

MAD50 Series AC/DC Power Supplies



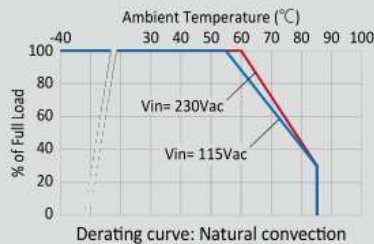
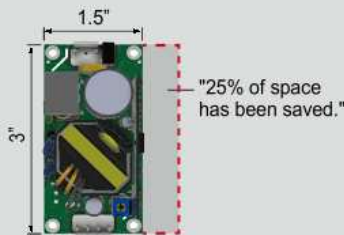
Highly Reliable Medical AC/DC Power Supplies That Help to Rescue Lives

Medical Certified 15-450W AC/DC Power Supplies

Compact Medical AC/DC Power Supplies

New Medical Grade 3"x1.5" Open Frame 50W AC/DC Power supplies

P-DUKE has expanded its medical grade open-frame power supplies portfolio with the addition of the new MAD50 series, ranging from 15W to 450W. The series features a compact 3"x1.5" footprint and delivers 50W continuous output power, with a peak power function that allows the power supply to deliver up to 140% of rated output power for 5 seconds. It is designed with a high conversion efficiency of up to 92.5%, enabling full-power operation from -40°C to +55°C ambient temperature without derating or forced air cooling. With forced air cooling or output power derating, the MAD50 series can perform up to +85°C. The universal input voltage range is 85-264Vac (120-370Vdc), and outputs are available from 5Vdc to 53Vdc, with output adjustability of -10% to +10% or -20% to +10%, depending on the output voltage.



The MAD50 series offers full protection against output short-circuit (continuous, automatic recovery), over-load (hiccup mode, automatic recovery), and output over-voltage (latch mode). It also integrates an EMC filter that complies with EN 55032, class B for conducted and radiated emission. With 2xMOPP (means of patient protection), 4000Vac/ 1 minute reinforced I/O insulation, and less than 100µA patient leakage current, it is suitable for type BF applied part medical applications. The allowance of 5000m operating altitude and certification to IEC60068-2-27 (Mechanical shock) and IEC60068-2-6 (Vibration) broadens the application limitation in rugged environments.

The MAD50 series prioritizes patient safety through the use of high-quality components and excellent thermal management, providing highly reliable power supplies for a variety of medical applications, such as pulse oximeters, handheld ultrasound devices, mobile C-arm systems, ambulatory infusion pumps, handheld ECG monitors, and more.

Features

- Up to 92.5% Conversion Efficiency
- Up to 140% Rated Power for 5 seconds
- 4000Vac reinforced 2xMOPP insulation
- Low leakage current < 100µA
- Protection type Class I & Class II
- Comply with EN55032 radiated & conducted EMI Class B
- Medical certification IEC/EN/ANSI/AAMI 60601-1
- Low Profile 3" x 1.5" x 1.24" Package
- Operating Altitude up to 5000 m
- Operating Temperature Range -40°C to +85°C
- 5 Years Product Warranty

Applications

- Pulse oximeters
- Handheld ultrasound devices
- Mobile C-arm systems
- Ambulatory infusion pumps
- Handheld ECG monitors

【お問い合わせ先】

JEMCO 株式会社ジェムコ
 大阪本社 TEL : 06-6338-8566
 東京 TEL : 080-6449-9194
 名古屋 TEL : 0587-96-1970
 URL : <http://www.jemc.co.jp/>
 E-Mail : inf@jemc.co.jp



P-DUKE POWER

MAD50 Series

AC-DC POWER SUPPLIES
Up to 50 Watts

5
YEARS
WARRANTY

ROHS
COMPLIANT

REACH
COMPLIANT

+85°C
-40°C
AMBIENT TEMP.



