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## 1 GENERAL

### 1.1 Description

This product is AC to DC power transfer device, it can provide for a 24W single DC output with constant voltage and constant current source.

- Simple design philosophy.
- Overload Latch-Off protection during either (a) specified power threshold requirements or (b) short circuit condition.
- Reliability level of 50K hours MTBF & 0.5% annual field failure rate @ 25° C.
- DC output voltage must be Safe Extra Low Voltage (SELV) & Limited Power as defined by IEC60950 3<sup>rd</sup> edition.

The maximum room ambient temperature ( $T_{mra}$ ), as mentioned in clause 1.4.12 of IEC 60950 3<sup>rd</sup> edition, for the external power supply is 40 °C.

### 1.2 DC Output Requirements

The power supply shall have one regulated DC outputs of +24V.

The table below defines the total regulation band for the output, which includes line regulation, load regulation, and effects due to environmental conditions and aging. Voltage shall be measured at the power supply output connector.

Output	Output Current Range		Output Voltage Range		Ripple & Noise
	Min.	Max.	Min.	Max.	Max.
+24V	0.0A	1.0A	22.8V	25.2V	100mV

Ripple & Noise Test : Add 0.1uF/50V ceramic capacitor across the output terminal. Measured with 20MHz Bandwidth Oscilloscope.

## 2 INPUT REQUIREMENTS

### 2.1 Input Conditions

The Supply shall operate over the voltage ranges as follows:

Rated Input Voltage	100-240Vac
Operating Range	90-264Vac
Rated Input Frequency	50/60Hz +/- 3Hz
Maximum input power	32W
Power Consumption (No Loading)	Max. 0.8W

## 2.2 AC Inrush Current

Peak inrush current shall be limited to 35 A for a cold start. Under both cold & warm start conditions, there shall be no immediate damage or long term impact on the reliability of the Supply. The conformance test for this requirement shall be performed at +12.5% of the rated input voltage. Voltage and current waveforms will be observed on an oscilloscope following closure of the external power switch. Switch closure will be repeated until the waveforms show closure coincident with a voltage peak. The current measured during this occurrence will be defined as the peak inrush current.

## 2.3 Brownout and Brownout Recovery

The supply shall be subjected to the following tests while under maximum rated load No component damage is permitted

### 2.3.1 Brownout

108 Vac 60 Hz to 0 Vac @ 60 Hz in 1 volt decrements in 30 minutes (North American)

180 Vac 50 Hz to 0 Vac @ 50 Hz in 1 volt decrements in 30 minutes (Continental Europe, United Kingdom and Australian)

108 Vac 50 Hz to 0 Vac @ 50 Hz in 1 volt decrements in 30 minutes (Universal)

### 2.3.2 Brownout Recovery

0 vac 60 Hz to 108 Vac @ 60 HZ in 1 volt decrements in 30 minutes (North America)

0 vac 50 Hz to 180 Vac @ 50 Hz in 1 volt decrements in 30 minutes (continental Europe United Kingdom and Australian)

0 Vac 50 Hz to 108 VAC @ 50 Hz in 1 volt decrements in 30 minutes (Universal)

After completion of the test, power will be reapplied within the rated line voltage ranges and normal operation is expected.

### 2.3.3 Efficiency

The efficiency of the Supply shall meet the following requirements:

Supply:	Load:	Line	Efficiency
Universal	Rated Output	90– 264 Vac	≥ 75%

### 2.4 On/Off and On/Standby Cycling

The Supply shall be subjected to the following test to ensure proper turn on and reliability.

The four conditions are:

105 Vac 60 Hz (North American)

175 Vac 50 Hz (Continental Europe, United Kingdom and Australian)

88 Vac 60 Hz & 270 Vac 50 Hz (Universal)

The Supply shall be cycled between:

“On” and “Off” using an external switching device which interrupts the current into the Supply.

