

LPD1886 IC Datasheet**Summary**

LPD1886 is single-line three-channel with 4096 levels PWM programmable constant current LED driver chip. It is a three-channel dedicated circuit for LED driving and control, internally integrated the bandgap reference, digital interface, PWM control and constant current driving circuit. It can achieve multicolor emitting system of the outdoor led displays, led guardrail tubes and led strips, via the control of peripheral circuit.

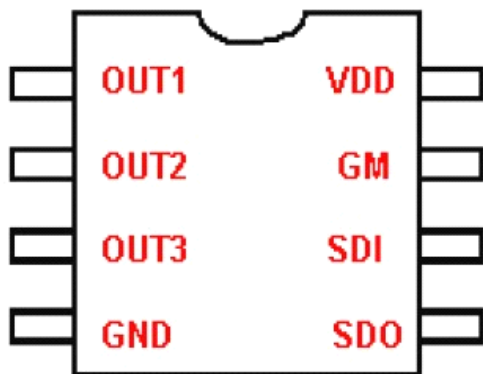
Features

1. Output three-channel constant current driving, the constant driving current is 17mA, Voltage output up to 12V.
2. Intergrated constant voltage circuit, workable from 5V to 24V by connecting electric resistance in series.
3. Single line transmission mode, the speed of DATA is changeable, the MAX is 16MHz.
4. Regeneration mechanism of interior wave form, the signal driving ability is very strong, can support more than 1700pixels'(25FPS) cascade connection, the distance between any two pixels can be more than 6m.
5. Double oscillating circuits are built in, support FREE-RUN mode, the renovate frequency is more than 400Hz. Distinctive design of timing sequence, convenient for the lower cost controller programmable design.
6. Each channel has independent linear PWM grayscale control circuit, 4096 grayscales effect can be really achieved.
7. Intergrated the holistic locking and saving function, each frame data will be locked and saved automatically 10us later after sending out, to avoid the picture's inconsistent appearance.
8. The reserved driving current of the red color channel is 1.5mA more than the blue color channel's, it makes the colour balance effect is better.
8. Industrial level design, makes the anti-interference capability is stronger.
8. Encapsulation: DIP8 and SOP8.

Applications

1. LED decorative lighting system
2. PWM signal generator
3. LCD backlight driver

Pin Figure



Pin Descriptions

SDI: Serial data input

SDO: Serial data output ,the strong internal drive output

GM: 256levels when it hangs in the air; 4096levels when it connects with low electrical level:

OUT1: Drive output, the current is constant, 17mA, advice to connect with red color light.

OUT2, OUT3: Drive output, the current is constant, 15.5mA, advice to connect with blue and green color light.

VDD: Power supply, the voltage range is 5-24V, have to connect one piece dropping resistor in series and connect one piece decoupling capacitor in paralleling at the same time.

GND: Ground

Limit Parameters

Parameter	symbol	Range	Unit
supply voltage	V _{CC}	5~24	V
LED's voltage	V _{LED}	5~12	V
max drive current	I _{OMAX}	18	mA
power consumption	P _{DMAX}	500	mW
solder temperature	T _M	250(8S)	°C
operation temperature	T _{OP}	-40~+80	°C
storage temperature	T _{ST}	-65~+150	°C

Recommended Working Parameters

Parameter	symbol	Range	Unit
supply voltage	V_{DD}	5	V
input voltage	V_{IN}	$-0.4 \sim V_{DD} + 0.4$	V
dat/clk frequency	F_{CLK}	1.25	MHz
input voltage in high level	V_{IH}	$0.7 * V_{DD} \sim V_{DD}$	V
input voltage in low level	V_{IL}	$0 \sim 0.3 * V_{DD}$	V
power consumption	P_D	<350	mW
operation temperature	T_{OP}	$-20 \sim +60$	°C

ON/OFF Parameters (T=25°C, $V_{CC}=5V$)

Parameter	symbol	Range	Unit
DATA tempo	T_{DAT}	0.1 ~ 1.6	MHz
time of convey delay	T_{CAS}	representative value: 100	ns
the MIN time width of PWM on	T_{ONMIN}	500	ns
input capacitance	C_I	15	pF

Application Description

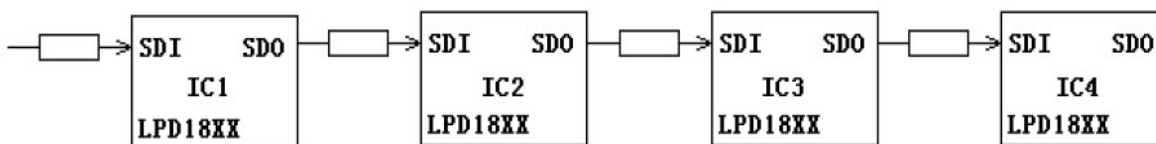
The circuit adopts single line communication mode to make cascade connection. The DATA adopts return-to-zero coding mode. When the power is on, the DATA will be input from the SDI pin, and each chip has 3channels output data(1team RGB data). Each channel needs 12levels grandscale, totally 36levels. Each level grandscale data adopts 4bits+8bits format, the high level is in front and the low level behind. When the input data achieves 36levels, it will be retransmitted to the next level circuit via SDO pin.

