

DC-DC module power supply specialized for SiC driver



Continuous Short
Circuit Protection



Patent Protection



CB

RoHS

UL60950-1

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		
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	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	%	
				-Vo	+5	+10	+15		
		QA01C-18	Full Load	+Vo	-4	-1.5	+1		
				-Vo	-4	+0.5	+5.5		
			Light Load	+Vo	0	+4	+9		
				-Vo	+6	+12	+20		
		QA051C	Full Load	+Vo	-7	-3	+2		
				-Vo	-5	0	+7		
			Light Load	+Vo	+4	+8	+12		
				-Vo	+6	+12	+18		
		QA151C	Full Load	+Vo	-3	+0.5	+4		
				-Vo	+1	+4	+8		
			Light Load	+Vo	-0.5	+1.5	+3.5		
				-Vo	0	+3	+6		
		QA121C2	Full Load	+Vo	-5	-3	-1		
				-Vo	-5	-2	1		
			Light Load	+Vo	0	+7	+15		
				-Vo	0	+15	+30		
		QA121C-20	Full Load	+Vo	-4	0	+5		
				-Vo	-5	+5	+15		
			Light Load	+Vo	+5.5	+8	+10.5		
				-Vo	+10	+12.5	+15		
		QA151C3	Full Load	+Vo	-2	0	+2		
				-Vo	+0	+3	+6		
			Light Load	+Vo	+2	+6	+10		
				-Vo	0	+10	+18		
		QA1201C-20	Full Load	+Vo	-2	0	+2		
				-Vo	-5	0	+5		
			Light Load	+Vo	0	+5	+10		
				-Vo	0	+7.5	+15		
		QA2401C-20	Full Load	+Vo	-2	0	+2		
				-Vo	-7.5	-2.5	+2.5		
			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% to100% 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	10	15		
			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 <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	--	
Safety Standard	IEC/UL60950-1 & 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℃		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 ±6kV perf. Criteria B			

Typical Characteristic Curves

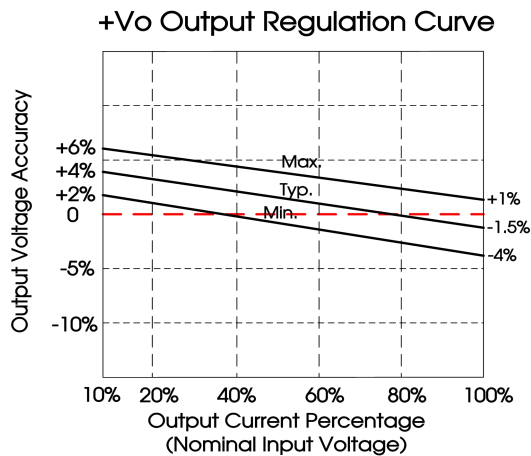


Fig. 1(QA01C)

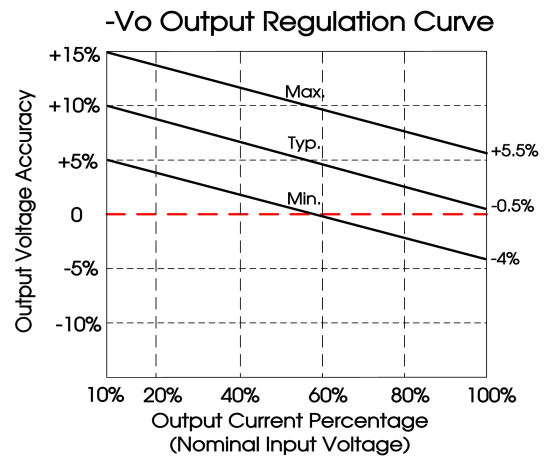


Fig. 2(QA01C)

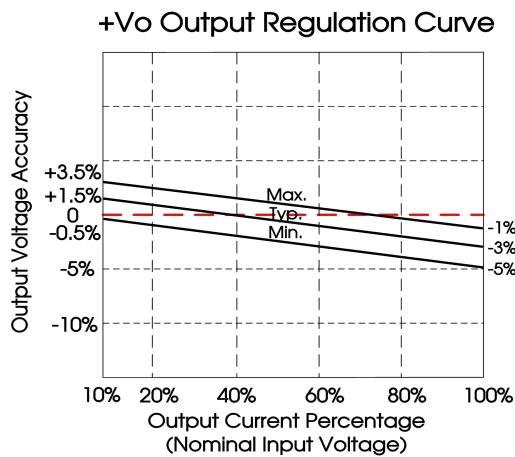


Fig. 3(QA151C)

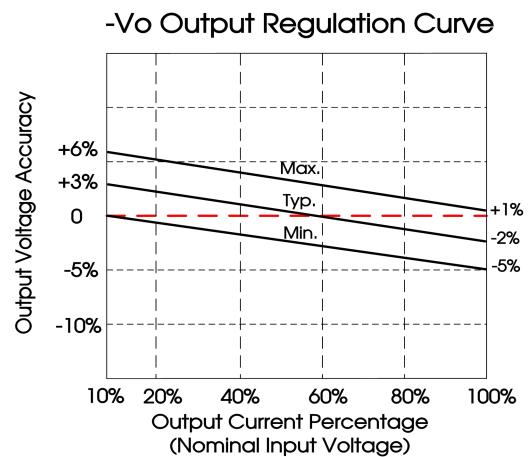


Fig. 4(QA151C)

