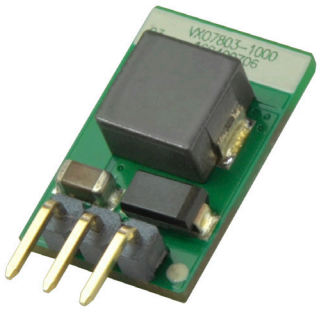
CUI INC
a bel group



# **SERIES:** VXO78-1000 | **DESCRIPTION:** NON-ISOLATED DC SWITCHING REGULATOR

## FEATURES

- wide input
- pin-out compatible with linear regulators
- open frame
- UL & CSA approved
- high efficiency up to 96%
- no-load input current as low as 0.2 mA
- wide operating temp: -40°C to +85°C
- supports negative output
- short circuit protection on the output
- designed to meet EN/BS EN 62368-1



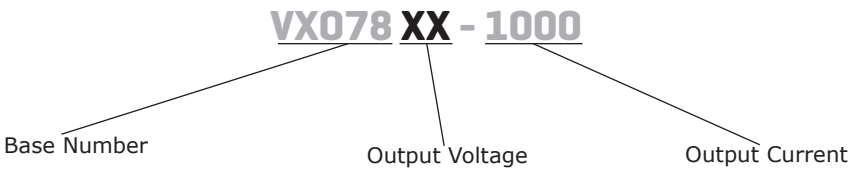

RoHS c UL us

## MODEL

| MODEL | input voltage[1] typ (Vdc) | input voltage[1] range (Vdc) | output voltage (Vdc) | output current max (mA) | output power max (W) | ripple & noise[2] max (mVp-p) | efficiency[3] typ (%) |
|---|---|---|---|---|---|---|---|
| VXO7803-1000 | 24 | 6~36 | 3.3 | 1000 | 3.3 | 75 | 90 |
| VXO7805-1000 | 24 | 8~36 | 5 | 1000 | 5 | 75 | 93 |
| | 12 | 8~27 | -5 | -500 | 2.5 | 75 | 86 |
| VXO78012-1000 | 24 | 16~36 | 12 | 1000 | 12 | 75 | 96 |
| | 12 | 8~20 | -12 | -300 | 3.6 | 75 | 89 |
| VXO78015-1000 | 24 | 20~36 | 15 | 1000 | 15 | 75 | 96 |
| | 12 | 8~18 | -15 | -300 | 4.5 | 75 | 89 |

Notes:
1. For input voltages higher than 30 Vdc, a 22 μF / 50 V input capacitor is required.
2. Tested at nominal input, 20~100% load, 20 MHz bandwidth, with 10 μF electrolytic and 1 μF ceramic capacitor on the output. At loads below 20%, the max ripple and noise of the 3.3 & 5 Vdc outputs will be 100 mVp-p, and the other outputs will be 2% Vo.
3. Measured at min Vin, full load.
4. All specifications are measured at Ta=25°C, humidity < 75%, nominal input voltage, and rated output load unless otherwise specified.

## PART NUMBER KEY



## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating input voltage[1] | for positive output applications<br>for negative output applications | 6<br>8 | 24<br>12 | 36<br>27 | Vdc<br>Vdc |
| filter | capacitor filter | | | | |
| input reverse polartiy protection | no | | | | |
| no-load input current | positive outputs | | 0.1 | 1 | mA |

Note: 1. See Model section on page 1 for specific input voltage ranges.

## OUTPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| maximum capacitive load[2] | for positive output applications<br>for negative output applications | | | 680<br>330 | µF<br>µF |
| voltage accuracy | at full load, input voltage range<br>3.3 Vdc output model<br>all other models | | ±2<br>±2 | ±4<br>±3 | %<br>% |
| line regulation | at full load, input voltage range | | ±0.2 | ±0.4 | % |
| load regulation | at nominal input, 10~100% load | | ±0.4 | ±0.6 | % |
| switching frequency | at nominal input voltage, full load<br>3.3/5 Vdc output models<br>all other models | 420<br>580 | 520<br>680 | 620<br>780 | kHz<br>kHz |
| transient recovery time | at nominal input voltage, 25% load step change | | 0.1 | 1 | ms |
| transient response deviation | at nominal input voltage, 25% load step change | | 50 | 300 | mV |
| temperature coefficient | at full load | | | ±0.03 | %/°C |

Note: 2. The maximum capacitive load was tested at nominal input voltage, full load.

