

Timing Differences of 10-pF Versus 50-pF Loading

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Introduction

This application report provides a data analysis of Texas Instruments (TI) 'ALVCH16244, which is an advanced low-voltage CMOS (ALVC) 16-bit unidirectional driver. The 'ALVCH16244, 'ALVCH16721, 'ALVCH162827, and 'ALVCH16835 are unidirectional drivers that are commonly used in personal computers and workstations for memory addressing in dual in-line memory modules (DIMMs). Typical DIMM applications, however, require loads of approximately 10 pF and a temperature range from 0°C to 70°C. Since the data sheet values for t_{pd} , t_{en} , and t_{dis} are characterized under a 50-pF load and a temperature range of -40°C to 85°C, designers may find the difference in typical values to be beneficial. The purpose of this application report is to provide design engineers with the difference in typical values for t_{pd} , t_{en} , and t_{dis} using a load of 10 pF, as opposed to 50 pF, and a temperature range of 0°C to 70°C, as opposed to -40°C to 85°C.

Laboratory Testing Technique

Due to its widespread use, the 'ALVCH16244 was selected as the device for actual laboratory data. The data measures propagation delay time, enable time, and disable time. The values presented are the averages of three different outputs. The data presented is indicative of the 'ALVCH16721, the 'ALVCH162827, and the 'ALVCH16835, since the size of their output transistors are the same as those on the 'ALVCH16244. All values provided are typical values. Unique testing specifications are shown in the top, left portion of each graph.

Figure 1 shows the difference in propagation delay time, enable time, and disable time for $V_{CC} = 2.7\text{ V}$ and temperature values of 0°C and 70°C. The impact of a 10-pF versus a 50-pF loading results in decreases of approximately 20% in propagation delay time, approximately 25% in enable time, and approximately 10% in disable time.

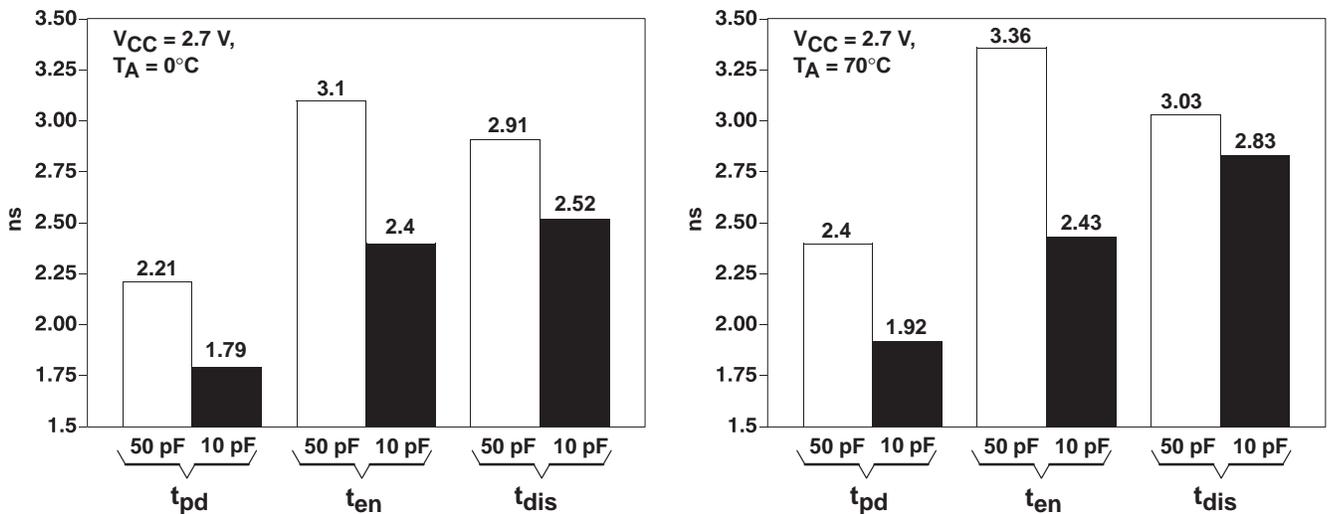


Figure 1. 'ALVCH16244 10-pF Versus 50-pF Switching-Time Differences for $V_{CC} = 2.7\text{ V}$

Figure 2 shows the difference in propagation delay time, enable time, and disable time for $V_{CC} = 3\text{ V}$ and temperature values of 0°C and 70°C. The impact of a 10-pF versus a 50-pF loading results in decreases of approximately 25% in propagation delay time and enable time, and approximately 8% in disable time.

