MVAD160 Series

160W 2" X 4" AC-DC Power Supply Converter

FEATURES

- 110W Wide Operating Temperature range AC-DC Power Supply
- IT (2nd Ed.) and Medical (3rd Ed. MOPP) safety approved, excluding conduction cooling condition
- 2" x 4" standard footprint
- High efficiency up to 93%
- Remote sense
- Remote On/Off (for V1, Negative logic)
- Universal AC input
- Low profile - 1U package
- Convection, conduction, and forced-air cooled operation
- Complies with 5000m altitude (at class I IT equipment)
- RoHS compliant
- Less than 0.3W input power at no load remote "off"
- Complies with ErP/Energy star requirement (average efficiency > 87%)

Available now at http://power.murata.com/acdc3d

DESCRIPTION

The MVAD160 series switching power supplies utilize advanced component and circuit technologies to deliver high efficiency. Designed for Medical, Telecom, and Industrial applications to satisfy 1U height design considerations, the MVAD160 Series measures only 2.0" x 4.0" x 1.5". All models offer universal AC input and compliance to worldwide safety and EMC standards.

ORDERING GUIDE

Model Number	Natural Convection Cooling (@ta = 50°C)	Conduction Cooling (@ta = 85°C)	Forced Air Cooling (@350LFM /ta=50°C)	Main Output (V1)	Aux Output (V2)
MVAD160-125	110W	110W	160W	12V	5V
MVAD160-245				24V	
MVAD160-485				48V	
MVAD160-12				12V	no aux output
MVAD160-24				24V	no remote sense
MVAD160-48				48V	no V1 remote

INPUT CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Operating Range	Single phase	85[1]	120/230	264	Vac
	DC[2]	200		300	Vdc
Input Frequency		47	50/60	63	Hz
Turn-on Input Voltage	Input rising at full load			84	Vac
Turn-off Input Voltage	Input falling at full load			84	
Input Current	90Vac input, full load			2.1	A
Inrush Current	At 264Vac, at 25°C cold start		100		Apk

OUTPUT CHARACTERISTICS

Model Number	Main Output Voltage (V1)	Load Current	Load Capacitance	Line, Load, Cross Regulation	Typical Efficiency @230Vac full load
MVAD160-12x	12V	0 to 13.34A	0 to 1500µF	± 2%	92%
MVAD160-24x	24V	0 to 6.67A	0 to 680µF		93%
MVAD160-48x	48V	0 to 3.34A	0 to 330µF		
Model Number	Aux Output Voltage (V2)	Load Current	Load Capacitance	Line, Load, Cross Regulation	
MVAD0160-xx5	5V	0 to 0.1A	0 to 220pF	± 5%	

Main Output Characteristics (all models)

Parameter	Conditions	Min.	Max.	Units
Transient Response	50% load step, min.5% load, 1A/µsec slew rate		± 5	%V1
Settling Time to 1% of Nominal	50% load step, min.5% load, 1A/µsec slew rate		2	msec
Turn On Delay	After application of input power		1.5	sec
Output Voltage Rise	Monotonic,[5] 0 to 100% load		200	msec
Setpoint Accuracy	115Vac, 110W load, 25°C		± 0.5	%V1
Output Holdup	100% load	10		msec
Temperature Coefficient			0.02	%/°C
Ripple Voltage & Noise[3]	min. 5% load		1	%V1
Remote Sense	Compensates for up to total 400mV of positive and negative lead drops with remote sense connected.		400	mV

1 Refer to power derating curve vs. input voltage. Input test condition on safety approval : 100-240Vac ±10%.

2 Applicable for IT Equipment only.

3 Ripple and noise are measured with 0.1 µF of ceramic capacitance and 47 µF of electrolytic capacitance on each of the power supply outputs. The output noise requirements apply over a 0 Hz to 20 MHz bandwidth. A short coaxial cable with 50Ω scope termination is used.

