

DQ1-xxDxxS Series

DC-DC Converter | 2W | SIP7 | IGBT/SiC Driver Power Supply | 5000VAC



Features

- SIP7 package
- Operating Temperature Range: -40°C ~ +105°C
- Isolation Voltage: 5000VAC
- High efficiency up to: 88% (Typ.)
- Continuous barrier withstand voltage: 2.4kVDC
- CMTI >200kV/μs
- Designed to meet IEC/EN/UL62368

Product Description



The DQ1-xxDxxS series are isolated DC-DC converters ideal for powering 'high side' and 'low side' gate drive circuits for IGBT/SiC and Mosfet gate drives in bridge circuits. It features a high efficiency up to 88%, 5.0KVAC I/P-O/P high isolation voltage, continuous short circuit protection, etc. The models are suitable for ultra-low leakage current, industrial control, telecommunication field. General applications include general inverters, server telecom, datacom system, uninterruptible power supply (UPS), and so on.

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output		Full Load Efficiency (%) Typ.	Capacitive Load (μF) Max.
		Nominal Value (Range)	Output Voltage (VDC) +Vo/-Vo	Max. Current (mA) +Io/-Io		
EN pending	DQ1-05D1505S	5 (4.5~5.5)	+15/-5	+80/-40	80	1000
	DQ1-05D1509S	5 (4.5~5.5)	+15/-8.7	+80/-40	81	680
	DQ1-05D1803S	5 (4.5~5.5)	+18/-3.5	+80/-40	81	680
	DQ1-05D2004S	5 (4.5~5.5)	+20/-4	+80/-40	84	470
	DQ1-05D2005S	5 (4.5~5.5)	+20/-5	+80/-40	81	470
	DQ1-12D1508S	12 (10.8~13.2)	+15/-8	+100/-80	82	2200
	DQ1-12D1509S	12 (10.8~13.2)	+15/-8.7	+80/-40	84	1000
	DQ1-15D1509S	15 (13.5~16.5)	+15/-8.7	+80/-40	85	2200
	DQ1-15D1709S	15 (13.5~16.5)	+17/-8.7	+80/-40	85	680
	DQ1-15D2005S	15 (13.5~16.5)	+20/-5	+80/-40	85	1000
	DQ1-15S09S	15 (13.5~16.5)	+9.0/--	+111/--	86	2200
	DQ1-24D1509S	24 (21.6~26.4)	+15/-8.7	+80/-40	88	2200
	DQ1-24D1803S	24 (21.6~26.4)	+18/-3.5	+80/-40	88	680

DQ1-xxDxxS Series IGBT Driver Power Supply



DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation

Notes:

- 1.Efficiency is measured at nominal input voltage and rated output load.
- 2.The positive and negative outputs are connected to the same capacitor.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (Full Load/No-load)	5VDC Input Nominal Input Voltage	DQ1-05D1505S	--	327/32	--	mA
		DQ1-05D1509S	--	370/32	--	mA
		DQ1-05D1803S	--	362/32	--	mA
		DQ1-05D2004S	--	410/32	--	mA
		DQ1-05D2005S	--	419/32	--	mA
	12VDC Nominal Input Voltage	DQ1-12D1508S	--	204/7	--	mA
		DQ1-12D1509S	--	145/7	--	mA
	15VDC Nominal Input Voltage	DQ1-15D1509S	--	116/6	--	mA
		DQ1-15D1709S	--	127/6	--	mA
		DQ1-15D2005S	--	136/6	--	mA
		DQ1-15S09S	--	78/6	--	mA
	24VDC Nominal Input Voltage	DQ1-24D1509S	--	72/3	--	mA
		DQ1-24D1803S	--	77/5	--	mA
Input Surge Voltage (1sec.max.)	5VDC Nominal Input Series		-0.7	--	9	VDC
	12VDC Nominal Input Series		-0.7	--	18	VDC
	15VDC Nominal Input Series		-0.7	--	21	VDC
	24VDC Nominal Input Series		-0.7	--	30	VDC
Input Filter Type			Capacitor Filter			
Hot Swap			Unavailable			

