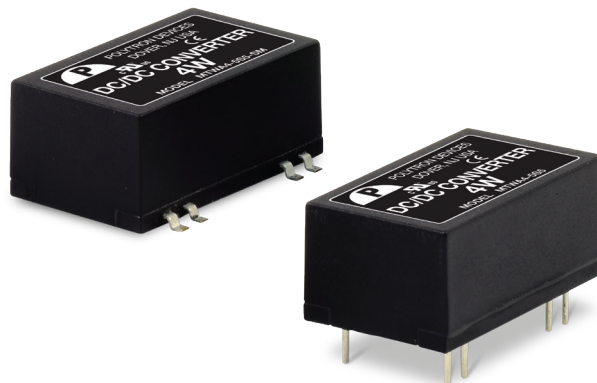


## DC-DC CONVERTERS

### 2:1 INPUT RANGE, UP TO 3.5 WATTS

#### MEDICAL APPLICATIONS

#### MTWA4 SERIES



#### FEATURES

- 2:1 Wide Input Voltage Range: 4.5-12Vdc Input, 9-18Vdc and 18-36 Vdc and 36-75Vdc
- 5000Vac Input to Output 2MOPP Isolation
- Remote On/Off
- Low Leakage Current
- Operating Altitude: 5000 Meters
- High Efficiency
- Over Voltage, Short Circuit and Under Voltage Protection
- No Minimum Load Required
- Miniature DIP16 Package (0.95" × 0.57" × 0.41")
- Miniature SMD16 Package (0.95" × 0.57" × 0.40")
- IEC 60601-1 Medical safety approval
- RoHS Compliant to 2011/65/EU

#### SELECTION GUIDE

All specifications are typical at 230Vac input, full load and 25°C, unless otherwise noted.

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load mA	Input Current at No Load mA	Efficiency %	Maximum Capacitor Load $\mu$ F	Model Number*
4.5 - 12	5	700	70	77	1470	MTWA4-5S5
4.5 - 12	9	389	70	78	680	MTWA4-5S9
4.5 - 12	12	292	70	82	470	MTWA4-5S12
4.5 - 12	15	234	90	82	330	MTWA4-5S15
4.5 - 12	24	146	90	82	170	MTWA4-5S24
9 - 18	5	700	40	79	1470	MTWA4-12S5
9 - 18	9	389	40	79	680	MTWA4-12S9
9 - 18	12	292	45	82	470	MTWA4-12S12
9 - 18	15	234	45	82	330	MTWA4-12S15
9 - 18	24	146	50	82	170	MTWA4-12S24
18 - 36	5	700	25	79	1470	MTWA4-24S5
18 - 36	9	389	25	80	680	MTWA4-24S9
18 - 36	12	292	25	83	470	MTWA4-24S12
18 - 36	15	234	25	83	330	MTWA4-24S15
18 - 36	24	146	30	82	170	MTWA4-24S24
36 - 75	5	700	12	79	1470	MTWA4-48S5
36 - 75	9	389	12	80	680	MTWA4-48S9
36 - 75	12	292	13	82	470	MTWA4-48S12
36 - 75	15	234	13	82	330	MTWA4-48S15
36 - 75	24	146	13	82	170	MTWA4-48S24

\* Surface Mount Package: Suffix "SM" after Model Number  
Standard Package. No Suffix

**MTWA4 SERIES**

**SELECTION GUIDE (CONTINUED)**

Input Range Vdc	Output Voltage Vdc	Output Current at Full Load mA	Input Current at No Load mA	Efficiency %	Maximum Capacitor Load $\mu$ F	Model Number*
4.5 - 12	$\pm$ 12	$\pm$ 146	90	82	$\pm$ 220	MTWA4-5-12
4.5 - 12	$\pm$ 15	$\pm$ 117	95	81	$\pm$ 160	MTWA4-5-15
9 - 18	$\pm$ 12	$\pm$ 146	50	82	$\pm$ 220	MTWA4-12-12
9 - 18	$\pm$ 15	$\pm$ 117	50	82	$\pm$ 160	MTWA4-12-15
18 - 36	$\pm$ 12	$\pm$ 146	30	82	$\pm$ 220	MTWA4-24-12
18 - 36	$\pm$ 15	$\pm$ 117	30	82	$\pm$ 160	MTWA4-24-15
36 - 75	$\pm$ 12	$\pm$ 146	13	82	$\pm$ 220	MTWA4-48-12
36 - 75	$\pm$ 15	$\pm$ 117	13	82	$\pm$ 160	MTWA4-48-15

