



# TR36M Series Application Note V14

## 36W AC-DC MEDICAL SWITCHING ADAPTER TR36M Series APPLICATION NOTE



**Approved By:**

Department	Approved By	Checked By	Written By
Research and Development Department	Ovid	Yang/Shih Hang	Joyce
Design Quality Department	Benny	JoJo	



# TR36M Series

## Application Note V14

---



# TR36M Series

## Application Note V14

---

### Content

<b>1. INTRODUCTION</b>	<b>4</b>
<b>2. ELECTRICAL BLOCK DIAGRAM</b>	<b>4</b>
<b>3. MAIN FEATURES AND FUNCTIONS</b>	<b>5</b>
3.1 <i>Operating Temperature Range</i>	5
3.2 <i>Output Current Protection</i>	5
<b>4. APPLICATIONS</b>	<b>5</b>
4.1 <i>Test Set-Up</i>	5
4.2 <i>Output Ripple and Noise Measurement</i>	5
<b>5. PACKING INFORMATION</b>	<b>6</b>



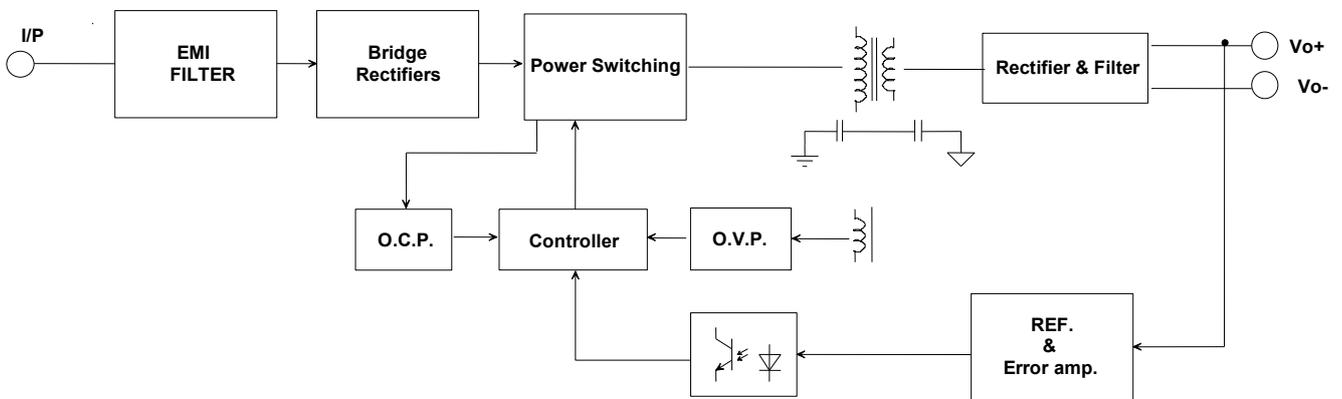
# TR36M Series

## Application Note V14

### 1. Introduction

This application note describes the features and functions of Cincon's TR36M 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 TR36M series power is extremely reliable.

### 2. Electrical Block Diagram





# TR36M Series

## Application Note V14

### 3. Main Features and Functions

#### 3.1 Operating Temperature Range

The highly efficient design of Cincon's TR36M series power has resulted in their ability to operate within ambient temperature environments from -30°C to 60°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)

#### 3.2 Output 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 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 TR36M 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:

$$\eta = \frac{V_o \times I_o}{P_{in}} \times 100\%$$

Where:

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

The value of load regulation is defined as:

$$Load\ reg1. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

- V<sub>FL</sub> is the output voltage at 100% full load
- V<sub>NL</sub> is the output voltage at 60% full load

$$Load\ reg2. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

- V<sub>FL</sub> is the output voltage at 60% full load
- V<sub>NL</sub> is the output voltage at 20% full load

The value of line regulation is defined as:

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

Where:

- V<sub>HL</sub> is the output voltage of maximum input voltage at 100% full load
- V<sub>LL</sub> is the output voltage of minimum input voltage at 100% full load

