

## Description

D24ExxM5AP DC/DC converter has input voltage range 9V ~ 36V, output power of 5W, with operating temperature range of -55 °C ~ +105 °C. It adopts PCB surface mount technology and is encapsulated with aluminum case with potting. The weight of the product is about 5g, the input and output are isolated. It is applied the DC power supply systems to realize the DC voltage conversion function. The module has the following characteristics.

## Product Features

1. Compatible with 0.5\*0.5 inch package
2. Input undervoltage protection
3. Output short-circuit protection
4. Output over-current protection
5. Isolation voltage 500VDC
6. Anti-input surge voltage 50V/50ms
7. Complies with GJB 10164-2021 "General Specification for Microcircuit Modules"



3 years  
Warranty

## 1.Selection Guide

Product Model	Output Power (W)	Nominal Output voltage/Current	Efficiency (@24VDC, %/Typ.)	Max. Capacitive Load (μF)
D24E3R3M5AP	5	3.3V/1.51A	75	470
D24E05M5AP	5	5V/1.0A	76	470
D24E12M5AP	5	12V/0.41A	82	220
D24E15M5AP	5	15V/0.33A	82	220
D24E24M5AP	5	24V/0.21A	83	100
D24E28M5AP	5	28V/0.18A	83	100

## 2.Environmental Specifications

Item	Min.	Typ.	Max.	Unit	Remarks
Operating temperature	-55	25	105	°C	Base plate temperature
Storage temperature	-55	25	125	°C	
Pin Soldering Resistance Temperature	-	-	300	°C	Soldering time shall not exceed 10 seconds

## 3.Electrical Specifications

Input Specifications		Condition	Minimum	Typical	Maximum	Unit
Input voltage range		$I_{out}=0\sim 100\%I_o$	9	-	36	V
Surge Voltage		50ms	-	-	50	
Input undervoltage protection	Starting voltage	$I_{out}=0\sim 100\%I_o$	7.0	-	9.0	
	Turn-off voltage		6.5	-	8.5	
Enable control voltage <sup>a</sup> (positive logic)	Starting voltage	Ctrl to high or floating	3.5	-	10.0	
	Turn-off voltage	Ctrl to low or ground	0	-	1.2	

Output Specifications	Condition	Minimum	Typical	Maximum	Unit
Output accuracy	$V_{in}=9V\sim 36V$ full load	-	-	$\pm 1$	%Vo

Output Specifications		Condition		Minimum	Typical	Maximum	Unit
Output current		Vin=9V~36V		Refer to Selection Guide			A
Linear Regulation		Vin=9V~36V full load		-	-	± 1	%
Current regulation		Vin=24V no-load→full load		-	-	± 1	
Ripple & Noise		full load BW=20MHz	3.3V	-	-	80	mV
			5V	-	-	80	
			12V	-	-	100	
			15V	-	-	100	
			24V	-	-	120	
			28V	-	-	120	
Over-current Protection		Hiccup mode		110	-	160	%
Efficiency		Vin=24V full load		Refer to Selection Guide			%
Load dynamic response	Overshoot	Iout:20%→50%→20%load di/dt=0.1A/us		-	-	5	%
	Recovery time <sup>b</sup>			-	-	500	μ s
Start delay time <sup>c</sup>		Vin=0V→24V full load		-	-	10	ms
Output rise time		Vout rises from 10% to 90% full load		-	-	10	ms
Starting overshoot		Vin=9V~36V		-	-	5	%
Capacitive load <sup>d</sup>		Full load Pure resistive load		Refer to Selection Guide			μ F
Short circuit protection		Hiccup mode		Automatic recovery			
a) When the Ctrl pin is connected to the high level (3.5V ~ 10V), the product operates normally. When it is connected to low level (0V ~ 1.2V) or the floating, the product has no output. b) Recovery time refers to the time from the beginning of the transition until the output voltage returns to the corresponding stable value within ± 1%. c) 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. d) 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 <sup>e</sup>		Add 500VDC between input and output, between input and shell, between output and shell for 10s	100	-	-	MΩ
Isolation voltage <sup>ef</sup>	Input-Output	t=1min set the leakage current to 1mA	500	-	-	VDC
	Input-Housing		500	-	-	
	Output-Housing		500	-	-	
e) The input leads are pins 1, 2 and 3, and the output leads are pins 4, 5. During the test, the input leads need to be shorted together, and the output leads need to be shorted together; f) Judgment criteria: the module shall be free of breakdown and arcing.						

Physical characteristics	
Dimension	12.70*12.70*10.80mm
Weight	5g±3g (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

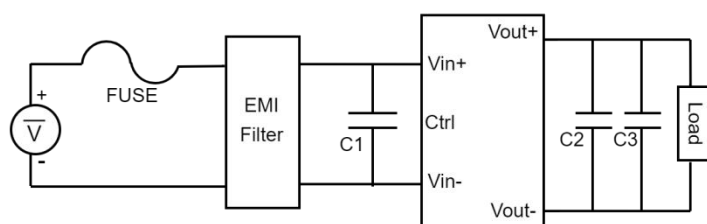


Fig. 1 Application

Note: A electrolytic capacitor of at least 100 $\mu$ F must be connected in parallel at the input terminal to suppress the surge voltage that may occur at the input terminal. If further reduction of input and output ripple is required, the external capacitors C1, C2, and C3 at the input and output can be increased, or capacitors with small series equivalent impedance can be selected, but the capacitance value shall not be greater than the maximum capacitive load of this product.

