

# VD-5W Series



*5W 2:1 Regulated Single & Dual output*

## Features

- Wide 2:1 Input Range
- 1500VDC Isolation, Up to 3500VDC
- Continuous Short Circuit Protection
- Efficiency up to 87%
- Operating Temperature Range -40 ~ 95°C max.



## PART NUMBER STRUCTURE

**VD** - **24** **05** **S** **5** **H**  
(1) (2) (3) (4) (5) (6)

### (1) Series

### (2) Input Voltage Range

12 - 9-18 V  
24 - 18-36 V  
48 - 36-72 V

### (4) Output Type

S - Single Output  
D - Dual Output

### (3) Output Voltage

3R3 - 3.3 V  
05 - 5.0 V  
7R2 - 7.2 V  
09 - 9.0 V  
12 - 12 V  
15 - 15 V  
18 - 18 V  
24 - 24 V

### (5) Watt

### (6) Isolation Voltage

Blank - 1500 VDC  
H - 3500 VDC

ALL SPECIFICATIONS ARE TYPICAL AT 25°C, NOMINAL INPUT AND FULL LOAD UNLESS OTHERWISE NOTED

| Model Number | Input Voltage Range (VDC) | Input Current      |                      | Output Voltage (VDC) | Output Current |                | Efficiency @FL (% , typ.) | Capacitive Load @FL (μF, max.) |
|--------------|---------------------------|--------------------|----------------------|----------------------|----------------|----------------|---------------------------|--------------------------------|
|              |                           | No-Load (mA, max.) | Full Load (mA, typ.) |                      | Min. load (mA) | Full load (mA) |                           |                                |
| VD-123R3S5   | 9-18                      | 15                 | 471                  | 3.3                  | 0              | 1300           | 76                        | 1000                           |
| VD-1205S5    | 9-18                      | 20                 | 528                  | 5                    | 0              | 1000           | 79                        | 1000                           |
| VD-127R2S5   | 9-18                      | 18                 | 509                  | 7.2                  | 0              | 694            | 82                        | 1000                           |
| VD-1209S5    | 9-18                      | 18                 | 509                  | 9                    | 0              | 555            | 82                        | 470                            |
| VD-1212S5    | 9-18                      | 20                 | 497                  | 12                   | 0              | 417            | 84                        | 330                            |
| VD-1215S5    | 9-18                      | 20                 | 497                  | 15                   | 0              | 333            | 84                        | 100                            |
| VD-1218S5    | 9-18                      | 20                 | 503                  | 18                   | 0              | 277            | 83                        | 100                            |
| VD-1224S5    | 9-18                      | 26                 | 497                  | 24                   | 0              | 208            | 84                        | 68                             |
| VD-123R3D5   | 9-18                      | 18                 | 571                  | ±3.3                 | 0              | ±750           | 73                        | ±1000                          |
| VD-1205D5    | 9-18                      | 18                 | 528                  | ±5                   | 0              | ±500           | 79                        | ±1000                          |
| VD-127R2D5   | 9-18                      | 20                 | 515                  | ±7.2                 | 0              | ±347           | 81                        | ±330                           |
| VD-1209D5    | 9-18                      | 25                 | 509                  | ±9                   | 0              | ±278           | 82                        | ±330                           |
| VD-1212D5    | 9-18                      | 25                 | 503                  | ±12                  | 0              | ±208           | 83                        | ±47                            |
| VD-1215D5    | 9-18                      | 28                 | 503                  | ±15                  | 0              | ±167           | 83                        | ±100                           |
| VD-1218D5    | 9-18                      | 30                 | 509                  | ±18                  | 0              | ±138           | 82                        | ±100                           |
| VD-1224D5    | 9-18                      | 30                 | 509                  | ±24                  | 0              | ±104           | 82                        | ±10                            |
| VD-243R3S5   | 18-36                     | 12                 | 230                  | 3.3                  | 0              | 1300           | 78                        | 1000                           |
| VD-2405S5    | 18-36                     | 10                 | 252                  | 5                    | 0              | 1000           | 83                        | 2000                           |
| VD-247R2S5   | 18-36                     | 15                 | 249                  | 7.2                  | 0              | 694            | 84                        | 1000                           |
| VD-2409S5    | 18-36                     | 12                 | 246                  | 9                    | 0              | 555            | 85                        | 470                            |
| VD-2412S5    | 18-36                     | 15                 | 243                  | 12                   | 0              | 417            | 86                        | 1000                           |
| VD-2415S5    | 18-36                     | 15                 | 249                  | 15                   | 0              | 333            | 84                        | 220                            |
| VD-2418S5    | 18-36                     | 15                 | 243                  | 18                   | 0              | 277            | 86                        | 100                            |
| VD-2424S5    | 18-36                     | 18                 | 243                  | 24                   | 0              | 208            | 86                        | 1000                           |

