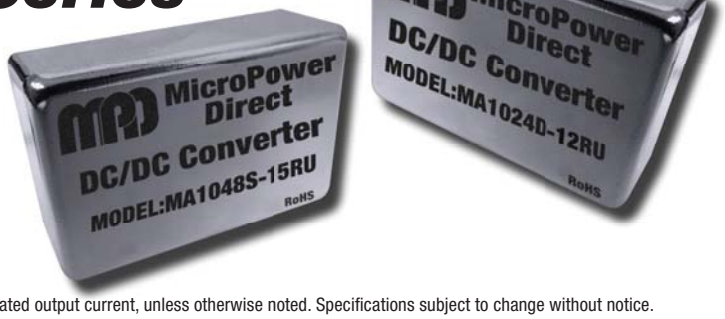
MA1000RU Series

4:1 Input Range, 10W Single & Dual Output DC/DC Converters



Key Features:

- 10W Output Power
- 4:1 Input Voltage Range
- Compact DIP Case
- High Efficiency
- 1,500 VDC I/O Isolation
- 16 Standard Models
- Single & Dual Outputs
- Remote On/Off Control
- Wide Temperature Operation
- Industry Standard Pin-Out

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
Start Up Threshold	24 VDC Input	7.0	8.0		VDC
	48 VDC Input	14.0	16.0		
Under Voltage Shutdown	24 VDC Input			8.5	VDC
	48 VDC Input			17.0	
Input Filter	π (Pi) Filter				

Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy			±1.0	±2.0	%
Output Voltage Balance	Dual Outputs, Balanced Load		±1.0	±2.0	%
Line Regulation	V_{IN} = Min to Max		±0.5	±1.0	%
Load Regulation	I_{OUT} = 0% To 100%			±0.5	%
Ripple & Noise (20 MHz)	See Note 2			100	mV P - P
Transient Recovery Time, See Note 3	25% Load Step Change		250		μSec
Transient Response Deviation				±3.0	%
Output Power Protection	Hiccup Circuit		150		% I_{OUT}
Temperature Coefficient			±0.01	±0.02	%/°C
Output Short Circuit Protection	Continuous (Autorecovery)				

General

Parameter	Conditions	Min.	Typ.	Max.	Units
Isolation Voltage	Input/Output, 60 Seconds	1,500			VDC
	Input/Output, 1 Seconds	1,800			
Isolation Resistance	500 VDC	1,000			MΩ
Isolation Capacitance	100 kHz/1V		1,000	1,500	pF
Switching Frequency			330		kHz

EMI Characteristics

Parameter	Standard	Criteria	Level
Radiated Emissions	EN 55022		Class A
Conducted Emissions	EN 55024		Class A
ESD	EN 61000-4-2	A	±8 kV Air
			±6 kV Contact
RS	EN 61000-4-3	A	10V/m
EFT, See Note 4	EN 61000-4-4	A	±2 kV
Surge, See Note 4	EN 61000-4-5	A	±1 kV
CS	EN 61000-4-6	A	10V/rms

Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40		+85	°C
	Case			+105	°C
Storage Temperature Range		-50		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing		95		%

Physical

Case Size	See Mechanical Diagram (Page 3)
Case Material	Metal With Nonconductive Base (UL94V-0)
Weight	0.61 Oz (17.3g)

Reliability Specifications

Parameter	Conditions	Min.	Typ.	Max.	Units
MTBF	MIL HDBK 217F, 25°C, Gnd Benign	1.0			MHours

Absolute Maximum Ratings

Parameter	Conditions	Min.	Typ.	Max.	Units
Input Voltage Surge (1 Sec)	24 VDC Input			50.0	VDC
	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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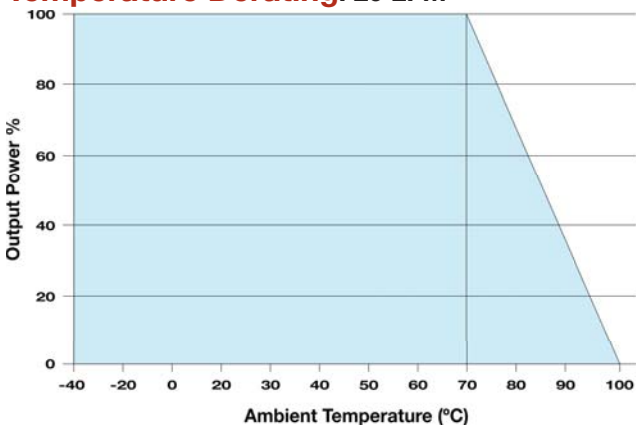
Model Selection Guide

