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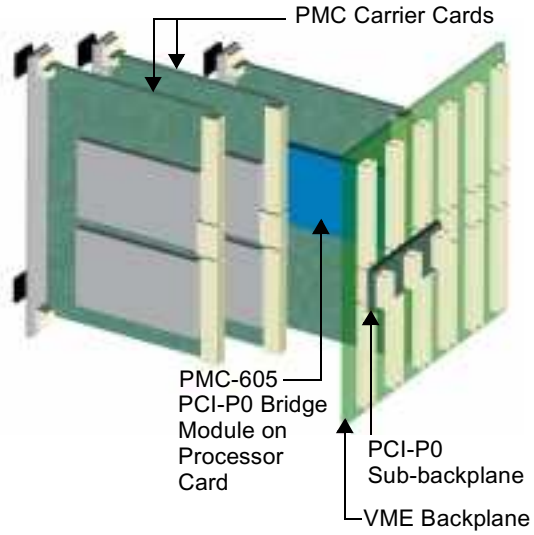
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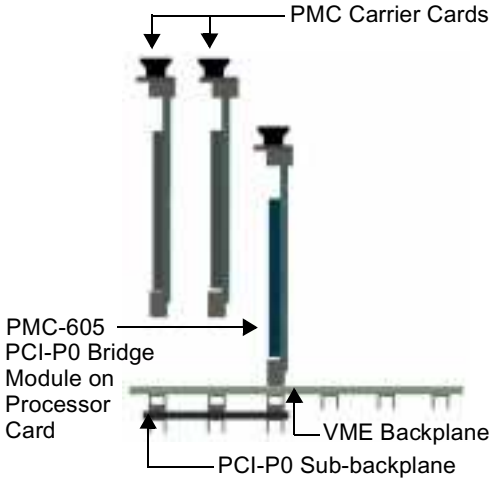
Outreach PCI/PMC Expansion System

SPMC/DPMC-605 PCI/P0 Bridge Module
SVME/DMV-210 Carrier Card

Features

- ***Capabilities***
  - *Expand the number of PMC modules attached to a processor card (single board computer or DSP)*
  - *Interconnect multiple processor cards via a high-speed PCI secondary backplane*
  - *Provide a private PCI data path to custom I/O cards*
- ***System Components***
  - *PCI-to-P0 bridge PMC module, air-cooled SPMC-605 and conduction-cooled DPMC-605*
  - *Dual PMC VMEbus carrier card, air-cooled SVME-210 and conduction-cooled DMV-210*
  - *Two and three slot PCI-P0 sub-back-planes (BPL-605-002 & BPL-605-003)*
  - *PMC I/O adapter cable for the SVME-210 PMC carrier card (CBL-210-000)*
  - *Host card firmware and BSP components*





DY 4's Outreach PCI/PMC Expansion System allows system integrators to exploit an industry-standard PCI interface for high performance board-to-board interconnects. Using Outreach, system integrators can interface VME processor cards to custom I/O cards via a PCI connection as well as expand the number of PMC modules attached to one VME processor card, or connect multiple processor cards together using PCI as a secondary backplane.

The Outreach PCI/PMC expansion system consists of the following components:

- The SPMC/DPMC-605 PCI bridge module, which bridges the internal PCI bus of a processor card to the Pn4 I/O connector and then to P0 (providing the PMC-605 is installed in the appropriate PMC slot)
- The SVME/DMV-210 PMC carrier card, which hosts either two standard-width PMC modules or one double-width and connects to the PCI backbone of a processor card via P0
- BPL-605-002 and -003 PCI-P0 sub-backplanes, which push onto the P0 connector from the rear of the VME backplane and span either 2 or 3 slots

