BSTHF28E Series

Product Features

- High reliability
- Wide input voltage range: 15V ~ 50V, nominal input DC voltage 28V
- High Input Transient Voltage: 80V, 1s
- Output power PO: 20W
- Operating temperature range Tc: -55℃ ~ +125℃
- Low starting current
- Small output overshoot
- Has a prohibited function
- Input under-voltage lockout and output short-circuit protection
- Maximum power density: 38W/in^3
- Metal hermetically sealed package

Product Category

Single channel	Dual channel	Multiplex
3.3V,5V,5.2V,5.7V 8V,12V,15V,18V,28V	±5V ±12V,±15V	5V/±12V 5V/±15V

Application

Aviation, aerospace and other high-reliability electronic systems, as well as some occasions that require high power surge resistance.

Product Overview

This series of products is a DC/DC converter with high reliability and anti-surge capability (80V, 1s). The product adopts the single-ended flyback circuit topology and the principle of pulse width modulation. After the sampling signal of the output voltage is isolated by the optocoupler, it modulates the pulse width of the controller simultaneously with the current sampling signal of the input loop, forming a double-loop closed-loop control, which makes the product Has a stable voltage output. This series of products are produced by thick film hybrid integration process and packaged in metal hermetically sealed shell. Product design and manufacturing meet the requirements of GJB2438A-2002 "General Specification for Hybrid Integrated Circuits" and product detailed specifications. The input end is connected to the matching power filter, which can improve the electromagnetic compatibility performance of the product.

Technical performance

Table 1. BSTHF28E Series Rated Conditions

Absolute Maximum Ratings	
Input voltage (continuous): 50V	Mechanical shock: 1500g
Input voltage (transient, 1s): 80V	Lead resistance soldering temperature: 300℃ (15s)
Output power: 20W	Weight (without flange/with flange): 31g/34g
Storage temperature: -65℃ ~ 150℃	Antistatic strength: 2000V

Table 2. Electrical Characteristics of BSTHF28E Series Products

NO.	Characteristic	Condition (Unless otherwise specified, -55℃≤T_C≤125℃, V_{IN}=28V±0.5V)	BSTHF28S3R3E BSTHF28S3R3FE		BSTHF28S05E BSTHF28S05FE		BSTHF28S05R2E BSTHF28S05R2FE		BSTHF28S05R7E BSTHF28S05R7FE		BSTHF28S08E BSTHF28S08FE		BSTHF28S12E BSTHF28S12FE	
			Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Minimum value	Minimum value	Maximum value

1	Input voltage/V	Normal temperature, high and low temperature	15	50	15	50	15	50	15	50	15	50	15	50
2	Output voltage/V	Normal temperature, full load	3.27	3.34	4.95	5.05	5.148	5.252	5.643	5.757	7.92	8.08	11.88	12.12
		High and low temperature, full load	3.25	3.35	4.925	5.075	5.122	5.278	5.615	5.786	7.88	8.12	11.82	12.18
3	Output current/A	V_{IN}=15V ~ 50V	—	3	—	3	—	3	-	2.63	-	2.50	-	1.67
4	Output Power/W		0	10	0	15	0	15.6	0	15	0	20	0	20
5	Output ripple voltage/mV	BW=6MHz, full load	—	40	—	40	—	40	—	40	—	40	—	40
6	Voltage regulation/ mV	V_{IN}=15V ~ 50V, full load	—	20	—	20	—	20	—	20	—	20	—	20
7	Load adjustment degree/mV	No load → full load	—	50	—	50	—	50	—	50	—	50	—	50
8	Input current/mA	Prohibited	—	6	—	6	—	6	—	6	—	6	—	6
		No load	—	65	—	65	—	65	—	65	—	65	—	65
9	Input ripple	BW≤20MHz, full load	—	80	—	80	—	80	—	80	—	80	—	80

	current/mA													
10	Efficiency/%	Full load	65	-	72	-	72	-	72	—	76	—	77	—
11	Insulation resistance/ MΩ	Add 500V between input and output or between package，T_c=25℃	100	—	100	-	100	-	100	—	100	—	100	—
12	Prohibit voltage		0	0.5	0	0.5	0	0.5	0	0.5	0	0.5	0	0.5
13	Inhibit terminal open circuit voltage /V	full load	10	14	10	14	10	14	10	14	10	14	10	14
14	Undervoltage turn-on voltage /V	full load	12.0	14.8	12.0	14.8	12.0	14.8	12.0	14.8	12.0	14.8	12	14.8
15	Undervoltage shutdown voltage /V	full load	11.0	14.5	11.0	14.5	11.0	14.5	11.0	14.5	11.0	14.5	11	14.5
16	Short circuit protection function		Reduced flow type		Reduced flow type		Reduced flow type		Reduced flow type		Reduced flow type		Reduced flow type	
17	Capacitive	T_c=25℃	—	1000	—	1000	—	1000	-	1000	-	500	—	500

	load /μF													
18	Switching frequency /kHz	full load	350	500	350	500	350	500	350	500	350	500	350	500
19	Output voltage change (peak) during load transient /mV	50% load → full load Or full load → 50% load	-400	400	-600	600	-600	600	-500	500	-500	500	-500	500
20	Recovery time of output voltage during load transient /μs	50% load → full load Or full load → 50% load	—	500	—	600	-	600	-	500	-	500	-	500
21	Output voltage change (peak) during input voltage transient /mV	Input voltage V_{IN} : 16V→40V，full load and Input voltage V_{IN} : 40V→16V，full load	-700	700	-800	800	-800	800	-800	800	-900	900	-900	900
22	Recovery	Input voltage V_{IN} :	—	600	—	700	-	700	-	700	-	600	-	500

	time of output voltage in case of input voltage transient /μs	16V→40V，full load and Input voltage V_{IN}：40V→16V，full load												
23	Start overshoot (peak) /mV	Input voltage V_{IN}：0→28V, full load	—	15	—	25	—	25	-	25	-	50	-	50
24	Startup delay /ms	Input voltage V_{IN}：0→28V,full load	—	20	—	20	—	20	-	20	-	20	-	20

Table 3. Electrical Characteristics of BSTHF28SE series products

No.	Characteristic	Condition (Unless otherwise specified, -55℃≤T_c≤125℃, V_{IN}=28V±5%)	BSTHF28S15E BSTHF28S15FE		BSTHF28S18E BSTHF28S18FE		BSTHF28S28E BSTHF28S28FE	
			Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/V	Normal temperature, high and low temperature	15	50	15	50	15	50
2	Output voltage/V	Normal temperature, full load	14.85	15.15	17.82	18.18	27.72	28.28
		High and low temperature, full load	14.77	15.23	17.73	18.27	27.16	28.84

3	Output current/A	V_{IN}=15V～50V	—	1.33	—	1.11	-	714
4	Output Power/W		0	20	0	20	0	20
5	Output ripple voltage/mV	BW≤20MHz，full load	—	50	—	50	-	150
6	Voltage regulation/mV	V_{IN}=15V～50V，full load	—	20	—	20	-	100
7	Load adjustment degree/mV	No load → full load	—	50	—	50	-	100
8	Input current/mA	Prohibited	—	6	—	6	-	6
		No load	—	65	—	65	-	65
9	Input ripple current/mA	BW≤20MHz，full load	—	80	—	80	-	100
10	Efficiency/%	full load	78	—	78	—	77	-
11	Insulation resistance/MΩ	Add 500V between input and output or between package，T_c=25℃	100	—	100	—	100	-
12	Prohibit voltage		0	0.7	0	0.7	0	0.7
13	Inhibit terminal open circuit voltage /V	full load	10	14	10	14	10	14

14	Undervoltage turn-on voltage /V	full load	12.0	14.8	12.0	14.8	12.0	14.8
15	Undervoltage shutdown voltage /V	full load	11.0	14.5	11.0	14.5	11.0	14.5
16	Short circuit protection function		Reduced flow type		Reduced flow type		Reduced flow type	
17	Capacitive load /μF	T_c=25℃	—	500	—	500	-	250
18	Switching frequency /kHz	full load	350	500	350	500	350	500
19	Output voltage change (peak) during load transient /mV	50% load → full load Or full load → 50% load	-500	500	-700	700	-1000	1000
20	Recovery time of output voltage during load transient /μs	50% load → full load Or full load → 50% load	—	500	-	500	-	500
21	Output voltage change (peak)	Input voltage V_{IN}：16V→40V， full load and Input voltage	-900	900	-1400	1400	-1300	1300

	during input voltage transient /mV	V_{IN}：40V→16V， full load						
22	Recovery time of output voltage in case of input voltage transient /μs	Input voltage V_{IN}：16V→40V，full load and Input voltage V_{IN}：40V→16V，full load	—	500	-	800	-	700
23	Start overshoot (peak) /mV	Input voltage V_{IN}：0→28V, full load	—	50	-	50	-	100
24	Startup delay /ms	Input voltage V_{IN}：0→28V,full load	—	20	-	20	-	20

