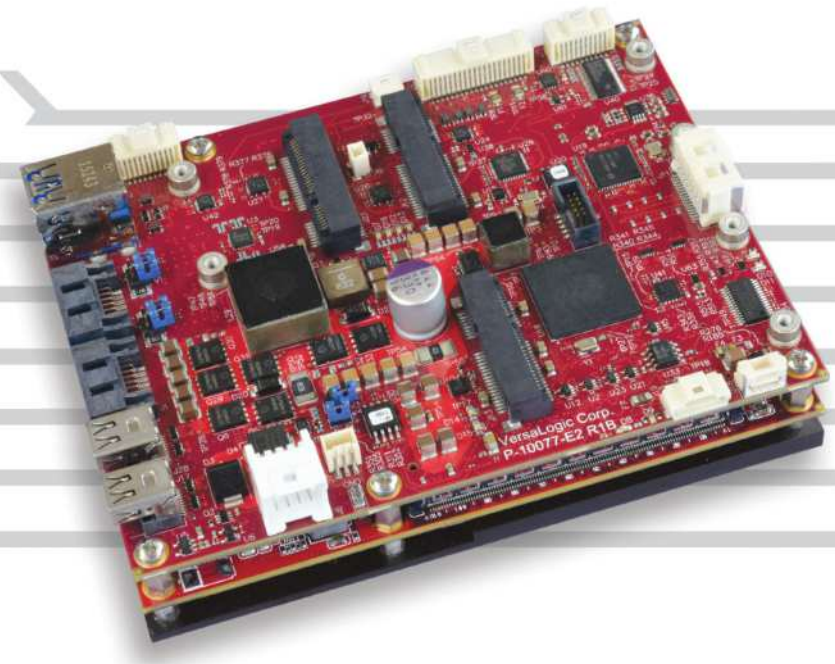
Blackbird

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

VERSALOGIC CORPORATION

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.

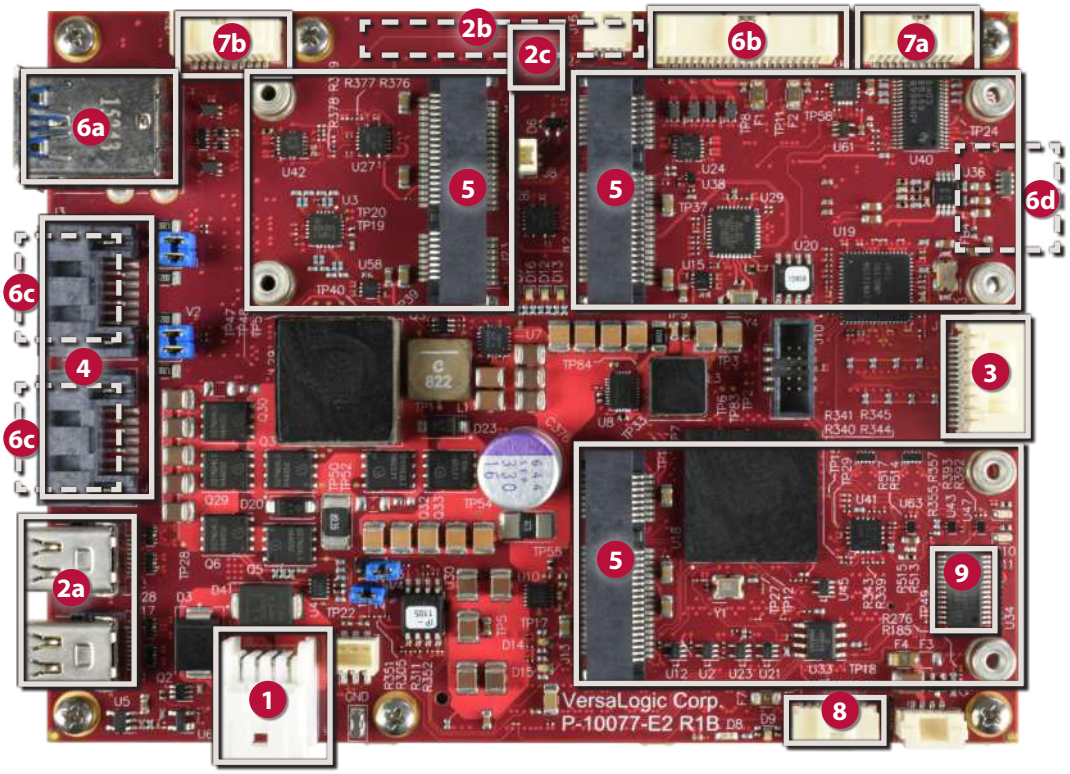
Intel Core "Skylake" Processor *(not shown)*
Up to 2.6 GHz clock rate. Quad- and dual-core options.

