MD200CHI

2W, High Isolation, Compact, Single & Dual Outputs DC/DC Converters

Key Features:

- **2W Output Power**
- **Miniature SIP Case**
- **-40°C to +105°C Operating Temperature Range**
- **6000VDC/5000VAC Isolation Voltage**
- **Single & Dual Outputs**
- **Short Circuit Protected**
- **Industry Standard Pin-Out**
- **Creepage & Clearance Distance > 5mm**

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 Voltage	12 VDC Input		10.8	12	13.2	VDC
	15 VDC Input		13.5	15	16.5	
	24 VDC Input		21.6	24	26.4	
Reflected Ripple Current	--		--	200	--	mA
Input Filter	--		Capacitance Filter			

Output

Parameter	Conditions		Min.	Typ.	Max.	Units
Output Voltage Accuracy	See characteristic curves					
Line Regulation	Input Voltage Variation ±1%		--	--	1.2	%
Load Regulation	10%-100% Load	5V Output	--	--	20	%
		Other output	--	--	15	
Ripple & Noise, See Note 1,3	20MHz Bandwidth	5V output	--	100	150	mVp-p
		Other output	--	80	120	
Temperature Coefficient	Full Load		--	±0.02	--	% / °C
Output Short Circuit	Continuous, self-recovery					

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds	5000	--	--	VAC
		6000	--	--	VDC
Isolation Resistance	500 VDC	1000	--	--	MΩ
Leakage Current, See Note 2	250VAC, 50/60Hz	--	--	2	uA
Isolation Capacitance	100 KHz /0.1V	--	4	--	pF
Switching Frequency	100% load	--	200	--	kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Derating when operating temperature >85°C (see Figure 3)	-40	--	+105	°C
Storage Temperature Range	--	-55	--	+125	
Case Temperature Rise	Ta=25°C	--	25	--	
Cooling	Free air convection				
Humidity, See Note 8	Non condensing	5	--	95	%RH

Physical

Case Size	0.77 x 0.39 x 0.49 in (See mechanical diagrams on page 4)
Case Material	Black plastic; flame retardant and heat resistant (UL94V-0 rated)
Weight	0.14 oz (3.97g) Typ.

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	1.936	--	--	MHours

Absolute Maximum Ratings

Parameter	Standard	Min.	Typ.	Max.	
Lead Temperature	1.5mm from case for 10 Sec	--	--	300	°C
Input Voltage Surge (1 Sec)	12V Input	-0.7	--	18	VDC
	15V Input	-0.7	--	21	
	24V Input	-0.7	--	30	

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

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Model Selection Guide

Model Number	Input				Output			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA Typ)	Capacitive Load (μF, Max) (See Note 7)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min) (Note 5)				
	Nominal	Range	Full Load (Typ)	No Load							
MD212S-05CHI	12	10.8-13.2	210	15	5	400	40	80	200	1000	500
MD212S-09CHI	12	10.8-13.2	210	15	9	222	22	82	200	680	500
MD212S-12CHI	12	10.8-13.2	210	15	12	167	17	84	200	470	500
MD212S-15CHI	12	10.8-13.2	210	15	15	133	14	84	200	470	500
MD212D-05CHI	12	10.8-13.2	210	15	±5	±200	±20	80	200	1000	500
MD212D-09CHI	12	10.8-13.2	210	15	±9	±111	±11	82	200	470	500
MD212D-12CHI	12	10.8-13.2	210	15	±12	±83	±9	83	200	220	500
MD212D-15CHI	12	10.8-13.2	210	15	±15	±67	±7	84	200	220	500
MD215D-05CHI	15	13.5-16.5	167	15	±5	±200	±20	78	200	1000	400
MD215D-09CHI	15	13.5-16.5	167	15	±9	±111	±11	80	200	470	400
MD215D-15CHI	15	13.5-16.5	167	15	±15	±67	±7	80	200	220	400
MD224S-05CHI	24	21.6-26.4	106	15	5	400	40	79	200	2200	250
MD224S-09CHI	24	21.6-26.4	106	15	9	222	22	81	200	680	250
MD224S-12CHI	24	21.6-26.4	106	15	12	167	17	82	200	470	250
MD224S-15CHI	24	21.6-26.4	106	15	15	133	14	84	200	470	250
MD224S-24CHI	24	21.6-26.4	106	15	24	83	9	84	200	220	250
MD224D-05CHI	24	21.6-26.4	106	15	±5	±200	±20	79	200	1000	250
MD224D-09CHI	24	21.6-26.4	106	15	±9	±111	±11	81	200	470	250
MD224D-12CHI	24	21.6-26.4	106	15	±12	±83	±9	82	200	220	250
MD224D-15CHI	24	21.6-26.4	106	15	±15	±67	±7	81	200	220	250

Notes:

1. The "parallel cable" method is used for ripple & noise test.
2. Leakage current and reinforced insulation is based on 250 VAC, 50/60 Hz system input voltage.
3. 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.4.
4. 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 Table1.
5. For a reliable and efficient operation of the converter, the minimum load should never be less than 10% of the rated output load. If the total required output power is below 10%, a parallel bleeding resistor is required on the output, ensuring that the sum of the power consumption is always maintained at 10% minimum.
6. 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.
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% with nominal input voltage and rated output load.
9. All index testing methods in this datasheet are based on our company corporate standards.
10. Products are related to laws and regulations: see "Features" and "EMC".

