



# TR160M SERIES 160 WATT MEDICAL SWITCH ADAPTER

## Features

- Universal Input Range 80~264VAC
- Meets EN55011 Class B and CISPR/FCC Class B
- Continuous Short Circuit Protection
- Over Voltage Protection
- No Load Input Power Consumption<150mW
- Meets CoC Tier 2 and DOE Level VI
- Meets IEC/EN 60335-1
- IEC/EN/UL 60601-1 2 MOPP Approval
- Class I (TR160MA), Class II (TR160MB)
- Operating Altitude 5000m
- IP22



MODEL NUMBER	OUTPUT VOLTAGE	OUTPUT CURRENT	RIPPLE & NOISE NOTE1	VOLTAGE ACCURACY NOTE1	LINE REGULATION NOTE3	LOAD REGULATION NOTE4	%EFF. (Typ.) NOTE5
TR160MA120	12 V	12.5A	1%	±2%	±1%	±4%	91%
TR160MA240	24 V	6.66 A	1%	±2%	±1%	±4%	92%
TR160MA360	36 V	4.44 A	1%	±2%	±1%	±4%	92%
TR160MA480	48 V	3.33A	1%	±2%	±1%	±4%	93%
TR160MB120	12 V	12.5A	1%	±2%	±1%	±4%	91%
TR160MB240	24 V	6.66 A	1%	±2%	±1%	±4%	92%
TR160MB360	36 V	4.44 A	1%	±2%	±1%	±4%	92%
TR160MB480	48 V	3.33A	1%	±2%	±1%	±4%	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 100Vac to 240Vac with full load.
4. Load regulation measured from 60% to 100% full load and from 60% to 20% load (60% +/- 40% full load).
5. Typical efficiency at 230 VAC and 75% full load at 25°C.

## PART NUMBER

Series	Output Voltage	DC Plug Type	OVP	DC Cable Length and Type
TR160MX	XXX	-XX	X	XX
X=A or B A: Class I B: Class II	120: 12VDC 240: 24VDC 360: 36VDC 480: 48VDC		E: with OVP	471:950mm with Ferrite Core 12:1220mm with Ferrite Core 13:1800mm with Ferrite Core *UL2464 Cable for All Models

12V: Output Cable Length ≤ 950mm, DIN Power Plug  
 24V: Output Cable Length ≤ 1220mm, DC Jack  
 36V & 48V: Output Cable Length ≤ 1800mm, DC Jack

Part Number Example:

**TR160MA480-02E13**,160W ,Class I , 48VDC Output , Cable Length 1800mm .



# TR160M Series

## 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	80		264	V <sub>ac</sub>
Operating Temperature	See Derating Curve	All	-20		70	°C
Storage Temperature		All	-40		85	°C
Input/Output Isolation Voltage	1 minute	All	4000			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		60	Hz
Maximum Input Current	100% Load, V <sub>in</sub> =100Vac	All			2.0	A
Leakage Current (Earth)		All			300	uA
Leakage Current (Touch)		All			100	uA
Under Voltage Protection		All	60	66	70	V

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =Nominal V <sub>in</sub> , I <sub>o</sub> =60% Load, T <sub>c</sub> =25°C.	TR160MA/B120	11.76	12	12.24	V <sub>dc</sub>
		TR160MA/B240	23.52	24	24.48	
		TR160MA/B360	35.28	36	36.72	
		TR160MA/B480	47.04	48	48.96	
Operating Output Current Range		TR160MA/B120			12.5	A
		TR160MA/B240			6.66	
		TR160MA/B360			4.44	
		TR160MA/B480			3.33	
Holdup Time	V <sub>in</sub> =115Vac	All		25		ms
Output Voltage Regulation						
Load Regulation	40% Load to Full Load	All			±4.0	%
Line Regulation	V <sub>in</sub> =High Line to Low Line	All			±1.0	%
Over Voltage Protection		TR160MA/B120		13.5		V <sub>dc</sub>
		TR160MA/B240		30		
		TR160MA/B360		42		
		TR160MA/B480		56		
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	TR160MA/B120			120	mV
		TR160MA/B240			150	
		TR160MA/B360			240	
		TR160MA/B480			480	
Load Capacitance	1. Ambient Temperature=25°C 2. Input Voltage is 115VAC and 230VAC 3. Output is max. Load	TR160MA/B120			122500	uF
		TR160MA/B240			6600	
		TR160MA/B360			4330	
		TR160MA/B480			3240	
Efficiency	Output is Rated Load Ambient Temperature=25°C @ Input Voltage is 230VAC	TR160MA/B120		91		%
		TR160MA/B240		92		
		TR160MA/B360		92		
		TR160MA/B480		93		



