Hybrid Surge Protection DC/DC Converter（HSFL28S15 Series）

1 Features

Size：76.70×29.00×10.66mm^3
Weight ：82g

- High reliability
- Wide input voltage range：15V～50V，Nominal DC input voltage: 28V
- Surge protection voltage：80V，1s
- Output Power P_O：65W
- Operating temperature range T_C：-55℃～+125℃
- Low Startup current
- No output overshoot
- Inhibit function
- Input under-voltage locked function and output short circuit protection
- Maximum power density：43W/in^3
- Hermetically sealed metal case

Table1 Device models

HSFL28S5
HSFL28S12
HSFL28S15

2 Scope of application

High-reliability electronic system for aviation and aerospace, etc

3 Description

- This series device is highly reliable and is featured with surge protection (80 v, 1 s) for DC/DC converter. Single ended, pulse width modulated and transformer magnetic feedback topology design are used in this device. The operating principle is that the sampling signal of output voltage , coupled by the opto-coupler, works together with the sampling signal of input loop current to regulate the pulse width of the controller. The double loop control creates constant voltage output and short circuit protection. Devices are produced by using thick film hybrid integration process, and metal package sealing. The design and manufacturing process of converters are in compliance with MIL-PRF-38534 and detailed specifications. Input terminal connected to the accessory power supply filter can improve the electro-magnetic compatibility of devices。

4 Technical Specifications

Table 2 Rated conditions and recommended operating conditions

Absolute Max. Rating	
Input voltage：15V～50V Input voltage（Transient,1s）：80V Output Power：71W Storage temperature：-65℃～150℃	Mechanical Shock：1500g Lead temperature：300℃（15s） Weight（without flange/ with flange ）：82g Antistatic intensity：2000V

Table 3 Electrical characteristics

NO.	Characteristics	Condition （Except provided by，-55℃≤Tc≤125℃，VIN=28V±5%）		HSFL28S5		HSFL28S12		HSFL28S15	
				min	max	min	max	min	max
1	Input Voltage /V	Low、High、Ambient Temperature		15	50	15	50	15	50
2	Output Voltage /V	Io=Full Load	Ambient	4.95	5.05	11.88	12.12	14.85	15.15
			Low/high	4.875	5.125	11.70	12.30	14.625	15.375
3	Output current/A	VIN=15V～50V		—	10	—	5	—	4.33
4	Output Power/W			0	50	0	60	0	65
5	Output Ripple Voltage/mV	BW≤20MHz，Io=Full load		—	50	—	80	—	100
6	Line Regulation/mV	VIN=15V～50V，Io=Full		—	20	—	20	—	20
7	Load Regulation/mV	Io=No load to load		—	50	—	50	—	50
8	Input current/mA	Inhibit		—	6	—	6	—	6
		Io=no load		—	60	—	60	—	60
9	Input Ripple current/mA	BW≤20MHz，Io=Full load		—	80	—	80	—	80
10	Efficiency/%	Io=Full load		74	—	80	—	81	—
11	Isolation/MΩ	Input to output or any pin to case(except pin 7、8)at 500V，Tc=25℃		100	—	100	—	100	—
12	Inhibit Function			0	0.7	0	0.7	0	0.7
13	Inhibit open-circuit Voltage/V	Io=Full Load		10	14	10	14	10	14
14	Under-voltage startup voltage/V	Io=Full Load		12	14.8	12	14.8	12	14.8
15	Under voltage cut-off voltage/V	Io=Full Load		11	14.5	11	14.5	11	14.5
16	Short Circuit Protection								
17	Capacitive load /μF	Tc=25℃		—	500	—	500	—	500
18	switching frequency/kHz	Io=Full Load		180	260	180	260	180	260

19	External sync frequency range/kHz	Io=Full Load	200	300	200	300	200	300
20	Step Line Response Transient(mV	Io=Full Load	—	500	—	700	—	700
21	Step Line Response Recovery(μs	50%load→full load →50%load	—	500	—	500	—	500
22	Step Line Response Transient(mV	VIN：16V→40V，VIN：40V→16V，Io=Full load	—	600	—	900	—	900
23	Step Line Response Recovery(μs ）	VIN：16V→40V，VIN：40V→16V，Io=Full load	—	500	—	500	—	500
24	Start-up Overshoot(peak)/mV	VIN：0→28V，Io=Full load	—	25	—	50	—	50
25	Start-up Delay (ms)	VIN：0→28V，Io=Full load	—	20	—	20	—	20

