



6W DIP Package DC-DC Medical Grade Regulated Converter

## MDS06 & MDD06 series



### ■ Features

- DIP 24 package with international standard pinout
- 4:1 wide input range
- Low patient leakage current <5μA
- Wide operating temperature range -40 ~ +90°C
- Medical safety approved (2xMOPP) according to IEC60601-1
- Protections: Short circuit (Continuous) / Overload
- 6KVDC or 4.2KVAC high I/O isolation (Reinforced isolation)
- 3 years warranty

### ■ Applications

- Medical devices
- Medical oxygen monitor
- CT scanning
- Medical carts
- Oral care equipment
- Industrial control system

### ■ GTIN CODE

MW Search: <https://www.meanwell.com/serviceGTIN.aspx>

### ■ Description

MDS06 and MDD06 series are 6W isolated and regulated module type medical grade DC-DC converter with DIP 24 package. It features international standard pins, a high efficiency up to 84%, wide working temperature range -40~+90°C, 6KVDC or 4.2KVAC I/P-O/P high isolation voltage, compliance with IEC60601-1 medical standard, continuous-mode short circuit protection, etc. The models account for different input voltage 9~36V and 18~75V 4:1 wide input range, and various output voltage, 5V/12V/15V for single output and  $\pm 5V/\pm 12V/\pm 15V$  for dual output. Which are suitable for medical systems, ultra low leakage current.

### ■ Model Encoding

MD S 06 F - 12

Output voltage (5/12/15Vdc,  $\pm 5/\pm 12/\pm 15$ Vdc)

Input voltage (F: 9~36Vdc, G: 18~75Vdc)

Rated wattage

Series name { S: Single output  
D: Dual output



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| 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 |                   |                   |                      |                          |
| MDS06F-05             | Normal 12V,24V<br>(9 ~ 36V)  | 20mA          | 625mA     | 5V                | 0 ~ 1200mA        | 80%                  | 330μF                    |
| MDS06F-12             |                              | 22mA          | 620mA     | 12V               | 0 ~ 500mA         | 81%                  | 120μF                    |
| MDS06F-15             |                              | 20mA          | 602mA     | 15V               | 0 ~ 400mA         | 83%                  | 100μF                    |
| MDD06F-05             |                              | 20mA          | 625mA     | ± 5V              | ±60 ~ 600mA       | 80%                  | *330μF                   |
| MDD06F-12             |                              | 28mA          | 617mA     | ± 12V             | ±25 ~ 250mA       | 81%                  | *47μF                    |
| MDD06F-15             |                              | 30mA          | 612mA     | ± 15V             | ±20 ~ 200mA       | 82%                  | *47μF                    |
| MDS06G-05             | Normal 24V,48V<br>(18 ~ 75V) | 10mA          | 315mA     | 5V                | 0 ~ 1200mA        | 80%                  | 330μF                    |
| MDS06G-12             |                              | 12mA          | 305mA     | 12V               | 0 ~ 500mA         | 84%                  | 120μF                    |
| MDS06G-15             |                              | 12mA          | 300mA     | 15V               | 0 ~ 400mA         | 84%                  | 100μF                    |
| MDD06G-05             |                              | 10mA          | 313mA     | ± 5V              | ±60 ~ 600mA       | 80%                  | *330μF                   |
| MDD06G-12             |                              | 15mA          | 315mA     | ± 12V             | ±25 ~ 250mA       | 81%                  | *47μF                    |
| MDD06G-15             |                              | 15mA          | 310mA     | ± 15V             | ±20 ~ 200mA       | 82%                  | *47μF                    |

