EN

Datasheet

RS Pro K78_T-500R3 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-500R3 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 (%)	Max. Capacitive Load (µF)
				Nominal (Range)	Voltage (VDC)	Current (mA) Max.	Vin Min. / Vin Max.	
CE	1933958	1933957	K7803T-500R3	24 (4.75-36)	3.3	500	86/80	680
	1933960	1933959	K7805T-500R3	24 (6.5-36)	5	500	90/84	680
	1933962	1933961	K7809T-500R3	24 (12-36)	9	500	93/90	680
	1933964	1933963	K7812T-500R3	24 (15-36)	12	500	94/91	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	1.5	mA
Reverse Polarity at Input		Avoid / Not protected			
Input Filter		Capacitance filter			
Ctrl*	Module on	Ctrl pin open or pulled high (TTL 3.5-5.5VDC)			
	Module off	Ctrl pin pulled low to GND (0-0.8VDC)			
	Input current when off	--	30	100	µA

Note: *The Ctrl pin voltage is referenced to input GND.

DC/DC Converter

K78_T-500R3 Series

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	±0.4	
Load Regulation	Nominal input voltage, 10% -100% load	3.3/5 VDC output	--	±0.6	--	%
		Others	--	±0.3	--	
Ripple & Noise*	20MHz bandwidth, nominal input voltage	3.3 VDC output, 20% -100% load	--	20	50	mVp-p
		Others, 10% -100% load	--	20	50	
Temperature Coefficient	Operating temperature -40℃ to +85℃		--	--	±0.03	%/℃
Transient Response Deviation	Nominal input voltage, 25% load step change		--	50	200	mV
Transient Recovery Time			--	0.2	1	ms
Short-circuit Protection	Nominal input voltage		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 loads at or below 10%, Ripple & Noise for 5V/6V/9V/12V output parts levels increase 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	--	700		KHz
				--	
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 8.25mm
Weight	1.5g (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

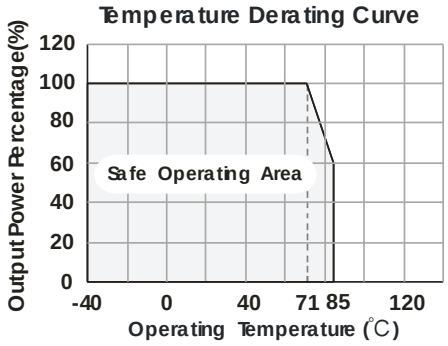
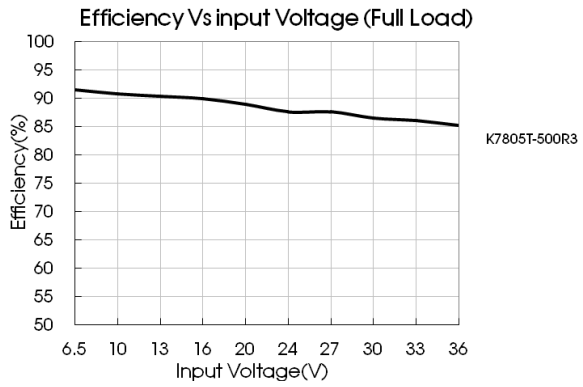
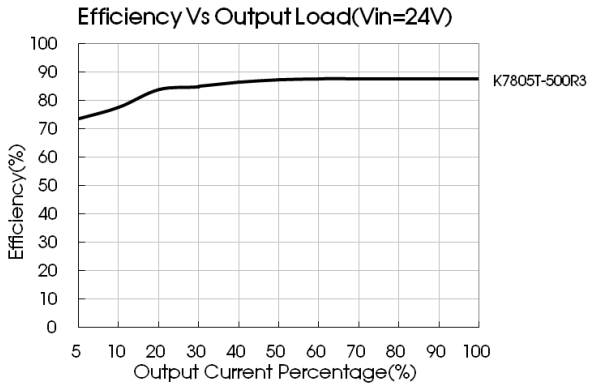
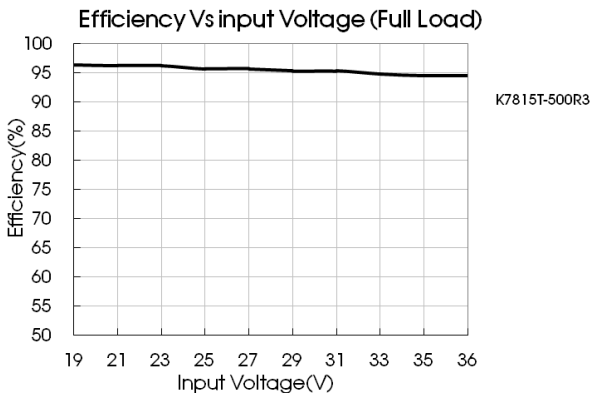
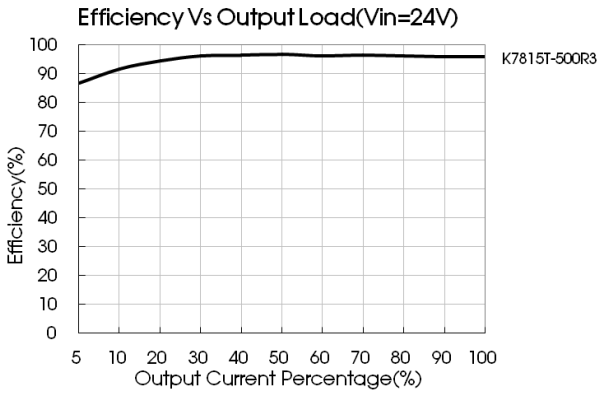


