

Solar lawn lamp controller

characteristic

- ✓ **High efficiency: 83% (typical value), which can make full use of solar cells**
- ✓ **Less peripheral devices: only one inductor is required**
- ✓ **Low voltage battery protection function**
- ✓ **The input current can be adjusted by adjusting the inductance**

Scope of application

- ✓ **Solar lawn light**
- ✓ **LED drive**
- ✓ **Landscape decorative lamp string**
- ☑ **Interior decoration lamp string**

describe

YX805F 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.

YX805F adopts green sot23-6s, sot23-5 and TO-94 packages and at least one peripheral device, which can effectively reduce the layout space of circuit PCB.

YX805F can work from - 40 ° C to + 85 ° C.

Application schematic diagram

a) **Single color LED application diagram**

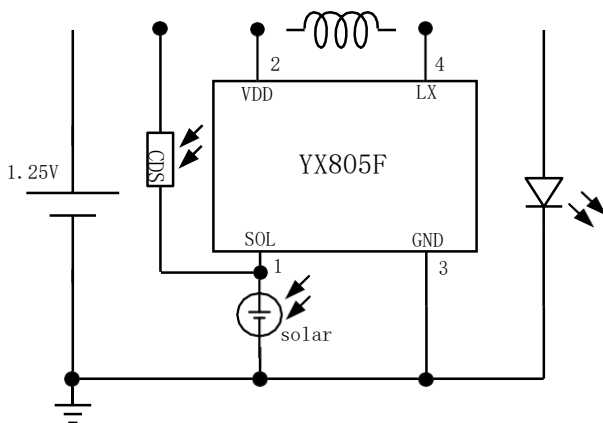


Figure 1. Photoresist control enable

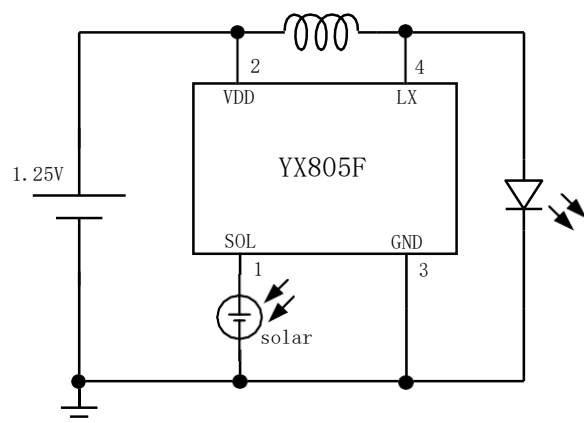


Figure 2. Solar cell control enable

b) Colorful LED application diagram

