

## AIQ02R300-L

**65 Watts**  
**300 V Quarter-Brick**

**Total Power:** 65 Watts  
**Input Voltage:** 390 V  
**# of Outputs:** Single



### Special Features

- Active power factor correction
- EN61000-3-2 harmonic compliance
- 65 W Continuous power at 100 °C baseplate temperature
- High efficiency: up to 90%
- Low output ripple and noise
- Positive Enable function
- Excellent transient response
- Safety isolated low voltage control and monitoring
- High reliability
- Wide input voltage range
- Adjustable output voltage
- Regulation to zero load
- EU Directive 2002/95/EC compliant for RoHS

### Safety

UL cUL 60950 Recognized  
TUV EN60950 Licensed  
CE CE Mark

### Product Descriptions

The AIQ02R300-L is an isolated, single output DC to DC converter module, providing up to 65W output with a maximum baseplate operating temperature of 100 °C with no derating. The AIQ02R300-L features full safety isolated low voltage secondary side control and International safety standard. It is designed to use at high reliability application.

## Model Numbers

Standard	Output Voltage	Minimum Load	Maximum Load Current (I <sub>o,max</sub> )	Maximum Load Power (P <sub>o,max</sub> )
AIQ02R300-L	28.0V	0A	23.2A	65W

## Options

None

## Electrical Specifications

### Absolute Maximum Ratings

Stress in excess of those listed in the “Absolute Maximum Ratings” may cause permanent damage to the power supply. These are stress ratings only and functional operation of the unit is not implied at these or any other conditions above those given in the operational sections of this TRN. Exposure to any absolute maximum rated condition for extended periods may adversely affect the power supply’s reliability.

Table 1. Absolute Maximum Ratings:

Parameter	Model	Symbol	Min	Typ	Max	Unit
Input Voltage: DC continuous operation	AIQ02R300-L	$V_{IN,DC}$	250	-	420	Vdc
Maximum Output Power	AIQ02R300-L	$P_{O,max}$	-	-	65	W
Isolation Voltage Input to output	AIQ02R300-L		-	-	2500	Vdc
Baseplate temperature	AIQ02R300-L	$T_A$	-40	-	+100	°C
Storage Temperature	AIQ02R300-L	$T_{STG}$	-55	-	+125	°C
Humidity (non-condensing)	Operating	AIQ02R300-L	15	-	95	%
	Storage	AIQ02R300-L	5	-	95	%
Altitude	Operating	AIQ02R300-L	-	-	10,000	feet
	Storage	AIQ02R300-L	-	-	30,000	feet

## Input Specifications

Table 2. Input Specifications:

Parameter	Conditions	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC		$V_{IN,DC}$	250	390	420	$V_{dc}$ RMS
Input under Voltage						
Power On			225	-	247.5	$V_{dc}$ RMS
Power Off		$V_{IN,DC}$	200	-	220	
Maximum Input Current ( $I_O = I_{O,max}$ )	$V_{IN,DC} = 250V$	$I_{I,max}$	-		0.5	$A_{RMS}$
Input Capacitance			-	100 <sup>1</sup>	-	$\mu F$
No Load Input Power ( $V_O$ On, $I_O = 0A$ )	$V_{IN,DC} = 390V$	$I_{I,no\_load}$	-	-	5.0	W
Isolation – Input to Output			-	2500	-	$V_{dc}$
Operating Efficiency @ 25°C	$I_O = I_{O,max}$ $V_{IN,DC} = 390V$	$\eta$	-	91	-	%

Note 1 -100uF E-cap+ 2pcs of 47nF ceramic caps

## Output Specifications

Table 3. Output Specifications:

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Voltage Set Point	All	$V_O$	27.72	28	28.28	$V_{dc}$
Output Regulation	Inclusive of set-point, temperature change, warm-up drift and dynamic load	$V_O$	-	-	±0.2	%
Output Ripple, pk-pk	Measure with a 0.1µF ceramic capacitor in parallel with a 10µF tantalum capacitor, 0 to 20MHz bandwidth	$V_{O,PK-PK}$	-	-	3	%
Output Current	All	$I_O$	0	-	2.32	A
Output Rise Time	$I_{O,max}$	$T_{rise}$ $T_{rise}$	- -	- -	40 40	mS
$V_O$ Dynamic Response	load change from full load to 80% load slew rate = 0.1A/us	$\pm\%V_O$ $T_s$	- -	- -	5 2.5	% mSec