## PROTECTIONS

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| short circuit protection | continuous, auto recovery | | | | |

## SAFETY AND COMPLIANCE

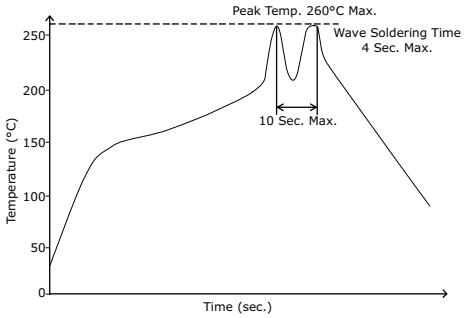
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| safety approvals | certified to 60950-1: UL<br>designed to meet 62368-1: EN, BS EN | | | | |
| EMI/EMC | EN 55032, EN 55024 | | | | |
| conducted emissions | CISPR22/EN55022, class B (external circuit required, see Figure 4-b) | | | | |
| radiated emissions | CISPR22/EN55022, class B (external circuit required, see Figure 4-b) | | | | |
| ESD | IEC/EN61000-4-2, contact ± 4kV, class B | | | | |
| radiated immunity | IEC/EN61000-4-3, 10V/m, class A | | | | |
| EFT/burst | IEC/EN61000-4-4, ± 1kV, class B (external circuit required, see Figure 4-a) | | | | |
| surge | IEC/EN61000-4-5, line-line ± 1kV, class B (external circuit required, see Figure 4-a) | | | | |
| conducted immunity | IEC/EN61000-4-6, 3 Vr.m.s, class A | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 2,000,000 | | | hours |
| RoHS | 2011/65/EU | | | | |

## ENVIRONMENTAL

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| operating temperature | see derating curve | -40 | | 85 | °C |
| storage temperature | | -55 | | 125 | °C |
| storage humidity | non-condensing | 5 | | 95 | % |

## SOLDERABILITY

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| wave soldering | see wave soldering profile | | | 260 | °C |



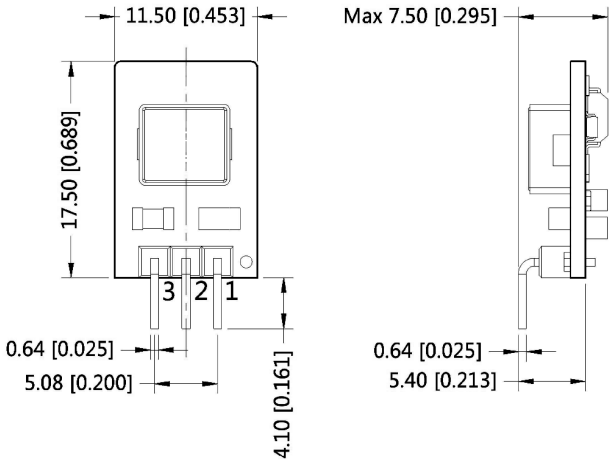

## MECHANICAL

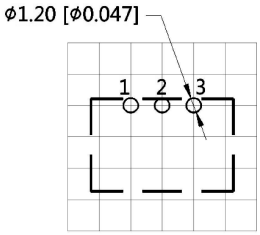
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 11.50 x 7.50 x 17.50 [0.453 x 0.295 x 0.689 inch] | | | | mm |
| weight | | | 2.1 | | g |

## MECHANICAL DRAWING

units: mm [inch]
tolerance: ±0.50[±0.020]
pin diameter tolerance: ±0.10[±0.004]

