FH20 Series High-temperature DC-DC Modules

Features:

：High operating temperature (ambient temperature:-55℃～+175℃ and max. shell temperature: +204℃)
：Small size （L：63.8×W：28.4×H：11.0MM.）
：High conversion efficiency (typical 78％～87％)
： Sealed metal casting (impact and moist resistance and electromagnetic radiation protection)
：Wide input range（16V～48V, 24V～72V, 36～108V，70~210V, 120～360V）
：Multi-output modes (single, dual and triple mode: 3.3V, 5V, 9V, 12V, 15V, 24V)
：High operating frequency（300KHZ）
：Integrated LC EMI filter
：Providing rated power without deduction at 175℃ (shell)；providing 80% rated power at 204℃ (shell)
：Over-heat protection at 210℃
：Over-voltage and over-current failure switch-off delay restart
: Input under-voltage and overvoltage turn-off protection
: 100MS soft-start function

Description:

The FH20 series 20W high-temperature DC-DC power module, designed for the electronic equipments working in the harsh environment, can work for 1,000 hours at shell temperature 150 ℃, 400 hours at shell temperature 175 ℃ and 48 hours at shell temperature 204 ℃. 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: 16～48V, 24～72V, 36～108V, 70～210V and 120～350V and can provide fixed-voltage output in the single, dual and triple modes. 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 FH20 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 ±8%.

FH20 series provides 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

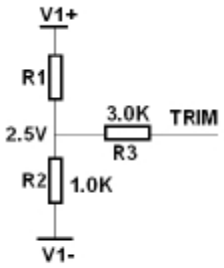
to convert by adding the level.

FH20 Series contains an in-built LC network, which can effectively reduce the fluctuations of the input current and the output voltage.

FH20 Series 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.

FH20 series 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.

SLEEP, the turn-off terminal of FH20 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 hangs in the air, the module operates properly. The input voltage of SLEEP terminal shall not exceed 5.5V.



