



## TR70M Series

Application Note V10 September 2018

### AC-DC SWITCHING ADAPTER TR70M Series APPLICATION NOTE



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### 1. Introduction

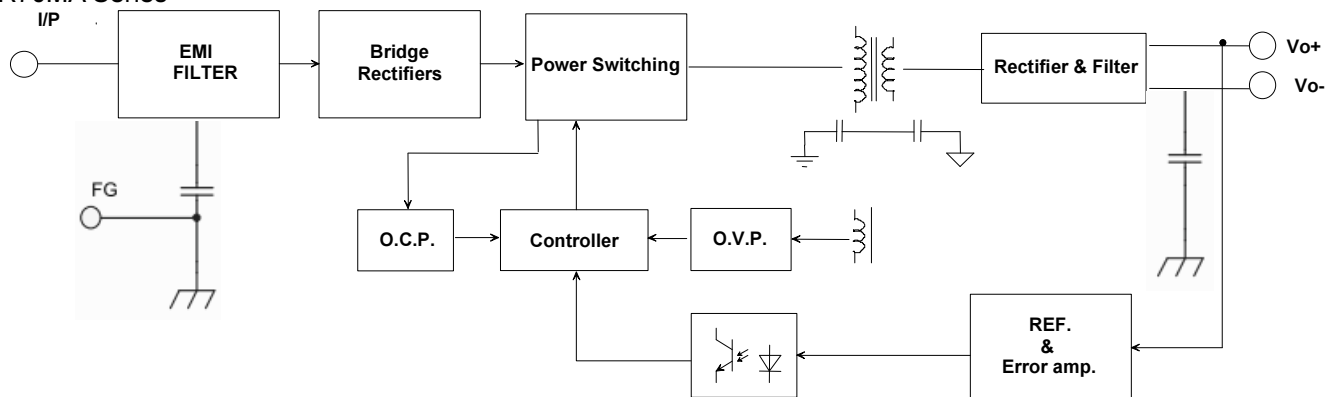
This application note describes the features and functions of Cincon's TR70M series of adapter, switching AC-DC power. These are highly efficient, reliable, compact, high power density, single output AC/DC power. The power is fully protected against short circuit and over-voltage conditions. Cincon's world class automated manufacturing methods, together with an extensive testing and qualification program ensure that the TR70M series power is extremely reliable.

### 2. TR70M Series Features

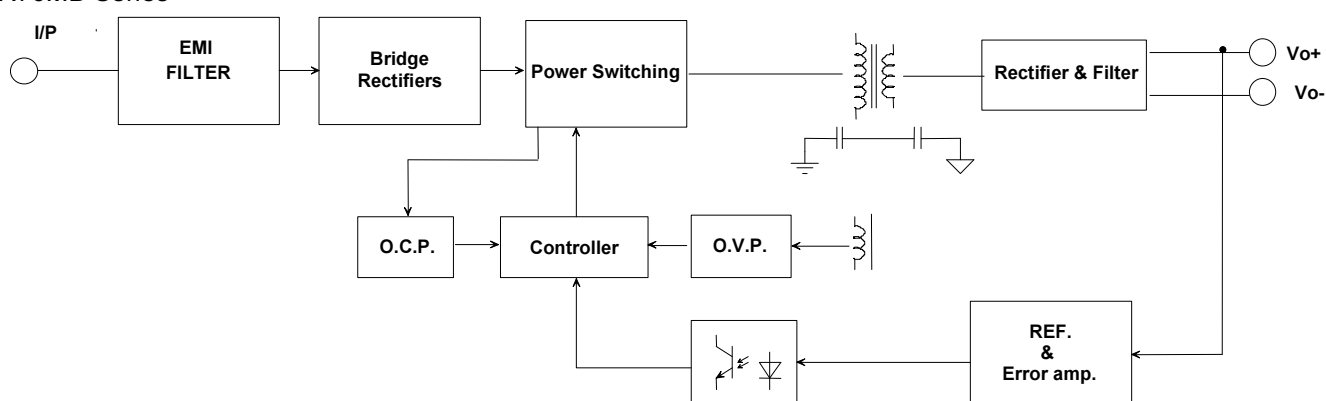
- Universal Input 80~264Vac
- EMI Meets EN55011 Class "B" and CISPR/FCC Class B
- Continuous Short Circuit Protection
- Over Voltage Protection
- No Load Power Consumption <150mW
- Input Class I System & AC Inlet ICE320/C14
- Input Class II System & AC Inlet ICE320/C8
- Meets 2 MOPP
- Class I (TR70MA) & Class II (TR70MB)
- Meet IEC/EN60335-1
- Altitude 5000m
- Meets CoC Tier 2 & DoE Level VI
- (TR70MA/B120: Length  $\leq$  1220mm 16AWG)
- (TR70MA/B150, Length  $\leq$  1220mm 16AWG)
- (TR70MA/B180: Length  $\leq$  1800mm 16AWG)
- (TR70MA/B240, TR70MA/B360: Length  $\leq$  1800mm 18AWG)
- (TR70MA/B480: Length  $\leq$  1800mm 18AWG)

