

iCE40 UltraPlus™

World's smallest FPGAs with enhanced memory & DSPs for reduced system cost, lower power consumption & faster time-to-market

iCE40 UltraPlus™ is the latest addition to the popular iCE40™ FPGA product family. It is the world's smallest distributed processing solution with up to 1 Mbit of integrated SRAM memory that can be used for buffering sensor data or storing embedded processor code. With its flexible I/Os, compute capabilities, hardware accelerators, and integrated DSP blocks (x8 DSP blocks in the 5K version), iCE40 UltraPlus is the go-to tool for technology innovators/designers to solve repetitive number crunching problems and extend system battery life by allowing the applications processor (AP) to stay in sleep mode longer.

Key Features and Benefits

Flexible I/Os

- Connect, bridge, and aggregate a variety of signaling standards
 - I²C, SPI, I³C, UART, I²S, and other proprietary interfaces
- Improve board layout through aggregation of multiple signals over a single interface
- Dynamic I/O placement can be adjusted to fit your layout needs

Small Packages with High Functional Density

- 2.15 mm x 2.55 mm WLCSP package
- Up to 5,280 LUTs
- Up to 8 DSP blocks (16 x 16 multiply, 32-bit Accumulator blocks)
- Up to 4 SPRAM blocks of 256 kbits
- Instant on with integrated NVCM configuration memory
- 120 kbits of Block RAM

Power Efficient

- 75µW (typical) static power consumption
- Active power depends on use case

Product Family Overview

Adding to the iCE40 family of small size and power efficient FPGAs, iCE40 UltraPlus offers more resources, while providing the same low power and small footprint required for the mobile market.

Device	iCE40 UltraLite		iCE40 Ultra			iCE40 UltraPlus	
	iCE40UL640	iCE40UL1K	iCE5LP1K	iCE5LP2K	iCE5LP4K	iCE40UP3K	iCE40UP5K
Static Current Draw (µA)	35	35	71	71	71	75	75
LUTs	640	1248	1100	2048	3520	2800	5280
Embedded Block RAM (kbits)	56	56	64	80	80	80	120
SPRAM Memory (kbits)	-	-	-	-	-	1024	1024
PLL	1	1	1	1	1	1	1
16 x 16 Multipliers	-	-	2	4	4	4	8
Packages	Number of User I/Os						
16-ball WLCSP (1.4 x 1.4 mm, 0.35 mm pitch)	10	10					
36-ball WLCSP (2.08 x 2.08 mm, 0.35 mm pitch)			26	26	26		
30-ball WLCSP (2.15 x 2.55 mm, 0.4 mm pitch)						21	21
36-ball ucBGA (2.5 x 2.5 mm, 0.4 mm pitch)	26	26					
36-ball ucfBGA (2.5 x 2.5 mm, 0.4 mm pitch)			26	26	26		
48-ball QFN (7 x 7 mm, 0.5 mm pitch)			39	39	39		39

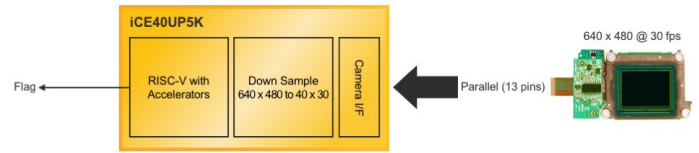
The arrows above indicate that you can design a single PCB and migrate between the products without any PCB board changes.

* Note: The height of the iCE40 UltraLite 36-ball ucBGA is not the same as the iCE40 Ultra 36-ball ucfBGA package. However, the PCB footprint will be the same between the two parts to achieve PCB migration.

End Market Application Examples

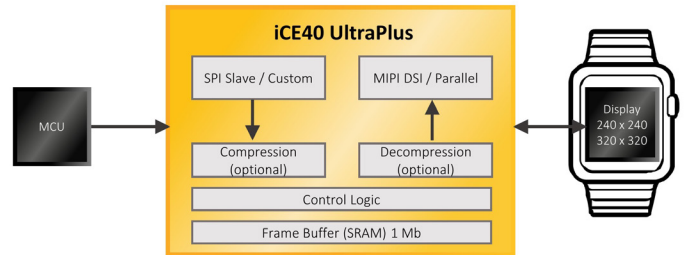
Always On Camera

- Support for:
 - Human face detection using neural network module
 - Binary weights and 8-bit fixed point activation to achieve 9x reduction in operations
 - Integrated 128K bytes of memory, allowing weights/activations to be stored directly inside of iCE40 UltraPlus FPGA



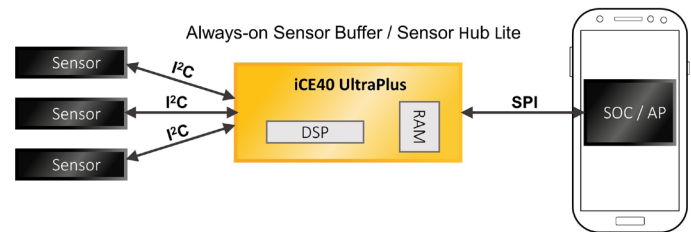
Display Driver (Graphics Acceleration, Bridging, Line/Frame Buffer)

- Support for:
 - Always-on display, while AP is in sleep mode
 - Interface bridge from MCU to display
 - Multi-level display controller



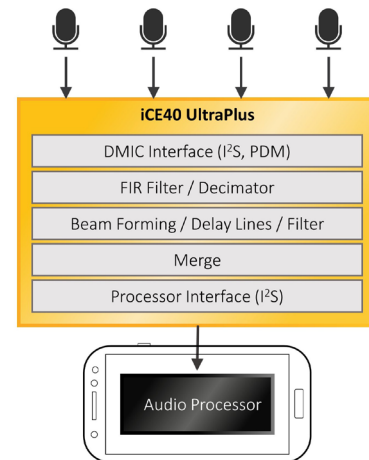
Distributed Sensor Processing and Sensor Buffer

- Support for:
 - Signal aggregation of multiple interfaces
 - I²C, SPI, I3C, UART, I²S, etc.
 - Localized processing for improved responsiveness
 - Always-on sense & detect to maximize host sleep mode
 - Phrase detection for system wake up
 - PDR using multiple sensors
 - Item or facial detection, motion detection
 - Pedometers
 - Double tap
 - Shake to wake



Audio Bridging and Pre-processing

- Support for:
 - Multi-mic bridging (multiple I²S or PDM inputs to a single output)
 - Multi-mic audio beam forming
 - Speaker dependent key phrase detection
 - Speaker independent key phrase detection



Applications Support

www.latticesemi.com/support

