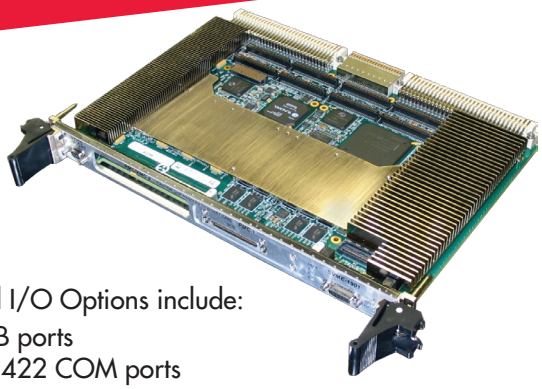
Data Sheet

SVME/DMV-1901

6U VME Intel® Core™2 Duo Single Board Computer



Features

- Intel® Core™2 Duo
  - 1.5GHz
  - 667MHz (5.3GB/s) FSB
  - 64 KB L1 cache per core
  - 4MB shared L2 advanced transfer cache
  - 1, 2 or 4GB of DDR2 SDRAM with ECC @ 400MHz
  - 6.4GB/s memory bandwidth
  - Intel® MMX™, SSE, SSE2, and SSE3 SIMD instruction support
- High-performance Intel® 7520 MCH
- 6300 ESB ICH
- 16Mb (2MB) Firmware Hub
  - Hardware flash write protection jumper
- 4 or 8GB flash
- Two 10/100/1000 Ethernet interfaces
  - 1x GbE to P0 connector
  - 1x GbE to front panel or P0 connector depending on pin-out mode
- 6U VME64x 320MB/s interface (optional)
- 2x RS-232 Async COM ports
- 3x RS-422 Async COM ports
- 2x PMC sites with 64/133 PCIx and 1x XMC site with 4-lane PCI Express® (PCIe)
- Optimized cooling for conduction-cooled PMCs
- ATI Radeon™ x300 Graphics on-board with 8-lane PCIe, Dual Display
- OpenGL® 1.3 support with video option Linux® Windows®
- Capacitor backed real-time clock
- Power: >40W
- Ruggedized, available as air- and conduction-cooled
- State-of-the-art EFI BIOS
- Additional I/O Options include:
  - 3x USB ports
  - 3x RS-422 COM ports
  - 2x SATA ports
  - AC97 Audio
  - 8x GPIO lines
  - 2x PS/2 ports
- Windows®, Linux®, Solaris® 10, VxWorks®, LynxOS® SE BSPs
- World class Longevity of Supply and Longevity or Repair supplied by the Life Cycle support group
- On-board temperature sensors
- Tundra® Tempe™ Renaissance master/slave interface with VME DMA (optional)
- Support for VME64x geographic addressing
- Basecard uses 3.3/5V from backplane 3.3V, 5V, and +/-12V are routed to the PMC sites
- Occupies single .8" slot in all configurations
- Optimized conduction-cooling with TherMax™ thermal frame and direct processor shunts
- EFI BIOS supports Ethernet and USB storage devices
  - Debug monitor with system exerciser functions in BIOS
  - Power-up BIT (PBIT)
  - Embedded non-volatile memory programmer (NVMP) for BIOS updates
- VxWorks®/Tornado™ integration:
  - Tornado™ 2.2.x and Workbench® 2.0
  - Full suite of drivers for hardware features
  - Run-time BIT libraries for Initiated and Continuous BIT
- Intel® supplied DSP libraries for Windows® and Linux®
- Available in a range of ruggedization levels, both air- and conduction-cooled

Please note:
All hardware features may not be supported by all operating systems. Contact Curtiss-Wright for details and release schedules.

