# AC-DC Switching ADAPTER
# TRG10R VI Series
# APPLICATION NOTE

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# TRG10R VI Series

# Application Note V12 September 2019

## Content

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## 1. Introduction

This application note describes the features and functions of Cincon's TRG10R VI 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 TRG10RVI series power is extremely reliable.

## 2. TRG10R VI Series Features

- Universal Input: 90~264Vac
- Continuous Short Circuit Protection
- Interchangeable AC Plugs
- EMI Meets EN55032 Class "B" and CISPR/FCC Class B
- Over Voltage Protection
- No Load Power Consumption<75mW
- Approved IEC/EN/UL62368-1
- Meet CoC V5 Tier 2 & DoE Level VI
  (Output Cable Length ≦ 1800mm)

## 3. 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. | Typical | Max. | Units |
| Input Voltage | | All | 90<br>120 | | 264<br>370 | Vac<br>Vdc |
| Operating Temperature | See derating curve | All | -20 | | +60 | ℃ |
| Storage Temperature | | All | -20 | | +85 | ℃ |
| Input/Output Isolation Voltage | | All | 4242 | | | Vdc |
| **INPUT CHARACTERISTICS** | | | | | | |
| Operating Voltage Range | | All | 100 | | 240 | Vac |
| Input Frequency Range | | All | 47 | | 63 | Hz |
| Maximum Input Current | 100% Load, Vin=100Vac | All | | | 0.4 | A |
| Leakage Current | | All | | | 250 | uA |
| Inrush Current | Vin=240Vac, cold start at 25℃ | All | | | 40 | A |
| **OUTPUT CHARACTERISTICS** | | | | | | |
| **PARAMETER** | **NOTES and CONDITIONS** | Device | Min. | Typical | Max. | Units |
| Output Voltage Set Point | Voltage setpoint at 60% full load. Tc=25℃ | TRG10R050<br>TRG10R059<br>TRG10R060<br>TRG10R075<br>TRG10R090<br>TRG10R120<br>TRG10R136<br>TRG10R150<br>TRG10R180<br>TRG10R240 | | 5<br>5.9<br>6.0<br>7.5<br>9<br>12<br>13.6<br>15<br>18<br>24 | | Vdc |
| Operating Output Current Range | | TRG10R050<br>TRG10R059<br>TRG10R060<br>TRG10R075<br>TRG10R090<br>TRG10R120<br>TRG10R136<br>TRG10R150<br>TRG10R180<br>TRG10R240 | | | 1.6<br>1.5<br>1.5<br>1.2<br>1.1<br>0.85<br>0.75<br>0.7<br>0.55<br>0.4 | A |
| Holdup Time | Vin=115Vac | All | | 10 | | ms |

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typical | Max. | Units |
|---|---|---|---|---|---|---|
| Output Voltage Regulation | | | | | | |
| Load Regulation | from 60% to full load and from 60% to 20% load | TRG10R050 | | | ±4 | % |
| | | TRG10R059 | | | ±3 | |
| | | TRG10R060 | | | ±3 | |
| | | TRG10R075 | | | ±3 | |
| | | TRG10R090 | | | ±2 | |
| | | TRG10R120 | | | ±2 | |
| | | TRG10R136 | | | ±2 | |
| | | TRG10R150 | | | ±2 | |
| | | TRG10R180 | | | ±2 | |
| | | TRG10R240 | | | ±2 | |
| Line Regulation | Vin=high line to low line,full load | All | | | ±1 | % |
| Over Voltage Protection | | TRG10R050 | 6.45 | | 7.54 | VDC |
| | | TRG10R059 | 7.13 | | 8.28 | |
| | | TRG10R060 | 7.13 | | 8.28 | |
| | | TRG10R075 | 10.5 | | 12.0 | |
| | | TRG10R090 | 11.4 | | 13.0 | |
| | | TRG10R120 | 14.3 | | 16.2 | |
| | | TRG10R136 | 14.3 | | 16.2 | |
| | | TRG10R150 | 17.1 | | 19.3 | |
| | | TRG10R180 | 20.9 | | 23.5 | |
| | | TRG10R240 | 25.7 | | 28.8 | |
| 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℃ | TRG10R050 | | | 50 | mVp-p |
| | | TRG10R059 | | | 60 | |
| | | TRG10R060 | | | 60 | |
| | | TRG10R075 | | | 75 | |
| | | TRG10R090 | | | 90 | |
| | | TRG10R120 | | | 120 | |
| | | TRG10R136 | | | 136 | |
| | | TRG10R150 | | | 150 | |
| | | TRG10R180 | | | 180 | |
| | | TRG10R240 | | | 240 | |
| Load Capacitance | 1. Ambient temperature=25℃<br>2. Input voltage is 115VAC and 230VAC<br>3. Output is max. load | TRG10R050 | | | 1600 | uF |
| | | TRG10R059 | | | 1500 | |
| | | TRG10R060 | | | 1500 | |
| | | TRG10R075 | | | 1200 | |
| | | TRG10R090 | | | 1100 | |
| | | TRG10R120 | | | 850 | |
| | | TRG10R136 | | | 750 | |
| | | TRG10R150 | | | 700 | |
| | | TRG10R180 | | | 550 | |
| | | TRG10R240 | | | 400 | |

