

BSTFL28FE SERIES CONVERTERS

65WATT

Product Features

1. 16 to 40 VDC input, typical 28V
2. 50W to 65W output power
3. -55 °C to +125 °C operation
4. Fully isolated
5. 100M Q minimum (500V DC) isolation
6. Inhibit and indefinite short circuit protection
7. 43W/in³ power density
8. Equivalent with Interpoint's MFL Series
9. Hermetically sealed metal cases

Table 1 Product models

MODELS	
SINGLE	DUAL
BSTFL28S05FE	BSTFL28D05FE
BSTFL28S12FE	BSTFL28D12FE
BSTFL28S15FE	BSTFL28D15FE
BSTFL28S28FE	

Product description

The BSTFL28FE Series of DC/DC converters offer up to 65 watts of output power with high reliability. The converters are packaged in hermetically sealed metal cases, making them ideal for use in aviation, aerospace and other high reliability applications.

The BSTFL28FE series of converters use a pulse width modulated and single ended forward topology design. The operating principle is that the sampling signal of output voltage, coupled by the opto-coupler, works together with the sampling signal of input loop current to regulate the pulse width of the controller. The magnetic feedback technology can avoid magnetic saturation and improve products reliability effectively.

Thick film hybrid techniques provide the BSTFL28FE Series of converters with reliability levels and optimum miniaturization. The design and manufacturing process of BSTFL28FE Series of

converters are in compliance with General Standards of Hybrid Integrated Circuits and detailed standards of manufacturing. Connected to a BSTFDCE03 filter, the BSTFL28FE Series of converters can achieve better electromagnetic compatibility (EMC) performance.

Absolute maximum ratings

- Input Voltage: 16 to 40 VDC
- Power Dissipation: 65 watts
- Lead Soldering Temperature: 300°C (10s)
- Storage Temperature Range: -55°C to +125°C
- Inhibit Voltage: 0.2V max
- External Synchronous Signals: Frequency Range: 400k to 600kHz Duty Ratio: 40% to 60%
- Level: 0.8 V_wV_w5V

Recommended operating conditions

- Input VDC: 16 to 40 V
- Case Temperature (T_c): -55°C to +125

Electrical performance

BSTFL28S05FE, BSTFL28S12FE

Table 2. Electrical Characteristics: (T_{case} = -55°C to +125°C, V_{in} = 28V ± 0.5V, Full Load Unless Otherwise Specified)

Single output models		BSTFL28S05FE		BSTFL28S12FE	
Parameter	Conditions	Min	Max	Min	Max
Output Voltage(V)	<i>I</i> _o =full load Ambient temperature high and low temperature	4.950 4.875	5.050 5.125	11.88 11.76	12.12 12.24
Output Current(A)	V _n = 16 TO 40 VDC		10		5

Output Power(W)			50		60
Output Ripple Voltage (mV)	BW=10 kHz to 2 MHz Io=full load	Ambient temperature high and low temperature		35 50	75 100
Line Regulation(mV)	Vin = 16 TO 40 VDC, Io=full load			20	20
Load Regulation(mV)	Io=No load to load			20	20
Input Ripple Current (mA)	BW=10 kHz to 10 MHz Io=full load	Ambient temperature high and low temperature		45 50	45 50
Efficiency (%)	Io=full load	Ambient temperature high and low temperature	77 75		83 81 >
Isolation (M Q)	Input to output or any pin to case (except case ground pin) at 500 VDC, TA = 25° C		100		100
Inhibit Function	TA = 25° C, Inhibit voltage, output disabled		0	0.2	0 0.2
Protection Function	TA = 25° C		5		5
Start-up Overshoot (mV pk)	Vin=0 to 28V, Io=full load			25	50
Start-up Delay(ms)	Vin=0 to 28V, Io=full load			6	6
Capacitive Load(□ F)	TA = 25° C, No effect on DC performance			1000	1000
Switching Frequency (kHz)	Io=full load		400	600	400 600
Step Load Response Transient (mV pK)	50% load -- full load -50% load		-350	350	600
Step Load Response Recovery (μ s)	50% load -- full load -50% load			3000	3000
Step Line Response Transient (mV pK)	Vin=16~40V, Io=full load, Vin=40~16V, Io=full load			300	400
Step Line Response Recovery (μ s)	Vin=16~40V, Io=full load, Vin=40~16V, Io=full load			300	300
Load Fault recovery (ms)	IO:short circuit to full load			4	4

Notes to Specifications:

- The step load transition time should be greater than or equal to 10 s.
- The step line transition time should be greater than or equal to 10 s

- Recovery time is measured from application of the transient to point at which VOUT is within 1% of VOUT at final value.

