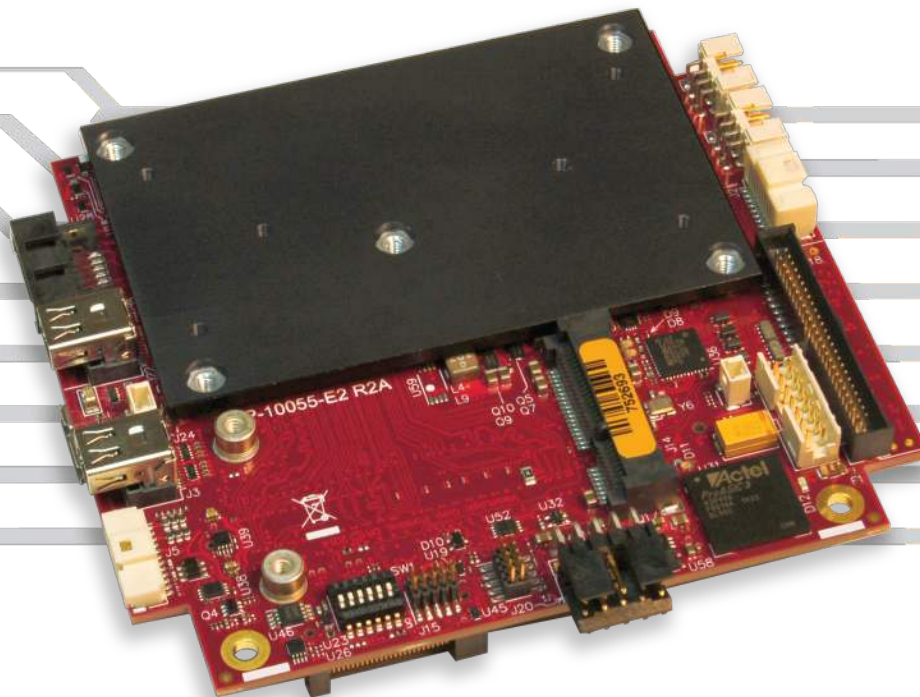


# Bengal

## PC/104 Format Single Board Computer



### Overview

The Bengal is a low-power / high-performance single board computer (SBC) with a full complement of on-board I/O. Driven by the low power Intel® 22nm Silvermont microarchitecture, the Bengal provides up to 1.9 GHz of performance with quad, dual, and single-core processor options. Based on the industry-standard PC/104 format (4.23 x 3.77 inches), this SBC is an excellent solution for size, weight and power (SWaP) constrained applications.

Bengal is built on the new "PCIe/104 OneBank" format. Compatible with the PCI/104-Express format, it includes a legacy PCI connector, and a single bank high-speed PCIe connector. This provides flexible system expansion, while leaving more on-board space available for product features. The single bank connector is mechanically and electrically compatible with the existing PCI/104-Express Type 1 and Type 2 modules.

As with all VersaLogic products, the Bengal is designed to support OEM applications where high reliability and long-term availability are required. From application design-in support, to its 5+ year production life guarantee, the Bengal provides a durable embedded computer solution with an excellent cost of ownership.

