

RoHS

K78UXX-500(L) Series

WIDE INPUT NON-ISOLATED & REGULATED SINGLE OUTPUT

FEATURES

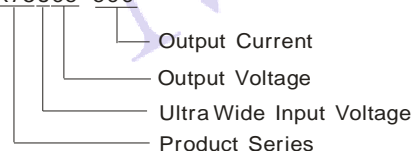
- Efficiency up to 95%
- Ultra wide input voltage range can up to 8:1
- Operating temperature: -40°C ~ +85°C
- Pin-out compatible with LM78XX Linear
- Short circuit protection, thermal shutdown
- Low ripple and noise
- Micro miniature SIP package, meet UL94-V0 requirement
- No heatsink required
- Industry standard pinout
- MTBE>2,000,000Hours

APPLICATIONS

The K78UXX-500(L) series high efficiency switching regulators are ideally suited to replace LM78xx linear regulators and are pin compatible. It has ultra wide input voltage range, the efficiency of up to 95% means that very little energy is wasted as heat so there is no need for any heatsinks with their additional space and mounting costs.

MODEL SELECTION

K78U05-500



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PRODUCT PROGRAM							
Part Number	Input Voltage(VDC)		Output			Efficiency(%) (typ.)	
	Nominal	Range	Voltage (VDC)	Current(mA)		Vin (Min.)	Vin (Max.)
				Min.	Max.		
K78U03-500(L)	48	9.0~72.0	3.3	10	500	82	75
K78U05-500(L)		9.0~72.0	5.0	10	500	87	81
K78U06-500(L)		9.0~72.0	6.5	10	500	91	84
K78U09-500(L)		14.0~72.0	9.0	10	500	92	86
K78U12-500(L)		17.0~72.0	12.0	10	500	93	89
K78U15-500(L)		20.0~72.0	15.0	10	500	94	90
K78U24-300(L)		36.0~72.0	24.0	6	300	95	91

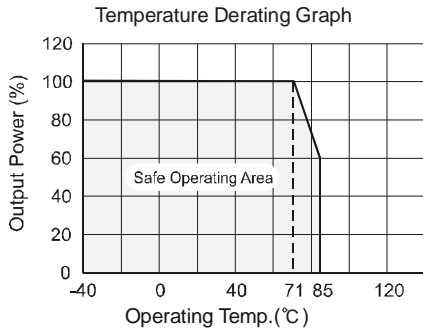
Note: Add suffix "L" for 90° bend pins, for example: K78U05-500L.

OUTPUT SPECIFICATIONS						
Item	Test conditions	Min.	Typ.	Max.	Units	
Output voltage accuracy	100% full load		±2	±3		
Line regulation	Vin=min. to max. at full load		±0.4	±1.0	%	
Load regulation*	From 10% to 100% Load		±0.3	±0.6		
Ripple & Noise	20MHz bandwidth, from 10% to 100% Load (refer to figure 2)		20	60	mVp-p	
Short circuit input power	Vin=Nominal		0.72	1.2	W	
Short circuit protection		Continuous, automatic				
Thermal shutdown			160		°C	
Switching frequency	100% full load	120		800	kHz	
Output current limit	Vin=Nominal		700	1200	mA	
Quiescent current	Vin=Nominal, Min. Load		1	5		
Temperature coefficient	-40°C ~ +85°C ambient			±0.015	%/°C	
Tendencies load	From 10% to 100% Load		1.0	1.5	ms	
Max capacitance load				100	µF	

Note: "GND" Pin can not vacant, or it will damage the module.

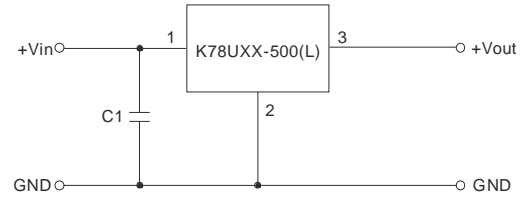
COMMON SPECIFICATIONS						
Item	Test conditions	Min.	Typ.	Max.	Units	
Storage humidity				95	%	
Operating temperature	Power derating (above 71°C)	-40		85		
Operating case temp.			65	100	°C	
Storage temperature		-55		125		
Lead temperature	1.5mm from case for 10 seconds			300		
Cooling		Free Air Convection				
Case material		Plastic (UL94-V0)				
MTBF	25°C (MIL-HDBK-217F)	3500			k hours	
	71°C (MIL-HDBK-217F)	1500				
Hop swap		Not supported				
Thermal resistance				60	°C/W	
EMI conducted	Refer to figure 5	EN55022, CLASS B				
RFI conducted						
Electrostatic discharge		IEC/EN 61000-4-2 level 4				
Safety approvals		EN-60950-1 standards				
Weight			4		g	

