# TR30RDM SERIES
## 30 WATT AC-DC MEDICAL INTERCHANGEABLE PLUG ADAPTER

## Features

- Universal Input Range 80~264Vac
- High Efficiency up to 88%
- Interchangeable AC Plugs
- Leakage Current < 50uA
- Class II
- No Load Power Consumption < 75mW
- Approval IEC/EN/UL 60601-1 2 MOPP
- Approval EN60601-1-11 for Home Healthcare Applications
- Approval EN 55011, FCC 47 CFR Part 18 Class B
- Approval IP22
- Meets IEC/EN 60335-1
- Operating Altitude 5000m
- Over Voltage Protection
- Continuous Short Circuit Protection
- Meets CoC Tier 2 & DoE Level VI

AC Plug Sold Separately

E252331

| MODEL NUMBER | OUTPUT VOLTAGE | OUTPUT CURRENT | VOLTAGE ACCURACY NOTE1 | RIPPLE& NOISE NOTE2 | LINE REGULATION NOTE3 | LOAD REGULATION NOTE4 | %EFF. (Typ.) NOTE5 |
|---|---|---|---|---|---|---|---|
| TR30RDM050 | 5 V | 5 A | ±2% | 100 mV | ±1% | ±6% | 84% |
| TR30RDM090 | 9 V | 3.3 A | ±2% | 100 mV | ±1% | ±3% | 88% |
| TR30RDM120 | 12 V | 2.5 A | ±2% | 120 mV | ±1% | ±2% | 88% |
| TR30RDM150 | 15 V | 2.0 A | ±2% | 120 mV | ±1% | ±2% | 88% |
| TR30RDM180 | 18 V | 1.67 A | ±2% | 120 mV | ±1% | ±2% | 88% |
| TR30RDM240 | 24 V | 1.25 A | ±2% | 120 mV | ±1% | ±2% | 88% |

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 100$V_{ac}$ to 240$V_{ac}$ 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 $V_{ac}$ and 75% full load at 25℃.

## PART NUMBER

| Series | Output Voltage | AC Plug Type | DC Plug Type | Cable Type | Cable Length | Case Color |
|---|---|---|---|---|---|---|
| TR30RDM | XXX | -XXXX | -XX | X | XX | -XX-BK |
| 30W Medical Adapter | 050：5V<br>090：9V<br>120：12V<br>150：15V<br>180：18V<br>240：24V | Blank: Sold Separately<br>ASUE: Include 4 Type AC Plug | See Page 6 | G：UL1571 with OVP | 01：720mm<br>02：1220mm<br>03：1800mm<br>11：720mm with Ferrite Core<br>12：1220mm with Ferrite Core<br>13：1800mm with Ferrite Core<br>See page 6 for restrictions | BK-BK：Black-Black<br>BE-BK：Blue-Black |

Part Number Example:

**TR30RDM120-11G13-BK-BK**, 12$V_{dc}$ Output, DC Jack Type, Cable Length 1800mm with Ferrite Core, Case Color Black-Black

**TR30RDM120-ASUE-11G03-BE-BK**, 12$V_{dc}$ Output, Include 4 Type AC Plug, DC Jack Type, Cable Length 1800mm, Case Color Blue-Black

## 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 | See Derating Curve | All | 80 | | 264 | $V_{ac}$ |
| Operating Case Temperature | See Derating Curve | All | -25 | | 70 | ℃ |
| Storage Temperature | | All | -25 | | 85 | ℃ |
| Operating Altitude | | All | | | 5000 | 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% Full load, $V_{in}$=100$V_{ac}$ | All | | | 0.8 | A |
| Leakage Current | | All | | | 50 | uA |
| Inrush Current | $V_{in}$=240$V_{ac}$, Cold start at 25℃ | All | | 85 | | A |

