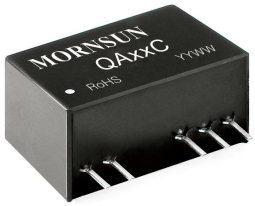
DC/DC Converter for SiC Driver

QAxCx Series

MORNSUN®

DC-DC module power supply specialized for SIC driver



Continuous Short Circuit Protection

c UL us CE CB Patent Protection RoHS

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℃ to +105℃
- Continuous short-circuit protection
- Industry standard pin-out
- IEC60950、UL60950 and EN60950 approved

QAxCx is DC-DC module power supplie 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/CE/CB	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
--	QA151C3	15 (13.5-16.5)	+15/-4	+100/-100	77/82	220
--	QA1201C-20	12 (10.8-13.2)	+20/-4	+100/-100	--/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	--	
		QA151C3		151/15		
		QA1201C-20		--/20		
		QA2401C-20		125/13		
Surge Voltage (1sec. max.)		QA01C	-0.7	--	21	VDC
		QA01C-18			21	
		QA051C			9	

		QA151C			21	
		QA121C2			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 (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	
		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	--	--	--	
				-Vo	--	--	--	
			Full Load	+Vo	-2	--	+2	
				-Vo	-7.5	--	+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	
		QA151C3				±1.1	±1.3	
		QA1201C-20				±1.5	±2	
		QA2401C-20				±1.1	±1.3	
Load Regulation	10% ~100% load	QA01C		+Vo	--	7	9	%
		QA01C-18				6	10	
		QA051C				8	12	
		QA151C				5	8	
		QA121C2				7	--	
		QA151C3				5	8	
		QA1201C-20				--	8	
		QA2401C-20				5	8	
		QA01C		-Vo	--	10	15	
		QA01C-18				12	20	
		QA051C				10	14	
		QA151C				5	10	

			QA121C2		10	--	
			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		
			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		
			QA151C3		100		
			QA1201C-20		100		
			QA2401C-20		75		
Temperature Coefficient	100% load		QA01C	--	±0.03	--	%/℃
			QA01C-18		±0.03		
			QA051C		±0.03		
			QA151C		±0.03		
			QA121C2		±0.02		
			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
			5000			VDC
		QA051C	3000			VAC
			5200			VDC
		QA151C	3500			VAC
			6000			VDC
		QA121C2	3500			VAC
		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℃, (Except QA051C see Fig. 5, QA051C see Fig. 6)		-40	--	105	℃
Storage Temperature		QA01C	-55	--	125	
		QA01C-18	-55		125	
		QA051C	-55		125	
		QA151C	-55		125	
		QA121C2	-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		
		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 （ExceptQA051C）	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

