



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



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PRODUCT SELECTOR GUIDE

MARCH 2017

FPGAs • ASSPs • pASSPs • CPLDs • REFERENCE DESIGNS • IP • DEVELOPMENT KITS • DESIGN TOOLS

Customizable Solutions

Lattice Semiconductor leads the industry in ultra-low power, small form factor, customizable solutions for today's quickly changing connected world. From heterogeneous networks and micro servers, to smartphones, tablets and wearables, Lattice FPGAs and CPLDs are at the heart of solutions that give designers the ability to quickly innovate, or build and add features to their systems that uniquely differentiate their products.

iCE40 Portfolio: World's Smallest FPGAs – Lattice's iCE40 family offers the world's smallest FPGAs at very low power enabling flexible and fast customization on standard platforms – perfect for implementing killer features on smartphones, tablets, wearables, IoT edge, and other mobile devices.

MachXO Portfolio: Control PLD and Bridging – The award-winning MachXO2 FPGA family and new MachXO3 family – the world's smallest, lowest-cost-per I/O, instant-on programmable platform – can be used to quickly implement system control functions, I/O expansion and bridging in applications such as routers, base stations, servers, storage, industrial, medical and consumer.

ECP Portfolio: Connectivity and Acceleration FPGAs – The LatticeECP3, ECP5 and ECP5-5G families are optimized for data and control path bridge and interfacing, architected with high-performance SERDES, full-featured DSP blocks, and for state-of-the-art memory interfaces for supporting a wide range of applications including wireless and wireline communication, video processing, security and surveillance, industrial automation, and automotive.

Power and Thermal Management Products

Lattice's Platform Manager 2 devices implement circuit board hardware management functions (Power Management, Control Plane Functions and Thermal Management). The Platform Manager 2 device family is comprised of a Platform Manager 2 device (Programmable Analog + FPGA) and a Programmable Analog Sense and Control device (L-ASC10).

In simpler boards, the Power Management functions can be integrated into Lattice Power Manager II products.

Standards-Based Products

Lattice enables high-performance digital connectivity for some of the world's biggest brands in mobile, consumer electronic (CE), and PC markets. As the driving force behind global standards including HDMI®, DVI®, MHL®, and WirelessHD®, Lattice's understanding of these technologies is second to none.

As a Founder of both the HDMI® and MHL® Specifications, and through extensive experience with compliance and interoperability testing, Lattice is in a unique position to offer tested, field-proven solutions that can be rapidly and reliably integrated into TVs, projectors, A/V receivers, Blu-ray players, set-top boxes, and other digital display and home theater products.

Lattice's mobile semiconductor products are designed for smartphones, tablets, digital cameras, streaming sticks, mobile docks, and other devices where a small form factor and lower power consumption are essential. Lattice offers support for proprietary connectors along with standard micro-USB, USB Type-C, superMHL™, and HDMI connectors.

pASSP™ Solutions

Lattice has combined the flexibility and fast time to market advantage of an FPGA with the power and efficiency of an ASSP to create a new product class called programmable ASSP (pASSP). This gives designers the best of both worlds by delivering the most flexible, highest bandwidth, lowest power and smallest footprint solutions for several high-growth market segments.

CrossLink Portfolio: pASSP Video Interface Bridges – CrossLink is the industry's first programmable bridging device that resolves interface mismatches between application processors, image sensors, and displays. This makes it the optimal solution for VR headsets, drones, smartphones, tablets, cameras, wearables, human machine interfaces (HMIs), and automotive.

SiBEAM

SiBEAM, a Lattice Semiconductor Company, is a pioneer in developing intelligent millimeter-wave technologies for wireless communications. The company was the first to build 60GHz chipsets using standard CMOS technology. SiBEAM is a global leader in driving next-generation architecture and semiconductor implementation of wireless connectivity solutions in the consumer electronics, mobile, enterprise and infrastructure markets.

SiBEAM's WirelessHD transmitter and receiver modules are completely self-contained, autonomous WirelessHD subsystems that connect to a host board and enables. These WirelessHD modules enable a robust high-definition wireless video connectivity between an HDMI® source and a display, delivering a cable-quality connection without wires.

For more information go to LATTICESEMI.COM

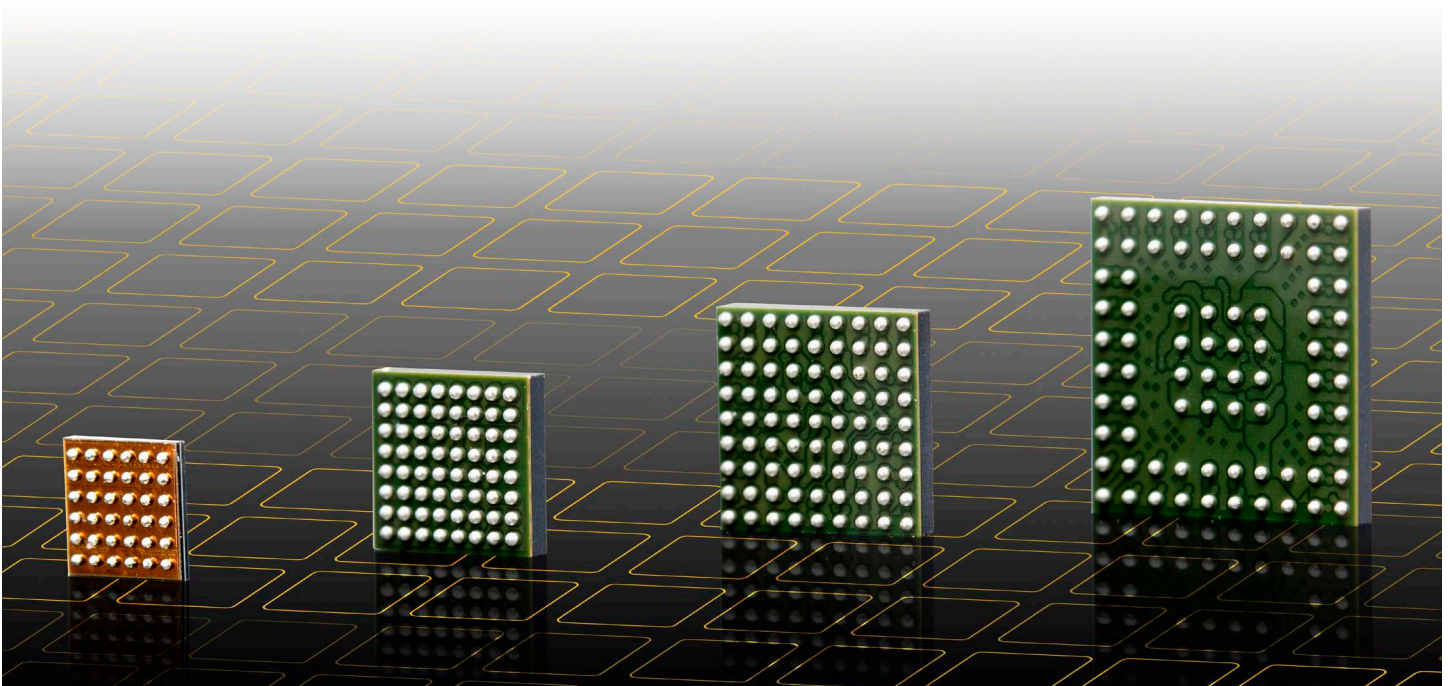
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FPGA Products

