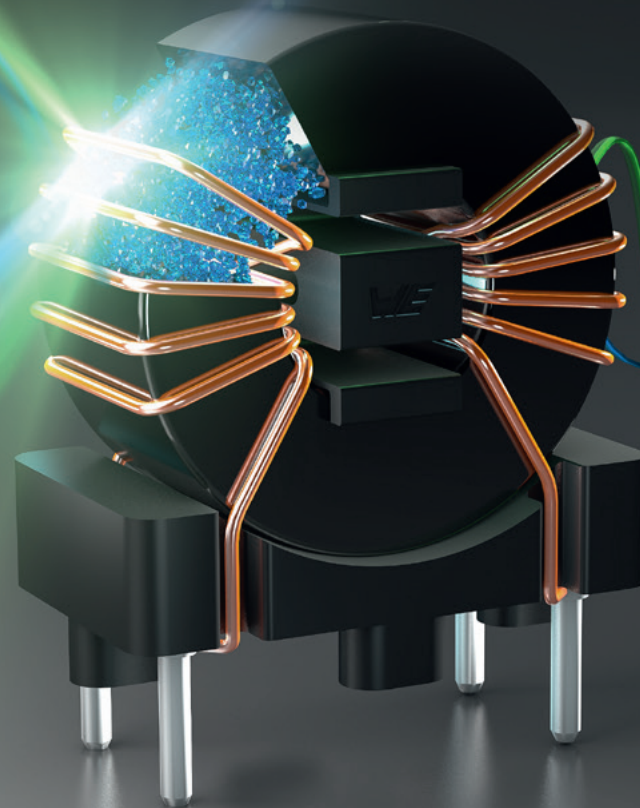
U<sub>R</sub>: Rated Voltage; I<sub>R</sub>: Rated Current; I<sub>Leak</sub>: Leakage Current; L: Inductance; C<sub>X</sub>: X2-Capacitance; C<sub>Y</sub>: Y2-Capacitance; R: Discharge Resistance; W: Width; H: Height

### Type Two-Stage

Technical Data:										
Order Code	U <sub>R</sub> (V)	I <sub>R</sub> (A)	I <sub>Leak</sub> (mA)	L (mH)	C <sub>X</sub> (μF)	C <sub>Y</sub> (nF)	R (kΩ)	L (mm)	W (mm)	H (mm)
810913006	250	6	0.369	6	0.47	4.7	330	114.9	58.5	45
810913010		10	0.369	6	0.47	4.7	330			
810913014		14	0.785	2.2	1	10	220			
810913020		20	0.785	2.2	1	10	220			

U<sub>R</sub>: Rated Voltage; I<sub>R</sub>: Rated Current; I<sub>Leak</sub>: Leakage Current; L: Inductance; C<sub>X</sub>: X2-Capacitance; C<sub>Y</sub>: Y2-Capacitance; R: Discharge Resistance; W: Width; H: Height

# crystal clear frequencies.



#CRYSTALCLEAR

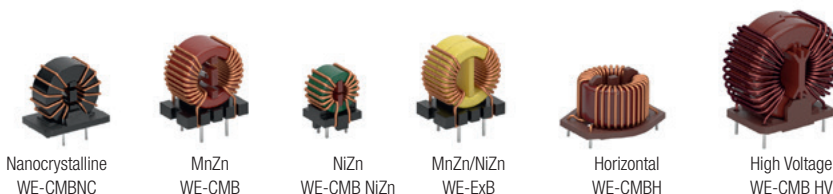
*WE speed up  
the future*

The WE-CMBNC is a VDE certified series of common mode chokes with a highly permeable **nanocrystalline core material**. Despite the small size, it delivers outstanding broadband attenuation performance, high rated currents and low DC resistance values. Low profile and high voltage ratings can also be realized by the common mode chokes of the WE-CMB family.

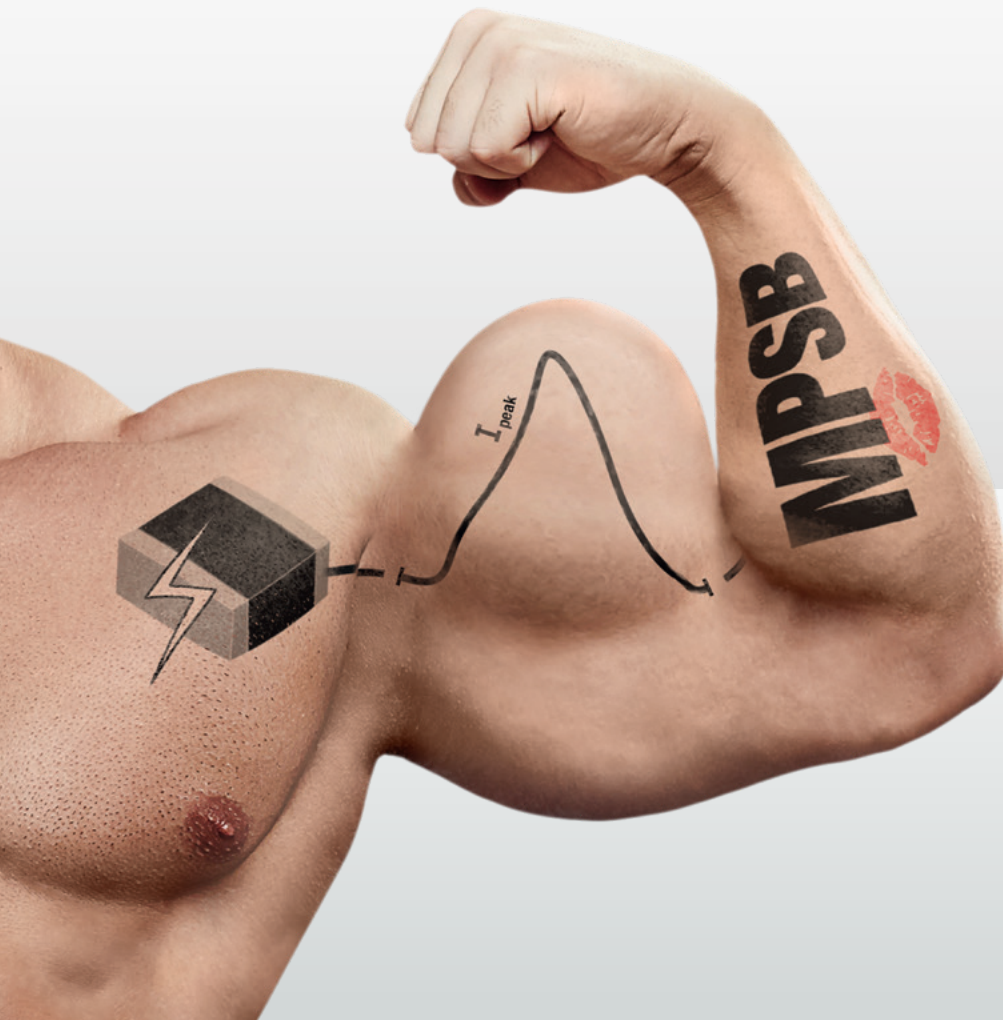
For further information, please visit:

[www.we-online.com/we-cmb](http://www.we-online.com/we-cmb)

- High permeability nanocrystalline core material
- High  $I_r$  & low  $R_{DC}$  in a small size
- Broadband suppression
- Stable inductance values at high temperatures
- Improved isolation through plastic case and patented winding spacer



# huge peak strong bead!



#strongBEAD

*WE speed up  
the future*

The WE-MPSB series is the world's first ferrite bead that specifies how it performs under high current transients. This unique bead protects and extends the life of your application. It features an ultra-low  $R_{DC}$  which delivers the lowest self-heating in its class at high currents. The WE-MPSB is ideal for DC/DC applications requiring high efficiency. For more information, please visit [www.we-online.com/](http://www.we-online.com/)

## WE-MPSB

- muscular peak current capability
- high rated currents
- ultra-low  $R_{DC}$  to minimize unwanted losses
- effective broadband filtering

Design your filter with our free online software – **REDEXPERT**. You will have the best guidance to ensure your circuit can withstand transient peak currents using our peak-specified WE-MPSB ferrite beads:

[www.we-online.com/MPSB-designer](http://www.we-online.com/MPSB-designer)

Products in original size:

0603

0805

1206

1612

1812

2220

3312



# Design Kits

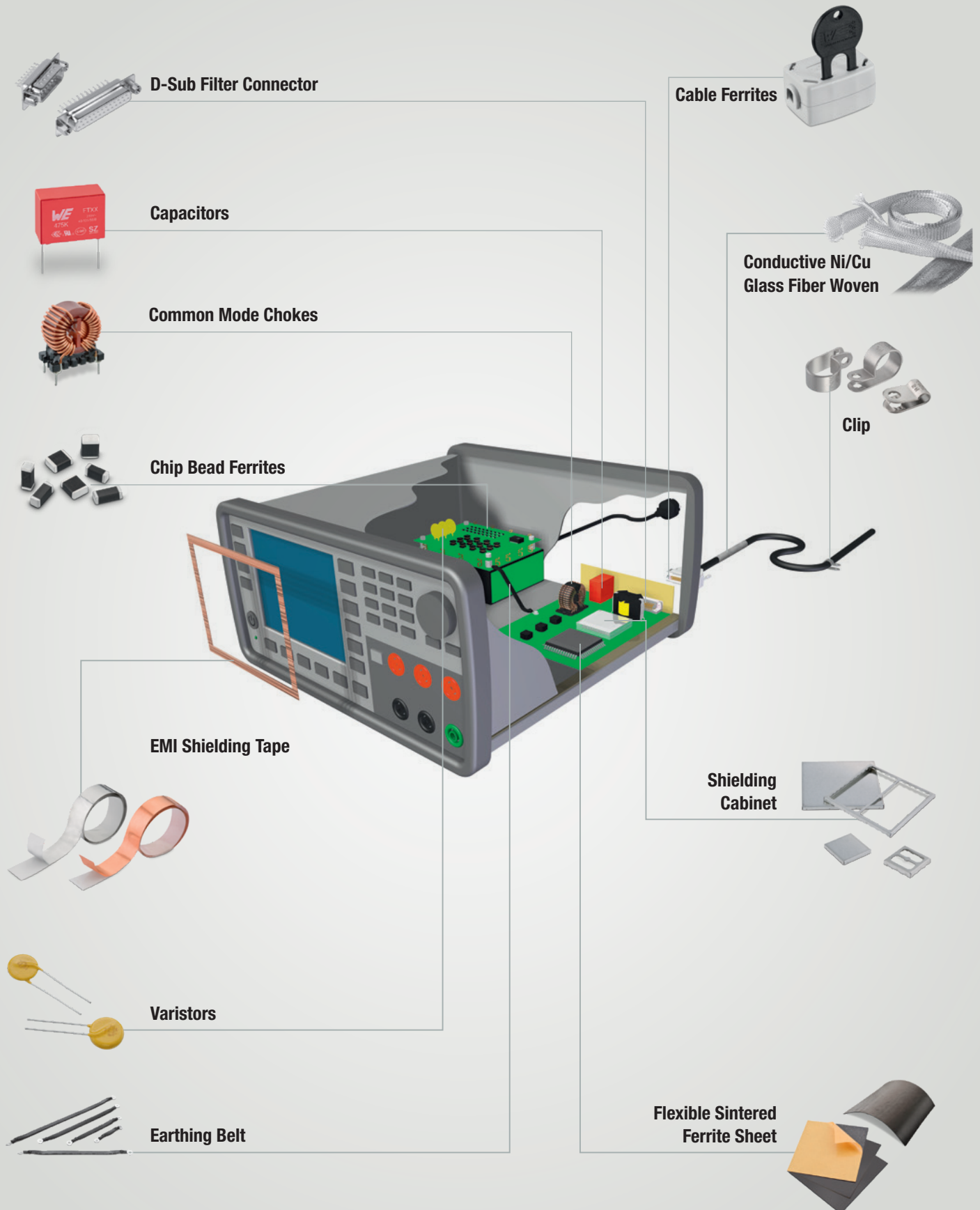


Product Category	Design Kit	Order Code	Lifelong Refill
<b>Ferrites for PCB Assembly</b>			
	WE-CBF 0402, 0603, 0805; SMD Ferrites	742790	✓
	WE-CBF 1206, 1210, 1806, 1812; SMD Ferrites	742791	✓
	WE-CBF HF 0402, 0603; SMD Ferrites for High Frequency Applications	742841	✓
	WE-MPSB, WE-PBF, WE-SUKW & WE-CMS; PCB Ferrites for Inrush Peak Currents	742793	✓
<b>Ferrites for Cable Assembly</b>			
	Snap Ferrites	742711	✓
	WE-AFB; Axial Ferrite Beads	742700	✓
	WE-FLAT; Flat Ferrite Cores	742722	✓
	WE-TOF; EMI Suppression Toroidal Ferrites	742701	✓
<b>Filter Chokes</b>			
	WE-FI; Toroidal Line Chokes	744705	✓
	WE-MI; SMD Multilayer Inductors	744790	✓
	WE-SD; Rod Core Chokes	744713	✓
<b>Common Mode Chokes</b>			
	SMD Common Mode Line Filters	744725	✓
	WE-CMB & WE-CMBH; Common Mode Power Line Chokes	744825	✓
	WE-CMB, WE-CMB HC, WE-CMB NiZn, Common Mode Power Line Chokes	744821	✓
	WE-CMBNC; Common Mode Power Line Chokes	744800	✓
	WE-CNSW & WE-CNSW HF; SMD Common Mode Line Filters	744230	✓
	WE-ExB, WE-CMB & WE-CMBNC	744824	✓
	WE-LF; Common Mode Power Line Chokes	744630	✓
	WE-TFC, WE-TFCH, WE-FC; Power Line Common Mode Filters	744864	✓



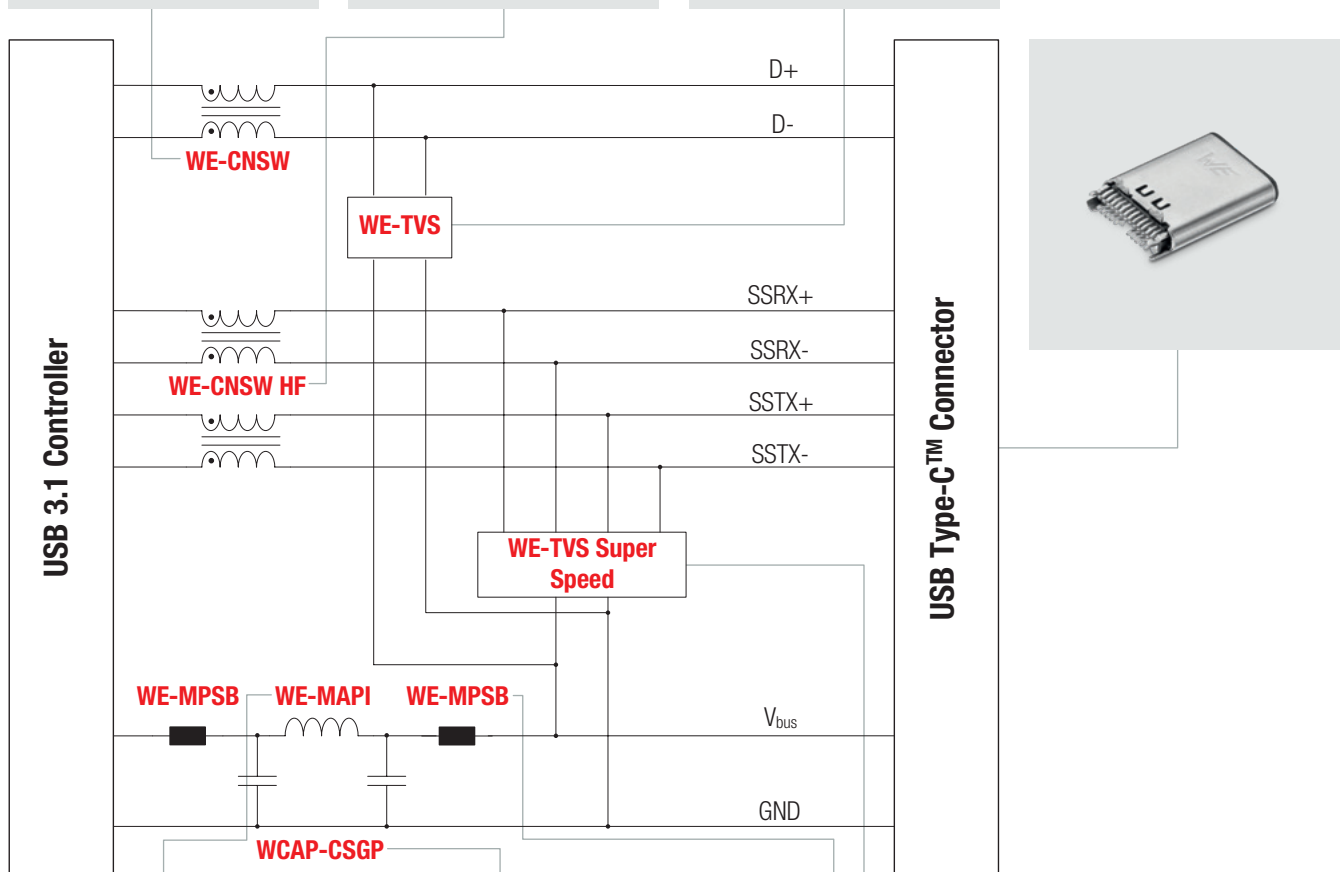
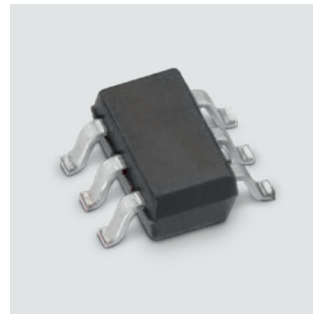
Product Category	Design Kit	Order Code	Lifelong Refill
<b>ESD Protection</b>	ESD Protection	823999	✓
<b>Surge Protection</b>	WE-TVSP; TVS Power Diodes Low Power	824599	✓
	WE-TVSP; TVS Power Diodes High Power	824598	✓
	WE-VD; Disk Varistors	820999	✓
	WE-VS; SMD Varistors	825998	✓
<b>EMI Shielding Material</b>	Shielding Cabinets	361999	✓
	ShieldDIY Do It Yourself Custom Shielding Cabinets	360002	
	WE-FAS/WE-FSFS	304999	✓
	WE-SECF; SMD EMI Contact Fingers	331001	✓
<b>EMC Filter</b>	Design Your EMC-Filter	744998	
<b>EMC General</b>	Interfaces; USB 2.0 / 3.0 / 3.1, Ethernet 100/1000 Base-T, CAN, VGA, HDMI, RS232, RS485	744999	✓

# Applications of EMC Components



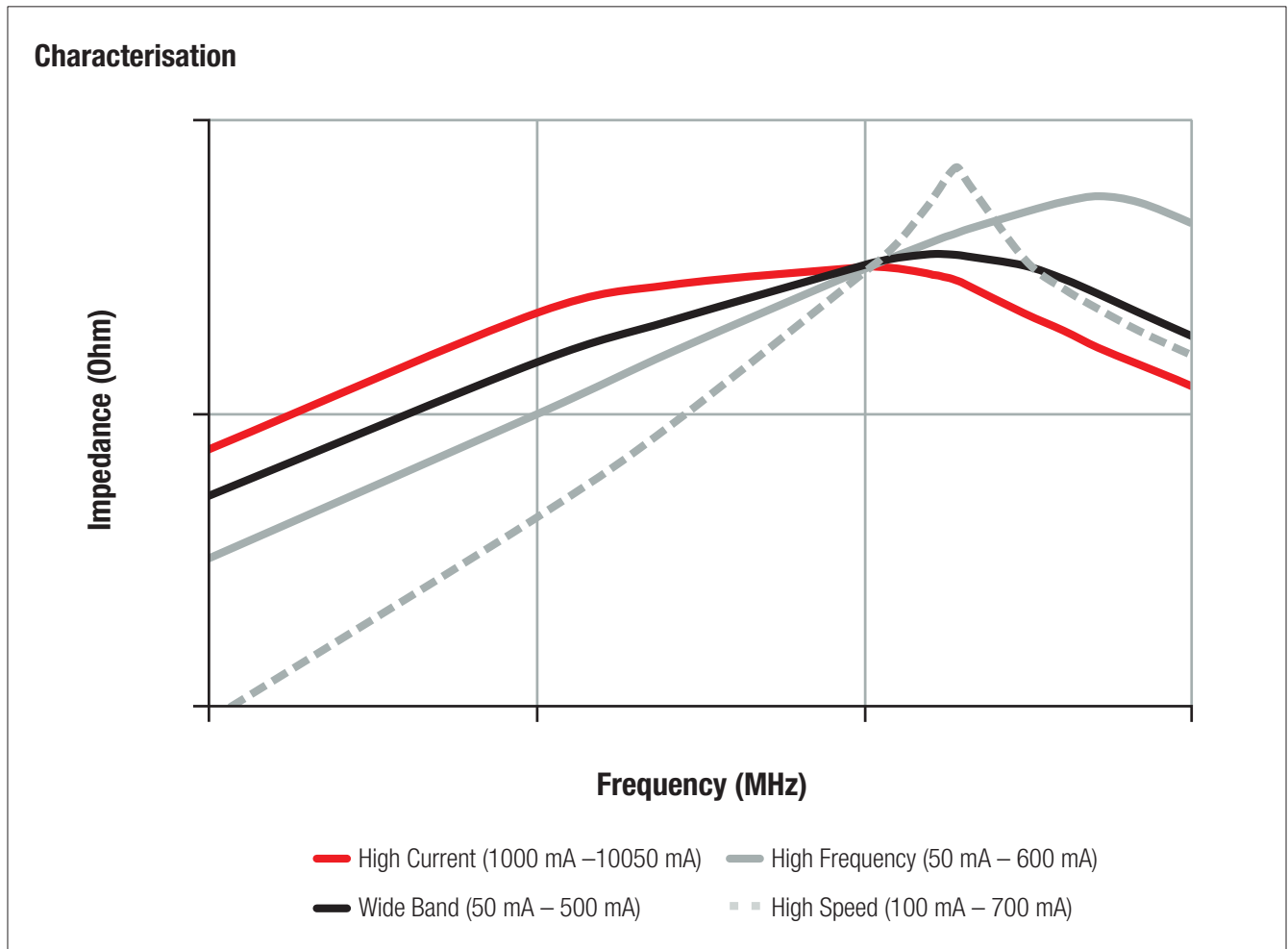
## Applications

- Control signals
- RS232
- RS422
- DC/DC converter
- USB 2.0
- USB 3.0
- USB 3.1
- IEEE 1394
- LVDS





# SMD EMI Suppression Ferrite Beads



**High Speed SMD ferrites** - -

Have lower impedance in the lower frequency ranges. Therefore they have only a low attenuation on fast signals. Application e.g. USB 2.0, USB 3.0, USB 3.1, IEEE 1394, LVDS.

**High Frequency SMD ferrites** —

Have, due to a modified internal layout, an increased effective suppression frequency range. Consequently the impedance at 1 GHz is up to 3 times higher. Application e.g. HDD, fast bus signals and clock signals.

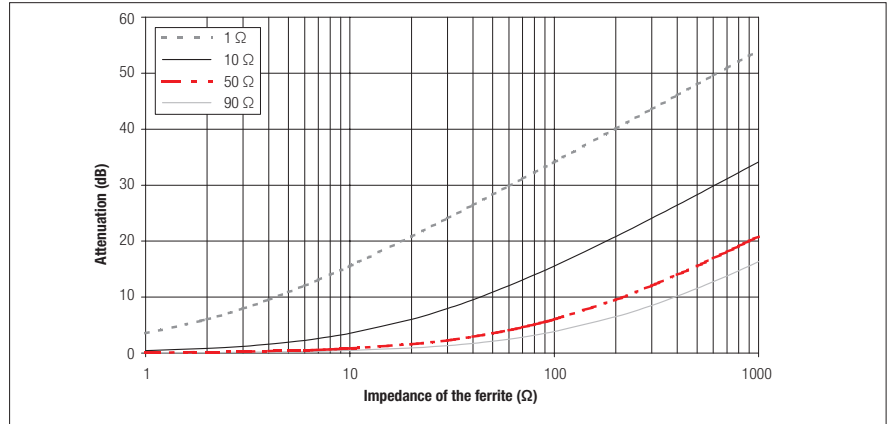
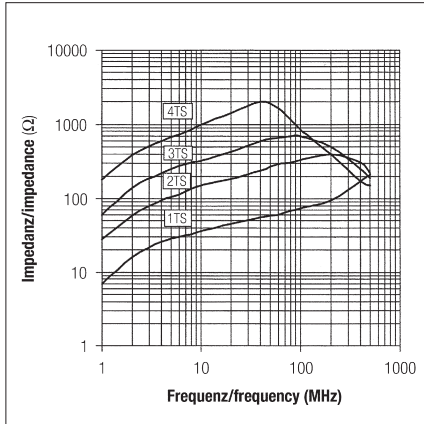
**High Current SMD ferrites** —

Are designed for high current (over 1 A). The rated current refers to 40 K self-heating. Application e.g. power supply, DC/DC converter.

**Wide Band SMD ferrites** —

Show already high impedance in low frequency range. Therefore they are wide band through the whole spectrum. Application e.g. control signals, RS232, RS422, DC/DC converter.

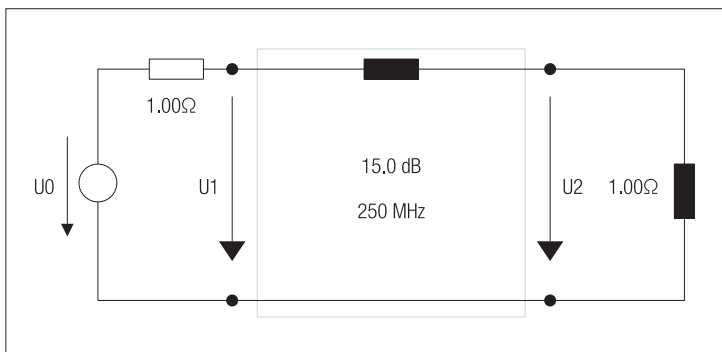
## Impedance vs. Frequency Cable Ferrites



Relationship between the number of winding turns and the impedance across the frequency spectrum

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

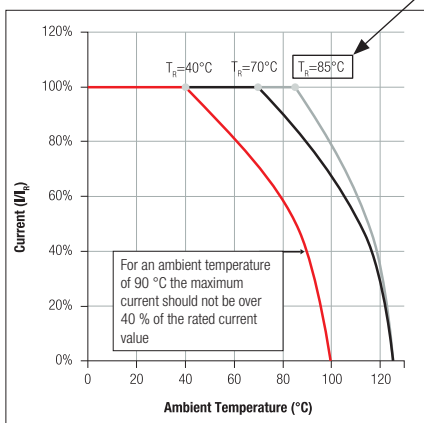
## Impedance determination in REDEXPERT



Determine the needed impedance in REDEXPERT  
[www.we-online.com/re-impedance](http://www.we-online.com/re-impedance)

## Derating

## Rated Temperature $T_R$



Rated Temperature  $T_R$

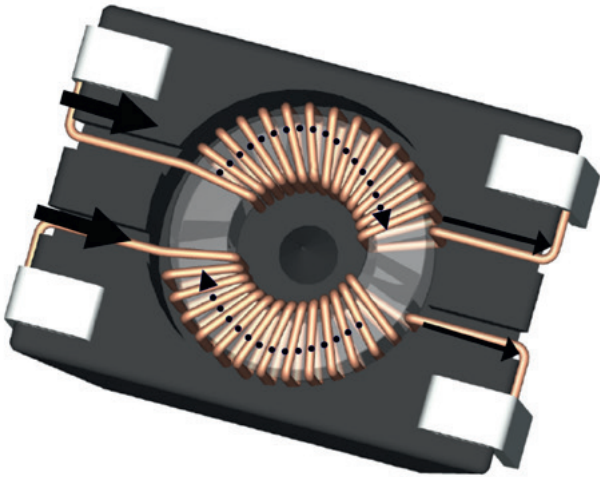
Rated Current	@ 70°C	$I_R$	0,9	A	max.
Operating Temperature	-40 °C up to +125 °C				
	Temperature Rise < 55K				

$\Delta T = T_{max} - T_R$   
 Max. temperature allowed  $T_{max}$

**Example of use:** For an ambient temperature of 90 °C the max. current should not be over 40 % of the rated current value.

# Common Mode Chokes

## Common Mode Behaviour

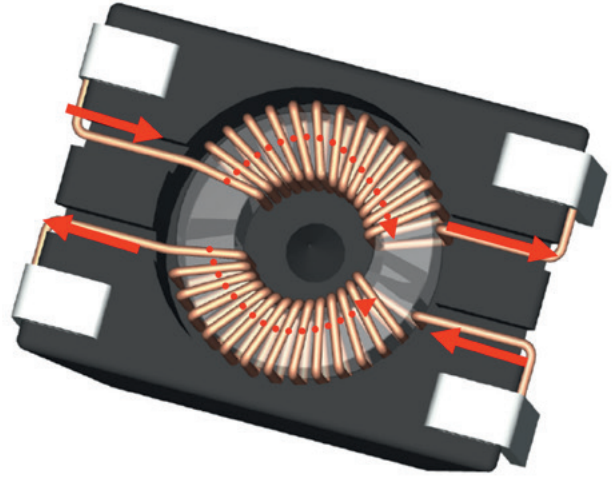


### Huge Common Mode Attenuation!

— Current    ····· Magnetic field

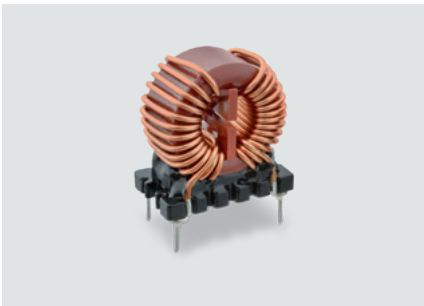
When the common mode portion of a signal tries to go through the choke, it will meet a high impedance, due to the inductance created by the magnetization of the core and the coils.

## Differential Mode Behaviour



— Current    ····· Magnetic field

In opposition to the common mode behaviour, the differential mode portion of the signal will see almost no impedance in the choke, this phenomenon could be explained with the magnetic field compensation inside the core. If the core is not magnetized, then no inductance will appear in the line.



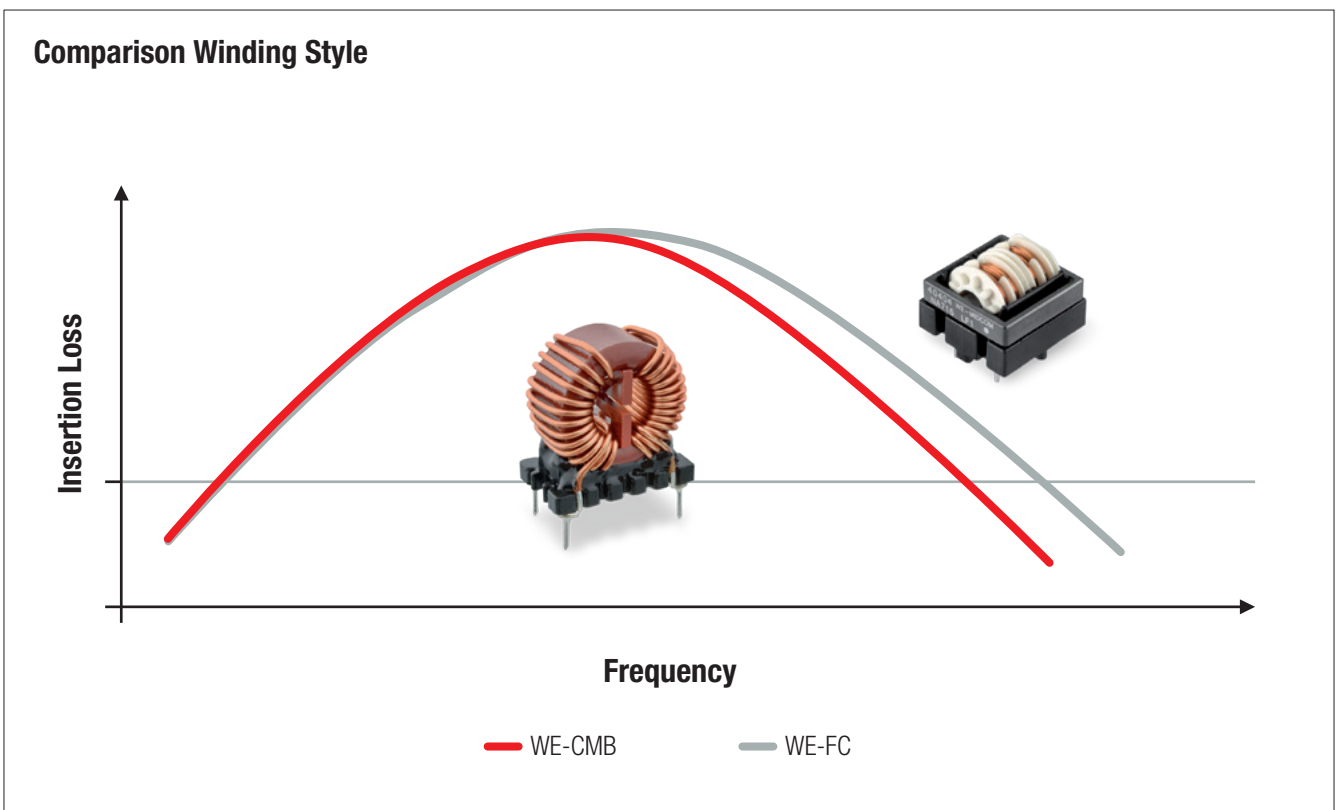
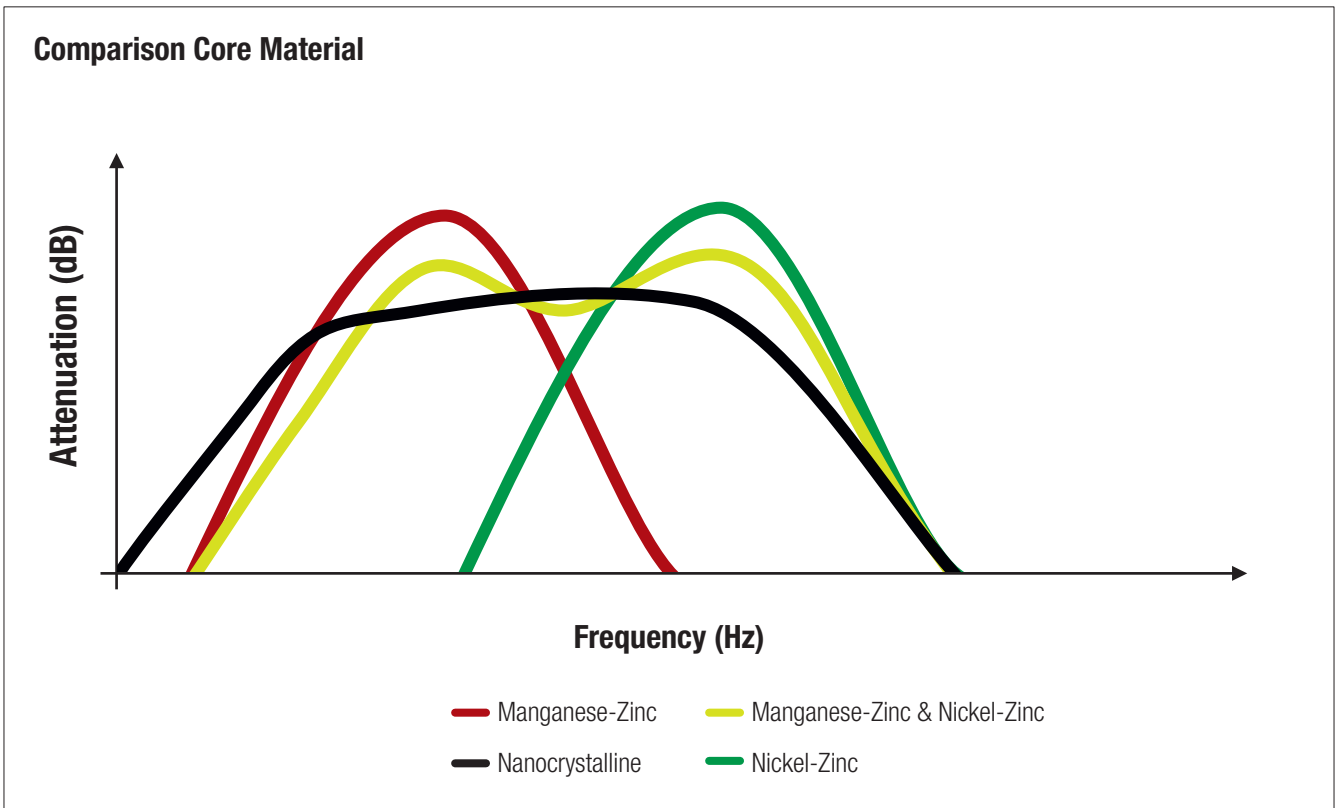
**Wild sectional winding** style shows the higher attenuation in differential mode (leakage Inductance)



**Symetric sectional winding** style shows a lower deviation in the attenuation curve



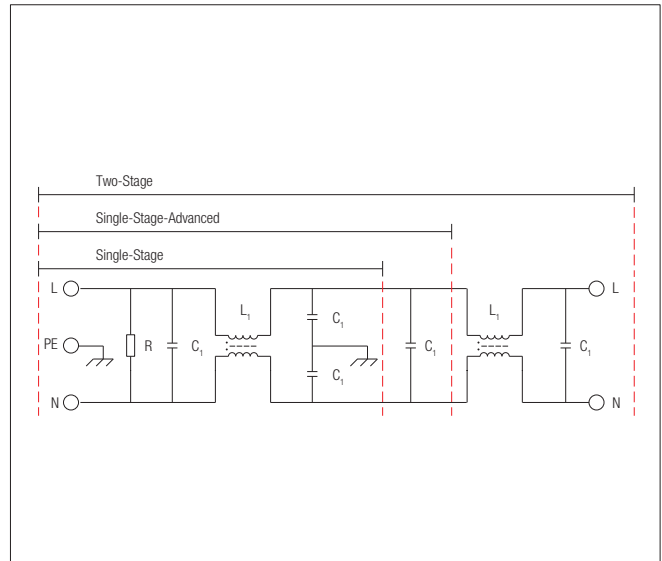
**Bifilar winding** style shows the lowest attenuation in differential mode inductance and lowest isolation



A division of the winding space in separate chambers (see WE-FC, 2 chambers on each winding) reduces the intrawinding capacitance increasing the bandwidth of the choke. The current capabilities will be reduced due to the smaller winding space.

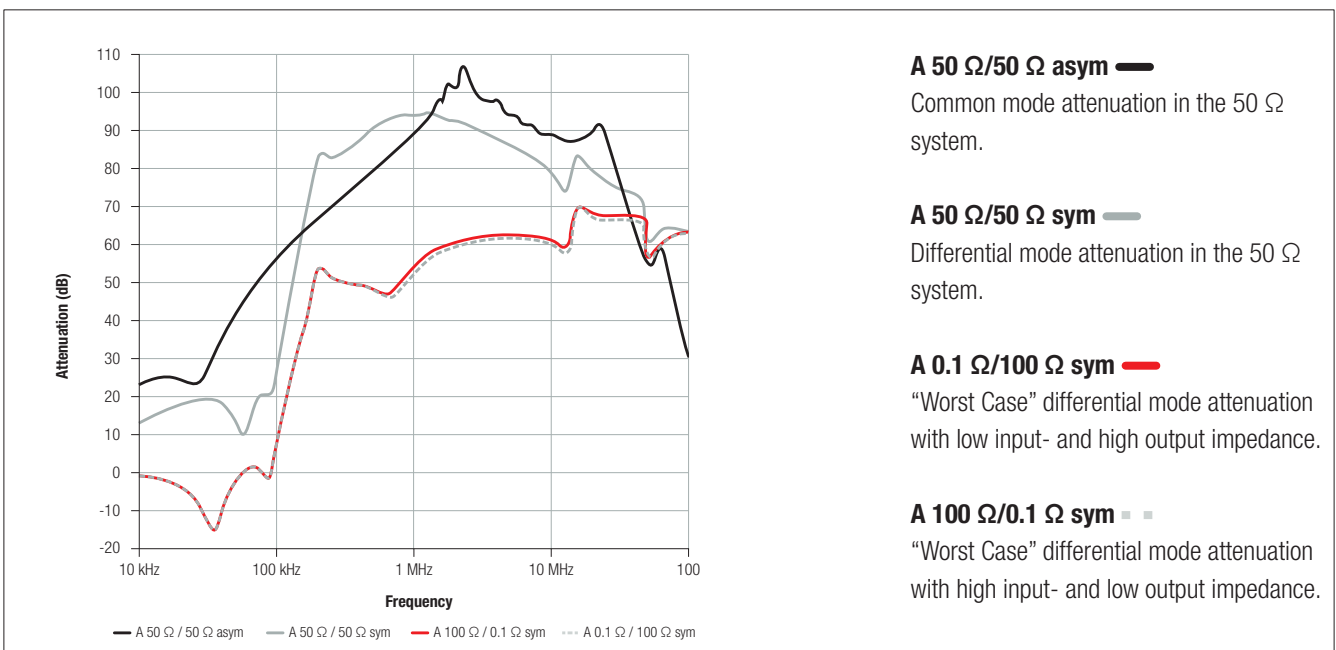


# EMC Filters



## Advantages

- Perfectly shielded
- High performance filter inside
- Amazing size-current ratio (current capabilities)!
- Perfect ground connection
- Easy to use Fast-On connectors
- **Discharge resistor** – Discharge of capacitors. Important safety standards
- **Cx** – Increases the differential mode attenuation
- **CMC** – Strongly increases the common mode and partly differential mode attenuation without deriving any leakage current to ground
- **Cy** – Strongly increases common and partly differential mode attenuation driving some leakage current to ground.

