SKC24H-R Series

CONSTANT CURRENT GREAT POWER BUCK LED DRIVER

PRODUCT FEATURES

- **High efficiency up to 95%**
- **Ultra wide range voltage input (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(1000μF)**
- **PWM dimming & Analogue dimming**
- **Remote ON/OFF**
- **Continuous short circuit protection**
- **DIP package, simple and convenient**
- **RoHS Compliance**

MODEL SELECTION

SKC24H-350RX3

- Footprint Details
- Special Mark
- Output Current
- Package Style
- Input Voltage
- Product Series

APPLICATIONS

SKC24H-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.

PRODUCT PROGRAM

Model	Input Voltage(VDC) Nominal (Range)	Output Voltage (VDC) (Range)	Output Current (mA)	Input Current (mA)(typ.) (5LEDs)	Dimming control	Max. Capacitive Load(μF)	Efficiency (%,max)	Approval
SKC24H-300R(X1/X2/X3)	24(5.5-46)	3.3-36	0-300	237	PWM+Analogue	1000	95	RoHS
SKC24H-350R(X1/X2/X3)			0-350	276				
SKC24H-500R(X1/X2/X3)			0-500	395				
SKC24H-600R(X1/X2/X3)			0-600	474				
SKC24H-700R(X1/X2/X3)			0-700	553				

Note:
1. The types without suffix, such as SKC24H-300R are four-pin products without analogue dimming+PWM dimming function.
2. The types with suffix X1,such as SKC24H-300RX1 are five-pin products with analogue dimming function only.
3. The types with suffix X2,such as SKC24H-300RX2 are five-pin products with PWM dimming function only.
4. The types with suffix X3,such as SKC24H-300RX3 are six-pin products with analogue dimming+PWM dimming function.

INTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Utmost Input Voltage	≤10 seconds	5	--	55	VDC
Recommended Input Voltage		5.5	24	46	
Input-Output Voltage Drop	Vin=5.5-46V,1-10LEDs	2	3	4	
Internal Power Dissipation	Vin=24V，5LEDs	--	--	0.7	W
Reverse Polarity Input		Forbid			
Input Filter		Capacitor Filter(1μF)			

OUTPUT SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Output Power	Io:300mA	--	--	10.8	W
	Io:350mA	--	--	12.6	
	Io:500mA	--	--	18	
	Io:600mA	--	--	21.6	
	Io:700mA	--	--	25.2	
Output Voltage Range	Vin=46V	3.3	--	36	VDC
Output Current Range		See the product program			

Output Current Accuracy	Io:300-600mA	--	± 3	±5	%
	Io:700mA	--	± 5	±7	
Output Current Stability	Vin=46V，Vo=3.3V~36V	--	±3	±5	
Temperature Drift	-40 °C to+71 °C	--	--	± 0.015	%/°C
Ripple & Noise*	20MHz Bandwidth(Vin=46V，1~ 10 LEDs)	--	--	100	mVp-p
Over Temperature Protection		After Cooling, Automatic Recovery			
Short Circuit Protection		Continuous, Automatic Recovery			
*Test ripple and noise by “parallel cable” method. See detailed operation instructions at Testing of Power Converter section, application notes.					

COMMON SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Operating Frequency Range*		550	645	750	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours
Case Material		Plastic(UL94-V0)			
Dimensions		22.8*10.2*9.5			mm
Weight		--	4.3	--	g
* When the mode works in the high-voltage input-area and 1LED load, its operating frequency will range from 100KHz to 400KHz.					

