MD200C

2W, Miniature, Isolated, Low Cost DC/DC Converters

Key Features:

- 2W Output Power
- Miniature SIP Case
- Efficiency to 86%
- 1500 VDC Isolation
- -40°C to +105°C Temp
- >3500 kHour MTBF
- Single & Dual Output
- 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	5 VDC Input	4.5	5	5.5	VDC
	12 VDC Input	10.8	12	13.2	
	24 VDC Input	21.6	15	26.4	
Reflected Ripple Current			15		mA
Surge Voltage (1 sec. max.)	5 VDC Input	-0.7		9	VDC
	12 VDC Input	-0.7		18	
	24 VDC Input	-0.7		30	
Input Filter		Capacitance Filter			

Output

Parameter	Conditions			Min.	Typ.	Max.	Units
Output Voltage Accuracy				See Output Regulation Curves on p. 3			
Line Regulation	Input Voltage Variation ±1%				±0.25		%
Load Regulation	10% - 100% Load	5 VDC Input	3.3 Vout		10	20	%
			5 Vout		8	15	
			9/12/15 Vout		7	10	
			24 Vout		5	10	
		12/24 VDC Input	3.3 Vout		15	20	
			5 Vout		7	15	
			9 Vout		5	15	
			12 Vout		5	10	
			15 Vout		4	10	
			24 Vout		3	10	
Ripple & Noise	20MHz Bandwidth	5 VDC Input			75	200	mVp-p
		12/24 VDC Input			75	180	
Temperature Coefficient	Full load				±0.02		%/°C
Output Short Circuit	Continuous, self-recovery						

General

Parameter	Conditions		Min.	Typ.	Max.	Units
Isolation Voltage	60 seconds, leakage <1mA		1500			VDC
Isolation Resistance	500 VDC		1000			MΩ
Isolation Capacitance	100 KHz /0.1V			20		pF
Switching Frequency	Full load, nominal input voltage	5VDC Input		220		kHz
		12/24VDC Input		260		

Environmental

Parameter	Conditions		Min.	Typ	Max.	Units
Operating Temperature Range	Derating when ≥85°C		-40		+105	°C
Storage Temperature Range			-55		+125	°C
Case Temperature Rise	Ta = 25°C	5VDC Input		25		°C
		12/24VDC Input		15		
Cooling	Free Air Convection					
Storage Humidity, See Note 4	Non-Condensing		5		95	%RH
Vibration	10-150Hz, 5G, 0.75mm along X, Y, Z axis					

Physical

Case Size	0.77 x 0.28 x 0.4 in (See mechanical drawing on page 5)
Case Material	Black plastic; flame retardant and heat resistant (UL94V-0)
Weight	0.085 oz (2.4g) (See mechanical drawing on page 5)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL-HDBK-217F@25°C	3500			kHours
Pin Soldering Resistance Temperature	1.5mm away from case for 10 sec			300	°C

EMI Characteristics

Parameter	Conditions	Criteria	Level
Radiated Emissions	CISPR/EN 55032		Class B
Conducted Emissions	CISPR/EN 55032		Class B
ESD	IEC/EN 61000-4-2	B	±8kV Air, ±6kV Contact

