Descriptions

50W Isolated，DC-DC Converter





RoHS

Features

- Wide input voltage range: 9-40VDC
- High efficiency up to 91%
- I/O isolation test voltage 2250VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard pin-out

Applications

- Communications
- Industrial control

Selection Guide

Certification	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.		
--	DWSB50-F2448	24 (9-40)	45	48	1042	89/91	100
		28 (9-40)					

Notes:
①Exceeding the maximum input voltage may cause permanent damage;
②Efficiency is measured in nominal input voltage and rated output load.

Specifications

Product Specifications	Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load/no-load)	Nominal input voltage	--	2289/--	2341/ 137	mA
	Reflected Ripple Current	Nominal input voltage, full load	--	50	--	
	Surge Voltage (1sec. max.)		-0.7	--	50	VDC
	Start-up Voltage		--	--	9	
	Input Under-voltage Protection		5.5	7.5	--	
	Start-up Time	Nominal input voltage & constant resistance load	--	30	100	ms
	Input Filter		C filter			
	Hot Plug		Unavailable			
	Ctrl①	Module on	Ctrl pin open or pulled high (3.5-12VDC)			
		Module off	Ctrl pin pulled low to TTL (0-1.2VDC)			
		Input current when off	--	20	50	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	--	--	0.5	ms
	Transient Response Deviation	25% load step change, nominal input voltage	--	±3	±5	%
	Temperature Coefficient	Full load	--	--	±0.03	%/℃
	Ripple & Noise④	20MHz bandwidth, 5%-100% load	--	--	250	mVp-p
	Trim	Input voltage range	85	--	110	%Vo
	Sense		--	--	105	
	Over-voltage Protection		110	--	160	
	Over-current Protection		110	--	260	%Io
	Short-circuit Protection		Continuous, self-recovery			
General Specifications	Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.	2250	--	--	VDC
		Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	2250	--	--	
	Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	4700	--	pF
	Operating Temperature	See Fig.1	-40	--	+105	℃
	Storage Temperature		-55	--	+125	
	Pin Soldering Resistance Temperature⑤	Soldering spot is 1.5mm away from the case, 10 seconds max.	--	--	+300	
		Wave soldering, maximum 10 seconds	255	260	265	
	Storage Humidity	Non-condensing	5	--	95	%RH
	Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
	Switching Frequency⑥	PWM mode	--	500	--	kHz
	MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Mechanical Specifications	Case Material	Black flame retardant and heat resistant plastic (UL94 V-0), aluminum alloy
	Dimensions	35.00 × 25.86 × 12.70 mm
	Weight	31.8g (Typ.)
	Cooling method	Free air convection

Notes:
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%;
④Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The " tip and barrel" method is used for Ripple and Noise test;
⑤The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection;
⑥Switching 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 for recommended circuit) /CLASS A (see Fig.4 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig.3 for recommended circuit) /CLASS A (see Fig.4 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 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig.3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A

Characteristic Curve

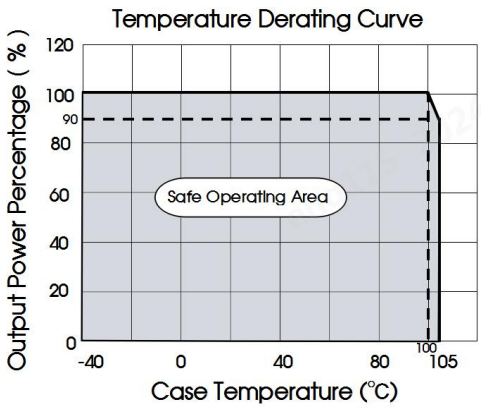
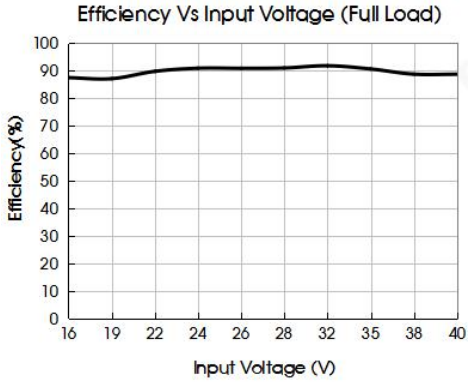
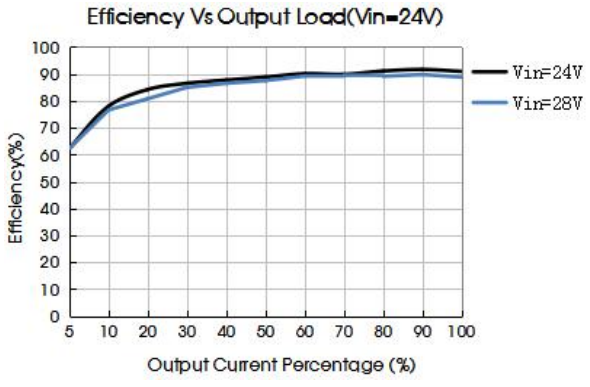


