FHMP5 Series High-Temperature DC-DC Power Converters

Features

- Working temperature: ambient temperature:-55℃～+175℃ and shell temperature: +185℃
- Output power: 5W
- Size: L35×W17.5×H8.5mm
- Output channels up to three and up to two isolated outputs (3.3V, 5V, 7V, 9V, 12V, 15V, 18V, 24V, 36V, 48V)
- Output ripple: max. 70mV, typical 25mV
- Conversion efficiency: typical 81%
- Input range: 4.5～15V, 10～30V, 16～48V, 24～72V, 36～108V , 70～210V
- Integrated LC EMI filter
- Insertion pin and baseplate are integrated to reduce vibration to the module through the insertion pin
- The shell is laser welded, and the inside is sealed with super high thermal conductivity sealant. Smaller temperature gradient in interior and enclosure, shock and moisture resistance, electromagnetic radiation protection
- Provide rated power without deduction at 175℃ (shell), provide 75% rated power at185℃
- Isolation voltage between input and output: 1000V; isolation voltage between outputs: 500V
- Restart after over-voltage and over-current shutdown
- Input under-voltage and overvoltage cut-off protection
- 100MS soft start
- 210℃ overheat protection

Description

FHMP5 series 5W high temperature DC-DC power converters are specially designed for electronic equipment working in harsh environments. We have upgraded the FHP5 series, and the size has been reduced by 1/3 under the premise that various electrical parameters have been improved and reliability has more than doubled.

FHMP5 series can continuously work for 4000 hours at shell temperature 150℃, for 1500 hours at shell temperature 175℃ and for 800 hours at shell temperature 185℃. With features of being resistant to high temperature, impact and humidity, it is particularly suitable for being used as power supply system for petroleum prospecting logging tool, petroleum drilling instrument, geophysical detecting instrument, vehicles, telecommunication, network infrastructures, enterprise and high-performance calculation, etc.

It has six input ranges, one more than FHP5, including 4.5～15V, 10～30V, 16～48V, 24～72V, 36～108V, 70～210V. the low voltage range 4.5～15V is added. The output voltages designed include 3.3V, 5V, 7V, 9V, 12V, 15V, 18V, 24V, 36V and 48V. The output can be either of them and combinations of any two, three or four voltages. The output can provide two isolation grounds at the most. When used, they can be connected as needed to form various forms of output combinations for ease of use.

The output voltage fluctuates within 0.3V over the whole operating temperature range and under the condition of full load and no load transformation. The output precision of 3.3V voltage is within 0.15V. FHMP5 series operates at frequencies up to 300KHZ, providing good filtering conditions. Without any filtering, its output voltage ripple is less than 70MV. The temperature stability of the frequency is ±8% over the whole temperature range.

The output of the terminal MOUT is the main output, and the output of the terminal AOUT is the auxiliary output. Terminals MOUT and AOUT are generally symmetry of positive and negative, but can also be one output or asymmetry of two

outputs. The main outputs are not isolated and auxiliary outputs are not isolated, too. But the main outputs and auxiliary outputs can be isolated or not isolated. It can only have main output without auxiliary output. If there is auxiliary output, the total number of main and auxiliary outputs should not exceed three.

The voltage output by the main output terminal MOUT is the most stable. If the main output is symmetry of positive or negative, and both positive and negative will sample to feedback voltage regulation. Its voltage is required to be large or equal to 3.3V. If the main output is asymmetric of two ways, one way samples 80% feedback voltage regulation and the other way samples 20% feedback voltage regulation. The voltage of one way must be greater than 5V. The output power of the main output is required to be greater than that of the auxiliary output. And the main sampling voltage output power in the main output is required to be maximum.

The output voltage and ripple of the main output do not vary with the power variation of the main output voltage and the auxiliary output voltage. In the case that the output power of the main output terminal MOUT is constant, the voltage of the auxiliary output terminal AOUT decreases with the increase of its output power, up to 2%. If the output power of the auxiliary output terminal AOUT is constant, their output voltage will increase with the output power of the main output MOUT. Because of this feature, the main output and auxiliary output must be clearly defined when selecting models. For example, the module FHMP5-150S12S24-S5 outputs voltages 12V, 24V and 5V, where 12V and 24V from MOUT, and 12V is from the main sampling. 5V is from AOUT. Thus the module is named as FHMP5-DCINSMOUT-SAOUT. "-" means isolation, which may not appear in a model, it means that the main outputs are not isolated. S*** can also be D*** or S***S***. Up to three S*** in one model. D*** stands for two S*** of positive and negative.

In the use of multi-output module, if the power of an output (main or auxiliary) dynamically changes, it will cause the auxiliary output voltage to fluctuate accordingly. If the fluctuation is greater than 50mA, measures must be taken. The voltage fluctuation above 50mA appears when output power varies between the rated power of below 10% and above 70%. The fluctuation increases along with the rise of proportion of high and low output power. The fluctuation frequency is equal to the frequency of power variation. At this time, the secondary filtering is thus considered. If the fluctuation frequency of power is less than 10KHz, there will be trouble in filtering. Then it is necessary to reduce the number of output ways of main converter and add secondary DC/DC converter to re-convert additional voltage. If the fluctuation frequency of power is greater than 10KHz, the simple filtering is able to remove the fluctuation.

