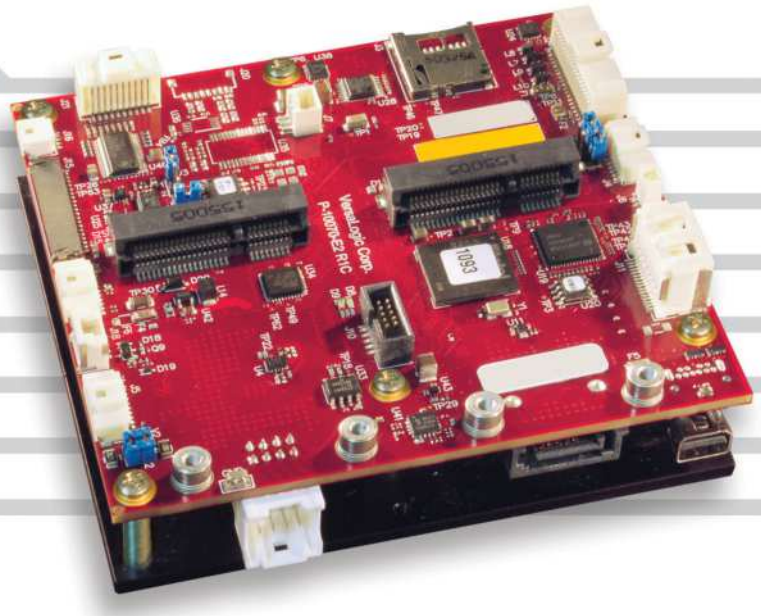
Raven

Embedded Processing Unit



95 x 95 x 27 mm
(3.7 x 3.7 x 1.1″)

Overview

The Raven is a compact, rugged board-level embedded computer. It has been engineered and tested to meet the military and medical industries' evolving requirements to develop smaller, lighter, and lower power embedded systems while adhering to stringent regulatory standards. Approximately four inches square and one inch thick, the Raven is a member of the VersaLogic family of small, light, ultra-rugged embedded x86 computers. This embedded computer, equipped with an Intel Atom E38xx "Bay Trail" processor, is designed to withstand extreme temperature, impact, and vibration.

Available in single-, dual-, and quad-core versions, the Raven provides great performance and I/O features, moderate power consumption (6 to 8W typical depending on model), and a compact package. The Raven provides compatibility with a broad range of standard x86 application development tools for reduced development time.

A wide input voltage range of 8 to 30 volts simplifies system power supply requirements. The Raven is fully compatible with 12 or 24V vehicle applications. In addition, Reverse Voltage Protection, and Over Voltage Protection enhances field durability and reliability.

continued ▸

Highlights

- A complete x86 embedded computer
- -40° to +85°C operating temperature
- Trusted Platform Module (TPM) security chip
- Shock & vibration per MIL-STD-202G
- 4th Generation Intel® Atom™ "Bay Trail" processor
  - E3845 (quad core) or
  - E3827 (dual core) or
  - E3815 (single core)
- Compact (95 x 95 x 27 mm)
- Up to 4 GB DDR3L soldered-on RAM
- Dual Gigabit Ethernet
- DisplayPort++ and LVDS video output
- Dual Mini PCIe Sockets
- USB 3.0 port, USB 2.0 ports
- Serial I/O ports, SATA, Digital I/O
- eMMC Flash. Up to 8 GB
- Analog Inputs (8 chan.)
- Wide input power regulation
  - 8 to 30 volt DC input
  - 12 and 24 volt system compatible
  - Over and reverse-voltage protection
- Fanless versions
- Customization available
- VersaAPI software support

VERSALOGIC CORPORATION

Overview *...continued*

Designed and tested for industrial temperature (-40° to +85°C) operation, the rugged Raven also meets MIL-STD-202G specifications for shock and vibration. Soldered-on RAM and latching SATA, Ethernet, power, and main I/O connectors provide additional ruggedization for use in harsh environments.

Raven is compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks.

Product customization is available, even in low OEM quantities. Options include conformal coating, BGA underfill, BIOS / splash screen configuration, application specific testing, BOM revision locks, custom labeling, etc. ■

Features

1 Wide Range Voltage Input
Accepts 8 to 30 volts DC with OVP, reverse polarity protection, and RF noise filtering.

2 High-performance Video
Integrated Intel Gen 7 graphics core supports DirectX 11, OpenGL 4, and H.264, MPEG-2 encoding/decoding. Mini DisplayPort (2a) and LVDS video outputs (2b). LVDS backlight control (2c).

