AC-DC Switching ADAPTER
TRH150 Series
APPLICATION NOTE

Approved By:

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TRH150 Series

Application Note V10 JAN 09 2017

Content

1. Introduction

This application note describes the features and functions of Cincon's TRH150 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 TRH150 VI series power is extremely reliable.

2. Features

- Universal Input: 90~264Vac
- Continuous Short Circuit Protection
- IEC320/C14
- EMI Meets EN55032 Class "B" and CISPR/FCC Class B
- Meet CoC Tier 2 & DoE Level VI
- Over Voltage Protection

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	-30		+65	℃
Storage Temperature		All	-40		+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			2.5	A
Leakage Current		All			3.5	mA
Inrush Current	Vin=240Vac, cold start at 25 ℃	All			120	A
No Load Power Consumption	Vin=240Vac	All			150	mW
OUTPUT CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	**Device**	**Min.**	**Typical**	**Max.**	**Units**
Output Voltage Set Point	±2.5%	TRH150A120		12		Vdc
		TRH150A150		15		
		TRH150A180		18		
		TRH150A190		19		
		TRH150A240		24		
		TRH150A280		28		
		TRH150A360		36		
		TRH150A480		48		
Operating Output Current Range		TRH150A120			12.50	A
		TRH150A150			10.00	
		TRH150A180			8.34	
		TRH150A190			7.90	
		TRH150A240			6.25	
		TRH150A280			5.36	
		TRH150A360			4.17	
		TRH150A480			3.13	
Holdup Time	Vin=115Vac	All		16		ms

Output Voltage Regulation						
Load Regulation	from 60% to full load and from 60% to 20% load	TRH150A120			±5	%
		TRH150A150			±5	
		TRH150A180			±5	
		TRH150A190			±5	
		TRH150A240			±5	
		TRH150A280			±5	
		TRH150A360			±5	
		TRH150A480			±5	
Line Regulation	Vin=high line to low line, full load	All			±1	%
Over Voltage Protection		TRH150A120	14.3		15.8	VDC
		TRH150A150	17.1		18.9	
		TRH150A180	20.9		23.1	
		TRH150A190	20.9		23.1	
		TRH150A240	28.5		31.5	
		TRH150A280	31.4		34.7	
		TRH150A360	40.9		45.2	
		TRH150A480	53.2		58.8	
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℃	TRH150A120			240	mVp-p
		TRH150A150			300	
		TRH150A180			360	
		TRH150A190			380	
		TRH150A240			480	
		TRH150A280			560	
		TRH150A360			720	
		TRH150A480			960	
Load Capacitance	1.Ambient temperature=25℃ 2.Input voltage is 115VAC and 230VAC 3.Output is max. load	TRH150A120			12500	uF
		TRH150A150			10000	
		TRH150A180			8340	
		TRH150A190			7900	
		TRH150A240			6250	
		TRH150A280			5360	
		TRH150A360			4170	
		TRH150A480			3130	
Average Efficiency	Average Efficiency measured =(25%+50%+75%+100% load)/4 and input Voltage is 230Vac	TRH150A120		91		%
		TRH150A150		92		
		TRH150A180		92		
		TRH150A190		92		
		TRH150A240		93		
		TRH150A280		94		
		TRH150A360		93		
		TRH150A480		94		
ISOLATION CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units

