

Product Feature

- ◆ Package Type: SIP4
- ◆ Operating temperature range: -40°C - +105°C
- ◆ Isolation voltage: 1500VDC
- ◆ Full load efficiency: 89% (Typ.)
- ◆ Complies with standards: International standard pin method
- ◆ Fields of application: Power, industrial control, communications, Internet of Things, automotive, etc



Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output		Full Load Efficiency (%)Typ. ^①	Capacitive Load (μF) Max.
		Nominal (Range)	Voltage (VDC)	Current Max./Min.(mA)		
EN	SB-0303 S-1WR4	3.3 (2.97-3.63)	3.3	303/30	82	2400
	SB-0305 S-1WR4		5	200/20	83	2400
	SB-0309 S-1WR4		9	111/11	84	1000
	SB-0312 S-1WR4		12	84/8	85	560
	SB-0315 S-1WR4		15	67/7	85	560
	SB-0324 S-1WR4		24	42/4	85	220
UL/EN/IEC	SB-0503 S-1WR4	5 (4.5-5.5)	3.3	303/30	82	2400
EN	SB-0505 S-1WR4		5	200/20	84	2400
UL/EN/IEC	SB-0509 S-1WR4		9	111/11	86	1000
EN	SB-0512 S-1WR4		12	84/8	88	560
	SB-0515 S-1WR4		15	67/7	88	560
	SB-0524 S-1WR4		24	42/4	89	220
	SB-1203 S-1WR4	12 (10.8-13.2)	3.3	303/30	84	2400
	SB-1205 S-1WR4		5	200/20	88	2400
	SB-1209 S-1WR4		9	111/11	87	1000
SB-1212 S-1WR4	12		84/8	89	560	
SB-1215 S-1WR4	15		67/7	88	560	
SB-1224 S-1WR4	24		42/4	89	220	
EN	SB-1503 S-1WR4	15 (13.5-16.5)	3.3	303/30	82	2400
	SB-1505 S-1WR4		5	200/20	85	2400
	SB-1509 S-1WR4		9	111/11	88	1000
	SB-1512 S-1WR4		12	84/8	89	560
	SB-1515 S-1WR4		15	67/7	89	560
	SB-1524 S-1WR4		24	42/4	89	220
EN	SB-2403 S-1WR4	24 (21.6-26.4)	3.3	303/30	84	2400
	SB-2405 S-1WR4		5	200/20	87	2400
	SB-2409 S-1WR4		9	111/11	89	1000
	SB-2412 S-1WR4		12	84/8	88	560
	SB-2415 S-1WR4		15	67/7	89	560
	SB-2424 S-1WR4		24	42/4	89	220

Certification	Part No.	Input Voltage (VDC)	Output		Full Load Efficiency (%)Typ. ^①	Capacitive Load (μF)Max.
		Nominal (Range)	Voltage (VDC)	Current Max./Min.(mA)		
--	SB-0404 S-1WR4	4 (3.6-4.4)	4	250/25	83	4000
	SB-0518 S-1WR4	5 (4.5-5.5)	18	56/6	87	470
	SB-0909 S-1WR4	9 (8.1-9.9)	9	111/11	87	1000
	SB-1818 S-1WR4	18 (16.2-19.8)	18	56/6	88	220
	SB-2418 S-1WR4	24 (21.6-26.4)	18	56/6	88	470

Notes:
 ①Efficiency is measured at nominal input voltage and rated output load.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load/no-Load)	3.3VDC Nominal input series	3.3/5VDC Output	--	370/10	385/15	mA
		Other Output	--	356/12	365/18	
	4VDC Nominal input series		--	301/10	311/15	
	5VDC Nominal input series	3.3VDC Output	--	244/10	250/15	
		15/24VDC Output	--	225/18	230/25	
		Other Output	--	227/10	241/15	
	9VDC Nominal input series		--	127/9	140/15	
	12VDC Nominal input series	3.3/5VDC Output	--	96/8	100/15	
		Other Output	--	94/8	98/15	
	15VDC Nominal input series	3.3/5VDC Output	--	78/8	88/15	
		Other Output	--	75/8	85/15	
	18VDC Nominal input series		--	63/6	70/15	
	24VDC Nominal input series	3.3/5VDC Output	--	47/5	50/15	
Other Output		--	46/5	48/15		
Reflected Ripple Current			--	15	--	
Impulse Voltage (1sec.max)	3.3VDC Nominal input series		-0.7	--	5	VDC
	4VDC Nominal input series		-0.7	--	8	
	5VDC Nominal input series		-0.7	--	9	
	9VDC Nominal input series		-0.7	--	15	
	12VDC Nominal input series		-0.7	--	18	
	15VDC Nominal input series		-0.7	--	21	
	18VDC Nominal input series		-0.7	--	24	
24VDC Nominal input series		-0.7	--	30		
Input Filter			Capacitance Filter			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy			See Envelope Curve Figure.1			
Linear Regulation Rate	Input Voltage Variation $\pm 1\%$	3.3VDC Output	--	± 1.5	--	--
		Other Output	--	± 1.2	--	--
Load Regulation Rate	10% - 100% load	3.3/4/5VDC Output	--	10	--	%
		9/12/15VDC Output	--	8	--	
		18/24VDC Output	--	6	--	
Ripple & Noise	20MHz bandwidth, 100% load, use the parallel line test		--	45	120	mVp-p
Temperature Drift Coefficient	Full Load		--	± 0.02	--	%/°C
Short-Circuit Protection			Continuous, Self-Recovery			

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Insulation Voltage	Input-output, test time 1 minute, leakage current less than 1mA	1500	--	--	VDC
Insulation Resistance	Input-output, insulated voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V	--	20	--	pF
Operating Temperature	Derating when operating temperature $\geq 85^\circ\text{C}$, (See Figure.2)	-40	--	105	°C
Storage Temperature		-55	--	125	°C
Case Temperature Rise	Ta=25°C, nominal input, output load	--	15	--	°C
Storage Humidity	Non-condensing	5	--	95	%RH
Soldering Profile	Wave-soldering	260 \pm 5°C; time: 5 - 10s			
	Manual-welding	360 \pm 10°C; time: 3 - 5s			
Switching Frequency	Full load, nominal input voltage	--	220	--	kHz
MTBF	MIL-HDBK-217F@25°C	3500	--	--	k hours

Mechanical Specification

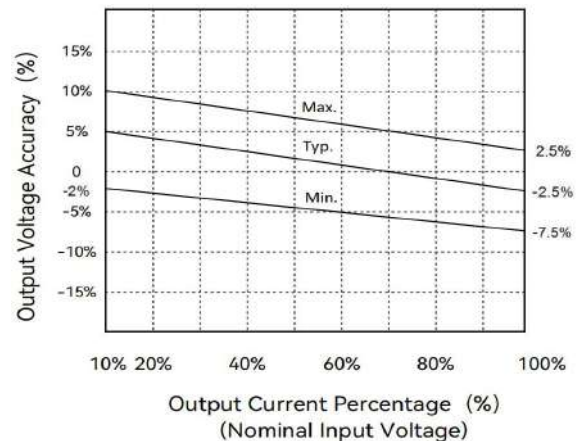
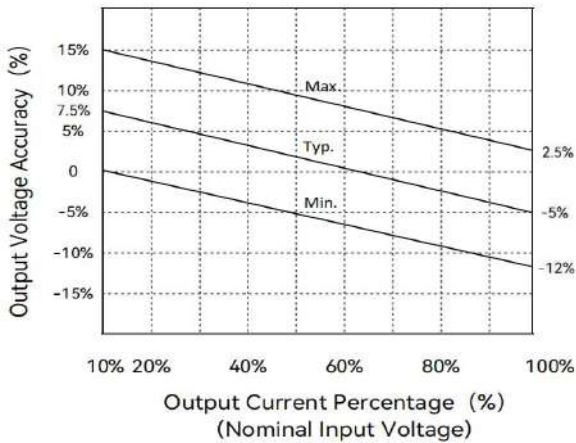
Case Material	Black plastic; flame-retardant and heat-resistant (UL94V-0)
Package Dimensions	11.6 x 6.00 x 10.20mm
Weight	1.3g (Typ.)
Cooling Method	Free air convection (20LFM)

EMC Specifications

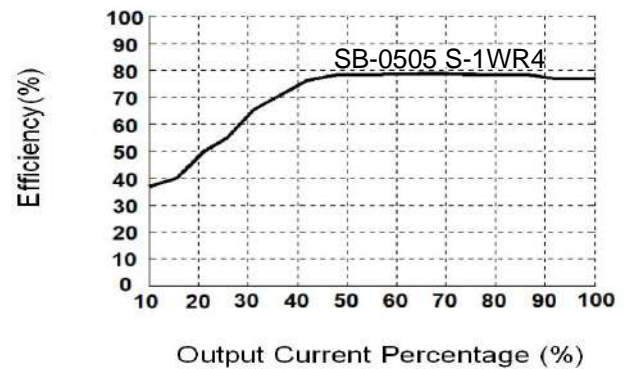
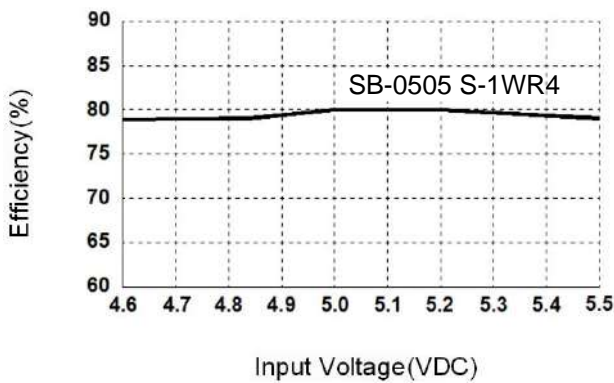
EMI	CE	CISPR32/EN55032 CLASS B (see Figure. 4 for EMC recommended circuit)
	RE	CISPR32/EN55032 CLASS B (see Figure. 4 for EMC recommended circuit)
EMS	ESD	IEC/EN61000-4-2 Contact $\pm 6\text{KV}$ Air $\pm 8\text{KV}$ perf. Criteria B

Typical Characteristic Curves

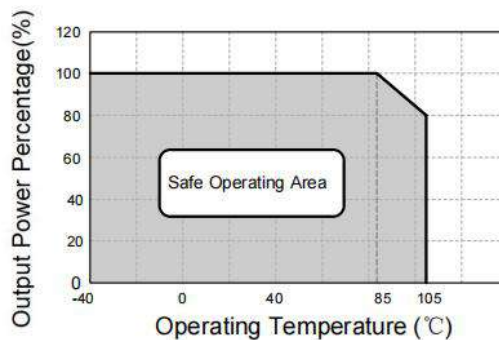
Output Regulation Curve 3.3V Output (Figure.1-1) Output Regulation Curve Other Output (Figure.1-2)



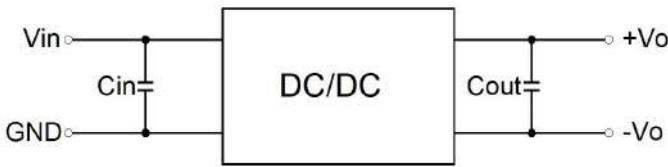
Efficiency VS Input Voltage Curve(Full load) Efficiency VS Output Load Curve (Vin=5V)



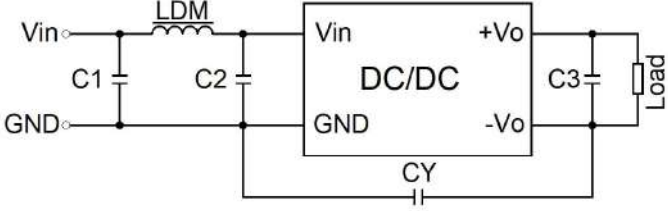
Temperature Derating Curve (Figure.2)



Typical Circuit Design and Application

Application Circuit (Figure.3)	Recommended Capacitive Load Value Table																							
	<table border="1"> <thead> <tr> <th>Vin</th> <th>Cin</th> <th>Vo</th> <th>Cout</th> </tr> </thead> <tbody> <tr> <td>3.3/4/5VDC</td> <td>4.7uF/16V</td> <td>3.3/4/5VDC</td> <td>10µF/16V</td> </tr> <tr> <td>9/12VDC</td> <td>2.2uF/25V</td> <td>9/12VDC</td> <td>4.7µF/16V</td> </tr> <tr> <td>15VDC</td> <td>2.2uF/50V</td> <td>15VDC</td> <td>1.0µF/25V</td> </tr> <tr> <td>18/24VDC</td> <td>1.0uF/50V</td> <td>18/24VDC</td> <td>0.47µF/50V</td> </tr> </tbody> </table>	Vin	Cin	Vo	Cout	3.3/4/5VDC	4.7uF/16V	3.3/4/5VDC	10µF/16V	9/12VDC	2.2uF/25V	9/12VDC	4.7µF/16V	15VDC	2.2uF/50V	15VDC	1.0µF/25V	18/24VDC	1.0uF/50V	18/24VDC	0.47µF/50V			
	Vin	Cin	Vo	Cout																				
	3.3/4/5VDC	4.7uF/16V	3.3/4/5VDC	10µF/16V																				
	9/12VDC	2.2uF/25V	9/12VDC	4.7µF/16V																				
15VDC	2.2uF/50V	15VDC	1.0µF/25V																					
18/24VDC	1.0uF/50V	18/24VDC	0.47µF/50V																					

