HL1606

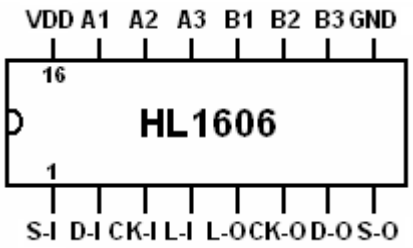
DESCRIPTION

HL1606 is a LED driver IC with SPI controlled. We can get “complex mode changes” by fewer data.

FEATURES

- NMOS output
- SPI controlled，plus synchronization speed control port: S-I
- PWM output,frequency:500Hz
- With a internal “change model” unit，only data calls, reducing the amount of data.
- Speed control bit，can speed up “changes in a pixel” rate of 2 times.
- Latch enable bit，concatenated string at a point can be read or not read data.
- Built-6 road, drive two pixels（three-output get a pixel）

Pin definition



No.	Name	Description	No.	Name	Description
1	S-I	Sync / speed clock input	7	D-O	Data buffer output
2	D-I	Data input	8	S-O	Sync / speed clock buffer output
3	CK-I	Clock input	9	GND	GND
4	L-I	Latch signal input	10~12	B3~B1	3 way drive output
5	L-O	Latch signal buffer output	13~15	A3~A1	3 way drive output
6	CK-O	Clock buffer output	16	V_{DD}	VDD

Data format

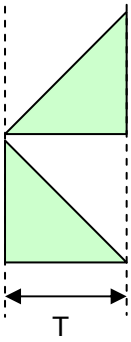
D1	D2	D3	D4	D5	D6	D7	D8	D9	D10	D11	D12	D13	D14	D15	D16	HIGH →
A1~A3 LED Control data-1								B1~B3 LED Control date-2								

Data format of A1-A3 LED Control data-1(B1-B3 LED Control data-2 can refer it)

D1（D9）	D2（D10）	D3（D11）	D4（D12）	D5（D13）	D6（D14）	D7（D15）	D8（D16）
A1（B1）Control bit		A2（B2）Control bit		A3（B3）Control bit		Control bit of speed	Latch enable bit

D2=0、D1=0 A1 Light out	D4=0、D3=0 A2 Light out	D6=0、D5=0 A3 Light out	D7=0 Default rate	D8=0 Can not latch
D2=0、D1=1 A1 Light on	D4=0、D3=1 A2 Light on	D6=0、D5=1 A3 Light on		
D2=1、D1=0 A1 fadein	D4=1、D3=0 A2 fadein	D6=1、D5=0 A3 fadein	D7=1 2 times rate	D8=1 Allowed to latch
D2=1、D1=1 A1 fadeout	D4=1、D3=1 A2 fadeout	D6=1、D5=1 A3 fadeout		

Description of build-in module



Fadein module：

When a data bit is 10(D2D1 or D4D3 or D6D5) and the latch is enable, corresponding output state of LED is fadein. After get the brightest state, it will keep the state, until the new data input by effective latch.

Fadeout module：

When a data bit is 11(D2D1 or D4D3 or D6D5) and the latch is enable, corresponding output state of LED is fadeout. After the lights out, it will keep the state, until the new data input by effective latch.

