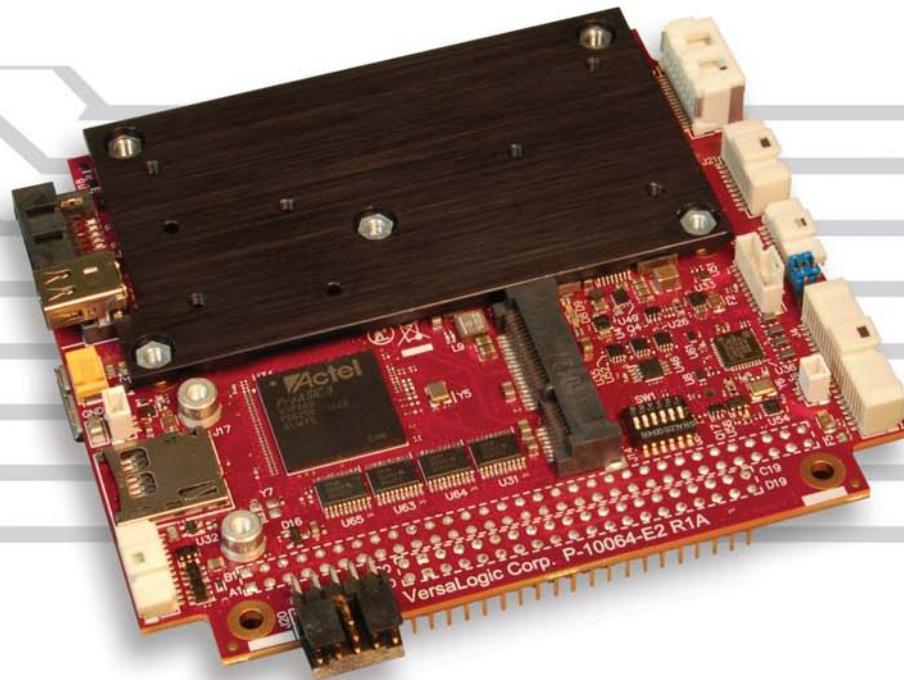


# BayCat

## PC/104-Plus Single Board Computer



### Overview

The BayCat is a low-power / high-performance single board computer (SBC) with a traditional PC/104-Plus™ expansion interface. This combination makes it easy to upgrade existing systems to a powerful 4th generation Atom processor, while preserving plug-in expansion to existing specialty I/O boards. In addition, it also contains a full complement of on-board I/O interfaces, including USB 3.0, mini PCIe expansion socket, TPM chip, and a 24 bit digital I/O port.

Driven by the low power E3800 (Bay Trail) processor, with clock rates up to 1.9 GHz, the BayCat features quad, dual, and single-core processor options. Based on the industry-standard PC/104™ format (4.2 x 3.8 inches), this SBC is an excellent solution for size, weight and power (SWaP) sensitive applications.

BayCat is built on the PC/104 form factor. It includes legacy ISA and PCI connectors to interface directly with PC/104-Plus plug-in boards.

As with all VersaLogic products, the BayCat is designed to support OEM applications where high reliability and long-term availability are required. From application design-in support, to its 10+ year extended life programs, the BayCat provides a durable embedded computer solution with an excellent cost of ownership.

### Highlights

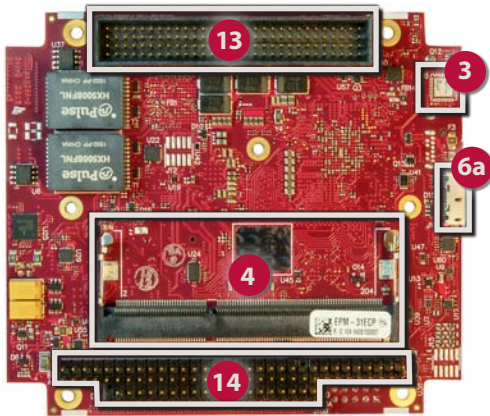
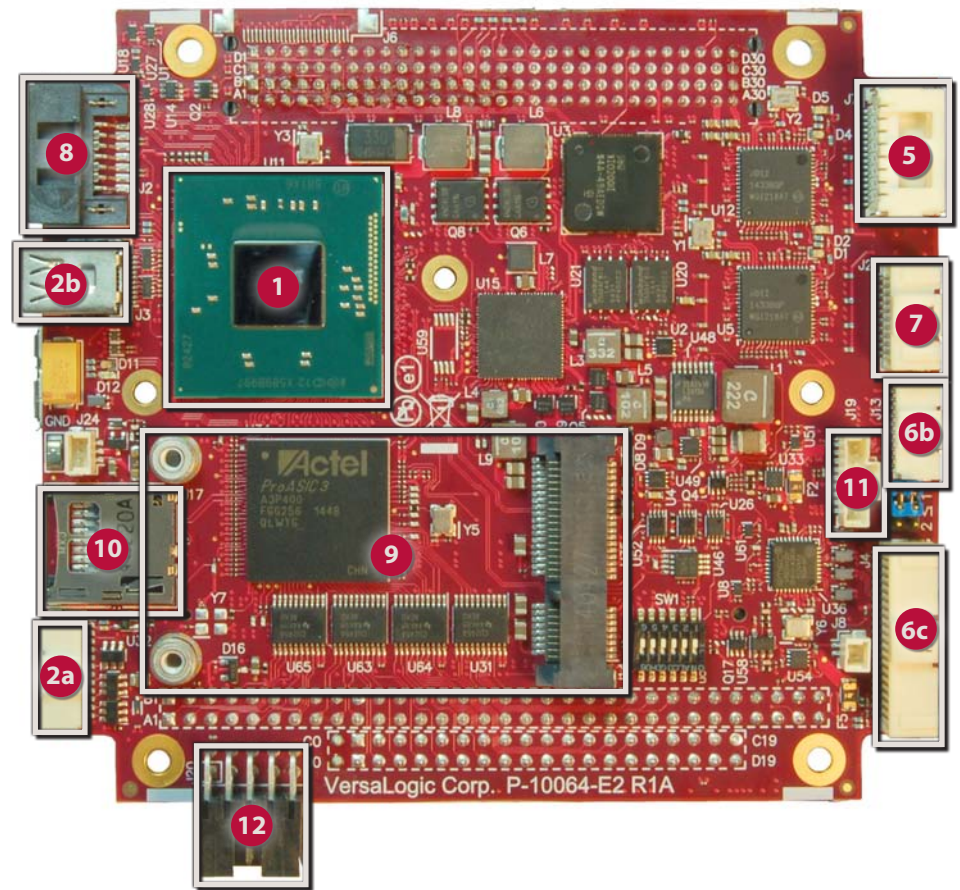
- PC/104-Plus expansion site (ISA + PCI)
- 4th Generation Intel® Atom™ processor (“Bay Trail”)
- Single, dual, and quad-core models
- TPM (Trusted Platform Module) security chip
- Up to 8 GB RAM
- Gigabit Ethernet (2 ports)
- VGA and DisplayPort video
- Mini PCIe Socket / with mSATA support
- USB 3.0 and USB 2.0 ports
- Fanless versions
- -40° to +85°C Operating Temperature
- MIL-STD-202G shock & vibration
- PC/104 form factor (with ISA and PCI buses)
- Serial I/O
- SATA
- Digital I/O (24 lines)
- VersaAPI software 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, and H.264, MPEG-2 encoding/decoding. Analog VGA (2a) and mini DisplayPort video output (2b); 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 (6a on back side); Dual RS-232/422/485 serial ports (6b); four USB 2.0 ports support keyboard, mouse, and other devices, three 8254 timer/counters, I<sup>2</sup>C, and audio support (6c).
- 7 Digital I/O**  
Twenty-four 3.3V digital I/O lines.
- 8 SATA**  
3 Gb/s SATA port. Supports rotating or solid state SATA 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 MicroSD Socket**  
Supports removable microSD card solid-state drives.