Learn More
Web / sales.cwcembedded.com
Email / sales@cwcembedded.com

ABOVE & BEYOND

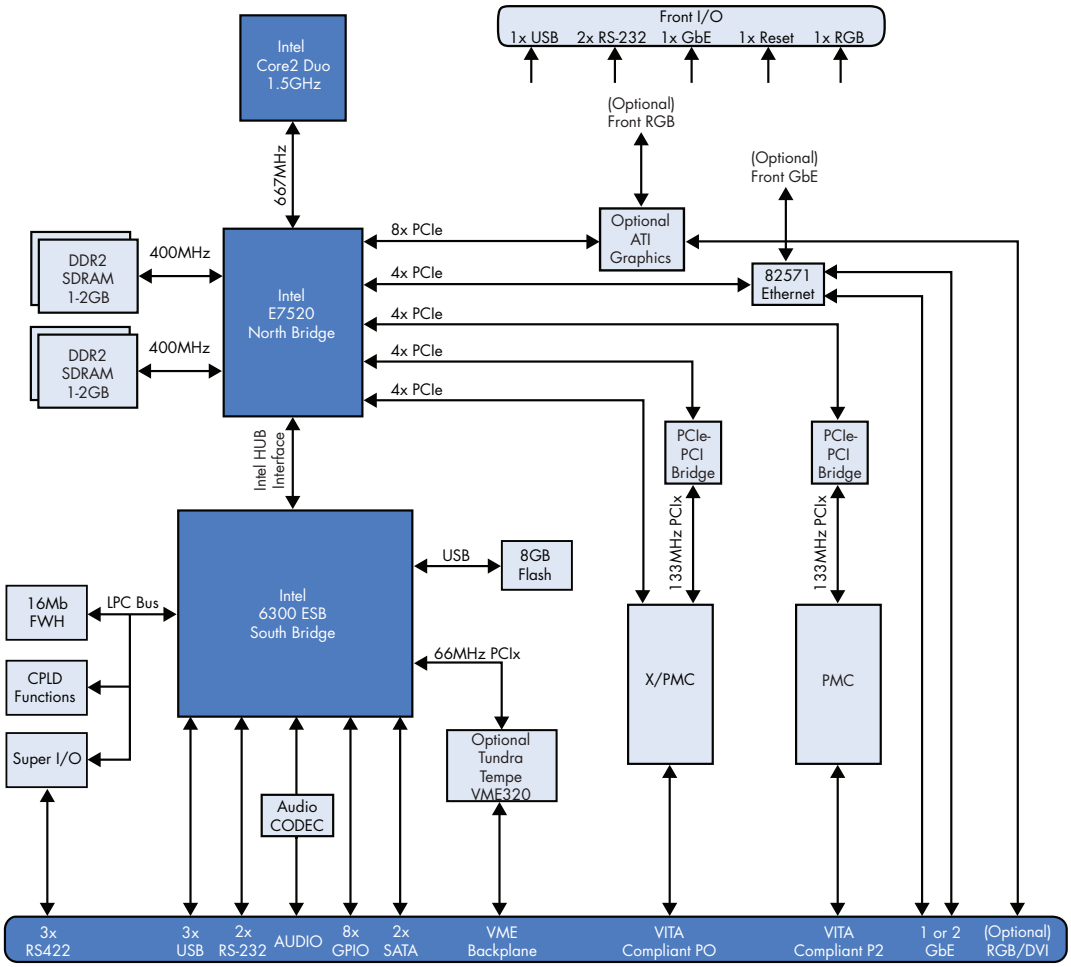
CURTISS WRIGHT Controls
Embedded Computing
cwcembedded.com

Overview

The SVME/DMV-1901 from Curtiss-Wright Controls Embedded Computing supports one Intel® Core™2 Duo. With a Core™2 Duo processor the SVME/DMV-1901 acts as a dual CPU 6U VME64x single board computer (SBC) built to meet the diverse needs of the evolving embedded community. With the addition of a SATA, or USB hard drive, the SVME-1901 becomes a full-featured computing platform. In addition to running Windows® XPe, the SVME-1901 runs Solaris® 10, Linux® and LynxOS® SE operating systems. Support for VxWorks® 6.x for real-time applications is now shipping.

The SVME/DMV-1901 is designed for both benign and rugged air- and conduction-cooled systems. It has support for a clock calendar and NVRAM from a system supplied battery backup and/or on-board capacitor. A BIOS controlled user programmable operating frequency allows dynamic, user controlled power consumption adjustment. The SVME/DMV-1901 supports extensive I/O on the faceplate including Video and Graphics. Optional dual video displays are supported with rear I/O configurations. The SVME/DMV-1901 is designed for embedded systems concerned with performance per watt. It also supports those users that desire the Windows® XPe operating system for legacy, driver, or development reasons. SCSI320 is available in select ruggedization levels. Please contact Curtiss-Wright Controls sales for information.

