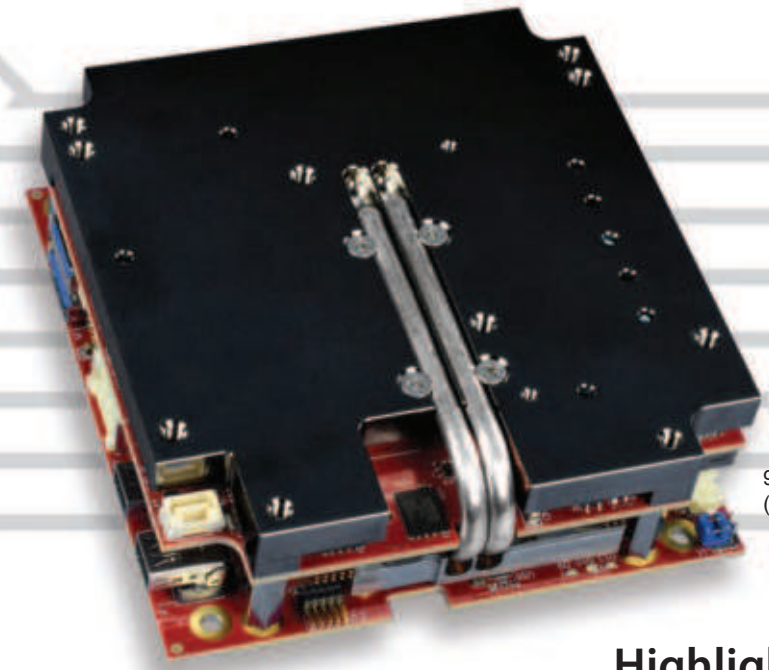
Sabertooth

PC104 Embedded Computer



90 x 96 x 43 mm
(3.5 x 3.8 x 1.7")

Overview

The Sabertooth is a rugged PC104 embedded computer featuring a high-bandwidth "3-Bank" expansion interface. The expansion connector supports high-speed peripherals, compute-offload, or GPU devices that require up to 16 high-speed PCIe lanes.

The Sabertooth is a highly effective edge computer which, with its high-bandwidth bus, can be further expanded with I/O such as 10 Gigabit Ethernet, FPGA, and GPU boards. The Sabertooth's high-bandwidth expansion port includes a PCIe Gen 3 x16 bus with bifurcation, four PCIe x1, two USB 2.0, and SMB interfaces.

Sabertooth is based on Intel's 9th Generation CPU family. Models are available with quad-core i3 or hex-core Xeon-E processors. Featuring Hyper-Threading on Xeon-E equipped models, the Sabertooth is a powerful computing platform. In addition to its powerful processor it includes high-speed SSD storage (NVMe), and up to 32 GB of RAM (error-correcting RAM in the Xeon-E model). This makes it ideal for embedded computing needs in defense, aerospace, medical, smart security, and energy applications.

The Sabertooth is designed and tested for full industrial temperature (-40° to +85°C) operation and meets MIL-STD-202H specifications for shock and vibration. It uses latching connectors to address cable detachment issues in hostile environments.

VersaLogic's 10+ year product life support ensures long-term availability. Long lifecycle products avoid expensive upgrades, redesigns, and migrations that come from shorter lifecycle products.

Highlights

- **High-Performance 9th Generation Coffee Lake Processor Options**
  Hex-core Xeon-E or quad-core i3 versions
- **3-Bank Expansion**
  PCIe x16 Gen 3 expansion
- **High-Speed On-board Storage**
  128 GB NVMe fast read/write SSD storage
- **Optional 2x 10-GB Ethernet**
  Available on Sabertooth model ASM51-1AE

VERSALOGIC CORPORATION

Features

1 PC104 "3-Bank" Expansion Connector

Gen 3 PCIe x16 bus with bifurcation, four PCIe x1, two USB 2.0, and SMB.

2 High-Performance Video

Intel UHD Graphics (P)630 supports DirectX 12 and OpenGL 4.5, 4K hardware video acceleration with HEVC (10-bit), VP8, VP9, and MPEG2 encoding/decoding and VC-1 decoding. Two Mini DisplayPort outputs.

3 Network

Two Gigabit Ethernet (GbE) ports.

