

# MA300ERW Series



## 2:1 Input, 3W DIP, Single & Dual Output DC/DC Converters

### Key Features:

- 3W Output Power
- 2:1 Input Voltage Range
- 1,500 VDC Isolation
- 30 Standard Models
- Efficiency to 86%
- Compact DIP Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Low Cost

3.0 kV Isolation Models Available

RoHS



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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	9.0	VDC
	12 VDC Input	9.0	12.0	18.0	
	24 VDC Input	18.0	24.0	36.0	
	48 VDC Input	36.0	48.0	75.0	
Input Start Voltage	5 VDC Input	3.5	4.0	4.5	VDC
	12 VDC Input	4.5	8.0	9.0	
	24 VDC Input	11.0	16.0	18.0	
	48 VDC Input	24.0	33.0	36.0	
Input Filter	π (Pi) Filter				

#### Output

Parameter	Conditions	Min.	Typ.	Max.	Units
Output Voltage Accuracy	I <sub>OUT</sub> = 5% to 100%		±1.0	±3.0	%
	I <sub>OUT</sub> = 0%		±1.5	±5.0	
Output Voltage Balance	Dual Outputs, Balanced Loads		±0.5	±1.0	%
Line Regulation	V <sub>IN</sub> = Min to Max		±0.2	±0.5	%
Load Regulation	I <sub>OUT</sub> = 5% to 100%		±0.2	±0.5	%
Ripple & Noise (20 MHz)	See Note 1		15	30	mV P - P
Noise (20 MHz)			45	75	
Transient Recovery Time, See Note 2	25% Load Step Change		0.5	2.0	mSec
Transient Response Deviation			±2.0	±5.0	
Temperature Coefficient			±0.02	±0.03	%/°C
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/0.1V		120		pF
Switching Frequency			200		kHz

#### Environmental

Parameter	Conditions	Min.	Typ.	Max.	Units
Operating Temperature Range	Ambient	-40	+25	+85	°C
Storage Temperature Range		-55		+125	°C
Cooling	Free Air Convection				
Humidity	RH, Non-condensing			95	%

#### Physical

Case Size	See Mechanical Diagram (Page 4)				
Case Material	Aluminum Alloy				
Weight	0.49 Oz (14g)				

#### 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)	5 VDC Input	-0.7		12.0	VDC
	12 VDC Input	-0.7		25.0	
	24 VDC Input	-0.7		50.0	
	48 VDC Input	-0.7		100.0	
Lead Temperature	1.5 mm From Case for 10 Sec			300	°C