# TR160M Series

## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Input to Output	1 minute (without Dielectric Breakdown)	All			4400	V <sub>ac</sub>
Input to Earth(Ground)	1 minute (without Dielectric Breakdown)	All			1700	V <sub>ac</sub>
Output to Earth(Ground)	1 minute (without Dielectric Breakdown)	All			1700	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		115		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	370			K hours
Humidity	Nom-condensing	All			93	% RH
Shock	Mests MIL-STD-810F Table 516.5, TABLE 516.5-1 10ms, each axis 3 times(+X · Y · Z axis)	All		75		g
Vibration	Mests MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X · Y · Z axis, 1 hr(each axis),. total 3 hrs.	All		4		g
Weight		All		575		grams
Safety	Class I, Class II, IEC60601-1, EN60601-1-11, 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 15					Ed 4.0
Conducted Disturbance	EN55011, FCC CFR47 Part 15					Class B
Radiated Disturbance	EN55011, FCC CFR47 Part 15					Class B
Harmonic Current Emissions	EN 61000-3-2:2014					Class A, D
Voltage Fluctuations & Flicker	EN 61000-3-3:2013					Criterion A
EMC Immunity	EN60601-1-2:2015, IEC61000-4-2,3,4,5,6,8,11					
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008 Air Discharge: ±16kV Contact Discharge: ±4kV					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2010					Criterion A
Electrical Fast Transient (EFT)	IEC61000-4-4:2012, ±1kV, ±2kV					Criterion A
Surge	IEC61000-4-5:2014, L-N: ±0.5kV, ±1kV, ±2kV 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, Dips:30% reduction, Dips: >95% reduction, Criteria A					Criterion A
Voltage Interruptions	IEC 61000-4-11:2004, >95% Reduction					Criterion B
Application Note Link						<a href="#">TR160M Series App Notes</a>

