



electronic powersolutions

# TRH160A SERIES 160 WATT I.T.E SWITCH ADAPTER

## Features

- Universal Input Range 90~264Vac
- High Efficiency up to 93%
- Class I
- No Load Input Power Consumption < 150mW
- Approval IEC/EN/UL 62368-1
- Approval EN55032 and CISPR/FCC Class B
- Meets IEC/EN 60335-1
- Operating Altitude 5000m
- Continuous Short Circuit Protection
- Over Voltage Protection
- Very Low Leakage Current <90uA
- Meets CoC Tier 2 and DOE Level VI
- IEC320/C14 Compact Size



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	RIPPLE & NOISE NOTE1	VOLTAGE ACCURACY NOTE2	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TRH160A120	12 V	12.5 A	120mV	±2%	±1%	±3%	91%
TRH160A240	24 V	6.66 A	200mV	±2%	±1%	±2%	92%
TRH160A280	28 V	5.7 A	200mV	±2%	±1%	±2%	92%
TRH160A300	30 V	5.31 A	200mV	±2%	±1%	±2%	92%
TRH160A360	36 V	4.44 A	200mV	±2%	±1%	±2%	92%
TRH160A480	48 V	3.33 A	200mV	±2%	±1%	±2%	93%
TRH160A560	56 V	2.85 A	200mV	±2%	±1%	±2%	93%

Note:

1. Add a 0.1uF ceramic capacitor and a 10uF E.L. capacitor to output for ripple & noise measuring @20MHz BW.
2. Voltage accuracy is set at 60% full load.
3. Line regulation is measured from 100V<sub>ac</sub> to 240V<sub>ac</sub> with full load.
4. Load regulation measured from 60% to 100% full load and from 60% to 20% full load (60%±40% full load).
5. Typical efficiency at 230V<sub>ac</sub> and 75% full load at 25°C.

## PART NUMBER

Series		Output Voltage	DC Plug Type	Cable Type	Cable Length
TRH160	X	XXX	-XX	E	XX
160W I.T.E Adapter	A : Class I	120 : 12V	See Page 7	E : UL2464 with OVP	12V : 950mm with DIN Power Plug
		240 : 24V			24V : 1220mm with DC Jack
		280 : 28V			28V : 1800mm with DC Jack
		300 : 30V			30V : 1800mm with DC Jack
		360 : 36V			36V : 1800mm with DC Jack
		480 : 48V			48V : 1800mm with DC Jack
		560 : 56V			56V : 1800mm with DC Jack

Part Number Example:

- TRH160A120-1446E471**, 150W, Class I, 12V<sub>dc</sub> Output, DIN Power Plug Type, Cable Length 950mm  
**TRH160A240-01E12**, 160W, Class I, 24V<sub>dc</sub> Output, DC Jack Type, Cable Length 1220mm



## 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.	Typ.	Max.	Units
Input Voltage		All	90		264	V <sub>ac</sub>
Operating Temperature	See Derating Curve, (-30°C Can be Start-up at full load.)	All	-20		70	°C
Storage Temperature		All	-40		85	°C
Input/Output Isolation Voltage	1 minute	All			3000	V <sub>ac</sub>
Operating Altitude		All			5000	m

### INPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Operating Voltage Range		All	100		240	V <sub>ac</sub>
Input Frequency Range		All	47		63	Hz
Maximum Input Current	100% Load, V <sub>in</sub> =100V <sub>ac</sub>	All			2.0	A
Leakage Current (Earth)		All			3.5	mA
Leakage Current (Touch)		All			90	uA
Under Voltage Protection		All	60	66	70	V <sub>ac</sub>
Power Factor	230V <sub>ac</sub> /50Hz at Full load	All	0.9			
Inrush Current	V <sub>in</sub> =240V <sub>ac</sub> , Cold start at 25°C	All			120	A

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , I <sub>o</sub> =60% Full load T <sub>c</sub> =25°C	TRH160A120	11.76	12	12.24	V <sub>dc</sub>
		TRH160A240	23.52	24	24.48	
		TRH160A280	27.44	28	28.56	
		TRH160A300	29.4	30	30.6	
		TRH160A360	35.28	36	36.72	
		TRH160A480	47.04	48	48.96	
		TRH160A560	54.88	56	57.12	
Operating Output Current Range	V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> , T <sub>c</sub> =25°C	TRH160A120	0		12.5	A
		TRH160A240	0		6.66	
		TRH160A280	0		5.7	
		TRH160A300	0		5.31	
		TRH160A360	0		4.44	
		TRH160A480	0		3.33	
		TRH160A560	0		2.85	
Holdup Time	V <sub>in</sub> =115V <sub>ac</sub>	All		25		ms
Output Voltage Regulation						
Load Regulation	60%±40% Full load change	TRH160A120			±3.0	%
		TRH160A240			±2.0	
		TRH160A280			±2.0	
		TRH160A300			±2.0	
		TRH160A360			±2.0	
		TRH160A480			±2.0	
		TRH160A560			±2.0	
Line Regulation	V <sub>in</sub> =High line to low line, full load	All			±1.0	%