The retransmitted data are all decoded and regenerated, so when transmitting in series, the number of cascade connection won't be influenced easily by the aberrant signals, but only restricted by the datas' tempos and refreshing speed. Under the limit circumstance, 1.6M data can achieve 1778pixels' control.

(1600000/each pixel 36levels/each second 25FPS=1778)

After all the datas are transmitted, input the low levels into the chip, more than 10us. It will touch off the intergrated automatically locking and saving mechanism. The data just input will be saved to the PWM array. Then the datas of all the chips will be refreshed at the same time.

To identify each frame's beginning status, you need to supply more than 24us low level to the chip, as reset code. And the coming input datas will be distributed successively to each chip automatically.



Typical Connection Mode

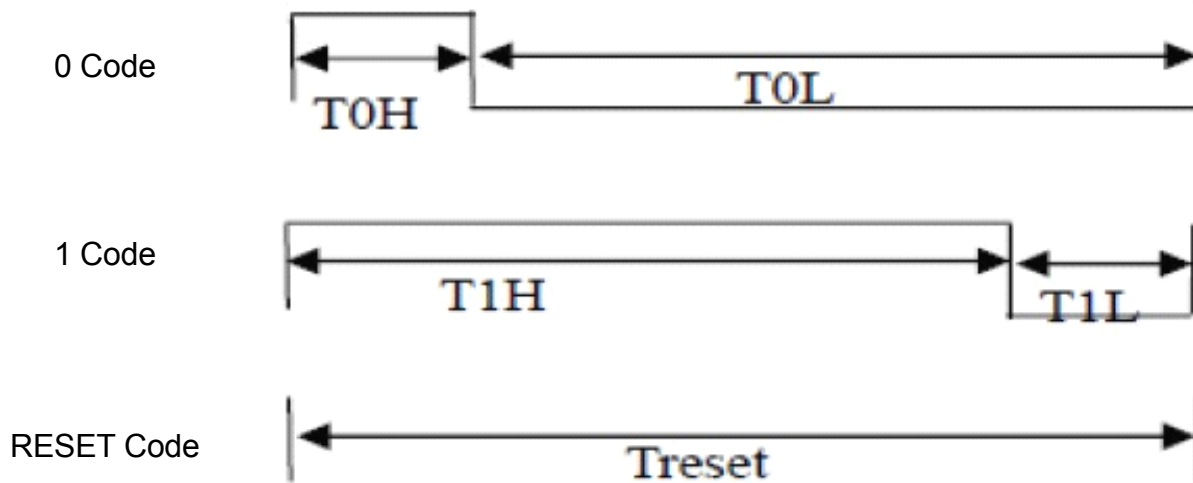
SDI1 : RESET CODE	the first 36bits	the second 36bits	the third 36bits	the forth 36bits	10us	NEXT RESET CODE
SDI2 :		the second 36bits	the third 36bits	the forth 36bits	saving & locking automatically	
SDI3 :			the third 36bits	the forth 36bits		
SDI4 :				the forth 36bits		

Transmission of DATA(4chips example)

R1.3	R1.2	R1.1	R1.0	R1.11	R1.10	R1.9	R1.8	R1.7	R1.6	R1.5	R1.4
G1.3	G1.2	G1.1	G1.0	G1.11	G1.10	G1.9	G1.8	G1.7	G1.6	G1.5	G1.4
B1.3	B1.2	B1.1	B1.0	B1.11	B1.10	B1.9	B1.8	B1.7	B1.6	B1.5	B1.4

36bits data sequence of each chip

DATA Code Pattern Description



	Description	MIN, ns	MAX, ns	recommended value, ns	Note
T0H	high level time of 0 code	150	280	200	T0H+T0L, T1H+T1L should be more than 800ns
T0L	low level time of 0 code	500	10000	600	
T1H	high level time of 1 code	450	9000	600	
T1L	low level time of 1 code	150	10000	200	
Treset	reset code, low level time	24000			

