AIQ02R300-L

65 Watts

300 V Quarter-Brick

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



RoHS 2002/95/EC

Special Features

- Active power factor correction
- EN61000-3-2 harmonic compliance
- 65 W Continuous power at 100 ^{O}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 Directive2002/95/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 ^{O}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.

ARTESYN™
EMBEDDED TECHNOLOGIES

Model Numbers

Standard	Output Voltage	Minimum Load	Maximum Load Current (Io,max)	Maximum Load Power (Po,max)
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	^{O}C
Storage Temperature	AIQ02R300-L	T_{STG}	-55	-	+125	^{O}C
Humidity (non-condensing) Operating Storage	 AIQ02R300-L AIQ02R300-L		 15 5	 - -	 95 95	 % %
Altitude Operating Storage	 AIQ02R300-L AIQ02R300-L		 - -	 - -	 10,000 30,000	 feet 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 Power Off		 $V_{IN,DC}$	 225 200	 - -	 247.5 220	$V_{dc\ RMS}$
Maximum Input Current ($I_O = I_{O,max}$)	$V_{IN,DC}$ = 250V	$I_{I,max}$	-		0.5	A_{RMS}
Input Capacitance			-	100[1]	-	uF
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	η	-	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 Vin to Vout Enable to Vout	Io,max	 T_{rise} T_{rise}	 - -	 - -	 40 40	mS
V_O Dynamic Response Peak Deviation Settling Time	load change from full load to 80% load slew rate = 0.1A/us	 ±%V_O T_s	 - -	 - -	 5 2.5	 % mSec

AIQ02R300-L Performance Curves

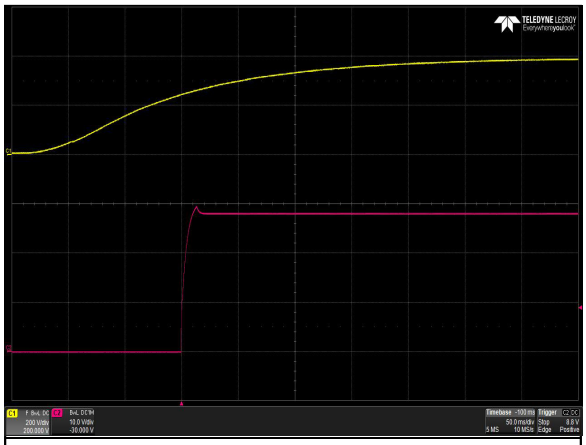


Figure 1: AIQ02R300-L Turn-on Characteristic via DC mains - Vin = 390Vdc
Full Load: Io = 2.32A,
Ch 1: DC Mains Ch 2: Vo

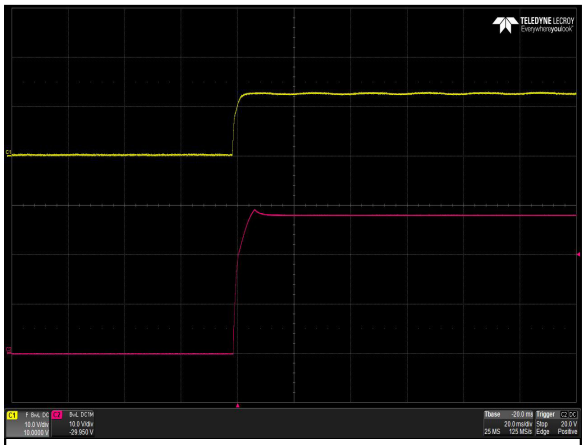


Figure 2: AIQ02R300-L Turn-on Characteristic via Enable Vin = 390Vdc
Full Load: Io = 2.32A,
Ch 1: Enable Ch 2: Vo

