Description

SL401 is a constant current driver chip with a default output current of 10mA. By using a bias resistor, the maximum output current can be set to 65mA, which can be used to drive low-power LEDs(The specific circuit can refer to Figure 6-1)

At the same time, a transistor can also be connected to the output pin of SL401, and the SL401 feedback control function can be used to achieve dimming control of high-power LEDs above 65mA(The specific circuit can refer to Figure 6-2)

Feature

- The output current is determined by the bias resistance and does not change with the number of LED lights in series or the change in the forward conduction voltage of the LED lights.
- The output current is stable and will not change due to changes in the power supply voltage. It can be ignored that if the power line is too long, it will reduce the power supply voltage of SL401.

Adventage

- Lower integration costs
- Small packaging size
- Fewer solder joints for higher reliability

SOT23 -6

Note:SL401 has the advantages of small package size and low cost, making it very suitable for driving low-power LEDs. At the same time, it adopts resistance bias, which consumes less voltage drop. The output current range is from 10mA to 65mA, and the current accuracy is high, which can effectively protect LEDs

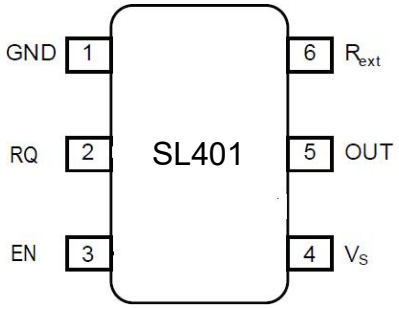
Characteristics

- The driving current of the LED (without using external adjustable resistors) is preset to 10mA
- Adjust the output current through an external resistor, with a maximum current of 65mA
- The maximum power supply voltage is 42V
- High accuracy of output current, not changing with changes in power supply voltageThe minimum saturation pressure drop is 1.4V
- Using SOT23-6 packaging, the maximum heat dissipation power consumption is 750mW
- RoHS

Application

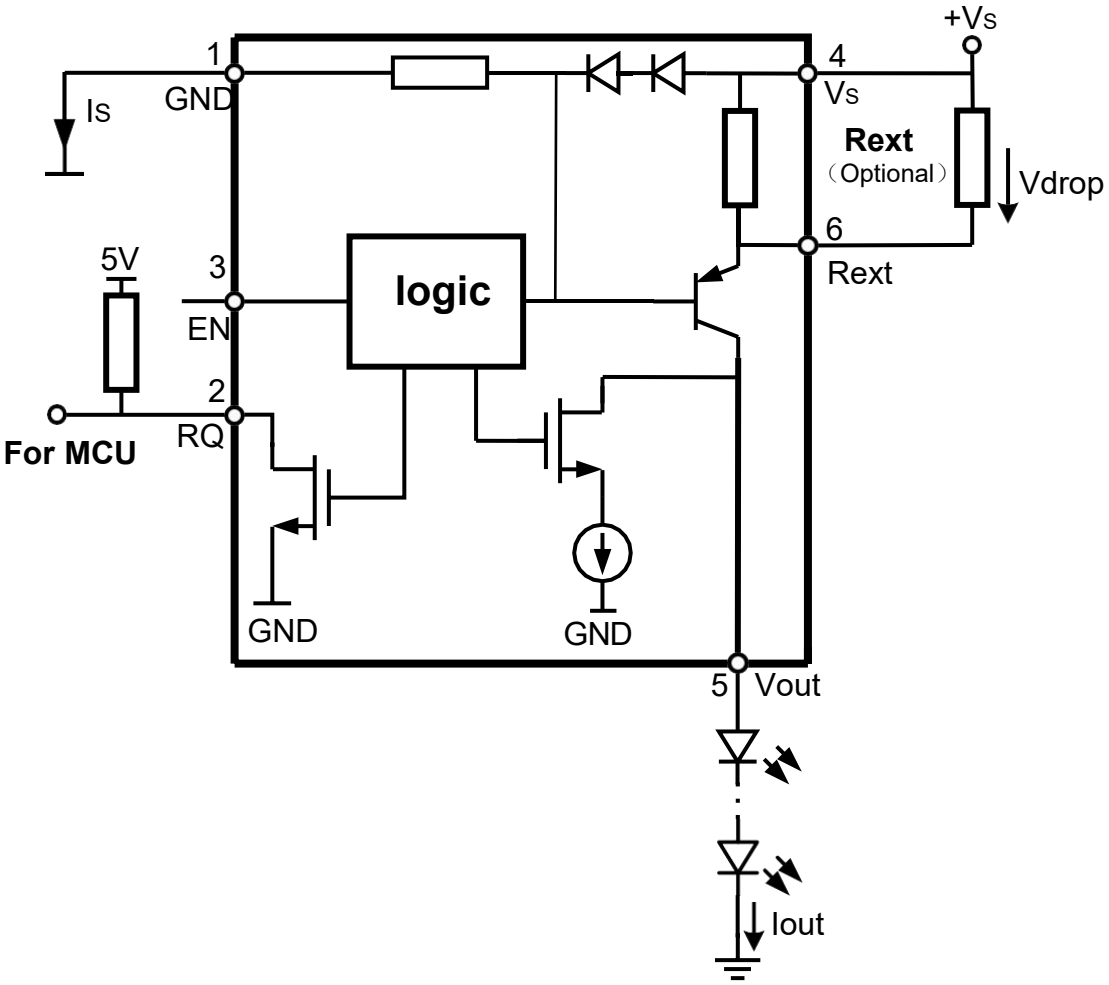
- Letters on billboards, LED strips for decorative lighting systems
- Lighting on airplanes, trains, and ships
- Environmental lighting, white goods lighting, such as refrigerator lighting
- Medical lighting
- Automotive lighting, such as high mounted brake lights and rear combination lights

