

DC/DC Converter

B_D-1WR3 Series

MORNSUN®

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



RoHS Patent Protection

CE Report
EN 62368-1

UK CA Report
BS EN 62368-1

CB
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_D-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.		
--	B0303D-1WR3	3.3 (2.97-3.63)	3.3	303/30	75/79	2400
	B0305D-1WR3		5	200/20	78/82	2400
--	B0503D-1WR3	5 (4.5-5.5)	3.3	303/30	70/74	2400
	B0505D-1WR3		5	200/20	78/82	2400
	B0507D-1WR3		7.2	139/13	76/80	1000
	B0509D-1WR3		9	111/12	79/83	1000
	B0512D-1WR3		12	84/9	79/83	560
	B0515D-1WR3		15	67/7	79/83	560
	B0524D-1WR3		24	42/4	81/85	220
	B1203D-1WR3		12 (10.8-13.2)	3.3	303/30	71/75
B1205D-1WR3	5	200/20		76/80	2400	
B1209D-1WR3	9	111/12		74/78	1200	
B1212D-1WR3	12	83/9		76/80	560	
B1215D-1WR3	15	67/7		77/81	560	
B1224D-1WR3	24	42/5		77/81	220	
B1505D-1WR3	15 (13.5-16.5)	5		200/20	76/80	2400
B1509D-1WR3		9		111/12	76/80	1200
B1515D-1WR3		15	67/7	77/81	560	
B2403D-1WR3	24 (21.6-26.4)	3.3	303/30	69/75	2400	
B2405D-1WR3		5	200/20	73/79	2400	
B2409D-1WR3		9	111/12	74/80	1200	
B2412D-1WR3		12	83/9	75/81	560	
B2415D-1WR3		15	67/7	75/81	560	
B2424D-1WR3		24	42/5	75/81	220	

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
	Input	Output				
Input Current (full load / no-load)	3.3VDC input	3.3VDC output	--	384/12	405/--	mA
		5VDC output	--	370/12	389/--	
	5VDC input	3.3VDC/5VDC output	--	270/8	286/--	
Input Current (full load / no-load)	5VDC input	7.2VDC/9VDC/12VDC output	--	241/8	254/--	mA
		15VDC/24VDC output	--	241/8	254/--	
	12V input	3.3VDC output	--	112/8	118/--	
		5VDC/9VDC/12VDC output	--	105/8	110/--	

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Page 1 of 6

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	15V input	15VDC/24VDC output	--	103/8	109/--	
		5VDC/9VDC output	--	83/8	88/--	
		15VDC output	--	82/8	87/--	
	24V input	3.3VDC output	--	56/8	61/--	
		5VDC output	--	53/8	58/--	
		9VDC output	--	52/8	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: * Reflected ripple current testing method please see DC-DC Converter Application Notes for specific operation.

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	10%-100% load	3.3VDC input	3.3VDC output	--	13	20	%
			5VDC output	--	11	15	
		5VDC input	3.3VDC output	--	15	20	
			5VDC/7.2VDC output	--	10	15	
			9VDC output	--	8	10	
			12VDC output	--	7	10	
			15VDC output	--	6	10	
			24VDC output	--	5	10	
		Other input	3.3VDC output	--	8	20	
			5VDC output	--	5	15	
			9V/12/15VDC output	--	3	10	
			24VDC output	--	2	10	
Ripple & Noise*	20MHz bandwidth	B03_D-1WR3	--	50	100	mVp-p	
		B05_D-1WR3	24VDC output	--	50		100
			other output	--	30		75
		Other input	3.3VDC/5VDC/9VDC/12VDC/15VDC output	--	30		75
			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 Voltage	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 $\geq 85^{\circ}\text{C}$, (see Fig. 2)	-40	--	105	$^{\circ}\text{C}$	
Storage Temperature		-55	--	125		
Case Temperature Rise	$T_a=25^{\circ}\text{C}$	--	25	--		
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300		
Storage Humidity	Non-condensing	5	--	95	%RH	
Vibration		10-150Hz, 5G, 0.75mm, along X, Y and Z				
Switching Frequency	Full load, nominal input voltage	B03_D-1WR3	--	220	--	kHz
		B05_D-1WR3	--	300	--	
		Other input	--	260	--	
MTBF	MIL-HDBK-217F @ 25°C	3500	--	--	k hours	

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94V-0)
Dimensions	12.70 x 10.16 x 8.20 mm
Weight	1.8g (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 Figure 4 for recommended circuit test.