## AIQ02R300-L Performance Curves

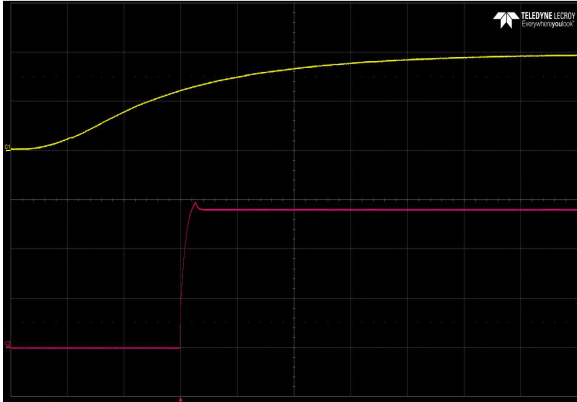


Figure 1: AIQ02R300-L Turn-on Characteristic via DC mains - Vin = 390Vdc  
Full Load:  $I_o = 2.32A$ ,  
Ch 1: DC Mains Ch 2: Vo

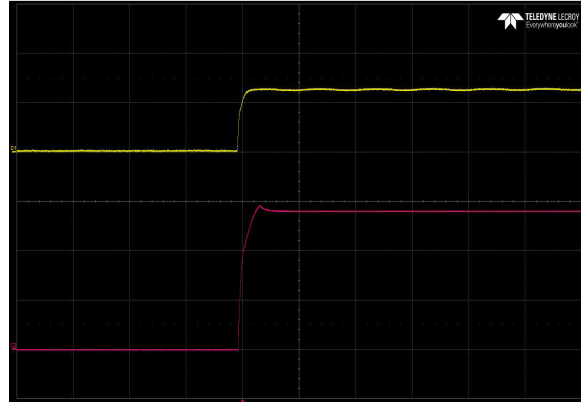


Figure 2: AIQ02R300-L Turn-on Characteristic via Enable Vin = 390Vdc  
Full Load:  $I_o = 2.32A$ ,  
Ch 1: Enable Ch 2: Vo

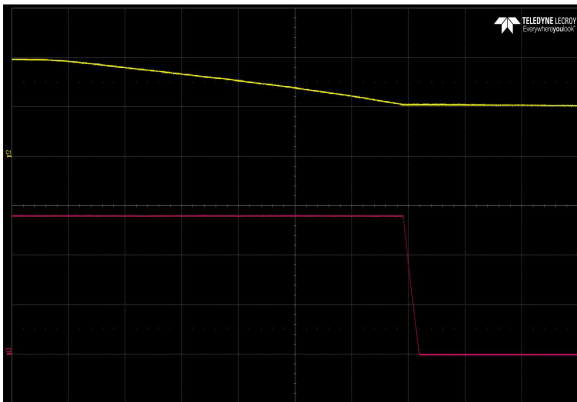


Figure 3: AIQ02R300-L Turn-off Characteristic via DC mains - Vin = 390Vdc  
Full Load:  $I_o = 2.32A$ ,  
Ch 1: DC Mains Ch 2: Vo

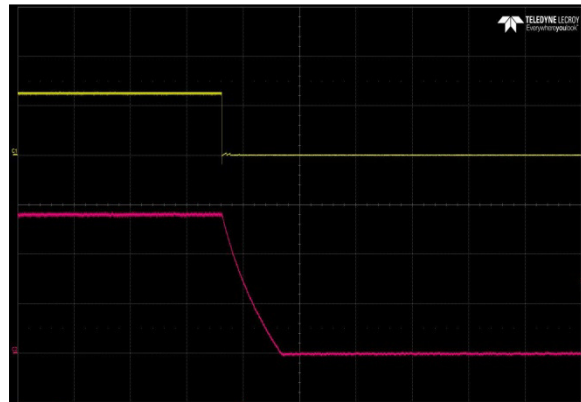


Figure 4: AIQ02R300-L Turn-off Characteristic via Enable - Vin = 390Vdc  
Full Load:  $I_o = 2.32A$ ,  
Ch 1: Enable Ch 2: Vo