Pin Description

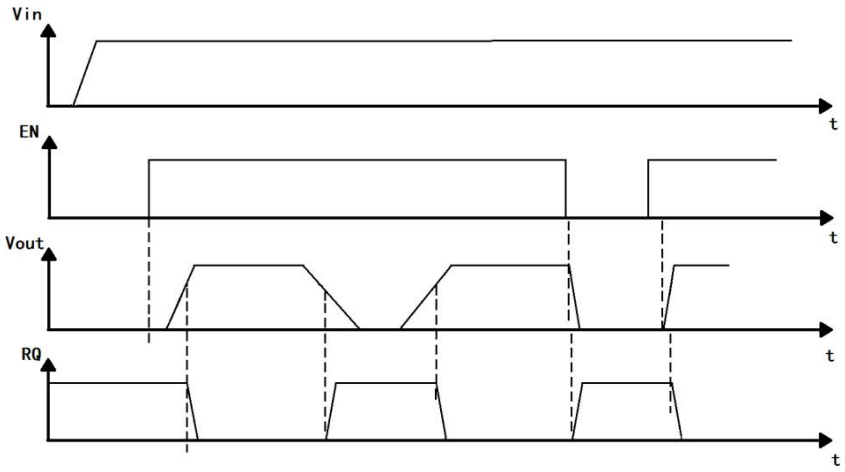


3-1 SL401 (SOT23-6) Pinout diagram

Pin number	Symbol	Parameter
1	GND	reference ground
2	R_Q	drain open circuit reset output
3	EN	enable terminal
4	V_s	power supply terminal
5	OUT	output terminal
6	R_{ext}	external resistor terminal



3-2 SL401 Typical application diagram



3-3 SL401timing diagram

Electrical parameter

4.1 Maximum rated range,at T_A=25°C

Parmeter		Value			
	Symbol	Min	Typ	Max	Uint
power supply voltage	V_s	-	-	42	V
enable voltage	V_{EN}	-		7	V
output current	I_{out}	-	65	100	mA
output voltage	V_{out}	-	-	40	V
reverse voltage rating for all pins	V_R	-	-	0.7	V
total power consumption	P_{tot}	-	-	750	mW
junction temperature	T_j	-	-	150	℃
storage temperature	T_{stg}	-40	-	150	℃

ps： Leaving the device in an environment where the temperature exceeds its maximum rated value for extended periods can affect the device's reliability. These maximum rated values are absolute; exceeding any one of these parameters can cause permanent damage.

4.2 Thermal resistance of SL401 at T_A=25°C

Parmeter		Value				Note
	Symbol	Min	Typ	Max	Uint	
thermal resistance	R_{thj-a}	-	-	220	K/W	SL401

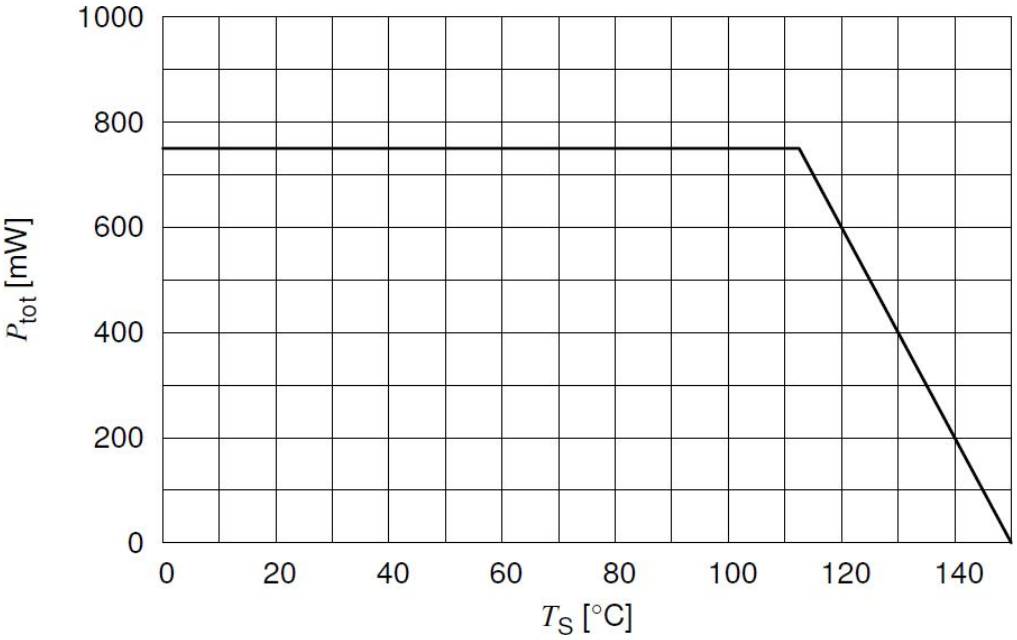
4.3 Electrical characteristics of SL401 at T_A=25°C

Parmeter		Value				Note
	Symbol	Min	Typ	Max	Uint	
input voltage	V_{IN}	4	-	42	V	I_O=10mA
static power consumption	I_q	120	160	200	uA	V_S=10V，EN=0V;
power supply current	I_S	130	265	400	uA	V_S<40V，EN=5V;
internal resistance	R_{int}	78	91	104	Ω	I_{Rint}=10mA
output current	I_{out}	9	10	11	mA	V_S=10V
voltage drop （v_{rext}）	V_{drop}	0.82	0.91	1	V	I_{out}=10mA
enable threshold	V_{thH}		2.9		V	
	V_{thL}		1.6		V	
rq flip threshold	V_{RQH}	5.05		5.6	V	V_O↑
	V_{RQL}	4.1		4.85	V	V_O↓
enable turn-on time	T_{on}			10	us	EN=5V to 90%V_O
						R_L<1K
enable turn-off time	T_{off}			1	us	EN=0V to 10%V_O

