

[www.rtd.com](http://www.rtd.com)



# RTD

**RTD Embedded Technologies, Inc.**

*Rugged, Modular, Stackable Solutions*

AS9100 and ISO 9001 Certified

2017 Q4 Product Guide

## Corporate Headquarters

*Design, Manufacturing, Engineering & Technical Support*

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## Global Partnerships

Americas	Netherlands
Australia	Norway
Belgium	Portugal
Czech Republic	South Africa
France	Spain
Germany	Sweden
Italy	Turkey



Advanced Analog I/O, Advanced Digital I/O, aAIO, aDIO, a2DIO, Autonomous SmartCal, "Catch the Express", cpuModule, dspFramework, dspModule, eBuild, expressMate, ExpressPlatform, "MIL Value for COTS prices", multiPort, PlatformBus, and PC/104EZ are trademarks, and "Accessing the Analog World", dataModule, IDAN, HiDAN, HiDANplus, RTD, the RTD logo and StackNET are registered trademarks of RTD Embedded Technologies, Inc. All other trademarks are the property of their respective owners.

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# RTD: Certified, Capable, Proven

Incorporated in 1985, RTD Embedded Technologies, Inc. – a founder of the PC/104 Consortium and an AS9100 and ISO 9001 certified company – specializes in the research, design, and manufacturing of standards-based computer modules and systems, addressing intelligent process control, data acquisition and processing, adaptive signal processing, video capture, telematics, wireless, field bus, and power supply technologies. Our high-performance products are all designed and manufactured in-house at our Pennsylvania facility.



*All of RTD's products are designed and manufactured under one roof at our state-of-the-art facility in State College, Pennsylvania, USA.*

When you work with RTD to engineer application solutions, you benefit from years of defense, aerospace, and industrial experience. Driven by some of the brightest minds in software, hardware, and systems engineering, RTD knows how to deliver.

As a long time supplier to the aerospace, defense, transportation, industrial, and maritime industries, RTD's continued focus is to assure the highest degree of excellence and customer satisfaction. Our AS9100 and ISO 9001 registration exemplifies our commitment to deliver superior products with unsurpassed attention to quality, safety, and reliability.

## AS9100 and ISO 9001 Certified

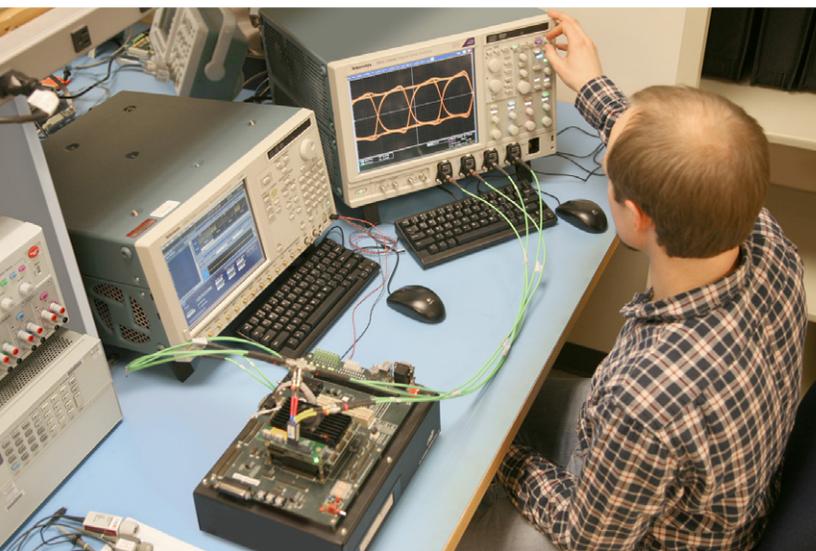
The AS9100 and ISO 9001 International Quality Management Standards have been established to encourage organizations to analyze customer requirements, define the processes that contribute to the achievement of a product which is acceptable to the customer, and keep these processes under control. In many arenas, certification to these standards is a prerequisite for doing business.

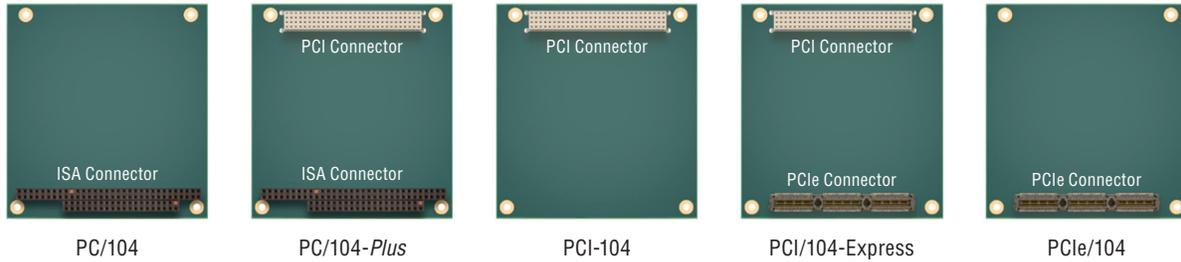
Over one million ISO 9001 certificates have been issued to companies worldwide compared to less than 15,000 for AS9100 certificates. AS9100 registration is a prestigious and distinctive certification which provides the most comprehensive quality management system recognized on a global basis.



As part of our commitment to total quality and zero defect policy, RTD is certified to both AS9100 and ISO 9001. A listing of our registration can be viewed by visiting the international OASIS (Online Aerospace Supplier Information System) database at [www.IAQG.org](http://www.IAQG.org).

*RTD's engineers and manufacturing teams have a complete line of advanced, cutting-edge equipment at their fingertips. When a product ships from our facility, we're truly proud of its quality workmanship, and its technical superiority.*

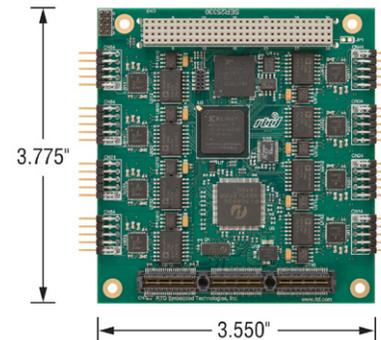




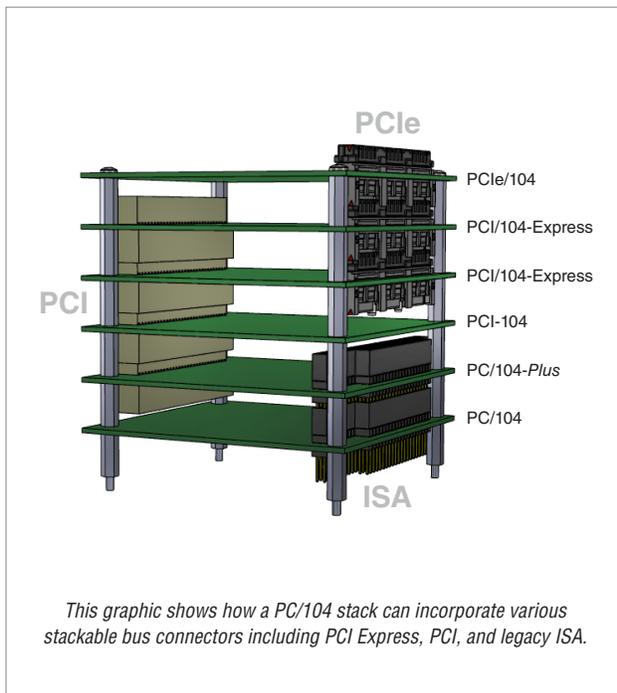
## What is PC/104?