BSTFL28S15FE, BSTFL28S28FE

Table 3 Electrical Characteristics: (TCASE = -55°C to +125°C, VIN = 28V ± 0.5V, Full Load, Unless Otherwise Specified)

Single output models		BSTFL28S15FE		BSTFL28S28FE	
Parameter	Conditions	Min	Max	Min	Max
Output Voltage (V)	I_o =full load Ambient temperature high and low temperature	14.85 14.55	15.15 15.45	27.72 27.16	28.28 28.84
Output Current(A)	V_n = 16 TO 40 VDC		4.33		2.32
Output Power(W)			65	>	65
Output Ripple Voltage (mV)	$BW=10$ kHz to 2 MHz I_o =full load Ambient temperature high and low temperature	>	85 110	>	200 300
Line Regulation(mV)	V_{in} = 16 TO 40 VDC, I_o =full load	>	20	>	120
Load Regulation(mV)	I_o =No load to load		20		150
Input Ripple Current (mA)	$BW=10$ kHz to 10 MHz I_o =full load Ambient temperature high and low temperature	>	> 45 50	>	> 50 60
Efficiency (%)	I_o =full load Ambient temperature high and low temperature	84 82	>	> 83 79	
Isolation (M Ω)	Input to output or any pin to case (except case ground pin) at 500 VDC, $T_A = 25^\circ C$	100	>	100	
Inhibit Function	$T_A = 25^\circ C$, Inhibit voltage, output disabled	0	0.2	0	0.2
Protection Function	$T_A = 25^\circ C$	5		5	
Start-up Overshoot (mV pk)	$V_{in}=0$ to 28V, I_o =full load		50		100
Start-up Delay(ms)	$V_{in}=0$ to 28V, I_o =full load		6		6
Capacitive Load(μF)	$T_A = 25^\circ C$, No effect on DC performance		1000		500
Switching Frequency(kHz)	I_o =full load	400	600	400	600
Step Load Response Transient (mV pK)	50% load -- full load -50% load		600		1400
Step Load Response Recovery (μs)	50% load -- full load -50% load		3000		3000
Step Line Response Transient (mV pK)	$V_{in}=16\sim 40V$, I_o =full load, $V_{in}=40\sim 16V$, I_o =full load		400		800

Step Line Response Recovery (μ s)	Vin=16~40V, Io=full load, Vin=40~16V, Io=full load		300		400
Load Fault recovery (ms)	IO:short circuit to full load		4		4

Notes to Specifications:

- The step load transition time should be greater than or equal to 10 s.
- The step line transition time should be greater than or equal to 10 s
- Recovery time is measured from application of the transient to point at which VOUT is within 1% of VOUT at final value.

BSTFL28D05FE / BSTFL28D12FE / BSTFL28D15FE

Table 4. Electrical Characteristics: (TCASE = -55°C to +125°C, VIN = +28V \pm 0.5V, Full Load, Unless Otherwise Specified)

