

AGQ200-48S1V2

48 Watts

Quarter-brick Converter

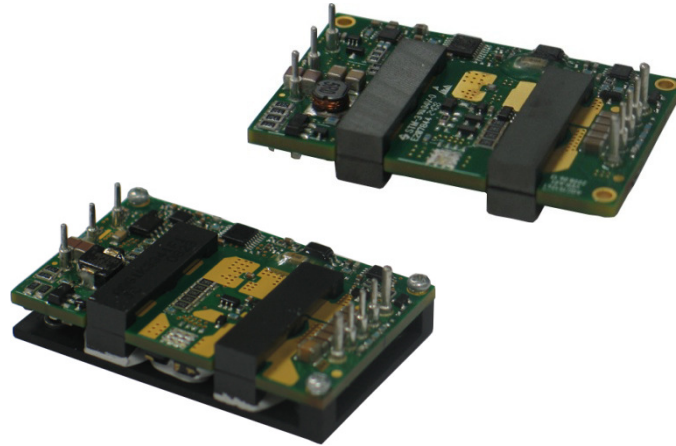
Total Power: 48 Watts
Input Voltage: 36 to 75 Vdc
of Outputs: Single

Special Features

- Delivering up to 40A output
- Ultra-high efficiency 85% typ. at full load
- Wide input range: 36V ~ 75V
- Excellent thermal performance
- No minimum load requirement
- Fixed frequency operation
- RoHS 6 compliant
- Remote ON/OFF control function
- Remote output sense
- Trim function: -20% ~ +10%
- Input under voltage lockout
- Output over current protection
- Output over voltage protection
- Over temperature protection
- Industry standard quarter-brick pin-out outline
- Open frame or baseplate optional
- Pin length optional

Safety

IEC/EN/UL/CSA 60950
CE Mark
UL/TUV
GB4943



Product Descriptions

The AGQ200-48S1V2 is a single output DC-DC converter with standard quarter-brick form factor and pin configuration. It delivers up to 40A output current with 1.2V output. Above 85% efficiency and excellent thermal performance makes it an ideal choice to use in telecom and datacom applications and can operate under an ambient temperature range of $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$.

Applications

Telecom/ Datacom

Model Numbers

Standard	Output Voltage	Structure	Remote ON/OFF logic	RoHS Status
AGQ200-48S1V2-4L	1.2Vdc	No baseplate	Negative	R6
AGQ200-48S1V2P-4L	1.2Vdc	No baseplate	Positive	R6
AGQ200-48S1V2B-4L	1.2Vdc	Baseplate	Negative	R6
AGQ200-48S1V2PB-4L	1.2Vdc	Baseplate	Positive	R6

Ordering information

AGQ200	-	48	S	1V2	P	B	-	4	L
①		②	③	④	⑤	⑥		⑦	⑧

①	Model series	AGQ: series name. The lower output is limited by its current
②	Input voltage	48: 36V ~ 75V input range, rated input voltage 48V
③	Output number	S: single output. D:dual output
④	Rated output voltage	1V2: 1.2V output
⑤	Remote ON/OFF logic	Default: negative logic; P: positive logic
⑥	Baseplate	B: baseplate; default: no baseplate
⑦	Pin length	4: 4.8±0.2mm
⑧	RoHS status	L: RoHS, R6

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 Operating -Continuous Non-operating -100mS	All	$V_{IN,DC}$	0	-	80	Vdc
	All		0	-	100	Vdc
Maximum Output Power	All	$P_{O,max}$	-	-	48	W
Isolation Voltage ¹ Input to outputs	All		2250	-	-	Vdc
Ambient Operating Temperature	All	T_A	-40	-	+85	°C
Storage Temperature	All	T_{STG}	-55	-	+125	°C
Voltage at Remote ON/OFF pin	All		-0.7	-	12	Vdc
Humidity (non-condensing) Operating Non-operating	All		-	-	95	%
	All		-	-	95	%

Note 1 - 1mA for 60s, slew rate of 1500V/10s

Input Specifications

Table 2. Input Specifications:

Parameter	Conditions ¹	Symbol	Min	Typ	Max	Unit
Operating Input Voltage, DC	All	$V_{IN,DC}$	36	48	75	Vdc
Turn-on Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,ON}$	31	34	36	Vdc
Turn-off Voltage Threshold	$I_O = I_{O,max}$	$V_{IN,OFF}$	30	33	35	Vdc
Lockout Voltage Hysteresis	$I_O = I_{O,max}$		1	-	3	V
Maximum Input Current ($I_O = I_{O,max}$)	$V_{IN,DC} = 36V_{DC}$	$I_{IN,max}$	-	-	2	A
No-load input current	$I_O = 0A$	I_{IN}	-	0.07	0.1	A
Standby Input current	Remote OFF	I_{IN}	-	0.01	0.1	A
Inrush current transient rating	Power ON		-	-	1	A ² s
Recommended Input Fuse	Fast blow external fuse recommended		-	-	15	A
Input filter component values (C\L)	Internal values			6.4\2.2		$\mu F\backslash\mu H$
Recommended External Input Capacitance	Low ESR capacitor recommended	C_{IN}	-	100	-	μF
Input Reflected Ripple Current	Through 12 μH inductor		-	7	20	mA
Input voltage ripple rejection	120Hz		40	70	-	dB
Operating Efficiency	$T_A = 25^\circ C$ $I_O = I_{O,max}$ $I_O = 50\% I_{O,max}$	η	-	85.0 86.6	-	% %

Note 1 - $T_a = 25^\circ C$, airflow rate = 400 LFM, $V_{in} = 48V_{dc}$, nominal V_{out} unless otherwise note.

