MD100CRW

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

Key Features:

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

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 Voltage Range	5 VDC Input	4.5	5	9	VDC
	12 VDC Input	9	12	18	
	24 VDC Input	18	24	36	
	48 VDC Input	36	48	75	
Reflected Ripple Current	5 VDC Input		30		mA
	12 VDC Input		40		
	24 VDC Input		55		
	48 VDC Input		45		
Input Filter			Capacitance Filter		

Output

Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy	5-100% load, input voltage range	3.3/5V outputs		±2	±5	%
		Others		±1	±3	
Line Regulation	Input Voltage Variation from low to high at full load			±0.2	±0.5	%
Load Regulation	5%-100% Load			±0.4	±0.75	%
Transient Recovery Time	25% load step change			0.5	2	mSec
Transient Response Deviation				±2.5	±5	%
Ripple & Noise, See Note 2	20MHZ Bandwidth	5, 24V inputs		70	100	mVp-p
		12, 48V inputs		100	150	
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 (PFM Mode)	Full load, nominal input voltage		200		kHz

Reliability Specifications

Parameter	Conditions	Min.	Typ	Max.	Units
MTBF	MIL-HDBK-217F@25°C	1.0			MHours
Surge Voltage (1 sec.)	5 VDC Input	-0.7		12	VDC
	12 VDC Input	-0.7		25	
	24 VDC Input	-0.7		50	
	48 VDC Input	-0.7		100	

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

Environmental Specifications

Parameter	Conditions	Min.	Typ	Max.	Units
Operating Temperature Range	Figure 1	-40		+85	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity, See Note 8	Non condensing			95	%RH

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Model Selection Guide

Model Number	Input				Output		Full Load Efficiency (%, Typ)	Capacitive Load (µF, Max) (See Note 7)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)			
	Nominal	Range	Full-Load Typ	No-Load					
MD105S-03CRW	5	4.5 - 9	281	40	3.3	303	71	1800	600
MD105S-05CRW	5	4.5 - 9	281	40	5	200	72	2200	600
MD105S-12CRW	5	4.5 - 9	281	40	12	83	76	1000	600
MD105S-15CRW	5	4.5 - 9	281	40	15	67	75	680	600
MD105S-24CRW	5	4.5 - 9	281	40	24	42	73	470	600
MD105D-05CRW	5	4.5 - 9	281	40	±5	±100	73	1000	600
MD105D-12CRW	5	4.5 - 9	281	40	±12	±42	76	470	600
MD105D-15CRW	5	4.5 - 9	281	40	±15	±33	75	330	600
MD112S-03CRW	12	9 - 18	111	15	3.3	303	75	2700	300
MD112S-05CRW	12	9 - 18	111	15	5	200	77	2200	300
MD112S-09CRW	12	9 - 18	111	15	9	111	79	1800	300
MD112S-12CRW	12	9 - 18	111	15	12	83	78	1000	300
MD112S-15CRW	12	9 - 18	111	15	15	67	80	680	300
MD112S-24CRW	12	9 - 18	111	15	24	42	76	470	300
MD112D-05CRW	12	9 - 18	111	15	±5	±100	77	1000	300
MD112D-12CRW	12	9 - 18	111	15	±12	±42	81	470	300
MD112D-15CRW	12	9 - 18	111	15	±15	±33	78	330	300
MD124S-03CRW	24	18 - 36	55	6	3.3	303	75	2700	150
MD124S-05CRW	24	18 - 36	55	6	5	200	77	2200	150
MD124S-12CRW	24	18 - 36	55	6	12	83	78	1000	150
MD124S-15CRW	24	18 - 36	55	6	15	67	78	680	150
MD124S-24CRW	24	18 - 36	55	6	24	42	77	470	150
MD124D-05CRW	24	18 - 36	55	6	±5	±100	79	1000	150
MD124D-09CRW	24	18 - 36	55	6	±9	±56	79	680	150
MD124D-12CRW	24	18 - 36	55	6	±12	±42	78	470	150
MD124D-15CRW	24	18 - 36	55	6	±15	±33	78	330	150
MD148S-03CRW	48	36 - 75	27	4	3.3	303	75	2700	75
MD148S-05CRW	48	36 - 75	27	4	5	200	76	2200	75
MD148S-12CRW	48	36 - 75	27	4	12	83	80	1000	75
MD148S-15CRW	48	36 - 75	27	4	15	67	79	680	75
MD148D-05CRW	48	36 - 75	27	4	±5	±100	76	1000	75
MD148D-12CRW	48	36 - 75	27	4	±12	±42	78	470	75
MD148D-15CRW	48	36 - 75	27	4	±15	±33	80	330	75