3 Network
Dual Gigabit Ethernet (GbE). One port with remote boot support.

4 SATA
3 Gb/s SATA port supports bootable SATA hard drive.

5 Mini PCIe Card Sockets
Dual full-sized sockets. Supports A/D, Wi-Fi modems, GPS, MIL-STD-1553, Ethernet, flash data storage with auto-detect mSATA flash storage support, 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 (7b). Four RS-232/422/485 serial ports (7c), three 8254 timer/counters, and I2C support.

8 Analog
On-board data acquisition support. Eight multi-range analog inputs.

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

Intel Atom "Bay Trail" Processor *(not shown)*
Up to 1.9 GHz clock rate. Quad-, dual-, or single-core options. Low power consumption.

Fanless Operation
No moving parts required for CPU cooling in most configurations.

Trusted Platform Module *(not shown)*
On-board TPM security chip can lock out unauthorized hardware and software.

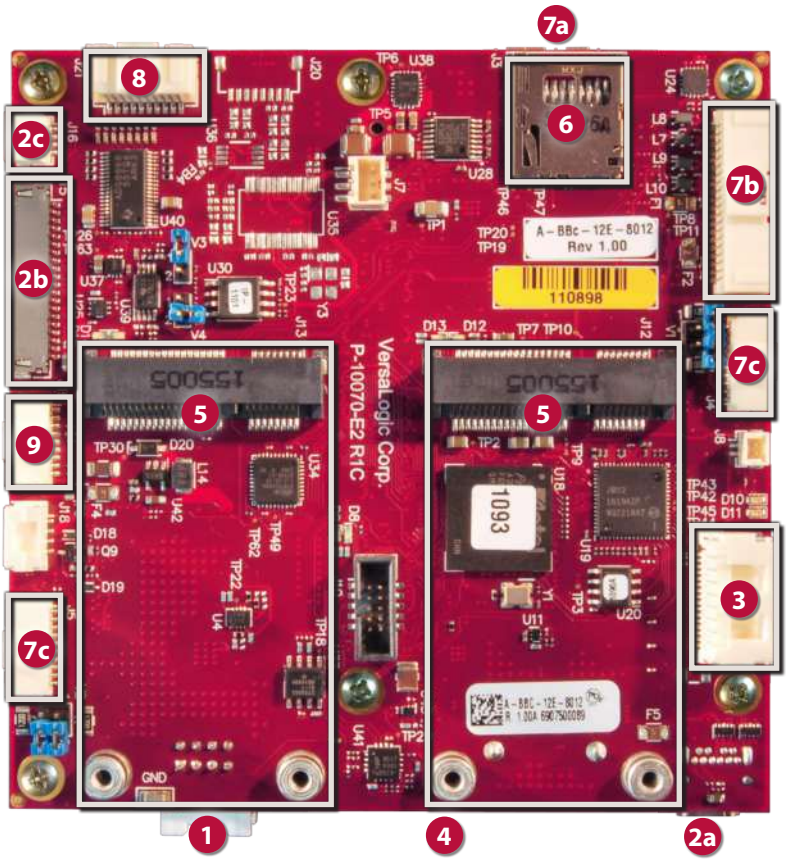
RAM *(not shown)*
Up to 4 GB soldered-down DDR3L RAM.

FLASH *(not shown)*
Up to 8 GB of on-board eMMC flash storage.

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

MIL-STD-202G
Qualified for high shock/vibration environments.

Software Support
Compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks.



Tailor Raven to Your Exact Requirements

Customization options are available in quantities as low as 100 pieces.

- Conformal Coating
- Custom Cabling
- Connector & I/O Changes
- Custom Testing
- Custom Labeling
- BIOS Modifications
- Software and Drivers
- Environmental Screening
- Revision Locks
- Application-Specific Testing
- And more –

Specifications

General	
Board Size	95 x 95 x 27 mm (3.74 x 3.74 x 01.08")
Weight	200 grams (7.05 oz.)
Processor	Intel Atom E38xx platform. 512K 8-way L2 cache per core. Intel 64-bit instructions, Virtualization Technology (VT), and new AES instructions.
Battery	Connection for 3.0V RTC backup battery

Power Requirements (@ +12V) †	*Model*	*Idle*	*Typical*	*Max.*	*S3*
	VL-EPU-3312-EAP	5.8W	6.0W	6.2W	1.1W
	VL-EPU-3312-EBP	6.4W	6.8W	7.2W	1.1W
	VL-EPU-3312-EDP	6.7W	7.8W	8.9W	1.1W

