CUI INC
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# **SERIES:** VX78-1000R | **DESCRIPTION:** NON-ISOLATED DC SWITCHING REGULATOR

## FEATURES

- wide input
- pin-out compatible with linear regulators
- encapsulated
- 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
- EN 62368-1

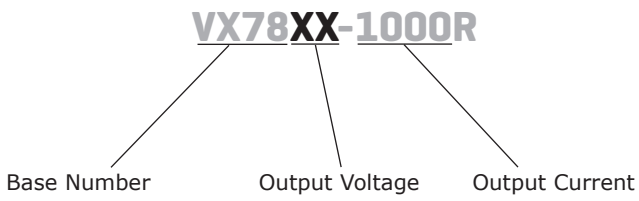



## MODEL

| 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 typ (%) |
|---|---|---|---|---|---|---|---|
| VX7803-1000R | 24 | 6~36 | 3.3 | 1000 | 3.3 | 75 | 90 |
| VX7805-1000R | 24 | 8~36 | 5 | 1000 | 5 | 75 | 93 |
| | 12 | 8~27 | -5 | -500 | 2.5 | 75 | 86 |
| VX7809-1000R | 24 | 13~36 | 9 | 1000 | 9 | 75 | 95 |
| VX7812-1000R | 24 | 16~36 | 12 | 1000 | 12 | 75 | 96 |
| | 12 | 8~20 | -12 | -300 | 3.6 | 75 | 89 |
| VX7815-1000R | 24 | 20~36 | 15 | 1000 | 15 | 75 | 96 |
| | 12 | 8~18 | -15 | -300 | 4.5 | 75 | 89 |

Note: 1. For input voltage exceeding 30 VDC, an input capacitor of 22uF/50V is required
2. 20MHz bandwidth, nominal input, 20%-100% load. With light loads at or below 20%, ripple and noise for 3/3V/5V output parts increases to 100mVp-p and for 9V/12V/15V output parts to 2%Vo max.

## PART NUMBER KEY



## INPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| filter | capacitor filter | | | | |
| no-load input current | positive outputs | | 0.1 | 1 | mA |

## OUTPUT

| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| maximum capacitive load | 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 | | <br>±2<br>±2 | <br>±4<br>±3 | <br>%<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 | <br>420<br>580 | <br>520<br>680 | <br>620<br>780 | <br>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 | Operating ambient temperature -40°C to +85°C | | | ±0.03 | %/°C |

## 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 62368-1: EN<br>certified to 60950: UL | | | | |
| 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, criteria B | | | | |
| radiated immunity | IEC/EN61000-4-3, 10V/m, criteria A | | | | |
| EFT/burst | IEC/EN61000-4-4, ± 1kV, criteria B (external circuit required, see Figure 4-a) | | | | |
| surge | IEC/EN61000-4-5, line-line ± 1kV, criteria B (external circuit required, see Figure 4-a) | | | | |
| conducted immunity | IEC/EN61000-4-6, 3 Vr.m.s, criteria A | | | | |
| MTBF | as per MIL-HDBK-217F, 25°C | 2,000,000 | | | hours |
| RoHS | yes | | | | |

## 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 | % |

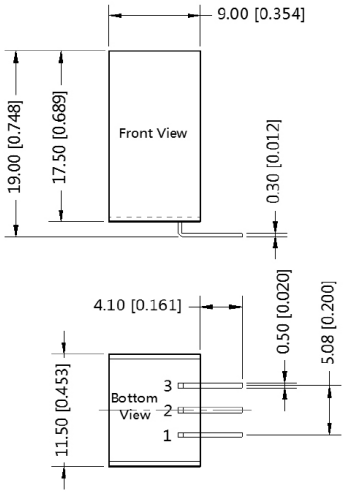
## MECHANICAL

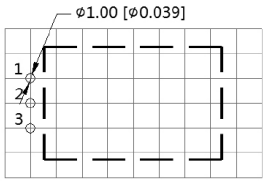
| parameter | conditions/description | min | typ | max | units |
|---|---|---|---|---|---|
| dimensions | 11.50 x 9.00 x 17.50 [0.453 x 0.354 x 0.689 inch] | | | | mm |
| case material | black flame-retardant heat-proof plastic (UL94V-0) | | | | |
| weight | | | 3.8 | | g |

## MECHANICAL DRAWING

units: mm [inch]
tolerance: ±0.25[±0.010]
pin diameter tolerance: ±0.10[±0.004]