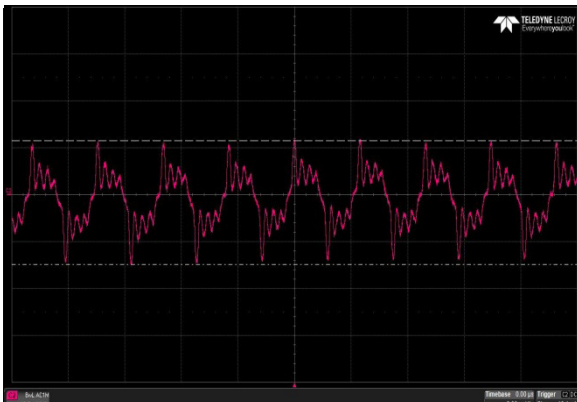


Figure 5: AIQ02R300-L Ripple and Noise Measurement - Vin = 390Vdc  
No Load:  $I_o = 0A$ ,  
Ch 2: Vo

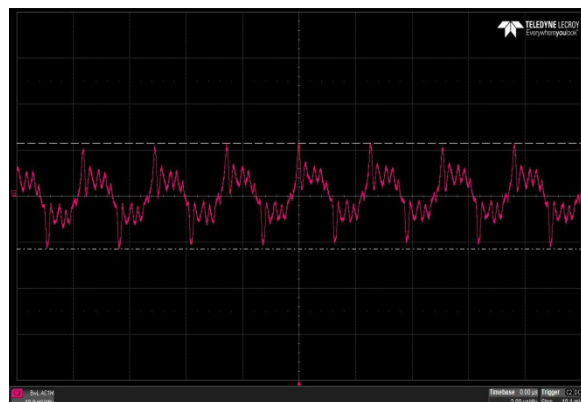
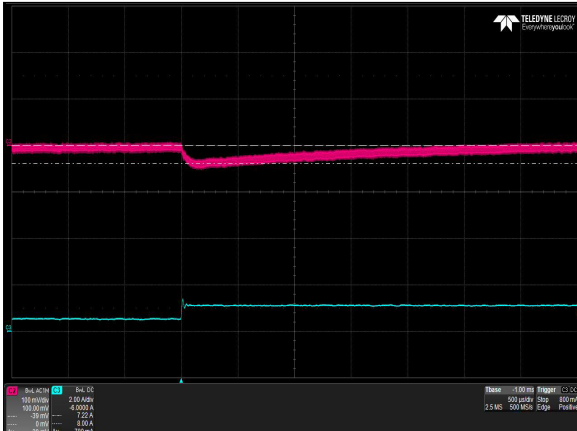
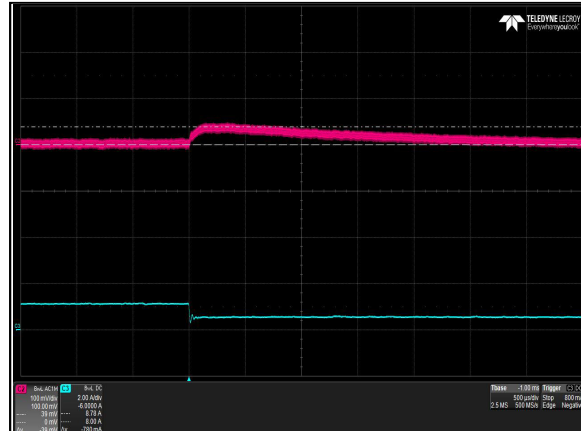


Figure 6: AIQ02R300-L Ripple and Noise Measurement - Vin = 390Vdc  
Full Load:  $I_o = 2.32A$ ,  
Ch 2: Vo

