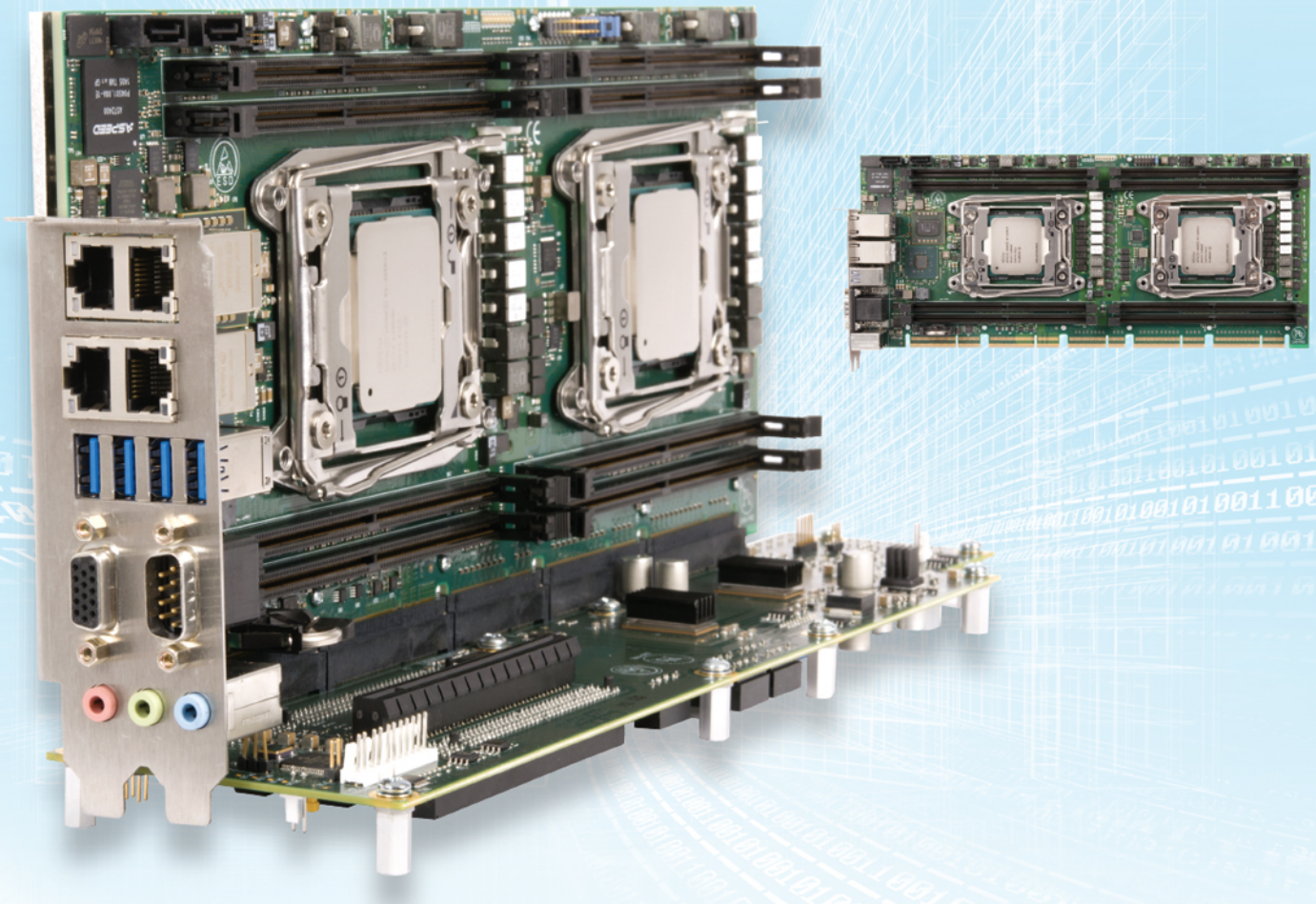
HDEC Series®

PRODUCT GUIDE

High-Density SHBs, backplanes and rackmount systems



- Expands PCIe Plug-In Card Support
- Lowers Data Latencies & Costs
- 5x Increase In Aggregate PCIe Bandwidth
- Provides More System I/O Capability

TRENTON SYSTEMS®

Engineered For Reliability

Why you should consider the Trenton Systems *HDEC Series*®

- HDEC is a Made in USA system solution comprised of a high-density system host board and backplane populated with industry standard PCI Express cards of your own choosing. HDEC Series systems deliver a 5-times increase in aggregate system bandwidth with lower SHB-to-PCIe card data latencies.

