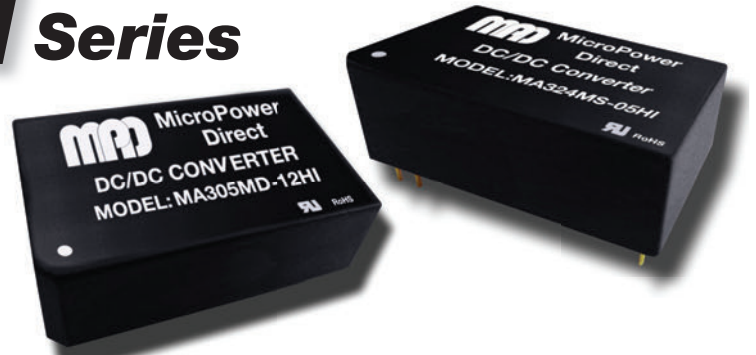


# MA300MHI Series

## High Isolation, 3W Medical Approved DC/DC Converters



### Key Features:

- 3W Output Power
- 3 kVAC rms Isolation
- Reinforced Insulation
- 2  $\mu$ A Leakage Current Max
- Fifteen Models
- Compact DIP Case
- Single & Dual Outputs
- Meets EN55022
- 1.0 MH MTBF
- EN 60950 Approved
- EN 60601 Approved



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### 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 Filter	$\pi$ (Pi) Filter (Complies with EN55022 Class A)					
Reverse Polarity Input Current				0.5	A	
Leakage Current	240 VAC, 60 Hz			2	$\mu$ A	
Short Circuit Input Power				2,500	mW	

Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy	50% Load, Nominal $V_{IN}$			$\pm 4.0$	%	
Output Voltage Balance	Dual Output, Balanced Loads		$\pm 2.0$	$\pm 4.0$	%	
Line Regulation	$V_{IN}$ = Min to Max		$\pm 0.3$	$\pm 0.5$	%	
Load Regulation	$I_{OUT}$ = 10% to 100%		$\pm 0.5$	$\pm 1.0$	%	
Ripple & Noise (20 MHz)	See Note 1		30	50	mV P - P	
Temperature Coefficient			$\pm 0.01$	$\pm 0.02$	%/°C	
Output Short Circuit	Continuous (Autorecovery)					

General						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation Voltage, Rated	60 Seconds	3,000			VAC rms	
Isolation Test Voltage	Flash Tested For 1 Sec	4,500			VPk	
Reinforced Insulation Working Voltage		300			VAC	
Isolation Resistance	500 VDC	10			$G\Omega$	
Isolation Capacitance	100 kHz, 1V		20		pF	
Switching Frequency		25	60		kHz	

Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-40		+75	°C	
Operating Temperature Range	Case			+95	°C	
Storage Temperature Range		-50		+125	°C	
Cooling	Free Air Convection					
Humidity	RH, Non-condensing			95	%	

Physical						
Case Size	1.25 x 0.80 x 0.41 Inches (31.8 x 20.3 x 10.5 mm)					
Case Material	Non-Conductive Black Plastic (UL94-V0)					
Weight	0.30 Oz (12.4g)					

Reliability Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Units	
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours	
Safety Approvals	UL 60601, UL 60950, EN 60601, EN 60950					

Absolute Maximum Ratings						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Surge (1 Sec)	5 VDC Input	-0.7		7.5	VDC	
	12 VDC Input	-0.7		15.0		
	24 VDC Input	-0.7		30.0		
Lead Temperature	1.5 mm From Case For 10 Sec			260	°C	
Internal Power Dissipation	All Models			3,000	mW	

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

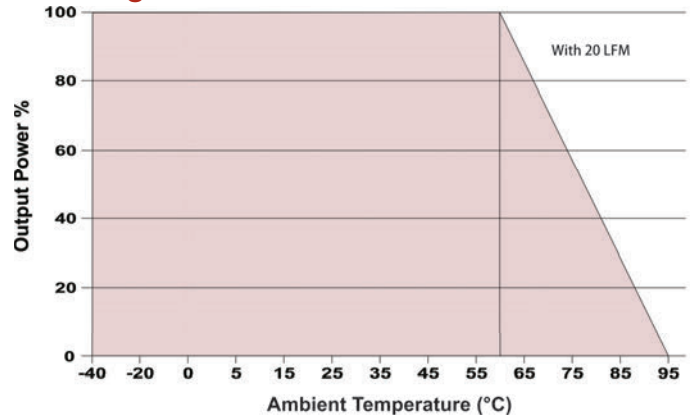
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Model Number	Input				Output			Capacitive Load ( $\mu$ F, Max)	Efficiency (% Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MA305MS-05HI	5.0	4.5 - 5.5	1,000	130	5.0	600	0.0	470	60	2,000
MA305MS-12HI	5.0	4.5 - 5.5	960	130	12.0	250	0.0	470	62	2,000
MA305MS-15HI	5.0	4.5 - 5.5	960	130	15.0	200	0.0	470	62	2,000
MA305MD-12HI	5.0	4.5 - 5.5	1,000	130	$\pm$ 12.0	$\pm$ 125	$\pm$ 0.0	$\pm$ 220	60	2,000
MA305MD-15HI	5.0	4.5 - 5.5	1,000	130	$\pm$ 15.0	$\pm$ 100	$\pm$ 0.0	$\pm$ 220	60	2,000
MA312MS-05HI	12	10.8 - 13.2	420	60	5.0	600	0.0	470	60	1,000
MA312MS-12HI	12	10.8 - 13.2	400	60	12.0	250	0.0	470	62	1,000
MA312MS-15HI	12	10.8 - 13.2	400	60	15.0	200	0.0	470	62	1,000
MA312MD-12HI	12	10.8 - 13.2	420	60	$\pm$ 12.0	$\pm$ 125	$\pm$ 0.0	$\pm$ 220	60	1,000
MA312MD-15HI	12	10.8 - 13.2	420	60	$\pm$ 15.0	$\pm$ 100	$\pm$ 0.0	$\pm$ 220	60	1,000
MA324MS-05HI	24	21.6 - 26.4	210	40	5.0	600	0.0	470	60	500
MA324MS-12HI	24	21.6 - 26.4	195	40	12.0	250	0.0	470	64	500
MA324MS-15HI	24	21.6 - 26.4	195	40	15.0	200	0.0	470	64	500
MA324MD-12HI	24	21.6 - 26.4	210	40	$\pm$ 12.0	$\pm$ 125	$\pm$ 0.0	$\pm$ 220	60	500
MA324MD-15HI	24	21.6 - 26.4	210	40	$\pm$ 15.0	$\pm$ 100	$\pm$ 0.0	$\pm$ 220	60	500