Table 4. Electrical Characteristics of BSTHF28E series products

No.	Characteristic	Condition (Unless otherwise specified, -55℃≤T_c≤125℃，V_{IN}=28V±5%）		BSTHF28D05E BSTHF28D05FE		BSTHF28D12E BSTHF28D12FE		BSTHF28D15E BSTHF28D15FE	
				Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/V	Normal temperature, high and low temperature		15	50	15	50	15	50
2	Output voltage/V	Positive	Normal temperature, full load	4.95	5.05	11.88	12.12	14.85	15.15
		Negative		-5.20	-4.80	-12.20	-11.80	-15.20	-14.80
		Positive	High and low temperature, full load	4.925	5.075	11.82	12.18	14.775	15.225
		Negative		-5.25	-4.75	-12.48	-11.52	-15.60	-14.40
3	Output current/A	V_{IN}=15V～50V		—	1.5	—	0.833	—	0.666
4	Output Power/W			0	15	0	20	0	20
5	Output ripple voltage/mV	BW≤20MHz，full load		—	60	—	50	—	60
6	Voltage regulation/mV	Positive	V_{IN}=16V～40V，full load	—	50	—	50	—	50
		Negative		—	50	—	50	—	50
7	Load adjustment degree/mV	Positive	No load → full load	—	50	—	50	—	50
		Negative		—	50	—	50	—	50

8	Input current/mA	Prohibited	—	6	—	6	—	6
		No load	—	65	—	65	—	65
9	Input ripple current/mA	BW≤20MHz，full load	—	60	—	60	—	60
10	Efficiency/%	full load	73	—	78	—	79	—
11	Insulation resistance/MΩ	Add 500V between input and output or between package，T_c=25℃	100	—	100	—	100	—
12	Prohibit voltage	No load, connection of inhibit terminal to input ground terminal	-	6	-	6	-	6
13	Inhibit terminal open circuit voltage /V	full load	10	14	10	14	10	14
14	Undervoltage turn-on voltage /V	full load	12.0	14.8	12.0	14.8	12	14.8
15	Undervoltage shutdown voltage /V	full load	11.0	14.5	11.0	14.5	11	14.5
16	Short circuit protection function		Reduced flow type		Reduced flow type		Reduced flow type	
17	Capacitive load /μF	T_c=25℃	—	500	—	500	—	500
18	Switching frequency /kHz	full load	350	500	350	500	350	500
19	Cross adjustment	30% load on one way, 30% to 70% on another	—	500	—	500	—	500

	degree/mV	way						
20	Change in output voltage during load transient(Peak)/mV	50% load → full load Or full load → 50% load	-400	400	-400	400	-400	400
21	Recovery time of output voltage during load transient /μs	50% load → full load Or full load → 50% load	—	500	—	500	—	500
22	Output voltage change (peak) during input voltage transient /mV	Input voltage V_{IN}：16V→40V， full load and Input voltage V_{IN}：40V→16V， full load	-800	800	-900	900	-900	900
23	Recovery time of output voltage in case of input voltage transient /μs	Input voltage V_{IN}：16V→40V， full load and Input voltage V_{IN}：40V→16V， full load	—	700	—	500	—	500
24	Start overshoot (peak) /mV	Input voltage V_{IN}：0→28V, full load	—	25	—	50	—	50
25	Startup delay /ms	Input voltage V_{IN}：0→28V,full load	—	20	—	20	—	20

Table 5. Electrical Characteristics of BSTHF28E series products

NO.	Characteristic	Condition(Unless otherwise specified, -55℃≤T_C≤125℃, V_{IN}=28V±5%）		BSTHF28T0512E BSTHF28T0512FE		BSTHF28T0515E BSTHF28T0515FE	
				Minimum alue	Maximum value	Minimum value	Maximum value
1	Input voltage/V	Normal temperature, high and low temperature		15	50	15	50
2	Output voltage/V	V_{O1}	Normal temperature, full load	4.95	5.05	4.95	5.05
				4.85	5.15	4.85	5.15
		V_{O2}	High and low temperature, full load	11.88	12.12	14.85	15.15
				11.64	12.36	14.55	15.45
		V_{O3}	Normal temperature, full load	-12.24	-11.76	-15.30	-14.70
				-12.48	-11.52	-15.60	-14.40
3	Output current/A	I_{O1}	High and low temperature, full load	-	1.5	-	1.5
		I_{O2}		-	0.313	-	0.25
		I_{O3}		-	0.313	-	0.25
4	Output Power/W			0	15	0	15
5	Output ripple voltage/mV	V_{RIP1}	BW=6MHz，full load	-	50	-	60
		V_{RIP2}		-	100	-	80
		V_{RIP3}		-	100	-	80
6	Voltage regulation/mV	S_{V1}	V_{IN}=15V～50V，full load	-	50	-	50
		S_{V2}		-	100	-	50

		S_{V3}		-	100	-	50
7	Load adjustment degree/mV	S_{I1}	I_{O1}=0→full load,I_{O2}=I_{O3} full load	-	50	-	50
		S_{I2}	I_{O2}=I_{O3}=0→full load(Both outputs change simultaneously),I_{O1} full load	-	100	-	50
		S_{I3}		-	100	-	200
8	Input current/mA	Prohibited		-	8	-	8
		No load		-	60	-	60
9	Input ripple current/mA	BW≤20MHz, full load		—	80	—	80
10	Efficiency/%	full load		72	—	72	—
11	Insulation resistance/MΩ	Add 500V between input and output or between package, T_c=25℃		100	—	100	—
12	Inhibit terminal open circuit voltage /V	full load		10	14	10	14
13	Undervoltage turn-on voltage /V	full load		—	—	12.0	14.8
14	Undervoltage shutdown voltage /V	full load		—	—	11.0	14.5
15	Short circuit protection function	T_A=25℃，Three output terminals are shorted at the same time		Reduced flow type		Reduced flow type	
16	Capacitive load /μF	C_{L1}	T_c=25℃	—	500	—	500
		C_{L2}		—	500	—	500
		C_{L3}		—	500	—	500
17	Switching frequency /kHz	full load		250	350	250	350

18	Frequency range of external synchronization /kHz	T_A=25℃，I_{O1} full load，I_{O2}=I_{O3} full load，9 pin connection TTL level（V_{IH}≥4.5V，0≤V_{IL}≤0.8V，V_{IH}-V_{IL}=5V，Duty cycle 50%		—	—	650	750
19	Cross adjustment degree /mV	T_A=25℃ I_{O1} full load，I_{O2}=70%load，I_{O3}=30% load；I_{O1} full load，I_{O2}=30% load，I_{O3}=70% load		—	550	—	550
20	Change in output voltage during load transient(Peak)/mV	V_{LT1}	I_{O2}=I_{O3} full load，I_{O1}：50% load→full load or full load→50% load	-500	500	-500	500
	Recovery time of output voltage during load transient /μs	V_{LT2}	I_{O1} full load，I_{O2}=I_{O3}：50% load→full load or full load→50% load	-700	700	-600	600
		V_{LT3}		-700	700	-600	600
21	Recovery time of output voltage during load transient/μs	t_{LT1}	I_{O2}=I_{O3} full load，I_{O1}：50% load→full load or full load→50% load	-	700	-	700
		t_{LT2}	I_{O1} full load，I_{O2}=I_{O3}：50% load→full load or full load→50% load	-	700	-	500
		t_{LT3}		-	700	-	500
22	Output voltage changes during input voltage transient C (peak)/mV	V_{VT1}	V_I:16V→40V，full load	-500	500	-800	800
			V_I:40V→16V，full load				
		V_{VT2}	V_I:16V→40V，full load	-700	700	-900	900
			V_I:40V→16V，full load				
		V_{VT3}	V_I:16V→40V，full load	-700	700	-900	900
			V_I:40V→16V，full load				
23	Recovery time of output	t_{VT1}	V_I:16V→40V，full load	-	700	-	800

	voltage in case of input voltage transient/μs		V_I:40V→16V，full load				
		t_{VT2}	V_I:16V→40V，full load	-	900	-	600
			V_I:40V→16V，full load				
		t_{VT3}	V_I:16V→40V，full load	-	900	-	600
			V_I:40V→16V，full load				
24	Start overshoot (peak) /mV	V_{TO1}	V_I:0→28V，full load	-	50	-	100
		V_{TO2}		-	50	-	100
		V_{TO3}		-	50	-	100
25	Startup delay /ms	t_{d1}	V_I:0→28V，full load	—	20	—	30
		t_{d2}					
		t_{d3}					

