

## Remote Radio Unit (RRU) Power Supply

Coordinated Overvoltage Protection for Mobile Broadband Infrastructure

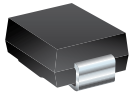
### Solution Products



[Power TVS Diode](#)



[Gas Discharge Tube \(GDT\)](#)



[TVS Diode](#)



[High Power Current Sense Chip Resistor](#)



[Current Sense Resistor](#)



[High Current Shielded Power Inductor](#)

### Situation

The adoption of 4.5G/5G mobile networks has led to an increase in the density of Remote Radio Units (RRU) in covered areas compared to previous generations of mobile networks. The DC supply for an RRU typically must operate continually, making robust and reliable surge protection an essential requirement to help guard against lightning surges that can threaten network equipment in exposed outdoor environments. Sensitive electronics within the RRU also need to be protected from severe overvoltage conditions.

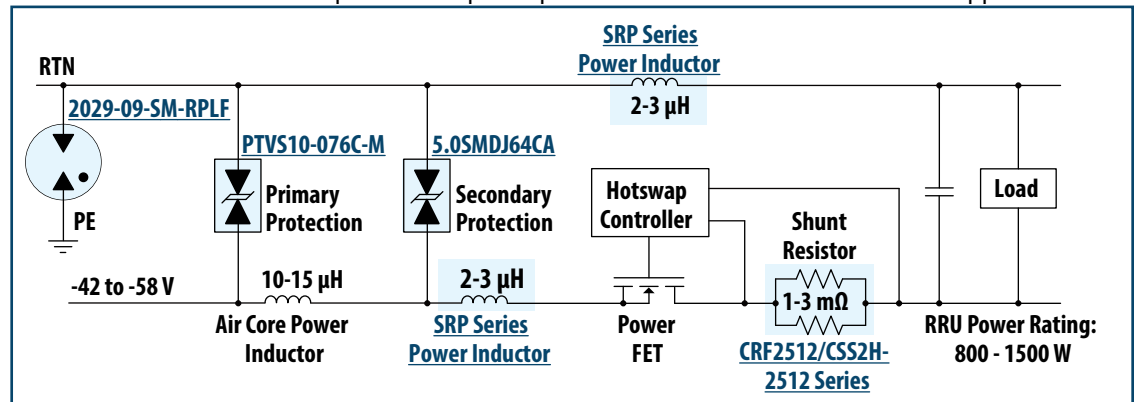
In addition, the more compact electronic design and enclosure of an RRU have made the electronics more susceptible to surges after migration to 5G networks. To address these issues and provide effective RRU DC power supply surge protection, Bourns offers a complete solution for both differential and common mode overvoltage protection that meets both primary and secondary typical requirements.

### Standard

- 8/20  $\mu$ s, 10 kA, as defined in IEC 61000-4-5, with low clamping voltage of 82 to 135 V in full surge rating IPP for differential mode surge
- 10/350  $\mu$ s, 800 A of long duration lightning in exposed environment
- 8/20  $\mu$ s, 20 kA as defined in IEC 61000-4-5 for common mode surge
- No degradation in surge rating over multiple transient events if within rated limits

### Bourns® PowerPlay Solution™

The circuit shown below is an optimized AC power protection solution for small cell or RRU applications.



The schematic shown here illustrates the application protection and does not constitute the complete circuit design. Customers should verify actual device performance in their specific applications.

Qty.	Component Description	Part Number & Data Sheet Link	Distributor Inventory
1	Power TVS Diode	<a href="#">PTVS10-076C-M</a>	<a href="#">Buy now</a>
1	Gas Discharge Tube (GDT)	<a href="#">2029-09-SM-RPLF</a>	<a href="#">Buy now</a>
1	TVS Diode	<a href="#">5.0SMDJ64CA</a>	<a href="#">Buy now</a>
1	High Power Current Sense Chip Resistor or Current Sense Resistor	<a href="#">CRF2512 (2W)</a> <a href="#">CSS2H2512 (1.5W-5W)</a>	<a href="#">Select and buy</a> <a href="#">Select and buy</a>
1	High Current Shielded Power Inductor	<a href="#">SRP Series</a>	<a href="#">Select and buy</a>

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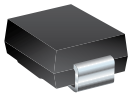
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### Coordinated Solution

The [Bourns® Model PTVS10-076C-M](#) Power TVS Diode is a compact, surface mount device with a high surge rating that supports a standoff voltage of 76 V. The device has been designed to handle repeated surges with a peak voltage of 10 kA (per IEC 61000-4-5, 8/20 μs) and 800 A (long duration, direct lightning 10/350 μs). Using Bourns® Power TVS Diode for this application allows the surge or transient voltage to be clamped to a lower level compared to using a varistor device solution for overvoltage protection. For common mode surge protection of 48V-PE and RTN-PE, Bourns recommends using its [Model 2029-09-SM-RPLF](#) Gas Discharge Tube (GDT) in a surface mount package. This GDT delivers a robust high surge current rating of 8/20 μs, 20 kA, which can help to divert longitudinal surge energy to ground.

For a design solution to offer complete protection, it should contain primary and secondary protection with appropriate coordination circuitry. The coordination impedance protects the lower voltage TVS Diode (secondary protector) from the voltage on the higher voltage TVS Diode (primary protector). The voltage difference across the coordination impedance is made by the voltage due to changing current:  $V = L di/dt$ .

A high current rating air core inductor is a good solution for this type of circuit coordination. The current rating for the inductor must pass the circuit's rated current plus the current peak during the surge without saturating, typically 5 A to 50 A. The coordination impedance needs to be in the range of 1 ohm to 2 ohms at 80 kHz, which is the primary frequency component of the lightning strike waveform. Bourns has a broad portfolio of flat wire power inductors and protection components with features that meet the requirements in this application.

In the power system of an RRU, there is a need for some current sensing functionality to monitor the level of current to the load of the wireless network. Low ohmic grade (in the milliohm range) and high reliable current sense resistors are recommended to measure current in the power line. The Bourns® [Model CRF2512\CSS2H-2512](#) resistor series are ideal choices for current sensing. These current sense resistors provide a current rating from 5 – 30 A to cover the common range of an RRU's power supply.

### Additional Resources

Readers may also be interested in the following resources from Bourns:

- [Application Note: Designing Effective Surge Protection for AC and DC Powered Systems](#)
- [Application Note: Using Current Sense Resistors for Accurate Current Measurement](#)
- [Brochure: Bourns® Power Supply Component Guide](#)
- [Brochure: Bourns® Surface Mount Power Inductors and Common Mode Chokes](#)

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