Cycle time of change--T：

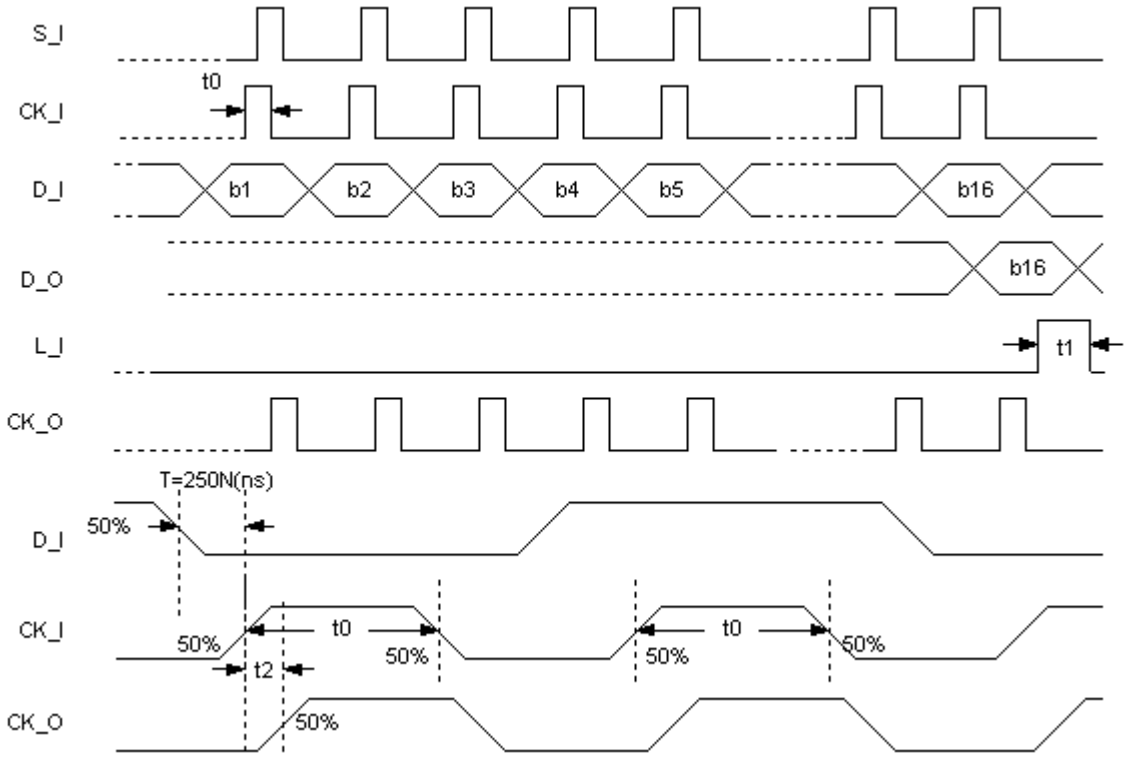
When D7=0,T=Tzc×128 set ,series is 128. For example: When Zc=50Hz,T=2.56s,if every latch is effective, fadein/fadeout module will resume the change.

Electric parameter（V_{DD}=5V，temperature=25℃）

ITEM	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNIT
Threshold voltage of output tube	V_{OL}	I_{DS}≤1μA，V_{DD}=5V	--	--	6	V
Operating voltage	V_{CC}	Stable and functioning properly	3	5	5.5	V
Operating current	I_{CC}	V_{DD}=5V，oscillations, no load	--	200	400	μA
DATA input, changes of high level and low level	V_{IN}	Stable and functioning properly	3.8	--	6	V
Output current of drive	I_{OL}	V_{DD}=5V，V_{DS}=0.8V	--	30	--	mA
Output current of buffer	I_{OH}	V_{DD}=5V，V_{DS}=-0.8V	--	5	--	mA
	I_{OL}	V_{DD}=5V，V_{DS}=0.8V	--	10	--	mA
temperature	Temp		0	25	70	℃
Work frequency of terminal-S	Fs	V_{DD}=5V			200	Hz

