YX8018

Solar energy Lawn lamp controller

characteristic

v **High efficiency: 85% (typical value), which can make full use of solar cells**

v **Less peripheral devices: only one inductor is required**

v **The input current can be adjusted by adjusting the inductance**

Scope of application

v **Solar lawn light**

v **Solar lamp string**

v **LED drive**

v **Landscape decorative lamp string**

v **Interior decoration lamp string**

describe

YX8018 is a high-performance solar lawn lamp boost control chip, which is suitable for a solar lawn lamp powered by a 1.2V rechargeable battery in series.The main functions include charging control, boost drive, optical control, etc.

The solar lawn lamp mainly uses the energy of the solar cell to work. When the sunlight shines on the solar cell during the day, the light energy is transformed into electric energy and stored in the battery, and then the battery provides power for the LED (light emitting diode) of the lawn lamp at night.It has the advantages of safety, energy saving, convenience and environmental protection.It is applicable to solar products powered by one 1.2V rechargeable battery.

YX8018 adopts green SOT23-6, SOT23-5 package, TO-94 package and at least one peripheral device, which can effectively reduce the layout space of circuit PCB.

YX8018 can operate from - 40 ° C to + 85 ° C.

Application schematic diagram(one battery application)

A. White, blue and green LED application circuit diagram
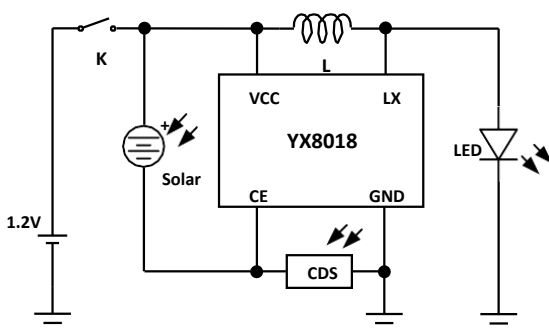

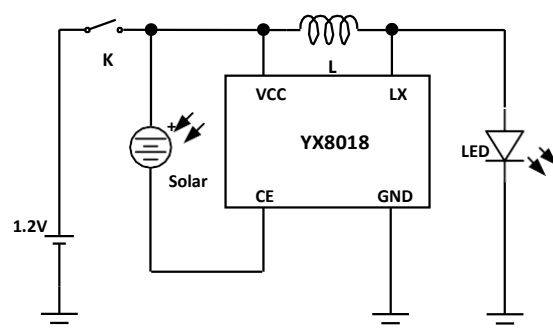Figure 1. Photoresist control enable

Figure 2. Solar cell control enable
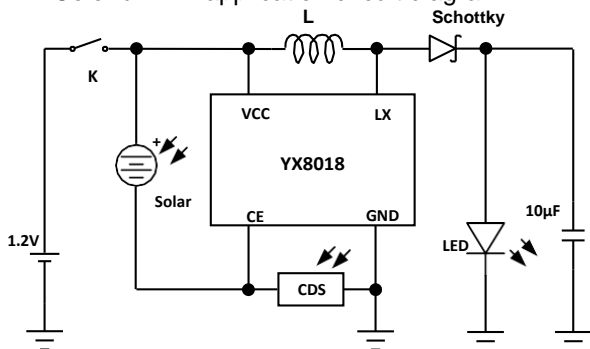
B. Colorful LED application circuit diagram

