

Constant current great power buck LED driver



RoHS

### FEATURES

- High efficiency up to 95%
- Ultra wide input voltage range (5.5-46 VDC)
- Drive current:300/350/500/600/700mA
- Output power: 10/12/18/21/25W
- Low ripple & noise(<100mV)
- With large capacitive loads(1000  $\mu$ F)
- Analogue dimming + PWM dimming
- Continuous short circuit protection

KC24H-R series is a high-power LED driver design for the step-down constant current source. With high efficiency, wide input voltage range, high-temperature environment, functional and so on. Contains a PWM dimming, analog dimming and remote shutdown capabilities. They can be widely used in Backlight and 12V, 24V, 36V automotive lighting, landscape lighting, special lighting controls, commercial lighting, street lighting, home lighting and other lighting systems.

### Selection Guide

Model	Input		Output		Efficiency (%, Typ.), Full Load	Max. Capacitive Load( $\mu$ F)
	Input Voltage (VDC)	Input Current (mA) (Typ.)(5LEDs)	Output Voltage (VDC)	Output Current (mA)		
KC24H-300R(X1/X2/X3)	24(5.5-46) Nominal (range)	237	3.3-36	0-300	95	1000
KC24H-350R(X1/X2/X3)		276		0-350		
KC24H-500R(X1/X2/X3)		395		0-500		
KC24H-600R(X1/X2/X3)		474		0-600		
KC24H-700R(X1/X2/X3)		553		0-700		

Notes:

1. For the product model without a suffix such as KC24H-300R, this product is a 4-pin product without the functions of analogue dimming and PWM dimming.
2. For the product model with a suffix X1 such as KC24H-300RX1, this product is a 5-pin product only with the function of analogue dimming.
3. For the product model with a suffix X2 such as KC24H-300R X2, this product is a 5-pin product only with the function of PWM dimming.
4. For the product model with a suffix X3 such as KC24H-300R X3, this product is a 6-pin product with the functions of analogue dimming and PWM dimming.

### Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Limit	$\leq 10$ seconds	5	--	55	VDC
Recommended Input Voltage		5.5	24	46	
Min. Input-output Voltage Drop	Input voltage range	2	--	4	
Internal Power Dissipation	$V_{in}=24V$ , 5LEDs	--	--	0.7	W
Reverse Polarity Input		Forbid			
Input Filter		Capacitor Filter			

### Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Power	Io:300mA	--	--	10.8	W
	Io:350mA	--	--	12.6	
	Io:500mA	--	--	18	
	Io:600mA	--	--	21.6	
	Io:700mA	--	--	25.2	
Output Current Accuracy	Io:300-600mA	--	$\pm 3$	$\pm 5$	%
	Io:700mA	--	$\pm 5$	$\pm 7$	
Output Current Stability	$V_{in}=46V$ , $V_o=3.3V\sim 36V$	--	$\pm 3$	$\pm 5$	
Temperature Drift Coefficient	$-40^{\circ}C \sim +71^{\circ}C$	--	--	$\pm 0.015$	$\%/^{\circ}C$
Ripple & Noise*	20MHz bandwidth( $V_{in}=46V$ , 1~ 10 LEDs)	--	--	100	mVp-p
Over-temperature Protection		Self-recovery after cooling			

Output Short Circuit Protection		Continuous, self-recovery
Note: *Ripple and noise tested with "parallel cable" method, please see DC-DC Converter Application Notes for specific operation methods.		

## General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Operating Temperature	300mA / 350mA	-40	--	85	°C
	500mA/ 600mA/ 700mA	-40	--	71	
Storage Temperature		-55	--	125	
Operating Humidity		--	--	95	%
Storage Humidity		--	--	95	
Case Temperature Rise	Ta=25°C	--	--	65	°C
Lead Temperature	Welding spot is 1.5mm away from the casing, 10 seconds	--	--	300	
Operating Frequency*		550	645	750	KHz
MTBF	MIL-HDBK-217F@25°C	1000	--	--	K hours
Thermal Impedance		--	60	--	°C/W

Note:\* When the mode works in the high-voltage input-area and 1LED load, its operating frequency will range from 100KHz to 400KHz.

## PWM Dimming and Remote on/off Control

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Analogue Dimming	Input Voltage Range	Vin=5.5-46V	0-15V		
	Output Current Range	Vin=5.5-46V	0%-100%		
	Control Voltage Range	Full on	0.2V±50mV		
		Full off	4.5V±200mV		
	Driving Current	Vc=5V	--	--	0.2 mA
PWM Dimming& Remote Turn-off	ON		Open or 2.8V<Vc<6V		
	OFF		Vc<0.6V		
	Turn-off-mode Static Input Current	Vin=24V, Vc <0.6V	--	400	-- μA
	Isink	Vc=5V, Vin=24V, 5LEDs	--	--	1 mA
	Isourse	Vc<0.6V, Vin=24V, 5LEDs	--	1	-- μA
	PWM Dimming Frequency*		--	--	200 Hz

Note: \*Refer to "PWM Dimming Control" on page five.

## Physical Specifications

Casing Material	Black flame-retardant and heat-resistant plastic (UL94 V-0)
Package Dimensions	22.80*10.20*9.50 mm
Weight	4.3g(Typ.)
Cooling method	Free air convection

## EMC Specifications

EMI	CE	EN55015 power port/CISPR22 CLASS B (see Fig. 5 for recommended circuit)			
	RE	EN55015 /CISPR22 CLASS B (see Fig. 5 for recommended circuit)			
EMS	ESD	KC24H-xxxR(X1)	IEC/EN 61000-4-2	Contact ±6KV	perf. Criteria B
		KC24H-xxxRX2/X3	IEC/EN 61000-4-2	Contact ±2KV(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	line to line ±1KV (see Fig. 5 for recommended circuit)	perf. Criteria B
	CS		IEC/EN 61000-4-6	3Vrms	perf. Criteria A

