



Descriptions

10W isolated , DC-DC Converter

VDB10-W Series



Features

- Ultra-wide 4:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40°C to +85°C
- Meets CISPR32/EN55032 CLASS A, without extra components
- Input reverse polarity protection available with Chassis (E2S) or 35mm DIN-Rail mounting (D4S) version
- Meets EN50155 railway standard
- Industry standard pin-out

Applications

- Industrial Control,
- Electric Power
- Instruments
- Communication
- Railway

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Selection Guide

Part No. ①	Input Voltage (VDC)		Output		Full Load Efficiency④ (%)Min./Typ.	Capacitive Load⑤ (μF)Max.
	Nominal ② (Range)	Max. ③	Voltage(VDC)	Current (mA) Max./Min.		
VDB10-24D05W	24 (9-36)	40	±5	±1000/0	81/83	1000
VDB10-24D09W			±9	±555/0	84/86	680
VDB10-24D12W			±12	±416/0	85/87	470
VDB10-24D15W			±15	±333/0	85/87	330
VDB10-24D24W			±24	±208/0	85/87	100
VDB10-24S03W			3.3	2400/0	75/77	2200
VDB10-24S05W			5	2000/0	80/82	2200
VDB10-24S09W			9	1111/0	83/85	680
VDB10-24S12W			12	833/0	84/86	470
VDB10-24S15W			15	667/0	84/86	330
VDB10-24S24W			24	416/0	86/88	100
VDB10-48D05W			48 (18-75)	80	±5	±1000/0
VDB10-48D12W	±12	±416/0			85/87	470
VDB10-48D15W	±15	±333/0			85/87	330
VDB10-48D24W	±24	±208/0			85/87	100
VDB10-48S03W	3.3	2400/0			77/79	2200
VDB10-48S05W	5	2000/0			81/83	2200
VDB10-48S12W	12	833/0			85/87	470
VDB10-48S15W	15	667/0			85/87	330
VDB10-48S24W	24	416/0			86/88	100

Notes :

- ① Use "H" suffix for heat sink mounting, "E2S" suffix for chassis mounting and "D4S" suffix for DIN-Rail mounting;
- ② The E2S and D4S Model's start-up and minimum input voltages are increased by 1VDC due to the input reverse polarity protection circuit;
- ③ Exceeding the maximum input voltage may cause permanent damage;
- ④ Efficiency is measured at nominal input voltage and rated output load; efficiencies for E2S and D4S Model's is decreased by 2% due to the input reverse polarity protection circuit;
- ⑤ The specified maximum capacitive load value for positive and negative output is identical;
- ⑥ Products marked with "\*" need an input capacitor in order to meet conducted specifications of CISPR32/EN55032 CLASS A.

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**Specifications**

Product Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	24VDC nominal input series, nominal input voltage	3.3VDC output	--	429/5	440/12	mA
			Others	--	502/5	521/12	
		48VDC nominal input series, nominal input voltage	3.3VDC output	--	190/4	215/8	
			Others	--	251/4	258/8	
	Reflected Ripple Current	24VDC nominal input series, nominal input voltage		--	40	--	VDC
		48VDC nominal input series, nominal input voltage		--	30	--	
	Surge Voltage (1sec. max.)	24VDC nominal input series		-0.7	--	50	VDC
		48VDC nominal input series		-0.7	--	100	
	Start-up Voltage	24VDC nominal input series		--	--	9	VDC
		48VDC nominal input series		--	--	18	
	Input Under-voltage Protection	24VDC nominal input series		5.5	6.5	--	VDC
		48VDC nominal input series		12	15.5	--	
	Start-up Time	Nominal input voltage & constant resistance load		--	10	--	ms
	Input Filter			Pi filter			
Hot Plug			Unavailable				
Ctrl <sup>®</sup>	Module on		Ctrl pin open or pulled high (3.5-12VDC)				
	Module off		Ctrl pin pulled low to GND (0-1.2VDC)				
	Input current when off		--	6	10	mA	
Output Specifications	Voltage Accuracy <sup>®</sup>	0%-100% load		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5	
			Vo2	--	±0.5	±1	
	Load Regulation <sup>®</sup>	5%-100% load	Vo1	--	±0.5	±1	
			Vo2	--	±0.5	±1.5	
	Cross Regulation	Dual output, Vo1 load at 50%, Vo2 load at range of 10%-100%		--	--	±5	
	Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	µs
Transient Response Deviation	--			±3	±5	%	
Temperature Coefficient	Full load		--	--	±0.03	%/°C	
Ripple & Noise <sup>®</sup>	20MHz bandwidth, 5%-100% load		--	40	80	mVp-p	
Over-voltage Protection	Input voltage range		110	--	160	%Vo	
Over-current Protection			110	140	190	%Io	
Short-circuit Protection			Continuous, self-recovery				