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| Model Number | Input Voltage Range (VDC) | Input Current      |                      | Output Voltage (VDC) | Output Current |                | Efficiency @FL (% , typ.) | Capacitive Load @FL (μF, max.) |
|--------------|---------------------------|--------------------|----------------------|----------------------|----------------|----------------|---------------------------|--------------------------------|
|              |                           | No-Load (mA, max.) | Full Load (mA, typ.) |                      | Min. load (mA) | Full load (mA) |                           |                                |
| VD-243R3D5   | 18-36                     | 15                 | 268                  | ±3.3                 | 0              | ±750           | 78                        | ±470                           |
| VD-2405D5    | 18-36                     | 15                 | 258                  | ±5                   | 0              | ±500           | 81                        | ±680                           |
| VD-247R2D5   | 18-36                     | 15                 | 249                  | ±7.2                 | 0              | ±347           | 84                        | ±470                           |
| VD-2409D5    | 18-36                     | 15                 | 243                  | ±9                   | 0              | ±278           | 86                        | ±220                           |
| VD-2412D5    | 18-36                     | 15                 | 246                  | ±12                  | 0              | ±208           | 85                        | ±220                           |
| VD-2415D5    | 18-36                     | 18                 | 246                  | ±15                  | 0              | ±167           | 85                        | ±22                            |
| VD-2418D5    | 18-36                     | 22                 | 249                  | ±18                  | 0              | ±138           | 84                        | ±10                            |
| VD-2424D5    | 18-36                     | 24                 | 252                  | ±24                  | 0              | ±104           | 83                        | ±22                            |
| VD-483R3S5   | 36-72                     | 8                  | 114                  | 3.3                  | 0              | 1300           | 79                        | 100                            |
| VD-4805S5    | 36-72                     | 10                 | 128                  | 5                    | 0              | 1000           | 82                        | 1000                           |
| VD-487R2S5   | 36-72                     | 10                 | 126                  | 7.2                  | 0              | 694            | 83                        | 680                            |
| VD-4809S5    | 36-72                     | 10                 | 122                  | 9                    | 0              | 555            | 86                        | 100                            |
| VD-4812S5    | 36-72                     | 10                 | 122                  | 12                   | 0              | 417            | 86                        | 470                            |
| VD-4815S5    | 36-72                     | 10                 | 125                  | 15                   | 0              | 333            | 84                        | 330                            |
| VD-4818S5    | 36-72                     | 10                 | 122                  | 18                   | 0              | 277            | 86                        | 47                             |
| VD-4824S5    | 36-72                     | 10                 | 120                  | 24                   | 0              | 208            | 87                        | 220                            |
| VD-483R3D5   | 36-72                     | 12                 | 132                  | ±3.3                 | 0              | ±750           | 79                        | ±1000                          |
| VD-4805D5    | 36-72                     | 10                 | 128                  | ±5                   | 0              | ±500           | 82                        | ±470                           |
| VD-487R2D5   | 36-72                     | 12                 | 126                  | ±7.2                 | 0              | ±347           | 83                        | ±220                           |
| VD-4809D5    | 36-72                     | 15                 | 123                  | ±9                   | 0              | ±278           | 85                        | ±220                           |
| VD-4812D5    | 36-72                     | 10                 | 122                  | ±12                  | 0              | ±208           | 86                        | ±100                           |
| VD-4815D5    | 36-72                     | 12                 | 120                  | ±15                  | 0              | ±167           | 87                        | ±220                           |
| VD-4818D5    | 36-72                     | 12                 | 123                  | ±18                  | 0              | ±138           | 85                        | ±47                            |
| VD-4824D5    | 36-72                     | 15                 | 128                  | ±24                  | 0              | ±104           | 82                        | ±22                            |