Notes:

1. For use of Ctrl, please refer to the "design reference" in this manual.
2. The 'parallel cable' method is used for Ripple and Noise test, please refer to DC/DC Converter Application Notes for specific information.
3. When the electricity is provided by the unstable power supply, please make sure that the range of the output voltage fluctuation and the ripple voltage of the power supply do not exceed the indicators of the modules. Input current of power supply should afford the flash startup current of this kind of DC/DC module.
   Generally:
   (Vin= 5V series, Iave=445mA); (Vin=12V series, Iave =205mA)
   (Vin=24V series, Iave =104mA); (Vin=48V series, Iave =53mA)
4. 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.
5. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product.
6. The recommended unbalance degree of the dual output module load is ≤±5%; if the degree exceeds ±5%, then the product performance cannot be guaranteed to comply with all parameters in the datasheet.
7. The maximum capacitive load offered were tested at input voltage range and full load.
8. 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.
9. All index testing methods in this datasheet are based on company corporate standards
10. Specifications are subject to change without prior notice.

Typical Characteristic Curves

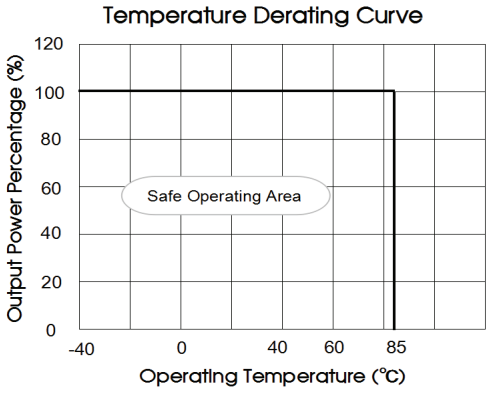


Fig. 1

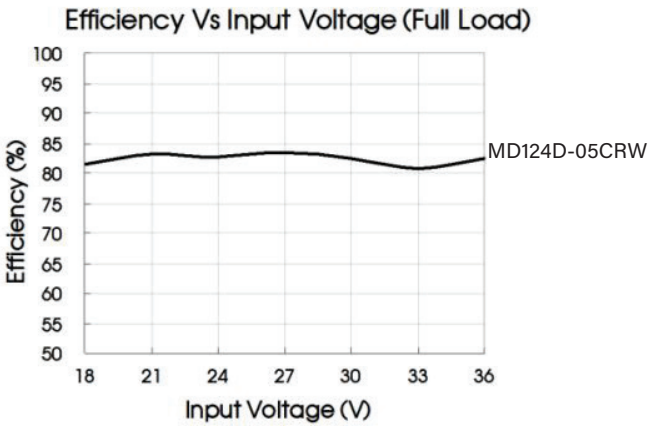


Fig. 2

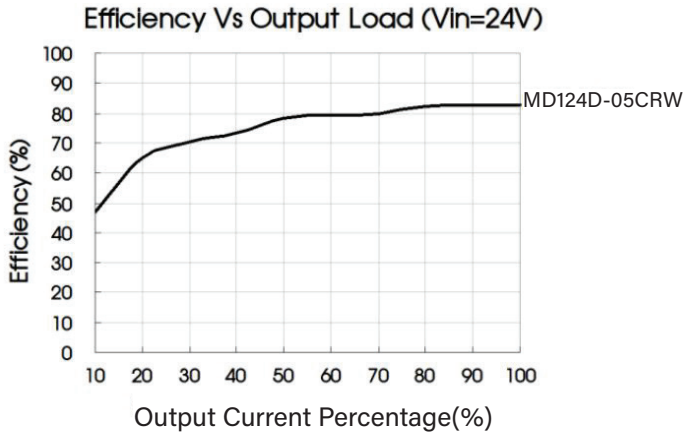


Fig. 3

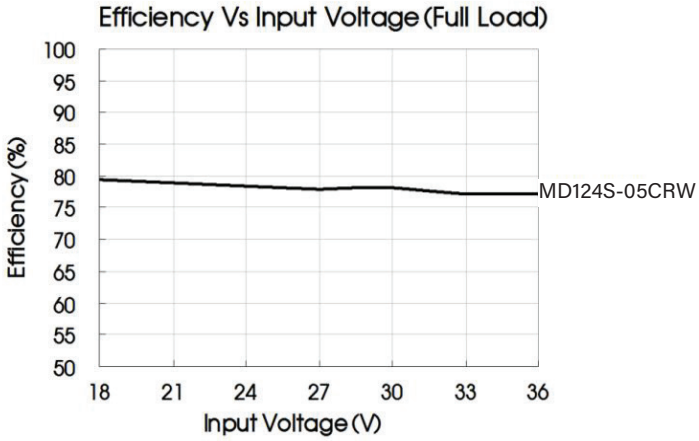


Fig. 4

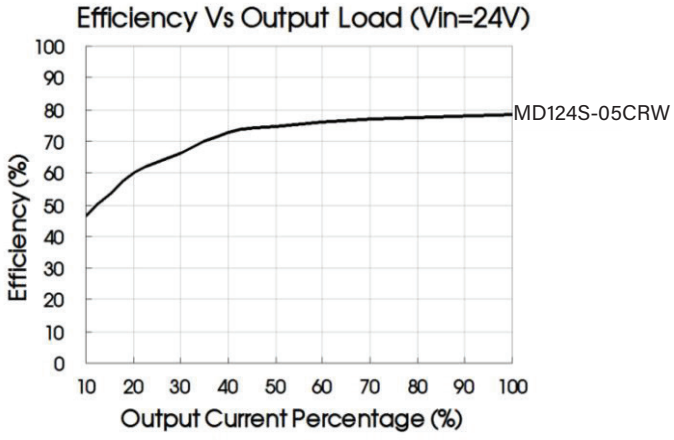


Fig. 5

Application Circuits

Notes:

1. All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 6.
2. Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout 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.

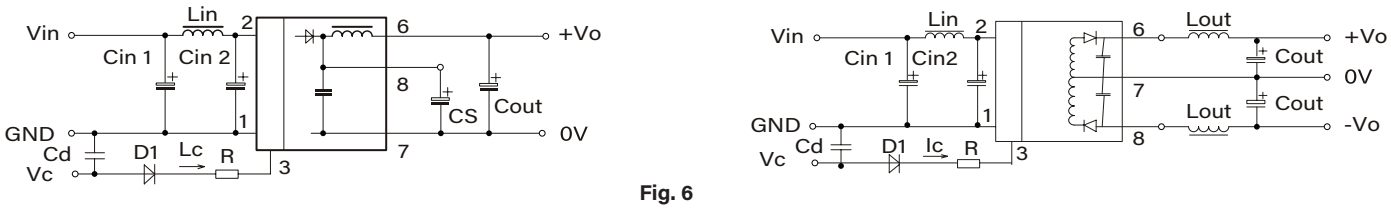


Fig. 6

Recommended component parameters		
Vin(VDC)	5VDC&12VDC	24VDC&48VDC
Cin1	100μF/25V	10μF/100V
Cin2	47μF/25V	1μF/100V
Lin	4.7μH-12μH	
Cs	10μF-22μF/50V	
Cout	Vo(3/±3/5/±5/9/±9V):100μF/16V	
	Vo(12/±12/15/±15V):100μF/25V	
	Vo(24/±24V):100μF/50V	
Lout	2.2μH-10μH	
Cd	47nF/100V	

Module on	Ctrl pin open (high resistance)
Module off	Ctrl pin pulled high (current 5-10mA typ. Into Ctrl)

EMC compliance recommended circuit

Notes:

1. For EMC tests we use Part 1 in Fig.7 for immunity and part 2 for emissions test. Selecting based on needs.
2. 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. 7-3 for the peripheral circuit of Ctrl end.
3. If there is no recommended parameters, no external component is required
4. 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.

