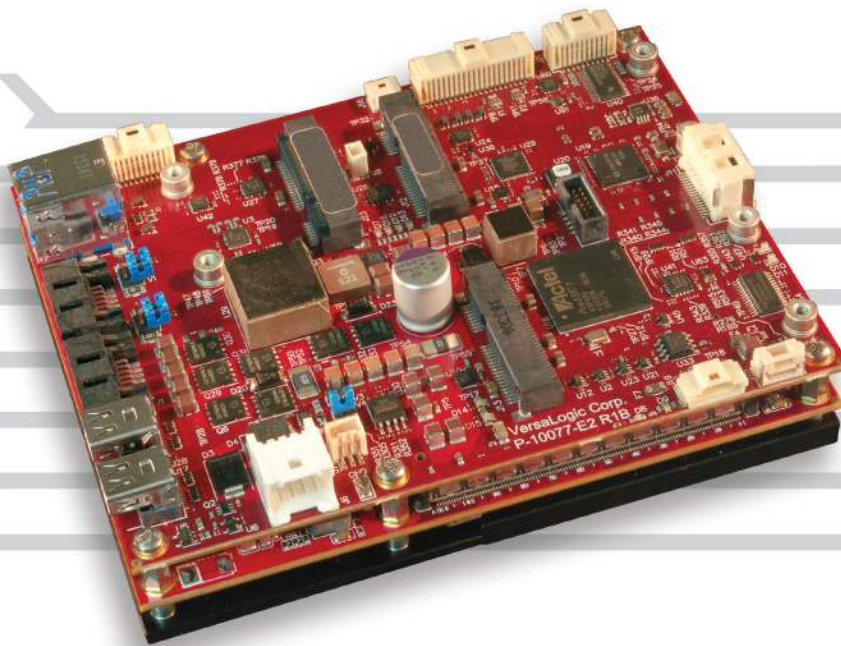


# Blackbird

## Embedded Processing Unit



95 x 125 x 37 mm  
(3.7 x 4.9 x 1.5")

### Overview

The Blackbird is a compact, rugged x86 type 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. The Blackbird is a member of the VersaLogic family of ultra-rugged EPU embedded computers. Using fully integrated COM components, the Blackbird is supplied fully assembled and tested, including heat plate, ready to install in a system. In addition to providing a very compact footprint, it is designed to withstand extreme temperature, impact, and vibration.

The Skylake processor options feature quad- and dual-core CPUs along with Hyper-Threading logic allowing up to 8 simultaneous threads to be executed. The Blackbird provides great performance and I/O features, moderate power consumption (15 to 22 W typical depending on model), and a compact package. The Blackbird provides compatibility with a broad range of standard x86 application development tools for reduced development time.

The on-board Power Management Unit greatly simplifies system power supply requirements. It features a wide input voltage range of 8 to 30 volts so it is fully compatible with 12 or 24V vehicle applications. It also includes reverse voltage protection,

*continued* ▶

### Highlights

- -40° to +85°C operating temperature models
- Trusted Platform Module (TPM) security chip
- Shock & vibration per MIL-STD-202G
- 6th Generation Intel® Core™ “Skylake” processor
  - i7-6822EQ (quad core) or
  - i5-6442EQ (quad core) or
  - i5-6300U (dual core) or
  - i3-6100U (dual core)
- On-board Power Management
  - 8 to 30 volt DC input (12 and 24 volt system compatible)
  - Over- and reverse-voltage protection
  - RF noise filtering
  - Transient voltage protection
- A complete x86 embedded computer
- COM Basic size: (95 x 125 x 37 mm)
- Up to 32 GB DDR4 RAM
- Two Gigabit Ethernet
- Two mini DisplayPort and LVDS video outputs
- Three Mini PCIe Sockets
- Two USB 3.0 port, four USB 2.0 ports
- Serial I/O ports, SATA, Digital I/O
- Analog Inputs (8 chan.)
- Analog Outputs (4 chan.)
- HD Audio
- Customization available
- VersaAPI software support

# Overview *...continued*

over voltage protection, RF noise filtering, and transient voltage protection, to provide enhanced durability and reliability in the field.