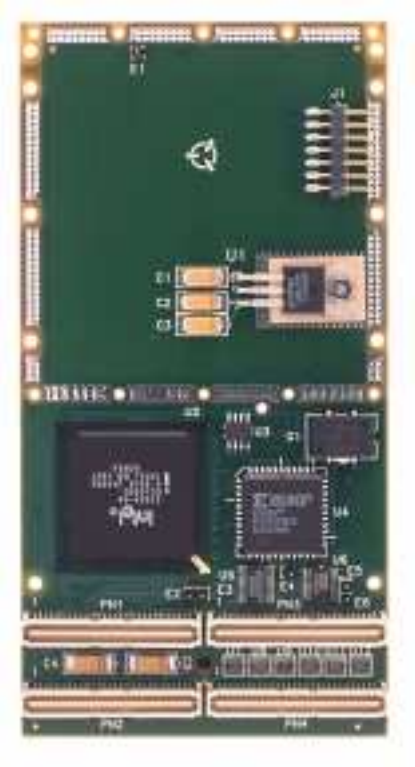
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- CBL-210-000 I/O adapter cable for the PMC carrier card that transitions the PMC I/O signals routed through the P2 and P0 backplane connectors to the DY 4-standard PMC breakout connectors
- Firmware and BSP elements, specific to each processor card which supports the Outreach system, that supports configuration of the PCI-P0 sub-bus and attached PMC/PCI modules

Outreach Bridge Module

The SPMC/DPMC-605 bridges the internal PCI bus of processor cards to the P0 connector, allowing system integrators to create a high-performance PCI sub-bus on P0 between processor cards, PMC carrier cards, and/or custom I/O cards.

Features



- Based on industry-standard Intel 21554 embedded PCI-to-PCI bridge device
- Single bridge module supports processor-to-processor, processor-to-carrier card, and processor-to-I/O card applications
- Backplane mode select inputs control P0-side 2-input PCI arbiter, PCI clocking options, and CompactPCI-type signal terminations, allowing identically configured PMC-605 modules to support a variety of operating modes
- Supports 32-bit P0-side PCI bus at up to 33 MHz (132 Mbytes/sec peak data rate)
- Supports 33 MHz, 32-bit or 64-bit host-side PCI bus
- Independent address spaces between host-side and P0-side PCI busses
- P0-side PCI uses only standard 64 pins of PMC I/O available through Pn4, allowing the Outreach system to be used with any processor cards that supports rear-panel PMC I/O
- Needs only +5 V, no other backplane voltages required
- 3.3 V signaling, 5 V tolerant
- Available in three ruggedization grades, level 0 air-cooled, level 200 air-cooled, and level 200 conduction-cooled

See Figure 1 for a block diagram of the ‘605 PCI-P0 bridge PMC module.

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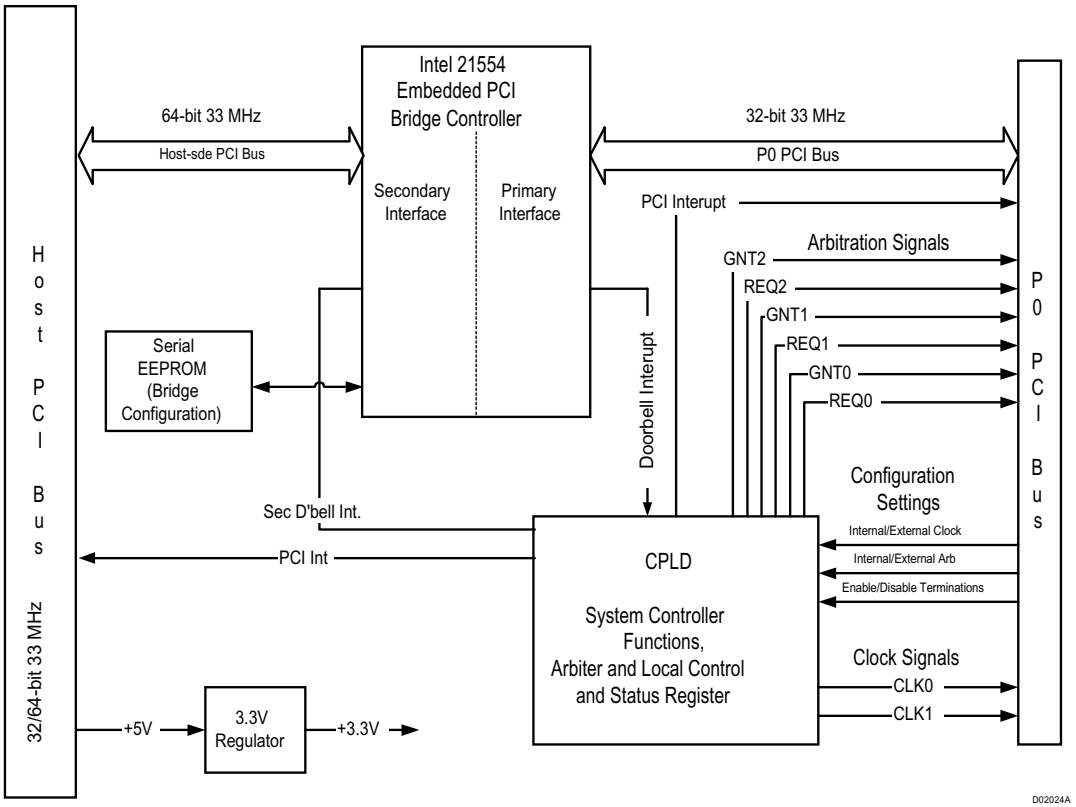


