Description

D24ExxM150EN DC/DC converter has an input voltage range of 9V ~ 36V, an output power of 150W, and an operating temperature range of -55℃ ~ +105℃. It adopts PCB surface mount technology and is encapsulated in a metal case with potting. The product weighs about 60g, with input and output isolated. It is applied in DC power supply systems to realize the DC voltage conversion function. The module has the following characteristics:

Product Features

1. Enable control function
2. Fixed switching frequency
3. Input undervoltage protection
4. Output short-circuit protection
5. Output over-current protection
6. 1/8 brick package
7. Complies with GJB 10164-2021 "General Specification for Microcircuit Modules"

RoHS CE 3 years Warranty

1.Selection Guide

Product Model	Output Power (W)	Nominal Output voltage/Current	Efficiency (@24VDC, %/Typ.)	Max. Capacitive Load (μF)
D24E12M150EN	150	12V/12.5A	92	3300
D24E15M150EN	150	15V/10.0A	92	3300
D24E24M150EN	150	24V/6.25A	92	2200
D24E28M150EN	150	28V/5.36A	92	2200

2.Environmental Specifications

Item	Min.	Typ.	Max.	Unit	Remarks
Operating temperature	-55	25	105	℃	Baseplate temperature
Storage temperature	-55	25	125	℃	
Relative humidity	-	-	95	%	non-condensing
Pin Soldering Resistance Temperature	-	-	300	℃	Soldering time shall not exceed 10 seconds

3.Electrical Specifications

Input Specifications		Condition	Minimum	Typical	Maximum	Unit
Input voltage range		Iout=0～100%Io	9	24	36	V
Surge Voltage		0.1s	-	-	50	V
Input under-voltage protection	Starting voltage	Iout=0～100%Io	-	-	9.0	V
	Turn-off voltage		6.0	-	-	V
Enable control voltage[a] (negative logic)	Starting voltage	Ctrl to low or ground	-0.5	-	1.2	V
	Turn-off voltage	Ctrl to high or floating	3.5	-	12	V
Standby power consumption		Vin=24V Enable OFF	-	1.5	-	W
No-load power consumption		Vin=24V no-load	-	3	-	W
Temperature coefficient		Full load	-	-	0.02	%℃

Output Specifications		Condition		Minimum	Typical	Maximum	Unit
Output voltage		Vin=9V～36V full load		-	-	±1	%Vo
Output current		Vin=9V～36V		Refer to Selection Guide			A
Linear Regulation		Vin=9V～36V full load		-	-	±1	%
Current regulation		Iout=0%～100%Io		-	-	±1	%
Ripple & Noise		Vin=9V～36V full load BW=20MHz	12V/15V	-	200	-	mV
			24V/28V	-	300	-	
Over-voltage Protection[bc]		Vin=9V～36V half load		110	-	-	%Vo
Over-current Protection		Hiccup mode, self-recovery after overcurrent removal		110	-	-	%Io
Efficiency		Vin=24V full load		Refer to Selection Guide			%
Trim		Guaranteed when output is down Iout≤100%Io, Guaranteed when output is up Po≤150W		90	-	110	%Vo
Sense		Output power range		-	-	105	%Vo
Load dynamic response	Overshoot	Iout:50%load→75%load→50%load，di/dt=0.1A/us		-	-	±5	%Vo
	Recovery time[d]			-	-	500	μs
Start delay time[e]		Vin=0V→24V full load		-	-	100	ms
Output rise time		Vout rises from 10% to 90% full load		-	-	100	ms
Starting overshoot		Vin=9V～36V no-load and full load		-	-	5	%Vo
Capacitive load[f]		Purely resistive load test,full load		Refer to Selection Guide			μF
Short circuit protection		Hiccup mode		Automatic recovery after short circuit removal			

a) When the Ctrl pin is connected to a low level (-0.5V～1.2V), the product operates normally. When it is connected to a high level (3.5V～12V) or left floating, the product has no output.
b) The overvoltage protection mode is hiccup mode. After the overvoltage protection is released, the output voltage test result meets the electrical characteristic requirements.
c) The parameters are guaranteed by the design and are only tested during identification and design or process changes.
d) Recovery time refers to the time from the beginning of the transition until the output voltage returns to the corresponding stable value within ±1%.
e) The start-up delay time can be calculated either from the power supply's transition or from the time when the ctrl terminal is connected to a low level, until the output voltage rises to 10% Vout.
f) Capacitive loads do not affect the DC parameters.
Note: The above specification parameter test circuit refers to the typical application 4.2 and 4.3.