Typical Performance Curves

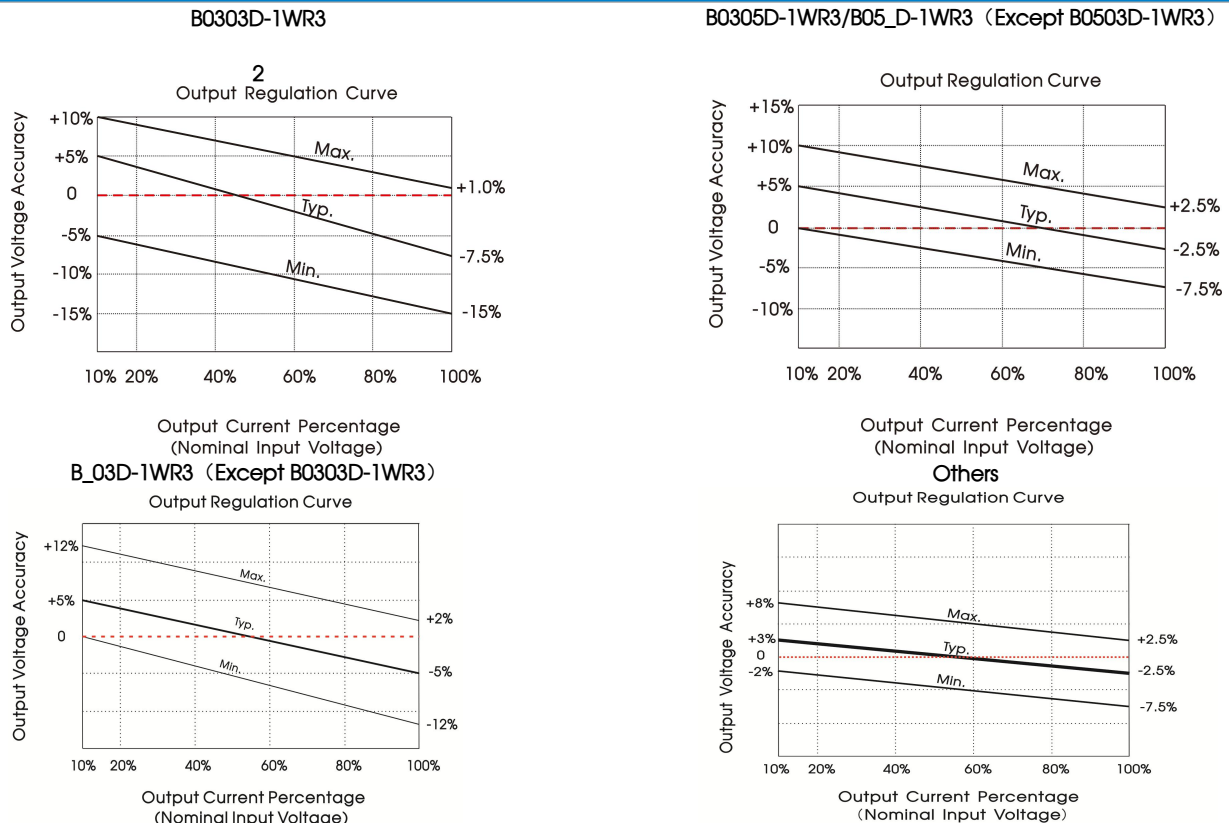


Fig. 1

Temperature Derating Curve

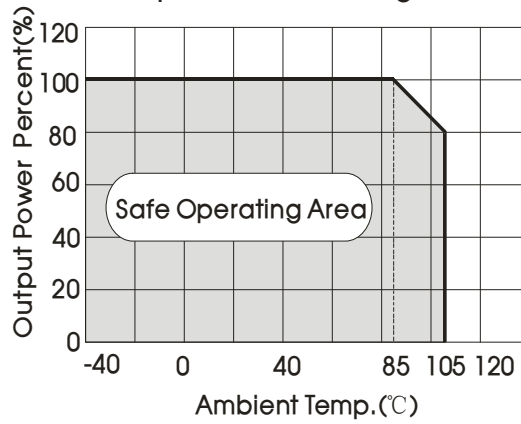
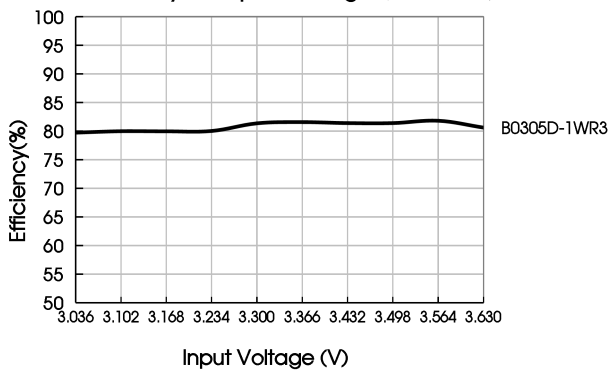
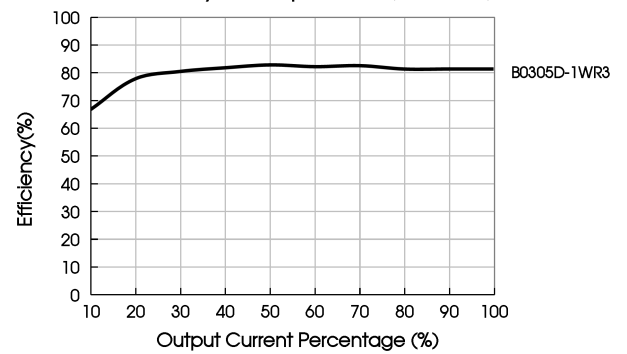


Fig. 2