The cycle profile shall use the following sequence:

<i>Step Number</i>	<i>Procedure Step</i>	<i>Repetitions</i>	<i>Output Load</i>
1	0.5 seconds ON, 0.5 seconds Off	4	Rated Output Current
2	1.0 seconds ON, 1.0 seconds Off	4	Rated Output Current
3	2.0 seconds ON, 2.0 seconds Off	4	Rated Output Current
4	4.0 seconds ON, 4.0 seconds Off	4	Rated Output Current
5	8.0 seconds ON, 8.0 seconds Off	4	Rated Output Current
6	16 seconds ON, 16 seconds Off	4	Rated Output Current
7	32 seconds ON, 32 seconds Off	4	Rated Output Current

## 3 OUTPUT REQUIREMENTS

### 3.1 Output Voltage , Current

Output#	Voltage	Minimum load	Max load	Peak load
1	+24V	0A	1000mA	*

#### 3.1.1 Load/Line Regulation

The output voltage shall be statically regulated for all combinations of load, line and environment including cross regulation as shown.

Output#	Normal Voltage	Min. Voltage	Max. Voltage	Tolerance
	+24V	+22.8V	+25.2V	+/-5%

### 3.1.2 Light Load Output Voltage

The output voltage shall be within the specified limits shown when subjected to the following conditions:

Line voltage: 90 Vac – 264 Vac 50 & 60 Hz (Universal)

Load:  $I_o \leq 10\text{mA dc}$

Ambient temperature:  $0^\circ\text{C} - 40^\circ\text{C}$

Output voltage: 24 Vdc +/-5%

No damage or hazardous condition will occur with the DC output connector disconnected from the load under all input line conditions.

### 3.2 Over voltage Protection

The output voltage shall be clamped by internal protection zener.

### 3.3 Over Current Protection

The output shall be protected against the over current conditions. A power cycle shall be required to restore normal operation.

### 3.4 Short Circuit Protection

The power supply shall have self-limiting protection. The output shall be protected against short circuit conditions.

### 3.5 Rise Time

The Supply shall have a start-up rise time of less than 20 msec to rise to within regulation limits for all DC outputs.

### 3.6 Hold Up Time

When power off , DC output +24 V must be maintain 10 msec in regulation limit at 115Vac and full load.

### 3.7 Turn On Delay Time

2000 msec @ Full load

### 3.8 Output Ripple

Maximum Ripple must be less than 100mVpp when subjected to the following conditions:

Bandwidth: Limited 1Hz to 20MHz (PARD)

Line voltage: 100Vac-240Vac 50 & 60 Hz (Universal)

Output Load: Full Load



**3.9 Overshoot**

During either Turn-On (120Vac or 240Vac) or Turn-Off (AC voltage absent) of the power supply, the output voltage shall not exceed 25.68Vdc. No voltage of opposite polarity shall be present on the output during turn-on or turn-off.

**3.10 Dynamic Response**

The power supply output voltage shall not undershoot or overshoot beyond the specified limits shown after applying load changes with a 0.15A/μsec slew rate on the output. The load change will be applied with a 50% duty cycle.

Voltage Limits		Load Change
Minimum	Maximum	
22.8 Vdc	25.2 Vdc	20% to 80% load and back to 20%

**3.11 Components Thermal Derating**

Under nominal output load conditions and any input operating conditions, all components shall not exceed 85% thermal derating. All magnetic components shall not exceed their designed safety rated temperatures for the insulation.

**4 MECHANICAL**

**4.1 Enclosure And Layout**

The Power Supply enclosure shall have no openings to its enclosure. The enclosure plastic shall be UL recognized flammability rating 94V-1 or better and black in color.

Casing                      Mechanical layout and material acc. To EN60950, UL94V-1(housing)  
Weight :                    156g (Max.)  
Dimensions:              93x47x34.2mm  
Colour :                    black

**4.2 Input and Output Configuration**

Input Pin:                    US Pin  
Output Connector :        DC Plug Type JACK-PLUG: 5.5\*2.1\*12 mm  
Polarity:                    Center:"+"

Cable: 6FT VW-1 80°C 300V 22AWG 2C 2468 BLACK+WHIATE

**4.2.1 Strain Relief Pull Test**

Put the DC cable connector in fixture and apply 60N force on the cable 25 times at 1 time per second. The cable shall not disengage. Long term stretch test is made with 30N for 1 hour.

