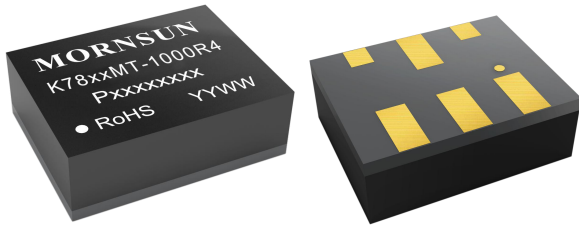


Wide input voltage non-isolated and regulated single output



Patent Protection RoHS

FEATURES

- Ultra-small, ultra-thin DFN package(9.00 x 7.00 x 3.10mm)
- Operating ambient temperature range: -40°C to +105°C
- High efficiency up to 94%
- No-load input current as low as 0.1mA
- Continuous short circuit protection
- Meets EN62368
- Meets AEC-Q100 (under testing)

K78_MT-1000R4 series are high efficiency switching regulators. The converters feature high efficiency, low loss and short-circuit protection in a compact DFN package. 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 (%) Typ. Vin Min./ Vin Nominal / Vin Max.	Capacitive Load (µF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.		
--	K7803MT-1000R4	24 (4.75-36)	3.3	1000	89/84/81	680
		12 (8-27)	-3.3	-500	85/85/81	330
	K7805MT-1000R4	24 (6.5-36)	5	1000	92/87/84	680
		12 (8-27)	-5	-500	85/85/83	330
	K78X6MT-1000R4	24 (8-36)	6.5	1000	92/88/86	680
		12 (8-24)	-6.5	-500	83/85/84	330
	K7809MT-1000R4	24 (12-36)	9	1000	92/90/87	680
		12 (8-24)	-9	-500	81/85/84	330
	K7812MT-1000R4	24 (15-36)	12	1000	94/91/89	680
		12 (8-20)	-12	-300	83/85/84	330
	K7815MT-1000R4	24 (18-36)	15	1000	94/93/90	680
		12 (8-18)	-15	-300	82/84/84	330

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

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Nominal input voltage	--	0.1	--	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Ctrl*	Module on	Ctrl pin open or pulled high(TTL 1.6~5VDC)			
	Module off	Ctrl pin pulled low to GND(-Vo)(0~0.6VDC)			

	Nominal input voltage, input current when off	--	240	--	uA
--	---	----	-----	----	----

Note: *The positive output ctrl pin voltage is referenced to input GND; Negative output ctrl pin voltage is referenced to -Vo.

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	Full load, input voltage range	3.3 VDC output	--	±2	±4	%
		Others	--	±2	±3	
Linear Regulation	Full load, input voltage range		--	±0.2	--	
Load Regulation	Nominal input voltage, 10% -100% load		--	±1.0	--	
Ripple & Noise*	20MHz bandwidth, nominal input voltage, full load		--	75	150	mVp-p
	20MHz bandwidth, nominal input voltage, full load, external capacitor 22µF		--	20	75	
Temperature Coefficient	Operating temperature -40°C to +105°C		--	±0.02	--	%/°C
Transient Response Deviation	Nominal input voltage, 25% load step change	3.3 V/5V/6.5V/9VDC output	--	50	150	mV
		12V/15VDC output	--	100	300	
Transient Recovery Time	Nominal input voltage, 25% load step change		--	0.1	0.8	ms
Short-circuit Protection	Continuous, self-recovery					
Trim	Input voltage range		--	±10	--	%Vo

Note: * The "parallel cable" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information;

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	See Fig. 1	-40	--	+105	°C
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Reflow Soldering Temperature		Peak temperature ≤245°C, duration ≤60s max. over 217°C. Also refer to IPC/JEDEC J-STD-020D.1.			
Switching Frequency	Full load, nominal input voltage	--	1.0	--	MHz
MTBF	MIL-HDBK-217F@25°C	8552	--	--	K hours
Moisture Sensitivity Level (MSL)	IPC/JEDEC J-STD-020D.1	Level 3			
Pollution Degree		PD3			