Figure 1: SVME/DMV-1901 Block Diagram





Powerful Intel® Server Architecture

The SVME/DMV-1901 was designed around Intel's state-of-the-art Core™2 Duo processors, the high-performance 7520 Northbridge Memory Controller (MCH), and the Intel 6300ESB Southbridge (ICH). These components were specifically designed for server class applications and provide the ultimate in performance. The 7520 Northbridge supports the following features:

- 667MHz Front Side Bus (FSB) which provides 5.3GB/s of data transfer performance between the memory controller and CPUs
- Dual 400MHz DDR2 interleaved memory busses provide 6.4GB/s of memory band-width
- Three 8-lane PCIe links provide 12GB/s of full-duplex I/O bandwidth (6GB/s in each direction)

Careful attention was paid to the flow-through I/O design in the SVME/DMV-1901 architecture. Data can be input on one PMC, written to memory, processed by the dual-core CPU and output to a second PMC maximizing the I/O and memory bandwidth of all components involved.

Hardware enforced cache coherency, read prefetching, write posting and many other features built into the Intel® 7520 MCH provide world class throughput for I/O and processor intensive applications. Applications requiring maximum sustained throughput are ideally suited to this SBC.

The SVME/DMV-1901 has a rich set of I/O capabilities as well. An Intel® 6300ESB Southbridge combined with a dual channel Gigabit Ethernet controller, ATI Video controller and a super I/O chip are all present in the design. Various I/O modes provide access to the following capabilities:

- 2x SATA ports (1.0)
- 2x RS-232 Async ports
- 1x PMC only site
- 2x Video channels
- AC97 Audio
- 3x RS-422 Async ports
- 1x X/PMC site
- 2x Gigabit Ethernet ports
- 2x PS2 Kybd and Mouse
- 1x On-board USB flash
- 3x USB ports
- 8x GPIO
- VME 320

**Not all OS BSP's support all audio and video functions. Contact Curtiss-Wright Controls for the latest software support of these features.*

High-performance 3D Graphics On-board

Visually Rich Multimedia

The on-board Mobility™ Radeon™ X300 graphics accelerator is the optimum solution for embedded users seeking stable 2D and advanced 3D graphics performance. It is an excellent choice for users engaging in all web usages and improves graphics experience with faster screen refresh rates and better overall visual quality. You can bring rich multimedia to your system with the Mobility™Radeon™ X300 by integrating OpenGL® 1.3 Linux® Windows® software into your application. The X300 is an excellent choice for streaming media files without blocky artifacts, thanks to ATI's FullStream™ technology, and ATI's VideoShader™ technology enables DVD playback with optimized visual quality and power consumption levels.

Advanced 3D Graphics

Mobility™ Radeon™ X300 offers both the performance and the power to handle the latest applications. Designed with an optimized 3D engine that is fully compatible with Microsoft® DirectX® 9.0 you have a tool that renders complex and realistic lighting effects and high-quality anti-aliasing image filtering for 3D game play. Mobility™ Radeon™ X300 improves image quality on a per pixel basis for smoother, sharper 3D action video and enables fully programmable pixel and vertex shaders to bring graphics-intensive applications to life.

Table 1: Maximum Resolution

Maximum 3D Resolutions	
65K colors	2048 x 1536
16.7M colors	2048 x 1536
Monitor Resolution	**Hz**
640 x 480	200
800 x 600	200
1024 x 768	200
1152 x 864	200
1280 x 1024	160
1600 x 1200	120
1920 x 1080* 16:9	120
1920 x 1200	100
1920 x 1440	90
2048 x 1536	85

*Not all OS BSP's support all audio and video functions.
Contact Curtiss-Wright Controls for the latest software support of these features.

Power Consumption and CPU Tuning

For applications requiring ultra low power consumption, the SVME/DMV-1901 comes with a configurable BIOS capable of turning off one of the processing cores and providing the ability to adjust the processor core speed. In a low power consumption mode, the SVME/DMV-1901 draws less than 30W.

