AGQ100 Series Isolated DC/DC Converter Technical Reference Notes

Industry Standard Quarter Brick: 36~75V Input, 2.5V, 3.3V, 5V and 12V Single Output

Industry Standard Quarter Brick:
2.28” × 1.45’’ × 0.4’’ (open frame) or
2.28” × 1.45” × 0.5” (baseplated)

Options

- Choice of positive logic or negative logic for CNT function
- Choice of short pins or long pins

Features

- **Delivers up to 25A output current**
- **Industry standard quarter brick (open frame/ baseplated): 57.9mm × 36.8mm × 9.0/11.5mm (2.28” × 1.45” × 0.4/0.5”)**
- **Basic isolation**
- **Ultra high efficiency**
- **Improved thermal performance: 25A@3.3V at 55ºC at 300LFM**
- **High power density**
- **Low output noise**
- **Industry standard pinout**
- **2:1 wide input voltage of 36-75V**
- **CNT function**
- **Remote sense**
- **Trim function: +10%/-20%**
- **Input under-voltage lockout**
- **Output over-current protection (hiccup)**
- **Output over-voltage protection (hiccup)**
- **Over-temperature protection**
- **RoHS compliant**

Description

The AGQ100 series is a new open frame DC/DC converter for optimum efficiency and power density. The AGQ100 series provide up to 25A output current in an industry standard quarter brick, which makes it an ideal choice for small space, high current and low voltage applications. The AGQ100 series uses an industry standard quarter brick (open frame/ baseplate): 57.9mm × 36.8mm × 9.0/11.5mm (2.28” × 1.45” × 0.4/0.5”) and standard pinout configuration, provides CNT and trim functions. AGQ100 series can provide 2.5V@25A, 3.3V@25A, 5V@20A and 12V@8.3A single output that are isolated from inputs. The series can achieve ultra high efficiency, for most applications a heat sink is not required.

Converter Numbering

AGQ 100 - 48 S 3V3 P B - 4

- Pin length: Omit for 5.8 mm± 0.5mm (0.228in. ± 0.02in.)
  - -4---4.8 mm± 0.5mm (0.189in. ± 0.02in.)
  - -6---3.80mm± 0.25mm (0.150in. ± 0.010in.)
  - -8---2.80mm± 0.25mm (0.110in. ± 0.010in.)
- Baseplated. By default, no baseplate.
- CNT logic, P---positive logic control, default is negative logic control
- Output rated voltage: 2V5---2.5V, 3V3---3.3V, 05---5V, 12---12V
- Output number: S ---single output, D---dual output
- Input rated voltage: 48V
- Rated output power: 100W. The lower output is limited by its current
- Series name

Note:

The following is based on positive logic converters. Negative logic converters are the same with positive ones except for their pin logic.

Electrical Specifications

Unless otherwise indicated, specifications apply over all operating input voltage and temperature conditions. Standard test condition on a single unit is as follows:

Tc (board): 25 °C

+Vin: 48V ± 2%

-Vin: return pin for +Vin

CNT: connected to -Vin for negative logic

open for positive logic

+Vout: connected to load

-Vout: connected to load (return)

+Sense: connected to +Vout

-Sense: connected to -Vout

Trim (Vadj): open

Input Specifications

Parameter	Device	Symbol	Min	Typ	Max	Unit
Operating Input Voltage	All	V_I	36	48	75	V_{dc}
Maximum Input Current (V_I = 0 to $V_{I,max}$, Io = Io,max)	All	$I_{I,max}$	-	-	3.4	A
Input Reflected-ripple Current (Rated input and output)	All	I_I	-	10	20	mAp-p
Supply Voltage Rejection (120Hz)	All	-	45	60	-	dB

CAUTION: This converter has no internally fused. An input line fuse must always be used.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the IPS. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter		Device	Symbol	Min	Typ	Max	Unit
Input Voltage	Continuous	All	V_I	0	-	80	V_{dc}
	Transient (100ms)	All	$V_{I,\ trans}$	0	-	100	V_{dc}
Operating Ambient Temperature (See *Thermal Consideration*)		All	Ta	-40	-	70	ºC
Operating Board Temperature		All	Tc	-40	-	105	ºC
Storage Temperature		All	T_{STG}	-55	-	125	ºC
Operating Humidity		All	-	5	-	95	RH%
Basic Input-Output Isolation (Conditions: 1mA for 1min, slew rate of 1,500V/10sec)		All	-			1,500	V_{dc}
Output Power		2.5V 3.3V 5V 12V	Po,max	-	-	62.5 82.5 100 100	W

Output Specifications

Parameter		Device	Symbol	Min	Typ	Max	Unit
Output Ripple and Noise Peak-to-Peak (5 Hz to 20 MHz) (high frequency low ESR external capacitor required for each output, see Figure 51)		2.5V 3.3V 5V 12V	-	-	-	100 100 120 180	mVp-p (f<20MHz)
External Load Capacitance		2.5V 3.3V 5V 12V	-	470	-	10,000 10,000 6,000 2,200	μF
Output Voltage Setpoint (V_I = $V_{I,min}$ to $V_{I,max}$: Io = Io,max; Ta = 25 ºC)		2.5V 3.3V 5V 12V	$V_{o,set}$	2.46 3.25 4.95 11.88	2.5 3.30 5 12	2.54 3.35 5.05 12.12	V_{dc}
Output Regulation	Line ($V_{i,min}$ to $V_{i,max}$)	2.5V 3.3V 5V 12V	-	-	5 5 5 12	8 10 10 25	mV
	Load (Io = Io,min to Io,max)	2.5V 3.3V 5V 12V	-	-	10 10 10 25	15 20 20 70	mV
	Temperature (whole range)	All	-	-	-	0.02	%Vo/ºC
Rated output current		2.5V 3.3V 5V 12V	Io	0 0 0 0	- -	25 25 20 8.33	A
Output current-limit inception (Hiccup)		2.5V 3.3V 5V 12V	Io	27 27 22 9.2	-	35 35 28 13.5	A
Over temperature protection (auto-recovery)	Thermal Measurement Sopt	All		110	120	130	°C
	Hysteresis	All		5			°C
Efficiency (V_I = $V_{I,nom}$; $I_{o,max}$; T_A = 25°C)		2.5V 3.3V 5V 12V	-		88 89.5 90 90	-	%

Output Specifications (Cont)

Parameter		Device	Symbol	Min	Typ	Max	Unit
Dynamic Response: ($\Delta Io/\Delta t$ = 1A/10μs; V_I = $V_{I,nom}$; TA = 25°C; additional 220μF load capacitor)	25% Ionom step from 50%Ionom	2.5V 3.3V 5V 12V	-	-	-	125 165 200 480	mV
	Deviation Settling Time (to $V_{o,nom}$)	All	-	-	-	400	μsec
	50% Ionom step from 50%Ionom	2.5V 3.3V 5V 12V	-	-	-	180 200 250 600	mV
	Deviation Settling Time (to $V_{o,nom}$)	All	-	-	-	-	μsec
	10% Ionom to 100%Ionom	2.5V 3.3V 5V 12V				250 330 500 1200	MV
	Deviation Settling Time (to $V_{o,nom}$)	All				-	μsec

Output Specifications (Cont)

Parameter	Device	Symbol	Min	Typ	Max	Unit
Turn-On Time (Io = Io,max ; Vo within 1%)	All	-	-	10	20	msec
Output Voltage Overshoot (Io = Io,max ; T_A = 25°C)	All	-	-	-	0	%Vo
Switching Frequency	All	-		300		kHz

Feature Specifications

Parameter		Device	Symbol	Min	Typ	Max	Unit
Enable pin voltage	Logic Low	All		-0.7	-	0.8	V
	Logic High*	All		3.5	-	12	V
Enable pin current	Logic Low	All		-	-	1.0	mA
	Logic High (leakage current, @10V)	All		-	-	-	μA
Output Voltage Trim Range		All	-	80	-	110	%Vo
Output Over-voltage (Hiccup)		2.5V 3.3V 5V 12V	Vo_{hiccup}	3.0 3.9 6.0 14.4	- -	3.8 5.0 7.5 18	V
Under-voltage Lockout	Turn-on Point	All	-	31	34	36	V
	Turn-off Point	All	-	30	33	35	V
Isolation Capacitance		All	-	-		-	PF
Isolation Resistance		All	-	10	-	-	MΩ
Calculated MTBF (Vin: 48V, Load: Ionom, Board@25°C)		All	-	-	2	-	Million hours
Weight (open frame)		All	-	-	42		g (oz.)
Vibration (Sine wave)		Vibration level: 3.5mm (2 ~ 9Hz), 10m/s^2 (9 ~ 200Hz),15m/s^2 (200 ~ 500Hz) Directions and time: 3 axis (X, Y, Z), 30 minutes each Sweep velocity: 1oct / min					
Shock (Half-sine wave)		Peak acceleration: 300m/s^2 Duration time: 6ms Continuous shock 3 times at each of 6 directions (± X, ± Y, ± Z)					

*When CNT is left open, V_{CNT} may reach 16V.

