

Features

60W isolated DC-DC converter in DIP package
Ultra-wide input and regulated dual output

- ◆ Ultra-wide 4: 1 input voltage range
- ◆ High efficiency up to 91.5%
- ◆ No-load power consumption as low as 0.19W
- ◆ I/O isolation test voltage 2250V_{DC}
- ◆ Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- ◆ Operating ambient temperature range:-40℃ to +70℃
- ◆ Industry standard pin-out
- ◆ Warranty period of three years



Selection Guide

Certification	Part No.	Input Voltage(V _{DC})		Output		Full Load Efficiency ² (%) Min./Typ.	Capacitive Load (μF) ³ Max.
		Nominal (Range)	Max. ^①	Voltage (V _{DC})	Current(mA) Max./Min.		
	CFDM60-24D12	24 (9-36)	40	±12	±2500/0	89/90.5	3000
	CFDM60-24D15			±15	±2000/0	89/91.5	2000
	CFDM60-24D24			±24	±1250/0	89/91	1000

Notes:

①Exceeding the maximum input voltage may cause permanent damage;

②Efficiency is measured at nominal input voltage and rated output load;

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current(fullload/no-load)	nominal input voltage	±12V output	--	2763/8	2809/20	mA
		±15V output	--	2733/8	2809/20	
		±24V output	--	2748/8	2809/20	
Reflected Ripple Current	nominal input voltage, 100%load		--	100	--	V _{DC}
Surge Voltage (1sec. max.)			-0.7	--	50	
Start-up Voltage			--	--	9	
Input Filter			Pi filter			
Hot Plug			Unavailable			
CNT* ^①	Module open	CNT pin open or TTL pulled high (3-12V _{DC})				
	Module shutdown	CNT pin pulled -Vin or pulled low (0-1.2V _{DC})				

Notes: ①The voltage of CNT pin is relative to input pin -Vin

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy ^②	5%-100% load		--	±1	±2	%
	0%-5% load		--	±2	±5	
Linear Regulation	Input voltage variation from low to high at full load	Vo1	--	±0.2	±0.5	
		Vo2	--	±0.5	±1.5	
Load Regulation ^③	5%-100% load		--	±0.5	±1	

		Vo2	--	±0.5	±1.5	
Transient Recovery Time	25% load step change, input voltage range		--	300	500	μs
Transient Response Deviation	25% load step change, nominal input voltage		--	±3	±5	%
Ripple/Noise®	20MHz bandwidth, 5%-100% load	±12V/±15V output	--	70	--	mVp-p
		±24V output	--	90	--	
Over-voltage Protection	Input voltage range		110	140	160	%Vo
Over-current Protection			110	140	200	%Io
Short-circuit Protection			Continuous, self-recovery			
Notes:						
① When the test condition is 0%~ 100% load regulation ratio is ±5%, Vo1 is positive output, and Vo2 is negative output.						
② The "Tip and barrel method" is used for ripple and noise test, please refer to Figure 2 for the recommended circuits. Ripple & noise value less than 5% Vo when with 0%~5% load.						
③ For dual output models, when short circuit test is performed on one output, the other output should be at least with 5% load.						

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Electric Strength test for 1 minute with a leakage current of 1mA max.	2250	--	--	V _{DC}
	Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	
Insulation Resistance	Input-output resistance at 500V _{DC}	100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100kHz/0.1V	--	1300	--	pF
Operating Temperature	See Fig.1	-40	--	+70	°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		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency *	PWM mode	--	370	--	kHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	k hours
Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.					

Mechanical Specifications

Case Material	Aluminum alloy		
Dimensions	Without heat sink	Horizontal package	50.8×25.4×11.8mm
	With heat sink		51.4×26.2×23.0mm
Weight	Without heat sink		41.0g
	With heat sink		50.8g
Cooling Method	Free air convection		

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A(see Fig.3-①)/CLASS B(see Fig.3-②)			
	RE	CISPR32/EN55032 CLASS A(see Fig.3-①)/CLASS B(see Fig.3-②)			
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	perf.Criteria A	
	RS	IEC/EN61000-4-3	10V/m	perf.Criteria A	
	EFT	IEC/EN61000-4-4	100KHz ±2KV(see Fig.3-②)	perf.Criteria A	
	Surge	IEC/EN61000-4-5	line to line±2KV(see Fig.3-②)	perf.Criteria A	
	CS	IEC/EN61000-4-6	10 Vr.m.s	perf.Criteria A	

Typical Characteristic Curve

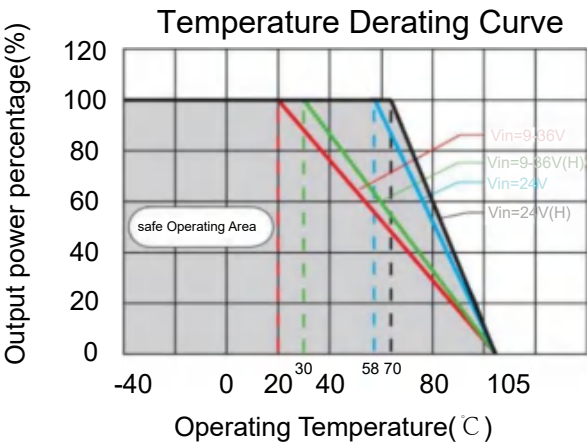


Fig. 1

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.



