Constant current great power buck LED driver

RoHS

FEATURES

- High SMD Package, simple and convenient
- High efficiency up to 96%
- Ultra-wide range voltage input and output
- Constant current mode, great power output
- AC-DC, EMC recommended circuit
- PWM dimming & Analogue dimming
- Remote ON/OFF, Short-circuit protection
- RoHS and UL Compliance
- Meets EN62368

KC24RT 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. SMD packaging brings convenience to customer automated production.

Selection Guide

Model	Input		Output		Full Load Efficiency (%) Min./Typ.	Capacitive Load(μF) Max.
	Input Voltage (VDC)	Input Current (mA) (Typ.)(5LEDs)	Voltage (VDC)	Current(mA)		
KC24RT-300	24	5.5-48	3.3-36	0-300	96	1000
KC24RT-350	24	5.5-48	3.3-36	0-350		
KC24RT-500	24	5.5-48	3.3-36	0-500		
KC24RT-600	24	5.5-48	3.3-36	0-600		
KC24RT-700	24	5.5-48	3.3-36	0-700		

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Limit	≤10 seconds	5	--	55	VDC
Recommended Input Voltage		5.5	24	46	
Min. Input-output Voltage Drop	Vin=5.5V-48V,1-10LEDs	2	--	4	
Internal Power Dissipation	Vin=24V, 5LEDs	--	--	0.7	W
Input Filter		Capacitance 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		--	± 2	±5	%
Output Current Stability	Vin=48V,Vo=3.3V-36V	--	--	±1	
Temperature Drift Coefficient	-40 °C to +71 °C	--	--	± 0.015	%/°C
Ripple & Noise*	20MHz bandwidth(Vin=24V, 5 LEDs)	--	--	120	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	℃
	500mA/ 600mA/ 700mA	-40	--	71	
Storage Temperature		-55	--	125	
Operating Humidity		--	--	95	%
Storage Humidity		--	--	95	
Case Temperature Rise	Ta=25°C	--	--	100	℃
Switching Frequency*		320	370	420	kHz
MTBF	MIL-HDBK-217F@25℃	2000	--	--	k hours

Note:*The working frequency will be 100-400kHz when with high input voltage and the output are connected to 1LED.

PWM Dimming and Remote on/off Control

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Analogue Dimming	Input Voltage Range	Vin=5.5V-48V	0-15V			
	Output Current Range	Vin=5.5V-48V	0%-100%			
	Control Voltage Range	Full on	0.2V±50mV			
		Full off	4.5V±200mV			
	Driving Current	Vc=5V	--	--	0.6	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
	Remote Pin Current	Vc=5V	--	--	1	mA
	PWM Dimming Frequency*		--	--	200	Hz

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

Physical Specifications

Case Material	Black epoxy resin; flame-retardant heat- resistant (UL94 V-0)
Dimensions	23.86 x 18.10 x 8.00 mm
Weight	6g(Typ.)
Cooling Method	Free air convection

EMC Specifications

EMI	CE	EN55015 power port (Refer to Figure 5)
	RE	EN55015/CISPR32 Class B (Refer to Figure 5)
EMS	ESD	IEC/EN 61000-4-2 Contact ±4kV perf. Criteria B (Refer to Figure 5)
	RS	IEC/EN 61000-4-3 10V/m perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±1kV perf. Criteria B (Refer to Figure 5)
	Surge	IEC/EN 61000-4-5 ±1kV perf. Criteria B (Refer to Figure 5)
	CS	IEC/EN 61000-4-6 10Vr.ms perf. Criteria A

