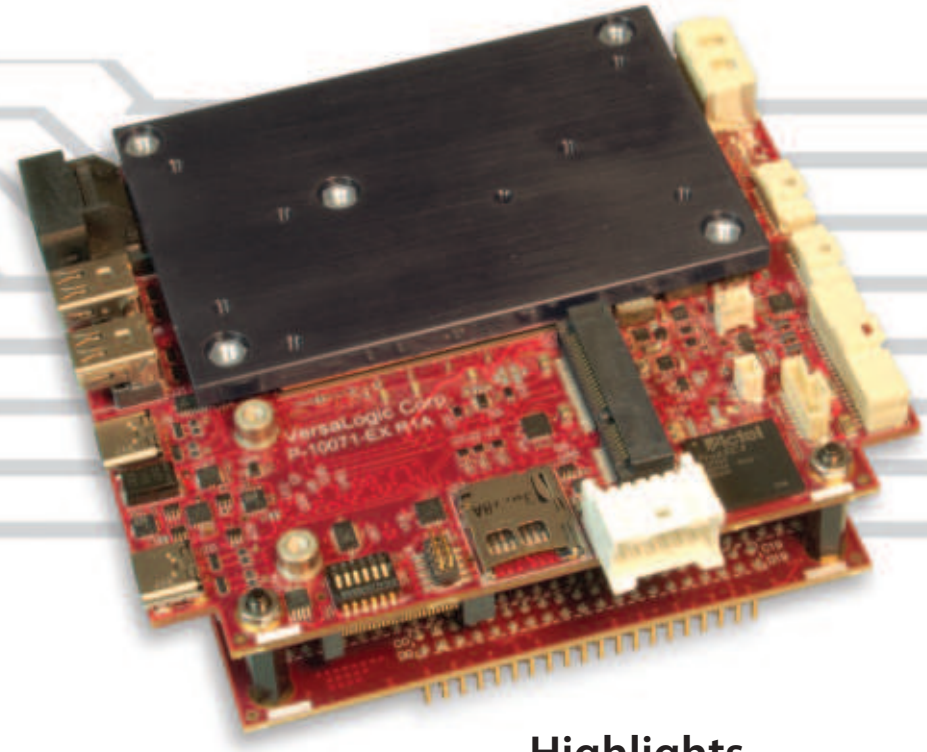
Liger

PC/104 Embedded Computer



Overview

The Liger is a high-performance computer which combines Intel's 7th Generation Core "Kaby Lake" processor, with a traditional PC/104-*Plus* expansion interface. This combination makes it easy to upgrade existing systems to a powerful 7th generation Kaby Lake Core processor, while preserving plug-in expansion to existing specialty I/O boards. In addition, the Liger also contains a full complement of on-board I/O interfaces, including USB 3.0, USB 2.0, mini PCIe expansion socket, TPM chip, multiple serial interfaces, and 8-bits of digital I/O.

The Liger is available with an embedded i7, i5, or i3 Kaby Lake processor, providing standard clock rates up to 2.8 GHz and Turbo Boost rates to 3.9 GHz. The Kaby Lake processors feature dual-core CPUs and Hyper-Threading logic allowing up to 4 simultaneous threads to be executed.

As with all VersaLogic products, the Liger is designed to support OEM applications where high reliability and long-term availability are required. Liger is backed by a five-year warranty, 5+ year off-the-shelf availability guarantee, and expert US-based technical support. From application design-in support, to its 10+ year extended life programs, the Liger provides a durable embedded computer solution with an excellent cost of ownership.

Highlights

- 7th Generation Intel® Core™ processor ("Kaby Lake") Dual-core
- PC/104-*Plus* expansion site (ISA + PCI)
- TPM (Trusted Platform Module) security chip
- Intel Active Management Technology
- -40° to +85°C Operating Temperature models
- Shock and vibration per MIL-STD-202G
- Up to 16 GB RAM
- Dual Gigabit Ethernet
- DisplayPort video outputs
- Mini PCIe Socket, with mSATA support
- USB 3.0 and 2.0 ports
- Serial I/O (RS-232/422/485)
- Digital I/O
- VersaAPI software support
- x86 operating systems (Windows, Linux, etc.)

VERSALOGIC CORPORATION

Features

1 Intel "Kaby Lake" Processor
Up to 2.8 GHz clock rate, dual-core.

2 Trusted Platform Module *(not shown; on back side)*
On-board TPM security chip can lock out unauthorized hardware and software access.

3 High-performance Video
Integrated Intel HD Graphics 620 core supports DirectX 12, OpenGL 4.4, and H.264, MPEG-2 encoding/decoding. Dual Mini DisplayPort outputs (DP++). DisplayPort supports HD audio output.

