

Constant current great power buck LED driver



Report EN 62368-1
 Report BS EN 62368-1
 RoHS Patent Protection

The KC24JT-xxxR3 series is a step-down constant current source designed for high power LED drivers. It features high efficiency, wide input voltage range, high temperature working environment and complete functions, which includes PWM dimming, analog dimming, and remote shutdown. They are widely used in backlights and 6V, 12V, 24V, 30V automotive lighting, landscape lighting, special lighting, commercial lighting, street lighting, home lighting and other lighting systems.

FEATURES

- High efficiency up to 95%
- Ultra-wide input voltage range (6-36VDC)
- Output current stability ($\pm 1\%$)
- Continuous short circuit protection
- Open frame and ultra-thin SMD package
- Analog dimming + PWM dimming
- RoHS Compliance

Selection Guide

Certification	Part No.	Input Voltage (VDC)	Output	Full Load Efficiency (%) Typ. Vin Min. / Vin Max.	Max. Capacitive Load(uF)
		Nominal (range)	Current (mA)		
EN/BS EN	KC24JT-300R3	24	300	91/95	1000uF
	KC24JT-700R3	(6-36)	700	91/95	

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Limit	≤ 10 seconds	0	--	40	VDC
Input-output Voltage Drop		2	3	--	
Input Filter		Capacitance filter			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Power	KC24JT-700R3, $I_o=700mA$	2.31	--	23.1	W
	KC24JT-300R3, $I_o=300mA$	0.99	--	9.9	
Current Accuracy		--	± 2	± 5	%
Current Stability	$V_{in}=36V$, 1-10 LEDs	--	--	± 1	
Temperature Coefficient	$-40^{\circ}C$ to $+71^{\circ}C$	--	± 0.05	--	$\%/^{\circ}C$
Ripple & Noise*	$V_{in}=36V$, 1-10 LEDs	--	--	150	mVp-p
Internal Power Dissipation	$V_{in}=24V$, 5 LEDs	--	--	1.2	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	See Fig. 1	-40	--	71	$^{\circ}C$
Storage Temperature		-55	--	125	
Switching Frequency		450	500	550	kHz
MTBF	MIL-HDBK-217F@25 $^{\circ}C$	1500	--	--	k hours
Moisture Sensitivity Level (MSL)*	IPC/JEDEC J-STD-020D.1	Level 1			

Note: * For actual application, please refer to IPC/JEDEC J-STD-020D.1.

General Specifications

Dimensions	21.50 x 16.72 x 5.20 mm
Weight	2.2g (Typ.)
Cooling Method	Free air convection

PWM Dimming

Remote ON/OFF	ON	Open or $0 < V_c < 0.75V$			
	OFF	$5V < V_c < 10V$			
Remote pin current	$V_c = 5V$	--	--	1	mA
Quiescent input current in Shutdown mode	$V_{in} = 24V, V_c < 0.75V$	--	400	--	uA
PWM frequency		--	--	200	Hz

Analogue dimming

Input voltage range	$V_{in} = 6-36V$	0-15V
Output current range	$V_{in} = 6-36V$	0%-100%
Control voltage range	Full on	Max 0.75V
	Full off	Min 4.7V

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 $\pm 4kV$	perf. Criteria B
	RS	IEC/EN 61000-4-3	10V/m	perf. Criteria B
	EFT	IEC/EN 61000-4-4	$\pm 1kV$ (see Fig. 4-① for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5	$\pm 1kV$ (see Fig. 4-① for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6	3Vr.m.s	perf. Criteria B

Typical Characteristic Curves

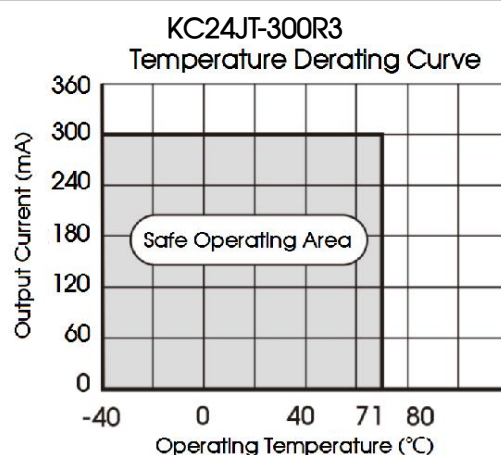
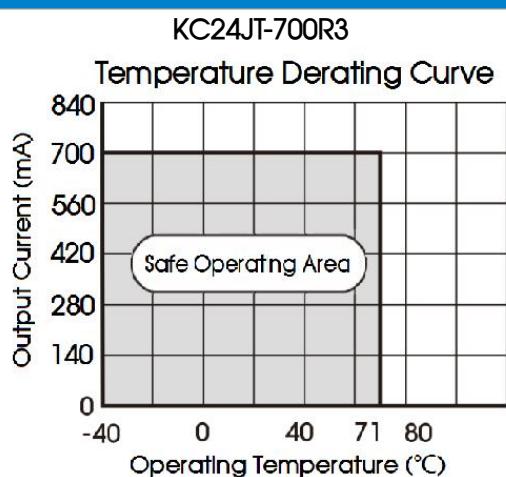


