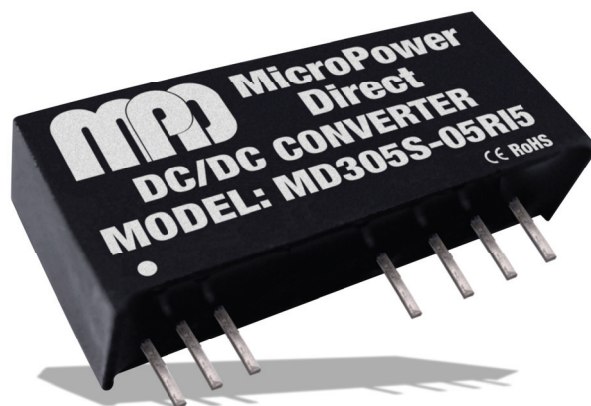


MD300R Series

3W, Very High Isolation Tightly Regulated, SIP DC/DC Converters



Key Features:

- 3W Output Power
- 1 kV to 5.2 kV Isolation
- Meets EN 55032
- Compact SIP Case
- Short Circuit Protection
- -25°C to +85°C Operation
- Tight Line/Load Regulation



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	5.5	VDC	
	12 VDC Input	10.8	12.0	13.2		
	24 VDC Input	21.6	24.0	26.4		
Input Reflected Ripple			20.0		mA Pk-Pk	
Input Filter	Capacitor Filter					
Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy			±2.0		%	
Line Regulation	V _{IN} = MIN to MAX		±0.5		%	
Load Regulation, See Note 1	3.3 V _{OUT} Models		±1.5		%	
	All Other Models		±0.5			
Ripple & Noise (20 MHz)			75		mV P - P	
Temperature Coefficient			±0.02		%/°C	
Output Short Circuit	Continuous (Autorecovery)					
General						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation Voltage, See Note 2	60 Sec	1,000		5,200	VDC	
Isolation Resistance			1,000		MΩ	
Isolation Capacitance			60		pF	
Switching Frequency			50		kHz	
EMI Characteristics, See Note 3						
Parameter	Standard	Criteria		Level		
Radiated Emissions	EN 55032			Class B		
Conducted Emissions	EN 55032			Class B		
ESD	EN 61000-4-2	A	±8kV Air			
			±6 kV Contact			
RS	EN 61000-4-3	A	10V/m			
EFT	EN 61000-4-4	A	±2 kV			
Surge	EN 61000-4-5	A	±1 kV L-L			
CS	EN 61000-4-6	A	10 Vrms			
PFMF	EN 61000-4-8	A	1A/m			
Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-25	+25	+85	°C	
	Case			+100		
Storage Temperature Range		-40		+125	°C	
Cooling	Free Air Convection					
Humidity	RH, Non-condensing				95	%
Physical						
Case Size	See Mechanical Diagram (Page 5)					
Case Material	Non-Conductive Black Plastic (UL94-V0)					
Weight	0.242 Oz (7.0g)					
Reliability Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Units	
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.12			MHours	
Absolute Maximum Ratings						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Surge (0.1 Sec)	5 VDC Input			7.0	VDC	
	12 VDC Input			15.0		
	24 VDC Input			28.0		
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 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						
MD305S-03R(IX)	5.0	4.5 - 5.5	720	80	3.3	600	0.0	55	470	1,500
MD305S-05R(IX)	5.0	4.5 - 5.5	923	55	5.0	600	0.0	65	470	1,800
MD305S-07R(IX)	5.0	4.5 - 5.5	896	90	7.2	416	0.0	67	470	1,800
MD305S-09R(IX)	5.0	4.5 - 5.5	857	70	9.0	333	0.0	70	470	1,800
MD305S-12R(IX)	5.0	4.5 - 5.5	882	70	12.0	250	0.0	68	470	1,800
MD305S-15R(IX)	5.0	4.5 - 5.5	870	90	15.0	200	0.0	69	470	1,800
MD305S-18R(IX)	5.0	4.5 - 5.5	896	100	18.0	166	0.0	67	470	1,800
MD305S-24R(IX)	5.0	4.5 - 5.5	870	100	24.0	125	0.0	69	470	1,800
MD312S-03R(IX)	12.0	10.8 - 13.2	280	25	3.3	600	0.0	59	470	600
MD312S-05R(IX)	12.0	10.8 - 13.2	391	50	5.0	600	0.0	64	470	800
MD312S-07R(IX)	12.0	10.8 - 13.2	352	35	7.2	416	0.0	71	470	800
MD312S-09R(IX)	12.0	10.8 - 13.2	352	35	9.0	333	0.0	71	470	800
MD312S-12R(IX)	12.0	10.8 - 13.2	342	40	12.0	250	0.0	73	470	800
MD312S-15R(IX)	12.0	10.8 - 13.2	352	50	15.0	200	0.0	71	470	800
MD312S-18R(IX)	12.0	10.8 - 13.2	357	30	18.0	166	0.0	70	470	800
MD312S-24R(IX)	12.0	10.8 - 13.2	342	30	24.0	125	0.0	73	470	800
MD324S-03R(IX)	24.0	21.6 - 26.4	142	20	3.3	600	0.0	58	470	300
MD324S-05R(IX)	24.0	21.6 - 26.4	195	20	5.0	600	0.0	64	470	400
MD324S-07R(IX)	24.0	21.6 - 26.4	187	20	7.2	416	0.0	67	470	400
MD324S-09R(IX)	24.0	21.6 - 26.4	174	20	9.0	333	0.0	72	470	400
MD324S-12R(IX)	24.0	21.6 - 26.4	169	20	12.0	250	0.0	74	470	400
MD324S-15R(IX)	24.0	21.6 - 26.4	176	21	15.0	200	0.0	71	470	400
MD324S-18R(IX)	24.0	21.6 - 26.4	174	30	18.0	166	0.0	72	470	400
MD324S-24R(IX)	24.0	21.6 - 26.4	169	20	24.0	125	0.0	74	470	400