Fig.1

DWSB50-F2448

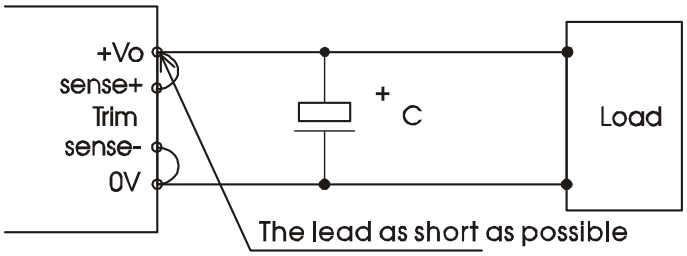


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Remote Sense Application

1. Remote Sense Connection if not used

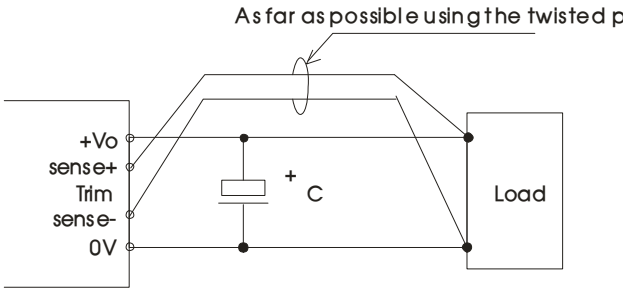


Note:

① If the sense function is not used for remote regulation the user must connect the +Sense to + Vo and -Sense to 0V at the DC-DC converter pins and will compensate for voltage drop across pins only.

②The connection between +Vo and Sense+, 0V and Sense- is as short as possible and close to the terminal. Avoid forming a large loop area, when the noise enters the loop, it may cause instability of the module.

2. Remote Sense Connection used for Compensation



Notes:

①Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.

②PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wires are suggested for remote compensation and must be kept as short as possible.

③We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.

④Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

Design Reference

1. Typical application

①All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

②Input 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.

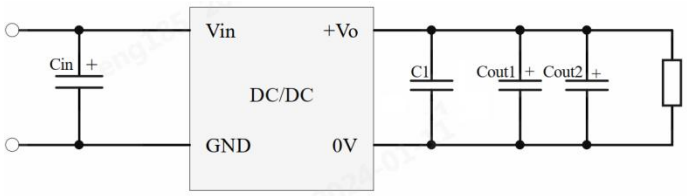


Fig. 2

Vin (VDC)	Vout (VDC)	Cin	Cout1/2	C1
24	48	100μF/63V	330uF/63V	10uF/63V

2. EMC compliance recommended circuit

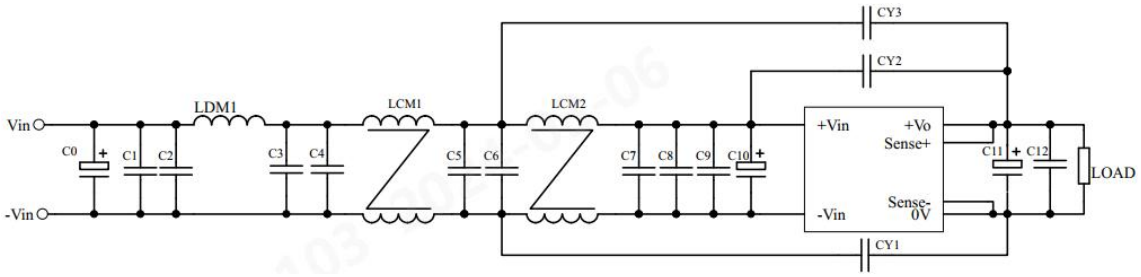


Fig. 3

Model	Others Output
C0	1000μF/100V electrolytic capacitor
C10	330μF/100V electrolytic capacitor
C11	470uF/50V electrolytic capacitor
C1,C2,C3,C4, C5,C6,C7,C8,C9,C12	22μF/50V ceramic capacitor
LDM1	4.7uH
LCM1	90uH/10A, recommended to use EFL2D-10-900
LCM2	2mH/10A, recommended to use EFL2D-13-202
CY1, CY3	2.2nF/400VAC Y safety capacitor
CY2	500pF/400VAC Y safety capacitor