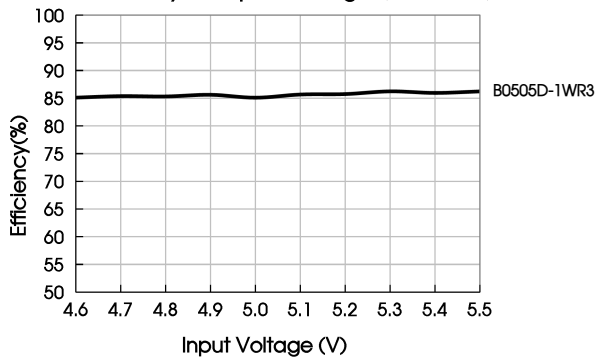
Efficiency Vs Input Voltage (Full Load)



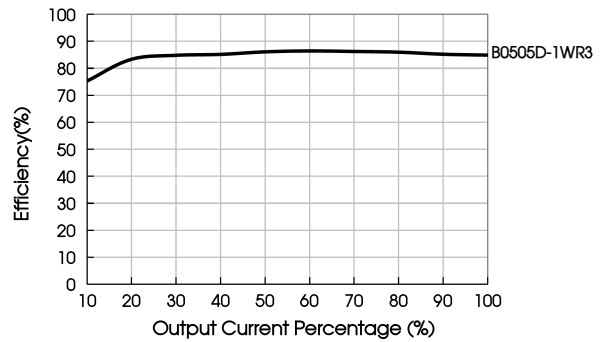
Efficiency Vs Output Load (Vin=3.3V)



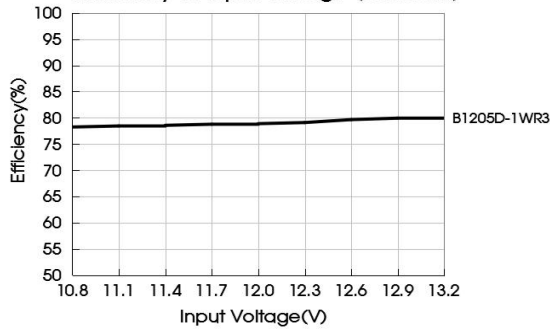
Efficiency Vs Input Voltage (Full Load)