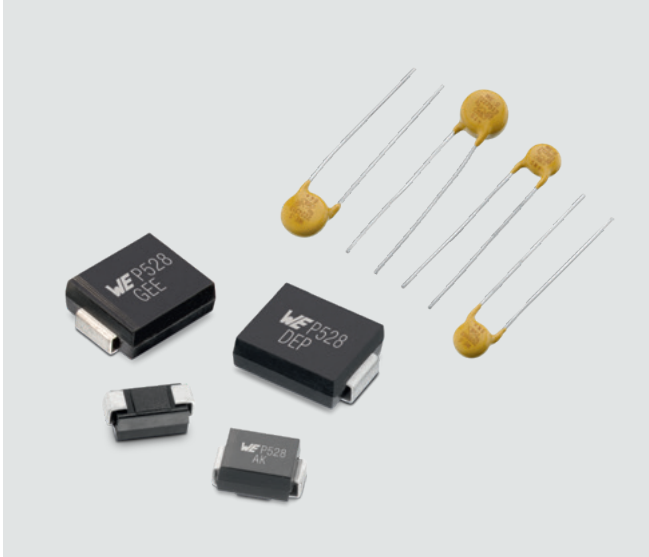


Easy selection of EMC Filters [www.we-online.com/re-emcfilter](http://www.we-online.com/re-emcfilter)



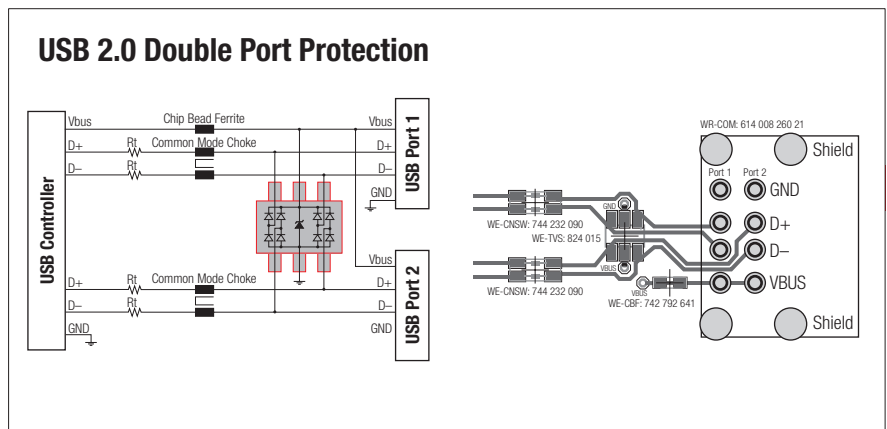
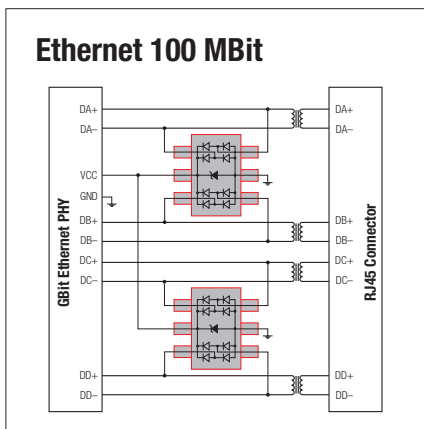
# ESD and Surge Protection

## How to Determine the right Overvoltage Protection Device for your Application

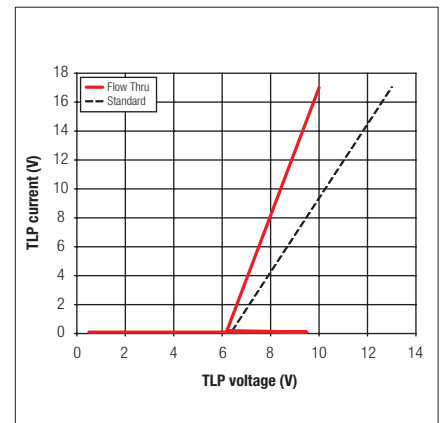
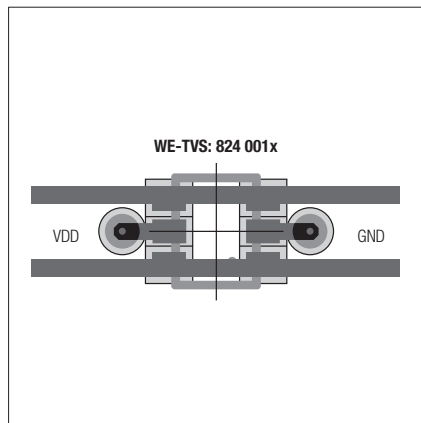
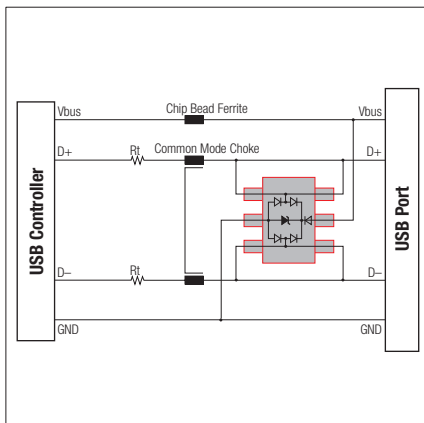


- Determine max. Operating Voltage of the application (inclusive tolerances)
- Component  $V_{rms}/V_{dc} \geq$  application max  $V_{rms}/V_{dc}$
- Determine Operating Temperature (Varistor parameter has to be derated)
- Max. allowable clamping voltage
- Capacitance (fast datalines need low capacitance due to signal integrity)
- Max. Energy/Power
- Max. possible Surge/Burst/ESD-Level
- Take standards into account (e.g. Audio/Video, IEC 62368-1)

## Application of High Speed TVS Diodes for ESD Protection



## The easy to use Flow-Thru Design – with double port connection of I/O pins



# **1** PASSIVE COMPONENTS

## **Power Magnetics**

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<b>New Products</b>	<b>46</b>
<b>Design Kits</b>	<b>52</b>
<b>Additional Information</b>	<b>54</b>

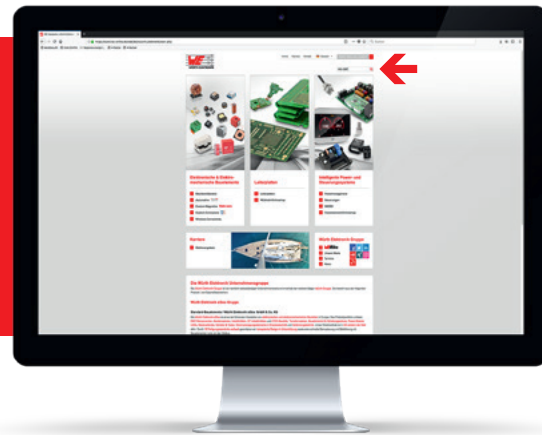


# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WE-PMI



### Single Coil Power Inductors



**WE-PMI**  
 L: 0.11 ~ 10 µH  
 $I_{\text{RMS}}$ : 450 ~ 4000 mA  
 $R_{\text{DC}}$ : 7 ~ 500 mΩ  
 Frequency Range: 0.1 ~ 100 MHz



**WE-PMMI**  
 L: 0.025 ~ 1.5 µH  
 $I_{\text{RMS}}$ : 1600 ~ 7000 mA  
 $R_{\text{DC}}$ : 9 ~ 100 mΩ  
 Frequency Range: 0.1 ~ 100 MHz



**WE-PMCI**  
 L: 0.24 ~ 2.2 µH  
 $I_{\text{RMS}}$ : 1200 ~ 3600 mA  
 $R_{\text{DC}}$ : 23 ~ 195 mΩ  
 Frequency Range: 0.05 ~ 6 MHz



**WE-GF**  
 L: 0.1 ~ 1000 µH  
 $I_{\text{RMS}}$ : 30 ~ 450 mA  
 $R_{\text{DC}}$ : 0.32 ~ 50 Ω  
 Frequency Range: 0.1 ~ 100 MHz



**WE-GFH**  
 L: 1.0 ~ 220 µH  
 $I_{\text{RMS}}$ : 75 ~ 1600 A  
 $R_{\text{DC}}$ : 81 ~ 9126 mΩ  
 Frequency Range: 0.1 ~ 100 MHz



**WE-LQ**  
 L: 1 ~ 2200 µH  
 $I_{\text{RMS}}$ : 0.04 ~ 1.8 A  
 $R_{\text{DC}}$ : 0.08 ~ 63 Ω  
 Frequency Range: 10 ~ 1000 MHz



**WE-LQS**  
 L: 0.16 ~ 10000 µH  
 $I_{\text{RMS}}$ : 0.13 ~ 6.85 A  
 $R_{\text{DC}}$ : 6 ~ 22800 mΩ  
 Frequency Range: 0.01 ~ 10 MHz



**WE-LQSH**  
 L: 0.47 ~ 10 µH  
 $I_{\text{RMS}}$ : 0.58 ~ 6.4 A  
 $R_{\text{DC}}$ : 18 ~ 816 mΩ  
 Frequency Range: 0.05 ~ 6 MHz

### Single Coil Power Inductors



**WE-LQFS**  
 L: 1.0 ~ 470 µH  
 $I_{\text{RMS}}$ : 0.26 ~ 4.47 A  
 $R_{\text{DC}}$ : 21 ~ 2803 mΩ  
 Frequency Range: 0.1 ~ 10 MHz



**WE-MAPI**  
 L: 0.33 ~ 47 µH  
 $I_{\text{RMS}}$ : 0.39 ~ 9.6 A  
 $R_{\text{DC}}$ : 7.2 ~ 2300 mΩ  
 Frequency Range: 0.05 ~ 6 MHz



**WE-TPC**  
 L: 0.056 ~ 1500 µH  
 $I_{\text{RMS}}$ : 0.08 ~ 8.5 mA  
 $R_{\text{DC}}$ : 0.0035 ~ 9 Ω  
 Frequency Range: 0.1 ~ 10 MHz



**WE-SPC**  
 L: 0.22 ~ 100 µH  
 $I_{\text{RMS}}$ : 0.40 ~ 5.30 A  
 $R_{\text{DC}}$ : 0.014 ~ 1.133 Ω  
 Frequency Range: 0.01 ~ 10 MHz



**EXTENDED WE-PD**  
 L: 0.47 ~ 1500 µH  
 $I_{\text{RMS}}$ : 0.2 ~ 23.5 A  
 $R_{\text{DC}}$ : 0.003 ~ 9.44 Ω  
 Frequency Range: 0.1 ~ 10 MHz



**WE-PDF**  
 L: 0.22 ~ 27 µH  
 $I_{\text{RMS}}$ : 4.3 ~ 19 A  
 $R_{\text{DC}}$ : 1.95 ~ 42.5 mΩ  
 Frequency Range: 0.1 ~ 10 MHz



**WE-PD2SR**  
 L: 1.2 ~ 220 µH  
 $I_{\text{RMS}}$ : 0.67 ~ 4.85 A  
 $R_{\text{DC}}$ : 8.5 ~ 876 mΩ  
 Frequency Range: 0.1 ~ 10 MHz



**WE-PD2**  
 L: 0.12 ~ 2200 µH  
 $I_{\text{RMS}}$ : 0.18 ~ 10 A  
 $R_{\text{DC}}$ : 0.004 ~ 5.3 Ω  
 Frequency Range: 0.1 ~ 10 MHz

### Single Coil Power Inductors



**WE-PD3**  
 L: 1 ~ 1000 µH  
 $I_{\text{RMS}}$ : 0.19 ~ 3.9 A  
 $R_{\text{DC}}$ : 0.027 ~ 3.2 Ω  
 Frequency Range: 0.1 ~ 10 MHz



**WE-PD4**  
 L: 0.47 ~ 10000 µH  
 $I_{\text{RMS}}$ : 0.07 ~ 18 A  
 $R_{\text{DC}}$ : 0.002 ~ 39 Ω  
 Frequency Range: 0.1 ~ 10 MHz



**WE-HCI**  
 L: 0.13 ~ 82 µH  
 $I_{\text{RMS}}$ : 3.5 ~ 41.5 A  
 $R_{\text{DC}}$ : 0.35 ~ 34 mΩ  
 Frequency Range: 0.1 ~ 3 MHz



**WE-HCC**  
 L: 0.22 ~ 10 µH  
 $I_{\text{RMS}}$ : 4.4 ~ 27 A  
 $R_{\text{DC}}$ : 1.5 ~ 41 mΩ  
 Frequency Range: 0.1 ~ 3 MHz



**EXTENDED WE-HCF**  
 L: 0.7 ~ 680 µH  
 $I_{\text{RMS}}$ : 12 ~ 56 A  
 $R_{\text{DC}}$ : 0.44 ~ 118.3 mΩ  
 Frequency Range: 0.1 ~ 3 MHz



**NEW WE-HCFT**  
 L: 1.5 ~ 65 µH  
 $I_{\text{RMS}}$ : 17.2 ~ 75 A  
 $R_{\text{DC}}$ : 0.4 ~ 13.13 mΩ  
 Frequency Range: 0.1 ~ 3 MHz



**WE-HCM**  
 L: 0.072 ~ 0.47 µH  
 $I_{\text{RMS}}$ : 24 ~ 65 A  
 $R_{\text{DC}}$ : 0.15 ~ 0.37 mΩ  
 Frequency Range: 0.1 ~ 3 MHz



**WE-XHMI**  
 L: 0.18 ~ 33 µH  
 $I_{\text{RMS}}$ : 4.7 ~ 20.0 A  
 $R_{\text{DC}}$ : 1.32 ~ 31.0 mΩ  
 Frequency Range: 0.05 ~ 5 MHz



# Product Overview

## Single Coil Power Inductors



**WE-LHMI**  
 L: 0.1 ~ 100  $\mu$ H  
 $I_{\text{R}}$ : 1 ~ 32.5 A  
 $R_{\text{DC}}$ : 0.60 ~ 500 m $\Omega$   
 Frequency Range: 0.05 ~ 5 MHz



**WE-FAMI**  
 L: 3.0 ~ 22.0  $\mu$ H  
 $I_{\text{R}}$ : 3.7 ~ 14.5 A  
 $R_{\text{DC}}$ : 3.8 ~ 36 m $\Omega$   
 Frequency Range: 0.01 ~ 10 MHz



**EXTENDED WE-TI**  
 L: 1 ~ 68000  $\mu$ H  
 $I_{\text{R}}$ : 0.05 ~ 9 A  
 $R_{\text{DC}}$ : 0.006 ~ 125  $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-TIF**  
 L: 100 ~ 10000  $\mu$ H  
 $I_{\text{R}}$ : 0.21 ~ 2.6 A  
 $R_{\text{DC}}$ : 90 ~ 10700 m $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-TIS**  
 L: 1.3 ~ 6800  $\mu$ H  
 $I_{\text{R}}$ : 0.05 ~ 8.5 A  
 $R_{\text{DC}}$ : 0.007 ~ 40  $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-SI**  
 L: 12 ~ 1619  $\mu$ H  
 $I_{\text{R}}$ : 0.5 ~ 5 A  
 $R_{\text{DC}}$ : 0.008 ~ 0.7  $\Omega$   
 Frequency Range: 0.01 ~ 0.1 MHz



**WE-PD HV**  
 L: 220 ~ 3300  $\mu$ H  
 $I_{\text{R}}$ : 0.24 ~ 1.30 A  
 $R_{\text{DC}}$ : 0.30 ~ 6.5  $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-PD2 HV**  
 L: 330 ~ 2200  $\mu$ H  
 $I_{\text{R}}$ : 0.15 ~ 0.43 A  
 $R_{\text{DC}}$ : 1.0 ~ 7.2  $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-TI HV**  
 L: 220 ~ 5600  $\mu$ H  
 $I_{\text{R}}$ : 0.18 ~ 0.9 A  
 $R_{\text{DC}}$ : 0.6 ~ 12  $\Omega$   
 Frequency Range: 0.05 ~ 1 MHz

## PFC Chokes



**WE-PFC**  
 L: 150 ~ 1800  $\mu$ H  
 $I_{\text{R}}$ : 0.3 ~ 3.0 A  
 $R_{\text{DC1}}$ : 78 ~ 1550 m $\Omega$   
 $R_{\text{DC2}}$ : 140 ~ 1200 m $\Omega$

## Dual Coil Power Inductors



**WE-EHPI**  
 L: 7.5 ~ 75000  $\mu$ H  
 $I_{\text{R}}$ : 0.0035 ~ 2.29 A  
 $R_{\text{DC}}$ : 1.5 ~ 1.9 m $\Omega$   
 Frequency Range: 0.001 ~ 0.3 MHz



**WE-TDC**  
 L: 0.33 ~ 22  $\mu$ H  
 $I_{\text{R}}$ : 0.7 ~ 4.5 A  
 $R_{\text{DC}}$ : 0.0145 ~ 0.48  $\Omega$   
 Frequency Range: 0.01 ~ 10 MHz



**WE-DD**  
 L: 1.3 ~ 470  $\mu$ H  
 $I_{\text{R}}$ : 0.3 ~ 8.6 A  
 $R_{\text{DC}}$ : 0.011 ~ 1.73  $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-DCT**  
 L: 0.091 ~ 100  $\mu$ H  
 $I_{\text{R}}$ : 1.1 ~ 14.5 A  
 $R_{\text{DC}}$ : 3.5 ~ 290 m $\Omega$   
 Frequency Range: 0.05 ~ 3 MHz



**WE-CFWI**  
 L: 0.8 ~ 4.4  $\mu$ H  
 $I_{\text{R}}$ : 12.0 ~ 28 A  
 $R_{\text{DC}}$ : 1.6 ~ 9.6 m $\Omega$   
 Frequency Range: 0.1 ~ 3 MHz



**WE-DPC**  
 L: 1 ~ 47  $\mu$ H  
 $I_{\text{R}}$ : 0.9 ~ 4.5 A  
 $R_{\text{DC}}$ : 25 ~ 350 m $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-MTCI**  
 L: 10 ~ 297  $\mu$ H  
 $I_{\text{R}}$ : 0.45 ~ 0.95 A  
 $R_{\text{DC}}$ : 349 ~ 5200 m $\Omega$   
 Frequency Range: 0.1 ~ 3 MHz



**WE-DPC HV**  
 L: 1 ~ 47  $\mu$ H  
 $I_{\text{R}}$ : 0.6 ~ 2.9 A  
 $R_{\text{DC}}$ : 32 ~ 1,200 m $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-CPIB HV**  
 L: 4.7 ~ 47  $\mu$ H  
 $I_{\text{R}}$ : 0.55 ~ 1.45 A  
 $R_{\text{DC}}$ : 105 ~ 1,000 m $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**WE-TDC HV**  
 L: 5.6 ~ 33  $\mu$ H  
 $I_{\text{R}}$ : 0.75 ~ 1.4 A  
 $R_{\text{DC}}$ : 190 ~ 700 m $\Omega$   
 Frequency Range: 0.1 ~ 10 MHz



**EXTENDED WE-MCRI**  
 L: 1 ~ 47  $\mu$ H  
 $I_{\text{R}}$ : 2.3 ~ 17 A  
 $R_{\text{DC}}$ : 4.5 ~ 240 m $\Omega$   
 Frequency Range: 0.1 ~ 3 MHz

## Wireless Power Transmission

**EXTENDED**



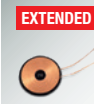
**WE-WPCC Wireless Power Transmitter Coil**  
 L: 2.8 ~ 24  $\mu$ H  
 Q: 30 ~ 220  
 $I_{\text{R}}$ : 2.0 ~ 18 A  
 $R_{\text{DC}}$ : 10 ~ 255 m $\Omega$

**EXTENDED**



**WE-WPCC Wireless Power Array**  
 L: 6.4 ~ 12.5  $\mu$ H  
 $\mu$ HQ: 100 ~ 145  
 $I_{\text{R}}$ : 8.0 ~ 10.0 A  
 $R_{\text{DC}}$ : 38 ~ 56 m $\Omega$

**EXTENDED**



**WE-WPCC Wireless Power Receiver Coil**  
 L: 1.4 ~ 47.0  $\mu$ H  
 Q: 10 ~ 50  
 $I_{\text{R}}$ : 0.40 ~ 5.0 A  
 $R_{\text{DC}}$ : 0.08 ~ 1200  $\Omega$

## Power Transformers



### WE-FLEX

suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter



### WE-FLEX+

suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter



### WE-FLEX HV

suitable for all switch mode power supply topologies like: Buck-Converter, Boost-Converter, SEPIC-Converter, Flyback-Converter, Forward-Converter and Push-Pull-Converter



### WE-PoE

suitable for Power over Ethernet ICs



### WE-PoE+

Compliant with the 30W PoE+ objectives of IEEE802.3at

Suitable for PoE+ powered devices



### WE-PoEH

- PoE and PoE+ powered devices  
- Flyback or Forward Transformer  
- designed for 12V, 24V or 48V input of Switching Mode Power Supply



### WE-FB

for LT3573, LT3751, LT3574, LT3575, LT3748

## Power Transformers



### WE-UOST

$U_i$ : 85 ~ 265 V<sub>ac</sub>  
 $U_{O1}$ : 5 ~ 24 V  
 $I_{O1}$ : 0.56 ~ 3.0 A



### WE-LLCR

$U_i$ : 360 ~ 400 Vdc  
 $U_o$ : 12, 24 or 48 Vdc  
 $P_o$ : 150, 200 or 250W



### WE-UNIT

$U_i$ : 85 ~ 265 V<sub>ac</sub>  
 $U_{O1}$ : 5 ~ 24 V  
 $I_{O1}$ : 0.13 ~ 2.0 A



### WE-GDT

$L$ : 260 ~ 650  $\mu$ H  
 $R_{DC1}$ : 520 ~ 1200 m $\Omega$   
 $R_{DC2}$ : 150 ~ 600 m $\Omega$   
 $R_{DC3}$ : 170 ~ 600 m $\Omega$



### WE-GDTI

$L$ : 735 ~ 1800  $\mu$ H  
 $R_{DC1}$ : 1000 ~ 1600 m $\Omega$   
 $R_{DC2}$ : 600 ~ 1300 m $\Omega$   
 $R_{DC3}$ : 650 ~ 1300 m $\Omega$



### WE-CST

for Switch Mode Power Supply and AC current detection



All Power Magnetic Components at a glance  
[www.we-online.com/power-magnetics](http://www.we-online.com/power-magnetics)



Explore our Application Notes for Power Magnetics  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)



Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics  
[www.we-online.com/library](http://www.we-online.com/library)

# WE-PD

## SMT Shielded Power Inductor

NEW PRODUCTS



### Characteristics:

- AECQ 200 Qualified
- Ultra low RDC an RAC
- Highest possible saturation current based on Ferrite
- Suitable for switching frequency up to 5MHz
- Temperature dependent parameter for Redexpert available
- Operating Temperature from -40°C to +150°C

### Applications:

- Switch Mode Power supplies from 0,01W up to 300W
- Integrated DC DC Converter
- Ideal for Switch Mode Power supplies with extremely high efficiency (>95%)

### Size 7345

#### Technical Data:

Order Code	L (μH)	Tol. L	I <sub>R</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC max.</sub> (mΩ)	R <sub>DC typ</sub> (mΩ)	f <sub>res</sub> (MHz)
7447773010	1	±30%	6	10	12	8.4	98
7447773022	2.2	±30%	4.8	8	17.5	12.5	61
7447773033	3.3	±30%	4.3	6.6	21	15.5	51
7447773047	4.7	±20%	3.6	5.5	26	20	35.5
7447773062	6.2	±20%	3.2	4.8	30	25	31
7447773100	10	±20%	2.6	3.8	45	37.5	23
7447773150	15	±20%	2.2	3.1	69.5	53	20.7
7447773220	22	±20%	1.85	2.5	87	75	16.1
7447773330	33	±20%	1.45	2.1	147	120	13.5
7447773470	47	±20%	1.3	1.7	182	150	10.3
7447773680	68	±20%	1.15	1.45	230	190	8.4
7447773101	100	±20%	0.97	1.2	335	270	6.7
7447773151	150	±20%	0.78	0.95	515	410	5.2
7447773221	220	±20%	0.63	0.81	770	640	4.3
7447773331	330	±20%	0.53	0.66	1085	900	3.6
7447773471	470	±20%	0.43	0.55	1700	1360	2.8
7447773681	680	±20%	0.36	0.46	2300	1950	2.3
7447773102	1000	±20%	0.3	0.38	3300	2850	1.9

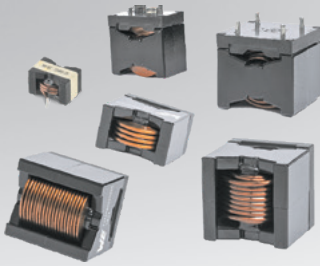
L: Inductance; Tol. L: Inductance (Tol.); I<sub>R</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC max.</sub>: DC Resistance; R<sub>DC typ</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

[www.we-online.com/WE-PD](http://www.we-online.com/WE-PD)



# WE-HCFT

## THT High Current Round Wire Inductor



### Applications:

- Power Supply
- DC/DC Converter
- Battery test & controller systems
- Lighting

[www.we-online.com/WE-HCFT](http://www.we-online.com/WE-HCFT)



NEW PRODUCTS

### Size 2012

Technical Data:								
Order Code	L (μH)	Tol. L	I <sub>R</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC typ.</sub> (mΩ)	R <sub>DC max.</sub> (mΩ)	f <sub>res</sub> (MHz)	Core Material
7443782012033	3.3	±20%	28.7	43	2.2	2.4	40	MnZn
7443782012047	4.7		28.7	29.8	2.2	2.4	28	
7443782012068	6.8		20.6	30.6	4.55	5	21	
7443782012082	8.2		20.6	25.6	4.55	5	18	
7443782012100	10		20.6	20.6	4.55	5	17	
7443782012150	15		20.6	12.9	4.55	5	13	

L: Inductance; Tol. L: Inductance (Tol.); I<sub>R</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC typ.</sub>: DC Resistance; R<sub>DC max.</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

### Size 3521

Technical Data:								
Order Code	L (μH)	Tol. L	I <sub>R</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC typ.</sub> (mΩ)	R <sub>DC max.</sub> (mΩ)	f <sub>res</sub> (MHz)	Core Material
7443763521015	1.5	±20%	75	125	0.34	0.4	37	MnZn
7443763521022	2.2			120			30	
7443763521033	3.3			91			25	

L: Inductance; Tol. L: Inductance (Tol.); I<sub>R</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC typ.</sub>: DC Resistance; R<sub>DC max.</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

### Size 3533

Technical Data:								
Order Code	L (μH)	Tol. L	I <sub>R</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC typ.</sub> (mΩ)	R <sub>DC max.</sub> (mΩ)	f <sub>res</sub> (MHz)	Core Material
7443783533220	22	±20%	23.2	49.4	8	8.8	8.15	MnZn
7443783533330	33		22	39.2	9	9.9	6.08	
7443783533470	47		19.3	32.3	11.8	12.98	5.1	
7443783533650	65		17.2	26.6	13.13	14.44	4.28	

L: Inductance; Tol. L: Inductance (Tol.); I<sub>R</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC typ.</sub>: DC Resistance; R<sub>DC max.</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

### Size 3540

Technical Data:								
Order Code	L (μH)	Tol. L	I <sub>R</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC typ.</sub> (mΩ)	R <sub>DC max.</sub> (mΩ)	f <sub>res</sub> (MHz)	Core Material
7443763540068	6.8	±20%	56.7	76.5	1.01	1.2	16	MnZn
7443763540100	10		56.7	62	1.01	1.2	14	
7443763540150	15		45.3	51.6	1.77	2.16	12	
7443763540220	22		40.6	42	2.63	3.2	9	
7443763540330	33		32	38.9	5.67	6.38	7	
7443763540470	47		32	31	5.67	6.38	6	

L: Inductance; Tol. L: Inductance (Tol.); I<sub>R</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC typ.</sub>: DC Resistance; R<sub>DC max.</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

### Test Conditions

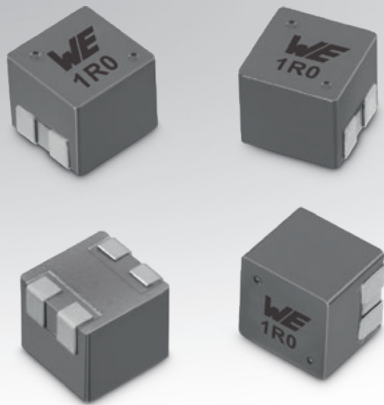
I<sub>R</sub> referring to 50 K self-heating above ambient temperature  
 I<sub>SAT</sub> referring to inductance loss of 30 % typ



# WE-MCRI

## SMT Molded Coupled Inductor

NEW PRODUCTS



### Characteristics:

- Composite core material allows high saturation current and compact design
- Better Leakage Inductance (Lk) and Rated Current (I<sub>r</sub>) than comparable components
- Magnetically shielded
- 1:1 Transformer
- Operation temperature: -40°C to +125°C

### Applications:

- Isolated converter application (e.g. Flyback converter)
- Buck, Boost, Sepic, Zeta, CLJK Converter
- Switching regulator with second, unregulated output voltage

### Size 1040

#### Technical Data:

Order Code	L (μH)	n	I <sub>r</sub> (A)	I <sub>SAT</sub> (A)	R <sub>DC max</sub> (mΩ)	R <sub>DC typ</sub> (mΩ)	f <sub>res</sub> (MHz)
7448991010	1	1:1	12	30.2	7.5	6.3	32
7448991015	1.5		11.1	28.1	10	8.6	24.5
7448991022	2.2		8.2	20.6	16.5	14	21.5
7448991027	2.7		7.4	16.5	16.8	16.3	19
7448991033	3.3		6.8	14.3	23.5	20.7	17
7448991047	4.7		6.2	13.8	29	24.4	14
7448991068	6.8		5	12	44	38	11.5
7448991082	8.2		4.7	11.3	46	41.2	10
7448991100	10		3.7	9.8	62	55	9.4
7448991150	15		3.25	7.8	95	83	7.7
7448991220	22		2.2	6.1	160	144	5.8
7448991330	33		2.05	5	230	207	4.7
7448991470	47		1.5	4.4	340	312	3.9

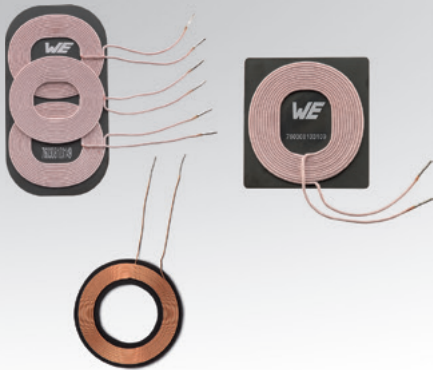
L: Inductance; n: Turns Ratio; I<sub>r</sub>: Rated Current; I<sub>SAT</sub>: Saturation Current; R<sub>DC max</sub>: DC Resistance; R<sub>DC typ</sub>: DC Resistance; f<sub>res</sub>: Self Resonant Frequency

[www.we-online.com/WE-MCRI](http://www.we-online.com/WE-MCRI)



# WE-WPCC

## Wireless Power Transfer Coil



### Characteristics:

- Wearables, medical technology, industry, consumer goods
- Applications that require clean or clean-air environments
- Medical technology, industry & consumer goods
- Wireless in-car charging
- In dirty, combustible or potentially explosive environments (ATEX)

### Applications:

- Ø 20 mm: smallest Qi coil, low inductance, for 5 V systems
- Work with Qi compliant chipset solutions up to 15 W
- Low RDC compared to other market players
- Most reliable design - solid ferrite plate for mechanical stability
- Qi standard MP-A9 coils
- Applicable up to 200 W outside Qi standard
- 3-coil array for greater freedom of receiver positioning
- Central hole:
  - Offers channel for sensors/wiring/connections
  - Replaces expensive & susceptible brushes or slip rings
- High quality value - due to high permeability of the shielding (no impact due to hole)
- Double sided tape on backside for easy assembly in application
- Compatible with all Qi transmitters

NEW PRODUCTS

### Transmitter

Technical Data:							
Order Code	L (µH)	R <sub>DC max.</sub> (mΩ)	I <sub>R</sub> (A)	Q	f <sub>res</sub> (MHz)	Size	Compliance
760308101106	2.8	90	2.5	30	38	Ø 20	works with Qi Tx IC's
760308103109	10.2	50	9	130	11	5751	Qi-MP-A9
760308101107	24	315	2	55	7.5	Ø 31	works with Qi Tx IC's

L: Inductance; R<sub>DC max.</sub>: DC Resistance; I<sub>R</sub>: Rated Current; Q: Q-Factor; f<sub>res</sub>: Self Resonant Frequency

### Transmitter Array

Technical Data:							
Order Code	L <sub>1,2,3</sub> (µH)	R <sub>DC max. 1,2,3</sub> (mΩ)	I <sub>R 1,2,3</sub> (A)	Q <sub>1,2,3</sub>	f <sub>res</sub> (MHz)	Size	Compliance
760308103149	10.2 / 9.8 / 10.2	55	9	135 / 130 / 135	8	10657	Qi - MP-A9 3-coil array
760308103113	12.5 / 11.5 / 12.5	65		125 / 115 / 125	14	10055	Qi - MP-A13 3-coil array

L: Inductance; R<sub>DC max.</sub>: DC Resistance; I<sub>R</sub>: Rated Current; Q: Q-Factor; f<sub>res</sub>: Self Resonant Frequency

### Receiver

Technical Data:							
Order Code	L (µH)	R <sub>DC max.</sub> (mΩ)	I <sub>R</sub> (A)	Q	f <sub>res</sub> (MHz)	Size	Compliance
760308105214	6.3	350	1.5	15	25	Ø 19	works with Qi Rx IC's
760308105309	10	450		19	18.5	Ø 26	

L: Inductance; R<sub>DC max.</sub>: DC Resistance; I<sub>R</sub>: Rated Current; Q: Q-Factor; f<sub>res</sub>: Self Resonant Frequency

[www.we-online.com/we-wpcc](http://www.we-online.com/we-wpcc)

# An Excellent Duet!



#INDUCTORDUET

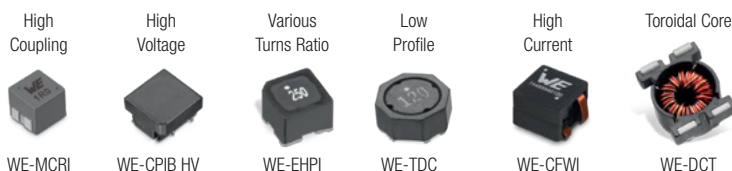
*WE speed up  
the future*

## Coupled Inductors

The WE-MCRI is an innovative molded coupled inductor with fully automated bifilar winding process. It offers an almost ideal coupling coefficient up to 0.995. The WE-MCRI features a soft saturation behavior with its crystalline core structure and distributed air gap. The coupled inductor range includes high voltage isolation versions up to 2 kV, low profile types and versions with various turns ratios.

- Up to 0.995 coupling coefficient
- Up to 2.0 kV isolation
- Soft saturation
- Up to 120 A  $I_{SAT}$  and 48 A  $I_R$
- Large portfolio

For further information, please visit: [www.we-online.com/coupled](http://www.we-online.com/coupled)





# Stay cool, be **MAPI!**



**#coolMAPI**

*WE speed up  
the future*

The WE-MAPI is the world's smallest metal alloy power inductor. It's efficiency is unmatched. Available from stock. Samples free of charge. For further information please visit:

[www.we-online.com/WE-MAPI](http://www.we-online.com/WE-MAPI)

Design your DC/DC converter in **REDEXPERT**, the world's most precise software tool to calculate AC losses.

- highest current ratings
- lowest AC losses in class
- incredibly low DCR
- excellent temperature stability
- innovative design
- lowest EMI radiation

The full  
WE-MAPI range:

1.6x1.0   2.0x1.0   2.5x0.6   2.5x0.8   2.5x1.0   2.5x1.2   3.0x1.0   3.0x1.2   3.0x1.5   3.0x2.0   4.0x2.0   4.0x3.0



# Design Kits

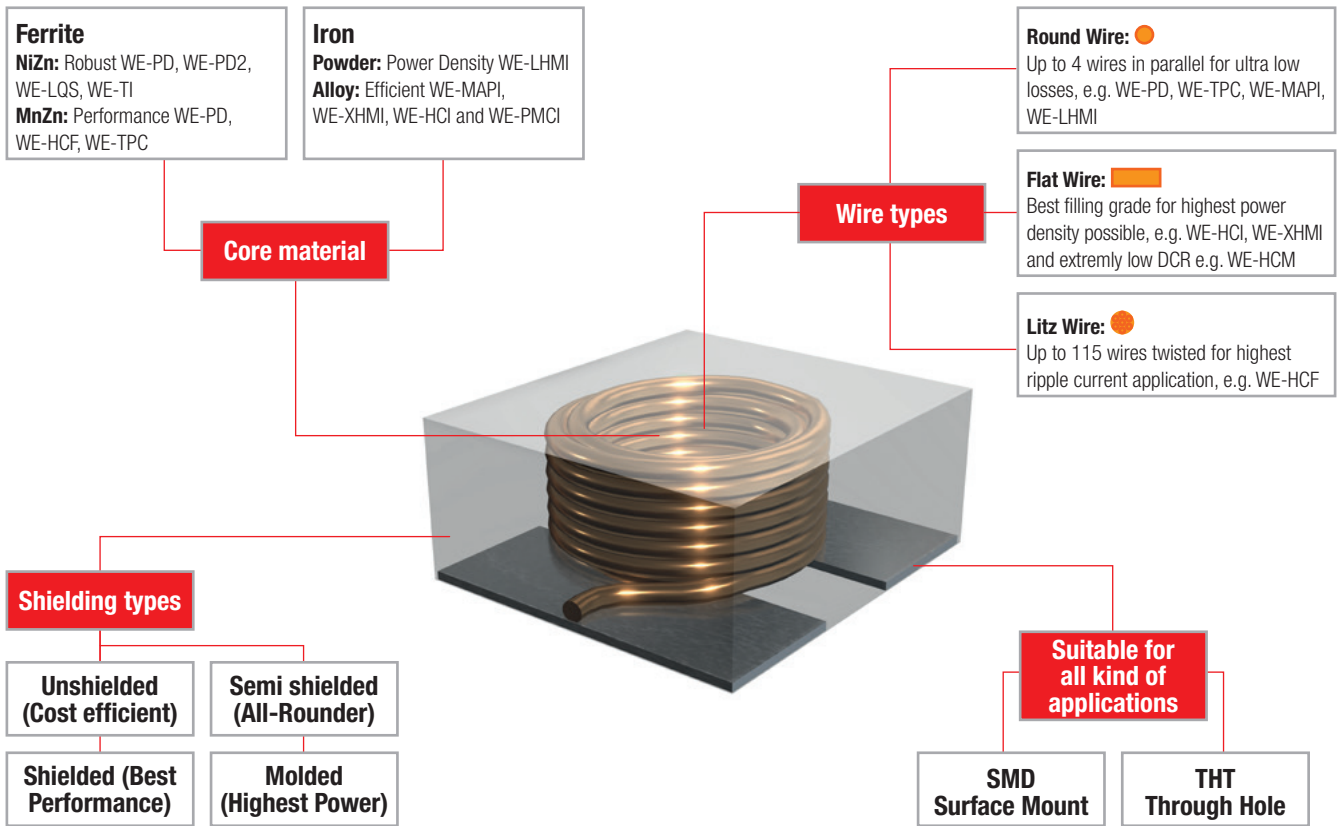


Product Category	Design Kit	Order Code	Lifelong Refill
Single Coil Power Inductor	WE-GF; SMD Wire Wound Inductors	744766	✓
	WE-HCC; SMD High Current Cube Inductors	744332	✓
	WE-HCI 1030, 1040, 1050; SMD Flat Wire High Current Inductors	744355	✓
	WE-HCI 1335, 1350, 1365; SMD Flat Wire High Current Inductors	744356	✓
	WE-HCI 1890; SMD Flat Wire High Current Inductors	744357	✓
	WE-HCI 5040, 7030, 7040, 7050; SMD Flat Wire High Current Inductors	744354	✓
	WE-PMCI 0603, 0805, 0806, 1008; Power Molded Chip Inductor	742792	✓
	WE-HCM; SMD High Current Flat Wire Inductors	744300	✓
	WE-LHMI 1040, 1335, 1365; SMD Low Profile High Current Molded Inductors	7443736	✓
	WE-LHMI 4012, 4020; SMD Low Profile High Current Molded Inductors	7443732	✓
	WE-LHMI 8030, 8040; SMD Low Profile High Current Molded Inductors	7443735	✓
	WE-LHMI 7030, 7050; SMD Low Profile High Current Molded Inductors	7443734	✓
	WE-LQ 1210, 1812; SMD Inductors	744032	✓
	WE-LQFS 3818, 4818, 4828; SMD Shielded Power Inductors	7440601	✓
	WE-LQS 2010, 2512, 3015; SMD Semi-Shielded Power Inductors	7440402	✓
	WE-LQS 3012, 4025; SMD Semi-Shielded Power Inductors – Low Loss	7440403A	✓
	WE-LQS 4012, 4018, 5020, 5040; SMD Semi-Shielded Power Inductors	7440405	✓
	WE-LQS 6028, 6045, 8040; SMD Semi-Shielded Power Inductors	7440408	✓
	WE-LQSH 2010, 2512, 3012, 4020; SMD Semi-Shielded High Saturation Power Inductors	7440502	✓
	WE-MAPI 1610, 2010; Metal Alloy Power Inductors	7443831	✓
	WE-MAPI 2506, 2508, 2510, 2512; Metal Alloy Power Inductors	7443832	✓
	WE-MAPI 3010, 3012, 3015, 3020; Metal Alloy Power Inductors	7443833	✓
	WE-MAPI 4020, 4030; Metal Alloy Power Inductors	7443834	✓
	WE-PD 1030, 1050; SMD Shielded Power Inductors	7447713	✓
	WE-PD 1210, 1280; SMD Shielded Power Inductors	744770	✓
	WE-PD 6033, 7332; SMD Shielded Power Inductors	744778	✓
	WE-PD 7345, 1260; SMD Shielded Power Inductors	744777	✓
	WE-PD2 4532, 5820, 5848; SMD Power Inductors	744773	✓

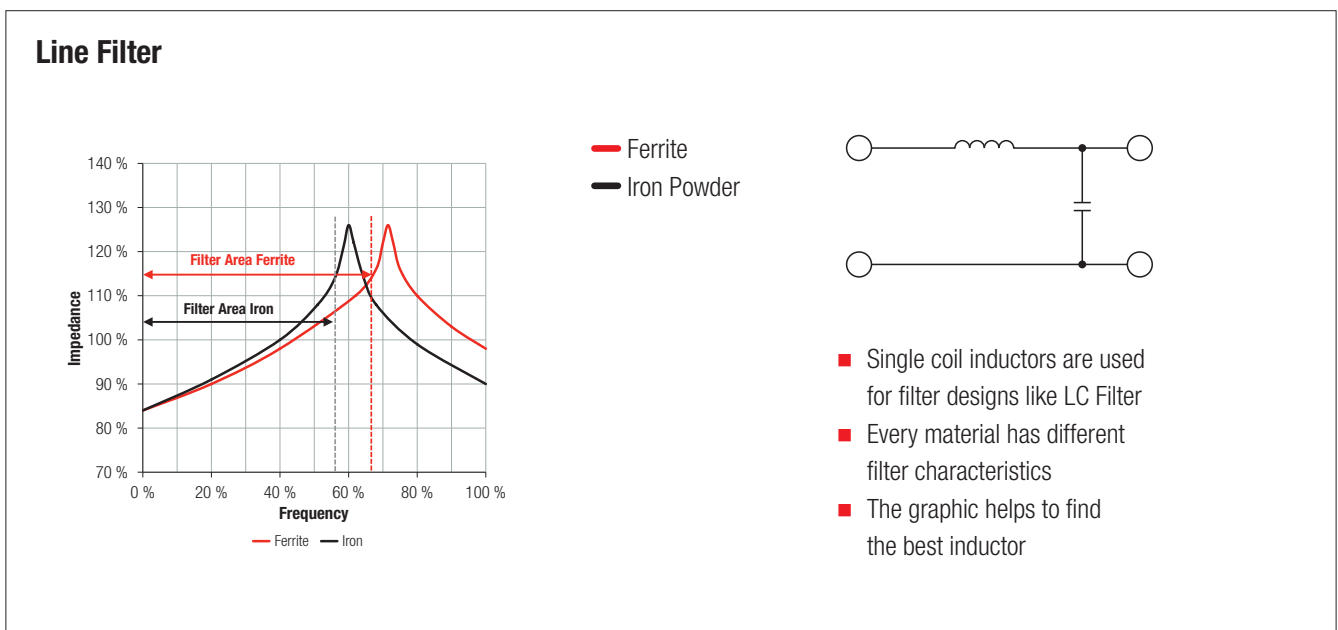


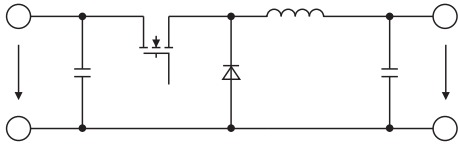
Product Category	Design Kit	Order Code	Lifelong Refill
	WE-PD2 7850, 1054; SMD Power Inductors	744775	✓
	WE-PMI; Power Multilayer Inductors	744797	✓
	WE-PD HV; SMT Power Inductors	768771	✓
	WE-SPC; SMD Shielded Power Inductors	7440894	✓
	WE-TI 5075, 6065, 8055, 8075, 8095; Radial Leaded Wire Wound Inductors	744741	✓
	WE-TI 8012, 1014; Radial Leaded Wire Wound Inductors	744743	✓
	WE-TIS; Shielded Radial Leaded Wire Wound Inductors	744731	✓
	WE-TPC 2811, 2813, 2828, 3816, 4818; SMD Shielded Tiny Power Inductors	744028	✓
	WE-TPC 4828, 5818, 5828; SMD Shielded Tiny Power Inductors	744043	✓
	WE-TPC 6823, 1028, 1038; SMD Shielded Tiny Power Inductors	744062	✓
	WE-TPC 8012, 8015, 8020; SMD Shielded Tiny Power Inductors	744070	✓
	WE-XHMI 1090, 1510; Metal Alloy Power Inductors	7443936	✓
	WE-XHMI 6030, 6060, 8080; Metal Alloy Power Inductors	7443934	✓
<b>PFC Chokes</b>			
	WE-PFC; Power Factor Correction Chokes	760801	✓
<b>Dual Coil Power Inductors</b>			
	Energy Harvesting Design Kit	IC-744885	
	Energy Harvestin Demo Kit Gleanergy	IC-744888	
	WE-DD; SMD Shielded Coupled Inductors	744870	✓
	WE-TDC; SMD Coupled Inductors	744894	✓
<b>Wireless Power Transmission</b>			
	200 W Development Kit Wireless Power Transfer Extend Medium Power Solution	760308EMP	
	15 W Design Kit Wireless Power Medium Solution including data transfer	760308MP	
<b>Flexible Transformers for SMPS</b>			
	WE-FLEX; Flexible Transformers	749196	✓
<b>Transformers for DC/DC-Converters</b>			
	WE-PoE; Transformer for Power-over-Ethernet	749119	✓

# Single Coil Inductors



- AEC-Q200 qualified (certain series)
- Temperature Range -40°C – 125°C/150°C/155 °C
- Outstanding saturation behavior
- Extreme low  $R_{DC}$
- Highest power density based in package volume
- Robust design for advanced applications
- Best filter characteristics
- Operating Voltage rating up to 400 V
- Size from 1.6 mm up to 41 mm
- Current rating up to >125 A
- Inductance value from 25 nH up to 22 mH
- Switching frequency from 10 kHz up to 10 MHz



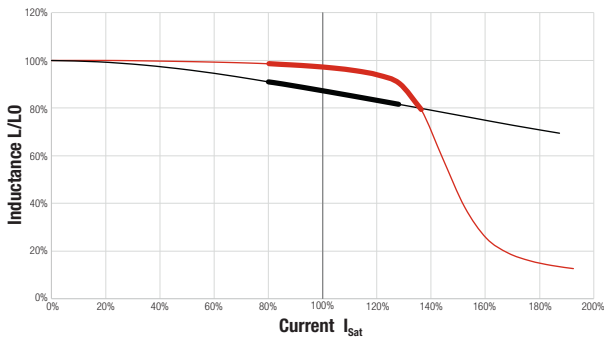


**Usage of single coil inductors:**

- Often used in DC/DC converter, e.g. buck converter.
- One of the most important factors of an inductor is its current capability

**Inductor in a DC/DC Converter**

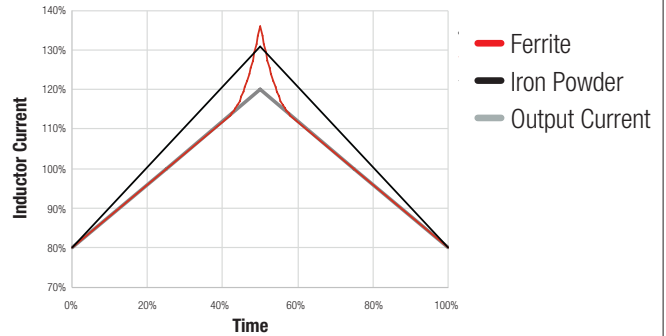
Hard vs. Soft Saturation



- Thick lines are showing the current load of the inductor with the duty cycle shown in the right graph
- The current load is depending on the switching frequency and the inductance value

**Ripple Current over Inductor**

Saturation Scenario



- In this example the duty cycle is 50%
- Soft Saturation leads to overall higher ripple
- Hard saturation may lead to ripple peaks when inductor is close to saturation

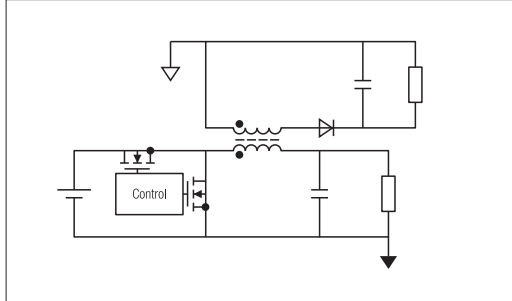


Compare in REDEXPERT  
[www.we-online.com/re-ferrite-iron](http://www.we-online.com/re-ferrite-iron)



# Overview

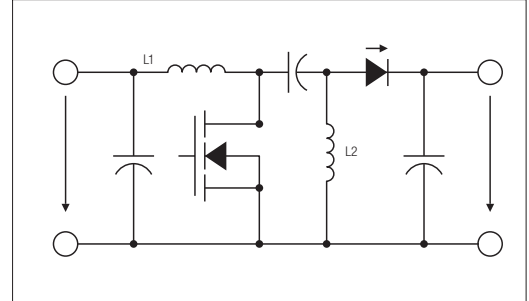
## Coupled Inductors



**Dual Output Isolated Buck Converter**

**Characteristics**

- 5 x 5 x 2 mm up to 21 x 18 x 13 mm
- Different core materials available:  
NiZn-Ferrite, Iron Powder, Metal Alloy Powder
- Low leakage inductance
- Isolation voltage: up to 2 kVrms



**SEPIC**

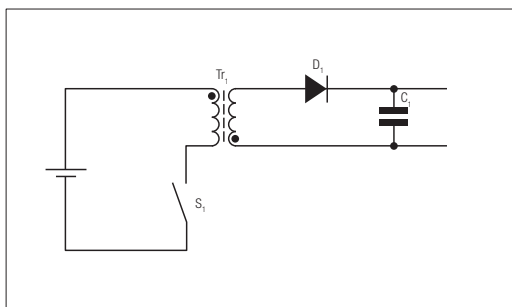
**Application**

- SEPIC, Zeta or Cúk-Converter
- Buck-Boost Converter
- Buck Converter with second isolated output
- Flyback converters
- Common Mode Choke

SEPIC Design with REDEXPERT  
[www.we-online.com/re-sepic](http://www.we-online.com/re-sepic)



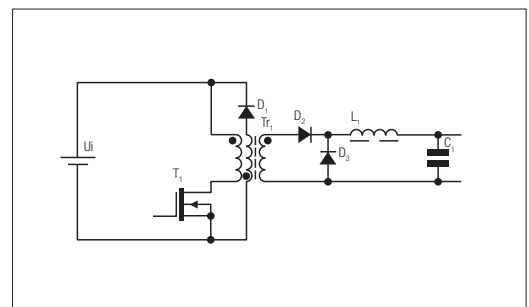
## Transformers for DC/DC Converters



**Flyback**

**Characteristics**

- Optimized for different input and output parameters or adjustable (WE-FLEX)
- Isolation voltage: up to 2 kVrms
- With or without airgap for Flyback or Forward topology
- Output power up to 70 W

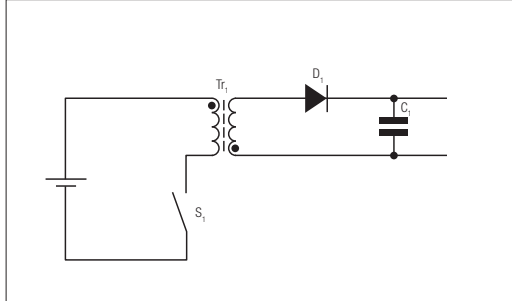


**Forward**

**Application**

- PoE powered devices
- 24V Rail input converters
- Isolated power supplies

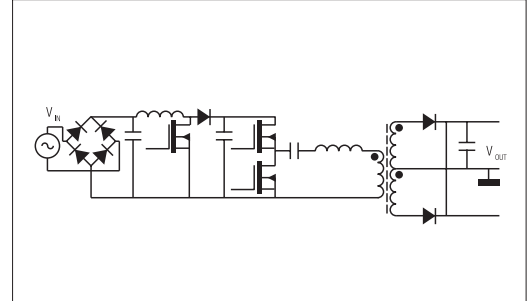
## Transformers for AC/DC Converters



### Flyback

#### Characteristics

- Output powers: up to 250 W
- Optimized winding strategy
- Re-inforced isolation