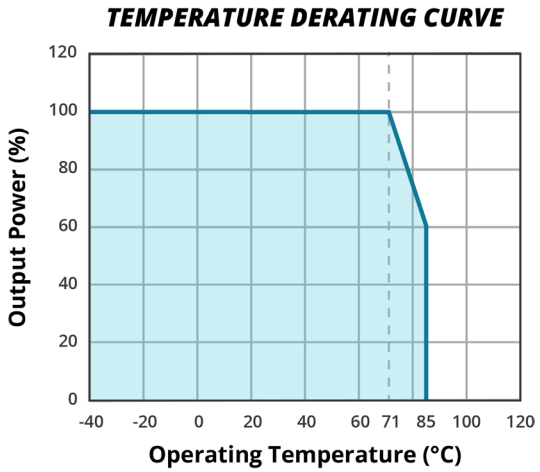
| PIN CONNECTIONS | | |
|---|---|---|
| PIN | +OUTPUT | -OUTPUT |
| 1 | +VIN | +VIN |
| 2 | GND | -VOUT |
| 3 | +VOUT | GND |



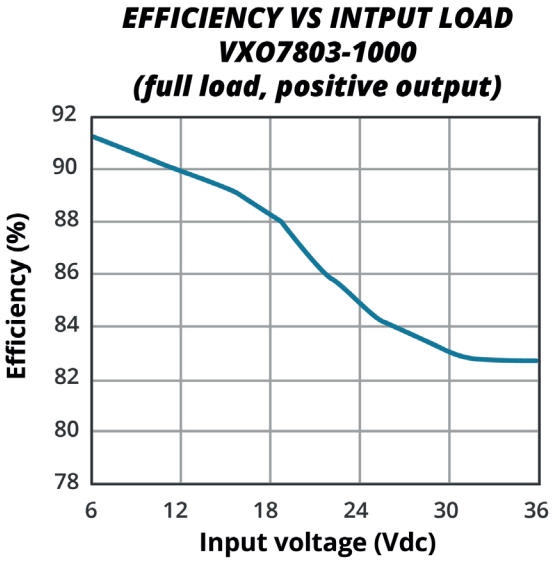



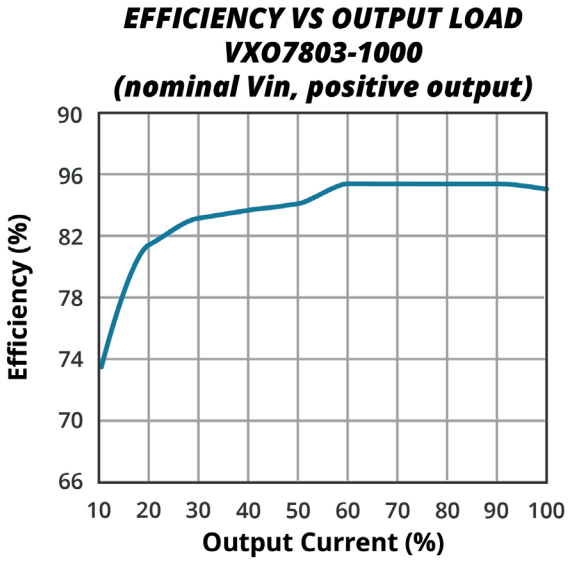

Note : Grid 2.54*2.54mm
Recommended PCB Layout
Top View

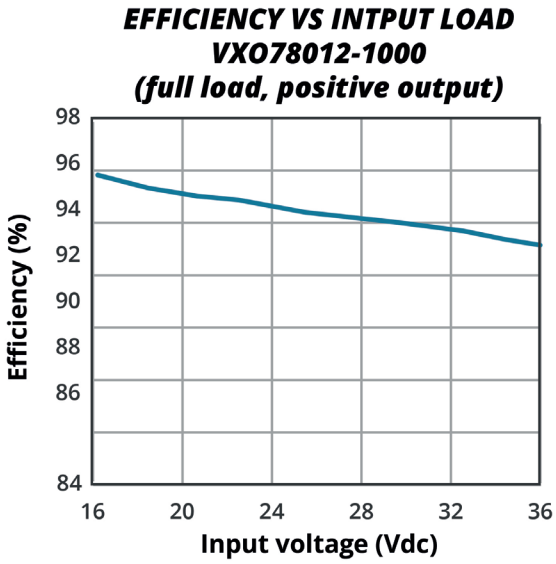
