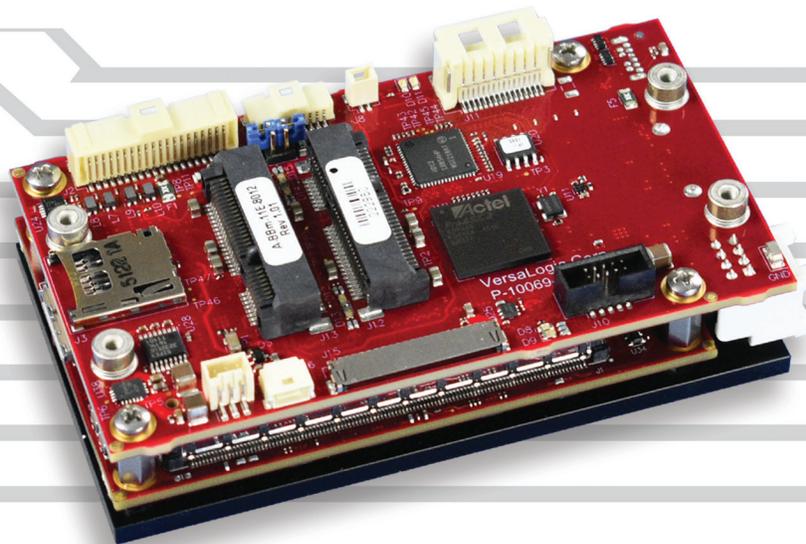


# Harrier

## Embedded Processing Unit



Actual Size  
55 x 95 x 29 mm  
(2.17 x 3.74 x 1.14")

## Overview

The Harrier is an extremely small and rugged SWaP-optimized embedded computer. It has been engineered and tested to meet the industries' need for smaller, lighter, and lower power embedded systems. Slightly larger than a credit card and one inch thick, the Harrier is a member of VersaLogic's small, ultra-rugged embedded x86 computers. Equipped with a powerful dual- or quad-core Intel "Apollo Lake" processor and soldered-on ECC RAM, the Harrier 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 with cosmic ray interactions which increase dramatically with altitude.

A TPM 2.0 chip is included for hardware-based security.

On-board I/O includes dual Gigabit Ethernet, one USB 3.0 and four USB 2.0 ports, and two serial ports. SATA interface, eMMC Flash options, and a microSD socket provide a range of data storage options. Dual Mini PCIe sockets accommodate plug-in A/D, Wi-Fi modems, GPS receivers, MIL-STD-1553, Ethernet, Firewire, and other mini cards.

The Harrier is designed and tested for full industrial temperature (-40° to +85°C) operation and meets MIL-STD-202H specifications for shock and vibration. It also features on-board power conditioning for dependable operation from nominal 12V sources.

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

## Highlights

- Error-correcting memory (up to 8 GB)
- Very small (55 x 95 x 29 mm)
- TPM 2.0 security chip
- -40° to +85°C Operating Temperature
- Wide Input Voltage Range (8 to 17 volts)
- Dual- or quad-core Intel® Atom™ Apollo Lake processor

# Features

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

Accepts 8 to 17 volts (12V typical).

**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 drives.

**5 Mini PCIe Card Sockets**

Full-**(5a)** and half-**(5b)** size sockets. Supports 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 on back)** 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.

**8 Serial Communications**

Two RS-232/422/485 serial ports.

**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 (ECC) soldered-down RAM enhances system reliability.

**FLASH**

Up to 32 GB of on-board eMMC flash storage.

