BSTMOR28FE Series

Product features

- High reliability;
- Input voltage range: 16 ~ 40 V, nominal input DC voltage: 28 V;
- Input surge voltage: 50V/1s;
- Output power Po: 100W ~ 120W;
- Operating temperature range Tc: -55 C ~ + 125 C;
- The starting current is small;
- Output overshoot is small;
- It has the function of prohibition;
- Input undervoltage and overvoltage lockout;
- Output short-circuit protection function;
- Output overcurrent protection function;
- Output voltage trimming;
- Output sensi ng function;
- Maximum power density: 80W/in3;
- The efficiency reaches 91%;
- Metal fully sealed structure;
- Volume: 76.70 * 38.60 * 10.66mm3
- Weight: about 95 G

Product category

One- way	Two- way
3.3V 5V	±5V ± 12V

6.3V 12V 15V 28V	± 15V

Scope of application

Highly reliable electronic systems for aerospace, aviation, weapons and ships

Product description

This series of products is a high reliability thick film hybrid power DC/ DC converter. The product adopts halz and manufacture of the product shall meet the requirements of GJB2438A-2002 General Specification for Hybrid Integrated Circuits and the detailed product specifications. The input end is connected with a matched power supply filter to improve the electromagnetic compatibility of the product.

Technical performance

Absolute maximum rating	Input voltage (instantaneous 1s): 50V
	Input voltage (continuous): 40V
	Output Power: 120W
	Storage temperature: -65 C ~ 150 C
	Mechanical impact : 1500g
	Soldering temperature resistance of lead : 300 C (10 s)
	Weight: about 95 G
	ESD：2000V

BSTMOR28FE series Electrical characteristics

NO.	Characteristic	Condition (Unless otherwise specified, -55 C ≤ Tc ≤ 125 C, VIN = 28V ± 0.5V)		BSTMOR28S3R3FE		BSTMOR28S05FE		BSTMOR28S6R3FE	
				Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/V	High, low, normal temperature		16	40	16	40	6	40
2	Output voltage/V	Fully loaded		Normal temperatur	3.267	3.333	4.95	5.05	6.24
2	Output voltage/V	Fully loaded VIN=16~40V	High and Low temperature	3.25	3.35	4.925	5.075	6.2	6.36
3	Output current/A			20	-	20	-	15.9	6.4
4	Output power/W	-		-	66	-	100	-	100
5	Output ripple voltage/mV	BW ≤ 20MHz, full load		-	80	-	80	-	80
6	Voltage regulation/mV	VIN = 16 ~ 40V, full load		-	20	-	20	-	20
7	Load Regulation/m	No load → full load		-	50	-	50	-	50
8	Input Current/mA	When prohibited		-	6	-	6	-	6
8	Input Current/mA	At no load		-	150	-	150	-	150
8	Input Current/mA	BW ≤ 20MHz, full load		-	80	-	80	-	80

9	Input ripple current/ mA								
10	Efficiency	Fully loaded		Normal temperature	88	-	88	-	88
	Efficiency	Fully loaded Add 500 V between	High and low temperature	85	-	85	-	85	-
10	Insulation		100	-	100	-	100	-	
11									-
	resistance/ MΩ	input and output or to the enclosure, T = 25 °C							
12	Prohibit voltage	-		-	1.5	-	1.5	-	1.5
13	Open circuit voltage at inhibit terminal/ V	Fully loaded		8	13	8	13	8	13
14	Undervoltage turn- on voltage/ V	Fully loaded		14.5	15.8	14.5	15.8	14.5	15.8
15	Undervoltage shutdown voltage/ V	Fully loaded		13.5	15	13.5	15	13.5	15
16	Short- circuit protection power consumption/ W	-		-	50	-	50	-	50
17	Capacitive Load/μF	Tc= 25 C		-	1000	-	1000	-	1000
18	Switching frequency/ KHz	-		270	330	270	330	270	330

19	Output voltage change (peak)/mV duri ng load transient	50% load → full load or full load → 50% load	-400	400	-500	500	-500	500
20	Recovery time of output	50% load → full load or full load → 50%	-	500	-	500	-	500
	power during load transient/ μs	load						
21	Output voltage change (peak)/mV duri ng input voltage transient	Input voltage VIN: 16→ 40V, or 40 → 16V, full load	-600	600	-600	600	-600	600
22	Recovery time of output voltage in case of input voltage transient/ μs	Input voltage VIN: 16 → 40V, or 40 → 16V, full load	-	500	-	500	-	500
23	Startup overshoot (peak)/mV	Input voltage VIN: 0 → 28V, full load	-	15	-	25	-	25
24	Startup delay/ ms	Input voltage VIN: 0 → 28V, full load	-	20	-	20	-	20
25	Limiting point/%	TA = 25 C, the output voltage is less than 90% of the rated output voltage (VO) when the output current reaches 50% IO	-	150	-	150	-	150