\* Surface Mount Package: **Suffix "SM"** after Model Number  
Standard Package: **No Suffix**

**Input Specifications**

Voltage range, Vdc	4.5 Min., 5 Typ., 12 Max.	5 Vin (nom)
	9 Min., 12 Typ., 18 Max.	12 Vin (nom)
	18 Min., 24 Typ., 36 Max.	24 Vin (nom)
	36 Min., 48 Typ., 75 Max.	28 Vin (nom)
Start up voltage, Vdc	4.5 Max.	5 Vin (nom)
	9 Max.	12 Vin (nom)
	18 Max.	24 Vin (nom)
	36 Max.	28 Vin (nom)
Shutdown voltage, Vdc	2 Min., 3 Typ., 4 Max.	5 Vin (nom)
	6 Min., 7 Typ., 8 Max.	12 Vin (nom)
	13 Min., 15 Typ., 17 Max.	24 Vin (nom)
	29 Min., 32 Typ., 35 Max.	28 Vin (nom)
Start up time, ms	10 Typ., 20 Max.	Constant resistive load, Power up, Remote ON/OFF
Input surge voltage, Vdc	15 Max.	5 Vin (nom)
	25 Max.	12 Vin (nom)
	50 Max.	24 Vin (nom)
	100 Max.	28 Vin (nom)
Input filter	Capacitor type	
Remote ON/OFF, mA	Open or high impedance	Referred to -Vin pin and Ctrl pin, DC-DC ON
	2 Min., 3 Typ., 4 Max.	Applied current, DC-DC OFF
	2.5 Typ.	Remote OFF input current

**Output Specifications**

Voltage accuracy, %	-1 Min., 1 Max.	
Line regulation, %	-0.2 Min., 0.2 Max.	Low line to high line at full load
Load regulation, %	-1 Min., 1 Max.	No load to full load, Single
	-1 Min., 1 Max.	Dual
	-0.5 Min., 0.5 Max.	10% load to 90% load, Single
Cross regulation, %	-0.8 Min., 0.8 Max.	Dual
	-5 Min., 5 Max.	Asymmetrical load 25%/100% FL, Dual
		Measured by 20MHz bandwidth
Ripple and noise, mVp-p	50 Typ.	5Vout
	50 Typ.	9Vout
	50 Typ.	12Vout
	50 Typ.	15Vout
	75 Typ.	24Vout
	75 Typ.	$\pm$ 12Vout
	75 Typ.	$\pm$ 15Vout
Temperature coefficient, %/ $^{\circ}$ C	-0.02 Min., 0.02 Max.	
Transient response recovery time, $\mu$ s	500 Typ.	25% load step change
	6 Min., 8 Max.	5Vout
	10 Min., 14 Max.	9Vout
	13 Min., 19 Max.	12Vout
	16 Min., 22 Max.	15Vout
	25 Min., 35 Max.	24Vout
Short circuit protection	Continuous, automatic recovery	

## MTWA4 SERIES

### General Specifications

Isolation voltage, Vac	1 minute, reinforced insulation for 250 Vac working voltage	5000 Min.		
Isolation capacitance, pF			16 Typ.	20 Max.
Leakage current, $\mu$ A	240 Vac, 60 Hz			2 Max.
Switching frequency, kHz		100 Min.		
Clearance/creepage, mm		8 Min.		

