

## FHG30 Series High-Temperature DC-DC Power Converter

### Features:

: High operating temperature : Ambient temperature:  $-55^{\circ}\text{C} \sim +175^{\circ}\text{C}$  and max. shell temperature up to  $+185^{\circ}\text{C}$

: High output power: 30W

: Small size:  $L94.0 \times W38.0 \times H19.5\text{mm}$

: Counterbore at four angles for installation of converter

: Upward pin plug easy for contact with printing circuit board

: Multiple output modes and isolation with each other

(single channel, dual-channel and triple-channel  
3.3V, 5V, 9V, 12V, 15V, 24V, 36V, 48V)

: Low output ripple: 50mV, typical 20mV

: Wide input range:  $16\text{V} \sim 48\text{V}$ ,  $24\text{V} \sim 72\text{V}$ ,  $36 \sim 108\text{V}$ ,  $70 \sim 210\text{V}$ ,  $120 \sim 360\text{V}$

: High conversion efficiency: typical 82-87%

: Sealed metal casting (impact and moist resistance and electromagnetic radiation protection)

: High operating frequency: 66.6KHZ

: Synchronous and cutoff function

: Integrated LC EMI filter

: Provide rated power without deduction at  $145^{\circ}\text{C}$  (shell); provide 80% rated power at  $185^{\circ}\text{C}$  (shell); provide 50% rated power at  $204^{\circ}\text{C}$  (shell)

: Over-heat protection at  $210^{\circ}\text{C}$

: Over-voltage and over-current failure cut-off delay restart

: Input undervoltage and overvoltage cutoff protection

: 100ms soft start function



### Description:

FHG30 series 30W high-temperature DC-DC power converter, designed for electronic equipment working in the harsh environment, can work for 2,000 hours at shell temperature  $150^{\circ}\text{C}$ , for 750 hours at shell temperature  $175^{\circ}\text{C}$  and for 400 hours at shell temperature  $185^{\circ}\text{C}$ . With features of being resistant to high temperature, impact and humidity, it is a power supply system especially applicable to petroleum survey logging tool, petroleum drilling instrument, geophysical detecting instrument, vehicles, telecommunication, network infrastructures, enterprise and high-performance calculation. It has five alternative input ranges including  $16 \sim 48\text{V}$ ,  $24 \sim 72\text{V}$ ,  $36 \sim 108\text{V}$ ,  $70 \sim 210\text{V}$  and  $120 \sim 360\text{V}$ . It provides single, dual and triple fixed-voltage outputs and outputs are isolated from each other. Thus the mutual interference between outputs is largely reduced. They can be connected to form output different groups as per requirement. These three output modes 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 2%.

The FHG30 series power converter is a DC/DC converter developed on the basis of FHAG30 series AC/DC converter by removing AC input and filter. It is especially suitable for DC/DC with high DC input. It also has low voltage

input, but its suitable input is higher than 70V series.

The output voltage types designed for FHG30 series 30W high-temperature AC-DC power-supply converter include 3.3V, 5V, 9V, 12V, 15V, 24V, 36V and 48V. The output can be either type of them and combinations of any two or three types. MOUT represents the main output terminal, OUT1 and OUT2 represents the auxiliary output terminals. During the use, the voltage output by MOUT is the most stable and its output voltage and ripple do not vary with the variation of itself and auxiliary output. With the precondition that MOUT outputs constant power, the voltage of auxiliary output terminals OUT1 and OUT2 drops at 2% max. with the rise of their output power. If auxiliary output terminals OUT1 and OUT2 output constant power, their output voltage will rise with the rise of power output by MOUT. For this feature, the output should be specified in using and selecting types. If the model is FHH30-150S5-S24-S36, it will output three channels 5V, 15V, and 36V isolated from each other. Of which, 5V is from MOUT, 15V from OUT1 and 36V from OUT2. That is our model FHG30-DCINSMOUT-SOUT1-SOUT2.

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

Our design concept is that if the required output voltage is above three channels, then FHG30 chooses OUT2 to output 24V, 36V and 48V. Following OUT2, connect our DC/DC converter with input voltage of 28V (16~48V) or 48V (24~72V) to conduct secondary conversion.

FHG30 series power-supply converter provides synchronous function, allowing several converters of the same series to work at same frequency. As a result, switch interference can be effectively reduced. When the power of one converter is inadequate or the output modes are insufficient, it is possible to realize the synchronous operation of several converters. In other word, the synchronous terminals of all converters are bond together to enable the synchronous operation. The converters can automatically distribute the main and auxiliary converters. The converters which are the first to reach steady operation obtain the main control power, and the remaining converters are auxiliary converters which operate by following the frequency of main converters. It is also possible to arrange an external clock at SYNC pin to link up SYNC pins of several converters to realize synchronization. If an external master clock signal is applied, it recommended that the frequency of oscillator should be 50KHZ~80KHZ. The impulse width (Larger than 20ns) of external master clock signal should be made available. At this time, all converters can operate by following the external sync frequency. The level received by SYNC pin should be TTL5V. At the time of application, if the external sync clock signal is not TTL level, it is necessary to convert by adding the level.

