

Features

- Sixteenth-brick footprint with DOSA pin-out
- 2:1 and 4:1 wide input ranges across the series
- Six-sided continuous aluminium shield
- 2250V DC input to output isolation
- Built-in PI input filter, MLCC output capacitors
- Up to 91% typical efficiency
- Remote on/off
- UVLO, OVP, OTP, OPP
- 3 base-plate options
- 3 years warranty

28STBxy-S-x-w50

50W Sixteenth-Brick Isolated DC/DC Converter



Image for illustration purposes only.



Description

The 28STBxy-S-x-w50 is an isolated 50W sixteenth-brick DC/DC converter for board mounting. Synchronous rectification and a built-in PI input filter hold conversion losses down across wide 2:1 and 4:1 input ranges. A six-sided continuous aluminium shield protects the module in industrial and transportation equipment, and three base-plate formats share one DOSA pin-out, so a single design-in covers several mounting arrangements.

Certified to CE, with EMC to EN 55032 and the EN 61000-4 immunity series, and thermal shock, vibration and drop testing to MIL-STD-810F. The unit meets RoHS and REACH requirements. These are primarily used in railway, industrial, military, automation, semiconductor and network and telecom equipment, and customised solutions are available upon request.

Part Number Breakdown

28STB	x	y	S	x	w	50
Series Name	Input Voltage	Output Voltage	Pin Out	Remote Control Option	Shape	Output Power

Models

Part Number	Input Voltage Range (V DC)	Rated Input Voltage (V DC)	Input Current at Full Load (A)	Output Voltage (V DC)	Output Current (A)	Output Power (W)	Efficiency Typ. (%)
28STB018033-S-x-w50	9–36	18	3.16	3.3	15.1	50	88
28STB018050-S-x-w50	9–36	18	3.09	5	10.0		90
28STB018120-S-x-w50	9–36	18	3.12	12	4.2		89
28STB018240-S-x-w50	9–36	18	3.12	24	2.1		89
28STB024033-S-x-w50	18–36	24	2.34	3.3	15.1		89
28STB024050-S-x-w50	18–36	24	2.29	5	10.0		91
28STB024120-S-x-w50	18–36	24	2.31	12	4.2		90
28STB036033-S-x-w50	18–75	36	1.58	3.3	15.1		88
28STB036050-S-x-w50	18–75	36	1.54	5	10.0		90
28STB036120-S-x-w50	18–75	36	1.56	12	4.2		89
28STB036240-S-x-w50	18–75	36	1.56	24	2.1		89
28STB048033-S-x-w50	36–75	48	1.17	3.3	15.1		89
28STB048050-S-x-w50	36–75	48	1.14	5	10.0		91
28STB048120-S-x-w50	36–75	48	1.16	12	4.2		90

Input Specifications

Parameter	Specification
Transient Input Voltage (100mS max.)	18V: 50V DC max. 24V: 50V DC max. 36V: 80V DC max. 48V: 80V DC max.
Undervoltage Lockout, Start-Up Voltage	18V: 8.5V DC typ., 9V DC max. 24V: 17.5V DC typ., 18V DC max. 36V: 17.5V DC typ., 18V DC max. 48V: 35.5V DC typ., 36V DC max.
Undervoltage Lockout, Shutdown Voltage	18V: 7V DC min., 8V DC typ. 24V: 16V DC min., 17V DC typ. 36V: 16V DC min., 17V DC typ. 48V: 32V DC min., 34V DC typ.
Enable Function Input, Positive Logic	ON: open, or 8–20V DC. OFF: short, or 0–1.2V DC
Enable Function Input, Negative Logic	ON: short, or 0–1.2V DC. OFF: open, or 8–20V DC
Input Filter	Built-in PI filter, all models

