Application Note

Display Interfaces: A Comprehensive Guide to Sitara MPU Visualization Designs

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ABSTRACT

This application note explores the four key display interfaces used by Sitara™ Processors in digital display systems: Display Parallel Interface (DPI), Display Serial Interface (DSI), OpenLDI/Low Voltage Differential Signaling (LVDS), and Embedded DisplayPort (eDP) The document provides an overview of these interfaces, their benefits, and application areas.

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Trademarks

1 Introduction

The four key display interfaces used by Sitara Processors in digital display systems are described in the following sections.

2 Display Parallel Interface

Display Parallel Interface (DPI) is a digital interface technology that connects source graphics devices to display panels. DPI is parallel, transmitting each individual pixel's color data on different wires. DPI is simple and low-cost, making DPI designed for applications that require communication between graphics sources and displays.

DPI offers a good data rate, due to their parallel nature, making them designed for low-resolution display systems. However, DPI also requires more physical connections and wiring than other interfaces, increasing complexity and design footprint. DPI interfaces are commonly used in low-cost panels designed for Factory Automation and Control Systems.

3 Display Serial Interface

Display Serial Interface (DSI) is a high-speed serial interface developed by the MIPI Alliance. DSI is commonly used in mobile devices such as smart phones, tablets, and some laptops due to the power efficiency and reduced pin count compared to DPI.

DSI uses differential signaling to transmit data, which enhances noise immunity and allows for longer transmission distances. DSI also supports command mode, allowing the display to remain in standby mode and only update when changes occur, further saving power.

Furthermore, DSI might not support as high resolution or color depth as LVDS.

4 OpenLDI/Low Voltage Differential Signaling

OpenLDI/Low Voltage Differential Signaling (LVDS), a variation of LVDS, is a differential signaling technology primarily used for high-speed data transmission. Compared to DPI, LVDS minimizes the number of signal lines needed and supports long cable lengths, making LVDS a popular choice for large screen displays and industrial applications.

LVDS interfaces offer robustness against electrical noise, power efficiency, and high data rates. These features make LVDS designed for high-speed, high-resolution display systems. LVDS is commonly found in HDTVs, high-resolution monitors, laptops, and medical imaging devices.

However, compared to DSI, LVDS interfaces consume more power and require more physical connections, making them less designed for compact and power-constrained applications.

5 Embedded Display Port

Embedded DisplayPort (eDP) is a high-performance audio/visual interface developed by the Video Electronics Standards Association (VESA). eDP is an advanced version of the DisplayPort interface, specifically designed for embedded systems such as laptops and all-in-one computers.

eDP's key advantage lies in the efficiency and high-resolution support. eDP uses fewer pins than LVDS, reducing the complexity and size of the connectors. This efficiency is coupled with advanced power saving features such as panel self-refresh (PSR), which allows the system to save power by not refreshing the screen when the image is static.

eDP also provides support for higher resolution and color depth compared to LVDS and DSI, and can carry audio, video, and USB signals over a single cable. However, eDP might not be designed for smaller, low-power devices that do not require high-resolution displays.

6 Summary

The choice between DPI, DSI, OLDI/LVDS, and eDP interfaces depends on the specific requirements of a given application. DPI is simple and low-cost, great for lower resolutions but requires more connections. DSI provides power efficiency and reduced pin count, suited for portable devices, but panel choice is limited compared to DPI and OLDI/LVDS. OLDI/LVDS allows for long cable lengths and robust data transmission but requires more power and connections compared to DSI. eDP, and also, offers high efficiency and high-resolution support, making the interface a good fit for embedded systems that require high-quality displays. By understanding these interfaces, designers can select the most appropriate interface for their display systems.

Table 6-1. Supported Display Interfaces

Devices	DPI	DSI	OLDI/LVDS	EDP
AM62x	✓	x	✓	x
AM62Ax	✓	x	x	x
AM62Px	✓	✓	✓	x
AM64x	x	x	x	x
AM68Ax	✓	✓	✓	✓
AM69Ax	✓	✓	✓	✓

Table 6-2. Technical Specifications Overview

Display Interface	# of Pins	Max Bandwidth	Applications	Clock
DPI	RGB 24 8 bits/color 4x Clock	24 bits x 165 MHz = 3.96 GB/Sec	Low resolution display systems	Max Clock at 165 MHz
LVDS	Single link: 4x Data/1x Clock Dual Link: 8x Data/2x Clock	6 x 165 MHz x 2 = 1.98 GB/Sec; Up to 3.125 GB/Sec	High Resolution Displays/ Industrial Applications	Max Clock at 165 MHz
DSI	4 Data Pairs and 1 clock pair	4 x 1.5 GB/Sec = 6 GB/Sec	Appliances/Medical	Max Clock 165 MHz
eDP	Up to 4 Data Pairs	Up to 4 x 8.1 Gbps = 32.4 Gbps	High Resolution Display/ Industrial Applications	Max Clock 600 MHz

7 References

- Texas Instruments, *AM625*, product folder.

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