# TRH160A Series

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Over Voltage Protection	Latch Off (AC Recycle to Reset)	TRH160A120		13.2		V <sub>dc</sub>
		TRH160A240		28.6		
		TRH160A280		33.4		
		TRH160A300		34.6		
		TRH160A360		41.8		
		TRH160A480		55.6		
		TRH160A560		59.8		
Over Current Protection	Auto recovery	All	110		125	%
Short Circuit Protection	Auto recovery	All				
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	TRH160A120			120	mV
		TRH160A240			200	
		TRH160A280			200	
		TRH160A300			200	
		TRH160A360			200	
		TRH160A480			200	
		TRH160A560			200	
Load Capacitance	1. V <sub>in</sub> =115V <sub>ac</sub> and 230V <sub>ac</sub> 2. Output is max. load 3. Ambient temperature=25°C	TRH160A120			12250	uF
		TRH160A240			6600	
		TRH160A280			5670	
		TRH160A300			5400	
		TRH160A360			4330	
		TRH160A480			3240	
		TRH160A560			2870	
Efficiency	1. V <sub>in</sub> =230V <sub>ac</sub> 2. Output is 75% full load 3. Ambient temperature=25°C	TRH160A120		91%		%
		TRH160A240		92%		
		TRH160A280		92%		
		TRH160A300		92%		
		TRH160A360		92%		
		TRH160A480		93%		
		TRH160A560		93%		

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute (without dielectric breakdown)	All			3000	V <sub>ac</sub>
Input to Earth (Ground)	1 minute (without dielectric breakdown)	All			1500	V <sub>ac</sub>
Isolation Resistance	Input to output	All	100			MΩ

## FEATURE CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Switching Frequency		All		110		kHz

## GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
MTBF	I <sub>o</sub> =100%; T <sub>a</sub> =25°C per MIL-HDBK-217F	All	300			k hours
Humidity	Non-condensing	All			93	% RH
Shock	MIL-STD-810F Table 516.5, TABLE 516.5-I 10ms, each axis 3 times(±X、±Y、±Z axis)	All		75		g
Vibration	MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X、Y、Z axis, 1 hour(each axis),. total 3 hours.	All		4		g
Weight		All		575		grams



# TRH160A Series

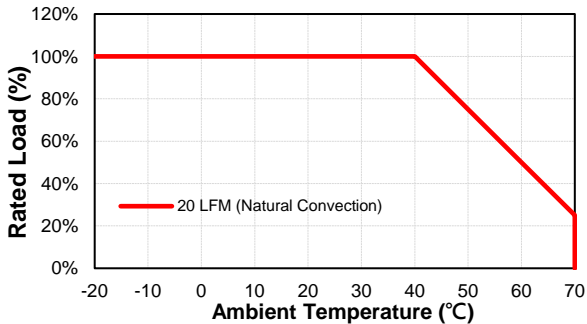
## GENERAL SPECIFICATIONS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Dimension		All	5.906x2.756x1.497 inches (150.00x70.00x38.00 mm)			
<b>Safety</b>	Class I, IEC62368-1:2014 EN62368-1:2014+A11 UL 62368-1, 2nd Edition					Ed 2.0
<b>EMC Emission</b>	EN55032:2015+AC:2016, EN61000-3-2:2014, EN61000-3-3:2013, FCC CFR 47 Part 15					
Conducted Disturbance	EN55032:2015+AC:2016, FCC CFR 47 Part 15					Class B
Radiated Disturbance	EN55032:2015+AC:2016, FCC CFR 47 Part 15					Class B
Harmonic Current Emissions	EN61000-3-2:2014					Class A
Voltage Fluctuations & Flicker	EN61000-3-3:2013					Criterion A
<b>EMC Immunity</b>	EN55024:2010+A1:2015, EN61000-6-1:2007, EN61204-3:2000, IEC61000-4-2,3,4,5,6,8,11					
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008, Air Discharge: ±8kV Contact Discharge: ±4kV					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2010					Criterion A
Electrical Fast Transient (EFT)	IEC 61000-4-4:2012, ±0.5kV, ±1kV					Criterion A
Surge	IEC 61000-4-5:2014+A1:2017, L-N: ±0.5kV, ±1kV, L-E (Ground): ±0.5kV, ±1kV, ±2kV					Criterion A
Conducted Disturbances, Induced by RF Fields	IEC 61000-4-6:2013					Criterion A
Power Frequency Magnetic Field	IEC 61000-4-8:2009					Criterion A
Voltage Dips	IEC 61000-4-11:2004+A1:2017, Dips:30% reduction, Dips:>95% reduction					Criterion A
Voltage Interruptions	IEC 61000-4-11:2004+A1:2017,>95% reduction					Criterion B
Application Note Link	<a href="#">TRH160A Series App Notes</a>					

