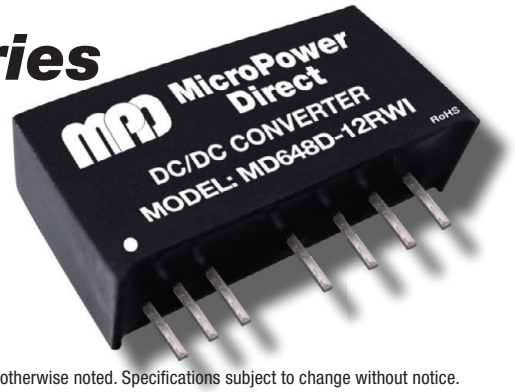
MD600xRWI Series

2:1 Input, SIP, High Isolation, 6W DC/DC Converters



Key Features:

- 6W Output Power
- Miniature SIP Case
- 2:1 Input Voltage Range
- 3,000 VDC Isolation
- 36 Standard Models
- Short Circuit Protected
- -40°C to +65°C Operation
- Single & Dual Outputs
- Industry Standard Pin-Out

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 Range	5 VDC Input	4.5	5.0	9.0	VDC
	12 VDC Input	9.0	12.0	18.0	
	24 VDC Input	18.0	24.0	36.0	
	48 VDC Input	36.0	48.0	75.0	
Input Reflected Ripple Current			30		mA P - P
Start Up Time	See Note 1		30		mS
Input Filter	Capacitor Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0		%
Line Regulation	VIN = Min to Max			±0.2	%
Load Regulation	IOUT = 0% to 100%			±1.0	%
Cross Regulation	See Note 2			±5.0	%
Ripple & Noise (20 MHz)	See Note 3			75	mV P - P
Transient Recovery Time	See Note 4		0.5		mSec
Transient Response Deviation				±3.0	%
Temperature Coefficient			±0.02		%/°C
Output Short Circuit	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	60 Seconds	3,000			VDC
Isolation Resistance		1.0			GΩ
Isolation Capacitance				50	pF
Switching Frequency		100			kHz

EMI Characteristics

Parameter	Standard		Level
Radiated Emissions		EN 55022	Class A
Conducted Emissions	See Note 4 Pg 3	EN 55022	Class A
ESD		EN 61000-4-2	Criteria A; ±8 kV Air
			Criteria A; ±6 kV Contact
RS		EN 61000-4-3	Criteria A; 10V/m
EFT	See Note 6 Pg 3	EN 61000-4-4	Criteria A; ±2 kV
Surge	See Note 6 Pg 3	EN 61000-4-5	Criteria A; ±1 kV
CS		EN 61000-4-6	Criteria A; 10 Vrms
PFMF		EN 61000-4-8	Criteria A; 1A/m

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+65	°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 4)
Case Material	Non-Conductive Black Plastic (UL94-V0)
Weight	0.166 Oz (4.8g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	770			kHours

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	5 VDC Input			15.0	VDC
	12 VDC Input			25.0	
	24 VDC Input			50.0	
	48 VDC Input			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

