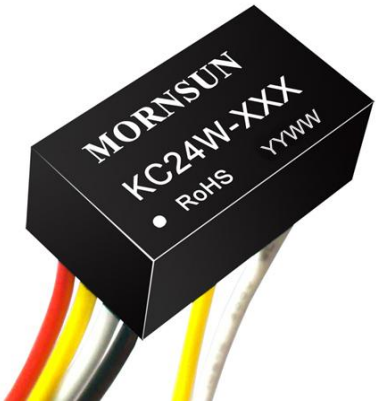
Constant current great power buck LED driver



RoHS

FEATURES

- High efficiency up to 96%
- Ultra-wide range voltage input (5.5-48 VDC)
- Drive current: 300/350/500/600/700mA
- Output Power:10/12/18/21/25W
- Low output ripple & noise(<100mV)
- Support large capacitive load(1000μF)
- PWM dimming & Analogue dimming
- Remote ON/OFF
- Continuous short-circuit protection
- Lead wire package, simple and convenient
- Waterproof Level: IP67
- RoHS Compliance
- Meets EN62368

KC24W series is a step-down constant current source designed for high-power LED drivers. It features with high efficiency, wide input voltage range, high temperature, PWM dimming, analog dimming and remote shutdown. Can be widely used in backlight and 12V, 24V, 36V automotive lighting, landscape lighting, special control lighting, commercial lighting, street lighting, home lighting and other lighting systems. The use of wire packaging makes it more convenient for customers to use.

Selection Guide

Part No.	Input Voltage (VDC)	Output		Dimming Control	Full Load Efficiency (%) Typ.	Capacitive Load(μF) Max.
	Nominal (Range)	Voltage (VDC)	Current (mA)			
KC24W-300X1 (X3)	24 (5.5-48)	3.3-36	0-300	PWM+Analogue	96	1000
KC24W-350 (X1/X3)			0-350			
KC24W-500 (X1/X2/X3)			0-500			
KC24W-600 (X1/X2/X3)			0-600			
KC24W-700 (X1/X2/X3)			0-700			

Note:
1. The types without suffix are four-wire products without analogue dimming+PWM dimming function.
2. The types with suffix X1 are five-wire products with analogue dimming function only.
3. The types with suffix X2 are five-wire products with PWM dimming function only.
4. The types with suffix X3 are six-wire products with analogue dimming+PWM dimming function.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range		5.5	24	48	VDC
Input Voltage Limit	≤10 seconds	5	--	55	
Min. Input-output Voltage Drop	Vin=5.5-48V,1-10LEDs	2	--	4	
Input Filter		Capacitance Filter			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Power	Io: 300mA	0.99	--	10.8	W
	Io: 350mA	1.16	--	12.6	
	Io: 500mA	1.65	--	18	
	Io: 600mA	1.98	--	21.6	
	Io: 700mA	2.31	--	25.2	
Output Current Accuracy		--	±2	±5	%
Output Current Stability	Vin=48V, Vo=3.3V-36V	--	--	±1	
Temperature Coefficient	-40℃ to +71℃ ambient	--	--	±0.015	%/℃
Ripple & Noise*	Vin=48V, 1-10 LEDs	--	--	100	mVp-p

Internal Power Dissipation	Vin=24V, 5LEDs	--	--	700	mW
Thermal Impedance		--	60	--	℃/W
Short-circuit Protection		Continuous, self-recovery			
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	300mA / 350mA	-40	--	85	℃
	500mA / 600mA / 700mA	-40	--	71	
Storage Temperature		-55	--	105	
Pin Soldering Resistance Temperature	Soldering spot is 1.5mm away from case for 10 seconds	--	--	265	
Case Temperature		--	--	100	
Switching Frequency		320	370	420	kHz
MTBF	MIL-HDBK-217F@25℃	1500	--	--	k hours
Thermal Impedance		--	60	--	℃/W

