

SERIES: VBT1-SMT | DESCRIPTION: DC-DC CONVERTER
FEATURES

- 1 W isolated output
- industry standard 8 pin SMT package
- single unregulated outputs
- 1,000 V isolation
- short circuit protection
- UL safety approvals (some models)
- wide temperature (-40~85°C)
- efficiency up to 79%


MODEL

| MODEL | input voltage | output voltage | output current | output power | ripple and noise ¹ | efficiency | | |
|--------------------|------------------|-------------------|-------------------|-----------------|----------------------------------|------------|----|----|
| | typ (Vdc) | range (Vdc) | min (mA) | max (mA) | max (W) | typ (%) | | |
| VBT1-S3.3-S3.3-SMT | 3.3 | 3.0~3.63 | 3.3 | 30 | 303 | 1 | 75 | 73 |
| VBT1-S3.3-S5-SMT | 3.3 | 3.0~3.63 | 5 | 20 | 200 | 1 | 75 | 74 |
| VBT1-S5-S3.3-SMT | 5 | 4.5~5.5 | 3.3 | 30 | 303 | 1 | 75 | 72 |
| VBT1-S5-S5-SMT | 5 | 4.5~5.5 | 5 | 20 | 200 | 1 | 75 | 77 |
| VBT1-S5-S9-SMT | 5 | 4.5~5.5 | 9 | 12 | 111 | 1 | 75 | 76 |
| VBT1-S5-S12-SMT | 5 | 4.5~5.5 | 12 | 9 | 84 | 1 | 75 | 79 |
| VBT1-S5-S15-SMT | 5 | 4.5~5.5 | 15 | 7 | 67 | 1 | 75 | 78 |
| VBT1-S5-S24-SMT | 5 | 4.5~5.5 | 24 | 4 | 42 | 1 | 75 | 78 |
| VBT1-S12-S3.3-SMT | 12 | 10.8~13.2 | 3.3 | 30 | 303 | 1 | 75 | 75 |
| VBT1-S12-S5-SMT | 12 | 10.8~13.2 | 5 | 20 | 200 | 1 | 75 | 69 |
| VBT1-S12-S9-SMT | 12 | 10.8~13.2 | 9 | 12 | 111 | 1 | 75 | 73 |
| VBT1-S12-S12-SMT | 12 | 10.8~13.2 | 12 | 9 | 84 | 1 | 75 | 73 |
| VBT1-S12-S15-SMT | 12 | 10.8~13.2 | 15 | 7 | 67 | 1 | 75 | 74 |
| VBT1-S12-S24-SMT | 12 | 10.8~13.2 | 24 | 4 | 42 | 1 | 75 | 79 |
| VBT1-S15-S5-SMT | 15 | 13.5~16.5 | 5 | 20 | 200 | 1 | 75 | 74 |
| VBT1-S15-S15-SMT | 15 | 13.5~16.5 | 15 | 7 | 67 | 1 | 75 | 79 |
| VBT1-S24-S3.3-SMT | 24 | 21.6~26.4 | 3.3 | 30 | 300 | 1 | 75 | 69 |
| VBT1-S24-S5-SMT | 24 | 21.6~26.4 | 5 | 20 | 200 | 1 | 75 | 70 |
| VBT1-S24-S9-SMT | 24 | 21.6~26.4 | 9 | 11 | 110 | 1 | 75 | 72 |
| VBT1-S24-S12-SMT | 24 | 21.6~26.4 | 12 | 8 | 83 | 1 | 75 | 75 |
| VBT1-S24-S15-SMT | 24 | 21.6~26.4 | 15 | 7 | 67 | 1 | 75 | 76 |
| VBT1-S24-S24-SMT | 24 | 21.6~26.4 | 24 | 4 | 42 | 1 | 75 | 77 |

Notes: 1. ripple and noise are measured at 20 MHz BW

PART NUMBER KEY
VBT1 - SXX - SXX - SMT - X

Base Number

Input Voltage

Output Voltage

Packaging Style

Package Options
"blank" = standard
TR = Tape & Reel

INPUT

| parameter | conditions/description | min | typ | max | units |
|-------------------------|------------------------|------|-----|------|-------|
| operating input voltage | 3.3 V model | 3.0 | 3.3 | 3.63 | Vdc |
| | 5 V model | 4.5 | 5 | 5.5 | Vdc |
| | 12 V model | 10.8 | 12 | 13.2 | Vdc |
| | 15 V model | 13.5 | 15 | 16.5 | Vdc |
| | 24 V model | 21.6 | 24 | 26.4 | Vdc |