PC/104 is an embedded computer standard defined by its compact footprint and its stacking bus structure. In essence, PC/104 is a modular, ruggedized version of the PC. Instead of using a backplane, PC/104 modules mate together via stackable ISA, PCI, and PCI Express bus connectors. The stackable connectors and asymmetric corner mounting holes create a compact and rugged modular system.

PC/104 leverages large PC hardware and software markets by following mainstream PC bus development. This reduces time-to-market and minimizes development costs. Completely defined bus pinouts enable interchangeability and interoperability. This means that users and system designers can choose from a wide array of specialized PC/104 modules to tailor a system to fit their project requirements.



The PC/104 specifications are maintained by the PC/104 Consortium – an international association comprised of member companies who have joined together to create, maintain, and distribute specifications supporting the PC/104 form factor. As new mainstream bus architectures come to market, PC/104 continues to evolve in order to meet the latest technological demands while continuing to leverage past development investments.



*All of RTD's products are available in advanced enclosures which maintain the modularity and stackability of PC/104.*

# PCIe/104 & PCI/104-Express

The PCIe/104 and PCI/104-Express specification establishes a standard to use the high speed PCI Express bus in stackable, modular embedded applications. It was developed by PC/104 Consortium members and adopted by its voting members in March 2008. The PC/104 Consortium chose PCI Express because of its full PC market adoption, performance, scalability, and growing silicon availability worldwide. It provides a high-performance physical interface while retaining software compatibility with the existing PCI infrastructure.

Incorporating the PCI Express bus within the industry proven PC/104 architecture brings many advantages for embedded applications including fast data transfer, low cost due to PC/104's unique self-stacking bus, high reliability, inherent ruggedness, and long term sustainability.



## Overview

There are two versions of PCIe/104 that are complementary. The difference is in banks 2 and 3 of the connector. Type 1 has a x16 PCI Express link in these banks while Type 2 has PCI Express x4, USB 3.0, SATA and LPC.

### Type 1 and Type 2 common feature set and pin assignments:

- Four x1 PCI Express Links
- Two USB 2.0
- ATX power and control signals: +5V Standby, Power supply on, Power OK
- Power: +3.3V, +5V, +12V
- SMBus

### Type 1 has the common feature set plus:

- One x16 PCI Express Link that can be configured as two x8 Links or two x4 PCI Express Links dependent on the host.

### Type 2 has the common feature set plus:

- Two x4 PCI Express Links
- Two USB 3.0
- Two SATA
- LPC Bus
- RTC Battery

## Connector Comparison

Feature	Type 1	Type 2	Type 2 Up Type 1 Down	Type 2 Up Type 2 Down
USB 2.0	2	2	4	4
SMB	1	1	1	1
PCIe x1	4	4	8	8
PCIe x4		2	2	4
PCIe x16	1		1	
USB 3.0		2	2	4
SATA		2	2	4
LPC		1	1	1
RTC Battery		1	1	1

*RTD takes advantage of the surface mount connector architecture which enables separate buses on the top and bottom of an embedded module. A host CPU with separate top and bottom buses allows peripheral modules to be stacked both up and down at the same time.*

## Type 1 and Type 2 stacking rules explained:

- PCI Express x1 or USB 2.0 peripheral cards are universal and can plug into either Type 1 or Type 2 hosts.
- PCI Express x16 peripheral cards must plug into Type 1 hosts.
- SATA, PCI Express x4, USB 3.0, and LPC peripheral cards must plug into Type 2 hosts.
- Anything plugged in the wrong bus holds the system in reset and causes no damage.

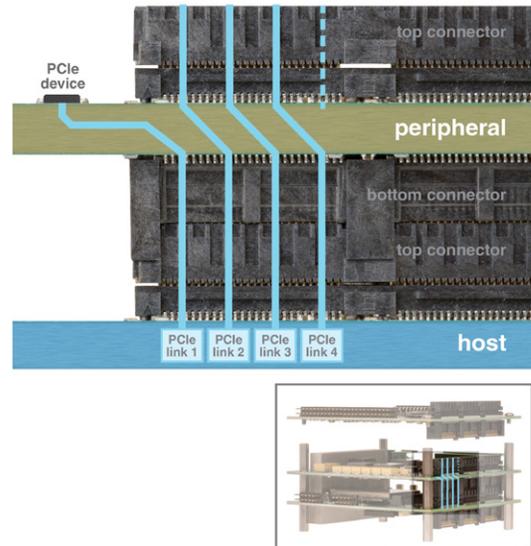
## PCI-104 PCI Bus connector

- PCI Bus: 32-bit, 33 MHz, Four Bus Master capable (same as on PC/104-Plus and PCI-104)
- Power: +3.3V, +5V, +12V, -12V, +5V Standby, Power Supply On, and PME for ATX power supply

## Automatic Link Shifting

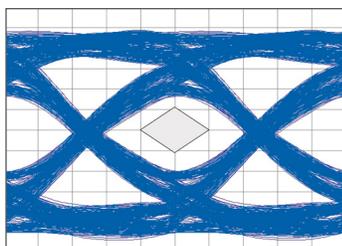
Link shifting allows automatic PCI Express link assignment to add-in modules. It operates above and below the CPU automatically. The flexibility and expandability of the bus and mechanical layout allow many different stack configurations to support an array of diverse project requirements. Automatic link shifting also applies to USB 2.0, USB 3.0, and SATA.

The graphic at right shows how each peripheral board uses the first PCI Express lane presented to it, and shifts the remaining links so that the next card in the stack will have an active link in the first position. Additionally, peripheral modules can be simultaneously stacked above and below the CPU. The peripheral modules can even be identical – each gets its own PCI Express link and will automatically be recognized by the host as a separate device. Each peripheral has a signal-controlled directional switch which informs the peripheral whether it is installed above or below the host, and can select a link from the top or bottom host connector accordingly.

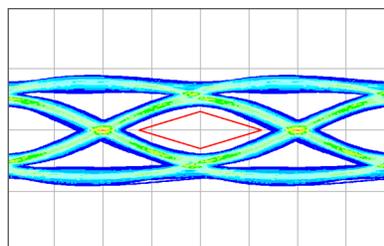


## PCIe Signal Integrity

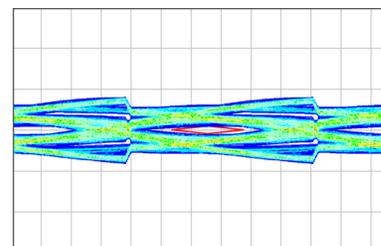
A specialized test fixture was designed to characterize PCIe Gen 2 and Gen 3. A signal analyzer and advanced simulation software yielded the eye diagrams below. These tests show excellent results with no crosstalk.