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

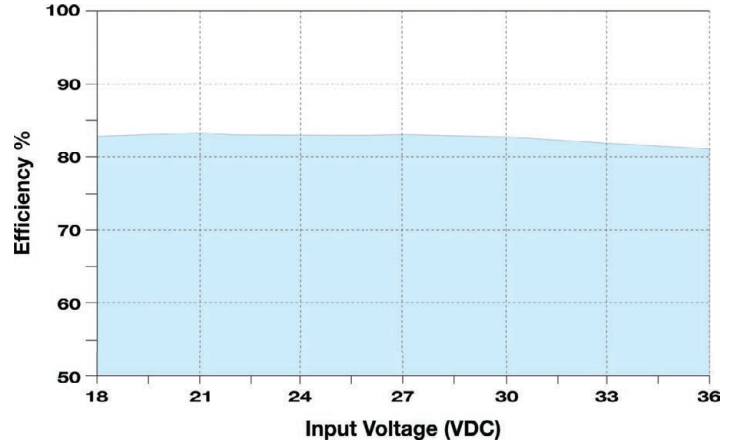
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Model Number	Input				Output			Efficiency (% Typ)	Reflected Ripple Current (mA Typ)	Capacitive Load (µF Max)	Fuse Rating Slow-Blow (mA)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)				
	Nominal	Range	Full-Load	No-Load							
MA305S-05ERW	5	4.5 - 9.0	811	40	5.0	600	30	74	20.0	4,700	1,600
MA305S-12ERW	5	4.5 - 9.0	780	40	12.0	250	12	77	20.0	2,700	1,600
MA305S-15ERW	5	4.5 - 9.0	780	40	15.0	200	10	77	20.0	2,200	1,600
MA305D-05ERW	5	4.5 - 9.0	790	40	±5.0	±300	±15	76	20.0	2,200	1,600
MA305D-12ERW	5	4.5 - 9.0	770	40	±12.0	±125	±6	78	20.0	1,800	1,600
MA305D-15ERW	5	4.5 - 9.0	770	40	±15.0	±100	±5	78	20.0	1,000	1,600
MA312S-03ERW	12	9.0 - 18.0	338	30	3.3	909	46	74	30.0	4,700	750
MA312S-05ERW	12	9.0 - 18.0	309	30	5.0	600	30	81	30.0	4,700	750
MA312S-12ERW	12	9.0 - 18.0	302	30	12.0	250	12	83	30.0	2,700	750
MA312S-15ERW	12	9.0 - 18.0	305	30	15.0	200	10	82	30.0	2,200	750
MA312S-24ERW	12	9.0 - 18.0	302	30	24.0	125	6	83	30.0	1,800	750
MA312D-05ERW	12	9.0 - 18.0	309	30	±5.0	±300	±15	81	30.0	2,200	750
MA312D-09ERW	12	9.0 - 18.0	298	30	±9.0	±166	±8	84	30.0	2,000	750
MA312D-12ERW	12	9.0 - 18.0	298	30	±12.0	±125	±6	84	30.0	1,800	750
MA312D-15ERW	12	9.0 - 18.0	295	30	±15.0	±100	±5	85	30.0	1,000	750
MA324S-03ERW	24	18.0 - 36.0	160	15	3.3	909	46	78	30.0	4,700	300
MA324S-05ERW	24	18.0 - 36.0	155	15	5.0	600	30	81	30.0	4,700	300
MA324S-12ERW	24	18.0 - 36.0	146	15	12.0	250	12	86	30.0	2,700	300
MA324S-15ERW	24	18.0 - 36.0	146	15	15.0	200	10	86	30.0	2,200	300
MA324S-24ERW	24	18.0 - 36.0	147	15	24.0	125	6	85	30.0	1,800	300
MA324D-05ERW	24	18.0 - 36.0	153	15	±5.0	±300	±15	82	30.0	2,200	300
MA324D-12ERW	24	18.0 - 36.0	149	15	±12.0	±125	±6	84	30.0	1,800	300
MA324D-15ERW	24	18.0 - 36.0	149	15	±15.0	±100	±5	84	30.0	1,000	300
MA348S-03ERW	48	36.0 - 75.0	82	5	3.3	909	46	76	30.0	4,700	150
MA348S-05ERW	48	36.0 - 75.0	77	5	5.0	600	30	82	30.0	4,700	150
MA348S-12ERW	48	36.0 - 75.0	73	5	12.0	250	12	86	30.0	2,700	150
MA348S-15ERW	48	36.0 - 75.0	73	5	15.0	200	10	86	30.0	2,200	150
MA348D-05ERW	48	36.0 - 75.0	77	5	±5.0	±300	±15	82	30.0	2,200	150
MA348D-12ERW	48	36.0 - 75.0	75	5	±12.0	±125	±6	84	30.0	1,800	150
MA348D-15ERW	48	36.0 - 75.0	74	5	±15.0	±100	±5	85	30.0	1,000	150

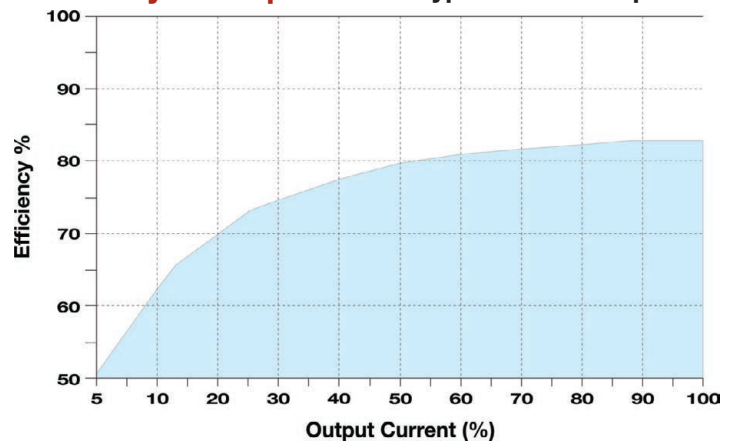
Notes:

1. When measuring output ripple & noise, it is recommended that an external capacitor (1 µF to 10 µF) be placed from the +Vout to the -Vout pins for single output units and from each output to common for dual output models..
2. Transient recovery is measured to within a 1% error band for a load step change of 25%.
3. These units should not be operated with a load under 5% of full load. Operation at no-load will not damage the unit, but they may not meet all specifications.
4. It is recommended that a fuse be used on the input of a power supply for protection. See the Model Selection table above for the correct rating.

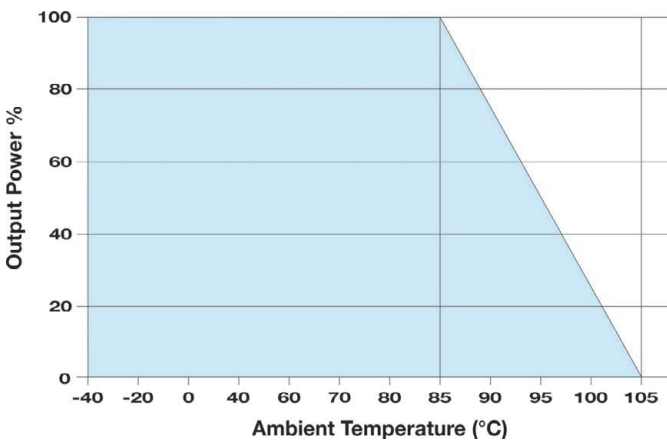
Efficiency vs Input Voltage: Typical 24 VDC Input



Efficiency vs Output Load: Typical 24 VDC Input



Derating Curve



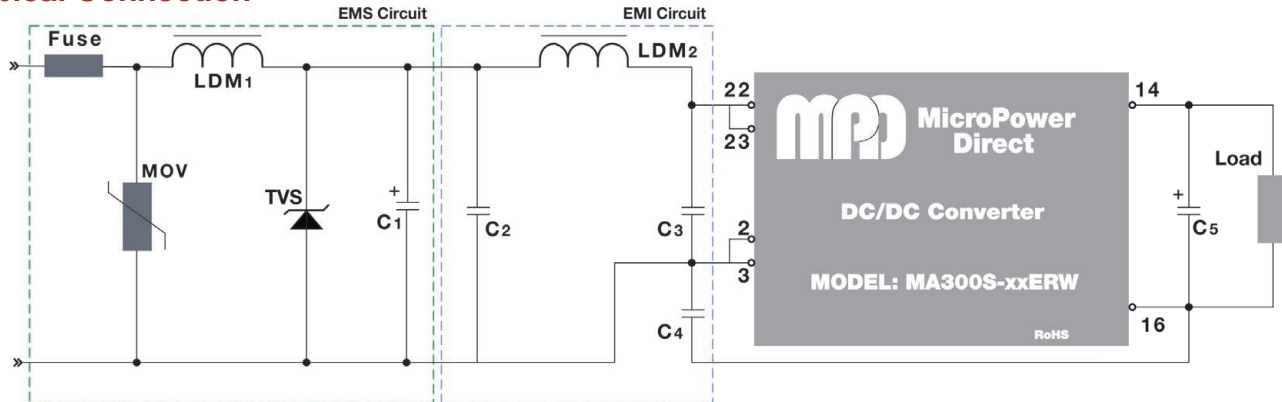
## EMC Specifications

Parameter	Standard		
Radiated Emissions	See Note 1	EN 55022	Class A
Conducted Emissions	See Note 1	EN 55022	Class A
ESD		EN 61000-4-2	Criteria B; ±4 kV Contact, ±8 kV Air
RS		EN 61000-4-3	Criteria A; 10V/m
EFT	See Note 2	EN 61000-4-4	Criteria B; ±2 kV
Surge	See Note 3	EN 61000-4-5	Criteria B; ±2 kV
CS		EN 61000-4-6	Criteria A; 3 Vrms
Voltage Dips		EN 61000-4-29	Criteria B; 0% - 70%