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General Specifications	Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
	Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	1000	--	pF
	Operating Temperature	See Fig. 1	-40	--	+85	°C
	Storage Temperature		-55	--	+125	
	Storage Humidity	Non-condensing	5	--	95	%RH
	Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	°C
	Vibration		IEC/EN61373 - Category 1, Grade B			
	Switching Frequency <sup>⑤</sup>	PWM mode	--	350	--	kHz
	MTBF	MIL-HDBK-217F@25°C	1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	Horizontal package (without heat sink)		25.40 × 25.40 × 11.70 mm		
		Horizontal package (with heat sink)		25.40 × 25.40 × 16.20 mm		
		E2S chassis mounting		76.00 × 31.50 × 21.20 mm		
		D4S DIN-rail mounting		76.00 × 31.50 × 25.80 mm		
	Weight	without heat sink	Horizontal package/E2S chassis mounting/D4S DIN-Rail mounting		12.5g/36.0g/56.0g (Typ.)	
with heat sink		Horizontal package		17.0g(Typ.)		
Cooling method	Free air convection					
<p>Note:</p> <p>①The Ctrl pin voltage is referenced to input GND;</p> <p>②Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;</p> <p>③Load regulation for 0%-100% load is ±5%;</p> <p>④Under 0% -5% load conditions, ripple &amp; noise does not exceed 5%Vo. The "parallel cable" method is used for Ripple and Noise test ;</p> <p>⑤Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.</p>						

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### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (Without extra components) CLASS B (see Fig.3-② for recommended circuit)
	RE	CISPR32/EN55032	CLASS A (Without extra components) CLASS B (see Fig.3-② for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2	Contact ±4kV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4 circuit)	±2kV (see Fig.3-① for recommended perf. Criteria B
	Surge	IEC/EN61000-4-5 recommended circuit)	line to line ±2kV (see Fig.3-①for perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70% perf. Criteria B

### Electromagnetic Compatibility (EMC) (EN50155)

Emissions	CE	CISPR32/EN55032	CLASS A (Without extra components) CLASS B (see Fig.3-② for recommended circuit)
	RE	CISPR32/EN55032	CLASS A (Without extra components) CLASS B (see Fig.3-② for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2	Contact ±4kV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4 circuit)	±2kV (see Fig.3-① for recommended perf. Criteria B
	Surge	IEC/EN61000-4-5 recommended circuit)	line to line ±2kV (see Fig.3-①for perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN61000-4-29	0%, 70% perf. Criteria B

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**Typical Characteristic Curves**