### OUTPUT CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Output Voltage Set Point | $V_{in}$=115$V_{ac}$ and 230$V_{ac}$, $I_o$=60% Full load $T_c$=25℃ | TR30RDM050 | 4.90 | 5 | 5.10 | $V_{dc}$ |
| | | TR30RDM090 | 8.82 | 9 | 9.18 | |
| | | TR30RDM120 | 11.76 | 12 | 12.24 | |
| | | TR30RDM150 | 14.70 | 15 | 15.30 | |
| | | TR30RDM180 | 17.64 | 18 | 18.36 | |
| | | TR30RDM240 | 23.52 | 24 | 24.48 | |
| Operating Output Current Range | $V_{in}$=115$V_{ac}$ and 230$V_{ac}$, $T_c$=25℃ | TR30RDM050 | | | 5 | A |
| | | TR30RDM090 | | | 3.3 | |
| | | TR30RDM120 | | | 2.5 | |
| | | TR30RDM150 | | | 2.0 | |
| | | TR30RDM180 | | | 1.67 | |
| | | TR30RDM240 | | | 1.25 | |
| Holdup Time | $V_{in}$=115$V_{ac}$ | All | | 10 | | ms |
| Output Voltage Regulation | | | | | | |
| Load Regulation | 60%±40% Full load change | TR30RDM050 | | | ±6.0 | % |
| | | TR30RDM090 | | | ±3.0 | |
| | | TR30RDM120 | | | ±2.0 | |
| | | TR30RDM150 | | | ±2.0 | |
| | | TR30RDM180 | | | ±2.0 | |
| | | TR30RDM240 | | | ±2.0 | |
| Line Regulation | $V_{in}$=100$V_{ac}$ to 240$V_{ac}$ | All | | | ±1.0 | % |
| Over Voltage Protection | Latch Off | TR30RDM050 | | 7.44 | | $V_{dc}$ |
| | | TR30RDM090 | | 12.60 | | |
| | | TR30RDM120 | | 15.50 | | |
| | | TR30RDM150 | | 19.50 | | |
| | | TR30RDM180 | | 23.50 | | |
| | | TR30RDM240 | | 31.50 | | |
| Over Current Protection | Auto recovery | All | 110 | | 160 | % |
| Short Circuit Protection | Auto recovery | All | | | | |

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Output Ripple and Noise | 1. Add a 0.1uF ceramic capacitor and a 10uF aluminum electrolytic capacitor to output<br>2. Oscilloscope is 20MHz band width<br>3. Ambient temperature=25℃ | TR30RDM050 | | | 100 | mV |
| | | TR30RDM090 | | | 100 | |
| | | TR30RDM120 | | | 120 | |
| | | TR30RDM150 | | | 120 | |
| | | TR30RDM180 | | | 120 | |
| | | TR30RDM240 | | | 120 | |
| Load Capacitance | 1. $V_{in}$=115$V_{ac}$ and 230$V_{ac}$<br>2. Output is max. load<br>3. Ambient temperature=25℃ | TR30RDM050 | | | 5000 | uF |
| | | TR30RDM090 | | | 3300 | |
| | | TR30RDM120 | | | 2500 | |
| | | TR30RDM150 | | | 2000 | |
| | | TR30RDM180 | | | 1670 | |
| | | TR30RDM240 | | | 1250 | |
| Efficiency | 1. $V_{in}$=230$V_{ac}$<br>2. Output is 75% full load<br>3. Ambient temperature=25℃ | TR30RDM050 | | 84 | | % |
| | | TR30RDM090 | | 88 | | |
| | | TR30RDM120 | | 88 | | |
| | | TR30RDM150 | | 88 | | |
| | | TR30RDM180 | | 88 | | |
| | | TR30RDM240 | | 88 | | |

## 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 | | | MΩ |

## FEATURE CHARACTERISTICS

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| Switching Frequency | Pout=max. rated power | All | | 65 | | kHz |

