

BSTCH28 Series

Product features

- High reliability
- Wide input voltage range: 12V to 50 V, nominal input DC voltage: 28 V
- Anti-surge voltage capability: 80 V, 1s
- Output Power PO: 1.5 W
- Operating temperature range Tc: -55 °C ~ + 125 °C
- The starting current is small
- Small output overshoot
- It has the function of prohibition
- Input under-voltage lockout and output short-circuit protection
- Maximum power density: 7W/in³
- Metal hermetic package
- When the product is used, the minimum load shall not be less than 10% of the rated load.

Product category

Single channel: 3.3V, 5V, 12V, 15V

Dual: $\pm 5V$, $\pm 15V$

Scope of application

Aviation, aerospace and other highly reliable electronic systems, as well as some occasions that require high anti-surge ability of power supply.

Product overview

This series of products is a highly reliable DC/DC converter with anti-surge capability (80 V, 1s). The product adopts single-ended flyback circuit topology and pulse width modulation principle. After the sampling signal of the output voltage is fed back by the winding, it modulates the pulse width of the controller with the current sampling signal of the input loop at the same time, forming a double-loop closed-loop control, so that the product has a stable voltage output. This series of products are manufactured by thick film hybrid integration process and packaged by energy storage welding metal fully sealed shell. The design 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

BSTCH28 series

Absolute maximum rating	
Input voltage (continuous): 50 V	Mechanical impact: 1500g
Input voltage (transient, 1s): 80V	Soldering temperature resistance of lead: 300 °C (15 s)
Output Power: 1.5 W	Weight: 11 G
Storage temperature: -65 °C ~ 150 °C	ESD : 2000V

Electrical characteristics of BSTCH28S series

NO.	Characteristic	Condition (Unless otherwise specified, $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{IN} = 28\text{V} \pm 0.5\text{V}$)		BSTCH28S3R3		BSTCH28S05		BSTCH28S12	
				Minimum value	Maximum value	Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/V	Sanwen		12	50	12	50	12	50
2	Output voltage/V	Fully loaded	Normal temperature	3.267	3.333	4.95	5.05	11.88	12.12
			High and low temperature	3.17	3.43	4.8	5.2	11.52	12.48
3	Output current/A	$V_{IN}=12\text{V} \sim 50\text{V}$		—	0.3	—	0.3	—	0.125
4	Output power/W			0	1	0	1.5	0	1.5
5	Output ripple voltage/mV	$BW \leq 20\text{MHz}$, full load		—	50	—	50	—	50
6	Voltage regulation/mV	$V_{IN} = 12\text{V} \sim 50\text{V}$, full load		—	150	—	150	—	60
7	Load regulation a/mV	10% load $\rightarrow$ full load		—	400	—	400	—	700
		50% load $\rightarrow$ full load		—	250	—	250	—	250
8	Input Current/mA	When prohibited		—	3.5	—	3.5	—	3.5
		At no load		—	10	—	10	—	10
9	Input ripple current/mA	$BW \leq 20\text{MHz}$, full load			30	—	30	—	30
10	Efficiency	Fully loaded		69		72	—	75	—
11	Insulation resistance /M Ω	Add 500 V between input and output or to the enclosure, $T_c = 25^{\circ}\text{C}$		100		100	—	100	—
12	Prohibit voltage			0	0.7	0	0.7	0	0.7
13	Undervoltage	Fully loaded		6.5	11.5	6.5	11.5	6.5	11.5

	turn-on voltage/V							
14	Short circuit protection function		Have		Have		Have	
15	Capacitive Load/ μ F	Tc=25℃	-	500	—	500	—	200
16	Switching frequency/kHz	Fully loaded	325	475	325	475	325	475
17	Output voltage change (peak)/mV during load transient	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	-300	300	-300	300	-300	300
18	Recovery time of output voltage during load transient/ μ s	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	—	500	—	600	—	400
19	Output voltage change (peak)/mV during input voltage transient	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 50V $\rightarrow$ 12V, full load	-300	300	-400	400	-400	400
20	Recovery time of output voltage in case of input voltage transient/ μ s	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 50V $\rightarrow$ 12V, full load	—	500	—	600	—	400
21	Startup overshoot (peak)/mV	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	15	—	25	—	50
22	Startup delay/ms	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	20	—	20	—	20