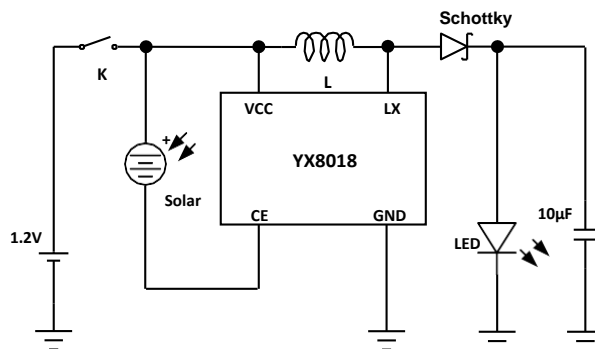Figure 3. Photoresist control enable

Figure 4. Solar cell control enable

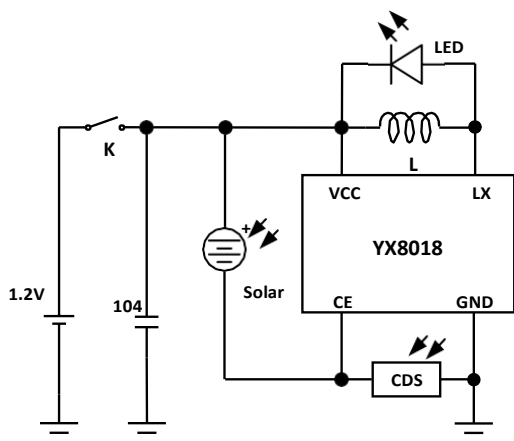## Application schematic diagram(two battery applications)
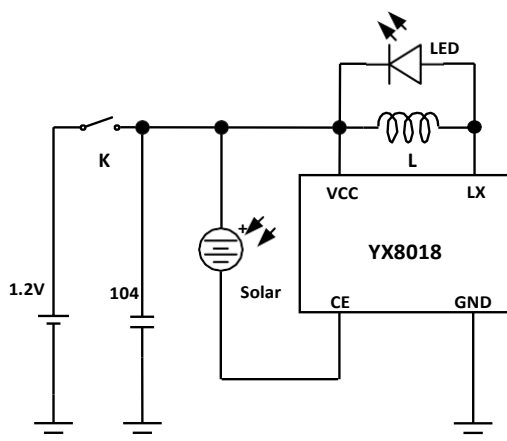

Figure 5. Photoresist control enable

Figure 6. Solar cell control enable

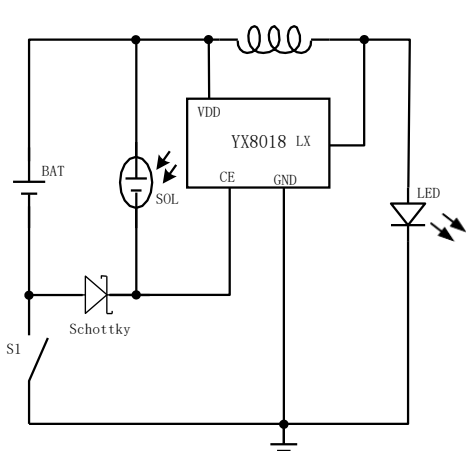## Application circuit capable of charging after power off

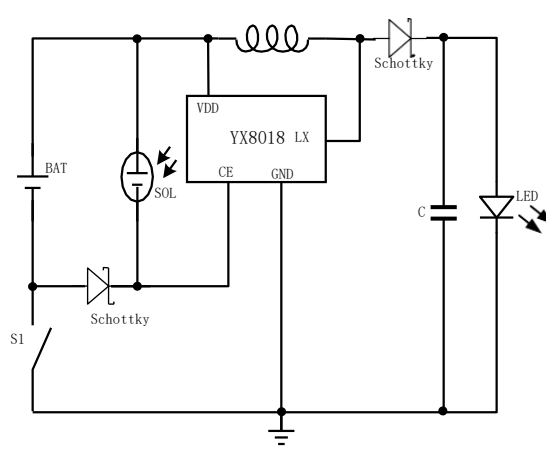Fig. 7. Circuit diagram corresponding
to white light application

Fig. 8. Circuit diagram corresponding
to color lamp application

ordering information

Device model	Order number	Package description	Storage temperature	Package mark	Packaging selection	remarks
YX8018	YX8018	SOT23-6S	-65℃ to +125℃		Tape and Reel	
YX8018	YX8018	SOT23-5	-65℃ to +125℃		Tape and Reel	
YX8018	YX8018	TO-94	-65℃ to +125℃		Bag	

