

BSTSA28 SERIES

Product Features

- High reliability
- Wide input voltage range: 15 V to 50 V, nominal input DC voltage 28 V
- Surge voltage resistance: 80 V, 1s
- Output power PO: 6W
- Operating temperature range Tc: -55 °C ~ + 125 °C
- Low starting current
- No output overshoot
- With inhibit function
- Input undervoltage lockout and output short-circuit protection
- Maximum power density: 19W/in³
- Metal hermetic package

Product Category

Single Path	Two-way
3.3V	
5V	±5V
5.2V	±12V
12V	±15V
15V	

Range of application

Aviation, aerospace and other highly reliable electronic systems, as well as some occasions with high requirements for power supply surge resistance.

Product Overview

This series is a DC/DC converter with high reliability and surge immunity (80 V, 1s). The product adopts single-ended flyback circuit topology and pulse width modulation principle. After the sampling signal of output voltage is isolated by optocoupler, the pulse width of the controller is modulated simultaneously with the current sampling signal of the input circuit to form double-loop closed-loop control, so that the product has stable voltage output. This series of products are manufactured by thick film hybrid integration process and packaged in a metal fully sealed case. The design and manufacturing of the product shall meet the requirements of GJB2438A-2002 General Specification for Hybrid Integrated Circuits and detailed product specifications. The input end is connected with a matched power supply filter, which can improve the electromagnetic compatibility of the product.

Technical Performance

BSTSA28 Series Rated Condition

Absolute maximum rating	
Input voltage (continuous): 150V Input voltage (transient, 1s): 80V Output power: 6 W Storage temperature: -65 °C ~ 150 °C	Mechanical impact: 1500g Soldering temperature of lead wire: 300 °C (15 s) Weight (flangeless/flanged): 19 G/24 G ESD: 2000V

Electrical characteristics of BSTSA28 series products

NO.	Characteristic	Condition (Unless otherwise specified, -55 °C ≤ T _c ≤ 125 °C, V _{IN} = 28V ± 0.5V)		BSTSA28S3R3		BSTSA28S05		BSTSA28S05R2		BSTSA28S12		BSTSA28S15	
				BSTSA28S3R3F		BSTSA28S05F		BSTSA28S05R2F		BSTSA28S12F		BSTSA28S15F	
				Minimum Value	Maximum Value	Minimum Value	Maximum Value	Minimum Value	Maximum Value	Minimum Value	Maximum Value	Minimum Value	Maximum Value
1	Input voltage/V	High, normal, low temperature		15	50	15	15	15	50	15	50	15	50
2	Output	Full	Normal	3.267	3.333	4.95	5.05	5.148	5.252	11.88	12.12	14.85	15.15

	voltage/V	load	temperature										
			High and low temperature	3.25	3.35	4.925	5.075	5.122	5.278	11.82	12.18	14.775	15.225
3	Output current/A	VIN=15V~50V	-	1.21	—	1	—	1	-	0.5	—	0.4	
4	Output power/W		-	4	-	5	-	5.2	-	6	0	6	
5	Output Ripple Voltage/mV	BW ≤ 20MHz, full load	-	50	—	50	—	50	-	50	—	50	
6	Voltage regulation/mV	VIN = 15V ± 50V, full load	-	15	—	15	—	15	-	15	—	15	
7	Load Regulation/mV	No load → full load	-	50	—	50	—	50	-	50	—	50	
8	Input current/mA	When prohibited	-	6	—	6	—	6	-	6	—	6	
		At no load	-	60	—	60	—	60	-	60	—	60	
9	Input Ripple Current/mA	BW ≤ 20MHz, full load	-	50	—	50	—	50	-	50	—	50	
10	Efficiency	Full load	62	-	65	-	65	—	—	65	-	65	
11	Insulation	Apply 500 V	100	-	100	-	100	—	—	100	-	100	

	Resistance /MΩ	between input, output or enclosure, Tc = 25 ° C										
12	Inhibit voltage		0	0.5	0	0.5	0	0.5	0	0.5	0	0.5
13	Open circuit voltage of prohibited end/V	Full load	10	14	10	14	10	14	10	14	10	14
14	Undervoltage turn-on voltage/V	Full load	12	14.8	12	14.8	12	14.8	12	14.8	12	14.8
15	Undervoltage shutdown voltage/V	Full load	11	14.5	11	14.5	11	14.5	11	14.5	11	14.5
16	Short-circuit protection function		Decreasing flow type		Decreasing flow type		Decreasing flow type		Decreasing flow type		Decreasing flow type	
17	Capacitive load/μF	Tc=25°C	—	1000	—	1000	—	1000	-	500	—	500
18	Switching	Full load	350	500	350	350	350	500	350	500	350	500

