



- Very high performance!
- 3rd Generation Intel Core i7
- Dual- and quad-core models
- Up to 16 GB DDR3 system memory
- Industrial temp. versions
- Wide input voltage (9V–15V)
- PCIe/104 or SUMIT expansion
- Trusted Platform Module (optional)

## Highlights

### Intel® 3rd Generation Core™ i7 Processor

Very high performance. 2.3 GHz quad-core and 1.7 GHz dual-core, hyper-threading CPU.

### EBX™ Format

Industry-standard format with SUMIT™ or PCIe/104 Type 1 expansion.

### High-performance Video

Integrated Intel HD 4000 graphics core with GPU Turbo Boost. DirectX 11, MPEG-2, H.264, and OGL 3.1 compliant. Supports three independent displays.

### Network Support

Dual gigabit Ethernet with remote boot support.

### RAM

Up to 16 GB DDR3 RAM with up to 1600 MT/s.

### SATA

Two SATA 6 Gb/s and two SATA 3 Gb/s ports.

### Device I/O

Two USB 3.0 ports, ten USB 2.0 ports, four serial ports, HD audio.

### Analog + Digital I/O

On-board data acquisition support. Eight analog inputs, four analog outputs, thirty-two digital I/O.

### Mini Card Socket

Supports Wi-Fi modems, GPS, MIL-STD-1553, Ethernet, solid-state storage, and other plug-in devices.

### Flash Memory

mSATA socket and eUSB interface for plug-in flash storage.

### Industrial Temperature Version

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

### MIL-STD-202G

Qualified for high shock/vibration environments.

### Wide Input Voltage Range

Accepts 9 to 15 volts (12V typ.).

### Trusted Platform Module (optional)

On-board security option defends against attacks from unauthorized hardware and software.



## Overview

The Copperhead is a high-performance embedded computer powered by a 3rd Generation Intel Core i7 processor. Its performance level allows for the integration of multiple high-bandwidth functions, such as digital signal processing and real-time video processing, onto a single board. This can drastically reduce system cost and size when used to replace multi-board chassis-based systems or custom hardware.

For video processing systems, the Copperhead features a high-speed memory interface, up to 16 GB on-board RAM capacity, and three independent display outputs. The PCIe/104 expansion site with a PCIe x16 lane is ideal for add-on cards, such as frame grabbers.

Based on the industry-standard EBX format, the Copperhead is available in either quad- or dual-core models (21 to 37W power dissipation). It features several heat management configurations and offers options for I/O interfaces and interface connectors. The Copperhead enables scalability, simplifies design, and lowers overall system cost.

## Details

Driven by an Intel 3rd Generation Core i7 processor, the Copperhead provides high performance with advanced technology features: Intel Turbo Boost 2.0, Intel vPro, Hyper-threading (two threads per core), and Advanced Vector Extensions (AVX). The Copperhead provides compatibility with a broad range of standard x86 application development tools for reduced development time.

The integrated Intel HD 4000 Graphics Processing Unit (GPU) provides hardware-accelerated MPEG-4/H.264 and MPEG-2 video encoding and decoding. The GPU supports graphics turbo boost and up to three simultaneous displays. Standard video outputs include LVDS for flat panel displays, dual DisplayPort™ outputs, and an analog VGA output. All outputs support multiple display modes including Extended Desktop and Clone.

Industry-standard system interfaces include dual Gigabit Ethernet ports with network boot capability, two USB 3.0 and ten USB 2.0 ports, four serial ports, and Intel High-Definition Audio (HDA). SATA 6 Gb/s and 3 Gb/s interfaces support high-capacity storage (rotating media or solid-state drives). A Mini PCIe socket with mSATA support provides additional solid-state drive (SSD) options. The Mini PCIe socket also accommodates plug-in Wi-Fi modems, GPS receivers, MIL-STD-1553, Ethernet, Firewire, and other mini cards. The Copperhead supports an optional Trusted Platform Module (TPM) chip for applications that require enhanced hardware-level security functions.

The rugged Copperhead meets MIL-STD-202G specifications for shock and vibration and includes models designed and tested for either commercial (0° to +60°C) or industrial (-40° to +85°C) temperature operation.

