

# DC/DC Converter

## B\_S-1WR3 Series

1W isolated DC-DC converter  
Fixed input voltage, unregulated single output



Continuous Short  
Circuit Protection



Patent Protection

**CE** Report  
EN 62368-1

**UK** Report  
BS EN 62368-1

**CB** **RoHS**  
IEC 62368-1

## FEATURES

- Continuous short-circuit protection
- No-load input current as low as 8mA
- Operating ambient temperature range: -40°C to +105°C
- High efficiency up to 85%
- I/O isolation test voltage: 1.5k VDC
- Industry standard pin-out

*B\_S-1WR3 series are specially designed for applications where an 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.		
--	B0303S-1WR3	3.3 (2.97-3.63)	3.3	303/30	75/79	2400
	B0305S-1WR3		5	200/20	78/82	2400
	B0309S-1WR3		9	111/11	81/85	1000
	B0312S-1WR3		12	83/8	78/82	560
	B0315S-1WR3		15	67/7	78/82	560
	B0324S-1WR3		24	42/4	80/84	220
EN/BS EN	B0503S-1WR3	5 (4.5-5.5)	3.3	303/30	70/74	2400
	B0505S-1WR3		5	200/20	78/82	2400
	B0509S-1WR3		9	111/12	79/83	1000
	B0512S-1WR3		12	84/9	79/83	560
	B0515S-1WR3		15	67/7	79/83	560
	B0524S-1WR3		24	42/4	81/85	220
EN/BS EN/IEC	B1203S-1WR3	12 (10.8-13.2)	3.3	303/30	71/75	2400
	B1205S-1WR3		5	200/20	76/80	2400
	B1209S-1WR3		9	111/12	76/80	1000
	B1212S-1WR3		12	83/9	76/80	560
	B1215S-1WR3	15	67/7	77/81	560	
	B1224S-1WR3	24	42/5	77/81	220	
	B1505S-1WR3	15 (13.5-16.5)	5	200/20	76/80	2400
	B1509S-1WR3		9	111/12	76/80	1000
	B1512S-1WR3		12	83/9	76/80	560
	B1515S-1WR3		15	67/7	77/81	560
B1524S-1WR3	24		42/5	77/81	220	
--						
EN/BS EN/IEC	B2403S-1WR3	24 (21.6-26.4)	3.3	303/30	69/75	2400
	B2405S-1WR3		5	200/20	73/79	2400
	B2409S-1WR3		9	111/12	74/80	1000
	B2412S-1WR3		12	83/9	75/81	560
	B2415S-1WR3		15	67/7	75/81	560
	B2424S-1WR3		24	42/5	75/81	220

## Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	3.3V input	3.3VDC output	--	384/10	405/--	mA
		Other output	--	370/18	389/--	

