# DC/DC Converter
## K78XXM-1000R3G Series

## Typical Features

- Wide input voltage range, non-isolated & regulated output
- Efficiency up to 95% (Typ.)
- Low standby power consumption
- Mini SIP package
- Short circuit protection
- Available for negative output
- Operating temperature from -40℃ to +85℃
- Plastic Case, flame class UL94-V0


**Test Condition:** Unless otherwise specified, all parameter values had been tested at nominal input voltage, pure resistive rated load, and at room temperature 25°C.

## Application Field

***This series of products can be widely used in the fields of instrument, communication, pure digital circuit, general low frequency analog circuit, relay drive circuit, data exchange circuit, etc.***

## Typical Product List

| Certificate | Part No. | Input Voltage Range (VDC) | | Output Voltage/ Current (Vo/Io) | | Max Capacitive Load | Ripple & Noise (20MHz) Max/Typ. | Efficiency (%) @full load (Typ.) | |
|---|---|---|---|---|---|---|---|---|---|
| | | Nom. | Range | Vo (VDC) | Io (mA) | uF | mVp-p | Vin (Min) | Vin (Max) |
| - | K783V3M-1000R3G | 24 | 6-34 | 3.3 | 1000 | 680 | 75/40 | 90 | 81 |
| - | K7805M-1000R3G | 24 | 8-34 | 5 | 1000 | 680 | 75/40 | 92 | 86 |
| | | 12 | 8-27 | -5 | -500 | 330 | 75/40 | 85 | 81 |
| - | K7806M-1000R3G | 24 | 10-34 | 6.5 | 1000 | 680 | 75/40 | 92 | 86 |
| - | K7809M-1000R3G | 24 | 13-34 | 9 | 1000 | 680 | 75/40 | 93 | 90 |
| - | K7812M-1000R3G | 24 | 15-34 | 12 | 1000 | 680 | 75/40 | 95 | 91 |
| | | 12 | 8-20 | -12 | -300 | 330 | 75/40 | 88 | 87 |
| - | K7815M-1000R3G | 24 | 20-34 | 15 | 1000 | 680 | 75/40 | 95 | 91 |
| | | 12 | 8-18 | -15 | -300 | 330 | 75/40 | 87 | 88 |

Note 1: It is recommended to connect an electrolytic capacitor (22uF/50V) to the input to protect the unit against the peak voltage when the input voltage is more than 30VDC.

Note 2: The Ripple & Noise is tested by the twisted pair method.

## Input Specifications

| Item | Operation Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| No-load Input Current | Positive output | -- | 0.2 | 1.5 | mA |
| | Negative output | -- | 1 | 4 | |
| Input Reversed | Not allowed | | | | |

| | |
|---|---|
| Input Filter | Capacitor filter |
| Hot Plug | Unavailable |

## Output Specifications

| Item | Operation Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage Accuracy | Full input voltage range, full load | Output 3.3V | -- | ±2 | ±4 | % |
| | | Others | -- | ±2 | ±3 | |
| Load Regulation | 10% ~ 100% load | V+ output | -- | ±0.4 | ±0.6 | % |
| | | V- output | -- | ±0.4 | ±0.8 | |
| Line Regulation | Full input voltage range, full load | | -- | ±0.2 | ±0.4 | |
| Temp. Drift Coefficient | 100% Load | | -- | -- | ±0.03 | %/°C |
| Transient Response Deviation | Nominal input voltage, 25%-50%-25% & 50%-75%-50% load step change | | -- | 50 | 300 | mV |
| Transient Recovery Time | | | -- | 0.1 | 1 | mS |
| Short Circuit Protection | | | Continuous, Self-recovery | | | |