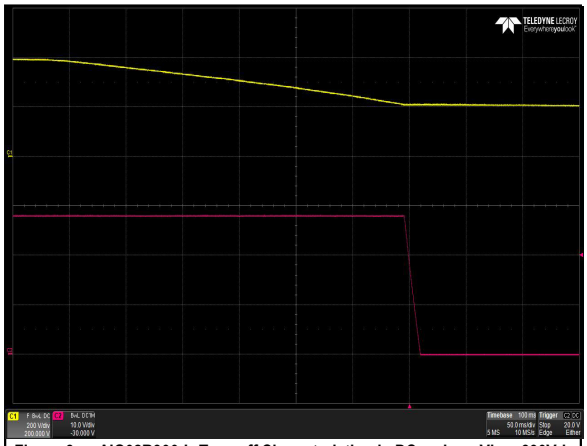


Figure 3: AIQ02R300-L Turn-off Characteristic via DC mains - Vin = 390Vdc
Full Load: Io = 2.32A,
Ch 1: DC Mains Ch 2: Vo

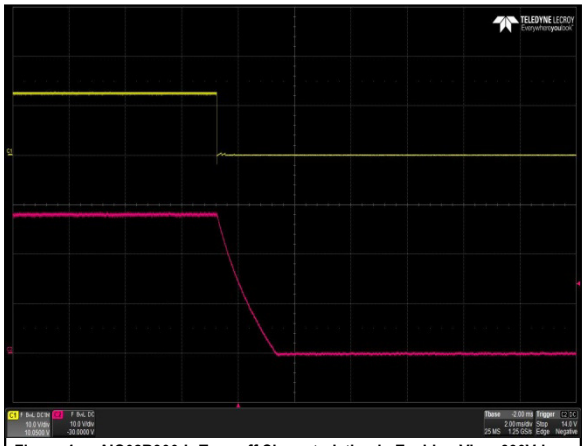


Figure 4: AIQ02R300-L Turn-off Characteristic via Enable - Vin = 390Vdc
Full Load: Io = 2.32A,
Ch 1: Enable Ch 2: Vo

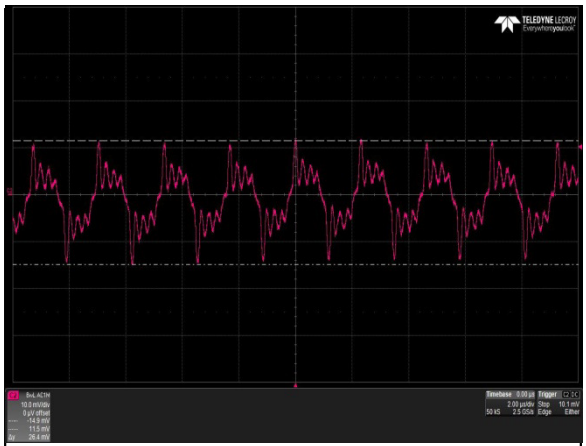


Figure 6: AIQ02R300-L Ripple and Noise Measurement - Vin = 390Vdc
No Load: Io = 0A,
Ch 2: Vo

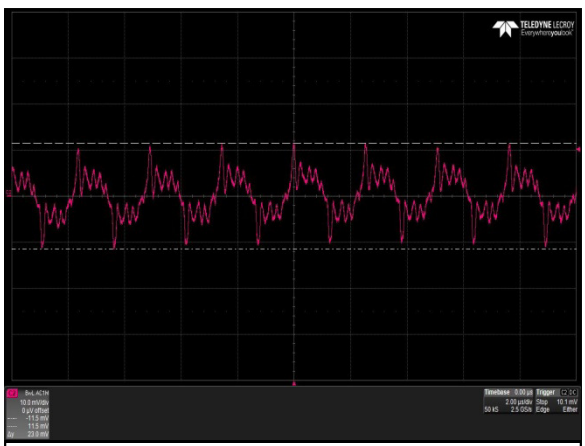


Figure 6: AIQ02R300-L Ripple and Noise Measurement - Vin = 390Vdc
Full Load: Io = 2.32A,
Ch 2: Vo