PWM Dimming and Remote on/off Control

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Analogue Dimming	Control Voltage Range	Vin=5.5-48V	0	--	15	V
	Output Current Range	Vin=5.5-48V	0	--	100	%
	Control Voltage Range	Full on	0.2V±50mV			
		Full off	4.5V±200mV			
	Driving Current	Vc=5V	--	--	0.6	mA
Remote Turn-off	ON	Vin=5.5-48V	Open or 2.8V<Vc<6V			
	OFF	Vin=5.5-48V	Vc<0.6V			
PWM Dimming	PWM dimming Pin suspended voltage	Vin=24V, 5LED	--	3.3	--	V
	PWM dimming Pin Isink	Vc=5V	--	--	1	mA
	PWM dimming Pin Isource	Vc<0.6V	--	1	--	μA
	Turn-off-mode Static Input Current	Vin=24V, Vc <0.6V	--	400	--	
	PWM Dimming Frequency*		--	--	200	Hz
Note: *Refer to "PWM Dimming Control" on page five.						

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94V-0)	
Dimensions	22.10 x 12.55 x 9.10 mm	
Weight	four-wire products/ five-wire products/six-wire products	7.1g /7.6g /8.2g (Typ.)
Cooling Method	Free air convection	

Electromagnetic compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS B EN55015 power port (see Fig. 5 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS B (see Fig. 5 for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±2kV	perf. Criteria B
		IEC/EN 61000-4-2	Contact ±6kV (see Fig. 5 for recommended circuit)	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4	±1kV (see Fig. 5 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	±1kV (see Fig. 5 for recommended circuit)	perf. Criteria B
Immunity	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria A
	Voltage dips, short interruptions and voltage variations immunity	IEC/EN 61000-4-29	0%-70%	perf. Criteria B

Typical Characteristic Curves

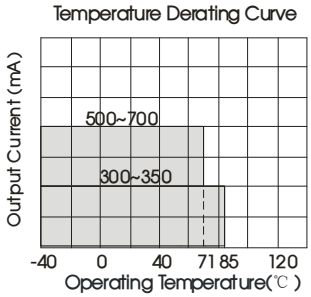
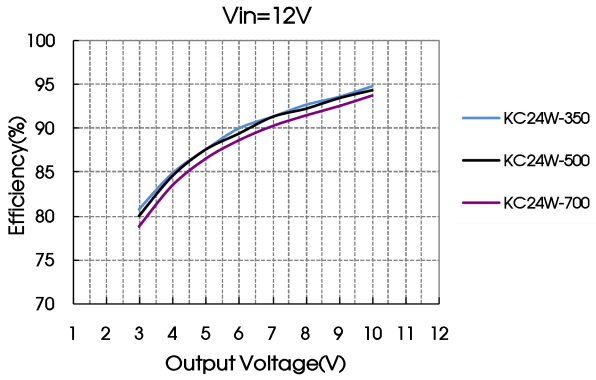
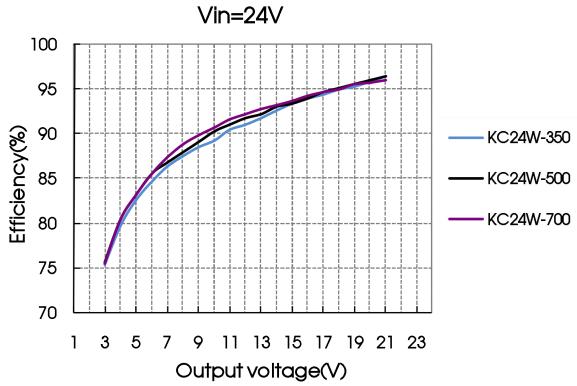
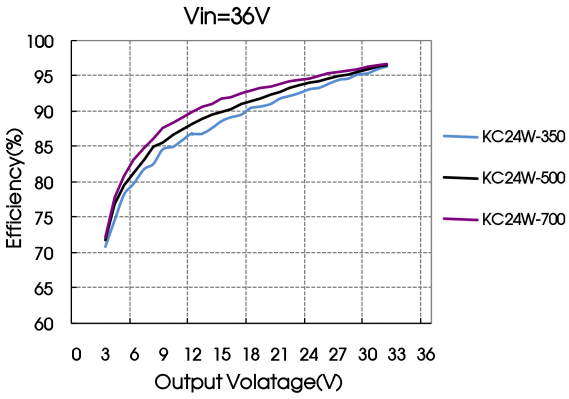
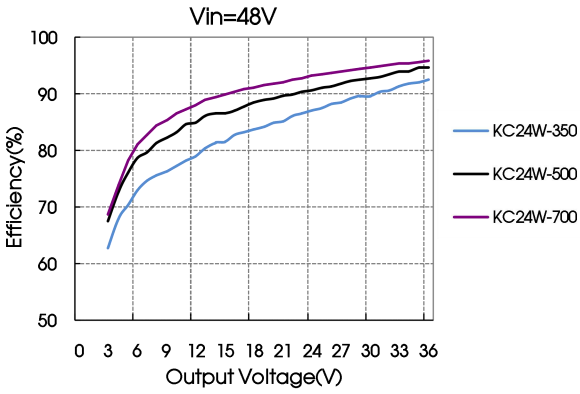