BSTMOR28FE series Electrical characteristics

NO.	Characteristic	Condition		BSTMOR28S12FE		BSTMOR28S15FE		BSTMOR28S28FE	
		(Unless otherwise specified, -55 C ≤ Tc ≤125 C, VIN = 28V ± 0.5)		Minimum value	Maximum value	Minimal Value	Maximum value	Minimal Value	Max Value
1	Input voltage/V	Sanwen		16	40	20	40	16	40
2	Output voltage/V	Fully loaded	Normal temperature	11.88	12. 12	14.85	5. 15	27.72	28.28
			High and low temperature	11.82	12. 18	14.80	15.20	27.58	28.42
3	Output current/A	VIN=16~40V		-	9.2	-	8	-	4.3
4	Output power/W	-		-	110	-	120	-	120
5	Output ripple voltage/mV	BW ≤ 20MHz, full load		-	120	-	150	-	200
6	Voltage regulation/mV	VIN = 16 ~ 40V, full load		-	20	-	75	-	80
7	Load Regulation/mV	No load → full load		-	120	-	75	-	100
8	Input Current/mA	When prohibited		-	6	-	10	-	6
		At no load		-	150	-	200	-	100
9	Input ripple current/mA	BW ≤ 20MHz, full load		-	80	-	-	-	80
10	Efficiency	Fully loaded	Normal temperature	88	-	86	-	87	-
			High and low temperature	85	-	84	-	84	-
11	Insulation resistance/MΩ	Add 500 V between input and output or to the enclosure, T = 25		100	-	100	-	100	-

		° C						
2	Prohibit voltage	-	-	1.5	-	0.7	-	1.5
13	Open circuit voltage at inhibit terminal/ V	Fully loaded	8	13	0.6	-	8	13
14	Under voltage turn-on voltage/V	Fully loaded	14.5	15.8	14.5	15.8	14.5	15.8
15	Undervoltage shutdown voltage/ V	Fully loaded	13.5	15	13.5	15	13.5	15
16	Short- circuit protection power consumption/ W	-	-	50	-	50	-	50
17	Capacitive Load/μF	Tc= 25 C	-	500	-	-	-	-
18	Switching frequency/KHz	-	270	330	270	330	270	330
19	Output voltage change (peak)/mV duri ngload transient	50% load → full load or full load → 50% load	- 1000	1000	-800	800	- 1500	1500
20	Recovery time of output power duri ng load transient/ μs	50% load → full load or full load → 50% load	-	500	-	600	-	500
21	Output voltage change (peak)/mV duri ng input voltage transient	Input voltage VIN: 16 → 40V, or 40 → 16V, full load	- 1200	1200	-	-	-2200	2200

22	Recovery time of output voltage in case of input voltage transient/μs	Input voltage VIN: 16 →40V, or 40 → 16V, full load	-	500	-	-	-	500
23	Startup overshoot (peak)/mV	Input voltage VIN: 0 → 28V, full load	-	50	-	50	-	50
24	Startup delay/ ms	Input votage VIN: 0 →28V, full load	-	20	-	20	-	30
25	Limiting point/%	TA = 25 C, the output voltage is less than 90% of the rated output voltage (VO) when the output current reaches 150% IO	-	150	-	150	-	150

BSTMOR28FE series Electrical characteristics

NO.	Characteristic	Condition (Unless otherwise specified, -55 C ≤ Tc ≤125 C, VIN = 28V ± 0.5V)		BSTMOR28S05FE		BSTMOR28S12FE		BSTMOR28S15FE	
				Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/ V	Sanwen		16	40	16	40	16	40
2	Output voltage/V	The right way	Normal temperature, full load	4.95	5.05	11.88	12. 12	14.85	15. 15
		Negative path		-5.05	-4.95	- 12. 12	- 11.88	- 15. 15	- 14.85
		The right way	High and low temperature, full load	4.925	5.075	11.82	12. 18	14.775	15.225
		Negative		-5.075	-4.925	- 12. 18	- 11.82	- 15.225	- 14.775

		path							
3	Output current/A	VIN=16~40 V		-	10	-	4.58	-	4
4	Output power/W	-		-	100	-	110	-	120
5	Output ripple voltage/mV	BW ≤ 20MHz, full load		-	120	-	120	-	150
6	Voltage regulation/ mV	The right way	VIN = 16 ~ 40V, full load	-	20	-	20	-	150
		Negative path		-	20	-	20	-	150
7	Load Regulation/ mV	The right way	No load → full load	-	50	-	120	-	150
		Negative path			50		120	-	150
8	Input Current/mA	When prohibited		-	6	-	6	-	6
		At no load		-	80	-	100	-	100
9	Input ripple current/mA	BW ≤ 20MHz, full load		-	80	-	80	-	80
10	Efficiency	Fully loaded	Normal temperature	82	-	87	-	87	-
			High and low temperature	81	-	84	-	84	-
11	Insulation resistance/ MΩ	Add 500 V between input and output or to the enclosure, T = 25 ° C		100	-	100	-	100	-
12	Prohibit voltage	-		-	1.5	-	1.5		1.5
13	Open circuit voltage at inhibit terminal/ V	Fully loaded		8	13	8	13	8	13
14	Undervoltage turn-on voltage/ V	Fully loaded		14.5	15.8	14.5	15.8	14.5	15.8

