

# Reference Manual

DOC. REV. 6/1/2009

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## EPMs-PS1

Power Supply SUMIT-104  
Module



**VERSA**LOGIC  
CORPORATION



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MEPSMPS1

# Product Release Notes

## ***Rev 2 Release***

Beta release. No battery backup function.

## ***Rev 1 Release***

Pre-production only. EPMs-PS1a model only—no battery backup function.

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## Features

The EPMs-PS1 is a DC switching power supply designed for high reliability in a wide variety of applications. The rugged design is conservatively rated to provide continuous 50 watt power output. When designing stacking SUMIT-104 compatible systems, OEMs and system integrators are able to develop entire systems using VersaLogic CPUs, I/O expansion modules and power supplies. Its features include:

- PC/104-Express compliant footprint.
- Transient voltage suppression provides enhanced ESD protection.
- Protected against output over-current, input over-current, and input polarity reversal.
- Engineered to minimize heat generation with 91% peak efficiency.
- Designed to provide -40° to +85°C operation for reliable use in harsh environments.
- Full compliance with EU Directive 2002/95/EC (RoHS) for devices used in Europe.
- Power is supplied into the SUMIT (PCI Express) and PC/104 (ISA) buses or can be accessed from the screw clamp terminal blocks.
- Each voltage output can be enabled or disabled with an external input signal.

All EPMs-PS1 boards are subjected to functional testing and are backed by a limited two-year warranty. Careful parts sourcing and US-based technical support ensure the highest possible quality, reliability, service and product longevity for this exceptional SUMIT-104 module.

## Technical Specifications

**Board Size:**

3.55" x 3.775" (90 mm x 96 mm),  
PC/104 compliant

**Storage Temperature:**

-40° C to +85° C

**Operating Temperature:**

-40° C to +60° C at 50W, derated to  
25W at +85° C (See Figure 10. Power  
Supply Derating Curve on page 18.)

**Power Requirements:**

+9V to +40V DC

**+5V Output:**

50W (10A) max. continuous from -40° C  
to +60° C, derated to 25W (5A) at +85°  
C (See Figure 10. Power Supply  
Derating Curve on page 18.)

**±12V Outputs:**

1.8W (150 mA) each max. continuous  
from -40° C to +85° C

**Output Regulation:**

1% – all outputs

**Output Voltage Ripple:**

5V output : 30 mV pk-pk at 50% load  
±12V output: 30 mv pk-pk at 50% load

**Switching Frequency:**

5V output: 200 KHz fixed  
± 12V output: 1.2 MHz fixed

**Bus Compatibility:**

PC/104 (ISA)  
SUMIT AB (PCI Express)

**Humidity:**

Less than 95%, noncondensing

**ESD Protection:**

Transient voltage suppression and  
overload protection

**Input Protection:**

Transient voltage suppression and  
fuse

**Output Protection:**

Current limiting and transient voltage  
suppression

**Weight:**

TBD

Specifications are subject to change without notice.