ECP Series - Connectivity and Acceleration FPGAs

Features			ECP5™-5G			ECP5 Automotive			ECP5™						LatticeECP3™					
Device			LFE5UM5G-25	LFE5UM5G-45	LFE5UM5G-85	LAE5UM-25	LAE5UM-45	LAE5UM-12	LFE5UM-25	LFE5UM-45	LFE5UM-85	LFE5U-12	LFE5U-25	LFE5U-45	LFE5U-85	LFE3-17EA	LFE3-35EA	LFE3-70EA	LFE3-95EA	LFE3-150EA
LUTs			24 k	44 k	84 k	24 k	44 k	12 k	24 k	44 k	84 k	12 k	24 k	44 k	84 k	17 k	33 k	67 k	92 k	149 k
EBR SRAM	# of Blocks		56	108	208	56	108	32	56	108	208	32	56	108	208	38	72	240	240	372
	kbits		1008	1944	3744	1008	1944	576	1008	1944	3744	576	1008	1944	3744	700	1,327	4,420	4,420	6,850
Distrib RAM	kbits		194	351	669	194	351	97	194	351	669	97	194	351	669	36	68	145	188	303
sysDSP™ Blocks	Multipliers		28	72	156	28	72	28	28	72	156	28	28	72	156	24	64	128	128	320
SERDES	Max. Chan.		1/2	2/4		1/2	2/4	0	1/2	2/4	0	0	0	0	4	12	16			
	Max. Rate		5 Gbps			3.2 Gbps			3.2 Gbps						3.2 Gbps					
PLL + DLL			2+2	4+4		2+2	4+4	2+2	2+2	4+4	2+2	2+2	4+4		2+2	4+2	10+2			
DDR Support			DDR2 800, DDR3 800, LPDDR2 800, LPDDR3 800			DDR2 800, DDR3 800, LPDDR2 800, LPDDR3 800			DDR2 800, DDR3 800, LPDDR2 800, LPDDR3 800						DDR3 800, DDR2 533, DDR 400					
Boot Flash			External			External			External						External					
Dual Boot			✓			✓			✓						✓					
Multiple Boot			✓			✓			✓											
Bit-stream Encryption			✓			✓			✓						✓					
Core Vcc			1.1 V			1.1 V			1.1 V						1.2 V					
Temp.	C		✓			✓			✓						✓					
	I		✓			✓			✓						✓					
	AEC-Q100		✓						✓						✓					
0.5 mm Spacing			I/O Count / SERDES			I/O Count / SERDES			I/O Count / SERDES											
csfBGA	285	10 x 10 mm	118/2	118/2	118/2				118/2	118/2	118/2	118/0	118/0	118/0	118/0					
csBGA	328	10 x 10 mm													116/2					
TQFP	144	20 x 20 mm																		
PQFP	208	28 x 28 mm																		
0.8 mm Spacing			I/O Count / SERDES			I/O Count / SERDES			I/O Count / SERDES											
caBGA	381	17 x 17 mm	197/2	203/4	205/4	197/2	203/4	197/0	197/2	203/4	205/4	197/0	197/0	203/0	205/0					
	554	23 x 23 mm		245/4	259/4					245/4	259/4			245/0	259/0					
	756	27 x 27 mm			365/4						365/4			365/0						
1.0 mm Spacing			I/O Count / SERDES			I/O Count / SERDES			I/O Count / SERDES											
ftBGA	256	17 x 17 mm													133/4	133/4				
fpBGA	256	17 x 17 mm																		
	484	23 x 23 mm													222/4	295/4	295/4	295/4		
	672	27 x 27 mm													310/4	380/8	380/8	380/8		
	900	31 x 31 mm																		
	1152	35 x 35 mm																		
1156	35 x 35 mm																490/12	490/12	586/16	

1) No PLL available

iCE40 Series - World's Smallest FPGAs

Features		iCE40 UltraPlus		iCE40 UltraLite		iCE40 Ultra			iCE40 LM			iCE40 LP					iCE40 HX		
Device		UP3K	UP5K	UL640	UL1K	LP1K	LP2K	LP4K	LM1K	LM2K	LM4K	LP384	LP640	LP1K	LP4K	LP8K	HX1K	HX4K	HX8K
Logic		2800	5280	640	1248	1100	2048	3520	1100	2048	3520	384	640	1280	3520	8680	1280	3520	7680
NVCM		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Static Power (µA)		75	75	35	35	71	71	71	100	100	100	21	100	100	250	250	296	1140	1140
EBR		80 kb	120 kb	56 kb	56 kb	64 kb	80 kb	80 kb	64 kb	80 kb	80 kb	0	64 kb	64 kb	80 kb	128 kb	64 k	80 k	128 k
PLL		1	1	1	1	1	1	1	1	1	1			1	2	2	1	2	2
ƆC core		2	2	2	2	2	2	2	1	2	2								
SPI Core		2	2			2	2	2	1	2	2								
Strobe (low)									1	1	1								
Strobe (high)									1	1	1								
Low Power Oscillator		1	1	1	1	1	1	1											
High Frequency Oscillator		1	1	1	1	1	1	1											
24 mA Drive		3	3	3	3	3	3	3	3	3	3		3	3 ³					
100 mA + 400 mA Drive				1	1														
500 mA Drive						1	1	1											
Mult 16 x 16, Accum 32 bit		4	8			2	4	4											
PWM Generator		Yes	Yes	Yes	Yes	Yes	Yes	No											
0.35 mm Spacing		Total I/Os (Dedicated I/Os)^{4,5}																	
WLCSP	16 1.40 x 1.40 mm													11(1) ¹	11(1) ¹				
	16 1.40 x 1.48 mm			10	10														
	25 1.71 x 1.71 mm								20(2)	20(2)	20(2)								
	36 2.08 x 2.08 mm					27(1)	27(1)	27(1)											
0.4 mm Spacing		Total I/Os (Dedicated I/Os)^{4,5}																	
WLCSP	30 2.15 x 2.55 mm	21	21																
	36 2.5 x 2.5 mm			26	26				30(2)	30(2)	30(2)	27(2)		27(2) ¹					
ucBGA	49 3 x 3 mm								39(2)	39(2)	39(2)	39(2)		37(2) ¹					
	81 4 x 4 mm													65(2)	65(2) ²	65(2) ²			
	121 5 x 5 mm													97(2)	95(2)	95(2)			
	225 7 x 7 mm														180(2)	180(2)			180(2)
0.5 mm Spacing		Total I/Os (Dedicated I/Os)^{4,5}																	
QFN	32 5 x 5 mm											23(2)							
	48 7 x 7 mm		39																
	84 7 x 7 mm													69(2) ¹					
csBGA	81 5 x 5 mm													64(2) ¹					
	121 6 x 6 mm													94(2)					
	132 8 x 8 mm																97(2)	97(2)	97(2)
VQFP	100 14 x 14 mm																74(2) ¹		
TQFP	144 20 x 20 mm																98(2)	109(2)	
0.8 mm Spacing		Total I/Os (Dedicated I/Os)^{4,5}																	
caBGA	256 14 x 14 mm																		208(2)

1) No PLL available on the 16 WLCSP, 36 ucBGA, 81 csBGA, 84 QFN and 100 VQFP packages.