Characteristic Curves

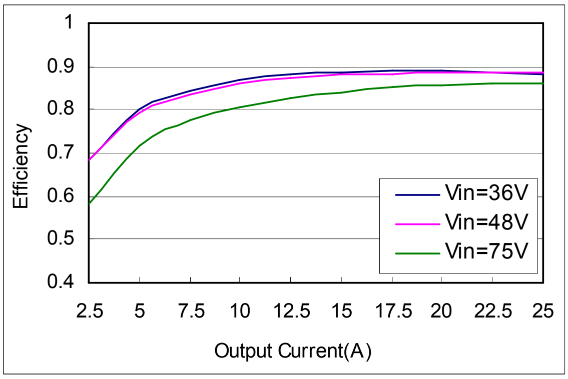


Fig. 1 AGQ100-48S2V5 Typical Efficiency

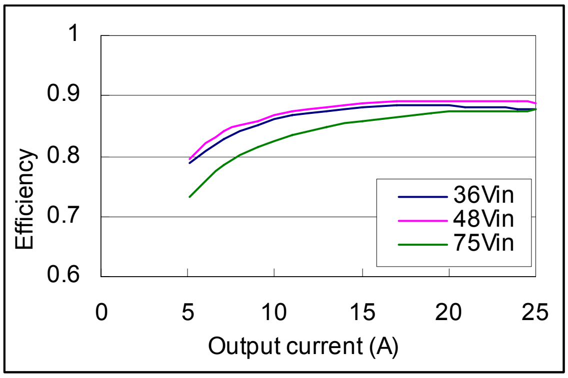


Fig. 2 AGQ100-48S3V3 Typical Efficiency

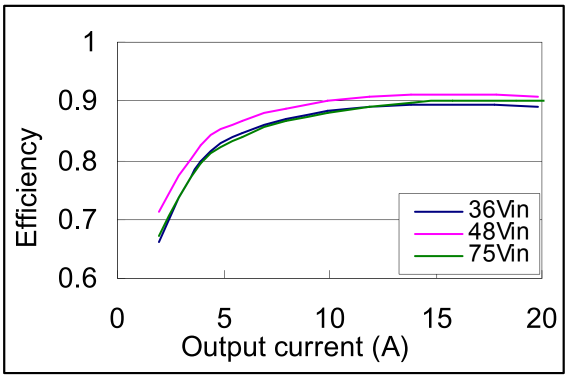


Fig. 3 AGQ100-48S05 Typical Efficiency

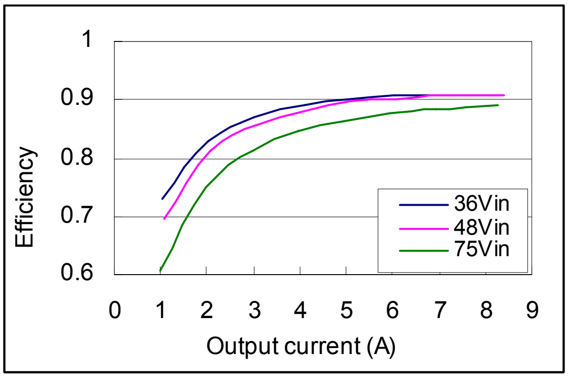


Fig. 4 AGQ100-48S12 Typical Efficiency

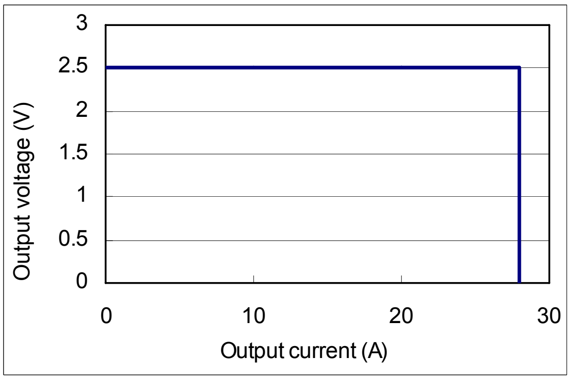


Fig. 5 AGQ100-48S2V5 Typical Output Over-current

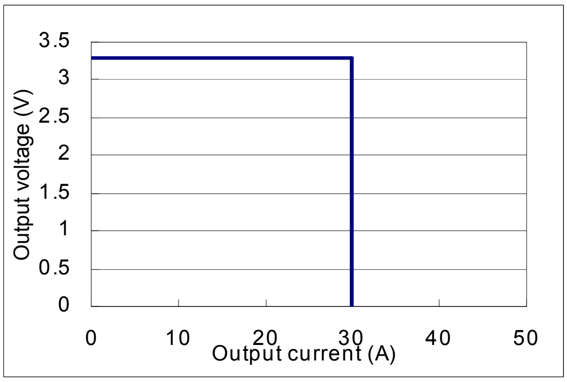


Fig. 6 AGQ100-48S3V3 Typical Output Over-current

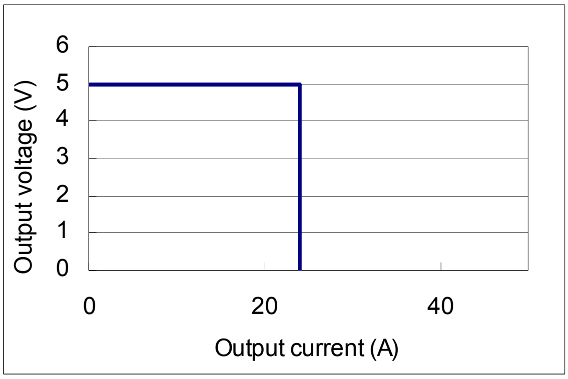


Fig. 7 AGQ100-48S05 Typical Output Over-current

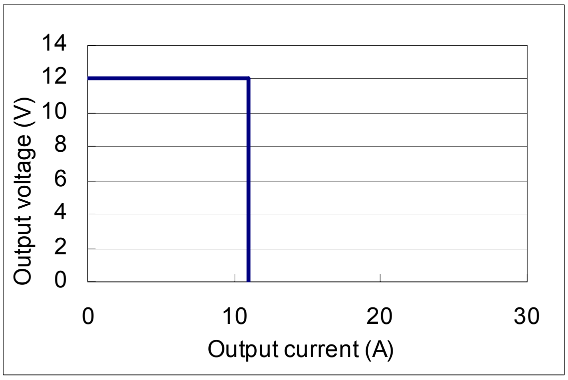


Fig. 8 AGQ100-48S12 Typical Output Over-Current

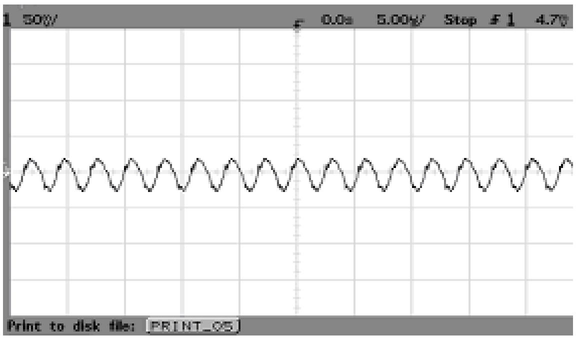


Fig. 9 AGQ100-48S2V5 Typical Output Ripple Voltage, Room Temperature, Io = Io,max

