Ultrafast Coaxial Current Shunt

◆ CSD***B Series (Wire Type)

CSD005B10	0.005Ω /1GHz
CSD01B20	0.01Ω/2GHz
CSD02B20	0.02Ω/2GHz
CSD050B12	0.05Ω/1.2GHz
CSD100B06	0.1Ω/600MHz

◆ CSD***M Series (Bolt Type)

CSD005M10	0.005Ω /1GHz
CSD01M20	0.01Ω/2GHz
CSD02M20	0.02Ω/2GHz
CSD050M12	0.05Ω/1.2GHz
CSD100M06	0.1Ω/600MHz

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1. Summary

As the development of modern electronics, more and more people have applied SiC / GaN power component in different specific field. Engineers will always need to measure the power circuit with above hundreds kHz of frequency and tens ampere of current. The traditional high frequency current probe (such as our HCP8000 series) containing iron core and shielding layer will suffer large loss and heating under high frequency current (Please refer to the current frequency derating curve from the HCP8000 series instruction manual.) As a result,the expensive probe will be broken during measurement.

Coaxial current shunt, on the other hand, is pure resistor structure and can remain low loss even under high frequency current , making it a very good choice for your high frequency current testing. Our latest Ultrafast coaxial current shunt is divided into two types based on connection method:

1. Wire type: CSD***B series coaxial shunt is soldered onto the circuit board through two pins.
2. Bolt type: CSD***M series coaxial shunt is fixed on the circuit board with bolts and nuts.

Comparing with the wire type CSD***B series coaxial shunt, the bolt type CSD***M series can be assembled and disassembled easily. Users only need to plug it in the holes on a PCB and tighten a nut. Comparing to the wire type design, this bolt type coaxial current shunt can be installed and uninstalled conveniently multiple times by the users.

The bolt fixing mechanical structure of the CSD***M series adopts a new high reliability design, which can lower the possibility for the users to break the inner structure of the coaxial shunt by over tightening the bolt.

Product features:

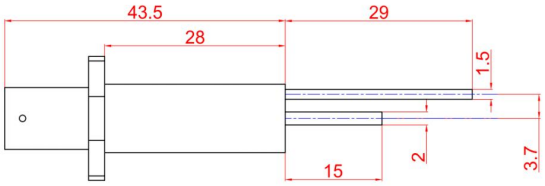
- UFCS High Bandwidth of 2GHz maximum.
- No high frequency insertion loss.
- Multiple options of resistance from 0.005Ω to 0.1Ω.
- The first high reliable single nut fixing bolt type structure.
- Small contact area between the shunt and PCB.
- Designed for the current measurement of SiC and GaN semiconductor.

2. Product specifications

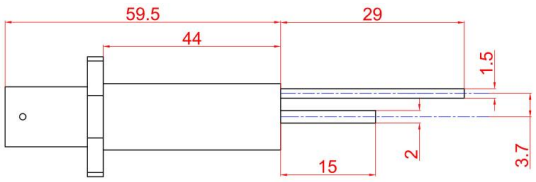
Model	CSD005B10 CSD005M10	CSD01B20 CSD01M20	CSD02B20 CSD02M20	CSD050B12 CSD050M12	CSD100B06 CSD100M06
Resistance	0.005Ω	0.01Ω	0.02Ω	0.05Ω	0.1Ω
Bandwidth (-3dB)	1GHz	2GHz	2GHz	1.2GHz	600MHz
Rise time	≤350ps	≤175ps	≤175ps	≤300ps	≤600ps
Maximum continuous power	2W				
Temperature coefficient of resistance/℃	±40ppm				
weight	16g			26g	
Maximum pulse energy that can be sustained	5J	4J	4J	6J	8J
coaxial shunt diameter	10.5mm				
coaxial shunt length	43.5mm			59.5mm	
Wire type input pin size	Diameter 2mm/Length 15mm				
Bolt type input bolt size	Bolt diameter M3/length10mm				
PCB copper foil with bolt type contact	10.5mm diameter conductive ring				
Signal output connector	BNC				
Maximum torque of fixed nut	0.5 N* m				

P. S. the actual resistance error is ≤1% from the theoretical value; the actual resistance value will be marked on the product.

Mechanical specifications of the wire type coaxial current shunt (unit: mm)



（CSD005B10，CSD01B20,CSD02B20）

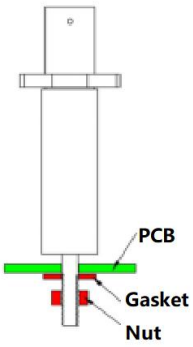


(CSD050B12,CSD100B06)

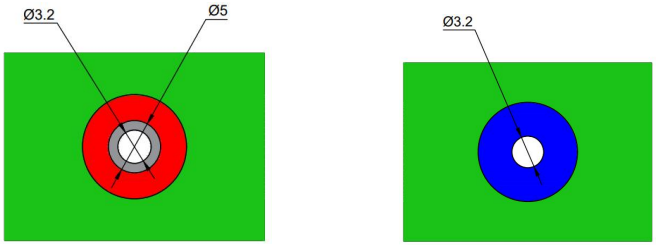
P.S. do not bend the central pin (2mm diameter); the side pin(1.5mm diameter) can be bend for certain degree according to PCB.