### LLC

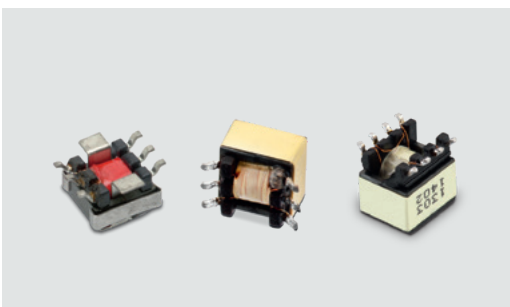
#### Application

- Low power supplies
- Resonant power supplies for medium range power



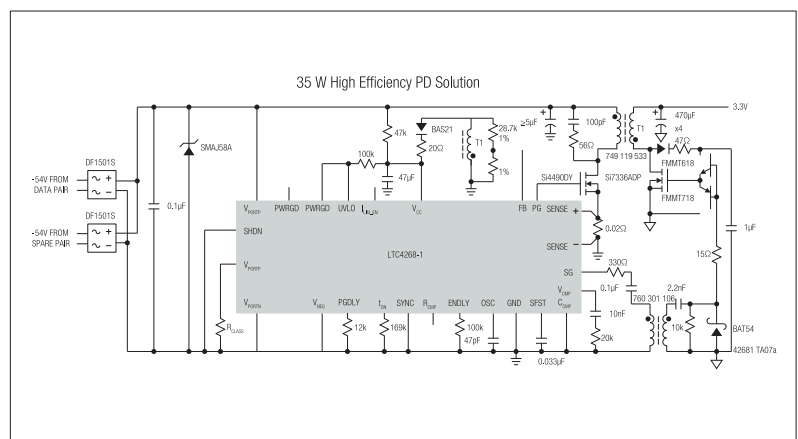
Off-the-shelf AC/DC transformer  
in REDEXPERT  
[www.we-online.com/re-acdc](http://www.we-online.com/re-acdc)

## Auxilliary Transformers



### For Example:

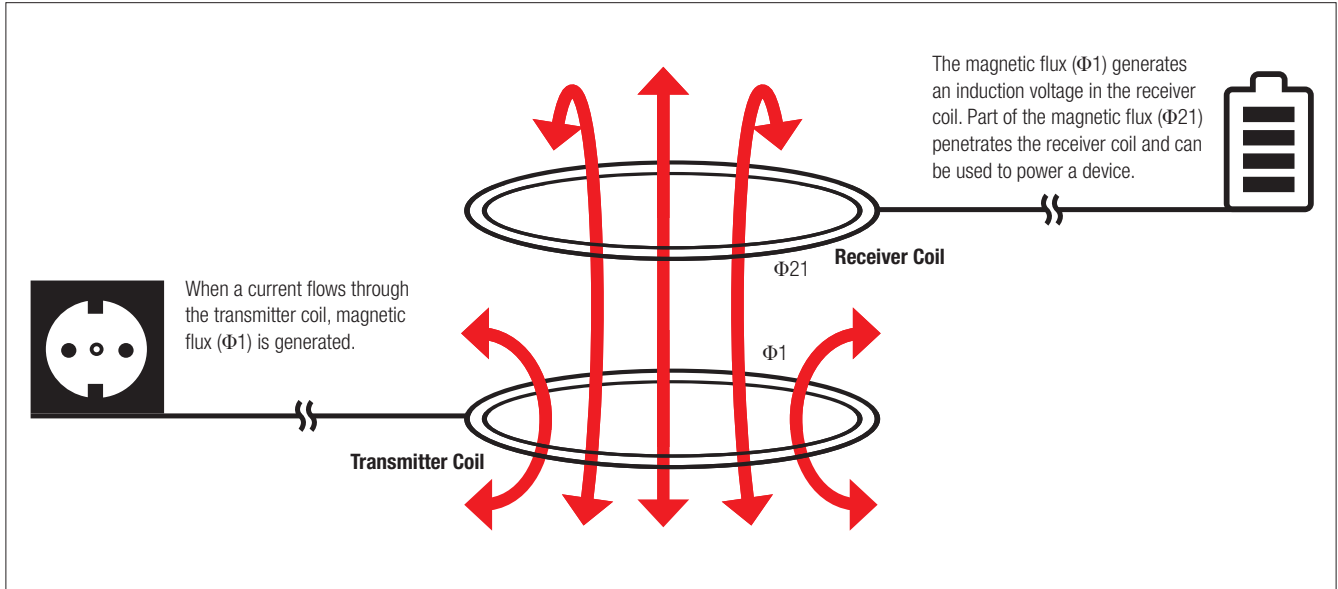
- Gate Drive Transformers
- Current Sense Transformers



Gate Drive Transformer

# Wireless Power – WE cut the Cord

## How wireless power transfer works



## Application Areas



Medical Technology



Industry

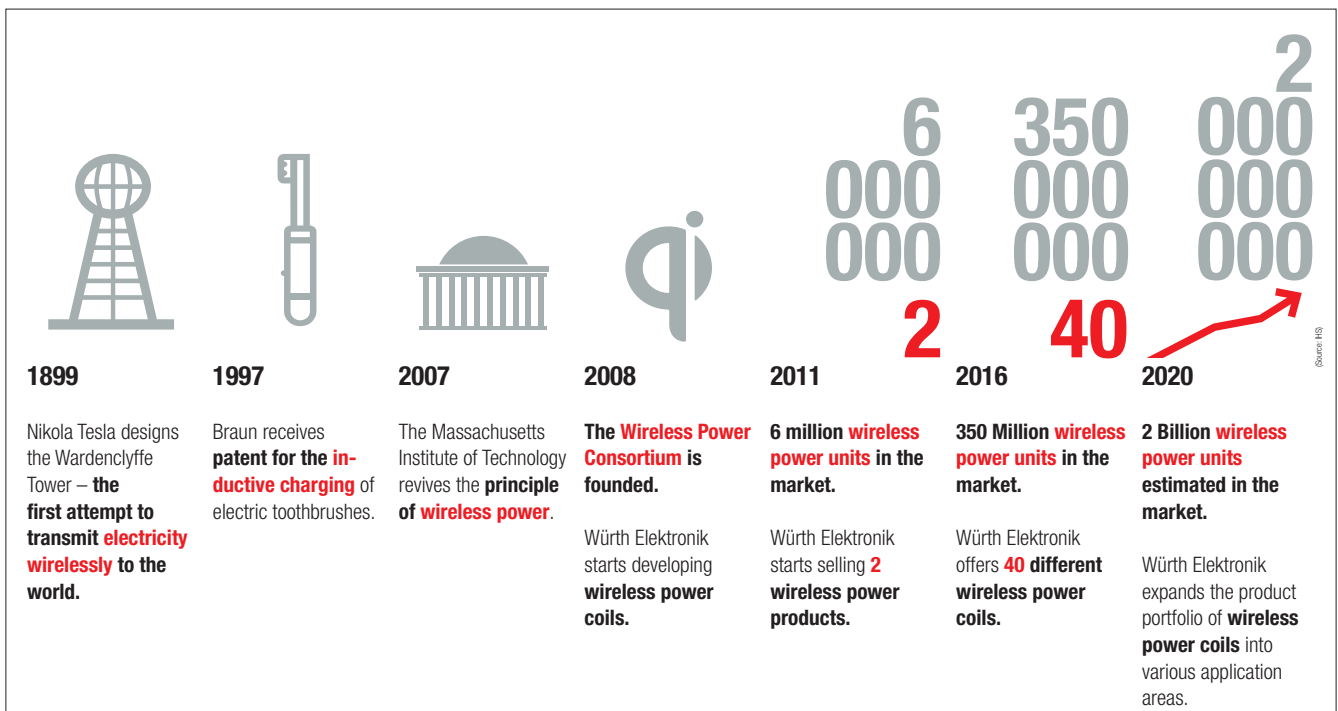


Furniture



eMobility

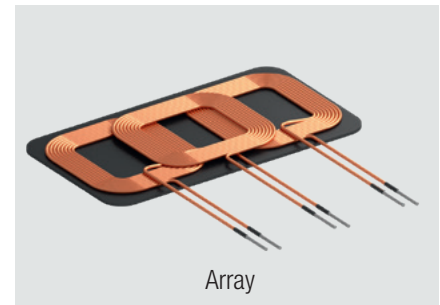
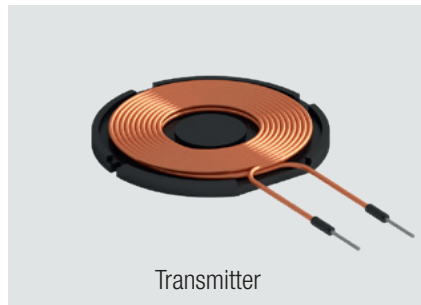
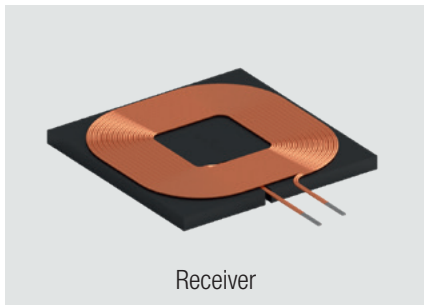
## Wireless Power – Past, Present & Future



## Three different types of coils

Your tool to find the perfect coil combination for wireless power applications

[www.we-online.com/wirelesspower/mixandmatch](http://www.we-online.com/wirelesspower/mixandmatch)



### Size of coils



### The leading standard



Wireless Power Consortium

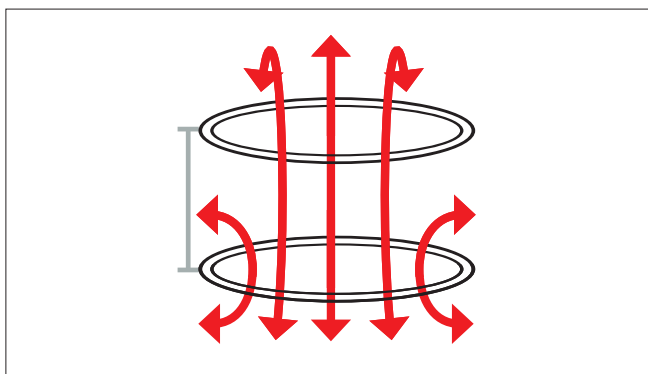
### Power up to 200 W



Find out more about high power wireless transfer

[www.we-online.com/wirelesspower/highpower](http://www.we-online.com/wirelesspower/highpower)

### Distance up to 10 mm



### Why Würth Elektronik coils?

- Broadest portfolio of standard wireless power charging coils in the market
- Best efficiency due to best Q-factor and lowest  $R_{DC}$
- High permeability shielding
- Highly reliable construction
- System support

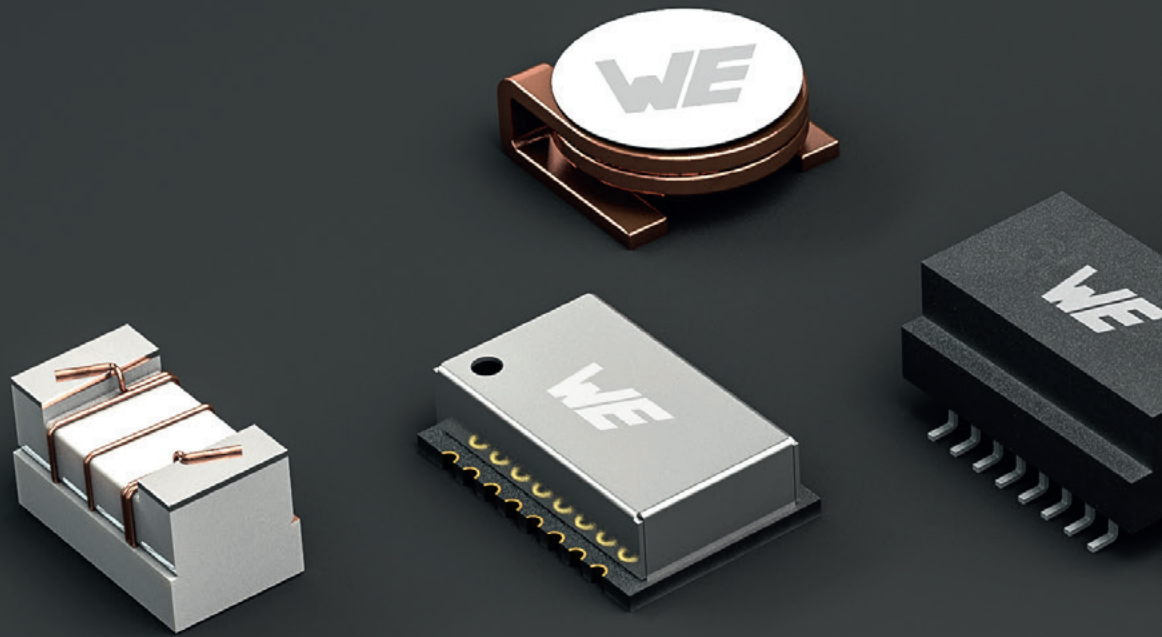


[www.we-online.com/wirelesspower](http://www.we-online.com/wirelesspower)

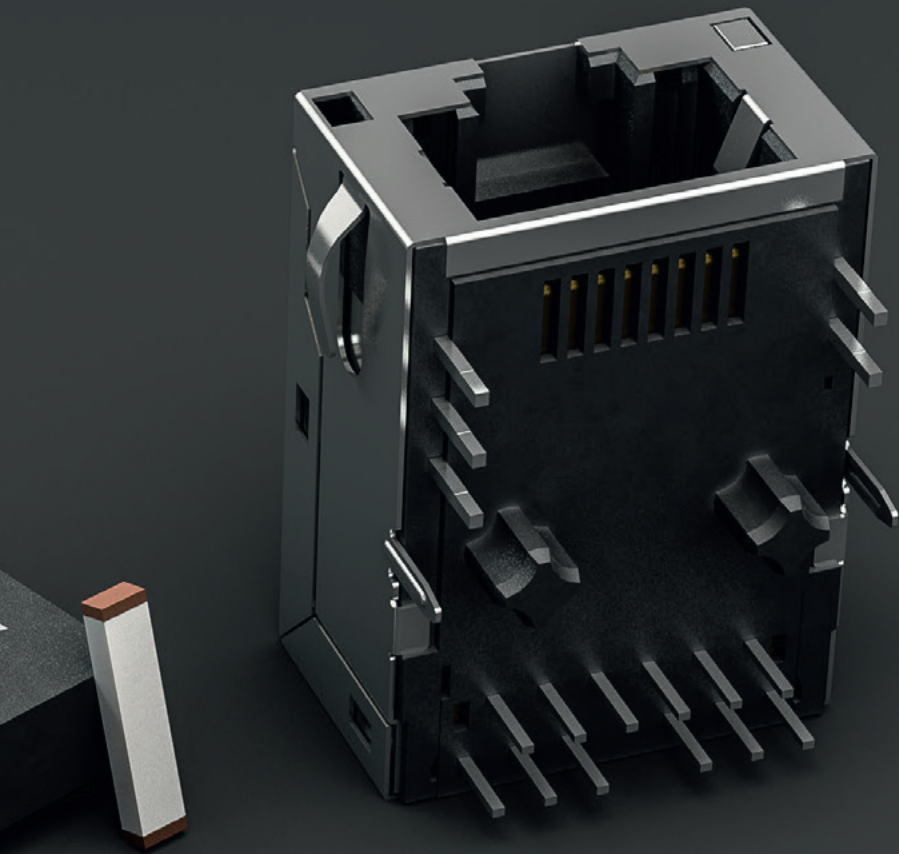


# 1 PASSIVE COMPONENTS

## Signal & Communications



<b>Product Overview</b>	<b>62</b>
<b>New Products</b>	<b>64</b>
<b>Design Kits</b>	<b>65</b>
<b>Additional Information</b>	<b>66</b>

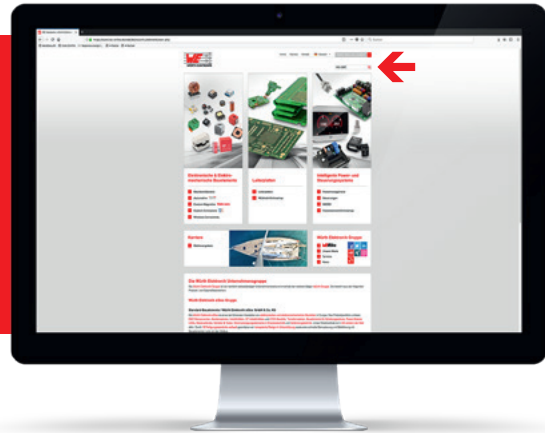


# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WE-ASI



### AS-Interface Inductor



#### WE-ASI

L: 3.0 ~ 18.0 mH  
 $I_{DC}$ : 0.08 ~ 0.24 A  
 $R_{DC}$ : 10.0 ~ 72.0 Ω

### Filter Solutions



#### WE-EPL

USB-A connector with integrated circuit protection device and EMI noise reduction

### RF Inductors



#### WE-KI

L (±2% or ±5%): 1 ~ 1500 nH  
 Q: 16 ~ 60  
 SRF: 200 ~ 12500 MHz  
 $I_{DC}$ : 100 ~ 1360 mA  
 Sizes: 0402, 0603, 0805, 1008



#### WE-KI HC

L (±2%): 1 ~ 390 nH  
 Q: 18 ~ 46  
 SRF: 880 ~ 16000 MHz  
 $I_{DC}$ : 170 ~ 2300 mA  
 Sizes: 0402, 0603



#### WE-RFI

L (±5%): 0.47 ~ 47 μH  
 Q: 15 ~ 45  
 SRF: 17 ~ 375 MHz  
 $I_{DC}$ : 45 ~ 500 mA  
 Sizes: 0805, 1008



#### WE-RFH

L (±5%): 0.56 ~ 10 μH  
 Q: 15 ~ 45  
 SRF: 40 ~ 415 MHz  
 $I_{DC}$ : 300 ~ 760 mA  
 Sizes: 1008



#### WE-TCI

L (±0.1nH or 2%): 1 ~ 22 nH  
 Q: 8 ~ 13  
 SRF: 2800 ~ 9000 MHz  
 $I_{DC}$ : 90 ~ 700 mA  
 Sizes: 0201, 0402



#### WE-MK

L (±5%): 1 ~ 470 nH  
 Q: 8 ~ 20  
 SRF: 250 ~ 17000 MHz  
 $I_{DC}$ : 100 ~ 600 mA  
 Sizes: 0201, 0402, 0603



#### WE-CAIR

L (±5%): 1.65 ~ 120 nH  
 Q: 100 ~ 140  
 SRF: 1.1 ~ 12.5 GHz  
 $I_{DC}$ : 1.5 ~ 4 A  
 Sizes: 1322, 1340, 3136, 3168, 4248



#### WE-AC HC

L (±20%): 22 ~ 146 nH  
 Q: 163 ~ 280  
 $SRF_{typ}$ : 332 ~ 867 MHz  
 $I_{DC}$ : 19 ~ 40 A  
 Sizes: 1010, 1212

### LAN Transformers



#### WE-LAN

Speed: 10/100/1000 MBit/s  
 Ports: 1~4  
 Temp. Range: -40 to +125°C  
 PoE: 350 ~ 1500 mA



#### WE-LAN 10G

Speed: 10.000 MBit/s  
 Ports: 1  
 Temp. Range: -40 to +85°C  
 PoE: 350 ~ 1500 mA



#### WE-LAN AQ

Speed: 1.000 MBit/s  
 Ports: 1  
 Temp. Range: -40 to +85°C



#### WE-RJ45 LAN

Speed: 10 ~ 1000 MBit/s  
 Ports: 1~4  
 Temp. Range: -40 to +85°C  
 PoE: 350 mA ~ 600 mA



#### WE-RJ45 LAN 10G

Speed: 10 ~ 10.000 MBit/s  
 Ports: 1  
 Temp. Range: -40 to +85°C  
 PoE: 350 mA ~ 600 mA

## LTCC Components



### WE-LPF

Low-Pass Filter

Frequency Range: 902 ~ 5875 MHz  
 Sizes: 0603, 0805

Wireless Communication Systems like Bluetooth, WiFi 2.4 & 5.0 GHz, ZigBee ...  
 Low insertion loss in passband and high attenuation in stopband



### WE-BPF

Band-Pass Filter

Frequency Range: 2400 ~ 5920 MHz  
 Sizes: 0805, 1008

Wireless Communication Systems like Bluetooth, WiFi 2.4 & 5.0 GHz, ZigBee ...  
 Low insertion loss in passband and high attenuation in stopband



### WE-BAL

Balun

Frequency Range: 2400 ~ 5875 MHz  
 Sizes: 0603, 0805

Wireless Communication Systems like Bluetooth, WiFi 2.4 & 5.0 GHz, ZigBee ...  
 Low loss SMD Balun with balanced impedance of 50-200 ohms



### WE-MCA

Multilayer Chip Antenna

Frequency Range: 423 ~ 5875 MHz  
 Wireless Communication Systems like GSM

900, ISM 868/2400, GPS, Bluetooth, WiFi 2.4 & 5.0 GHz, ZigBee ...



All Signal & Communications Components at a glance:  
[www.we-online.com/signal-com](http://www.we-online.com/signal-com)



Explore our Application Notes for Signal & Communications:  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)



Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
  - S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
  - RF & Microwave Simulation Models: Modelithics
- [www.we-online.com/library](http://www.we-online.com/library)



# WE-RJ45 LAN

## RJ45 Through Hole Reflow

NEW PRODUCTS



### Characteristics:

- RJ45 designed to use for Pin-in-Paste soldering
- High mechanical stability through THT pins
- High Temperature LEDs
- Extra high standoff for a good thermal airflow
- Power over Ethernet up to 30 W
- Compliant with standard: IEEE 802.3u, IEEE 802.3ab, IEEE 802.3af, IEEE 802.3at

### Applications:

- Suitable for industrial temperatures from -40 °C up to +85 °C
- Compatible to Industrial Ethernet systems like EtherCAT or Profinet
- Compliant with most IC's for Ethernet applications such as Microchip, Texas Instruments, Broadcom, Linear Technology
- Hubs, Routers, Switches, IP cameras, IoT applications

### Technical Data:

Order Code	Data rate	PoE	Tab	Shield Tabs	LED	L (mm)	W (mm)	H (mm)
74980104400	10/100 Base-T	non-PoE	Up	No	green/ yellow-green/ yellow	21.5	16	13.6
74982104400	10/100 Base-T	PoE (up to 350 mA)						
74984104400	10/100/1000 Base-T	non-PoE						
74981104400	10/100/1000 Base-T	PoE (up to 600 mA)						

Tab: Tab Position; LED: LED (Left-Right); L: Length; W: Width; H: Height

[www.we-online.com/RJ45](http://www.we-online.com/RJ45)



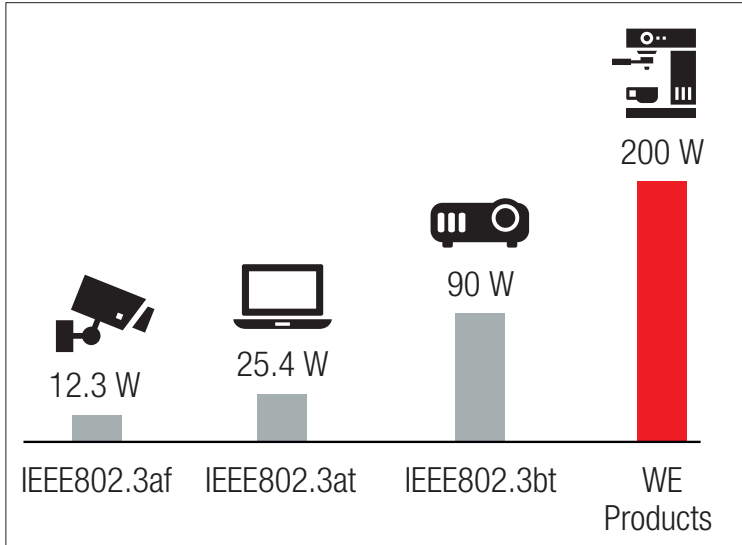
# Design Kits



Product Category	Design Kit	Order Code	Lifelong Refill
<b>LAN Transformers</b>	WE-LAN; LAN Transformers	749010	✓
	LAN Transformers & RJ45 Connectors without Magnetics	749615	✓
<b>RF Inductors</b>	WE-KI HC 0402, 0603; SMD High Current Ceramic Inductor	74476	✓
	WE-KI 0402; SMD Wire Wound Ceramic Inductors	744765A	✓
	WE-KI 0603; SMD Wire Wound Ceramic Inductors	744761	✓
	WE-KI 0805, 1008; SMD Wire Wound Ceramic Inductors	744762	✓
	WE-RFI; Ferrite SMD Inductors	744762A/RFI	✓
	WE-MK 0201; Multilayer Ceramic SMD Inductors	744785	✓
	WE-MK 0402A; Multilayer Ceramic SMD Inductors	744784A	✓
	WE-MK 0603A; Multilayer Ceramic SMD Inductors	744786A	✓
	WE-CAIR; Air Coil Inductors	74491	✓

# LAN – Power over Ethernet

## Beyond the Standard

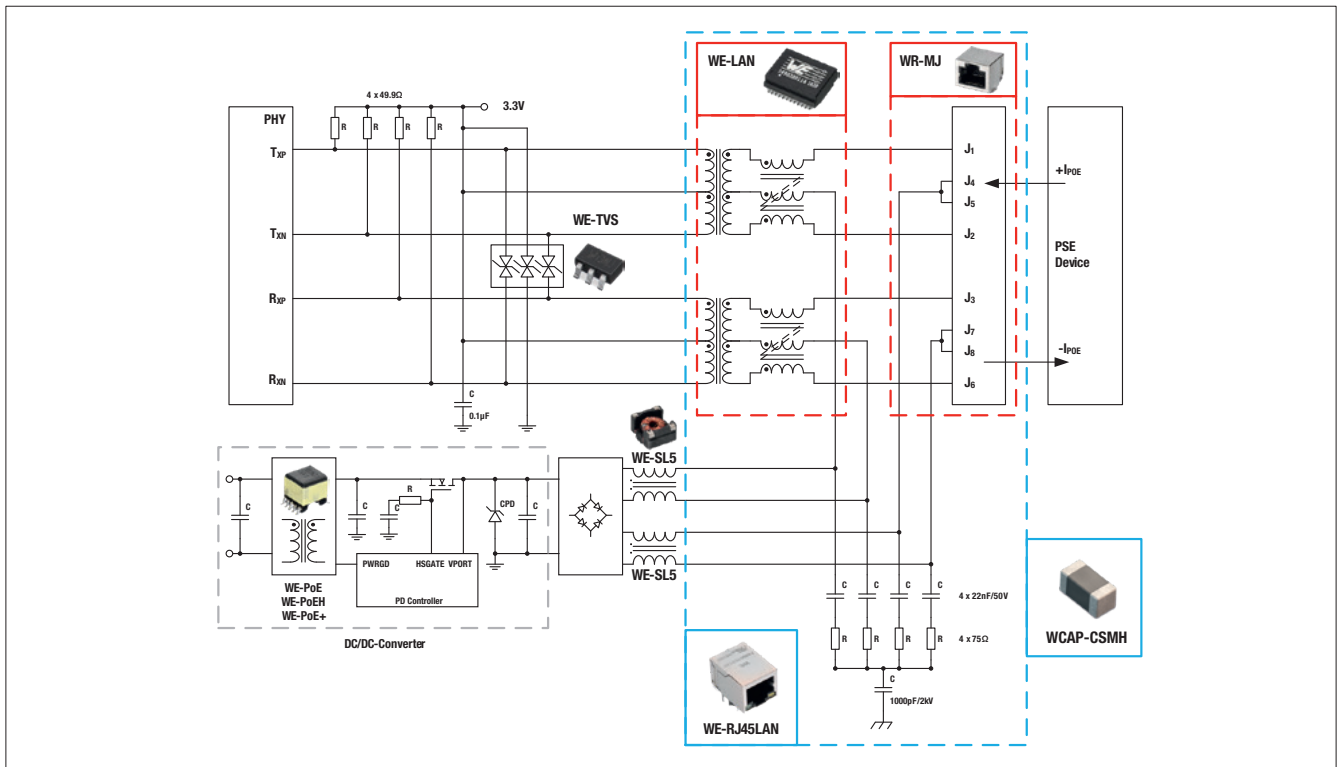


LAN PoE products available even for applications beyond the newest IEEE802.3bt standard.



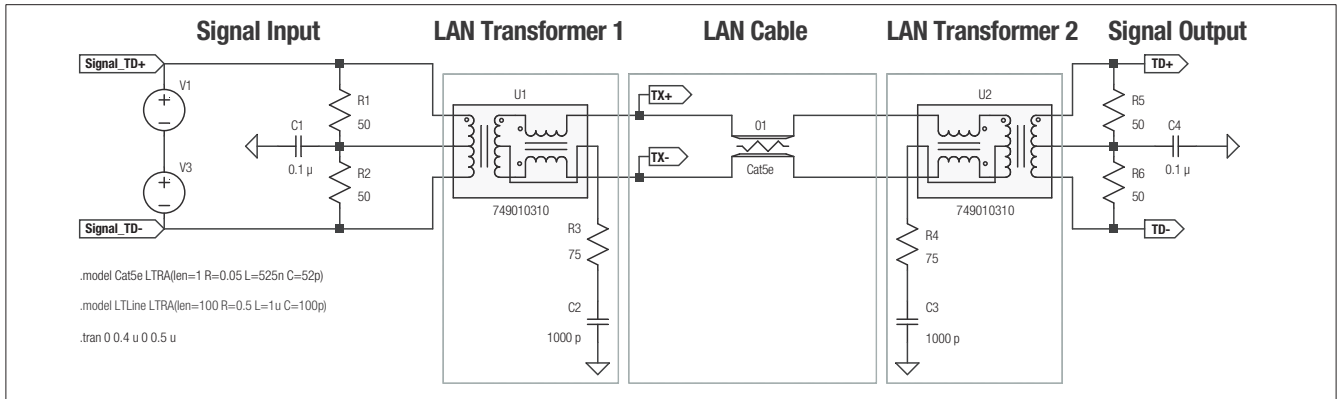
LAN Transformer Selection  
in REDEXPERT  
[www.we-online.com/re-LAN](http://www.we-online.com/re-LAN)

## LAN – Power over Ethernet



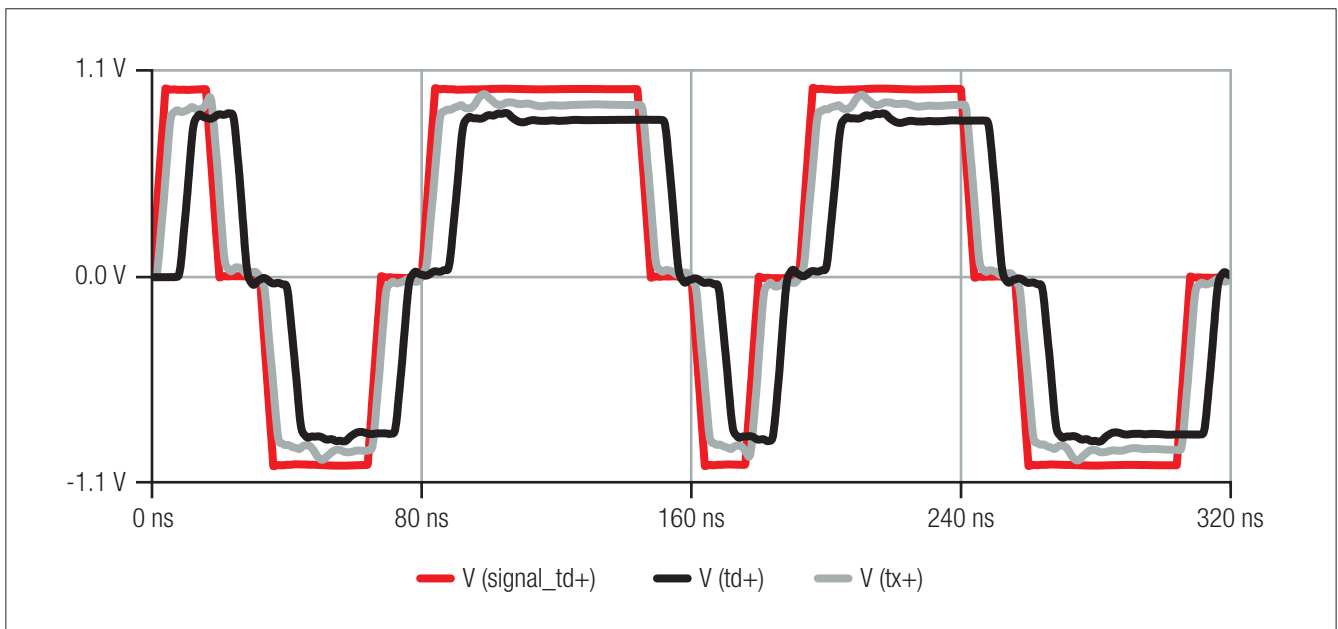
Example of the LAN schematic used for powered Devices. The PSE device (right side) provides PoE-Power and LAN signals over the same cable. The signals will be transferred through the LAN Transformer to the PHY chip (left side), while the PoE current will be led to the DC/DC converter. For ESD protection, it's recommended to place a TVS diode with low capacitance (e.g. WE-TVS 824 015) between LAN Transformer and PHY chip. An additional Common Mode Choke reduces the EMI at the power lines to the DC/DC converter (e.g. WE-SL5 744272392 for PoE and WE-SL5 744272332 for PoE+).

## NEW: Spice models for LAN Simulation



- Download free Spice models on: [www.we-online.com/LTspice](http://www.we-online.com/LTspice)
- Simulation of real signal behaviour
- Easy electrical comparison of different LAN transformer types
- Highest accuracy on the market

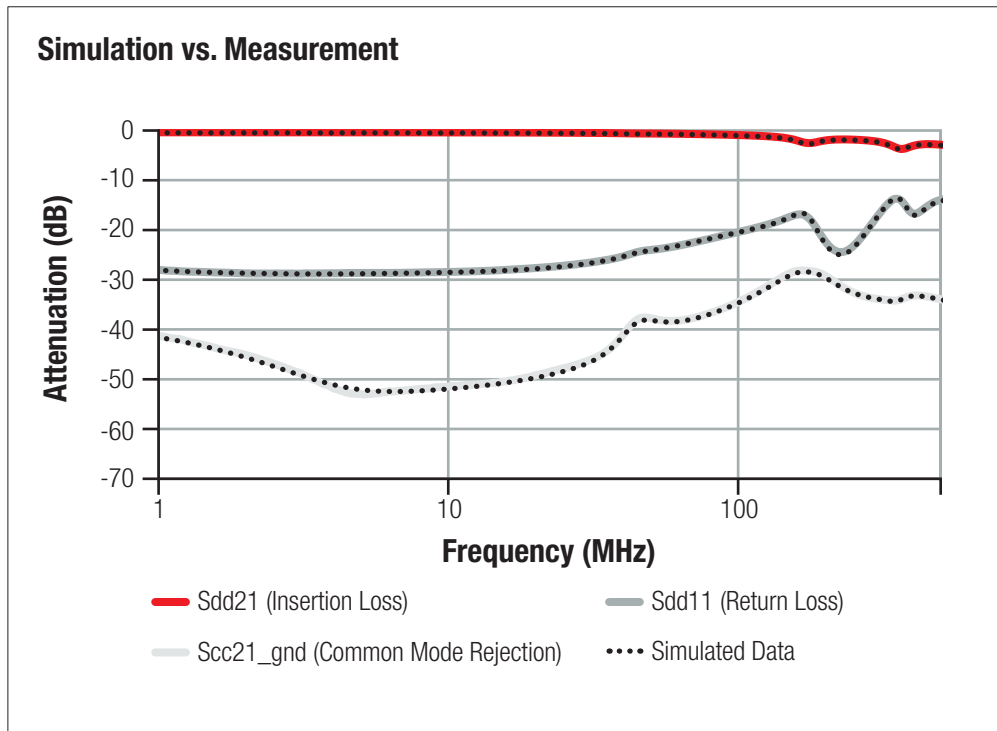
Simulation example for a data transfer with 32 MHz over two LAN transformers. On the left side a voltage probe is placed to simulate the incoming signal. Further probes are placed after the first and second LAN transformer. Between the two transformers, a CAT5e cable is simulated with an impedance of 100 Ω.



### Simulation results

- Test 1 (red curve): Incoming signal
- Test 2 (grey grey curve) Signal simulation after the first LAN transformer
- Test 3 (black curve): Signal simulation after the second LAN transformer

# LAN – Power over Ethernet

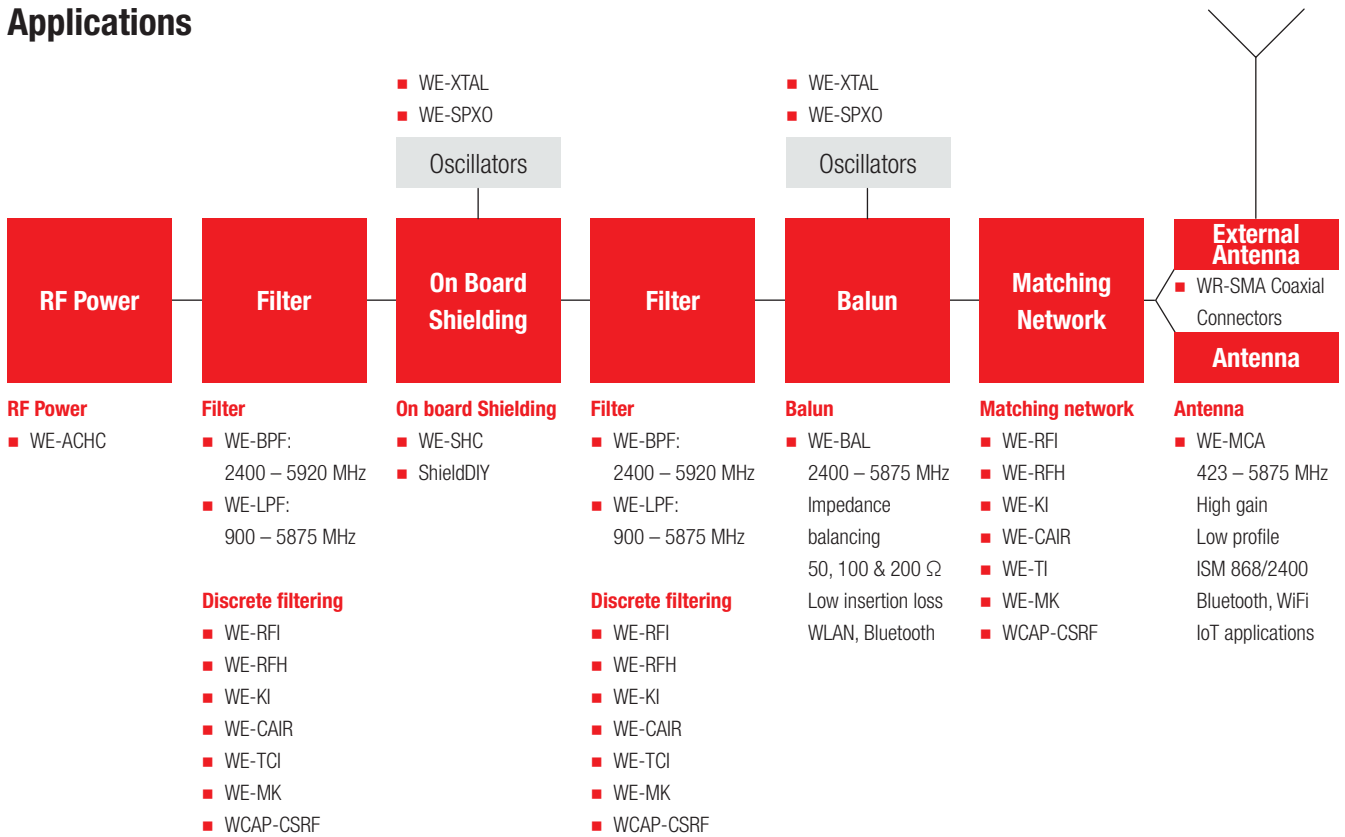


Simulated RF parameters compared with measurements on the Network Analyzer



# RF Inductors & LTCC Components

## Applications



## RF Inductors Overview

Series	Size	R <sub>DC</sub>	Q	IR	Inductance Tolerances
WE-KI (HC)	■	Ω Ω		⚡⚡	2 %
WE-RFI (RFH)	■	Ω Ω		⚡⚡	5 %
WE-CAIR	■	Ω		⚡⚡⚡	2 %
WE-TCI	■	Ω Ω Ω		⚡	2 %
WE-MK	■	Ω Ω Ω	·	⚡	5 %
WE-ACHC	■	Ω		⚡⚡⚡	5 %



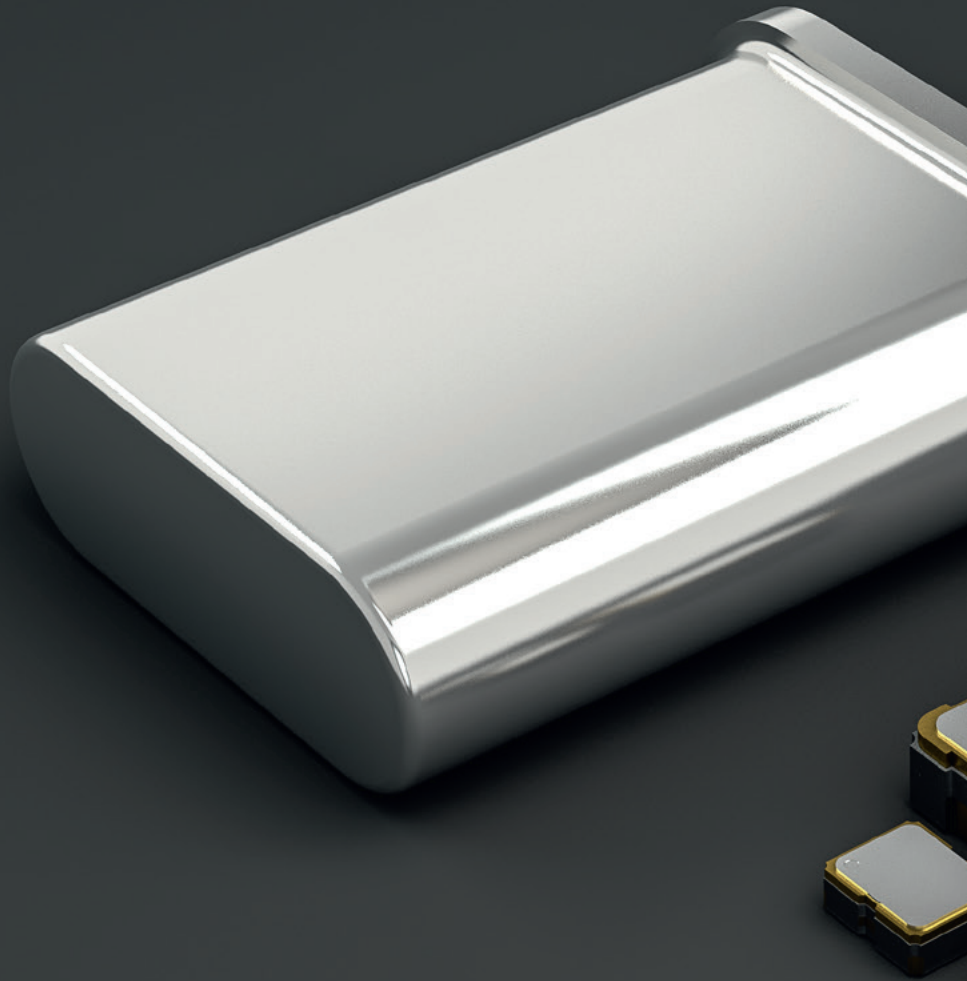
Plug & Play Modules available, too:  
[www.we-online.com/wireless-connectivity](http://www.we-online.com/wireless-connectivity)



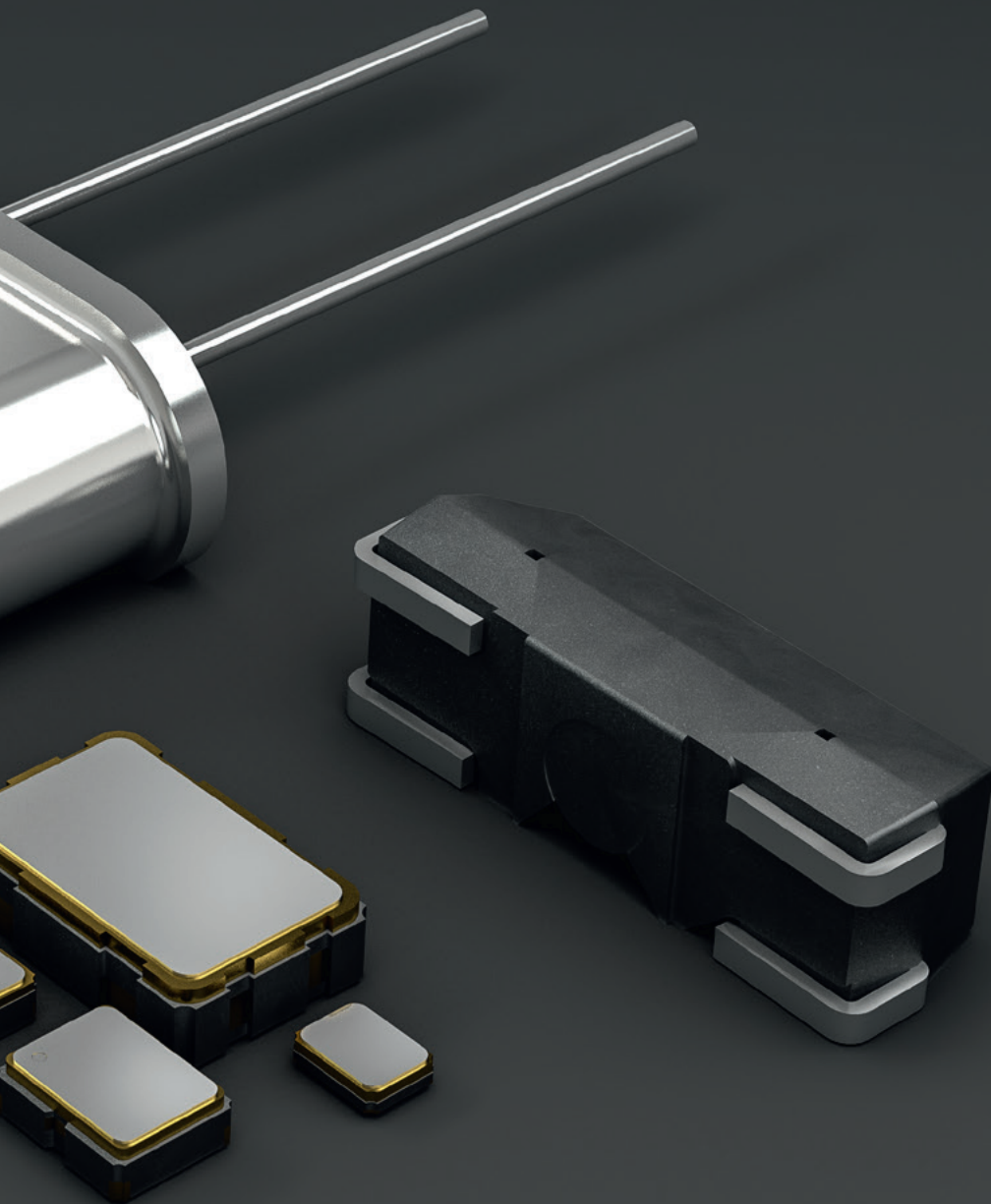
Graphical search with L@F and Q@F in REDEXPERT  
[www.we-online.com/re-LQ](http://www.we-online.com/re-LQ)