## DERATING CURVE

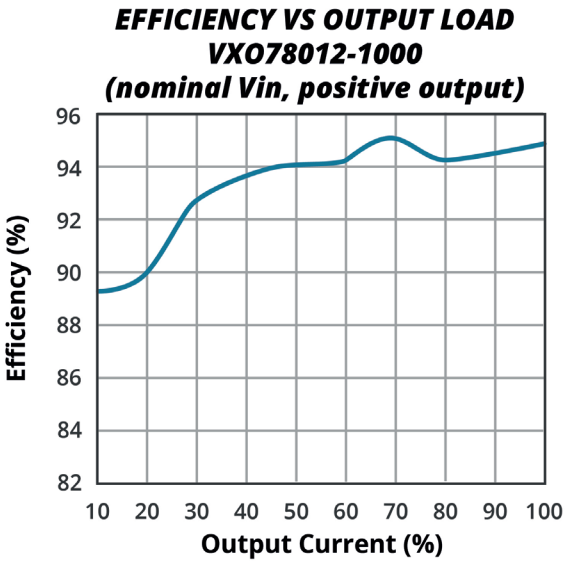



## EFFICIENCY CURVES



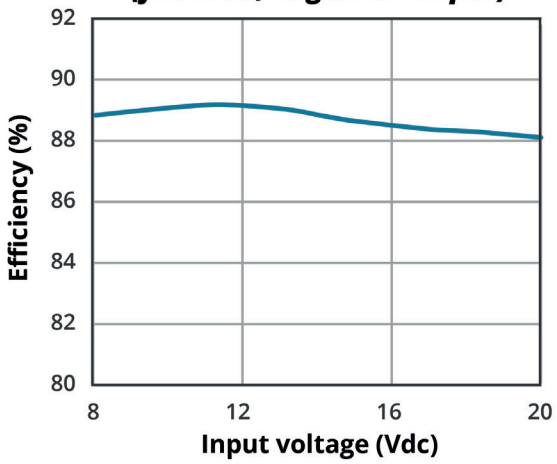



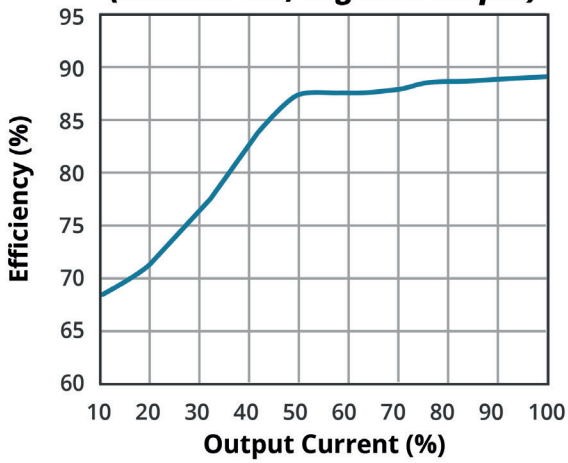



## EFFICIENCY CURVES (CONTINUED)

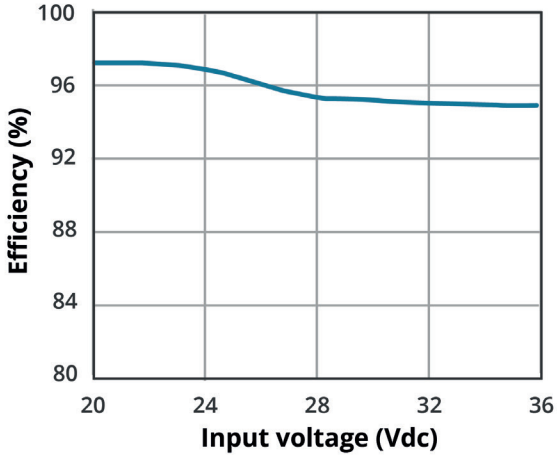
***EFFICIENCY VS INTPUT LOAD***
***VXO78012-1000***
***(full load, negative output)***



