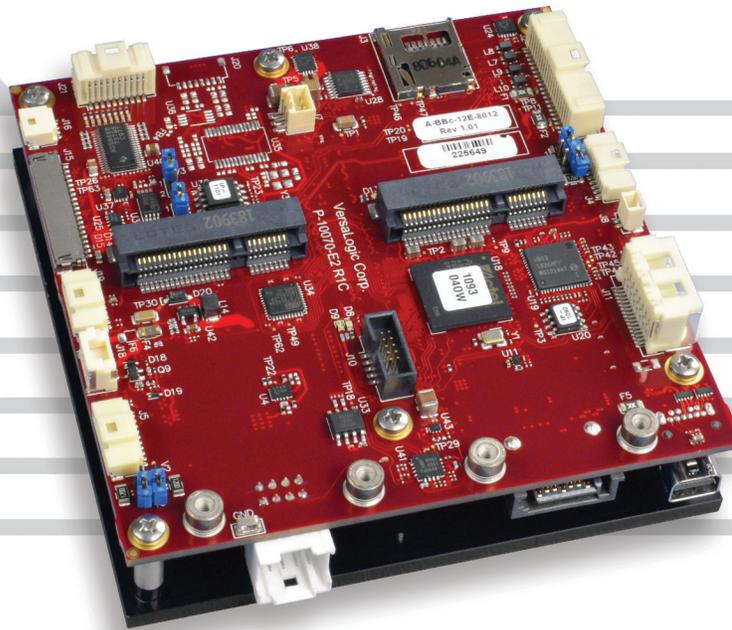# Owl
Embedded Processing Unit

**95 x 95 x 29 mm
(3.7 x 3.7 x 1.14")**

Overview

The Owl is a small, rugged board-level embedded computer. Approximately four inches square and one inch thick, the Owl is a member of VersaLogic's ultra-rugged x86 computer family. Equipped with a powerful dual- or quad-core Intel "Apollo Lake" processor, and soldered-on ECC RAM, the Owl is designed to withstand extreme temperature, impact, and vibration.

Up to 8 GB of soldered-on Error Correcting Code (ECC) memory is available for high-reliability applications. ECC memory is beneficial in environments where single bit memory errors may occur, such as cosmic ray interactions which increase dramatically with altitude.

A TPM 2.0 chip supports hardware-based security.

On-board I/O includes dual Gigabit Ethernet, USB 3.0 and 2.0 ports, serial ports, and analog inputs. SATA interface, eMMC Flash options, and a microSD socket provide a range of data storage options. Dual Mini PCIe sockets accommodate a wide range of plug-in accessory cards.

The on-board power conditioning supports an input of 8 to 30 volts to simplify system power supply requirements. The Owl is fully compatible with 12 or 24V vehicle applications. Over Voltage Protection and Reverse Voltage Protection are included to enhance reliability in the field.

For hostile environments, the Owl is designed and tested for full industrial temperature operation (-40° to +85°C) and meets MIL-STD-202H specifications for shock and vibration.

VersaLogic's 10+ year product life support programs ensure long-term availability. This avoids expensive upgrades, redesigns, and migrations that come from shorter lifecycle products.

Highlights

- Error-correcting RAM. Up to 8 GB
- -40° to +85°C Operating Temperature
- Intel® Atom™ Apollo Lake processor
  - Dual core or quad core
- TPM 2.0 security
- COMe compact size (95 x 95 x 29 mm)
- On-board power conditioning. 8 to 30 volt input

VERSALOGIC
CORPORATION

Features

1 On-board Power Conditioning *(on back)*

Accepts 8 to 30 volts DC. Overvoltage and reverse polarity protection. RF noise filtering.

2 High-performance Video

Integrated Intel HD Graphics 505/500 supports Ultra HD 4k, DirectX 12, OpenGL 4.3, and H.264, MPEG-2 encoding/decoding. DisplayPort++ (**2a**) and LVDS (**2b**) video outputs support multiple display modes including Extended Desktop and Clone. LVDS backlight control (**2c**).

3 Network

Dual GbE Ethernet interfaces. Autodetect 10BaseT / 100BaseTX / 1000BaseT with remote boot support.