Circuit block diagram

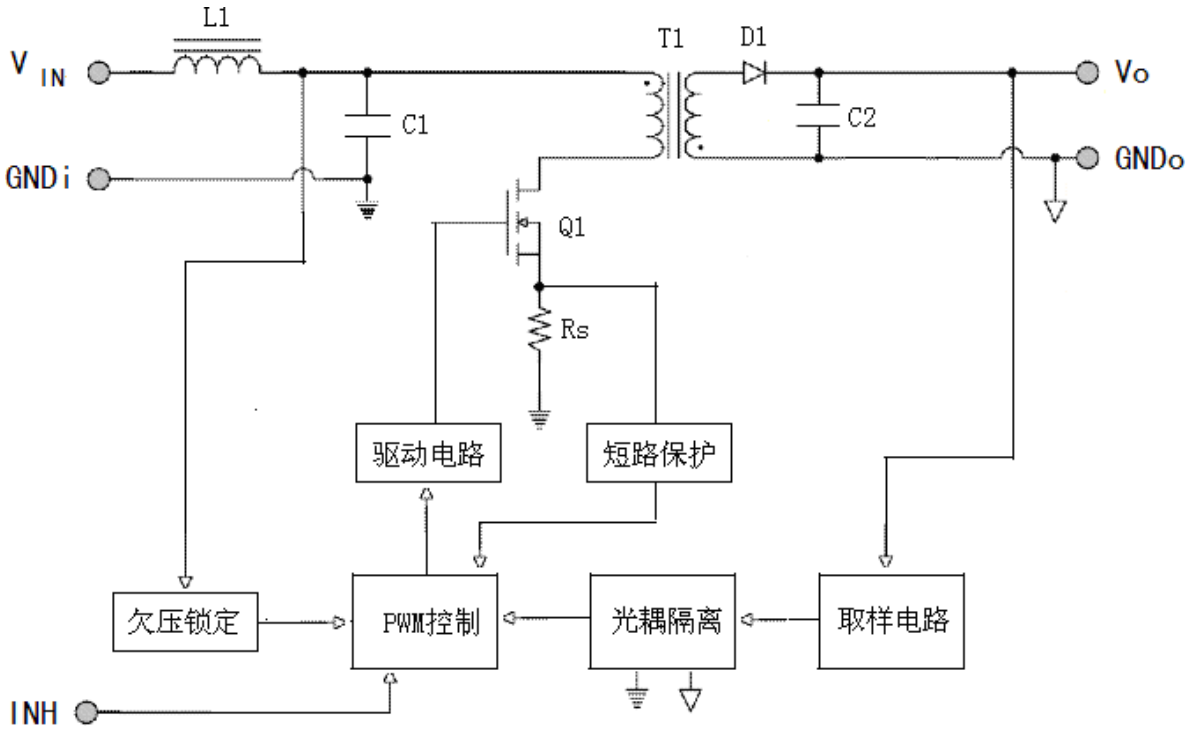


Figure 1. BSTHF28E Series Circuit Block Diagram

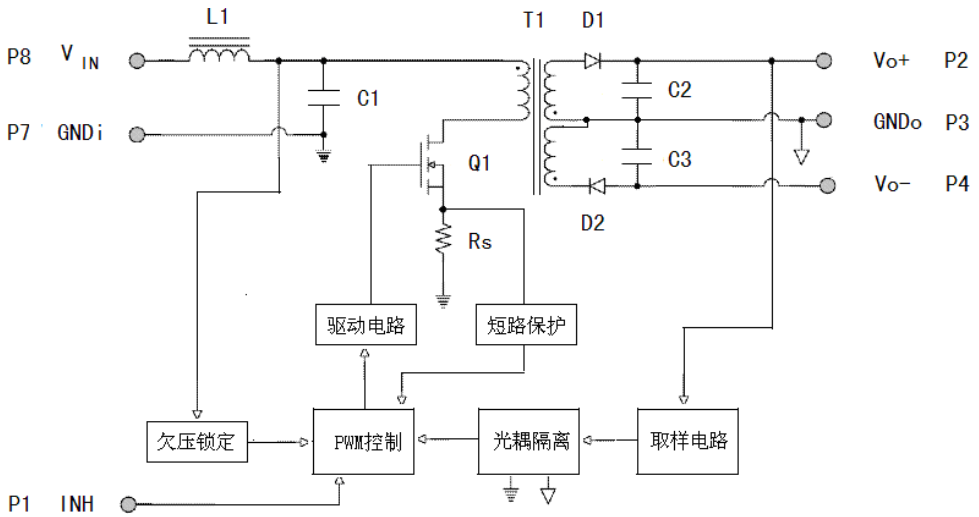


Figure 2. BSTHF28E Series Circuit Block Diagram

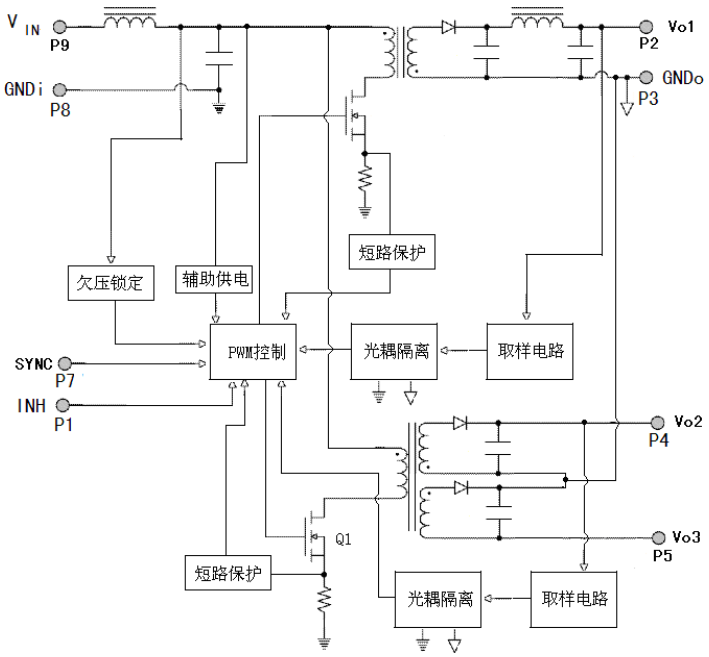


Figure 3. BSTHF28E Series Circuit Block Diagram

Typical characteristic curve

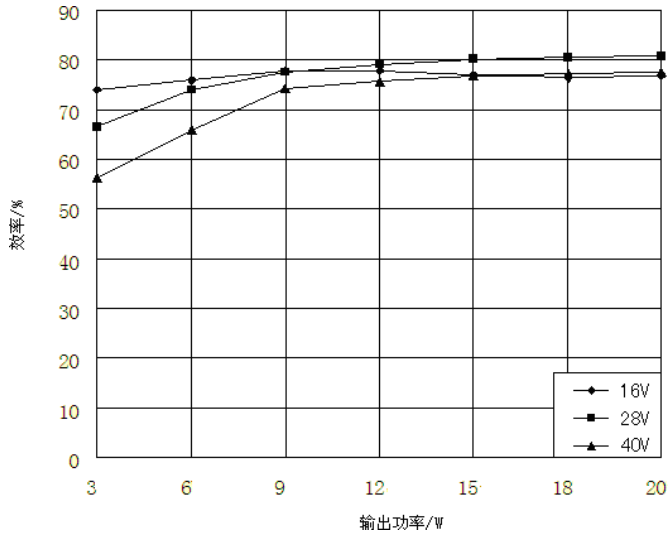


Figure 4. Efficiency curve of BSTHF28E

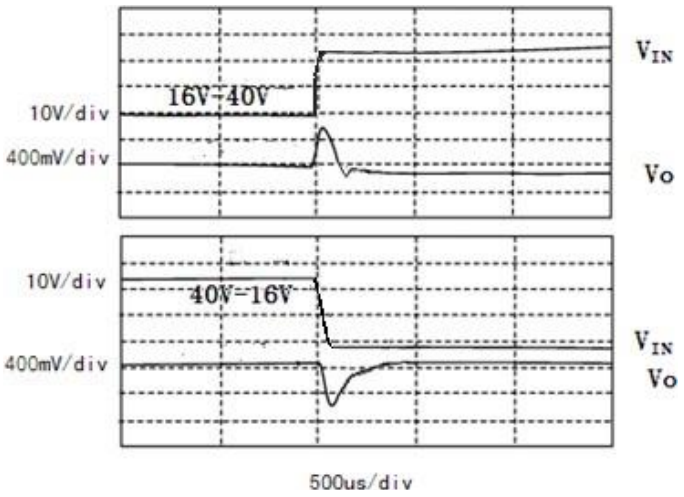


Figure 5. Input step curve of BSTHF28E