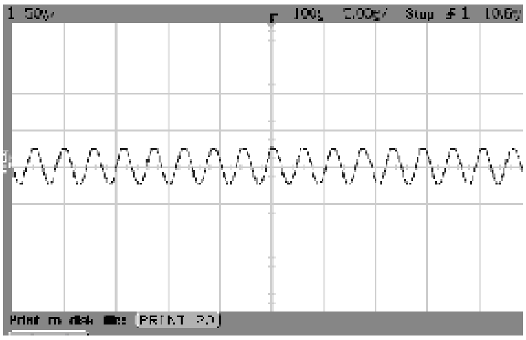


Fig. 10 AGQ100-48S3V3 Typical Output Ripple Voltage, Room Temperature, Io = Io,max

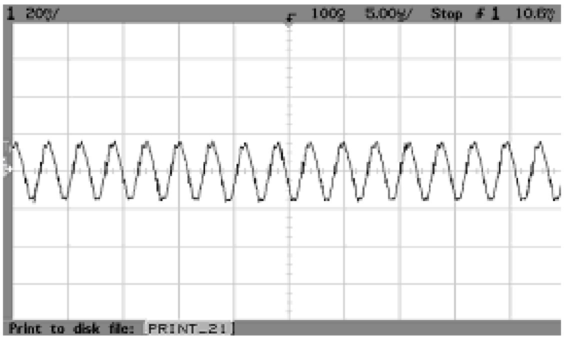


Fig. 11 AGQ100-48S05 Typical Output Ripple Voltage, Room Temperature, Io = Io,max,

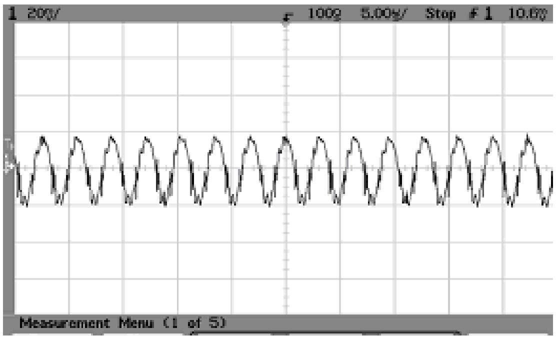


Fig. 12 AGQ100-48S12 Typical Output Ripple Voltage, Room Temperature, Io = Io,max

Fig.13 AGQ100-48S2V5 typical transient response to step decrease in load from 50% to 25%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

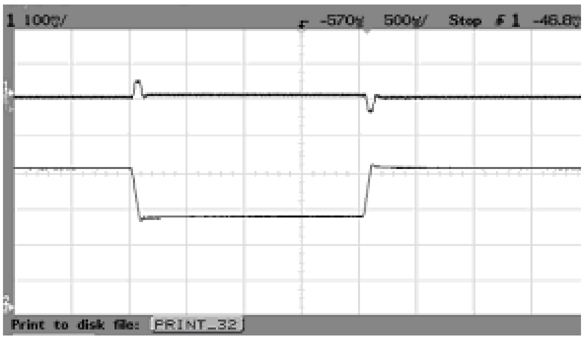


Fig.14 AGQ100-48S2V5 typical transient response to step increase in load from 50% to 75%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

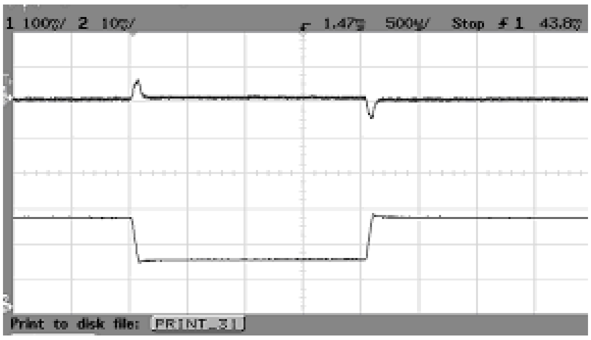


Fig.15 AGQ100-48S3V3 typical transient response to step decrease in load from 50% to 25%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

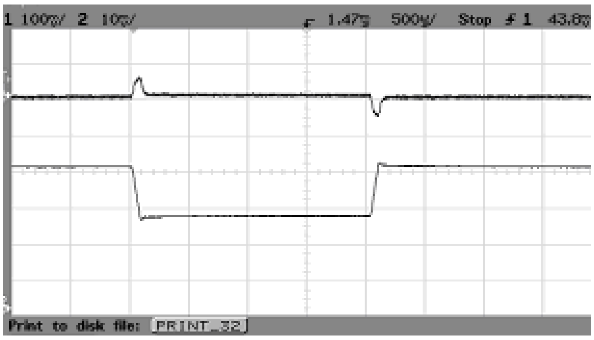


Fig.16 AGQ100-48S3V3 typical transient response to step increase in load from 50% to 75%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

Fig. 17 AGQ100-48S05 typical transient response to step decrease in load from 50% to 25%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

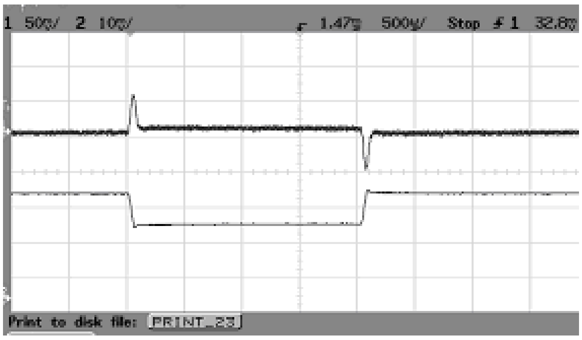


Fig. 18 AGQ100-48S05 typical transient response to step increase in load from 50% to 75%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

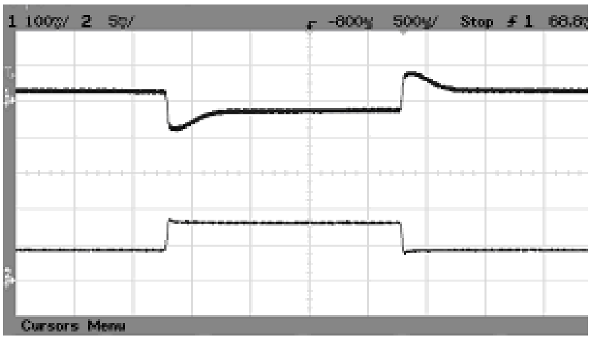


Fig. 19 AGQ100-48S12 typical transient response to step decrease in load from 50% to 25%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

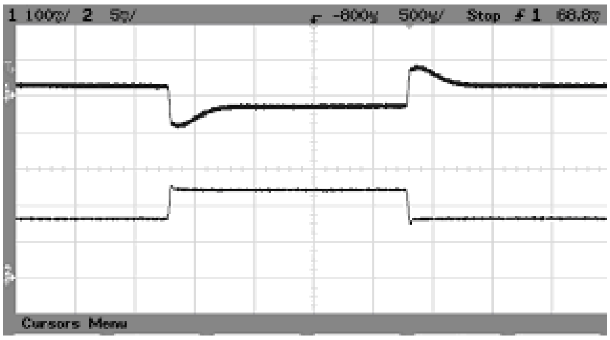


Fig. 20 AGQ100-48S12 typical transient response to step increase in load from 50% to 75%, room temperature, 48Vdc input (ΔIo/Δt = 0.1A/1μs)