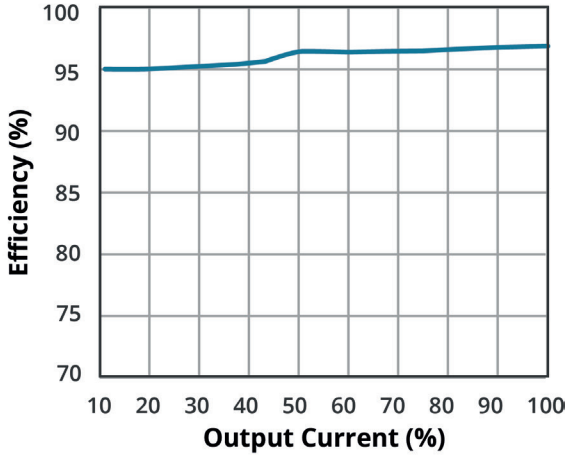

***EFFICIENCY VS OUTPUT LOAD***
***VXO78012-1000***
***(nominal Vin, negative output)***



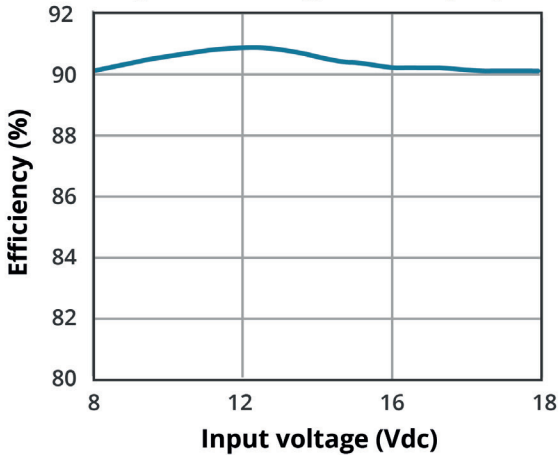

***EFFICIENCY VS INTPUT LOAD***
***VXO78015-1000***
***(full load, positive output)***



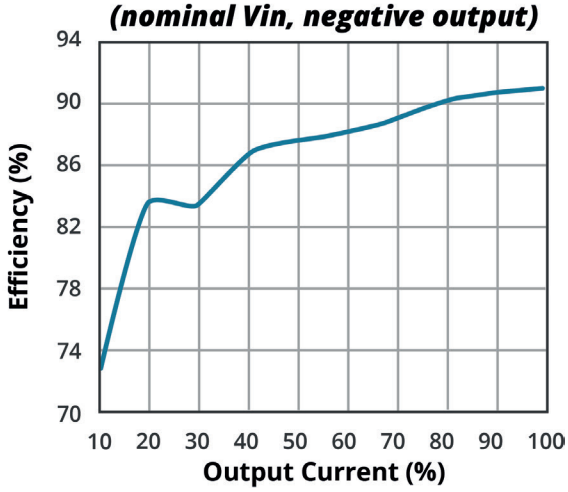

***EFFICIENCY VS OUTPUT LOAD***
***VXO78015-1000***
***(nominal Vin, positive output)***




***EFFICIENCY VS INTPUT LOAD***
***VXO78015-1000***
***(full load, negative output)***




***EFFICIENCY VS OUTPUT LOAD***
***VXO78015-1000***
***(nominal Vin, negative output)***



## TYPICAL APPLICATION CIRCUIT

**Figure 1**

Positive Output Application Circuit

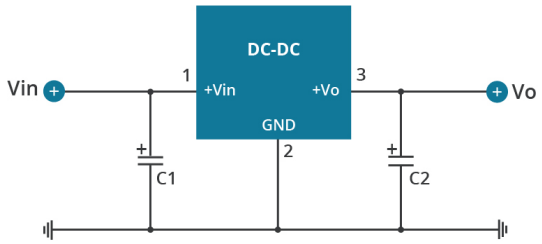



**Figure 2**

Negative Output Application Circuit

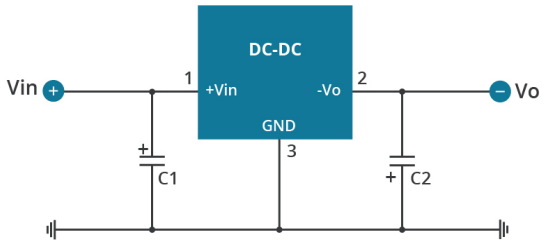



**Figure 3**

Positive and Negative Output Paralleling Application Circuit

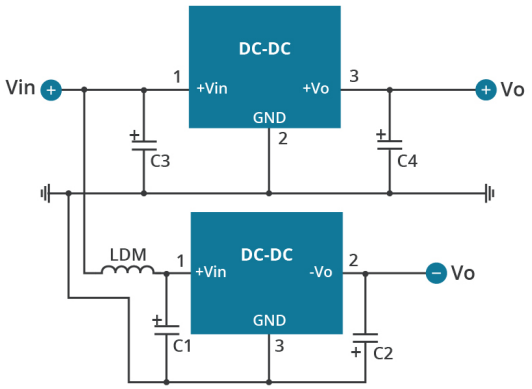



**Table 1**

External Capacitor Table

| Model Number | C1, C3 (ceramic capacitor) | C2, C4 (ceramic capacitor) |
|---|---|---|
| VXO7803-1000 | 10 µF/50 V | 22 µF/10 V |
| VXO7805-1000 | 10 µF/50 V | 22 µF/10 V |
| VXO78012-1000 | 10 µF/50 V | 22 µF/25 V |
