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PCM-DC-AT512-P

+5V and ±12V DC/DC PC/104 Power Supply

PRODUCT MANUAL



WinSystems, Inc.
715 Stadium Drive
Arlington, TX 76011

http://www.winsystems.com

MANUAL REVISION HISTORY

P/N G400-0379-000B (PCM-DC-AT512-P)

Revision Date Code	ECO Number
120410	Initial Release
120510	
120614	
130718	
130725	
130806	
130809	

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BEFORE YOU BEGIN

WinSystems offers best practice recommendations for using and handling WinSystems embedded PCs. These methods include valuable advice to provide an optimal user experience and to prevent damage to yourself and/or the product.

YOU MAY VOID YOUR WARRANTY AND/OR DAMAGE AN EMBEDDED PC BY FAILING TO COMPLY WITH THESE BEST PRACTICES.

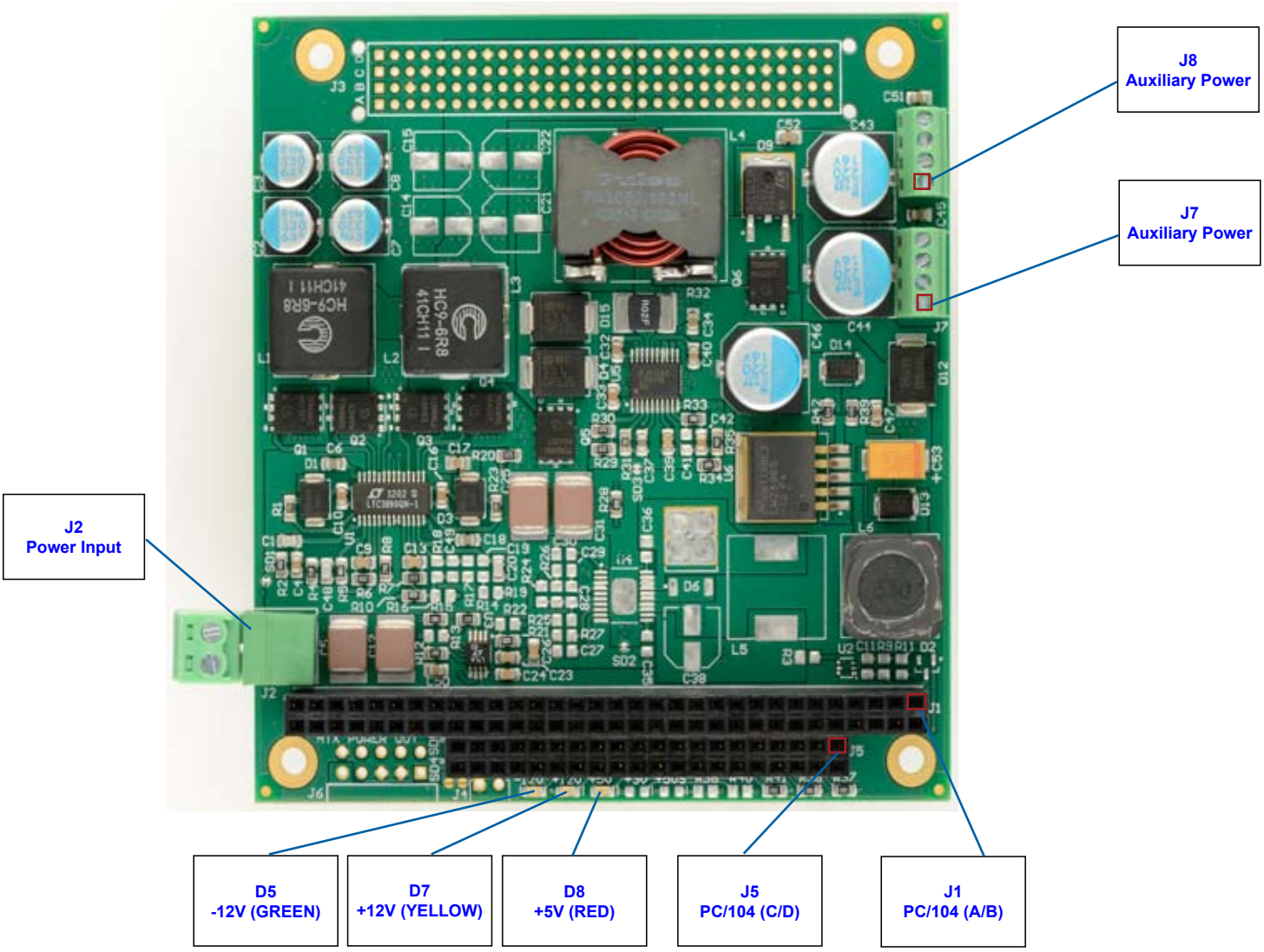
Reference **Appendix - A** for **Best Practices**.