2) Only one PLL available on the 81 ucBGA package.

3) 24 mA constant current sink available on the 16 WLCSP package only.

4) Total I/Os include dedicated I/Os.

5) Dedicated I/Os are defined to be pins that are dedicated and cannot be used by user logic after configuration.

FPGA Products

MachXO3 Series - Bridging and I/O Expansion FPGAs

Features		MachXO3LF™						MachXO3L™					
Device		LCMXO3LF-640	LCMXO3LF-1300	LCMXO3LF-2100	LCMXO3LF-4300	LCMXO3LF-6900	LCMXO3LF-9400	LCMXO3L-640	LCMXO3L-1300	LCMXO3L-2100	LCMXO3L-4300	LCMXO3L-6900	LCMXO3L-9400
LUTs		640	1300	2100	4300	6900	9400	640	1300	2100	4300	6900	9400
EBR SRAM	# of Blocks	2	7	8	10	26	48	2	7	8	10	26	48
kbits		18	64	74	92	240	432	18	64	74	92	240	432
Distrib. RAM	kbits	5	10	16	34	54	75	5	10	16	34	54	75
UFM	kbits	24	64	80	96	256	456						
Configuration Memory		Flash						Internal NVM					
Dual Boot⁴								✓					
Embedded Function Blocks		I ² C (2), SPI (1), Timer (1)						I ² C (2), SPI (1), Timer (1)					
Core Vcc	1.2 V	E						E					
	2.5 - 3.3 V	C						C					
Temp.	C	✓						✓					
	I	✓						✓					
0.4 mm Spacing		I/O Count											
WLCSP	36 ²	2.5 x 2.5 mm		28						28			
	49 ²	3.2 x 3.2 mm			38					38			
	81 ²	3.8 x 3.8 mm				63					63		
0.5 mm Spacing		I/O Count											
csfBGA	121 ²	6 x 6 mm		100					100				
	256 ²	9 x 9 mm			206					206			
	324 ²	10 x 10 mm				281					281		
0.8 mm Spacing		I/O Count											
caBGA	256	14 x 14 mm			206 ³					206 ³			
	324	15 x 15 mm				279 ³					279 ³		
	400	17 x 17 mm					335 ³					335 ³	
	484	19 x 19 mm						384					384

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.

FPGA Products

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

Features			MachXO2™							MachXO™						LatticeXP2™										
Device			LCMXO2-256	LCMXO2-640	LCMXO2-640U	LCMXO2-1200	LCMXO2-1200U	LCMXO2-2000	LCMXO2-2000U	LCMXO2-4000	LCMXO2-7000	LCMXO256E	LCMXO256C	LCMXO640E	LCMXO640C	LCMXO1200E	LCMXO1200C	LCMXO2280E	LCMXO2280C	LFXP2-5E	LFXP2-8E	LFXP2-17E	LFXP2-30E	LFXP2-40E		
LUTs			256	640	640	1280	1280	2112	2112	4320	6864	256		640		1200		2280		5 k	8 k	17 k	29 k	40 k		
EBR SRAM # of Blocks			0	2	7	7	8	8	10	10	26					1		3		9	12	15	21	48		
kbits			0	18	64	64	74	74	92	92	240					9.2		27.6		166	221	276	387	885		
Distrib. RAM kbits			2	5	5	10	10	16	16	34	54	2		6.1		6.4		7.7		10	18	35	56	83		
UFM kbits			0	24	64	64	80	80	96	96	256															
sysDSP™ Blocks																				3	4	5	7	8		
18x18 Blocks																										
Multipliers																				12	16	20	28	32		
PLL + DLL						1+2			2+2						1+0		2+0			2+0			4+0			
DDR Support						DDR 266, DDR2 266, LPDDR266														DDR/2 400						
Configuration Memory			Internal Flash							Internal Flash						Internal Flash										
Dual Boot ⁴																										
Bit-stream Encryption																										
Embedded Function Blocks			I ² C (2), SPI (1), Timer (1)																							
Core Vcc			1.2 V							ZE & HE																
1.8 - 3.3 V												✓		✓		✓		✓					✓			
2.5 - 3.3 V													✓		✓		✓						✓			
Temp.			C							HC							HC									
I																										
AEC-Q100														✓			✓			✓			✓			
0.4 mm Spacing																										
WLCSP			25	2.5 x 2.5 mm				18			18															
49 ²				3.2 x 3.2 mm						38																
ucBGA			64	4 x 4 mm		44																				
0.5 mm Spacing																										
QFN			32	5 x 5 mm		21			21																	
48				7 x 7 mm		40	40																			
84				7 x 7 mm						68																
csBGA			100	8 x 8 mm								78	74													
132				8 x 8 mm		55	79		104	104	104							101								
184 ¹				8 x 8 mm							150 ¹															
132				8 x 8 mm																			86			
TQFP			100	14 x 14 mm		55	78		79	79		78	74		73											
144				20 x 20 mm				107	107	111	114	114						113					100			
0.8 mm Spacing																										
caBGA			256	14 x 14 mm					206		206	206		159		211										
332				17 x 17 mm							274	278														
1.0 mm Spacing																										
ftBGA			256	17 x 17 mm				206	206		206	206		159		211				172		201				
324				19 x 19 mm														271								
fpBGA			484	23 x 23 mm						278	278	334											358	363		
672				27 x 27 mm																			472	540		

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.

