

# DC/DC Converter

K78UXX-500R3 (L) Series

MORNSUN®

Wide input voltage non-isolated and regulated single output

## FEATURES



CE Patent Protection RoHS

EN 62368-1

- Input voltage range up to 10:1
- High efficiency up to 93%
- No-load input current as low as 1.5 mA
- Operating ambient temperature range: -40°C to 85°C
- Output short-circuit protection
- Pin compatible with K78XX series
- International standard pin package

K78Uxx-500R3(L) series are high efficiency switching regulators. The converters feature high efficiency, low loss and short-circuit protection in a compact DFN package. These products are widely used in applications such as industrial control, instrumentation and electric power.

## Selection Guide

Certification	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Typ. Vin Min./Vin Max.	Capacitive Load (µF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
EN	K78U03-500R3 (L)	48 (9-90)	3.3	500	82/69	100
	K78U05-500R3 (L)	48 (9-90)	5	500	87/75	
	K78UX6-500R3 (L)	48 (9-90)	6.5	500	91/78	
	K78U09-500R3 (L)	48 (14-90)	9	500	91/80	
	K78U12-500R3 (L)	48 (18-90)	12	500	91/83	
	K78U15-500R3 (L)	48 (20-90)	15	500	93/84	
	K78U24-300R3 (L)	48 (36-90)	24	300	93/85	

Note: \* For input voltage exceeding 80 VDC, an input capacitor of 22µF/100V is required.

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Nominal input voltage	--	--	1.5	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Voltage Accuracy	10%-100%, input voltage range	3.3V output	--	±3.5	±4.5	
		Others	--	±2	±3	
Linear Regulation	Full load, input voltage range	K78U03/05/X6-500R3	--	±0.6	±1.5	%
		K78U09/12/15-500R3	-	±0.6	±2.0	
		K78U24-300R3	-	±1.2	±2.5	
Load Regulation	Nominal input voltage, 10% -100% load	--	±1.0	±2.0		
Ripple & Noise*	20MHz bandwidth, nominal input voltage, full load	--	40	80	mVp-p	
Temperature Coefficient	Operating temperature -40°C to +85°C	--	--	±0.03	%/°C	

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Transient Response Deviation	Nominal input voltage, 25% load step change	--	±0.4	±1.5	%
Transient Recovery Time	Nominal input voltage, 25% load step change	--	0.2	1	ms
Short-circuit Protection	Nominal input voltage	Continuous, self-recovery			

Note: \* The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;

### General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1, Fig.2.	-40	--	+85	°C
Storage Temperature		-55	--	+125	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Storage Humidity	Non-condensing	5	--	95	%RH
Switching Frequency*	Full load, nominal input voltage	--	300	--	kHz
MTBF	MIL-HDBK-217F@25°C	2000	--	--	k hours

Note: \*Different output voltage with different switching frequency.

### Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)				
Dimensions	K78U-500R3 / K78U24-300R3	11.50 x 9.00 x 17.50 mm			
	K78U-500R3L / K78U24-300R3L	19.00 x 11.50 x 9.00 mm			
Weight	3.8g(typ.)				
Cooling Method	Free air convection				

### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 6-② for recommended circuit)		
	RE	CISPR32/EN55032 CLASS B (see Fig. 6-② for recommended circuit)		
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4kV	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria B
	EFT	IEC/EN 61000-4-4	100kHz ±1kV (see Fig. 6-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line ±1kV (see Fig. 6-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria B

### Typical Characteristic Curves

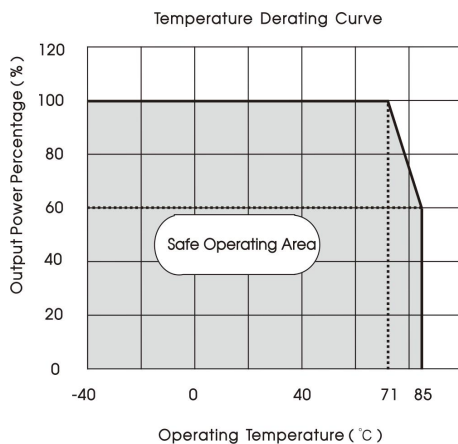


Fig.1 K78UXX-500R3(L)  
K78U24-300R3(L) (Vin=36V~60V)

