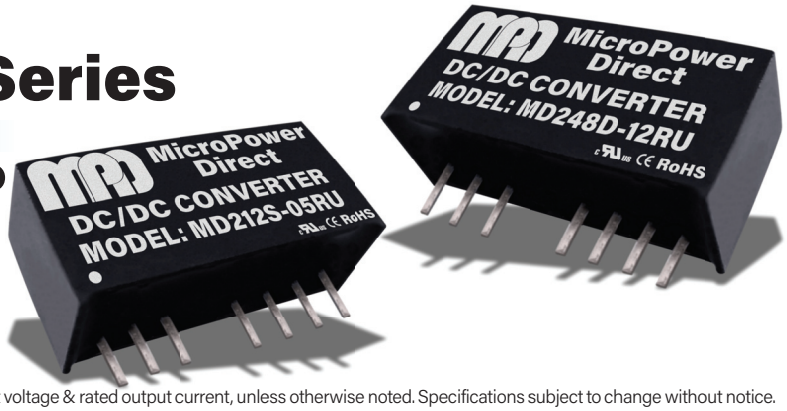
MD200RU Series

Wide 4:1 Input, 2W SIP Single & Dual Output DC/DC Converters



Key Features:

- 2W Output Power
- Wide 4:1 Input Range
- Miniature SIP Case
- EN 62368 Approved
- 1,500 VDC Isolation
- Single And Dual Outputs
- Tight Line/Load Regulation
- 21 Standard Models
- 1.0 MH MTBF Minimum
- 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	12 VDC Input	4.5	12.0	18.0	VDC
	24 VDC Input	9.0	24.0	36.0	
	48 VDC Input	18.0	48.0	75.0	
Startup Threshold Voltage	12 VDC Input	3.0	4.0	4.5	VDC
	24 VDC Input	4.5	6.0	9.0	
	48 VDC Input	8.5	12.0	18.0	
Under Voltage Shutdown	12 VDC Input			4.0	VDC
	24 VDC Input			8.0	
	48 VDC Input			16.0	
Short Circuit Input Power				1,500	mW
Input Filter	Internal Capacitor				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy				±2.0	%
Output Voltage Balance	Dual Outputs, Balanced Loads		±1.0	±2.0	%
Line Regulation	For V_{IN} = Min to Max		±0.3	±0.5	%
Load Regulation	I_{OUT} = 0% to 100%		±0.5	±1.0	%
Ripple & Noise (20 MHz)	See Note 1			100	mV P - P
Transient Recovery Time	See Note 2		300	500	mSec
Transient Response Deviation			±3.0	±5.0	%
Temperature Coefficient			±0.01	±0.02	%/°C
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	1,500			VDC
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz, 1V		250	500	pF
Switching Frequency			300		kHz

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+75	°C
Operating Temperature Range	Case			+105	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

Physical

Case Size	See Mechanical Drawing (Page 2)
Case Material	Non-Conductive Black Plastic (UL-94V0)
Weight	0.07 Oz (2.1g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Safety Standards	UL/cUL 62368-1 recognition (UL certificate)				

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	12 VDC Input	-0.7		25.0	VDC
	24 VDC Input	-0.7		50.0	
	48 VDC Input	-0.7		100.0	
Lead Temperature	1.5 mm From Case For 10 Sec			260	°C

