

Military Grade DC/DC converter (HVHF28 series)

1. Features of Military Grade DC/DC converter (HVHF28 series) (see Fig. 1 for outside view, and Table 1 for models)

Range of input DC voltage: 18~36V, nominal input DC voltage 28V

Output power: 20W

Operating temperature: -55~+125°C

Input, output and case are isolated mutually

Insulation resistance: $R \geq 100M\Omega$ (DC 500V)

With the function of inhibit and short-circuit protection

Power density: 32W/in³

Function of pins: output voltage is adjustable

Totally sealed metal case



Size: 36.83×28.44×8.5mm³

(without fixed end)

50.8×28.44×8.5mm³

(with fixed end)

Weight: 31g (without fixed end)

34g (with fixed end)

2. Scope of Military Grade DC/DC converter (HVHF28 series) application

High-reliability electronic system for aeronautics and astronautics, etc.

Table1 Product models

Single	Dual
HVHF28S5(F)	HVHF28D12(F)
HVHF28S12(F)	HVHF28D15(F)
HVHF28S15(F)	
HVHF28S8(F)	

Fig.1 Outside view of HVHF28 series

3. Description of Military Grade DC/DC converter (HVHF28 series)

The HVHF28 series products are designed using forward PWM principle and are new generation 20W series high-reliability DC/DC converters developed through improvement. After being isolated and coupled through opto-coupler isolation, the sampling signal of output voltage of the product and the sampling signal of current in input circuit modulate the pulse width of controller at the same time. Its double-output close-loop control makes the product have stable voltage output and short-circuit protection function. Magnetic reset measures effectively prevent magnetic saturation of converter, thus improving the reliability of the product. In addition, the product also has fine adjustment function for output voltage.

This series products are made by the thick-film hybrid integration process and is totally sealed in a metal case. Both the design and manufacture of the product satisfy the requirements of GJB2438A-2002 “General specification for hybrid integrated circuits” and specific specifications of the products. Connection of input into HFG-CE03 power filter can improve EMC performance of the product.

4. Electrical performance of Military Grade DC/DC converter (HVHF28 series)

(Table2, Table3, Table 4)

Table 2 Rated conditions and recommended operating conditions	
Absolute max. rated value	Input voltage: 40V
	Output power: 20W
	Lead soldering temperature: 300°C/(10s)
	Storage temperature range: -55~125°C
Recommended operating conditions	Inhibit voltage: $\leq 0.2V$
	Range of input voltage: 18~36V
	Case temperature(T_c): -55~+125°C

5. Circuit block diagram of Military Grade DC/DC converter (HVHF28 series)

(Fig. 2, Fig. 3)

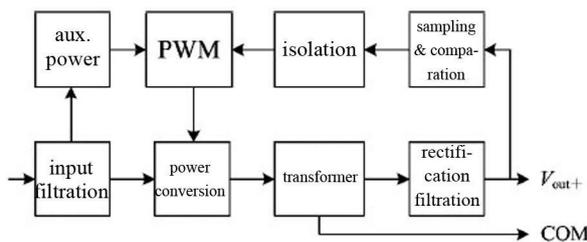


Fig. 2 Circuit block diagram of single output DC/DC converter

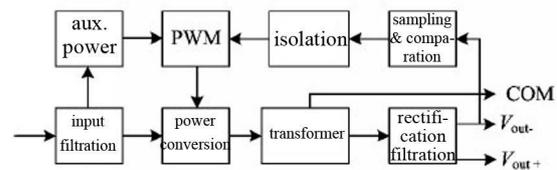


Fig. 3 Circuit block diagram of dual output DC/DC converter

Table 3 Electric characteristics (single output)