MicroPower Direct
46 Eastman Street
Unit 1
Easton, MA 02375
USA

T: (781) 344-8226
E: sales@micropowerdirect.com
W: www.micropowerdirect.com

MICROPOWER DIRECT

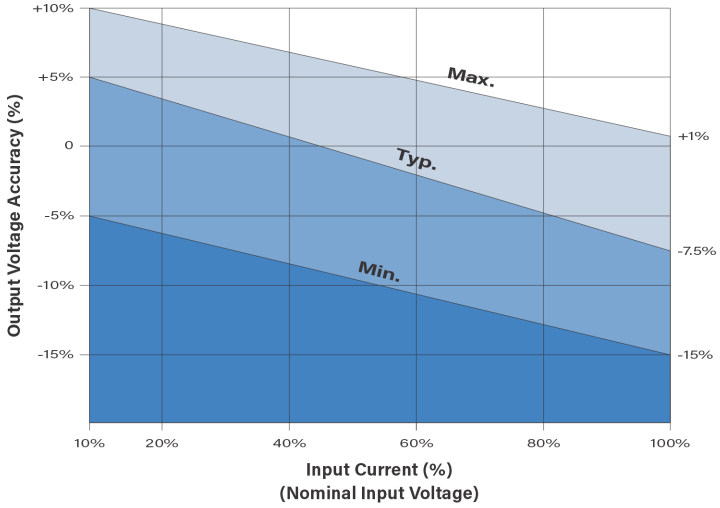
Model Selection Guide

UL	Model Number	Input				Output			Full Load Efficiency (%, Typ)	Reflected Ripple Current (mA, Typ)	Capacitive Load (uF Max) (See Note 1)	Fuse Rating Slow-Blow (mA)
		Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min.)				
		Nominal	Range	Full-Load (Typ)	No-Load							
	MD205S-03C	5	4.5 - 5.5	534	8	3.3	400	40	78	15	2400	1200
▪	MD205S-05C	5	4.5 - 5.5	477	8	5	400	40	84	15	2400	1200
	MD205S-09C	5	4.5 - 5.5	471	8	9	222	22	85	15	1000	1200
	MD205S-12C	5	4.5 - 5.5	471	8	12	167	17	85	15	560	1200
	MD205S-15C	5	4.5 - 5.5	466	8	15	133	13	86	15	560	1200
▪	MD205S-24C	5	4.5 - 5.5	466	8	24	83	8	86	15	220	1200
	MD205D-03C	5	4.5 - 5.5	534	8	±3.3	±303	±30	75	15	1200	1200
	MD205D-05C	5	4.5 - 5.5	477	8	±5	±200	±20	84	15	1200	1200
	MD205D-09C	5	4.5 - 5.5	471	8	±9	±111	±11	85	15	470	1200
	MD205D-12C	5	4.5 - 5.5	471	8	±12	±83	±8	85	15	220	1200
	MD205D-15C	5	4.5 - 5.5	466	8	±15	±67	±7	86	15	220	1200
	MD205D-24C	5	4.5 - 5.5	466	8	±24	±42	±4	86	15	100	1200
	MD212S-03C	12	10.8 - 13.2	223	8	3.3	400	40	79	15	2400	500
▪	MD212S-05C	12	10.8 - 13.2	208	8	5	400	40	82	15	2400	500
	MD212S-09C	12	10.8 - 13.2	203	8	9	222	22	82	15	1000	500
▪	MD212S-12C	12	10.8 - 13.2	201	8	12	167	17	84	15	560	500
	MD212S-15C	12	10.8 - 13.2	201	8	15	133	13	85	15	560	500
▪	MD212S-24C	12	10.8 - 13.2	201	8	24	83	8	86	15	220	500
	MD212D-03C	12	10.8 - 13.2	223	8	±3.3	±303	±30	75	15	1200	500
	MD212D-05C	12	10.8 - 13.2	208	8	±5	±200	±20	80	15	1200	500
	MD212D-09C	12	10.8 - 13.2	203	8	±9	±111	±11	82	15	470	500
▪	MD212D-12C	12	10.8 - 13.2	201	8	±12	±83	±8	83	15	220	500
▪	MD212D-15C	12	10.8 - 13.2	201	8	±15	±67	±7	83	15	220	500
	MD212D-24C	12	10.8 - 13.2	201	8	±24	±42	±4	83	15	100	500
	MD224S-03C	24	21.6 - 26.4	110	8	3.3	400	40	76	15	2400	250
▪	MD224S-05C	24	21.6 - 26.4	104	8	5	400	40	80	15	2400	250
	MD224S-09C	24	21.6 - 26.4	103	8	9	222	22	81	15	1000	250
	MD224S-12C	24	21.6 - 26.4	101	8	12	167	17	84	15	560	250
	MD224S-15C	24	21.6 - 26.4	101	8	15	133	13	86	15	560	250
▪	MD224S-24C	24	21.6 - 26.4	101	8	24	83	8	86	15	220	250
	MD224D-03C	24	21.6 - 26.4	110	8	±3.3	±303	±30	76	15	1200	250
	MD224D-05C	24	21.6 - 26.4	104	8	±5	±200	±20	80	15	1200	250
	MD224D-09C	24	21.6 - 26.4	103	8	±9	±111	±11	81	15	470	250
	MD224D-12C	24	21.6 - 26.4	101	8	±12	±83	±8	83	15	220	250
	MD224D-15C	24	21.6 - 26.4	101	8	±15	±67	±7	83	15	220	250
	MD224D-24C	24	21.6 - 26.4	101	8	±24	±42	±4	83	15	100	250
	* MD205S-05C, -24C, MD212S-05C, -12C, -24C, MD212D-12C, -15C, MD224S-05C, -24C have UL/cUL 62368 recognition (UL certificate). Contact factory for safety standard status of other models.											