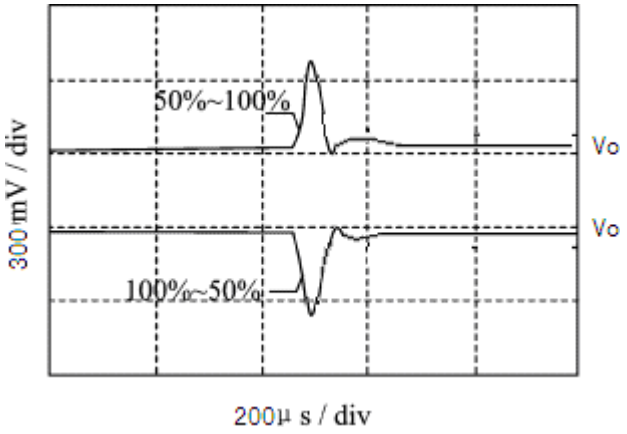


Figure 6. BSTHF28E Load Step Curve

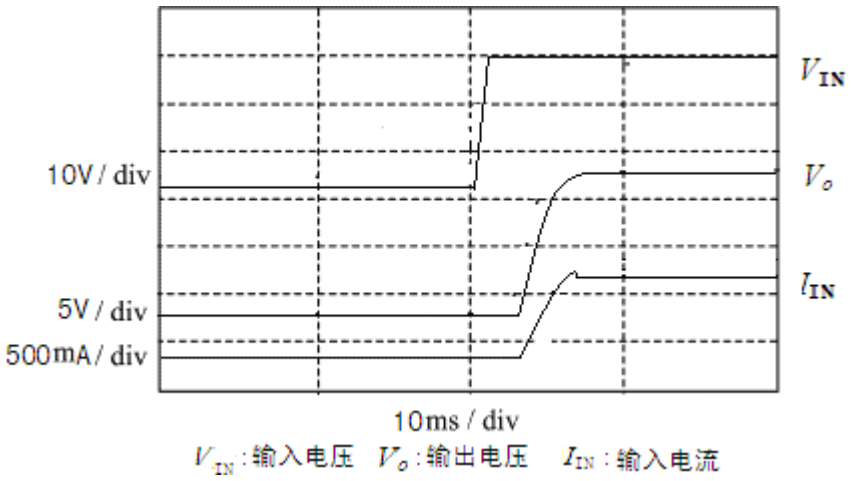


Figure 7. BSTHF28E Start Delay Overshoot/Start Peak Current Curve

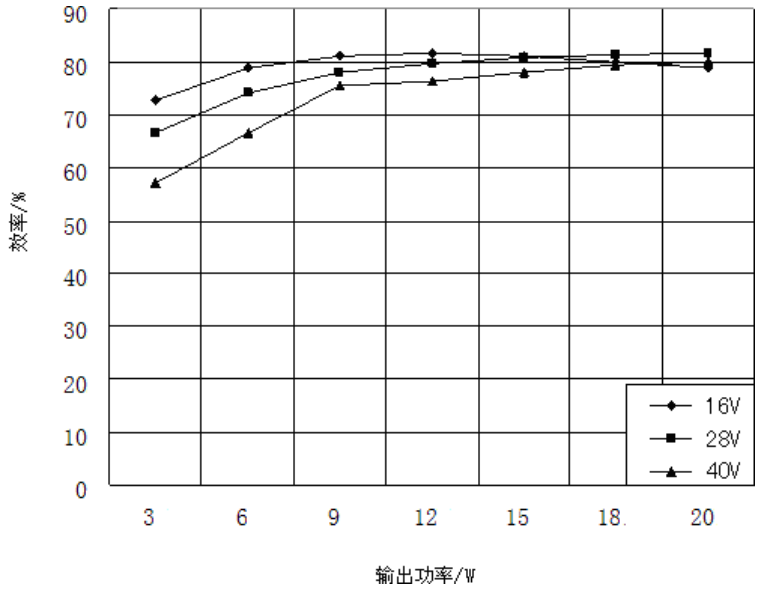


Figure 8 Efficiency curve of BSTHF28E

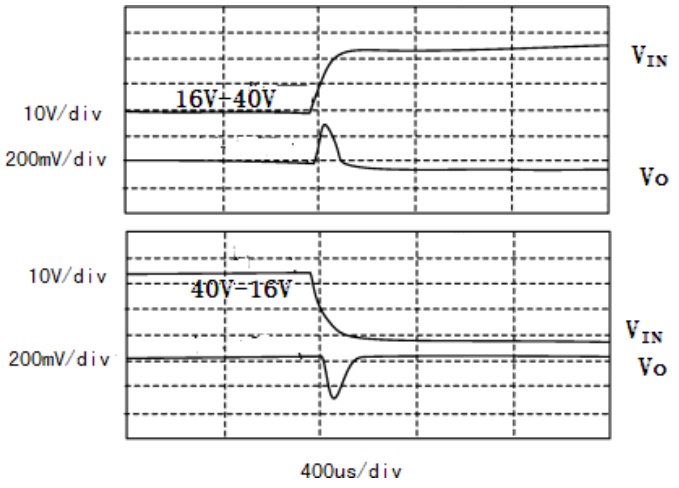


Figure 9. BSTHF28E Input Step Response

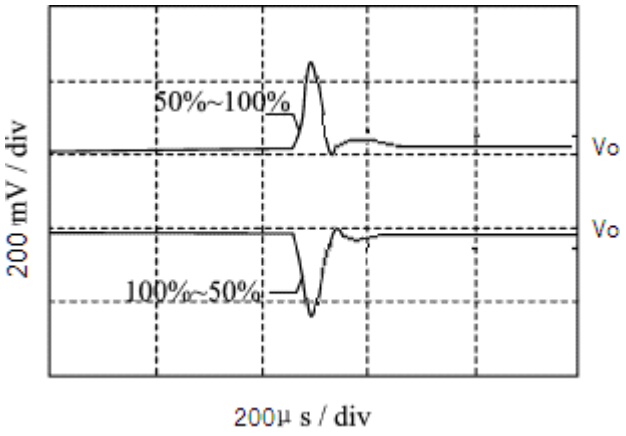


Figure 10. BSTHF28E Load Step Response

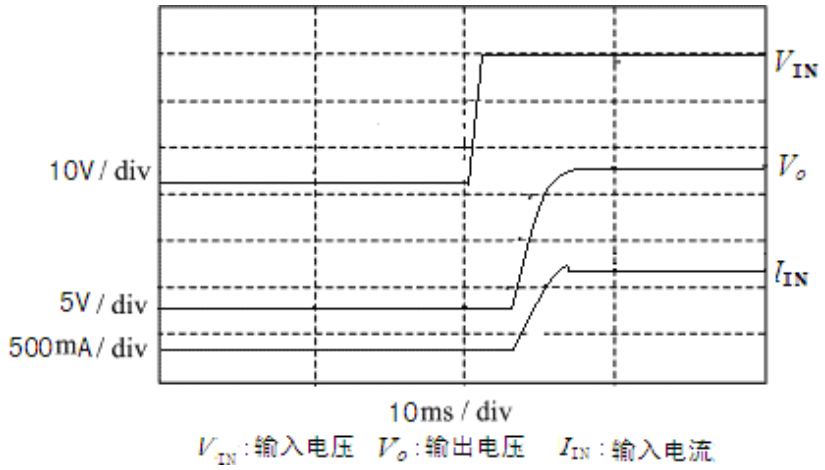
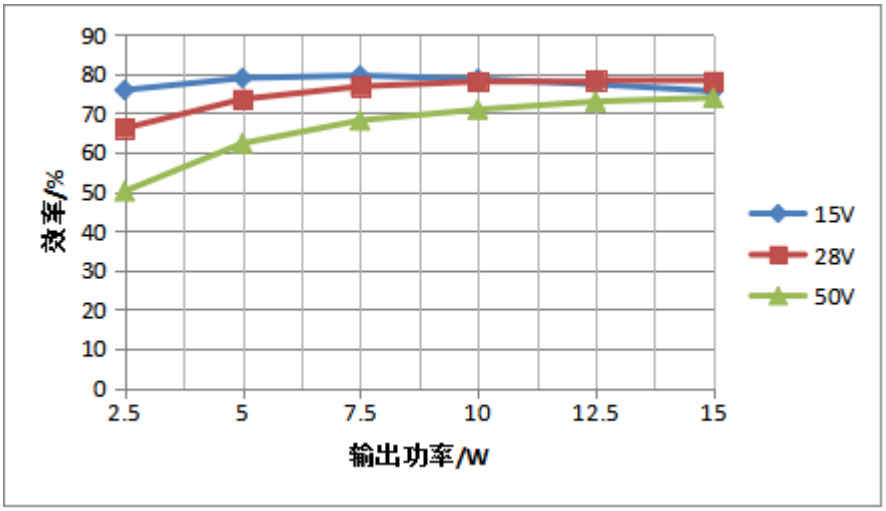