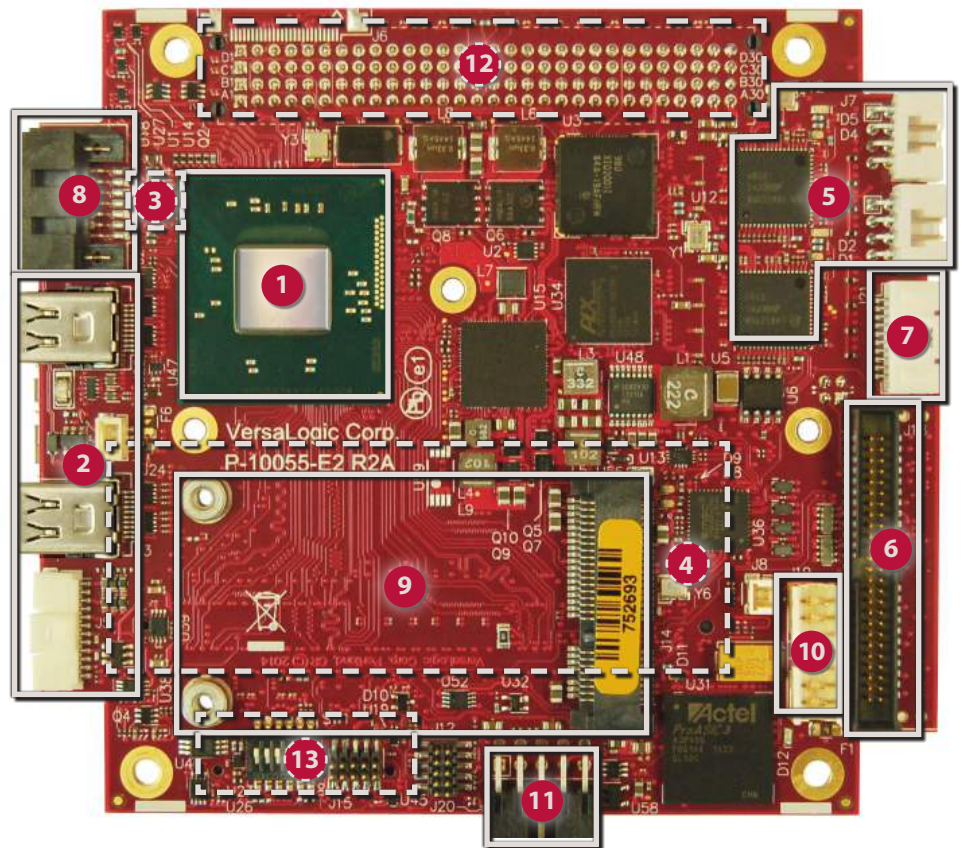
### Highlights

- -40° to +85°C Operating Temperature
- Shock & vibration per MIL-STD-202G
- PCI/104 OneBank™ form factor
- 4th Generation Intel® Atom™ processor ("Bay Trail")
  - E3845 (quad core) or
  - E3826 (dual core) or
  - E3815 (single core)
- Trusted Platform Module (TPM) security chip
- Up to 8GB SO-DIMM RAM
- Gigabit Ethernet (2 ports)
- VGA and dual mini DisplayPorts
- Mini PCIe Socket / with mSATA support
- USB 3.0 and USB 2.0 ports
- Serial I/O
- SATA
- Digital I/O (18 lines)
- Fanless versions
- VersaAPI programming support
- Customization available in quantities as low as 100 pcs.

## Features

- 1 Intel Atom™ “Bay Trail” Processor**  
Up to 1.9 GHz clock rate. Quad, dual or single core options. Low power consumption.
- 2 High-performance Video**  
Integrated Intel Gen 7 graphics core supports DirectX 11, OpenGL 4.0, and H.264, MPEG-2 encoding/decoding. Analog and Dual mini DisplayPort video outputs; both outputs support multiple display modes including Extended Desktop and Clone.
- 3 Trusted Platform Module (on back side)**  
On-board TPM security chip can lock out unauthorized hardware and software.
- 4 RAM (on back side)**  
Up to 8 GB DDR3L socketed memory, one SO-DIMM.
- 5 Network**  
Dual Ethernet interfaces, autodetect 10BaseT / 100BaseTX / 1000BaseT with remote boot support.
- 6 Industrial I/O**  
One USB 3.0 port and five USB 2.0 ports support keyboard, mouse, and other devices. Dual RS-232/422/485 serial ports, three 8254 timer/counters, I2C, PWM output, and audio support.
- 7 Digital I/O**  
Eighteen 3.3V digital I/O lines.
- 8 SATA**  
3 Gb/s SATA port supports bootable SATA hard drive.
- 9 Mini PCIe socket**  
Supports Wi-Fi modems, GPS receivers, flash data storage with auto-detect mSATA flash storage support, and other mini PCIe modules.
- 10 SPI Interface**  
Supports SPI and SPX devices, including low cost analog and digital modules
- 11 Main Power Input**  
5V Input ±5%

- 12 Stackable Expansion (on back side)**  
Legacy stack-down PCI connector.
- 13 Stackable Expansion (on back side)**  
High speed stack-down PCIe/104 One Bank connector
- PC/104™ Form Factor**  
Industry-standard PC/104 OneBank™ expansion.
- MIL-STD-202G**  
Qualified for high shock/vibration operation.
- Industrial Temperature**  
-40° to +85°C operation for harsh environments.