Vout(Vdc)	Cin	Cout
$\pm 12/\pm 15$	100 μ F/50V	220 μ F/50V
± 24		100 μ F/50V

Fig.2

2. EMC compliance circuit

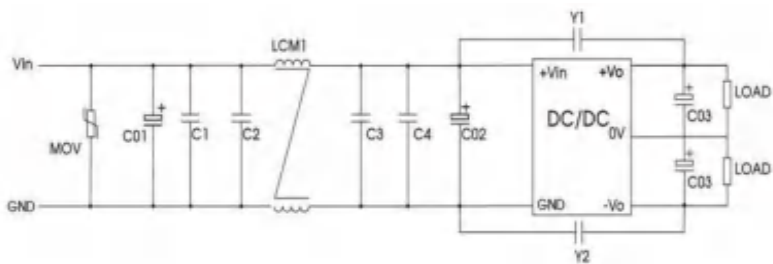


Fig.3-①

Parameter description:

Model	Parameter
C 1/C2	4.7 μ F/50V
C3/C4	10 μ F/50V
C01	680 μ F/50V
C02	330 μ F/50V
C03	100 μ F/50V
Y1/Y2	2.2nF/Y1
LCM1	10.0mH(Min.)/180m Ω (Max.)
MOV	14D470

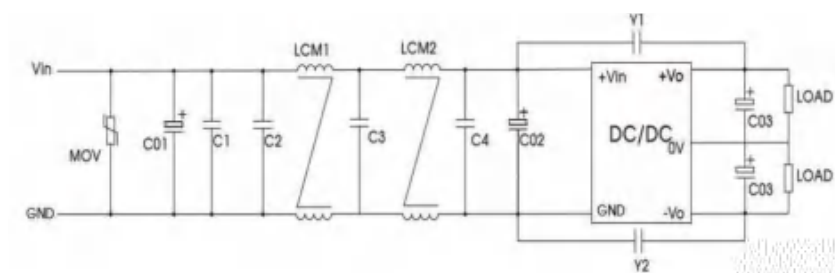


Fig.3-②

Parameter description:

Model	Parameter
C 1/C2	4.7uF/50V
C3	10uF/50V
C4	47uF/50V
C01	680uF/50V
C02	330uF/50V
C03	100uF/50V
Y1/Y2	2.2nF/Y1
LCM1/LCM2	10.0mH (Min.)/180m Ω (Max.)
MOV	14D470

3. Recommended scheme for thermal testing

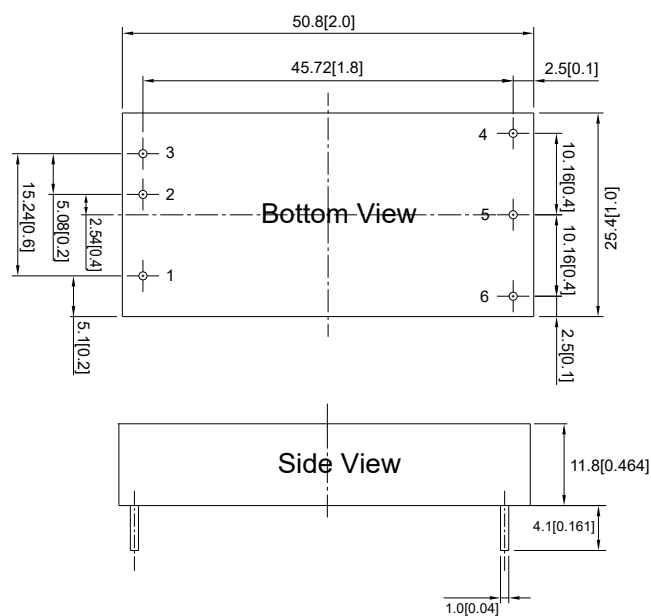
In the application process, the thermal design of the product can be evaluated with the product temperature derating curve; or by testing the temperature of point A in Fig.4 to determine the stable working range of the product, when the temperature of point A is lower than 100℃, it is the stable working range of the product.