Output Regulation Curve (5VDCoutput)

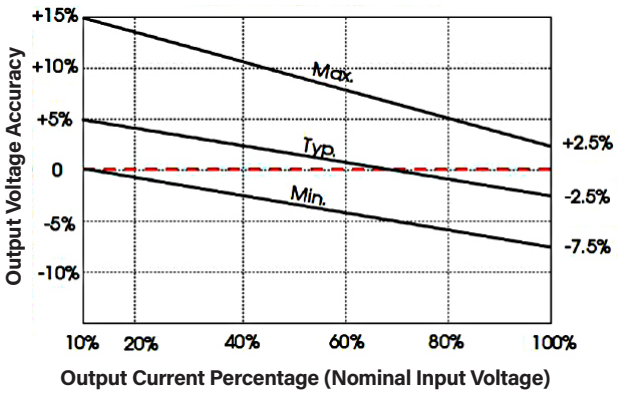


Fig. 1

Output Regulation Curve (Other output)

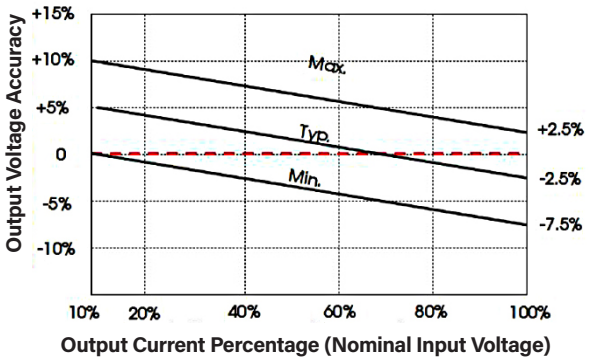


Fig. 2

Typical Characteristic Curves

Temperature Derating Curve

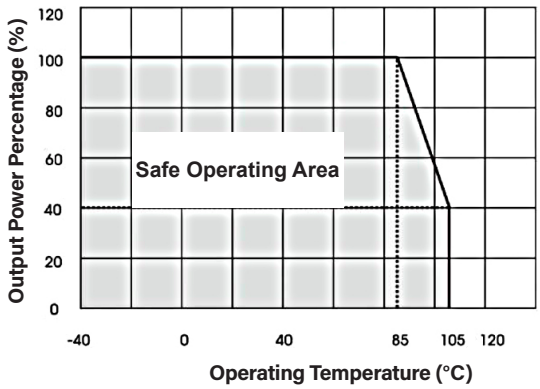


Fig. 3

Application Circuits

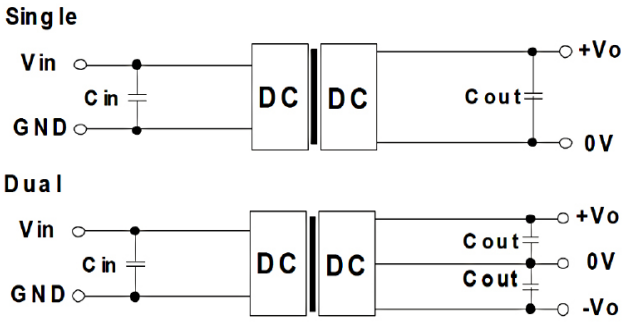


Fig. 4

Recommended input and output capacitor values					
Vin	Cin	Single Vout	Cout	Dual Vout	Cout
12VDC	10μF/25V	5VDC	10μF/16V	--	--
15VDC	4.7μF/25V	9VDC	10μF/16V	±5/±9VDC	4.7μF/16V
24VDC	2.2μF/50V	12VDC	2.2μF/25V	±12/±15VDC	1μF/25V
--	--	15VDC	1μF/25V	--	--
--	--	24VDC	0.47μF/50V	--	--

Table 1

EMC Recommended Circuit

EMC compliance circuit (MD215D-xxCHI, MD224D-xxCHI)

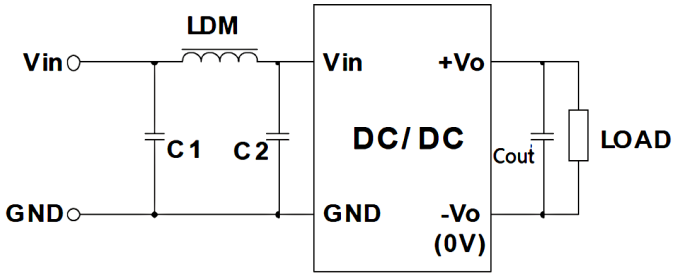


Fig. 5-1

EMC recommended circuit value table

Input Voltage		MD215D-xxCHI, MD224D-xxCHI
Emissions	C1/C2	4.7μF/50V
	Cout	Refer to the Cout in table 1
	LDM	22μH