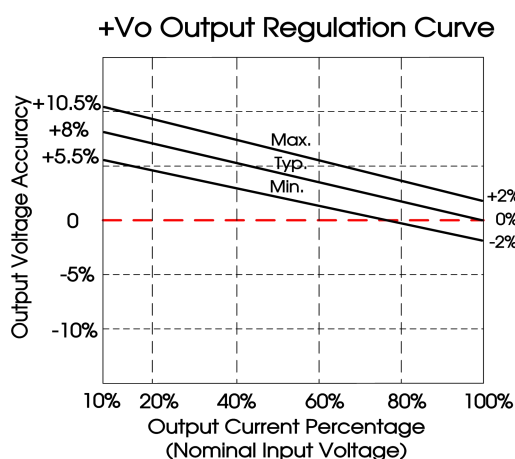


Fig. 5(QA121C-20)

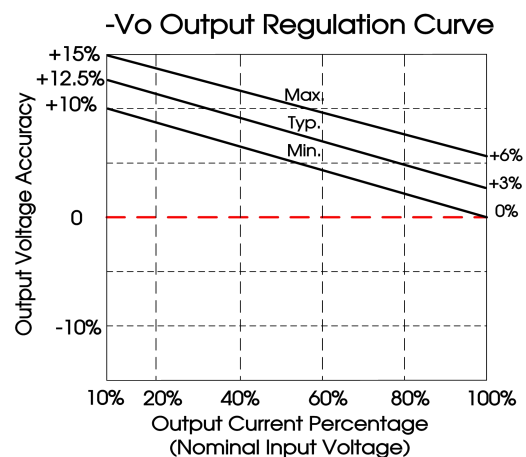


Fig. 6(QA121C-20)

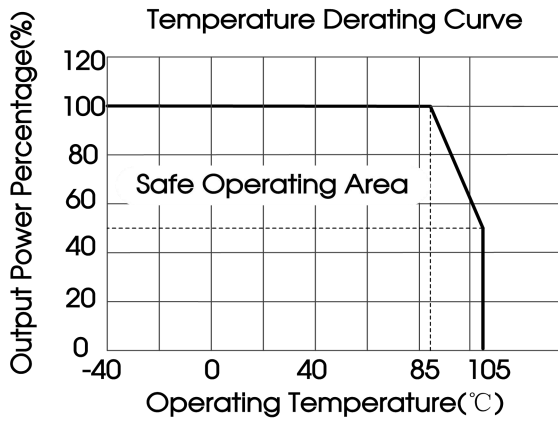


Fig. 7(others P/N)

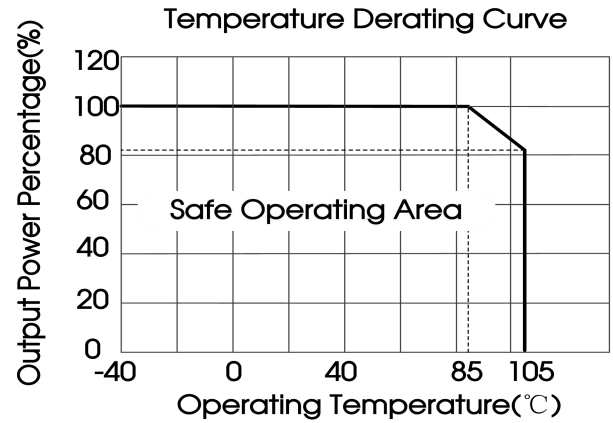


Fig. 8(QA051C)