4 Unless otherwise specified all readings are taken at 115Vac input and 25°C ambient temperature.

5 This power supply may exhibit up to 5% turn on overshoot.

RoHS COMPLIANT · c UL us · VDE · CE · CB Test Certificate and Test Report

ENVIRONMENTAL CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Storage Temperature Range		-40		85	°C
Operating Temperature Range	Refer to power derating curve vs. operating temperature	-40		85	
	Start up	-40			
Operating Humidity	Non-condensing	10		95	%
Operating Altitude	For class I IT equipment deployment	-200		5000	m
	Other	-200		2000	
MTBF	Telcordia SR-332 M1C3 50°C, 110W	1M			Hours
Shock	Operating, IEC60068-2-27, half-sine 5G, 6ms, 3 times per face, 6 faces	Complies			
	Non-operating, IEC60068-2-27, half-sine, 30G, 18ms, 3 times per face, 6 faces	Complies			
Vibration	Operating, IEC60068-2-6, 1.0G, 10-150Hz, 10minutes per axis, on all 3 axes	Complies			
	Non-operating, IEC60068-2-6, 2.0G, 10-150Hz, 10minutes per axis, on all 3 axes	Complies			
Safety	IEC60950-1:2005 2nd Ed.; Am1:2009 EN60950-1:2006; A11:2009; A1:2010; A12:2011 UL60950-1, 2nd Ed., 2011-12-19 & CSA C22.2 No. 60950-1-07, 2nd Ed., 2011-12 IEC60601-1:2005 3rd Ed. + CORR.1(2006) + CORR.2(2007) ANSI/AAMI ES60601-1 (2005+C1:09 + A2:10), CSA-C22.2 No. 60601-1(2008), MOPP CE Marking per LVD				
Warranty	2 years[6]				
Outside Dimensions	2.0" x 4.0" x 1.5" (50.8mm x 101.6mm x 38.1mm)				
Weight	0.42lbs (190g) typical				

PROTECTION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Overvoltage Protection	V1; Latching (50% load)	110		140	%
	V2; Latching (50% load)	110		170	
Overcurrent Protection	V1; Hiccup mode; Auto Recovery	110		170	
	V2; Hiccup mode; Auto Recovery	0.11	0.4		A
Overtemperature Protection	Auto recovery		Complies		

ISOLATION CHARACTERISTICS

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation	Primary to Earth Ground (1x MOPP)	1500			Vac
	Primary to Secondary (2x MOPP)[7]	4000			
	Secondary to Earth Ground	500			Vdc
Leakage Current (under normal conditions)	264Vac, 60Hz, 25°C			350	µA
	240Vac, 60Hz, 25°C			300	µA
Touch Current	264Vac, 60Hz, 25°C			100	µA

EMISSIONS AND IMMUNITY

Characteristic	Standard	Compliance
Input Current Harmonics	IEC/EN 61000-3-2	Class D, Class C
Voltage Fluctuation and Flicker	IEC/EN 61000-3-3	Complies
Conducted Emissions	EN 55022	Class B, (Class A as Class II equipment deployment)
	FCC Part 15	Class B, (Class A as Class II equipment deployment)
ESD Immunity	IEC/EN 61000-4-2	Level 4, Criterion A
Radiated Field Immunity	IEC/EN 61000-4-3	Level 2, Criterion A
Electrical Fast Transient Immunity	IEC/EN 61000-4-4	Level 3, Criterion A
Surge Immunity	IEC/EN 61000-4-5	Level 4, Criterion A
RF Conducted Immunity	IEC/EN 61000-4-6	Level 2, Criterion A
Magnetic Field Immunity	IEC/EN 61000-4-8	Level 2, Criterion A
Voltage dips, interruptions	IEC/EN 61000-4-11	Level 3, Criterion B

6 At Ta<50°C.

7 Class I equipment deployment.

CONTROL SIGNAL

Parameter	Conditions
V1 Remote	This signal must be pulled low state (maximum of 0.2Vdc, sink current >15mA) to V2 return terminal to turn on the main V1 output. The power supply shall include an internal pull up resistor to an internal 12Vdc to disable the main V1 output if the signal is left open. The power supply shall not pull this signal down if there is no AC input. The open circuit voltage present when in the "open" state shall not exceed 15Vdc. The AUX output is independent of the V1 remote signal.

