



# TR70M SERIES 70 WATT MEDICAL SWITCH ADAPTER

## Features

- Universal Input Range 80~264Vac
- High Efficiency up to 91%
- Class I (TR70MA), Class II (TR70MB)
- No Load Input Power Consumption < 150mW
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval IEC/EN 60601-1-11 (TR70MB)
- Home Healthcare Applications (TR70MB)
- Approval IP21 (TR70MB)
- Approval EN55011 and CISPR/FCC Class B
- Operating Altitude 5000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Meets CoC Tier 2 and DOE Level VI



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	RIPPLE & NOISE NOTE1	VOLTAGE ACCURACY NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TR70MA120	12 V	5.8 A	120 mV	±2%	±1%	±5%	89%
TR70MA150	15 V	4.65 A	150 mV	±2%	±1%	±3%	89%
TR70MA180	18 V	3.9 A	180 mV	±2%	±1%	±2%	89%
TR70MA240	24 V	3.0 A	240 mV	±2%	±1%	±2%	90%
TR70MA360	36 V	1.9 A	360 mV	±2%	±1%	±2%	90%
TR70MA480	48 V	1.5 A	480 mV	±2%	±1%	±2%	91%
TR70MB120	12 V	5.8 A	120 mV	±2%	±1%	±5%	89%
TR70MB150	15 V	4.65 A	150 mV	±2%	±1%	±3%	89%
TR70MB180	18 V	3.9 A	180 mV	±2%	±1%	±2%	89%
TR70MB240	24 V	3.0 A	240 mV	±2%	±1%	±2%	90%
TR70MB360	36 V	1.9 A	360 mV	±2%	±1%	±2%	90%
TR70MB480	48 V	1.5 A	480 mV	±2%	±1%	±2%	91%

Note:

1. Add a 0.1uF ceramic capacitor and a 10uF E.L. capacitor to output for ripple & noise measuring @20MHz BW.
2. Voltage accuracy is set at 60% full load.
3. Line regulation is measured from 100V<sub>ac</sub> to 240V<sub>ac</sub> with full load.
4. Load regulation measured from 60% to 100% full load and from 60% to 20% full load (60%±40% full load).
5. Typical efficiency at 230V<sub>ac</sub> and 75% full load at 25°C.
6. TR70MA120 & TR70MB120 of 115VAC meet DoE Level VI and 230VAC meet CoC Tier 2

## PART NUMBER

Series		Output Voltage	DC Plug Type	Cable Type	Cable Length
TR70M	X	XXX	-XX	E	XX
70W Medical Adapter	A : Class I B : Class II	120 : 12V	<a href="#">See Page 6</a>	E : UL1185 with OVP	01 : 720mm
		150 : 15V			02 : 1220mm
		180 : 18V			03 : 1800mm
		240 : 24V			11 : 720mm with Ferrite Core
		360 : 36V			12 : 1220mm with Ferrite Core
		480 : 48V			13 : 1800mm with Ferrite Core
					<a href="#">See page 6 for restrictions</a>

Part Number Example:

**TR70MA120-01E02**, 70W, Class I, 12V<sub>dc</sub> Output, DC Jack Type, Cable Length 1220mm



# TR70M Series

## TECHNICAL SPECIFICATIONS

(All specifications are typical at nominal input, full load at 25°C unless otherwise noted.)