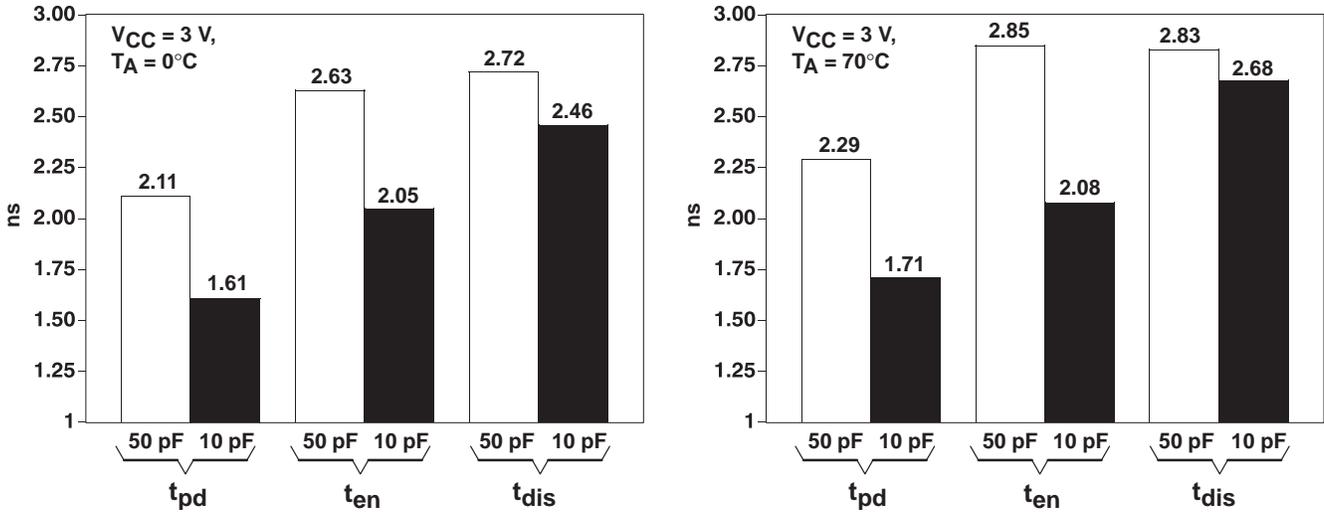


Figure 2. 'ALVCH16244 10-pF Versus 50-pF Switching-Time Differences for V_{CC} = 3 V

Figure 3 shows the difference in propagation delay time, enable time, and disable time for V_{CC} = 3.3 V and temperature values of 0°C and 70°C. The impact of a 10-pF versus a 50-pF loading results in decreases of approximately 27% in propagation delay time, approximately 23% in enable time, and approximately 7% in disable time.