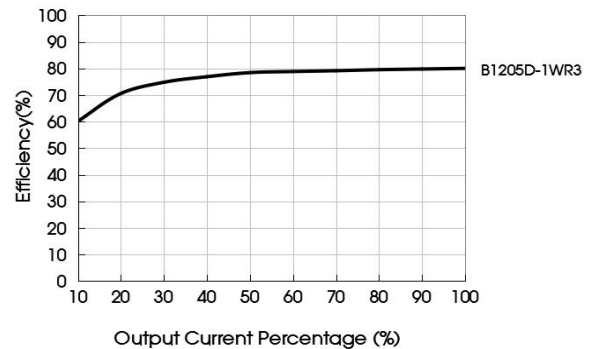
Efficiency Vs Output Load (Vin=5V)

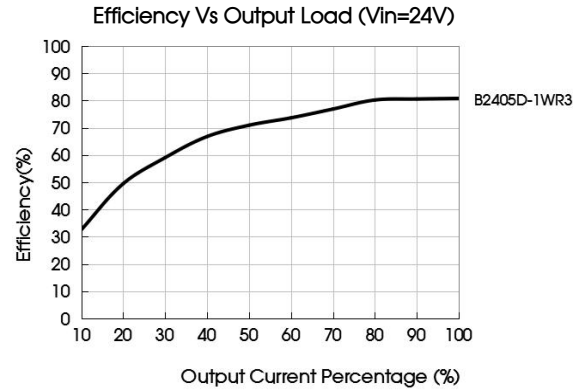
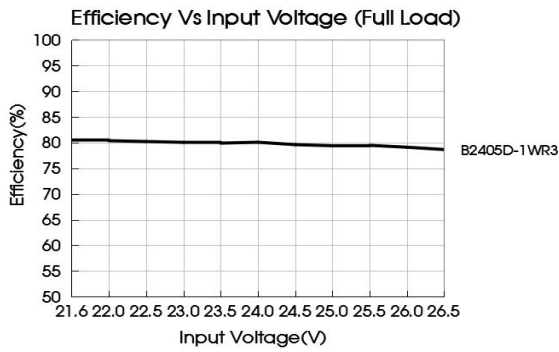


Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=12V)





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.

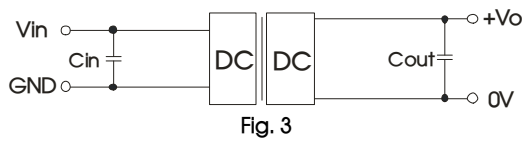


Table 1: Recommended input and output capacitor values

Vin	Cin	Vo	Cout
3.3VDC	10μF/16V	3.3VDC	10μF/16V
--	--	5VDC	10μF/16V
5VDC	4.7μF/16V	3.3/5/7.2VDC	10μF/16V
--	--	9/12VDC	2.2μF/25V
--	--	15/24VDC	1μF/50V
12VDC	2.2μF/25V	3.3/5VDC	10μF/16V
15VDC	2.2μF/25V	9VDC	4.7μF/25V
24VDC	1μF/50V	12VDC	2.2μF/25V
--	--	15/24VDC	1μF/50V

2. EMC compliance circuit

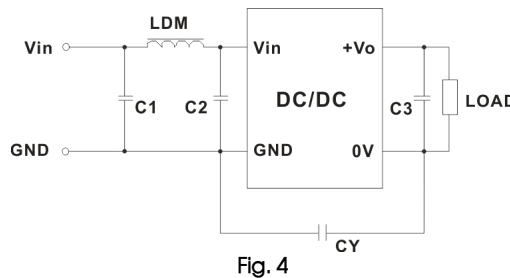


Table 2: Recommended EMC filter values

Input voltage	3.3VDC	5VDC		Other Input
Output voltage	--	3.3/5/7.2/9VDC	12/15/24VDC	--
Emissions	C1/C2	4.7μF /16V	4.7μF /25V	4.7μF /50V
	CY	270pF/2kVDC	100pF /2kVDC	1nF /2kVDC
	C3	Refer to the Cout in table 1		
	LDM	6.8μH		

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

3. For additional information please refer to DC-DC converter application notes on

www.mornsun-power.com