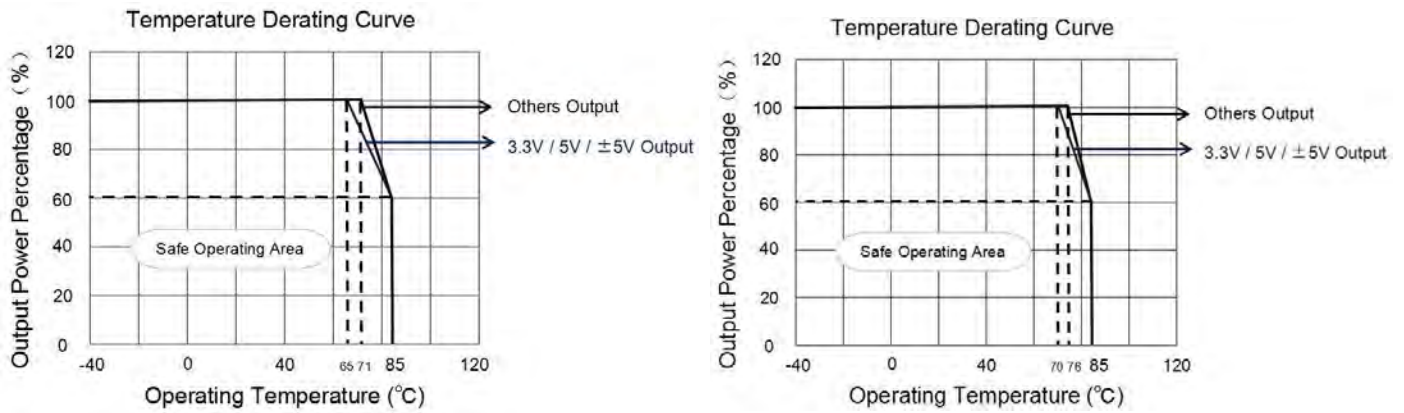
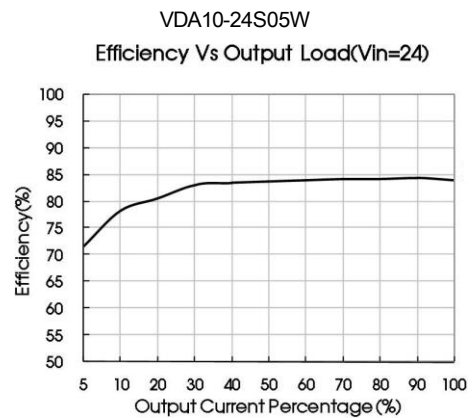
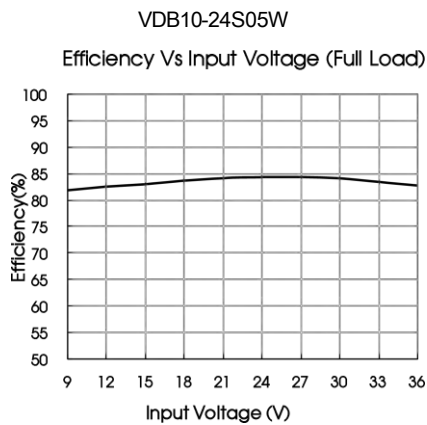
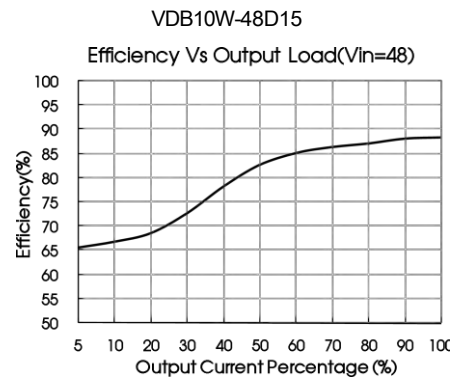
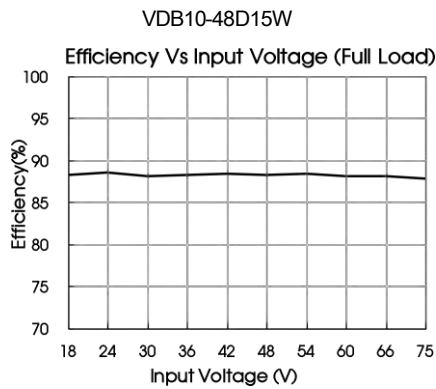


Fig. 1



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## Design Reference

### 1. Typical application

All the DC/DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values  $C_{in}$  and  $C_{out}$  and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