Dual output models			BSTFL28D05FE		BSTFL28D12FE		BSTFL28D15FE	
Parameter	Conditions		Min	Max	Min	Max	Min	Max
Output Voltage (V)	Io1= Io2= full load	Ambient temperature high and low temperature	4.95	5.05	11.88	12.12	14.85	15.15
		Ambient temperature high and low temperature	4.85	5.15	11.64	12.36	14.55	15.45
Output Voltage (V)	Io1= Io2= full load	Ambient temperature high and low temperature	-5.08	-4.92	-12.18	-11.82	-15.23	-14.77
		Ambient temperature high and low temperature	-5.18	-4.82	-12.42	-11.58	-15.53	-14.47
Output Current(A)	VIN = 16 TO 40 VDC			5		2.5		2.17
Output Power(W)	-			50		60		65
Output Ripple Voltage(mV)	BW=10 kHz to 2 MHz Io1= Io2= full load	Ambient temperature high and low temperature		50		80		100
		Ambient temperature high and low temperature		100		120		150
Line Regulation (mV)	VIN = 16 TO 40 VDC, Io1= Io2= full load	+Vout		50		50		50
		-Vout		100		100		100
Load Regulation (mV)	Io1= Io2=No load to full load	+Vout		50		50		50
		-Vout		100		120		150
Input Ripple Current(mA)	BW=10 kHz to 10 MHz Io1= Io2=full load	Ambient temperature high and low temperature		45		45		45
		Ambient temperature high and low temperature		50		50		50

Efficiency (%)	Io1= Io2=full load	Ambient temperature high and low temperature	77 75	—	83 81	—	84 82	—
Isolation (MQ)	Input to output or any pin to case (except case ground pin) at 500 VDC, TA = 25° C		100		100		100	
Inhibit Function	TA = 25° C, Inhibit voltage, output disabled		0	0.2	0	0.2	0	0.2
Protection Function	TA = 25° C		5		5		5	
Start-up Overshoot (mV pk)	Vin=0 to 28V, Io1=Io2=full load		-25	25	-50	50	-50	50
Start-up delay (ms)	Vin=0 to 28V, Io1=Io2 = fu1110ad			6		6		6
Capacitive Load(μF)	TA = 25° C, No effect on DC performance			500		500		500
Switching Frequency(kHz)	Io1=Io2=full load		400	600	400	600	400	600
Step Load Response Transient (mV pK)	50% load to full load or full load to 50% load, Each Vout has balanced load		-350	350	-600	600	-600	600
Step Load Response Recovery (μ s)	50% load to full load or full load to 50% load, Each Vout has balanced load			3000		3000		3000
Step Line Response Transient (mV pK)	Vin=16~40V, Io1= Io2=full load Vin=40~16V, Io1= Io2=full load		-300	300	-400	400	-400	400
Step Line Response recovery (μ s)	Vin=16~40V, Io1=Io2=full load Vin=40~16V, Io1= Io2=full load			300		300		300
Load Short recovery (ms)	Fault Circuit	Io1= Io2 short circuit to full load		4		4		4

Notes to Specifications:

- The step load transition time should be greater than or equal to 10 s
- The step line transition time should be greater than or equal to 10 s.
- Recovery time is measured from application of the transient to point at which VOUT is within 1% of VOUT at final value.

Typical performance curves

Single output model (BSTFL28S15FE)

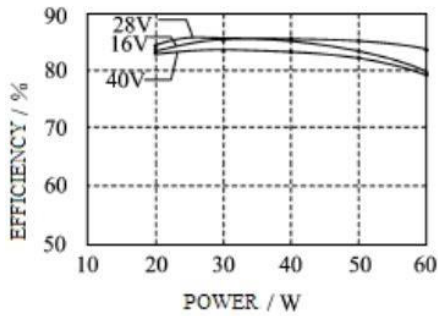
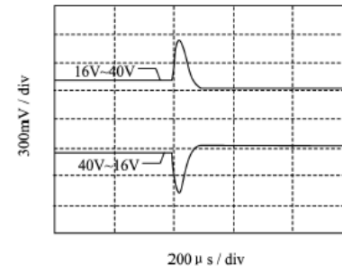


Figure 2. Efficiency (output power)