## Tailor Bengal 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
- BGA Underfill
- BIOS Modifications
- Software and Drivers
- Revision Locks
- Custom Screening
- Application-Specific Testing
- And more –

## Specifications

General				
<b>Board Size</b>	PC/104 Compliant: 108 mm x 96 mm (4.23" x 3.77")			
<b>Processor</b>	Intel 4th Generation Atom E3845 (quad core), E3826 (dual core), or E3815 (single core). 512K L2 cache per core. Supports Intel 64-bit instructions, AES Instructions, Execute Disable Bit, and Virtualization Technology.			
<b>Battery</b>	Connector for external 3.0V RTC backup battery			
<b>Power Requirements (+5V) †</b>	<i>Model</i>	<i>Idle</i>	<i>Typical</i>	<i>Max.</i>
	VL-EPMe-30EAP	5.5W	6.7W	7.0W
	VL-EPMe-30EBP	6.5W	7.0W	7.5W
	VL-EPMe-30ECP	7.5W	8.7W	10.0W
<b>Input Voltage</b>	5V ± 5%			
<b>System Reset &amp; Hardware Monitors</b>	Major voltage rails monitored. Watchdog timer with programmable timeout. CPU temperature and fan speed monitoring. Push-button reset and power.			
<b>Stackable Buses</b>	PCI/104-Express OneBank format including: Legacy PCI connector and high speed OneBank connector (supports two PCIe x1 lanes)			
<b>RoHS</b>	RoHS (EU 2015/863)			

Environmental				
<b>Cooling Options</b>	Bolt-on heat plate standard. Optional Heat sink, Heat sink with fan, heat pipe, and other adaptors available.			
<b>Operating Temperature</b> ◊	<i>Model</i>	<i>Heat Plate**</i>	<i>Heat Sink</i>	<i>Heat Sink + Fan</i>
	All Models	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
	Ranges shown assume 90% CPU utilization. For detailed thermal information, refer to the VL-EPMe-30 Reference Manual. **Heat plate must be kept below 90°C			
<b>Airflow Requirements</b>	Refer to the VL-EPMe-30 Reference Manual for detailed airflow requirements.			
<b>Storage Temperature</b>	-40° to +85°C			
<b>Altitude</b>	Operating*	To 15,000 ft. (4,570m)		
	Storage	To 40,000 ft. (12,000m)		
<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 minutes per axis			
<b>Vibration, Random</b> ⌘	MIL-STD-202G, Method 214A, Condition A: 5.35g rms, 5 minutes per axis			
<b>Mechanical Shock</b> ⌘	MIL-STD-202G, Method 213B, Condition G: 20g half-sine, 11 ms duration per axis			

Security	
<b>TPM</b>	Support for Intel Trusted Platform Module 1.2 device. Atmel - AT97SC3204-U2MA-20

† Represents operation at +25°C with +5V supply running Windows 7. Typical power computed as the mean value of Idle and Maximum power specifications. Maximum power is measured with 95% CPU utilization.

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

\* For extended altitude information contact VersaLogic Sales Dept.

‡ TVS protected port (enhanced ESD protection)

§ Power pins on this port are overload protected

¥ Bootable storage device capability

⌘ MIL-STD-202G shock and vibration 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. PC/104, PCI/104-Express and PCIe/104 OneBank are trademarks of the PC/104 Consortium. PCI Express is a registered trademark of PCI-SIG. SATA and mSATA are trademarks of the Serial ATA International Organization. All other trademarks are the property of their respective owners.