Electrical characteristics of BSTCH28S series

NO.	Characteristic	Condition(Unless otherwise specified, $-55^{\circ}\text{C} \leq T_c \leq 125^{\circ}\text{C}$, $V_{IN} = 28V \pm 0.5V$)		BSTCH28S15	
				Corporate Military Standard: Q/HW32455-2015	
				Minimum value	Maximum value
1	Input voltage/V	Sanwen		12	50
2	Output voltage/V	Fully loaded	Normal temperature	14.85	15.15
			High and low temperature	14.40	15.60
3	Output current/A	$V_{IN}=12V \sim 50V$		—	0.1
4	Output power/W			0	1.5
5	Output ripple voltage/mV	$BW \leq 20\text{MHz}$, full load		—	50
6	Voltage regulation/mV	$V_{IN} = 12V \sim 50V$, full load		—	60
7	Load regulation a/mV	10% load $\rightarrow$ full load		—	700
		50% load $\rightarrow$ full load		—	250
8	Input Current/mA	When prohibited		—	3.5
		At no load		—	10
9	Input ripple current/mA	$BW \leq 20\text{MHz}$, full load		—	30
10	Efficiency	Fully loaded		76	—
11	Insulation resistance /M Ω	Add 500 V between input and output or to the enclosure, $T_c = 25^{\circ}\text{C}$		100	—
12	Prohibit voltage			0	0.7

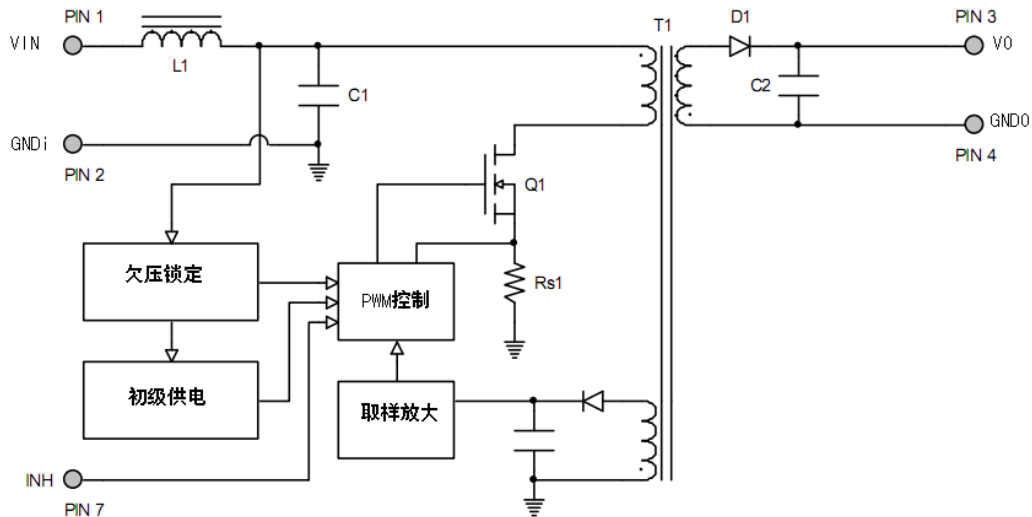
13	Undervoltage turn-on voltage/V	Fully loaded	6.5	11.5
14	Short circuit protection function		Have	
15	Capacitive Load/ μ F	Tc=25°C	—	200
16	Switching frequency/kHz	Fully loaded	325	475
17	Output voltage change (peak)/mV during load transient	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	-300	300
18	Recovery time of output voltage during load transient/ μ s	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	—	400
19	Output voltage change (peak)/mV during input voltage transient	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 50V $\rightarrow$ 12V, full load	-400	400
20	Recovery time of output voltage in case of input voltage transient/ μ s	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 50V $\rightarrow$ 12V, full load	—	400
21	Startup overshoot (peak)/mV	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	50
22	Startup delay/ms	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	20
a. The output load shall not be less than 10% of the rated load				

