TR60M SERIES
60 WATT MEDICAL SWITCH ADAPTER

Features

- Universal Input Range 90~264Vac
- High Efficiency up to 88%
- Class II
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval EN 55011 and CISPR/FCC Class B
- Operating Altitude 3000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Meets CEC Level V (except 5V)

E252331

MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	RIPPLE & NOISE NOTE1	VOLTAGE ACCURACY NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TR60M05	5 V	6 A	50mV	±4%	±1%	±6%	75%
TR60M12	12 V	5 A	120mV	±2%	±1%	±5%	85%
TR60M15	15 V	4 A	150mV	±2%	±1%	±3%	87%
TR60M18	18 V	3.33 A	180mV	±2%	±1%	±2%	87%
TR60M19	19 V	3.15 A	190mV	±2%	±1%	±2%	87%
TR60M24	24 V	2.5 A	240mV	±2%	±1%	±2%	88%
TR60M36	36 V	1.66 A	360mV	±2%	±1%	±2%	88%
TR60M48	48 V	1.25 A	480mV	±2%	±1%	±2%	88%

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_{ac} to 240V_{ac} 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_{ac} and 75% full load at 25℃.

PART NUMBER

Series	Output Voltage	DC Plug Type	Cable Type	Cable Length
TR60M	XX	-XX	E	XX
60W Medical Adapter	05：5V 12：12V 15：15V 18：18V 19：19V 24：24V 36：36V 48：48V	See Page 7	E： UL1185 with OVP	01：720mm 02：1220mm 03：1800mm 11：720mm with Ferrite Core 12：1220mm with Ferrite Core 13：1800mm with Ferrite Core See page 7 for restrictions

Part Number Example:

TR60M12-01E01,60W, Class II, 12V_{dc} Output, DC Jack Type, Cable Length 720mm

TECHNICAL SPECIFICATIONS

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

ABSOLUTE MAXIMUM RATINGS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input Voltage	Safety approvals only to the AC input	All	90 120		264 370	V_{ac} V_{dc}
Operating Temperature	See Derating Curve	All	0		60	℃
Storage Temperature		All	-20		85	℃
Input/Output Isolation Voltage	1 minute	All			4000	V_{ac}
Operating Altitude		All			3000	m

INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Voltage Range		All	100		240	V_{ac}
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, V_{in}=100V_{ac}	All			1.5	A
Leakage Current (Touch)		All			100	uA
Under Voltage Protection		All	48		67	V_{ac}
Inrush Current	V_{in}=240V_{ac}, Cold start at 25℃	All			80	A

OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V_{in}=115V_{ac} and 230V_{ac}, I_o=60% Full load T_c=25℃	TR60M05 TR60M12 TR60M15 TR60M18 TR60M19 TR60M24 TR60M36 TR60M48	4.8 11.76 14.7 17.64 18.62 23.52 35.28 47.04	5 12 15 18 19 24 36 48	5.2 12.24 15.3 18.36 19.38 24.48 36.72 48.96	V_{dc}
Operating Output Current Range	V_{in}=115V_{ac} and 230V_{ac},T_c=25℃	TR60M05 TR60M12 TR60M15 TR60M18 TR60M19 TR60M24 TR60M36 TR60M48	0 0 0 0 0 0 0 0		6 5 4 3.33 3.15 2.5 1.66 1.25	A
Holdup Time	V_{in}=115V_{ac}	All		8		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TR60M05 TR60M12 TR60M15 TR60M18 TR60M19 TR60M24 TR60M36 TR60M48			±6% ±5% ±3% ±2% ±2% ±2% ±2% ±2%	%
Line Regulation	V_{in}=High line to low line, full load	All			±1.0	%