EMI CONSIDERATIONS

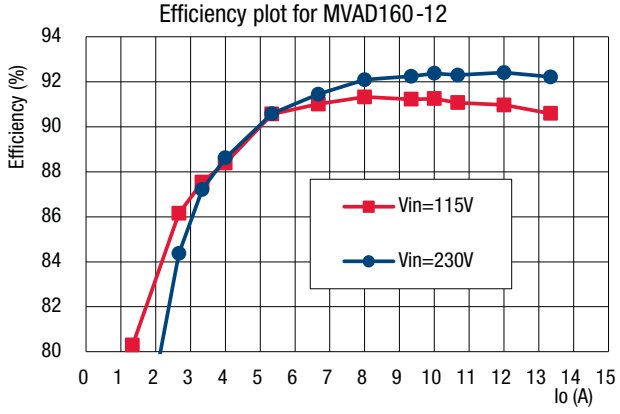
For optimum EMI performance, the power supply should be mounted to a metal plate grounded to all 4 mounting holes of the power supply. To comply with safety standards, this plate must be properly grounded to protective earth (see mechanical dimension notes). Pre-compliance testing has shown that a stand-alone power supply complies with EN55022 class A radiated emissions. Radiated emission results vary with system enclosure and cable routing paths.

SAFETY CONSIDERATIONS

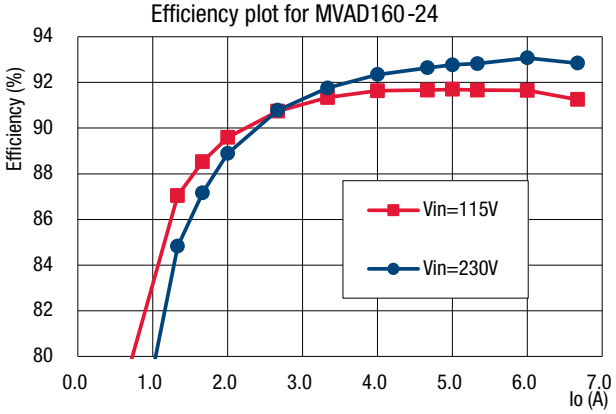
1. This power supply is a component level power supply intended for use in Class I or Class II applications. Secondary ground traces need to be suitably isolated from primary ground traces when used in class II applications.
2. When the power supply is used in Class II equipment, all ground traces and components connected to the primary side are considered primary for spacing and insulation considerations.