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage		All	80		264	V <sub>ac</sub>
Operating Temperature	See Derating Curve	All	-30		70	°C
Storage Temperature		All	-40		85	°C
Input/Output Isolation Voltage	1 minute	All			4400	V <sub>ac</sub>
Operating Altitude		All			5000	m

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Voltage Range		All	100		240	V <sub>ac</sub>
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, V <sub>in</sub> =100V <sub>ac</sub>	All			1.5	A
Leakage Current (Earth)		TR70MA			300	uA
Leakage Current (Touch)		All			90	uA
Under Voltage Protection		All	60	65	70	V <sub>ac</sub>
Inrush Current	V <sub>in</sub> =240V <sub>ac</sub> , Cold start at 25°C	All			100	A

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , I <sub>o</sub> =60% Full load T <sub>c</sub> =25°C	TR70MA/B120	11.76	12	12.24	V <sub>dc</sub>
		TR70MA/B150	14.7	15	15.3	
		TR70MA/B180	17.64	18	18.36	
		TR70MA/B240	23.52	24	24.48	
		TR70MA/B360	35.28	36	36.72	
		TR70MA/B480	47.04	48	48.96	
Operating Output Current Range	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , T <sub>c</sub> =25°C	TR70MA/B120	0		5.8	A
		TR70MA/B150	0		4.65	
		TR70MA/B180	0		3.9	
		TR70MA/B240	0		3.0	
		TR70MA/B360	0		1.9	
		TR70MA/B480	0		1.5	
Holdup Time	V <sub>in</sub> =115V <sub>ac</sub>	All	8	10		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TR70MA/B120			±5.0	%
		TR70MA/B150			±3.0	
		TR70MA/B180			±2.0	
		TR70MA/B240			±2.0	
		TR70MA/B360			±2.0	
		TR70MA/B480			±2.0	
Line Regulation	V <sub>in</sub> =High line to low line, full load	All			±1.0	%
Over Voltage Protection	IC component to clamp (auto recovery)	TR70MA/B120		13.5		V <sub>dc</sub>
		TR70MA/B150		16.5		
		TR70MA/B180		19.5		
		TR70MA/B240		26		
		TR70MA/B360		40		
		TR70MA/B480		53.5		
Over Current Protection	Auto recovery	All	130		150	%



# TR70M Series

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Short Circuit Protection	Auto recovery	All				
Output Ripple and Noise	1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output 2. Oscilloscope is 20MHz band width 3. Ambient temperature=25°C	TR70MA/B120 TR70MA/B150 TR70MA/B180 TR70MA/B240 TR70MA/B360 TR70MA/B480			120 150 180 240 360 480	mV
Load Capacitance	1. $V_{in}=115V_{ac}$ and $230V_{ac}$ 2. Output is max. load 3. Ambient temperature=25°C	TR70MA/B120 TR70MA/B150 TR70MA/B180 TR70MA/B240 TR70MA/B360 TR70MA/B480			5800 4650 3900 3000 1900 1500	uF
Efficiency	1. $V_{in}=230V_{ac}$ 2. Output is 75% full load 3. Ambient temperature=25°C	TR70MA/B120 TR70MA/B150 TR70MA/B180 TR70MA/B240 TR70MA/B360 TR70MA/B480		89% 89% 89% 90% 90% 91%		%

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute (without dielectric breakdown)	All			4400	$V_{ac}$
Input to Earth (Ground)	1 minute (without dielectric breakdown)	TR70MA			1800	$V_{ac}$
Output to Earth (Ground)	1 minute (without dielectric breakdown)	TR70MA			1800	$V_{ac}$
Isolation Resistance	Input to output	All	100			M $\Omega$