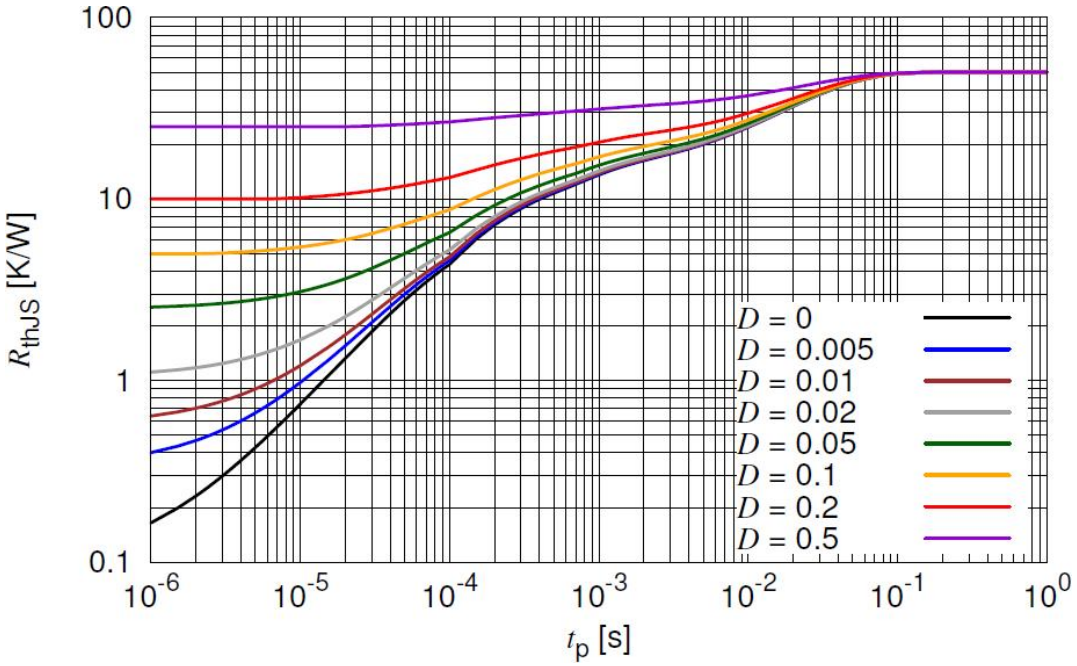
4.4 DC characteristics of SL401 driving LED load at T_A=25°C

Parmeter		Value				Note
	Symbol	Min	Typ	Max	Uint	
minimum saturation voltage drop	V_{Smin}	-	1.4	-	V	I_{OUT}=10mA
temperature coefficient of output current	DI_{out} / I_{out} /Δt	-	0	0.1	%/K	V_S=10V
voltage coefficient of output current	DI_{out} / I_{out} /ΔV	-	0	-	%/V	V_S=10V