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

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

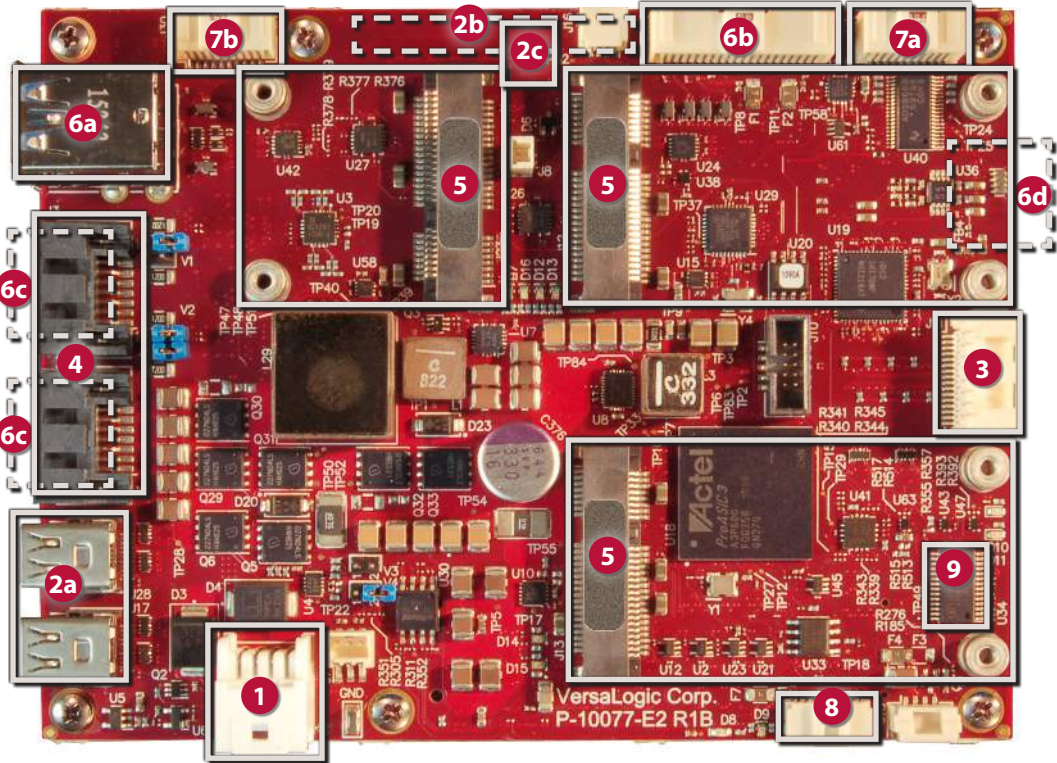
COTS modifications are available, even in low OEM quantities. Modifications include conformal coating, BIOS / splash screen configuration, application specific testing, BOM revision locks, custom labeling, etc. ■

## Features

- 1 On-board Power Management**  
Accepts 8 to 30 volts DC, and provides OVP, reverse polarity protection, RF noise filtering, and transient voltage suppression.
- 2 High-performance Video**  
Integrated Intel HD Graphics Gen 9 core supports DirectX 12, OpenGL 4.4, and H.264, MPEG-2 encoding/decoding. Two Mini DisplayPorts (2a) and a dual-channel LVDS video output (2b on back side). LVDS backlight control (2c).
- 3 Network**  
Two Gigabit Ethernet (GbE) ports. One port with remote boot support.
- 4 SATA**  
Two 6 Gb/s SATA ports support bootable SATA hard drives.
- 5 Mini PCIe Card Sockets**  
Two full- and one half-sized sockets. Supports Wi-Fi modems, GPS, MIL-STD-1553, Ethernet, flash data storage with auto-detect mSATA flash storage support, and other mini PCIe modules.
- 6 Industrial I/O**  
Two USB 3.0 ports (6a) and four USB 2.0 ports (6b) support keyboard, mouse, and other devices.  
  