Latching SATA, Ethernet, and power connectors provide additional ruggedization for use in very harsh environments. Heatsink, fan+heatsink, and heat plate versions provide flexible options for thermal management. For extremely-high-reliability applications, IPC-A-610 Class 3 versions are available.

The wide input voltage range of 9 to 15 volts (12V nominal) simplifies system power supply requirements. Copperhead is fully compatible with 12V automotive applications.

Copperhead is compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks.

Various product customizing is available for the Copperhead, even in low quantities. Options include Trusted Platform Module, conformal coating, BGA underfill, IPC Class 3 assembly, BIOS/splash screen pre-configuration, application-specific testing, custom labeling, etc.

### Ordering Information

Model	Processor	Nominal Speed	Expansion	Operating Temp.	Cooling
VL-EBXs-41SAK	Dual-core i7	1.7 GHz	SUMIT	0° to +60°C	Heatsink (fanless)
VL-EBXs-41EAF	Dual-core i7	1.7 GHz	SUMIT	-40° to +85°C	Fan + heatsink
VL-EBXe-41SJF	Quad-core i7	2.3 GHz	PCIe/104	0° to +60°C	Fan + heatsink
VL-EBXe-41EJP	Quad-core i7	2.3 GHz	PCIe/104	-40° to +85°C	Heat plate (fanless)

### Accessories

Part Number	Description
<b>Cable Kit</b>	
VL-CKR-COPPR	Copperhead cable kit. Includes VL-CBR-0702, 0808, 1201, 4004, 5013, and VL-HDW-105 (x2).
VL-CBR-5013	Primary breakout cable (4 USB, 4 RS-232/422/485, programmable LED, speaker, audio, reset PB, power PB)
VL-CBR-1201	12-pin 2 mm (latching) / 15-pin VGA adapter
VL-CBR-0702	20" SATA cable. Latching.
VL-CBR-0808	12" power adapter cable. ATX12 to Copperhead.
VL-CBR-4004	Cable & paddleboard for the A/D, D/A, DIO, CTC
VL-HDW-105 (x2)	15.24 mm standoffs, metric thread (four per kit)
<b>Cables</b>	
VL-CBR-0401	6.25" ATX to SATA power cable
VL-CBR-1401	6" 14-pin cable assembly for (2) SPX modules
VL-CBR-1402	12" 14-pin cable assembly for (4) SPX modules
VL-CBR-2010	20" 18-bit LVDS flat panel cable (Hirose)
VL-CBR-2011	20" 18-bit LVDS flat panel cable (JAE)
VL-CBR-2012	20" 24-bit LVDS flat panel cable (Hirose)
VL-CBR-0201	Cable Wi-Fi 12" to VL-CBR-ANT01
VL-CBR-ANT01	Cable 802.11n ant. for VL-WD10-CBN
<b>Memory</b>	
VL-MM9-xxxx	DDR3 PC3-12800 SO-DIMM memory module
<b>Drives</b>	
VL-HDS35-xxx	3.5" hard drive (SATA)
VL-F15-xxxx	eUSB flash module
VL-F29-xxxx	mSATA flash module
<b>Expansion Modules</b>	
VL-WD10-CBN	802.11g/n wireless Mini PCIe card
VL-SPX-x	SPX expansion modules
<b>Hardware</b>	
VL-PS-ATX12-300A	ATX12 development power supply
VL-HDW-106	0.6" standoffs, English thread (four per kit)
VL-HDW-107	Mini PCIe/mSATA hardware kit (metric thread)
VL-HDW-109	eUSB hardware kit
<b>Miscellaneous</b>	
VL-HDW-203	PC/104 extractor tool (metal)
VL-HDW-401	Thermal compound paste (1.75g)

§ Represents operation at +25°C and +12V running Windows 7 with 4 GB RAM, 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.

‡ TVS protected port (enhanced ESD protection)

# Power pins are overload protected

† IEEE 1588 Precision Time Protocol (PTP) compatible

\* Extended altitude specifications available upon request

\*\* Bootable storage device

‡ MIL-STD-202G shock and vibrate 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 a VersaLogic Sales Engineer for further information.