# **1** PASSIVE COMPONENTS

## Quartz & Oscillators



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<b>Additional Information</b>	<b>82</b>

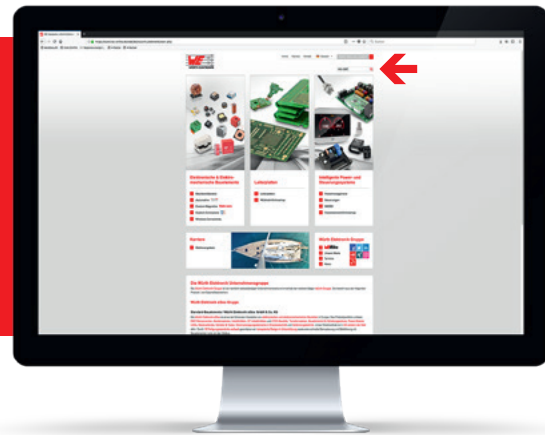


# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WE-XTAL



### Quartz Crystals

NEW

#### WE-XTAL

Frequency: 1.84320 - 50 MHz  
Model: HC49, HC49/4H, 12SMX, CFPX-104, CFPX-180, CFPX-218, HC49/4HSMX, IQXC-26, IQXC-42



NEW

#### WE-XTAL (Watch)

Frequency: 32.7680 kHz  
Model: Watch, 85SMX, 91SMX, 90SMX, CFPX-217, CFPX-56, IQXC-25, IQXC-90



### Clock Oscillators

NEW

#### WE-SPXO

Frequency: 3.68640 - 125 MHz  
Model: CFPS-39, CFPS-72, CFPS-73, CFPS-9, IQXO-540, IQXO-542, IQXO-791, IQXO-794



All Frequency Products at a glance  
[www.we-online.com/frequency-products](http://www.we-online.com/frequency-products)



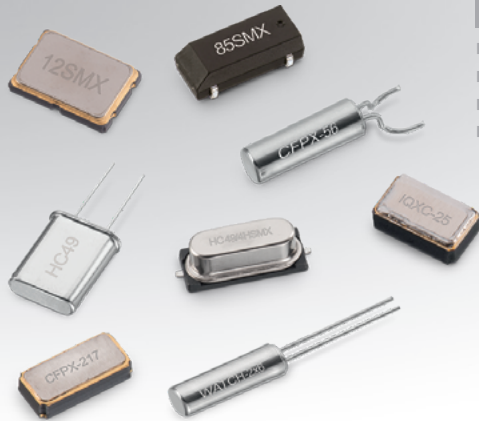
Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics

[www.we-online.com/library](http://www.we-online.com/library)

# WE-XTAL

## Quartz Crystal



### Characteristics:

- Industry standard packages
- Miniature package size
- SMT and THT models
- Hermetically sealed

### Applications:

- Microprocessor applications
- Industrial machinery
- Asset location, data tracking and GPS
- Real Time Clocks (RTC)
- Internet of Things (IoT)

[www.we-online.com/WE-XTAL](http://www.we-online.com/WE-XTAL)

NEW PRODUCTS

### Technical Data:

Order Code	Size	f	C <sub>load</sub> (pF)	Operating Temperature (°C)
830025159	CFPX-56	32.768 kHz	12.5	-40 up to +85
830055901	CFPX-104	8 MHz	18	-20 up to +70
830055663	CFPX-104	8 MHz	18	-40 up to +85
830061486	CFPX-104	8.192 MHz	10	-40 up to +85
830056583	CFPX-104	10 MHz	12	-40 up to +85
830072402	CFPX-104	10 MHz	18	-40 up to +85
830032878	CFPX-104	12 MHz	18	-10 up to +60
830036401	CFPX-104	12 MHz	18	-20 up to +70
830055999	CFPX-104	12 MHz	18	-40 up to +85
830059522	CFPX-104	12 MHz	18	-40 up to +85
830059523	CFPX-104	12.288 MHz	18	-40 up to +85
830056556	CFPX-104	12.5 MHz	18	-40 up to +85
830059477	CFPX-104	12.8 MHz	15	-40 up to +85
830033643	CFPX-104	14.31818 MHz	18	-10 up to +60
830059526	CFPX-104	14.31818 MHz	18	-40 up to +85
830033328	CFPX-104	14.7456 MHz	18	-10 up to +60
830072403	CFPX-104	14.7456 MHz	18	-40 up to +85
830030819	CFPX-104	16 MHz	18	-10 up to +60
830059528	CFPX-104	16.384 MHz	18	-40 up to +85
830059529	CFPX-104	18.432 MHz	18	-40 up to +85
830056808	CFPX-104	20 MHz	18	-40 up to +85
830032817	CFPX-104	24 MHz	18	-10 up to +60
830059530	CFPX-104	24 MHz	18	-40 up to +85
830053798	CFPX-104	24 MHz	18	-40 up to +85
830033644	CFPX-104	24.576 MHz	18	-10 up to +60
830059531	CFPX-104	24.576 MHz	18	-40 up to +85
830033075	CFPX-104	25 MHz	18	-10 up to +60
830059532	CFPX-104	25 MHz	18	-40 up to +85
830072404	CFPX-104	26 MHz	18	-40 up to +85
830065460	CFPX-104	30 MHz	10	-40 up to +85
830030820	CFPX-104	30 MHz	18	-10 up to +60
830059535	CFPX-104	32 MHz	18	-40 up to +85
830033645	CFPX-104	40 MHz	18	-10 up to +60
830059537	CFPX-104	40 MHz	18	-40 up to +85
830059539	CFPX-104	48 MHz	18	-40 up to +85
830069882	CFPX-180	12 MHz	10	-40 up to +125
830061647	CFPX-180	12 MHz	12	-40 up to +85
830069944	CFPX-180	12 MHz	15	-40 up to +85
830070868	CFPX-180	12 MHz	18	-40 up to +85
830055295	CFPX-180	12 MHz	18	-40 up to +85
830056346	CFPX-180	12 MHz	18	-40 up to +85



# WE-XTAL

## Quartz Crystal

NEW PRODUCTS

Technical Data:				
Order Code	Size	f	C <sub>load</sub> (pF)	Operating Temperature (°C)
830055293	CFPX-180	14.7456 MHz	18	-40 up to +85
830064296	CFPX-180	16 MHz	8	-10 up to +70
830035264	CFPX-180	16 MHz	16	-10 up to +60
830055951	CFPX-180	16 MHz	18	-40 up to +85
830035503	CFPX-180	16.384 MHz	16	-10 up to +60
830035265	CFPX-180	20 MHz	16	-10 up to +60
830059638	CFPX-180	20 MHz	18	-40 up to +85
830058149	CFPX-180	24 MHz	10	-20 up to +70
830035266	CFPX-180	24 MHz	16	-10 up to +60
830064703	CFPX-180	24 MHz	18	-40 up to +85
830058124	CFPX-180	24 MHz	18	-40 up to +85
830035267	CFPX-180	24.576 MHz	16	-10 up to +60
830072604	CFPX-180	25 MHz	8	-40 up to +85
830051068	CFPX-180	25 MHz	9	-20 up to +70
830059800	CFPX-180	25 MHz	10	-10 up to +60
830035268	CFPX-180	25 MHz	16	-10 up to +60
830055474	CFPX-180	25 MHz	16	-40 up to +85
830068911	CFPX-180	25 MHz	18	-20 up to +70
830055299	CFPX-180	25 MHz	18	-40 up to +85
830063321	CFPX-180	25 MHz	18	-40 up to +85
830059643	CFPX-180	26 MHz	18	-40 up to +85
830057824	CFPX-180	27 MHz	18	-40 up to +85
830053099	CFPX-180	27.12 MHz	10	-20 up to +70
830059962	CFPX-180	30 MHz	12	-10 up to +60
830035269	CFPX-180	30 MHz	16	-10 up to +60
830059646	CFPX-180	30 MHz	18	-40 up to +85
830060258	CFPX-180	32 MHz	10	-20 up to +70
830061677	CFPX-180	32 MHz	12	-40 up to +85
830069377	CFPX-180	32 MHz	18	-40 up to +85
830059648	CFPX-180	40 MHz	18	-40 up to +85
830060843	CFPX-180	50 MHz	10	-20 up to +70
830054236	CFPX-217	32.768 kHz	6	-40 up to +85
830009709	CFPX-217	32.768 kHz	7	-40 up to +85
830009706	CFPX-217	32.768 kHz	9	-40 up to +85
830009678	CFPX-217	32.768 kHz	12.5	-40 up to +85
830069392	CFPX-218	16 MHz	10	-40 up to +85
830069395	CFPX-218	16.384 MHz	10	-40 up to +85
830069400	CFPX-218	18.432 MHz	18	-40 up to +85
830069404	CFPX-218	19.2 MHz	10	-40 up to +85
830069381	CFPX-218	20 MHz	10	-40 up to +85
830069383	CFPX-218	24 MHz	10	-40 up to +85
830069387	CFPX-218	24.576 MHz	10	-40 up to +85
830063334	CFPX-218	25 MHz	10	-40 up to +85
830050991	CFPX-218	26 MHz	10	-40 up to +85
830069405	CFPX-218	27 MHz	18	-40 up to +85
830069407	CFPX-218	30 MHz	10	-40 up to +85
830069390	CFPX-218	32 MHz	10	-40 up to +85
830003033B	HC49	1.8432 MHz	30	-10 up to +60
830003037B	HC49	2 MHz	20	0 up to +50
830003044B	HC49	2.4576 MHz	30	-10 up to +60
830003051B	HC49	3.2768 MHz	12	-10 up to +60
830003056B	HC49	3.579545 MHz	20	-10 up to +60
830003257B	HC49	3.6864 MHz	30	-10 up to +60
830003068B	HC49	4 MHz	30	-10 up to +60
830003086B	HC49	4.194304 MHz	12	-10 up to +60
830003099B	HC49	4.433619 MHz	20	-10 up to +60

# WE-XTAL

## Quartz Crystal

**NEW PRODUCTS**

Technical Data:				
Order Code	Size	f	C <sub>load</sub> (pF)	Operating Temperature (°C)
830003110B	HC49	4.9152 MHz	30	-10 up to +60
830003127B	HC49	6 MHz	30	-10 up to +60
830003134B	HC49	6.144 MHz	30	-10 up to +60
830003329B	HC49	7.3728 MHz	30	-10 up to +60
830003147B	HC49	8 MHz	30	-10 up to +60
830003277B	HC49	9.8304 MHz	30	-10 up to +60
830003164B	HC49	10 MHz	30	-10 up to +60
830003327B	HC49	11 MHz	30	-10 up to +60
830003515B	HC49	11.0592 MHz	20	-10 up to +60
830003206B	HC49	12 MHz	30	-10 up to +60
830003218B	HC49	14.7456 MHz	30	-10 up to +60
830003231B	HC49	16 MHz	30	-10 up to +60
830003298B	HC49	17.73447 MHz	30	-10 up to +60
830003174B	HC49	18.432 MHz	-	-10 up to +60
830003179B	HC49	20 MHz	-	-10 up to +60
830003177B	HC49	20 MHz	30	-10 up to +60
830003312B	HC49	22.1184 MHz	-	-10 up to +60
830003386B	HC49	24.576 MHz	30	-10 up to +60
830003342B	HC49	30 MHz	-	-10 up to +60
830024985B	HC49/4H	3.2768 MHz	12	-10 up to +60
830003063B	HC49/4H	3.579545 MHz	20	-20 up to +70
830003263B	HC49/4H	3.6864 MHz	30	-20 up to +70
830027298B	HC49/4H	4 MHz	18	-20 up to +70
830003074B	HC49/4H	4 MHz	30	-10 up to +60
830003084B	HC49/4H	4.096 MHz	30	-10 up to +60
830003093B	HC49/4H	4.194304 MHz	12	-10 up to +60
830003102B	HC49/4H	4.433619 MHz	20	-10 up to +60
830003115B	HC49/4H	4.9152 MHz	30	-20 up to +70
830003119B	HC49/4H	5 MHz	30	-10 up to +60
830003132B	HC49/4H	6 MHz	30	-10 up to +60
830003137B	HC49/4H	6.144 MHz	30	-10 up to +60
830003336B	HC49/4H	7.3728 MHz	18	-10 up to +60
830003335B	HC49/4H	7.3728 MHz	30	-10 up to +60
830003156B	HC49/4H	8 MHz	30	-20 up to +70
830003271B	HC49/4H	8.192 MHz	30	-10 up to +60
830003279B	HC49/4H	9.8304 MHz	30	-10 up to +60
830032341B	HC49/4H	10 MHz	18	-20 up to +70
830003169B	HC49/4H	10 MHz	30	-20 up to +70
830018496B	HC49/4H	11.0592 MHz	18	-20 up to +70
830003523B	HC49/4H	11.0592 MHz	30	-20 up to +70
830003215B	HC49/4H	12 MHz	30	-20 up to +70
830003286B	HC49/4H	12.288 MHz	30	-10 up to +60
830031646B	HC49/4H	13 MHz	18	-20 up to +70
830003200B	HC49/4H	14.31818 MHz	30	-20 up to +70
830003224B	HC49/4H	14.7456 MHz	30	-10 up to +60
830058383B	HC49/4H	16 MHz	20	-40 up to +85
830003240B	HC49/4H	16 MHz	30	-20 up to +70
830003176B	HC49/4H	18.432 MHz	30	-20 up to +70
830003309B	HC49/4H	19.6608 MHz	30	-10 up to +60
830003185B	HC49/4H	20 MHz	12	-20 up to +70
830003186B	HC49/4H	20 MHz	20	-10 up to +60
830003325B	HC49/4H	24 MHz	30	-10 up to +60
830014948B	HC49/4H	27.12 MHz	-	-10 up to +60
830028430	HC49/4HSMX	3.2768 MHz	18	-20 up to +70
830003058	HC49/4HSMX	3.579545 MHz	16	-10 up to +60
830003260	HC49/4HSMX	3.6864 MHz	16	-10 up to +60

# WE-XTAL

## Quartz Crystal

NEW PRODUCTS

Technical Data:				
Order Code	Size	f	C <sub>load</sub> (pF)	Operating Temperature (°C)
830030798	HC49/4HSMX	3.6864 MHz	16	-40 up to +85
830033158	HC49/4HSMX	3.6864 MHz	18	-20 up to +70
830003071	HC49/4HSMX	4 MHz	16	-10 up to +60
830024940	HC49/4HSMX	4 MHz	18	-20 up to +70
830034654	HC49/4HSMX	4 MHz	18	-20 up to +70
830011300	HC49/4HSMX	4 MHz	30	-10 up to +60
830018153	HC49/4HSMX	4.9152 MHz	16	-10 up to +60
830034439	HC49/4HSMX	4.9152 MHz	16	-20 up to +70
830028392	HC49/4HSMX	4.9152 MHz	18	-20 up to +70
830012312	HC49/4HSMX	5 MHz	30	-10 up to +60
830026900	HC49/4HSMX	6 MHz	16	-10 up to +60
830016788	HC49/4HSMX	6 MHz	30	-10 up to +60
830027527	HC49/4HSMX	7.175 MHz	16	-55 up to +105
830003334	HC49/4HSMX	7.3728 MHz	16	-10 up to +60
830010689	HC49/4HSMX	7.3728 MHz	30	-10 up to +60
830003151	HC49/4HSMX	8 MHz	16	-10 up to +60
830029914	HC49/4HSMX	8 MHz	16	-40 up to +85
830020423	HC49/4HSMX	8 MHz	18	-20 up to +70
830050510	HC49/4HSMX	8 MHz	18	-40 up to +85
830011301	HC49/4HSMX	8 MHz	30	-10 up to +60
830026902	HC49/4HSMX	8.192 MHz	16	-10 up to +60
830026904	HC49/4HSMX	9.8304 MHz	16	-10 up to +60
830003166	HC49/4HSMX	10 MHz	16	-10 up to +60
830021675	HC49/4HSMX	10 MHz	18	-20 up to +70
830017145	HC49/4HSMX	10 MHz	30	-10 up to +60
830003519	HC49/4HSMX	11.0592 MHz	16	-10 up to +60
830028928	HC49/4HSMX	11.0592 MHz	20	-20 up to +70
830003210	HC49/4HSMX	12 MHz	16	-10 up to +60
830035293	HC49/4HSMX	12 MHz	16	-40 up to +85
830033580	HC49/4HSMX	12 MHz	18	-20 up to +70
830010043	HC49/4HSMX	12 MHz	30	-10 up to +60
830026908	HC49/4HSMX	14.7456 MHz	16	-10 up to +60
830036956	HC49/4HSMX	14.7456 MHz	16	-20 up to +70
830012313	HC49/4HSMX	14.7456 MHz	30	-10 up to +60
830034122	HC49/4HSMX	16 MHz	12	-20 up to +70
830003237	HC49/4HSMX	16 MHz	16	-10 up to +60
830036034	HC49/4HSMX	16 MHz	16	-40 up to +85
830029370	HC49/4HSMX	16 MHz	18	-20 up to +70
830051235	HC49/4HSMX	16 MHz	18	-40 up to +85
830015055	HC49/4HSMX	16 MHz	20	-10 up to +60
830011263	HC49/4HSMX	16 MHz	30	-10 up to +60
830063075	HC49/4HSMX	17.2032 MHz	22	-40 up to +85
830026911	HC49/4HSMX	18.432 MHz	16	-10 up to +60
830015023	HC49/4HSMX	18.432 MHz	30	-20 up to +70
830003181	HC49/4HSMX	20 MHz	16	-10 up to +60
830034225	HC49/4HSMX	20 MHz	16	-30 up to +80
830061856	HC49/4HSMX	20 MHz	18	-20 up to +70
830020131	HC49/4HSMX	20 MHz	18	-20 up to +70
830028710	HC49/4HSMX	20 MHz	18	-40 up to +85
830017146	HC49/4HSMX	20 MHz	30	-10 up to +60
830012504	HC49/4HSMX	24 MHz	16	-10 up to +60
830026548	HC49/4HSMX	24 MHz	18	-20 up to +70
830036533	HC49/4HSMX	24 MHz	18	-40 up to +85
830003387	HC49/4HSMX	24.576 MHz	20	-10 up to +60
830010595	HC49/4HSMX	25 MHz	16	-10 up to +60
830056463	HC49/4HSMX	25 MHz	18	-40 up to +85

# WE-XTAL

## Quartz Crystal

**NEW PRODUCTS**

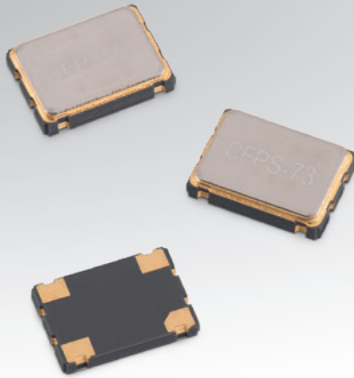
Technical Data:				
Order Code	Size	f	C <sub>load</sub> (pF)	Operating Temperature (°C)
830054555	HC49/4HSMX	25 MHz	20	-40 up to +85
830062558	IQXC-25	32.768 kHz	9	-40 up to +85
830050789	IQXC-25	32.768 kHz	12.5	-40 up to +85
830072539	IQXC-26	24 MHz	8	-20 up to +70
830066742	IQXC-26	26 MHz	8	-20 up to +70
830072541	IQXC-26	27 MHz	8	-20 up to +70
830069526	IQXC-26	32 MHz	8	-20 up to +70
830069527	IQXC-26	40 MHz	8	-20 up to +70
830069528	IQXC-26	48 MHz	8	-20 up to +70
830059585	IQXC-42	20 MHz	10	-40 up to +85
830069493	IQXC-42	24 MHz	10	-40 up to +85
830069494	IQXC-42	25 MHz	10	-40 up to +85
830059591	IQXC-42	26 MHz	10	-40 up to +85
830072543	IQXC-42	27 MHz	10	-40 up to +85
830059596	IQXC-42	30 MHz	10	-40 up to +85
830059597	IQXC-42	32 MHz	10	-40 up to +85
830059627	IQXC-42	38.4 MHz	10	-40 up to +85
830059632	IQXC-42	40 MHz	10	-40 up to +85
830072546	IQXC-42	48 MHz	10	-40 up to +85
830066431	IQXC-90	32.768 kHz	7	-40 up to +85
830066198	IQXC-90	32.768 kHz	9	-40 up to +85
830065253	IQXC-90	32.768 kHz	12.5	-40 up to +85
830014219B	WATCH	32.768 kHz	6	-40 up to +85
830002995B	WATCH	32.768 kHz	12.5	-40 up to +85
830002996B	WATCH	32.768 kHz	12.5	-40 up to +85
830002997B	WATCH	32.768 kHz	12.5	-40 up to +85
830059082	12SMX	8 MHz	10	-20 up to +70
830026380	12SMX	8 MHz	16	-20 up to +70
830026382	12SMX	11.0592 MHz	16	-20 up to +70
830026384	12SMX	12 MHz	16	-20 up to +70
830026386	12SMX	14.31818 MHz	16	-20 up to +70
830026388	12SMX	14.7456 MHz	16	-20 up to +70
830026392	12SMX	16 MHz	16	-20 up to +70
830026394	12SMX	20 MHz	16	-20 up to +70
830026396	12SMX	24.576 MHz	16	-20 up to +70
830026504	12SMX	30 MHz	16	-20 up to +70
830016178	85SMX	32.768 kHz	6	-40 up to +85
830003000	85SMX	32.768 kHz	12.5	-40 up to +85
830015822	90SMX	32.768 kHz	6	-40 up to +85
830003004	90SMX	32.768 kHz	12.5	-40 up to +85
830010193	91SMX	32.768 kHz	6	-40 up to +85
830003003	91SMX	32.768 kHz	12.5	-40 up to +85

f: Frequency; C<sub>load</sub>: Load Capacitance

# WE-SPXO

## Crystal Oscillator

NEW PRODUCTS



### Characteristics:

- Industry standard packages
- Miniature package size
- Surface mount devices (SMD)
- Hermetically sealed

### Applications:

- Consumer goods
- Industrial equipment
- Test and measurement
- Telecommunications

[www.we-online.com/WE-SPXO](http://www.we-online.com/WE-SPXO)



### Technical Data:

Order Code	Size	f (MHz)	V <sub>Supply</sub> (V)	Operating Temperature (°C)
831024978	CFPS-9	4	3.3	-40 up to +85
831024807	CFPS-9	10	3.3	-40 up to +85
831026152	CFPS-9	12	3.3	-40 up to +85
831024986	CFPS-9	24	3.3	-40 up to +85
831024880	CFPS-9	32	3.3	-40 up to +85
831026068	CFPS-9	40	3.3	-40 up to +85
831024589	CFPS-9	50	3.3	-40 up to +85
831025492	CFPS-39	12	3.3	-40 up to +85
831025493	CFPS-39	14.31818	3.3	-40 up to +85
831025494	CFPS-39	16	3.3	-40 up to +85
831025495	CFPS-39	20	3.3	-40 up to +85
831025558	CFPS-39	24	3.3	-40 up to +85
831025496	CFPS-39	24.576	3.3	-40 up to +85
831025165	CFPS-39	25	3.3	-40 up to +85
831027167	CFPS-39	26	3.3	-40 up to +85
831026368	CFPS-39	27	3.3	-40 up to +85
831025497	CFPS-39	30	3.3	-40 up to +85
831025019	CFPS-39	32	3.3	-40 up to +85
831025559	CFPS-39	40	3.3	-40 up to +85
831025166	CFPS-39	48	3.3	-40 up to +85
831025560	CFPS-39	50	3.3	-40 up to +85
831020502	CFPS-72	4	5	-40 up to +85
831018033	CFPS-72	4	5	0 up to +70
831019079	CFPS-72	8	5	0 up to +70
831017735	CFPS-72	10	5	0 up to +70
831019275	CFPS-72	16	5	-40 up to +85
831018034	CFPS-72	16	5	0 up to +70
831018032	CFPS-72	20	5	0 up to +70
831019082	CFPS-72	24	5	0 up to +70
831019083	CFPS-72	32	5	0 up to +70
831019137	CFPS-72	40	5	-40 up to +85
831018739	CFPS-72	40	5	0 up to +70
831019805	CFPS-72	48	5	-40 up to +85
831018871	CFPS-72	48	5	-40 up to +85
831019884	CFPS-72	48	5	0 up to +70
831018035	CFPS-72	50	5	0 up to +70
831009443	CFPS-72	80	5	0 up to +70
831018610	CFPS-73	3.6864	3.3	0 up to +70
831018379	CFPS-73	4	3.3	-40 up to +85
831018041	CFPS-73	4	3.3	0 up to +70
831018534	CFPS-73	6	3.3	0 up to +70



# WE-SPXO

## Crystal Oscillator

**NEW PRODUCTS**

Technical Data:				
Order Code	Size	f (MHz)	V <sub>Supply</sub> (V)	Operating Temperature (°C)
831021890	CFPS-73	8	3.3	-40 up to +85
831018045	CFPS-73	8	3.3	0 up to +70
831019928	CFPS-73	10	3.3	-40 up to +85
831018036	CFPS-73	10	3.3	0 up to +70
831018785	CFPS-73	12	3.3	-40 up to +85
831019966	CFPS-73	12	3.3	-40 up to +85
831018037	CFPS-73	12	3.3	0 up to +70
831020465	CFPS-73	12.288	3.3	0 up to +70
831020184	CFPS-73	14.31818	3.3	-40 up to +85
831018538	CFPS-73	14.31818	3.3	0 up to +70
831019710	CFPS-73	16	3.3	-40 up to +85
831018038	CFPS-73	16	3.3	0 up to +70
831020466	CFPS-73	16.384	3.3	0 up to +70
831020392	CFPS-73	18.432	3.3	-40 up to +85
831019992	CFPS-73	20	3.3	-40 up to +85
831018039	CFPS-73	20	3.3	0 up to +70
831021270	CFPS-73	24	3.3	-40 up to +85
831018541	CFPS-73	24	3.3	0 up to +70
831019170	CFPS-73	25	3.3	-40 up to +85
831018077	CFPS-73	25	3.3	0 up to +70
831018040	CFPS-73	32	3.3	0 up to +70
831019203	CFPS-73	32.768	3.3	0 up to +70
831019870	CFPS-73	40	3.3	-40 up to +85
831017885	CFPS-73	40	3.3	-40 up to +85
831018042	CFPS-73	40	3.3	0 up to +70
831018287	CFPS-73	48	3.3	-40 up to +85
831018577	CFPS-73	48	3.3	-40 up to +85
831018043	CFPS-73	48	3.3	0 up to +70
831019987	CFPS-73	50	3.3	-40 up to +85
831018044	CFPS-73	50	3.3	0 up to +70
831018545	CFPS-73	60	3.3	0 up to +70
831009441	CFPS-73	80	3.3	0 up to +70
831022731	CFPS-73	100	3.3	-40 up to +85
831009437	CFPS-73	100	3.3	0 up to +70
831022825	CFPS-73	125	3.3	-40 up to +85
831009440	CFPS-73	125	3.3	0 up to +70
831068242	IQXO-540	8	3.3	-40 up to +85
831054046	IQXO-540	10	3.3	-40 up to +85
831056237	IQXO-540	12	3.3	-40 up to +85
831056238	IQXO-540	13	3.3	-40 up to +85
831066629	IQXO-540	16	3.3	-40 up to +85
831056239	IQXO-540	19.2	3.3	-40 up to +85
831056240	IQXO-540	19.44	3.3	-40 up to +85
831056241	IQXO-540	20	3.3	-40 up to +85
831056242	IQXO-540	24	3.3	-40 up to +85
831056243	IQXO-540	24.576	3.3	-40 up to +85
831056244	IQXO-540	25	3.3	-40 up to +85
831056245	IQXO-540	26	3.3	-40 up to +85
831056246	IQXO-540	27	3.3	-40 up to +85
831068248	IQXO-540	32	3.3	-40 up to +85
831068250	IQXO-540	38.4	3.3	-40 up to +85
831056247	IQXO-540	40	3.3	-40 up to +85
831056248	IQXO-540	48	3.3	-40 up to +85
831056249	IQXO-540	50	3.3	-40 up to +85
831056168	IQXO-542	12	1.8	-40 up to +85
831056169	IQXO-542	13	1.8	-40 up to +85

# WE-SPXO

## Crystal Oscillator

NEW PRODUCTS

**Technical Data:**

Order Code	Size	f (MHz)	V <sub>Supply</sub> (V)	Operating Temperature (°C)
831056188	IQXO-542	19.2	1.8	-40 up to +85
831056214	IQXO-542	19.44	1.8	-40 up to +85
831056215	IQXO-542	20	1.8	-40 up to +85
831056216	IQXO-542	24	1.8	-40 up to +85
831056217	IQXO-542	24.576	1.8	-40 up to +85
831056218	IQXO-542	25	1.8	-40 up to +85
831056219	IQXO-542	26	1.8	-40 up to +85
831056220	IQXO-542	27	1.8	-40 up to +85
831056221	IQXO-542	40	1.8	-40 up to +85
831056222	IQXO-542	48	1.8	-40 up to +85
831056223	IQXO-542	50	1.8	-40 up to +85
831072801	IQXO-791	8	3.3	-40 up to +85
831061624	IQXO-791	10	3.3	-40 up to +85
831056289	IQXO-791	12	3.3	-40 up to +85
831056290	IQXO-791	13	3.3	-40 up to +85
831066657	IQXO-791	16	3.3	-40 up to +85
831056293	IQXO-791	20	3.3	-40 up to +85
831056294	IQXO-791	24	3.3	-40 up to +85
831056295	IQXO-791	24.576	3.3	-40 up to +85
831056296	IQXO-791	25	3.3	-40 up to +85
831056297	IQXO-791	26	3.3	-40 up to +85
831056298	IQXO-791	27	3.3	-40 up to +85
831056299	IQXO-791	40	3.3	-40 up to +85
831056300	IQXO-791	48	3.3	-40 up to +85
831056301	IQXO-791	50	3.3	-40 up to +85
831056262	IQXO-794	12	1.8	-40 up to +85
831056263	IQXO-794	13	1.8	-40 up to +85
831066658	IQXO-794	16	1.8	-40 up to +85
831056264	IQXO-794	19.2	1.8	-40 up to +85
831056266	IQXO-794	20	1.8	-40 up to +85
831056267	IQXO-794	24	1.8	-40 up to +85
831056268	IQXO-794	24.576	1.8	-40 up to +85
831056269	IQXO-794	25	1.8	-40 up to +85
831056270	IQXO-794	26	1.8	-40 up to +85
831056271	IQXO-794	27	1.8	-40 up to +85
831056272	IQXO-794	40	1.8	-40 up to +85
831056273	IQXO-794	48	1.8	-40 up to +85
831056274	IQXO-794	50	1.8	-40 up to +85

f: Frequency; V<sub>Supply</sub>: Supply Voltage

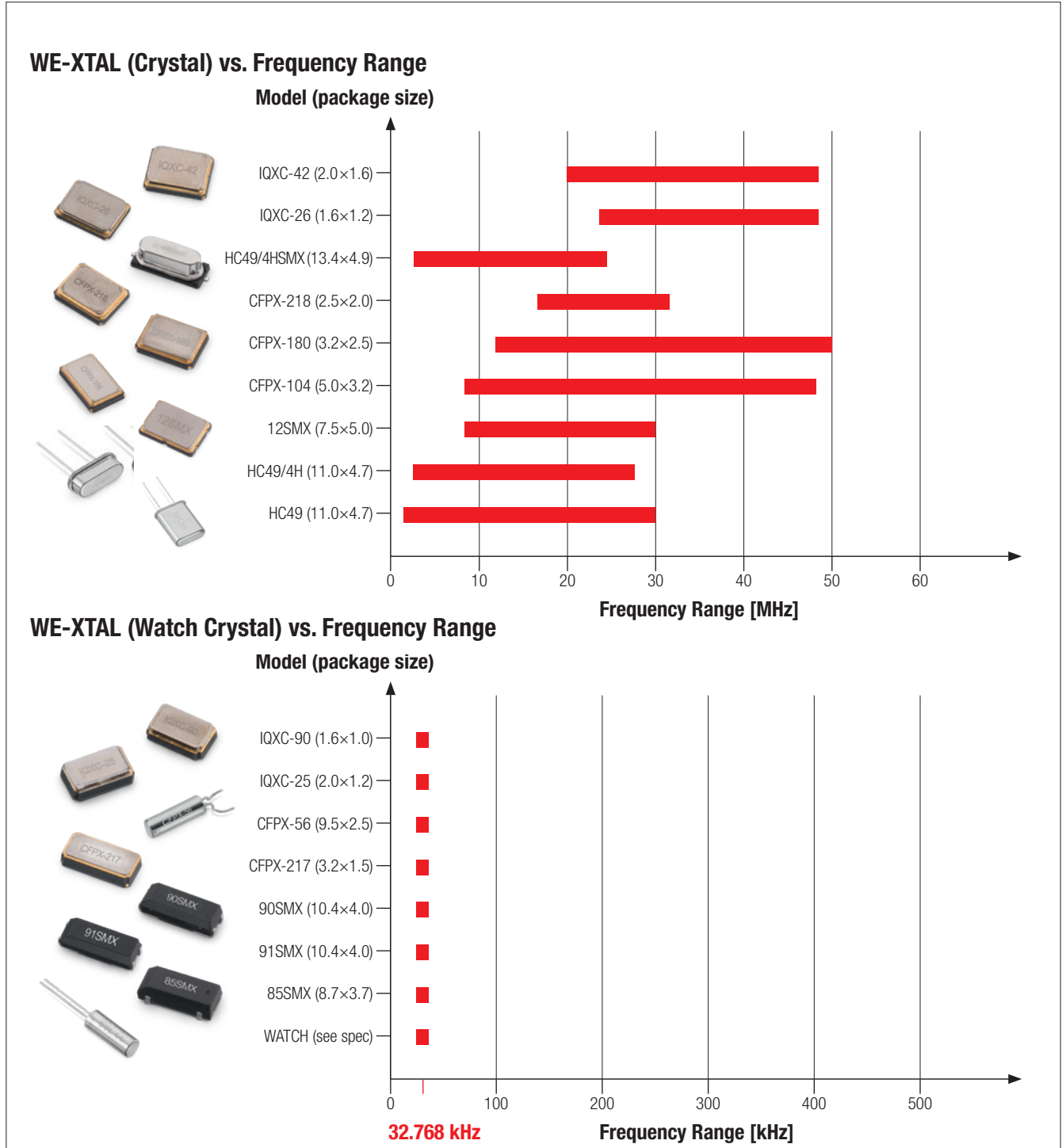
# Design Kits



Product Category	Design Kit	Order Code	Lifelong Refill
Quartz & Oscillators	WE-XTAL; 32.768 kHz Watch Crystals	830001	✓
	WE-XTAL; Surface Mount Ceramic Package Quartz Crystals	830002	✓
	WE-XTAL; Through Hole and Surface Mount Metal Can Quartz Crystals	830003	✓

# Quartz crystals

## Model vs. Frequency



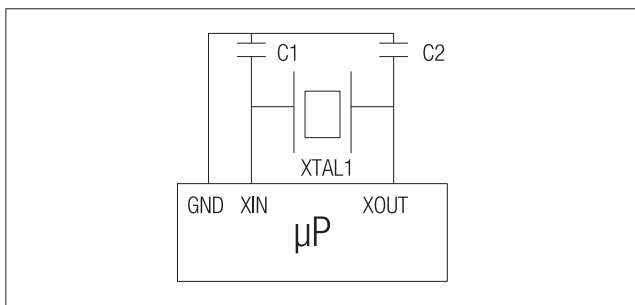
## Crystal Specification

- Frequency [kHz or MHz]
- Package Size (model and dimension)
- Tolerance [ppm] – The frequency accuracy at 25 °C
- Stability [ppm]\* – The frequency change over operating temperature
- Operating Temperature Range [°C]\*
- Circuit load condition  $C_{Load}$  [pF]
  - For Capacitive load ( $C_{Load}$ ) value the stray PCB capacitance and the IC pin capacitance should be considered.
  - Full CL value must match that of the crystal specification
  - $CL = (C1 * C2) / (C1 + C2) + C_{stray}$
  - $C_{stray} = \mu P \text{ pin stray} + PCB \text{ Stray} \approx 3 \text{ pF to } 6 \text{ pF}$

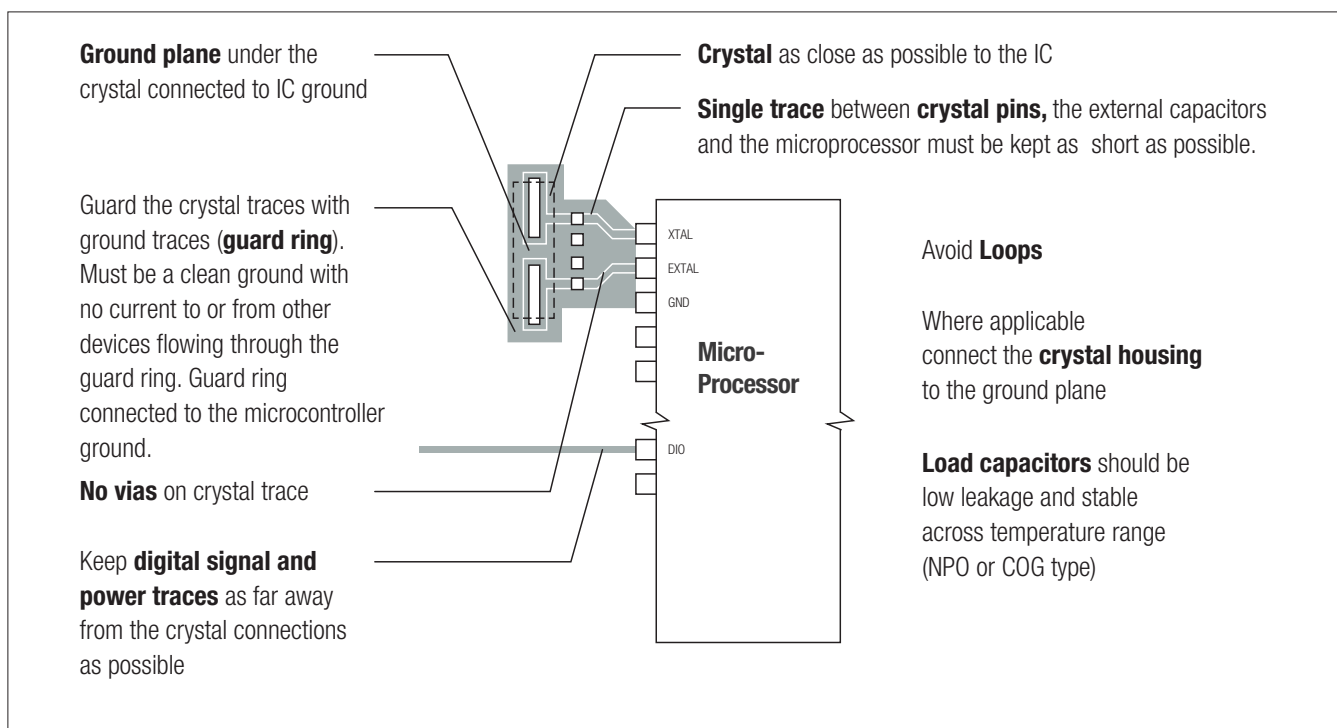
\* Not relevant for watch crystal.



## Capacitive Load



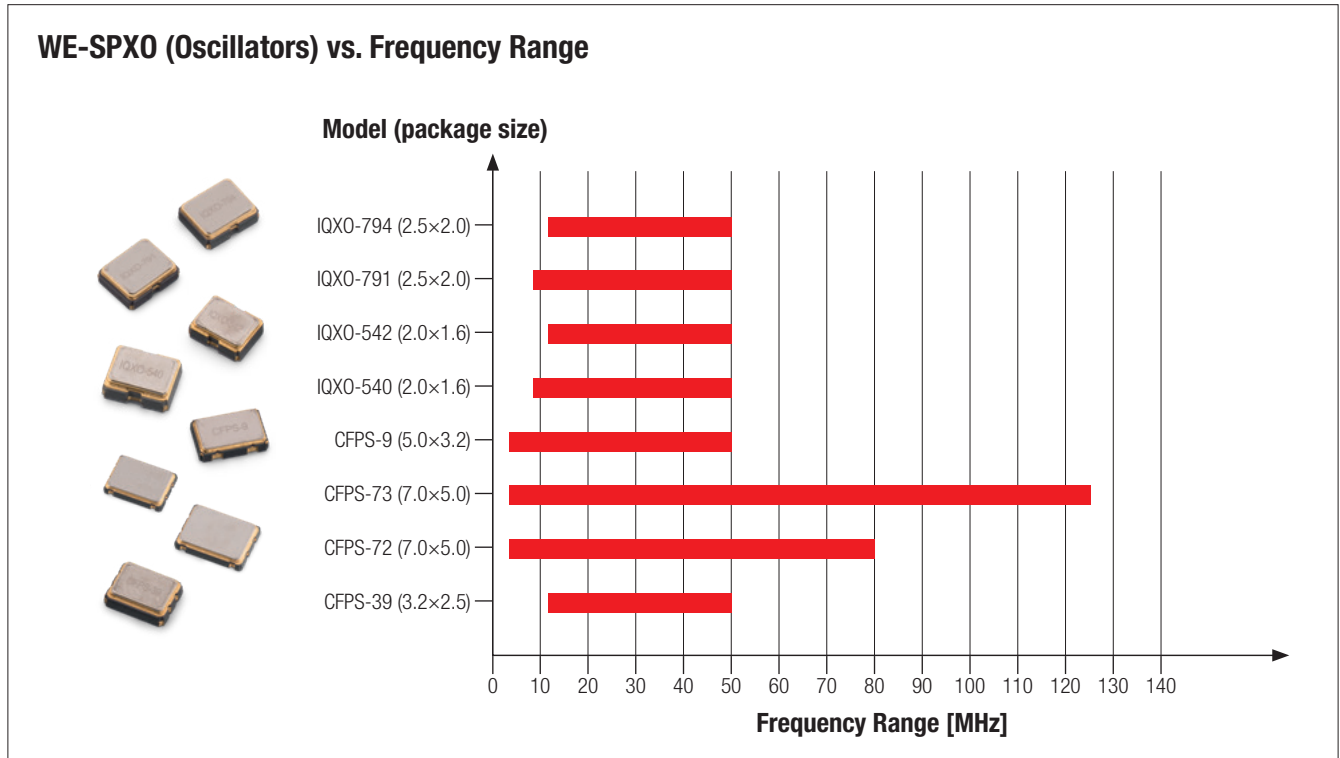
## PCB Layout Design Considerations





# Oscillators

## Model vs. Frequency

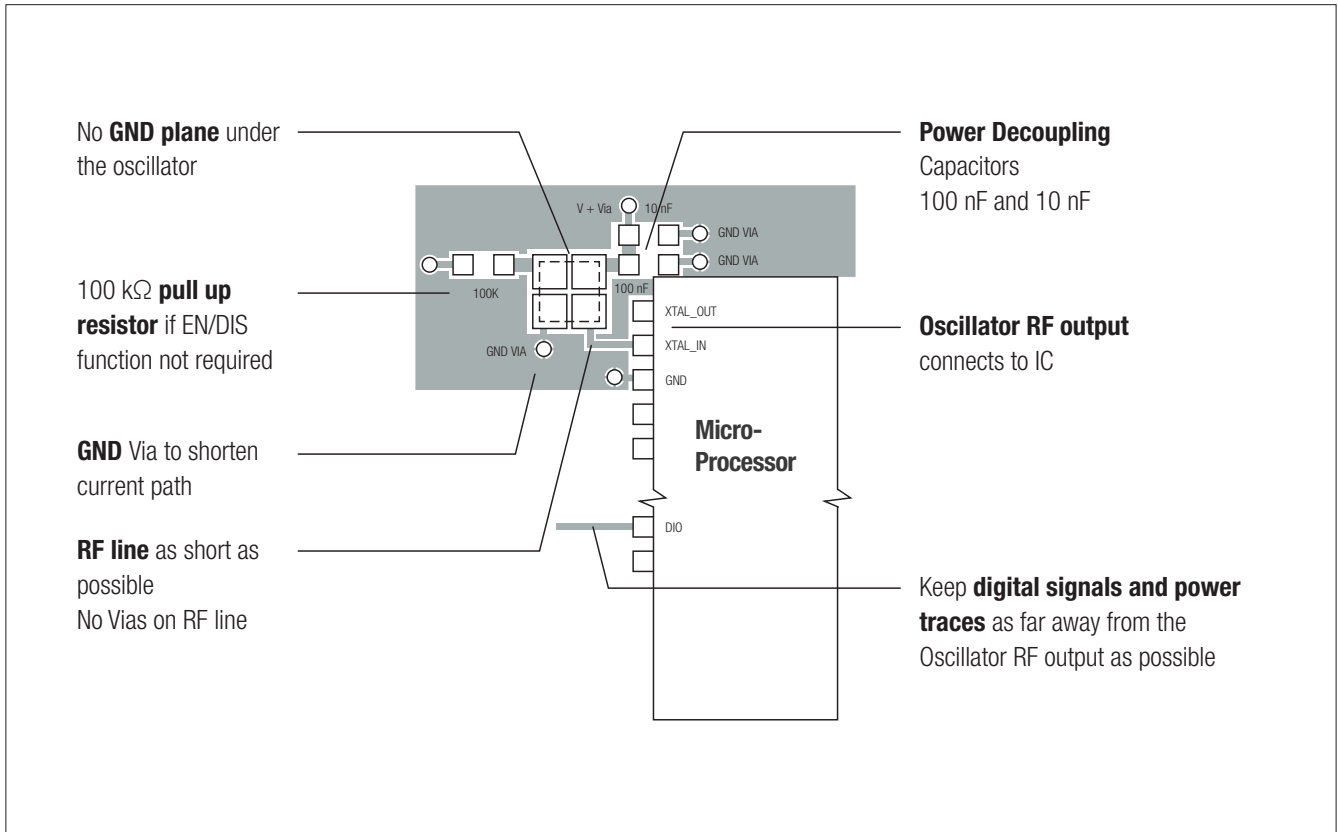


## Oscillator Specification

- Frequency [MHz or kHz]
- Package Size (model and dimension)
- Stability [ppm] – The frequency change over operating temperature
- Supply Voltage [V]
- Output level (CMOS, TTL, LVPECL, LVDS)
- Operating Temperature Range [°C]