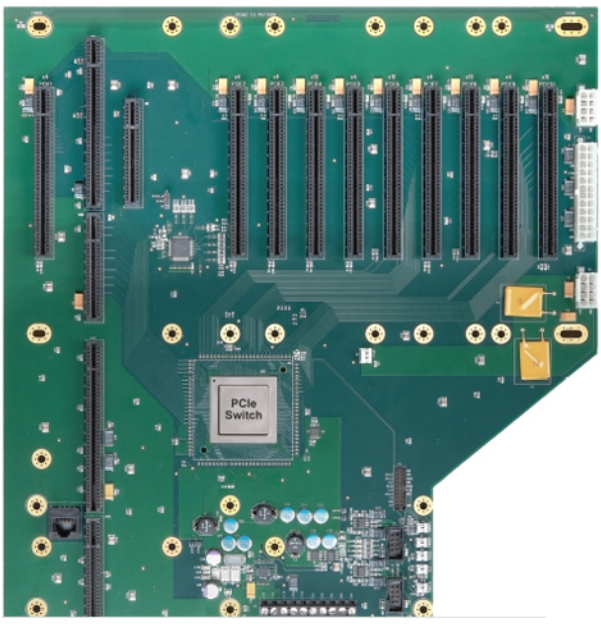
Why *HDEC?*

- Reduces dependence on PCIe Switch architecture for I/O card slots
- Greater SHB I/O features available on the backplane
- 5x increase in aggregate PCI Express 3.0 bandwidth
- Provides more available power
- Maintains industry standard chassis form factors
- Improved system cable management
- Supports the broadest availability of standard I/O cards
- New mechanical packaging attributes for rugged environments
- Lowers SHB-to-PCIe Card data latencies
- Made in USA computer hardware platform
- Provides a growth path for future system performance

More native PCIe 3.0 links between an HDEC Series system host board and backplane reduces the number of data "hops" through PCI Express® switches.

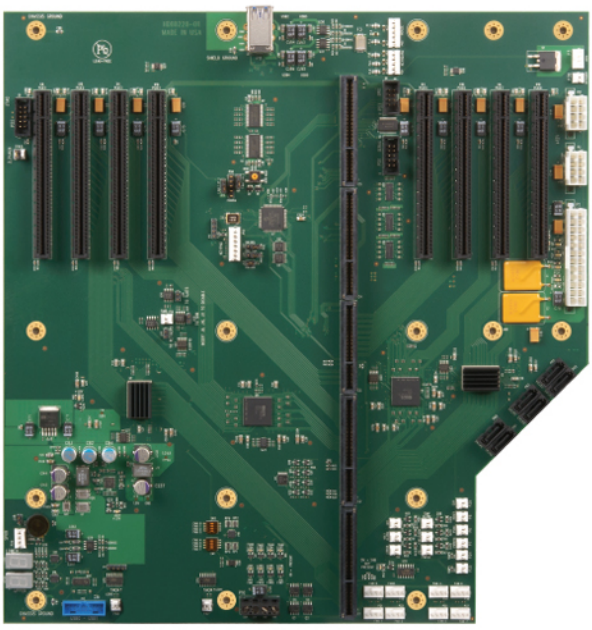
- Reduces backplane cost
- Lowers data latencies
- 15.3% average bandwidth increase per slot

- The following images illustrate this fundamental HDEC Series application advantage.



PICMG® 1.3 Backplane - 1 PCIe Switch, 1 switch hop, Aggregate slot bandwidth* = 32GB/s (both directions)

**assumes PCIe Gen3 switch and eight slots communicating at once to CPU*



HDEC Series Backplane - No PCIe Switch, No switch hop, Aggregate slot bandwidth* = 160GB/s (both directions)

**all direct PCIe Gen3 links to CPU eliminates slot contention issues*

What is the Trenton Systems *HDEC Series*®

- A long-life system solution made up of a high-density system host board, backplane, and industry standard PCI Express option cards packaged in a rackmount computer to meet the increasing data demands of modern information-driven organizations.

