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VITA 93 Small Form Factor Mezzanine Modules

QMC I/O Modules Catalog

High-Density

High-Reliability

High-Performance

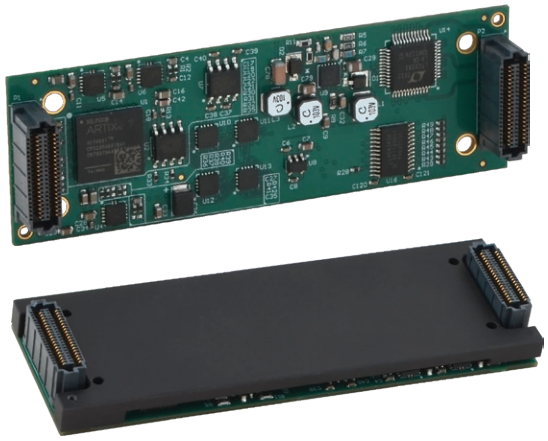
Industrial and Military-Ready Rugged Mezzanine Modules

Tel: 844-878-2352 ■ solutions@acromag.com ■ www.acromag.com ■ 30765 Wixom Rd, Wixom, MI 48393 USA

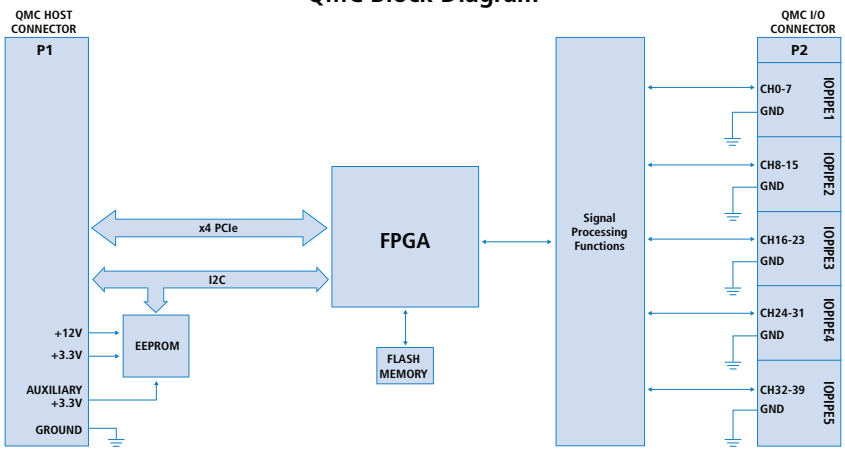
Bulletin #8401100

VITA 93 QMC Modules

QMCxxx Series I/O Modules



QMC Block Diagram



High-density I/O capabilities ◆ High-speed PCIe interface ◆ Compact, rugged design ◆ Convection or conduction-cooled

Description

QMC modules follow the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide an I/O interface and a host interface supporting high-speed serial data links. Modules are deployable on a variety of carrier card platforms including 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, PCIe expansion cards, and many other architectures. The rugged design is well-suited for use in aerospace, defense, industrial, and laboratory applications.

QMC modules can support a variety of I/O functions. Mezzanine modules are commonly used to provide analog input/output operations with A/D and D/A conversion. Other popular I/O functions include measurement and control of discrete events, serial communication, high-speed Ethernet, and signal processing capabilities. The ability to combine sensor and actuator interfaces with FPGA and GPU processors, plus avionics and industrial protocol transceivers offer unlimited possibilities.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. Their compact size and flexibility make QMCs ideal for embedded computing systems with strict size, weight, power and cost (SWAP-C) limitations.

Typical applications involve monitoring sensors and controlling equipment levels in deployed systems or for lab test and simulation projects. Other common operations include signal or protocol conversion, image processing, adaptive filtering, and sensor fusion. With powerful FPGAs, GPUs and other processors, QMCs can provide artificial intelligence and machine learning capabilities.

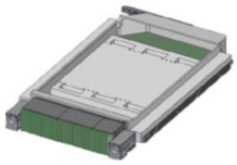
An Intelligent Platform Management Interface (IPMI) facilitates system management of field replaceable units (FRU). An EEPROM on the QMC stores module information and sensor data. Smart carrier cards with an IPMC controller can read the EEPROM over an I2C interface to manage the modules and access sensor data such as temperature and voltage levels.

Key Features & Benefits

- Compact 26 x 78.25 mm module
- Two 80-pin connectors rated for up to PAM4 64Gbps data rates
  - one connector for host interface
  - one connector for I/O signals
- Supports PCIe Gen 4 x4 interface
- Up to 40 single-ended or 20 differential pairs arranged as five IOPipe ports
- Scalable for dual, triple, and quad-width modules providing up to 160 I/O channels and PCIe x16 for advanced performance
- Standardized skyline heat sink for conduction-cooled applications
- Supports IPMI allowing system to identify, supervise, and manage QMC modules
  - EEPROM holds module and sensor data
  - I2C interface to IPMC on carrier card
- Four 3.3V and three 12V power pins available to drive high-performance ICs
- JTAG interface for diagnostics and presence detection

PCIe expansion carrier card.

VITA 90 VNX+ carrier card.



3U/6U VPX, CompactPCI, Eurocard carrier.

