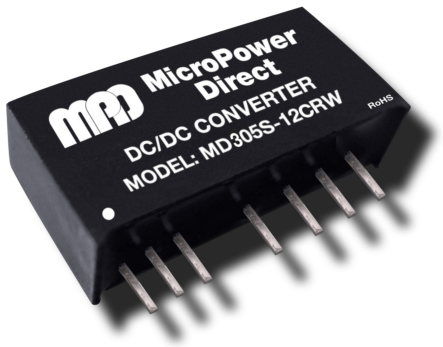
MD300CRW

3W, 2:1 Input Range, Single & Dual Output DC/DC Converters



Key Features:

- 3W Output Power
- Miniature SIP Case
- 2:1 Wide Input Range
- -40°C to +85°C Operating Temperature Range
- 1500VDC Isolation Voltage
- 39 Standard Models
- Single & Dual Outputs
- Short Circuit Protected
- Industry Standard Pin-Out

CE

RoHS

Electrical Specifications

Specifications typical @ +25°C, nominal input voltage & rated output current, unless otherwise noted. Specifications subject to change without notice.

Input

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Start Voltage, See Note 2	5 VDC Input	4.5	5	9.0	VDC
	12 VDC Input	9.0	12	18.0	VDC
	24 VDC Input	18.0	24	36.0	VDC
	48 VDC Input	36.0	48	75.0	VDC
Reflected Ripple Current	5 VDC Input	--	20	--	mA
	12 VDC Input	--	20	--	mA
	24 VDC Input	--	55	--	mA
	48 VDC Input	--	55	--	mA
Input Filter	--		Capacitor		

Output

Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy, See Note 4	5% - 100% Load		--	±1.0	±3.0	%
Line Regulation, See Note 5	Full Load		--	±0.2	±0.5	%
Load Regulation	5%-100% Of Load		--	±0.6	±1.0	%
Ripple & Noise, See Note 6 & 8	20 MHz band-width	MD312S-12CRW MD312S-15CRW MD348S-24CRW	--	70	100	mVp-p
		MD312S-24CRW MD324S-15CRW MD324S-24CRW MD348D-05CRW MD348S-03CRW	--	100	150	
		Other		40	75	
Temperature Coefficient	Full load		--	±0.02	±0.03	% / °C
Output Short Circuit	Continuous, self-recovery					

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds	1500	--	--	VDC
Isolation Resistance	500 VDC	1000	--	--	MΩ
Isolation Capacitance	100 KHz /0. 1V	--	120	--	pF
Switching Frequency	Full load, nominal input voltage	--	250	--	kHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	KHours

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	See Figure 1	-40	--	+85	°C
Storage Temperature Range	--	-55	--	+125	°C
Cooling	Free air convection				
Humidity, See Note 16	Non condensing	--	--	95	%RH

Physical

Case Size	0.87 in x 0.37 in x 0.47 in (See mechanical diagrams on page 5, 6)
Case Material	Black plastic; flame retardant and heat resistant
Weight	0.159 oz (4.5 grams) (Typ.)

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	5 VDC Input	-0.7	--	12	VDC
	12 VDC Input	-0.7	--	25	VDC
	24 VDC Input	-0.7	--	50	VDC
	48 VDC Input	-0.7	--	100	VDC
Lead Temperature	1.5 mm from Case for 10 Sec.	--	--	300	°C

Caution: Exceeding Absolute Maximum Ratings may damage the module. These are not continuous operating ratings.