FHG30 series power-supply converter contains an in-built LC network, which can effectively reduce the fluctuations of the input current and the output voltage.

FHG30 series power-supply converter contains a 100MS soft-start circuit, which can slowly increase the input current when the converter is activated and after the failure is removed so as to facilitate external connection of a large-capacity

output filtering capacitor and reduce the impact from starting.

FHG30 series power-supply 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 36-108V, its under-voltage cut-off voltage will be 31-35.9V and over-voltage cut-off voltage will be 110~115V.

SLEEP, the cut-off terminal of FHG30 series, is high-level effective. When the voltage is 3.2~5.3V, the converter enters the resting state, all outputs are cut off, and the input current is less than 1mA. If a multiple of converters operate in synchronous manner, the auxiliary converter shall generate a main converter after the main converters is turned off. At this moment, the original auxiliary converters will operate by following the frequency of new main converters. If the auxiliary converter is turned off, the unturned-off converters shall not be affected, and shall still operate by following the frequency of main converters. When the voltage is 0~ 2.5V, or suspended, the converter operates properly. The input voltage of SLEEP terminal shall not exceed 6.0V.

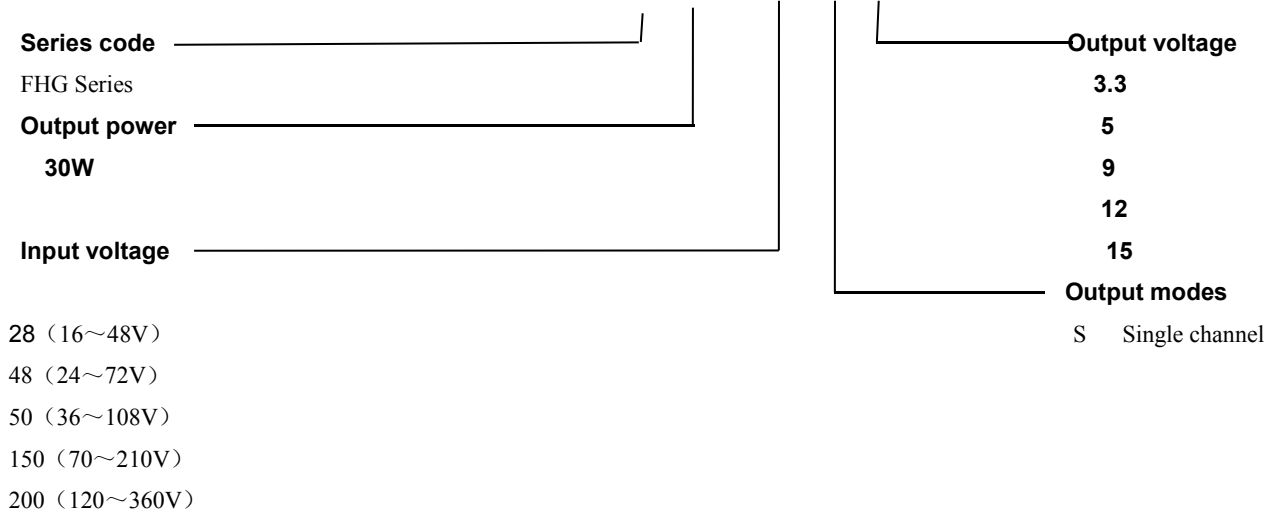
FHG30 series power-supply converter includes the output short circuit and overload automatic turn-off circuit. When the output lasts 0.1s and exceeds 120% of the rated output power, the converter cuts off all outputs. After the over-current fault is eliminated, it automatically enters soft-start mode and restores the output voltage. If the overload duration of output is less than 0.1s, the converter will not act.

The operating frequency of FHG30 series power-supply converter is up to 66.6KHz, which provides a good condition for filtering. Under the circumstance without any filtering, its output voltage ripple is less than 50mV. The appearance of FHG series is designed easy for installation and contacting with printing circuit board. Printing circuit board can be directly installed on the power-supply converter. Adding of some post-processing filters on printing board above the converter will easily make output ripple less than 5mV, suitable for some precise applications.

Key components used for FHG30 series power-supply 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°C. All finished products have experienced 8-hour full-load operation under the temperature of +185 °C before delivery so as to fully check the damage to the components during the production process and hence ensure the reliability of products.

### Type Selection:

#### FHG30---200S12-S12-S5



NOTE: “—” in model refers to the meaning of isolation. If the single-channel output is adopted, there is no—SOUT1—SOUT2; if double-channel

output is adopted, there is no -SOUT2.