### Environmental Specifications

Operating ambient temperature, °C	With derating	-40 Min.	+105 Max.
Maximum case temperature, °C			+105 Max.
Storage temperature range, °C		-55 Min.	+125 Max.
Operating altitude, m			5000 Max.
Thermal shock		MIL-STD-810-F	
Shock		MIL-STD-810-F	
Vibration		MIL-STD-810-F	
Relative humidity		5% to 95% RH	
Load-free reflow solder process	SMD type only	IPC J-STD-020E	
Moisture sensitivity level (MSL)	SMD type only	IPC J-STD-033C, Level 2	

### Physical Specifications

Design meet safety standard	EN/IEC/ANSI/AAMI ES60601-1, UL:E360199, EN/IEC/UL 60950-1, 62368-1, UL:E193009, CB:UL(Demko)	
Case material	Non-conductive black plastic	
Base material	Non-conductive black plastic	
Potting material	Silicone, (UL94 V-0)	
Dimensions	0.95" × 0.57" × 0.40" (24.3 × 14.4 × 10.2 mm)	SMD Type
	0.95" × 0.57" × 0.41" (24.3 × 14.4 × 10.5 mm)	DIP Type
Weight	7g (0.24oz)	
MTBF	5.041 × 10 <sup>6</sup> hrs, MIL-HDBK-217F, Full load	

### EMC Specifications

Specifications	Conditions	Level
EMI	EN55011, EN55032 and FCC Part 18 With external components	Class A, Class B
ESD	EN61000-4-2 Air ±15KV and Contact ±8KV	Perf. Criteria A
Radiated immunity	EN61000-4-3 10V/m	Perf. Criteria A
Fast transient <sup>(1)</sup>	EN61000-4-4 ±2KV	Perf. Criteria A
Surge <sup>(1)</sup>	EN61000-4-5 ±1KV	Perf. Criteria A
Conducted immunity	EN61000-4-6 10 Vr.m.s	Perf. Criteria A
Power frequency magnetic field	EN61000-4-8 100A/m continuous; 1000A/m 1 second	Perf. Criteria A

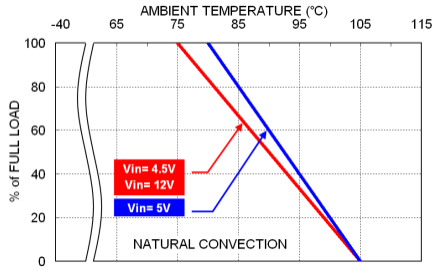
#### Note:

- The MTWA4-5-XX recommended an aluminum electrolytic capacitor (Nippon Chemi-con KY series, 1000 $\mu$ F/25V) and a TVS (SMAJ18A, 18V, 400Watt peak pulse power) to connect in parallel.  
The MTWA4-12-XX recommended an external input filter capacitor (Nippon Chemi-con KY series, 470 $\mu$ F/50V).  
The MTWA4-24-XX recommended an external input filter capacitor (Nippon Chemi-con KY series, 470 $\mu$ F/50V).  
The MTWA4-48-XX recommended an external input filter capacitor (Nippon Chemi-con KY series, 220 $\mu$ F/100V).
- For further information, please contact Polytron Devices.

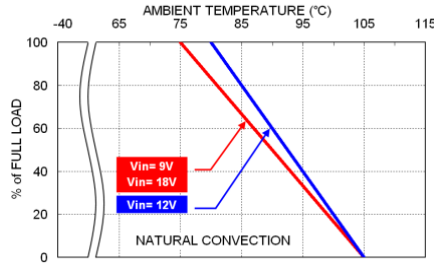
**CAUTION:** This power module is not internally fused. An input line fuse must always be used.