4 SATA *(on back)*

SATA III port supports bootable SATA drive.

5 Mini PCIe Card Sockets

Dual full-sized sockets. Supports A/D, Wi-Fi modems, GPS, MIL-STD-1553, Ethernet, flash data storage, and other Mini PCIe modules.

6 MicroSD Socket

Supports removable microSD card solid-state drives.

7 Industrial I/O

One USB 3.0 port (**7a**) and four USB 2.0 ports (**7b**) support keyboard, mouse, and other devices. Eight 3.3V digital I/O lines, three 8254 timer/counters, and I2C support (**7b**).

8 Serial Communications

Four RS-232/422/485 serial ports.

9 Analog

Eight 12-bit analog input channels for data acquisition support.

10 SPI Interface

Supports SPI and SPX devices, including low cost analog and digital modules.

Intel Atom "Apollo Lake" Processor

Up to 2 GHz burst clock rate. Quad- or dual-core options. Low power consumption.

Embedded Processing Unit

The assembled and tested 2-board set creates a complete embedded computer in an extremely small and rugged format.

Fanless Operation

No moving parts required for CPU cooling in most configurations.

RAM

Up to 8 GB error-correcting soldered-down RAM enhances system reliability.

Flash

Up to 32 GB of on-board eMMC non-volatile memory.

Industrial Temperature Operation

-40° to +85°C operation for harsh environments.

MIL-STD-202H

Qualified for high shock / vibration environments.

Software Support

Compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks. Supported by the VersaAPI I/O routines.
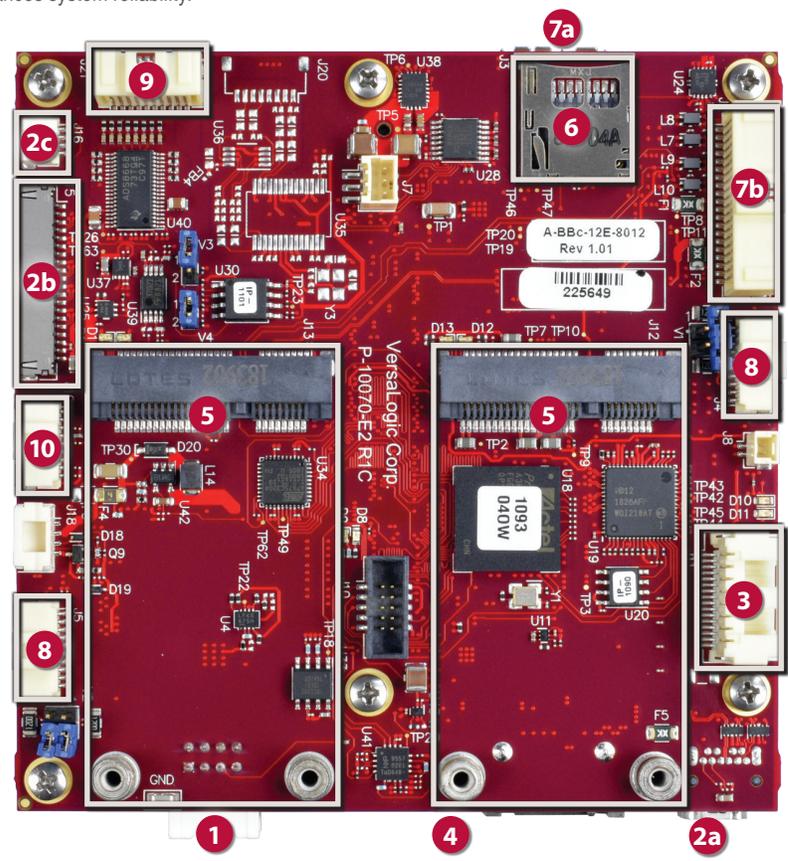
Modify Owl to Your Exact Requirements

COTS modifications are available in quantities as low as 100 pieces.