I/O Isolation

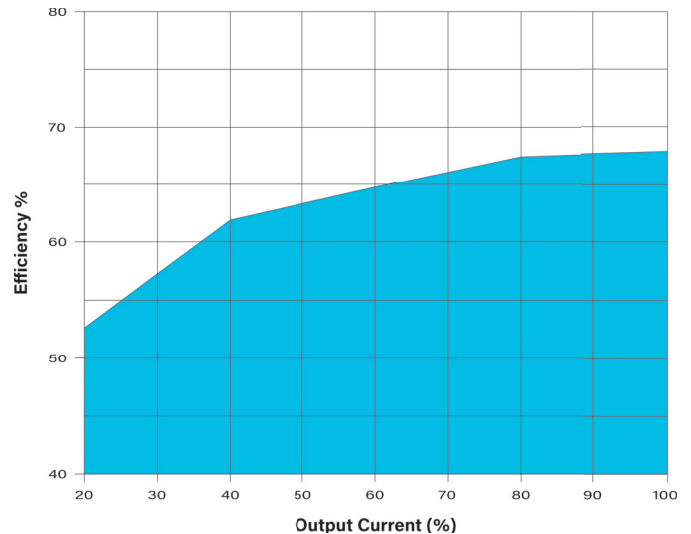
Models are available with input/output isolation levels ranging from 1 kVDC to 5.2 kVDC. To order units with higher isolation levels an "IX" is added to the Model number, as shown in the table at right.