15	Undervoltage shutdown voltage/ V	Fully loaded	13.5	15	13.5	15	13.5	15
16	Short- circuit protection power consumption/ W	-	-	30	-	30	-	30
17	Capacitive Load/μF	Tc= 25 C	-	500	-	500	-	500
18	Switching frequency/KHz	-	270	330	270	330	270	330
9	Crossover adjustment/ mV	30% load on one leg, 30% to 70% on the other	-	450	-	450	-	450
20	Output voltage change (peak)/mV duri ng load transient	50% load → full load or full load → 50% load	-500	500	-600	600	-600	600
21	Recovery time of output power duri ng load transient/μ s	50% load → full load or full load → 50% load	-	500	-	500	-	500
22	Output voltage change (peak)/mV duri ng input voltage transient	Input voltage VIN: 16 →40V, or 40 → 16V, full load	-600	600	- 1200	1200	- 1200	1200
23	Recovery time of output voltage in case of input voltage transient/μ s	Input voltage VIN: 16 →40V, or 40 → 16V, full load	-	500	-	500	-	500
24	Startup overshoot (peak)/mV	Input voltage VIN: 0 → 28V, full load	-	25	-	50	-	50

25	Startup delay/ms	Input voltage VIN: 0 → 28V, full load	-	30	-	30	-	30
26	Limiting point/%	TA = 25 C, the output voltage is less than 90% of the rated output voltage (VO) when the output current reaches 150% IO	-	150	-	150	-	150

