

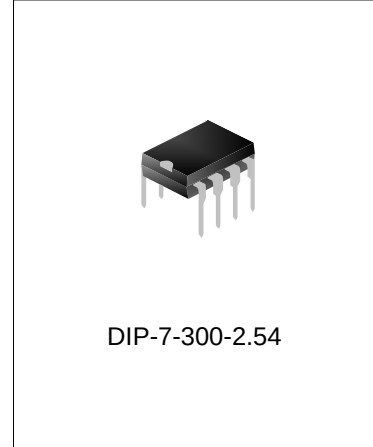
NON-ISOLATED BUCK LED LIGHTING DRIVE IC WITH LOW POWER AND HIGH CONSTANT CURRENT ACCURACY**DESCRIPTION**

SD670XDC is designed for non-isolated LED driving with Buck structure, high constant current accuracy and high line/load regulation available with assistant of special sense technology.

SD670XDC integrates various protections, such as output open/short circuit protection, cycle-by-cycle current limit protection and over temperature protection.

The start-up current and operating current are low and highlight LED can be driven with high efficiency in full range (85VAC~265VAC).

SD670XDC has a built-in high voltage power MOSFET, reducing the system cost and the whole volume.

**FEATURES**

- ◆ Built-in 500V high voltage power MOSFET
- ◆ Constant current with high accuracy for LED ($<\pm 3\%$)
- ◆ Output open/short circuit protection
- ◆ CS open/short circuit protection
- ◆ VCC undervoltage protection
- ◆ Over temperature protection
- ◆ Cycle-by-cycle current protection
- ◆ No auxiliary winding

APPLICATION

- ◆ Bulb Lamp
- ◆ T5/T8 LED Lamp
- ◆ Various LED Lighting

ORDERING INFORMATION

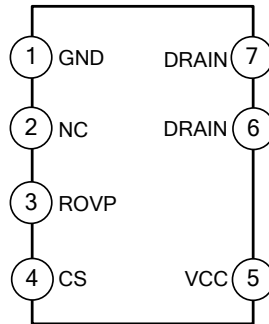
Part No.	Package	Hazardous Substance Control	Packing
SD6701DC	DIP-7-300-2.54	Halogen free	Tube
SD6702DC	DIP-7-300-2.54	Halogen free	Tube

Characteristics		Symbol	Rating	Unit
Drain-Gate voltage (R _{GS} =1MW)		V _{DGR}	500	V
Gate-Source Voltage		V _{GS}	±30	V
Drain current pulse	SD6701DC	I _{DM}	4	A
	SD6702DC		8	
Drain continuous current (Tamb=25°C)	SD6701DC	I _D	1	A
	SD6702DC		2	
Supply voltage		V _{CC}	-0.3~17	V
ROVP voltage		V _{ROVP}	-0.3~6.5	V
Sense voltage		V _{CS}	-0.3~6.5	V
DRAIN voltage		V _{DRAIN}	-0.3~500	V
Junction temperature Range		T _j	-40~150	°C
Storage temperature Range		T _S	-55~150	°C

ELECTRICAL CHARACTERISTICS (Unless otherwise stated, $V_{CC}=14V$, $T_{amb}=25^{\circ}C$)

Characteristics		Symbol	Test condition	Min.	Typ.	Max.	Unit
VCC clamp voltage		VCC _{CLAMP}	I _{VCC} =0.5mA	14	16	17	V
UVLO VH		UVLO _H		10.5	12	13.5	V
UVLO VL		UVLO _L		6.5	7.5	8.5	V
Start-up current		I _{START}	V _{CC} =10V	65	100	125	μA
Operating current		I _{VCC}	CS=1V	100	175	250	μA
Protection current		I _{PRO}	CS=5V	800	1200	2000	μA
CC parameters							
CS reference voltage		CS _{REF}		388	400	412	mV
CS current limit reference voltage		CS _{PEAK}		450	500	550	mV
Time Parameters							
Max. on time		T _{ON,MAX}		40	55	65	μs
LEB		T _{LEB}		--	0.6	--	μs
Max. off time		T _{OFF,MAX}		160	225	290	μs
Min. off time		T _{OFF,MIN}		--	--	4	μs
Min. period		T _{MIN}		--	--	6.3	μs
Internal OVP control		T _{ovp}		--	6.5	--	μs
ROVP voltage		V _{ROVP}		2	2.4	2.8	V
Internal high voltage MOSFET							
On resistance	SD6701DC	R _{DSON}	V _{GS} =12V, I _D =0.1A	--	7.5	8.6	Ω
	SD6702DC			--	5	5.7	
withstand voltage at Drain	SD6701DC	BV _{DSS}	V _{GS} =0V, I _D =50uA	500	550	--	V
	SD6702DC			500	550	--	
Zero gate voltage drain current	SD6701DC	I _{DSS}	V _{DS} =500V, V _{GS} =0V	--	--	1.0	μA
	SD6702DC			--	--	1.0	
Gate-Source Leakage Current	SD6701DC	I _{GSS}	V _{GS} =±30V, V _{DS} =0V	--	--	±100	nA
	SD6702DC			--	--	±100	
Temperature characteristics							
Regulatory temperature threshold value		T _{REG}		--	150	--	°C
Over temperature protection threshold value		T _{SD}		--	170	--	°C
Over temperature protection release point		T _{RECOVERY}		--	155	--	°C