	frequency/kHz											
19	Output voltage change during load transient (peak)/mV	50% load → full load Or full load → 50% load	-300	300	-500	500	-500	500	-700	700	-700	700
20	Recovery time of output voltage during load transient/μs	50% load → full load Or full load → 50% load	—	700	—	700	—	700	-	400	—	400
21	Output voltage change during input voltage transient (peak)/mV	Input voltage VIN: 16V → 40V, full load or input voltage VIN: 40V → 16V, full load	-500	500	-700	700	-700	700	-1200	1200	-1300	1300
22	Recovery time of output voltage during input voltage transient/μs	Input voltage VIN: 16V → 40V, full load or input voltage VIN: 40V → 16V, full load	-	1200	—	1200	—	1200	-	600	—	600

23	Start-up overshoot (peak)/mV	Input voltage VIN: 0 → 28V, full load		15	—	25	—	25	-	50	—	50
24	Startup delay/ms	Input voltage VIN: 0 → 28V, full load		20	—	20	—	20	-	20	—	20

Electrical characteristics of BSTSA28 series products

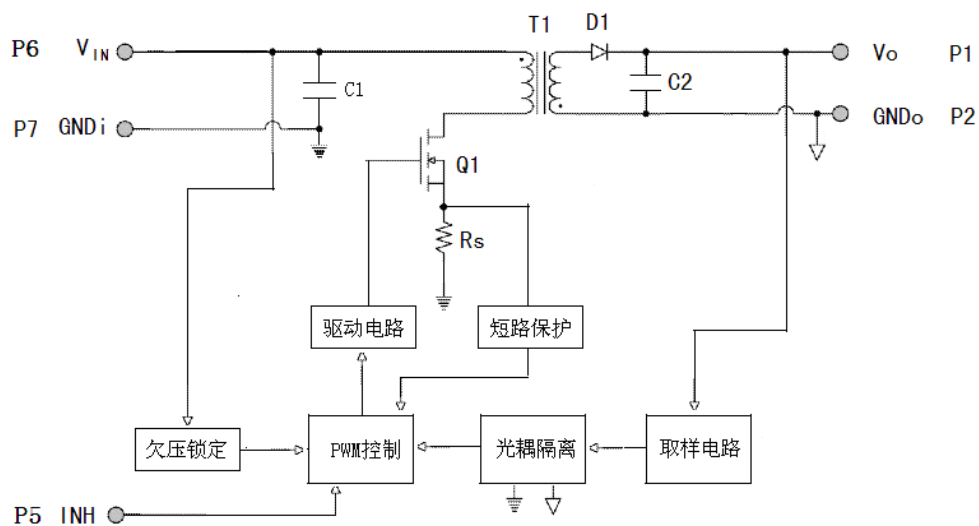
NO.	Characteristic	Condition (Unless otherwise specified, -55 °C ≤ Tc ≤ 125 °C, VIN = 28V ± 0.5V)		BSTSA28D05 BSTSA28D05F		BSTSA28D12 BSTSA28D12F		BSTSA28D15 BSTSA28D15F	
				Minimum Value	Maximum Value	Minimum Value	Maximum Value	Minimum Value	Maximum Value
1	Input voltage/V	High, normal, low temperature		15	50	15	50	15	50
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 path		-5.075	-4.925	-12.18	-11.82	-15.225	-14.775
3	Output current/A	VIN=15V~50V		—	0.5	—	0.25	—	0.2
4	Output power/W			0	5	0	6	0	6
5	Output Ripple Voltage/mV	BW ≤ 20MHz, full load		—	50	—	50	—	50
6	Voltage regulation/mV	The right way	VIN = 16V to 40V, full load	—	50	—	50	—	50
		Negative path		—	50	—	50	—	50

7	Load Regulation/mV	The right way	No load → full load	—	50	—	50	—	50
		Negative path		—	50	—	50	—	50
8	Input current/mA	When prohibited		—	6	—	6	—	6
		At no load		—	60	—	60	—	60
9	Input Ripple Current/mA	BW ≤ 20MHz, full load		—	50	—	50	—	50
10	Efficiency	Full load		66	—	72	—	73	—
11	Insulation Resistance /MΩ	Apply 500 V between input, output or enclosure, Tc = 25 ° C		100	—	100	—	100	—
12	Inhibit voltage			0	0.7	0	0.7	0	0.7
13	Open circuit voltage of prohibited end/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			Decreasing flow type		Decreasing flow type		Decreasing flow type	
17	Capacitive load/μF	Tc=25°C		—	500	—	500	—	500

