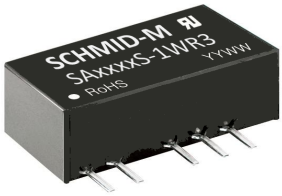
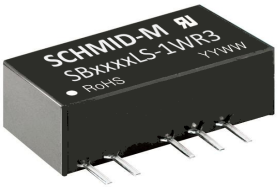
DC/DC Converter

SA05_S-1WR3 & SB05_LS-1WR3 Series

1W isolated DC-DC converter

Fixed input voltage and unregulated dual/single output





c UL us CE CB Patent Protection RoHS

Continuous Short Circuit Protection

FEATURES

- Continuous short-circuit protection
- No-load input current as low as 5mA
- Operating temperature range: -40℃ to +105℃
- High efficiency up to 85%
- I/O isolation test voltage 1.5k VDC
- Industry standard pin-out
- SIP package
- IEC62368, UL62368, EN62368 approved

SA05_S-1WR3 & SB05_LS-1WR3 series are specially designed for applications where an isolated (two isolated) voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.

Selection Guide

Certification	Part No.	Input Voltage(VDC)	Output		Full Load Efficiency(%) Min./Typ.	Capacitive Load(μF)* Max.
		Nominal (Range)	Voltage (VDC)	Current(mA) Max./Min.		
CE	SA0503S-1WR3	5 (4.5-5.5)	±3.3	±152/±15	70/74	1200
UL/CE/CB	SA0505S-1WR3		±5	±100/±10	78/82	1200
	SA0509S-1WR3		±9	±56/±6	79/83	470
	SA0512S-1WR3		±12	±42/±5	79/83	220
	SA0515S-1WR3		±15	±34/±4	79/83	220
	SA0524S-1WR3		±24	±21/±3	81/85	100
	SB0503LS-1WR3		3.3	303/30	70/74	2400
	SB0505LS-1WR3		5	200/20	78/82	2400
	SB0509LS-1WR3		9	111/12	79/83	1000
	SB0512LS-1WR3		12	84/9	79/83	560
	SB0515LS-1WR3		15	67/7	79/83	560
	SB0524LS-1WR3		24	42/4	81/85	220

Note: *The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Current (full load / no-load)	3.3VDC/5VDC output	--	270/5	286/10	mA
	9VDC/12VDC output	--	241/12	254/20	
	15VDC/24VDC output	--	241/18	254/30	
Reflected Ripple Current*		--	15	--	
Surge Voltage (1sec. max.)	5VDC input	-0.7	--	9	VDC
Input Filter		Capacitance filter			
Hot Plug		Unavailable			

Note: * Refer to DC-DC Converter Application Notes for detailed description of reflected ripple current test method.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy			See output regulation curve(Fig. 1)			
Linear Regulation	Input voltage change: ±1%	3.3VDC output	--	--	1.5	%
		Others	--	--	1.2	

Load Regulation	10%-100% load	3.3VDC output	--	15	20	%
		5VDC output	--	10	15	
		9VDC output	--	8	10	
		12VDC output	--	7	10	
		15VDC output	--	6	10	
		24VDC output	--	5	10	
Ripple & Noise*	20MHz bandwidth	Others	--	30	75	mVp-p
		24VDC output	--	50	100	
Temperature Coefficient	100% load		--	±0.02	--	%/℃
Short-circuit Protection			Continuous, self-recovery			
Note: * The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.						

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.		1500	--	--	VDC
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V		--	20	--	pF
Operating Temperature	Derating when operating temperature≥85℃, (see Fig. 2)		-40	--	105	℃
Storage Temperature			-55	--	125	
Case Temperature Rise	Ta=25℃	3.3VDC output	--	25	--	
		Others	--	15	--	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	
Storage Humidity	Non-condensing		--	--	95	%RH
Switching Frequency	100% load, nominal input voltage		--	270	--	KHz
MTBF	MIL-HDBK-217F@25℃		3500	--	--	K hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	19.65 x 6.00 x 10.16mm
Weight	2.1g(Typ.)
Cooling Method	Free air convection

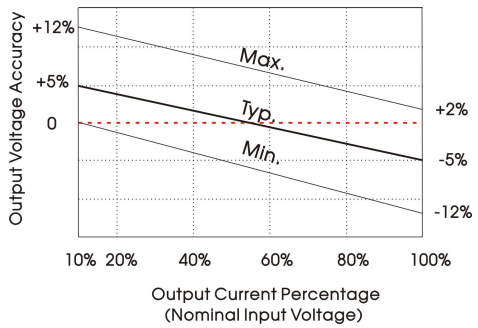
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit)
	RE	CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2 Air ±8kV , Contact ±4kV perf. Criteria B

Typical Characteristic Curves

3.3VDC output

Output Regulation Curve



Others

Output Regulation Curve

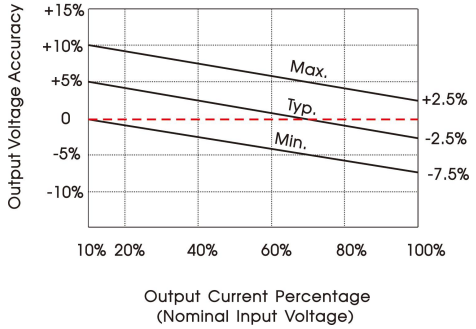
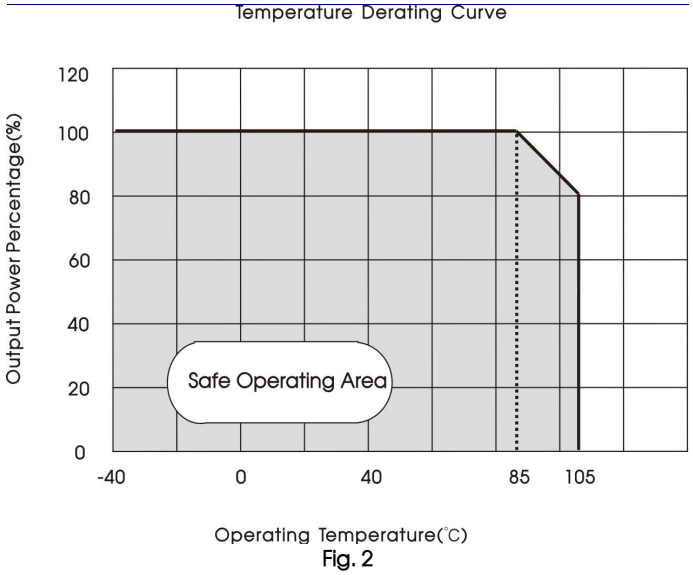
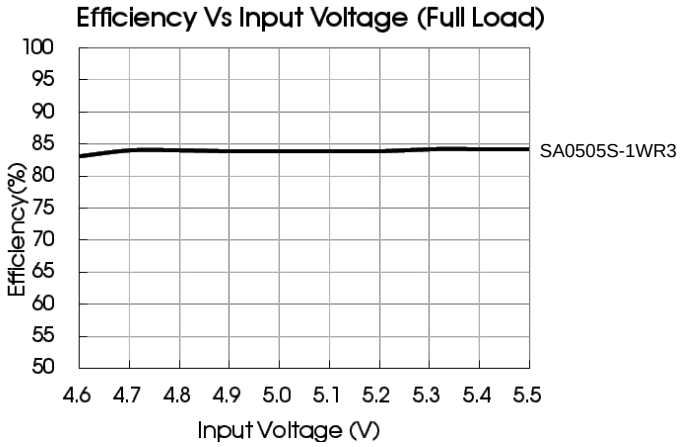
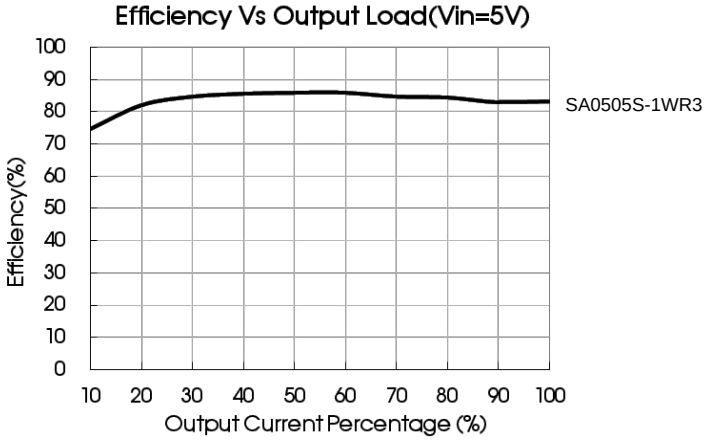
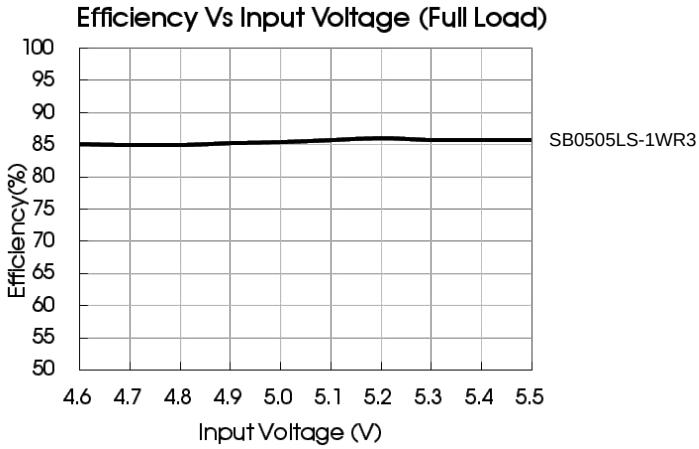