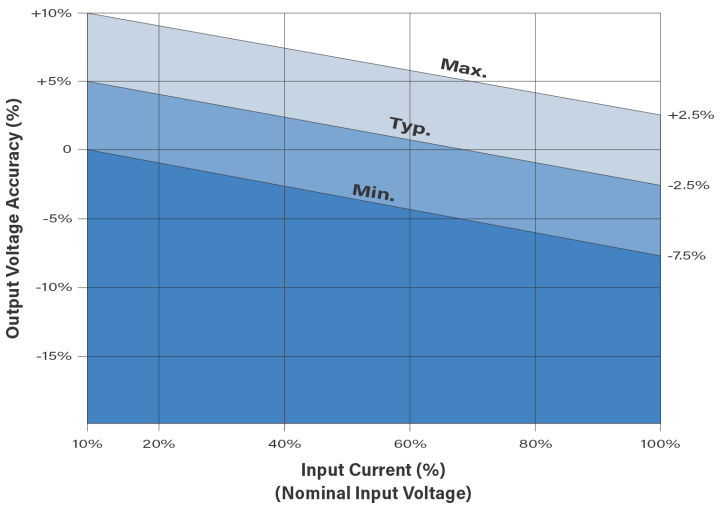
Notes:

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage.
2. The "parallel cable" method is used for ripple and noise test.
3. The maximum capacitive load is tested within the input voltage range and under full load conditions.
4. Unless otherwise specified, all indicators in this manual are measured at Ta=25 °C, humidity from 40% to 75% RH, nominal input voltage, and output rated load.