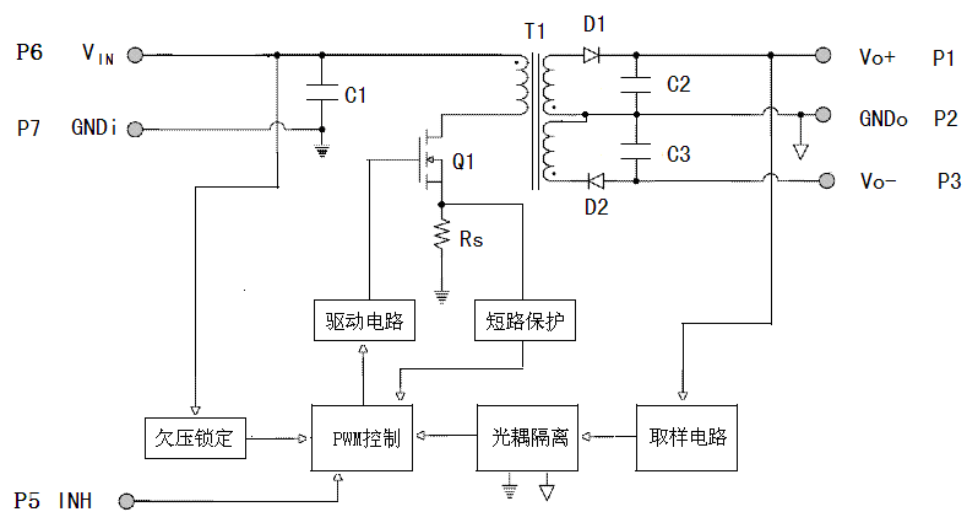
18	Switching frequency/kHz	Full load	350	500	350	500	350	500
19	Cross regulation/mV	One 30% load, the other Load varies from 30% to 70%	—	450	—	450	—	450
20	Output voltage change during load transient (peak)/mV	50% load → full load Or full load → 50% load	-300	300	-300	300	-300	300
21	Recovery time of output voltage during load transient/μs	50% load → full load Or full load → 50% load	—	400	—	450	—	500
22	Output voltage change during input voltage transient (peak)/mV	Input voltage VIN: 16V → 40V, full load or input voltage VIN: 40V → 16V, full load	-900	900	-900	900	-900	900
23	Recovery time of output voltage during input voltage transient/μs	Input voltage VIN: 16V → 40V, full load or input voltage VIN: 40V → 16V, full load	—	700	—	500	—	500
24	Start-up overshoot (peak)/mV	Input voltage VIN: 0 → 28V, full load	—	25	—	50	—	50

25	Startup delay/ms	Input voltage VIN: 0 → 28V, full load	—	20	—	20	—	20
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Circuit principle block diagram

