



# TR15RAM SERIES 15 WATT AC-DC MEDICAL INTERCHANGEABLE PLUG ADAPTER

## Features

- Universal Input Range 90~264Vac
- High Efficiency up to 82%
- Interchangeable AC Plugs
- Class II
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval EN55011, FCC 47 CFR Part 15 Class B
- Operating Altitude 3000m
- Over Voltage Protection
- Continuous Short Circuit Protection
- Meet ErP Level V



AC Plug Sold Separately



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	VOLTAGE ACCURACY NOTE1	RIPPLE & NOISE NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TR15RAM050	5 V	2 A	±3%	50 mV	±1%	±4%	75%
TR15RAM120	12 V	1.1 A	±2%	120 mV	±1%	±2%	81%
TR15RAM150	15 V	1 A	±2%	150 mV	±1%	±2%	82%
TR15RAM240	24 V	0.625 A	±2%	240 mV	±1%	±2%	80%

Note:

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

## PART NUMBER

Series	Output Voltage	AC Plug Type	DC Plug Type	Cable Type	Cable Length	Case Color
TR15RAM	XXX	-XXXX	-XX	X	XX	-XX-BK
15W Medical Adapter	050 : 5V 120 : 12V 150 : 15V 240 : 24V	Blank : Sold Separately ASUE : Include 4 Type AC Plug	See Page 6	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  <a href="#">See page 6 for restrictions</a>	BE-BK: Blue-Black GY-BK: Gray-Black RD-BK: Red-Black PE-BK: Purple-Black OR-BK: Orange-Black

Part Number Example:

**TR15RAM050-01E03-GY-BK**, 5V<sub>dc</sub> Output, DC Jack Type, Cable Length 1800mm, Case Color Gray-Black

**TR15RAM050-ASUE-01E03-GY-BK**, 5V<sub>dc</sub> Output, Include 4 Type AC Plug, DC Jack Type, Cable Length 1800mm, Case Color Gray-Black



# TR15RAM 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	90		264	V <sub>ac</sub>
				120		370
Operating Case Temperature	See Derating Curve	All	0		70	°C
Storage Temperature		All	-20		85	°C
Operating Altitude		All			3000	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% Full load, V <sub>in</sub> =100V <sub>ac</sub>	All			0.4	A
Leakage Current		All			100	uA
Inrush Current	V <sub>in</sub> =240V <sub>ac</sub> , Cold start at 25°C	All			50	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	TR15RAM050	4.85	5	5.15	V <sub>dc</sub>
		TR15RAM120	11.76	12	12.24	
		TR15RAM150	14.7	15	15.3	
		TR15RAM240	23.52	24	24.48	
Operating Output Current Range	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , T <sub>c</sub> =25°C	TR15RAM050			2	A
		TR15RAM120			1.1	
		TR15RAM150			1	
		TR15RAM240			0.625	
Holdup Time	V <sub>in</sub> =115V <sub>ac</sub>	All		10		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TR15RAM050			±4.0	%
		TR15RAM120			±2.0	
		TR15RAM150			±2.0	
		TR15RAM240			±2.0	
Line Regulation	V <sub>in</sub> =100V <sub>ac</sub> to 240V <sub>ac</sub>	All			±1.0	%
Over Voltage Protection	TVS Component to clamp	TR15RAM050			7.14	V <sub>dc</sub>
		TR15RAM120			15.8	
		TR15RAM150			18.9	
		TR15RAM240			31.5	
Over Current Protection	Auto recovery	All	110		160	%
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	TR15RAM050			50	mV
		TR15RAM120			120	
		TR15RAM150			150	
		TR15RAM240			240	
Load Capacitance	1. V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> 2. Output is max. load 3. Ambient temperature=25°C	TR15RAM050			2000	uF
		TR15RAM120			1100	
		TR15RAM150			1000	
		TR15RAM240			610	



# TR15RAM Series

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Efficiency	1. $V_{in}=230V_{ac}$ 2. Output is 75% full load 3. Ambient temperature= $25^{\circ}C$	TR15RAM050		75		%
		TR15RAM120		81		
		TR15RAM150		82		
		TR15RAM240		80		

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute	All			4000	$V_{ac}$
Isolation Resistance	Input to output	All	100			$M\Omega$

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency	Pout=max. rated power	All		95		kHz