Electrical characteristics of BSTCH28D series

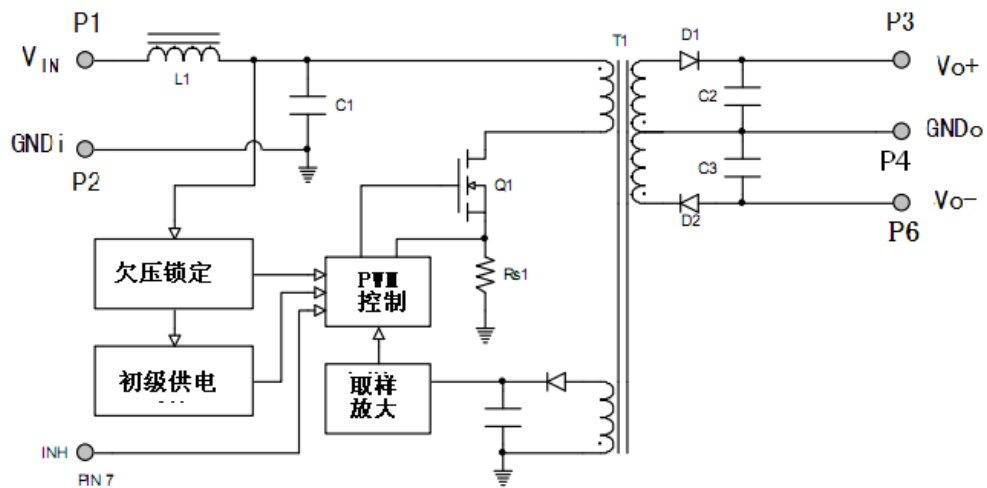
NO.	Characteristic	Condition(Unless otherwise specified, -55 ℃ ≤ Tc ≤ 125 ℃, VIN = 28V ± 0.5V)		BSTCH28D05		BSTCH28D15	
				Minimum value	Maximum value	Minimum value	Maximum value
1	Input voltage/V	Sanwen		12	50	12	50
2	Output voltage/V	The right way	Normal temperature, full load	4.95	5.05	14.85	15.15
		Negative path		-5.05	-4.95	-15.15	-14.85
		The right way	High and low temperature, full load	4.8	5.2	14.40	15.60
		Negative path		-5.2	-4.8	-15.60	-14.40
3	Output current/A	VIN=15V~50V		—	0.15	—	0.05
4	Output power/W			0	1.5	0	1.5
5	Output ripple voltage/mV	BW ≤ 20MHz, full load		—	50	—	100
6	Voltage regulation/mV	The right way	VIN = 12V ~ 50V, full load	—	150	—	150
		Negative path		—	150	—	150
7	Load Regulation/mV	The right way	10% load → full load	—	400	—	700
		Negative path		—	400	—	700
		The right way	50% load → full load	—	250	—	250
		Negative path		—	250	—	250
8	Input Current/mA	When prohibited		—	3.5	—	3.5
		At no load		—	10	—	14
9	Input ripple current/mA	BW ≤ 20MHz, full load		—	30	—	30
10	Efficiency	Fully loaded		72	—	73	—
11	Insulation resistance /MΩ	Add 500 V between input and output or to the enclosure, Tc = 25 ° C		100	—	100	—
12	Prohibit voltage			0	0.7	0	0.7

13	Undervoltage turn-on voltage/V	Fully loaded	6.5	11.5	6.5	11.5
14	Short circuit protection function		Have		Have	
15	Capacitive Load/ μ F	$T_c=25^{\circ}\text{C}$	—	500	—	200
16	Switching frequency/kHz	Fully loaded	325	475	325	475
17	Output voltage change (peak)/mV during load transient	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	-300	300	-300	300
18	Recovery time of output voltage during load transient/ μ s	50% load $\rightarrow$ full load Or full load $\rightarrow$ 50% load	—	500	—	400
19	Output voltage change (peak)/mV during input voltage transient	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 40V $\rightarrow$ 16V, full load	-400	400	-600	600
20	Recovery time of output voltage in case of input voltage transient/ μ s	Input voltage VIN: 12V $\rightarrow$ 50V, full load or input voltage VIN: 40V $\rightarrow$ 16V, full load	—	600	—	600
21	Startup overshoot (peak)/mV	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	25	—	50
22	Startup delay/ms	Input voltage VIN: 0 $\rightarrow$ 28V, full load	—	20	—	20