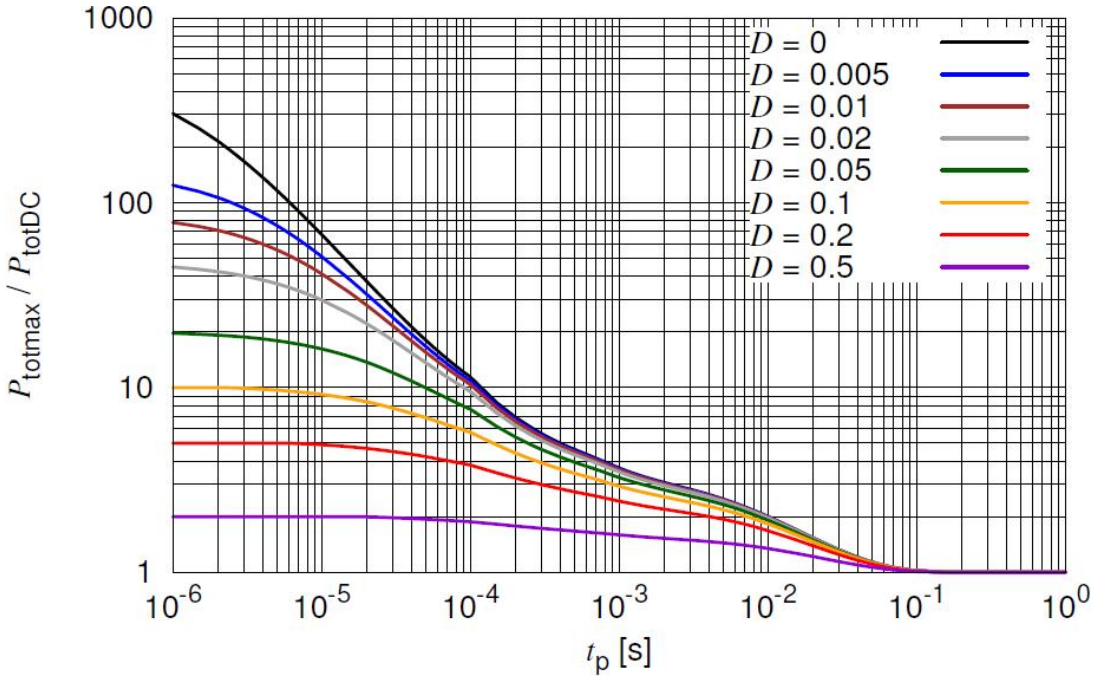
Typical characteristics



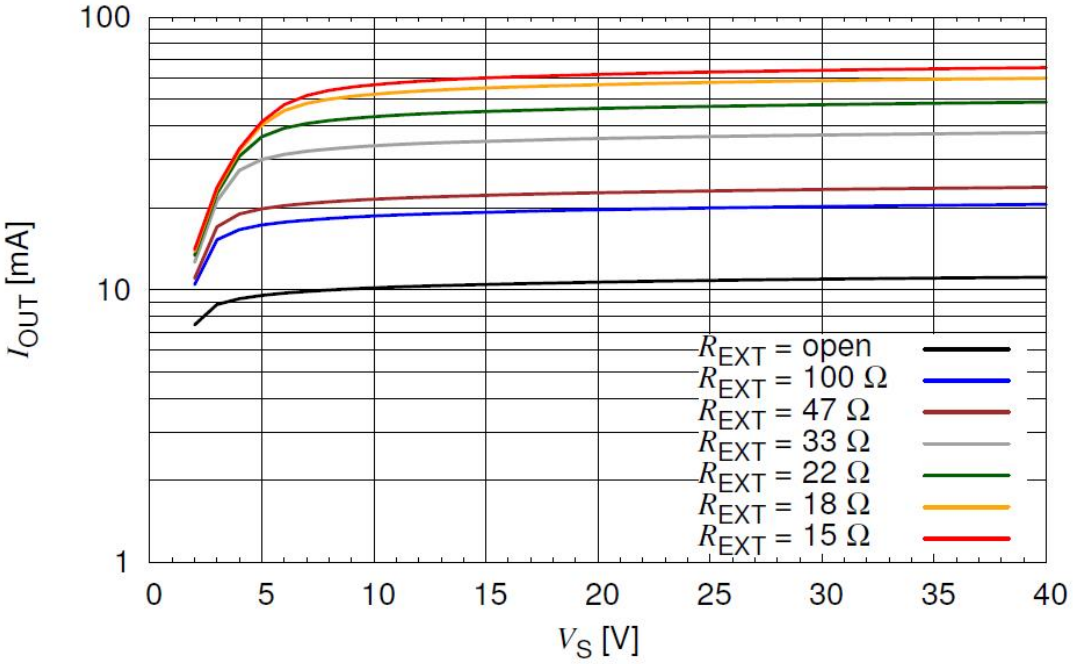
5-1 Total dissipation power P_{tot} = f (T_S)



5-2 Thermal resistance versus pulse duration graph $R_{thJS} = f(t_p)$

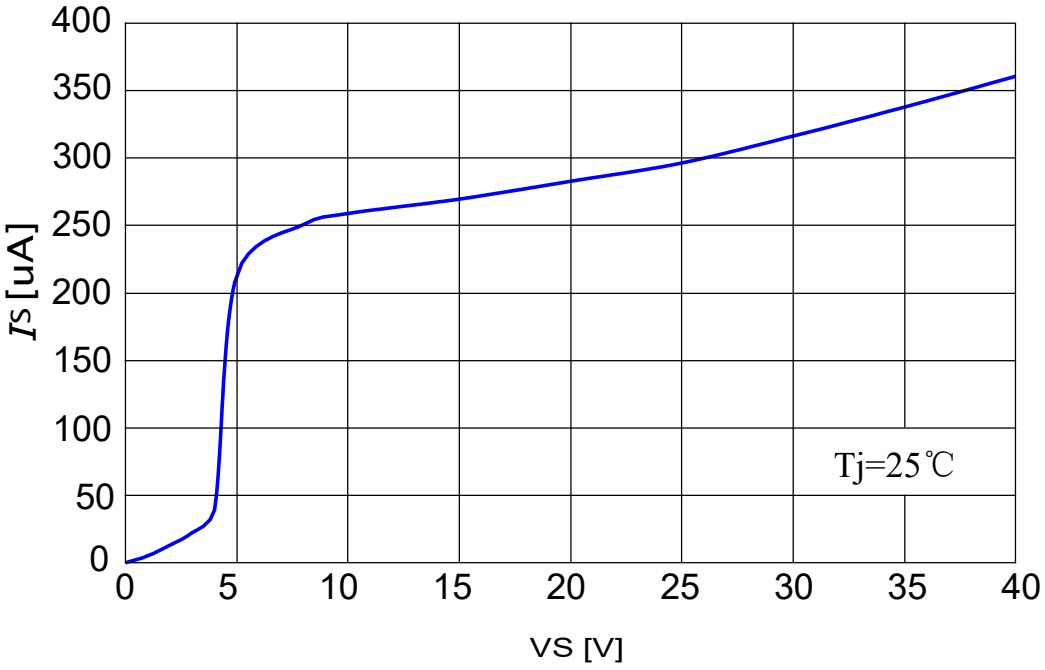


5-3 Power dissipation versus pulse relationship graph $P_{tot\ max}$ / P_{totDC} = f (t_p)



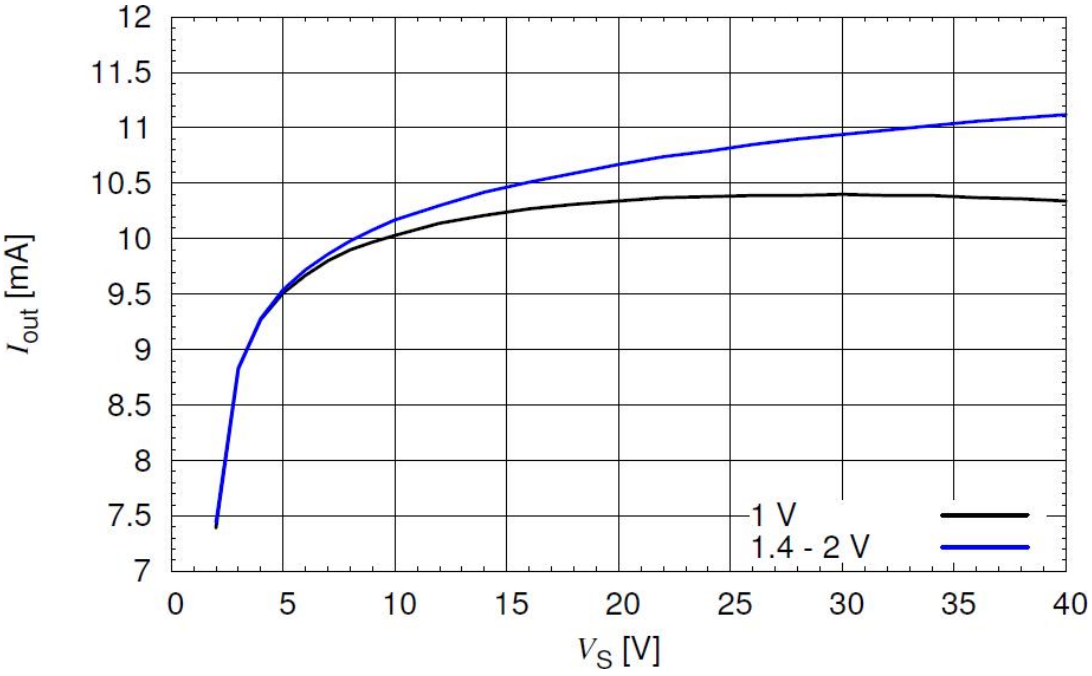
5-4 Output current versus power supply voltage graph