U.S. Made HEP8225 HDEC Series System Host Board (SHB)

- A dual-processor SHB; oftentimes referred to as a single board computer or SBC, featuring embedded Intel® Xeon® E5-2600 v3 processors and double-density PCIe edge connectors that enables:
  - Faster I/O Communication
  - Wider Bandwidths
  - Reduced Data Latency
  - Expanded PCIe Card Support
  - Lower Backplane Costs
  - Extended Hardware Deployments

U.S. Made HDEC Series Backplanes

- Available in a wide variety of different form factors, HDEC Serie pport standard PCIe cards and enclosures.
  - 2U Butterfly
  - Midsize Format
  - Small Form Factor Shoebox
  - Large Format-Single Segment
  - Large Format-Dual Segment
  - Large Format, Triple Segment

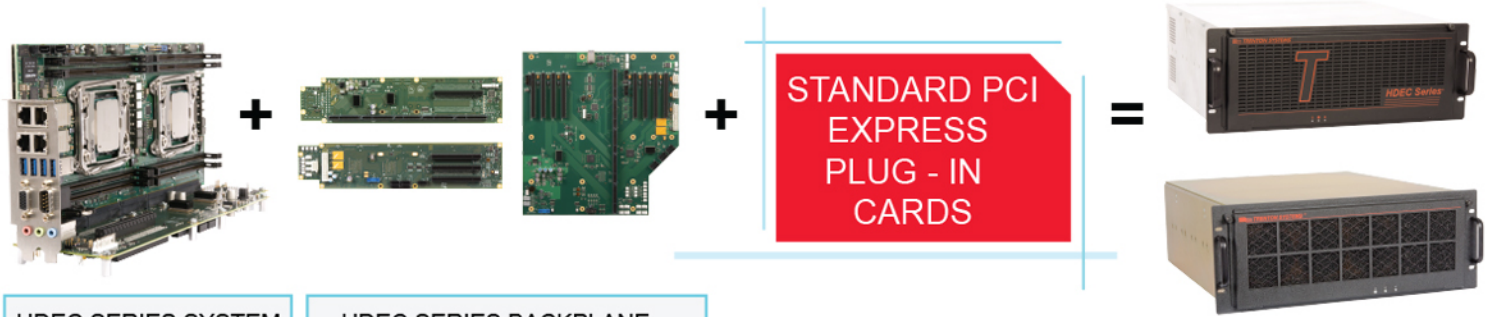
Industry Standard PCI Express Plug-In Cards

- The HDEC Series system architecture expands the support of a wide variety of industry standard, plug-in PCIe option cards.
  - Graphics Processing Units (GPUs)
  - Discrete I/O
  - Telemetry & Sensor Capture
  - Network Interface Cards (NICs)
  - Video Capture and Control
  - Data Storage

U.S. Made HDEC Series Computers

- Standard 19" rackmount and desktop chassis form factors enable cost-saving HDEC Series system designs.
  - Standard Chassis Designs
  - MIL-STD Chassis Options
  - Small Form Factors
  - Rugged Aluminum Cases
  - Lightweight
  - Easy Installation