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02/15/13

### Specifications

<b>General</b>	Board Size	EBX standard: 5.75" x 8" (146 mm x 203 mm)			
	Processor	Intel 3rd Generation Core i7 platform. Intel Turbo Boost Technology 2.0 and Intel HT Technology. - Dual-core models: 2.3 GHz, 6 MB L3 cache - Dual-core models: 1.7 GHz, 4 MB L3 cache			
	Chipset	Embedded Intel QM77			
	Input Power	12V (9V-15V)			
	Power Requirements (@ +12V) §	Model	Idle	Typical	Max.
		VL-EBXs-41SAK	7.6W	20.7W	33.7W
		VL-EBXs-41EAF	7.6W	20.7W	33.7W
		VL-EBXe-41SJF	16.2W	37.2W	58.1W
		VL-EBXe-41EJP	16.2W	37.2W	58.1W
	System Reset & Hardware Monitors	All voltage rails monitored. Two watchdog timers with programmable timeout. Push-button sleep, reset, and power.			
Stackable Bus	SUMIT or PCIe/104 Type 1 expansion site				
Manufacturing Standards	Standard	IPC-A-610 Class 2 modified			
	Special Order	IPC-A-610 Class 3 modified			
Regulatory Compliance	RoHS (2002/95/CE)				
<b>Environmental</b>	Operating Temperature	See Ordering Information Derate -1.1°C per 305m (1,000 ft.) above 2,300m (7,500 ft.)*			
	Storage Temperature	-40° to +85°C			
	Altitude †	Operating	To 4,570m (15,000 ft.)		
		Storage	To 12,000m (40,000 ft.)		
	Cooling	See Ordering Information			
	Airflow Requirements	- 125 LFM for heatsink (fanless) models - Zero for fanned or heat plate models			
	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				
<b>Security</b>	TPM (optional)	Optional support for Intel Trusted Platform Module 1.2 devices			
<b>Memory</b>	System RAM	Two SO-DIMM sockets. Up to 16 GB DDR3 SDRAM total. Supports 1066, 1333, and 1600 MT/s. 1.35V.			
<b>Video</b>	General	Integrated high-performance video. Intel HD Graphics 4000 graphics core with GPU Turbo Boost. Supports three simultaneous independent displays.			
	VRAM	Up to 512 MB shared DRAM			
	Desktop Display Interface ‡	Analog output (VGA). Up to 2048 x 1536 (75 Hz). 32-bit.			
	OEM Flat Panel Interface #	LVDS interface. 18/24-bit. Up to 1280 x 800 (60 Hz), 8 bpp. CMOS-selectable TFT panel types. Support for LVDS Backlight Control and FPD power control.			
	DisplayPort	Two DisplayPort outputs. Up to 2560 x 1600 (60 Hz). 10 bpp.			
<b>Mass Storage</b>	Rotating Drives/Flash/Solid-State Drives**	- Two SATA 6 Gb/s ports (latching connectors) - Two SATA 3 Gb/s ports (latching connectors) Supports RAID 0, 1, 5, and 10. mSATA modules (SATA signaling, bootable) eUSB modules (USB signaling, bootable)			
	Network Interface	Ethernet ‡ †	Two autodetect 10BaseT/100BaseTX/1000BaseT ports Standard RJ45 connectors Special Order Ruggedized connectors		
<b>Device I/O</b>	Network Boot Option	Via BIOS extension or Ethernet controller flash			
	USB ** ‡ †	Ten USB 2.0 host ports. Two USB 3.0 host ports.			
	COM 1/2/3/4 ‡	RS-232/422/485 selectable. 16C550 compatible.			
	Analog Input	Sixteen channels. 12-bit single-ended. 100 Ksps. 16-bit by special order.			
	Analog Output	Eight channels. 12-bit single-ended. 100 Ksps.			
	Digital I/O	Thirty-two TTL I/O lines (3.3V). Independently configurable.			
	Audio	Intel High-Definition Audio (HDA)			
	Counter/Timers	Three general-purpose 16-bit timers			
<b>Other I/O</b>	Mini PCIe Socket	Supports Wi-Fi modems, GPS receivers, MIL-STD-1553, Ethernet channels, non-volatile flash data storage with auto-detect mSATA support, and other plug-in modules			
	VersaLogic SPX Interface	Supports analog, digital, and CANbus SPX modules			
<b>Software</b>	BIOS	AMI Aptio UEFI BIOS with OEM enhancements. Field reprogrammable.			
	Sleep Mode	ACPI 4.0a. Support for S3 and S4 suspend states.			
	Operating Systems	Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks			