

# MA300MRUR14

## EN 60601 Approved 4:1 Input, 3W DIP, DC/DC Converters



### Key Features:

- EN 60601 3<sup>RD</sup> Ed. Approved
- 3W Output Power
- 4.0 kVrms Isolation
- Reinforced Insulation
- 1 x MOPP & 2xMOOP per EN 60601-1 3<sup>RD</sup> Edition & ANSI/AAMI ES 60601-1
- 2  $\mu$ A Leakage Current Max
- Wide 4:1 Input Range
- Compact 24 Pin DIP Case
- 110 VDC Input Models
- 1.0 MH MTBF



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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 Start Voltage	24 VDC Input	8.0	8.5	9.0	VDC	
	48 VDC Input	13.0	15.0	17.0		
	110 VDC Input	26.0	30.0	34.0		
Under Voltage Shutdown	24 VDC Input			8.5	VDC	
	48 VDC Input			16.0		
	110 VDC Input			32.0		
Input Filter	$\pi$ (Pi) Filter					
Short Circuit Input Power				2,000	mW	
Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy				$\pm 1.0$	%	
Output Voltage Balance	Dual Output , Balanced Loads		$\pm 0.5$	$\pm 2.0$	%	
Line Regulation	$V_{IN} = \text{Min to Max}$		$\pm 0.3$	$\pm 0.5$	%	
Load Regulation	$I_{OUT} = 25\% \text{ to } 100\%$		$\pm 0.5$	$\pm 1.0$	%	
Ripple & Noise (20 MHz), See Note 2	5V Output Models		75	100	mV P - P	
	All Other Models		100	150		
Output Power Protection		120	150		%	
Transient Recovery Time, See Note 3			150	500	$\mu$ Sec	
Transient Response Deviation	25% Load Step Change		$\pm 3.0$	$\pm 6.0$	%	
Temperature Coefficient			$\pm 0.02$	$\pm 0.05$	%/°C	
Output Short Circuit	Continuous (Autorecovery)					
General						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Isolation Voltage	60 Seconds	4,000			Vrms	
Reinforced Insulation Working Voltage				1,000	Vrms	
Leakage Current	240 VAC, 60 Hz			2	$\mu$ A	
Isolation Resistance	500 VDC	10			G $\Omega$	
Isolation Capacitance	100 kHz, 1V		7	13	pF	
Switching Frequency			150		kHz	
EMI Characteristics						
Parameter	Standard	Criteria			Level	
EMC		Complies With EN 55011 4 <sup>TH</sup> Edition				
EMS		Complies With EN 60601-1-2				
Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-40	+25	+85	°C	
	Case			+100		
Storage Temperature Range		-50		+125		
Cooling		Free Air Convection				
Humidity	RH, Non-condensing			95	%	
Physical						
Case Size		See Mechanical Diagram (Page 3)				
Case Material		Non-Conductive Black Plastic (UL94-V0)				
Weight		0.58 Oz (16.6g)				
Reliability Specifications						
Parameter	Conditions	Min.	Typ.	Max.	Units	
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours	
Safety Standards	IEC/EN 60601-1 3 <sup>RD</sup> Edition, 1xMOPP & 2xMOOP					
	ANSI/AAMI ES 60601-1 1xMOPP & 2xMOOP Recognition (UL Certificate)					
	ANSI/AAMI ES 60601-1, CAN/CSA-C22.2 No.60601-1					
Absolute Maximum Ratings						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Input Voltage Surge (1.0 Sec)	24 VDC Input			50.0	VDC	
	48 VDC Input			100.0		
	110 VDC Input			180.0		
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 ( $\mu\text{F}$ Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)			
	Nominal	Range	Full-Load	No-Load						
MA324SMRU-05RI4	24	9.0 - 40.0	160	20	5.0	600	90.0	78	1,000	1,100
MA324SMRU-12RI4	24	9.0 - 40.0	151	20	12.0	250	37.5	83	470	1,100
MA324DMRU-12RI4	24	9.0 - 40.0	151	20	$\pm 12.0$	$\pm 125$	$\pm 18.8$	83	220	1,100
MA324DMRU-15RI4	24	9.0 - 40.0	151	29	$\pm 15.0$	$\pm 100$	$\pm 15.0$	83	220	1,100
MA348SMRU-05RI4	48	18.0 - 80.0	80	10	5.0	600	90.0	78	1,000	500
MA348SMRU-12RI4	48	18.0 - 80.0	75	10	12.0	250	37.5	83	470	500
MA348DMRU-12RI4	48	18.0 - 80.0	75	10	$\pm 12.0$	$\pm 125$	$\pm 18.8$	83	220	500
MA348DMRU-15RI4	48	18.0 - 80.0	75	10	$\pm 15.0$	$\pm 100$	$\pm 15.0$	83	220	500
MA3110SMRU-05RI4	110	36.0 - 160.0	35	5	5.0	600	90.0	78	1,000	250
MA3110SMRU-12RI4	110	36.0 - 160.0	33	5	12.0	250	37.5	83	470	250
MA3110DMRW-12RI4	110	36.0 - 160.0	33	5	$\pm 12.0$	$\pm 125$	$\pm 18.8$	83	220	250
MA3110DMRW-15RI4	110	36.0 - 160.0	33	5	$\pm 15.0$	$\pm 100$	$\pm 15.0$	83	220	250