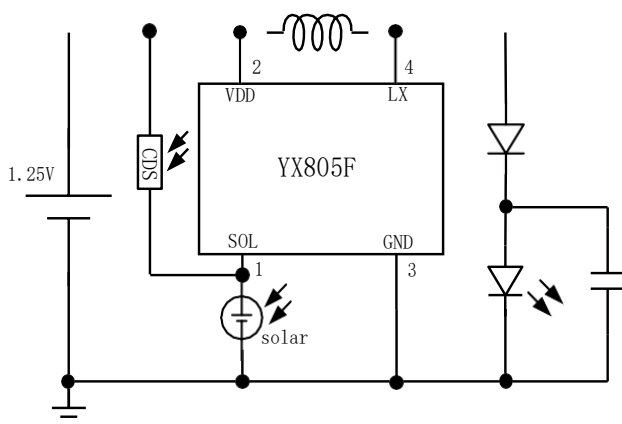


Figure 3. Photoresist control enable

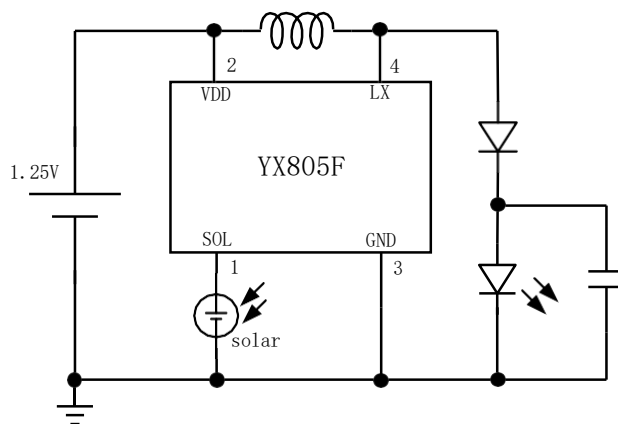


Figure 4. Solar cell control enable

c) Switch connection

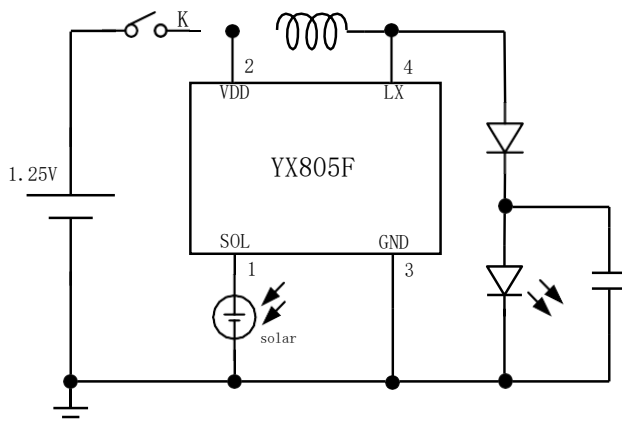


Figure 5. Recommended connection 1

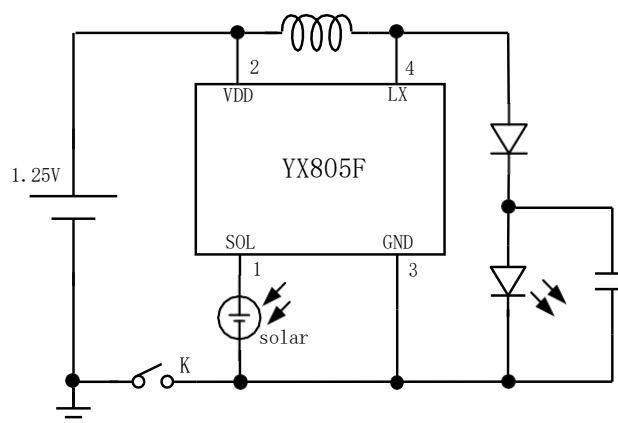


Figure 6. Recommended connection 2

ordering information

Device model	Order number	Package description	Storage temperature	Package mark	Packaging selection	remarks
YX805F	YX805FST26	SOT23-6S	-65°C to +125°C		Tape and Reel	
YX805F	YX805FST25	SOT23-5	-65°C to +125°C		Tape and Reel	
YX805F	YX805FT004	TO-94	-65°C to +125°C		Bag	

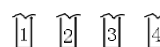
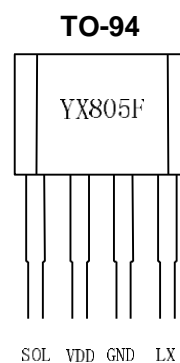
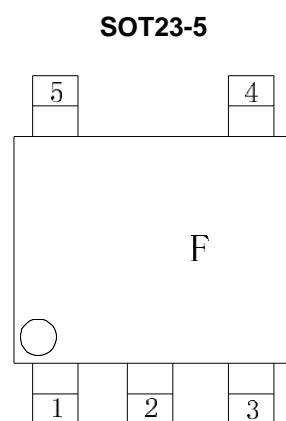
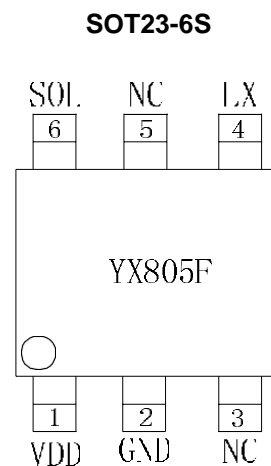
引脚信息

表 1. 引脚描述

Pin	name	Pin function description
1	VDD	Power terminal
2	GND	land
4	LX	Power switch drain
6	SOL	Connected to the positive end, enabling and charging control end of solar cell
3, 5	NC	Empty foot