Please review these guidelines carefully and follow them to ensure you are successfully using your embedded PC.

For any questions you may have on WinSystems products, contact our Technical Support Group at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

Visual Index - Top View (Connectors & LEDs)



NOTE: The reference line to each component part has been drawn to Pin 1, and is also highlighted with a square, where applicable.

D5, D7, D8 - Status LED

Visual Index

The PCM-DC-AT512-P has up to 3 status LED indicators populated on the board at **D5**, **D7**, and **D8**, which can display the status of each regulated output. When one of the LEDs is not lit or pulses ON and OFF, the respective supply is not in regulation. A pulsating LED indicates the respective converter is in current limit . See the table below for a description of the status LEDs.

LED	Function	Color
D5	-12V	GREEN
D7	+12V	YELLOW
D8	+5V	RED

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INTRODUCTION

This manual is intended to provide the necessary information regarding configuration and usage of the PCM-DC-AT512-P power supply. WinSystems maintains a Technical Support Group to help answer questions not adequately addressed in this manual. Contact Technical Support at (817) 274-7553, Monday through Friday, between 8 AM and 5 PM Central Standard Time (CST).

FEATURES

Power Supply Module

- PC/104 triple output DC/DC power supply

Input Voltage

- Wide range: 10-50 VDC

Output Voltage

- +5V @ 20A (Refer to the Derating Formula section of this manual.)
- +12V @ 3A
- -12V @ 800 mA
- Over current protection (OCP) and over voltage protection (OVP) for all outputs

Bus Expansion

- PC/104

Industrial Operating Temperature

- -40°C to 85°C ambient

Mechanical

- PC/104-compliant
- Dimensions: 3.6 x 3.8 inches (90 x 96 mm)
- Weight: 4 oz (114g)

Additional Features

- LED provides visual status of power
- High efficiency
- Fast transient response
- Low voltage ripple
- No minimum load required for regulation
- No fan or heat sink required
- RoHS compliant
- Custom OEM configurations available
- Two connectors for disk driver/accessory power

System

The PCM-DC-AT512-P is a high efficiency, non-isolated switch mode power supply with a wide input range of 10-50 VDC. From one common DC input, it supplies +5V, -12V, and 12V. The overall efficiency of the power supply varies between 80 and 92% depending on the individual converter loading and input level.

Theory of Operation

The PCM-DC-AT512-P employs a variety of synchronous and asynchronous, single and multiphase, buck and buck-boost topology DC-DC converters. The guaranteed input voltage range is 10-50 VDC, however operation is possible above and below this input limit. Inputs below 10V may result in startup instability issues on the -12V and 12V supplies. With a converter silicon rating of 60 VDC or greater, operation up to the 60 VDC is possible with reduced output power or active cooling.

Derating Formula

The main 5V output on the PCM-DC-AT512-P may have to be derated depending on the user's input voltage and maximum ambient operating temperature.

Use the following formula to derate the main 5V, 20A output current:

$I_{OUT} = (215 - V_{IN} - T_{AMB})/ 8.$

I_{OUT} = The output current in Amps. ($I_{OUT} < 20$)

V_{IN} = Input voltage in Volts.

T_{AMB} = Ambient operating temperature in degrees Celsius. ($-40°C < T_{AMB} < 85°C$)

See Appendix D for more derating chart information.

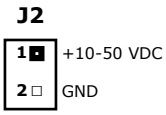
CONNECTOR REFERENCE

POWER

J2 - VDC Input

Visual Index

PCB Connector: **PHOENIX 180327 (J2)**
Mating Connector: **PHOENIX 1803578 (Housing) *Note: Mating Connector ships with board.**

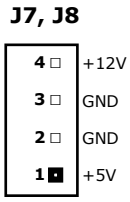


DC power input is supplied to the PCM-DC-AT512-P via the 2-pin Phoenix connector at **J2**.

J7, J8 - Auxiliary Power

Visual Index

PCB Connector: **PHOENIX CONTACT 1725672**



The connectors at **J7** and **J8** provide auxiliary power output.