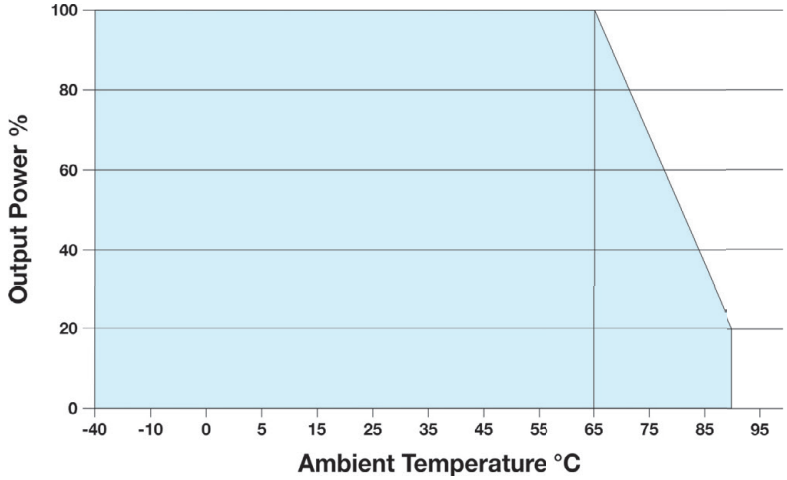
Model Number	Input				Output			Efficiency (%, Typ)	Capacitive Load (µF, Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MD605S-03RWI	5	4.5 - 9.0	1,144	105	3.3	1,300	0.0	75	6,600	3,000
MD605S-05RWI	5	4.5 - 9.0	1,519	105	5.0	1,200	0.0	79	3,300	3,000
MD605S-09RWi	5	4.5 - 9.0	1,445	105	9.0	666	0.0	83	2,000	3,000
MD605S-12RWI	5	4.5 - 9.0	1,428	105	12.0	500	0.0	84	1,600	3,000
MD605S-15RWI	5	4.5 - 9.0	1,428	105	15.0	400	0.0	84	1,400	3,000
MD605S-24RWI	5	4.5 - 9.0	1,428	105	24.0	250	0.0	84	680	3,000
MD605D-05RWI	5	4.5 - 9.0	1,481	105	±5.0	±600	0.0	81	±2,000	3,000
MD605D-12RWI	5	4.5 - 9.0	1,428	105	±12.0	±250	0.0	84	±900	3,000
MD605D-15RWI	5	4.5 - 9.0	1,428	105	±15.0	±200	0.0	84	±660	3,000
MD612S-03RWI	12	9.0 - 18.0	470	55	3.3	1,300	0.0	76	6,600	1,250
MD612S-05RWI	12	9.0 - 18.0	602	55	5.0	1,200	0.0	83	3,300	1,250
MD612S-09RWI	12	9.0 - 18.0	595	55	9.0	666	0.0	84	2,000	1,250
MD612S-12RWI	12	9.0 - 18.0	588	55	12.0	500	0.0	85	1,600	1,250
MD612S-15RWI	12	9.0 - 18.0	588	55	15.0	400	0.0	85	1,400	1,250
MD612S-24RWI	12	9.0 - 18.0	581	55	24.0	250	0.0	86	680	1,250
MD612D-05RWI	12	9.0 - 18.0	609	55	±5.0	±600	0.0	82	±2,000	1,250
MD612D-12RWI	12	9.0 - 18.0	595	55	±12.0	±250	0.0	84	±900	1,250
MD612D-15RWI	12	9.0 - 18.0	581	55	±15.0	±200	0.0	86	±660	1,250
MD624S-03RWI	24	18.0 - 36.0	229	30	3.3	1,300	0.0	78	6,600	750
MD624S-05RWI	24	18.0 - 36.0	301	30	5.0	1,200	0.0	83	3,300	750
MD624S-09RWI	24	18.0 - 36.0	294	30	9.0	666	0.0	85	2,000	750
MD624S-12RWI	24	18.0 - 36.0	294	30	12.0	500	0.0	85	1,600	750
MD624S-15RWI	24	18.0 - 36.0	287	30	15.0	400	0.0	87	1,400	750
MD624S-24RWI	24	18.0 - 36.0	287	30	24.0	250	0.0	87	680	750
MD624D-05RWI	24	18.0 - 36.0	304	30	±5.0	±600	0.0	82	±2,000	750
MD624D-12RWI	24	18.0 - 36.0	297	30	±12.0	±250	0.0	84	±900	750
MD624D-15RWI	24	18.0 - 36.0	297	30	±15.0	±200	0.0	84	±660	750
MD648S-03RWI	48	36.0 - 75.0	117	15	3.3	1,300	0.0	76	6,600	300
MD648S-05RWI	48	36.0 - 75.0	156	15	5.0	1,200	0.0	80	3,300	300
MD648S-09RWI	48	36.0 - 75.0	147	15	9.0	666	0.0	85	2,000	300
MD648S-12RWI	48	36.0 - 75.0	149	15	12.0	500	0.0	84	1,600	300
MD648S-15RWI	48	36.0 - 75.0	145	15	15.0	400	0.0	86	1,400	300
MD648S-24RWI	48	36.0 - 75.0	148	15	24.0	250	0.0	84	680	300
MD648D-05RWI	48	36.0 - 75.0	152	15	±5.0	±600	0.0	82	±2,000	300
MD648D-12RWI	48	36.0 - 75.0	147	15	±12.0	±250	0.0	85	±900	300
MD648D-15RWI	48	36.0 - 75.0	147	15	±15.0	±200	0.0	85	±660	300

For Remote Control option, add suffix "R" to model number (i.e. **MD624S-05RWI-R**)

Notes:

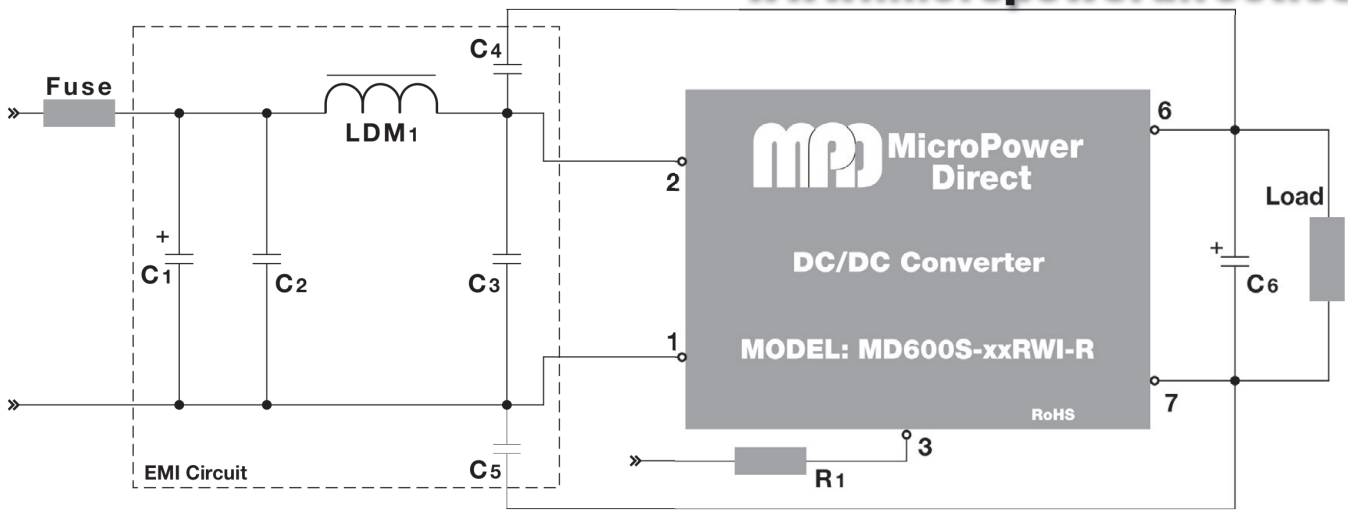
1. Start up time is specified at nominal input and with a constant resistive load.
2. Cross regulation is measured by monitoring one output set at 100% load while varying the second output from 25% to 100% load.
3. When measuring output ripple & noise, it is recommended that an external ceramic capacitor (0.1 µF typ.) be placed from the +Vout to the -Vout pins for single output units and from each output to common for dual output models.
4. Transient recovery is measured to within a 1% error band for a load step change of 25%.
5. Free air convection is typically 30 - 65 LFM. THe units should not be operated in still air (0 LFM).
6. Exceeding the absollute ratings could damage the unit.
7. 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.

Derating Curve



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Typical Connection



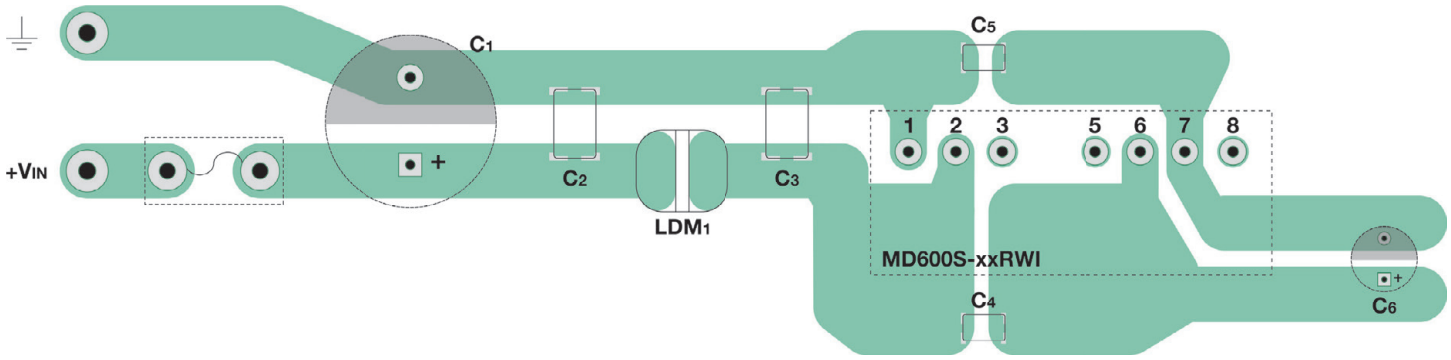
For applications that require meeting EMC standards, the diagram above illustrates a typical connection of the **MD600xRWI** series. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