- On-board RAM Size
- Non-ECC memory
- On-board Flash Storage Size
- Conformal Coating
- Custom Cabling
- Connector & I/O Changes
- Custom Testing
- Custom Labeling
- BGA Underfill
- BIOS Modifications
- Software and Drivers
- Revision Locks
- Custom Screening
- Application-Specific Testing
- Etc.

Specifications

General

General	
Board Size	95 x 95 x 29 mm (3.74 x 3.74 x 1.14") COM Express Compact form factor
Weight	200 grams (7.05 oz.)
Processor	Intel Atom E39xx platform. 2 MB L2 cache. Intel 64-bit instructions, Virtualization Technology (VT), AES New Instructions, Secure Boot, Secure Key, and Execute Disable Bit
Battery	Connection for 3.0V RTC backup battery. Battery not required for operation.

Power Requirements (@ +12V) †	Model	Idle	Typical	Max.	S3
	EPU-4012-EAP-02X-08	6.5 W	8.1 W	9.6 W	1.4 W
	EPU-4012-EDP-08X-00	6.2 W	9.3 W	12.4 W	1.4 W
	EPU-4012-EDP-08X-32	7.0 W	10.1 W	13.2 W	1.4 W

Input Voltage	8V – 30V DC
Input Protection	Over-voltage protection. Self-resetting when input falls to a safe level. Reverse voltage input protection to -30V. RF noise filtering. Transient voltage protection (inductive kickback / lightning).
System Reset & Hardware Monitors	Voltage rail monitoring. Watchdog timer with programmable timeout. Push-button sleep, reset, and power.
Regulatory Compliance	RoHS (EU 2015/863), Conflict Minerals compliant.

Environmental

Environmental	
Thermal Management	Bolt-on heat plate standard (included). Optional heat sink, fan, heat pipe, and other thermal accessories available.

Operating Temperature ◊	Model	Heat Plate**	Heat Sink	Heat Sink + Fan
	All models	-40° to +85°C	-40° to +85°C	-40° to +85°C

	Ranges shown assume 90% CPU utilization. For detailed thermal information, refer to the VL-EPU-4012 Reference Manual. ** Heat plate must be kept below 90°C
Airflow Requirements	0.5 linear m/s typical. Refer to the VL-EPU-4012 Reference Manual for detailed airflow requirements.
Storage Temperature	-40° to +85°C
Altitude*	Operating — To 4,570m (15,000 ft.) Storage — To 12,000m (40,000 ft.)
Thermal Shock	5°C/min. over operating temperature
Humidity	Mil-STD-202H method 103 – Humidity steady state
Vibration, Sinusoidal Sweep ¤	MIL-STD-202H method MIL-STD-202-204, Condition A: 2g
Vibration, Random ¤	MIL-STD-202H method MIL-STD-202-214, Condition A: 5.35g rms
Mechanical Shock ¤	MIL-STD-202H method MIL-STD-202-213, Condition G: 20g half-sine

Security

Security	
TPM	Trusted Platform Module 2.0 device for hardware security

Memory

Memory	
System RAM	2 GB or 8 GB of soldered-on ECC DDR3L SDRAM

Video

Video	
General	Integrated high-performance video. Intel HD Graphics 505 with 18 Execution Units (EPU-4012-EDP) or Intel Graphics 500 with 12 Execution Units (EPU-4012-EAP). Turbo Boost. Supports DirectX 12, OpenGL 4.4, Quick Sync Video, Clear Video HD Technology, Clear Video Technology, VP8, VP9, MPEG2, H.264, H.265, and VC1.
VRAM	Up to 2 GB shared DRAM
DisplayPort Interface §	Mini DisplayPort++ output. 24-bit. Up to 4096 x 2160 @ 60 Hz. Supports DisplayPort and HDMI signaling (Video and Audio outputs).
OEM Flat Panel Interface	Single-channel LVDS interface. 18/24-bit. Up to 1200 x 800 (60 Hz). Backlight control signals.

Mass Storage

Mass Storage	
Rotating Drives / Flash / SSD ¥	• One SATA III port. Latching connector. • On-board eMMC MLC Flash drive. 0, 8, or 32 GB. • One microSD socket. • Mini PCIe socket with mSATA support.

