# VMG series

**2 WATT DC/DC CONVERTER**
**Single & Dual Output**
**1000/3000kVDC Isolation**

vitec dc conversion

## FEATURES

- 1000 VDC Isolation, up to 3000VDC
- 2:1 Wide Input Range
- Efficiency up to 81%
- Plastic Case Standard
- Remote ON/OFF Control (optional)
- SIL8 / DIL16 Housings
- Continuous Short Circuit Protection
- Extended Operating Temperature Range -40~99°C



CE RoHS COMPLIANT

## GENERAL DESCRIPTION

The VMG-2W series is a family of cost effective 2 W single & dual output DC-DC converters with 1kVDC and 3kVDC isolation. These converters achieve low cost and miniature SIL or DIL size without compromising performance or field reliability. Models operate from an input bus voltage of 5, 12, 24 and 48 VDC offering output voltage levels of 3.3, 5, 9, 12, 15, 24, ±3.3, ±5, ±9, ±12, ±15 or ±24 VDC.

## PART NUMBERING

| VMG - | 24 | 05 | S | 2 | - H |
|---|---|---|---|---|---|
| **Series Name** | **Input Voltage (VDC)** | **Output Voltage (VDC)** | **Output and Housing** | **Power Level** | **Options** |
| | **05:** 4.5-9<br>**12:** 9-18<br>**24:** 18-36<br>**48:** 36-72 | **3R3:** 3.3<br>**05:** 5.0<br>**09:** 9.0<br>**12:** 12<br>**15:** 15<br>**24:** 24<br>**3R3:** ±3.3<br>**05:** ±5.0<br>**09:** ±9.0<br>**12:** ±12<br>**15:** ±15<br>**24:** ±24 | **SS:** SIL8, Single Output<br>**S:** SIL8, Dual Output<br>**DS:** DIL16, Single Output<br>**D:** DIL16, Dual Output | | □: None<br>**H:** 3kVDC Isolation<br>**C:** remote on/off (SIL8-models only)<br>**-T:** Alternative Pinning (SIL8/dual output-models only) |



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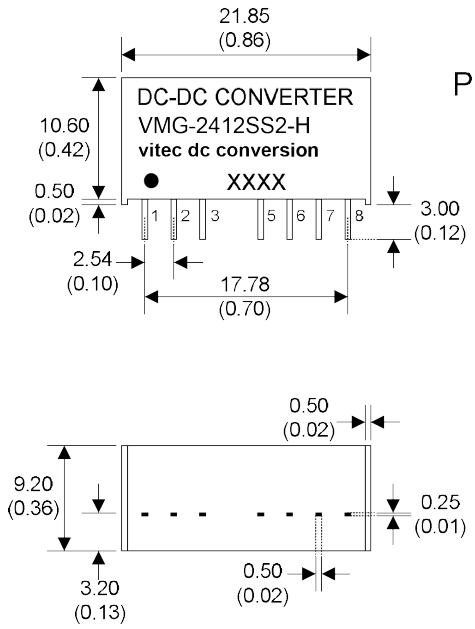
## SIL 8 Package - Standard Types