Product Characteristic Curve

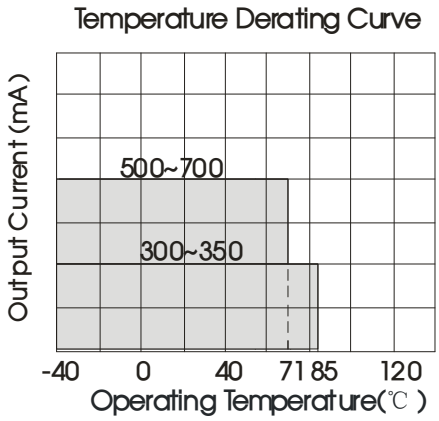
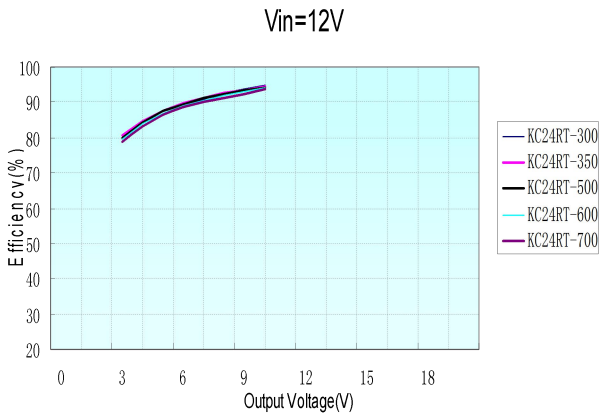
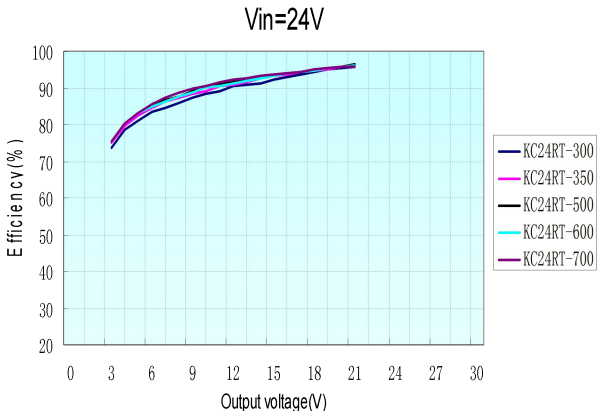
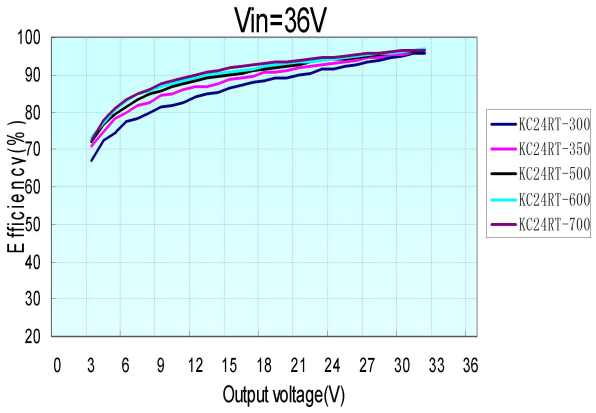
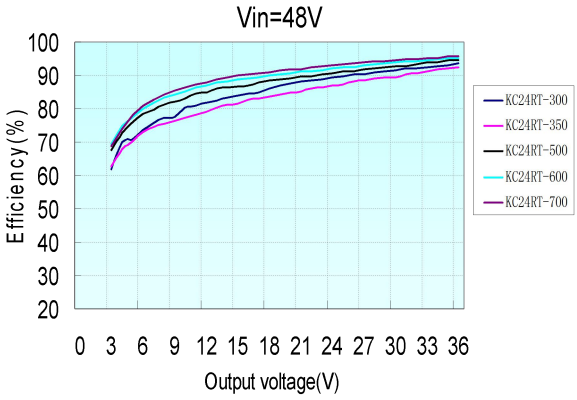


Fig. 1









Design Reference

1. Input/output relationship

Input voltage (VDC)	Output voltage range(VDC)	Output constant current (mA)	Output power (W Max)
48	3.3-36.0	300	10.80
36	3.3-32.0	300	9.60
24	3.3-21.0	300	6.30
20	3.3-17.0	300	5.10
15	3.3-13.2	300	3.96
12	3.3-10.0	300	3.00
5.5	3.3-4.0	300	1.20

Input voltage (VDC)	Output voltage range(VDC)	Output constant current (mA)	Output power (W Max)
48	3.3-36.0	350	12.60
36	3.3-32.0	350	11.20
24	3.3-21.0	350	7.35
20	3.3-17.0	350	5.95
15	3.3-13.2	350	4.62
12	3.3-10.0	350	3.50
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

