Welcome to E-XFL.COM

Understanding Embedded - FPGAs (Field Programmable Gate Array)

Embedded - FPGAs, or Field Programmable Gate Arrays, are advanced integrated circuits that offer unparalleled flexibility and performance for digital systems. Unlike traditional fixed-function logic devices, FPGAs can be programmed and reprogrammed to execute a wide array of logical operations, enabling customized functionality tailored to specific applications. This reprogrammability allows developers to iterate designs quickly and implement complex functions without the need for custom hardware.

Applications of Embedded - FPGAs

The versatility of Embedded - FPGAs makes them indispensable in numerous fields. In telecommunications.

Details	
Product Status	Obsolete
Number of LABs/CLBs	80
Number of Logic Elements/Cells	640
Total RAM Bits	18432
Number of I/O	79
Number of Gates	-
Voltage - Supply	2.375V ~ 3.465V
Mounting Type	Surface Mount
Operating Temperature	0°C ~ 85°C (TJ)
Package / Case	132-LFBGA, CSPBGA
Supplier Device Package	132-CSPBGA (8x8)
Purchase URL	https://www.e-xfl.com/product-detail/lattice-semiconductor/lcmxo2-640hc-4mg132c2u

CONTENTS

Programmable Products

- FPGA and CPLD Products 4-8
- Power and Thermal Management Products 9
- Lattice IP Cores and Reference Designs 10-15
- Development Kits 16-25
- Programming Hardware 26
- FPGA and CPLD Design Software 27

Standards-based Products

- Connectivity ASSPs 28-31
- pASSP™ Solutions 32
- SiBEAM WirelessHD Modules 33

MachXO & LatticeXP Series - Bridging and I/O Expansion FPGAs

Features		MachXO2™	MachXO™	LatticeXP2™
		3	3	3
Bit-stream Encryption				3
Embedded Function Blocks		I²C (2), SPI (1), Timer (1)		
Core Vcc	1.2 V	ZE & HE	3 3 3 3	3
	1.8 - 3.3 V		3 3 3 3	
	2.5 - 3.3 V	HC	HC	HC
Temp.	C	3	3	3
	I	3	3	3
	AEC-Q100		3 3	3
0.4 mm Spacing				
0.5 mm Spacing				
0.8 mm Spacing				
1.0 mm Spacing				

1) Contact your Lattice sales representative for the support of the 184-ball csBGA package, available with the HE option only.
2) Package is only available for E=1.2 V devices.
3) Package is only available for C=2.5 V/3.3 V devices.
4) Dual Boot supported with external boot Flash.

Power and Thermal Management Products

		Power & Thermal Management		Power Management				
Features		**L-ASC10**	**LPTM21**	**POWR1220AT8**	**POWR1014A**	**POWR1014**	**POWR607**	**POWR605**
Voltage Monitoring Inputs		10	10	12	10	10	6	6
Current Monitoring Inputs		2	2					
Temperature Monitoring Inputs		2	2					
Number of Trimming Channels		4	4	8				
MOSFET Drives		4	4	4	2	2	2	
On-Chip Non-Volatile Fault Log		3	3					
Number of LUTs			1280					
Distributed RAM (Kbits)			10					
EBR SRAM (kBits)			64					
Number of EBR Blocks (9 kBits)			7					
Number of PLLs			1					
Number of Macrocells				48	24	24	16	16
Communication I/F		I^2C	I^2C/JTAG	I^2C	I^2C			
Programming Interface		I^2C	I^2C/JTAG	JTAG	JTAG	JTAG	JTAG	JTAG
Operating Voltage		3.3	2.8V to 12V	3.3V	3.3V	3.3V	3.3V	3.3V
In-system Update Support		3	3					
Temp.	**I**	3	3	3	3	3	3	3
	AEC-Q100				3	3		
Package Options		**Digital I/Os**						
48-pin QFN (7 x 7)		9[5]						
237-Ball ftBGA (1 mm) (17 x 17)			95 + 10[4]					
100-pin TQFP (14 x 14)				22[1]				
48-pin TQFP (7 x 7)					16[2]	16[2]		
32-pin QFN (5 x 5)							7[3]	
24-pin QFN (4 x 4)							7[3]	7[3]

1) POWR1220AT8 provides 6 (5V Tolerant) Digital inputs and 16 (5V Tolerant) Open-drain Digital Outputs
2) POWR1014 & PWOR1014A provide 4 (5V Tolerant) Digital inputs and 12 (5V Tolerant) Open-drain Digital Outputs
3) POWR607 & PWOR605 provide 2 (5V Tolerant) Digital inputs and 5 (5V Tolerant) Open Drain I/O
4) LPTM21 provide 95 (3.3V Tolerant) Logic I/Os 10 (5V tolerant) open-drain I/Os
5) 5V Tolerant Open Drain I/O

IP Cores

Lattice IP Cores are pre-tested, reusable functions, that allow designers to focus on their unique system architectures. These IP cores provide industry-standard functions such as PCI Express, DDR, Ethernet, CPRI, and embedded microprocessors. In addition, a number of independent IP providers have teamed with Lattice to offer additional high quality, reusable IP cores. Partners are selected for their industry leadership, high development standards, and commitment to customer support. For a complete listing of IP cores from Lattice and its 3rd party partners, please go to latticesemi.com/IP. Note that a Diamond Subscription License and the IP license are required to use the IPs for production.

