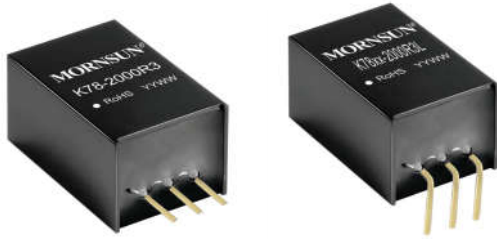


Wide input voltage, non-isolated and regulated single output



Report
 Report
 RoHS
 Patent Protection
 EN 62368-1 BS EN 62368-1

K78xx-2000R3 series are high efficiency switching regulators and ideal substitutes of LM78xx series three-terminal linear regulators. The converters feature high efficiency, low loss, and there is no need for a heat sink. These products are widely used in applications such as Industrial control, Instrumentation and electric power.

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 compatible with LM78XX series linear regulators

Selection Guide

Certification	Part Number	Input Voltage (VDC)*	Output		Full Load Efficiency(%) typ. Vin Min. / Vin Max.	Capacitive Load(μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
-	K78X2-2000R3	24 (4.5-28)	1.8	2000	83/79	2000
		24 (4.5-36)	2.5	2000	89/83	2000
EN/BS EN	K7802-2000R3	12 (8-32)	-2.5	1000	86/80	1000
		24 (6-36)	3.3	2000	89/85	1800
	K7803-2000R3(L)	12 (8-31)	-3.3	1000	85/83	1000
		24 (8-36)	5	2000	92/89	1000
	K7805-2000R3(L)	12 (8-30)	-5	1000	86/84	680
		24 (10-36)	6.5	2000	92/89	1000
-	K78X6-2000R3(L)	12 (8-29)	-6.5	1000	85/83	680
		24 (13-36)	9	2000	95/92	680
EN/BS EN	K7809-2000R3(L)	12 (8-26)	-9	800	86/81	330
		24 (16-36)	12	2000	96/94	470
	K7812-2000R3(L)	12 (8-23)	-12	600	87/85	220
		24 (18-36)	15	2000	96/94	470
	K7815-2000R3	12 (8-20)	-15	600	87/87	220
		24 (18-36)	15	2000	96/94	470

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, nominal input voltage	1.8V/2.5V output	—	0.2	0.5	mA
		Others	—	0.1	1	
	Negative output, nominal input voltage	-2.5V/-3.3V/-5V/-6.5V output	—	—	1	
		-9V/-12V/-15V output	—	—	2	
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	1.8V/±2.5V/±3.3V output	—	±2	±4	%	
		Other positive and negative output	—	±2	±3		
Linear Regulation	Full load, input voltage range		—	±0.4	±0.8		
Load Regulation	10% -100% load step; nominal input voltage		—	±0.5	±1.5		
Ripple & Noise*	Positive output, 20MHz bandwidth, nominal input voltage, 100% load		—	30	75	mVp-p	
	Negative output, 20MHz bandwidth, nominal input voltage, 100% load		—	—	150		
Temperature Coefficient	Operating temperature -40℃ to +85℃		—	—	±0.03	%/℃	
Transient Response Deviation	Nominal input, 25% load step (25%-50%-25%, 50%-75%-50% step)	Positive output	1.8V, 2.5V output	—	±80	±150	mV
		Negative output	Other output	—	±50	±150	
			—	—	±100	±150	
Transient Recovery Time	Nominal input, 25% load step (25%-50%-25%, 50%-75%-50% step)		—	0.2	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 Non-Isolated DC-DC Converter Application Notes for specific information;
*2.Positive output: Input voltage range, 20%-100% load ripple & noise is less than 100mVp-p, 0%-20% load ripple & noise is less than 180mVp-p.
*3.Negative output: Input voltage range, 20%-100% load ripple & noise is less than 150mVp-p, 0%-20% load ripple & noise is less than 180mVp-p.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1	-40	—	85	℃
Storage Temperature		-55	—	125	
Pin Soldering Resistance Temperature	Soldering time: 10s (Max.)	—	—	260	
Storage Humidity	Non-condensing	5	—	95	%RH
Switching Frequency	Full load, nominal input	—	400	—	kHz
MTBF	MIL-HDBK-217F@25℃	2000	—	—	k hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94V-0)				
Dimensions	K78xx-2000R3	11.50 x 9.00 x 17.50 mm			
	K78xx-2000R3L	19.00 x 11.50 x 9.00 mm			
Weight	3.8g (Typ.)				
Cooling Method	Free air convection				

