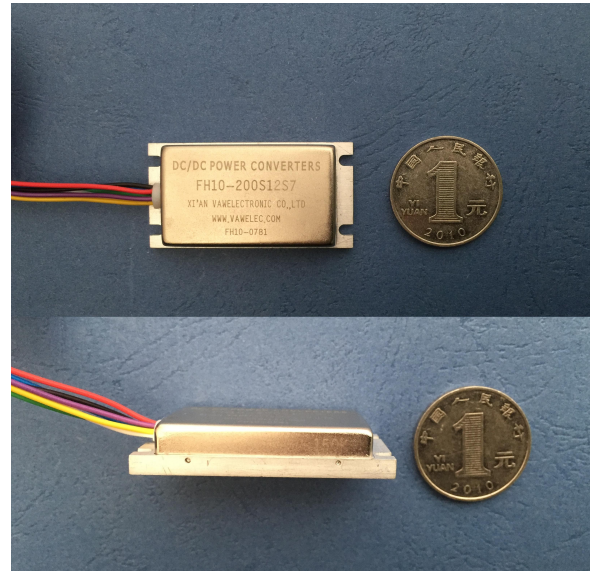


FH10 Series High-temperature DC-DC Modules

Features:

- : High operating temperature (ambient temperature: $-55^{\circ}\text{C} \sim +175^{\circ}\text{C}$ and max. shell temperature: $+185^{\circ}\text{C}$)
- : Small size (1: L: 38.0×W: 22.0×H: 9.0MM) **This dimension does not include the size of the mounting base**
- : High conversion efficiency (typical 80%)
- : Sealed metal casting (impact and moist resistance and electromagnetic radiation protection)
- : Wide input range (10~30V, 16~48V, 24~72V, 36~108V, 70~210V, 120~360V)
- : Multi-output modes (up to three modes: 3.3V, 5V, $\pm 5\text{V}$, $\pm 9\text{V}$, $\pm 12\text{V}$ and ± 15)
- : High operating frequency (300KHZ)
- : Integrated LC EMI filter
- : Provide rated power without deduction at 175°C (shell); provide 50% rated power at 204°C (shell)
- : Over-voltage and over-current failure switch-off delay restart
- : Input under-voltage and overvoltage turn-off protection
- : 100MS soft-start function
- : Over-heat protection at 210°C



Description:

The FH10 series 10W high-temperature DC-DC power module, designed for the electronic equipments working in the harsh environment, can work for 2,000 hours at shell temperature 150°C , for 750 hours at shell temperature 175°C and for 400 hours at shell temperature 185°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 six optional input ranges: 10~30V, 16~48V, 24~72V, 36~108V, 70~210V and 120~360V and can provide fixed-voltage output in the mode of single-way, double-way and three-way. Within the entire operating temperature range and under the condition that full-load and no-load change alternatively, the output voltage fluctuation is less than 0.3V and the output precision of 3.3V voltage is even less than 0.15V. The operating frequency of the FH10 series is up to 300KHZ, which provides good wave filtration. Its output voltage ripple is less than 100MV in the condition of no wave filtering. Within the entire temperature range, the temperature stability of frequency is $\pm 8\%$.

FH10 series provide synchronization features, allowing several modules of the same series to work at same frequency. As a result, switch interference can be effectively reduced. When the power of one module is inadequate or the output modes are insufficient, it is possible to realize the synchronous operation of several modules. In other word, the synchronous terminals of all modules are bond together to enable the synchronous operation. The modules can automatically distribute the main and auxiliary modules. The modules which are the first to reach steady operation obtain the main control power, and the remaining modules are auxiliary modules which operate by following the frequency of main modules. It is also possible to arrange an external clock at SYNC pin to link up SYNC pins of several modules to realize synchronization. If an external master clock signal is applied, it recommended that the frequency of oscillator should be 250KHZ~350KHZ. If it is not within this range, the in-service condition may not be the optimal, even if the module can still operate within the wide range of 200KHZ ~ 450KHZ. The impulse width (Larger than 20ns) of external master clock signal

should be made available. At this time, all modules 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.

