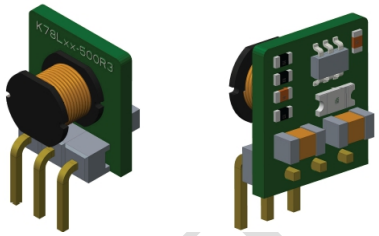
GDHUIZHI®

Characteristics

- Wide input voltage range, non-isolated regulated single-output
- Efficiency: Up to 95%
- Operating temperature range:-40℃～+85℃
- No-load input current as low as 0.2mA
- Output short-circuit protection
- Pin-compatible with the LM78xx series
- Compact SIP package, bare board

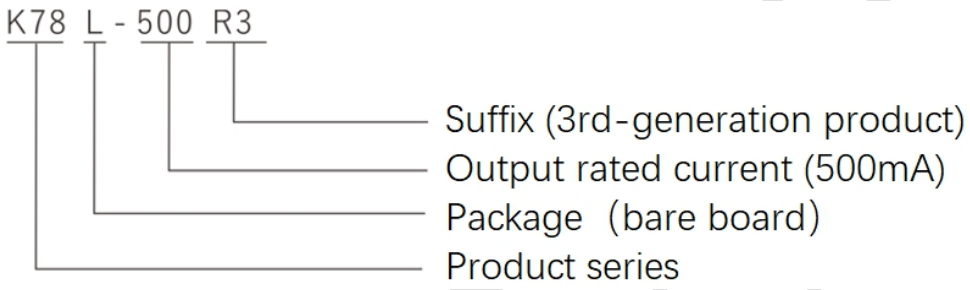
Wide-input-voltage, non-isolated, single-output DC-DC power supply module



RoHS

The K78xx-500R3 series consists of highly efficient switching regulators that serve as ideal replacements for the LM78xx series of three-terminal linear regulators. These regulators feature high efficiency, low no-load power consumption, and short-circuit protection, while requiring no external heat sink and supporting negative output. The products are widely applicable in various industries, including industrial control, power, and instrumentation.

Model Number Description



Product selection table

Certification	Model number	Input voltage range (Vdc)	Output voltage/current		Ripple and Noise	Efficiency @ Full Load
		Rated value② (Range)	Output V. (Vdc)	Output C. (mA) (Max. Min.)	Full load (mVp-p) TypMax.	% Min./ Max.
	K78L03-500R3	24 (4.75-36)	3.3	500	20/75	80/86
	K78L05-500R3	24 (6.5-36)	5	500	20/75	84/90
		12 (7-31)	-5	-300	20/75	80/81
	K78L09-500R3	24 (12-36)	9	500	20/75	86/91
	K78L12-500R3	24 (15-36)	12	500	20/75	91/94
		12 (8-24)	-12	-150	20/75	80/85
	K78L15-500R3	24 (19-36)	15	500	20/75	93/95
		12 (8-21)	-15	-150	20/75	85/87

Note: 1. Due to space limitations, the above is only a list of representative products. For products not included in this list, please contact our sales department.

2. When the input voltage exceeds 30 VDC, a 22μF/50V electrolytic capacitor must be connected to the input terminal to prevent damage to the module caused by voltage spikes.

Test Conditions: unless otherwise specified, all parameter measurements were taken at the rated input voltage, with a purely resistive rated load, and at an ambient temperature of 25° C.

Input Characteristics

Items	Operating Conditions	Min.	Typ.	Max.	Unit
No-load input current (full load/no-load)	Positive output	--	0.2	1.5	mA
Reverse input		Prohibited			mA
Input filter type (Isec.max)		Capacitive filtering			VDC
Hot swap		Not supported			

Output Characteristics

Items	Operating and Test Conditions		Min.	Typ.	Max.	Unit
Output voltage accuracy	Full load, input voltage range	3.3V output	--	±2	±4	%
		other models	--	±2	±3	%
Linear adjustment rate	Full load, input voltage range		--	±0.2	±0.4	%
Load adjustment rate	10%~100% load	3.3/5VDC output	--	±0.6	--	%
		other models	--	±0.3	--	%
Ripple & Noise	Pure resistive load, 20 MHz bandwidth, peak-to-peak, 10%-100% load		--	20	75	mVp-p
Temperature drift coefficient	Operating temperature -40° C to +85° C		--	--	±0.03	%/° C
Transient response deviation	Rated input voltage, 25% load step change		--	50	250	mVp-p
During transient recovery			--	0.2	1	ms
Output short-circuit protection			Long-term short circuit, automatic recovery			-

Note: ① The test method for ripple and noise is the twisted-pair test method.

