DC/DC Converter

K78Uxx-1000R3(L) Series

MORNSUN®

Wide input voltage, non-isolated and regulated single output

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

FEATURES

- Input voltage range up to 8:1
- High efficiency up to 92%
- No-load input current as low as 0.5mA
- Operating ambient temperature range: -40℃ to 105℃
- Output short-circuit protection
- Meet MIL-STD-810F vibration test

K78Uxx-1000R3(L) series are high efficiency switching regulators. The converters feature high efficiency, low loss and short-circuit protection in a compact SIP 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 (%) MIN./Typ.		Capacitive Load (μF) Max.
		Nominal (Range)	Voltage (VDC)	Current (mA) Max.	Vin=24V	Vin=48V	
EN/BS EN	K78U03-1000R3(L)	48 (9-75)	3.3	1000	76/80	72/76	2400
	K78U05-1000R3(L)	48 (9-75)	5	1000	80/84	78.5/82.5	1580
	K78UX6-1000R3(L)	48 (9-75)	6.5	1000	82/86	81/85	1200
	K78U09-1000R3(L)	48 (14-75)	9	1000	84/88	83.5/87.5	880
	K78U12-1000R3(L)	48 (17-75)	12	1000	86.5/90.5	86.5/90.5	660
	K78U15-1000R3(L)	48 (21-75)	15	1000	87/91	86/90	530
	K78U24-700R3(L)	48 (33-75)	24	700	--	88/92	330

Note: * For input voltage exceeding 60 VDC, an input capacitor of 100uF/100V is required.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
No-load Input Current	Nominal input voltage	--	0.5	1.5	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	10%-100%, input voltage range		--	±1.5	±3	%
Linear Regulation	Full load, input voltage range	K78U03/05/X6-1000R3(L)	--	±0.6	±3.0	
		K78U09/12/15-1000R3(L)	-	±0.6	±3.0	
		K78U24-700R3(L)	-	±1.2	±3.0	
Load Regulation	Nominal input voltage, 10% -100% load		--	±0.6	±3.0	
Ripple & Noise*	20MHz bandwidth, nominal input voltage, 10% -100% load		--	75	--	mVp-p

Temperature Coefficient	Operating temperature -40℃ to +105℃		--	--	±0.02	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change		--	±100	±180	mV
Transient Recovery Time			--	150	250	us
Short-circuit Protection	Input voltage range	Ambient temperature≤85℃	Continuous, self-recovery			
		Ambient temperature>85℃	Short≤3s			
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	℃
Storage Temperature	Product		-55	--	+125	
	Tag		-40	--	+300	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds		--	--	+300	
Storage Humidity	Non-condensing		5	--	95	%RH
Vibration*	Bottom-filled silicone rubber		MIL-STD-810F			
Switching Frequency	Full load, nominal input voltage	K78U03/05-1000R3(L)	--	200	--	kHz
		K78UX6/09-1000R3(L)	--	250	--	
		K78U12-1000R3(L)	--	350	--	
		K78U15-1000R3(L)	--	400	--	
		K78U24-700R3(L)	--	550	--	
MTBF	MIL-HDBK-217F@25℃		8215	--	--	k hours
Note: * Meeting the vibration standard requires filling the bottom void of the product with silicone rubber.						