Output Specifications

Table 3. Output Specifications:

Parameter	Condition ¹	Symbol	Min	Typ	Max	Unit	
Factory Set Voltage	$V_{IN,DC} = 48V_{DC}$ $I_O = I_{O,max}$	V_O	1.18	1.20	1.22	Vdc	
Total Regulation	Inclusive of line, load temperature change, warm-up drift	V_O	1.18	1.20	1.22	Vdc	
Output Voltage Line Regulation	All	$\pm V_O$	-	0.12	5	mV	
Output Voltage Load Regulation	All	$\pm V_O$	-	0.18	10	mV	
Output Voltage Temperature Regulation	All	$\%V_O$	-	-	0.02	$\%/^{\circ}C$	
Output Voltage Trim Range	All	V_O	0.96	-	1.32	V	
Output Ripple, pk-pk	Measure with a 1uF ceramic capacitor in parallel with a 10uF tantalum capacitor, 0 to 20MHz bandwidth	V_O	-	45	100	mV_{PK-PK}	
Output Current	All	I_O	0	-	40	A	
Output DC current-limit inception ²		I_O	44	-	56	A	
V_O Load Capacitance ³	All	C_O	470	-	15000	μF	
V_O Dynamic Response	Peak Deviation Settling Time	25%~50%~25% load change slew rate = 0.1A/us	$\pm V_O$ T_s	- -	30 120	- -	mV uSec
		25%~50%~25% load change slew rate = 1A/us	$\pm V_O$ T_s	- -	141 85	- -	mV uSec
		0%~50%~0% load change slew rate = 0.1A/us	$\pm V_O$	-	45	--	mV
		10%~100%~10% load change slew rate = 0.1A/us	$\pm V_O$	-	35	-	mV
Turn-on transient	Rise time	$I_O = I_{max}$	T_{rise}	-	5	30	mS
	Turn-on delay time	$I_O = I_{max}$	$T_{turn-on}$	-	3	10	mS
	Output voltage overshoot	$I_O = I_{max}$ $T_A = 25^{\circ}C$	$\%V_O$	-	-	5	%

Note 1 - $T_a = 25^{\circ}C$, airflow rate = 400 LFM, $V_{in} = 48V_{dc}$, nominal V_{out} unless otherwise note.

Note 2 - Hiccup: auto-restart when over-current condition is removed.

Note 3 - High frequency and low ESR is recommended.

Output Specifications

Table 3. Output Specifications, con't:

Parameter	Condition	Symbol	Min	Typ	Max	Unit
Switching frequency ⁴	All	f_{sw}	-	280	-	KHz
Remote ON/OFF control (positive logic)	Off-state voltage	All	-0.7	-	1.2	V
	On-state voltage	All	3.5	-	12	V
Remote ON/OFF control (Negative logic)	Off-state voltage	All	3.5	-	12	V
	On-state voltage	All	-0.7	-	1.2	V
Output over-voltage protection ⁵	All	$\%V_O$	120	-	140	%
Output over-temperature protection ⁶	No baseplate	T	110	-	135	°C
	Baseplate		90	-	120	
Over-temperature hysteresis	All	T	5	-	-	°C
Output voltage remote sense range	All	$\pm V_O$	-	-	0.5	V
MTBF	Telcordia SR-332-2006; 80% load, 300LFM, 40 °C T _A		-	2	-	10 ⁶ h

Note 4 - Regulation stage and isolation stage.

Note 5 - Hiccup: auto-restart when over-voltage condition is removed.

Note 6 - Auto recovery.

AGQ200-48S1V2 Performance Curves

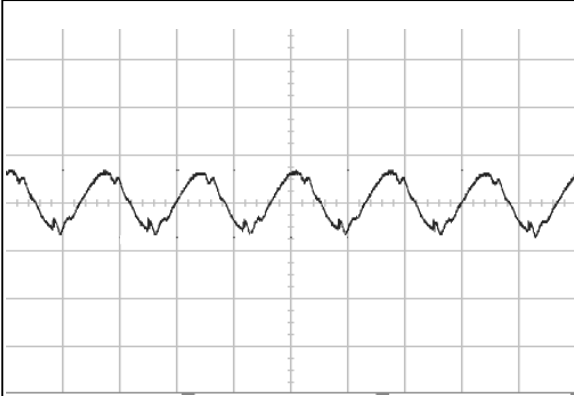


Figure 1: AGQ200-48S1V2 Input Reflected Ripple Current Waveform (2µs/div, 5mA/div)

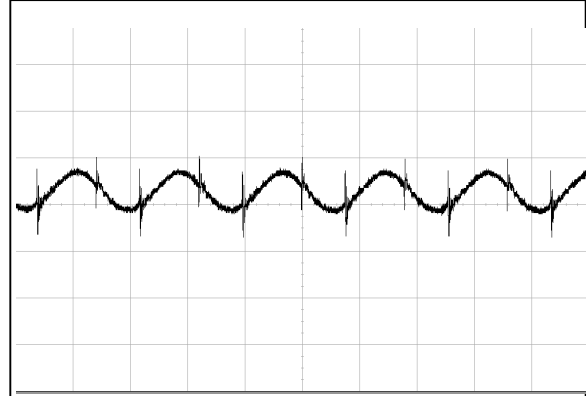


Figure 2: AGQ200-48S1V2 Ripple and Noise Measurement (2µs/div, 10mV/div)

