Descriptions

40W isolated, DC/DC Converter

VDB40-WSeries

RoHS

Features

- Ultra-Wide 4:1 input voltage range
- High efficiency up to 91.5%
- No-load power consumption as low as 0.096W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage, over-temperature protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard pin-out
- Meets EN62368 standards

Applications

- Industrial Control
- Electric Power
- Instrumentation
- Communication

Selection Guide

Part No.	Input Voltage (VDC)		Output		Full Load Efficiency② (%) Min./Typ.	Capacitive Load (μF)Max.
	Nominal (Range)	Max.①	Voltage (VDC)	Current(mA) Max./Min.		
VDB40-24S03W	24 (9-36)	40	3.3	10000/0	87/89.5	7200
VDB40-24S05W			5	8000/0	88/90	7200
VDB40-24S12W			12	3333/0	89/91.2	2000
VDB40-24S15W			15	2667/0	89/91.5	1500
VDB40-24S24W			24	1667/0	88/90.1	1000
VDB40-24S28W			28	1429/0	88/90.1	1000
VDB40-48S03W	48 (18-75)	75	3.3	10000/0	87/89	7200
VDB40-48S05W			5	8000/0	88/90	7200
VDB40-48S12W			12	3333/0	89/91	2000
VDB40-48S15W			15	2667/0	89/91	1500

Note :
①Exceeding the maximum input voltage may cause permanent damage;
②Efficiency is measured in nominal input voltage and rated output load;
③Rated output load is derated to 75% at minimun input voltage.

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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	3.3V output	--	1545/4	1580/12	mA
			Others	--	1852/4	1894/12	
		48VDC nominal input series, nominal input voltage	3.3V output	--	772/7	790/15	
			Others	--	926/7	947/15	
	Reflected Ripple Current	nominal input series		--	100	--	
	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	
		48VDC nominal input series		--	--	18	
	Input under-voltage protection	24VDC nominal input series		5.5	7.5	--	
		48VDC nominal input series		12	15	--	
	Start-up Time	Nominal input voltage & constant resistance load		--	30	100	ms
	Input Filter			Capacitance filter			
	Hot Plug			Unavailable			
	Ctrl①	Module on		Ctrl pin open or pulled high (TTL 3.5-12VDC)			
		Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
		Input current when off		--	6	12	mA
Output Specifications	Voltage Accuracy②	5%-100% load		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
	Load Regulation③	5%-100% load		--	±0.5	±1	
	Transient Recovery Time	25% load step change, nominal input voltage		--	250	500	μs
	Transient Response Deviation	25% load step change, input voltage range		--	±5	±8	%
	Temperature Coefficient	Full load		--	--	±0.03	%/℃
	Ripple & Noise④	20MHz bandwidth, nominal input voltage, 5%-100% load		--	100	150	mV p-p
	Trim	Input voltage range		90	--	110	%Vo
	Over-temperature Protection	Max. Case Temperature		--	125	--	℃
	Over-voltage Protection	Input voltage range		110	140	160	%Vo
	Over-current Protection			110	140	200	%Io
	Short circuit Protection			Hiccup, continuous, self-recovery			
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	24VDC input series	--	10	--	nF
			48VDC input series	--	2.2	--	

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	Operating Temperature	See Fig. 1	-40	--	+105	℃
	Max. Case Temperature	Rated output load	--	110	--	
	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	℃
	Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
	Switching Frequency ⑤	PWM mode	--	400	--	kHz
	MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	25.40 × 25.40 × 11.70 mm				
	Weight	20.0g (Typ.)				
	Cooling method	Free air convection				

Note:

①The Ctrl pin voltage is referenced to input GND.

②Output voltage accuracy for 0%-5% load is ±5% max;

③Load regulation for 0% -100% load increases to ±3%;

④ Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. By measuring method is used for Ripple and Noise test, please refer to Fig. 2 for recommended circuit.

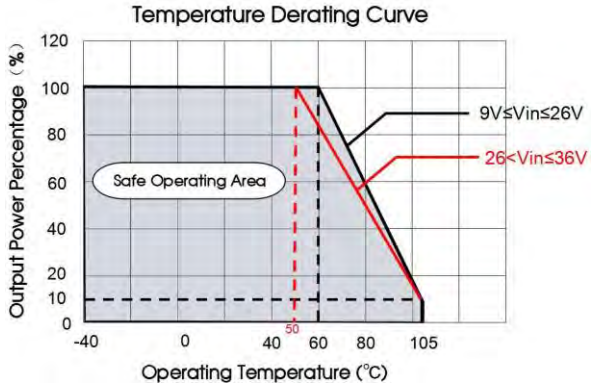
⑤Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Electromagnetic Compatibility (EMC)