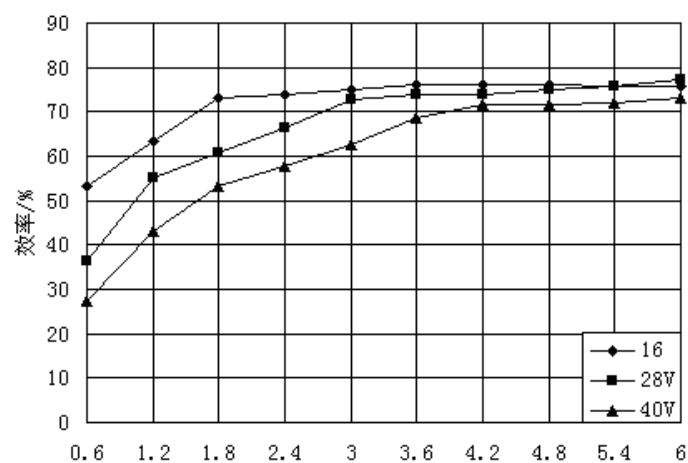


BSTSA28. Series Circuit Block Diagram

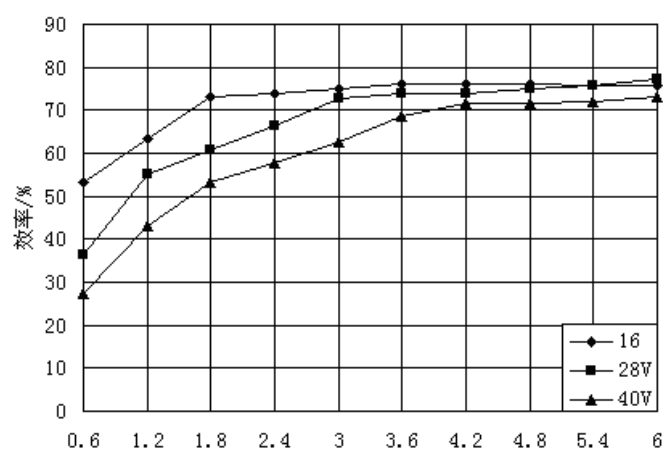


BSTSA28 Series Circuit Block Diagram

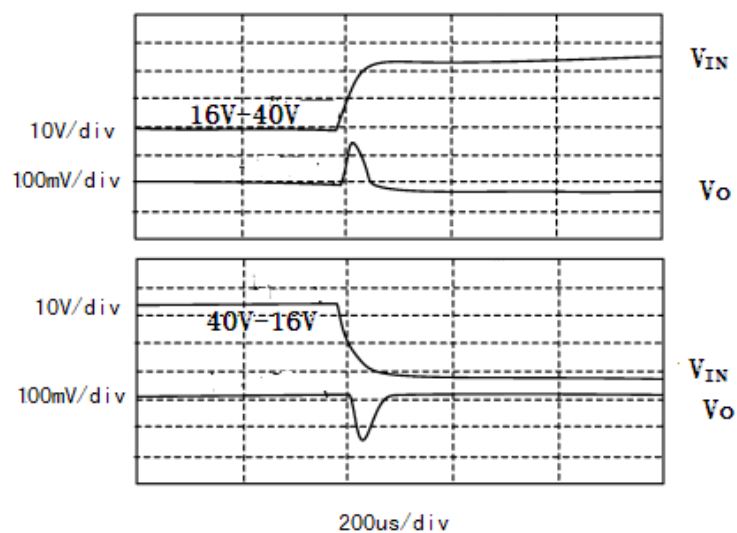
Typical Characteristic Curve



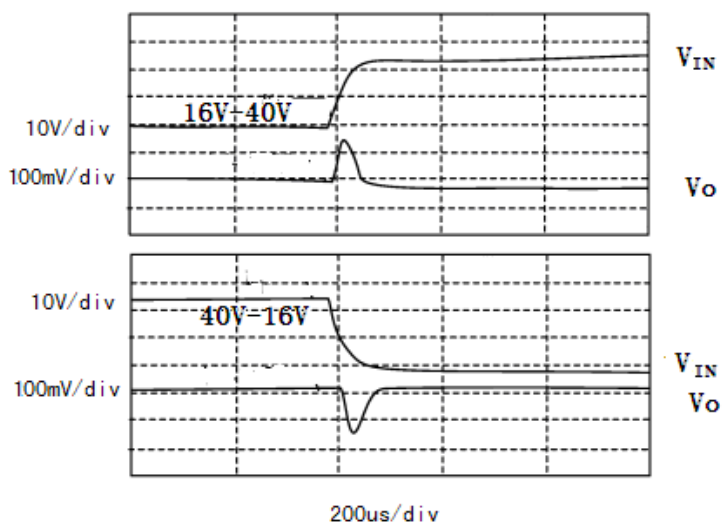
BSTSA28S15 Efficiency Curve



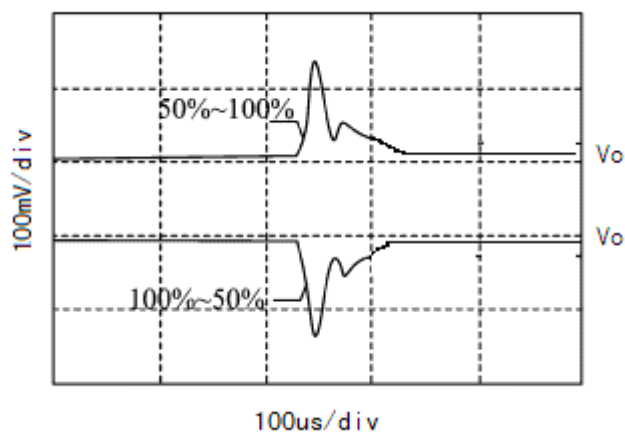
BSTSA28S15 Efficiency Curve



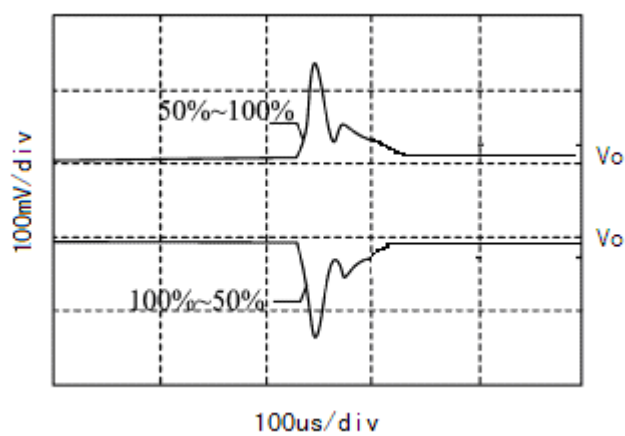
BSTSA28S15 Input Step Curve



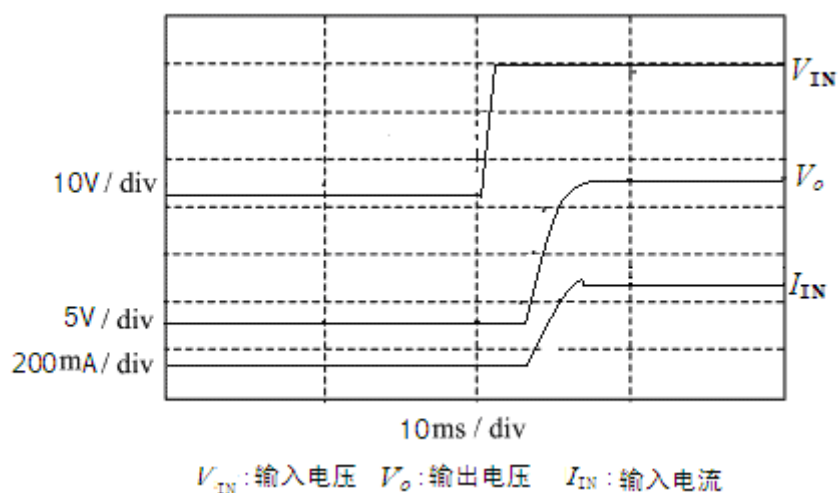
BSTSA28S15 Input Step Curve



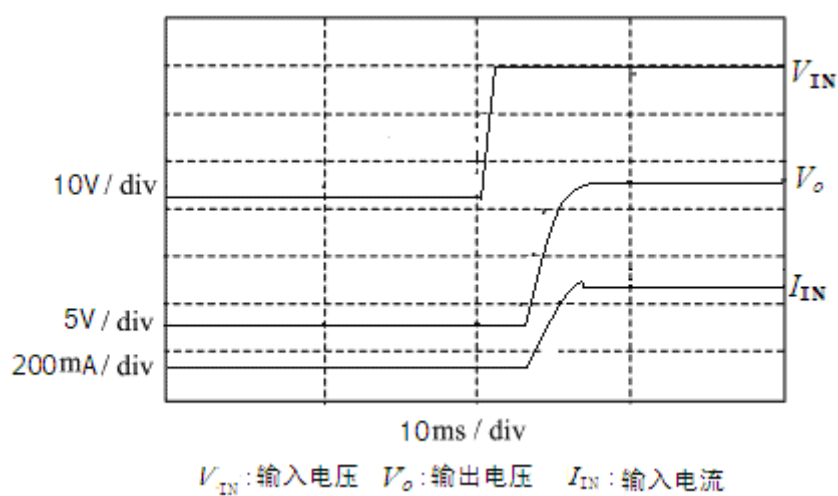
BSTSA28S15 Load Step Curve



