Overview

The Copperhead is a high-performance embedded computer powered by the 3rd Generation Intel "Ivy Bridge" family of processors. Its performance level and extensive I/O 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 systems that require video processing or intense computation, the Copperhead features a high-speed memory interface, up to 16 GB on-board RAM capacity, and up to 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 provides a choice of Intel core i7, core i3, and Celeron processor options to meet a variety of price/performance application requirements. 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.

Highlights

- Industrial temp (-40° to +85°C) operating temperature versions
- Shock & vibration per MIL-STD-202G
- EBX™ form factor
- Very high performance!
- 3rd Generation Intel processor ("Ivy Bridge")
  - Core i7-3615QE (quad core) or
  - Core i7-3517UE (dual core) or
  - Core i3-3217UE (dual core) or
  - Celeron 1047UE (dual core)
- Up to 16 GB SO-DIMM RAM system memory
- Wide input voltage (9V–15V)
- PCIe/104 or SUMIT expansion
- Gigabit Ethernet
- VGA, LVDS, and mini DisplayPort video
- Mini PCIe socket / with mSATA support
- USB 3.0 and USB 2.0 ports
- Serial I/O (4 RS-232/422/485)
- SATA (6 Gb/s and 3 Gb/s)
- Digital I/O (32 lines)
- Fanless versions
- Trusted Platform Module (TPM) security chip (optional)
- VersaAPI programming support
- Customization available in quantities as low as 100 pcs.
Features

1. **Intel® 3rd Generation Core™ Processor**
   - Core i7, Core i3, and Celeron CPU options allow selecting best price/performance for the application.
   - 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).

2. **Intel QM77 Platform Controller Hub**
   - The PCH provides extensive I/O support to the CPU

3. **High-performance Video**
   - Integrated Intel HD graphics core with GPU Turbo Boost*. DirectX 11, H.264, OGL 3.1 compliant and MPEG-2 video encoding and decoding.
   - Supports up to three independent displays.
   - Standard video outputs include LVDS (3a on back side) for flat panel displays, dual mini DisplayPort™ (3b), and an analog VGA output (3c). All outputs support multiple display modes including Extended Desktop and Clone.

4. **Network Support**
   - Dual Ethernet interfaces, autodetect 10BaseT / 100BaseTX / 1000BaseT with network boot capability.

5. **RAM**
   - Up to 16 GB DDR3L socket memory up to 1600 MT/s., two SO-DIMM sockets (one each on top and bottom.)

6. **SATA**
   - Two SATA 6 Gb/s (6a) and two SATA 3 Gb/s (6b) ports support high-capacity storage (rotating media or solid-state drives).
   - Includes hardware RAID 0/1/5/10 support

7. **Device I/O**
   - Two USB 3.0 ports (7a), ten USB 2.0 ports (7b) support keyboard, mouse, and other devices.
   - Four RS-232/422/485 serial ports, three 8254 timer/counters (7c), and Intel High Definition Audio (HDA) compatible.

8. **Analog + Digital I/O**
   - On-board data acquisition support. Sixteen analog inputs, eight analog outputs, and thirty-two digital I/O lines.

9. **Mini Card Socket**
   - Supports Wi-Fi modems, Ethernet, Analog I/O, Serial ports, GPS, MIL-STD-1553, Ethernet, solid-state storage, and other plug-in devices.

10. **Flash Memory**
    - Dedicated mSATA socket (10a) and eUSB interface (10b on back side) provides additional solid-state drive (SSD) options.

11. **Wide Input Voltage Range**
    - Accepts 9 to 15 volts (12V nominal) simplifies system power supply requirements. Copperhead is fully compatible with 12V automotive applications.

12. **Trusted Platform Module (optional)**
    - On-board security option defends against attacks from unauthorized hardware and software for applications that require enhanced hardware-level security functions.

13. **SPX Expansion**
    - Add low cost analog, digital, and CANbus modules. SPX interface supports up to four external SPX devices.

14. **EBX™ Format**
    - Industry-standard format with SUMIT™(14a) or PCIe/104 Type 1 (14b) expansion.

15. **Industrial Temperature Versions**
    - -40° to +85°C operation for harsh environments.

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

17. **Software Support**
    - Compatible with a variety of popular x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks.
    - Supports VersaAPI programming support for onboard I/O devices.

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Tailor Copperhead 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 –
Copperhead
EBX Single Board Computer

Specifications

General
Board Size
EBX standard: 5.75” x 8” (146 mm x 203 mm)

Processor
Intel 3rd Generation 64-bit CPU platform.

Operating
To 4,570m (15,000 ft.)

