

# MF3000TERU



## Wide 4:1 Input 30W Triple Output DC/DC Converters

### Key Features:

- 30W Output Power
- 4:1 Input Voltage Range
- 1,500 VDC Isolation
- Triple Outputs
- High Efficiency
- Compact 1.6 x 2 Inch Case
- -40°C to +85°C Operation
- Industry Standard Pin-Out
- Low Cost

RoHS



### MicroPower Direct

292 Page Street  
Suite D  
Stoughton, MA 02072  
USA

T: (781) 344-8226  
F: (781) 344-8481  
E: sales@micropowerdirect.com  
W: www.micropowerdirect.com



### 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	24 VDC Input	9.0	24.0	36.0	VDC	
	48 VDC Input	18.0	48.0	75.0		
Start Time	Nominal Input		10		mS	
Reflected Ripple Current			30		mA	
Input Filter	π (Pi) Filter					
Output						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Output Voltage Accuracy	Main Output (+V1)		±1.0	±3.0	%	
	Auxiliary Outputs (±V2)		±3.0	±5.0		
Line Regulation, VIN = Min to Max	Main Output (+V1)			±1.0	%	
	Auxiliary Outputs (±V2)			±5.0		
Load Regulation, IOUT = 5% to 100%	Main Output (+V1)			±2.0	%	
	Auxiliary Outputs (±V2)			±5.0		
Cross Regulation, See Note 1	Main Output (+V1)			±2.0	%	
	Auxiliary Outputs (±V2)			±5.0		
Capacitive Load	3.3V/5V Output			4,700	μF	
	12V Output			300		
	15V Output			220		
Ripple & Noise (20 MHz)	See Note 2		85	100	mV P - P	
Transient Recovery Time, See Note 3	25% Load Step Change		300	500	μSec	
Transient Response Deviation			±3.0	±5.0	%	
Temperature Coefficient				±0.03	%/°C	
Over Power Protection			150		%IOUT	
Output Short Circuit, See Note 4	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		2,000		pF	
Switching Frequency			400		kHz	
Environmental						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Operating Temperature Range	Ambient	-40	+25	+85	°C	
Operating Temperature Range	Case			+105	°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 With Non-Conductive Base (UL94-V0)					
Weight	Without Heatsink				1.77 Oz (50g)	
	With Heatsink				2.48 Oz (70g)	
Remote On/Off						
Parameter	Conditions	Min.	Typ.	Max.	Units	
Unit On	See Note 5	2.5		12.0	VDC	
Unit Off	See Note 5	0		1.2	VDC	
Off Idle Current			1.0		mA	
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	-0.7		50.0	VDC	
	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.

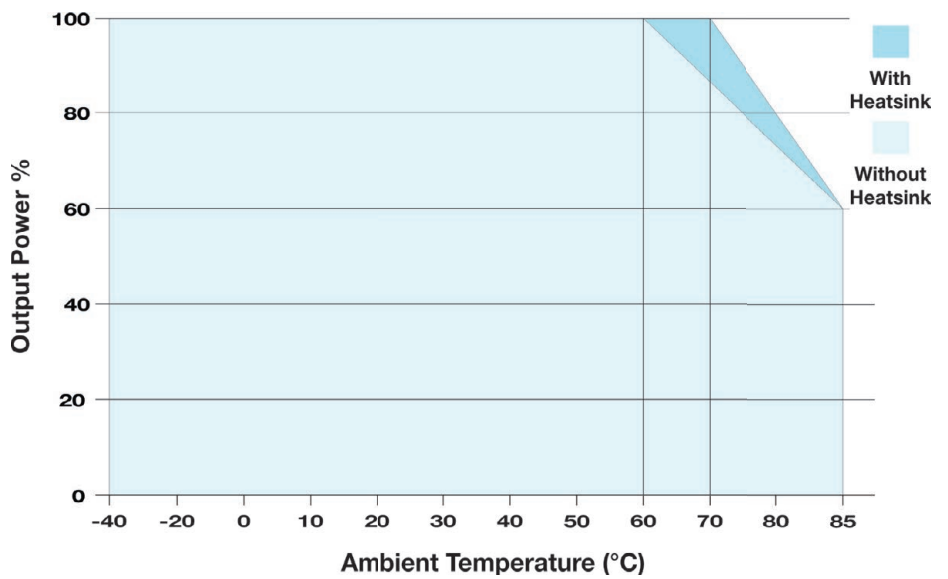
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Model Number	Input				Output 1			Outputs 2/3			Efficiency (% Typ)
	Voltage (VDC)		Current (mA)		Voltage (VDC)	Current (mA, Max)	Current (mA, Min)	Voltage (VDC)	Current (mA, Max)	Current (mA, Min)	
	Nominal	Range	Full-Load	No-Load							
MF3024T-0312ERU(-H)	24	9.0 - 36.0	1,302	30	3.3	3,500	175	±12.0	±625	±31	85
MF3024T-0315ERU(-H)	24	9.0 - 36.0	1,286	30	3.3	3,500	175	±15.0	±500	±25	86
MF3024T-0512ERU(-H)	24	9.0 - 36.0	1,420	30	5.0	3,000	150	±12.0	±625	±31	88
MF3024T-0515ERU(-H)	24	9.0 - 36.0	1,420	30	5.0	3,000	150	±15.0	±500	±25	88
MF3048T-0312ERU(-H)	48	18.0 - 75.0	651	30	3.3	3,500	175	±12.0	±625	±31	85
MF3048T-0315ERU(-H)	48	18.0 - 75.0	651	30	3.3	3,500	175	±15.0	±500	±25	85
MF3048T-0512ERU(-H)	48	18.0 - 75.0	710	30	5.0	3,000	150	±12.0	±625	±31	88
MF3048T-0515ERU(-H)	48	18.0 - 75.0	718	30	5.0	3,000	150	±15.0	±500	±25	87