- 11 SPI Interface**  
Supports SPI and SPX devices, including low cost analog and digital modules.
- 12 Main Power Input**  
5V Input ±5%
- 13 PC/104 Expansion (on back side)**  
Legacy PCI connector, stack-down
- 14 PC/104 Expansion (on back side)**  
Legacy ISA connector, stack-down

- Industrial Temperature**  
-40° to +85°C operation for harsh environments
- PC/104 Form Factor**  
Industry-standard PC/104-Plus expansion
- MIL-STD-202G**  
Qualified for high shock/vibration environments



Back side

## Tailor BayCat to Your Exact Requirements

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

- Conformal Coating
- Custom Labeling
- Custom Screening
- Custom Cabling
- BGA Underfill
- Storage device installation
- Connector & I/O Changes
- BIOS Modifications
- Software and Drivers
- Software pre-load
- Custom Testing
- Revision Locks
- And more –

## Specifications

|   |   |                         |                  |                        |
|---|---|-------------------------|------------------|------------------------|
| <b>General</b>                              |   |                         |                  |                        |
| <b>Board Size</b>                           | PC/104 standard: 108 mm x 96 mm (4.23" x 3.77")   |                         |                  |                        |
| <b>Weight</b>                               | 140 grams (4.93 oz.)  |                         |                  |                        |
| <b>Processor</b>                            | Intel 4th Generation "Bay Trail" 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-EPM-31EAP  | 4.8W                    | 5.15W            | 5.5W                   |
|   | VL-EPM-31EBP  | 4.9W                    | 5.2W             | 5.5W                   |
|   | VL-EPM-31ECP  | 5.0W                    | 6.5W             | 8.0W                   |
| <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 Bus</b>                        | PC/104-Plus format. Legacy ISA and PCI connectors.  |                         |                  |                        |
| <b>RoHS</b>                                 | RoHS (EU 2015/863)  |                         |                  |                        |
| <b>Environmental</b>                        |   |                         |                  |                        |
| <b>Cooling Options</b>                      | Bolt-down heat plate standard. Optional Heat sink, Heat sink with 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> |
|   | 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-EPM-31 Reference Manual.<br>**Heat plate must be kept below 90°C   |                         |                  |                        |
| <b>Airflow Requirements</b>                 | Refer to the VL-EPM-31 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 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  |                         |                  |                        |
| <b>Security</b>                             |   |                         |                  |                        |
| <b>TPM</b>                                  | Trusted Platform Module 1.2 device.<br>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 and PC/104-Plus 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.

|                                    |   |
|------------------------------------|---|
| <b>Memory</b>                      |   |
| <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   |
| <b>Video</b>                       |   |
| <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. |
|                                    | <i>Hardware Based</i>   <i>Format</i>   |
| Decode                             | H.264, MPEG2, MVC, VC-1, WMV9, VP8, MJPEG   |
| Encode                             | H.264, MPEG2, MVC   |
|                                    | Analog (VGA) and mini DisplayPort video interfaces support Extended Desktop, Clone, and Twin display modes. Optional 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++ outputs supports DisplayPort and HDMI signaling (Video and Audio outputs). 24-bit. Up to 2560 x 1600.   |

|   |  |
|---|--|
| <b>Mass Storage</b>                                   |  |
| <b>Rotating Drives / Flash / Solid-State Drives ¥</b> | Single SATA (Revision 2.0) port. Latching connector. mSATA modules (SATA signaling, bootable). One microSD socket. Supports up to 32 GB. Bootable. |

|                            |  |
|----------------------------|--|
| <b>Network Interface</b>   |  |
| <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  |

|                       |   |
|-----------------------|---|
| <b>Device I/O</b>     |   |
| <b>USB ‡ §</b>        | Four USB 2.0 host ports and one USB 3.0 host port.                          |
| <b>COM 1 / 2 ‡</b>    | RS-232/422/485 selectable. 16C550 compatible. 460 Kbps.                     |
| <b>Digital I/O</b>    | Twenty-four TTL I/O lines (3.3V). Independently configurable.               |
| <b>I2C</b>            | Single I2C interface (3.3V)   |
| <b>Audio</b>          | Via DisplayPort and HDMI interfaces, or optional VL-ADR-01 audio interface. |
| <b>Counter/Timers</b> | Three 8254 compatible Programmable Interval Timers (PITs).                  |

|                         |  |
|-------------------------|--|
| <b>Other I/O</b>        |  |
| <b>Mini PCIe Socket</b> | Full-length 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 two SPX modules.  |

|                          |  |
|--------------------------|--|
| <b>Software</b>          |  |
| <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!

