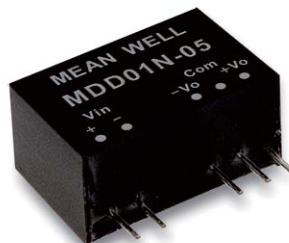




1W SIP Package DC-DC Medical Grade Unregulated Converter

## MDS01 & MDD01 series



### ■ Features

- SIP7 package with international standard pinout
- Operating temperature range -40 ~ +85°C
- Medical safety approved (1xMOPP/2xMOOP) according to ANSI/AAMI ES60601-1
- Low patient leakage current <2μA
- Protection: Short circuit(3 second max.)
- 6KVDC or 4.2KVAC high I/O isolation (Reinforced isolation)
- Low cost
- 3 years warranty

### ■ Applications

- Medical devices
- Medical oxygen monitor
- CT scanning
- Medical carts
- Oral care equipment

### ■ Description

MDS01 and MDD01 series are 1W isolated and unregulated module type medical grade DC-DC converter with SIP7 package. It features international standard pins, a high efficiency up to 83%, wide working temperature range -40~+85°C, 6KVDC or 4.2KVAC I/P-O/P high isolation voltage, short circuit protection, etc. The models account for different input voltage 5V/12V/24V±10%, and various output voltage, 3.3V/5V/12V/15V for single output and ±5V/±9V/±12V/±15V for dual outputs, which are suitable for medical systems, ultra low leakage current.

### ■ Model Encoding

**MD S 01 L - 12**

Output voltage (3.3/5/12/15Vdc , ±5/±9/±12/±15Vdc)

Input voltage (L: 4.5 ~ 5.5Vdc , M: 10.8 ~ 13.2Vdc , N: 21.6 ~ 26.4Vdc)

Rated wattage

Series name { S:Single output  
D:Dual output



1W SIP Package DC-DC Medical Grade Unregulated Converter

# MDS01 & MDD01 series

| MODEL SELECTION TABLE |                              |               |           |                   |                   |                      |                          |
|-----------------------|------------------------------|---------------|-----------|-------------------|-------------------|----------------------|--------------------------|
| ORDER NO.             | INPUT                        |               |           | OUTPUT            |                   | EFFICIENCY<br>(TYP.) | CAPACITOR LOAD<br>(MAX.) |
|                       | INPUT VOLTAGE<br>(RANGE)     | INPUT CURRENT |           | OUTPUT<br>VOLTAGE | OUTPUT<br>CURRENT |                      |                          |
|                       |                              | NO LOAD       | FULL LOAD |                   |                   |                      |                          |
| MDS01L-03             | Normal 5V<br>(4.5 ~ 5.5V)    | 25mA          | 260mA     | 3.3V              | 31 ~ 303mA        | 73%                  | 1000μF                   |
| MDS01L-05             |                              | 25mA          | 260mA     | 5V                | 20 ~ 200mA        | 78%                  | 1000μF                   |
| MDS01L-12             |                              | 40mA          | 260mA     | 12V               | 9 ~ 84mA          | 77%                  | 470μF                    |
| MDS01L-15             |                              | 45mA          | 265mA     | 15V               | 7 ~ 67mA          | 75%                  | 470μF                    |
| MDD01L-05             |                              | 25mA          | 260mA     | ±5V               | ±10 ~ 100mA       | 79%                  | *470μF                   |
| MDD01L-09             |                              | 35mA          | 260mA     | ±9V               | ±6 ~ 56mA         | 81%                  | *470μF                   |
| MDD01L-12             |                              | 40mA          | 265mA     | ±12V              | ±5 ~ 42mA         | 77%                  | *220μF                   |
| MDD01L-15             |                              | 45mA          | 275mA     | ±15V              | ±4 ~ 34mA         | 77%                  | *220μF                   |
| MDS01M-05             | Normal 12V<br>(10.8 ~ 13.2V) | 15mA          | 105mA     | 5V                | 20 ~ 200mA        | 78%                  | 1000μF                   |
| MDS01M-12             |                              | 15mA          | 105mA     | 12V               | 9 ~ 84mA          | 82%                  | 470μF                    |
| MDS01M-15             |                              | 15mA          | 105mA     | 15V               | 7 ~ 67mA          | 83%                  | 470μF                    |
| MDD01M-05             |                              | 14mA          | 105mA     | ±5V               | ±10 ~ 100mA       | 78%                  | *470μF                   |
| MDD01M-09             |                              | 14mA          | 105mA     | ±9V               | ±6 ~ 56mA         | 82%                  | *470μF                   |
| MDD01M-12             |                              | 22mA          | 114mA     | ±12V              | ±5 ~ 42mA         | 75%                  | *220μF                   |
| MDD01M-15             |                              | 22mA          | 114mA     | ±15V              | ±4 ~ 34mA         | 76%                  | *220μF                   |
| MDS01N-05             | Normal 24V<br>(21.6 ~ 26.4V) | 9mA           | 55mA      | 5V                | 20 ~ 200mA        | 77%                  | 1000μF                   |
| MDS01N-12             |                              | 9mA           | 55mA      | 12V               | 9 ~ 84mA          | 79%                  | 470μF                    |
| MDS01N-15             |                              | 9mA           | 55mA      | 15V               | 7 ~ 67mA          | 79%                  | 470μF                    |
| MDD01N-05             |                              | 9mA           | 55mA      | ±5V               | ±10 ~ 100mA       | 77%                  | *470μF                   |
| MDD01N-09             |                              | 9mA           | 55mA      | ±9V               | ±6 ~ 56mA         | 79%                  | *470μF                   |
| MDD01N-12             |                              | 10mA          | 56mA      | ±12V              | ±5 ~ 42mA         | 77%                  | *220μF                   |
| MDD01N-15             |                              | 11mA          | 57mA      | ±15V              | ±4 ~ 34mA         | 77%                  | *220μF                   |

