

VB-9W Series

9W 2:1 Regulated Single & Dual output



Features

- Highest Power Density In 8 Pin SIP Package
- Wide 2:1 Input Voltage Range
- Smallest Footprint 9W Converter
- -40°C ~+ 85°C Operation Temperature Range
- Efficiency Up To 90%
- Indefinite Short-Circuit Protection
- I/O Isolation 1600VDC
- Remote On/Off Control
- Fully RoHS Compliant



The VB-9W series is a family of high performed 9W single & dual output DC-DC converters. These converters are built in copper package in a 8-pin SIP miniature compact case with high performance features wide range devices operate over 2:1 input voltage range providing stable output voltage which is much smaller than package of DIP 24 - Same power rating but only 43% of the traditional volume. Devices are encapsulated using flame retardant resin.

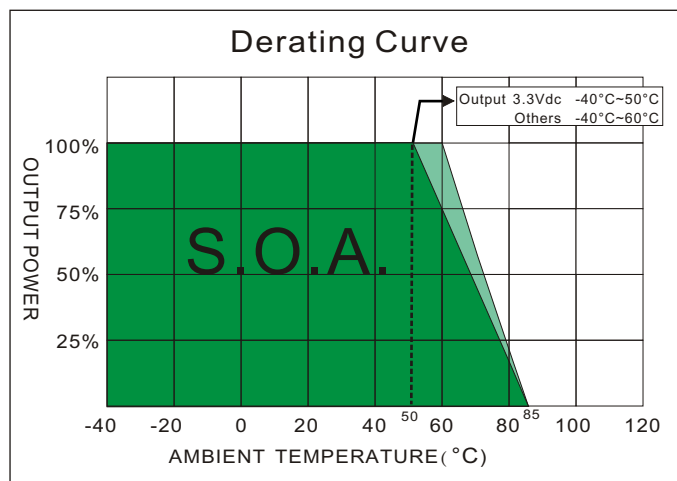
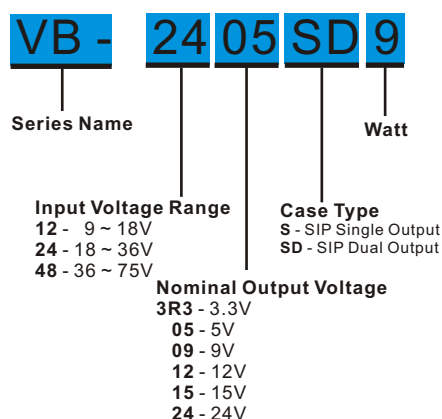
Input voltages are 12 Vdc , 24 Vdc and 48 Vdc with output voltage of 3.3 , 5 , 9 , 12 , 15 , 24 , ± 5 , ± 12 , ± 15 Vdc. Featuring new PWM construction, no minimum load required and precise 1% output voltage accuracy.

All specifications typical at $T_a=25^\circ\text{C}$, nominal input voltage and full load unless otherwise specified.