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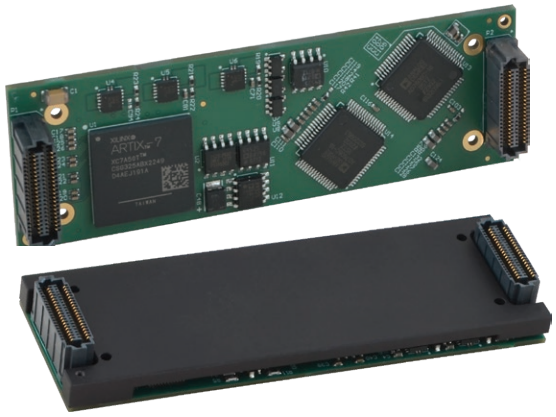
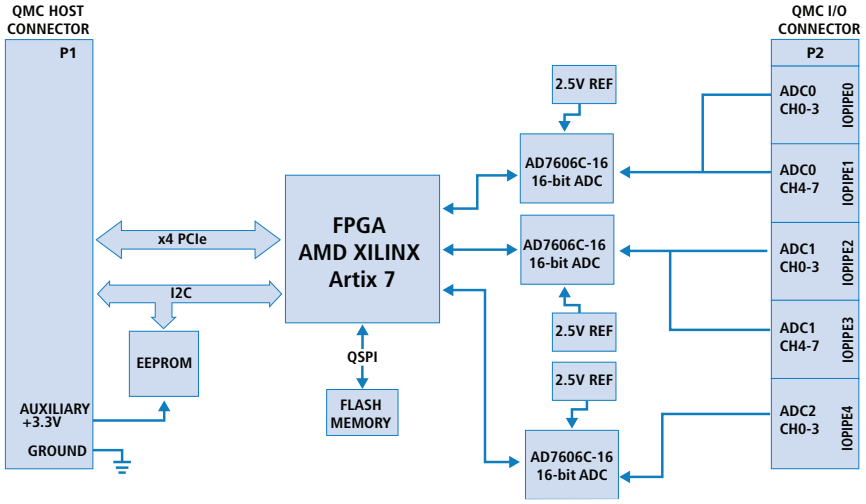
VITA 93 QMC Modules

QMC350 Series Analog Input





20 Analog Input Channels ◆ 16-bit A/D Converter on Each Channel ◆ 1 MHz Sampling Rate ◆ PCIe Bus Interface

Models

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC350 modules offer 20 input channels for high-speed, high-resolution analog-to-digital signal conversion. A PCIe bus interface provides communication to the carrier and host computer.

Each input channel has its own simultaneous sampling 16-bit A/D converter with a throughput rate of 1MSPS. Flexible digital filtering with software calibration of system gain, offset, and phase enables high accuracy.

Software-selectable inputs provide great flexibility. Select from a wide variety of unipolar and bipolar voltage ranges for single-ended and differential pair inputs. Individual input control allows flexible channel selection and updating.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- 20 analog input channels
- Individual 16-bit ADC on each channel
- Simultaneous Sampling ADC with 1MSPS sampling rate (1MHz)
- Software-selectable input voltage range
- Input ranges selectable per-channel with 12 unipolar/bipolar voltage range options
  - Single-ended analog input ranges: 0-5V, 0-10V, 0-12.5V, ±2.5V, ±5V, ±6.25V, ±10V, ±12.5V
  - Differential pair input ranges: ±5V, ±10V, ±12.5V, ±20V
- Two bandwidth options: 25KHz and 220KHz
- ±21 input clamp on all channels
- 1M Ω input on all channels
- Reliable software calibration with coefficients stored on-board
- Individual selection and updating of analog input channels
- Failsafe reset
- Extended temperature range and support for conduction-cooled systems

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VITA 93 QMC Modules

ISO9001 AS9100 MADE IN USA

Performance Specifications

Analog Inputs

Input channel configuration
20 differential or single-ended analog inputs

A/D converter resolution
16-bit ADC

A/D sampling rate
1 MSPS on all channels
Conversion time: 550ns
Acquisition time: 450ns

Analog input ranges
Selectable on individual channel basis

Bipolar single-ended:
±12.5 V, ±10 V, ±6.25 V, ±5 V, ±2.5 V

Unipolar single-ended:
0 V to 12.5 V, 0 V to 10 V, 0 V to 5 V.

Bipolar differential:
±20 V, ±12.5 V, ±10 V, ±5 V.

System accuracy
Bipolar ranges: ±5 LSB full scale error, typical. Unipolar ranges: ±15 LSB full scale error, typical.

Data sample memory
16k sample FIFO buffer.

Dynamic performance
92 dB typical SNR for ±20 V bipolar differential range
95 dB SNR, oversampling by 32
–100 dB typical THD for all other ranges.

PCI Express Base Specification

Conforms to revision 2.1

Lanes
4 lanes in each direction

Bus Speed
5 Gbps (Generation 2)

Memory
64k space: Base address register 0
256k space: Base address register 2
1M space: Base address register 4

Environmental

Operating temperature
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC (±5%): 1.28 A typical
+3.3 VDC AUX (±5%): 0.02 A typical
+12 VDC (±5%): 0.278 A typical

MTBF (Mean Time Between Failure)
Contact factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 13.26g (0.47 oz)

Ordering Information

QMC Models

Go to on-line ordering page >

QMC351-3111
QMC352-3111
Analog input, 20-channel 16-bit A/D,
Air-cooled (QMC351) or Conduction (QMC352)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®

Example QMC Module shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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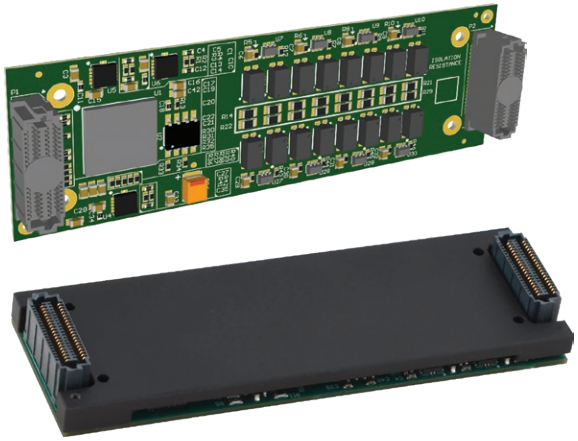
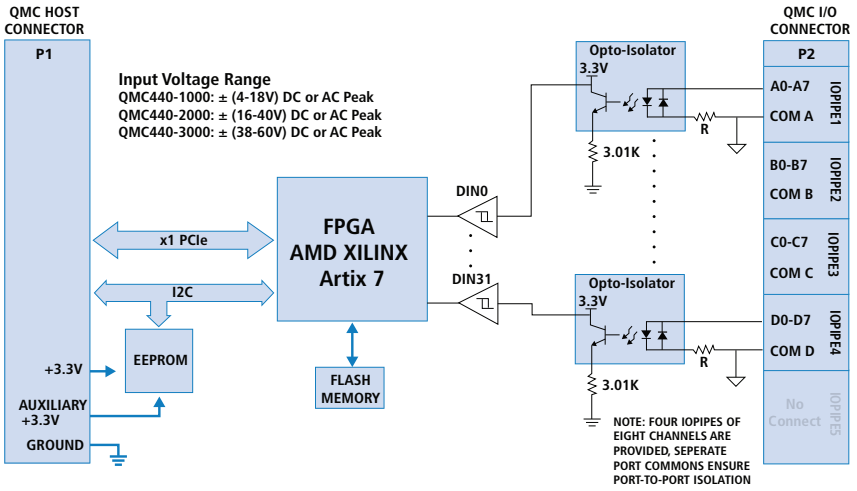
VITA 93 QMC Modules