SLEEP, the turn-off terminal of FH10 series, is high-level effective. When the voltage is 3.2~5.3V, the module enters the resting state, all outputs are cut off, and the input current is less than 1MA. If a multiple of modules operate in synchronous manner, the auxiliary module shall generate a main module after the main modules is turned off. At this moment, the original auxiliary modules will operate by following the frequency of new main modules. If the auxiliary module is turned off, the unturned-off modules shall not be affected, and shall still operate by following the frequency of main modules. When the voltage is 0~ 2.5V, or suspended, the module operates properly. The input voltage of SLEEP terminal shall not exceed 5.5V.

FH10 Series contains an in-built LC network, which can effectively reduce the fluctuations of the input current and the output voltage.

FH10 contains a 100MS soft-start circuit, which can slowly increase the input current when the module 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.

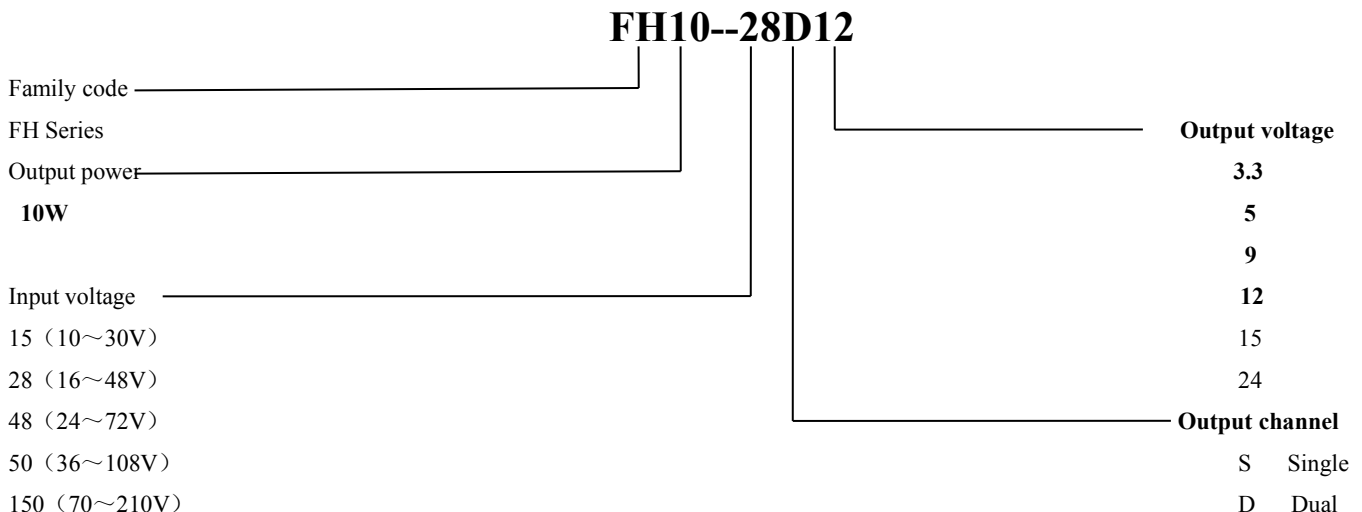
FH10 has over-voltage and under-voltage turn-off functions, which can enable the module to stop working beyond the range of the input voltage to protect the module. The under-voltage and over-voltage turn-off voltage is within 5V of extension of VAC. If the input range is rated at 36-108V, its under-voltage turn-off voltage will be 31-35.9V and over-voltage turn-off voltage will be 110~115V.

FH10 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 module 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 01s, the module will not take action.

The operating frequency of FH10 is up to 300KHZ, which provides a good filtering condition. Its output voltage ripple is less than 100MV without any additional filtering conditions.

FH10 components completely pass the in-factory test in strict accordance with the enterprise standards and GJB, which 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 expose the damage to the components during the production process and hence ensure the reliability of products.