### 3. Electrical Block Diagram

TR70MA Series



TR70MB Series





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### 4. 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 (Continuous)		All	80		264	Vac
Operating Temperature	See derating curve	All	-20		+70	°C
Storage Temperature		All	-40		+85	°C
Input/Output Isolation Voltage		All			4400	Vac
Altitude		All			5000	m

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Operating Voltage Range		All	100		240	Vac
Input Frequency Range		All	47		63	Hz
Input Current	100% Load, Vin=100Vac	All			1.5	A
Leakage Current		All			90	uA
Inrush Current	Vin=240Vac, cold start at 25°C	All			100	A

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Voltage setpoint at 60% full load. Tc=25°C	TR70MA/B120	11.76	12	12.24	Vdc
		TR70MA/B150	14.7	15	15.3	
		TR70MA/B180	17.64	18	18.36	
		TR70MA/B240	23.52	24	24.48	
		TR70MA/B360	35.28	36	36.72	
		TR70MA/B480	47.04	48	48.96	
Operating Output Current Range		TR70MA/B120			5.8	A
		TR70MA/B150			4.65	
		TR70MA/B180			3.9	
		TR70MA/B240			3.0	
		TR70MA/B360			1.9	
		TR70MA/B480			1.5	
Holdup Time	Vin=115Vac	All	8	10		ms
Output Voltage Regulation						
Load Regulation	from 60% to full load and from 60% to 20% load	TR70MA/B120			±5%	%
		TR70MA/B150			±3%	
		TR70MA/B180			±2%	
		TR70MA/B240			±2%	
		TR70MA/B360			±2%	
		TR70MA/B480			±2%	
Line Regulation	Vin=high line to low line, full load	All			±1	%
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	TR70MA/B120			120	mVp-p
		TR70MA/B150			150	
		TR70MA/B180			180	
		TR70MA/B240			240	
		TR70MA/B360			360	
		TR70MA/B480			480	



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PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Capacitance	1. Ambient temperature=25°C 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	TR70MA/B120			5800	uF
		TR70MA/B150			4650	
		TR70MA/B180			3900	
		TR70MA/B240			3000	
		TR70MA/B360			1900	
		TR70MA/B480			1500	
Efficiency	1. Input voltage is 230VAC 2. Output is max. load.	TR70MA/B120		89		%
		TR70MA/B150		89		
		TR70MA/B180		89		
		TR70MA/B240		90		
		TR70MA/B360		90		
		TR70MA/B480		91		

### ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			4400	Vac
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°C per MIL-HDBK-217F	All	500			K hours
Weight		All		300		g
Safety	Class I, Class II, IEC60601-1, EN60601-1, ANSI/AAMI ES60601-1					Ed.3.1
EMC Emission	EN55011 Class B, EN61000-3-2:2014, EN6100-3-3:2013, FCC CFR47 Part 18 Subpart C, Oct.2015					Ed.4.0
Conducted Disturbance	EN55011, FCC CFR47 Part 18					Class B
Radiated Disturbance	EN55011, FCC CFR47 Part 18 Class I,(Class II see Section 7.5)					Class B
Harmonic Current Emissions	IEC61000-3-2:2014					Class A, Class D
Voltage Fluctuations & Flicker	IEC61000-3-3:2013					Criteria A
EMC Immunity	IEC61000-4-2,3,4,5,6,8,11					
Electrostatic Discharge (ESD)	IEC61000-4-2:2008					Criteria A
Radio Frequency Continuous Field	IEC 61000-4-3:2010					Criteria A
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, ±2kv					Criteria A
Surge	IEC 61000-4-5:2014, L-N: ±1kv, L-PE, N-PE: ±2kv					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, Dip: 30% 500ms, Dip: 60% 100ms, Dip >95% 10ms					Criteria A
Voltage Interruptions	IEC 61000-4-11:2004, >95% 5000ms					Criteria B
Voltage Interruptions	IEC 61000-4-11:2004, >95% 5000ms					



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### 5. Main Features and Functions

#### 5.1 Operating Temperature Range

The highly efficient design of Cincon's TR70M series power has resulted in their ability to operate within ambient temperature environments from -20°C to 40°C. -30°C can be start-up at full load. 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

#### 5.2 Over Current Protection

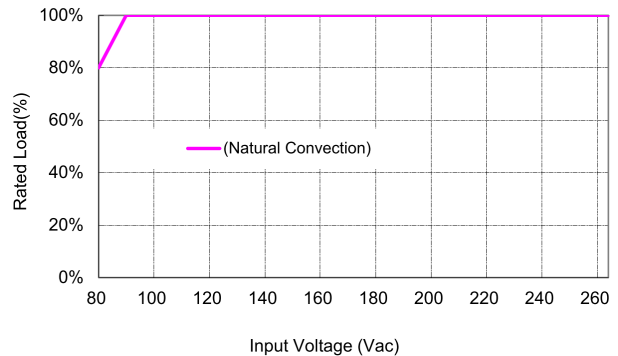
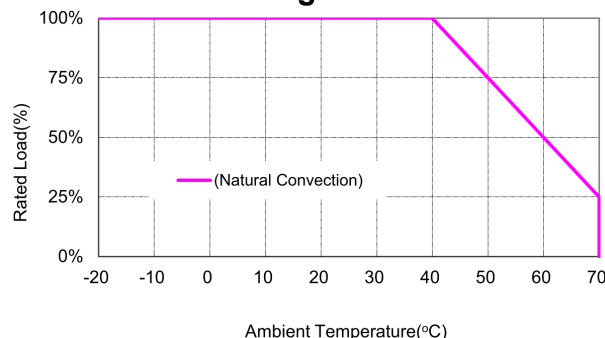
All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed. The power module will supply up to 120-140% of rated current. In the event of an over current converter will go into a hiccup mode protection

### 6. EMC & Safety

- Emission and Immunity (Ed4.0)
  - EN55011, EN60601-1-2, EN61000-3-2
  - EN61000-3-3, IEC61000-4-2, 3, 4, 5, 6, 8, 11
  - FCC CFR47 Part 15 Class B
- Safety (Ed3.1)
  - IEC60601-1:2005+A1, EN60601-1
  - EN60601-1:2006+A11:2011+A1+A12
  - ANSI/AAMI ES60601-1:2005/A1:2012

### 7. Applications

#### 7.1 Power De-Rating Curve



#### 7.2 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 TR70M 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:

$V_o$  is output voltage

$I_o$  is output current

$P_{in}$  is input power

The value of load regulation is defined as:

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

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:

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

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.

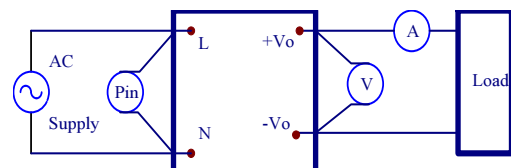


Figure 1 TR70M Series Test Setup



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### 7.3 Output Ripple and Noise Measurement

The test set-up for noise and ripple measurements is shown in Figure 2. Measured method:  
Add a C1:10 uF electrolytic capacitor and a C2:0.1 uF ceramic capacitor to output at 20 MHz Band Width.