QMC440 Series Isolated Digital Input





32 Isolated Digital Input Channels ◆ Three Voltage Range Options ◆ Programmable Interrupts ◆ PCIe Bus Interface

Description

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC440 modules offer 32 optically isolated inputs to safely monitor a wide range of digital input signal voltage levels. A PCIe bus interface provides communication to the carrier and host computer.

Isolation protects your computer system from noise, transient signals, and field wiring faults. The inputs are grouped into four 8-channel ports. Ports are isolated from the logic and each other.

Change-of-state, high-to-low and low-to high interrupts are individually programmable for each channel. Debounce eliminates spurious interrupts from noise and switching transients for error-free edge detection.

Closed-loop monitoring of critical control signals is easily accomplished using the QMC440 in conjunction with Acromag's QMC450 digital output module.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- 32 port-isolated input channels
- Low, medium, and high voltage versions:
  - ±4 to ±18V input
  - ±16 to ±40V input
  - ±38 to ±60V input
- Interrupt support for each channel
- Programmable event interrupts (change-of-state, low-to-high, high-to-low)
- Programmable debounce
- Input hysteresis
- Reverse polarity protection
- Software configured (no jumpers/switches) allowing "on-the-fly" changes without removing modules
- Pins are compatible with QMC450 output module for loopback monitoring
- Loopback monitoring enables self-test and fault detection of open switches or shorts
- Extended temperature range and support for conduction-cooled systems

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VITA 93 QMC Modules

ISO9001
AS9100
MADE IN USA

Performance Specifications

Digital Inputs

Input channel configuration
32 optically isolated bipolar inputs

Isolation
Individual opto-couplers provide isolation. Four groups (ports) of 8 channels, each with separate port commons, ensure port-to-port isolation. Individual ports are isolated from each other and from the PCIe interface logic.

Host connector to I/O connector isolation
IPC-2221B: 548.64V (peak) at sea level
IPC-9592: 425V (peak)
UL61010C-1: 250V (rms)

IOPIPE to IOPIPE isolation
IPC-2221B: 30V (peak) at sea level
IPC-9592: 30V (peak)
UL61010C-1: 60V (rms)

Bipolar input voltage range
QMC44x-1xxx: ±4 to ±18V DC or AC peak
QMC44x-2xxx: ±16 to ±40V DC or AC peak
QMC44x-3xxx: ±38 to ±60V DC or AC peak

Input low-to-high threshold
QMC44x-1xxx: ±4V maximum
QMC44x-2xxx: ±16V maximum
QMC44x-3xxx: ±38V maximum

Input response time
On to off: 15µS typical
Off to on: 35µS typical

Interrupts: 32 channels configurable as below
High-to-low transitions
Low-to-high transitions
Change-of-state

Debounce
Selectable for 4µs, 64µs, 1ms, or 8ms

PCI Express Base Specification

Conforms to revision 2.1

Lanes
1 lane in each direction

Bus Speed
2.5 Gbps (Generation 1)

Memory
256k space: Base address register 0
1M space: Base address register 2

Environmental

Operating temperature range
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC(±5%): 0.50A typical
+3.3 VDC AUX(±5%): 0.20A typical
+12 VDC(±5%): Not used

MTBF
Contact the factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 8.9g (0.31 oz)

Ordering Information

QMC Modules

Go to on-line ordering page >

QMC441-1111
QMC442-1111
Isolated Digital input, ±4 to ±18V range
Air-cooled (QMC441) or Conduction (QMC442)

QMC441-2111
QMC442-2111
Isolated Digital input, ±16 to ±40V range
Air-cooled (QMC441) or Conduction (QMC442)

QMC441-3111
QMC442-3111
Isolated Digital input, ±38 to ±60V range
Air-cooled (QMC441) or Conduction (QMC442)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®.

Example QMC Module shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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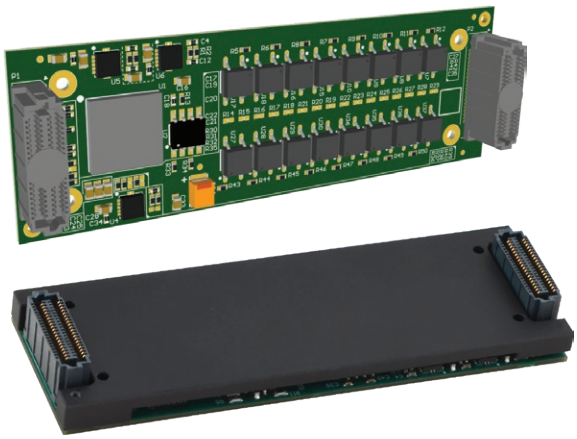
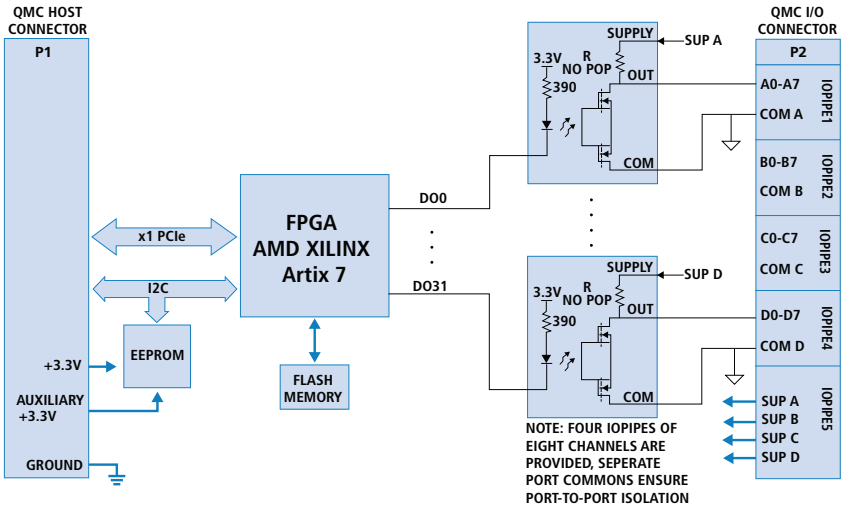
VITA 93 QMC Modules