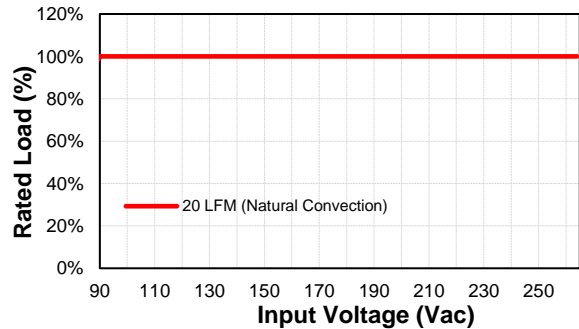
## CHARACTERISTIC CURVE

### Power Derating Curve

TRH160A Derating Curve

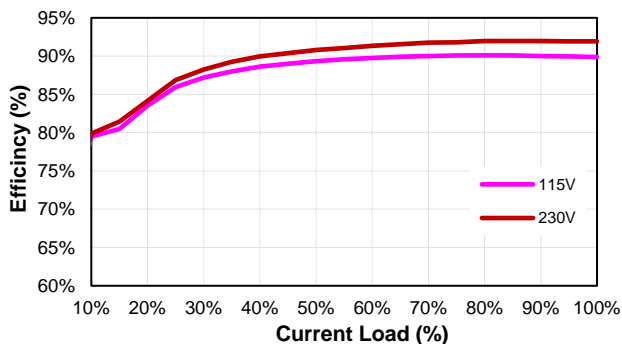


TRH160A Input Voltage Derating Curve

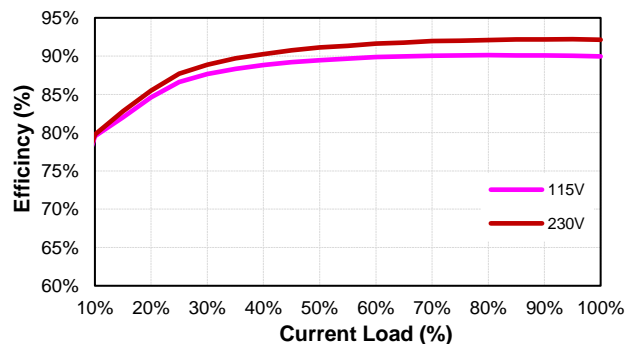


### Performance Data

TRH160A120 (Eff Vs Io)



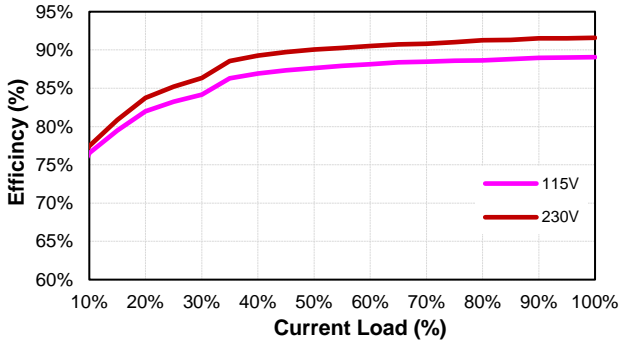
TRH160A240 (Eff Vs Io)



