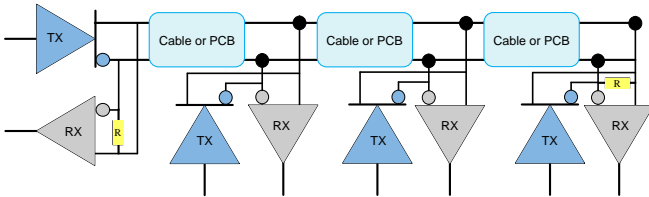


How Far, How Fast Can You Operate M-LVDS Transceivers?



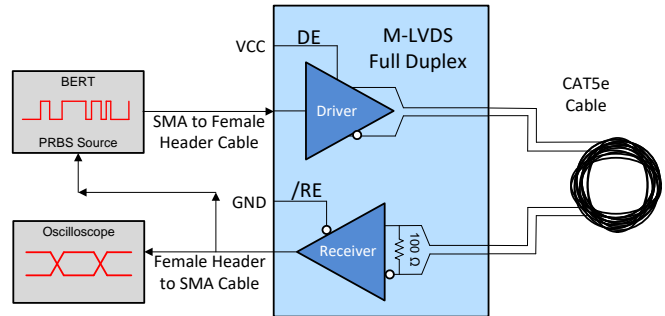
Multipoint Low Voltage Differential Signaling (M-LVDS) devices give LVDS benefits to the multipoint data transmission world. In a multipoint configuration, transmitters/drivers and receivers are interconnected on a single transmission line. The line is doubly terminated on both ends with matching impedance (usually 100Ω), see [Figure 1](#). This technical note shows the performance in maximum data rates and distances connecting M-LVDS transceivers.

Figure 1. Multipoint Typical Application



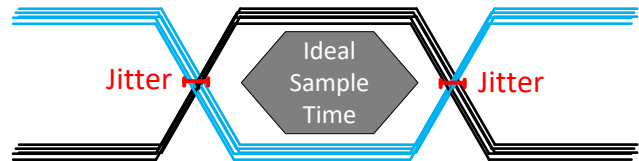
The test setup shown in [Figure 2](#) connects a pseudo-random binary sequence (PRBS) source with two M-LVDS Evaluation Module (EVM) Boards to an oscilloscope. The three parts that use the half duplex configuration in [Figure 4](#) are: [SN65MLVD201](#), [SN65MLVD206](#), and the [SN65MLVD206B](#). The test set up for the full duplex configuration of the [SN65MLVD207](#) is shown in [Figure 2](#). The tests were conducted at the following cable lengths: 1m, 5m, 10m, 50m, and 100m; and each Cat-5e cable was modified with female headers to connect to the male headers on the EVM boards. A Bit Error Rate Tester (BERT) generates a $2^{31}-1$ PRBS pattern, it is sent to the system and loops back to the analyzer, which compares to the generated signal. If the pattern matches, the system is said to have no errors. The error margin to not be surpassed in this lab experiment was 1×10^{-12} for the bit error rate.

Figure 2. Full Duplex M-LVDS Test Setup



The signal passing through the driver and receiver is connected to an oscilloscope to be observed as an eye diagram. Eye diagrams are made when a signal is repeatedly sampled over itself and is used to measure jitter. Jitter is the measured "error" in time difference of when a system cannot tell the difference between a high or a low bit. It is measured at the crossing point of the bits in an eye diagram as shown in [Figure 3](#).

Figure 3. Eye Diagram



Jitter percentage is valuable when seeing what percentage of the eye will be open, providing a window of bit time to correctly sample the signal. To better understand jitter, [Figure 5](#) shows examples of what 5%, 10%, 20% jitter. Up to 20% jitter, the signal should be clean enough to get readings with no errors. Above 20% it is not ensured that the signal is error free; however, higher jitter percentages were shown to be below the error margin of 1×10^{-12} bit error rate using the BERT.