+Vo Tolerance Envelope Graph

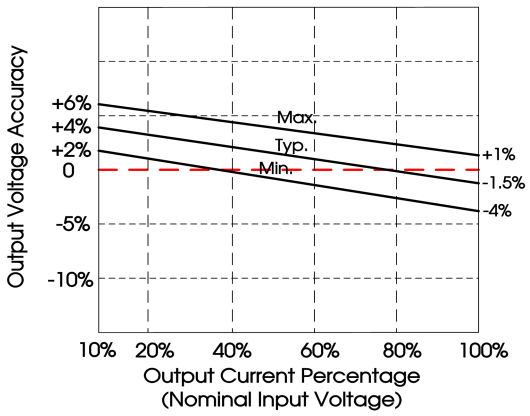


Fig. 1

-Vo Output Regulation Curve

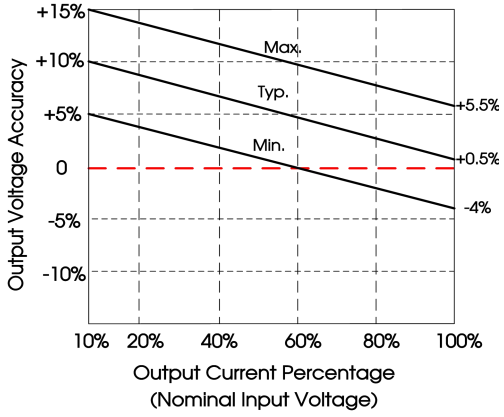


Fig. 2

+Vo Output Regulation Curve

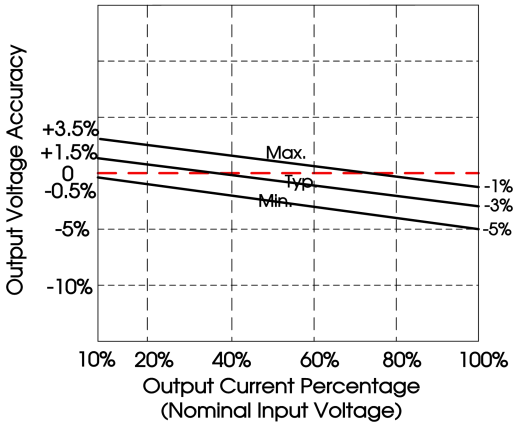


Fig. 3(QA151C)

-Vo Output Regulation Curve

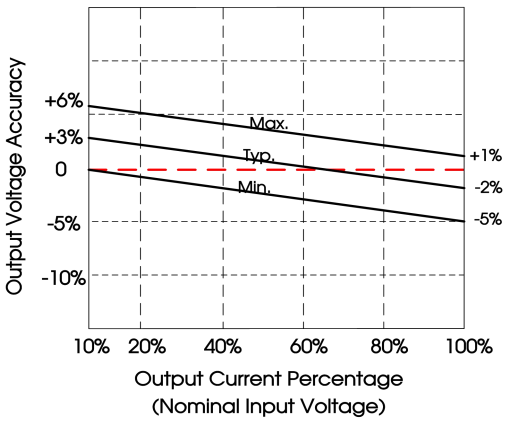


Fig. 4(QA151C)

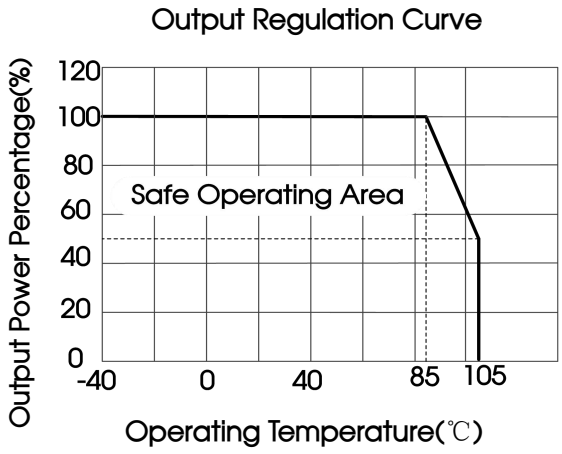


Fig. 5

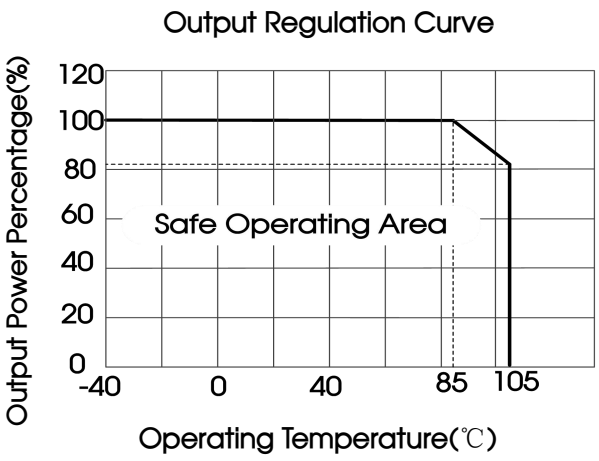


Fig. 6(QA051C)

