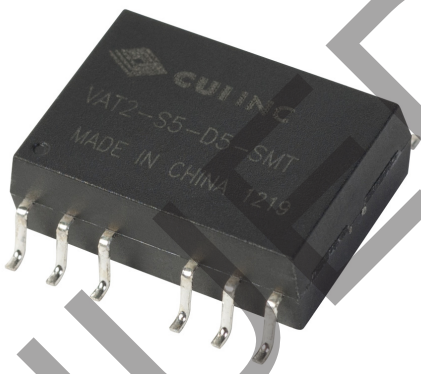
# **SERIES:** VAT2-SMT | **DESCRIPTION:** DC-DC CONVERTER

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## FEATURES

- 2 W isolated output
- industry standard 14 pin SMT package
- dual unregulated outputs
- 1,000 Vdc isolation
- short circuit protection
- wide temperature (-40~105°C)
- efficiency up to 85%



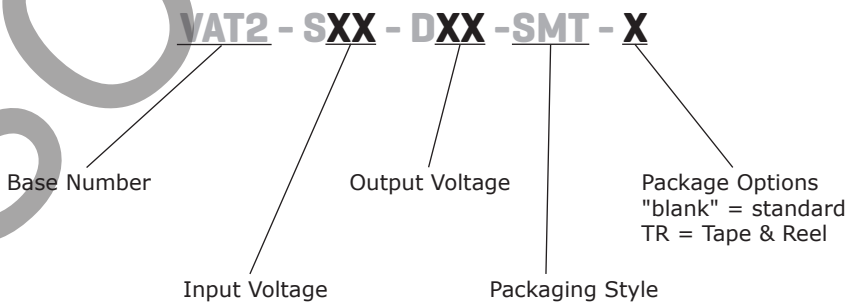

RoHS

## MODEL

| MODEL | input voltage typ (Vdc) | input voltage range (Vdc) | output voltage (Vdc) | output current min (mA) | output current max (mA) | output power max (W) | ripple and noise[1] max (mVp-p) | efficiency typ (%) |
|---|---|---|---|---|---|---|---|---|
| VAT2-S5-D5-SMT* | 5 | 4.5~5.5 | ±5 | ±20 | ±200 | 2 | 150 | 82 |
| VAT2-S5-D9-SMT* | 5 | 4.5~5.5 | ±9 | ±12 | ±111 | 2 | 150 | 83 |
| VAT2-S5-D12-SMT | 5 | 4.5~5.5 | ±12 | ±9 | ±83 | 2 | 150 | 84 |
| VAT2-S5-D15-SMT* | 5 | 4.5~5.5 | ±15 | ±7 | ±67 | 2 | 150 | 82 |
| VAT2-S12-D5-SMT* | 12 | 10.8~13.2 | ±5 | ±20 | ±200 | 2 | 150 | 83 |
| VAT2-S12-D9-SMT* | 12 | 10.8~13.2 | ±9 | ±12 | ±111 | 2 | 150 | 84 |
| VAT2-S12-D12-SMT* | 12 | 10.8~13.2 | ±12 | ±9 | ±83 | 2 | 150 | 84 |
| VAT2-S12-D15-SMT* | 12 | 10.8~13.2 | ±15 | ±7 | ±67 | 2 | 150 | 85 |

Notes: 1. Ripple and noise are measured at 20 MHz BW by "parallel cable" method with 1 µF ceramic and 10 µF electrolytic capacitors on the output.
*. Discontinued

## PART NUMBER KEY






Please read our datasheet & drawing disclaimer here.

## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating input voltage | 5 Vdc model | 4.5 | 5 | 5.5 | Vdc |
| | 12 Vdc model | 10.8 | 12 | 13.2 | Vdc |

## OUTPUT

| parameter | conditions/description | | min | typ | max | units |
|---|---|---|---|---|---|---|
| line regulation | for Vin change of 1% | | | | ±1.2 | % |
| load regulation | measured from 10% load to full load | 5 Vdc models | | 12.8 | 15 | % |
| | | 9 Vdc models | | 8.3 | 10 | % |
| | | 12 Vdc models | | 6.8 | 10 | % |
| | | 15 Vdc models | | 6.3 | 10 | % |
| voltage accuracy | see derating curves | | | | | |
| switching frequency | 100% load | | | 70 | | kHz |
| temperature coefficient | 100% load | | | | ±0.03 | %/°C |

## PROTECTIONS

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

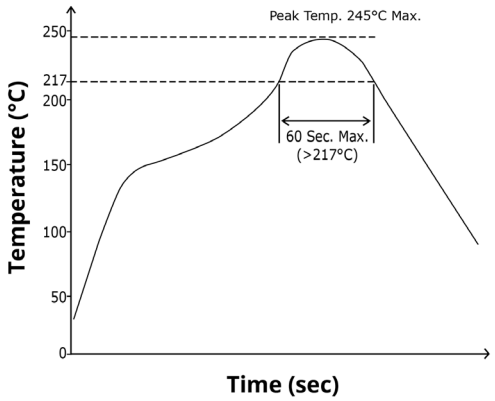
## SAFETY AND COMPLIANCE

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| isolation voltage | input to output for 1 minute at 1 mA max. | 1,000 | | | Vdc |
| isolation resistance | input to output at 500 Vdc | 1,000 | | | MΩ |
| conducted emissions | CISPR22/EN55022, class A (external circuit required, see Figure 1) | | | | |
| ESD | IEC/EN 61000-4-2, class B, contact ±6kV | | | | |
| MTBF | as per MIL-HDFK-217 at 25 °C | 3,500,000 | | | hours |
| RoHS | 2011/65/EU | | | | |

## ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | see derating curve | -40 | | 105 | °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 |

***WAVE SOLDERING PROFILE***




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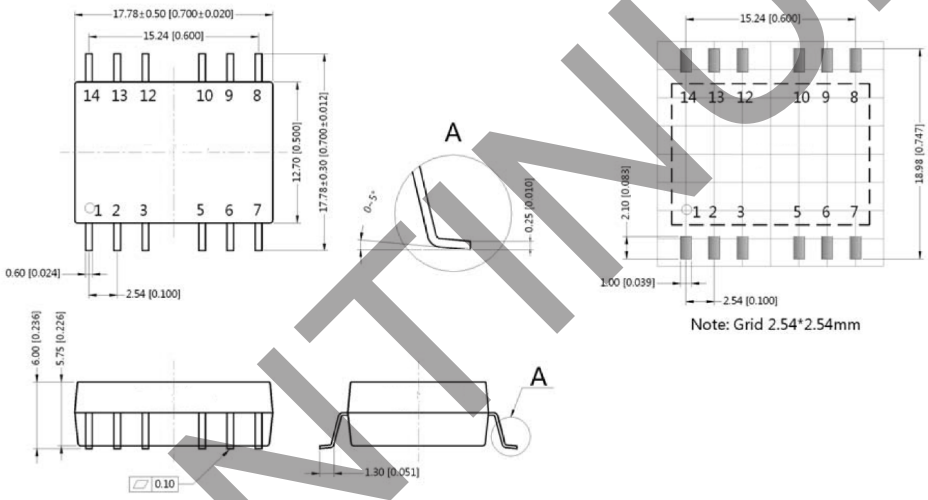
## MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 17.78 x 12.70 x 6.00 (0.700 x 0.500 x 0.236 inch) | | | | mm |
| case material | plastic (UL94-V0) | | | | |
| weight | | | 2.1 | | g |