QMC450 Series Isolated Digital Output





32 Isolated Digital Output Channels ◆ Bipolar Solid-State Relays ◆ AC and DC Switching ◆ PCIe Bus Interface

Description

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC450 modules offer 32 isolated solid-state relay outputs to safely control discrete level devices. A PCIe bus interface provides communication to the carrier and host computer.

Isolation protects your computer system from noise, transient signals, and field wiring faults. The outputs are grouped into four 8-channel ports. Ports are isolated from the logic and each other.

A major QMC450 advantage is its flexibility. The module supports wide-range, bipolar, AC or DC voltage switching. Each port is configurable for high or low-side switches.

Readback buffers simplify output status monitoring. And for easy closed-loop monitoring of critical control signals, use the QMC450 in conjunction with Acromag's QMC440 digital input module.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- 32 bipolar solid-state relays
- Port-isolated output channels
- ±60V AC/DC voltage range
- Unique ground reference points for each port permits AC and DC switching
- High-side or low-side switch configuration
- TTL-compatible with pull-up resistors
- High speed processing
- Failsafe power-up and system reset
- Output readback function
- Software configured (no jumpers/switches) allowing "on-the-fly" changes without removing modules
- Pins are compatible with QMC440 input module for loopback monitoring
- Extended temperature range and support for conduction-cooled systems

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VITA 93 QMC Modules

ISO9001
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Performance Specifications

Digital Outputs

Output channel configuration
32 isolated bipolar solid-state SPST-NO relays.
Supports AC and DC switching.

Isolation
Individual solid-state relays provide isolation. Four groups (ports) of 8 channels, each with separate port commons, ensure port-to-port isolation. Individual ports are isolated from each other and from the PCIe interface logic. Output lines of an individual port share a common connection and are not isolated from each other.

Host connector to I/O connector isolation
IPC-2221B: 548.64V (peak) at sea level
IPC-9592: 425V (peak)
UL61010C-1: 250V (rms)

IOPIPE to IOPIPE isolation
IPC-2221B: 30V (peak) at sea level
IPC-9592: 30V (peak)
UL61010C-1: 60V (rms)

Voltage range
±60V DC or AC peak

Output ON current range
150mA maximum continuous
(up to 1A total per port)

Turn on time
1ms typical, 2ms maximum

Turn off time
0.2ms typical, 1ms maximum

Output pull-up resistors
Not populated (default), consult factory

PCI Express Base Specification

Conforms to revision 2.1

Lanes
1 lane in each direction

Bus Speed
2.5 Gbps (Generation 1)

Memory
256k space: Base address register 0
1M space: Base address register 2

Environmental

Operating temperature range
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC(±5%): 0.50A typical
+3.3 VDC AUX(±5%): 0.20A typical
+12 VDC(±5%): Not used

MTBF (Mean Time Between Failure)
Contact the factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 8.9g (0.31 oz)

Ordering Information

QMC Modules

Go to on-line ordering page >

QMC451-1111
QMC452-1111
Isolated digital output module,
Air-cooled (QMC451) or Conduction (QMC452)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®

Example QMC Module shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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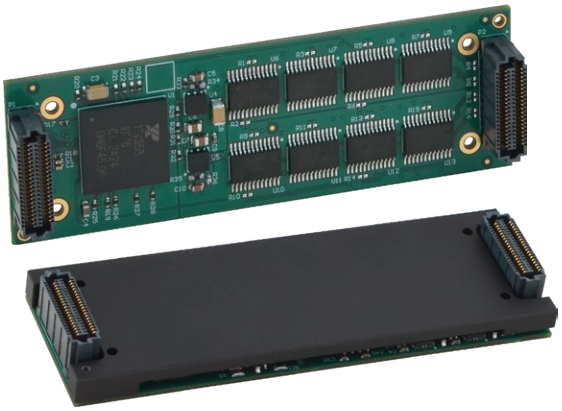
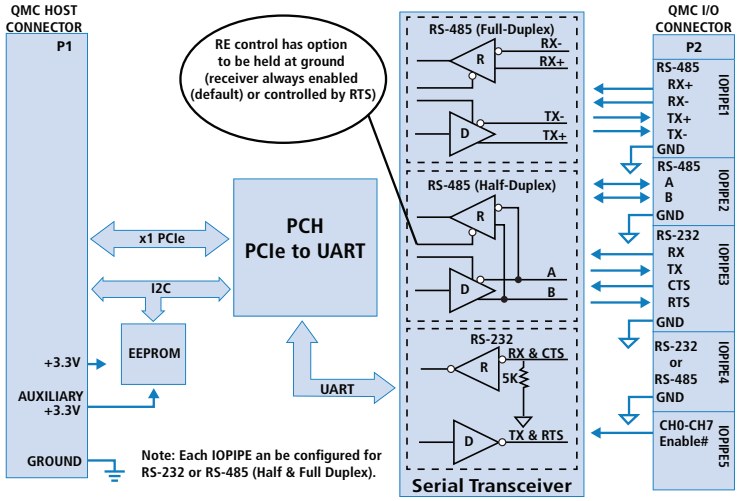
VITA 93 QMC Modules

QMC510 Series Serial Communication





8 Serial Communication Ports ◆ Programmable for EIA/TIA-232/422/485 ◆ 256-byte FIFO Buffers ◆ PCIe Bus Interface

Description

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC510 modules offer eight programmable serial ports for reliable communication with a broad range of systems. A PCIe bus interface provides communication to the carrier and host computer.