**Notes:**

1. The specified maximum capacitive load is for each output.
2. When measuring output ripple, it is recommended that an external 0.47  $\mu\text{F}$  ceramic capacitor be placed from the +Vout pin to the -Vout pin for single output units and from each output to common for dual output units.
3. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
4. Dual output units may be connected to provide a 24 VDC or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
5. 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. The size of the recommended capacitor is given below.
6. 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.

**Typical Connection/ Single Output**

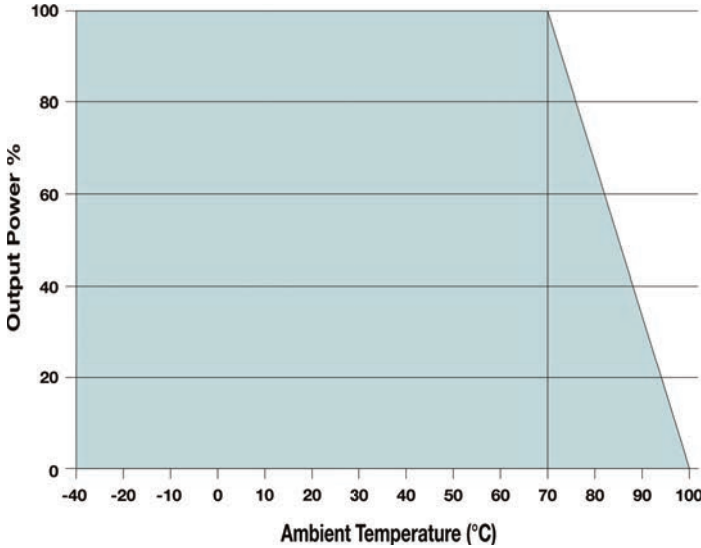


**Typical Connection/ Dual Output**

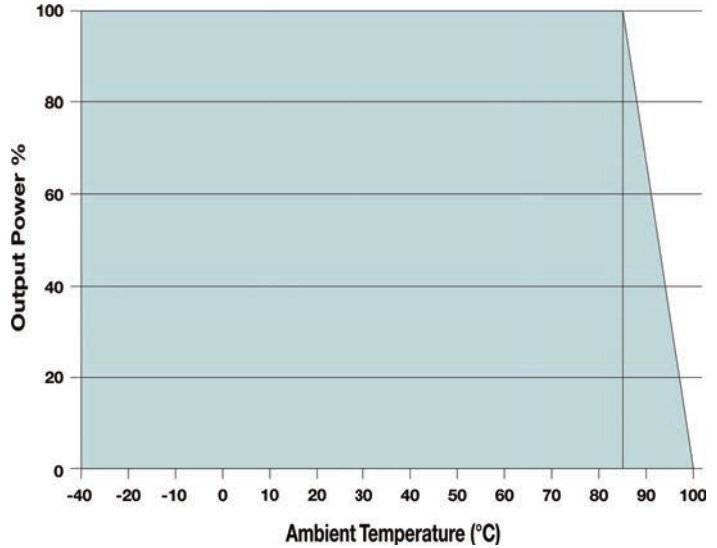


These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors, as shown in the typical connection diagram above, will enhance stability and reduce output ripple. This simple connection includes a low ESR ( $<1\Omega$  at 100 kHz) capacitor connected across the input (C1). It is recommended that a 