PCIe Gen 1



PCIe Gen 2



PCIe Gen 3

# Stackable PCI Express Leadership

Quad-Core PCIe/104  
Intel Atom E3800 cpuModule  
CMX34BT



Quad-Core PCI/104-Express  
Intel Atom E3800 cpuModule  
CML24BT



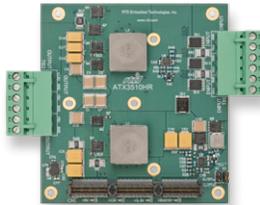
Quad-Core PCI/104-Express  
Intel Core i7 cpuModule  
CMA24CR



Quad-Core PCIe/104  
Intel Core i7 cpuModule  
CMA34CR



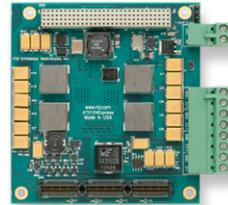
190W Synchronous Power Supply  
ATX3510



70W Avionics Power Supply  
APWR35110



88W Poly-Phase Power Supply  
ATX104HR-Express



100W Isolated Power Supply  
IATX25110



Multi-Core PCIe/104  
Texas Instruments TMS320C66x  
SPM34CP



24-bit Delta-Sigma A/D  
DM35424



1.5 MHz 18-bit A/D  
DM35418



12-bit Analog I/O  
DM35520



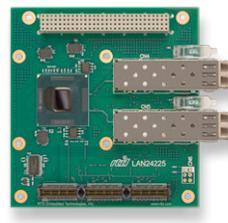
8-Port Managed Ethernet Switch  
LAN35MH08



8-Port Ethernet Switch  
LAN35H08



Dual Fiber Gigabit Ethernet  
LAN24225



Dual Gigabit Ethernet  
LAN25222



## Setting the Standard

RTD products are among the most reliable in the embedded industry. We take great pride in the quality of what we produce. From design to production, we're making sure that the best materials come together in a product that is worthy of your attention. At RTD, excellence doesn't come from luck – it's result of continuous improvement, and dedication to doing the job right.

As one of the founding members of the PC/104 Consortium, RTD has a long history of PC/104 leadership and development. We continue to develop new technical standards that follow the PC market and meet the needs of our customers. The products on this spread show a sample of our product line based on the latest PC/104 specifications: PCIe/104 and PCI/104-Express. Building on success, our engineers are still hard at work developing many more new and innovative products. It's an exciting time for stackable PCI Express, and RTD is leading the way.

**Synchro Resolver Interface**  
ERES35104



**Xilinx Spartan-6 FPGA**  
FPGA35S6



**Auto-Calibrating Analog I/O**  
SDM35540



**Isolated Digital I/O**  
DM35888



**Isolated Octal Serial Port**  
SER35330



**3-Channel Firewire**  
FW25208



**4-Port USB 3.0 Controller**  
USB25407



**Wireless Ethernet**  
WLAN25203



**Linx RXM-GNSS-TM GPS**  
GPS25165



**NovAtel GPS Carrier**  
GPS35185



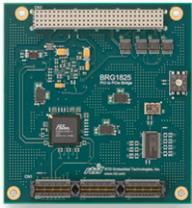
**Uninterruptible Power Supply**  
UPS25210



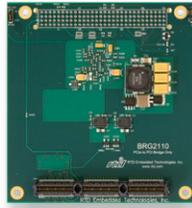
**PEAK-Systems CAN Bus**  
CAN35414



**PCI to PCI Express Bridge**  
BRG1825



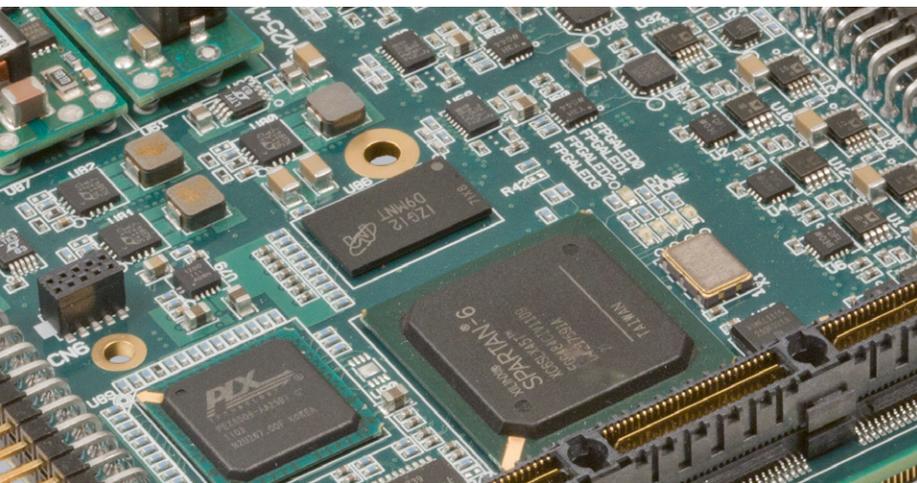
**PCI Express to PCI Bridge**  
BRG2110



**3.0 Gbps SATA Controller**  
IOM35106



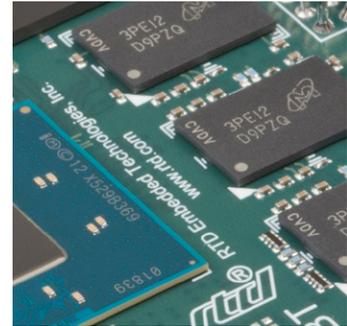
**Dual Mini PCIe Carrier**  
IM25410 (with options)



# Single Board Computers

## Smart Design

The best meals start with the best quality ingredients. The same idea is true for RTD's modules and systems. Not only do we develop beautifully routed circuit boards with well-organized components, we make sure that all of the materials that go into our production line are of the highest quality. Our Design Control works in tandem with our Purchasing and Receiving Control, which then feeds into our Manufacturing Process Control. These processes – along with the other elements of our comprehensive quality management system – result in products that often exceed our customers' performance expectations.



*RTD's rugged, single board computers feature surface-mounted RAM soldered directly onto the board to maximize reliability in extreme temperatures, and in high shock and vibration environments.*

## Built Best to Handle the Worst

We design our CPUs and peripheral modules to operate flawlessly in the most rigorous of applications. RTD products are found in some of the most sophisticated military and industrial vehicles, machines, and devices. These systems are deployed in some of the most hostile arenas. In other applications where conditions are more mild, our systems can be found serving low-level data collection, monitoring and control requirements. RTD customers don't always seek out the harshest environmental conditions, but when they do, they know that their system will do its job.

## CPUs Rooted in Quality

The fundamental policy of RTD is one of total quality responsibility – responsibility for the satisfactory performance of its service and the assured quality of its end product, from the inception of the job to the ultimate fulfillment of the customer's requirements. This responsibility resides in some measure with each individual of RTD.

The primary purpose must be to meet the needs and expectations of our customers and other stakeholders to achieve a competitive advantage in an effective and efficient manner, and to achieve, maintain, and improve overall organizational performance and capabilities.

Assurances of quality further require recognition of the axiom that quality cannot be inspected into a product; it must be designed and built into the product. RTD is committed to continuous improvement through an unwavering quest toward quality excellence and a zero defects policy.

Therefore, consistent achievement of a quality engineered and manufactured product can only be realized by a self-imposed system of discipline and control that is conscientiously subscribed to by all employees at every working level in the company. Manager, salesman, engineer, designer, and production worker must share alike the responsibility for the control of quality, thereby guaranteeing production quality as a natural result rather than a manifestation of chance.



# Processor Choices

BTQ



BTD



BTS



## Intel Atom E3800 Family

RTD's PCIe/104 and PCI/104-Express ultra low-power 1.33 – 1.91 GHz single board computers and controllers based on Intel's Atom E3800 processors offer excellent performance in extreme temperatures. The robust CPUs are available in quad-core, dual-core, and single-core configurations. All models include surface-mount dual-channel DDR3 SDRAM and an industrial-grade surface-mount SATA flash drive.

CRQ



CRD



CRS



## Intel Core i7 Family

RTD's 1.5 – 3.1 GHz PCIe/104 single board computers and controllers based on Intel's Core i7 processors offer high-end performance with a comprehensive set of on-board features. The CMA34CR-series and CMA24CR-series CPUs are available in quad-core, dual-core, and low-power single-core configurations. All models include surface-mount dual-channel ECC DDR3 SDRAM and an industrial-grade surface-mount SATA flash drive.