Figure 1: SPMC/DPMC-605 Outreach PCI-P0 Bridge Module Block Diagram

PCI-to-PCI Bridge

The key component of the PMC-605 Outreach bridge module is the Intel® 21554 embedded PCI-to-PCI bridge device. It provides a high performance bridge between the internal PCI bus of a processor card and the P0-side PCI sub-bus. The 21554 embedded bridge, when used with DY 4's Outreach firmware, acts as a standard transparent PCI-to-PCI bridge to interface to PMC carrier cards and custom I/O cards.

To support multi-processor configurations, the bridge device has the important capability of being used in a non-transparent manner whereby the address space on the host-side PCI bus is independent of the address space on the P0-side PCI bus. Programmable base address and translation registers control the window size and address translation from host-side to P0-side PCI and from P0-side to host-side for memory, configuration, and I/O spaces. This capability is vital when interconnecting multiple processor cards via PCI-P0 that otherwise may not be able to present a compatible set of address regions to the PCI-P0 sub-bus.

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Host-side PCI Bus

The host-side PCI bus of the ‘605 is a PCI Rev 2.1-compliant bus operating at 33 MHz and is capable of either 32-bit or 64-bit operation. Note that the ‘605 can be mounted on a PMC site that supports 66 MHz operation, in which case the presence of a 33 MHz PMC will be detected and the bus will operate at 33 MHz. I/O signalling is 3.3 V, 5 V tolerant. The ‘605 is keyed as a 5 V-signalling PMC module.

The host-side PCI is attached to what is defined as the secondary side of the 21554 bridge device in its data sheet.

P0-side PCI Bus

The P0-side PCI bus of the ‘605 is a PCI Rev 2.1-compliant bus supporting speeds up to 33 MHz and a bus width of 32 bits. I/O signaling is 3.3 V, 5 V tolerant.

The P0-side PCI is attached to what is defined as the primary side of the 21554 bridge device.

P0-side PCI Arbiter Options

When so enabled, the ‘605 provides an onboard arbiter for the P0-side PCI bus. Using the onboard arbiter up to 3 boards can be connected on the P0-side PCI bus. The arbiter onboard the ‘605 arbitrates internal requests from the P0 side of the bridge device in addition to handling two Request/Grant pairs from the P0-side bus. For situations where a longer P0-side bus is desired, the internal arbitration function can be disabled in favor of external arbitration. In this mode, one of the Request/Grant pairs on P0 sends requests to and receives grants from a user-provided external arbiter

The selection between onboard and external arbitration modes is determined by a mode select discrete from the backplane.

P0-side PCI Clocking Options

The P0-side PCI bus of the PMC-605 is clocked asynchronously to the host-side PCI bus. The P0-side clock can either be supplied to the PCI-P0 backplane from the PMC-605, or provided to the PMC-605 from the backplane. When internal clocking is selected, the PMC-605 supplies its own clock and also supplies two clocks to the P0-side bus. When external clocking is selected, the PMC-605 accepts its clock from the P0-side bus. Standard modules are configured to derive the PCI clock from the host-side PCI bus. To support long PCI-P0 spans that may not operate reliably at 33 MHz, a separate oscillator for the P0-side PCI can be installed as a factory build option.

The clocking mode is determined by a mode select input from the backplane.