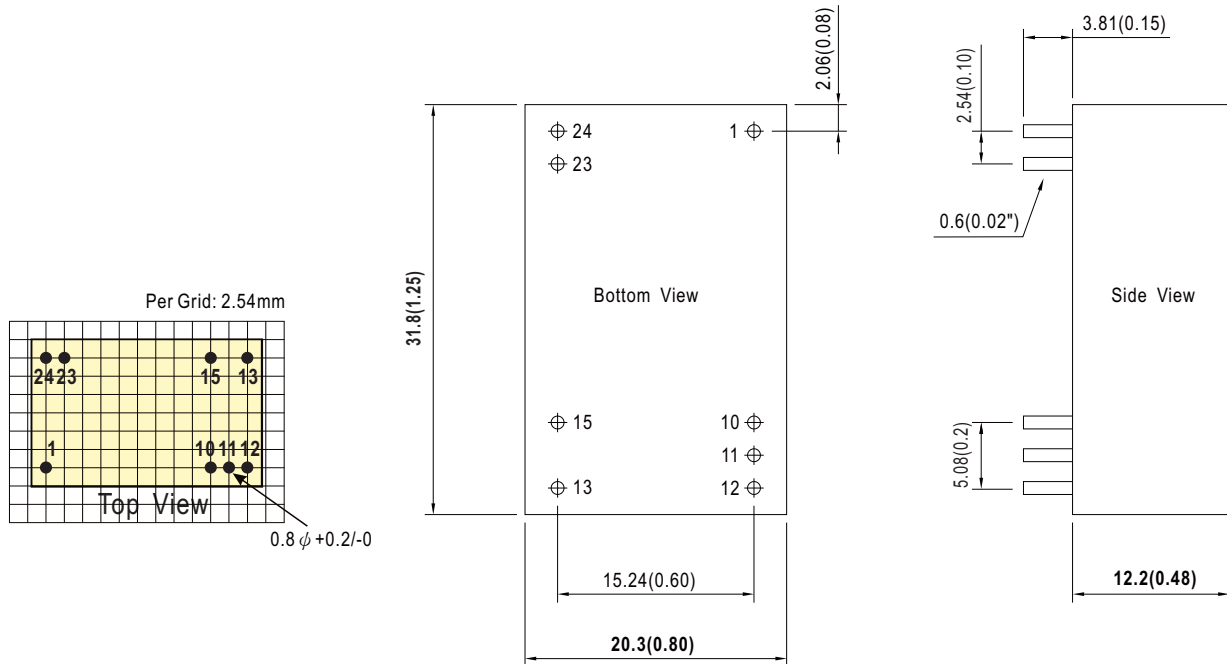
\* For each output



| SPECIFICATION             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                            |                             |                                     |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------|-------------------------------------|
| INPUT                     | VOLTAGE RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | F: 9 ~ 36Vdc , G: 18 ~ 75Vdc                                                                               |                             |                                     |
|                           | SURGE VOLTAGE (100ms max.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | F models : 50Vdc ; G models : 100Vdc                                                                       |                             |                                     |
|                           | FILTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Pi type                                                                                                    |                             |                                     |
|                           | PROTECTION (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Fuse recommended. F models: 2A slow-blow Type, G models: 1A slow-blow Type                                 |                             |                                     |
| OUTPUT                    | VOLTAGE ACCURACY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ±2%                                                                                                        |                             |                                     |
|                           | RATED POWER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 6W                                                                                                         |                             |                                     |
|                           | RIPPLE & NOISE    Note.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 100mVp-p                                                                                                   |                             |                                     |
|                           | LINE REGULATION   Note.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ±0.5%                                                                                                      |                             |                                     |
|                           | LOAD REGULATION   Note.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ±0.5%                                                                                                      |                             |                                     |
|                           | SWITCHING FREQUENCY (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 280KHz                                                                                                     |                             |                                     |
| PROTECTION                | SHORT CIRCUIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Protection type : Continuous, automatic recovery                                                           |                             |                                     |
|                           | OVERLOAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 110 ~ 250% rated output power<br>Protection type : Recovers automatically after fault condition is removed |                             |                                     |
| ENVIRONMENT               | COOLING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Free-air convection                                                                                        |                             |                                     |
|                           | WORKING TEMP.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | -40 ~ +90℃ (Refer to "Derating Curve")                                                                     |                             |                                     |
|                           | CASE TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | +105℃ max.                                                                                                 |                             |                                     |
|                           | WORKING HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 20% ~ 90% RH non-condensing                                                                                |                             |                                     |
|                           | STORAGE TEMP., HUMIDITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -55 ~ +125℃, 10 ~ 95% RH non-condensing                                                                    |                             |                                     |
|                           | TEMP. COEFFICIENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.05% / °C (0 ~ 71℃)                                                                                       |                             |                                     |
|                           | SOLDERING TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 1.5mm from case of 3 ~ 5sec./265℃ max.                                                                     |                             |                                     |
|                           | VIBRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes                                    |                             |                                     |
| SAFETY & EMC<br>( Note.5) | SAFETY STANDARDS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IEC60601-1(LVD) 3 <sup>rd</sup> edition, EAC TP TC 020/2011(EAC TP TC 004 for 48Vin type only) approved    |                             |                                     |
|                           | WITHSTAND VOLTAGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | I/P-O/P:6KVDC or 4.2KVAC                                                                                   |                             |                                     |
|                           | ISOLATION RESISTANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | I/P-O/P:1000M Ohms / 500VDC / 25℃/ 70% RH                                                                  |                             |                                     |
|                           | ISOLATION CAPACITANCE (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 20pF                                                                                                       |                             |                                     |
|                           | ISOLATION LEVEL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Primary-secondary: 2xMOPP when system input voltage is with 250VAC, 50/60Hz                                |                             |                                     |
|                           | EMC EMISSION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Parameter                                                                                                  | Standard                    | Test Level / Note                   |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Conducted                                                                                                  | BS EN/EN55011               | N/A                                 |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Radiated                                                                                                   | BS EN/EN55011               | Class A without external components |
|                           | EMC IMMUNITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Parameter                                                                                                  | Standard                    | Test Level / Note                   |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ESD                                                                                                        | BS EN/EN61000-4-2           | ±15KV air                           |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Radiated Susceptibility                                                                                    | BS EN/EN61000-4-3           | 10V/m                               |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | EFT/Bursts                                                                                                 | BS EN/EN61000-4-4           | ±2KV                                |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Surge                                                                                                      | BS EN/EN61000-4-5           | ±2KV Line-Line                      |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Conducted                                                                                                  | BS EN/EN61000-4-6           | 10Vrms(e.m.f.)                      |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Magnetic Field                                                                                             | BS EN/EN61000-4-8           | 30A/m                               |
| OTHERS                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MTBF                                                                                                       | >454Khrs MIL-HDBK-217F(25℃) |                                     |
|                           | DIMENSION (L*W*H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 31.8*20.3*12.2mm (1.25*0.8*0.48 inch)                                                                      |                             |                                     |
|                           | CASE MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | UL94V-0 plastic case                                                                                       |                             |                                     |
|                           | PACKING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 17g ; 15pcs/per tube, 750pcs/50 tube max./carton                                                           |                             |                                     |
| NOTE                      | 1.All parameters are specified at normal input(F: 12Vdc, G: 24Vdc), rated load, 25℃ 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 for MDD06.<br>5.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 <a href="http://www.meanwell.com">http://www.meanwell.com</a> )<br>※ Product Liability Disclaimer : For detailed information, please refer to <a href="https://www.meanwell.com/serviceDisclaimer.aspx">https://www.meanwell.com/serviceDisclaimer.aspx</a> |                                                                                                            |                             |                                     |