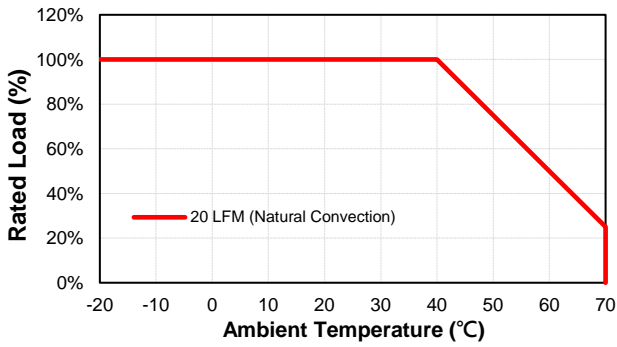


# TR160M Series

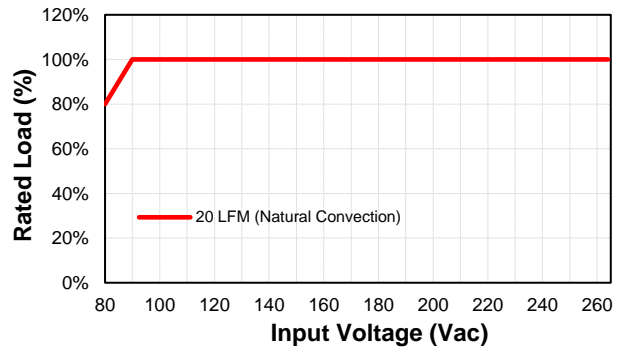
## CHARACTERISTIC CURVE

### Power Derating Curve

TR160M Derating Curve

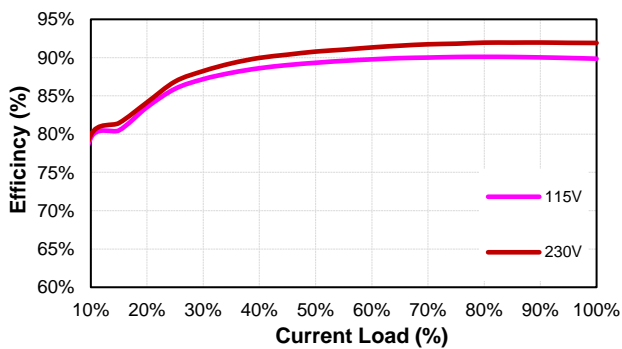


TR160M Input Voltage Derating Curve

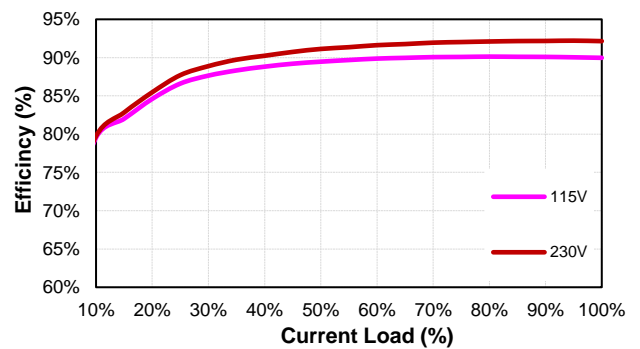


### Performance Data

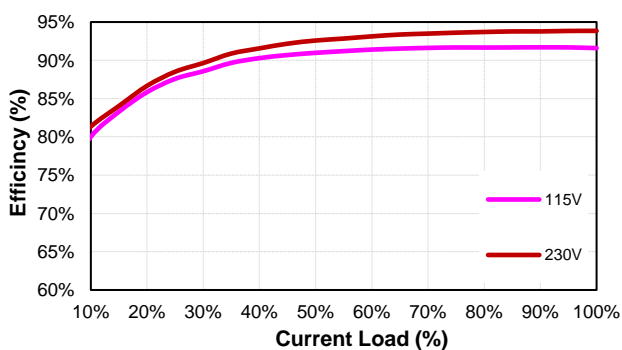
TR160M120 (Eff Vs Io)



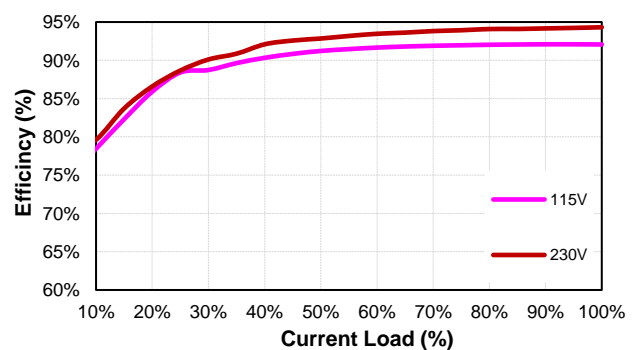
TR160M240 (Eff Vs Io)



TR160M360 (Eff Vs Io)



CFM130S480 (Eff Vs Io)





# TR160M Series

## 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	80		264	V <sub>ac</sub>
Operating Temperature	See Derating Curve	All	-20		70	°C
Storage Temperature		All	-40		85	°C
Input/Output Isolation Voltage	1 minute	All	4000			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		60	Hz
Maximum Input Current	100% Load, V <sub>in</sub> =100Vac	All			2.0	A
Leakage Current (Earth)		All			300	uA
Leakage Current (Touch)		All			100	uA
Under Voltage Protection		All	60	66	70	V