BSTSA28S15 Load Step Curve

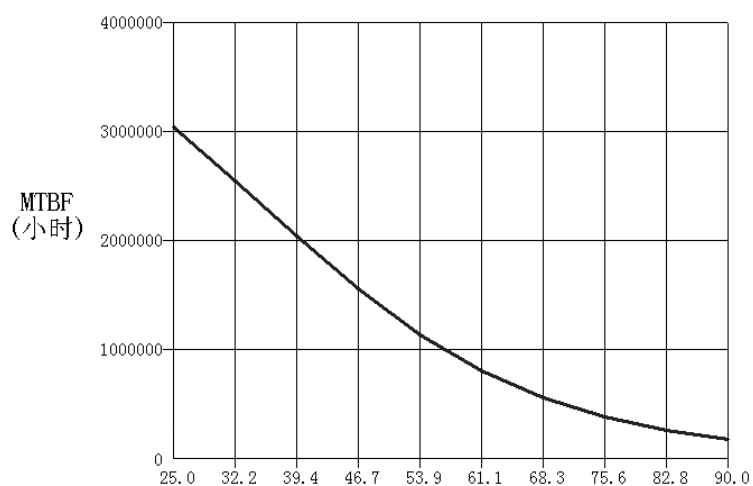


BSTSA28S15 Start Overshoot/Delay and Start Current



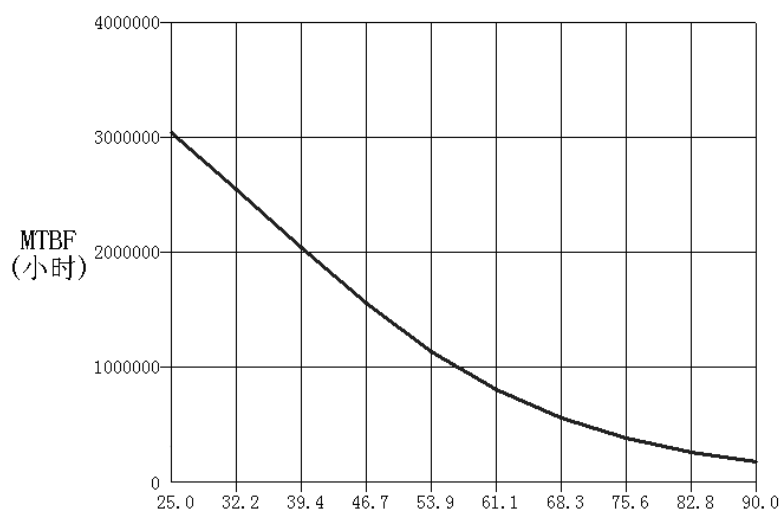
BSTSA28S15 Start Overshoot/Delay and Start Current

MTBF curve



MTBF Temperature Curve (BSTSA28S15)

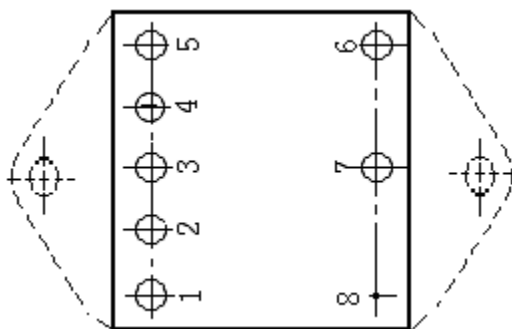
(According to GJB/Z 299C-2006, the ground is expected to be in good condition)



MTBF Temperature Curve (BSTSA28S15)

(According to GJB/Z 299C-2006, the ground is expected to be in good condition)

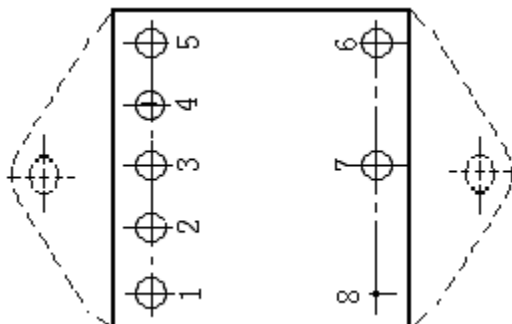
Function description of lead-out terminal



BSTSA28S15 Series Enclosure Bottom View