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

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Model Selection Guide

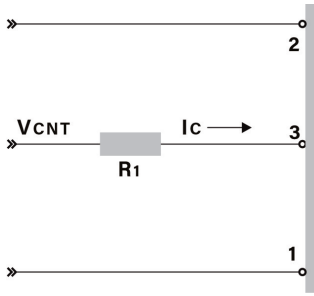
Model Number	Input				Output			Output Capacitive Load (µF Max)	Efficiency (%, Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MD212S-03RU	12	4.5 - 18.0	183	60	3.3	500	0.0	1,000	75	500
MD212S-05RU	12	4.5 - 18.0	208	60	5.0	400	0.0	1,000	80	500
MD212S-12RU	12	4.5 - 18.0	204	60	12.0	167	0.0	170	82	500
MD212S-15RU	12	4.5 - 18.0	204	60	15.0	134	0.0	110	82	500
MD212D-05RU	12	4.5 - 18.0	208	60	±5.0	±200	0.0	±470	80	500
MD212D-12RU	12	4.5 - 18.0	202	60	±12.0	±83	0.0	±100	82	500
MD212D-15RU	12	4.5 - 18.0	204	60	±15.0	±67	0.0	±470	82	500
MD224S-03RU	24	9.0 - 36.0	92	30	3.3	500	0.0	1,000	75	250
MD224S-05RU	24	9.0 - 36.0	104	30	5.0	400	0.0	1,000	80	250
MD224S-12RU	24	9.0 - 36.0	102	30	12.0	167	0.0	170	82	250
MD224S-15RU	24	9.0 - 36.0	102	30	15.0	134	0.0	110	82	250
MD224D-05RU	24	9.0 - 36.0	104	30	±5.0	±200	0.0	±470	80	250
MD224D-12RU	24	9.0 - 36.0	101	30	±12.0	±83	0.0	±100	82	250
MD224D-15RU	24	9.0 - 36.0	102	30	±15.0	±67	0.0	±470	82	250
MD248S-03RU	48	18.0 - 75.0	46	20	3.3	500	0.0	1,000	74	100
MD248S-05RU	48	18.0 - 75.0	52	20	5.0	400	0.0	1,000	80	100
MD248S-12RU	48	18.0 - 75.0	51	20	12.0	167	0.0	170	82	100
MD248S-15RU	48	18.0 - 75.0	51	20	15.0	134	0.0	110	82	100
MD248D-05RU	48	18.0 - 75.0	52	20	±5.0	±200	0.0	±470	80	100
MD248D-12RU	48	18.0 - 75.0	51	20	±12.0	±83	0.0	±100	82	100
MD248D-15RU	48	18.0 - 75.0	51	20	±15.0	±67	0.0	±470	82	100

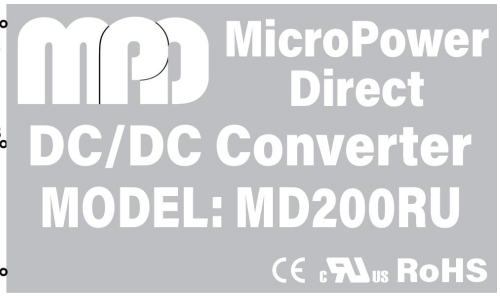
Notes:

1. When measuring output ripple & noise, it is recommended that an external ceramic capacitor (0.47 µF typ) be placed from the +VOUT to the -VOUT pins single output models, or from each output to common for dual output models.
2. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Free air convection is typically 20 LFM. The units should not be operated in still air (0 LFM).
4. Exceeding the absolute ratings could damage the unit.
5. It is recommended that a fuse be used on the input of a power converter for protection. See the Model Selection table above for the correct rating.

Remote Control

The **MD200RU** remote control input (pin 3) is current controlled. The unit operates when this input is open. When the input is "high" (current is flowing into the pin), the converter shuts down. The input current to this pin should be kept between 2 mA and 4 mA. The diagram at right shows a simple connection for the control pin. Using a value of 1 kV for R1, a voltage level of 5V - 9V may be used to control the unit. The table below gives specifications for this feature.

