Descriptions

400W isolated，DC/DC Converter





RoHS

Report EN62368-1

Report BS EN62368-1

Features

- Wide input voltage range: 9-40VDC
- High efficiency up to 95.5%
- I/O isolation test voltage 2250VDC
- Output over - voltage, over-current, short circuit and over-temperature protection
- Support parallel current sharing
- Operating ambient temperature range: -40℃ to +100℃
- Industry standard package: 1/2 brick

Applications

- Battery-powered equipment
- Industrial control
- Electric power
- Instrumentation
- Communications

Selection Guide

Certification	Part No	Input Voltage (VDC)		Output		Full Load Efficiency②(%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal (Range)	Max.①	Voltage (VDC)	Current (mA)③ Max./Min.		
EN/BS EN	DWHB400-F2412N	24 (9-40)	40	12	33340/0	93/95.5	12000
	DWHB400-F2415N			15	26670/0	93/95.0	10000
	DWHB400-F2424N			24	16670/0	93/95.5	6000
	DWHB400-F2428N			28	14290/0	93/95.0	5000
	DWHB400-F2448N			48	8340/0	93/94.5	1000

Notes:
①The input voltage should not exceed this value, otherwise permanent and unrecoverable damage may be caused;
②This efficiency value is the full load efficiency at nominal input voltage;
③Output power linearly derated from 400W to 250W when input voltage between 18-9V;
④Product images are for reference only; the actual product shall prevail.

Specifications

Product Specifications	Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (full load / no-load)	Nominal, 100%Io	12V/24V	--	17452/150	17921/290	mA
			15V/28V	--	17544/150	17921/290	
			48V	--	17637/150	17921/290	
	Reflected Ripple Current	Nominal input voltage, 100%Io		--	300	--	
	Surge Voltage (100msec. max.)			-0.7	--	50	VDC
	Start-up Voltage			--	--	9	
	Input Under-voltage Protection			7	8	--	
	Input Filter			Pi filter			
	Hot Plug			Unavailable			
	ON/OFF ①	Module turn-on		ON/OFF pulled low to -Vin (0-1.2VDC)			
		Module turn-off		ON/OFF open or pulled high (TTL 3.3-12VDC)			
		Input current during shutdown		--	20	50	mA
Output Specifications	Voltage Accuracy	Input voltage range, 0%Io-100%Io		--	±1	±3	%
	Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
	Load Regulation	5%-100% Io		--	±0.5	±0.75	
	Transient Recovery Time	25% load step change, nominal input voltage		--	300	500	us
	Transient response deviation			--	±3	±5	%
	Temperature Coefficient	Full load		--	--	±0.03	%/℃
	Ripple & Noise②	20MHz, nominal input voltage,5%-100% load	12V/15V	--	100	--	mVp-p
			24V/28V	--	150	--	
			48V	--	200	--	
	Trim	Nominal input		80	--	110	%
	Sense			--	--	110	
	Over-temperature Protection	Product surface max. temperature		--	110	125	℃
	Over-voltage Protection	Input voltage range		110	--	140	%
	Over-current Protection			110	--	180	%Io
	Short-circuit Protection			Continuous, self-recovery			
General Specifications	Isolation	Input-output	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max	2250	--	--	VDC
		Input-case		1500	--	--	
		Output-case		750	--	--	
	Insulation Resistance	Input-output resistance at 500VDC		100	--	--	mΩ
	Isolation Capacitance	Input-output, 100KHz/0.1V		--	1500	--	pF