1. An external fuse should be used in all power module applications. The recommended fuse is shown in the model chart on page 2.
2. To protect against a surge, an external MOV is recommended on the input. For a suggested value, contact the factory.
3. To protect against voltage spikes, it is recommended that a TVS be used on the input. For a suggested value, contact the factory.
4. The filtering components shown are needed to meet the conducted emissions requirements for EN 55022 Class A. All components should be mounted as close to the converter as possible.
5. Recommended values for components are:

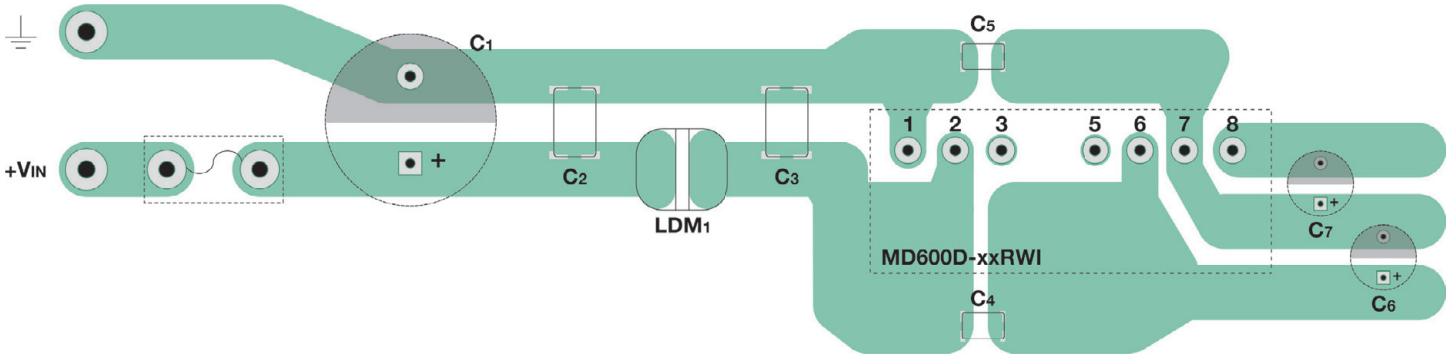
Component	5 VIN	12 VIN	24 VIN	48 VIN
C1	220 µF/25V			
C2	22 µF/25V	10 µF/50V	10 µF/50V	2.2 µF/100V
LDM1	10 µH	10 µH	10 µH	15 µH
C3	22 µF/25V	10 µF/50V	10 µF/50V	2.2 µF/100V
C4	220 pF/3 kV	220 pF/3 kV	220 pF/3 kV	220 pF/3 kV
C5	220 pF/3 kV	220 pF/3 kV	220 pF/3 kV	220 pF/3 kV
C6	10 µF - 22 µF			

6. To meet the requirements of EN 61000-4-4 and EN 61000-4-5, an external input capacitor is required for all models. The suggested value is 330 µF/100V. Contact the factory for more information
7. The output filtering capacitor (C6) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above
8. The drawings below show typical board layouts for the EMI circuit shown above (one for single output models and one for dual output units).
9. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The value of the input capacitor can range from 220 µF to 330 µF, depending on the needs of the application. The output capacitor would typically be 10 µF.

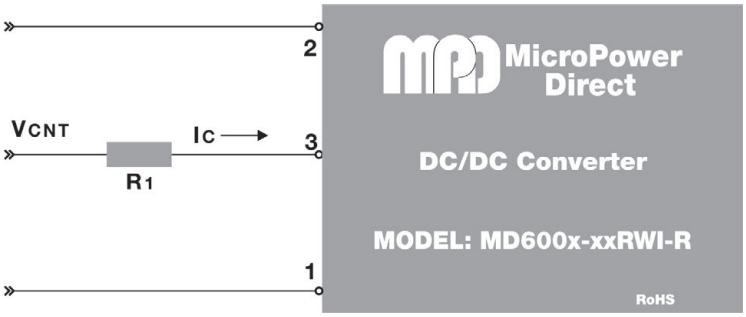
Typical Board Layout: With External Filter Components for Single Output Unit



Typical Board Layout: With External Filter Components for Dual Output Unit



Remote ON/OFF Control



The **MD600x-xxRWI** is available with an optional remote control input. This 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 to 4 mA.