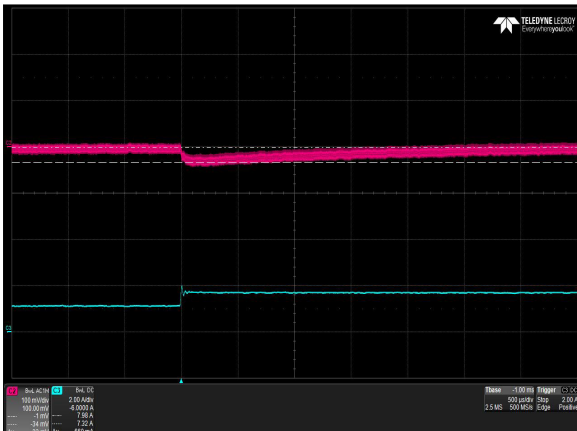
## AIQ02R300-L Performance Curves



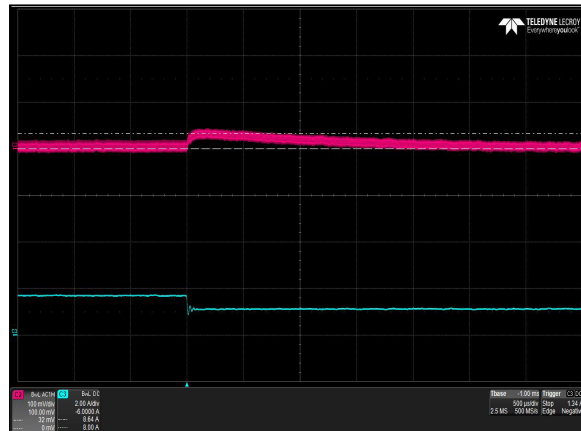
**Figure 7:** AIQ02R300-L Transient Response - Vo Deviation (low to high)  
25%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc  
Ch 2: Vo  
Ch 3: Io



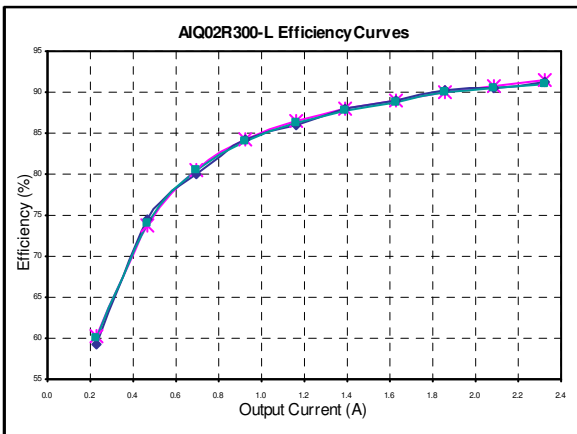
**Figure 8:** AIQ02R300-L Transient Response - Vo Deviation (high to low)  
25%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc  
Ch 2: Vo  
Ch 3: Io



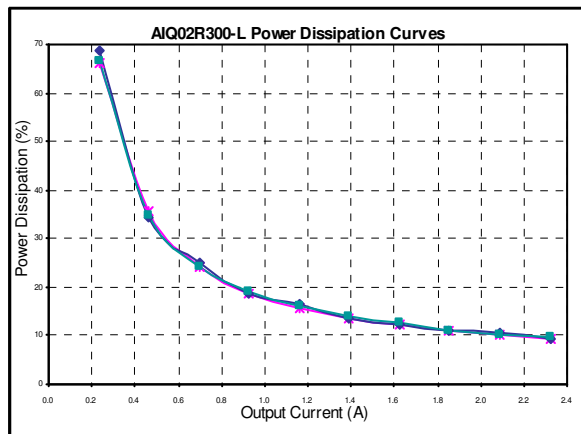
**Figure 9:** AIQ02R300-L Transient Response - Vo Deviation (low to high)  
50%-75% load change, 0.1A/uS slew rate, Vin = 390Vdc  
Ch 2: Vo  
Ch 3: Io



**Figure 10:** AIQ02R300-L Transient Response - Vo Deviation (high to low)  
75%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc  
Ch 2: Vo  
Ch 3: Io



**Figure 11:** AIQ02R300-L Efficiency Curves @ 25 degC  
◆ 250 Vdc ■ 390 Vdc ▲ 420 Vdc  
Loading: Vo = 10% increment to 2.32A



**Figure 12:** AIQ02R300-L Power Dissipation Curves @ 25 degC  
◆ 250 Vdc ■ 390 Vdc ▲ 420 Vdc  
Loading: Vo = 10% increment to 2.32A

## Protection Function Specification

### Input Fusing

AIQ02R300-L has no internal fused, so an input line fuse must always be used a 2.5A/450Vdc rated fuse is recommended to achieve safety testing only.

### Over Voltage Protection (OVP)

The AIQ02R300-L power supply latches off during output overvoltage with the DC line recycled to reset the latch.