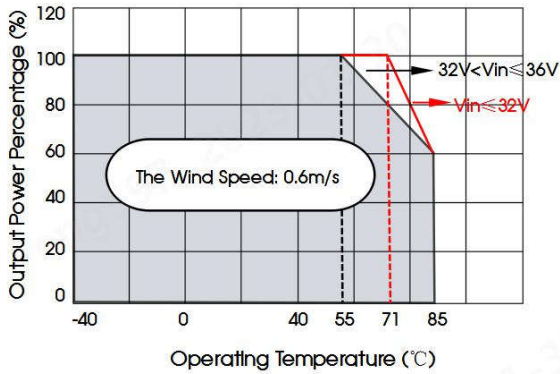
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 3-② for recommended circuit)			
	RE	CISPR32/EN55032 CLASS B (Positive output see Fig. 3-② for recommended circuit, Negative output see Fig. 3-③ for recommended circuit)			

Immunity	ESD	IEC/EN 61000-4-2	Contact $\pm 6\text{kV}$	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. 3-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line $\pm 1\text{kV}$ (see Fig. 3-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A

Typical Characteristic Curves

1.8V/2.5V/3.3V/5V output
Temperature Derating Curve



6.5V/9V/12V/15V output
Temperature Derating Curve

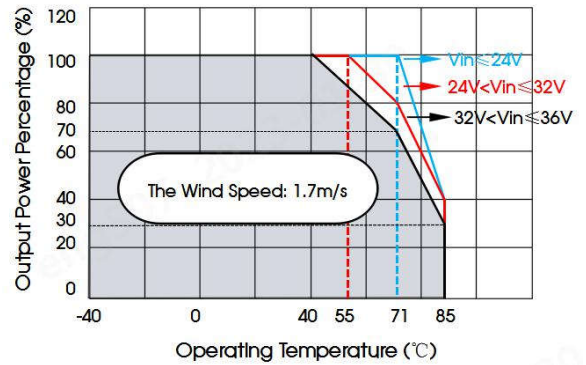
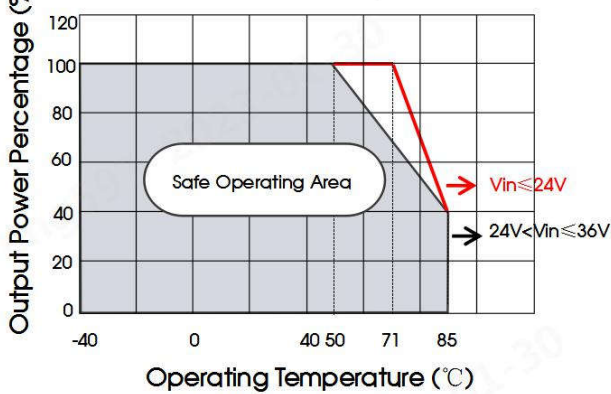


Fig. 1-① Forced convection curve (Positive output)

1.8V/2.5V/3.3V/5V/6.5V output
Temperature Derating Curve



9V/12V/15V output
Temperature Derating Curve

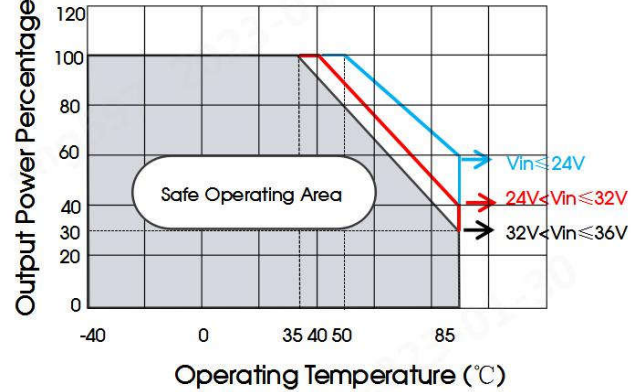
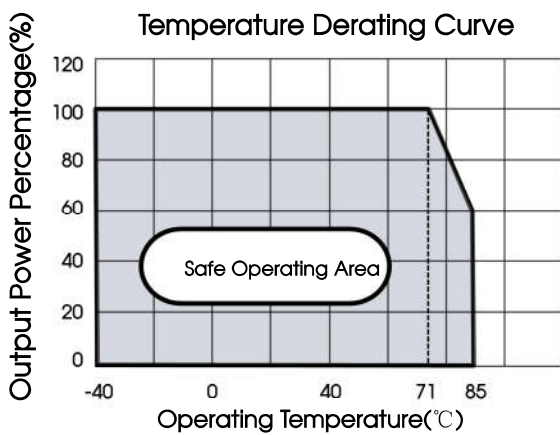


Fig. 1-② Free air convection curve (Positive output)