There're three methods to install our bolt type coaxial current shunt:

1. Fixing with a nut on the other side of the PCB.



CSD ***M bolt type PCB wiring diagram



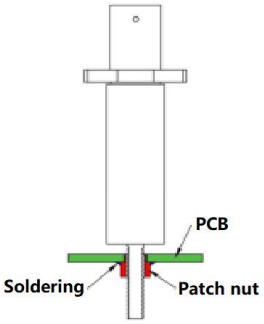
Unit：mm

The green part is the PCB board, and the through-hole is a circle with a hole diameter of 3.2mm.
The gray area is the insulation zone, which is a circle with a diameter of 5mm.
The red part is the exposed copper area on the top layer of the PCB, which is a circle with a diameter of ≥ 12mm.
The blue part is the exposed copper area on the bottom layer of the PCB, which is a circle with a diameter of ≥ 12mm.

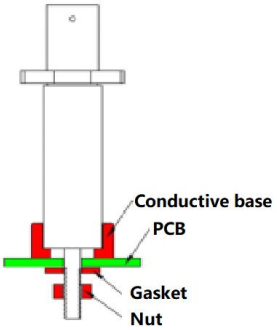
P.S. The maximum torque used to fix nut cannot be over 0.5N·m

2. Welding a patch nut on the other side of the PCB.

In this case, the users can install and uninstall the coaxial current shunt conveniently without any tools. It will be a easy task for the engineers to replace coaxial current shunts of different resistance value, and installing with bare hand won't result in torque that will likely damage it.



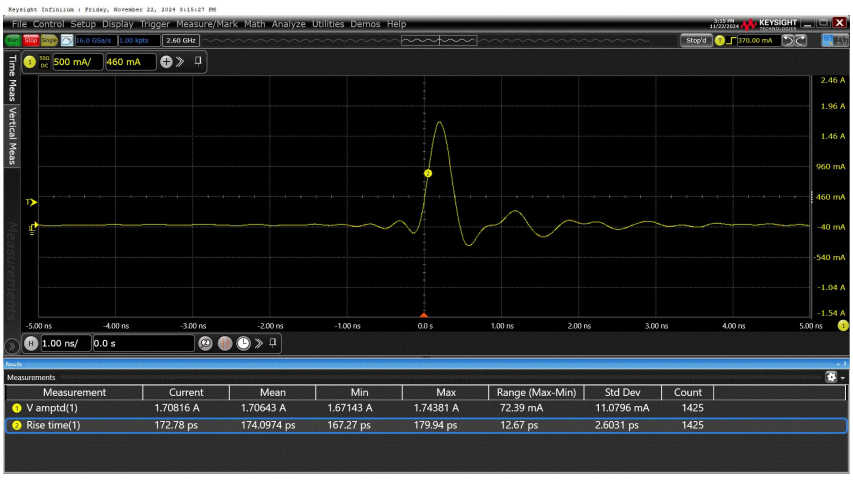
3. Installing a conductive base on PCB to adapt the dimensions of the PCB copper foil installation of original T&M coaxial shunt



3. Basic theory and performance of our product

Our coaxial current shunt has unique coaxial resistor structure design, with little input&output stray inductance, large bandwidth (typical bandwidth over 2GHz) and flat amplitude-frequency response curve. The output waveform of our coaxial current shunt has almost no distortion or oscillation.

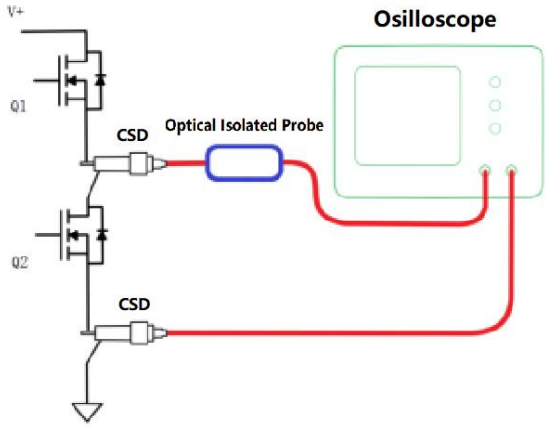
The diagram shown below is the waveform measuring a certain ultra-fast edge pulse current(rising edge 100ps, current amplitude 1.7A) by CSD02M20 coaxial current shunt. Limited to oscilloscope bandwidth of 2.6GHz, the shown rise time is 170ps. The bandwidth corresponding to the rise time of 170ps is 2GHz, so the bandwidth of our coaxial current shunt is 2GHz.