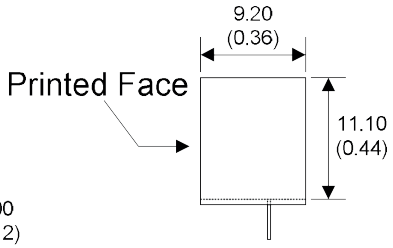
| Model No. | Input Voltage (Range) [Vdc] | nominal Output Voltage [Vdc] | Output Current [mA] @ min. load | Output Current [mA] @ full load | Input Current [mA] 05/12/24/48 @ No Load | Input Current [mA] 05/12/24/48 @ Full Load | Max. Capacitive Load [µF] | Efficiency typ. [%] 05/12/24/48 |
|---|---|---|---|---|---|---|---|---|
| VMG-xx3R3SS2 | "xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V | 3.3 | 125 | 500 | 20/15/8/6 | 508/196/94/50 | 3300 | 65/70/73/69 |
| VMG-xx05SS2 | | 5.0 | 100 | 400 | 25/10/8/6 | 588/216/108/55 | 3300 | 68/77/77/76 |
| VMG-xx09SS2 | | 9.0 | 56 | 222 | 50/15/10/6 | 555/214/107/55 | 470 | 72/78/78/76 |
| VMG-xx12SS2 | | 12 | 42 | 167 | 85/15/12/6 | 563/216/105/53 | 470 | 71/77/79/78 |
| VMG-xx15SS2 | | 15 | 33 | 133 | 30/15/12/6 | 555/210/104/53 | 470 | 72/79/80/78 |
| VMG-xx24SS2 | | 24 | 21 | 83 | 70/25/15/8 | 555/214/105/54 | 220 | 72/78/79/77 |
| VMG-xx3R3S2 | "xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V | ±3.3 | ±63 | ±250 | 25/15/8/6 | 493/196/97/48 | ±1000 | 67/70/71/71 |
| VMG-xx05S2 | | ±5.0 | ±50 | ±200 | 35/20/8/6 | 493/228/108/57 | ±1000 | 67/73/77/73 |
| VMG-xx09S2 | | ±9.0 | ±28 | ±111 | 30/20/8/6 | 548/210/108/55 | ±220 | 73/79/77/76 |
| VMG-xx12S2 | | ±12 | ±21 | ±83 | 35/15/8/6 | 548/210/102/53 | ±220 | 73/79/81/78 |
| VMG-xx15S2 | | ±15 | ±17 | ±67 | 40/20/12/8 | 556/210/105/52 | ±220 | 72/79/80/80 |
| VMG-xx24S2 | | ±24 | ±10 | ±42 | 120/35/25/12 | 580/219/107/56 | ±100 | 69/76/78/74 |

## MECHANICAL DRAWING - SIL8 Package










All dimensions in mm [inch]
1. Pin diameter: 0.5 ±0.05 [0.02 ±0.002]
2. Pin pitch and length tolerance: ±0.35 [±0.014]
3. Pin to case tolerance: ±0.5 [±0.02]
4. Case Tolerance: ±0.5 [±0.02]
5. Stand-off Tolerance: ±0.1 [±0.004]

| PIN | SS (single) | SS+C | S (dual) | S+C | S+T | S+C+T |
|---|---|---|---|---|---|---|
| 1 | -Vin | -Vin | -Vin | -Vin | -Vin | -Vin |
| 2 | +Vin | +Vin | +Vin | +Vin | +Vin | +Vin |
| 3 | no Pin | CTRL | N.C. | CTRL | N.C. | CTRL |
| 5 | no Pin | N.C. | N.C. | N.C. | N.C. | N.C. |
| 6 | +Vout | +Vout | +Vout | +Vout | +Vout | +Vout |
| 7 | -Vout | -Vout | -Vout | -Vout | COM | COM |
| 8 | N.C. | N.C. | COM | COM | -Vout | -Vout |

N.C.: No connection



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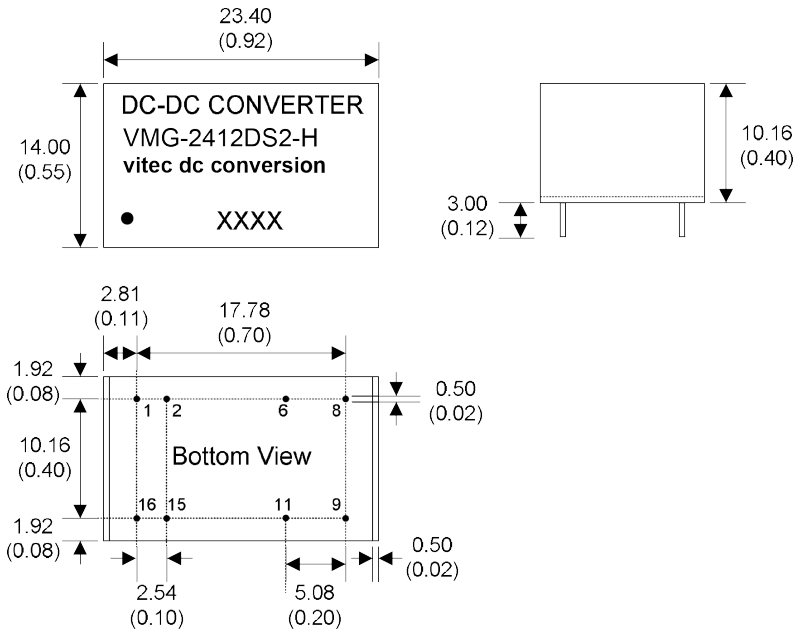
## DIL16 Package - Standard Types