Input Current (full load / no-load)	5V input	3.3VDC output	--	271/8	286/--	mA
		5VDC output	--	244/8	257/--	
		9VDC/12VDC/15VDC output	--	241/12	254/--	
		24VDC output	--	241/18	254/--	
	12V input	3.3VDC output	--	112/8	118/--	
		5VDC/9VDC/12VDC output	--	105/8	110/--	
		15VDC/24VDC output	--	103/8	109 /--	
	15V input	5VDC/9VDC/12VDC output	--	84/8	88/--	
		15VDC/24VDC output	--	83/8	87/--	
	24V input	3.3VDC output	--	56/8	61/--	
		5VDC output	--	53/8	58/--	
		9VDC output	--	53/8	57/--	
12VDC/15VDC/24VDC output		--	52/8	56/--		
Reflected Ripple Current		--	15	--		
Surge Voltage(1sec. max.)	3.3VDC input	-0.7	--	5	VDC	
	5VDC input	-0.7	--	9		
	12VDC input	-0.7	--	18		
	15VDC input	-0.7	--	21		
	24VDC input	-0.7	--	30		
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 curves (Fig. 1)				
Linear Regulation	Input voltage change: ±1%	3.3VDC output	--	--	1.5	--
		Other output	--	--	1.2	
Load Regulation	3.3VDC input 10%-100% load	3.3VDC output	--	12	18	%
		Other output	--	8	15	
	5VDC input 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	
	12VDC/15VDC/24VDC input 10%-100% load	3.3VDC output	--	8	20	
		5VDC output	--	5	15	
		9VDC output	--	3	10	
		12VDC output	--	3	10	
		15VDC output	--	3	10	
		24VDC output	--	2	10	
Ripple & Noise*	20MHz bandwidth	Other output	--	30	75	mVp-p
		24VDC output	--	50	100	
Temperature Coefficient	Full load	--	±0.02	--	%/°C	
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
	5V input, input-output electric strength test for 1 second with a leakage current of 1mA max.		3000	--	--	
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V		--	20	--	pF
Operating Temperature	3.3V input	Derating when operating temperature $\geq 100^{\circ}\text{C}$ , (see Fig. 2) Derating when operating temperature $\geq 85^{\circ}\text{C}$ , (see Fig. 2)	-40	--	105	$^{\circ}\text{C}$
	Other input					
Storage Temperature			-55	--	125	
Case Temperature Rise	Ta=25 $^{\circ}\text{C}$		--	25	--	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	
Storage Humidity	Non-condensing	5V input	--	--	95	
		Other output	5	--	95	
Vibration	3.3V/12V/15V/24V input		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency	3.3V input, full load, nominal input voltage		--	220	--	kHz
	5V input, full load, nominal input voltage		--	270	--	
	12V/15V/24V input, full load, nominal input voltage		--	260	--	
MTBF	MIL-HDBK-217F @ 25 $^{\circ}\text{C}$		3500	--	--	k hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	11.60 x 6.00 x 10.16 mm
Weight	1.3g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

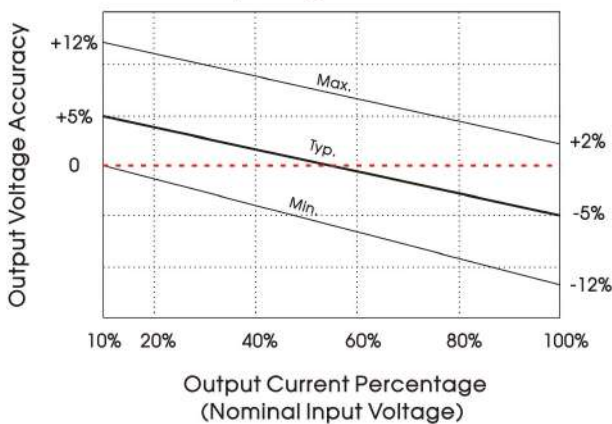
Emissions	CE	CISPR32/EN55032 CLASS B
	RE	CISPR32/EN55032 CLASS B
Immunity	ESD	IEC/EN61000-4-2 Air $\pm 8\text{kV}$ , Contact $\pm 6\text{kV}$ perf. Criteria B

Note: Refer to Fig.4 for recommended circuit test.