OUTPUT SPECIFICATIONS		GENERAL SPECIFICATIONS	
Voltage Accuracy	$\pm 1\%$, max.	Efficiency	See table, typ.
Output Current	See table, max.	Switching Frequency	12V,24Vin Models : 400KHz, typ. 48Vin Models : 500KHz, typ.
Line Regulation	$\pm 0.2\%$, max.	I/O Isolation Voltage (60sec)	
Load Regulation	Single output : $\pm 0.5\%$, max.	Input / Output	1600Vdc
(From 0% to 100% Load)	3.3V : $\pm 1.0\%$, max.	Case / Input & Output	1000Vdc
(Balance load)Dual output : $\pm 1.0\%$, max.		I/O Isolation Resistance	1G Ω , min.
Cross Regulation (Dual Output) (1)	$\pm 5\%$, max.	I/O Isolation Capacity	50pF, max.
Ripple & Noise (20MHz bandwidth)(2)	75mVpk-pk, max.	Humidity	5-95% rel. H
Over Voltage Protection	130%, typ.	Reliability Calculated MTBF(MIL-HDBK-217 F)	> 900 Khrs
Over Load Protection	150%, typ.	Safety Approvals (7)	UL/cUL 60950-1, 62368-1 IEC/EN 60950-1, 62368-1
Short Circuit Protection	Indefinite(Automatic Recovery)		
Temperature Coefficient	$\pm 0.02\%/^\circ\text{C}$		
Capacitive Load(3)	See table, max.		
Transient Recovery Time (4)	250 μs , typ.		
Transient Response Deviation(4)	$\pm 3\%$, max.		
	Single Output 3.3V: $\pm 5\%$, max.		
INPUT SPECIFICATIONS		PHYSICAL SPECIFICATIONS	
Voltage Range	See table	Case Material	Copper
Start up Time(Nominal Vin and constant resistive load)	50ms, typ.	Potting Material	Epoxy (UL94V-0 rated)
Input Filter	Capacitor	Pin Material	C5191R-H Solder-coated
Input Current (No-Load)	See table, max.	Weight	7.3g, typ.
Input Current (Full-Load)	See table, typ.	Dimensions	0.86"x0.38"x0.44"
Input Reflected Ripple Current(5)	30mA _{pk-pk} , max.		
Remote on/off			
ON:	Open or high impedance		
OFF:	2-4mA input current (via 1K Ω).		
Off stand by input current(Nominal Vin)	2.5mA, typ.		
Under voltage lockout			
12V Module ON / OFF	8.9Vdc / 7.0Vdc typ.		
24V Module ON / OFF	16.0Vdc / 13.0Vdc typ.		
48V Module ON / OFF	33.0Vdc / 30.0Vdc typ.		
ABSOLUTE MAXIMUM RATINGS(6)		ENVIRONMENT SPECIFICATIONS	
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.		Operating Temperature	-40°C~85°C(See Derating Curve) 3.3V : -40°C ~ +50°C(For 100% Load) Others : -40°C ~ +60°C(For 100% Load)
Input Surge Voltage(100ms max)		Maximum Case Temperature	100°C
12 Models	25Vdc, max.	Storage Temperature	- 55°C~125°C
24 Models	50Vdc, max.	Cooling (8)	Nature Convection
48 Models	100Vdc, max.		
Soldering Temperature	260°C, max.		
(1.5mm from case 10sec max.)			
		EMC CHARACTERISTICS	
		Radiated Emissions (9)	EN55032 CLASS A
		Conducted Emissions (9)	EN55032 CLASS A
		ESD	IEC61000-4-2 Perf. Criteria B
		RS	IEC61000-4-3 Perf. Criteria A
		EFT (10)	IEC61000-4-4 Perf. Criteria A
		Surge (10)	IEC61000-4-5 Perf. Criteria A
		CS	IEC61000-4-6 Perf. Criteria A
		PFMF	IEC61000-4-8 Perf. Criteria A

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PART NUMBER STRUCTURE



MODEL SELECTION GUIDE

Model Number	Certification	INPUT Voltage Range (Vdc)	INPUT Current		OUTPUT Voltage (Vdc)	OUTPUT Current		Efficiency @FL (% , typ.)	Capacitor Load @FL (μF, max.)
			No-Load (mA, max.)	Full Load (mA, typ.)		Min. load (mA)	Full load (mA)		
VB-123R3S9	CE/UL/CB	9-18,12V Nom.	15	679	3.3	0	2000	81	2600
VB-1205S9	CE/UL/CB	9-18,12V Nom.	15	784	5	0	1600	85	1300
VB-1209S9	CE/UL/CB	9-18,12V Nom.	15	862	9	0	1000	87	800
VB-1212S9	CE/UL/CB	9-18,12V Nom.	15	852	12	0	750	88	560
VB-1215S9	CE/UL/CB	9-18,12V Nom.	15	843	15	0	600	89	470
VB-1224S9	CE/UL/CB	9-18,12V Nom.	15	843	24	0	375	89	200
VB-1205SD9	CE/UL/CB	9-18,12V Nom.	15	784	±5	0	±800	85	±800
VB-1212SD9	CE/UL/CB	9-18,12V Nom.	15	852	±12	0	±375	88	±390
VB-1215SD9	CE/UL/CB	9-18,12V Nom.	15	843	±15	0	±300	89	±200
VB-243R3S9	CE/UL/CB	18-36,24V Nom.	15	344	3.3	0	2000	80	2600
VB-2405S9	CE/UL/CB	18-36,24V Nom.	15	392	5	0	1600	85	1300
VB-2409S9	CE/UL/CB	18-36,24V Nom.	15	426	9	0	1000	88	800
VB-2412S9	CE/UL/CB	18-36,24V Nom.	15	421	12	0	750	89	560
VB-2415S9	CE/UL/CB	18-36,24V Nom.	15	417	15	0	600	90	470
VB-2424S9	CE/UL/CB	18-36,24V Nom.	15	417	24	0	375	90	200
VB-2405SD9	CE/UL/CB	18-36,24V Nom.	15	388	±5	0	±800	86	±800
VB-2412SD9	CE/UL/CB	18-36,24V Nom.	15	421	±12	0	±375	89	±390
VB-2415SD9	CE/UL/CB	18-36,24V Nom.	15	431	±15	0	±300	87	±200
VB-483R3S9	CE	36-75,48V Nom.	10	168	3.3	0	2000	82	2600
VB-4805S9	CE/UL/CB	36-75,48V Nom.	10	196	5	0	1600	85	1300
VB-4809S9	CE	36-75,48V Nom.	10	213	9	0	1000	88	800
VB-4812S9	CE/UL/CB	36-75,48V Nom.	10	211	12	0	750	89	560
VB-4815S9	CE	36-75,48V Nom.	10	211	15	0	600	89	470
VB-4824S9	CE	36-75,48V Nom.	10	211	24	0	375	89	200
VB-4805SD9	CE	36-75,48V Nom.	10	194	±5	0	±800	86	±800
VB-4812SD9	CE	36-75,48V Nom.	10	216	±12	0	±375	87	±390
VB-4815SD9	CE	36-75,48V Nom.	10	216	±15	0	±300	87	±200

