

## Datasheet

# RS Pro K78xxM-1000R3 DC-DC Converter

Wide input voltage non-isolated and regulated single output.



**CE** RoHS

## FEATURES

- High efficiency up to 96%
- No-load input current as low as 0.3mA
- Operating ambient temperature range -40°C to +85°C
- Output short-circuit protection
- Pin-out compatible with LM78XX linear regulators
- EN62368 Approval
- 3 Year Warranty

*K78xxM-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. (Tube Pack 43)	Part No.	Input Voltage (VDC)*	Output		Full Load Efficiency (%) Vin Min. / Vin Max.	Max. Capacitive Load (µF)
				Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
CE	1934002	1934001	K7803M-1000R3	24 (6-36)	3.3	1000	90/80	680
	1934004	1934003	K7805M-1000R3	24 (8-36)	5	1000	93/85	680
	1934006	1934005	K78X6M-1000R3	24 (10-36)	6.5	1000	93/85	680
	1934008	1934007	K7809M-1000R3	24 (13-36)	9	1000	94/89	680
	1934010	1934009	K7812M-1000R3	24 (16-36)	12	1000	95/92	680

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

\*K78X6M-1000R3 is under development

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Positive output	--	0.3	1	mA
	Negative output	--	1	4	
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			

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### Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	K7803M-1000R3	--	±2	±4	
		Others	--	±1.5	±3	
Linear Regulation	Full load, input voltage range		--	±0.2	±0.4	%
Load Regulation	Nominal input, 10% -100% load	Positive output	--	±0.4	±0.6	
Ripple & Noise*	20MHz bandwidth, nominal input, 20% -100% load		--	25	75	mVp-p
Temperature Coefficient	100% load		--	--	±0.03	%/°C
Transient Response Deviation	Nominal input voltage, 25% load step change		--	±60	±200	mV
Transient Recovery Time				--	--	1
Short-circuit Protection	Nominal input		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 20%, Ripple and Noise for 3.3V/ 5V output parts increases to 100mVp-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	--	--	95	%RH
Switching Frequency	Full load, nominal input	--	520	--	KHz
MTBF	MIL-HDBK-217F@25°C	2000	--	--	K hours

Note:  
When  $V_{in} > 30V$ , for positive output of 9V/12V/15V, product start to derating from temperature  $\geq 55^{\circ}C$  and derating to 40%Io if the temperature is  $85^{\circ}C$ .

### Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	11.60 × 8.00 × 10.40 mm
Weight	1.9g (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 ±4KV	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	±1KV (see Fig. 4-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line ±1KV(see Fig. 4-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A

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## Typical Characteristic Curves