ENVIRONMENTAL SPECIFICATIONS

Item	Test Conditions	Min.	Typ.	Max.	Units
Operating Humidity		--	--	95	%
Storage Humidity		--	--	95	
Operating Temperature	300mA / 350mA	-40	--	85	°C
	500mA/ 600mA/ 700mA	-40	--	71	
Storage Temperature		-55	--	125	
Temp. rise at full load	Ta=25°C	--	--	65	
Soldering Temperature	1.5mm from case for 10 seconds	--	--	265	
Thermal Resistance		60			°C/W
Cooling		Free air convection			

PWM DIMMING AND REMOTE ON/OFF CONTROL

Item		Test Conditions	Min.	Typ.	Max.	Units
Remote ON/OFF		ON	Open or 2.8V<Vc<6V			
		OFF(shutdown)	Vc<0.6V			
Remote pin	voltage	Vin=24V, 5LED	--	3.3	--	V
	I_{sink}	Vc=5V	--	--	1	mA
	I_{sourse}	Vc<0.6V	--	1	--	μA
Quiescent input current		Vin=24V, Vc <0.6V (shutdown)	--	400	--	
PWM frequency*			--	--	200	Hz
* Refer to “Digital Dimming Control” at page 5.						

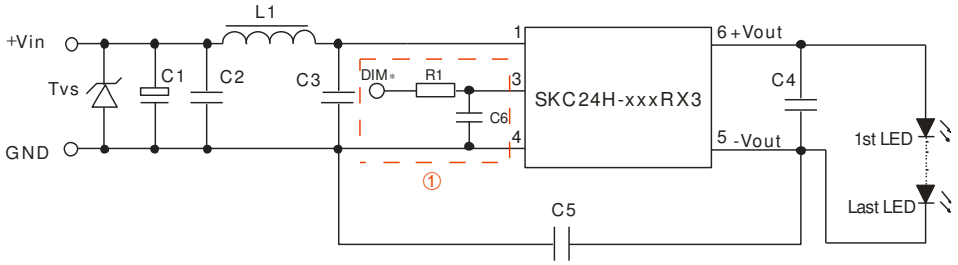
ANALOG DIMMING(Leave open if not used)

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	0.2mA(max)

EMC

EMI	CE		EN55015 power port/CISPR22 CLASS B (Refer to Figure 1)
	RE		EN55015 /CISPR22 CLASS B (Refer to Figure 1)
EMS	ESD	SKC24H-xxxR(X1)	IEC/EN 61000-4-2 Contact ±6KV perf. Criteria B
		SKC24H-xxxRX2/X3	IEC/EN 61000-4-2 Contact ±2KV perf. Criteria B(Contact ±6KV Refer to Figure 1)
	RS		IEC/EN 61000-4-3 10V/m perf. Criteria A
EMS	EFT		IEC/EN 61000-4-4 ±1KV perf. Criteria B (Refer to Figure 1)
	Surge		IEC/EN 61000-4-5 ±1KV perf. Criteria B (Refer to Figure 1)
	CS		IEC/EN 61000-4-6 3Vr.ms perf. Criteria A

EMC RECOMMENDED CIRCUIT



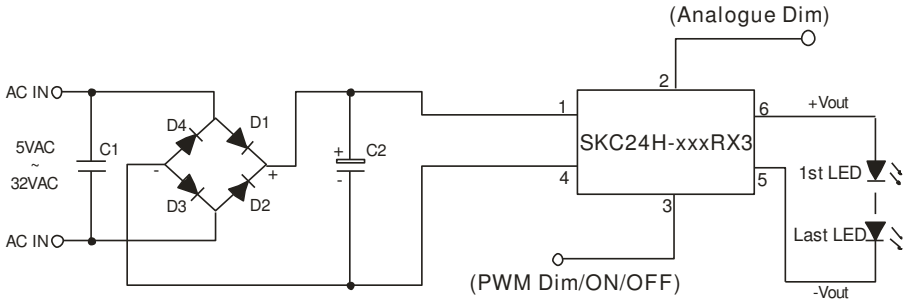
(Figure 1) EMI/EMC recommended circuit

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

Recommended parameter(Table 1)

Components	Specifications
Tvs	SMC51A,1500W（ON）
L1	CD53-82μH（CEAIYA）
C1	470μF/100V（NCC）
C2	225K/50V 1210 X7R (TORCH)
C3	104K/50V 0805 X7R (TORCH)
C4	105K/50V 1210 X7R (TORCH)
C5	102K/2000V 1210 (TDK)（choose or no）
C6	470pF/100V 0805 (TORCH)
R1	680Ω 0805(can replaced by inductance or magnetic bead)