## GENERAL SPECIFICATIONS

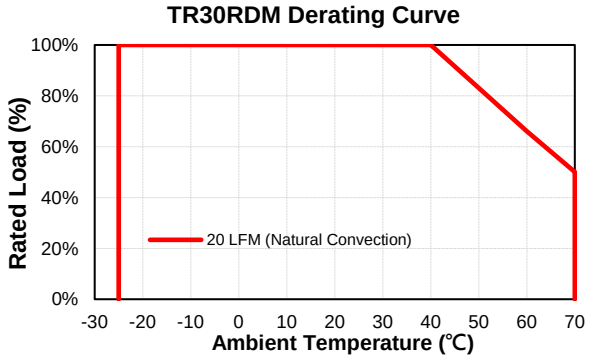
| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typ. | Max. | Units |
|---|---|---|---|---|---|---|
| MTBF | $I_o$=100%; $T_a$=25℃ per MIL-HDBK-217F | All | 380 | | | k hours |
| Humidity | Non-condensing | All | | | 93 | % RH |
| Shock | Meet MIL-STD-810F Table 516.5,Table 516.5-I 10ms, each axis 3 times(±X、±Y、±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 | | 170 | | g |
| Dimensions | | All | 3.807x2.283x1.703 inches (96.70x58.00x43.25 mm) | | | |
| **Safety** | Class II, IEC 60601-1:2005+CORR1:2006+CORR2:2007+A1:2012<br>EN 60601-1:2006+A11:2011+A1:2013+A12:2014<br>ANSI/AAMI ES 60601-1:2005/(R)2012+A1:2012, C1:2009/(R)2012+A2:2010/(R)2012<br>IEC/EN 60601-1-11:2015 for Home Healthcare Applications | | | | | Ed.3.1 |
| **EMC Emission** | EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, Class B, EN 61003-3:2013, FCC 47 CFR Part 18 | | | | | |
| Conducted Disturbance | EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, FCC 47 CFR Part 18 | | | | | Class B |
| Radiated Disturbance | EN 55011:2009+A1:2010, CISPR 11:2009+A1:2010, FCC 47 CFR Part 18 | | | | | Class B |
| Voltage Fluctuations & Flicker | EN 61000-3-3:2013 | | | | | |
| **EMC Immunity** | EN 60601-1-2:2015, IEC 61000-4-2, 3, 4, 5, 6, 8, 11 | | | | | Ed.4.0 |
| Electrostatic Discharge (ESD) | IEC 61000-4-2:2008, Air Discharge: ±15kV, Contact Discharge: ±8kV | | | | | Criteria A |
| Radio-Frequency, Continuous Radiated Disturbance | IEC 61000-4-3:2006+A1:2007+A2:2010 | | | | | Criteria A |

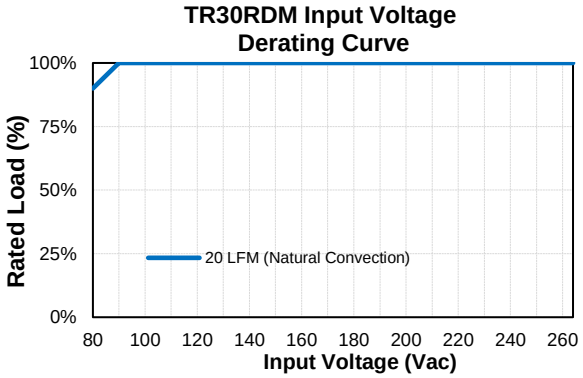
## GENERAL SPECIFICATIONS

| | | |
|---|---|---|
| Electrical Fast Transient (EFT) | IEC 61000-4-4:2012, ±2kV | Criteria A |
| Surge | IEC 61000-4-5:2014+A1:2017, L-N: ±0.5kV, ±1kV | Criteria A |
| Conducted disturbances, induced by RF fields | IEC 61000-4-6:2013+COR1:2015 | Criteria A |
| Power frequency magnetic field | IEC 61000-4-8:2009 | Criteria A |
| Voltage dips | IEC 61000-4-11:2004+A1:2017, Dips: 30% Reduction, Dips: >95% Reduction | Criteria A |
| Voltage interruptions | IEC 61000-4-11:2004+A1:2017, >95% reduction | Criteria B |
| Application Note Link | TR30RDM Series App Notes | |