4 Storage

On-Board fast read/write bootable 128 GB NVMe SSD. Larger capacities available.

6 Gb/s SATA port supports bootable SATA hard drive. Dual-port (non-latching) option available.

5 Industrial I/O

Two USB 3.1 ports (5a) and four USB 2.0 ports (5b) support video cameras, keyboard, mouse, and other devices.

Two RS-232/422/485 serial ports (5c). Three 8254 timer/counters. I2C support (5d).

6 Digital I/O

Eight TTL I/O Lines 3.3V. Independently configurable.

7 On-board Power Conditioning

10V–15VDC input for nominal 12V power sources

8 Thermal Solution

Built-in heat plate supports direct attachment to a thermal bulkhead, or attachment to other thermal options (heat sink, heat pipe adaptor, etc).

9 Expansion Power

Power input for any expansion boards added to the system.

Intel Xeon or iCore "Coffee Lake Refresh" Processor *(not shown)*

Quad-core or hex-core, up to 4.2 GHz turbo clock rate.

RAM *(not shown)*

Up to 32 GB ECC or non-ECC DDR4 RAM depending on model.

Trusted Platform Module *(not shown)*

On-board TPM 2.0 security chip can lock out unauthorized hardware and software access.

Industrial Temperature Operation

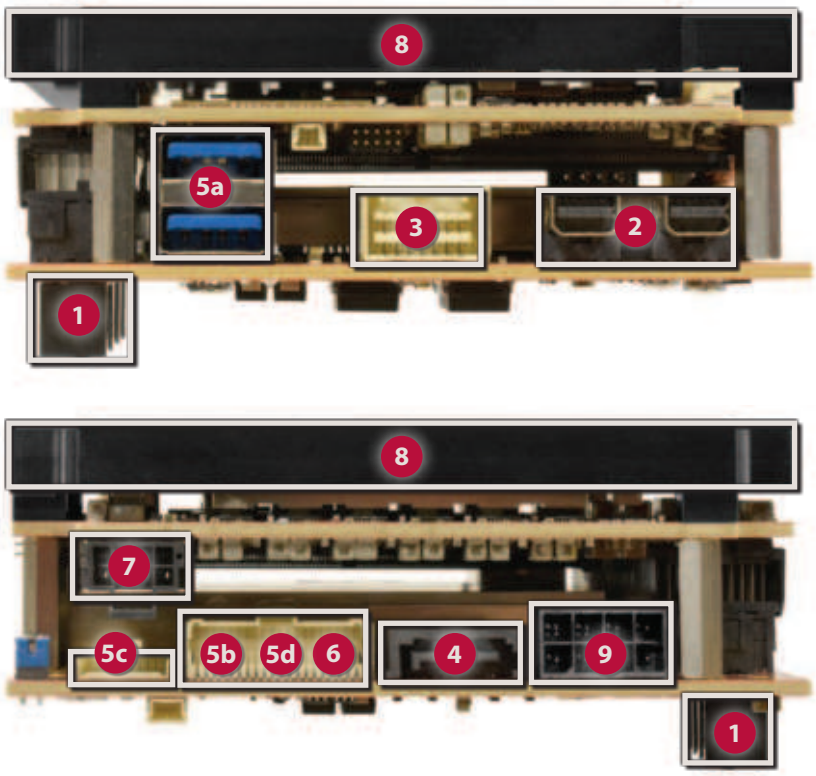
-40° to +85°C operation for harsh environments.

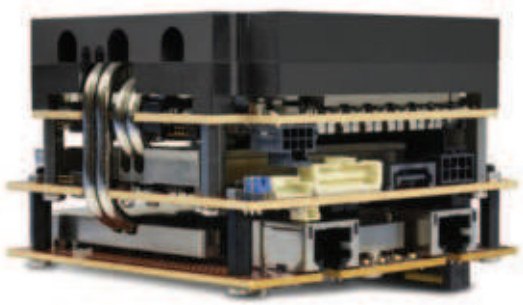
MIL-STD-202H

Qualified for high shock/vibration environments.

Software Support

Compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks. Supported by the VersaAPI I/O routines.





View showing model VL-ASM51-1AE with additional Dual 10GbE ports

Modify Sabertooth to Your Exact Requirements

COTS modifications are available in quantities as low as 100 pieces.

