

DC-DC module power supply specialized for SiC driver



Patent Protection
CE Report **CB** **RoHS**
 EN62368-1 IEC60950-1

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		
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	73/75	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	75/80	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, QA151C, QA121C-20 as an example, see Fig.1-6)	QA01C	Light Load +Vo	+2	+4	+6	%
			Light Load -Vo	+5	+10	+15	
		QA01C-18	Full Load +Vo	-4	-1.5	+1	
			Full Load -Vo	-4	+0.5	+5.5	
		QA051C	Light Load +Vo	0	+4	+9	
			Light Load -Vo	+6	+12	+20	
		QA151C	Full Load +Vo	-7	-3	+2	
			Full Load -Vo	-5	0	+7	
		QA121C2	Light Load +Vo	+4	+8	+12	
			Light Load -Vo	+6	+12	+18	
		QA121C-20	Full Load +Vo	-3	+0.5	+4	
			Full Load -Vo	+1	+4	+8	
		QA151C3	Light Load +Vo	-0.5	+1.5	+3.5	
			Light Load -Vo	0	+3	+6	
		QA1201C-20	Full Load +Vo	-5	-3	-1	
			Full Load -Vo	-5	-2	1	
		QA2401C-20	Light Load +Vo	0	+7	+15	
			Light Load -Vo	0	+15	+30	
		QA01C	Full Load +Vo	-4	0	+5	
			Full Load -Vo	-5	+5	+15	
		QA01C-18	Light Load +Vo	+5.5	+8	+10.5	
			Light Load -Vo	+10	+12.5	+15	
		QA051C	Full Load +Vo	-2	0	+2	
			Full Load -Vo	+0	+3	+6	
QA151C	Light Load +Vo	+2	+6	+10			
	Light Load -Vo	0	+10	+18			
QA151C3	Full Load +Vo	-2	0	+2			
	Full Load -Vo	-5	0	+5			
QA1201C-20	Light Load +Vo	0	+5	+10			
	Light Load -Vo	0	+7.5	+15			
QA121C-20	Full Load +Vo	-2	0	+2			
	Full Load -Vo	-7.5	-2.5	+2.5			
QA2401C-20	Light Load +Vo	+0.5	+5.5	+10.5			
	Light Load -Vo	+5.5	+13	+20.5			
QA01C	Full Load +Vo	-2.5	0	+2.5			
	Full Load -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		
			QA01C		10	15		
		-Vo	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			
			QA121C-20		--			±0.1
			QA151C3		±0.03			--
			QA1201C-20		--			±0.03
QA2401C-20	--	±0.03						
Output Short Circuit Protection				Continuous, self-recovery				
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	--	--	M Ω
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	3.5	--	pF
Operating Temperature	Derating when operating temperature up to 85°C, (QA051C see Fig. 8, others refer to Fig. 7)	-40	--	105	°C
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°C	--	30	--	
Safety Standard	IEC60950-1 & EN62368-1 (Report)				
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°C	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	CE	CISPR32/EN55032 CLASS B (see Fig. 12 for recommended circuit)
	RE (Except QA051C)	CISPR32/EN55032 CLASS B (see Fig. 12 for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2 Contact \pm 6kV perf. Criteria B

Typical Characteristic Curves

+Vo Output Regulation Curve

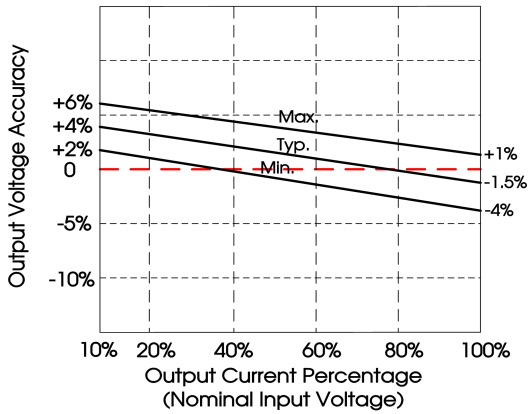


Fig. 1(QA01C)