Four RS-232/422/485 serial ports (6c on back side), three 8254 timer/counters, I2C support, and audio output (6d on back side).
- 7 Analog + Digital I/O**  
On-board data acquisition support. Eight multi-range analog inputs, four analog outputs (7a), and twenty four 3.3V digital I/O lines (7b).
- 8 SPI Interface**  
Supports SPI and SPX devices, including low cost analog and digital modules.
- 9 Trusted Platform Module**  
On-board TPM security chip can lock out unauthorized hardware and software.

- Intel Core “Skylake” Processor**  
*(not shown)*  
Up to 2.6 GHz clock rate. Quad- and dual-core options.
- RAM** *(not shown)*  
Up to 32 GB DDR4 RAM.
- 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 Blackbird to Your Exact Requirements

COTS modifications 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

<b>General</b>				
<b>Board Size</b>	95 x 125 x 37 mm (3.74 x 4.92 x 1.45")			
<b>Weight</b>	378 grams (13.33 oz.)			
<b>Processor</b>	Intel 6th Gen Core platform. 8 MB SmartCache. Intel 64-bit instructions, Hyper-Threading, Virtualization Technology (VT), SpeedStep Technology, and AES New Instructions.			
<b>Battery</b>	Connection for 3.0V RTC backup battery			
<b>Power Requirements (@ +12V) †</b>	<i>Model</i>	<i>Idle</i>	<i>Typical</i>	<i>Max.</i>
	VL-EPU-4462-xAP-08	7.7W	15.3W	23.0W
	VL-EPU-4462-xBP-16	7.4W	15.6W	23.8W
	VL-EPU-4462-xCP-16	7.8W	16.2W	24.2W
	VL-EPU-4562-xBP-16	12.0W	21.0W	30.0W
	VL-EPU-4562-xCP-16	12.0W	21.6W	31.2W
VL-EPU-4562-xCP-32	12.0W	22.2W	32.4W	
<b>Input Voltage</b>	8V – 30V DC			
<b>Input Protections</b>	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			
<b>System Reset &amp; Hardware Monitors</b>	All voltage rails monitored. Watchdog timer with programmable timeout. Push-button sleep, reset, and power.			
<b>Regulatory Compliance</b>	RoHS (2011/65/EU)			
<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>Heat Plate**</i>	<i>Heat Sink</i>	<i>Heat Sink + Fan</i>
	EPU-4x62-E	-40° to +85°C	-40° to +85°C	-40° to +85°C
	EPU-4x62-S	0° to +60°C	0° to +60°C	0° to +60°C
	Ranges shown assume 90% CPU utilization. For detailed thermal information and exceptions, refer to the VL-EPU-4562 Reference Manual. ** Heat plate must be kept below 90°C			
<b>Airflow Requirements</b>	Refer to the VL-EPU-4462/4562 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>	Less than 95%, noncondensing			
<b>Vibration, Sinusoidal Sweep</b> □	MIL-STD-202G, Method 204, Modified Condition A: 2g constant acceleration from 5 to 500 Hz, 20 min. per axis			
<b>Vibration, Random</b> □	MIL-STD-202G, Method 214A, Condition A: 5.35g rms, 5 min. per axis			
<b>Mechanical Shock</b> □	MIL-STD-202G, Method 213B, Condition G: 20g half-sine, 11 ms duration per axis			
<b>Security</b>				
<b>TPM</b>	Intel Trusted Platform Module 2.0 device.			

