

DC-DC module power supply specialized for SiC driver



Continuous Short
Circuit Protection



Patent Protection **UL** **us**
UL60950-1



CB Report **RoHS**
EN60950-1

FEATURES

- High efficiency up to 82%
- SIP package
- I/O isolation test voltage: 3.5kVAC/ 6kVDC
- Ultra-low isolation capacitance
- Operating ambient temperature range: -40°C to +105°C
- Continuous short-circuit protection
- Industry standard pin-out

QAxCx is DC-DC module power supply designed for SiC driver requiring two sets of isolation power supply. The mode of common ground outputs is adopted internally for better energy provision of SiC turn-on and turn-off. Output short-circuit protection and self-recovery capabilities are also provided. General application includes:

1. Universal converter
2. AC servo drive system
3. Electric welding machine
4. Uninterruptible power supply (UPS)

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output		Efficiency at Full Load (%) Min./Typ	Capacitive Load* (μF) Max.
		Nominal (Range)	Voltage (VDC)+Vo/-Vo	Current (mA)+Io/-Io		
UL/EN/IEC	QA01C	15 (13.5-16.5)	+20/-4	+100/-100	76/80	220
--	QA01C-18	15 (13.5-16.5)	+18/-3	+100/-100	76/79	220
--	QA051C	5 (4.5-5.5)	+20/-5	+80/-40	75/79	100
--	QA151C	15 (13.5-16.5)	+20/-5	+80/-40	76/78	220
--	QA121C2	12 (10.8-13.2)	+15/-3.5	+111/-111	77/81	220
--	QA121C-20	12 (10.8-13.2)	+20/-5	+100/-100	77/79	220
--	QA151C3	15 (13.5-16.5)	+15/-4	+100/-100	77/82	220
--	QA1201C-20	12 (10.8-13.2)	+20/-4	+100/-100	79/80	220
--	QA2401C-20	24 (21.6-26.4)	+20/-4	+100/-100	75/80	220

Note: *The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal voltage input	QA01C	--	193/16	--	mA
		QA01C-18		177/16	185/30	
		QA051C		456/53	--	
		QA151C		150/20	160/30	
		QA121C2		210/15	--	
		QA121C-20		260/20		
		QA151C3		151/15		
		QA1201C-20		240/20		
		QA2401C-20		125/13		

Surge Voltage (1sec. max.)		QA01C	-0.7	—	21	VDC
		QA01C-18			21	
		QA051C			9	
		QA151C			21	
		QA121C2			18	
		QA121C-20			18	
		QA151C3			21	
		QA1201C-20			18	
		QA2401C-20			30	
Input Filter				Capacitance filter		
Hot Plug				Unavailable		