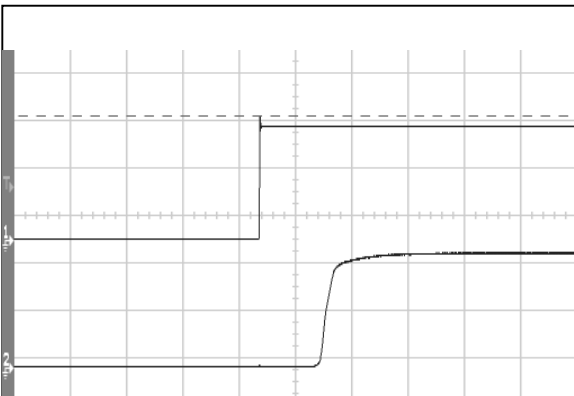


Figure 3: AGQ200-48S1V2 Output Voltage Startup Characteristic (2ms/div)
Ch 1: Vin (20V/div) Ch 2: Vo (0.5V/div)

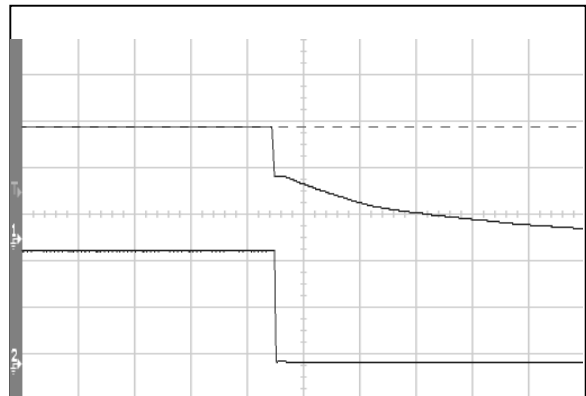


Figure 4: AGQ200-48S1V2 Turn Off Characteristic (5ms/div)
Ch 1: Vin (20V/div) Ch 2: Vo (0.5V/div)

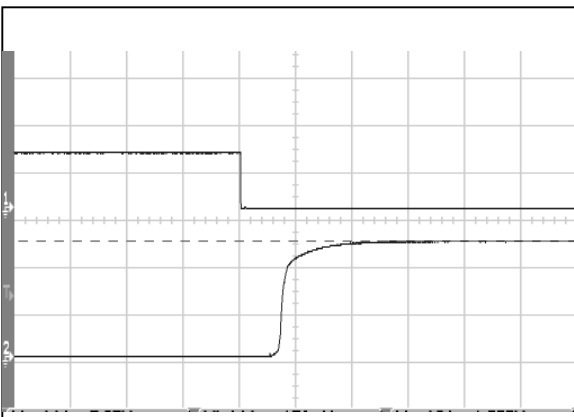


Figure 5: AGQ200-48S1V2 Remote ON Waveform (2ms/div)
Ch 1: Remote ON (5V/div) Ch 2: Vo (0.5V/div)

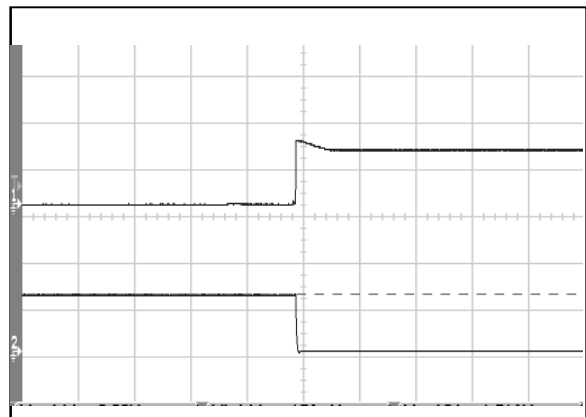


Figure 6: AGQ200-48S1V2 Remote OFF Waveform (2ms/div)
Ch 1: Remote OFF (5V/div) CH 2: Vo (1V/div)

AGQ200-48S1V2 Performance Curves

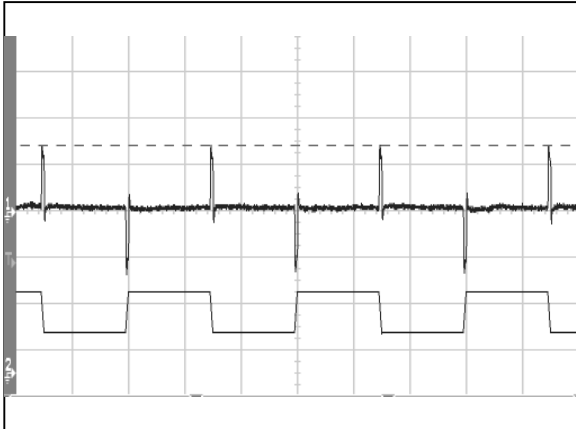


Figure 7: AGQ200-48S1V2 Transient Response (2mS/div)
 25%-50%-25% load change, 0.1A/uS slew rate
 Ch 1: Vo (20mV/div) Ch 2: Io (10A/div)