Figure 11. BSTHF28E Startup Overshoot/Delay and Startup Current



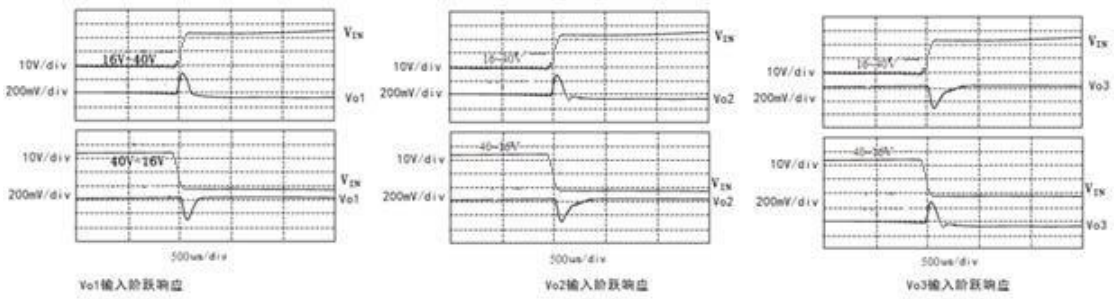


Figure 12. Efficiency curve of BSTHF28E

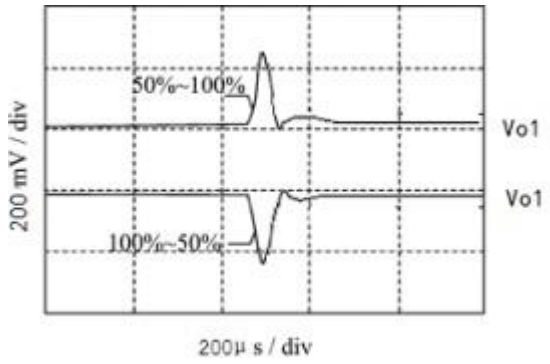


Figure 13. BSTHF28E Input Step Response

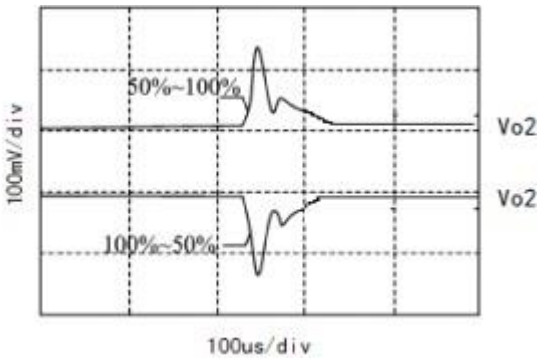
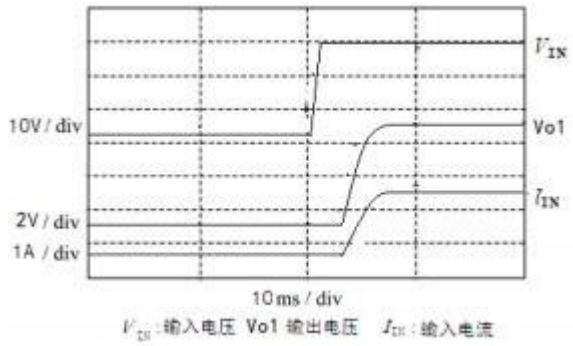


Figure 14. BSTHF28E Load Step Response



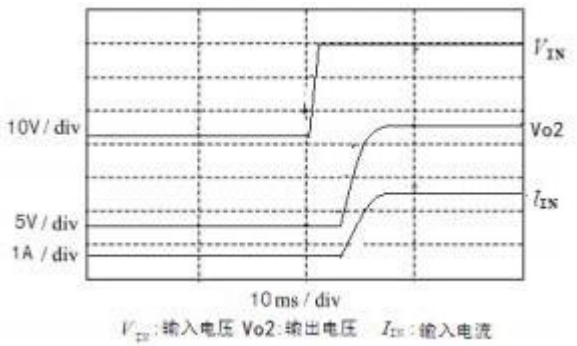
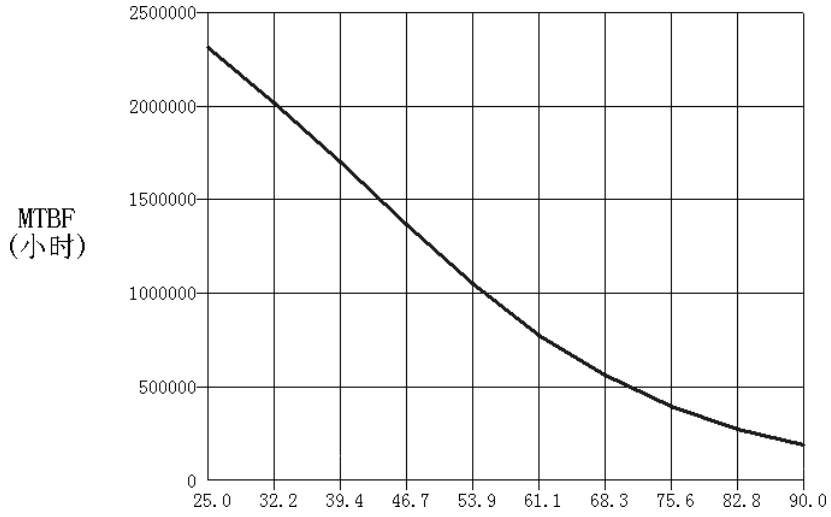
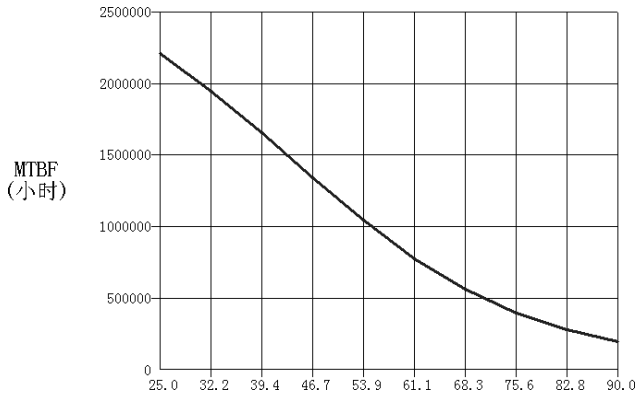


Figure 15. BSTHF28E Startup Overshoot/Delay and Startup Current

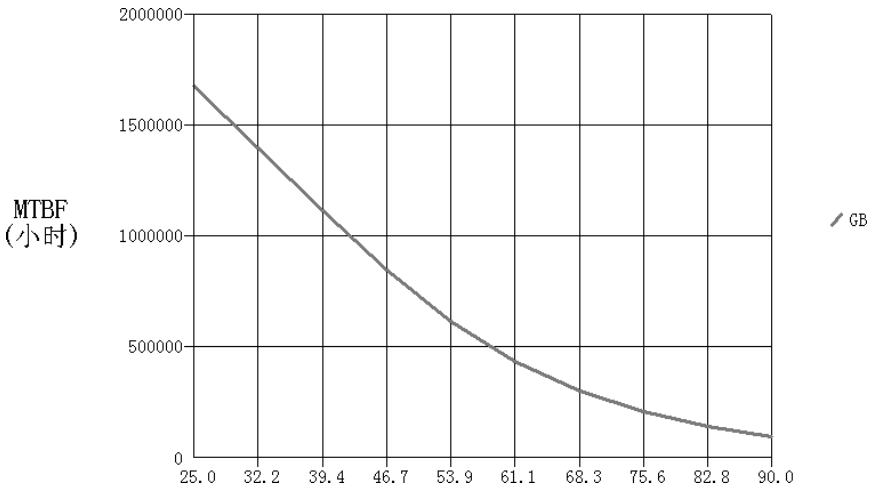
MTBF curve



MTBF Temperature Curve (BSTHF28E)