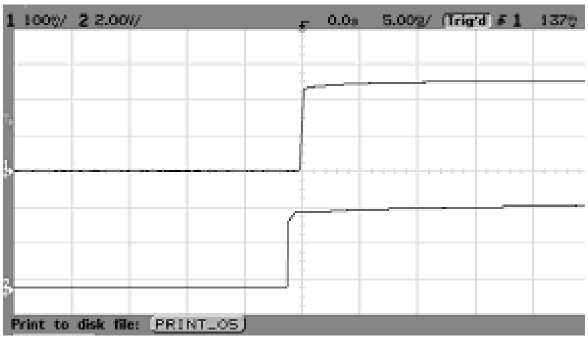


Fig.21 AGQ100-48S2V5 typical start-up from power on

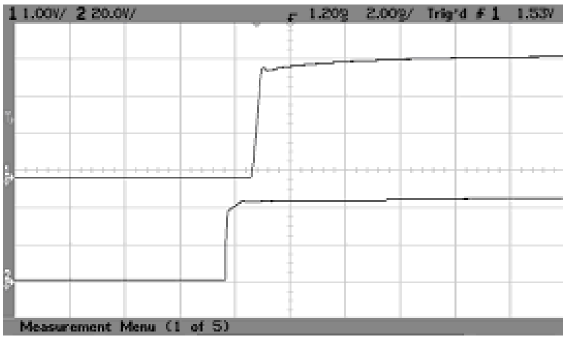


Fig.22 AGQ100-48S3V3 typical start-up from power on

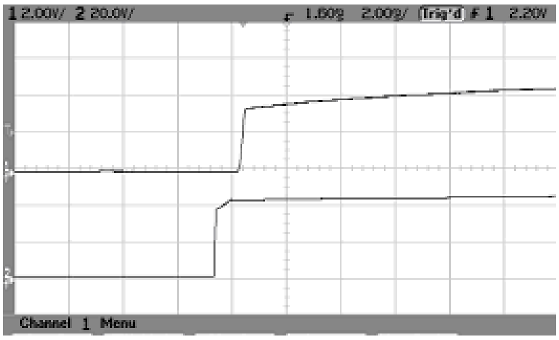


Fig.23 AGQ100-48S05 typical start-up from power on

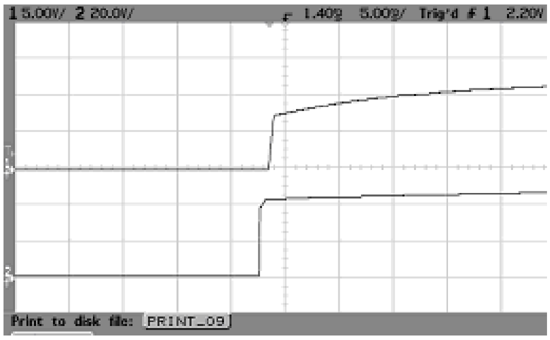


Fig.24 AGQ100-48S12 typical start-up from power on

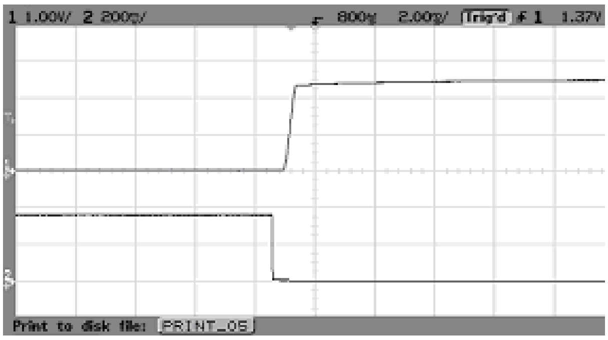


Fig.25 AGQ100-48S2V5 typical start-up from CNT on

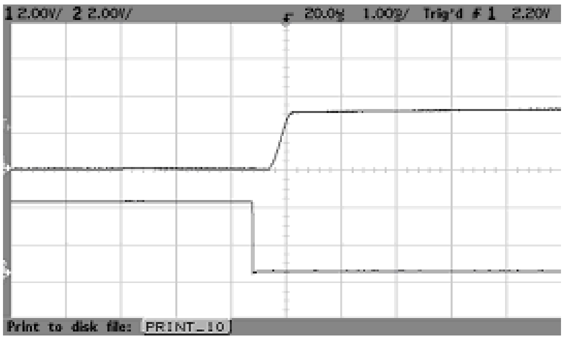


Fig.26 AGQ100-48S3V3 typical start-up from CNT on

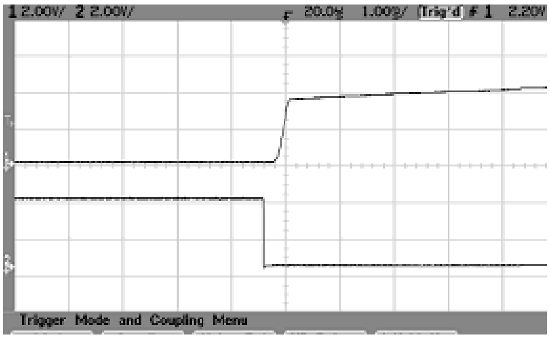


Fig. 27 AGQ100-48S05 typical start-up from CNT on

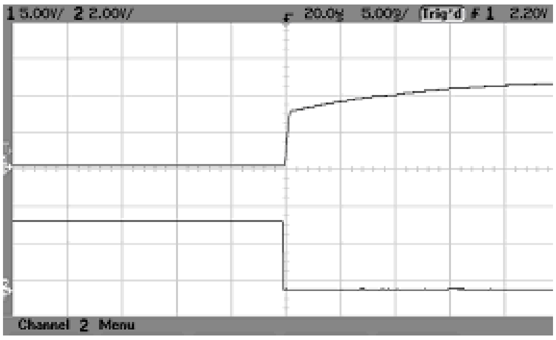


Fig. 28 AGQ100-48S12 typical start-up from CNT on

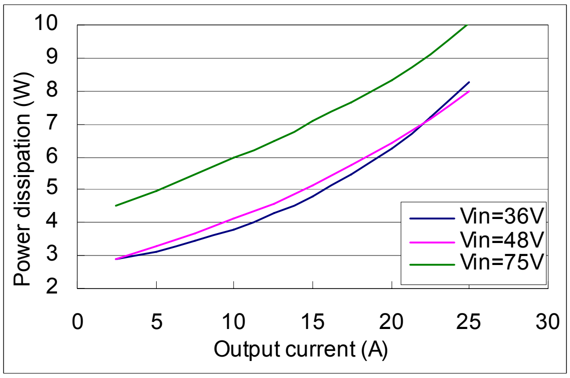


Fig. 29 Typical power dissipation curve of AGQ100-48S2V5

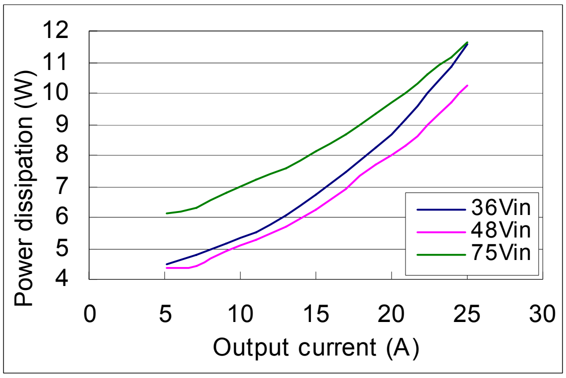


Fig. 30 Typical power dissipation curve of AGQ100-48S3V3

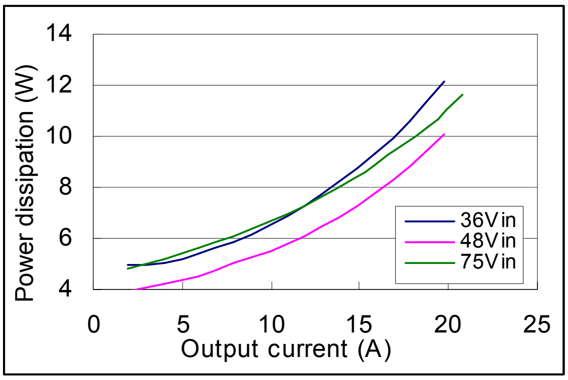


Fig.31 Typical power dissipation curve of AGQ100-48S05

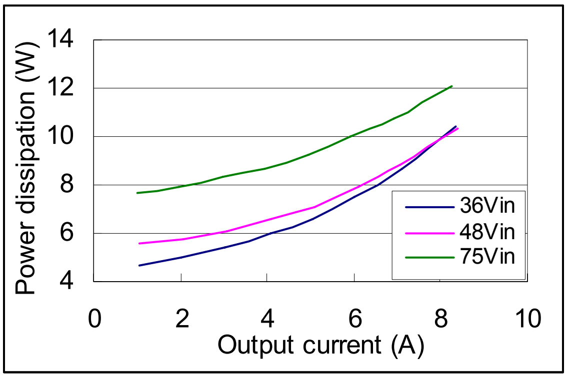


Fig.32 Typical power dissipation curve of AGQ100-48S12

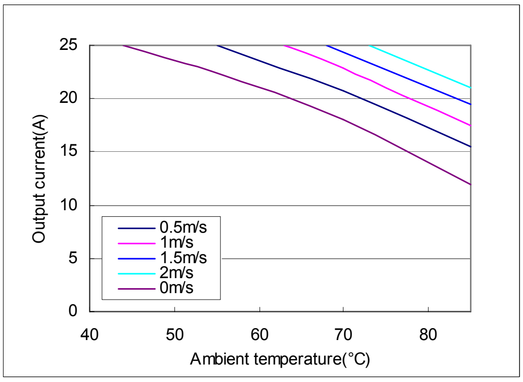


Fig.33 Output power derating of 2.5V

(airflow direction from output to input, open frame)

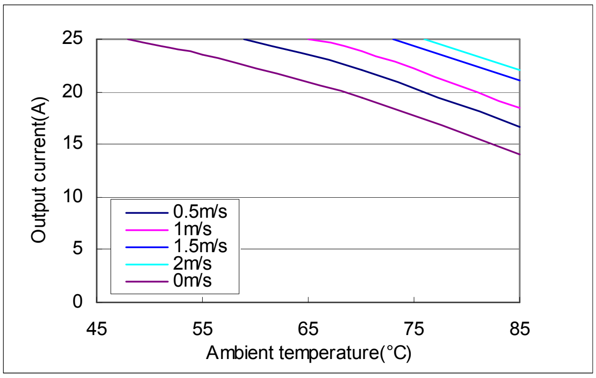


Fig.34 Output power derating of 2.5V