| VXO78015-1000 | 10 µF/50 V | 22 µF/25 V |

## EMC RECOMMENDED CIRCUIT

**Figure 4**

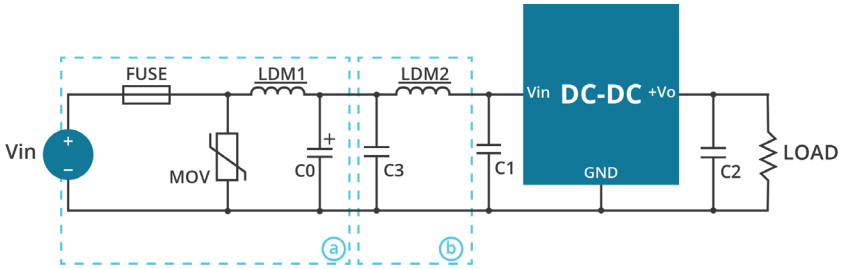



**Table 2**

| Recommended external circuit components | |
|---|---|
| FUSE | choose according to actual input current |
| MOV | S20K30 |
| LDM1 | 82 µH |
| C0 | 680 µF/50 V |
| C1, C2 | see Table 1 |
| C3 | 4.7 µF/50 V |
| LDM2 | 12 µH |

Note:
1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.
2. To reduce the output ripple further, C2 & C4 can be increased as needed and the use of tantalum or low ESR electrolytic capacitors would be recommended.
3. When using application circuit in Figure 3, a 10 µH LDM component is recommended to reduce the interference.

## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 05/19/2017 |
| 1.01 | logo & packaging updates | 02/21/2020 |
| 1.02 | features and safety line updated | 01/14/2021 |
| 1.03 | derating curve, efficicency curves and circuit figures updated | 09/21/2021 |
| 1.04 | safeties updated | 12/20/2022 |
| 1.05 | application circuits updated | 03/30/2023 |

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

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

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