Product Characteristic Curve

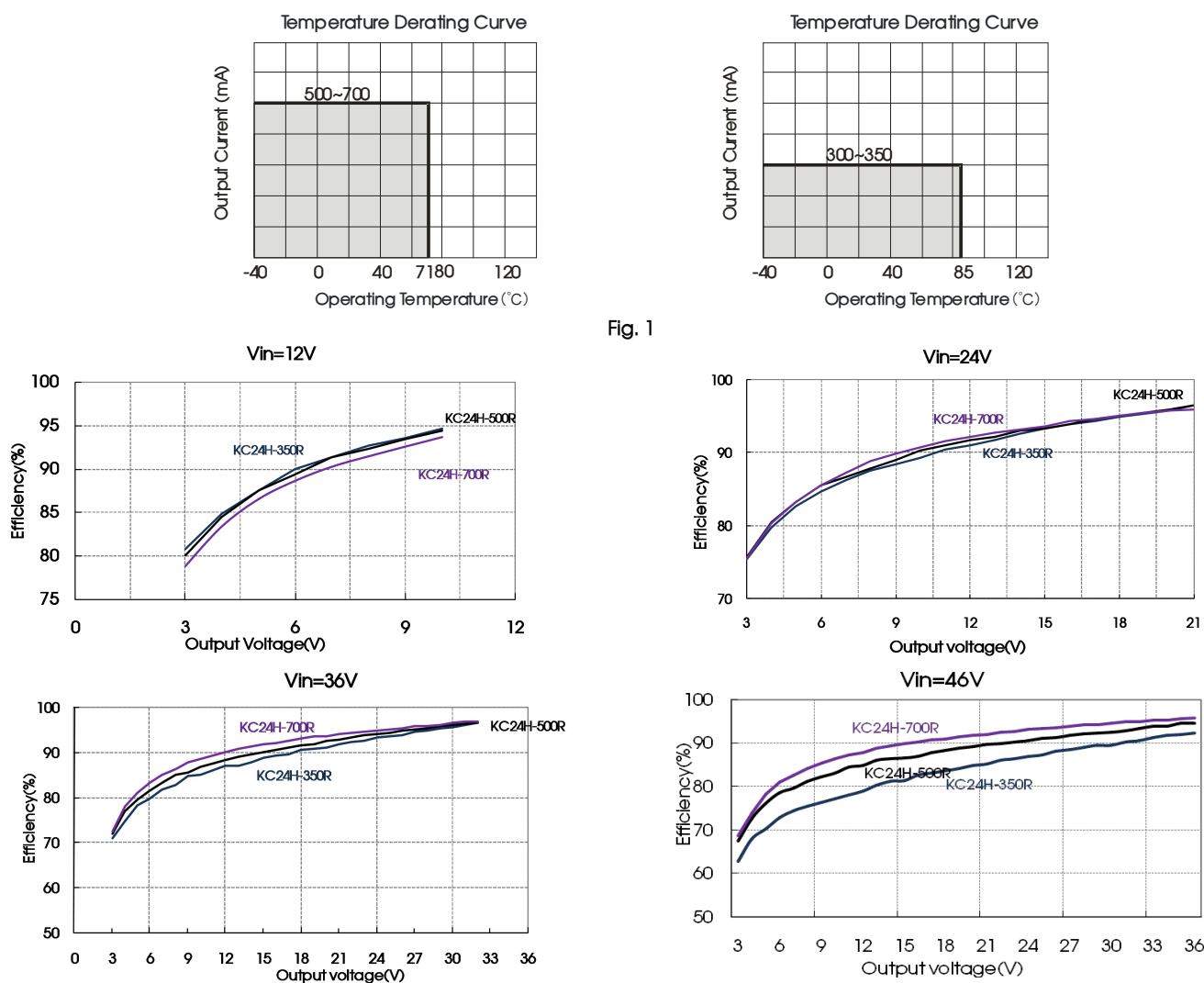


Fig. 1

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.)
46	3.3-36.0	300	10.80	46	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
46	3.3-36.0	500	18.00	46	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

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.)
46	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

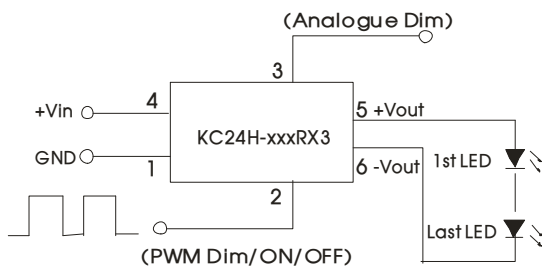


Fig. 2 Application circuits in series

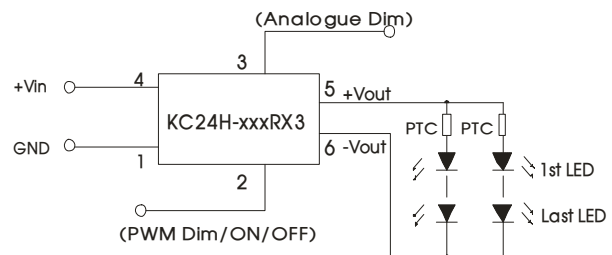


Fig. 3 Application circuits in series and parallel

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 can't connect GND, or the module may be damaged.

## 3. Recommended AC input circuit

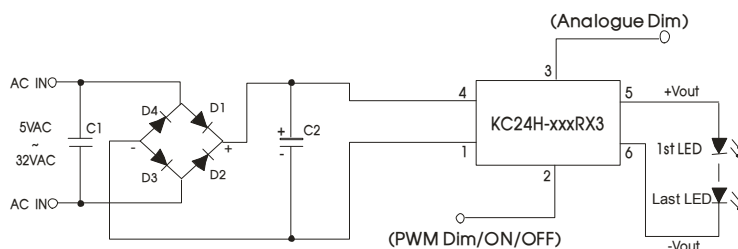


Fig. 4

Components	Specification
C1	X1 Safety capacitor, 0.1μF /300VAC (QIYA)
C2	100μF /63V Electrolytic capacitor, Φ10x16(Flat surface)NCC
D1, D2, D3, D4	Rectifier diode 1N4007 1A/1000V D0-41(PANJIT)