Model No	Isolation Level
MD3xxS-xx	1 kVDC
MD3xxS-xxI	3 kVDC
MD3xxS-xxI4	4 kVDC
MD3xxS-xxI5	5.2 kVDC

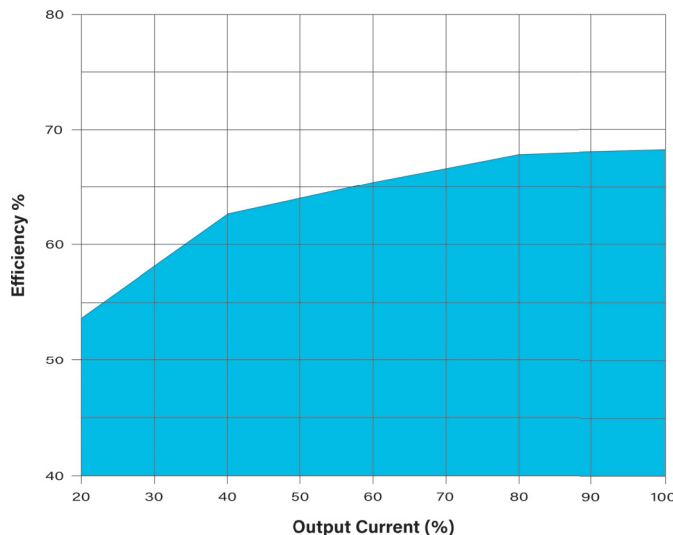
Notes:

1. Load regulation is measured over a range of 0% to 100% I_{OUT}.
2. Selection for models with high input/output isolation levels is given in the chart & note above.
3. To meet the requirements of EN 61000-4-4 and EN 61000-4-5, external components are needed. See page 4 for a typical connection. Contact the factory for more information.
4. Operation at no-load will not damage the unit, but they may not meet all specifications.
5. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection tables for the correct rating.

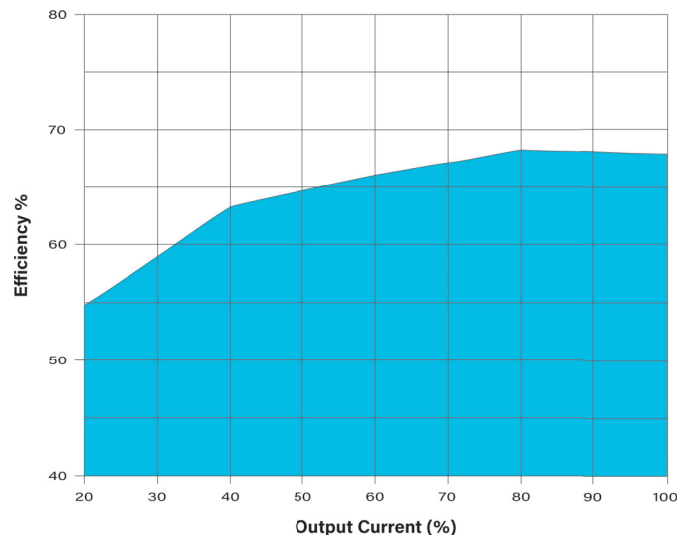
Efficiency vs Output Current: 5 VIN, High Line



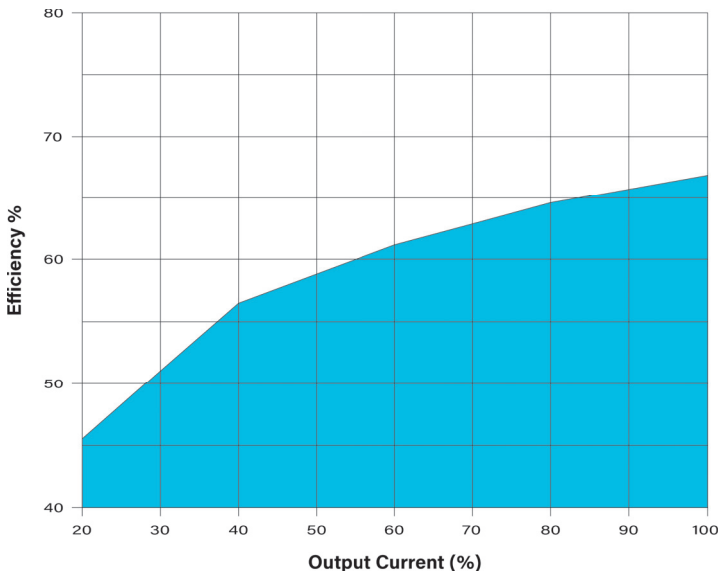
Efficiency vs Output Current: 5 VIN, Nom Line