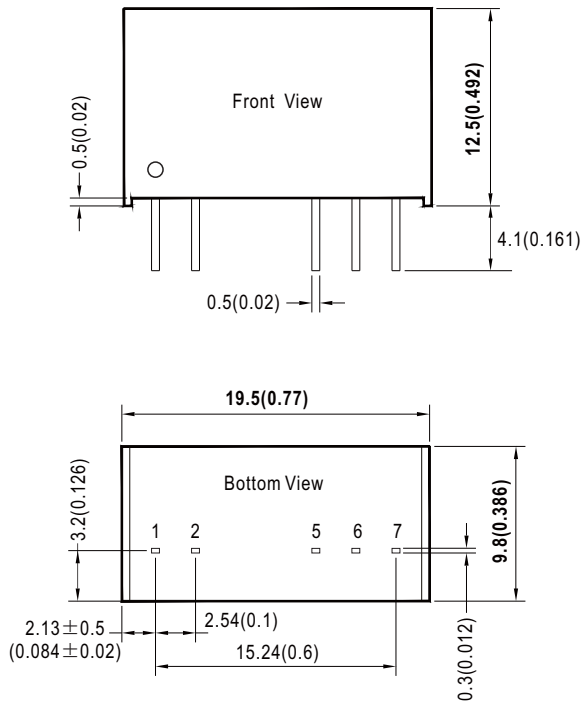
\* For each output



| SPECIFICATION             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                      |                       |                   |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-----------------------|-------------------|
| INPUT                     | VOLTAGE RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | L: 4.5 ~ 5.5Vdc<br>M: 10.8 ~ 13.2Vdc<br>N: 21.6 ~ 26.4Vdc                            |                       |                   |
|                           | SURGE VOLTAGE (100ms max.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 5Vin models : 9Vdc<br>12Vin models : 18Vdc<br>24Vin models : 30Vdc                   |                       |                   |
|                           | FILTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Internal capacitor                                                                   |                       |                   |
|                           | PROTECTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Fuse recommended. 500mA Slow-Blow Type for all models                                |                       |                   |
| OUTPUT                    | VOLTAGE ACCURACY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ±5.0%                                                                                |                       |                   |
|                           | RATED POWER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1W                                                                                   |                       |                   |
|                           | RIPPLE & NOISE   Note.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 75mVp-p                                                                              |                       |                   |
|                           | LINE REGULATION   Note.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1.2% for 1% input variation                                                          |                       |                   |
|                           | LOAD REGULATION   Note.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ±10%                                                                                 |                       |                   |
|                           | SWITCHING FREQUENCY (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 100KHz                                                                               |                       |                   |
| PROTECTION                | SHORT CIRCUIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 3 second max.                                                                        |                       |                   |
| ENVIRONMENT               | COOLING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Free-air convection                                                                  |                       |                   |
|                           | WORKING TEMP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | -40 ~ +85°C (Refer to "Derating Curve")                                              |                       |                   |
|                           | WORKING HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 20% ~ 90% RH non-condensing                                                          |                       |                   |
|                           | STORAGE TEMP., HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -55 ~ +125°C, 10 ~ 95% RH non-condensing                                             |                       |                   |
|                           | TEMP. COEFFICIENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.02% / °C (0 ~ 85°C)                                                                |                       |                   |
|                           | SOLDERING TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1.5mm from case of 1 ~ 3sec./260°C max.                                              |                       |                   |
|                           | VIBRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes              |                       |                   |
| SAFETY & EMC<br>( Note.6) | SAFETY STANDARDS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | UL60601-1, EAC TP TC 004 approved                                                    |                       |                   |
|                           | WITHSTAND VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | I/P-O/P:6KVDC or 4.2KVAC                                                             |                       |                   |
|                           | ISOLATION RESISTANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | I/P-O/P:100M Ohms / 500VDC / 25°C / 70% RH                                           |                       |                   |
|                           | ISOLATION LEVEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Primary-secondary: 1xMOPP / 2xMOOP when system input voltage is with 250VAC, 50/60Hz |                       |                   |
|                           | ISOLATION CAPACITANCE (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 5pF                                                                                  |                       |                   |
|                           | EMC EMISSION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Parameter                                                                            | Standard              | Test Level / Note |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Conducted                                                                            | EN55011(CISPR11)      | Class B           |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Radiated                                                                             | EN55011(CISPR11)      | Class B           |
|                           | EMC IMMUNITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Parameter                                                                            | Standard              | Test Level / Note |
| ESD                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | EN61000-4-2                                                                          | Level 2, ±8KV contact |                   |
| OTHERS                    | MTBF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 3500Khrs   MIL-HDBK-217F(25°C)                                                       |                       |                   |
|                           | DIMENSION (L*W*H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 19.5*9.8*12.5mm (0.77*0.386*0.492 inch)                                              |                       |                   |
|                           | CASE MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non-Conductive black plastic (UL 94V-0 rated)                                        |                       |                   |
|                           | PACKING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 4.2g                                                                                 |                       |                   |
| NOTE                      | 1.All parameters are specified at normal input(L:5Vdc, M:12Vdc, N:24Vdc), rated load, 25°C 70% RH ambient.<br>2.Ripple & noise are measured at 20MHz by using a 12" twisted pair terminated with a 0.1µf & 47µf capacitor.<br>3.Line regulation is measured from low line to high line at rated load.<br>4.Load regulation is measured from 10% to 100% rated load.<br>5.Patient leakage current(2µA max.) and reinforced isolation is based on a 250VAC, 50/60Hz system input voltage.<br>6.The final equipment must be re-confirm that it still meet EMC directives. For guidance on how to perform these EMC tests, please refer to "EMI testing of component power supplies."(as available on http://www.meanwell.com)<br>※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx |                                                                                      |                       |                   |