Typical Characteristic Curves

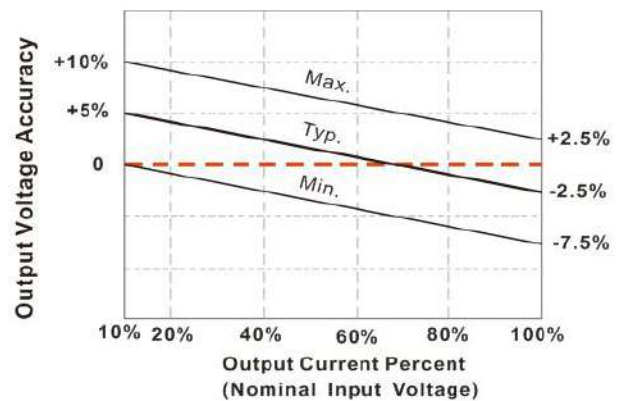
3.3VDC output

Output Regulation Curve



3.3/5VDC input other output

Output Regulation Curve



12VDC/15VDC/24VDC input  
Other output  
Output Regulation Curve

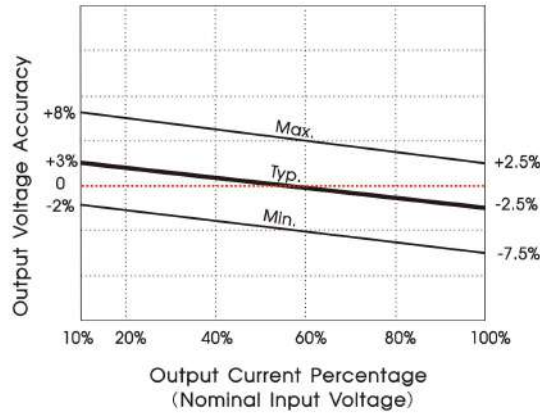


Fig. 1

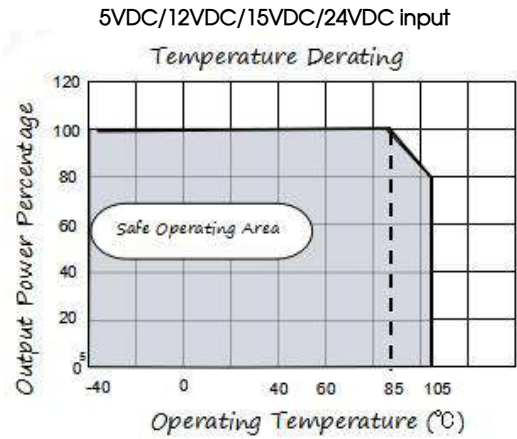