TYPICAL CHARECTERISTICS



(figure 1)

TYPICAL APPLICATION CIRCUIT



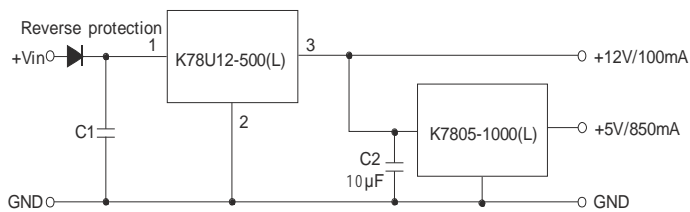
(figure 2)

Note:

1. The regulator proposed to establish the input voltage by soft-start, no plug and play, if the input voltage changes from low voltage to high voltage abruptly, the regulator might be damaged.
2. If the applications is high-voltage input, the regulator must add an external capacitor C1($\leq 47\mu\text{F}/100\text{V}$),to prevent voltage spikes caused by damage to the module.
3. No parallel connection.

APPLICATION EXAMPLE

High voltage input, Multiple Outputs, with greater load

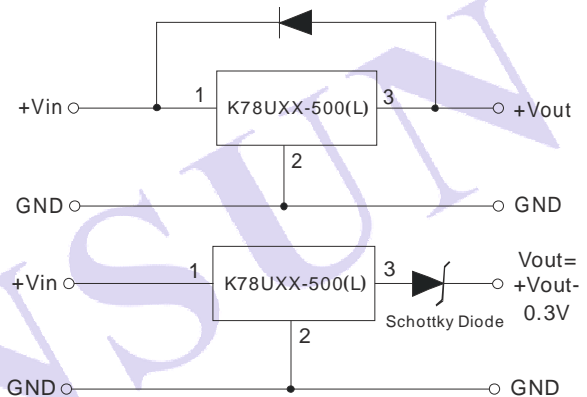


(figure 3)

Note:

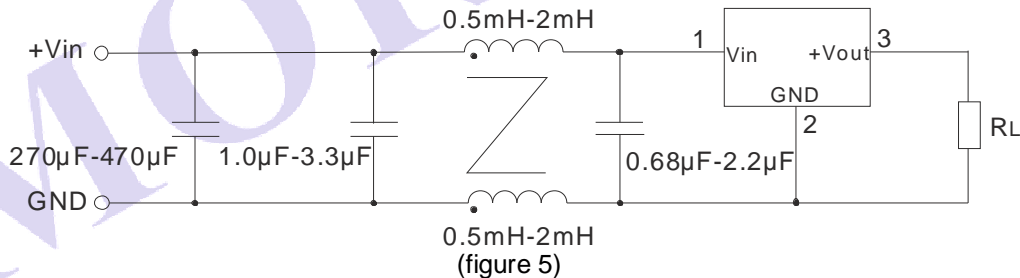
1. the input current amount of the back-grade regulator and the pre-class load should be less than or equal the max load current of the pre-class regulator.
2. If further filtering is required, please add components as per the above circuit(We recommend not to add components), if request, please make sure the capacitors C1 $\leq 47\mu\text{F}$, C2 $\leq 10\mu\text{F}$ more close to the back-grade regulator.

MODULES PROTECT RECOMMENDED CIRCUIT



(figure4)

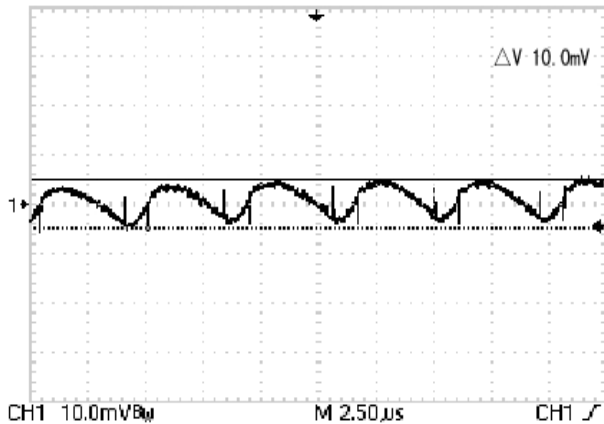
EMC RECOMMENDED CIRCUIT



(figure 5)