### OUTPUT CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
Output Voltage Set Point	V <sub>in</sub> =Nominal V <sub>in</sub> , I <sub>o</sub> =60% Load, T <sub>c</sub> =25°C.	TR160MA/B120	11.76	12	12.24	V <sub>dc</sub>
		TR160MA/B240	23.52	24	24.48	
		TR160MA/B360	35.28	36	36.72	
		TR160MA/B480	47.04	48	48.96	
Operating Output Current Range		TR160MA/B120			12.5	A
		TR160MA/B240			6.66	
		TR160MA/B360			4.44	
		TR160MA/B480			3.33	
Holdup Time	V <sub>in</sub> =115Vac	All		25		ms
Output Voltage Regulation						
Load Regulation	40% Load to Full Load	All			±4.0	%
Line Regulation	V <sub>in</sub> =High Line to Low Line	All			±1.0	%
Over Voltage Protection		TR160MA/B120		13.5		V <sub>dc</sub>
		TR160MA/B240		30		
		TR160MA/B360		42		
		TR160MA/B480		56		
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	TR160MA/B120			120	mV
		TR160MA/B240			150	
		TR160MA/B360			240	
		TR160MA/B480			480	
Load Capacitance	1. Ambient Temperature=25°C 2. Input Voltage is 115VAC and 230VAC 3. Output is max. Load	TR160MA/B120			122500	uF
		TR160MA/B240			6600	
		TR160MA/B360			4330	
		TR160MA/B480			3240	
Efficiency	Output is Rated Load Ambient Temperature=25°C @ Input Voltage is 230VAC	TR160MA/B120		91		%
		TR160MA/B240		92		
		TR160MA/B360		92		
		TR160MA/B480		93		



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## ISOLATION CHARACTERISTICS

PARAMETER	NOTES and CONDITIONS	Device	Min.	Typ.	Max.	Units
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Input to Earth(Ground)	1 minute (without Dielectric Breakdown)	All			1700	V <sub>ac</sub>
Output to Earth(Ground)	1 minute (without Dielectric Breakdown)	All			1700	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		115		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				K hours
Humidity	Nom-condensing	All			93	% RH
Shock	Mests MIL-STD-810F Table 516.5, TABLE 516.5-1 10ms, each axis 3 times(+X · Y · Z axis)	All		75		g
Vibration	Mests MIL-STD-810F Table 514.5C-VIII, 15~2000Hz, X · Y · Z axis, 1 hr(each axis),. total 3 hrs.	All		4		g
Weight		All		575		grams
Safety	Class I, Class II, IEC60601-1, EN60601-1-11, 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 15					Ed 4.0
Conducted Disturbance	EN55011, FCC CFR47 Part 15					Class B
Radiated Disturbance	EN55011, FCC CFR47 Part 15					Class B
Harmonic Current Emissions	EN 61000-3-2:2014					Class A, D
Voltage Fluctuations & Flicker	EN 61000-3-3:2013					Criterion A
EMC Immunity	EN60601-1-2:2015, IEC61000-4-2,3,4,5,6,8,11					
Electrostatic Discharge (ESD)	IEC 61000-4-2:2008 Air Discharge: ±16kV Contact Discharge: ±4kV					Criterion A
Radio-Frequency, Continuous Radiated Disturbance	IEC 61000-4-3:2010					Criterion A
Electrical Fast Transient (EFT)	IEC61000-4-4:2012, ±1kV, ±2kV					Criterion A
Surge	IEC61000-4-5:2014, L-N: ±0.5kV, ±1kV, ±2kV 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, Dips:30% reduction, Dips: >95% reduction, Criteria A					Criterion A
Voltage Interruptions	IEC 61000-4-11:2004, >95% Reduction					Criterion B
Application Note Link						<a href="#">TR160M Series App Notes</a>

