



PART NUMBER: VBT1-SMT series

DESCRIPTION: dc-dc converter

description

Designed to convert fixed voltages into an isolated voltage, the VBT1-SMT 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, datacom/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
- SMD package style
- industry standard pinout
- UL94-V0 package
- no heatsink required
- 1K Vdc isolation
- power density 0.85 W/cm³
- no external component required
- low cost



| model number | input voltage | | output voltage | output current | | efficiency | package | |
|--------------------|---------------|---------------|----------------|----------------|-------|------------|---------|-----------|
| | nominal | range | | max. | min. | | style | UL60950-1 |
| VBT1-S3.3-S3.3-SMT | 3.3 Vdc | 2.97~3.63 Vdc | 3.3 Vdc | 304 mA | 30 mA | 73% | SMD | NO |
| VBT1-S3.3-S5-SMT | 3.3 Vdc | 2.97~3.63 Vdc | 5 Vdc | 200 mA | 20 mA | 75% | SMD | NO |
| VBT1-S5-S3.3-SMT | 5 Vdc | 4.5~5.5 Vdc | 3.3 Vdc | 300 mA | 30 mA | 70% | SMD | NO |
| VBT1-S5-S5-SMT | 5 Vdc | 4.5~5.5 Vdc | 5 Vdc | 200 mA | 20 mA | 70% | SMD | YES |
| VBT1-S5-S9-SMT | 5 Vdc | 4.5~5.5 Vdc | 9 Vdc | 111 mA | 12 mA | 76% | SMD | YES |
| VBT1-S5-S12-SMT | 5 Vdc | 4.5~5.5 Vdc | 12 Vdc | 84 mA | 9 mA | 79% | SMD | YES |
| VBT1-S5-S15-SMT | 5 Vdc | 4.5~5.5 Vdc | 15 Vdc | 67 mA | 7 mA | 78% | SMD | YES |
| VBT1-S5-S24-SMT | 5 Vdc | 4.5~5.5 Vdc | 24 Vdc | 42 mA | 5 mA | 78% | SMD | NO |
| VBT1-S12-S3.3-SMT | 12 Vdc | 10.8~13.2 Vdc | 3.3 Vdc | 300 mA | 30 mA | 75% | SMD | NO |
| VBT1-S12-S5-SMT | 12 Vdc | 10.8~13.2 Vdc | 5 Vdc | 200 mA | 20 mA | 69% | SMD | YES |
| VBT1-S12-S9-SMT | 12 Vdc | 10.8~13.2 Vdc | 9 Vdc | 111 mA | 12 mA | 73% | SMD | YES |
| VBT1-S12-S12-SMT | 12 Vdc | 10.8~13.2 Vdc | 12 Vdc | 84 mA | 9 mA | 73% | SMD | YES |
| VBT1-S12-S15-SMT | 12 Vdc | 10.8~13.2 Vdc | 15 Vdc | 67 mA | 7 mA | 74% | SMD | YES |
| VBT1-S12-S24-SMT | 12 Vdc | 10.8~13.2 Vdc | 24 Vdc | 42 mA | 5 mA | 79% | SMD | NO |
| VBT1-S15-S3.3-SMT | 15 Vdc | 13.5~16.5 Vdc | 3.3 Vdc | 300 mA | 30mA | 73% | SMD | NO |
| VBT1-S15-S5-SMT | 15 Vdc | 13.5~16.5 Vdc | 5 Vdc | 200 mA | 20 mA | 74% | SMD | NO |
| VBT1-S15-S9-SMT | 15 Vdc | 13.5~16.5 Vdc | 9 Vdc | 111 mA | 12 mA | 75% | SMD | NO |
| VBT1-S15-S12-SMT | 15 Vdc | 13.5~16.5 Vdc | 12 Vdc | 83 mA | 9 mA | 79% | SMD | NO |
| VBT1-S15-S15-SMT | 15 Vdc | 13.5~16.5 Vdc | 15 Vdc | 67 mA | 7 mA | 79% | SMD | NO |
| VBT1-S15-S24-SMT | 15 Vdc | 13.5~16.5 Vdc | 24 Vdc | 42 mA | 5 mA | 79% | SMD | NO |
| VBT1-S24-S3.3-SMT | 24 Vdc | 21.6~26.4 Vdc | 3.3 Vdc | 300 mA | 30 mA | 73% | SMD | NO |
| VBT1-S24-S5-SMT | 24 Vdc | 21.6~26.4 Vdc | 5 Vdc | 200 mA | 20 mA | 72% | SMD | YES |
| VBT1-S24-S9-SMT | 24 Vdc | 21.6~26.4 Vdc | 9 Vdc | 111 mA | 12 mA | 76% | SMD | YES |
| VBT1-S24-S12-SMT | 24 Vdc | 21.6~26.4 Vdc | 12 Vdc | 83 mA | 8 mA | 83% | SMD | YES |
| VBT1-S24-S15-SMT | 24 Vdc | 21.6~26.4 Vdc | 15 Vdc | 67 mA | 7 mA | 80% | SMD | YES |
| VBT1-S24-S24-SMT | 24Vdc | 21.6~26.4 Vdc | 24 Vdc | 42 mA | 5 mA | 80% | SMD | NO |