No.	Parameter	Conditions (unless otherwise specified) $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{in} = 28 \pm 1.4\text{V}$	HVHF28S5(F)		HVHF28S8(F)		HVHF28S12(F)		HVHF28S15(F)	
			Enterprise military standard Q/HW30637-2005		Enterprise military standard Q/HW30802-2006		Enterprise military standard Q/HW30638-2005		—	
			min.	max.	min.	max.	min.	max.	min.	max.
1	output voltage/V	$I_O = \text{full load}$	4.90	5.10	7.90	8.10	11.88	12.12	14.88	15.12
2	output current/A	$V_{in} = 16 \sim 40\text{V}$	0	3	0	2.5	0	1.5	0	1.5
3	output power/W	—	—	15	—	20	—	18	—	22
4	output ripple voltage/mV	$\text{BW} = 20\text{Hz} \sim 100\text{MHz}$, $I_O = \text{full load}$	—	40	—	40	—	40	—	40
5	voltage regulation/mV	$V_{in} = 18 \sim 36\text{V}$, $I_O: \text{full load}$	—	20	—	20	—	20	—	20
6	load regulation/mV	$I_O: 0 \rightarrow \text{full load}$	—	50	—	50	—	50	—	50
7	efficiency/%	$I_O = \text{full load}$	72	—	75	—	77	—	78	—
8	insulation resistance /MΩ	apply 500V DC voltage between input and output or any pin (except for pin 6) and case $T_A = 25^{\circ}\text{C}$	100	—	100	—	100	—	100	—
9	inhibit voltage/V	$T_A = 25^{\circ}\text{C}$, apply inhibit voltage, output is disabled	0	0.2	0	0.2	0	0.2	0	0.2
10	protection function/s	$T_A = 25^{\circ}\text{C}$, reducing current protection	5	—	5	—	5	—	5	—
11	startup delay/ms	$I_O = \text{full load}$	—	25	—	25	—	25	—	25

Note: Item 9 and 10 of electric characteristics are guaranteed by design

Table 4 Electric characteristics (double output)

No.	Parameter	Conditions (unless otherwise specified) $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{in} = 28 \pm 1.4\text{V}$	HVHF28D12(F)		HVHF28D15(F) Enterprise military standard (Q/HW30922-2006)	
			min.	max.	min.	max.
			1	output voltage/V	$I_O = \text{full load}$	11.88
2	output current/A	$V_{in} = 18 \sim 36\text{V}$	0	0.625	0	0.5
3	output power/W	—	—	15	—	15
4	output ripple voltage/mV	$\text{BW} = 20\text{Hz} \sim 100\text{MHz}$, $I_O = \text{full load}$	—	50	—	80
5	voltage regulation/mV	$V_{in}: 16 \rightarrow 40\text{V}(\text{HVHF28D12(F)}),$ $18 \rightarrow 36\text{V}(\text{HVHF28D15(F)}),$ $I_O: \text{full load}$	—	20	—	50
6	load regulation/mV	$I_O = 0 \rightarrow \text{full load}$	—	50	—	100
7	efficiency/%	$I_O = \text{full load}$	78	—	78	—
8	insulation resistance/MΩ	apply 500V DC voltage between input and output or any pin (except for pin 6) and case $T_A = 25^{\circ}\text{C}$	100	—	100	—
9	inhibit voltage/V	$T_A = 25^{\circ}\text{C}$, LV disabled	0	0.7	0	0.7
10	protection function/s	$T_A = 25^{\circ}\text{C}$, reducing current protection	10	—	10	—
11	startup overshoot(peak)/mV	output voltage $V_{in}: 0 \rightarrow 28\text{V}$, $I_O = \text{full load}$	—	1200	—	—
12	startup delay/ms	input voltage $V_{in}: 0 \rightarrow 28\text{V}$, $I_O = \text{full load}$	—	5	—	15

