

# Datasheet

## RS Pro K78xx-500R3 DC-DC Converter

Wide input voltage non-isolated and regulated single output.

### FEATURES

- High efficiency up to 95%
- No-load input current as low as 0.2mA
- Operating ambient temperature range -40°C ~ +85°C
- Output short-circuit protection
- Pin-out compatible with LM78XX linear regulators
- IEC60950, UL60950, EN60950 approved
- 3 Year Warranty



*K78xx-500R3 series are high efficiency switching regulators and ideal substitutes for LM78xx series three-terminal linear regulators. The converters feature high efficiency, low loss, short circuit protection, positive output voltage and there is no need for a heat sink. These products are widely used in applications such as industrial control, instrumentation and IoT.*

### Selection Guide

Certification	RS Stock no. (Standard Pack)	RS Stock no. (Tube Pack 43)	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Vin Min. / Vin Max.	Max. Capacitive Load (µF)
				Nominal (Range)	Voltage (VDC)	Output Current (mA)		
UL/CE/CB	1933974	1933972	K7803-500R3	24 (4.75-36)	3.3	500	86/80	680
	1933976	1933975	K7805-500R3	24 (6.5-36)	5.0	500	90/84	680
	1933978	1933977	K7809-500R3	24 (12-36)	9	500	93/90	680
	1933980	1933979	K7812-500R3	24 (15-36)	12	500	94/91	680
	1933982	1933981	K7815-500R3	24 (19-36)	15	500	95/93	680

\* Note: For input voltages exceeding 30 VDC, an input capacitor of 22µF/50V is required.

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### Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Positive output	--	0.2	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	Full load, input voltage range				
	K7803-500R3	--	±2	±4	
	Others	--	±2	±3	
Linear Regulation	Full load, input voltage range	--	±0.2	±0.4	%
Load Regulation	Nominal input voltage, 10% -100% load				
	3.3/5 VDC output	--	±0.6	--	
	Others	--	±0.3	--	
Ripple & Noise*	20MHz bandwidth, nominal input voltage, 10% -100% load	--	20	75	mVp-p
Temperature Coefficient	Operating ambient temperature -40°C ~ +85°C	--	--	±0.03	%/°C
Transient Response Deviation	Nominal input voltage, 25% load step change	--	50	250	mV
Transient Recovery Time		--	0.2	1	ms
Short-circuit Protection	Nominal input voltage	Continuous, self-recovery			

\*Note:

① The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;

② With light loads at or below 10%, Ripple & Noise for 3.3V/5V output parts increases to 150mVp-p max, and for 9V/12V/15V output parts to 2%Vo max.

### General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1	-40	--	+85	°C
Storage Temperature		-55	--	+125	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+260	
Storage Humidity	Non-condensing	5	--	95	%RH
Switching Frequency	Full load, nominal input voltage	550	--	850	KHz
MTBF	MIL-HDBK-217F@25°C	2000	--	--	K hours

### Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	11.60 x 7.55 x 10.16 mm
Weight	1.8g (Typ.)
Cooling Method	Free air convection

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### Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B (see Fig. 5-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 5-② for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2	Contact $\pm 4\text{KV}$	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	$\pm 1\text{KV}$ (see Fig. 5-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line $\pm 1\text{KV}$ (see Fig. 5-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A

### Typical Characteristic Curves

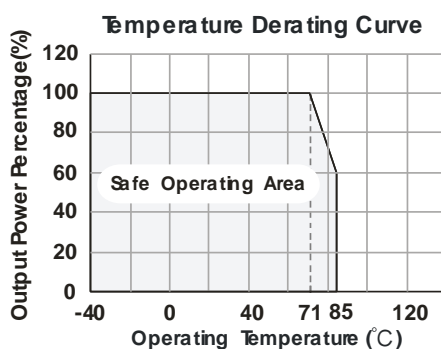
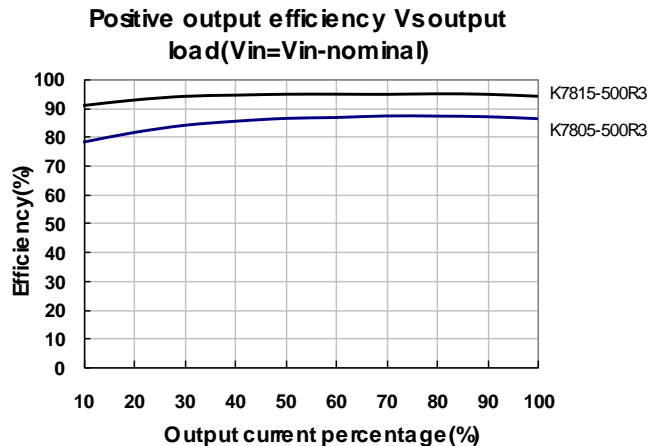
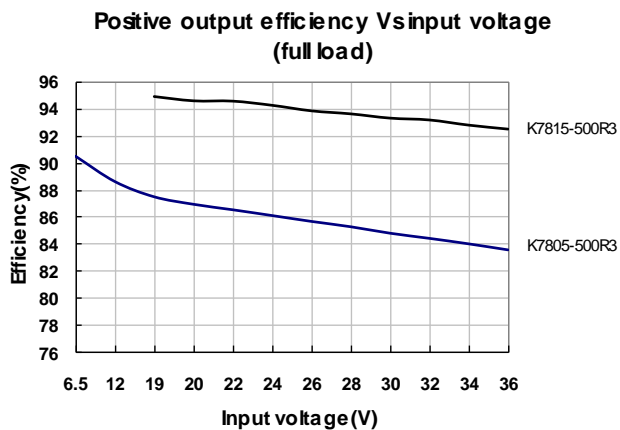