Fig. 1

Design Reference

1. Input/output relationship

Input voltage	Output voltage range	Constant output current	Output power
36 VDC	2.8-33.0 VDC	700/300 mA	23.1/9.9 W, Max.
24 VDC	2.8-18.0 VDC	700/300 mA	15.2/5.4 W, Max.
6 VDC	2.8-3.3 VDC	700/300 mA	2.31/0.9 W, Max.

2. Typical application circuit

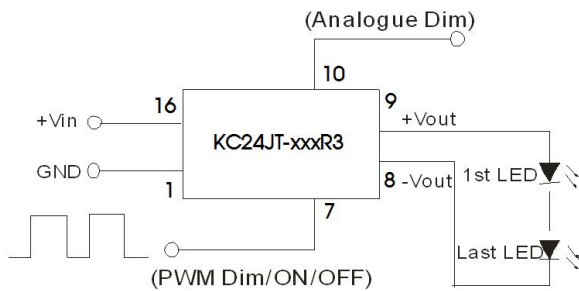


Fig. 2 Application circuits in series

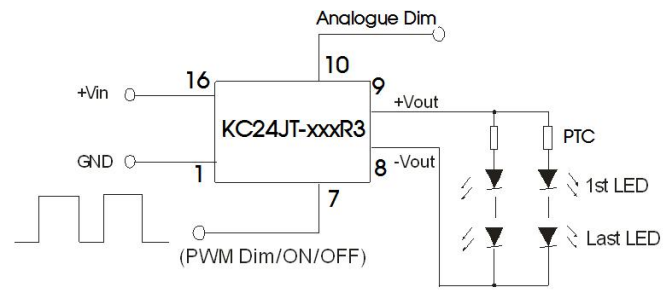
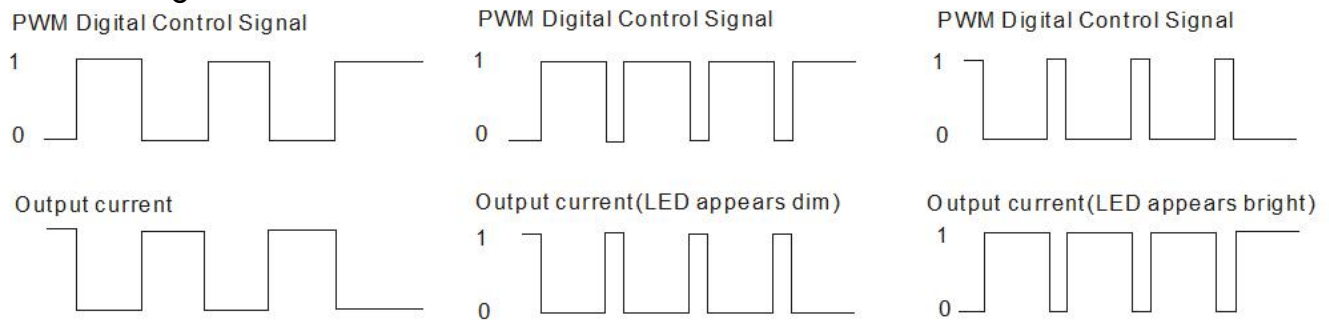