# Block Diagram

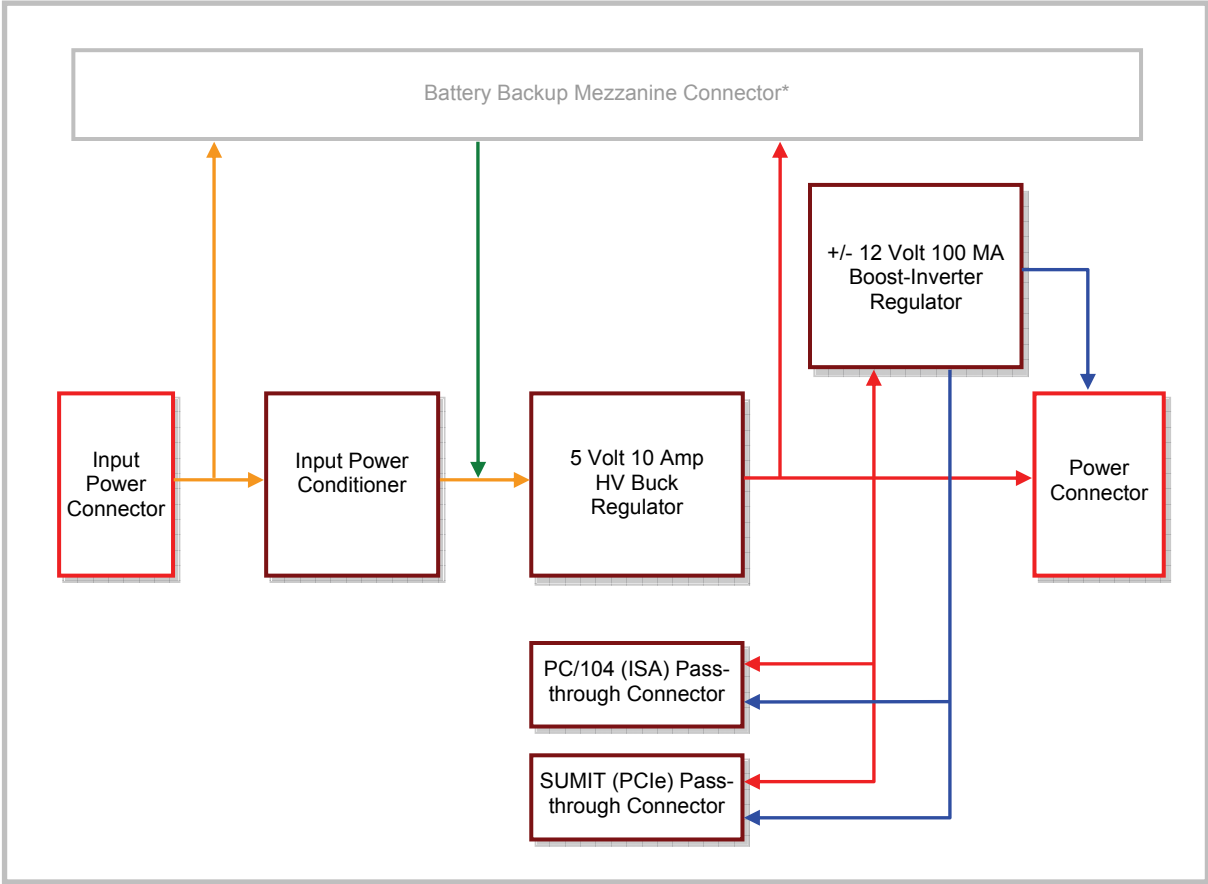


Figure 1. EPMs-PS1 Block Diagram

Orange = Input Power. Red = 5V Output Power. Blue = ±12V Power Output. Green = Battery backup from battery card.

\* Battery backup feature is not implemented on the EPMs-PS1a model.

## RoHS-Compliance

The EPMs-PS1 is RoHS-compliant.

### ABOUT ROHS

In 2003, the European Union issued Directive 2002/95/EC regarding the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment.

The RoHS directive requires producers of electrical and electronic equipment to reduce to acceptable levels the presence of six environmentally sensitive substances: lead, mercury, cadmium, hexavalent chromium, and the presence of polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) flame retardants, in certain electrical and electronic products sold in the European Union (EU) beginning July 1, 2006.

VersaLogic Corporation is committed to supporting customers with high-quality products and services meeting the European Union's RoHS directive.

## Warnings

### ELECTROSTATIC DISCHARGE

Electrostatic discharge (ESD) can damage board components. The circuit board must only be handled at an ESD workstation. If an approved station is not available, some measure of protection can be provided by wearing a grounded antistatic wrist strap. Keep all plastic away from the board, and do not slide the board over any surface.

After removing the board from its protective wrapper, place the board on a grounded, static-free surface, component side up. Use an antistatic foam pad if available.

The board should also be protected inside a closed metallic anti-static envelope during shipment or storage.

## TRANSIENT VOLTAGE SUPPRESSION (TVS) DEVICES

The EPMs-PS1 circuitry is protected from spike and surge damage by on-board transient voltage suppression (TVS) devices on the power out signals. In order for the TVS devices to function properly, they must be connected to earth ground. This connection is made at the board's lower right mounting hole, as shown in Figure 2. All other mounting holes are floating. Use metal standoffs or a grounding strap to connect the lower right mounting hole to the enclosure chassis, which should be connected to earth ground.

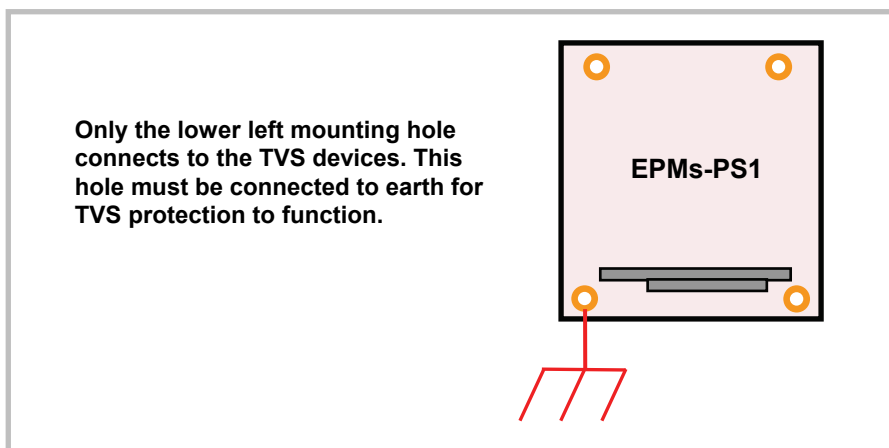


Figure 2. Attaching the EPMs-PS1 to Earth Ground

## Technical Support

If you are unable to solve a problem with this manual please, contact VersaLogic technical support at (541) 485-8575. VersaLogic technical support engineers are also available via e-mail at [Support@VersaLogic.com](mailto:Support@VersaLogic.com).

### REPAIR SERVICE

If your product requires service, you must obtain a Returned Material Authorization (RMA) number by calling (541) 485-8575.

