Description

D28CxxM50KN DC/DC converter has input voltage range 16V ~ 40V, output power of 50W, with operating temperature range of -55℃ ~ +105℃. It adopts PCB surface mount technology and is encapsulated with metal case with potting. The product weighs about 35g, 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

RoHS CE 3 years Warranty

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

1.Selection Guide

Product Model	Output Power (W)	Nominal Output voltage/Current	Efficiency (@28VDC, %/Typ.)	Max. Capacitive Load (μF)
D28C05M50KN	50	05V/10.0A	87	2000
D28C12M50KN	50	12V/4.20A	88	1000
D28C15M50KN	50	15V/3.40A	88	820
D28C24M50KN	50	24V/2.08A	88	820
D28C28M50KN	50	28V/1.80A	88	820

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	16	28	40	V
Surge Voltage		0.1s	-	-	50	
Input undervoltage protection	Starting voltage	Iout=0～100%Io	-	-	16.0	
	Turn-off voltage		13.0	-	-	
Enable control voltage[a] (negative logic)	Starting voltage	Ctrl to low or ground	-0.5	-	1.2	
	Turn-off voltage	Ctrl to high or floating	3.5	-	12	
Standby power consumption		Vin=28V Enable OFF	-	-	0.8	W

No-load power consumption	Vin=28V no-load	-	-	1	W
Temperature coefficient	Full load	-	-	0.02	%℃

Output Specifications	Condition		Minimum	Typical	Maximum	Unit
Output voltage	Vin=16V～40V full load		-	-	±1	%Vo
Output current	Vin=16V～40V		Refer to Selection Guide			A
Linear Regulation	Vin=16V～40V full load		-	-	±1	%
Current regulation	Iout=0%～100%Io		-	-	±1	%
Ripple & Noise	Vin=16V～40V full load BW=20MHz	05V	-	100	-	mV
		12V	-	120	-	
		15V	-	150	-	
		24V	-	180	-	
		28V	-	200	-	
Over-voltage Protection[bc]	Vin=16V～40V full load		110	130	140	%Vo
Over-current Protection	Hiccup mode, self-recovery after overcurrent removal		110	-	180	%Io
Efficiency	Vin=28V full load		Refer to Selection Guide			%
Trim	Guaranteed when output is down Iout≤100%Io Guaranteed when output is up Po≤50W		90	-	110	%Vo
Load dynamic response overshoot	Iout:50% load→75% load→50% load, di/dt=0.1A/us		-	-	±5	%Vo
Load dynamic response Recovery time[d]			-	-	400	μs
Start delay time[e]	Vin=0V→28V full load		-	-	100	ms
Output rise time	Vout rises from 10% to 90% full load		-	-	100	ms
Starting overshoot	Vin=16V～40V 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～25V) or left floating, the product has no output.
b) The overvoltage protection mode is clamping 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 the accuracy range.
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	-	300	-	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. 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	50.8*25.4*11.70mm
Weight	35g±5g（Type）
Cooling Method	Conduction Heat Dissipation

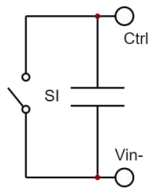
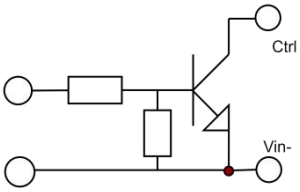
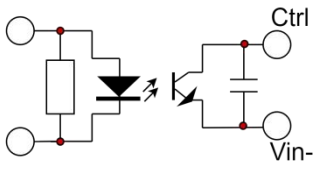
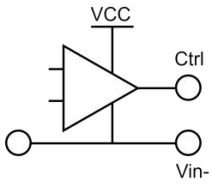
4.Typical Applications

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

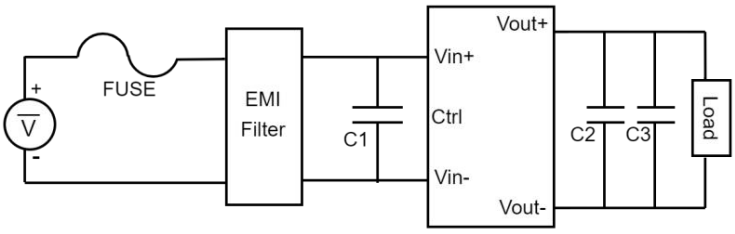


Fig.1 Application

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						
C1	Input capacitance: 100μF electrolytic capacitor					
C2	Output capacitance: The capacitance values in the table below are for solid - state capacitors					
	Output voltage（V）	5	12	15	24	28
	Value selection for C2（μF）	100	68	47	47	47
C3	Output capacitance：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