Model Number	Input				Output			Max Capacitive Load (µF Max)	Efficiency (%, Typ)	Reflected Ripple Current (mA Typ)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MA1024S-03RU	24	9.0 - 36.0	432	30	3.3	2,700	0.0	1,000	86	40.0	1,000
MA1024S-05RU	24	9.0 - 36.0	490	30	5.0	2,000	0.0	1,000	85	40.0	1,000
MA1024S-12RU	24	9.0 - 36.0	479	30	12.0	833	0.0	470	87	40.0	1,000
MA1024S-15RU	24	9.0 - 36.0	478	30	15.0	666	0.0	330	87	40.0	1,000
MA1024S-24RU	24	9.0 - 36.0	478	30	24.0	416	0.0	150	87	40.0	1,000
MA1024D-12RU	24	9.0 - 36.0	478	30	±12.0	±416	±0.0	220	87	40.0	1,000
MA1024D-15RU	24	9.0 - 36.0	478	30	±15.0	±333	±0.0	150	87	40.0	1,000
MA1048S-03RU	48	18.0 - 75.0	216	20	3.3	2,700	0.0	1,000	86	30.0	500
MA1048S-05RU	48	18.0 - 75.0	245	20	5.0	2,000	0.0	1,000	85	30.0	500
MA1048S-12RU	48	18.0 - 75.0	239	20	12.0	833	0.0	470	87	30.0	500
MA1048S-15RU	48	18.0 - 75.0	236	20	15.0	666	0.0	330	87	30.0	500
MA1048S-24RU	48	18.0 - 75.0	244	20	24.0	416	0.0	150	87	30.0	500
MA1048D-12RU	48	18.0 - 75.0	244	20	±12.0	±416	±0.0	220	87	30.0	500
MA1048D-15RU	48	18.0 - 75.0	244	20	±15.0	±333	±0.0	150	87	30.0	500

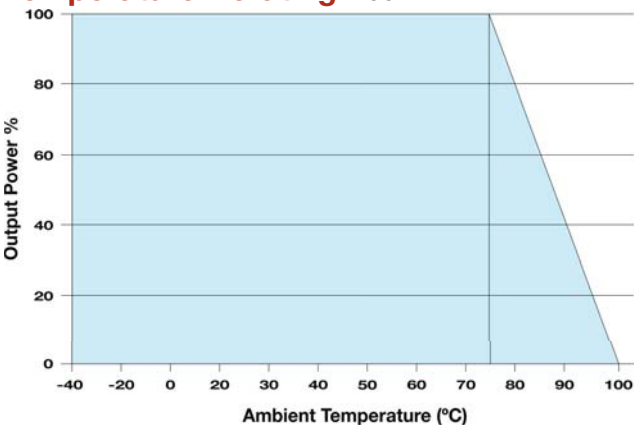
Notes:

1. The specified maximum capacitive load is for each output.
2. When measuring output ripple, it is recommended that an external 0.47 µF 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. An external 220 µF/100V capacitor connected across the input pins is required to meet EN61000-4-4 and EN61000-4-5.
5. Operation at no-load will not damage these units.
6. Dual output units may be connected to provide a or 30 VDC output. To do this, connect the load across the positive (+VOUT) and negative (-VOUT) outputs and float the output common.
7. Free air convection is typically 20 LFM. The units should not be operated in still air (0 LFM).
8. 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 <1.0Ω at 100 kHz) capacitor be mounted close to the converter. For 24V input units a 4.7 µF is recommended; and for 48V units a 2.2 µF.
9. 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.

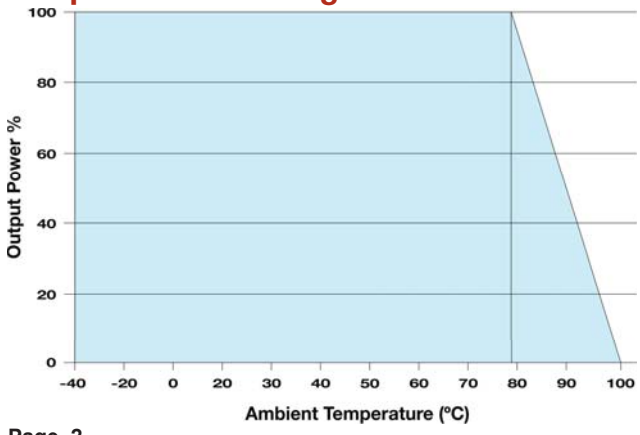
Temperature Derating: 20 LFM



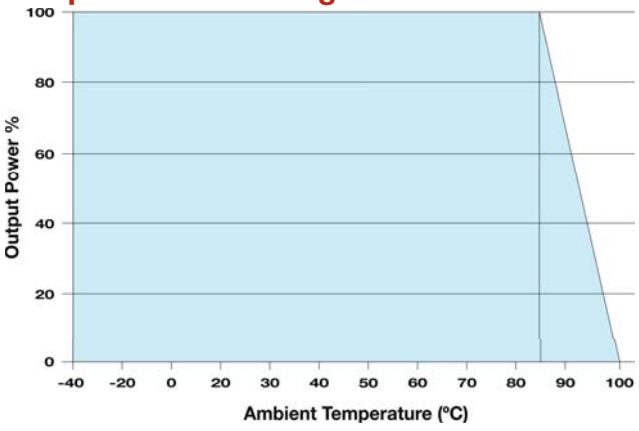
Temperature Derating: 100 LFM



Temperature Derating: 200 LFM



Temperature Derating: 400 LFM



Typical Connection

Input/Output Capacitors

To meet the requirements of EN 61000-4-4 & EN 61000-4-5, an external filter capacitor (C_1 in the diagram above) is required. The recommended value for C_1 is 220 μF/100V.