Output Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage	DQ1-05D1505S	+Vo	Vin=5VDC, Pin6 & Pin7 +Io=+80mA	13.88	14.63	15.38	VDC
		-Vo	Vin=5VDC, Pin5 & Pin6 +Io=-40mA	4.40	4.80	5.05	VDC
	DQ1-05D1509S	+Vo	Vin=5VDC, Pin6 & Pin7 +Io=+80mA	14.25	15.00	15.75	VDC
		-Vo	Vin=5VDC, Pin5 & Pin6 +Io=-40mA	8.70	9.14	9.57	VDC
	DQ1-05D1803S	+Vo	Vin=5VDC, Pin6 & Pin7 +Io=+80mA	16.56	17.46	18.36	VDC
		-Vo	Vin=5VDC, Pin5 & Pin6 +Io=-40mA	2.67	2.96	3.14	VDC
	DQ1-05D2004S	+Vo	Vin=5VDC, Pin6 & Pin7 +Io=+80mA	19.50	20.50	21.50	VDC
		-Vo	Vin=5VDC, Pin5 & Pin6 +Io=-40mA	3.58	3.90	4.10	VDC
	DQ1-05D2005S	+Vo	Vin=5VDC, Pin6 & Pin7 +Io=+80mA	19.10	20.10	21.10	VDC
		-Vo	Vin=5VDC, Pin5 & Pin6 +Io=-40mA	4.37	4.78	5.03	VDC
	DQ1-12D1508S	+Vo	Vin=12VDC, Pin6 & Pin7 +Io=+100mA	14.40	15.15	15.90	VDC

DQ1-xxDxxS Series IGBT Driver Power Supply



DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation

	-Vo	Vin=12VDC, Pin5 & Pin6 +Io=-80mA	7.60	8.00	8.40	VDC
DQ1-12D1509S	+Vo	Vin=12VDC, Pin6 & Pin7 +Io=+80mA	13.95	14.70	15.45	VDC
	-Vo	Vin=12VDC, Pin5 & Pin6 +Io=-40mA	8.52	8.96	9.40	VDC
DQ1-15D1509S	+Vo	Vin=15VDC, Pin6 & Pin7 +Io=+80mA	14.17	14.93	15.68	VDC
	-Vo	Vin=15VDC, Pin5 & Pin6 +Io=-40mA	7.96	8.40	8.84	VDC
DQ1-15D1709S	+Vo	Vin=15VDC, Pin6 & Pin7 +Io=+80mA	15.98	16.83	17.68	VDC
	-Vo	Vin=15VDC, Pin5 & Pin6 +Io=-40mA	7.96	8.40	8.84	VDC
DQ1-15D2005S	+Vo	Vin=15VDC, Pin6 & Pin7 +Io=+80mA	18.70	19.70	20.70	VDC
	-Vo	Vin=15VDC, Pin5 & Pin6 +Io=-40mA	5.00	5.40	5.65	VDC
DQ1-15S09S	+Vo	Vin=15VDC, Pin6 & Pin7 +Io=+80mA	8.64	9.09	9.54	VDC
	-Vo	--	--	--	--	VDC
DQ1-24D1509S	+Vo	Vin=24VDC, Pin6 & Pin7 +Io=+80mA	13.95	14.70	15.45	VDC
	-Vo	Vin=24VDC, Pin5 & Pin6 +Io=-40mA	8.35	8.79	9.23	VDC
DQ1-24D1803S	+Vo	Vin=24VDC, Pin6 & Pin7 +Io=+80mA	16.65	17.55	18.45	VDC
	-Vo	Vin=24VDC, Pin5 & Pin6 +Io=-40mA	3.24	3.41	3.59	VDC
Output Voltage Accuracy		10%-100% Load	See below: Envelope Curve			
Line Regulation	Full input voltage range	Positive output	--	±1.2	±1.5	%
		Negative output	--	±1.2	±1.5	%
Load Regulation	10%~100% load	Positive output	--	6	15	%
		Negative output	--	8	15	%
Ripple & Noise	20MHz bandwidth, 100% load, using parallel line test method		--	100	150	mV
Temperature Coefficient	Full load		--	±0.04	±0.1	%/°C
Short Circuit Protection		Continuous short circuit, self-recovery				

