

FEATURES

- 1000 VDC Isolation, up to 3000VDC
- 2:1 Wide Input Range
- Efficiency up to 76%
- Plastic Case Standard
- Remote ON/OFF Control (optional)
- SIL8 / DIL16 Housings
- Continuous Short Circuit Protection
- Extended Operating Temperature Range -40~99°C



GENERAL DESCRIPTION

The VMG series is a family of cost effective 1 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.

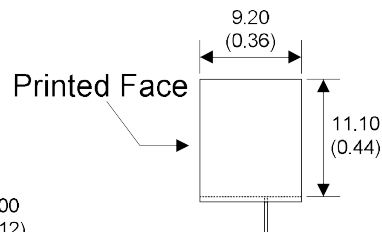
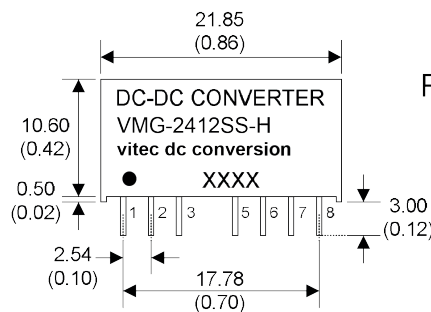
PART NUMBERING

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

SIL 8 Package - Standard Types

Model No.	Input Voltage (Range) [Vdc]	nominal Output Voltage [Vdc]	Output Current [mA]		Input Current [mA] 05/12/24/48		Max. Capacitive Load [µF]	Efficiency typ. [%] 05/12/24/48
			@ min. load	@ full load	@ No Load	@ Full Load		
VMG-xx3R3SS	"xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V	3.3	76	303	15/15/8/6	294/121/60/32	3300	68/69/69/66
VMG-xx05SS		5.0	50	200	15/15/8/6	294/114/60/31	3300	68/73/70/67
VMG-xx09SS		9.0	28	111	40/17/12/8	294/110/56/30	470	68/76/74/69
VMG-xx12SS		12	21	83	55/25/12/8	293/111/57/31	470	68/75/73/67
VMG-xx15SS		15	17	67	55/20/12/10	296/113/57/30	470	68/74/73/69
VMG-xx24SS		24	10	42	70/35/20/10	305/115/60/31	220	66/73/70/67
VMG-xx3R3S	"xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V	±3.3	±38	±152	30/15/8/8	287/123/61/32	±1000	70/69/69/65
VMG-xx05S		±5.0	±25	±100	20/20/12/6	282/117/59/30	±1000	71/71/71/70
VMG-xx09S		±9.0	±14	±56	30/20/10/10	280/115/56/29	±220	72/73/75/72
VMG-xx12S		±12	±10	±42	50/25/8/10	296/114/56/29	±220	68/74/75/72
VMG-xx15S		±15	±8	±33	55/35/10/10	279/118/54/29	±220	71/70/76/72
VMG-xx24S		±24	±5	±21	70/40/25/15	301/127/63/30	±100	67/66/67/71

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]