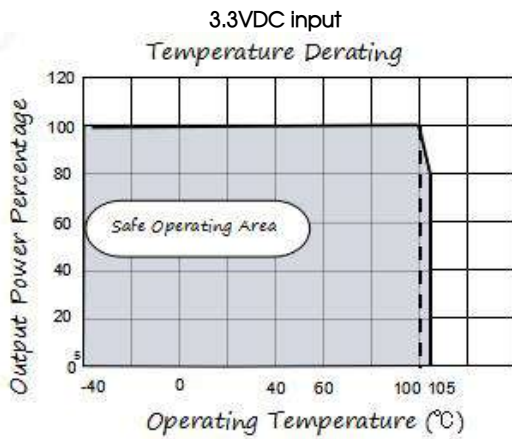
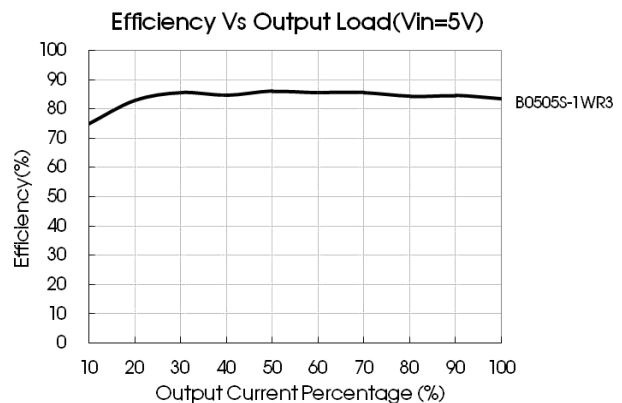
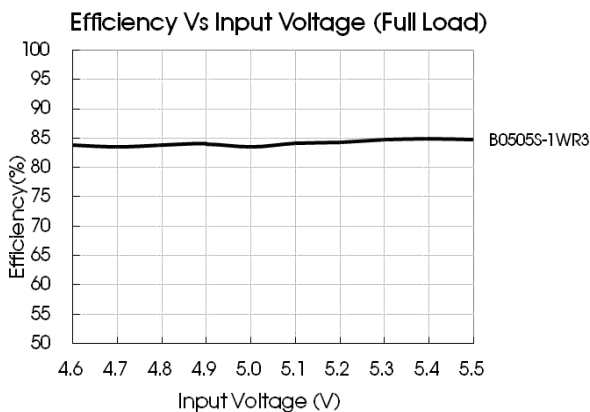
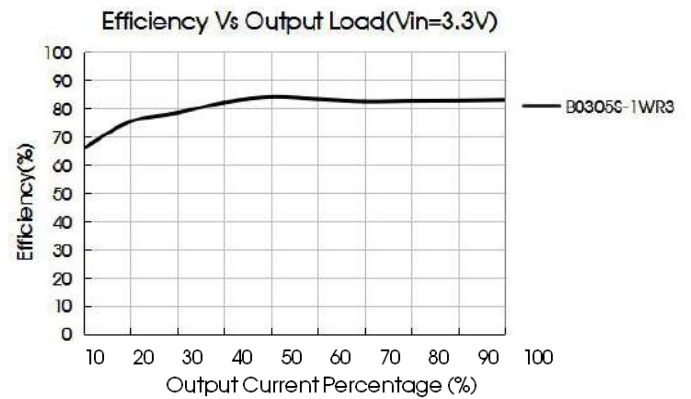
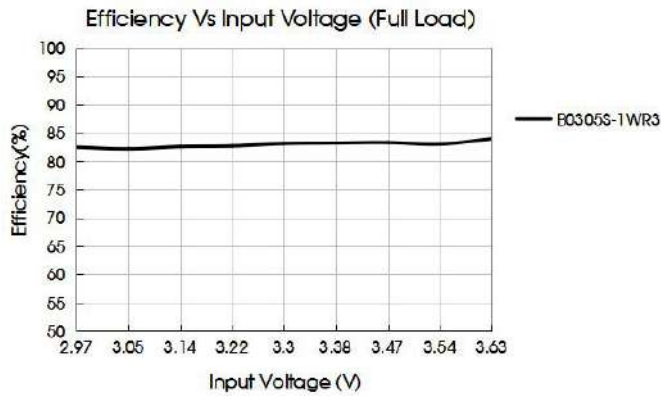
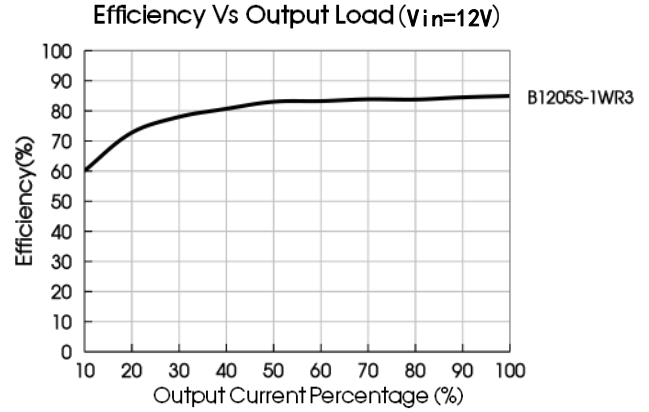
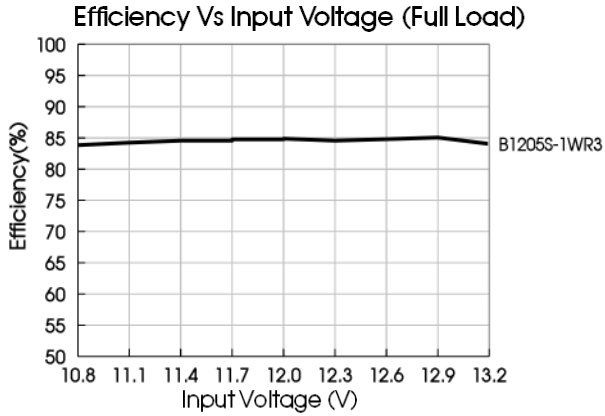