	IP Core	CrossLink	ECP5/ ECP5-5G	ECP3	ECP2/M	ECP2	MachXO2	MachXO	XP2
Communications	10 Gigabit Ethernet MAC		3	3	3[1]	3[1]			
	2.5 Gb Ethernet MAC		3	3					
	2.5 Gb Ethernet PCS			3[1]					
	CPRI		3	3	3[1]				
	SGMII and Gigabit Ethernet PCS		3	3	3[1]				
	Triple Speed 10/100/1G Ethernet MAC		3	3	3[1]	3[1]			3
	XAUI		3	3	3[1]				
Connectivity	PCI Express x1 Endpoint		3	3	3[1]				
	PCI Express x2 Endpoint		3						
	PCI Express x4 Endpoint		3	3	3[1]				
	PCI Express Root Complex Lite X1		3	3					
	PCI Express Root Complex Lite X4		3	3					
	PIPE			3					
	PCI Master/Target 33			3	3[1]	3[1]	3	3	3
	PCI Master/Target 66			3	3[1]	3[1]			3
	PCI Target 33			3	3[1]	3[1]	3	3	3
	PCI Target 66			3	3[1]	3[1]		3	3
	Tri-Rate Serial Digital Interface (SDI) PHY			3					
	JESD204A			3					
	JESD204B		3	3					
	JESD207		3[1]	3					
Digital Signal Processing	Block Convolutional Encoder			3[1]	3[1]	3[1]			3[1]
	Block Viterbi Decoder			3[1]	3[1]	3[1]			3[1]
	Cascaded Integrator-Comb (CIC) Filter			3[1]	3[1]	3[1]			3[1]
	CORDIC			3[1]	3[1]	3[1]			3[1]
	Distributed Arithmetic (DA) FIR Filter			3[1]	3[1]	3[1]			3[1]
	Divider			3	3[1]	3[1]			3
	Dynamic Block Reed-Solomon Decoder			3[1]	3[1]	3[1]			3[1]
	FFT Compiler			3[1]	3[1]	3[1]			3[1]
	FIR Filter Generator			3	3[1]	3[1]			3
	Interleaver/De-interleaver			3[1]	3[1]	3[1]			3[1]
	Median Filter			3[1]	3[1]	3[1]			3[1]
	Numerically-Controlled Oscillator (NCO)			3	3[1]	3[1]			3
	Peak Cancellation Crest Factor Reduction (CFR)		3	3					
Processor, Controller & Peripheral	DDR SDRAM Controller			3[1]	3[1]	3[1]			3[1]
	DDR SDRAM Controller Pipelined						3		
	DDR2 SDRAM Controller		3[1]	3	3[1]	3[1]			3
	DDR2 SDRAM Controller Pipelined						3		
	DDR3 SDRAM Contoller		3	3					
	DDR3 SDRAM PHY		3	3					
	LPDDR SDRAM Controller						3		
	LPDDR3 SDRAM Controller		3						
	Scatter Gather DMA		3	3	3[1]	3[1]			3
Video & Imaging	1:2 MIPI DSI Display Interface Bridge	3							
	2:1 MIPI CSI-2 Aggregator Bridge	3							
	2:2 MIPI DSI Display Interface Bridge	3							
	2D Edge Detector			3[1]	3[1]	3[1]			3[1]
	2D FIR Filter			3[1]	3[1]	3[1]			3[1]
	2D Scaler		3[1]	3	3[1]	3[1]			3
	Color Space Converter		3	3	3[1]	3[1]	3		3
	CMOS to MIPI CSI-2 Interface Bridge	3							
	Deinterlacer		3[1]	3	3[1]	3[1]			3
	Display Interface Mux						3[1]		
	DVB-ASI			3					
	Gamma Corrector		3	3	3[1]	3[1]			3
	Median Filter			3[1]	3[1]	3[1]			3[1]
	MIPI DSI to MIPI DSI	3							
	MIPI DSI to OpenLDI LVDS Display Interface Bridge	3							
	MIPI DSI to RGB Display Interface Bridge	3							
	Open LDI/FPD-Link/LVDS to MIPI DSI Display Interface Bridge	3							
	RGB to MIPI DSI Display Interface Bridge	3							
	SubLVDS to MIPI CSI-2 Image Sensor Bridge	3							
	Video Frame Buffer		3	3	3[1]	3[1]			3[1]

1) Contact Lattice for version support information.

Lattice IP Suites provide many of the IP cores required to develop a total solution for common FPGA applications. In addition, multiple Lattice FPGA families are supported with each IP Suite, so designers can develop solutions across multiple Lattice families, taking advantage of the best features of each. The following table summarizes which IP cores are included in each IP Suite, and which FPGA families are supported.

	IP Core	ECP5/ ECP5-5G	Lattice ECP3	Lattice ECP2M	Lattice ECP2	Mach XO2	Mach XO	Lattice XP2	Suite (One Year Subscription)	Annual License Renewal (After First Year)
Value Suite	DDR SDRAM Controller		3	3	3			3	Order #: DS-VAL-ST-U1	Order #: DS-VAL-ST-UR1
	DDR2 SDRAM Controller	3[1]	3	3	3	3		3		
	DDR3 SDRAM Controller	3	3							
	LPDDR SDRAM Controller					3				
	LPDDR3 SDRAM Controller	3								
	FIR Filter Generator		3	3[1]	3[1]			3		
	Triple Speed Ethernet MAC	3	3	3[1]	3[1]			3		
PCI Express Suite	PCI Express x1 Endpoint	3	3	3[1]					Order #: DS-PCIE-ST-U1	Order #: DS-PCIE-ST-UR1
	PCI Express x2 Endpoint	3								
	PCI Express x4 Endpoint	3	3	3[1]						
	PCIe Root Complex Lite x1	3	3							
	PCIe Root Complex Lite x4	3	3							
	Scatter Gather DMA	3	3	3[1]	3[1]			3		
	PCI Master/Target 33		3	3[1]	3[1]	3	3	3		
	PCI Master/Target 66		3	3[1]	3[1]			3		
	PCI Target 33		3	3[1]	3[1]	3	3	3		
	PCI Target 66		3	3[1]	3[1]		3	3		
	DDR SDRAM Controller		3[1]	3[1]	3[1]			3[1]		
	DDR2 SDRAM Controller	3[1]	3	3[1]	3[1]			3		
	DDR3 SDRAM Controller	3	3							
	LPDDR SDRAM Controller					3				
	LPDDR3 SDRAM Controller	3								
Ethernet Suite	10 Gigabit Ethernet MAC	3	3	3[1]	3[1]				Order #: DS-ETH-ST-U1	Order #: DS-ETH-ST-UR1
	SGMII and Gigabit Ethernet PCS	3	3	3[1]						
	Triple Speed 10/100/1G Ethernet MAC	3	3	3[1]	3[1]			3		
	XAUI	3	3	3[1]						
	Scatter Gather DMA	3	3	3[1]	3[1]			3		
	DDR SDRAM Controller		3[1]	3[1]	3[1]			3[1]		
	DDR2 SDRAM Controller	3[1]	3	3[1]	3[1]			3		
	DDR3 SDRAM Controller	3	3							
Digital Signal Processing (DSP) Design Suite	Block Convolutional Encoder		3[1]	3[1]	3[1]			3[1]	Order #: DS-DSP-ST-U1	Order #: DS-DSP-ST-UR1
	Block Viterbi Decoder		3[1]	3[1]	3[1]			3[1]		
	Cascaded Integrator-Comb (CIC) Filter		3[1]	3[1]	3[1]			3[1]		
	CORDIC		3[1]	3[1]	3[1]			3[1]		
	Distributed Arithmetic (DA) FIR Filter		3[1]	3[1]	3[1]			3[1]		
	Dynamic Block Reed-Solomon Decoder		3[1]	3[1]	3[1]			3[1]		
	FFT Compiler		3[1]	3[1]	3[1]			3[1]		
	FIR Filter Generator		3	3[1]	3[1]			3		
	Interleaver/De-Interleaver		3[1]	3[1]	3[1]			3[1]		
	Numerically Controlled Oscillators (NCO)		3	3[1]	3[1]			3		
Video and Display Suite	2D Edge Detector		3[1]	3[1]	3[1]			3[1]	Order #: DS-VDS-ST-U1	Order #: DS-VDS-ST-UR1
	2D FIR Filter		3[1]	3[1]	3[1]			3[1]		
	2D Scaler	3[1]	3	3[1]	3[1]			3		
	Color Space Converter	3	3	3[1]	3[1]	3		3		
	Deinterlacer	3[1]	3	3[1]	3[1]			3		
	Median Filter		3[1]	3[1]	3[1]			3[1]		
	DVB-ASI		3							
	Tri-rate Serial Digital Interface (SDI) PHY	3	3							
	DDR SDRAM Controller		3[1]	3[1]	3[1]			3[1]		
	DDR2 SDRAM Controller	3[1]	3	3[1]	3[1]			3		
	DDR3 SDRAM Controller	3	3							

1) Contact Lattice for version support information.