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MICROPOWER DIRECT

Model Selection Guide

Model Number	Input				Output		Efficiency (%, Typ)	Reflected Ripple Current (mA Typ)	Capacitive Load (µF, Max) (See Note 9)	Fuse Rating Slow-Blow (mA) (See Note 1)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)				
	Nominal	Range	Full-Load	No-Load						
MD305S-03CRW	5	4.5 – 9.0	735	40	3.3	758	68	20.0	1800	900
MD305S-05CRW	5	4.5 – 9.0	805	40	5.0	500	73	20.0	2200	900
MD305S-09CRW	5	4.5 – 9.0	805	40	9.0	278	74	20.0	1000	900
MD305S-12CRW	5	4.5 – 9.0	805	40	12.0	208	77	20.0	680	900
MD305S-15CRW	5	4.5 – 9.0	805	40	15.0	167	74	20.0	470	900
MD305S-24CRW	5	4.5 – 9.0	805	40	24.0	104	76	20.0	330	900
MD305D-05CRW	5	4.5 – 9.0	805	40	±5.0	±250	74	20.0	1000	900
MD305D-12CRW	5	4.5 – 9.0	805	40	±12.0	±104	77	20.0	470	450
MD305D-15CRW	5	4.5 – 9.0	805	40	±15.0	±83	77	20.0	330	450
MD305D-24CRW	5	4.5 – 9.0	805	40	±24.0	±52	76	20.0	220	450
MD312S-03CRW	12	9.0 – 18.0	278	30	3.3	758	75	20.0	2700	450
MD312S-05CRW	12	9.0 – 18.0	314	30	5.0	600	76	20.0	2200	450
MD312S-09CRW	12	9.0 – 18.0	314	30	9.0	333	79	20.0	1000	450
MD312S-12CRW	12	9.0 – 18.0	314	30	12.0	250	82	20.0	680	450
MD312S-15CRW	12	9.0 – 18.0	314	30	15.0	200	83	20.0	470	450
MD312S-24CRW	12	9.0 – 18.0	314	30	24.0	125	81	20.0	330	450
MD312D-05CRW	12	9.0 – 18.0	314	30	±5.0	±300	78	20.0	1000	300
MD312D-09CRW	12	9.0 – 18.0	314	30	±9.0	±167	78	20.0	680	300
MD312D-12CRW	12	9.0 – 18.0	314	30	±12.0	±125	79	20.0	470	300
MD312D-15CRW	12	9.0 – 18.0	314	30	±15.0	±100	80	20.0	330	300
MD324S-03CRW	24	18.0 – 36.0	140	20	3.3	758	74	55.0	2700	450
MD324S-05CRW	24	18.0 – 36.0	154	20	5.0	600	81	55.0	2200	450
MD324S-09CRW	24	18.0 – 36.0	154	20	9.0	333	83	55.0	1000	450
MD324S-12CRW	24	18.0 – 36.0	154	20	12.0	250	83	55.0	680	450
MD324S-15CRW	24	18.0 – 36.0	154	20	15.0	200	83	55.0	470	450
MD324S-24CRW	24	18.0 – 36.0	154	20	24.0	125	83	55.0	330	450
MD324D-05CRW	24	18.0 – 36.0	154	20	±5.0	±300	79	55.0	1000	300
MD324D-09CRW	24	18.0 – 36.0	154	20	±9.0	±167	81	55.0	680	300
MD324D-12CRW	24	18.0 – 36.0	154	20	±12.0	±125	83	55.0	470	300
MD324D-15CRW	24	18.0 – 36.0	154	20	±15.0	±100	83	55.0	330	300
MD348S-03CRW	48	36.0 – 75.0	69	5	3.3	758	75	55.0	2700	450
MD348S-05CRW	48	36.0 – 75.0	78	5	5.0	600	76	55.0	2200	450
MD348S-12CRW	48	36.0 – 75.0	78	5	12.0	250	80	55.0	680	450
MD348S-15CRW	48	36.0 – 75.0	78	5	15.0	200	84	55.0	470	450
MD348S-24CRW	48	36.0 – 75.0	78	5	24.0	125	82	55.0	330	450
MD348D-05CRW	48	36.0 – 75.0	78	5	±5.0	±300	79	55.0	1000	450
MD348D-12CRW	48	36.0 – 75.0	78	5	±12.0	±125	82	55.0	470	300
MD348D-15CRW	48	36.0 – 75.0	78	5	±15.0	±100	82	55.0	330	300

Notes:

1. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.
2. Exceeding the maximum input voltage may cause permanent damage.
3. The specified maximum capacitive load value for positive and negative output is identical.
4. Under the of 5%-100% load, the maximum output voltage accuracy of MD312D-09CRW, MD324D-05CRW and MD324D-15CRW auxiliary circuit is ±4%.
5. Line Regulation for 100% load, MD312D-09CRW, MD324D-05CRW and MD324D-15CRW main road increases to ±1%, side road increases to ±2.5% ;
6. The "parallel cable" method is used for Ripple and Noise test.
7. All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 7.
8. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values C1, C2, C3 and C4 and/or by selecting capacitors with a low ESR (equivalent series resistance). C3 is used to reduce ripple. No need to add C3, if ripple meets the demand.
9. Appropriate filter capacitance shall be chosen, start-up problems may be caused if the capacitance is too large. For each output circuit, under the condition of safe and reliable operation, the max. capacity of its filter capacitor should be lower than the max. capacitive load.
10. For EMC tests we use Part 1 in Fig.8 for immunity and part 2 for emissions test. Selecting based on needs.
11. VC is the voltage of the Ctrl end relative to the GND of the input grounding; VD is the positive-going conduction pressure drop of D1; IC is the current flows into the Ctrl end and its value is generally 5-10mA, see Fig. 7&8 for the peripheral circuit of Ctrl end.

Notes:

12. If there is no recommended parameters, no external component is required
13. The modules are of normal output when the Ctrl end is suspended or of high resistance; the modules turn off when connecting with high level (relative to the input grounding); notice that the current flows into the pin shall be 5- 10mA, the modules will be permanently damaged if the current exceeds its max. value (20mA in general). The value of R can be derived using formula given in table for EMC Compliance Circuit. For detailed parameter, please refer to EMC compliance circuit.
14. When using, the minimum load of the module output should not be less than 5% of the nominal load. In order to meet the performance parameters of this datasheet, please connect a 5% dummy load in parallel at the output end, the dummy load is generally a resistor, please note that the resistor needs to be used in derating.
15. The maximum capacitive load offered were tested at input voltage range and full load.
16. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity < 75%RH with nominal input voltage and rataed output load.
17. All index testing methods in this datasheet are based on company corporate standards.

Typical Characteristic Curves

Temperature Derating Curve

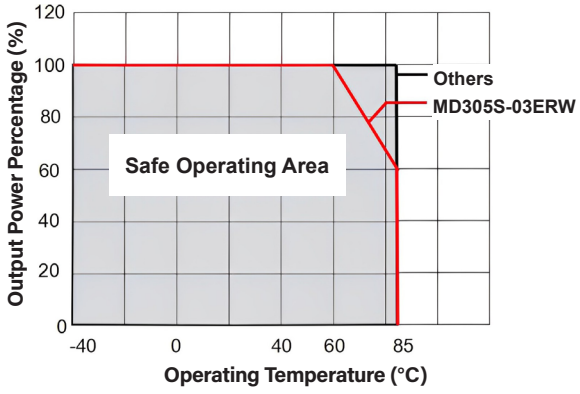


Fig. 1

Efficiency Vs Input Voltage (Full Load)

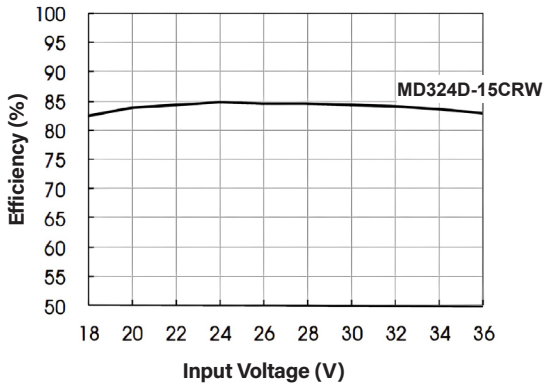


Fig. 3

Efficiency Vs Output Load (Vin=24)