AIQ02R300-L Performance Curves

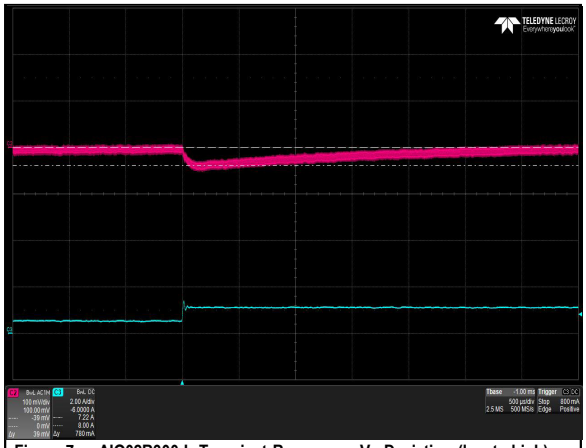


Figure 7: AIQ02R300-L Transient Response - Vo Deviation (low to high)
25%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc
Ch 2: Vo Ch 3: Io

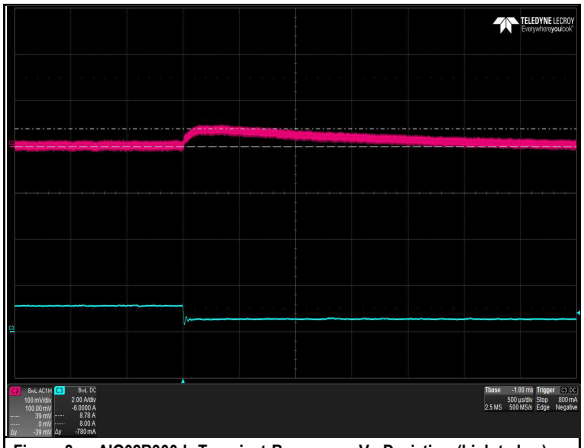


Figure 8: AIQ02R300-L Transient Response - Vo Deviation (high to low)
25%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc
Ch 2: Vo Ch 3: Io

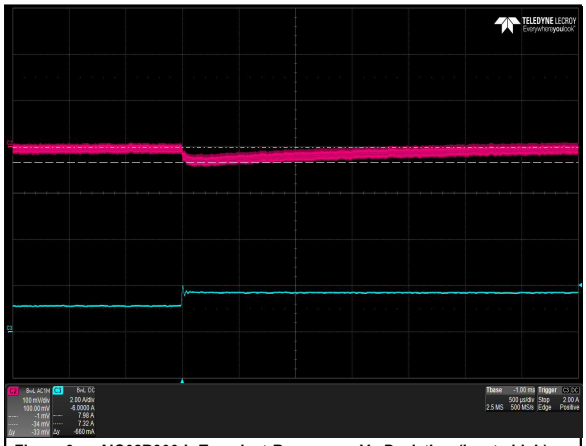


Figure 9: AIQ02R300-L Transient Response - Vo Deviation (low to high)
50%-75% load change, 0.1A/uS slew rate, Vin = 390Vdc
Ch 2: Vo Ch 3: Io

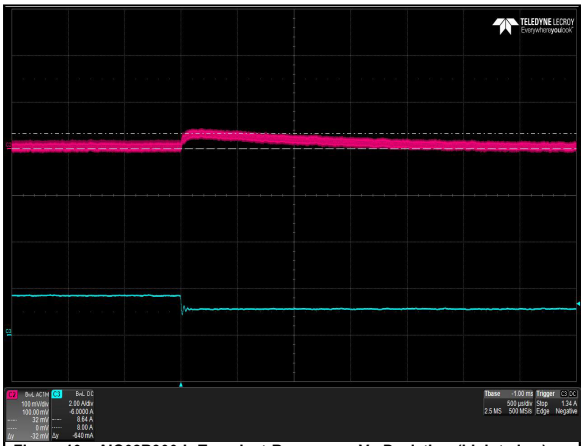


Figure 10: AIQ02R300-L Transient Response - Vo Deviation (high to low)
75%-50% load change, 0.1A/uS slew rate, Vin = 390Vdc
Ch 2: Vo Ch 3: Io