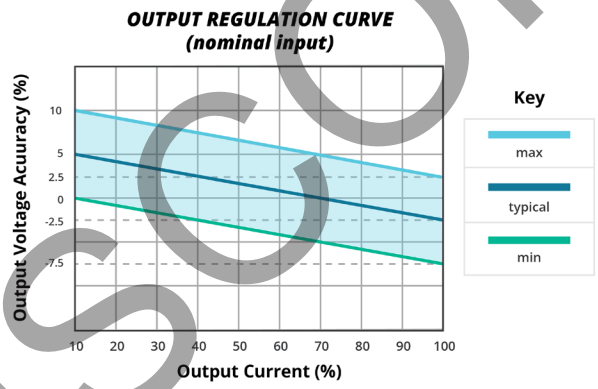
## MECHANICAL DRAWING

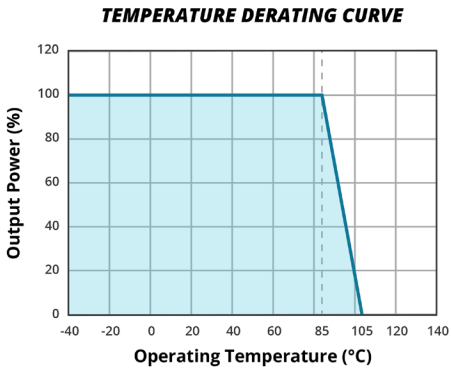
units: mm [inches]
tolerance: ±0.25 [±0.010]
pin section tolerance: ±0.10 [±0.004]

| PIN CONNECTIONS | |
|---|---|
| PIN | FUNCTION |
| 1 | GND |
| 2 | +Vin |
| 5 | -Vo |
| 6 | 0 V |
| 7 | +Vo |
| 10 | -Vo |
| others | NC |




## DERATING CURVES




## EMC RECOMMENDED CIRCUIT

**Figure 1**

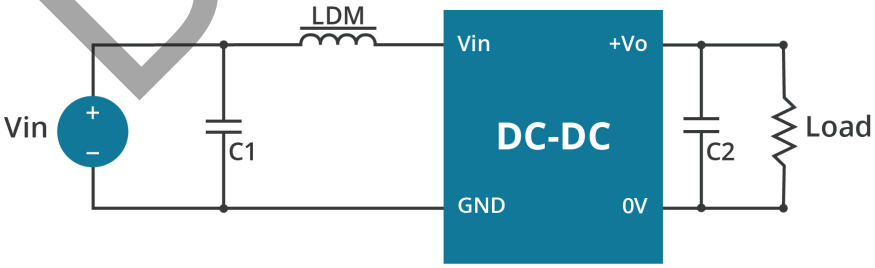



**Table 1**

| Recommended external circuit components | | |
|---|---|---|
| Vout (Vdc) | C1 | C2 |
| 5 | 2.2µF/50V | 4.7µF |
| 9 | 2.2µF/50V | 2.2µF |
| 12 | 2.2µF/50V | 1µF |
| 15 | 2.2µF/50V | 0.47µF |

DISCONTINUED

## APPLICATION NOTES

1. **Output load requirement**
   To ensure this module can operate efficiently and reliably, the minimum output load may not be less than 10% of the full load during operation. If the actual output power is low, connect a resistor at the output end in parallel to increase the load.

2. **Overload Protection**
   Under normal operating conditions, the output circuit of this product has no protection against overload. The simplest method to add this is to add a circuit breaker to the circuit.

3. **Recommended circuit**
   If you want to further decrease the input/output ripple, you can increase the capacitance accordingly or choose capacitors with low ESR (see Figure 2 & Table 2). However, the capacitance of the output filter capacitor must be appropriate. If the capacitance is too high, a startup problem might arise. For every channel of the output, to ensure safe and reliable operation, the maximum capacitance must be less than the maximum capacitive load (see Table 3).