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	Input-output, test time 1 minute, leakage current less 1mA	5000	--	--	VAC
Insulation Resistance	Input-output, insulated voltage 500VDC	1000	--	--	MΩ
Isolation Capacitance	Input-Output, 100KHz/0.1V	--	5	10	pF
Operating Temperature	Derating when operating temperature ≥ 85°C,	-40	--	105	°C
Storage Temperature		-55	--	125	°C
Case Temperature Rise	Ta=25°C, Nominal Input, Full Load Output	--	30	--	°C
Storage Humidity	No Condensation	5	--	95	%RH
Soldering Profile	Wave soldering	260±5°C; Time: 5 - 10s			
	Manual soldering	360±10°C; Time: 3 - 5s			
Switching Frequency	Full Load, Nominal Input Voltage	--	250	--	kHz
MTBF	MIL-HDBK-217F@25°C	>3500Kh			

Mechanical Specifications

DQ1-xxDxxS Series IGBT Driver Power Supply



DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation

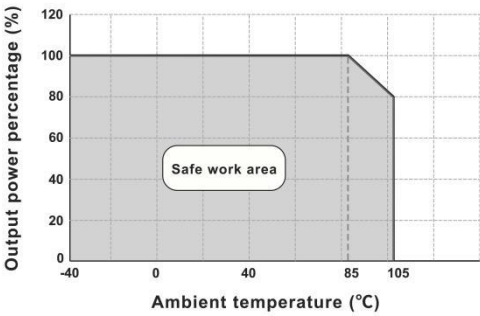
Case Material	Black flame-retardant heat-resistant plastic (UL94V-0)
Mechanical Dimensions	19.50 * 9.80 * 12.50mm
Weight	4.3g (typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

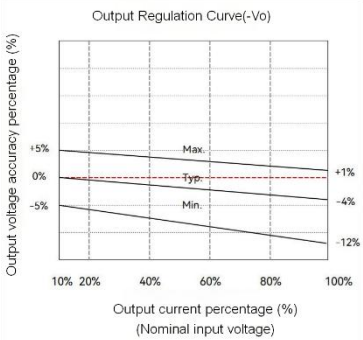
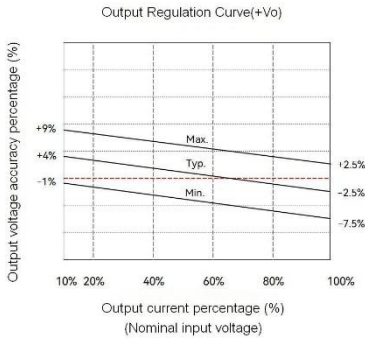
EMI	CE	CISPR32/EN55032 CLASS B (EMC recommended circuit see Figure 2)	
	RE	CISPR32/EN55032 CLASS B (EMC recommended circuit see Figure 2)	
EMS	ESD	IEC/EN61000-4-2 Contact $\pm 8\text{KV}$	perf. Criteria B

Product Characteristic Curve

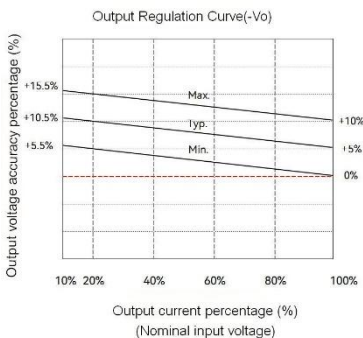
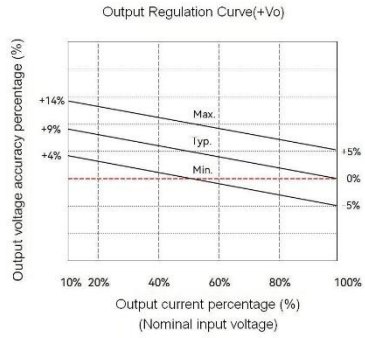
Temperature Derating Curve



Main Road Output Regulation Curve (DQ1-05D1505S, +Vo) Auxiliary Road Output Regulation Curve (DQ1-05D1505S, -Vo)



Main Road Output Regulation Curve (DQ1-05D1509S, +Vo) Auxiliary Road Output Regulation Curve (DQ1-05D1509S, -Vo)

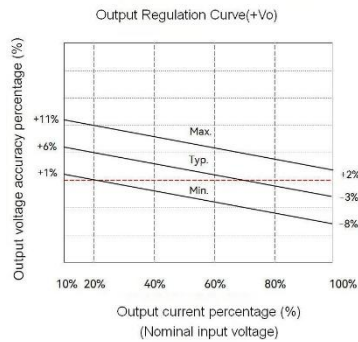


DQ1-xxDxxS Series IGBT Driver Power Supply

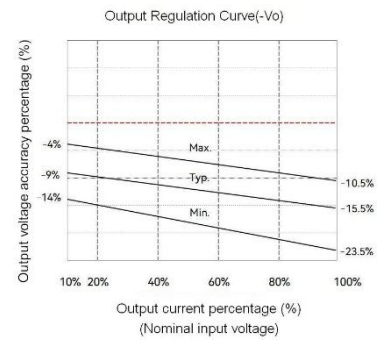
DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation



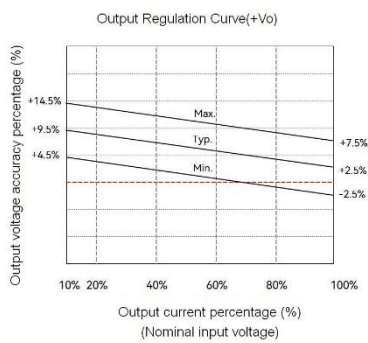
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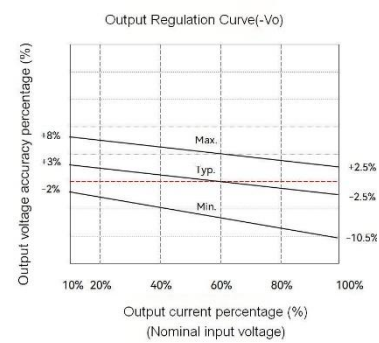
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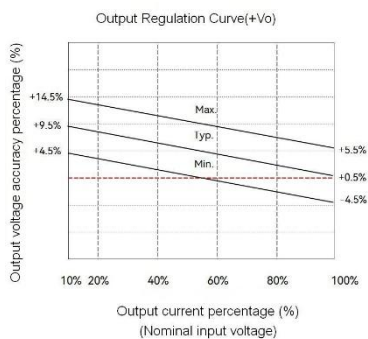
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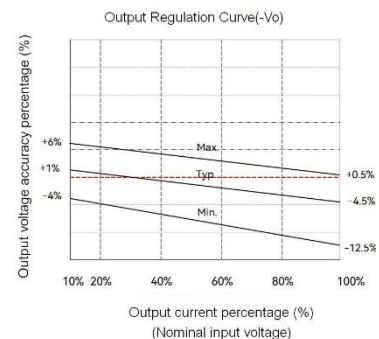
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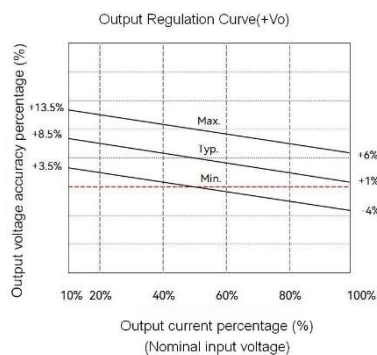
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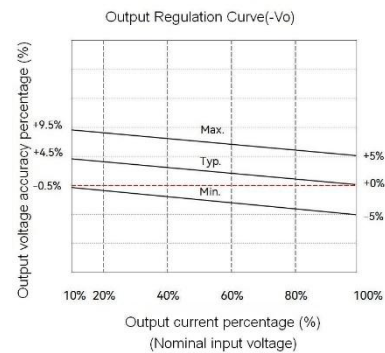
Auxiliary Road Output Regulation Curve (DQ1-05D2005S, -Vo)



Main Road Output Regulation Curve (DQ1-12D1508S,+Vo)



Auxiliary Road Output Regulation Curve (DQ1-12D1508S,-Vo)

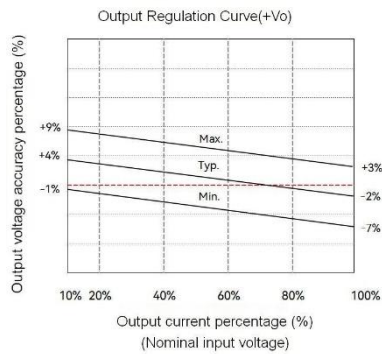


DQ1-xxDxxS Series IGBT Driver Power Supply

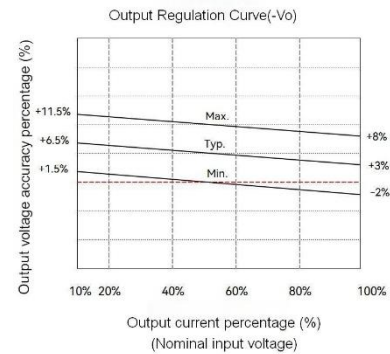
DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation



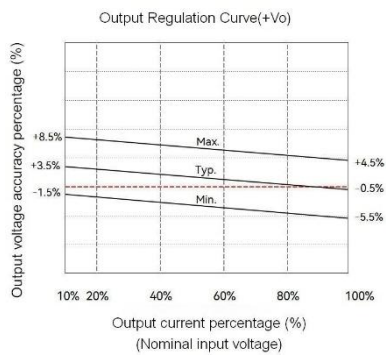
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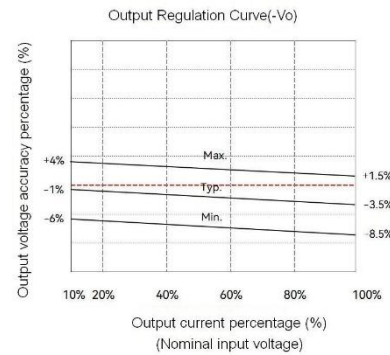
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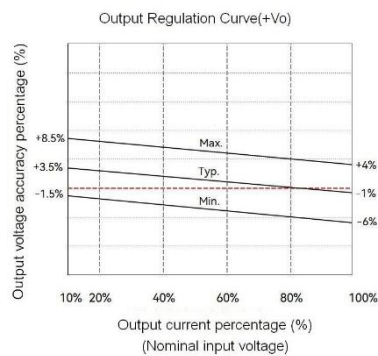
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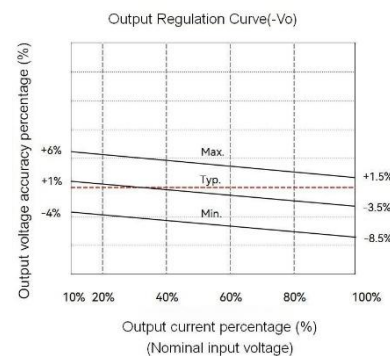
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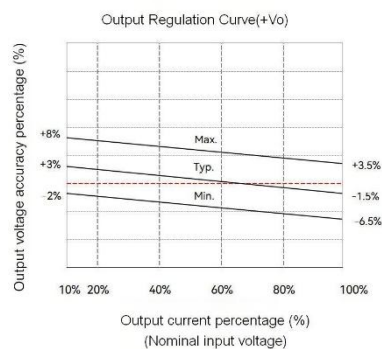
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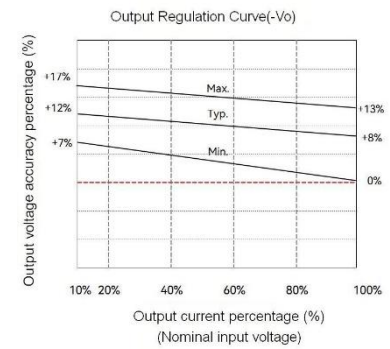
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Main Road Output Regulation Curve (DQ1-15D2005S, +Vo)



Auxiliary Road Output Regulation Curve (DQ1-15D2005S, -Vo)

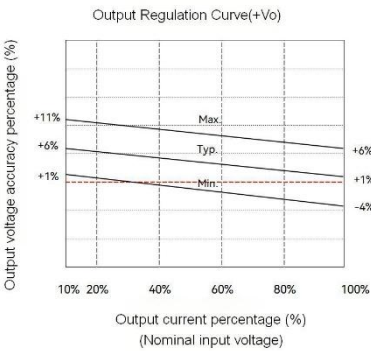


DQ1-xxDxxS Series IGBT Driver Power Supply

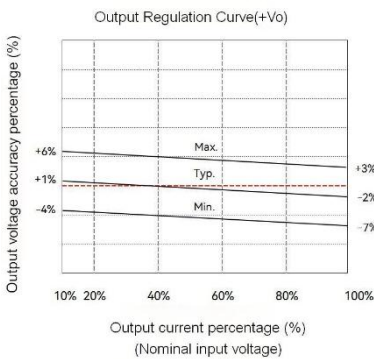
DC-DC Converter | 1W | SIP7 Package | IGBT Driver Power Supply | 5000VAC Isolation