Pin information

Table **1. Pin Description**

Pin	name	Pin function description	SOT23-6S
1	LX	Power switch drain	
2	GND	land	
4	CE	Connected to the negative terminal, enabling terminal and charging control terminal of solar cell	
6	VCC	Connected to the positive end of rechargeable battery and solar cell	
3、5	empty		
Pin	name	Pin function description	TO-94
1	LX	Power switch drain	
2	GND	land	
3	CE	Connected to the negative terminal, enabling terminal and charging control terminal of solar cell	
4	VCC	Connected to the positive end of rechargeable battery and solar cell	
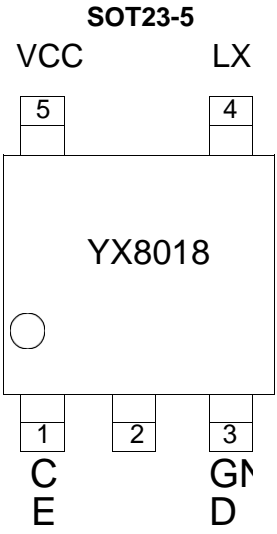
Pin	name	Pin function description	
1	CE	Connected to the negative terminal, enabling terminal and charging control terminal of solar cell	
2	Empty		
3	GND	land	
4	LX	Power switch drain	
5	VCC	Connected to the positive end of rechargeable battery and solar cell	

SOT23-5

VCC   LX

| 5 | | 4 |

YX8018

○

| 1 | 2 | 3 |

C   GN
E   D

Absolute maximum rated range

describe		Range	Company
supply voltage		-0.3 ~ 5	V
Other pins		-0.3 ~ 5	V
Maximum power consumption		0.6	W
Storage temperature range		-65 ~ +125	°C
Junction temperature		150	°C
welding temperature		260（10s)	°C
Static discharge (ESD)	HBM (Human Body Mode)	2000	V
	MM (Machine Mode)	200	V

Heat loss information

describe		Range	Company
Package thermal resistance（θJA）	TO-94	150	°C/W
	SOT23-6S	150	
power waste,PD@TA=25°C	TO-94	0.6	W
	SOT23-6S,SOT23-5	0.4	

Recommended working conditions

describe	Range	Company
Working junction temperature	-40 ~ 125	°C
Operating ambient temperature	-40 ~ 85	°C
supply voltage	+0.9 ~ +1.2	V
Continuous input current	3～40	mA

Electrical characteristics

(VIN = 2.4V, Ta = 25 ° C, unless otherwise specified.)

| parameter	Symbol	Test conditions	minimum value	Typical value	Maximum	Company
Power input						
Input voltage range	VIN	IIN=40mA	0.9		1.5	V
Input current range	IIN	VIN=1.2V，L=10μH	3		40	mA
Off state current	ISD	VIN=1.2V，VCE=0.4V		22		μA
power switch						
Switch on resistance	RDS(ON)	VIN=1.2V，IIN=40mA L=10μH		6		Ω
Output leakage current	ILEAKAGE	VCE=2.4V				μA
Solar control						
Enable input threshold	V on-off	VIN=1.2V		0.36		V
	V off on			0.29		V
Charging minimum differential pressure	VCH△min	VIN=1.2V，ICE =1mA		87		mV
Charging capacity	ICH	VIN=1.2V，VCE-GND=300mV		132		mA
Enable input resistance	RCE-VCC	-		37		KΩ
working frequency						
working frequency	flx	VIN=1.2V，L=82μH		316		KHz
work efficiency						
work efficiency	η			83		%