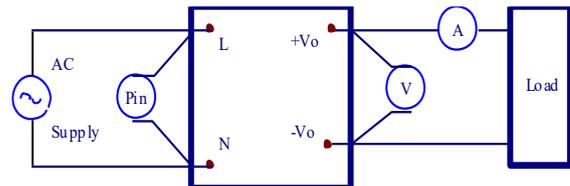


Figure 1. TR36M Series Test Setup

#### 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.

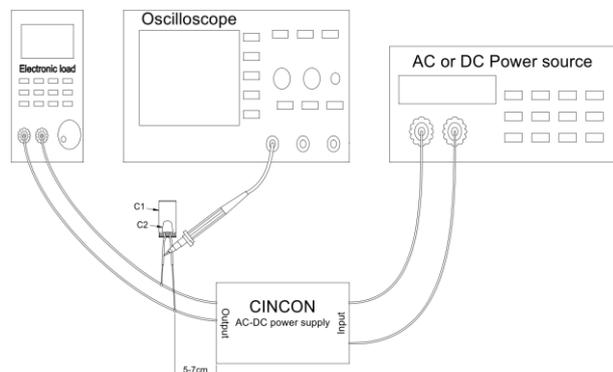


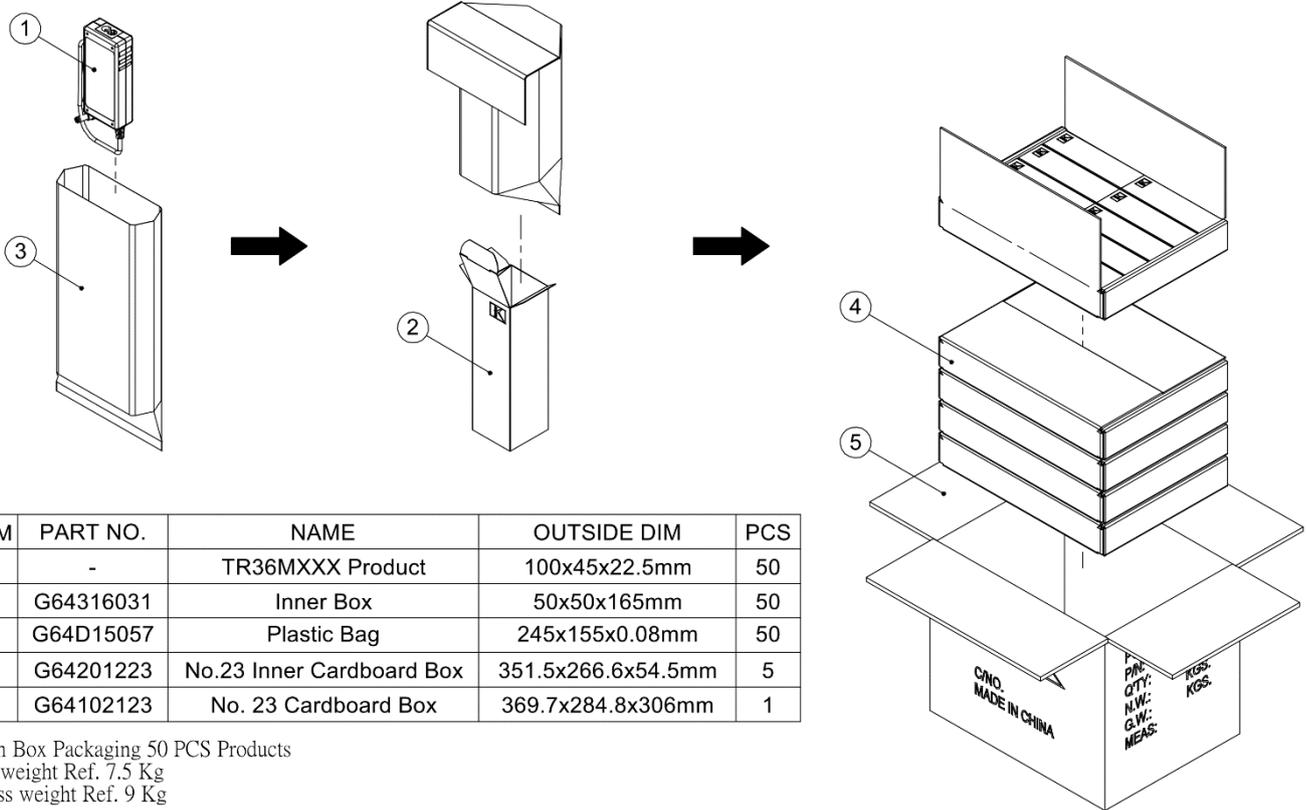
Figure 2. Output Voltage Ripple and Noise Measurement Set-Up