Memory	
<b>System RAM</b>	One SO-DIMM socket. Up to 8 GB DDR3L (1.35V) SDRAM.
<b>Memory Speed</b>	1066 MHz or 1333 MHz, CPU dependent

Video							
<b>General</b>	Integrated high-performance video. Intel Gen-7 graphics core with 4 Execution Units and Turbo Boost. Supports 2 independent displays. Supports DirectX 11, OpenGL 4.0, VP8, MPEG2, H.264, VC1, 2 HD streams (1080p@30fps), Flash and WMP support.						
	<table border="1"> <tr> <th>Hardware Based</th> <th>Format</th> </tr> <tr> <td>Decode</td> <td>H.264, MPEG2., MPEG4, MVC, VC-1, WMV9, VP8, MJPEG</td> </tr> <tr> <td>Encode</td> <td>H.264, MPEG2, MVC</td> </tr> </table>	Hardware Based	Format	Decode	H.264, MPEG2., MPEG4, MVC, VC-1, WMV9, VP8, MJPEG	Encode	H.264, MPEG2, MVC
Hardware Based	Format						
Decode	H.264, MPEG2., MPEG4, MVC, VC-1, WMV9, VP8, MJPEG						
Encode	H.264, MPEG2, MVC						
	Analog and dual mini DisplayPort video interfaces support Extended Desktop, Clone, and Twin display modes. Optional video adapter card converts DisplayPort output to LVDS for flat panel operation.						
<b>VRAM</b>	Up to 224 MB shared DRAM						
<b>Desktop Display Interface ‡</b>	Standard analog output (VGA). 24-bit. Up to 2560 x 1600 (60 Hz).						
<b>DisplayPort Interface §</b>	Support DisplayPort Standard Version 1.1 Mini DisplayPort and Mini DisplayPort++ outputs. 24-bit. Up to 2560 x 1600. Mini DisplayPort++ supports DisplayPort and HDMI signaling (Video and Audio outputs).						

Mass Storage	
<b>Rotating Drive ¥</b>	Single SATA (Revision 2.0) port. Latching SATA connector.
<b>Flash / SSD ¥</b>	mSATA modules (SATA signaling, bootable)

Network Interface	
<b>Ethernet ‡</b>	Two autodetect 10BaseT/100BaseTX/1000BaseT ports. On-board status LEDs and external LED header. IEEE 1588 Precision Time Protocol (PTP) slave compatible. Latching headers
<b>Network Boot Option</b>	Via on-board BIOS extension

Device I/O	
<b>USB ‡§</b>	Five USB 2.0 host ports and a single USB 3.0 host port.
<b>COM 1 / 2 Interface ‡</b>	RS-232/422/485 selectable. 16C550 compatible. 460 Kbps.
<b>Digital I/O</b>	Sixteen TTL I/O lines (3.3V). Independently configurable. Two General Purpose I/O lines (3.3V)
<b>I2C</b>	Single I2C interface (3.3V)
<b>Audio</b>	DisplayPort and HDMI interfaces, or use optional part VL-ADR-01 Audio interface.
<b>Counter/Timers</b>	Three 8254 compatible Programmable Interval Timers (PITs).

Other I/O	
<b>Mini PCIe / Socket</b>	Full-size Mini PCIe socket. Supports Wi-Fi modems, GPS receivers, non-volatile flash data storage with auto-detect mSATA support, and other plug-in modules.
<b>SPI Interface</b>	Supports SPI and SPX devices. Supports up to four SPX modules.

Software	
<b>BIOS</b>	Phoenix Technologies UEFI BIOS. Field reprogrammable. Support for USB keyboard/mouse and USB boot.
<b>VersaAPI</b>	VersaLogic Application Programming Interface to support on-board I/O devices.
<b>Sleep Mode</b>	ACPI 3.0. Support for S3 and S4 suspend states and C1 processor state.
<b>Operating Systems</b>	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, VxWorks, and QNX.