Output Specifications

Parameter	Specification
Output Voltage Accuracy	±1.5% max. @ nominal input and 50% load
Line Regulation	±0.3% max., low line to high line
Load Regulation	±0.5% max., 10% to 100% load
Ripple and Noise	1.5%V _{pk-pk} typ. @ 20MHz bandwidth with a 1μF MLCC output capacitor
Temperature Coefficient	±0.04% max. per °C
Transient Recovery Time	800μS typ. @ 25% load step change
Transient Peak Deviation	±2% V _o typ. @ ΔI _o /Δt = 2.5A/μs
Start-Up Time	20mS typ., using the Enable function
Trimming Output Voltage	±10% typ. @ nominal input and 10% load

Protection

Parameter	Specification
Overvoltage Protection	120% of nominal output voltage typ. @ nominal input and 10% load
Output Power Protection	120% of rated output power typ. @ nominal input
Overtemperature Protection	110°C typ., automatic recovery, all models

Environmental Characteristics

Parameter	Specification
Operating Case Temperature	-45°C to +105°C, all models
Storage Temperature Range	-55°C to +125°C, all models
Humidity	95% max., non-condensing, all models
Thermal Shock	MIL-STD-810F, environmental engineering experimental tests
Vibration	MIL-STD-810F, environmental engineering experimental tests
Drop	MIL-STD-810F, environmental engineering experimental tests
Derating	Refer to the derating curves under Performance Graphs

Safety Standards

Parameter	Specification
Certifications	CE, RoHS, REACH
Input Protection	Protect the input with a fuse or other protection device

Electromagnetic Compatibility (EMC)

Parameter	Standard	Test Conditions	Performance Criteria
EMI	EN 55032	Class A and Class B are achievable with external components	Class A / Class B
ESD	EN 61000-4-2	±4kV air discharge, ±4kV contact discharge	Criterion A
Radiated Immunity	EN 61000-4-3	Level 2, 3V/m	Criterion A
Fast Transient	EN 61000-4-4	±2kV applied	Criterion A
Surge	EN 61000-4-5	±2kV applied	Criterion A
Conducted Immunity	EN 61000-4-6	Level 2, 3V rms	Criterion A

Reliability

Parameter	Specification
Calculated MTBF	1.6M hours typ., BellCore TR-332 @ 50°C, ground benign

General Specifications

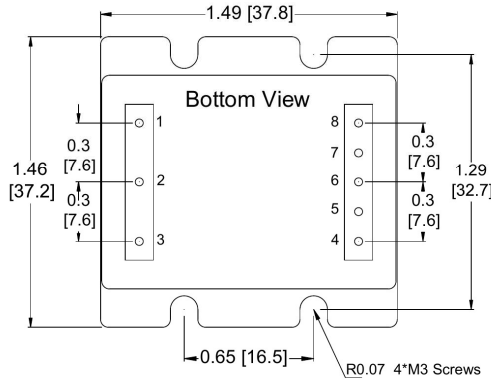
Parameter	Specification
Switching Frequency	2:1 wide input models: 270–330kHz, 300kHz typ. / 4:1 wide input models: 220–300kHz, 260kHz typ.
Isolation Voltage (Input to Output)	2250V DC min. for 1 minute, all models
Isolation Resistance (Input to Output)	100MΩ min. @ 500V DC and 70% RH, all models
Isolation Capacitance (Input to Output)	1500pF typ., all models
Case Material	Aluminium, six-sided continuous shield
Potting Material	Silicone
Pin Material	Copper alloy, gold plated
Warranty	Three years

Weight & Dimensions

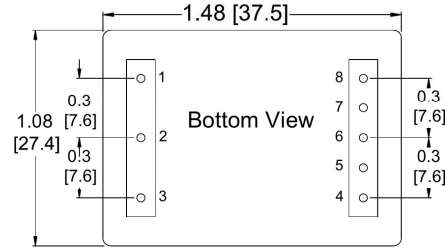
Parameter	Specification		
Weight	Shape-B: 34g (1.23oz.)	Shape-WB: 35g (1.24oz.)	Shape-F: 33g (1.2oz.)
Dimensions	Shape-B: 37.8 x 37.2 x 13.5mm (1.49" x 1.46" x 0.52")	Shape-WB: 37.8 x 38.1 x 13.5mm (1.49" x 1.50" x 0.52")	Shape-F: 37.5 x 27.4 x 13.5mm (1.48" x 1.08" x 0.52")