**Figure 2**

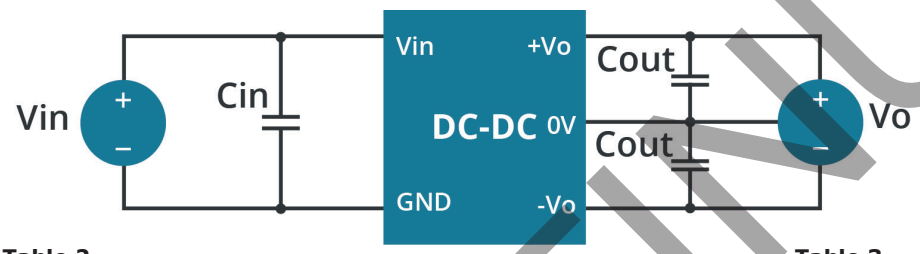



**Table 2**

| Vin (Vdc) | Cin (μF) | Dual Vo (Vdc) | Cout (μF) |
|---|---|---|---|
| 5 | 4.7 | ±5 | 4.7 |
| 12 | 2.2 | ±9 | 2.2 |
| - | - | ±12 | 1 |
| - | - | ±15 | 0.47 |

Note: It's not recommended to connect any external capacitors in applications with less than 0.5 watt output.

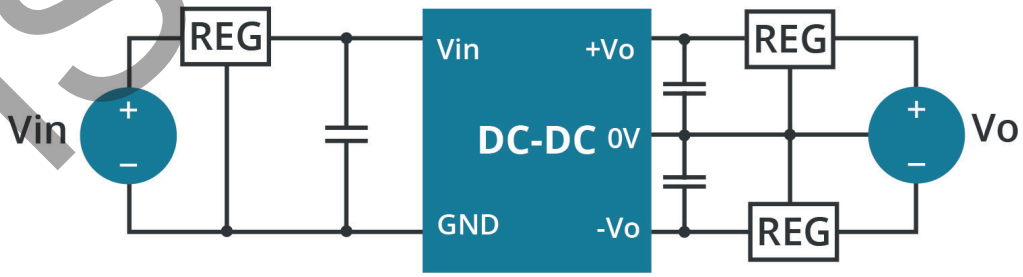
**Table 3**

| Dual Vout (Vdc) | Max. Capacitive Load[1] (μF) |
|---|---|
| 5 | 100 |
| 9 | 100 |
| 12 | 100 |
| 15 | 100 |

Note: 1. For each output.

4. **Output Voltage Regulation and Over-voltage Protection Circuit**
   The device for output voltage regulation, over-voltage and over-current protection is a linear regulator and a capacitor filtering network with overheat protection which can be connected to the input or output end in series (see Figure 3). The recommended capacitance of its filter capacitor (see Table 3), and the linear regulator is based on the actual voltage and current required.

**Figure 3**




Note: 1. Operation under minimum load will not damage the converter; however, they may not meet all specifications listed.
2. Max. capacitive load tested at input voltage range and full load.
3. It is recommended to use either ceramic capacitors or electrolytic capacitors on the input and the output. Using tantalum capacitors may increase the risk of failure.
4. All specifications measured at: Ta=25°C, humidity<75%, nominal input voltage and rated output load, unless otherwise specified.

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## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 02/11/2008 |
| 1.01 | new template applied | 04/20/2012 |
| 1.02 | V-Infinity branding removed | 09/04/2012 |
| 1.03 | added TR package option | 11/01/2012 |
| 1.04 | reflow solder profile changed | 05/25/2014 |
| 1.05 | updated datasheet | 03/30/2015 |
| 1.06 | discontinued VAT2-S5-D9-SMT, VAT2-S12-D5-SMT, & VAT2-S12-D9-SMT models | 10/30/2018 |
| 1.07 | discontinued model VAT2-S12-D12-SMT | 12/14/2018 |
| 1.08 | data update | 01/08/2020 |
| 1.09 | discontinued model VAT2-S12-D15-SMT; logo update | 06/18/2020 |
| 1.10 | discontinued model VAT2-S5-D15-SMT & VAT2-S5-D5-SMT | 04/27/2021 |
| 1.11 | derating curves and circuit figures updated | 07/13/2021 |

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

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