Fig. 2





## 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.

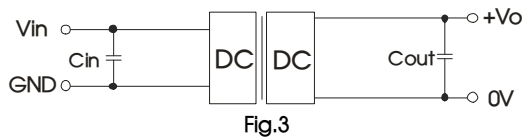


Table 1: Recommended input and output capacitor values

Vin	Cin	Vo	Cout
3.3VDC	10μF/25V	3.3VDC	10μF/16V
5VDC	4.7μF/16V	5VDC	10μF/16V
12VDC	2.2μF/25V	9VDC	2.2μF/16V
15VDC	2.2μF/25V	12VDC	2.2μF/25V
24VDC	1μF/50V	15VDC	1μF/25V
--	--	24VDC	1μF/50V

### 2. EMC compliance circuit

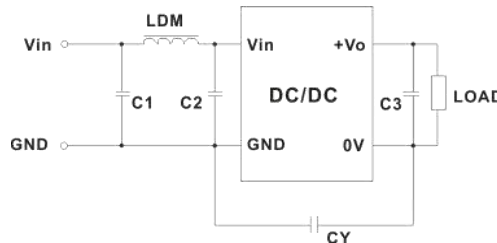
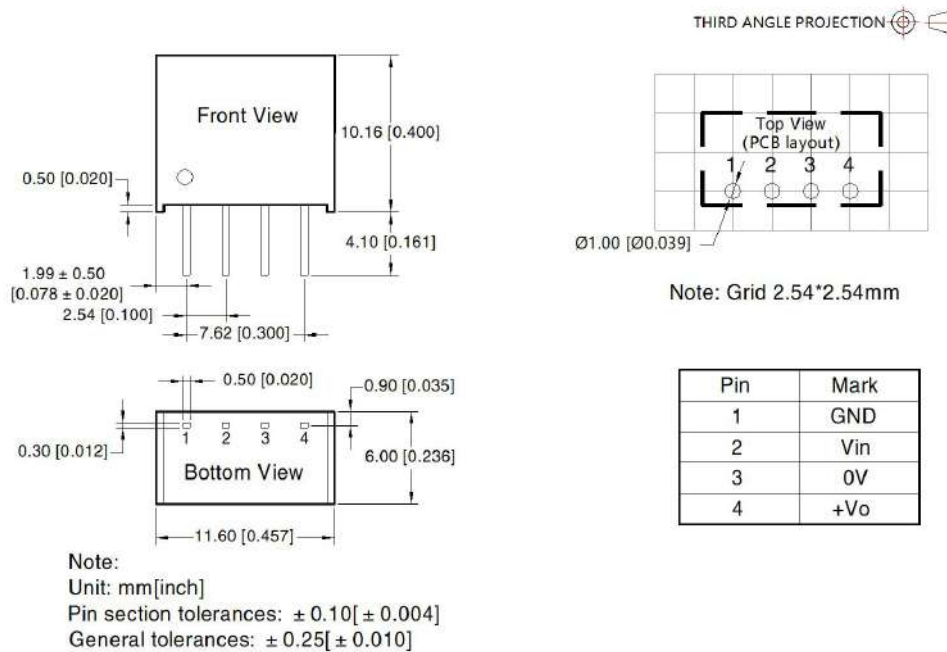


Table 2: Recommended EMC filter values

Input voltage	3.3DVC		5DVC		12/15/24DVC
Output voltage	3.3/5VDC	9/12/15/24VDC	3.3/5/9VDC	12/15/24VDC	--
Emissions	C1/C2	4.7μF /16V	4.7μF/16V	4.7μF/25V	4.7μF/25V
	CY	--	270pF /4kVDC VISHAY HGZ102MBP	100pF/4kV	1000pF/4kV
	C3	Refer to the Cout in table 1			
	LDM	6.8μH			

3. For additional information please refer to DC-DC converter application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200003;
2. 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;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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