AC INPUT RECOMMENDED CIRCUIT



(Figure 2)AC input recommended circuit

Recommended parameter(Table 2)

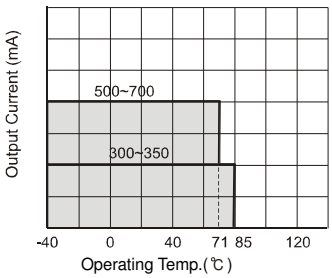
Components	Specifications
C1	X1 Safety capacitor, 0.1μF /300VAC (QIYA)
C2	100μF /63V Electrolytic capacitor, Φ10×16（Flat surface） NCC
D1、D2、D3、D4	Rectifier diode 1N4007 1A/1000V D0-41(PANJIT)

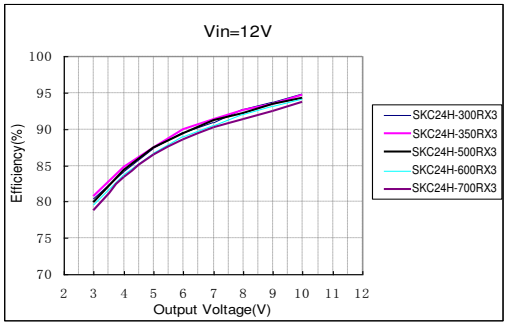
INPUT VS OUTPUT

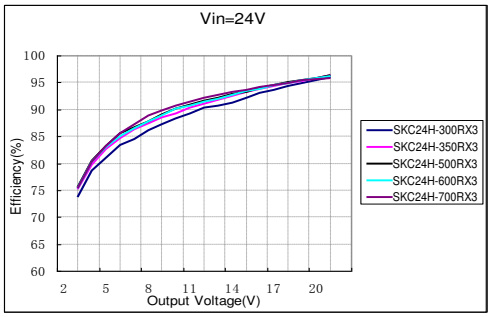
Input voltage(VDC)	Output voltage range(VDC)	Output constant current (mA)	Output power (W Max)	Input voltage(VDC)	Output voltage range(VDC)	Output constant current (mA)	Output power (W Max)
46	3.3-36.0	300	10.80	46	3.3-36.0	350	12.60
36	3.3-32.0	300	9.60	36	3.3-32.0	350	11.20
24	3.3-21.0	300	6.30	24	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
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				