Please provide the following information:

- Your name, the name of your company and your phone number
- The name of a technician or engineer that can be contact if any questions arise.
- Quantity of items being returned
- The model and serial number (barcode) of each item
- A detailed description of the problem
- Steps you have taken to resolve or recreate the problem
- The return shipping address

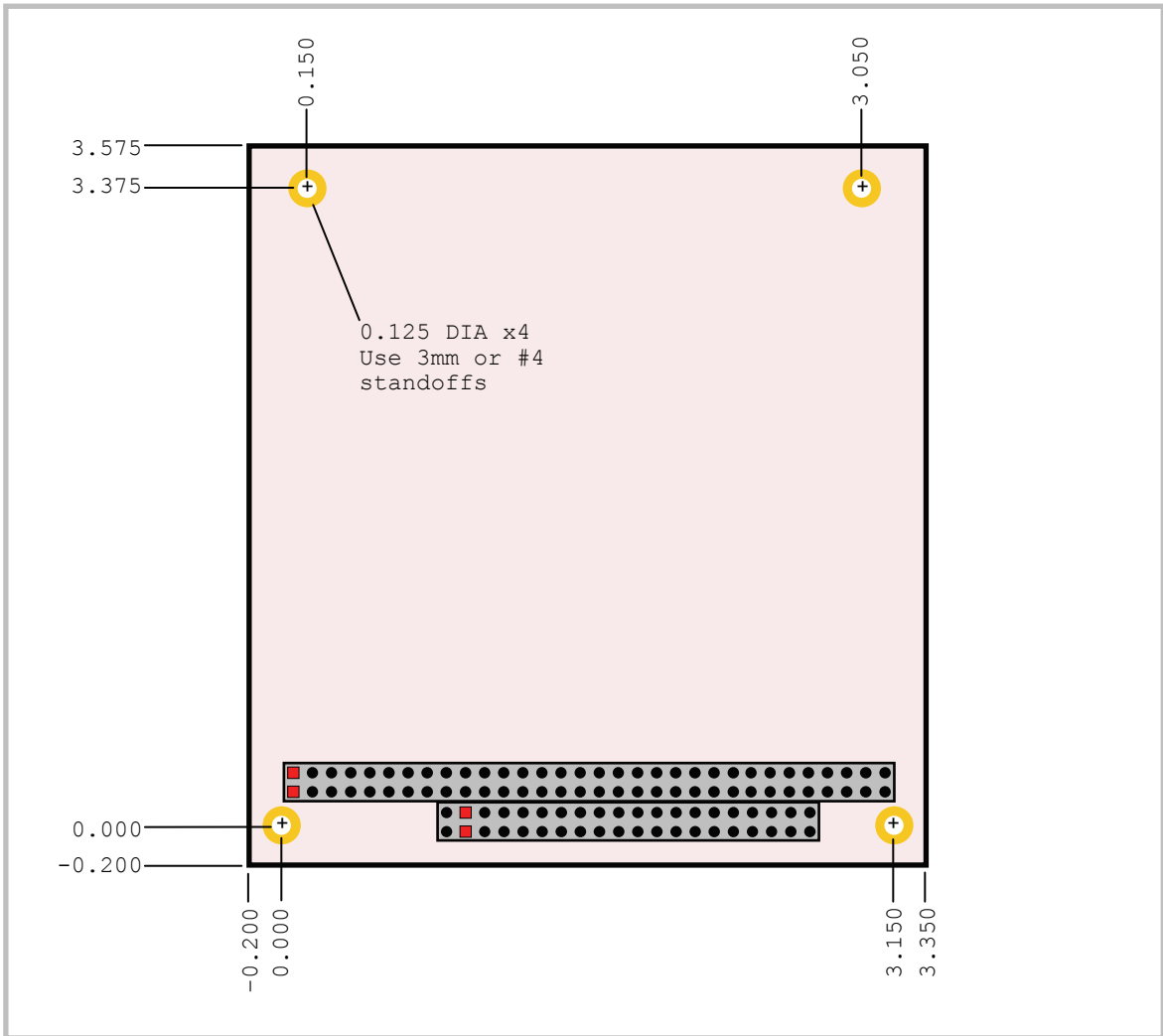
**Warranty Repair** All parts and labor charges are covered, including return shipping charges for UPS Ground delivery to United States addresses.

**Non-warranty Repair** All non-warranty repairs are subject to diagnosis and labor charges, parts charges and return shipping fees. Please specify the shipping method you prefer and provide a purchase order number for invoicing the repair.

**Note** Please mark the RMA number clearly on the outside of the box before returning. Failure to do so can delay the processing of your return.

## Dimensions and Mounting

The EPMs-PS1 complies with all PC/104-Express standards, which provide for specific mounting hole and stack locations as shown in the diagram below.



**Figure 3. EPMs-PS1 Dimensions and Mounting Holes**

*(Not to scale. All dimensions in inches.)*

### Caution

The board must be supported at all four mounting points to prevent excessive flexing when expansion modules are mated and detached. Flex damage caused by excessive force on an improperly mounted circuit board is not covered under the product warranty.

## HARDWARE ASSEMBLY

The EPMs-PS1 uses PC/104 (ISA) and SUMIT AB bottom (PCI Express) connectors for expansion. The following stacking rules apply to the EPMs-PS1:

- The EPMs-PS1 must be the top SUMIT board.
- The EPMs-PS1 must be stacked above the CPU board. This is a general requirement for SUMIT expansion boards.
- ISA boards can be stacked above or below the EPMs-PS1, but no ISA boards can be stacked between the EPMs-PS1 and other SUMIT boards.