Continued on next page

	IP Core	ECP5/ ECP5-5G	Lattice ECP3	Lattice ECP2M	Lattice ECP2	Mach XO2	Mach XO	Lattice XP2	Suite (One Year Subscription)	Annual License Renewal (After First Year)
Connectivity IP Suite	DDR3 SDRAM Controller	3	3						Order #: DS-CONN-ST-U	Order #: DS-CONN-ST-UR
	LPDDR3 SDRAM Controller	3								
	PCI Express x1 Endpoint	3	3	3[1]						
	PCI Express x2 Endpoint	3								
	PCI Express x4 Endpoint	3	3	3[1]						
	PCIe Root Complex Lite x1	3	3							
	PCIe Root Complex Lite x4	3	3							
	10 Gigabit Ethernet MAC	3	3	3[1]	3[1]					
	SGMII and Gigabit Ethernet PCS	3	3	3[1]						
	Triple Speed 10/100/1G Ethernet MAC	3	3	3[1]	3[1]			3		
	XAUI	3	3	3[1]						
	Scatter Gather DMA	3	3	3[1]	3[1]			3		
	CPRI	3	3	3						
	JESD204B	3	3							
	DDR3 PHY	3	3							

1) Contact Lattice for version support information.

Name	Reference Design No.	ECP5/ ECP5-5G	Lattice ECP3	Mach XO3	Mach XO2	Mach XO	Lattice XP2	iCE40 LP/HX/LM	iCE40 Ultra	iCE40 UltraPlus	Format	
											Verilog	VHDL
RAM-Type Interface for Embedded User Flash Memory - WISHBONE Compatible	RD1126				3							
RC4 Based PRNG Generator	RD1179							3				3
Read and Write Usercode	RD1041			3	3	3					3	3
RGMII to GMII Bridge	RD1022	3	3								3	3
SD Flash Controller - WISHBONE Compatible	RD1048					3	3				3	3
SD Host Controller	RD1165							3			3	3
SDR SDRAM Controller	RD1174			3				3			3	
SDR SDRAM Controller – Advanced	RD1010	3	3		3	3	3				3	3
Simple Sigma-Delta ADC	RD1066				3	3	3				3	3
SMPTE SDI Dual HD from/to 3G Level-B Converter	RD1132		3								3	
SPI Master Controller	RD1141							3			3	
SPI Peripheral	RD1075					3					3	3
SPI Slave Controller	RD1142							3			3	3
SPI Slave Peripheral Using the Embedded Function Block - WISHBONE Compatible	RD1125			3	3						3	3
SPI Slave Port Expander	RD1168							3				3
SPI to I²C Bridge	RD1173							3			3	
SPI to MIPI-DSI Bridge										3		
SPI to UART Expander	RD1143							3				3
SPI Wishbone Compatible	RD1044			3	3	3	3				3	3
Sub-LVDS Serial to CMOS Parallel Sensor Bridge	RD1130				3						3	
Sub-LVDS-to-Parallel Sensor Bridge	RD1122	3	3		3		3				3	3
UART - WISHBONE Compatible	RD1042			3	3	3	3				3	3
UART (Universal Asynchronous Receiver/ Transmitter)	RD1011					3	3					3
UART 16550 Transceiver	RD1138							3			3	

ispMACH 4000 Reference Designs

Name	Reference Design Number	WISHBONE Compatible	Format		
			Verilog	VHDL	BLIF NGO
8b/10b Encoder/Decoder	RD1012				3
GPIO Expander	RD1065		3	3	
I²C Bus Controller for Serial EEPROMs	RD1006	3	3		3
I²C (Inter-Integrated Circuit) Bus Master	RD1005	3			3
I²C (Inter-Integrated Circuit) Slave / Peripheral	RD1054	3			
LPC (Low Pin Count) Bus Controller	RD1049	3	3		3
Multiple Scan Port Addressable Buffer (BSCAN1)	RD1001	3			
Multiple Scan Port Linker (BSCAN 2)	RD1002				3
PCI Target 32 bit/33 MHz	RD1008		3	3	
PWM Fan Controller	RD1060		3	3	
Read and Write Usercode	RD1041		3	3	
SDR SDRAM Controller - Advanced	RD1010	3	3		3
SPI GPIO Expander	RD1073		3		
SPI Controller - WISHBONE Compatible	RD1044	3	3	3	
SPI (Serial Peripheral Interface) Peripheral	RD1075	3	3		3
UART (Universal Asynchronous Receiver/ Transmitter)	RD1011	3			

Hardware Management IPs, that are integrated in the Platform Designer tool, simplify implementation of functions, such as Fault Logging, Fan Controller and PMBus Controller through a simple GUI interface.

Lattice Reference Designs are reusable as-is codes that allow designers to quickly build their unique applications. These reference designs provide functions such as I²C, SPI, BSCAN and LPC Bus Controller interface solutions. For a complete listing of reference designs from Lattice, please go to latticesemi.com/IP.

Hardware Management IPs

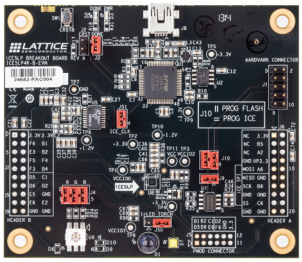
IP Core	MachXO2+ L-ASC10	PLATFORM MANAGER 2	Format			
			VHDL	Verilog	LogiBuilder	Analog Circuit
Fault Logging	3	3	3	3		
Hot Swap Controller	3	3	3	3		3
Fan Controller	3	3	3	3		
PMBus Controller	3		3	3	3	
Trim & Margin	3	3				3
Power & Reset Sequencing	3	3	3	3	3	
Voltage Scaling & VID	3	3	3	3		3

Hardware Management Reference Designs

Name	Reference Design No.	MachXO2+ L-ASC10	PLATFORM MANAGER 2	Format	
				VHDL	Verilog
BSCAN - Multiple Boundary Scan Port Addressable Buffer (BSCAN1)	RD1001	3	3	3	3
BSCAN - Multiple Boundary Scan Port Linker (BSCAN 2)	RD1002	3	3	3	3
FPGA Loader	AN8077	3	3	3	3
I²C Bus Controller for Serial EEPROM	RD1006	3	3	3	3
I²C Master Controller	RD1005	3	3	3	3
I²C Slave Peripheral Using Embedded Function Block	RD1124	3	3	3	3
I2S Controller	RD1101	3	3	3	3
LPC Bus Controller	RD1049	3	3	3	3
MachXO2 I²C Embedded Programming Access Firmware	RD1129	3	3	3	3
MachXO2 Soft I²C Slave with Clock Stretching	RD1186	3	3	3	3
NAND Flash Controller	RD1055	3	3	3	3
PWM Fan Controller	RD1060	3	3	3	3
RAM-Type Interface for Embedded User Flash Memory	RD1126	3	3	3	3
Read and Write Usercode	RD1041	3	3	3	3

iCE40 Ultra Breakout Board

Featuring an ultra-small FGPA optimized for mobile applications. Typical mobile interfaces like RGB, IR and high current Torch LEDs are included, as well as access to every device I/O.



