# MA300RU Series

# Wide 4:1 Input, 3W, Single & Dual Output DC/DC Converters


## Key Features:

- 3W Output Power
- 4:1 Input Voltage Range
- 1,500 VDC Isolation
- 16 Standard Models
- Single & Dual Outputs
- Compact DIP Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out

**3.0 kV Isolation Models Available**

**2:1 Input Range Models Available**

RoHS

## 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 | | | 9.0 | VDC |
| | 48 VDC Input | | | 18.0 | |
| Under Voltage Shutdown | 24 VDC Input | | | 8.5 | VDC |
| | 48 VDC Input | | | 17.5 | |
| Input Filter | π (Pi) Filter | | | | |

### Output

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Output Voltage Accuracy | | | | ±2.0 | % |
| Output Voltage Balance | Dual Output, Balanced Loads | | ±0.5 | ±2.0 | % |
| Line Regulation | $V_{IN}$ = Min to Max | | ±0.3 | ±1.0 | % |
| Load Regulation | $I_{OUT}$ = 0% to 100% | | ±0.3 | ±1.0 | % |
| Ripple & Noise (20 MHz) | See Note 1 | | | 70 | mV P - P |
| Transient Recovery Time, See Note 2 | 25% Load Step Change | | 200 | 500 | µSec |
| Transient Response Deviation | | | ±3.0 | ±5.0 | % |
| Temperature Coefficient | | | ±0.01 | ±0.02 | %/°C |
| Output Overload Protection | Foldback | 120 | | | % |
| Output Short Circuit | Continuous (Autorecovery) | | | | |

### General

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Isolation Voltage | 60 Seconds | 1,500 | | | VDC |
| Isolation Resistance | 500 VDC | 1,000 | | | MΩ |
| Isolation Capacitance | 100 kHz/1.0V | | 500 | | pF |
| Switching Frequency | | 90 | | | kHz |

### EMI Characteristics

| Parameter | Standard | Criteria | Level |
|---|---|---|---|
| Radiated Emissions | EN 55022 | | Class A |
| Conducted Emissions | EN 55022 | | 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/m |

### Environmental

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| Operating Temperature Range | Ambient | -40 | +25 | +85 | °C |
| Operating Temperature Range | Case | | | +100 | °C |
| Storage Temperature Range | | -50 | | +125 | °C |
| Cooling | Free Air Convection | | | | |
| Humidity | RH, Non-condensing | | | 95 | % |
| **Physical** | | | | | |
| Case Size | See Mechanical Diagram (Page 2) | | | | |
| Case Material | Non-Conductive Black Plastic (UL94-V0) | | | | |
| Weight | 0.45 Oz (12.8g) | | | | |

### Reliability Specifications

| Parameter | Conditions | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|
| MTBF | MIL HDBK 217F, 25°C, Gnd Benign | 1.0 | | | MHours |
| Shock & Vibration | A random waveform 1~200 Hz/0.52 Grms, 30 min. on each axis (X, Y, Z) and 2~300 Hz/1.05 Grms, 30 min. on each axis (X, Y, and Z) | | | | |