During use, when an output power (main or auxiliary) varies between the rated power of above 10% and below 70%, its voltage fluctuation generally is less than 50mV and this fluctuation can be neglected in general.

FHMP5 series contain LC network, which can effectively reduce input current fluctuation and output voltage fluctuation. When we developed this series, we had established the most authoritative R$S certification test system certified by EMI in the industry. We used it to design the input-output LC network contained in FHMP5, making the input current fluctuation and output voltage fluctuation and interference are more than twice as much as those of the FHP5 series.

FHMP5 series contain 100MS soft start circuit, which can slowly increase the input current after module startup and elimination of fault, facilitating external large capacity of output filter capacitance and reducing start shock.

FHMP5 series contain undervoltage and overvoltage shutoff, which makes the module stop working when it exceeds the input voltage range and protects the module. Undervoltage overvoltage shutoff voltage is within 5V of rated voltage epitaxy. For example, with an input range rated from 24 to 72V, its undervoltage shutoff voltage is 21 to 23.9V, and its overvoltage shutoff voltage is 72.1 to 77V.

FHMP5 series power converters contain the output short circuit and overload automatic cut-off circuit. When the output lasts for 0.1s and exceeds 120% of the rated output power, the converters will cut off all outputs. After the over-current fault is eliminated, it will automatically resume the output voltage. If the overload duration of output is less than 01s, the converter will not act.

FHMP5 series operate at frequencies up to 300KHZ, providing good filtering conditions. Without any filtering, its output voltage ripple is less than 70MV.

Key components used for the FHMP5 series power converters completely pass the in-factory test in accordance with the national military product quality standard, including live aging for 24-72 hours under the temperature of +175℃. All finished products have experienced full-load operation for 8 hours under the temperature of +175℃ before delivery so as to fully check the damage to the components during the production process and hence ensure the reliability of products.

Technical Parameters

（1） Working temperature: -55℃ ~ +175℃, Max. shell temperature: +185 ℃.
（2） Input voltage: 4.5～15V, 10～30V, 16～48V, 24～72V, 36～108V, 70～210V
（3） Output channels up to three and up to two isolated outputs
(3.3V, 5V, 7V, 9V, 12V, 15V, 18V, 24V, 36V, 48V)
（4） Output ripple: 70mVp-p, typical 25mVp-p
（5） Output power: 5W
Provide rated power without reduction at 175℃ (shell); provide 75% of rated power at 185℃ (shell)
（6） Output precision: less than 4.5%
（7） Load regulation: less than 4%
（8） Temperature stability: Less than ±2.0% , typical ±1%
（9） Line regulation: ±0.1%(10% linear variation)
（10） Shock resistance: 40G, 0 ~ 600Hz
（11） Conversion efficiency: 73%-87%
（12） Static power consumption: 0. 5WMax.
（13） Overheat shutoff at 210℃
（14） Dimension: L35×W17.5×H8.5mm
（15） Isolation voltage between input and output: 1000V; isolation voltage between outputs: 500V
（16） Voltage output type: pin

Service Requirements

As the power converter has nearly 1W power consumption under the condition of full-load operation and its size are small, good medium is necessary to be added between the shell of the power converter and the radiator so as to ensure the temperature of the converter shell to be less than 185℃.

Module shell is isolated from input and output. In the use of the module, it is generally installed directly on the framework of the instrument or equipment. The framework is used as a radiator. At the time, if the ripple cannot continue to be filtered by the electricity capacity or LC network, then the ripple that cannot be filtered is EMI interference. EMI filtering module should be added to the input and output terminals of FHMP5. As we have added EMI network to input and output terminals inside converter, so long as the shell is suspended, it will function. To make internal EMI function, the shell of filtering converter should be suspended not to connect with radiator, input and output ground wires. If it is connected to either of them, EMI filtering converter will not function properly. To suspend shell, it usually puts heat-conducting pad, ceramics backing or silicon rubber pad between the shell and radiator. If the ripple is still large, it is needed to externally connect input or output EMI filter outside the

shell. The input and output of the module shall have a maximum of three ground wires. If any of them need to be connected together, they must be connected at a place less than 1CM from the outgoing module. The shorter the line of the connection point from the module, the less interference.

If the input and output need to be isolated, there is no need for isolation between outputs, but the module output has chosen the isolated type, the connection between the output and output places is optional, there is no requirement.