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency		All		65		kHz

## GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	$I_o=100\%$ ; $T_a=25^\circ\text{C}$ per MIL-HDBK-217F	All	500			k hours
Humidity	Non-condensing	All			93	% RH
Shock	MIL-STD-810F Table 516.5, TABLE 516.5-1 10ms, each axis 3 times( $\pm X$ 、 $\pm Y$ 、 $\pm Z$ axis)	All		75		g
Vibration	MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour(each axis),. total 3 hours.	All		4		g
Weight		All		300		grams
Dimension		All	4.724x2.047x1.220 inches (120.00x52.00x31.00 mm)			
Safety	Class I (TR70MA), Class II (TR70MB) IEC 60601-1:2005 (Third Edition) + CORR. 1:2006 + CORR. 2:2007 + A1:2012 EN 60601-1:2006;A1 ANSI/AAMI ES60601-1 (2005/(R)2012 + A1:2012, C1:2009/(R)2012 + A2:2010/(R)2012) IEN/EN 60601-1-11-2015 For TR70MB (Home Health Care)					Ed 3.1
EMC Emission	EN55011:2009+A1:2010, EN61000-3-2:2014, EN6100-3-3:2013, 47 CFR FCC Part 18					
Conducted Disturbance	EN55011:2009+A1:2010, 47 CFR FCC Part 18					Class B
Radiated Disturbance	EN55011:2009+A1:2010, 47 CFR FCC Part 18					Class B
Harmonic Current Emissions	EN 61000-3-2:2014					Class A
Voltage Fluctuations & Flicker	EN 61000-3-3:2013					Criterion A
EMC Immunity	EN60601-1-2:2015, IEC61000-4-2,3,4,5,6,8,11					Ed 4.0



# TR70M Series

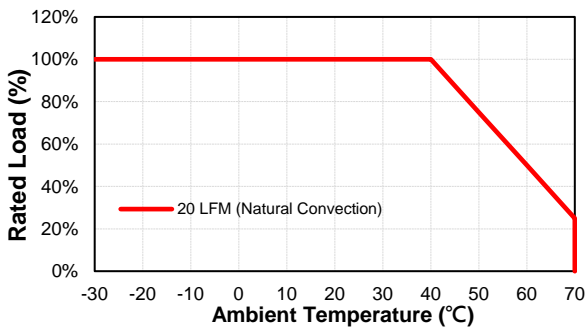
## GENERAL SPECIFICATIONS

Electrostatic Discharge (ESD)	IEC 61000-4-2:2008 Air Discharge: $\pm 15\text{kV}$ Contact Discharge: $\pm 8\text{kV}$	Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2006+A1:2007+A2:2010	Criterion A
Electrical Fast Transient (EFT)	IEC61000-4-4:2012, $\pm 1\text{kV}$ , $\pm 2\text{kV}$	Criterion A
Surge	IEC61000-4-5:2014+A1:2017, L-N: $\pm 0.5\text{kV}$ , $\pm 1\text{kV}$ , L-E (Ground): $\pm 0.5\text{kV}$ , $\pm 1\text{kV}$ , $\pm 2\text{kV}$	Criterion A
Conducted Disturbances, Induced by RF Fields	IEC 61000-4-6:2013+COR1:2015	Criterion A
Power Frequency Magnetic Field	IEC 61000-4-8:2009	Criterion A
Voltage Dips	IEC 61000-4-11:2004+A1:2017, Dips:30% reduction, Dips: >95% Reduction, Criteria A	Criterion A
Voltage Interruptions	IEC 61000-4-11:2004+A1:2017, >95% Reduction	Criterion B
Application Note Link	<a href="#">TR70M Series App Notes</a>	