4 Network
Dual Gigabit Ethernet (GbE) with remote boot support.

5 SATA
6 Gb/s SATA port. Supports rotating or solid state SATA drives.

6 Mini PCIe Card Socket
Supports Wi-Fi modems, GPS receivers, flash data storage with auto-detect mSATA flash storage support, and other mini PCIe modules.

7 MicroSD Socket
Supports removable microSD card solid-state drives.

8 Industrial I/O
(8a) Two USB 3.0 and four USB 2.0 ports support keyboard, mouse, and other devices.
(8b) Dual RS-232/422/485 and Dual RS-232 ports, three 8254 timer/counters, and I2C support.

9 Digital I/O
Eight 3.3V digital I/O lines.

10 SPI Interface
Supports SPI and SPX devices, including low cost analog and digital modules.

11 Power Input
5V Input

12 PC/104-*Plus* Expansion *(on back side)*
Legacy PCI and ISA connectors, stack-down

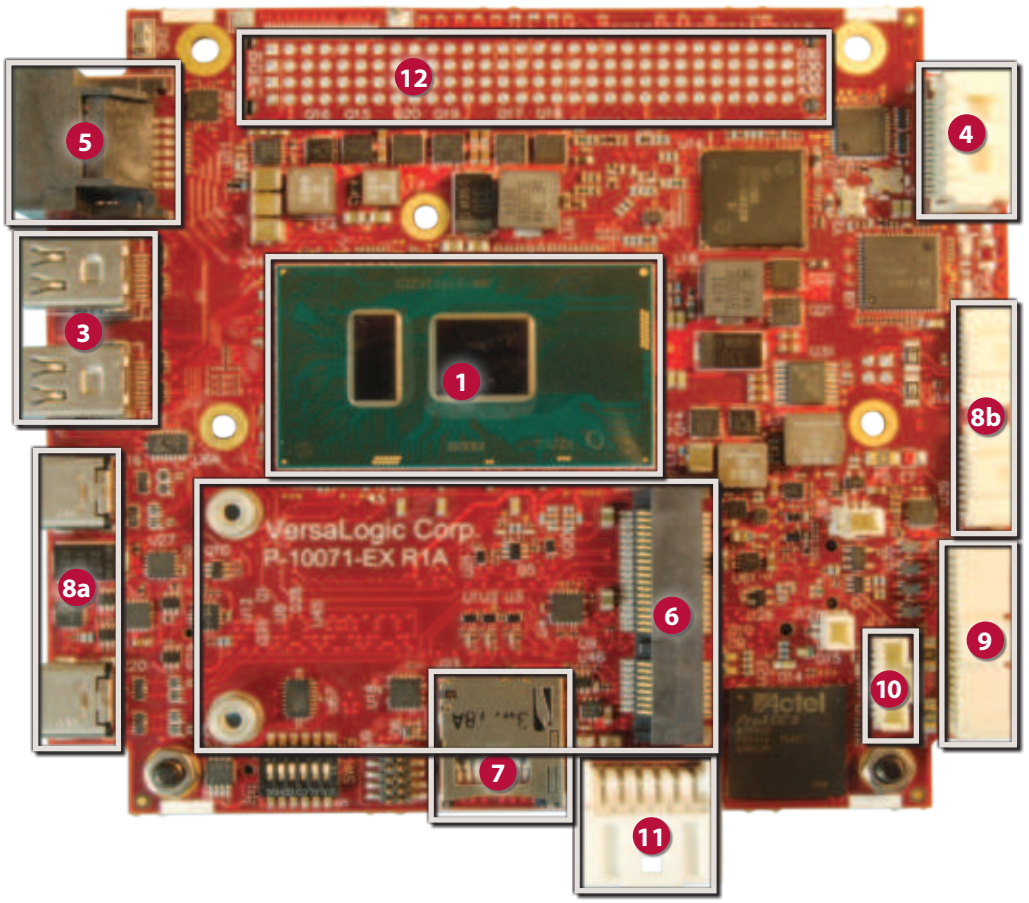
Fanless Operation
No moving parts required for CPU cooling in most configurations.

Memory *(on back side)*
Up to 16 GB DDR3L memory.

Industrial Temperature Operation
-40° to +85°C versions available for harsh environments.

MIL-STD-202G
Qualified for high shock and vibration environments.

Software Support
Compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks..