Circuit block diagram

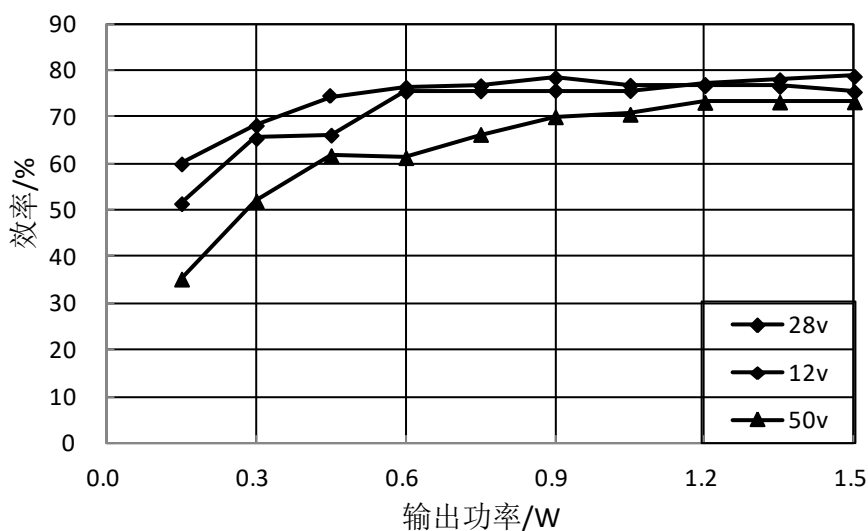


BSTCH28S Series Circuit Block Diagram

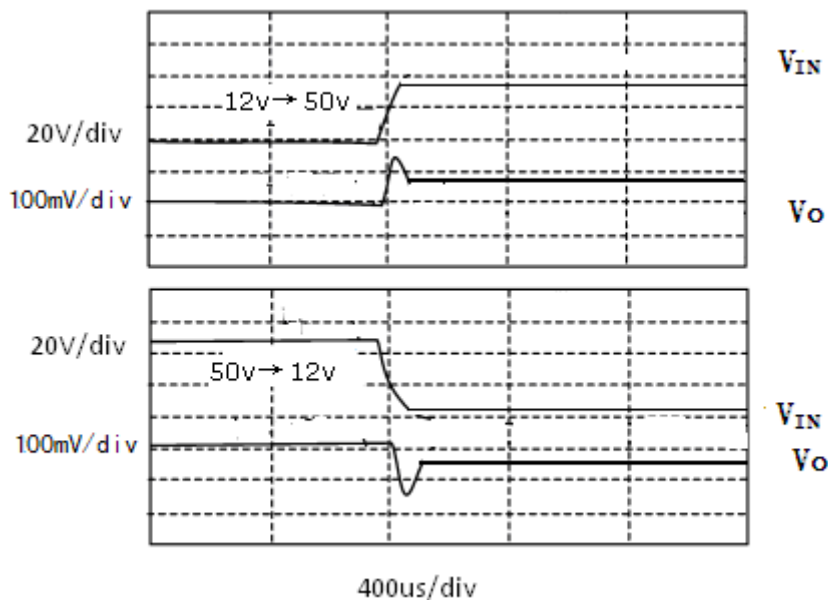


BSTCH28D Series Circuit Block Diagram

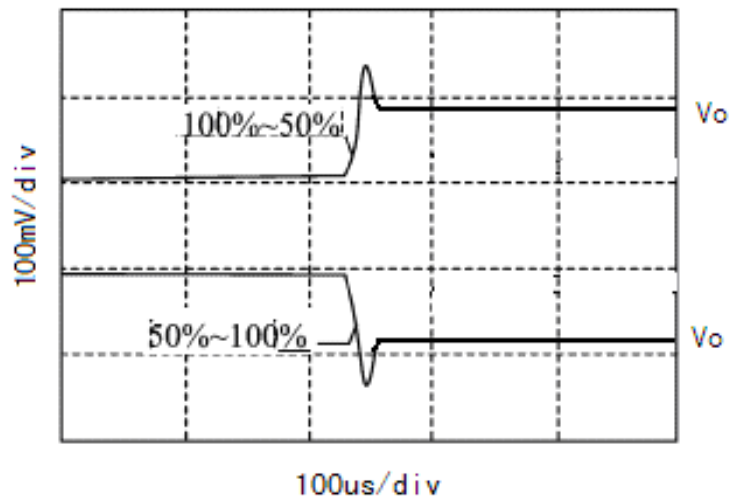
Typical characteristic curves (unless otherwise specified, the following curves are tested at $T_c = 25^\circ\text{C}$ and $V_{IN} = 28\text{V} \pm 5\%$)