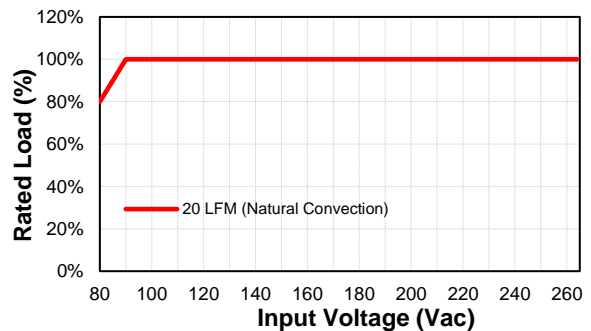
## CHARACTERISTIC CURVE

### Power Derating Curve

TR70M Derating Curve

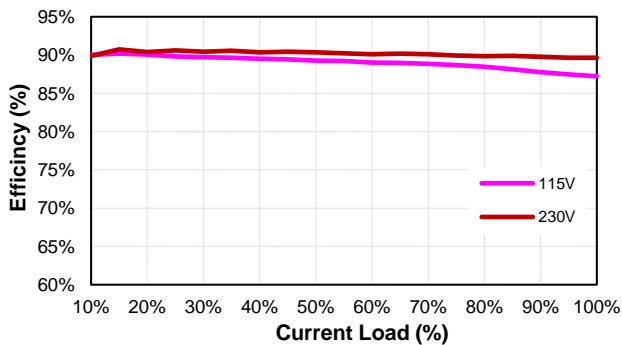


TR70M Input Voltage Derating Curve

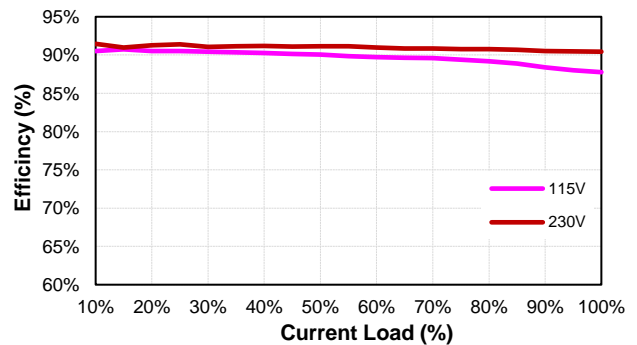


### Performance Data

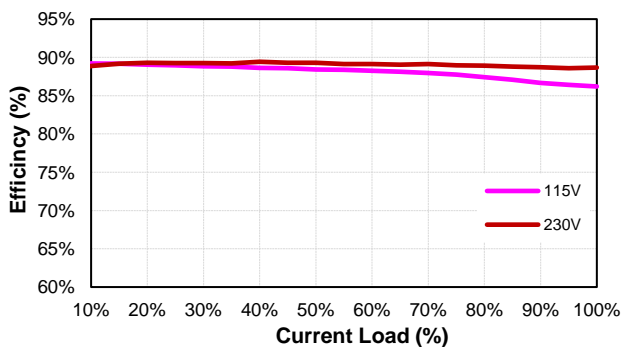
TR70M120 (Eff Vs Io)



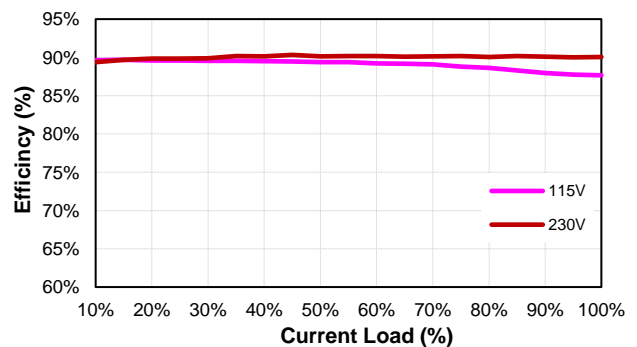
TR70M150 (Eff Vs Io)



TR70M180 (Eff Vs Io)



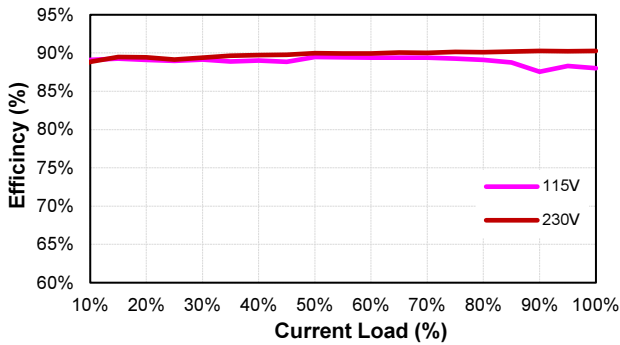
TR70M240 (Eff Vs Io)



