K78-500 series DataSheet

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

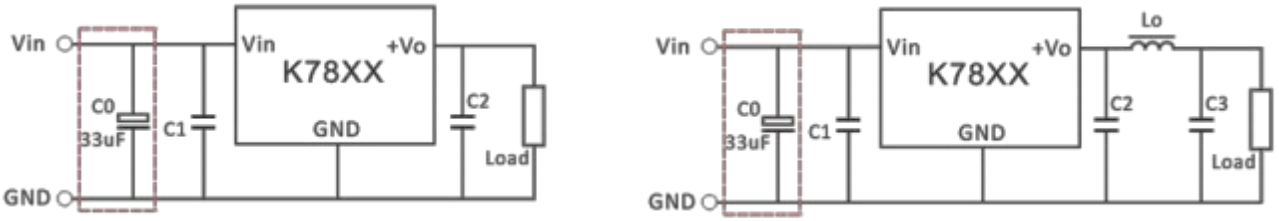
- Wide input voltage range: 4.5-36VDC
- High conversion efficiency (up to 96%), low no-load current: 0.2mA(typ)
- Pin-compatible with LM78xx series three-terminal linear regulators
- Output short-circuit protection (self-recovery)
- Operating temperature: -40℃~+85℃

This series module power supply is a three-end switching regulator, which has high efficiency, low loss, low heatoutput, no need to add heat sink, and can work stably and reliably. It makes up for the defects of low efficiencyand large heat output of the previous three-terminal linear voltage regulator, and is the perfect substitute for thecurrent three-terminal linear voltage regulator, which should be widely used in industrial control system powersupply, 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)
K7803-500R3	4.5-30V (24)	3.3V	500mA	88/80	4700
K7805-500R3	6.0-36V (24)	5.0V	500mA	93/83	3300
K7809-500R3	12-36V (24)	9.0V	500mA	94/90	2000
K7812-500R3	15-36V (24)	12V	500mA	96/92	1000
K7815-500R3	18-36V (24)	15V	500mA	96/93	1000

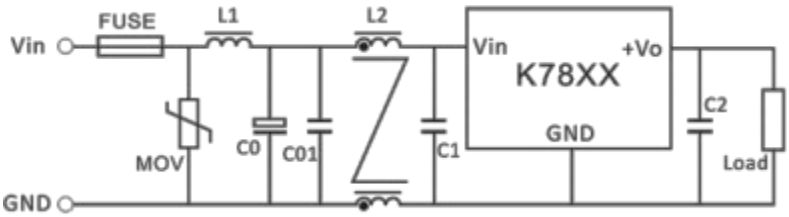
Design reference

1. Application circuit



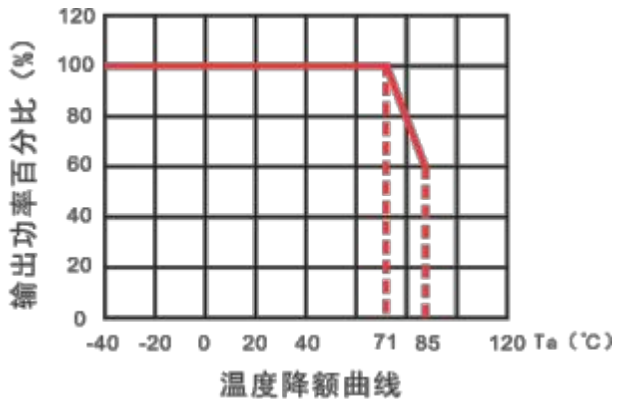
C0	C1	Vout	C2/C3(MLCC)	Vout	C2/C3(MLCC)	Vout	C2/C3(MLCC)	Lo
Vin≧30V DC Time required addition	10uF/50V MLCC	3.3V	22uF/10V	9.0V	22uF/16V	15V	22uF/25V	4.7uH
		5.0V	22uF/10V	12V	22uF/25V	--	--	

2、EMC Recommended circuit



Product characteristics					
item	Working condition	Min	Typ	Max	Unit
No load input current	24V Nominal input	--	0.2	1.0	mA
Output voltage accuracy	@100%load	-3	±1	+3	%
Linear adjustment rate	@Full load, Vin_min t o 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%change	--	80	230	mV
Dynamic recovery time	Nominal input@load 50%-75%-50%change	--	200	500	μs
Ripple & Noise	20MHz bandwidth@Vin_nom,100%load	--	45	85	mVp-p
Short circuit protection		Sustainable, self-healing			
Coefficient of temperature drift	Nominal input@100%load	--	±0.03	--	%/℃
Switching frequency	100%load@Vin_nom	1.6	--	2.4	MHz
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	--	--	KHours
Welding temperature	Hand welding	370±10℃@3～5Sec			
	Wave soldering welding	260±10℃@5～10Sec			
Hot swap		nonsupport			
Cooling mode		Natural air cooling			
Housing material		Black flame-retardant plastic housing			
weight		--	2	--	G
Dynamic recovery time	Length * width * height	11.6*7.5*10.2mm			

Characteristic curve



Product use precautions

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 supplywork steadily and reliably, it is usually necessary to add a suitable absorption capacitance in itsinput side; In some cases, the lead between the power supply and the module power supply on thecontrol board is very long, and then it is necessary to connect an external filter capacitor near theinput pin of the module power supply to achieve the effect of impedance matching. The greater theinterference noise, the longer the line, the greater the required external capacitance value. Werecommend the use of high frequency and low resistance electrolytic capacitors to meet therequirements, general application, can be selected according to the recommended value of the"Design reference chapter". Please note: During testing or use, if the input voltage will be higherthan 30V, it is necessary to connect 33uF high frequency low resistance electrolytic capacitoroutside the input end.