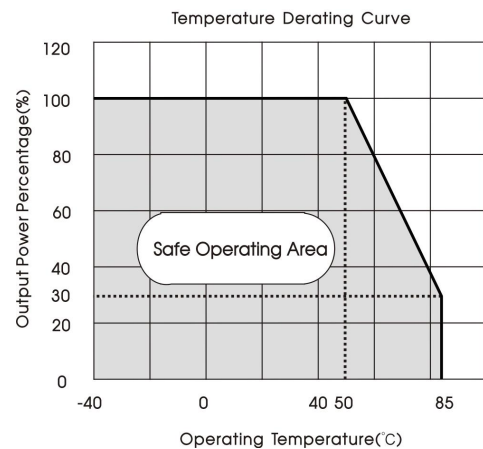


Fig.2 K78U24-300R3(L) (Vin≥60V)

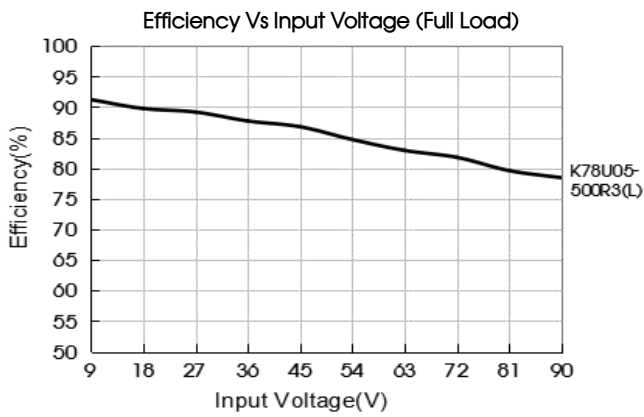


Fig.3

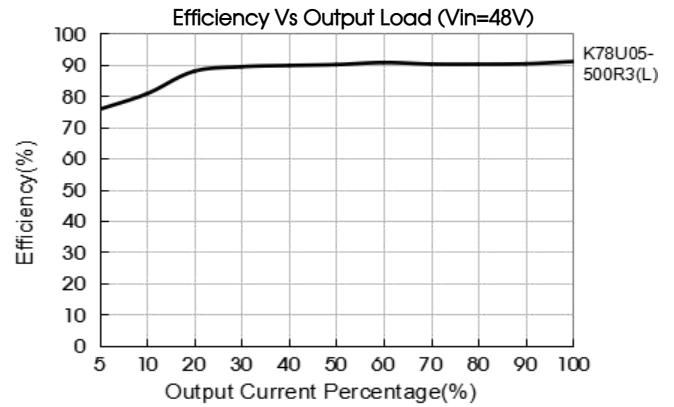


Fig.4

## Design Reference

### 1. Typical application

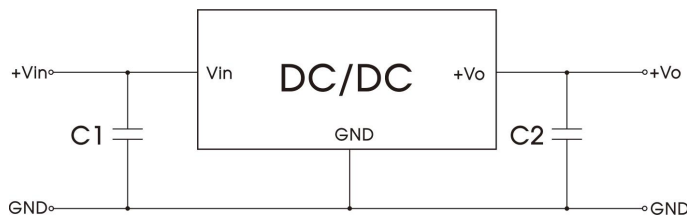


Fig. 5

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K78U03-500R3 (L)	10μF/100V	22μF/10V
K78U05-500R3 (L)		22μF/10V
K78UX6-500R3 (L)		22μF/10V
K78U09-500R3 (L)		22μF/16V
K78U12-500R3 (L)		22μF/25V
K78U15-500R3 (L)		22μF/25V
K78U24-300R3 (L)		10μF/50V

Table 1

Notes:

- The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
- Refer to Table 1 for C1 and C2 capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
- Converter cannot be used for hot swap and with output in parallel.