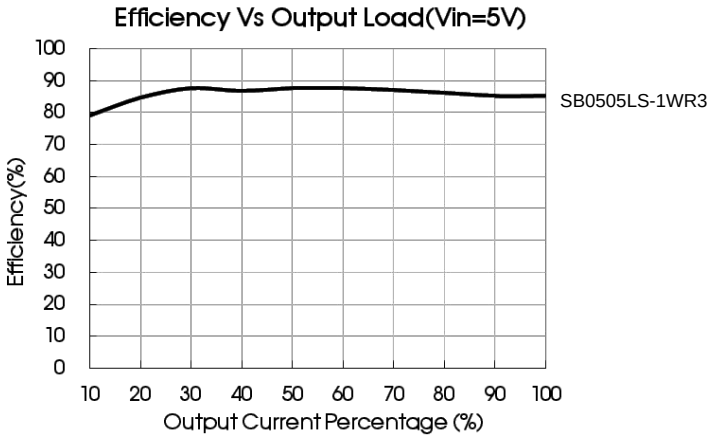
Fig. 1


Temperature Derating Curve
Output Power Percentage(%)
120
100
80
60
40
20
0
Safe Operating Area
-40
0
40
85
105
Operating Temperature(℃)
Fig. 2


Efficiency Vs Input Voltage (Full Load)
Efficiency(%)
100
95
90
85
80
75
70
65
60
55
50
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
Input Voltage (V)
SA0505S-1WR3


Efficiency Vs Output Load(Vin=5V)
Efficiency(%)
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
Output Current Percentage (%)
SA0505S-1WR3


Efficiency Vs Input Voltage (Full Load)
Efficiency(%)
100
95
90
85
80
75
70
65
60
55
50
4.6
4.7
4.8
4.9
5.0
5.1
5.2
5.3
5.4
5.5
Input Voltage (V)
SB0505LS-1WR3


Efficiency Vs Output Load(Vin=5V)
Efficiency(%)
100
90
80
70
60
50
40
30
20
10
0
10
20
30
40
50
60
70
80
90
100
Output Current Percentage (%)
SB0505LS-1WR3

Design Reference

1.Typical application

Input and/or output ripple can be further reduced, by connecting a filter capacitor from the input and/or output terminals to ground as shown in Fig.3.

Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

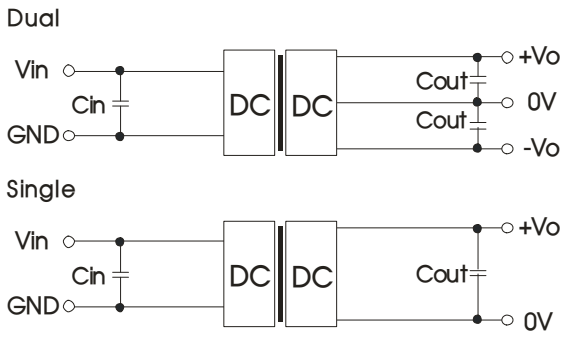


Fig. 3

Recommended capacitive load value table (Table 1)