## 4. EMC solution-recommended circuit

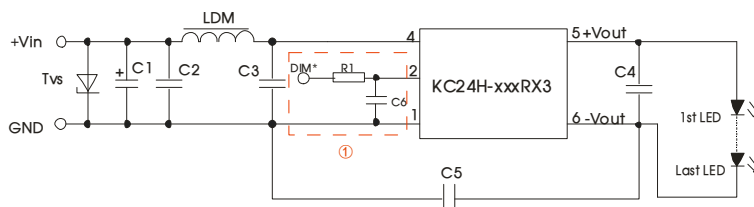
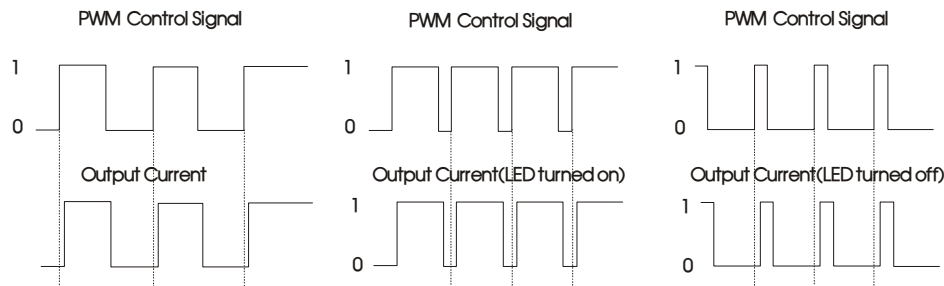


Fig.5 Recommended EMC circuit

Components	Specification
Tvs	SMC51A,1500W (ON)
LDM	CD53-82μH (CEAIA)
C1	470μF/100V (NCC)
C2	2.2μF/50V 1210 X7R (TORCH)
C3	0.1μF/50V 0805 X7R (TORCH)
C4	1μF/50V 1210 X7R (TORCH)
C5	1nF/2000V 1210 (TDK)(choose or no)
C6	470pF/100V 0805 (TORCH)
R1	680Ω 0805(can replaced by inductance or magnetic bead)

Note: Add circuit ① may let the ESD level of PWM-control pin reach to ±6KV.

## 5. PWM dimming control



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,  $I_{o\_set}$  represents required output current (mA);  $D$  represents the duty ratio (%) of PWM signal;  $T$  represents the period (ms) of PWM signal; and  $I_{o\_nom}$  represents the rated output value (mA) of the driver.

Note: The above formula is for reference only; and deviation of output current may exist due to various loads. The min. conducted time of PWM signal shall not be less than 0.8ms, or the product will be in abnormal operation; in case of low voice from the driver during PWM dimming, it is normal since the PWM dimming frequency is within the auditory frequency range of human ears (20Hz-20KHz in general). To prevent seeing flash of the LED by human eyes, it is suggested to set the PWM dimming frequency between 100-200Hz.

PWM curve( $V_{in}=24V, 5LEDs$ ):

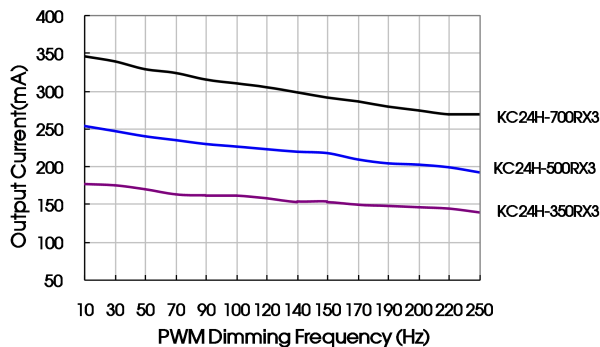


Fig. 6 Output current VS PWM dimming frequency (D=50%)

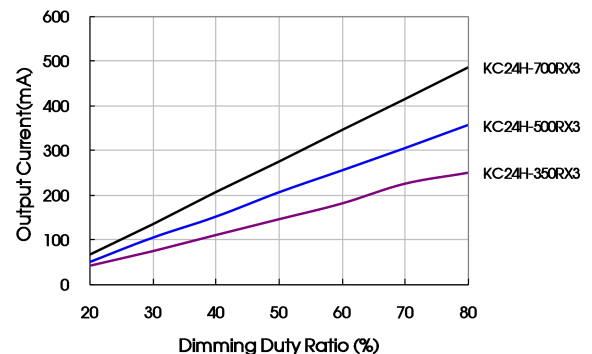


Fig. 7 Output current VS Dimming duty ratio( $f=200Hz$ )