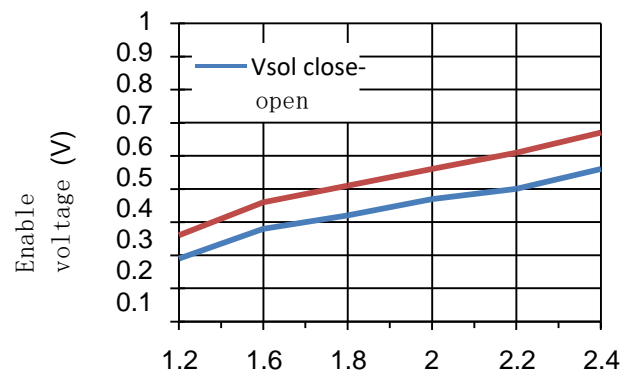# Functional diagram
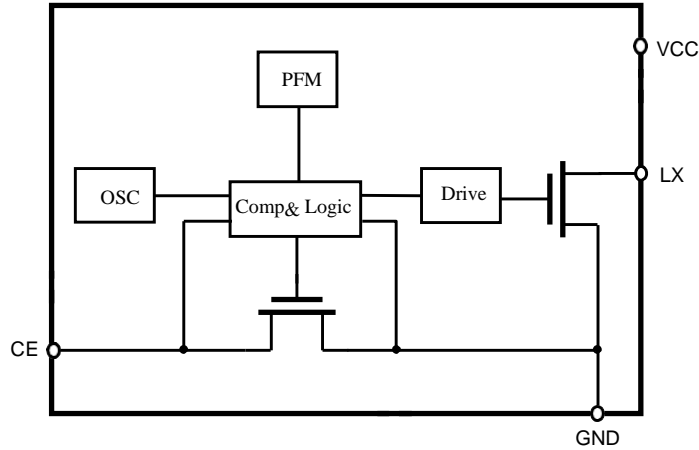
Figure 2 internal logic block diagram

Characteristic curve

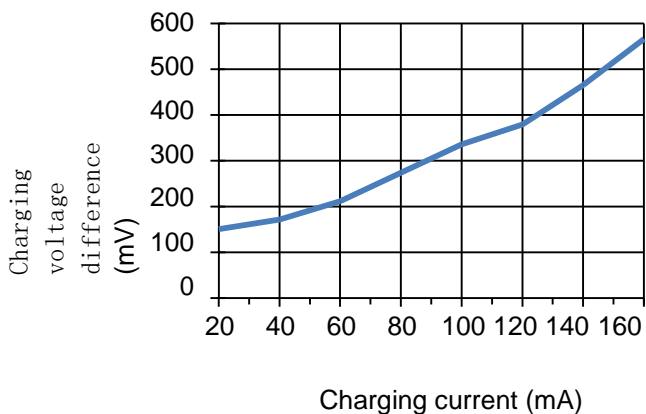VIN = 1.2V，L=82µH (0307), load 1 white LED, Ta = 25 ° C, unless otherwise specified.

Discharge current vs. input voltage
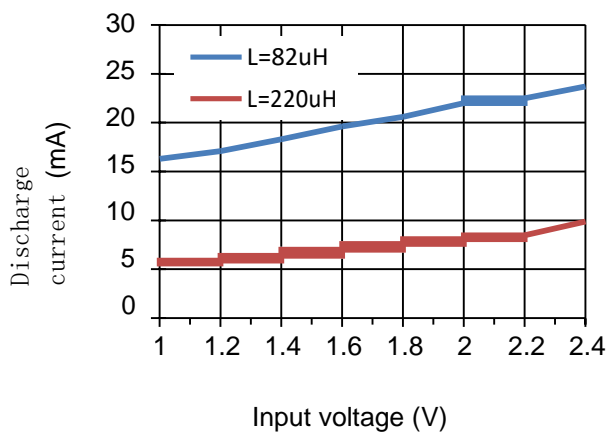
enable voltage vs. input voltage

Charging voltage difference vs. charging current

working principle

YX8018 is a solar lawn lamp LED drive control chip with an input current range of 3mA to 100mA.YX8018 is suitable for solar lawn lamps powered by one rechargeable battery. Through different circuit connection modes and inductance cooperation, YX8018 can realize the control of different input currents.