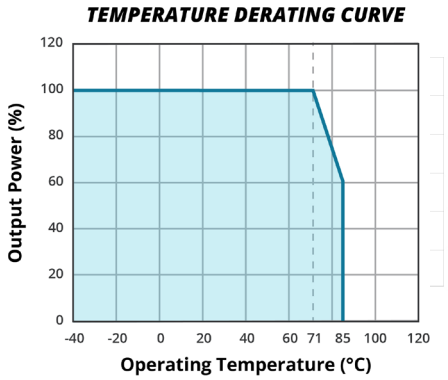
| PIN CONNECTIONS | | |
|---|---|---|
| PIN | +OUTPUT | -OUTPUT |
| 1 | +VIN | +VIN |
| 2 | GND | -VOUT |
| 3 | +VOUT | GND |



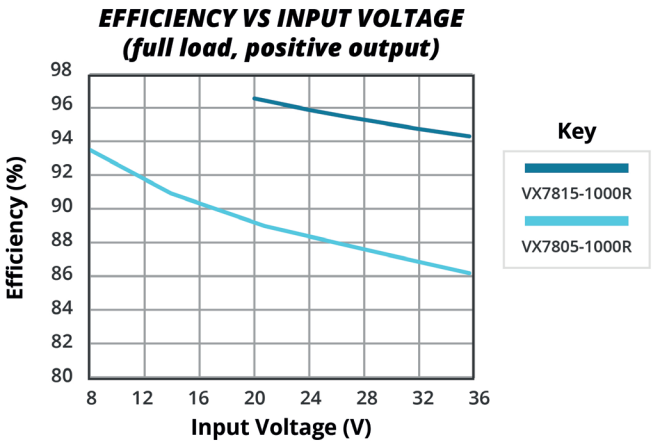



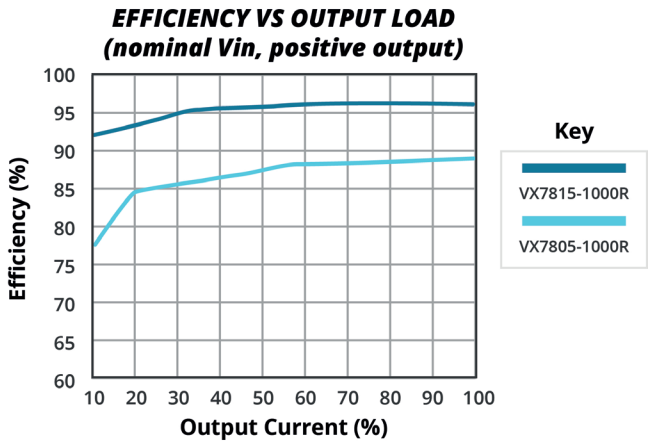

Note : Grid 2.54*2.54mm

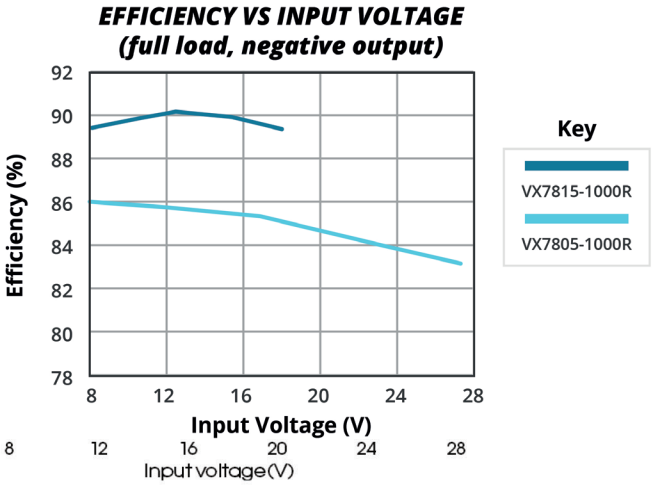
## DERATING CURVE

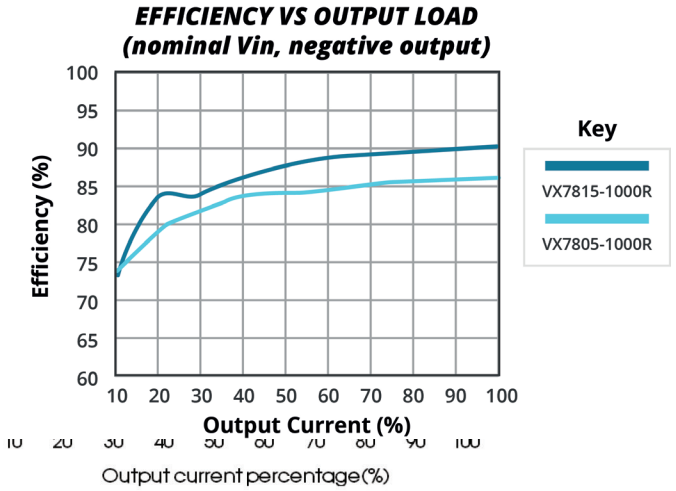



## EFFICIENCY CURVES



## TYPICAL APPLICATION CIRCUIT

**Figure 1**
**Positive output application circuit**

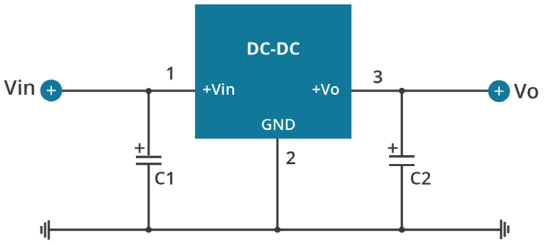



**Figure 2**
**Negative output application circuit**

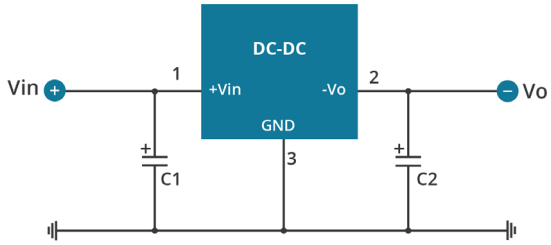



**Figure 3**

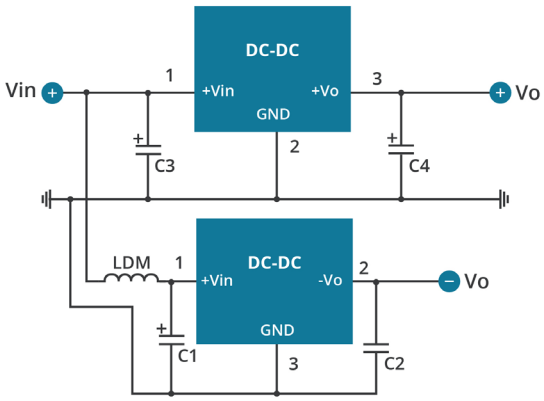


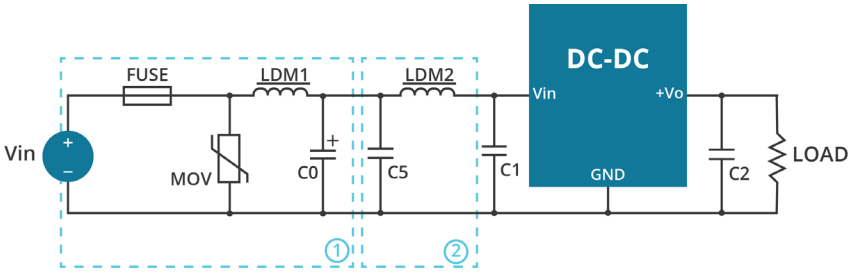

**Table 1**
External Capacitor Table

| Model Number | C1, C3 (ceramic capacitor) | C2, C4 (ceramic capacitor) |
|---|---|---|
| VX7803-1000R | 10 µF/50 V | 22 µF/10 V |
| VX7805-1000R | 10 µF/50 V | 22 µF/10 V |
| VX7809-1000R | 10 µF/50 V | 22 µF/16 V |
| VX7812-1000R | 10 µF/50 V | 22 µF/25 V |
| VX7815-1000R | 10 µF/50 V | 22 µF/25 V |

Note: 1. C1 & C2 (C3 & C4) are required and should be connected as close to the module pins as possible.
2. Refer to Table 1 for C1 and C2 (C3 and C4) capacitor values. For certain applications, increased values for C2 and C4 and/or tantalum or low ESR electrolytic capacitors may also be used instead;
3. When using configurations as shown in figure 3, we recommended to add an inductor (LDM) with a value of up to 10µH which helps reducing mutual interference;
4. Converter cannot be used for hot swap and with output in parallel.

## EMC RECOMMENDED CIRCUIT

**Figure 4**




Note: 1. Part ① in Fig. 4 shows EMS compliance filter and part ② filter for EMI compliance; depending on requirement both filters ① and ② can be used in series as shown.

**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 |
| C5 | 4.7 µF/50 V |
| LDM2 | 12 µH |

## REVISION HISTORY

| rev. | description | date |
|---|---|---|
| 1.0 | initial release | 03/09/2020 |
| 1.01 | safeties updated | 02/03/2021 |
| 1.02 | derating curve, efficiency curves and circuit figures updated | 09/21/2021 |

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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