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Over Voltage Protection	TVS Component to clamp	TR60M05	6.45		7.6	V_{dc}
		TR60M12	14.3		16.2	
		TR60M15	17.1		19.3	
		TR60M18	20.9		23.5	
		TR60M19	20.9		23.5	
		TR60M24	28.5		31.9	
		TR60M36	40.9		45.6	
		TR60M48	53.2		59.2	
Over Current Protection	Auto recovery	All	150		180	%
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℃	TR60M05			50	mV
		TR60M12			120	
		TR60M15			150	
		TR60M18			180	
		TR60M19			190	
		TR60M24			240	
		TR60M36			360	
		TR60M48			480	
Load Capacitance	1. V_{in}=115V_{ac} and 230V_{ac} 2. Output is max. load 3. Ambient temperature=25℃	TR60M05			6000	uF
		TR60M12			5000	
		TR60M15			4000	
		TR60M18			3300	
		TR60M19			3150	
		TR60M24			2500	
		TR60M36			1660	
		TR60M48			1250	
Efficiency	1. V_{in}=230V_{ac} 2. Output is 75% full load 3. Ambient temperature=25℃	TR60M05		75		%
		TR60M12		85		
		TR60M15		87		
		TR60M18		87		
		TR60M19		87		
		TR60M24		88		
		TR60M36		88		
		TR60M48		88		

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 Minute (without dielectric breakdown)	All			4000	V_{ac}
Isolation Resistance		All	100			MΩ

FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency		All		100		kHz

GENERAL SPECIFICATIONS

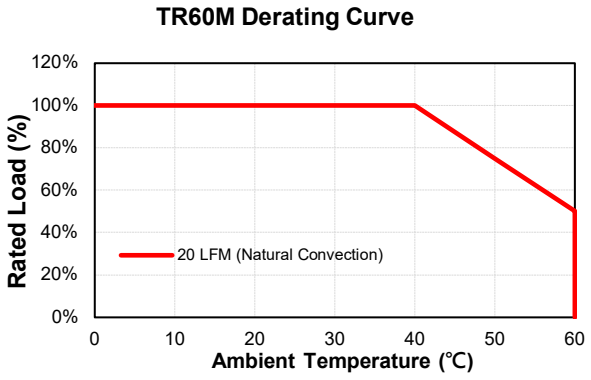
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	I_o=100%; T_a=25℃ per MIL-HDBK-217F	All	200			k hours
Humidity	Non-condensing	All			93	% RH
Shock	MIL-STD-810F Table 516.5,TABLE 516.5-I 10ms, each axis 3 times(±X、±Y、±Z axis)	All		75		g

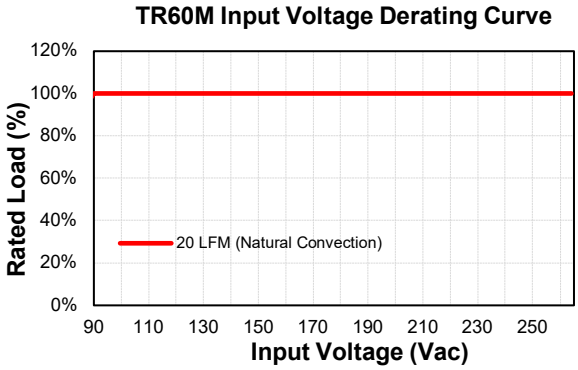
GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
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		345		grams
Dimension		All		5.197x2.283x1.201 inches (132.00x58.00x30.50 mm)		
Safety	Class II, IEC 60601-1:2005+A1+A2 EN 60601-1:2006+A1+A12+A2 ANSI/AAMI ES 60601-1:2005 & A1:2012 & A2:2021					Ed 3.2
EMC Emission	EN 55011:2016+A1:2017+A11:2020+A2+2021, EN 61000-3-2:2018, EN6100-3-3:2013+A1:2017, FCC CFR 47 Part 15					
Conducted Disturbance	EN 55011:2016+A1:2017+A11:2020+A2+2021, FCC CFR 47 Part 15					Class B
Radiated Disturbance	EN 55011:2016+A1:2017+A11:2020+A2+2021, FCC CFR 47 Part 15					Class B
Harmonic Current Emissions	IEC 61000-3-2:2018					Class A
Voltage Fluctuations & Flicker	EN 6100-3-3:2013+A1:2017					Criterion A
EMC Immunity	EN 60601-1-2:2015+A1:2021, IEC61000-4-2,3,4,5,6,8,11					Ed 4.1
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008 Air Discharge: ±15kV Contact Discharge: ±8kV					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2020					Criterion A
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, ±2kV					Criterion A
Surge	IEC 61000-4-5:2014+A1:2017, L-N: ±0.5kV,±1kV, ±2kV					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 61000-4-11:2020, Dips:30% reduction, Dips: >95% Reduction					Criterion A
Voltage Interruptions	IEC 61000-4-11:2020, >95% Reduction					Criterion B
Application Note Link	TR60M Series App Notes					