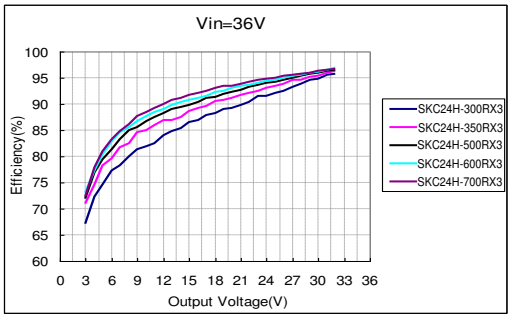
PRODUCT TYPICAL CURVE

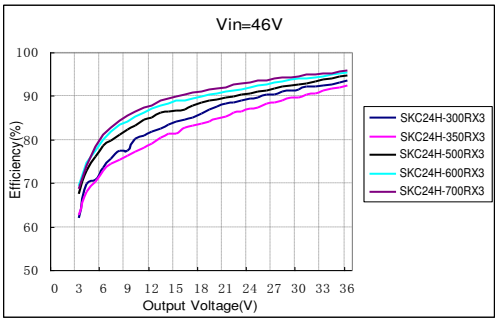
Temperature Derating Graph





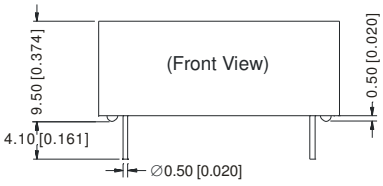


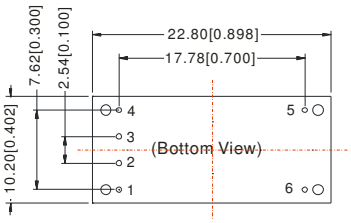




OUTLINE DIMENSIONS、RECOMMENDED FOOTPRINT & PACKAGING

MECHANICAL DIMENSIONS

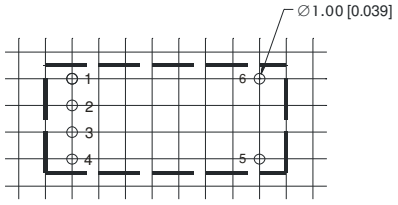




FOOTPRINT DETAILS		
Pin	Function	Comments
1	Vin	DC Supply
2	Analog dimming	Leave open if not use
3	ON/OFF/PWM	Leave open if not use
4	GND	Do not connect to -Vout
5	-Vout	LED Cathode connection
6	+Vout	LED Anode connection

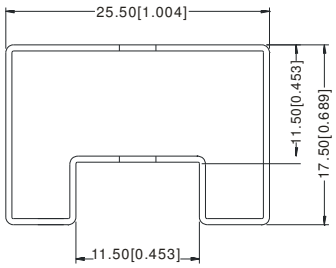
Note:
Unit: mm[inch]
Pin diameter tolerances:± 0.1mm[±0.039inch]
General tolerances:± 0.25mm[±0.010inch]

RECOMMENDED FOOTPRINT



Note:
grid: 2. 54*2. 54mm.

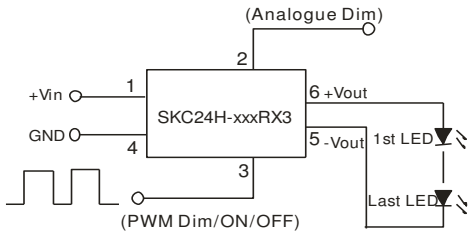
TUBE OUTLINE DIMENSIONS



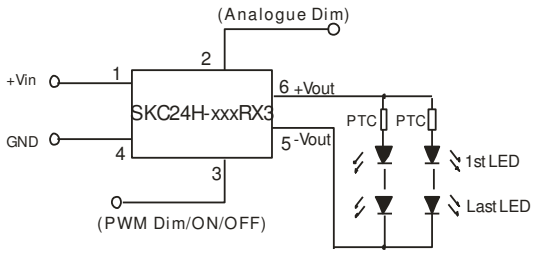
Note:
Unit: mm[inch]
General tolerances:±0.5mm[±0.020inch]
L=530mm[20.866inch] Devices per tube quantity: 50pcs
L=220mm[8.661inch] Devices per tube quantity: 20pcs
Short tube inner packaging dimensions: L*W*H=255*170*80mm
Short tube outer packaging dimensions(with six inner packaging boxes):
L*W*H=375*280*270mm
Long tube inner packaging dimensions: L*W*H=580*200*100mm
Long tube outer packaging dimensions(with two inner packaging boxes):
L*W*H=600*215*220mm
Long tube outer packaging dimensions(with three inner packaging boxes):
L*W*H=600*215*325mm

DESIGN & APPLY CONSIDERATIONS

1) Typical Application Circuits



(Figure 3) Series Application

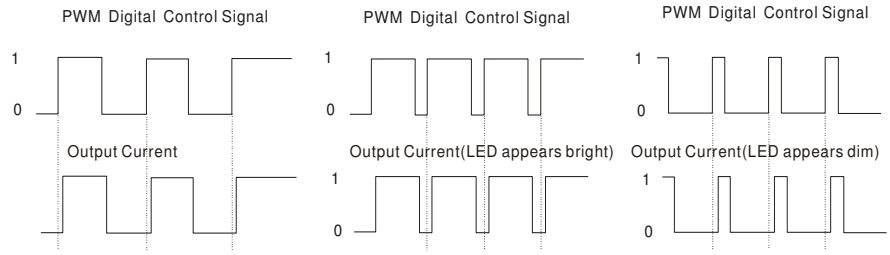


(Figure 4) Parallel-series Application

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 4.