HDEC Series High-Density Embedded Computing Solution

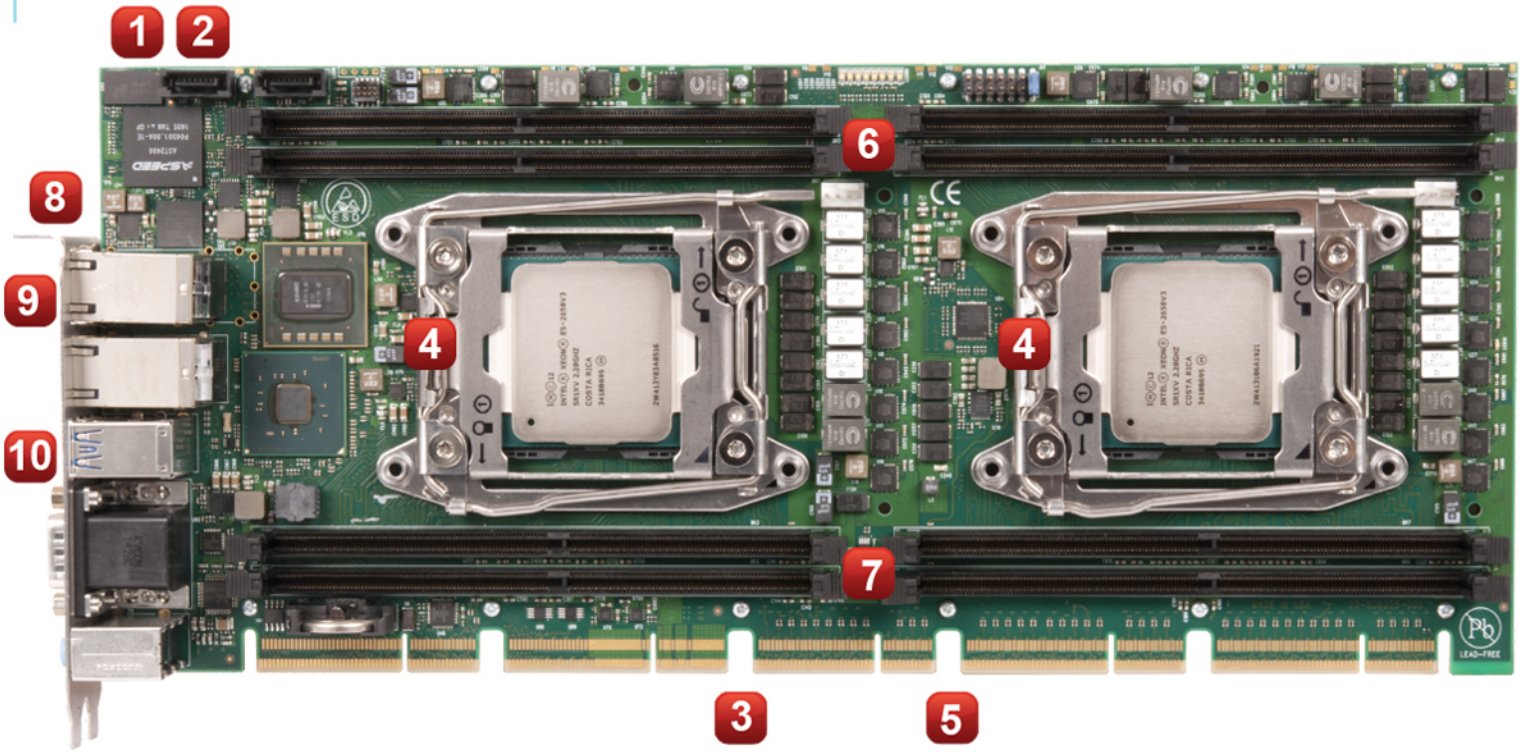


HDEC SERIES SYSTEM HOST BOARD (SHB)
HEP8225

HDEC SERIES BACKPLANE
2U, COMPACT, MIDSIZE OR LARGE FORMAT
HDB8228 - MIDSIZE
HDB8227 - 2U
HDB8229 - LARGE FORMAT, 2 SW
HDB8230 - MIDSIZE, 1 SW
HDB8231 - LARGE FORMAT
HDB8236 - SHOEBOX
HDB8237 - QUAD SEGMENT
HDB8228 - MIDSIZE, 10 X8

HDEC SERIES COMPUTERS
THS2085 - 2U
THS4086 - 4U/MID BP/16.5"
THS4095 - 4U/LG BP/26"
THS5087 - 5U/LG BP/23"
THS5088 - 4U/MULTI-SEGMENT
TMH4087 - 4U/MID BP/STD I/O