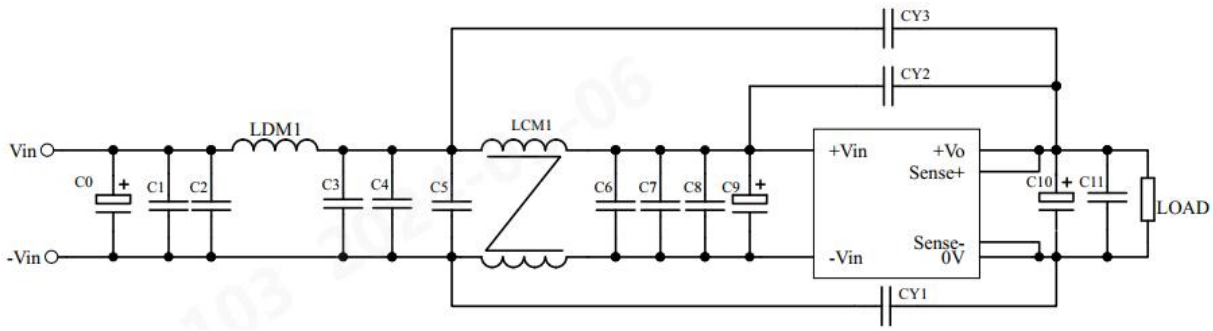
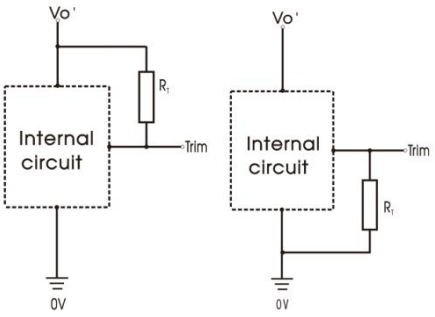


Fig. 4

Model	Parameter description
C0	100μF/100V electrolytic capacitor
C9	330μF/100V electrolytic capacitor
C10	470uF/50V electrolytic capacitor
C1, C2, C3, C4, C5,C6,C7,C8,C11	22μF/50V ceramic capacitor
LDM1	4.7uH
LCM2	2mH/10A, recommended to use EFL2D-13-202
CY1, CY3	2.2nF/400VAC Y safety capacitor
CY2	500pF/400VAC Y safety capacitor

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



Trim up Trim down

Fig.5 TRIM resistor connection

(dashed line shows internal resistor network)

Calculating Trim resistor values:

Trim up

$$R_T = \left(\frac{5.11 V_{nom}(100+\Delta\%)}{1.225\Delta\%} - \frac{511}{\Delta\%} - 10.22 \right)(k\Omega)$$

Trim down

$$R_T = \left(\frac{511}{\Delta\%} \right) - 10.22(k\Omega)$$

Note:

R_T = Trim Resistor value

$$\Delta\% = \left| \frac{V_{nom} - V_{out}}{V_{nom}} \right| \times 100$$

V_{nom} = nominal output voltage

V_{out} = desired output voltage

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

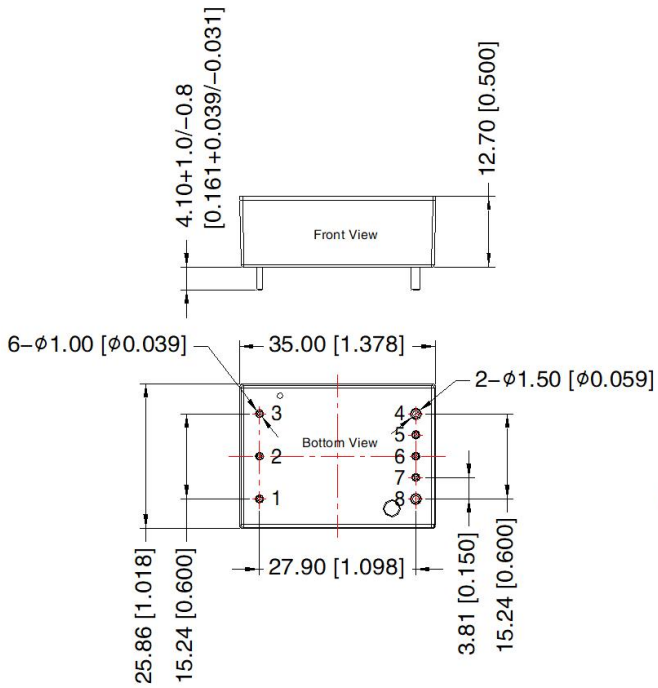
5. Recommended solution for thermal test

In the application process, the thermal design of the product can be evaluated with the product temperature derating curve; or by testing the temperature of point A in Fig.6 to determine the stable working range of the product, when the temperature of point A is lower than 105℃, it is the stable working range of the product.



Fig.6

Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
1, 2, 3, 5, 6, 7diameter: 1.00 [0.039]
4, 8diameter: 1.50 [0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

Pin−Out			
Pin	Mark	Pin	Mark
1	Vin	6	Trim
2	Ctrl	7	Sense+
3	GND	8	+Vo
4	0V		
5	Sense−		

Notes:

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 our company corporate standards;
4. Products are related to laws and regulations: see "Features" and "EMC";
5. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.