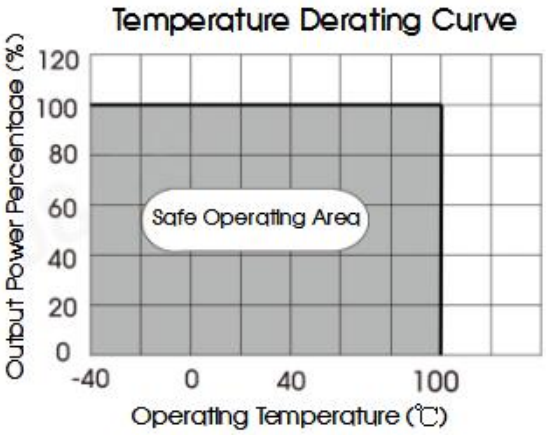
	Operating Temperature	Forced air cooling or other heat dissipation methods	-40	--	100	℃
	Storage Temperature		-55	--	125	
	Storage Humidity	Non-condensing	5	--	95	%RH
	Pin Soldering Resistance Temperature③	Soldering spot is 1.5mm away from the case, 10 seconds max.	--	--	+300	℃
		Wave soldering, maximum 10 seconds	255	260	265	
	Vibration Test		10-150Hz, 5G, 0.75mm. along X, Y and Z			
	Switching Frequency	PWM mode	--	340	--	kHz
	MTBF	MIL-HDBK-217F @25℃	500	--	--	k hours
Mechanical Specifications	Shell Material	Black plastic bottom, flame-retardant and heat-resistant (UL94 V-0) & Aluminum alloy case				
	Size	61.0 × 57.9 × 12.7 mm				
	Weight	140.0g±14g (Typ.)				
	Cooling Method	Forced air-cooling or other ways is required to ensure that the surface temperature is less than 100℃.				

Note:
①The(ON/OFF) pin voltage is referenced to input Pin -Vin;
②The "Tip and barrel method" is used for ripple and noise test, ripple noise does not exceed 4%Vo at 0% to 5% load;
③The 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.

Electromagnetic Compatibility (EMC)

EMI	CE	CISPR32/EN55032 CLASS B (See Fig. 3 for recommended circuits)	
	RE	CISPR32/EN55032 CLASS B (See Fig. 3 for recommended circuits)	
EMS	ESD	IEC/EN61000-4-2 Contact ±6KV/Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m (See Fig. 3 for recommended circuits)	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2KV (See Fig. 3 for recommended circuits)	perf. Criteria A
	Surge	IEC/EN61000-4-5 line to line ±2KV (See Fig. 3 for recommended circuits)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s. (See Fig. 3 for recommended circuits)	perf. Criteria A

Characteristic Curve



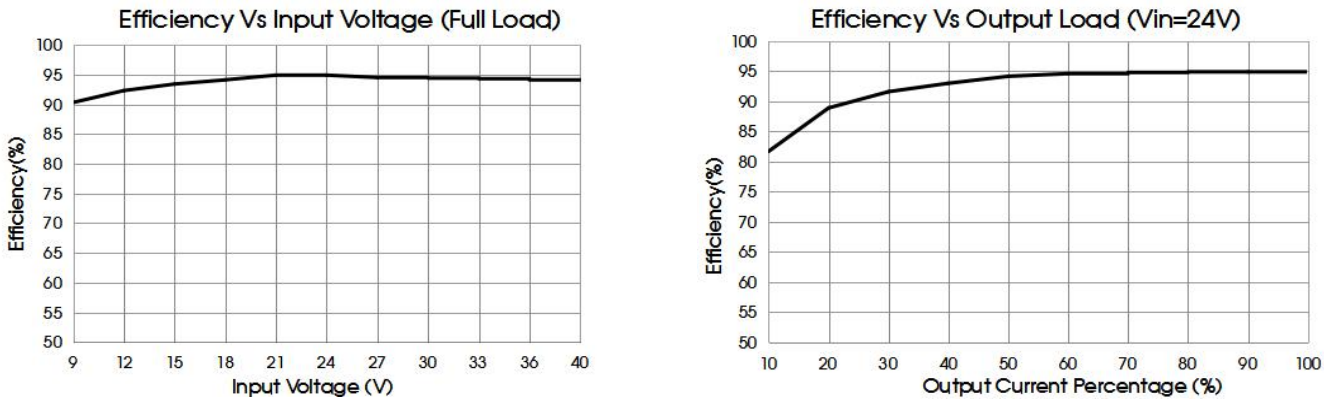
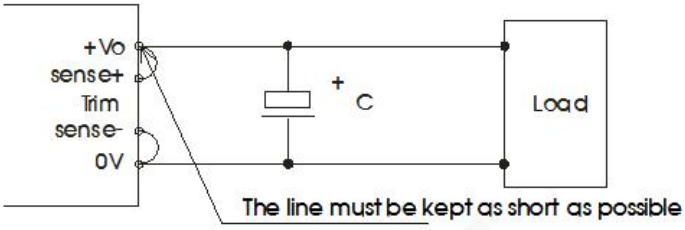