Fig. 1



# DC/DC Converter

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### Design Reference

#### 1. Typical application

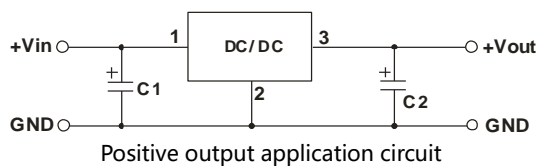
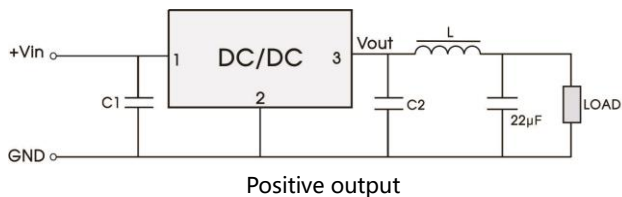


table 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K7803-500R3	10 $\mu$ F/50V	22 $\mu$ F/10V
K7805-500R3		22 $\mu$ F/10V
K7809-500R3		22 $\mu$ F/16V
K7812-500R3		22 $\mu$ F/25V
K7815-500R3		22 $\mu$ F/25V

Fig. 2 Typical application circuit

- Note:
1. The required capacitors C1 and C2 (C3 and C4) must be connected as close as possible to the terminals of the module;
  2. Refer to Table 1 for C1 and C2 (C3 and C4) capacitor values. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
  3. When using configurations as shown in figure 3, we recommended to add an inductor (LDM) with a value of up to 10 $\mu$ H which helps reducing mutual interference;
  4. Converter cannot be used for hot swap and with output in parallel;
  5. To further reduce the output ripple and noise, we suggested the use of a "LC" filter at the output terminals, with an inductor value (L) of 10 $\mu$ H-47 $\mu$ H.



Negative output

Fig. 4 Using the "LC" output filter application

#### 2. EMC compliance circuit

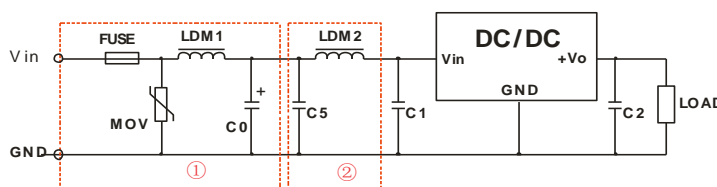


Fig. 5 EMC compliance circuit

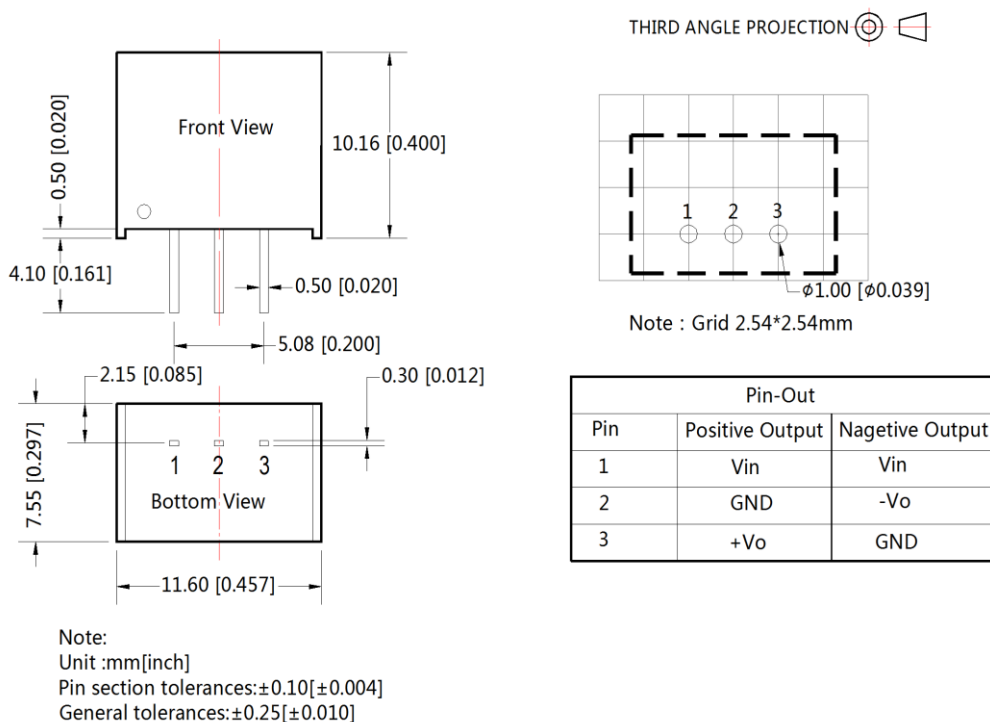
FUSE	MOV	LDM1	C0	C1/C2	C5	LDM2
Select fuse value according to actual input current	S20K30	82 $\mu$ H	680 $\mu$ F /50V	Refer to table 1	4.7 $\mu$ F /50V	12 $\mu$ H

Note: Part ① in Fig. 5 shows EMS compliance filter and part ② filter for EMI compliance; depending on requirement both filters ① and ② can be used in series as shown.

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## Dimensions and Recommended Layout



### Notes:

1. The specified maximum capacitive load is tested under full load condition and over the input voltage range;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^{\circ}\text{C}$ , humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information; Products are related to laws and regulations: see "Features" and "EMC";
5. Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.