OUTPUT

| parameter | conditions/description | min | typ | max | units |
|-------------------------|---|-------------------|-----|-------|-------|
| line regulation | for Vin change of 1%, 3.3 V model for Vin change of 1%, all other models | | | 1.5 | % |
| load regulation | measured from 10% load to full load | | | | |
| | 3.3 V model | 15 | 20 | | % |
| | 5 V model | 12.8 | 15 | | % |
| | 9 V model | 8.3 | 10 | | % |
| | 12 V model | 6.8 | 10 | | % |
| | 15 V model | 6.3 | 10 | | % |
| | 24 V model | 6.0 | 10 | | % |
| voltage accuracy | see derating curves | | | | |
| switching frequency | 100% load, 5 and 12 V input 100% load, 24 V input 100% load, all other models | 100 500 100 | | 500 | kHz |
| temperature coefficient | | | | ±0.03 | %/°C |

PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|--------------------------|------------------------|-----|-----|-----|-------|
| short circuit protection | | | | 1 | s |

SAFETY AND COMPLIANCE

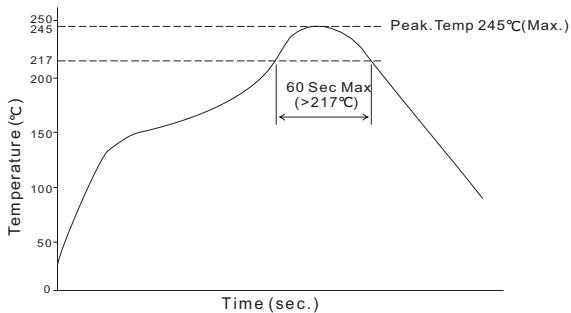
| parameter | conditions/description | min | typ | max | units |
|-------------------------------|---------------------------|-----------|-----|-----|-------|
| isolation voltage | for 1 minute at 1 mA max. | 1,000 | | | Vdc |
| isolation resistance | at 500 Vdc | 1,000 | | | MΩ |
| safety approvals ¹ | UL 60950-1 (E222736) | | | | |
| MTBF | | 3,500,000 | | | hours |
| RoHS compliant | yes | | | | |

Notes: 1. VBT1-S3.3-S9/12/15/24, VBT1-S5-S3.3 and 24, VBT1-S12-S3.3 and S24, VBT1-S15 (all), and VBT1-S24 (all) models UL 60950-1 pending

ENVIRONMENTAL

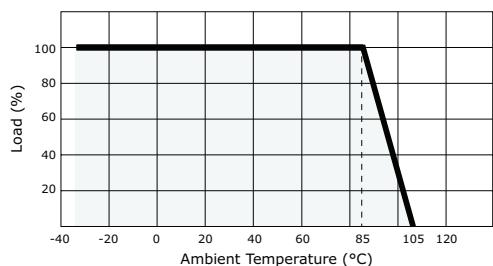
| parameter | conditions/description | min | typ | max | units |
|-----------------------|------------------------------|-----|-----|-----|-------|
| operating temperature | | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | | | 95 | % |
| temperature rise | at full load | | 25 | | °C |
| reflow soldering | see reflow soldering profile | | | 245 | °C |