BSTSA28 Series Pin Function Description

NO	Symbol	Function
1	VO	Output positive terminal
2	GNDO	Outgoing
3	NC	Empty End
4	NC	Empty End
5	INH	Prohibited End
6	VIN	Input positive terminal
7	GNDI	Input Ground
8	GNDC	Externally

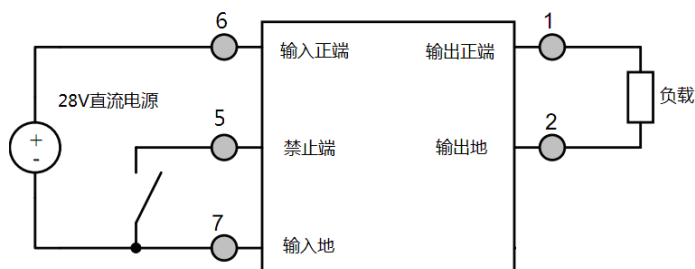


BSTSA28 Series Enclosure Bottom View

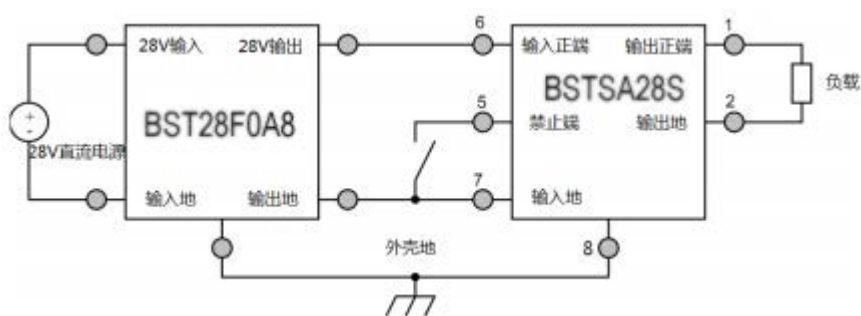
BSTSA28 Series Pin Function Description

NO	Symbol	Function
1	VO+	Output positive terminal
2	GNDO	Outgoing
3	VO-	Output negative terminal
4	NC	Empty End
5	INH	Prohibited End
6	VIN	Input positive terminal
7	GNDI	Input Ground
8	GNDC	Externally