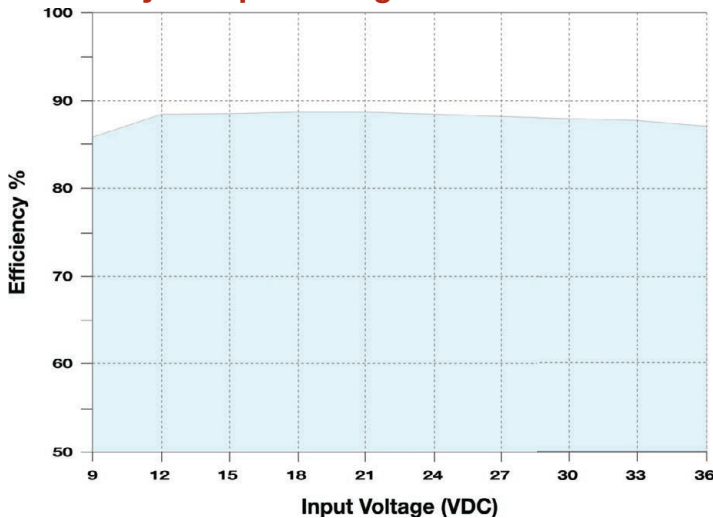
For the heatsink option, add suffix "H" to the model number (i.e. MF3024T-0512ERU-H)

- Notes:
1. Cross regulation is measured with output V<sub>1</sub> and one auxiliary output at 100% load. The second auxiliary output is varied from 25% to 100% load.
  2. When measuring output ripple, it is recommended that an external ceramic capacitor (approx 4.7 - 10 µF) be placed from each output to common.
  3. Transient recovery is measured to within a 1% error band for a load step change of 25%.
  4. Short circuit protection is provided by a "hiccup mode" circuit.
  5. If the on/off pin is left open, the unit operates. If it is grounded, the unit will shut off. The control circuit is referenced to the minus (-) input.
  6. These units should not be operated with a load under 10% of full load. Operation at no-load will not damage the unit, but they may not meet all specifications.
  7. These units should not be operated over +85°C. Exceeding +85°C may damage the unit.
  8. It is recommended that a fuse be used on the input of a power supply for protection. It is recommended that a slow blow fuse rated at 6,000 mA be used with the 24V input models and a 3,000 ma fuse be used with 48V input models.