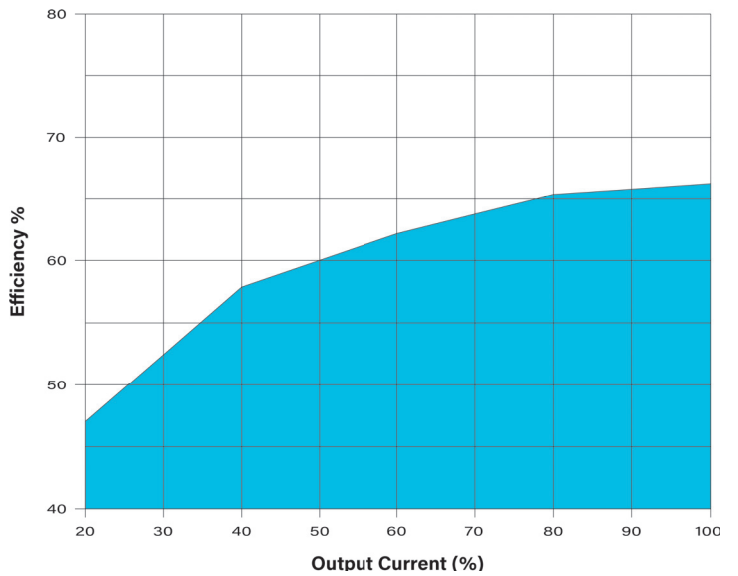
Efficiency vs Output Current: 5 VIN, Low Line



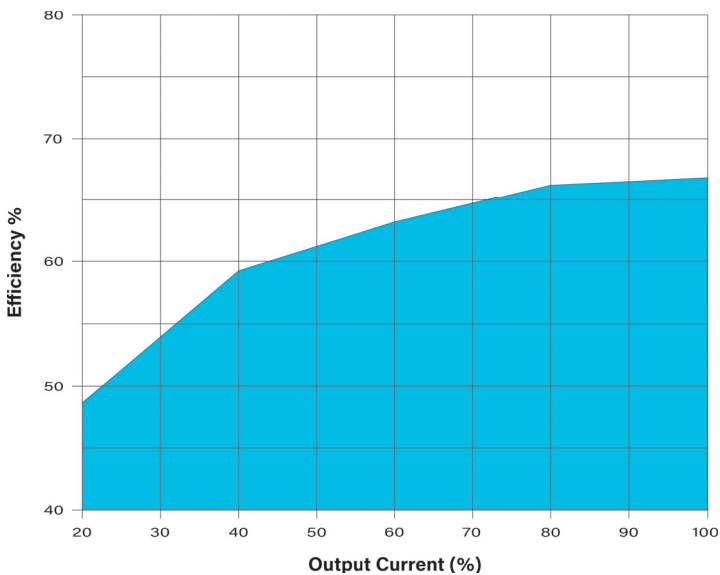
Efficiency vs Output Current: 12 VIN, High Line



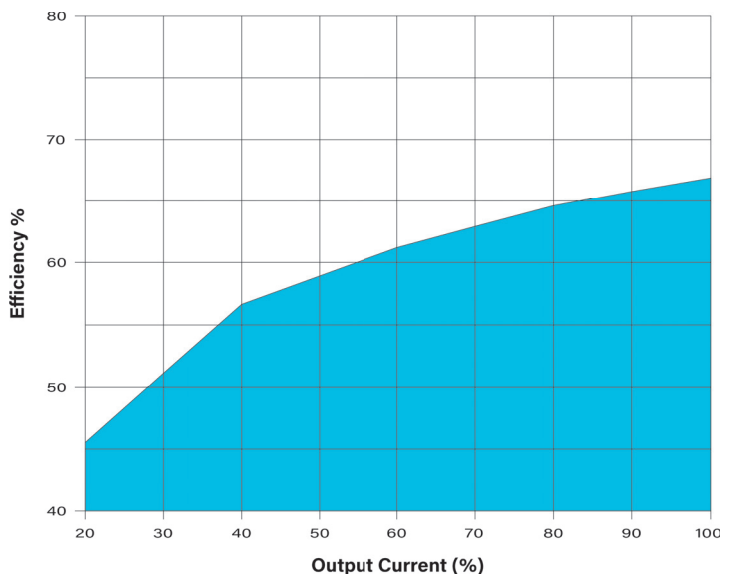
Efficiency vs Output Current: 12 VIN, Nominal Line