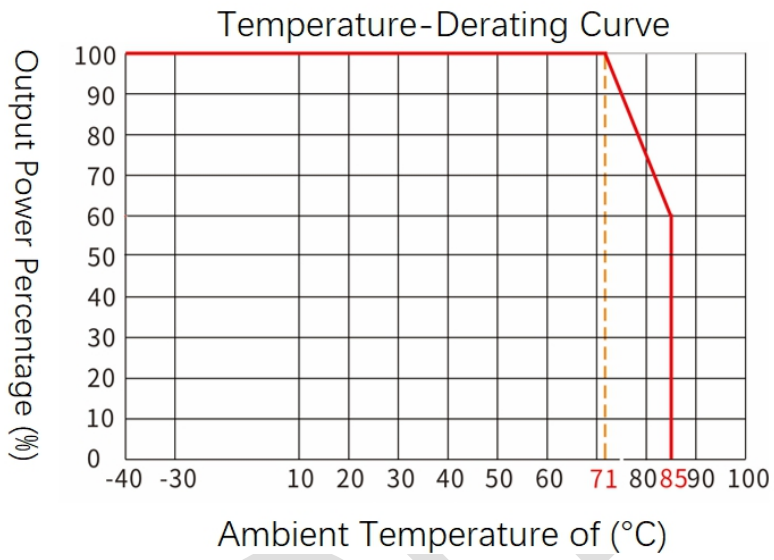
② At loads below 10%, the maximum ripple and noise for the 3.3V/5V outputs is 150 mVp-p, and for the 9V/12V/15V outputs, it is 2% of the output voltage (Vo).

General Characteristics

Items	Operating Conditions	Min.	Typ.	Max.	单位
Operating temperature	Use the reference temperature derating curve	-40	--	+85	℃
Storage temperature		-55	--	+125	
Temperature rise of the housing during operation		--	25	--	

Storage humidity	No condensation	5	--	95	%RH
Pin soldering temperature resistance	The solder joint is 1.5 mm from the housing, 10 seconds (max.)	--	--	+260	℃
Switching frequency	Full load, rated voltage input	--	650	--	KHz
Vibration		10-55Hz, 10G, 30 Min. along X, Y and Z			
Housing material		Black flame-retardant heat-resistant plastic (UL94 V-0)			
Package size	10.0x7.2x11.0mm				
Weight	1.0g (Typ.)				
Cooling method	Natural cooling				
Minimum mean time between failures	MIL-HDBK-217F@25℃	2000	--	--	KHrs

Product Characteristics Curve



Typical Application Reference Circuit (Recommended Parameters)