# TR36M Series Application Note V14

## 5. Packing Information

The packing information for TR36M series is showing as follows:



### Headquarters:

14F, No.306, Sec.4, Hsin Yi Rd.  
 Taipei, Taiwan  
 Tel: 886-2-27086210  
 Fax: 886-2-27029852  
 E-mail: [sales@cincon.com.tw](mailto:sales@cincon.com.tw)  
 Web Site: <https://www.cincon.com>

### CINCON ELECTRONICS CO., LTD.

#### Factory:

No. 8-1, Fu Kung Rd.  
 Fu Hsing Industrial Park  
 Fu Hsing Hsiang,  
 Chang Hua Hsien, Taiwan  
 Tel: 886-4-7690261  
 Fax: 886-4-7698031

#### Cincon North America:

1655 Mesa Verde Ave. Ste 180  
 Ventura, CA 93003  
 Tel: 805-639-3350  
 Fax: 805-639-4101  
 E-mail: [info@cincon.com](mailto:info@cincon.com)



# TR36M Series

## Application Note V14

---

### Revision History

Revision Version	Date	Change Description	Signature
V10	2018/06/13	New Release	Pei chun
V11	2018/08/23	Modify 2. TR36M Series Features	Joyce
V12	2019/04/12	Modify 4. Technical Specification Operating/Storage Temperature $-20^{\circ}\text{C} \rightarrow -30^{\circ}\text{C}$ , 5.1 Operating Temperature Range $-20^{\circ}\text{C} \rightarrow -30^{\circ}\text{C}$ , 9. Part Number Add 4. Technical Specification DC Input Voltage	Joyce
V13	2021/06/15	Modify New Format	Pei chun
V14	2024/01/23	Modify 4.1 Test Set-Up Line/Load Regulation Formula, Change to Product Picture	Joyce



# TR36M Series

## Application Note V14

---

### Content

<b>1. INTRODUCTION</b>	<b>3</b>
<b>2. ELECTRICAL BLOCK DIAGRAM</b>	<b>3</b>
<b>3. MAIN FEATURES AND FUNCTIONS</b>	<b>4</b>
3.1 <i>Operating Temperature Range</i>	4
3.2 <i>Output Current Protection</i>	4
<b>4. APPLICATIONS</b>	<b>4</b>
4.1 <i>Test Set-Up</i>	4
4.2 <i>Output Ripple and Noise Measurement</i>	4
<b>5. PACKING INFORMATION</b>	<b>5</b>