Circuit block diagram

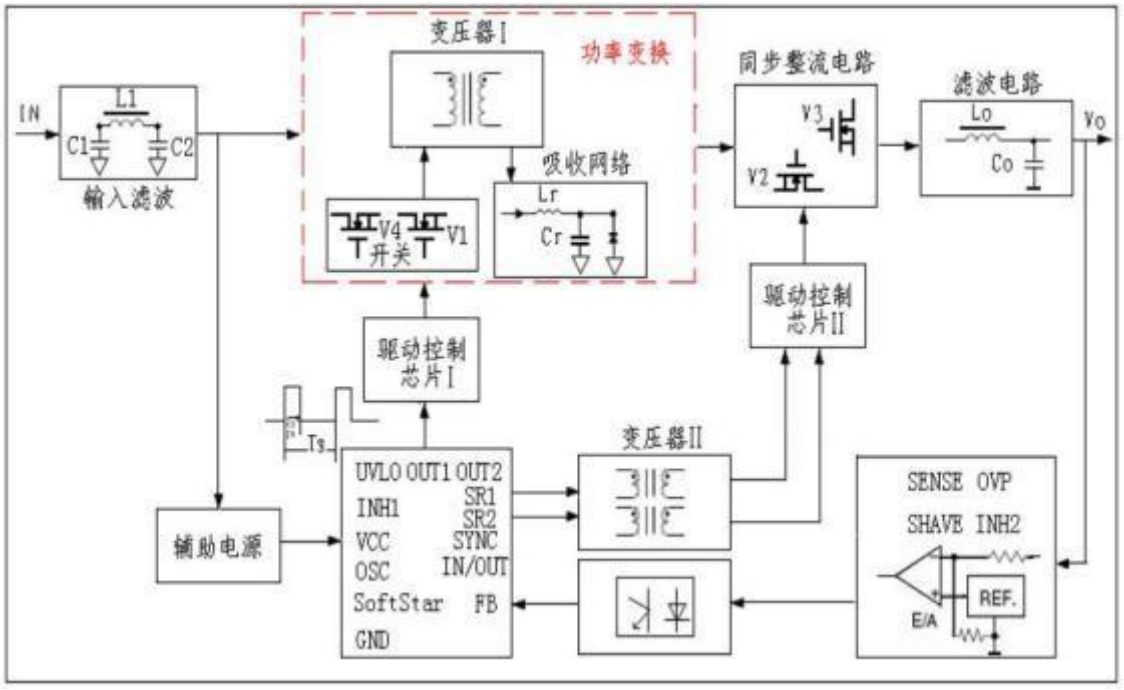


Figure 1. Block diagram of BSTMOR28SFE series circuit

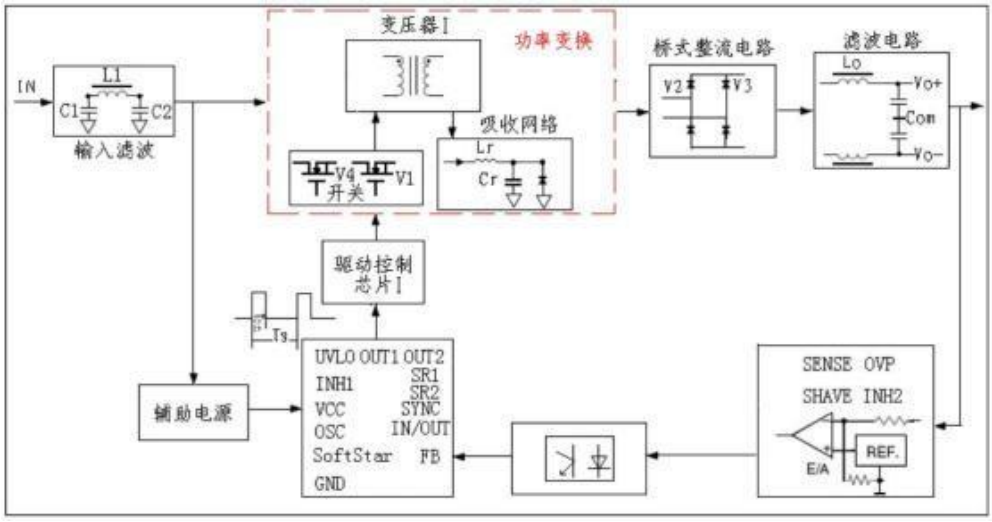


Figure 1. Block diagram of BSTMOR28E series circuit

Typical characteristic curves (unless otherwise specified, the following curves are tested at Tc = 25 ° C, VIN = 28 ± 0.5V, full load)