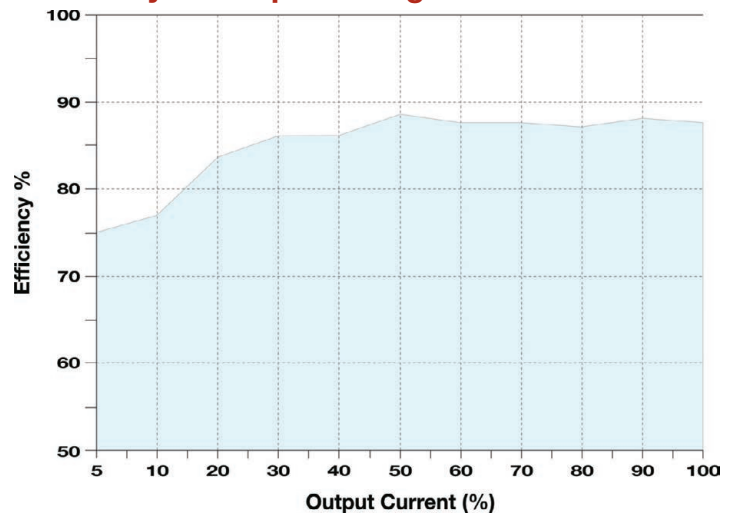
Derating Curve, Without Heatsink



Efficiency vs Input Voltage



Efficiency vs Output Voltage



## 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; $\pm 4$ kV Contact
RS		EN 61000-4-3	Criteria A; 10V/m
EFT	See Note 2	EN 61000-4-4	Criteria B; $\pm 2$ kV
Surge	See Note 3	EN 61000-4-5	Criteria B; $\pm 2$ kV
CS		EN 61000-4-6	Criteria A; 3 Vrms
Voltage Dips		EN 61000-4-29	Criteria B; 0% - 70%

### Notes:

1. All units are rated for EN 55022 (CE/RE) class A without external components. They will meet class B with the addition of a discrete filter circuit like that illustrated below. Contact the factory for more information.
2. To meet the requirements of EN 61000-4-4 ( $\pm 2$  kV), external components are needed, as shown on the typical connection diagram below. Contact the factory for more information.
3. To meet the requirements of EN 61000-4-5 ( $\pm 2$  kV), external components are needed. This can be done discretely, as shown in the typical connection diagram below. Contact the factory for more information.

The diagram below illustrates a typical connection of the **MF3000TERU** 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:

1. It is recommended that an external fuse be used. The recommended fuse is shown in the table at right.
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.
3. The output filtering capacitors (C4, C5, C6) are high frequency, low resistance electrolytic capacitors. Care must be taken in choosing these capacitors 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:

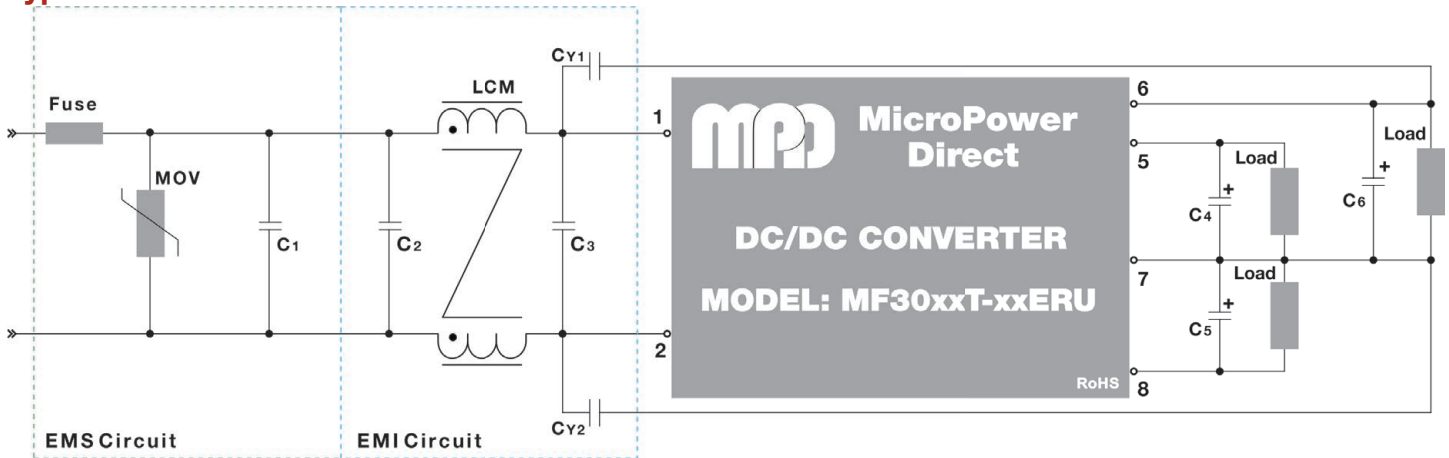
Component	24 VIN	48 VIN
Fuse	6,000 mA	3,000 mA
MOV	S14K35	S14K60
C1	330 $\mu$ F/50V	330 $\mu$ F/100V
C2	4.7 $\mu$ F/50V	2.2 $\mu$ F/100V
LCM	2.2 mH	2.2 mH
C3	4.7 $\mu$ F/50V	2.2 $\mu$ F/100V
Cy1, Cy2	1.0 nF/2 kV	2.2 nF/2 kV
C4	4.7 $\mu$ F	4.7 $\mu$ F
C5	4.7 $\mu$ F	4.7 $\mu$ F
C6	10 $\mu$ F	10 $\mu$ F

