3-channel Constant Current LED Driver

（V2.2）

TERALANE SEMICONDUCTOR INC.

ADDRESS：7th Floor,Building 3,China Academy of Science and Technology Development,Gaoxin South Road 1, Nanshan District,Shenzhen,P.R.china

Tel：86-755-8630 9506

Fox：86-755-8630 9523

Features

- 3 constant-current output channels, constant output current invariant to load voltage change
- Output current range: 0 ~ 30mA,

  Output current adjusted through an external resistor. the default value is 20 mA with a 620 Ohm external resistor
- Manchester communication interface
- Single wire data transmission
- Strong drive ability, The max TLS3001 IC in series :1024
- 8 bit color depth PWM control
- Staggered output dalay:80ns
- Low power consume:<100mW
- Excellent output current accuracy:

  Between channels: <±1.5% , and

  Between Ics: <±3%
- 100KHz ~ 1MHz clock frequency
- Supply voltage range: 5~17V
- ESD > 7KV

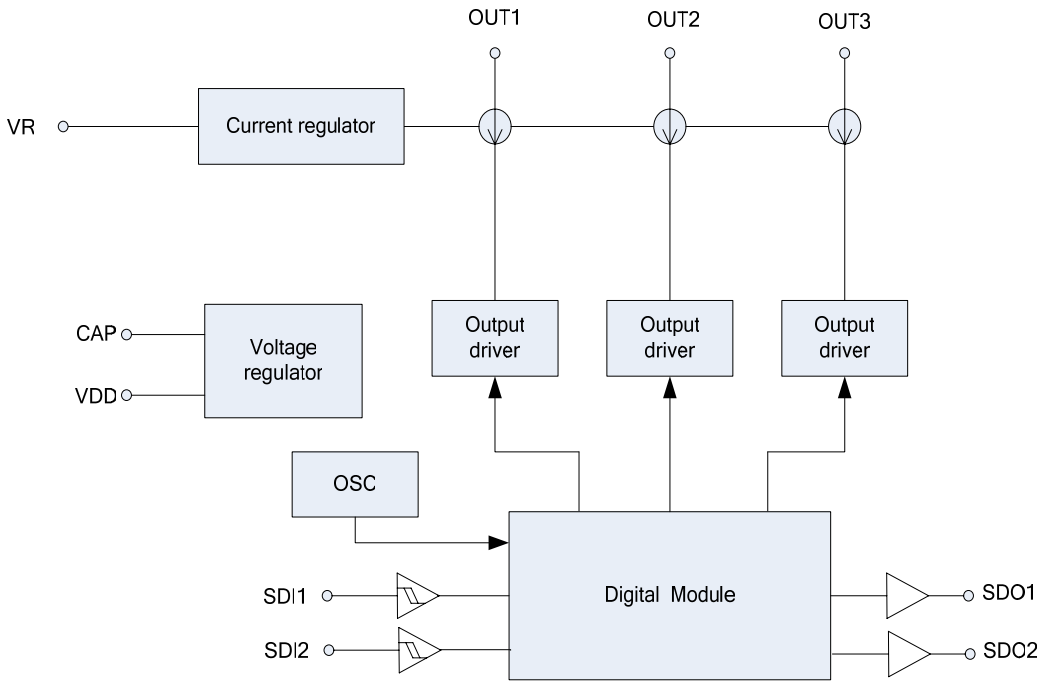
Typical application

- Signel pix light (SOP14/SSOP10)
- Twinkle light(SOP8apply in 5V system）
- Signboard(customized)

Product Description

TLS3001 provide Single wire data transmission and contains 3 constant-current output channels and internal Pulse Width Modulation (PWM) control with 8-bit color depth. At TLS3001 output stages, three regulated current port are designed to provide uniform and constant current sinks with a wide range of loading variations. The output current can be present through an external resistor, and the default value is 20mA. TLS3001 provides supply voltage range from 5V to 17V through internal voltage regulator. TLS3001 guarantees to endure maximum 17V at the output ports.