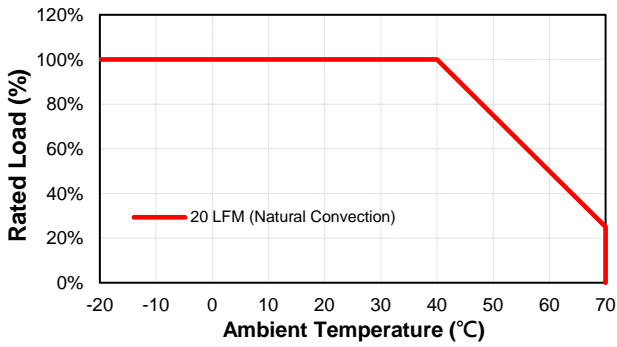


# TR160M Series

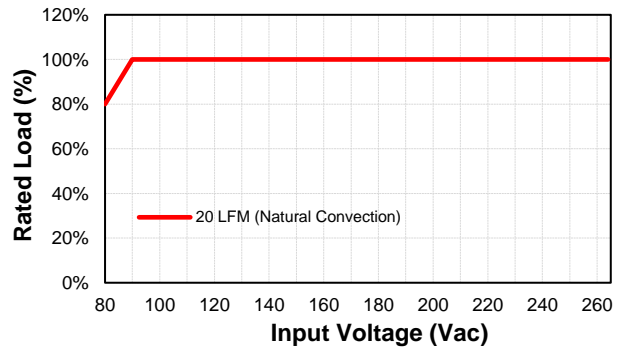
## CHARACTERISTIC CURVE

### Power Derating Curve

TR160M Derating Curve

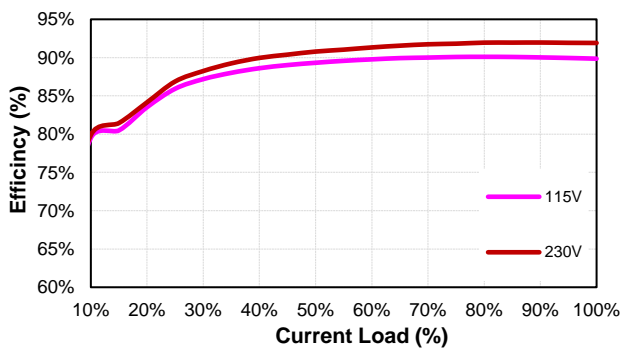


TR160M Input Voltage Derating Curve

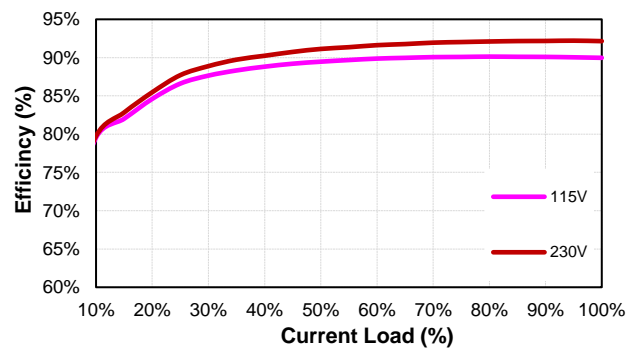


### Performance Data

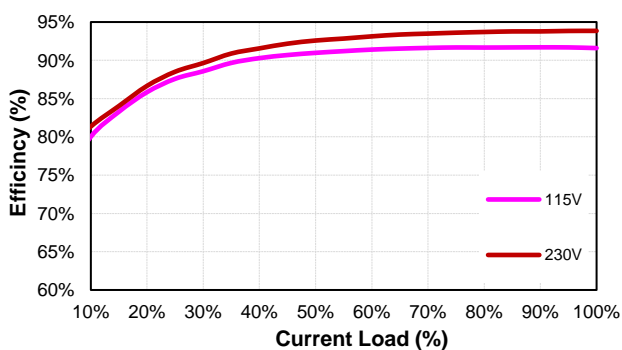
TR160M120 (Eff Vs Io)