6. In many applications simply adding input/output capacitors will enhance the input surge protection and reduce output ripple sufficiently. The input capacitor C1 and output capacitors C4, C5 and C6 shown in the typical connection/board layout drawings below show their connection. In this case, recommended capacitor values are:

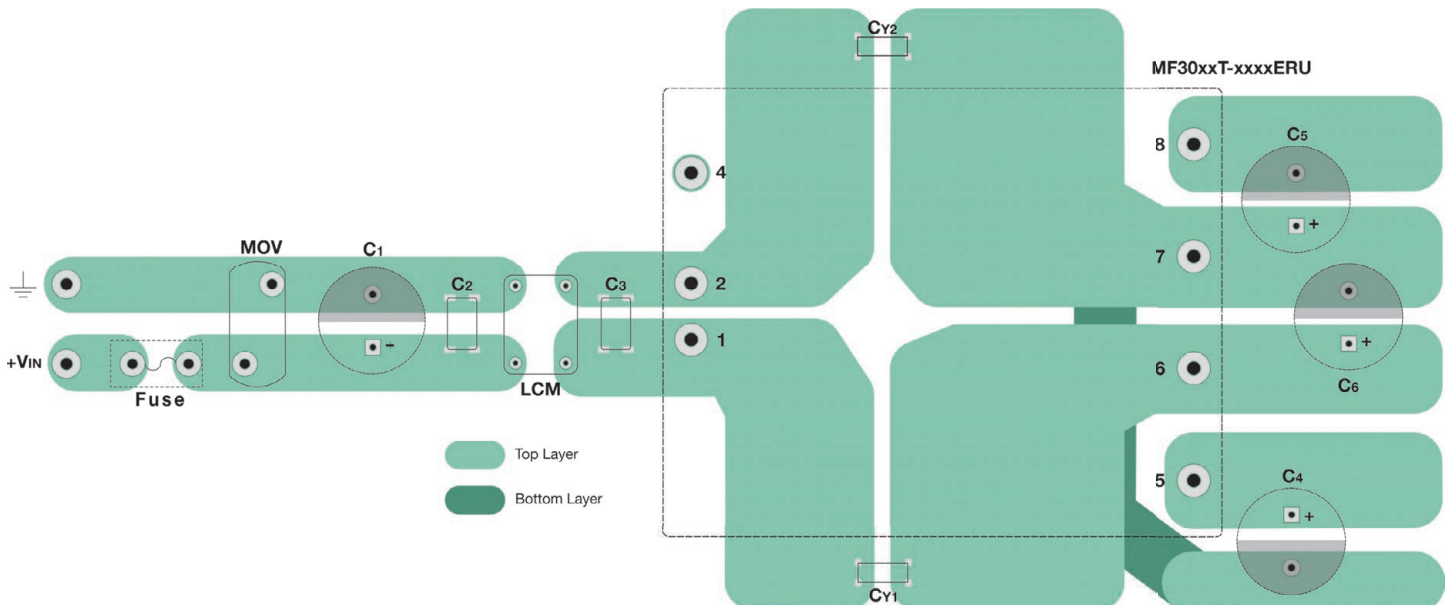
CIN: 10  $\mu$ F

COU: 10  $\mu$ F for 3.3V/5 V Outputs  
4.7  $\mu$ F for 12V/15V Outputs

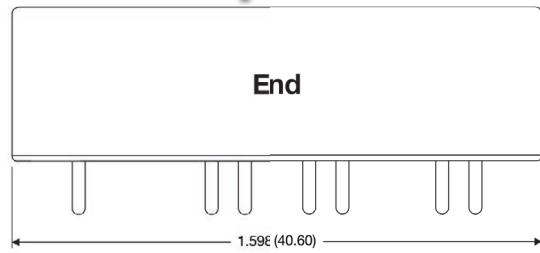
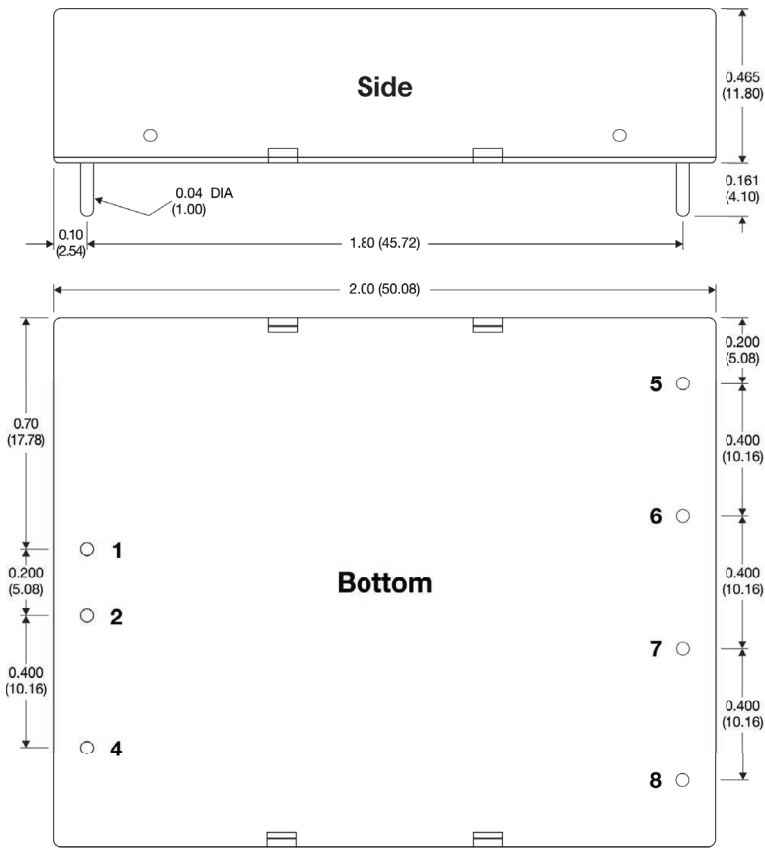