- Conformal Coating
- Connector Changes
- I/O Changes
- Custom Testing
- Custom Labeling
- BGA Underfill
- BIOS Modifications
- Software and Drivers
- Revision Locks
- Custom Screening
- Larger Storage Device
- Software Pre-load
- Etc.

Sabertooth

PC104 Embedded Computer

Specifications

General				
Board Size	PC104 90 x 96 x 43 mm (3.5 x 3.8 x 1.7")			
Weight	476 grams (16.8 oz.) including heat plate			
Processor Options	*Processor*	*Cache*	*Intel vPro®*	
	i3-9100HL	6 MB	No	
	Xeon E-2276ML	12 MB	Yes	
	Intel 64-bit instructions, Secure Key, Intel Trusted Execution Technology, Intel Enhanced SpeedStep® Technology, Intel Turbo Boost Technology, Intel Virtualization Technology, AES New Instructions.			
Battery	Connection for 3.0V RTC backup battery			
Power Requirements (@ +12V) †	*Model*	*Idle*	*Average*	*Max.*
	VL-EPMe-51EAP-16 (Core i3)	4.4 W	23.9 W	43.3 W
	VL-EPMe-51EDP-16X (Xeon-E)	4.2 W	26.1 W	48.0 W
	VL-EPMe-51EDP-32X (Xeon-E)	4.2 W	26.7 W	49.2 W
Input Voltage	10V – 15VDC			
System Reset and 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 included. Optional heat sink, fan, and other thermal accessories available.			
Operating Temperature	*Model*	*Heat Plate***	*Heat Pipe Adapter kit*	*Heat Sink + Fan*
	All models	-40° to +85°C	-40° to +85°C	-40° to +60°C
	Ranges shown assume 90% CPU utilization. For detailed thermal information and exceptions, refer to the VL-EPMe-51 Reference Manual. ** Heat plate must be kept below 80°C			
Airflow Requirements	0.5 linear m/s.			
Storage Temperature	-40° to +85°C			
Altitude	Operating*	To 4,570m (15,000 ft.)		
	Storage	To 12,000m (40,000 ft.)		
Vibration, Sinusoidal Sweep ¤	MIL-STD-202H method MIL-STD-202-204, Condition A: 2g			
Vibration, Random ¤	MIL-STD-202H method MIL-STD-202-214, Condition A: 5.35g rms			
Mechanical Shock ¤	MIL-STD-202H method MIL-STD-202-213, Condition G: 20g half-sine			

Security	
TPM	Infineon Trusted Platform Module 2.0 discrete device

† Represents operation at +25°C and +12V supply running Windows 10 with DisplayPort display, GbE, and USB keyboard/mouse. Average power computed as the mean value of Idle and Maximum power specifications. Maximum power measured with 95% CPU utilization in Turbo mode.

◊ 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

¤ MIL-STD-202H 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.

Memory	
System RAM	16 or 32 GB DDR4 SDRAM. ECC or non-ECC depending on model.

Video	
General	Integrated Intel UHD Graphics (P)630 supports DirectX 12 and OpenGL 4.5, Quick Sync Video, Clear Video HD Technology, 4K
Hardware Based Acceleration	Video acceleration with HEVC (10-bit), VP8, VP9, and MPEG2 encoding/decoding and VC-1 decoding
DisplayPort Interface §	Two Mini DisplayPort++ outputs. 24-bit. Up to 3840 x 2160 at 60 Hz (30 Hz for Xeon model). 4K support at 60 Hz. Supports DisplayPort and HDMI signaling (Video and Audio outputs).

Mass Storage	
Rotating/SSD Drive ¥	SATA 6 Gb/s port. Latching SATA connector. Optional dual non-latching connector.
Flash/SSD ¥	Soldered-down 128 GB NVMe. Supports Data at Rest security functions. Capacities to 1 TB supported.

Network Interface	
Ethernet ‡	Two AutoDetect 10BaseT/100BaseTX/1000BaseT ports. (Additional two 10,000 Base T available depending on model.) Latching connector. One port with network boot option.

Device I/O	
USB ‡§	Two USB 3.1 / 2.0 ports. Four USB 2.0 host ports.
COM Interface ‡	Two RS-232/422/485 selectable. 16C550 compatible. 1 Mbps max.
Digital I/O	Eight TTL I/O Lines 3.3V. Independently configurable.
I2C	Single I2C interface
Counter/Timers	Three 8254 compatible Programmable Interval Timers (PITs).