Vin (VDC)	Cin (μF)	Single Vout (VDC)	Cout (μF)	Dual Vout (VDC)	Cout (μF)
5	4.7	3.3/5	10	±5	4.7
--	--	9/12	2.2	±9/±12	1
--	--	15/24	1	±15/±24	0.47

2. EMC (CLASS B) compliance circuit

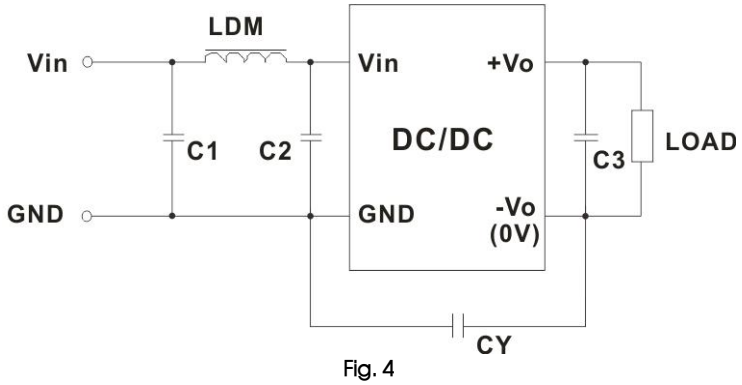


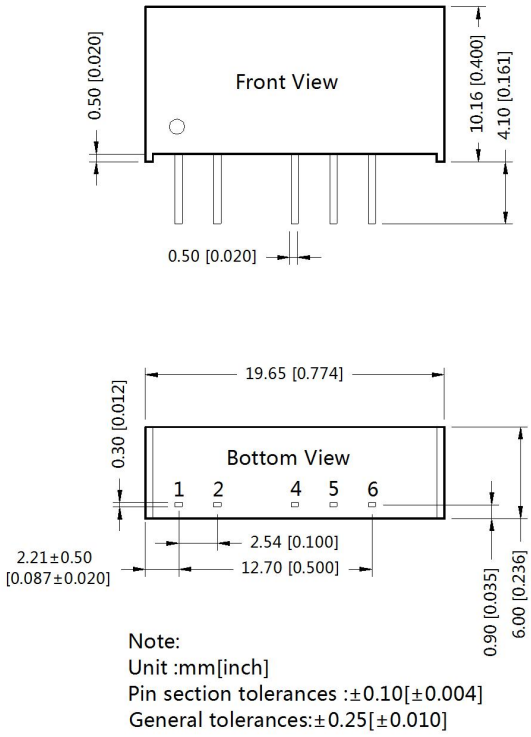
Fig. 4

EMC recommended circuit value table (Table 2)

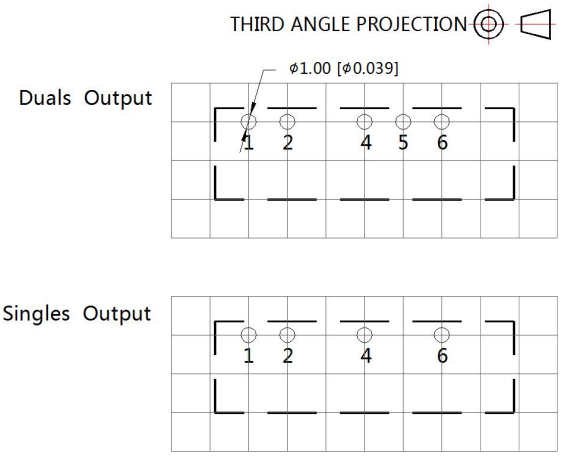
Input voltage 5VDC	Output voltage (VDC)		3.3/5/9	12/15/24
	EMI	C1/C2	4.7μF /25V	4.7μF /25V
		CY	--	1nF/4KVDC VISHAY HGZ102MBP TDK CD45-E2GA102M-GKA
		C3	Refer to the Cout in table 1	
		LDM	6.8μH	6.8μH

Note: In the case of actual use, the requirements for EMI are high, it is subject to CY .

Dimensions and Recommended Layout



Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.25[±0.010]



Note : Grid 2.54*2.54mm

Pin-Out		
Pin	Singles	Duals
1	Vin	Vin
2	GND	GND
4	0V	-Vo
5	No Pin	0V
6	+Vo	+Vo

Notes:

1. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.