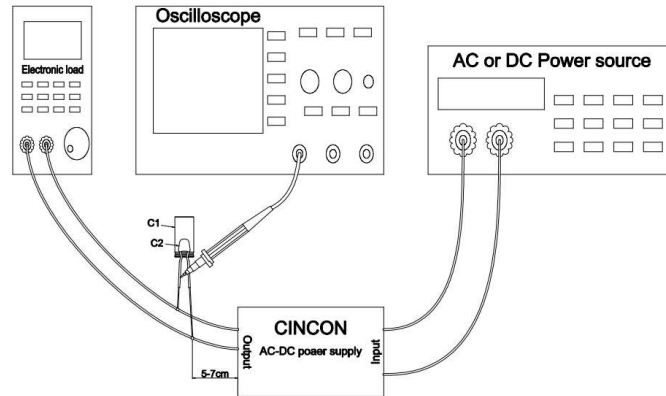
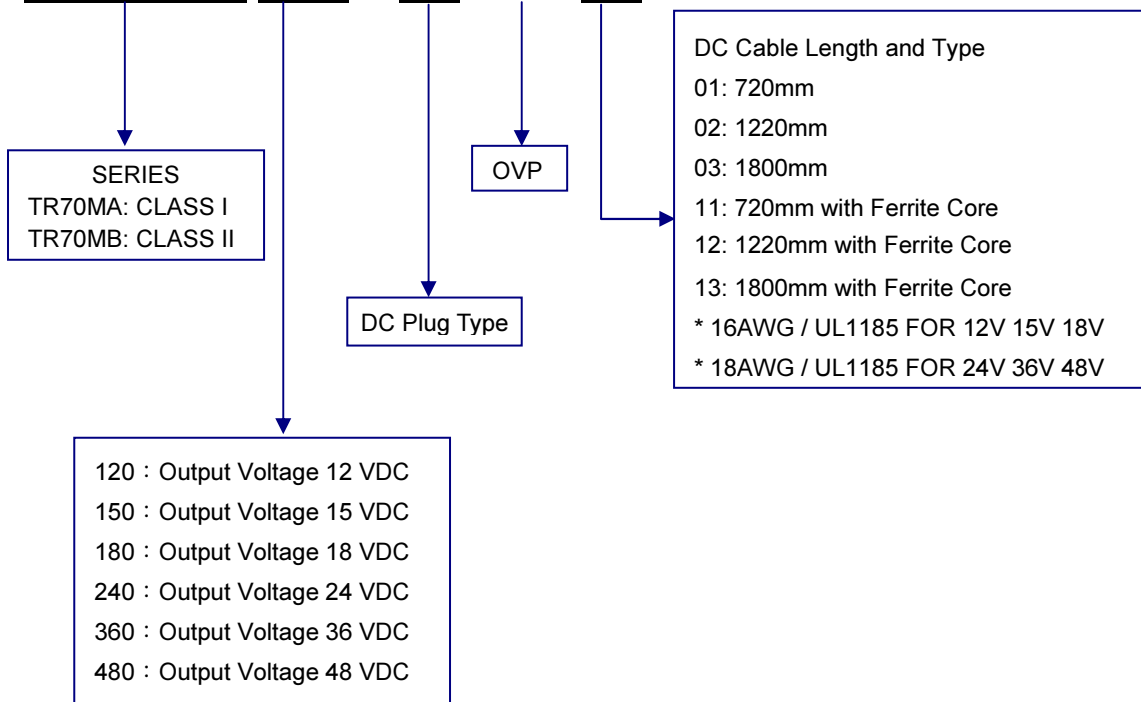