Parameter	Min	Nom	Max	Unit
V <sub>O</sub> Output Over Voltage	30.0	/	31.5	Vo

### Over Current Protection (OCP)

The AIQ02R300-L power supply includes internal current limit circuitry to prevent damage in the event of overload. In the event of overloads, the output voltage may deviate from the regulation band but recovery is automatic when the load is reduced to within specified limits.

Parameter	Min	Nom	Max	Unit
I <sub>O</sub> Output Over Current	105	/	175	%I <sub>o</sub>

### Short Circuit Protection (SCP)

The AIQ02R300-L power supply will withstand a continuous short circuit with no permanent damage, applied to its main output during start-up or while running. When the output is shorted, measure the output RMS current during short circuit Mean current should maintain at < 3.5A during the period of the output is being shorted. Output shall be recovered after complete short is removed.

### Over Temperature Protection (OTP)

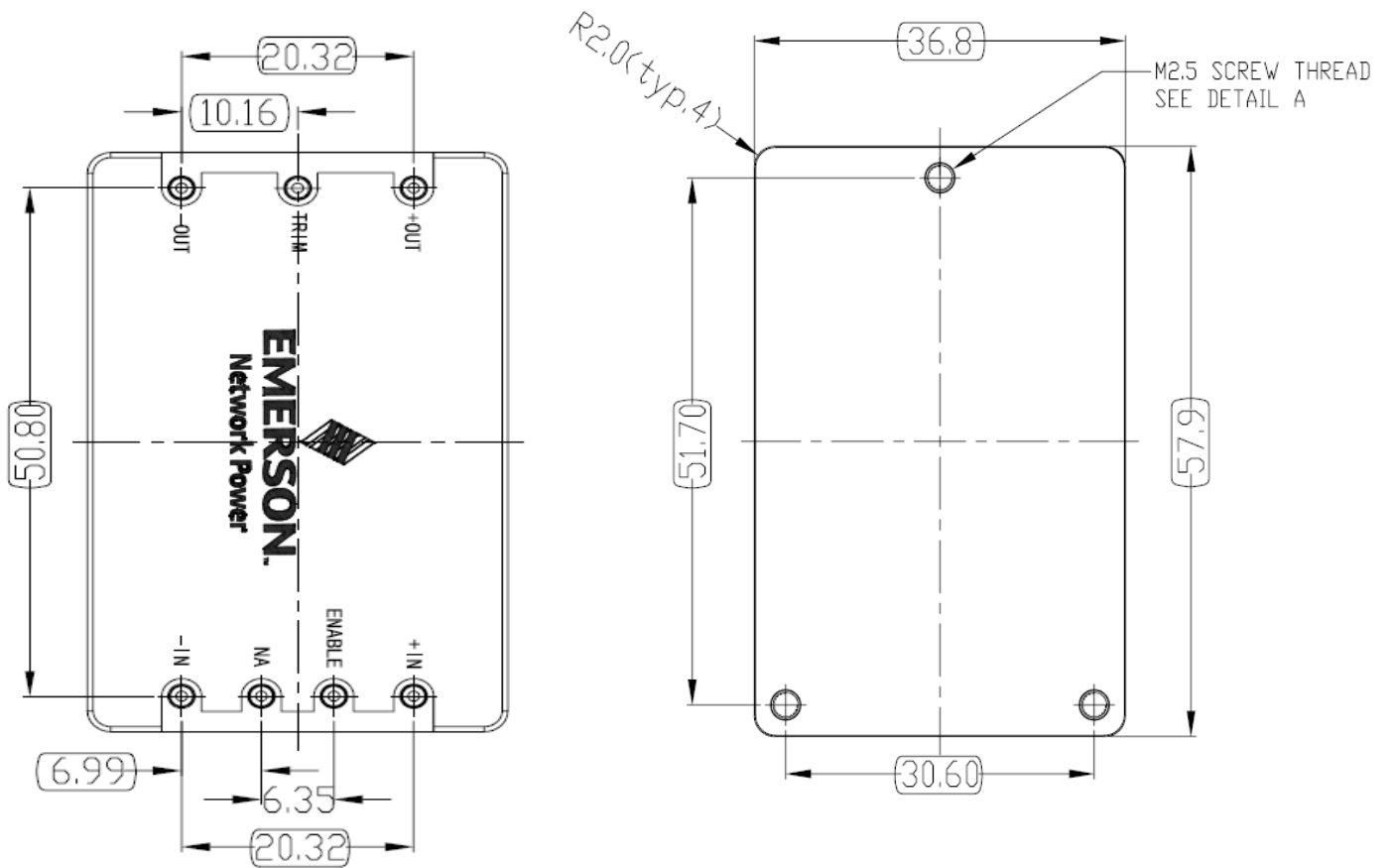
The power supply is internally protected against over temperature conditions. When the OTP circuit is activated, the power supply will latch off, requiring DC power or recycling to restart the power supply.