Mechanical Specifications

Case Material	Black epoxy resin; flame-retardant and heat-resistant(UL94 V-0)
Dimensions	9.00 × 7.00 × 3.10mm
Weight	0.58g(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 (see Fig. 3-② for recommended circuit)
Immunity	ESD*	IEC/EN 61000-4-2	Contact ±6KV perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m perf. Criteria A
	CS	IEC/EN 61000-4-6	3Vr.m.s perf. Criteria A
	EFT	IEC/EN 61000-4-4	±1KV (see Fig. 3-① for recommended circuit) perf. Criteria B
	Surge	IEC/EN 61000-4-5	line to line ±1KV (see Fig. 3-① for recommended circuit) perf. Criteria B

Note: * The static level of the Ctrl & Trim pin is $\pm 2\text{KV}$ when they are not connected to external devices; It is suggested to connect an external capacitor (225K/50V) from Ctrl to GND/-Vo to meet ESD ($\pm 6\text{KV}$) of the Ctrl pin, and to connect a varistor (22V/30A) from Trim to GND/-Vo to meet ESD ($\pm 6\text{KV}$) of the Trim pin.

Typical Characteristic Curves

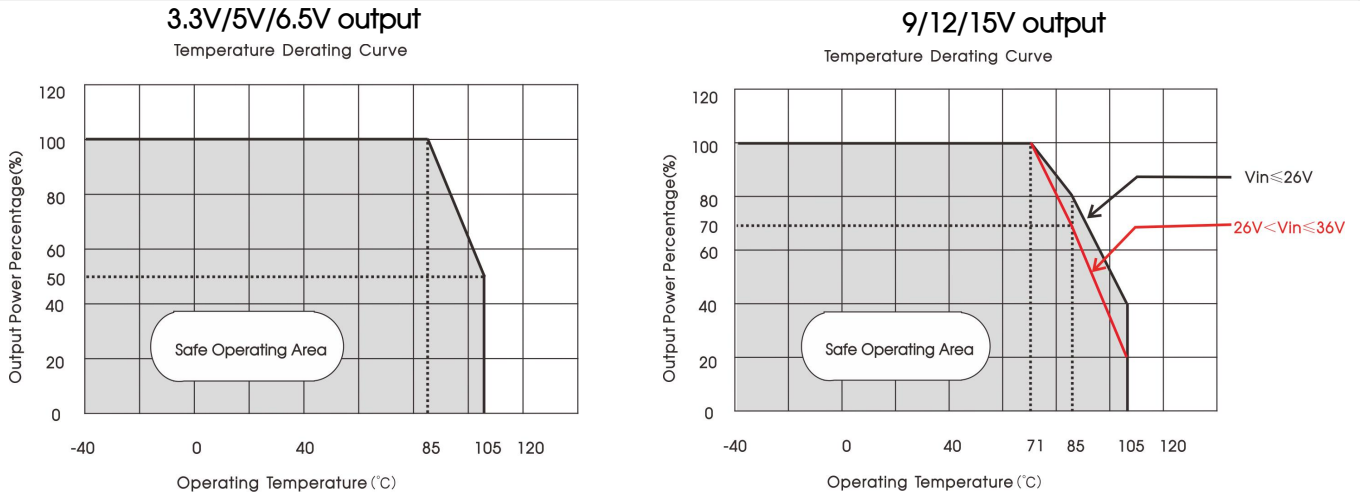


Fig. 1

Design Reference

1. Typical application

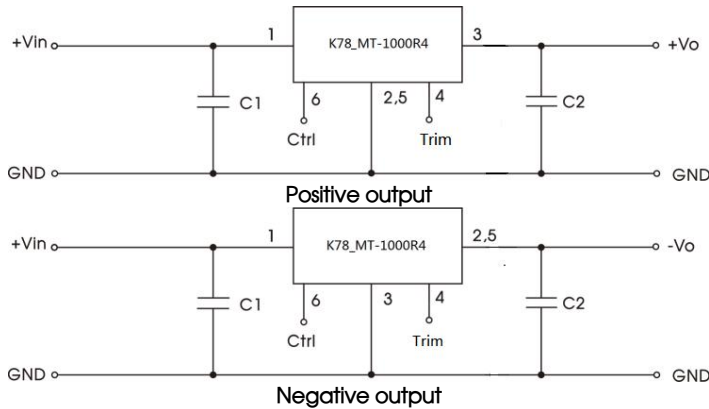


Fig. 2 Typical application circuit

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)	Ra1/Ra2 (Trim resistance)
K7803MT-1000R4	10 μF /50V	22 μF /10V	Refer to Trim resistance calculation
K7805MT-1000R4		22 μF /10V	
K78X6MT-1000R4		22 μF /16V	
K7809MT-1000R4		22 μF /16V	
K7812MT-1000R4		22 μF /25V	
K7815MT-1000R4		22 μF /25V	

Table 1

Notes:

- The required C1 and C2 capacitors must be connected as close as possible to the terminals of the module;
- 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;
- Converter cannot be used for hot swap and with output in parallel.