ACPI
4.0a. Support for S3 and S4 suspend states

MIL-STD-202G, Method 214A, Condition A: 5.35g rms,

Intel High-Definition Audio (HDA)
Integrated high-performance video.

Full-size Mini PCIe socket. Supports Wi-Fi modems, GPS

Compatible with most x86 operating systems including

Ten USB 2.0 host ports. Two USB 3.0 host ports.

Intel 3rd Generation 64-bit CPU platform.

Up to 512 MB shared DRAM

Support for Intel Trusted Platform Module 1.2 devices

Two mini DisplayPort outputs. Up to 2560 x 1600 (60 Hz).

Two SO-DIMM sockets. Up to 16 GB DDR3L SDRAM

Less than 95%, noncondensing

Sixteen channels. 12-bit single-ended. 100 Ksps. 16-bit

VersaLogic Application Programming Interface to support

Two autodetect 10BaseT/100BaseTX/1000BaseT ports

12V (9V–15V) Compliant

Three general-purpose 16-bit timers

Fan + Heat sink -40° to +85°C 125 Linear Feet per Minute

90°C)

be kept below
(Heat plate must
allow ample
convection
cooling.

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

References and Notes
‡ TVS protected port (enhanced ESD protection)
† TVS protected port (enhanced ESD protection)
‡ Power pins are overload protected
¥ 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 a VersaLogic Sales Engineer for further information.

Specifications are subject to change without notice. Intel and Core are trademarks of Intel Corp. EBX and PCIe/104 are trademarks of the PC/104 Consortium. SUMIT is a trademark of the SFF-SIG. PCI Express is a registered trademark of the PCI-SIG. DisplayPort is a trademark of VESA. All other trademarks are the property of their respective owners.

Security
TPM (optional) Support for Intel Trusted Platform Module 1.2 devices

Memory
System RAM
Two SO-DIMM sockets. Up to 16 GB DDR3L SDRAM total. Supports 1066, 1333, and 1600 MT/s, 1.35V.

Video
General
Integrated high-performance video.

Operating Systems
Compatible with most x86 operating systems including Windows, Windows Embedded, Linux, and VxWorks

Interface
OEM Flat Panel Interface
# Power pins are overload protected
‡ TVS protected port (enhanced ESD protection)
¥ 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 a VersaLogic Sales Engineer for further information.

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§ 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.
† Standard IPC-A-610 Class 2 modified
‡ Special Order IPC-A-610 Class 3 modified
§  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.
## Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Processor</th>
<th>Cores</th>
<th>Nominal Speed</th>
<th>Max Turbo Speed</th>
<th>Hyper-Threading</th>
<th>vPro Technology</th>
<th>AVX Instructions</th>
<th>Expansion</th>
<th>Operating Temp.</th>
<th>Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL-EBXe-41SJF</td>
<td>i7-3615QE</td>
<td>Quad</td>
<td>2.3 GHz</td>
<td>3.3 GHz</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>PCIe/104</td>
<td>0° to +60°C</td>
<td>Fan + heat sink</td>
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<tr>
<td>VL-EBXe-41LJP</td>
<td>i7-3615QE</td>
<td>Quad</td>
<td>2.3 GHz</td>
<td>3.3 GHz</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>PCIe/104</td>
<td>-40° to +85°C</td>
<td>Heat sink (fanless)</td>
</tr>
<tr>
<td>VL-EBXs-41SAK*</td>
<td>i7-3517UE</td>
<td>Dual</td>
<td>1.7 GHz</td>
<td>2.8 GHz</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>PCIe/104</td>
<td>0° to +60°C</td>
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<td>Yes</td>
<td>PCIe/104</td>
<td>-40° to +85°C</td>
<td>Heat sink (fanless)</td>
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<tr>
<td>VL-EBXs-41SLK*</td>
<td>i3-3217UE</td>
<td>Dual</td>
<td>1.6 GHz</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>PCIe/104</td>
<td>0° to +60°C</td>
<td>Heat sink (fanless)</td>
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<tr>
<td>VL-EBXs-41SLK*</td>
<td>i3-3217UE</td>
<td>Dual</td>
<td>1.6 GHz</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>PCIe/104</td>
<td>-40° to +85°C</td>
<td>Heat sink (fanless)</td>
</tr>
</tbody>
</table>

* Special Order Product – Contact VersaLogic Sales for minimum order quantities and lead time.