CHARACTERISTIC CURVE

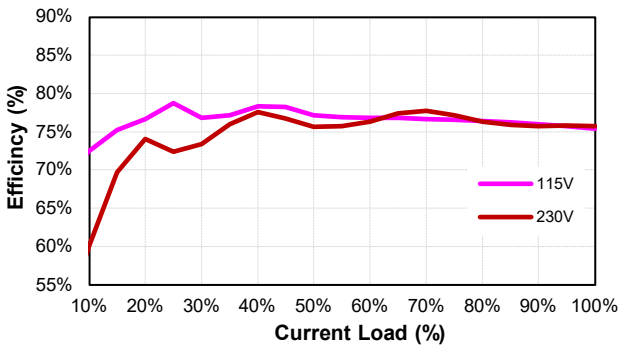
Power Derating Curve



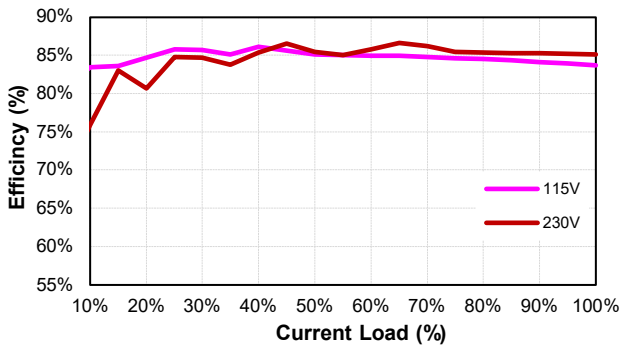


Performance Data

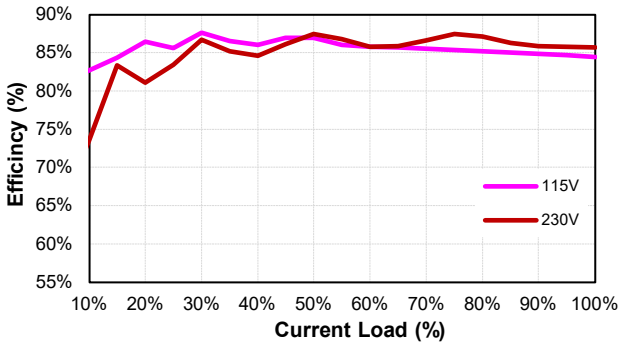
TR60M05 (Eff Vs Io)



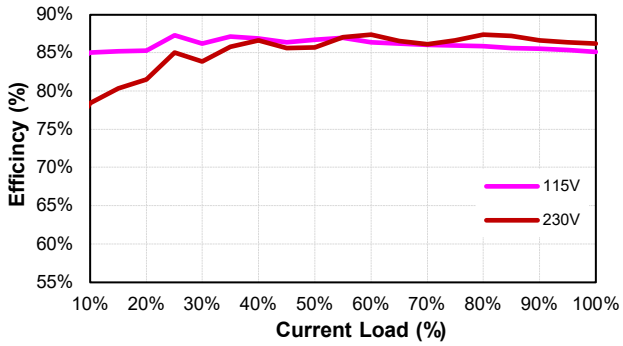
TR60M12 (Eff Vs Io)