Figure 2 Output Voltage Ripple and Noise Measurement Set-Up

### 8. Part Number

TR70MA/B XXX – XX E XX





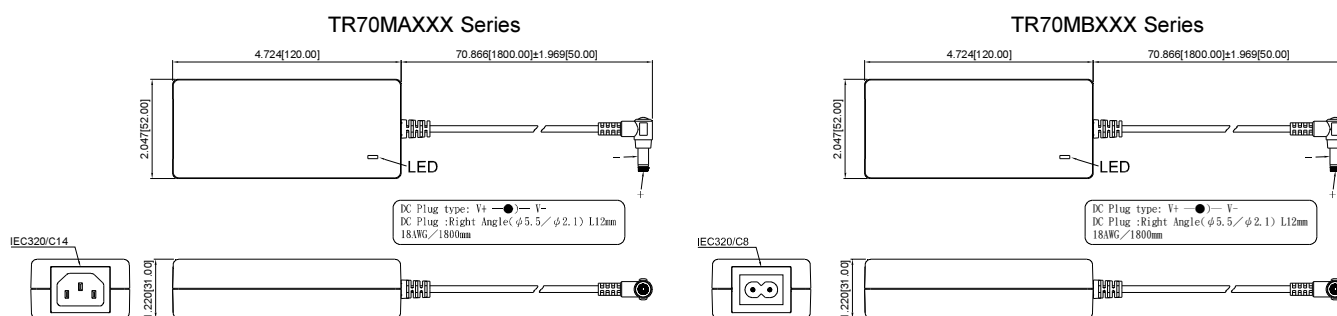
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### 9. TR70M Series Mechanical Outline Diagrams

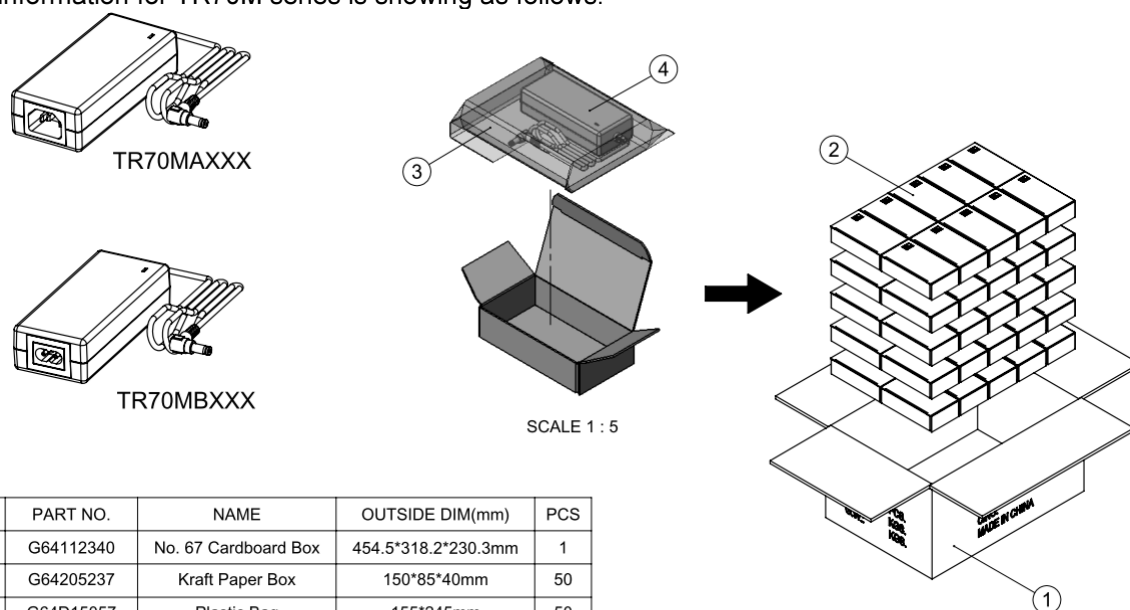
#### 9.1. Mechanical Outline Diagrams

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



#### 9.2. Packing Information

The packing information for TR70M series is showing as follows:



ITEM	PART NO.	NAME	OUTSIDE DIM(mm)	PCS
1	G64112340	No. 67 Cardboard Box	454.5*318.2*230.3mm	1
2	G64205237	Kraft Paper Box	150*85*40mm	50
3	G64D15057	Plastic Bag	155*245mm	50
4	G98~	TR70MXXXX Product	120*52*31mm	50

Each Box Packaging 50 PCS Products  
Gross weight Ref. 17.5 Kg  
Net weight 15.0 Kg

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