Current regulation reference

YX8018 changes the input current by changing the peripheral inductance value.The following table lists the relationship between inductance and input current when driving a white LED according to the connection method in Figure 2:

Table 1. 1.2V battery power supply   for reference only

Inductance	Specifications	LED load	Input current (MA)
220uH			5.8
150uH			8.2
82uH	0307	1 white LEDs	14.8
68uH			19.9
47uH			26.6
22uH			51.4

Charge discharge and enable control

The CE pin is externally connected with the negative pole of the solar panel, the positive pole of the solar panel and the positive pole of the battery are connected with VCC, and the negative pole of the battery is connected with GND. During the day, the solar cell converts sunlight into electric energy to charge the battery, and at night, the battery discharges to drive the LED.The internal high-precision comparator monitors the voltage difference between CE and GND pins. When the CE voltage is lower than 74% of GND voltage, the chip enters the shutdown state and turns off the LED. When the CE voltage is lower than 70% of GND voltage, the chip returns to normal operation and turns on the LED, so as to realize the optical control function. The LED is automatically turned off during the day and turned on at night.This function does not affect the function of CE charging the negative GND of the battery.

Power consumption considerations

Chip junction temperature depends on many factors, such as ambient temperature, PCB layout, load and package type.Power consumption and chip junction temperature can be calculated according to the following formula:
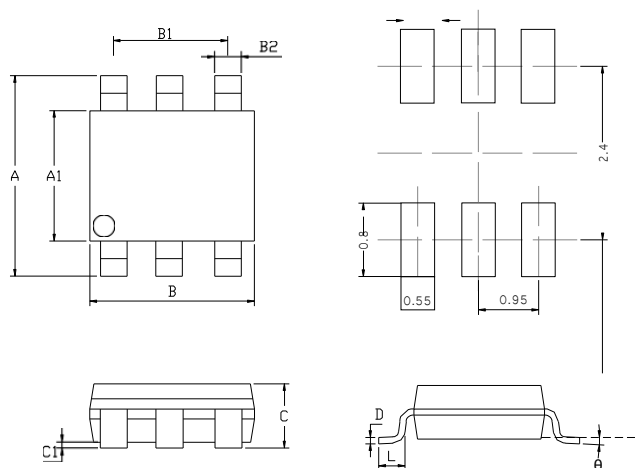
$$P_D = R_{DS(ON)} \times I_{OUT}^2$$

$$T_J = P_D \times \theta_{JA} + T_A$$
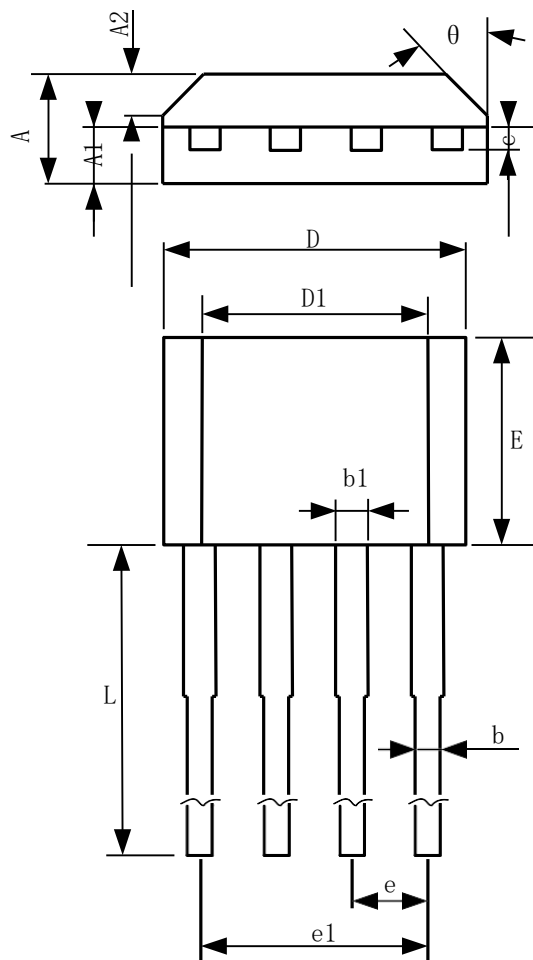
Package dimension drawing

