

- Ultra-wide 4:1 input voltage range
- High efficiency up to 91%
- I/O isolation test voltage 2.25k VDC
- Operating ambient temperature range -40°C to +85°C
- Input under-voltage protection, output short-circuit, over-current, over-voltage, over-temperature protection
- Five-sided metal shielded package
- Industry standard 1/4-Brick package and pin-out

DUF200-48XXQB



RoHS



3-Year Warranty

Description

DUF200-48XXQB series are isolated 200W DC-DC products with 4:1 input voltage. They feature efficiency up to 91%, 2250VDC input to output isolation, operating ambient temperature of -40°C to +85°C, input under-voltage, output short circuit, over-current, over-voltage, over-temperature protection. The products meet CLASS A of CISPR32/EN55032 EMI standards by adding the recommended external components and they are widely used in applications such as battery powered systems, industrial controls, electricity, instrumentation, railway, communication and intelligent robotic.

Selection Guide

Certificati on	Part No.	Input Voltage (Vdc) Nominal (Range)	Input Voltage (Vdc) Max.	Output Voltage (Vdc)	Output Current (mA) (Max.)	Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF) Max.
/	DUF200-4805QB	48 (18 - 75)	80	5	40	86/88	6000
	DUF200-4812QB			12	16.7	89/91	2000
	DUF200-4815QB			15	13.3	87/89	2000
	DUF200-4824QB			24	8.4	89/91	1000
	DUF200-4836QB			36	5.56	86/88	1000
	DUF200-4842QB			42.5	5	88/90	2000
	DUF200-4848QB			48	4.2	89/91	450

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	--	4735/100	4845/200	mA
Reflected Ripple Current		--	100	--	
Surge Voltage (1sec. max.)		-0.7	--	90	VDC
Start-up Voltage		--	--	18	
Input Under-voltage Protection		14	16	--	
Input Filter		Pi 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	--	2	10	mA

Note: ①The Ctrl pin voltage is referenced to input GND.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0% - 100% load		--	±1	±3	%
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation	5% - 100% load		--	±0.5	±0.75	
Transient Recovery Time	25% load step change		--	300	500	μs
Transient Response Deviation	25% load step change	5V output	--	±3	±7.5	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple & Noise⑤	20MHz bandwidth	36V, 42.5V output	--	150	300	mVp-p
		Others	--	150	250	
Trim	36V output		100	--	110	%Vo
	Others		90	--	110	
Sense			--	--	105	
Over-temperature Protection	Max. Case Temperature 36V, 42.5V output		95	105	115	°C
	Max. Case Temperature Others		--	115	120	
Output Over - voltage Protection	Input voltage range		110	130	160	%Vo
Output Over - current Protection			110	130	150	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation Voltage	Electric Strength Test for 1 minute with a leakage current of 5mA max	Input - output	2250	--	--	VDC
		Input - case	1500	--	--	
		Output - case	500	--	--	
Insulation Resistance	Input-output insulation voltage 500VDC		100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
Operating Temperature			-40	--	+85	°C
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Pin Soldering Resistance Temperature	Wave-soldering, 10 seconds		--	--	260	°C
	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Shock And Vibration		IEC/EN61373 - Category 1, Grade B			
Switching Frequency	PWM mode	--	250	--	KHz
MTBF	MIL-HDBK-217F@25°C	500	--	--	K hours