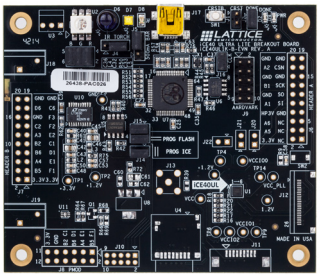
Features

- iCE5LP4K FPGA in 0.35 mm pitch, 36-ball WLCSP
- RGB LED
- High-brightness “torch” LED
- Infrared (IR) LED
- Status LEDs
- Access to all device I/Os
- On-board 32Mbit SPI Flash for reconfiguration
- Windows- & Mac-based GUI for interface to the RGB LED, includes FPGA source code
- USB Type-A to Type-B (mini) cable for FPGA power and programming via PC

Ordering Part Number
ICE5LP4K-B-EVN

iCE40 UltraLite Breakout Board

Featuring the world’s smallest FGPA optimized for mobile applications. Typical mobile interfaces like RGB, IR and high current Torch LEDs are included, as well as access to every device I/O.



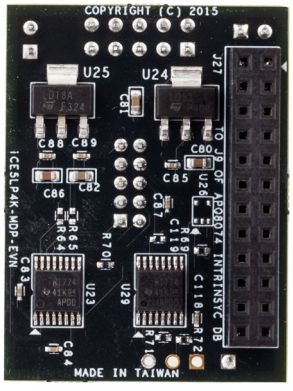
Features

- iCE40UL1K (iCE401K-CM36A) device in a 36-ball BGA package
- Layout example of a board using 0.40 mm pitch BGA package
- High current LED output
- Infrared transmit capability for remote control functions
- iCE40UL1K application-based current measurements
- Standard USB cable for device programming
- RoHS-compliant packaging and process
- Preloaded RGB LED Demo
- Software-run GUI
- USB connector cable

Ordering Part Number
iCE40UL1K-B-EVN

iCE40 Ultra Mobile Development Platform

iCE40 Ultra Mobile Development Platform enables rapid implementation and development of several always-on functions popular in mobile platforms.



Features

- iCE40 Ultra FPGA (iCE5LP4KSWG36)
- USB programming/interface
- High-current LED output
- Infrared transmit and receive
- RGB LED control
- Numerous Sensors
  - Two I2S MICs
  - Proximity sensor
  - Temperature Sensors
  - Barometric pressure sensor
  - Accelerometer
  - Gyroscope
  - Magnetometer
  - Humidity sensor
  - Hall sensor
  - Fingerprint sensor
- On-board oscillator

Ordering Part Number
iCE5LP4K-MDP-EVN

iCE40 Ultra Wearable Development Platform

Peripheral and sensor-rich development platform with iCE40 Ultra and MachXO2 in a wearable watch form factor.

Features

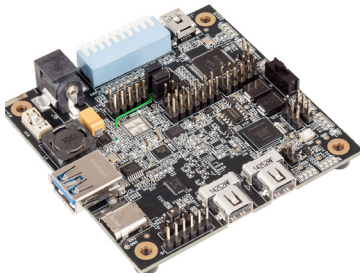
- Approximately (WxLxH) 1.50“x1.57“x0.87“ form factor with wrist strap
- iCE40 Ultra iCE5LP4K and MachXO2 LCMXO2-2000ZE
- LG 1.54” 240x240 single-lane MIPI DSI display
- Bluetooth low-energy module
- Sensors: Heart-rate/SpO2, skin temperature, pressure and accelerometer/ gyroscope
- 2 user LEDs, RGB LEDs, high-current white LED and high-current IR LED
- Stereo MEMs PDM microphones
- 32Mbit Quad SPI-flash
- 27MHz Oscillator
- Power via built-in 3.7V, 250mAh lithium-polymer battery or mini-USB cable
- FTDI 2232HQ USB device allows programming of FPGA and Flash
- Reference design available for download:
  - Parallel RGB to MIPI DIS bridging
  - Health monitoring*
  - Pedometer*
  - IR transmitter*
  - Flashlight*

* Reference Android APK available to interface with mobile phone over Bluetooth

Ordering Part Number
ICE5LP4K-WDEV-EVN

iCE40 USB Type-C Demo Kit

iCE40 USB Type-C Demo kit enables demonstration and development of Downstream Facing Ports(DFP), Upstream Facing Ports(UFP) and Dual Role Ports(DRP) capabilities.



Features

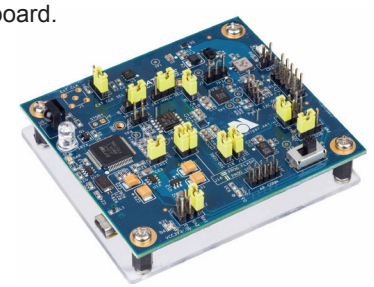
- Supports Cable Configuration
  - UFP/DFP/DRP modes supported
  - Dead battery mode supported
- Supports Power Delivery
  - Dual voltage output *
  - Power and data role swaps *
  - Display port alternate mode *
  - Vendor defined messages *
- UART Monitor of USB Type-C interface *
- Pre-configured bit streams allow rapid testing of common functions
- Source code licensed free of charge to qualified customers
- Note: Some demonstration modes for this product require an available Type-C port on external hardware (PC, tablet, etc.) not included in this kit. Consult the product documentation to make sure you have the required hardware.

* Requires iCE40LP8K-USBC-EVN

Ordering Part Number	
iCE40 Ultra USB Type-C Demo Kit V2	iCE5LP4K-USBC-EVN
iCE40LP8K USB Type-C Demo Kit V2	iCE40LP8K-USBC-EVN

iCE40LM4K Sensor Evaluation Kit

A rich assortment of sensors for FGPA development in mobile applications. Interfaces to Snapdragon development board.



