

Wide input voltage, non-isolated & regulated single output



CE RoHS

## FEATURES

- High efficiency up to 95%
- No-load input current as low as 0.2mA
- Operating temperature range: -40°C to +85°C
- Output short circuit protection
- SMD package
- EN62368 approval

K78\_T-1000R3 series are high efficiency switching regulators. The product is featured with high efficiency, low loss, short circuit protection and no heat sink requirement. They are widely used in industrial control, instrumentation, and electric power applications.

## Selection Guide

Certification	Part Number	Input Voltage (VDC)	Output		Efficiency (%/Typ.) (Min. Vin)/ (Max. Vin) @Full Load	Max. Capacitive Load(μF)
		Nominal (Range)	Output Voltage (VDC)	Max. Output Current (mA)		
CE	K7801T-1000R3	12 (4.75-32)	1.5	1000	76/66	680
	K78X2T-1000R3	12 (4.75-32)	1.8	1000	79/69	680
	K7802T-1000R3	12 (4.75-32)	2.5	1000	86/74	680
	K7803T-1000R3	24 (6.5-36)	3.3	1000	90/80	680
	K7805T-1000R3	24 (8-36)	5	1000	93/85	680
	K78X6T-1000R3	24 (10-36)	6.5	1000	93/86	680
	K7809T-1000R3	24 (13-36)	9	1000	94/89	680
	K7812T-1000R3	24 (16-36)	12	800	95/92	680

Note: For input voltage higher than 30 VDC, a 22μF/50V input capacitor is required.

## Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current		--	0.2	1	mA
Reverse Polarity Input		Forbidden			
Input Filter		Capacitor filter			
Remote ON/OFF	Module switch on	suspended or connected to TTL high level (3.2-5.5VDC)			
	Module switch off	pin connected to GND or low level (0-0.8VDC)			
	Input current when switched off	--	0.2	1	mA

## Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Output Voltage Accuracy	Full load, input voltage range	1.5/1.8/2.5/3.3VDC output	--	±2	±4	%
		Others	--	±2	±3	
Line Regulation	Full load, input voltage range	1.5/1.8/2.5VDC output	--	±0.3	±0.6	
		Others	--	±0.2	±0.4	

Load Regulation	Nominal input voltage, 10% -100% load	1.5/1.8/2.5VDC output	--	0.8	±1.5	%
		Others	--	0.3	±0.6	
Ripple & Noise*	20MHz bandwidth		--	30	75	mVp-p
Temperature Coefficient	Operating temperature -40°C to +85°C		--	--	±0.03	%/°C
Transient response deviation	Nominal input voltage, 25% load step change		--	50	150	mV
Transient recovery time			--	0.2	1	ms
Output short circuit protection	Nominal input voltage		Continuous, self-recovery			
Vadj	input voltage range		--	±10	--	%Vo
Note: *1. Ripple and noise tested with "parallel cable" method, please refer to <i>DC-DC Converter Application Notes</i> for specific operation methods; *2. With the load lower than 20%, the maximum ripple and noise will be 150mVp-p.						

## General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	单位	
Operating Temperature	see Fig. 1	-40	--	+85	°C	
Storage Temperature		-55	--	+125		
Storage Humidity	Non-condensing	5	--	95	%RH	
Reflow Soldering Temperature		Peak temp. ≤245°C, maximum duration time ≤60s at 217°C. For actual application, please refer to IPC/JEDEC J-STD-020D.1.				
Switching Frequency	Full load, nominal input voltage	1.5/1.8/2.5VDC output	--	370	--	KHz
		3.3/5/6.5VDC output	--	520	--	
		09/12VDC output	--	700	--	
MTBF	MIL-HDBK-217F@25°C	2000	--	--	K hours	

## Physical Specifications

Casing Material	Black flame-retardant and heat-resistant plastic (UL94 V-0)
Package Dimensions	15.24*11.40*8.25mm
Weight	1.7g (Typ.)
Cooling Method	Free air convection

## EMC Specifications

EMI	CE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 4-② for recommended circuit)	
EMS	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

