

# SB-9W Series



9W2:1 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 SB-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 Ta=25°C, nominal input voltage and full load unless otherwise specified.

OUTPUT SPECIFICATIONS	
Voltage Accuracy	±1%, max.
Output Current	See table, max.
Line Regulation	±0.2%, max.
Load Regulation (From 0% to 100% Load)	Single output : ±0.5%, max. 3.3V : ±1.0%, max. (Balance load)Dual output : ±1.0%, max.
Cross Regulation (Dual Output) (1)	±5%, max.
Ripple & Noise (20MHz bandwidth)(2)	75mVpk-pk, max.
Over Voltage Protection	130%, typ.
Over Load Protection	150%, typ.
Short Circuit Protection	Indefinite(Automatic Recovery)
Temperature Coefficient	±0.02%/°C
Capacitive Load(3)	See table, max.
Transient Recovery Time (4)	250µs, typ.
Transient Response Deviation(4)	±3%, max. Single Output 3.3V: ±5%, max.

INPUT SPECIFICATIONS	
Voltage Range	See table
Start up Time(Nominal Vin and constant resistive load)	50ms, typ.
Input Filter	Capacitor
Input Current (No-Load)	See table, max.
Input Current (Full-Load)	See table, typ.
Input Reflected Ripple Current(5)	30mApk-pk, max.
Remote on/off	
ON:	Open or high impedance
OFF:	2-4mA input current (via 1KΩ).
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)	
These are stress ratings. Exposure of devices to any of these conditions may adversely affect long-term reliability.	
Input Surge Voltage(100ms max)	
12 Models	25Vdc, max.
24 Models	50Vdc, max.
48 Models	100Vdc, max.
Soldering Temperature (1.5mm from case 10sec max.)	260°C, max.

GENERAL SPECIFICATIONS	
Efficiency	See table, typ.
Switching Frequency	12V,24Vin Models : 400KHz, typ. 48Vin Models : 500KHz, typ.
I/O Isolation Voltage (60sec)	
Input / Output	1600Vdc
Case / Input & Output	1000Vdc
I/O Isolation Resistance	1GΩ, min.
I/O Isolation Capacity	50pF, max.
Humidity	5-95% rel. H
Reliability Calculated MTBF(MIL-HDBK-217 F)	> 900 Khrs
Safety Approvals (7)	UL/cUL 60950-1, 62368-1 IEC/EN 60950-1, 62368-1

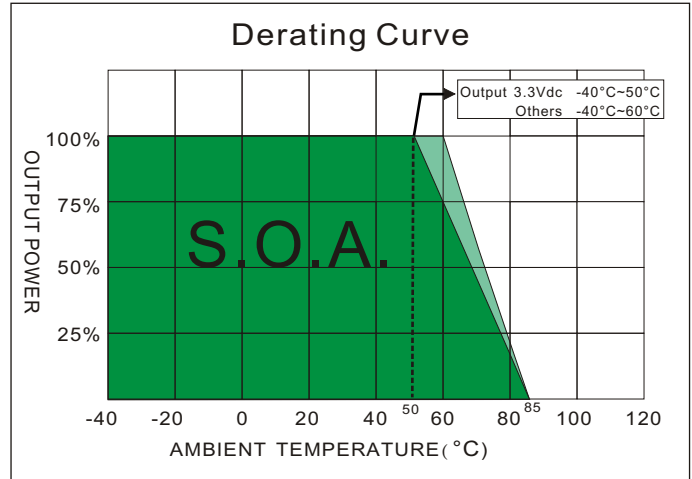
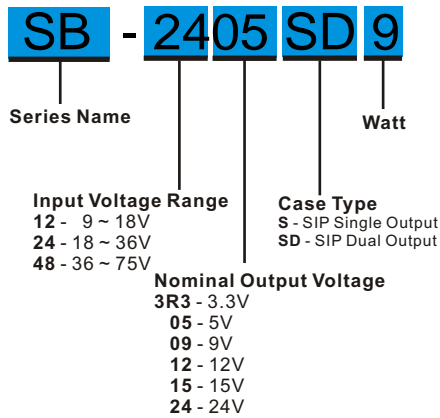
PHYSICAL SPECIFICATIONS	
Case Material	Copper
Potting Material	Epoxy (UL94V-0 rated)
Pin Material	C5191R-H Solder-coated
Weight	7.3g, typ.
Dimensions	0.86"x0.38"x0.44"