† 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 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

<b>Memory</b>		
<b>System RAM</b>	Up to 32 GB DDR4 SDRAM.	
<b>Video</b>		
<b>General</b>	Integrated high-performance video. Intel HD 520 and 530 - Gen-9 compute architecture, 24 execution units, and GPU Turbo Boost. Supports 3 independent displays. Supports DirectX 12, OpenGL 4.4, OpenCL 2.0.	
<b>Hardware Based Acceleration</b>	Decode and Encode of JPEG, MJPEG, MPEG2, AVC, MVC, HEVC 8-bit, VC-1, VP8, VP9	
<b>DisplayPort Interface</b> §	Two Mini DisplayPort++ outputs. 24-bit. Up to 4096 x 2160 at 60 Hz.	
<b>OEM Flat Panel Interface</b>	Dual-channel LVDS interface. 18/24-bit. Up to 1920 x 1200. Backlight control signals.	
<b>Mass Storage</b>		
<b>Rotating Drive</b> ¥	Two SATA 6 Gb/s ports. Latching SATA connectors.	
<b>Flash / SSD</b> ¥	Mini PCIe socket with mSATA support	
<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> ‡§	Two USB 3.0 / 2.0 ports and four USB 2.0 host ports	
<b>COM Interface</b> ‡	Four RS-232/422/485 selectable. 16C550 compatible. 1 Mbps max.	
<b>Digital I/O</b>	Twenty four TTL I/O Lines 3.3V. Independently configurable.	
<b>Analog Input</b>	Eight channels. 12-bit. Single-ended. 500 Ksps. Independently configurable +/- 0.64V to +/- 10.24V high input impedance inputs	
<b>Analog Output</b>	Four channels. 12-bit single-ended. 100 Ksps.	
<b>I2C</b>	Single I2C interface	
<b>Counter / Timers</b>	Three 8254 compatible Programmable Interval Timers (PITs).	
<b>Audio Input / Output</b>	<i>Connector</i>	<i>Signal Characteristics</i>
	Line Input - Latching	10 kΩ minimum
	Line Output - Latching	600 Ω (to drive a 10 kΩ load)
<b>VersaLogic SPI Interface</b>	Supports SPI and SPX devices. Supports up to two SPX modules.	
<b>Mini PCIe Card Socket</b>		
<b>Full size Socket #1</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>Full size Socket #2</b>	PCIe and USB 2.0 signaling	
<b>Half size Socket #3</b>	PCIe and USB 2.0 signaling	
<b>Software</b>		
<b>BIOS</b>	AMI Aptio UEFI BIOS with OEM enhancements. Field reprogrammable	
<b>Sleep Mode</b>	ACPI 3.0. Support for S3 suspend and S4 hibernate states.	
<b>Operating Systems</b>	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks	

□ MIL-STD-202G 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 VersaLogic Sales for further information.

Specifications are subject to change without notification. Intel and Core are trademarks of Intel Corp. All other trademarks are the property of their respective owners.



## Ordering Information

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

Model	Operating Temp.†	Processor	Cores	Hyper-Threads / Threading	CPU Clock / Turbo Speed	Graphics Core	Graphics Base Clock / Max Dynamic Speed	Memory	Cooling
VL-EPU-4462-SAP-08	0° to +60°C	i3-6100U	2	Yes / 4	2.3 GHz / NA	HD 520	300 MHz / 1.0 GHz	8 GB	Heat plate
VL-EPU-4462-SBP-16	0° to +60°C	i5-6300U	2	Yes / 4	2.4 / 3.0 GHz	HD 520	300 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4462-SCP-16 **	0° to +60°C	i7-6600U	2	Yes / 4	2.6 / 3.4 GHz	HD 520	300 MHz / 1.05 GHz	16 GB	Heat plate
VL-EPU-4562-SBP-16	0° to +60°C	i5-6442EQ	4	No / 4	1.9 GHz / 2.7 GHz	HD 530	350 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4562-SCP-16	0° to +60°C	i7-6822EQ	4	Yes / 8	2.0 GHz / 2.8 GHz	HD 530	350 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4562-SCP-32	0° to +60°C	i7-6822EQ	4	Yes / 8	2.0 GHz / 2.8 GHz	HD 530	350 MHz / 1.0 GHz	32 GB	Heat plate
VL-EPU-4462-EAP-08	-40° to +85°C	i3-6100U	2	Yes / 4	2.3 GHz / NA	HD 520	300 MHz / 1.0 GHz	8 GB	Heat plate
VL-EPU-4462-EBP-16	-40° to +85°C	i5-6300U	2	Yes / 4	2.4 / 3.0 GHz	HD 520	300 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4462-ECP-16 **	-40° to +85°C	i7-6600U	2	Yes / 4	2.6 / 3.4 GHz	HD 520	300 MHz / 1.05 GHz	16 GB	Heat plate
VL-EPU-4562-EBP-16	-40° to +85°C	i5-6442EQ	4	No / 4	1.9 GHz / 2.7 GHz	HD 530	350 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4562-ECP-16	-40° to +85°C	i7-6822EQ	4	Yes / 8	2.0 GHz / 2.8 GHz	HD 530	350 MHz / 1.0 GHz	16 GB	Heat plate
VL-EPU-4562-ECP-32	-40° to +85°C	i7-6822EQ	4	Yes / 8	2.0 GHz / 2.8 GHz	HD 530	350 MHz / 1.0 GHz	32 GB	Heat plate