CPLD Products

ispMACH 4000 Series

Features			ispMACH® 4000ZE				ispMACH® 4000V					
Parameter	4032ZE	4064ZE	4128ZE	4256ZE	4032	4064	4128	4256	4384	4512		
Macrocells	32	64	128	256	32	64	128	256	384	512		
tpd (ns)	4.4	4.7	5.8	5.8	2.5	2.5	2.7	3.0	3.5	3.5		
tco (ns)	3.0	3.2	3.8	3.8	2.2	2.2	2.7	2.7	2.7	2.7		
ts (ns)	2.2	2.5	2.9	2.9	1.8	1.8	1.8	2.0	2.0	2.0		
fMAX (MHz)	260	241	200	200	400	400	333	322	322	322		
Supply Voltage (V)	ZE=1.8				V=3.3							
I/O Standard Support	LVTTTL, LVCMOS3.3/2.5/1.8/1.5, PCI3.3				LVTTTL, LVCMOS3.3/2.5/1.8, PCI3.3							
Embedded Oscillator	✓	✓	✓	✓								
5 V Tolerant I/Os	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
Typ. Standby Current (@ 3.3 V)	10 µA	11 µA	12 µA	13 µA	11.3 mA	11.5 mA	11.5 mA	12 mA	12.5 mA	13 mA		
Temperature Grades	C/I	C/I	C/I	C/I	C/I/E/A	C/I/E/A	C/I/E/A	C/I/E	C/I	C/I		
0.4 mm Spacing			I/O Count + Inputs									
ucBGA	64	4 x 4 mm	48 + 4									
	132	6 x 6 mm		96 + 4								
TQFP	128	14 x 14 mm					92 + 4					
0.5 mm Spacing			I/O Count + Inputs									
TQFP	48	7 x 7 mm	32 + 4	32 + 4			32 + 4	32 + 4				
	100	14 x 14 mm		64 + 10	64 + 10	64 + 10		64 + 10	64 + 10			
	144	20 x 20 mm			96 + 4	96 + 14			96 + 4	96 + 14		
	176	24 x 24 mm							128 + 4	128 + 4	128 + 4	
csBGA	64	5 x 5 mm	32 + 4	48 + 4								
	144	7 x 7 mm		64 + 10	96 + 4	108 + 4						
0.8 mm Spacing			I/O Count + Inputs									
TQFP	44	10 x 10 mm					30 + 2	30 + 2				
1.0 mm Spacing			Total I/Os (Dedicated I/Os)^{4,5}									
ftBGA	256	17 x 17 mm							160 + 4	192 + 4	208 + 4	

Power and Thermal Management Products

Features	Power & Thermal Management		Power Management				
	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	✓	✓					
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 ² C	I ² C/JTAG	I ² C	I ² C			
Programming Interface	I ² C	I ² C/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	✓	✓					
Temp.	I	✓	✓	✓	✓	✓	✓
	AEC-Q100			✓	✓		
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 and Reference Designs

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

1) Contact Lattice for version support information.

IP Cores and Reference Designs

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

1) Contact Lattice for version support information.

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IP Cores and Reference Designs

	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	✓	✓						Order #: DS-CONN-ST-U	Order #: DS-CONN-ST-UR
	LPDDR3 SDRAM Controller	✓								
	PCI Express x1 Endpoint	✓	✓	✓ ¹						
	PCI Express x2 Endpoint	✓								
	PCI Express x4 Endpoint	✓	✓	✓ ¹						
	PCIe Root Complex Lite x1	✓	✓							
	PCIe Root Complex Lite x4	✓	✓							
	10 Gigabit Ethernet MAC	✓	✓	✓ ¹	✓ ¹					
	SGMII and Gigabit Ethernet PCS	✓	✓	✓ ¹						
	Triple Speed 10/100/1G Ethernet MAC	✓	✓	✓ ¹	✓ ¹			✓		
	XAUI	✓	✓	✓ ¹						
	Scatter Gather DMA	✓	✓	✓ ¹	✓ ¹			✓		
	CPRI	✓	✓	✓						
	JESD204B	✓	✓							
	DDR3 PHY	✓	✓							

1) Contact Lattice for version support information.

IP Cores and Reference Designs

Reference Designs

Lattice Reference Designs are reusable as-is codes that allow designers to quickly build their unique applications. These reference designs provide functions such as 7:1 LVDS, Barcode Emulation, Sensor Interfacing & Preprocessing, I²C, SPI, and MIPI solutions. For a complete listing of reference designs from Lattice, please go to latticesemi.com/IP.

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
7:1 LVDS Video Interface	RD1030	✓	✓		✓		✓				✓	✓
8b/10b Encoder/Decoder	RD1012	✓	✓	✓	✓	✓	✓				✓	✓
ADC Interface	RD1089		✓								✓	✓
BSCAN - Multiple Boundary Scan Port Addressable Buffer (BSCAN1)	RD1001				✓	✓	✓					
BSCAN - Multiple Boundary Scan Port Linker (BSCAN 2)	RD1002	✓			✓	✓	✓					
Controller Area Network (CAN) Controller	RD1170							✓			✓	
FPGA Loader	AN8077				✓	✓	✓					
GPIO Expander	RD1065		✓			✓	✓				✓	✓
HDMI/DVI Interface	RD1097	✓	✓								✓	✓
HiSPi-to-Parallel Sensor Bridge	RD1120	✓	✓	✓	✓		✓				✓	✓
I ² C Bus Controller for Serial EEPROM	RD1006	✓	✓	✓	✓	✓	✓				✓	✓
I ² C Master Controller	RD1005	✓	✓	✓	✓	✓	✓				✓	✓
I ² C Master Controller	RD1139							✓			✓	
I ² C Master with WISHBONE Controller	RD1046	✓	✓	✓	✓	✓	✓				✓	✓
I ² C Slave Controller	RD1140							✓			✓	
I ² C Slave Peripheral Using Embedded Function Block - WISHBONE Compatible	RD1124			✓	✓						✓	✓
I ² C Slave to SPI Master Bridge	RD1094					✓					✓	✓
I ² C Slave/Peripheral	RD1054	✓	✓			✓	✓				✓	✓
I ² C to SPI Bridge	RD1172							✓			✓	✓
I ² S Controller	RD1101			✓	✓	✓					✓	✓
I ² S Controller	RD1171							✓			✓	✓
I3C Host/Device										✓		
iCE40 Ultra Barcode Emulation Reference Design	UG73								✓	✓	✓	
iCE40 Ultra Pedometer	UG76								✓	✓	✓	
iCE40 Ultra RGB LED Controller	UG75								✓	✓	✓	
iCE40 Ultra Self-Learning IR Remote	UG74								✓	✓	✓	
iCE40LM Barcode Emulation	RD1191							✓			✓	
iCE40LM Phillips IR Rx	RD1192							✓			✓	
iCE40LM Sensor Interfacing and Preprocessing	RD1189							✓	✓	✓	✓	
iCE40LM Sony IR Tx Reference Design	RD1190							✓			✓	
Keypad Scanner	RD1180							✓				✓
LatticeMico32 - Embedded Processor - WISHBONE Compatible		✓	✓	✓	✓		✓				✓	✓
LatticeMico8 - Embedded Processor - WISHBONE Compatible		✓	✓	✓	✓		✓				✓	✓
LatticeMico8 Microcontroller User's Guide	RD1026			✓	✓	✓	✓				✓	✓
LatticeMico8 to WISHBONE Interface Adapter	RD1043					✓	✓				✓	✓
LED/OLED Driver	RD1103			✓	✓	✓					✓	
LPC Bus Controller	RD1049		✓		✓	✓	✓				✓	✓
MachXO2 Display Interface	RD1093				✓						✓	✓
MachXO2 I ² C Embedded Programming Access Firmware - WISHBONE Compatible	RD1129				✓						✓	
MachXO2 Soft I ² C Slave with Clock Stretching - WISHBONE Compatible	RD1186				✓						✓	
MDIO Peripheral - WISHBONE Compatible	RD1074		✓			✓					✓	✓
MIPI CSI-2-to-CMOS Parallel Sensor Bridge	RD1146			✓	✓						✓	
MIPI DPHY Interface IP	RD1182	✓	✓	✓	✓						✓	
MIPI DSI RX to Parallel Bridge	RD1185			✓	✓						✓	
MxN Channel PWM	RD1175							✓				✓
NAND Flash Controller	RD1055				✓	✓	✓				✓	✓
Panasonic Area Sensor-to-Parallel Bridge	RD1121				✓		✓				✓	
Parallel to MIPI CSI-2 TX Bridge	RD1183			✓	✓						✓	
Parallel to MIPI DSI TX Bridge	RD1184			✓	✓						✓	
PCI Target 32 bit/33 MHz	RD1008		✓		✓	✓	✓				✓	✓
PCI/WISHBONE Bridge - WISHBONE Compatible	RD1045		✓			✓	✓				✓	✓
PWM Fan Controller - WISHBONE Compatible	RD1060			✓	✓	✓	✓				✓	✓
PWM Generator	RD1178							✓				✓