### Mechanical Specification

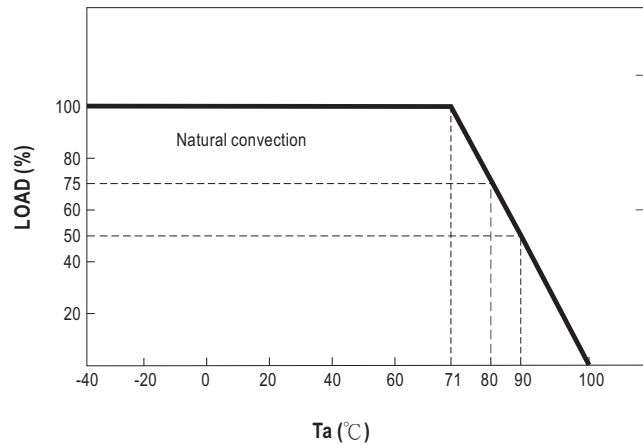
- All dimensions in mm(inch)
- Tolerance: x.x or x.xx $\pm$ 0.5mm(x.xx $\pm$ 0.02")
- Pin size is: 0.6 $\pm$ 0.10mm (0.02"  $\pm$  0.004")



### Plug Assignment

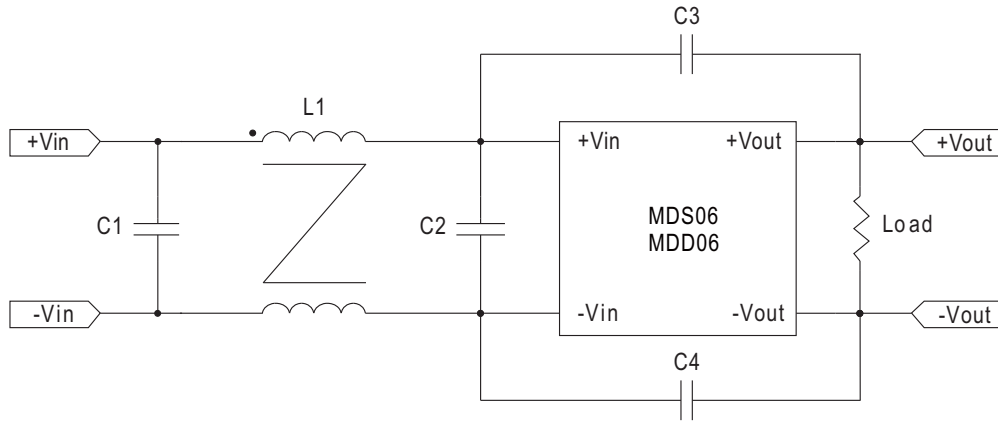
| Pin-Out |                          |                        |
|---------|--------------------------|------------------------|
| Pin No. | MDS06<br>(Single output) | MDD06<br>(Dual output) |
| 1       | +Vin                     | +Vin                   |
| 10      | No pin                   | No pin                 |
| 11      | No pin                   | Common                 |
| 12      | -Vout                    | No pin                 |
| 13      | +Vout                    | -Vout                  |
| 15      | No pin                   | +Vout                  |
| 23,24   | -Vin                     | -Vin                   |