Figure 4. Half Duplex M-LVDS Test Setup

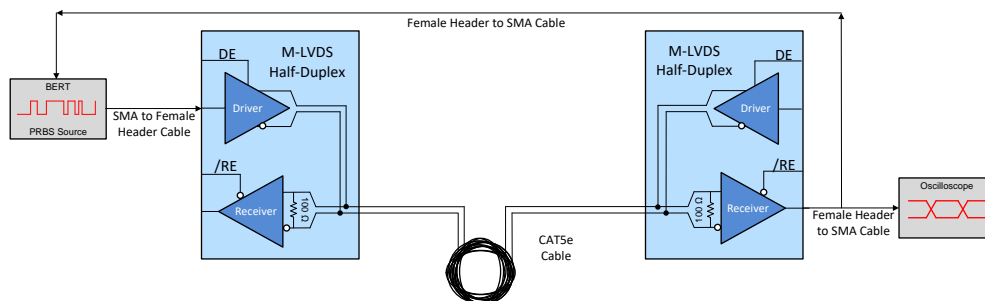
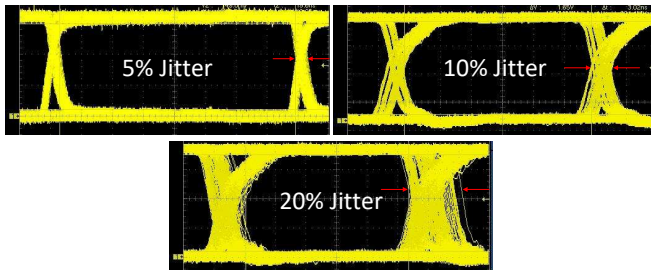
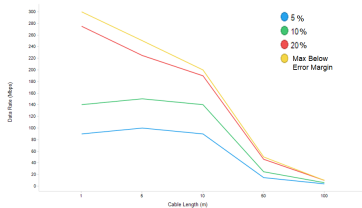


Figure 5. Example of 5%, 10%, and 20% Jitter



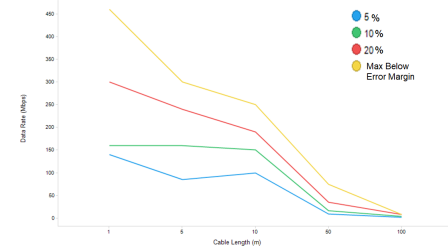
All of the parts chosen for this experiment (SN65MLVD201, SN65MLVD206, SN65MLVD206B, SN65MLVD207) have data sheet specifications of being able to achieve signaling rates up to 200 Mbps. As you can see, in Figure 6, Figure 7, and Figure 8, all devices meet and exceed the specified up to 200 Mbps signaling rates from the data sheets.

Figure 6. SN65MLVD201 Results



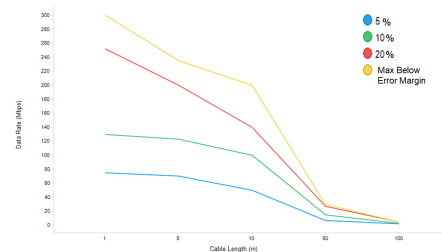
SN65MLVD201 operates up to 300 Mbps at short distances, 100 Mbps above what is specified on the data sheet. At a longer distance of 50m, the SN65MLVD201 is able to function up to 50 Mbps.

Figure 7. SN65MLVD206



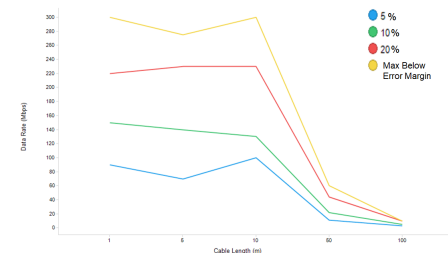
SN65MLVD206 operates up to 450 Mbps at short distances, 250 Mbps above what is specified on the data sheet. The limitation of M-LVDS standard is 500 Mbps. At a longer distance of 50m, the SN65MLVD206 is able to function up to 50 Mbps.

Figure 8. SN65MLVD206B



SN65MLVD206B operates up to 300 Mbps at short distances, 100 Mbps above what is specified on the data sheet up to 10m.

Figure 9. SN65MLVD207



SN65MLVD207 performed above the 200 Mbps at short distances, and in longer distances like 5m it could handle a data rate of 60 Mbps.

Table 1. Final Results⁽¹⁾⁽²⁾

Jitter	5%				10%				20%				Max Below Error Margin			
EVM	201	206	206B	207	201	206	206B	207	201	206	206B	207	201	206	206B	207
1m	90	140	75	90	140	160	160	150	275	300	252	220	300	460	300	300
5m	100	85	70	70	150	160	160	140	225	240	200	230	250	300	235	275
10m	90	100	50	100	140	150	150	135	190	190	140	230	200	250	200	250
50m	15	9	7	11	25	17	17	22	46	35	27	44	50	50	27	60
100m	4	3	2	3	6	4	4	5	10	8	5	10	10	8	5	10

(1) All data values are in Mbps.

(2) '201' is representative of the SN65MLVD201; '206' is representative of the SN65MLVD206; '206B' is representative of the SN65MLVD206B; '207' is representative of the SN65MLVD207

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