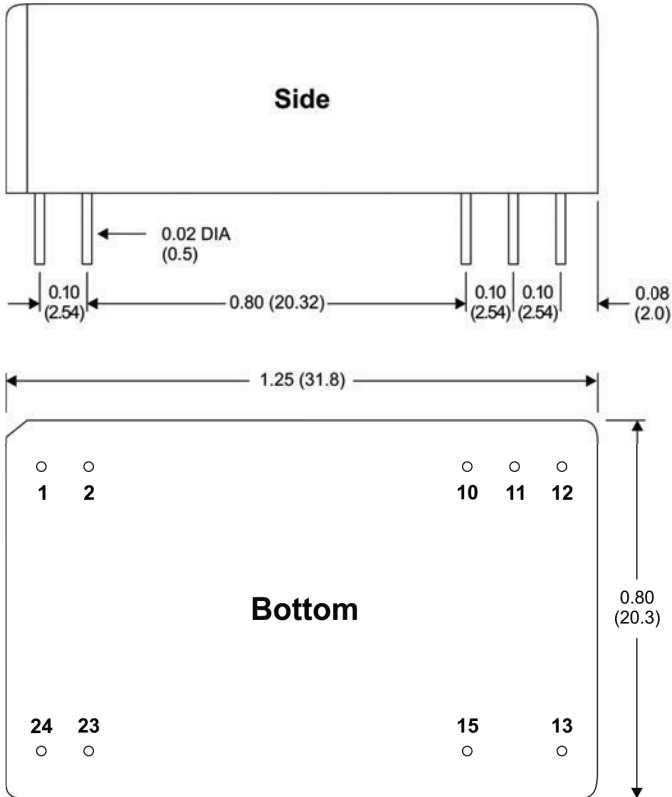
**Notes:**

- When measuring output ripple, it is recommended that an external 0.33  $\mu$ F ceramic capacitor be placed from the +V<sub>OUT</sub> pin to the -V<sub>OUT</sub> pin for single output units and from each output to common for dual output units. For noise sensitive applications, the use of 1.5  $\mu$ F capacitors will reduce the output ripple.
- Dual output units may be connected to provide a 24 VDC or 30 VDC output. To do this, connect the load across the positive (+V<sub>OUT</sub>) and negative (-V<sub>OUT</sub>) outputs and float the output common.
- The converter should be connected to a low ac-impedance source. An input source with a highly inductive impedance may affect the stability of the converter. In applications where the converter output loading is high and input power is supplied over long lines, it may be necessary to use a capacitor on the input to insure start-up. In this case, it is recommended that a low ESR (ESR <1.0 $\Omega$  at 100 kHz) capacitor be mounted close to the converter. For 5V input units a 4.7  $\mu$ F is recommended, for 12V and 24V units a 2.2  $\mu$ F.
- It is recommended that a fuse be used on the input of a power supply for protection. See the table above for the correct rating.

**Derating Curve**



**Mechanical Dimensions**



**Mechanical Notes:**

- All dimensions are typical in inches (mm)
- Tolerance x.xx =  $\pm$ 0.01 ( $\pm$ 0.25)

**Pin Connections**

Pin	Single	Dual
1	+V <sub>IN</sub>	+V <sub>IN</sub>
2	+V <sub>IN</sub>	+V <sub>IN</sub>
10	No Pin	Common
11	No Pin	Common
12	-V <sub>OUT</sub>	No Pin
13	+V <sub>OUT</sub>	-V <sub>OUT</sub>
15	No Pin	+V <sub>OUT</sub>
23	-V <sub>IN</sub>	-V <sub>IN</sub>
24	-V <sub>IN</sub>	-V <sub>IN</sub>



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