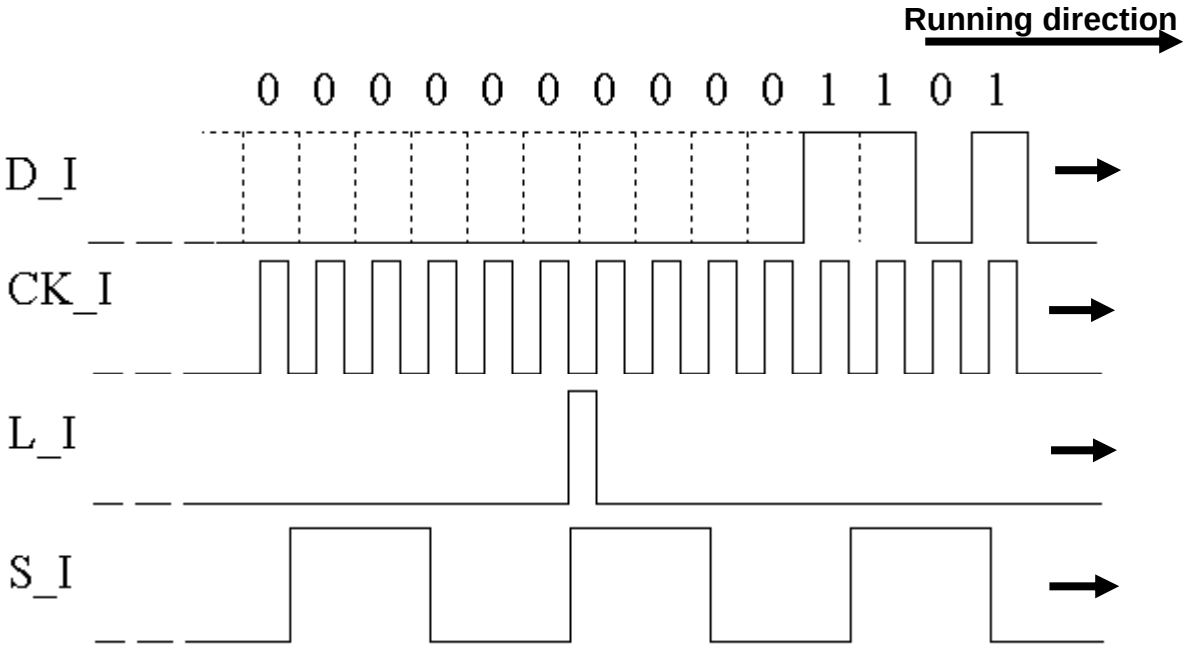
Timing diagram(entry data from high level)