Note: The negative output terminal can't connect GND, or the module may be damaged.

2) Digital Dimming Control



For the rated frequency PWM dimming, the output current of driver matters to the pulse width of the PWM signal, and the numerate please refer to the following formula:

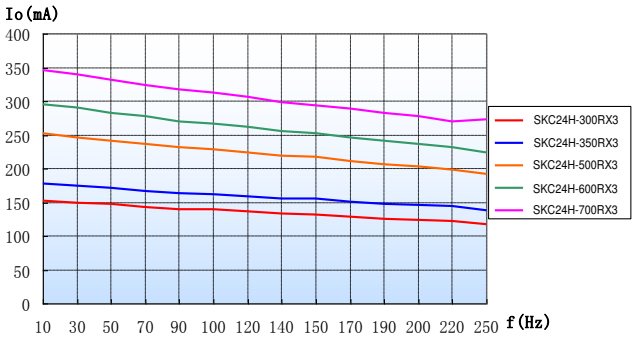
$$I_{o\_set} = \frac{(DT-0.8)}{T} I_{o\_norm}$$

Io_set refers to the expected output current value (mA) , Io_norm refers to the rated output current (mA) ,

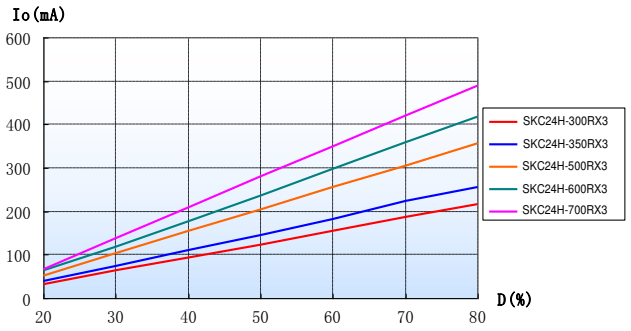
D refers to the pulse width of the PWM signal (%),T refers to the cycle of the PWM signal (ms).

Note: The formula only supplies as a reference, and the output current may be a little deviation with different load. The Ton(min) of PWM signal must be greater than 0.8ms, or the driver can't be operated normally. It is natural for the driver to generate an 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 curve(Vin=24V,5LEDs):

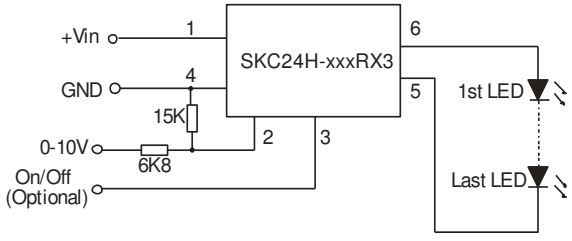


(Figure 5) PWM Frequency VS Output current(D=50%)

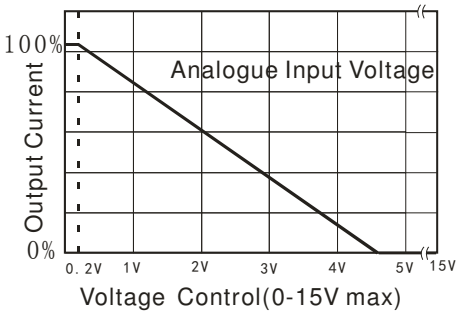


(Figure 6) Pulse width of the PWM signal VS Output current(f=200Hz)

3) Analogue Dimming Control And Application Example



(Figure 7) Analogue dimming circuit



(Figure 8) Analogue input voltage VS Output current

4) No parallel connection(output) or plug and play

Note:

1. If product isn't operating in the required load range, it may not meet all specification listed, and that will reduce the life of product.
2. All specifications measured at Ta=25°C, humidity<75%, nominal input voltage and output 5LEDs unless otherwise specified.
3. In this datasheet, all the test methods of indications are based on corporate standards.
4. Only typical models listed, other models may be different, please contact our technical person for more details.
5. Our company offer custom products.
6. Specifications subject to change without notice.