-2.5V/-3.3V/-5V/-6.5V output



-9V/-12V/-15V output

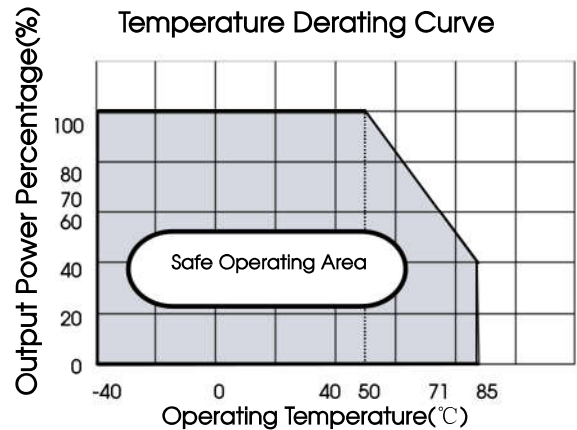
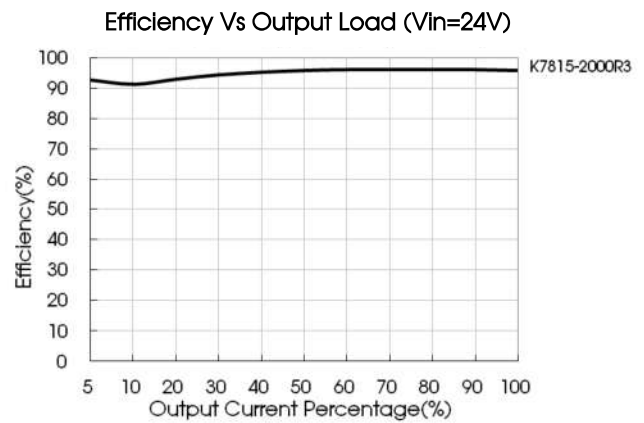
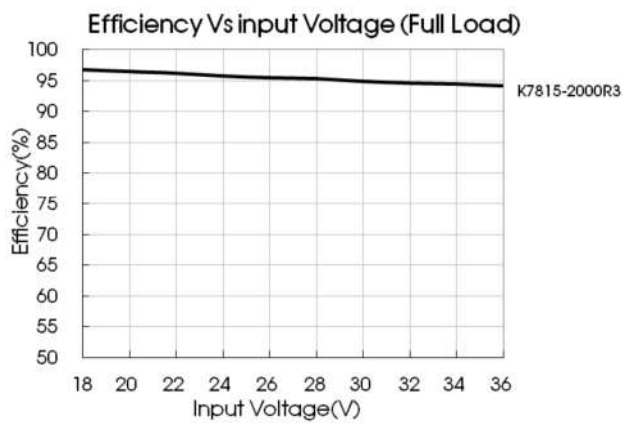
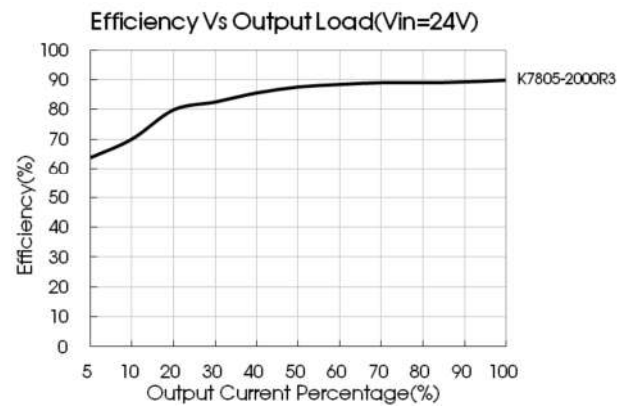
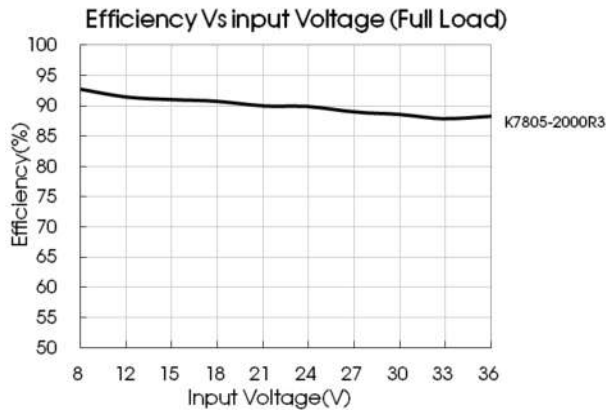


Fig. 1-③ Free air convection curve (Negative output)