t0≥300ns ；t1≥1μs；T≥250N(ns)，N: the number of cascade；t2≈100ns。



Impression Drawing & Data Format

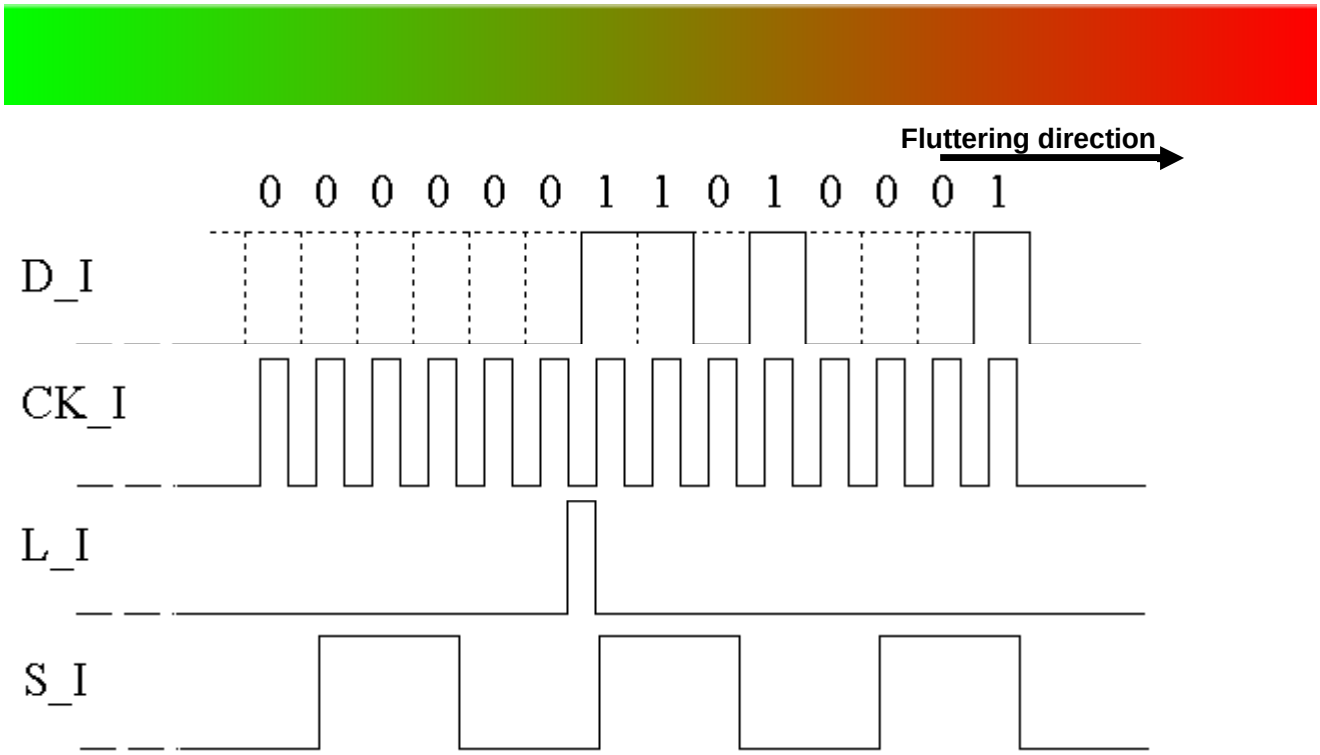
1. Monochrome , one-way, gradually run



Description: There is a “gradual change” mode in HL1606, so D_I only need one set of data”10110000”, then input ”0” to the end is okay. Clock signal has been sent to CK_I, sent a “1” to L_I after 8 clock signal. Change once the signal of S_I, the output decline in a series. A clock cycle in S_I,. output is keep in 512Hz refresh frequency, to maintain the same level(series) of output duty cycle refresh. If no data sent to S_I,

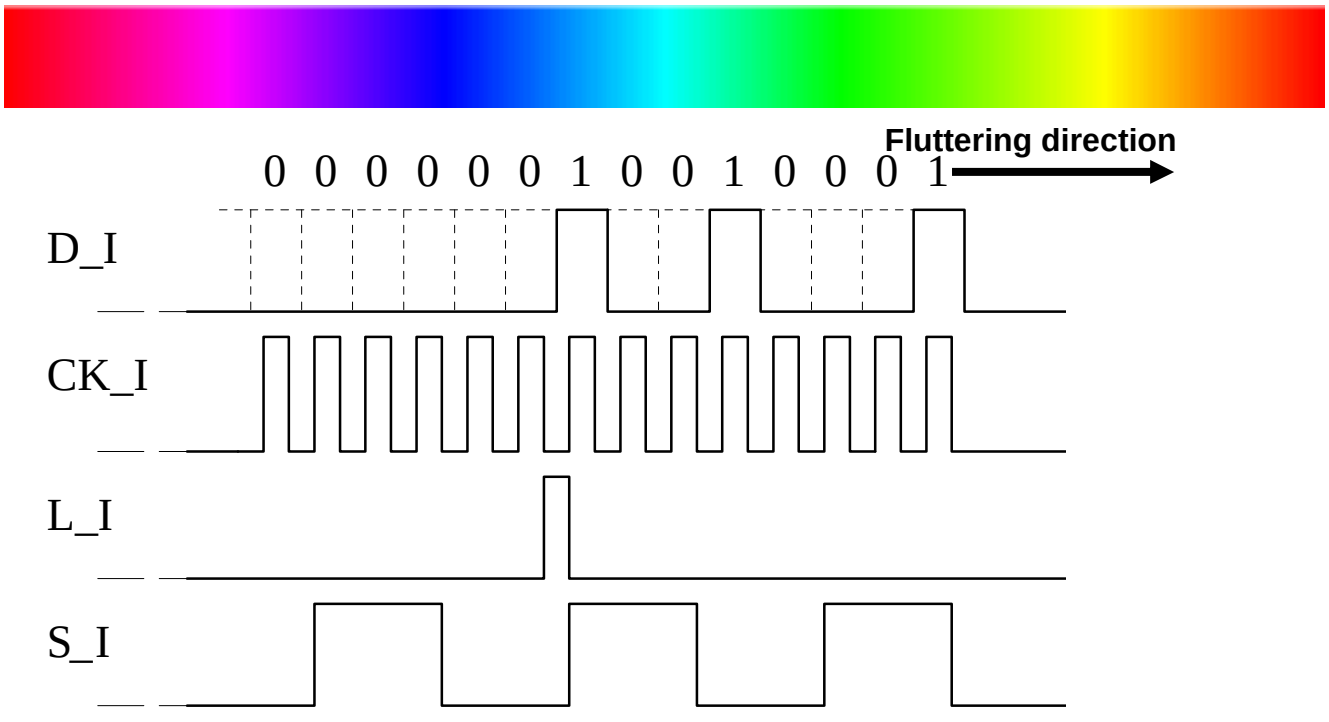
output will remain the same duty cycle refresh.

