CUI INC®



# **SERIES:** VAWQ12 | **DESCRIPTION:** DC-DC CONVERTER

## FEATURES

- up to 12 W isolated output
- wide input (4:1)
- industry standard 24 pin DIP package
- single regulated outputs
- 1,500 V isolation
- short circuit and over voltage protection
- wide temperature (-40~85°C)
- efficiency up to 88%

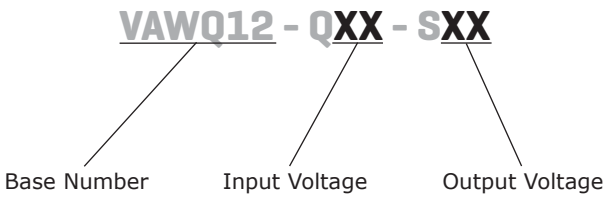

RoHS

## MODEL

| MODEL | input voltage typ (Vdc) | input voltage range (Vdc) | output voltage (Vdc) | output current max (mA) | output power max (W) | ripple and noise[1] max (mVp-p) | efficiency typ (%) |
|---|---|---|---|---|---|---|---|
| VAWQ12-Q24-S3R3 | 24 | 9.0~36.0 | 3.3 | 3,500 | 11.55 | 85 | 85 |
| VAWQ12-Q24-S5 | 24 | 9.0~36.0 | 5 | 2,400 | 12 | 85 | 86 |
| VAWQ12-Q24-S12 | 24 | 9.0~36.0 | 12 | 1,000 | 12 | 85 | 86 |
| VAWQ12-Q24-S15 | 24 | 9.0~36.0 | 15 | 800 | 12 | 85 | 86 |
| VAWQ12-Q48-S3R3 | 48 | 18.0~75.0 | 3.3 | 3,500 | 11.55 | 85 | 85 |
| VAWQ12-Q48-S5 | 48 | 18.0~75.0 | 5 | 2,400 | 12 | 85 | 87 |
| VAWQ12-Q48-S12 | 48 | 18.0~75.0 | 12 | 1,000 | 12 | 85 | 87 |
| VAWQ12-Q48-S15 | 48 | 18.0~75.0 | 15 | 800 | 12 | 85 | 88 |

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

## PART NUMBER KEY



## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating input voltage | | 9.0<br>18.0 | 24<br>48 | 36.0<br>75.0 | Vdc<br>Vdc |
| CTRL[1] | module on | 3 | | 40 | Vdc |
| | | | or open circuit | | |
| | module off | 0 | | 1.2 | Vdc |

Note: 1. Control pin voltage referenced to GND

## OUTPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| output power | | 1.2 | | 12 | W |
| line regulation | input voltage from low to high | | ±0.2 | ±0.5 | % |
| load regulation | measured from 10% load to full load | | ±0.5 | ±1.5 | % |
| voltage accuracy | | | ±1 | ±3 | % |
| switching frequency | measured from 10% load to full load | 350 | 400 | 450 | kHz |
| temperature coefficient | | | ±0.02 | | %/°C |

## PROTECTIONS

| parameter | conditions/description | | min | typ | max | units |
|---|---|---|---|---|---|---|
| over voltage protection | 3.3 V model<br>5 V model<br>12 V model<br>15 V model | | | 4.3<br>6<br>13<br>16 | | Vdc<br>Vdc<br>Vdc<br>Vdc |
| under voltage protection | 24 V input | module on | | 8.8 | 9 | Vdc |
| | | module off | | 8.3 | 8.5 | Vdc |
| | 48 V input | module on | | 17 | 17.5 | Vdc |
| | | module off | | 16.5 | 17 | Vdc |
| short circuit protection | continuous, automatic recovery | | | | | |

## SAFETY AND COMPLIANCE

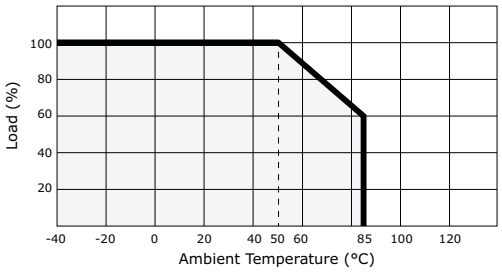
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| isolation voltage | for 1 minute at 1 mA max. | 1,500 | | | Vdc |
| isolation resistance | at 500 Vdc | 1,000 | | | MΩ |
| MTBF | MIL-HDBK-217F, at 25°C | 1,000,000 | | | hours |
| RoHS compliant | yes | | | | |

## ENVIRONMENTAL

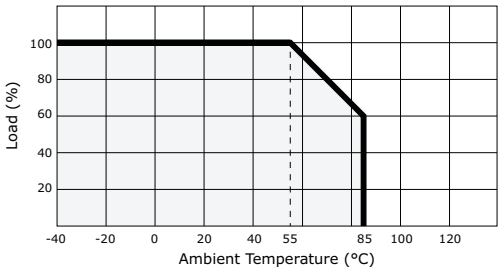
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | see derating curves | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| case temperature | | | 95 | 105 | °C |
| storage humidity | non-condensing | | | 95 | % |
| lead temperature | 1.5 mm from case for 10 seconds | | | 300 | °C |

## DERATING CURVES

1. output power vs. ambient temperature (3.3 V)




2. output power vs. ambient temperature (≥5 V)