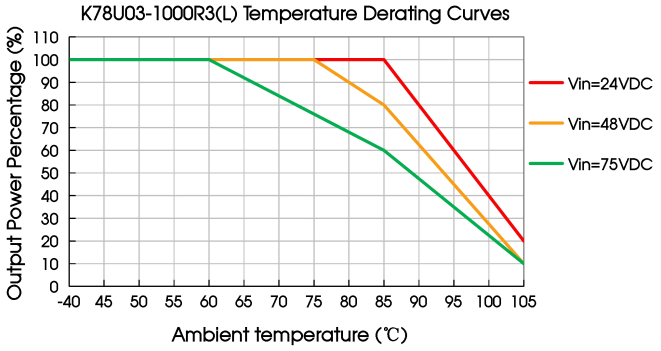
Mechanical Specifications

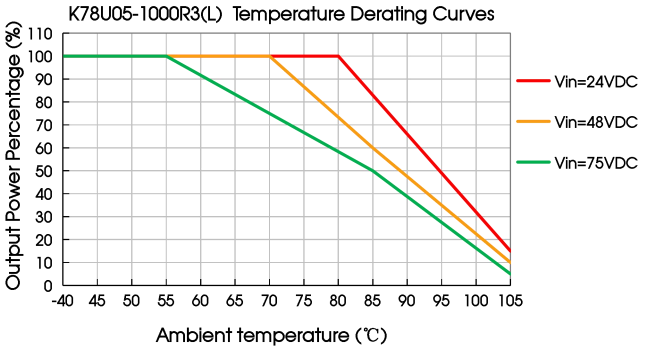
Case Material	Copper alloy	
Dimensions	K78U-1000R3 series	12.10 x 8.60 x 17.50 mm
	K78U-1000R3L series	20.35 x 12.10 x 8.60 mm
Weight	K78U-1000R3 series	6.2g(Typ.)
	K78U-1000R3L series	6.6g(Typ.)
Cooling Method	Free air convection	

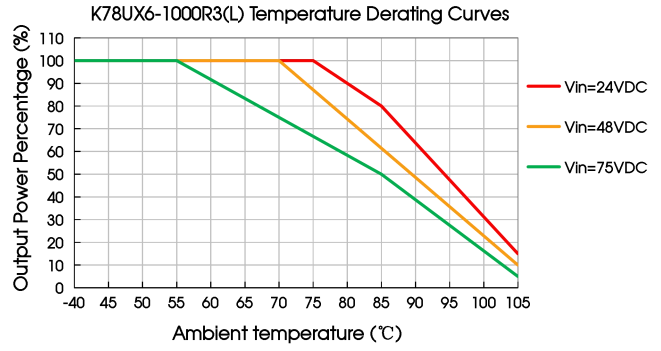
Electromagnetic Compatibility (EMC)

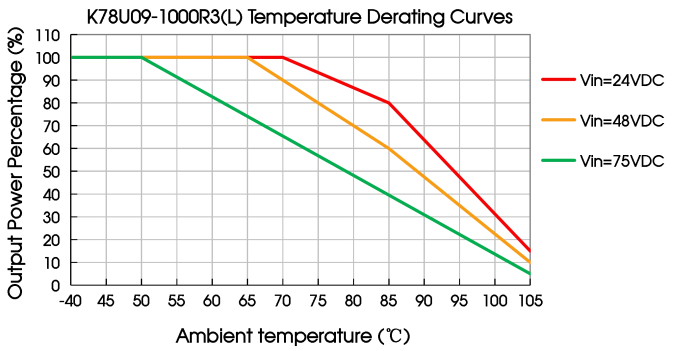
Emissions	CE	CISPR32/EN55032	CLASS B	(see Fig. 4-② for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B	(see Fig. 4-② for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±4kV		perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m		perf. Criteria B
	EFT	IEC/EN 61000-4-4	100kHz ±1kV	(see Fig. 4-① for 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 B