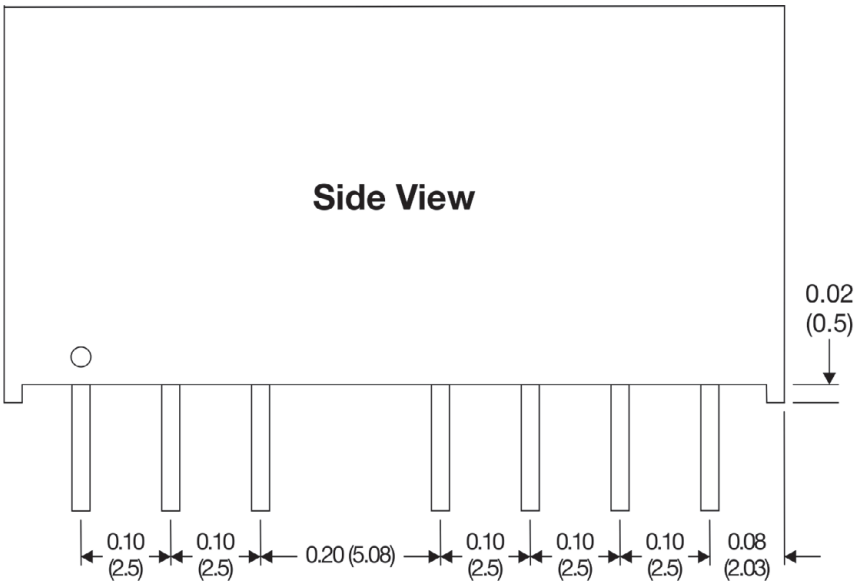
The diagram at right shows a simple connection for the control pin.

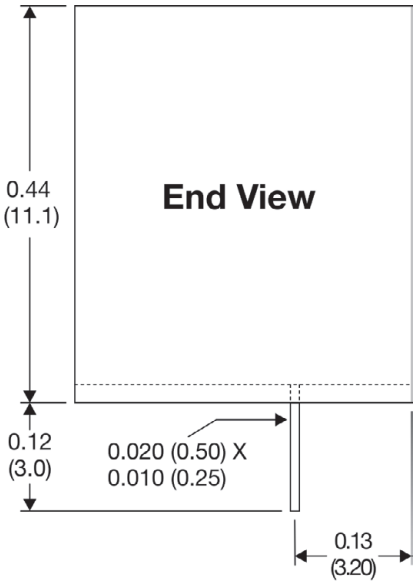
To order units with the control input, add a "-R" to the model number (i.e. **MD605D-12RWI-R**).

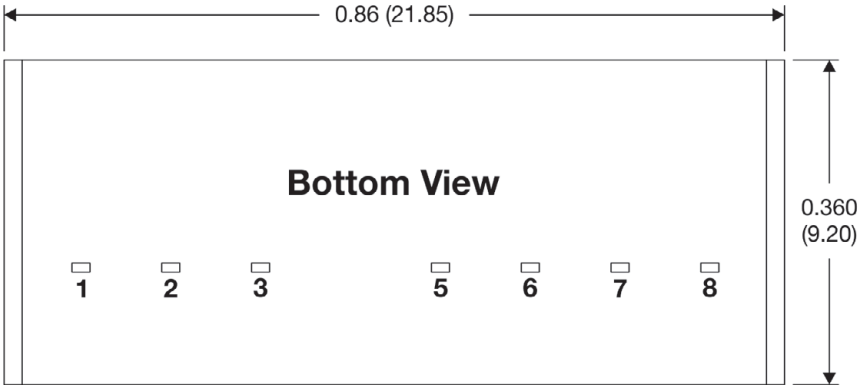
Remote On/Off

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

Mechanical Dimensions







Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.5)
- Pin 1 is marked by a "dot" or indentation on the top of the unit

Pin Connections

Standard Model		Remote Control Model	
Pin	Single Output	Pin	Single Output
1	-VIN	1	-VIN
2	+VIN	2	+VIN
3	No Pin	3	Remote On/Off
5	No Pin	5	No Connection
6	+VOUT	6	+VOUT
7	-VOUT	7	-VOUT
8	No Connection	8	No Connection

Pin	Dual Output	Pin	Dual Output
1	-VIN	1	-VIN
2	+VIN	2	+VIN
3	No Connection	3	Remote On/Off
5	No Connection	5	No Connection
6	+VOUT	6	+VOUT
7	Common	7	Common
8	-VOUT	8	-VOUT

For Remote Control option, add suffix "R" to model number (i.e. **MD624S-05RWI-R**)

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