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Figure.3. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

EMC Recommended Circuit (Figure.4)	EMC Recommended Parameter Table											
	<table border="1"> <thead> <tr> <th>Parameter</th> <th>Value</th> </tr> </thead> <tbody> <tr> <td>C1/C2</td> <td>4.7µF /50V</td> </tr> <tr> <td>C3</td> <td>Refer Figure.3 Capacitive load value table</td> </tr> <tr> <td>CY</td> <td>1000pF/2kVDC</td> </tr> <tr> <td>LDM</td> <td>6.8µH</td> </tr> </tbody> </table>	Parameter	Value	C1/C2	4.7µF /50V	C3	Refer Figure.3 Capacitive load value table	CY	1000pF/2kVDC	LDM	6.8µH	
	Parameter	Value										
	C1/C2	4.7µF /50V										
	C3	Refer Figure.3 Capacitive load value table										
CY	1000pF/2kVDC											
LDM	6.8µH											

Note:

1. Typical applications

To further reduce input and output ripple, a capacitor filtering network can be connected at the input and output terminals. The application circuit is shown in Figure.3. However, care should be taken to select a suitable filter capacitor. If the capacitance is too large, it is likely to cause start-up problems. For each output, the recommended capacitive load values are shown in "Recommended Capacitive Load Value Table" for safe and reliable operation.

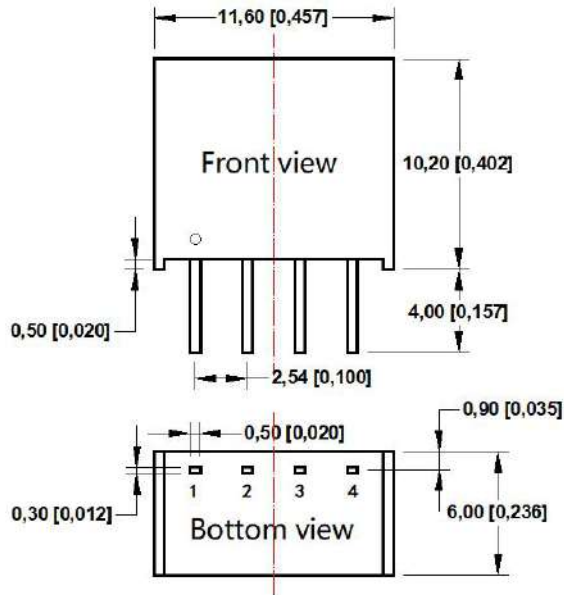
2. See Figure. 4 for EMC recommended circuit.

3. Output load requirements

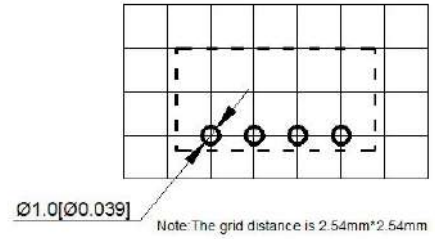
In order to ensure that the module can work efficiently and reliably, the minimum output load should not be less than 10% of the rated load when used. If the power required is really small, connect a resistor in parallel to the output end (the sum of the power consumed by the resistance and the power actually used is greater than or equal to 10% of the rated power).

Dimensions and Recommended Layout

Dimensions



PCB Printing Layout



Pin Definition Table

Pin	Function
1	GND
2	Vin
3	-Vo
4	+Vo

Note:

Unit: mm[inch]

Pin section tolerances: $\pm 0.10 [\pm 0.004]$

General tolerances: $\pm 0.50 [\pm 0.020]$

Packaging instructions

Packaging Information

Product quantity of single tube (pcs/tube)	Electrostatic bag quantity (pcs/ bag)	Inner carton quantity (pcs/carton)	Outer carton quantity (pcs/carton)
44	704	2816	11264

Note :

- ✧ The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
- ✧ It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
- ✧ The maximum capacitive load is tested within the input voltage range and under full load conditions;
- ✧ Unless otherwise specified, all indicators in this manual are measured at $T_a=25\text{ }^\circ\text{C}$, humidity<75% RH, nominal input voltage, and output rated load;
- ✧ All indicator testing methods in this manual are based on our company's corporate standards;
- ✧ Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
- ✧ Product specifications are subject to change without prior notice.