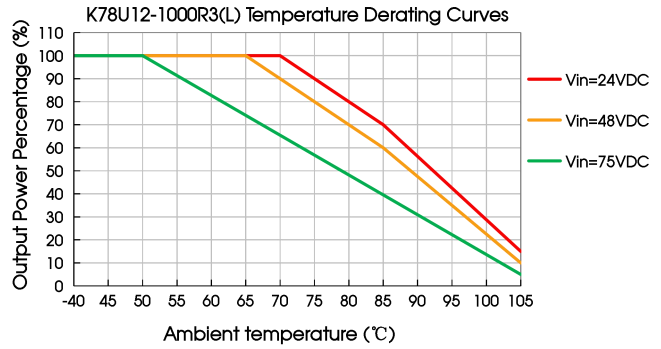
Typical Characteristic Curves

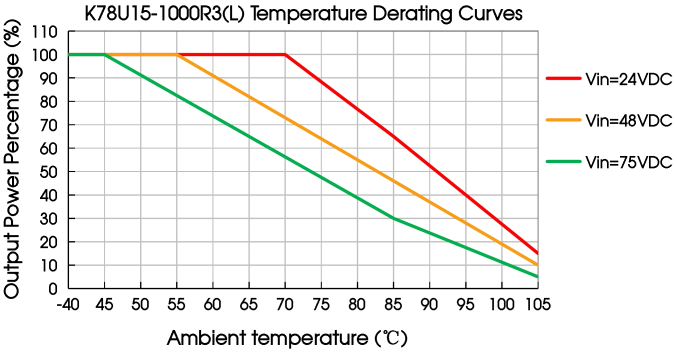












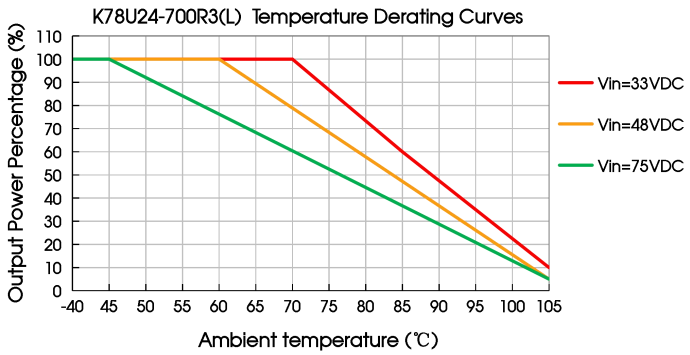
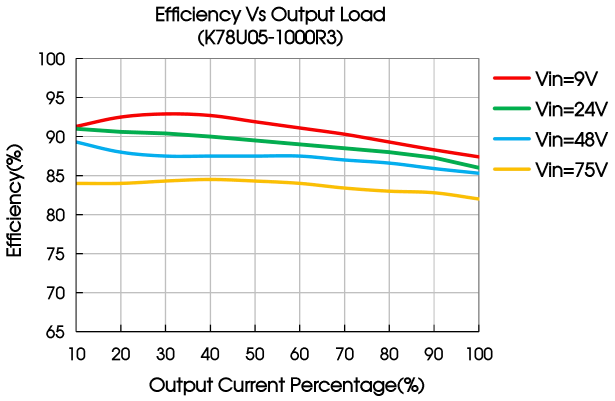


Fig.1



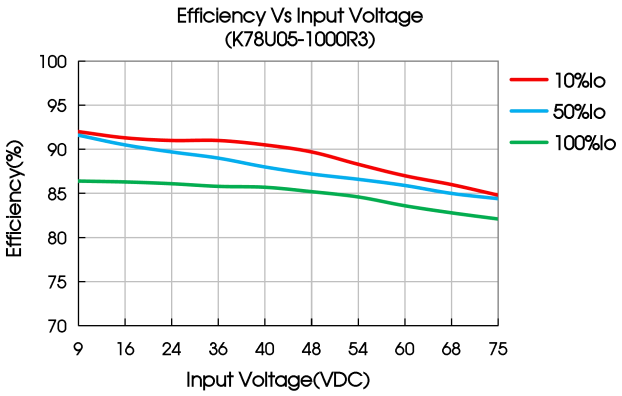


Fig. 2

Design Reference

1. Typical application

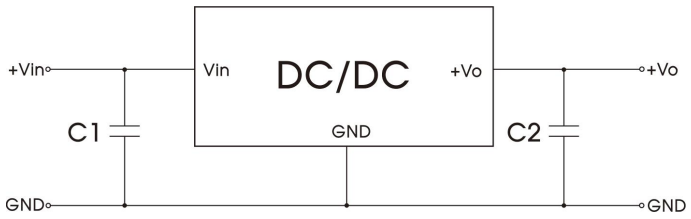


Fig. 3

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)
K78U03-1000R3(L)	10μF/100V	22μF/10V
K78U05-1000R3(L)		22μF/10V
K78UX6-1000R3(L)		22μF/10V
K78U09-1000R3(L)		22μF/25V
K78U12-1000R3(L)		22μF/25V
K78U15-1000R3(L)		22μF/25V
K78U24-700R3(L)		10μF/50V

Table 1

Notes:
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 or output in parallel.