PERFORMANCE DATA

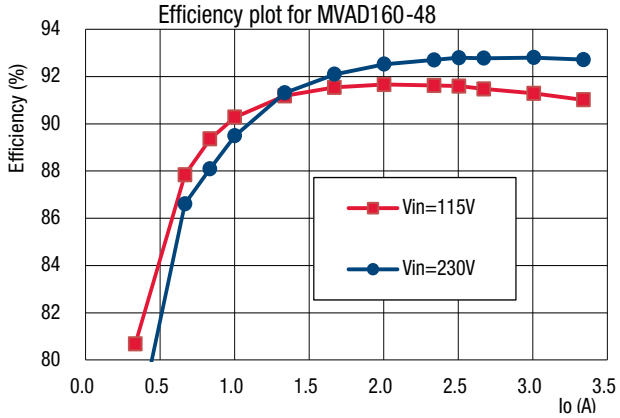
Efficiency plot for MVAD160-12



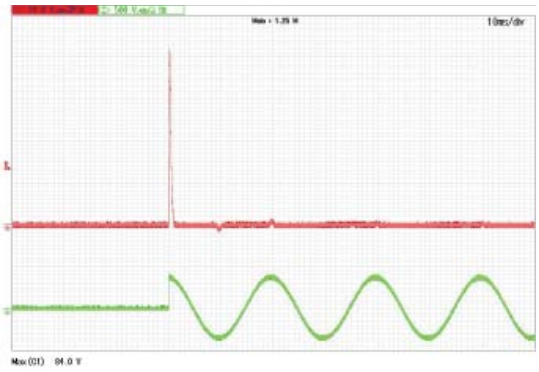
Efficiency plot for MVAD160-24



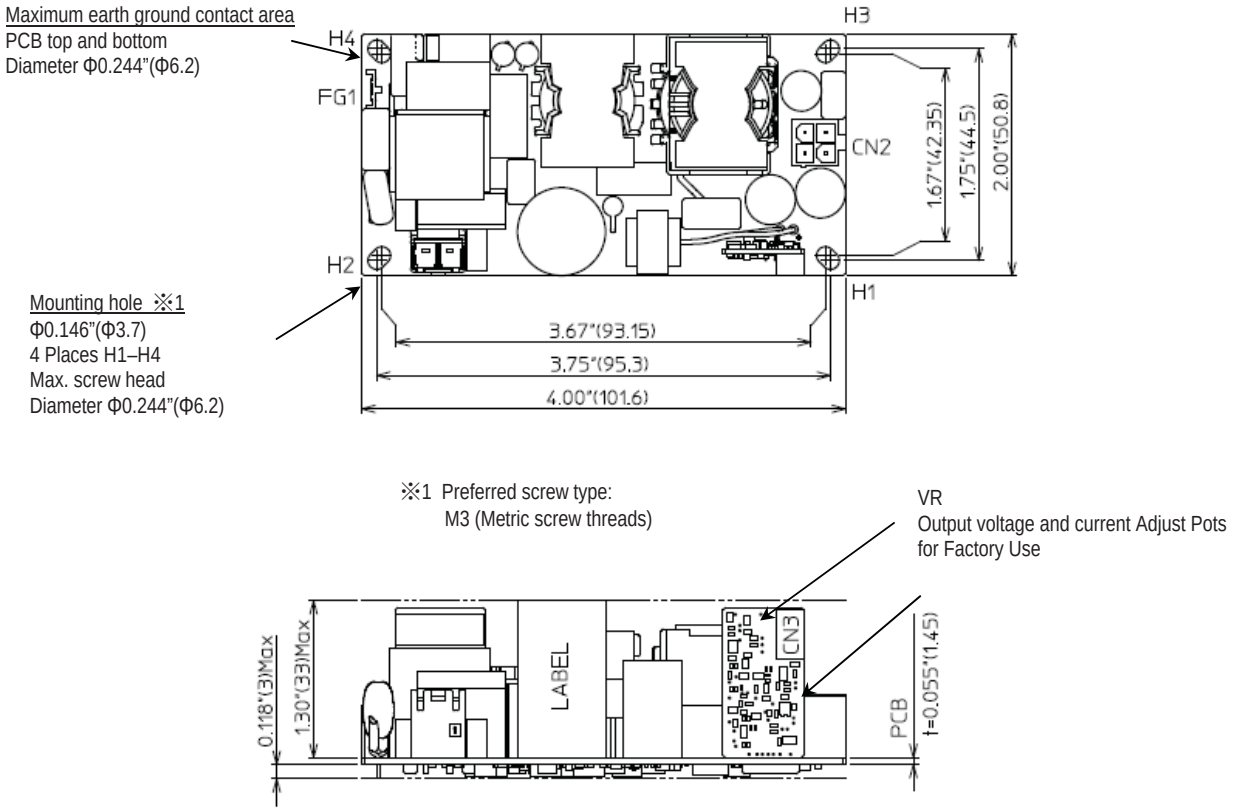
Efficiency plot for MVAD160-48



Inrush waveform (AC264V 25°C) Peak 84.0A



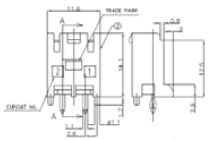
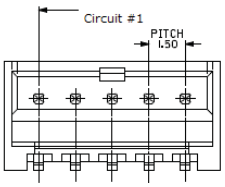
MECHANICAL DIMENSIONS