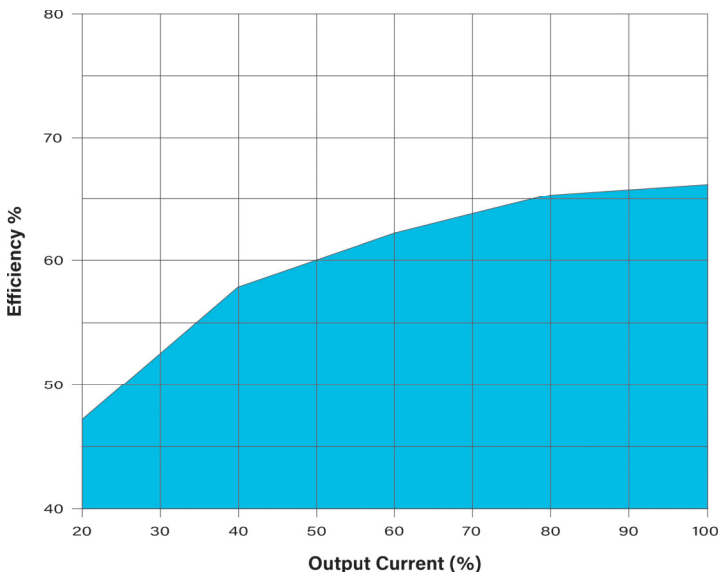
Efficiency vs Output Current: 12 VIN, Low Line



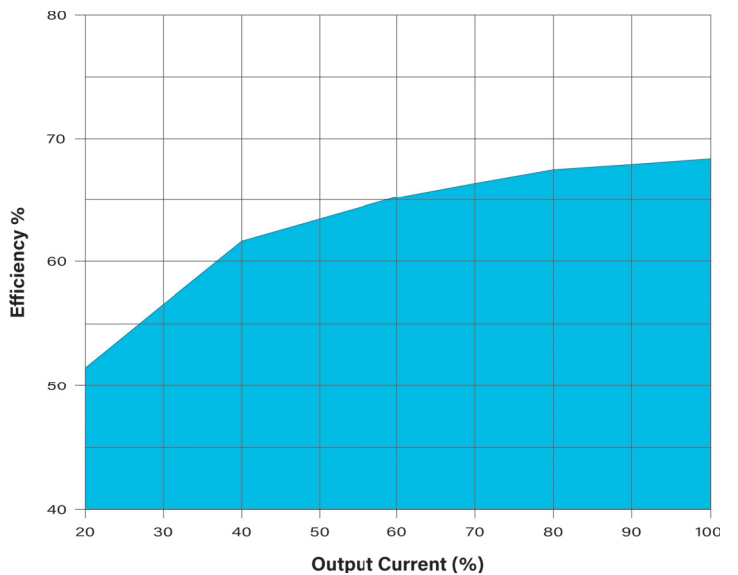
Efficiency vs Output Current: 24 VIN, High Line



