



# P-DUKE POWER

## MAD100 Series

2 X 3 Inch AC-DC POWER SUPPLIES  
Up to 100 Watts

# 5

YEARS  
WARRANTY

ROHS  
COMPLIANT

REACH  
COMPLIANT



Medical



Automation



Datacom



IPC



Industry



Measurement



Telecom



Automobile



Boat



Charger



PV



Railway

UL US

CB

CE

FC



2  
x  
MOPP

4000  
VAC  
Reinforced  
Insulation

ADJ.  
Output  
Voltage

Internal  
EN55032  
Class  
Filter **B**

LOW  
Leakage  
Current

LOW  
Standby  
Power

Protection  
Class I  
Class II

Operating  
Altitude  
**5000**  
meter

OCP

OVP

SCP

### PART NUMBER STRUCTURE

| M                   | A                                                                         | D              | 100              | U                           | S               | 12                                                                        | B                             | - |                                             |
|---------------------|---------------------------------------------------------------------------|----------------|------------------|-----------------------------|-----------------|---------------------------------------------------------------------------|-------------------------------|---|---------------------------------------------|
| Application         | Package Code                                                              | Dimension Code | Output Power (W) | Input Voltage (VAC)         | Output Quantity | Output Voltage (VDC)                                                      | Protection Type               |   | Connector Option                            |
| Medical Application | A: Open type<br>U: U chassis type<br>E: Enclosed type<br>D: Din rail type |                |                  | U: Universal<br>85 ~ 264VAC | SSingle         | 12: 12V<br>15: 15V<br>18: 18V<br>24: 24V<br>28: 28V<br>36: 36V<br>48: 48V | B: CLASS II<br>Blank: CLASS I |   | Blank: JST<br>M: Molex<br>T: Terminal Block |

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

| Model Number | Input Range<br>VAC | Output Voltage<br>VDC | Output Current<br>Natural convection<br>A | Input Power<br>No Load<br>W | Efficiency<br>% | Maximum<br>Capacitor Load<br>μF |
|--------------|--------------------|-----------------------|-------------------------------------------|-----------------------------|-----------------|---------------------------------|
| MAD100US12B  | 85 ~ 264           | 12                    | 8.34                                      | 0.3                         | 91              | 6950                            |
| MUD100US12B  |                    |                       |                                           |                             |                 |                                 |
| MED100US12B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US12B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US15B  | 85 ~ 264           | 15                    | 6.67                                      | 0.3                         | 92              | 4450                            |
| MUD100US15B  |                    |                       |                                           |                             |                 |                                 |
| MED100US15B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US15B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US18B  | 85 ~ 264           | 18                    | 5.56                                      | 0.3                         | 92              | 3100                            |
| MUD100US18B  |                    |                       |                                           |                             |                 |                                 |
| MED100US18B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US18B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US24B  | 85 ~ 264           | 24                    | 4.17                                      | 0.3                         | 92              | 1750                            |
| MUD100US24B  |                    |                       |                                           |                             |                 |                                 |
| MED100US24B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US24B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US28B  | 85 ~ 264           | 28                    | 3.58                                      | 0.3                         | 92              | 1280                            |
| MUD100US28B  |                    |                       |                                           |                             |                 |                                 |
| MED100US28B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US28B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US36B  | 85 ~ 264           | 36                    | 2.78                                      | 0.3                         | 91              | 770                             |
| MUD100US36B  |                    |                       |                                           |                             |                 |                                 |
| MED100US36B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US36B  |                    |                       |                                           |                             |                 |                                 |
| MAD100US48B  | 85 ~ 264           | 48                    | 2.09                                      | 0.3                         | 91              | 430                             |
| MUD100US48B  |                    |                       |                                           |                             |                 |                                 |
| MED100US48B  |                    |                       |                                           |                             |                 |                                 |
| MDD100US48B  |                    |                       |                                           |                             |                 |                                 |

| 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                 | 115VAC and Full Load              |      |      | 1.15          | A     |  |
|                               | 230VAC and Full Load              |      |      | 0.55          |       |  |
| No load input power           | 230VAC                            |      |      | 0.3           | Watts |  |
| Leakage current               | 264VAC                            |      |      | 75            | μA    |  |
| Power Factor                  |                                   | 0.95 |      |               |       |  |
| Start up time                 |                                   |      |      | 1000          | ms    |  |
| Rise time                     |                                   |      | 20   |               | ms    |  |
| Hold up time                  | 115VAC and Full Load              | 16   |      |               | ms    |  |
| Input inrush current          | 230VAC                            |      |      | 60            | A     |  |
| Input protection              | Internal fuse in line and neutral |      |      | T3.15A/250VAC |       |  |