The HEP8225 System Host Board is the heart of the *HDEC Series*®



HEP8225 HDEC Series Dual-Processor System Host Board

1 U.S. Made SHBs/SBCs Maximize Quality
- ✓ 5-yr warranty/7+yr. availability

2 Revision Controlled Board BIOS
- ✓ Maximizes performance & flexibility

3 Eighty (80) PCI Express 3.0 Lanes
- ✓ Automatic link negotiation & bifurcation

4 Dual Long Life Intel® Xeon® Processors
- ✓ Supports up to 14 cores per processor

5 Device, Data Storage and Diagnostic I/O
- ✓ Enhanced system flexibility and capability

6 DDR4-2133 Memory Interfaces
- ✓ Eight, Full-Size DDR4 32GB DIMMs

7 Four Direct Memory Interfaces Per CPU
- ✓ Supports a 256GB memory capacity

8 Standard I/O Bracket Extends I/O
- ✓ Ethernet, USB, Video, Serial, Audio

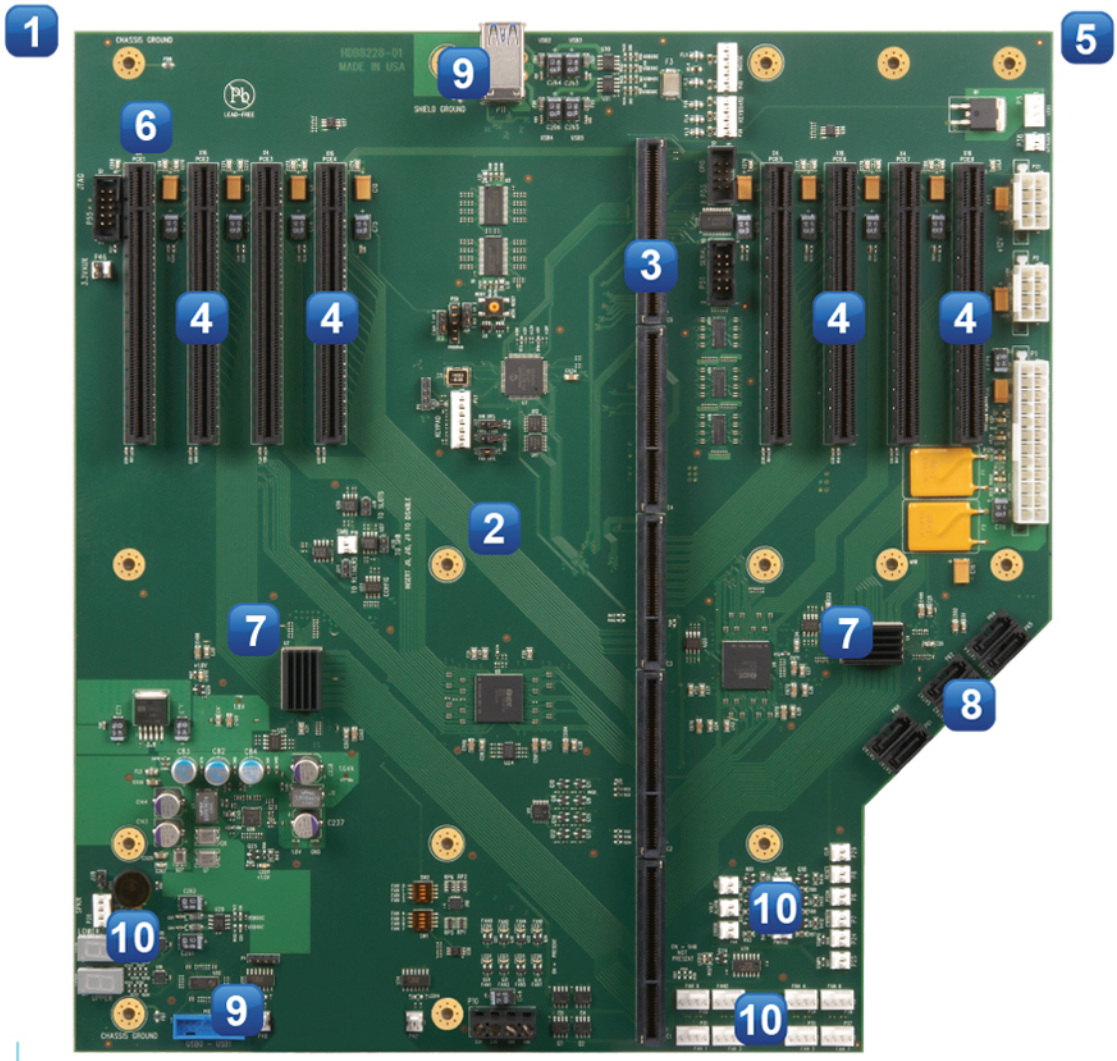
9 Multiple 10GbE and 1GbE Ethernet LANs
- ✓ Flexible Ethernet configuration options

10 I/O Bracket Supports Four USB 3.0 Ports
- ✓ Expands system device I/O support

High-Density PCI Express edge connectors used on the HEP8225 SHB enable...

- Standard HDEC backplane designs
- Six (6) SATA/600 interfaces
- Six (6) USB interfaces
- More available backplane connections
- Eliminates pin-and-socket connectors
- Enhanced standard plug-in card support
- 80 lanes of PCIe Gen3 available to the backplane
- Simplifies and improves system cable management
- More front, internal and rear device I/O support
- Increases power, diagnostics and system I/O capabilities
- Reduces connector cost and maintenance expenses
- Lowers system costs via standard plug-in edge card usage

***HDEC Series* backplanes such as the HDB8228 midsize format illustrated below form the backbone of diverse high-density embedded computing systems.**



HDB8228 HDEC Series Midsize Format Backplane

1 U.S. Made Backplanes Maximize Quality
- ✓ 5-yr warranty/7+yr. availability

2 HDEC Design Reduces PCIe Switch Usage
- ✓ Reduces cost & maximizes performance

3 HDEC System Host Board Slot
- ✓ Standard high-density PCIe connectors

4 x16 Slots Spaced For Double-Wide Cards
- ✓ Perfect for high-end cards such as GPUs