(airflow direction from output to input, baseplated)

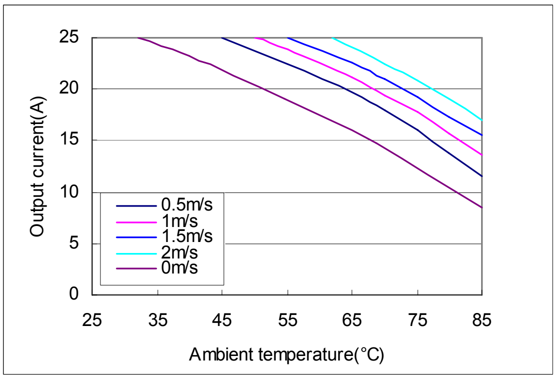


Fig.35 Output power derating of 3.3V

(airflow direction from output to input, open frame)

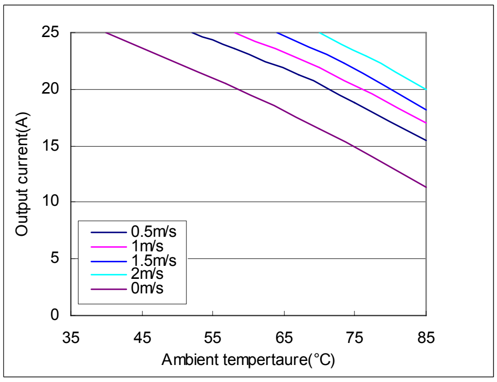


Fig.36 Output power derating of 3.3V

(airflow direction from output to input, baseplated)

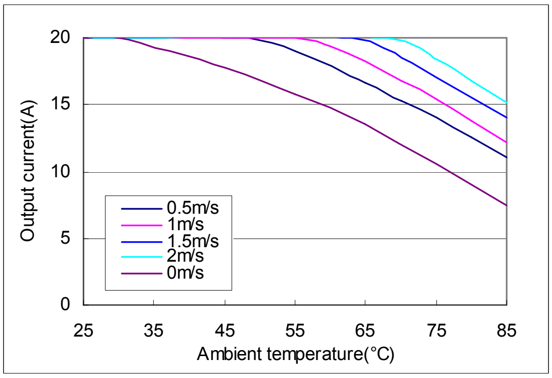


Fig. 37 Output power derating of 5V

(airflow direction from output to input, open frame)

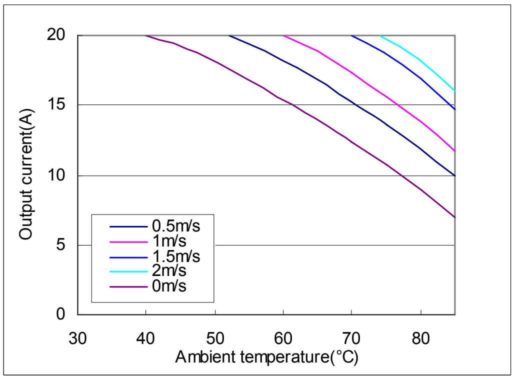


Fig. 38 Output power derating of 5V

(airflow direction from output to input, baseplated)

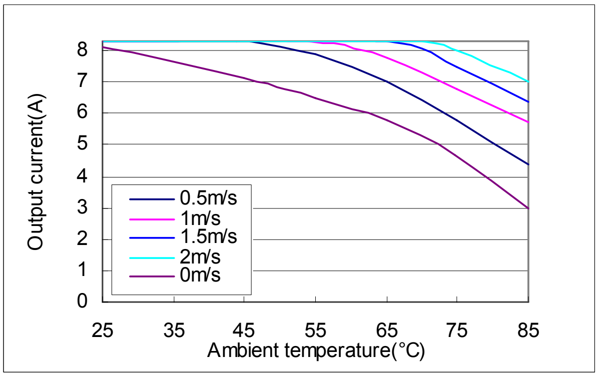


Fig. 39 Output power derating of 12V

(airflow direction from output to input, open frame)

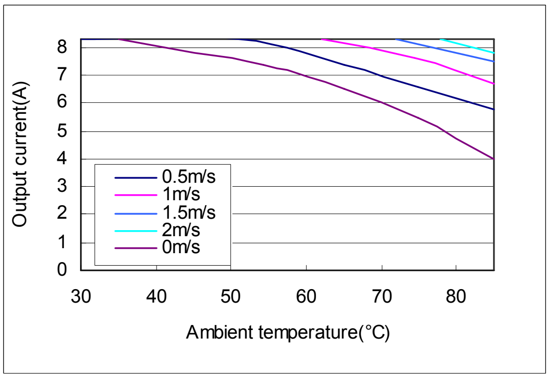


Fig.40 Output power derating of 12V

(airflow direction from output to input, baseplated)

Feature Description

CNT Function

Two CNT logic options are available. The CNT logic, CNT voltage and the converter working state are as the following table.

	L	H	OPEN
N	ON	OFF	OFF
P	OFF	ON	ON

N--- “Negative Logic”

P--- “Positive Logic”

L--- “Low Voltage”, -0.7V≤L≤0.8V

H--- “High Voltage”, 3.5V≤H≤12V

ON--- “Converter is on”, OFF--- “Converter is off”

Open--- “CNT pin is left open “

Note: Normally, V_{CNT} ≤12V.

The following figure shows a few simple CNT circuits.