**OUTPUT SPECIFICATIONS**

| Parameter                    | Conditions                                                         | Min.                           | Typ. | Max.  | Unit    |
|------------------------------|--------------------------------------------------------------------|--------------------------------|------|-------|---------|
| Output power                 |                                                                    |                                |      | 100   | Watts   |
| 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                                               | -0.5                           |      | +0.5  | %       |
|                              | 10% Load to 90% Load                                               | -0.4                           |      | +0.4  | %       |
| Voltage adjustability        |                                                                    | -10                            |      | +10   | %       |
| Minimum load                 |                                                                    |                                | 0    |       | %       |
| Ripple and noise             | Measured by 20MHz bandwidth<br>With a 10 $\mu$ F/25V 1206 X7R MLCC |                                | 120  |       | mVp-p   |
|                              | 12Vout                                                             |                                | 150  |       |         |
|                              | 15Vout                                                             |                                | 160  |       |         |
|                              | With a 1 $\mu$ F/50V 1206 X7R MLCC                                 |                                | 160  |       |         |
|                              | 24Vout                                                             |                                | 180  |       |         |
|                              | 28Vout                                                             |                                | 190  |       |         |
|                              | With a 0.1 $\mu$ F/100V 1206 X7R MLCC                              |                                | 340  |       |         |
| Temperature coefficient      |                                                                    | -0.02                          |      | +0.02 | %/°C    |
| Transient response           | Load step from 50 ~ 75% change at 2.5A/ $\mu$ s                    |                                |      | 3     | % Vout  |
|                              | Peak deviation                                                     |                                | 500  |       | $\mu$ s |
|                              | Recovery time                                                      |                                |      |       |         |
| Over voltage protection      | % of Vout(nom); Latch mode                                         | 115                            |      | 135   | %       |
| Over load protection         | % of Iout rated; Hiccup mode                                       | 115                            |      | 150   | %       |
| Short circuit protection     |                                                                    | Continuous, automatic recovery |      |       |         |

**GENERAL SPECIFICATIONS**

| Parameter            | Conditions                                           | Min. | Typ. | Max.                                                             | Unit       |
|----------------------|------------------------------------------------------|------|------|------------------------------------------------------------------|------------|
| Isolation voltage    | 1 minute (2MOPP insulation)                          | 4000 |      |                                                                  | VAC        |
|                      | Input to Output                                      | 1500 |      |                                                                  |            |
|                      | Input (Output) to F.G.                               |      |      |                                                                  |            |
| Isolation resistance | 500VDC                                               | 0.1  |      |                                                                  | G $\Omega$ |
| Switching frequency  |                                                      |      | 60   |                                                                  | kHz        |
| Safety approvals     | IEC/ EN/ ANSI/AAMI ES 60601-1<br>IEC/ EN/ UL 60950-1 |      |      | UL:E360199<br>UL:E193009<br>CB:UL(Demko)                         |            |
| Weight               | MAD<br>MUD<br>MED<br>MDD                             |      |      | 156g (5.50oz)<br>194g (6.84oz)<br>210g (7.41oz)<br>232g (8.18oz) |            |
| MTBF                 | MIL-HDBK-217F Ta=25°C, Full load                     |      |      | 7.903 x 10 <sup>5</sup> hrs                                      |            |

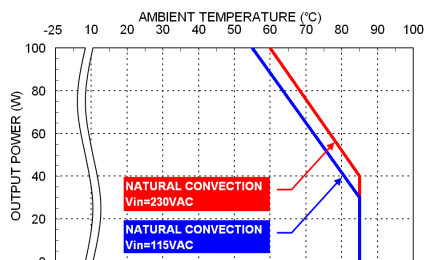
**ENVIRONMENTAL SPECIFICATIONS**

| Parameter                     | Conditions         | Min. | Typ. | Max.          | Unit |
|-------------------------------|--------------------|------|------|---------------|------|
| Operating ambient temperature | Natural convection | -25  |      | +85           | °C   |
| Storage temperature range     | With derating      | -40  |      | +85           | °C   |
| Operating altitude            |                    |      |      | 5000          | m    |
| Shock                         |                    |      |      | IEC60068-2-27 |      |
| Vibration                     |                    |      |      | IEC60068-2-6  |      |
| Relative humidity             | Non-condensing     |      |      | 5% to 95% RH  |      |