5 Circuit block diagram

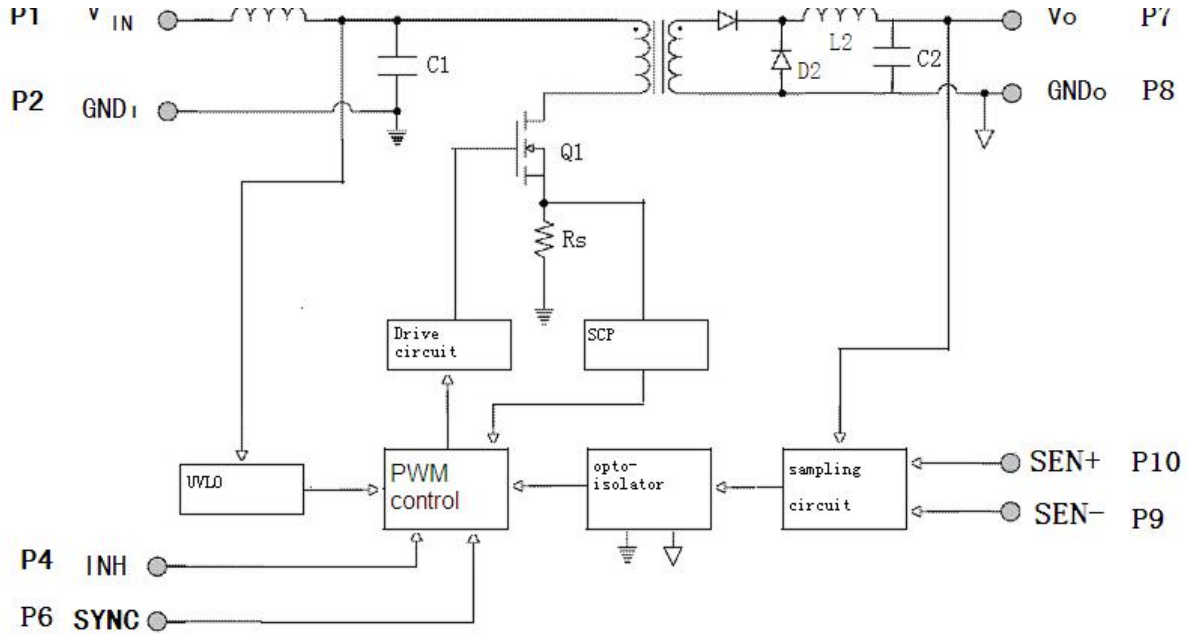

Fig. 1 HSFL28S Circuit block diagram

6. Typical Characteristic Curve(T_c=25℃，V_{IN}=28V±5%)

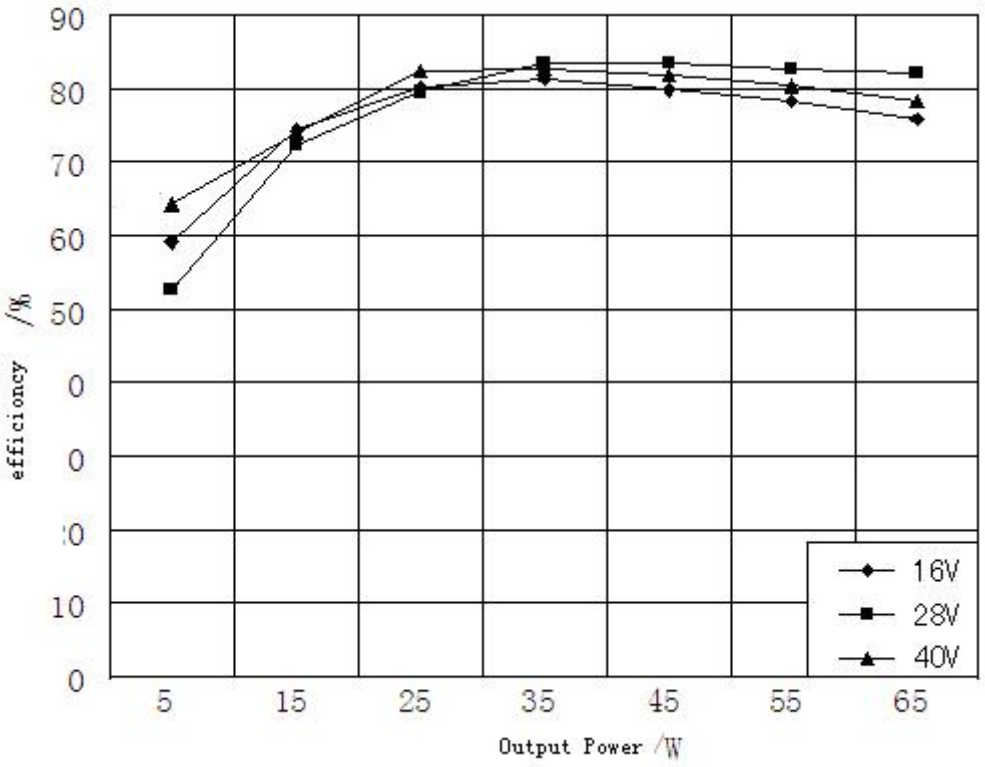

Fig 2 HSFL28S15 Efficiency

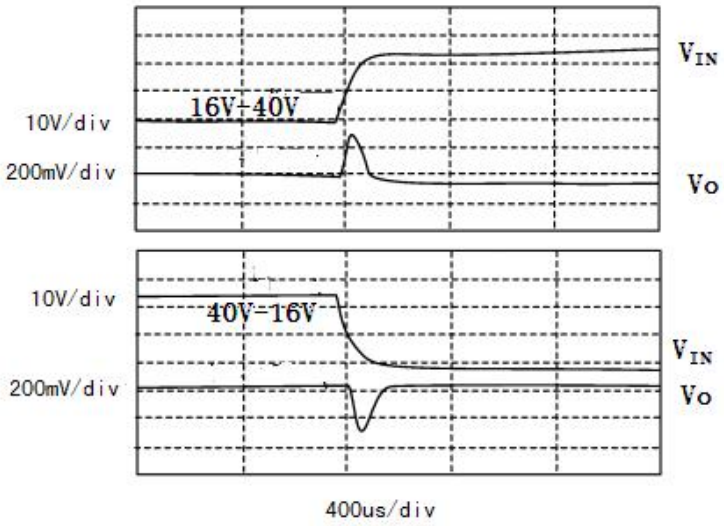