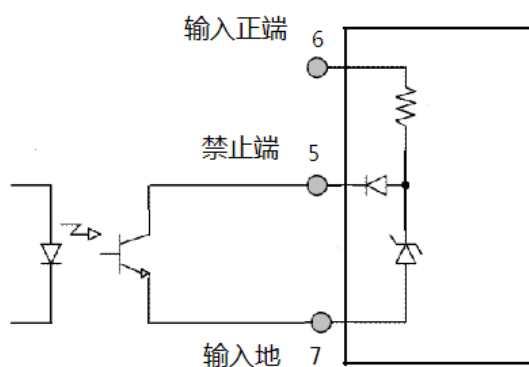
Typical application connection



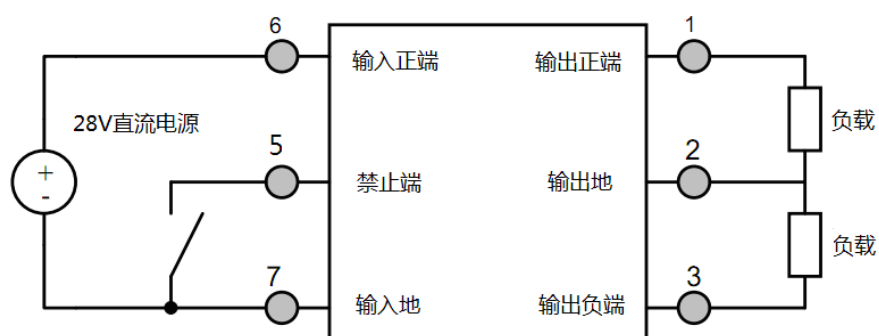
BSTSA28S Series Product Usage Connection Diagram



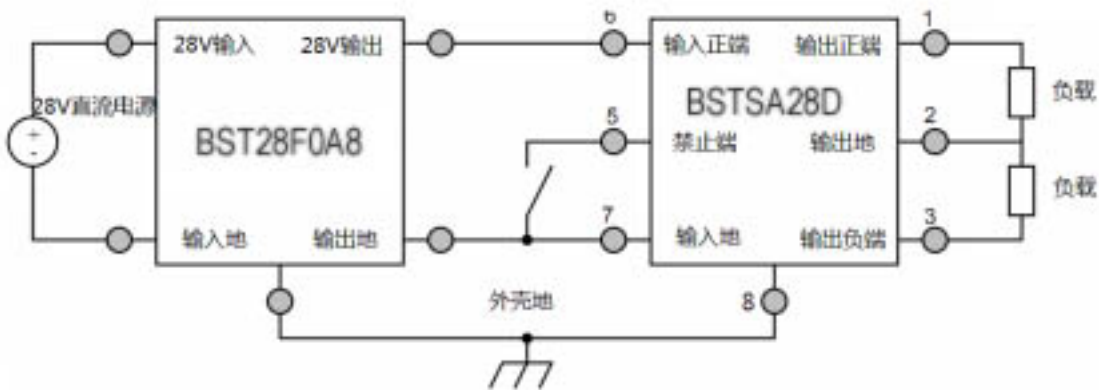
BSTSA28S Series EMI Filter Connection Diagram