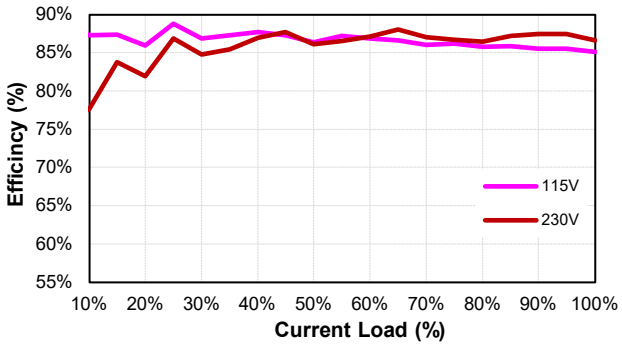
TR60M15 (Eff Vs Io)



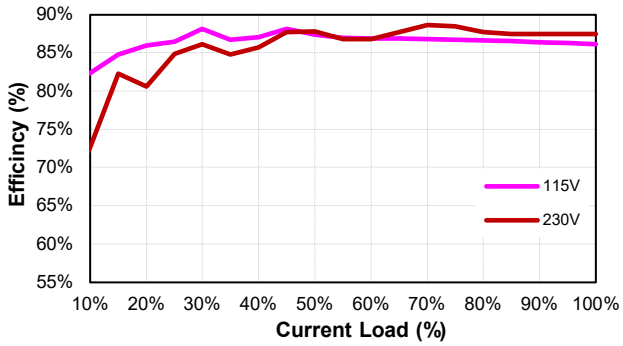
TR60M18 (Eff Vs Io)



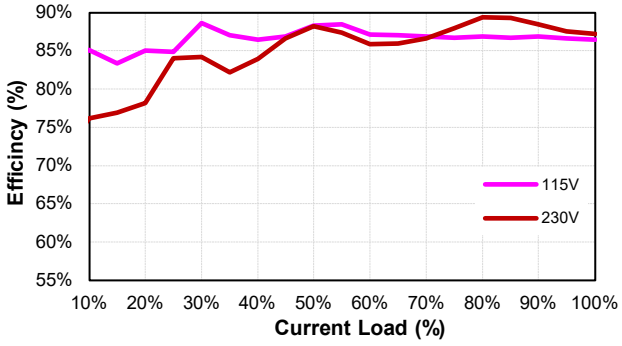
TR60M19 (Eff Vs Io)



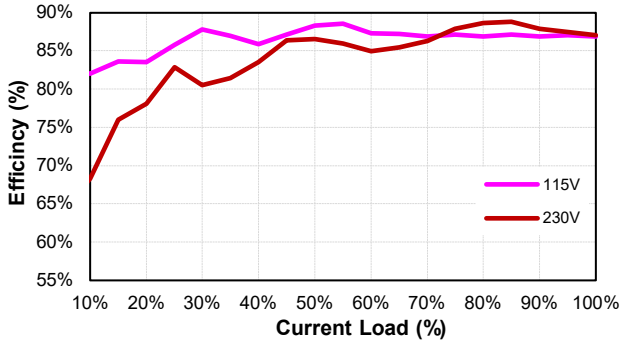
TR60M24 (Eff Vs Io)



TR60M36 (Eff Vs Io)

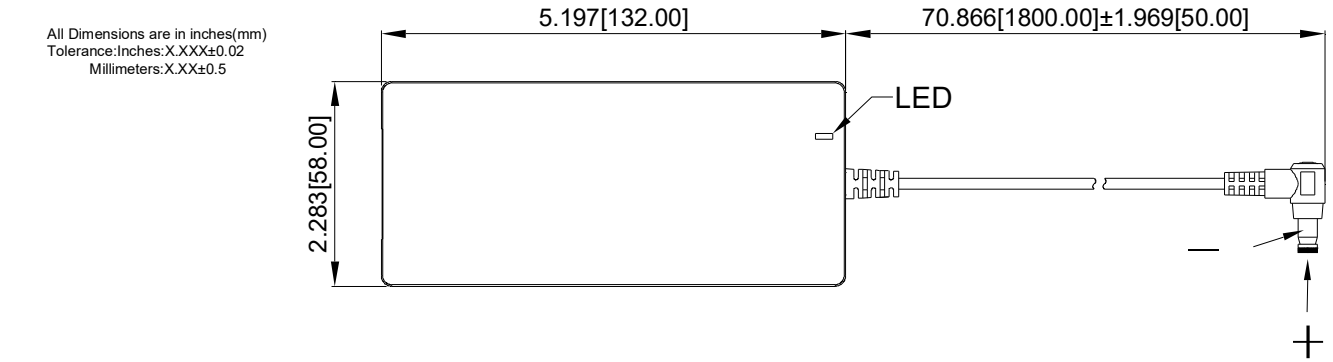


TR60M48 (Eff Vs Io)