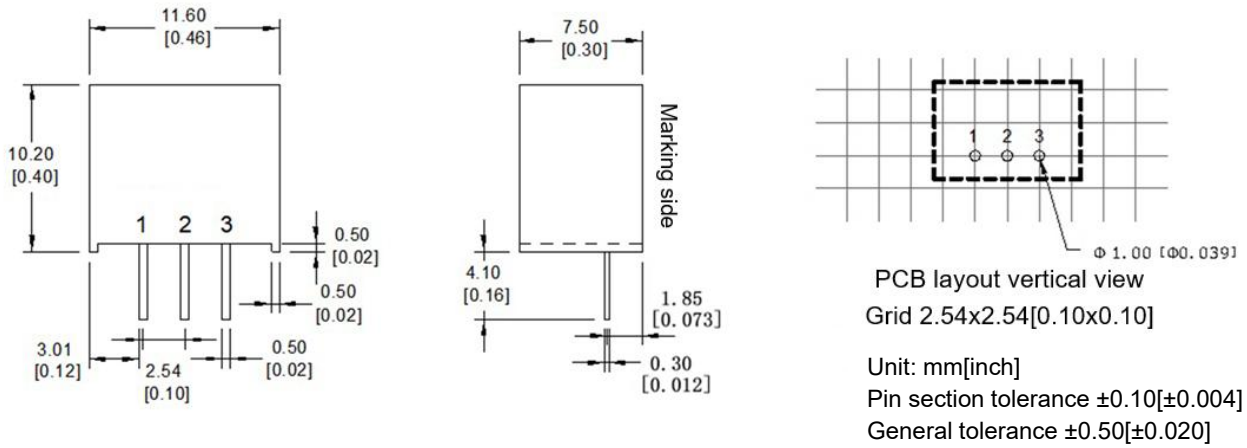
## General Specifications

| Item | Operation Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Switching Frequency | Nominal input voltage, full load | Output 3.3V & 5V | -- | 520 | -- | KHz |
| | | Others | -- | 800 | -- | |
| Operating Temperature | Refer to the Temperature Derating Graph | | -40 | -- | +85 | °C |
| Storage Temperature | | | -55 | -- | +125 | |
| Case temperature rise | Operating at Ta =25℃ | | -- | 30° | -- | |
| Pin Soldering Temperature | 1.5mm from the case, 10S | | -- | -- | 300 | |
| Relative humidity | No condensation | | 5 | -- | 95 | %RH |
| Vibration | | | 10-150Hz, 5G, 30 Min. along X, Y and Z | | | |
| MTBF | MIL-HDBK-217F@25℃ | | 3500 | -- | -- | K hours |
| Case Material | Plastic in Black, flame class UL94-V0 | | | | | |
| Unit Weight | 1.4g (Typ.) | | | | | |
| Cooling Method | Natural air | | | | | |
| Packing | Tube size (526x9.5x17mm) | | 43PCS/Tube | | | |
| | Carton size (542x110x155mm) | | 3440PCS/Carton (total 80 tubes) | | | |
| Unit Dimensions | L x W x H | 11.60× 7.50 × 10.20 mm | | 0.457 × 0.295 × 0.402 inch | | |

## EMC Performances

| | | |
|---|---|---|
| EMI | CE | CISPR32/EN55032, CLASS B (with the Recommended EMC Circuit) |
| | RE | CISPR32/EN55032, CLASS B (with the Recommended EMC Circuit) |
| EMS | ESD | IEC/EN61000-4-2, Contact ±4kV perf.Criteria B |
| | RS | IEC/EN61000-4-3, 10V/m perf. Criteria A |
| | EFT | IEC/EN61000-4-4, ±1kV perf. Criteria B (with the Recommended EMC Circuit) |
| | Surge | IEC/EN61000-4-5, Line to line ±1kV perf. Criteria B (with the Recommended EMC Circuit) |
| | CS | IEC/EN61000-4-6, 3Vr.m.s perf. Criteria A (with the Recommended EMC Circuit) |

## Mechanical Dimensions




PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]

Unit: mm[inch]
Pin section tolerance ±0.10[±0.004]
General tolerance ±0.50[±0.020]