Product Characteristic Curve

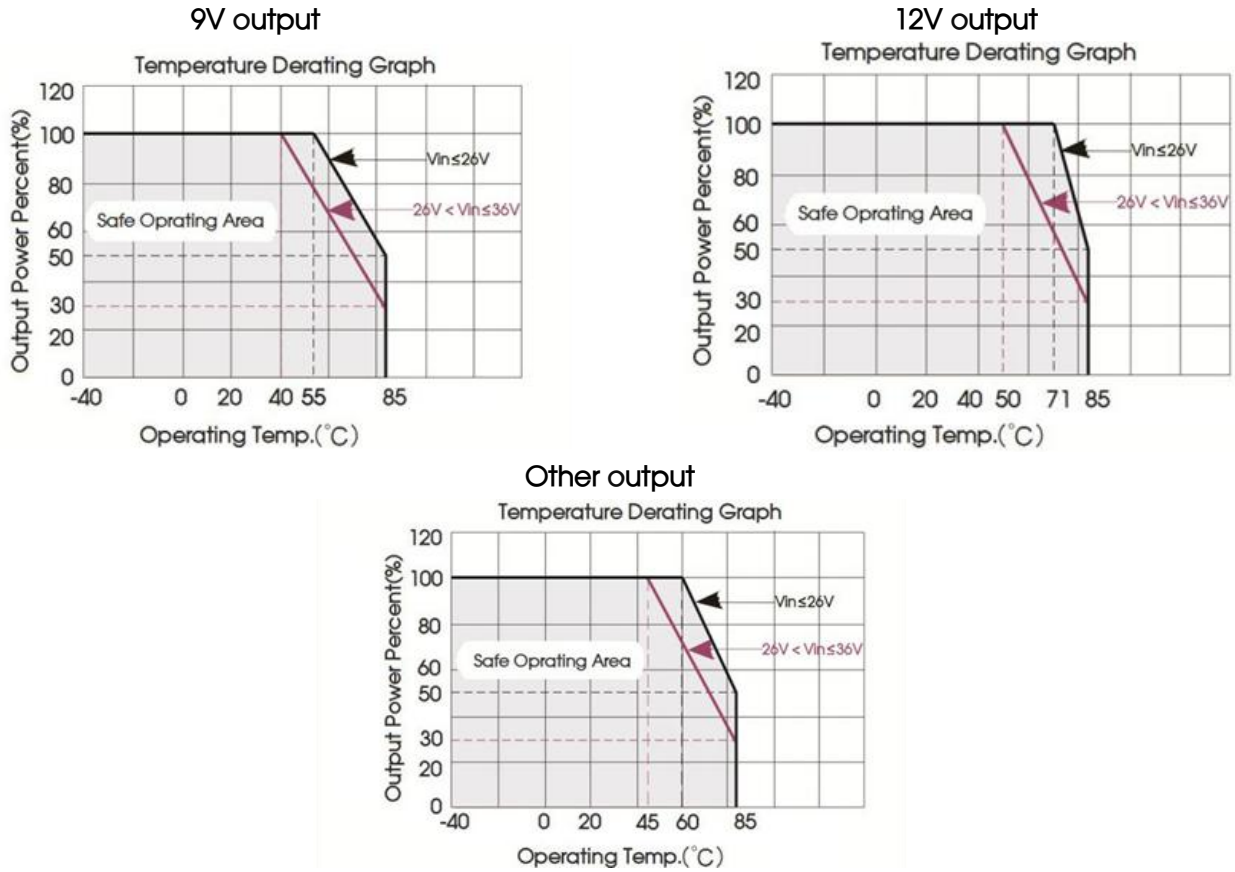
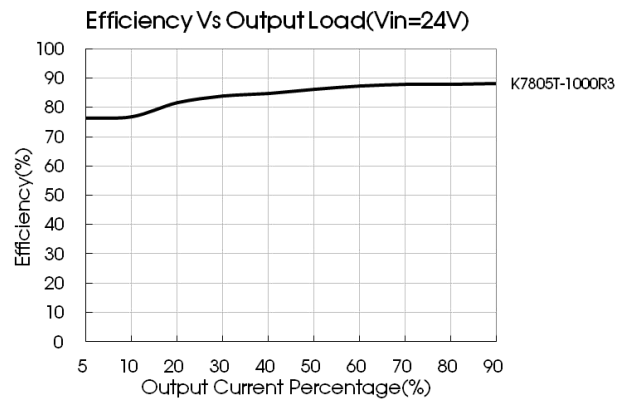
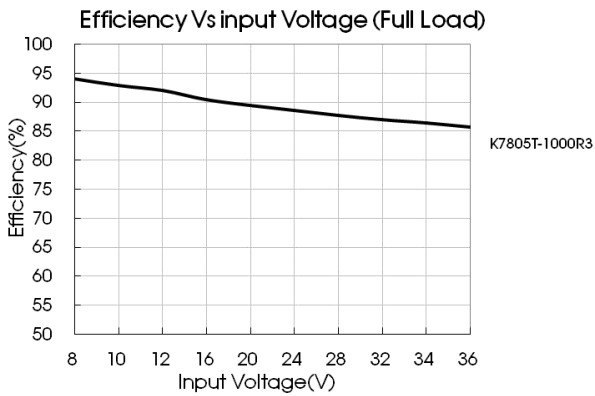