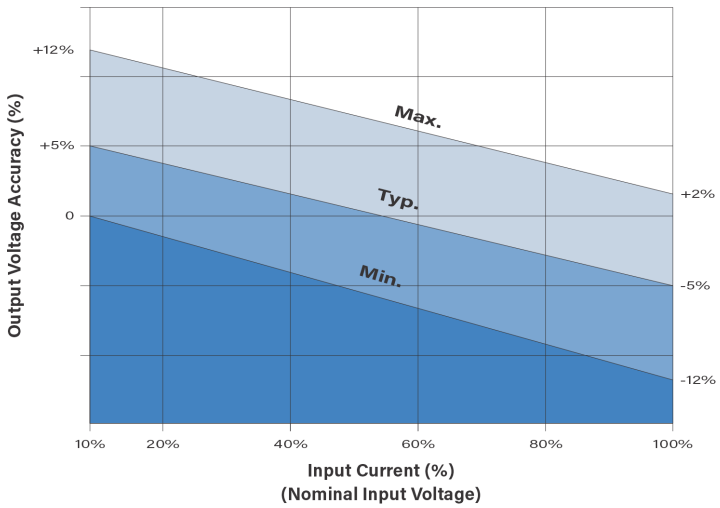
Output Regulation: 5VIN 3.3VOUT



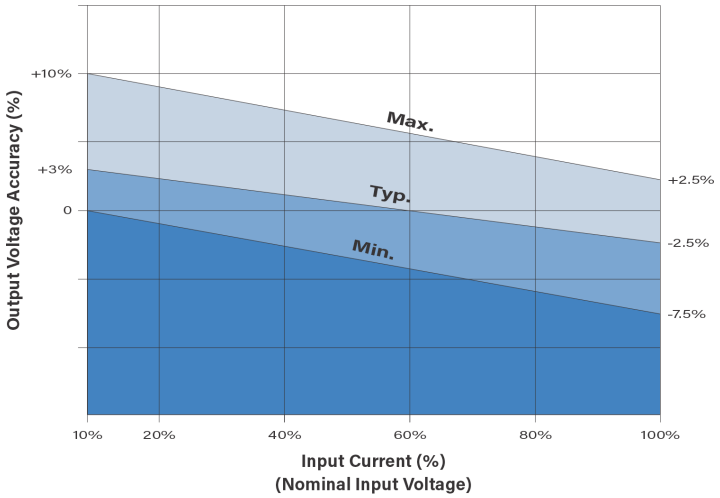
Output Regulation: 5VIN Other Output



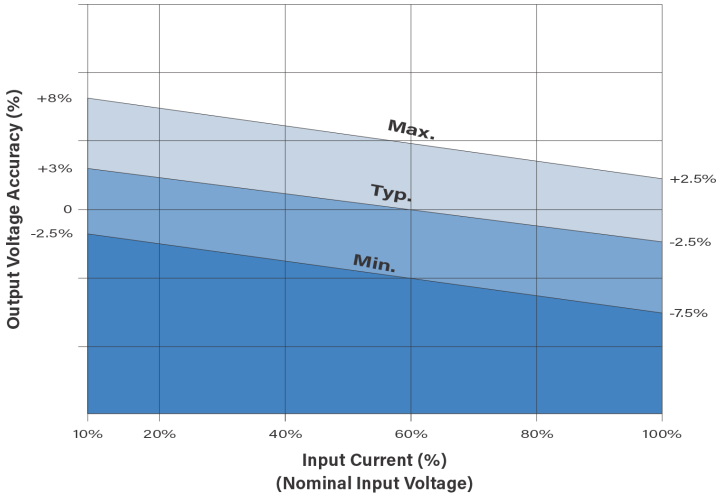
Output Regulation: 12/15/24VIN 3.3VOUT



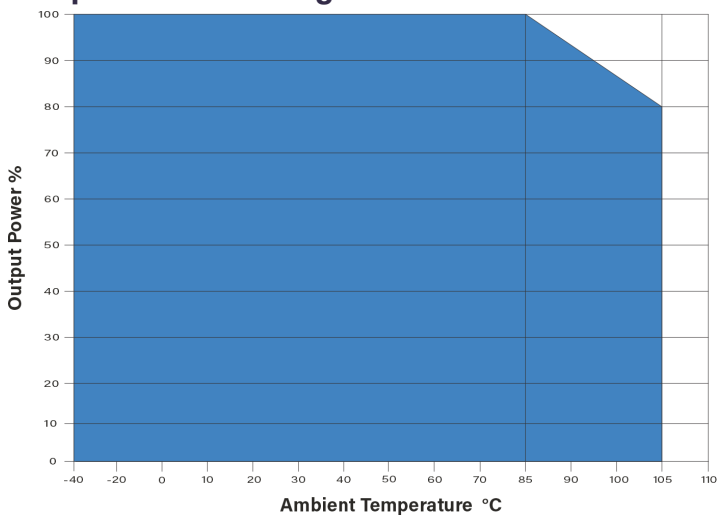
Output Regulation: 12/15/24VIN 5VOUT



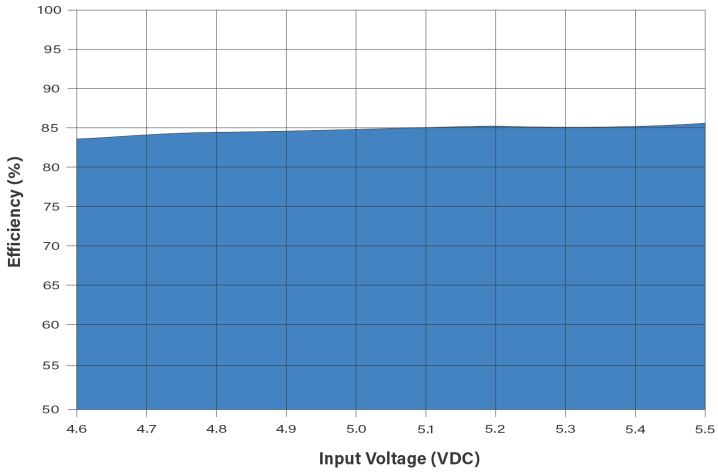
Output Regulation: 12/15/24VIN Other Output