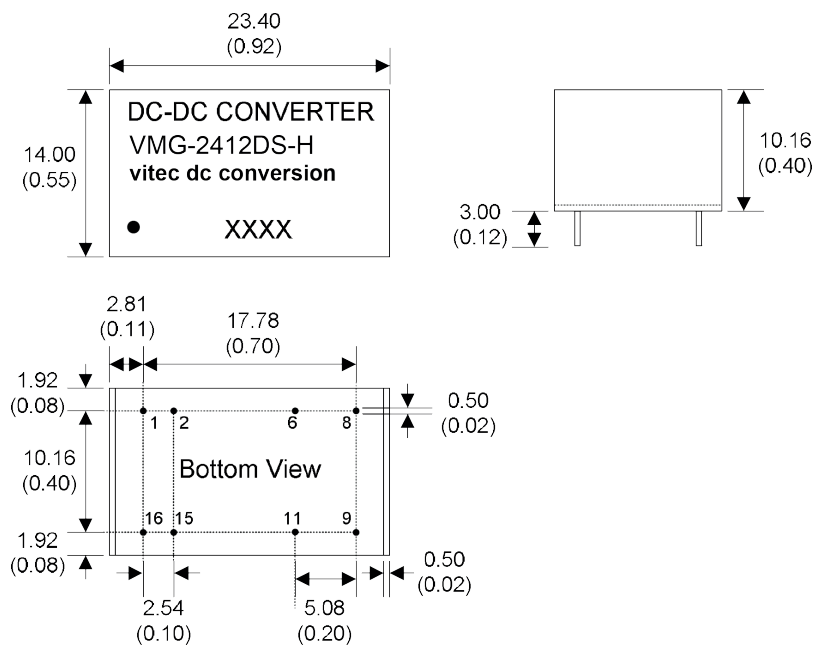
PIN	SS (single)	SS+C	S (dual)	S+C	S+T	S+C+T
1	-Vin	-Vin	-Vin	-Vin	-Vin	-Vin
2	+Vin	+Vin	+Vin	+Vin	+Vin	+Vin
3	no Pin	CTRL	N.C.	CTRL	N.C.	CTRL
5	no Pin	N.C.	N.C.	N.C.	N.C.	N.C.
6	+Vout	+Vout	+Vout	+Vout	+Vout	+Vout
7	-Vout	-Vout	-Vout	-Vout	COM	COM
8	N.C.	N.C.	COM	COM	-Vout	-Vout

N.C.: No connection

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. Capacitive Load [µF]	Efficiency typ. [%] 05/12/24/48
			@ min. load	@ full load	@ No Load	@ Full Load		
VMG-xx3R3DS	"xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V	3.3	76	303	15/10/8/6	294/124/60/32	3300	68/67/69/66
VMG-xx05DS		5.0	50	200	15/10/10/6	294/114/58/30	3300	68/73/72/69
VMG-xx09DS		9.0	28	111	40/15/12/8	294/110/56/30	470	68/76/74/69
VMG-xx12DS		12	21	83	55/25/10/8	293/112/56/31	470	68/74/74/67
VMG-xx15DS		15	17	67	55/25/15/10	309/115/56/30	470	65/73/75/69
VMG-xx24DS		24	10	42	70/28/15/10	305/116/60/31	220	66/72/70/67
VMG-xx3R3D	"xx" 05: 4.5-9V 12: 9-18V 24: 18-36V 48: 36-72V	±3.3	±38	±152	30/15/8/8	287/123/61/32	±1000	70/69/66/65
VMG-xx05D		±5.0	±25	±100	20/20/12/6	282/117/59/30	±1000	71/71/73/70
VMG-xx09D		±9.0	±14	±56	30/20/10/10	280/115/56/29	±220	72/73/75/72
VMG-xx12D		±12	±10	±42	50/25/8/10	296/114/56/29	±220	68/73/75/71
VMG-xx15D		±15	±8	±33	55/35/10/10	279/118/54/29	±220	75/70/73/72
VMG-xx24D		±24	±5	±21	70/40/25/15	301/127/63/30	±100	67/66/67/71

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

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 circuit 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	0.4			A
	12Vin module	0.2			
	24Vin module	0.1			
	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			

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	1.66 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	

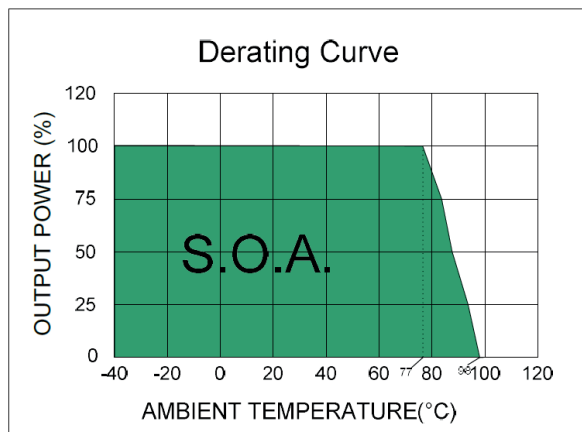
ENVIRONMENTAL SPECIFICATIONS

Item	Conditions	Min.	Typ.	Max.	Unit
Operating ambient temperature (see derating curve)	-	-40	-	+99	°C
Maximum case temperature	-	-	-	+100	°C
Thermal impedance	-	42.29	-	-	°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			