## GENERAL SPECIFICATIONS

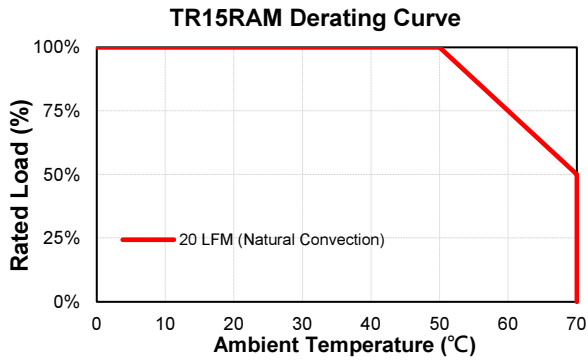
PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	$I_o=100\%$ ; $T_a=25^{\circ}C$ per MIL-HDBK-217F	All	200			k hours
Humidity	Non-condensing	All			93	% RH
Shock	Meet MIL-STD-810F Table 516.5, Table 516.5-1 10ms, each axis 3 times( $\pm X$ · $\pm Y$ · $\pm Z$ axis)	All		75		g
Vibration	Meet MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X · Y · Z axis, 1 hour (each axis), Total 3 hrs.	All		4		g
Weight		All		130		g
Dimensions		All	3.173x1.885x1.704 inches (80.60x47.90x43.30 mm)			
<b>Safety</b>	Class II, IEC 60601-1:2005+CORR.1:2006+CORR.2:2007+A1:2012 EN 60601-1:2006+A11:2011+A1:2013+A12:2014 ANSI/AAMI ES 60601-1:2005 (Ed.3.0)					Ed.3.1
<b>EMC Emission</b>	EN 55011:2009+A1:2010, Class B, EN 61000-3-2:2014 and EN 61000-3-3:2013, FCC 47 CFR Part 15					
Conducted Disturbance	EN 55011:2009+A1:2010, Class B, FCC 47 CFR Part 15					Class B
Radiated Disturbance	EN 55011:2009+A1:2010, Class B, FCC 47 CFR Part 15					Class B
Power Harmonics	EN 61000-3-2:2014					
Voltage Fluctuations	EN 61000-3-3:2013					
<b>EMC Immunity</b>	EN 60601-1-2:2015, IEC 61000-4-2, 3, 4, 5, 6, 8, 11					
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008, Air Discharge: $\pm 15kV$ , Contact Discharge: $\pm 8kV$					Criteria A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2010					Criteria A
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, $\pm 2kV$					Criteria A
Surge	IEC 61000-4-5:2014, L-N: $\pm 1kV$					Criteria A
Conducted disturbances, induced by RF fields	IEC 61000-4-6:2013					Criteria A
Power frequency magnetic field	IEC 61000-4-8:2009					Criteria A
Voltage dips	IEC 61000-4-11:2004, Dips: 30% reduction, Dips: 100% reduction					Criteria A
Voltage interruptions	IEC 61000-4-11:2004, 100% reduction					Criteria B
Application Note Link						<a href="#">TR15RAM Series App Notes</a>



# TR15RAM Series

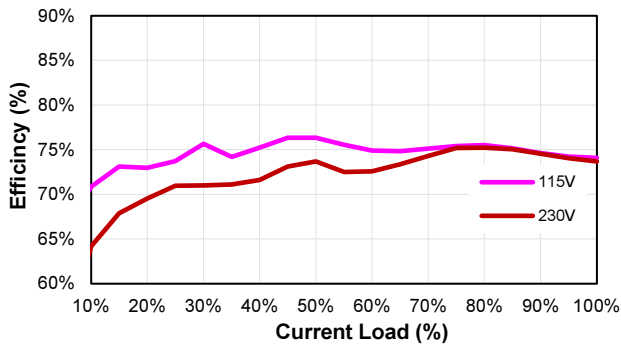
## CHARACTERISTIC CURVE

### Power Derating Curve

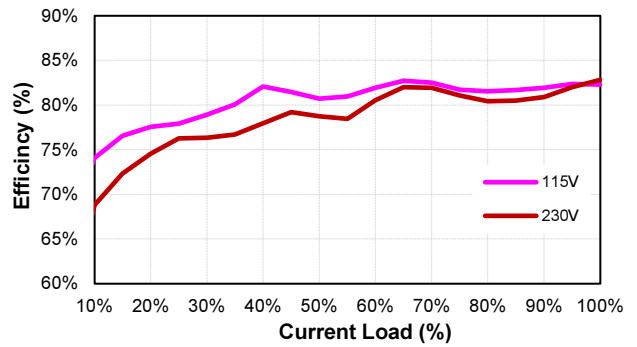


### Performance Data

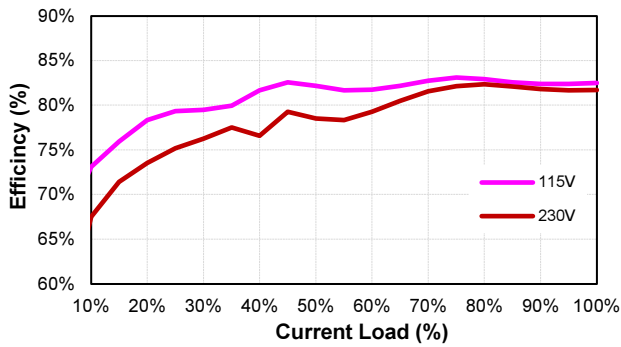
TR15RAM050 (Eff Vs Io)