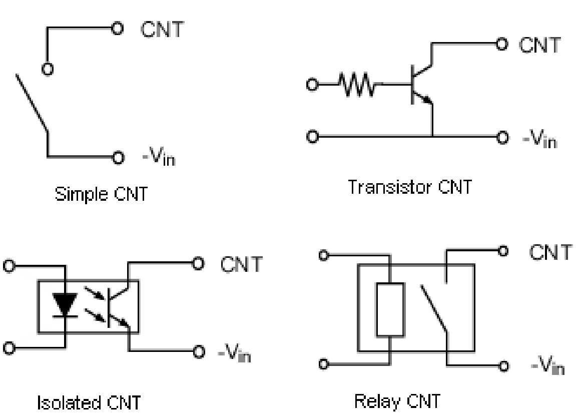


Fig. 41 CNT Circuit

Remote Sense

The AGQ100 converter can remotely sense both lines of its output which moves the effective output voltage regulation point from the output terminals of the unit to the point of connection of the remote sense pins. This feature automatically adjusts the real output voltage of the AGQ100 in order to compensate for voltage drops in distribution and maintain a regulated voltage at the point of load.

When the converter is supporting loads far away, or is used with undersized cabling, significant voltage drop can occur at the load. The best defense against such drops is to locate the load close to the converter and to ensure adequately sized cable is used. When this is not possible, the converter can compensate for a drop of up to 10%Vo, through use of the sense leads.

When used, the + Sense and - Sense leads should be connected from the converter to the point of load as shown in Figure 42, using twisted pair wire, or parallel pattern to reduce noise effect. The converter will then regulate its output voltage at the point where the leads are connected. Care should be taken not to reverse the sense leads. If reversed, the converter will trigger OVP protection.

When not used, the +Sense lead must be connected with +Vo, and -Sense with -Vo. Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both.

The maximum increase is the larger of either the remote sense or the trim.

Note that at elevated output voltages the maximum power rating of the converter remains the same, and the output current capability will decrease correspondingly.

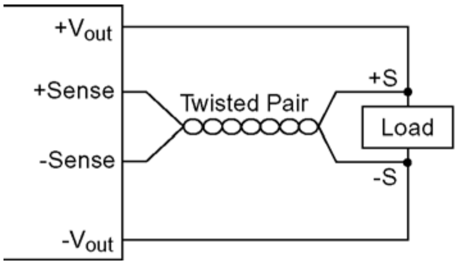


Fig. 42 Sense connections

Trim

The +Vo output voltage of the AGQ100 series can be trimmed using the trim pin provided. Applying a resistor to the trim pin through a voltage divider from the output will cause the +Vo output to increase by up to 10%or decrease by up to 20%. Trimming up by more than 10% of the nominal output may activate the OVP circuit or damage the converter. Trimming down more than 20% can cause the converter to regulate improperly. If the trim pin is not needed, it should be left open.

Trim up

With an external resistor connected between the TRIM and +SENSE pins, the output voltage set point increases (see Figure 43).

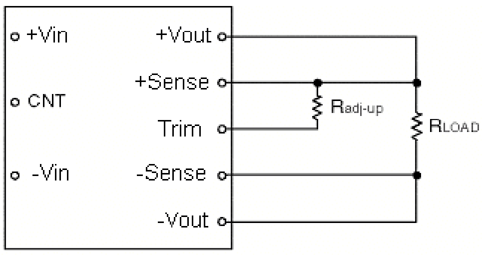


Fig. 43 Trim up circuit

The following equation determines the required external-resistor value to obtain a percentage output voltage change of 1%.

$$R_{adj-up} = \frac{5.1 \times V_{nom} \times (100 + \Delta)}{1.225 \times \Delta} - \frac{510}{\Delta} - 10.2(K\Omega)$$

Note: △= (Vo-Vnom) % 100/Vnom

Trim down

With an external resistor between the TRIM and -SENSE pins, the output voltage set point decreases (see Figure 44).

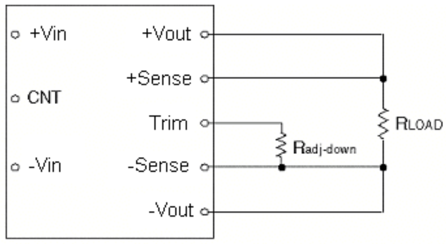


Fig. 44 Trim down circuit

The following equation determines the required external-resistor value to obtain a percentage output voltage change of 1%.

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

Note: △= (Vnom-Vo) % 100/Vnom

Although the output voltage can be increased by both the remote sense and by the trim, the maximum increase for the output voltage is not the sum of both. The maximum increase is the larger of either the remote sense or the trim.

Note that at elevated output voltages the maximum power rating of the converter remains the same, and the output current capability will decrease correspondingly.

Minimum Load Requirements

There is no minimum load requirement for the AGQ100 series converter.

Output Capacitance

High output current transient rate of change (high di/dt) loads may require high values of output capacitance to supply the instantaneous energy requirement to the load. To minimize the output voltage transient drop during this transient, low ESR (Equivalent Series Resistance) capacitors may be required, since a high ESR will produce a correspondingly higher voltage drop during the current transient.

When the load is sensitive to ripple and noise, an output filter can be added to minimize the effects. A simple output filter to reduce output ripple and noise can be made by connecting a capacitor C1 across the output as shown in Figure 45. The recommended value for the output capacitor C1 is 1,000μF.

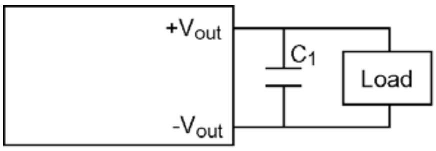


Fig. 45 Output ripple filter

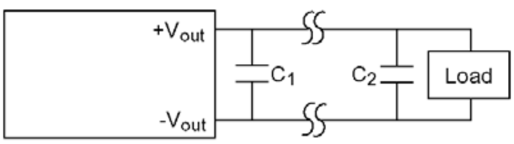


Fig. 46 Output ripple filter for a distant load

Extra care should be taken when long leads or traces are used to provide power to the load. Long lead lengths increase the chance for noise to appear on the lines. Under these conditions C1 can be added across the load, with a 1μF ceramic capacitor C2 in parallel generally as shown in Figure 46.

Decoupling

Noise on the power distribution system is not always created by the converter. High speed analog or digital loads with dynamic power demands can cause noise to cross the power inductor back onto the input lines. Noise can be reduced by decoupling the load. In most cases, connecting a 10μF tantalum or ceramic capacitor in parallel with a 0.1μF ceramic capacitor across the load will decouple it. The capacitors should be connected as close to the load as possible.

Ground Loops

Ground loops occur when different circuits are given multiple paths to common or earth ground, as shown in Figure 47. Multiple ground points have slightly different potential and cause current flow through the circuit from one point to another. This can result in additional noise in all the circuits. To eliminate the problem, circuits should be designed with a single ground connection as shown in Figure 48.

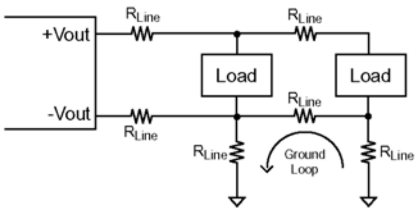


Fig. 47 Ground loops

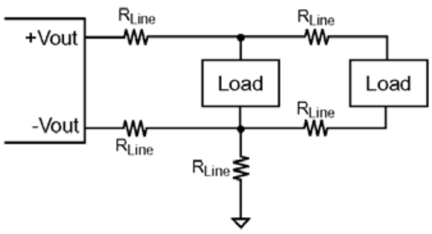


Fig. 48 Single point ground

Output Over-current Protection

AGQ100 series DC/DC converters feature foldback current limiting as part of their OCP (Over-current Protection) circuits. When output current exceeds 110 to 150% of rated current, such as during a short circuit condition, the converter will shut down and attempt to restart normally once a second.

