AC-DC Switching ADAPTER
TRH21 VI Series
APPLICATION NOTE

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Content

TRH21 VI Series

Application Note V10 July 2016

1. Introduction

This application note describes the features and functions of Cincon's TRH21 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 TRH21 VI series power is extremely reliable. is extremely reliable.

2. TRH21 VI Series Converter Features

- Universal Input: 90~264Vac
- EMI Meets EN55022 Class "B" and CISPR/FCC Class B
- Continuous Short Circuit Protection
- Over Voltage Protection
- Meet CoC V5 Tier 2 & DoE Level VI
  (TRH21A050: Length≦1220mm 18AWG)
  (TRH21A090, TRH21A120: Length≦1800mm 18AWG)
  (TRH21A150: Length≦1800mm 20AWG)
  (TRH21A180, TRH21A240: Length≦1800mm 22AWG)
- No Load Power Consumption<75Mw
- Input Class II System & AC Inlet ICE320/C8

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 (Continuous)		All	90		264	Vac
Operating Temperature	See derating curve	All	-20		+70	℃
Storage Temperature		All	-25		+85	℃
Input/Output Isolation Voltage		All	4000			Vac
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			0.6	A
Leakage Current		All			250	uA
Inrush Current	Vin=240Vac, cold start at 25℃	All			50	A
OUTPUT CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Output Voltage Set Point	Voltage setpoint at 60% full load. Tc=25℃	TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240		5 9 12 15 18 24		Vdc
Operating Output Current Range		TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240			3 2.3 1.8 1.4 1.2 0.9	A
Holdup Time	Vin=115Vac	All		8		ms
Output Voltage Regulation						
Load Regulation	from 60% to full load and from 60% to 20% load	TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240			±5% ±4% ±3% ±3% ±2% ±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℃	TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240			50 50 90 100 100 100	mVp-p

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Load Capacitance	1. Ambient temperature=25℃ 2. Input voltage is 115VAC and 230VAC 3. Output is max. load	TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240			3000 2330 1800 1410 1170 880	uF
Average Efficiency	Average Efficiency measured at 25%,50%,75%,100% load and input voltage is 115Vac / 230Vac.	TRH21A050 TRH21A090 TRH21A120 TRH21A150 TRH21A180 TRH21A240	81.84 86.13 86.33 86.2 86.33 86.2			%

ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typical	Max.	Units
Input to Output	1 minute	All			4000	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℃ per MIL-HDBK-217F	All	400			K hours
Weight		All		140		g
EMI	EN55022,EN55011,FCC PART15 &18 meets Class B					
Radio-frequency field strength immunity	IEC61000-4-3:2010					
Electrical Fast Transient	IEC61000-4-4:2012 ±2KV					
Surge	IEC61000-4-5:2014 Line to Line ±1KV ,Line to Earth ±2KV					
Conducted disturbances, induced by RF fields	IEC61000-4-6:2013					
Power frequency magnetic field	IEC61000-4-8:2009					
Voltage dips	IEC61000-4-11:2004					
Voltage interruptions	IEC61000-4-11:2004					

4. Main Features and Functions

4.1 Operating Temperature Range

The highly efficient design of Cincon's TRH21 VI series power has resulted in their ability to operate within ambient temperature environments from -20℃ to 50℃. 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

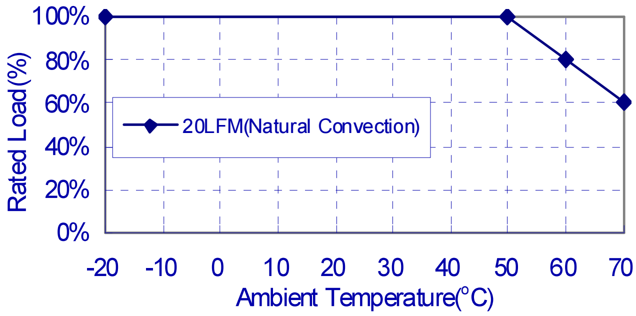
All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed.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

5. EMC & Safety

- CB IEC 60950-1
- TUV EN 60950-1
- UL/cUL UL60950-1
- CE EN55022 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 TRH21 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.

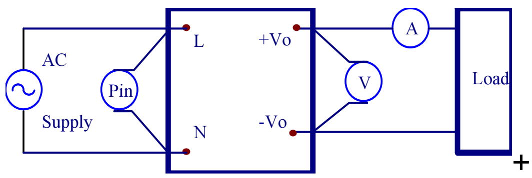


Figure 1 TRH21 VI Series Test Setup

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.