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

General	
Board Size	95 x 125 x 37 mm (3.74 x 4.92 x 1.45")
Weight	378 grams (13.33 oz.)
Processor	Intel 6th Gen Core platform. 8 MB SmartCache. Intel 64-bit instructions, Hyper-Threading, Virtualization Technology (VT), SpeedStep Technology, and AES New Instructions.
Battery	Connection for 3.0V RTC backup battery

Power Requirements (@ +12V) †	*Model*	*Idle*	*Typical*	*Max.*
	VL-EPU-4462-xAP-08	7.7W	15.3W	23.0W
	VL-EPU-4462-xBP-16	7.4W	15.6W	23.8W
	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

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 sleep, reset, and power.
Regulatory Compliance	RoHS (EU 2015/863), Conflict Minerals compliant.

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 or Heat Pipe Adapter*
	EPU-4x62-E	-40° to +85°C	-40° to +85°C	-40° to +85°C
	EPU-4562-W	-20° to +70°C	-20° to +70°C	-20° to +70°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 (80°C for EPU-4562-ECP)			
Airflow Requirements	Refer to the VL-EPU-4462/4562 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 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

Memory	
System RAM	Up to 32 GB DDR4 SDRAM.

Video	
General	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.
Hardware Based Acceleration	Decode and Encode of JPEG, MJPEG, MPEG2, AVC, MVC, HEVC 8-bit, VC-1, VP8, VP9
DisplayPort Interface §	Two Mini DisplayPort++ outputs. 24-bit. Up to 4096 x 2160 at 60 Hz.
OEM Flat Panel Interface	Dual-channel LVDS interface. 18/24-bit. Up to 1920 x 1200. Backlight control signals.

Mass Storage	
Rotating Drive ¥	Two SATA 6 Gb/s ports. Latching SATA connectors.
Flash / SSD ¥	Mini PCIe socket with mSATA support

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

Device I/O		
USB ‡§	Two USB 3.0 / 2.0 ports and four USB 2.0 host ports	
COM Interface ‡	Four RS-232/422/485 selectable. 16C550 compatible. 1 Mbps max.	
Digital I/O	Twenty four 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	
Analog Output	Four channels. 12-bit single-ended. 100 ksps.	
I2C	Single I2C interface	
Counter / Timers	Three 8254 compatible Programmable Interval Timers (PITs).	
Audio Input / Output	*Connector*	*Signal Characteristics*
	Line Input - Latching	10 kΩ minimum
	Line Output - Latching	600 Ω (to drive a 10 kΩ load)
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
Half size Socket #3	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 and S4 hibernate states.
Operating Systems	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks

¤ 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 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-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-4562-WCP-16	-20° to +70°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-WCP-32	-20° to +70°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-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

† Final operating temperature is dependent on the customer thermal solution

Accessories

Part Number	Description
Cable Kit	
VL-CKR-BLACKBIRD	BLACKBIRD Eval. 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)
Cables	
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
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-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.
VL-HDW-423	Heat Pipe Adapter Plate

Expansion Modules

Part Number	Description	Form Factor
Network		
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 adapter (PCIe signaling)	Mini PCIe
VL-MPEe-E6E-P	Gigabit Ethernet with PoE+ adapter (PCIe signaling)	Mini PCIe
VL-MPEe-FW1E	FireWire adapter (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
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
GPS		
VL-MPEu-G2E	GPS receiver (USB signaling)	Mini PCIe
VL-MPEu-G3E	Advanced GPS receiver (USB signaling)	Mini PCIe
Solid-State Storage (flash memory)		
VL-MPEs-F1Exx	mSATA module (4/16/32 GB) (SATA signaling)	Mini PCIe
Adapters		
VL-MPEs-S3E	SATA adapter (SATA signaling)	Mini PCIe
Video		
VL-MPEe-V5E	VGA and LVDS Interface (PCIe signaling)	Mini PCIe

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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