



# Cell Phone Base Station Circuit Protection

## Application Note

### The Protection Challenge

Mobile phone base stations are often placed in exposed elevated locations for the maximum possible broadcast coverage. Often this unintentionally results in the erection of an ideally positioned lightning conductor. Protection of all mobile base stations against inevitable direct or nearby lightning strikes is essential. Failure to design robust protection leads to expensive repairs in these exposed and often difficult to reach areas. It is common for antenna masts to see voltages of 250 kV from top to bottom during a direct lightning strike. With appropriate protection these events can be survivable.

### Circuit Protection Solutions

Protection is required on all services into and out of the base station equipment; failure to protect just one port can lead to extensive equipment damage. Ports commonly found are coaxial or waveguide for RF transmission, as well as multiple control lines which are used to monitor and control antenna status, etc. To add further complication, the distance between the tower and the transmitters can be up to 30 meters, adding Ground Potential Rise (GPR) as an additional threat. Following are three common interface ports which are exposed to significant threat from lightning and resultant GPR. The unique Bourns® TBU® High-Speed Protector (HSP) technology can prevent the high currents caused by lightning events from reaching sensitive electronic circuits, resulting in greater system reliability and ultimately, lifetime cost savings.

### RS-232 Protection

RS-232 is a relatively old signalling standard dating back to the late 1960s. Logic levels for “0” and “1” are  $\pm 5$  V to  $\pm 12$  V on the transmit (TX) lines, and are  $\pm 3$  V to  $\pm 15$  V for the receive (RX) lines. Therefore, a symmetrical protection topology is suggested allowing the datastream to pass with some common mode offset on either the TX or RX lines without damage or signal degradation. The TBU® HSP limits currents into or out of the interface to a typical value of  $\pm 150$  mA.



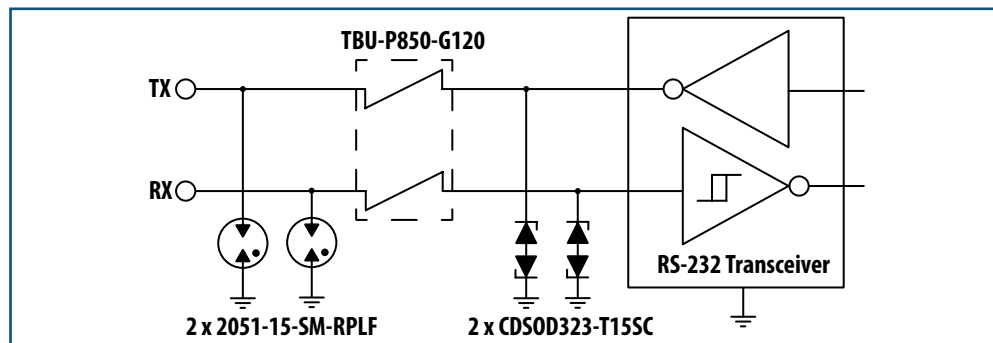
TBU® High-Speed Protectors



TVS Diodes



GDT Surge Arrestors



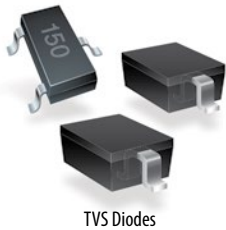
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## RS-485 Protection

RS-485 is a more modern signalling standard, employing differential signalling which allows a higher data rate on a more defined transmission line. Multiple RS-485 terminals can coexist on the same bus. The dual diode shown in the protection circuit below is designed to meet the -7 V to +12 V common mode range of the RS-485 standard. The TBU® HSP protector limits the fault currents to the transceiver and protection diodes to a typical value of  $\pm 450$  mA.



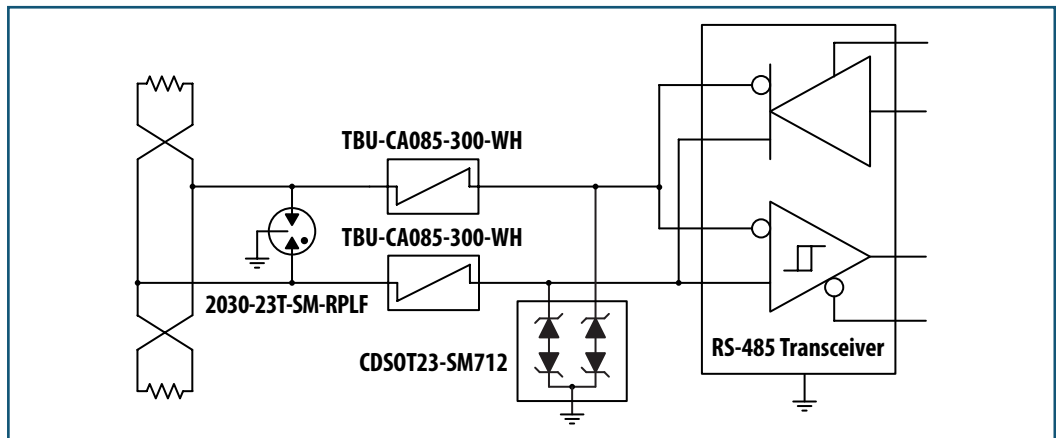
TBU® High-Speed Protectors



TVS Diodes

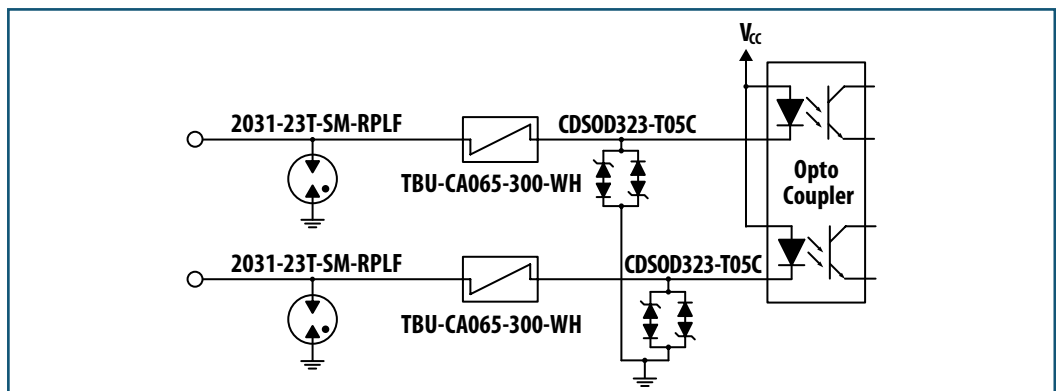


GDT Surge Arrestors



## Opto-Input Protection

The most basic signalling likely to be deployed is an opto-isolated alarm with status lines to report system status. The TBU® HSP protects the interface circuitry from excessive energy due to lightning and GPR events.



For more information on circuit protection products from Bourns, please visit

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