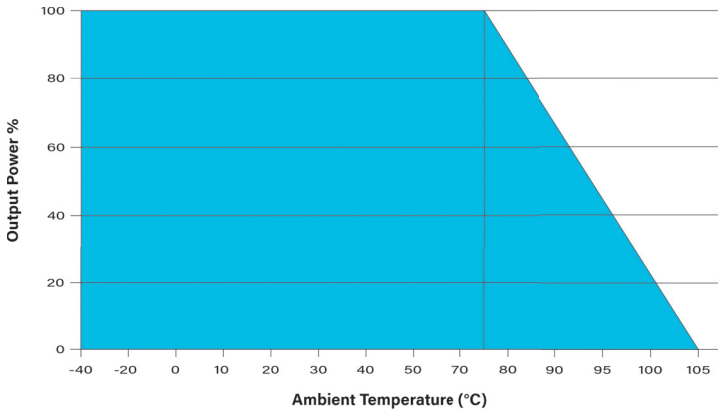




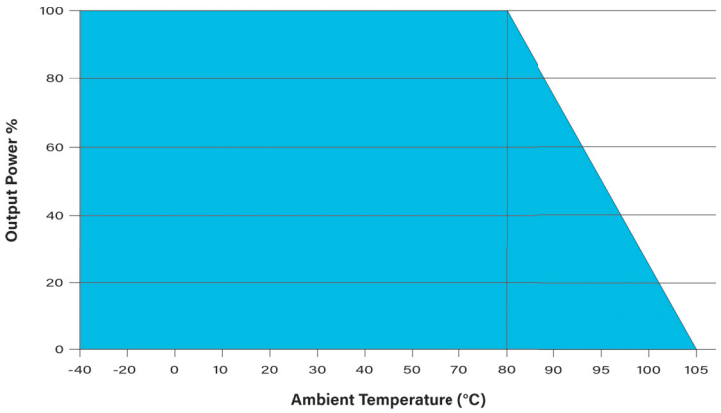
Remote On/Off

Parameter	Min.	Typ.	Max.	Units
Supply On	Open or High Impedance			
Supply Off	2		4	mA
Standby Input Current		2.5		mA

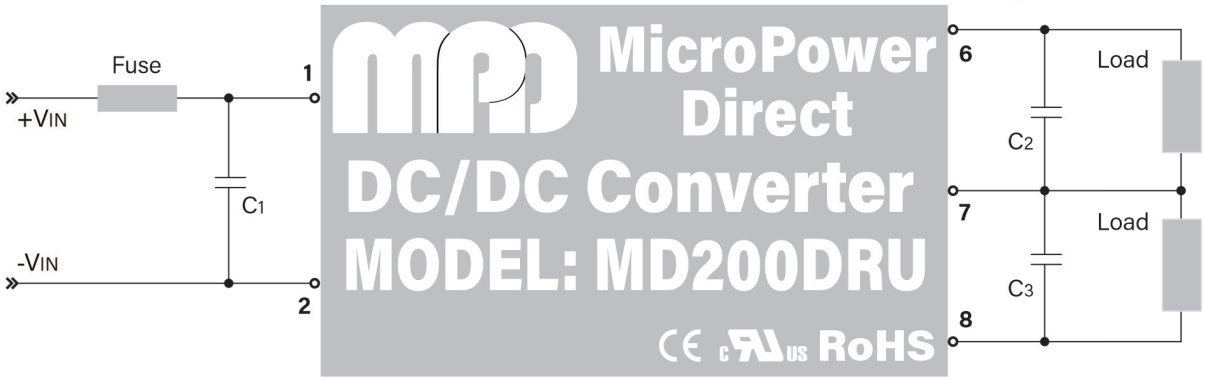
Derating Curve, Free Air (20 LFM)



Derating Curve , 400 LFM)