Fig. 1

Remote Sense Application

1. Remote Sense Connection if not used

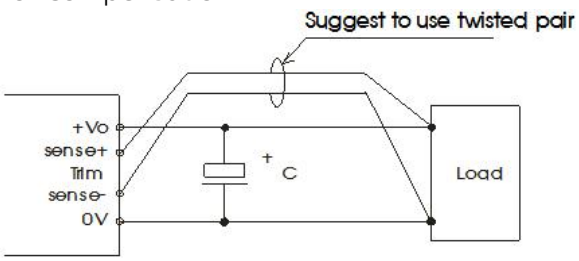


Notes:

①If 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 connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power 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 the 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.

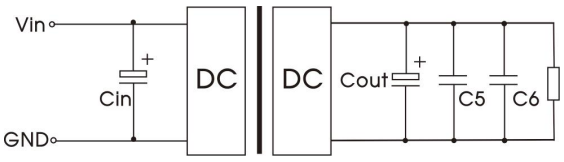


Fig. 2

Vout (VDC)	Cin	Cout	C5	C6
12/15	2000μF /63V	1500uF/25V	1μF/25V	10μF/25V
24/28		680uF/50V	1μF/50V	10μF/50V
48		550uF/100V	1μF/100V	10μF/100V

2. EMC compliance recommended circuit

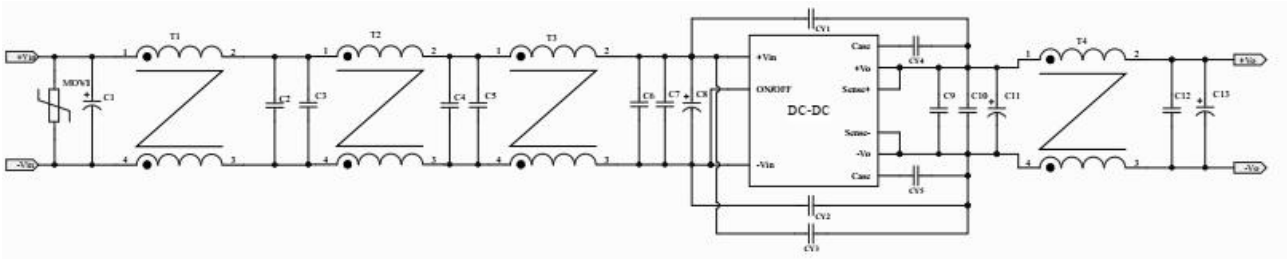
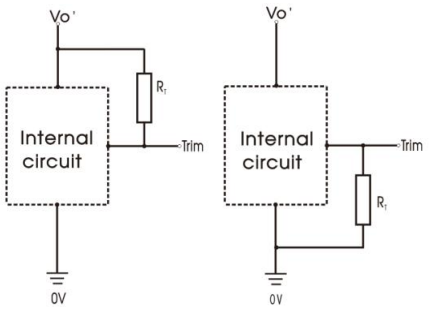


Fig. 3

Components	Value	Recommended Component
MOV1	14D101K	varistor
C1/C8	1000uF/63V	electrolytic capacitor, Voltage≥63V
C2/C3/C4/C5/C6/C7/C9/C10/C12	2.2uF/100V	ceramic capacitance,Voltage≥100V
CY1/CY2/CY3	2.2nF	Y2 safety standard Y capacitor
CY4/CY5	1.0nF	Y2 safety standard Y capacitor
C11/C13	680uF	solid-state capacitor,Voltage≥63V
T1/T2	1.4mH	CM inductor
T3/T4	300uH	CM inductor