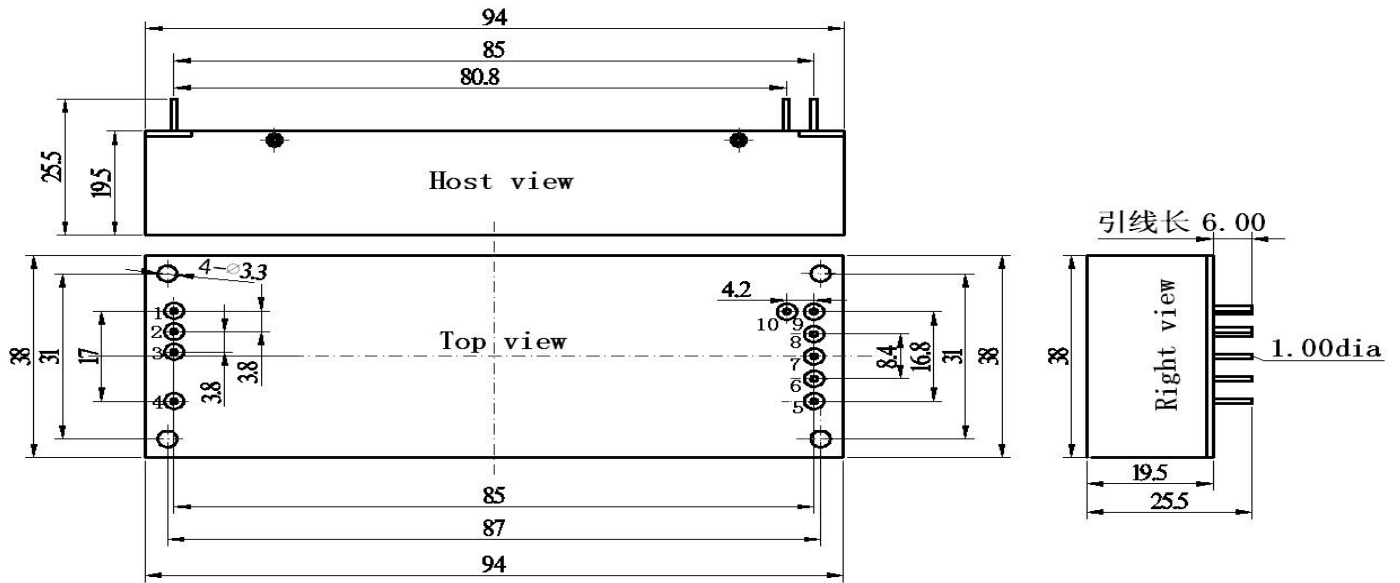
**Technical Parameters:**

- (1) Operating temperature: -55°C ~ +175 °C Max. shell temperature: +185 °C.
- (2) Input voltage: 16V ~48V, 24V~72V, 36~108V, 70~210V, 120~360V
- (3) Output voltage: 3.3V, 5V, 9V, 12V, 15V, 24V, 36V, 48V
- (4) Output ripple: 50mVp-p (typical 20mVp-p)
- (5) Output power: 30W
- (6) Output precision: less than 4%
- (7) Load regulation: less than 4%.
- (8) Temperature stability: less than  $\pm 2.5\%$  (typical  $\pm 1\%$ )
- (9) Linear regulation:  $\pm 0.1\%$  (10% linear change)
- (10) Shock resistance: 25G, 0 ~ 300Hz
- (11) Conversion efficiency: 82-87%
- (12) Static power consumption: 1.2W Max.
- (13) Isolation voltage between input and output: 1000V
- (14) 100ms soft start function
- (15) Under-voltage and over-voltage cutoff
- (16) Dimension: L94.0×W38.0×H19.5mm

**Service Requirement:**

As the power converter has nearly 5W 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 °C. The shell of the converter is isolated from the input and output. During the use, it is directly installed on 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 FHG30. To function properly, the shell of filtering converter should be suspended not to connect with radiator, input GND and output GND. 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 ordinarily put heat-conducting pad, ceramics backing or silicon rubber pad between the shell and radiator.

**Outline diagram:**



**Definition of Pins:**

	Definition of single output	Definition of dual output	Definition of triple output
1	Synchronization (SYNC)	Synchronization (SYNC)	Synchronization (SYNC)
2	Cutoff (SLEEP)	Cutoff (SLEEP)	Cutoff (SLEEP)
3	Input negative (IN-)	Input negative (IN-)	Input negative (IN-)
4	Input positive (IN+)	Input positive (IN+)	Input positive (IN+)
5	MOUT	OUT1	OUT2
6	MOUT	GND1	GND2
7	MGND	MOUT	OUT1
8	MGND	MGND	GND1
9	Null NC	Null NC	MOUT
10	Null NC	Null NC	MGND

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

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