2. EMC compliance circuit

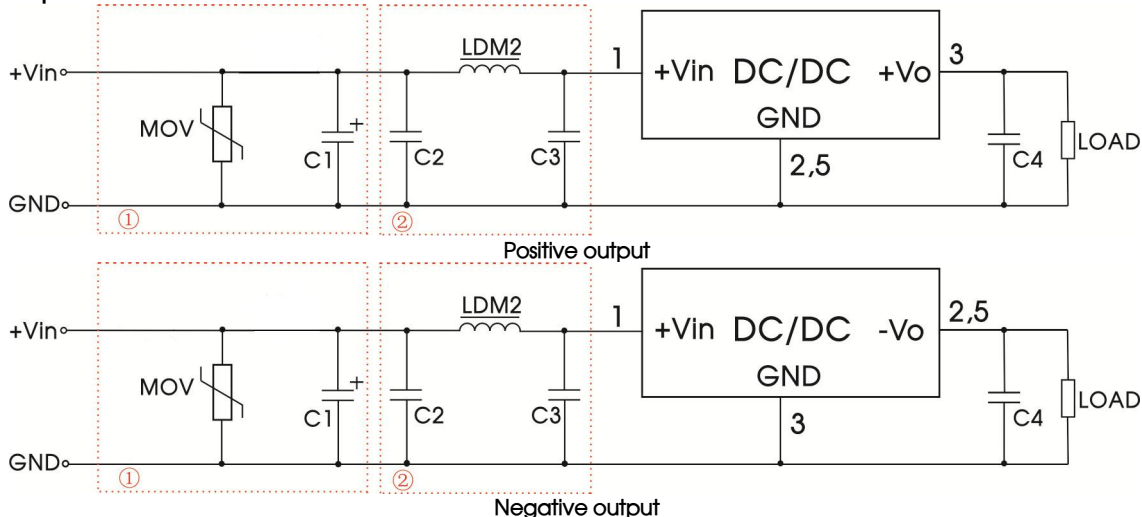


Fig.3 Recommended compliance circuit

Part No.	MOV	C1	C2	LDM2	C3	C4
K7803/05/X6MT-1000R4 (Positive output)	S20K30	680μF /50V	10μF/50V	68μH	-	22μF/25V
Others	S20K30	680μF /50V	10μF/50V	68μH	10μF/50V	22μF/25V

Notes: For EMC tests we use Part ① in Fig.3 for immunity and part ② for emissions test. Selecting based on needs.

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

- 1.Positive output application: connect trim resistor to GND/Vo respectively for adjusting up/down.
- 2.Negative output application: connect trim resistor to GND/Vo- respectively for adjusting up/down