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

## Accessories

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>VL-CBR-COPPR</td>
<td>Copperhead cable kit. Includes VL-CBR-0702, 0808, 1201, 4004, 5013, and VL-HDW-105 (x2).</td>
</tr>
<tr>
<td>VL-CBR-0702</td>
<td>20&quot; SATA cable. Latching.</td>
</tr>
<tr>
<td>VL-CBR-0808</td>
<td>12&quot; power adapter cable. AXI12 to Copperhead.</td>
</tr>
<tr>
<td>VL-CBR-1201</td>
<td>12-pin 2 mm (latching) / 15-pin VGA adapter</td>
</tr>
<tr>
<td>VL-CBR-2010</td>
<td>20&quot; SATA cable. Latching.</td>
</tr>
<tr>
<td>VL-CBR-2011</td>
<td>20&quot; SATA cable. Latching.</td>
</tr>
<tr>
<td>VL-HDW-105 (x2)</td>
<td>15.24 mm standoffs, metric thread (four per kit)</td>
</tr>
<tr>
<td>VL-CBR-0401</td>
<td>6.25&quot; ATX to SATA power cable</td>
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<tr>
<td>VL-CBR-1401</td>
<td>6&quot; 14-pin assembly for (2) SPX modules</td>
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<tr>
<td>VL-CBR-1402</td>
<td>12&quot; 14-pin assembly for (4) SPX modules</td>
</tr>
<tr>
<td>VL-CBR-2010</td>
<td>20&quot; 18-bit LVDS flat panel cable (Hirose)</td>
</tr>
<tr>
<td>VL-CBR-2011</td>
<td>20&quot; 18-bit LVDS flat panel cable (JAE)</td>
</tr>
<tr>
<td>VL-CBR-2012</td>
<td>20&quot; 24-bit LVDS flat panel cable (Hirose)</td>
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<tr>
<td>VL-MM9-xxxx</td>
<td>DDR3 PC3-12800 SO-DIMM memory module (1.35v)</td>
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<tr>
<td>VL-HDS35-xxxx</td>
<td>3.5&quot; hard drive (SATA)</td>
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<tr>
<td>VL-F15-xxxx</td>
<td>eUSB flash module</td>
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<tr>
<td>VL-PS-ATX12-300A</td>
<td>ATX12 development power supply</td>
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<tr>
<td>VL-HDW-106</td>
<td>0.6&quot; standoffs, English thread (four per kit)</td>
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<tr>
<td>VL-HDW-108</td>
<td>Mini PCIe / mSATA hardware kit (metric thread) 2.5 mm</td>
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<tr>
<td>VL-HDW-109</td>
<td>eUSB hardware kit</td>
</tr>
<tr>
<td>VL-HDW-111</td>
<td>Half to Full Size MiniPCIe Adapter kit. Metal adapter and screws (2).</td>
</tr>
<tr>
<td>VL-HDW-203</td>
<td>PC104 extractor tool (metal)</td>
</tr>
<tr>
<td>VL-HDW-401</td>
<td>Thermal compound paste (11.75g)</td>
</tr>
<tr>
<td>VL-EFH-V6</td>
<td>Display Port to Dual Channel LVDS converter</td>
</tr>
</tbody>
</table>

## Expansion Modules

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>VL-MPEW-W2E</td>
<td>Wi-Fi 802.11 a/b/g/n Mini PCIe</td>
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<tr>
<td>VL-SX-3E</td>
<td>CANbus Module single-channel V2.0B SPX</td>
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<tr>
<td>VL-MPE-E3E</td>
<td>Gigabit Ethernet adapter Mini PCIe</td>
</tr>
<tr>
<td>VL-MPE-E1E</td>
<td>Analog input (12-bit resolution) Mini PCIe</td>
</tr>
<tr>
<td>VL-MPE-E2E</td>
<td>Analog input (16-bit resolution) Mini PCIe</td>
</tr>
<tr>
<td>VL-SX-1E</td>
<td>Analog Input Module 8-Channels SPX</td>
</tr>
<tr>
<td>VL-SX-2E</td>
<td>Digital I/O Module 16-lines SPX</td>
</tr>
<tr>
<td>VL-SX-3E</td>
<td>Analog Output Module 4-channels 12-bit SPX</td>
</tr>
<tr>
<td>VL-SX-5E</td>
<td>Solid State Switch Module 8-channel SPX</td>
</tr>
<tr>
<td>VL-MPEu-G2E</td>
<td>GPS receiver Mini PCIe</td>
</tr>
<tr>
<td>VL-MPEu-K1Exx</td>
<td>AES Encrypted Memory (8 or 32 GB) Mini PCIe</td>
</tr>
<tr>
<td>VL-MPEs-F1Exx</td>
<td>mSATA module (4/16/32 GB) (SATA) Mini PCIe</td>
</tr>
<tr>
<td>VL-MPEs-SJExx</td>
<td>SATA adapter Mini PCIe</td>
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</tbody>
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