Block Diagram



Maximum Ratings

CHARACTERISTIC	SYMBOL		RATING	UNIT
Supply Voltage	V_{DD}		17	V
Input Voltage（SDI）	V_{IN}		$-0.4 \sim V_{cap}+0.4$	V
Output Current	I_{OUT}		30	mA
Endurance Voltage of Output	V_{DS}		17	V
GND Terminal Current	I_{GND}		95	mA
Clock Frequency	F_{DCLK}		0.1～2	MHz
Endurance power	PDmax	SOP14	0.87	W
		SSOP10	0.625	
		SOP8	0.625	
Operating Temperature	T_{opr}		-45 ~ +85	℃
Storage Temperature	T_{stg}		−55 ~ +125	℃

Electrical Characteristics

CHRACTERISTIC	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Supply Voltage	VDD		5		17	V
Output Current	V_{cap}		3.1	3.15	3.32	V
Current Skew（channel）	I_{OUT}		0	20	30	mA
Current Skew（IC）	dI_{OUT1}	I_{out}＝20mA VR＝461 mV R=620Ω		± 1.5	±3	%
Current Skew vs. Supply Voltage	dI_{OUT2}	I_{out}＝20mA VR＝461 mV R=620Ω		±3	±6	%
Supply Voltage	%/dVDD	Supply Voltage＝5～17V		± 0.2	±0.5	%/V

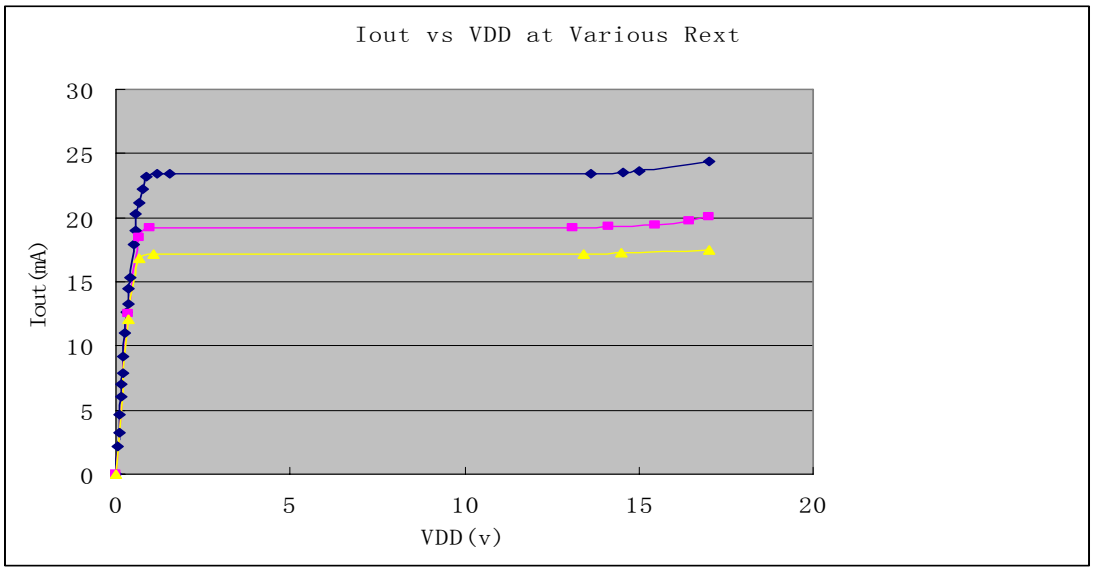
Switching Characteristics

CHRACTERISTIC	SYMBOL	MIN.	TYP.	MAX.	UNIT
Internal clock Frequency	OSC	13		27	MHz
Pulse Width		19		38	ns
Staggered output delay		19		38	ns
Output Rise Time of Output Ports			80		ns
Output Fall Time of Output Ports			300n		ns
Internal clock Frequency			600n		ns