| Model No. | Input Voltage (Range) [Vdc] | nominal Output Voltage [Vdc] | Output Current [mA] | | Input Current [mA] 05/12/24/48 | | Max. Cpacitive Load [µF] | Efficiency typ. [%] 05/12/24/48 |
|---|---|---|---|---|---|---|---|---|
| | | | @ min. load | @ full load | @ No Load | @ Full Load | | |
| **VMG-xx3R3DS2** | "xx"<br>05: 4.5-9V<br>12: 9-18V<br>24: 18-36V<br>48: 36-72V | 3.3 | 125 | 500 | 20/15/8/6 | 508/196/97/51 | 3300 | 65/70/71/67 |
| **VMG-xx05DS2** | | 5.0 | 100 | 400 | 20/10/8/6 | 588/222/111/56 | 3300 | 68/75/75/75 |
| **VMG-xx09DS2** | | 9.0 | 56 | 222 | 50/15/10/10 | 580/219/105/57 | 470 | 69/76/79/73 |
| **VMG-xx12DS2** | | 12 | 42 | 167 | 30/15/15/10 | 563/214/104/54 | 470 | 71/78/80/77 |
| **VMG-xx15DS2** | | 15 | 33 | 133 | 70/15/15/6 | 563/214/105/54 | 470 | 71/78/79/77 |
| **VMG-xx24DS2** | | 24 | 21 | 83 | 70/35/15/8 | 556/216/108/54 | 220 | 72/77/77/77 |
| **VMG-xx3R3D2** | "xx"<br>05: 4.5-9V<br>12: 9-18V<br>24: 18-36V<br>48: 36-72V | ±3.3 | ±63 | ±250 | 25/15/8/6 | 485/194/95/49 | ±1000 | 68/71/72/70 |
| **VMG-xx05D2** | | ±5.0 | ±50 | ±200 | 35/20/10/6 | 597/231/113/57 | ±1000 | 67/72/74/73 |
| **VMG-xx09D2** | | ±9.0 | ±28 | ±111 | 30/20/8/6 | 547/211/105/54 | ±220 | 73/79/79/77 |
| **VMG-xx12D2** | | ±12 | ±21 | ±83 | 60/15/10/10 | 555/214/105/53 | ±220 | 72/78/79/79 |
| **VMG-xx15D2** | | ±15 | ±17 | ±67 | 60/30/12/8 | 555/214/105/53 | ±220 | 72/78/79/78 |
| **VMG-xx24D2** | | ±24 | ±10 | ±42 | 110/45/25/12 | 563/222/108/56 | ±100 | 71/75/77/74 |

## MECHANICAL DRAWING - DIL16 Package




All dimensions in mm [inch]
1. Pin diameter: 0.5 ±0.05 [0.02 ±0.002]
2. Pin pitch and length tolerance: ±0.35 [±0.014]
3. Pin to case tolerance: ±0.5 [±0.02]
4. Case Tolerance: ±0.5 [±0.02]
5. Stand-off Tolerance: ±0.1 [±0.004]

| PIN | DS (single) | D (dual) |
|---|---|---|
| 1 | -Vin | -Vin |
| 2 | -Vin | -Vin |
| 6 | N.C. | COM |
| 8 | N.C. | -Vout |
| 9 | +Vout | +Vout |
| 11 | -Vout | COM |
| 15 | +Vin | +Vin |
| 16 | +Vin | +Vin |

