Description

D270ExxM500HPH DC/DC converter has input voltage range 180V ~ 425V, output power of 500W, with operating temperature range of -55℃ ~ +105℃. It adopts PCB surface mount technology and is encapsulated with aluminum case with potting. The product weighs about 135g, with input and output isolated. It is applied in industrial control, rail transit, military and other fields. 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. 1/2 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 (@28VDC, %/Typ.)	Max. Capacitive Load (μF)
D270E05M500HPH	400	5V/80A	92	10000
D270E12M500HPH	500	12V/41.7A	93	4700
D270E15M500HPH	500	15V/33.33A	94	4000
D270E24M500HPH	500	24V/20.83A	94	2000

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	180	270	425	V
Surge Voltage		0.1s	-	-	450	
Input under-voltage protection	Starting voltage	Iout=0～100%Io	-	-	178	
	Turn-off voltage		160	-	-	
Enable control voltage[a] (positive logic)	Starting voltage	Ctrl to high or floating	3.5	-	12	
	Turn-off voltage	Ctrl to low or ground	0	-	0.7	
Standby power consumption		Vin=270V Enable OFF	-	-	1.5	W
No-load power consumption		Vin=270V no-load	-	-	10	W
Temperature coefficient		Full load	-	-	0.02	%℃

Output Specifications		Condition		Minimum	Typical	Maximum	Unit
Output voltage		Vin=180V～425V full load		-	-	±2	%Vo
Output current		Vin=180V～425V		Refer to Selection Guide			A
Linear Regulation		Vin=180V～425V full load		-	-	±1	%
Current regulation		Iout=0%～100%Io		-	-	±1	%
Ripple & Noise		Vin=180V～425V full load BW=20MHz	5V	-	150	-	mV
			12V	-	120	-	
			15V	-	150	-	
			24V	-	200	-	
Over-voltage Protection[bc]		Vin=180V～425V		110	-	140	%Vo
Over-current Protection		Hiccup mode, self-recovery after overcurrent removal		110	-	150	%Io
Over-temperature protection		Surface temperature of the shell		-	110	-	℃
Efficiency		Vin=270V full load		Refer to Selection Guide			%
Trim		Guaranteed when output is down Iout≤100%Io Guaranteed when output is up Po≤500W		90	-	110	%Vo
Sense		Output power range		-	-	105	%Vo
Load dynamic response	overshoot	Iout:25%load→50%load→25%load, 50%load→75%load→50%load, di/dt=0.1A/us		-	-	±5	%Vo
	Recovery time[d]			-	-	500	μs
Start delay time[e]		Vin=0V→270V full load		-	50	100	ms
Output rise time		Vout rises from 10% to 90% full load		-	25	50	ms
Starting overshoot		Vin=180V～425V full load		-	-	3	%Vo
Capacitive load[f]		Purely resistive load full load		Refer to Selection Guide			μF
Short circuit protection		Lock mode		After the short circuit is removed, restore by re-powering on or resetting the enable pin.			

a) When the Ctrl pin is connected to a high level (3.5V ~ 12V) or left floating, the product operates normally. When it is connected to a low level (0V ~ 0.7V), the product has no output.
b) The overvoltage protection mode is lock 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 ± 2%.
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	2250	-	-	VDC
	Input-Housing		2500	-	-	
	Output-Housing		1500	-	-	

g) The input leads are pins 1, 2 and 3, and the output leads are pins 4, 5, 6. 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	60.6*63.1*12.80mm
Weight	135g±5g（Type）
Cooling Method	Conduction Heat Dissipation

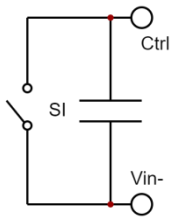
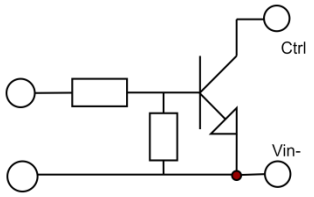
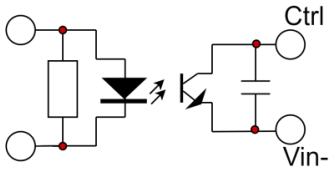
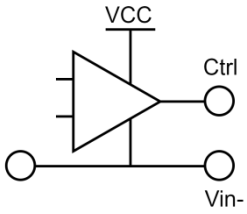
4. Typical Applications

