

**PART NUMBER:** VBSD1-DIP series

**DESCRIPTION:** dc-dc converter

## description

Designed to convert fixed voltages into an isolated voltage, the VBSD1-DIP series is well suited for providing board-mount local supplies in a wide range of applications, including mixed analog/digital circuits, test & measurement equip., process/machine controls, data-com/telecom fields, etc...

The semi-regulated output can be followed by 3-terminal regulators to provide output protection, in addition to output regulation.

## features

- isolated 1 W output
- temperature range: -40°C~+85°C
- unregulated
- high efficiency to 80%
- single voltage output
- small footprint
- DIP package style
- industry standard pinout
- UL94-V0 package
- no heatsink required
- 1K Vdc isolation
- power density 0.85 W/cm<sup>3</sup>
- no external component required
- low cost



## MODEL

|                     | input voltage     |                 | output voltage<br>(V dc) | output current |              | efficiency<br>typ.<br>(%) | UL60950-1 |
|---------------------|-------------------|-----------------|--------------------------|----------------|--------------|---------------------------|-----------|
|                     | nominal<br>(V dc) | range<br>(V dc) |                          | max.<br>(mA)   | min.<br>(mA) |                           |           |
| VBSD1-S3.3-S3.3-DIP | 3.3               | 3.00~3.60       | 3.3                      | 303            | 31           | 72                        | NO        |
| VBSD1-S3.3-S5-DIP   | 3.3               | 3.00~3.60       | 5                        | 200            | 20           | 73                        | NO        |
| VBSD1-S5-S3.3-DIP   | 5                 | 4.5~5.5         | 5                        | 100            | 10           | 68                        | NO        |
| VBSD1-S5-S5-DIP     | 5                 | 4.5~5.5         | 5                        | 200            | 20           | 70                        | YES       |
| VBSD1-S5-S9-DIP     | 5                 | 4.5~5.5         | 9                        | 111            | 12           | 78                        | YES       |
| VBSD1-S5-S12-DIP    | 5                 | 4.5~5.5         | 12                       | 83             | 9            | 78                        | YES       |
| VBSD1-S5-S15-DIP    | 5                 | 4.5~5.5         | 15                       | 67             | 7            | 80                        | YES       |
| VBSD1-S12-S3.3-DIP  | 12                | 10.8~13.2       | 3.3                      | 303            | 31           | 73                        | NO        |
| VBSD1-S12-S5-DIP    | 12                | 10.8~13.2       | 5                        | 200            | 20           | 71                        | YES       |
| VBSD1-S12-S9-DIP    | 12                | 10.8~13.2       | 9                        | 111            | 12           | 76                        | YES       |
| VBSD1-S12-S12-DIP   | 12                | 10.8~13.2       | 12                       | 83             | 9            | 78                        | YES       |
| VBSD1-S12-S15-DIP   | 12                | 10.8~13.2       | 15                       | 67             | 7            | 79                        | YES       |
| VBSD1-S15-S3.3-DIP  | 15                | 13.5~16.5       | 3.3                      | 303            | 31           | 73                        | NO        |
| VBSD1-S15-S5-DIP    | 15                | 13.5~16.5       | 5                        | 200            | 20           | 74                        | NO        |
| VBSD1-S15-S9-DIP    | 15                | 13.5~16.5       | 9                        | 111            | 12           | 75                        | NO        |
| VBSD1-S15-S12-DIP   | 15                | 13.5~16.5       | 12                       | 83             | 9            | 79                        | NO        |
| VBSD1-S15-S15-DIP   | 15                | 13.5~16.5       | 15                       | 67             | 7            | 75                        | NO        |
| VBSD1-S24-S3.3-DIP  | 24                | 21.6~26.4       | 3.3                      | 303            | 31           | 76                        | NO        |
| VBSD1-S24-S5-DIP    | 24                | 21.6~26.4       | 5                        | 200            | 20           | 73                        | YES       |
| VBSD1-S24-S9-DIP    | 24                | 21.6~26.4       | 9                        | 111            | 12           | 78                        | YES       |
| VBSD1-S24-S12-DIP   | 24                | 21.6~26.4       | 12                       | 83             | 9            | 78                        | YES       |
| VBSD1-S24-S15-DIP   | 24                | 21.6~26.4       | 15                       | 67             | 7            | 79                        | YES       |
| VBSD1-S24-S24-DIP   | 24                | 21.6~26.4       | 24                       | 42             | 4            | 78                        | NO        |



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## OUTPUT

| parameter               | conditions/description         | min | nom  | max  | units |
|-------------------------|--------------------------------|-----|------|------|-------|
| output power            |                                | 0.1 |      | 1    | W     |
| voltage accuracy        | refer to recommended circuit   |     | ±1   | ±2   | %     |
| ripple                  | @ 20MHz Bandwidth 3.3/5/12/15V |     | 75   | 100  | mVpp  |
|                         | 24 V                           |     | 100  | 150  | mVpp  |
| line regulation         | input voltage from low to high |     |      | 1.2  | %     |
| load regulation         | 10% to 100% full load 3.3V     |     | 12   | 20   | %     |
|                         | 5V                             |     | 10.5 | 15   | %     |
|                         | 12V                            |     | 6.8  | 15   | %     |
|                         | 15V                            |     | 6.3  | 15   | %     |
| temperature coefficient | refer to recommended circuit   |     |      | 0.03 | %/°C  |
| switching frequency     | 100% load, nominal input       |     | 100  |      | KHz   |

note: 1. All specifications measured at TA=25°C, humidity <75%, normal input voltage and rated output load unless otherwise specified.