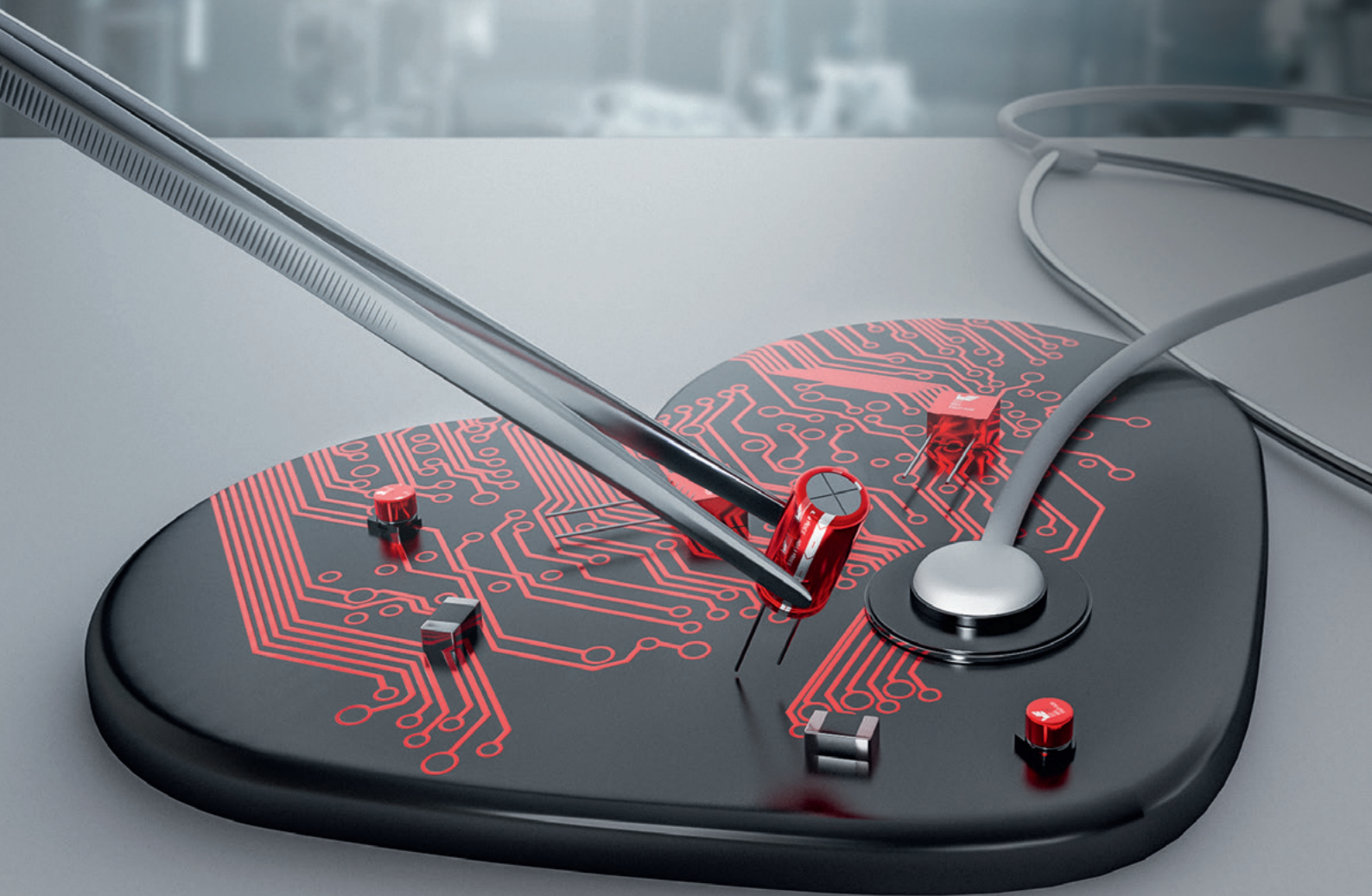


## PCB Layout Design Considerations



# 1 PASSIVE COMPONENTS

## Capacitors



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# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WCAP-ATG8



## Electrolytic Capacitors

### Aluminum Electrolytic Capacitors

#### Radial THT



**WCAP-ATG8**  
General Purpose 85 °C  
C: 0.1 – 33000 µF  
U<sub>R</sub>: 10 – 400 V (DC)  
Temp.: -40 °C or -25 °C up to +85 °C  
Endurance: 2000 h



**WCAP-ATG5**  
General Purpose 105 °C  
C: 0.1 – 18000 µF  
U<sub>R</sub>: 10 – 400 V (DC)  
Temp.: -40 °C or -25 °C up to +105 °C  
Endurance: 2000 h



**WCAP-AT1H**  
Long Life  
C: 6.8 – 3300 µF  
U<sub>R</sub>: 10 – 450 V (DC)  
Temp.: -40 °C or -25 °C up to +105 °C  
Endurance: 5000 – 10000 h



**WCAP-ATET**  
High Temperature 125 °C  
C: 0.47 – 1000 µF  
U<sub>R</sub>: 10 – 350 V (DC)  
Temp.: -40 °C or -25 °C up to +125 °C  
Endurance: 1000 – 2000 h



**WCAP-ATLI**  
Low Impedance  
C: 10 – 6800 µF  
U<sub>R</sub>: 10 – 63 V (DC)  
Temp.: -55 °C up to +105 °C  
Endurance: 2000 – 5000 h



**WCAP-ATUL**  
Low Leakage & Long Life  
C: 22 – 4700 µF  
U<sub>R</sub>: 10 – 100 V (DC)  
Temp.: -40 °C up to +105 °C  
Endurance: 4000 – 10000 h



**WCAP-ATLL**  
Long Life  
C: 0.47 – 6800 µF  
U<sub>R</sub>: 10 – 50 V (DC)  
Temp.: -55 °C up to +105 °C  
Endurance: 3000 – 10000 h

#### V-Chip SMT



**WCAP-ASLI**  
Low Impedance  
C: 0.1 – 6800 µF  
U<sub>R</sub>: 6.3 – 100 V (DC)  
Temp.: -55 °C up to +105 °C  
Endurance: 2000 h



**WCAP-ASLL**  
Low Impedance & Long Life  
C: 1.0 – 6800 µF  
U<sub>R</sub>: 6.3 – 450 V (DC)  
Temp.: -55 °C or -40 °C up to +105 °C  
Endurance: 2000 – 5000 h

EXTENDED



**WCAP-ASLU**  
Low Leakage Current  
C: 0.1 – 330 µF  
U<sub>R</sub>: 6.3 – 63 V (DC)  
Temp.: -40 °C up to +85 °C  
Endurance: 1000 – 2000 h



**WCAP-ASNP**  
Non-Polar  
C: 0.1 – 560 µF  
U<sub>R</sub>: 6.3 – 50 V (DC)  
Temp.: -40 °C up to +85 °C  
Endurance: 2000 h



**WCAP-ASSH**  
Long Life  
C: 0.1 – 1000 µF  
U<sub>R</sub>: 6.3 – 50 V (DC)  
Temp.: -40 °C up to +105 °C  
Endurance: 5000 h

#### Snap-In



**WCAP-AIG8**  
General Purpose 85 °C  
C: 47 – 6800 µF  
U<sub>R</sub>: 63 – 450 V (DC)  
Temp.: -40 °C or -25 °C up to +85 °C  
Endurance: 2000 h



**WCAP-AIE8**  
Long Life  
C: 68 – 6800 µF  
U<sub>R</sub>: 63 – 450 V (DC)  
Temp.: -40 °C or -25 °C up to +85 °C  
Endurance: 3000 h



**WCAP-AIG5**  
General Purpose 105 °C  
C: 33 – 10000 µF  
U<sub>R</sub>: 63 – 450 V (DC)  
Temp.: -40 °C or -25 °C up to +105 °C  
Endurance: 2000 h



**WCAP-AI3H**  
Long Life  
C: 68 – 10000 µF  
U<sub>R</sub>: 63 – 450 V (DC)  
Temp.: -40 °C or -25 °C up to +105 °C  
Endurance: 3000 h



# Product Overview

## Electrolytic Capacitors

### Aluminum Polymer Capacitors

#### Radial THT



**WCAP-PTG5**  
General Purpose 105 °C

C: 39 – 2000 µF  
 U<sub>R</sub>: 6.3 – 25 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h



**WCAP-PTHR**  
Low ESR & High Voltage

C: 10 – 150 µF  
 U<sub>R</sub>: 35 – 100 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h



**WCAP-PTHT**  
High Temperature 125 °C

C: 22 – 2000 µF  
 U<sub>R</sub>: 6.3 – 50 V (DC)  
 Temp.: -55 °C up to +125 °C  
 Endurance: 2000 h



**WCAP-PT5H**  
Long Life

C: 22 – 2000 µF  
 U<sub>R</sub>: 6.3 – 35 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 5000 h

#### V-Chip SMT



**WCAP-PSLC**  
Large Capacitance

C: 10 – 2000 µF  
 U<sub>R</sub>: 6.3 – 100 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h



**WCAP-PSLP**  
Low Profile

C: 4.7 – 390 µF  
 U<sub>R</sub>: 6.3 – 100 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h



**WCAP-PSHP**  
High Ripple Current

C: 6.8 – 1200 µF  
 U<sub>R</sub>: 6.3 – 100 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 – 5000 h

#### H-Chip SMT

NEW



**WCAP-PHGP**  
General Purpose

C: 15 – 560 µF  
 U<sub>R</sub>: 2 – 35 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h

NEW



**WCAP-PHET**  
High Temperature 125 °C

C: 15 – 100 µF  
 U<sub>R</sub>: 10 – 25 V (DC)  
 Temp.: -55 °C up to +125 °C  
 Endurance: 1000 h

NEW



**WCAP-PHLE**  
Low ESR

C: 100 – 560 µF  
 U<sub>R</sub>: 2 – 6.3 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h

NEW



**WCAP-PHSE**  
Super Low ESR

C: 330 – 560 µF  
 U<sub>R</sub>: 2 – 2.5 V (DC)  
 Temp.: -55 °C up to +105 °C  
 Endurance: 2000 h

## MLCC – Multilayer Ceramic Chip Capacitors

#### SMT-Chip



**WCAP-CSGP**  
General Purpose

C: 0.5 pF – 100 µF  
 U<sub>R</sub>: 6.3 – 100 V (DC)  
 Ceramic: NPO, X7R, X5R



**WCAP-CSMH**  
Mid and High Voltage

C: 10 pF – 470 nF  
 U<sub>R</sub>: 200 – 3.000 V (DC)  
 Ceramic: NPO, X7R

NEW



**WCAP-CSRF**  
High Frequency

C: 0.2 pF – 33 pF  
 U<sub>R</sub>: 25 – 50 V (DC)  
 Ceramic: NPO

NEW



**WCAP-CSST**  
Soft Termination

C: 220 pF – 2.2 µF  
 U<sub>R</sub>: 16 – 2.000 V (DC)  
 Ceramic: X7R

## DC Film Capacitors

#### Boxed THT



**WCAP-FTBP**  
Boxed Type Metallized Polypropylene

C: 33 nF – 6.8 µF  
 U<sub>R</sub>: 160 – 630 V (DC)  
 Pitch: 7.5 / 10.0 / 15.0 / 22.5 / 27.5 mm  
 Dielectric: Polypropylene



**WCAP-FTBE**  
Boxed Type Metallized Polyester

C: 10 nF – 6.8 µF  
 U<sub>R</sub>: 100 – 1.000 V (DC)  
 Pitch: 7.5 / 10.0 / 15.0 / 22.5 / 27.5 / 37.5 mm  
 Dielectric: Polyester

## Safety Capacitors (X/Y)

#### Film Capacitors

##### Boxed THT



**WCAP-FTXX**  
X2-Capacitors

C: 5.6 nF – 6.8 µF  
 U<sub>R</sub>: 310 V (AC)  
 Pitch: 7.5 / 10.0 / 12.5 / 15.0 / 22.5 / 27.5 / 37.5 mm  
 Safety class: X2



**WCAP-FTX2**  
X2-Capacitors

C: 5.6 nF – 6.8 µF  
 U<sub>R</sub>: 275 V (AC)  
 Pitch: 7.5 / 10.0 / 12.5 / 15.0 / 22.5 / 27.5 / 37.5 mm  
 Safety class: X2

## Supercapacitors (EDLCs)

#### Radial THT



**WCAP-STSC**  
Standard Cylindrical

C: 3 – 50 F  
 U<sub>R</sub>: 2.7 V (DC)  
 Temp.: -40 °C up to +65 °C

#### MLCC

#### SMT-Chip



**WCAP-CSSA**  
Safety Capacitors

C: 33 pF – 4.7 nF  
 U<sub>R</sub>: 250 V (AC)  
 Ceramic: NPO, X7R  
 Safety class: X1/Y2, X2





All Capacitors at a glance  
[www.we-online.com/capacitors](http://www.we-online.com/capacitors)



Explore our Application Notes for Capacitors:  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)



Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics  
[www.we-online.com/library](http://www.we-online.com/library)

# WCAP-ASLU

## Aluminum Electrolytic Capacitors

NEW PRODUCTS



Low Leakage Current +85°C

### Characteristics:

- Aluminum Electrolytic Capacitor
- Recommended Soldering: Reflow
- Operating Temperature: - 40°C\* up to 85°C\*\*
- Low Leakage Current Product Series
- Endurance: 1000 up to 2000h @ +85°C\*\*\*
- Capacitance Tolerance: ± 20%
- Small Size

### Applications:

- Miniaturization of DC/DC SMPS
- Input and output capacitor
- Filter application

[www.we-online.com/WCAP-ASLU](http://www.we-online.com/WCAP-ASLU)



### V-Chip SMT

#### Technical Data:

Order Code	C (µF)	U <sub>R</sub> (V (DC))	I <sub>RIPPLE</sub> (mA)	DF (%)	I <sub>Leak</sub> (µA)	Endurance (h)	Ø D (mm)	L (mm)
865090668014#	0.1	50	1	12	3	2000	3	5.5
865090768002#	0.1	63	1	12				
865090668015#	0.22	50	2	12				
865090768003#	0.22	63	2	12				
865090668016#	0.33	50	2	12				
865090768004#	0.33	63	2	12				
865090768005#	0.47	63	3	12				
865090468010#	3.3	25	11	16				
865090468011	4.7	25	15	16				
865090268009#	10	10	18	22				
865090368008	10	16	20	18				
865090168010	22	6.3	25	26				

C: Capacitance; U<sub>R</sub>: Rated Voltage; I<sub>RIPPLE</sub>: Ripple Current; DF: Dissipation Factor; I<sub>Leak</sub>: Leakage Current; Ø D: Diameter; L: Length

\* It is recommended that the temperature of the part does not exceed less than -40 °C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\* It is recommended that the temperature of the part does not exceed more than +85 °C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*\* Maximum ripple current applied.

# Available on request.

# WCAP-PHGP

## Aluminum Polymer Capacitors



General Purpose +105°C

### Characteristics:

- H-Chip Aluminum Polymer Capacitor
- Recommended Soldering: Reflow
- Operating Temperature: -55°C\* up to +105°C\*\*
- Capacitance Tolerance: ±20%
- Endurance: 2000h @ +105°C\*\*\*
- High ripple current capability
- Low Profile

### Applications:

- Noise suppression
- Input and output capacitor for DC/DC converter
- USB Charger, Smart Meter, Power Banks

[www.we-online.com/WCAP-PHGP](http://www.we-online.com/WCAP-PHGP)



NEW PRODUCTS

### H-Chip SMT

#### Technical Data:

Order Code	C (µF)	U <sub>R</sub> (V (DC))	I <sub>RIPPLE</sub> (mA)	DF (%)	R <sub>ESR</sub> (mΩ)	I <sub>Leak</sub> (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875015619003	15	35	3200	6	40	157.5	2000	7.3	4.3	1.9
875015319003	22	16	3200		40	105.6				
875015519003	22	25	3200		40	165				
875015619004	22	35	3200		40	231				
875015519004	33	25	3200		40	247.5				
875015319004	47	16	3200		40	225.6				
875015119003	100	6.3	5100		15	63				
875015119004	150	6.3	5100		15	94.5				
875015019003	180	4	5600		12	72				
875015119005	180	6.3	5100		12	113.4				
875015019004	220	4	5600		12	88				
875015119006	220	6.3	5100		15	138.6				
875016219004	330	2	5600		12	66				
875016319002	330	2.5	5100		15	82.5				
875015019005	330	4	5100		15	132				
875016219005	390	2	5100		15	78				
875016319003	390	2.5	5100		15	97.5				
875016219006	470	2	5100		15	94				
875016319004	470	2.5	5100		15	117.5				
875016219007	560	2	5100		15	112				

C: Capacitance; U<sub>R</sub>: Rated Voltage; I<sub>RIPPLE</sub>: Ripple Current; DF: Dissipation Factor; R<sub>ESR</sub>: ESR; I<sub>Leak</sub>: Leakage Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +105°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

\*\*\* Maximum ripple current applied.

# WCAP-PHET

## Aluminum Polymer Capacitors

NEW PRODUCTS



Extended Temperature +125°C

### Characteristics:

- H-Chip Aluminum Polymer Capacitor
- Recommended Soldering: Reflow
- Operating Temperature: -55°C\* up to +125°C\*\*
- Capacitance Tolerance: ±20%
- Endurance: 1000h @ +125°C\*\*\*
- High ripple current capability
- Low Profile

### Applications:

- Noise suppression
- Input and output capacitor for DC/DC Converter
- USB Charger, Smart Meter, Power Bank
- High Temperature Applications

[www.we-online.com/WCAP-PHET](http://www.we-online.com/WCAP-PHET)



### H-Chip SMT

#### Technical Data:

Order Code	C (µF)	U <sub>R</sub> (V (DC))	I <sub>RIPPLE</sub> (mA)	DF (%)	R <sub>ESR</sub> (mΩ)	I <sub>Leak</sub> (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875135519001	15	25	3200	10	40	112.5	1000	7.3	4.3	1.9
875135319002	22	16				105.6				
875135519002	22	25				165				
875135219001	47	10				141				
875135319004	47	16				225.6				
875135219003	100	10				300				

C: Capacitance; U<sub>R</sub>: Rated Voltage; I<sub>RIPPLE</sub>: Ripple Current; DF: Dissipation Factor; R<sub>ESR</sub>: ESR; I<sub>Leak</sub>: Leakage Current; L: Length; W: Width; H: Height

# WCAP-PHSE

## Aluminum Polymer Capacitors



Super Low ESR +105°C

### Characteristics:

- H-Chip Aluminum Polymer Capacitor
- Recommended Soldering: Reflow
- Operating Temperature: -55°C\* up to +105°C\*\*
- Capacitance Tolerance: ±20%
- Endurance: 2000h @ +105°C\*\*\*
- High ripple current capability
- Low Profile

### Applications:

- Noise suppression
- Input and output capacitor for DC/DC Converter
- USB Charger, Smart Meter, Power Bank
- Communication infrastructure, Server, Mainboards

[www.we-online.com/WCAP-PHSE](http://www.we-online.com/WCAP-PHSE)



### H-Chip SMT

#### Technical Data:

Order Code	C (µF)	U <sub>R</sub> (V (DC))	I <sub>RIPPLE</sub> (mA)	DF (%)	R <sub>ESR</sub> (mΩ)	I <sub>Leak</sub> (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875046219001	330	2	10200	6	3	66	2000	7.3	4.3	1.9
875046219002	470	2				94				
875046319001	470	2.5				117.5				
875046219003	560	2				112				

C: Capacitance; U<sub>R</sub>: Rated Voltage; I<sub>RIPPLE</sub>: Ripple Current; DF: Dissipation Factor; R<sub>ESR</sub>: ESR; I<sub>Leak</sub>: Leakage Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +105°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*\* Maximum ripple current applied.

# WCAP-PHLE

## Aluminum Polymer Capacitors



Low ESR +105°C

### Characteristics:

- H-Chip Aluminum Polymer Capacitor
- Recommended Soldering: Reflow
- Operating Temperature: -55°C\* up to +105°C\*\*
- Capacitance Tolerance: ±20%
- Endurance: 2000h @ +105°C\*\*\*
- High ripple current capability
- Low Profile

### Applications:

- Noise suppression
- Input and output capacitor for DC/DC Converter
- USB Charger, Smart Meter, Power Bank
- Server, SSD

[www.we-online.com/WCAP-PHLE](http://www.we-online.com/WCAP-PHLE)

NEW PRODUCTS

### H-Chip SMT

Technical Data:										
Order Code	C (µF)	U <sub>R</sub> (V (DC))	I <sub>RIPPLE</sub> (mA)	DF (%)	R <sub>ESR</sub> (mΩ)	I <sub>Leak</sub> (µA)	Endurance (h)	L (mm)	W (mm)	H (mm)
875035019001	100	4	6300	6	9	40	2000	7.3	4.3	1.9
875035019002	180	4	6300		9	72				
875035119002	180	6.3	6300		9	113.4				
875035019003	220	4	6300		9	88				
875036219012	330	2	8500		4.5	66				
875036319012	330	2.5	8500		4.5	82.5				
875036219015	390	2	8500		4.5	78				
875036319015	390	2.5	8500		4.5	97.5				
875036219018	470	2	8500		4.5	94				
875036319018	470	2.5	8500		4.5	117.5				
875036219019	560	2	8500		4.5	112				

C: Capacitance; U<sub>R</sub>: Rated Voltage; I<sub>RIPPLE</sub>: Ripple Current; DF: Dissipation Factor; R<sub>ESR</sub>: ESR; I<sub>Leak</sub>: Leakage Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +105°C under worst case operating conditions. Temperature of the part should be verified in the final application.

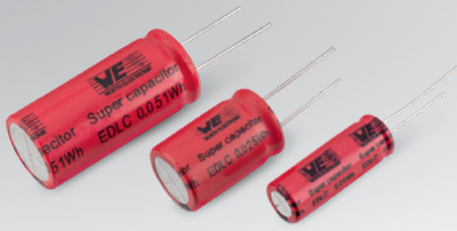
\*\*\* Maximum ripple current applied.



# WCAP-STSC

## Supercapacitors (EDLCs)

NEW PRODUCTS



### Characteristics:

- Electric Double Layer Capacitor
- Operating Temperature: -40°C up to +65 °C
- Capacitance Range: 3 F - 50 F
- Rated Voltage: 2.7 V(DC)

### Applications:

- Memory Backup
- Smart Meters
- Network Equipment
- UPS systems
- Power Assist
- Energy Harvesting

Standard Cylindrical +65°C

### Radial THT

#### Technical Data:

Order Code	C (F)	U <sub>R</sub> (V (DC))	R <sub>ESR DC</sub> (mΩ)	R <sub>ESR AC</sub> (mΩ)	I <sub>Leak</sub> (mA)	I <sub>Max</sub> (A)	I <sub>Rated</sub> (A)	P (kW/kg)	E (Wh/kg)	Endurance (Cycles)	Ø D (mm)	L (mm)	P (mm)
850617030001	3	2.7	70	60	0.008	3.3	0.7	18.08	2.1	500000	8	20	3.5
850617021001	5		50	40	0.012	5.4	1.29	17.35	2.41		10	20	5
850617021002	7		45	35	0.02	7.1	1.7	18.92	3.3		10	20	5
850617021004	10		35	30	0.03	10	2.5	19.1	3.7		10	25	5
850617021005	15		33	30	0.06	13.5	3.6	12.27	3.3		13	25	5
850617022001	25		25	20	0.068	20.7	6	10.72	3.7		16	25	7.5
850617022002	50		20	15	0.105	33.7	11.2	8.13	4.5		18	40	7.5

C: Capacitance; U<sub>R</sub>: Rated Voltage; R<sub>ESR DC</sub>: DC ESR; R<sub>ESR AC</sub>: AC ESR; I<sub>Leak</sub>: Leakage Current; I<sub>Max</sub>: Max. Discharge Current; I<sub>Rated</sub>: Rated Discharge Current; P: Power Density; E: Energy Density; Ø D: Diameter; L: Length

[www.we-online.com/WCAP-STSC](http://www.we-online.com/WCAP-STSC)



# WCAP-CSRF

## High Frequency



### Characteristics:

- Multilayer Ceramic Chip Capacitor
- Recommended soldering: Reflow
- Operating temperature: -55°C up to +125 °C
- Capacitance range: 0.2 pF - 33 pF
- Rated voltage: 25 V(DC) and 50 V(DC)
- Size: 0201 and 0402
- High frequency
- Class I NPO

### Applications:

- High frequency applications
- Antenna matching

NEW PRODUCTS

[www.we-online.com/WCAP-CSRF](http://www.we-online.com/WCAP-CSRF)



### Size 0201

#### Technical Data:

Order Code	C (pF)	Tol. C	U <sub>R</sub> (V (DC))	Q-Factor	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885392004001	0.2	±0.05pF	25	404	10	0.6	0.3	0.3
885392004002	1	±0.1pF		420				
885392004003	1.2	±0.1pF		424				
885392004004	1.5	±0.1pF		430				
885392004005	2.2	±0.1pF		444				
885392004006	2.7	±0.1pF		454				
885392004007	3.3	±0.1pF		466				
885392004008	4.7	±0.25pF		494				
885392004009	5.6	±0.25pF		512				
885392004010	9	±0.5pF		580				
885392004011	33	±5%		1000				

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

### Size 0402

#### Technical Data:

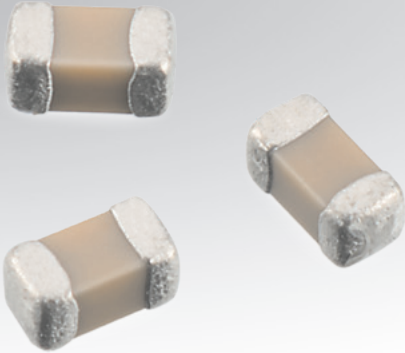
Order Code	C (pF)	Tol. C	U <sub>R</sub> (V (DC))	Q-Factor	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885392005001	0.3	±0.1pF	50	406	10	1	0.5	0.5
885392005002	0.4	±0.05pF		408				
885392005003	0.4	±0.1pF		408				
885392005004	0.5	±0.05pF		410				
885392005005	1	±0.05pF		420				
885392005006	1	±0.1pF		420				
885392005007	1.5	±0.1pF		430				
885392005008	1.8	±0.1pF		436				
885392005009	2.3	±0.05pF		446				
885392005010	3	±0.1pF		460				
885392005011	3.3	±0.1pF		466				
885392005012	4.7	±0.1pF		494				
885392005013	5.6	±0.1pF		512				
885392005014	9	±0.25pF		580				

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

# WCAP-CSST

## Soft Termination

NEW PRODUCTS



### Characteristics:

- Multilayer Ceramic Chip Capacitor
- Recommended soldering: Reflow
- Operating temperature: -55°C up to +125 °C
- Capacitance range: 220 pF - 2.2 μF
- Rated voltage: 16 V(DC) to 2 kV(DC)
- Size: 0603, 0805, 1206 and 1210
- High absorption of mechanical stress

### Applications:

- Application with high mechanical stress
- Power supply
- Lighting application

### Size 0603

#### Technical Data:

Order Code	C	Tol. C	U <sub>R</sub> (V (DC))	DF (%)	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885382206005	1 nF	±10%	200	2.5	10	1.6	0.8	0.8
885382206002	10 nF		50	2.5	10			
885382206003	22 nF		50	2.5	10			
885382206004	100 nF		50	3	5			
885382206001	220 pF		50	2.5	10			

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; DF: Dissipation Factor; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

### Size 0805

#### Technical Data:

Order Code	C	Tol. C	U <sub>R</sub> (V (DC))	DF (%)	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885382207001	1 μF	±10%	16	5	0.5	2	1.25	1.25
885382207003	1 μF		25	5	0.5			
885382207004	1 nF		50	2.5	10			
885382207005	2.2 nF		50	2.5	10			
885382207006	10 nF		50	2.5	10			
885382207009	10 nF		100	2.5	10			
885382207007	100 nF		50	2.5	5			
885382207008	220 nF		50	3	2.3			
885382207010	270 pF		500	2.5	10			
885382207002	330 nF		25	3.5	1.5			

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; DF: Dissipation Factor; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

# WCAP-CSST

## Soft Termination

Size 1206

NEW PRODUCTS

Technical Data:								
Order Code	C	Tol. C	U <sub>R</sub> (V (DC))	DF (%)	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885382208005	1 μF	±10%	50	3	0.5	3.2	1.6	1.6
885382208001	2.2 μF		25	3.5	0.2			1.6
885382208012	4.7 nF		1000	2.5	10			1.25
885382208002	10 nF		50	2.5	10			1.25
885382208009	10 nF		500	2.5	10			1.25
885382208010	22 nF		500	2.5	4.5			1.6
885382208011	33 nF		500	2.5	3			1.6
885382208003	100 nF		50	2.5	5			1.25
885382208006	100 nF		100	2.5	1			1.25
885382208007	100 nF		250	2.5	1			1.6
885382208008	270 pF		500	2.5	10			1.25
885382208004	470 nF		50	3	1			1.6
885382208013	470 pF		2000	2.5	10			1.25
885382208014	680 pF		2000	2.5	10			1.25

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; DF: Dissipation Factor; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

Size 1210

Technical Data:								
Order Code	C	Tol. C	U <sub>R</sub> (V (DC))	DF (%)	R <sub>ISO</sub> (GΩ)	L (mm)	W (mm)	H (mm)
885382209002	2.2 μF	±10%	100	5	0.05	3.2	2.5	2.5
885382209001	33 nF		500	2.5	3			1.6

C: Capacitance; Tol. C: Capacitance Tolerance; U<sub>R</sub>: Rated Voltage; DF: Dissipation Factor; R<sub>ISO</sub>: Insulation Resistance; L: Length; W: Width; H: Height

[www.we-online.com/WCAP-CSST](http://www.we-online.com/WCAP-CSST)

# Design Kits



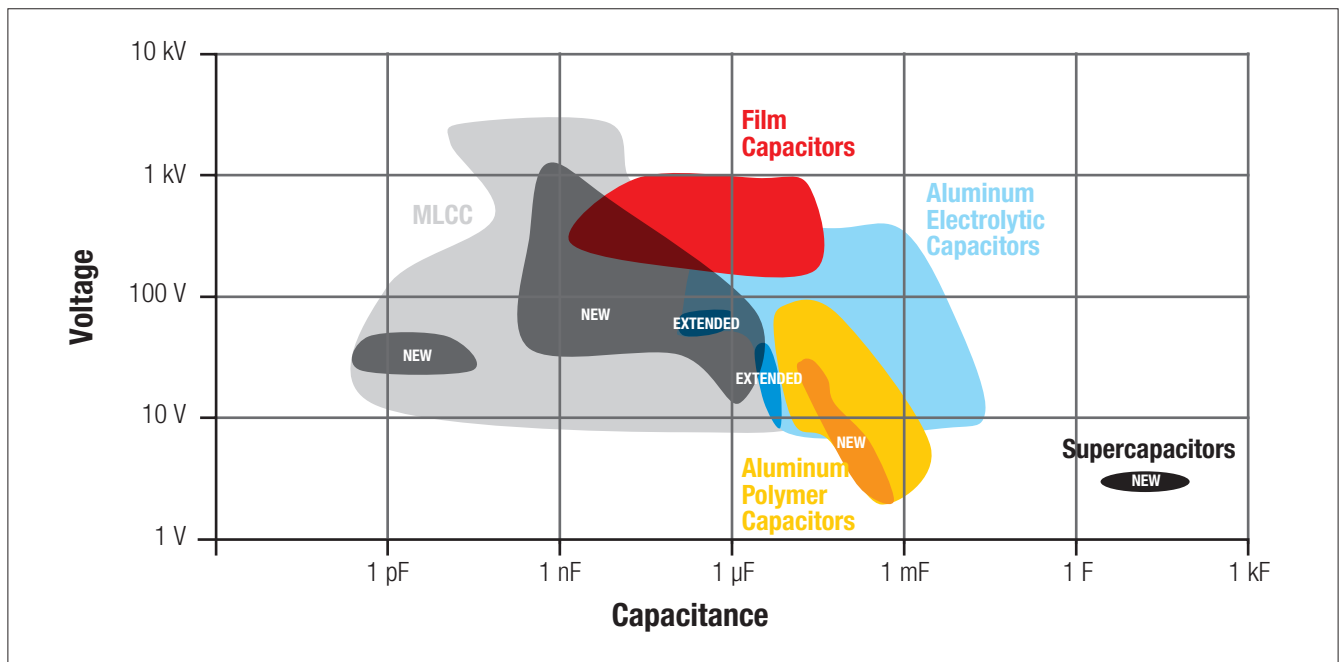
Product Category	Design Kit	Order Code	Lifelong Refill
<b>Aluminum Electrolytic Capacitors</b>			
	WCAP-AI3H; Aluminum Electrolytic Capacitors; Snap-In – Low Profile – 3000 h @ 105 °C	861142	✓
	WCAP-AI3H; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 3000 h @ 105 °C	861141	✓
	WCAP-AIE8; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 3000 h @ 85 °C	861221	✓
	WCAP-AIG5; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 2000 h @ 105 °C	861021	✓
	WCAP-AIG8; Aluminum Electrolytic Capacitors; Snap-In – Low Profile – 2000 h @ 85 °C	861012	✓
	WCAP-AIG8; Aluminum Electrolytic Capacitors; Snap-In – Slim Line – 2000 h @ 85 °C	861011	✓
	WCAP-AS5H; Aluminum Electrolytic Capacitors; SMT V-Chip – 5000 h @ 105 °C	865230	✓
	WCAP-ASLI; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 105 °C	865080	✓
	WCAP-ASLI; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 105 °C	865081	✓
	WCAP-ASLL; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h to 5000 h @ 105 °C	865060	✓
	WCAP-ASLL; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h to 5000 h @ 105 °C	865061	✓
	WCAP-ASLU; Aluminum Electrolytic Capacitors; SMT V-Chip – 1000 h @ 85 °C	865090	✓
	WCAP-ASNP; Aluminum Electrolytic Capacitors; SMT V-Chip – 2000 h @ 85 °C	865250	✓
	WCAP-AT1H; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860240	✓
	WCAP-AT1H; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860241	✓
	WCAP-ATET; Aluminum Electrolytic Capacitors; Radial THT – 1000 h up to 2000 h @ 125 °C	860130	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860020	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860021	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860022	✓
	WCAP-ATG5; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 105 °C	860023	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860012	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860011	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860013	✓
	WCAP-ATG8; Aluminum Electrolytic Capacitors; Radial THT – 2000 h @ 85 °C	860010	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860082	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860080	✓
	WCAP-ATLI; Aluminum Electrolytic Capacitors; Radial THT – 2000 h up to 5000 h @ 105 °C	860081	✓
	WCAP-ATLL; Aluminum Electrolytic Capacitors; Radial THT – 3000 h up to 7000 h @ 105 °C	860160	✓
	WCAP-ATLL; Aluminum Electrolytic Capacitors; Radial THT – 4000 h up to 7000 h @ 105 °C	860161	✓
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860040	✓





Product Category	Design Kit	Order Code	Lifelong Refill
<b>Aluminum Electrolytic Capacitors</b>			
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860041	✓
	WCAP-ATUL; Aluminum Electrolytic Capacitors; Radial THT – 5000 h up to 10000 h @ 105 °C	860042	✓
<b>Aluminum Polymer Capacitors</b>			
	WCAP-PSHP; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875115	✓
	WCAP-PSLC; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875075	✓
	WCAP-PSLP; Aluminum Polymer Capacitors; SMT V-Chip – 2000 h @ 105 °C	875105	✓
	WCAP-PT5H; Aluminum Polymer Capacitors; Radial THT – 5000 h @ 105 °C	870235	✓
	WCAP-PTG5; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 105 °C	870025	✓
	WCAP-PTHR; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 105 °C	870055	✓
	WCAP-PTHT; Aluminum Polymer Capacitors; Radial THT – 2000 h @ 125°C	870135	✓
<b>MLCC</b>			
	WCAP-CSGP; MLCC 0402, General Purpose	885050	✓
	WCAP-CSGP; MLCC 0603, General Purpose	885060	✓
	WCAP-CSGP; MLCC 0805, General Purpose	885070	✓
	WCAP-CSGP; MLCC 1206, 1210, 1812, General Purpose	885080	✓
	WCAP-CSGP; MLCC 100 V, General Purpose	885090	✓
	WCAP-CSMH 200 V / 250 V / 500 V / 630 V, Mid and High Voltage MLCC	885341	✓
	WCAP-CSMH; 1 kV / 2 kV / 3 kV, Mid and High Voltage MLCC	885342	✓
	WCAP-CSRF MLCC High Frequency	885390	✓
	WCAP-CSST MLCC Soft Termination	885380	✓
<b>DC Film Capacitors</b>			
	WCAP-FTBE; General Purpose, MKT DC Film, 10 %	890020	✓
	WCAP-FTBP; General Purpose, MKP DC Film, 5 %	890010	✓
<b>Safety Capacitors</b>			
	WCAP-CSSA; Safety MLCC X1/Y2, X2, 250 V(AC)	885300	✓
	WCAP-FTX2; MKP Film Capacitors X2 275 V(AC)	890324	✓
	WCAP-FTXX; MKP Film Capacitors X2 310 V(AC)	890334	✓

# New Products & Extensions



## New Products and Extensions

### H-Chip Aluminum Polymer Capacitors

- Aluminum Polymer technology
- Low profile surface mount (SMT) package
- Extremely low ESR and ESL

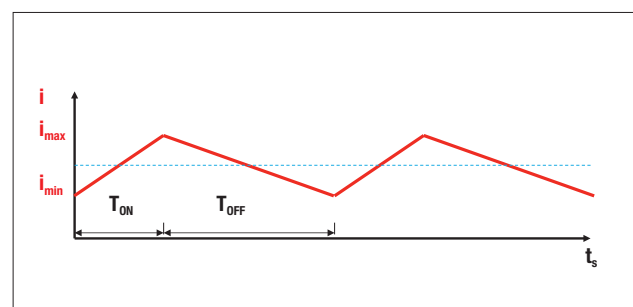
**Suitable alternative for  
Tantalum Capacitors & MLCCs**



### Applications / Features

- Input and output capacitors for SMPS
- Noise suppression
- Communication infrastructures
- Servers
- Mainboards

Suitable for high ripple currents



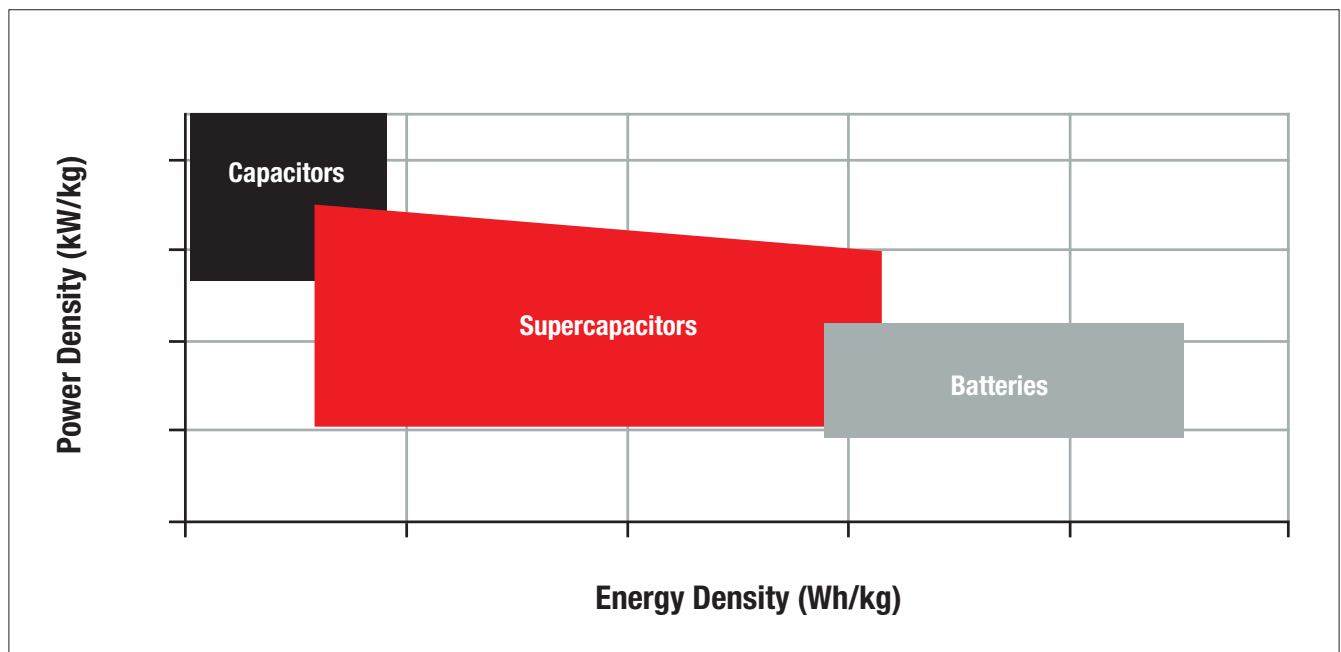
## Supercapacitors

### Electric Double Layer Capacitors – EDLC

Supercapacitors close the gap between Capacitors and Batteries

Supercapacitors have:

- Higher power density than Batteries
- Higher energy density than other Capacitors



## Features

- Large charge storing capacitance
- Ultra low equivalent series resistance (ESR)
- Provide a fast charging and discharging within seconds or minutes
- Life cycle is about 500 times and power output about 10 times higher compared to usual Batteries
- Depending on the field of applications: Replacement for batteries
- Easy to use: No battery charging circuit is required to prevent overcharging

## Applications



Storage devices for power-offline periods



Hybrid application with battery

# Product Portfolio

## MLCCs – High Frequency

- Designed for high frequency applications
- NPO ceramic for high temperature stability, low equivalent series resistance and high Q characteristics
- Inner electrode consists of an exceeding conductive material



## Applications



Power amplifier



Telecommunication

## MLCCs – Soft Termination

- Terminations with an additional conductive polymer layer
- Better absorption of mechanical stress
- Minimizes the risk of internal cracks
- More stable and robust performance during PCB handling as well as in the final application



## Applications



Power Supply



Lighting Applications

## WCAP-ASLU with slim diameter of 3 mm

- Low leakage current series of SMT Aluminum Electrolytic Capacitors
- Products with a diameter of 3mm are now available



## Applications



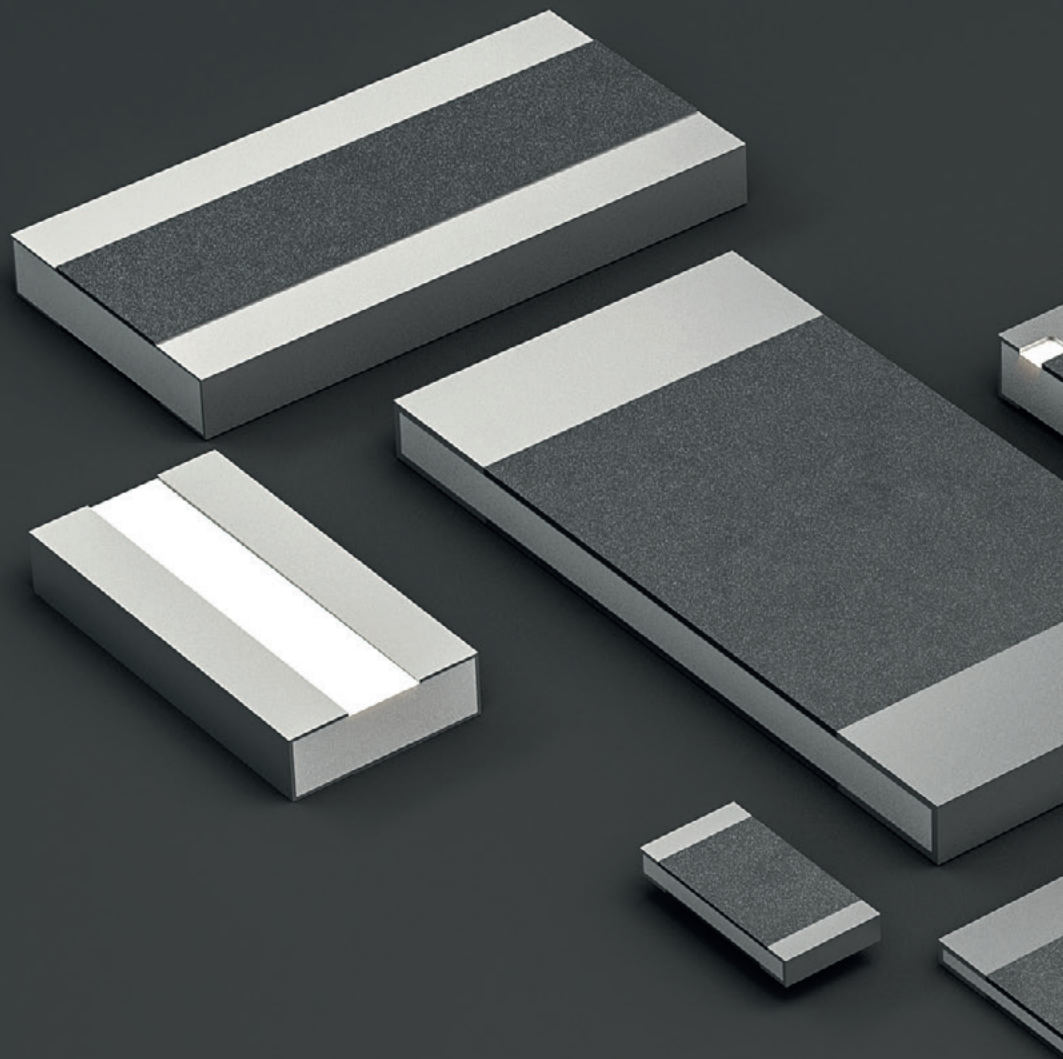
DC/DC Converter



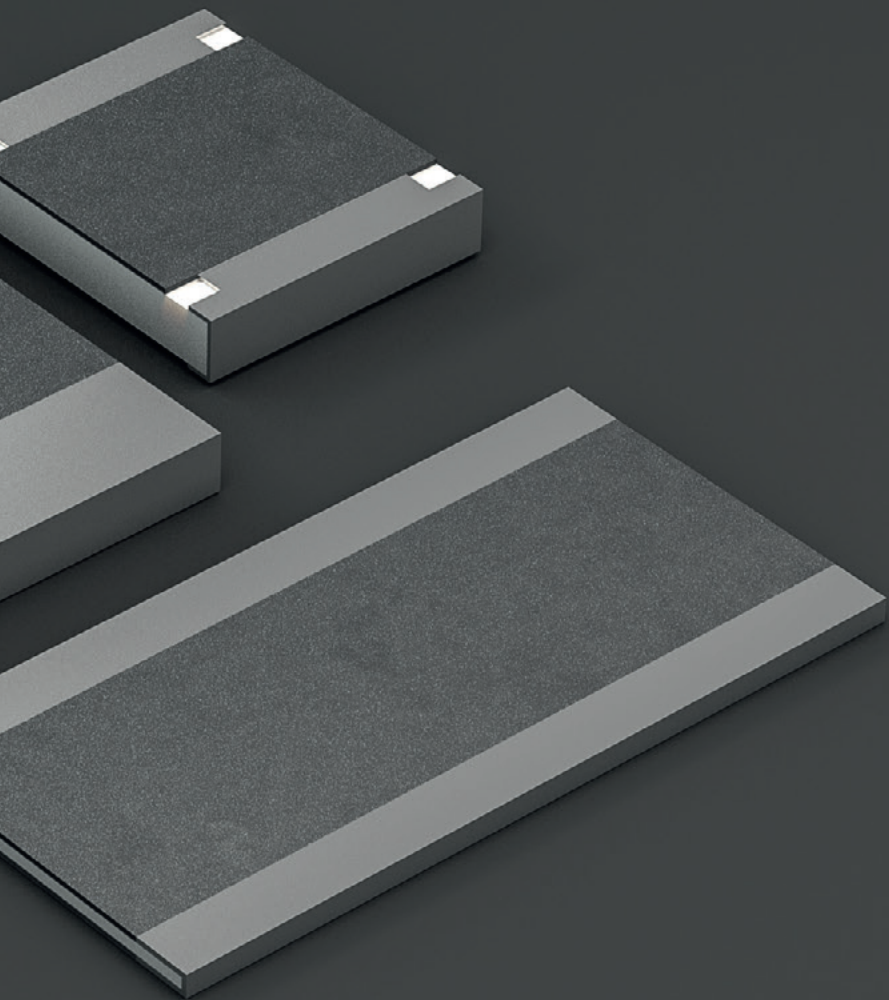


# **1** PASSIVE COMPONENTS

## Resistors



<b>Product Overview</b>	<b>106</b>
<b>New Products</b>	<b>107</b>
<b>Additional Information</b>	<b>114</b>

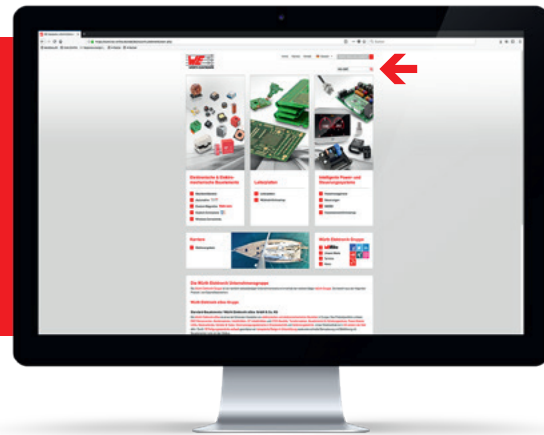


# Product Overview

## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WRIS-PSMB



### Metal Plate Resistors

NEW



#### WRIS-PSMB

##### Enhanced Current Sensing

R: 5 mΩ – 10 mΩ  
 $R_{tol}$ : ±1%  
 P: 0.33 W up to 1 W  
 TCR: ±100 ppm/°C  
 Temp.: -55 °C up to +155°C

NEW



#### WRIS-PSMC

##### High Power Current Sensing

R: 2 mΩ – 10 mΩ  
 $R_{tol}$ : ±1% / ±5%  
 P: 2 W  
 TCR: ±100 ppm/°C  
 Temp.: -55 °C up to +155°C

NEW



#### WRIS-PWMC

##### High Power Current Sensing

R: 1 mΩ – 5 mΩ  
 $R_{tol}$ : ±1%  
 P: 3 W up to 6 W  
 TCR: ±100 ppm/°C  
 Temp.: -55 °C up to +170°C

### Thick Film Resistors

NEW



#### WRIS-KSKE

##### General Purpose Current Sensing

R: 50 mΩ – 10 Ω  
 $R_{tol}$ : ±1%  
 P: 0.125 W up to 1 W  
 TCR: ±100 / +200 / +250 / +300 ppm/°C  
 Temp.: -55 °C up to +155°C

NEW



#### WRIS-KWKB

##### High Power Current Sensing

R: 2.2 Ω - 18 kΩ  
 $R_{tol}$ : ±1% / ±5%  
 P: 0.75 W up to 2 W  
 TCR: ±200 ppm/°C  
 Temp.: -55 °C up to +155°C

NEW



#### WRIS-KWKH

##### High Power Current Sensing

R: 100 mΩ – 620 mΩ  
 $R_{tol}$ : ±1% / ±5%  
 P: 1 W  
 TCR: +200 / +250 / +350 ppm/°C  
 Temp.: -55 °C up to +155°C



All Resistors at a glance:  
[www.we-online.com/resistors](http://www.we-online.com/resistors)



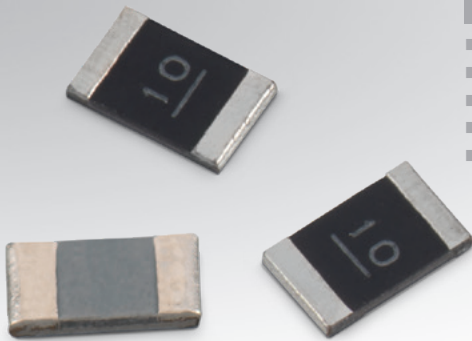
Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics

[www.we-online.com/library](http://www.we-online.com/library)

# WRIS-PSMB

## Metal Plate Resistors



Extended current sensing

### Characteristics:

- Recommended soldering: Reflow
- Operating temperature: -55°C\* up to +155°C\*\*
- Resistance range: 5 mΩ up to 10 mΩ
- Resistance tolerance: ± 1%
- Rated power: 0.33 W up to 0.5 W

### Applications:

- Motor control

[www.we-online.com/WRIS-PSMB](http://www.we-online.com/WRIS-PSMB)



NEW PRODUCTS

### Size 0603

#### Technical Data:

Order Code	R (mΩ)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
580060716001 #	5	±1%	0.33	100	8.12	1.6	0.8	0.35
580060716002 #	10				5.74			0.3

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 0805

#### Technical Data:

Order Code	R (mΩ)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
580060720003 #	5	±1%	0.5	100	10	2	1.25	0.35
580060720008	10				7.07			0.22

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 2512

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
580060763005	0.007	±1%	1	100	12	6.3	3.1	0.35

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

# Available on request

# WRIS-PSMC

## Metal Plate Resistors

NEW PRODUCTS



High power current sensing

### Characteristics:

- Recommended soldering: Reflow
- Operating temperature: -55°C\* up to +155°C\*\*
- Resistance range: 2 mΩ up to 10 mΩ
- Resistance tolerance: ± 1%
- Rated power: 2 W

### Applications:

- Ignition coil & igniter
- Motor control
- Inverter

[www.we-online.com/WRIS-PSMC](http://www.we-online.com/WRIS-PSMC)



## Size 2512

### Technical Data:

Order Code	R (mΩ)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/°C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
580070763001 <sup>#</sup>	2	±1%	2	100	31.62	6.3	3.1	0.58
580070763021	2	±5%			31.62			0.58
580070763005 <sup>#</sup>	5	±1%			20			0.51
580070763010 <sup>#</sup>	10	±1%			14.14			0.35

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

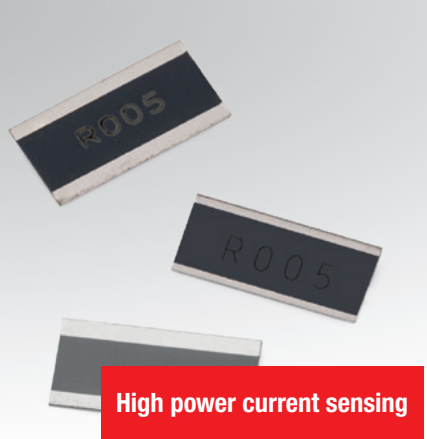
\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions. Temperature of the part should be verified in the final application.