Note: Item 9 and 10 of electric characteristics are guaranteed by design

6 MTBF curve (Fig.4, Fig.5)

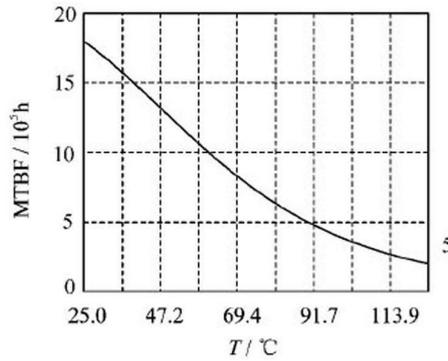


Fig.4 Model HVHF28S5

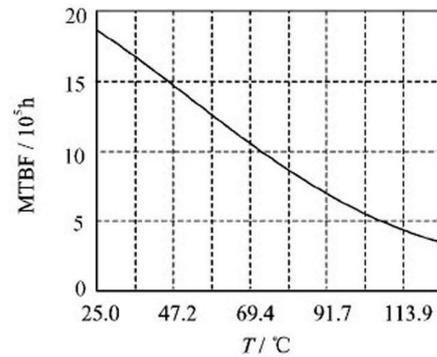


Fig.5 Model HVHF28D12

(Note: as per GJB/Z299B-98, envisaged good ground condition)

7 Pin designation (Fig.6, Table 5)

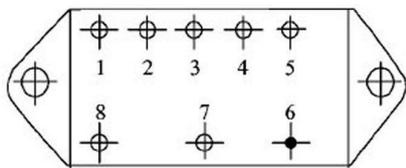


Fig.6 Bottom view

Table 5 Pin designation

pin	function		pin	function	
	single	dual		single	dual
1	inhibit	inhibit	5	adjustment *	adjustment *
2	no connection	positive output	6	case	case
3	output ground	output common	7	input	input
4	output	negative output	8	input positive	input positive

Note: *① For single output model, applying external resistance between adjustment and output (positive or ground) can adjust the change of output voltage.

② For dual output model, applying external resistance between adjustment and output (positive or negative) can adjust the change of output voltage.

8 Connection diagram for typical application

(1) Connection diagram for operation (Fig.7, Fig.8)

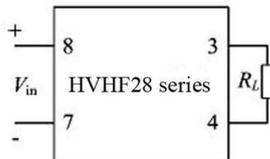


Fig. 7 Connection diagram for single output operation

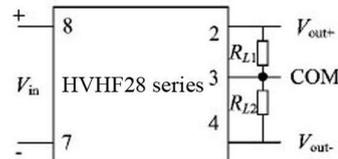


Fig.8 Connection diagram for dual output operation

(2) Connection diagram for inhibit (Fig.9, Fig.10)

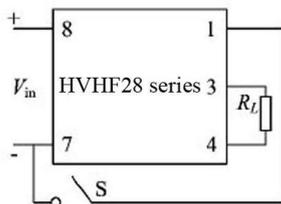


Fig. 9 Connection diagram for single output inhibit

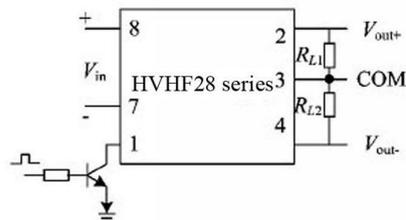


Fig. 10 Connection diagram for dual inhibit

(3) Connection diagram for EMI filter (Fig.11)

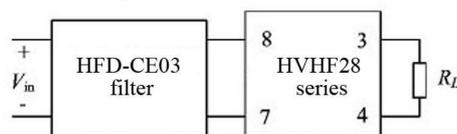


Fig.11 Connection diagram for EMI filter

9 Package specifications (unit: mm) (Fig.12, Fig.13, Table 6)

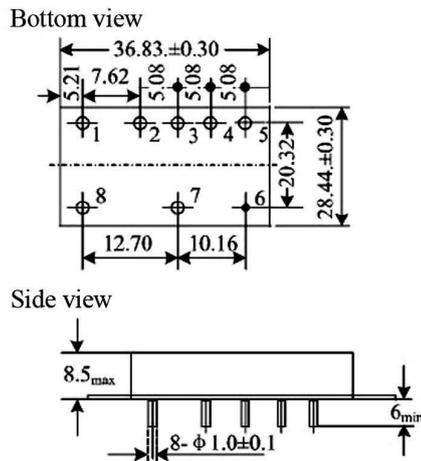


Fig.12 External dimension diagram
(without fixed end)