5 Supports Up To Eight PCIe 3.0 Cards
- ✓ Direct PCIe links maximize throughput

6 I/O Card Slots Use x16 PCIe Connectors
- ✓ Automatic link negotiation & bifurcation

7 PCI Express 3.0 Link Retimers
- ✓ Ensures I/O card-to-SHB data integrity

8 Six SATA/600 Interface Connectors
- ✓ Maximizes cable routing efficiency

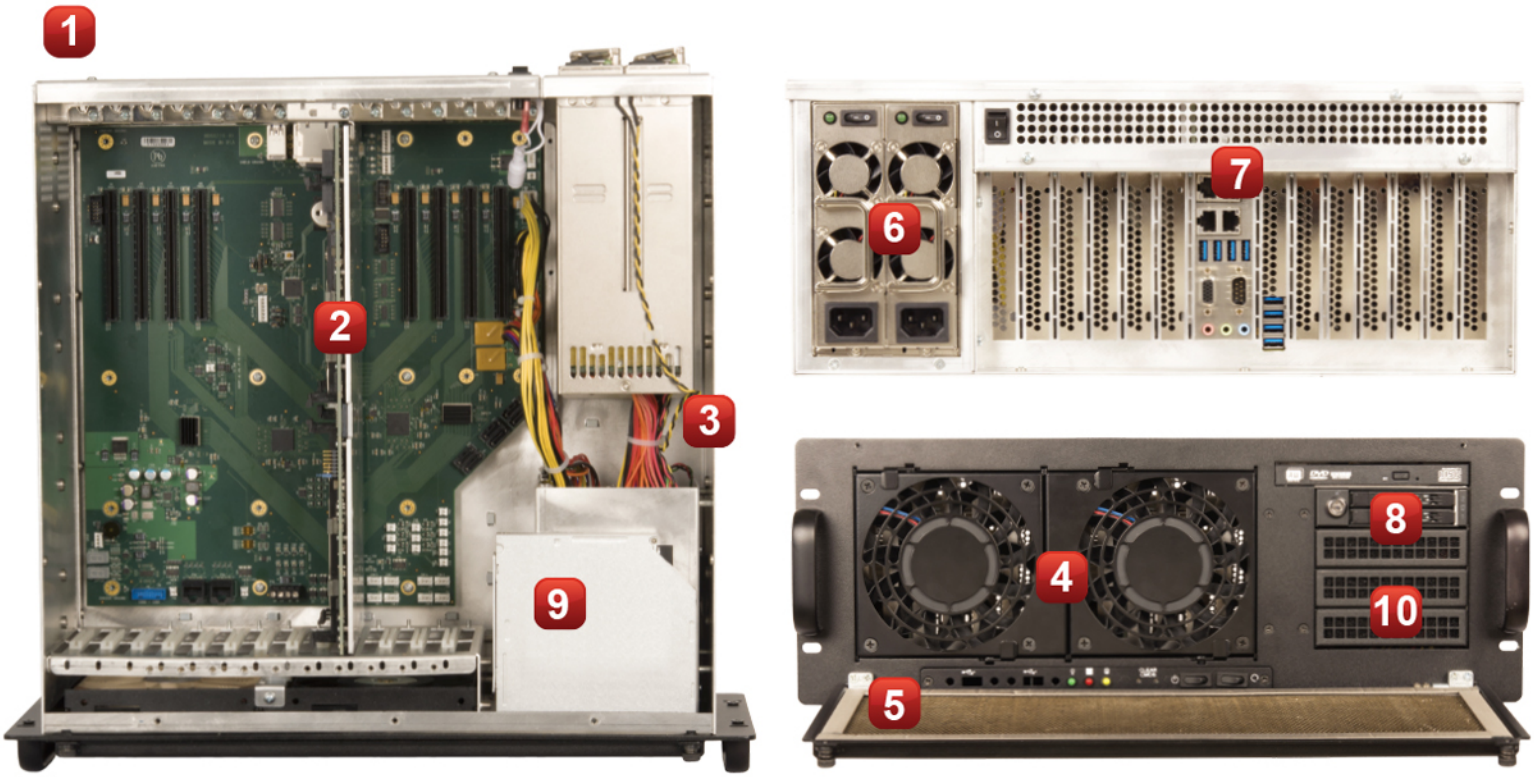
9 Front and rear USB Device Interfaces
- ✓ Enhances system design flexibility

10 Multiple System Interface Connections
- ✓ Enables local and remote diagnostics

See page seven for a complete listing of the standard HDEC backplanes available in the 2U butterfly, small from-factor shoebox, midsize, large and multi-segment formats.