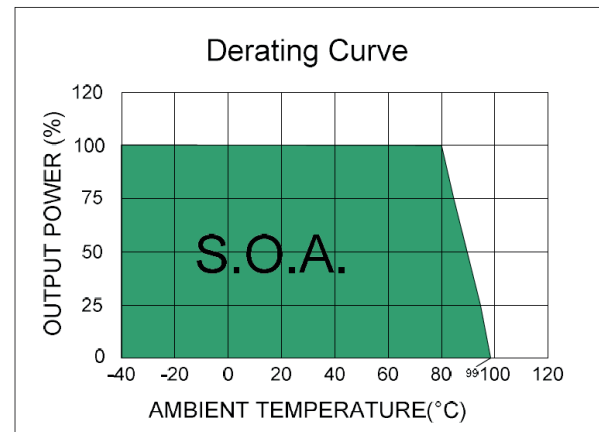
EMC SPECIFICATIONS

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 - Conducted immunity	EN61000-4-6	10Vrms	Perf. Criteria A
PFMF - Power frequency magnetic field	EN61000-4-8	1A/m	Perf. Criteria A

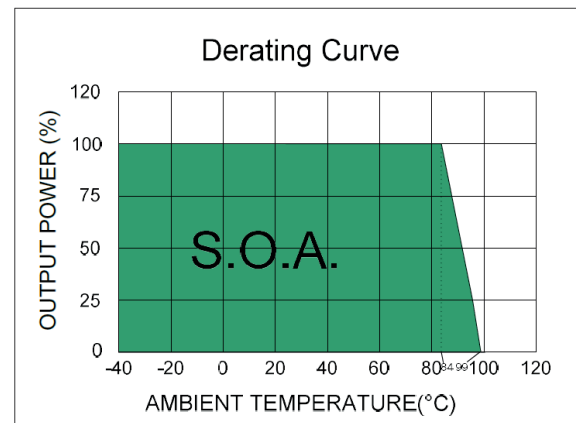
DERATING CURVES



Efficiency = 65% ~ 67%



Efficiency = 68% ~ 72%

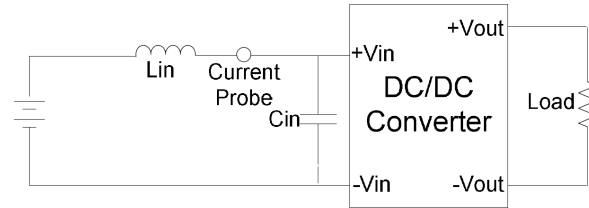


Efficiency = 73% ~ 76%

TEST CONFIGURATIONS

Input Reflected Ripple Current Test Step

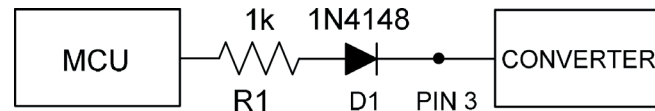
Input reflected ripple current is measured with a source inductor L_{in} ($12\mu\text{H}$) and a source capacitor C_{in} ($47\mu\text{F}$, $\text{ESF} < 1.0\Omega$ at 100kHz) at nominal input and full load.



REMOTE ON / OFF

Remote On / Off

* MCU: Master Control Unit

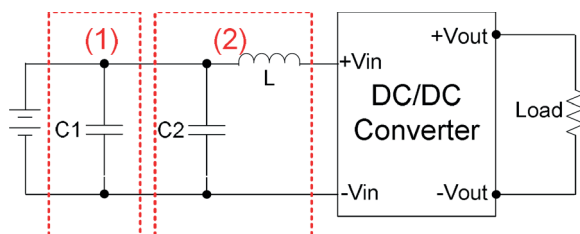


	remote	Ctrl pin applied voltage via R1-D1	Output Voltage	Converter Input Current
Converter on	Off	0~0.8 Vdc (Short circuit pin1 and pin3) or open circuit	see module	see module
Converter off	On	4.5 to 15 Vdc or 3.5mA to 15mA	no output voltage	5mA, typ.

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 220 μF , 100V	Nippon Chemi-con KY series 100 μF , 100V	12 μH
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.