AN-8597

HI-8597 Verification of Integrated Lightning Protection Circuitry after DO-160G Section 22 Level 3 Pin Injection

December 2014

This Application Note provides a methodology for testing the integrated lightning protection circuitry on the HI-8597 ARINC 429 Line Driver. This note assumes that the HI-8597 is mounted on a PCB with its digital inputs driven by a ARINC 429 transmitter (FPGA or ASIC) while its analog outputs are accessible at the bus connector.

The HI-8597 Line Driver decodes the digital inputs, TX0 and TX1, as depicted in Figure 1. The Driver is forced into a high impedance state (tri-state) for: TX0 = TX1 = Logic '1'. The Line Driver output impedance is >1MΩ during tri-state. The high impedance state effectively isolates the Line Driver from the bus.

The IV characteristics of a single-ended output while in tri-state is depicted in Figure 2. In tri-state the HI-8597 output stage is powered down and only the lightning protection circuitry is active at the bus. These IV characteristics will be remain unchanged after Level-3 Pin Injection if the lightning protection circuitry is not damaged during Pin Injection.

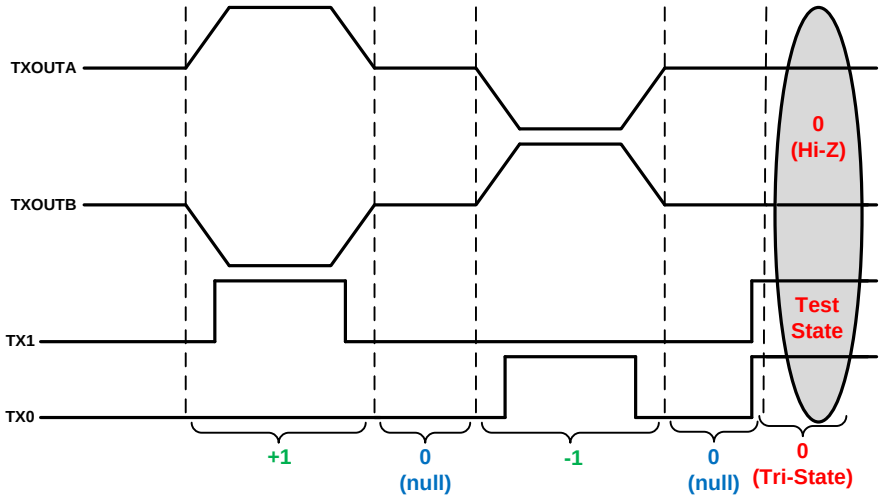


Figure 1. Differential Bus Digital Data Decode.

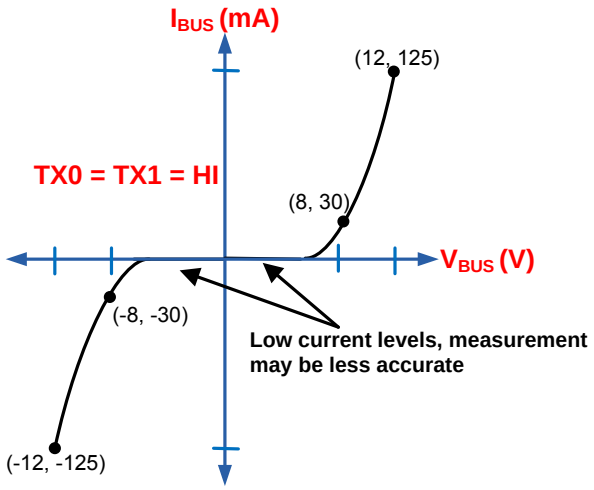
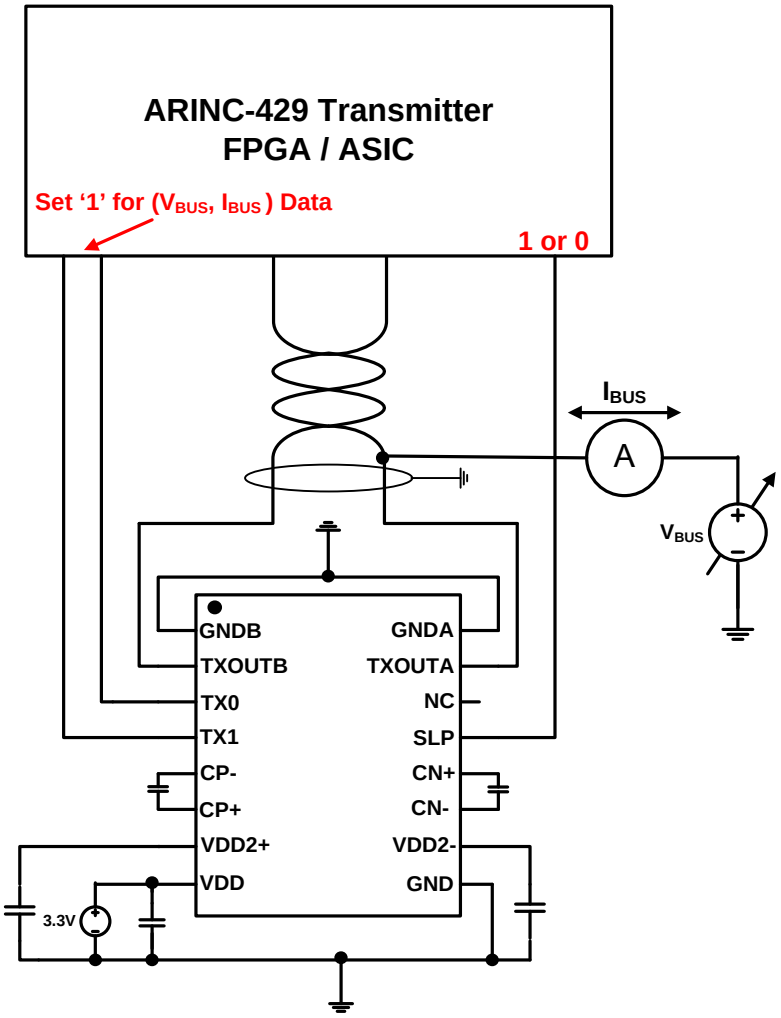


Figure 2. TXOUT[A:B] Tri-State IV Characteristics



Verification Procedure:

First record the pre-excitation IV-characteristics for TXOUTA and TXOUTB. Configure your ARINC 429 protocol device to force TX0 and TX1 to logic-1. This powers down the Line Driver and isolates the lightning shunt circuitry. Using a series Amp-meter and DC power supply record a few (V_{BUS}, I_{BUS}) data points with V_{BUS} in the ±[6, 12]V domain. Current measurements will be extremely low from 0 to ±5.5V, the protection circuitry begins to turn on around ±5.5V (i.e. $I_{BUS} \approx 75\mu A$ @ ±5.5V). Note that the clamp circuit IV-characteristics are an exponential odd function.

Next, perform Level-3 Pin Injection on TXOUTA and/or TXOUTB. The state of the digital inputs is irrelevant during Pin Injection, so the configuration of the ARINC 429 transmitter is arbitrary.

Measure the post excitation IV-characteristics. The pre and post data should match within 10%.

REVISION HISTORY

Revision	Date	Description of Change
AN-8597, Rev. New	3/23/2013	Initial Release
Rev. A	12/4/2014	Reverse TX0 and TX1 labels in Figure 1