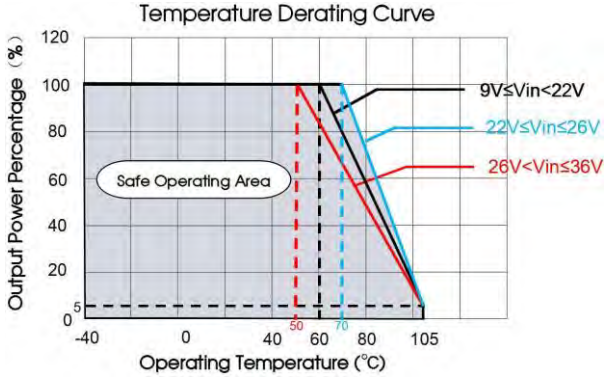
Emissions	CE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2kV (see Fig.3-① for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig.3-①for recommended circuit)	perf. Criteria A
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Characteristic Curve

VDB40-24S03W



VDB40-24S05W



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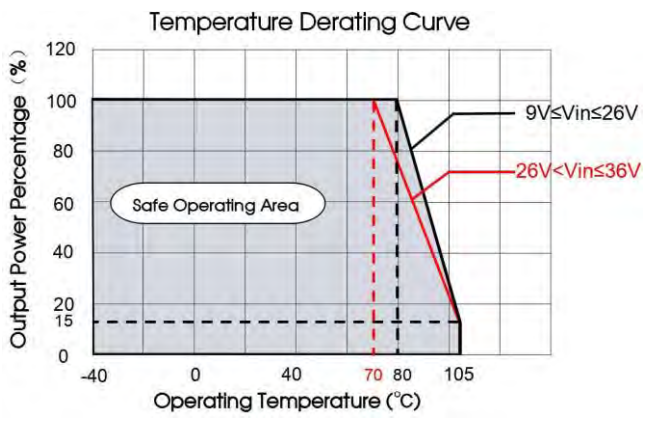
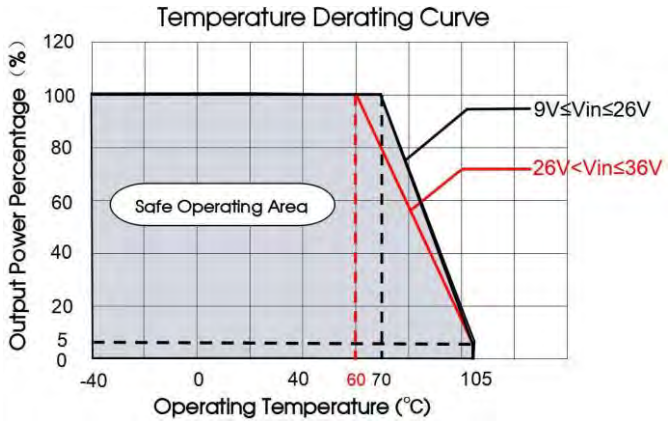
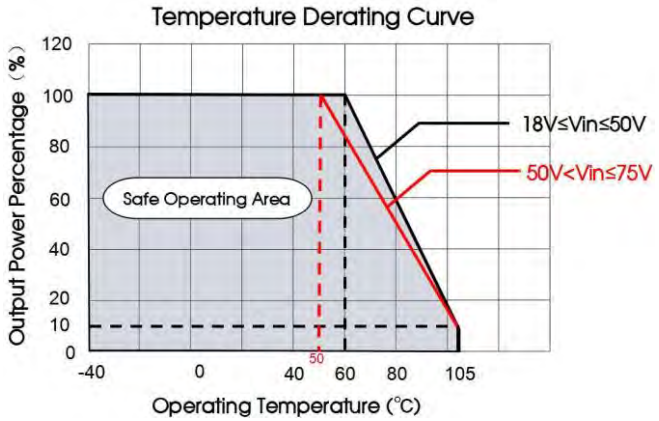
VDB40-24S12W/15W



VDB40-24S24W/28W



VDB40-48S03W



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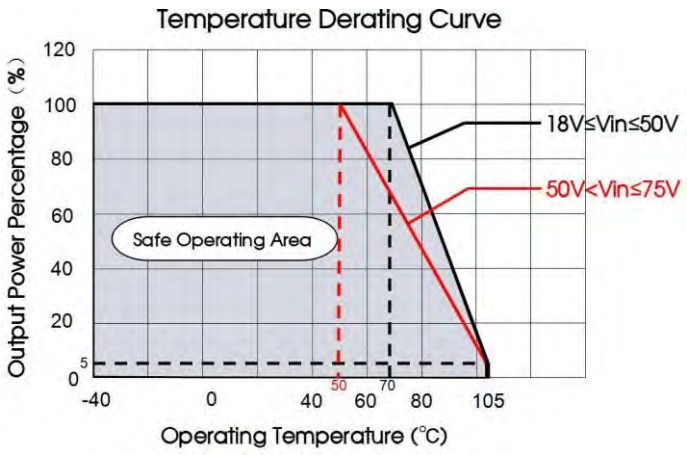