J1, J5 - PC/104

Visual Index

PCB Connector: **TEKA PC232-A-1A7-M (J1)**
TEKA PC220-A-1A7-M (J5)

The PC/104 bus is electrically equivalent to the 16-bit ISA bus. Standard PC/104 I/O cards can be populated on PCM-DC-AT512-P's connectors, located at **J1** and **J5**. The interface does not support hot swap capability. The PC/104 bus connector pin definitions are provided below for reference. Refer to the PC/104 Bus Specification for specific signal and mechanical specifications.

J5 (C/D)

GND	D0	C0		GND
MEMCS16#	D1	C1		SBHE#
IOCS16#	D2	C2		LA23
IRQ10	D3	C3		LA22
IRQ11	D4	C4		LA21
IRQ12	D5	C5		LA20
IRQ15	D6	C6		LA19
IRQ14	D7	C7		LA18
DACK0#	D8	C8		LA17
DRQ0	D9	C9		MEMR#
DACK5#	D10	C10		MEMW#
DRQ5	D11	C11		SD8
DACK6#	D12	C12		SB9
DRQ6	D13	C13		SD10
DACK7#	D14	C14		SD11
DRQ7	D15	C15		SD12
+5V	D16	C16		SD13
MASTER#	D17	C17		SD14
GND	D18	C18		SD15
GND	D19	C19		KEY

J1 (A/B)

IOCHK#	A1	B1		GND
SD7	A2	B2		RESET
SD6	A3	B3		+5V
SD5	A4	B4		IRQ
SD4	A5	B5		-5V
SD3	A6	B6		DRQ2
SD2	A7	B7		-12V
SD1	A8	B8		SRDY#
SD0	A9	B9		+12V
IOCHRDY	A10	B10		KEY
AEN	A11	B11		SMEMW#
SA19	A12	B12		SMEMR#
SA18	A13	B13		IOW#
SA17	A14	B14		IOR#
SA16	A15	B15		DACK3#
SA15	A16	B16		DRQ3
SA14	A17	B17		DACK1#
SA13	A18	B18		DRQ1
SA12	A19	B19		REFRESH#
SA11	A20	B20		BCLK
SA10	A21	B21		IRQ7
SA9	A22	B22		IRQ6
SA8	A23	B23		IRQ5
SA7	A24	B24		IRQ4
SA6	A25	B25		IRQ3
SA5	A26	B26		DACK2#
SA4	A27	B27		TC
SA3	A28	B28		BALE
SA2	A29	B29		+5V
SA1	A30	B30		OSC
SA0	A31	B31		GND
GND	A32	B32		GND

= Active Low Signal

NOTES:

1. Rows C and D are not required on 8-bit modules.
2. B10 and C19 are key locations. WinSystems uses key pins as connections to GND.
3. Signal timing and function are as specified in ISA specification.
4. Signal source/sink current differ from ISA values.

CABLES

See WinSystems website.

SPECIFICATIONS

MODELS	PCM-DC-AT512-P
Electrical (Input)	
Input Voltage	10-50 VDC
Input Current	3-12A
Inrush Current	20A (Inrush currents at startup can be larger than steady state currents.)

Electrical (Outputs)

V_{OUT}	I_{OUT}	Load Regulation	Line Regulation	Ripple	Power
+5V	20A	30 mV	10 mV	<100 mV	100W*
+12V	3A	10 mV	20 mV	<150 mV	36W
-12V	800 mA	10 mV	20 mV	<150 mV	6W

* Use the following formula to derate the main 5V, 20A output current:

$I_{OUT} = (215 - V_{IN} - T_{AMB})/ 8.$

I_{OUT} = The output current in Amps. ($I_{OUT} < 20$)

V_{IN} = Input voltage in Volts.