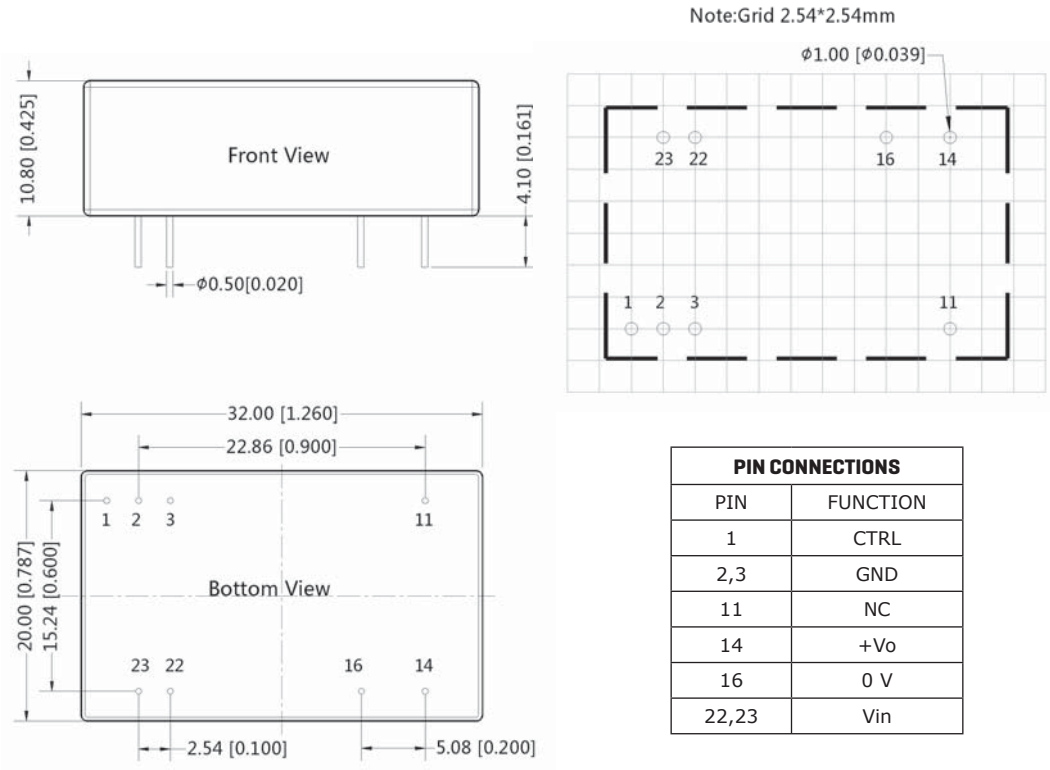



## MECHANICAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 32.00 x 20.00 x 10.80 (1.260 x 0.787 x 0.425 inch) | | | | mm |
| case material | aluminum alloy | | | | |
| weight | | | 14 | | g |

## MECHANICAL DRAWING

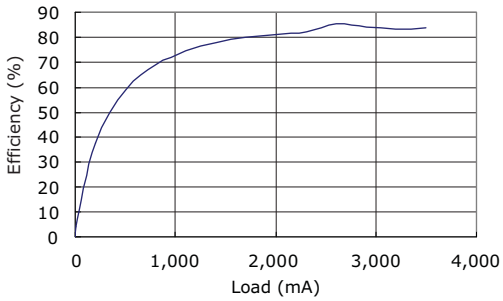
units: mm [inches]
tolerance: ±0.25 [±0.010]
pin section tolerance: ±0.10 mm [±0.004]



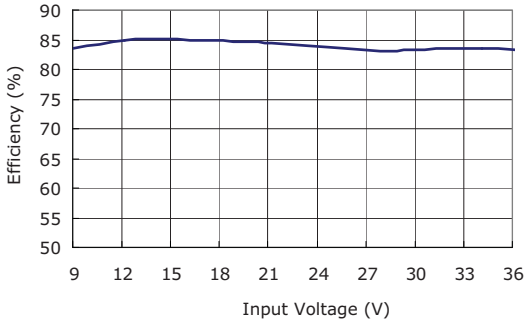

| PIN CONNECTIONS | |
|---|---|
| PIN | FUNCTION |
| 1 | CTRL |
| 2,3 | GND |
| 11 | NC |
| 14 | +Vo |
| 16 | 0 V |
| 22,23 | Vin |

## EFFICIENCY CURVES

1. efficiency vs. load
VAWQ12-Q24-S3R3



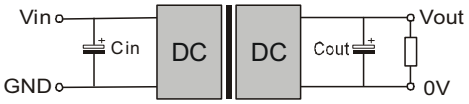

2. efficiency vs. input voltage
VAWQ12-Q24-S3R3




## APPLICATION NOTES

1. **Recommended Circuit**
All of the VAWQ12 models have been tested according to the following recommended testing circuit before leaving factory. If you want to further decrease the input ripple, Cin is recommended to use 100 μF. If ripple and noise are required, you can increase capacitance of Cout properly. However, the capacitance should not be higher than Max capacitance. (see Figure 1).

**Figure 1**




2. **Recommended Capacitance**

**Table 1**

| Vout (Vdc) | Cin (μF) | Cout (μF) |
|---|---|---|
| 3.3/5 | 100 | 220 |
| 12/15 | 100 | 100 |

Note: 1. All specifications measured at Ta: 25°C, humidity <75%, nominal input voltage and rated output load unless otherwise specified
2. When product begins to work, the temperature may rise slowly until the unit is stabilized. It is normal that the output voltage, derating, and efficiency may reduce during this time.
3. Min. load shouldn't be less than 10%, otherwise ripple maybe increased dramatically. If the product operates under min. load may not meet all specifications listed. Operation under minimum load will not damage the converter.

## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 09/10/2009 |
| 1.01 | new template applied | 04/17/2012 |
| 1.02 | V-Infinity branding removed | 09/11/2012 |
| 1.03 | case material changed to aluminum alloy, dimensions changed, spec updated | 07/19/2013 |
| 1.04 | added minimum load note | 09/19/2013 |

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

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