N.C.: No connection



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## INPUT SPECIFICATIONS

| Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input voltage range | 5 Vin Models | 4.5 | 5 | 9 | Vdc |
| | 12 Vin Models | 9 | 12 | 18 | |
| | 24 Vin Models | 18 | 24 | 36 | |
| | 48 Vin Models | 36 | 48 | 72 | |
| Start up time | nominal Vin and constant resistive load | - | 20 | - | ms |
| Input Filter | - | Capacitor | | | |
| Input Reflected Ripple Current | measured input reflected ripple current with a simulated source inductance of 12µH and a source capacitor Cin(47µF, ESR<1.0Ω at 100kHz) | - | 35 | - | mApk-pk |
| Remote ON/OFF | DC-DC ON | Open or 0 ~ 0.8Vdc max. (Short sircuit Pin1 and Pin3) or open circuit | | | |
| | DC-DC OFF | 4.5 to 15Vdc max. (or 3.5mA to 15mA max.) (via R1,D1) | | | |
| | OFF idle current | - | 5 | - | mA |
| Recommended input fuse (slow blow) | 5Vin module | 0.75 | | | A |
| | 12Vin module | 0.3 | | | |
| | 24Vin module | 0.2 | | | |
| | 48Vin module | 0.1 | | | |

## OUTPUT SPECIFICATIONS

| Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Voltage accuracy | - | -2.0 | - | +2.0 | % |
| Line regulation | - | -0.5 | - | +0.5 | % |
| Load regulation | From 25% to 100% Load | -1.0 | - | +1.0 | % |
| Cross regulation | Asymmetrical Load 25% / 100% for Double Output | -5 | - | +5 | % |
| Ripple and noise | 20MHz bandwidth | - | - | 80 | mVp-p |
| Short circuit protection | - | Indefinite hiccup (Automatic Recovery) | | | |
| Temperature coefficient | - | -0.02 | - | +0.02 | %/°C |
| Maximum Capacitive Load | Minimum Vin and constant resistive load | see Table | | | |



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## GENERAL SPECIFICATIONS

| Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Isolation voltage (input-output, 60 sec) | Standard Type | 1000 | - | - | Vdc |
| | Suffix „H“ | 3000 | - | - | |
| Isolation resistance | Input - Output | 1000 | - | - | MΩ |
| Isolation capacitance | Input - Output | - | - | 60 | pF |
| Switching frequency | - | 100 | - | 650 | kHz |
| Safety standards | (designed to meet) | IEC / UL / EN62368-1 | | | |
| MTBF | MIL-HDBK-217F @ 25°C | 1.61 MHrs | | | |
| Environmental compliance | - | RoHS conform | | | |
| Case material | (UL94V-0 rated) | non-conductive Black Plastik | | | |
| Pin material | SIL8 Case | Alloy42 Solder-coated | | | |
| | DIL16 Case | Ø0.5mm Brass Solder-coated | | | |
| Potting material | (UL94V-0 rated) | Epoxy | | | |
| Weight | SIL8 Case | 4.5 g | | | |
| | DIL16 Case | 6.0 g | | | |
| Dimensions | SIL8 Case | 0.86“ x 0.36“ x 0.44“ | | | |
| | DIL16 Case | 0.92“ x 0.55“ x 0.40“ | | | |
| Soldering Temperature | 1.5 mm from case, 10 sec max. | 260°C | | | |
| Absolute Specifications Input Surge Voltage (100ms) | 5 Vin Models | - | - | 12 | Vdc |
| | 12 Vin Models | - | - | 24 | |
| | 24 Vin Models | - | - | 40 | |
| | 48 Vin Models | - | - | 80 | |

## ENVIRONMENTAL SPECIFICATIONS

| Item | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Operating ambient temperature (see derating curve) | - | -40 | - | +99 | °C |
| Maximum case temperature | - | - | - | +100 | °C |
| Thermal impedance | - | 27.18 | - | - | °C/W |
| Storage temperature range | - | -55 | - | +125 | °C |
| Cooling | „Natural convection“ is usually about 30-65 LFM, but is not equal to still air (0 LFM). | Natural convection | | | |
| Relative humidity | - | 95% RH | | | |