Constant Current

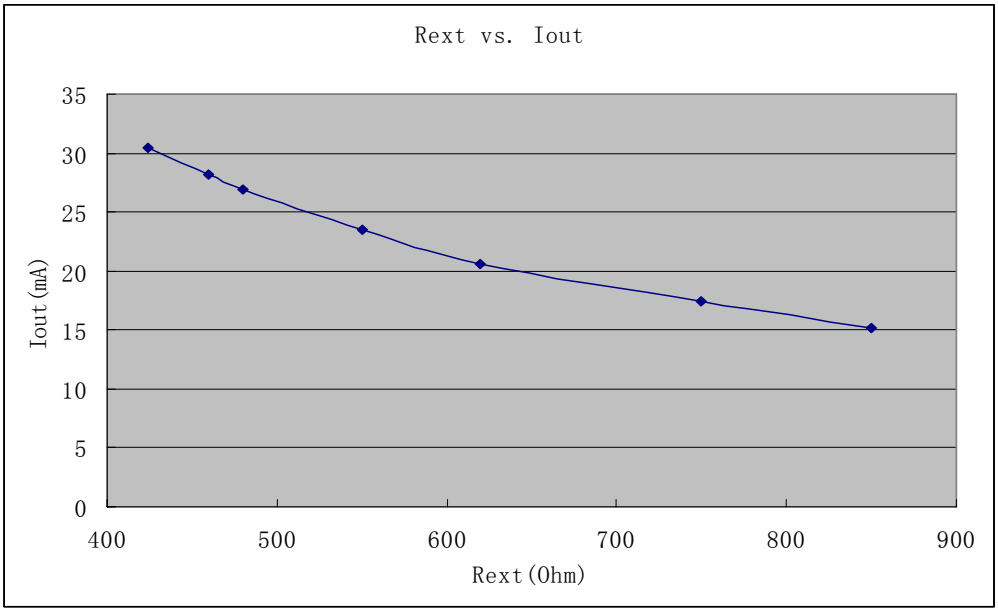
1） The maximum current skew between channels is less than ±1.5％ and between Ics is less than ±3％.

2） As the flowering figure, The output current can be kept constant regardless of the variations of LED forward voltages(Vf).



Setting Output Current

Output current adjusted through an external resistor,the ralation showed as following:



The output current can be calculated from the equation：

Iout = (Vref/R)*2*13.8

Vref=0.46V；

Where R is the resistance of the external resistor connected to VR terminal and VR is its voltage. The output current is about 20mA when VR=620Ω.