# MTWA4 SERIES

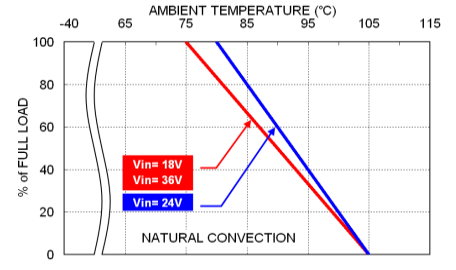
## Characteristic Curve



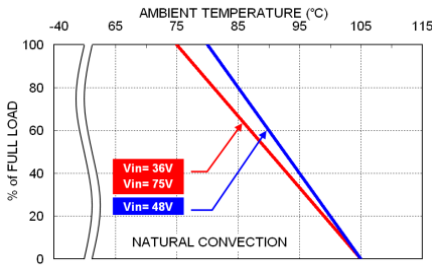
MTWA4-5-XX Derating Curve



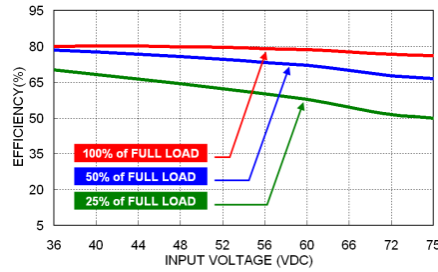
MTWA4-12-XX Derating Curve



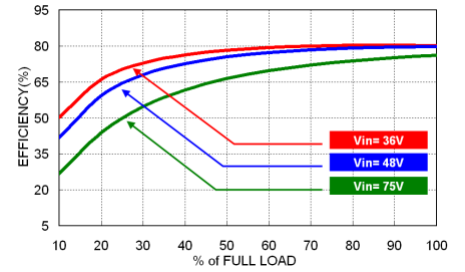
MTWA4-24-XX Derating Curve



MTWA4-48-XX Derating Curve



MTWA4-48S5 Efficiency vs. Input Voltage



MTWA4-48S5 Efficiency vs. Output Current

## Fuse Consideration

Modules	Fuse Rating (A)	Fuse Type
MTWA4-5SXX, MTWA4-5-XX	1.6	Slow-Blow
MTWA4-12SXX, MTWA4-12-XX	0.8	Slow-Blow
MTWA4-24SXX, MTWA4-24-XX	0.5	Slow-Blow
MTWA4-48SXX, MTWA4-48-XX	0.315	Slow-Blow

This power module is not internally fused. An input line fuse must always be used.

This encapsulated power module can be used in a wide variety of applications, ranging from simple stand-alone operation to an integrated part of sophisticated power architecture.

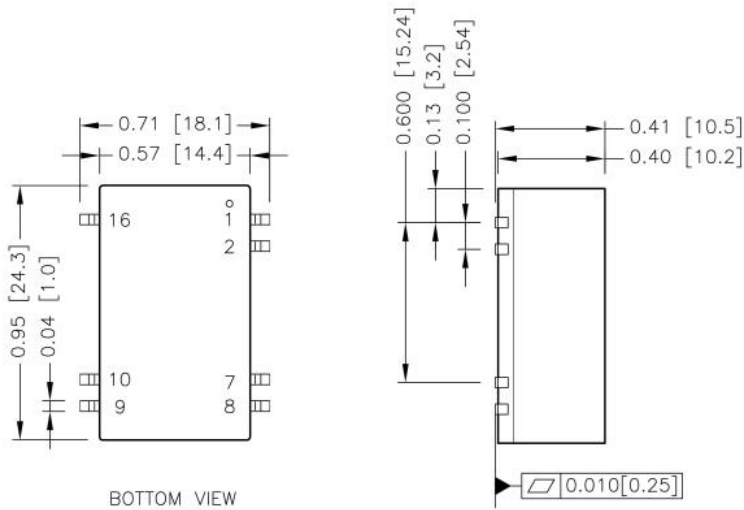
To maximum flexibility, internal fusing is not included; however, to achieve maximum safety and system production, always use an input line fuse.

The table based on the information provided in this data sheet on inrush energy and maximum DC input current at low Vin.