2. Colorful fluttering



Description: There is a “gradual change” mode in HL1606, so D_I only need one set of data”10001011”, then input ”0” to the end is okay(red to green gradually). Clock signal has been sent to CK_I, sent a “1” to L_I after 8 clock signal. Change once the signal of S_I, the output series change once. A clock cycle in S_I,. output is keep in 512Hz refresh frequency, to maintain the same level(series) of output duty cycle refresh. If no data sent to S_I, output will remain the same duty cycle refresh. Just finished in a color change, change the data of D-I.

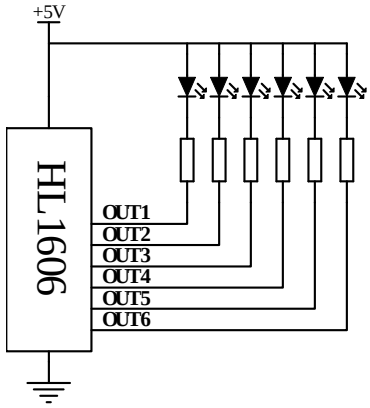
3.Full-color fluttering



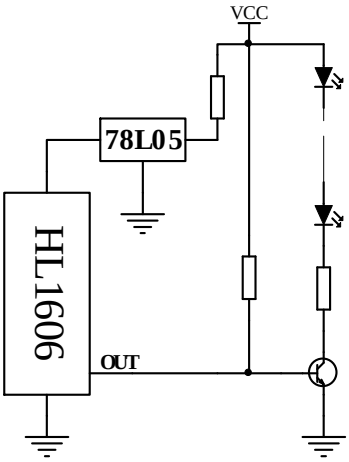
Description: There is a “gradual change” mode in HL1606, so D_I only need one set of data”10001001”,

then input ”0” to the end is okay(red to yellow gradually). Clock signal has been sent to CK_I, sent a “1” to L_I after 8 clock signal. Change once the signal of S_I, the output series change once. A clock cycle in S_I,. output is keep in 512Hz refresh frequency, to maintain the same level(series) of output duty cycle refresh. If no data sent to S_I, output will remain the same duty cycle refresh. Just finished in a color change, change the data of D-I.