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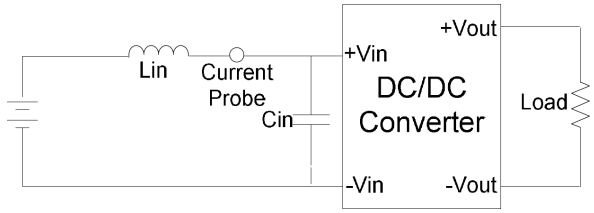
## EMC SPECIFICATIONS

| Item | Conditions | | Level |
|---|---|---|---|
| Radiated Emissions | EN55032 | - | Class A |
| Conducted Emissions | EN55032 | with external components | Class A |
| ESD | EN61000-4-2 | Air: 8kV / Contact: 6kV | Perf. Criteria A |
| RS - Radiated Immunity | EN61000-4-3 | 10V/m | Perf. Criteria A |
| EFT - Fast transient | EN61000-4-4 | ±2kV with external components | Perf. Criteria A |
| Surge | EN61000-4-5 | ±1kV with external components | Perf. Criteria A |
| CS - Conduced immunity | EN61000-4-6 | 10Vrms | Perf. Criteria A |
| PFMF - Power frequency magnetic field | EN61000-4-8 | 1A/m | Perf. Criteria A |

## TEST CONFIGURATIONS

### Input Reflected Ripple Current Test Step

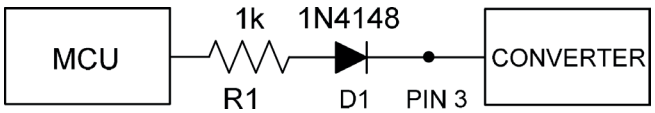
Input reflected ripple current is measured with a source inductor Lin (12µH) and a source capacitor Cin (47µF, ESF<1.0Ω at 100kHz) at nominal input and full load.




## REMOTE ON / OFF

**Remote On / Off**

* MCU: Master Control Unit




| | remote | Ctrl pin applied voltage via R1-D1 | Output Voltage | Coverter Input Current |
|---|---|---|---|---|
| Converter on | Off | 0~0.8 Vdc (Short circuit pin1 and pin3) or open circuit | see module | see module |
| Converter off | On | 4.5 to 15 Vdc or 3.5mA to 15mA | no output voltage | 5mA, typ. |



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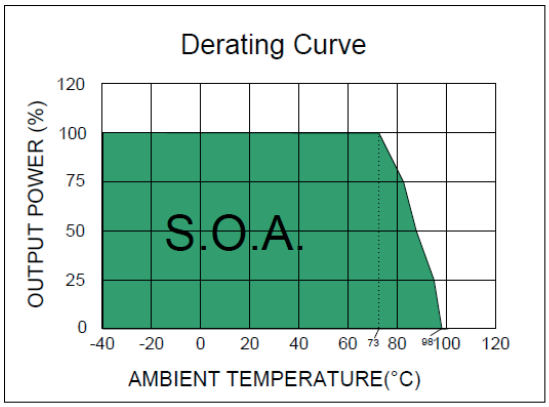
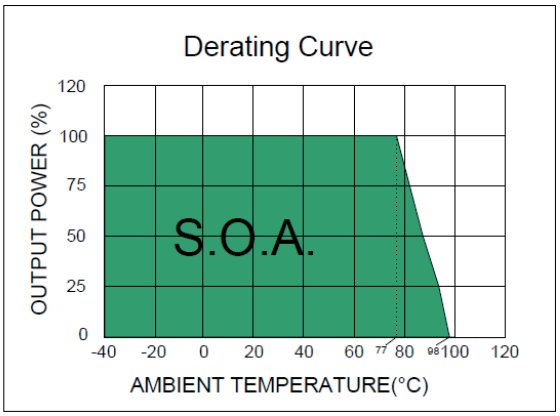
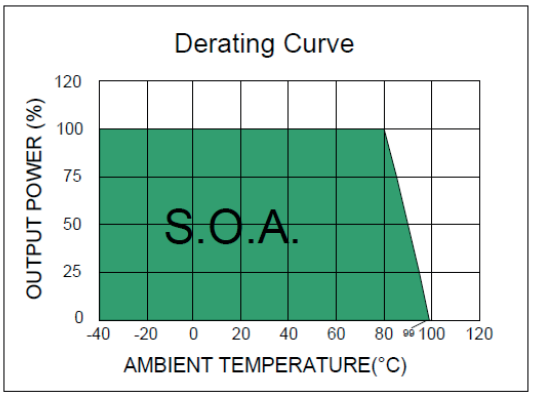
## DERATING CURVES



