FHP5 Series High-temperature DC-DC Power Converter

Features:

- Working temperature: Ambient temperature:-55℃ ～+175℃, max. shell temperature up to +185℃
- Output power: 5W
- Dimension: L：33.0×W：22.0×H：7.8MM
- Multiple outputs up to 3 and at most 2 isolated output ground circuits (3.3V,5V,7V,9V,12V,15V,18V,24V,36V,48V）
- Output ripple: Maximum 100mV, typical 30mV
- Conversion efficiency: Typical 80%
- Input range: 10～30V, 16～48V，24～72V, 36～108V , 70～210V
- Integrated LC EMI filter
- Sealed metal casting: Impact and moist resistance and electromagnetic radiation protection
- Provide rated power without deduction at 175℃ (shell); provide 80% rated power at 185℃ (shell) and 50% rated power at 204℃ (shell)
- Isolation voltage between input and output: 1000V, isolation voltage between outputs: 500V
- Overvoltage and overcurrent fault cutoff delay restart
- Input undervoltage and overvoltage cutoff protection
- 100ms soft start function
- Over-heat protection at 210℃

Description

FHP5 series 5W high-temperature DC-DC power converters are specially designed for electronic equipment working in the harsh environment. We upgraded FHP5 series changing the former output common ground to isolation ground with two outputs.

FHP5 series 5W high-temperature power converter can work for 2000 hours at shell temperature 150 ℃, for 750 hours at shell temperature 175 ℃ and for 400 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 for petroleum prospecting logging tool, petroleum drilling instrument, geophysical detecting instrument, vehicles, telecommunication, network infrastructures, enterprise and high-performance calculation, etc.

FHP5 series has five alternative input ranges including 10～30V, 16～48V， 24～72V, 36～108V ,70～210V. The output voltage designed for FHP5 series includes 3.3V，5V，7V,9V， 12V, 15V，18V,24V,36V,48V. The output can be either of them and combinations of any two or three voltages. The output can provide at most two isolated ground circuits. During the use, they are allowed to be connected to form output combinations of different types as per requirement.

Within the entire temperature range and conversion between full load and no-load, the output voltage fluctuation is within 0.3V. The output accuracy of 3.3V can even be within 0.15V. The working frequency of FHP5 series power converter is up to 300KHz, which provides good filtering condition. In the condition without adding any filtering, its output voltage ripple is less

than 100MV. The temperature stability of frequency within the entire range of temperature is ±8%.

MOUT is main output terminal and AOUT is auxiliary output terminal. The MOUT and AOUT terminals are generally symmetric of positive and negative, and it allows one output or two unsymmetric outputs. Main outputs and auxiliary output are not isolated but outputs between MOUT and AOUT can be isolated and non-isolated. It can work with only main output without auxiliary output. It there is auxiliary output, the number of channels of auxiliary output shall not exceed 3.

Voltage output from MOUT terminal is the most stable. If main output is symmetric of positive and negative, positive and negative outputs sample feedback regulated voltage which is required to be greater than or equal to 3.3V. Given that positive and negative outputs of main output are not symmetric, one samples 80% of feedback regulated voltage and the other samples 20% of feedback regulated voltage. There must be one output voltage that is greater than 5V. The output power of main output is required to be greater than that of auxiliary output and the output power of main sampling voltage in main output is required to be the highest.

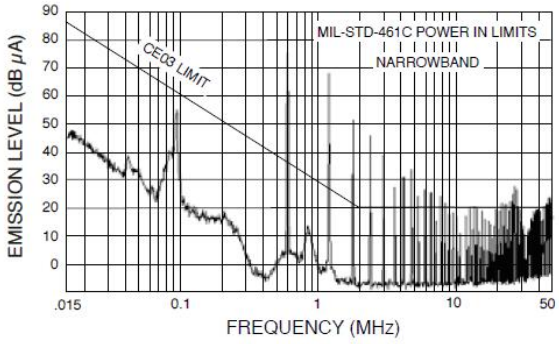
The voltage and ripple wave outputted from main output terminal do not vary with the variation of itself and auxiliary output voltage power. In the condition that power outputted from main output terminal is constant, the voltage of auxiliary output terminals decrease with the rise of its output power, reaching 2% at most. If power outputted from auxiliary output terminals is constant, their output voltage increases with the increase of power outputted from main output terminal. For this feature, the output should be specified in using and selecting types. If the model is FHP5-150S12S24-S5, it will output voltages 12V, 24V, and 5, of which, 12V and 24V are from MOUT and 12V is main sampling voltage. 5V is from AOUT. That is our model FHP5-DCINSMOUT-SAOUT. In this model, "-" means isolation. "-" may not appear in a model, which means that there is no isolation between outputs. S*** can also be represented with D***or S***S***. There are at most four S*** in a model. D*** represents two S***.

In the course of using multi-output converter, if the output (main or auxiliary) of an output dynamically changes, it will cause the auxiliary output voltage to fluctuate accordingly. If the fluctuation is greater than 50mV, measures must be taken. The voltage fluctuation above 50mV appears when output power varies between the rated power of above 10% and below 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 to be done. 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 channels 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.