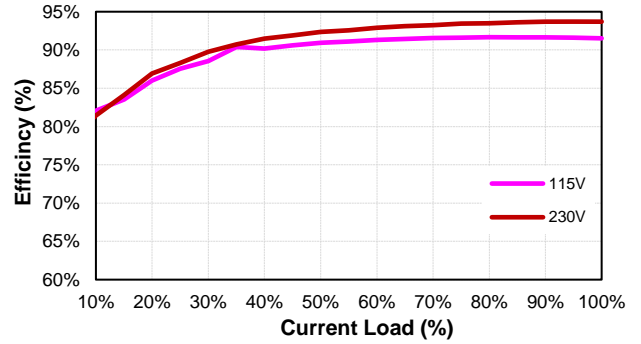


# TRH160A Series

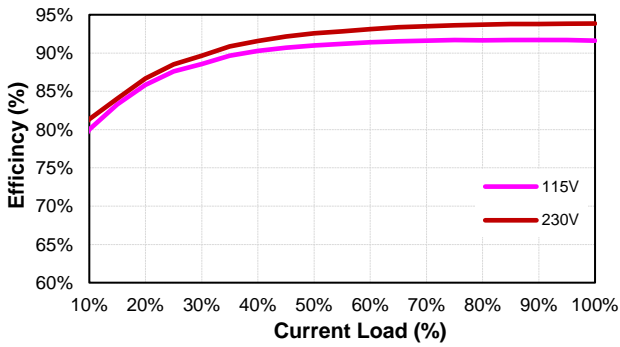
### TRH160A280 (Eff Vs Io)



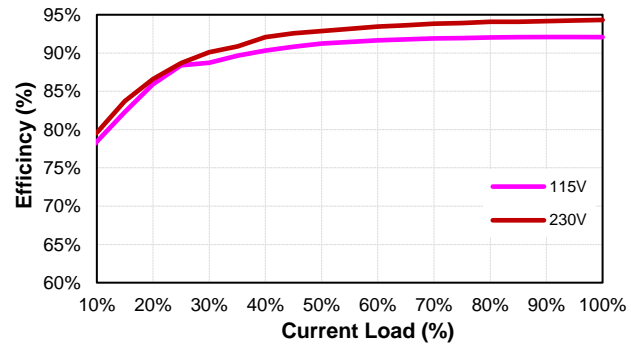
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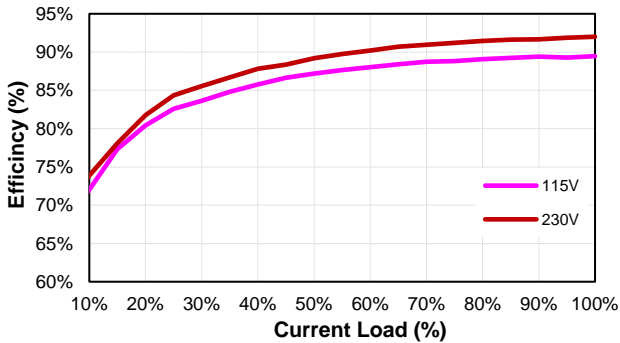
### TRH160A360 (Eff Vs Io)



### TRH160A480 (Eff Vs Io)



### TRH160A560 (Eff Vs Io)

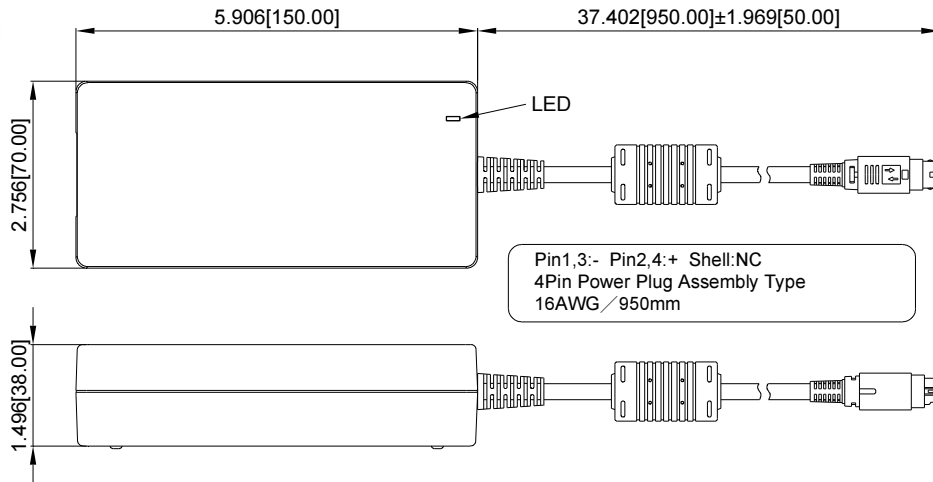
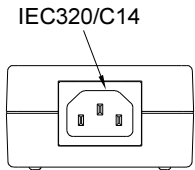