### Notes:

- All units are rated for EN 55022 (CE/RE) class A without external components. They will meet class B with the addition of the **MDCFM-02A(W)** (or a similar discrete filter circuit). Contact the factory for more information.
- To meet the requirements of EN 61000-4-4 (±2 kV), external components are needed. This can be done discretely as shown in the typical connection diagram below. With the addition of the **MDCFM-02A(W)**, the unit will meet EN 61000-4-4 (±4 kV). Contact the factory for more information.
- To meet the requirements of EN 61000-4-5 (±2 kV), external components are needed. This can be done discretely, or with the addition of the **MDCFM-02A(W)**. Contact the factory for more information.

## Typical Connection



The diagram above illustrates a typical connection of the **MA300xERW** series for applications that require meeting EMC standards. The units do not require external components to operate as specified. Some notes on this diagram (starting with the input circuit) are:

- It is recommended that an external fuse be used. The recommended fuse is shown in the model chart on page 2.
- An external MOV is recommended on the input to protect the unit in the event of a surge. A recommended value is given in the table at right.
- An external TVS is recommended on the input to protect the unit in the event of a voltage spike. A recommended value is given in the table at right.
- The output filtering capacitor (C<sub>5</sub>) is a high frequency, low resistance electrolytic capacitor. Care must be taken in choosing this capacitor not to exceed the capacitive load specification for the unit. Voltage derating of capacitors should be 80% or above.

5. Recommended values for components are:

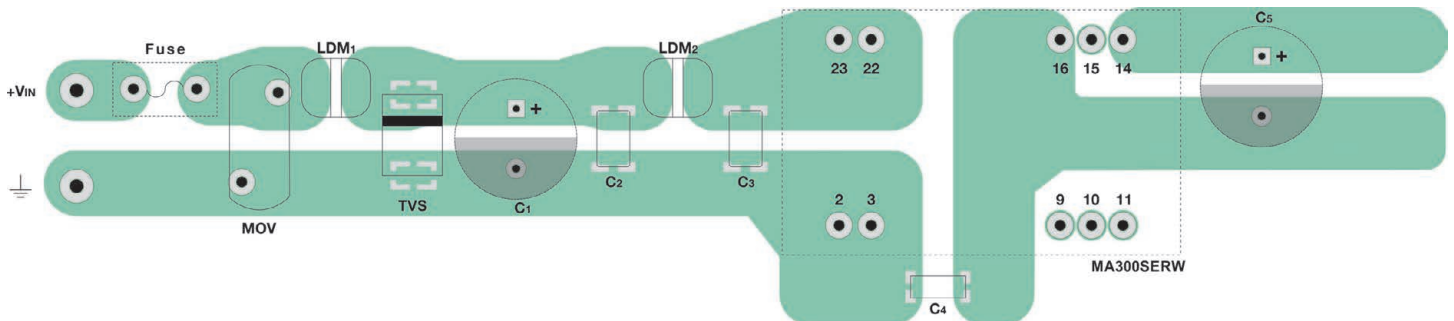
Component	5 V <sub>IN</sub>	12 V <sub>IN</sub>	24 V <sub>IN</sub>	48 V <sub>IN</sub>
MOV	---	---	S14K35	S14K60
LDM <sub>1</sub>	---	---	56 μH	56 μH
TVS	SMCJ13A	SMCJ28A	SMCJ48A	SMCJ90A
C <sub>1</sub>	680 μF/16V	680 μF/25V	330 μF/50V	330 μF/100V
C <sub>2</sub>	4.7 μF/50V	4.7 μF/50V	4.7 μF/50V	4.7 μF/100V
LDM <sub>2</sub>	12 μH	12 μH	12 μH	12 μH
C <sub>3</sub>	4.7 μF/50V	4.7 μF/50V	4.7 μF/50V	4.7 μF/100V
C <sub>4</sub>	1 nF/2 kV	1 nF/2 kV	1 nF/2 kV	1 nF/2 kV
C <sub>5</sub>	10 μF	10 μF	10 μF	10 μF
C <sub>6</sub>	10 μF	10 μF	10 μF	10 μF

- Input noise and surge suppression modules are available for a number of **MPD** DC/DC power supplies. For pricing or full technical information, please contact the factory.
- In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C<sub>1</sub> and output capacitors C<sub>5</sub> and C<sub>6</sub> shown in the typical connection diagram above (& board layout drawing below), illustrate their connection.