Fig 3 HSFL28S15 Step Line Response

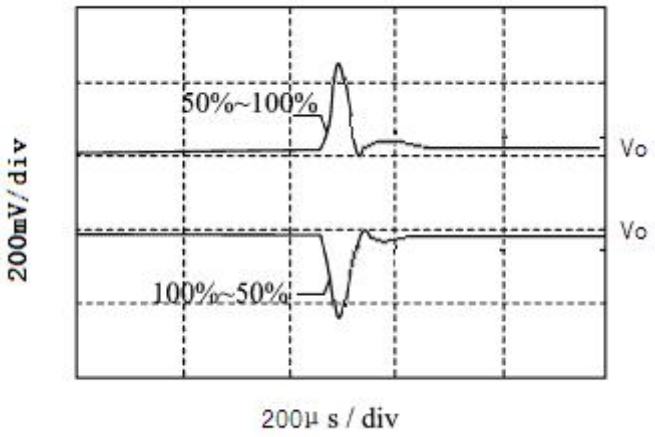

Fig. 4 HSFL28S15 Step Load Response

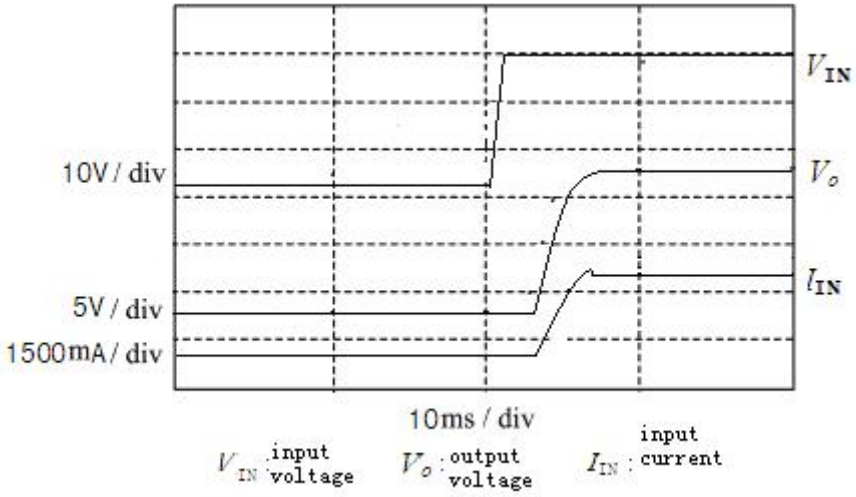

Fig. 5 HSFL28S15 Start-up Overshoot/Start-up Delay Current

7. MTBF Curve

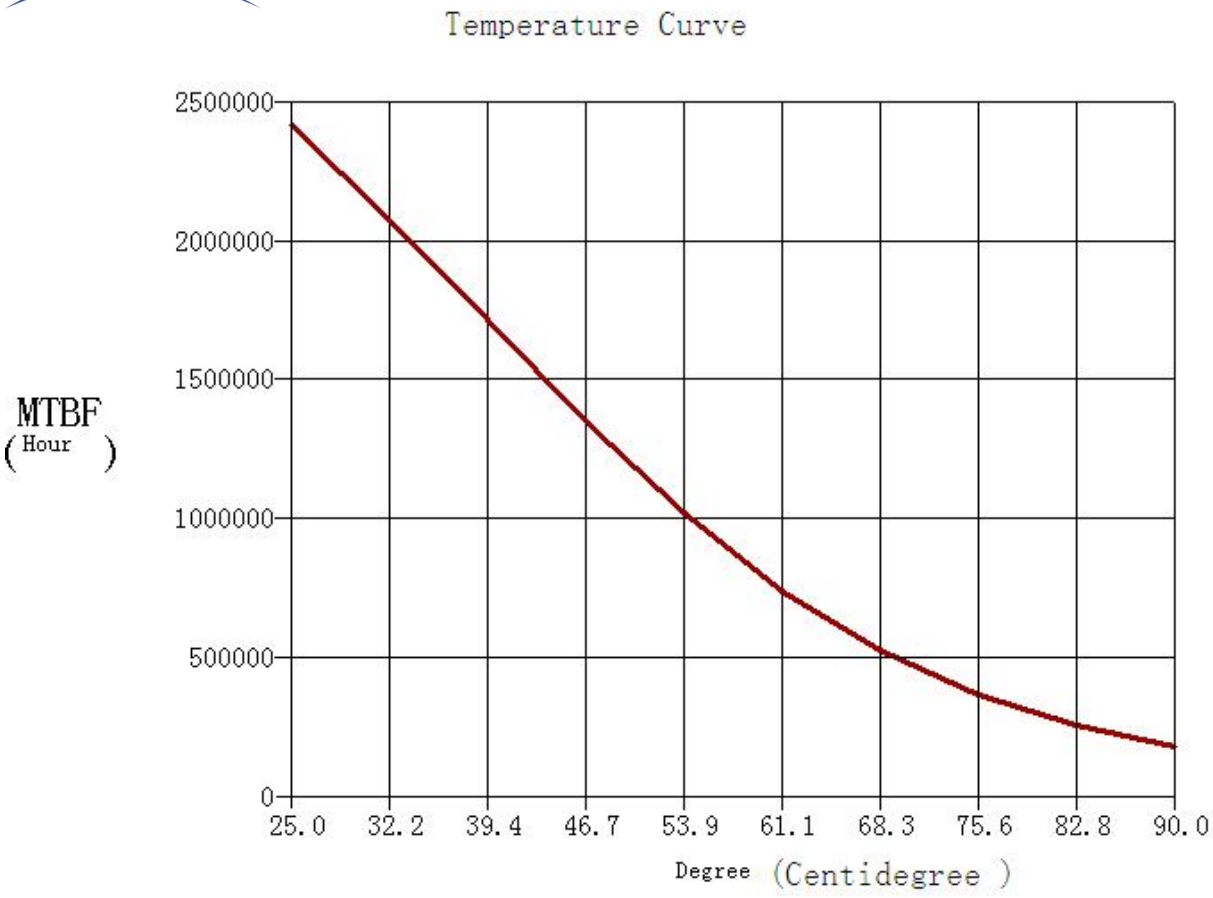

Fig. 6 MTBF Temperature Curve（HSFL28S15）

8 Pin Designation

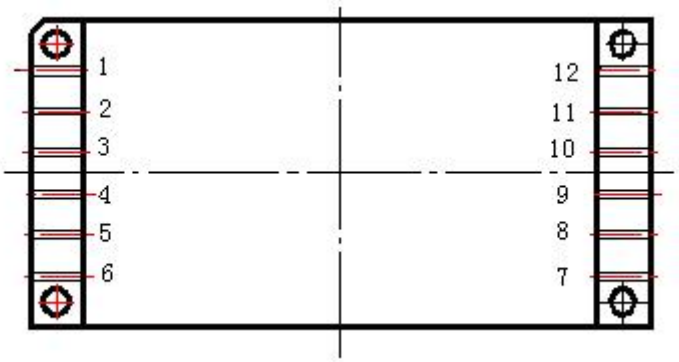

Fig. 7 Pin Out Top View

Table 4 Pin Designation

No.	Symbol	Designation	No	Symbol	Designation
1	V_{IN}	Positive Output	7	V_o	Positive Output
2	GND_I	Input Common	8	GND_o	Output Common
3	NC	No connection	9	SEN	Sensitive

