



20W 2"x1" Package Medical Grade DC-DC Converter

**MDS20** series



## ■ Features

- DIP 2"x1" package with international standard pinout
- 2:1 wide input range
- Low patient leakage current <5μA
- Wide operating temperature range -40 ~ +90°C
- Medical safety approved (2xMOPP) according to IEC60601-1
- No minimum load required
- Protections: Short circuit (Continuous) / Overload / Input under voltage
- 4000VAC high I/O isolation (Reinforced isolation)
- 3 years warranty

## ■ Applications

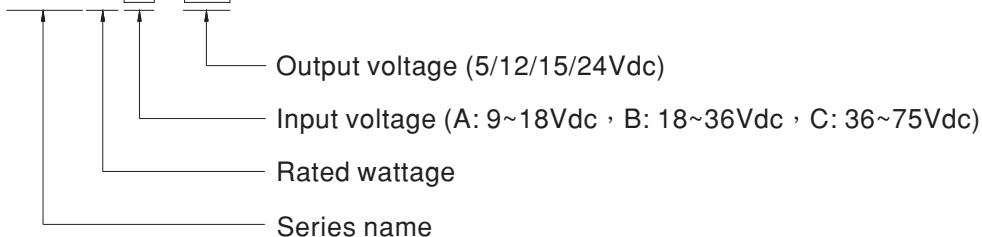
- Medical devices
- Medical oxygen monitor
- CT scanning
- Medical carts
- Oral care equipment

## ■ Description

MDS20 series is 20W isolated and regulated module type medical grade DC-DC converter with 2"x1" package. It features international standard pins, a high efficiency up to 90%, wide working temperature range -40~+90°C, 4KVAC 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 9~18V, 18~36V and 36~75V 2:1 wide input range, and various output voltage 5V/12V/15V/24V, which are suitable for medical systems, ultra low leakage current.

## ■ Model Encoding

**MDS20 A -12**



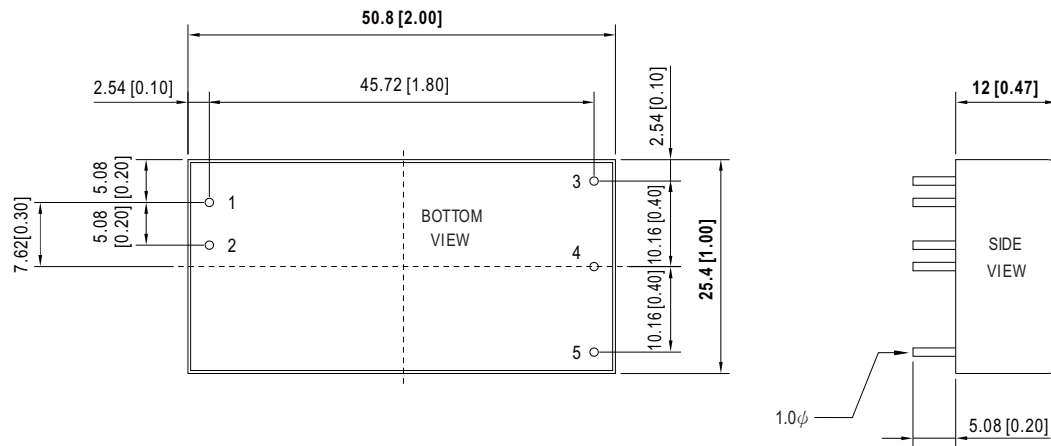
| MODEL SELECTION TABLE |                          |               |           |                   |                   |                      |                          |
|-----------------------|--------------------------|---------------|-----------|-------------------|-------------------|----------------------|--------------------------|
| 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 |                   |                   |                      |                          |
| MDS20A-05             | Normal 12V<br>(9 ~ 18V)  | 10mA          | 1950mA    | 5V                | 4000mA            | 86%                  | 6800μF                   |
| MDS20A-12             |                          | 10mA          | 1950mA    | 12V               | 1670mA            | 89%                  | 1200μF                   |
| MDS20A-15             |                          | 10mA          | 1950mA    | 15V               | 1333mA            | 88%                  | 800μF                    |
| MDS20A-24             |                          | 10mA          | 1950mA    | 24V               | 833mA             | 88%                  | 300μF                    |
| MDS20B-05             | Normal 24V<br>(18 ~ 36V) | 7mA           | 1000mA    | 5V                | 4000mA            | 86%                  | 6800μF                   |
| MDS20B-12             |                          | 7mA           | 1000mA    | 12V               | 1670mA            | 88%                  | 1200μF                   |
| MDS20B-15             |                          | 7mA           | 1000mA    | 15V               | 1333mA            | 88%                  | 800μF                    |
| MDS20B-24             |                          | 7mA           | 1000mA    | 24V               | 833mA             | 89%                  | 300μF                    |
| MDS20C-05             | Normal 48V<br>(36 ~ 75V) | 5mA           | 500mA     | 5V                | 4000mA            | 86%                  | 6800μF                   |
| MDS20C-12             |                          | 5mA           | 500mA     | 12V               | 1670mA            | 89%                  | 1200μF                   |
| MDS20C-15             |                          | 5mA           | 500mA     | 15V               | 1333mA            | 88%                  | 800μF                    |
| MDS20C-24             |                          | 5mA           | 500mA     | 24V               | 833mA             | 90%                  | 300μF                    |