PIN CONFIGURATIONS



PIN DESCRIPTION

Pin No.	Pin Name	I/O	Description
1	GND	GND	Ground
2	NC	/	No connection
3	ROVP	I/O	OVP pin, short-circuited or connected to GND through a resistor
4	CS	I	Sense current pin
5	VCC	POWER	Power supply
6, 7	DRAIN	O	Drain of internal high voltage MOSFET

FUNCTION DESCRIPTION

SD670XDC is a non-isolated LED driver IC adopting BUCK structure with internal high voltage power MOSFET. The function is described below.

1. Start control

For SD670XDC, no auxiliary winding is needed. The bus voltage charges capacitor of VCC through start resistor. The operating current should be as low as possible for high conversion efficiency. It features undervoltage protection at VCC and the on/off threshold value are 12V and 7.5V. The hysteresis characteristic guarantees that the IC can be powered by the capacitor during the start.

2. Constant current accuracy control

IC senses the MOSFET current, which is input to Gm amplifier together with internal reference voltage for error amplification, to obtain high constant current accuracy and high line/load regulation.

CS voltage and 400mV reference voltage are the inputs of Gm amplifier, and then the output is integrated through internal COMP capacitor.

Output current is given by:

$$I_{OUT}=400mV/2 \cdot R_{CS}.$$

3. Boundary-conduction mode

SD670XDC works in boundary-conduction mode with strong anti-interference and high conversion efficiency. Auxiliary winding is unnecessary to detect zero-crossing current and the peripheral circuit is simple. Due to the boundary-conduction mode, part of harmonic oscillation energy generated by external switch is transferred to VCC.

4. Current detection and LEB

With the cycle-by-cycle current limit function, internal switch M1 will be turned off if CS voltage exceeds 500mV. System still works and internal switch M1 is turned on in the next period. There is no LEB for current limit comparator. CS voltage and COMP voltage are compared by COMP comparator, if CS voltage is higher than COMP, internal switch M1 is off and system keeps work. During the instant of turning on internal switch M1, 0.6 μ s LEB is used for avoiding the error operation on internal switch M1.

5. CS open/short circuit protection (also known as maximum output current limit)

If CS is open, open circuit protection activates and the IC stops; if CS resistor is shorted, there is no limit for inductor current, voltage on pin CS is zero, and the short-circuit status is judged by checking drain voltage during on of internal OUT signal. If short-circuit protection activates, output is shutdown, VCC decreases and IC restarts. SD670XDC series products all have OUT limit voltage setting, the larger the area of high-voltage MOSFET packaged, the higher the OUT limit voltage setting, therefore the higher the output current limit. Please refer to application note for maximum output current limit of each product.

6. Source driver

Source drive is adopted for this IC. Gate of M2 is connected to VCC through a resistor, Source is connected to Drain of internal switch M1. When Gate of internal switch M1 is driven by IC, the IC current can be reduced because of the low gate capacitance of M1, and hence no auxiliary winding is needed.