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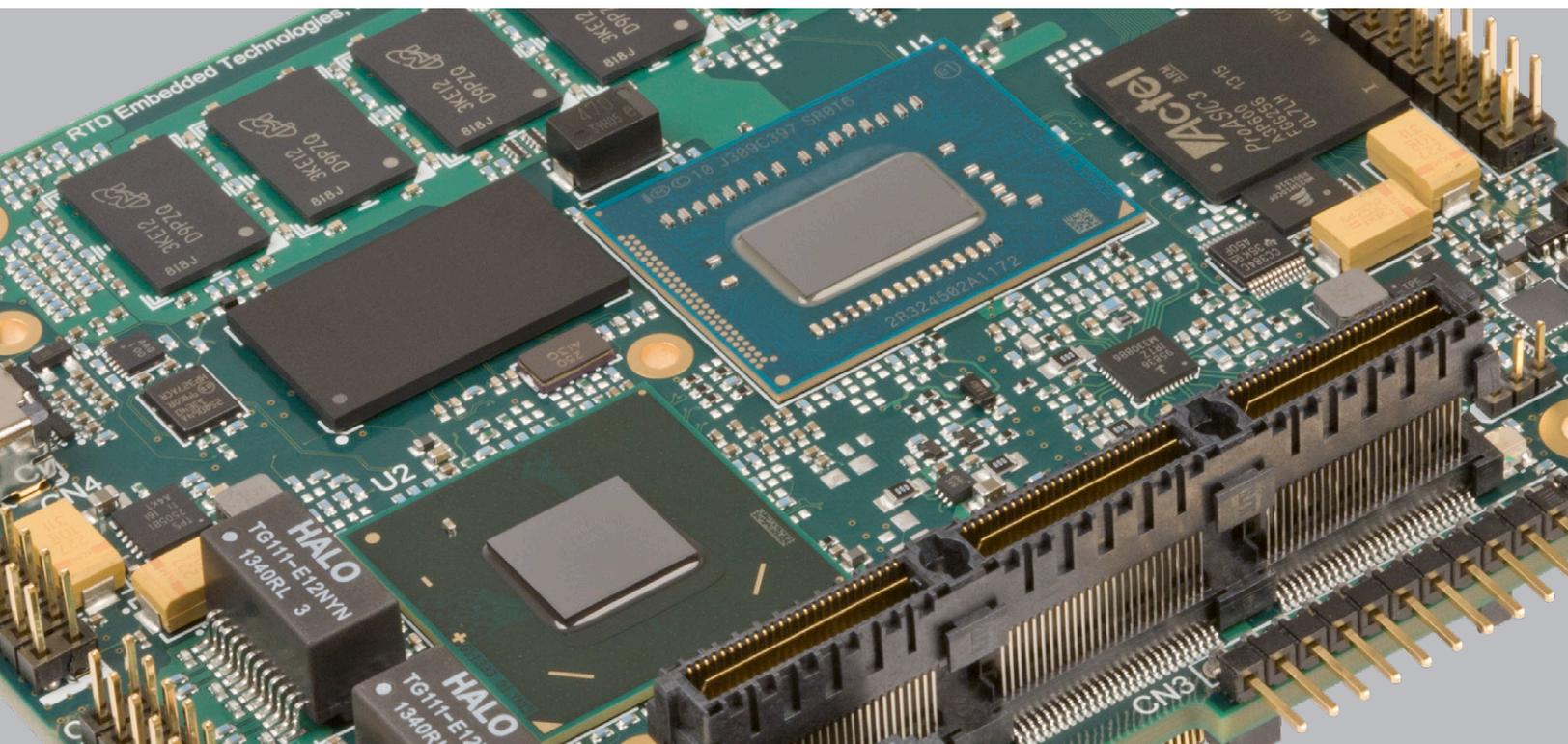


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## AMD Geode LX Family

RTD's CPUs based on the AMD Geode LX processor are an excellent fit for customers looking for a low-power, feature-rich ISA or PCI-based solution. The "LX" has become a versatile and proven architecture for customers seeking premium performance in an energy-efficient x86 package. These PC/104 and PC/104-Plus CPUs include standard embedded PC features, RTD's Advanced Digital I/O, and surface-mount DDR SDRAM.



# Single Board Computers

NOTE: These tables highlight some, but not all of the features in each product family. Please see our online data sheets for complete technical documentation.

## Intel Atom E3800: 1.46 – 1.91 GHz

–40 to +85°C

		Cores	Clock Speed	DDR3 SDRAM	SSD Max	SATA Ports	PCIe x1	PCI	GigE	USB 2.0	Serial	aDIO	DisplayPort w/ Audio	SVGA
PCIe/104	CMX34BTS	1	1.46 GHz	4 GB	32 GB	1	4	–	2	9	4	14	1	1
PCIe/104	CMX34BTD	2	1.33 GHz	4 GB	32 GB	1	4	–	2	9	4	14	1	1
PCIe/104	CMX34BTQ	4	2.91 GHz	4 GB	32 GB	1	4	–	2	9	4	14	1	1
PCIe/104-Express	CML24BTS	1	1.46 GHz	4 GB	32 GB	1	4	yes	1	7	4	14	1	1
PCIe/104-Express	CML24BTD	2	1.33 GHz	4 GB	32 GB	1	4	yes	1	7	4	14	1	1
PCIe/104-Express	CML24BTQ	4	2.91 GHz	4 GB	32 GB	1	4	yes	1	7	4	14	1	1

## Intel Core i7: 1.5 – 2.1 GHz (with up to 3.1 GHz Turbo Boost)

–40 to +85°C<sub>T</sub>

		Cores	Clock Speed	Max Turbo	DDR3 SDRAM	SSD	SATA Ports	PCIe x1	PCIe x4	PCI	GigE	USB 3.0	USB 2.0	Serial	aDIO	DisplayPort w/ Audio	SVGA
PCIe/104	CMA34CRS	1	1.5 GHz	1.5 GHz	16 GB	32 GB	5	8	3	–	2	4	3	4	14	1	1
PCIe/104	CMA34CRD	2	1.7 GHz	2.8 GHz	16 GB	32 GB	5	8	3	–	2	4	3	4	14	1	1
PCIe/104	CMA34CRQ	4	2.1 GHz	3.1 GHz	16 GB	32 GB	5	8	3	–	2	4	3	4	14	1	1
PCI/104-Express	CMA24CRS	1	1.5 GHz	1.5 GHz	8 GB	32 GB	5	7	3	yes	2	4	3	4	14	1	1
PCI/104-Express	CMA24CRD	2	1.7 GHz	2.8 GHz	8 GB	32 GB	5	7	3	yes	2	4	3	4	14	1	1
PCI/104-Express	CMA24CRQ	4	2.1 GHz	3.1 GHz	8 GB	32 GB	5	7	3	yes	2	4	3	4	14	1	1

<sup>†</sup> 2.1 GHz Quad-Core configurations are operational from –40 to +70°C.

## AMD Geode LX: 333 MHz & 500 MHz

–40 to +85°C

		Speed (MHz)	DDR SDRAM	SSD Max	EIDE	Ethernet	USB 2.0	Serial	aDIO	SVGA	LVDS
PC/104	CME136686LX	333 / 500	512 MB	8 GB	1	2	2	4	18	1	1
PC/104-Plus	CME137686LX	333 / 500	512MB	8 GB	1	1	2	4	18	1	–



RTD's off-the-shelf IDAN® eBuild™ systems offer rapid up-time for system development and deployment. These pre-configured starter systems include a CPU and power supply, and can be expanded to include additional peripheral modules based on application needs.