Input to Output	1 minute	All			4242	Vdc
Isolation Resistance		All	100			MΩ
FEATURE CHARACTERISTICS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
Switching Frequency		All		100		KHz
GENERAL SPECIFICATIONS						
PARAMETER	**NOTES and CONDITIONS**	Device	Min.	Typical	Max.	Units
MTBF	Vin=115Vac , Io=100%; Ta=25℃ per MIL-HDBK-217F	All	160			K hours
Weight		All		950		g
Safety	Class I, IEC60950-1, EN60950-1, UL60950-1					
EMC Emission	EN55032, EN61000-3-2, EN61000-3-3, FCC Part 15 Subpart B Class B					
Conducted disturbance at main terminal	EN55032:2012 Class B, FCC Part 15 Subpart B Class B					
Radiated disturbance	EN55032:2012 Class B, FCC Part 15 Subpart B Class B					
Harmonic current emissions	IEC 61000-3-2:2014					
Voltage fluctuations & Flicker	IEC 61000-3-3:2013					
EMC Immunity	IEC 61000-4-2,3,4,5,6,8,11					
Electrostatic discharge (ESD)	IEC 61000-4-2:2008, ±4kv,±8kv, Criteria A					
Radio-frequency, Continuous radiated disturbance	IEC 61000-4-3:2006+A1:2007+A2:2010, Criteria A					
Electrical fast transient (EFT)	IEC 61000-4-4:2012, ±1kv, Criteria A					
Surge	IEC 61000-4-5:2014 L-N:±0.5kv,±1kv, L-PE, N-PE: ±0.5kv,±1kv,±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, Dips:30% reduction, Dips:>95% reduction, Criteria A					
Voltage interruptions	IEC 61000-4-11:2004,>95% reduction, Criteria B					

4. Main Features and Functions

4.1 Operating Temperature Range

The highly efficient design of Cincon's TRH150 VI series power has resulted in their ability to operate within ambient temperature environments from -30°C to 65°C Due consideration must be given to the de-rating curves when ascertaining the maximum power that can be drawn from the adapter. 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)
- Permissible Ambient Temperature(per derating curve)

4.2 Over Current Protection

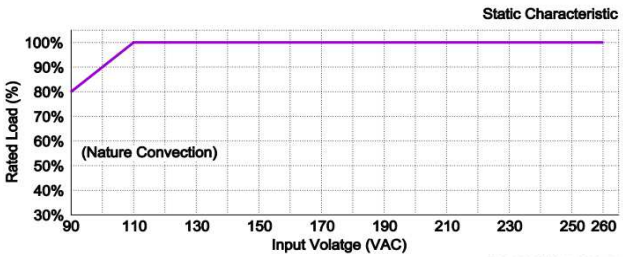
All different voltage models have a full continuous short-circuit protection. The unit will auto recover once the short circuit is removed. To provide protection in a fault condition, the unit is equipped with internal over-current protection. The unit operates normally once the fault condition is removed.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

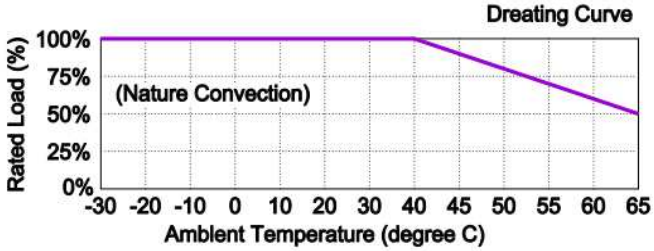
5. EMC & Safety

- NEMKO GS EN60950-1
- CB IEC60950-1
- UL/cUL60950-1
- CE EN55032 Class B,
  FCC Part 15 Subpart 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 TRH150 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, eoad 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:

$$\text{Load reg1.} = \frac{V_{FL} - V_{60\%}}{V_{60\%}} \times 100\%$$

Where:
V_{FL} is the output voltage at full load
V_{NL} is the output voltage at 60% load

$$\text{Load reg2.} = \frac{V_{60\%} - V_{20\%}}{V_{20\%}} \times 100\%$$

Where:
$V_{60\%}$ is the output voltage at 60%load
$V_{20\%}$ is the output voltage at 20% load

The value of line regulation is defined as:

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

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.

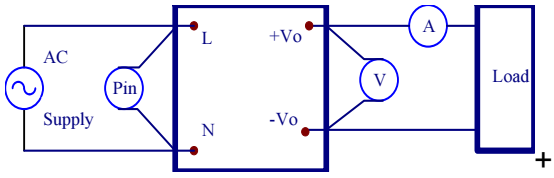


Figure 1 TRH150 VI Series Test Setup

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.