Parameter	Min	Nom	Max	Unit
OTP (Base-plate temp - turn on)	105	/	115	degC
OTP (Base-plate temp - turn off)	100	/	105	degC

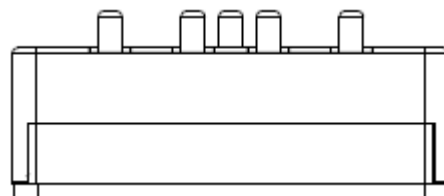
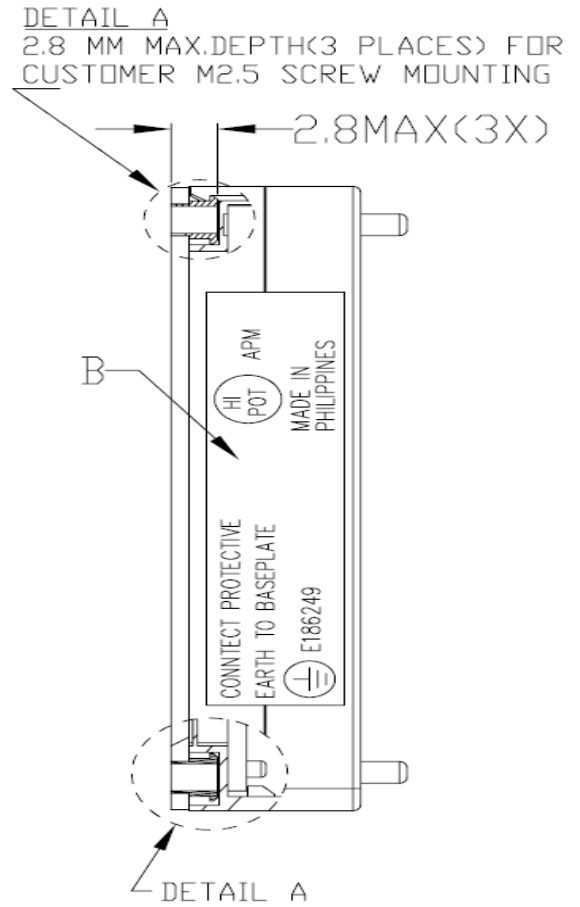
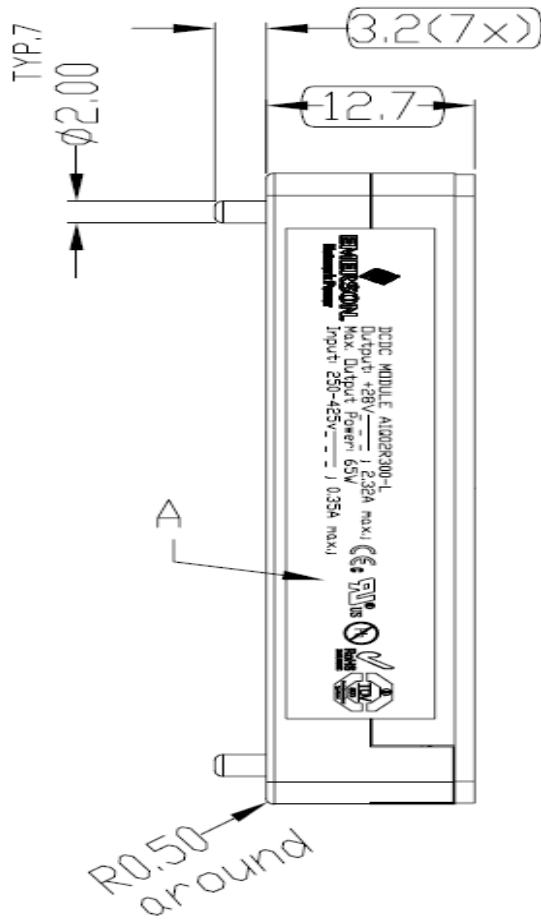


## Mechanical Specifications

### Mechanical Outlines



**Mechanical Outlines**



## Connector Definitions

### Input Connection Definition

Pin No.	Signal Description
1	+In
2	Enable
3	NA
4	-In

### Output Connection Definition

Pin No.	Signal Description
5	-Out
6	Trim
7	+Out

### **Weight**

The AIQ02R300-L series weight is 0.144lbs/65g maximum.