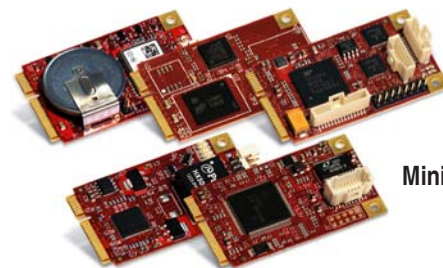
| Model        | Processor  | Cores  | Speed    | DDR Max Speed | Graphics Frequency (Normal/Boost) | Operating Temp. | Cooling    |
|--------------|------------|--------|----------|---------------|-----------------------------------|-----------------|------------|
| VL-EPM-31EAP | Atom E3815 | Single | 1.46 GHz | 1066 MHz      | 400 MHz / none                    | -40° to +85°C   | Heat Plate |
| VL-EPM-31EBP | Atom E3826 | Dual   | 1.46 GHz | 1066 MHz      | 533 MHz/ 667 MHz                  | -40° to +85°C   | Heat Plate |
| VL-EPM-31ECP | Atom E3845 | Quad   | 1.91 GHz | 1333 MHz      | 542 MHz/ 792 MHz                  | -40° to +85°C   | Heat Plate |

## Accessories

| Part Number                               | Description   |
|---|---|
| <b>Cable Kit</b>                          |   |
| VL-CKR-BAYCAT                             | BayCat development cable kit. Includes VL-CBR-4005, 2005, 1008, 1204, 1604, 0702, 1014, 1015, VL-HDW-105, and VL-HDW-401. |
| VL-CBR-4005                               | 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-1604                               | 12" Dual Ethernet cable   |
| VL-CBR-0702                               | 20" SATA cable – latching   |
| VL-CBR-1014                               | 12" 1 mm 10-pin Pico-Clasp to two DB-9 Cable  |
| 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  |
| VL-HDW-401                                | Thermal Compound Paste. For attaching heat plates and sinks.  |
| <b>Thermal Options</b>                    |   |
| VL-HDW-412                                | Passive Heat Sink. Mounts to product's heat plate.  |
| VL-HDW-407                                | Cooling fan for HDW-406 passive heat sink.  |
| <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-0901                               | 9" Pico-Clasp to Dual SPX Cable, 9-pin  |
| VL-CBR-1206                               | 18" 12-pin Pico-Clasp / 15-pin VGA, RoHS  |
| 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>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>Drives</b>                             |   |
| VL-HDS35-xxx                              | 3.5" rotating hard drive (SATA)   |
| <b>Solid-State Storage (flash memory)</b> |   |
| VL-F41-xxxx                               | microSD card (SDIO), SLC, industrial temp.  |
| <b>Hardware</b>                           |   |
| VL-HDW-105                                | 0.6" standoff package (Metric thread)   |
| VL-HDW-108                                | Mini PCIe Module / mSATA hardware kit (metric thread) 2.5 mm  |
| <b>Miscellaneous</b>                      |   |
| VL-PS200-ATX                              | 200W ATX-style power supply (20+4+4-pin ATX connector)  |
| 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   |
| VL-PS-ATX12-300A                          | ATX development power supply (requires VL-CBR-2034)   |

## Expansion Modules

| Part Number                               | Description                            | Form Factor |
|---|--|-------------|
| <b>Network</b>                            |  |             |
| 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   |
| <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                               | Advanced GPS receiver                  | 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-EPM-P2E                                | Dual Mini PCIe Adapter                 | PC-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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