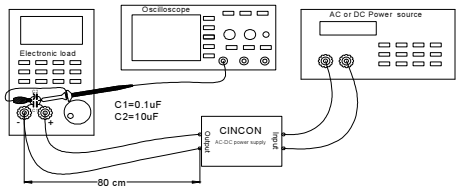
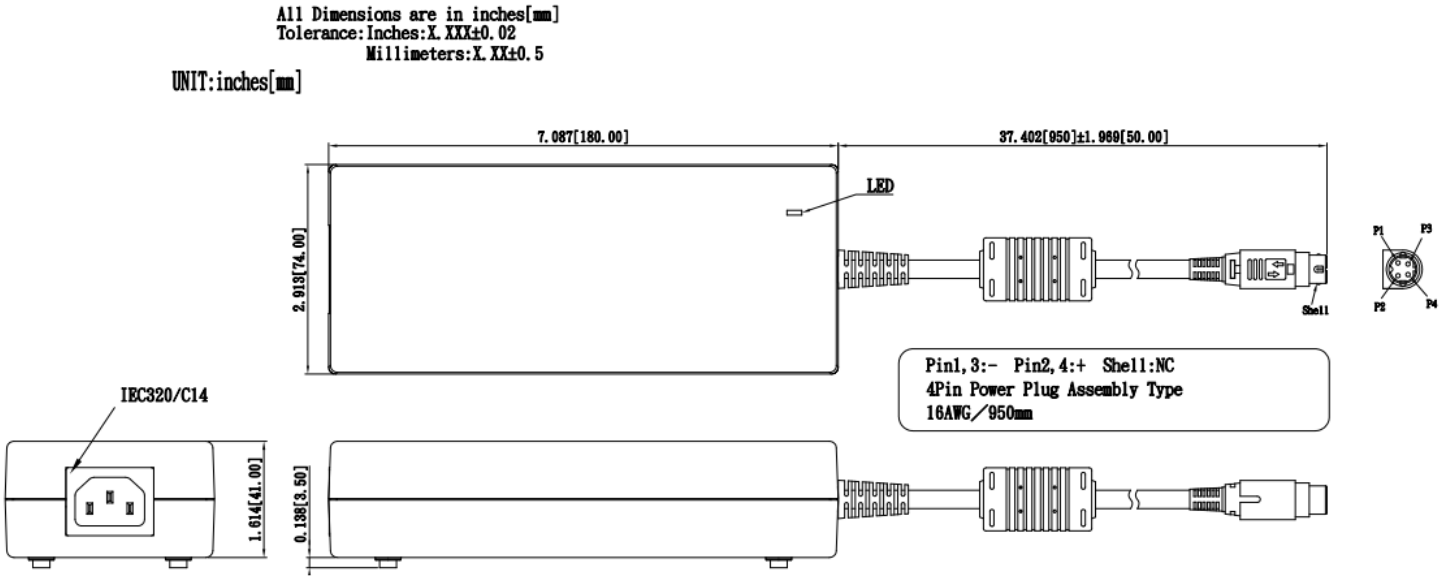


