TEXAS INSTRUMENTS

Low Voltage Differential Signaling (LVDS) Evaluation Module (EVM)

User's Guide

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Mixed Signal Products

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Chapter 1

The Evaluation Board

The TI low voltage differential signaling (LVDS) evaluation module (EVM) is designed for the analysis of low-voltage differential signaling with the SN65LVDS31 and SN65LVDS32 quad drivers and receivers. Not only is the EVM designed for the implementation of point-to-point or multidrop transmission, but it can also be configured for the application of TIA/EIA-422 data to an LVDS receiver.

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1.1 The Evaluation Board

The EVM is designed with the driver section on the top half of the board and the receiver section on the bottom half. While the SN65LVDS31 driver (U1) occupies the driver section, any of three TI LVDS quad receivers (U2) sharing the same footprint may be analyzed. These include the SN65LVDS32 original receiver, the SN65LVDS32A with enhanced common mode range, and the SN65LVDT32A, which provides internal termination with the enhanced common mode range. All three are available for this application. The driver and the three receivers mentioned are four-channel devices with the same enabling scheme.

There are two observations to make about the EVM. First, if the internally terminated receiver is used (SN65LVDT32A), the onboard 100-Ω termination resistors R5, R6, R7, and R10 must be removed. Second, jumpers J5 and J6 allow the devices to either share the same power and ground source or be powered separately for independent device analysis.

Chapter 2

Equipment Required

This chapter provides a list of equipment required for the analysis of low-voltage differential signaling. It also provides a schematic diagram and parts list.

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2.1 Equipment Required

- ❑ 3.3-V_{DC} power supply
- ❑ A transmission medium from the driver to the receiver (cable or wire)
- ❑ A function generator capable of supplying TTL level signaling rates of up to 400 Mbps. Note: 50 Ω source impedance.
- ❑ A high bandwidth oscilloscope, preferably in the 4-GHz range.