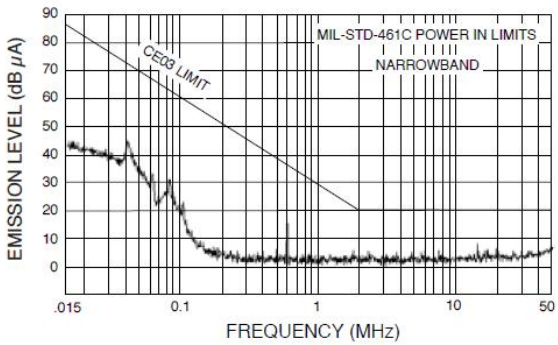
In the course of operation, when an output power (main or auxiliary) varies between the rated power of above 10% and below 70%, its voltage fluctuation generally is less than 50mV. This fluctuation is free from consideration in general.

FHP5 series power converter contains an in-built LC network, which can effectively reduce the fluctuations of the input current and the output voltage. In the course of developing this series power converter, we established EMI authoritative R$S certification test system. We rationally and scientifically designed input LC network and output EMI filtering contained in FHP5, which makes FHP5 effectively reduce current and voltage fluctuation and interference. The below picture on the left shows the result tested with this system

and the picture on the right shows the result after using FMP filter. When working separately, it is clear that is slightly above CE03 standard and meets the CE03 standard after using FMP.



FHP5



FHP5+FMP

FHP5 contains 100MS soft start circuit, able to slowly increase input current after converter is started and fault is removed for externally connecting large capacity output filtering capacitance and reducing start impact.

FHP5 series power converter contains over-voltage and under-voltage cut-off functions, which enables the converter to stop working beyond the range of the input voltage to protect the converter. The under-voltage and over-voltage cut-off voltage is within 5V of extension of rated voltage. If the input range is rated at 24-72V, its under-voltage cut-off voltage will be 21-23.9V and over-voltage cut-off voltage will be 72.1～77V.

FHP5 series power converter contains the output short circuit and overload automatic turn-off circuit. When the output lasts for 0.1s and exceeds 120% of the rated output power, the converter cuts off all outputs. After the over-current fault is eliminated, it automatically resumes the output voltage. If the overload duration of output is less than 0.1s, the converter will not act.

The working frequency of FHP5 series power converter is up to 300KHz, which provides good filtering condition. In the condition without adding any filtering, its output voltage ripple is less than 100mV.

Key components used for FHP5 series power converter are purchased in military level and completely pass the in-factory test in strict accordance with the national military product quality standard. The factory test includes 24~72-hour live aging and screening under the temperature of +175℃. All finished products have experienced 8-hour full-load operation 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) Operating temperature: -55℃～+175 ℃, Max. shell temperature: +185 ℃.
(2) Input voltage: 10～30V, 16～48V， 24～72V，36～108V， 70～210V
(3) Output voltage: multiple outputs up to 3 and at most 2 isolated output ground circuits: 3.3V,5V,7V,9V,12V,15V,18V,24V,36V,48V
(4) Output ripple: Less than 100mVp-p, typical 30mVp-p
(5) Output power: 5W
(6) Output accuracy: Less than 5%
(7) Load regulation: Less than 5%
(8) Temperature stability: Less than ±2.5% , typical ±1%
(9) Linear regulation: ±0.1% (10% linear change)

(10)Shock resistance: 25G, 0 ~ 300Hz
(11)Conversion efficiency: 75%～85%
(12)Static power consumption: 0.5W Max.
(13)Overheat cutoff at 210℃
(14)Dimension: L: 33.0MM × W: 22.0MM × H:7.8MM
(15)Isolation voltage between input and output: 1000V, isolation voltage between outputs: 500V
(16)Output form of voltage: Plug pin leading out

Service Requirement:

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 204℃.

The shell of the converter is isolated from the input and output. During the use, the converter is usually mounted on instrument or its framework with the framework as a radiator. If the ripple cannot be filtered with capacitance or LC network, then this ripple is electro-magnetic interference (EMI). Thus, an EMI filtering converter is necessary to be added to input and output terminals of FHP5. To function properly, 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. As we have added EMI network to input and output terminals inside converter, so long as the shell is suspended, it will function. If the ripple is still large, it is needed to externally connect input or output EMI filter outside the shell. 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 after the internal EMI functions, it is necessary to connect input or output EMI filtering outside the converter. Input and output of the converter at most have three ground circuits and if they are needed to be connected together, connection should be done at the point less than 1cm where the lead wires go out of the converter. The closer that wire at connection point is to the converter, the less the intervention will be.

If isolation is needed between output and input, and not needed between outputs, but isolated type converter is selected, there is no requirement on connection between output grounds.

