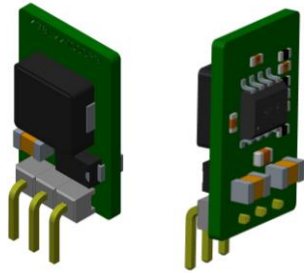


## Datasheet

# RS Pro K78Lxx-1000R3 DC-DC Converter

Wide input voltage non-isolated and regulated single output.



## Features

- High efficiency up to 96%
- No-load input current as low as 0.1mA
- Operating ambient temperature range -40°C to +85°C
- Output short-circuit protection
- Pin-out compatible with LM78XX linear regulators
- IEC60950, UL60950, EN60950 approved
- 3 Year Warranty

*K78Lxx-1000R3 series switching regulators are drop in replacements for LM78xx series three-terminal linear regulators. The high efficiency of these converters allows operation at full load without the need for a heat sink. With low ripple and standby power consumption these regulated converters are widely used in instrumentation, IoT and battery powered applications.*

## Selection Guide

Certification	RS Stock no. (Standard Pack)	RS Stock no. (Tray Pack)	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Vin Min. / Vin Max.	Capacitive Load (µF) Max.
				Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
UL/CE/CB	1933996	1933995	K78L03-1000R3	24 (6-36)	3.3	1000	89/80	680
	1933998	1933997	K78L05-1000R3	24 (8-36)	5	1000	93/86	680
	1934000	1933999	K78L12-1000R3	24 (16-36)	12	1000	95/92	680

Note: \* For input voltage exceeding 30 VDC, an input electrolytic capacitor of 22µF/50V is required to prevent the module from being damaged by voltage spikes.

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Positive output	--	0.1	1	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		PI filter			

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### Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Voltage Accuracy	Full load, input voltage range	K78L03-1000R3	--	±2	±4	%
		Others	--	±2	±3	
Linear Regulation	Full load, input voltage range	--	±0.2	±0.4		
Load Regulation	Nominal input, 10% -100% load	--	±0.4	±0.6		
Ripple & Noise <sup>①</sup>	20MHz bandwidth, nominal input, 20% -100% load	--	20	75	mVp-p	
Temperature Coefficient	Operating ambient temperature -40°C ~ +85°C	--	--	±0.03	%/°C	
Transient Response Deviation	Nominal input, 25% load step change	--	50	300	mV	
Transient Recovery Time		--	0.1	1	ms	
Short-circuit Protection	Nominal input	Continuous, self-recovery				

Notes:  
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 the load lower than 20%, the maximum ripple and noise of 3.3V/5V output products will be 100mVp-p, 12V/15V output products will be 2%Vo.

### General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Operating Temperature	Derating when operating temperature $\geq 71^\circ\text{C}$ (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	K78L03-1000R3/K78L05-100R3	420	520	620	KHz
		Others	580	680	780	
MTBF	MIL-HDBK-217F@25°C	2000	--	--	K hours	

### Mechanical Specifications

Dimensions	11.50mm x 7.50mm x 17.50mm
Weight	2.1g (Typ.)
Cooling Method	Free air convection

### Electromagnetic Compatibility (EMC)

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

# DC/DC Converter

K78Lxx-1000R3 Series

## Typical Characteristic Curves

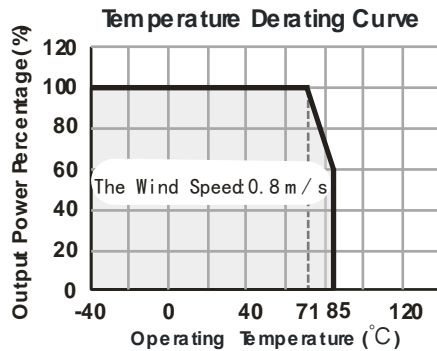
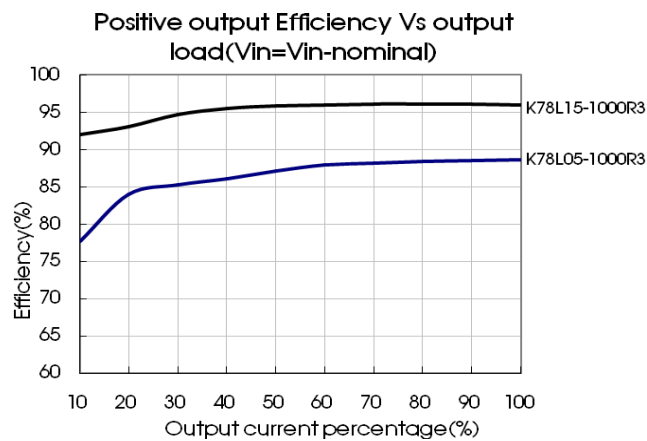
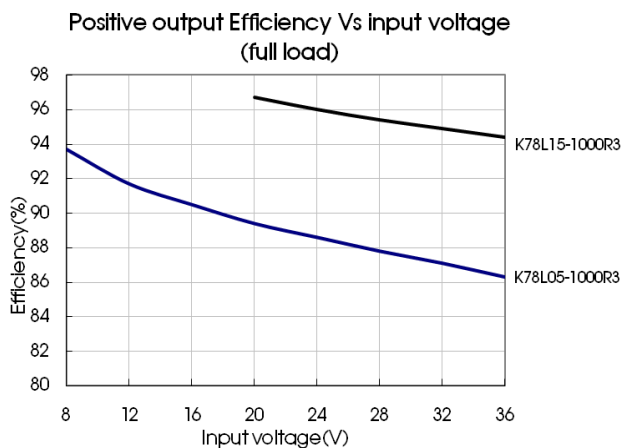