## 6. Analogue dimming and typical application

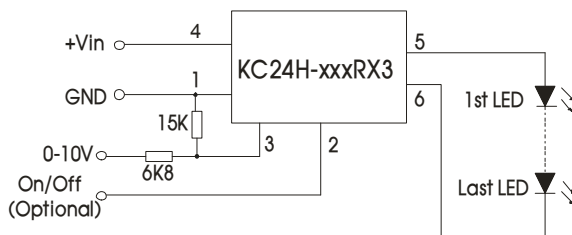


Fig. 8 Analogue dimming circuit

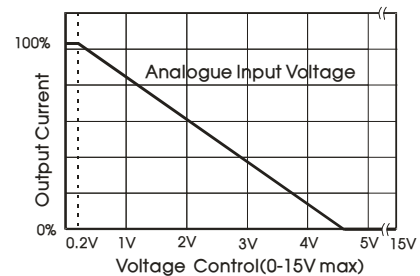
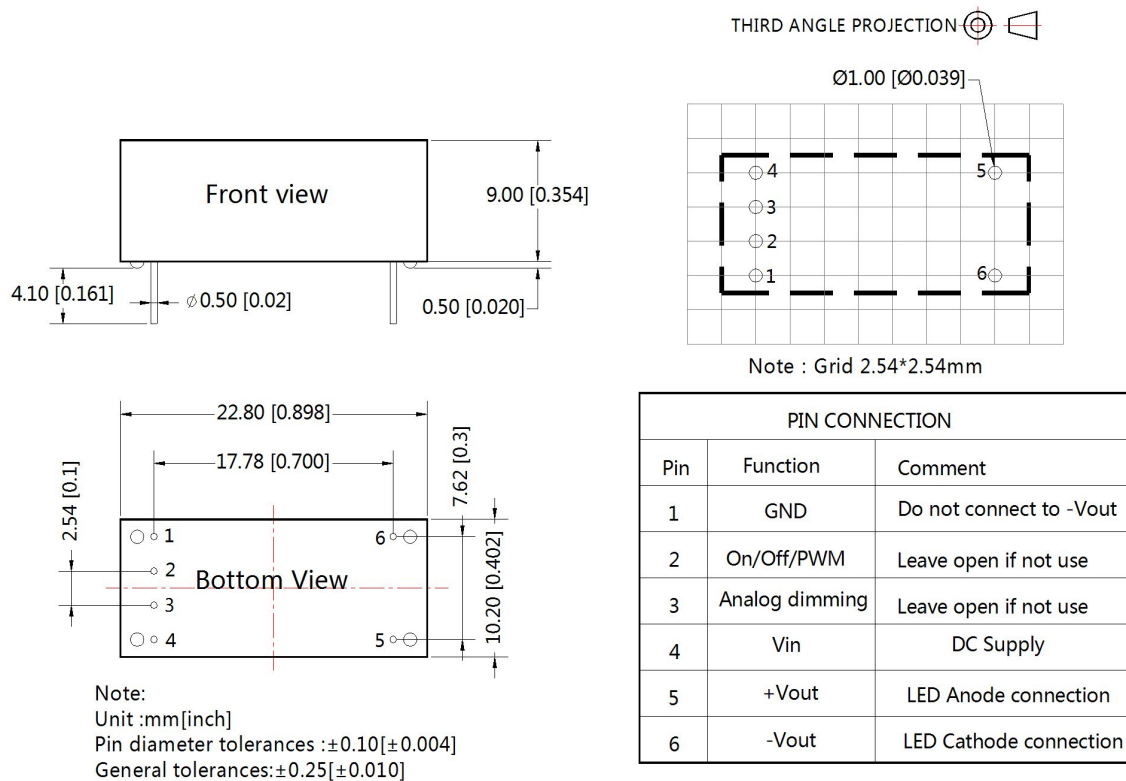


Fig. 9 Analogue input voltage and output current

- The voltage drop of all LEDs in the datasheet is 3.3-3.8V, during actual application, the number of LEDs can be confirmed based on the actual voltage drop and output voltage of LEDs.
- This product does not support hot-Plug use.
- For more information Please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com)

## Dimensions and Recommended Layout



### Notes:

1. Packing information please refer to Product Packing Information which can be downloaded from [www.mornsun-power.com](http://www.mornsun-power.com). Packing bag number: 58210025;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our Company's corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Specifications are subject to change without prior notice.

## MORNSUN Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Luogang District, Guangzhou, P. R. China  
Tel: 86-20-38601850-8801 Fax: 86-20-38601272 E-mail: [info@mornsun.cn](mailto:info@mornsun.cn)