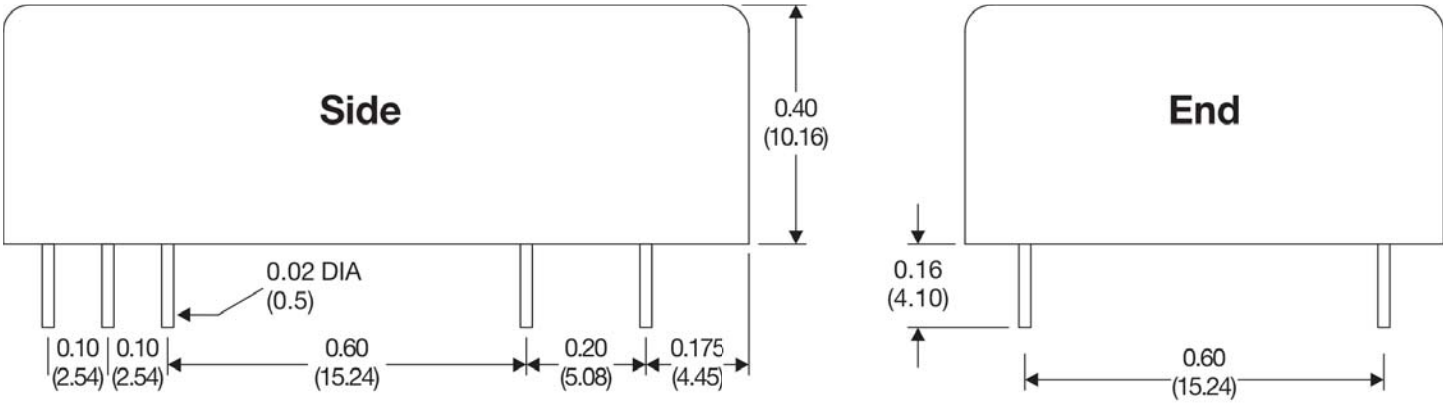
Capacitor C_2 is not required, but can improve the converter stability in some applications. The recommended value is 4.7 μF for 24V input models & 2.2 μF for 48V input models. To reduce output ripple, a 3.3 μF capacitor connected from each output to ground (See C_3 and C_4) is recommended.

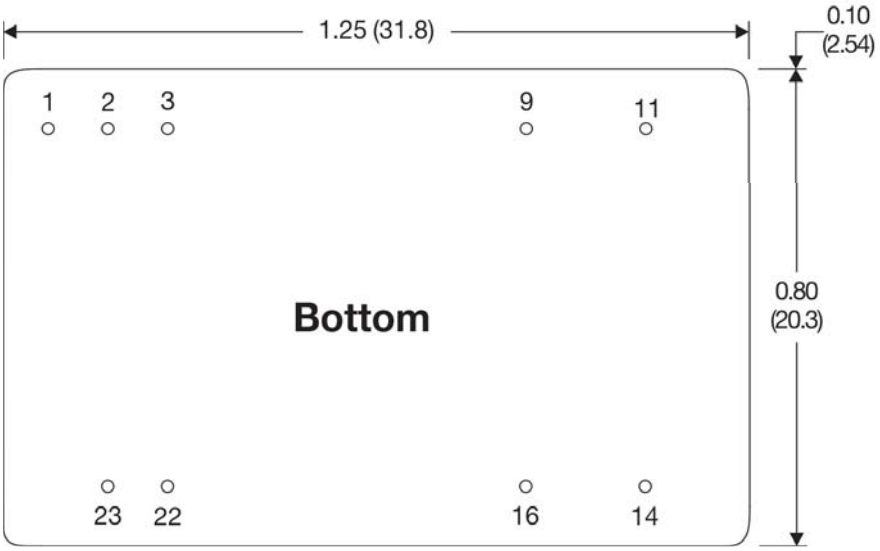
Remote On/Off

The Remote On/Off circuit is referenced to the minus input of the unit (pins 2 & 3). If the On/Off input (pin 1) is connected to the minus input (or a signal is applied), the unit is shut off. If pin 1 is left open, the unit operates normally. The specifications for the ON/OFF function are:

Parameter	Min	Typ	Max	Units
Supply On	3.5		12.0	VDC
Supply Off	0.0		1.2	VDC
Standby Input Current			10.0	mA
Control Common	Referenced to Negative Input (pin 2)			
Control Input Current (ON, V_{CTR} = 5V)		500		μA
Control Input Current (OFF , V_{CTR} = 0V))		-500		μA

Mechanical Dimensions





Pin Connections

Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-VIN	-VIN
3	-VIN	-VIN
9	No Pin	Common
11	NC	-VOUT
14	+VOUT	+VOUT
16	-VOUT	Common
22	+VIN	+VIN
23	+VIN	+VIN

NC: No Connection

Mechanical Notes:

- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)

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