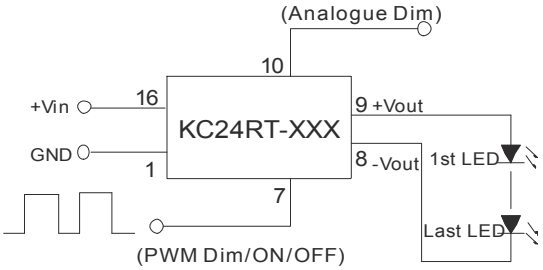


Fig. 2 Application circuits in series

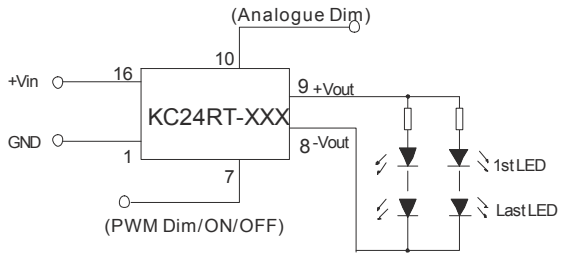


Fig. 3 Application circuits in series and parallel

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

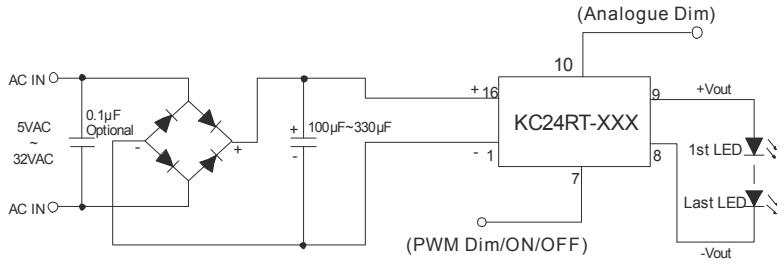


Fig. 4

4. EMC solution-recommended circuit

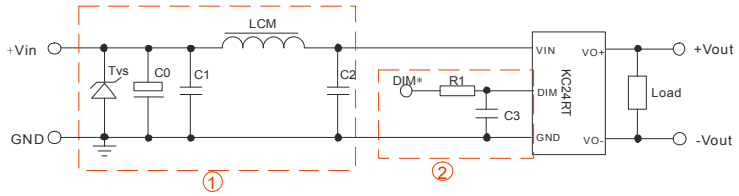


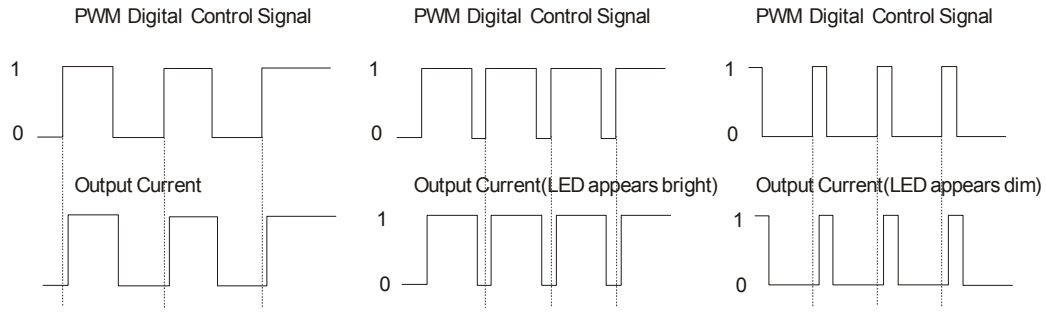
Fig.5 Recommended EMC circuit

Note:
1. DIM pin is the module's PWM dimming pin as shown in Figure 6.
2. The output response time of PWM dimming may be prolonged if add part ②.

Recommended parameter:

Components	Specifications
Tvs	SMCJ48A,1500W（Bringtking）
LCM	6.8μH CD43（CEAIYA）
C0	470μF/50V（CapXon）
C1	4.7μF/50V 1210 (TORCH)
C2	2.2μF/50V 1210 (TORCH)
C3	470pF/100V 0805 (TORCH)
R1	680Ω 0805(can be replaced by inductance or magnetic bead)

5. PWM dimming control



For a certain frequency of PWM dimming, there is an connection between the output current of the driver and the duty cycle of the PWM signal, please refer to the following formula for calculation:

$$I_{o\_set} = \frac{DT - 0.7}{T} I_{o\_nom}$$

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: 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 0.7ms, 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 100Hz.