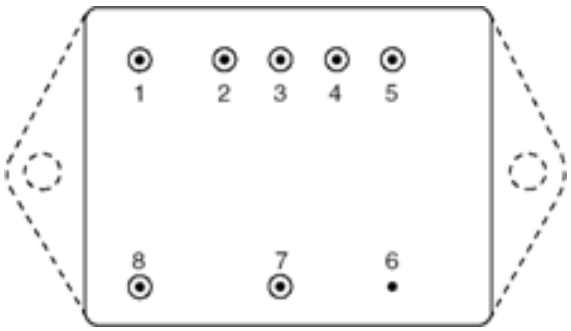


MTBF Temperature Curve (BSTHF28E)



MTBF Temperature Curve (BSTHF28E)

Functional description of the lead-out terminal



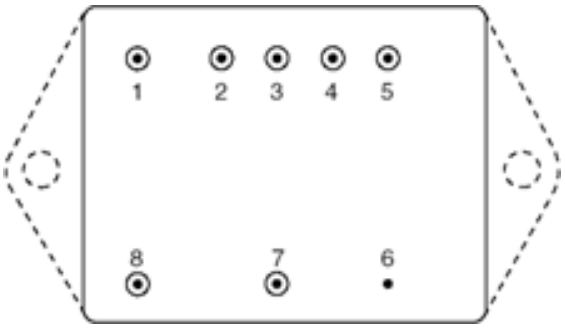
BSTHF28SE Series Enclosure Bottom View

BSTHF28SE series pin function description (excluding BSTHF28S28E)

No.	Symbol	Function
1	INH	Forbidden end
2	NC	Empty end
3	GND_O	Output ground
4	V_O	Output terminal
5	NC	Empty end
6	GND_C	Package ground
7	GND_I	Input ground
8	V_{IN}	Enter the positive terminal

BSTHF28S28E pin function description

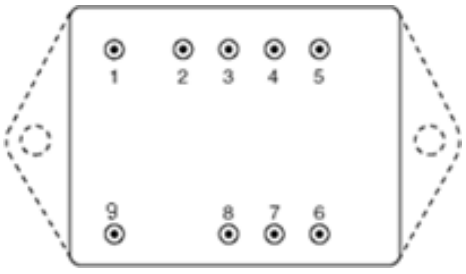
No.	Symbol	Function
1	INH	Forbidden end
2	V_O	Output terminal
3	NC	Empty end
4	GND_O	Output ground
5	NC	Empty end
6	GND_C	Package ground
7	GND_I	Input ground
8	V_{IN}	Enter the positive terminal



BSTHF28SE Series Enclosure Bottom View

BSTHF28DE Series Pin Function Description

No.	Symbol	Function
1	INH	Forbidden end
2	V_{O+}	Output positive terminal
3	GND_O	Output ground
4	V_{O-}	Output negative terminal
5	NC	Empty end
6	GND_C	Package ground
7	GND_I	Input ground
8	V_{IN}	Enter the positive terminal



BSTHF28TE Series Enclosure Bottom View

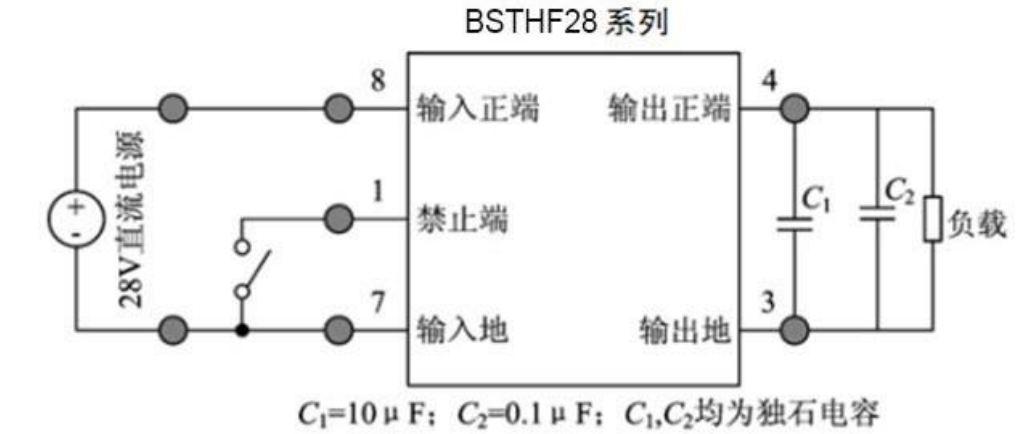
BSTHF28T0512E pin function description

No.	Symbol	Function
1	INH	Forbidden end
2	V_{O1}	+5V output
3	GND_O	Output ground
4	V_{O2}	+12V output
5	V_{O3}	-12V output
6	GND_C	Package ground
7	SYNC	Synchronization terminal
8	GND_{IN}	Enter the negative terminal
9	V_{IN}	Enter the positive terminal

BSTHF28T0515E pin function description

No.	Symbol	Function
1	INH	Forbidden end
2	V_{O1}	+ 5V output
3	GND_O	Output ground
4	V_{O2}	+15 Output
5	V_{O3}	-15 Output
6	GND_C	Package ground
7	SYNC	Synchronization terminal
8	GND_{IN}	Enter the negative terminal
9	V_{IN}	Enter the positive terminal

Typical application connection



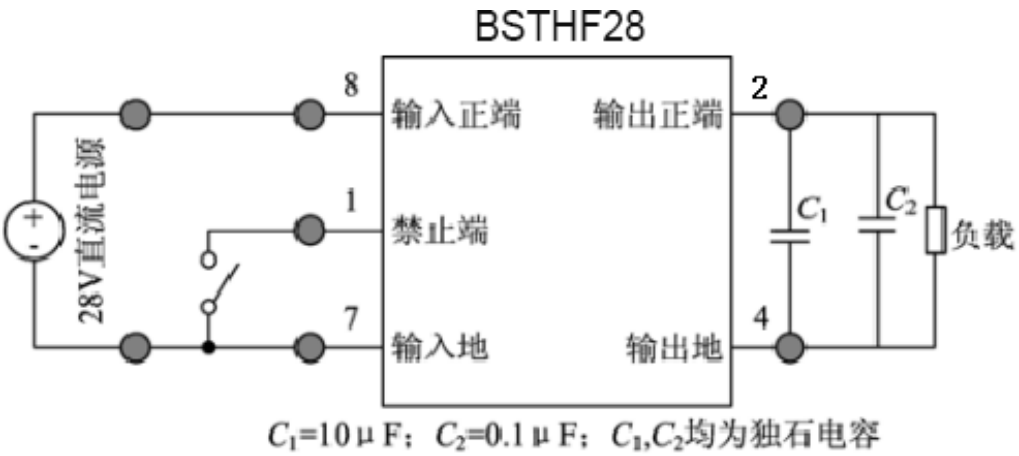


Figure 8. Connection diagram of BSTHF28E series products (excluding BSTHF28S28E)

Figure 9. BSTHF28E product connection diagram

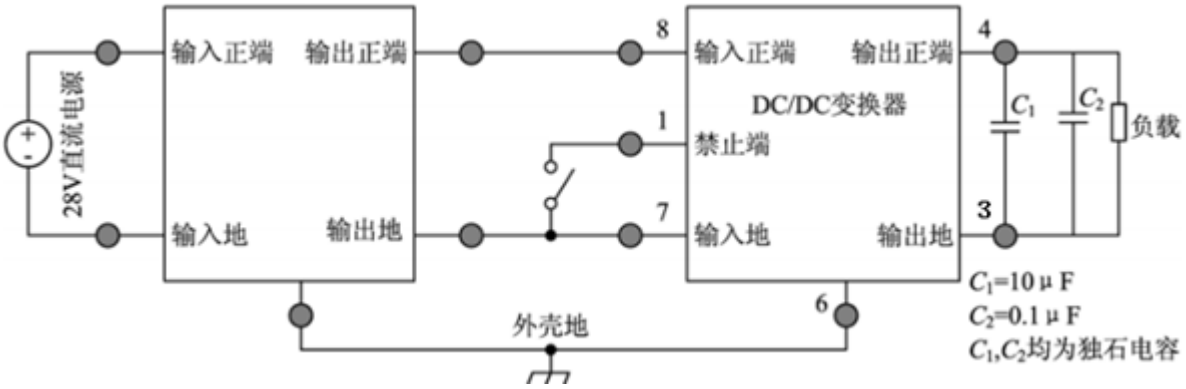


Figure 10. Connection diagram of BSTHF28E series EMI filter (excluding BSTHF28S28E)