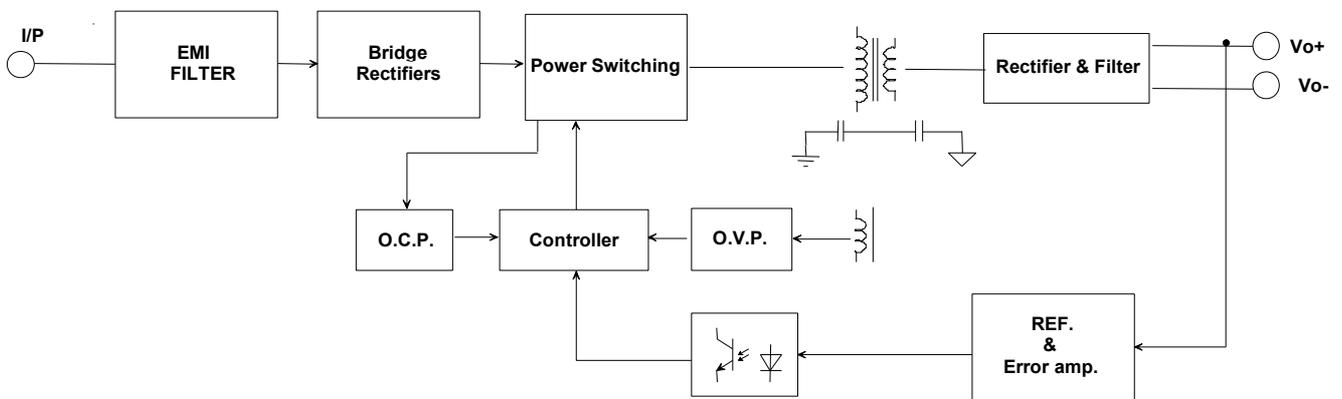
# TR36M Series

## Application Note V14

### 1. Introduction

This application note describes the features and functions of Cincon's TR36M 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 TR36M series power is extremely reliable.

### 2. Electrical Block Diagram





# TR36M Series

## Application Note V14

### 3. Main Features and Functions

#### 3.1 Operating Temperature Range

The highly efficient design of Cincon's TR36M series power has resulted in their ability to operate within ambient temperature environments from -30°C to 60°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)

#### 3.2 Output 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 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 TR36M 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:

$$\eta = \frac{V_o \times I_o}{P_{in}} \times 100\%$$

Where:

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

The value of load regulation is defined as:

$$Load\ reg1. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

- V<sub>FL</sub> is the output voltage at 100% full load
- V<sub>NL</sub> is the output voltage at 60% full load

$$Load\ reg2. = \frac{V_{FL} - V_{NL}}{V_{NL}} \times 100\%$$

Where:

- V<sub>FL</sub> is the output voltage at 60% full load
- V<sub>NL</sub> is the output voltage at 20% full load

The value of line regulation is defined as:

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

Where:

- V<sub>HL</sub> is the output voltage of maximum input voltage at 100% full load
- V<sub>LL</sub> is the output voltage of minimum input voltage at 100% full load