Fig. 1



Design Reference

1. Typical application circuit

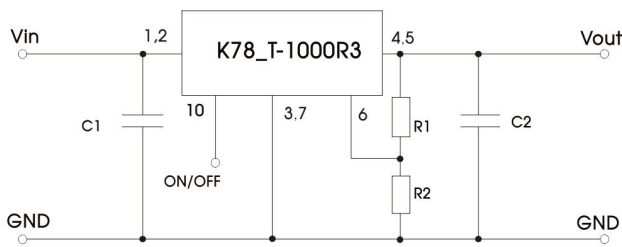


Fig. 2 Typical application circuit

Part Number	C1 (ceramic capacitor)	C2 (ceramic capacitor)	Ra1/Ra2 (Vadj resistance)
K7801T-1000R3	10µF/50V	22µF/10V	Refer to Vadj resistance calculation
K78X2T-1000R3		22µF/10V	
K7802T-1000R3		22µF/10V	
K7803T-1000R3		22µF/10V	
K7805T-1000R3		22µF/16V	
K78X6T-1000R3		22µF/16V	
K7809T-1000R3		22µF/16V	
K7812T-1000R3		22µF/25V	

Sheet 1

- Note:
1. C1 and C2 are required and should be connected close to the pin terminal of the module.
  2. The capacitance of C1 and C2 refer to Sheet 1, it can be increased properly if required, and tantalum or low ESR electrolytic capacitors may also suffice.
  3. Cannot be used in parallel for output and hot swap.

To reduce the output ripple furtherly, it is suggested to connect a "LC" filter at the output terminal, and recommended value of L is 10μH-47μH.

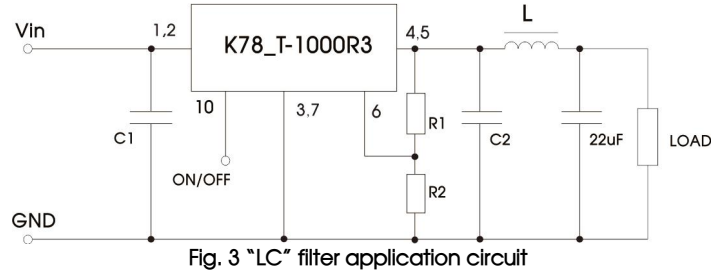


Fig. 3 "LC" filter application circuit

## 2. EMC solution-recommended circuit

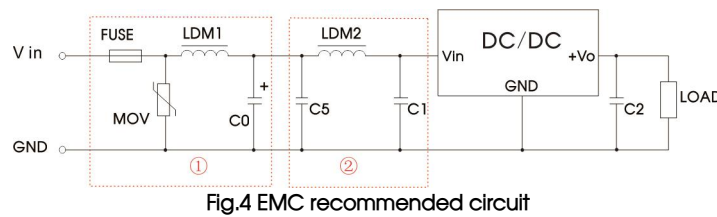


Fig.4 EMC recommended circuit

FUSE	MOV	LDM1	C0	C2	C1/C5	LDM2
Selected based on the actual input current from the customer	S20K30	82μH	680μF /50V	Refer to Sheet 1	4.7μF /50V	68μH

Note: Part ① in the Fig. 4 is for EMS test, part ② is for EMI filtering; parts ① and ② can be added based on actual requirement.