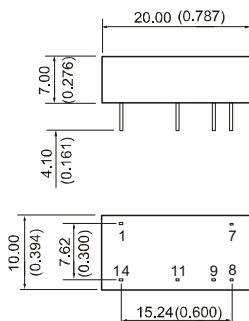
## GENERAL SPECIFICATIONS

| parameter                       | conditions/description |
|---------------------------------|------------------------|
| output short circuit protection | <1 second              |
| temperature rise at full load   | 15°C typ., 25°C max.   |
| cooling                         | free air convection    |
| operating temp. range           | -40°C ~ +85°C          |
| storage temp. range             | -55°C ~ +125°C         |
| storage humidity range          | ≤95%                   |
| case material                   | plastic (UL94-V0)      |
| MTBF                            | >3,500,000 hours       |

## ISOLATION SPECIFICATIONS

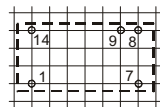
| parameter            | conditions/description    | min  | nom | max | units |
|----------------------|---------------------------|------|-----|-----|-------|
| isolation voltage    | flash tested for 1 minute | 1000 |     |     | V dc  |
| isolation resistance | test at 500 V dc          | 1000 |     |     | MΩ    |

## DIMENSIONS (mm)



Note:  
Unit:mm(inch)  
Pin section:0.50\*0.30mm(0.020\*0.012inch)  
Pin tolerances:±0.10mm(±0.004inch)  
General tolerances:±0.25mm(±0.010inch)

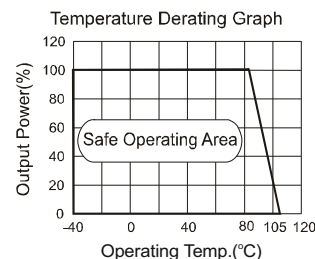
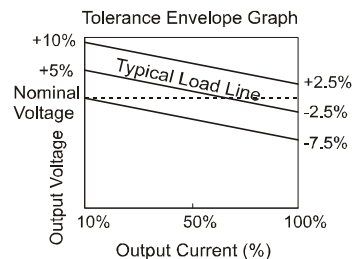
First Angle Projection   
RECOMMENDED FOOTPRINT  
Top view, grid:2.54mm(0.1inch),  
diameter:1.00mm



FOOTPRINT DETAILS

| Pin | Single |
|-----|--------|
| 1   | -Vin   |
| 7   | NC     |
| 8   | -Vout  |
| 9   | +Vout  |
| 11  | No Pin |
| 14  | +Vin   |

## TYPICAL CHARACTERISTICS



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### APPLICATION NOTES:

#### - Requirement on output load

To ensure this module can operate efficiently and reliably, the minimum output load should not be less than 10% of the full load. Also, this product should never be operated under no load conditions. If the actual output power is too small, please connect a resistor with proper resistance at the output end in parallel to increase the load.

#### - Overload protection

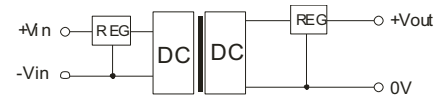
Under normal operating conditions, the output circuit of these products has no protection against overload. The simplest method is to connect a self-recovery fuse in series at the input end or to add a circuit breaker to the circuit.

#### - Recommended circuit

If you want to further decrease the input/output ripple, an "LC" filtering network may be connected to the input and output ends of the dc-dc converter, see (Figure 1).

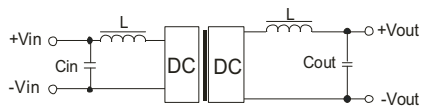
- Output voltage regulation and over-voltage protection circuit  
 The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (Figure 2).

**FIGURE 2**



No parallel connection or plug and play.

**FIGURE 1**



It should also be noted that the inductance and the frequency of the "LC" filtering network should be staggered with the dc-dc frequency to avoid mutual interference. However, the capacitance of the output filter capacitor must be proper. If the capacitance is too big, a startup problem might arise. For every channel of output, provided that safe and reliable operation is ensured, the recommended capacitance of its filter capacitor see (Table 1).

**TABLE 1**

| Vin (VDC) | Cin (uF) | Single Vout (VDC) | Cout (uF) |
|-----------|----------|-------------------|-----------|
| 5         | 4.7      | 5                 | 10        |
| 12        | 2.2      | 9                 | 4.7       |
| 15        | 2.2      | 12                | 2.2       |
| 24        | 1        | 15                | 1         |

It is not recommended to connect any external capacitor in the application field with less than a 0.5 watt output.