EMC compliance circuit (12/15/24V input)

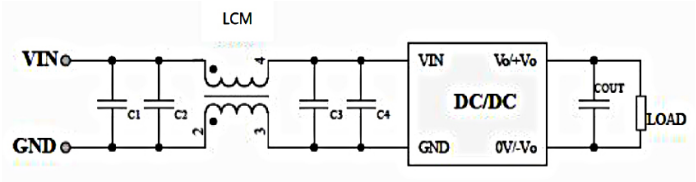


Fig. 5-2

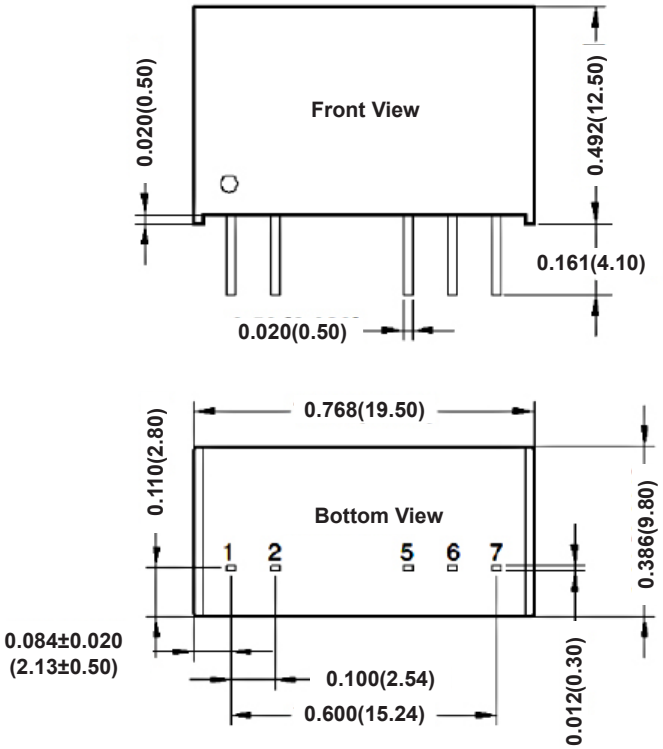
EMC recommended circuit value table

Input Voltage			12/15/24VDC
Emissions	C1/C2		4.7μF/50V
	C3	MD224S-24CHI	100μF/50V
		Other output	4.7μF/50V
	C4	MD224S-24CHI	--
		Other output	4.7μF/50V
	COUT		Refer to the Cout in table 1
	LCM		22μH(Nickel zinc inductance)

EMI Characteristics

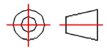
Parameter	Standard	Criteria	Level
CE	MD2155 & MD224S	--	Class A
RE	MD2155 & MD224S	--	Class A
Radiated Emissions	CISPR32/EN 55032	--	Other Class B (Fig. 5)
Conducted Emissions	CISPR32/EN 55032	--	Other Class B (Fig. 5)
ESD	EN 61000-4-2	B	±8 kV Contact, Air ±15kV

Mechanical Diagrams

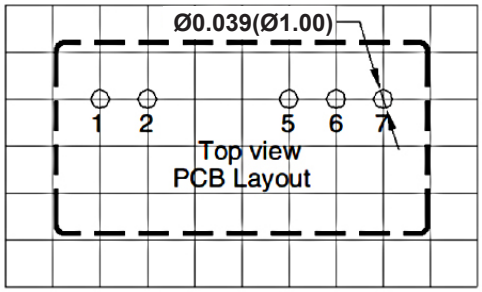


Note:
Unit: inches(mm)
Pin section tolerances: ±0.004(±0.10)
General tolerances: ±0.020(±0.50)

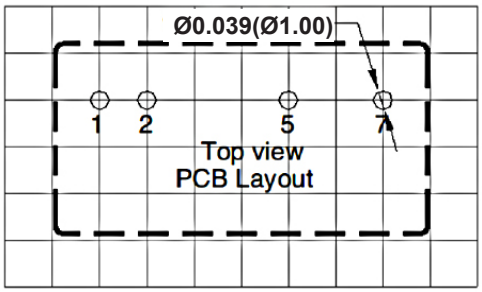
Third Angle Projection



Dual



Single



Note: The grid distance is 2.54mm*2.54mm

Pin-Out

Pin	Single	Dual
1	Vin	Vin
2	GND	GND
5	0V	-Vo
6	No Pin	0V
7	+Vo	+Vo