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IP Cores and Reference Designs

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				✓							
RC4 Based PRNG Generator	RD1179							✓				✓
Read and Write Usercode	RD1041			✓	✓	✓					✓	✓
RGMIII to GMII Bridge	RD1022	✓	✓								✓	✓
SD Flash Controller - WISHBONE Compatible	RD1048					✓	✓				✓	✓
SD Host Controller	RD1165							✓			✓	✓
SDR SDRAM Controller	RD1174			✓				✓			✓	
SDR SDRAM Controller – Advanced	RD1010	✓	✓		✓	✓	✓				✓	✓
Simple Sigma-Delta ADC	RD1066				✓	✓	✓				✓	✓
SMPTE SDI Dual HD from/to 3G Level-B Converter	RD1132		✓								✓	
SPI Master Controller	RD1141							✓			✓	
SPI Peripheral	RD1075					✓					✓	✓
SPI Slave Controller	RD1142							✓			✓	✓
SPI Slave Peripheral Using the Embedded Function Block - WISHBONE Compatible	RD1125			✓	✓						✓	✓
SPI Slave Port Expander	RD1168							✓				✓
SPI to I ² C Bridge	RD1173							✓			✓	
SPI to MIPI-DSI Bridge										✓		
SPI to UART Expander	RD1143							✓				✓
SPI Wishbone Compatible	RD1044			✓	✓	✓	✓				✓	✓
Sub-LVDS Serial to CMOS Parallel Sensor Bridge	RD1130				✓						✓	
Sub-LVDS-to-Parallel Sensor Bridge	RD1122	✓	✓		✓		✓				✓	✓
UART - WISHBONE Compatible	RD1042			✓	✓	✓	✓				✓	✓
UART (Universal Asynchronous Receiver/Transmitter)	RD1011					✓	✓					✓
UART 16550 Transceiver	RD1138							✓			✓	

ispMACH 4000 Reference Designs

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

IP Cores and Reference Designs

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

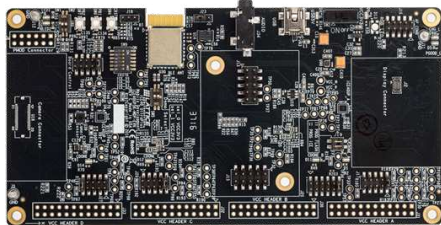
IP Core	MachXO2+ L-ASC10	PLATFORM MANAGER 2	Format			
			VHDL	Verilog	LogiBuilder	Analog Circuit
Fault Logging	✓	✓	✓	✓		
Hot Swap Controller	✓	✓	✓	✓		✓
Fan Controller	✓	✓	✓	✓		
PMBus Controller	✓		✓	✓	✓	
Trim & Margin	✓	✓				✓
Power & Reset Sequencing	✓	✓	✓	✓	✓	
Voltage Scaling & VID	✓	✓	✓	✓		✓

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	✓	✓	✓	✓
BSCAN - Multiple Boundary Scan Port Linker (BSCAN 2)	RD1002	✓	✓	✓	✓
FPGA Loader	AN8077	✓	✓	✓	✓
I ² C Bus Controller for Serial EEPROM	RD1006	✓	✓	✓	✓
I ² C Master Controller	RD1005	✓	✓	✓	✓
I ² C Slave Peripheral Using Embedded Function Block	RD1124	✓	✓	✓	✓
I2S Controller	RD1101	✓	✓	✓	✓
LPC Bus Controller	RD1049	✓	✓	✓	✓
MachXO2 I ² C Embedded Programming Access Firmware	RD1129	✓	✓	✓	✓
MachXO2 Soft I ² C Slave with Clock Stretching	RD1186	✓	✓	✓	✓
NAND Flash Controller	RD1055	✓	✓	✓	✓
PWM Fan Controller	RD1060	✓	✓	✓	✓
RAM-Type Interface for Embedded User Flash Memory	RD1126	✓	✓	✓	✓
Read and Write Usercode	RD1041	✓	✓	✓	✓

iCE40 UltraPlus Mobile Development Platform

Enables designers to evaluate key connectivity features of the iCE40 UltraPlus FPGA as well as processing features utilizing multiple DSPs, integrated RAM, and FPGA fabric.



Features

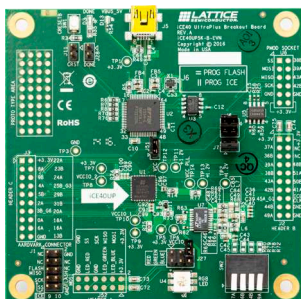
- x1 MIPI DSI interface up to 108 Mbps
- 4x Microphone bridging (2x I2S mics and 2x PDM mics)
- Compass sensor (LSM303), pressure sensor (BMP180), gyro sensor (LSM330), and accelerometer (LIS2D12)
- 640 x 480 Image sensor (OVM7692)
- BLE module to transfer any captured data from iCE40 UltraPlus wirelessly
- iCE40 UltraPlus can be programmed via on-board SPI Flash or via USB port

Ordering Part Number

ICE40UP5K-MDP-EVN

iCE40 UltraPlus Breakout Board

Enables designers to evaluate key connectivity features of the iCE40 UltraPlus FPGA. The breakout board brings out all I/Os and allows the FPGA to be programmed over a USB connector.