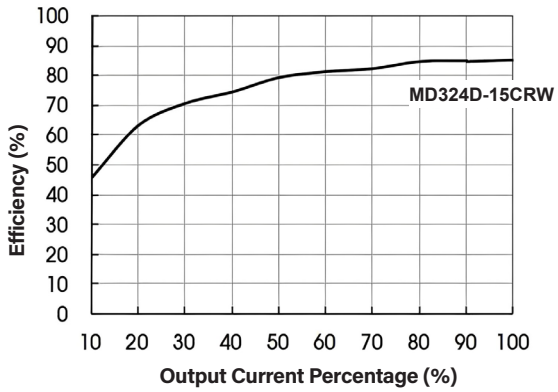


Fig. 4

Efficiency Vs Input Voltage (Full Load)

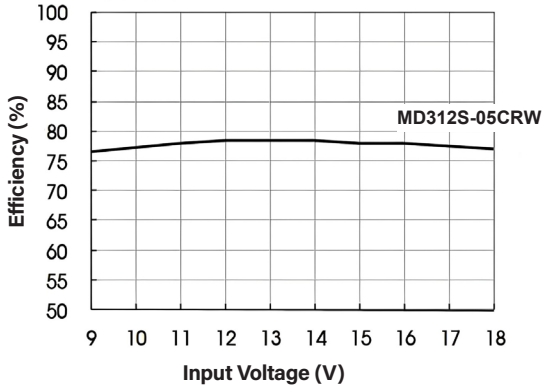


Fig. 5

Efficiency Vs Output Load (Vin=12V)

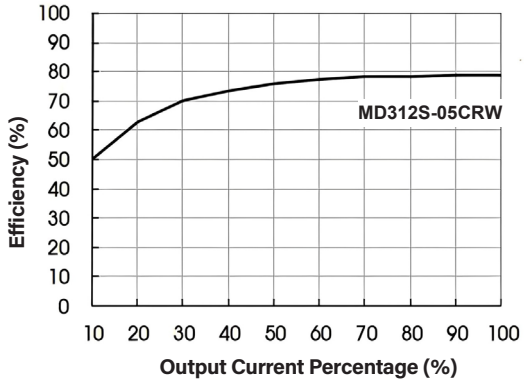


Fig. 6

Application Circuits

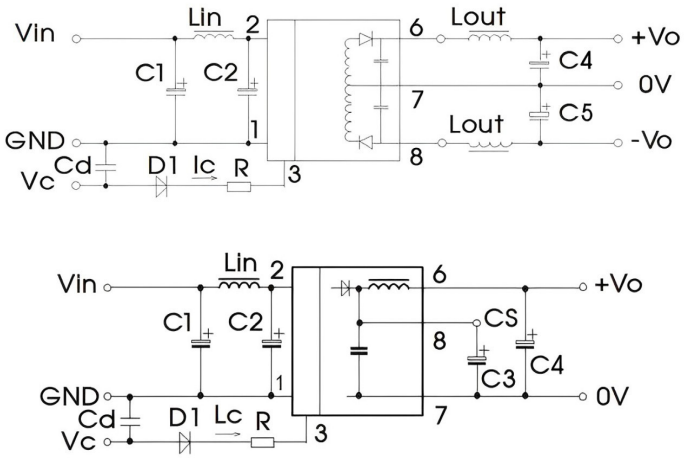


Fig. 7

Recommended Capacitive Load Value Table		
Vin	5VDC&12VDC	24VDC&48VDC
C1	100uF/25V	10uF/100V
C2	47uF/25V	1uF/100V
Lin	4.7uH-12uH	
C3	10uF/50V-22 uF/50V	
C4/C5	100uF/50V(Typ.)	
Lout	2.2uH-10uH	
Cd	47nF/100V	