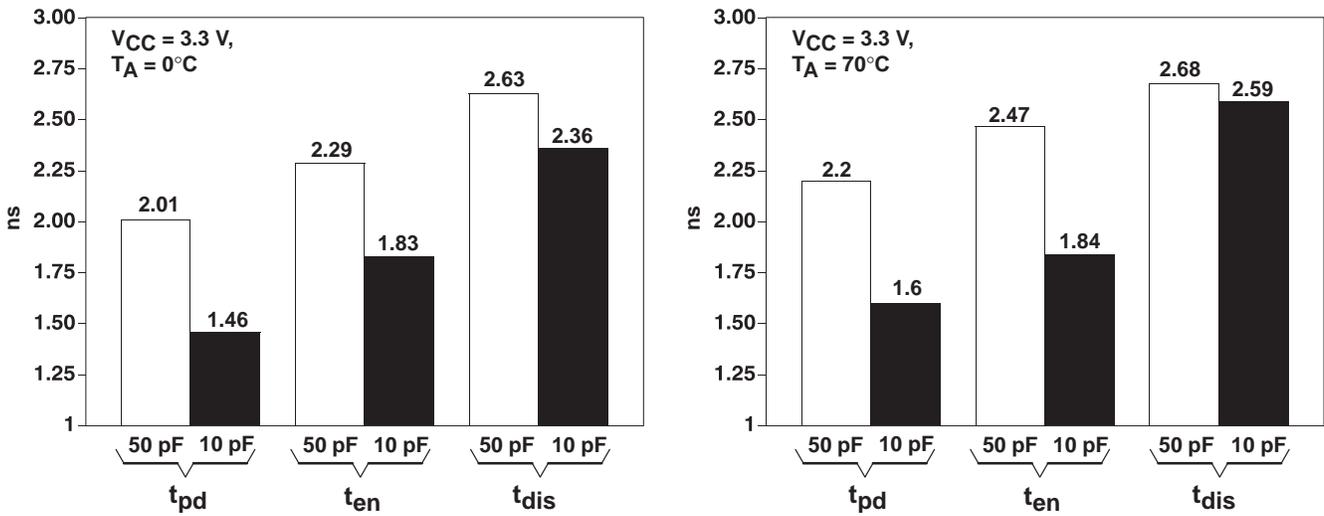


Figure 3. 'ALVCH16244 10-pF Versus 50-pF Switching-Time Differences for V_{CC} = 3.3 V

Figure 4 shows the difference in propagation delay time, enable time, and disable time for V_{CC} = 3.6 V and temperature values of 0°C and 70°C. The impact of a 10-pF versus a 50-pF loading results in decreases of approximately 32% in propagation delay time, approximately 24% in enable time, and approximately 8% in disable time.

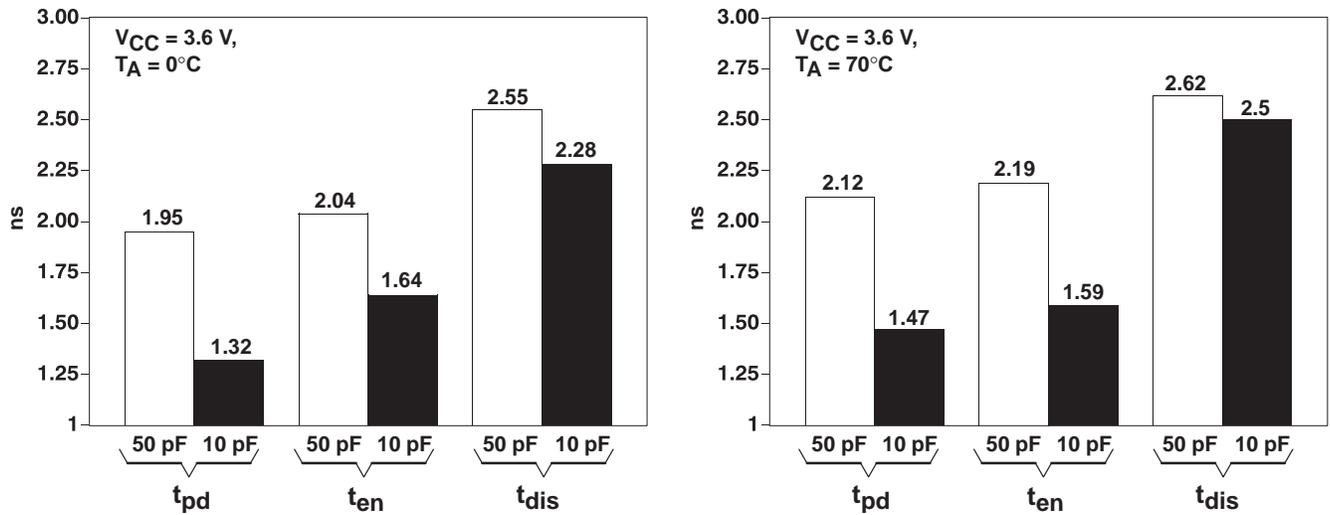


Figure 4. 'ALVCH16244 10-pF Versus 50-pF Switching-Time Differences for $V_{CC} = 3.6\text{ V}$

Conclusion

There is a noticeable difference in propagation delay time, enable time, and disable time when a 10-pF load versus a 50-pF load is used, and when an operating temperature range of 0°C to 70°C, as opposed to -40°C to 85°C, is used. The propagation delay time decreased an average of 26%, the enable time decreased an average of 24%, and the disable time decreased an average of 8%.