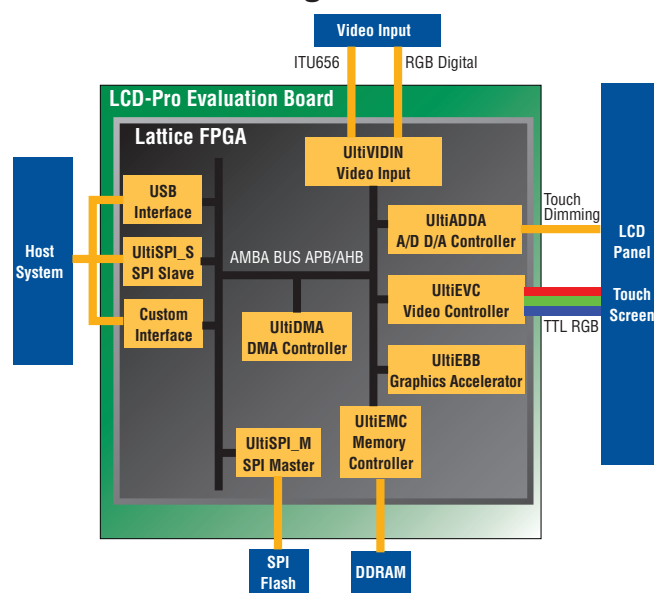


LCD-Pro Evaluation Kit

Advanced Touch-Screen Video Graphics Controller

The LCD-Pro™ Evaluation Kit enables evaluation of the LCD-Pro library, a set of flexible, configurable IP cores which can be used to implement versatile and powerful display control, graphics and video applications. The library is based around the industry standard AMBA® bus architecture, allowing interconnection of the LCD-Pro IP with a wide range of system components compatible with the AMBA bus. The LCD-Pro IP cores are targeted to Lattice FPGAs, specially optimized for the LatticeECP2™ low-cost FPGA family. The library contains several IP cores that provide advanced graphics system functionality.

LCD-Pro Block Diagram



Extensive IP Library

LCD-Pro IP	Description
UtiEVC Video Controller	Advanced flat panel display controller.
UtiEMC Memory Controller	Low slice cost, high bandwidth, DDR memory controller.
UtiEBB 2D Graphics Accelerator	Advanced BITBLT core providing ROP and alpha blending operations.
UtiVIDIN Video Input	Advanced video input/frame grabber core.
UtiADDA	FPGA based A/D, D/A touch screen controller (coupled with external analog circuitry). These cores are supported by a reliable and efficient set of system IP.
UtiAHB_I	AMBA 3 AHB multi-layer switch matrix interconnect.
UtiAPB_B	AMBA 3 AHB to APB bridge.
UtiSPI_M	SPI master controller.
UtiSPI_S	SPI slave core providing AMBA bus access to external host.
UtiI2C_M	I²C master controller.
UtiUSBDMA	USB to AMBA AHB interface - versatile test and debug link.



Key Features

- Fast Time-to-Market
- Easy Core Integration into LatticeECP2 and LatticeXP2™ FPGAs
- Field-Proven IP
- High-Performance Advanced Video Architecture
- Design Optimized for Cost-Sensitive Applications
- Video Controller Integrates LCD Display Support from 2 inches to 23 inches and larger
- Easy to add Custom or Proprietary IP Core from Third Parties
- Applications Include:
 - Industrial and automated control
 - Automotive graphics and video systems
 - Medical monitors and instrumentation
 - Household consumer products (washing machines, refrigerators)
 - Building automation HMI
 - Marine systems
 - Consumer automation (kiosks, vending machines, ATMs)



LCD-Pro IP Library

The library offers simplified system and host interfacing due to the use of widely adopted, industry standard AMBA bus architecture and included system interface cores. The cores, which are configurable with various implementation options, offer a high degree of solution scalability. Additionally, the cores are designed and optimized for the high speed required by state-of-the-art graphics systems, providing simplified timing closure and short development time.

The library allows easy integration of advanced FPGA-based graphics systems with powerful features:

- Ability to control a wide range of flat panel displays ranging from low-end CIF and QVGA up to high definition TFT, in 8, 16 or 24-bit color (field proven with more than 30 commercially available displays).
- Multi-layer image compositing available in display controller, supporting simple overlaying, color keyed transparency, alpha blending and alpha masking.
- Variable layer color depth, size, positioning, memory geometry and location, smooth scrolling.
- Display refresh synchronization.
- Support for fast hardware BITBLT operations with standard ROP or alpha composition.
- Support for 8,16, 24 and 32-bit bitmap formatting, variable and independent memory geometry for source and destination bitmaps.
- Powerful alpha blending operations supporting Porter-Duff alpha composition rules.
- Solid and pattern fill operations.
- Hardware color expansion of monochromatic bitmaps; color channel mixing support.
- Versatile video input allowing multiple video input channels with multiple input muxing, supporting ITU-R BT.656 (ITU656) or digital RGB video inputs.
- Real-time down-scaling of input video stream.
- Variable video image memory geometry, cropping and positioning.
- Frame grabbing, video input signal synchronization.
- High bandwidth DDR frame buffer memory support.
- FPGA-based A/D, D/A controller employing external analog circuitry.
- Touch sensing, backlight and dimming control.
- Control of embedded peripheral memories over SPI and I²C buses.
- System interfacing over peripheral SPI bus or via USB link from an external USB host.

Applications Support

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LCD-Pro Version Examples

IP Core	Base Enhanced Video Controller Module	Base Plus Graphic Accelerator Module IP Library	Base Plus 2D and Video Module
UltiEVC Video Controller	✓	✓	✓
UltiEMC Memory Controller	✓	✓	✓
UltiADDA A/D, D/A Controller	✓	✓	✓
UltiEBB 2D Graphics Accelerator		✓	✓
UltiVIDIN Video Input			✓
AMBA APB AHB System Bus IP Modules	✓	✓	✓
UltiSPI_M SPI Master	✓	✓	✓
UltiSPI_S SPI Slave	✓	✓	✓

Ordering Information

Product	Ordering Part #
LCD-Pro Evaluation Kit	LFE2-50E-LCDPRO-EVN

LCD-Pro Evaluation Kit Contents

- Carrier Board including 2x CVBS and 1x VGA Video Input Ports
- LatticeECP2-based FPGA Module
- 7" WVGA LCD Color Touch Display
- LCD-Pro Configurator Installation CD
- Video Camera Included
- 12V DC Power Supply
- 1 USB 2.0 Cable
- Adapter for Lattice JTAG Cable

FPGA Module Features

- FPGA: LFE2-50E 5FN484C
- SPI Flash M25P32 - 4Mx8-bit
- DDR Video Memory 64MB (32Mx16-bit)
- Clocking - 48MHz Oscillator
- JTAG Port

Carrier Board

- Analog Circuits for A/D, D/A Converters
- Analog Front-End for Video Input
- USB 2.0 Device Port
- Universal LCD and Touch Screen Connectors
- Expansion Connector
- 3.3V Power Supply
- Display Power Supply

LCD Module

- 7" WVGA 800x480 64K Color TFT
- White LED Backlight
- 4-wire Analog Resistive Touch Screen
- 1²C 256 Byte EEPROM