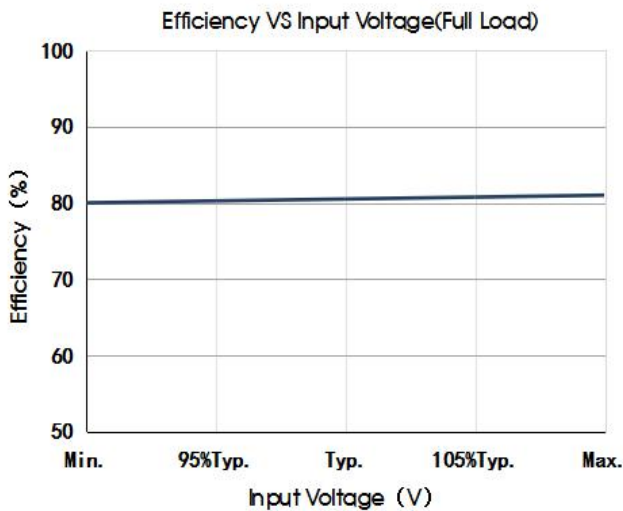


Fig. 9

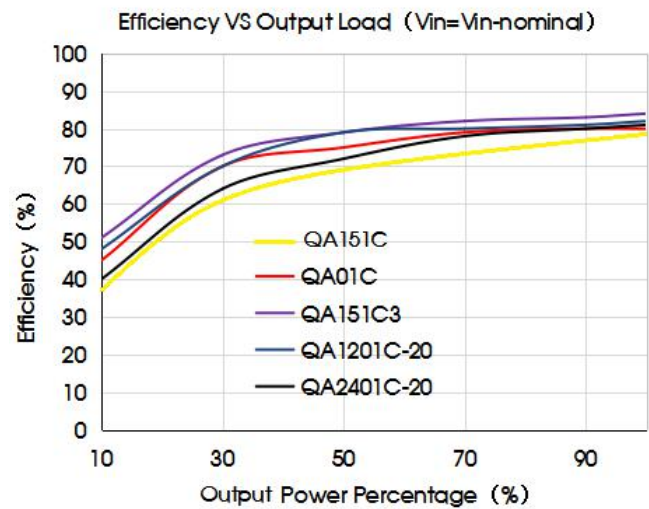


Fig. 10

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

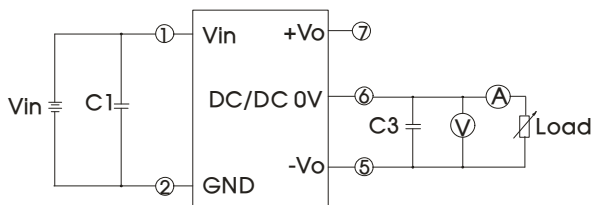


Fig. 11

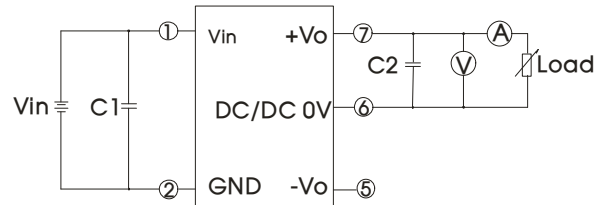


Fig. 12

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

3. Typical application

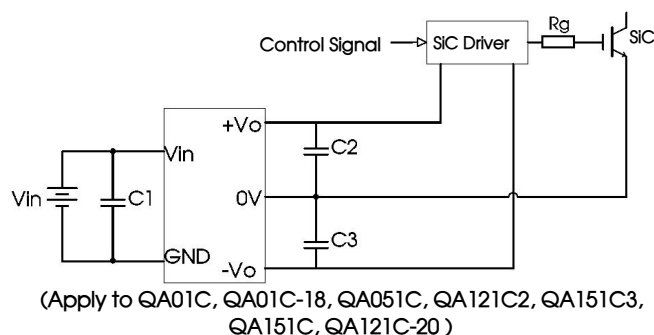


Fig. 13

4. EMC typical recommended circuit (CLASS B)

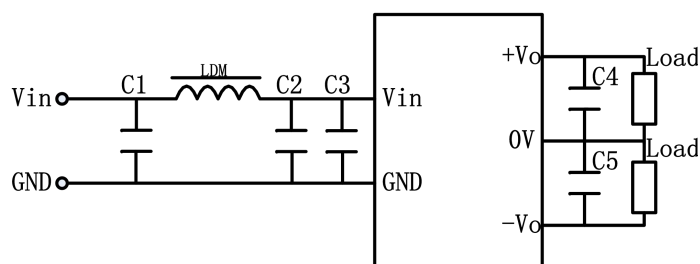


Fig. 14

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

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

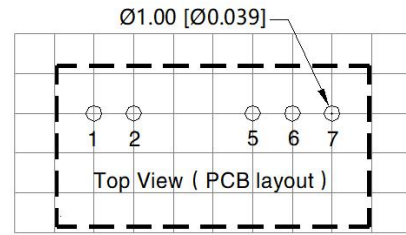
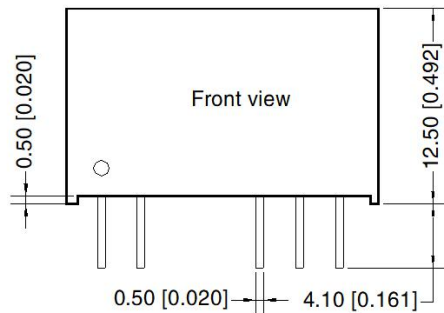
5. The products do not support parallel connection of their output for power expansion purpose or hot-plug.

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.

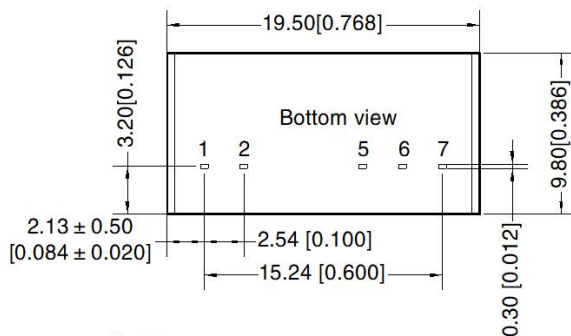
7. For more information please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 



Note: Grid 2.54*2.54mm



Note:
Unit: mm[inch]
Pin section tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[\pm 0.020]$

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

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 $T_a=25^{\circ}\text{C}$, 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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