$I_{out} = f(V_S), V_S - V_{out} = 1.4V$, R_{EXT}



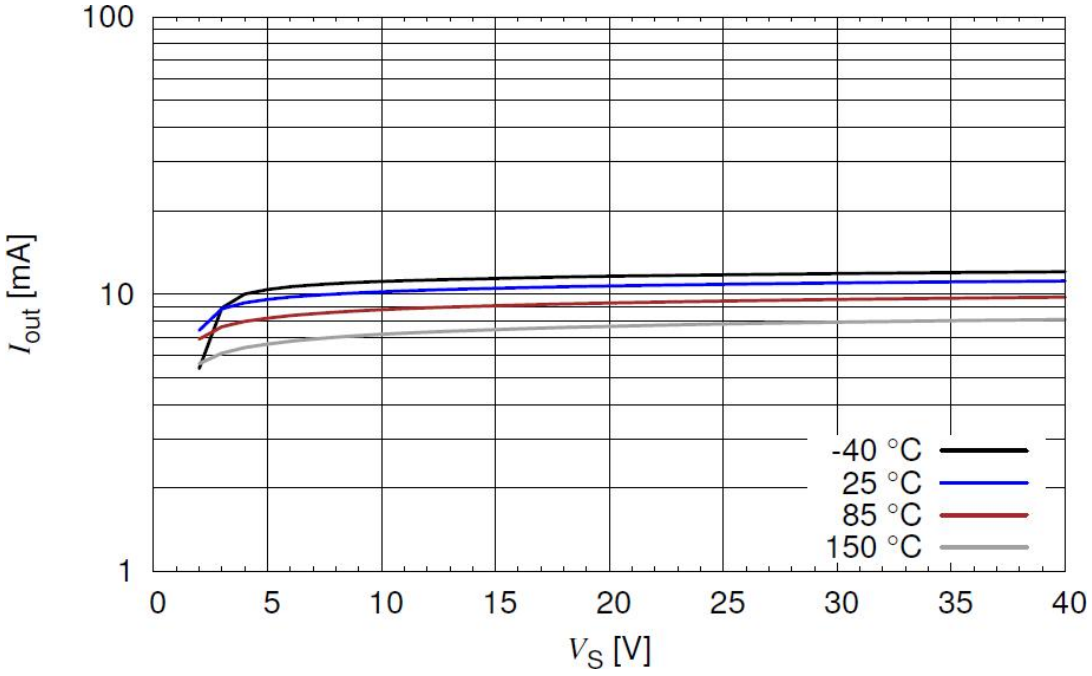
5-5 Power supply current versus power supply voltage graph

$I_S = f(V_S), T_A$



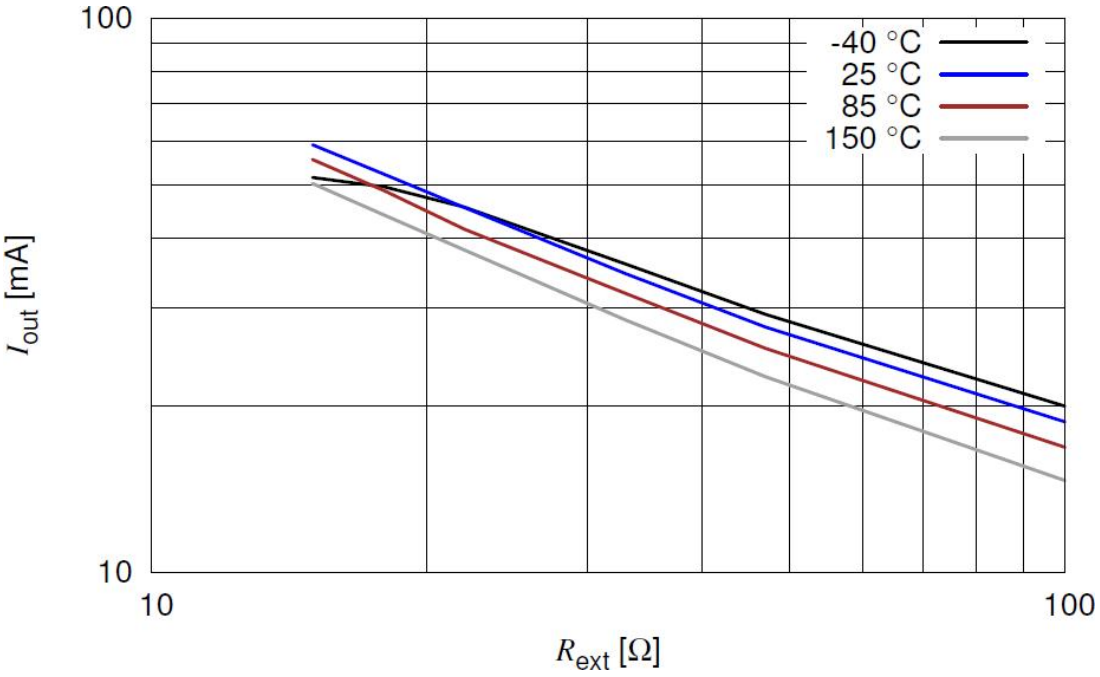
5-6 Output current versus power supply voltage graph