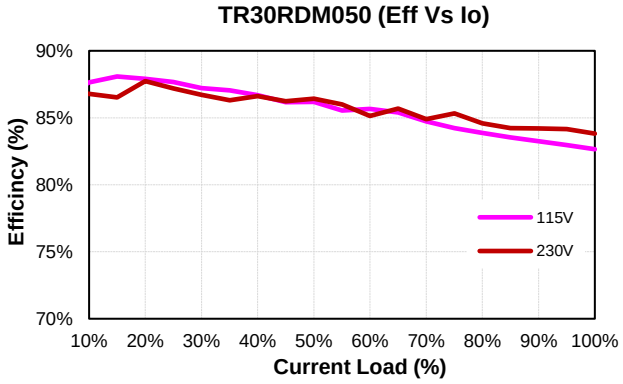
# CHARACTERISTIC CURVE

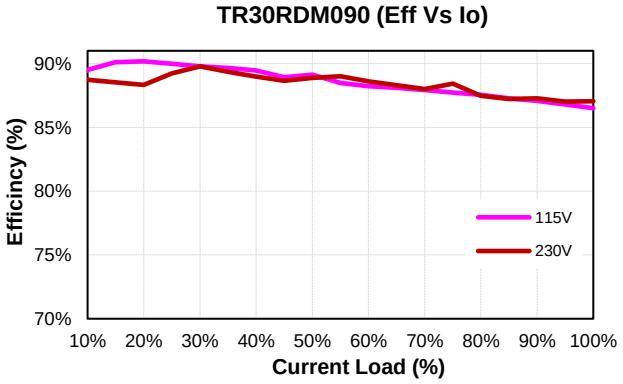
## Power Derating Curve

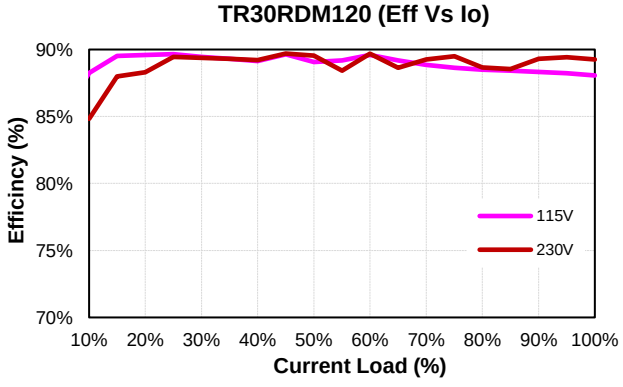


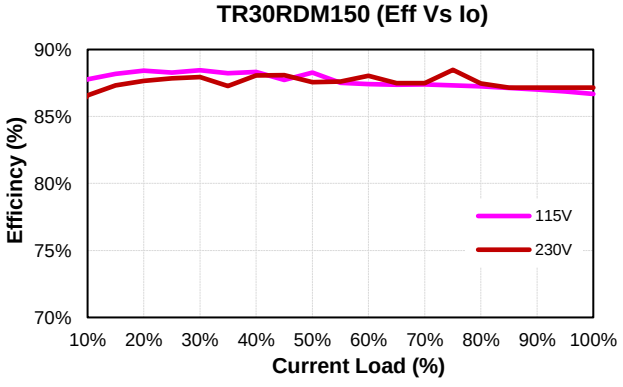




## Performance Data

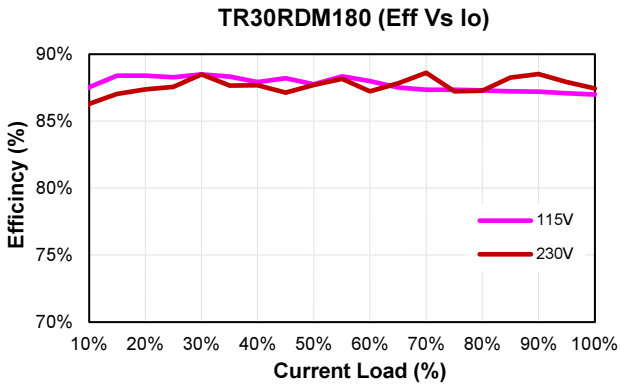