4.7  $\mu\text{F}$  be used for 24V input models, a 2.2  $\mu\text{F}$  for 48V models and 1.0  $\mu\text{F}$  for 100V input units. To improve the output ripple performance, a 3.3  $\mu\text{F}$  is connected across the output. For dual output units, a 3.3  $\mu\text{F}$  capacitor should be connected from each output to common.

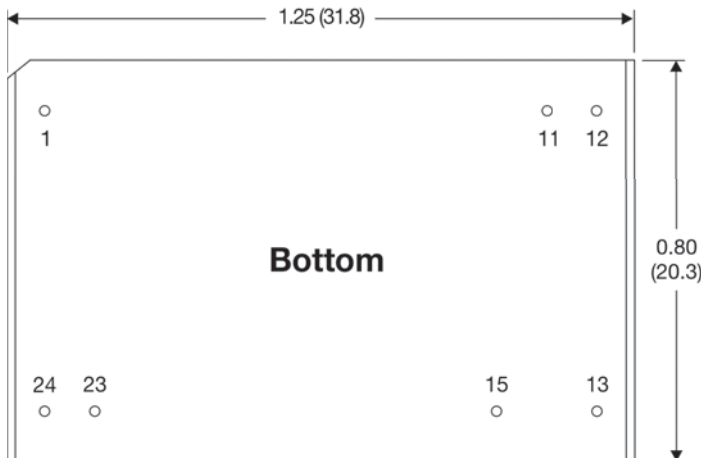
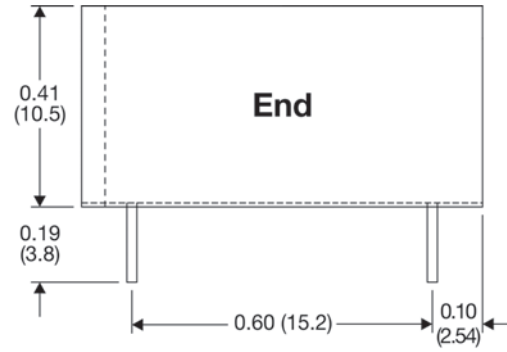
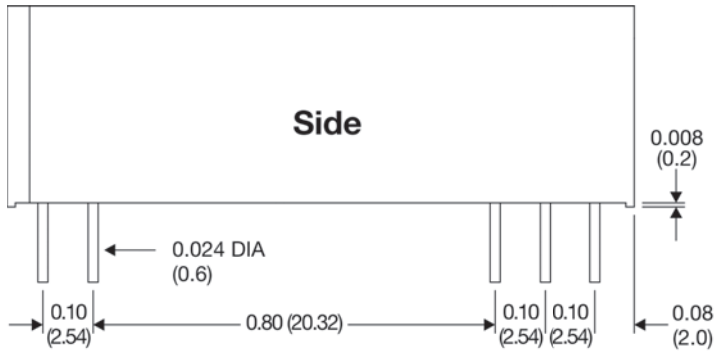
Temperature Derating, 20LFM (Ambient Air)



Temperature Derating, 400 LFM



Mechanical Dimensions



Pin Connections

Pin	Single	Dual
1	+VIN	+VIN
11	No Pin	Common
12	-VOUT	No Pin
13	+VOUT	-VOUT
15	No Pin	+VOUT
23	-VIN	-VIN
24	-VIN	-VIN

Mechanical Notes:

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

# Medical Approved Power Products

Thousands of standard power products ranging from 0.5W to 500W are available from MPD in a wide variety of packages and pin-outs. This includes many more DC/DC and AC/DC product families with EN 60601 medical approval. Go to [micropowerdirect.com](http://micropowerdirect.com) for full information.

