

K78-1000 series DataSheet

Wide voltage input non-isolated regulator Output module power supply (three-terminal switching regulator)

- ◆ Wide input voltage range: 6-36VDC
- ◆ High conversion efficiency (up to 96%), low no-load current: 0.5mA(typ)
- ◆ Pin-compatible with LM78xx series three-terminal linear regulators
- ◆ Output short-circuit protection (self-recovery)
- ◆ Operating temperature: -40℃ ~ +85℃



This series module power supply is a three-end switching regulator, which has high efficiency, low loss, low heat output, no need to add heat sink, and can work stably and reliably. It makes up for the defects of low efficiency and large heat output of the previous three-terminal linear voltage regulator, and is the perfect substitute for the current three-terminal linear voltage regulator, which is widely used in industrial control system power supply, power monitoring system power supply, instrument power supply and other power systems.

Selection list

| Model number | Input voltage range (nominal value) | Output rated voltage | Output rated current | Efficiency (%_typ) Vin_min/Vin_max @ Full load | Maximum capacitive load (μF) |
|--------------|-------------------------------------|----------------------|----------------------|---|------------------------------|
| K7803-1000R3 | 6.0-36V (24) | 3.3V | 1000mA | 90/82 | 3300 |
| K7805-1000R3 | 8.0-36V (24) | 5.0V | 1000mA | 93/87 | 2000 |
| K7809-1000R3 | 12-36V (24) | 9.0V | 1000mA | 95/91 | 1000 |
| K7812-1000R3 | 16-36V (24) | 12V | 1000mA | 96/92 | 820 |
| K7815-1000R3 | 18-36V (24) | 15V | 1000mA | 96/93 | 680 |

Product characteristics

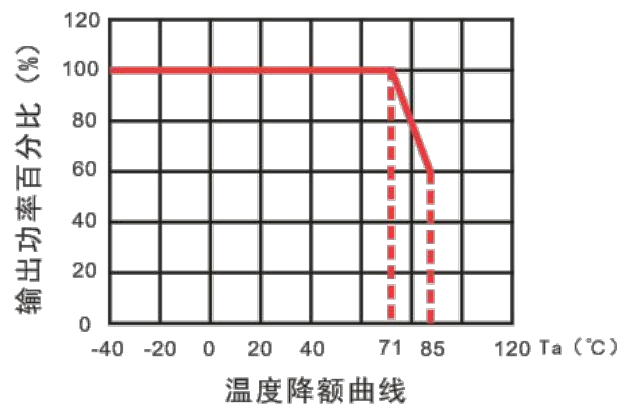
| item | Working condition | Min | Typ | Max | unit |
|-----------------------|-------------------|-----|-----|-----|------|
| No load input current | 24V nominal input | -- | 0.5 | 1.0 | mA |

| Output voltage accuracy | @100% load | DC-DC module power supply | | | |
|----------------------------|--|---------------------------|------|-------|----|
| | | -3 | ±1 | +3 | |
| | | | | | |
| Linear adjustment rate | @Full load, Vin_min to Vin_max | -0.5 | ±0.3 | +0.5 | % |
| Load adjustment rate | @ Nominal input, 10%-100% load | -0.75 | ±0.5 | +0.75 | |
| Dynamic response deviation | Nominal input @ load 50%-75%-50% variation | -- | 80 | 350 | mV |
| Dynamic recovery time | Nominal input @ load 50%-75%-50% variation | -- | 200 | 500 | μs |

| Product characteristics | | | | | |
|----------------------------------|---|---------------------------------------|-------|------|-------|
| item | Working condition | Min | Typ | Max | unit |
| Ripple & Noise | 20MHz bandwidth @Vin_nom,100% load | -- | 50 | 100 | mVp- |
| Short circuit protection | | p 可持续, 自恢复 | | | |
| Coefficient of temperature drift | Nominal input @100% load | -- | ±0.03 | -- | %/℃ |
| Operating ambient temperature | The temperature derating requirement is met | -40 | -- | +85 | ℃ |
| Product working temperature rise | 100% load @Vin_nom,Ta=25℃ | -- | 30 | -- | |
| Storage temperature | | -55 | -- | +125 | |
| Storage humidity | non-condensing | -- | -- | 95 | %RH |
| MTBF | MIL-HDBK-217F@25℃ | 1000 | -- | -- | KHour |
| Welding temperature | Hand welding | 370±10℃@3 ~ 5Sec ^s | | | |
| | Wave soldering welding | 260±10℃@5 ~ 10Sec | | | |
| Hot swap | | nonsupport | | | |
| Cooling mode | | Natural air cooling | | | |
| Housing material | | Black flame-retardant plastic housing | | | |