General Specifications		Condition	Minimum	Typical	Maximum	Unit
Insulation resistance[g]		Add 500VDC between input and output, between input and shell, between output and shell for 10s	100	-	-	MΩ
Switching frequency		Full load	-	330	-	kHz
Isolation voltage[gh]	Input-Output	t=1min set the leakage current to 1mA	1500	-	-	VDC
	Input-Housing		1500	-	-	
	Output-Housing		500	-	-	

g) The input leads are pins 1, 2 and 3, and the output leads are pins 4, 5, 6,7,8. During the test, the input leads need to be shorted together, and the output leads need to be shorted together;
h) Judgment criteria: the module shall be free of breakdown and arcing.

Physical characteristics	
Dimension	60.60*25.0*12.70mm
Weight	60g±5g（Type）
Cooling Method	Conduction Heat Dissipation

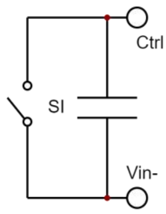
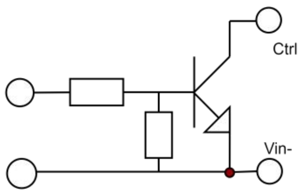
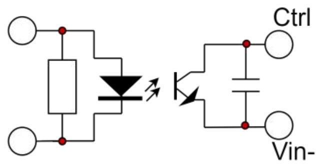
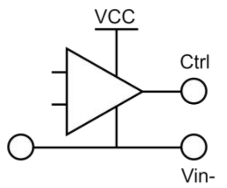
4.Typical Applications

4.1 Enable Control

The function of the positive and negative enable logic is as follows:

For positive logic enable, the module works normally when the control pin is connected to high level or floating, and is turned off when grounded or low level. For negative logic enable, the module works normally when the control pin is grounded or at low level, and is turned off when connected to high level or floating;

The enable pin of this model is negative logic. When the enable pin is left floating (or connected to high level), the product has no output. When not in use, the enable pin can be left floating; when using the enable pin, the product has output when the enable pin is connected to the input ground (or connected to low level) by means of a switch, etc.

Switching mode	Triode control mode	Optocoupler isolation control mode	Logic gate control mode
			

4.2 Application Diagram

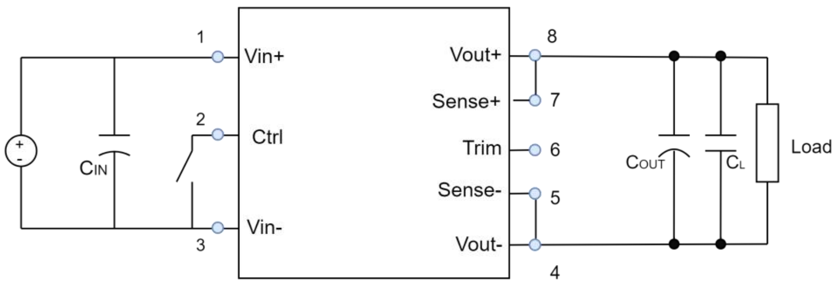


Fig.1 Application

Fig. 1 shows the typical application connection method of the module. The input terminals of the module power supply will have significant differences due to the length of the input source leads. In order to prevent input oscillation caused by excessively long input lines, it is recommended to add input capacitors near the input pins of the module. Similarly, an output capacitor should be added at the output end of the module:

Recommend parameters			
C_{IN}	Input capacitor: 100μF solid-state capacitor		
Cout	Solid-state capacitors with the capacitance values listed in the table below,		
	Output voltage（V）	12V/15V	24V/28V
	Value selection for Cout（μF）	470	220
C_L	Output capacitor: 1μF ceramic capacitor		
The above parameters can be adjusted according to the actual system application requirements, select the appropriate parameter values.			