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 positive logic. When the enable pin is left floating (or connected to high level), the product has output. When not in use, the enable pin can be left floating; when using the enable pin, the product has no 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

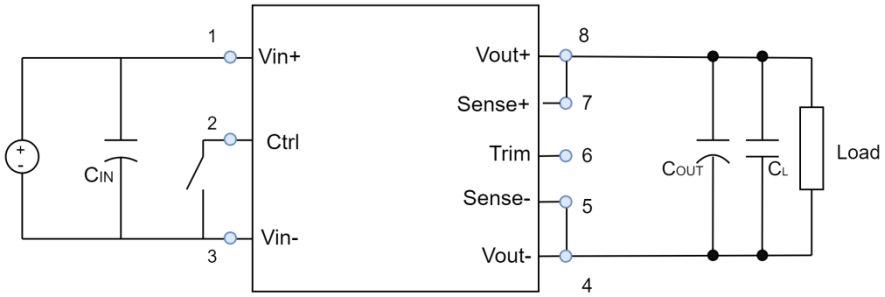


Fig. 1 Application

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 electrolytic capacitor, with a voltage rating of ≥450V
Cout	Output capacitor: 220μF ceramic capacitor or solid-state capacitor, with a voltage rating of ≥25V
C_L	Output capacitor: 1μF ceramic capacitor, with a voltage rating of ≥25V
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

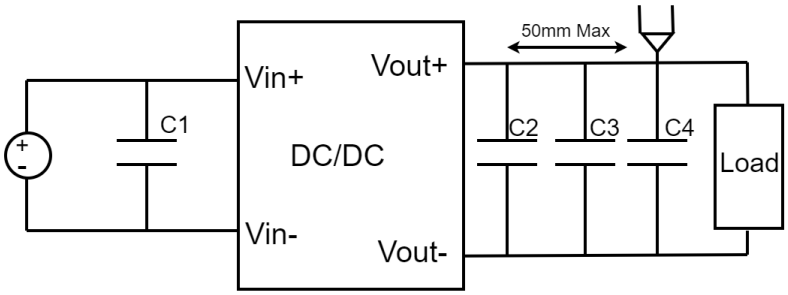


Fig.2: Schematic diagram of output ripple voltage

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/500V electrolytic capacitor
C2	Requires mounting close to the module's output pins, recommend a 220μF/25V ceramic capacitor to better reduce output ripple voltage and improve the product's output characteristics in high and low temperature environments.
C3	1μF/50V ceramic capacitor
C4	10μF/50V tantalum capacitor or ceramic capacitor