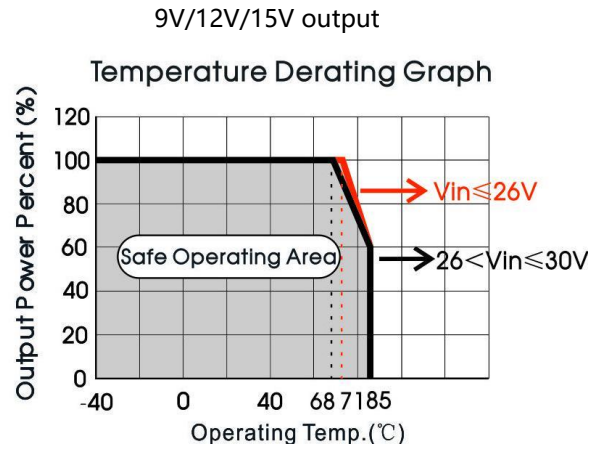
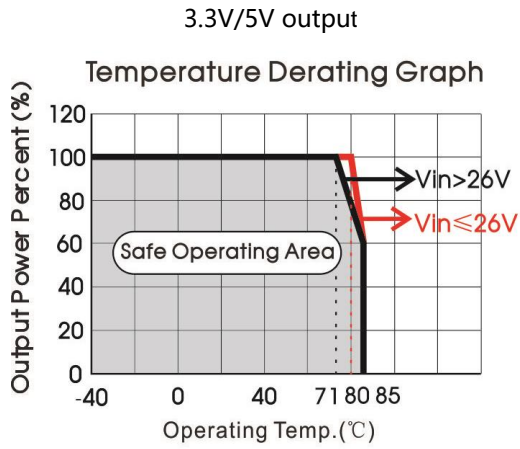
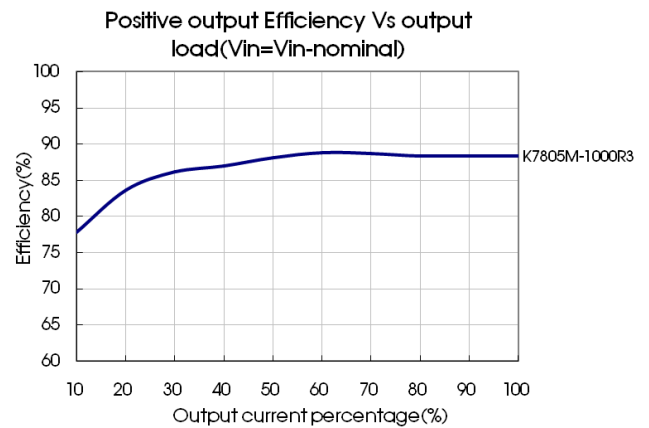
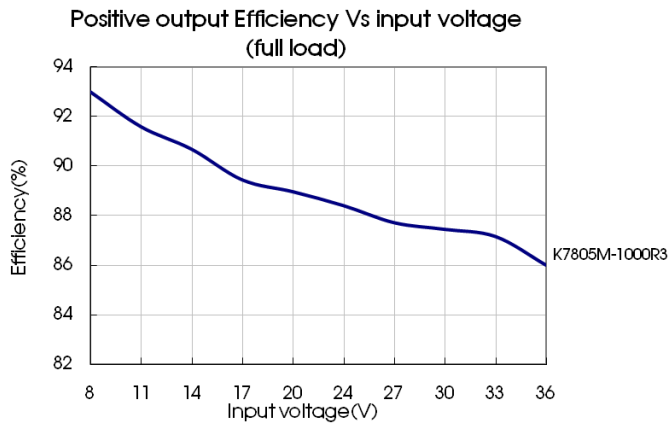


Fig. 1



# DC/DC Converter

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## Design Reference

### 1. Typical application

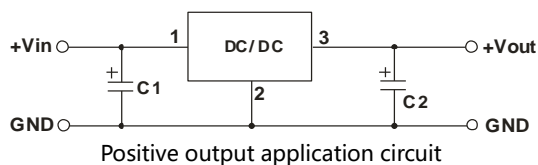


Fig. 2 Typical application circuit

Table 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K7803M-1000R3	10 $\mu$ F/50V	22 $\mu$ F/10V
K7805M-1000R3		22 $\mu$ F/10V
K78X6M-1000R3		22 $\mu$ F/10V
K7809M-1000R3		22 $\mu$ F/16V
K7812M-1000R3		22 $\mu$ F/25V