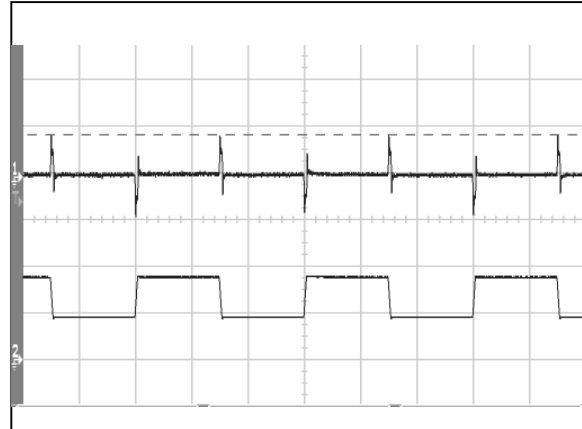


Figure 8: AGQ200-48S1V2 Transient Response (2mS/div)
 50%-75%-50% load change, 1A/uS slew rate
 Ch 1: Vo (50mV/div) Ch 2: Io (20A/div)

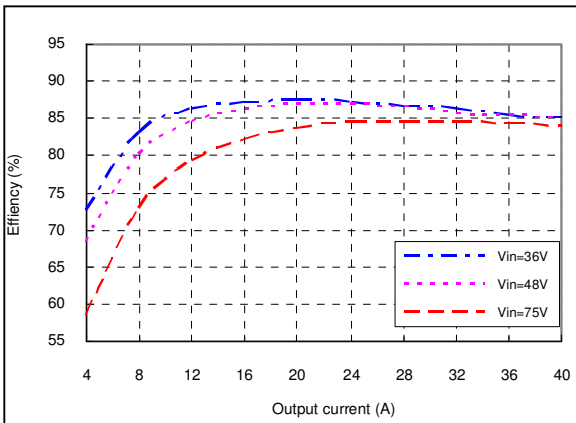
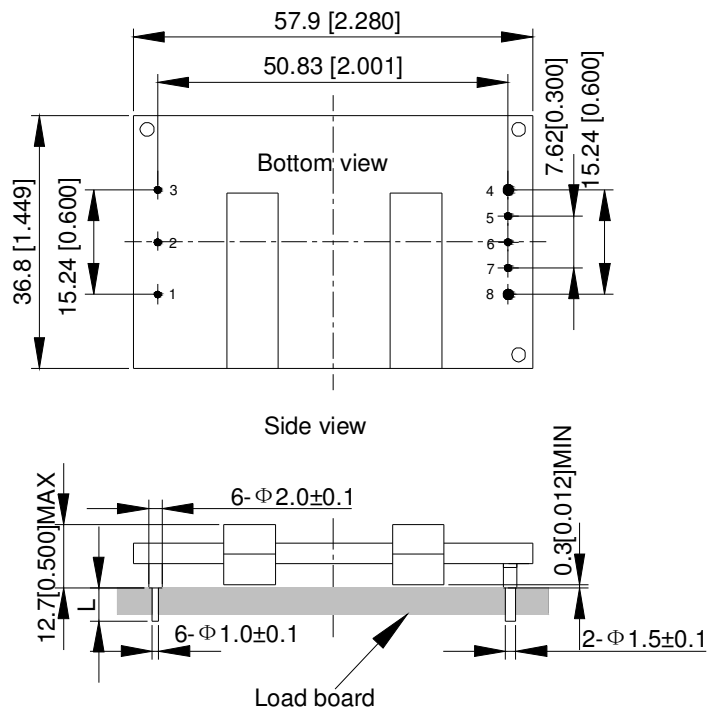


Figure 9: AGQ200-48S1V2 Efficiency Curves @ 25 °C, Vo=1.2V

Mechanical Specifications

Mechanical Outlines – No baseplate Module



Unit: mm[inch]

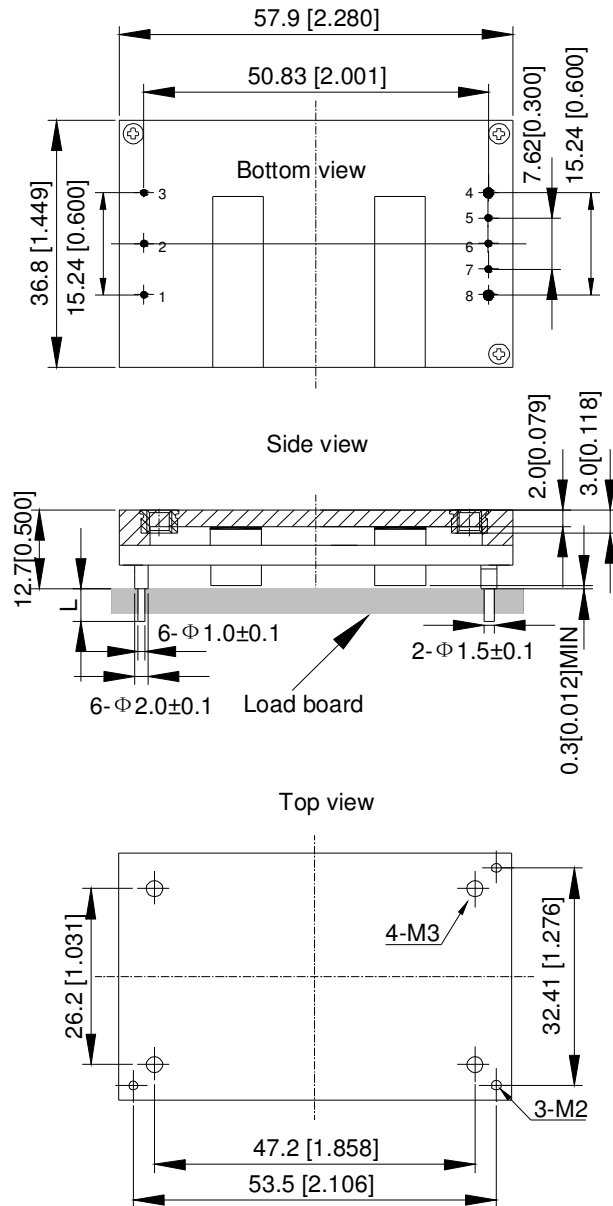
Bottom view: pin on upside

Tolerance: X.Xmm±0.5mm[X.X in.±0.02in.]