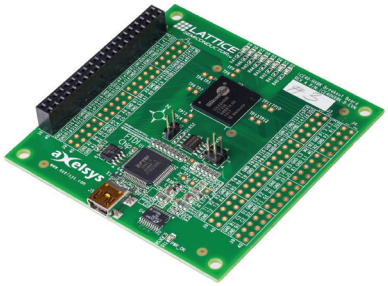
Features

- iCE40LM4K FPGA in 25-WLCSP (0.35 mm ball pitch)
- Infrared transmit and Receive
- Numerous Sensors
  - Proximity sensor
  - RGB Color, Infrared, and Temperature Sensors
  - Barometric pressure sensor
  - Accelerometer
  - Gyro Magnetometer/compass/ accelerometer
  - Humidity & Temp sensor
  - Hall Sensor
- High current LED output
- Barcode LED/emulation
- VLT Adapter board for connection to Snapdragon APQ8060A
- Configuration SPI Flash
- USB A to USB B (mini) Cable for Power and Programming via a PC

Ordering Part Number
ICE40LM4K-S-EVN

iCE40-HX8K Breakout Board

A simple, low-cost board with an iCE40-HX8K FPGA, and generous I/O access.



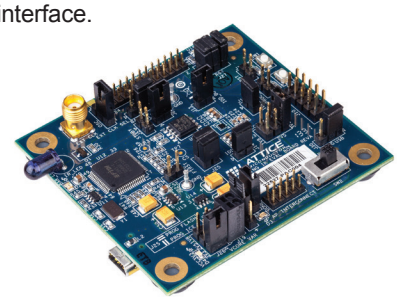
Features

- iCE40-HX8K CT256 device
- 8 user-accessible LEDs
- SPI Flash for programming configuration
- 40-pin 0.1” header for user connectivity
- 0.1” holes for user connectivity
- FTDI 2232H for USB interface
- 12MHz oscillator
- Jumpers to select programming of the SPI Flash or iCE40-HX8K
- USB Type-A to Type-B (mini) cable for FPGA programming via PC
- Demo designs available for download

Ordering Part Number
ICE40HX8K-B-EVN

iCE40LP1K Evaluation Kit

Featuring our ultra-small FPGA – 1K LUTs in a 16-ball WLCSP package (0.35 mm-ball pitch), only 1.4 mm x 1.48 mm, RGB LED control, GUI available for PC or Mac interface.



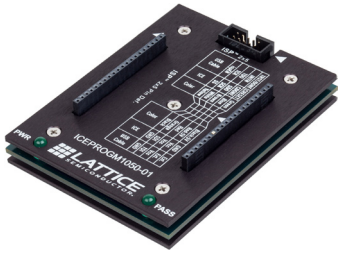
Features

- iCE40LP1K in 16-WLCSP package (0.35 mm-ball pitch)
- High current tri-color LED (RGB)
- Infrared transmit LED
- Barcode emulation LED
- 27MHz on-board oscillator
- SMA connector for external clock input
- SPI configuration Flash
- USB Type-A to Type-B (mini) cable for FPGA power and programming via PC

Ordering Part Number
ICE40LP1K-SWG16-EVN

iCEprog Desktop Programmer

The iCEprog Desktop Programmer supports programming of the OTP fuses of Lattice iCE products (NVCM programming). It can also be used for SPI programming of iCE devices.



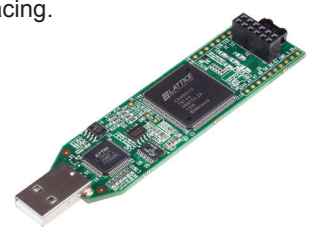
Features

- Support for all Lattice programmable products
  - 1.2V to 3.3V programming (HW-USBN-2B)
  - 1.2V to 5V programming (All other cables)
  - Ideal for design prototyping and debugging
- Connect to multiple PC interfaces
  - USB (v.1.0, v.2.0)
  - PC Parallel Port
- Easy-to-use programming connectors
  - Versatile flywire, 2 x 5 (.100”) or 1 x 8 (.100”) connectors
  - 6 feet (2 meters) or more of programming cable length (PC to DUT)
- Lead-free, RoHS-compliant construction

Ordering Part Number
ICEPROGM1050-01

iCEstick Evaluation Kit

Low-cost evaluation of the iCE40 FPGA, in a convenient USB drive form factor. Includes Pmod™ connector for versatile interfacing.



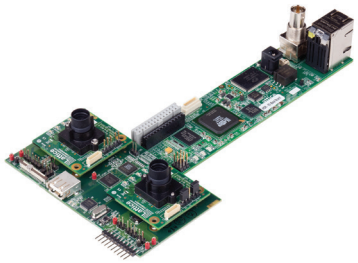
Features

- USB thumb drive form factor
- iCE40HX-1K on board
- 2x6 position Digilent Pmod™ connector for multiple peripheral connections
- Vishay TFDU4101 IrDA transceiver
- FTDI 2232H USB device allows iCE-device programming and UART interface to a PC
- Five user LEDs
- Discera 12MHz MEMS oscillator
- Micron 32Mbit N25Q32 SPI Flash
- USB connector provides the power supply
- 16 LVCMOS/LVTTL (3.3V) digital I/O connections on 0.1” through-hole connections
- IrDA & Tx/Rx reference designs available for download

Ordering Part Number
ICE40HX1K-STICK-EVN

HDR-60 Video Camera System

This is a family of inter-connectable boards that showcase the video processing capabilities of the LatticeECP3 FPGA in a compact standard format.



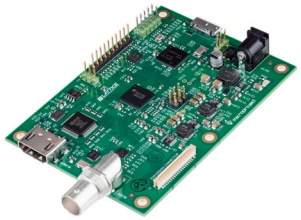
Features

- LatticeECP3-70 in 484 fpBGA package
- Production-ready HDR camera design
- 1080p60 frames per second (fps)
- Extremely low-latency
- Autoexposure
- Supports dual-sensors simultaneously
- Direct HDMI/DVI output from FPGA
- On-board Ethernet PHY
- HDR image processing reference design
- > 120dB HDR Performance
- Additional image processing IP library
- Image shows HDR-60, plus Dual-Sensor interface and two NanoVesta sensor boards

Ordering Part Number	
HDR-60 with MT9M024 NanoVesta	LFE3-70EA-HDR60-DKN
HDR-60 without NanoVesta	LFE3-70EA-HDR60-EVN
Dual Sensor Interface	LCMXO2-4000HE-DSIB-EVN
CSI2-to-Parallel Bridge	LF-C2P-EVN
MT9M024 Sensor NanoVesta	LF-9MT024NV-EVN
MN34041 Sensor NanoVesta	LF-PNV-EVN

Lattice USB3 Video Bridge Development Kit

This is a production-ready, high-definition video capture and conversion system, based on the LatticeECP3™ FPGA family.