Each port is individually programmed for RS-232, RS-422, or RS-485 communication to provide optimal flexibility and utility. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines. These FIFO buffers minimize CPU interaction for improved system performance.

The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. All interrupts can be read from a single register.

The 16-bit timer/counter uses an internal 125MHz clock. This timer supports a single-shot mode for one-time events and a re-triggerable mode for periodic signals. The timer can also generate interrupts for timeout conditions.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- Eight (octal) asynchronous serial communication ports
- Each port programmable for EIA/TIA-232-F, EIA-TIA-422B, or EIA-485
- Full/half-duplex EIA-485 line support
- 16550-compatible register set
- 256-byte transmit and receive FIFO buffers with programmable trigger levels
- Programmable baud rate (up to 20Mbps)
- Individually controlled transmit, receive, line status, and data set interrupts
- General-purpose 16-bit timer/counter
- Extended temperature range and support for conduction-cooled systems

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VITA 93 QMC Modules

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Performance Specifications

Serial Ports

Configuration
Eight independent, non-isolated serial ports with a common single return connection

Data Rate
20M bits/second, maximum

Max. Cable Length
1200 meters (4000 feet) typical

Character size
5 to 8 bits, software-programmable

Parity
Odd, even, or no parity; software-programmable

Stop bits
1, 1-1/2, or 2 bits; software-programmable

Data register buffers
256-byte FIFO buffer

Interrupts
Receiver line status (overrun, parity, framing error, or break interrupt); receive/transmit FIFO level reached or character time-out; Xon/Xoff or special character detected

PCI Express Base Specification

Conforms to revision 2.1

Lanes
1 lane in each direction

Bus Speed
2.5 Gbps (Generation 1)

Memory
256k space: Base address register 0
1M space: Base address register 2

Environmental

Operating temperature
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC(±5%): 0.10A typical
+3.3 VDC AUX(±5%): 0.20A typical
+12 VDC(±5%): 0.28A typical

MTBF (Mean Time Between Failure)
Contact factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 11.28g (0.988 ounces)

Ordering Information

QMC Modules

Go to on-line ordering page >

QMC511-1111
QMC512-1111
Octal 232/422/485 serial communication,
Air-cooled (QMC511) or Conduction (QMC512)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®

Example QMC Module shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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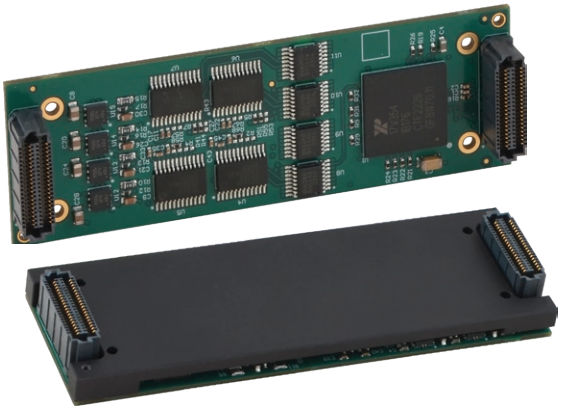
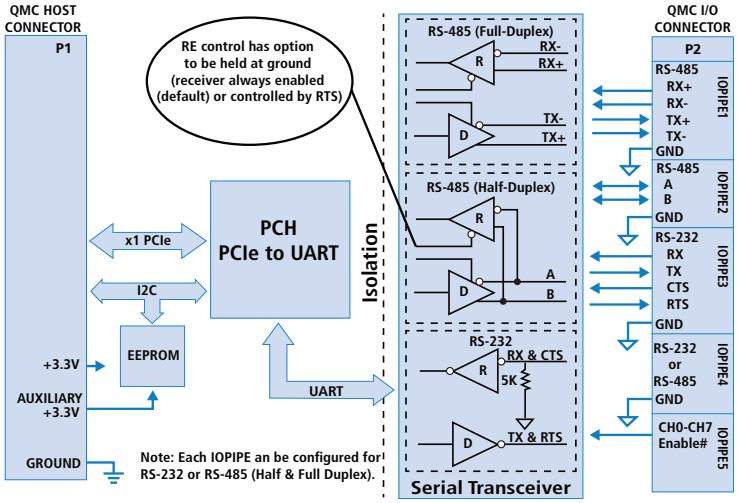
VITA 93 QMC Modules

QMC520 Series Isolated Serial Communication





4 Serial Ports ◆ Programmable for EIA/TIA-232/422/485 ◆ 256-byte FIFO Buffers ◆ PCIe Bus Interface

Description

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC520 modules offer four programmable, isolated serial ports for safe, reliable communication with a broad range of systems. A PCIe bus interface provides communication to the carrier and host computer.

Each port is isolated and individually programmed for RS-232, RS-422, or RS-485 communication to provide optimal flexibility and utility. Software-configuration helps you quickly set baud rates, character-sizes, stop bits, and parity.

For more efficient data processing, each serial port is equipped with 256-character FIFO buffers on the transmit and receive lines. These FIFO buffers minimize CPU interaction for improved system performance.

The data ports generate individually controlled transmit, receive, line status, data set, and flow control interrupts. All interrupts can be read from a single register.

The 16-bit timer/counter uses an internal 125MHz clock. This timer supports a single-shot mode for one-time events and a re-triggerable mode for periodic signals. The timer can also generate interrupts for timeout conditions.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- Four (quad) isolated asynchronous serial communication ports
- Each port isolated (250V) from digital circuitry and (100V) from the other ports
- Each port programmable for EIA/TIA-232-F, EIA-TIA-422B, or EIA-485
- Full/half-duplex EIA-485 line support
- 16550-compatible register set
- 256-byte transmit and receive FIFO buffers with programmable trigger levels
- Programmable baud rate (up to 20Mbps)
- Individually controlled transmit, receive, line status, and data set interrupts
- General-purpose 16-bit timer/counter
- Extended temperature range and support for conduction-cooled systems

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VITA 93 QMC Modules

ISO9001
AS9100
MADE IN USA

Performance Specifications

Serial Ports

Configuration
Four independent, isolated serial ports with separate port commons

Isolation
Individual opto-couplers provide isolation. Four groups (ports) of 8 channels, each with separate port commons, ensure port-to-port isolation. Individual ports are isolated from each other and from the PCIe interface logic.