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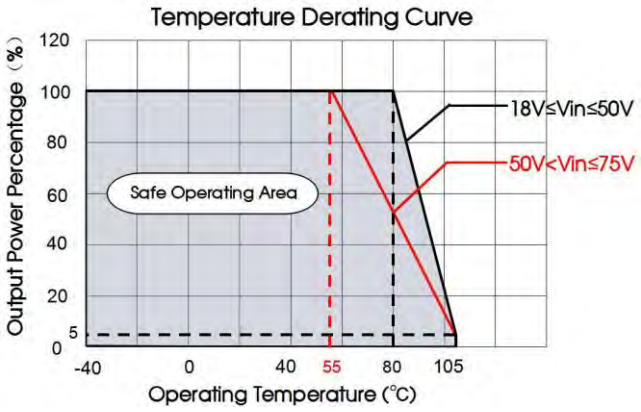

Fig. 1

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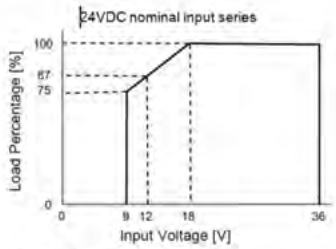
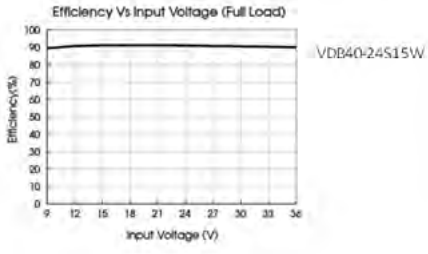
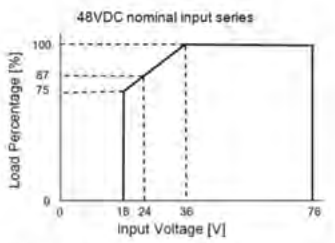
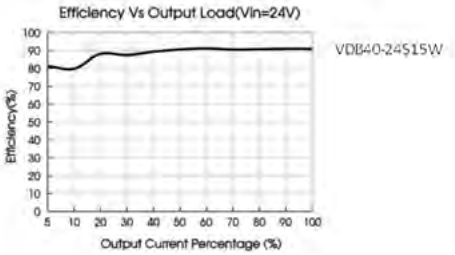
24VDC nominal input series

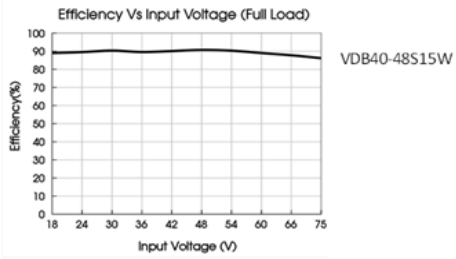


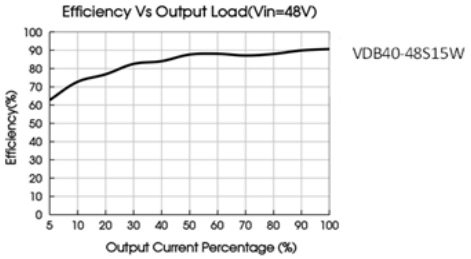


48VDC nominal input series









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Design Reference

1. Typical application

All 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 Cin and Cout 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.

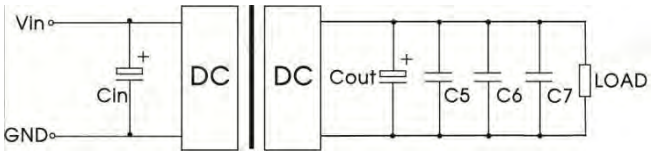


Fig. 2

Vin (VDC)	Vout (VDC)	Cin	Cout	C5	C6	C7
24	3.3-5	100uF /50V	470u F/50V	22uF/ 16V	1uF/ 16V	10uF/ 16V
	12/15			22uF/ 25V	1uF/ 25V	10uF/ 25V
	24/28			22uF/ 50V	1uF/ 50V	10uF/ 50V
48	3.3/5	100uF /100V		22uF/ 16V	1uF/ 16V	10uF/ 16V
	12/15			22uF/ 25V	1uF/ 25V	10uF/ 25V