**4.2.2 Strain Relief Bend Test**

Put the DC cable connector in appropriate fixture and apply 200g/f load to the cable. Then swing the

DC cable connector 6,000 times from 90° to -90° at a rate of 10 to 15 cycles per minute. Any crack in the strain relief is not allowed, the strain relief shall not detach from DC cable connector, and the conduction resistance shall not change by more than 10% from initial.

#### 4.3 Label or Marking

- ⊙ Marking shall be legible and locate within specified area.
- ⊙ Attachment test : stick 3 M 600 scotch tape on test area for 30 seconds. Then remove tape in vertical direction. no removal of marking is allowed.
- ⊙ Durability test : test according to IEC950 paragraph 1.7.15. The rubbing shall be to and fro 5 times on test area. After the test , the marking shall be legible without fading.

### 5 REGULATORY COMPLIANCE

#### 5.1 EMC Specifications

The external power supply must meet all specification in this section. it is required that the external power supply work closely with the \*\*\*\* in order to get the best EMC solution.

##### 5.1.1 Radiated and Conducted Emission

The power supply shall complied to:

FCC part 15 : Class B for radiated and conducted emissions.

EN55022 , 1992 , Class B for radiated and conducted emissions.

GB9254-1998,GB17625.1-2003

##### 5.1.2 Immunity

###### 5.1.2.1 Electrostatic Discharge Immunity

EN 55024:1998, EN 61000-4-2

- Air Discharge: ±8kV

- Contact Discharge: ±4kV

- Performance Criteria B

Electrostatic-discharge test by contact or air should be conducted with Static-discharge tester,

energy storage capacitance of 150pF, and discharge resistance of 330Ω, 8KV air discharge, 4KV contact discharge.

###### 5.1.2.2 Radiated Field Immunity

EN 55024:1998, EN 61000-4-3

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- Frequency Range: 80-1000MHz

- Field Strength: 3 V/m with 80% amplitude modulation of 1kHz

- Performance Criteria A

Radio-frequency electromagnetic field susceptibility test, RS 80-1000MHz, 3V/m, 80%AM(1KHz).



### 5.1.2.3 Fast Transient Immunity

EN 55024:1998, EN 61000-4-4

- Power line: 1kV
- Signal line: 0.5kV
- Performance Criteria B

### 5.1.2.4 Surge Immunity

EN 55024:1998, EN 61000-4-5

- 1.2/50 usec Open Circuit voltage
- 8/20 usec Short Circuit current
- Power line: 1kV
- Line to Earth: 2kV

Lighting Surge Voltage of differential and common modes shall be applies across AC input lines and cross input and frame ground.

## 5.2 Safety Requirements and Certification

### 5.2.1 Regulatory Standard

The power supply shall complied the following international regulatory standards

	Country	Certified Status	Standard
UL	USA	Meet	UL 60950
CSA	Canada	Meet	CSA C22.2 NO.950
TUV	Europe	Meet	TUVVDE-EN60950
CE	Europe	Meet	Declared& CE Mark
PSE			
CB Report			
CCC	CHINA	Meet	GB4943-2001

### 5.2.2 Additional Safety Requirements

- ⊙ Dielectric Withstand Voltage, Primary-to-Secondary: 3000 Vac. 5m A. 1 MINUTE.
- ⊙ Insulation Resistance, Input to output: 50M OHM at 500 VDC.
- ⊙ Reinforced insulation system, Primary-to-Ground and Primary-to-Secondary.
- ⊙ The leakage current shall not exceed 0.25mA.