2. EMC compliance circuit

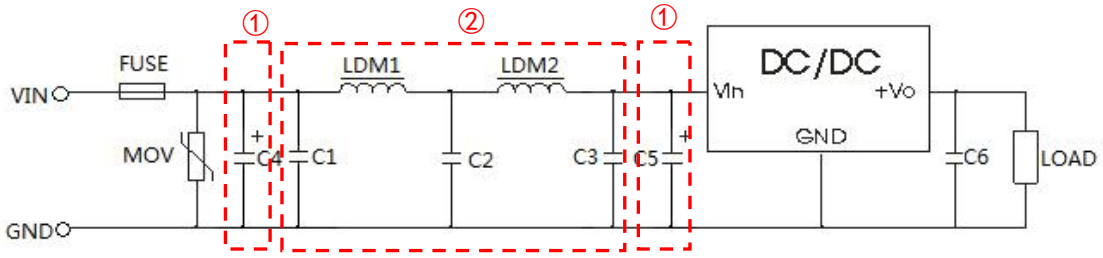


Fig. 4 K78U03/05/X6/09/12/15-1000R3(L) recommend peripheral circuit

Series	MOV	C4/C5	C1/C2/C3	C6	LDM1	LDM2
K78U03/05/X6/09/12/15-1000R3(L)	NC	680μF/100V	4.7μF/100V	10μF/50V	10μH	22μH

