

Home & Building Automation

Protecting the 2-Wire Differential Interface in Security Systems

Situation

- Building and public area security systems play an important role in society protection. Part of this protection scheme is the utilization of video surveillance and alarmed systems that monitor and restrict entry in order to protect the inhabitants of homes and/or buildings.
- Security systems such as cameras and door entry systems are adapting 2-wire differential signal lines for communication in complex field environments where they are exposed to electrically noisy conditions as well as lightning that can have a detrimental effect on electronics.

- 2-wire differential signaling is effective for noise protection in several communication protocols such as Ethernet, RS-485, CAN and USB. The basic idea is that common-mode noise will be rejected due to the structure of the wiring (twisted pair).
- In most applications, there are several design considerations that relate to maintaining the integrity of the data. Impedance and line matching must be considered when adding components intended to protect the lines from electrostatic discharge, voltage surges, or electrical bursts.

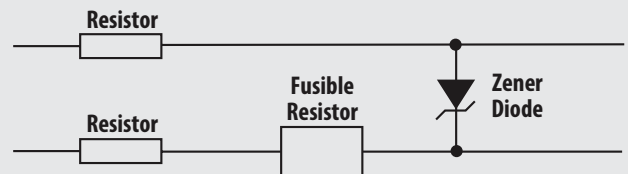
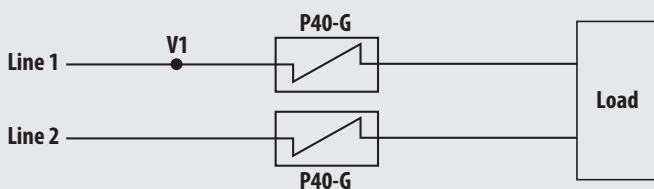
- Other important factors are power cross during installation as well as energy distribution systems that have a potential risk for power surges or faults. Often, traditional passive components are not fast enough to handle the fast transients created by these lightning events.
- This application brief presents solutions from Bourns to protect 2-wire differential signal lines from electrical transients without adversely impacting the integrity of the signal.

Solution

- Bourns® Transient Blocking Unit (TBU®) High-Speed Protector (HSP) utilizes less board space, reacts very quickly to transients, and is extremely reliable. The chart to the right details the differences between a typical configuration that employs a resistor, fuse and Zener diode versus the Bourns® Model P40-G240-WH TBU® HSP solution.
- Bourns® TBU® HSPs feature extremely low energy let-through and are resettable to provide secure protection for a diverse range of power surge threats from lightning and power cross to technician error.

Parameter	P40-G240-WH	2 Res + Fuse + Zener Diode
Response Time	> 0.2 μ s	> 1000 μ s
PCA Size	16 mm ²	25.25 mm ²
Number of Components	1	4
Life Cycles	100 million	Begins to degrade after tens of times
Reliability	Good	Depends
Diagram	P1	P2

- Bourns® TBU® HSPs offer very high speed data bus compatibility enabling them to meet faster performance and bandwidth requirements for reliable power surge protection.
- Providing a very small footprint and long lifecycle solution, Bourns® TBU® HSPs meet extremely high equipment uptime requirements in space-constrained applications.
- TBU® HSPs deliver compatibility with faster next-generation chipsets and are resettable within microseconds to provide virtually immediate recovery in critical operations.



Benefits

- As shown in the table above, the TBU® HSP blocks transients much faster than the traditional Zener diode and resettable fuse.

- One TBU® HSP allows OEMs to reduce use of valuable board space by decreasing component count.

- The TBU® HSP will protect 2-wire differential signal lines from electrical transients without adversely impacting the integrity of the signal due to the fast response time and the low capacitance of the TBU® HSP.

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Americas: Tel +1-951 781-5500
Email americus@bourns.com

EMEA: Tel +36 88 520 390
Email eurocus@bourns.com

Asia-Pacific: Tel +886-2 256 241 17
Email asiacus@bourns.com