The entire assembly can sit on a table top or be secured to a base plate. When bolting the unit down, make sure to secure all four standoffs to the mounting surface to prevent circuit board flexing. Standoffs are secured to the top circuit board using four pan head screws. Standoffs and screws are available as part number VL-HDW-105. Note that the standoffs in this kit are 15.25 mm (0.60 inch), and must not be mixed with the 15.0 mm standoffs used for non-SUMIT boards.

An extractor tool is available (part number VL-HDW-201) to separate the PC/104 modules from the stack. Use caution when using the extractor tool not to damage any board components.

## STACK ARRANGEMENT EXAMPLE

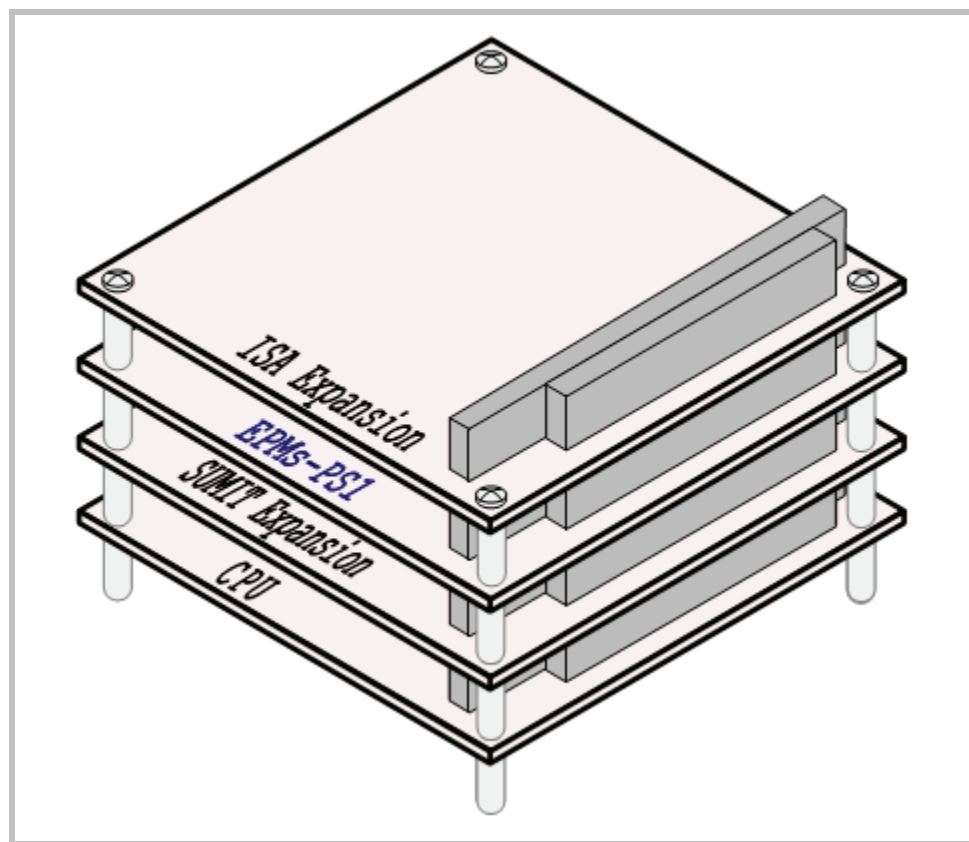


Figure 4. Stack Arrangement Example

## External Connectors

### EPMs-PS1 CONNECTORS

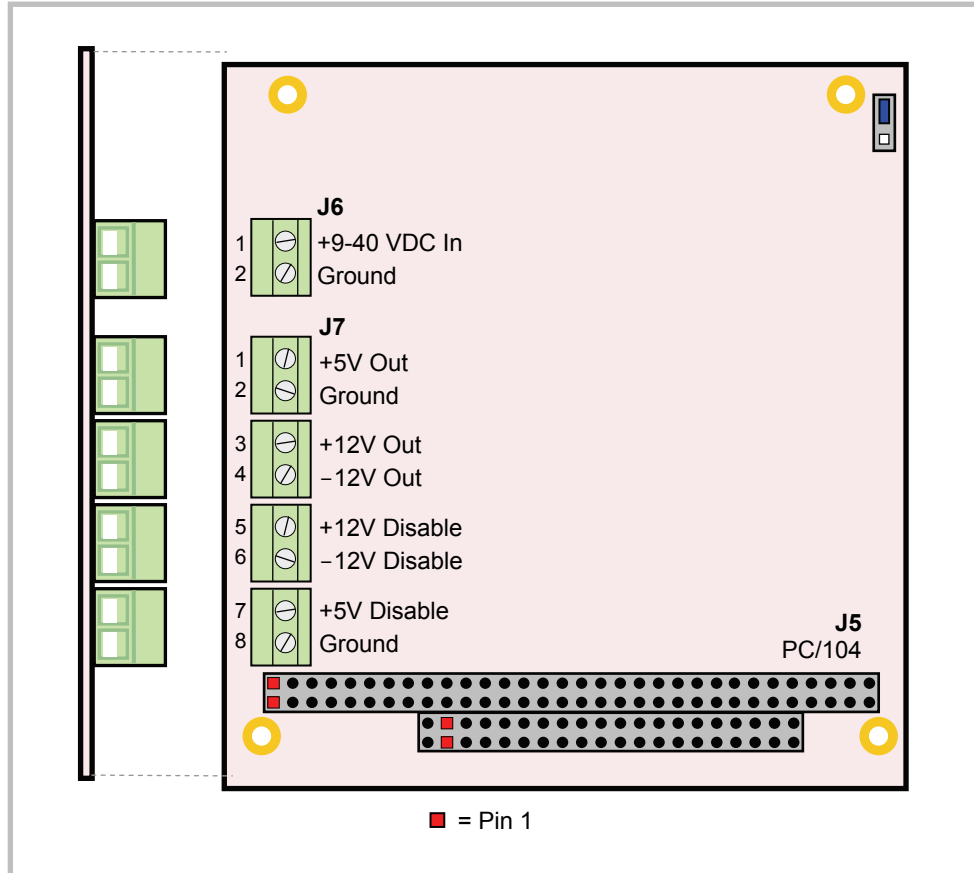


Figure 5. EPMS-PS1 Connectors – Top Side

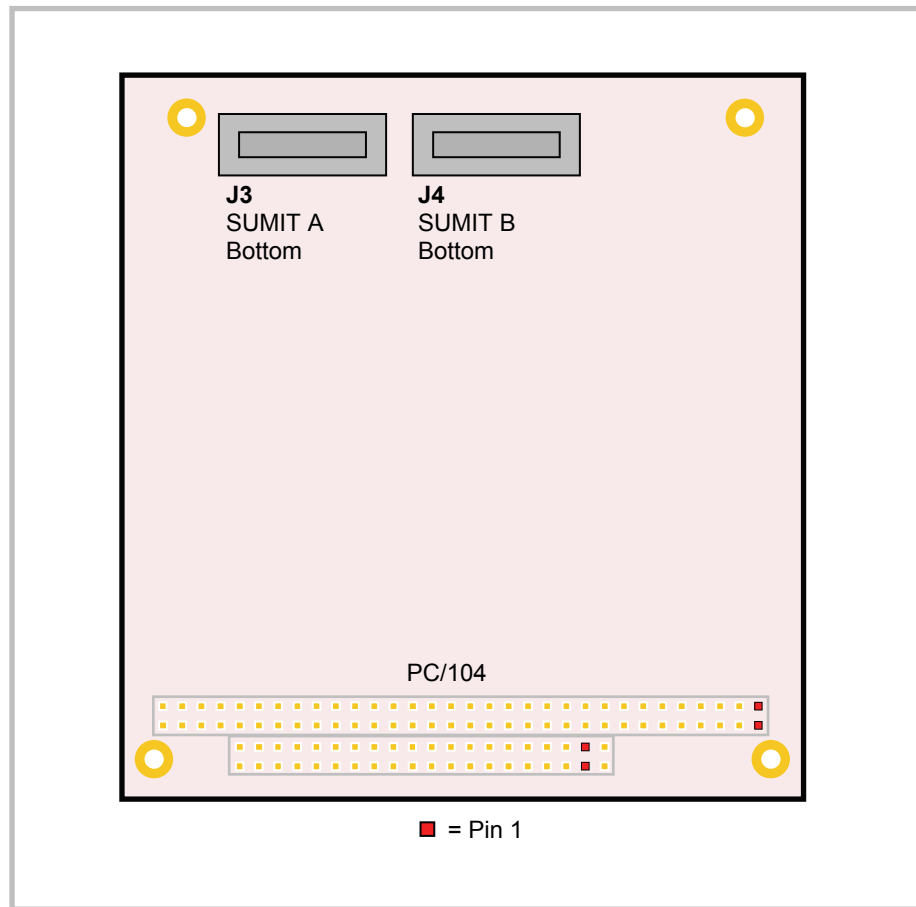


Figure 6. EPMs-PS1 Connectors – Bottom Side

## EPMS-PS1 CONNECTOR FUNCTIONS AND INTERFACE CABLES

The following table notes the function of each connector, as well as mating connectors and cables, and the page where a detailed pinout or further information is available.

**Table 1: Connector Functions and Interface Cables**

Connector	Function	Mating Connector	Transition Cable	Cable Description	Pin 1 Location <sup>1</sup>		Page
					x coord.	y coord.	
J3 <sup>2</sup>	SUMIT A Bottom	Samtec ASP-129646-01	–	–	2.712	3.317	14
J4	SUMIT B Bottom	Samtec ASP-129646-01	–	–	1.669	3.317	15
J5	PC/104 (ISA)	AMP 1375795-2	–	–	0.050	0.200	16
J6	Power In	–	–	Insulated wire <sup>3</sup> , AWG 16-14, to screw terminal	0.098	2.629	13
J7	Aux Power Out and PS Control	–	–	Insulated wire <sup>3</sup> , AWG 16-14, to screw terminal	0.102	1.941	13, 17

1. The PCB origin is the mounting hole to the lower left, as oriented in Figure 5.
2. Connectors are not installed at locations J1 and J2.
3. Wire insulation should be chosen based on the application and safety agency requirements.