<sup>#</sup> Available on request



# WRIS-PWMC

## Metal Plate Resistors



### Characteristics:

- Recommended soldering: Reflow
- Operating temperature: -55°C\* up to +155°C\*\*
- Resistance range: 1 mΩ up to 5 mΩ
- Resistance tolerance: ± 1%
- Rated power: 3 W up to 6 W

### Applications:

- Ignition coil & igniter
- Inverter

NEW PRODUCTS

[www.we-online.com/WRIS-PWMC](http://www.we-online.com/WRIS-PWMC)

### Size 1225

Technical Data:								
Order Code	R (mΩ)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
581070763001 #	1	±1%	3	100	54.77	3.2	6.3	0.2
581070763005 #	5				24.49			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 2043

Technical Data:								
Order Code	R (mΩ)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
581070768001 #	1	±1%	6	100	77.46	5	11	0.2
581070768005 #	5				34.6			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

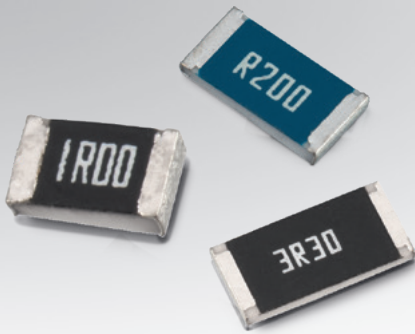
\*\*It is recommended that the temperature of the part does not exceed more than +170°C under worst case operating conditions. Temperature of the part should be verified in the final application

# Available on request

# WRIS-KSKE

## Thick Film Resistors

NEW PRODUCTS



### Characteristics:

- Recommended Soldering: Reflow
- Operating Temperature: -55°C\* up to +155°C\*\*
- Resistance Range: 50 mΩ up to 10 Ω
- Resistance Tolerance: ± 1%
- Rated Power: 0.125 W up to 1 W

General purpose current sensing

[www.we-online.com/WRIS-KSKE](http://www.we-online.com/WRIS-KSKE)



### Size 0402

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050310002	0.15	±1%	0.125	300	0.91	1	0.5	0.35
560050310010 <sup>#</sup>	0.5			200	0.5			
560050310009 <sup>#</sup>	10			100	0.11			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 0603

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050316001	0.1	±1%	0.25	250	1.58	1.6	0.8	0.45
560050316011	0.5			100	0.7			
560050316012 <sup>#</sup>	10			100	0.15			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 0805

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050320012 <sup>#</sup>	0.1	±1%	0.33	100	1.81	2	1.25	0.6
560050320001	0.1			250	1.81			
560050320003	0.27			200	1.1			
560050320011 <sup>#</sup>	1			100	0.57			
560050320007	2.2			100	0.38			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions. Temperature of the part should be verified in the final application.

<sup>#</sup> Available on request

# WRIS-KSKE

## Thick Film Resistors

### Size 1206

Technical Data:								
Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050332001 <sup>#</sup>	0.05	±1%	0.5	250	3.16	3.1	1.6	0.6
560050332013	0.5			100	1			
560050332011 <sup>#</sup>	3.3			100	0.38			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 2010

Technical Data:								
Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050350011 <sup>#</sup>	0.2	±1%	0.75	200	1.93	5	2.5	0.6
560050350012 <sup>#</sup>	0.39				1.38			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 2512

Technical Data:								
Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
560050363011 <sup>#</sup>	0.5	±1%	1	100	1.41	6.3	3.2	0.6
560050363012 <sup>#</sup>	3.3				0.55			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions. Temperature of the part should be verified in the final application.

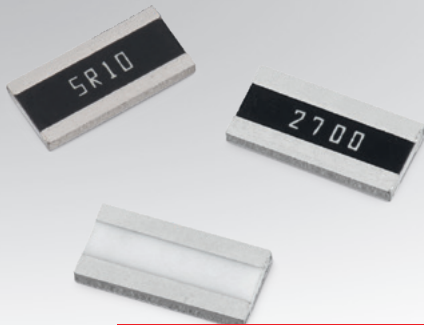
<sup>#</sup> Available on request

NEW PRODUCTS

# WRIS-KWKB

## Thick Film Resistors

NEW PRODUCTS



### Characteristics:

- Recommended soldering: Reflow
- Operating temperature: -55°C\* up to +155°C\*\*
- Resistance range: 2.2 Ω up to 270 Ω
- Resistance tolerance: ± 1%
- Rated power: 1 W up to 2 W

### Applications:

- Electric motor
- Camera
- Lightning control
- TV

High power current sensing

[www.we-online.com/WRIS-KWKB](http://www.we-online.com/WRIS-KWKB)



### Size 0612

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	U <sub>R</sub> (V)	L (mm)	W (mm)	H (mm)
561020132004	47	±5%	0.75	200	5.9	1.6	3.2	0.55
561020132008	100	±1%			8.7			
561020132009	100	±5%			8.7			
561020132010	110	±5%			9.1			
561020132011	120	±1%			9.5			
561020132014	240	±1%			13.4			
561020132023	470	±5%			18.8			
561020132030	1200	±1%			30			
561020132031	1500	±1%			33.5			
561020132032	1800	±1%			36.7			
561020132034	2200	±1%			40.6			
561020132037	2700	±1%			45			
561020132059	18000	±1%			116.2			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); U<sub>R</sub>: Rated Voltage; L: Length; W: Width; H: Height

### Size 1020

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	U <sub>R</sub> (V)	L (mm)	W (mm)	H (mm)
561020150010 <sup>#</sup>	270	±1%	1	200	16.4	2.5	5	0.55

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); U<sub>R</sub>: Rated Voltage; L: Length; W: Width; H: Height

### Size 1225

#### Technical Data:

Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	U <sub>R</sub> (V)	L (mm)	W (mm)	H (mm)
561020163016	2.2	±1%	2	200	2.1	3.2	6.3	0.55
561020163017 <sup>#</sup>	5.1	±1%			3.2			
561020163018 <sup>#</sup>	10	±1%			4.5			
561020163011	270	±1%			23.2			
561020163012	430	±5%			29.3			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); U<sub>R</sub>: Rated Voltage; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions.

Temperature of the part should be verified in the final application.

<sup>#</sup> Available on request

# WRIS-KWKH

## Thick Film Resistors



High power current sensing

### Characteristics:

- Recommended soldering: Reflow
- Operating temperature: -55°C\* up to +155°C\*\*
- Resistance range: 2.2 Ω up to 270 Ω
- Resistance tolerance: ±1 %
- Rated power: 1 W up to 2 W

### Applications:

- DC/DC converter
- Camera
- Night vision device
- TV
- Lighting

[www.we-online.com/WRIS-KWKH](http://www.we-online.com/WRIS-KWKH)



NEW PRODUCTS

### Size 0612

Technical Data:								
Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
561070332051	0.1	±1%	1	350	3.2	1.6	3.2	0.55
561070332055	0.15	±1%		350	2.6			
561070332057	0.18	±1%		350	2.4			
561070332092	0.24	±5%		250	2			
561070332071	0.33	±1%		250	1.7			
561070332096	0.33	±5%		250	1.7			
561070332076	0.47	±1%		350	1.5			
561070332078	0.51	±1%		200	1.4			
561070332079	0.56	±1%		200	1.3			
561070332080	0.6	±1%		200	1.3			
561070332081	0.62	±1%		200	1.3			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

### Size 2010

Technical Data:								
Order Code	R (Ω)	Tol. R	P <sub>Rated</sub> (W)	TCR (ppm/ °C)	I <sub>R</sub> (A)	L (mm)	W (mm)	H (mm)
561070350055 <sup>#</sup>	0.15	±1%	1	350	2.58	2.5	5	0.55
561070350077 <sup>#</sup>	0.5			200	1.41			
561070350078 <sup>#</sup>	0.51			200	1.4			

R: Resistance; Tol. R: Resistance Tolerance; P<sub>Rated</sub>: Rated Power; TCR: Temperature Coefficient of Resistance (max.); I<sub>R</sub>: Rated Current; L: Length; W: Width; H: Height

\* It is recommended that the temperature of the part does not exceed less than -55°C under worst case operating conditions. Temperature of the part should be verified in the final application.

\*\*It is recommended that the temperature of the part does not exceed more than +155°C under worst case operating conditions. Temperature of the part should be verified in the final application.

<sup>#</sup> Available on request



# Current Sense Resistors

## Introduction

We are expanding our range of passive components with Current Sense Resistors.

## How does Current Sensing work?

- Using a resistor within the circuit of application to make the current measurable (called: shunt)

The current through such a resistor generates a proportional voltage drop according to **Ohm's Law**:

$$I_{\text{meas}} = \frac{V_{\text{Rshunt}}}{R_{\text{shunt}}}$$

- Very low resistance values are used to generate a low voltage drop up to a few hundred mV
- In case of low currents, very precise resistance values and an amplifying circuit have to be used to get stable measurements, because of the very small voltage drop

## Current Control

- Used to detect and control the current on each phase and time
- To arrange a feedback for the control circuit

## Applications



Motor Control



DC/DC Converter

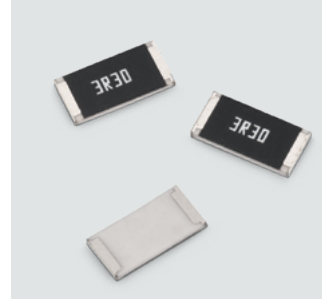


Power Supply Inverter

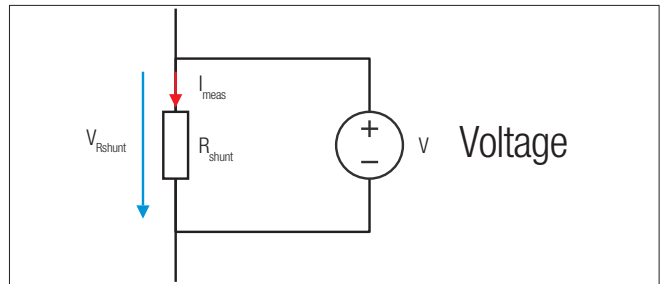
## Product Portfolio



Metal Plate Resistors



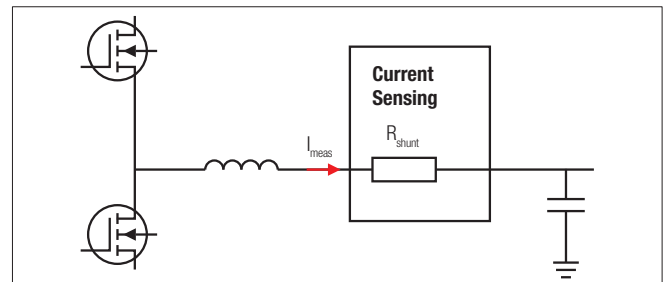
Thick Film Resistors



## Where do I use Current Sense Resistors?

### Overcurrent Sensing & Detection

- Overcurrent within the circuit can cause malfunctions and failures
- Measured current is higher than the max. defined current  
→ the system will detect a failure state



## Applications



Motor Control



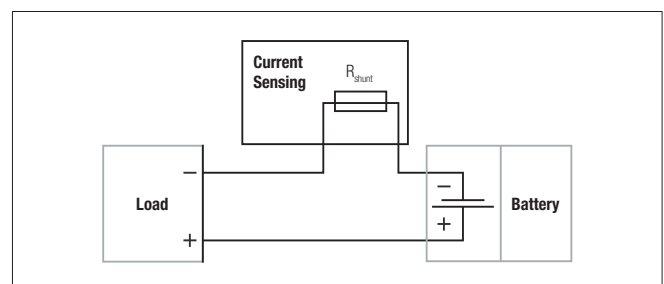
Battery Control



Power Supply Protection

## Current Management

- Especially for systems using secondary batteries
- Monitoring current or voltage level of a battery, to know the remaining power level and to keep the system properly operating
- Real-time measurement to monitor the power level and charging status



## Applications



Electric Vehicle



Mobile Devices

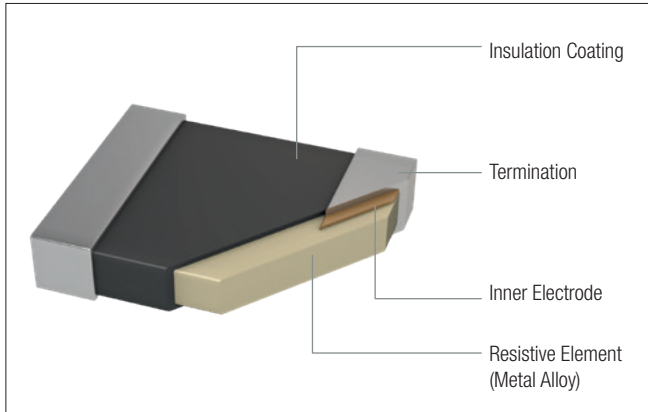


Computer Devices driven by a battery

# Types of Resistors and Selection

## Which type of Resistors do I need?

### Metal Plate Resistors



- Current detection of a few tens of Amperes
- Ultra low resistance values (up to 10 mΩ)

#### Features

- Superior abilities in case of power, temperature characteristics, linearity, accuracy and current-noise suppression level
- Stability and robustness make them suitable for current sensing applications

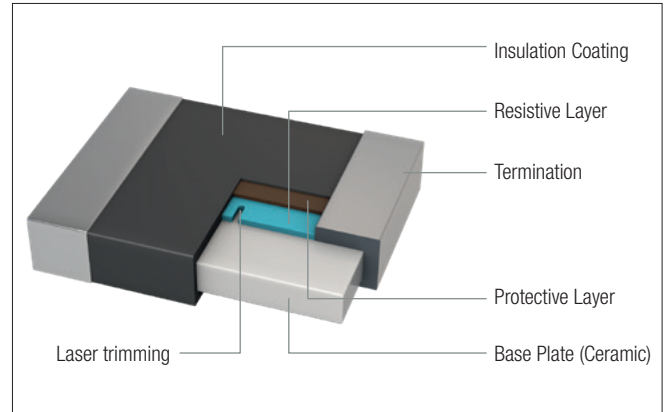
#### Construction

- Resistive body covered with conductive metal plate
- Material of metal plate: copper alloys like Fe-Cr alloy or Cu-Ni-Mn alloy

#### Available Product Series

- WRIS-PSMB – Enhanced Current Sensing (max. 0.5 W)
- WRIS-PSMC – High Power Current Sensing (max. 2 W)
- WRIS-PWMC – High Power Current Sensing (max. 6 W)

### Thick Film Resistors



- Current detection of small current levels
- Low- to mid-level resistance values (a few hundred mΩ up to a few Ω)

#### Features

- For Applications with General Purpose and not very precise low current measurements
- High cost efficiency, but not as accurate as Metal Plate Resistors

#### Construction

- Stable substrate, which is coated in a printing process with a thick film of metal (e.g. RuO<sub>2</sub>, Ag-Pd, etc.) and will run through a firing process after printing

#### Available Product Series

- WRIS-KSKE – General Purpose Current Sensing (max. 1 W)
- WRIS-KWKB – High Power Current Sensing (max. 2 W)
- WRIS-KWKH – High Power Current Sensing (max. 1 W)

# Notes



## **2** OPTOELECTRONICS

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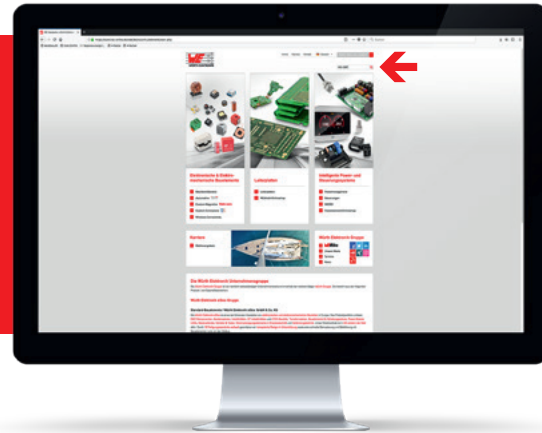




## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

WL-SMCC



## Visible LEDs

### Chip LEDs

EXTENDED



#### WL-SMCC SMD Mono-color Chip LED Compact

Size: 0402, 0603  
 $\lambda_{\text{DOM typ}}$ : 470 – 630 nm  
 $I_{\text{V typ}}$ : 50–800 mcd  
 $V_{\text{F typ}}$ : 2.0 – 3.2 V  
 Emitting color: Super Red, Red, Amber, Yellow, Bright Green, Green, Blue

NEW



#### WL-SBCC SMD Bi-color Chip LED Compact

Size: 0603  
 $\lambda_{\text{DOM typ}}$ : 570 – 625 nm  
 $I_{\text{V typ}}$ : 30 – 60 mcd  
 $V_{\text{F typ}}$ : 2 V  
 Emitting color: Red/Bright Green

NEW



#### WL-SFCC SMD Full-color Chip LED Compact

Size: 0404  
 $\lambda_{\text{DOM typ}}$ : 470 – 621 nm  
 $I_{\text{V typ}}$ : 50 – 180 mcd  
 $V_{\text{F typ}}$ : 2 – 2.8 V  
 Emitting color: Red, Green, Blue



#### WL-SMCW SMD Mono-color Chip LED Waterclear

Size: 0603, 0805, 1206  
 $\lambda_{\text{DOM typ}}$ : 470–630 nm  
 $I_{\text{V typ}}$ : 40 – 450 mcd  
 $V_{\text{F typ}}$ : 1.9 – 3.2 V  
 Emitting color: Super Red, Red, Amber, Yellow, Bright Green, Green, Blue



#### WL-SMCD SMD Mono-color Chip LED Diffused

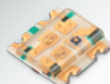
Size: 0603  
 $\lambda_{\text{DOM typ}}$ : 470 – 630 nm  
 $I_{\text{V typ}}$ : 60 – 430 mcd  
 $V_{\text{F typ}}$ : 2.0 – 3.2 V  
 Emitting color: Super Red, Red, Yellow, Bright Green, Green, Blue



#### WL-SBCW SMD Bi-color Chip LED Waterclear

Size: 0606, 1210  
 $\lambda_{\text{DOM typ}}$ : 570 – 630 nm  
 $I_{\text{V typ}}$ : 30 – 120 mcd  
 $V_{\text{F typ}}$ : 2 V  
 Emitting color: Super Red/Bright Green, Yellow/Bright Green

### Chip LEDs



#### WL-SFCW SMD Full-color Chip LED Waterclear

Size: 0606, 0805, 1210  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 70 – 360 mcd  
 $V_{\text{F typ}}$ : 1.9 – 3.3 V  
 Emitting color: Red, Green, Blue



#### WL-SFCD SMD Full-color Chip LED Diffused

Size: 0606, 0805, 1210  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 70 – 900 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Red, Green, Blue

### Chip LED Side View



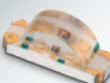
#### WL-SMSW SMD Mono-color Side view Waterclear

Size: 1204  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 50 – 600 mcd  
 $V_{\text{F typ}}$ : 2 – 3.4 V  
 Emitting color: Red, Yellow, Bright Green, Green, Blue



#### WL-SBSW SMD Bi-color Side view Waterclear

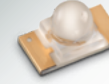
Size: 1204  
 $\lambda_{\text{DOM typ}}$ : 525 – 624 nm  
 $I_{\text{V typ}}$ : 30 – 160 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Red/Bright Green, Red/Green



#### WL-SFSW SMD Full-color Side view Waterclear

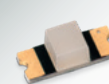
Size: 1204  
 $\lambda_{\text{DOM typ}}$ : 465 – 622 nm  
 $I_{\text{V typ}}$ : 140 – 850 mcd  
 $V_{\text{F typ}}$ : 2 – 3 V  
 Emitting color: Red, Green, Blue

### Chip LED Reverse Mount



#### WL-SMRW SMD Mono-color Reverse mount Waterclear

Size: 1205 (rectangular), 1206 (rectangular, cylindrical, dome)  
 $\lambda_{\text{DOM typ}}$ : 470 – 630 nm  
 $I_{\text{V typ}}$ : 30 – 2200 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Super Red, Red, Amber, Yellow, Bright Green, Green, Blue



#### WL-SMRD SMD Mono-color Reverse mount Diffused

Size: 1205  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 40 – 200 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Red, Yellow, Bright Green, Green, Blue



#### WL-SBRW SMD Bi-color Reverse mount Waterclear

Size: 1205  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 45 – 285 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Red/Green, Red/Bright Green, Red/Blue, Yellow/Bright Green

EXTENDED



#### WL-SFRW SMD Full-color Reverse mount Waterclear

Size: 1205, 1206  
 $\lambda_{\text{DOM typ}}$ : 470 – 624 nm  
 $I_{\text{V typ}}$ : 70 – 280 mcd  
 $V_{\text{F typ}}$ : 2 – 3.3 V  
 Emitting color: Red, Green, Blue



# Product Overview

## Visible LEDs

### TOP LED

**EXTENDED**



**WL-SMTW SMD Mono-color TOP LED**  
**Waterclear**  
 Size: 2214, 3528  
 $\lambda_{\text{DOM typ}}$ : 465 – 636 nm  
 $I_{\text{v typ}}$ : 70 – 2500 mcd  
 $V_{\text{F typ}}$ : 2 – 3.2 V  
 Emitting color: Super Red, Red, Amber, Yellow, Bright Green, Green, Blue

**NEW**



**WL-SMTD Mono-color TOP LED Diffused**  
 Size: 3528  
 $\lambda_{\text{DOM typ}}$ : 470 – 630 nm  
 $I_{\text{v typ}}$ : 6000 – 13000 mcd  
 $V_{\text{F typ}}$ : 2.4 – 3.2 V  
 Emitting color: Super Red, Red, Yellow, Green, Blue

**EXTENDED**



**WL-SBTW SMD Bi-color TOP LED**  
**Waterclear**  
 Size: 3528  
 $\lambda_{\text{DOM typ}}$ : 470 – 625 nm  
 $I_{\text{v typ}}$ : 60 – 260 mcd  
 $V_{\text{F typ}}$ : 2 – 3.2 V  
 Emitting color: Red/Blue, Red/Bright Green, Yellow/Blue, Yellow/Bright Green



**WL-SFTW SMD Full-color TOP LED**  
**Waterclear**  
 Size: 3528, 5050  
 $\lambda_{\text{DOM typ}}$ : 470 – 625 nm  
 $I_{\text{v typ}}$ : 230 – 1.700 mcd  
 $V_{\text{F typ}}$ : 2 – 3.2 V  
 Emitting color: Red, Green, Blue



**WL-STFD SMD Full-color TOP LED**  
**Diffused**  
 Size: 3535  
 $\lambda_{\text{DOM typ}}$ : 470 – 625 nm  
 $I_{\text{v typ}}$ : 400 – 1900 mcd  
 $V_{\text{F typ}}$ : 2 – 3.2 V  
 Emitting color: Red, Green, Blue

### High Power Ceramic



**WL-SMDC SMD Mono-color Ceramic LED**  
**Waterclear**  
 Size: 3535  
 $\lambda_{\text{DOM typ}}$ : 460 – 625 nm  
 $\Phi_{\text{v typ}}$ : 25 – 85 lm  
 $V_{\text{F typ}}$ : 2 – 3.4 V  
 Emitting color: Red, Yellow, Green, Blue



**WL-SMDC Mono-color Ceramic LED**  
**Waterclear**  
 Size: 3535  
 $\lambda_{\text{DOM typ}}$ : 450 – 730 nm  
 $\Phi_{\text{v typ}}$ : Radiant 240 – 600 mW  
 $V_{\text{F typ}}$ : 1.8 – 3.2 V  
 Emitting color: Far Red, Hyper Red, Deep Blue

### THT Round



**WL-TMRW THT Mono-color Round**  
**Waterclear**  
 Size: 3 mm (with/without stopper)  
 5 mm (with/without stopper)  
 $\lambda_{\text{DOM typ}}$ : 470 – 623 nm  
 $I_{\text{v typ}}$ : 1500 – 15000 mcd  
 $V_{\text{F typ}}$ : 1.9 – 3.4 V  
 Emitting color: Red, Yellow, Green, Blue



**WL-TMRW THT Mono-color Round Color**  
 Size: 3 mm (without stopper)  
 5 mm (without stopper)  
 $\lambda_{\text{DOM typ}}$ : 470 – 645 nm  
 $I_{\text{v typ}}$ : 30 – 500 mcd  
 $V_{\text{F typ}}$ : 2 – 3.2 V  
 Emitting color: Red, Super Red, Yellow, Bright Green, Blue

## White LEDs

### TOP LED



**WL-SWTP SMD White Top view PLCC**  
**Waterclear**  
 Size: 3014, 3022, 5630  
 CCT: 2700 – 6000 K  
 $\Phi_{\text{v typ}}$ : 7 – 39 lm  
 $V_{\text{F typ}}$ : 3 – 3.2 V  
 Emitting color: Sunrise, Warm White, Moonlight, Daylight, Cool White

### High Power Ceramic



**WL-SWTC SMD White Top view Ceramic LED**  
 Size: 3535  
 CCT: 2700 – 6000 K  
 $\Phi_{\text{v typ}}$ : 95 – 121 lm  
 $V_{\text{F typ}}$ : 3.2 V  
 Emitting color: Sunrise, Warm White, Moonlight, Daylight, Cool White

## Ultraviolet LEDs

### High Power Ceramic



**WL-SUMW SMD Ultraviolet Ceramic**  
**Waterclear**  
 Size: 3535  
 $\lambda_{\text{back}}$ : 385 – 405 nm  
 $I_{\text{v typ}}$ : 650 – 1100 mW  
 $V_{\text{F typ}}$ : 3.5 V



All Optoelectronic Components at a glance:  
[www.we-online.com/optoelectronic](http://www.we-online.com/optoelectronic)



Explore our Application Notes for Optoelectronics:  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)



Component Libraries available for:

- PCB Library: Altium Designer, EAGLE, Cadence OrCAD & Allegro, Zuken CAD-Star
- S-Parameter & SPICE Model: S-Parameter, LTspice, PSpice, Spectre
- RF & Microwave Simulation Models: Modelithics

[www.we-online.com/library](http://www.we-online.com/library)

## Infrared

### Infrared Emitter

#### Chip LED

**EXTENDED**



##### WL-SICW SMD Infrared Chip LED Waterclear

Size: 0402, 0603, 1206  
 $\lambda_{\text{center}}:$  850, 940 nm  
 $I_{\text{s typ}}$ : 0.8 – 2 mW/sr  
 $V_{\text{F typ}}$ : 1.2 – 1.4 V

#### Chip LED Side View

**EXTENDED**



##### WL-SISW SMD Infrared Sideview LED Waterclear

Size: 0402, 1002, 1104, 1106, 1206  
 $\lambda_{\text{center}}:$  850, 940 nm  
 $I_{\text{s typ}}$ : 1 – 11 mW/sr  
 $V_{\text{F typ}}$ : 1.2 – 1.6 V

#### Chip LED Reverse Mount



##### WL-SIRW SMD Infrared Reverse mount Waterclear

Size: 1206 (dome)  
 $\lambda_{\text{center}}:$  850, 940 nm  
 $I_{\text{s typ}}$ : 5 – 20 mW/sr  
 $V_{\text{F typ}}$ : 1.2 – 1.4 V

#### TOP LED



##### WL-SITW SMD Infrared TOP LED Waterclear

Size: 3528  
 $\lambda_{\text{center}}:$  845, 940 nm  
 $I_{\text{s typ}}$ : 8 – 9 mW/sr  
 $V_{\text{F typ}}$ : 1.4 – 1.5 V

#### High Power Ceramic



##### WL-SIMW SMD Infrared Ceramic Waterclear

Size: 3535  
 $\lambda_{\text{center}}:$  850, 940 nm  
 $I_{\text{s typ}}$ : 220 – 350 mW/sr  
 $V_{\text{F typ}}$ : 1.9 – 2.2 V

#### THT Infrared Round



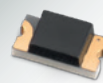
##### WL-TIRW THT Infrared Round Waterclear

Size: 3 mm (without stopper)  
 5 mm (without stopper)  
 $\lambda_{\text{center}}:$  845, 940 nm  
 $I_{\text{s typ}}$ : 30 – 85 mW/sr  
 $V_{\text{F typ}}$ : 1.3 – 1.5 V

## Photodiodes

#### Chip Top View

**NEW**



WL-SDCB SMT Photodiode Chip Black  
 Size: 1206  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{p typ}}$ : 1.8  $\mu$ A  
 $I_{\text{D max}}$ : 10 nA

#### Chip Side View

**NEW**



WL-SDSB SMT Photodiode Sideview Black  
 Size: 3010  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{p typ}}$ : 2.5  $\mu$ A  
 $I_{\text{D max}}$ : 10 nA

#### THT Round

**NEW**



##### WL-TDRW THT Photodiode Round Waterclear

Size: 5 mm  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{p typ}}$ : 28  $\mu$ A  
 $I_{\text{D max}}$ : 30 nA

**NEW**

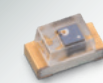


WL-TDRB THT Photodiode Round Black  
 Size: 5 mm  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{p typ}}$ : 31  $\mu$ A  
 $I_{\text{D max}}$ : 30 nA

## Phototransistors

#### Chip Top View

**NEW**



WL-STCW SMT Phototransistor Chip  
 Waterclear  
 Size: 0603  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 1.6 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

#### Chip Side View

**NEW**



WL-STCB SMT Phototransistor Chip  
 Black  
 Size: 1206  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 1.2 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

#### Chip Side View

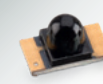
**NEW**



WL-STSW SMT Phototransistor  
 Sideview Waterclear  
 Size: 1104  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 2.5 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

#### Chip Reverse Mount

**NEW**



WL-STRB SMT Phototransistor  
 Reverse mount Black  
 Size: 1206 (dome)  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 4.4 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

#### PLCC Type

**NEW**



WL-STTW SMT Phototransistor Top  
 Waterclear  
 Size: 3528  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 3.1 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

**NEW**

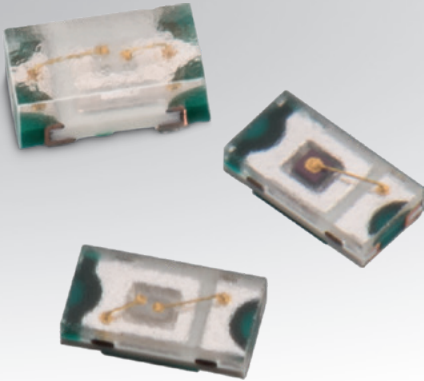


WL-STTB SMT Phototransistor Top Black  
 Size: 3528  
 $\lambda_{\text{peak}}$ : 940 nm  
 $I_{\text{CE, p typ}}$ : 2.8 mA  
 $I_{\text{CEO, Dark max}}$ : 100 nA

# WL-SMCC

## SMT Mono-color Chip LED Compact

NEW PRODUCTS



### Characteristics:

- Ultra thin Chip LED of 0.25mm with exceptional brightness
- 0402 industry standard footprint
- High reliability PCB based
- Compatible to IR reflow soldering
- Miniaturized color effects
- Waterclear lens

### Applications:

- Front panel indicator
- Navigation systems
- Cellphone display
- Display for industrial control systems
- Traffic display
- LCD backlighting for LCD, push button, symbol and keypad

[www.we-online.com/WL-SMCC](http://www.we-online.com/WL-SMCC)



Size 0402 super flat 0.25 mm

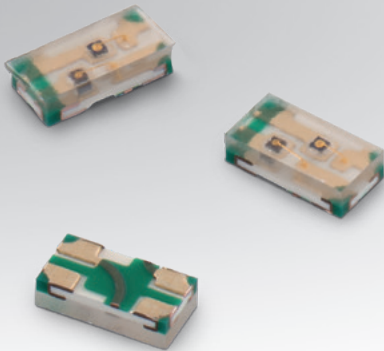
### Electrical & Optical Characteristics @20mA (typ.)

Order Code	Emitting Color	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Dom typ.}}$ (nm)	$I_{\text{V typ.}}$ (mcd)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
150040SS73220	Super Red	645	630	90	2	AllnGaP	120
150040RS73220	Red	632	624	110	2	AllnGaP	
150040AS73220	Amber	609	605	80	2	AllnGaP	
150040YS73220	Yellow	591	589	70	2	AllnGaP	
150040VS73220	Bright Green	575	573	60	2	AllnGaP	
150040GS73220	Green	520	525	750	3.3	InGaN	
150040BS73220	Blue	465	470	140	3.2	InGaN	

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Dom typ.}}$ : Dominant Wavelength [typ.];  $I_{\text{V typ.}}$ : Luminous Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-SBCC

## SMT Bi-color Chip LED Compact



### Characteristics:

- Two chips in one packaging
- Small size
- Industry standard footprint
- High efficiency
- Low power consumption
- Wide viewing angle
- Small package for exceptional brightness
- Packaged in standard tape and reel 7"

### Applications:

- Backlighting applications
- Status indicator
- Front panel indicators
- Push button backlighting
- Symbol and switch backlighting

[www.we-online.com/WL-SBCC](http://www.we-online.com/WL-SBCC)



Size 0603

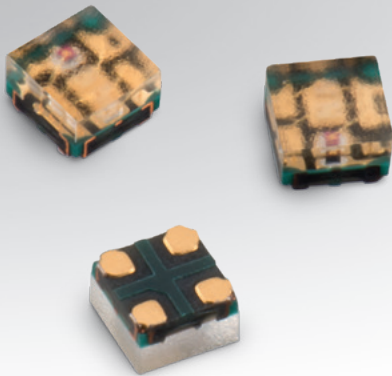
### Electrical & Optical Characteristics @20 mA (typ.)

Order Code	Emitting Color	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Dom typ.}}$ (nm)	$I_{\text{V typ.}}$ (mcd)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
150060RV75240	Red	630	625	60	2	AllnGaP	140
	Bright Green	572	570	30			

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Dom typ.}}$ : Dominant Wavelength [typ.];  $I_{\text{V typ.}}$ : Luminous Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-SFCC

## SMT Full-color Chip LED Compact



### Characteristics:

- Anti-reflection surface
- Smallest RGB package
- Very wide viewing angle

### Applications:

- Full-color display
- Indoor video walls
- Backlighting
- Indicator
- Front panel indicator
- Home and smart appliances
- Wearable and portable devices
- Healthcare applications
- Signal control system

[www.we-online.com/WL-SFCC](http://www.we-online.com/WL-SFCC)



NEW PRODUCTS

Size 0404

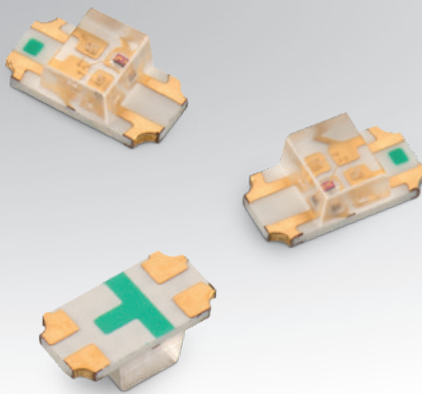
### Electrical & Optical Characteristics @5 mA (typ.)

Order Code	Emitting Color	$\lambda_{Peak\ typ.}$ (nm)	$\lambda_{Dom\ typ.}$ (nm)	$I_V\ typ.$ (mcd)	$V_F\ typ.$ (V)	Chip Technology	$2\theta_{50\% typ.}$ (°)
150044M155260	Red ■	625	621	80	2	AllnGaP + InGaN	140
	Green ■	522	530	180	2.7		
	Blue ■	465	470	50	2.8		

$\lambda_{Peak\ typ.}$ : Peak Wavelength [typ.];  $\lambda_{Dom\ typ.}$ : Dominant Wavelength [typ.];  $I_V\ typ.$ : Luminous Intensity [typ.];  $V_F\ typ.$ : Forward Voltage [typ.];  $2\theta_{50\% typ.}$ : Viewing Angle Phi 0° [typ.]

# WL-SFRW

## SMT Full-color Reverse mount Waterclear



### Characteristics:

- RGB
- Ideal for narrow space applications
- Wide viewing angle
- Low power consumption
- Standard soldering pads
- Small package for exceptional brightness
- To emit light through a small cut-out hole in PCB
- Compatible with automatic placement machine

### Applications:

- Front panel indicators
- LCD backlighting
- Backlighting for keypad, symbol and switch button

[www.we-online.com/WL-SFRW](http://www.we-online.com/WL-SFRW)



Size 1206 rectangular

### Electrical & Optical Characteristics @ 20 mA (typ.)

Order Code	Emitting Color	$\lambda_{Peak\ typ.}$ (nm)	$\lambda_{Dom\ typ.}$ (nm)	$I_V\ typ.$ (mcd)	$V_F\ typ.$ (V)	Chip Technology	$2\theta_{50\% typ.}$ (°)
156120M173000	Red ■	632	624	270	2	AllnGaP + InGaN	120
	Green ■	520	525	700	3.3		
	Blue ■	468	470	250	3.3		

$\lambda_{Peak\ typ.}$ : Peak Wavelength [typ.];  $\lambda_{Dom\ typ.}$ : Dominant Wavelength [typ.];  $I_V\ typ.$ : Luminous Intensity [typ.];  $V_F\ typ.$ : Forward Voltage [typ.];  $2\theta_{50\% typ.}$ : Viewing Angle Phi 0° [typ.]

# WL-SMTW

## SMT Mono-color TOP LED Waterclear

NEW PRODUCTS



### Characteristics:

- Low energy consumption
- High reliability
- Fast switching
- Flexibility in design
- No UV/IR radiation
- Black surface
- PLCC 2 package with black surface
- Variety of colors
- High intensity

### Applications:

- Signage and indirect illumination
- Consumer application: dash-board, telephone or AV equipments
- Flat backlight for LCDs, switches and symbols
- Optical indicators
- Scanner
- Camera flash, hand carrier flash
- Coupling into light guides

[www.we-online.com/WL-SMTW](http://www.we-online.com/WL-SMTW)



Size 3528, Advance

### Electrical & Optical Characteristics @ 20 mA (typ.)

Order Code	Emitting Color	$\lambda_{Peak typ.}$ (nm)	$\lambda_{Dom typ.}$ (nm)	$I_V typ.$ (mcd)	$V_F typ.$ (V)	Chip Technology	$2\theta_{50% typ.}$ (°)
150141RS73113	Red	629	620	900	2.2	AllInGaP	120
150141AS73113	Amber	615	609	800	2.2	AllInGaP	
150141YS73113	Yellow	592	590	1000	2.2	AllInGaP	
150141GS73113	Green	517	522	2500	3	InGaN	
150141BS73113	Blue	463	467	530	3.2	InGaN	

$\lambda_{Peak typ.}$ : Peak Wavelength [typ.];  $\lambda_{Dom typ.}$ : Dominant Wavelength [typ.];  $I_V typ.$ : Luminous Intensity [typ.];  $V_F typ.$ : Forward Voltage [typ.];  $2\theta_{50% typ.}$ : Viewing Angle Phi 0° [typ.]

# WL-SMTD

## SMT Mono-color TOP LED Diffused



### Characteristics:

- Industry standard PLCC-4
- High reliability LED package
- High optical efficiency
- Narrow viewing angle at 30°
- Compatible with both IR soldering process

### Applications:

- Traffic lights
- Backlighting
- For central console, cabin or push button
- Signal and symbol luminary
- Instrument panel backlighting
- Navigation and audio system

[www.we-online.com/WL-SMTD](http://www.we-online.com/WL-SMTD)



Size 3528 30° dome

### Electrical & Optical Characteristics @50 mA (typ.)

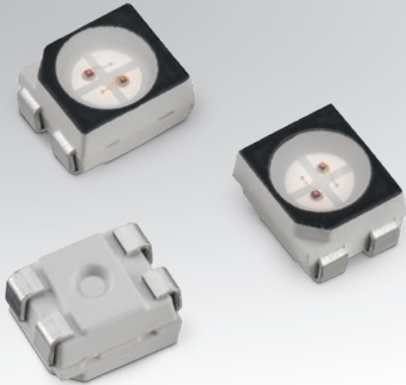
Order Code	Emitting Color	$\lambda_{Peak typ.}$ (nm)	$\lambda_{Dom typ.}$ (nm)	$I_V typ.$ (mcd)	$V_F typ.$ (V)	Chip Technology	$2\theta_{50% typ.}$ (°)
150141SS63140	Super Red	640	630	13000	2.4	AllInGaP	30
150141RS63140	Red	630	620	16000	2.4	AllInGaP	
150141YS63140	Yellow	592	590	15000	2.4	AllInGaP	
150141GS63140	Green	515	520	30000	3.2	InGaN	
150141BS63140	Blue	465	470	6000	3.2	InGaN	

$\lambda_{Peak typ.}$ : Peak Wavelength [typ.];  $\lambda_{Dom typ.}$ : Dominant Wavelength [typ.];  $I_V typ.$ : Luminous Intensity [typ.];  $V_F typ.$ : Forward Voltage [typ.];  $2\theta_{50% typ.}$ : Viewing Angle Phi 0° [typ.]



# WL-SBTW

## SMT Bi-color TOP LED Waterclear



### Characteristics:

- Low energy consumption
- High reliability
- Low current requirement
- Fast switching
- No UV/IR radiation
- None diffused lens
- Black surface
- Compact package outline

### Applications:

- Flat backlight for LCDs, switches and symbols
- Decorative lighting

NEW PRODUCTS

### Size 3528 Antidirectional

Electrical & Optical Characteristics @ 20 mA (typ.)

Order Code	Emitting Color	$\lambda_{Peak\ typ.}$ (nm)	$\lambda_{Dom\ typ.}$ (nm)	$I_V\ typ.$ (mcd)	$V_F\ typ.$ (V)	Chip Technology	$2\theta_{50\% typ.}$ (°)	Packaging
150141YV73110	Yellow	592	590	230	2	AlInGaP	120	Tape and Reel
	Bright Green	572	570	40				
150141RY73110	Red	630	625	150				
	Yellow	592	590	230				
150141SV73110	Super Red	645	630	60				
	Bright Green	572	570	40				

$\lambda_{Peak\ typ.}$ : Peak Wavelength [typ.];  $\lambda_{Dom\ typ.}$ : Dominant Wavelength [typ.];  $I_V\ typ.$ : Luminous Intensity [typ.];  $V_F\ typ.$ : Forward Voltage [typ.];  $2\theta_{50\% typ.}$ : Viewing Angle Phi 0° [typ.]