Using the SVME/DMV-1901's power saving BIOS mode, testing was accomplished on the SVME/DMV-1901 driving a single processor core running at 1.5GHz (Core™2 Duo) with noted decreased power consumption. To simulate actual operating environments of real-world applications, the testing was performed with the SVME/DMV-1901 running at TDP in various temperatures ranging from -40°C to +71°C. Table 1: SVME-1901 (air-cooled) CPU Load, Edge Temp & PWR Consumption and Table 2: DMV-1901 (Conduction-cooled) CPU Load, Edge Temp & PWR Consumption, reflect the power consumption data observed during testing for air- and conduction-cooled models. The testing was performed with Clock Gating (TM1), Voltage and Frequency Throttling (TM2), as well as processor Sleep-states (C0-C6) all disabled during the power measurements.

The Intel® Core™ processor comes equipped with a thermal overrun detector providing an additional safeguard which cannot be disabled. If the junction temperature of the processor were to exceed 124°C the processor would perform an automatic shutdown - this condition was not observed during testing.

Table 2: SVME-1901 (air-cooled) CPU Load, Edge Temp & PWR Consumption

Air-cooled SVME-1901	Temp °C	5V Current	3.3V Current	Power (Watts)
Core2 Duo, 4GB RAM, 2GB Flash, VME				
Dual-core/TDP	-40	7.00	5.50	44.5
Single-core/TDP	-40	5.90	5.50	39.0
Dual-core/TDP	-20	7.10	5.60	45.3
Single-core/TDP	-20	6.00	5.60	39.8
Dual-core/TDP	0	7.10	5.70	45.7
Single-core/TDP	0	6.00	5.70	40.2
Dual-core/TDP	24	7.40	5.90	47.8
Single-core/TDP	24	6.20	5.80	41.5
Dual-core/TDP	71	7.90	6.30	51.7
Single-core/TDP	71	6.80	6.40	46.5

Notes:
1. TDP: Thermal Design Power – Set by Intel® at 85%

Table 3: DMV-1901 (conduction-cooled) CPU Load, Edge Temp & PWR Consumption

Conduction-cooled DMV-1901	Temp °C	5V Current	3.3V Current	Power (Watts)
Core™2 Duo, 4GB RAM, 2GB Flash, VME, Video, SCSI				
Dual-core/TDP	-40	7.77	7.60	54.9
Single-core/TDP	-40	6.58	7.58	48.9
Dual-core/TDP	0	7.83	7.76	55.8
Single-core/TDP	0	6.64	7.70	49.6
Dual-core/TDP	24	8.10	8.20	58.6
Single-core/TDP	24	6.70	8.00	50.9
Dual-core/TDP	71	8.40	8.75	61.9
Single-core/TDP	71	7.04	8.68	54.8
Dual-core/TDP	85	8.57	9.00	63.6
Single-core/TDP	85	7.30	9.11	57.6

Notes:
1. TDP: Thermal Design Power – Set by Intel® at 85%

As mentioned above, the BIOS for the SVME/DMV-1901 is capable of setting the processor clock speed at slower frequencies to save power. The default setting is full speed at 1.5GHz, however the SVME/DMV-1901 processor can also be set to a medium speed of 1.33GHz or a slow speed of 1.0GHz. The table below summarizes the speed settings and the approximate power savings relative to full speed for a SVME/DMV-1901 SBC with a 1.5GHz Core™2 Duo processor.

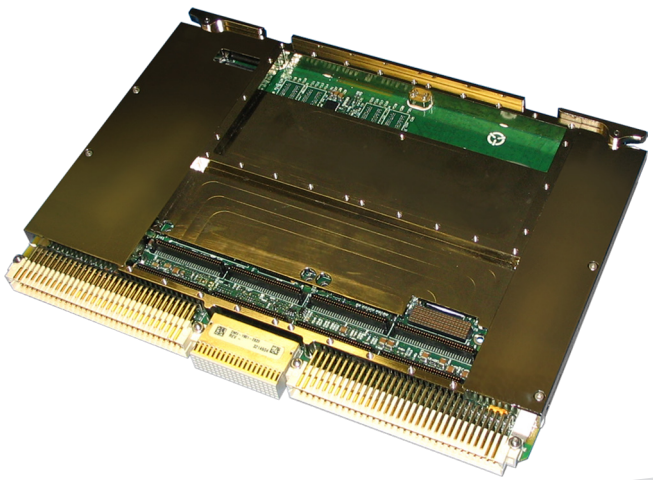
Table 4: Speed settings and the approximate power savings relative to full speed for a SVME/DMV-1901 SBC with a 1.5GHz Core™2 Duo processor