# High-Performance DSP

Based on the Texas Instruments TMS320C667x, RTD's SPM34CP dspModules are versatile fixed/floating point embedded DSP controllers with a PCIe/104 stackable bus structure. The onboard DSP chip supports high-performance signal processing applications such as imaging, test, and automation. Deterministic processing allows the DSP to outperform general purpose processors for time-critical applications. The C6678 platform is power-efficient and easy to use. The C66x CorePac DSP is fully backward compatible with TI's existing C6000 family of fixed and floating point DSPs.



High-speed data connections such as PCI Express, Serial RapidIO®, and Gigabit Ethernet connect the DSP to the outside world. The PCI Express connector permits the DSP to act as a co-processor to a PCIe/104 Type 2 host cpuModule while 16 Mbyte of onboard flash permits true stand-alone operation of the DSP without a host. A high-speed multifunction interface enables system-level peer-to-peer data transfer. Additional hardware features include one RS-232/422/485 serial port as well as fourteen 5V-tolerant 3VTTL digital I/O.

When paired with an RTD cpuModule and a high-speed signal source/drain (for example, RTD's DM35418HR dataModule), the result is a complete high-speed data acquisition, signal processing, and decision-making system. The Gigabit Ethernet connections, or stackable Serial RapidIO® (which boasts four configurable lanes), are ideal for high-speed data transfers between the DSP and the mated data acquisition board or system.

The SPM34CP is available in dual-core and octal-core configurations and includes a suite of matching host-side and DSP-side libraries permitting single and multi-threaded applications for all on-board features.



# Data Acquisition Modules

## Setting the Standard

RTD was founded on data acquisition nearly 30 years ago, and has since been providing the PC/104 industry with dataModules that are second to none. We provide a wide array of data acquisition and control modules with auto-calibrating analog I/O, advanced digital I/O, SyncBus for multi-board simultaneous sampling, and a high-speed McBSP serial port. In today's high accuracy environments, where discerning signals from noise at high throughput rates is the difference between success and failure, RTD is continually redefining the DAQ industry.

		Smart A/D		Analog I/O						Digital I/O					
		SDM7540	SDM35540	DM6425	DM6430	DM7520	DM35520	DM35418 DM35218	DM35424 DM35224	DM35425	DM6810	DM6812	DM7820	DM35820	
Bus	Active Bus	PCI	PCIe	ISA	ISA	PCI	PCIe	PCIe	PCIe	PCIe	ISA	ISA	PCI	PCIe	
	Passthrough Bus	ISA				ISA							ISA		
	DMA or PCI Bus Master	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	
	McBSP Sync Serial Interface	✓	✓			✓	✓								
ANALOG	Analog Input	Single-Ended Inputs	16	16	32	16	16	16	4 / 8		32				
		Differential Inputs	8	8	16	8	8	8	4 / 8	8 / 16	16				
		Max Throughput (KHz)	1250	1250	500	100	1250	1250	1538	100	1250				
		Resolution (bits)	12	12	12	16	12	12	18	24	12				
		Input Ranges	3	3	3	1	3	3	9	1	3				
		Programmable Gains	7	7	4	4	6	6	5	7	4				
		Autonomous Calibration	✓	✓											
		Data Marker Inputs	3	3	3		3	3							
		Analog Trigger			✓				✓	✓	✓				
	Analog Out	Analog Outputs	2	2	4	2	2	2	4 / 8	8 / 16	4				
		Max Throughput (KHz)	200	200	200	100	200	200	1000	100	200				
		Resolution (bits)	12	12	12	16	12	12	16	16	12				
		Output Ranges	4	4	4	1	4	4	6	1	4				
		D/A FIFO Buffer	8K	8K			8K	8K	DMA	DMA	DMA				
	Advanced Features	Scan/Burst/Multi-Burst	✓	✓	✓	✓	✓	✓							
		Channel-Gain Table	1K	1K	1K	1K	1K	1K							
		A/D FIFO Buffer	8K	8K	8K	8K	8K	8K	DMA	DMA	DMA				
Sample Counter		✓	✓	✓	✓	✓	✓	✓	✓	✓					
SyncBus™		✓	✓			✓	✓	✓	✓						
Simultaneous Sampling							✓	✓							
DIGITAL	Digital I/O	Total Digital I/O	16	16	32	16	16	16	32	14	32	48	48	48	48
		Bit Programmable I/O	8	8	16	8	8	8	32	14	32	48	24	48	48
		Input FIFO Buffer	8K	8K	8K	8K	8K	8K			DMA				
		Max Digital Clock Rate (KHz)	1250	1250	500	100	1250	1250	500	500	40M			25000	25000
		Opto-Isolated Inputs													
		Opto-Isolated Outputs													
		User Timer/Counters	3	3	2	2	3	3				3	3	10	10
	Advanced Features	Advanced Interrupt Modes	2	2	2	2	2	2			2		2	2	2
		Versatile Memory Buffer											4M	4M	
		External Trigger	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	
Incremental Encoders/PWMs											4 / 8	4 / 8			
Operating Temperature: -40 to +85°C		✓	✓	✓	✓	✓	✓	✓*	✓	✓	✓	✓	✓	✓	
Power Consumption (W, +5V, typical)		4.0	4.0	3.2	3.5	2.5	3.1	5.0/9.0	4.0/8.0	4.35	1.2	1.2	1.5	1.5	

visit [www.rtd.com](http://www.rtd.com) for a complete selection of dataModules



## 1.5 MHz 18-bit A/D Simultaneous Sampling DAQ

The DM35218 and DM35418 are high speed 18-bit data acquisition modules in a PCIe/104 format. The DM35218 provides 4 differential or single-ended analog input channels with programmable gain and input ranges; the DM35418 provides 8 channels. Each module has simultaneous or independent sampling rates up to 1.5 MHz. The DM35418 and DM35218 also provide 4 or 8 individually controlled analog outputs, multiple board synchronization with the SyncBus.



## Delta-Sigma 24-Bit A/D Simultaneous Sampling DAQ

The DM35224 and DM35424 are software configurable simultaneous sampling PCIe/104 data acquisition modules. The DM35224 provides 8 differential analog input channels, with programmable gains. It also provides 8 individually controlled analog outputs and digital I/O. The DM35424 doubles the number of analog I/O to 16. These boards are targeted to sensors that require high precision with a low signal level, such as accelerometers, pressure transducers, and Resistance Temperature Detectors (RTD). The DAC output can provide sufficient current and voltage for the excitation voltage of most sensors.



## Xilinx Spartan-6 User Programmable FPGA

The FPGA35S6046 and FPGA35S6101 are PC/104 FPGA modules with a PCIe/104 stackable bus structure. These modules provide a platform for customer developed FPGA code. They are based on a Xilinx Spartan-6 with a hardware PCIe x1 endpoint to provide the interface to the host CPU. On board DDR2 memory provides dedicated storage space for the FPGA application. A total of 88 I/O pins interface the FPGA to the outside world, and allow for a variety of signal levels. These modules include four RS-232/422/485 transceivers connected to FPGA pins allowing custom serial port implementation.