## Jumper Block

### JUMPERS AS-SHIPPED CONFIGURATION – REV. 1.XX BOARDS

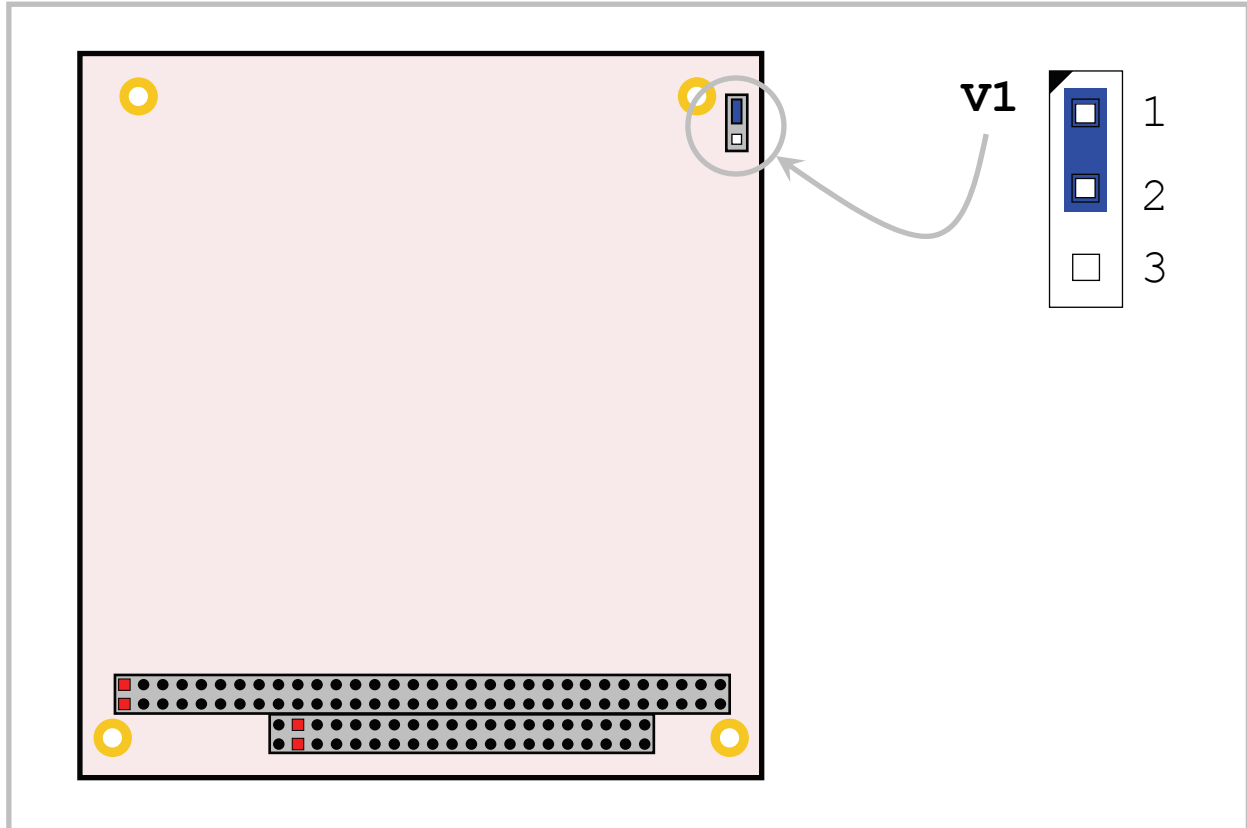


Figure 7. V1 Jumper Block Location – Rev. 1.xx Boards

**Note:** On Rev. 2.xx boards, the V1 jumper header is not installed.

Table 2: Jumper Summary – Rev. 1.xx Boards

Jumper Block	Description	As Shipped
V1	<b>Factory Use Only</b> – This jumper must be installed or the EPMs-PS1 Rev. 1.xx will not operate.	[1-2]

## Main Power Input

Power is input to the EPMs-PS1 through connector J6, which is a two-position, 5.08 mm screw terminal accepting AWG 16-14 insulated wire. Input voltage can range from 7V to 40V.

**Table 3: Main Power Input Connector Pinout**

J6 Pin	Signal Name	Description
1	V <sub>IN</sub>	+9-40 VDC Input
2	GND	Input Ground

## Power Out

Power is output through connector J7 and the SUMIT (J3 and J4) and ISA (J5) connectors.

### J7 CONNECTOR POWER OUT

The J7 connector is a series of four two-position, 5.08 mm screw terminals accepting AWG 16-14 insulated wire.

**Table 4: J7 Power Out Connector Pinout**

J7 Pin	Signal
1	+5V out
2	Ground
3	+12V out
4	-12V out

## SUMIT CONNECTOR POWER OUT

Power is output on the SUMIT connectors (J3 and J4) as shown in Table 5 and Table 6. Available ground pins are also shown in these tables.

**Table 5: SUMIT A (J3) Connector Power Out**

Pin	Signal	Signal	Pin
1	+5VSB	<b>+12V</b>	<b>2</b>
3	3.3V (not supplied)	SMB/I2C_DATA	4
5	3.3V (not supplied)	SMB/I2C_CLK	6
7	EXPCD_REQ#	SMB/I2C_ALERT#	8
9	EXPCD_PRSNT#	SPI/uWire_DO	10
11	USB_OC#	SPI/uWire_DI	12
13	Reserved	SPI/uWire_CLK	14
15	Reserved	SPI/uWire_CS0#	16
17	Reserved	SPI/uWire_CS1#	18
19	Reserved	Reserved	20
<b>21</b>	<b>+5V</b>	Reserved	22
23	USB2+	LPC_AD0	24
25	USB2-	LPC_AD1	26
<b>27</b>	<b>+5V</b>	LPC_AD2	28
29	USB1+	LPC_AD3	30
31	USB1-	LPC_FRAME#	32
<b>33</b>	<b>+5V</b>	SERIRQ#	34
35	USB0+	LPC_PRSNT#/GND	36
37	USB0-	CLK_33MHz	38
39	GND	GND	40
41	A_PETp0	A_PERp0	42
43	A_PETn0	A_PERn0	44
45	GND	APRSNT#/GND	46
47	PERST#	A_CLKp	48
49	WAKE#	A_CLKn	50
<b>51</b>	<b>+5V</b>	GND	52