## 6 PRODUCT ENVIRONMENTAL REQUIREMENTS

### 6.1 Temperature

- ⊙ Operating: 0 °C- +40 °C
- ⊙ Non-Operating -40 °C- +80 °C

## 6.2 Humidity

☉ Operating: 5% - 90% (Non Condensing)

## 6.3 Vibration

	<u>Frequency</u>	<u>Slope</u>	<u>Power Spectra Density</u>
Random	3 to 100 Hz	0	0.015 g <sup>2</sup> /Hz
	100 to 137 Hz	-6dB/octave	--
	137 to 357 Hz	0	0.0080 g <sup>2</sup> /Hz
	350 to 500 Hz	-6dB/octave	--
	500Hz (~2.41Grms)	--	0.0039 g <sup>2</sup> /Hz

15 minutes/axis along all three axes

## 6.4 Shock

### 6.4.1 End Use Handling (operational)

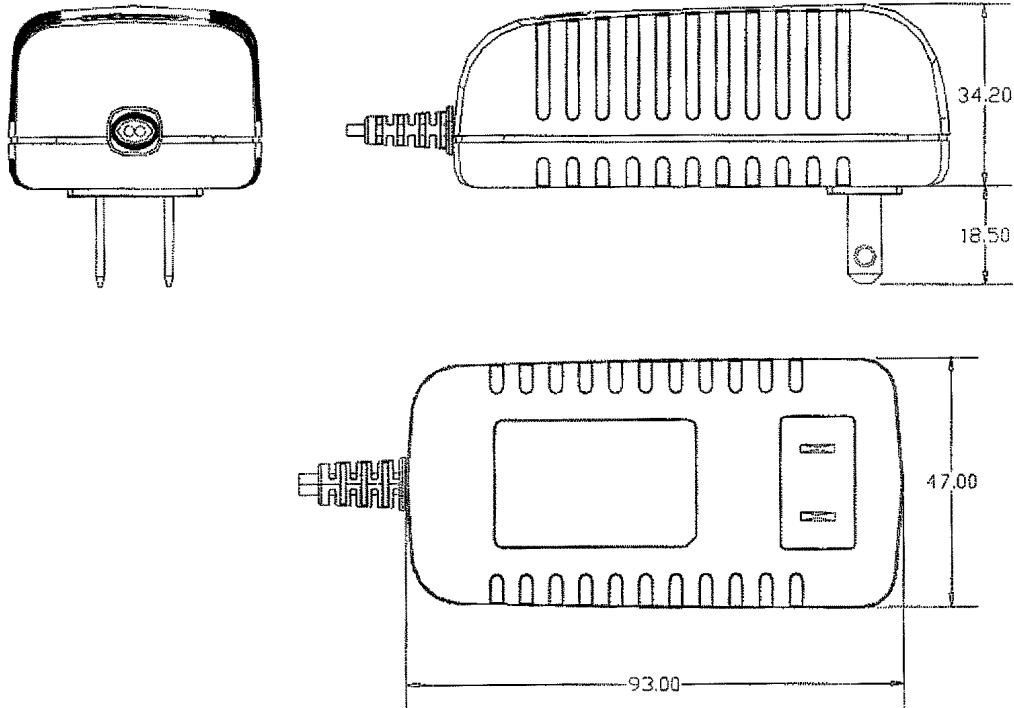
Half sine shock	Duration	<3msec
	Delta V	165cm/sec