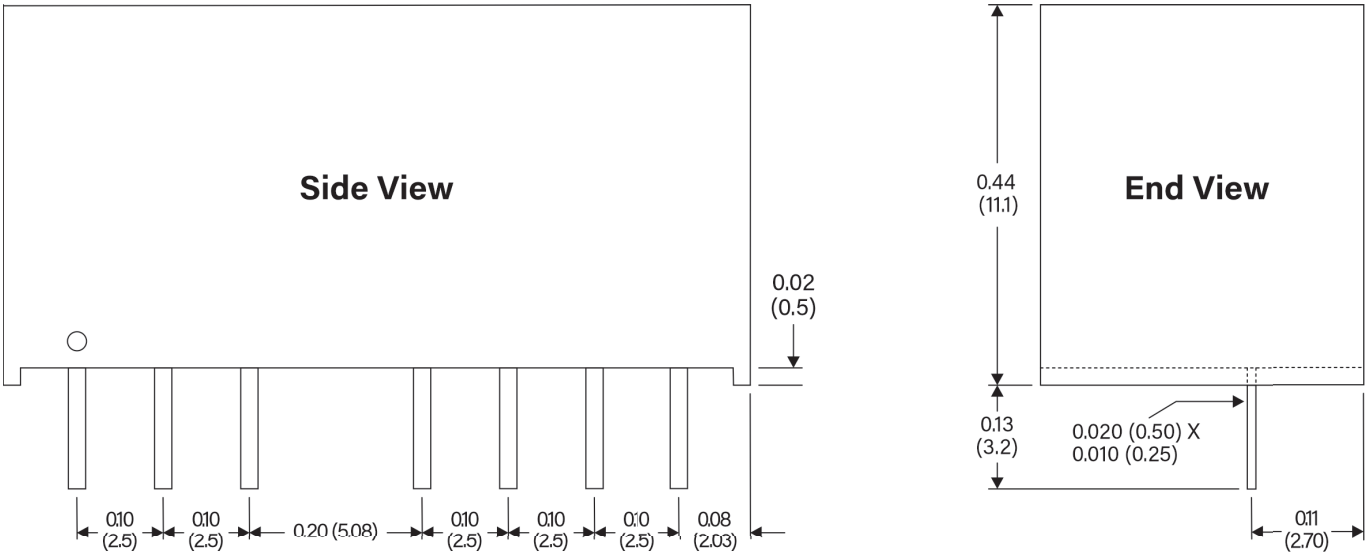
Typical Connection

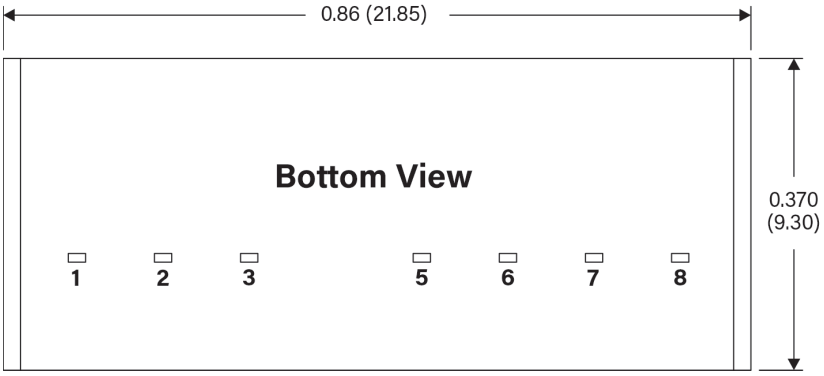


The diagram above illustrates a simple connection of the **MD200RU** series. Capacitor C1 is recommended to insure the unit starts in applications where power to the device is supplied over long lines or, where the output loading is high. The capacitors C3 and C4 will reduce output ripple and improve the converter stability over time and temperature. Recommended component values are given in the table at right.

VIN	C1	C2	C3
12 VDC	4.7 µF	3.3 µF	3.3 µF
24 VDC	2.2 µF	3.3 µF	3.3 µF
48 VDC	2.2 µF	3.3 µF	3.3 µF

Mechanical Dimensions





Pin Connections

Pin	Single	Dual
1	-VIN	-VIN
2	+VIN	+VIN
3	Remote On/Off	Remote On/Off
5	NC	NC
6	+VOUT	+VOUT
7	-VOUT	Common
8	NC	-VOUT

NC: No Connection

Notes:

- All dimensions are typical in inches (mm)
- Pin 1 is marked by a "dot" or indentation on the unit
- General Tolerance = ±0.02 (±0.50)
- Pin Tolerance = ±0.002 (±0.05)
- Recommended pin hole size (on the application PC Board) is Ø 0.03 (Ø0.80)

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