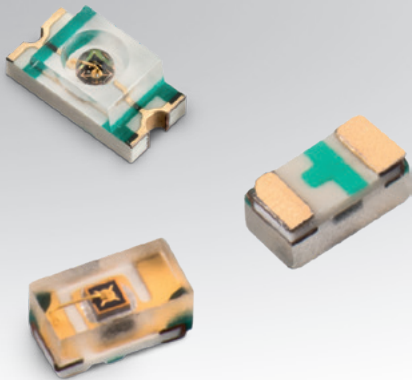
[www.we-online.com/WL-SBTW](http://www.we-online.com/WL-SBTW)



# WL-SICW

## SMT Infrared Chip LED Waterclear

NEW PRODUCTS



### Characteristics:

- Low energy consumption
- High reliability
- Low current requirement
- Fast switching
- IR Emitter

### Applications:

- Infrared sensor
- Distance measurement
- Remote control
- Smoke detector

### Size 0402

#### Electrical & Optical Characteristics @70mA (typ.)

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15404085BA420	850	845	6	1.6	AlGaAs	140
15404094BA420	940	940	5	1.4		

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

### Size 1206

#### Electrical & Optical Characteristics @20mA (typ.)

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15412085A9000	850	845	5	1.4	AlGaAs	90
15412094A9000	940	940	5.5	1.2		

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

[www.we-online.com/WL-SICW](http://www.we-online.com/WL-SICW)



# WL-SISW

## SMT Infrared Sideview LED Waterclear



### Characteristics:

- Low energy consumption
- High reliability
- Low current requirement
- Fast switching
- IR Emitter - Side view

### Applications:

- Infrared sensor
- Distance measure
- Remote control
- IR Lightbarrier

[www.we-online.com/WL-SISW](http://www.we-online.com/WL-SISW)

**NEW PRODUCTS**

### Size 0402

Electrical & Optical Characteristics @20mA						
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15404085BA470	850	845	1.5	1.6	AlGaAs	140
15404094BA470	940	940	1	1.4		

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

### Size 1002

Electrical & Optical Characteristics @20mA						
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15410285AA170	850	845	5	1.4	AlGaAs	110
15410294AA570	940	940	1.5	1.2		150

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

### Size 1106

Electrical & Optical Characteristics @20mA						
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15411085A4570	850	845	11	1.4	AlGaAs	45
15411094A6070	940	940	6	1.2		60

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

### Size 1206

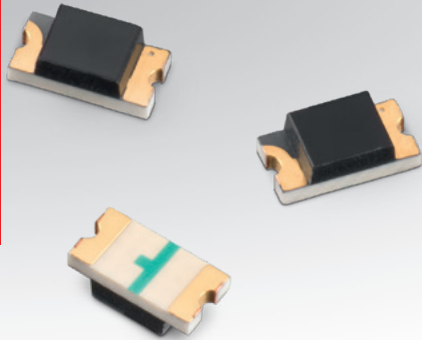
Electrical & Optical Characteristics @20mA						
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{Centroid typ.}}$ (nm)	$I_{\text{e typ.}}$ (mW/sr)	$V_{\text{F typ.}}$ (V)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
15412085A2070	850	845	12	1.4	AlGaAs	20
15412094A2070	940	940	6	1.2		

$\lambda_{\text{Peak typ.}}$ : Peak Wavelength [typ.];  $\lambda_{\text{Centroid typ.}}$ : Centroid Wavelength [typ.];  $I_{\text{e typ.}}$ : Radiant Intensity [typ.];  $V_{\text{F typ.}}$ : Forward Voltage [typ.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-SDCB

## SMT Photodiode Chip Black

NEW PRODUCTS



### Characteristics:

- Standard package size
- Wide viewing angle
- Fast response time
- High photo sensitivity

### Applications:

- IR data transmission
- Touch screen
- Copier
- Security systems

[www.we-online.com/WL-SDCB](http://www.we-online.com/WL-SDCB)



Size 1206 rectangular

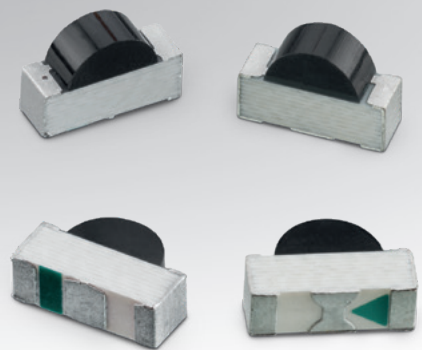
### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_P$	$I_{P \text{ min.}}$ ( $\mu\text{A}$ )	$I_{P \text{ typ.}}$ ( $\mu\text{A}$ )	TC $I_D$	$I_{D \text{ max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541201EEA400	940	700	1100	$V_R = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.2	1.8	$V_R = 10 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	10	Si	140

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_P$ : Photo Current (Test cond.);  $I_{P \text{ min.}}$ : Photo Current [min.];  $I_{P \text{ typ.}}$ : Photo Current [typ.]; TC  $I_D$ : Dark Current (Test cond.);  $I_{D \text{ max.}}$ : Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-SDSB

## SMT Photodiode Sideview Black



### Characteristics:

- Sideview package
- High Sensitivity
- Small package size
- High Reliability
- Wide Viewing Angle

### Applications:

- Infrared remote control
- Light barrier
- Infrared sensor
- Infrared data transmission
- Infrared touch panels

[www.we-online.com/WL-SDSB](http://www.we-online.com/WL-SDSB)



Size 1104

### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_P$	$I_{P \text{ min.}}$ ( $\mu\text{A}$ )	$I_{P \text{ typ.}}$ ( $\mu\text{A}$ )	$I_{D \text{ max.}}$ (nA)	TC $I_D$	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541141ECA570	940	700	1100	$V_R = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	1.3	2.5	10	$V_R = 10 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	Si	150

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_P$ : Photo Current (Test cond.);  $I_{P \text{ min.}}$ : Photo Current [min.];  $I_{P \text{ typ.}}$ : Photo Current [typ.];  $I_{D \text{ max.}}$ : Dark Current [max.]; TC  $I_D$ : Dark Current (Test cond.);  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-TDRW

## THT Photodiode Round Waterclear



### Characteristics:

- Standard THT 5mm package size
- High reliability
- Detector for visible and infrared light
- Fast switching times
- Low power consumption
- High sensitivity

### Applications:

- Touch screen
- Cleaning roboter
- Remote controller
- Optoelectronic switch
- Video camera
- Security systems

[www.we-online.com/WL-TDRW](http://www.we-online.com/WL-TDRW)



NEW PRODUCTS

Size 5 mm - without stopper

### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_P$	$I_{P \text{ min.}}$ ( $\mu\text{A}$ )	$I_{P \text{ typ.}}$ ( $\mu\text{A}$ )	TC $I_D$	$I_{D \text{ max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1540051EA3590	940	400	1100	$V_R = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	5	28	$V_R = 10 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	30	Si	35

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_P$ : Photo Current (Test cond.);  $I_{P \text{ min.}}$ : Photo Current [min.];  $I_{P \text{ typ.}}$ : Photo Current [typ.]; TC  $I_D$ : Dark Current (Test cond.);  $I_{D \text{ max.}}$ : Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-TDRB

## THT Photodiode Round Black



### Characteristics:

- Standard THT 5mm package size
- High reliability
- Detector with daylight filter
- Fast switching times
- Low power consumption
- High sensitivity
- Suitable for near infrared radiation

### Applications:

- Photointerrupter
- Touch screen
- Cleaning roboter
- Industrial electronics
- Remote controller
- Optoelectronic switch
- Security systems

[www.we-online.com/WL-TDRB](http://www.we-online.com/WL-TDRB)



Size 5 mm - without stopper

### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_P$	$I_{P \text{ min.}}$ ( $\mu\text{A}$ )	$I_{P \text{ typ.}}$ ( $\mu\text{A}$ )	TC $I_D$	$I_{D \text{ max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1540051EC3590	940	700	1100	$V_R = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	5	31	$V_R = 10 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	30	Si	35

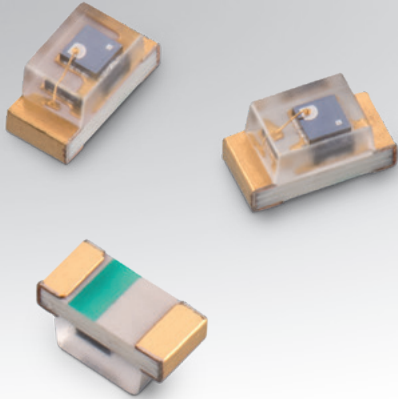
$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_P$ : Photo Current (Test cond.);  $I_{P \text{ min.}}$ : Photo Current [min.];  $I_{P \text{ typ.}}$ : Photo Current [typ.]; TC  $I_D$ : Dark Current (Test cond.);  $I_{D \text{ max.}}$ : Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]



# WL-STCW

## SMT Phototransistor Chip Waterclear

NEW PRODUCTS



### Characteristics:

- Small standard package size
- Perfect match to IR and visible emitter
- High reliability
- High sensitivity

### Applications:

- Security systems
- Counters
- IR data transmission
- Encoder

[www.we-online.com/WL-STCW](http://www.we-online.com/WL-STCW)



Size 0603

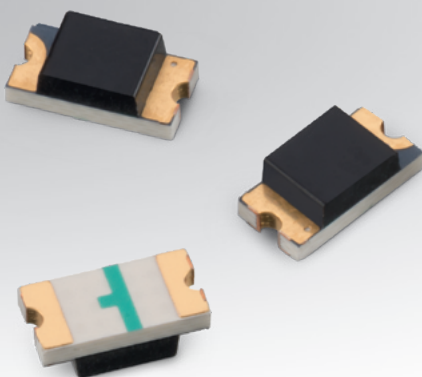
### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P min.}}$ (mA)	$I_{\text{CE.P typ.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1540601NBA500	940	400	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.9	1.6	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	150

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-STCB

## SMT Phototransistor Chip Black



### Characteristics:

- 1206 standard package with rectangular lens
- Perfect match with infrared emitter
- Phototransistor with daylight filter
- High photo sensitivity

### Applications:

- Encoder
- Counters
- Security systems
- Position sensors
- Smoke detector

[www.we-online.com/WL-STCB](http://www.we-online.com/WL-STCB)



Size 1206 rectangular

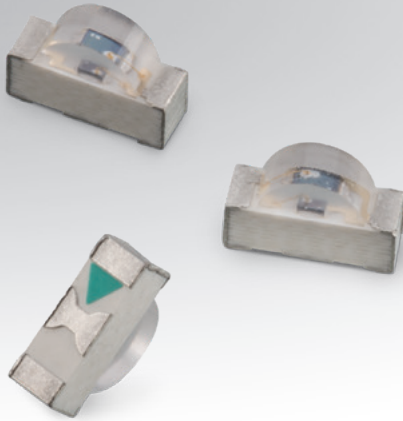
### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P min.}}$ (mA)	$I_{\text{CE.P typ.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541201NEA400	940	700	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.1	1.2	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	140

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-STSW

## SMT Phototransistor Sideview Waterclear



### Characteristics:

- Small standard package size
- High reliability
- Perfect match to IR and visible emitter
- High photo sensitivity
- Fast switching time

### Applications:

- IR sensors
- IR touch panel solutions
- Security systems

[www.we-online.com/WL-STSW](http://www.we-online.com/WL-STSW)

NEW PRODUCTS

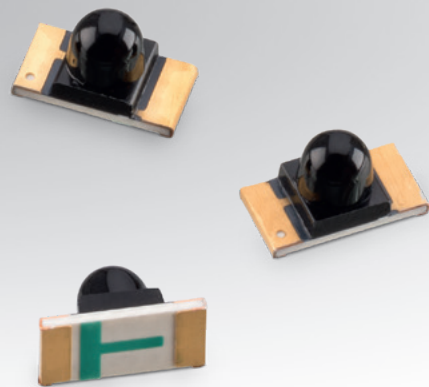
Size 1104

Electrical & Optical Characteristics										
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P min.}}$ (mA)	$I_{\text{CE.P typ.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541141NAA570	940	400	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.9	2.5	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	150

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-STRB

## SMT Phototransistor Reverse Mount Black



### Characteristics:

- 1206 standard package with dome lens
- Perfect match with infrared emitter
- Phototransistor with daylight filter
- Small detection angle
- High photo sensitivity

### Applications:

- Encoder
- Counters
- Security systems
- Position sensors
- Cleaning roboter
- Remote control

[www.we-online.com/WL-STRB](http://www.we-online.com/WL-STRB)

Size 1206 dome

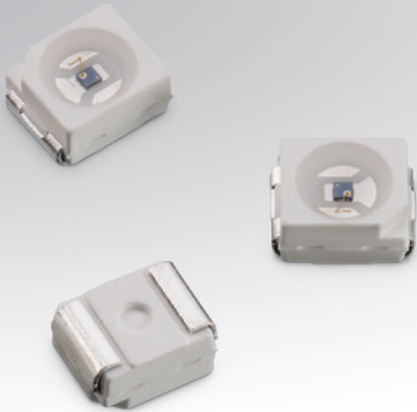
Electrical & Optical Characteristics										
Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P min.}}$ (mA)	$I_{\text{CE.P typ.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541201NC3060	940	700	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.6	4.4	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	30

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-STTW

## SMT Phototransistor Top Waterclear

NEW PRODUCTS



### Characteristics:

- High sensitivity
- Fast response time
- Perfect match with IR and visible emitter
- Compatible with automatic placement machines
- High reliability
- Standard PLCC 2 package

### Applications:

- Light sensors
- Position sensors
- Counters
- Miniature switch
- Encoder
- Photo interrupter

[www.we-online.com/WL-STTW](http://www.we-online.com/WL-STTW)



Size 3528

### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P min.}}$ (mA)	$I_{\text{CE.P typ.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541411NBA210	940	400	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	0.6	3.1	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	120

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]

# WL-STTB

## SMT Phototransistor Top Black



### Characteristics:

- High sensitivity
- Fast response time
- Perfect match with IR emitter
- Compatible with automatic placement machines
- High reliability
- Standard PLCC 2 package
- Integrated daylight filter

### Applications:

- Light sensors
- Position sensors
- Counters
- Miniature switch
- Encoder
- Photo interrupter

[www.we-online.com/WL-STTB](http://www.we-online.com/WL-STTB)



Size 3528

### Electrical & Optical Characteristics

Order Code	$\lambda_{\text{Peak typ.}}$ (nm)	$\lambda_{\text{min.}}$ (nm)	$\lambda_{\text{max.}}$ (nm)	TC $I_{\text{CE.P}}$	$I_{\text{CE.P typ.}}$ (mA)	$I_{\text{CE.P min.}}$ (mA)	TC $I_{\text{CEO.Dark}}$	$I_{\text{CEO.Dark max.}}$ (nA)	Chip Technology	$2\theta_{50\% \text{ typ.}}$ (°)
1541411NEA210	940	700	1100	$V_{\text{CE}} = 5 \text{ V}$ $E_e = 1 \text{ mW/cm}^2$ $\lambda = 940 \text{ nm}$	2.8	0.6	$V_{\text{CE}} = 20 \text{ V}$ $E_e = 0 \text{ mW/cm}^2$	100	Si	120

$\lambda_{\text{Peak typ.}}$ : Wavelength of Peak Sensitivity [typ.];  $\lambda_{\text{min.}}$ : Range of Spectral Bandwidth [min.];  $\lambda_{\text{max.}}$ : Range of Spectral Bandwidth [max.]; TC  $I_{\text{CE.P}}$ : Collector Current (Test cond.);  $I_{\text{CE.P min.}}$ : Collector Current [min.];  $I_{\text{CE.P typ.}}$ : Collector Current [typ.]; TC  $I_{\text{CEO.Dark}}$ : Collector-Emitter Dark Current (Test cond.);  $I_{\text{CEO.Dark max.}}$ : Collector-Emitter Dark Current [max.];  $2\theta_{50\% \text{ typ.}}$ : Viewing Angle Phi 0° [typ.]



# HortiCoolture. **LED it grow!**



#LEDITGROW

*WE speed up  
the future*

## Horticulture LED Lighting

New horticultural products from the high power ceramic series. Specially chosen wavelengths (450 nm, 660 nm and 730 nm) increase photosynthesis, optimizing plant development and growth. With outstanding PPF-value, small size and low power consumption, the WL-SMDC is the future choice for horticultural lighting. Available ex stock. Samples free of charge.

For further information please visit:

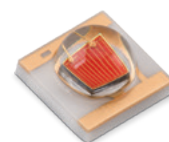
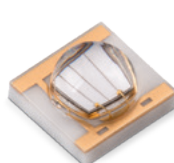
[www.we-online.com/leditgrow](http://www.we-online.com/leditgrow)

For a short introduction of Horticulture

LEDs read our Application Note:

[www.we-online.com/AN-Horti](http://www.we-online.com/AN-Horti)

- High efficacy
- Individually adjustable color spectrum for each plant
- Full color spectrum available incl. white, UV and IR-LEDs
- Low thermal resistance
- Electrically neutral thermal path
- One footprint for all colors



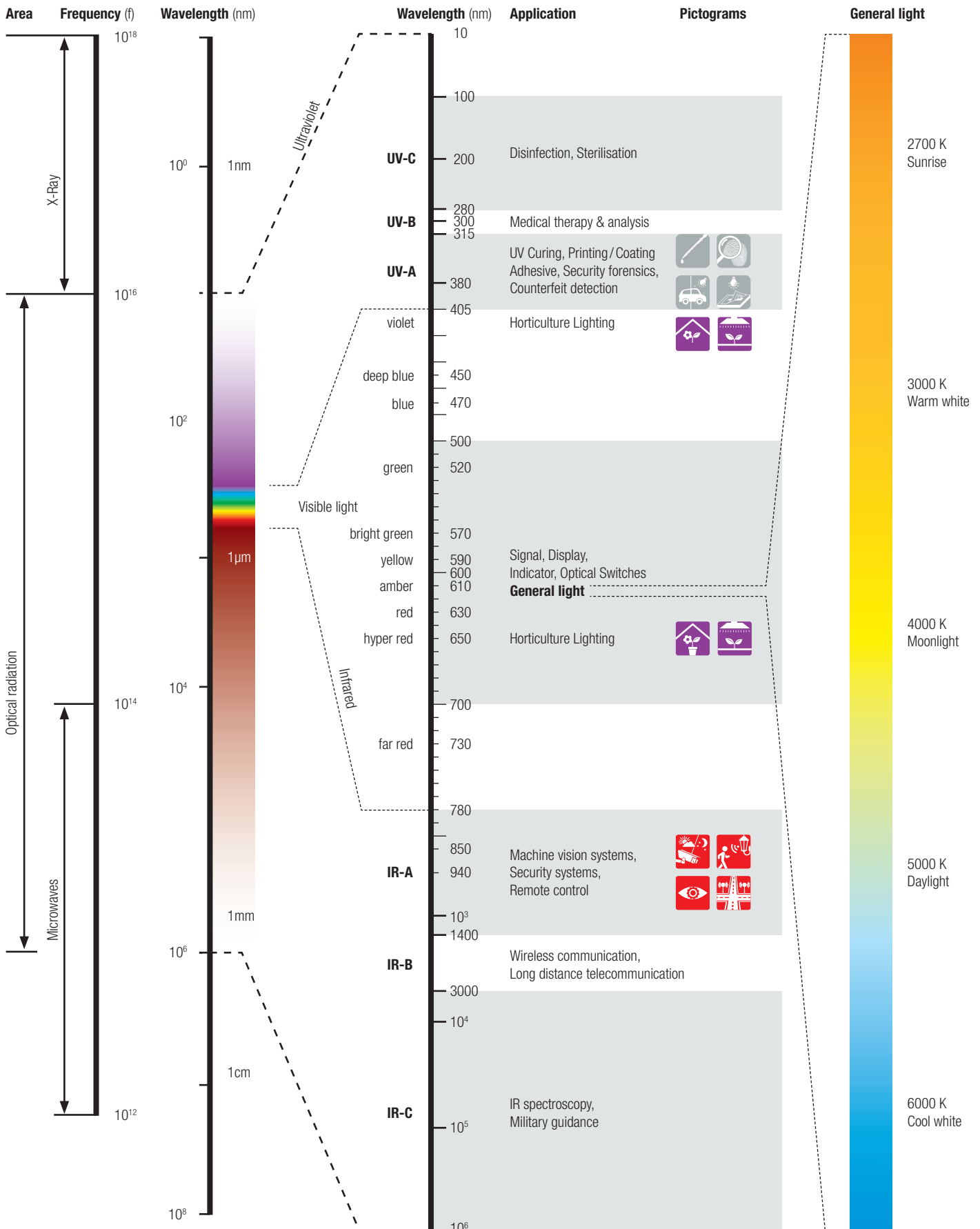
# Design Kits



Product Category	Design Kit	Order Code	Lifelong Refill
<b>White LEDs</b>			
	Demo Board Ceramic Power LEDs	158997	
	White LEDs	158300	✓
	Demo Board White LEDs – PLCC	158999	
<b>Visible LEDs</b>			
	Chip LED – Top View	150155	✓
	Chip LED – Reverse Mount & Side View	150156	✓
	PLCC, THT and Ceramic LED	150151	✓
	Demo Board Visible LEDs	9999003	
<b>Infrared LEDs</b>			
	Infrared LEDs	154150	✓



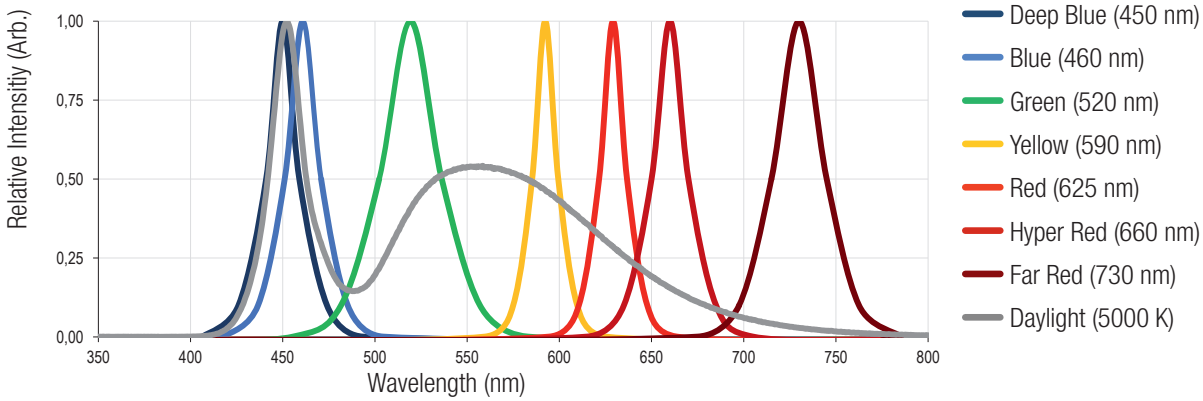
# Spectral Distribution



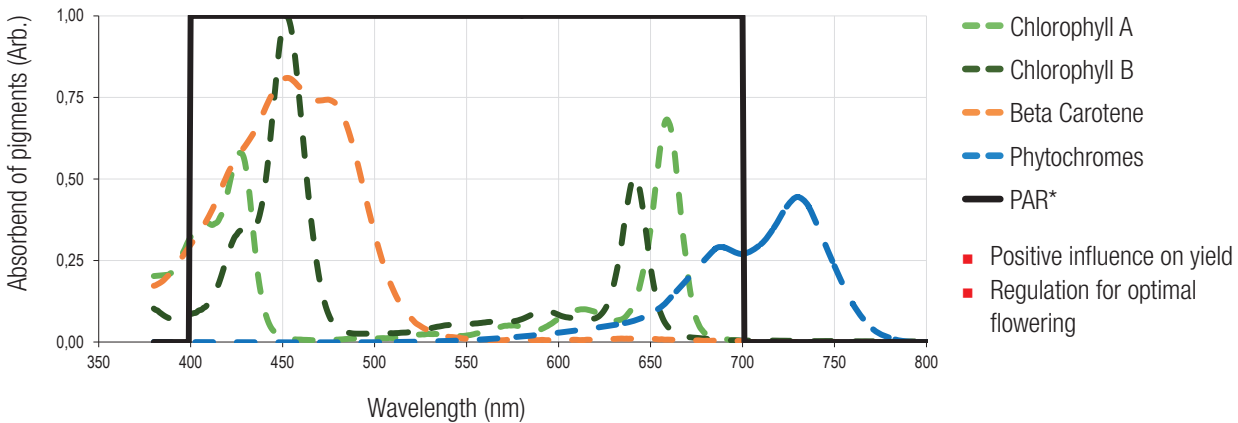
# Horticulture LEDs

## What Plants Need

### Emission Spectrum of WL-SMDC Horticulture LEDs



### Photosynthetic Pigments and Light Receptors



**\*PAR: Photosynthetically Active Radiation** Spectral range 400 to 700 nm for photosynthesis

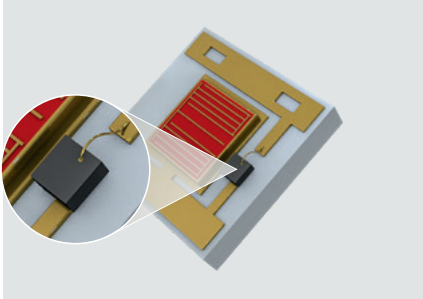
**Perfect quality – very high Efficacy** – up to 3.0  $\mu\text{mol}/\text{J}$  (Deep Blue), 3.6  $\mu\text{mol}/\text{J}$  (Hyper Red), 4.0  $\mu\text{mol}/\text{J}$  (Far Red)

**\*PPF: Photosynthetic Photon Flux** Rate of flow of photons within PAR

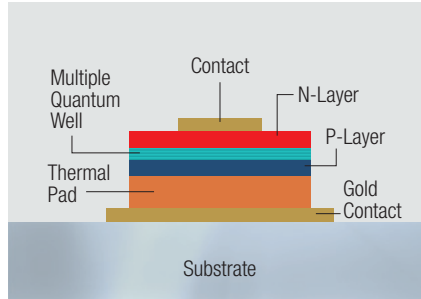
**Our LEDs have been developed for customized light solutions for each grower.**



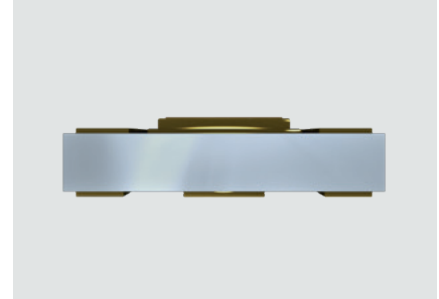
## Innovative Structure



Zener diode for ESD protection



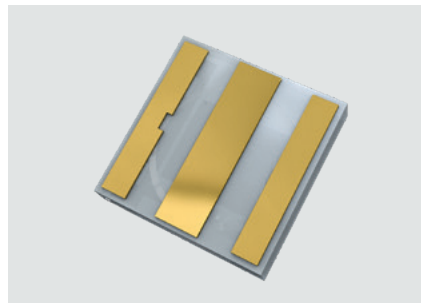
Vertical chip for perfect thermal stability and current control



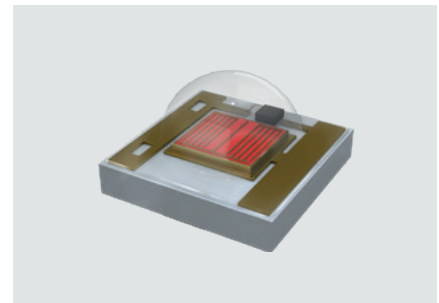
Ceramic substrate for low thermal resistance



Nonabsorbent material – MSL level 2



Gold contacts – low corrosion, perfect solderability



Small footprint – High emission power

### One footprint many opportunities

- Available in Horticulture wavelengths, CCT from 2700K to 6000K and RGBY
- Make your own light recipe with all available colors

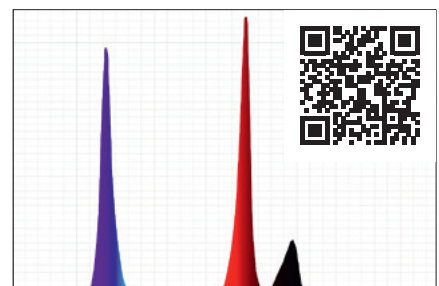
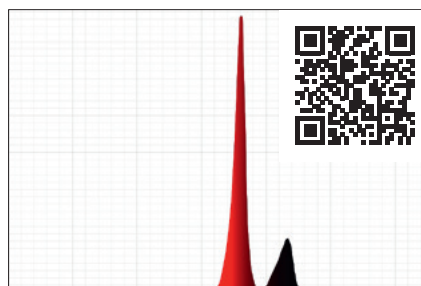
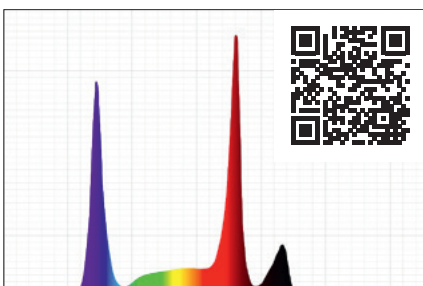
### REDEXPERT dedicated module

- Test your recipes – see how they look
- Compute your opto/electrical parameters
- Test your ideas and estimate the output of your lamp
- PPF values, Power usage, R/B ratio and much more directly computed



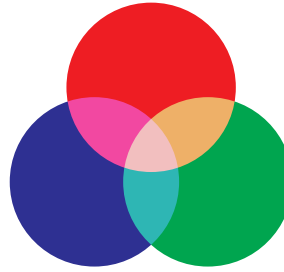
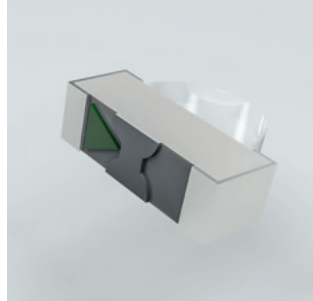
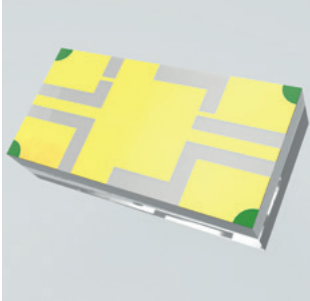
[www.we-online.com/leditgrow](http://www.we-online.com/leditgrow)

### Horticultator Radiant Flux



# Visible, Infrared and Photodetectors

## Visible LEDs



### Premium-quality

- Chip for excellent brightness in small packaging
- Packaging with mate and non-reflective surface
- Water-resistant IPx6 for all out-door application
- Plating for the greatest solderability and conduct

### Flexible in design

- top view, side view and reverse montage
- waterclear lens for ideal performance of intensity
- diffused lens for the perfect performance of homogenous lighting distribution

### Variety of emitting colors

- mono-color for all single indicator applications
- bi-color & full-color (RGB): million colors for all additive color mixing applications

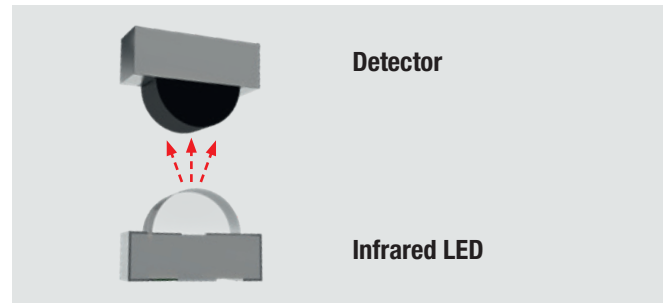
### Multi-Choice of packaging

- SMT (Surface mount)
- THT (Through hole technology)
- For all narrow space application

## Infrared LEDs and Photodetectors

### Benefits

- Perfect match of IR LEDs with Photodiodes and Phototransistors
- Same wavelength range
- Same package size
- Many packages
- Only one footprint for Emitter and Detectors
- For every application



**Detector**

**Infrared LED**

## Applications



**Oximeter/Heart Beat**



**Surveillance/Security**



**Touchless Screen**



**Home Appliances**

# Notes



## 3 POWER MODULES

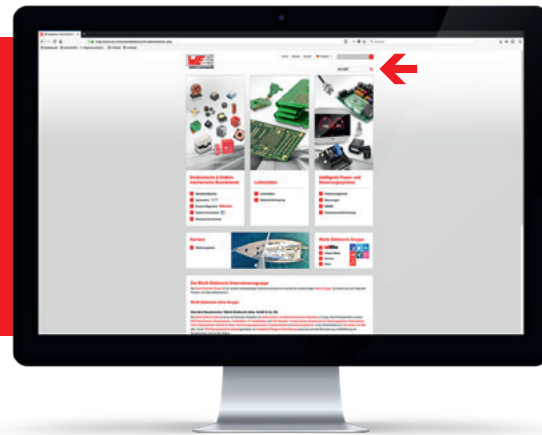
Product Overview	141
New Products	142
Reference Designs, EMI Filter	145
Evaluation Boards	146
Additional Information	148



## How to find detailed product information?

Visit [www.we-online.com](http://www.we-online.com) and search for product series information, e.g.:

Magic-LDHM



### Variable Step Down Regulator Modules



**MagiPC-VDRM**  
Variable Step Down Regulator Module

$V_{in}$ :	2.95 – 50 V
$V_{out}$ :	0.8 – 24 V
$I_{out}$ :	1 – 6 A
Switching Frequency:	0.2 – 2 MHz



**MagiPC-VDMM**  
Variable Step Down MicroModule

$V_{in}$ :	2.7 – 5.5 V
$V_{out}$ :	0.6 – 5.5 V
$I_{out}$ :	0.6 A
Switching Frequency:	2.25 MHz

### Fixed Isolated Modules

NEW



**MagiPC-FISM**  
Fixed Isolated SIP Module

$V_{in}$ :	3.3 – 24 V
$V_{out}$ :	5 V / 12 V / 15 V
$P_{out}$ :	1 W
$V_{isolation}$ :	1000 – 4000 V

### Variable Isolated SIP Modules

NEW



**MagiPC-VISM**  
Variable Isolated SIP Module

$V_{in}$ :	8 – 42 V
$V_{out}$ :	3.3 – 6 V
$P_{out}$ :	1 W
$V_{isolation}$ :	2000 V

### Fixed Step Down Regulator Modules



**MagiPC-FDSM**  
Fixed Step Down Regulator Module

$V_{in}$ :	6 – 42 V
$V_{out}$ :	3.3 V / 5 V
$I_{out}$ :	0.5 – 1 A
Switching Frequency:	0.3 – 0.57 MHz

### LED Driver Modules



**MagiPC-LDHM**  
LED Step Down High Current Module

$V_{in}$ :	4.5 – 60 V
$V_{out}$ :	4.5 – 60 V
$I_{out}$ :	0.45 A
Switching Frequency:	0.8 MHz



All Power Modules at a glance  
[www.we-online.com/power-mod](http://www.we-online.com/power-mod)



Explore our Application Notes for Power Modules:  
[www.we-online.com/app-notes](http://www.we-online.com/app-notes)

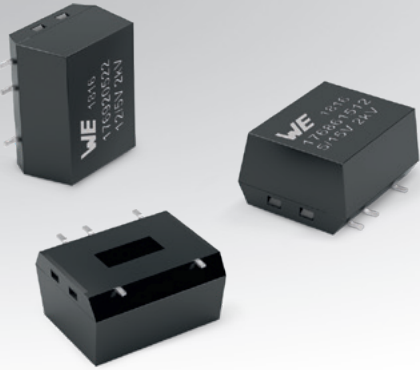


Component Libraries available for:  
■ PCB Library: Altium Designer, EAGLE  
[www.we-online.com/library](http://www.we-online.com/library)

# MagI<sup>3</sup>C-FISM

## Fixed Isolated Module

NEW PRODUCTS



### Characteristics:

- Simplest design (no transformer design know how required)
- Stand alone solution ( $C_{IN}$  and  $C_{OUT}$  integrated, no external components)
- Simple functional isolation for overvoltage protection, avoiding ground loops, ground shift and noise in signal path or sensor systems
- Industrial standard package and pin configuration
- Low conducted and radiated EMI (compliant to EN55022 class B)
- UL60950 certified

### Applications:

- Data acquisition
- Test and measurement systems
- Interface and microcontroller supply
- Industrial control

### Size SMT-8

Technical Data:				
Order Code	$V_{IN}$ (V (DC))	$V_{OUT}$ (V (DC))	$P_o$ (W)	$V_{ISO}$ (V (DC))
176920502	3.3	5	1	2000
176920512	5	5		
176881212	5	12		
176861512	5	15		
176920522	12	5		

$V_{IN}$ : Input Voltage;  $V_{OUT}$ : Output Voltage;  $P_o$ : Total Output Power;  $V_{ISO}$ : Insulation Voltage

[www.we-online.com/magic-fism](http://www.we-online.com/magic-fism)



# MagI<sup>3</sup>C-VISM

## Variable Isolated SIP Module



### Characteristics:

- Simplest design (no transformer design know how required)
- Leaded through-hole package for easy manufacturing and prototyping
- Stand alone solution ( $C_{IN}$  and  $C_{OUT}$  integrated, no external components)
- Only one external resistor required to set the  $V_{OUT}$
- ON / OFF control Pin
- Static and dynamic power boost
- Simple functional isolation for overvoltage protection, avoiding ground loops, ground shift and noise in signal path or sensor systems
- Industrial standard package and pin configuration
- Low conducted and radiated EMI (compliant to EN55032 class B / CISPR-32)
- IEC/EN/UL60950 & IEC/EN/UL62368 certified

### Applications:

- Data acquisition
- Test and measurement systems
- Interface and microcontroller supply
- Industrial control

NEW PRODUCTS

### Size SIP-8

#### Technical Data:

Order Code	$V_{IN}$ (V (DC))	$V_{OUT}$ (V (DC))	$P_o$ (W)	$V_{ISO}$ (V (DC))
17791063215	8 V - 42	3.3 - 6	1	2000

$V_{IN}$ : Input Voltage;  $V_{OUT}$ : Output Voltage;  $P_o$ : Total Output Power;  $V_{ISO}$ : Insulation Voltage

[www.we-online.com/magic-vism](http://www.we-online.com/magic-vism)





# All inclusive.



#MAGICPOWERMODULES

*WE speed up  
the future*

**MagI<sup>3</sup>C Power Modules** are easy-to-use DC/DC converters with integrated regulator IC, power inductor and capacitors. Design and layout reviews as well as support with EMI filter design are offered as a service for all customers. Datasheets contain detailed specifications and application information.

For more information please visit:

[www.we-online.com/powermodules](http://www.we-online.com/powermodules)

- Simple design-in process
- Design and layout support
- EMI filter design for EN55022 class B compliance
- Evaluation Boards for all products



LGA-6



LGA-16



QFN



T0263



SIP-3



SIP-4



SIP-7



SMT-8



SIP-8

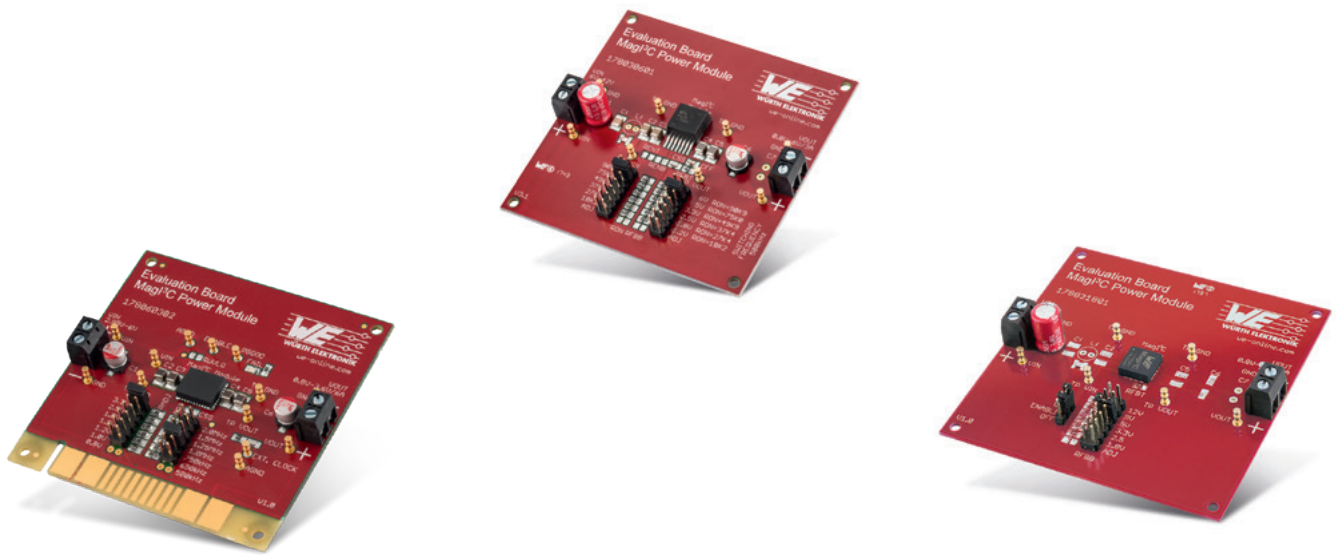


# Reference Designs & EMI Filter

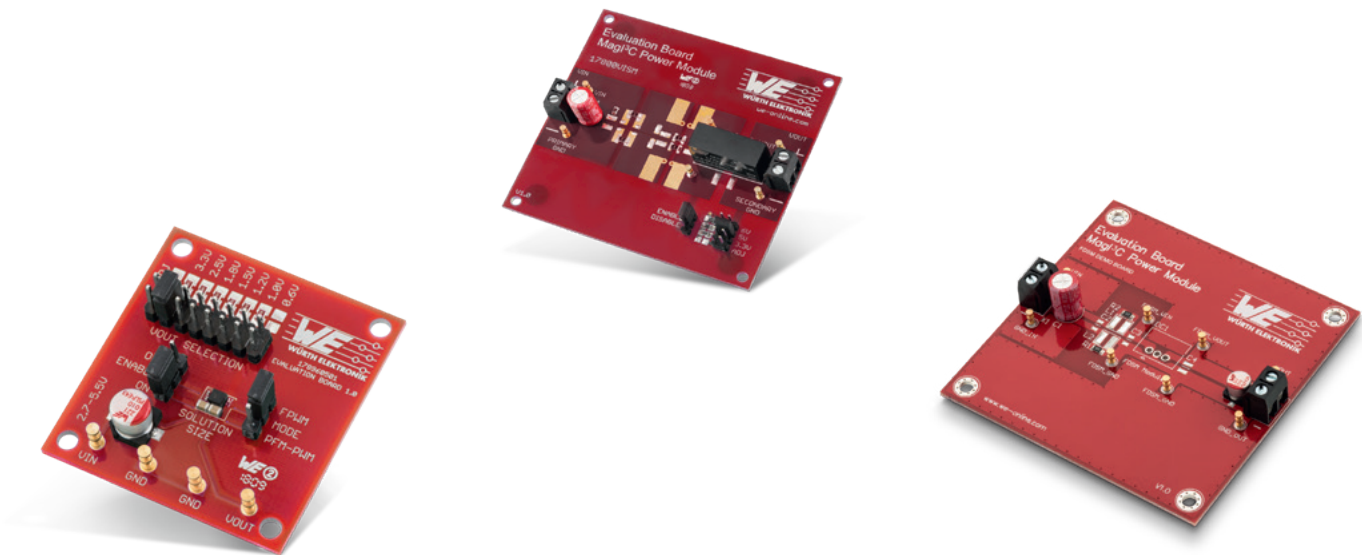


Product Category	Name	Description	Order Code
Reference Design	VDRM (171021501)		
	LED Driver	$V_{IN}$ : 7 – 24 V; $V_{OUT}$ : up to 15 V; $I_{OUT}$ : 1.5 A	178001
	MagI³C Power Supply	$V_{IN}$ : 18 – 36 V; $V_{OUT}$ : 0-15V; $I_{OUT}$ : 0 – 2.5 A	178002
	MagI³C Current Sharing	$V_{IN}$ : 7 – 50 V; $V_{OUT}$ : 2.5-15V; $I_{OUT}$ : 0 – 5 A	178003
	VDRM (171031801)		
	MagI³C Current Source	$V_{IN}$ : 4 – 18 V; $V_{OUT}$ : 1.45-14.4V; $I_{OUT}$ : 0 – 3 A	178004
	LDHM (172946001)		
MagI³C Multi-Color LED Driver	$V_{IN}$ : 18 V – 48 V; $V_{OUT}$ : 1.8V- $V_{IN}$ ; $I_{OUT}$ : up to 450 mA	178005	
EMI Kit	SIP-8		
	Application specific filtering	Using a Polymer capacitor based filter Conducted/Radiated Filter for Class B EN55022	177001BAG

# Evaluation Boards



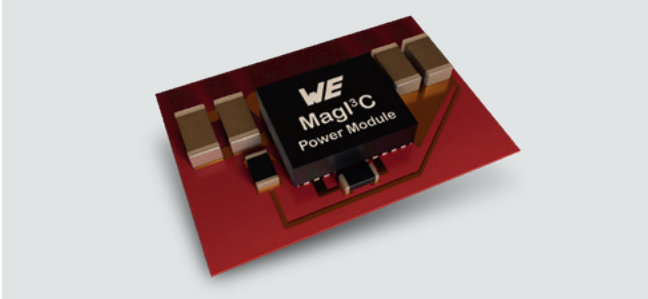
Product Category	Evaluation Board	Order Code
Variable Step Down Converter	BQFN-39	
	$V_{IN}$ : 2.95 – 6 V, $V_{OUT}$ : 0.8 – 3.6 V, $I_{OUT}$ : 2 A	178 020 302
	$V_{IN}$ : 2.95 – 6 V, $V_{OUT}$ : 0.8 – 3.6 V, $I_{OUT}$ : 4 A	178 040 302
	$V_{IN}$ : 2.95 – 6 V, $V_{OUT}$ : 0.8 – 3.6 V, $I_{OUT}$ : 6 A	178 060 302
	BQFN-41	
	$V_{IN}$ : 7 – 50 V, $V_{OUT}$ : 2.5 – 15 V, $I_{OUT}$ : 2.5 A	178 021 501
	TO263-7EP	
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 5 – 24 V, $I_{OUT}$ : 1 A	178 012 401
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 5 – 24 V, $I_{OUT}$ : 2 A	178 012 402
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 5 – 24 V, $I_{OUT}$ : 3 A	178 032 401
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 0.8 – 6 V, $I_{OUT}$ : 1 A	178 010 601
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 0.8 – 6 V, $I_{OUT}$ : 2 A	178 020 601
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 0.8 – 6 V, $I_{OUT}$ : 3 A	178 030 601
	$V_{IN}$ : 6 – 36 V, $V_{OUT}$ : 0.8 – 6 V, $I_{OUT}$ : 5 A	178 050 601
	LGA-16EP	
	$V_{IN}$ : 4 – 18 V, $V_{OUT}$ : 0.8 – 17 V, $I_{OUT}$ : 1 A	178 011 801
$V_{IN}$ : 4 – 18 V, $V_{OUT}$ : 0.8 – 17 V, $I_{OUT}$ : 2 A	178 021 801	
$V_{IN}$ : 4 – 18 V, $V_{OUT}$ : 0.8 – 17 V, $I_{OUT}$ : 3 A	178 031 801	
LED Step Down High Current Module	TO263-7EP	
	$V_{IN}$ : 4.5 – 60 V, $V_{OUT}$ : 4.5 – 60 V, $I_{OUT}$ : 0.45 A	178 946 001