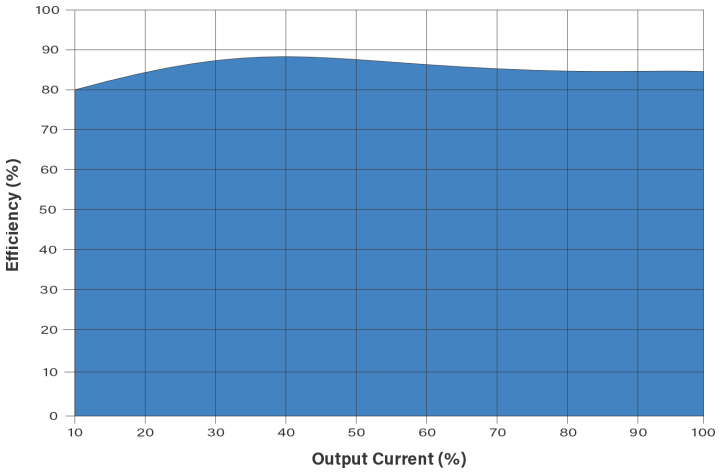
Temperature Derating



Efficiency vs Input Voltage (Full Load): MD205S-05C



Efficiency vs Output Load (Vin=5V): MD205S-05C



Typical Application Circuit

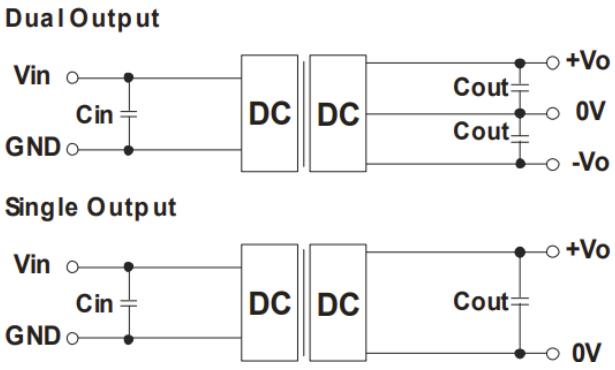


Fig. 1

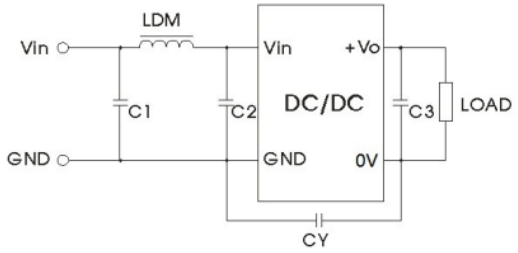
Recommended Capacitive Load Values					
Vin (VDC)	Cin	Single Vout	Cout	Dual Vout	Cout
5	10uF/16V	3.3 VDC	10uF/16V	±3.3 VDC	4.7uF/16V
12	2.2uF/25V	5 VDC	10uF/16V	±5 VDC	4.7uF/16V
24	1uF/50V	9 VDC	2.2uF/25V	±9 VDC	2.2uF/25V
--	--	12 VDC	2.2uF/25V	±12 VDC	1uF/25V
--	--	12 VDC	1uF/25V	±15 VDC	1uF/25V
--	--	24 VDC	1uF/50V	±24 VDC	0.47uF/50V

Notes:

1. To further reduce input and output ripple, a capacitor filtering network can be connected at the input and output terminals. It is important to choose suitable filter capacitor values for smooth operation of the module, particularly to avoid start-up problems caused by capacitor values that are too high. Refer to the table above for recommended input and output capacitor values.