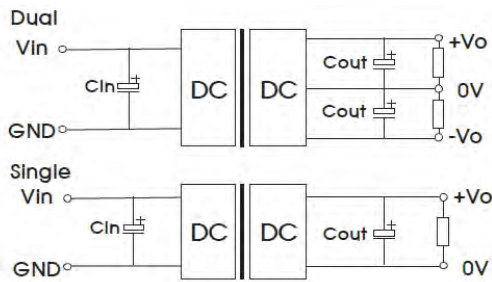


Fig. 2

Vin(VDC)	Vout(VDC)	Cin	Cout
24	3.3/5/±5	100µF/50V	10µF/16V
	9/12/15/±9/ ±12/±15		10µF/25V
	24/±24		10µF/50V
48	3.3/5/±5	10µF - 47µF/100V	10µF/16V
	9/12/15/±9/ ±12/±15		10µF/25V
	24/±24		10µF/50V

### EMC compliance circuit

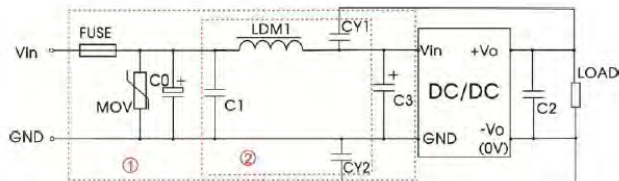


Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

### Parameter description:

Model	Vin: 24VDC	Vin: 48VDC
FUSE	Choose according to actual input current	
MOV	S20K30	S14K60
C0, C3	330µF/50V	330µF/100V
C1	1µF/50V	1µF/100V
C2	Refer to the Cout in Fig.2	
LDM1	4.7µH	
CY1, CY2	1nF/2kV	

### 2. The products do not support parallel connection of their output

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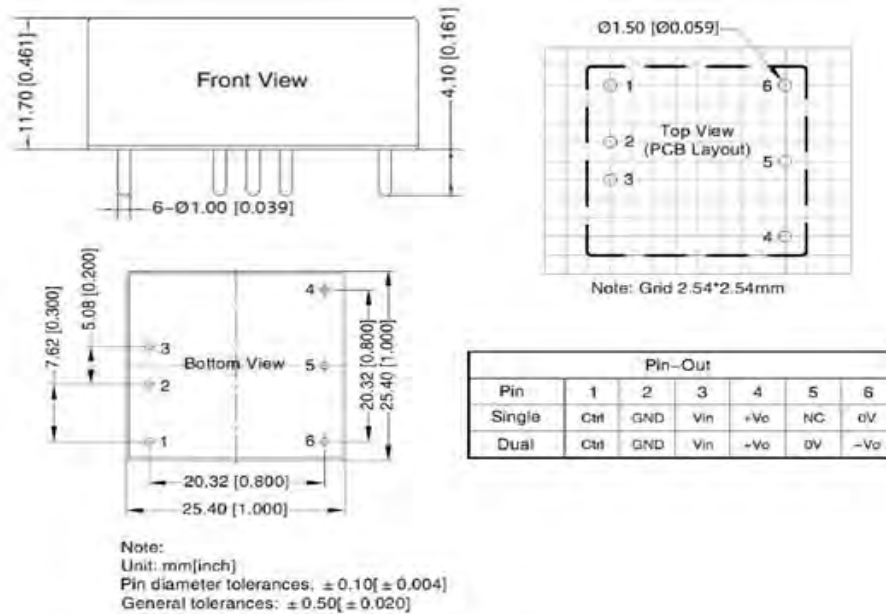
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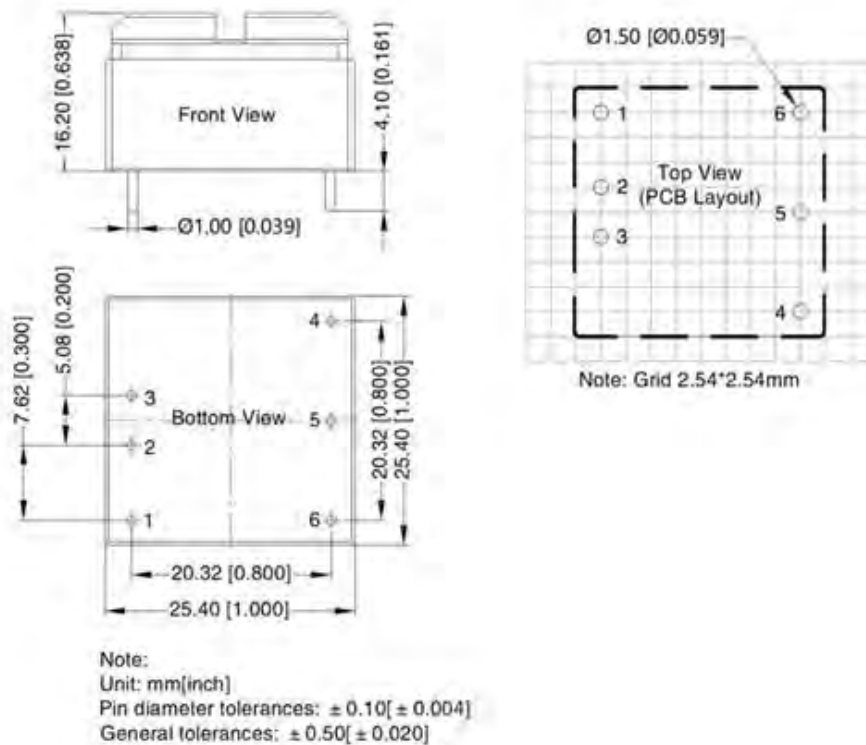
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## Horizontal Package (without heat sink) Dimensions and Recommended Layout