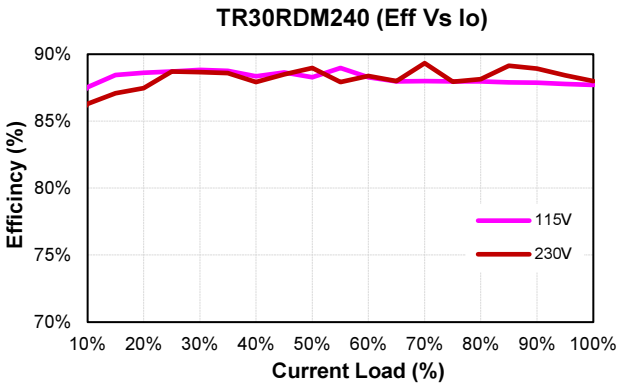



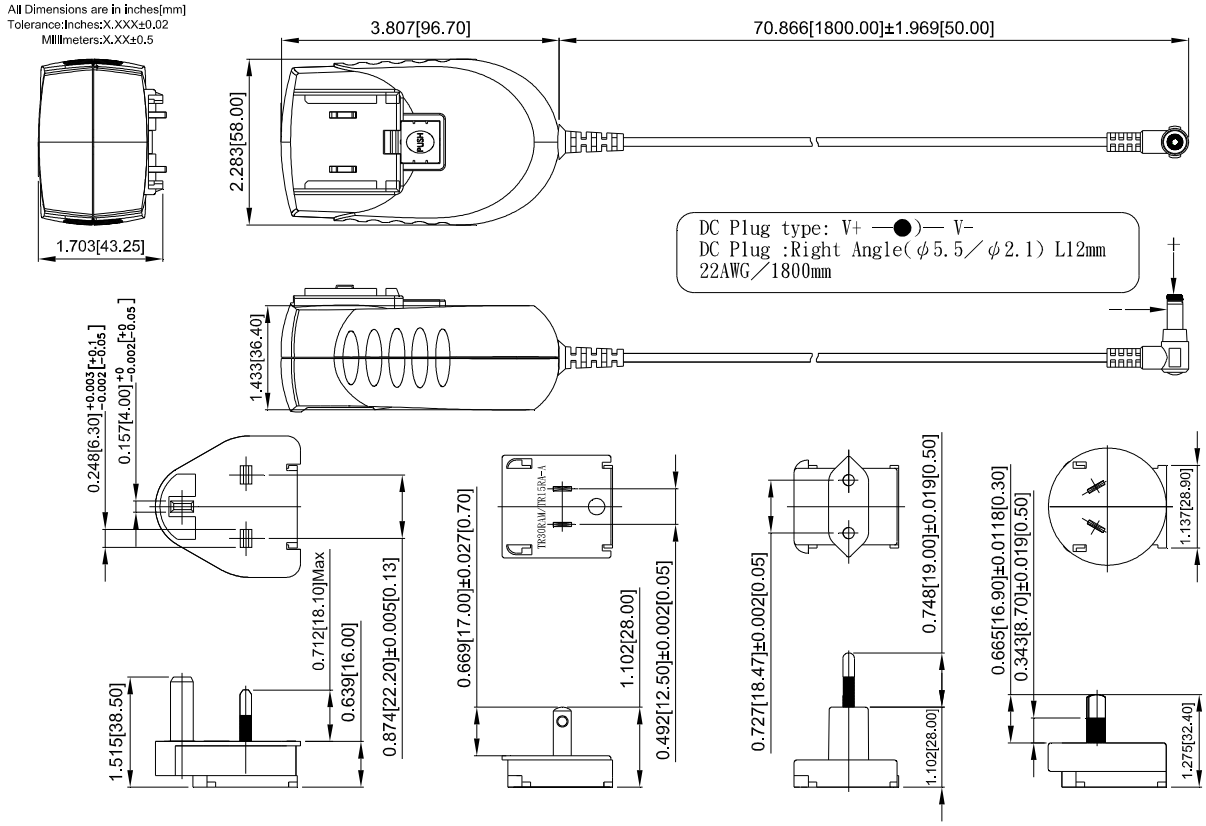



# TR30RDM Series

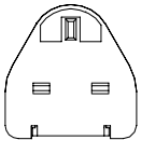
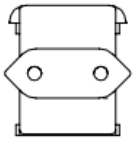
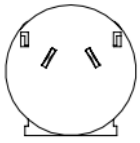