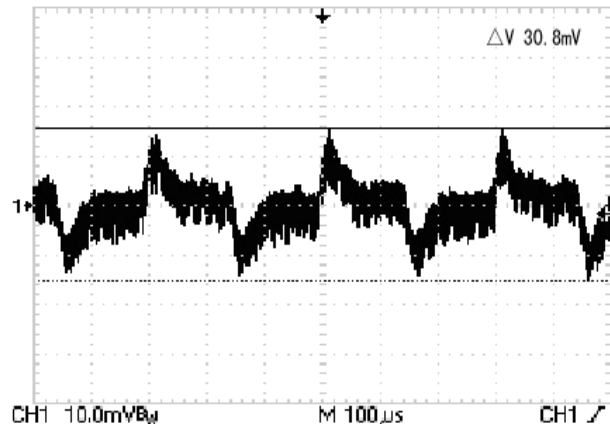
TEST CONFIGURATIONS (TA=25°C)

1、 FULL LOAD OUTPUT RIPPLE & NOISE MEASURED GRAPH



(figure 6)

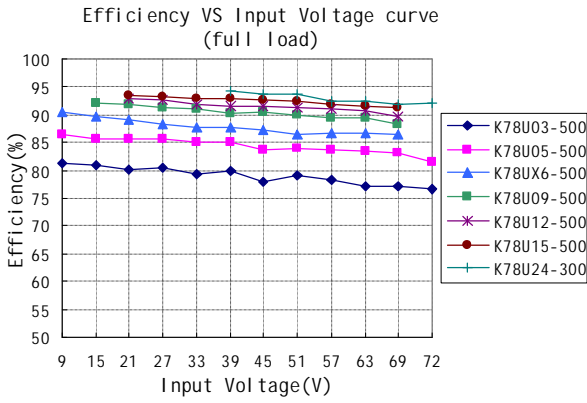
2、 LOAD TRANSIENT RESPONSE WAVEFORM



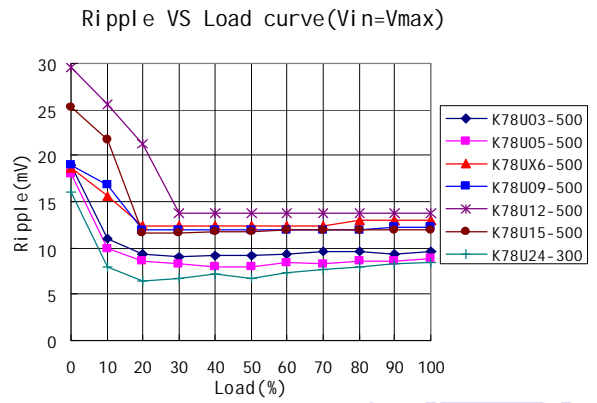
(figure 7)

CHARACTERISTICS CURVE

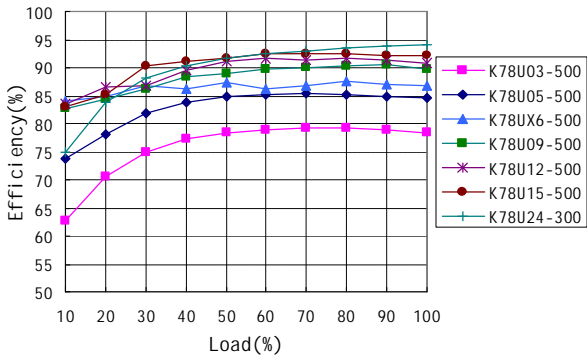
Efficiency



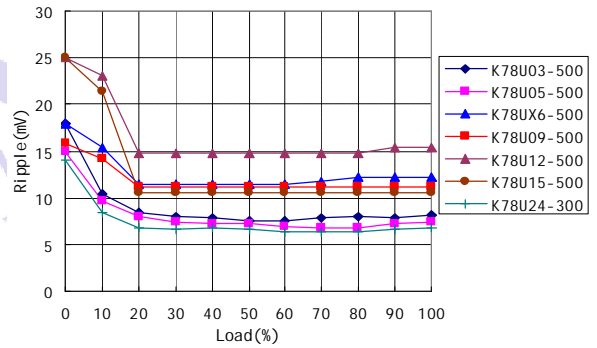
Ripple



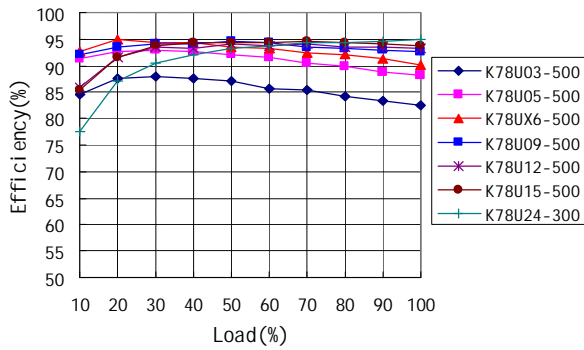
Efficiency VS Load curve (Vin=Vin-nominal)