ENVIRONMENT SPECIFICATIONS	
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)
Maximum Case Temperature	100°C
Storage Temperature	- 55°C~125°C
Cooling (8)	Nature Convection

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

## SB - 9W 2:1 Regulated Single & Dual output

### 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)		
SB-123R3S9	CE/UL/CB	9-18,12V Nom.	15	679	3.3	0	2000	81	2600
SB-1205S9	CE/UL/CB	9-18,12V Nom.	15	784	5	0	1600	85	1300
SB-1209S9	CE/UL/CB	9-18,12V Nom.	15	862	9	0	1000	87	800
SB-1212S9	CE/UL/CB	9-18,12V Nom.	15	852	12	0	750	88	560
SB-1215S9	CE/UL/CB	9-18,12V Nom.	15	843	15	0	600	89	470
SB-1224S9	CE/UL/CB	9-18,12V Nom.	15	843	24	0	375	89	200
SB-1205SD9	CE/UL/CB	9-18,12V Nom.	15	784	±5	0	±800	85	±800
SB-1212SD9	CE/UL/CB	9-18,12V Nom.	15	852	±12	0	±375	88	±390
SB-1215SD9	CE/UL/CB	9-18,12V Nom.	15	843	±15	0	±300	89	±200
SB-243R3S9	CE/UL/CB	18-36,24V Nom.	15	344	3.3	0	2000	80	2600
SB-2405S9	CE/UL/CB	18-36,24V Nom.	15	392	5	0	1600	85	1300
SB-2409S9	CE/UL/CB	18-36,24V Nom.	15	426	9	0	1000	88	800
SB-2412S9	CE/UL/CB	18-36,24V Nom.	15	421	12	0	750	89	560
SB-2415S9	CE/UL/CB	18-36,24V Nom.	15	417	15	0	600	90	470
SB-2424S9	CE/UL/CB	18-36,24V Nom.	15	417	24	0	375	90	200
SB-2405SD9	CE/UL/CB	18-36,24V Nom.	15	388	±5	0	±800	86	±800
SB-2412SD9	CE/UL/CB	18-36,24V Nom.	15	421	±12	0	±375	89	±390
SB-2415SD9	CE/UL/CB	18-36,24V Nom.	15	431	±15	0	±300	87	±200
SB-483R3S9	CE	36-75,48V Nom.	10	168	3.3	0	2000	82	2600
SB-4805S9	CE/UL/CB	36-75,48V Nom.	10	196	5	0	1600	85	1300
SB-4809S9	CE	36-75,48V Nom.	10	213	9	0	1000	88	800
SB-4812S9	CE/UL/CB	36-75,48V Nom.	10	211	12	0	750	89	560
SB-4815S9	CE	36-75,48V Nom.	10	211	15	0	600	89	470
SB-4824S9	CE	36-75,48V Nom.	10	211	24	0	375	89	200
SB-4805SD9	CE	36-75,48V Nom.	10	194	±5	0	±800	86	±800
SB-4812SD9	CE	36-75,48V Nom.	10	216	±12	0	±375	87	±390
SB-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.

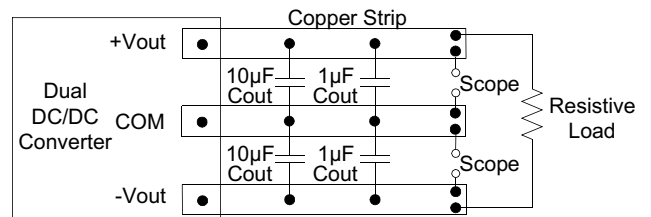
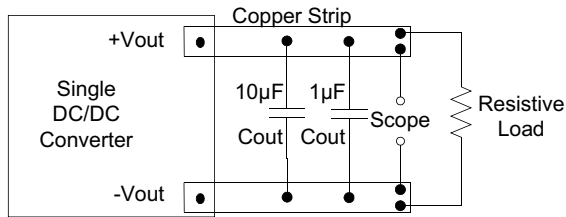
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8. "Nature Convection" is usually about 30-65 LFM but not equal to still air (0 LFM).
9. EMI filter components are used to meet radiated and conducted emissions, which application refer to the EMI filter of test configurations.
10. TVS are required to meet IEC61000-4-4 and IEC61000-4-5.  
The filter SCHMID-M 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

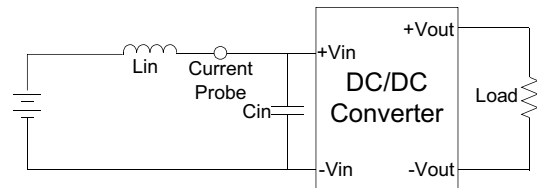
### Output Ripple & Noise Measurement Test

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



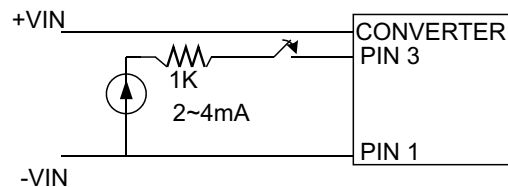
### Input Reflected Ripple Current Test

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.