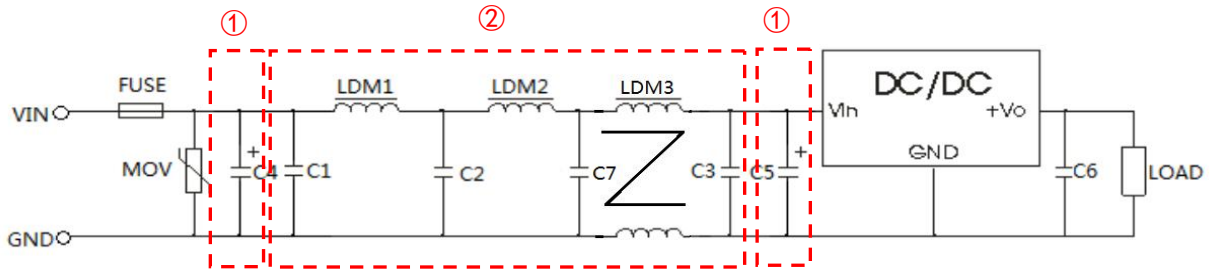


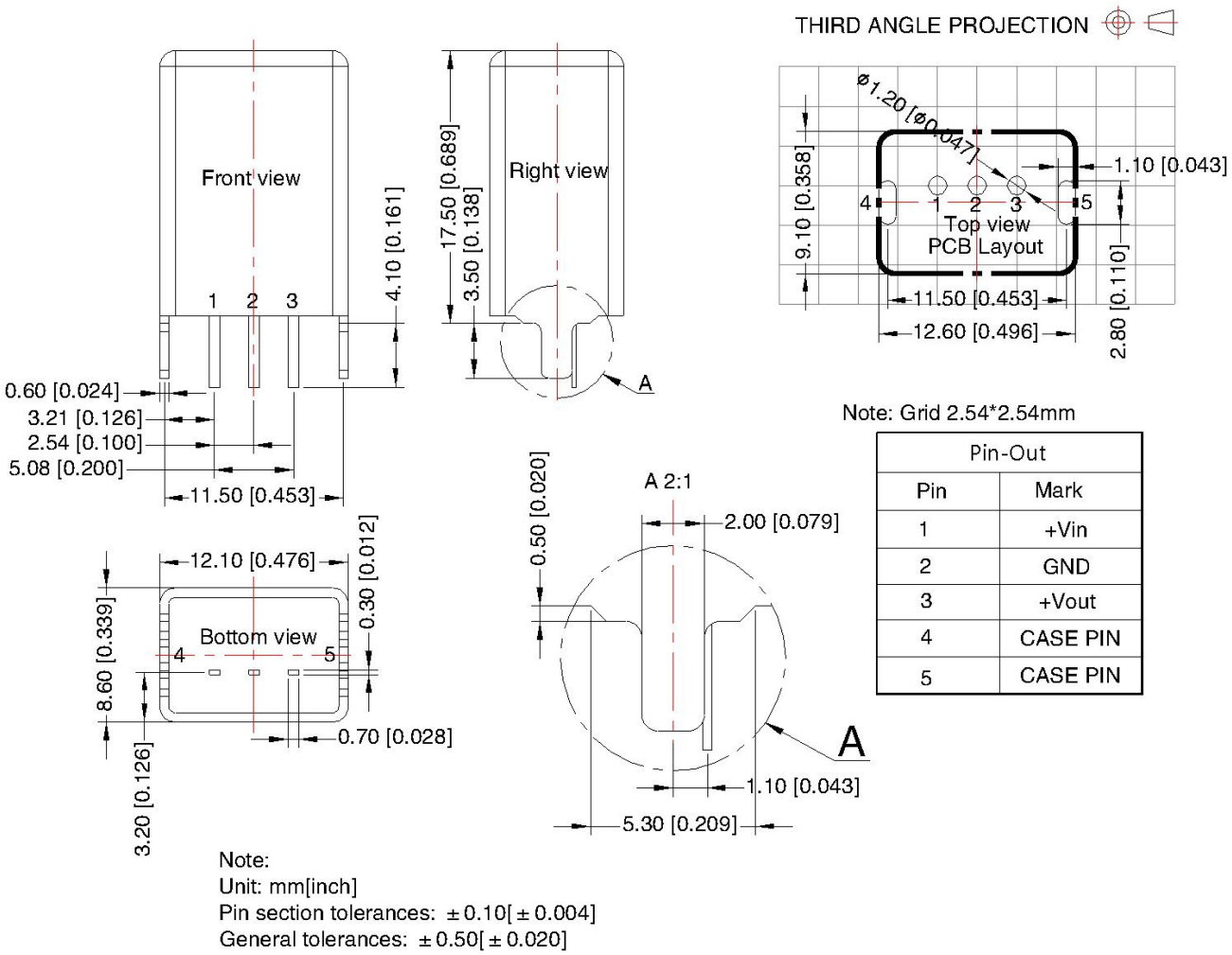
Fig. 4 K78U24-700R3(L) recommend peripheral circuit

Series	MOV	C4/C5	C1/C2/C3/C7	C6	LDM1	LDM2	LDM3
K78U24-700R3(L)	NC	680μF/100V	4.7μF/100V	10μF/50V	10μH	22μH	1.3mH