T_{AMB} = Ambient operating temperature in degrees Celsius. ($-40°C < T_{AMB} < 85°C$)

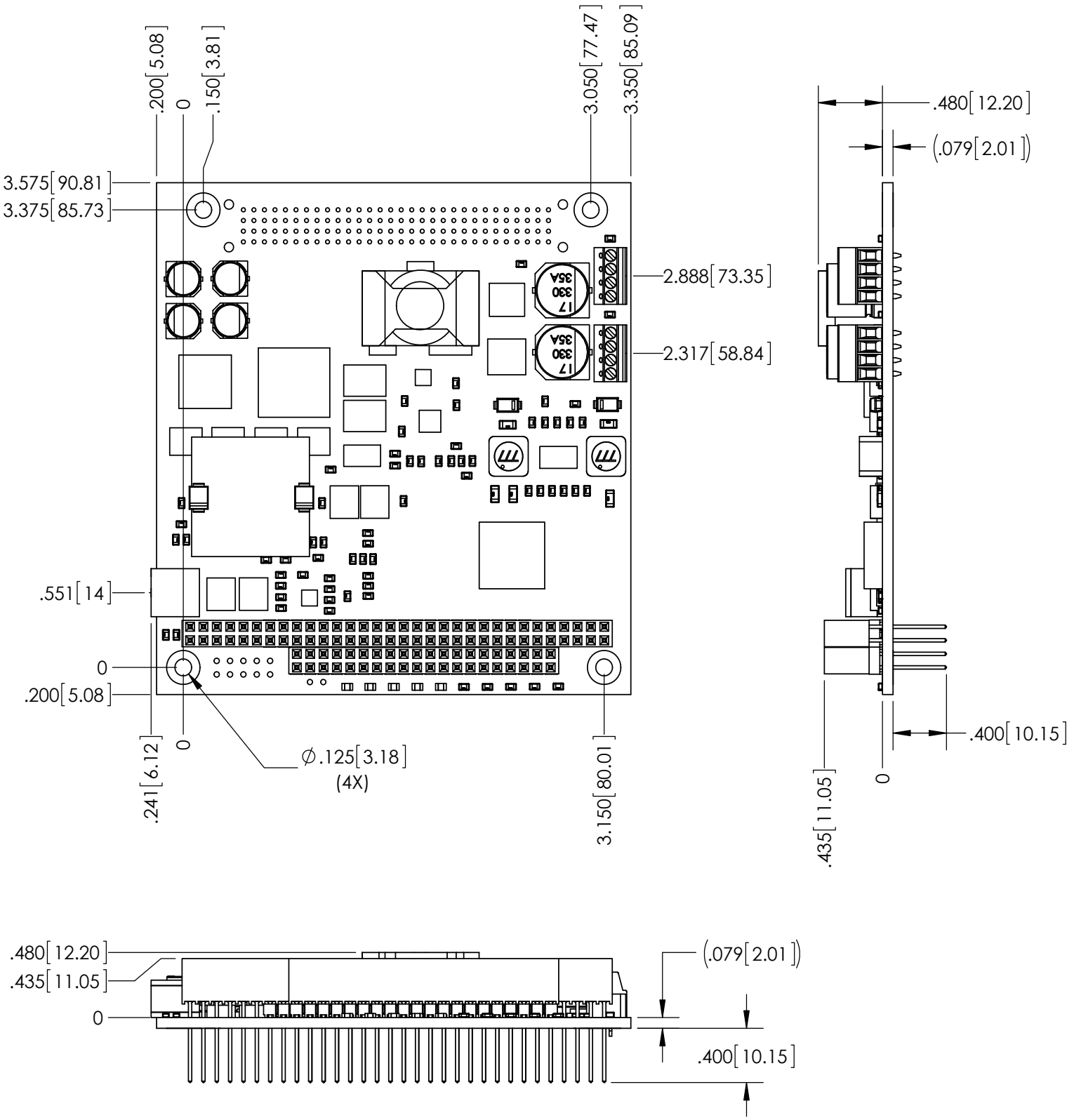
See Appendix D for more derating charge information.

Current Limiting

Voltage	Current Limit
+5V	22A
+12V	4.5A
-12V	3A

MTBF	3,068,324 hours MIL-217 Part Count Reliability method using Manufacturer's Failure Rate Data
Mechanical	
Dimensions	3.6 x 3.8 inches (90 x 96 mm)
Weight	4 oz (114g)
Printed Circuit Board	0.078 inches 4-Layer FR4
Environmental	
Operating Temperature	-40°C to 85°C ambient
Humidity	5% to 95% non-condensing

MECHANICAL DRAWING



PCM-DC-AT512-P

APPENDIX - A

BEST PRACTICES

POWER SUPPLY

The power supply and how it is connected to the Single Board Computer (SBC) is very important.



Avoid Electrostatic Discharge (ESD)
Only handle the SBC and other bare electronics when electrostatic discharge (ESD) protection is in place. Having a wrist strap and a fully grounded workstation is the minimum ESD protection required before the ESD seal on the product bag is broken.