Figure 2–1. The EVM Schematic Diagram

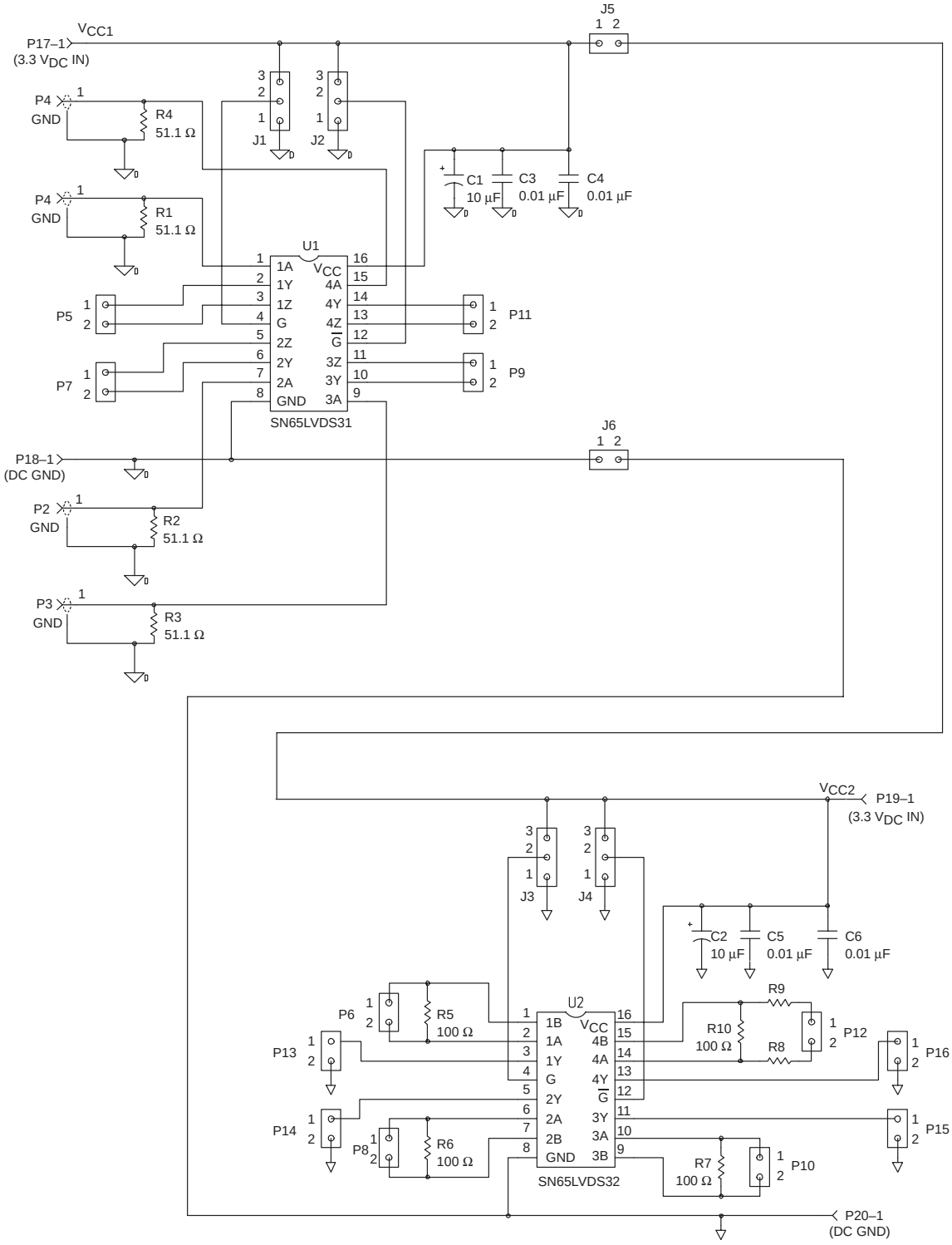

Table 2–1. Parts List

Quantity	Reference Des.	Description
2	C1, C2	Capacitor, 10.0 μF, tantalum
4	C3–C6	Capacitor, 0.01 μF
4	J1–J4	3-Position male post with shorting jumpers
2	J5, J6	2-Position male post with shorting jumpers
4	P1–P4	Connectors, SMA, edgemount
8	P5–P12	2-Position female post, SIP
4	P13–P16	2-Position male post
4	P17–P20	Banana jack connectors, female
4	R1–R4	Resistors, 51 Ω
3	R5–R7	Resistors, 100 Ω
2	R8–R9	Resistors, 0 Ω (optional: 45.3 Ω)
1	R10	Resistors, 100 Ω (optional: 10.22 Ω)
1	U1	SN65LVDS31
1	U2	SN65LVDS32, SN65LVDS32A, or SN65LVDT32A

Chapter 3

Point-to-Point Transmission

This chapter shows the setup for point-to-point transmission.

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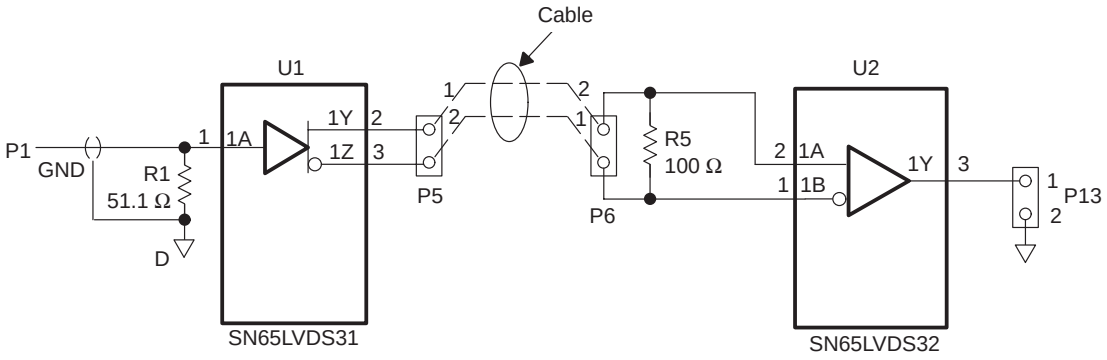
3.1 Point-to-Point Transmission

The point-to-point configuration with one driver transmitting to one receiver is a typical transmission scheme. The transmission quality is superior, since there are no stubs and few discontinuities on the bus to degrade the signal. Again note that the required 100-Ω termination resistor (R5) is already in place across the differential pair at the input of the receiver (U2).

Figure 3–1. Point-to-Point Schematic Diagram



Chapter 4

Multidrop Transmission

This chapter shows the setup for multidrop transmission.