## Environmental Specifications

### Electrostatic Discharge

AIQ02R300-L power supply is designed to meet the following Electrostatic Discharge (ESD) specifications:

Contact discharge: 6KV

Air discharge: 8KV

The unit shall pass performance criteria B as per IEC1000-4-X standards.

## Safety Certifications

The AIQ02R300-L power supply is intended for inclusion in other equipment and the installer must ensure that it is in compliance with all the requirements of the end application. This product is only for inclusion by professional installers within other equipment and must not be operated as a stand alone product.

Table 4. Safety Certifications for AIQ02R300-L power supply system

Document	File #	Description
UL 60950-1(2 <sup>nd</sup> edition)	E186249-A110-UL	US and Canada Requirements
CSA C22.2 No. 60950-1-07(2 <sup>nd</sup> edition)		Information Technology Equipment - Safety - Part 1: General Requirements (Bi-National standard, with UL 60950-1)
EN60950		European Requirements
CE Mark		LVD
CB Certificate and Report	SG-OF-05908A1M1	(All CENELEC Countries)

## Storage and Shipping Temperature / Humidity

The AIQ02R300-L power supplies can be stored or shipped at temperatures between -55 °C to +125 °C and relative humidity from 5% to 95% non-condensing.

## Altitude

The AIQ02R300-L will operate within specifications at altitudes up to 10,000 feet above sea level. The power supply shall not be damaged when stored at altitudes of up to 30,000 feet above sea level.

## Humidity

The AIQ02R300-L will operate within specifications when subjected to a relative humidity from 15% to 90% non-condensing. The AIQ02R300-L can be stored in a relative humidity from 5% to 95% non-condensing.

## Reliability

The AIQ02R300-L will will operate within specifications and fit rate based on the 50% component stress at 45 °C ambient.

Env: GB, GC – Ground Benign

Temperature : 45 °C

Calculation: Telcordia Issue 1

Method : Method I Case 3

MTTF - Demonstrated : 4.15Mhrs

MTBF - Demonstrated : 1,964,698 Hours

## Vibration

The AIQ02R300-L power supply will pass the following vibration specifications:

### **Non-Operating Random Vibration**

Acceleration	2.7	gRMS
Frequency Range	10-2000	Hz
Duration	20	mins
Direction	X, Y, Z direction	
PSD Profile	<b>FREQ</b>	<b>SLOPE</b>
	10-190 Hz	---
	190-210 Hz	-31.213dB/oct
	210-2000 Hz	---
		<b>PSD</b>
		0.01 g <sup>2</sup> /Hz
		---
		0.003 g <sup>2</sup> /Hz

## **Shock**

The AIQ02R300-L power supply will pass the following shock specifications:

### **Non-Operating Half Sine Shock**

Acceleration	30	G
Duration	18	msec
Pulse	Half-Sine	
No. of Shock	3 times in each positive and negative directions	



## Power and Control Signal Descriptions

### DC Input Pins

This two pins supplies the DC Mains to the AIQ02R300-L power supply.

Pin1 +In - DC input voltage positive

Pin4 -In - DC input voltage negative

### DC Output Pins

These pins provide the main output for the AIQ02R300-L power supply.

Pin5 +Out - DC output voltage positive

Pin7 -Out - DC output voltage negative

### Output Connector - Control Signals

#### **ENABLE**

The enable pin is a TTL compatible input used to turn the output of the module on or off. The output is enabled when the Enable (pin 2 ) is open or driven to a logic high from 2V to 14V. The output is disabled when the Enable is connected to -In (pin 4 ) or driven to a logic low of < 0.8V.