Modify Liger to Your Exact Requirements

COT's modifications 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				
Board Size	PC/104 Compliant: 108 x 96 x 42.5 mm (4.23 x 3.77 x 1.67")			
Weight	226 grams (8.0 oz)			
Processor	Intel 7th Generation Core i3-7100U, i5-7300U, or i7-7600U. Dual core. L2 cache. Supports enhanced Intel SpeedStep, Intel 64-bit instructions, Hyper-Threading, AES Instructions, Execute Disable Bit, and Virtualization Technology.			
Input Voltage	5.15V +/- 2%			
RTC Battery	Connector for external 3.0V RTC backup battery.			
Power Requirements §	*Model*	*Idle*	*Typical*	*Max.*
	VL-EPM-43xAP-00	3.6W	12.0W	20.4W
	VL-EPM-43xAP-04	3.6W	12.0W	20.4W
	VL-EPM-43xBP-00	4.0W	12.5W	20.9W
	VL-EPM-43xBP-04	4.0W	12.5W	20.9W
	VL-EPM-43xCP-00	4.1W	12.5W	21.9W
	VL-EPM-43xCP-04	4.1W	12.5W	21.9W
	VL-EPM-43xCP-08	4.1W	13.3W	22.4W
	VL-EPM-43xCP-16	4.1W	13.5W	22.9W
System Reset & Hardware Monitors	All voltage rails monitored. Watchdog timer with programmable timeout. CPU temperature and fan speed monitoring. Push-button reset and power.			
Stackable Bus	PC/104-*Plus* format. Legacy ISA and PCI connectors.			
Manufacturing Standards	Standard	IPC-A-610 Class 2 modified		
	Special Order	IPC-A-610 Class 3 modified		
Regulatory Compliance	RoHS (EU 2015/863)			

Environmental				
Cooling Options	Bolt-on heat plate standard. Optional Heat sink, Heat sink with fan, heat pipe, and other adaptors available.			
Operating Temperature ◊	*Model*	*Heat Plate***	*Heat Sink*	*Heat Sink + Fan*
	VL-EPM-43E	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
	VL-EPM-43S	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-EPM-43 Reference Manual. **Heat plate must be kept below 90°C			
Airflow Requirements	Refer to the VL-EPM-43 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			

§ Represents operation at +25°C and +5V running Windows 7 with on-board, DisplayPort display, SATA, Ethernet, 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.

‡ TVS protected port (enhanced ESD protection)

Power pins are overload protected

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

* For extended altitude information contact VersaLogic Sales

¤ MIL-STD-202G shock and vibe levels were used to illustrate the overall ruggedness of this product. Certification at higher levels or different types of shock or vibration methods per the specific requirements of the application is available. Contact VersaLogic Sales for further information.

Δ RS232 through CPU HSUART ports and Operating System (Windows WINSSD, Linux Minicom compatible). Some applications may require customer developed drivers.

Security	
TPM	Trusted Platform Module 2.0 device.

Memory	
System RAM	Up to 16 GB DDR3L (1.35V) SDRAM.
Memory Speed	1600 MHz

Video	
General	Integrated high-performance video. HD Graphics 620 core – 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 §	Dual Mini DisplayPort outputs supports DP++ and HDMI signaling (Video and Audio outputs). 24-bit. Up to 4096 x 2304 at 60 Hz. Supports Extended Desktop, Clone, and Twin display modes.

Mass Storage	
Rotating or Solid-State Drives	SATA (Revision 3.0) port. (optional dual SATA available)
Flash storage	mSATA modules (SATA signaling, bootable).
Flash storage	One microSD socket. Bootable

Network Interface	
Ethernet ‡	Two autodetect 10BaseT/100BaseTX/1000BaseT ports with status LEDs. IEEE 1588 Precision Time Protocol (PTP) compatible.
Network Boot Option	Via BIOS extension
Remote Management	Intel vPro Active Management Technology (AMT) (i5-7300U and i7-7600U CPUs only). Supports out-of-band management capabilities including Keyboard-Video-Mouse (KVM) Remote Control, alerting, and event logging. Supports remote control, alerting, and event logging. Note: Disabled by default. Enable using BIOS setup option.

Device I/O	
USB # ‡	Two USB 3.0 host port (Type-C connectors) and four USB 2.0 host ports.
COM 1 / 2 Interface ‡	Two RS-232/422/485 selectable ports. 16C550 compatible. 460 Kbps.
COM 3 / 4 Interface ‡Δ	Two RS-232 ports. 115 Kbps.
Digital I/O	Eight TTL I/O lines (3.3V). Independently configurable.
I2C	Single I2C interface
Audio	Optional. Use VL-ADR-01 audio interface.
Counter/Timers	Three 8254 compatible Programmable Interval Timers (PITs).

Other I/O	
Mini PCIe / mSATA Socket	Full-size Mini PCIe socket with mSATA signaling support. Supports Wi-Fi modems, GPS receivers, solid state mSATA drives, and other plug-in modules.
SPI Interface	Supports SPI and SPX devices. Supports up to two SPX modules.