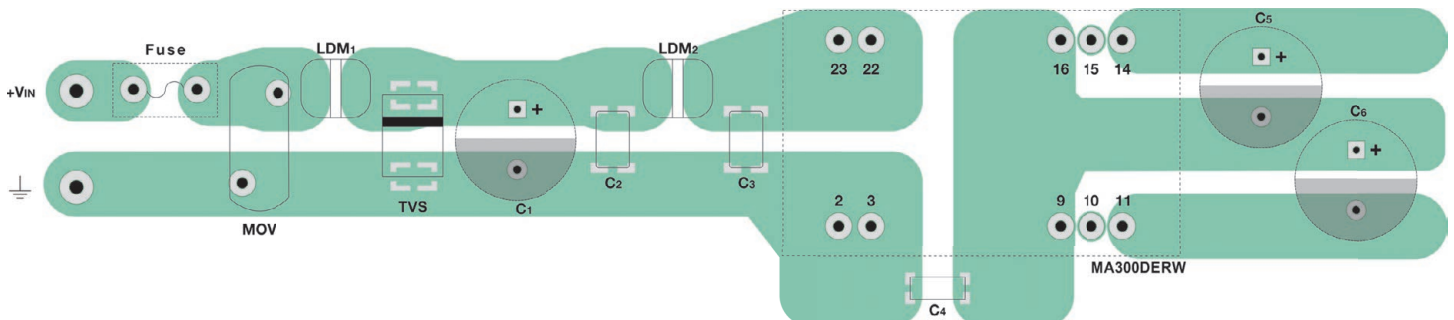
The recommended capacitor values are as follows:

C <sub>IN</sub>	5V/12V Input:	100 μF
	24V/48V Input:	10 μF - 47 μF
C <sub>OUT</sub>	All Models:	10 μF/100mA