Fig. 1









Design Reference

1. Input/output relationship

Input voltage (VDC)	Output voltage range (VDC)	Constant output current (mA)	Output power (W, Max.)	Input voltage (VDC)	Output voltage range (VDC)	Constant output current (mA)	Output power (W, Max.)
48	3.3-36.0	300	10.80	48	3.3-36.0	350	12.60
36	3.3-32.0	300	9.60	36	3.3-32.0	350	11.20
24	3.3-21.0	300	6.30	24	3.3-21.0	350	7.35
20	3.3-17.0	300	5.10	20	3.3-17.0	350	5.95
15	3.3-13.2	300	3.96	15	3.3-13.2	350	4.62
12	3.3-10.0	300	3.00	12	3.3-10.0	350	3.50
5.5	3.3-4.0	300	1.20	5.5	3.3-4.0	350	1.40
48	3.3-36.0	500	18.00	48	3.3-36.0	600	21.60
36	3.3-32.0	500	16.00	36	3.3-32.0	600	19.20
24	3.3-21.0	500	10.50	24	3.3-21.0	600	12.60
20	3.3-17.0	500	8.50	20	3.3-17.0	600	10.20

15	3.3-13.2	500	6.60	15	3.3-13.2	600	7.92
12	3.3-10.0	500	5.00	12	3.3-10.0	600	6.00
5.5	3.3-4.0	500	2.00	5.5	3.3-4.0	600	2.40
48	3.3-36.0	700	25.20	--	--	--	--
36	3.3-32.0	700	22.40	--	--	--	--
24	3.3-21.0	700	14.70	--	--	--	--
20	3.3-17.0	700	11.90	--	--	--	--
15	3.3-13.2	700	9.24	--	--	--	--
12	3.3-10.0	700	7.00	--	--	--	--
5.5	3.3-4.0	700	2.80	--	--	--	--

2. Typical application circuit

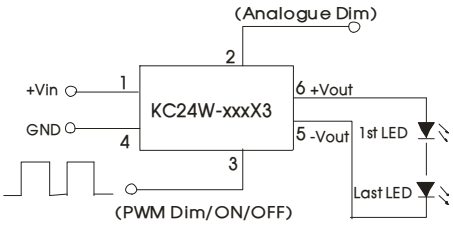


Fig. 2 Application circuits in series

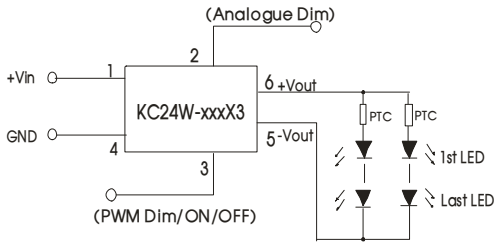


Fig. 3 Application circuits in series and parallel

If it is necessary to protect LED in actual application, you could connect a PTC to the input of every channel or all channels, as shown in Figure 3.

Note: The negative output terminal could not connect GND, or the module may be damaged.