| PARAMETER | NOTES and CONDITIONS | Device | Min. | Typical | Max. | Units |
|---|---|---|---|---|---|---|
| Average Efficiency | | TRG10R050 | 77.37 | | | % |
| | | TRG10R059 | 78.12 | | | |
| | | TRG10R060 | 81.57 | | | |
| | | TRG10R075 | 81.57 | | | |
| | | TRG10R090 | 82.14 | | | |
| | | TRG10R120 | 82.32 | | | |
| | | TRG10R136 | 82.32 | | | |
| | | TRG10R150 | 82.49 | | | |
| | | TRG10R180 | 82.14 | | | |
| | | TRG10R240 | 81.96 | | | |
| **ISOLATION CHARACTERISTICS** | | | | | | |
| **PARAMETER** | **NOTES and CONDITIONS** | Device | Min. | Typical | Max. | Units |
| Input to Output | 1 minute (without dielectric breakdown) | All | | | 4242 | Vdc |
| Isolation Resistance | | All | 100 | | | MΩ |
| **FEATURE CHARACTERISTICS** | | | | | | |
| **PARAMETER** | **NOTES and CONDITIONS** | Device | Min. | Typical | Max. | Units |
| Switching Frequency | | All | | 65 | | KHz |
| **GENERAL SPECIFICATIONS** | | | | | | |
| **PARAMETER** | **NOTES and CONDITIONS** | Device | Min. | Typical | Max. | Units |
| MTBF | Vin=115Vac , Io=100%; Ta=25℃ per MIL-HDBK-217F | All | 200 | | | K hours |
| Weight | | All | | 130 | | g |

# 4. Main Features and Functions

## 4.1 Operating Temperature Range

The highly efficient design of Cincon's TRG10R VI series power has resulted in their ability to operate within ambient temperature environments from -20$^0$C to 40$^0$C. 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)
- Effective heat sinks

## 4.2 Over Current Protection

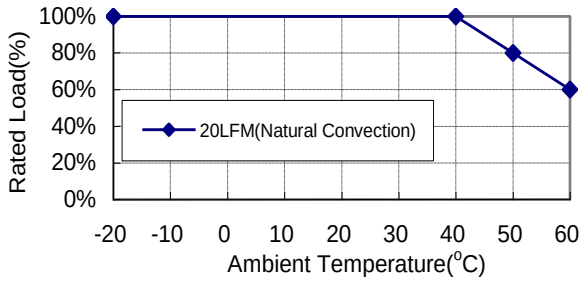
All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. The power module will supply up to 140% of rated current. In the event of an over current converter will go into a hiccup mode protection

# 5. EMC & Safety

- CB IEC 62368-1/60950-1
- TUV EN 62368-1/60950-1
- UL UL62368-1/60950-1
- CE EN55032 Class B, FCC Part 15 Class B,
  EN61000-6-3, EN61000-3-2, EN61000-3-3
  EN55024, EN61204-3, EN61000-6-1

# 6. Applications

## 6.1 Power De-Rating Curve




## 6.2 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 TRG10R VI 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.

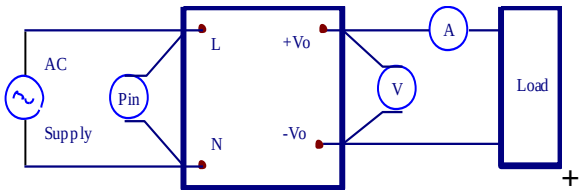



Figure 1 TRG10R VI Series Test Setup

## 6.3 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2. Measured method:
Add a 0.1 uF ceramic capacitor and a 10 uF electrolytic capacitor to output at 20 MHz Band Width.