Output Over-Voltage Protection

The output over-voltage protection consists of circuitry that monitors the voltage on the output terminals. If the voltage on the output terminals exceeds the over voltage protection threshold, the converter will shut down and attempt to restart normally once a second.

Over-Temperature Protection

The AGQ100 converter features an over-temperature protection circuit to safeguard against thermal damage. The converter will work on intermittent mode when the maximum device reference temperature is exceeded. When the over-temperature condition is removed, the converter will automatically restart.

Input Reverse Voltage Protection

Under installation and cabling conditions where reverse polarity across the input may occur, reverse polarity protection is recommended. Protection can easily be provided as shown in Figure 49. In both cases the diode used is rated for 10A/100V. Placing the diode across the inputs rather than in-line with the input offers an advantage in that the diode only conducts in a reverse polarity condition, which increases circuit efficiency and thermal performance.

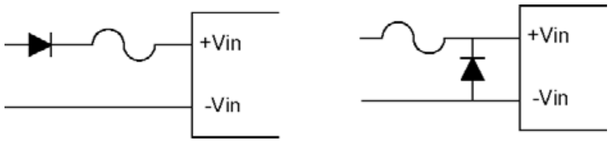


Fig. 49 Reverse polarity protection circuit

Safety Consideration

For safety-agency approval of the system in which the converter is used, the converter must be installed in compliance with the spacing and separation requirements of the end-use safety agency standard, i.e., UL1950, CSA C22.2 No. 950-95, and EN60950. The AGQ100 series input-to-output isolation is a basic insulation. The DC/DC converter should be installed in end-use equipment, in compliance with the requirements of the ultimate application, and is intended to be supplied by an isolated secondary circuit. When the supply to the DC/DC converter meets all the requirements for SELV (<60Vdc), the output is considered to remain within SELV limits (level 3). If connected to a 60Vdc power system, double or reinforced insulation must be provided in the converter that isolates the input from any hazardous voltages, including the AC mains. One input pin and one output pin are to be grounded or both the input and output pins are to be kept floating. Single fault testing in the power supply must be performed in combination with the DC/DC converter to demonstrate that the output meets the requirement for SELV. The input pins of the converter are not operator accessible.

Note: Do not ground either of the input pins of the converter, without grounding one of the output pins. This may allow a non-SELV voltage to appear between the output pin and ground.

Fusing

The AGQ100 converters have no internal fuse. An external fuse must always be employed! To meet international safety requirements, a 250 Volt rated fuse should be used. If one of the input lines is connected to chassis ground, then the fuse must be placed in the other input line.

Standard safety agency regulations require input fusing. Recommended ratings is 5A for the AGQ100 Series

Note: The fuse is fast blow type.

Typical Application

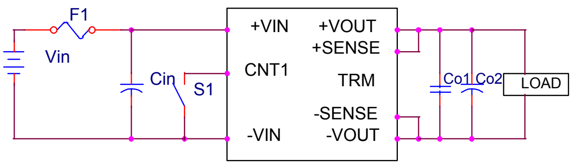


Fig. 50 Typical application

F1: Fuse*: 5A fuse (fast blow type).

Cin: Recommended input capacitor. Use 100μF/100V high frequency low ESR electrolytic type capacitor.

Co1: Recommended 1μF /25V ceramic capacitor

Co2: Recommended output capacitor Recommended 1,000μF/25V high frequency low ESR electrolytic type capacitor.

If Ta<-5°C, use 220μF//220μF tantalum capacitor parallel with Co2.

Note: The AGQ100 converter cannot be used in parallel mode directly!

EMC

For conditions where EMI is a concern, a different input filter can be used. Figure 51 shows the filter designed to reduce EMI effects for AGQ100 series.

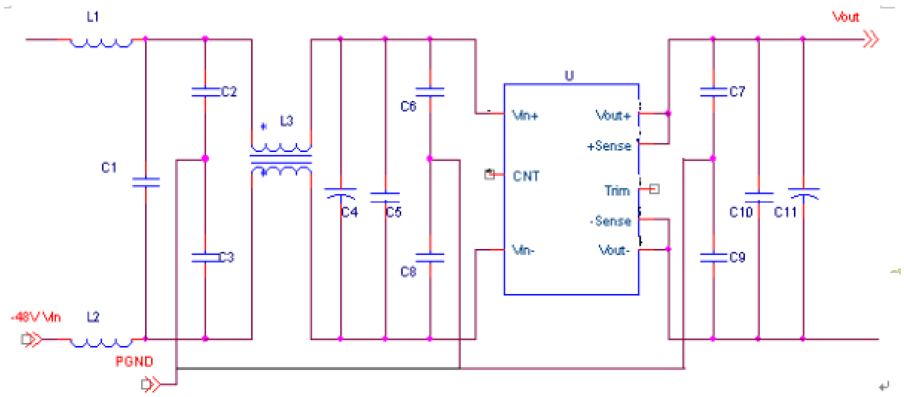


Fig. 51 EMI reduction filter

Recommended values:

Component	Value/Rating	Type		Component	Value/Rating	Type
C1	2.2μF	Metal-film		C10	10μF/25V	Chip
C2, C3	0.22μF	Metal-film		C11	1000μF/25V	Aluminum Electrolytic
C4	100μF/100V	Aluminum Electrolytic		L1,L2	H5B SMB	Bead
C5	1μF/100V*4	Chip		L3	1.8mH	Common
C6, C7 C8, C9	1000P/2KV	Chip				

Remark:

For AGQ100-48S3V3B-4 and AGQ100-48S12B-4, it is no need to use L1 and L2.

For AGQ100-48S3V3-4 and AGQ100-48S12-4, it is no need to use L1, L2, C6, and C8.

Thermal Consideration

Technologies

AGQ100 converters have ultra high efficiency at full load. With less heat dissipation and temperature-resistant components such as ceramic capacitors, these converters exhibit good performance during pro-longed exposure to high temperatures. Maintaining the operating board temperature within the specified range help keep internal component temperatures within their specifications which in turn help keep MTBF from falling below the specified rating. Proper cooling of the converter is also necessary for reliable and consistent operation.

Basic Thermal Management

Measuring the board temperature of the converter as the method shown in Figure 52 can verify the proper cooling. If the converter has a baseplate, the measurement location is the case of the converter.

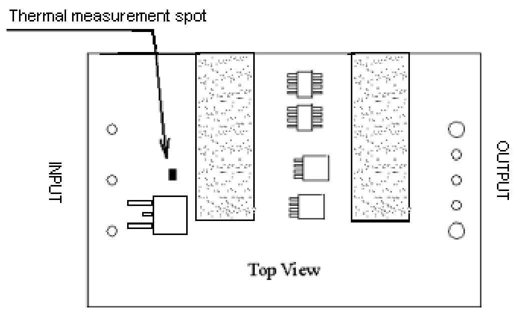


Fig. 52 Temperature measurement spot

The converter should work under 70°C ambient for the reliability of operation and the temperature of measurement spot must not exceed 110°C while operating in the final system configuration. The measurement can be made with a surface probe after the converter has reached thermal equilibrium. Be careful that the thermocouple must not touch the pads of any components. No heat sink is mounted, make the measurement as close as possible to the indicated position. It makes the assumption that the final system configuration exists and can be used for a test environment. Note that the board temperature of converter must always be checked in the final system configuration to verify proper operation due to the variation in test conditions. Thermal management acts to transfer the heat dissipated by the converter to the surrounding environment. The amount of power dissipated by the converter as heat (PD) is got by the equation below:

PD = PI - PO

Where: PI is input power; PO is output power; PD is dissipated power.

Also, converter efficiency (η) is defined as the following equation:

η = PO / PI

By eliminating the input power term, we can get the equation below from the above two equations:

PD = PO (1-η) / η

The converter power dissipation then can be calculated through the equation.

Because each converter output voltage has a different power dissipation curve, the typical power dissipation curve of AGQ100 series are shown in the figures 29 to 32.