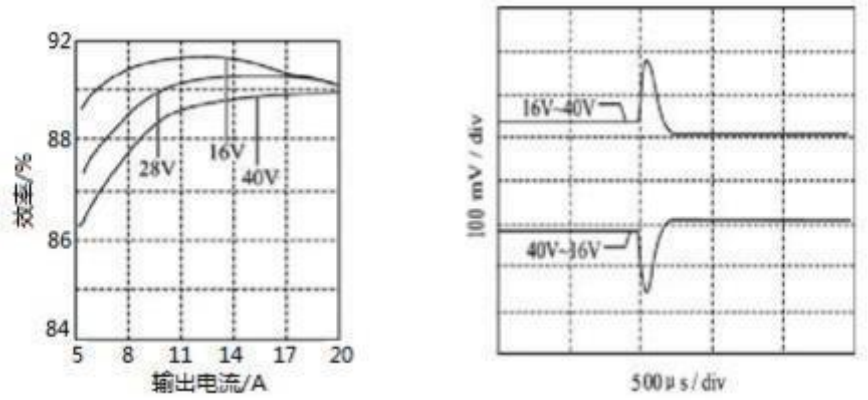


Figure 2. BSTMOR28FE Efficiency Curve 3 BSTMOR28FE Input Step Curve

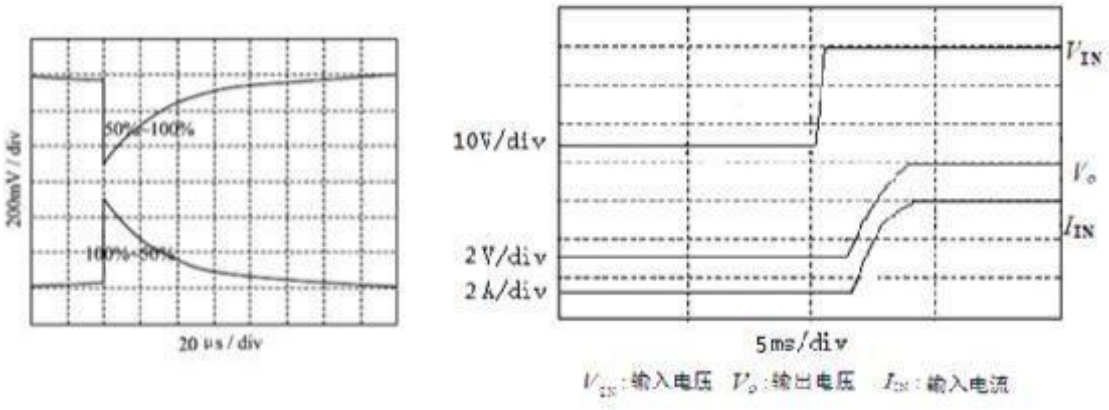


Figure 3. BSTMOR28FE Load Step

Curve 4 BSTMOR28E Startup Overshoot/Delay and Startup Current

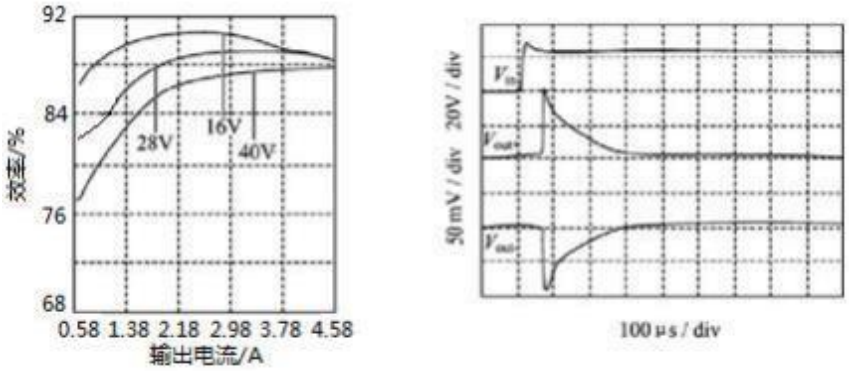


Figure 2. BSTMOR28FE Efficiency

Curve 3. BSTMOR28E Input Step Curve

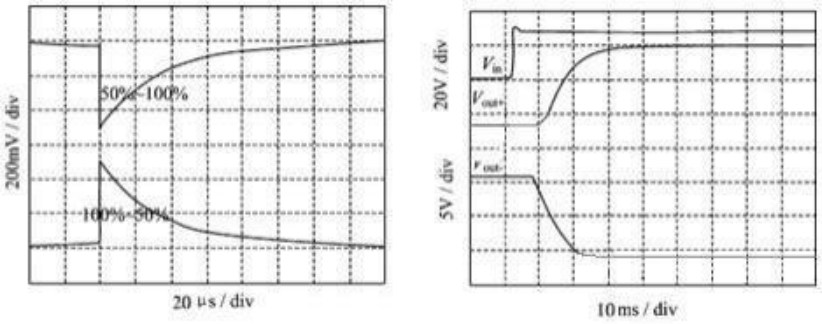
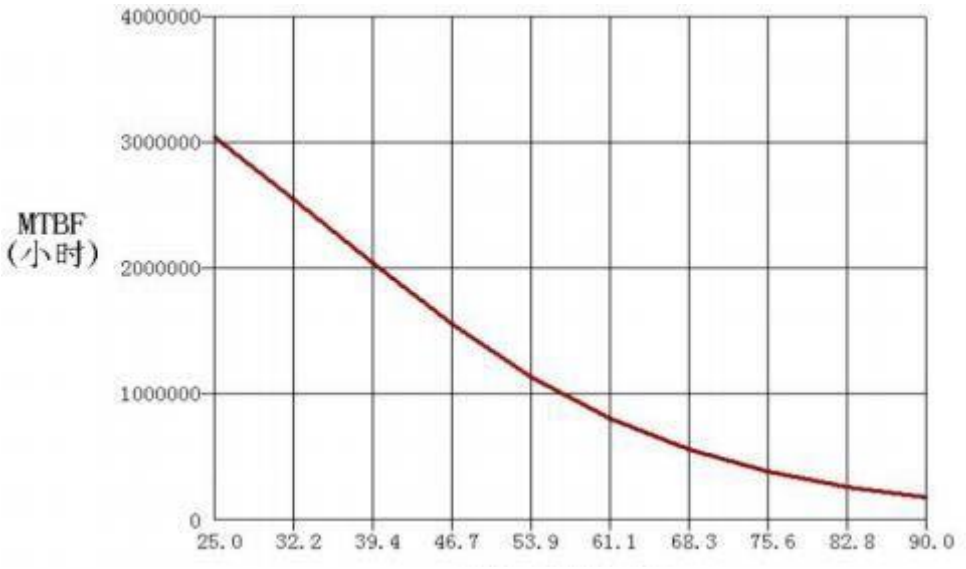


Figure 3. BSTMOR28FE Load Step

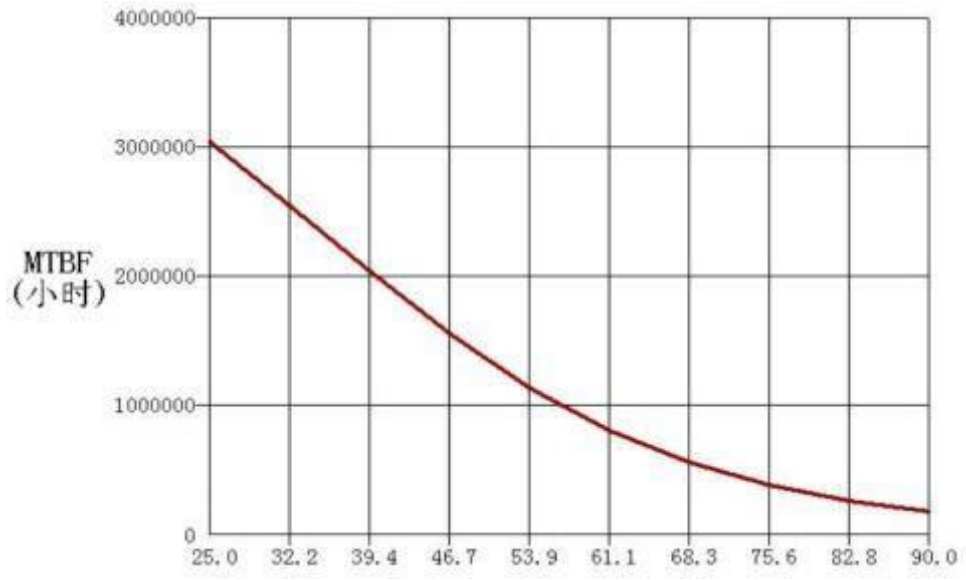
Curve 4. BSTMOR28E Startup Overshoot/Delay and Startup Current

MTBF curve (Fig.)