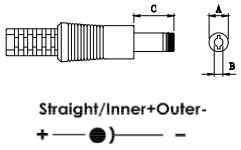
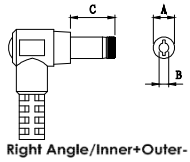
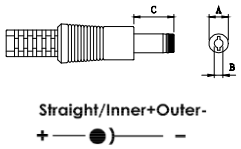
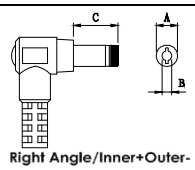

## MECHANICAL SPECIFICATION




## INTERCHANGEABLE AC PLUG SPECIFICALLY for TR30RDM (SOLD SEPARATELY)

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

## STANDARD OUTPUT PLUG

| DC Plug Type | Cable Number -XXXXX | A OD (mm) | B ID (mm) | C L (mm) | Cable Type | Cable Length | Cable AWG |
|---|---|---|---|---|---|---|---|
|  Straight/Inner+Outer- | 11G02 | Φ5.5 | Φ2.1 | 12 | UL1571 | 1220mm without Core | 16AWG for Vo: 5V |
| | 12G02 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23G02 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26G02 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  Right Angle/Inner+Outer- | 01G02 | Φ5.5 | Φ2.1 | 12 | | | |
| | 02G02 | Φ5.5 | Φ2.5 | 12 | | | |
| | 21G02 | Φ5.5 | Φ2.5 | 9.5 | | | |
| | 24G02 | Φ5.5 | Φ2.1 | 9.5 | | | |
|  Straight/Inner+Outer- | 11G03 | Φ5.5 | Φ2.1 | 12 | UL1571 | 1800mm without Core | 16AWG for Vo: 9V<br>18AWG for Vo: 12V, 15V<br>22AWG for Vo: 18V, 24V |
| | 12G03 | Φ5.5 | Φ2.5 | 12 | | | |
| | 23G03 | Φ5.5 | Φ2.1 | 9.5 | | | |
| | 26G03 | Φ5.5 | Φ2.5 | 9.5 | | | |
|  Right Angle/Inner+Outer- | 01G03 | Φ5.5 | Φ2.1 | 12 | | | |
| | 02G03 | Φ5.5 | Φ2.5 | 12 | | | |
| | 21G03 | Φ5.5 | Φ2.5 | 9.5 | | | |
| | 24G03 | Φ5.5 | Φ2.1 | 9.5 | | | |

※Other DC Plug Type please refer to the link: https://www.cincon.com/productdownload/TR30RDM-cable-DC-Plug.pdf

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# 30W AC-DC MEDICAL INTERCHANGEABLE PLUG ADAPTER TR30RDM Series APPLICATION NOTE

**Approved By:**

| Department | Approved By | Checked By | Written By |
|---|---|---|---|
| Research and Development Department | Enoch | Yang<br>Ovid | Su Shih Hang |
| Quality Assurance Department | Ryan | Benny | |