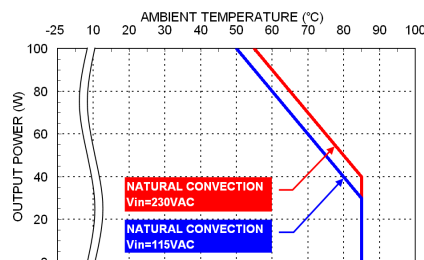
## EMC SPECIFICATIONS

| Parameter                      | Conditions                                                                                                         | Level                               |
|--------------------------------|--------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| EMI                            | EN55011, EN55032, EN60601-1-2 and FCC Part 18 / 15<br>External components may be required for class I application. | Conducted ClassB<br>Radiated ClassA |
| Harmonic currents              | EN61000-3-2 Full Load                                                                                              | Class A and D                       |
| Voltage flicker                | EN61000-3-3                                                                                                        |                                     |
| EMS                            | EN55024 and EN60601-1-2                                                                                            |                                     |
| ESD                            | EN61000-4-2 Air $\pm 15\text{kV}$ and Contact $\pm 8\text{kV}$                                                     | Perf. Criteria A                    |
| Radiated immunity              | EN61000-4-3 20 V/m                                                                                                 | Perf. Criteria A                    |
| Fast transient                 | EN61000-4-4 $\pm 2\text{kV}$                                                                                       | Perf. Criteria A                    |
| Surge                          | EN61000-4-5 DM $\pm 1\text{kV}$ and CM $\pm 2\text{kV}$                                                            | 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                                                                                                       |                                     |

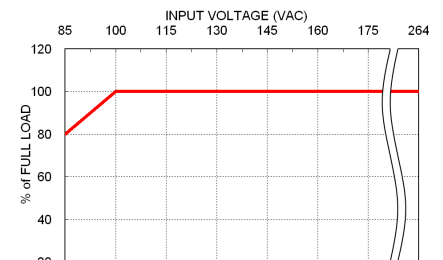
## CHARACTERISTIC CURVE



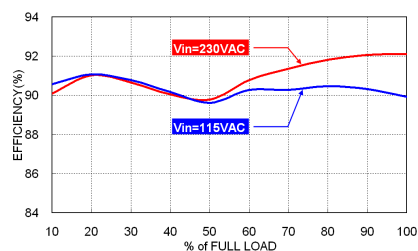
Derating Curve vs. Ambient Temperature  
MED100 & MDD100



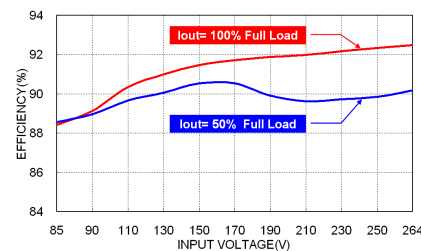
Derating Curve vs. Ambient Temperature  
MAD100 & MUD100



Derating Curve vs. Input Voltage  
MD100



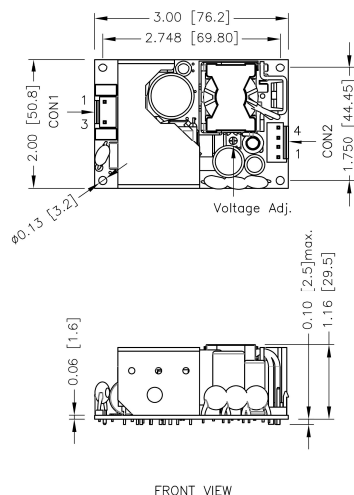
Efficiency vs. Output Load  
MD100US24B



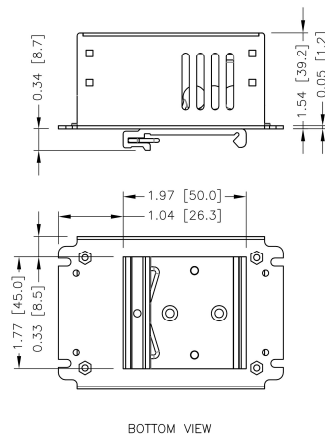
Efficiency vs. Input Voltage  
MD100US24B