4	INH	Inhibit	10	SEN+	Sensitive
5	NC	No connection	11	NC	No connection
6	SYNC	External sync input	12	NC	No connection

9 Typical Connection Diagram

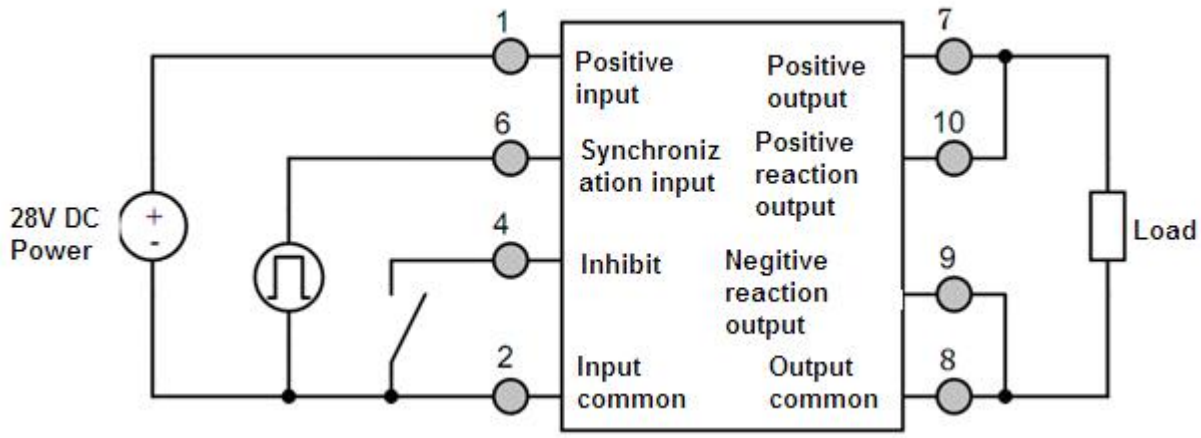

Fig. 8 Connection Diagram

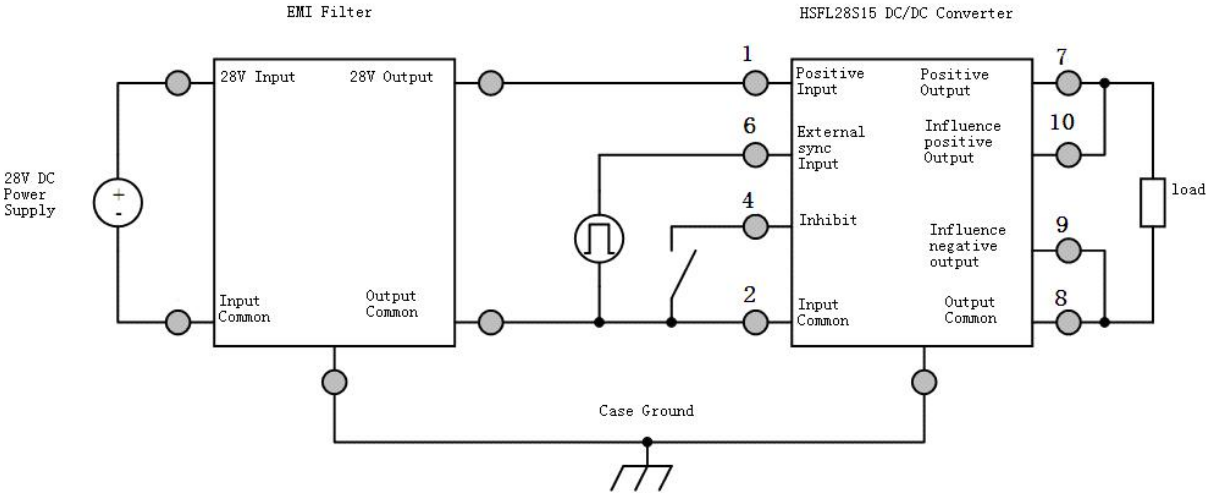

Fig. 9 EMI Filter Connection Diagram

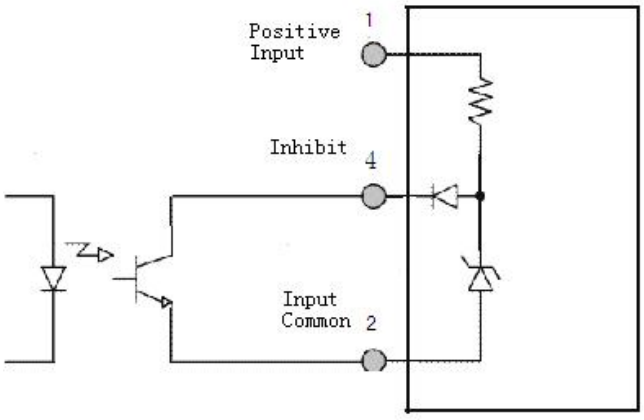

Fig. 10 Inhibit Driver Circuit Diagram

10. Package Specifications

Fig. 11 Bottom View

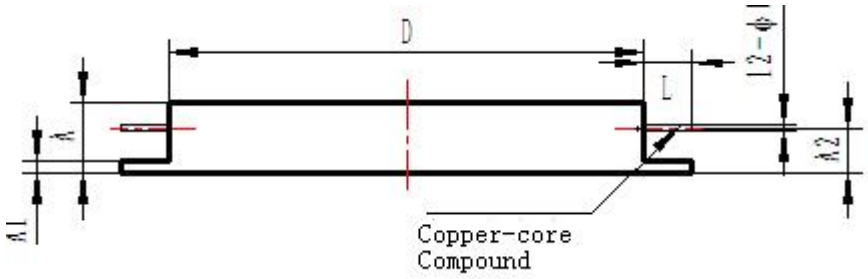

Fig. 12 Side View

Table 5 Package Outline

Symbol	Data/mm		
	Min	Typical	Max
A	-	-	10.66
A1	0.97	-	1.57
A2	5.09	-	6.09
Φb	0.87	-	1.13
D	-	-	64.00
E	-	-	38.60
e	-	5.08	-
L	5.35	-	-
ΦP	3.00	-	3.60
X2	31.50	-	32.50
X1	69.60	-	70.60
X	75.70	-	76.70

Table 6 Case Materials

Case Model	Header	Header Plating	Cover	Cover Plating	Pin	Pin Plating	Sealing	Notes
FPP6438-12	Cold Rolled Steel (10#)	Ni	Kovar (4J42)	Ni	Cu–core Compound	Ni/Au	Parallel seam	