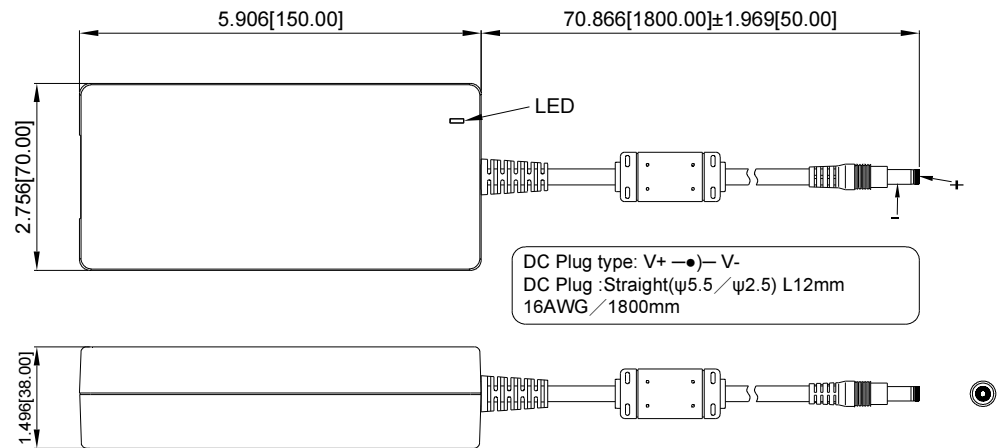
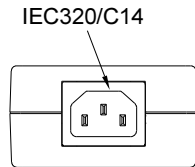
## MECHANICAL SPECIFICATION

### Din Power Plug

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



### DC Jack

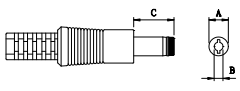
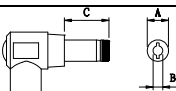
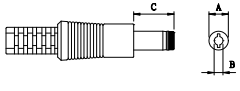
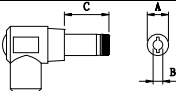
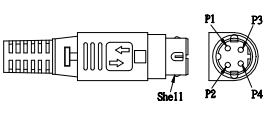
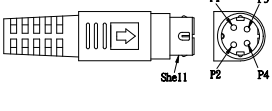


\* For Output Voltage 12Vdc model, it must select Din Power Plug Molded Type or equivalent

\* For Output Voltage 24Vdc to 56Vdc models, it's able to select Din Power Plug Molded Type, DC Jack or equivalent.



## STANDARD OUTPUT DC PLUG

DC Plug Type	Cable Number -XXXXX	A	B	C	Cable Type	Cable Length	Cable AWG
		OD (mm)	ID (mm)	L (mm)			
 <p>Straight/Inner+Outer- + ● -</p>	11E13	Φ5.5	Φ2.1	12	UL2464	1800mm with Ferrite Core	16AWG for 28V,30V,36V, 48V,56V
	12E13	Φ5.5	Φ2.5	12			
	23E13	Φ5.5	Φ2.1	9.5			
	26E13	Φ5.5	Φ2.5	9.5			
 <p>Right Angle/Inner+Outer- + ● -</p>	01E13	Φ5.5	Φ2.1	12			
	02E13	Φ5.5	Φ2.5	12			
	21E13	Φ5.5	Φ2.5	9.5			
	24E13	Φ5.5	Φ2.1	9.5			
 <p>Straight/Inner+Outer- + ● -</p>	11E12	Φ5.5	Φ2.1	12	UL2464	1220mm with Ferrite Core	16AWG for Vo: 24V
	12E12	Φ5.5	Φ2.5	12			
	23E12	Φ5.5	Φ2.1	9.5			
	26E12	Φ5.5	Φ2.5	9.5			
 <p>Right Angle/Inner+Outer- + ● -</p>	01E12	Φ5.5	Φ2.1	12			
	02E12	Φ5.5	Φ2.5	12			
	21E12	Φ5.5	Φ2.5	9.5			
	24E12	Φ5.5	Φ2.1	9.5			
Din Plug Type	Cable Number -XXXXX	Pin Assignment		Cable Type	Cable Length	Cable AWG	
		PIN No.	Polarity				
KYCON KPPX-4P equivalent with Lock (Din Power Plug Assembly Type) 	1446E471	P1	-	UL2464	950mm with Ferrite Core	16AWG for Vo: 12V	
		P2	+				
		P3	-				
		P4	+				
		Shell	No Connection				
KYCON KPPX-4P equivalent without Lock (Din Power Plug Molded Type) 	1538E471	P1	+				
		P2	+				
		P3	-				
		P4	-				
		Shell	No Connection				