FRONTGRADE

APPLICATION NOTE

Compatibility of 3.3V and 5.0V LVDS Drivers and Receivers

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Table 1: Cross Reference of Applicable Products

Product Name:	Manufacturer Part Number	SMD #	Device Type	Internal PIC
3.3V QUAD DRIVER	UT54LVDS031LV/E	5962-98651	02, 03, 04, 05	WD03, WD07, WD28, WD30
3.3V QUAD RECEIVER	UT54LVDS032LV/E	5962-98652	02, 03, 04, 05	WD04, WD08, WD29, WD31
3.3V QUAD RECEIVER with TERMINATION RESISTOR	UT54LVDS032LVT	5962-04201	01, 02	WD06, WD10
3.3V BUS QUAD DRIVER	UT54LVDM031LV	5962-06201	01	WD21
3.3V DUAL DRIVER and RECEIVER	UT54LVDM055LV	5962-06202	01	WD22
5.0V QUAD DRIVER	UT54LVDS031	5962-95833	02	JR05, JR08
5.0V QUAD RECEIVER	UT54LVDS032	5962-95834	02	JR06. JR09
5.0V QUAD DRIVER with COLD SPARE	UT54LVDSC031	5962-95833	03	JR10
5.0V QUAD RECEIVER with COLD SPARE	UT54LVDSC032	5962-95834	03	JR11
3.3V QUAD BUS LVDS CROSSPOINT SWITCH	UT54LVDM228	5962-01537	01	WD15, WD16
3.3V OCTAL BUS LVDS REPEATER	UT54LVDM328	5962-01536	01	WD17, WD18
3.3V SERIALIZER	UT54LVDS217	5962-01534	01, 02	WD11, WD13
3.3V DESERIALIZER	UT54LVDS218	5962-01535	01, 02	WD12, WD14

Overview

Aeroflex Colorado Springs has reviewed the I/O specifications of all the LVDS Drivers and Receivers for compatibility. The 5.0V drivers and receivers: UT54LVDS031, UT54LVDSC031, UT54LVDS032, and UT54LVDSC032 are compatible with the 3.3V drivers and receivers: UT54LVDS031LV/E, UT54LVDS032LV, UT54LVDS032LVT, UT54LVDM055LV, UT54LVDM228, UT54LVDM328, UT54LVDS217, and the UT54LVDS218. This application note covers compatibility assessment between the 5.0V devices and the 3.3V devices.

LVDS Specifications

Low Voltage Differential Signaling or LVDS is a method used to transmit and receive hundreds of megabits per second over differential media using a low voltage swing (~350mV). LVDS communications are performed by a driver and a receiver. The driver accepts a standard Complementary Metal Oxide Semiconductor (CMOS) single ended signal and outputs a differential signal. Standard CMOS signals have voltage levels of 0.0V for a logic Low and 3.3V for logic High. The receiver senses the differential signal and outputs a standard CMOS signal.

The LVDS driver contains a constant current source that drives ±3.5mA or ±10mA. The Driver output current travels through a 100Ω or 35Ω resistive load across the receiver inputs. The current flow through the resistor results in a voltage

across the differential terminals of ±350mV. The state of the driver's constant current source determines the logic state sensed at the receiver.

Input/Output signal levels for LVDS are defined by the Telecommunications Industry Association/ Electronic Industries Association ANSI/TIA/EIA-644 and TIA/EIA-899. ANSI/TIA/EIA-644 and TIA/EIA-899 are electrical standards only and do not define a protocol. Aeroflex LVDS drivers and receivers designed to work within this specification regardless of supply voltage.

Compatibility Assessment

The output and input characteristics of the 5.0V and 3.3V Aeroflex LVDS Drivers and Receivers are designed to operate within the TIA/EIA-644 LVDS specification. Based on the limits listed in the datasheets and corresponding SMDs, there are no compatibility problems when using a 5.0V driver with a 3.3V receiver or 5.0V receiver with a 3.3V driver in normal operating conditions. Normal operating conditions are described as having the Driver and Receiver properly connected to the datasheet and SMD specified VDD (5.0V or 3.3V), enable signals are correctly connected, and no fault conditions are occurring.

Permanent damage to the 3.3V drivers and receivers may occur if any of the pins are shorted to 5.0V because 5.0V is outside of the Absolute Maximum Ratings of the UT54LVDS031LV/E, UT54LVDS032LV, UT54LVDS032LVT, UT54LVDM055LV, UT54LVDM228, UT54LVDM328, UT54LVDS217, and UT54LVDS218, Additionally exposure to any of the absolute maximum rating conditions for an extended period may also effect device reliability and performance.

Operating 5.0V drivers and receivers with 3.3V drivers and receivers under normal non-fault operating conditions do not cause any operational problems or compatibility issues.

Fault Scenario

Aeroflex Colorado Springs performed a reliability assessment on the 3.3V LVDS drivers and receivers, listed in Table 1. This evaluation determined the maximum voltage and duration that an overstress event could occur without compromising the 3.3V device life below 15 years. This evaluation applies ONLY to the 3.3V drivers and receivers, UT54LVDS031LV/E, UT54LVDS032LV, UT54LVDS032LVT, UT54LVDM055LV, UT54LVDM228, UT54LVDM328, UT54LVDS217, and UT54LVDS218, listed in Table 1. The fault analysis does not apply to the 5.0V devices (UT54LVDS031, UT54LVDS032, UT54LVDSC031, and UT54LVDSC032).

Reliability Assessment

The following operational parameters were used during the assessment:

Temperature = T = 100°C

Supply Voltage for 3.3V devices = VDD = 3.6V max voltage (worst case)

Fault Voltage = 3.6V to 6.0V

The 3.3V devices listed in Table 1 are built on Aeroflex's 0.25µm LVDS technology that has a oxide breakdown voltage specification of 8.0V. Based on the above listed inputs Aeroflex was able to evaluate the maximum voltage spike the 3.3V devices could sustain and the event duration without degradation. Because the absolute maximum ratings of the 5.0V LVDS drivers and receivers are -0.3V to +6.0V, Aeroflex used 6.4V as the maximum stress voltage for the reliability calculations assuming a 3.3V and 5.0V devices are used together.

Table 2. Allowed Duration of Applied Overvoltage

Stress Voltage	Allowed time at Stress Voltage	Allowed time at Stress Voltage
(V)	(seconds)	(hours)
3.6	1.370E+11	38.06E+6
4.0	2.090E+10	5.81E+6
4.4	3.190E+09	886111
4.8	4.867E+08	135194
5.2	7.427E+07	20630
5.6	1.133E+07	3147
6.0	1.729E+06	480
6.4	2.639E+05	73

Based on a review of 0.25µm process capabilities Aeroflex has concluded that a 6.4V overvoltage on any of the 3.3V devices listed in Table 1 can occur for approximately 263900 seconds and does not impact the 15 year mission life. It is recommended that the momentary stress voltage spike not exceed the absolute maximum ratings of any of the 3.3V devices.

The results discussed above are not guaranteed by Aeroflex. Any operation outside of the ABSOLUTE MAXIMUM RATINGS as stated in the datasheet and/or SMD may affect negatively device reliability and performance.

Revision History

Date	Revision #	Author	Change Description	Page #
4/20/2026	1.0.0	MJL	Converted original app note of 11/18/2011 into Frontgrade App Note Template	all