Note: Minimum 3 shocks on each of 6 faces while product is powered on

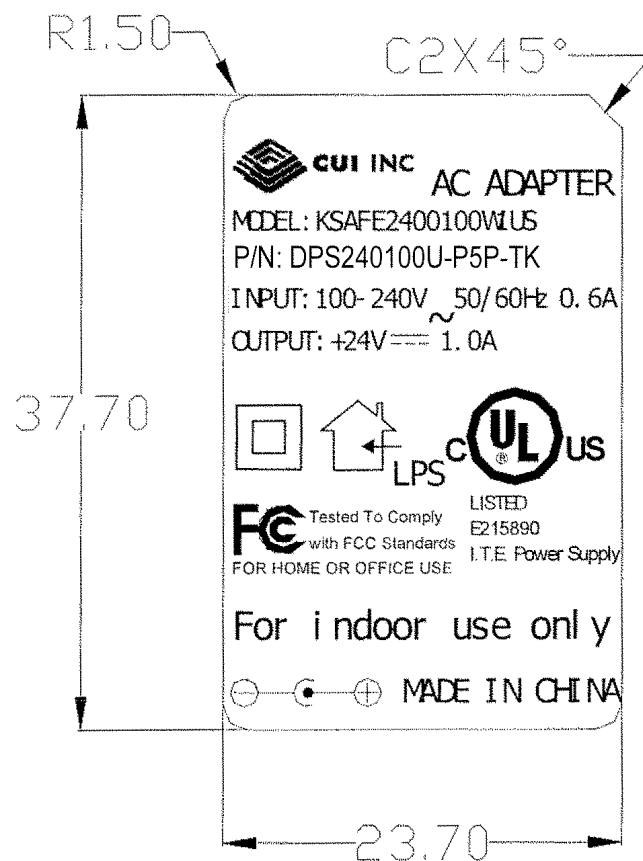
### 6.4.2 Transportation Simulation

Trapezoidal shock:	Acceleration:	50 g
	Delta V:	742 cm/sec

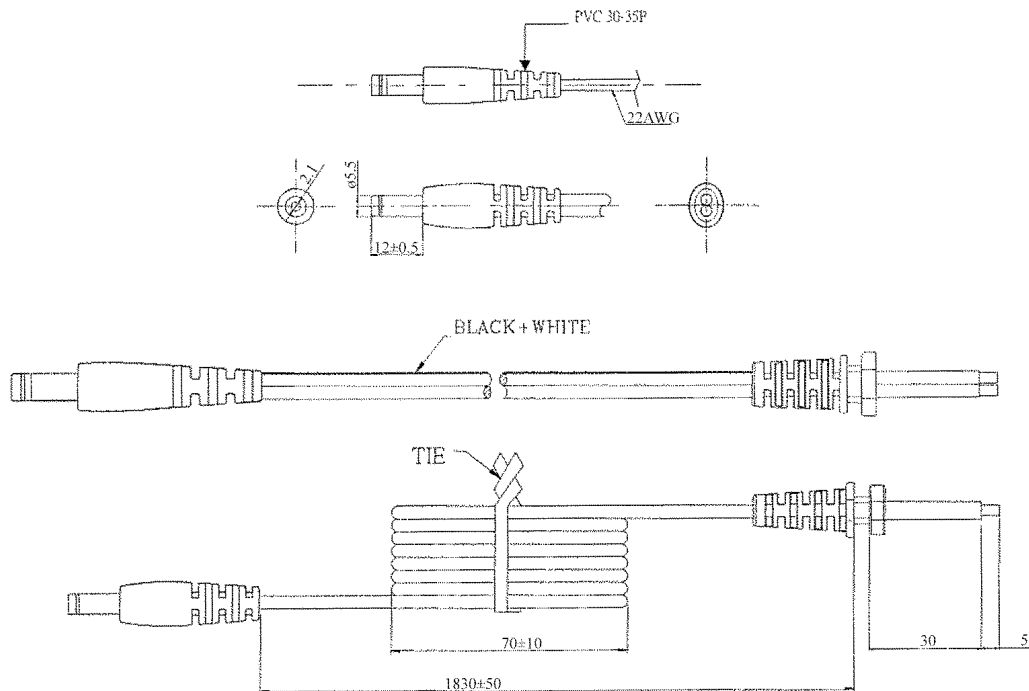
Note: Minimum 3 shocks on each of 6 faces

**7 Appearance Drawing: (Unit: mm)**


- NOTE:1. Case cover & chassis material:  
 PC/ABS (UL94V-1) BLACK  
 2. AC PIN MATERIAL:BRASS (NI PLATED)

**8 NAME PLATE**
**8.1 Dimension of name plate (Unit: mm)**


**Note: 1. MATERIAL: POLYESTER+PET; COATING:0.25+-0.05mm**  
**2. White characters Black background**

**9 Dimension of output plug & DC cord (Unit: mm)**


- NOTE: 1. WIRE TYPE: WW1 80° C 300V 6FT(1830mm) 22AWG 2468 2C BLACK+WHITE  
 2. WIRE JACKET MATERIAL: PVC (94V-0)  
 3. THE POLARITY:  $\ominus$  —  $\bullet$  —  $\oplus$