## Ordering Information

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

Model	Processor	Cores	Speed	DDR Max Speed	Graphics Frequency (Normal/Turbo)	Operating Temp.	Cooling	Trusted Platform Module	Conformal Coating
VL-EPMe-30EAP	Atom E3815	Single	1.46 GHz	1066 MHz	400 MHz / none	-40° to +85°C	Heat Plate	Yes	None
VL-EPMe-30EBP	Atom E3826	Dual	1.46 GHz	1066 MHz	533 MHz/ 667 MHz	-40° to +85°C	Heat Plate	Yes	None
VL-EPMe-30EBPA	Atom E3826	Dual	1.46 GHz	1066 MHz	533 MHz/ 667 MHz	-40° to +85°C	Heat Plate	Yes	Acrylic
VL-EPMe-30ECP	Atom E3845	Quad	1.91 GHz	1333 MHz	542 MHz/ 792 MHz	-40° to +85°C	Heat Plate	Yes	None

## Accessories

Part Number	Description
<b>Cable Kit</b>	
VL-CKR-BENGAL	Development cable kit . Includes VL-CBR-5015, 2005, 1008, 1204, 0804 (x2), 0702, 1015, and VL-HDW-105.
VL-CBR-5015	System I/O paddleboard
VL-CBR-2005	12" 1mm 20-pin DIO cable and paddleboard
VL-CBR-1008	12" ATX power adapter cable
VL-CBR-1204	12" VGA Interface Cable, 12-pin PicoClasp Cable to 15-pin VGA
VL-CBR-0804	12" Ethernet cable (Qty. 2)
VL-CBR-0702	20" SATA cable – latching
VL-CBR-1015	1 m USB 3.0 Micro A plug to 3.0 Micro B plug
VL-HDW-105	0.6" standoff package, metric thread
<b>Thermal Options</b>	
VL-HDW-401	Thermal Compound Paste. For attaching heat plates and sinks.
VL-HDW-406	Passive Heat Sink to mount on product heat plate.
VL-HDW-407	Cooling fan for HDW-406 passive heat sink.
VL-HDW-408	Heat Pipe system to mount on product heat plate.
<b>Cables</b>	
VL-CBR-0401	6.25" ATX to SATA power cable
VL-CBR-0503	0.5 m USB 2.0 Male A to Male Micro-B Cable
VL-CBR-0701	19.75" SATA cable (non-latching)
VL-CBR-1206	18" 12-pin Pico-Clasp / 15-pin VGA, RoHS
VL-CBR-1401	Cable assembly for (2) SPX modules
VL-CBR-1402	Cable assembly for (4) SPX modules
VL-CBR-2031	36" miniDisplayPort to MiniDisplayPort
VL-CBR-2033	miniDisplayPort to HDMI Active Adapter, 6" (Commercial Temp.)
VL-CBR-2034	6" 20-pin (F) ATX to 24-pin (M) ATX adapter cable (use with PS-ATX12-300A)
<b>Development</b>	
VL-PS200-ATX	200W ATX-style power supply (20+4+4-pin ATX connector)
VL-DEV-USB-VV1	VersaViewer: A real-time viewer for embedded hardware developers
VL-PS-ATX12-300A	ATX development power supply (requires VL-CBR-2034)
<b>Audio</b>	
VL-ADR-01S	USB to Audio Adapter, -25° to +85°C
<b>Memory</b>	
VL-MM9-xxEBN	DDR3 PC3-12800 SO-DIMM memory module (1.35v)
<b>Hardware</b>	
VL-HDW-108	Mini PCIe Module / mSATA hardware kit (metric thread) 2.5 mm
VL-HDW-114	PC104 (PCIe) Spacer
VL-HDW-115	PC104 (blank) Spacer
<b>Miscellaneous</b>	
VL-HDW-111	Half to Full Size MiniPCIe Adapter kit. Metal adapter and screws (2)
VL-HDW-203	PC/104 extractor tool (metal)
VL-EPH-V6	Display Port to Dual Channel LVDS converter

## Expansion Modules

Part Number	Description	Form Factor
<b>Network</b>		
VL-MPEe-FW1E	1394 Firewire Module, industrial temperature	Mini PCIe
VL-MPEe-E4E	Gigabit Ethernet Over Fiber Optic media	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
VL-MPEu-G3E	Precision GPS Receiver, industrial temperature	Mini PCIe
<b>Solid-State Storage (flash memory)</b>		
VL-MPEs-F1Exx	mSATA module (4/16/32 GB) (SATA)	Mini PCIe
<b>Adapters</b>		
VL-MPEs-S3E	SATA adapter	Mini PCIe
VL-EPMp-P2E	Dual Mini PCIe adapter	PCI-104



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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