Power Supply Budget
Evaluate your power supply budget. It is usually good practice to budget 2X the typical power requirement for all of your devices.

Zero-Load Power Supply
Use a zero-load power supply whenever possible. A zero-load power supply does not require a minimum power load to regulate. If a zero-load power supply is not appropriate for your application, then verify that the single board computer's typical load is not lower than the power supply's minimum load. If the single board computer does not draw enough power to meet the power supply's minimum load, then the power supply will not regulate properly and can cause damage to the SBC.



Use Proper Power Connections (Voltage)
When verifying the voltage, you should always measure it at the power connector on the SBC. Measuring at the power supply does not account for voltage drop through the wire and connectors.

The single board computer requires +5V (±5%) to operate. Verify the power connections. Incorrect voltages can cause catastrophic damage.

Populate all of the +5V and ground connections. Most single board computers will have multiple power and ground pins, and all of them should be populated. The more copper connecting the power supply to the single board computer the better.

Adjusting Voltage
If you have a power supply that will allow you to adjust the voltage, it is a good idea to set the voltage at the power connector of the SBC to 5.1V. The SBC can tolerate up to 5.25V, so setting your power supply to provide 5.1V is safe and allows for a small amount of voltage drop that will occur over time as the power supply ages and the connector contacts oxidize.

Power Harness
Minimize the length of the power harness. This will reduce the amount of voltage drop between the power supply and the single board computer.

Gauge Wire
Use the largest gauge wire that you can. Most connector manufacturers have a maximum gauge wire they recommend for their pins. Try going one size larger; it usually works and the extra copper will help your system perform properly over time.



Contact Points
WinSystems' boards mostly use connectors with gold finish contacts. Gold finish contacts are used exclusively on high speed connections. Power and lower speed peripheral connectors may use a tin finish as an alternative contact surface. It is critical that the contact material in the mating connectors is matched properly (gold to gold and tin to tin). Contact areas made with dissimilar metals can cause oxidation/corrosion resulting in unreliable connections.

Pin Contacts
Often the pin contacts used in cabling are not given enough attention. The ideal choice for a pin contact would include a design similar to Molex's or Trifurcons' design, which provides three distinct points to maximize the contact area and improve connection integrity in high shock and vibration applications.

POWER DOWN

Make sure the system is **completely off/powered down** before connecting anything.



Power Supply OFF
The power supply should always be off before it is connected to the single board computer.

I/O Connections OFF
I/O Connections should also be off before connecting them to the single board computer or any I/O cards. Connecting hot signals can cause damage whether the single board computer is powered or not.

MOUNTING AND PROTECTING THE SINGLE BOARD COMPUTER

Do Not Bend or Flex the SBC
Never bend or flex the single board computer. Bending or flexing can cause irreparable damage. Single board computers are especially sensitive to flexing or bending around Ball-Grid-Array (BGA) devices. BGA devices are extremely rigid by design and flexing or bending the single board computer can cause the BGA to tear away from the printed circuit board.

Mounting Holes
The mounting holes are plated on the top, bottom and through the barrel of the hole and are connected to the single board computer's ground plane. Traces are often routed in the inner layers right below, above or around the mounting holes.

Never use a drill or any other tool in an attempt to make the holes larger.

Never use screws with oversized heads. The head could come in contact with nearby components causing a short or physical damage.

Never use self-tapping screws; they will compromise the walls of the mounting hole.

Never use oversized screws that cut into the walls of the mounting holes.

Always use all of the mounting holes. By using all of the mounting holes you will provide the support the single board computer needs to prevent bending or flexing.



Plug or Unplug Connectors Only on Fully Mounted Boards
Never plug or unplug connectors on a board that is not fully mounted. Many of the connectors fit rather tightly and the force needed to plug or unplug them could cause the single board computer to be flexed.

Avoid cutting of the SBC
Never use star washers or any fastening hardware that will cut into the single board computer.

Avoid Overtightening of Mounting Hardware
Causing the area around the mounting holes to compress could damage interlayer traces around the mouting holes.

Use Appropriate Tools
Always use tools that are appropriate for working with small hardware. Large tools can damage components around the mounting holes.

Placing the SBC on Mounting Standoffs
Be careful when placing the single board computer on the mounting standoffs. Sliding the board around until the standoffs are visible from the top can cause component damage on the bottom of the single board computer.