4.3 Output Ripple Voltage Test Diagram

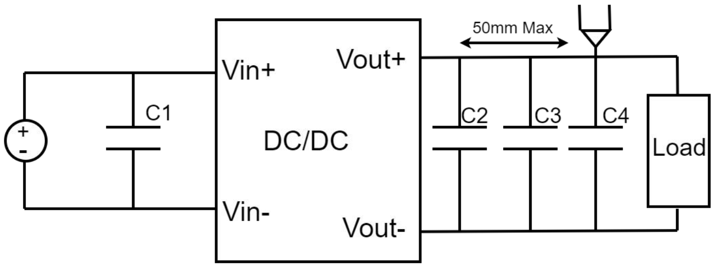


Fig.2 Schematic diagram of output ripple voltage

Ripple measurement is generally measured under the condition of rated input and output, the oscilloscope bandwidth is set to 20MHz, and the oscilloscope probe with the ground clamp removed is used to measure at a distance of about 3~5cm from the output end.

Note: The oscilloscope uses a bandwidth of 20MHz.

Recommend parameters

C1	Requires mounting close to the input pins of the module, recommend 100 μF solid-state capacitor		
C2	Solid-state capacitors, which are required to be installed close to the output pins of the module to better reduce the output ripple voltage and improve the output characteristics of the product in high and low temperature environments.		
	Output voltage（V）	12V/15V	24V/28V
	Value selection for C2（μF）	470	220
C3	1μF ceramic capacitor		
C4	10μF tantalum capacitor or ceramic capacitor		

4.4 EMI Filter Circuit Connection Diagram

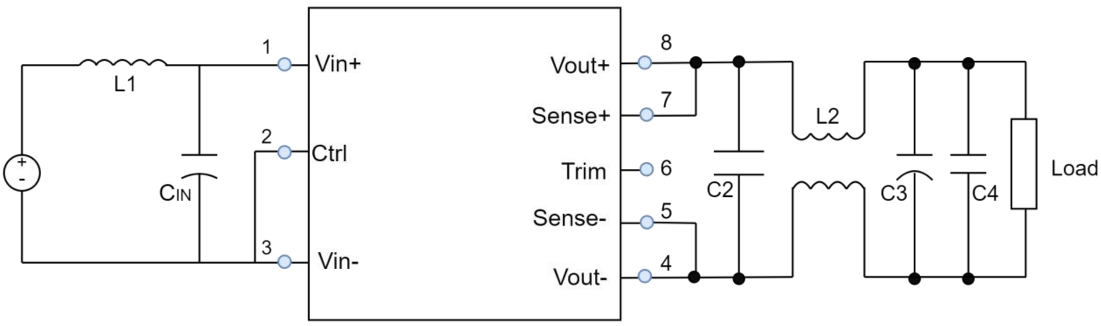


Fig.3 Link diagram of EMI filter circuit

L1, Cin and C2 should be connected close to the product pins, while C3 and C4 should be connected close to the load.. The inductance of L1 and L2 and the capacity of Cin ~ C4 should be selected according to the actual situation to meet the application requirements of the whole machine.

4.5 Sense Function Application Description

4.5.1.Do not use remote compensation

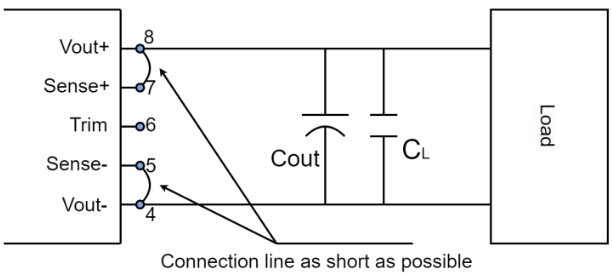


Fig. 4 Schematic Diagram of Sense Terminal Wiring

Note：

1) When remote compensation is not used, ensure that Vout and Sense ,Vout-and Sense-are shorted, and the compensation pin is not left floating. If there is no connection or wrong connection, it may cause permanent damage to the power module;

2) The connection between Vout and Sense, Vout-and Sense-is as short as possible and close to the terminal to avoid forming a large loop area. When noise enters this loop, it may cause instability of the module.

4.5.2.Using Remote Compensation

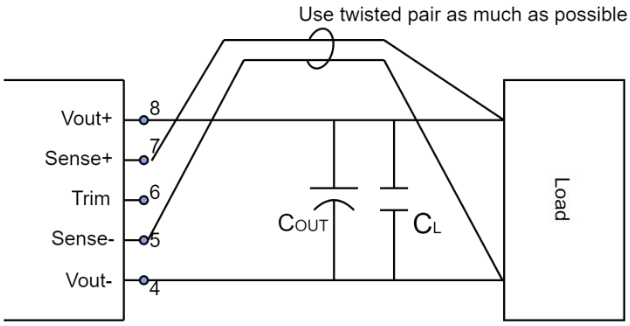


Fig. 5 Schematic Diagram of Sense Terminal Wiring

Note:

1) If the use of remote compensation lead is relatively long, it may lead to unstable output voltage. If you must use a longer remote compensation lead, please contact our technical staff;

2) If you use remote compensation, please use twisted pair or shielded wire, and make the lead as short as possible.