| INPUT SPECIFICATIONS                                                                                            |                                         |         |      |      |         |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------|---------|------|------|---------|
| Parameter                                                                                                       | Conditions                              | Min.    | Typ. | Max. | Unit    |
| Input Voltage Range                                                                                             | 12V Input                               | 9       | 12   | 18   | VDC     |
|                                                                                                                 | 24V Input                               | 18      | 24   | 36   |         |
|                                                                                                                 | 48V Input                               | 36      | 48   | 72   |         |
| Input Filter                                                                                                    |                                         | Pi Type |      |      |         |
| Input Reflected Ripple Current (1)                                                                              |                                         |         | 35   |      | mApk-pk |
| Start up Time                                                                                                   | Nominal Vin and constant resistive load |         | 500  |      | ms      |
| Recommended input fuse ( slow blow )                                                                            | 12V Input                               | 1       |      |      | A       |
|                                                                                                                 | 24V Input                               | 0.5     |      |      |         |
|                                                                                                                 | 48V Input                               | 0.25    |      |      |         |
| Note :                                                                                                          |                                         |         |      |      |         |
| 1. Measured with a simulated source inductance of 12μH and a source capacitor Cin ( 47μF, ESR<1.0Ω at 100kHz ). |                                         |         |      |      |         |

| OUTPUT SPECIFICATIONS          |                                              |              |                                   |      |       |         |
|--------------------------------|----------------------------------------------|--------------|-----------------------------------|------|-------|---------|
| Parameter                      | Conditions                                   |              | Min.                              | Typ. | Max.  | Unit    |
| Output Voltage Accuracy        | 3.3V Output                                  |              | -2.0                              |      | +2.0  | %       |
|                                | Other Output                                 |              | -1.0                              |      | +1.0  |         |
| Line Regulation                |                                              |              | -0.5                              |      | +0.5  | %       |
| Load Regulation                | From 0% to 100% Load                         | 3.3V Output  | -1.5                              |      | +1.5  | %       |
|                                |                                              | Other Output | -0.5                              |      | +0.5  |         |
| Cross Regulation               | Asymmetrical Load 25% / 100% for Dual Output |              | -5                                |      | +5    | %       |
| Ripple & Noise (1)             | 20MHz bandwidth                              | 24V Output   |                                   |      | 150   | mVpk-pk |
|                                |                                              | Other Output |                                   |      | 60    |         |
| Short Circuit Protection       |                                              |              | Indefinite ( Automatic Recovery ) |      |       |         |
| Temperature Coefficient        |                                              |              | -0.02                             |      | +0.02 | %/°C    |
| Maximum Capacitive Load        | Nominal Vin and constant resistive load      |              | See Table                         |      |       |         |
| Note :                         |                                              |              |                                   |      |       |         |
| 1. Measured with a 1.0μF MLCC. |                                              |              |                                   |      |       |         |

| ABSOLUTE MAXIMUM RATINGS                                                                                                    |                            |      |      |      |      |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------|------|------|------|------|
| Parameter                                                                                                                   | Conditions                 | Min. | Typ. | Max. | Unit |
| Input Surge Voltage ( 100 ms )                                                                                              | 12V Input                  |      |      | 24   | VDC  |
|                                                                                                                             | 24V Input                  |      |      | 40   |      |
|                                                                                                                             | 48V Input                  |      |      | 80   |      |
| Soldering Temperature                                                                                                       | 1.5mm from case 10sec max. |      |      | 260  | °C   |
| Note : These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability. |                            |      |      |      |      |