Type selection:



200 (120~360V)

Technical parameters:

- (1) Operating temperature: -55 °C ~ +175 °C Max. shell temperature: +185 °C.
- (2) Input voltage: 10~30V, 16~48V, 24~72V, 36~108V, 70~210V, 120~360V
- (3) Output voltage: 3.3V, 5V, 9V, 12V, 15V, 24V
- (4) Output ripple: 100mVp-p (typical 30mVp-p)
- (5) Output power: 10W
- (6) Output accuracy: less than 5%
- (7) Load regulation: less than 5%.
- (8) Temperature Stability: less than $\pm 2.5\%$ (typical $\pm 1\%$)
- (9) Line regulation: $\pm 0.1\%$ (10% linear change).
- (10) Earthquake resistance: 25G, 0 ~ 300Hz
- (11) Conversion efficiency: 75%~85%
- (12) Static power consumption: 0.5W Max.
- (13) Isolation voltage between input and output: 1000V; isolation voltage between outputs: 500V
- (14) Over-heat turnoff at 210°C
- (15) Dimension : L: 38.2×W: 22.2×H: 8.9MM, **This dimension does not include the size of the mounting base**
- (16) Output form of voltage: high-temperature lead wire

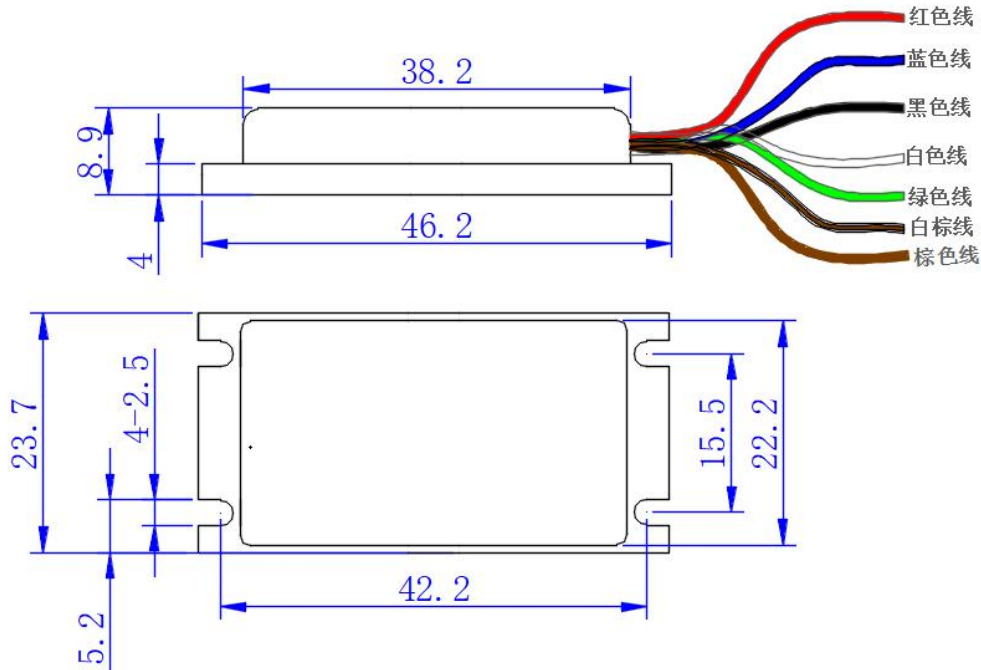
Service Requirements:

As the modules have nearly 2W power consumption under the condition of full-load operation and their sizes are small, good medium need to be added between the shell of the power supply and the radiator so as to ensure the temperature of the module case to be less than 204 °C. The shell of the module is isolated from the input and output. The shell is directly connected with the shortest outgoing line terminal between the input and output to FG or connected through a 1000V/4700PF capacitor, which ensures the contact resistance between the inner part of the module and the shell is minimum one so as to effectively reduce the switching spikes. In some applications, it requires that input and output have common ground and it must use the shortest and roughest wire to make input and output ground wire short circuit as soon as it comes out the module. The shorter the connection distance is, the less the interference is.

For the module with single output, the output voltage remains constant with output current changing. For the module with positive and negative dual output, the positive and negative output voltage difference does not vary along with output current. If current of positive and negative output is not balanced, the route voltage with lower output current is higher and the route voltage with higher output current is lower, but the difference value does not change and the error between each route and rated value is less than 5%. As for the module with triple-route output, the property of primary and auxiliary symmetrical output is equal to that of the module with positive and negative dual output. But when the load of the third route is one third of total power of output, the voltage value of the third is rated value; when the load of the third route is less than one third of total power, the voltage value of the third is higher than rated value, otherwise it is less than the rated value. The deviation is not more than 0.5V.