Network Interface

Network Interface	
Ethernet ‡	Two AutoDetect 10BaseT/100BaseTX/1000BaseT ports. Latching connector. One port with network boot option.

Device I/O

Device I/O	
USB ‡§	One USB 3.0 / 2.0 port and four USB 2.0 host ports.
COM Interface ‡	Four RS-232/422/485 selectable. 16C550 compatible. RS-232 115 Kbps – RS-422/485 460 Kbps max.
Digital I/O	Eight TTL I/O Lines 3.3V. Independently configurable.
Analog Input	Eight channels. 12-bit. Single-ended. 500 Ksps. Independently configurable +/- 0.64V to +/- 10.24V high input impedance inputs.
I2C	Single I2C interface
Counter / Timers	Three 8254 compatible Programmable Interval Timers (PITs).
VersaLogic SPI Interface	Supports SPI and SPX devices. Supports up to two SPX modules.

Mini PCIe Card Socket

Mini PCIe Card Socket	
General	Supports Wi-Fi modems, GPS receivers, MIL-STD-1553, Ethernet channels, non-volatile flash data storage, and other plug-in modules.
Socket #1	Full size. USB, SATA, and PCIe signaling. Autodetect mSATA support.
Socket #2	Full size. PCIe and USB 2.0 signaling.

Software

Software	
BIOS	Phoenix SecureCore Technology™ UEFI BIOS with OEM enhancements. Field reprogrammable.
Sleep Mode	ACPI 3.0. Supports S3 and S4 suspend states.
Operating Systems	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks.
VersaAPI Support	Library of API calls for reading and controlling on-board devices. Visual Studio and C/C++ software development interfaces. Supported on Windows and Linux.

† Represents operation at +25°C and +12V supply running Windows 10 with LVDS display, SATA, GbE, COM, and USB keyboard/mouse. Typical power computed as the mean value of Idle and Maximum power specifications. Maximum power measured with 90% CPU utilization.

◊ Derate -1.1°C per 305m (1,000 ft.) above 2,300m (7,500 ft.)

* Extended altitude specifications available upon request.

‡ TVS protected port (enhanced ESD protection)

§ Power pins on this port are overload protected

¥ Bootable storage device capability

¤ MIL-STD-202H shock and vibe levels are used to illustrate the extreme ruggedness of this product in general. Testing at higher levels and/or different types of shock or vibration methods can be accommodated per the specific requirements of the application. Contact a VersaLogic Sales Engineer for further information.

Specifications are subject to change without notification. Intel and Atom are trademarks of Intel Corp. microSD is a trademark of SD-3C, LLC. All other trademarks are the property of their respective owners.

Ordering Information

**Call VersaLogic Sales at (503) 747-2261 for more information!**

Model	Processor	Cores	Speed / Boost	RAM	eMMC Flash	Cooling
VL-EPU-4012-EAP-02X-08	Atom E3930	2	1.3 / 1.8 GHz	2 GB ECC	8 GB	Heat Plate
VL-EPU-4012-EDP-08X-00	Atom E3950	4	1.6 / 2.0 GHz	8 GB ECC	none	Heat Plate
VL-EPU-4012-EDP-08X-32	Atom E3950	4	1.6 / 2.0 GHz	8 GB ECC	32 GB	Heat Plate