System Slot Termination Selection

To ensure reliable system operation, DY 4’s Outreach PCI/PMC expansion system follows the CompactPCI practice of providing parallel termination resistors on the system controller slot for selected PCI signals. Accordingly, the PMC-605 includes the option to provide parallel termination for signals INTA#, FRAME#, TRDY#, IRDY#, DEVSEL#, STOP#, SERR#, and PERR#.

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The system slot termination option is enabled and disabled by a mode select input from the backplane.

Local Control and Status Register

A local control and status register onboard the PMC-605 allows driver and/or application software on the host processor to enable interrupt generation and to determine the configuration of the PMC-605 with respect to P0-side arbiter mode, clocking option, and system slot termination selection.

Bus Bridging

The central feature of the PMC-605 bridge module is its ability to forward bus cycles, or transactions, from one side of the bridge module to the other in a controlled manner.

In the direction of the host-side PCI bus to the P0-side PCI bus, termed the “upstream” direction in the 21554 data sheet, up to three separate address ranges can be programmed for the forwarding of PCI transactions. The capabilities of the forwarding ranges vary and are listed below:

- Upstream range 0 can forward I/O transactions over an address range of from 64 bytes to 2 Gbytes in size, or memory transactions over an address range of from 4 Kbytes to 2 Gbytes in size. An address offset can optionally be applied. When forwarding memory transactions, a selection between prefetchable or non-prefetchable memory can be made that applies to the entire range
- Upstream range 1 can forward memory transactions over an address range of from 4 Kbytes to 2 Gbytes in size, with an optional address offset applied. A selection between prefetchable or nonprefetchable memory can be made that applies to the entire range
- Upstream range 2 can forward memory transactions over an address range of up to 256 Mbytes. Address translation and prefetchable/nonprefetchable selection is done with a lookup table with 64 entries for the entire range

In the direction of the P0-side PCI bus to the host-side PCI bus, termed the “downstream” direction in the 21554 data sheet, up to three separate address ranges can be programmed for the forwarding of PCI cycles. The capabilities of these ranges are listed below:

- Downstream range 1 can forward I/O transactions over an address range of from 64 bytes to 2 Gbytes in size, or memory transactions over an address range of from 4 Kbytes to 2 Gbytes in size. An address offset can optionally be applied. When forwarding memory transactions, a selection between prefetchable or nonprefetchable memory can be made that applies to the entire range.
- Downstream ranges 1 and 2 can forward memory transactions over an address range of from 4 Kbytes to 2 Gbytes in size, with an optional address offset applied. A selection between prefetchable or nonprefetchable memory can be made that applies to the entire range.

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Interrupts

The PMC-605 bridge module routes a single interrupt signal, INTA#, to the host's PMC site. The single interrupt to the base card forwards interrupts from the P0-side PCI bus and also, optionally, doorbell interrupts that are generated by the 21554 bridge device itself. The doorbell interrupts are implemented via registers within the Control and Status Register (CSR) block of the 21554 PCI-to-PCI bridge device. They provide a flexible means for the P0-side PCI bus to interrupt the host-side and vice versa. User software is required to generate and handle the interrupts.

Serial EEPROM

The PMC-605 is equipped with a serial EEPROM that loads configuration data into the 21554 bridge device automatically at power-up. This configuration data includes the Subsystem ID and Subsystem Vendor ID values that allow PCI configuration software to differentiate the 605 from other PMC devices that may use the same 21554 bridge device.

Mechanical Format

The PMC-605 is a single width PMC module. Air-cooled modules are designed in accordance with the IEEE P1386 and P1386.1 preliminary specifications. There is no I/O from the front of the card and no front panel is installed.

Conduction-cooled modules are designed in accordance with VITA 20-200x, Conduction-Cooled PCI Mezzanine Card Draft Standard. The cooling surfaces provided are the Primary Thermal Interface Regions and the side 1 Secondary Thermal Interface Regions.

Ruggedization Levels

Functionally identical versions of the PMC-605 are available in DY 4 ruggedization level 0 air-cooled, and air-cooled and conduction-cooled level 200. Level 200 in the case of the PMC-605 refers to card-edge temperatures of supported basecards from -40 to +85C.