Table 6: SUMIT B (J4) Connector Power Out

Pin	Signal	Signal	Pin
1	GND	GND	2
3	B_PETp0	B_PERp0	4
5	B_PETn0	B_PERn0	6
7	GND	BPRSNT#/GND	8
9	C_CLKp	B_CLKp	10
11	C_CLKn	B_CLKn	12
13	CPRSNT#/GND	GND	14
15	C_PETp0	C_PERp0	16
17	C_PETn0	C_PERn0	18
19	GND	GND	20
21	C_PETp1 G	C_PERp1	22
23	C_PETn1 N	C_PERn1	24
25	GND D	GND	26
27	C_PETp2	C_PERp2	28
29	C_PETn2	C_PERn2	30
31	GND	GND	32
33	C_PETp3	C_PERp3	34
35	C_PETn3	C_PERn3	36
37	GND	GND	38
39	PERST#	WAKE#	40
41	Reserved	Reserved	42
43	<b>+5V</b>	Reserved	44
45	<b>+5V</b>	3.3V (not supplied)	46
47	<b>+5V</b>	3.3V (not supplied)	48
49	<b>+5V</b>	3.3V (not supplied)	50
51	<b>+5V</b>	+5VSB	52

### PC/104 (ISA) CONNECTOR POWER OUT

Power is output on the ISA connector (J5) as shown in Figure 8. Available ground pins are also shown in this figure.