Speed/Core Status	Approximate Watts Saved Relative to Full Speed
Full Speed/Both Cores Active (Normal)	Baseline, 100%
Medium Speed/Both Cores Active	2.35 (-6.9%)
Low Speed/Both Cores Active	6.12 (-18.1%)
Full Speed/2nd Core Parked	6.12 (-18.1%)
Medium Speed/2nd Core Parked	7.14 (-21.2%)
Low Speed/2nd Core Parked	8.98 (-26.7%)

Table 5: Specifications

General Specifications		
Memory	64MB DDR1	
Peak memory Bandwidth	3.2GB/s	
Graphics Engine Bandwidth	56.32GB/s	
Peak Pixel Fill rate	1.3G pixels/s	
Bus Type	PCe (x16 lanes) native bus support	
Maximum Vertical Refresh Rate	85Hz	
Display Support	Integrated 400MHz RAMDAC	
Display Max Resolution	2048 x 1536	
Board Display Options	- Radeon™ X300 SE PCIe supports 2 analog CRT or flat panel with 2 VGA connectors - Radeon™ X300 PRO PCIe supports 2 analog CRT or flat panel and S-Video with a VGA connector and DVI-I connector and TV Connector 7-pin mini-DIN	
Board Configuration 64MB Frame Buffer	Specification	Description
	Graphics Chip	Radeon™ X300 PCIe
	Core clock	325MHz
	Memory clock	200MHz (SE) / 300MHz (PRO)
	Frame buffer 64MB DDR	
	Memory I/O 64 bit	
	Memory Configuration 4 pcs 8Mx16 DDR	
Form Factor	Low Profile board form factor (Half Height)	
Memory Type	DDR1	
Maximum Memory	64MB	
Operating Temperature	50° to 122° F (10° to 50° C)	
Languages Supported	24 languages: English, Arabic, Chinese Simplified, Chinese Traditional, Czechoslovakian, Danish, Dutch, Finnish, French, German, Greek, Hebrew, Hungarian, Italian, Japanese, Korean, Norwegian, Polish, Portuguese, Russian, Spanish, Swedish, Thai, Turkish	
Operating Systems Supported	Windows® 2000, Windows® XP, Linux® Xfree86. (Windows® 98, ME and Windows® NT 4.0 also with limited support). Future MS Longhorn™ support is planned.	
Voltage	1.2V and 1.8V power rails used for PCIe. 10W (Max ASIC power)	
Core Power	18W (max board power)	
Option Kit Contents	A) ATI Radeon™ X300 PCIe graphics card B) Software CD with graphics drivers C) Warranty documentation	
Compliance Standards	EMC Emissions	A) FCC Part 15, Subpart B – Unintentional Radiators, Class B Computing Devices for Home & Office Use B) CISPR22: 1997/EN 55022:1998 – Class B – Limits and methods of measurement of radio disturbance characteristics of Information Technology Equipment C) Canadian Standard ICES-003 is equivalent to CISPR22 D) Taiwanese Standard BSMI – if specified E) Japanese VCCI – if specified F) Australian C-Tick – if specified
	EMC Immunity	- CISPR 24:1997/EN 55024:1998 - Information Technology Equipment - Immunity Characteristics - Limits and Methods of Measurement
	Safety	UL 60950 (USA) & EN 60950 (EU): Safety of Information Technology Equipment, Including Electrical Business Equipment. All boards meet UL PCB flammability requirements.

Figure 2: SVME/DMV 1901 Conduction-cooled





High-performance X/PMC support

Two PMC sites complement the flow-through architecture of the SVME/DMV-1901. The left site in the SVME/DMV-1901 block diagram (Figure 1) is an X/PMC site (PCIx @ 64-bits/133MHz) which is located on the P1 side of the SVME/DMV-1901. The right PMC site in Figure 1 is a PCI-x only site (64-bits/133MHz). The following table summarizes the location of each site on the SVME/DMV-1901 and documents the theoretical performance of each site.