Pin	name	Pin function description
1	SOL	Connected to the positive end, enabling and charging control end of solar cell
2	NC	empty
3	LX	Power switch drain
4	GND	land
5	VDD	Power terminal

Pin	name	Pin function description
1	SOL	Connected to the positive end, enabling and charging control end of solar cell
2	VDD	Power terminal
3	GND	land
4	LX	Power switch drain



Absolute maximum rated range

describe	Range	Company	
supply voltage	-0.3 ~ 5	V	
Other pins	-0.3 ~ 5	V	
Maximum power consumption	0.5	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

		Range	Company
Package thermal resistance (θ_{JA})	TO-94	150	°C/W
	SOT23-6S	150	
power waste,PD@TA=25°C	TO-94	0.6	W
	SOT23-6S	0.6	

Recommended working conditions

	Range	Company
Working junction temperature	-40 ~ 125	°C
Operating ambient temperature	-40 ~ 85	°C
supply voltage	+0.9 ~ +1.5	V
Continuous input current	3~40	mA

Electrical characteristics

(VIN=5V, TA=25°C, unless otherwise specified.)

parameter	Symbol	Test conditions	minimum value	Typical value	Maximum	Company
Power input						
Input voltage range	VIN	IIN=40mA	0.8		1.5	V
Input current range	IIN	VIN=1.2V	3		180	mA
Off state current	ISD	VIN=1.2V · VSOL=0.4V		30		μA
power switch						
Switch on resistance	RDS(ON)	VIN=1.2V IIN=1mA L=10μH		1.7		Ω
Output leakage current	ILEAKAGE	VSOL=VIN		18		μA
Solar control						
Enable input threshold	V on-off	VIN=1.2V		0.4		mV
	V off on			0.3		mV
Charging minimum differential pressure	VCHΔmin	VIN=1.2V · ISOL =1mA		150		mV
Maximum charging capacity	ICHMAX	VIN=1.2V · VSOL- VDD=350mV			300	mA
Enable input resistance	RSOL-GND	-		32		KΩ
working frequency						
working frequency	flx	VIN=1.2V · L=47μH		110		KHz
work efficiency						
work efficiency	η	VIN=1.2V · L=47μH · 1 individualΦ5LED		83		%
Over discharge voltage						
Over discharge voltage	VOD	L=47μH		0.8		V

Functional block diagram

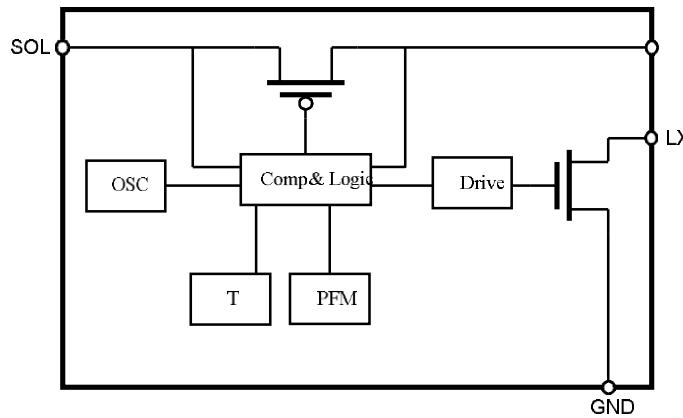
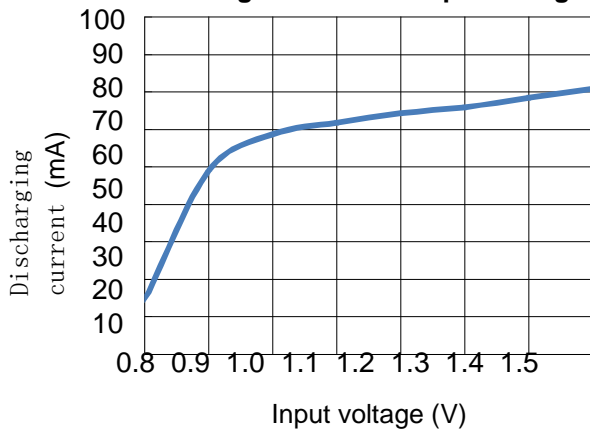