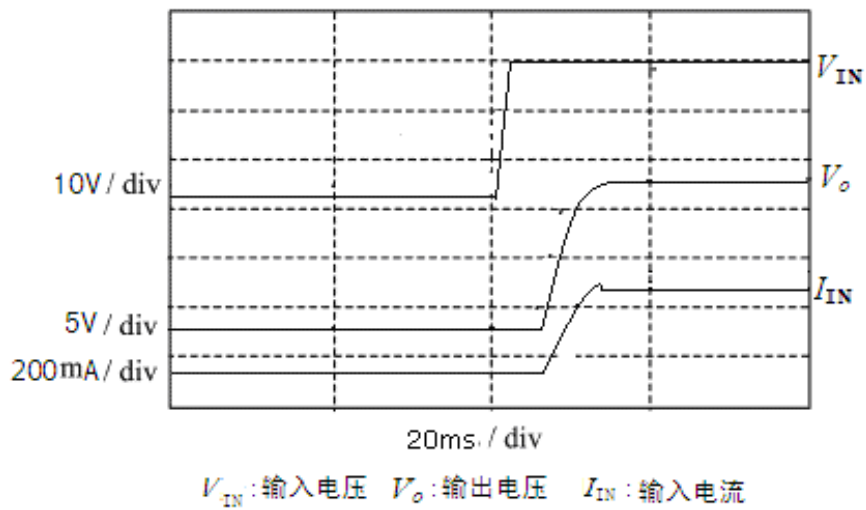
BSTCH28S15 efficiency curve



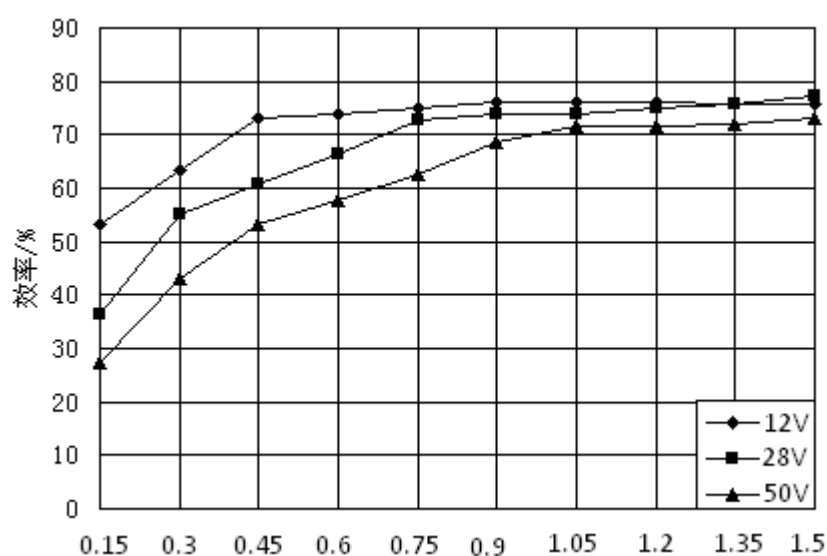
BSTCH28S15 input step curve



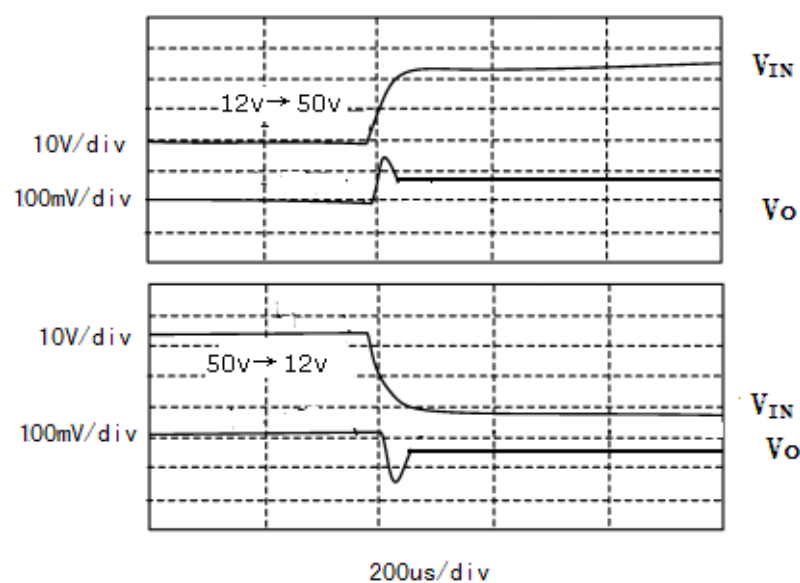
BSTCH28S15 load step curve



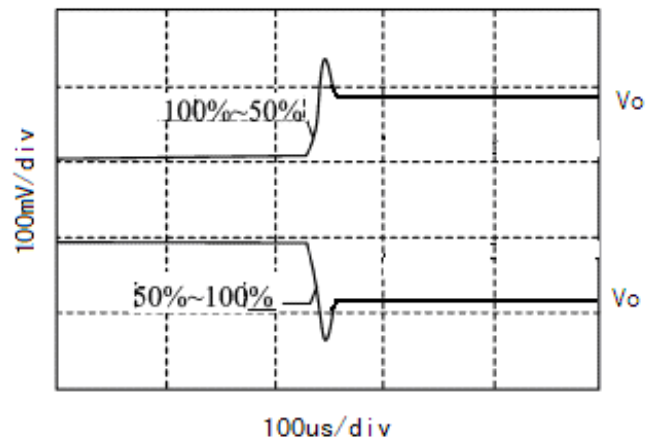
BSTCH28 S15 Startup Overshoot/Delay and Startup Current