-Vo Output Regulation Curve

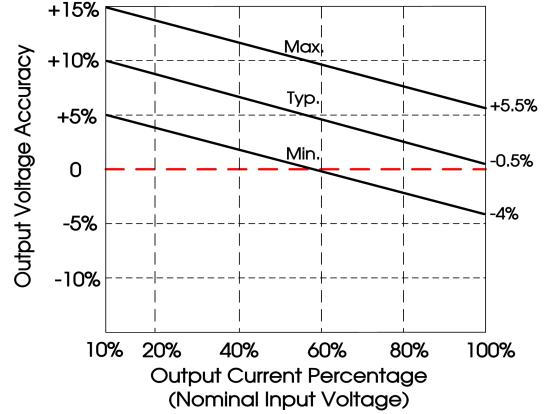


Fig. 2(QA01C)

+Vo Output Regulation Curve

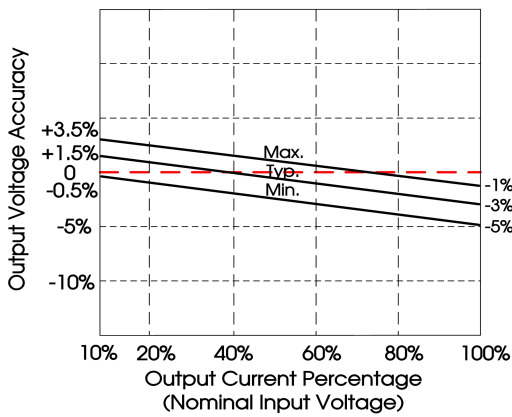


Fig. 3(QA151C)

-Vo Output Regulation Curve

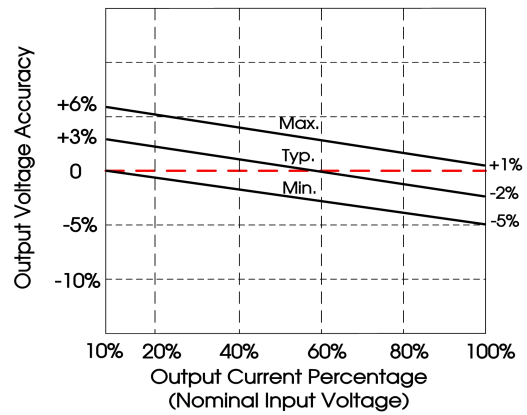


Fig. 4(QA151C)

+Vo Output Regulation Curve

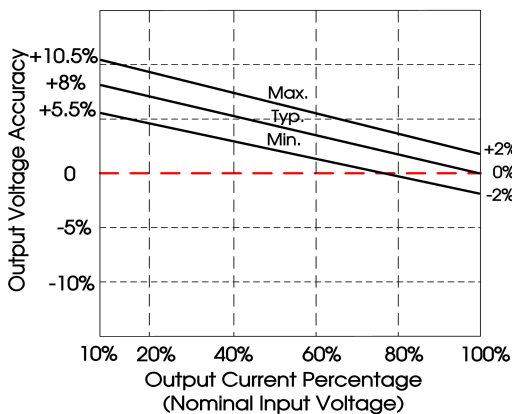


Fig. 5(QA121C-20)

-Vo Output Regulation Curve

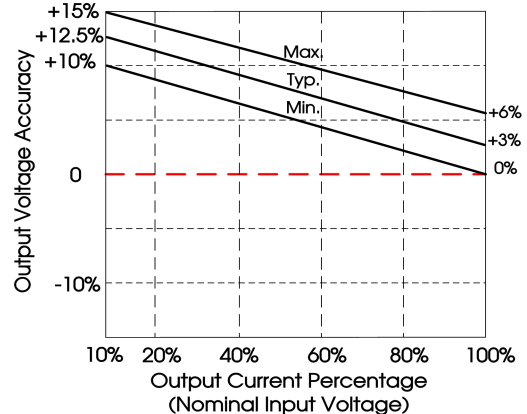


Fig. 6(QA121C-20)