Mechanical Drawing

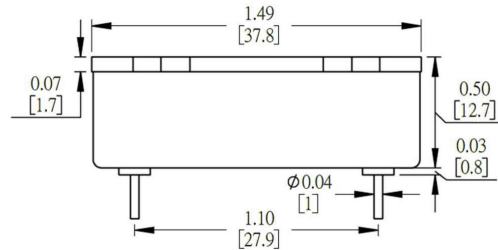
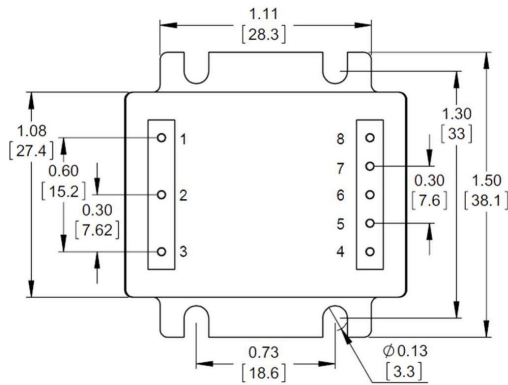
Shape – B (Base Plate)



Shape – F (No Flange Base Plate)



Shape – WB (Wide Base Plate)



Bottom views shown. Shape-B and Shape-WB carry a mounting flange; Shape-F has no flange.

Shape-B mounts on four M3 screws through the base-plate cut-outs. Shape-WB carries four Ø3.3mm mounting cut-outs.

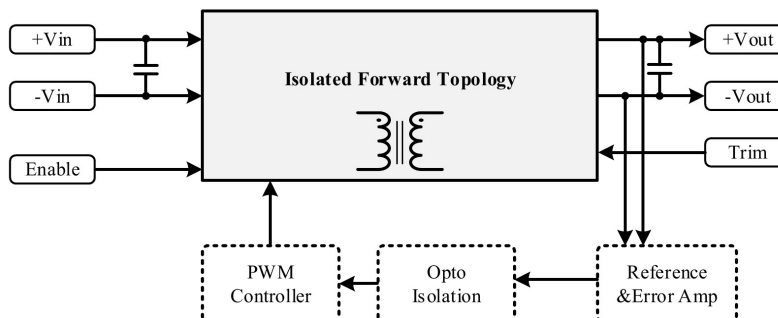
Body height 12.7mm above a 0.8mm base plate, 13.5mm overall. Pin diameter Ø1mm, pin row spacing 27.9mm, pin pitch 7.6mm.

Pin pitch tolerance ± 0.01 in (± 0.25 mm). Pin material copper alloy, gold plated.

Dimensions in inches [millimetres], tolerance of ± 0.02 in (± 0.5 mm).

Pin	Definition	Pin	Definition
1	-Vin	5	+Sense
2	Enable	6	Adjust
3	+Vin	7	-Sense
4	+Vout	8	-Vout

Block Diagram



Performance Graphs

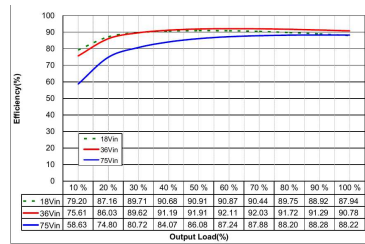


Figure 1 : Efficiency at Minimum, Nominal and Maximum Input Voltages VS. Output Load.