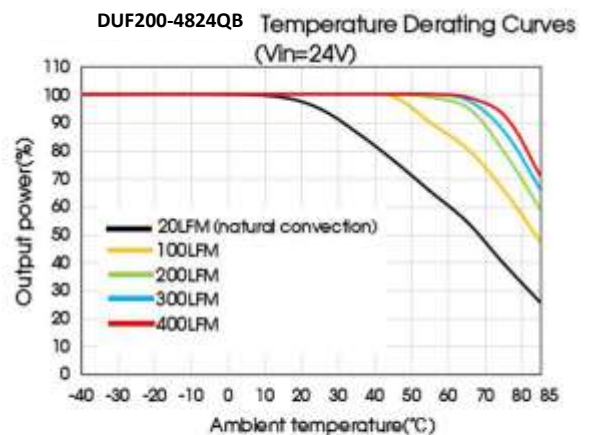
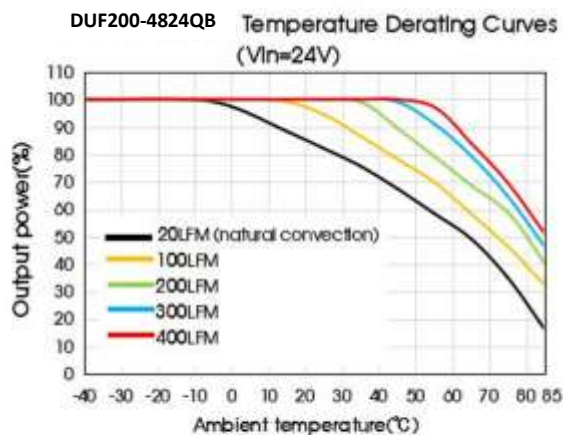
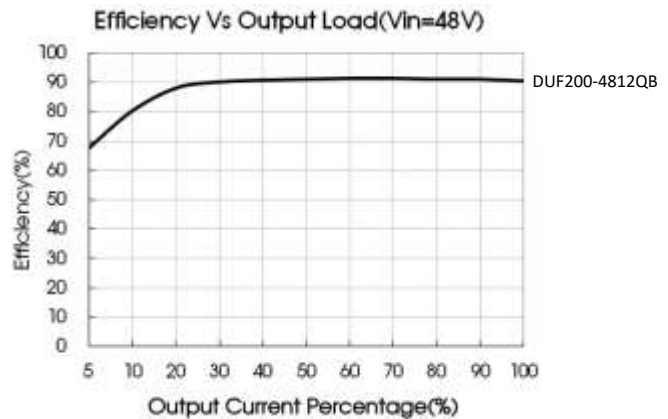
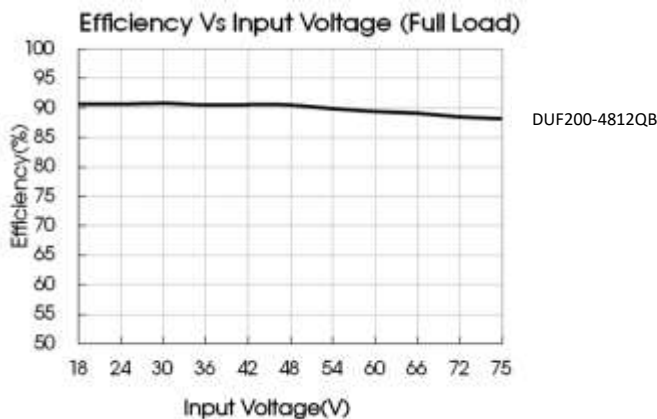
Mechanical Specifications

Case Material	Aluminum alloy case, black plastic bottom, flame-retardant and heat-resistant (UL94 V-0)
Dimension	61.8 × 40.2 × 12.7 mm
Weight	89.0g (Typ.)
Cooling Method	Free air convection (20LFM)

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (see Fig. 2 for recommended circuit)
	RE	CISPR32/EN55032 CLASS A (see Fig. 2 for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2, EN50121-3-2 Contact ±6KV Air ±8KV perf.Criteria B
	RS	IEC/EN61000-4-3, EN50121-3-2 10V/m perf.Criteria A
	EFT	IEC/EN61000-4-4, EN50121-3-2 ±2KV (see Fig. 2 for recommended circuit) perf.Criteria A
	Surge	EN50121-3-2 differential mode ±1KV, 1.2/50us, source impedance 42Ω (see Fig.2 for recommended circuit)
	CS	IEC/EN61000-4-6, EN50121-3-2 10Vr.m.s perf.Criteria A

Typical Characteristic Curves

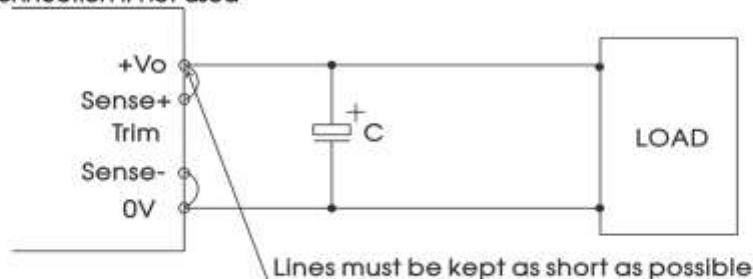


Note:

1) Product application thermal design should be referred to the recommended PCB layout and recommended heat dissipation structure, please refer to DC-DC Converter Application Notes for specific information.