X.XXmm±0.25mm[X.XX in.±0.01in.]

Mechanical Specifications

Mechanical Outlines – Baseplate Module



Unit: mm[inch]

Bottom view: pin on upside

Tolerance: X.Xmm \pm 0.5mm[X.X in. \pm 0.02in.]

X.XXmm \pm 0.25mm[X.XX in. \pm 0.01in.]

Mechanical Specifications

Pin Length Options

Device code suffix	L
-4	4.8mm ± 0.2 mm
-6	3.8mm ± 0.2 mm
-8	2.8mm ± 0.2 mm
None	5.8mm ± 0.2 mm

Pin Designations

Pin No	Name	Function
1	Vin+	Positive input voltage
2	CNT	Remote ON/OFF control
3	Vin-	Negative input voltage
4	Vo-	Negative output voltage
5	S-	Negative remote sense
6	Trim	Output voltage trim
7	S+	Positive remote sense
8	Vo+	Positive output voltage

Environmental Specifications

EMC Immunity

AGQ200-48S1V2 series power supply is designed to meet conducted emission's requirements of EN55022 Class A with external filter.

EMC Filter Configuration

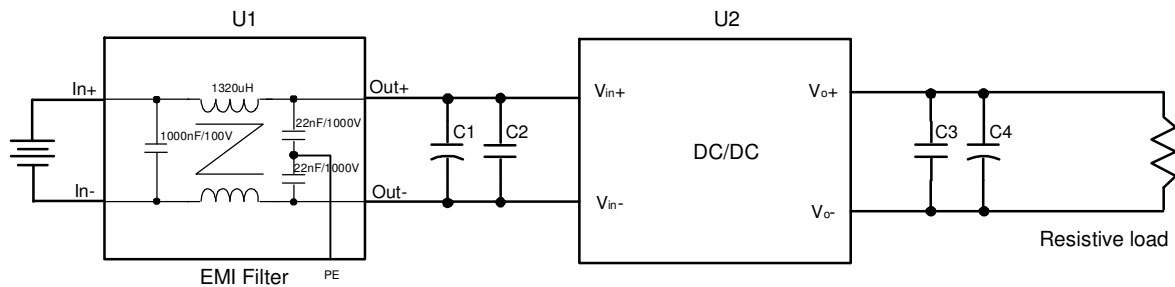


Figure 10 EMC test configuration

U1: 5A input EMC filter module

U2: Module to test, AGQ200-48S1V2

C1 ~ C4: See Figure 16

Safety Certifications

The AGQ200-48S1V2 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 AGQ200-48S1V2 series power supply system

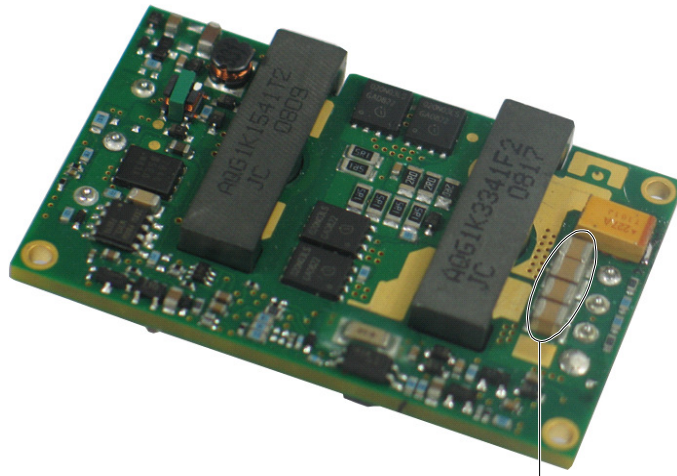
Document	File #	Description
UL/CSA 60950		US and Canada Requirements
EN60950		European Requirements
IEC60950		International Requirements
GB4943		Chinese Requirements
CE		CE Marking

Operating Temperature

The AGQ200 series power supplies will start and operate within stated specifications at an ambient temperature from -40 °C to 85 °C under all load conditions. The storage temperature is -55 °C to 125 °C.

Thermal Considerations – No baseplate Model

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling of the DC/DC converter can be verified by measuring the temperature at the test point as shown in the Figure 11



Note: When the temperature of this test point is lower than 100°C, the module thermal reliability is available

Figure 11 No baseplate model temperature test point

For a typical application, Figure 12 shows the derating of output current vs. ambient air temperature at different air velocity.