4. Application of the product

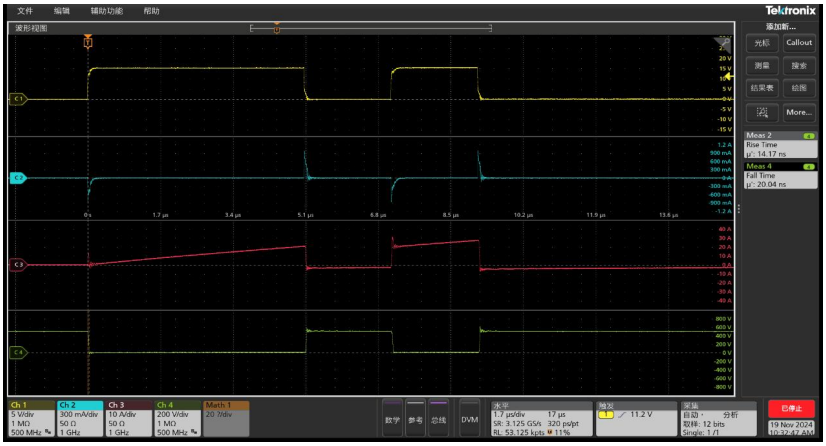
The coaxial current shunt is just a resistor without isolation function, so the oscilloscope and the circuit under test must be common grounded. If you need measure floating current, the measurement must be done with our OPL6000 or OPB6000 series optical isolated probe.

The BNC output connector of the coaxial current shunt need a 50Ω coaxial cable connecting to the input connector of the oscilloscope, meanwhile the input impedance of the oscilloscope must be set to 50Ω, or there will be waveform oscillation when testing high frequency pulse. The low-end oscilloscope may not contain 50Ω impedance option, and in this case, please purchase our 50Ω thorough type resistor CK-50 for pairing.



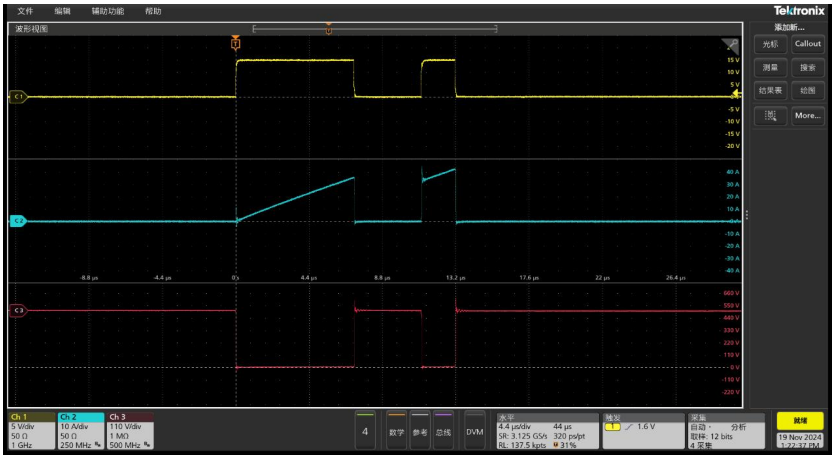
Application 1: Measuring the Id current from the lower tube of the double pulse testing, as shown in the CH3 below. Because the Source of lower side MOSFET of the half bridge can be common grounded with the oscilloscope, the coaxial current shunt can be connected with the oscilloscope directly without isolation.

Oscilloscope Channel	CH1	CH2	CH3	CH4
Test item	Vgs2	Ig2	Id2	Vds2
Probe type	10:1 passive probe	Low voltage differential probe	Coaxial current shunt	High voltage differential probe
Probe model	P6501	DP6020A	CSD01M20	DP6150

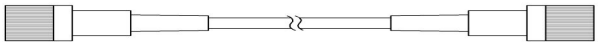


Application 2: measuring the Id current from the upper MOSFET of the double pulse testing. Because the upper MOSFET of the half bridge is floating ground, the coaxial current shunt must operate with our OPL6000 or OPB6000 series optical isolated probe to proceed testing. As shown in the CH2 below, under same condition, the current waveform the of upper MOSFET is completely same with that of the lower tube in Application 2. This proves the reliability and high CMRR of our combination (coaxial current shunt + optical isolated probe).

Oscilloscope Channel	CH1	CH2	CH3
Test item	Vgs1	Id1	Vds1
Probe type	Optical isolated probe	Coaxial current shunt +Optical isolated probe	High voltage differential probe
Probe model	OPL6050	CSD01M20+OPL6050	DP6150



5. Product Accessories



CK-310: BNC coaxial cable, 1-meter length

6. Packing List

Packing List	
Coaxial current shunt	1
BNC cable	1
Instruction manual	1
Warranty card	1
Test report	1

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