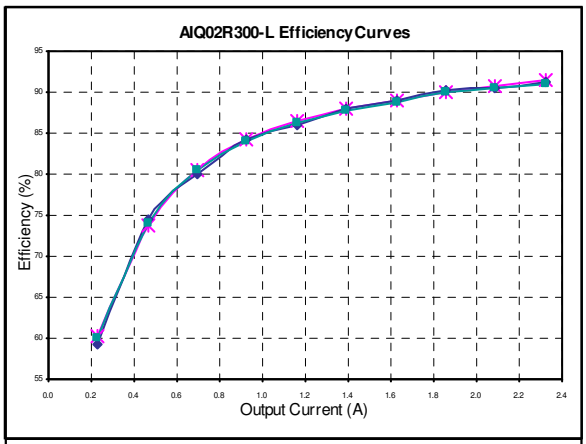


Figure 11: AIQ02R300-L Efficiency Curves @ 25 degC
250 Vdc 390 Vdc 420 Vdc
Loading: Vo = 10% increment to 2.32A

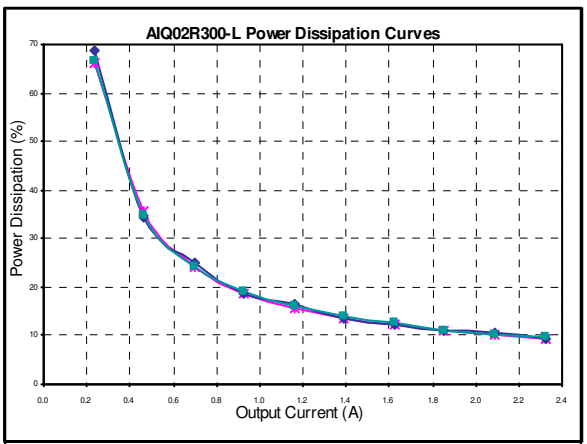


Figure 12: AIQ02R300-L Power Dissipation Curves @ 25 degC
250 Vdc 390 Vdc 420 Vdc
Loading: Vo = 10% increment to 2.32A

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_O 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_O Output Over Current	105	/	175	%Io

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.