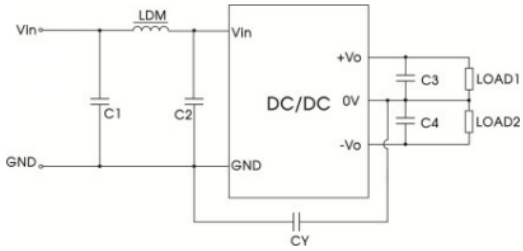
EMC Application Recommended Circuit

Single Output



Recommended EMC Values			
Input Voltage		5 VDC	12/15/24 VDC
Emissions	C1/C2	4.7uF/16V	4.7uF/50V
	CY	260pF/2kV	
	C3	Refer to Cout in Fig. 1	
	LDM	6.8uH	

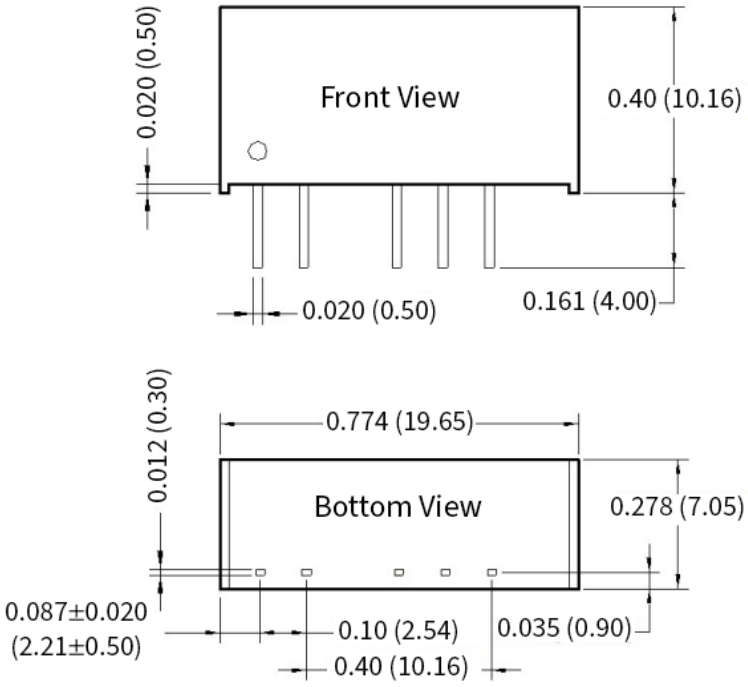
Dual Output

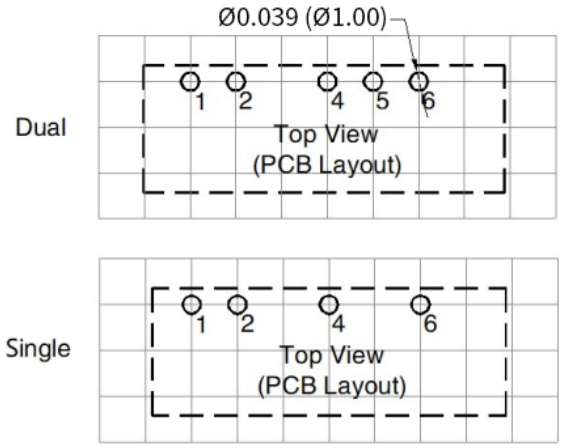


Recommended EMC Values			
Input Voltage		5 VDC	12/15/24 VDC
Emissions	C1/C2	4.7uF/16V	4.7uF/50V
	CY	260pF/2kV	
	C3/C4	Refer to Cout in Fig. 1	
	LDM	6.8uH	

Mechanical Dimensions

THIRD ANGLE PROJECTION





Note: Grid distance is 2.54 * 2.54 mm

Pin	Single	Dual
1	Vin	Vin
2	GND	GND
4	0V	-Vo
5	No Pin	0V
6	+Vo	+Vo

Note:

- Unit: inches (mm)
- Pin section tolerances: ±0.004 (±0.10)
- General tolerances: ±0.010 (±0.25)
- Weight: 0.85 oz (2.4g)