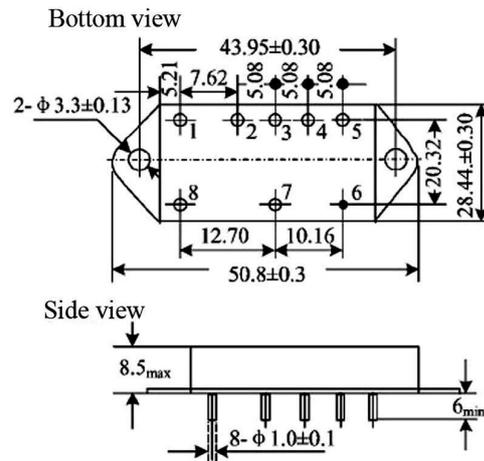


Fig.12 External dimension diagram
(with fixed end)

Table 6 Package specifications

Case model	Header	Header plating	Cover	Cover plating	Pin material	Pin plating	Sealing style	Notes
UPP3728-08b	cold-rolled steel (10#)	Ni	Iron/nickel alloy (4J420)	Ni	Copper compound	Ni/Au	Compression seal	ground pin (pin 6) plating is Ni

Note: the temperature of solder pins within 10s shall not exceed 300°C

10 Part numbering key (Fig.14)

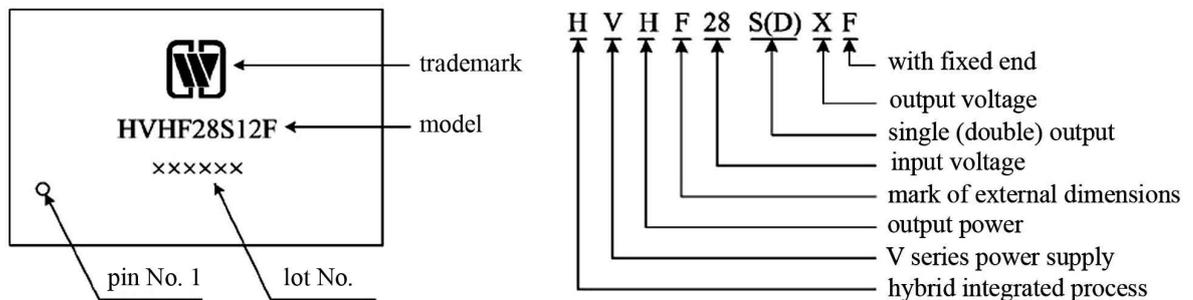


Fig.14 Part numbering key

Precautions for use:

- ★ Upon power-on, be sure to correctly connect the positive and negative pole of the power supply to ensure correct power supply for fear of burning. When carrying out the electrical performance test, the test position shall be the pinouts of the product.
- ★ Upon assembly, the bottom of the product shall fit to the circuit board closely so as to avoid damage of pins, and shockproof provision shall be added, if necessary.
- ★ Do not bend the pinouts to prevent the insulator from breaking, which affects the sealing property.
- ★ When the case temperature is 105°C, it is suggested that the thickness of heat sinking plate (copper) shall be 3mm, and the area shall be greater than 85mm x 50mm.
- ★ When the case temperature is 125°C, it is suggested that the thickness of heat sinking plate (copper) shall be 3mm, and the area shall be greater than 80mm x 65mm.
- ★ When the user places an order for the product, detailed electric performance indexes shall refer to the relevant enterprise standard.