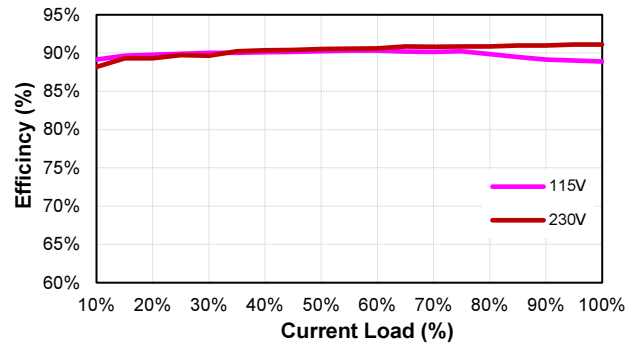


# TR70M Series

TR70M360 (Eff Vs Io)



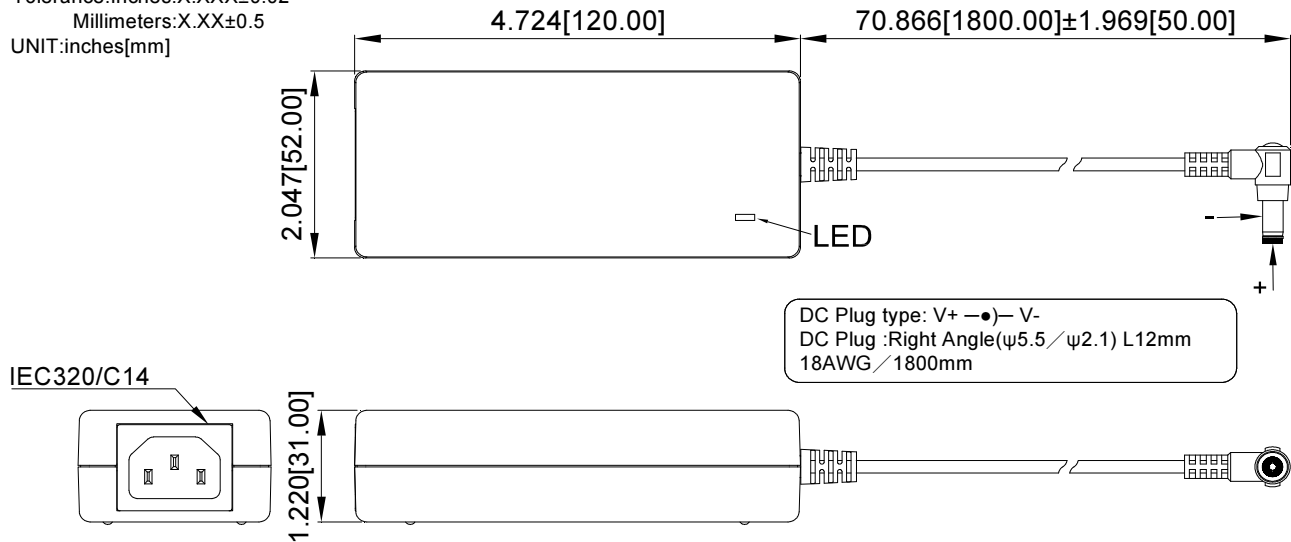
TR70M480 (Eff Vs Io)