2. EMC compliance circuit

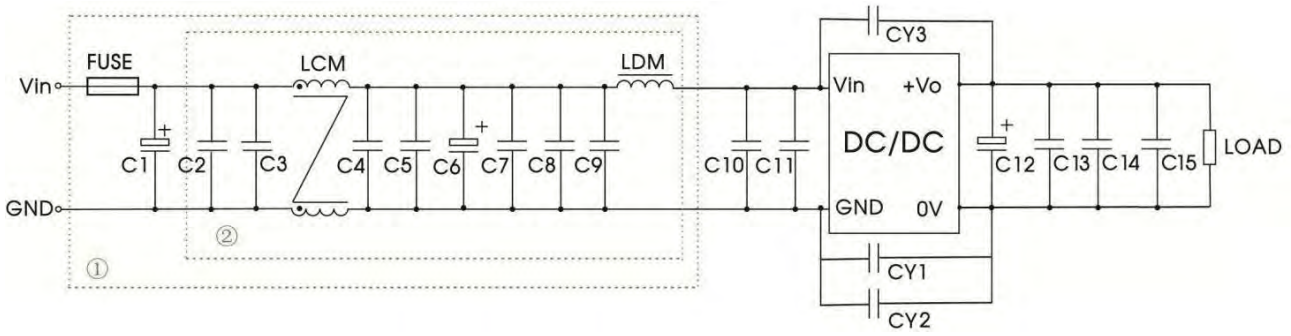


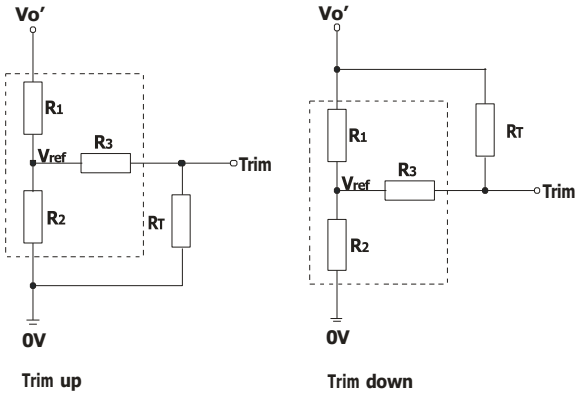
Fig. 3

Note: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

Components	Vin: 24VDC	Vin: 48VDC
FUSE	Choose according to actual input current	
C1	1000uF/50V	680uF/100V
C2/C3/C4/C5/ C7/C8/C9	4.7uF/50V	4.7uF/100V
LCM	350uH*2	10mH*2
C6	220uF/50V	100uF/100V
LDM	2.2uH	6.8uH
C12	Refer to the Cout in Fig.2	
C13/C14	Refer to the C5, C6 in Fig.2	
C15	/	Refer to the C7 in Fig.2
C10/C11	/	4.7uF/100V
CY1	Y2/222K/250VAC	2200PF/3000VDC
CY2/CY3	/	2200PF/3000VDC
Note: The Part ② of the circuit can be simplified, and ClassA can be satisfied by removing the LCM.		

3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2 - a} - R_3 \qquad a = \frac{Vref}{Vo' - Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1 - a} - R_3 \qquad a = \frac{Vo' - Vref}{Vref} R_2$$

R_T is Trim resistance

a is a self-defined parameter,

Vout(V)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
3.3	4.83	2.87	4.7	1.25
5	2.87	2.87	5.6	2.5
12	10.91	2.87	15	2.5
15	14.35	2.87	15	2.5
24	24.77	2.87	17.4	2.5
28	29.41	2.87	17.4	2.5

4. The products do not support parallel connection of their output

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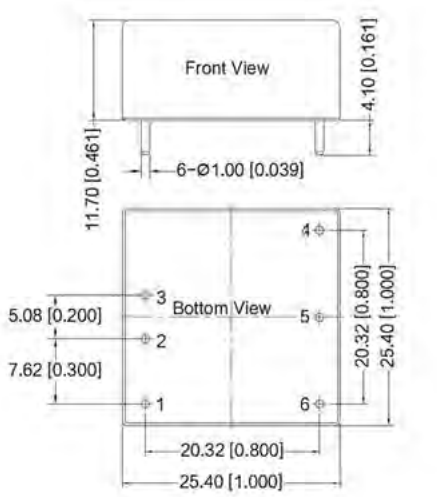
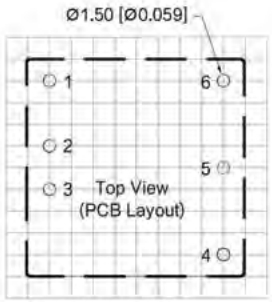
Dimensions and Recommended Layout



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



Note: Grid 2.54*2.54mm

Pin-out						
PIN	1	2	3	4	5	6
Single	Ctrl	GND	Vin	+Vo	Trim	0V

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℃, humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on 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.