## Typical Connection



## Typical Board Layout: With External Filter/Surge Components



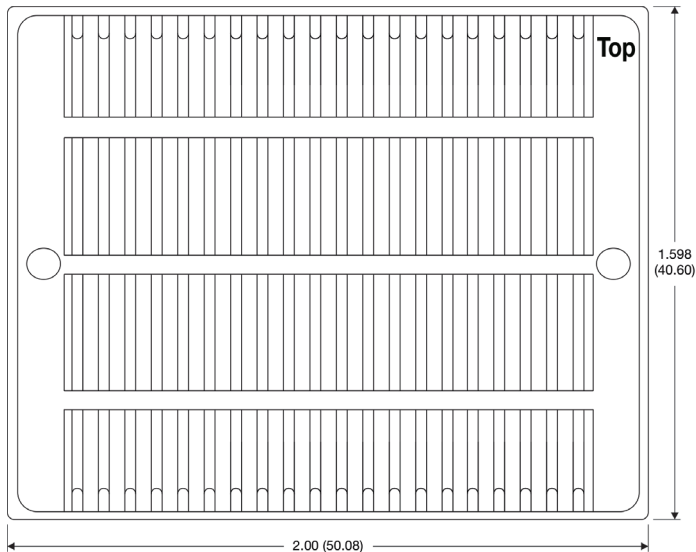
**Mechanical Dimensions**



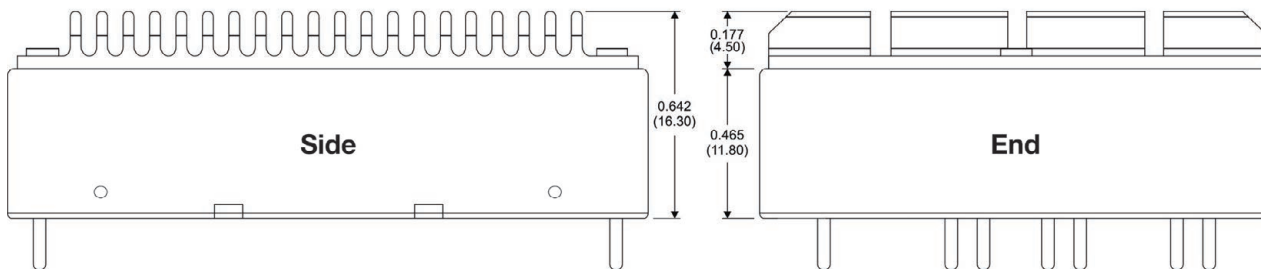
**Pin Connections**

Pin	Function
1	+VIN
2	-VIN
4	Remote On/Off
5	+VOUT2
6	+VOUT1
7	Common
8	-VOUT2

**Mechanical Dimensions: With Optional Heatsink**



For the heatsink option, add suffix "H" to the model number (i.e. MF3048T-0512ERU-H)



**Notes:**

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