Features

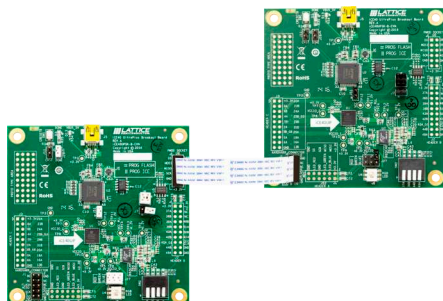
- iCE40 UltraPlus (ICE40UP5K) device in a 48-pin QFN package
- High-current LED output
- iCE40UP5K application based current measurements
- Standard USB cable for device programming
- RoHS-compliant packaging and process
- Pre-loaded RGB LED Demo
- Software run GUI
- USB Connector Cable

Ordering Part Number

ICE40UP5K-B-EVN

iCE40 UltraPlus I3C Evaluation Kit

Enables designers to evaluate I3C host interface along with I3C device interface embedded with iCE40 UltraPlus.



Features

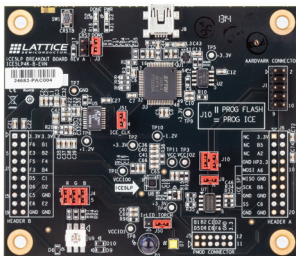
- Reuse iCE40 UltraPlus Breakout Boards
- Signal Generator with I3C host on one FPGA
- I3C device on second FPGA along with additional I²C host interfaces

Ordering Part Number

ICE40UP5K-VGPIO-I3C-EVN

iCE40 Ultra Breakout Board

Featuring an ultra-small FPGA 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

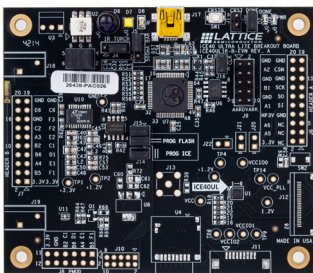
- iCE5LP4K FPGA in 0.35 mm pitch, 36-ball WLCSP
- RGB LED
- High-brightness “torch” LED
- Infrared (IR) LED
- Status LEDs
- Access to all device I/Os
- On-board 32Mbit SPI Flash for reconfiguration
- Windows- & Mac-based GUI for interface to the RGB LED, includes FPGA source code
- USB Type-A to Type-B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

Ordering Part Number

ICE5LP4K-B-EVN

iCE40 UltraLite Breakout Board

Featuring the world’s smallest FPGA 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

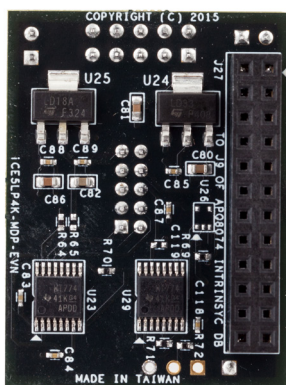
- iCE40UL1K (iCE401K-CM36A) device in a 36-ball BGA package
- Layout example of a board using 0.40 mm pitch BGA package
- High current LED output
- Infrared transmit capability for remote control functions
- iCE40UL1K application-based current measurements
- Standard USB cable for device programming
- 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

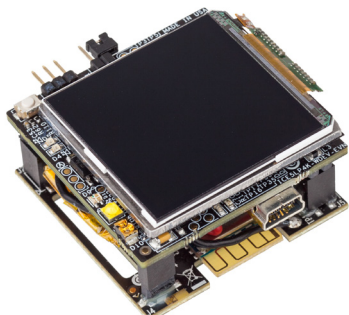
- iCE40 Ultra FPGA (iCE5LP4KSWG36)
- USB programming/interface
- High-current LED output
- Infrared transmit and receive
- RGB LED control
- Numerous Sensors
 - Two I2S MICs
 - Proximity sensor
 - Temperature Sensors
 - Barometric pressure sensor
 - Accelerometer
 - Gyroscope
 - Magnetometer
 - Humidity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

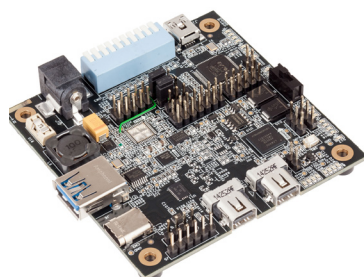
* Reference Android APK available to interface with mobile phone over Bluetooth

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.

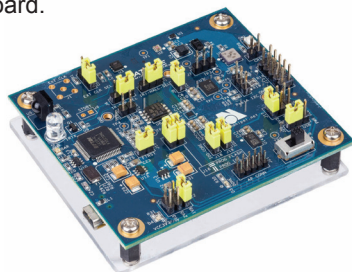
* Requires iCE40LP8K-USBC-EVN

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 FPGA 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

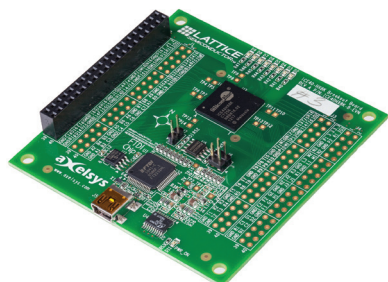
Ordering Part Number

ICE40LM4K-S-EVN

Development Kits

iCE40-HX8K Breakout Board

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



Features

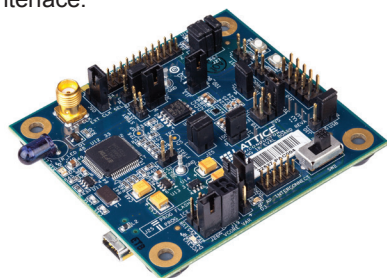
- iCE40-HX8K CT256 device
- 8 user-accessible LEDs
- SPI Flash for programming configuration
- 40-pin 0.1" header for user connectivity
- 0.1" holes for user connectivity
- FTDI 2232H for USB interface
- 12MHz oscillator
- Jumpers to select programming of the SPI Flash or iCE40-HX8K
- USB Type-A to Type-B (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

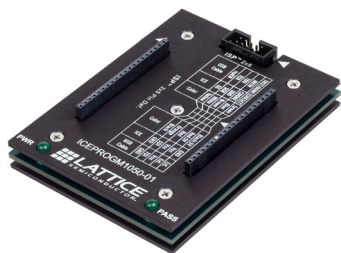
- iCE40LP1K in 16-WLCSP package (0.35 mm-ball pitch)
- High current tri-color LED (RGB)
- Infrared transmit LED
- Barcode emulation LED
- 27MHz on-board oscillator
- SMA connector for external clock input
- SPI configuration Flash
- USB Type-A to Type-B (mini) cable for FPGA power and programming via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

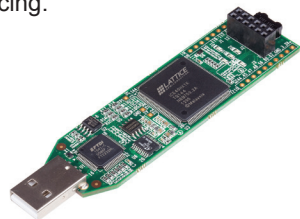
- Easy-to-use programming connectors
 - Versatile flywire, 2 x 5 (.100") or 1 x 8 (.100") connectors
 - 6 feet (2 meters) or more of programming cable length (PC to DUT)
- Lead-free, RoHS-compliant construction

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

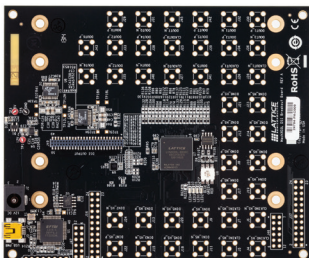
- Micron 32Mbit N25Q32 SPI Flash
- USB connector provides the power supply
- 16 LVCMOS/LVTTL (3.3V) digital I/O connections on 0.1" through-hole connections
- IrDA & Tx/Rx reference designs available for download

Ordering Part Number

ICE40HX1K-STICK-EVN

MachXO3L Breakout Board

Focusing on evaluating high-speed source synchronous interfaces with the Lattice MachXO3L-2100 and MachXO3L-6900 products in both 49-ball WLCSP and 256-ball caBGA packages respectively.



