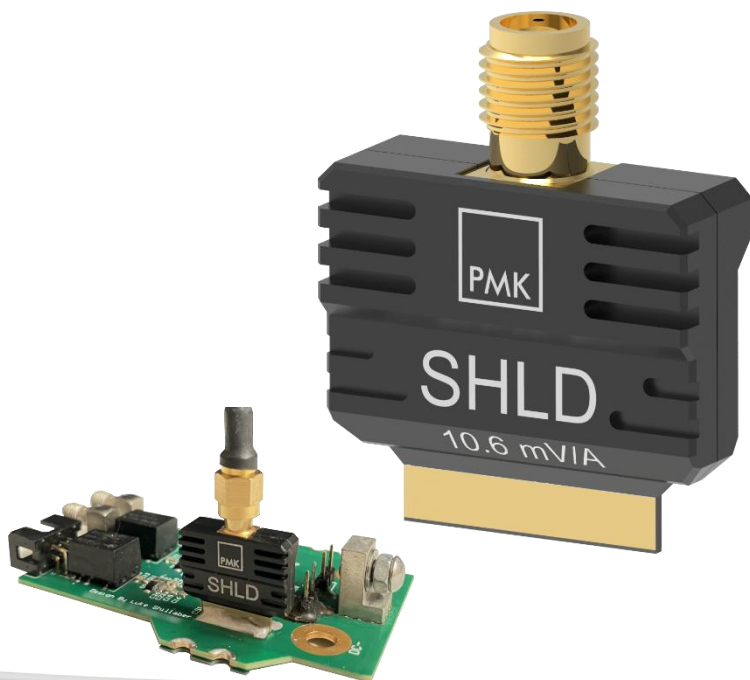




**Probing Solutions.
Made in Germany.**



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Ultra-Fast Current Shunt Series UFCS

>1 GHz Bandwidth, <200 pH Insertion Inductance

Various sizes available: 1 m Ω – 52 m Ω

Datasheet



The Ultra-Fast Current Shunt series UFCS

The Ultra-Fast Current Shunts (UFCS) represent a paradigm shift in the realm of current measurement technology, setting new standards in terms of technological sophistication. >1GHz bandwidth and ultra-low insertion inductance of <200pH enable the precise analysis of fast rise time signals with exceptional signal fidelity, making PMK's shunts with non-inductive frequency response ideal for challenging measurements like WBG (wide-bandgap) switching loss or pulse current analysis.

The UFCS models' compact form factor and high current carrying capacity ensure consistent and reliable performance. Whether measuring GaN switching losses or analysing high-frequency transients, the solder-in shunts always guarantee highest accuracy.

The UFCS are a result of technological advancement that has not been surpassed in the field of current measurement in modern power electronics. For measurements with highest CMRR requirements the UFCS can be connected to optically isolated voltage probes, like PMK's FireFly®. For general purpose measurements the UFCS can also be connected directly to a 50 Ω input measuring instrument.

Specifications

Read the Instruction Manual before first use and keep it for future reference. A digital copy of the latest Instruction Manual revision can be downloaded at www.pmk.de.

Electrical Specifications

Allow the shunt to warm up for 20 minutes. This shunt comes with 1 year warranty. Each specification is determined at +23°C ambient temperature. Do not exceed the specifications.

PMK's UFCS ultra-fast current shunts are for use in a controlled environment in accordance with IEC 61010-1 only. The shunts are not for hand-held use. This product is not rated for CAT II, III or IV. Do not exceed the specifications¹.

Order number	Shunt Resistance	Gain (nominal) *	3 dB Bandwidth	Insertion Inductance ³
UFCS-R001	1 mΩ	0.957 mV/A	>600 MHz	120 pH
UFCS-R005	5 mΩ	4.30 mV/A	>900 MHz	140 pH
UFCS-R011	11 mΩ	10.6 mV/A	>1 GHz	110 pH
UFCS-R024	24 mΩ	23.6 mV/A	>1 GHz	140 pH
UFCS-R052	52 mΩ	51.1 mV/A	>900 MHz	150 pH

Order number	Maximum 1us Pulse Current ²	Maximum 100us Pulse Current ²	Maximum Continuous Current (DC or RMS) ^{2, 4}
UFCS-R001	2000 A	1250 A	50 A
UFCS-R005	800 A	300 A	25 A
UFCS-R011	340 A	105 A	15 A
UFCS-R024	230 A	70 A	10 A
UFCS-R052	160 A	50 A	7 A

Notes:

¹ Electrical Specifications¹ that are not marked with (*) as guaranteed are typical.

² Performance parameters may vary if not using the recommended footprint.

³ See Maximum Current per Pulse Length graph.

⁴ When soldered into recommended footprint, measured at 5-10 MHz, does not include footprint inductance.

⁵ Preliminary – measured at room temperature

* A more precise gain is indicated on each shunt.

The following specifications are valid for all models of the UFCS series:

Pollution Degree: 1

DC Gain Accuracy: 1 %

Output connector: SMA (female)

Input Coupling of the Measuring Instrument: 50 Ω



Exceeding the specified ratings may cause irreversible failure and damage to the connected equipment.