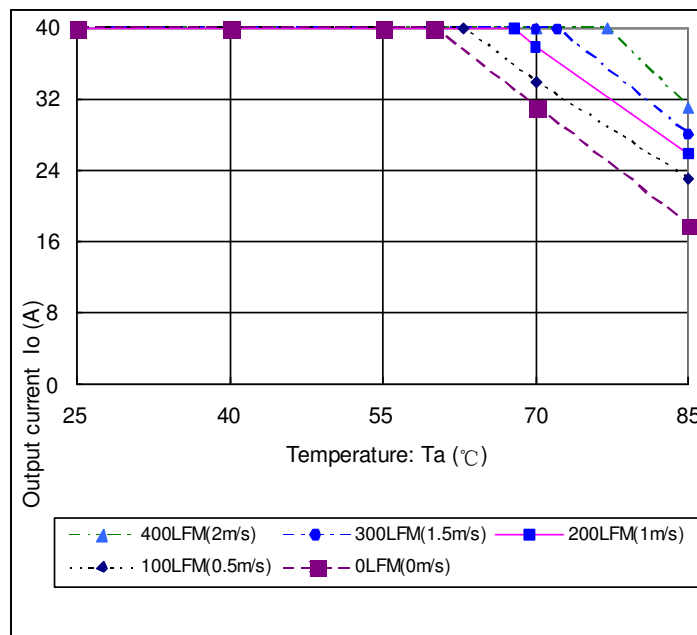
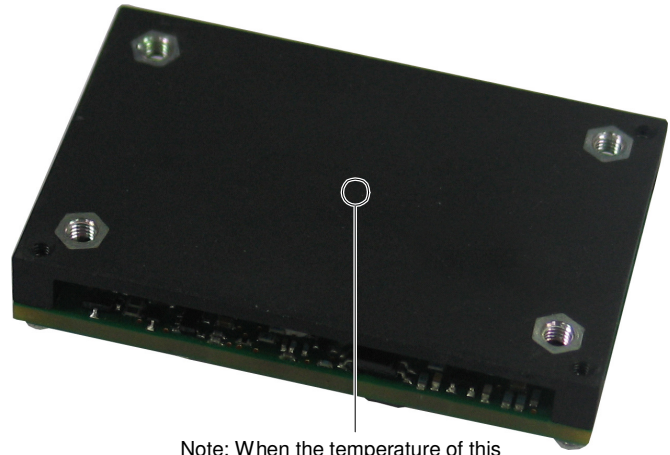


Figure 12 No baseplate model , output power derating, 48Vin, air flowing across the converter from pin 1 to pin 3
Artesyn Embedded Technologies

Thermal Considerations — Baseplate Model

The converter is designed to operate in different thermal environments and sufficient cooling must be provided. Proper cooling of the DC/DC converter can be verified by measuring the temperature at the test point as shown in the Figure 13



Note: When the temperature of this test point is lower than 95°C, the module thermal reliability is available

Figure 13 Baseplate model temperature test point on converter

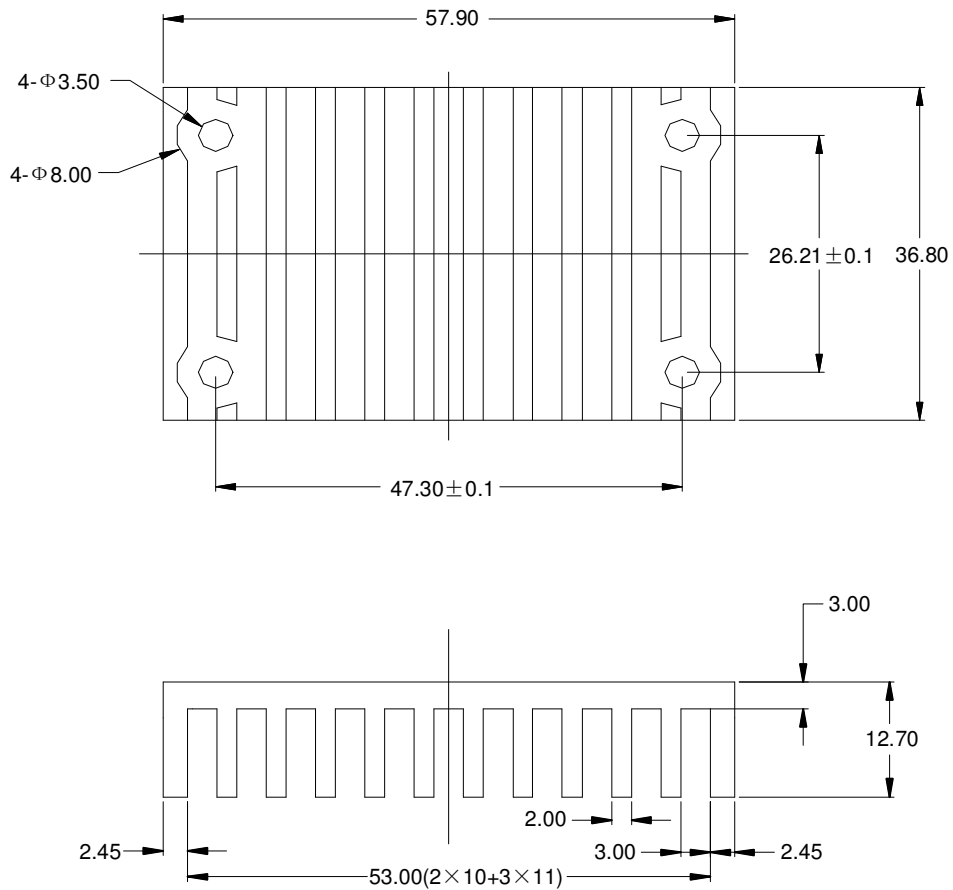


Figure 14 Heatsink (unit:mm)

Thermal Considerations — Baseplate Model Con't

For a typical application, Figure 15 shows the derating of output current vs. ambient air temperature at different air velocity