11 Ordering Information

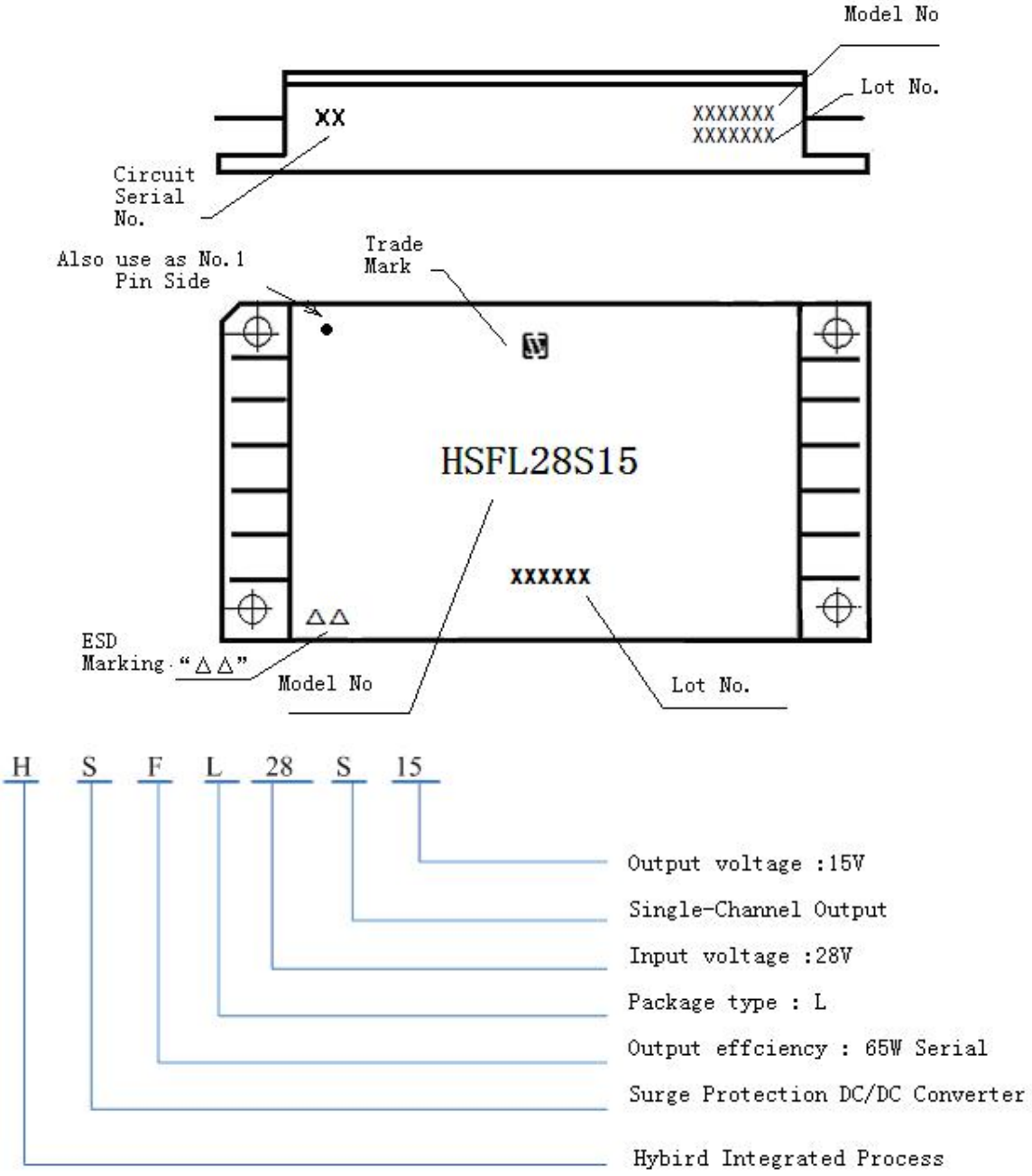

Fig.13 Part Numbering Key

Application Notes:

☆ Both positive and negative terminals for power supply shall be correctly connected when power is applied so as to offer power supply and avoid permanent damage to the device.

☆ This device has the sensitive terminal. Devices in use shall be correctly connected in accordance with specified drawings, in order to avoid damage to the device and ensure a good sensitive terminal contact.

☆ Testing position shall be pin bottom of the device when the electrical characteristic is measured

☆ The baseplate of the device shall be closely attached to the circuit board during device mounting so as to avoid the damage on pins. The shockproof actions shall be adopted when necessary.

☆ Pins shall not be bended to avoid the glass insulator cracking and case leaking.

☆ Pins at inhibit terminal shall be hung in the air during no operation.

☆ When the case temperature reaches 125℃, the thickness of the heat sink (copper) shall be 3mm and the size shall be greater than 120mm×80mm。

☆ When ordering this device，the detail electrical specification shall be based on relevant enterprise standard. Data offered in this document shall be for reference only。