EN

Datasheet

RS Pro K78_T-1000R3 DC-DC Converter

Wide input voltage non-isolated and regulated single output.

CE RoHS

FEATURES

- High efficiency up to 95%
- No-load input current as low as 0.2mA
- Operating ambient temperature range -40℃ to +85℃
- Output short-circuit protection
- SMD package
- EN62368 Approval
- 3 Year Warranty

K78_T-1000R3 series are high efficiency switching regulators. The converters feature high efficiency, low loss and short circuit protection in a compact SMD package. These products are widely used in applications such as industrial control, instrumentation and IoT.

Selection Guide

Certification	RS Stock no. (Standard Pack)	RS Stock no. (Tube Pack 32pcs)	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	1933988	1933987	K7803T-1000R3	24 (6.5-36)	3.3	1000	90/80	680
	1933990	1933989	K7805T-1000R3	24 (8-36)	5	1000	93/85	680
	1933992	1933991	K78X6T-1000R3	24 (10-36)	6.5	1000	93/86	680
	1933994	1933993	K7812T-1000R3	24 (16-36)	12	800	95/92	680

Note:*For input voltage exceeding 30 VDC, an input capacitor of 22uF/50V is required.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current		--	0.2	1	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Ctrl*	Module on	Open or pulled high (TTL level 3.2-5.5VDC)			
	Module off	Pulled low to GND level (0-0.8VDC)			
	Input current when off	--	0.2	1	mA

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Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	3.3VDC output	--	±2	±4	%
		Others	--	±2	±3	
Linear Regulation	Full load, input voltage range		--	±0.2	±0.4	
Load Regulation	Nominal input voltage, 10% -100% load		--	0.3	±0.6	%
Ripple & Noise*	20MHz bandwidth		--	30	75	mVp-p
Temperature Coefficient	Operating temperature range -40℃ to +85℃		--	--	±0.03	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change		--	50	150	mV
Transient Recovery Time			--	0.2	1	ms
Short-circuit Protection	Nominal input		Continuous, self-recovery			
Vadj	Input voltage range		--	±10	--	%Vo

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 & Noise increases to 150mVp-p max.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1		-40	--	+85	℃
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Reflow Soldering Temperature	Peak temperature ≤245℃, duration ≤60s max. over 217℃. Also refer to IPC/JEDEC J-STD-020D.1.					
Switching Frequency	Full load, nominal input	3.3/5/6.5VDC output	--	520	--	KHz
		09/12VDC output	--	700	--	
MTBF	MIL-HDBK-217F@25℃		2000	--	--	K hours

Mechanical Specifications

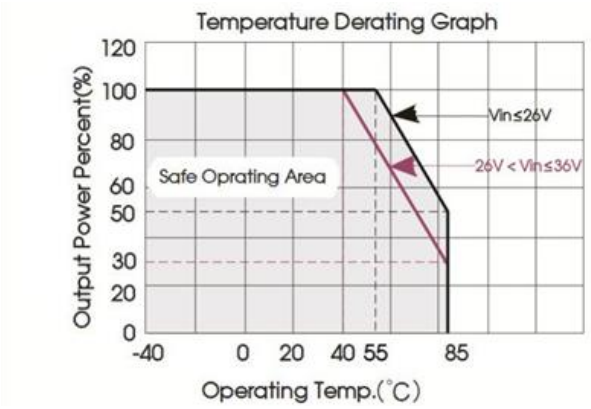
Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0)
Dimensions	15.24 x11.40 x 8.25 mm
Weight	1.7g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

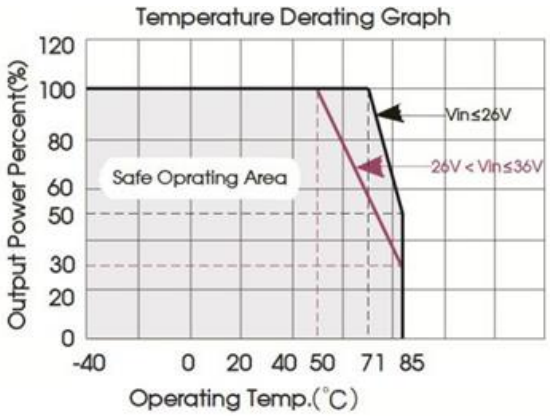
Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 4-② for recommended circuit)	
	RE	CISPR32/EN55032 CLASS B (see Fig. 4-② for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±4KV	perf. Criteria B
	RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±1KV (see Fig. 4-① for recommended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