MTBF Temperature Profile (BSTMOR28E)

Temperature profile



MTBF Temperature Profile (BSTMOR28FE)

Functional description of the lead-out terminal

BSTMOR28FE Series Enclosure Top View

BSTMOR28FE Series Pin Function Description

Pin-out NO.	Symbol	Function	Pin-out NO.	Symbol	Function
1	VI	Enter the positive terminal	7	V0	Output positive terminal
2	GNDI	Input ground	8	GNDO	Output ground
3	TRIM	Adjusting end	9	SEN-	Sense the negative terminal
4	INH	Forbidden end	10	SEN+	Inductive positive terminal
5	NC	Empty end	11	NC	Empty end
6	SYNI	Sync input	12	NC	Empty end

BSTMOR28FE Series Enclosure Top View

BSTMOR28FE Series Pin Function Description

Pin-out NO.	Symbol	Function	Pin-out NO.	Symbol	Function
1	VI	Enter the positive terminal	7	V0+	Output positive terminal
2	GNDI	Input ground	8	GNDO	Output Common
3	Case	Tube Shell	9	V0-	Output negative terminal
4	INH	Forbidden end	10	TRIM	Adjusting end
5	NC	Empty end	11	NC	Empty end
6	SYNI	Sync input	12	NC	Empty end