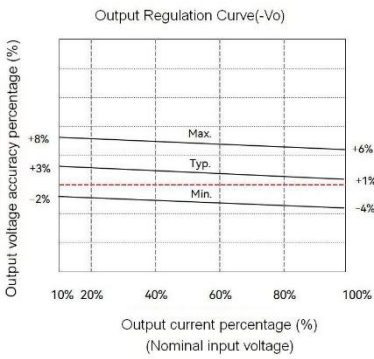
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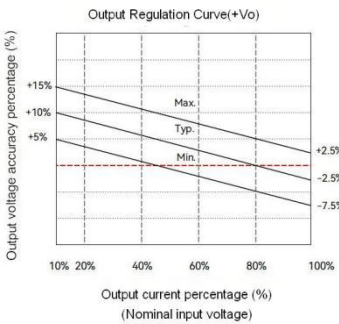
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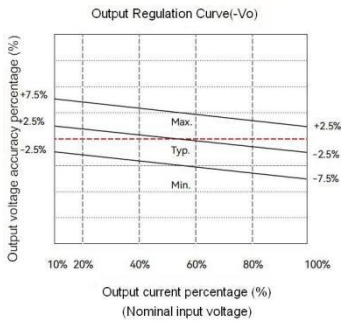
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Main Road Output Regulation Curve (DQ1-24D1803S,+Vo)

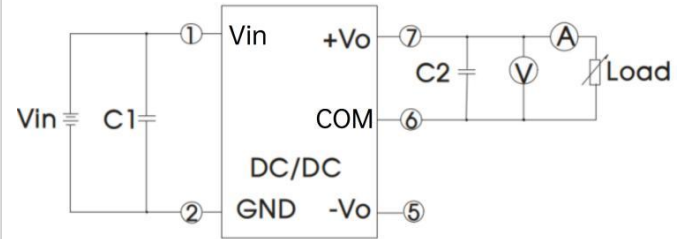
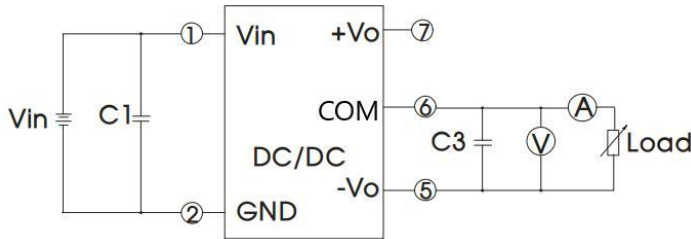


Auxiliary Road Output Regulation Curve (DQ1-24D1803S,-Vo)



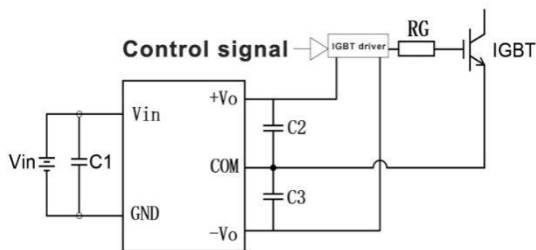
Design Reference - Test configurations

Typical Circuit Design and Application



Design Reference – Application circuit

EMC Recommended Circuit Design and Application



(Figure 1)

Recommended Capacitive Load Value Table

C1/C2/C3: 100 μ F/35V (Low ESR Capacitor)

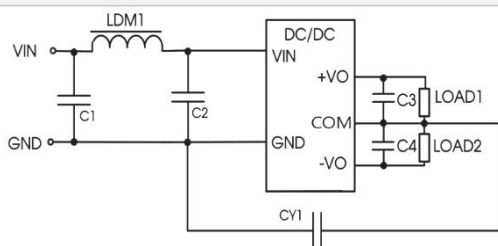
Note: A ceramic capacitor with a value between 1 μ F~10 μ F can be connected in parallel across capacitors C2 and C3 to reduce ripple noise.

Note:

1. When in use, keep the leads connecting the power module and the IGBT driver as short as possible;
2. Place the output filter capacitor as close as possible to the power module and the IGBT driver;
3. The gate drive current peak of the IGBT driver is high; it is recommended to use low-ESR electrolytic capacitors for the output filter capacitor of the power module;
4. The average output power of the driver must be less than the output power of the power module;
5. If used in vibration environments, consider fixing the module with glue nearby;
6. The maximum capacitive load is tested within the input voltage range and under full load conditions.