9V output



12V output



Other outputs

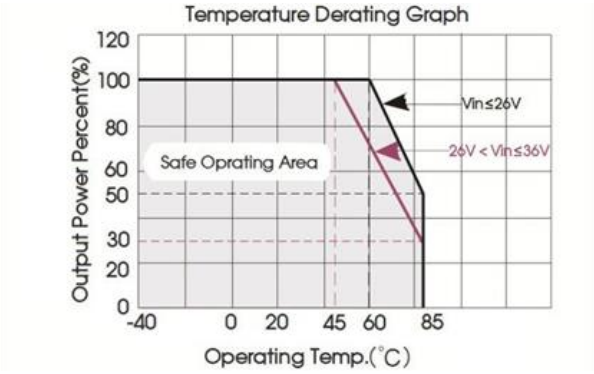
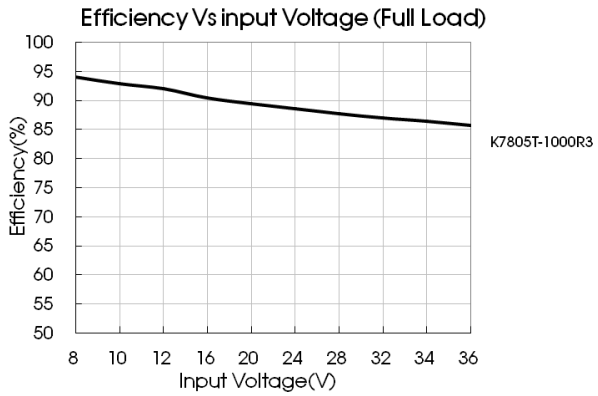
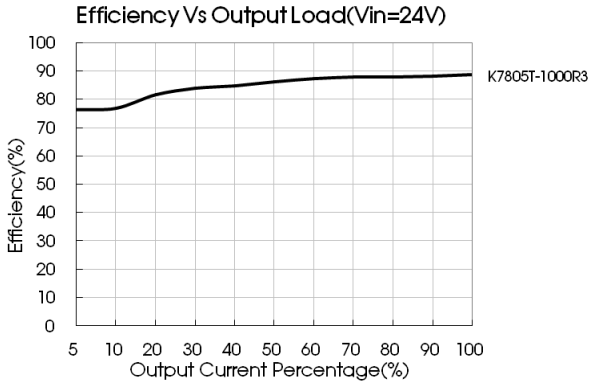


Fig. 1





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Design Reference

1. Typical application

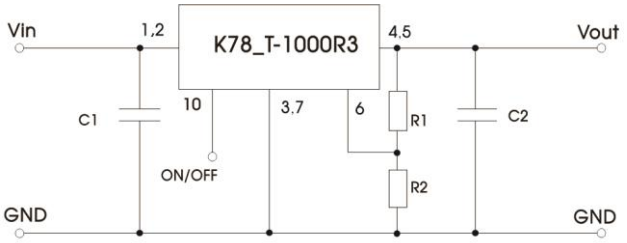

Fig. 2 Typical application circuit

Part No.	C1 (ceramic capacitor	C2 (ceramic capacitor)	Ra1/Ra2 (Vadj resistance)
K7803T-1000R3	10μF/50 V	22μF/10V	Refer to Vadj resistance calculation
K7805T-1000R3		22μF/16V	
K78X6T-1000R3		22μF/16V	
K7812T-1000R3		22μF/25V	

table 1

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. For certain applications, increased values and/or tantalum or low ESR electrolytic capacitors may also be used instead.
3. Converter cannot be used for hot swap and with output in parallel.
4. To further reduce the output ripple and noise, we suggested the use of a "LC" filter at the output terminals, with an inductor value (L) of 10μH-47μH.

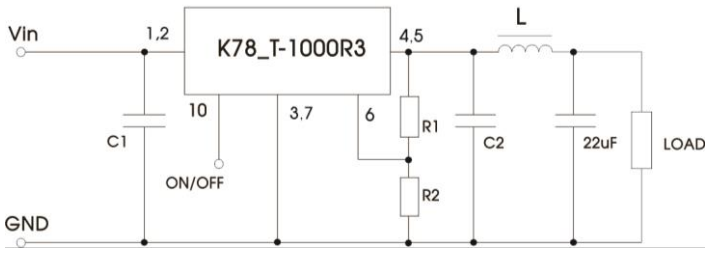

Fig. 3 External "LC" output filter circuit diagram

2. EMC compliance circuit

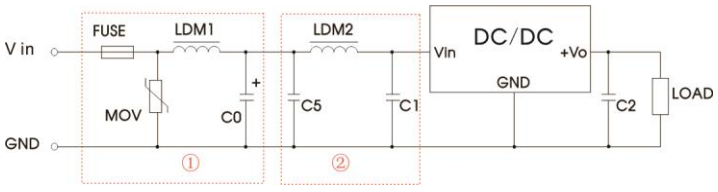

Fig.4 Recommended compliance circuit

FUSE	MOV	LDM1	C0	C2	C1/C5	LDM2
Select fuse value according to actual input current	S20K30	82μH	680μF /50V	Refer to table 1	4.7μF /50V	68μH

Note: Part ①in 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.