Output Specifications

Item	Operating Conditions				Min.	Typ.	Max.	Unit	
Voltage Accuracy	Nominal voltage input (The output regulation curve only take QA01C as an example, see Fig.1 and Fig.2)		QA01C	Light Load	+Vo	+2	+4	+6	%
					-Vo	+5	+10	+15	
				Full Load	+Vo	-4	-1.5	+1	
					-Vo	-4	+0.5	+5.5	
			QA01C-18	Light Load	+Vo	0	+4	+9	
					-Vo	+6	+12	+20	
				Full Load	+Vo	-7	-3	+2	
					-Vo	-5	0	+7	
			QA051C	Light Load	+Vo	+4	+8	+12	
					-Vo	+6	+12	+18	
				Full Load	+Vo	-3	+0.5	+4	
					-Vo	+1	+4	+8	
			QA151C	Light Load	+Vo	-0.5	+1.5	+3.5	
					-Vo	0	+3	+6	
				Full Load	+Vo	-5	-3	-1	
					-Vo	-5	-2	1	
			QA121C2	Light Load	+Vo	0	+7	+15	
					-Vo	0	+15	+30	
				Full Load	+Vo	-4	0	+5	
					-Vo	-5	+5	+15	
			QA121C-20	Light Load	+Vo	+5.5	+8	+10.5	
					-Vo	+10	+12.5	+15	
				Full Load	+Vo	-2	0	+2	
					-Vo	+1	+3	+5	
			QA151C3	Light Load	+Vo	+2	+6	+10	
					-Vo	0	+10	+18	
				Full Load	+Vo	-2	0	+2	
					-Vo	-5	0	+5	
			QA1201C-20	Light Load	+Vo	+6	+8	+10	
					-Vo	+5.5	+10.5	+15.5	
				Full Load	+Vo	-2	0	+2	
					-Vo	-7.5	-2.5	+2.5	
			QA2401C-20	Light Load	+Vo	+6.5	+8	+10.5	
					-Vo	+5.5	+13	+20.5	
				Full Load	+Vo	-2.5	0	+2.5	
					-Vo	-7.5	0	+7.5	
Linear Regulation	Input voltage change: ±10%		QA01C			—	±1.1	±1.3	%/%
			QA01C-18				±1.1	±1.3	
			QA051C				±1.4	±2	
			QA151C				±1.1	±1.3	
			QA121C2				±1.1	±1.2	
			QA121C-20				—	±1.5	
			QA151C3				±1.1	±1.3	
			QA1201C-20				±1.5	±2	
			QA2401C-20				±1.1	±1.3	
Load Regulation	10% to 100% load	+Vo	QA01C			—	7	9	%
			QA01C-18				6	10	

			QA051C		8	12	
			QA151C		5	8	
			QA121C2		7	—	
			QA121C-20		—	12	
			QA151C3		5	8	
			QA1201C-20		—	8	
			QA2401C-20		5	8	
			-Vo		QA01C	—	
		QA01C-18		12	20		
		QA051C		10	14		
		QA151C		5	10		
		QA121C2		10	—		
		QA121C-20		—	15		
		QA151C3		10	13		
		QA1201C-20		—	13		
		QA2401C-20	10	13			
Ripple & Noise*	20MHz bandwidth	Ripple	QA01C	—	60	—	mVp-p
			QA01C-18		60		
			QA051C		40		
			QA151C		60		
			QA121C2		120		
			QA121C-20		60		
			QA151C3		80		
			QA1201C-20		60		
QA2401C-20	60						
Ripple & Noise*	20MHz bandwidth	Noise	QA01C	—	75	—	mVp-p
			QA01C-18		75		
			QA051C		75		
			QA151C		75		
			QA121C2		80		
			QA121C-20		100		
			QA151C3		100		
			QA1201C-20		100		
QA2401C-20	75						
Temperature Coefficient	100% load		QA01C	—	±0.03	—	% / °C
			QA01C-18		±0.03		
			QA051C		±0.03		
			QA151C		±0.03		
			QA121C2		±0.02	±0.1	
			QA121C-20		—		
			QA151C3		±0.03		
			QA1201C-20		—		
QA2401C-20	—	±0.03					
Output Short Circuit Protection			Continuous, self-recovery				
Note:*Ripple and noise tested with “parallel cable” method, please see <i>DC-DC</i> Converter Application Notes for specific operation methods.							

Note: *Ripple and noise tested with "parallel cable" method, please see DC-DC Converter Application Notes for specific operation methods.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output Electric Strength test for 1 minute with a leakage current of 1mA max.	QA01C	3500	—	VAC
			6000		VDC
		QA01C-18	3500		VAC
			6000		VDC
		QA051C	3000		VAC
			5200		VDC
		QA151C	3500		VAC
			6000		VDC
		QA121C2	3500		VAC
			3500		VAC
		QA121C-20	3500		VDC
			6000		VDC
		QA151C3	3500		VAC
			6000		VDC
		QA1201C-20	3500		VAC
		QA2401C-20	3500		VAC