3. Recommended AC input circuit

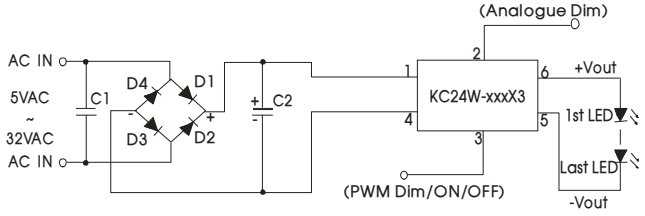


Fig. 4

Components	Specifications
C1	X1 Safety capacitor,0.1μF /300VAC (QIYA)
C2	100μF /63V Electrolytic capacitor (CapXon)
D1, D2, D3, D4	Rectifier diode 1N4007 1A/1000V DO-41(PANJIT)

4. EMC compliance recommended circuit

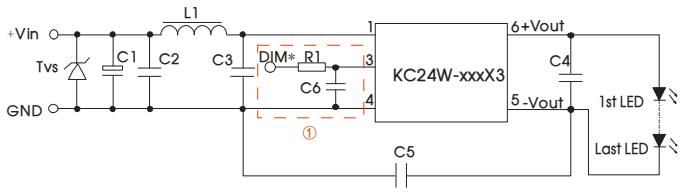


Fig.5

Tips: The ESD level of pin 3 (PWM dimming pin) is ±2kV, which Could reach ±6kV after add the recommended circuit ①.

Components	Specifications	Components	Specifications
Tvs	SMC51A,1500W (Bringtking)	C4	105k/50V 1210 X7R (TORCH)
L1	CD53-82μH（CEAIYA）	C5	102k/2000V 1210 (TDK)(choose)
C1	470μF/100V （CapXon）	C6	470pF/100V 0805 (TORCH)
C2	225k/50V 1210 X7R (TORCH)	R1	680Ω 0805(can be replaced by inductance or magnetic bead)
C3	104k/50V 0805 X7R (TORCH)	--	--

EMI/RFI conducted EN55032 Class B recommended circuit

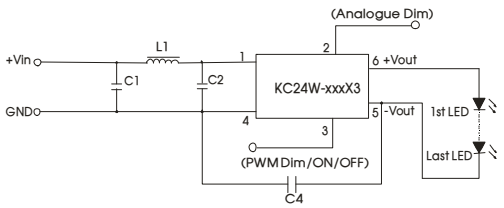


Fig. 6

Components	Specifications
C1	225k/50V 1210 x7R(TORCH)
C2, C4	104k/50V 1210 x7R(TORCH)
L1	PI043-131MT(SHENZHEN CEAIYA)

5. PWM dimming control

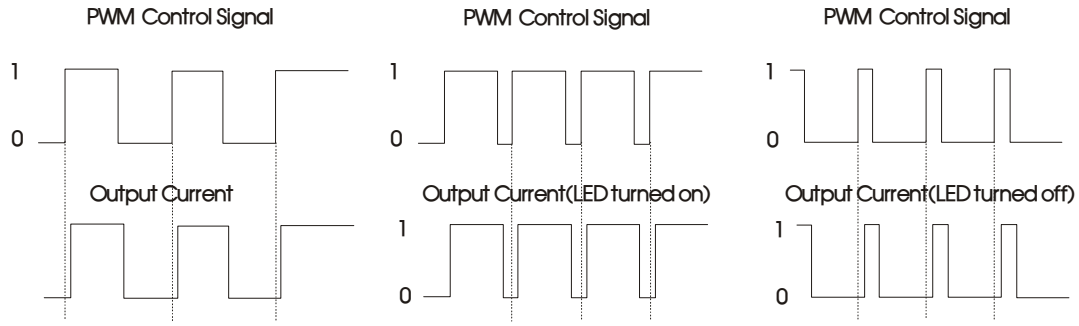


Fig.7

For PWM dimming signals with a certain frequency, the output current of the driver is related to the duty ratio of PWM signal. Refer to the formula for the calculation method:

$$I_{o\_set} = \frac{DT - 0.8}{T} = I_{o\_nom}$$

Where, Io_set represents required output current (mA); D represents the duty ratio (%) of PWM signal; T represents the period (ms) of PWM signal; and Io_nom represents the rated output value (mA) of the driver.