*RTD's stackable packaging allows systems to scale to the user's needs. The system shown here includes multiple analog and digital DAQ modules for an application requiring high levels of data acquisition.*



# Power Supplies

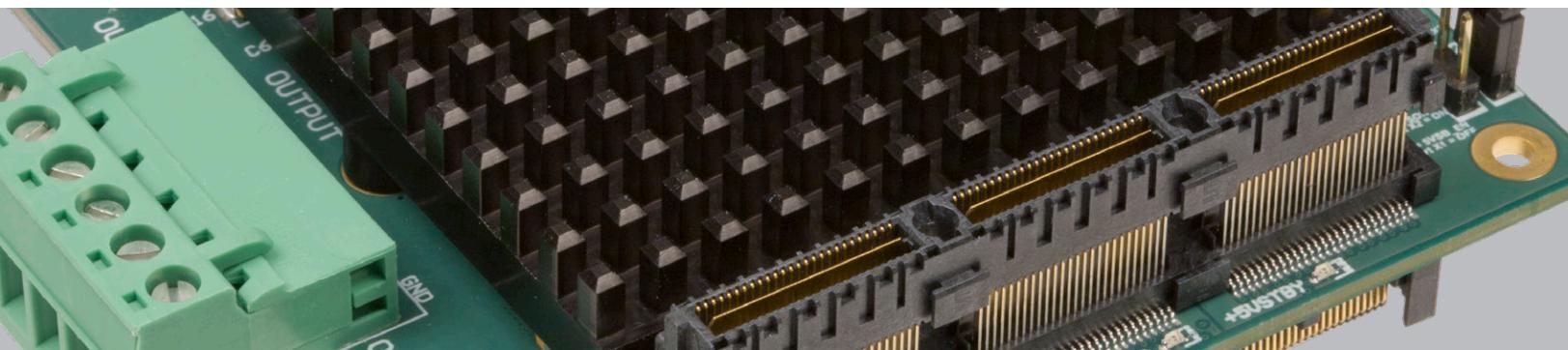
## The Best of COTS

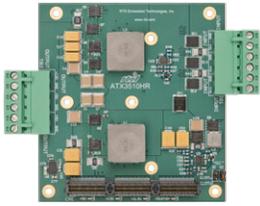
RTD has a proud tradition in high-quality PC/104 form factor power supply systems. Our latest products in this line include 88 W and 190 W ATX power supplies, and a 70 W avionics power module. We produce rugged MIL-rated supplies designed for demanding applications, isolated modules that provide protection in challenging environments, and standard units for everyday PC/104 applications. Our engineers are personally driven to continually advance power supply and battery back-up performance.

RTD's most advanced modules utilize low profile, lightweight, surface-mount components for increased shock and vibration resistance. They are engineered as uncompromised power efficient workhorses, utilizing advanced thermal techniques and cutting-edge component selection to ensure cool operation. To remove noise from a design is to eliminate it at its source. RTD uses precise layout practices along with post-design bench testing to generate the greatest possible suppression of EMI. Our dual-phase designs feature current foldback output short circuit protection.

		Non-Isolated						Isolated						
		1500V (2 sec)			500V (2s)			1500V (2 sec)			500V (2s)			
		VPWR104 50W	XPWR104 75W	HPWR104plus 83W	ATX104plus 88W	ATX104-Express 88W	ATX3510HR 190W	IPWR104HR 50W	IPWR104HR L100W	IPWR104HR H100W	IATX104plusHR 123W †	APWR104HR 50W	APWR3510HR 70W	APWR35210HR 80W
Bus	Active Bus	ISA	ISA	PCI	PCI	PCIe	PCIe	ISA	ISA	ISA	PCI	ISA	PCIe	PCIe
	Passthrough Bus			ISA	ISA	PCI	PCIe				ISA		PCIe	PCIe
	Input (Vdc)	8-36	8-36	8-36	8-36	8-36	8-36	9-36	18-36	33-75	18-36	16-50	16-40	16-40
	Power (W)	50	75	83	88	88	190	50	100	100	118	50	70	83.3
	5 Vdc Output (A)	10.0	15.0	10.0	10.0	10.0	16.8	10.0	20.0	20.0	15.0	6.0	10.0	8.0
	5 Vdc STNDBY (A)				1.0	1.0	2.0				2.0			
	-5 Vdc Output (A)	0.1	0.1	0.1	0.1			0.1	0.1	0.1	0.1			
	12 Vdc Output (A)	2.0	2.0	2.0	2.0	2.0	8.4	2.0	2.0	2.0	2.0	1.17	1.69	3.33
	-12 Vdc Output (A)	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	1.17		
	3.3 Vdc Output (A)			10.0	10.0	10.0					10.0			1.0
	Max Efficiency (%)	90	92	90	90	90	90	81	88	88	90	72	83	83
	MIL-STD-704, 461											✓		✓
	Continuous Output Short Circuit Protection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Reverse Polarity Input Protection (Vdc)	-40	-40	-40	-40	-40	-40	-40	-40	-100	-40	-100	-40	-50
	Voltage Transient Input Protection (kW)	1.5 †	1.5 †	1.5 †	6.6 †	6.6 †	6.6 †	1.5 †	1.5 †	1.5 †	1.5 †	1.5 †	1.5 †	1.5 †
	Over Temp Protection (°C)							100	105	105	100		125	125
	Remote ON/OFF	✓	✓	✓			✓	✓	✓	✓	✓	✓		✓
	ATX Control Signal				✓	✓	✓				✓			
	Operating Temperature: -40 to +85°C	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

† Peak pulse current (28A) 10 μs, (14A) 1000 μs  
‡ Available only in HiDAN and HiDANplus Systems





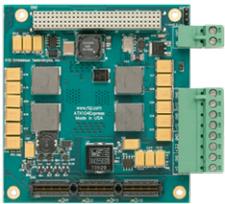
## 190 Watt Synchronous Power Supply

The ATX3510HR is a 190 Watt embedded power supply with a PCIe/104 stackable bus structure. With 5V standby, 5V main, and 12V, this module is also input protected against over-voltage, over-current, and reverse voltage. This rugged power supply is synchronized to reduce noise and system stress. The small footprint and high power capabilities of the ATX3510HR-190W make it suitable for many technology-rich, high-reliability military, industrial, and research applications.



## 70 Watt Filtered Avionics Power Supply

The APWR35110HR filtered avionics embedded power supply module provides an excellent solution for PCI Express systems requiring a rugged MIL-type power supply for PC/104 applications. The wide input voltage range of 16 - 40 VDC will suit applications ranging from communications to aviation. The APWR35110 is exceptionally suited for powering PCIe/104 systems drawing on noise-filled, unregulated 28 VDC aircraft power. This power supply is available with PCIe/104 and PCI/104-Express bus structures.



## 88 Watt Synchronous Poly-Phase Power Supply

The ATX104HR-Express is an 88 Watt high power DC/DC converter in a PCI/104-Express format. The supply provides +5V, +3.3V, +12V and -12V to the PCI Express bus and to the PCI bus. Additionally, +5V, +3.3V, +12V, and -12V are provided at auxiliary connectors on the supply. The ATX104HR-Express provides the additional ATX signals PS\_ON#, PWRGOOD and +5VSB on the PCI bus using the reserved pins and PCI Express dedicated pins. The design uses a +5V dual phase supply cascaded to a +12V and a -12V circuit. The +5V is designed for 50 Watts, the +12V is designed for 24 Watts, and the -12V is designed for 6 Watts.



## 123 Watt Isolated Power Supply with ATX Signaling

The IATX104plusHR is a 123 Watt high power DC/DC converter for PC/104 systems. The supply provides +5V, +5VSTNDBY, +3.3V, +12V, -12V, and -5V to the ISA bus and to the PCI bus. Additionally, +5V, +3.3V, +12V, and -12V are provided at auxiliary connectors on the supply. The design uses a +5V isolated supply to cascade to a +12V and a -12V circuit. The -5V is cascaded from the -12V circuit. The +5V is designed for 80 Watts, the 3.3V is designed for 33 W, the +12V is designed for 24 Watts, and the -12V is designed for 6 Watts.



