

BSTHF28S12F

DC/DC converter

Datasheet

I. Product Introduction

BSTHF28S12F DC/DC converter is a highly reliable isolated DC-DC power module manufactured using thick-film hybrid integrated circuit technology. It features a dual-in-line package (DIP) fully sealed metal housing and is a replacement for similar products in Interpoint's MHF series. It is used in DC power supply systems to achieve DC voltage conversion.

This product is controlled according to the H-level quality standard of GJB2438A-2002 "General Specification for Hybrid Integrated Circuits".

Fixed switching frequency + single-ended forward topology ensures high efficiency, fast dynamic response, and good electromagnetic compatibility.

II. Features

- High efficiency up to 78%
- Low voltage 12V output
- Output power 15W
- Output current 1.25A
- High reliability
- Low switching noise
- Wide input voltage range: 16V~40V
- Output short circuit protection
- Standard UPP 37 28 steel housing
- Models with an "F" indicate that they are equipped with mounting flanges.

III. Performance Indicators

Table 1

ABSOLUTE MAXIMUM RATINGS (UNLESS OTHERWISE SPECIFIED, T _C = -55°C~+125°C, V _{IN} = +28V±0.5V, FULL LOAD)	
Input voltage (steady state): 28V _{DC} Output power 15W Power consumption (full load, T _C = +125°C): 5.3W	Storage temperature: -65°C ~ +150°C Pin soldering temperature 300°C /10s

The electrical characteristics shall conform to the specifications in Table 2.

Table 2. Electrical characteristics

CHARACTERISTIC	SYMBOL	CONDITION (UNLESS OTHERWISE SPECIFIED) -55°C ≤ T _C ≤ 125°C, V _I = 28V ± 0.5V, NO EXTERNAL SYNCHRONIZATION, C _L = 0)	GROUP A GROUPING	LIMIT VALUE		UNIT
				MINIMUM	MAXIMUM	
Output voltage	V _O	I _O =1.25A	1	11.88	12.12	V
			2, 3	11.76	12.24	
Output current	I _O	V _I =16V~40V	1,2,3	-	1250	mA
Output ripple voltage (Peak-to-peak value)	V _{RIP}	BW=10kHz~2MHz, I _O =1.25A	1	-	80	mV
			2,3	-	120	
Voltage regulation	S _V	V _I =16V→40V, I _O =1.25A	1,2,3	-	50	mV
Current regulation	S _I	I _O =0→1.25A	1,2,3	-	50	mV
Input current	I _I	No load, prohibit the connection of the terminal to the input ground terminal.	1,2,3	-	12	mA
		No load, no open circuit allowed	1,2,3	-	50	
Input ripple current (Peak-to-peak value)	I _{RIP}	BW = 10kHz~10MHz, I _O = 1.25A	1	-	80	mA
			2,3	-	120	
Efficiency	η	I _O = 1.25A	1	78	-	%
			2,3	74	-	
Insulation resistance	R _I	Apply 500V between the input/output terminals or between any of the leads (except for the 6-terminal terminal) and the casing. T _A = 25°C	1	100	-	MΩ
Short-circuit power consumption	P _D	Short circuit	1,2,3	-	6	W
Capacitive load ^{ab}	C _L	T _A = 25°C, has no effect on DC parameters.	4	-	100	μF

Table 1. (continued)

CHARACTERISTIC	SYMBOL	CONDITION (UNLESS OTHERWISE SPECIFIED) -55°C ≤ T _c ≤ 125 °C V _I = 28 V ± 0.5 V, NO EXTERNAL SYNCHRONIZATION, C _L = 0)	GROUP A GROUPING	LIMIT VALUE		UNIT
				MINIMUM	MAXIMUM	
Switching frequency	f _s	I _o =1.25A	4,5,6	400	600	kHz
External synchronization frequency range ^b	f _{SYNC}	I _o =1.25A, pin 5 connected to TTL level (V _{IH} ≥4.5V, V _{IL} ≤0.8V), duty cycle 40%~60%.	4,5,6	400	600	kHz
Output voltage change ^{bc} (peak value) during load transient	V _{LT}	50% load → Full load or Full load → 50% load	4,5,6	-500	500	mV
Recovery time of output voltage during load transients ^{bcd}	t _{LT}	50% load → Full load or Full load → 50% load	4,5,6	-	300	μs
Output voltage change (peak value) during input voltage transients ^{be}	V _{VT}	Input voltage V _i : 16→40V, I _o =1.25A Input voltage V _i : 40→16V, I _o =1.25A	4,5,6	-800	800	mV
Output voltage recovery time ^{bde} during input voltage transient	t _{VT}	Input voltage V _i : 16→40V, I _o =1.25A Input voltage V _i : 40→16V, I _o =1.25A	4,5,6	-	1200	μs
Initiate overshoot ^b (peak value)	V _{TO}	Input voltage V _i : 0→28V, I _o =1.25A	4,5,6	-	1200	mV
Startup delay ^f	t _d	Input voltage V _i : 0→28V, I _o =1.25A	4,5,6	-	25	ms
Load failure recovery time ^{bd}	t _{LF}	I _o from short circuit to 1.25A	4,5,6	-	30	ms