Avoid Conductive Surfaces
Never allow the single board computer to be placed on a conductive surface. Almost all single board computers use a battery to backup the clock-calendar and CMOS memory. A conductive surface such as a metal bench can short the battery causing premature failure.

ADDING PC/104 BOARDS TO YOUR STACK

Be careful when adding PC/104 boards to your stack.

Never allow the power to be turned on when a PC/104 board has been improperly plugged onto the stack. It is possible to misalign the PC/104 card and leave a row of pins on the end or down the long side hanging out of the connector. If power is applied with these pins misaligned, it will cause the I/O board to be damaged beyond repair.

CONFORMAL COATING

Applying conformal coating to a WinSystems product will not in itself void the product warranty, if it is properly removed prior to return. Coating may change thermal characteristics and impedes our ability to test, diagnose, and repair products. Any coated product sent to WinSystems for repair will be returned at customer expense and no service will be performed.

OPERATIONS / PRODUCT MANUALS

Every single board computer has an Operations manual or Product manual.



Manual Updates
Operations/Product manuals are updated often. Periodicially check the WinSystems website (http://www.winsystems.com) for revisions.

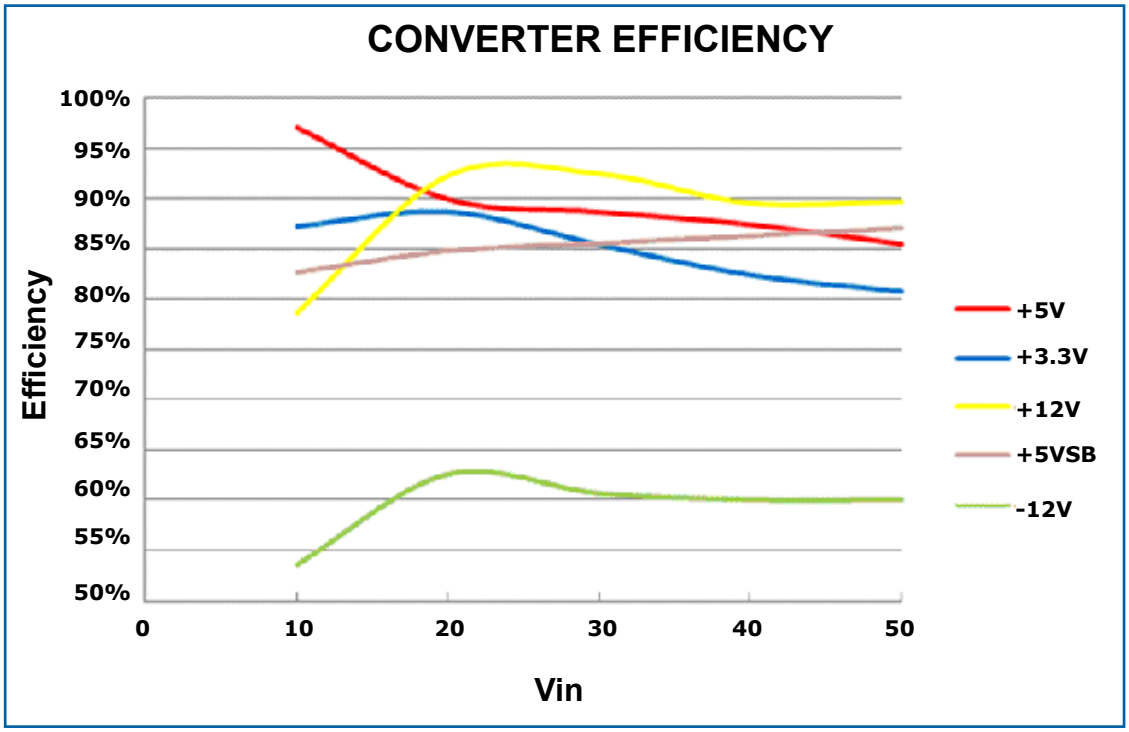
Check Pinouts
Always check the pinout and connector locations in the manual before plugging in a cable. Many single board computers will have identical headers for different functions and plugging a cable into the wrong header can have disastrous results.

Contact an Applications Engineer with questions
If a diagram or chart in a manual does not seem to match your board, or if you have additional questions, contact your Applications Engineer.