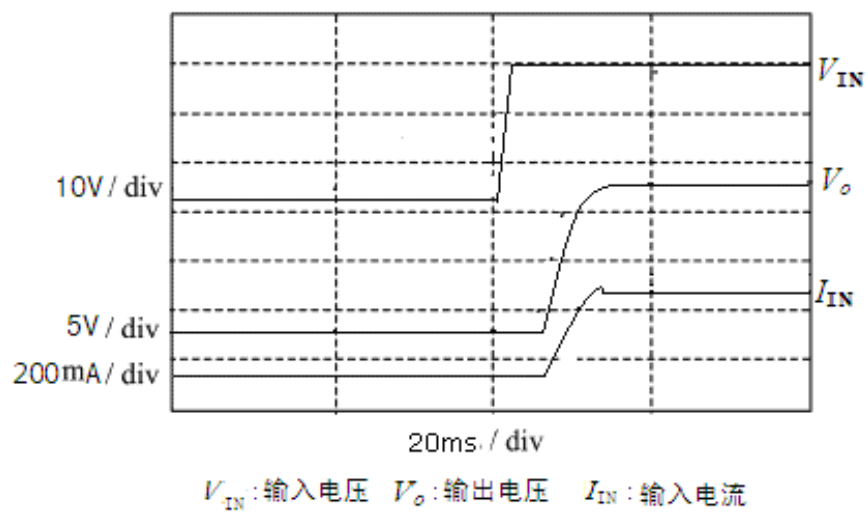
Efficiency curve of BSTCH28D15



BSTCH28D15 input step curve

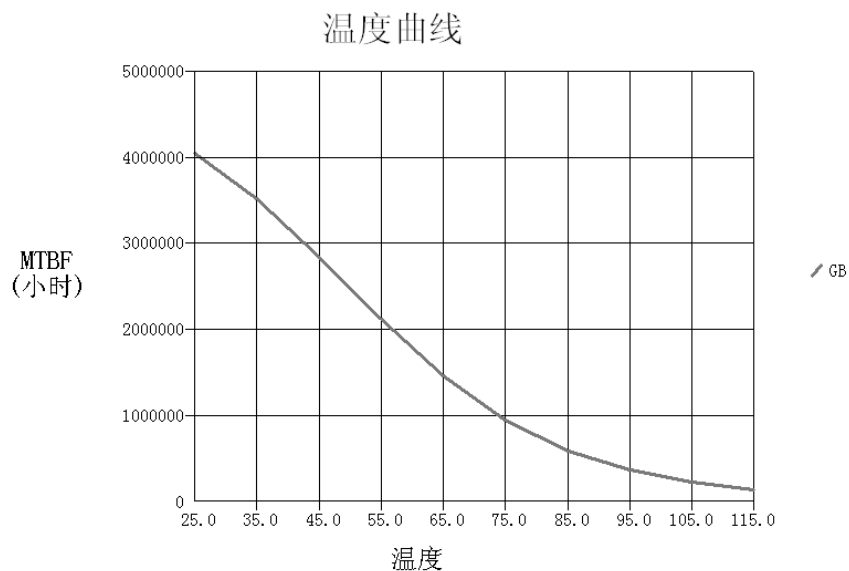


BSTCH28D15 load step curve



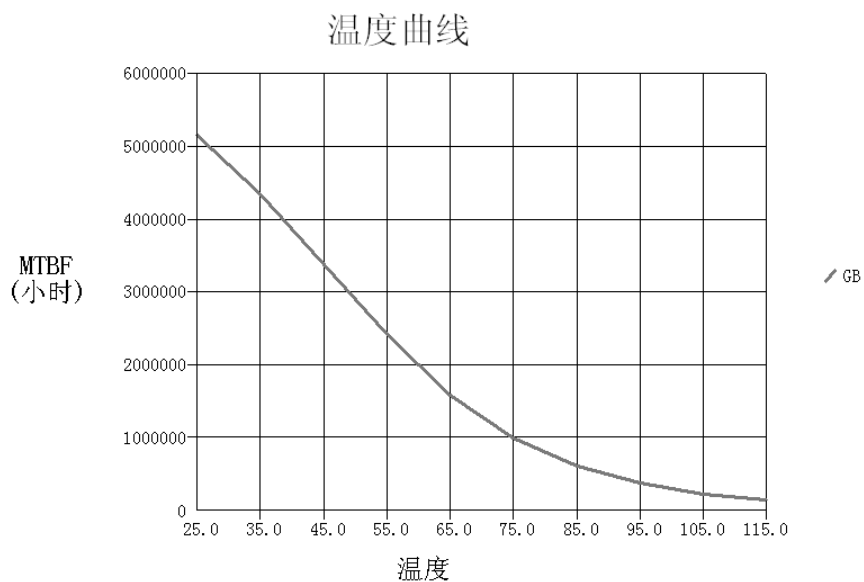
BSTCH28 D15 Startup Overshoot/Delay and Startup Current

MTBF curve



MTBF Temperature Curve (BSTCH28 S15)

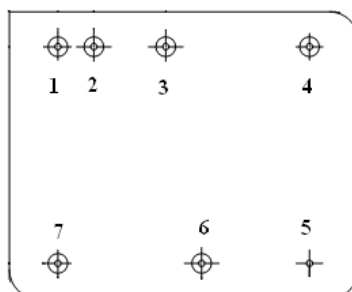
(According to GJB/Z 299C-2006, the ground is expected to be in good condition)



MTBF Temperature Profile (BSTCH28 D15)

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

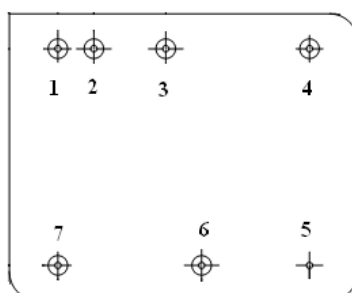
Functional description of the lead-out terminal



BSTCH28S Series Enclosure Bottom View

BSTCH28 S Series Pin Function Description

Pin-out NO.	Symbol	Function
1	VIN	Enter the positive terminal
2	GNDI	Input ground
3	VO	Output positive terminal
4	GNDO	Output ground
5	GNDC	Shell ground
6	NC	Empty end
7	INH	Forbidden end