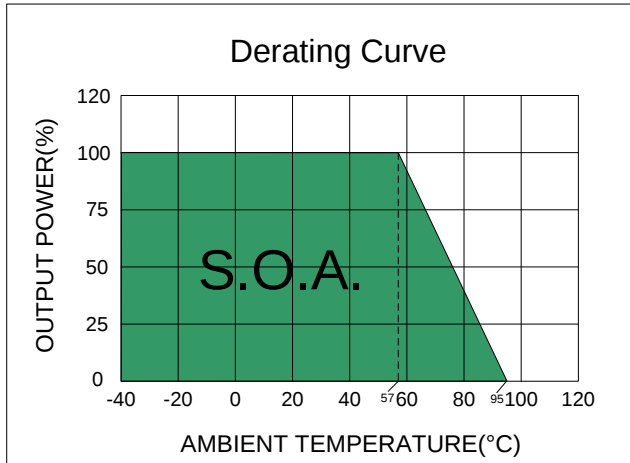
| GENERAL SPECIFICATIONS   |                                   |               |                      |      |      |         |
|--------------------------|-----------------------------------|---------------|----------------------|------|------|---------|
| Parameter                | Conditions                        |               | Min.                 | Typ. | Max. | Unit    |
| Isolation Voltage        | Input-output, and rated for 60sec | Standard Type | 1500                 |      |      | VDC     |
|                          |                                   | Suffix “H”    | 3500                 |      |      |         |
|                          | Case-I/O, and rated for 60sec     |               | 1000                 |      |      |         |
| Isolation Resistance     | Input-output                      |               | 1000                 |      |      | MΩ      |
| Isolation Capacitance    | Input-output                      |               |                      | 500  |      | pF      |
| Switching Frequency      |                                   |               |                      | 266  |      | kHz     |
| MTBF                     | MIL-HDBK-217 F @ 25°C             |               | 1121                 |      |      | k hours |
| Safety Approval          | IEC / EN / UL 62368-1             |               | DK-64825-UL, E252573 |      |      |         |
| Environmental compliance |                                   |               | RoHS                 |      |      |         |

| ENVIRONMENT SPECIFICATIONS    |                        |           |      |      |          |
|-------------------------------|------------------------|-----------|------|------|----------|
| Parameter                     | Conditions             | Min.      | Typ. | Max. | Unit     |
| Operating Ambient Temperature | See the Derating Curve | -40       |      | 95   | °C       |
| Maximum Case Temperature      |                        |           |      | 100  | °C       |
| Thermal Impedance             |                        | 23        |      |      | °C/W     |
| Storage Humidity              |                        |           |      | 95   | % rel. H |
| Storage Temperature           |                        | -55       |      | 125  | °C       |
| Cooling                       | Natural Convection     | 30-65 LFM |      |      |          |