The no-load current of the module is 12MA. The current after turnoff is 2MA and the operating frequency at +25°C is 300 ± 20 KHZ while it is 310 ± 20 KHZ at +175°C.

Outline diagram:



Note: 1、 Mounting hole and mounting hole spacing dimension tolerance is $\pm 0.1\text{mm}$
2、 The tolerance of external dimension is $\pm 0.2\text{mm}$

Definition of pinouts:

Output category (model)	Lead color		White Input+	Blue	Brown	Green	White & brown	Yellow (if any)	Purple (if any)	Remark
	Red Input+	Black Input-								
Single output (e.g. FH10-28S5)	IN+	IN-	MOUT main output	MGND	/	/	/	on/off lead	sync lead	1 main output
Single output shares the ground (e.g. FH10-28S5S12)	IN+	IN-	The first output MOUT main output	The first and second outputs share the ground MGND	/	The second output+OUT2 auxiliary output	/	on/off lead	sync lead	1 main and 1 auxiliary outputs
Single output isolates (e.g. FH10-28S5-S12)	IN+	IN-	The first output MOUT main output	The first output MGND	The second output GND2	/	The second output +OUT2 auxiliary output	on/off lead	sync lead	1 main and 1 auxiliary outputs
Positive and negative symmetric output (e.g. FH10-28D5)	IN+	IN-	The first output MOUT main output	The first and second outputs share the ground MGND	The second output-OUT2 auxiliary output or main output	/	/	on/off lead	sync lead	2 main output and 1 main and 1 auxiliary outputs
Three single outputs share the ground (e.g. FH10-28S5S12S15)	IN+	IN-	The first output MOUT	Three outputs share the ground	The second output+OUT2 auxiliary	The third output+OUT3 auxiliary	/	on/off lead	sync lead	1 main and 2 auxiliary outputs

			main output	MGND	output	output				
2 single outputs share the ground+1 isolated single output (e.g FH10-28S5S12-S15)	IN+	IN-	The first output MOUT main output	The first and the second outputs share the ground MGND	The second output+OUT2 auxiliary output	The third output+OUT3 auxiliary output	The third output GND3	on/off lead	sync lead	1 main and 2 auxiliary outputs
1 isolated single output+2 single outputs share the ground (e.g FH10-28S5-S12S15)	IN+	IN-	The second output+OUT2 auxiliary output	The first output MGND	The second and the third outputs share the ground GND2	The first output MOUT main output	The third output +OUT3 auxiliary output	on/off lead	sync lead	1 main and 2 auxiliary outputs
2 positive and negative symmetric outputs share the ground+1 isolated single output (e.g FH10-28D5-S12)	IN+	IN-	The first output MOUT main output	The first and the second outputs share the ground MGND	The second output-OUT2 auxiliary output or main output	The third output+OUT3 auxiliary output	The third output GND3	on/off lead	sync lead	1 main and 2 auxiliary outputs and 2 main and 1 auxiliary outputs
2 positive and negative symmetric outputs share the ground+1 single output shares the ground (e.g FH10-28D5S12)	IN+	IN-	The first output MOUT main output	Three outputs share the ground MGND	The second output-OUT2 auxiliary output or main output	The third output+OUT3 auxiliary output	/	on/off lead	sync lead	1 main and 2 auxiliary outputs and 2 main and 1 auxiliary output
1 single output+2 positive and negative symmetric outputs share the ground (e.g FH10-28S5-D12)	IN+	IN-	The second output+OUT2 auxiliary output	The first output MGND	The third output OUT3 auxiliary output	The first output MOUT main output	The second and the third outputs share the ground GND2	on/off lead	sync lead	1 main and 2 auxiliary outputs
1 single output+2 positive and symmetric outputs share the ground (e.g FH10-28S5D12)	IN+	IN-	The second output+OUT2 auxiliary output	Three outputs share the ground MGND	The third output OUT3 auxiliary outputs	The first output MOUT main output	/	on/off lead	sync lead	1 main and 2 auxiliary outputs

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

June 11, 2022