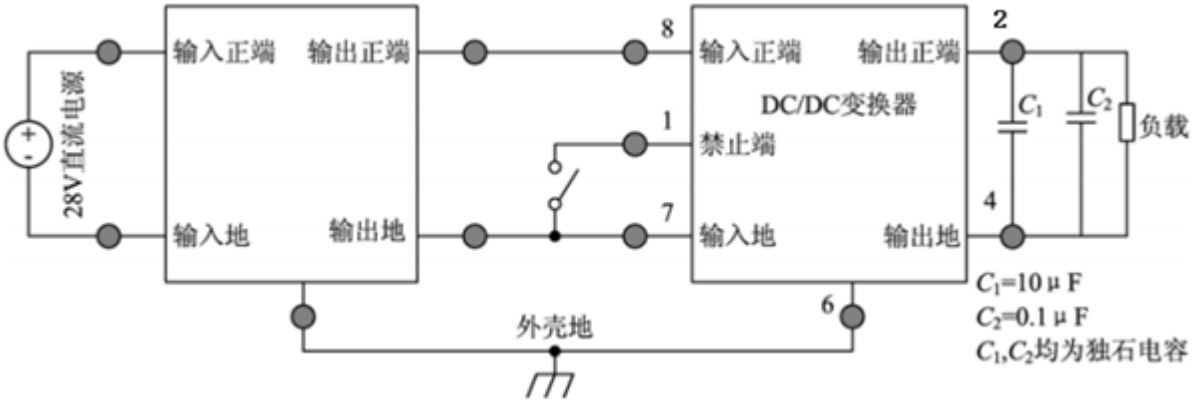


Figure 11. EMI Filter Connection Diagram (BSTHF28S28E)

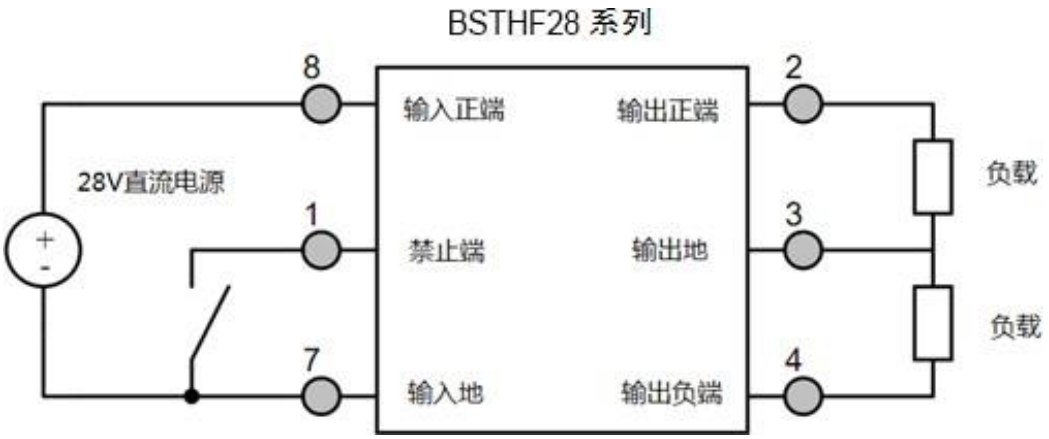


Figure 8. Connection diagram of BSTHF28E series products

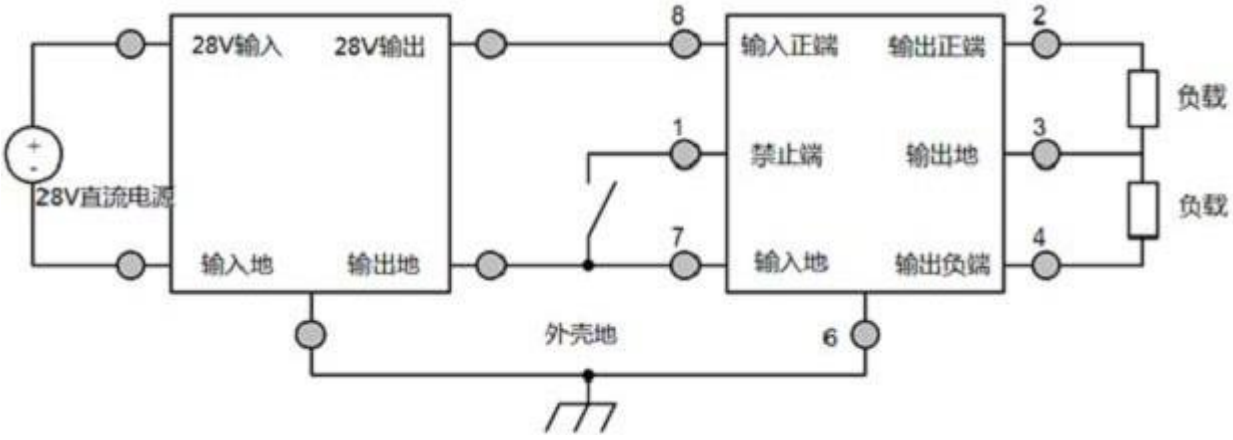


Figure 9. BSTHF28E Series EMI Filter Connection Diagram

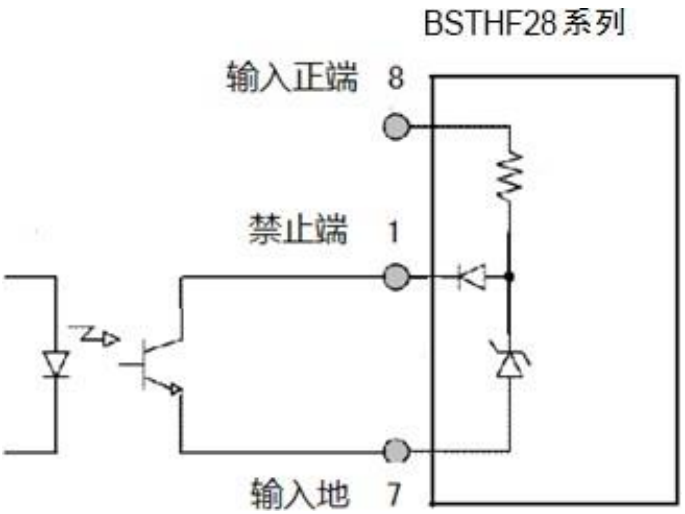


Figure 10. BSTHF28E Series Inhibit Drive Circuit

Figure 8. Connection diagram of BSTHF28E series products

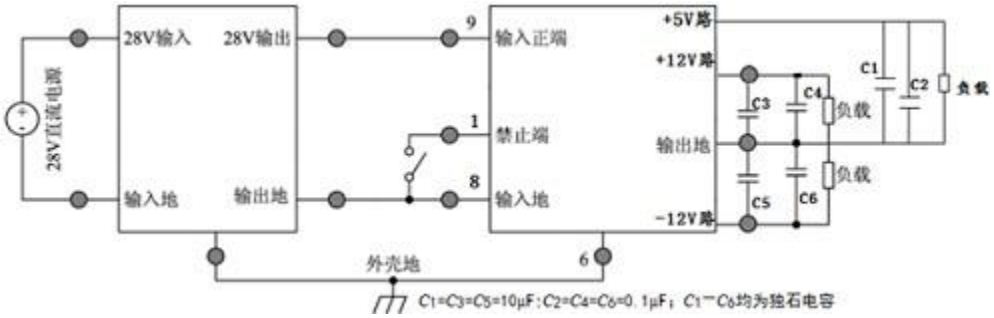


Figure 9. Connection diagram of BSTHF28E series EMI filter

Dimensions and description of package outline drawings BSTHF28E Series Package Outline