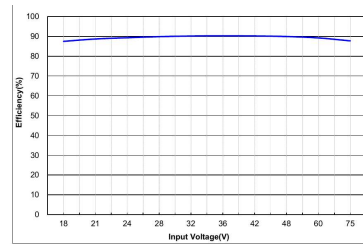


Figure 2 : Efficiency VS. Input Voltages at 100% rated power

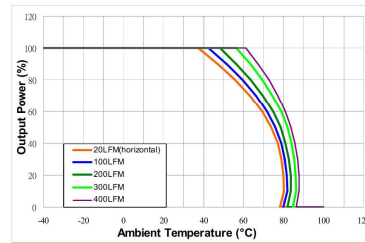


Figure 3 : Ambient Temperature VS. Output Power Derating Curves(Note: 20LFM = Free Air)

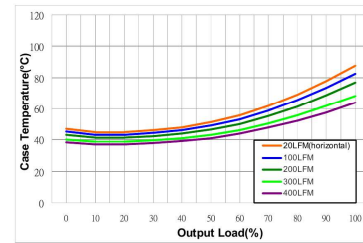


Figure 4 : Case Temperature VS. Output rated Power (Note: 20LFM = Free Air)

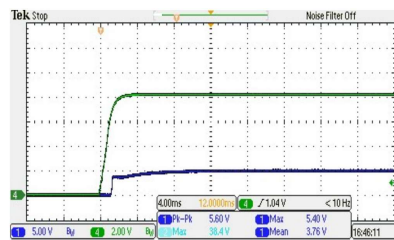


Figure 5 : CH1 = Vout, CH3 = Nominal Input Typical Start-up waveform at Full load.

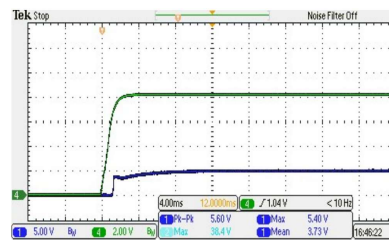


Figure 6 : CH1 = Vout, CH3 = Enable Pin Typical Start-up waveform. Input voltage pre-applied

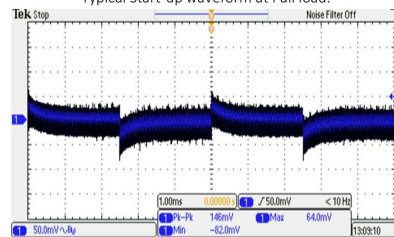


Figure 7 : Transient Response at Output step load (Vin: Typical, 50~75% of output current; $\Delta I_o/\Delta t = 1A/\mu S$)

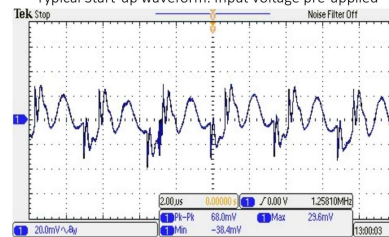
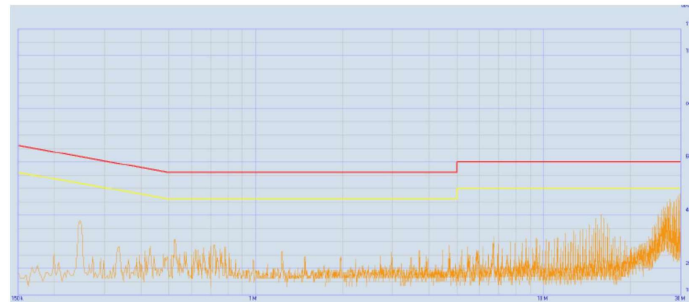


Figure 8 : Output Voltage Ripple & Noise at full load. (Vin: Typical, With Output Capacitor to add 1uF MLCC)



Curves and waveforms measured on a 28STB036050-S-P-B50 sample at typical input, $T_a = +25^\circ\text{C}$, full load and horizontal mount unless otherwise indicated. 20 LFM is free air.

Conducted emissions measured at the input terminals of a 28STB036050-S-P-B50 sample at 36V DC input and 10A output, over 0.15–30MHz with a 9kHz resolution bandwidth on lines L1 and L2. The two straight traces are the EN 55032 limit lines.

The fundamental switching frequency of the module is 260kHz.

These are measured values from sample units. They are not guaranteed limits.

Trim Adjustment

Only the single-output converters have a trim function. It allows the output voltage to be adjusted from +10% to -10% using a single fixed resistor, which raises or lowers the output voltage depending on how it is connected.