Note: FUSE is selected according to the customer's actual input current

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

K78Uxx-1000R3 Dimensions and Recommended Layout



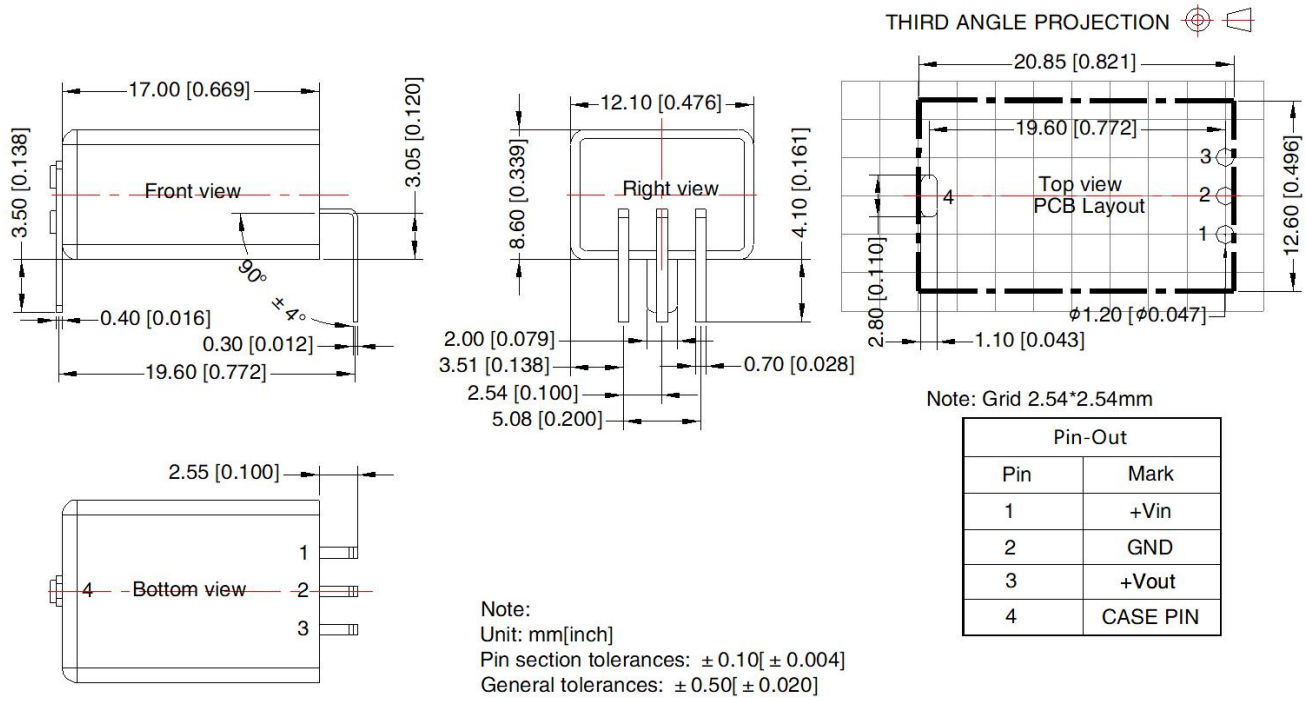
Note: Grid 2.54*2.54mm

Pin-Out	
Pin	Mark
1	+Vin
2	GND
3	+Vout
4	CASE PIN
5	CASE PIN

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

Note: PIN4 and PIN5 are shell terminals for heat dissipation. When using the product, connect the terminals to the rear PCB board, and the PCB must be suspended.