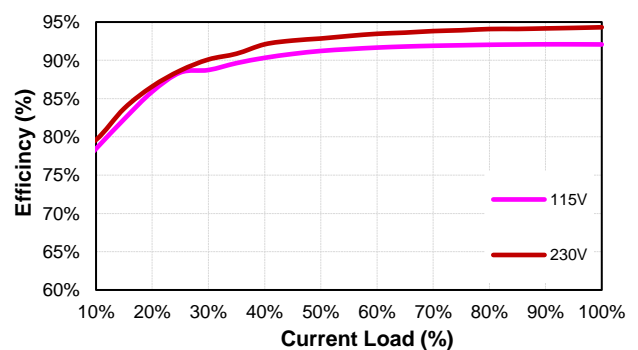
TR160M240 (Eff Vs Io)



TR160M360 (Eff Vs Io)



CFM130S480 (Eff Vs Io)



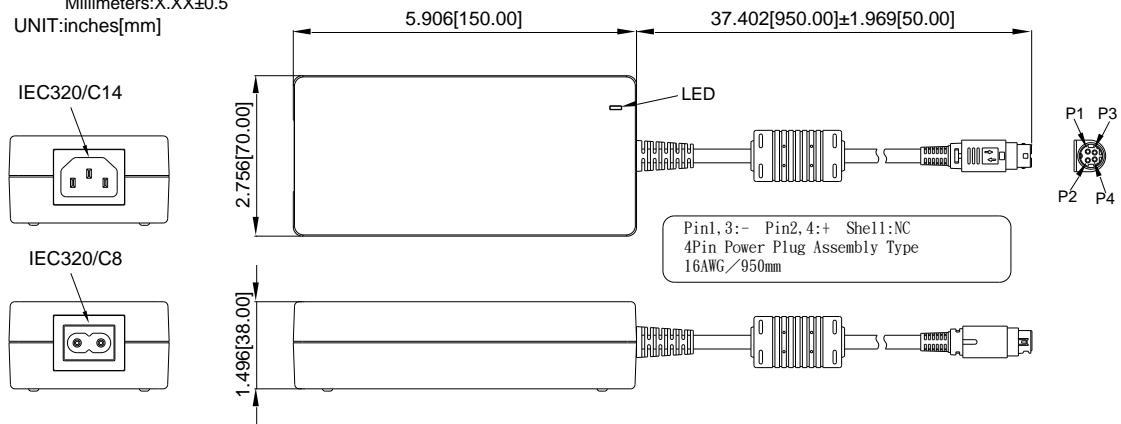


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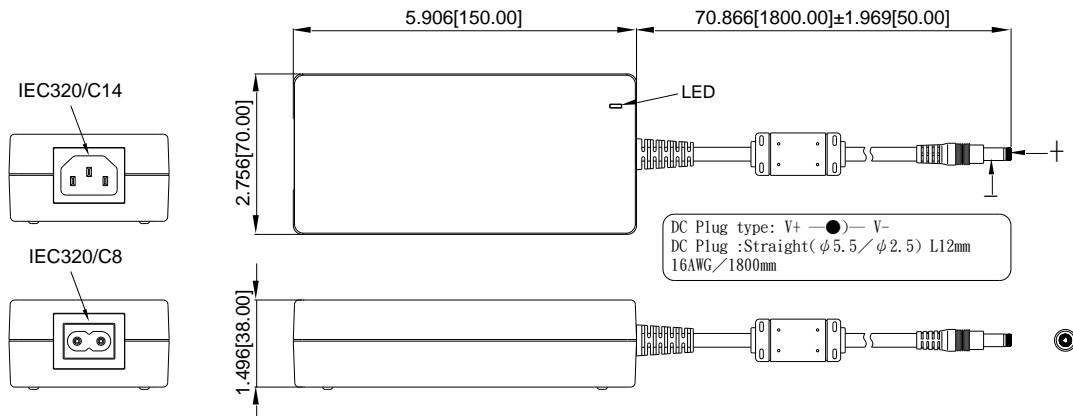
## MECHANICAL SPECIFICATION

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

### Din Power Plug



### DC Jack



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

\* For Output Voltage 24Vdc to 48Vdc models, it's able to select Din Power Plug, DC Jack or equivalent.