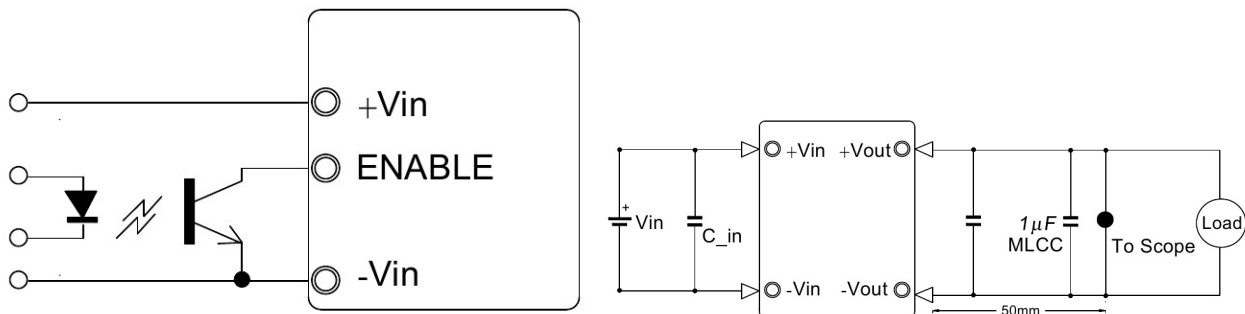
Left: trim connection to increase the output voltage. Right: trim connection to decrease the output voltage.

Trim adjustments beyond the specified range can affect converter performance and are not recommended. If the trim function is not used, leave the trim pin open.



Trim up resistor value (kΩ)										
Vout (V)	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%
3.3	72.9	33.1	19.8	13.1	9.1	6.5	4.6	3.2	2.1	1.2
5	113.1	52.0	31.6	21.5	15.3	11.3	8.4	6.2	4.5	3.1
12	267.2	121.6	73.1	48.8	34.2	24.5	17.6	12.4	8.4	5.1
15	340.4	156.2	94.8	64.1	45.7	33.4	24.6	18.0	12.9	8.8
24	527.7	240.3	144.6	96.7	67.9	48.8	35.1	24.8	16.9	10.5
Trim down resistor value (kΩ)										
Vout (V)	-1%	-2%	-3%	-4%	-5%	-6%	-7%	-8%	-9%	-10%
3.3	81.9	36.7	21.6	14.1	9.6	6.6	4.4	2.8	1.5	0.5
5	115.2	51.8	30.7	20.1	13.8	9.5	6.5	4.3	2.5	1.1
12	297.6	133.7	79.1	51.8	35.4	24.4	16.6	10.8	6.2	2.6
15	346.1	155.3	91.7	59.9	40.8	28.1	19.0	12.2	6.9	2.7
24	665.3	302.7	181.8	121.3	85.1	60.9	43.6	30.7	20.6	12.5

Application Circuits



The primary-side Enable control can be specified with positive or negative polarity. Positive-polarity devices are enabled with the enable pin open or pulled high, and disabled with it pulled low, under +1.0V with respect to -Vin. Negative-polarity devices are off with the enable pin high or open, and on with it pulled low.

Left: driving the Enable control pin.

Right: measuring output ripple and noise at 20MHz bandwidth. The two copper strips simulate real PCB impedance between the converter and its load.

Make scope measurements with BNC connectors, or with a probe ground of under 1/2 inch soldered directly to the fixture.

External capacitors must carry appropriate voltage ratings and sit as close to the converter as possible. The most effective combination of external I/O capacitors depends on line voltage, source impedance, load and layout.

Notes

1. All specifications are typical at $T_a = +25^{\circ}\text{C}$ under nominal line voltage conditions unless otherwise noted.
2. In the series name, x is the input voltage code (018: 9–36V DC, 024: 18–36V DC, 036: 18–75V DC, 048: 36–75V DC) and y is the output voltage code (033: 3.3V DC, 050: 5V DC, 120: 12V DC, 150: 15V DC, 240: 24V DC). x is the remote control logic, P for positive logic or N for negative logic. w is the base-plate shape, B for base plate, F for no flange base plate, or WB for wide base plate.