## 3. Application of Vadj and calculation of Vadj resistance

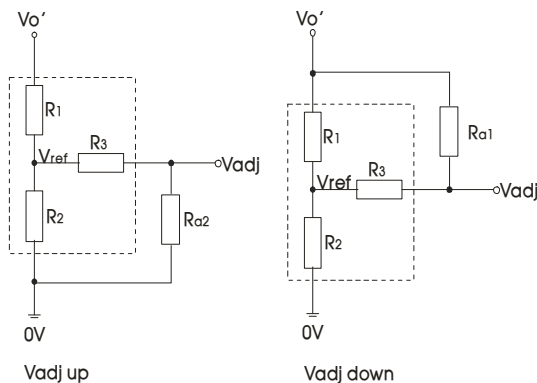


Fig.5 Applied circuits of Vadj (Part in broken line is the interior of models)

Calculation formula of Vadj resistance:

$$\begin{aligned} \text{up: } R_{a2} &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1 \\ \text{down: } R_{a1} &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

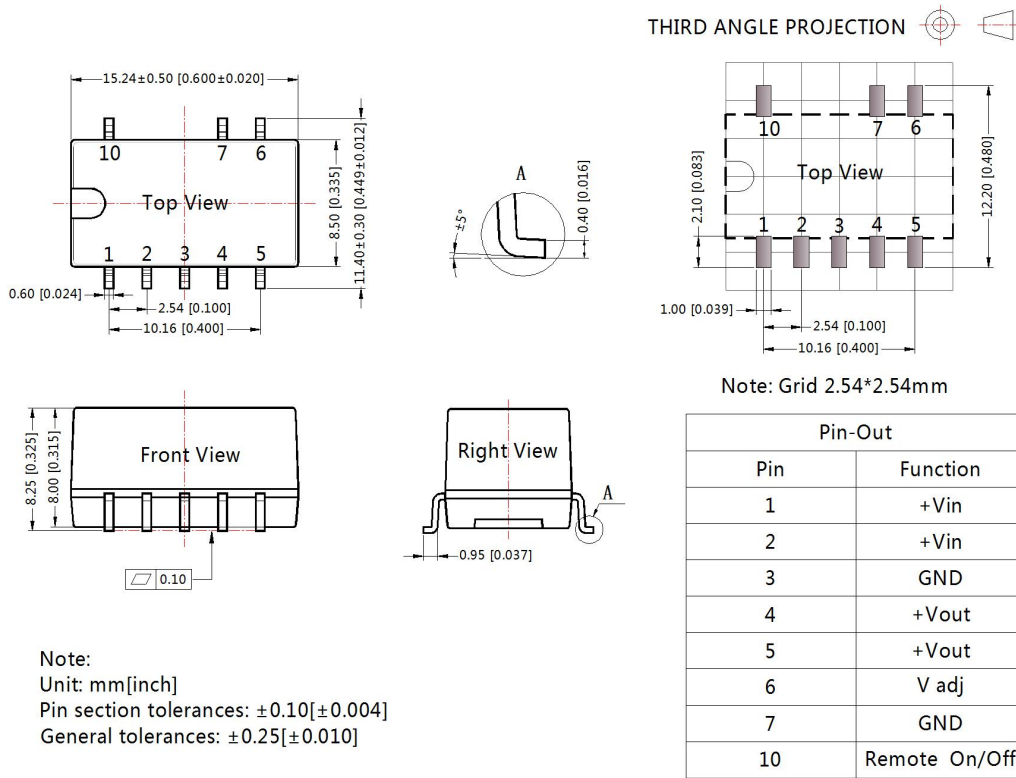
$R_{a1}$ ,  $R_{a2}$  is Vadj resistance,  $\alpha$  is a self-defined parameter, with no real meaning.  $V_{o'}$  for the actual needs of the up or down regulated voltage

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
1.5	7.5	7.5	15	0.75
1.8	4.7	3.3	6.8	0.75
2.5	9.1	3.9	8.2	0.75
3.3	75	22	75	0.75
5	43	7.5	33	0.75
6.5	43	5.6	22	0.75
9	43	3.9	22	0.75
12	36	2.4	10	0.75

Note: The 1.5VDC output model only support Vadj up, do not support Vadj down.

4. For more information please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

Dimensions and Recommended Layout



NC: Pin to be isolated from circuitry

Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from [www.mornsun-power.com](http://www.mornsun-power.com). Tube Packing bag number: 58210057, Roll packing bag number: 58210058;
2. The max. capacitive load should be tested within the input voltage range and under full load conditions;
3. Unless otherwise specified, data in this datasheet should be tested under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75%RH when inputting nominal voltage and outputting rated load;
4. All index testing methods in this datasheet are based on our Company's corporate standards;
5. 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;
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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