All dimensions in inches (mm). Tolerance is +/-0.02" (0.5)
Mounting holes H3 and H4 should be earth-grounded for EMI purpose.
Mounting holes H4 is earth ground connection
This power supply requires mounting on standoffs minimum 0.197" (5.0) in height for forced air cooling.

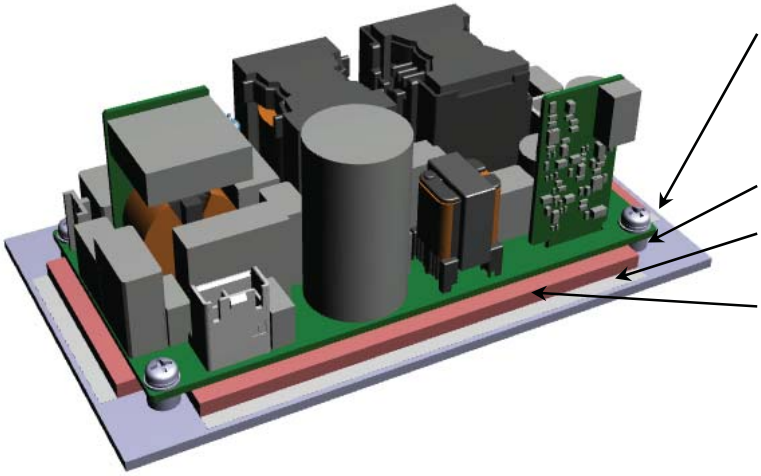
Dimensions: 2.0" x 4.0" x 1.5" (50.8mm x 101.6mm x 38.1mm)

INPUT/OUTPUT CONNECTOR AND SIGNAL SPECIFICATION AND MATING CONNECTORS

Pin	Description	Mating Housing	Crimp terminal/pins	Outline
Input Connector CN1: TE Connectivity 5-1376382-1		TE Connectivity 1376388-1	TE Connectivity 1376348-1	
1	Line (V-)			
2	Neutral (V+)			
Spade Connector: #250				
GND	Earth Ground			
Output Connector CN2: Molex 39-28-8040		Molex 39-01-2040	Molex 39-00-0038	
1, 2	V1			
3, 4	V1 Return			
Output Connector CN3: Molex 87438-0643 for models with auxiliary output		Molex 87439-0600	Molex 87421-0000	
1	V2			
2	V2 Return			
3	V1 Remote			
4	V1 -Sense			
5	N.C			
6	V1 +Sense			

THERMAL CONSIDERATIONS

Conduction Cooling Image (and Preferred Interface Materials)



Aluminum Baseplate:

Thickness 2.5 to 3mm
Maximum operating temperature +85°C (measurement point: center on the back side of baseplate)

Preferred mounting on standoffs: 3.5mm

Isolation sheet or Isolation tape
Preferred materials: thickness 50 to 130um, 94V-0