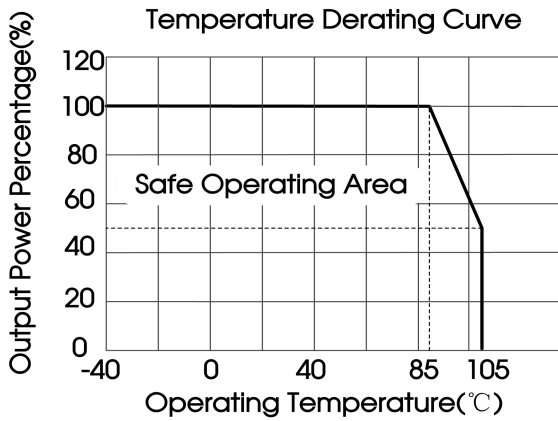


Fig. 7(others P/N)

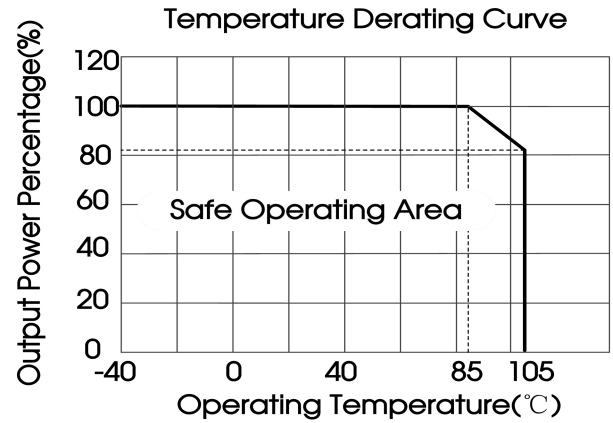


Fig. 8(QA051C)