Remote Sense Application

1. Remote Sense Connection if not used

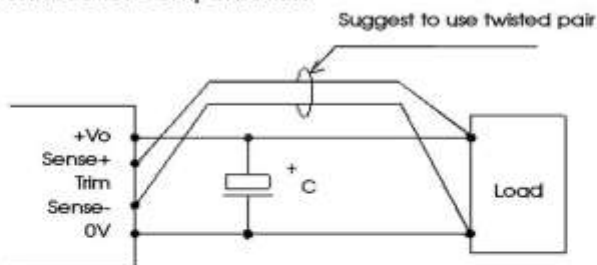


Note:

- (1) If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V.
- (2) The 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.

Remote Sense Application

2. Remote Sense Connection used for Compensation



Note:

- (1) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
- (2) PCB-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.
- (3) We 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.
- (4) Note 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

- (1) We recommended using the recommended circuit shown in Fig.1 during product testing and application, otherwise please ensure that at least a 220 μ F electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.
- (2) We recommended increasing the value of C_{in} and pay attention to the unstable input voltage if the product input side is paralleled with motor drive circuit and/or larger energy transient circuits, to ensure the stability of input terminal and avoid repeatedly start-up problems due to input voltage lower than under-voltage protection point.
- (3) We recommended increasing the output capacitance with limited to the capacitive load specification and/or increasing the voltage clamping circuit(such as TVS) if the output terminal is inductive device such as relay or a motor, to ensure adequate voltage surge suppression and protection.
- (4) 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.

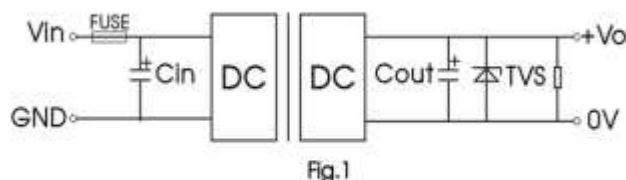


Fig.1

Vout(VDC)	Fuse	Cin ^①	Cout	TVS
5	20A, slow blow	220 μ F	470 μ F	SMDJ6.0A
12			220 μ F	SMDJ14A
15				SMDJ17A
24			100 μ F	SMDJ28A
36				SMDJ47A
42.5				SMDJ54A
48				SMDJ54A

Note:

- ① Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low (such as -25 $^{\circ}$ C).

2. EMC compliance circuit

We recommended using the recommended circuit shown in Fig.2 during product EMC testing and application.

Design Reference

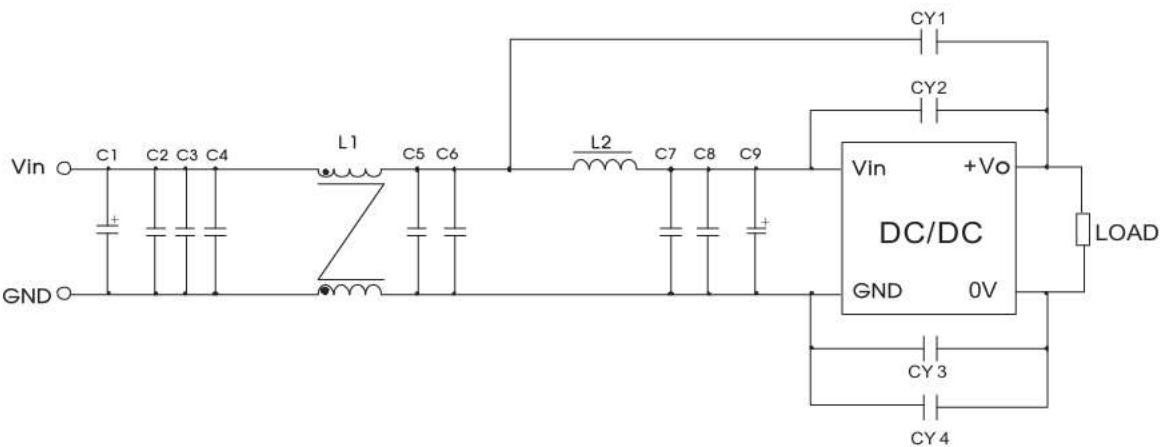
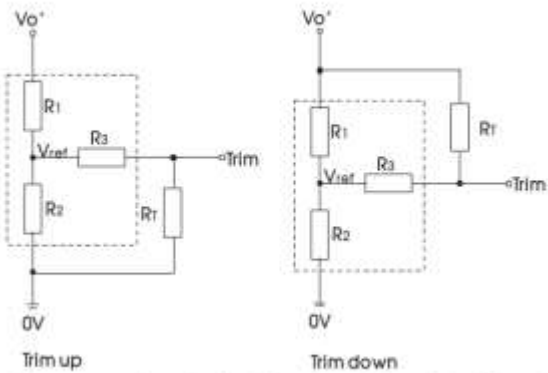