Parameter	Min	Typ	Max	Unit
Enable Turn On	2	-	14	V <sub>dc</sub>
Enable Turn Off	-	-	0.8	V <sub>dc</sub>

#### **TRIM**

The trim pin is used to adjust the output voltage. Connect Rtrimup resistors from Trim to -Out, Vout can be adjusted to as high as 105%. Connect Rtrimdown resistors from Trim to +Out, Vout can be adjusted to as low as 90%.

## Application Notes

### Typical Application

Below is the typical application of the AIQ02R300-L series power supply.

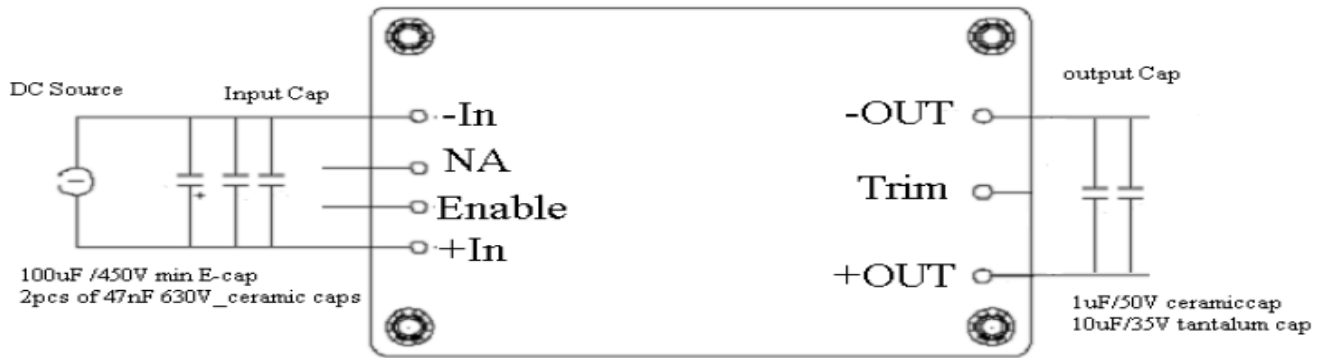


Figure 13. standard test setup

## Input Ripple & Output Ripple & Noise Test Configuration

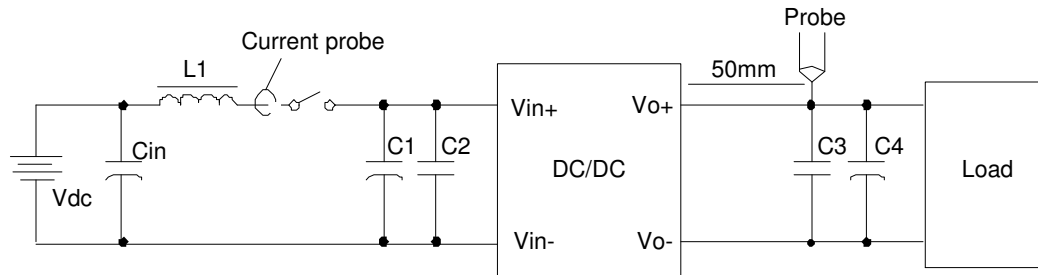


Figure 14 Input ripple & output ripple & noise test configuration

Vdc: DC power supply

L1: 12uH

Cin: 100uF/450V typical

C1,C2 : 47nF/630V ceramic capacitor

C3: 1uF/50V ceramic capacitor

C4: 10uF/35V tantalum capacitor

Note - Using a coaxial cable with series 50ohm resistor and 0.68uF ceramic capacitor or a ground ring of probe to test output ripple & noise is recommended.

## Trim Characteristics

The Vout can be trimmed up to 110% or down to 90% of Vout, please see below formula for trim-up and trim-down resistors. The following equations determine the external resistance to obtain the trimmed output voltage.

Connect Rtrimup resistors from Trim to -Out, Vout can be adjusted to as high as 105%.

$$R_{trimup} (K\Omega) = \frac{540.5}{4.6V_o - 129} - 1$$

Connect Rtrimdown resistors from Trim to +Out, Vout can be adjusted to as low as 90%.

$$R_{trimdown} (K\Omega) = \frac{(216.2V_o - 540.5)}{129 - 4.6V_o} - 1$$

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## Record of Revision and Changes

Issue	Date	Description	Originators
1.1	02.06.2015	First Issue	K. Zou
1.2	03.09.2015	Update Enable (pin2) connect to -In(pin4)	K. Zou

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