200 u s / div

Figure 3. Step line response

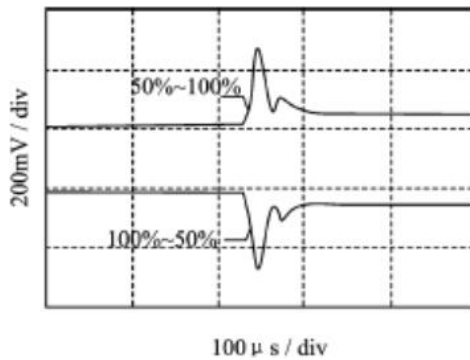


Figure 4. Step load response

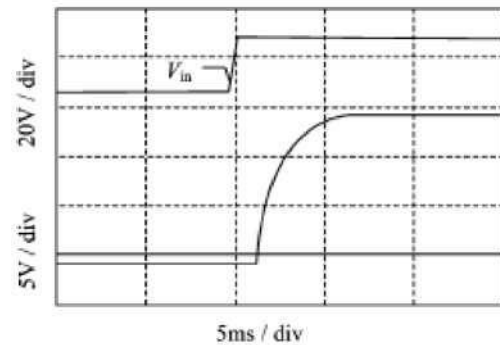


Figure 5. Start-up overshoot/ delay

Dual output model (BSTFL28D15FE)

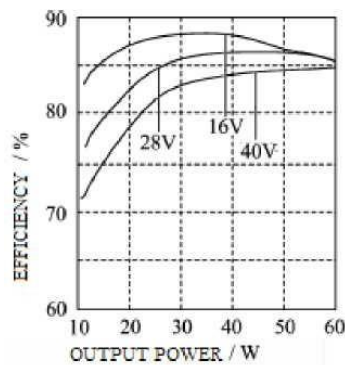


Figure 6. Efficiency (output power)