4.4 EMI Filter Circuit Connection Diagram

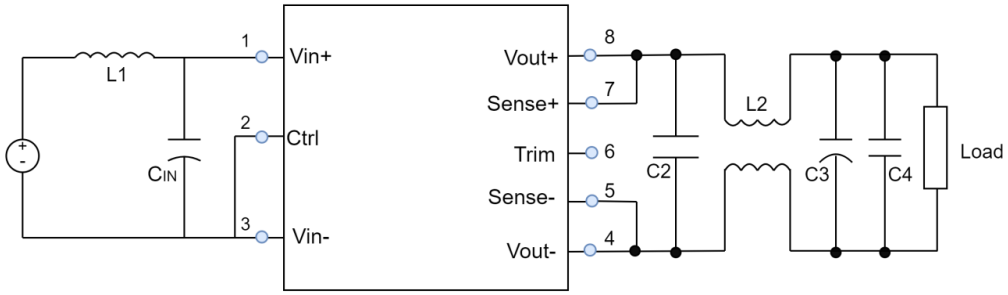


Fig.3 Link diagram of EMI filter circuit

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

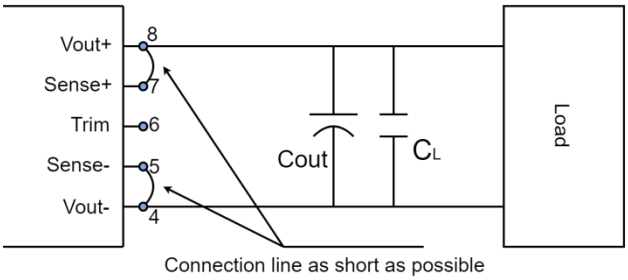


Fig. 4 Schematic Diagram of Sense Terminal Wiring

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

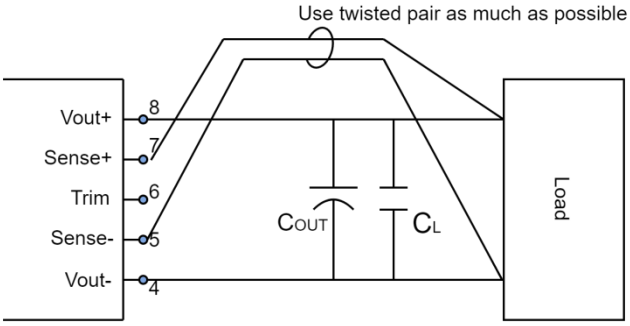


Fig. 5 Schematic Diagram of Sense Terminal Wiring

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

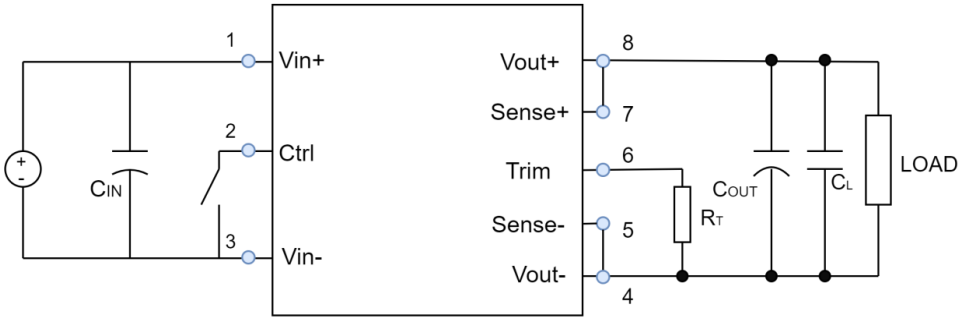


Fig. 6 Output Voltage Forward Regulation

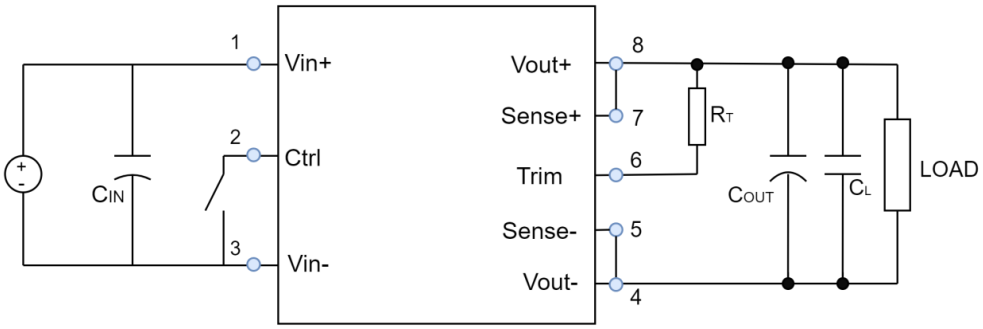


Fig. 7 Negative Regulation of Output Voltage

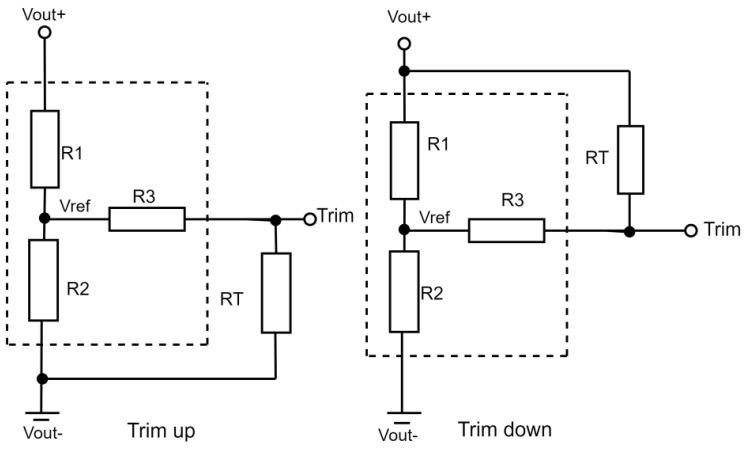


Fig. 8 Trim circuit (dashed box is inside the product)

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

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

Model	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
D270E05M500HPH	7.48	2.49	10	2.5