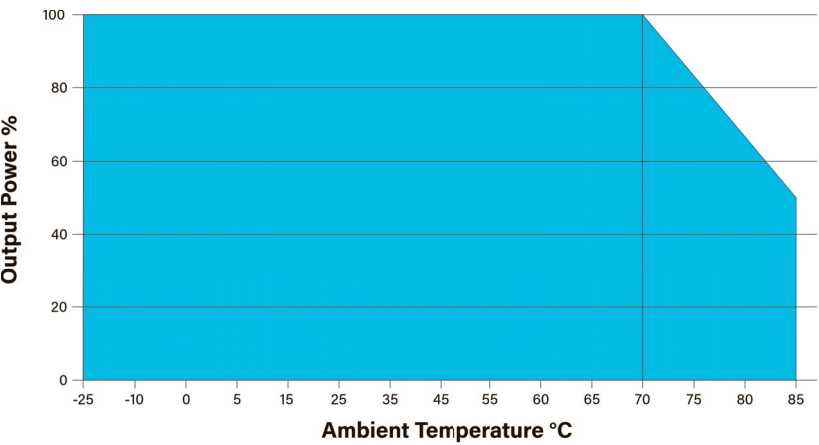
Efficiency vs Output Current: 24 VIN, Nominal Line



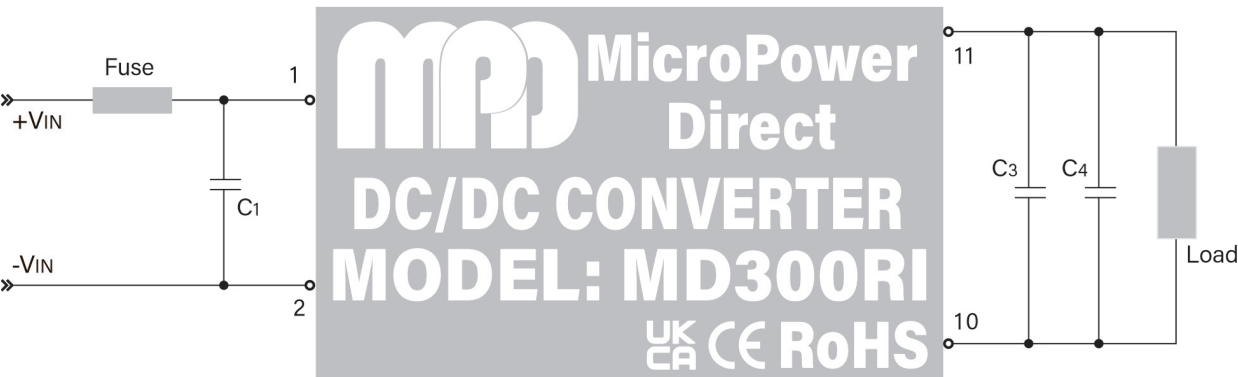
Efficiency vs Output Current: 24 VIN, Low Line