*VB(X)T1-Series with ALT PIN config. (see dimensions, page 3)



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OUTPUT SPECIFICATIONS

| item | test conditions | min. | typ. | max. | units |
|-------------------------|------------------------------|------|------|------|-------|
| output power | | 0.1 | | 1 | W |
| line regulation | for Vin change of 1% | | | 1.2 | % |
| load regulation | 10% to 100% full load | | 10 | 15 | % |
| output voltage accuracy | see tolerance envelope graph | | | | |
| temperature drift | @ 100% load | | | 0.03 | %/°C |
| output ripple | 20 MHz bandwidth | | 50 | 75 | mVp-p |
| output noise | 20 MHz bandwidth | | 75 | 150 | mVp-p |
| switching frequency | full load, nominal input | | 100 | | KHz |

GENERAL SPECIFICATIONS

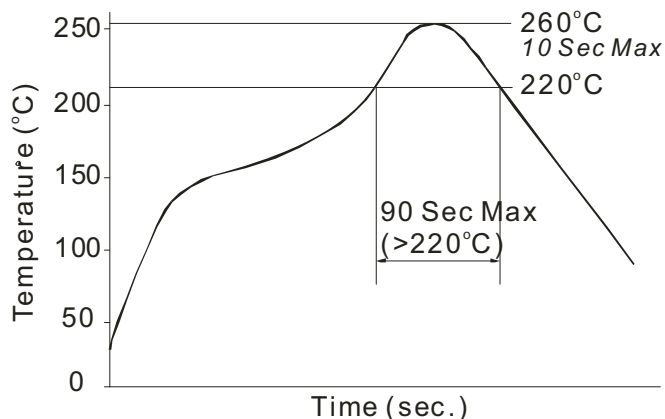
| | |
|-------------------------------|--|
| short circuit protection | <1 second |
| temperature rise at full load | 25°C Max, 15°C typ. |
| cooling | free air convection |
| operating temperature range | -40°C to +85°C |
| storage temperature range | -55°C to +125°C |
| soldering temperature | 260°C (1.5mm from case for 10 sec.) |
| storage humidity range | <95% |
| case material | plastic (UL94-V0) |
| safety | approved to UL60950-1 (E222736) |
| MTBF | >3,500,000 hrs. |
| burn-in | full load at +85°C, for 4 hours at no-load and 4 hours at full load. |

ISOLATION SPECIFICATIONS

| item | test conditions | min. | typ. | max | units |
|-----------------------|-------------------|------|------|-----|-------|
| isolation voltage | tested for 1 min. | 1000 | | | Vdc |
| insulation resistance | test at 500 Vdc | 1000 | | | M Ω |

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

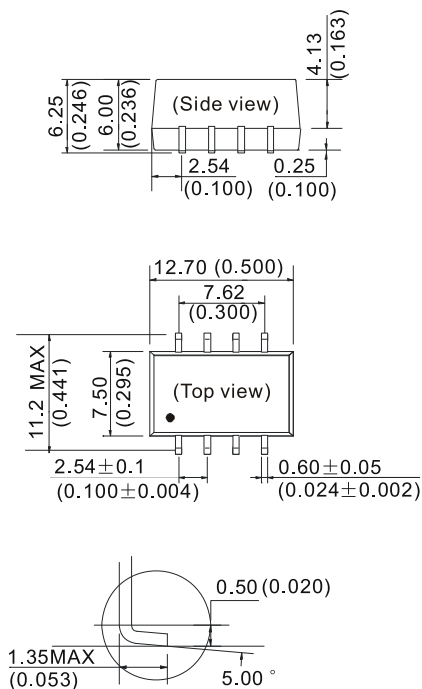
REFLOW SOLDERING PROFILE



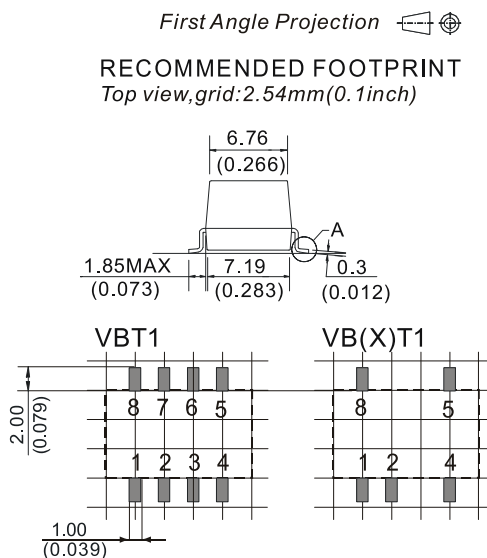
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DIMENSIONS (mm)