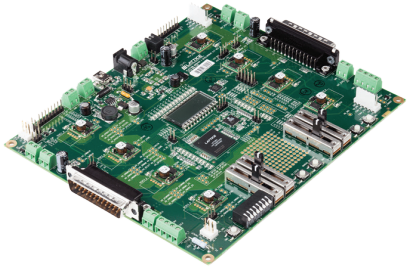
Features

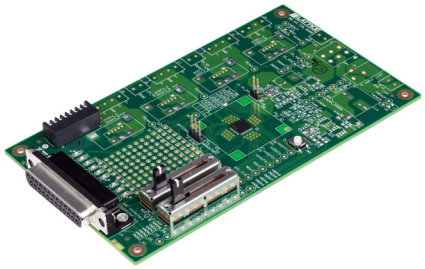
- Production-ready USB3 audio/video bridging reference design
- 1080p video streaming over USB 3.0 at 60fps
- HDMI 1.4a audio and video capture
- SD-, HD-, 3G-SDI audio and video capture
- Supports video capture from external MIPI CSI-2 , SubLVDS or Parallel sensors
- Reference design provides fast USB 3.0 UVC and UAC class data packing
- Plug and play operations as a video capture device on multiple standard platforms (Windows, MacOS, Linux)
- Complete reference design schematics and documentation available

Ordering Part Number
LFE3-17EA-USB3-EVN

Platform Manager 2 Development Kit

The Platform Manager 2 Development Kit is a versatile, ready-to-use hardware platform for evaluating and designing with Platform Manager 2 and L-ASC10 devices. This kit includes a board, programming cable, and assorted example designs and documentation available for download. You can implement and debug your hardware management functions (power, thermal and control plane management) and test them out with this kit.





Features

- LPTM21 (Platform Manager 2 device) & L-ASC10 (Hardware Management expander)
- Temperature monitoring/measurement, with temperature control using fan (included)
- Fault logging under various types of hardware management faults
- 4 potentiometers & 2 POLs for sequencing, VID/Voltage scaling, margining, fault creation
- Background programming support with Dual boot from golden image stored on the SPI Flash
- Hardware management expansion through external L-ASC10 boards
- 3-digit LCD for additional code debug support

L-ASC10 Breakout Board

The L-ASC10 (ASC) Breakout Board is a versatile hardware platform for evaluation and desig with L-ASC10 devices. The board is designed to work alongside the Platform Manager 2 Development Kit.

Features

- L-ASC10 (Hardware Management Expander)
- 2 potentiometers for sequencing & fault creation
- 9 LEDs for sequencing
- Temperature monitor & measurement with 2 on-board temperature sensors
- Connector for use with Platform Manager 2 Development Kit

Ordering Part Number	
Platform Manager 2 Development Kit	LPTM-BPM-EVN
L-ASC10 Breakout Board	LPTM-ASC-B-EVN

Power Manager II Hercules Development Kit

The Hercules Development Kit is an easy-to-use platform for evaluating and designing with the Power Manager II ispPAC®-POWR1220AT8 and MachXO™2280.

Features

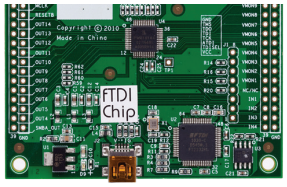
The Hercules Evaluation Board with the following circuits:

- ispPAC-POWR1220AT8 Power Manager II device
- MachXO 2280 programmable logic device
- ispMACH® 4000 programmable logic device
- USB interface for JTAG, I2C, and SPI
- Main and external 12V supply connections
- 12V Hot Swap for Hot Swap demo
- 12V OR'ing for redundant power puppply demo
- 1.2V DC-DC supply for margin, trim, and VID Demos
- SPI memory for fault logging demo
- 3-digit LCD display
- Various LEDs and switches for status and control

Ordering Part Number
PAC-POWR1220AT8-HS-EVN (Standard)

POWR1014 Breakout Board

The POWR1014A Breakout Board is a simple, low-cost board that provides convenient access to densely-spaced I/Os. Each I/O on the device is connected to 100-mil header holes.



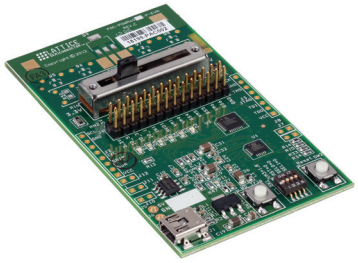
Features

- Power Manager II - POWR1014A-02TN48I device/package
- Pre-programmed hardware test program (Source is downloadable)
- LEDs expansion header landings prototyping area
- USB Type-B (mini) connector for programming and power
- JTAG header landing

Ordering Part Number
Ordering Part Number: POWR1014A-B-EVN

POWR607/6AT6 Evaluation Board

The POWR607/6AT6 Evaluation Board is an easy-to-use platform for evaluating and designing with the Lattice Power Manager II devices, POWR607 and POWR6AT6.



Features

- Power Manager II ispPAC® -POWR607
- Power Manager II ispPAC®-POWR6AT6
- LEDs for general purpose I/O, power indicators, and watchdog timer interrupt indication
- Slide potentiometer
- USB Type-B(mini) connector for power and programming
- 2x14 expansion header for general I/O, voltage monitor inputs, and power supply trim outputs
- Thru-hole and surface mount prototyping area for custom design verification
- Push buttons for reset and watchdog timer trigger
- 4-bit DIP switch for watchdog timer period programming and reset pulse stretch enable
- JTAG and I²C header landings for JTAG cable programming and I²C interface (cables not included).

Ordering Part Number
Ordering Part number: PACPOWR607-P-EVN

ProcessorPM Development Kit

This kit is a versatile, ready-to-use hardware platform for evaluating and designing with POWR605 (ProcessorPM) power management devices.

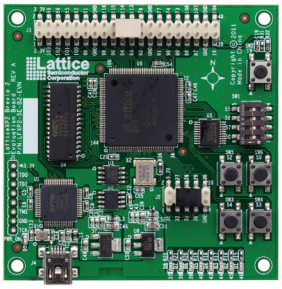
Features

- Power Manager II ProcessorPM-POWR605
- Power Manager II ispPAC®-POWR6AT6
- LEDs for general purpose I/O, power indicators, and watchdog timer interrupt indication
- Slide potentiometer
- USB Type-B(mini) connector for power and programming
- 2x14 expansion header for general I/O, voltage monitor inputs, and power supply trim outputs
- Thru-hole and surface mount prototyping area for custom design verification
- Push buttons for reset and watchdog timer trigger
- 4-bit DIP switch for watchdog timer period programming and reset pulse stretch enable
- JTAG and I^2C header landings for JTAG cable programming and I^2C interface (cables not included)

Ordering Part Number
PACPOWR605-P-EVN

LatticeXP2 Brevia2 Development Kit

Easy-to-use, low-cost platform for evaluating and designing with LatticeXP2 FPGAs.