1. Common Applications:

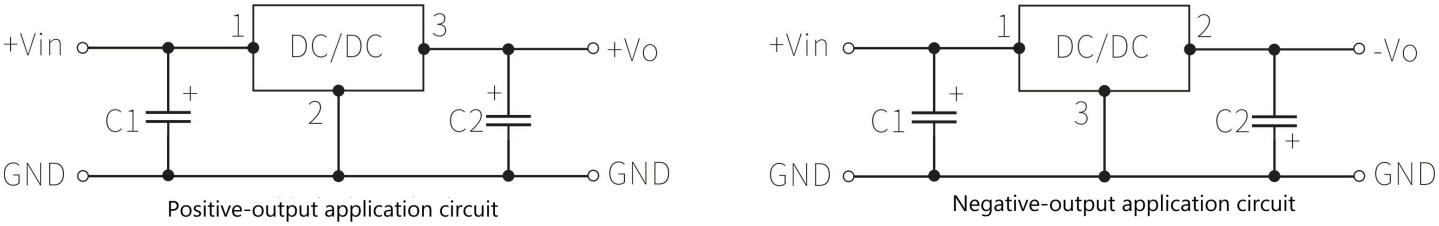


Figure 1: Typical Application Circuit

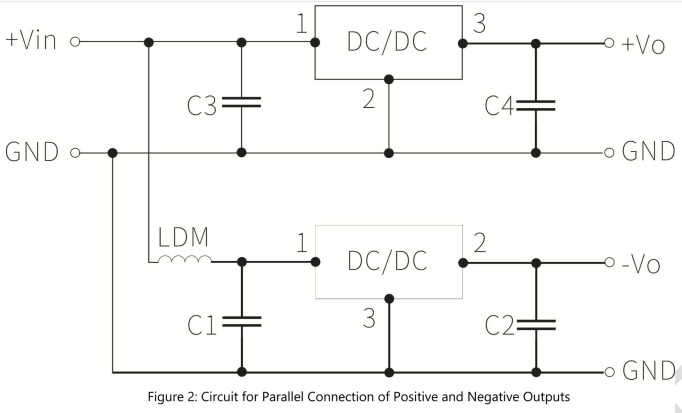


Figure 2: Circuit for Parallel Connection of Positive and Negative Outputs

Table 1

Model No.	C1/C3 (Ceramic capacitor)	C2/C4 (Ceramic capacitor)
K78L03-500R3	10uF/50V	22uF/10V
K78L05-500R3		22uF/10V
K78L09-500R3		22uF/16V
K78L12-500R3		22uF/25V
K78L15-500R3		22uF/25V

Note:

1. Under normal circumstances, external capacitors C1 and C2 (C3 and C4) should be connected based on the product's operating environment, and these capacitors should be placed close to the product's pins;
2. For the capacitance values of C1 and C2 (C3 and C4) refer to Table 1; these values may be increased as needed, and low-ESR tantalum or electrolytic capacitors may be used;
3. When the product is used in the application circuit shown in Figure 2, it is recommended to add an inductor LDM to reduce mutual interference between products; the recommended value for LDM is 10μH;
4. This product does not support hot-swapping, and the output terminals must not be used in parallel;
5. If further reduction of output ripple is required, an external "LC" filter network can be added to the output terminals. The recommended value for L is 10μH-47μH, and the recommended value for C5 is 22μF, as shown in Figure 3.

Figure 3: "LC" Filter Application Circuit

2. Recommended EMC Circuits

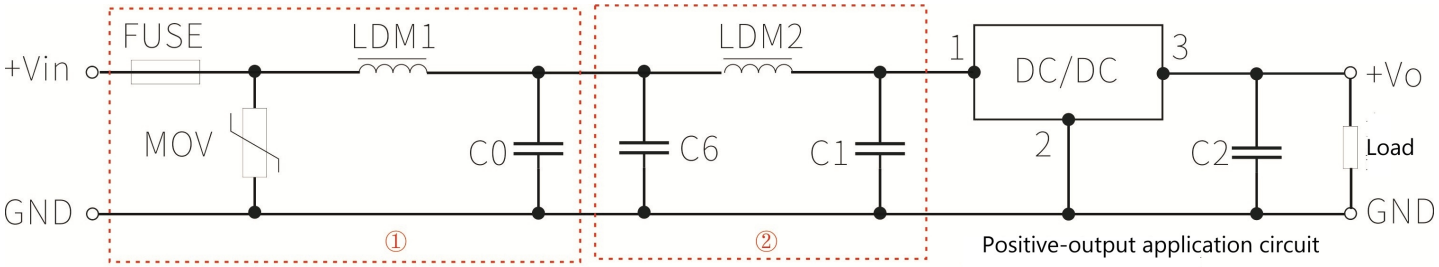
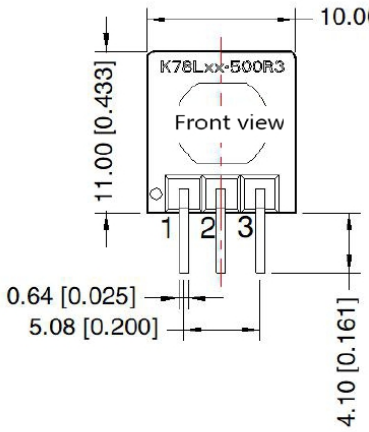