### Derating Curve



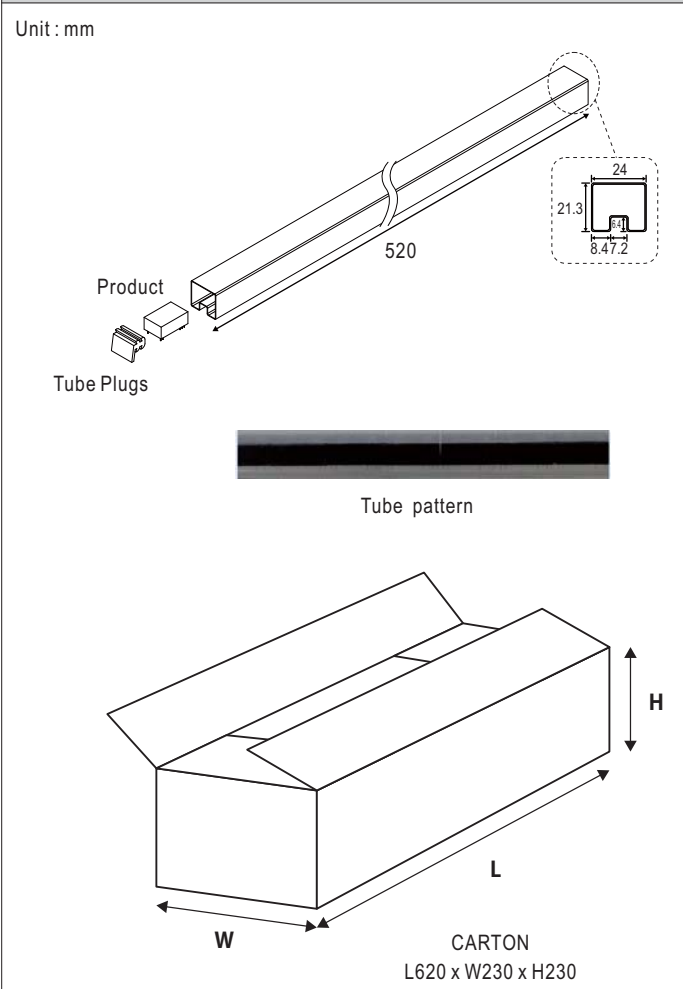
### ■ EMC Suggestion Circuit

※Required external components to meet BS EN/EN55011 class B emission are as below:



|        | C1                       | C2                       | C3 | C4 | L1                               |
|--------|--------------------------|--------------------------|----|----|----------------------------------|
| MDS06F | 10 $\mu$ F/50V<br>MLCC   | 10 $\mu$ F/50V<br>MLCC   | X  | X  | 450 $\mu$ H<br>Common Mode Choke |
| MDS06G | 4.7 $\mu$ F/100V<br>MLCC | 4.7 $\mu$ F/100V<br>MLCC | X  | X  | 450 $\mu$ H<br>Common Mode Choke |

## Packing

| Standard Tube Packing                                                                                                                                                                                                                                                  | MPQ<br>Per Tube<br>(PCS) | One Tube<br>G.W. | Max. Q'TY/<br>Carton(PCS) | One Carton<br>G.W. |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------|---------------------------|--------------------|
| <p>Unit : mm</p>  <p>Product</p> <p>Tube Plugs</p> <p>520</p> <p>24</p> <p>21.3</p> <p>8.472</p> <p>Tube pattern</p> <p>CARTON<br/>L620 x W230 x H230</p> <p>W</p> <p>L</p> <p>H</p> | 15                       | 310g             | 750                       | 16.1Kg             |

## Installation Manual

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