**Industrial Temperature Operation**

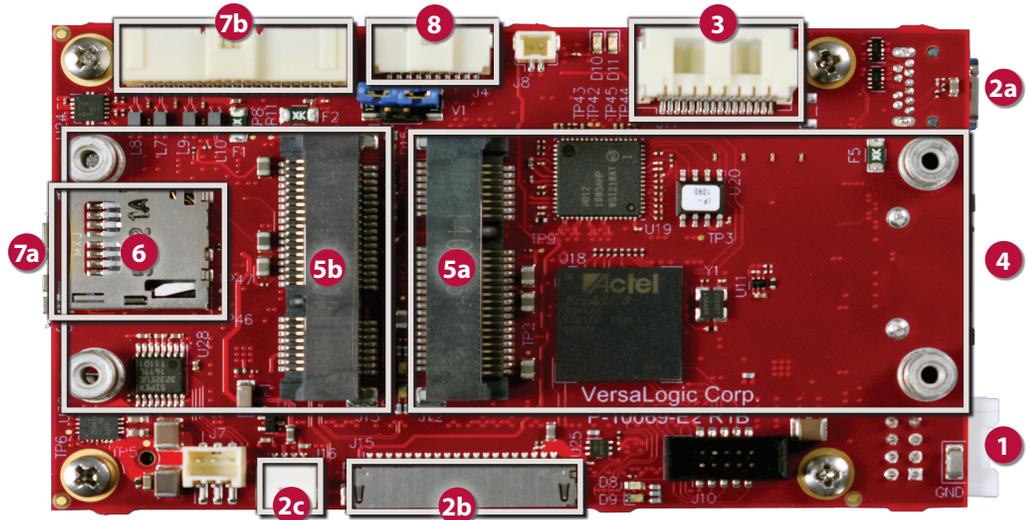
-40° to +85°C operation for harsh environments.

**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 Harrier 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

<b>General</b>					
<b>Board Size</b>	55 x 95 x 29 mm (2.17 x 3.74 x 1.14")				
<b>Weight</b>	140 grams (4.93 oz.)				
<b>Processor</b>	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.				
<b>Battery</b>	Connection for 3.0V RTC backup battery. Not required for operation.				
<b>Power Requirements (@ +12V) †</b>	<i>Model</i>	<i>Idle</i>	<i>Typical</i>	<i>Max.</i>	<i>S3</i>
	EPU-4011-EAP-02X-08	6.4 W	8.1 W	9.8 W	1.4 W
	EPU-4011-EDP-08X-00	6.2 W	9.3 W	12.4 W	1.6 W
	EPU-4011-EDP-08X-32	7.0 W	10.1 W	13.2 W	1.7 W
<b>Input Voltage</b>	8V–17V (nominal 12V operation)				
<b>System Reset &amp; Hardware Monitors</b>	Voltage rail monitoring. Watchdog timer with programmable timeout. Push-button sleep, reset, and power.				
<b>Regulatory Compliance</b>	RoHS (EU 2015/863), Conflict Minerals compliant.				

<b>Environmental</b>				
<b>Thermal Management</b>	Bolt-on heat plate standard. Optional heat sink, fan, heat pipe, and other thermal accessories available.			
<b>Operating Temperature</b> ◊	<i>Model</i>	<i>HeatPlate**</i>	<i>HeatSink</i>	<i>HeatSink + Fan</i>
	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-4011 Reference Manual. ** Heat plate must be kept below 90°C			
<b>Airflow Requirements</b>	Refer to the VL-EPU-4011 Reference Manual for detailed airflow requirements.			
<b>Storage Temperature</b>	-40° to +85°C			
<b>Altitude*</b>	Operating	To 4,570m (15,000 ft.)		
	Storage	To 12,000m (40,000 ft.)		
<b>Thermal Shock</b>	5°C/min. over operating temperature			
<b>Humidity</b>	Mil-STD-202H method 103 – Humidity steady state			
<b>Vibration, Sinusoidal Sweep</b> □	MIL-STD-202H method MIL-STD-202-204, Condition A: 2g			
<b>Vibration, Random</b> □	MIL-STD-202H method MIL-STD-202-214, Condition A: 5.35g rms			
<b>Mechanical Shock</b> □	MIL-STD-202H method MIL-STD-202-213, Condition G: 20g half-sine			

<b>Security</b>	
<b>TPM</b>	Trusted Platform Module 2.0 device for hardware security

† Represents operation at +25°C and +12V supply running Windows 10 with DisplayPort monitor display, SATA SSD, GbE, two COM in loopback, and USB keyboard/mouse, running Passmark V9 burn-in test. 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 vbe 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.

<b>Memory</b>	
<b>System RAM</b>	2 GB or 8 GB of soldered-on ECC DDR3L SDRAM

<b>Video</b>	
<b>General</b>	Integrated high-performance video. Intel HD Graphics 505 with 18 Execution Units (EPU-4011-EDP) or Intel HD Graphics 500 with 12 Execution Units (EPU-4011-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.