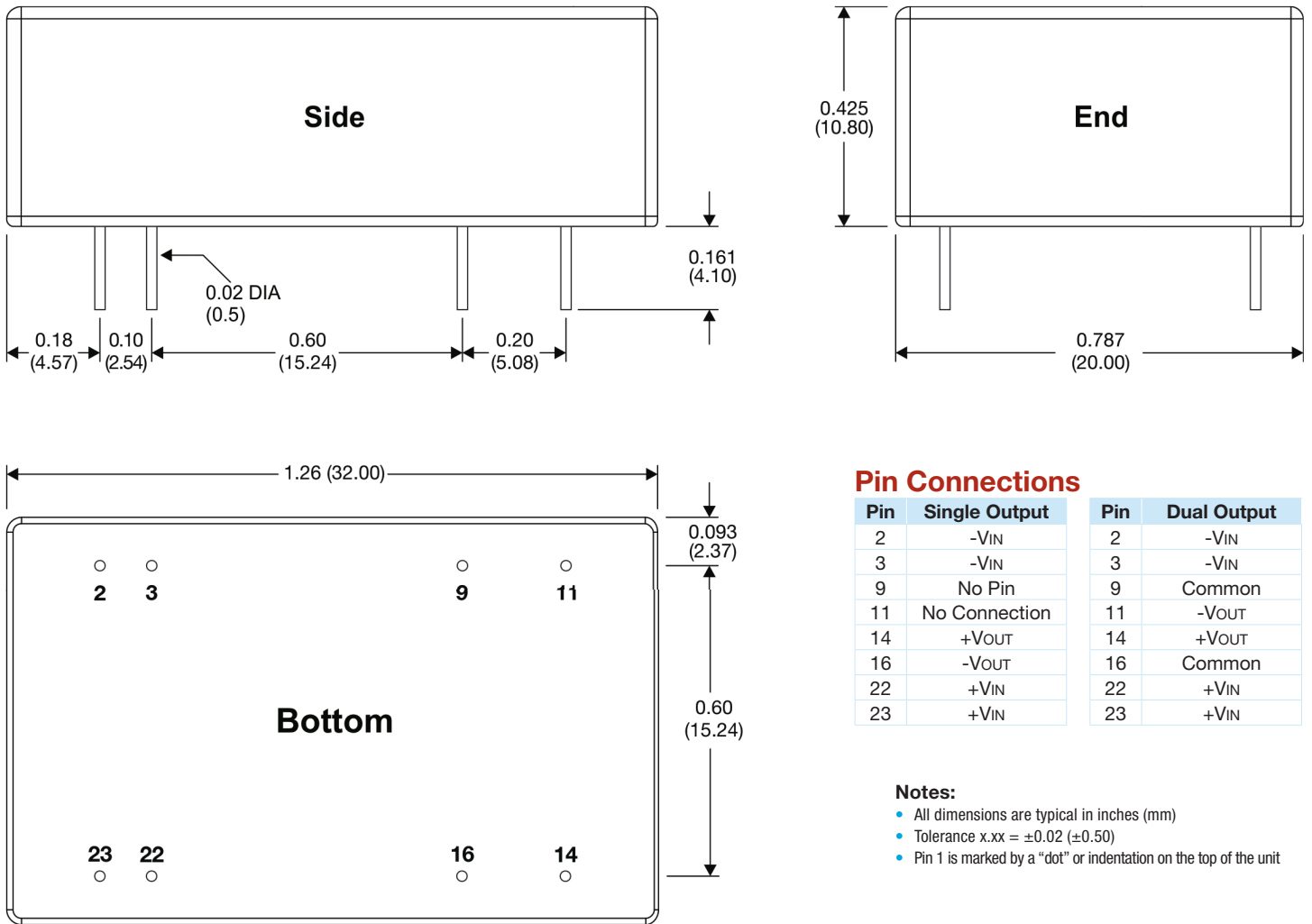
## Typical Board Layout: With External Filter/Surge Components for Single Output Unit



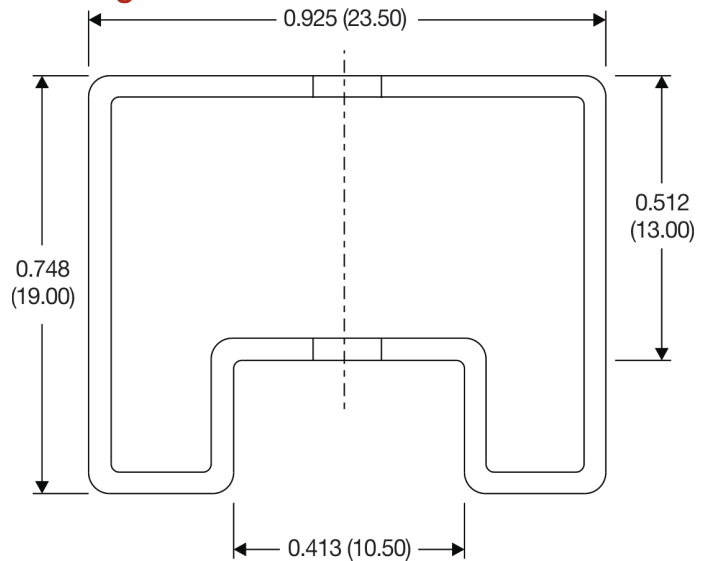
## Typical Connection: With External Filter/Surge Components for Dual Output Unit



**Mechanical Dimensions**



**Packing Tube Dimensions**



**Notes:**

- Tube length equals 20.866 (530), unit quantity equals 15 pcs.
- Tube length equals 8.661 (220), unit quantity equals 6 pcs.
- All dimensions are typical in inches (mm)
- Tolerance x.xx = ±0.02 (±0.50)



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