$I_{out} = f(V_S), V_S - V_{out}$



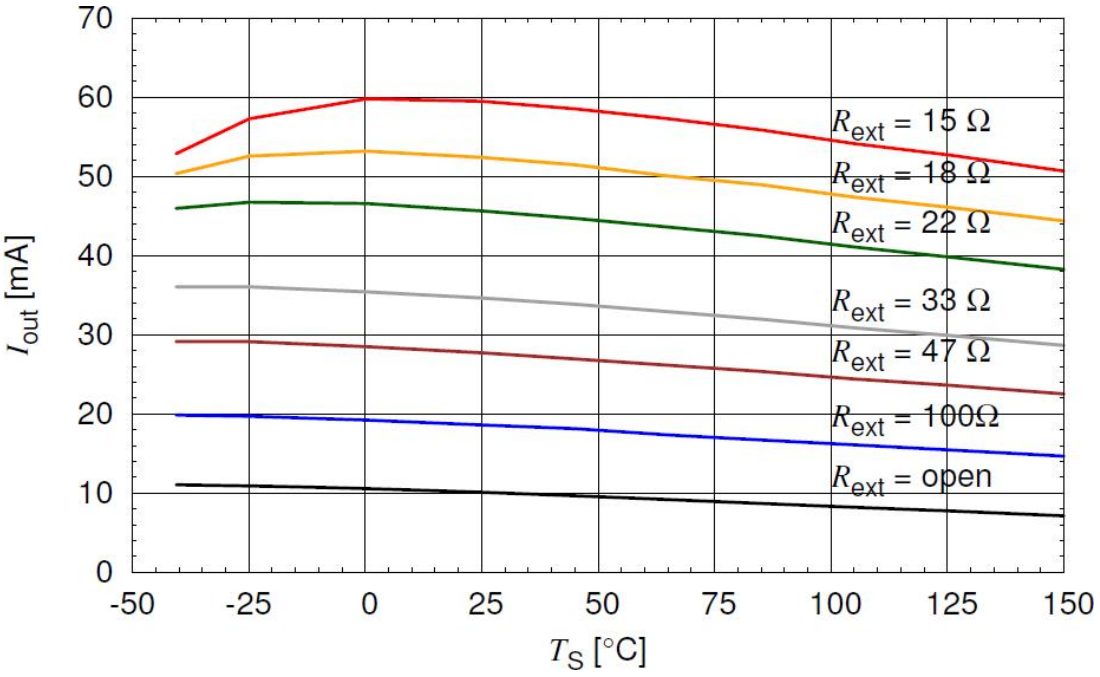
5-7 Output current versus power supply voltage characteristic graph

$I_{out} = f(V_S), V_S - V_{out} = 1.4V, T_A$



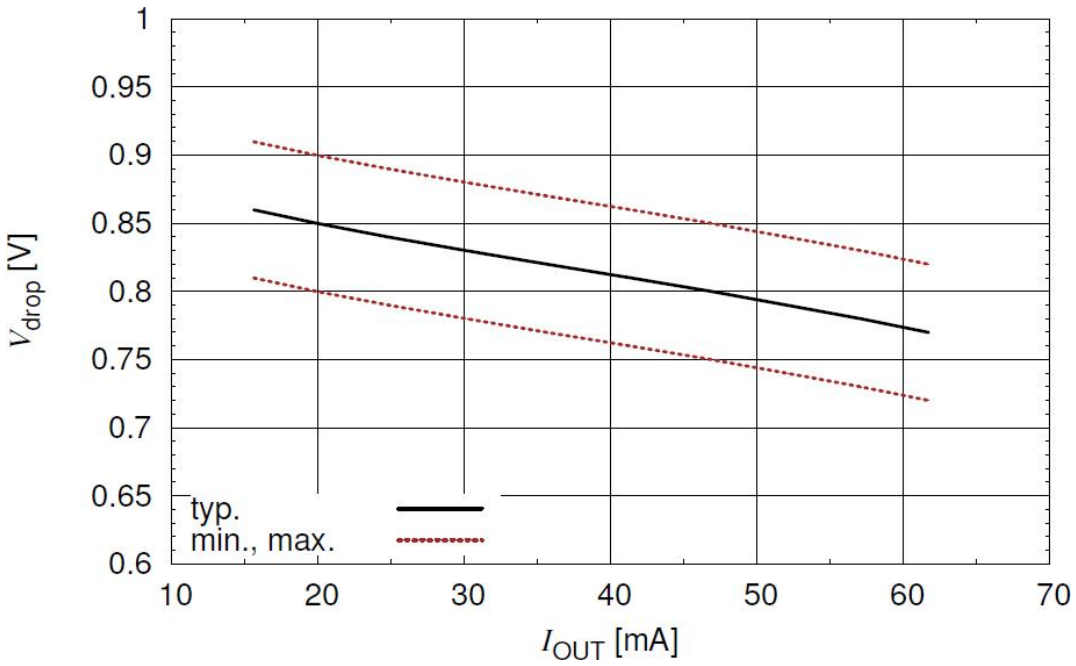
5-8 Output current versus external resistance graph