APPENDIX - B

EFFICIENCY MEASUREMENTS

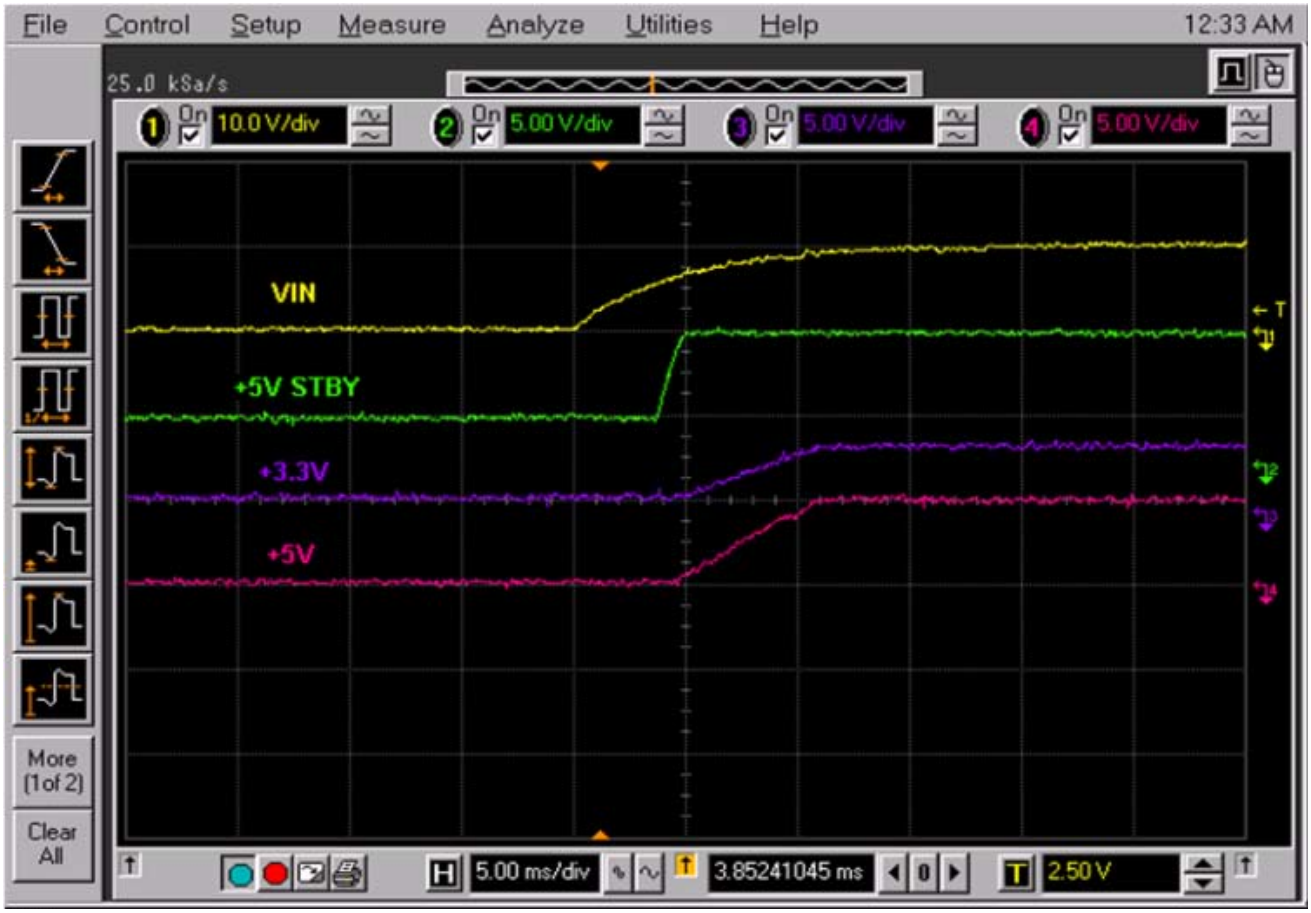
CONVERTER EFFICIENCY



APPENDIX - C

START-UP TIMING

ITO



ITO (No Load)

***Note: +5V STBY and +3.3V apply to the PPM-DC-ATX model only.**


File
Control
Setup
Measure
Analyze
Utilities
Help
9:40 AM
25.0 kSa/s
10.0 V/div
10.0 V/div
10.0 V/div
VIN
+12V
-12V
More (1 of 2)
Clear All
5.00 ms/div
0.0 s
6.11 V