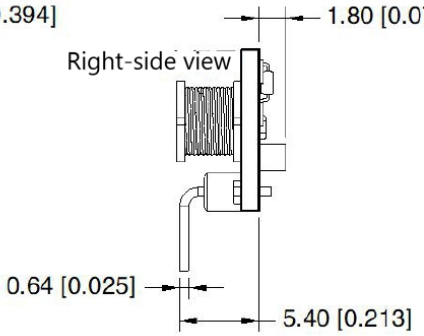
Figure 4: EMC Recommended Application Circuit

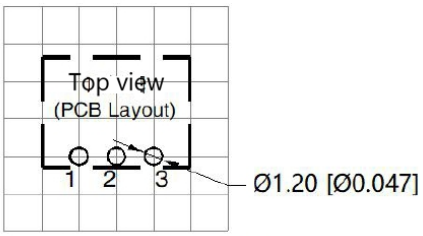
FUSE	MOV	LDM1	Co	C1/C2	C6	LDM2
Select based on the customer's actual input current	20D470K	82uH	680uF/50V	参照表 1	4.7Uf/50V	12uH

Note: Part ① in Figure 4 is used for EMS testing; Part ② is used for EMI testing. The appropriate circuit can be selected based on requirements.

Product Dimensions and Pin Assignment, Recommended PCB Layout







Note: Grid spacing 2.54*2.54mm

Note:
Size unit： mm[inch]
Pin cross-sectional tolerance： ±0.10[±0.004]
Unspecified tolerances： ±0.50[±0.020]

Pin configuration		
Pin	+ output	- output
1	Vin	Vin
2	GND	-Vo
3	+Vo	GND

*Note: If the pin definitions of the power module differ from those in the selection guide, refer to the labels on the actual unit.

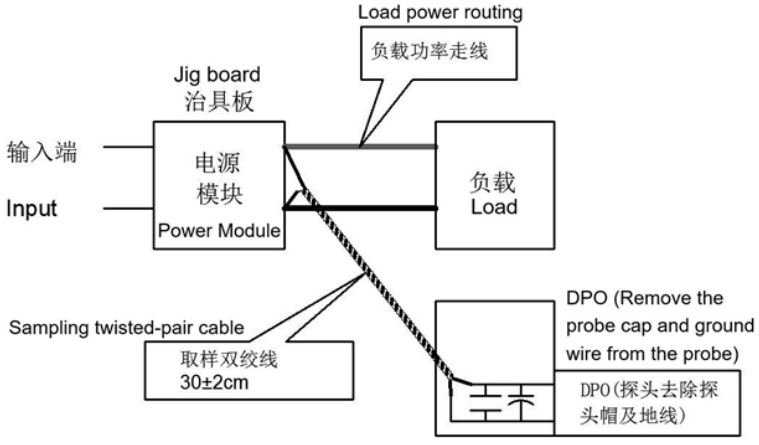
Test Application Reference

Ripple & Noise Testing: (Twisted-pair Method, 20 MHz Bandwidth) Test Method:

1. For ripple and noise testing, use a 12-gauge twisted-pair cable. Set the oscilloscope bandwidth to 20 MHz and use a 100 MHz bandwidth probe. Connect a 0.1μF polypropylene capacitor and a 4.7μF high-frequency, low-impedance electrolytic capacitor in parallel at the probe tip. Set the oscilloscope to “Sample” mode.

2. Output Ripple Noise Test Diagram:

Connect the power supply input to the input power source. Connect the power supply output to the electronic load via the fixture board. For testing, use a 30 cm ± 2 cm sampling lead to take a direct sample from the power supply output port. Select insulated wires with appropriate gauge based on the magnitude of the output current.



Precautions for Product Use

1. Input Requirements: Ensure that the output voltage fluctuation range of the power supply does not exceed the input requirements of the DC/DC module itself; the output power of the input power supply must be greater than the output power of the DC/DC module;

2. The capacitance of the external capacitor connected to the output should not be too large, otherwise it may cause overcurrent or poor startup of the module;

3. Maximum capacitive load values are tested within the input voltage range and under full-load conditions;

4. Unless otherwise specified, all specifications in this manual are measured at Ta=25° C, humidity <75% RH, nominal input voltage, and rated output load;

5. All test methods for the specifications in this manual are based on our company's standards;

6. We offer product customization; please contact our technical staff directly for details;

7. Product specifications are subject to change without notice.

Contact

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