4.6 Trim Function Application Note

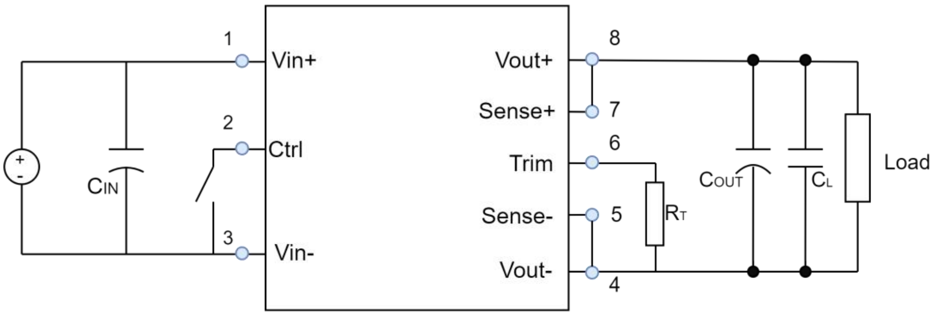


Fig. 6 Output Voltage Forward Regulation

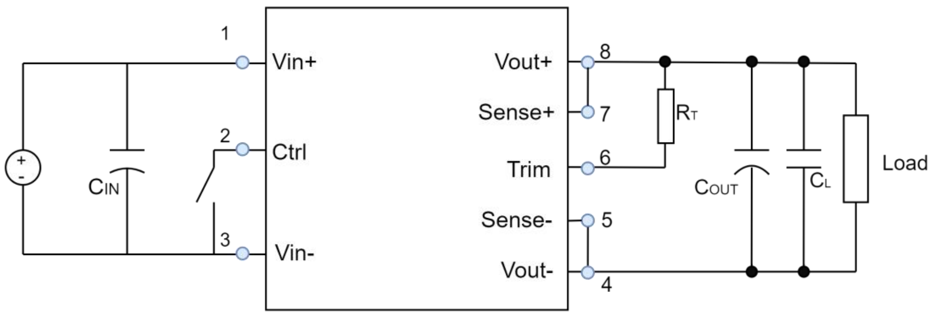


Fig. 7 Negative Regulation of Output Voltage

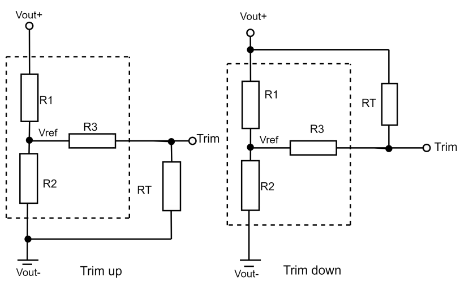


Fig. 8 Trim circuit (dashed box is inside the product)

The output voltage can be fine-tuned through external connection. The specific method is: 6-pin Trim is connected to 4-pin Vout through adjusting resistor for positive adjustment, and 6-pin TRIM is connected to 8-pin Vout through adjusting resistor for negative adjustment