Outreach PMC Carrier Card

DY 4's Outreach PMC carrier card (SVME/DMV-210) is a 6U VME that carries up to two single-width PMC modules or one double-width PMC modules. Used with a PMC-605 Outreach bridge module, the '210 allows a processor card to interface to more PMC modules than the two that are normally supported on the processor card itself. Up to two '210 carrier cards can be supported from one processor card allowing a typical processor card to support a total of five PMC modules.

See Figure 2 for a block diagram of the '210 carrier card.

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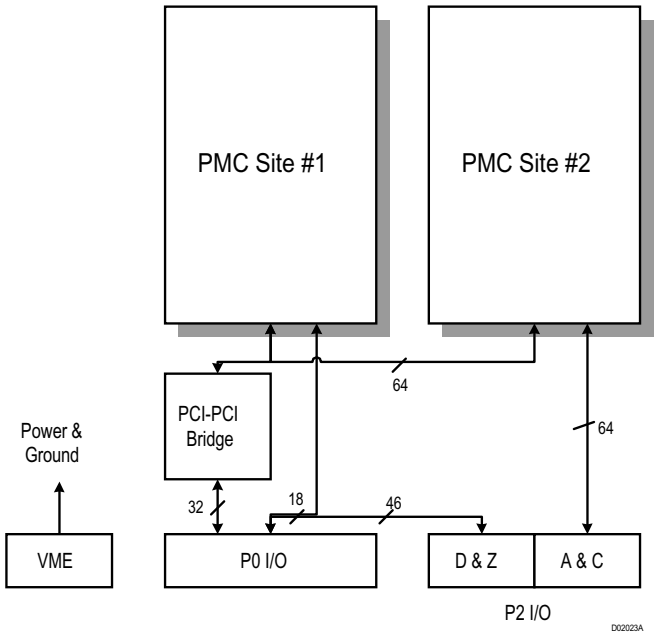


Figure 2: SVME/DMV-210 Carrier Card Block Diagram

Features

- Based on industry-standard Intel 21154 transparent PCI-to-PCI bridge device
- Supports two single width PMC modules or one dual-width module
- Supports 32-bit P0-side PCI bus at up to 33 MHz (132 Mbytes/sec peak data rate)
- 64-bit internal PCI bus, at up to 33 MHz
- Concurrent, independent bus operations on internal PCI bus and P0-side PCI
- P0-side PCI uses only 64 I/O pins on P0
- +5V-only operation
- Optional onboard regulator to provide 3.3 V to PMC modules requiring 3.3 V
- PCI signaling is 3.3V signaling, 5 V tolerant
- Available in three ruggedization grades, level 0 air-cooled, level 200 air-cooled, and level 200 conduction-cooled

PCI-to-PCI Bridge

The ‘210 incorporates the Intel 21145 device which provides the functions of a standard transparent PCI-to-PCI bridge in accordance with the PCI-to-PCI Bridge Architecture specification.

The P0-side PCI bus of the ‘210 is a PCI Rev 2.1-compliant bus supporting speeds up to 33 MHz with a bus width of 32 bits. I/O signaling is 3.3V, 5V tolerant. The on-card PCI bus is a 64-bit PCI Rev 2.1-compliant bus operating synchronously to the P0-side bus.

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The PCI bus on the ‘210 can operate concurrently to the P0-side PCI bus, i.e., one PMC module could initiate a transfer to another PMC on the same carrier card at data rates of up to 256 MBytes/sec without impacting the P0-side PCI bus. In addition, a PMC module on one ‘210 can communicate over the P0-side PCI to a PMC module on another ‘210 carrier card without affecting the internal PCI bus of the host processor.

Interrupts

The ‘210 supports a single interrupt, INTA#, from each PMC site and combines the two into a single wire-or’d interrupt to the P0-side PCI bus. Via the PMC-605 module a single interrupt is generated to the host processor for all PMCs on all ‘210 cards controlled from one processor card. When an interrupt is generated the operating system interrupt handler will call the I/O driver for each PMC module in turn. As per PCI guidelines, each driver must check the interrupt status bit of its PMC as its first step and simply return if the interrupt is not for it.

PCI Signaling

The 21154 PCI-to-PCI bridge device used on the ‘210 is a 5 V tolerant device that uses 3.3 V signaling. Since it can accept PMCs that use 5 V signaling, the ‘210 is keyed as a 5 V signaling host to prevent the inadvertent installation of a 5 V signaling PMC and 3.3 V-only PMC at the same time.