Host connector to I/O connector isolation
IPC-2221B: 548.64V (peak) at sea level
IPC-9592: 425V (peak)
UL61010C-1: 250V (rms)

IOPIPE to IOPIPE isolation
IPC-2221B: 30V (peak) at sea level
IPC-9592: 30V (peak)
UL61010C-1: 60V (rms)

Data Rate
20M bits/second, maximum

Max. Cable Length
1200 meters (4000 feet) typical

Character size
5 to 8 bits, software-programmable

Parity
Odd, even, or no parity; software-programmable

Stop bits
1, 1-1/2, or 2 bits; software-programmable

Data register buffers
256-byte FIFO buffer

Interrupts
Receiver line status (overrun, parity, framing error, or break interrupt); receive/transmit FIFO level reached or character time-out; Xon/Xoff or special character detected

PCI Express Base Specification

Conforms to revision 2.1

Lanes
1 lane in each direction

Bus Speed
2.5 Gbps (Generation 1)

Memory
256k space: Base address register 0
1M space: Base address register 2

Environmental

Operating temperature
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC(±5%): 0.12A typical
+3.3 VDC AUX(±5%): 0.20A typical
+12 VDC(±5%): Not used

MTBF (Mean Time Between Failure)
Contact factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 11.37g (0.401 ounces)

Ordering Information

Modules

Go to on-line ordering page >

QMC521-1111
QMC522-1111
Quad isolated 232/422/485 serial communication, Air-cooled (QMC521) or Conduction (QMC522)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®

Example QMC Module shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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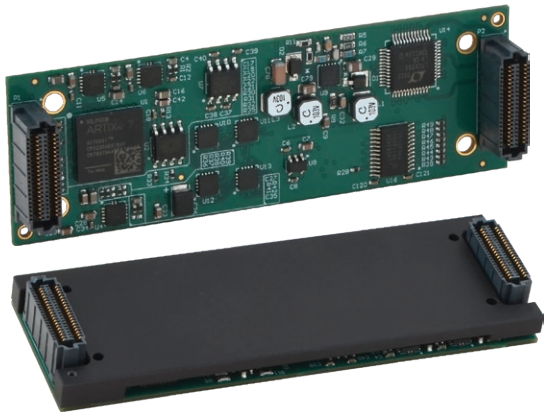
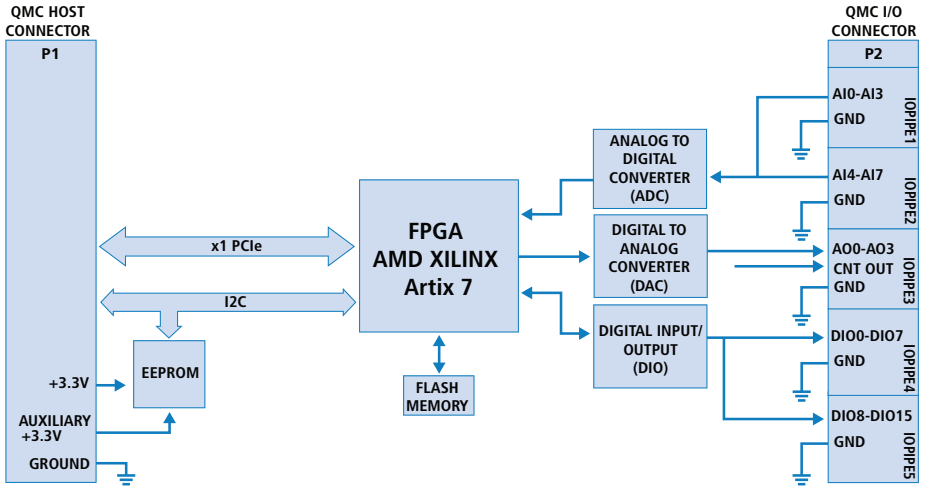
VITA 93 QMC Modules

QMC730 Series Multi-function I/O





Analog inputs ◆ Analog outputs ◆ Digital I/O ◆ Counter/Timers ◆ PCIe Bus Interface

Models

QMC mezzanine modules plug into a carrier card to interface connected I/O and provide a variety of signal processing functions. Acromag QMC730 modules offer a high-density combination of analog input, analog output, digital I/O, and counter/timer functions. A PCIe bus interface provides communication to the carrier and host computer.

The analog input channels perform high-speed, high-resolution A/D conversion. Input ranges, calibration, and other operational parameters are individually selectable for each channel to provide great flexibility.

Analog output channels are also individually configured, allowing users to select ranges, trigger methods, and operation modes to accommodate application requirements. High-performance D/A converters provide fast and accurate output.

Digital I/O is configured as TTL-level input or output in groups of eight channels. Interrupts are software programmable for any bit change-of-state or level.

A multi-function, high-resolution counter/timer supports a variety of measurement operations. Programmable polarity, thresholds, and interrupts along with internal or external triggering offer extensive adaptability to meet your needs.

QMC modules adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors provide separate field I/O and PCIe bus host interfaces. Modules can deploy on a variety of carrier card platforms including PCIe expansion cards, 3U/6U Eurocards such as VPX and CompactPCI, VNX+ SFF cards, and many other architectures. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

QMC modules have a much smaller footprint than PMC/XMC modules. Single-width QMC modules are only 26 x 78.25mm which facilitates mixing and matching of multiple functions on a single carrier card for high-density I/O solutions. They are ideal for computing systems with strict size, weight, power, and cost (SWAP-C) limitations.

An Intelligent Platform Management Interface (IPMI) facilitates system management. The QMC EEPROM holds module information and sensor data that is accessible by a smart carrier card with an IPMC controller over an I2C interface.