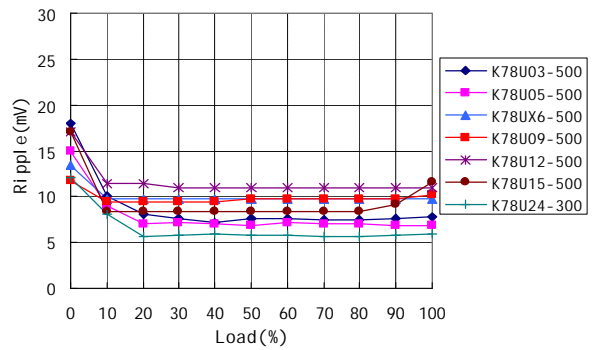
Ripple VS Load curve (Vin=Vin-nominal)



Efficiency VS Load curve (Vin=Vmin)



Ripple VS Load curve (Vin=Vmin)



OUTLINE DIMENSIONS & FOOTPRINT DETAILS

MECHANICAL DIMENSIONS	RECOMMENDED FOOTPRINT										
<p>K78UXX-500</p> <p>17.50 [0.689] (Front View) 0.50 [0.020] 4.10 [0.161] 5.08 [0.200]</p> <p>11.50 [0.453] (Bottom View) 0.50 [0.020] 0.55 [0.022] 9.00 [0.354] 2.15 [0.085]</p> <p>Note: Unit:mm[inch] Pin section tolerances:±0.10mm[±0.004inch] General tolerances:±0.25mm[±0.010inch]</p>	<p>K78UXX-500</p> <p>Φ 1.00 [Φ 0.039]</p> <p>K78UXX-500L</p> <p>Φ 1.00 [0.039]</p> <p>Note: grid:2.54*2.54mm.</p> <table border="1"> <thead> <tr> <th colspan="2">FOOTPRINT DETAILS</th> </tr> <tr> <th>Pin</th> <th>Function</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+Vin</td> </tr> <tr> <td>2</td> <td>GND</td> </tr> <tr> <td>3</td> <td>+Vout</td> </tr> </tbody> </table>	FOOTPRINT DETAILS		Pin	Function	1	+Vin	2	GND	3	+Vout
FOOTPRINT DETAILS											
Pin	Function										
1	+Vin										
2	GND										
3	+Vout										
<p>K78UXX-500L</p> <p>9.00 [0.354] (Front View) 19.00 [0.748] 17.50 [0.689] 0.30 [0.012]</p> <p>11.50 [0.453] (Bottom View) 0.50 [0.020] 0.55 [0.022] 5.08 [0.200]</p> <p>Note: Unit:mm[inch] Pin section tolerances:±0.10mm[±0.004inch] General tolerances:±0.25mm[±0.010inch]</p>	<p>TUBE OUTLINE DIMENSIONS</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>K78UXX-500</p> <p>11.60 [0.457] 27.10 [1.067] 20.6 [0.811] 6.60 [0.260]</p> </div> <div style="text-align: center;"> <p>K78UXX-500L</p> <p>11.40 [0.449] 23.40 [0.921] 20.40 [0.803] 4.20 [0.205] 11.00 [0.433] 16.00 [0.630]</p> </div> </div> <p>Note: Unit:mm[inch] General tolerances:±0.50mm[±0.020inch] L=530mm[20.866inch] Devices per tube quantity: 44pcs L=220mm[8.661inch] Devices per tube quantity: 17pcs Short tube inner packaging dimensions: L*W*H=255*170*80mm Short tube outer packaging dimensions(with six inner packaging boxes): L*W*H=375*280*270mm Long tube inner packaging dimensions: L*W*H=580*200*100mm Long tube outer packaging dimensions(with two inner packaging boxes): L*W*H=600*215*220mm Long tube outer packaging dimensions(with three inner packaging boxes): L*W*H=600*215*325mm</p>										

Note:

1. The load shouldn't be less than 10%, and the output external capacitor should not be too large (recommend <math><10\mu\text{F}</math>), otherwise ripple will increase dramatically.
2. Operation under 10% load will not damage the converter; However, they may not meet all specification listed
3. All specifications measured at $T_a=25^\circ\text{C}$, humidity<75%, nominal input voltage and rated output load unless otherwise specified.
4. In this datasheet, all the test methods of indications are based on corporate standards.