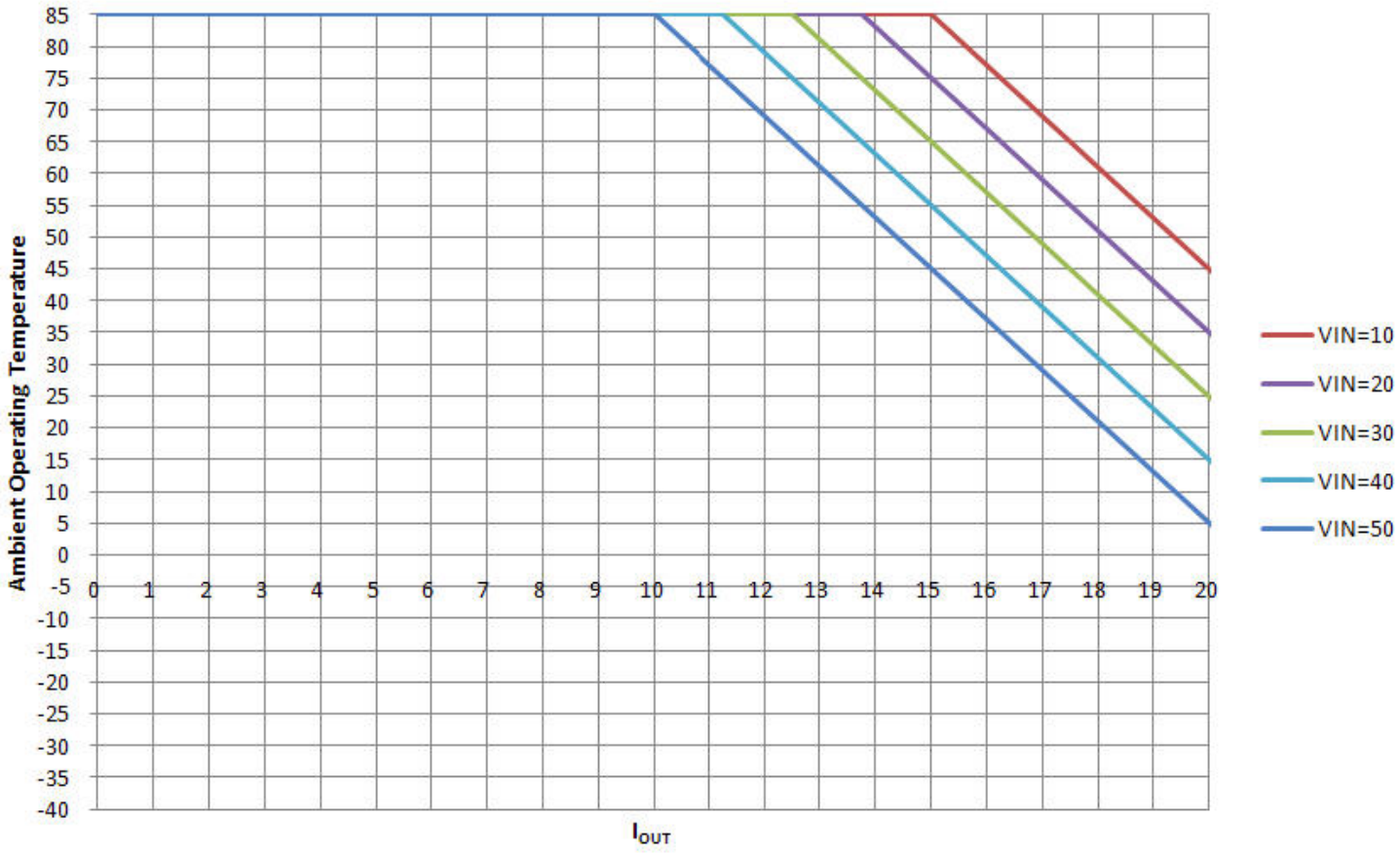
ITO (No Load)

APPENDIX - D

OUTPUT DERATING

+5V Output Derating

$I_{OUT} = (215 - V_{IN} - T_{AMB})/8 : \{I_{OUT} < 20 ; -40 < T_{AMB} < 85\}$



WARRANTY INFORMATION

(http://www.winsystems.com/warranty.cfm)

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WARRANTY SERVICE

1. To obtain service under this warranty, obtain a return authorization number. In the United States, contact the WinSystems' Service Center for a return authorization number. Outside the United States, contact your local sales agent for a return authorization number.

2. You must send the product postage prepaid and insured. You must enclose the products in an anti-static bag to protect from damage by static electricity. WinSystems is not responsible for damage to the product due to static electricity.

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