Key Features & Benefits

- Eight analog input channels with 16-bit A/D
  - 1.264µs conversion time (791KHz)
  - 1026 sample FIFO buffer
  - Unipolar and bipolar voltage ranges
  - Input range selectable for each channel
- Four analog output channels with 16-bit D/A
  - 7.5µs output settling time
  - Individually configured operating mode
  - Direct, single, continuous, or FIFO mode
  - Software, timer, or external trigger
  - Unipolar and bipolar voltage ranges
  - Output range selectable for each channel
- Sixteen digital input/output channels
  - TTL-compatible thresholds
  - Programmable change/level interrupts
  - Failsafe power-up and reset
- Multi-function 32-bit counter/timer
  - Waveform generation
  - Event counting
  - Watchdog timing
  - Pulse-width or period measurement
  - Quadrature position measurement
- Extended temperature range and support for conduction-cooled systems

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Bulletin #8401098

VITA 93 QMC Modules

ISO9001 AS9100 MADE IN USA

Performance Specifications

Analog Input

Input channels
8 differential, voltage (non-isolated)

Resolution
16 bits.

Conversion rate
791,139.24Hz maximum

Settling time
Full-scale step 420 ns to 0.005% of FSR

Input ranges
Software-selectable on a per channel basis
Bipolar: ±10.24V, ±10.0V ±5.12V, ±5.0V
Unipolar: 0 to 10.24V, 0 to 10.0V, 0 to 5.12V

Calibrated error
±3.125 LSB max. (0 to 5.12V)
±2.125 LSB max. (all other ranges)

Analog Output

Output channels
4 single-ended voltage (non-isolated)

Resolution
16 bits

Settling Time
12.5 µs 20 V step to 1 LSB maximum
8.5 µs 10 V step to 1 LSB maximum
7.5 µs typical

Output ranges (software-selectable)
Bipolar: ±10V, ±5V, ±3V, -2.5 to +7.5V
Unipolar: 0 to 10V, 0 to 5V

Output current:
± 10mA maximum (minimum load resistance of 1KΩ with a 10V output)

Calibrated error:
±2.125 LSB (±0.0032% FSR) max.

Digital I/O

Input/output range
0 to 5V

Signal thresholds
VIH: 2.0V minimum
VIL: 0.8V maximum
IOH: -24 mA maximum
IOL: 24mA maximum
VOH: 3.7V minimum VCCA
VOL: 0.55V maximum VCCA

Minimum pulse
32nS

Debounce
Filters signals with duration 4.0 µs

Counter/Timer

Configuration:
32-bit timer

Counter input and output
TTL input port.
MOSFET output port.

Counter output pull-up voltage
+5V with 1K pull-up.

Internal clock
62.5MHz, 15.625MHz, 7.8125MHz, 3.90625MHz, 1.953125MHz

PCI Express Base Specification

Conforms to revision 2.1

Lanes
1 lane in each direction

Bus Speed
2.5 Gbps (Generation 1)

Memory
256k space: Base address register 0
1M space: Base address register 2

Environmental

Operating temperature
Air-cooled: 0 to 70°C (200 LFM airflow)
Conduction-cooled: -40°C to +85°C

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
+3.3 VDC(±5%): 0.50A typical
+3.3 VDC AUX(±5%): 0.20A typical
+12 VDC(±5%): 0.20A typical

MTBF (Mean Time Between Failure)
Contact factory

Physical

Size
Length: 78.25mm (3.08 in)
Width: 26.00mm (1.02 in)
Height: 11.00mm (0.43 in)

Weight
Unit weight: 8.9g (0.31 oz)

Ordering Information

QMC Models

Go to on-line ordering page >

QMC731-1111
QMC732-1111
Multi-function analog and digital I/O
Air-cooled (QMC731) or Conduction (QMC732)

Carrier Cards

See Acromag.com/QMC-Carriers for a full list of QMC carrier cards.

Software *(see software documentation for details)*

USW-API
Universal Embedded Design Suite with software support for VxWorks®, Windows®, and Linux®

QMC730 Shown with attatched heatsink inlcluded with conduction-cooled QMC Modules.

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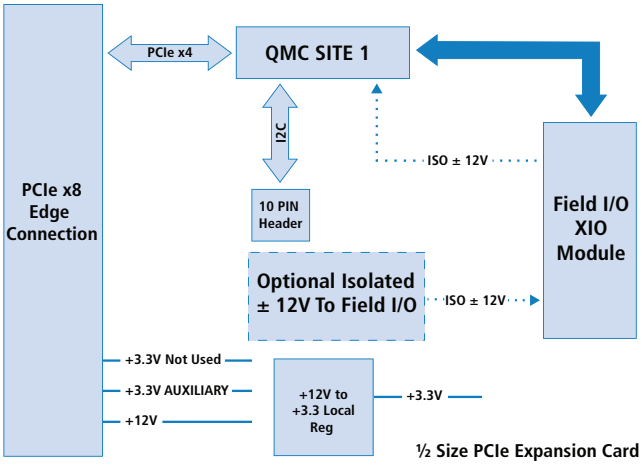
VITA 93 QMC Modules

QPCe7210 Series PCI Express Carrier Cards for QMC Modules

CE 2 YEAR WARRANTY RoHS Compliant

QPCe7211-1111 QMC Carrier Functional Block Diagram



Half-length PCIe Expansion Card ◆ One QMC Module Site ◆ Isolation Support ◆ PCIe Bus Gen 3 x4 Interface

Description

QMC carrier cards provide an electrical and mechanical interface for QMC mezzanine modules. A QMC module plugs into the carrier card to interface connected I/O and perform a variety of signal processing functions. Acromag's QPCe7210 carriers are PCIe expansion cards with a single QMC site and a high-density connector for field I/O signals. The QMC module's PCIe bus interface routes to the carrier card edge connector for communication with the host computer.

QPCe7210 carrier cards offer a variety of features to support a broad range of QMC modules. A standard 14-pin JTAG programming header facilitates programming and debugging of QMC modules equipped with an FPGA device. Fused, +3.3V, +3.3V Aux, +12V, DC power lines are available for the QMC module. An on-board fan provides direct cooling to the QMC module.

This carrier will also maintain isolation when hosting an isolated QMC module. The carrier's QMC host connector is electrically isolated from the QMC I/O connector.

QMC carrier cards adhere to the VITA 93 standard for small form factor (SFF) mezzanine modules. Two high-performance 80-pin connectors for each QMC module site provide separate field I/O and PCIe bus host interfaces. The rugged design is well-suited for use in laboratory, industrial, defense, and aerospace applications.