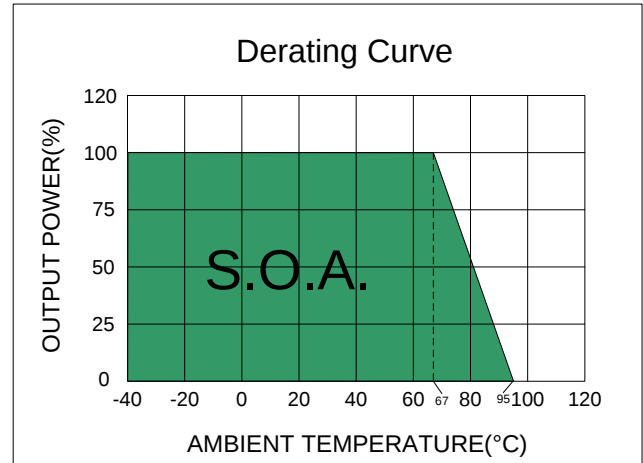
| EMC SPECIFICATIONS  |               |                               |           |
|---------------------|---------------|-------------------------------|-----------|
| Parameter           | Standard      | Condition                     | Criterion |
| Conducted Emissions | EN55032       | with external components      | A         |
| Radiated Emissions  | EN55032       |                               | A         |
| ESD                 | IEC 61000-4-2 | Air: ±8kV / Contact: ±6kV     | A         |
| RS                  | IEC 61000-4-3 | 10V/m                         | A         |
| EFT                 | IEC 61000-4-4 | ±2kV with external components | A         |
| Surge               | IEC 61000-4-5 | ±1kV with external components | A         |
| CS                  | IEC 61000-4-6 | 10Vrms                        | A         |
| PFMF                | IEC 61000-4-8 | 1A/m                          | A         |

| PHYSICAL SPECIFICATIONS |                            |
|-------------------------|----------------------------|
| Parameter               | Value                      |
| Case Material           | Aluminum                   |
| Pin Material            | Ø0.5mm Brass Solder-coated |
| Potting Material        | Epoxy ( UL94V-0 rated )    |
| Weight                  | 13.0 g, typ.               |
| Dimensions              | 1.25" x 0.8" x 0.4"        |