Isolation Resistance	Input-output insulation at 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	3.5	--	pF
Operating Temperature	Derating when operating temperature up to 85℃, (QA051C see Fig. 8, others refer to Fig. 7)	-40	--	105	℃
Storage Temperature		QA01C	-55	125	
		QA01C-18	-55	125	
		QA051C	-55	125	
		QA151C	-55	125	
		QA121C2	-55	125	
		QA121C-20	-55	125	
		QA151C3	-40	105	
		QA1201C-20	-50	105	
		QA2401C-20	-55	125	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from the case, 10 seconds	--	--	300	
Case Temperature Rise	Ta=25℃	--	30	--	
Storage Humidity	Non-condensing	--	--	95	%RH
Switching Frequency	100% load, nominal input voltage	QA01C	--	95	kHz
		QA01C-18	--	95	
		QA051C	--	100	
		QA151C	--	95	
		QA121C2	--	67	
		QA121C-20	--	95	
		QA151C3	--	100	
		QA1201C-20	--	100	
		QA2401C-20	--	100	
MTBF	MIL-HDBK-217F@25℃	3500	--	--	k hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Package Dimensions	19.50 × 9.80 × 12.50mm
Weight	4.2g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

Emissions	Conducted disturbance	CISPR32/EN55032	CLASS B (see Fig. 12 for recommended circuit)
	Radiated emission (Except QA051C)	CISPR32/EN55032	CLASS B (see Fig. 12 for recommended circuit)
Immunity	Electrostatic discharge	IEC/EN61000-4-2	Contact ±6kV perf. Criteria B

Typical Characteristic Curves

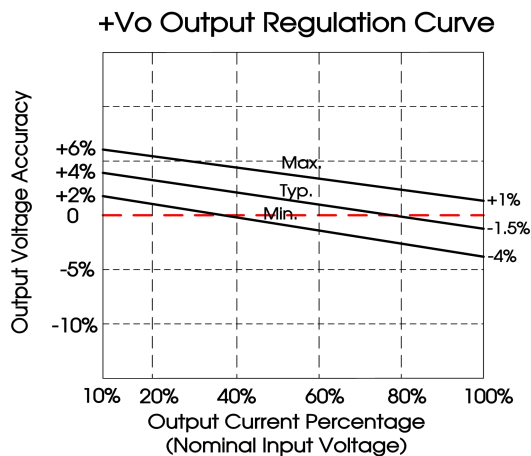


Fig. 1(QA01C)

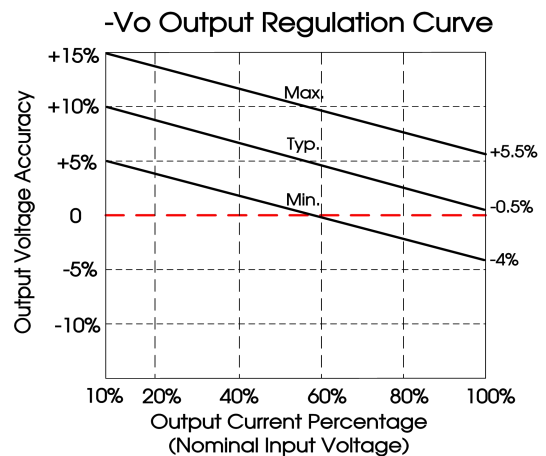


Fig. 2(QA01C)

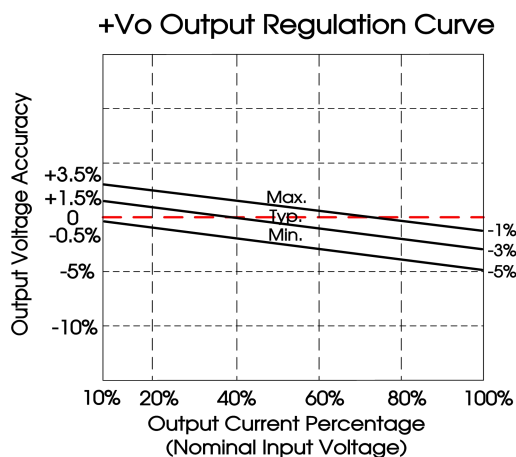


Fig. 3(QA151C)