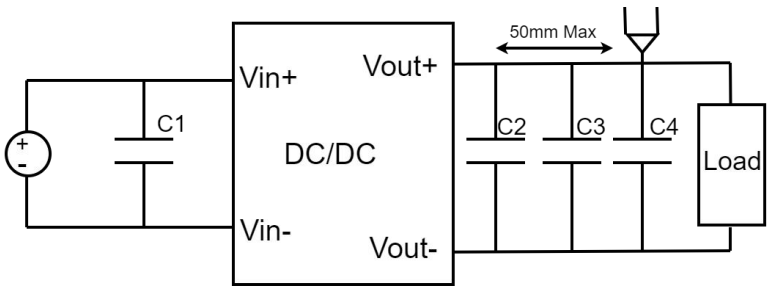


Fig.2 Schematic diagram of output ripple voltage

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 ceramic capacitor or solid-state capacitor					
C2	Ceramic capacitors with the capacitance values listed in the table below, 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）	5	12	15	24	28
	Value selection for C2（μF）	100	68	47	47	47
C3	1μF ceramic capacitor					
C4	10μF tantalum capacitor or ceramic capacitor					

4.4 Trim Function Application Note

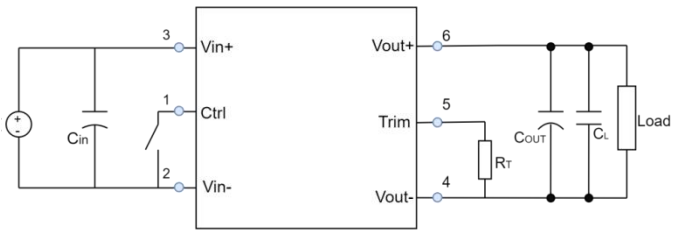


Fig 3: Functional application diagram of Trim

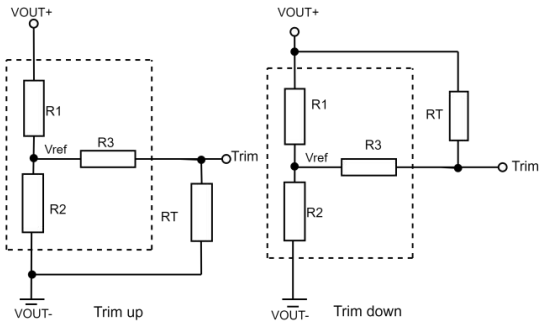


Fig.4 Trim circuit (dashed box is inside the product)

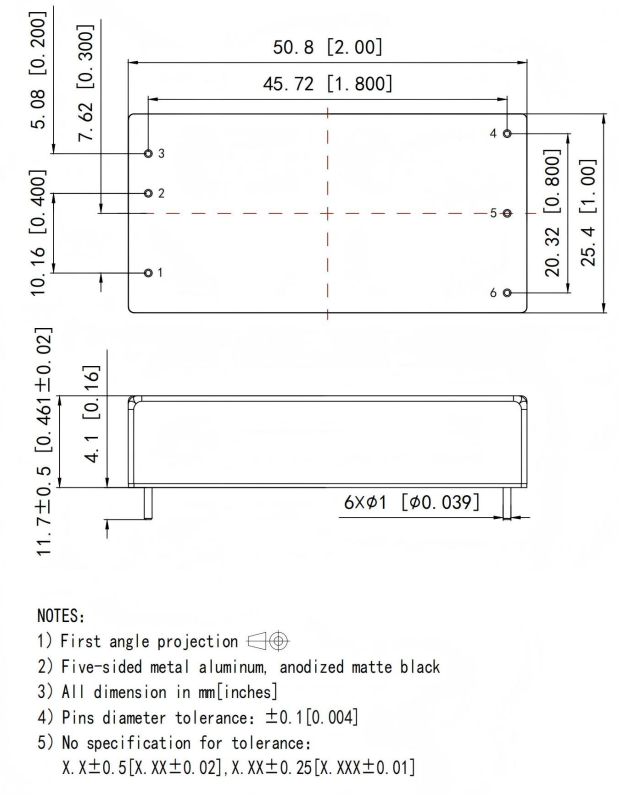
Trim resistance calculation formula:

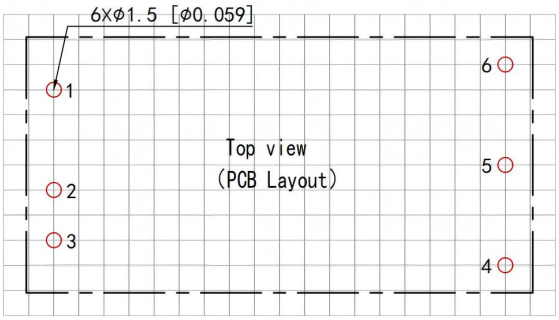
up:$R_T=\frac{aR2}{R2-a}-R3$ $a=\frac{Vref}{Vo'-Vref}\cdot R1$ RT is Trim resistance

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

Model	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
D28C05M50KN	7.48	2.49	4.3	1.25
D28C12M50KN	9.49	2.49	4.3	2.5
D28C15M50KN	21.5	2.49	4.3	2.5
D28C24M50KN	21.5	2.49	4.3	2.5
D28C28M50KN	21.5	2.49	4.3	2.5

5.Dimension and Terminal Definition





Recommended PCB hole size
NOTE: Grid size is 2.54*2.54[0.1*0.1]

No.	Symbol	Function
1	Ctrl	Enable control end
2	Vin-	Input negative terminal
3	Vin+	Input positive end
4	Vout+	Output positive terminal
5	Vout-	Negative output terminal
6	Trim	Output voltage adjustment 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 16V ~ 40V;
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 °C≤TC≤ 105 °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 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 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.