## Horizontal Package (with heat sink) Dimensions and Recommended Layout



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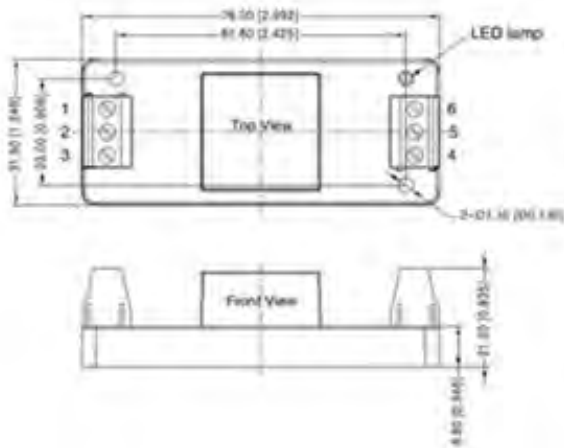
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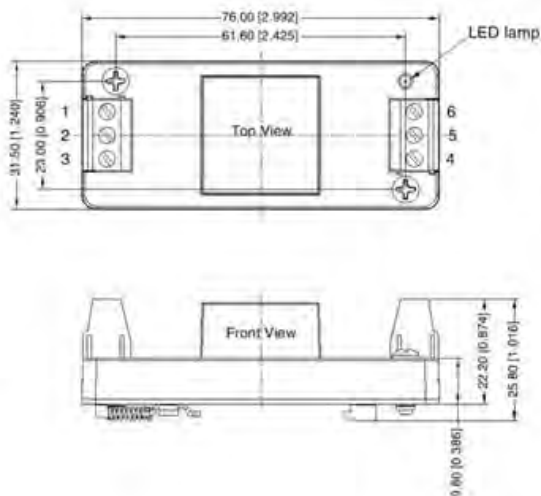
## E2S Without Heat Sink Dimensions



Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	V <sub>in</sub>	+V <sub>o</sub>	NC	0V
Dual	Ctrl	GND	V <sub>in</sub>	+V <sub>o</sub>	0V	-V <sub>o</sub>

Note:  
 Unit: mm[inch]  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.00[ ± 0.039]

## D4S Din Rail Without Heat Sink Dimensions



Pin-Out						
Pin	1	2	3	4	5	6
Single	Ctrl	GND	V <sub>in</sub>	+V <sub>o</sub>	NC	0V
Dual	Ctrl	GND	V <sub>in</sub>	+V <sub>o</sub>	0V	-V <sub>o</sub>

Note:  
 Unit: mm[inch]  
 Mounting rail: TS35  
 Wire range: 24-12 AWG  
 Tightening torque: Max 0.4 N · m  
 General tolerances: ± 1.00[ ± 0.039]

### Note:

1. The maximum capacitive load offered were tested at input voltage range and full load;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. 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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