a) Capacitive load can be any value from 0 to the maximum limit, without affecting DC parameters;
b) This parameter is guaranteed by design and is only tested during the initial quality conformity inspection and design or process changes.
c) The jump time of the load should be greater than 10μs;
d) The recovery time refers to the time from the start of the jump until the output voltage returns to within ±1% of the corresponding stable value;
e) The jump time of the input voltage should be greater than 10μs;
f) The start-up delay time can be calculated either from the power supply transition or from when the grounded prohibition terminal is disconnected.

IV. Environmental Adaptability

- Operating temperature range: -55°C~+125°C;
- Storage temperature range: -65°C~+150°C;
- Salt spray protection: 24 hours
- Static electricity: 2000V

V. Circuit Functional Block Diagram

The circuit block diagram of this product is shown in Figure 1.

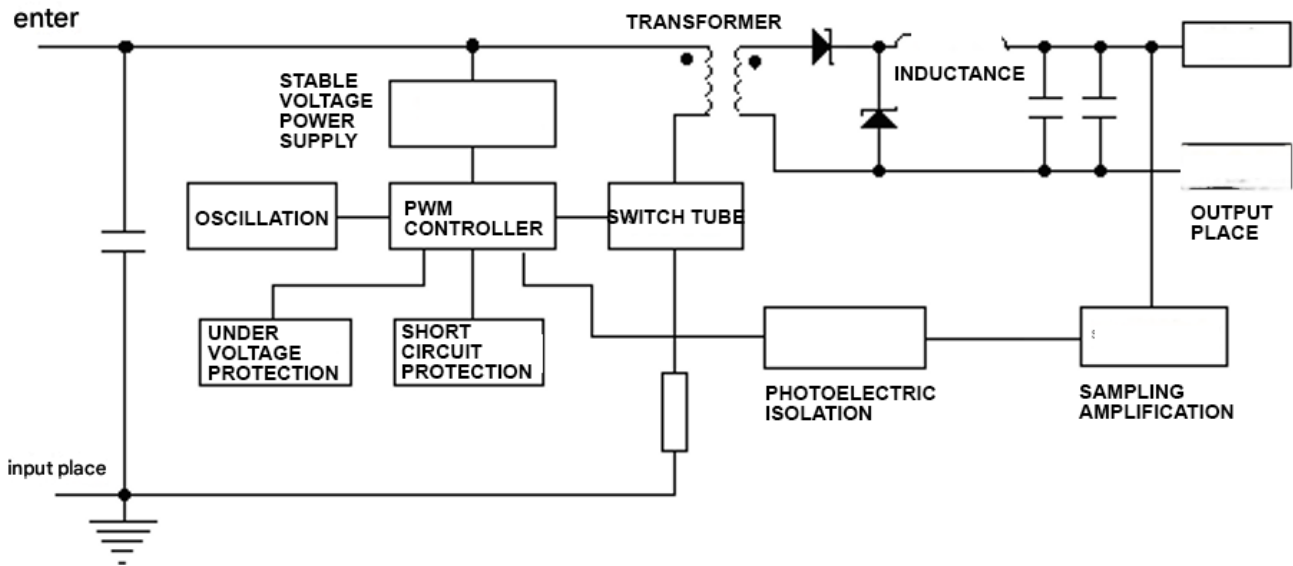


Figure 1. Product Circuit Block Diagram

VI. External Dimensions

The outer dimensions of the outer casing are as specified in Figure 2.

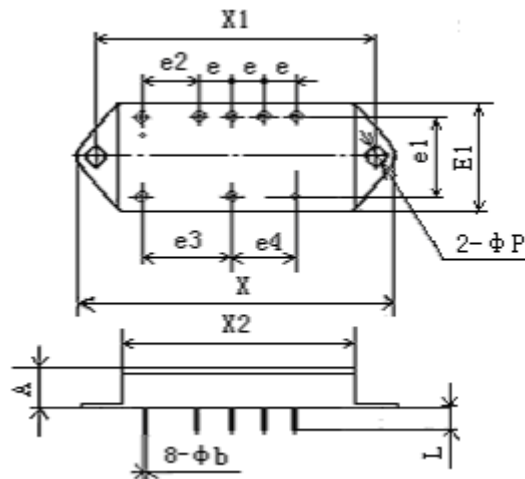


Figure 2. BSTHF28S12F External Dimensions

Table 2

The unit is mm.