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

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Ordering Information

Other configurations are possible. Contact VersaLogic Sales at (503) 747-2261 to discuss requirements!

Model	Processor	Cores	Memory Size (GB)	Clock Frequency (Normal / Turbo)	Graphics Frequency (Normal / Boost)	vPro Capabilities	Operating Temp.	Cooling
VL-EPM-43ECP-00	i7-7600U	Dual	0	2.8 GHz / 3.9 GHz	300 MHz / 1.15 GHz	Yes	-40° to +85°C	Heat plate
VL-EPM-43ECP-16	i7-7600U	Dual	16	2.8 GHz / 3.9 GHz	300 MHz / 1.15 GHz	Yes	-40° to +85°C	Heat plate

Accessories

Part Number	Description
Cable Kit	
VL-CKR-LION	Development Cable kit for EPM-43. Includes: VL-4005, 0702, 1014, 1205, 1604, 2402, 2032, HDW-401, and 105.
VL-CBR-4005	I/O Cable Assembly, Cable & Paddle Board
VL-CBR-0702	SATA cable, 20"
VL-CBR-1014	1 mm 10-pin Pico-Clasp to two DB-9 Cable, 12"
VL-CBR-1205	12-pin Micro-clasp to ATX 5V power adapter cable 7"
VL-CBR-1604	Dual Ethernet cable – rugged latching, 12"
VL-CBR-2402	USB 3.0 Type-C to Type-A plug cable
VL-CBR-2032	miniDisplayPort to 15-pin VGA adapter 6" (Commercial Temperature)
VL-HDW-105	Standoff package (metric thread) 0.6"
VL-HDW-401	Thermal compound paste. For attaching heat plates and sinks
Thermal Options	
VL-HDW-406	Passive Heat Sink to mount on product heat plate.
VL-HDW-413	Heat Sink + Cooling fan assembly to mount on product heat plate.
VL-HDW-408	Heat Pipe system to mount on product heat plate.
Cables	
VL-CBR-0203	2-pin Latching Battery Module, 6"
VL-CBR-0901	9-pin Pico-Clasp to Dual SPX cable, 8"
VL-CBR-2031	miniDisplayPort to miniDisplayPort, 0.5 m
VL-CBR-2033	miniDisplayPort to HDMI Active Adapter, 6" (Commercial Temperature)
Memory	
VL-MM9-xxEBN	DDR3 PC3-12800 SO-DIMM memory module (1.35v) (Industrial Temperature)
VL-MM9-xxSBN	DDR3 PC3-12800 SO-DIMM memory module (1.35v) (Commercial Temperature)
Audio	
VL-ADR-01S	USB to Audio Adapter
Solid-State Storage (flash memory)	
VL-F41-xxxx	microSD card (SDIO), SLC, (Industrial temperature)
Hardware	
VL-PS-ATX-300A	Bench-top / development power supply
VL-HDW-106	0.6" standoffs, English thread (four per kit)
VL-HDW-108	Mini PCIe / mSATA hardware kit (metric thread) 2.5 mm
VL-HDW-112	PC104 (ISA) Spacer
VL-HDW-113	PC104 (PCI) Spacer
VL-HDW-115	PC104 (blank) Spacer
Miscellaneous	
VL-HDW-111	Half to Full Size Mini PCIe Adapter kit. Metal adapter and screws (2)
VL-HDW-203	PC/104 extractor tool (metal)

Expansion Modules

Part Number	Description	Form Factor
Network		
VL-MPEe-E4E	Gigabit Ethernet over Fiber adapter	Mini PCIe
VL-MPEe-E3E	Gigabit Ethernet adapter	Mini PCIe
VL-MPEe-FW1E	1394 Firewire Module, (Industrial Temperature)	Mini PCIe
Serial I/O		
VL-MPEe-U2E	Quad serial plus twelve GPIOs	Mini PCIe
Analog & Digital I/O		
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
GPS		
VL-MPEu-G2E	GPS receiver	Mini PCIe
VL-MPEu-G3E	Advanced GPS receiver	Mini PCIe
Video		
VL-EPM-V7E	Video Expansion Module: VGA and LVDS	PC/104-*Plus*
VL-MPEe-V5E	VGA and LVDS Interface	Mini PCIe
Solid-State Storage (flash memory)		
VL-MPEs-F1Exx	mSATA module (4/16/32 GB) (SATA)	Mini PCIe
Adapters		
VL-EPM-P2E	PC/104 Mini PCIe socket x2 Adapter	PC/104-*Plus*
VL-MPEs-S3E	SATA adapter	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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