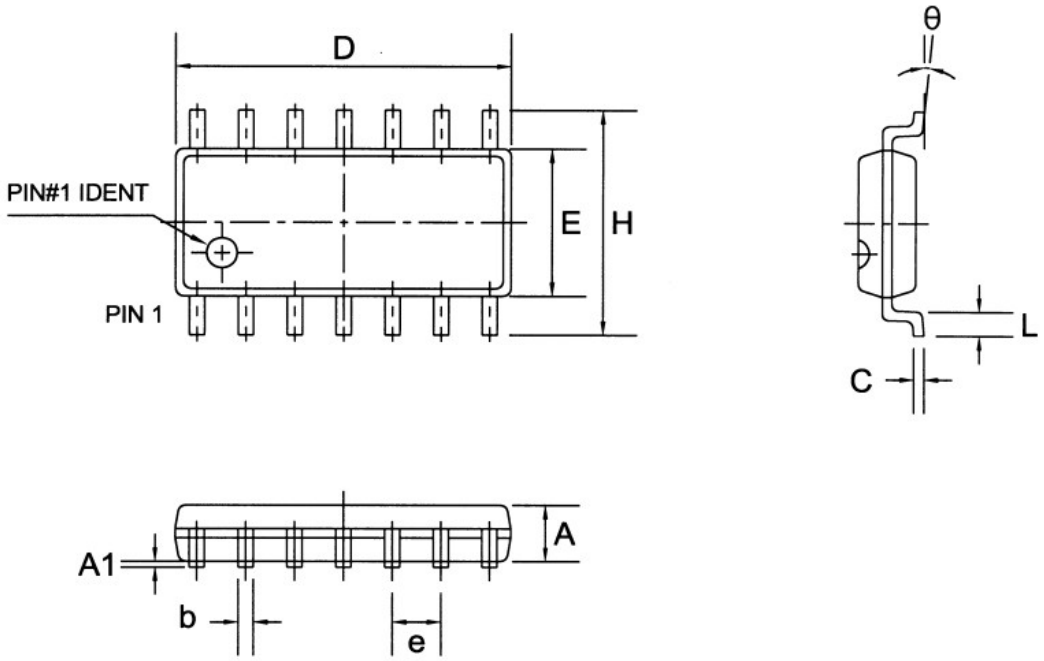
Package infomation

- **SOP14**

Pin description

PIN NAME	TYPE	DESCRIPTION	PIN NAME
1	VREF/NC	output	Test pin
2	VANA/NC	output	Test pin
3	SDI1	input	Serial-data input1 to the shift register
4	SDO2	output	Serial-data output2 to the receiver-end SDI of next driver IC
5	OSC/NC	output	Test pin
6	VR	input	Input terminal used to connect an external resistor for setting up output current for all output channels. The default is 620 Ω
7	GND	supply	Ground terminal for control logic and current sink
8	CAP	output	Connect a 1uF capacitor
9	SDI2	input	Serial-data input2 to the shift register
10	SDO1	output	Serial-data output1 to the receiver-end SDI of next driver IC
11	VDD	supply	Supply voltage terminal
12	OUT3	output	Constant current output terminals3
13	OUT2	output	Constant current output terminals2
14	OUT1	output	Constant current output terminals1

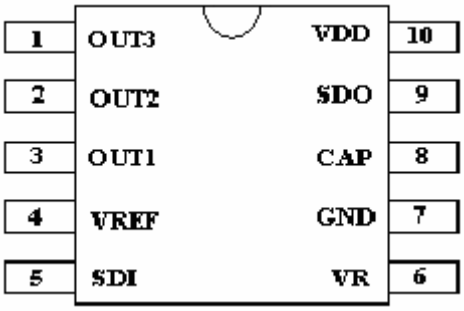
Package information



Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.30	1.50	1.70	0.051	0.059	0.067
A1	0.08	0.16	0.24	0.003	0.006	0.009
b	—	0.40	—	—	0.016	—
C	—	0.25	—	—	0.010	—
D	8.25	8.55	8.85	0.325	0.337	0.348
E	3.75	3.95	4.15	0.148	0.156	0.163
e	—	1.27	—	—	0.050	—
H	5.70	6.00	6.30	0.224	0.236	0.248
L	0.45	0.65	0.85	0.018	0.026	0.033
θ	0°	—	8°	0°	—	8°

