*Application Note*

# *Display Interfaces: A Comprehensive Guide to Sitara MPU Visualization Designs*

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**ABSTRACT**

This application note details 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, the benefits, and application areas.

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# 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 color data in an individual pixel 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 the parallel nature, which makes DPI 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, there is a possibility that DSI does 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 and 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.

A key advantage of eDP lies in 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, there is a possibility that eDP is not 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, an excellent choice 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 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 display systems.

**Table 6-1. Supported Display Interfaces**

| Devices | DPI | DSI | OLDI/LVDS | EDP |
|---|---|---|---|---|
| AM62Lx | ✓ | ✓ | x | x |
| AM62x | ✓ | x | ✓ | x |
| AM62Ax | ✓ | x | x | x |
| AM62Px | ✓ | ✓ | ✓ | x |
| AM64x | x | x | x | x |
| AM67x | ✓ | ✓ | ✓ | x |
| AM68Ax | ✓ | ✓ | ✓ | ✓ |
| AM69x | ✓ | ✓ | ✓ | ✓ |
| AM69Ax | ✓ | ✓ | ✓ | ✓ |

**Table 6-2. Technical Specifications Overview**

| Display Interface | Number of Pins | Max Bandwidth | Applications | Clock |
|---|---|---|---|---|
| DPI | RGB 24<br>8 bits/color<br>4x clock | 24 bits x 165MHz = 3.96GB/Sec | Low resolution display systems | Max clock at 165MHz |
| LVDS | Single link: 4x Data/1x Clock<br>Dual link: 8x Data/2x Clock | 6 x 165MHz x 2 = 1.98 GB/Sec; Up to 3.125 GB/Sec | High resolution displays and industrial applications | Max clock at 165MHz |
| DSI | 4 data pairs and 1 clock pair | 4 x 1.5 GB/Sec = 6 GB/Sec | Appliances and medical | Max clock 165MHz |
| eDP | Up to 4 data pairs | Up to 4 x 8.1 Gbps = 32.4 Gbps | High resolution display and industrial applications | Max clock 600MHz |

**Table 6-3. Max Resolution**

| Device | Max Resolution |
|---|---|
| AM62Lx | 1920x1080p at 60FPS |
| AM62x | 2048x1080p at 60FPS |
| AM62Ax | 2048x1080p at 60FPS |
| AM62Px | 3840x1080p at 60FPS |
| AM64x | N/A |
| AM67x | 3840x1080p at 60FPS |
| AM68Ax | 4K at 60FPS |
| AM69x | 4K at 60FPS |
| AM69Ax | 4K at 60FPS |

# 7 References


- Texas Instruments, *AM625*, product folder.

# 8 Revision History

NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

| Changes from Revision * (November 2023) to Revision A (February 2025) | Page |
|---|---|
| • Added *Max Resolution* table | 3 |
| • Added AM62Lx, AM67x, and AM69x to *Supported Display Interfaces* table | 3 |

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