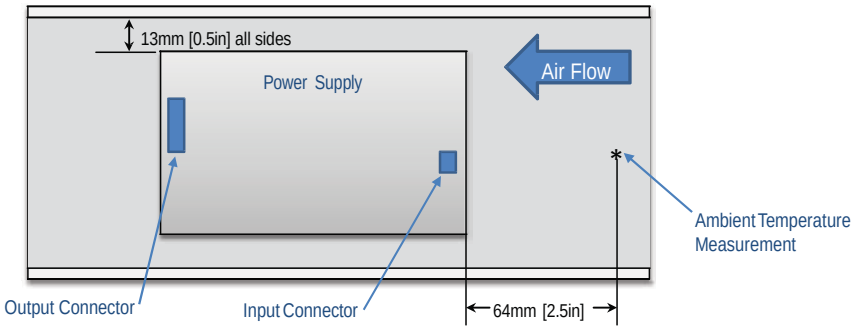
Thermal Sheet or Thermal Gel:
Preferred Materials:
Type: Sarcon 300G-ae (thickness 3mm, thermal conductivity 1.3W/m·K)
Manufacturer: Fuji Polymer

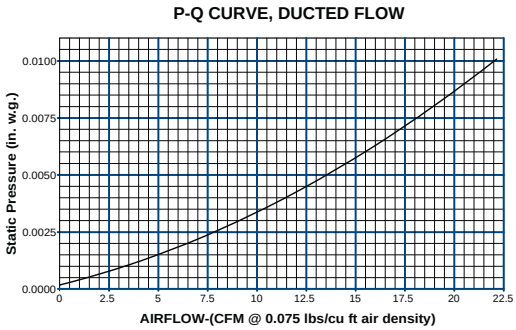
Type: GEL30 (thermal conductivity 3.5W/m·K)
Manufacturer: Parker

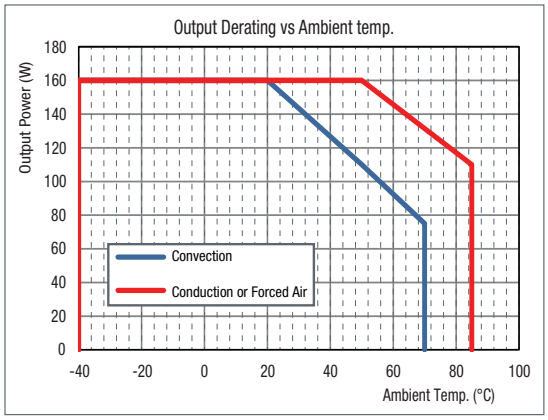
Forced Air Cooling

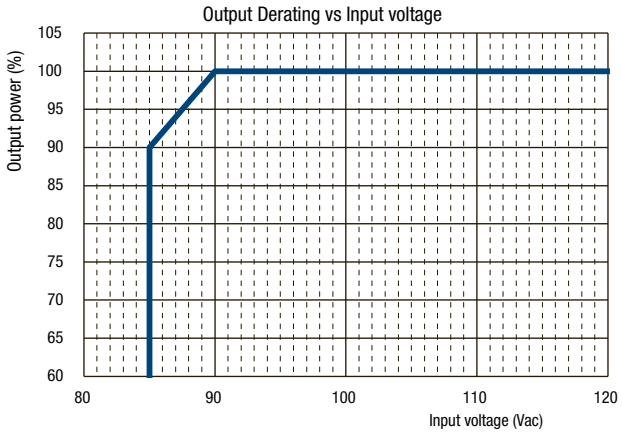
System thermal management is critical to the performance and reliability of the MVAC series power supplies. Performance derating curves are provided which can be used as a guideline for what can be achieved in a system configuration with controlled airflow at various input voltage conditions.

The air flow curves are generated using an AMCA 210-99 and ASHRAE 51-1999 compliant wind tunnel with heated inlet air and a controlled CFM providing a duct test section having a calculated average LFM. A correlation between the test setup and the actual system environment is paramount to understanding what can be achieved in an actual system. In a power supply of this density, cooling air moving both through the unit as well as around the unit strongly influences local temperatures. The wind tunnel test setup was constructed to produce a flow with a slight back pressure to induce both flow conditions by providing a small gap between the power supply and duct walls of 0.5" (13mm). The optimal and characterized airflow direction is from the input connector to the output connector (see diagram below). The P-Q flow curve for this test setup is also shown below.









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