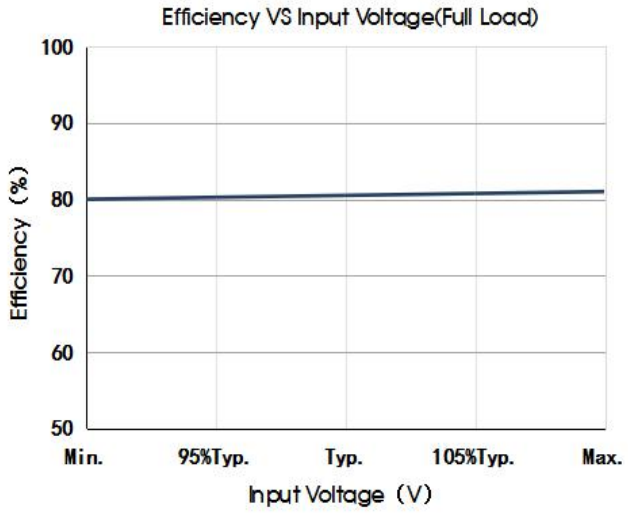


Fig. 7

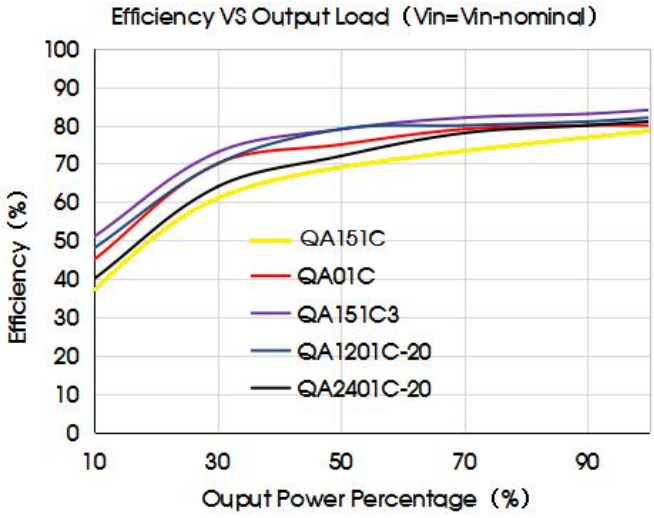


Fig. 8

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

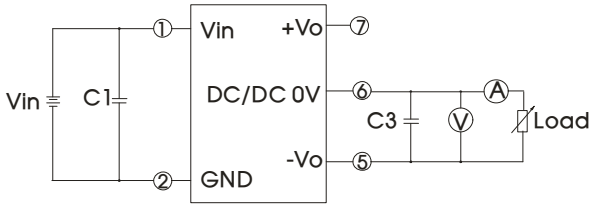


Fig. 9

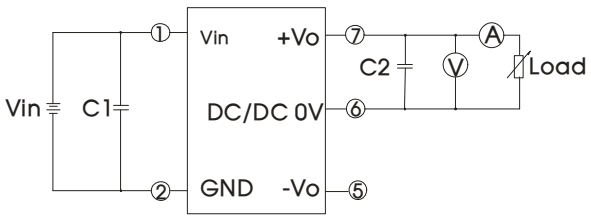
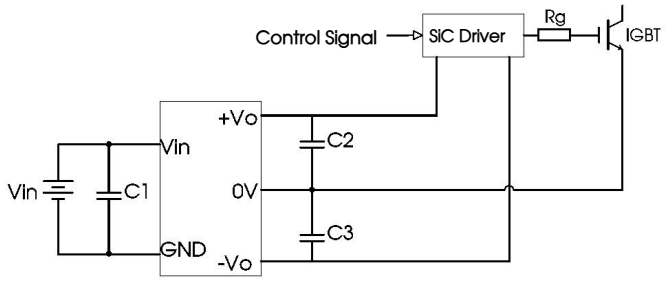


Fig. 10

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

3.Typical application



(Apply to QA01C、QA01C-18、QA051C、QA121C2、QA151C3、QA151C)