Fig. 3 Application circuits in series and parallel

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. PWM dimming control



For a certain frequency of PWM dimming, the output current of the driver is inversely proportional to the duty cycle of the PWM signal. By adjusting the duty cycle of the PWM signal, the brightness of the LED can be adjusted. The formula is:

$$I_{o_set} = I_{o_nom} \times (1-D) \quad (\text{Error} \pm 80\text{mA})$$

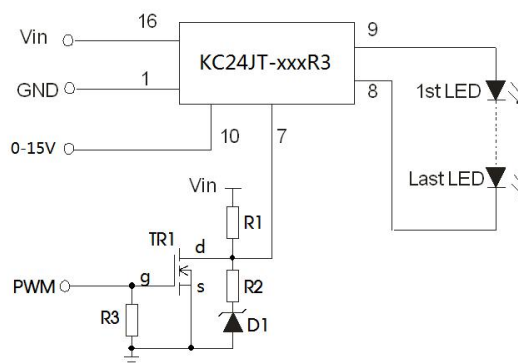
I_{o_set} refers to the wanted output current value.

I_{o_nom} refers to the rated output current

D refers to the pulse width of the PWM signal

For example: we assume the rated output current is 700mA and wanted output current is 350mA, then the pulse width should be 0.5 from the equation above. That is say if we keep the pulse width of PWM signal at 0.5, the output current will be kept at 350mA. It is natural for the driver to generate a audibly noise in dimming process, because the frequency of the control circuit is within human audibly range (20Hz~20KHz). In order to avoid the human eye can observe the LED flashes, the PWM dimming frequency is recommended to set above 100Hz.

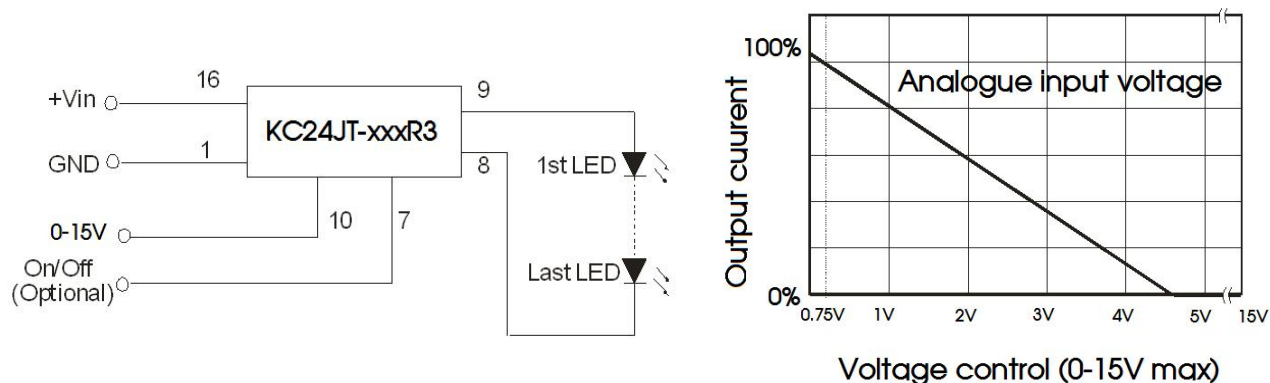
PWM dimming positive logic application recommended circuit



Components	KC24JT-xxxR3
R1	8.2k Ω /0.5W
R2/R3	1k Ω /0.5W
TR1 (N type)	40V/2A
D1 (Zener tube)	5.1V

For a certain frequency of PWM dimming, the output current of the driver is proportional to the duty cycle of the PWM signal.

4. Analogue dimming control and application example



5. EMC compliance circuit

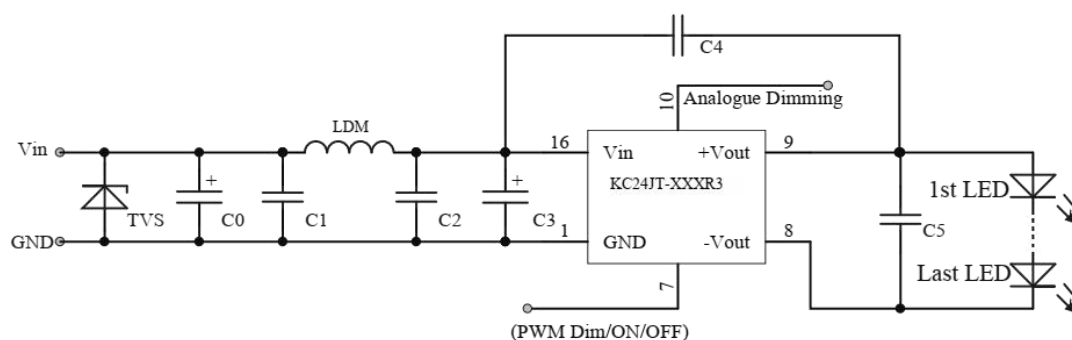


Fig. 4

Components	KC24JT-xxxR3
TVS	SMC51A,1500W
C0/C3	1000uF/63V
LDM	47uH/2A
C1/C2/C4/C5	10uF/50V