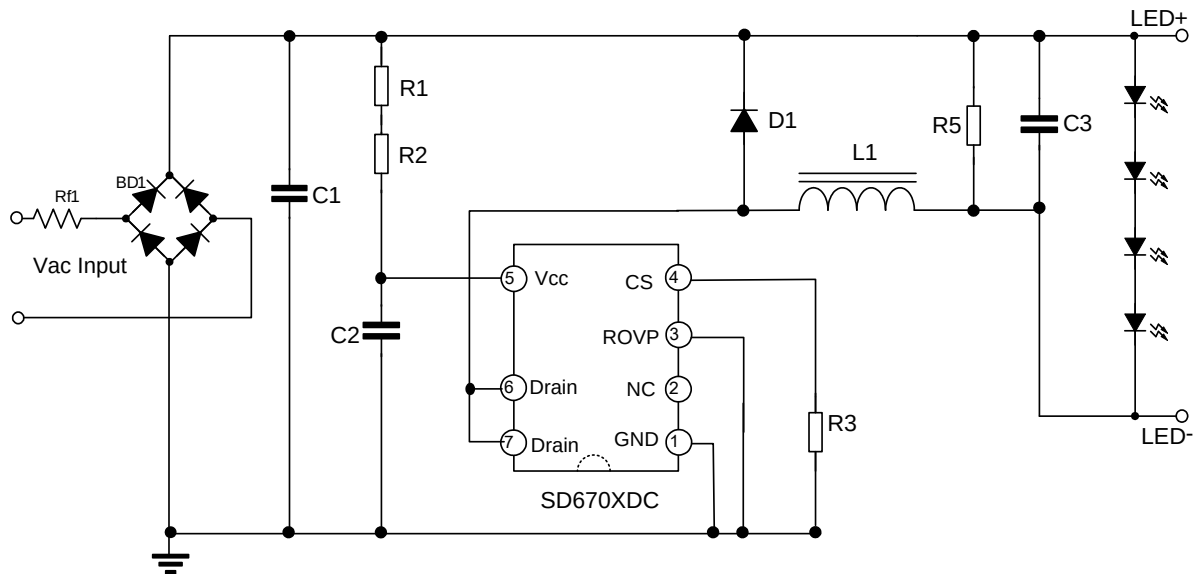
7. Output short/open circuit protection

There is no signal which reflects the output, the IC detects the discharge time for judging over voltage. When ROVP is connected to GND via resistor, the over voltage protection threshold value is set through resistance adjustment; when ROVP is shorted connected to GND, the over voltage protection threshold is set by the IC. Internal T_{ovp} is set as 6.5 us, the over voltage protection activates if T_{off}<T_{ovp}, please refer to application note for details. It is recommended to connect ROVP to GND.

8. Internal temperature regulatory

The output current will be reduced if the IC temperature exceeds the certain value.

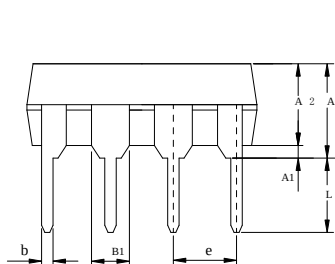
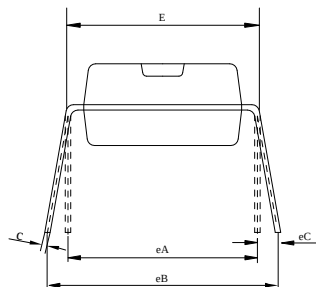
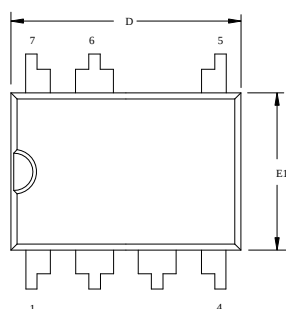
TYPICAL APPLICATION CIRCUIT



PACKAGE OUTLINE

DIP-7-300-2.54

UNIT: mm



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	4.10
A1	0.50	—	—
A2	2.90	3.30	3.40
b	0.38	0.46	0.55
B1	1.22	1.52	1.82
c	0.20	0.25	0.32
D	9.00	9.40	9.80
E	7.62	7.87	8.26
E1	6.10	6.35	6.60
e	2.54BSC		
eA	7.62BSC		
eB	7.62	—	9.30
eC	0	—	1.52
L	3.00	—	—

**MOS DEVICES OPERATE NOTES:**

Electrostatic charges may exist in many things. Please take following preventive measures to prevent effectively the MOS electric circuit as a result of the damage which is caused by discharge:

- The operator must put on wrist strap which should be earthed to against electrostatic.
- Equipment cases should be earthed.
- All tools used during assembly, including soldering tools and solder baths, must be earthed.
- MOS devices should be packed in antistatic/conductive containers for transportation.

Disclaimer :

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Part No.:	SD670XDC	Document Type:	Datasheet
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Rev.:	1.3	Author:	Zhu Xiaojie
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Revision History:

1. Modify the Characteristics of Max off time

Rev.:	1.2	Author:	Zhu Xiaojie
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Revision History:

1. Modify the Electrical Characteristics
2. Modify the Function Description

Rev.:	1.1	Author:	Zhu Xiaojie
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Revision History:

1. Add parameter of the internal OVP control;
2. Modify the typical application circuit.
3. Modify the package outline

Rev.:	1.0	Author:	Zhu Xiaojie
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Revision History:

1. First release
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