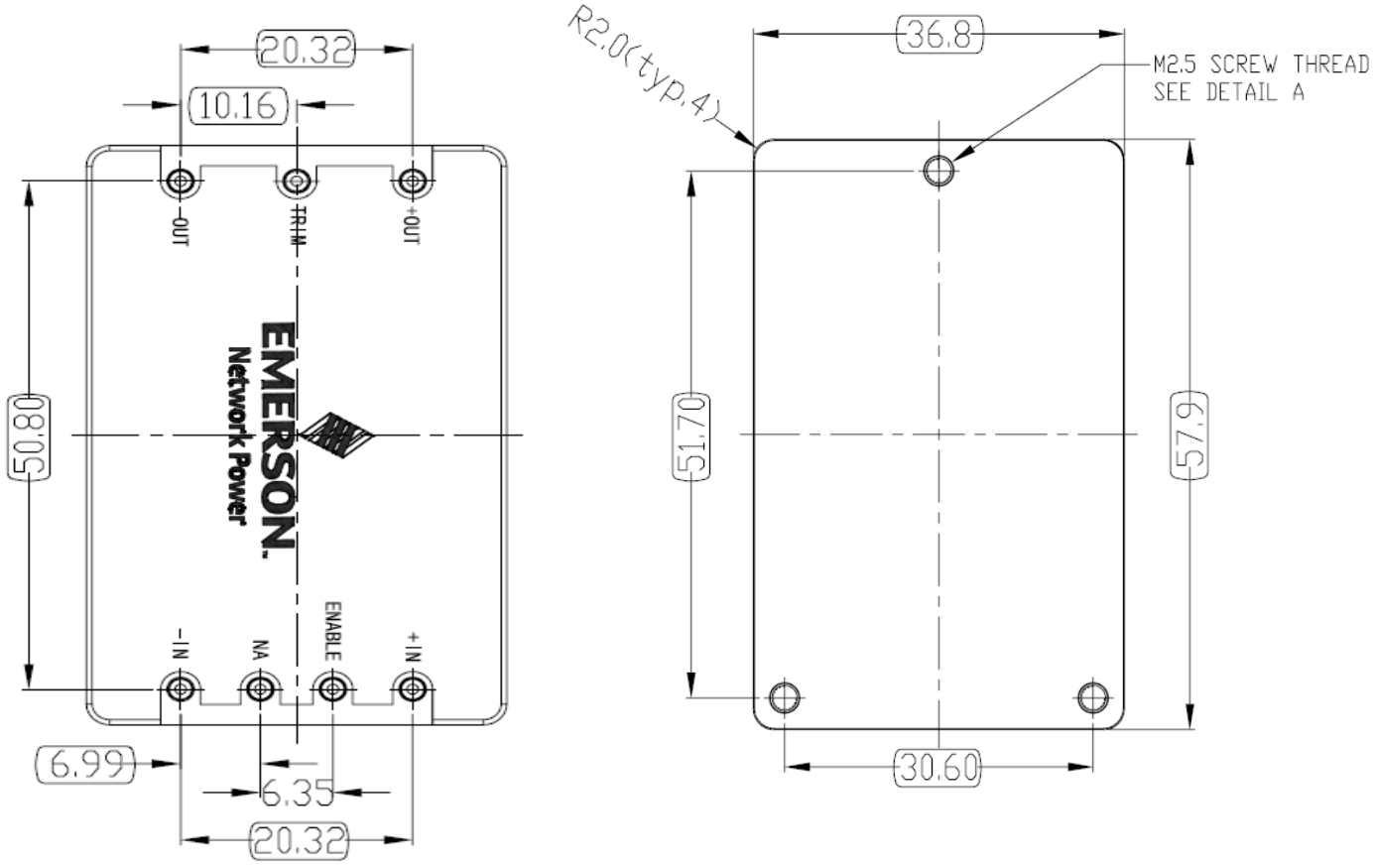
Over Temperature Protection (OTP)

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.