- **SSOP10**

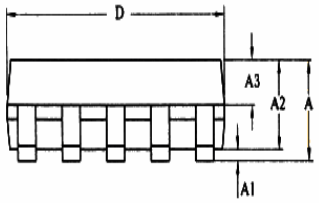
Pin diagram

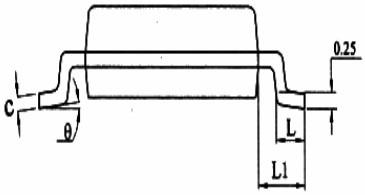


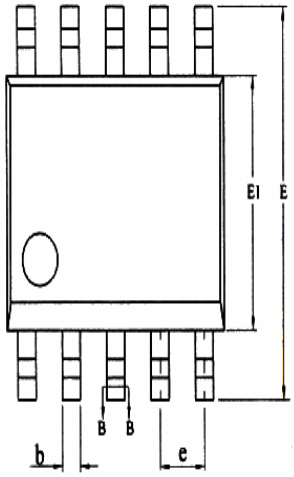
Pin description

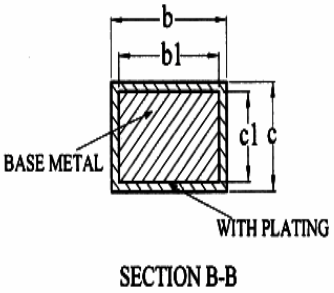
PIN NAME	TYPE	DESCRIPTION	PIN NAME
1	OUT3	output	Constant current output terminals3
2	OUT2	output	Constant current output terminals2
3	OUT1	output	Constant current output terminals1
4	VREF		Test pin
5	SDI	input	Serial-data input to the shift register
6	VR	input	Input terminal used to connect an external resistor for setting up output current for all output channels. The default is 620Ω
7	GND	supply	Ground terminal for control logic and current sink
8	CAP	output	Connect a 1uF capacitor
9	SDO	output	Serial-data output to the receiver-end SDI of next driver IC
10	VDD	supply	Supply voltage terminal

Package information







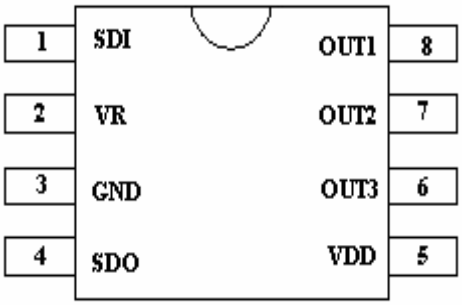


SECTION B-B

SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	—	—	1.75
A1	0.10	—	0.25
A2	1.30	1.40	1.50
A3	0.60	0.65	0.70
b	0.39	—	0.48
b1	0.38	0.41	0.43
c	0.21	—	0.26
c1	0.19	0.20	0.21
D	4.70	4.90	5.10
E	5.80	6.00	6.20
E1	3.70	3.90	4.10
e	1.00BSC		
L	0.50	—	0.80
L1	1.05BSC		
θ	0	—	8°
L/F载体尺寸 (mil)	95*110		