Type Selection:

FHP5-DCINSMOUT-SAOUT

FHP5--28D12—S5

Series code
FHP series
Output power
5W

Input voltage
15（10～30V）
28（16～48V）
48（24～72V）

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

50（36～108V）　　S Single

150（70～210V）　　D Dual

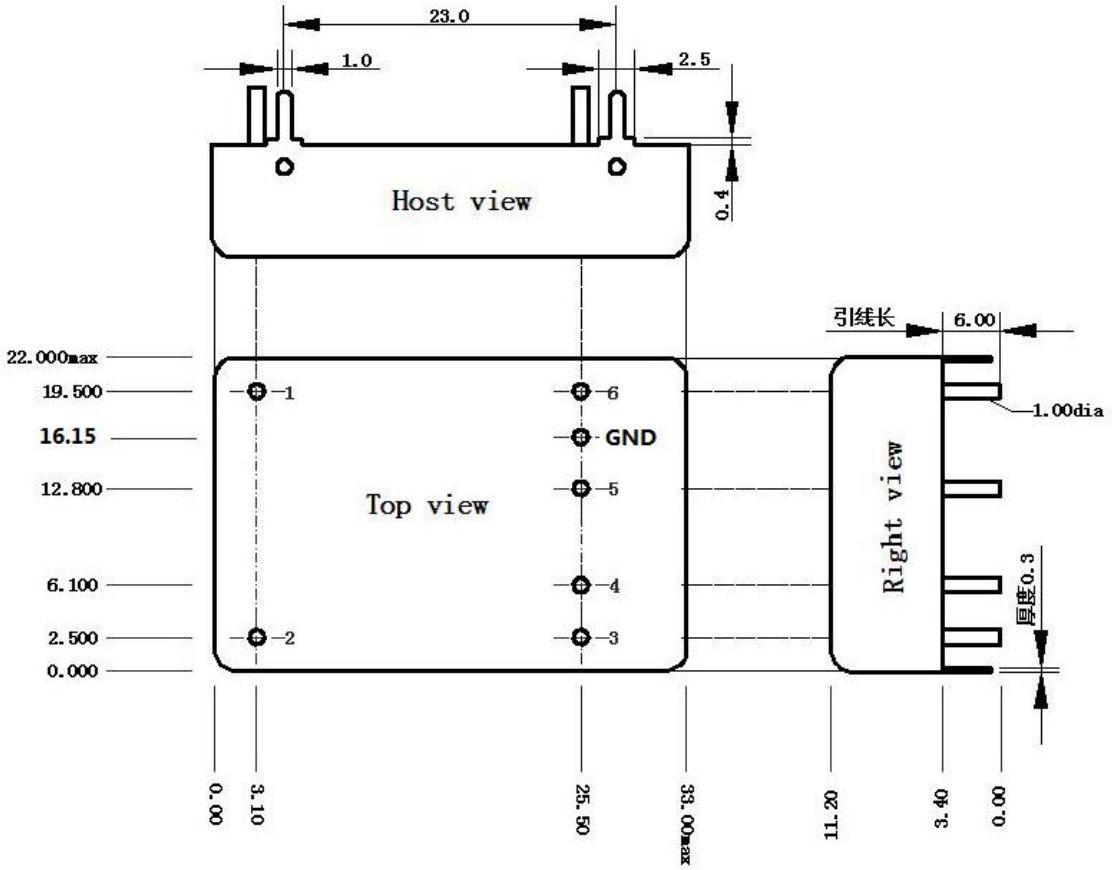
NOTE: "-" in model refers to isolation. It is always isolated between input and output. For this reason, the first "-" is necessary. If it is not isolated between main and auxiliary outputs, there is no the second "-". If there is no auxiliary output, there is no –SAOUT.

Model example: FHP5-150D15-S5, where MOUT outputs ± 15V and AOUT outputs 5V. It is isolated between main and auxiliary outputs

FHP5-50S15S3.3-S5, where MOUT outputs ± 15V and +3.3V, AOUT outputs 5V. In the condition that MOUT has two outputs, when module stably outputs voltage, feedback sampling takes 80% of front voltage and 20% of back voltage.

FHP5-50S15-S3.3S5 outputs non-isolated common ground voltages ±15V, +3.3V and +5V. Stabilize +15V and +3.3V, +15V stabilizes 80% and +3.3V stabilizes 20%.

Outline Diagram:



Definition of Pins

	Common Ground between outputs			Isolation between outputs		
Pin No.	Single output	Dual output	Three output	1 Main 1 auxiliary output	1 Main 2 auxiliary outputs	2 main and 1 auxiliary output
1	IN-	IN-	IN-	IN-	IN-	IN-
2	IN+	IN+	IN+	IN+	IN+	IN+
3	GND	OUT2	OUT2	AOUT-	MOUT-	AOUT-
4	GND	GND	GND	AOUT+	MOUT+	AOUT+
5	OUT	OUT1	OUT1	MOUT+	AOUT1	MOUT1
6	Null	Null	OUT3	MOUT+	AOUT2	MOUT2
GND	Null	Null	Null	MOUT-	AGND	MGND

Special notes:

1. OUT2，AOUT2，MOUT2 are generally negative output, but they can be positive output too.

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

3. Common ground dual output OUT1 is MOUT. It must be positive output

4. For common ground three-output, generally OUT1 is MOUT, but in some conditions OUT3 is MOUT. This condition is that OUT1 and OUT2 combine to symmetric output of positive and negative, but not serves as MOUT, for example FHP5-150S5D15.

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

June 24th, 2014