The ratings may vary depending on usage conditions and usage environment. The provided data is intended as a reference only.

Environmental Specifications

Parameter		Specification
Temperature Range	Operating	-40 °C to +85 °C -40 °C to +30 °C under non-pulsed current conditions
	Non-Operating	-40 °C to +85 °C
Maximum Relative Humidity	Operating	80 % relative humidity for temperatures up to +31 °C, decreasing linearly to 40 % at +50 °C, non-condensing humidity
	Non-Operating	95 % relative humidity for temperatures up to +40 °C, non-condensing humidity
Altitude	Operating	up to 2000 m
	Non-Operating	up to 15000 m

Please contact sales@pmk.de, if another temperature range is of interest.

Mechanical Specifications

Parameter	Shunt Specifications	UFCS-Choke Specifications
Weight	6.2 g	560g incl. cables
Dimensions (L x W x H)	See drawing ⁵	12.65cm x 11.6cm x 6.3cm
Input	Soldering Pads ⁵	SMA (male)
Output Connector	SMA (female)	BNC (male)
Input Coupling of the Measuring Instrument ⁶	50 Ω	

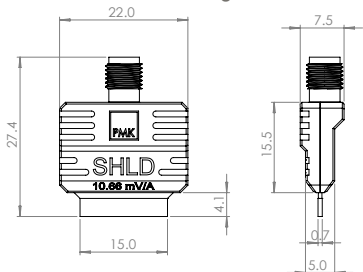
Notes:

⁵ See section "Dimensional Drawing and Recommended Footprint"

⁶ Or 1M Ω input impedance and a 50 Ω feed-through termination, see ordering information

Dimensional Drawing and Recommended Footprint

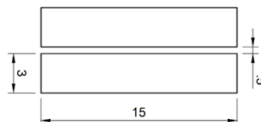
The schematical drawing and all dimensions in the recommended footprint drawing are shown in [mm].



Contact sales@pmk.de or your local PMK representative for design files. Drawings not to scale.



Observe Solder-in direction: UFCS IN for input, SHLD for reference (internally connected to output connector shield).



Maximum Pulse Current Derating

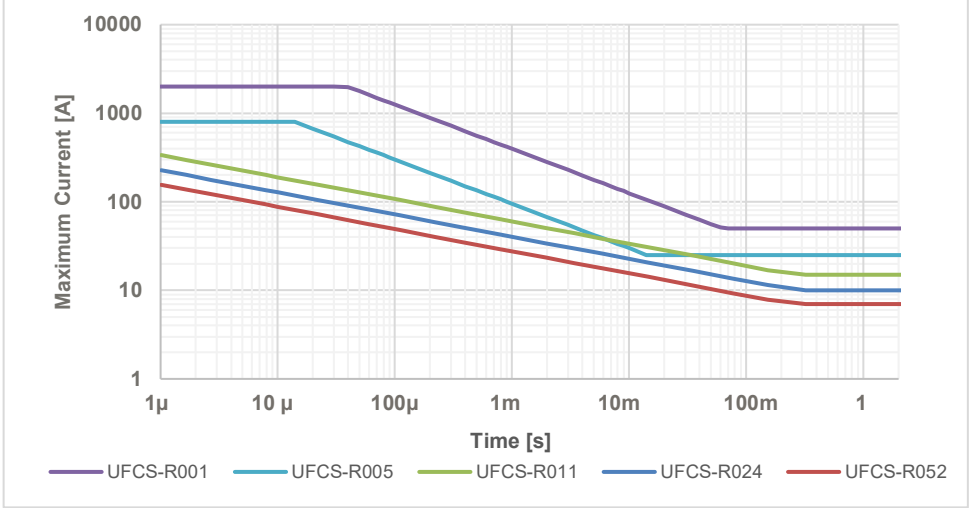


Exceeding the maximum pulse rating of the UFCS can cause irreversible damage to the product and connected accessories.



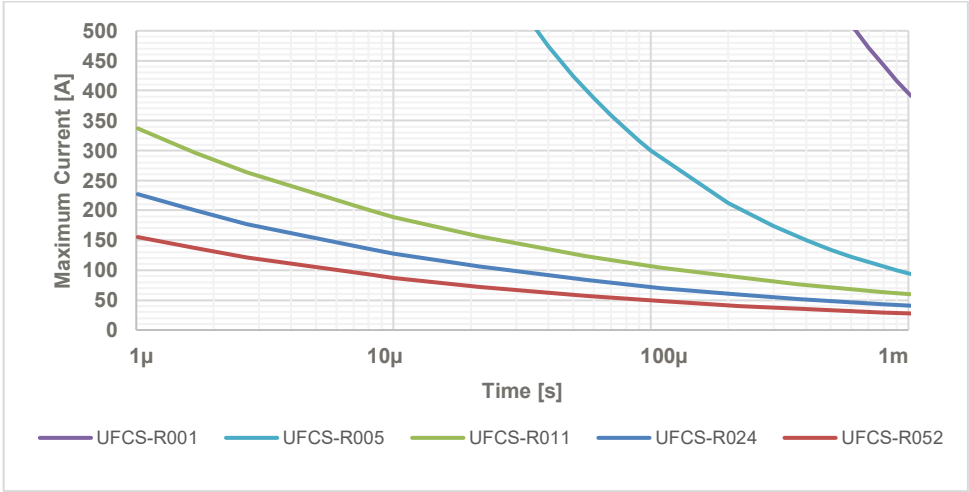
Always check that output voltage is compatible with ratings of oscilloscope or isolated probe.
 $V_{OUT,SHUNT} = \text{Shunt Gain} \times \text{Test Current}$.