➢ SOP8

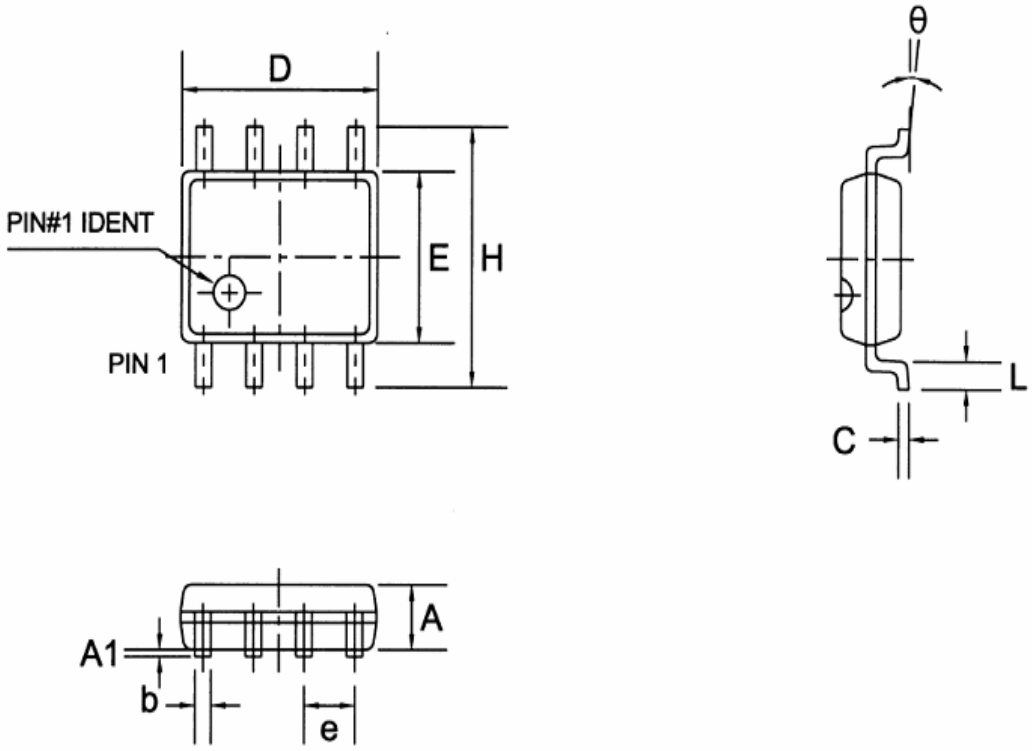
Pin diagram



Pin description

PIN NAME	TYPE	DESCRIPTION	PIN NAME
1	SDI	input	Serial-data input to the shift register
2	VR	input	Input terminal used to connect an external resistor for setting up output current for all output channels. The default is 620Ω
3	GND	supply	Ground terminal for control logic and current sink
4	SDO	output	Serial-data output to the receiver-end SDI of next driver IC
5	VDD	supply	Supply voltage terminal
6	OUT3	output	Constant current output terminals3
7	OUT2	output	Constant current output terminals2
8	OUT1	output	Constant current output terminals1