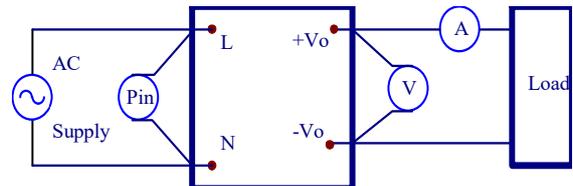


Figure 1. TR36M Series Test Setup

#### 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.

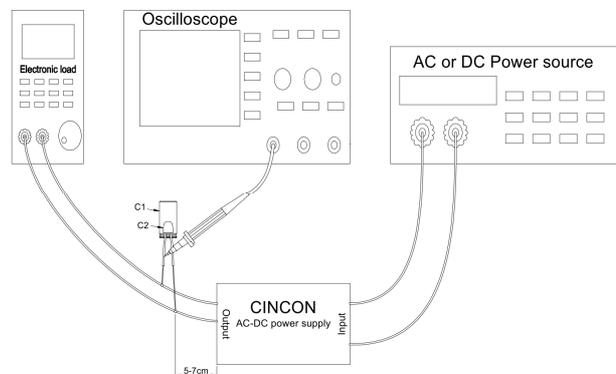


Figure 2. Output Voltage Ripple and Noise Measurement Set-Up

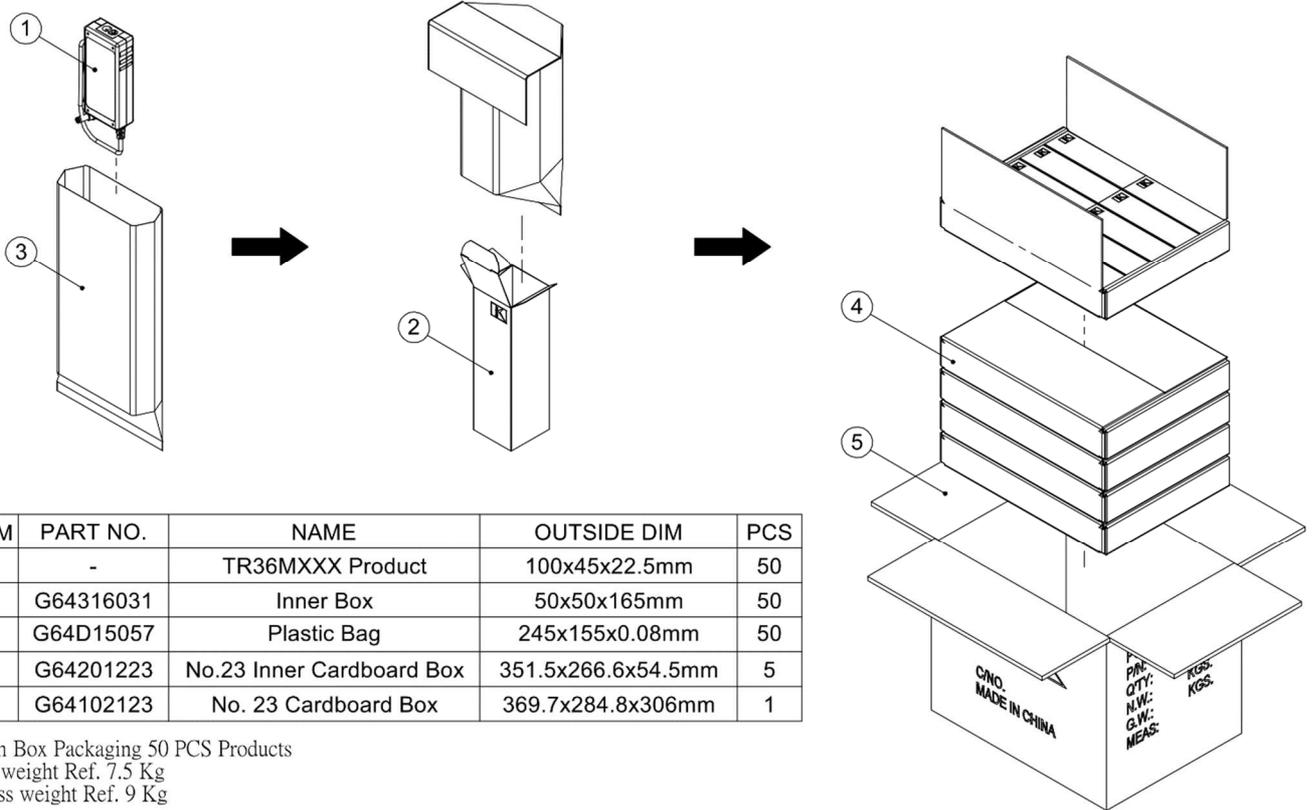


# TR36M Series

## Application Note V14

### 5. Packing Information

The packing information for TR36M series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM	PCS
1	-	TR36MXXX Product	100x45x22.5mm	50
2	G64316031	Inner Box	50x50x165mm	50
3	G64D15057	Plastic Bag	245x155x0.08mm	50
4	G64201223	No.23 Inner Cardboard Box	351.5x266.6x54.5mm	5
5	G64102123	No. 23 Cardboard Box	369.7x284.8x306mm	1

Each Box Packaging 50 PCS Products  
 Net weight Ref. 7.5 Kg  
 Gross weight Ref. 9 Kg

#### Headquarters:

14F, No.306, Sec.4, Hsin Yi Rd.  
 Taipei, Taiwan  
 Tel: 886-2-27086210  
 Fax: 886-2-27029852  
 E-mail: [sales@cincon.com.tw](mailto:sales@cincon.com.tw)  
 Web Site: <https://www.cincon.com>

#### CINCON ELECTRONICS CO., LTD.

#### Factory:

No. 8-1, Fu Kung Rd.  
 Fu Hsing Industrial Park  
 Fu Hsing Hsiang,  
 Chang Hua Hsien, Taiwan  
 Tel: 886-4-7690261  
 Fax: 886-4-7698031

#### Cincon North America:

1655 Mesa Verde Ave. Ste 180  
 Ventura, CA 93003  
 Tel: 805-639-3350  
 Fax: 805-639-4101  
 E-mail: [info@cincon.com](mailto:info@cincon.com)