3.Trim Function for Output Voltage Adjustment (open if unused)

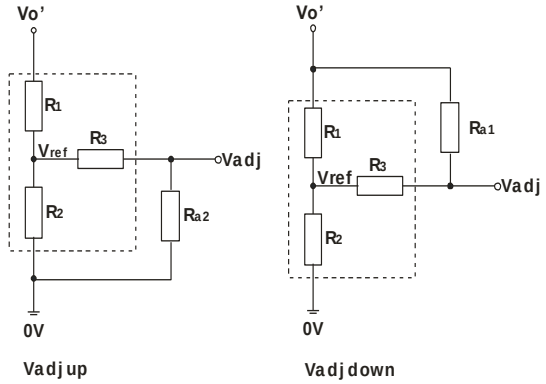

Fig.5 Circuit diagram of Vadj up and down (dashed line shows internal part of module)

Calculating Trim resistor values:

$$up:\ R_{a2}=\frac{aR_2}{R_2-a}-R_3 \qquad a=\frac{Vref}{Vo'-Vref}\cdot R_1$$

$$down:\ R_{a1}=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

Ra1、Ra2= Trim Resistor value;
a= self-defined parameter;
Vo' =desired output voltage.

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	75	22	75	0.75
5	43	7.5	33	0.75
6.5	43	5.6	22	0.75
12	36	2.4	10	0.75

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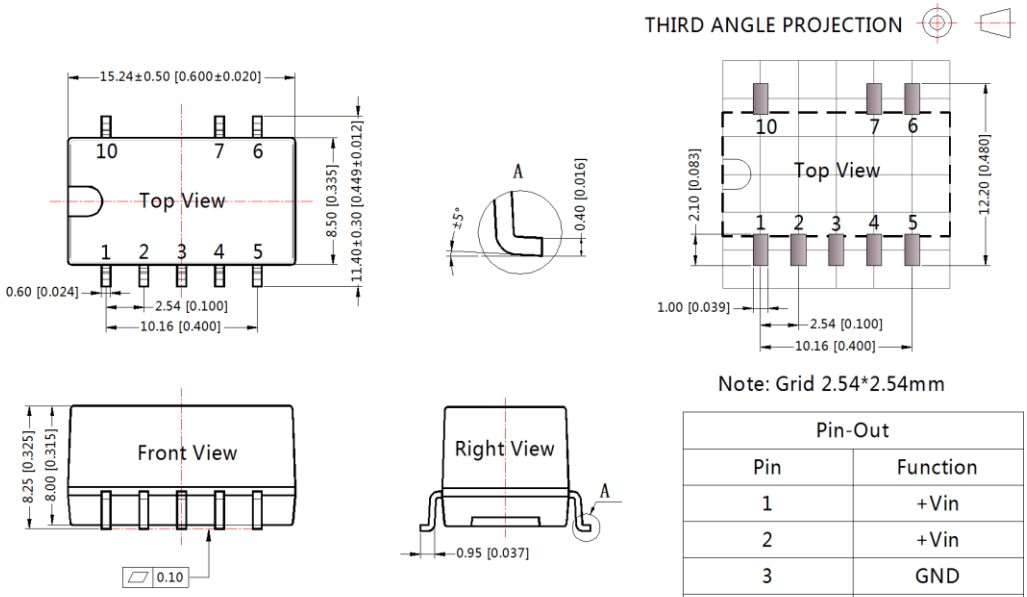
Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Function
1	+Vin
2	+Vin
3	GND
4	+Vout
5	+Vout
6	V adj
7	GND
10	Remote On/Off

NC: Pin to be isolated from circuitry

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.25[±0.010]

Notes:

1. The max. capacitive load should be tested within the input voltage range and under full load conditions;
2. Unless otherwise specified, data in this data table should be tested under the conditions of Ta=25℃, humidity<75%RH when inputting nominal voltage and outputting rated load;
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.