K78Uxx-1000R3L Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

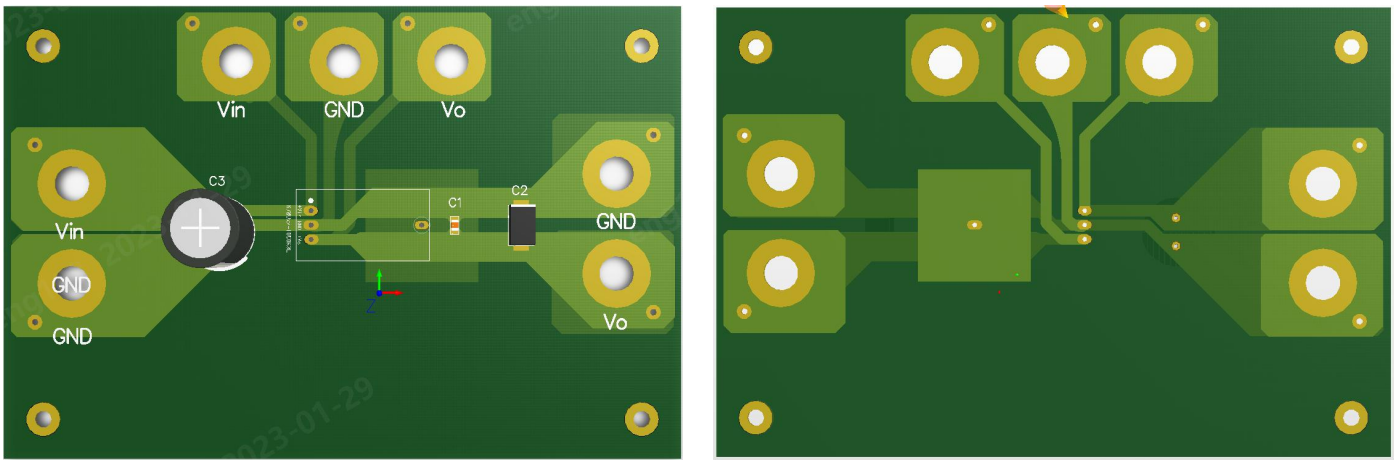
Pin-Out	
Pin	Mark
1	+Vin
2	GND
3	+Vout
4	CASE PIN

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

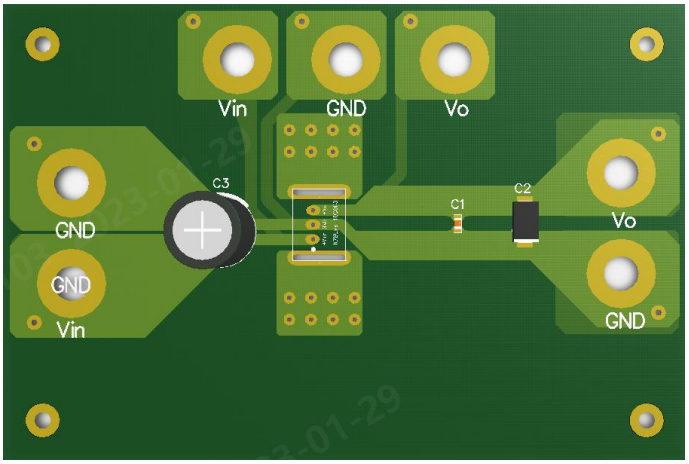
Note: PIN4 is the shell terminal, which dissipates heat. When using the product, connect the terminal to the rear PCB board. The PCB must be suspended in the air.

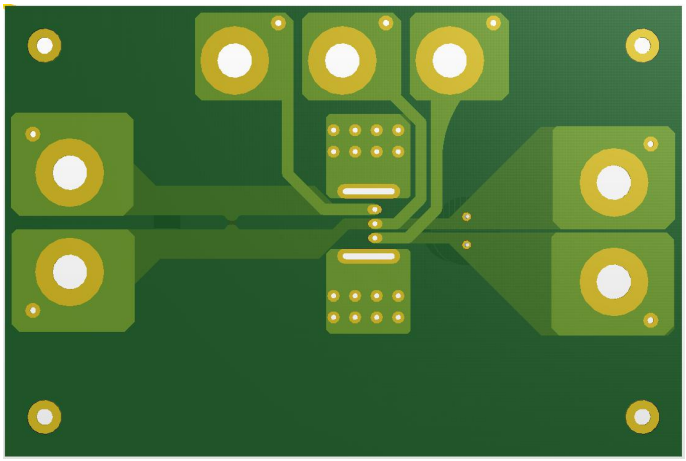
PCB Heat Dissipation Copper Foil Recommended

Series	Heat dissipation copper foil layer	Heat dissipation copper foil area
K78U-1000R3	double	15mmx15mm
K78U-1000R3L	single	20mmx20mm



K78U-1000R3L series





K78U-1000R3 series

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210185(K78U-1000R3 series), 58210187(K78U-1000R3L series);
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 Ta=25℃, 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.

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