## 50 Watt & 100 Watt Isolated Power Supplies

The RTD IPWR104HR embedded power supply module provides an elegant solution for PC/104 systems requiring an isolated reliable power supply. The two available wide input voltage ranges of 18 - 36V and 33 - 75V will suit applications ranging from communications to aviation. Power from the module is delivered to the ISA bus as well as to the card edge terminal blocks. Output voltages include +5 at 12A/20A, +12V at 2.0A and -12V at 500mA (100 Watt maximum combined output). These outputs are connected to the ISA bus and terminal blocks.

# Highlighted Peripheral Modules

## Some of Our Latest Work

Our in-house engineering teams are always leaning forward. As new technologies come to market, RTD is at the forefront of PC/104 development – bringing the latest I/O and signaling technologies to the stackable small form factor world. RTD has brought to market many new PCI Express products this past year. Among these latest solutions are high-end CPUs, power supplies, network modules, and a number of useful peripheral modules and accessories – all sporting the latest high-speed, stackable PCI Express bus connector.



### Managed Ethernet Switches

The LAN35MH08HR is an 8-port 10/100/1000 Managed Ethernet switch. This switch module has a total of 10 ports: eight ports are available on-board, one port is available to the host CPU through a x1 PCI Express GigE controller, and one port is used as a stacking switch expansion port allowing full compatibility with RTD's managed and unmanaged StackNET® Ethernet switch family. Additionally, this allows the CPU to use the switch without the need for external cables.

The LAN35MH08HR can also be used as an expandable, standalone 8-port Ethernet switch (using the LAN35ME08HR or unmanaged LAN35E08HR). These GigE switches are available with 10-pin right-angle headers (LAN35MH08HR-D) or with RJ-45 jacks (LAN35MH08HR-RJ).

The onboard CEServices Carrier Ethernet switching software provides a rich Layer 2 switching solution with Layer 3-aware packet processing. All of the industry-standard Managed Ethernet Switch features found in an enterprise rackmount switch are provided, such as VLANs, Spanning Tree, QoS, and SNMP. Additionally, the CEServices software provides features for carrier and timing-critical networks such as OAM, Synchronous Ethernet, and IEEE 1588. The switch may be configured via a web GUI interface, or a command-line console via USB, Telnet, or SSH.



### UPS Optimized for Harsh Environments

The UPS25210HR pairs a 136 W programmable Uninterruptible Power Supply (UPS) with a super capacitor energy storage module. Both elements are suitable for extended temperatures in rugged environments. The ultracapacitor module's advantage over conventional batteries is its high-charge discharge rate, light weight, and wide operating temperature range. This module's primary use is to perform short-term system backup. The ultracapacitor board works together with RTD's uninterruptible power supply and ATX3510HR-190W power module. Together, these three products provide a robust power supply and backup solution.



### 4-Port USB 3.0 Controller

The USB25407 is a four port USB 3.0 controller. This module provides the latest in high-speed connectivity with transfer rates up to 5 Gbps. Advanced connectivity opens the door to high resolution and high frame rates for USB cameras. The USB25407 also allows USB hard drives to perform as well as SATA hard drives. The USB25407 supports all USB 3.0 speeds, and features a best-in-class adaptive receive equalizer design to maximize cable length.



## The RTD Product Line



This catalog is just a sample of our full selection. RTD designs and manufactures one of the largest and most comprehensive PC/104 product lines in the embedded industry. In addition to our COTS-Plus offering, our engineering and manufacturing capabilities allow us to design fully customized solutions. Our AS9100 and ISO 9001 certification means that our products are backed by a quality management standard which meets the stringent and complex demands of the defense and commercial aerospace industry. Whether your application is in these arenas, or in the maritime, industrial, medical, transportation, research or gaming fields, RTD provides a wide range of highly reliable embedded solutions.

### Single Board Computers

- Latest Intel and AMD Processors
- RTD Enhanced BIOS
- Rugged, Surface-Mount Soldered RAM
- Onboard Industrial Flash Disk
- -40 to +85°C Operation

### Specialty Modules

- Managed Ethernet Switches
- Delta-Sigma Analog I/O
- Hot-Swappable Removable SATA
- User-Configurable Mini PCIe
- Digital Signal Processors

### Data Collection Modules

- Auto-Calibrating Analog I/O
- Advanced Digital I/O
- Simultaneous Sampling
- High-Speed McBSP
- Pulse Width Modulation
- Incremental Encoding
- Opto-Isolated MOSFET
- User Programmable FPGA

### Power Supplies

- High-Efficiency Power Supplies
- Uninterruptible Power Supplies

### Peripheral Modules

- Mass Storage
- Motion Control
- Synchro/Resolver
- Video Control
- FireWire
- USB 3.0 & USB 2.0
- CAN Bus
- Serial Interface
- Gigabit Ethernet
- GPS
- GSM/GPRS/EDGE Modem
- Wireless Telematics

### Bus Structures

- PCIe/104
- PCI/104-Express
- PCI-104
- PC/104-Plus
- PC/104

### Tailored Solutions

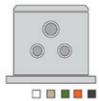
RTD is able to tailor any of its products to fit a customer's particular requirements. Contact Sales to learn more.

# Advanced System Packaging

RTD specializes in the design and manufacture of turnkey PC/104 systems qualified for the most demanding applications. RTD's HighRel systems include the IDAN® (Intelligent Data Acquisition Node) and the HiDAN® and HiDANplus® (High Reliability Intelligent Data Acquisition Nodes). Each system is built using frames milled from solid aluminum blocks to exacting specifications ensuring that your "Box PC" is rugged and reliable. Frames for thermally sensitive components have internally milled heat sinks and embedded heat pipes to move heat to the outside walls of the enclosure, allowing operation from -40 to +85°C without the use of active cooling. Optional shock-mount bases withstand specific shock and vibration specifications.



**IDAN®** is a standard off-the-shelf product consisting of any RTD PC/104 board mounted in its own frame and wired to the frame's standard PC connectors, thus eliminating the need for module-to-module wiring inside the case. This solution maintains PC/104's modularity and lets one configure a system as rapidly as one would configure a stack of boards.

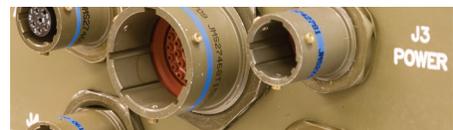


**HiDAN®** is a rugged, watertight enclosure for a stack of PC/104 boards. Environmental sealing and EMI suppression O-rings coupled with MIL I/O connectors make HiDAN ideal for environmentally challenging applications. A custom internal wiring harness minimizes external I/O connections and ensures rugged reliability.



**HiDANplus®** is a scalable PC/104 system that combines the modularity of IDAN with the rugged MIL I/O connectors and watertight/EMI suppression features of HiDAN. Inter-module communications via a custom wiring harness is enhanced by an internal 120-pin stackable signal raceway. Our standard HiDANplus® has been tested to IP67 and IP69.

*RTD's stackable chassis systems maintain the modularity of PC/104. This streamlines system configuration, and allows for future upgrades and system modification.*



	IDAN®	HiDAN®	HiDANplus®
IP54 Water & Dust Protection	✓	✓	✓
IP67 and IP69 Water & Dust Protection		✓	✓
Modular Stack	✓		✓
EMI Suppression		✓	✓
-40 to +85°C Operation	✓	✓	✓
Shock Mount Isolation Available	✓	✓	✓
Milled T-6061 Aluminum Frames	✓	✓	✓
Optional Milled Heat Sink Fins	✓	✓	✓
MIL-SPEC Paint Available	✓	✓	✓
Standard PC Interface Connectors	✓	✓	✓
MIL-SPEC Cylindrical Connectors		✓	✓

# Anatomy of an RTD System

An RTD system starts with our high-quality, stackable PC/104 modules. These modules are then mounted in modular aluminum frames which have been milled to exacting tolerances with integral heat sinks and EMI gasketing. I/O connectors are mounted to each frame based on the customer's specific needs. RF shielding, custom paint, and custom mounting configurations are among the many options available.