Maximum Current Ratings “Rectangular Pulse” UFCS-R0XX



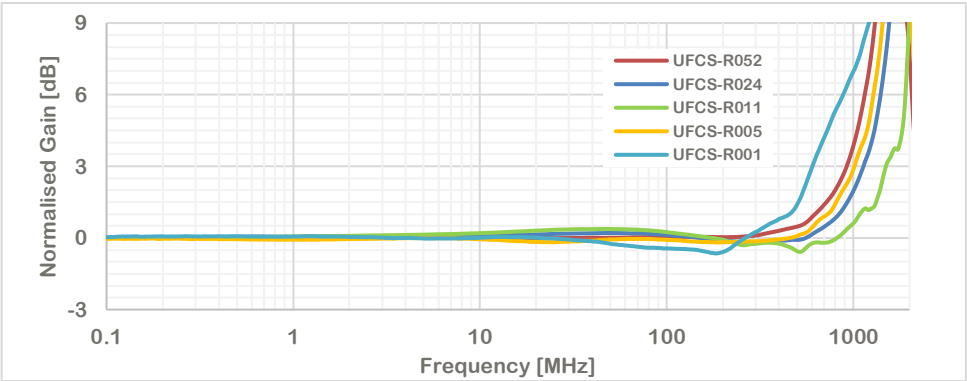
Maximum Current Ratings “Rectangular Pulse” UFCS-R0XX

Zoom 1μs to 1ms:



Frequency Response

UFCS-R0XX Frequency Response



The Frequency Response graphs are normalised to 0 dB for better comparison.

Scope of Delivery

See chapter “Ordering Information” to review the selection of recommended accessories for connections to different measuring instruments, like optically isolated probes or direct connection to grounded oscilloscopes. See also the latest instruction manual for installation recommendations at www.pmk.de online.

UFCS series shunt

Ordering Information

Step 1: Select the Shunt

Each resistance model is available as a single pack or as more cost-effective packs of 10 or 25 pieces.

UFCS-R001	1 mΩ, >600 MHz bandwidth, 120 pH insertion inductance, 1250 A maximum pulse current @ 100μs, SMA (F) output, 1 pc. Also available as packs: 10 pcs UFCS-R001x10 , 25 pcs UFCS-R001x25	
UFCS-R005	5 mΩ, >900 MHz bandwidth, 140 pH insertion inductance, 300 A maximum pulse current @ 100 μs, SMA (F) output, 1 pc. Also available as packs: 10 pcs UFCS-R005x10 , 25 pcs UFCS-R005x25	
UFCS-R011	11 mΩ, >1GHz bandwidth, 110 pH insertion inductance, 105 A maximum pulse current @ 100 μs, SMA (F) output, 1 pc Also available as packs: 10 pcs UFCS-R011x10 , 25 pcs UFCS-R011x25	
UFCS-R024	24 mΩ, >1GHz bandwidth, 140pH insertion inductance, 70A maximum pulse current @ 100μs, SMA (F) output, 1pc Also available as packs: 10pcs UFCS-R024x10 , 25 pcs UFCS-R024x25	
UFCS-R052	52 mΩ, >900 MHz bandwidth, 150 pH insertion inductance, 50 A maximum pulse current @ 100 μs, SMA (F) output, 1 pc Also available as packs: 10 pcs UFCS-R052x10 , 25 pcs UFCS-R052x25	

Step 2: Select Output Connection Accessories

Different output connection accessories are available for either using the shunt as input for optically isolated probes or for direct electrical connection to an oscilloscope because the shunt is no stand-alone measuring instrument.

018-291-970	Adapter for use with PMK's >1.5 GHz FireFly® optically isolated probe series' input tip cables with integrated 50 Ω feed-through. SMA plug to MMCX socket, 50 Ω	
UFCS-CHOKE	50 Ω connection kit for connecting UFCS directly to an oscilloscope. Includes SMA(F)-SMA(F) common mode choke, and dedicated 1 m SMA(M)-SMA(M) coaxial cable, 0.5 m SMA(M)-SMA(M) coaxial cable and SMA(F)-BNC(M) adaptor. Bandwidth >3.5 GHz.	
D010031	50 Ω BNC feed-through for 1 MΩ input oscilloscopes, >500MHZ	



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