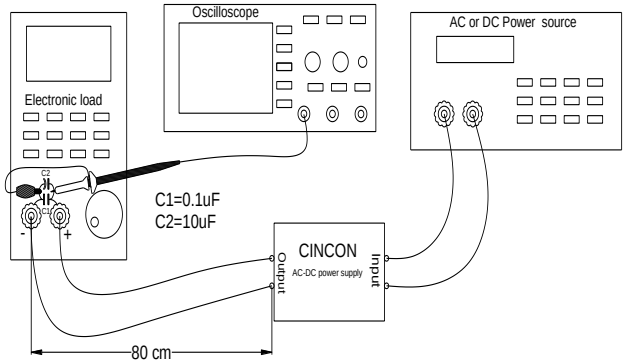



Figure 2 Output Voltage Ripple and Noise Measurement Set-Up

# 7. Part Number

TRG XX R XXX

- 050：Output Voltage 5 VDC
- 059：Output Voltage 5.9 VDC
- 060：Output Voltage 6 VDC
- 075：Output Voltage 7.5 VDC
- 090：Output Voltage 9 VDC
- 120：Output Voltage 12 VDC
- 136：Output Voltage 13.6 VDC
- 150：Output Voltage 15 VDC
- 180：Output Voltage 18 VDC
- 240：Output Voltage 24 VDC

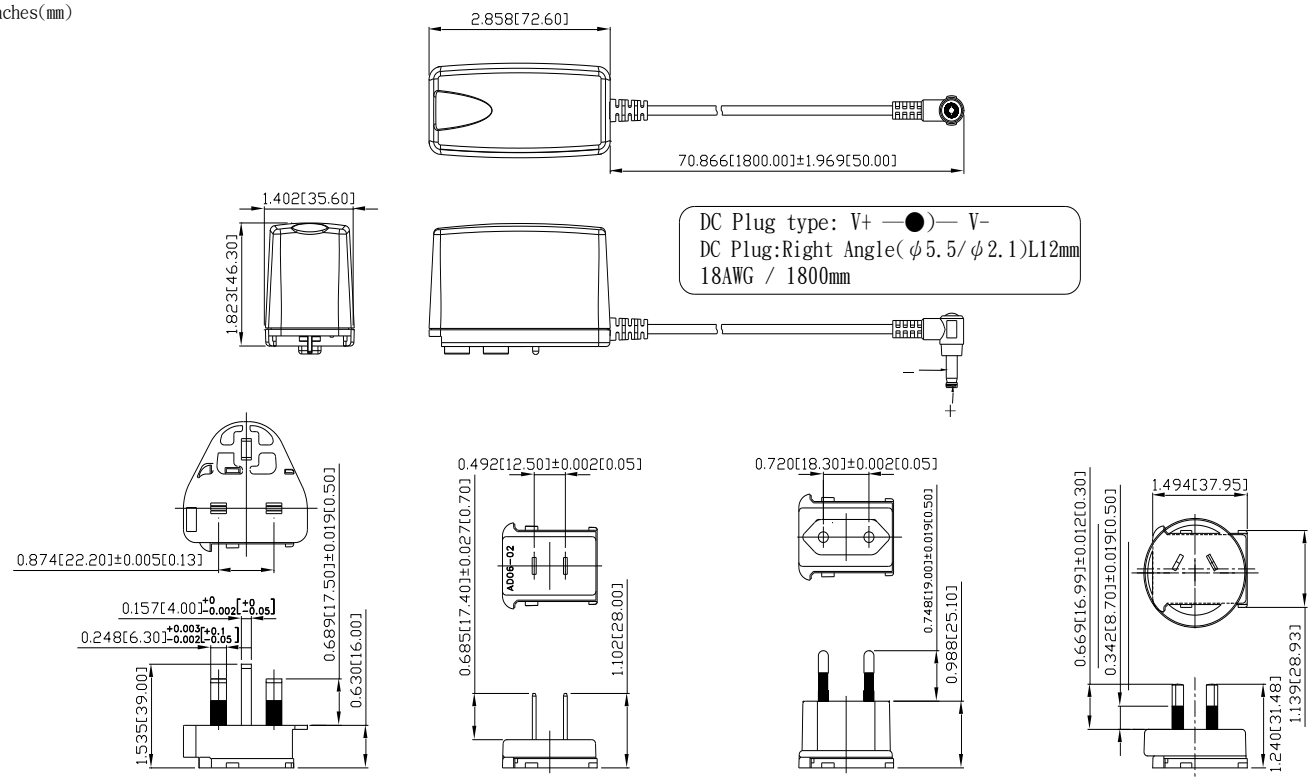
XX: Interchangeable AC Plugs

R: 10：Supply Max. Power

TRG: TR SERIES

# 8. TRG10R Series Mechanical Outline Diagrams

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



# 9. Order Information

**TRG10RXXX- XX E XX**

**Model No.** **DC Plug Type** **DC Cable Length and Type**

**01: 720mm**
**02: 1220mm**
**03: 1800mm**
**11: 720mm with Ferrite Core**
**12: 1220mm with Ferrite Core**
**13: 1800mm with Ferrite Core**

* 18AWG / UL1185 for Vo: 5V, 5.9V, 6V, 7.5V, 9V
* 20AWG / UL1185 for Vo: 12V, 13.6V
* 22AWG / UL1185 for Vo: 15V, 18V
* 24AWG / UL1185 for Vo: 24V

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