EMC compliance circuit

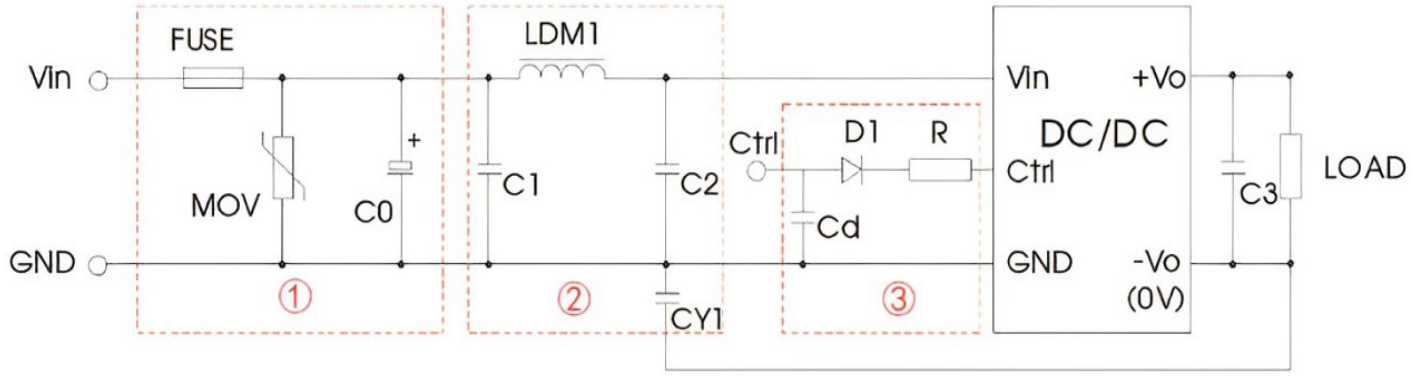


Fig. 8

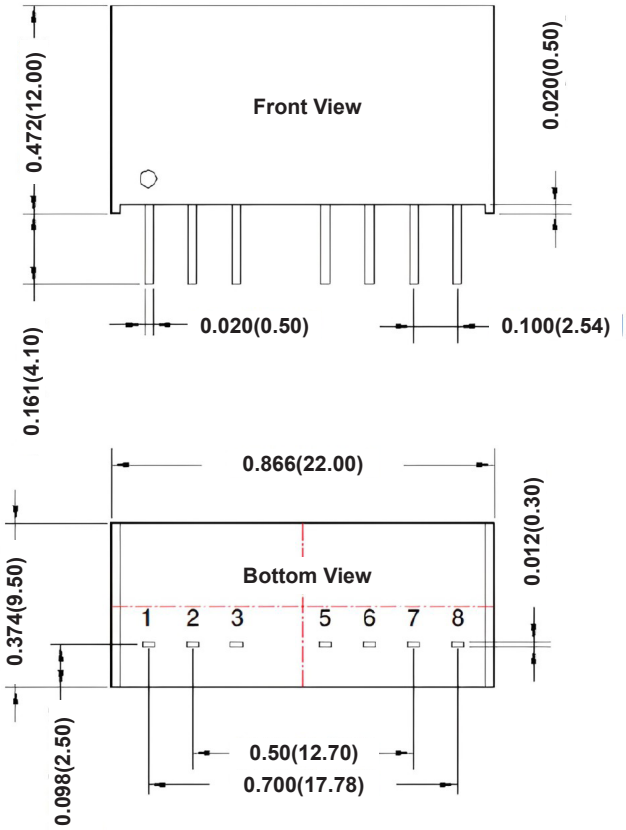
Parameter Description

Model	Vin: 5VDC	Vin: 12VDC	Vin: 24VDC	Vin: 48VDC
FUSE	Slow-blow, selecting based on needs			
MOV	--	S14K20	S20K30	S14K60
C0	680uF/25V	680uF/25V	330uF/50V	330uF/100V
C1	4.7uF/50V			4.7uF/100V
LDM1	12uH			
C2	4.7uF/50V			4.7uF/100V
C3	Refer to the Cout in Fig.7			
CY1	1nF/2kV			
D1	RB160M-60V/1A			
R	In accordance with the formula: $R = \frac{V_C - V_D - 1.0}{I_C} - 300$			
Cd	47nF/100V			

