

# DC/DC Converter

## K78xxM-1000R3 Series

## Wide input voltage non-isolated and regulated single output



## FEATURES

- High efficiency up to 96%
- No-load input current as low as 0.3mA
- Operating ambient temperature range: -40°C to +85°C
- Support the negative output
- Output short-circuit protection
- Pin-out compatible with LM78XX linear regulators

*K78xxM-1000R3 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 or negative output voltage, and there is no need for a heat sink. 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 (%) Vin Min. / Vin Max.	Capacitive Load (µF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
EN/BS EN	K7803M-1000R3	24 (6-36)	3.3	1000	90/80	680
	K7805M-1000R3	24 (8-36)	5	1000	93/85	680
		12 (8-27)	-5	-500	85/81	330
	K78X6M-1000R3	24 (10-36)	6.5	1000	93/85	680
	K7809M-1000R3	24 (13-36)	9	1000	94/89	680
	K7812M-1000R3	24 (16-36)	12	1000	95/92	680
		12 (8-20)	-12	-300	88/87	330
	K7815M-1000R3	24 (20-36)	15	1000	96/93	680
		12 (8-18)	-15	-300	87/88	330

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

## 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			

## 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 voltage, 10% -100% load	Positive output	--	±0.4	±0.6	
		Negative output	--	±0.4	±0.8	

Ripple & Noise*	20MHz bandwidth, nominal input voltage, 20% -100% load	--	25	75	mVp-p
Temperature Coefficient	100% load	--	--	±0.03	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change	--	±60	±200	mV
Transient Recovery Time		--	--	1	ms
Short-circuit Protection	Nominal input voltage	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 light loads at or below 20%, the maximum Ripple and Noise for 3.3/5V output parts increase to 100mVp-p and for 6.5/9/12/15V output parts increase to 2%Vo.					

## 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 Vin >30V, for positive output of 6.5V/9V/12V/15V, product start to derating from temperature ≥ 55°C and derating to 40%Io if the temperature is 85°C.					

## Mechanical Specifications

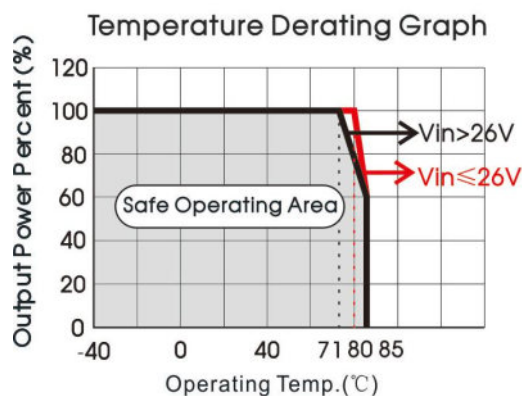
Case Material	Black plastic; flame-retardant and heat-resistant (UL94V-0)
Dimensions	11.60 x 8.00 x 10.40 mm
Weight	1.9g (Typ.)
Cooling Method	Free air convection

## Electromagnetic Compatibility (EMC)

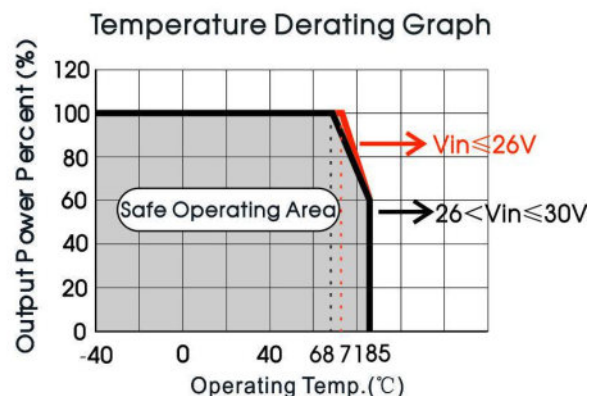
Emissions	CE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4kV	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	±1kV (see Fig. 4-① for recommended 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

## Typical Characteristic Curves

3.3V/5V output



6.5V/9V/12V/15V output



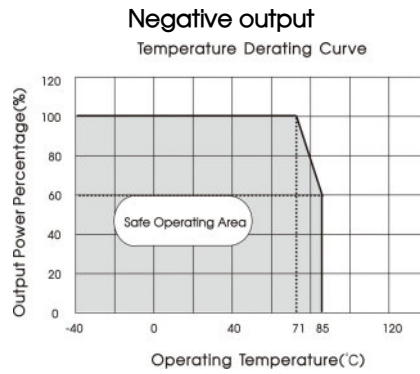
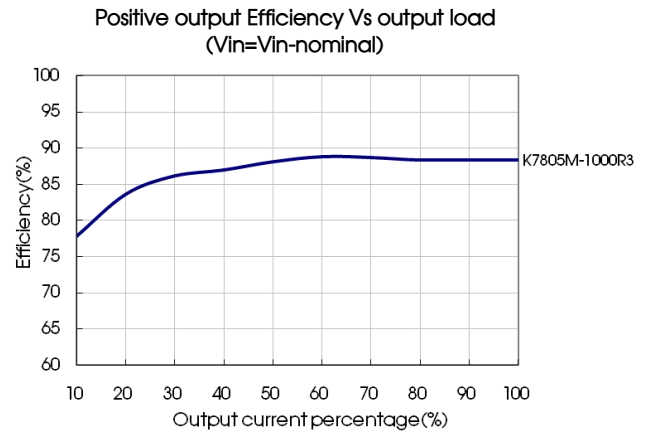
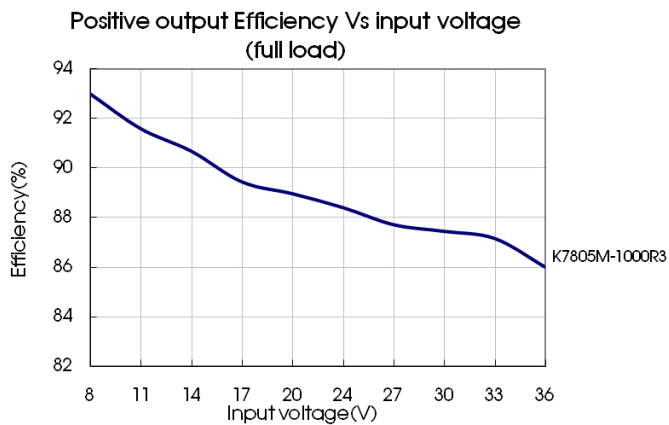