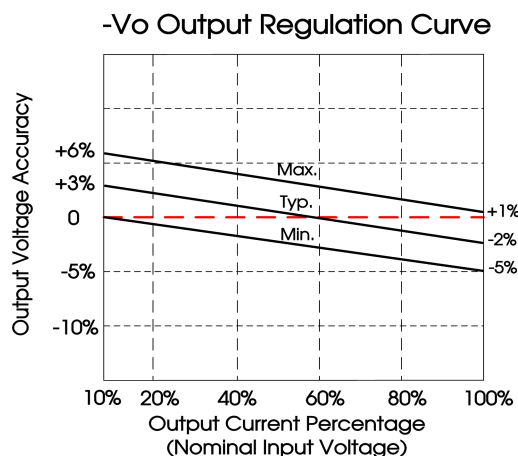


Fig. 4(QA151C)

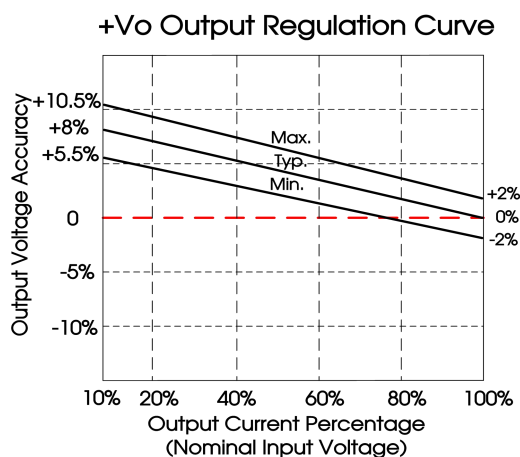


Fig. 5(QA121C-20)

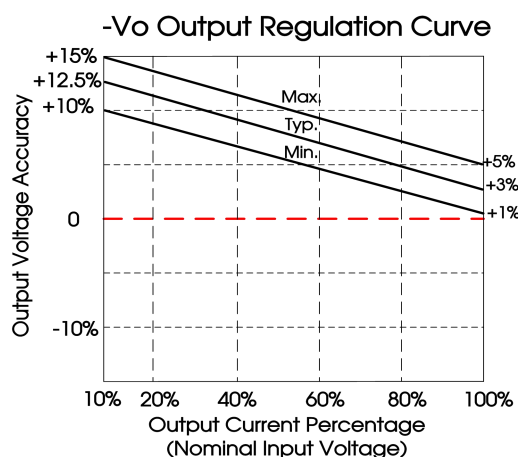


Fig. 6(QA121C-20)

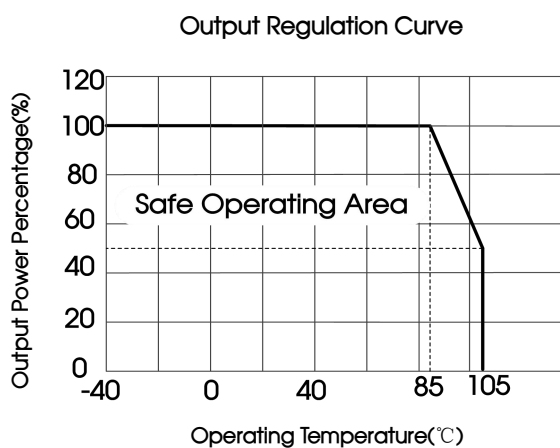


Fig. 7(others P/N)

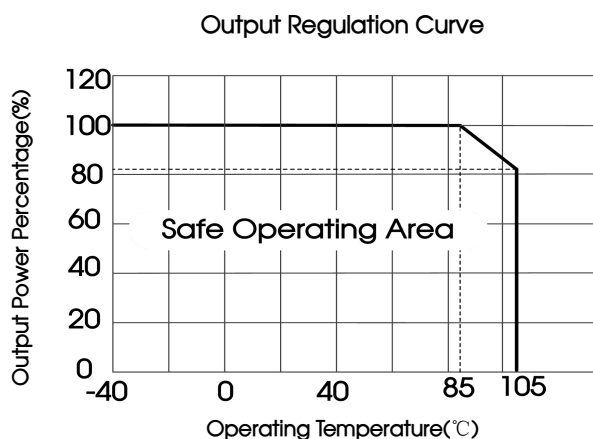


Fig. 8(QA051C)