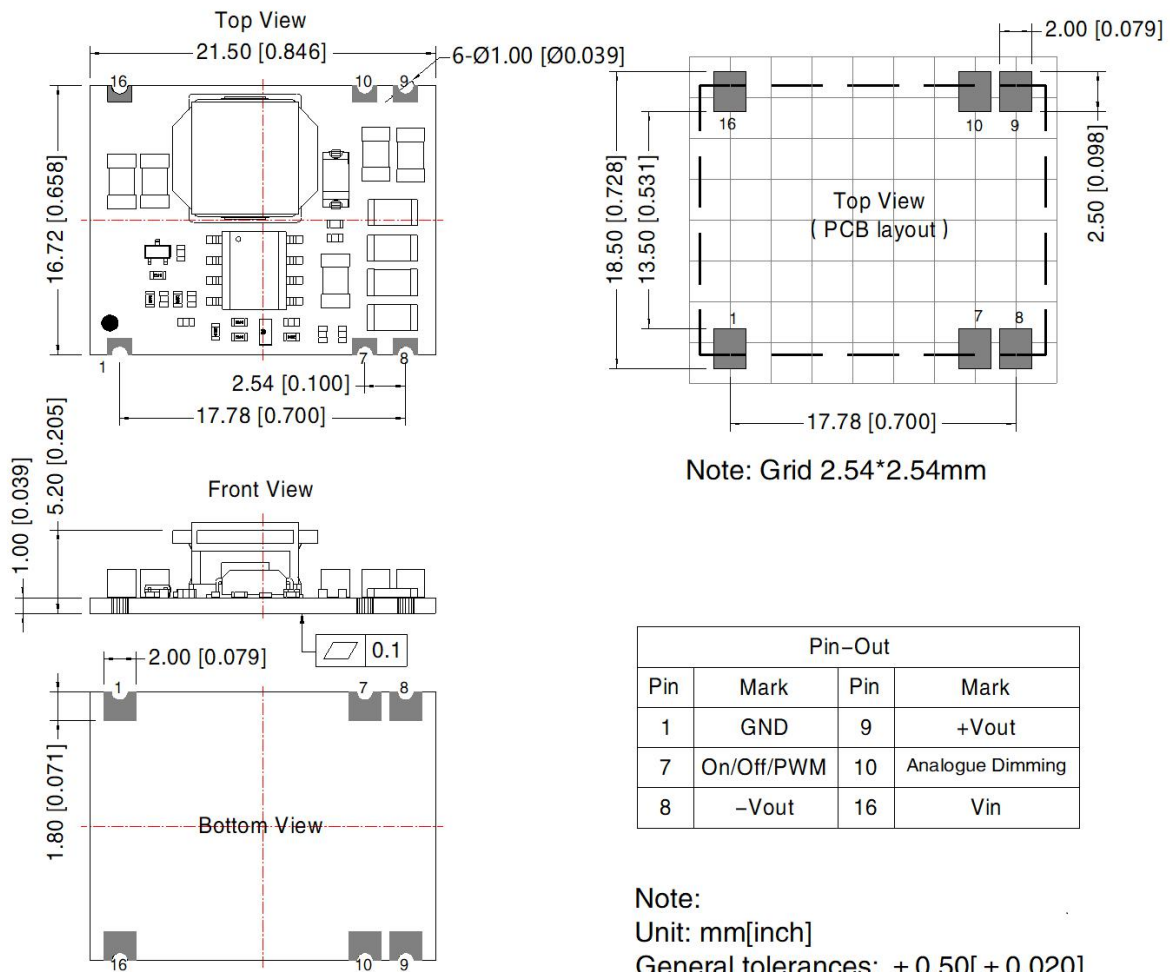
6. The voltage drop of all LEDs in the datasheet is 2.8-3.3V, during actual application, the number of LEDs can be confirmed based on the actual voltage drop and output voltage of LEDs.

7. This product does not support Hot-Plug use.

8. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note:

- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number : 58210090;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and half output load;
- All index testing methods in this datasheet are based on company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- 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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