### 2. EMC compliance circuit

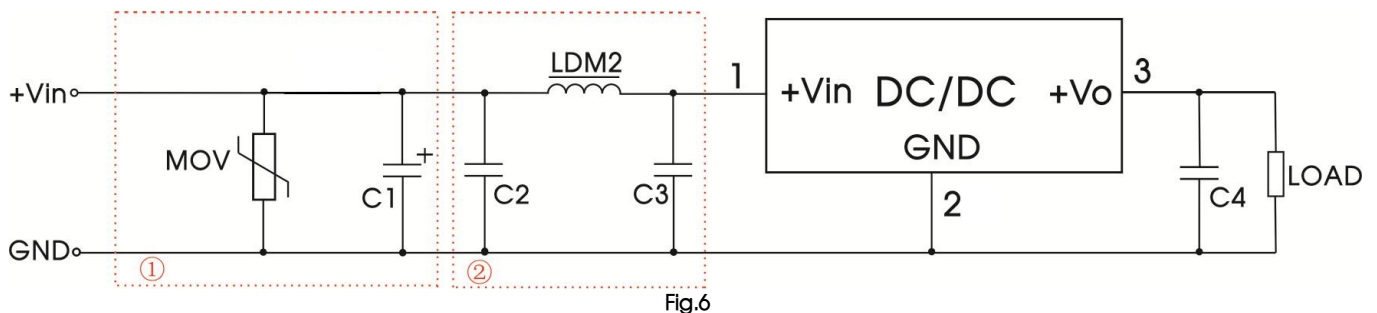


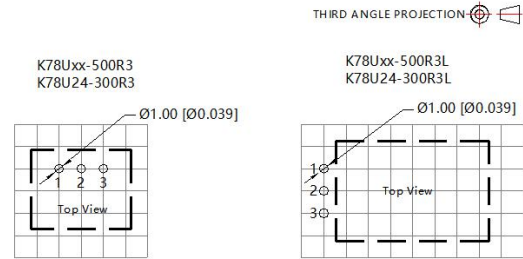
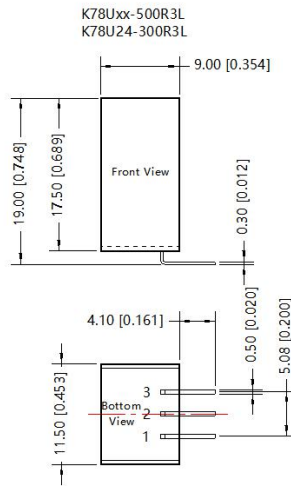
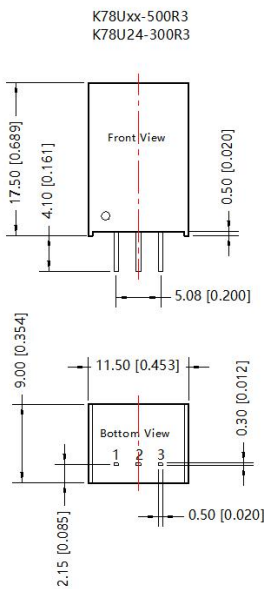
Fig.6

Part No.	MOV	C1	C2	LDM2	C3	C4
K78UXX-500R3(L)	S20K30	680μF /100V	4.7μF/100V	120μH	4.7μF/100V	10μF/50V

Table.2

3. For additional information please refer to DC-DC converter application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



Note: Grid 2.54\*2.54mm

Pin-Out	
Pin	Function
1	Vin
2	GND
3	+Vo

Note:  
Unit: mm[inch]  
Pin diameter tolerances:  $\pm 0.10[\pm 0.004]$   
General tolerances:  $\pm 0.50[\pm 0.020]$

Notes:

1. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Tape/Reel packaging bag number: 58210021(K78UXX-500R3, K78U24-300R3); 58210027(K78U-500R3L, K78U24-300R3L);
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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