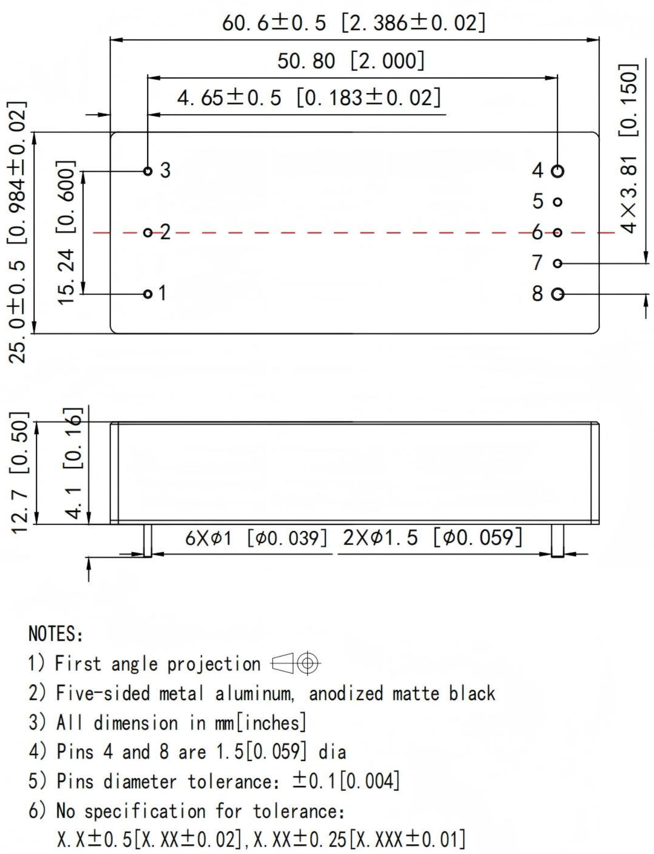
Trim resistance calculation formula:

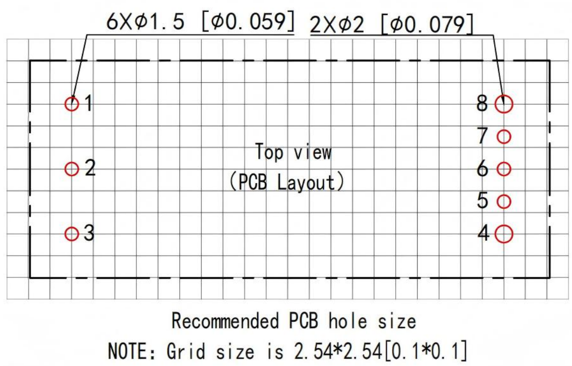
up: $R_T = \frac{aR2}{R2-a} - R3$ $a = \frac{Vref}{Vo'-Vref} \cdot R1$ RT is Trim resistance

$R_T = \frac{aR1}{R1-a} - R_3$ $a = \frac{Vo'-Vref}{Vref} \cdot R2$ a is a custom parameter and has no actual meaning.

Model	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
D24E12M150EN	9.49	2.49	4.3	2.5
D24E15M150EN	12.49	2.49	4.3	2.5
D24E24M150EN	21.5	2.49	4.3	2.5
D24E28M150EN	25.5	2.49	4.3	2.5

5.Dimension and Terminal Definition





No.	Symbol	Function
1	Vin+	Input positive end
2	Ctrl	Enable control end
3	Vin-	Input negative terminal
4	Vout-	Negative output terminal
5	Sense-	Output Sense negative terminal
6	Trim	Output voltage adjustment terminal
7	Sense+	Output Sense positive end
8	Vout+	Output positive terminal

Fig. 9 Terminal Arrangement (Top View, Pin Up) and Appearance Dimension

6. Precautions

6.1. Do not reverse the polarity of the power supply. Pay attention to the input voltage range, which is 9V～36V;

6.2. Please use wide PCB leads or thick wires between the power module and the load, and keep the line voltage drop below 1% Vo to ensure that the output voltage of the power module remains within the specified range;

6.3. The measurement of voltage must be conducted at the root of the module terminals, eliminating the measurement errors caused by the test tooling fixtures;

6.4. The impedance of the lead may cause output voltage oscillation or large ripple. Please make sufficient evaluation before use;

6.5. Prevent product collision;

6.6. Pay attention to the "1" pin (or ESD) identification, and weld according to the correct installation direction on the board;

6.7. Heat sink or other heat dissipation measures should be installed to ensure that the shell temperature is lower than the maximum operating temperature specified by the product. The operating temperature range of the product is: -55℃≤TC≤105℃;

6.8. Lead welding temperature is less than 300℃, and welding time should not exceed 10 seconds;

Note:
1. Our products shall be classified and stored according to ISO14001 and relevant environmental laws and regulations after being scrapped, and shall be handled by qualified units;
2. Except for special instructions, all indicators in this manual are measured when Ta = 25 °C, humidity <75%, nominal input voltage 24V and output rated load;
3. The test methods of all indicators in this manual are based on the company's enterprise standards;
4. Our company can provide customized products, specific needs can directly contact our technical personnel;
5. If the product involves multi-brand materials, please refer to the manufacturer's standards for differences such as different colors.

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