Table 6: XMC-PMC Location and Performance

Location in Block Diagram	Location on SVME/DMV-1901	Rear I/O connector	Performance
Left side	P1 Side of board	P0	- PCI-x 1GB/s - 4x PCIe 1GB/s input 1GB/s output
Right side	Center of board	P2	- PCI-x 1GB/s

Due to the component density and connector placement on the SVME/DMV-1901 there are some potential issues with the PMC keep-out area of the center PMC site. An issue is only likely to arise for air-cooled PMCs. A possible keep-out issue is possible on the center PMC site:

In select configurations, memory components on the top side of the board may interfere with PMC connectors that require the full keep-out area. The interfering memory components are approximately .5mm thick. Versions of the SVME/DMV-1901 that have all four memory banks (4GB models) have memory parts mounted in the keep-out area of the center site.

There are no issues with the out-board PMC site of the SVME/DMV-1901. The out-board site supports both XMCs and PMCs. The keep-out area is in compliance with the air-cooled PMC specification. All 64-bits of PMC rear I/O are present on the P0 connector. The P0 connector also has superior high speed performance characteristics over the P2 connector used by the center PMC site.

Please contact the Curtiss-Wright Controls sales representative in your area for details.

Designed for Harsh Environments

To cost-effectively address a diverse range of military/aerospace applications, the SVME/DMV-1901 is available in a range of ruggedization levels, both air- and conduction-cooled. All versions are functionally identical, with air-cooled versions (SVME) available in Curtiss-Wright Controls ruggedization levels 0 and 100, and conduction-cooled version (DMV) in level 200. Air-cooled level 200 is available on a special order basis. Curtiss-Wright Controls' standard ruggedization guidelines define the environmental tolerance of each ruggedization level (see Curtiss-Wright Ruggedization Guidelines factsheet for more information).

Enhanced Thermal Management for Conduction-cooled Applications

For those demanding application environments that require conduction-cooling, the SVME/DMV-1901 uses a combination of thermal management layers within the Printed Wiring Board (PWB) and an aluminum thermal frame that provides a cooling path for the PMC sites and for high-power components such as the processors, caches, and bridge devices. The SVME/DMV-1901 thermal frame employs a number of innovative design techniques to keep the temperature rise of the electronic components to a minimum, thus increasing the long-term reliability of the product:

- Direct processor thermal shunts
- Provision of both primary and secondary thermal interfaces on PMC sites
- Mid-plane thermal shunts for PMC sites
- TherMax™ design approach
- Full-width thermal interface to back-side slot wall

Mid-plane Thermal Shunts for PMCs

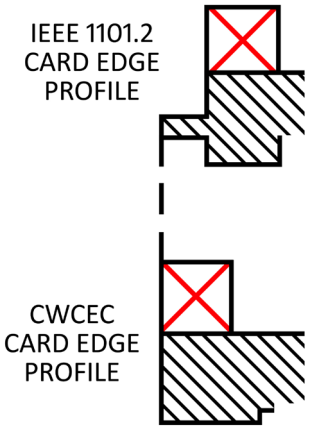
To optimize the conduction-cooling of high-performance, high-power PMC modules such as graphics or networking PMCs, the SVME/DMV-1901 thermal frame incorporates mid-plane thermal shunts for the PMC sites. High-power PMCs can include a mating cooling surface on the PMC module to contact the mid-plane thermal shunt. By taking advantage of the thermal shunt, suitably designed PMC modules can significantly lower the heat rise from the SVME/DMV-1901 card edge to the PMC components. The mid-plane thermal shunt does not impinge on the VITA 20 allowed component height.



TherMax™-style Thermal Frame

A TherMax™ thermal frame provides an unbroken metallic path from the PMC sites and shunted components to the back-side cooling surface of the card therefore minimizing the temperature rise to these devices. In comparison, a typical thermal frame simply sits on top of the PWB and forces heat to flow through the PWB which has a high thermal resistance compared to aluminum.