Design Reference

1. Typical application

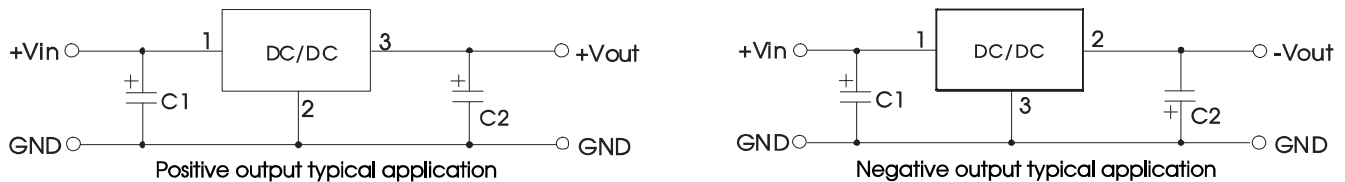


Fig. 2 Typical application

Sheet 1

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K78X2-2000R3	22μF/50V	22μF/10V
K7802-2000R3		22μF/10V
K7803-2000R3(L)		22μF/10V
K7805-2000R3(L)		22μF/10V
K78X6-2000R3(L)		22μF/10V
K7809-2000R3(L)		22μF/16V
K7812-2000R3(L)		22μF/25V
K7815-2000R3		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 of C2 and/or tantalum or low ESR electrolytic capacitors may also be used instead;
4. Converter cannot be used for hot swap and with output in parallel.

2. EMC compliance circuit

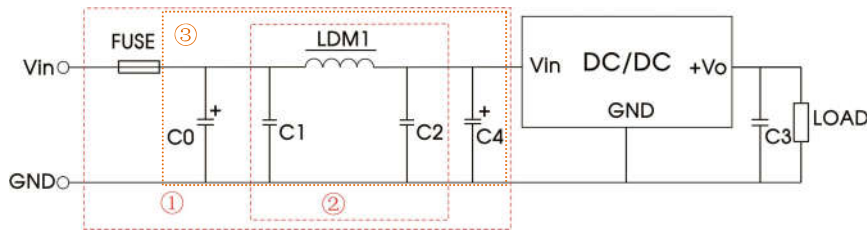


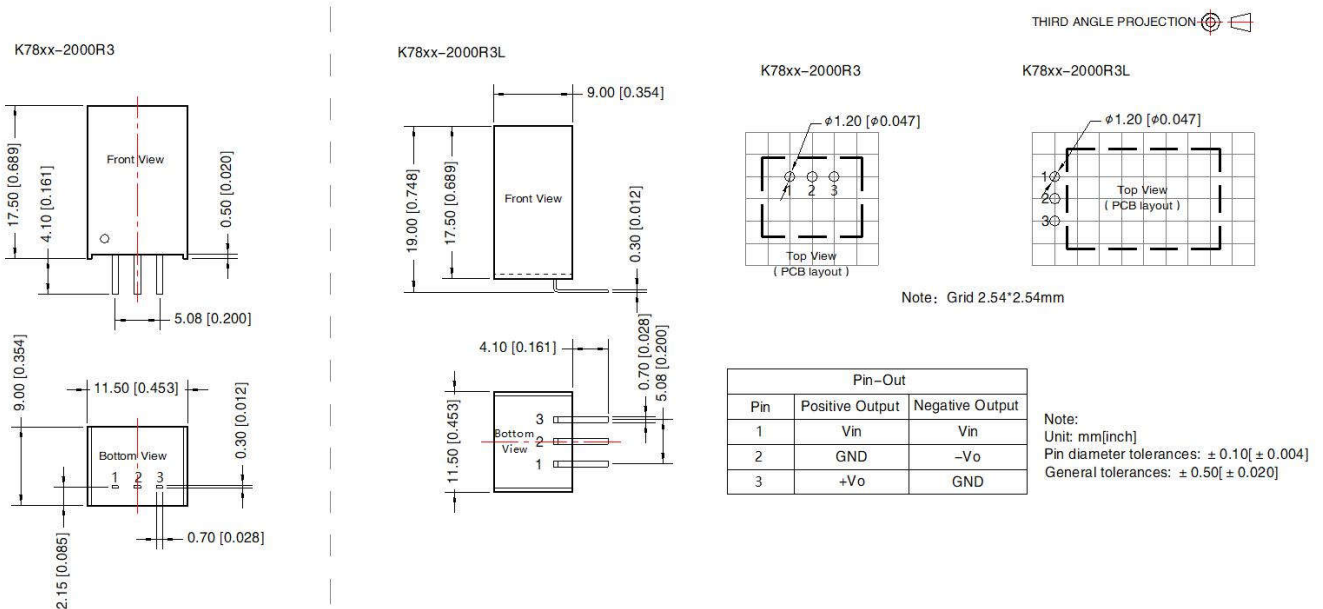
Fig. 3 EMC recommended circuit

FUSE	C0	LDM1	C4	C1/C2	C3
Selected based on the actual input current in application	100μF /100V	22μH	680μF /50V	10μF /50V	22μF /25V

Note: For EMC tests we use Part ① in Fig. 3 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

Dimensions and Recommended Layout



Notes:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210021(Straight Legs Series), 58210027(Bend Legs Series);
- The maximum capacitive load offered were tested at input voltage range and full load;
- 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;
- All index testing methods in this datasheet are based on our company corporate standards;
- 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";
- 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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