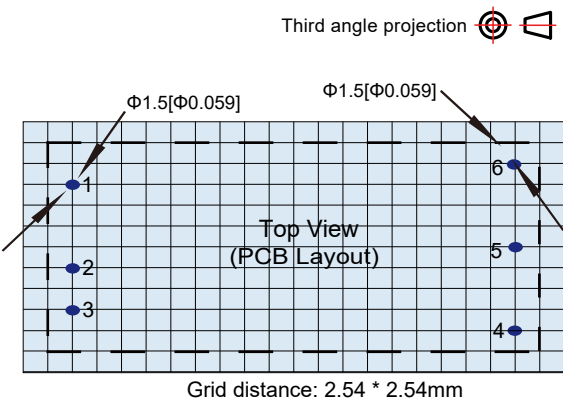
Fig.4

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

Packaging size and printing layout:

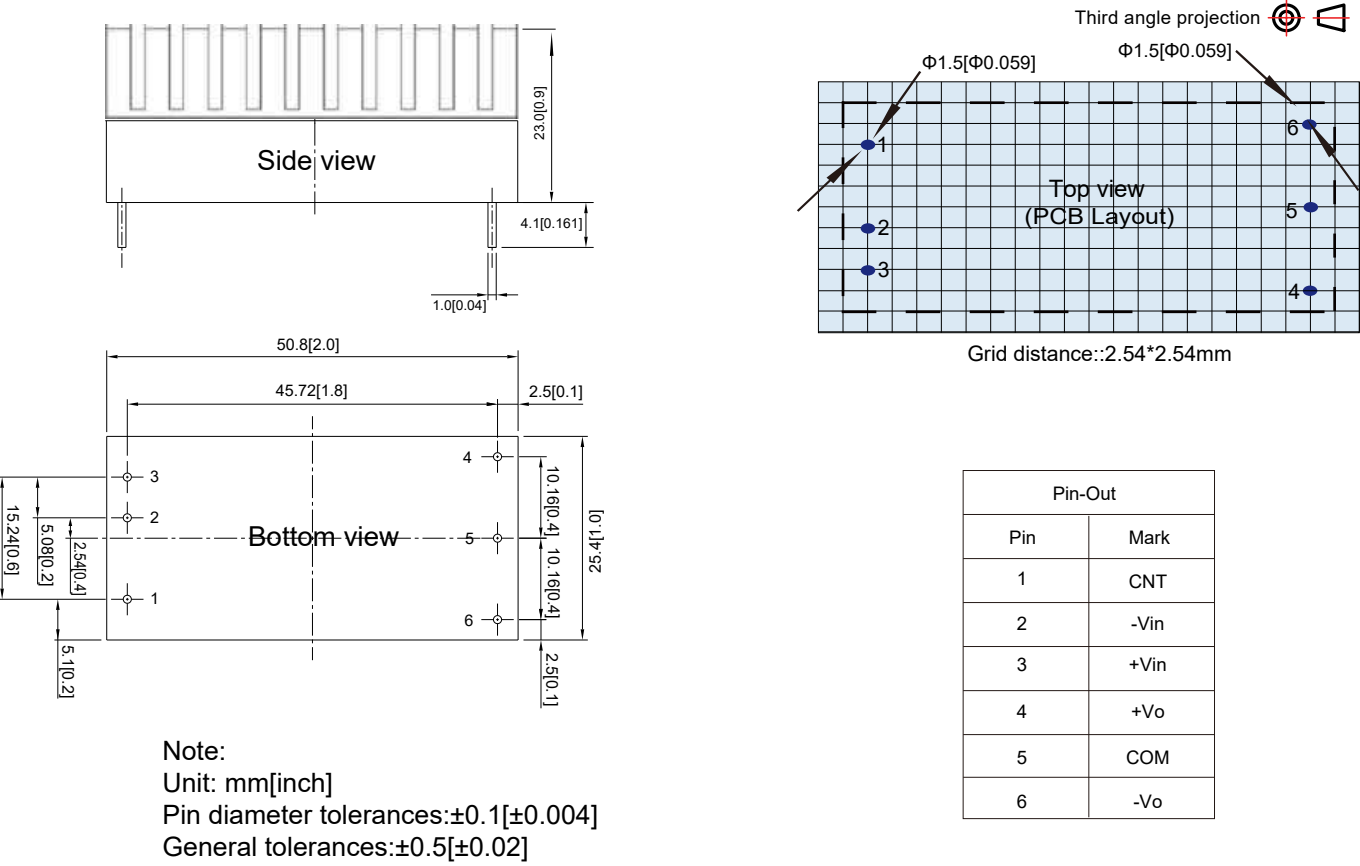


Note:
Unit: mm[inch]
Pin diameter tolerances:±0.1[±0.004]
General tolerances:±0.5[±0.02]



Pin-Out	
Pin	Mark
1	CNT
2	-Vin
3	+Vin
4	+Vo
5	COM
6	-Vo

Size with heat sink:



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