Derating Curve

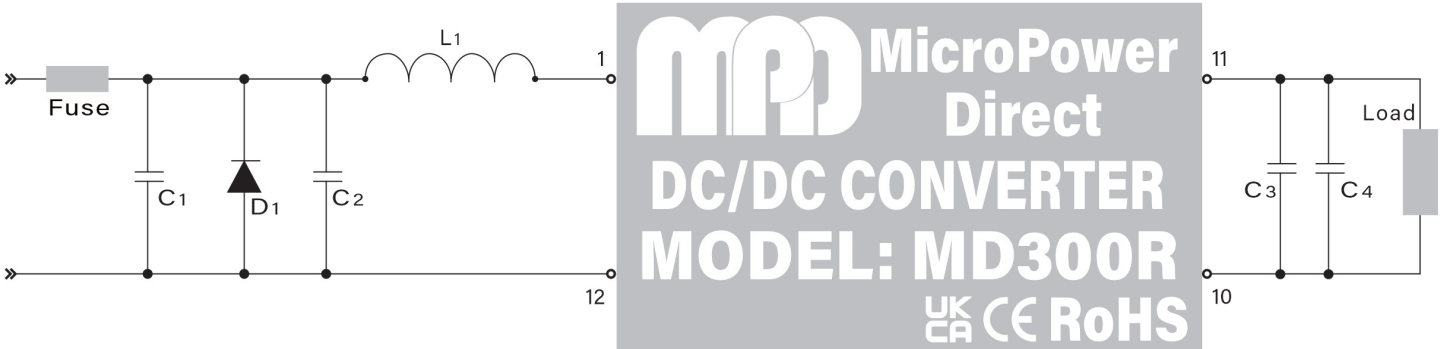


Typical Connection



The diagram above illustrates a simple connection of the **MD300R** series. For applications that do not require the circuit to meet EMI/EMC specifications, the capacitors C1, C2 and C3 will reduce input/output ripple and improve the converter stability over time and temperature. The recommended component values are 100 μ F for C1, 10 μ F for C3 & 0.1 μ F (MLCC) for C4.

EMI Connection



The diagram above shows a typical connection of the **MD300R** series for an application that requires compliance to EMI/EMC standards (as specified on page 1). Some notes on these components are:

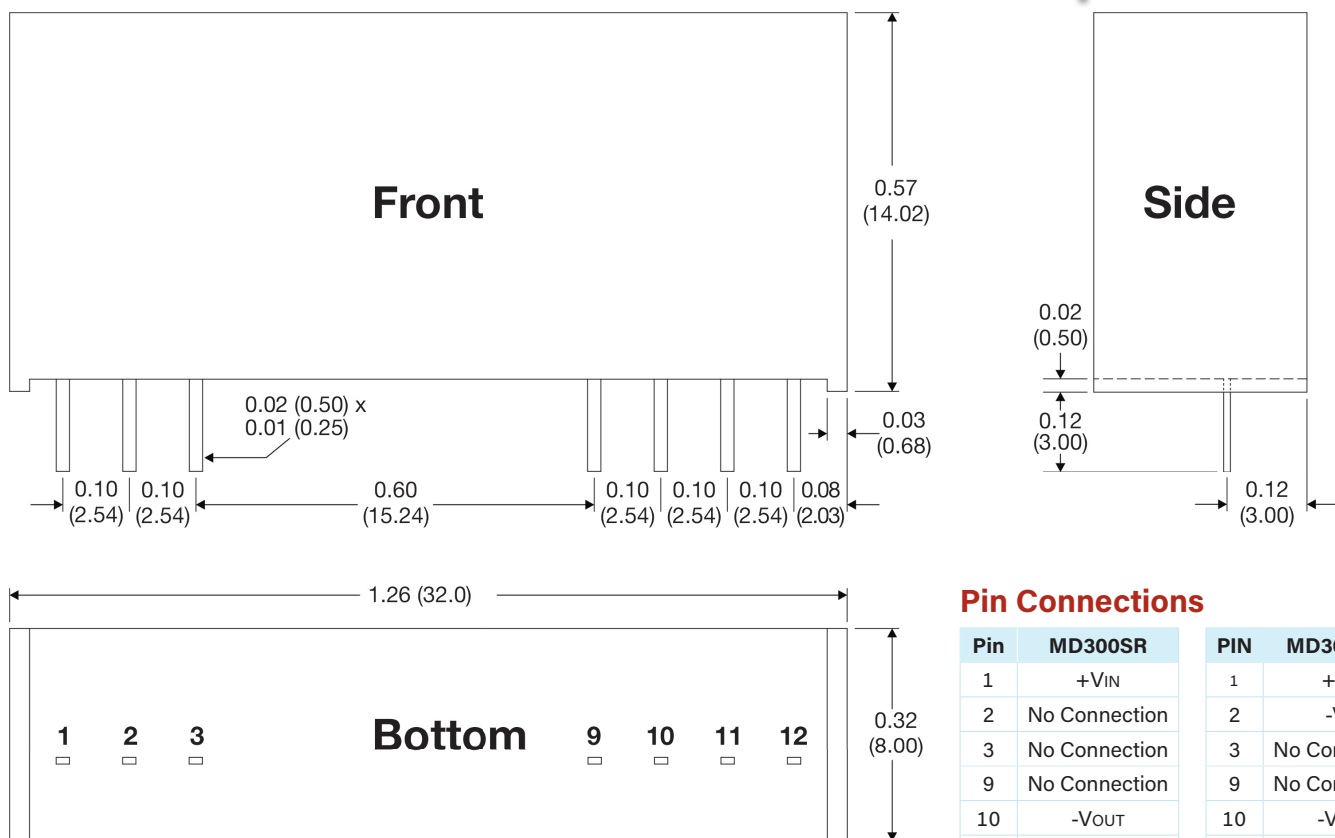
1. An external fuse is recommended to protect the unit in the event of a fault on the input line. A recommended value is given in the model selection table on page 2.
2. The output filtering capacitor (C3) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive

load specification for the unit. Voltage derating of capacitors should be 80% or above.

3. Suggested component values are:

Component	5 VIN	12 VIN	24 VIN
C1	1,000 μ F/100V		
D1	SMAJ9A	SMAJ14A	SMAJ26A
C2	220 μ F/100V		
L1	12 μ H		
C3	See the typical connection note above		
C4			

4. In many applications, simply adding input/output capacitors will enhance the input surge protection & and reduce output ripple sufficiently. In this case, the unit could be connected as shown in the simple connection above, without the other filter components. Recommended capacitor values are given above.



Notes:

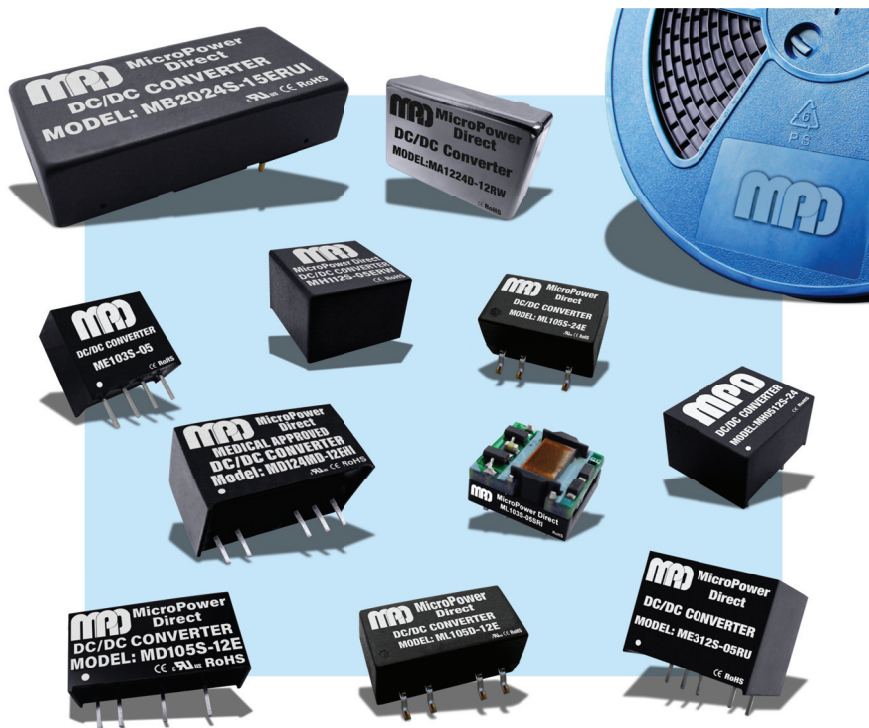
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ± 0.02 (± 0.5)
- Pin pitch & Length tolerance = ± 0.014 (± 0.35)
- Pin 1 is marked by a "dot" or indentation on the unit
- Recommended pin hole size (on the application PC Board) is $\varnothing 0.039$ ($\varnothing 1.00$)

Pin Connections

Pin	MD300SR	PIN	MD300SRix
1	+VIN	1	+VIN
2	No Connection	2	-VIN
3	No Connection	3	No Connection
9	No Connection	9	No Connection
10	-VOUT	10	-VOUT
11	+VOUT	11	+VOUT
12	-VIN	12	No Connection

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