

## RS-485 TRANSIENT PROTECTION VS FAULT PROTECTION

### 1.0 INTRODUCTION

This document is written to help understand the difference between RS-485 serial transceiver devices having a transient protection feature or a fault protection feature.

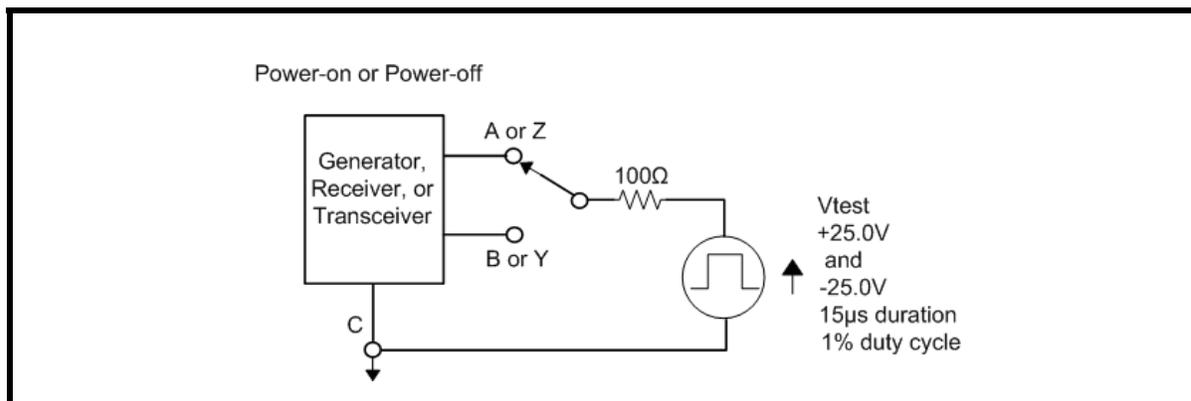
RS-485 devices have been used in harsh industrial applications for many years. One of the major problems encountered in these types of applications is that the device can be exposed to voltage faults that result in device failure. These fault conditions include shorts to the power grid or large electromagnetic interference spikes. Standard RS-485 devices with a common mode range of -7V to +12V can be permanently damaged if exposed to faults outside these limits.

Historically, users of RS-485 transceivers who experience such failures increase the I/O protection levels by using external protection components to reduce the amount of field failures. Additionally, vendors offering serial transceivers have developed enhanced features to help combat this and other application problems. Some of the modern advancements include internal ESD protection, enhanced RX Failsafe, hot-swap capabilities, thermal shutdown, and extended common mode range. The latest enhanced features being offered are transient protection and fault protection.

### 2.0 TRANSIENT PROTECTION

A transient event is similar to an ESD event in that the I/O is exposed to a pulse or momentary glitch of high voltage. The EIA-485 standard includes a device survivability test for a +/-25V transient, applied through a 100Ω resistor, for a defined period of time. Figure 1 below is the test figure and conditions of the test pulse or transient as provided by the EIA-485 standard.

FIGURE 1. EIA-485 +/-25V TRANSIENT TEST



### 3.0 FAULT PROTECTION

Some transceivers offer a fault protection feature that protects the device from long term exposure to a fault event. Unlike a transient event, these devices are protected from long term exposure and direct shorts to high voltage sources.

**4.0 COMPARISON OF TRANSIENT AND FAULT PROTECTION**

In comparing these specifications, two main differences between transient and fault protection come to light. In the case of transient protection, the high voltage is applied through a 100Ω resistor, whereas in the case of the fault protection the high voltage can be applied directly to the bus pins. The second difference is that the fault protection device does not specify how long the fault can remain connected, whereas the EIA-485 standard very specifically describes the period of time the high voltage fault is applied.

**5.0 SUMMARY**

Both fault and transient protection are innovations introduced by RS-485 chip vendors to reduce device failure in harsh industrial applications. Transient protection can be viewed as a subset of fault protection; all fault protected parts should pass the less stringent test conditions of transient protection, but not the other way around. However, both are upgrades to the standard RS-485 transceiver common in the industry.

Exar offers several RS-485 transceiver families with increased transient protection, up to +/-65V. These products greatly exceed the requirements of the RS-485 standard, and are suitable for use in rugged industrial environments where electromagnetic interference and transient spikes are common. Exar does not offer fault protected devices.

Table 1: Exar Transceivers with +/-65V Transient Protection

<b>PART NUMBER</b>	<b>SUPPLY VOLTAGE V<sub>DC</sub></b>	<b>DUPLEX</b>	<b>DATA RATE KBPS</b>	<b>PACKAGE</b>
SP3080EEN-L	5.0	Full	115	NSOIC-14
SP3081EEN-L	5.0	Full	115	NSOIC-8
SP3082EEN-L	5.0	Half	115	NSOIC-8
SP3083EEN-L	5.0	Full	500	NSOIC-14
SP3084EEN-L	5.0	Full	500	NSOIC-8
SP3085EEN-L	5.0	Half	500	NSOIC-8
SP3086EEN-L	5.0	Full	20000	NSOIC-14
SP3087EEN-L	5.0	Full	20000	NSOIC-8
SP3088EEN-L	5.0	Half	20000	NSOIC-8
XR5486EID-F	5.0	Full	54000	NSOIC-14
XR5487EID-F	5.0	Full	54000	NSOIC-8
XR5488EID-F	5.0	Half	54000	NSOIC-8

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