Features

- LatticeXP2 FPGA: LFXP2-5E-6TN144C
- 2Mbit SPI Flash memory
- 1Mbit SRAM
- Programmed via included mini-USB Cable
- 2x20 and 2x5 expansion headers
- Push buttons for general purpose I/O and reset
- 4-bit DIP Switch for user-defined inputs
- 8 Status LEDs for user-defined outputs

Ordering Part Number
LFXP2-5E-B2-EVN

HMI Development Kit

An FPGA-based Human Machine Interface kit with touchscreen. Scalable firmware and software makes adapting to your target system easy.

Features

- Includes LatticeECP3 Versa Board
- 480 x 272 touchscreen included
- SD card for loading of new projects
- Licensable HMI-on-chip (HoC) solution features
  - Scalable IP for high-end graphics
  - Fast response times
  - Easy design/re-configuration via GUI
  - No O/S or custom coding – all GUI
  - Implement on ECP3 or MachXO2/3L
  - Only 8K LUTs of FPGA required
  - Eval version included with the board
- USB Type-A to Type-B (mini) cable for FPGA programming via PC
- 12V AC power adapter with international plugs

Ordering Part Number
LFE3-35EA-HMI-DKN

Port Processors	Sil9777	Sil9575	Sil9573	Sil9535	Sil9533
HDMI® Input	4	6	6	4	3
MHL® Input	2	2	2	2	2
HDMI Output	3	2	2	1	1
InstaPort™ S		3	3	3	3
InstaPrevue™		3	3	3	3
Hardware HDCP Repeater	3	3	3	3	3
HDCP Upstream Authentication Support	3	3	3	3	3
HDMI Bandwidth	18 Gbps	9 Gbps	9 Gbps	9 Gbps	9 Gbps
Audio Return Channel	3	3	3	3	3
Maximum HDMI Resolution	4K60 4:4:4	4K60 4:2:0	4K60 4:2:0	4K60 4:2:0	4K60 4:2:0
Maximum MHL Resolution	4K30	1080p30	1080p30	1080p60	1080p60
HDCP 1.4 support	3	3	3	3	3
HDCP 2.2 support	3				
Audio Extraction (I2S x 4)	3	3	3	3	3
Pre-programmed HDCP keys	3	3	3	3	3
CEC Processor		3	3		3
OSD controller		3	3	3	
Integrated NVRAM EDID		3	3	3	3
Package	208-pin LQFP	176-pin TQFP	176-pin TQFP	100-pin TQFP	88-pin QFN
Package Size	28 x 28 mm	20 x 20 mm	20 x 20 mm	14 x 14 mm	10 x 10 mm
Starter Kit	CP9777	CP9575HDMI	CP9575HDMI	CP9535	CP9533

Video Processors	Sil9612	Sil9616
HDMI® Input	1	1
MHL® Input	1	1
HDMI Output	1	1
Parallel Video Input		3
Parallel Video Output		3
OSD controller	3	3
Hardware HDCP Repeater	3	3
HDCP Upstream Authentication Support	3	3
HDMI Bandwidth	9 Gbps	9 Gbps
Audio Return Channel	3	3
Maximum HDMI Resolution	4K60 4:2:0	4K60 4:2:0
Maximum MHL Resolution	1080p60	1080p60
HDCP 1.4 support	3	3
Audio Extraction (I2S x 4)	3	3
Pre-programmed HDCP keys	3	3
CEC Processor	3	3
Package	76-pin QFN	176-pin TQFP
Package Size	9 x 9 mm	20 x 20 mm
Starter Kit	CP9612	CP9616

Analog Front End	Sil8784	Sil8788
Component Video Input	3	3
Composite Video Input	3	3
D-Connector Support	3	
VGA Support	3	
SCART Suppport	3	
Parallel Video Output		3
HDMI Output	3	
MHL Output	3	
SPDIF Audio Input	3	
I2S Audio Input	3	
Package	88-pin QFN	88-pin QFN
Package Size	10 x 10 mm	10 x 10 mm
Starter Kit	CP8784MHL/ CP8784HDMI	CP8788

HDMI Transmitter	Sil9022A	Sil9024A	Sil1136	Sil9136-3	Sil9334	Sil9678	Sil7172	Sil164
HDMI® Output Type	HDMI1.3	HDMI1.3	HDMI1.4	HDMI1.4	HDMI1.4	HDMI2.0	iTMDS	DVI
Number of HDMI Outputs	1	1	1	1	1	1		
RGB/YCbCr Input	24-bit / 16-bit	24-bit / 16-bit	Up to 48-bit	Up to 48-bit	Up to 36-bit		Dual 36-bit	Up to 24-bit
HDMI Input						HDMI2.0		
Max Video Resolution	1080p60 4:4:4	1080p60 4:4:4	4K30 4:4:4	4K30 4:4:4	1080p60 (225MHz)	4K60 4:2:0	1080p60	1080p60
HDMI Bandwidth	4.9 Gbps	4.9 Gbps	9 Gbps	9 Gbps	6.75 Gbps	9 Gbps	6.75 Gbps	4.95 Gbps
HDCP support		HDCP 1.3		HDCP 1.2	HDCP 1.4	HDCP 1.4/ HDCP 2.2	HDCP 1.1	
Pre-programmed HDCP keys		3		3	3	3	3	3
Audio Insertion (I2S x 4) 192kHz	3	3	3	3	3			
S/PDIF	3	3	3	3	3	3		
High Bit Rate Audio (Dolby TrueHD, DTS-HD)			3	3	3	3		
I²C Interface	3	3	3	3	3	3	3	3
Package	81-ball VFBGA 72-pin QFN 49-ball VFBGA	81-ball VFBGA 72-pin QFN 49-ball VFBGA	100-pin TQFP	100-pin TQFP	100-pin TQFP	76-pin QFN	129-Pin LQFP	64-Pin TQFP
Package Size	4 x 4 mm (VFBGA) 10 x 10 mm (QFN)	4 x 4 mm (VFBGA) 10 x 10 mm (QFN)	14 x 14 mm	14 x 14 mm	14 x 14 mm	9 x 9 mm	14 x 20 mm	12 x 12 mm
Starter Kit			CP1136HDMI	CP9136HDMI-3	CP9334	CP9678		