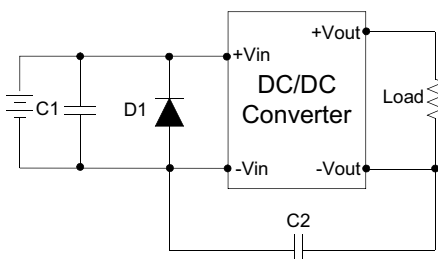
### Remote ON / OFF Test Step

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



### EFT & Surge Test Countermeasures

The filter SCHMID-M 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



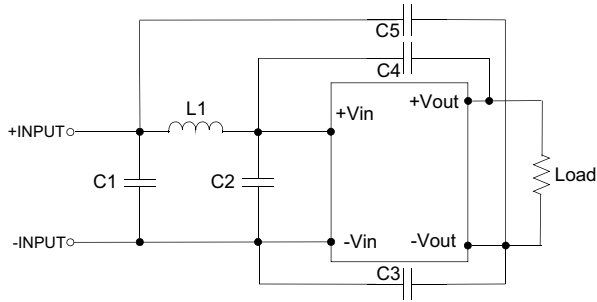
Models	C1	C2	D1
SB-12YYO9	330uF,100V		TVS,3KW,26V
SB-24YYO9	330uF,100V		TVS,3KW,70V
SB-48YYO9	330uF,100V	1808,1000pF,3KV	TVS,3KW,120V

TEST CONFIGURATIONS

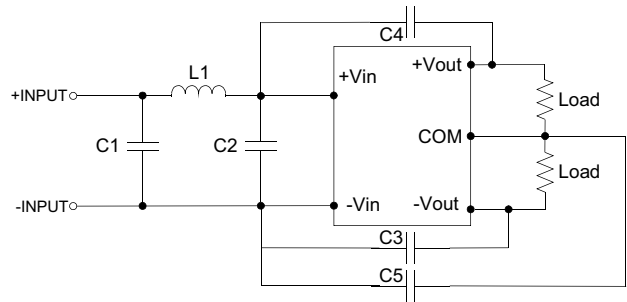
EMI Filter

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

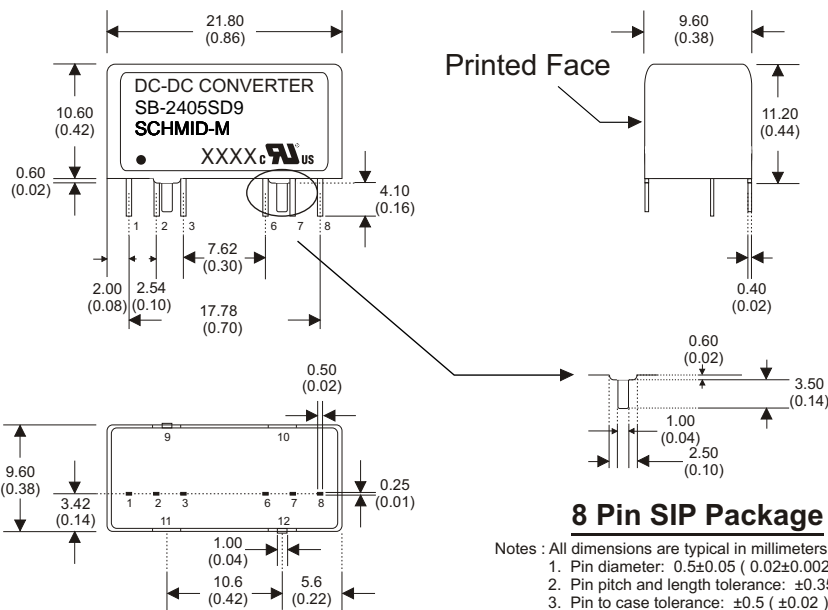


Dual Output Model



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

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