Medical



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



PV



Railway



2
X
MOPP

PEAK
POWER

4000
VAC
Reinforced
Insulation

ADJ.
Output
Voltage

Internal
EN55032
Class
Filter **B**

LOW
Leakage
Current

LOW
Standby
Power

Operating
Altitude
5000
meter

Protection
Class I
Class II

OCP

OVP

SCP

PART NUMBER STRUCTURE

MAD50	U	S	12	B	-	J	
Series Name	Input Voltage (VAC)	Output Quantity	Output Voltage (VDC)	Protection Type		Connector Options	Package Options
	U: Universal 85 ~ 264	S: Single	05:5 7P5:7.5 09:9 12:12 15:15 18:18 24:24 36:36 48:48 53:53	A: CLASS I B: CLASS II		J: JST M: Molex T: Terminal Block D: Pin Type* *(Only for CLASS II)	<input type="checkbox"/> : Open type E1: Enclosed type

TECHNICAL SPECIFICATION All specifications are typical at 230VAC input, full load and 25°C unless otherwise noted

Model Number	Input Range	Output Voltage	Output Current Natural Convection	Max. Output Power	Input Power @No Load	Efficiency	Maximum Capacitor Load
	VAC	VDC	mA	W	mW	%	μF
MAD50US05B	85 ~ 264	5	8000	40	50	90.5	16000
MAD50US7P5B	85 ~ 264	7.5	6670	50	50	90.5	8900
MAD50US09B	85 ~ 264	9	5560	50	50	90.5	6200
MAD50US12B	85 ~ 264	12	4170	50	50	92.5	3500
MAD50US15B	85 ~ 264	15	3340	50	50	92.5	2300
MAD50US18B	85 ~ 264	18	2780	50	100	92.5	1600
MAD50US24B	85 ~ 264	24	2085	50	100	92.5	870
MAD50US36B	85 ~ 264	36	1390	50	100	91.5	390
MAD50US48B	85 ~ 264	48	1045	50	100	91.5	220
MAD50US53B	85 ~ 264	53	950	50	100	91.5	180

INPUT SPECIFICATIONS						
Parameter	Conditions	Min.	Typ.	Max.	Unit	
Operating input voltage range	AC input	85		264	VAC	
	DC input	120		370	VDC	
Input frequency	AC input	47		63	Hz	
Input current	100VAC and Full Load			1.4	A	
	240VAC and Full Load			0.8	A	
Leakage current	264VAC			100	μA	
Start up time				1000	ms	
Rise time			15		ms	
Hold up time	115VAC and Full Load		12		ms	
Input inrush current	230VAC		60		A	
Input protection	Internal fuse		T3.15A/250VAC			

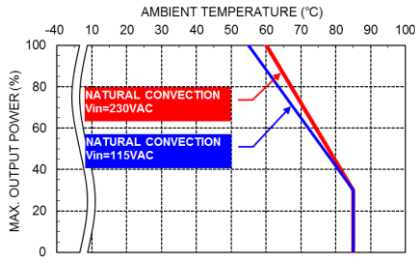
OUTPUT SPECIFICATIONS							
Parameter	Conditions	Min.	Typ.	Max.	Unit		
Output power	Full Load			40	Watts		
					5Vout	50	
Output peak power	Peak power			56	Watts		
					7.5Vout	65	
					Others	70	
	Peak power time		5		s		
	Peak power duty		20		%		
Average operation power (% of Full Load)		70		%			
Initial set voltage accuracy	230VAC and Full Load	-1.0		+1.0	%		
Line regulation	Low Line to High Line at Full Load	-0.2		+0.2	%		
Load regulation	No Load to Full Load			-0.7	%		
					5Vout	+0.7	
	Others	-0.5	+0.5				
10% Load to 90% Load				-0.6	%		
					5Vout	+0.6	
					Others	+0.4	
Voltage adjustability	Single output			-10	%		
					5Vout, 7.5Vout, 9Vout, Others	+10	+10
Minimum load				0	%		
Ripple and noise	Measured by 20MHz bandwidth With a 10μF/25V 1206 X7R MLCC			75	mVp-p		
					5Vout, 7.5Vout, 9Vout	100	
					12Vout, 15Vout, 18Vout	100	
					24Vout, 36Vout	100	
With a 1μF/50V 1206 X7R MLCC				100	mVp-p		
					24Vout, 36Vout	100	
With a 0.1μF/100V 1206 X7R MLCC				100	mVp-p		
					48Vout, 53Vout	100	
Temperature coefficient		-0.02		+0.02	%/°C		
Transient response	Load step from 50 ~ 75% change at 2.5A/μs	Peak deviation		3	%		
					Recovery time	300	
Over voltage protection	% of Vout(nom); Latch mode	115		135	%		
Over load protection	% of Iout rated; Hiccup mode			165	%		
Short circuit protection		Continuous, automatics recovery					

GENERAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Isolation voltage	1 minute (2MOPP insulation)	Input to Output	4000			VAC
		Input (Output) to F.G.	2500			
Isolation resistance	500VDC		0.1			GΩ
Switching frequency	230VAC	5Vout	70		95	kHz
		7.5Vout	95		120	
		Others	110		135	
Safety approvals (Pending)			IEC/ EN/ ANSI/AAMI ES 60601-1 IEC/ EN/ UL 62368-1			
Weight		Open type				78g (2.75oz)
		Enclosed type				175g(6.18oz)
		Pin type				75g(2.65oz)
MTBF	MIL-HDBK-217F, Full load					1.487 x 10 ⁶ hrs

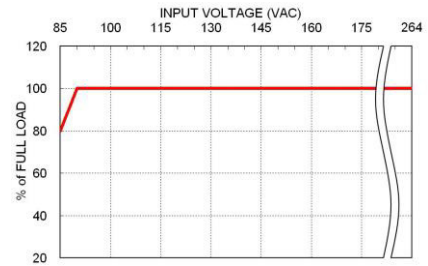
ENVIRONMENTAL SPECIFICATIONS						
Parameter	Conditions		Min.	Typ.	Max.	Unit
Operating ambient temperature	Natural convection	With derating	-40		+85	°C
Storage temperature range			-40		+85	°C
Operating altitude					5000	m
Shock					IEC60068-2-27	
Vibration					IEC60068-2-6	
Relative humidity	Non-condensing				5% to 95% RH	

EMC SPECIFICATIONS			
Parameter	Conditions		Level
EMI	EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15		Conducted
	External components may be required for class I application.		Radiated
			Class B Class B
Harmonic currents	EN61000-3-2	Full Load	Class A
Voltage flicker	EN61000-3-3		
EMS	EN55035 and EN60601-1-2		
ESD	EN61000-4-2		Perf. Criteria A
Radiated immunity	EN61000-4-3	20 V/m	Perf. Criteria A
Fast transient	EN61000-4-4	± 2kV	Perf. Criteria A
Surge	EN61000-4-5	DM ± 1kV and CM ± 2kV	Perf. Criteria A
Conducted immunity	EN61000-4-6	20 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8	10 A/m	Perf. Criteria A
Dip and interruptions	EN61000-4-11		