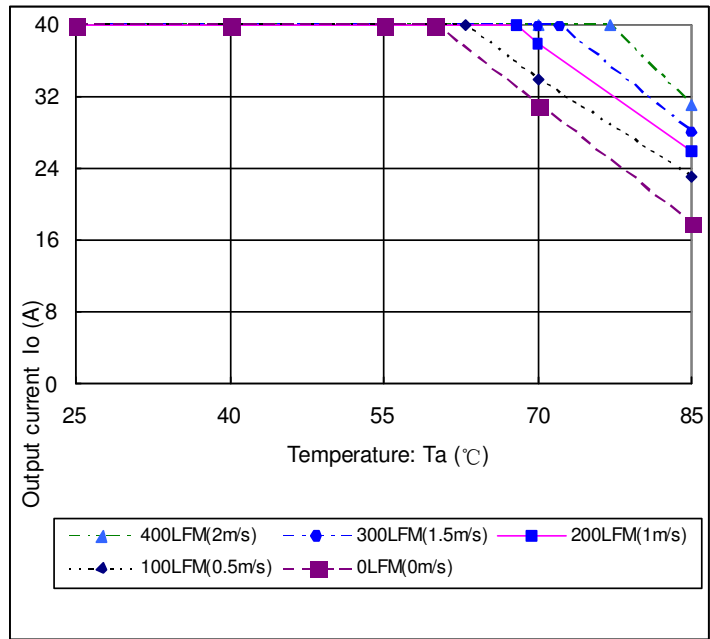


Figure 15 Baseplate model , output power derating, 48Vin, air flowing across the converter from pin 1 to pin 3

Qualification Testing

Parameter	Unit (pcs)	Test condition
Halt test	4-5	$T_{a,min} - 10\text{ }^{\circ}\text{C}$ to $T_{a,max} + 10\text{ }^{\circ}\text{C}$, $5\text{ }^{\circ}\text{C}$ step, $V_{in} = \text{min to max}$, $0 \sim 105\%$ load
Vibration	3	Frequency range: $5\text{Hz} \sim 20\text{Hz}$, $20\text{Hz} \sim 200\text{Hz}$, A.S.D: $1.0\text{m}^2/\text{s}^3$, -3db/oct , axes of vibration: X/Y/Z. Time: 30min/axes
Mechanical Shock	3	30g, 6mS, 3axes, 6directions, 3time/direction
Thermal Shock	3	$-40\text{ }^{\circ}\text{C}$ to $100\text{ }^{\circ}\text{C}$, unit temperature 20cycles
Thermal Cycling	3	$-40\text{ }^{\circ}\text{C}$ to $55\text{ }^{\circ}\text{C}$, temperature change rate: $1\text{ }^{\circ}\text{C}/\text{min}$, cycles: 2cycles
Humidity	3	$40\text{ }^{\circ}\text{C}$, 95%RH, 48h
Solder Ability	15	IPC J-STD-002C-2007

Application Notes

Typical Application

Below is the typical application of the AGQ200-48S1V2 series power supply.

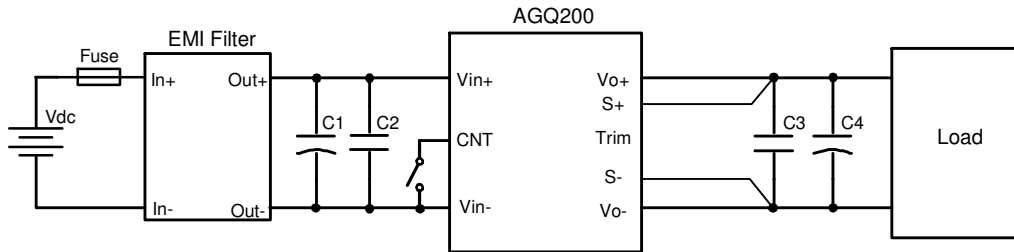


Figure 16 Typical application

C1: 100uF/100V electrolytic capacitor, P/N: UVZ2A101MPD (Nichicon) or equivalent caps

C2: 1uF/100V X7R ceramic capacitor

C3: 1uF/25V X7R ceramic capacitor

C4: 470uF/25V electrolytic capacitor, P/N: UPM1E471MPD (Nichicon) or equivalent caps

Fuse: External fast blow fuse with a rating of 15A

If the load is far from the unit, connect S+ and S- to the terminal of the load respectively to compensate the voltage drop on the transmission line.

Remote ON/OFF

Either positive or negative remote ON/OFF logic is available in AGQ200-48S1V2. Figure 17 is the detailed internal circuit and reference in AGQ200-48S1V2.

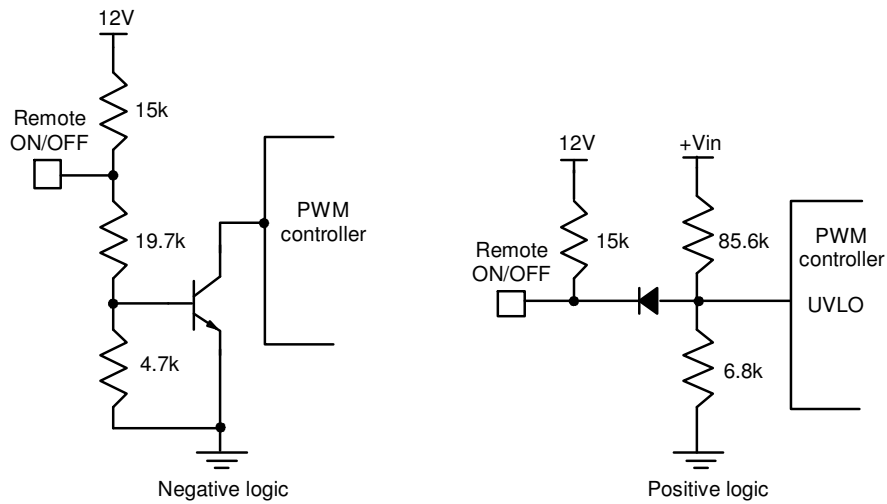


Figure 17 Remote ON/OFF internal diagram

Trim Characteristics

Connecting an external resistor between Trim pin and Vo- pin will decrease the output voltage. While connecting it between Trim and Vo+ will increase the output voltage. The following equations determine the external resistance to obtain the trimmed output voltage.