\*\* Special order product. Contact VersaLogic Sales for minimum order quantities and lead time.

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

## Ordering Information

Part Number	Description
<b>Cable Kit</b>	
VL-CKR-BLACKBIRD	BLACKBIRD cable kit. Includes VL-CBR-4005, 1014 (x2), 0702, 1604, 2004, 2005, 2032, 0809, 0810, 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	Analog I/O cable and paddleboard, 1mm 20-pin, 12"
VL-CBR-2005	Digital I/O cable and paddleboard, 1mm 20-pin, 12"
VL-CBR-2032	miniDisplayPort to VGA adapter, 6"
VL-CBR-0809	Power adapter cable, 12V medium-power. ATX12 to Blackbird. 12"
VL-CBR-0810	Stereo Audio Cable, 8-pin Pico-Clasp to 3.5mm Jacks, 0.5m
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)
<b>Cables</b>	
VL-CBR-0203	2-pin Latching Battery Module, 6"
VL-CBR-0401	ATX to SATA power cable, 6.25"
VL-CBR-0404	LED Back Light, 3-pin Pico-Clasp / 4-pin IDE Power to 6-pin 12V, 500mm
VL-CBR-0503	USB 2.0 Male A to Male Micro-B Cable, 0.5 m
VL-CBR-0901	Pico-Clasp to Dual SPX Cable, 9-pin. 9"
VL-CBR-2014	LVDS to VGA adapter board
VL-CBR-2031	miniDisplayPort to miniDisplayPort, 36"
VL-CBR-2033	miniDisplayPort to HDMI active adapter, 6"
VL-CBR-3001	20" 2-Ch LVDS 30-pin JAE to 30-pin JAE, RoHS
VL-CBR-3002	20" 1-Ch LVDS 30-pin JAE to 1.25mm 20-pin Hirose, RoHS
VL-CBR-3003	20" 1-Ch LVDS 30-pin JAE to 20-pin JAE, RoHS
<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-417	Passive Heat Sink. Mounts to heat plate on standard product 95 x 125 x 15 mm
VL-HDW-418	12V Cooling fan for optional use with HDW-417 heat sink.

## Expansion Modules

Part Number	Description	Form Factor
<b>Network</b>		
VL-MPEe-E3E	Gigabit Ethernet adapter	Mini PCIe
VL-MPEe-FW1E	FireWire adapter	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)	Mini PCIe
VL-MPEe-A2E	Analog input (16-bit resolution)	Mini PCIe
VL-SPX-1	Analog Input Module 8-Channels	SPX
VL-SPX-2	Digital I/O Module 16-lines	SPX
VL-SPX-4	Analog Output Module 4-channels 12-bit	SPX
VL-SPX-5	Solid State Switch Module 8-channel	SPX
<b>GPS</b>		
VL-MPEu-G2E	GPS receiver	Mini PCIe
<b>Video</b>		
VL-MPEe-V5E	VGA and LVDS Interface	Mini PCIe
<b>Solid-State Storage (flash memory)</b>		
VL-MPEs-F1Exx	mSATA module (4/16/32 GB)	Mini PCIe
<b>Adapters</b>		
VL-MPEs-S3E	SATA adapter	Mini PCIe

### 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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