## Pin-out Function Description

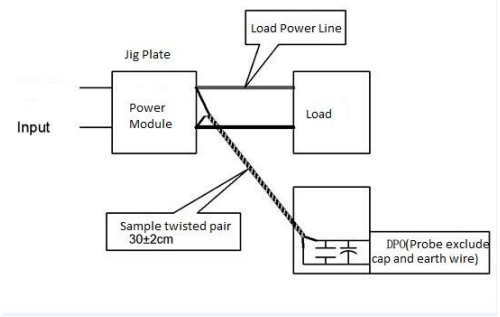
| Pin No. | 1 | 2 | 3 |
|---|---|---|---|
| Positive output | +Vin | GND(Common) | +Vo |
| Negative output | +Vin | -Vo | GND(Common) |

Note 1: Please take the pin definition on the product marking as the right one if there is any difference than the description on the data sheet.

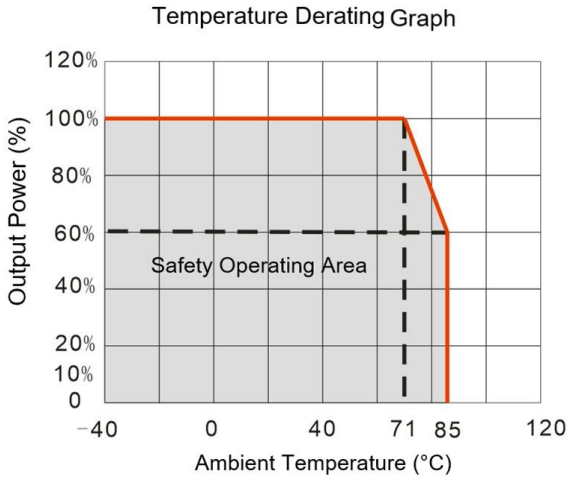
## Ripple & Noise Test Instruction (Twisted Pair Method, 20MHz bandwidth)

1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 10uF high-frequency low-resistance electrolytic capacitor are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the Sample Mode.

2) The test diagram is shown on the right. The converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible to the output pins or terminals. The test can be start after input power on.



## Product Characteristics Graph




## Recommended Circuits for Application

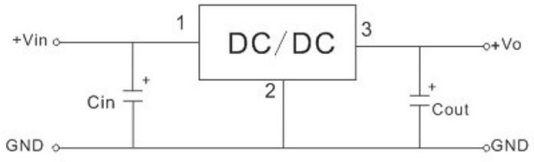
**1. Requirements for output load**

a. To ensure the converter operating efficiently and reliably, its minimum load should not be less than 10% of the rated load. It is recommended to connect a resistor in parallel to the output when the real load is less than 10% (the sum of the power consumed should be bigger than or equal to 10% of the rated power).

b. The maximum capacitive load is tested at nominal input voltage and full load. The converter may not start or be damaged at the capacitive over-load.

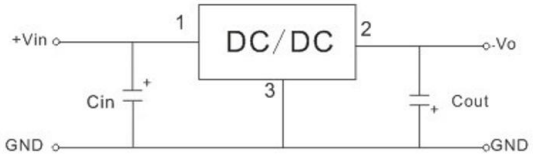
**2. Typical application circuits**

To effectively decrease the input and output ripple and noise, a capacitor filter can be connected to the input and output as below circuit diagrams (Figure 1 for the Positive output application, Figure 2 for the Negative output application and Figure 3 for Positive & Negative outputs connected in parallel application, 10uH is recommended for LDM). The suitable filtering capacitors should be chosen as the recommended capacitive load values in Table 1. The converter could not start if the capacitance is too big.