Features

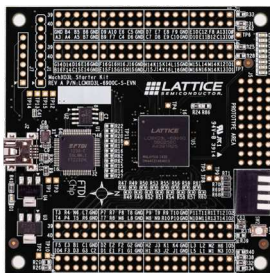
- Two MachXO3L FPGAs
 - XO3L-6900E in 256caBGA
 - XO3L-2100E in 49WLCSP
- Two optional configurations:
 - 50-pin Harwin Archer connector for interface to DSI screen (screen not included)
 - 40 SMA connectors for LVDS I/O evaluation
- Generous prototyping/breakout access
- Switches and LEDs for user input and feedback

- Discrete resistors to support SLVS, subLVDS or DPHY Tx, and DPHY Rx, LP mode
- USB Type-A to Type-B (mini) cable for FPGA power and programming via PC
- DC jack for supplemental power input

Ordering Part Number	
MachXO3L SMA Breakout	LCMXO3L-SMA-EVN
MachXO3L DSI Breakout	LCMXO3L-DSI-EVN

MachXO3L Starter Kit

The MachXO3L Starter Kit is a basic breakout board to allow simple evaluation and development of MachXO3L based designs. It includes the LCMXO3L-6900C-5BG256C device.



Features

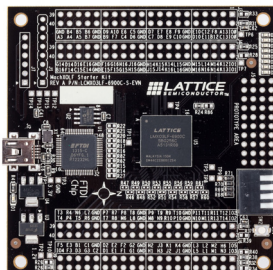
- MachXO3L FPGA – LCMXO3L-6900C-5BG256C
- USB Type-B (mini) connector (program/power)
- Pre-programmed example design (available on latticesemi.com)
- Eight LEDs
- 4-position DIP switch
- 40-hole prototyping area
- Four 2x20 expansion header landings for general I/O, JTAG and external power
- 1x8 expansion header landing for JTAG
- 1x6 expansion header landing for SPI/ I²C

- SPI Flash for external boot or dual boot
- 3.3V and 1.2V supply rails

Ordering Part Number	
LCMXO3L-6900C-S-EVN	

MachXO3LF Starter Kit

The MachXO3LF Starter Kit is a basic breakout board to allow simple evaluation and development of MachXO3LF based designs. It includes the LCMXO3LF-6900C-5BG256C device.



Features

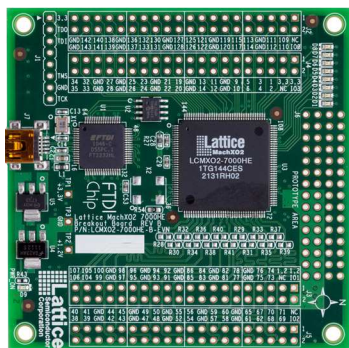
- MachXO3L FPGA – LCMXO3LF-6900C-5BG256C
- USB Type-B (mini) connector (program/power)
- Pre-programmed example design (available on latticesemi.com)
- Eight LEDs
- 4-position DIP switch
- 40-hole prototyping area
- Four 2x20 expansion header landings for general I/O, JTAG and external power
- 1x8 expansion header landing for JTAG
- 1x6 expansion header landing for SPI/ I²C
- SPI Flash for external boot or dual boot
- 3.3V and 1.2V supply rails

Ordering Part Number	
LCMXO3LF-6900C-S-EVN	

MachXO2 Boards and Kits

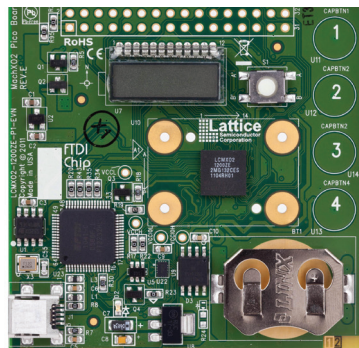
MachXO2 Breakout Board Features

- MachXO2 LCMXO2-7000HE
- Access to all device I/O via four 2x20 expansion header landings for I/O, JTAG and external power
- 60-hole prototype area
- USB Type-B (mini) connector for power and programming (cable included)
- Eight general purpose LEDs
- 3.3V and 1.2V supply rails



MachXO2 Pico Development Kit Features

- MachXO2 LCMXO2-1200ZE
- 4-character, 16-segment LCD display
- 4 capacitive touch sense buttons
- 1Mbit SPI Flash
- I2C temperature sensor
- Current and voltage sensor circuits
- Expansion header for JTAG, I2C
- Standard USB cable for device programming and I2C communication
- RS-232/USB & JTAG/USB interface
- RoHS-compliant packaging and process
- Watch battery



MachXO2 Control Development Kit Features

- MachXO2 LCMXO2-4000HC
- Power Manager II ispPAC-POWR1014A
- 128Mbit LPDDR memory, 4Mbit SPI Flash
- Current and voltage sensor circuits
- SD memory card socket
- Microphone
- Audio amplifier and Delta-Sigma ADC
- Up to two DVI sources and one DVI output.
- Up to two Display inputs (7:1 LVDS) and one Display output (7:1 LVDS)
- Audio output channel
- Expansion header for JTAG, SPI, I2C and PLD I/Os.
- LEDs & switches
- Standard USB cable for device programming
- RS-232/USB & JTAG/USB interface
- RoHS-compliant packaging and process
- AC adapter (international plugs)

Ordering Part Number

Breakout Board	LCMXO2-7000HE-B-EVN
Pico Development Kit	LCMXO2-1200ZE-P1-EVN
Control Development Kit	LCMXO2-4000HC-C-EVN

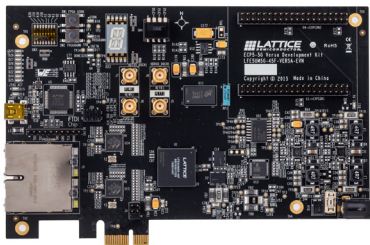
ECP5 and ECP5-5G Versa Development Kits

For evaluation and development with the ECP5 and ECP5-5G FPGAs, including PCI Express, Gigabit Ethernet, DDR3 and generic SERDES performance.