# TR30RDM Series

# Application Note V13

## Content

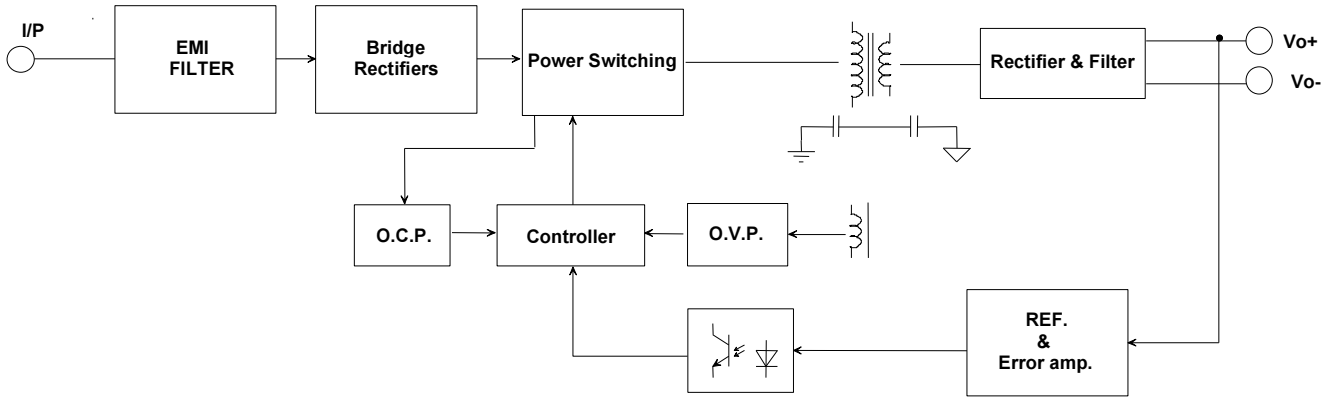
# TR30RDM Series

# Application Note V13

## 1. Introduction

This application note describes the features and functions of Cincon's TR30RDM series of adapter, switching AC-DC power. These are highly efficient, reliable, compact, high power density, single output AC/DC power. The power is fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program, ensure that the TR30RDM series power is extremely reliable.

## 2. Electrical Block Diagram



## 3. Main Features and Functions

### 3.1 Operating Temperature Range

The highly efficient design of Cincon’ s TR30RDM series power has resulted in their ability to operate within ambient temperature environments from -25℃ to 70℃. Due consideration must be given to the de-rating curves when ascertaining the maximum power that can be drawn from the power. The maximum power which can be drawn is influenced by a number of factors, such as:

- Input voltage range
- Permissible Output load (per derating curve)

### 3.2 Output Protection

All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. The power module will supply up to 110% - 160% of rated current. In the event of an over current converter will go into a hiccup mode protection.

## 4. Applications

### 4.1 Test Set-Up

The basic test set-up to measure parameters such as efficiency and load regulation is shown in Figure 1. When testing the Cincon’s TR30RDM series under any transient conditions, please ensure that the transient response of the source is sufficient to power the equipment under test. We can calculate the

- Efficiency
- Load regulation and line regulation.

The value of efficiency is defined as:

$$\eta = \frac{Vo \times Io}{Pin} \times 100\%$$

Where:

Vo is output voltage,
Io is output current,
Pin is input power

The value of load regulation is defined as:

$$Load\ reg. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

$V_{FL}$ is the output voltage at full load
$V_{NL}$ is the output voltage at 10% load

The value of line regulation is defined as:

$$Line\ reg. = \frac{V_{HL} - V_{LL}}{V_{LL}} \times 100\%$$

Where:

$V_{HL}$ is the output voltage of maximum input voltage at full load. $V_{LL}$ is the output voltage of minimum input voltage at full load.

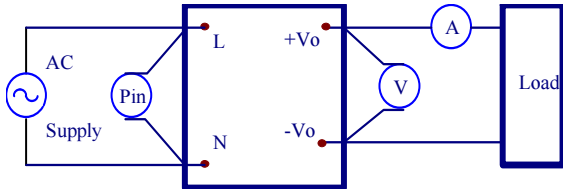



Figure 1. TR30RDM Series Test Setup

### 4.2 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2 Measured method:

Add a C1: 10uF electrolytic capacitor and a C2: 0.1uF ceramic capacitor to output at 20 MHz band width.