# MTWA4 SERIES

## Mechanical Drawing

### SMD Type: Suffix "SM" after Model Number

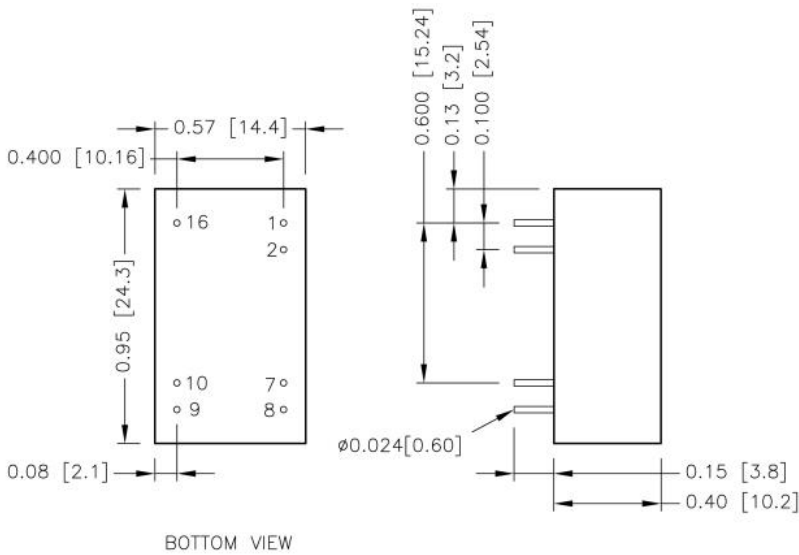


### PIN CONNECTION

PIN	SINGLE	DUAL
1	-Vin	-Vin
2	Ctrl	Ctrl
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

1. All dimensions in inch (mm)
2. Tolerance :x.xx±0.02 (x.x±0.5)  
x.xxx±0.01 (x.xx±0.25)
3. Pin dimension tolerance ±0.004(0.10)

### DIP Type: No Suffix

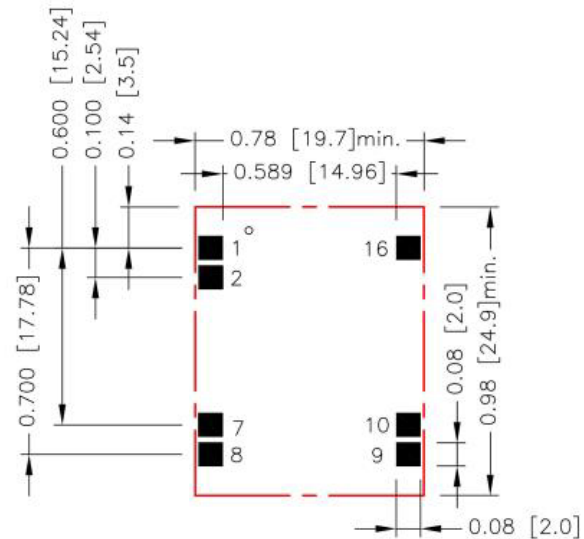
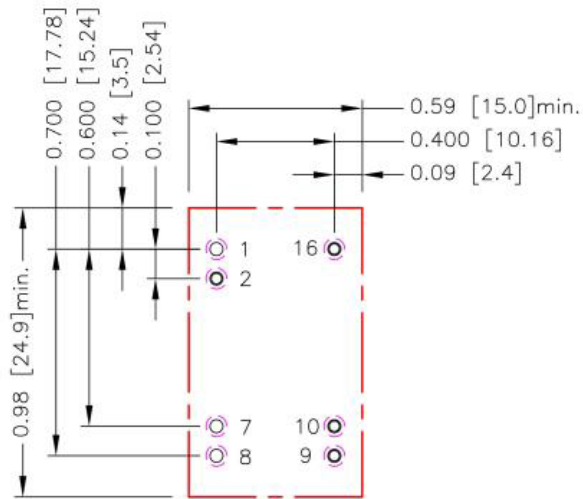


## MTWA4 SERIES

### Recommended Pad Layout

SMD Type: Suffix "SM" after Model Number

DIP Type: No Suffix



1. All dimensions in inch (mm)
2. Pad Size (lead free recommended)
3. Through hole 1.2.7.8.9.10.16:  $\phi 0.035(0.90)$
4. Top view pad 1.2.7.8.9.10.16:  $\phi 0.044(1.13)$
5. Bottom view pad 1.2.7.8.9.10.16:  $\phi 0.07(1.80)$
6. There should be at least 8mm between primary and secondary circuit

1. All dimensions in inch (mm)
2. Pad Size (lead free recommended)
3. Top view pad:  $0.080 \times 0.080 (2.00 \times 2.00)$
4. There should be at least 8mm between primary and secondary circuit

### Thermal Considerations

The power module operates in a variety of thermal environments.

However, sufficient cooling should be provided to help ensure reliable operation of the unit.

Heat is removed by conduction, convection and radiation to the surrounding Environment.

Proper cooling can be verified by measuring the point as the figure below.

The temperature at this location should not exceed "Maximum case temperature".

When Operating, adequate cooling must be provided to maintain the test point temperature at or below "Maximum case temperature".

You can limit this Temperature to a lower value for extremely high reliability.