Fig. 11

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

4.EMC typical recommended circuit (CLASS B)

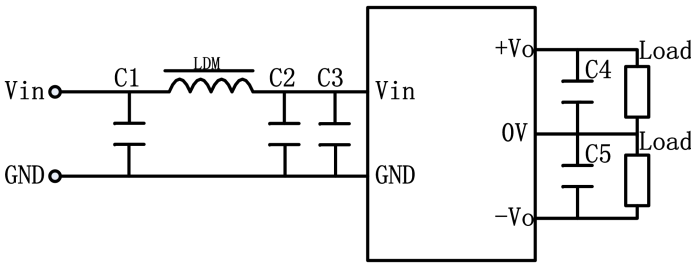


Fig. 12

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

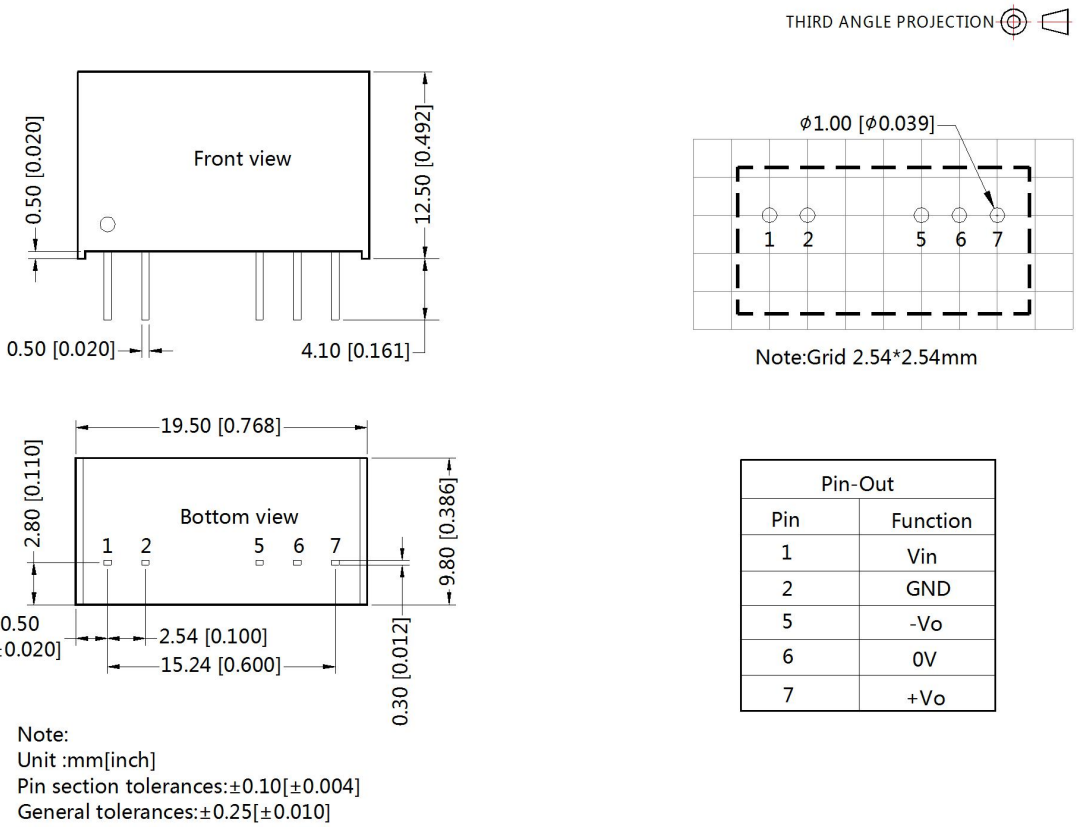
model		QA151C
EMI	C1/C2	4.7μF /50V
	C3	100pF /50V
	C4/C5	100μF /35V (Low internal resistance capacitance)
	LDM	22μH

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



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

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

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 Ta=25℃, 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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