Expansion	
3-Bank Type 1. Stack Down	PCIe Gen 3 x16 with bifurcation (1 x16, or 2 x8, or 2 x4), four PCIe Gen 3 x1 lanes, two USB 2.0, and SMB.

Software	
BIOS	UEFI based on Phoenix SecureCore Tiano™
Sleep Mode	ACPI 3.0. Support for S0, S3, S4, S5 states.
Operating Systems	Compatible with most x86 operating systems including Windows, Linux, and Windows Server (Xeon model only)



Inverted view showing stack-down 3-bank connector

Ordering Information

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

Model	Processor	Cores	Hyper-Threading / Threads	CPU Clock / Turbo Speed	Graphics Core	On-board Storage	SODIMM Memory	Ethernet	Operating Temp.†	Cooling
VL-EPMe-51EAP-16	i3-9100HL	4	No / 4	1.6 GHz / 2.9 GHz	UHD 630	128 GB NVMe SSD	16 GB	GbE 2x	-40° to +85°C	Heat Plate
VL-EPMe-51EDP-16X*	Xeon E-2276ML	6	Yes / 12	2.0 GHz / 4.2 GHz	UHD P630	128 GB NVMe SSD	16 GB ECC	GbE 2x	-40° to +85°C	Heat Plate
VL-EPMe-51EDP-32X	Xeon E-2276ML	6	Yes / 12	2.0 GHz / 4.2 GHz	UHD P630	128 GB NVMe SSD	32 GB ECC	GbE 2x	-40° to +85°C	Heat Plate
VL-ASM51-1AE	Xeon E-2276ML	6	Yes / 12	2.0 GHz / 4.2 GHz	UHD P630	128 GB NVMe SSD	32 GB ECC	10GbE 2x, GbE 2x	-40° to +85°C	Heat Plate

† Final operating temperature is dependent on the customer thermal solution

Accessories

Part Number	Description
Cable Kit	
VL-CKR-SABERTOOTH	Sabertooth Eval. cable kit. Includes VL-CBR-4005, 0812, 1604, 0815, 0702, 2033, 1014, 0816, 0817, HDW-105 and 401.
VL-CBR-4005	System I/O paddleboard
VL-CBR-0812	12" 8 pin Nanofit to Fork Terminal, Power Cable
VL-CBR-1604	Dual Ethernet cable, 16-pin Clik-Mate to 2 RJ-45 – rugged latching, 12"
VL-CBR-0815	12" 8-pin Molex Micro-Fit+ to Fork Terminals, 3-Bank Power Cable
VL-CBR-0816	12" ATX 8-pin to 8-pin Molex Nano-Fit
VL-CBR-0817	12" ATX 24-pin to 8-pin Molex Micro-Fit+
VL-CBR-0702	SATA cable – rugged latching, 20"
VL-CBR-2033	Mini DisplayPort to HDMI Active Adapter
VL-CBR-1014	RS232 Dual channel cable 2xDsub (9-pin), Latching, 12"
VL-HDW-105	0.6" Standoff Package, metric thread
VL-HDW-401	Thermal compound paste. For heat sink attachment.
Cables and Adapters	
VL-CBR-0203	2-pin Latching Battery Module, 6"
VL-CBR-2031	36" mDP to mDP Cable
VL-CBR-2032	Mini DisplayPort to VGA Adapter
Hardware	
VL-HDW-114	PC104 (PCIe) Spacer
VL-HDW-115	PC104 (blank) Spacer
Thermal Options	
VL-HDW-424	Heat Sink with Fan
VL-HDW-425	Heat Pipe Adapter Kit
Miscellaneous	
VL-PS-ATX12-300A	ATX development power supply (requires VL-CBR-0816 and VL-CBR-0817)
Expansion Module	
VL-EPM-E9E	10 Gigabit Ethernet Expansion Module PCIe/104

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.

ISO 9001 • AS9100 CERTIFIED COMPANY
PRI Registrar
PERFORMANCE REVIEW INSTITUTE

VDC research PLATINUM VENDOR

Copyright © 2024 VersaLogic Corporation. All rights reserved.
10/29/24