## Mechanical Specification

- All dimensions in mm(inch)
- Tolerance:  $x.x \pm 0.25\text{mm}$  ( $x.xx \pm 0.01"$ )  
 $x.xx \pm 0.10\text{mm}$  ( $x.xxx \pm 0.004"$ )
- Pin pitch tolerance:  $\pm 0.05\text{mm}$  ( $\pm 0.002"$ )

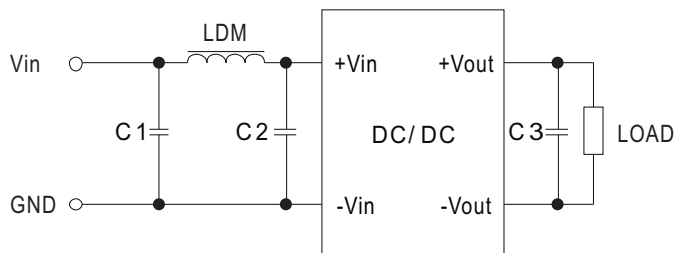


## Plug Assignment

| Pin-Out |                          |                        |
|---------|--------------------------|------------------------|
| Pin No. | MDS01<br>(Single output) | MDD01<br>(Dual output) |
| 1       | +Vin                     | +Vin                   |
| 2       | -Vin                     | -Vin                   |
| 5       | -Vout                    | -Vout                  |
| 6       | No pin                   | Common                 |
| 7       | +Vout                    | +Vout                  |

## EMC Suggestion

EMC typical recommended circuit (Class B)



Recommended typical circuit parameters:

| Input voltage (V) |       | 3.3/5/12/15/24 |
|-------------------|-------|----------------|
| EMI               | C1,C2 | 4.7μF/50V      |
|                   | C3    | See table 2    |
|                   | LDM   | 6.8μH          |

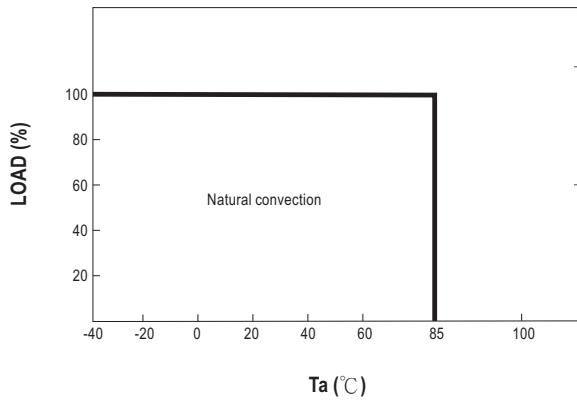
Table 1

| Single Vout | C3(μF) | Dual Vout  | C3(μF) |
|-------------|--------|------------|--------|
| 3.3/5V      | 10μF   | ±5V        | 4.7μF  |
| 12V         | 2.2μF  | ±9V        | 2.2μF  |
| 15V         | 1μF    | ±12V / 15V | 1μF    |

Table 2



## ■ Derating Curve



## ■ Installation Manual

Please refer to : <http://www.meanwell.com/manual.html>