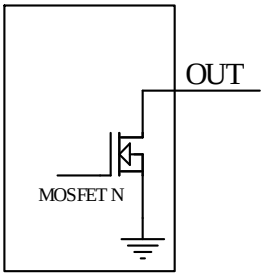
Application



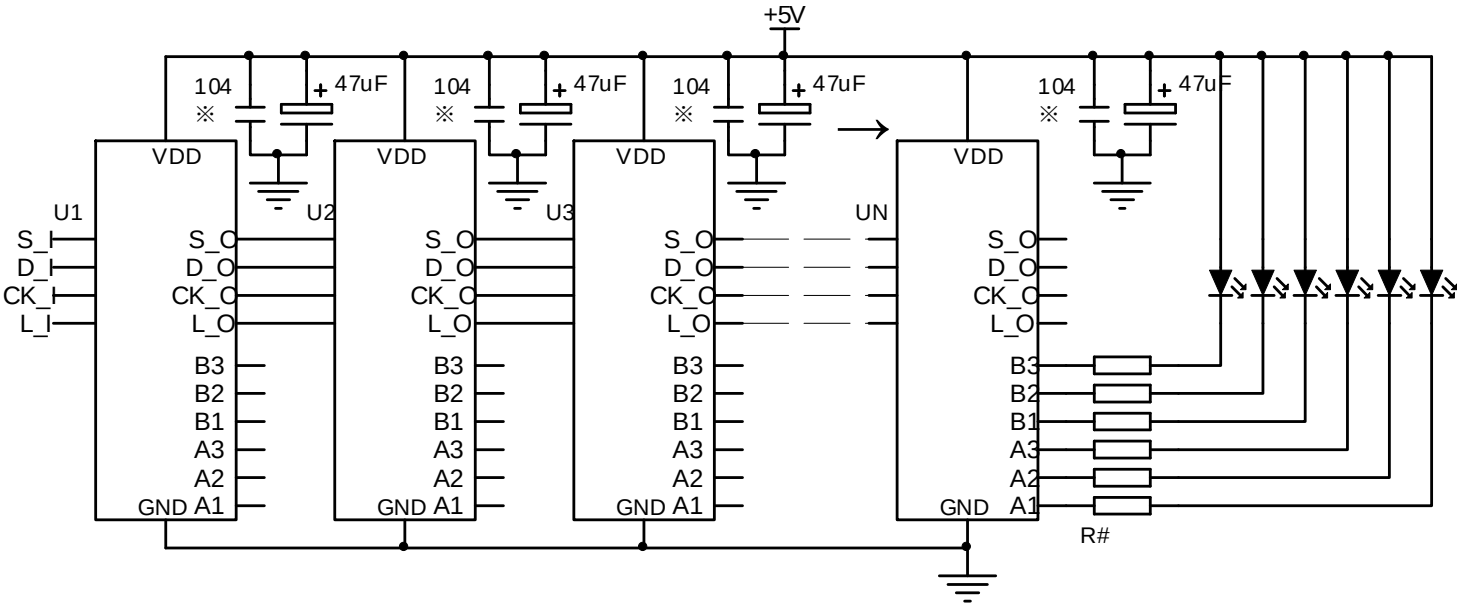
(1)



(2)



(3)



(4)

Application Notes

1. Picture(1),1st connection method: triode will not connect to output of IC, output current reach 30Ma,output can connect to two-ways, ensure that the output voltage must be less than 6V.
2. Picture(2), 2nd connection method: triode connect to output of IC. Because the NPN-type transistor at the base took on the extreme pull-up resistor, the “output duty cycle of IC” and the” LED brightness” is inversely proportional to. When the IC doesn’t output, the transistor fully conducting, LED full-bright.

3. Picture (3), internal structure of the “output port of IC”. The output is NMOS open-drain output.
4. Picture (4), application drawing of cascade. Connection method of output termination (U1-UN) is same. Ceramic capacitor ”※” should be as close as possible to the chip, and work before the power input to the IC. Resistance “#” is adjustable, adjust the brightness of LED by adjust the value of resistance, and then we can get different blending effect. When the IC work, first into the highest, then into the low, the output is after the drive of “chip control signal”, this output can be used as the input signal of back-end circuit.