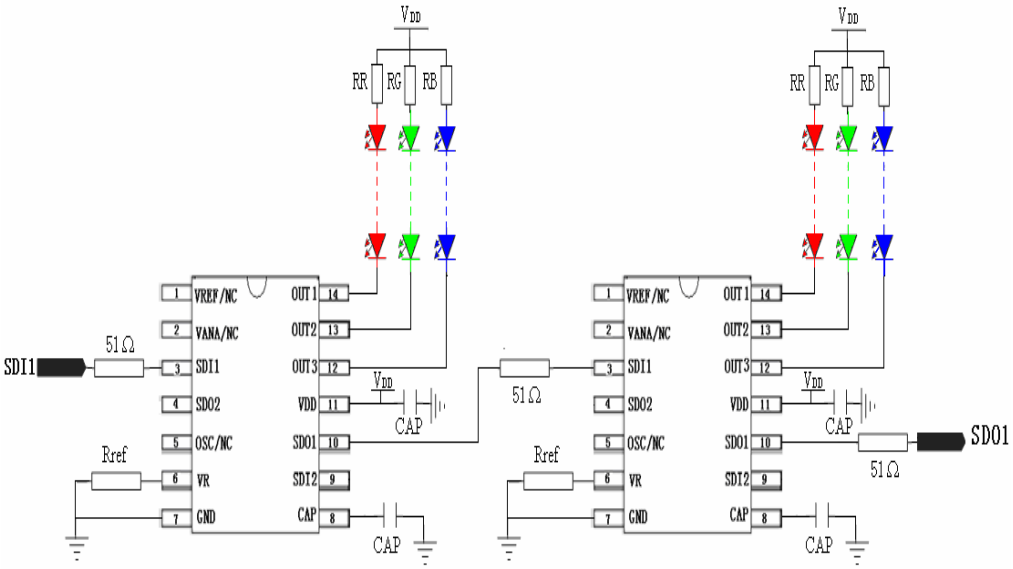
Package information



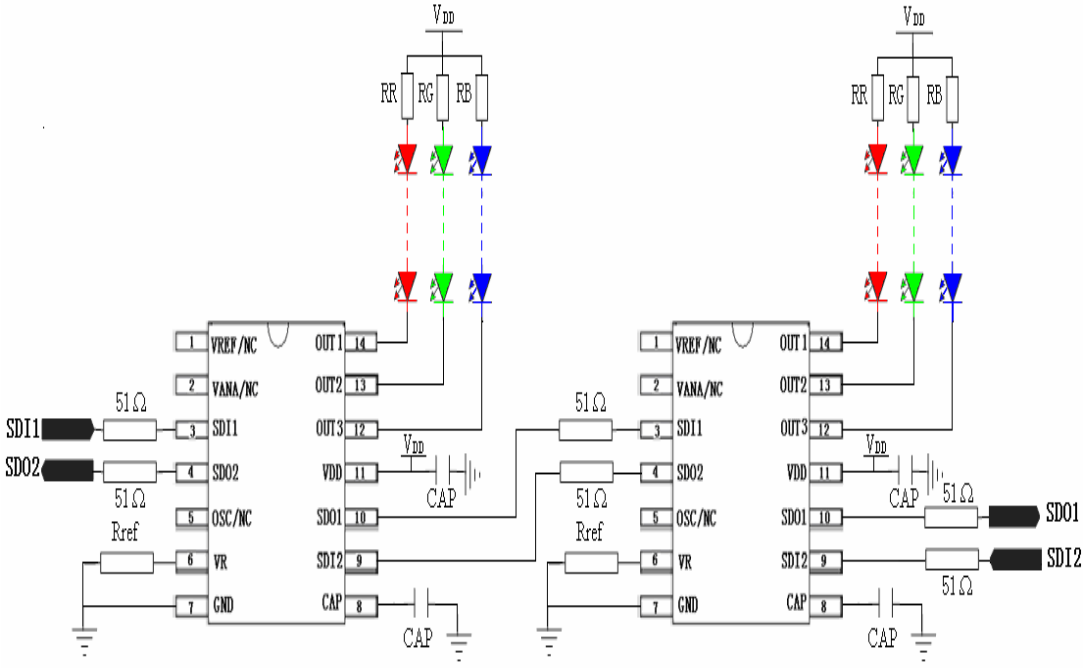
Symbol	Dimensions In Millmeters			Dimensions In Inches		
	Min	Nom	Max	Min	Nom	Max
A	1.30	1.50	1.70	0.051	0.059	0.067
A1	0.06	0.16	0.26	0.002	0.006	0.010
b	0.30	0.40	0.55	0.012	0.016	0.022
C	0.15	0.25	0.35	0.006	0.010	0.014
D	4.72	4.92	5.12	0.186	0.194	0.202
E	3.75	3.95	4.15	0.148	0.156	0.163
e	—	1.27	—	—	0.050	—
H	5.70	6.00	6.30	0.224	0.236	0.248
L	0.45	0.65	0.85	0.018	0.026	0.033
θ	0°	—	8°	0°	—	8°

