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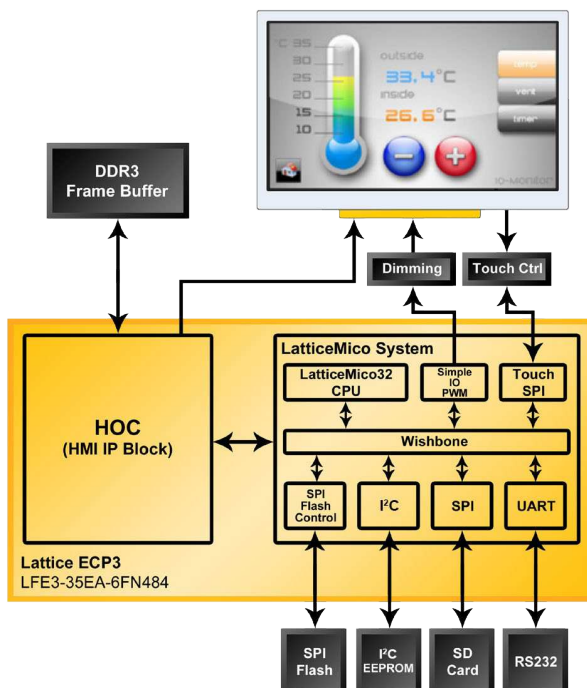# HOC: Embedded HMI-On-Chip solution

Embedded HMI on Chip (HOC) is a compact HMI solution for rapid creation and implementation of embedded graphical human-machine interfaces (HMIs) on Lattice FPGA's. The HMI on Chip solution has been developed by Mikroprojekt on the LatticeECP3™ HMI Development Kit. The solution offers the complete functionality required for display driving, graphics rendering and embedded visualization, scalable from small size QVGA to large full HD displays, as well as a wide variety of touch screen and system interfaces.

The advantage of HOC solution is the concept of HMI-On-Chip: TFT display driving, graphics rendering, touch screen handling and system interfacing are handled directly in the FPGA hardware, without the requirement of an operating system and associated design complexity required by the typical graphical solutions. The built-in graphical engine (IQ-Engine) interprets an integrated interface project file to visualize and modify a set of values shared with the host application, allowing easy integration of the user interface. Using an FPGA brings an absolute flexibility of the solution to the user, supporting the widest possible range of displays, memories or system interfaces.

The HOC solution can be evaluated on the LatticeECP3 HMI Development Kit. The LatticeECP3 HMI Development Kit couples the LatticeECP3 Versa Development kit with an add-on HMI display kit. The HMI display kit is based on a 4.3'' TFT touch screen display mezzanine module for the LatticeECP3 Versa Kit. The add-on display mezzanine module also provides an SD card slot allowing for easy deployment and evaluation of graphical user interfaces.

Solution Architecture

Key Features

- Lattice FPGA-based embedded HMI solution
- No operating system required
- HMI-on-chip: fully integrated design
- Memory and display control; Graphics accelerator
- Alpha blending and transparency
- Various HMI graphics objects: Buttons, sliders, bar-graphs, data fields
- Easy interface deployment; single integrated file
- No-coding, fully graphical interface design process, WYSIWYG
- Small FPGA footprint for compact implementation
- Easy system integration with memory-mapped data exchange
- Fully configurable external interfaces
- Simple evaluation with the LatticeECP3 HMI Development Kit

Device Utilization

Device/Cfg.	LUT4	REG	EBRs	MULs	PIOs
ECP3-35[1]	14591	9024	30	8	99
ECP2-12[2]	9242	5375	11	8	80

[1]ECP3-35, DDR3 memory, high resolution display, large Mico32 cache size, SD card
[2]ECP2-13, SDRAM memory, compact implementation

HMI Interface Design

The graphical user interface can be designed simply and quickly in a what-you-see-is-what-you-get manner, and deployed to the hardware without the need to develop software or write code.

The HOC Editor interface designer application allows easy inclusion and manipulation of high-end graphical elements, managing multiple graphics levels and transparencies, and creating unlimited levels of menu structure, graphics, and details. Standard objects such as buttons, sliders and bar-graphs are supported.

Target Applications

- Domestic appliances
- HVAC (Heating, Ventilation, Air Conditioning) systems
- Vending machines
- On-screen display (OSD) menu systems
- Automotive information displays
- Building automation and elevator controls
- Industrial automation systems
- Service and control terminals

Ordering Information

Product	Description	Order Code
Lattice ECP3 HMI Development Kit	■ Lattice ECP3 HMI Development Kit consisting of LatticeECP3 Versa Kit with mounted HMI Display Kit. ■ 12V power supply ■ SD card preloaded with demo project and HOC Editor evaluation version ■ Quick start guide ■ Evaluation netlist and design available	LFE3-35EA-HMI-DKN
Diamond License	■ Free one-year evaluation license valid only for used with ECP3 HMI Development Kit	
Mikroprojekt HOC IP License	■ Mikroprojekt's HMI design Suite consisting of single project license for HOC FPGA netlist and IQ-Engine library (requires licensing agreement with Mikroprojekt)	ST-IQDISP

HOC is a compact, Lattice FPGA based solution for rapid creation and implementation of embedded graphical human-machine interfaces (HMIs), based on Intellectual Property (IP) cores and Software from Lattice partner Mikroprojekt.

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