Note: The above formula is for reference only, and the output current may vary due to different loads. The minimum on-time of the PWM signal cannot be less than 0.8ms, otherwise the product will not work normally. It is normal to hear a slight sound from the driver during PWM dimming, because the PWM dimming frequency is within the range of human hearing frequency (usually 20Hz-20KHz). In order to prevent human eyes from observing the flicker of the LED, it is recommended to set the PWM dimming frequency at 100-200Hz.

6. Analogue dimming and typical application

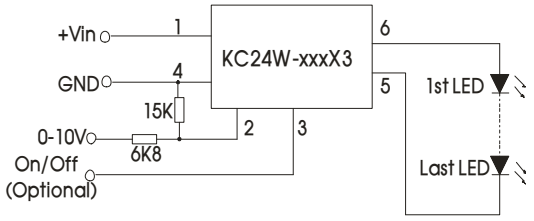


Fig. 8 Analogue dimming circuit

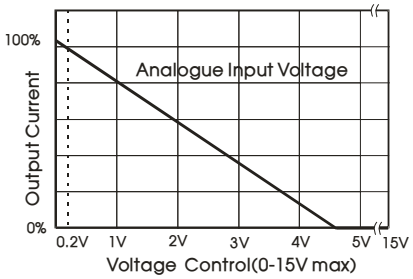


Fig. 9 Analogue input voltage and output current

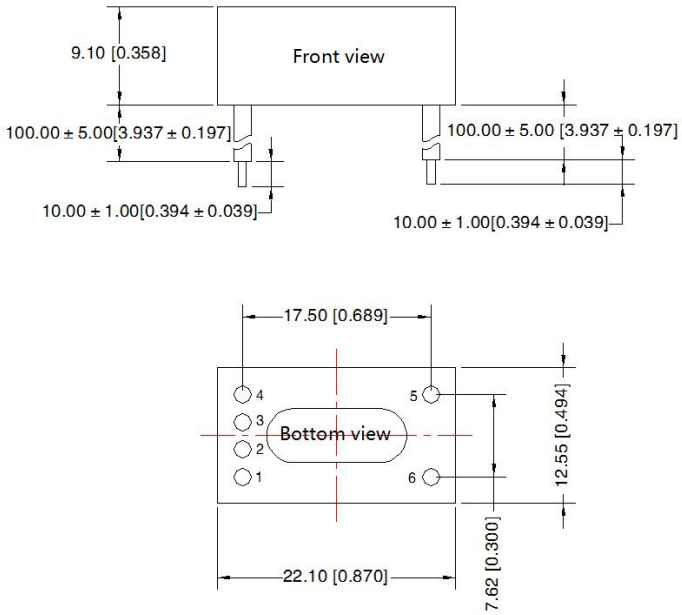
7. The voltage drop of all LEDs in this datasheet is 3.3-3.8V. In actual use, the number of LED lights can be determined according to the actual voltage drop and output voltage of the LED lights.

8. This product does not support hot-Plug use.

9. For additional information please refer to the application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Pin–Out		
Pin	Mark	Comments
1(red)	Vin	DC Supply
2(yellow)	AnalogDimming	Leave open if no use
3(white)	PWM/On/Off	Leave open if no use
4(black)	GND	Do not connect to –Vout
5(white)	–Vout	LED Cathode connection
6(yellow)	+Vout	LED Anode connection

Note:
Unit: mm[inch]
General tolerances: ± 0.50[± 0.020]
Lead internal diameter: 0.76[0.030]
Lead external diameter: 1.60[0.063]
Lead wire spec: UL1569 AWG22 300V 105° C

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58250002;
2. If the product is not operated within the required load range, the product performance can not be guaranteed to comply with all performance indexes in the datasheet;
3. Unless otherwise specified, data in this datasheet should be tested under the conditions of Ta=25°C, humidity<75% when input nominal voltage and output 5 LEDs;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. The performance indexes of the product models listed in this datasheet 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;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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