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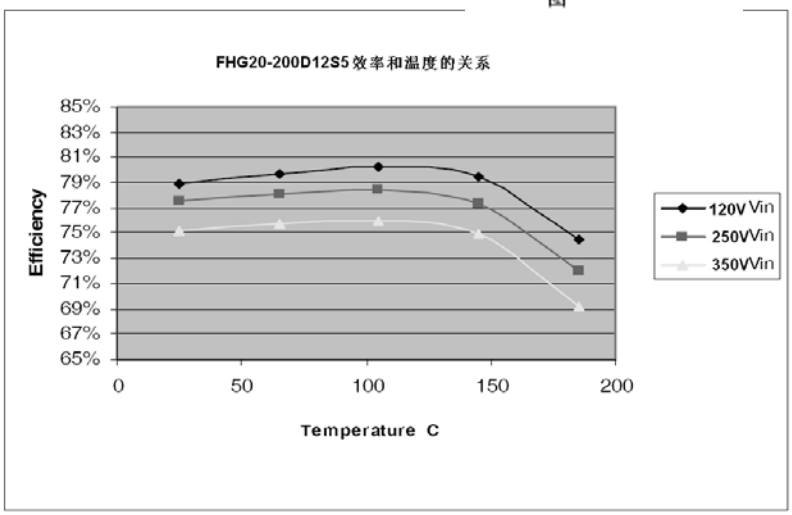
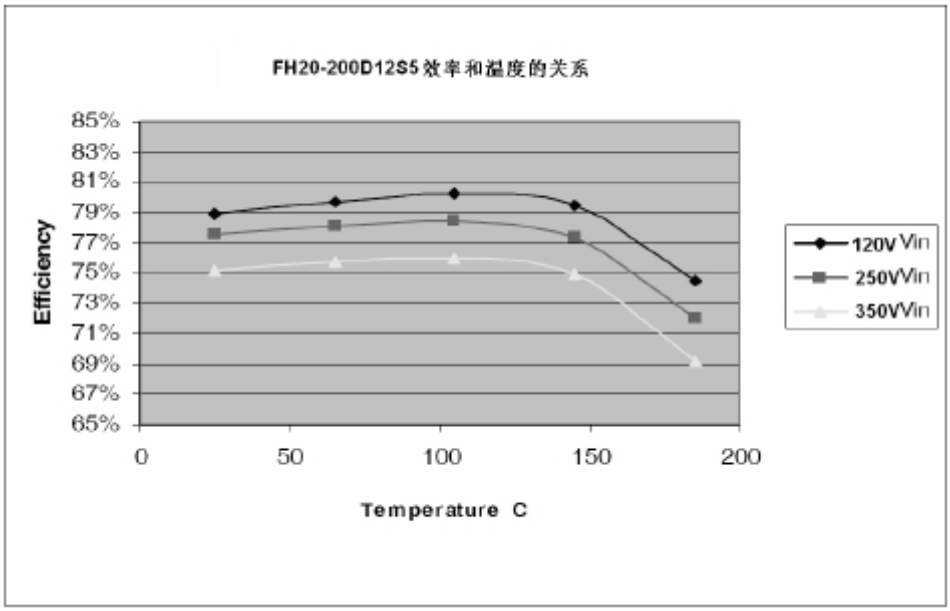
The output voltage of FH20 series can be regulated within the range of ±25% to facilitate the application and type selection of customers. Figure 1 is the internal adjustment circuit. During the adjustment, it is necessary to always ensure that the voltage at the junction between R1 and R2 should be 2.5V. TRIM is directly connected to V-, and the output is maximum; TRIM is directly connected to V+, and the output is the minimum. During the actual adjustment, R3 is required to connect appropriate resistance, and then connect with V1+ or V1-. It can be found in the adjustment diagram that adjustment of output voltage can break the limit of ±25%. However, we do not recommend this kind of application for the reason that the module efficiency decreases along the reliability as long as this limit is exceeded. For the single output module, V1+ is positive output, and V1- is negative output (output ground). For the double output module, V1+ is positive output, and V1- is negative output. The control circuit controls the voltage difference of positive and negative output. Since v1+ is symmetrical with v- in the internal circuit, we can thus conclude that the output voltage should also be the same as long as the output current is the same. If the output current is not the same, the output voltage is high for small current while the output voltage is low for large current. However, the difference should be within 0.3V. No matter how the output current will be, the voltage difference of positive and negative output under the internal control should remain unchanged. For 3-output module, positive output 2 is the auxiliary output which free from the control of control circuit. However, it receives the electromagnetic control from v1+ and v1-. Therefore, its output voltage decreases along with the increase of its output current, and increases along with the increase of v1+ and v1- output current.





FH20 series 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 FH20 series is up to 300KHZ, which provides a good filtering condition. Its output voltage ripple is less than 100MV without any additional filtering conditions.

FH20 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:

FH10--28D12

Family code
FH Series
Output power
20W

Input voltage
28（16～48V）
48（24～72V）
50（36～108V）
150（70～210V）
200 （120～360V）

Output voltage
3.3v
5
9
12
15
24

Output channel
S Single
D Dual

Technical parameters:

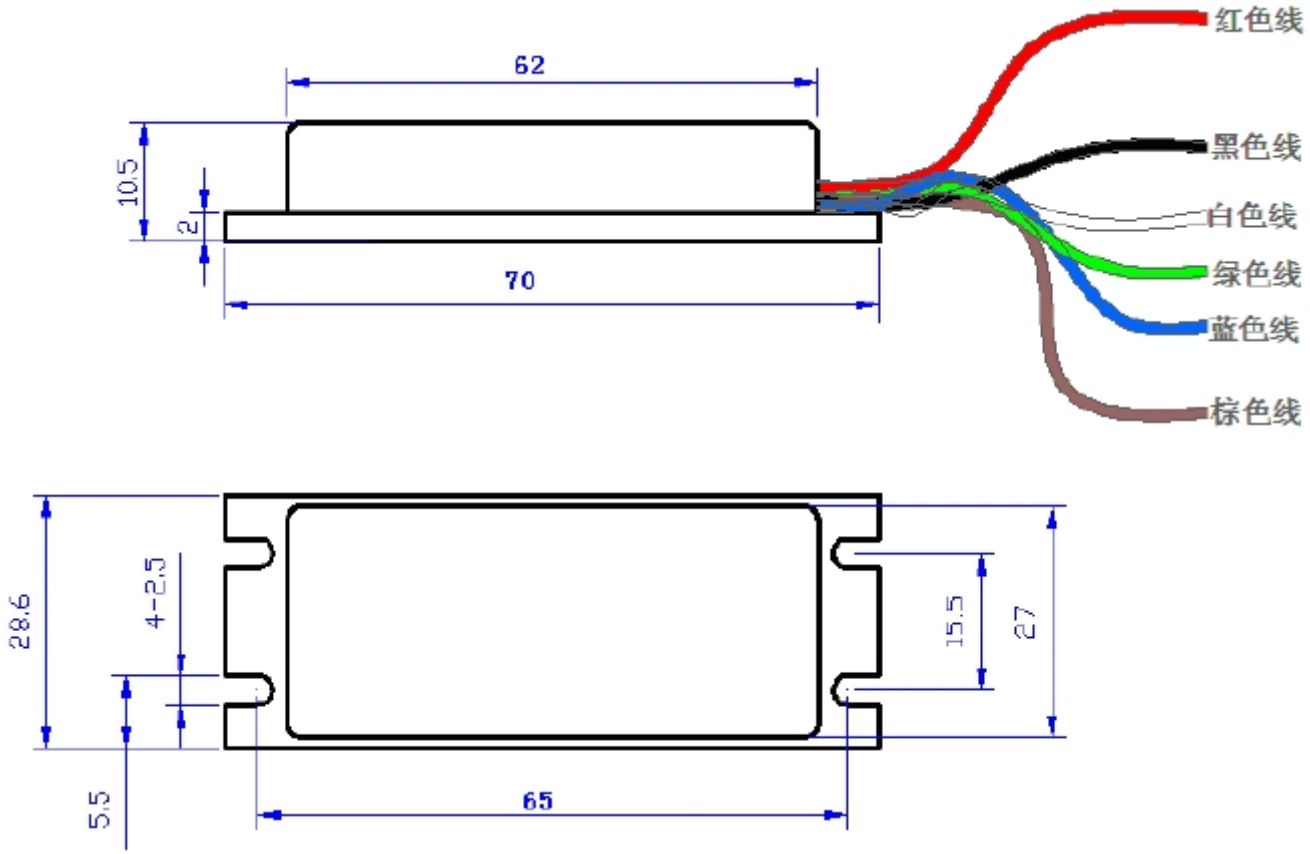
(1) Operating temperature: -55 ℃ ~ +175 ℃ Max. shell temperature: +204 ℃.
(2) Input voltage: 16～48V, 24～72V，36～108V, 70～210V, 120～360V
(3) Output voltage: 3.3V, 5V, 9V, 12V, 15V, 24V
(4) Output ripple: 100mVp-p (typical 30mVp-p)
(5) Output power: 20W
(6) Output accuracy: less than 4%
(7) Load regulation: less than 4%.
(8) Temperature Stability: less than ±2.5% (typical ±1%)
(9) Line regulation: ±0.1% (10% linear change).
(10) Earthquake resistance: 25G, 0 ~ 300Hz
(11) Conversion efficiency: 78-87%
(12) Static power consumption: 0.5W Max.
(13) Isolation voltage between input and output or between the outputs: 1000V
(14) 100MS soft starting function
(15) Over-heat turnoff at 210℃
(16) Size: L:63.8×W:28.4×H:110MM

Service Requirements:

As modules have nearly 3W 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 ℃. 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. The shell of the module is isolated from the input and output and withstand voltage is 1000V. During use, in order to reduce electro-magnetic interference, it requires to connect a 4700PF /1000V capacitor respectively at positive and negative end. If it requires not isolate shell from input or output, directly connect input or output ground wire in shortest distance.

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

Outline diagram:



引线定义：
红线：输入正　　黑线：输入负　　黄线：关断线
蓝线：输出地　　白线：9V/+12 V/+15V/　　灰线：-9V/-12V/-15V
橙线：调整线

Definition of pinout:
Red: Input positive　　Black: Input negative　　Yellow: Turn-off
Blue: Output ground　　White: 9V/+12 V/+15V/　　Gray: -9V/-12V/-15V
Orange: Adjusting

(Product performance, reliability and information are subject to change without prior notice.)
Dec.10, 2010