Input Voltage	8V – 30V DC
Input Protections	Over-voltage protection. Self resetting when input falls to a safe level. Reverse voltage input protection to -30V. RF noise filtering (900 MHz, 2.5/5 GHz) – Minimum of 30 dB RF attenuation above 100 MHz. Transient voltage protection (inductive kickback / lightning) clamp at ~+60V / -40V – MSL level 1, per J-STD-020, LF maximum peak of 260 °C
System Reset & Hardware Monitors	All voltage rails monitored. Watchdog timer with programmable timeout. Push-button reset and power.
Regulatory Compliance	RoHS (2011/65/EU)

Environmental				
Thermal Management	Bolt-on heat plate standard. 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-3312 Reference Manual. ** Heat plate must be kept below 90°C			
Airflow Requirements	Refer to the VL-EPM-3312 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	Less than 95%, noncondensing			
Vibration, Sinusoidal Sweep ¤	MIL-STD-202G, Method 204, Modified Condition A: 2g constant acceleration from 5 to 500 Hz, 20 min. per axis			
Vibration, Random ¤	MIL-STD-202G, Method 214A, Condition A: 5.35g rms, 5 min. per axis			
Mechanical Shock ¤	MIL-STD-202G, Method 213B, Condition G: 20g half-sine, 11 ms duration per axis			

Security	
TPM	Intel Trusted Platform Module 1.2 device. Atmel – AT97SC3204-U2MA-10

Memory	
System RAM	2 GB or 4 GB of soldered-on DDR3L SDRAM.

Video	
General	Integrated high-performance video. Intel Gen-7 graphics core with 4 Execution Units and Turbo Boost. Supports DirectX 11, OpenGL 4, VP8, MPEG2, H.264, and VC1.
VRAM	Up to 224 MB shared DRAM
DisplayPort Interface §	Mini DisplayPort++ output. 24-bit. Up to 2560 x 1600. Supports DisplayPort and HDMI signaling (Video and Audio outputs).
OEM Flat Panel Interface	Single-channel LVDS interface. 18/24-bit. Up to 1024 x 768 (60 Hz). Backlight control signals.

Mass Storage	
Rotating Drive ¥	One SATA 3 Gb/s port. Latching SATA connector.
Flash / Solid-State Drives ¥	On-board eMMC MLC Flash drive. 0 to 8 GB
	One microSD socket. Bootable
	Mini PCIe socket with mSATA support

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

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

Software	
BIOS	AMI Aptio UEFI BIOS with OEM enhancements. Field reprogrammable.
Sleep Mode	ACPI 3.0. Support for S3 suspend state.
Operating Systems	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks

† Represents operation at +25°C and +12V supply running Windows 7 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 95% 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-202G 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 VersaLogic Sales 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	RAM	eMMC Flash	Cooling
VL-EPU-3312-EAP	E3815	1	1.46 GHz	2 GB	None	Heat plate
VL-EPU-3312-EBP	E3827	2	1.75 GHz	2 GB	4 GB	Heat plate
VL-EPU-3312-EDP	E3845	4	1.91 GHz	4 GB	8 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, 12V medium-power. ATX12 to Raven. 12"
VL-CBR-1014 x2	RS232 Dual channel cable 2xDsub (9-pin), Latching, 12"
VL-HDW-401	Thermal compound paste. For heat sink attachment.
VL-HDW-108	Mini PCIe/mSATA hardware kit (metric thread) 2.5 mm (10ea)
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-0901	Pico-Clasp to Dual SPX Cable, 9-pin. 9"
VL-CBR-1015	USB 3.0 Micro A plug to 3.0 Micro B plug, 1 m
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
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-E5E	Dual Gigabit Ethernet adapter	Mini PCIe
VL-MPEe-E4E	Gigabit Ethernet over Fiber adapter	Mini PCIe
VL-MPEe-E3E	Gigabit Ethernet adapter	Mini PCIe
VL-MPEe-FW1E	FireWire adapter	Mini PCIe
Serial I/O		
VL-MPEe-U2E	Quad serial plus twelve GPIOs	Mini PCIe
Analog & Digital I/O		
VL-MPEe-A1E	Analog input (12-bit resolution)	Mini PCIe
VL-MPEe-A2E	Analog input (16-bit resolution)	Mini PCIe
GPS		
VL-MPEu-G2E	GPS receiver	Mini PCIe
VL-MPEu-G3E	Advanced GPS receiver	Mini PCIe
Video		
VL-MPEe-V5E	VGA and LVDS Interface	Mini PCIe
Solid-State Storage (flash memory)		
VL-MPEs-F1Exx	mSATA module (4/16/32 GB) (SATA)	Mini PCIe
Adapters		
VL-MPEs-S3E	SATA adapter	Mini PCIe



Mini PCIe Modules

Take the Risk out of Embedded Computing

Whether it's selecting the optimum solution for your application, lending expertise 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 us today to learn more.

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