RULER INCH TALISMAN NUMBER	NUMERICAL VALUES		
	MINIMUM	NOMINAL	MAXIMUM
A	-	-	8.38
ϕb	0.63	-	0.89
e	-	5.08	-
e1	-	20.32	-
e2	-	7.62	-
e3	-	12.70	-
e4	-	10.16	-
E1	-	-	28.58
L	6.05	-	-
ϕP	3.17	-	3.43
X	-	-	50.80
X1	43.82	-	44.0 8
X2	-	-	36.96

VII. Lead Wire Function Definition

The lead wire arrangement should conform to the specifications in Figure 3 (lead wires downwards, note the marking of pin 1).

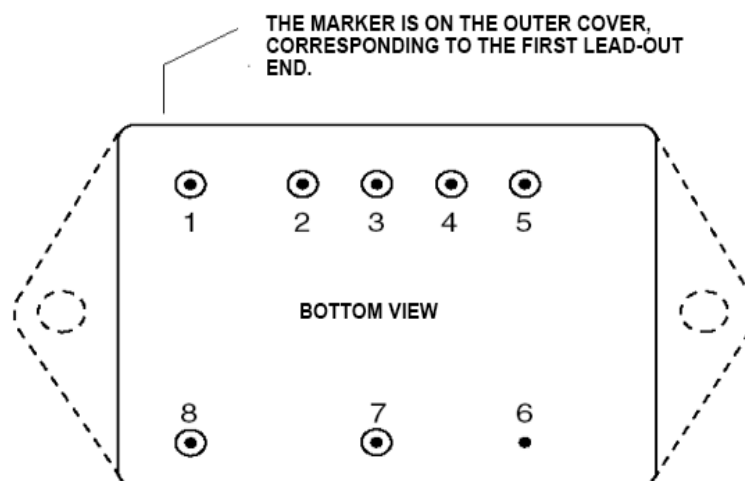


Figure 3. Arrangement of lead-out ends (top view)

Table 3

LEAD-OUT SERIAL NUMBER	SYMBOL	FUNCTION	LEAD-OUT SERIAL NUMBER	SYMBOL	FUNCTION
1	INH	Inhibit	5	SYNC	Synchronization
2	NC	No connection	6	GND _C	Case ground
3	GND _O	Output common	7	GND _I	Input common
4	V _O	Positive output	8	V _{IN}	Positive input

VIII. Typical Application Diagram

Typical application diagram of the product is shown in Figure 4.

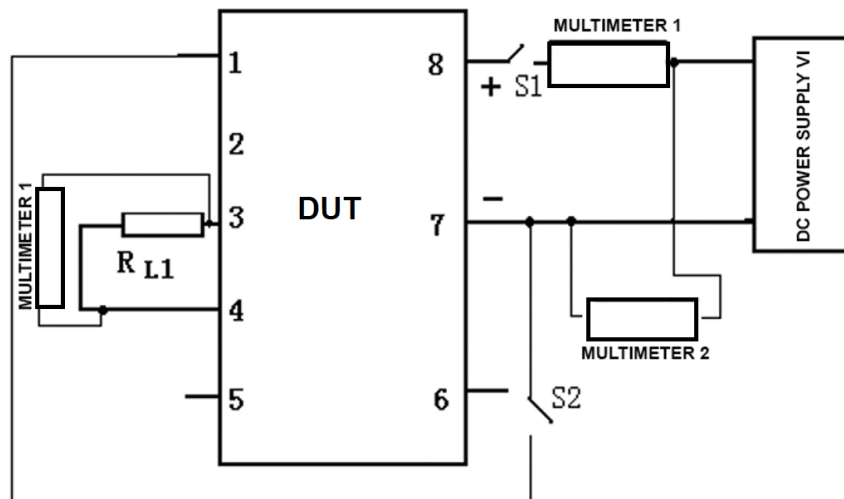


Figure 4. Typical Application Diagram of the Product

IX. Application Notes

9.1. Application instructions for the blocking function

The blocking terminal can be left empty when the blocking function is not in use.

The wiring diagram for the prohibited terminal is shown in Figure 5.