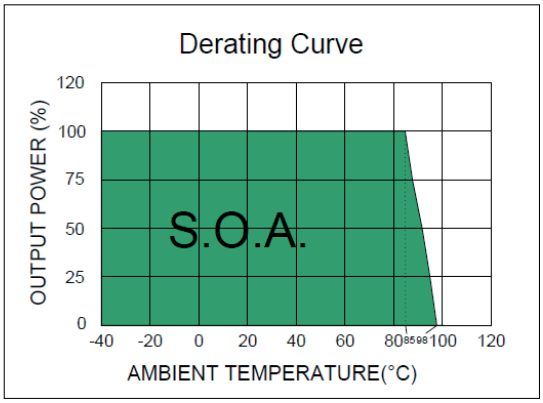

Efficiency = 65% - 69%



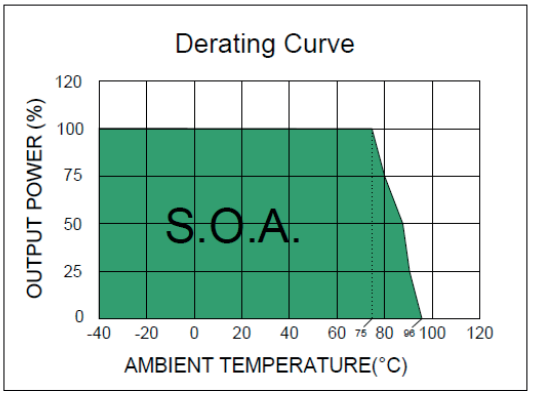

Efficiency = 71% - 73%



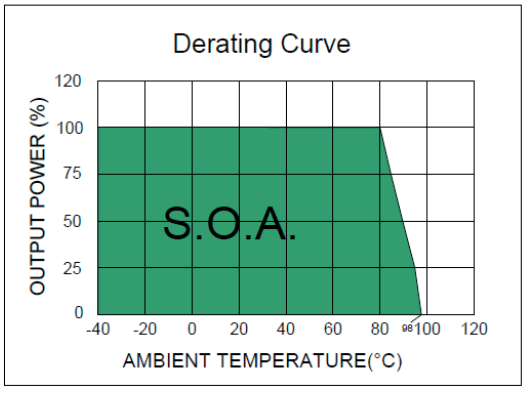

Efficiency = 74% - 77%




Efficiency = 78% - 81%




VMG-053R3SS2, VMG-053R3DS2,
VMG-483R3DS2, VMG-053R3S2,
VMG-053R3D2




VMG-123R3SS2, VMG-243R3SS2, VMG-483R3SS2,
VMG-123R3DS2, VMG-243R3DS2, VMG-123R3DS2,
VMG-243R3S2, VMG-483R3S2, VMG-123R3D2,
VMG-243R3D2, VMG-483R3D2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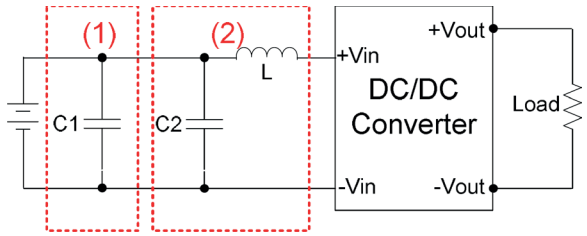
## TEST CONFIGURATIONS

### EMC Filter

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




| Model | C1 | C2 | L |
|---|---|---|---|
| VMG-05xxxxx | Nippon Chemi-con KY series 220µF, 100V | Nippon Chemi-con KY series 100µF, 100V | 12µH |
| VMG-12xxxxx | | | |
| VMG-24xxxxx | | | |
| VMG-48xxxxx | | | |

Note: Specifications can be changed without prior notice. Products are not intended for and must not be used in life support systems, human implantation, nuclear facilities or systems or any other application where product failure or malfunction of the component could lead to loss of life or catastrophic property damage.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