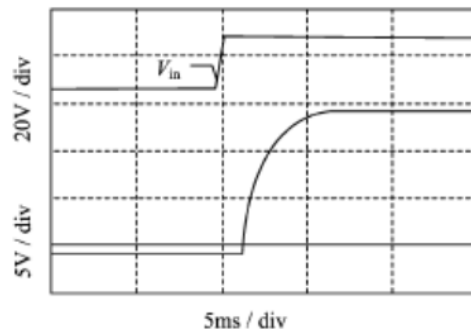


Figure 7. Step line response

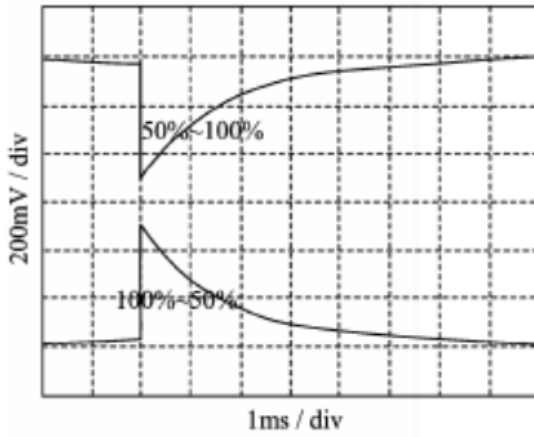


Figure 8. Step load response

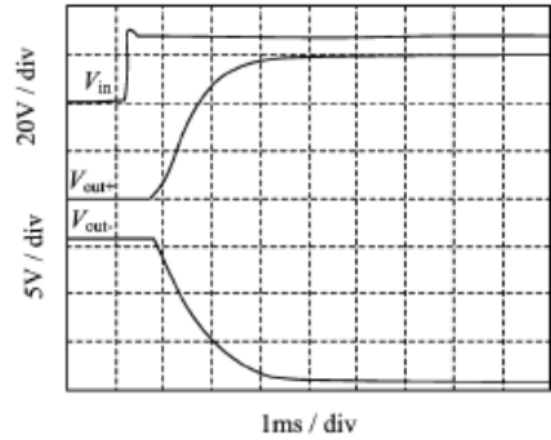


Figure 9. start-up overshoot/delay

Typical MTBF curves

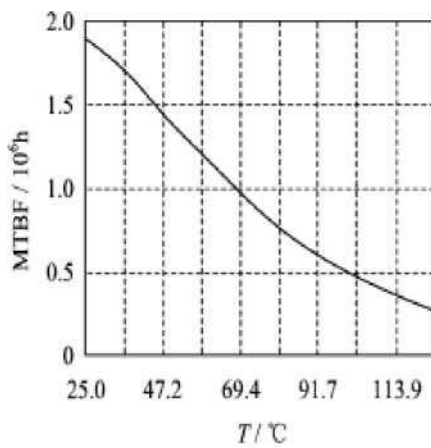


Figure10. Model BSTFL28S15FE

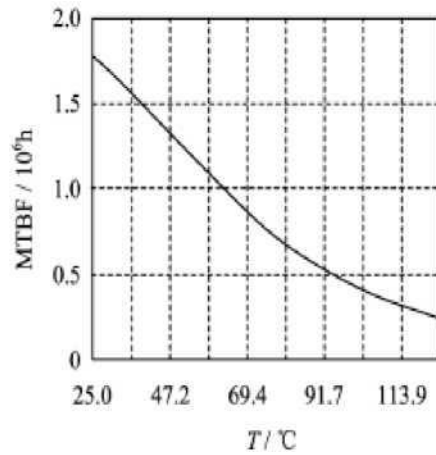


Figure 11. Model BSTFL28D15FE

Typical connection diagram

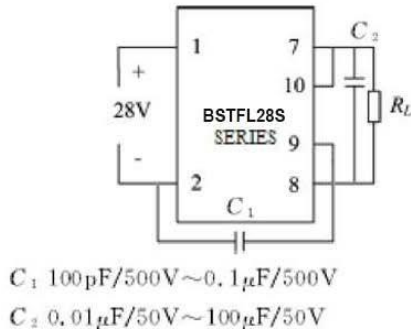


Figure12. Application Connection Diagram For Single Output Models

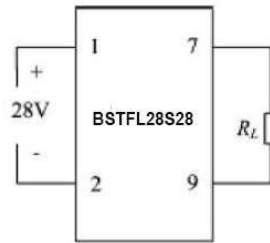


Figure13. Application Connection Diagram For Model BSTFL28S28FE

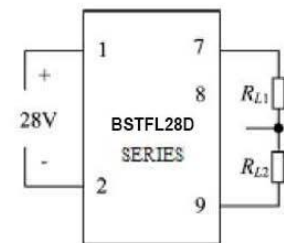


Figure14. Application Connection Diagram For Dual Output Models

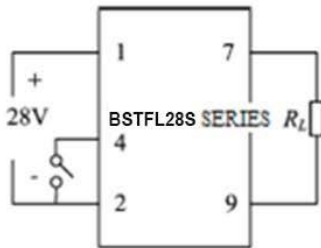


Figure 15. Diagram for Single Output Models

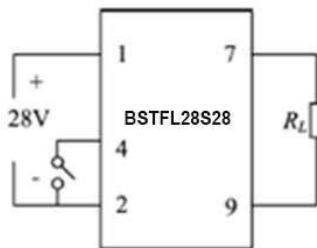


Figure 16. Inhibit Drive Connection Diagram for Model BSTFL28S28FE

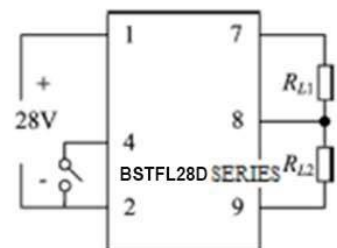


Figure 17. Inhibit Drive Connection Diagram for Dual Output Models

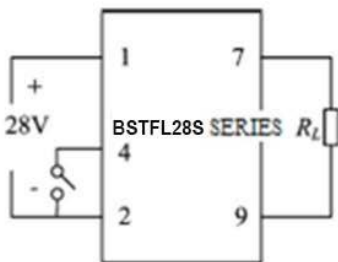


Figure 18. Connection Diagram for Single Output Converter with EMI Filter

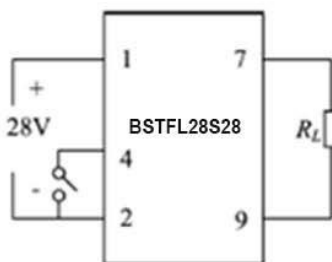


Figure 19. Connection Diagram for Model BSTFL28S28FE Converter with EMI Filter

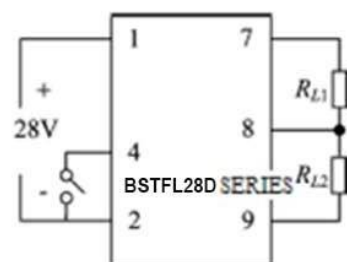
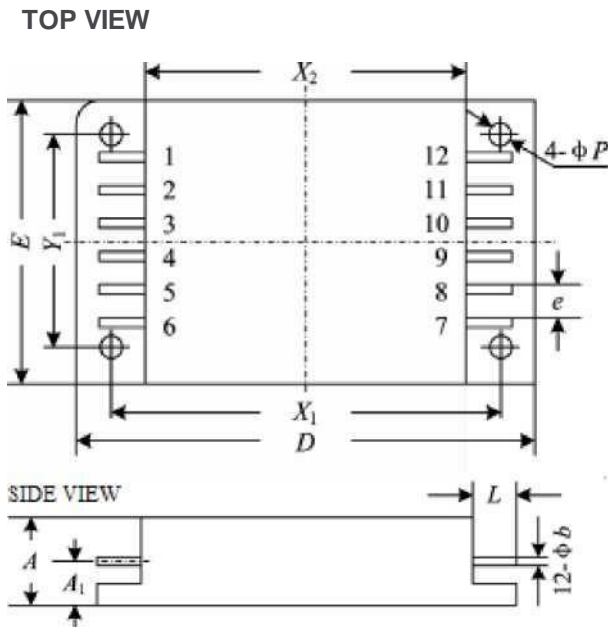


Figure 20. Connection Diagram for Dual Output Converter with EMI Filter

Package specifications



Units :mm			
Dimension Symbols	Min.	Typ.	Max.
A	—	—	10.16
A ₁	5.39	—	5.79
φb	0.89	—	1.14
D	75.95	—	76.45
e	—	5.08	—