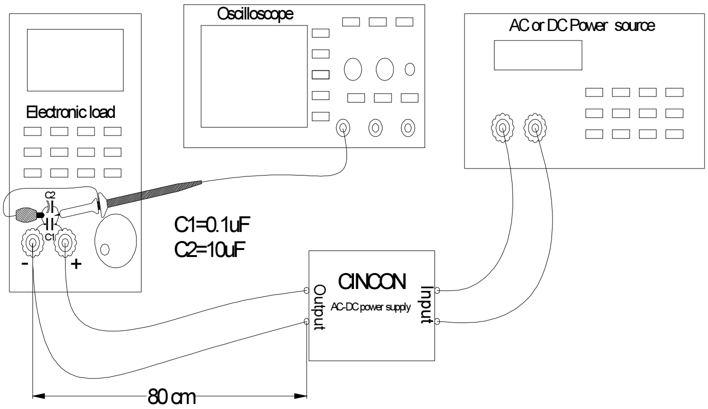


Figure 2 Output Voltage Ripple and Noise Measurement Set-Up

7. Part Number

TRH21A XXX – XX E XX

SERIES

OVP

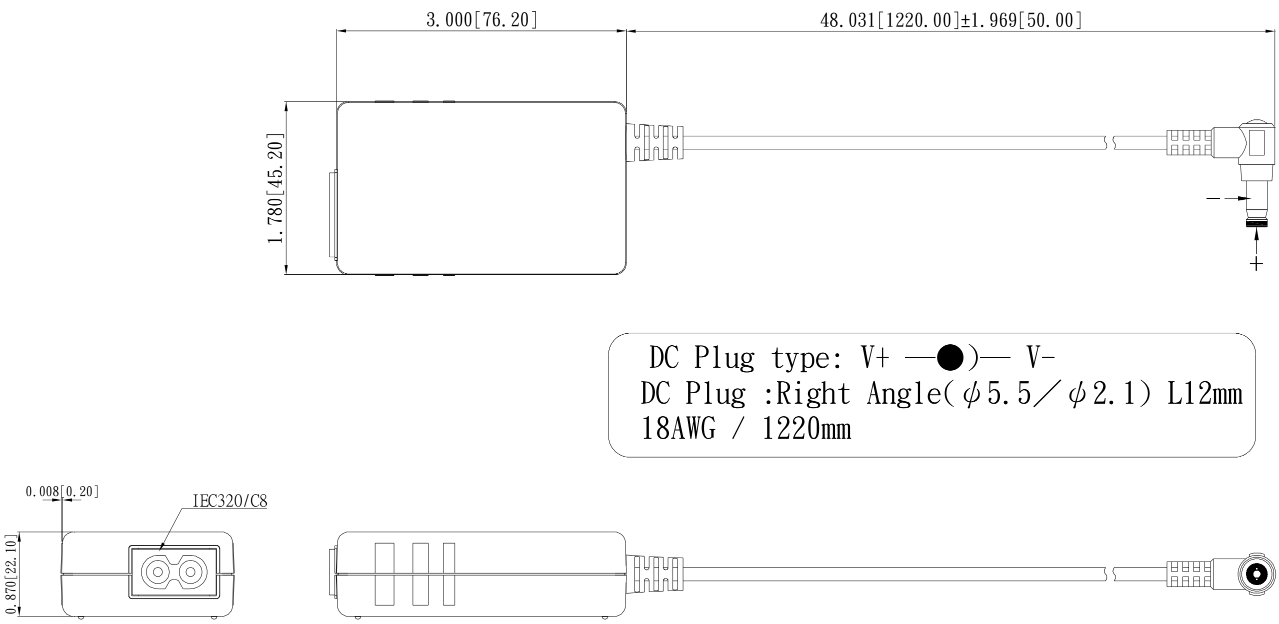
DC Plug Type

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 5V 9V 12V
* 20AWG / UL1185 FOR 15V
* 22AWG / UL1185 FOR 18V 24V

- 050：Output Voltage 5 VDC
- 090：Output Voltage 9 VDC
- 120：Output Voltage 12 VDC
- 150：Output Voltage 15 VDC
- 180：Output Voltage 18 VDC
- 240：Output Voltage 24 VDC

8. TRH21 Series Mechanical Outline Diagrams

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



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