Features

- Half-length PCI Express form factor: allows demonstration of PCI Express x1 interconnection
- Electrical testing of one full-duplex SERDES channel via SMA connections
- USB Type-B connection for UART and device programming
- Two RJ45 interfaces to 10/100/1000 Ethernet to RGMII
- On-board boot Flash: 128Mbit Serial SPI Flash
- DDR3-1866 memory components (64Mbit/x16)

- Expansion mezzanine interconnection for prototyping
- 14-segment alphanumeric display
- Switches, LEDs and displays for demo purposes
- Diamond® programming support
- On-board reference clock sources



Ordering Part Number

LFE5UM-45F-VERSA-EVN
LFE5UM5G-45F-VERSA-EVN

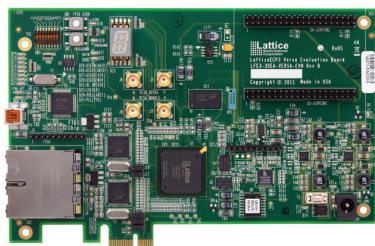
LatticeECP3 Versa Development Kit

Industry's lowest cost platform for designing PCI Express and Gigabit Ethernet based systems. The kit includes free demos and reference designs.

Features

- The LatticeECP3 Versa Evaluation Board:
 - PCI Express 1.x1 Edge connector interface
 - Two Gigabit Ethernet ports (RJ45)
 - 4 SMA connectors for SERDES access
 - USB Type-B (mini) for FPGA programming
 - LatticeECP3 FPGA: LFE3-35EA-FF484
 - 64Mbit Serial Flash memory
 - 1GB DDR3 Memory
 - 14 segment alphanumeric display
 - Switches and LEDs for demos
 - SERDES Eye Quality Demo

- 4 PCI Express Demos
- Gigabit Ethernet MAC Demo using Mico32
- DDR3 Memory Controller Demo
- Available on Windows and Linux platforms
- USB Type-A to Type-B (mini) cable for FPGA programming via PC
- 12V AC power adapter and international plug adapters

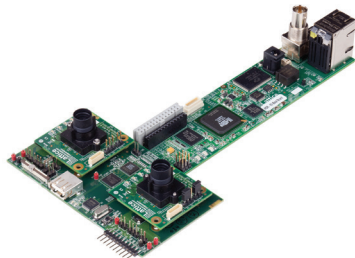


Ordering Part Number

LFE3-35EA-VERSA-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.



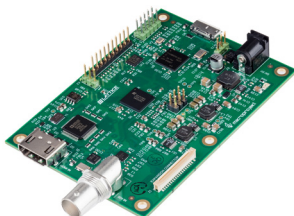
Features

- 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

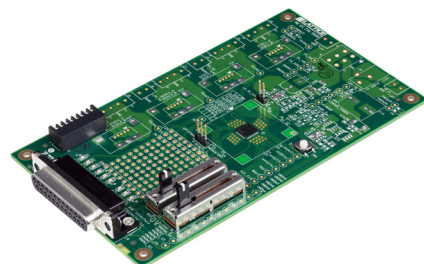
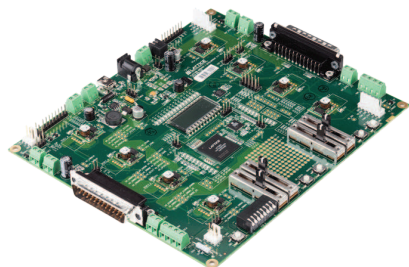
- Production-ready USB3 audio/video bridging reference design
- 1080p video streaming over USB 3.0 at 60fps
- HDMI 1.4a audio and video capture
- SD-, HD-, 3G-SDI audio and video capture
- Supports video capture from external MIPI CSI-2, SubLVDS or Parallel sensors
- Reference design provides fast USB 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 design 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

Development Kits

POWR1220

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 supply 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

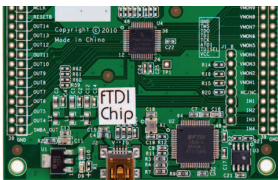
Ordering Part Number

PAC-POWR1220AT8-HS-EVN (Standard)

POWR1014

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

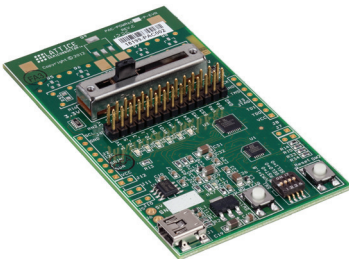
Ordering Part Number

Ordering Part Number: POWR1014A-B-EVN

POWR607

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

Development Kits

POWR605

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 I²C header landings for JTAG cable programming and I²C interface (cables not included)

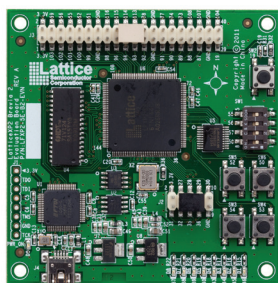
Ordering Part Number

PACPOWR605-P-EVN

LatticeXP2

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

Industrial

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

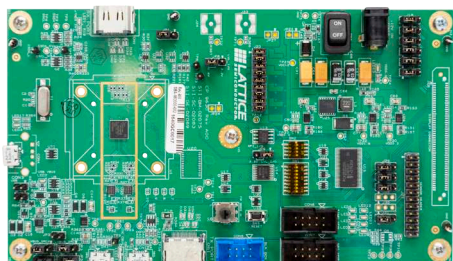
LFE3-35EA-HMI-DKN

Development Kits

ASSP Video

Sil9630 evaluation kit

This is an evaluation kit for Sil9630, HDMI/MHL transceiver solution. Input can be eTMDS or HDMI while output can be MHL or HDMI. The evaluation kit allows HDCP decryption and encryption to be evaluated, DSC compression to be evaluated, and MHL/HDMI transmission up to 4K60 444 video resolution.



Features

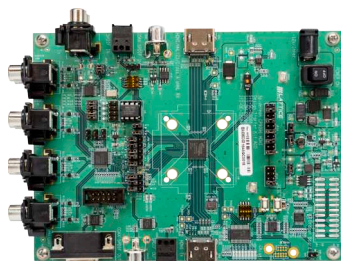
- Dual-Mode MHL or HDMI Transmitter
- Input: HDMI or eTMDS (Up to 4K60 444)
- Output: MHL (Up to 4K60 444) or HDMI (Up to 4K60 444)
- Header pins available to measure power consumption
- DSC encoder support
- RGB/YCbCr/xvYCC support

Ordering Part Number

CP9630

Sil9396 evaluation kit

This is an evaluation kit for Sil9396, which is a DSC decompression IC supporting HDMI and MHL up to 4K60 444.



Features

- Dual inputs (MHL or HDMI)
 - HDMI can support up to 4K60 444
 - MHL1/2 can support up to 1080p60
 - MHL3 can support up to 4K30 422pp
- Output support for HDMI2.0 up to 4K60 444
- DSC decompression supported
- CSC & chroma down/up-sampling support, RGB/YCbCr/xvYCC support
- Two LED supported
 - LED1: Green, ON – source connected
 - LED2: Red, ON – Power error

Ordering Part Number

CP9396

More

Additional Boards and Kits

Lattice and our hardware partners produce many additional boards with a rich selection of features to match your needs.

For additional information, explore our full catalog at www.latticesemi.com/boards