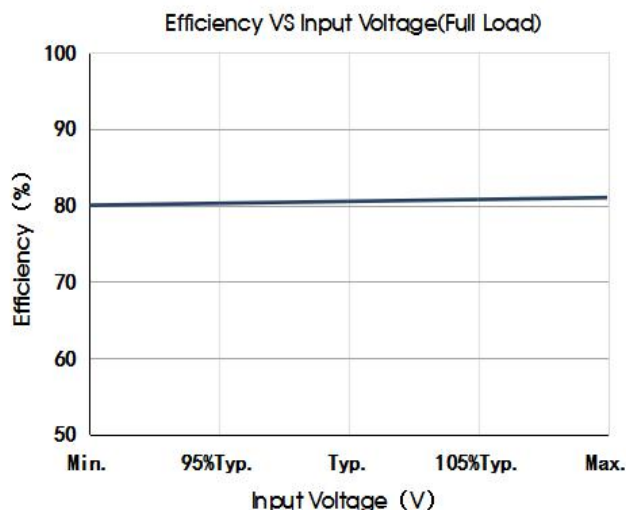


Fig. 9

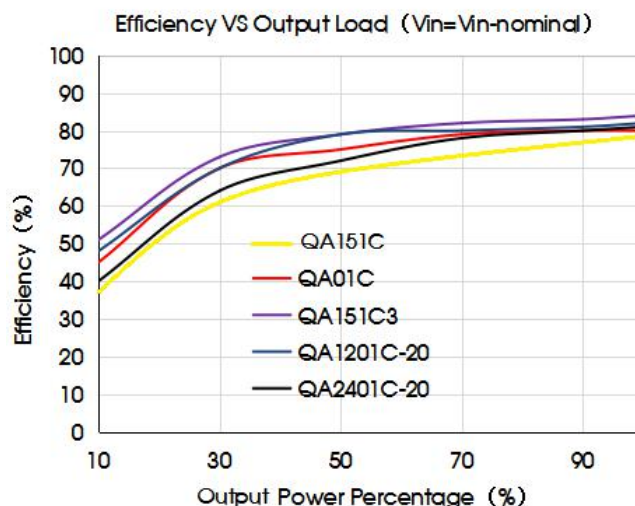


Fig. 10

Design Reference

1. Overload Protection

There is no over-load protection under normal operating conditions, we suggest to add an circuit breaker outside in the circuit.

2. Test configurations

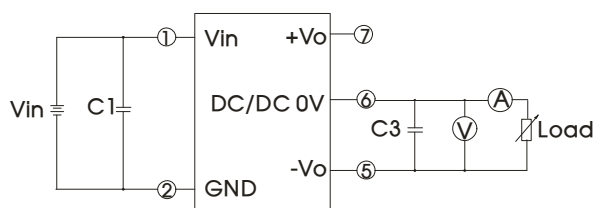


Fig. 11

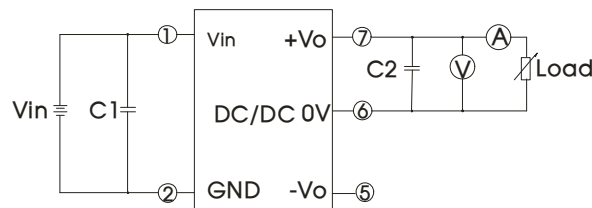
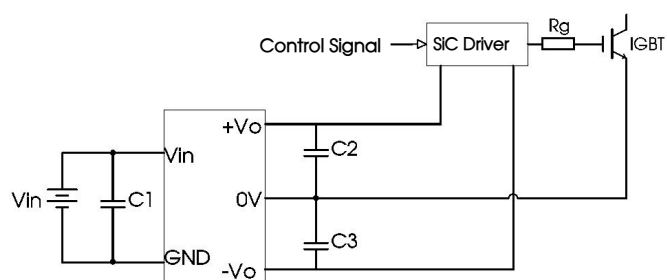