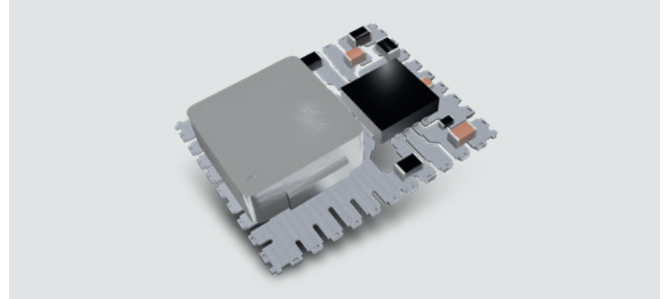
Product Category	Evaluation Board	Order Code
<b>Variable Step Down MicroModule</b>	LGA-6EP	
	$V_{IN}$ : 2.7 – 5.5 V, $V_{OUT}$ : 0.6 – 5.5 V, $I_{OUT}$ : 0.6 A	178 960 501
<b>Fixed Step Down Regulator Module</b>	SIP-3	
	$V_{IN}$ : 6 – 42 V, $V_{OUT}$ : 3.3 / 5 V, $I_{OUT}$ : 0.5 A / 1 A	17800FDSM
<b>Fixed Isolated Module</b>	SIP-4	
	$V_{IN}$ : 3.3 – 24 V, $V_{OUT}$ : 5 V and adjustable LDO output, $P_{OUT}$ : 1 W, 1 kV Isolation	178 920 5X1
	SIP-7	
	$V_{IN}$ : 5 – 24 V, $V_{OUT}$ : 5 V and adjustable LDO output, $P_{OUT}$ : 1 W, 4 kV Isolation	178 920 5X4
<b>Variable Isolated SIP Module</b>	SMT-8	
	$V_{IN}$ : 3.3 – 12 V, $V_{OUT}$ : 5 – 15 V and adjustable LDO output, $P_{OUT}$ : 1 W, 2 kV Isolation	17800FISM
<b>Variable Isolated SIP Module</b>	SIP-8	
	$V_{IN}$ : 8 – 42 V, $V_{OUT}$ : 3.3 – 6 V, $P_{OUT}$ : 1 W, 2 kV Isolation	17800 VISM

# All inclusive

## Advantages



Fewer external components (reduces overall footprint)



IC and inductor combined into a single package (smaller PCB size)



Simple design-in process & fast time to market



Low conducted & radiated EMI complaint to EN55022 class B / CISPR-22

## Individual Design-in Support

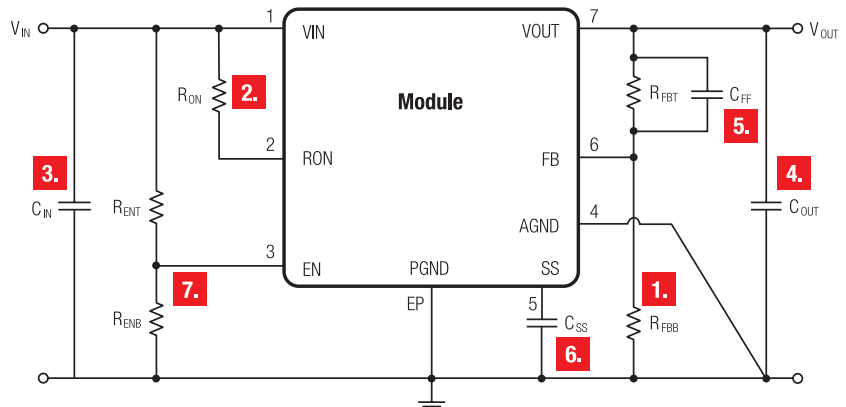
Electrical Calculations, Product Behavior & Thermal Design

### 6 design steps

1. Set the output voltage
2. Set the operating frequency with  $R_{ON}$
3. Select the input capacitor
4. Select the output capacitor
5. Select the feed forward capacitor
6. Select the soft-start capacitor

### 1 optional design step:

7. Select under-voltage lockout divider

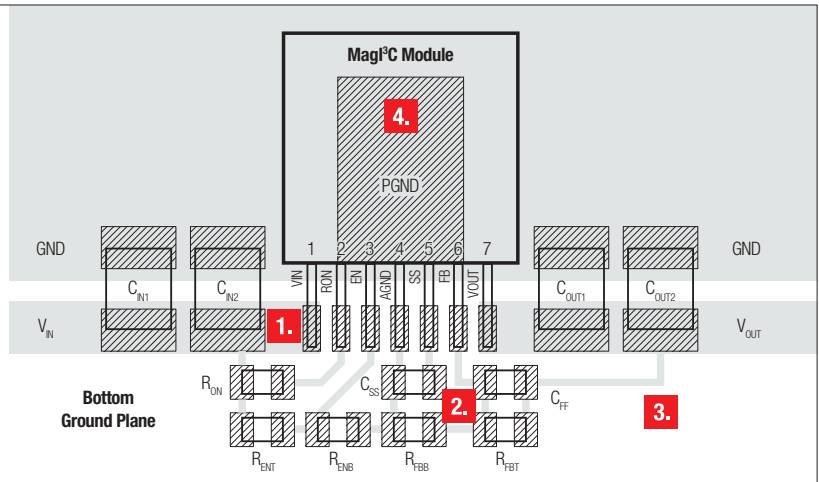


## Layout Review of your PCB Files

Analysis and recommendations of customer layouts

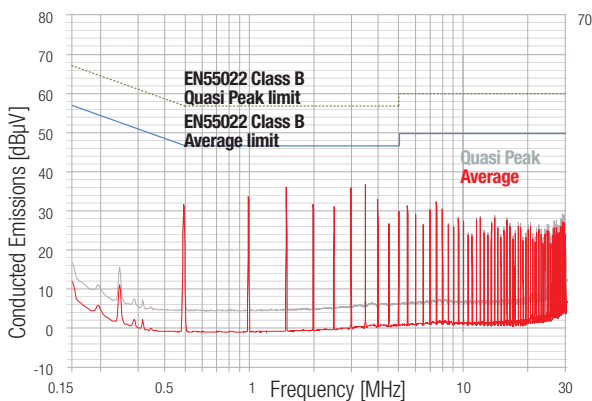
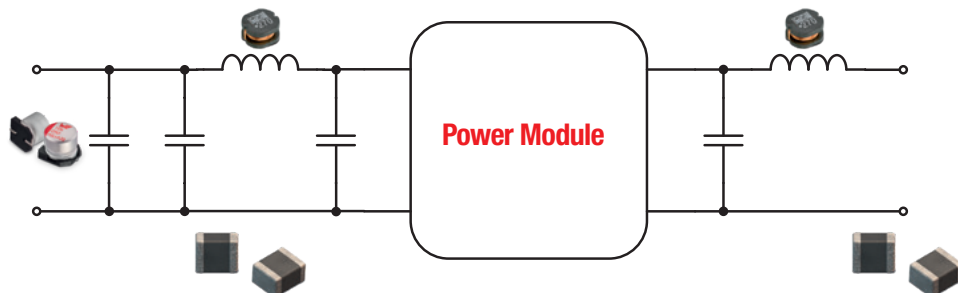
### 4 design steps

1. Place the input capacitors close to  $V_{IN}$  and PGND
2. Place  $C_{SS}$ ,  $R_{FBT}$  and  $R_{FBB}$  close to their respective pins and analog ground (AGND)
3. Place the resistor divider ( $R_{FBT}$  and  $R_{FBB}$ ) close to the FB pin and trace at the positive terminal of the last output capacitor ( $C_{OUT2}$ )
4. Design the thermal vias

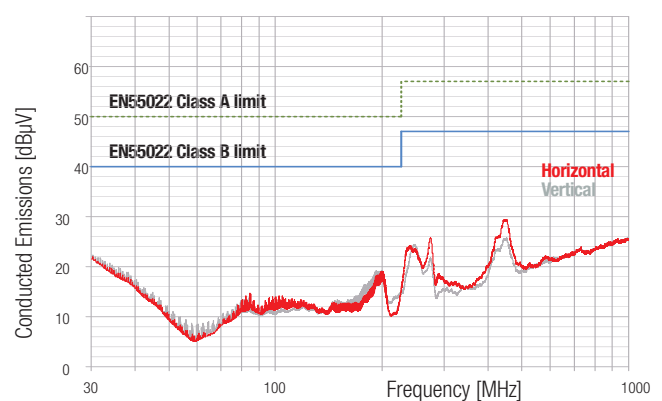


## EMI Filter Design Support

Tested filter configuration with inductor and capacitor order codes



**Conducted Emissions** 171 021 501. Measured on evaluation board with input filter  $C_i = 2.2 \mu\text{F}$  and  $L_i = 22 \mu\text{H}$ .  
 $V_{IN} = 24 \text{ V}$ ,  $V_{OUT} = 5 \text{ V}$ ,  $f_{SW} = 500 \text{ kHz}$ ,  $I_{LOAD} = 2 \text{ A}$



**Radiated Emissions** 171 021 501. Measured on evaluation board with input filter  $C_i = 2.2 \mu\text{F}$  and  $L_i = 22 \mu\text{H}$ .  
 $V_{IN} = 24 \text{ V}$ ,  $V_{OUT} = 5 \text{ V}$ ,  $f_{SW} = 500 \text{ kHz}$ ,  $I_{LOAD} = 2 \text{ A}$

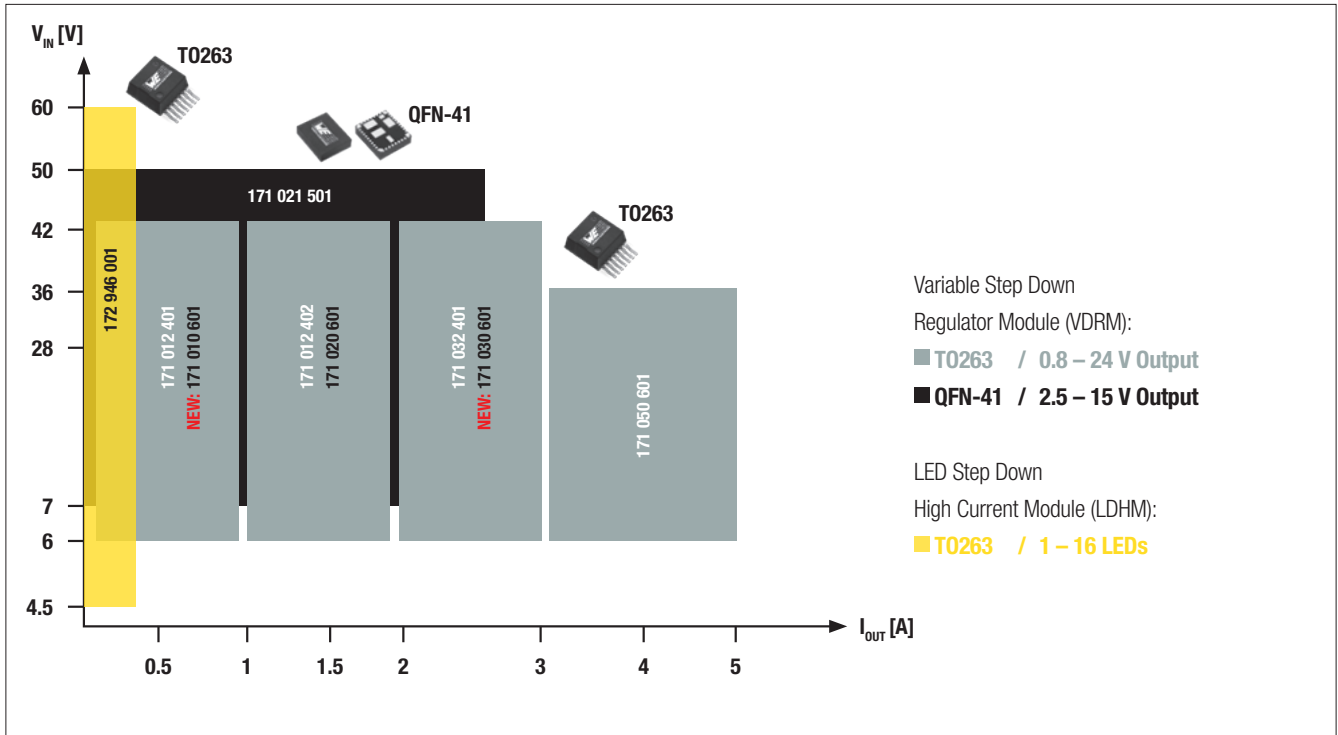


View details of emissions and temperature behavior in REDEXPERT  
[www.we-online.com/re-behavior](http://www.we-online.com/re-behavior)

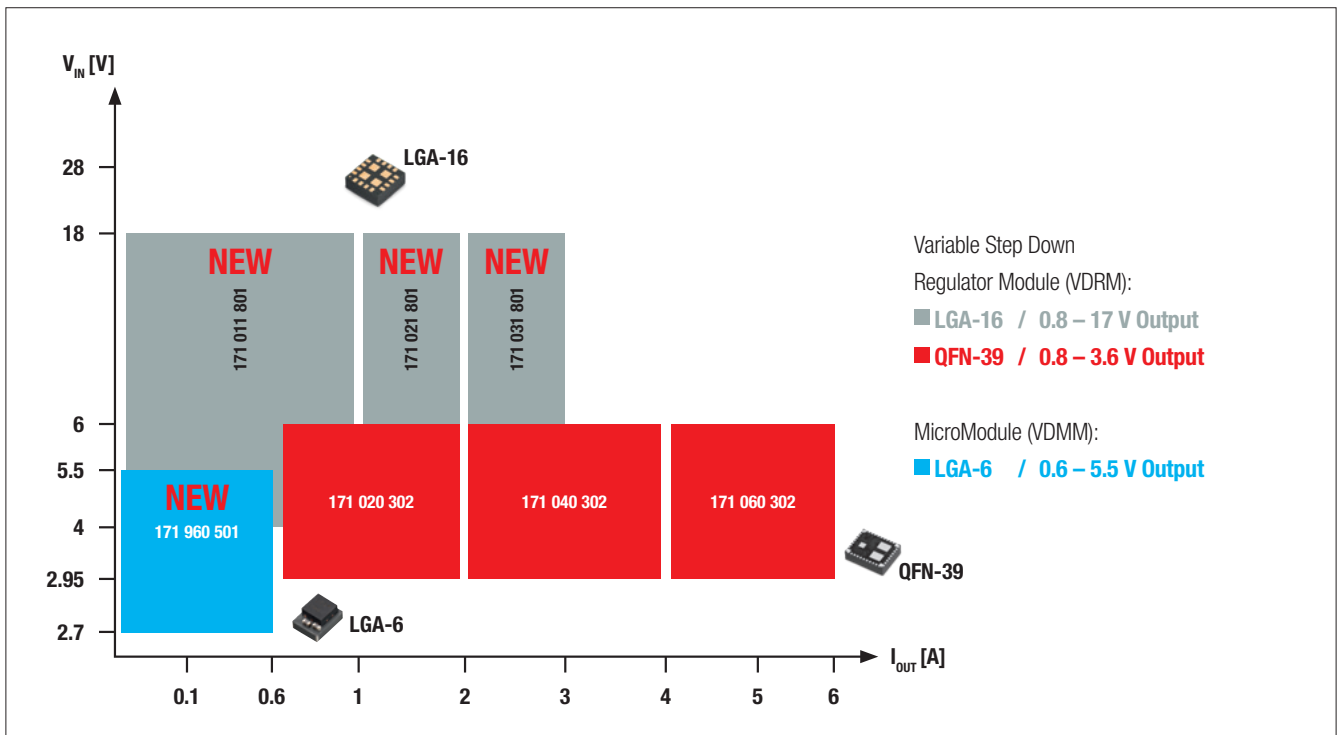


# Portfolio

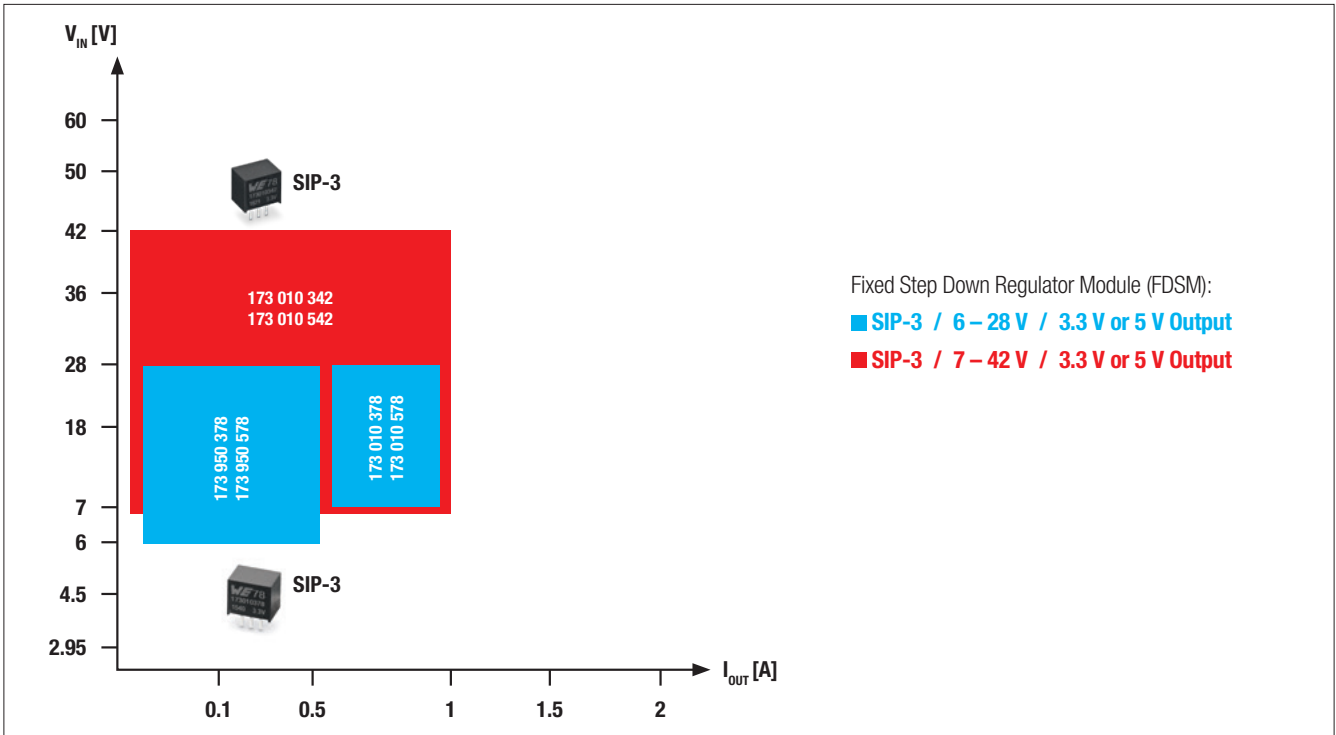
## Variable Step Down Regulator Modules (VDRM) & LED Step Down High Current Module (LDHM)



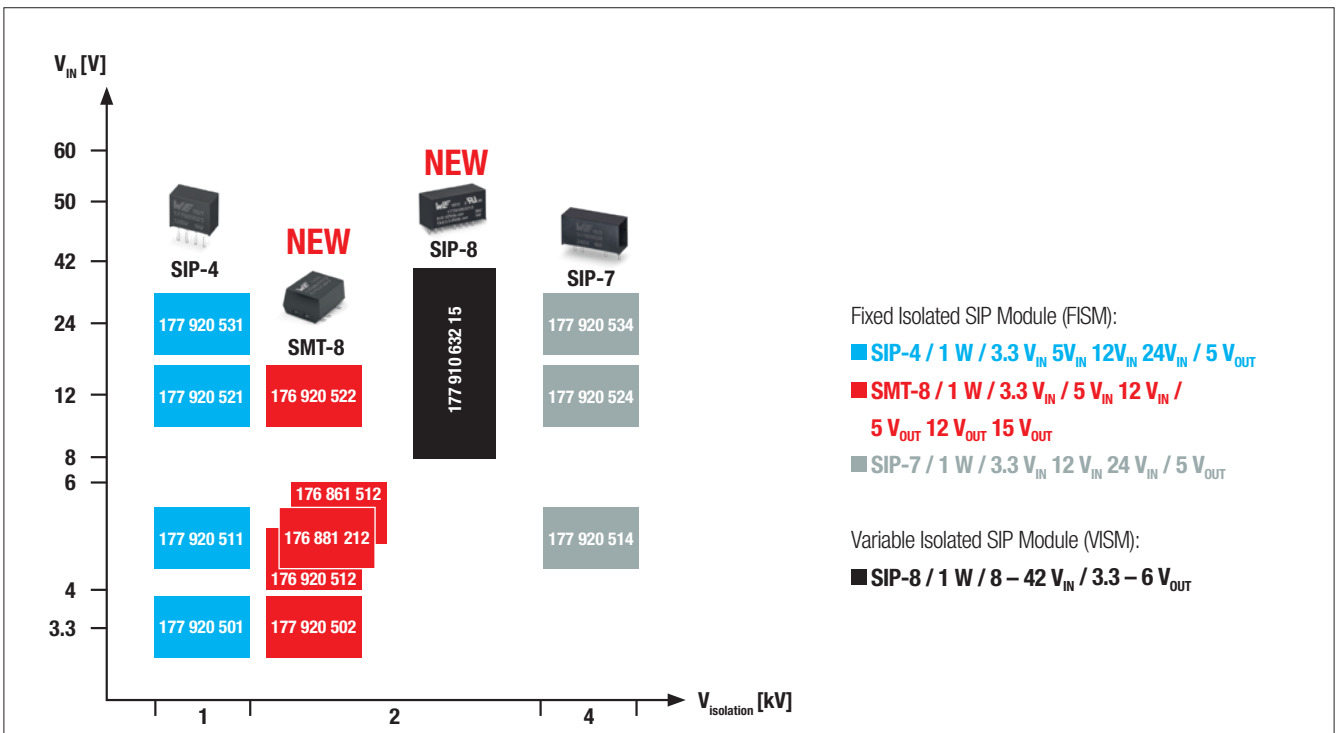
## Variable Step Down Regulator Modules (VDRM) & MicroModule (VDMM)



## Fixed Step Down Regulator Module (FDSM)



## Fixed Isolated SIP Module (FISM) & Variable Isolated SIP Module (VISM)



# General Terms and Conditions of the Würth Elektronik eiSos Group

As of: February 2017

## 1. Application

1.1 These General Terms and Conditions (hereinafter "Conditions") shall apply to all deliveries and services of Würth Elektronik eiSos GmbH & Co. KG, Würth Elektronik iBE GmbH, Erwin Büchele GmbH & Co. KG and AMBER wireless GmbH (hereinafter "Würth Elektronik") even if they are not referred to in subsequent contracts. Any terms and conditions of the customer that conflict with, supplement, or deviate from these Conditions shall not become part of the contract unless their application is expressly approved by Würth Elektronik in writing. These Conditions shall apply even if Würth Elektronik accepts a delivery or service from the customer without reservations whilst being aware of the customer's conflicting or deviating terms and conditions.

1.2 Agreements which supplement or deviate from these Conditions and which are made between the customer and Würth Elektronik for the performance of a contract must be set out in writing in the contract. This also applies to the cancellation of this requirement of the written form.

1.3 Any rights beyond these Conditions to which Würth Elektronik is entitled by law shall remain unaffected.

## 2. Offer and formation of contract

2.1 Offers from Würth Elektronik shall be subject to change and non-binding, unless they are expressly stated to be binding.

2.2 Pictures, drawings, information as to weight, measurement, performance and consumption as well as other descriptions of the goods in the documentation pertaining to the offer shall be approximations only, unless they are expressly stated to be binding. They do not constitute an agreement on, or guarantee of, the corresponding quality of the goods.

2.3 Würth Elektronik reserves all proprietary rights and copyrights in any offer documents. Such documents may not be made available to any third party.

2.4 Orders from the customer shall be binding. Würth Elektronik may accept orders by sending a written order confirmation, by making delivery or providing the services.

2.5 Executing orders according to the documents to be provided by the customer shall require written approval by Würth Elektronik.

2.6 Contracts that are concluded shall oblige the customer to accept and pay for the goods or services ordered.

## 3. Prices, payment, set-off

3.1 The agreed price shall always be decisive. Not included in the price shall, in particular, be the costs for packaging, freight, insurance, customs, public levies and VAT. Statutory VAT shall be stated separately in the invoice, at the statutory rate applicable on the day the invoice is issued.

3.2 For services that shall not be performed within a period of four months after the contract has been concluded Würth Elektronik shall be entitled to adjust the price in line with any increases in wages and in the cost of materials that may have occurred in the meantime. The same shall apply for services that are to be provided as part of continuous obligations. If Würth Elektronik has agreed with the customer that the prices shall depend on specific price factors, for example, raw material prices, changes in the price factors lead to price adjustments, irrespective of the performance period.

3.3 Unless otherwise agreed, payment shall be made net within 30 days after the date of the invoice. Würth Elektronik shall, however, be entitled to make the execution of outstanding deliveries or the provision of services contingent upon pre-payment or the provision of security if no previous business relationship exists with the customer, deliveries are to be made abroad, the customer's registered office is abroad or if there are any other reasons that give Würth Elektronik reason to doubt that payment will be made promptly after delivery or provision of the services.

3.4 If after the contract has been entered into Würth Elektronik becomes aware of circumstances that could considerably reduce the customer's creditworthiness and which could endanger the payment of outstanding receivables of Würth Elektronik by the customer under the individual contract, Würth Elektronik shall be entitled to refuse to continue to execute the contract until the customer makes payment or provides security for such. If the customer is in default of payment, all the receivables of Würth Elektronik that are outstanding with the customer shall become due immediately.

3.5 Payment shall be deemed made on the date on which Würth Elektronik can dispose of the amount owed. When paying by cheque, payment shall only be deemed made after the cheque has been cashed and Würth Elektronik can dispose of the amount. Discount charges and other cheque costs shall be borne by the customer. In the event of default of payment, the customer shall pay default interest at the rate of 9 percentage points above the base rate. The right to assert a further claim for damages is not excluded.

3.6 Würth Elektronik shall be entitled to credit payments made by the customer towards the customer's oldest debt first. If costs and interest have already accrued, Würth Elektronik shall be entitled to credit the payment towards the costs first, then towards interest, and finally towards the principal claim.

3.7 Counterclaims of the customer may only be set off or used to assert a right of retention by the customer if they have become final by virtue of a judgment or if they are undisputed. A right to retain may be asserted by the customer only if the customer's counterclaim is based on the same contractual relationship.

## 4. Deliveries

4.1 Delivery periods and dates shall only be binding for Würth Elektronik if Würth Elektronik explicitly states or confirms that they are binding. Agreed delivery periods shall be deemed met if the goods have been handed over to the person in charge of the transport at Würth Elektronik's registered office or at one of Würth Elektronik's warehouses before this period has expired or if Würth Elektronik has provided notification that they are ready for dispatch but have not left the registered office or warehouse because the customer has declared that it will not accept the goods.

4.2 If making the agreed deliveries or providing the services of Würth Elektronik requires the cooperation of the customer, the customer shall ensure that Würth Elektronik is provided with all the necessary and appropriate information and data within good time and that such is of the required quality. If programming is required, the customer shall provide Würth Elektronik with the necessary computer processing power, test data and data inputting capacities within good time and to a sufficient extent.

4.3 The delivery period shall not start before all the documents, information, approvals and permits that are to be provided by the customer have been provided in full and any technical issues have been clarified and any agreed down-payment has been received. As a prerequisite for compliance with the delivery period or the delivery date, the customer must perform its other obligations properly and in due time. Compliance with the agreed delivery deadlines and delivery dates is subject to the condition that Würth Elektronik is supplied by its own suppliers in due time and properly. Any changes or amendments that are subsequently agreed with Würth Elektronik may result in a reasonable extension of the agreed delivery dates.

4.4 Würth Elektronik shall be entitled to make reasonable part deliveries and provide partial services. Unless otherwise expressly agreed, deliveries and services ahead of schedule shall be allowed.

4.5 If the customer is in default of acceptance or violates other duties to cooperate, Würth Elektronik can claim compensation for the damage caused including any additional expenditure and storage costs. Any other claims remain unaffected. Würth Elektronik shall be entitled, after setting a reasonable subsequent deadline, to otherwise dispose of the goods and to supply the customer with new goods within a reasonable extended deadline.

## 5. Passing of risk/dispatch

5.1 The risk of accidental loss or accidental deterioration of the goods shall pass to the customer at the latest when the goods are handed over to the customer or, if it is agreed that the goods will be shipped, already with the handing over of the goods to the shipping company, freight carrier or to any other person instructed to carry out the dispatch. This shall also apply to part deliveries or if it has been agreed that the dispatch is "freight paid" or free of charge. In the absence of written instructions from the customer, Würth Elektronik shall be entitled to choose the carrier and the itinerary at its own discretion and after a due assessment of the circumstances. At the request and expense of the customer, Würth Elektronik shall take out transport insurance to insure the goods against the risks specified by the customer.

5.2 If there is a delay in handing over or dispatch for reasons for which the customer is responsible, the risk shall pass to the customer on the day the goods are ready to be dispatched and Würth Elektronik informs the customer of such.

5.3 If Würth Elektronik chooses the type of dispatch, the dispatch route and/or the person to carry out the dispatch, Würth Elektronik shall only be liable for wilful misconduct or gross negligence resulting from this choice.

## 6. Retention of title

6.1 The goods supplied remain the property of Würth Elektronik until all receivables owed to Würth Elektronik by the customer as a result of the business relationship have been fully paid. If Würth Elektronik's obligations to be performed include delivering software, up until payment in full has been made of any receivables, the customer shall in any case only be granted a revocable usage right. These receivables also include claims under cheques and bills of exchange, as well as current-account claims. The customer shall be obliged to handle all goods to which title is retained, and as long as title is retained, with due care. In particular, the customer is obliged to sufficiently insure the goods at the customer's own expense against damage by fire, water, and theft at their replacement value. The customer hereby assigns to Würth Elektronik all claims for compensation arising from such insurance. Würth Elektronik hereby accepts the assignment. If an assignment is not allowed, the customer hereby irrevocably instructs its insurer to make payments, if any, only to Würth Elektronik. This does not affect any further claims of Würth Elektronik. Upon request, the customer must provide Würth Elektronik with evidence of the conclusion of the insurance policy.

6.2 The customer shall only be allowed to sell the goods which are subject to retention of title in the ordinary course of business. The customer shall not be entitled to pledge the goods which are subject to retention of title, to transfer them by way of security or to make any other dispositions which may jeopardize Würth Elektronik's ownership. In the event of attachments or other encroachments by third parties, the customer must notify Würth Elektronik without undue delay in textual form and provide all the information required, advise the third party of Würth Elektronik's property rights and assist with the measures taken by Würth Elektronik to protect the goods which are subject to retention of title. The customer shall bear any costs for which it is responsible and which are necessary for the removal of the encroachment and the recovery of the goods, if and to the extent that these costs cannot be obtained from the third party.

6.3 The customer hereby assigns to Würth Elektronik all receivables arising from the resale of the goods, including all ancillary rights, irrespective of whether the goods which are subject to retention of title are resold without or after further processing. Würth Elektronik hereby accepts this assignment. In the event that such assignment is not allowed, the customer hereby irrevocably instructs the third-party debtor to make payments, if any, only to Würth Elektronik. The customer has the authority, which may be revoked at any time, to collect the receivables assigned to Würth Elektronik as a trustee on behalf of Würth Elektronik. All amounts collected must be remitted to Würth Elektronik immediately. Würth Elektronik may revoke the customer's authority to collect receivables and its right to resell the goods if the customer fails to properly perform its payment obligations to Würth Elektronik, if the customer is in default of payment or stops payment, or if the creditworthiness or financial position of the customer deteriorates, he ceases any other business activity essential for the contractual performance or if he becomes incapable for other reasons to fulfil the contractual duties. Any resale of these receivables is subject to prior approval by Würth Elektronik. The customer's authority to collect shall expire with the notification of the assignment to the third-party debtor. In the event of a revocation of the authority to collect, Würth Elektronik may request that the customer disclose all receivables assigned, as well as the respective debtors' names, provide all information necessary for collection, provide the related documents and inform the debtors of the assignment.

6.4 In the event of default of payment on the part of the customer, Würth Elektronik shall be entitled to rescind the contract without prejudice to its other rights. The customer must immediately grant Würth Elektronik, or any third party commissioned by Würth Elektronik, access to the goods that are subject to retention of title, surrender such goods and inform Würth Elektronik where these goods are located. After a timely warning to such effect, Würth Elektronik may otherwise dispose of the goods that are subject to retention of title for the purpose of satisfying its due claims against the customer.

6.5 Any processing or alterations made by the customer to the goods which are subject to retention of title shall always be deemed made on behalf of Würth Elektronik. The customer's right to acquire ownership of the goods which are subject to retention of title continues to exist as a right to acquire ownership of the processed or altered item. If the goods are processed, combined or mixed with other goods that are not owned by Würth Elektronik, Würth Elektronik shall acquire a co-ownership interest in the new item that is equal to the ratio of the value of the goods supplied to the value of the other items processed at the time of processing. The customer shall store the new items on behalf of Würth Elektronik. In all other respects, the item created through processing or alteration shall be governed by the same provisions as the goods that are subject to retention of title.

6.6 If requested by the customer, Würth Elektronik shall be obliged to surrender the security interests to which Würth Elektronik is entitled to the extent that the realizable value of these security interests exceeds Würth Elektronik's receivables arising from the business relationship with the customer by more than 20% upon deduction of the mark-downs customary in the banking business. For valuation purposes, goods that are subject to retention of title shall be assessed on the basis of their invoice value and receivables shall be assessed on the basis of their nominal value.

6.7 In the event that goods are delivered to destinations with other legal systems in which the retention of title pursuant to clauses 6.1 to 6.6 above does not offer the same degree of protection as in the Federal Republic of Germany, the customer hereby grants Würth Elektronik the equivalent security interest. If the creation of this security interest requires further declarations or actions, the customer shall make these declarations and perform these actions. The customer shall assist with all measures required for, and conducive to, the validity and enforceability of such security interests.

## 7. Claims for quality defects and liability

7.1 Würth Elektronik shall manufacture its products according to the state of the art in technology applicable at time of entering into the contract. Any intended usage that goes beyond the customary usage of the products or that requires a quality that deviates from the norm, in particular, any usage that is relevant for safety purposes, for example, aerospace or automobile usage, must be agreed in advance in writing.

7.2 The customer's defect rights shall require that the customer has fulfilled its statutory obligations to inspect and give notice of defects (Sec. 377, 381 German Commercial Code (HGB)), in particular that the customer has checked the delivered goods upon receipt and notified Würth Elektronik without undue delay and in textual form upon receipt of the goods of any obvious defects and defects that could be identified during such inspection. The customer shall inform Würth Elektronik in writing of any hidden defects without

# General Terms and Conditions of the Würth Elektronik eiSos Group



As of: February 2017

undue delay after they have been discovered. The notification shall be deemed without undue delay if made within two weeks after delivery for obvious defects and defects that could be identified during a proper inspection or after discovery in the event of hidden defects; to meet the deadline, the dispatch of the notification or complaint shall suffice. If the customer fails to carry out a proper inspection and/or notification of the defects, Würth Elektronik shall not be liable for the defect. When reporting defects to Würth Elektronik, the customer must supply a detailed description of the defects in textual form.

7.3 Unless otherwise agreed, the customer shall be obliged to initially deliver the goods at its own expense to Würth Elektronik so that the defects can be examined. The expenses that are required for the inspection and subsequent performance, in particular transportation, travel, labour and material costs within the meaning of Sec. 439 (2) German Civil Code (BGB) shall only be borne by Würth Elektronik if it is determined during the inspection that a defect actually exists and provided these expenses are not increased due to the fact that the customer took the goods to a different location than the original delivery address. Personnel and material costs claimed by the customer in this connection shall be charged on the basis of net costs.

7.4 If the goods are defective, Würth Elektronik shall be entitled - for the purposes of subsequent performance - to choose between remedying the defect or delivering goods that are free from defects.

7.5 If Würth Elektronik is not prepared or is not in a position to carry out subsequent performance after a reasonable deadline has expired, the customer can choose to rescind the agreement or reduce the purchase price. The same shall apply if the subsequent performance fails, if it is unacceptable to the customer or if a reasonable deadline is exceeded due to reasons for which Würth Elektronik is responsible.

7.6 The customer shall have no right to rescind the contract if the customer is unable to return the goods received and this is not due to the fact that it is impossible to return such due to their nature, if Würth Elektronik is responsible for such or if the defect did not become apparent until after the goods were processed or altered. The right to rescind the contract shall furthermore not exist if Würth Elektronik is not responsible for the defect and if instead of the received goods or services being returned by the customer, Würth Elektronik has to pay compensation for lost value.

7.7 Claims for defects shall not exist with respect to defects that are due to natural wear and tear, to improper handling by the customer or a third party, or to changes or repairs to the goods that have been carried out by the customer or a third party in an improper manner. The same shall apply to defects which can be attributed to the customer or which arise as a result of technical reasons other than the original defect. The customer shall, in particular, comply with the operational, storage and/or maintenance recommendations provided by Würth Elektronik or the manufacturer.

7.8 The customer's claim for reimbursement of expenses in place of damages in lieu of performance shall be excluded if and to the extent that such expenses would not have been made by a reasonable third party.

7.9 Würth Elektronik shall not be liable for damage for which it is not responsible, in particular, it shall not be liable for damage that is caused by improper usage or handling of the products. The customer is obliged to comply with the operational, storage and/or maintenance recommendations provided by Würth Elektronik or the manufacturer, to only make authorised changes, replace spare parts professionally and use the consumables that have the necessary specifications. Where applicable the customer shall, both before and also regularly after the deliveries have been made or the services have been provided by Würth Elektronik, perform backups to its computer systems at sufficiently regular intervals. Würth Elektronik shall assume no liability for damage which is caused by or can be attributed to a breach of the aforesaid obligations of the customer.

7.10 Würth Elektronik shall be liable without limitation for any damage resulting from breach of guarantee or from death, bodily injury, or damage to health. The same shall apply to wilful misconduct and gross negligence, to mandatory statutory liability for product defects (in particular under the German Product Liability Act (ProdHaftG) and to liability if defects were concealed with fraudulent intent. In cases of slight negligence, Würth Elektronik shall only be liable if material obligations are breached that result from the nature of the contract and the performance of which is of particular importance in order for the purpose of the contract to be achieved. If such obligations are breached, as well as in the event of default or if performance is impossible, Würth Elektronik's liability shall be limited to the damage which can typically be expected with such contract.

7.11 The limitation period for claims for defects of the customer shall be one year, unless the defective good has been used in its customary manner for a building and this has caused a defect to the building. The limitation period shall also apply to claims resulting from a tortious act that are based on a defect of the goods. The limitation period shall start with the delivery of the goods. This shall not affect the unlimited liability of Würth Elektronik for damage resulting from a breach of guarantee or from death, bodily injury or damage to health, for wilful misconduct and gross negligence, and product defects. If Würth Elektronik makes a statement with regard to a claim for defects asserted by the customer, this shall not be deemed as the start of negotiations with regard to the claim or the circumstances on which the claim is based, provided the claim for defects is fully rejected by Würth Elektronik.

## 8. Intellectual property and usage rights relating to software and other protected products, information and co-operation duties

8.1 Unless otherwise provided in the contract or by law, any rights relating to software or other protected products which are delivered to the customer or which are produced for the customer, in particular, copyrights, industrial property rights such as, patents, trademarks and registered designs, shall remain the property of Würth Elektronik or the individual proprietor of the rights. This shall also apply if the software or any other protected products are produced according to the specifications of or in co-operation with the customer.

8.2 If Würth Elektronik uses the customer's software, Würth Elektronik shall only use such software for the contractually agreed purpose. If Würth Elektronik requires the source codes for the software to make contractually agreed changes or remedy defects, the customer shall provide Würth Elektronik with such free of charge for use.

8.3 The customer shall only receive a simple right of use to the software and other protected products to such extent as is required for the purpose of the contract, unless otherwise provided in the contract, in particular, the applicable licencing terms of the software or an individual licence agreement, or by mandatory statutory law. With regard to software provided by Würth Elektronik, unless expressly permitted under the contract or by law, the customer shall in particular be forbidden from reproducing, distributing, disclosing, changing, translating, extending, making other modifications to and/or decompiling such.

8.4 For backup purposes, the customer may create the necessary backup copies of the software, provided the individual licence agreement does not contain provisions to the contrary. Sec. 69d (2) Germany Act on Copyright and Related Rights (UrHGr) remains unaffected. Backup copies on moveable data carriers shall be marked as such and shall be endorsed with the copyright notice of the original data carrier.

8.5 In the event of unlawful use Würth Elektronik and/or third parties, in particular, the manufacturer of the software or other protected products, reserve the right to assert claims for compensation.

8.6 In the event that a third party alleges it has a claim which conflicts with the right of use granted to the customer, the customer shall inform Würth Elektronik without undue delay in text form. The notification shall also include information as to whether the customer has changed the software or the product or combined such with other software and whether this, from the customer's perspective, could justify the third party's claim. If so requested by Würth Elektronik, the customer shall allow Würth Elektronik to handle the defence against these claims and, to the extent permissible and possible, shall allow Würth Elektronik to represent the customer or shall conduct the defence itself as instructed by Würth Elektronik. Up until receiving noti-

fication as to whether Würth Elektronik will deal with the defence, the customer shall not acknowledge or enter into a settlement agreement regarding the alleged claims of the third party without the express approval of Würth Elektronik. If Würth Elektronik deals with the defence, this obligation shall continue to apply. In addition, the customer shall support Würth Elektronik in its defence, if this is required for an appropriate defence. In return, Würth Elektronik shall indemnify and hold the customer harmless against any necessary external costs and any third party compensation claims and claims for reimbursement of expenses resulting from the defence, provided these can be attributed to the fault of Würth Elektronik. In the event that Würth Elektronik does not deal with the defence, the customer shall be entitled to defend itself at its own discretion. If existing third party claims cannot be attributed to the fault of Würth Elektronik, the customer shall not be entitled to assert claims against Würth Elektronik.

8.7 Notwithstanding Sec. 439 (1) German Civil Code (BGB), Würth Elektronik shall also be entitled with regard to title defects relating to software to attempt subsequent performance, if Würth Elektronik so chooses (cf. 7.4). In all other respects, the statutory provisions for warranty obligations for title defects with regard to software shall apply irrespective of whether Würth Elektronik is dealing with the defence against third party claims under clause 8.6 of these Conditions, however, with the following exceptions: (i) for the recovery of data, Würth Elektronik shall only be liable insofar as the loss of data would also have occurred if the customer had carried out the usual backups; (ii) clause 7.3 of these Conditions applies accordingly.

## 9. Product liability

9.1 The customer shall not modify the goods; in particular, the customer shall not modify or remove existing warnings relating to risks by improperly using the goods. If this duty is violated, the customer must inter partes indemnify and hold Würth Elektronik harmless from and against any product liability claims of third parties to the extent that the customer is responsible for the defect giving rise to liability.

9.2 If Würth Elektronik has to carry out a product recall or issue a product warning because of a product defect to the goods, the customer shall assist Würth Elektronik and take all measures ordered by Würth Elektronik, provided that these do not pose an unreasonable burden to the customer. The customer shall be obliged to bear the costs of the product recall or product warning, provided the customer is responsible for the product defect and the damage sustained. This does not affect any further claims of Würth Elektronik.

9.3 The customer shall inform Würth Elektronik without undue delay in textual form of any risks in the use of the goods and any possible product defects of which the customer becomes aware.

## 10. Force majeure

10.1 If Würth Elektronik is prevented by force majeure from performing its contractual obligations, in particular from delivering the goods, Würth Elektronik shall be released from its obligation to perform for the duration of the impediment and for a reasonable start-up period without being liable to the customer for damages. The same shall apply if the performance of its obligations by Würth Elektronik becomes unreasonably complicated or temporarily impossible because of unforeseeable circumstances for which Würth Elektronik is not responsible, in particular, because of industrial action, official acts, energy shortages, delivery problems on the part of suppliers, or major disruptions of operations.

10.2 Würth Elektronik shall have the right to rescind the contract if such an impediment continues for more than three months and if, as a result of such impediment, the performance of the contract is no longer of interest to Würth Elektronik. At the request of the customer, Würth Elektronik shall declare after the expiry of the aforesaid three-month period whether it intends to make use of its right to rescind the contract or whether it intends to deliver the goods within a reasonable period of time.

## 11. Data protection and confidentiality

11.1 The customer is instructed by Würth Elektronik that the data recorded during the course of entering into the contract may be collected, processed and used by Würth Elektronik in accordance with the provisions of the German Federal Data Protection Act (BDSG) for the purpose of fulfilling its obligations under the contracts entered into with the customer. Such data may also be transmitted to affiliated companies of Würth Elektronik or vicarious agents for the purposes of fulfilling the contract and for credit investigations.

11.2 The customer shall be obliged for an unlimited period of time to maintain the confidentiality of any and all information received through Würth Elektronik which is stated to be confidential or which due to other circumstances can be identified as a trade or business secret; the customer may neither record nor disclose or use any such information. The customer must ensure by means of suitable contractual agreements with its employees and those agents working on its behalf that such persons also refrain for an unlimited period of time from any use, disclosure and unauthorised recording of such trade and business secrets for their own purposes.

## 12. Final provisions

12.1 Any rights and obligations of the customer may only be assigned or transferred to a third party with the written consent of Würth Elektronik.

12.2 The legal relations between the customer and Würth Elektronik shall be governed by the laws of the Federal Republic of Germany, without regard to the United Nations Convention on Contracts for the International Sale of Goods (CISG).

12.3 Exclusive place of jurisdiction for all disputes arising from the business relationship between Würth Elektronik and the customer shall be the registered office of Würth Elektronik. Würth Elektronik may in addition sue the customer at the latter's registered office, as well as at any other permissible place of jurisdiction.

12.4 The place of performance for any and all obligations to be performed by the customer and by Würth Elektronik shall be the registered office of Würth Elektronik.

12.5 If a provision of this agreement is or becomes invalid or impracticable in whole or in part, or if this agreement is incomplete, this shall not affect the validity of the remaining provisions hereof. In lieu of the invalid or impracticable provision, such valid and impracticable provision shall be deemed agreed as comes closest to the purpose of the invalid or impracticable provision. In the event that this agreement is incomplete, such provision shall be deemed agreed as corresponds to what would have been agreed according to the purpose of this agreement if the contracting parties had considered the matter from the outset.

## Environmental declaration

Würth Elektronik is committed to people and the environment. Therefore, we undertake to manufacture our products in a manner that conserves resources and to systematically realise any potential for saving energy in manufacturing processes and in transportation. We pay close attention to ecological alternatives as concerns the selection of sources of energy and raw materials and pursue a consistent policy of waste reduction and product recycling.

# Notes

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# Electronic & Electromechanical Components



## EMC Components



## Power Magnetics



## Signal & Communications



## Quartz & Oscillators



## Capacitors



## Resistors



## Automotive Standard Products



## Optoelectronics



## Power Modules



## Wireless Connectivity & Sensors



## Connectors



## Fuseholders



## Switches



## Assembly Technique



## REDCUBE Terminals

# more than you expect

## Würth Elektronik eiSos differs from all other component manufacturers in several aspects:

- We guarantee all catalogue products are available ex stock
- Samples free of charge
- Orders below MOQ
- Design kits with lifelong free refill
- Design Guide Trilogy of Magnetics, Trilogy of Connectors, Abc of Capacitors, Abc of Power Modules & Application Handbook The LTspice IV Simulator
- Design Seminars and Webinars free of charge
- Reference designs of leading IC manufacturers
- Worldwide technical sales force and field application engineers on site