MHL Transmitters	Sil8334	Sil8620	Sil8240	Sil8346	Sil8348	Sil8630	Sil9630	Sil8558
HDMI input		3				3	3	3
eTMDS input	3	3	3			3	3	3
MIPI DSI input								
Parallel Digital Video Input				3	3			
MHL output	MHL1	MHL3	MHL2	MHL2	MHL2	superMHL	superMHL	MHL2
Integrated Analog Switch	USB ID & Data		USB ID			MHL Demux for Type-C	MHL Demux for Type-C	USB, UART, audio
MAX video resolution	1080p30	4K30	1080p60	1080p60	1080p60	4K60	4K60	1080p60
720p adaptive Scaler								
HDCP decryption on input	Pass through	HDCP1.4				HDCP1.4	HDCP1.4	HDCP1.4
HDCP encryption on output	Pass through	HDCP1.4/ HDCP2.2	HDCP1.4	HDCP1.4		HDCP1.4/ HDCP2.2	HDCP1.4/ HDCP2.2	HDCP1.4
Dolby Digital	3	3	3	3	3	3	3	
DTS digital Audio	3	3	3	3	3	3	3	
Object Audio - Dolby Atmos, DTS:X						3	3	
8-ch I2S interface @ 192KHz								
Package	49ball VFBGA	64ball VFBGA	49ball VFBGA	64ball VFBGA	64ball VFBGA	64ball VFBGA	64ball BGA	64ball VFBGA
Package size	4 x 4 mm	4 x 4 mm	3.5 x 3.5 mm	4.5 x 4.5 mm	4.5 x 4.5 mm	4 x 4 mm	6.5 x 6.5 mm	4 x 4 mm
Starter Kit	CP8334	CP8620	CP8240	CP8346	CP8348	CP8630	CP9630	CP8558

MHL Bridges	Sil9292	Sil9293A	Sil9296	Sil9394	Sil9396	Sil1296	Sil1292A	Sil9617
MHL input	MHL1	MHL2	MHL2	MHL3	superMHL	MHL2.0	MHL1	MHL2
HDMI input		HDMI1.4			HDMI2.0	HDMI1.4	HDMI1.4	2x HDMI1.4
eTMDS input					3			
HDMI output	HDMI1.4		HDMI1.4	HDMI1.4	HDMI2.0		HDMI1.4	HDMI1.4
Other Video Output		Parallel 24-bit			superMHL	VGA		
MAX video resolution	1080p30	1080p60	1080p60	4K30	4K60	1080p60	1080p30 MHL 1080p60 HDMI 12-bit DC	1080p60 MHL 4K30 HDMI
HDCP decryption on input	Pass through	HDCP 1.4	HDCP 1.4	HDCP 1.4/ HDCP 2.2	HDCP 1.4/ HDCP 2.2		Pass through	HDCP 1.3
HDCP encryption on output	Pass through		HDCP 1.4	HDCP 1.4/ HDCP 2.2	HDCP 1.4/ HDCP 2.2		Pass through	HDCP 1.3
Dolby Digital		3		3	3	3		
DTS digital Audio		3		3	3	3		
Object Audio - Dolby Atmos, DTS:X		3			3			
8-ch I2S interface @ 192KHz		3		3	3			
8ch TDM		3				3		
Package	40-pin QFN	72-pin QFN	49-pin QFN	76-pin QFN	76-pin QFN	72-pin QFN	40-pin QFN	76-pin MQFN
Package size	6 x 6 mm	10 x 10 mm	7 x 7 mm	9 x 9 mm	9 x 9 mm	10 x 10 mm	6 x 6 mm	9 x 9 mm
Starter Kit	CP9292	CP9293	CP9296	CP9394	CP9396	CP1296	CP1292	CP9617

USB Switches/ Type-C Port Controllers	Sil6031	Sil7024	Sil7033	Sil7014	LIF-UC110	LIF-UC140
Type-C		3	3	3	3	3
Main function	USB2.0/MHL/ UART switch	CC/PD PHY + MHL/debug	CC/PD PHY + MHL/debug/ USB3.1 switch	CC/PD PHY + HPD generator + AUX switch	CC/PD port controller for charger	Full CC/PD port controller
SuperSpeed switch		Gen 1	Gen 1			
HPD generator			3	3	3	3
High speed video switch	MHL1/2/3/ superMHL	MHL1/2/3/ superMHL/ x 2DP	MHL1/2/3/ superMHL x 2DP	DP AUX		
Billboard support		3	3	3		3
BMC		3	3	3	3	3
VDM		3	3	3	3	3
Package	24 -pin QFN	32 -pin QFN	36ball BGA	24 -pin QFN	48 -pin QFN	81ball BGA
Package size	3 x 3 mm	4 x 4 mm	3 x 3 mm	3 x 3 mm	7 x 7 mm	4 x 4 mm
Starter kit	CP7033	CP7033	CP7033	CP7033	iCE5LP4K-USBC-EVN	iCE40LP8K-USBC-EVN

SiBEAM WirelessHD® Modules

WirelessHD transmitter and receiver modules are completely self-contained, autonomous WirelessHD subsystems that connect to a host board and provide wireless video connectivity between an HDMI® source and a display. The modules eliminate the complexity associated with radio performance, regulatory requirements, and compliance to standards in wireless system design. The module-to-system interface carries video, audio, power, and control signals.
SiBEAM offers three programming cables to suit your needs.

Features

- WirelessHD V 1.1 compliant device
- 60 GHz interference free link for up to 4 Gbps video data rate
- Small form factor module
- Wide support for video resolutions
  - VGA through SXGA+
  - 480i/576i to 1080p/60 Hz
  - 3D video support 720p/1080p
- Subframe latency video for real time control of interactive content, such as video games
- Support for surround sound audio
- Support for CEC or AVC commands
- HDCP content protection
- Automated advanced power control, for energy saving operation

Ordering Part Number	
Wireless Transmitter	MOD6320-T
Wireless Transmitter with Cable	MOD6320-T-C
Wireless Receiver	MOD6321-R
Wireless Receiver with Cable	MOD6321-R-C
Wireless Receiver (Dual Polarization Antenna)	MOD6321-R-12
Wireless Receiver (Dual Polarization Antenna) with Cable	MOD6321-R-12-C

Software Licensing
Email: lic_admn@latticesemi.com
Web: latticesemi.com/licensing

Technical Support
latticesemi.com/support

Copyright © 2017 Lattice Semiconductor Corporation. All brand names and product names are trademarks or registered trademarks of their respective holders. Lattice Semiconductor (logo), L Lattice Semiconductor Corporation (logo), Lattice Semiconductor Corporation (and logo), CrossLink, pASSP, HDMI, HDMI High-Definition Multimedia Interface, HDMI Standard, MHL (and design) superMHL (and design), SiBEAM (and design), WirelessHD (and design), WiHD (and design), UltraGig, TMDS, Lattice (design), Lattice Diamond, iCE40 Ultra, iCE40, iCEcube2, ISP, ispDOWNLOAD, ispMACH, ispPAC, ispXPGA, ECP5, LatticeECP3, LatticeECP2, LatticeECP2M, LatticeECP, LatticeECP-DSP, LatticeMico, LatticeMico8, LatticeMico32, LatticeXP, LatticeXP2, MACH, MachXO, MachXO2, MachXO3, MACO, ORCA, PAC, Reveal, sysDSP, and specific product designations are either registered trademarks or trademarks of Lattice Semiconductor Corporation or its subsidiaries in the United States and/or other countries. ISP is a service mark of Lattice Semiconductor Corporation.

March 2017 • Order #: I0211 Rev. 8