### 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

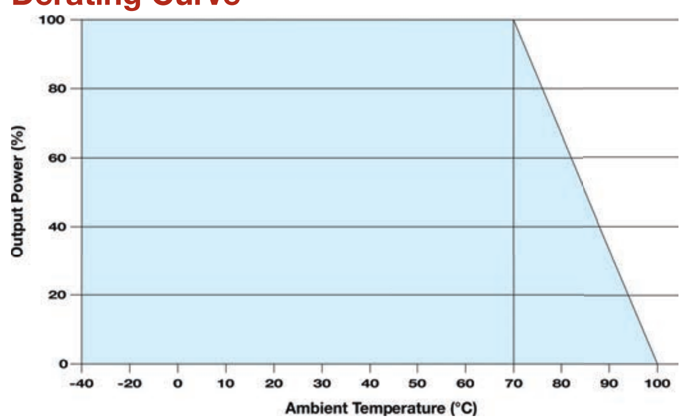


| Model Number | Input | | | | Output | | | Efficiency (%, Typ) | Reflected Ripple Current (mA Typ) | Capacitive Load (µF, Max) | Fuse Rating Slow-Blow (mA) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Voltage (VDC) | | Current (mA) | | Voltage (VDC) | Current (mA, Max) | Current (mA, Min) | | | | |
| | Nominal | Range | Full-Load | No-Load | | | | | | | |
| MA324S-03RU | 24 | 9.0 - 36.0 | 134 | 30 | 3.3 | 750.0 | 0.0 | 77 | 15.0 | 680 | 1,000 |
| MA324S-05RU | 24 | 9.0 - 36.0 | 158 | 30 | 5.0 | 600.0 | 0.0 | 79 | 15.0 | 470 | 1,000 |
| MA324S-12RU | 24 | 9.0 - 36.0 | 152 | 30 | 12.0 | 250.0 | 0.0 | 82 | 15.0 | 330 | 1,000 |
| MA324S-15RU | 24 | 9.0 - 36.0 | 151 | 30 | 15.0 | 200.0 | 0.0 | 83 | 15.0 | 220 | 1,000 |
| MA324S-24RU | 24 | 9.0 - 36.0 | 154 | 30 | 24.0 | 125.0 | 0.0 | 81 | 15.0 | 100 | 1,000 |
| MA324D-05RU | 24 | 9.0 - 36.0 | 130 | 30 | ±5.0 | ±250.0 | ±0.0 | 80 | 15.0 | ±220 | 1,000 |
| MA324D-12RU | 24 | 9.0 - 36.0 | 152 | 30 | ±12.0 | ±125.0 | ±0.0 | 82 | 15.0 | ±150 | 1,000 |
| MA324D-15RU | 24 | 9.0 - 36.0 | 152 | 30 | ±15.0 | ±100.0 | ±0.0 | 82 | 15.0 | ±100 | 1,000 |
| MA348S-03RU | 48 | 18.0 - 75.0 | 67 | 20 | 3.3 | 750.0 | 0.0 | 77 | 10.0 | 680 | 500 |
| MA348S-05RU | 48 | 18.0 - 75.0 | 78 | 20 | 5.0 | 600.0 | 0.0 | 80 | 10.0 | 470 | 500 |
| MA348S-12RU | 48 | 18.0 - 75.0 | 75 | 20 | 12.0 | 250.0 | 0.0 | 83 | 10.0 | 330 | 500 |
| MA348S-15RU | 48 | 18.0 - 75.0 | 74 | 20 | 15.0 | 200.0 | 0.0 | 84 | 10.0 | 220 | 500 |
| MA348S-24RU | 48 | 18.0 - 75.0 | 76 | 20 | 24.0 | 125.0 | 0.0 | 82 | 10.0 | 100 | 500 |
| MA348D-05RU | 48 | 18.0 - 75.0 | 65 | 20 | ±5.0 | ±250.0 | ±0.0 | 80 | 10.0 | ±220 | 500 |
| MA348D-12RU | 48 | 18.0 - 75.0 | 76 | 20 | ±12.0 | ±125.0 | ±0.0 | 82 | 10.0 | ±150 | 500 |
| MA348D-15RU | 48 | 18.0 - 75.0 | 76 | 20 | ±15.0 | ±100.0 | ±0.0 | 82 | 10.0 | ±100 | 500 |

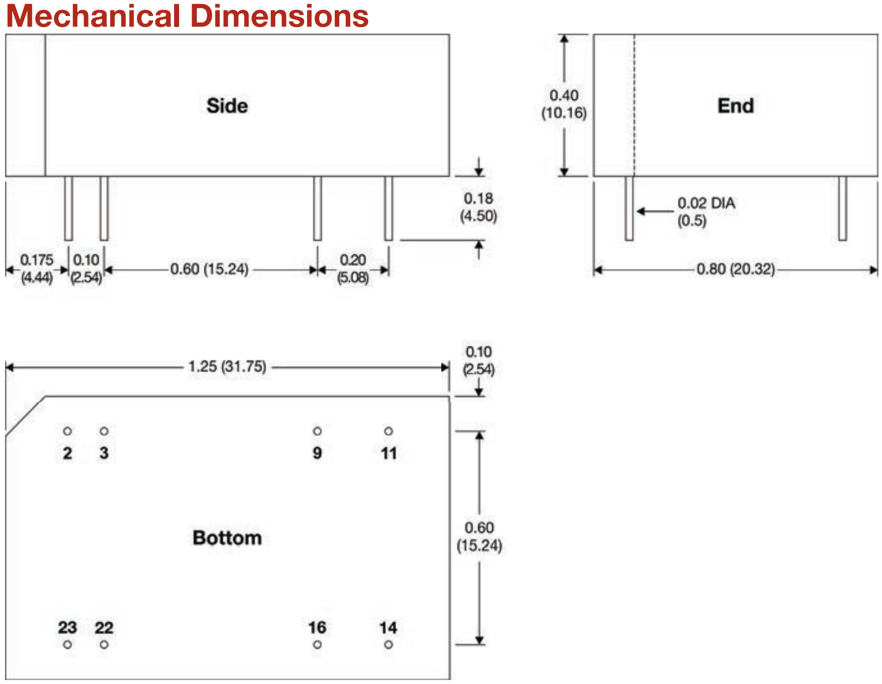
**Notes:**

1. When measuring output ripple, it is recommended that an external 3.3 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.
2. Transient recovery is measured to within a 1% error band for a load step change of 75% to 100%.
3. Operation at no-load will not damage these units.
4. An external 220 µF/100V capacitor connected across the input pins is required to meet EN61000-4-4 and EN61000-4-5.
5. Dual output units may be connected to provide a 10, 24 or 30 VDC output. To do this, connect the load across the positive (+Vout) and negative (-Vout) outputs and float the output common.
6. 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.
7. 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




For 3 kV Isolation, See **MA300x-xxRUI** Series Datasheet

For 2:1 Inputs, See **MA300x-xxRW** Series Datasheet

## Pin Connections

| Pin | Single | Dual |
|---|---|---|
| 2, 3 | -Vin | -Vin |
| 9 | No Pin | Common |
| 11 | NC | -Vout |
| 14 | +Vout | +Vout |
| 16 | -Vout | Common |
| 22, 23 | +Vin | +Vin |

NC: No Connection

**Mechanical Notes:**

- All dimensions are typical in inches (mm)
- Tolerance x.x = ±0.02 (±0.50)
- Tolerance x.xx = ±0.01 (±0.25)

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