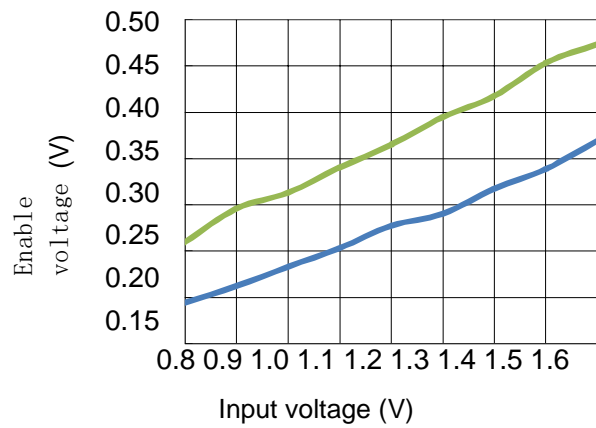
Figure 2 internal logic block diagram

(TO-94 package, VIN = 1.2V, I = 47)μH (0307), load 1 white LED, Ta = 25 ° C)

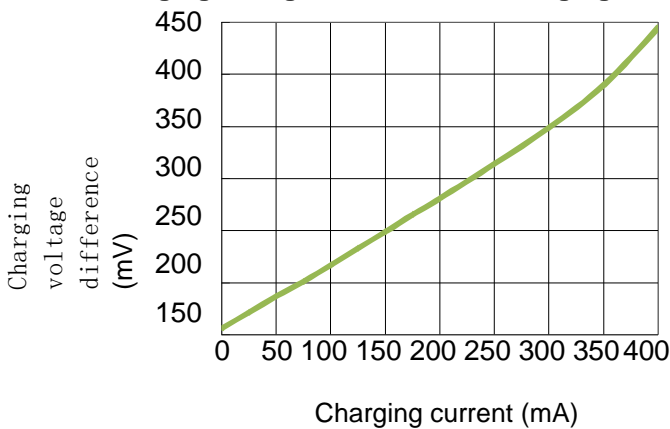
Discharge current vs. input voltage



enable voltage vs. input voltage



Charging voltage difference vs. charging current



working principle

YX805F is a solar lawn lamp LED drive control chip with an input current range of 3mA to 80mA. YX805F is suitable for solar lawn lamps powered by one rechargeable battery. Through different circuit connection modes and inductance cooperation, YX805F can realize the control of different input currents.

Current regulation reference (VIN = 1.2V)

YX805F 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. The connection method of Figure 1 and Figure 2 for reference only

Inductance	Specifications	LED load	Input current (MA)
220uH	0307	1 individualΦ5 white LED	15.2
150uH			23.7
82uH			39.2
68uH			47.9
47uH			67.3
22uH	0410	3 individualΦ5 white LED	124

Table 2. The connection method of Fig. 3 ~ Fig. 6 for reference only

Inductance	Specifications	LED load	Input current (MA)	Output current (MA)
220uH	0307	1 individualΦ5 white LED	15.5	4.8
150uH			24.2	7.5
82uH			40.2	11.1
68uH			49.2	13.5
47uH			0410	2 individualΦ5 white LED
22uH	129.7	31.8		

Charge discharge and enable control

Sol pin is externally connected to the positive pole of solar panel, and bat pin is connected to the positive pole of rechargeable battery. During the day, solar cell converts sunlight into electric energy to charge the battery, and at night, battery discharge drives led.

The internal high-precision comparator monitors the sol and bat pin voltages. When the sol voltage is 30% higher than the bat voltage, the chip enters the shutdown state and turns off the LED. When the sol voltage is 22% lower than the bat 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 charging function of sol to bat.

Power consumption considerations

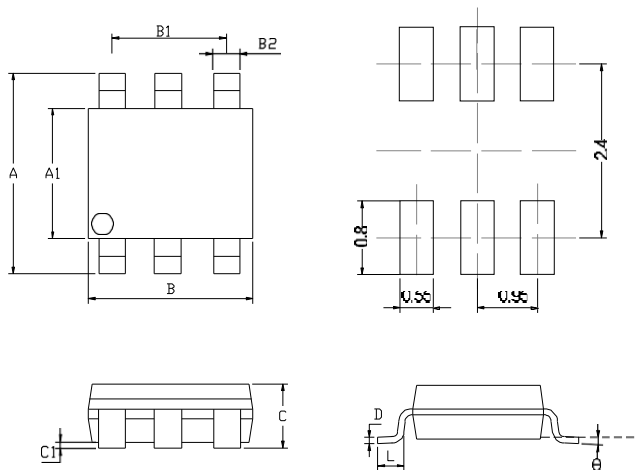
Chip junction temperature depends on many factors, such as ambient temperature, PCB layout, load and package type. Power consumption and chip junction temperature can be calculated according to the following formula:

$$P_D = R_{DS(ON)} \times I_{OUT}^2$$

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

Package dimension drawing

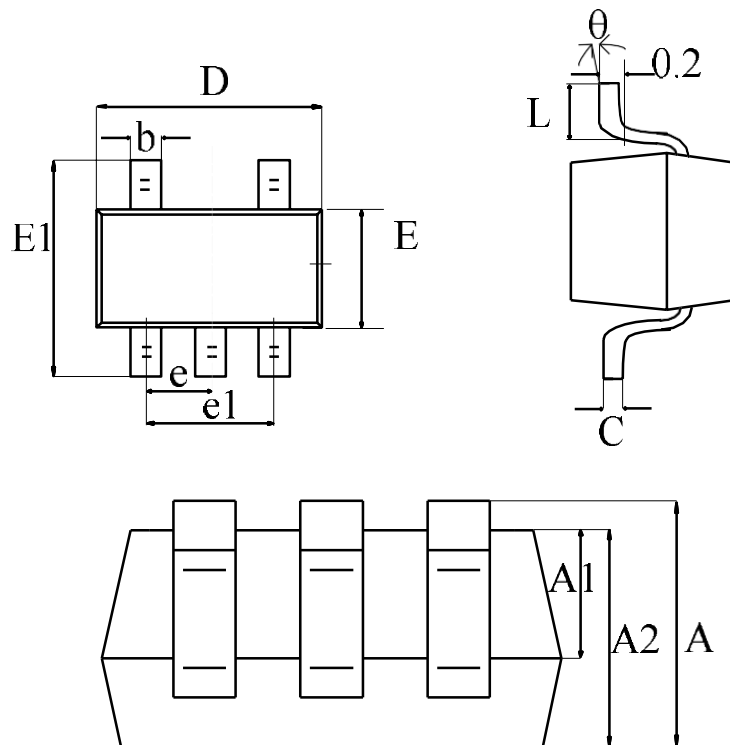
SOT23-6S



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 °

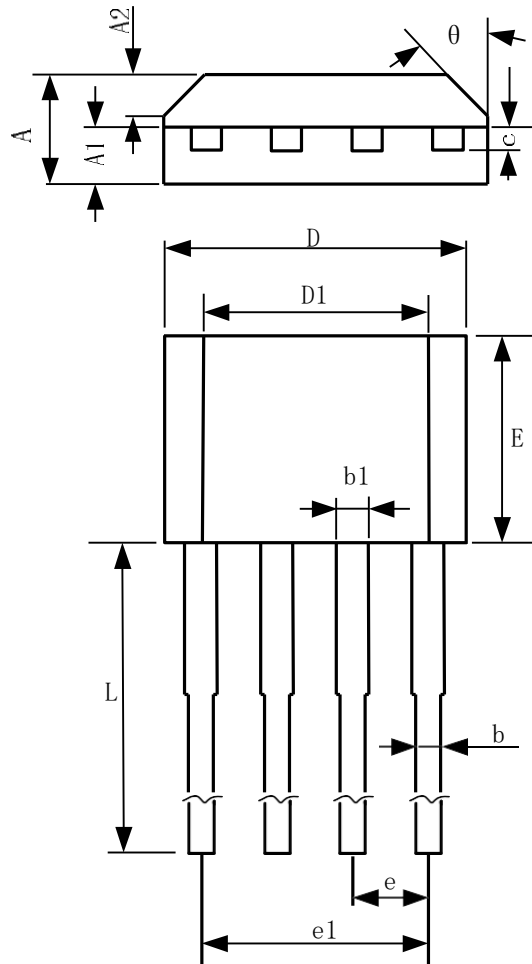
SOT23-5



SOT23-5 package mechanical data

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°

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	