$$R_{trim-down} = \frac{510}{\Delta} - 10.2(K\Omega)$$

$$R_{trim-up} = \frac{5.1 \times V_{nom} \times (100 + \Delta)}{0.6 \times \Delta} - \frac{510}{\Delta} - 10.2(K\Omega)$$

Δ : Output error rate against nominal output voltage.

$$\Delta = \frac{100 \times (V_{nom} - V_o)}{V_{nom}}$$

V_{nom} : Nominal output voltage.

For example, to get 1.32V output, the trimming resistor is

$$\Delta = \frac{100 \times (V_{nom} - V_o)}{V_{nom}} = \frac{100 \times (1.32 - 1.2)}{1.2} = 10$$

$$R_{trim-up} = \frac{5.1 \times 1.2 \times (100 + 10)}{0.6 \times 10} - \frac{510}{10} - 10.2 = 51(K\Omega)$$

The output voltage can also be trimmed by potential applied at the Trim pin.

$$V_o = V_{trim} + 0.6$$

When V_{trim} is the potential applied at the Trim pin, and V_o is the desired output voltage.

When trimming up, the output current should be decreased accordingly so as not to exceed the maximum output power.

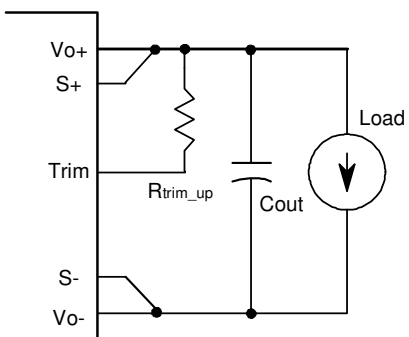


Figure 18 Trim up

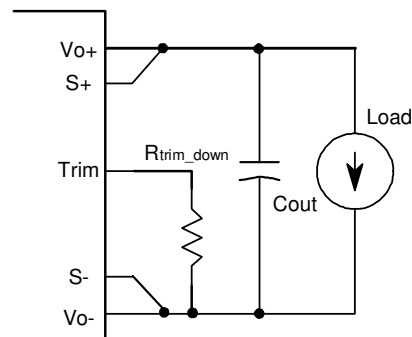


Figure 19 Trim down

Input Ripple & Output Ripple & Noise Test Configuration

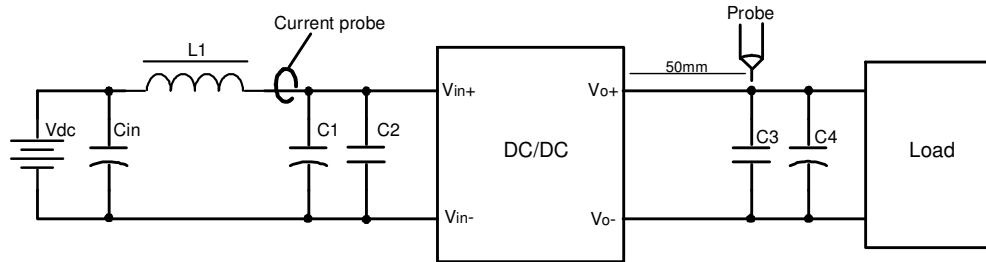


Figure 20 Input ripple & inrush current, output ripple & noise test configuration

Vdc: DC power supply

L1: 12uH

Cin: 220uF/100V typical

C1 ~ C4: See Figure 16

Baseplate case: No connected to PE, Vin+, Vin-

Soldering

The product is intended for standard manual or wave soldering.

When wave soldering is used, the temperature on pins is specified to maximum 260 °C for maximum 7s.

When manual soldering is used, the iron temperature should be maintained at 300 °C ~ 380 °C and applied to the converter pins for less than 10s. Longer exposure can cause internal damage to the converter.

Cleaning of solder joint can be performed with cleaning solvent IPA or similitive.

Hazardous Substances Announcement (RoHS of China R6)

Parts	Hazardous Substances					
	Pb	Hg	Cd	Cr ⁶⁺	PBB	PBDE
AGQ200-48S1V2	x	x	x	x	x	x

x: Means the content of the hazardous substances in all the average quality materials of the part is within the limits specified in SJ/T-11363-2006

√: Means the content of the hazardous substances in at least one of the average quality materials of the part is outside the limits specified in SJ/T11363-2006

Artesyn Embedded Technologies has been committed to the design and manufacturing of environment-friendly products. It will reduce and eventually eliminate the hazardous substances in the products through unremitting efforts in research. However, limited by the current technical level, the following parts still contain hazardous substances due to the lack of reliable substitute or mature solution:

1. Solders (including high-temperature solder in parts) contain plumbum.
2. Glass of electric parts contains plumbum.
3. Copper alloy of pins contains plumbum

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