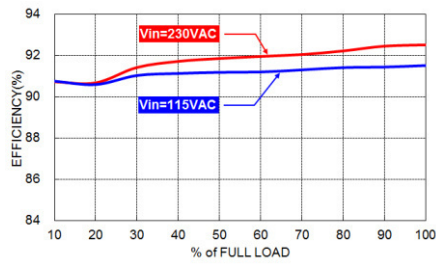
CHARACTERISTIC CURVE



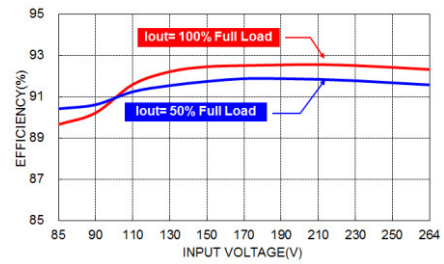
Derating Curve vs. Ambient Temperature



Derating Curve vs. Input Voltage



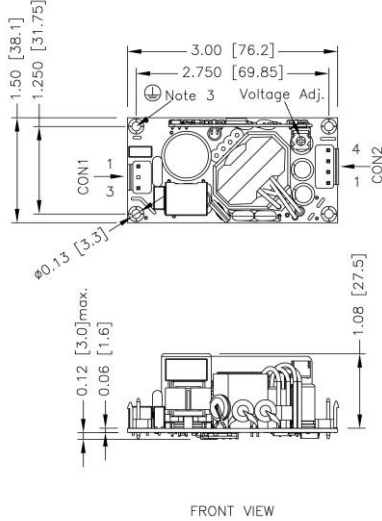
MAD50US12 Efficiency VS Output Load



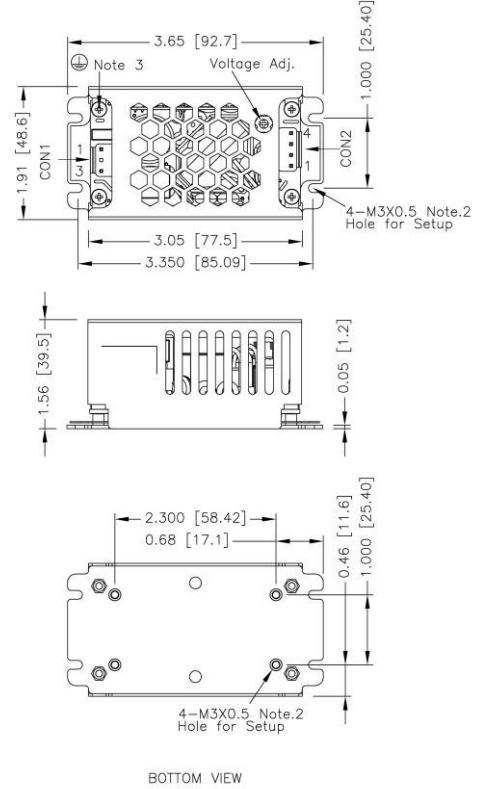
MAD50US12 Efficiency vs. Input Voltage

MECHANICAL DRAWING

MAD Open type



MAD -E1 Enclosed type



1.All dimensions in inch [mm]

Tolerance : x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]

2.The screw locked torque: MAX 3.4Kgf-cm/0.33N-m

3.The screws holes can be considered as PE connection for CLASS I application.

1.All dimensions in inch [mm]

Tolerance : x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]

2.The screw locked torque: MAX 4.2Kgf-cm/0.41N-m

3.The screws holes can be considered as PE connection for CLASS I application.

CONNECTORS CONNECTIONS

CON1 – Input Connector	
Pin Number	AC Input
Pin 1	Line
Pin 3	Neutral

CON2 – Output Connector	
Pin 1,2	-Vout
Pin 3,4	+Vout

CONNECTOR OPTIONS

-J

JST Type

Mates with housing
CON1: **VHR-3N**
CON2: **VHR-4N**



Crimp terminals
CON1: **SVH-21T-P1.1**
CON2: **SVH-21T-P1.1**

-M

Molex Type

Mates with housing
CON1: **09-50-8031**
CON2: **09-50-8041**



Crimp terminals
CON1: **SD-2478**
CON2: **SD-2478**

-T

Terminal Block

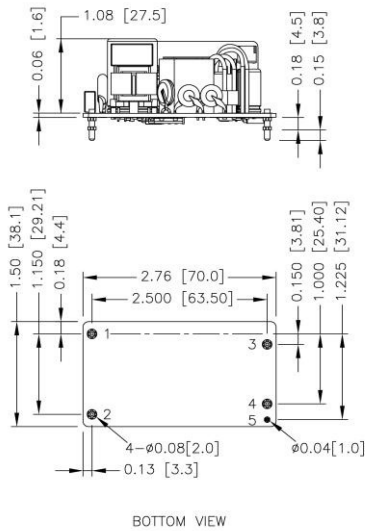
Mates with
Screw locked torque
MAX 2Kgf.cm/0.2N.m



Wire dimension range
26 ~ 18AWG

MECHANICAL DRAWING

MAD -D Pin type

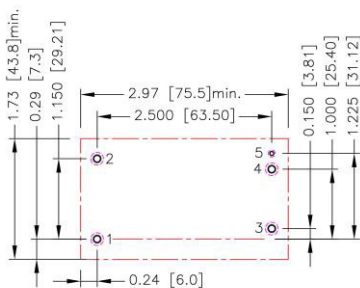

PIN CONNECTION

PIN	DEFINE
1	Neutral
2	Line
3	-Vout
4	+Vout
5	Trim

- All dimensions in inch [mm]
Tolerance :x.xx±0.02 [x.x±0.5]
x.xxx±0.01 [x.xx±0.25]
- Pin dimension tolerance ±0.004[0.10]

RECOMMENDED PAD LAYOUT

MAD -D Pin type



- All dimensions in inch[mm]
 Pad size(lead free recommended)
 Through hole 5:∅0.051[1.30]
 Through hole 1.2.3.4:∅0.091[2.30]
 Top view pad 5:∅0.064[1.63]
 Top view pad 1.2.3.4:∅0.113[2.88]
 Bottom view pad 5:∅0.102[2.60]
 Bottom view pad 1.2.3.4:∅0.181[4.60]