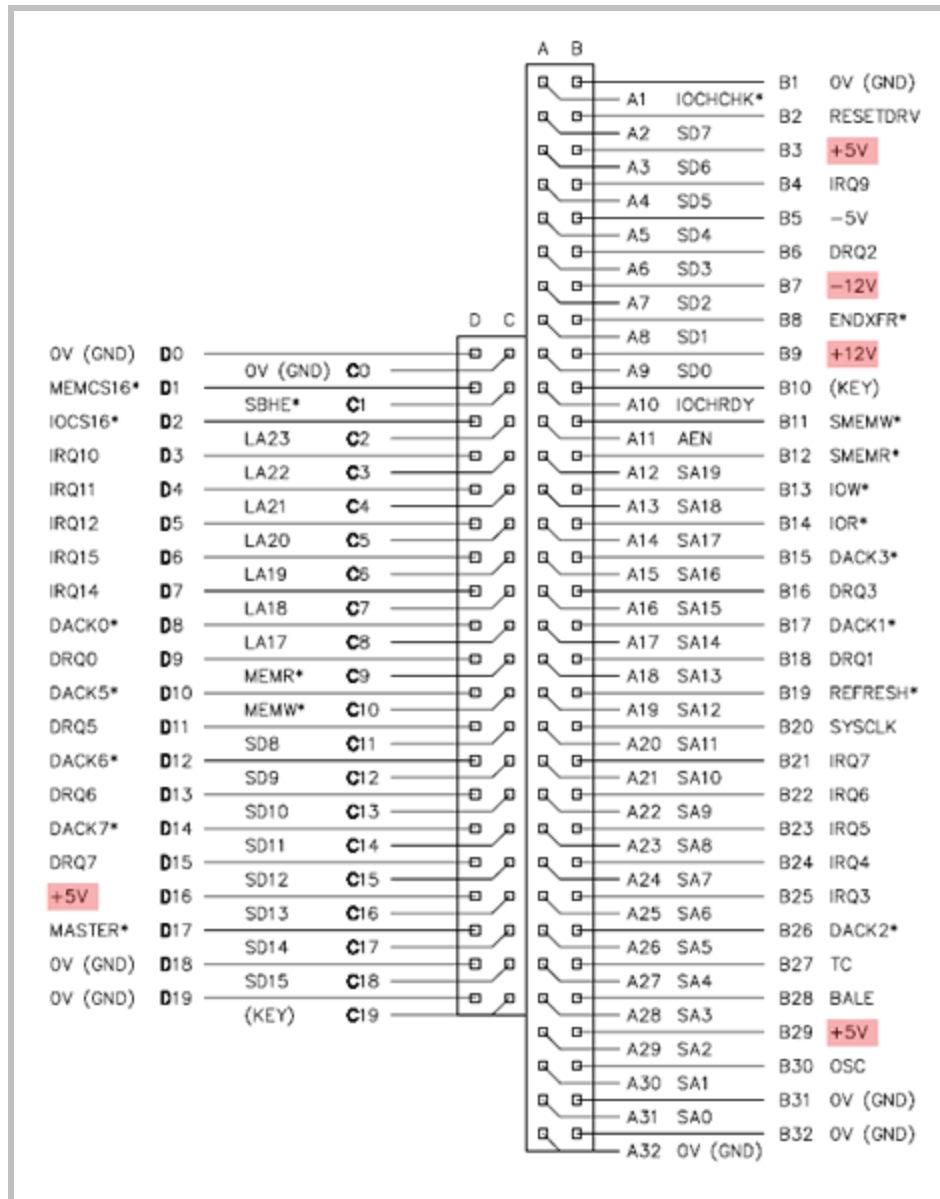


Figure 8. ISA Connector (J5) Power Outputs

## Power Supply Control

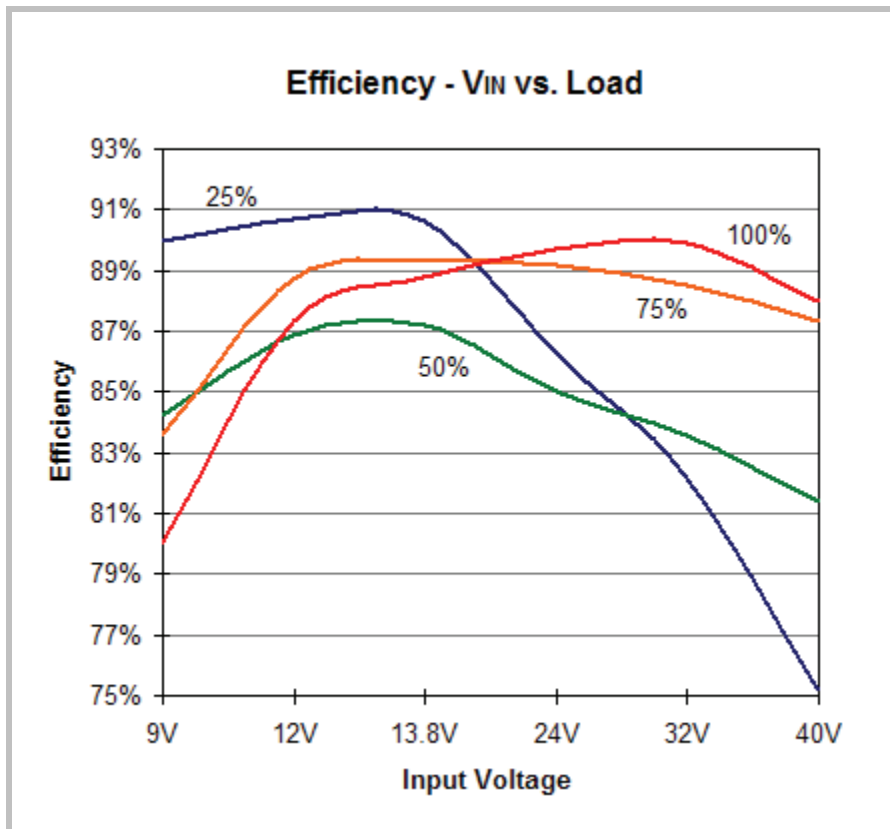
Individual voltage outputs can be disabled using the disable lines on the J7 connector. The J7 connector is a series of four two-pin, 5.08 mm screw terminals accepting AWG 16-14 insulated wire.

All output voltages are on by default. To turn off a voltage, tie the voltage disable pin directly to ground. Disabling the +5V output turns off all outputs.

**Table 7: Power Supply Control Connector Pinout**

J7 Pin	Signal
5	+12V Disable
6	-12V Disable
7	+5V Disable
8	Ground

## Efficiency and Derating



**Figure 9. Power Supply Efficiency over  $V_{IN}$  and Load**

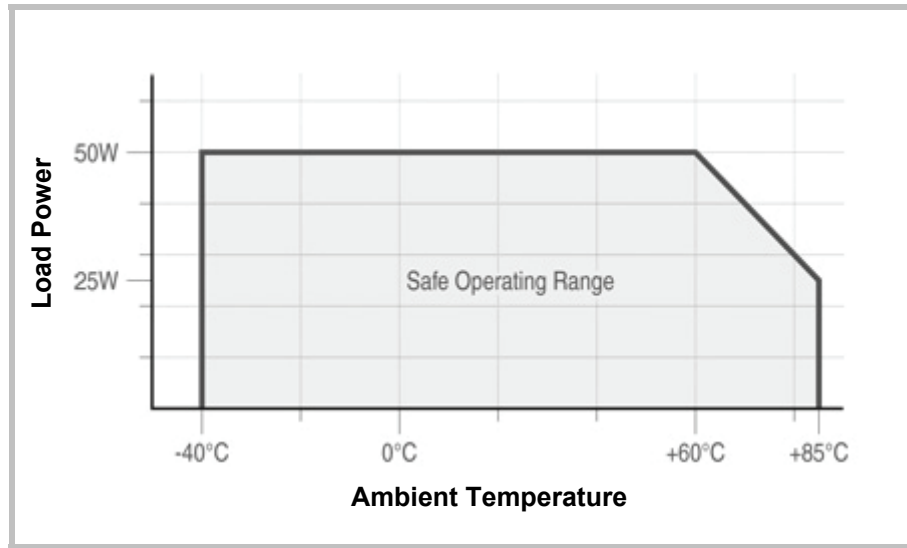


Figure 10. Power Supply Derating Curve

## Appendix A – References

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- [PC/104 Specification](#)
- [SUMIT Specification](#)