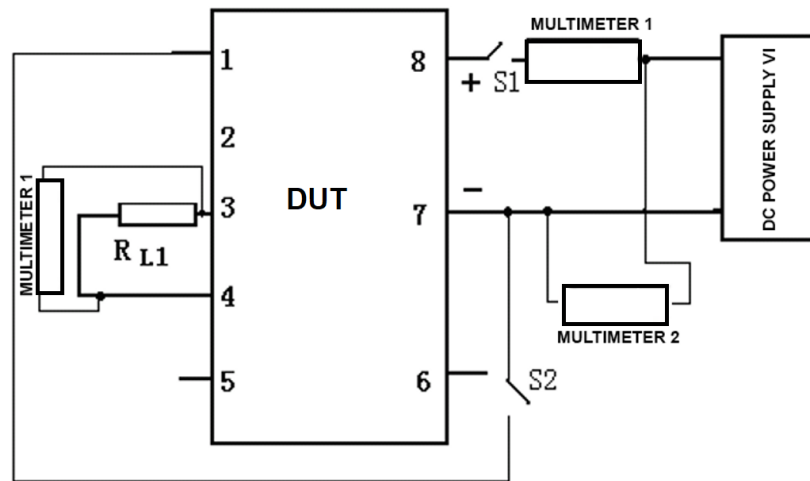


Figure 5. Wiring diagram for prohibited applications.

X. Product Installation Instructions

This product is recommended to be installed according to the following requirements:

- The product is prohibited from being assembled using reflow soldering, wave soldering, or wave soldering (because the soldering temperature exceeds the melting point of the solder paste inside the product). Manual soldering is recommended.
- When soldering the product leads by hand, the soldering iron temperature should not exceed 360°C (recommended to be below 300°C), and the soldering time on each lead should not exceed 10 seconds (recommended to be below 5 seconds).
- This product is a power circuit. Under the conditions of $T_c = -55^{\circ}\text{C} \sim +125^{\circ}\text{C}$ and $V_{IN} = +28\text{V} \pm 0.5\text{V}$, the full load power consumption is approximately 5.3 W. The product will generate heat during operation, causing the case temperature to rise. Therefore, heat dissipation treatment is required during assembly to ensure that the case temperature of the product is below 125°C . Since the main heat-generating surface of the product is the bottom (lead-out end), the heat dissipation treatment method is to first apply thermal grease to the bottom of the product, and then place the bottom of the product tightly against the heat dissipation device.
- When the product is installed on a PCB board or other carrier, care should be taken to protect the product pins to prevent them from being subjected to external stress, which could cause the glass insulator to break.

- During installation, pay attention to the "1" pin marking on the product and install the plate according to the correct installation direction. The pin near the "△△" marking on the upper surface of the casing is pin 1.
- Installation of products with mounting flanges:
 - After the product pins are inserted into the PCB board or other carrier, the product flange and carrier are secured with screws. It is recommended to cut first and then solder. If soldering is used first and then cutting, the solder joints should be remelted (the length of the lead extending out of the mounting carrier should be $1.5\text{mm} \pm 0.8\text{mm}$).
 - For wire soldering, use a soldering iron to solder the pins. First, solder the four outermost pins, and then solder the other pins.
- Installation of products without mounting flanges:
 - It is recommended to use the method of cutting first and then welding. If welding first and then cutting is used, the solder joints should be remelted (the length of the lead wire extending out of the mounting carrier should be $1.5\text{mm} \pm 0.8\text{mm}$).
 - For wire soldering, after the product pins are inserted into the PCB board or other carrier, the pins are soldered using a soldering iron. First, solder the four outermost pins, and then solder the other pins.
 - After welding, it is recommended to use epoxy adhesive to reinforce the product and the carrier.
 - Epoxy adhesive reinforcement (such as DG-4, mainly for large and heavy products such as dual in-line packages) is used. The reinforcement method is to apply epoxy adhesive between the four corners of the product and the carrier (the height of the epoxy adhesive should exceed 25% of the product height). The reinforcement positions are shown in Figure 6.

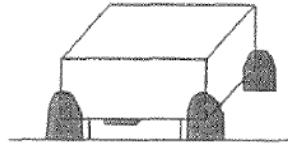


Figure 6. Schematic diagram of epoxy adhesive reinforcement products and carriers

XI. Precautions

- Do not reverse the polarity of the input power supply, otherwise the product will be burned. For the functions of the lead pins of this product, please refer to "7 Lead Function Definition" in this document.
- Note the input voltage range. The input voltage range of this product is 16V to 40V. Using it outside the input voltage range may damage the product.
- The product leads are connected to the metal housing by glass insulators. Bending or impacting the leads is prohibited.