I/O Routing

The 64 PMC I/O signals from PMC site #2 (nearest P2 connector) are routed to the A and C rows of the P2 connector in accordance with IEEE P1386, Table 6.2. For PMC site #1, 48 of the 64 I/O signals are routed to the D and Z rows of P2 in accordance with IEEE P1386, Table 6.3, with the other 18 of the 64 I/O signals being routed to the P0 connector.

For support of high-bandwidth signals such as Fibre Channel, 8 of the 64 I/O lines for PMC site #2 are implemented as 4 pairs of 150 ohm (nominal) differential impedance traces matching the PMC-642A1 pin-out.

Power Routing Options

The SVME/DMV-210 itself only uses +5 V, which is used to power the bridge device through a 3.3v regulator. Backplane +5 V, +/-12 V, and, optionally, +3.3 V power connections are routed to the PMC sites. PMC modules that require 3.3 V can optionally be provided with 3.3 V from an onboard regulator, up to a maximum of 4 A total.

Mechanical Format

The SVME/DMV-210 is a standard 6U format VME card. The only electrical connection to the VME bus is for power and ground. Air-cooled modules provide appropriate front-panel openings for PMC bezels.

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Conduction-cooled modules conform to the IEEE 1101.2 standard for a conduction-cooled VME card. The thermal interface details of the PMC sites are in accordance with VITA 20-200x, Conduction-Cooled PCI Mezzanine Card Draft Standard. The cooling surfaces provided are the Primary Thermal Interface Regions and the side 1 Secondary Thermal Interface Regions.

Ruggedization Levels

Functionally identical versions of the PMC-605 are available in DY 4 ruggedization level 0 air-cooled, and air-cooled and conduction-cooled level 200. Level 200 in the case of the SVME/DMV-210 refers to card-edge temperatures from -40 to +85C.

Outreach Backplanes

DY 4's Outreach sub-backplanes (BPL-605-002/003) provide a fast and efficient interconnect method for systems using Outreach components such as the PMC-605 PCI-P0 bridge and the SVME/DMV-210 PMC carrier card. These sub-backplanes push directly onto the P0 connector of standard VME64x backplanes and span either two or three slots.

Features

- Standard units span two and three slots, contact DY 4 for custom requirements
- No interference with adjacent slots, or above or below P0 area
- Extended tails on non-PCI signals allow cable connection for I/O signals
- Four configuration jumpers to set PCI-P0 options provided for each slot
- Intended for use in standard development chassis

Firmware & BSP Components

See individual processor card data sheet for details on their support for the Outreach PCI/PMC Expansion System.

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Table 1: Outreach Specifications

RUGGEDIZATION LEVELS (Refer to *Ruggedization Guidelines* data sheet for more details)	
Air-cooled modules	Available in levels 0 and 200*
Conduction-cooled modules	Available in levels 200*
Level 200 in the case of the SVME/DMV-210 refers to card-edge temperatures from -40 to +85C.	

POWER REQUIREMENTS SPMC/DPMC-605 BRIDGE MODULE		
+5 V +12 V -12 V	1.0 A (maximum) 0 A 0 A	0.8 A (typical) 0 A 0 A
3.3 V	Only routed to the PMC sites, not used by the base card.	

DIMENSIONS SPMC/DPMC-605 BRIDGE MODULE		
	Size	**Weight**
Air-cooled module (SPMC)	per ANSI/VITA 1-1994 IEEE P 1386/P1386.1	<300 g
Conduction-cooled modules (DPMC)	per IEEE 1101.2 VITA 20-200X	<300 g

POWER REQUIREMENTS SVME/DMV-210 CARRIER CARD (Does not include PMC modules)		
+5 V +12 V -12 V	1.0 A (maximum) 0 A 0 A	0.8 A (typical) 0 A 0 A

DIMENSIONS SVME/DMV-210 CARRIER CARD		
	Size	**Weight**
Air-cooled module (SVME)	per ANSI/VITA 1-1994	<500 g
Conduction-cooled modules (DPMC)	per IEEE 1101.2	<600 g

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