Design Reference – EMC Solutions – Recommended circuit

EMI Recommended Circuit Design and Application



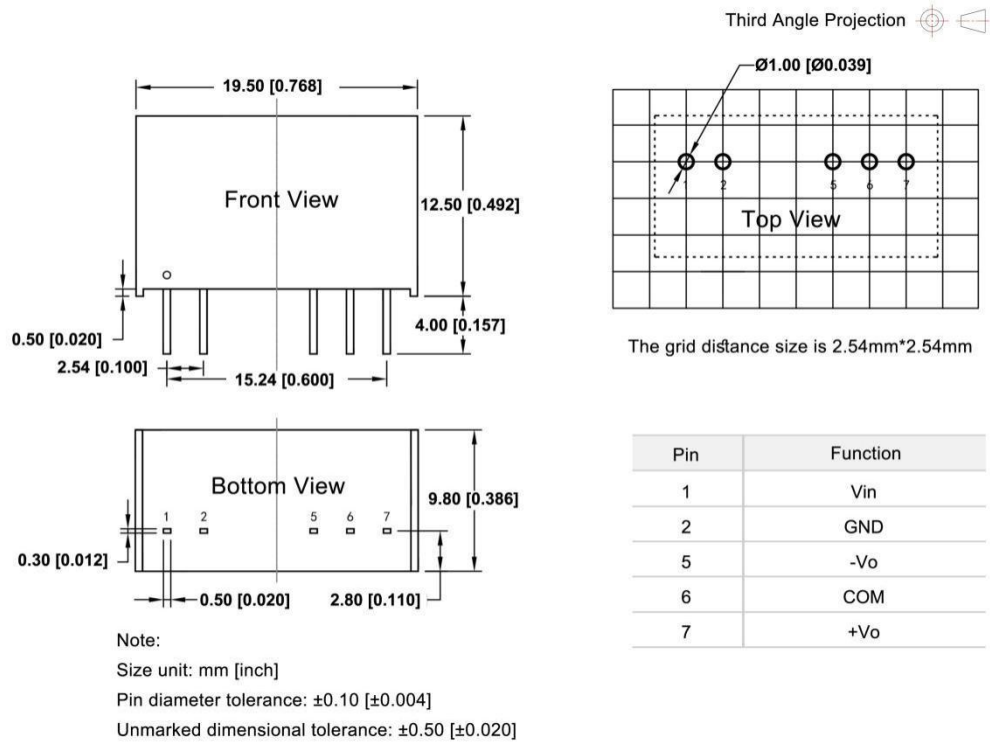
(Figure 2)

Recommended Parameter Table

Input Voltage	5/12/15/24VDC
C1, C2	4.7 μ F/50V
C3, C4	10 μ F /50V
LDM1	33 μ H
CY1	330pF

Dimensions and Recommended Layout

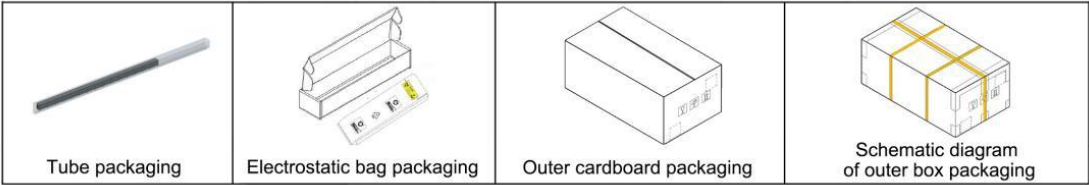
DQ1-xxDxxS Dimensions and Recommended Layout



Packaging Information

Model Series (Tube Packaging)	Single tube product quantity (pcs/tube)	ESD bag product quantity (pcs/bag)	Inner carton product quantity (pcs/carton)	Full carton product quantity(pcs)
DQ1-xxDxxS	26	260	780	3120

The schematic diagram of tube packaging is shown below:



Product precautions

1. The input voltage should not exceed the specified range value, otherwise it may cause permanent and irreparable damage;
2. It is recommended to use at a load of over 5%. If the load is below 5%, the ripple index of the product may exceed the specifications, but it does not affect the reliability of the product;
3. The maximum capacitive load is tested within the input voltage range and under full load conditions;
4. Unless otherwise specified, all indicators in this manual are measured at $T_a=25\text{ }^{\circ}\text{C}$, humidity<75% RH, nominal input voltage, and output rated load;
5. All indicator testing methods in this manual are based on our company's corporate standards;
6. Our company can provide product customization, and specific requirements can be directly contacted by our technical personnel;
7. Product specifications are subject to change without prior notice.

Manufacturer contact information

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