SOLDERING

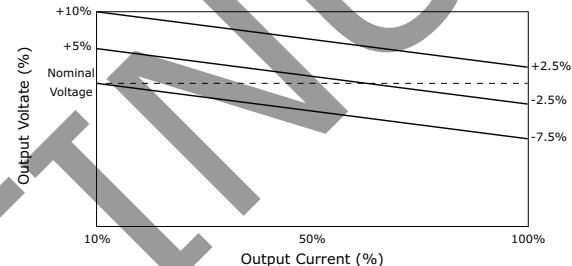


DERATING CURVES

1. output power vs. ambient temperature



2. output voltage vs. output current

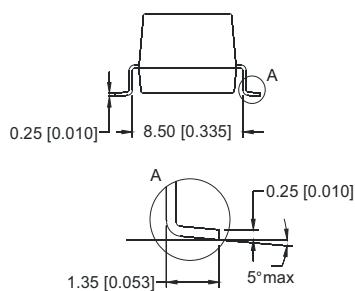
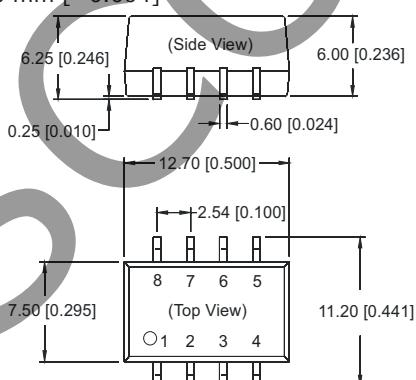
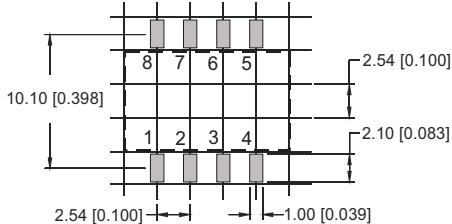


MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---------------|---|-----|------|-----|-------|
| dimensions | 12.70 x 11.20 x 6.25 (0.500 x 0.441 x 0.246 inch) | | | | mm |
| case material | plastic (UL94-V0) | | | | |
| weight | | | 1.41 | | g |

MECHANICAL DRAWING

units: mm [inches]

tolerance: ± 0.15 [± 0.006]pin section tolerance: ± 0.10 mm [± 0.004]RECOMMENDED FOOTPRINT
Top view, grid: 2.54mm(0.1inch)

| PIN CONNECTIONS | |
|-----------------|----------|
| PIN | FUNCTION |
| 1 | GND |
| 2 | +Vin |
| 4 | 0 V |
| 5 | +Vo |
| 3,6,7 | NC |
| 8 | NC |

APPLICATION NOTES

1. Requirement on Output Load

In order to ensure the product operates efficiently and reliably, make sure the specified range of input voltage is not exceeded and the minimum output load is not less than 10% load. If the actual load is less than the specified minimum load, the output ripple may increase sharply while its efficiency and reliability will reduce greatly. If the actual output power is very small, please add an appropriate resistor as extra loading.

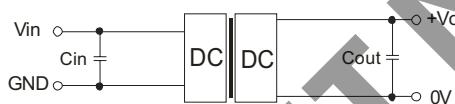
2. Overload Protection

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

3. Filtering

In some circuits which are sensitive to noise and ripple, a filtering capacitor may be added to the DC/DC output end and input end to reduce the noise and ripple. 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 the safe and reliable operation is ensured, the greatest capacitance of its filter capacitor sees the external capacitor table. To get an extremely low ripple, an "LC" filtering network may be connected to the input and output ends of the DC/DC converter, which may produce a more significant filtering effect. 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 (Figure 1).

Figure 1



4. 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



5. External Capacitor Table

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

Table 1

| Vin (Vdc) | Cin (µF) | Vout (Vdc) | Cout (µF) |
|-----------|----------|------------|-----------|
| 3.3/5 | 4.7 | 3.3/5 | 10 |
| 12 | 2.2 | 9 | 4.7 |
| 15 | 2.2 | 12 | 2.2 |
| 24 | 0.47 | 15 | 1 |
| -- | -- | 24 | 0.47 |

REVISION HISTORY

| rev. | description | date |
|------|---|------------|
| 1.0 | initial release | 01/14/2011 |
| 1.01 | new template applied | 04/11/2012 |
| 1.02 | V-Infinity branding removed | 09/05/2012 |
| 1.03 | added TR package option | 11/01/2012 |
| 1.04 | discontinued alternate pin configuration, "X", option | 07/09/2013 |
| 1.05 | reflow solder profile changed | 05/25/2014 |

The revision history provided is for informational purposes only and is believed to be accurate.



Headquarters
20050 SW 112th Ave.
Tualatin, OR 97062
800.275.4899

Fax 503.612.2383
cui.com
techsupport@cui.com

CUI offers a two (2) year limited warranty. Complete warranty information is listed on our website.

CUI reserves the right to make changes to the product at any time without notice. Information provided by CUI is believed to be accurate and reliable. However, no responsibility is assumed by CUI for its use, nor for any infringements of patents or other rights of third parties which may result from its use.

CUI products are not authorized or warranted for use as critical components in equipment that requires an extremely high level of reliability. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.