| | | | | | |
|--------------------|-------------------------|------------------|-----|----|---|
| weight | | -- | 4.5 | -- | G |
| Apparent dimension | Length * width * height | 11.75*9.1*17.5mm | | | |

Temperature characteristic curve



Precautions for use

1. Consideration of additional input capacitance:

Because there are all kinds of interference noises in the power supply side, the frequency is high, the duration is short, but the peak value is very high, in order to make the module power supply work stably and reliably, it is usually necessary to add a suitable absorption capacitance in its input side; In some cases, the lead between the power supply and the module power supply on the control board is very long, then it is necessary to connect an external filter capacitor near the input pin of the module power supply to achieve the effect of impedance matching. The greater the interference noise, the longer the line, the greater the required external capacitance value. Our company recommends the use of high frequency and low resistance electrolytic capacitors to meet the requirements, general application, can be selected according to the recommended values in the "Design reference" chapter. Please note: During testing or use, if the input voltage will be higher than 28V, it is necessary to connect 33uF high frequency low resistance electrolytic capacitor to the input terminal.

2, the consideration of the output filter capacitance:

In the actual application circuit, the load size of the module power supply varies, usually accompanied by large or small changes. In order to adapt to different use occasions and load requirements, and work more stably and reliably, it is necessary to add a suitable capacitor to the output end of the module power supply. This is mainly due to two considerations: one is to further reduce the output ripple and noise; On the other hand, the output capacitance is applied to further improve the response deviation caused by the load

jump, so that the output voltage is more stable. However, the output end can not add too large capacity capacitance, the larger the output capacitance, the power supply needs to start the instantaneous current provided by the power supply end will increase, too large capacitance may even cause the output voltage of the module can not be established; In addition, the output capacitor value is too large, the power supply is prone to output overrush when starting, in order to ensure that it works more safely and reliably, under the premise of output ripple and noise to meet the requirements, reduce the capacity of the output capacitor as much as possible, or use LC filter to replace the capacitor with a large capacity value. The maximum capacitive load in the selection list only means that the power supply can start normally when the total capacitance of its output is within this value, which is not recommended. Please see the "Design Reference" section for the recommended value.

3. Prevent hot swap test or use of the power module:

The so-called hot swap usually refers to inserting the power supply of a module into the circuit or removing it from the circuit when the power supply is not disconnected. The power supply does not support hot swap during use or testing. Because in the hot swap process, due to the current mutation will produce high voltage spike, it may cause damage; In another case, a mechanical switch is connected in series between the power supply and the input end of the module power supply, and the power supply is controlled through the mechanical switch. The mechanical switch will also produce high voltage spikes during on-off operation, which may also cause damage to the power supply. During the test or use of the module power supply, any operation that will produce high voltage spikes should not be ignored. Measures should be taken to prevent high voltage spikes from being directly added to the input end. For details, see the "Design Reference" section. Please note: During testing or use, it is necessary to ensure that the "GND" pin of the product is well connected to the GND of the power supply, otherwise the product will be damaged.