## MECHANICAL DRAWING

**MAD** Open type



**MDD** Din rail type



1. All dimensions in inch [mm]
2. Tolerance :  $x.xx \pm 0.02$  [ $x.x \pm 0.5$ ]  $x.xxx \pm 0.01$  [ $x.xx \pm 0.25$ ]
3. M3×0.5 screw locked torque MAX 5Kgf.cm/0.49N.m

## CONNECTORS CONNECTIONS

### CON1 – Input Connector

|       |         |
|-------|---------|
| Pin 1 | Line    |
| Pin 3 | Neutral |

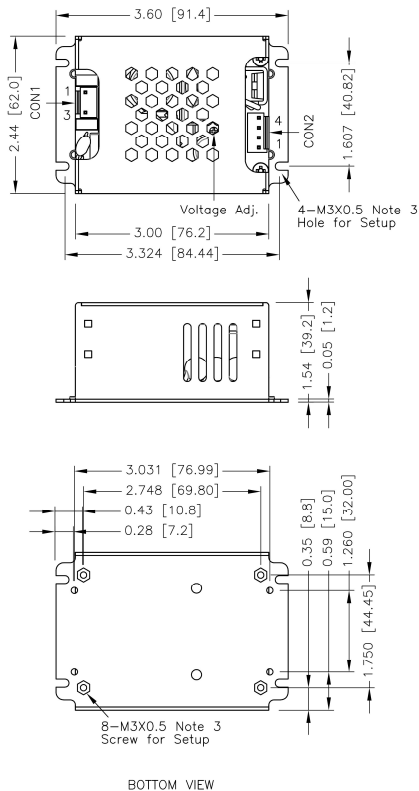
### CON2 – Output Connector

|         |       |
|---------|-------|
| Pin 1,2 | -Vout |
| Pin 3,4 | +Vout |

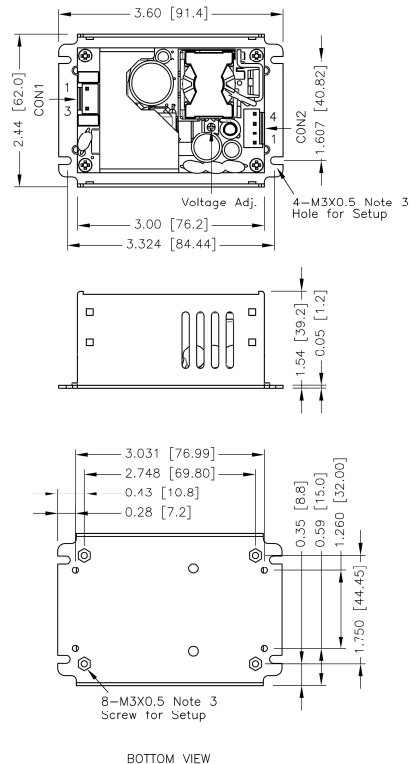
\*Either one of four screws holes of Open / Chassis type can be considered as PE connection for CLASS I application.

## MECHANICAL DRAWING(CONTINUED)

**MED** Open type



**MUD** Din rail type



1. All dimensions in inch [mm]
2. Tolerance : x.xx±0.02 [x.x±0.5] x.xxx±0.01 [x.xx±0.25]
3. M3×0.5 screw locked torque MAX 5Kgf.cm/0.49N.m

### CONNECTORS CONNECTIONS

| CON1 – Input Connector |         |
|------------------------|---------|
| Pin 1                  | Line    |
| Pin 3                  | Neutral |

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

\*Either one of four screws holes of Open / Chassis type can be considered as PE connection for CLASS I application.

### CONNECTOR OPTIONS

| Blank: | JST Type                                                    | -M | Molex Type                                                 | -T | Terminal Block                            |
|--------|-------------------------------------------------------------|----|------------------------------------------------------------|----|-------------------------------------------|
|        | Mates with housing<br>CON1: VHR-3N<br>CON2: VHR-4N          |    | Mates with housing<br>CON1: 09-50-8031<br>CON2: 09-50-8041 |    | Screw locked torque<br>MAX 2Kgf.cm/0.2N.m |
|        | Crimp terminals<br>CON1: SVH-21T-P1.1<br>CON2: SVH-21T-P1.1 |    | Crimp terminals<br>CON1: SD-2478<br>CON2: SD-2478          |    | Wire dimension range<br>26 ~ 16AWG        |