NOTE

1. The load condition , one is 25% to 100% and the other one is 100%. The output voltage variable rate is within ±5%.
2. Measured with a 1μF ceramic capacitor and a 10μF electrolytic capacitor.
3. Test by minimal Vin and constant resistive load.
4. Test by normal Vin and 100% to 25% load, 25% load step change.
5. Measured Input reflected ripple current with a simulated source inductance Lin(12uH) and a source capacitor Cin(47uF , ESR<1.0Ω at 100KHz)
6. Exceeding the absolute ratings of the unit could cause damage. It's NOT allowed for continuous operating ratings.
7. Please refer to page.2 "Model Selection Guide" for safety approved models.

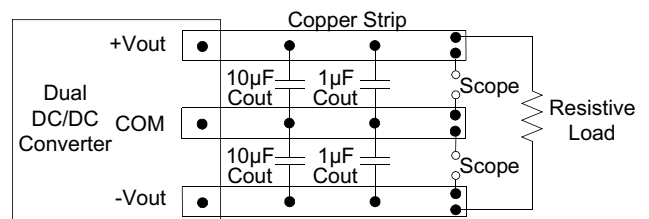
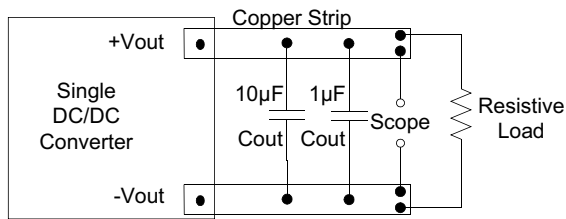
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8. "Nature Convection" is usually about 30-65 LFM but not equal to still air (0 LFM).
9. EMI filter components are used to meet radiated and conducted emissions, which application refer to the EMI filter of test configurations.
10. An external filter capacitor and TVS are required to meet IEC61000-4-4 and IEC61000-4-5.
The filter MOTIEN suggest : 12Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 26V
24Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 70V
48Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 120V
11. To operate without LOAD will not damage the product ; however, it will NOT meet all specification.

TEST CONFIGURATIONS

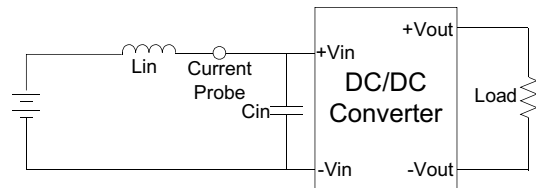
Output Ripple & Noise Measurement Test

To reduce ripple and noise , it's recommended to connect a 1.0 μ F ceramic disk capacitor and a 10 μ F electrolytic capacitor to output.



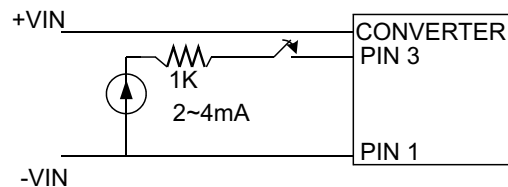
Input Reflected Ripple Current Test

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



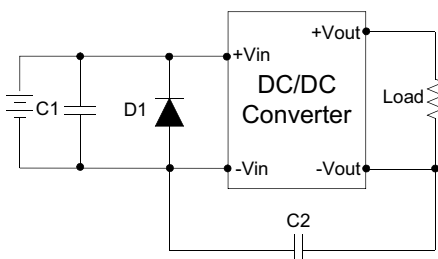
Remote ON / OFF Test Step

Input current (2~4mA) via 1K Ω to Pin3, converter OFF.
Open or high impedance, converter ON.