<b>VRAM</b>	Up to 2 GB shared DRAM
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<b>DisplayPort Interface</b> §	Mini DisplayPort++ output. 24-bit. Up to 4096 x 2160 @ 60 Hz. Supports DisplayPort and HDMI signaling (Video and Audio outputs).
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<b>OEM Flat Panel Interface</b>	Single-channel LVDS interface. 18/24-bit. Up to 1200 x 800 (60 Hz).
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<b>Mass Storage</b>	
<b>Rotating Drives / Flash / SSD</b> ¥	<ul style="list-style-type: none"> <li>One SATA III (6Gbps) port. Latching connector</li> <li>On-board eMMC MLC Flash drive. 0, 8, or 32 GB</li> <li>One microSD socket</li> <li>Mini PCIe socket with mSATA support</li> </ul>

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

<b>Device I/O</b>	
<b>USB</b> ‡§	One USB 3.0 / 2.0 port and four USB 2.0 host ports
<b>COM 1 / 2 Interface</b> ‡	RS-232/422/485 selectable. 16C550 compatible. RS-232 115 Kbps – RS-422/485 460 Kbps max.
<b>Digital I/O</b>	Eight TTL I/O Lines 3.3V. Independently configurable.
<b>I2C</b>	Single I2C interface
<b>Counter / Timers</b>	Three 8254 compatible Programmable Interval Timers (PITs).

<b>Mini PCIe Card Socket</b>	
<b>Full size</b>	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.
<b>Half size</b>	PCIe and USB 2.0 signaling

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

## Ordering Information

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

Model	Processor	Cores	Speed / Boost	RAM	eMMC Flash	Cooling
VL-EPU-4011-EAP-02X-08	Atom E3930	2	1.3/1.8 GHz	2 GB ECC	8 GB	Heat Plate
VL-EPU-4011-EDP-08X-00	Atom E3950	4	1.6/2.0 GHz	8 GB ECC	none	Heat Plate
VL-EPU-4011-EDP-08X-32	Atom E3950	4	1.6/2.0 GHz	8 GB ECC	32 GB	Heat Plate

## Accessories

Part Number	Description
<b>Cable Kit</b>	
VL-CKR-BB11	Osprey/Harrier cable kit. Includes CBR-0702, 1014, 1604, 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-2032	miniDisplayPort to VGA adapter, 6"
VL-CBR-0809	Power adapter cable, ATX 12V to 8 pin 12V medium-power. 12"
VL-CBR-1014	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.
<b>Cables</b>	
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"
<b>Audio</b>	
VL-ADR-01S	USB to Audio Adapter, -25° to +85°C
<b>Solid-State Storage (flash memory)</b>	
VL-F41-xxxx	microSD card (SDIO), SLC, industrial temp.
<b>Hardware</b>	
VL-PS-ATX12-300A	ATX development power supply
VL-HDW-111	Half to Full Size Mini PCIe Adapter kit. Metal adapter and screws (2)
<b>Thermal Options</b>	
VL-HDW-406	Passive Heat Sink. Mounts to heat plate on standard product.
VL-HDW-411	12V Cooling fan for optional use with HDW-406 heat sink.
VL-HDW-405	Mounting Adaptor Plate - Flat. 75 x 84 mm. Simplifies installation in many situations. Attaches to heat plate on standard product.
VL-HDW-408	Heat Pipe Connector Plate. Mounts to heat plate on standard product.

## Mini PCIe Modules

Part Number	Description	Form Factor
<b>Network</b>		
VL-MPEe-E4E	Gigabit Ethernet over Fiber adapter (PCIe signaling)	Mini PCIe
VL-MPEe-E5E	Dual 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
<b>Serial I/O</b>		
VL-MPEe-U2E	Quad serial plus twelve GPIOs	Mini PCIe
<b>Analog &amp; Digital I/O</b>		
VL-MPEe-A1E	Analog input (12-bit resolution) (PCIe signaling)	Mini PCIe
VL-MPEe-A2E	Analog input (16-bit resolution) (PCIe signaling)	Mini PCIe
<b>GPS</b>		
VL-MPEu-G2E	GPS receiver (USB signaling)	Mini PCIe
VL-MPEu-G3E	Advanced GPS receiver (USB signaling)	Mini PCIe
<b>Video</b>		
VL-MPEe-V5E	VGA and LVDS Interface (PCIe signaling)	Mini PCIe
<b>Solid-State Storage (flash memory)</b>		
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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