2, the consideration of the output filter capacitance:In the actual application circuit, the load size of the module power supply varies, usuallyaccompanied by large or small changes. In order to adapt to different use occasions and loadrequirements, and work more stably and reliably, it is necessary to add a suitable capacitor to theoutput end of the module power supply. This is mainly due to two considerations: one is to furtherreduce the output ripple and noise; On the other hand, the output capacitance is applied to furtherimprove 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 outputcapacitance, 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 modulecan not be established; In addition, the output capacitor value is too large, the power supply isprone 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 theoutput capacitor as much as possible, or use LC filter to replace the capacitor with a large capacityvalue. The maximum capacitive load in the selection list only means that the power supply can startnormally when the total capacitance of its output is within this value, which is not recommended.
For the recommended value, please see the "Design Reference chapter".

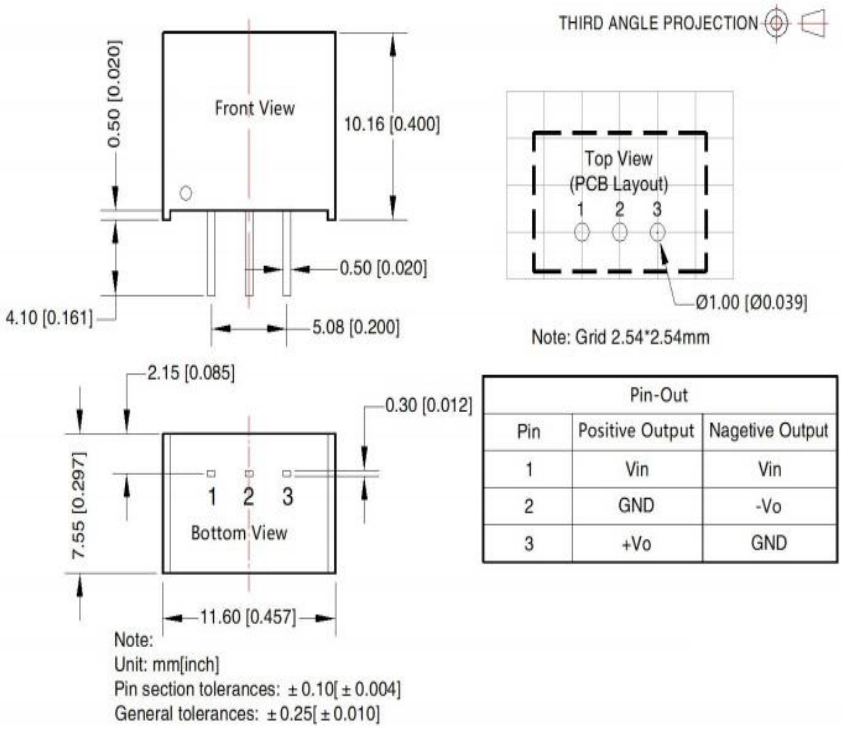
3. Prevent hot swap test or use of the power module:
The so-called hot swap usually refers to inserting the power supply of a module into the circuit orremoving it from the circuit when the power supply is not disconnected. The power supply doesnot support hot swap during use or testing. Because in the hot swap process, due to the currentmutation will produce high voltage spike, it may cause damage; In another case, a mechanicalswitch is connected in series between the power supply and the input end of the module powersupply, and the power supply is controlled on and off by the mechanical switch. In fact, themechanical switch will also produce high voltage spikes during on-off operation, which may alsocause damage to the power supply. During the test or use of the module power supply, anyoperation that will produce high voltage spikes should not be ignored. Measures should be takento prevent high voltage spikes from being directly added to the input end. For details, see "DesignReference Chapter". 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 bedamaged.

4, input high transient voltage peak protection:If the product is used in an environment with harsh electromagnetic interference, such as sharingthe power supply between the input end of the product and the inductive load, or when the currentloop of the power supply end is on/off, if not handled properly, there will be a high transient voltagespike in the power supply circuit, and this interference is not dealt with, and too high peak voltageenters the product input end. It is very likely to cause product damage. The suppression of highvoltage spikes is very important to ensure stable and reliable use of the product. Commonly usedtransient voltage suppression devices are varistor (MOV), transient voltage suppression diode(TVS) and so on. Different devices have advantages and disadvantages, please choose accordingto the use of the occasion and requirements, refer to the "Design reference chapter".

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

FUSE	MOV	L1	C0	C01	L2	C1/C2
Note Select based on the actual current	20D470K	300uH	470uF/50V	4.7uF/50V MLC C	5mH	Refer to the application circuit

Appearance size and pin function



Pin-Out		
Pin	Positive Output	Nagetive Output
1	Vin	Vin
2	GND	-Vo
3	+Vo	GND

Note:

1. For our specific packaging information, please refer to "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 Ta=25℃, humidity <75%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.