| SPECIFICATION             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                        |                   |                                        |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------------------------|
| INPUT                     | VOLTAGE RANGE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | A: 9~18Vdc<br>B: 18~36Vdc<br>C: 36~75Vdc                                                                               |                   |                                        |
|                           | SURGE VOLTAGE (100ms max.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12Vin models : 25Vdc, 24Vin models : 50Vdc, 48Vin models : 100Vdc                                                      |                   |                                        |
|                           | FILTER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Pi type                                                                                                                |                   |                                        |
|                           | PROTECTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Fuse recommended. 12Vin models: 5A delay time Type, 24Vin models: 3A delay time Type, 48Vin models: 2A delay time Type |                   |                                        |
| OUTPUT                    | VOLTAGE ACCURACY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ± 1%                                                                                                                   |                   |                                        |
|                           | RATED POWER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 20W                                                                                                                    |                   |                                        |
|                           | RIPPLE & NOISE   Note.2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 60mVp-p                                                                                                                |                   |                                        |
|                           | LINE REGULATION   Note.3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ±0.5%                                                                                                                  |                   |                                        |
|                           | LOAD REGULATION   Note.4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ±0.5%                                                                                                                  |                   |                                        |
|                           | SWITCHING FREQUENCY (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 12Vin/24Vin:250KHz, 48Vin:300KHz                                                                                       |                   |                                        |
| PROTECTION                | SHORT CIRCUIT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Protection type : Continuous, automatic recovery                                                                       |                   |                                        |
|                           | OVERLOAD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 110 ~ 180% rated output power                                                                                          |                   |                                        |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Protection type : Recovers automatically after fault condition is removed                                              |                   |                                        |
|                           | UNDER VOLTAGE LOCKOUT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 12Vin: 7.5Vdc, 24Vin: 15Vdc, 48Vin: 33Vdc                                                                              |                   |                                        |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 0.03% / °C (0 ~ 70℃)                                                                                                   |                   |                                        |
|                           | SOLDERING TEMPERATURE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1.5mm from case of 1 ~ 3sec./260℃ max.                                                                                 |                   |                                        |
|                           | VIBRATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes                                                |                   |                                        |
| SAFETY & EMC<br>( Note.6) | 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 4KVAC                                                                                                          |                   |                                        |
|                           | ISOLATION RESISTANCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | I/P-O/P:100M Ohms / 500VDC / 25℃ / 70% RH                                                                              |                   |                                        |
|                           | ISOLATION CAPACITANCE (Typ.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 100pF                                                                                                                  |                   |                                        |
|                           | EMC EMISSION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Parameter                                                                                                              | Standard          | Test Level / Note                      |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Conducted                                                                                                              | BS EN/EN55011     | Class A without external components    |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Radiated                                                                                                               | BS EN/EN55011     | N/A                                    |
|                           | EMC IMMUNITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Parameter                                                                                                              | Standard          | Test Level / Note                      |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | ESD                                                                                                                    | BS EN/EN61000-4-2 | Level 1, ±15KV air, ±8KV contact       |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Radiated Susceptibility                                                                                                | BS EN/EN61000-4-3 | Level 1, 10V/m                         |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | EFT/Burest                                                                                                             | BS EN/EN61000-4-4 | Level 1, ±2KV                          |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Surge                                                                                                                  | BS EN/EN61000-4-5 | Level 1, ±1KV Line-Line, ±2KV Line-GND |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Conducted                                                                                                              | BS EN/EN61000-4-6 | Level 1, 10Vrms(e.m.f.)                |
|                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                        |                   |                                        |
| OTHERS                    | MTBF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 1016Khrs MIL-HDBK-217F(25℃)                                                                                            |                   |                                        |
|                           | DIMENSION (L*W*H)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 50.8*25.4*12mm (2*1*0.47 inch)                                                                                         |                   |                                        |
|                           | CASE MATERIAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | UL94V-0 plastic case                                                                                                   |                   |                                        |
|                           | PACKING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 30g; 18pcs/per tube, 432pcs/24 tube max./carton                                                                        |                   |                                        |
| NOTE                      | 1.All parameters are specified at normal input(A:12Vdc, B:24Vdc, C:48Vdc), 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 0% to 100% rated load.<br>5.2xMOPP base on a working voltage of 250Vac between Primary to Secondary.<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 <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:  $x.x \pm 0.5\text{mm}$  ( $x.xxx \pm 0.125"$ )
- Pin size is  $1 \pm 0.1\text{mm}$  ( $0.04 \pm 0.004"$ )

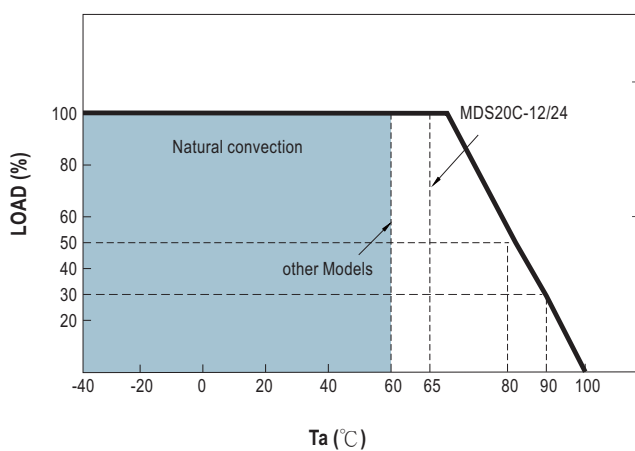
Unit:mm(inch)



### Pin Configuration

| Pin No. | Pin-Out |
|---------|---------|
| 1       | +Vin    |
| 2       | -Vin    |
| 3       | +Vout   |
| 4       | No Pin  |
| 5       | -Vout   |

### Derating Curve



### Installation Manual

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