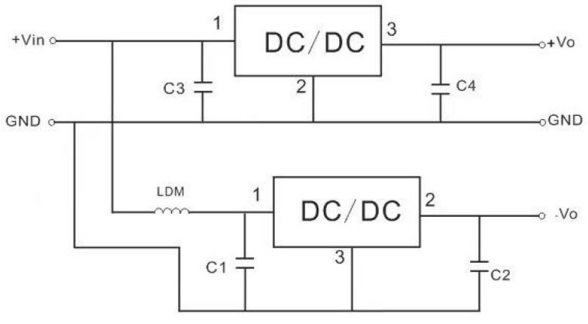

Positive output circuit diagram

Figure 1




Negative output circuit diagram

Figure 2




Positive & Negative outputs connected in parallel application circuit diagram

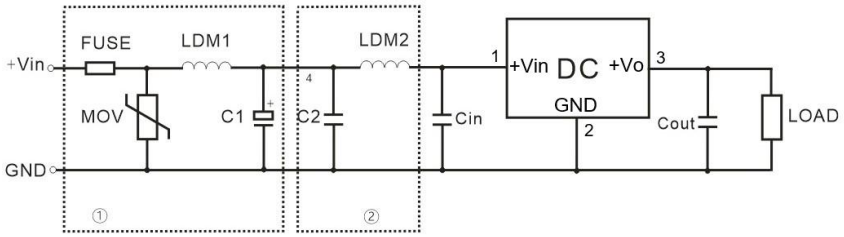
Recommended Capacitive Load Values (Table 1)

| Part No. | C1/C3 (Ceramic capacitor) | C2/C4 (Ceramic capacitor) |
|---|---|---|
| K783V3M-1000R3G | 10μF/50V | 22μF/10V |
| K7805M-1000R3G | | 22μF/10V |
| K7806M-1000R3G | | 22μF/16V |
| K7809M-1000R3G | | 22μF/16V |
| K7812M-1000R3G | | 22μF/25V |
| K7815M-1000R3G | | 22μF/25V |

Figure 3

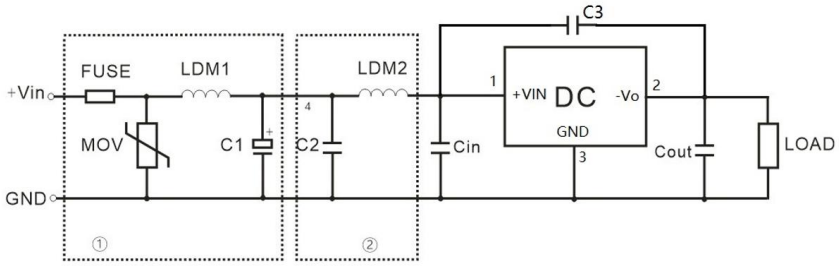
### 3. Recommended EMC circuit diagrams

Positive output




| | |
|---|---|
| FUSE | TBD by input current |
| MOV | 20D470K |
| C1 | 680μF/50V |
| C2 | 4.7μF/50V |
| Cin/Cout | Refer to table 1 |
| LDM1 | 82μH |
| LDM2 | 12μH |

Negative output




| | |
|---|---|
| FUSE | TBD by input current |
| MOV | 20D470K |
| C1 | 680μF/50V |
| C2/C3 | 4.7μF/50V |
| Cin/Cout | Refer to table 1 |
| LDM1 | 82μH |
| LDM2 | 12μH |

Note: Part ① circuit is for EMS test, part ② for EMI filtering, both can be adjusted according to the actual situation.

**Application Notice**

1.The product performance in this manual cannot be guaranteed if it works at a lower load than the minimum load condition.

2. All values or indicators in this manual have been tested based on Aipupower test specifications.

**Guangzhou Aipu Electron Technology Co., Ltd**

Address: Building 4, HEDY Park, No.63, Punan Road, Huangpu Dist, Guangzhou, China.

Tel: 86-20-84206763 Fax: 86-20-84206762 HOTLINE: 400-889-8821

E-mail: sales@aipu-elec.com Website: https://www.aipupower.com