Model Naming Rules

FHMP5-DCINSMOUT-SAOUT

FHMP 5--28D12—S5

Series code
FHMP series

Output pwoer
5W

Input voltage
5（4.5～15V）
15（10～30V）
28（16～48V）
48（24～72V）
50（36～108V）
150（70～210V）

Auxiliary output voltage
(3.3,5,7,9,12,15,18,24,36,48)

Main output voltage
(3.3,5,7,9,12,15,18,24,36,48)

Output mode
S Single
D Dual

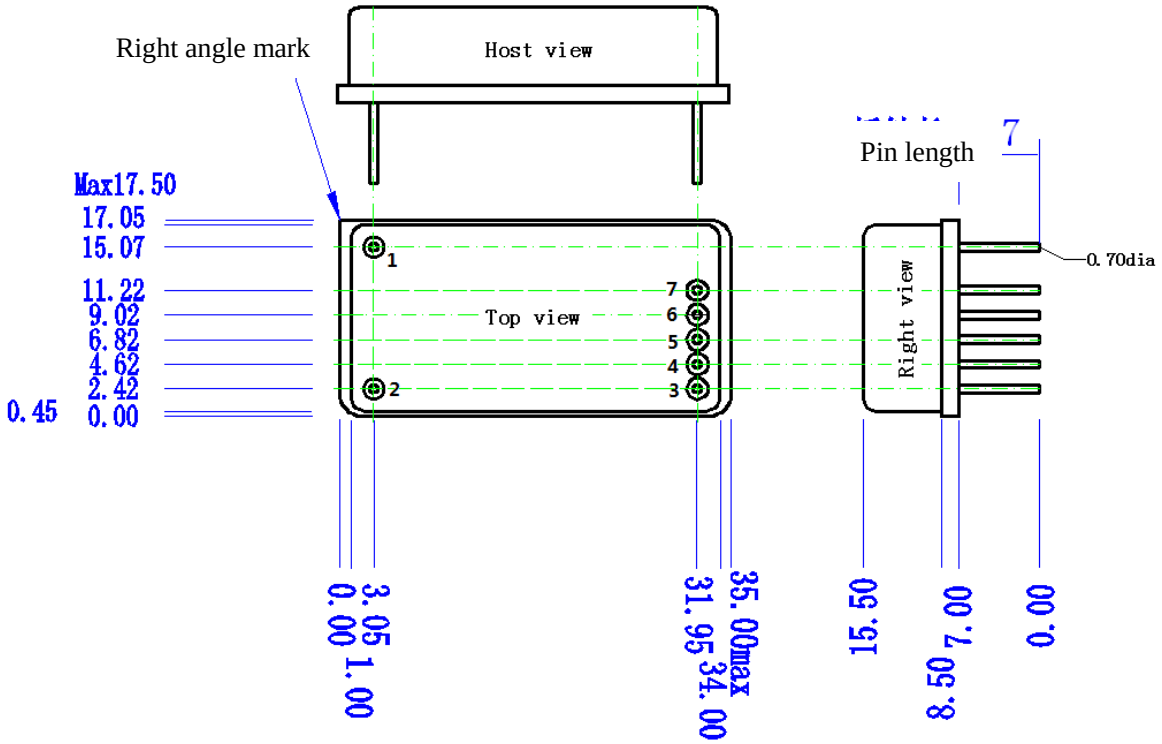
Note: "—" in the above model means isolation, that is input is always isolated from output, so the first "—" is required. If the main output is not isolated from the auxiliary output, there is no the second "—". There will be no —SAOUT, if there is no the auxiliary output.

Model example: in FHMP5-150D15-S5, MOUT outputs ±15V, AOUT outputs 5V. There is isolation between the main output and auxiliary output.

In **FHMP5-50S15S3.3-S5, MOUT outputs +15V and +3.3V, AOUT outputs 5V. In the case that MOUT has two output channels, when the module outputs stable voltage, the feedback sampling takes 80% of the voltage in the front row and only 20% of the voltage in the back row.**

In **FHMP5-50S15S3.3S5, outputs are not isolated and commonly grounded +15V, +3.3V and +5V. Stabilize +15V and +3.3V. +15V stabilizes 80% and +3.3V stabilizes 20%.**

Outline Diagram



Definition of pins

	Outputs common GND			Outputs isolated		
Pin No.	Single output	Double outputs	Three outputs	One main one auxiliary	One main two auxiliary	Two main one auxiliary
1	IN-	IN-	IN-	IN-	IN-	IN-
2	IN+	IN+	IN+	IN+	IN+	IN+
3	GND	NC	OUT3-	AOUT-	MOUT-	AOUT-
4	GND	NC	OUT3+	AOUT+	MOUT+	AOUT+
5	NC	OUT1	OUT1	MOUT+	AOUT1	MOUT1
6	OUT	GND	GND	MOUT-	AGND	MGND
7	OUT	OUT2	OUT2	NC	AOUT2	MOUT2

Notes:

1. OUT2，AOUT2，MOUT2 are generally negative outputs, but may also be positive outputs.

2. MOUT is main output and AOUT is auxiliary output.

3. Common grounded output OUT1 is MOUT and it must be positive output.

4. For common grounded three outputs, generally OUT1 is MOUT, but in some cases, OUT3 is MOUT. In this case, OUT1 and OUT2 combines a symmetric output of positive and negative, but not serves as MOUT. For example FHMP5-150S5D15.

Product performance, reliability and information are subject to change without prior notice.

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