Converter Derating

With 48V input, 25°C ambient temperature, and 200LFM airflow, AGQ100 series are rated for full power. For operation above ambient temperature of 25°C, output power must be derated as shown in figures 33 to Figure 40. The board temperature should be used to determine maximum temperature limits. The converter cannot work continuously when the board temperature is over 100°C. The minimum operating temperature for the AGQ100 is -40°C.

Increasing airflow over the converter enhances the heat transfer via convection.

The converter is not designed to operate for a long time with the baseplate temperature being above 100℃.

The use of output power derating curve is shown in the following example.

Example:

What is the minimum airflow necessary for AGQ100-48S05 operating at VI = 48 V, an output current of 20A, and a maximum ambient temperature of 55°C?

Solution: Given: VI = 48V, Io = 20A, Ta = 55°C

Determine airflow (v) (Use Figure 37): V = 1.5m/sec.

MTBF

The MTBF, calculated in accordance with Bellcore TR-NWT-000332, is 2,000,000 hours. Obtaining this MTBF in practice is entirely possible. If the board temperature is expected to exceed +25°C, then we also advise an oriented for the best possible cooling in the air stream.

Emerson Network Power can supply replacements for converters from other manufacturers, or offer custom solutions. Please contact the factory for details.

Mechanical Considerations

Installation

Although AGQ100 series converters can be mounted in any orientation, free air-flowing must be taken. Normally power components are always put at the end of the airflow path or have the separate airflow paths. This can keep other system equipment cooler and increase component life spans.

Note:

1. There should be no electrical connection between the case and the PE or any converter ports.

2. The fixing screw of the heatsink should not be too long. Please refer to the mechanical chart for detail.

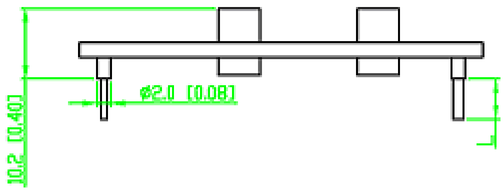
Soldering

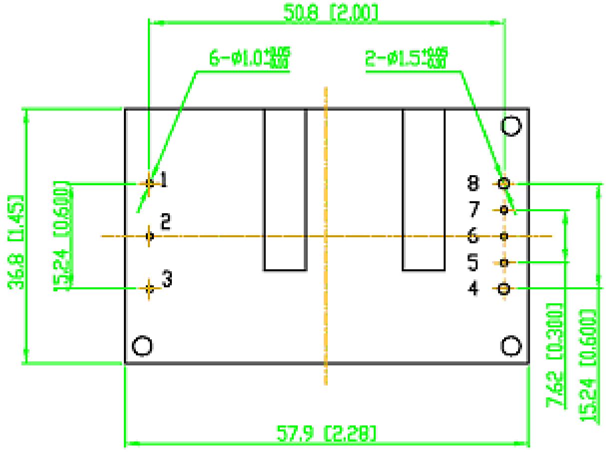
AGQ100 series converters are compatible with standard wave soldering techniques. When wave soldering, the converter pins should be preheated for 20-30 seconds at 110°C, and wave soldered at 260°C for less than 10 seconds.

When hand soldering, the iron temperature should be maintained at 425°C and applied to the converter pins for less than 5 seconds. Longer exposure can cause internal damage to the converter. Cleaning can be performed with cleaning solvent IPA or with water.

Mechanical Chart (Top & Side View)

Open frame





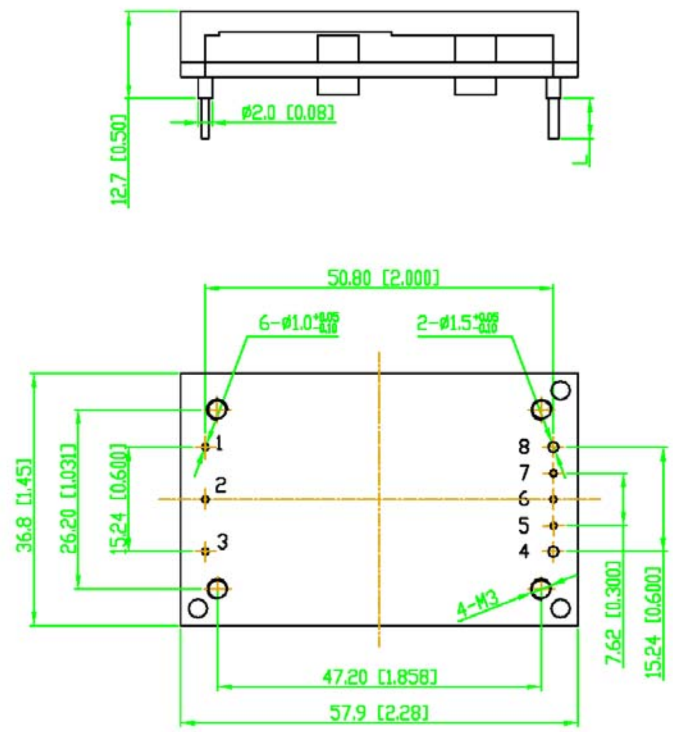
Pin Length

4.8mm	-4
3.8mm	-6
2.8mm	-8
5.8mm	None

Pin Assignments

1. +Vin	5. -Sense
2. CNT	6. Trim
3. -Vin	7. +Sense
4. -Vout	8. +Vout

Baseplated



Notes:M3 hole is only for 3.3v,5v

Pin Length

4.8mm	-4
3.8mm	-6
2.8mm	-8
5.8mm	None

Pin Assignments

1. +Vin	5. -Sense
2. CNT	6. Trim
3. -Vin	7. +Sense
4. -Vout	8. +Vout

Ordering Information

Model Number	Input Voltage (V)	Output Voltage (V)	Output Current (A)	Ripple and Noise (mV pp)		Efficiency (%) Typ.
				Typ.	Max.	
AGQ100-48S2V5-4	36~75	2.5	25	-	100	88
AGQ100-48S2V5P-4	36~75	2.5	25	-	100	88
AGQ100-48S2V5B-4	36~75	2.5	25	-	100	88
AGQ100-48S2V5PB-4	36~75	2.5	25	-	100	88
AGQ100-48S3V3-4	36~75	3.3	25	-	100	89.5
AGQ100-48S3V3P-4	36~75	3.3	25	-	100	89.5
AGQ100-48S3V3B-4	36~75	3.3	25	-	100	89.5
AGQ100-48S3V3PB-4	36~75	3.3	25	-	100	89.5
AGQ100-48S05-4	36~75	5	20	-	120	90
AGQ100-48S05P-4	36~75	5	20	-	120	90
AGQ100-48S05B-4	36~75	5	20	-	120	90
AGQ100-48S05PB-4	36~75	5	20	-	120	90
AGQ100-48S12-4	36~75	12	8.33	-	180	90
AGQ100-48S12P-4	36~75	12	8.33	-	180	90
AGQ100-48S12B-4	36~75	12	8.33	-	180	90
AGQ100-48S12PB-4	36~75	12	8.33	-	180	90
AGQ100-48S2V5-6	36~75	2.5	25	-	100	88

有毒有害物质或元素标识表

部件名称	有毒有害物质或元素					
	铅	汞	镉	六价铬	多溴联苯	多溴联苯醚
	Pb	Hg	Cd	C^{6+}	PBB	PBDE
制成板	×	○	○	○	○	○

○：表示该有毒有害物质在该部件所有均质材料中的含量在 SJ/T-11363-2006 规定的限量要求以下。

×：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出 SJ/T-11363-2006 规定的限量要求

艾默生网络能源有限公司一直致力于设计和制造环保的产品，我们会通过持续的研究来减少和消除产品中的有毒有害物质。以下部件或应用中含有有毒有害物质是限于目前的技术水平无法实现可靠的替代或者没有成熟的解决方案：

1. 焊料（含器件的高温焊料）中含有铅。
2. 电子器件的玻璃中含有铅。
3. 插针的铜合金中含有铅

适用范围：AGQ100-48S2V5, AGQ100-48S3V3, AGQ100-48S05, AGQ100-48S12