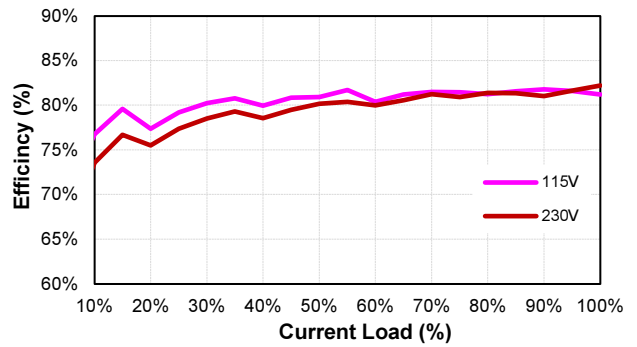
TR15RAM120 (Eff Vs Io)



TR15RAM150 (Eff Vs Io)



TR15RAM240 (Eff Vs Io)



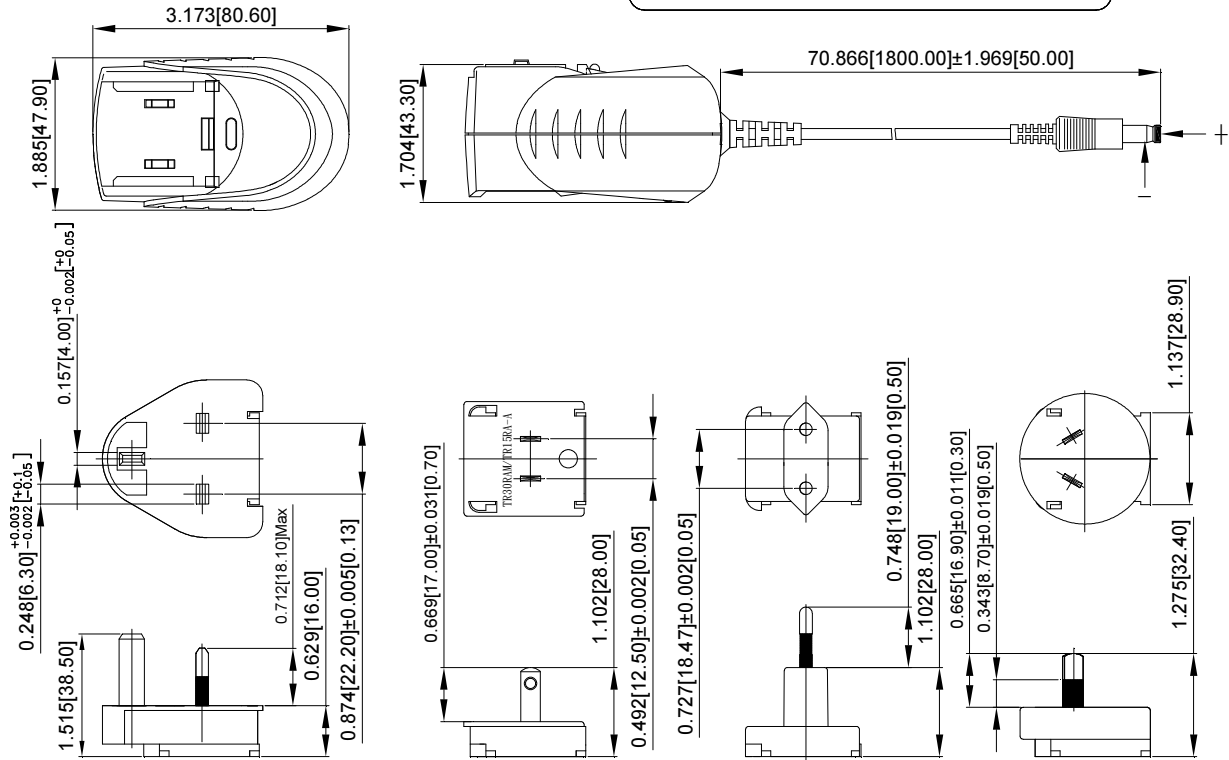


# TR15RAM Series

## 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 : Straight(φ5.5/φ2.1) L12mm  
 18AWG/1800mm



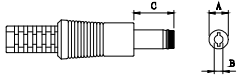
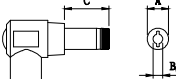
## INTERCHANGEABLE AC PLUG SPECIFICALLY for TR15RAM (SOLD SEPARATELY)

TYPE				
	U.K type (U)	American type (A)	European type (E)	Australian type (S)
ORDER NO.	AC PLUG RA-U	AC PLUG RA-A	AC PLUG RA-E	AC PLUG RA-S



# TR15RAM Series

## STANDARD OUTPUT 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>	11E03	Φ5.5	Φ2.1	12	UL1185	1800mm without Core	18AWG for Vo: 5V, 12V, 15V, 24V
	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/TR15RAM-cable-DC-Plug.pdf>