$I_{out} = f(T_S), V_S = 10V, V_S - V_{out} = 1.4V, T_A$



5-9 Output current versus junction temperature graph

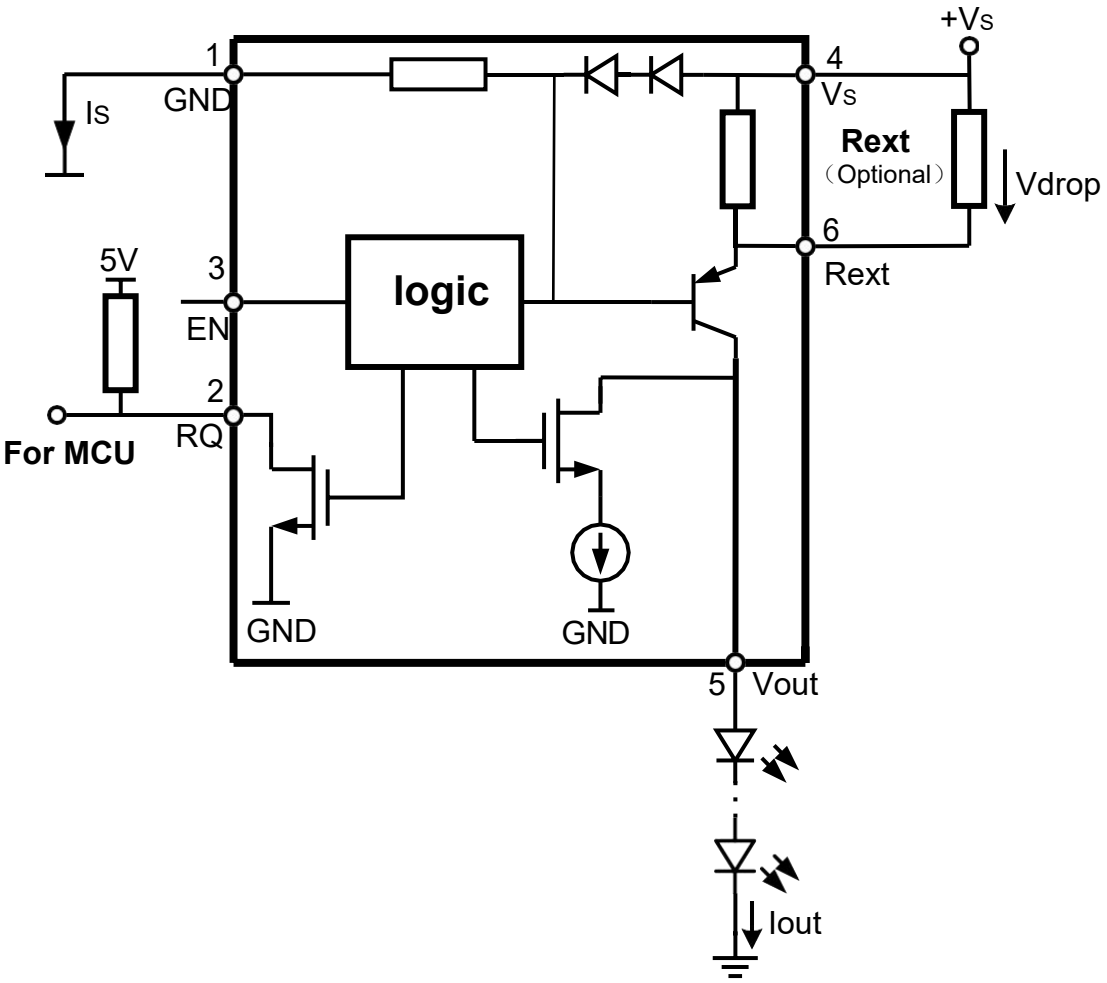
$I_{out} = f(T_S), V_S = 10V, V_S - V_{out} = 1.4V, R_{ext}$



5-10 Voltage drop versus output current graph

V_{drop} = f (I_{out}), I_{out} = 10mA ~ 65mA

Detailed Description



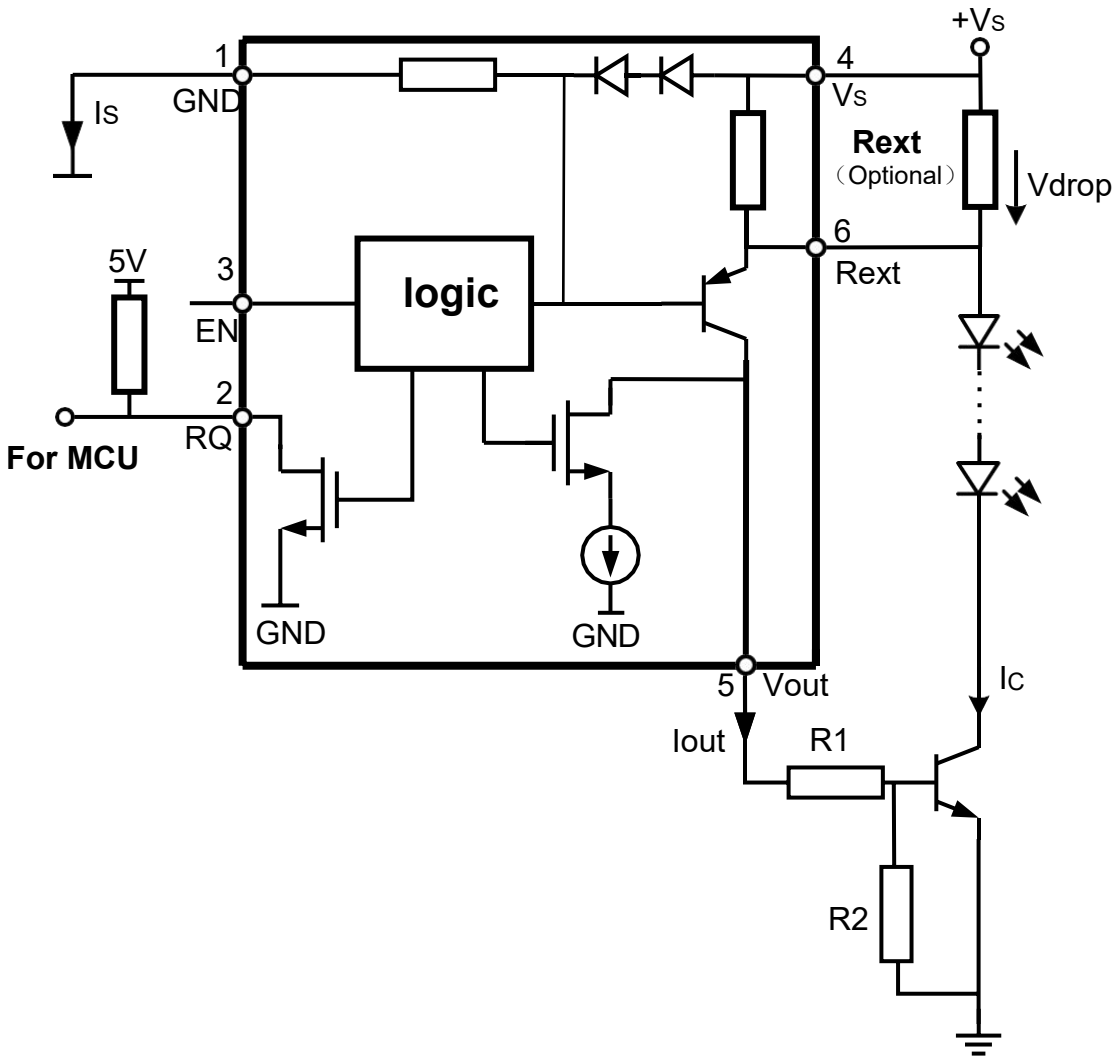
6-1 Typical application circuit: independent current source