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 Web: [www.cincon.com.tw](http://www.cincon.com.tw)



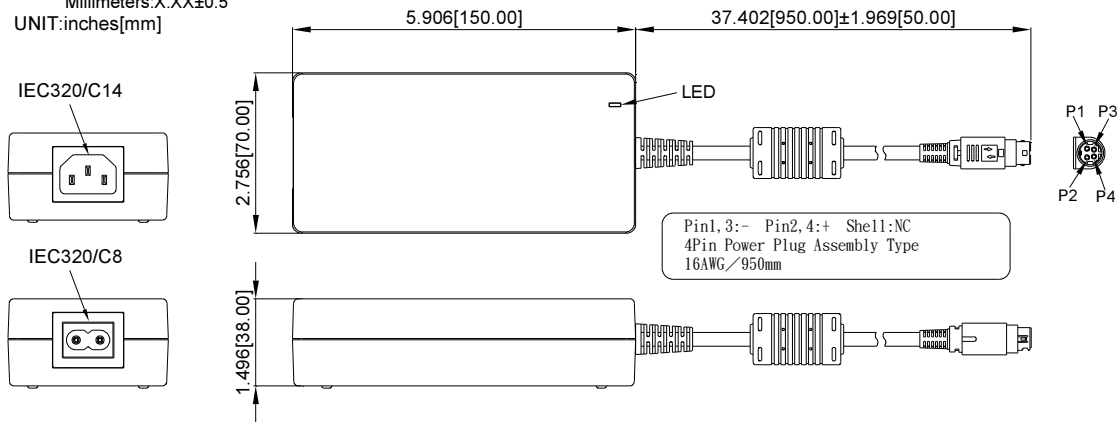


# TR160M Series

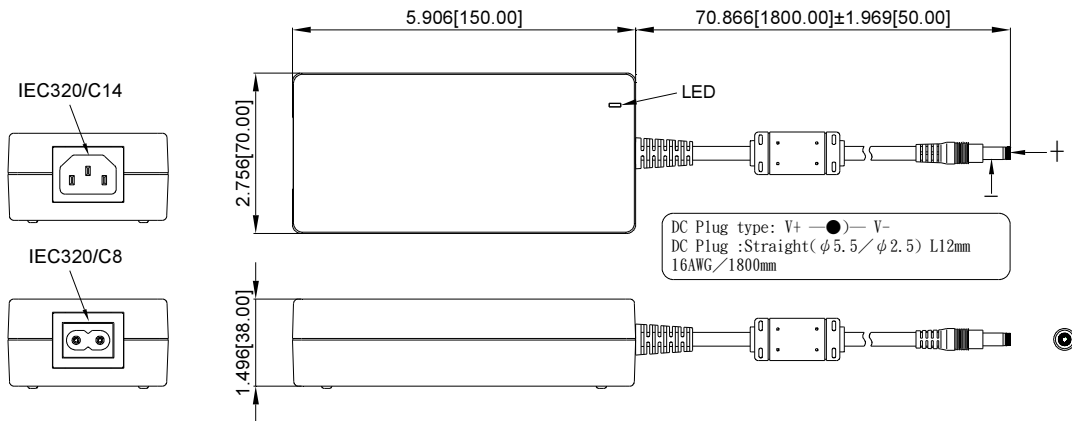
## MECHANICAL SPECIFICATION

All Dimensions are in inches[mm]  
 Tolerance:Inches:X.XXX±0.02  
 Millimeters:X.XX±0.5  
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### Din Power Plug



### DC Jack



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

\* For Output Voltage 24Vdc to 48Vdc models, it's able to select Din Power Plug, DC Jack or equivalent.

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