Typical application information

➢ Typical application circuit using SOP14

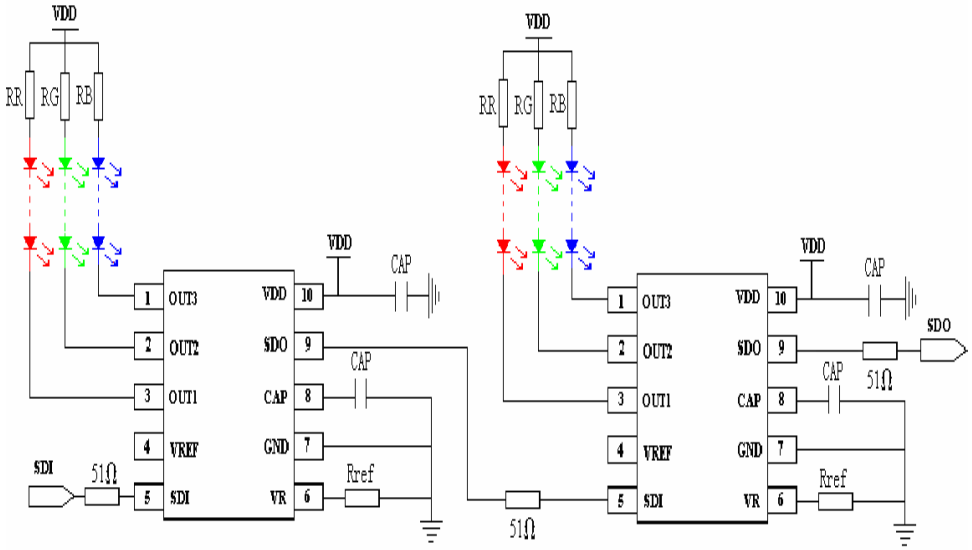


Single channel mode

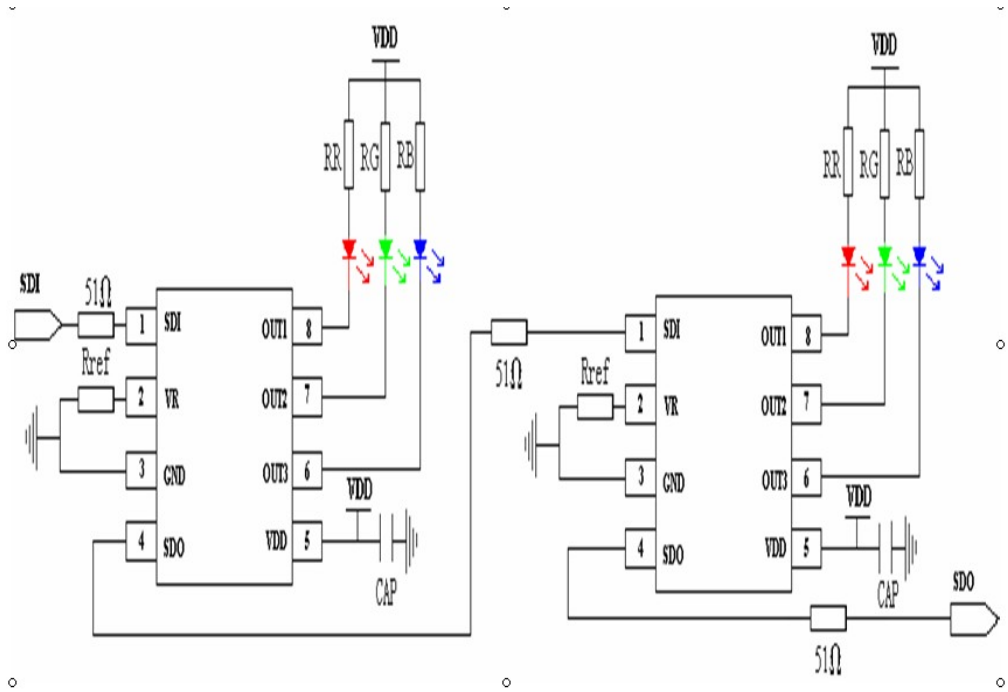


double channle mode

➢ Typical application circuit using SSOP10



➢ Typical application circuit using SOP8



Application notice

- VDD Supply voltage range
  - ✧ Supply voltage range using SOP14 and SSOP10：5-17V，
  - ✧ Supply voltage range using SOP8：4.5-7.5V
  - ✧ Place a 0.1uF bypass capacitor between VDD and GND terminal
- In order to transmit data to more nodes, the clock frequency of input data must be between 100Khz~2MHz and the clock freqency of output data is suggested to be set below 1Mhz
- The max voltage of SDI terminal must be below 3.5V
- The high level voltage of SDO terminal is 3.3V
- To transmit data to more node, minimize the distributed capacitor of SDO and SDO.
- It is recommended to low the VDS considering the package power dissipating limits. Typically, the output current rang is from 10mA to 40mA with VDS ranging from 0.5V to 0.8V.
- Add a triode protection circuit to low the supply voltage below 17V, if the supply voltage is higher than 17V for the LEDs in series is too much.
- Unused channels must be floating or pull up when using SOP14 in single-channel mode.