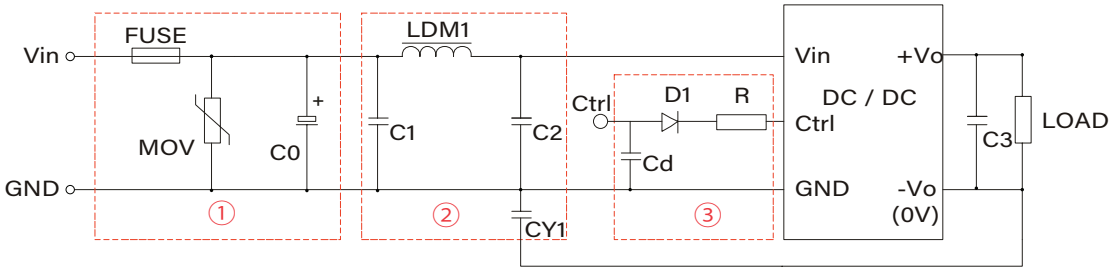


Fig. 7

EMC Compliance Recommended Circuit Value				
Model	Vin:5VDC	Vin: 12VDC	Vin:24VDC	Vin:48VDC
FUSE	Slow-blow, selecting based on needs			
MOV	--	S14K25	S14K35	S14K60
C0	1000μF/16V	1000μF/25V	330μF/50V	330μF/100V
C1	4.7μF/50V			4.7μF/100V
LDM1	12μH			
C2	4.7μF/50V			4.7μF/100V
C3	Refer to the Cout in Fig.6			
CY1	1nF/2kV			
D1	60V/1A			
R	In accordance with the formula: $R = \frac{V_C - V_D - 1.0}{I_C} - 300$			
CD	47nF/100V			

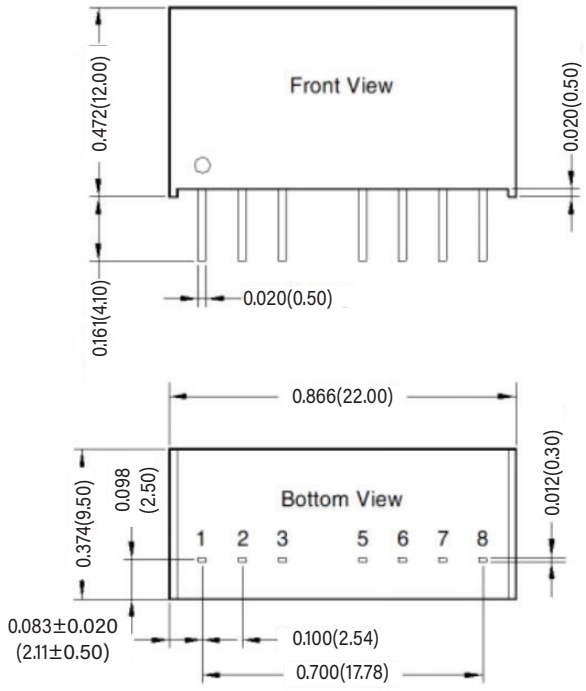
EMI Characteristics

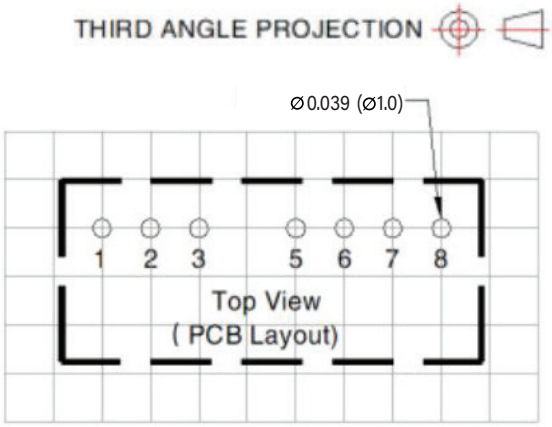
Parameter	Standard	Criteria	Level
Radiated Emissions	CISPR32/EN 55032		Class B (see fig. 7 for rec. circuit)
Conducted Emissions	CISPR32/EN 55032		Class B
ESD	EN 61000-4-2	B	±4 kV Contact
RS	IEC/EN61000-4-3	A	10V/m
EFT	IEC/EN61000-4-4	B	±2kV (see fig. 7 for rec. circuit)
Surge	IEC/EN61000-4-5	B	Line to line ±2kV (see fig. 7 for rec. circuit)
CS	IEC/EN61000-4-6	A	3 Vr.m.s
Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	B	0%, 70%

Mechnical Dimensions

Physical Specifications

Case Size	0.87 in x 0.37 in x 0.47 in (See mechanical diagrams)
Case Material	Black plastic; flame retardant and heat resistant (UL94V-0 rated)
Weight	0.16Oz (Typ.) (4.5g)





The grid distance is 2.54 x 2.54 mm

Pin Definition Table

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

NC: Not availabel for electrical connection

Note:

Unit: inches(mm)
Pin section tolerances: ±0.004 (±0.10)
General tolerances: ±0.010 (±0.25)