Typical application connection

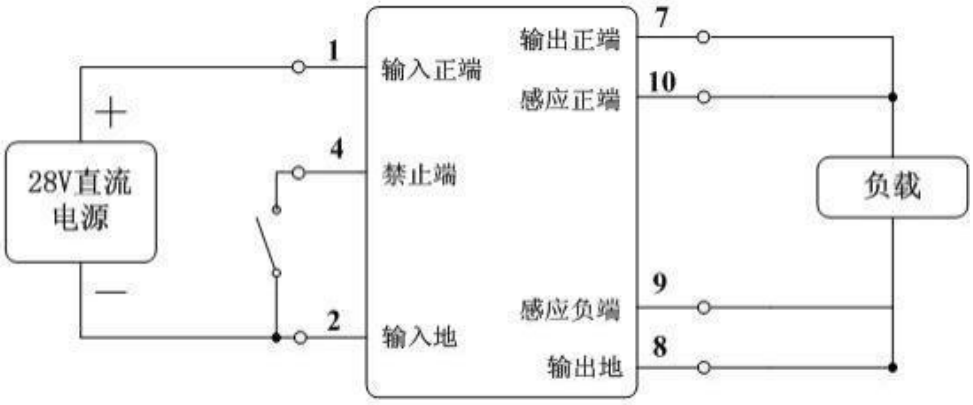


Figure 8. BSTMOR28FE Series Product Usage Connection Diagram

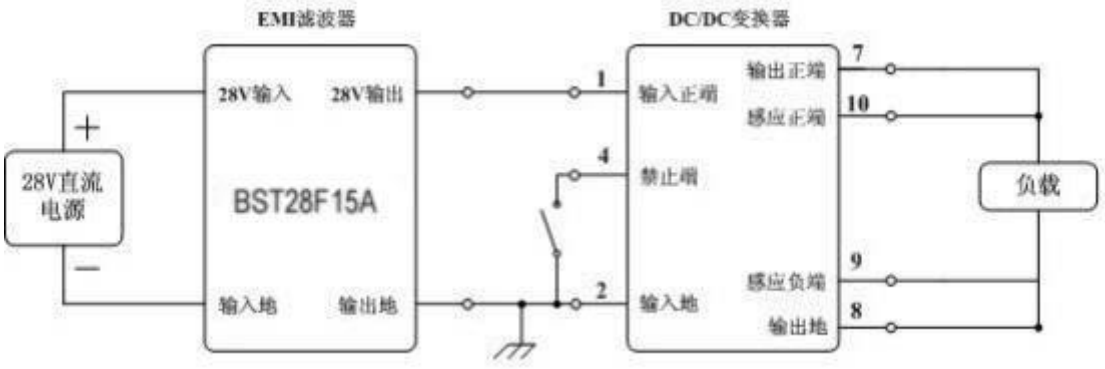


Figure 9. BSTMOR28FE Series EMI Filter Connection Diagram

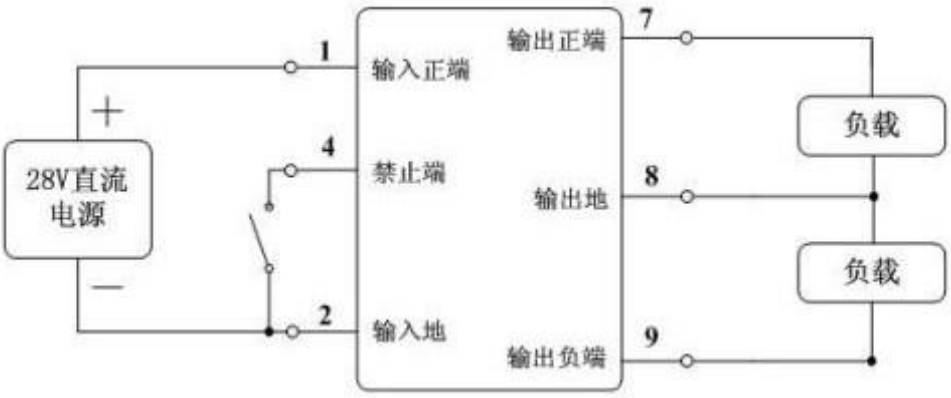


Figure 8. BSTMOR28FE Series Product Usage Connection Diagram

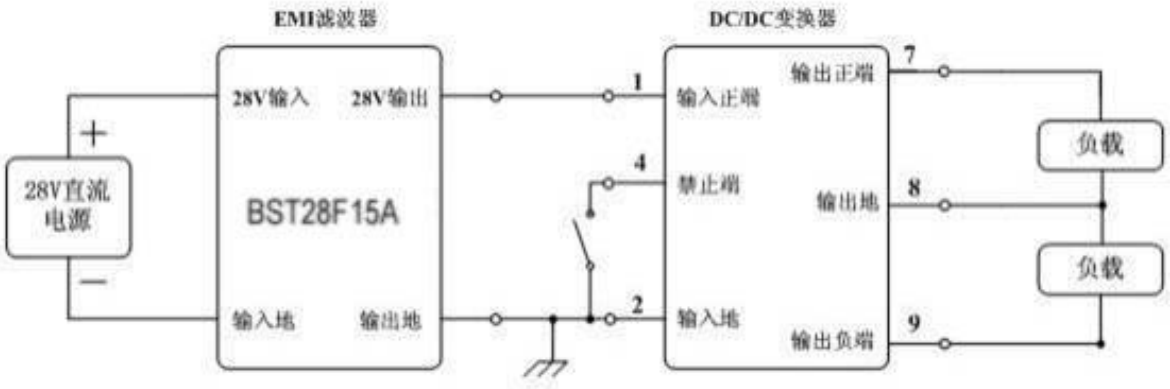


Figure 9. BSTMOR28FE Series EMI Filter Connection Diagram

The output voltage can be adjusted by connecting a resistor RTrim (TRIM DOWN) between the TRIM pin (Pin 3) and the VO pin (Pin 7), or by connecting a resistor RTrim (TRIM UP) between the TRIM pin (Pin 3) and the GNDo pin (Pin 8). The maximum adjustment range is + 10% up and -20% down. The relationship between the selection of the resistance value and the output voltage is shown in the following table:

BSTMOR28S3R3FE		BSTMOR28S05FE		BSTMOR28S6R3FE		BSTMOR28S12FE		BSTMOR28S15FE		BSTMOR28S28FE	
Vo	Rtrim	Vo	Rtrim	Vo	Rtrim	Vo	Rtrim	Vo	Rtrim	Vo	Rtrim
3.465	413.	5.5	130.5	6.93	103.6	13.2	53.5	16.5	19.5	30.8	4.6
3.4	693.2	5.4	164.3	6.8	132.2	13	65.7	16.2	28.5	30.5	7.2

3.3	-	5.3	220.8	6.7	167	12.8	84.4	15.9	43.8	30	13.5
3.2	179.2	5.2	333.75	6.6	225.6	12.6	116.5	15.6	75.7	29.5	24.7
3.1	75. 1	5.1	672.5	6.5	344.6	12.4	184.4	15.3	183.3	29	50.8
3	39.7	5	-	6.4	717. 1	12.2	424.5	15	-	28.5	176
2.9	21.9	4.9	645.4	6.3	-	12	-	14.5	425.5	28	-
2.8	11. 1	4.8	306.6	6.2	939.3	11.7	723.5	14	205.5	27.8	115
2.7	3.9	4.7	193.7	6.0	304.8	11.4	370.5	13.5	127.8	27.2	463
2.64	0.722	4.6	137.3	5.8	171.7	11. 1	242.3	13	88	26.8	324
		4.5	103.4	5.6	114	10.8	176. 1	12.5	63.8	26.4	246
		4.4	80.8	5.4	8.2	10.5	135.6	12	47.6	26	196
		4.3	64.7	5.2	6.1	10.2	108.3			25.6	161
		4.2	52.6	5.1	5.3	9.9	88.6				
		4.1	43.2	5.04	4.9	9.6	73.8				
		4	35.6								

BSTMOR28FE Series:

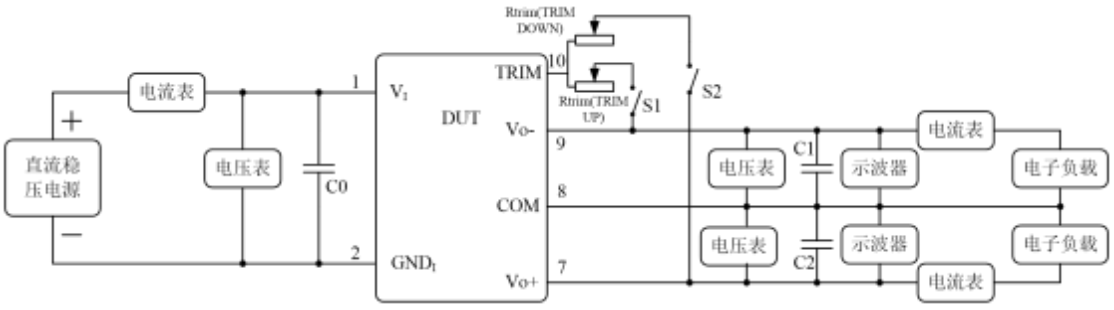
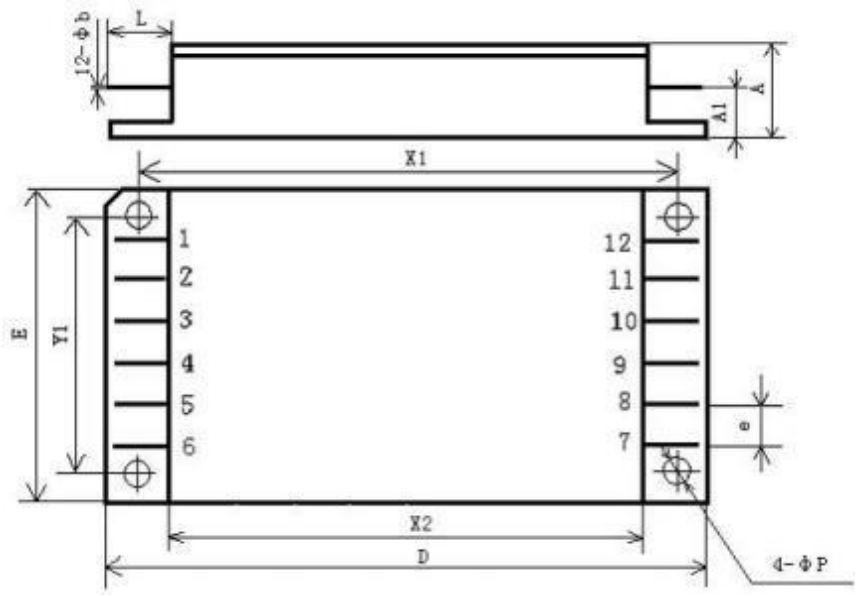


Fig 2. Schematic Diagram of Output Voltage Adjustment Test

The output voltage can be adjusted by connecting a resistor RTrim (TRIM UP) between the TRIM pin (Pin 3) and the VO- pin (Pin 9), or by connecting a resistor RTrim (TRIM DOWN) between the TRIM pin (Pin 3) and the VO + pin (Pin 7). The maximum adjustment range is + 10% up and -20% down. The relationship between the selection of the resistance value and the output voltage is shown in the following table:

BSTMOR28S05FE		BSTMOR28S12FE		BSTMOR28S15FE	
Vo	Rtrim	Vo	Rtrim	Vo	Rtrim
5.5	3.7	13.2	9.49	16.5	4.2
5.4	50.6	13	15.4	16.2	9.8
5.3	73.8	12.8	25. 1	15.9	20.39
5.2	122.2	12.6	43.9	15.6	46.4
5.1	287.2	12.4	96.2	15.3	215.2
5	-	12.2	948. 1	15	-
4.8	314	12	-	14.5	370
4.6	146.5	11.7	428.2	14	200
4.4	87.6	11.4	248.6	13.5	130.4
4.2	58	11. 1	169.4	13	92.6
4	39	10.8	124.5	12.5	68.9
		10.5	96. 1	12	52.6
		10.2	76. 1		
		9.9	61.4		
		9.6	50.2		

Package outline drawing dimensions and description



Outline dimension drawing

Description of the package housing

Dimension symbol	Value (mm)		
	Minimal	Nominal	Max
A	-	10.16	10.66
A1	5.29	5.59	5.89
φb	0.87	1.00	1.13
D	-	-	76.70
E	-	-	38.60
e	-	5.08	-
L	5.35	-	-
φP	3.00	3.30	3.60
X1	69.60	70.10	70.60
X2	-	-	64.00
Y1	31.50	32.00	32.50
Note: e refers to the interchangeability dimension, which is guaranteed by the manufacturing and inspection of the shell, and there is no assessment requirement in this specification.			

Description of the package housing

Housing model	Base material	Base plating	Cover plate (cap) material	Cover plate (cap) coating	Lead material	Lead plating	Sealing mode	Remark
FPP6438- 12bf	Cold rolled steel (10 #)	Ni	Iron- Nickel Alloy (4J42)	Ni	Oxygen- free copper	Au	Parallel seam welding	