Ps 1

SL401 is a simple LED constant current driver chip. As shown in Figure 6-1, the output current of SL401 can be adjusted from 10mA to 65mA using an external adjustable resistor Rext. Refer to Figure 5-8 for the recommended size of Rext. It is advisable to use high-precision resistors for Rext to ensure the accuracy of the resistance formed by Rint and Rext in parallel, and hence the accuracy of the output current. Due to device self-heating and negative temperature effects, the output current may be slightly lower than the theoretical value.

RQ flip threshold

RQ is the open-drain output terminal. As shown in Figure 6-1, RQ incorporates an internal pull-down MOSFET. When the chip detects that the voltage Vout is higher than VRQH, the internal MOSFET of RQ opens, resulting in a low signal output "0". When Vout is lower than VRQL, the internal switch of RQ closes, allowing the external power supply to pull the RQ signal high, resulting in a high signal output "1".



6-2 Application circuit: Enhancement-mode constant current source using an external transistor

Ps 2

Using the enhancement-mode constant current output circuit shown in Figure 6-2, SL401 can drive high-power LEDs.
The formula relating LED current (IC) to Rext is as follows:

$$I_{out}=V_{drop}/R_{ext}+10mA-I_C$$

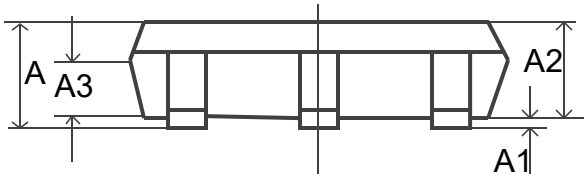
I_c:Something went wrong, please try again later.

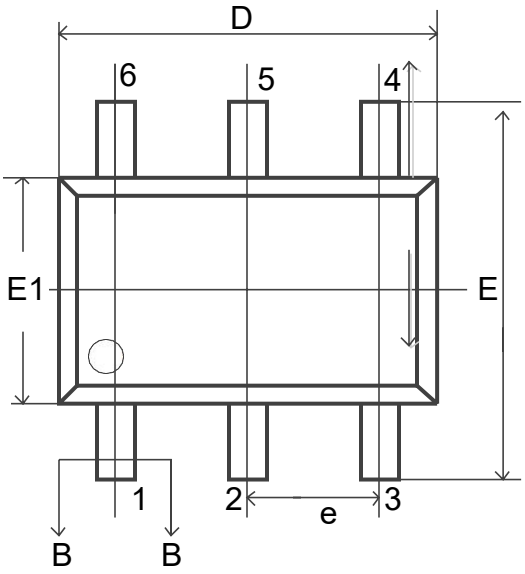
I_{out} :The output current of the chip

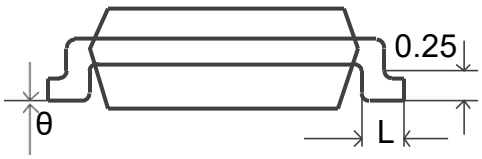
- During normal operation, the transistor voltage drop is Vce = VS - VLED - Vdrop, and the transistor power dissipation is Pw = Vce * IC.
- When the LED fails open circuit, the voltage drop across resistor R1 is V = (VS - 0.7V) * R1 / (R1 + Rint), so special attention should be paid to the power rating of R1.

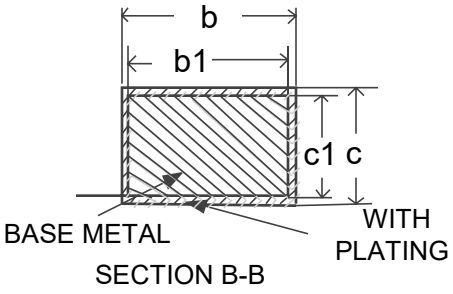
Package outline dimensions

SOT23-6 Package









Symbol	Millimeter		
	Min	Nom	Max
A	----	----	0.9
A1	0	----	0.1
A2	0.7	0.75	0.8
A3	0.35	0.4	0.45
b	0.3	0.44	0.5
b1	0.3	0.4	0.45
c	0.11	0.16	0.2
c1	0.11	0.13	0.15
D	2.7	2.9	3.1
E	2.6	2.8	3
E1	1.5	1.6	1.7
e	0.95 BSC		
L	0.3	0.4	0.5
θ	0	----	8°

pad size