Fig. 2

Components	Recommended Component Value
C1	150μF/100V electrolytic capacitor
C9	47μF/100V electrolytic capacitor
C2/ C3/ C4/ C5/ C6/C7/ C8	2.2μF/100V ceramic capacitor
L1	2.0mH, recommended to use MORNSUN P/N: FL2D-A2-202 (C)
L2	1.5μH/15A Inductance
CY1/ CY2/ CY3/ CY4	1nF Y1 safety capacitor

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculation formula of Trim resistance:

up: $R_1 = \frac{aR_2}{R_2 - a} - R_3$ $a = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$

down: $R_1 = \frac{aR_1}{R_1 - a} - R_3$ $a = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$

R_1 = Trim Resistor value;
 a = User-defined parameter, no actual meanings
 V_o' = desired output voltage ($\pm 10\%$ max.)

Design Reference

Vout (VDC)	R1 (K Ω)	R2 (K Ω)	R3 (K Ω)	Vref (V)
5	3.036	3	10	2.5
12	11.00	2.87	15	2.5
15	14.03	2.8	15	2.5
24	24.872	2.87	15	2.5
36	38.73	2.85	15	2.5
42.5	46.789	2.913	15	2.5
48	53.017	2.913	15	2.5

Note: When using the Trim down function, if RT resistor value is too low, or the Trim pin is shorted with +Vo, then the output voltage Vo' would be lower than 0.9Vo, which may cause permanent damage to the product.

4. Reflected ripple current--test circuit

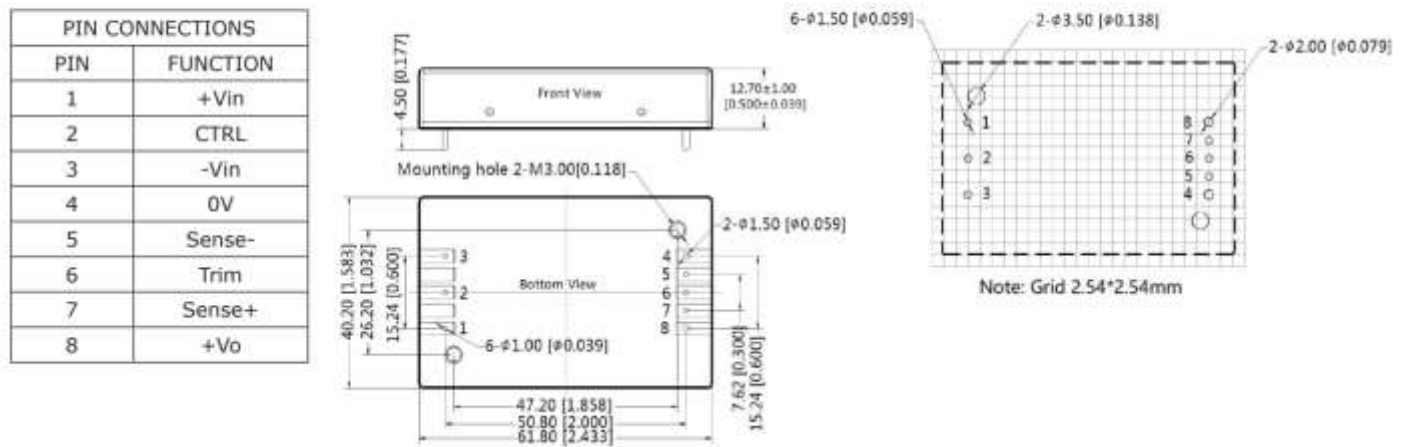


Note: L_{in} (4.7 μ H) , C_{in} (220 μ F, ESR < 1.0 Ω at 100 KHz)

- The products do not support parallel connection of their output.
- The product test process shall ensure that the current of the input terminal meets the requirements of the starting current to ensure that the power supply of the product does not suffer from under-power.

Dimensions and Recommended Layout

units: mm [inches]
pin 1,2,3,5,6,7's diameter: 1.00 [0.039]
pin 4,8's diameter: 1.50 [0.059]
pin diameter tolerance: ± 0.10 [± 0.004]
general tolerance: ± 0.50 [± 0.020]
mounting hole screwing torque: Max 0.4 N·m



Note:

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