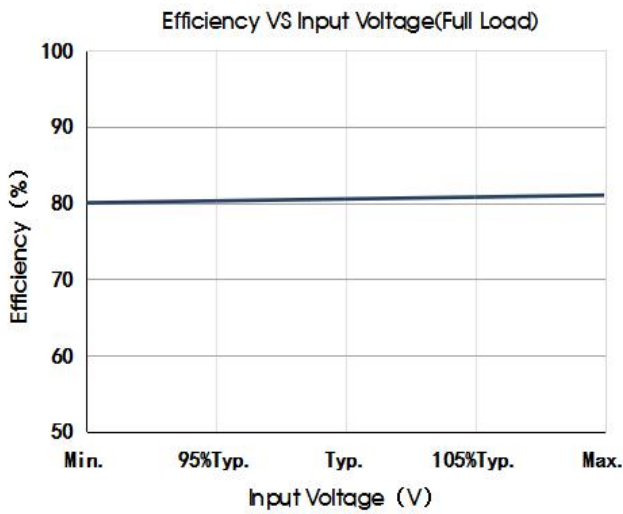


Fig. 9

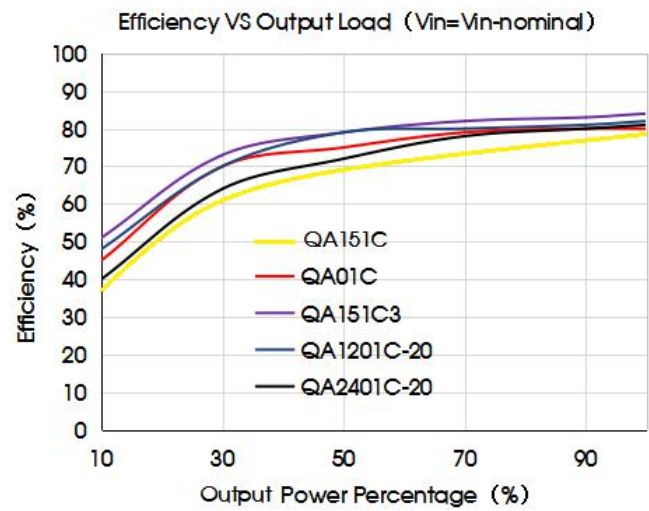


Fig. 10

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

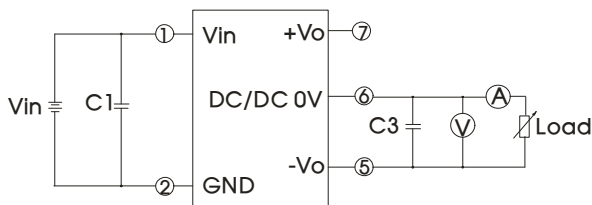


Fig. 11

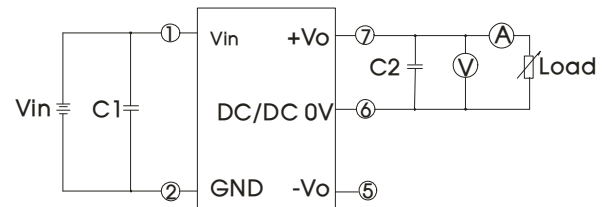


Fig. 12

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

3. Typical application

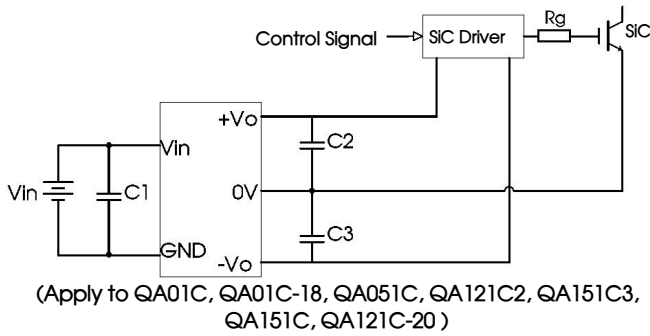


Fig. 13

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

4. EMC typical recommended circuit (CLASS B)

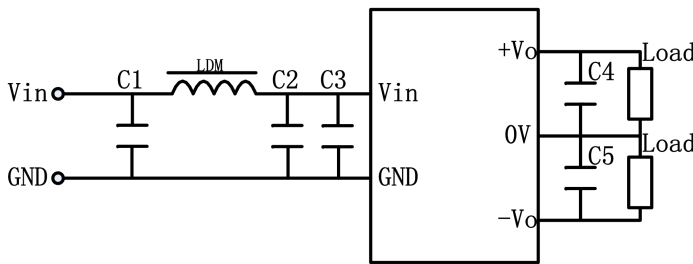


Fig. 14

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	

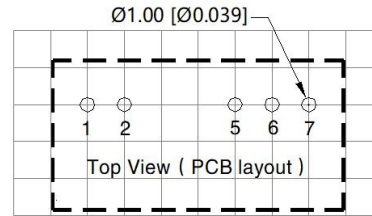
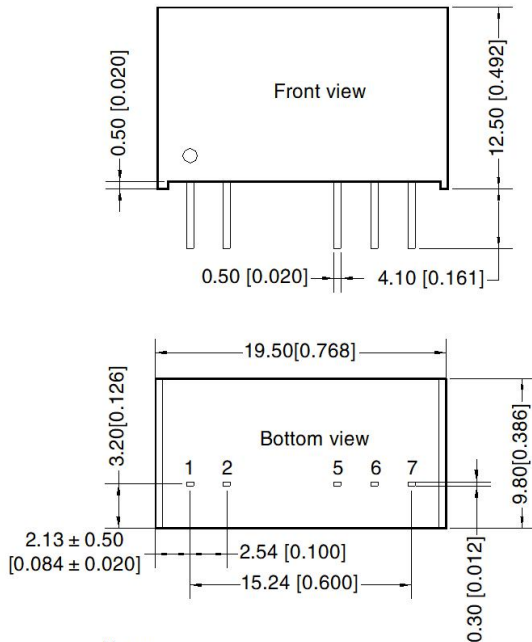
5. The products do not support parallel connection of their output for power expansion purpose or hot-plug.

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 



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

Note:
 Unit: mm[inch]
 Pin section tolerances: ±0.10[±0.004]
 General tolerances: ±0.50[±0.020]

Notes:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200013;
- The lead connecting the power supply module and SiC driver should be as short as possible during use;
- The output filtering capacitor should be as close as possible to the power supply module and SiC driver;
- 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;
- The average output power of the driver must be lower than that of the power supply module;
- Consider fixing with glue near the module if being used in vibration occasion;
- The maximum capacitive load offered were tested at nominal input voltage and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- 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;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- 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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