Fig. 12

Note: C1,C2,C3: 100uF/35V (Low impedance)

3. Typical application



(Apply to QA01C, QA01C-18, QA051C, QA121C2, QA151C3, QA151C, QA121C-20)

Fig. 13

C1/C2/C3
100uF/35V (Low internal resistance capacitance)

4. EMC typical recommended circuit (CLASS B)

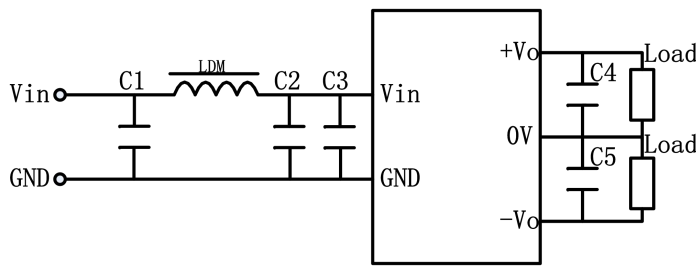


Fig. 14

model		Except QA151C、QA121C-20	
EMI	C1/C2	4.7μF /50V	
	C4/C5	100μF /35V (Low internal resistance capacitance)	
	LDM	6.8μH	22μH (QA121C2)

model		QA151C、QA121C-20	
EMI	C1/C2	4.7μF /50V	
	C3	100pF /50V	
	C4/C5	100μF /35V (Low internal resistance capacitance)	
	LDM	22μH	

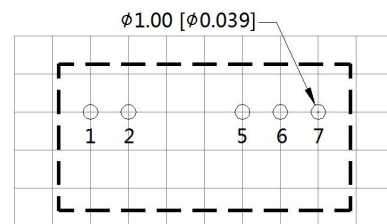
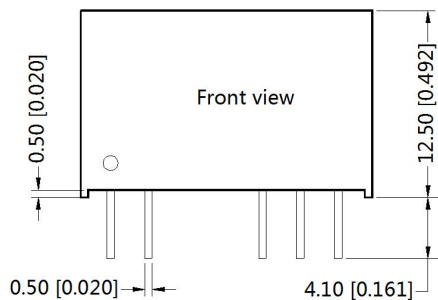
5. The products do not support parallel connection of their output for power expansion purpose or hot-plug.

6. Electrolytic capacitors are recommended for external capacitors at the input or output of the product. Tantalum capacitors are not, otherwise there is a risk of failure.

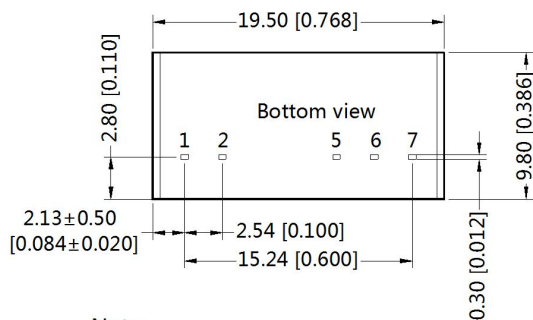
7. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm



Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.25[±0.010]

Pin-Out	
Pin	Mark
1	Vin
2	GND
5	-Vo
6	0V
7	+Vo

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200013;
2. The lead connecting the power supply module and SiC driver should be as short as possible during use;
3. The output filtering capacitor should be as close as possible to the power supply module and SiC driver;
4. The peak of the SiC driver gate drive current is high, so low internal resistance electrolytic capacitor is recommended to be used for the power supply module output filter capacitor;
5. The average output power of the driver must be lower than that of the power supply module;
6. Consider fixing with glue near the module if being used in vibration occasion;
7. The maximum capacitive load offered were tested at nominal input voltage and full load;
8. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated output load;
9. All index testing methods in this datasheet are based on company corporate standards;
10. The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
11. We can provide product customization service, please contact our technicians directly for specific information;
12. Products are related to laws and regulations: see "Features" and "EMC";
13. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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