Note:
Unit:mm(inch)
Pin section:0.60*0.25mm(0.024*0.010inch)
Pin tolerances:±0.10mm(±0.004inch)
General tolerances:±0.15mm(±0.006inch)

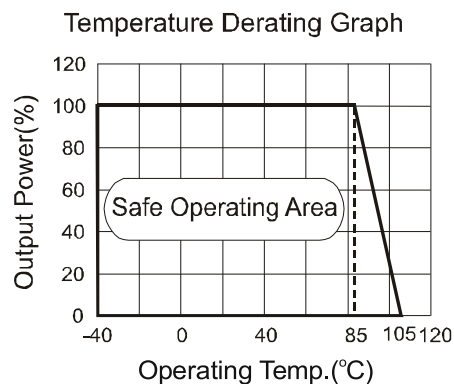
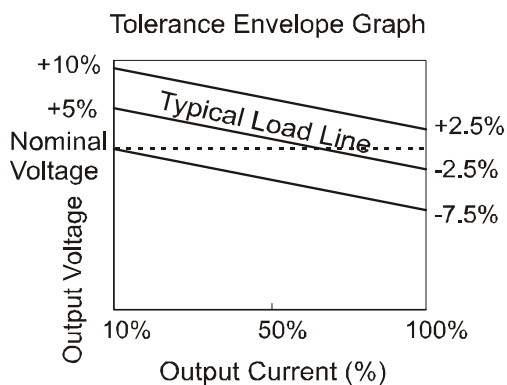


FOOTPRINT DETAILS

| Pin | Single | ALT |
|-------|--------|--------|
| 1 | GND | GND |
| 2 | Vin | Vin |
| 4 | 0V | 0V |
| 5 | +V0 | +Vo |
| 3,6,7 | NC | NO Pin |
| 8 | NC | NC |

NC:No Connection

TYPICAL CHARACTERISTICS



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APPLICATION NOTES:

- Input filtering
To reduce the reflected ripple current and minimize EMI, especially when the converter input is more than 2" away from the DC source, it is recommended to connect a low ESR electrolytic capacitor between Vin and Gnd. The values suggested are as shown in Table 1. If additional filtering is required, the capacitance may be increased, or expanded to an LC network as shown in Figure 1.

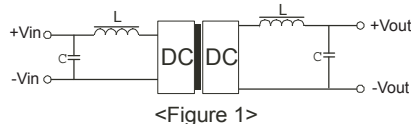
TABLE 1

| Input Voltage | External Input Capacitance |
|---------------|----------------------------|
| 3.3, 5 V | 4.7 μ F |
| 12 V | 2.2 μ F |
| 15 V | 2.2 μ F |
| 24 V | 1.0 μ F |

- Output filtering
An output capacitor is needed to meet output ripple requirements as shown in Table 2. Output capacitance may be increased for additional filtering, but should not exceed 10 μ F or expanded to an LC network as in Figure 1.

TABLE 2

| Vout | External Output Capacitance |
|----------|-----------------------------|
| 3.3, 5 V | 4.7 μ F |
| 9 V | 2.2 μ F |
| 12 V | 1.0 μ F |
| 15 V | 0.47 μ F |
| 24 V | 0.33 μ F |



- Minimum loading
The converter needs a minimum of 10% loading to maintain output regulation. Operation under no-load conditions will not cause immediate damages but may reduce reliability, and cause performance not to meet specifications.
- Regulation
With a semi-regulated design, the converter's output voltage varies with load current and will change proportionally to the input voltage. If regulated output is needed, an external regulator can be used as shown in Figure 2.
- Protection
The converter has minimal protection against input over-voltage or output over-load, and may be permanently damaged if exposed to these conditions. An input clamping device can be used for input voltage limiting. An input fuse or an output fuse also be used to protect against over-loading.
- Dual outputs used as a single output
The +Vout and -Vout can be used to obtain a single output that is the sum of the two outputs. In this case, the COM pin shouldn't be used.
- External Regulator
An external 3-terminal regulator can be connected to the output of the converter to achieve full regulation. Make sure the converter's output voltage provides sufficient head room for the regulator. An additional benefit is that the built-in protection features in the regulator, such as OCP, OTP, etc, will protect the converter also. In a complimentary supply, a negative output regulator must be used to achieve the negative regulated output.