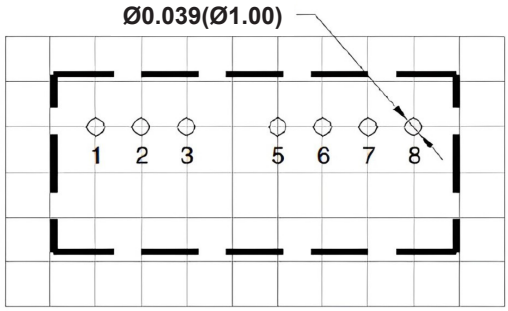
EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR32/EN 55032	--	Class B (Fig 8 part 2)
Conducted Emissions	CISPR32/EN 55032	--	Class B (Fig 8 part 2)
ESD	EN 61000-4-2	B	±4 kV Contact
RS	EN61000-4-3	A	10V/m
EFT	EN61000-4-4	B	±2 kV (Fig 8 part 1)
Surge	EN61000-4-5	B	±2 kV (Fig 8 part 1)
CS	EN61000-4-6	A	3 Vrms

Mechanical Dimensions- MD300CRW Dual



Third Angle Projection



Note: The grid distance is 2.54mm*2.54mm

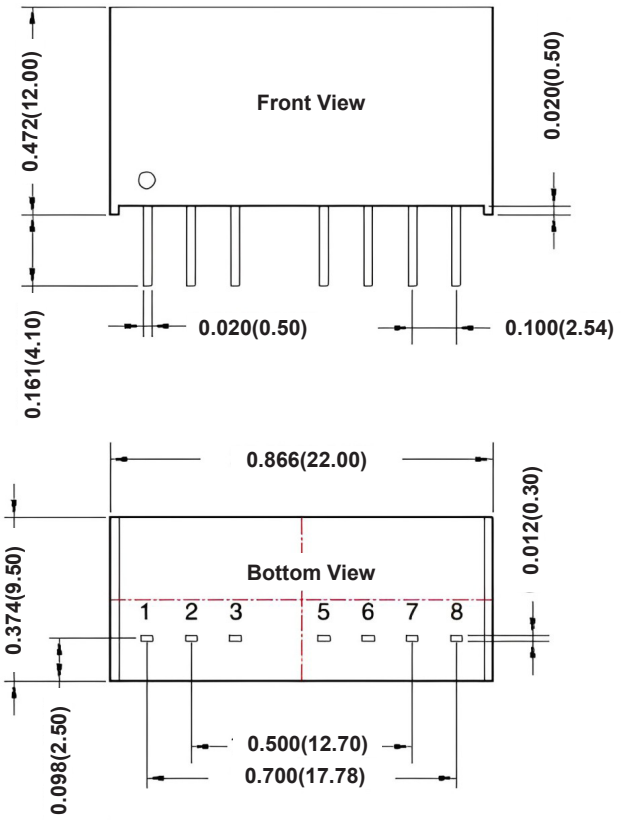
Pin-Out

Pin	Mark
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	-Vo

Note: Pin to be isolated from circuitry

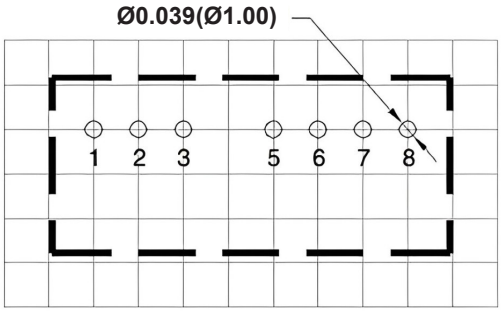
Note:
Unit: inches(mm)
Pin section tolerances: ±0.004(±0.10)
General tolerances: ±0.020(±0.50)

Mechanical Dimensions- MD300CRW Single



Note:
Unit: inches(mm)
Pin section tolerances: ±0.004(±0.10)
General tolerances: ±0.020(±0.50)

Third Angle Projection



Note: The grid distance is 2.54mm*2.54mm

Pin-Out

Pin	Mark
1	GND
2	Vin
3	Ctrl
5	NC
6	+Vo
7	0V
8	CS

Note: Pin to be isolated from circuitry