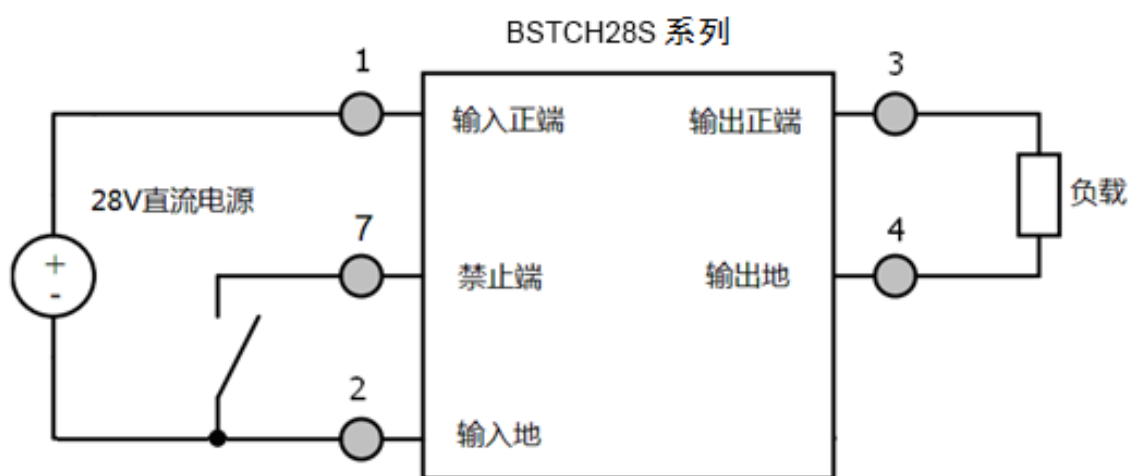


BSTCH28D Series Enclosure Bottom View

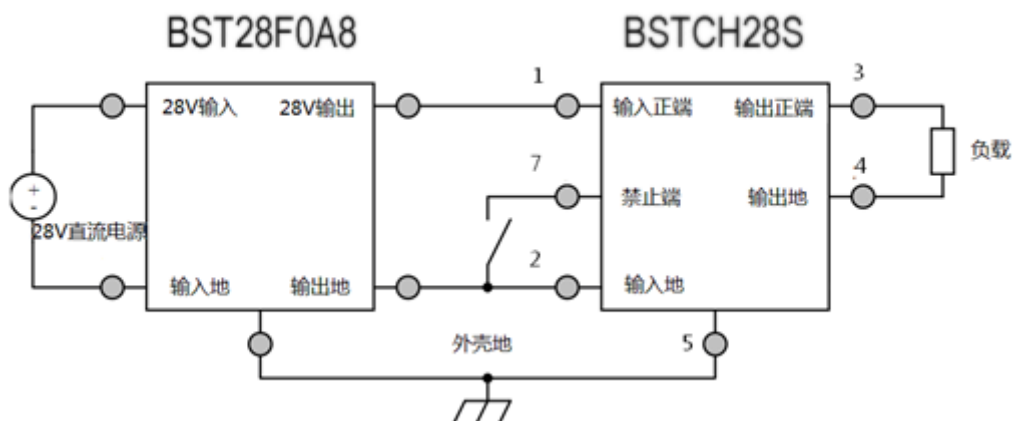
BSTCH28D Series Pin Function Description

Pin-out NO.	Symbol	Function
1	VIN	Enter the positive terminal
2	GNDI	Input ground
3	VO+	Output positive terminal
4	GNDO	Output ground
5	GNDC	Shell ground
6	VO-	Output negative terminal
7	INH	Forbidden end