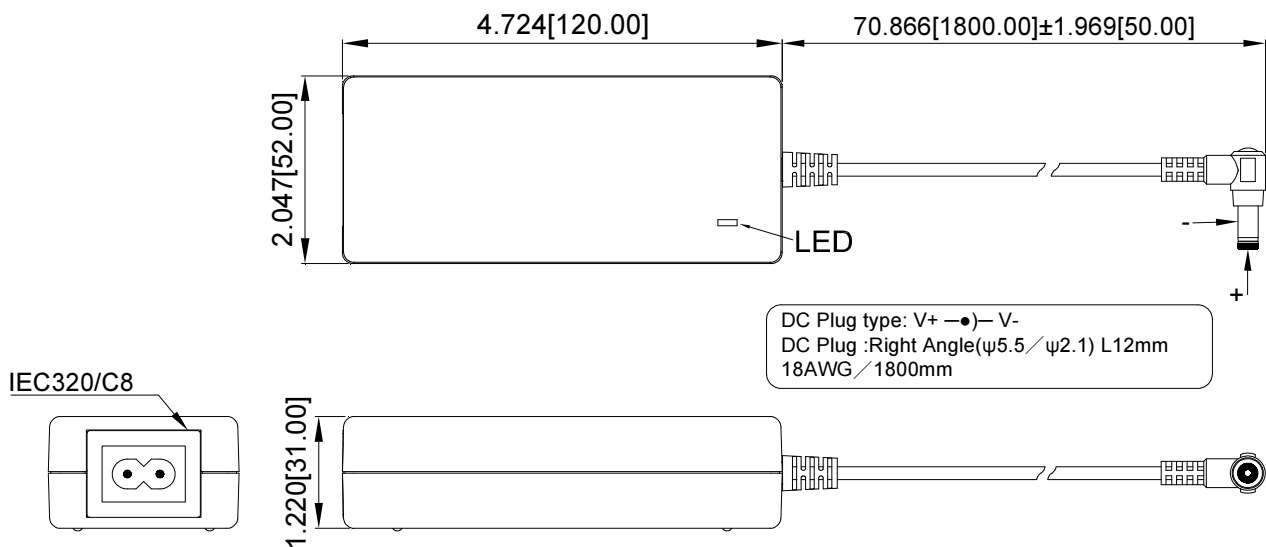
## MECHANICAL SPECIFICATION

All Dimensions are in inches(mm)  
 Tolerance: Inches: X.XXX±0.02  
 Millimeters: X.XX±0.5  
 UNIT: inches[mm]

### TR70MAXXX Series



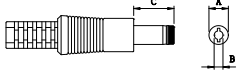
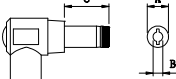
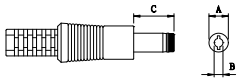
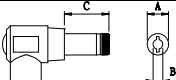
### TR70MBXXX Series





# TR70M Series

## Standard Output DC Plug

DC Plug Type	Cable Number-XXXXX	A	B	C	Cable Type	Cable Length	Cable AWG
		OD (mm)	ID (mm)	L (mm)			
 <p>Straight/Inner+Outer- + ● -</p>	11E02	Φ5.5	Φ2.1	12	UL1185	1220mm without Core	16AWG for Vo: 12V, 15V
	12E02	Φ5.5	Φ2.5	12			
	23E02	Φ5.5	Φ2.1	9.5			
	26E02	Φ5.5	Φ2.5	9.5			
 <p>Right Angle/Inner+Outer- + ● -</p>	01E02	Φ5.5	Φ2.1	12			
	02E02	Φ5.5	Φ2.5	12			
	21E02	Φ5.5	Φ2.5	9.5			
	24E02	Φ5.5	Φ2.1	9.5			
 <p>Straight/Inner+Outer- + ● -</p>	11E03	Φ5.5	Φ2.1	12	UL1185	1800mm without Core	16AWG for Vo: 18V 18AWG for Vo: 24V, 36V, 48V,
	12E03	Φ5.5	Φ2.5	12			
	23E03	Φ5.5	Φ2.1	9.5			
	26E03	Φ5.5	Φ2.5	9.5			
 <p>Right Angle/Inner+Outer- + ● -</p>	01E03	Φ5.5	Φ2.1	12			
	02E03	Φ5.5	Φ2.5	12			
	21E03	Φ5.5	Φ2.5	9.5			
	24E03	Φ5.5	Φ2.1	9.5			

※Other DC Plug Type please refer to the link: <https://www.cincon.com/productdownload/TR70M-cable--DC-Plug.pdf>

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