Accessories

Part Number	Description
Cable Kit	
VL-CKR-BB12	Raven/Owl cable kit. Includes VL-CBR-0702, 1014 (x2), 1604, 2004, 2032, 0809, 4005, HDW-401, and 108
VL-CBR-4005	System I/O paddleboard
VL-CBR-0702	SATA cable – rugged latching, 20"
VL-CBR-1604	Dual Ethernet cable, 16-pin Clik-Mate to 2 RJ-45 – rugged latching, 12"
VL-CBR-2004	I/O screw terminal paddleboard, and cable, Latching, 12"
VL-CBR-2032	miniDisplayPort to VGA adapter, 6"
VL-CBR-0809	Power adapter cable, ATX 12V to 8 pin 12V medium-power. 12"
VL-CBR-1014 x2	RS-232 Dual channel cable 2xDsub (9-pin), Latching, 12"
VL-HDW-108	Mini PCIe / mSATA hardware kit (metric thread) 2.5 mm (10ea)
VL-HDW-401	Thermal compound paste. For heat sink attachment.
Cables	
VL-CBR-0203	2-pin Latching Battery Module, 6"
VL-CBR-0401	ATX to SATA power cable, 6.25"
VL-CBR-0503	USB 2.0 Male A to Male Micro-B Cable, 0.5 m
VL-CBR-0701	SATA cable, 20"
VL-CBR-1015	USB 3.0 Cable, Micro-A plug to Micro-B plug, 1 m, RoHS
VL-CBR-2014	LVDS to VGA adapter board
VL-CBR-2015	24-bit LVDS 1mm Hirose Cable, 20"
VL-CBR-2016	18-bit LVDS cable (JAE), 20"
VL-CBR-2017	LVDS 24-bit 1.25 mm Hirose Cable, 20"
VL-CBR-0404	LED Back Light, 3-pin Pico-Clasp / 4-pin IDE Power to 6-pin 12V, 0.5 m
VL-CBR-2031	miniDisplayPort to MiniDisplayPort, 36"
VL-CBR-2033	miniDisplayPort to HDMI Active Adapter, 6"
Audio	
VL-ADR-01S	USB to Audio Adapter, -25° to +85°C
Solid-State Storage (flash memory)	
VL-F41-xxxx	microSD card (SDIO), SLC, industrial temp.
Hardware	
VL-PS-ATX12-300A	ATX development power supply
VL-HDW-111	Half to Full Size Mini PCIe Adapter kit. Metal adapter and screws (2)
Thermal Options	
VL-HDW-416	Passive Heat Sink. Mounts to heat plate on standard product 95 x 95 x 10.5 mm
VL-HDW-415	12V Cooling fan for optional use with HDW-416 heat sink.
VL-HDW-408	Heat Pipe Connector Plate. Mounts to heat plate on standard product.

Mini PCIe Modules

Part Number	Description	Form Factor
Network		
VL-MPEe-E4E	Gigabit Ethernet over Fiber adapter (PCIe signaling)	Mini PCIe
VL-MPEe-E5E	Gigabit Ethernet adapter (PCIe signaling)	Mini PCIe
VL-MPEe-E6E	Gigabit Ethernet (PCIe signaling)	Mini PCIe
VL-MPEe-E6E-P	Gigabit Ethernet with POE+ (PCIe signaling)	Mini PCIe
VL-MPEu-C1E	Dual CAN Bus Interface (USB signaling)	Mini PCIe
Serial I/O		
VL-MPEe-U2E	Quad serial plus twelve GPIOs (PCIe signaling)	Mini PCIe
Analog & Digital I/O		
VL-MPEe-A1E	Analog input (12-bit resolution) (PCIe signaling)	Mini PCIe
VL-MPEe-A2E	Analog input (16-bit resolution) (PCIe signaling)	Mini PCIe
GPS		
VL-MPEu-G2E	GPS receiver (USB signaling)	Mini PCIe
VL-MPEu-G3E	Advanced GPS receiver (USB signaling)	Mini PCIe
Video		
VL-MPEe-V5E	VGA and LVDS Interface (PCIe signaling)	Mini PCIe
Solid-State Storage (flash memory)		
VL-MPEs-F1Exx	4/16/32/64/128/256 GB mSATA drive (SATA signaling)	Mini PCIe
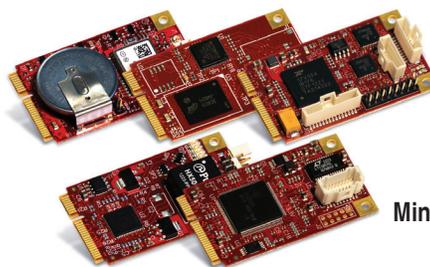
Mini PCIe Modules

Take the Risk out of Embedded Computing

Whether it's selecting the optimum solution for your application, providing expert support during development, or on-time delivery of defect-free products, VersaLogic is here to make sure your project goes smoothly from initial concept through the extended life of your program. Contact VersaLogic today to learn more.

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