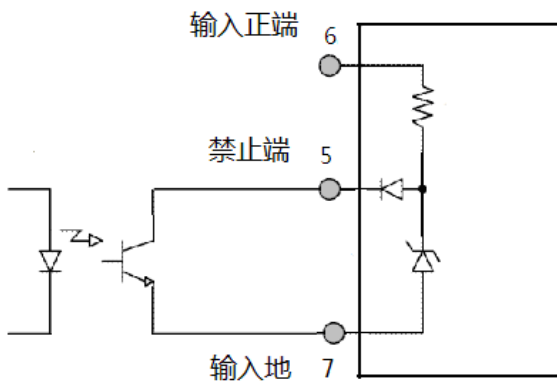
BSTSA28S Series Inhibit Driver Circuit



BSTSA28D Series Product Usage Connection Diagram

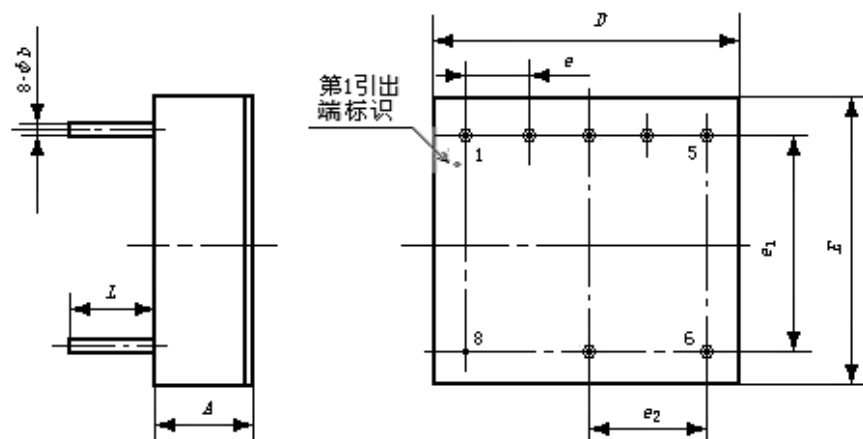


BSTSA28D Series EMI Filter Connection Diagram

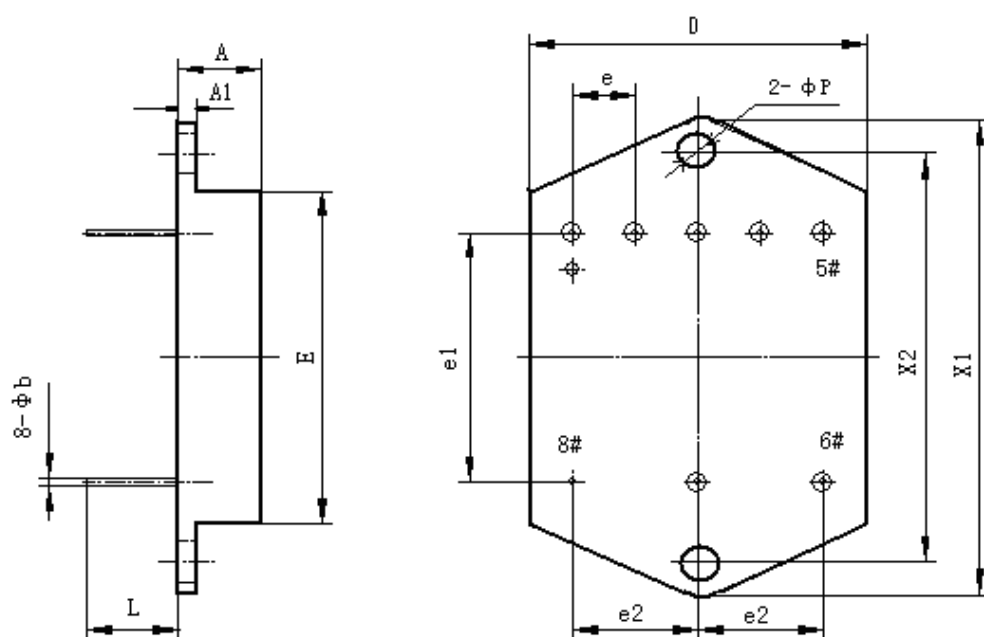


BSTSA28D Series Disable Driver Circuit

Dimensions and description of package outline drawings



Bottom view side view



Bottom view side view

Table 5. Package Size Parameters

Symbol	Value (mm)		
	Minimal	Nominal	Max.
A	-	-	7.36

A1	1.20	-	1.80
Φb	0.51	-	0.77
D	-	-	27.73
E	-	-	27.73
e	-	5.08	-
e1	-	20.32	-
e2	-	10.16	-
L	4.21	-	-
ΦP	2.50	-	3.10
X1	-	-	39.50
X2	32.70	-	33.70
Note: The interchangeability dimensions of e, E1 and E2 are guaranteed by the shell manufacturing and inspection, and there is no examination requirement in this specification.			

Table 6. Description of Encapsulated Enclosure

Enclosure Model	Base Material	Base Plating	Cover plate (Cap) material	Cover plate (Cap) coating	Lead Wire Material	Lead Wire Plating	Sealing Way	Remark
UPP2727-08a (Without flange)	Cold-rolled steel (10#)	Ni	Iron-nickel alloy Gold (4J42)	Ni	Copper core Compound	Ni/Au	Parallel Seam welding	The grounding pin is plated with Ni.
UPP2727-08u (With flange)	Cold-rolled steel (10#)	Ni	Iron-nickel alloy Gold (4J42)	Ni	Copper core Compound	Ni/Au	Parallel Seam welding	The grounding pin is plated with Ni.