## A History of Success

- Lunar impact and crater observation
- Space telescope positioning
- Wireless telematics
- Geological surveying
- Torpedo defense
- Vehicle performance monitoring
- Border security
- High altitude research
- Precision steel bending
- Electromagnetic aircraft launch
- Aircraft arresting gear
- Pyrotechnic bolt control
- Acoustic research
- Small arms detection and localization
- Beyond-line-of-sight communications
- Autonomously guided parafoil
- Aerial surveillance and threat detection
- Aerospace tracking systems
- Rainfall radiometry
- Antenna beam steering
- Rocket-based mesospheric research
- Star tracking
- Vehicle event data recording
- Aircraft-ground communications
- Jet engine monitoring and control
- Experimental aircraft control
- Intelligence gathering
- Atmospheric laser systems
- Aircraft navigation
- Space-based plant growth chamber control
- Radar control
- And many more...



# Industries Served



## Aerospace & Avionics

When program managers need to ensure quality and reliability, they often specify RTD products. RTD has been involved in dozens of high-profile aerospace programs dealing with tracking, navigation, communication, surveillance, threat detection, radar control and research. In a recent application, NASA's MLAS mission was a successful demonstration of an alternate astronaut escape system. An RTD CPU was responsible for initiating all staging separations and all drogue parachute deployments during the flight.



## Communications

RTD offers the widest network and communications selection in the PC/104 industry. Customers can choose from Ethernet controllers, Ethernet switches, wireless Ethernet modules, CAN bus modules, serial interface cards, USB 3.0 and USB 2.0 controllers, and FireWire modules. RTD's product line meets requirements for advanced high-speed communication with fiber optics, as well as simple two-wire serial communication scenarios.



## Energy

Many of the latest field operations in the energy sector require extensive equipment tracking and reliable performance feedback. RTD's PC/104 data collection and network modules offer excellent solutions for monitoring equipment status and performance. Our rugged, modular electronics packaging systems are optimized for reliability in harsh environments and remote areas. Customers can choose from enclosures with standard PC connectors, or advanced waterproof systems with military-style cylindrical connectors.



## Industrial Automation

With sustained vibration and intense temperatures, industrial manufacturing facilities present a wide range of embedded computing challenges. RTD's stringent design and manufacturing standards ensure that our products are suited for the most demanding environments. When RTD's high-end manufacturing is paired with the small PC/104 footprint, the end result is an extremely rugged, highly reliable product. Seen here is a paper mill using an RTD CPU and multiple network modules.



*With our in-house engineering, we are able to tailor systems to fit your particular requirements. Customers benefit from our many years of experience in embedded system design and packaging solutions.*



## Military & Defense

RTD has a long history of successful integration into defense programs. Whether it's torpedo defense, aerial surveillance, real-time encrypted communications, or fully classified programs, RTD systems are supporting mission-critical applications across the world. RTD HiDAN and HiDAN*plus* systems play a critical role in EMALS (Electromagnetic Aircraft Launch System) – the latest technology used to launch carrier-based aircraft from linear motor drive catapults.



## Mining

Mining environments pose unique sets of complexities for embedded developers. Open-pit and sub-surface mining operations each have specific requirements, as well as specific restrictions. With an excellent selection of GPS carriers and networking modules including CAN bus, RF and WiFi connectivity, RTD offers mining engineers a full range of solutions. With our -40 to +85°C temperature ratings and a variety of enclosure configurations and mounting options, RTD products meet mining challenges without flinching.



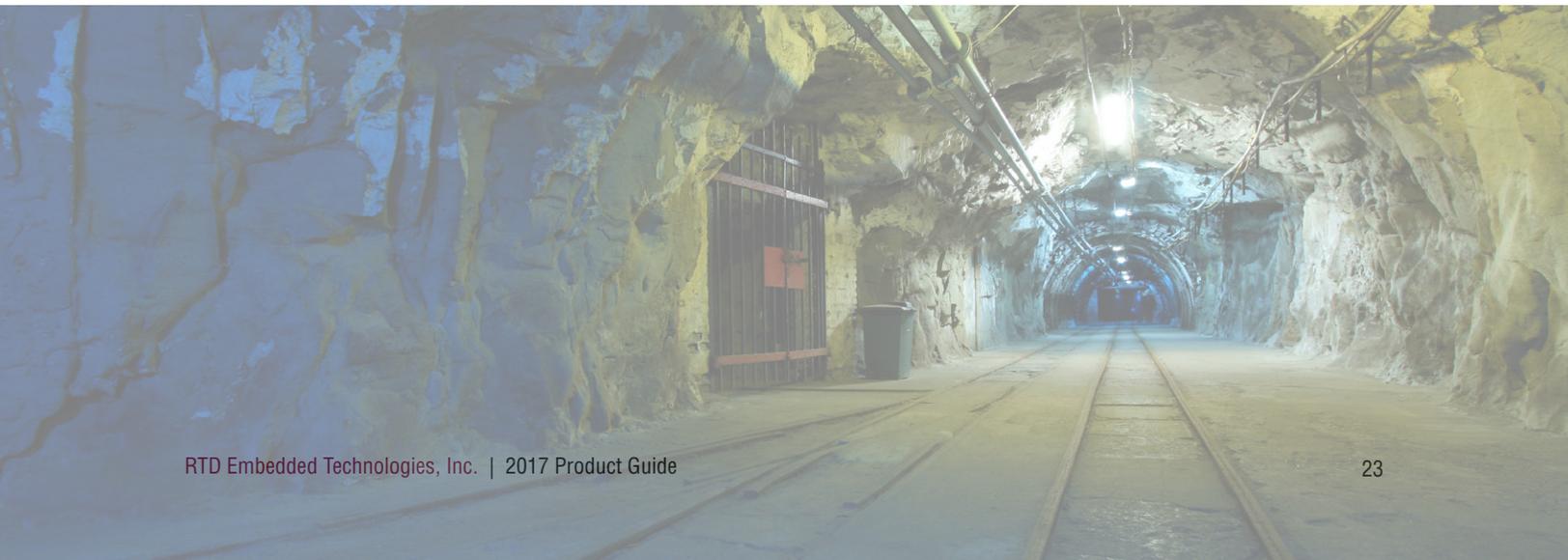
## Research

The stackable interoperability of RTD's COTS (Commercial Off The Shelf) modules makes developing prototypes very straightforward. Simple applications might be solved with a CPU and power supply while more complex challenges could require multiple add-in peripheral and data-collection modules. The image shown here is from a subatomic particle research program in Antarctica in which an RTD IDAN operated flawlessly under 2 meters of -50°C snow and ice.



## Transportation

RTD's product line is well-suited to meet the needs of the transportation industry. From our CAN bus offering to our Cisco-based router systems RTD boards and systems are right at home on trucks and railways across the globe. Our compact wireless telematics and GPS carrier modules support fleet management and vehicle monitoring systems. As seen on the left, an RTD HiDAN*plus* gathers information about acceleration, roll, pitch, global positioning, and mechanical functionality.



[www.rtd.com](http://www.rtd.com)

