TI Designs: TIDA-00131

High-Def (HD) Automotive SerDes w/ OpenLDI Interface over twisted pair for TFT LCD Displays

System Description

The design is a high speed serial video interface to connect a remote automotive TFT LCD display with 720p x 60Hz format and OpenLDI (LVDS) Interface to a video processing system. It uses TIs FPD-Link III SerDes technology to transmit uncompressed video data (with Content Protection - HDCP option) and bidirectional control signals over shielded twisted pair.

Featured Applications

- Rear Seat Entertainment Systems
- Automotive Cluster
- HUD

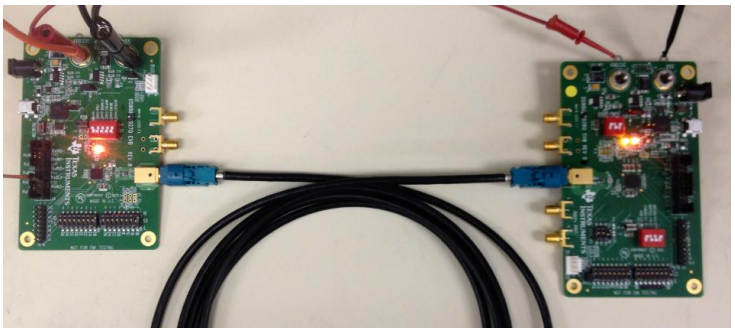
Design Resources

DS90UB927Q-Q1	Product Folder
EVM User's Guide	Document
DS90UB928Q-Q1	Product Folder
EVM User's Guide	Document

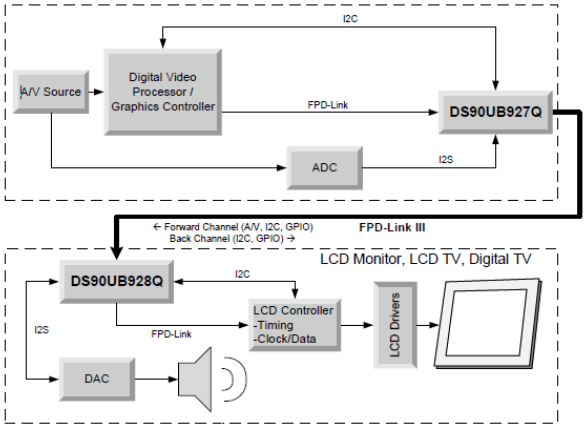
Design Features

- Direct Connect to Displays supporting the OpenLDI Standard (LVDS)
- Bi-Directional Control Channel supporting GPIO and I2C
- Supports TFT LCD displays up to 720p x 60Hz
- Adaptive Equalizer Auto Calibrates for cable length, aging, and over temperature
- Optional Content Protection - HDCP (DS90UH928QEVM & DS90UH927QEVM)
- Diagnostic Built In Self-Test (BIST) and Pattern Generation

Design Photo



Block Diagram



Jump start system design and speed time to market

Comprehensive designs include schematics or block diagrams, BOMs, design files and test reports by experts with deep system and product knowledge. Designs span TI's portfolio of analog, embedded processor and connectivity products and supports a board range of applications including industrial, automotive, medical, consumer, and more. To explore the designs, go to http://www.ti.com/tidesigns

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Associated Part Numbers

Part Number	Part Description	EVM Link
DS90UB927Q-Q1	5MHz - 85MHz 24-bit Color FPD-Link III Serializer with Bidirectional Control Channel	EVM User's Guide
DS90UB928Q-Q1	5-85 MHz 24-bit Color FPD-Link III Deserializer with Bidirectional Control Channel	EVM User's Guide

Design Considerations:

Connecting a remote dislay to an infotainment system does not only require a data line with sufficient bandwith and the capability to drive multiple meters of cable, there additional other aspects to consider. To diagnose the functionality of the display or to return touch display information from the display to the infotainment system, an additional control channel is required. EMI is another important factor when driving signals in the GHz range over long distances through the car. With TI's FPD-Link III SerDes family of products the video signal, a bidirectional I2C channel, and the clock are all transmitted through the same differential pair of cables. This reduces the wiring harness, saving space, weight and cost for the operation of a remote display while the differential signal through shielded twisted pair keeps electromagnetic emissions low.

Quick Start Guide

1. **What's Needed:**
    a. DS90UB928QEVM (Des)
    b. DS90UB927QEVM (Ser)
    c. USB to mini-USB cable
    d. Applicable cable (HSD automotive connector configured by default)
    e. Display with OpenLDI input and flat cable
    f. PC with TI ALP software installed
    g. Video source with OpenLDI output and flat cable
    h. 5V or 3.3V power supply
2. **Before the system is powered up:** Make sure all hardware is configured properly. Check that all jumpers and headers are connected appropriately. For a detailed description of configurations, see EVM user's guide.
    a. Connect 3.3V DC power and ground from a power supply to J8 (VDD33C) and J9 (VSS).
    b. If 1.8V VDDIO operation is desired, set the 1.8V position at JP7 and apply 1.8V DC at pin 1 of JP6.
    c. Alternatively, onboard 1.8V DC and 3.3V DC voltage regulators may be utilized by connecting 5V DC at the J7 barrel power jack (center positive).
    d. Connect an applicable cable (not provided, HSD automotive connector configured by default) from the DS90UB928QEVM (RX) board to the FPD-Link III input (J4) of the DS90UB927QEVM (TX) board.
    e. From the Video source, connect a flat cable to the TX board and connect the appropriate cable from the RX board to the panel.
    f. Connect the included USB cable from a host computer running the included TI ALP software to the USB port (J6) on the RX board.
    g. (Optional) Connect audio from an I2S audio source to TX board pins DA (data), CLK (clock), and WC (word clock) and from RX board pins DA, CLK, and WC to an I2S DAC.
    h. (Optional) Connect and configure any required GPIO interfaces. GPIO0 and GPIO1 are dedicated pins.

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