▸ Trenton also designs and manufactures custom backplane solutions for unique application requirements. Contact Trenton to discuss your specific system needs with one of our backplane design engineers.

HDEC Series systems **like the THS4086 4U rackmount computer are built for superior processing performance, expanded PCI Express standard I/O card support, rugged dependability and system configuration stability over the life of your application.**



THS4086 HDEC Series Rackmount Computer

1 U.S. Made Systems Maximize Quality
- ✓ 5-yr warranty/7+yr. availability (HDEC boards)

2 Complete System BIOS Control
- ✓ Maximizes flexibility & long-term stability

3 Rugged, Lightweight with a Shallow-Depth
- ✓ Aluminum enclosure with a 16.5" depth

4 High CFM Front Access/Easy Swap Fans
- ✓ Ensures cooling & maintenance efficiency

5 Front Access Air Filter Inside Front Door
- ✓ Simplifies system maintenance

6 Flexible Power Supply Options
- ✓ Fixed or redundant for specific needs

7 I/O Card Lightbar Illuminates The Way
- ✓ Reduces I/O card connection errors

8 Supports Up To Eight Front Access Drives
- ✓ Maximizes user accessible data storage

9 U.S. Made Systems Maximize Security
- ✓ Configuration stability supports long-life deployments

10 Supports RAID Storage Arrays
- ✓ Space-saving HDD/SDD data arrays

See page seven for a listing of HDEC systems available in standard 2U, 4U and 5U rackmount computer enclosures.

▶ Trenton also offers custom engineered and manufactured solutions to meet unique high-density embedded computing application requirements. Contact Trenton to discuss your specific needs with one of our system design engineers.

Choose the *HDEC Series* building blocks or a complete system for your computing application.

SHB Model	Processors	Board Standard	System Memory	Available I/O
HEP8225	Two, 6 to 14-Core Intel® Xeon® E5-2600 v3 Series (1.9 to 2.6GHz, Haswell-EP)	HDEC® Series SHB delivers 80 PCIe 3.0 links to an HDEC Series Backplane plus expanded system I/O	8 - Standard DDR4-2133 DIMM sockets support up to a 256GB of system memory when using 32GB DDR4 DIMMs	2 - 10GbE, 2 - GbE, 6 - USB, 4 - USB2, 8 - SATA/600, VGA, Audio, Status, Diagnostics, & I/O

Backplane	Number of HDEC SHB Slots	Backplane Standard	PCI Express I/O Card Slots	Suggested HDEC Series System(s)
HDB8227	One	HDEC Series 2U Butterfly, switchless	A - 1, x16 PCIe elect./x16 mech. B - 3, x16 PCIe elect./x16 mech.	THS2085 - HDEC Series 2U Rackmount Computer
HDB8228	One	HDEC Series Midsize Format, switchless	8 total PCIe card slots* 4, x16 PCIe electrical/x16 mechanical and 4, x4 PCIe elect./x16 mech.	THS4086 - HDEC Series 4U Rackmount Computer TMH4787 - HDEC Series MIL-STD 4U Rackmount Computer
HDB8229	One	HDEC Series Large Format	16 total PCIe card slots* 12, x16 PCIe elect./x16 mech. 4, x4 PCIe elect./x16 mech.	THS4095 - HDEC Series 4U Rackmount Computer THS5087 - HDEC Series 5U Rackmount Computer
HDB8230	One	HDEC Series Midsize Format	8 total PCIe card slots* 5, x16 PCIe elect./x16 mech. 1, x8 PCIe elect./x16 mech. 2, x4PCIe elect./x16 mech.	THS4086 - HDEC Series 4U Rackmount Computer TMH4787 - HDEC Series MIL-STD 4U Rackmount Computer
HDB8231	One	HDEC Series Large Format, switchless	18 total PCIe card slots* 2, x8 PCIe elect./x16 mech. 16, x4 PCIe elect./x16 mech.	THS4095 - HDEC Series 4U Rackmount Computer THS5087 - HDEC Series 5U Rackmount Computer
HDB8236	One	HDEC Series Shoebox Format, switchless	5 total PCIe card slots* 4, x16 PCIe elect./x16 mech. 1, x8 PCIe elect./x16 mech.	THS5088 - HDEC Series 5U Rackmount Computer for multiple shoebox backplanes THS5089 - HDEC Series 5U Rackmount Computer for multiple shoebox backplanes
HDB8237	Four	HDEC Series Large Format, Quad-Segment, switchless	4 total PCIe card slots* 1, x16 PCIe elect./x16 mech. per each SHB segment	THS5090 - HDEC Series 5U Rackmount Computer for quad-segment backplanes THS5091 - HDEC Series 5U Rackmount Computer for quad-segment backplanes
HDB8238	One	HDEC Series Midsize Format, switchless	10 total PCIe card slots* 10, x8 PCIe elect./x16 mech.	THS4086 - HDEC Series 4U Rackmount Computer TMH4787 - HDEC Series MIL-STD 4U Rackmount Computer
HDB8243	One	HDEC Series Shoebox Format, switchless	2 total PCIe card slots* 2, x16 PCIe elect./x16mech.	THS5092 - HDEC Series 5U Rackmount Computer supports three HDB8243 backplanes for 3-in-1 system applications