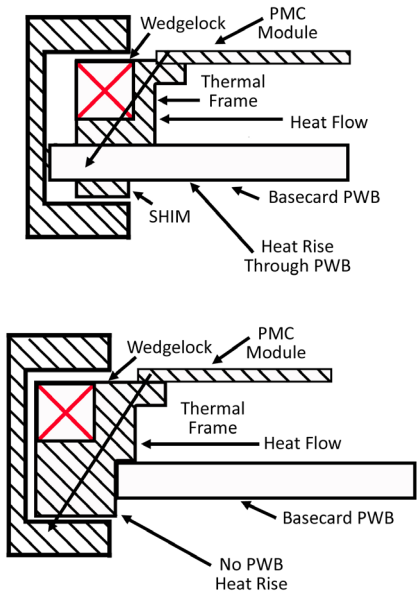
Figure 3: Deviation from 1101.2 Standard



Full-width thermal interface to back-side slot wall

To minimize the temperature rise from the mating slot wall of conduction-cooled enclosures to the back-side thermal interface region of the SVME/DMV-1901, the SVME/DMV-1901 thermal frame maximizes the thermal interface area by extending the frame to the full width of the card, as illustrated below. This deviation from the IEEE 1101.2 standard, which calls for the thermal frame to be notched for compatibility with card guides in standard air-cooled chassis, has the benefit of lower card operating temperatures and increased long-term reliability. During test and integration activities where it may be desirable to install a conduction-cooled SVME/DMV-1901 into an air-cooled card-cage, this can normally be accomplished simply by removing the card guides.

Figure 4: TherMax™ Style Thermal Frame



Built-in Self Test

Curtiss-Wright Controls' COTS Continuum Initiative defines common software and user interfaces for all Curtiss-Wright Controls products. The SVME/DMV-1901 is designed with a rich set of Built-in Test (BIT) functions both at the BIOS and operating system levels.

Ordering Information

The SVME/DMV-1901 is available in both air- and conduction-cooled variants. There are two air-cooled ruggedization levels (L0, and L100) and one conduction-cooled ruggedization level (L200). All ruggedization levels greater than L0 have an acrylic conformal coating. The SVME/DMV-1901 adheres to the standard Curtiss-Wright Controls ruggedization standards, please see Table 7.



Table 7: Ruggedization

Text [Paragraph Style "Large Table Headline"]		Air-cooled		Conduction-cooled
		Level 0	Level 100	Level 200
Temperature	Operating	0°C - 50°C (Note 4)	-40°C - 71°C (Note 4)	-40°C - 85°C (Note 6)
	Non-operating (storage)	-40°C - 85°C	-55°C - 125°C	-55°C - 125°C
Humidity	Operating (non-condensing)	0 - 95%	0 - 100%	0 - 100%
	Non-operating (storage, condensing))	0 - 95%	0 - 100%	0 - 100%
Vibration	Sine (Note 1)	2g peak 15-2k Hz	10g peak 15-2k Hz	10g peak 15-2k Hz
	Random (Note 2)	$0.01g^2$/Hz 15-2k Hz	$0.04g^2$/Hz 15-2k Hz	$0.1g^2$/Hz 15-2k Hz
Shock (Note 3)		20g peak	30g peak	40g peak
Conformal Coating (Note 5)		No	Yes	Yes
2 Level Maintenance Ready		-	-	No

Notes
1. Sine vibration based on a sine sweep duration of 10 minutes per axis in each of three mutually perpendicular axes.
2. May be displacement limited from 15 to 44Hz, depending on specific test equipment.
3. Random vibration 60 minutes per axis, in each of three mutually perpendicular axes.
4. Three hits in each axis, both directions, 1/2 sine and saw tooth. Total 36 hits.
5. Standard air-flow is 8 cfm at sea level. Some higher-powered products may require additional airflow. Consult the factory for details.
6. Conformal coating type is manufacturing site-specific. Please consult the factory for details.

Table 8: Specifications

Power	<52W
PMC	<52 Watts maximum, 20 Watts standby, 5V and 3.3V Power required
Weight	950 grams (est)

Warranty

This product has a one year warranty.

Contact Information

To find your appropriate sales representative, please visit:

Website: www.cwcembedded.com/sales

Email: sales@cwcembedded.com

Technical Support

For technical support, please visit:

Website: www.cwcembedded.com/support1

Email: support1@cwcembedded.com

The information in this document is subject to change without notice and should not be construed as a commitment by Curtiss-Wright Controls Embedded Computing. While reasonable precautions have been taken, Curtiss-Wright Controls assumes no responsibility for any errors that may appear in this document. All products shown or mentioned are trademarks or registered trademarks of their respective owners.