3. Trim function for output voltage adjustment (open if unused)



Tim up Trim down

Trim resistor connection (dashed line shows internal resistor network)

Fig. 4

Calculating Trim resistor values:

Trim up

$$R_T = \frac{1.2 * V_{nom}(1+\Delta\%)}{\Delta\% * 2.5} - \frac{1.2}{\Delta\%} - 4.94(K\Omega)$$

Trim dowm:

$$R_T = \frac{1.2}{\Delta\%} - 4.94(K\Omega)$$

Note:

R_T = Trim Resistor value

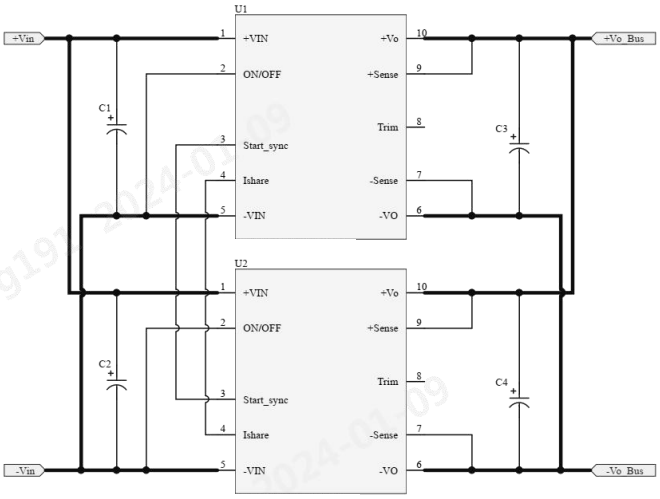
V_{nom} = nominal output voltage

Table 1

Output voltage(V)	R_T(up to110%Vo) (KΩ)	R_T(down to 80%Vo) (KΩ)
12	46.42	1.06
15	62.26	1.06
24	109.78	1.06
28	130.9	1.06
48	236.5	1.06

4. The products support parallel connection of their output

The product supports parallel use: up to 2 units can be connected in parallel, and when a single power supply fails, automatic disconnection can be realised without affecting the work of the other modules. The product adopts the maximum current automatic sharing mode suitable for: redundancy applications, parallel power up occasions, etc. The maximum current automatic sharing mode means that among N parallel connected modules, the module with the largest output current will automatically become the master module, and the rest of the modules will be the slave modules, and their error voltages will be adjusted in order to correct the uneven distribution of load current.



Device	Value		
	12V/15V	24V/28V	48V
C1, C2, C3, C4	2200uF/63V		
C5, C6, C7, C8	1500uF/25V	680uF/50V	550uF/100V

5. Recommended solution for thermal testing

In the process of application, the thermal design of the product can be evaluated in combination with the product temperature derating curve, or the stable working interval of the product can be determined by the temperature of the thermal test point in Figure 5. When the temperature at point A is lower than 100℃, it is the stable working range of the product.