6. Analogue dimming and typical application

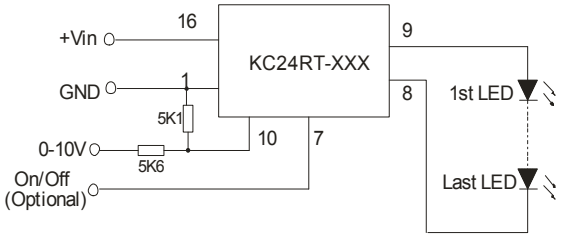


Fig. 6 Analogue dimming circuit

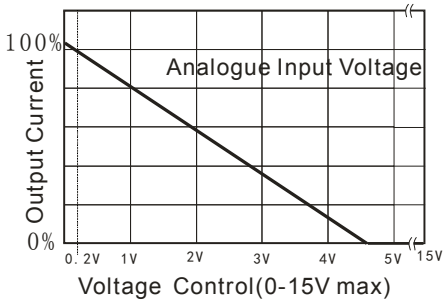


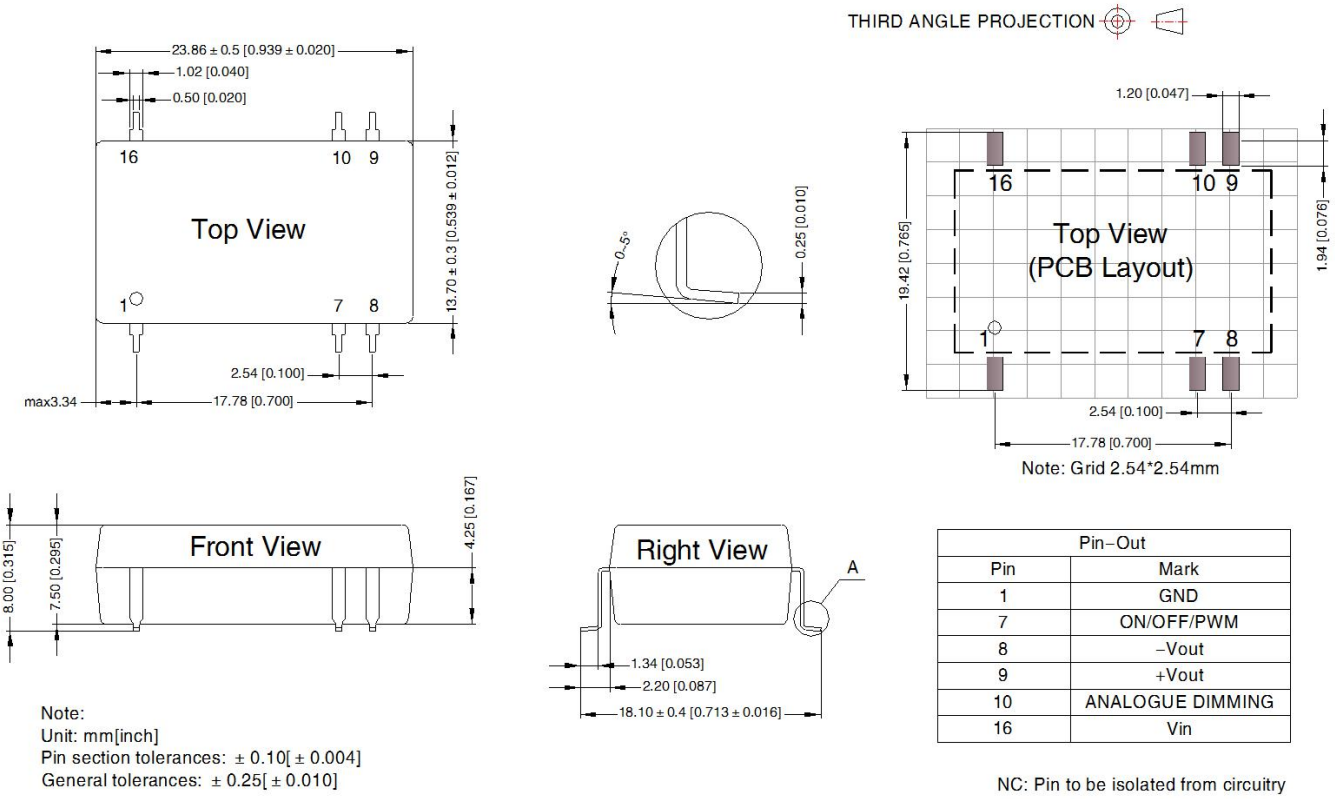
Fig. 7 Analogue input voltage and output current

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 more information Please find the application notes on www.mornsun-power.com

Dimensions and Recommended Layout



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

Pin-Out	
Pin	Mark
1	GND
7	ON/OFF/PWM
8	-Vout
9	+Vout
10	ANALOGUE DIMMING
16	Vin

NC: Pin to be isolated from circuitry

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210019;
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. The specified maximum capacitive load is tested under full load condition and over the input voltage range; The maximum capacitive load offered were tested at input voltage range and full load;
4. 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;
5. All index testing methods in this datasheet are based on our company corporate standards;
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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