EFT & Surge Test Countermeasures

The filter MOTIEN suggest : 12Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 26V
24Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 70V
48Vin models : Nippon - chemi - con KY series , 330uF/100V and a TVS , 3KW , 120V



Models	C1	C2	D1
VB-12YYO9	330uF,100V	1808,1000pF,3KV	TVS,3KW,26V
VB-24YYO9	330uF,100V		TVS,3KW,70V
VB-48YYO9	330uF,100V		TVS,3KW,120V

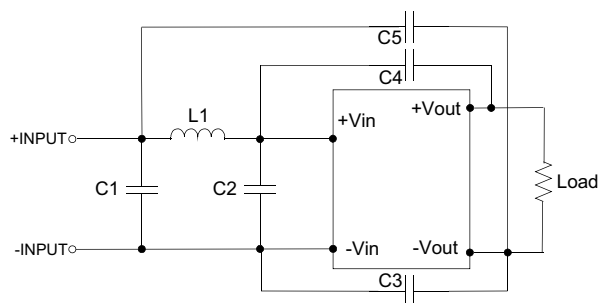
TEST CONFIGURATIONS

EMI Filter

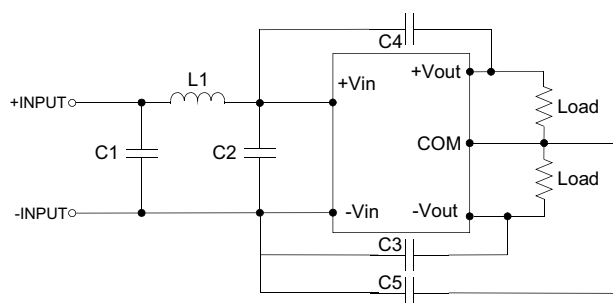
Input filter components (C1,C2,C3,C4,C5,L1) are used to meet EMI test criteria A.

These components should be mounted as close as possible to the module; and all leads should be minimized to decrease radiated noise.

Single Output Model

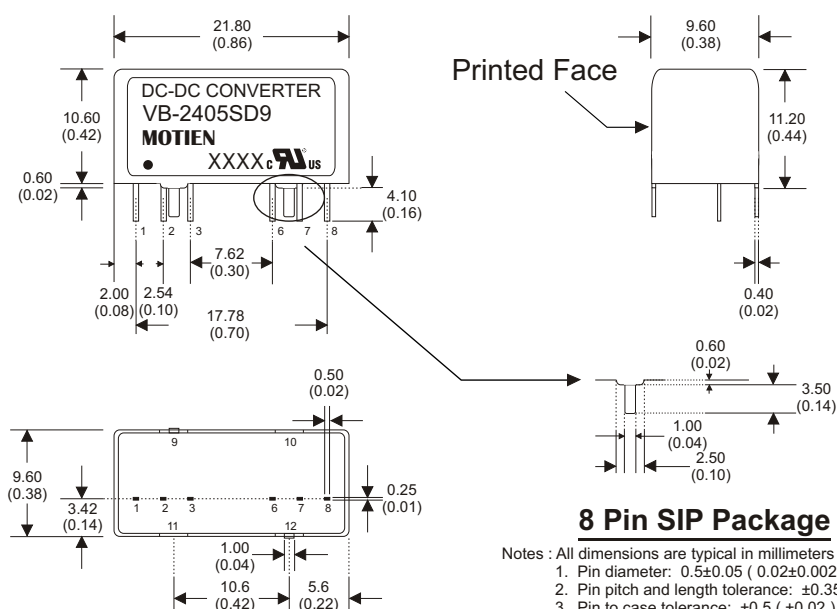


Dual Output Model



MODELS	C1	C2	C3,C4	C5	L1
12Vin	1210 10 μ F/35V		1808 1000pF/3kV		3.3 μ H
24Vin					
48Vin	1210 4.7 μ F/100V	1210 4.7 μ F/100V	1808 1000pF/3kV	1808 220pF/3kV	10 μ H

MECHANICAL SPECIFICATION



PIN CONNECTIONS

PIN NUMBER	SINGLE	DUAL
1	-V Input	-V Input
2	+V Input	+V Input
3	Remote On/Off	Remote On/Off
6	+V Output	+V Output
7	-V Output	Common
8	N.C	-V Output
9	Case	Case
10	Stand Off	Stand Off
11	Stand Off	Stand Off
12	Case	Case