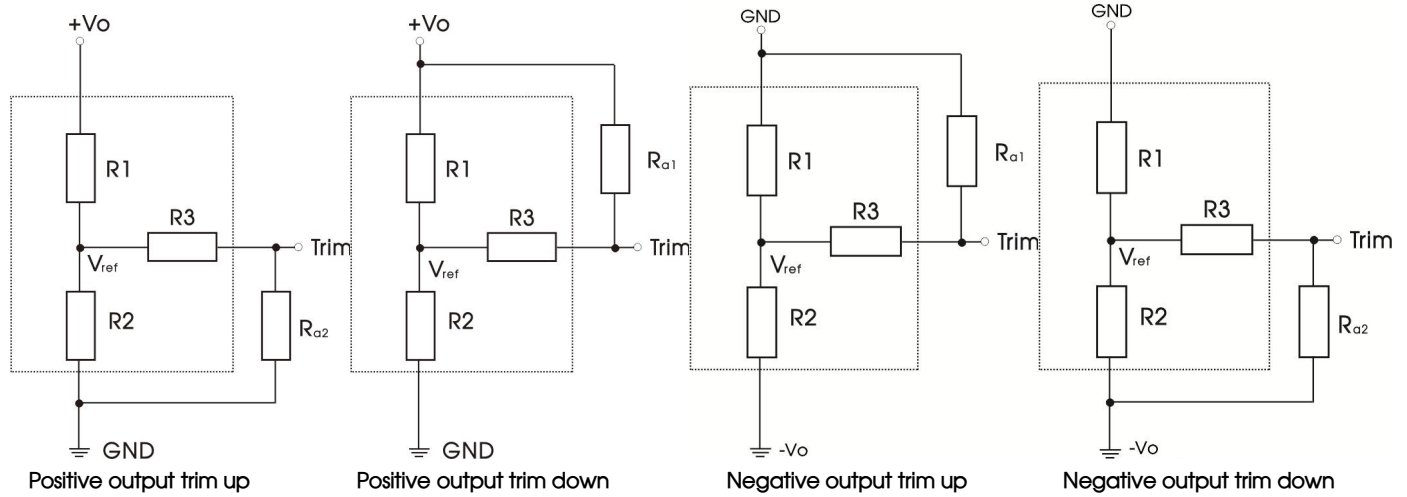


Fig.4 Circuit diagram of Trim up and down (dashed line shows internal part of module)

Calculating Trim resistor values:

$$\text{Trim up : } R_{a2} = \frac{aR_2}{R_2 - a} - R_3, \quad a = R_2 // (R_3 + R_{a2}) = \frac{V_{ref} - V_o}{V_{ref} - V_o}$$

$$\text{Trim down : } R_{a1} = \frac{aR_1}{R_1 - a} - R_3, \quad a = R_1 // (R_3 + R_{a1}) = \frac{V_o - V_{ref}}{V_o - V_{ref}}$$

Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	150	33	180	0.6
5	100	13.66	82	0.6
6.5	32.4	3.3	20	0.6
9	100	7.14	47	0.6
12	100	5.28	43	0.6
15	180	7.5	51	0.6

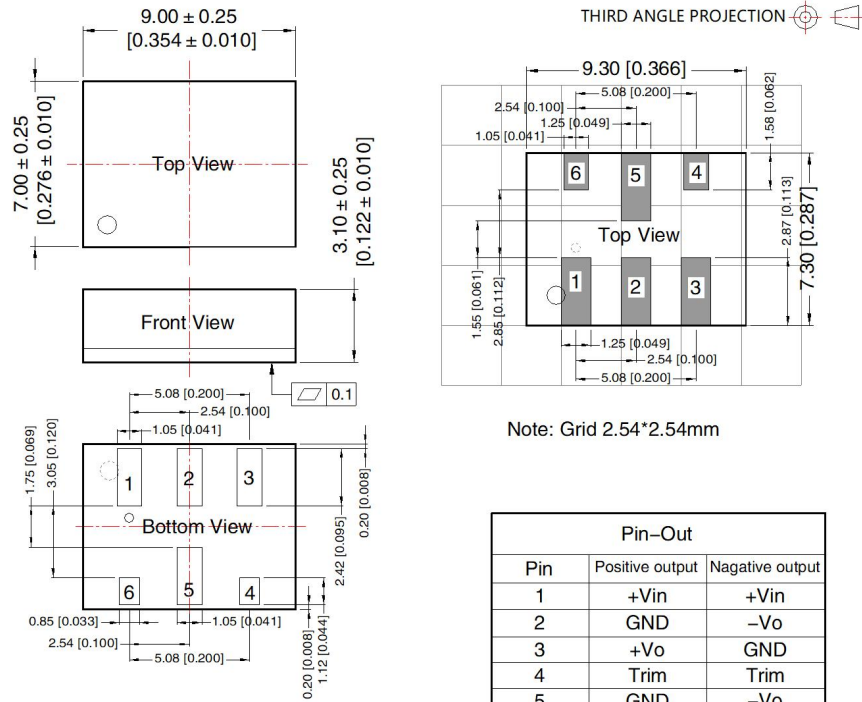
Table:

Vout nom.	±3.3VDC		±5.0VDC		±6.5VDC		±9.0VDC		±12VDC		±15VDC	
	Ra1 (KΩ)	Ra2 (KΩ)	Ra1 (KΩ)	Ra2 (KΩ)	Ra1 (KΩ)	Ra2 (KΩ)	Ra1 (KΩ)	Ra2 (KΩ)	Ra1 (KΩ)	Ra2 (KΩ)	Ra1 (KΩ)	Ra2 (KΩ)
2.97	815	-	-	-	-	-	-	-	-	-	-	-
3.63	-	117.3	-	-	-	-	-	-	-	-	-	-
4.5	-	-	710	-	-	-	-	-	-	-	-	-
5.5	-	-	-	36.2	-	-	-	-	-	-	-	-
5.85	-	-	-	-	245.4	-	-	-	-	-	-	-
7.15	-	-	-	-	-	9.5	-	-	-	-	-	-
8.1	-	-	-	-	-	-	783.2	-	-	-	-	-
9.9	-	-	-	-	-	-	-	19.9	-	-	-	-
10.8	-	-	-	-	-	-	-	-	382.2	-	-	-
13.2	-	-	-	-	-	-	-	-	-	5.5	-	-
13.5	-	-	-	-	-	-	-	-	-	-	509.6	-

16.5	-	-	-	-	-	-	-	-	-	-	-	21
------	---	---	---	---	---	---	---	---	---	---	---	----

4. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

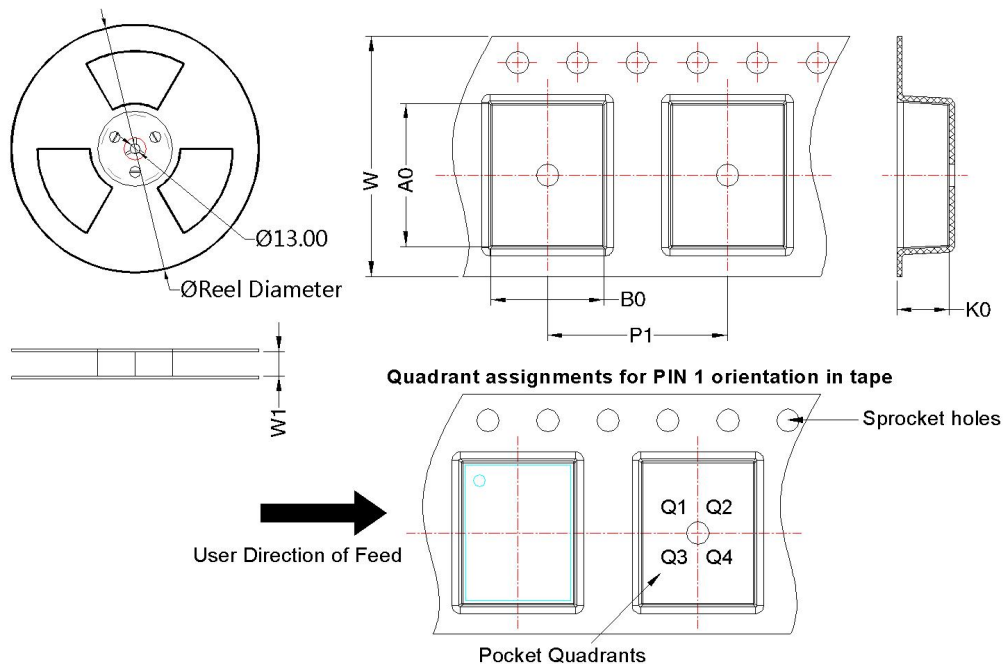
Dimensions and Recommended Layout



Pin-Out		
Pin	Positive output	Negative output
1	+Vin	+Vin
2	GND	-Vo
3	+Vo	GND
4	Trim	Trim
5	GND	-Vo
6	Ctrl	Ctrl

Note:
Unit : mm[inch]
Pin diameter tolerances : ± 0.10[± 0.004]

Tape/Reel packaging



Device	Package Type	Pin	MPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
K78_MT-1000R4	SMD	6	1200	330.0	12.4	9.56	7.56	3.5	12.0	16.0	Q1

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Tape/Reel packaging bag number: 58240017;
2. The maximum capacitive load offered were tested at nominal input voltage 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 datasheet 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.

MORNSUN Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com