D270E12M500HPH	9.49	2.49	10	2.5
D270E15M500HPH	12.49	2.49	10	2.5
D270E24M500HPH	21.49	2.49	10	2.5

5.Dimension and terminal definition

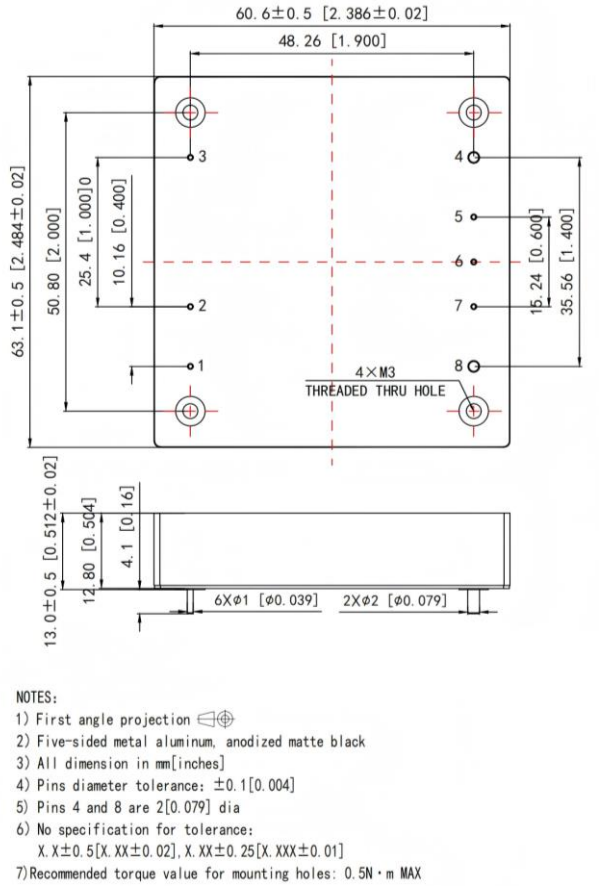
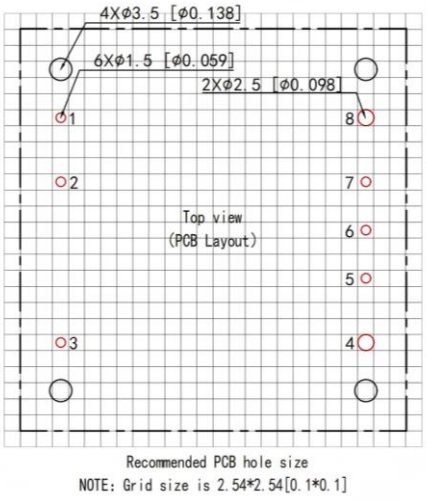


Fig. 9 Terminal Arrangement (Top View, Pin Up) and Appearance Dimension



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

6. Precautions

6.1. Do not reverse the polarity of the power supply.Pay attention to the input voltage range, which is 180V～425V;

6.2. Please use wide PCB leads or thick wires between the power module and the load, and keep the line voltage drop below 2% 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, according to the correct installation direction plate welding;

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 ℃, 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 ℃, humidity <75%, nominal input voltage 28V 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.