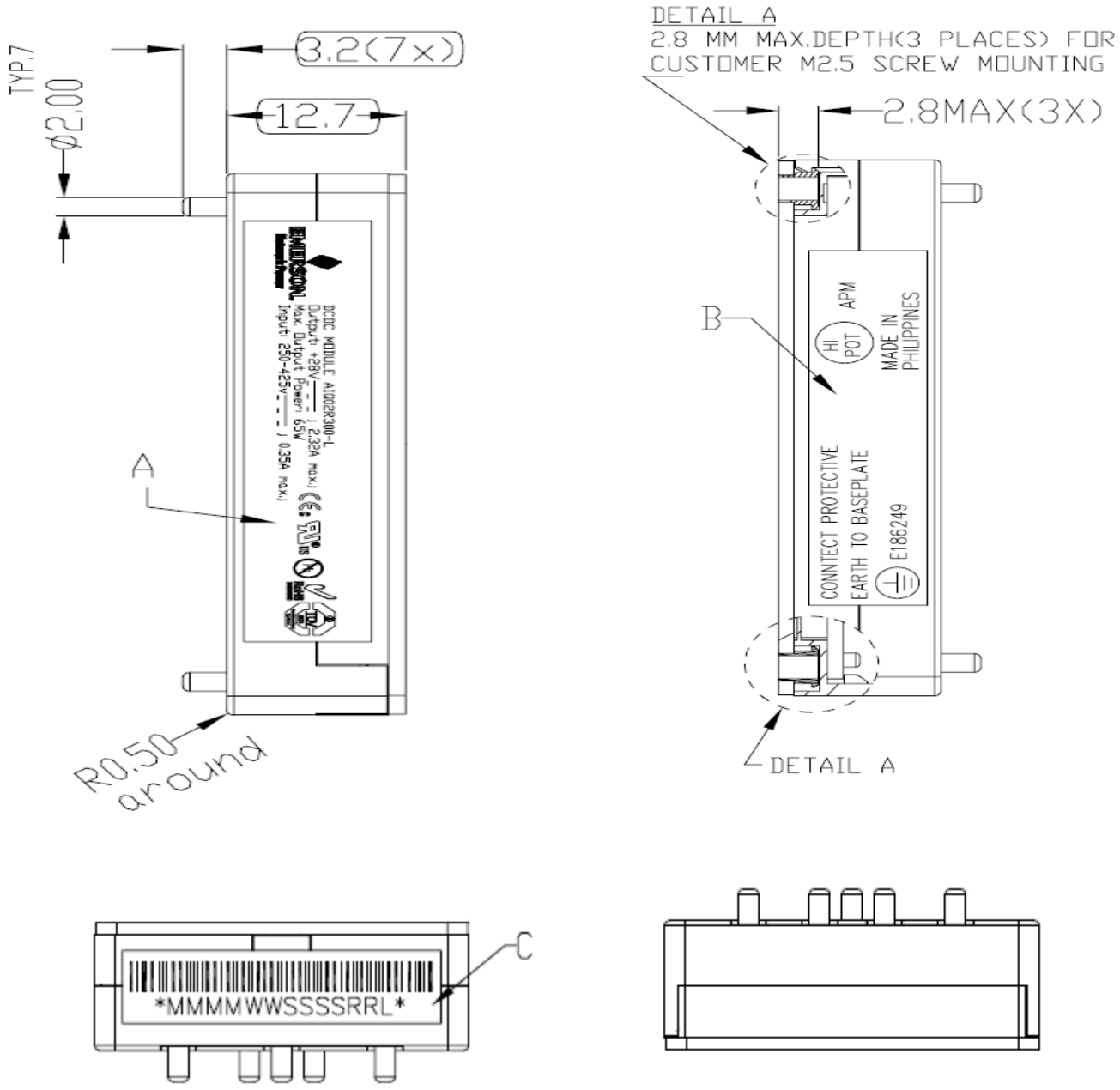
Parameter	Min	Nom	Max	Unit
OTP (Base-plate temp - turn on)	105	/	115	degC
OTP (Base-plate temp - turn off)	100	/	105	degC

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(2nd edition)	E186249-A110-UL	US and Canada Requirements
CSA C22.2 No. 60950-1-07(2nd 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 ^{O}C to +125 ^{O}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 ^{O}C ambient.

Env: GB, GC – Ground Benign

Temperature : 45 ^{O}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	**FREQ** 10-190 Hz 190-210 Hz 210-2000 Hz	**SLOPE** --- -31.213dB/oct ---	**PSD** 0.01 g^2/Hz --- 0.003 g^2/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_{dc}
Enable Turn Off	-	-	0.8	V_{dc}

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.