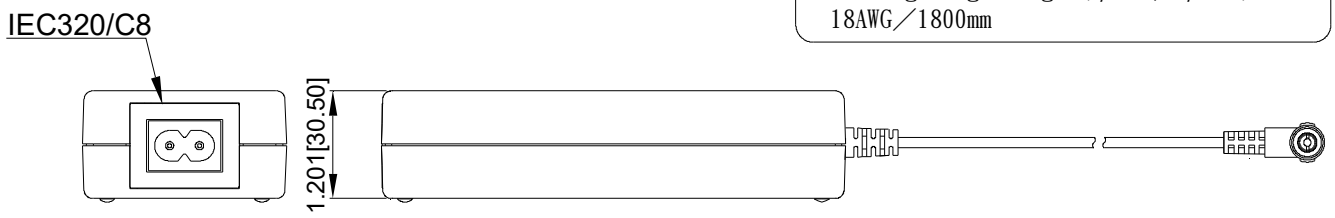


MECHANICAL SPECIFICATION

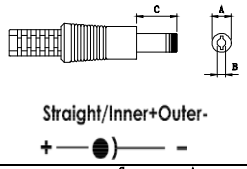
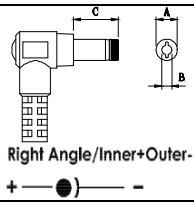
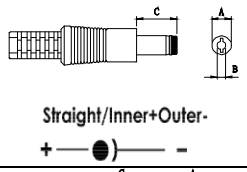
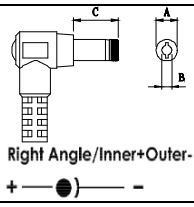
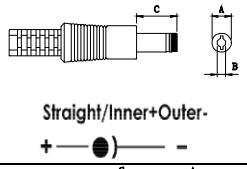
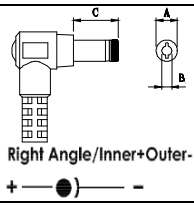
All Dimensions are in inches(mm)
Tolerance:Inches:X.XXX±0.02
Millimeters:X.XX±0.5



DC Plug type: V+ —●)— V-
DC Plug :Right Angle(φ5.5／φ2.1) L12mm
18AWG／1800mm



STANDARD OUTPUT DC PLUG

DC Plug Type	Cable Number-XXXXX	A OD (mm)	B ID (mm)	C L (mm)	Cable Type	Cable Length	Cable AWG
	11E01	Φ5.5	Φ2.1	12	UL1185	720mm without Core	16AWG for Vo: 5V, 12V
	12E01	Φ5.5	Φ2.5	12			
	23E01	Φ5.5	Φ2.1	9.5			
	26E01	Φ5.5	Φ2.5	9.5			
	01E01	Φ5.5	Φ2.1	12			
	02E01	Φ5.5	Φ2.5	12			
	21E01	Φ5.5	Φ2.5	9.5			
	24E01	Φ5.5	Φ2.1	9.5			
	11E02	Φ5.5	Φ2.1	12	UL1185	1220mm without Core	16AWG for Vo: 15V
	12E02	Φ5.5	Φ2.5	12			
	23E02	Φ5.5	Φ2.1	9.5			
	26E02	Φ5.5	Φ2.5	9.5			
	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			
	11E03	Φ5.5	Φ2.1	12	UL1185	1800mm without Core	16AWG for Vo: 18V, 19V 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			
	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/TR60M-cable-DC-plug.pdf

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