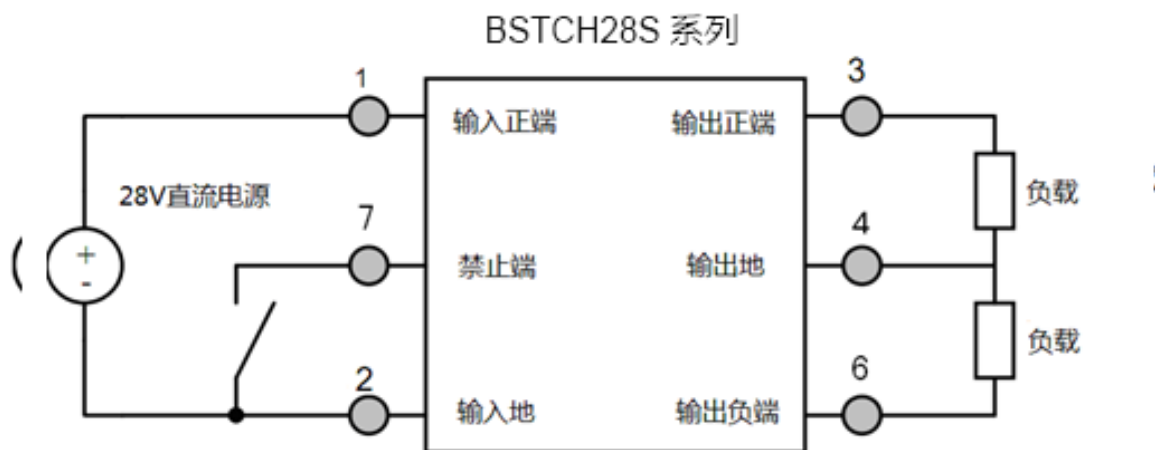
Typical application connection



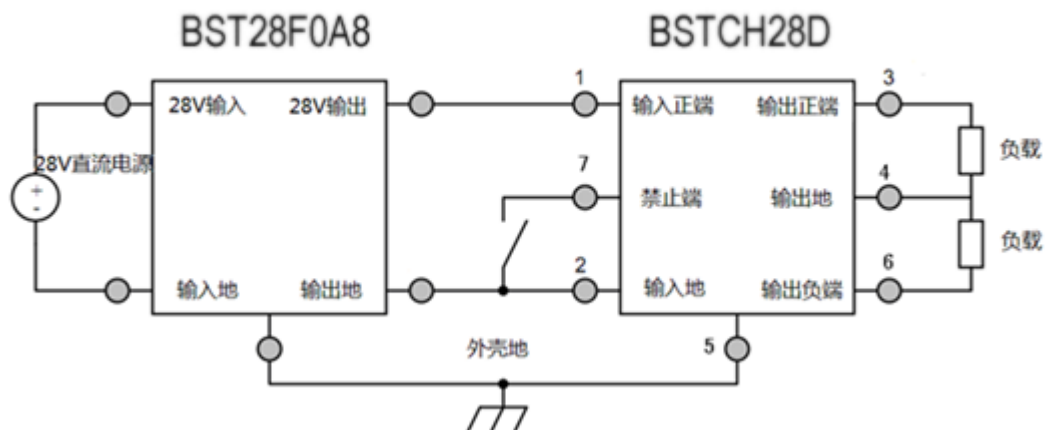
Connection diagram of BSTCH28S series products



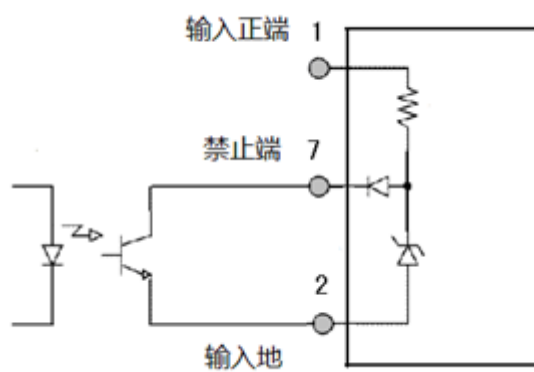
BSTCH28S Series EMI Filter Connection Diagram



Connection diagram of BSTCH28D series products

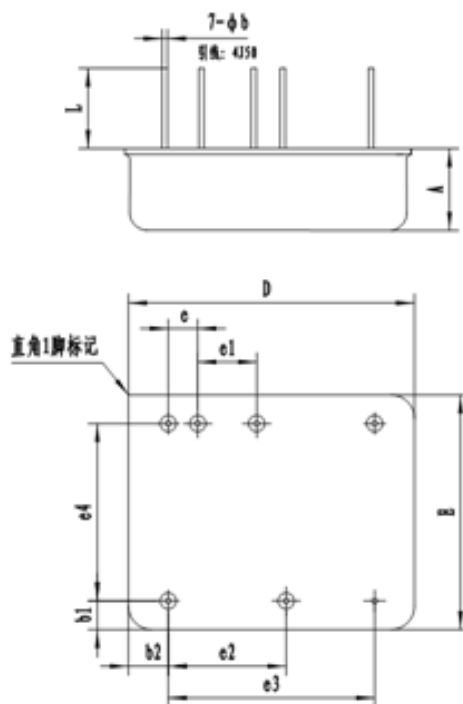


Connection Diagram of EMI Filter for BSTCH28D Series Products



BSTCH28 Series Inhibit Drive Circuit

Dimensions and description of package outline drawings



BSTCH28 Series Bottom and Side View

BSTCH28 Series Package Dimensions

Dimension symbol	Value (mm)		
	Minimal	Nominal	Max
A	-	-	7.38
ϕb	0.32	-	0.58
b1	2.16	-	2.76
b2	3.13	-	3.73
D	-	-	25.14
E	-	-	20.66
e	2.24	2.54	2.84
e1	4.78	5.08	5.38

e2	9.86	10.16	10.46
e3	17.28	17.78	18.28
e4	14.74	15.24	15.74
L	5.86	-	-
Note: e, e1, e2, e3 and e4 are interchangeable dimensions, which are guaranteed by shell manufacturing and inspection, and no assessment requirements are made in this document.			

BSTCH28 series product package housing description

Enclosure Model	Base Material	Base Plating	Cover plate (Cap) material	Cover plate Coating (cap)	Lead wire Material	Lead wire Plating	Sealing Way	Remark
UPP2520-07	Quality carbon structural steel (08 AL)	Au	SPCC-SD	Ni	4J50	Au	Energy storage welding	