System Model	Form Factor	Local Storage	System I/O^	System Power
THS2085	2U, 19" rackmount, 19" (W) x 3.5" (H) x 17" (D)	4 - Front access 2.5" drive carriers for SATA HDD/SDDs	Front: 2-USB 3.0, Power & Reset, Diagnostic LEDs Rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Fixed ATX/EPS or micro-redundant supply
THS4086	4U, 19" rackmount, 19" (W) x 7.0" (H) x 17" (D)	8 - Front access 2.5" drive carriers for SATA HDD/SDDs	Front: 2-USB 3.0, Power & Reset, Diagnostic LEDs Rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Fixed ATX/EPS or micro-redundant supply
THS4095	4U, 19" rackmount, 19" (W) x 7.0" (H) x 24" (D)	8 - Front access 2.5" drive carriers for SATA HDD/SDDs	Front: 2-USB 3.0, Power & Reset, Diagnostic LEDs Rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Front-access, fixed ATX/EPS supply
THS5087	5U, 19" rackmount, 19" (W) x 8.75" (H) x 23" (D)	8 - Front access 2.5" drive carriers for SATA HDD/SDDs	Front: 2-USB 3.0, Power & Reset, Diagnostic LEDs Rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Rear-access, N+1 ATX/EPS supply
THS5088	5U, 19" rackmount, 19" (W) x 8.75" (H) x 18" (D)	None	2x front: 2-USB 3.0, Power & Reset, Diagnostic LEDs 2x rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Two - Fixed ATX/EPS independent supplies
THS5089	5U, 19" rackmount, 19" (W) x 8.75" (H) x 18" (D)	1 - 3.5" drive bay per segment supporting DP25 drive frames	2x front: 2-USB 3.0, Power & Reset, Diagnostic LEDs 2x rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Two - Fixed ATX/EPS independent supplies
THS5090	5U, 19" rackmount, 19" (W) x 8.75" (H) x 18" (D)	1 - 3.5" drive and 1 - optical media bay per segment	2x front: 2-USB 3.0, Power & Reset, Diagnostic LEDs 2x rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Two - Fixed ATX/EPS independent supplies
THS5091	5U, 19" rackmount, MIL-STD 19" (W) x 8.75" (H) x 18" (D)	None	4x front: Power & Reset, Diagnostic LEDs 4x rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Four - Fixed ATX/EPS independent supplies
THS5092	5U, 19" rackmount, MIL-STD 19" (W) x 8.75" (H) x 18" (D)	None	3x front: Power & Reset, Diagnostic LEDs 3x rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Three - Fixed ATX/EPS independent supplies
TMH4787	4U, 19" rackmount, 19" (W) x 7.0" (H) x 22" (D)	8*** - Front access 2.5" drive carriers for SATA HDD/SDDs	Front: 2-USB 3.0, Power & Reset, Diagnostic LEDs Rear: 4-USB 3.0, 2-GbE, 2-10GbE, VGA, Serial, Audio	Rear-access, fixed ATX/EPS 115/230VAC, or 18-32VDC

**All HDEC Series backplane slots support industry standard PCI Express 3.0, 2.0 and 1.1 plug-in I/O cards*

^Rear I/O SHB configuration dependent

Trenton Systems SHBs, Backplanes and Integrated System Solutions are deployed in a wide array of embedded computing applications.

Government & Defense

Communications

Industrial Automation

Energy

Video Capture & Display

Data Storage & IoT Infrastructure

Don't see a standard HDEC Series board or system that meets your specific requirements?

- Contact us to discuss your unique application needs and we will develop a custom solution using standard COTS components.

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