Use of any single-width, 26 x 78.25mm VITA 93 compliant QMC module is supported. Typical applications involve monitoring sensors and controlling equipment levels in deployed systems or for lab test and simulation projects. Other common operations include communication, networking, and signal or protocol conversion. With powerful FPGAs, GPUs and other processors, QMCs can perform image processing, adaptive filtering, sensor fusion, artificial intelligence, and machine learning functions.

Key Features & Benefits

- Half-length PCIe expansion card ideal for use with compact, rugged servers and workstations
- One QMC mezzanine site
- PCI Express Gen 3 x4 interface
- Isolated QMC support
- JTAG programming header
- Cooling fan
- Individually fused power
- Resettable Positive Temperature Coefficient (PTC) fuse on each supply line

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VITA 93 QMC Modules

ISO9001
AS9100
MADE IN USA

Performance Specifications

Carrier Card

Connectors
J1 (IO interface): QMC 80-pin male receptacle

J2 (Host interface): QMC 80-pin male receptacle

J5 (Carrier Field I/O): 68-pin 0.8mm CHAMP

P1 (PCIe Bus): Eight lanes (only four used)

P3 (I2C): 4-pin header

P4 (JTAG): 14-pin header

QMC cooling fan
40 x 40 x 6 mm, 3-pin connector
5V DC, 0.075 A, 6000 RPM, 6.3 CFM

Isolation
This carrier provides isolation between the QMC field I/O signals and the host. The QMC module must also be isolated to maintain isolation between the logic and field I/O signals. Otherwise, the field I/O connections are not isolated from the host connector and PCIe bus.

Host logic and field I/O are isolated from each other for voltages up to 250V AC or DC on a continuous basis (unit will withstand a 1500V AC dielectric strength test for one minute without breakdown).

Due to spacing between pads of the 68-pin CHAMP connector and cable, isolation between adjacent pins/signals on the front I/O is 30V.

Isolated Power
Use of an optional isolated DC/DC converter is required for use with isolated Acromag QMC modules. The isolated DC/DC converter plugs into a socket.

Compatible DC/DC isolated converters (6W, ±12V DC, ±250mA) include:

DELTA DH06S/D Series, DH06D1212A

XP Power JCE Series, JCE0612D12

TRACO POWER, TEN 6N Series, TEN 6-1222N

PCI Express Bus Compliance

Conforms to revision 2.1

PCIe bus Interface
PCIe Gen 3 x4 lanes

Bus Speed
Up to 8.0 Gbps per lane

Environmental

Operating temperature
-10 to 70°C (200 LFM airflow)

Storage temperature
-55 to 125°C

Relative humidity
5 to 95% non-condensing

Power
For carrier board only:
+3.3 VDC (±5%): 0.023 A typical
+3.3 VDC AUX (±9%): 0.005 A typical
+12 VDC (±8%): 0.023 A typical

For supply to QMC module:
+3.3 VDC (±5%): 2.5 A typical
+3.3 VDC AUX (±9%): 0.1 A typical
+12 VDC (±8%): 0.5 A typical

NOTE: Maximum current provided to the carrier via the PCIe bus edge connector varies with each system. Refer to your system documentation.

MTBF (Mean Time Between Failure)
Contact factory

Physical

Size
Length: 167.64mm (6.60 in)
Width: 76.20mm (3.00 in)
Height: 20.32mm (0.80 in)
Board thickness: 1.575mm (0.062 in)

Weight
Unit weight: 113.83g (4.02 oz)

Ordering Information

Modules

Go to on-line ordering page >

QPCe7211-1111
Half-length, single QMC site carrier card

QMC Modules

See Acromag.com/QMC for a full list of QMC carrier modules.

Software *(see software documentation for details)*

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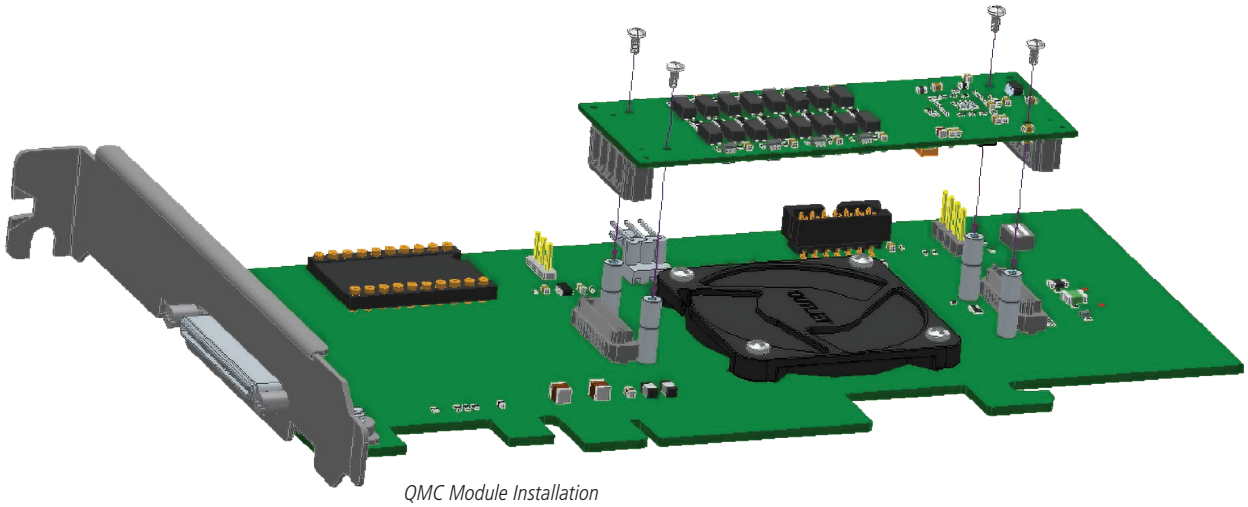

QMC Module Installation

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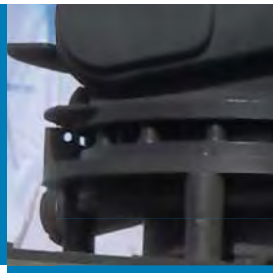

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