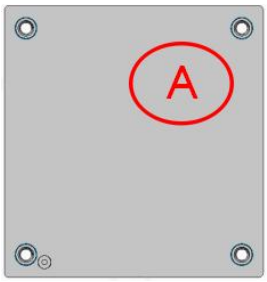
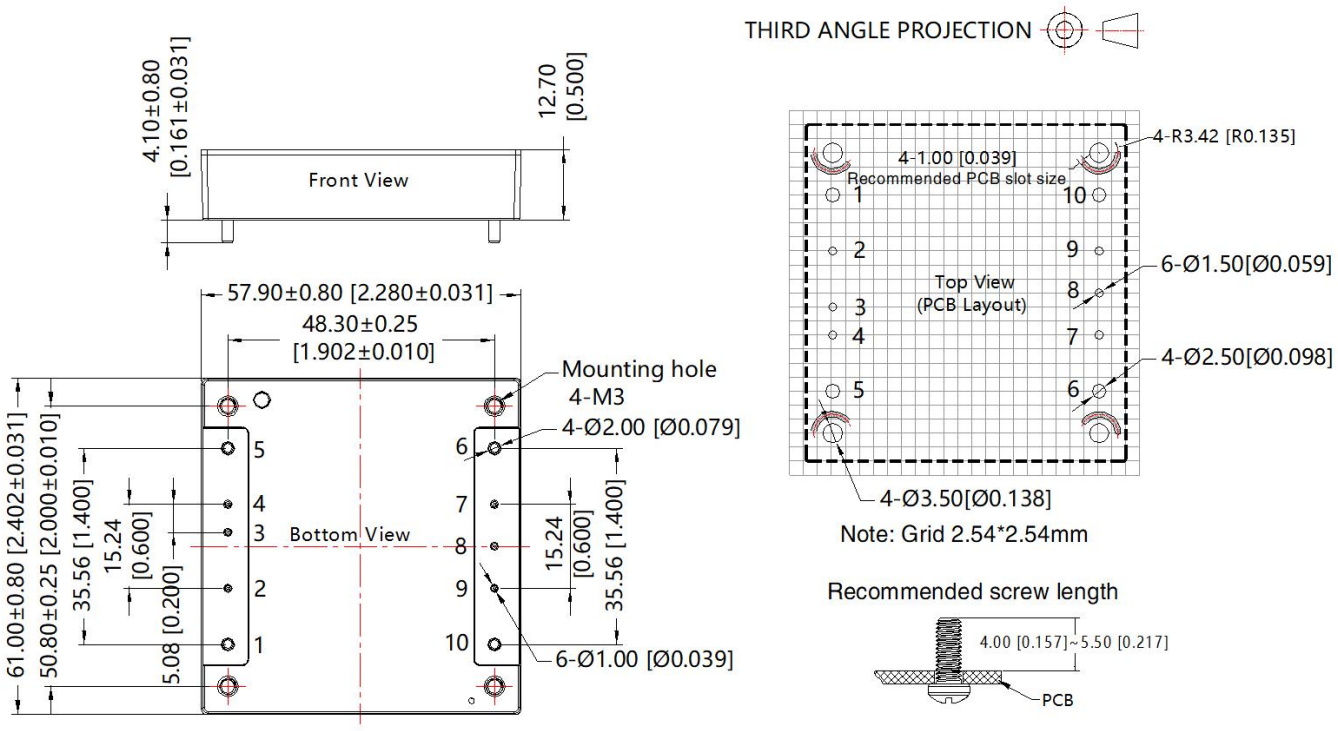


Fig. 5

Top view of the product

Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin2, 3, 4, 7, 8, 9diameter: 1.00[0.039]
Pin1, 5, 6, 10diameter: 2.00[0.079]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
Mounting hole screwing torque: Max 0.4 N・m

Pin-Out			
Pin	Mark	Pin	Mark
1	+Vin	6	0V
2	ON/OFF	7	Sense-
3	START SYNC	8	Trim
4	ISHARE	9	Sense+
5	-Vin	10	+Vo

URF24xxHB-400WR3-N-V0

Notes:

1. It is recommended that the load imbalance of the dual output is ≤±5%. If it exceeds ±5%, the performance of the product cannot be guaranteed to meet as datasheet marked. For details, please contact our technical staff;
2. The maximum capacitive load is tested in the input voltage range and under full load condition;
3. Unless otherwise stated, all indicators in this manual are in Ta=25℃, humidity & LT; 75%RH, nominal input voltage and output rated load measured;
4. If the product works below the minimum required load, it cannot be guaranteed that the product performance meets all performance indicators in this manual
5. All index testing methods in this datasheet are based on company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. The products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified companies.
9. The image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on the physical mark or packaging label.