Fig. 1



## Design Reference

### 1. Typical application

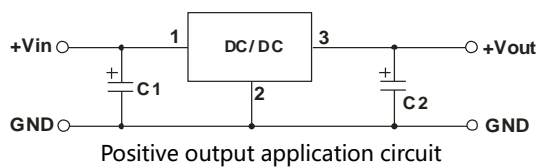


Fig.2. Typical application Circuit

Table 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K78L03-1000R3	10μF/50V	22μF/10V
K78L05-1000R3		22μF/10V
K78L12-1000R3		22μF/25V
K78L15-1000R3		22μF/25V

- Note:
1. The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
  2. Refer to Table 1 for C1 and C2 capacitor values;
  3. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead;
  4. When using configurations as shown in figure 3, we recommended to add an inductor (LDM) with a value of up to 10μH which helps reducing mutual interference;
  5. Converter cannot be used for hot swap and with output in parallel.

# DC/DC Converter

## K78Lxx-1000R3 Series

### 2. EMC compliance circuit

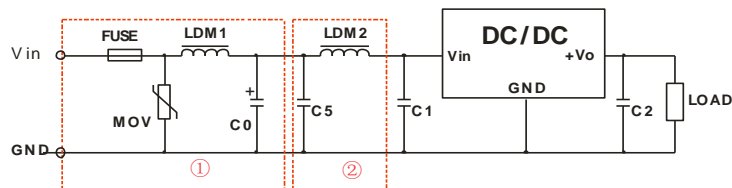
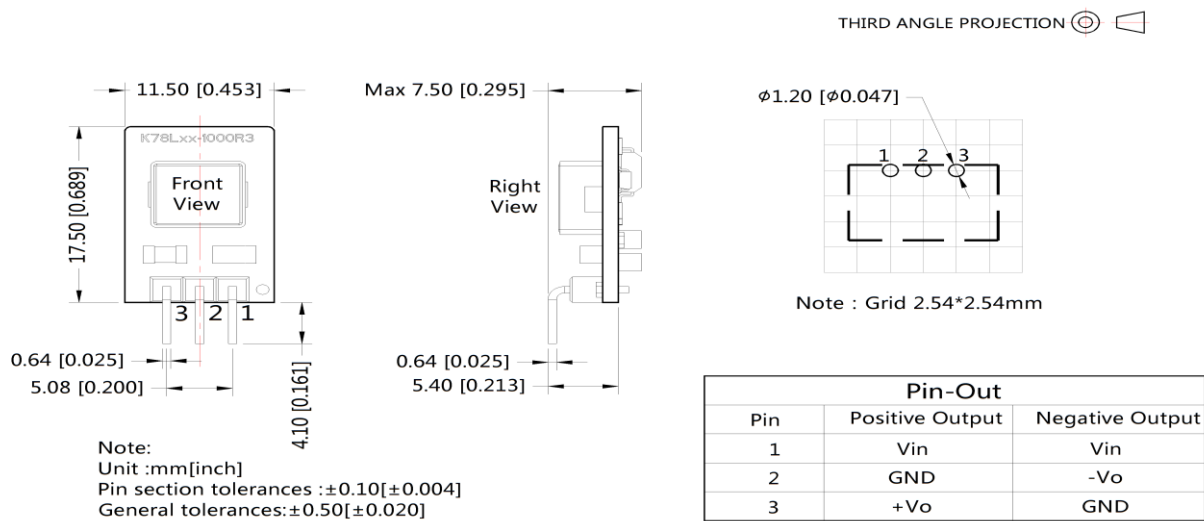


Fig.4 Recommended compliance circuit

FUSE	MOV	LDM1	C0	C1/C2	C5	LDM2
Selected fuse value according to actual input current	S20K30	82μH	680μF /50V	Refer to table 1	4.7μF /50V	12μH

Note: For EMC tests we use Part ① in Fig. 4 for immunity and part ② for emissions test. Selecting based on needs.

## Dimensions and Recommended Layout



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 Ta=25°C, humidity<75%RH with nominal input voltage and rated output load;
3. All index testing methods in this data table are based on our company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. Our products shall be classified according to ISO14001 and related environmental laws and regulations and shall be handled by qualified units.