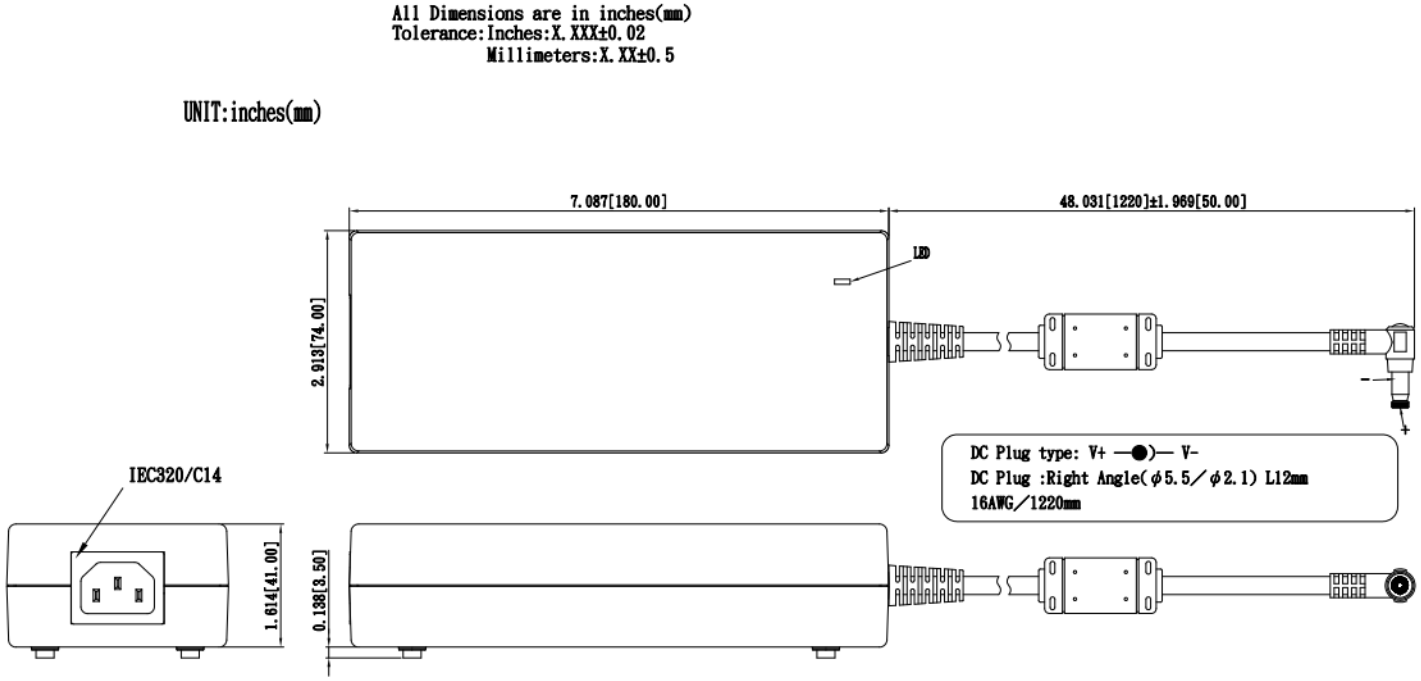
Figure 2 Output Voltage Ripple and Noise Measurement Set-UP

7. Mechanical Outline Diagrams

Model TRH150A120~150:



Model TRH150A180~480:



8. Order Information

TRH150A	XXX	-	XX	E	XX
TRH Series	Output Voltage (ex:120=12V)		DC Plug Type Please see catalogue page71,only KPPX-4P for 12V model and 15V model	E: With OVP	DC Cable Length and Type 471:950mm with Ferrite Core 12:1220mm with Ferrite Core
	120				
	150				
	180				
	190				
	240				
	280				
	360				
	480				
					Note: *UL2464 Cable for all Models *12V~15V ≦ 950mm / 18V~48V ≦ 1220mm

KPPX-4P DC Plug Type for 12V model and 15V model:

1424	KPPX-4P, 4Pin Power Plug Assembly Type with Lock Mechanism Pin1,2:+，Pin3,4,shell:"-"
1442	KPPX-4P, 4Pin Power Plug Assembly Type with Lock Mechanism ,Pin1,3:"+",Pin2,4,Shell:"-"
1446	KPPX-4P, 4Pin Power Plug Assembly Type with Lock Mechanism, Pin1,3:"-",Pin2,4:"+"
1467	KPPX-4P, Power Plug Assembly Type with Lock Mechanism Pin1,3:-, Pin2,4:+, shell: GND
1538	KPPX-4P, 4Pin Power Plug Molded Type without Lock Mechanism Pin1,2:+，Pin3,4:-

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