Package description

SOT23-6S

SOT23-6S package mechanical data

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	2.320	2.520	0.0928	0.1008
A1	1.250	1.350	0.0500	0.0540
B	2.820	2.950	0.1128	0.1180
B1	1.900		0.0760	
B2	0.270	0.330	0.0108	0.0132
c	1.050	1.100	0.0420	0.0440
c1	0.000	0.050	0.0000	0.0020
D	0.080	0.120	0.0032	0.0048
L	0.300	0.600	0.0120	0.0240
θ	0 °	6 °	0 °	6 °

TO-94

TO-94 package mechanical data

symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	1.520	1.720	0.059	0.067
A1	0.700	0.900	0.028	0.035
A2	0.500	0.700	0.020	0.028
b	0.360	0.500	0.014	0.020
b1	0.380	0.550	0.015	0.022
C	0.360	0.510	0.014	0.020
D	4.980	5.280	0.196	0.208
D1	3.780	4.080	0.149	0.161
E	3.450	3.750	0.136	0.148
e	1.270 TYP		0.050 TYP	
e1	3.710	3.910	0.146	0.154
L	14.900	15.300	0.587	0.602
θ	45 ° TYP		45 ° TYP	

SOT23-5
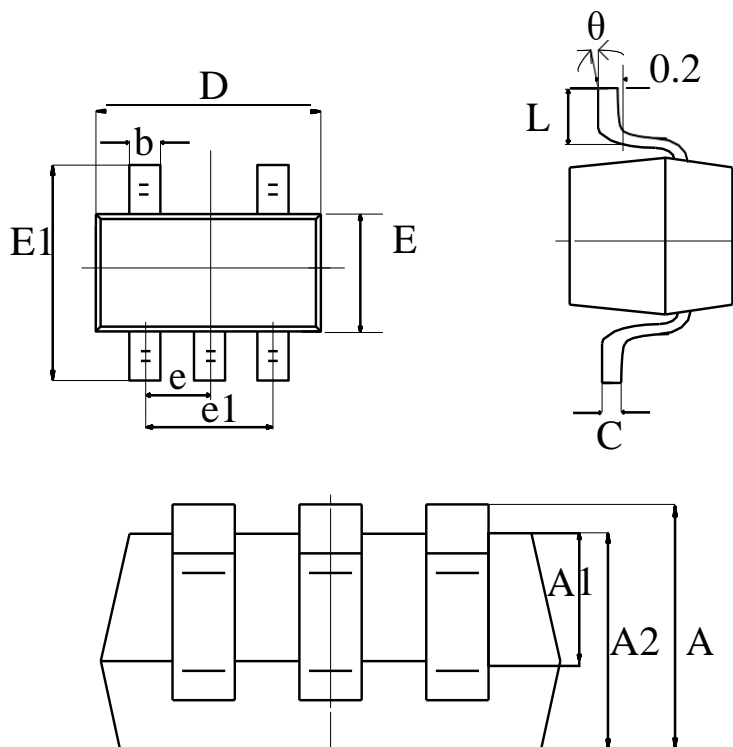
symbol	dimensions			
	millimeters		inches	
	min	max	min	max
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
b	0.300	0.500	0.012	0.020
C	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	1.500	1.700	0.059	0.067
E1	2.650	2.950	0.104	0.116
e	0.950（BSC）		0.037（BSC）	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
θ	0°	8°	0°	8°