Symbol	Component Description
C1、C2、C3	Ceramic capacitor with capacitance not less than 4.7 $\mu$ F
The above parameters can be adjusted according to the actual system application requirements, select the appropriate parameter values.	

### 4.3 EMI Filter Circuit Connection Diagram

When the subsequent equipment has high requirements for ripple or is particularly sensitive to interference, a common-mode inductor filter should be added at the output terminal. The recommendations are as follows:

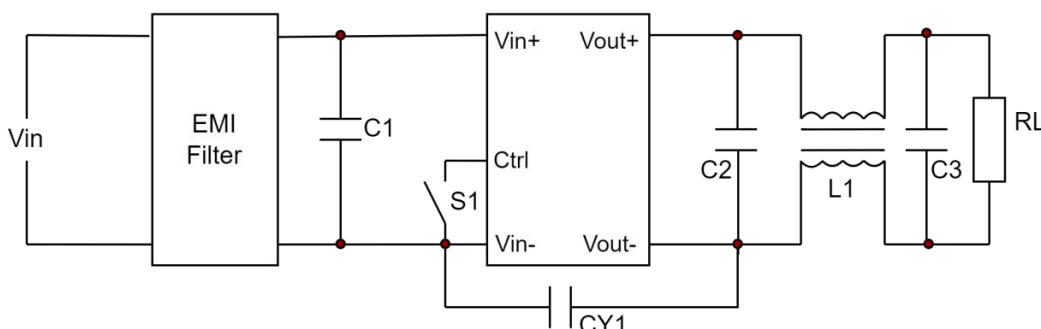


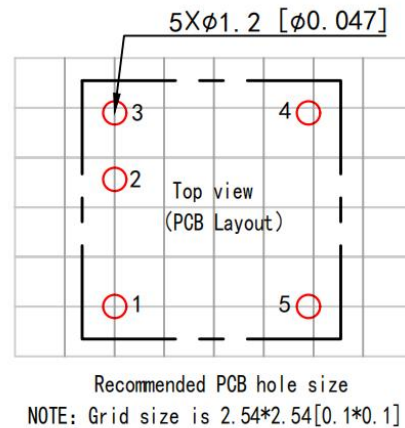
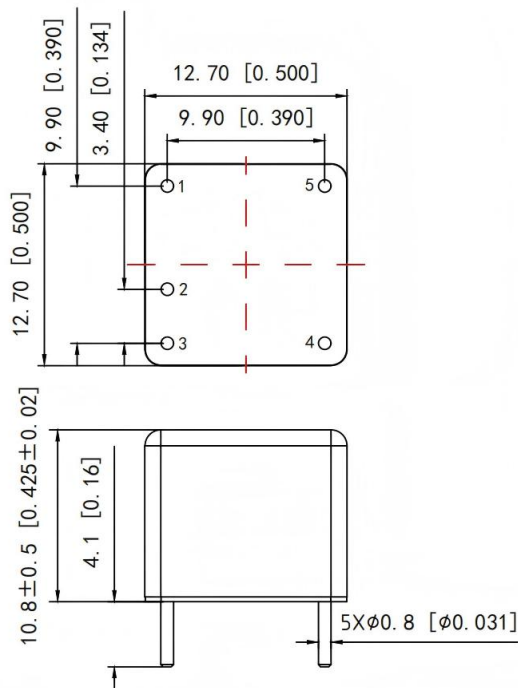
Fig.2 Link diagram of EMI filter circuit

Note: A electrolytic capacitor of at least 100 $\mu$ F must be connected in parallel at the input terminal to suppress any possible surge voltages. To further reduce input/output ripple, increase the capacitance values of external capacitors C1 and C2, or select capacitors with low equivalent series resistance (ESR). However, the total capacitance must not exceed the maximum capacitive load specified for this product.

Symbol	Component Description
EMI Filter	Filter (it is recommended to select an internal two-stage common-mode filter circuit), and the rated current is selected according to the actual power of the module.
C1	Ceramic capacitor, with a capacitance of not less than 4.7 $\mu$ F.
L1	Common-mode inductor, the current is selected according to the magnitude of the output current (it is recommended to select nanocrystalline ring material, and the inductance is more than 100 $\mu$ H).
C2	Ceramic capacitor, with a capacitance of not less than 4.7 $\mu$ F.

CY1	Ceramic capacitor, 4.7nF/2000V.
S1	S1 is the enable control circuit.
The above parameters can be adjusted according to the actual system application requirements, select the appropriate parameter values.	

### 5.Dimension and Terminal Definition



- NOTES:
- 1) First angle projection
  - 2) Five-sided metal aluminum, anodized matte black
  - 3) All dimension in mm[inches]
  - 4) Pins diameter tolerance:  $\pm 0.1 [0.004]$
  - 5) No specification for tolerance:  
 $X.X \pm 0.5 [X.XX \pm 0.02]$ ,  $X.XX \pm 0.25 [X.XXX \pm 0.01]$

Fig. 3 Terminal Arrangement (Top View, Pin Up) and Appearance Dimension

No.	Symbol	Function
1	Vin+	Input positive end
2	Vin-	Input negative terminal
3	Ctrl	Enable control end
4	Vout-	Negative output terminal
5	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 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, 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:  $-55^{\circ}\text{C} \leq \text{TC} \leq 105^{\circ}\text{C}$ ;
- 6.8. Lead welding temperature is less than 300 °C, welding time should not exceed 10 seconds;

**Note:**

1. Our products shall be classified and stored according to ISO17501 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  $T_a = 25\text{ }^{\circ}\text{C}$ , 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.