Fig. 1



## Design Reference

### 1. Typical application

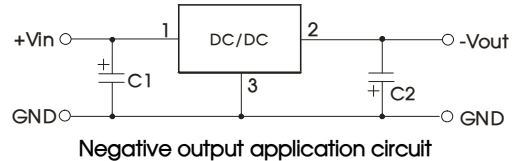
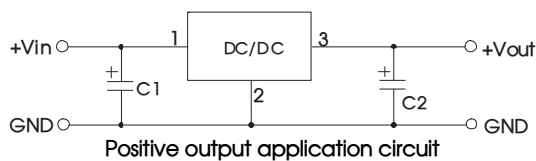


Fig. 2 Typical application circuit

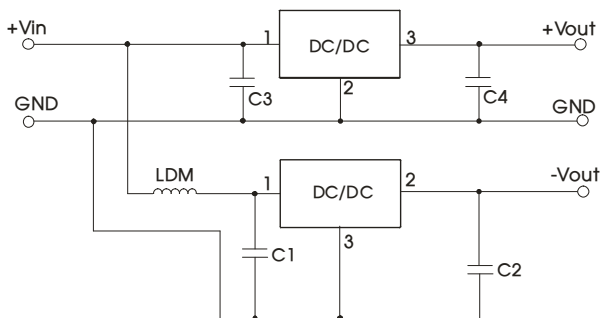


Fig. 3 Positive and Negative output application circuit

#### Notes:

1. The required capacitors C1 and C2 (C3 and C4) must be connected close as possible to the terminals of the module.
2. Refer to Table 1 for C1 and C2 (C3 and C4) capacitor values.
3. For certain applications, increased values for C2 and C4 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.

Table 1

Part No.	C1/C3 (ceramic capacitor)	C2/C4 (ceramic capacitor)
K7803M-1000R3	10μF/50V	22μF/10V
K7805M-1000R3		22μF/10V
K78X6M-1000R3		22μF/16V
K7809M-1000R3		22μF/16V
K7812M-1000R3		22μF/25V
K7815M-1000R3		22μF/25V

2. EMC Compliance circuit

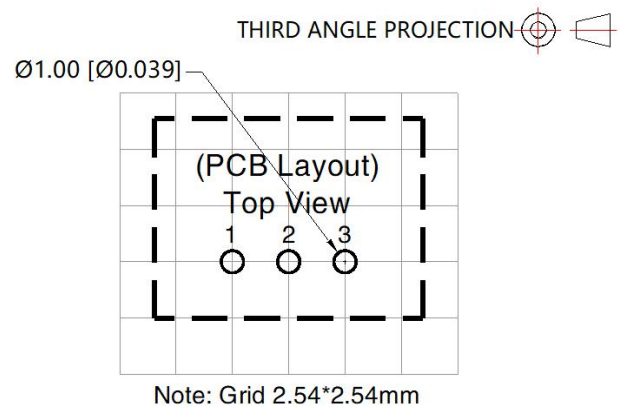
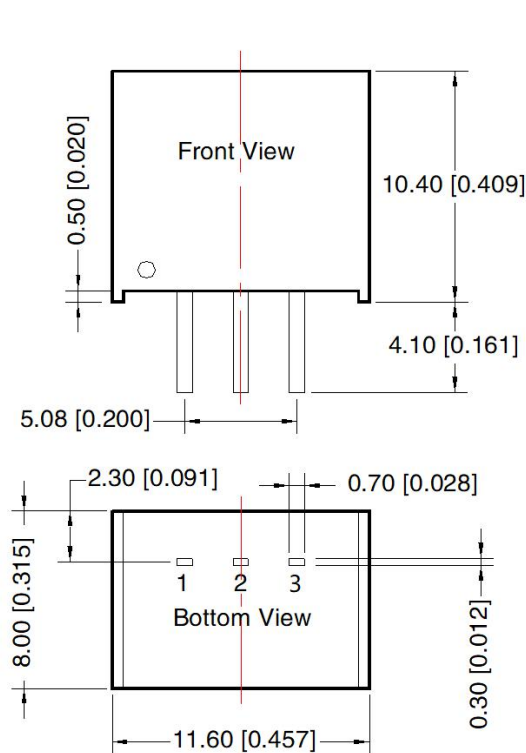
	EMC recommended compliance circuit	Parameter description
Positive Output		

Fig. 4 Recommended compliance circuit

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

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



Pin-Out		
Pin	Positive Output	Negative 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. For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58210074,
2. The maximum capacitive load offered were tested at input voltage range 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 datatable 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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