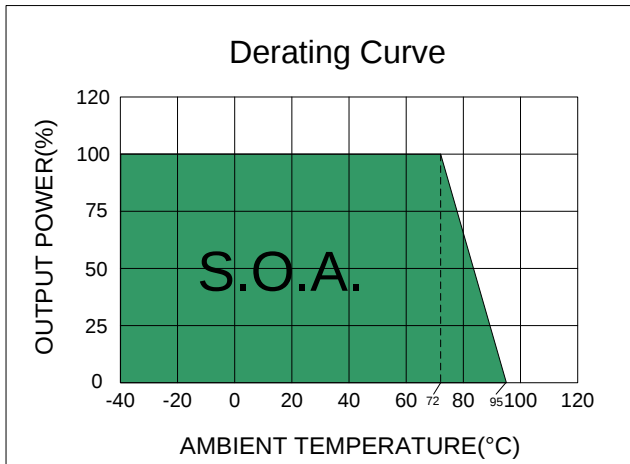
## ELECTRICAL CHARACTERISTIC CURVES



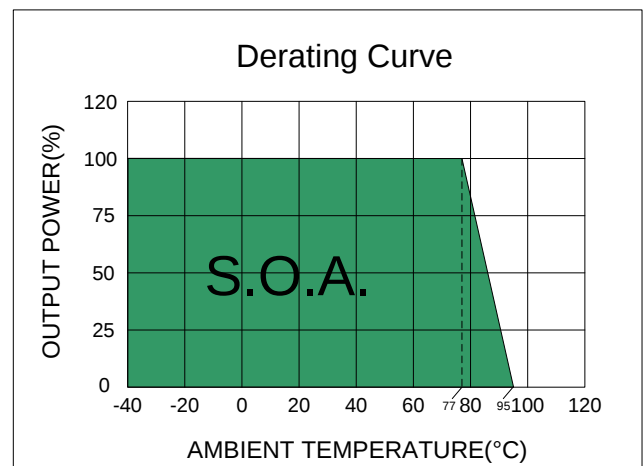
VD-123R3D5



Efficiency 76% ~ 80% Models



Efficiency 81% ~ 83% Models

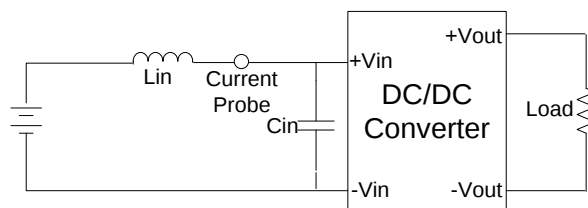


Efficiency 84% ~ 87% Models

## TEST CONFIGURATIONS

**Input Reflected Ripple Current Test Step**

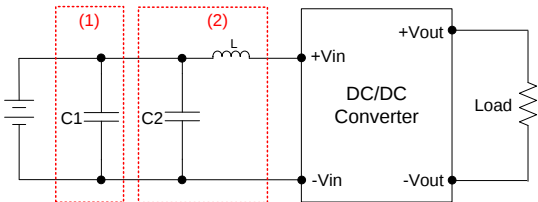
Input reflected ripple current is measured with a source inductor  $L_{in}$  ( 12 $\mu$ H ) and a source capacitor  $C_{in}$  ( 47 $\mu$ F, ESR<1.0 $\Omega$  at 100kHz ) at nominal input and full load.



DESIGN & FEATURE CONFIGURATIONS

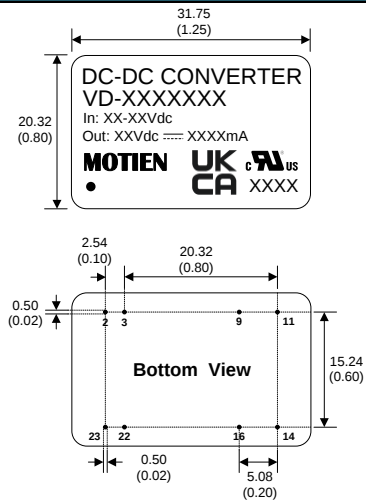
EMC Filter

The part (1) Circuit is used to meet Surge & EFT test, and the part (2) Circuit is used to meet EMI test.



|           | C1                                              | C2                                              | L    |
|-----------|-------------------------------------------------|-------------------------------------------------|------|
| VD-12XXX5 | NIPPON<br>Chemi-con<br>KY series<br>220μF, 100V | NIPPON<br>Chemi-con<br>KY series<br>100μF, 100V | 12μH |
| VD-24XXX5 |                                                 |                                                 |      |
| VD-48XXX5 |                                                 |                                                 |      |

MECHANICAL SPECIFICATIONS

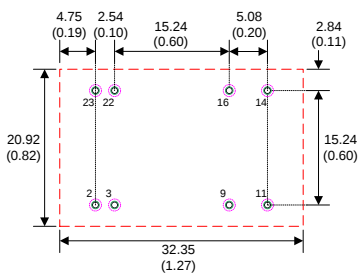


- Notes : All dimensions are typical in millimeters ( inches ).
1. Pin diameter: 0.5±0.05 ( 0.02±0.002 )
  2. Pin pitch and length tolerance: ±0.35 (±0.014 )
  3. Case Tolerance: ±0.5 (±0.02 )
  4. Stand-off tolerance: ±0.1 ( ±0.004 )

| PIN CONNECTIONS |        |       |
|-----------------|--------|-------|
| PIN NUMBER      | SINGLE | DUAL  |
| 2               | -Vin   | -Vin  |
| 3               | -Vin   | -Vin  |
| 9               | N.P.   | COM   |
| 11              | N.C.   | -Vout |
| 14              | +Vout  | +Vout |
| 16              | -Vout  | COM   |
| 22              | +Vin   | +Vin  |
| 23              | +Vin   | +Vin  |

\*N.P. : No PIN  
\*N.C. : No Connection

RECOMMENDED FOOTPRINT DETAILS



- Notes : 1. All dimensions are typical in millimeters ( inches ).
- Through hole ( black ) 2 ~ 23: Ø0.80 ( 0.031 )
- Top view pad ( green ) 2 ~ 23: Ø1.00 ( 0.039 )
- Bottom view pad ( pink ) 2 ~ 23: Ø1.60 ( 0.063 )