Fig. 1









Design Reference

1. Typical application

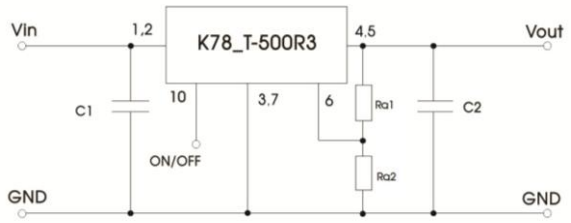


Fig. 2 Typical application circuit

Part No.	C1 (ceramic capacitor)	C2 (ceramic capacitor)	Ra1/Ra2 (Vadj resistance)
K7803T-500R3	10μF/50V	22μF/10V	Refer to Vadj resistance calculation
K7805T-500R3		22μF/16V	
K7809T-500R3		22μF/25V	
K7812T-500R3		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.

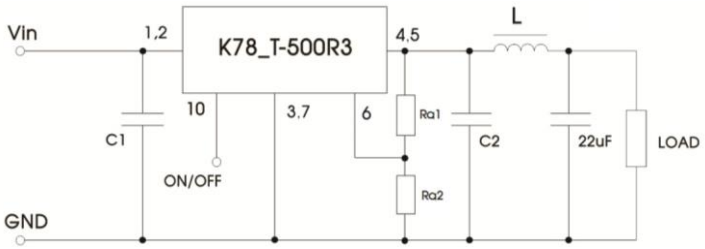
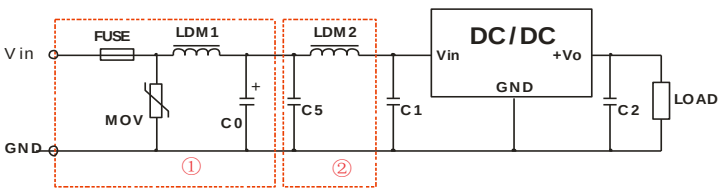


Fig. 3 External "LC" output filter circuit diagram

2. EMC Compliance circuit



FUSE	MOV	LDM1	C0	C1/C2	C5	LDM2
Select fuse value according to actual input current	S20K30	82μH	680μF /50V	Refer to table 1	4.7μF /50V	12μH

Fig.4 Recommended compliance circuit

Note: Part ① in Fig. 4 shows Immunity compliance filter and part ② filter for Emission 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)

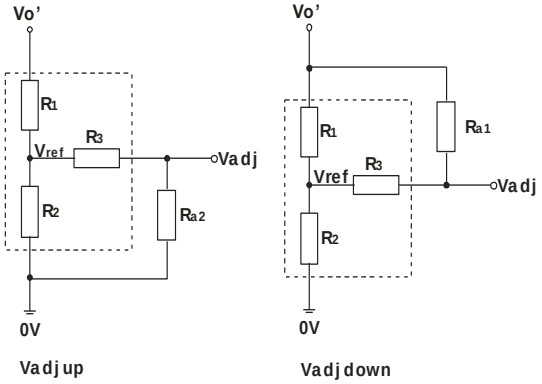


Fig.5 Circuit diagram of Vadj up and down (dashed line shows internal part of module)

Calculating Trim resistor values:

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

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

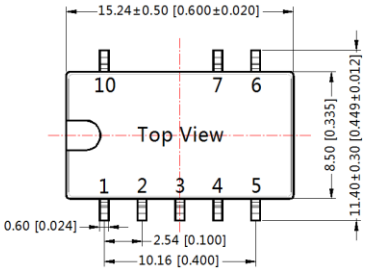
Ra1、Ra2= Trim Resistor value;
a= self-defined parameter;
Vo‘=desired output voltage.

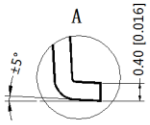
Vout(V)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
3.3	33	9.9	47	0.765
5	75	13.5	75	0.765
9	51	4.7	27	0.765
12	75	5.1	27	0.765

DC/DC Converter

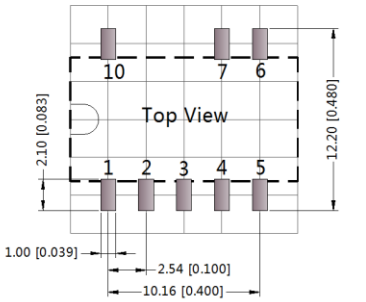
K78_T-500R3 Series

Dimensions and Recommended Layout

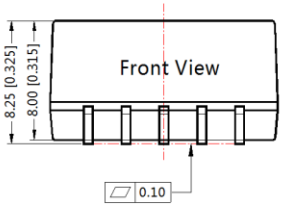


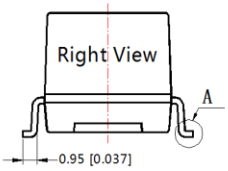


THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm





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

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

Notes:

1. The specified maximum capacitive load is tested under full load condition and over the input voltage range;
2. All parameters in this datasheet were measured under following conditions: Ta=25℃, relative humidity <75%RH, nominal input voltage and rated output load (unless otherwise specified);
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.