4, input high transient voltage peak protection:

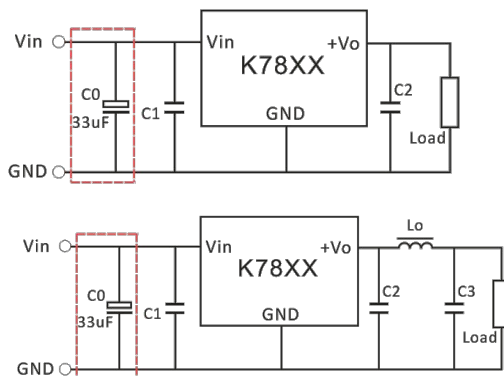
If the product is used in an environment with harsh electromagnetic interference, for example, the input end of the product shares the power supply with the inductive load, or the current loop at the power supply end is on/off, if not handled properly, there will be a high transient voltage spike in the power supply circuit, and this interference will not be dealt with, and too high peak voltage will enter the product input end. It is very likely to cause product damage. The suppression of high voltage spikes is very important to ensure the stable and reliable use of the product. Commonly used transient voltage suppression devices are varistor (MOV), transient voltage suppression diode (TVS) and so on. Different devices have advantages and disadvantages, please choose according to the use of the occasion and requirements, refer to the "Design Reference" section

5, input polarity:

The input end of the product has no anti-reverse protection, please note: the input polarity will cause damage to the product when in use.

Design reference

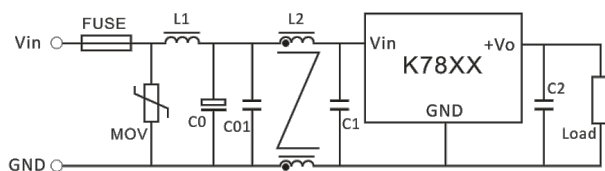
1、 Application circuit:



| C0 | C1 | Vo | C2/C3(MLCC) | Lo |
|---------------------------------------|------------------|------|-------------|-------|
| Vin ≥ 28VDC Time required addition | 10uF/50V MLCC | 3.3V | 22uF/10V | 4.7uH |
| | | 5.0V | 22uF/10V | |
| | | 9.0V | 22uF/16V | |
| | | 12V | 22uF/25V | |
| | | 15V | 22uF/25V | |

Table (1)

2、 EMC Recommended circuit:

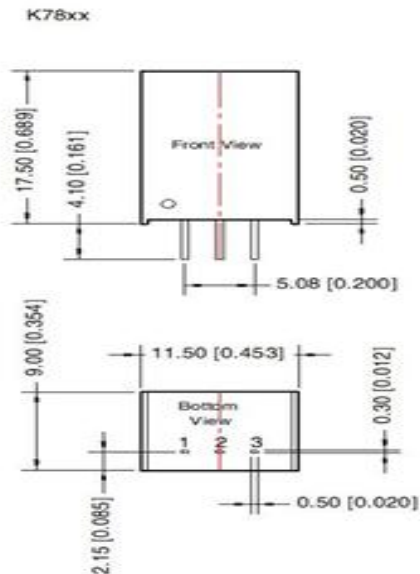


| FUSE | Select according to the actual current | C01 | 4.7uF/50V MLCC |
|------|--|-------|----------------|
| MOV | 20D470K | L2 | 10mH |
| L1 | 300uH | C1/C2 | Table (1) |
| C0 | 470uF/50V | | |

Appearance size and pin function

11.75

9.1



| Pin-Out | | |
|---------|-----------------|-----------------|
| Pin | Positive Output | Negative Output |
| 1 | V _{in} | V _{in} |
| 2 | GND | -V _o |
| 3 | +V _o | GND |

Note:

Unit: mm[inch]

Pin diameter tolerances: ± 0.10 [± 0.004]

General tolerances: ± 0.50 [± 0.020]

Note:

1. For our specific packaging information, please refer to "Dexu Product Shipping Packaging Instructions";
2. If the working load of the product is lower than the minimum load requirements, we cannot guarantee that the product performance can meet all performance indicators;
3. The maximum capacitive load is tested in the input voltage range and under full load conditions;
4. Unless otherwise specified, all indicators in this manual are measured at $T_a=25^{\circ}\text{C}$, humidity $<75\%\text{RH}$, nominal input voltage and rated output load;
5. All index test methods in this manual are based on the company's enterprise standards;
6. Our company can provide product customization, specific circumstances can directly contact our technical personnel;
7. Products related to laws and regulations: see "Product Characteristics", "EMC characteristics";
8. Our products shall be classified and stored in accordance with ISO14001 and relevant environmental laws and regulations after scrapping, and handed over to qualified units.