E	37.97	—	38.23
L	5.58	—	6.10
φP	3.12	—	3.38
X ₁	69.85	—	70.36
X ₂	63.37	—	63.63
Y ₁	31.88	—	32.13

Figure 21. Package Outline

Table 5. Case Materials

Case Model	Header	Header Plating	Cover	Cover Plating	Pin	Pin Plating	Sealing Style	Notes
FPP6438-12	Cold Rolled Steel	Nickel	Iron/Nickel Alloy(4J42)	Nickel	Copper Compound	Nickel/Gold	Compression Seal	

Notes: Solder pins individually with heat application not exceeding 300° C for 10 seconds per pin.

Pin designation

1	12
3	10
4	少
6	7

Table 6. Pin Designation

Pin	Single Output	Dual Output
1	Positive Input	Positive Input
2	Input Common	Input Common
3	NC	NC
4	Inhibit 1	Inhibit 1
5	NC	NC
6	Synchronous Input	Synchronous Input
7	Output	Positive Output
8	Output Common	Output Common
9	Negative Output Sense	Negative Output
10	Positive Output Sense	NC
11	NC	NC
12	Inhibit 2	Inhibit 2

Ordering information

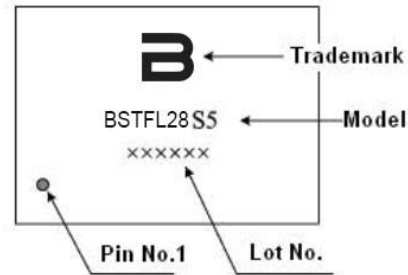


Figure 22. Bottom View of Pin

Application Notes:

- The correct power supply is to be ensured that may not cause permanent damage to the device.
- When the electrical performance is tested, the testing position should be pin of the device.
- When the device is mounted, the bottom of the device should be closely attached to the circuit board. So as to avoid the damage of the pins, the shockproof should be increased when it is required
- The pin should not be bending to avoid the glass insulator breaking and case leakage.
- When the case temperature is at 105c it is suggested that thickness of the thermal sinking plate (copper material) is 5mm, the dimension is greater than 120mm X 100mm.