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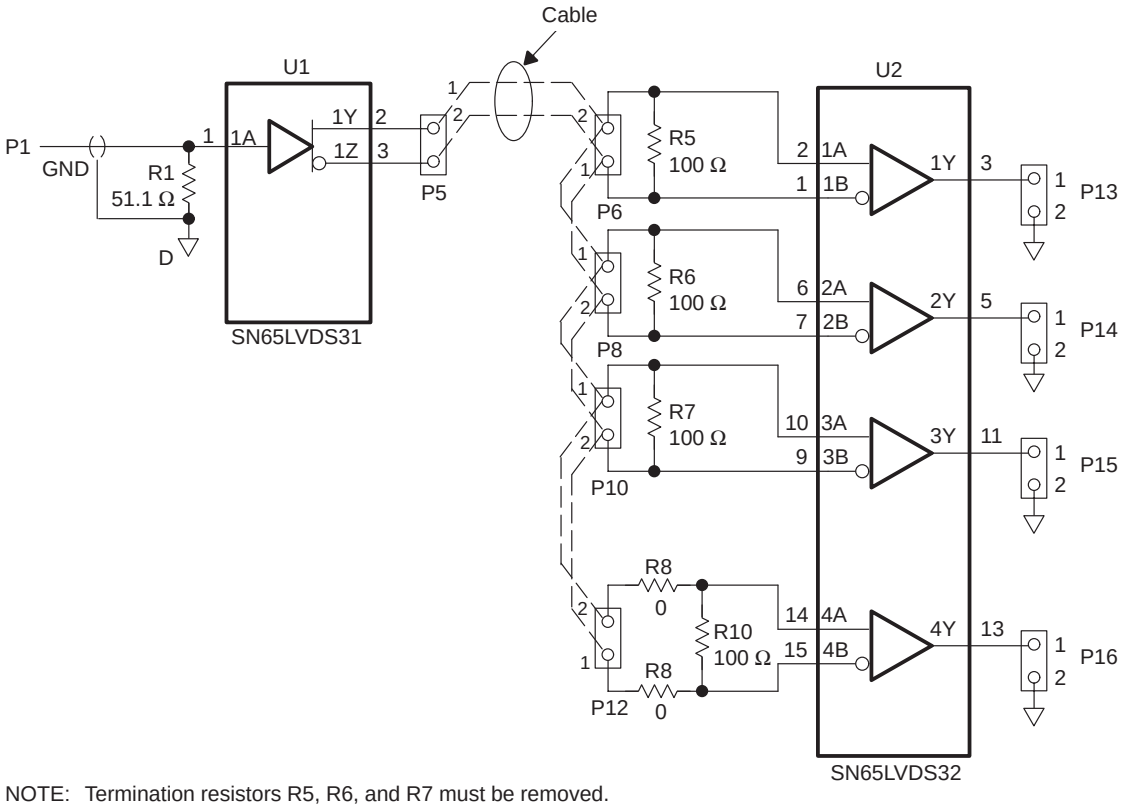
4.1 Multidrop Transmission

The multidrop configuration with one driver transmitting to several receivers may be implemented as shown in Figure 4–1. In this application, only a single 100-Ω termination resistor is required across the differential pair at the inputs of the last receiver. Termination resistors at the inputs of the middle receivers in the configuration must be removed. To minimize reflections, line length between receivers should be kept as short as possible. Stub length should also be kept to a minimum. On the EVM, stub length is approximately 3 cm.

For a complete discussion of this configuration with up to 36 receivers, consult the TI application note, *LVDS Multidrop Connections*, literature number SLLA054.

Figure 4–1. Multidrop Schematic Diagram



NOTE: Termination resistors R5, R6, and R7 must be removed.

Chapter 5

The Application of TIA/EIA-422 Data to an LVDS Receiver

This chapter explains the application of TIA/EIA-422 data into an LVDS receiver.

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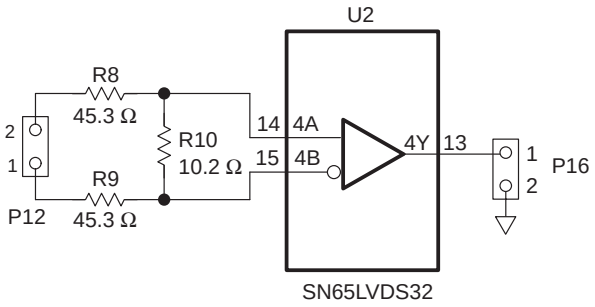
5.1 The Application of TIA/EIA-422 Data to an LVDS Receiver

The fourth channel of the receiver (4A and 4B) configured with the resistor divider network of R8, R9, and R10 may be used for the evaluation of TIA/EIA-422 data applied to an LVDS receiver. TIA/EIA-422 signaling voltage levels are adjusted to appropriate LVDS input voltage levels by installing 45-Ω resistors in the spaces provided for R8 and R9 on the evaluation board. The 100-Ω resistor (R10) must then be removed and replaced with a 10-Ω resistor as shown in Figure 5–1. This resistor divider network now comprises a total differential load of 100 Ω to match the characteristic impedance of a common transmission line, and reduces the TIA/EIA-422 maximum differential signal amplitude from 6 V to an appropriate 600 mV.

Figure 5–1. TIA/EIA-422 Data to an LVDS Receiver Schematic



Chapter 6

References

This chapter contains a list of LVDS literature available.

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6.1 References

There is a wide selection of the LVDS devices and related applications materials available to assist in the design and development of LVDS interfaces. This information is located at http://www.ti.com/sc/datatran. Input LVDS into the search tool or enter the part number of a specific device to obtain additional information.

1) *LVDS Designer's Notes* (SLLA014)

2) *Reducing EMI With Low Voltage Differential Signaling* (SLLA030)

3) *Measuring Crosstalk in LVDS Systems* (SLLA064)

4) *1998 Data Transmission Data Book* (SLLD001B)

5) *Performance of LVDS With Different Cables* (SLLA053)

6) *LVDS Multidrop Connections* (SLLA054)