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

### 2. EMC Compliance circuit

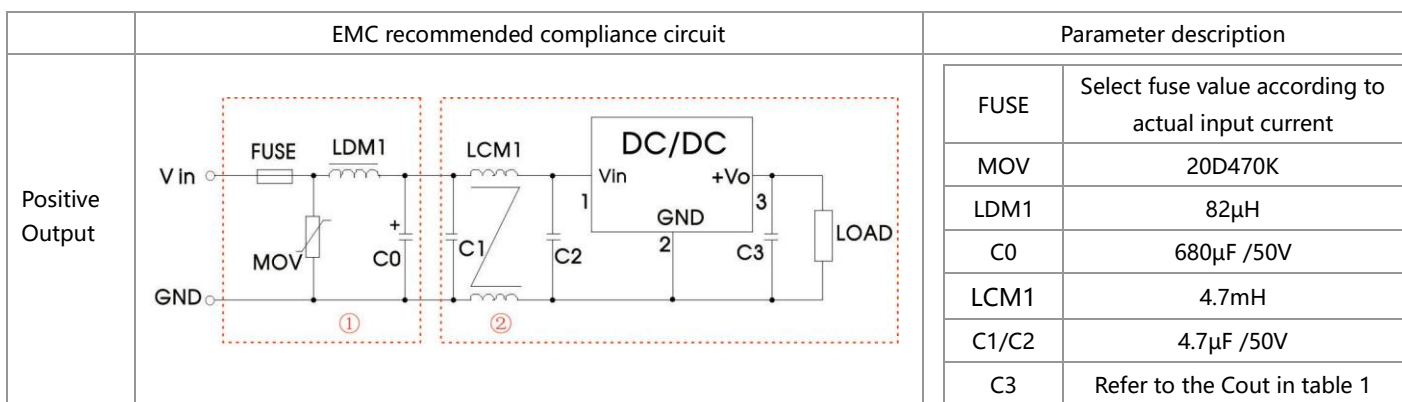


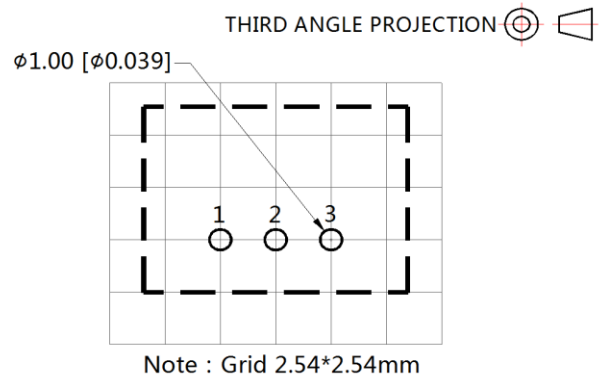
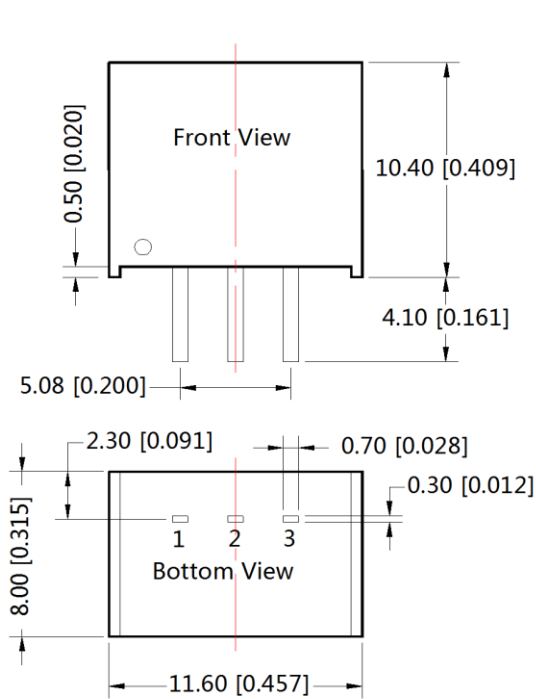
Fig. 4 Recommended compliance circuit

Note: Part ① in Fig. 4 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



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

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

### Notes:

1. The specified maximum capacitive load is tested under full load condition and over the input voltage range;
2. All parameters in this datasheet were measured under following conditions:  $T_a=25^\circ\text{C}$ , relative humidity <75%RH, nominal input voltage and rated output load (unless otherwise specified);
3. All index testing methods in this data table are based on our Company' s corporate standards;
4. The performance indexes of the product models listed in this manual are as above, but some indexes of non-standard model products will exceed the above-mentioned requirements, and please directly contact with our technician 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.