1. Package outline drawing without flange

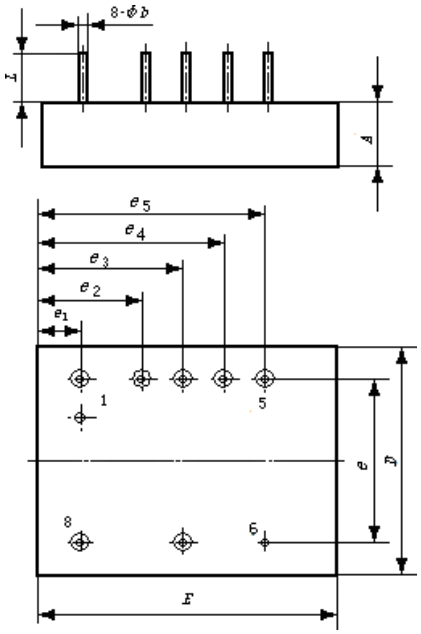
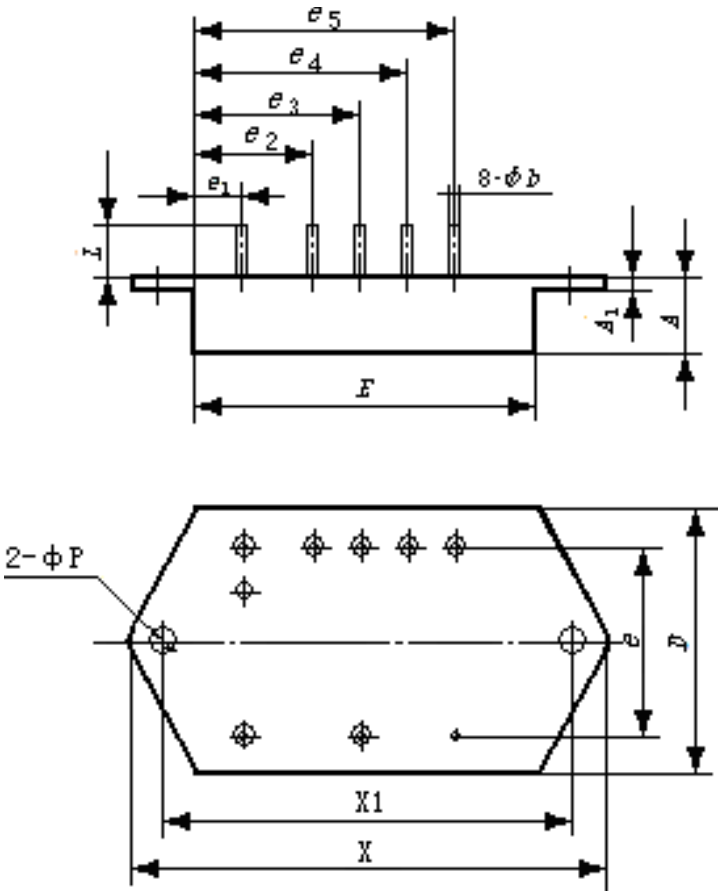


Figure 10. Bottom and side view of BSTHF28DE series products (without flange)

- Package outline drawing with flange



Bottom and side view of BSTHF28E series (with flange)

Package size parameter table

Dimension symbol	value (mm)		
	Min	Nominal	Max
A	-	-	8.90
A1	1.20	-	1.80
Φ b	0.63	-	0.89
D	-	-	28.94

E	-	-	37.33
e	-	20.32	-
e1	-	5.21	-
e2	-	12.83	-
e3	-	17.91	-
e4		22.99	-
e5	-	28.07	-
X	-	-	51.30
X1	43.45	-	44.45
φP	3.00	-	3.60
L	5.35	-	-
Note: e, e1, e2, e3, e4 and e5 are interchangeable dimensions, which are guaranteed by package manufacturing and inspection, and no assessment requirements are made in this specification.			

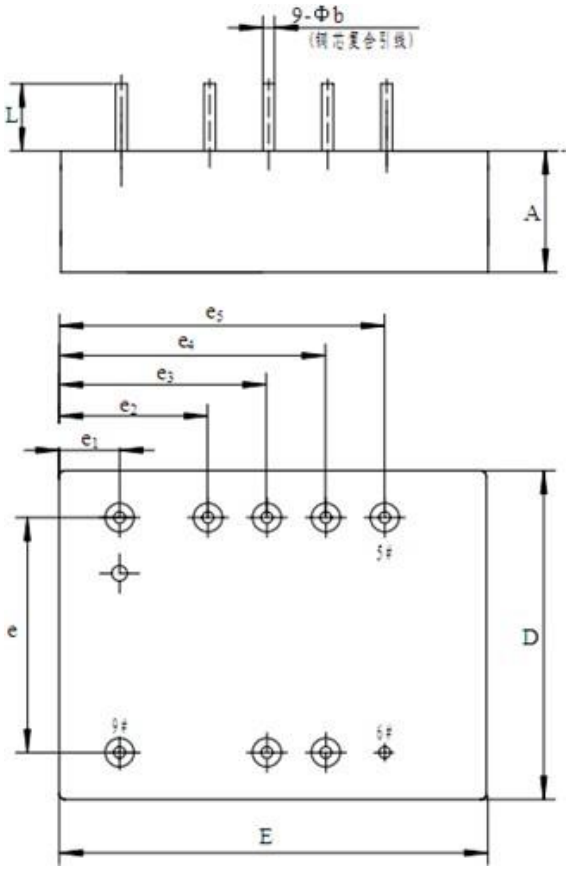
Description of the package housing

Model	Base Material	Plating	Cover plate of (cap) material	Cover plate of (cap) plating	Lead Material	Lead plating	Seal method	Note
UPP3728-08t (With flange)	Cold rolled steel（0#）	Ni	Iron-nickel alloy (4J42)	Ni	Copper core composite	Ni/Au	Parallel seam welding	The grounding pin is plated with Ni.
UPP3728-08j	Cold	Ni	Iron-nickel	Ni	Copper	Ni/Au	Parallel	The

(Without flange)	rolled steel （10#）		alloy (4J42)		core composite		seam welding	grounding pin is plated with Ni.

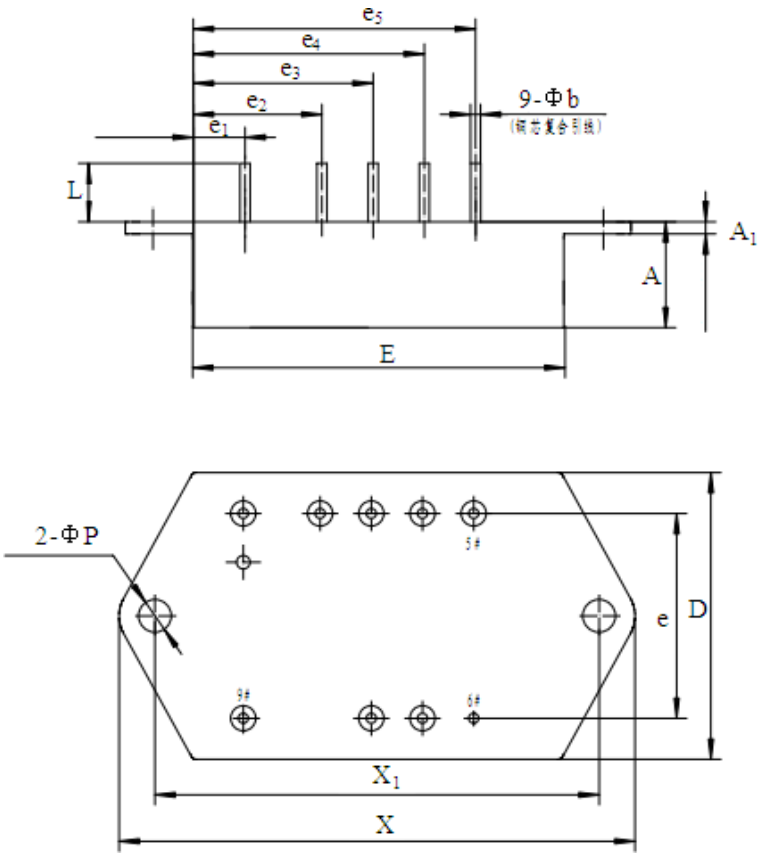
BSTHF28E Series Package Outline

- Package outline drawing without flange



BSTHF28T0515E Dimensions

- Package outline drawing with flange



BSTHF28E Dimensions

Unit:mm

Dimension symbol	value (mm)		
	Min	Nominal	Max
A	-	-	9.50
A1	1.20	1.50-	1.80
φb	0.63	0.76	0.89

D	-	-	28.94
E	-	-	37.33
e	-	20.32	-
e1	-	5.21	-
e2	-	12.83	-
e3	-	17.91	-
e4		22.99	-
e5	-	28.07	-
X	-	-	51.30
X1	43.45	43.95	44.45
φP	3.00	3.30	3.60
L	5.35	-	-
Note: e, e1, e2, e3, e4 and e5 are interchangeable dimensions, which are guaranteed by package manufacturing and inspection, and no assessment requirements are made in this specification.			

Description of the package housing

Model	Base Material	Plating	Cover plate of (cap) material	Cover plate of (cap) plating	Lead Material	Lead plating	Seal method	Note
UPP3728-09a (Without flange)	Cold rolled steel（0#）	Ni	Iron-nickel alloy (4J42)	Ni	Copper core composite	Ni/Au	Parallel seam welding	The grounding pin is plated with Ni.
UPP3728-09 (With flange)	Cold rolled steel （10#）	Ni	Iron-nickel alloy (4J42)	Ni	Copper core composite	Ni/Au	Parallel seam welding	The grounding pin is plated with Ni.