

MA300MRUR14

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



Key Features:

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

RoHS



**ANSI/AAMI
ES 60601-1**



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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		Conditions	Min.	Typ.	Max.	Units
Parameter						
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		π (Pi) Filter				
Short Circuit Input Power					2,000	mW

Output		Conditions	Min.	Typ.	Max.	Units
Parameter						
Output Voltage Accuracy					± 1.0	%
Output Voltage Balance		Dual Output , Balanced Loads		± 0.5	± 2.0	%
Line Regulation		V _{IN} = Min to Max		± 0.3	± 0.5	%
Load Regulation		I _{OUT} = 25% to 100%		± 0.5	± 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	μ Sec
Transient Response Deviation		25% Load Step Change		± 3.0	± 6.0	%
Temperature Coefficient				± 0.02	± 0.05	%/ $^{\circ}$ C
Output Short Circuit		Continuous (Autorecovery)				

General		Conditions	Min.	Typ.	Max.	Units
Parameter						
Isolation Voltage		60 Seconds	4,000			Vrms
Reinforced Insulation Working Voltage			1,000			Vrms
Leakage Current		240 VAC, 60 Hz			2	μ A
Isolation Resistance		500 VDC	10			G Ω
Isolation Capacitance		100 kHz, 1V		7	13	pF
Switching Frequency				150		kHz

EMI Characteristics		Standard	Criteria	Level
Parameter				
EMC		Complies With EN 55011 4 TH Edition		
EMS		Complies With EN 60601-1-2		

Environmental		Conditions	Min.	Typ.	Max.	Units
Parameter						
Operating Temperature Range		Ambient	-40	+25	+85	$^{\circ}$ C
		Case			+100	
Storage Temperature Range			-50		+125	
Cooling		Free Air Convection				
Humidity		RH, Non-condensing			95	%

Physical		Conditions	Min.	Typ.	Max.	Units
Parameter						
Case Size						See Mechanical Diagram (Page 3)
Case Material						Non-Conductive Black Plastic (UL94-V0)
Weight						0.58 Oz (16.6g)

Reliability Specifications

Reliability Specifications		Conditions	Min.	Typ.	Max.	Units
Parameter						
MTBF		MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours
Safety Standards		IEC/EN 60601-1 3 RD 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

Absolute Maximum Ratings		Conditions	Min.	Typ.	Max.	Units
Parameter						
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	$^{\circ}$ 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 (μ 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 μ F ceramic capacitor be placed from the +V_{OUT} pin to the -V_{OUT} 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 (+V_{OUT}) and negative (-V_{OUT}) 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

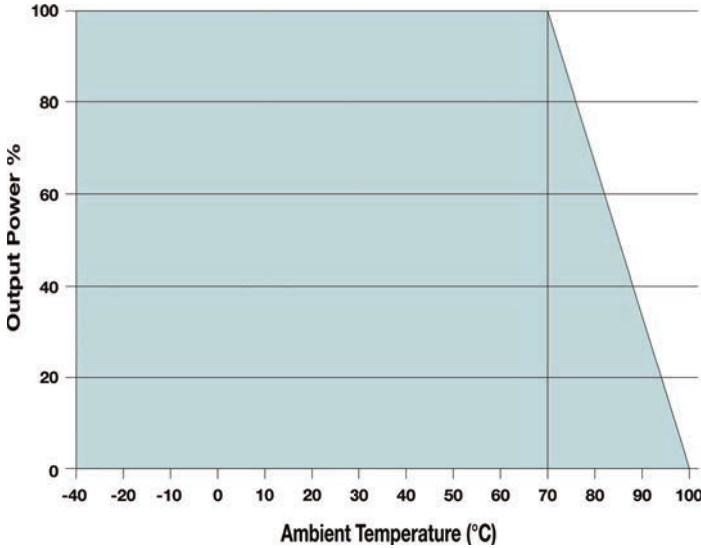


Typical Connection/ Dual Output

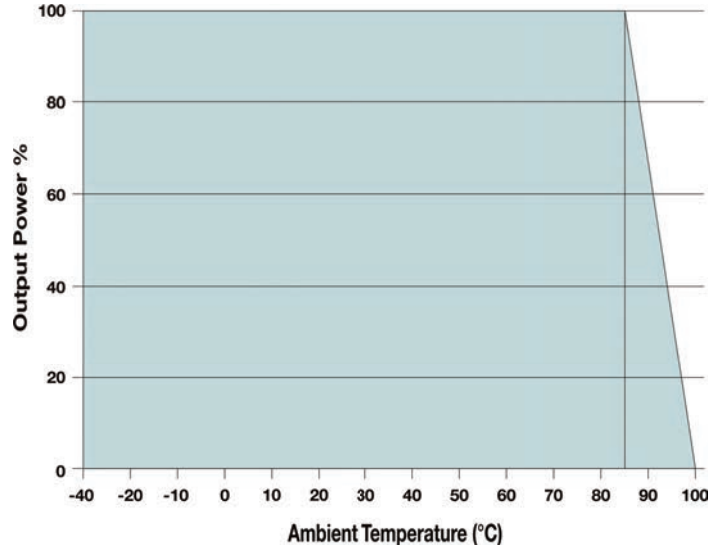


These converters are specified for operation without external components. However, in some applications the addition of input/output capacitors, as shown in the typical connection diagram above, will enhance stability and reduce output ripple. This simple connection includes a low ESR (<1 Ω at 100 kHz)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

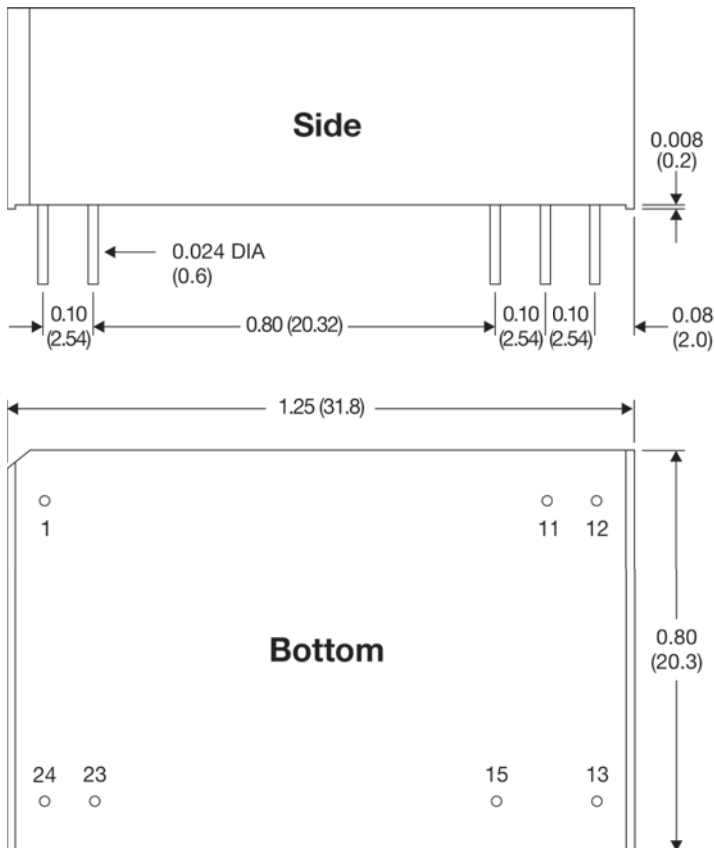
Temperature Derating, 20LFM (Ambient Air)



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 for full information.

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