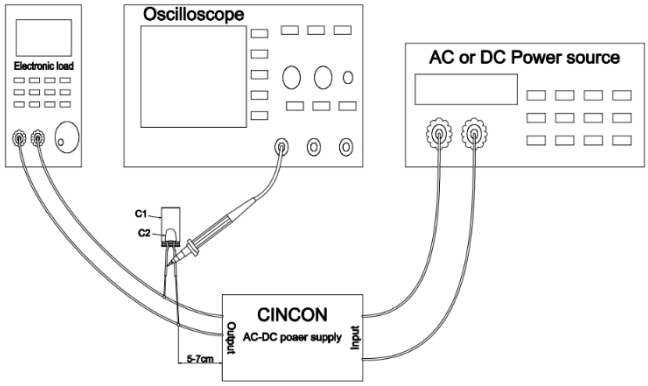
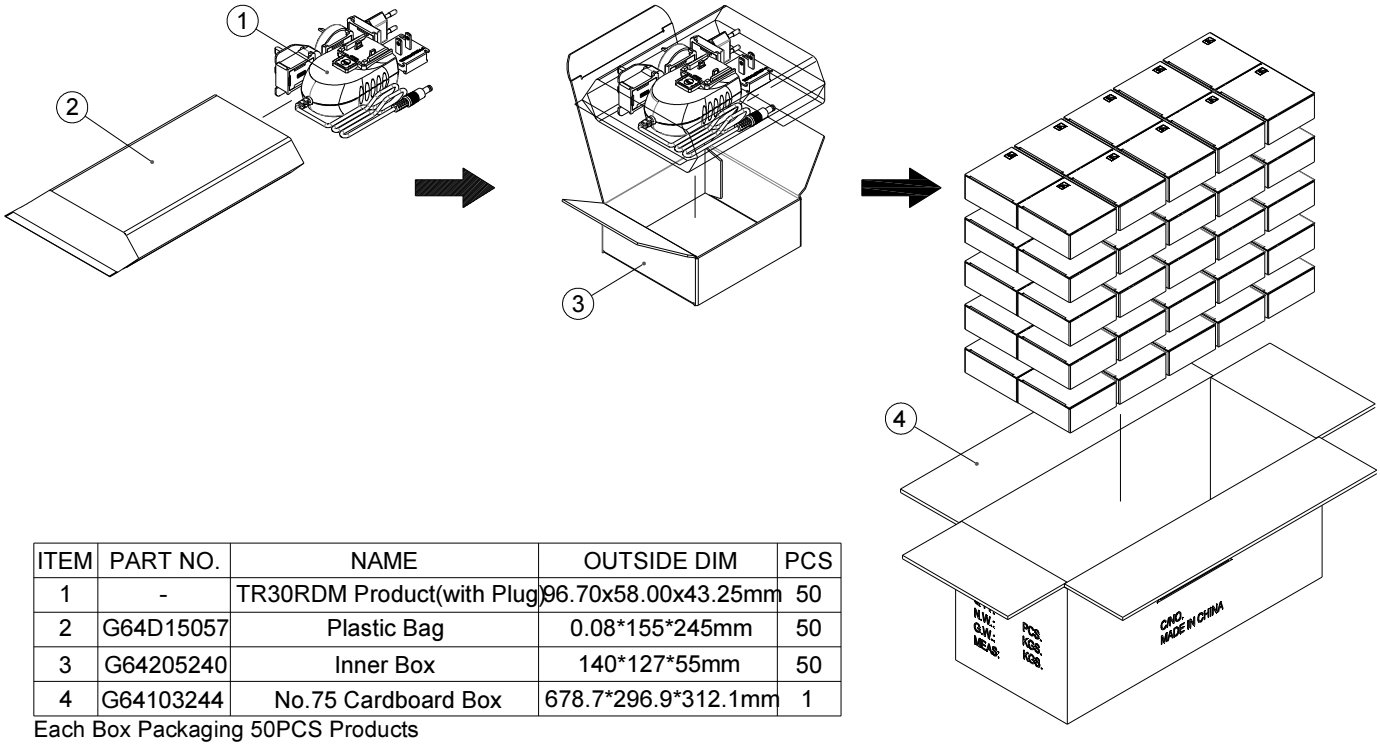



Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

## 5. Packing Information

The packing information for TR30RDM series is showing as follows:




| ITEM | PART NO. | NAME | OUTSIDE DIM | PCS |
|---|---|---|---|---|
| 1 | - | TR30RDM Product(with Plug) | 96.70x58.00x43.25mm | 50 |
| 2 | G64D15057 | Plastic Bag | 0.08*155*245mm | 50 |
| 3 | G64205240 | Inner Box | 140*127*55mm | 50 |
| 4 | G64103244 | No.75 Cardboard Box | 678.7*296.9*312.1mm | 1 |

Each Box Packaging 50PCS Products
Gross weight Ref. 12.0Kg

TR30RDM 50pcs a box, including the total weight of package material about 12.0Kg

**CINCON ELECTRONICS CO., LTD.**

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Fu Hsing Industrial Park
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