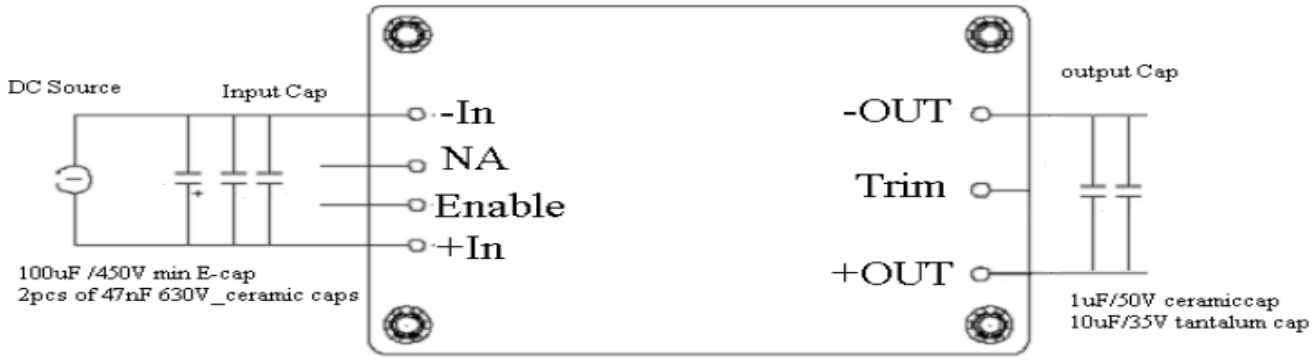


Figure 13. standard test setup

Input Ripple & Output Ripple & Noise Test Configuration

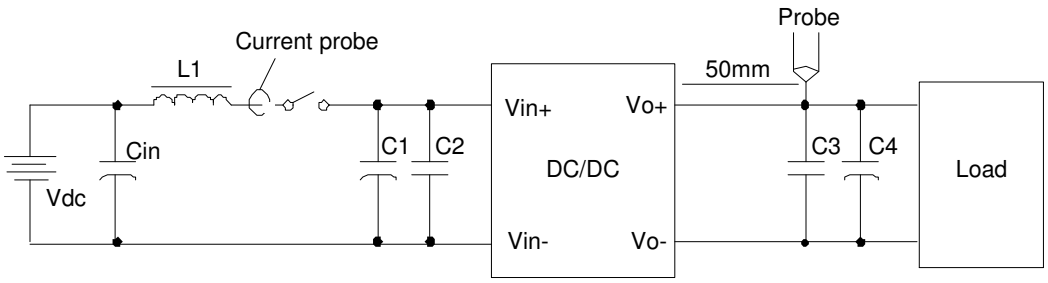


Figure 14 Input ripple & output ripple & noise test configuration

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%.

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

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

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

WORLDWIDE OFFICES

Americas
2900 S.Diablo Way
Tempe, AZ 85282
USA
+1 888 412 7832

Europe (UK)
Waterfront Business Park
Merry Hill, Dudley
West Midlands, DY5 1LX
United Kingdom
+44 (0) 1384 842 211

Asia (HK)
14/F, Lu Plaza
2 Wing Yip Street
Kwun Tong, Kowloon
Hong Kong
+852 2176 3333

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com

For more information: **www.artesyn.com/power**
For support: **productsupport.ep@artesyn.com**

While every precaution has been taken to ensure accuracy and completeness in this literature, Artesyn Embedded Technologies assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions. Artesyn Embedded Technologies, Artesyn and the Artesyn Embedded Technologies logo are trademarks and service marks of Artesyn Technologies, Inc. All other names and logos referred to are trade names, trademarks, or registered trademarks of their respective owners.
© 2014 All rights reserved.

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

WORLDWIDE OFFICES

Americas
2900 S.Diablo Way
Tempe, AZ 85282
USA
+1 888 412 7832

Europe (UK)
Waterfront Business Park
Merry Hill, Dudley
West Midlands, DY5 1LX
United Kingdom
+44 (0) 1384 842 211

Asia (HK)
14/F, Lu Plaza
2 Wing Yip Street
Kwun Tong, Kowloon
Hong Kong
+852 2176 3333

ARTESYN™
EMBEDDED TECHNOLOGIES

www.artesyn.com

For more information: **www.artesyn.com/power**
For support: **productsupport.ep@artesyn.com**

While every precaution has been taken to ensure accuracy and completeness in this literature, Artesyn Embedded Technologies assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions. Artesyn Embedded Technologies, Artesyn and the Artesyn Embedded Technologies logo are trademarks and service marks of Artesyn Technologies, Inc. All other names and logos referred to are trade names, trademarks, or registered trademarks of their respective owners.
© 2014 All rights reserved.