Power Supplier Configuration

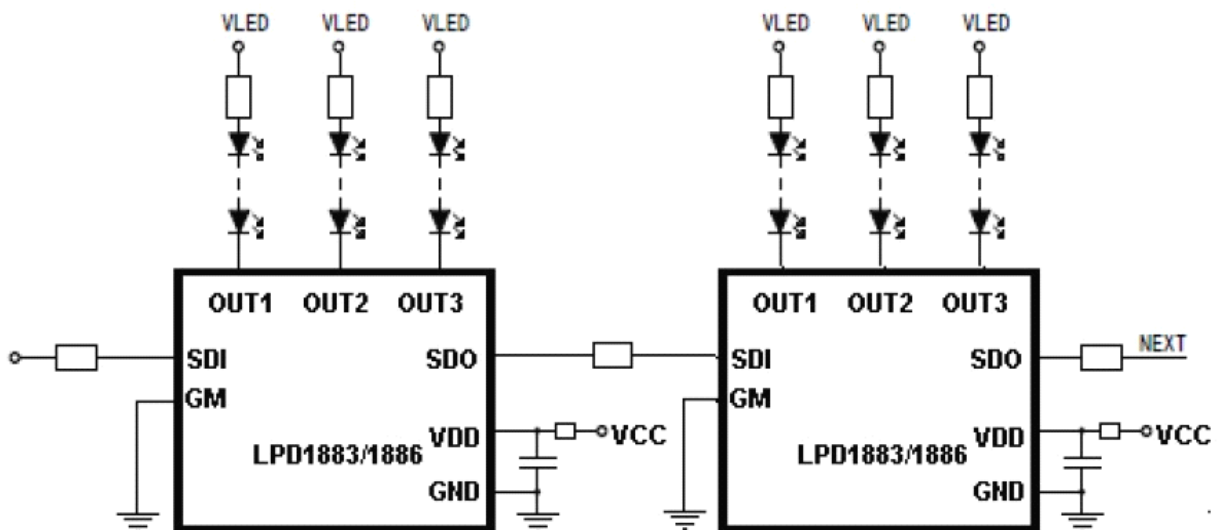
After connection with resistors in series to the chip, can use 5V to 24V power supply, meanwhile, 1pc 104 capacitor parallelly connected with VDD anti to earth is better. And the capacitor should be as close to the IC as possible. The connected resistors in series should choose different values, depended on the supply voltage.

supply voltage	the value of connected resistors in series(ohm,1/4W)
5V	50
12V	1.8K
24V	4.5K

Tips:

The chip consumes less than 2mA current by itself, but if there is a long signal line between the chips, a lower value resistor is recommended, to gain the better cascade connection performance.

Typical Application Circuit : Constant Current Driving Mode



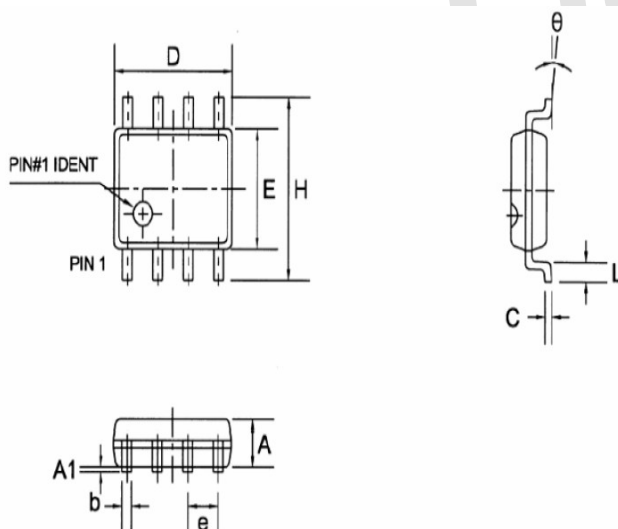
This mode suits for most single light application. V_{LED} is 5V to 12V. When current constant, the $I_{LED}=15.5/17mA$ (Pls NOTE the output voltage to ground should be more than 8V when the circuit is closed). The resistors connected in series here, can't adjust the I_{LED} value, they are used to share responsibility for the chip's power consumption PD, to improve the working stability(When the power consumption is enough, they can be omitted).

When designing the circuits, pls note that the power dissipation P_D should not bigger than the maximum P_{DMAX} , the $P_D = \sum I_{LEDX} * V_{OUTX} + P_{IC}$ (PIC is the basic power consumption of the IC, normally no more than 15mW) .

Cascade signal's driving and connecting:

Considering the cascade transmission distance may be very long among the chips, the output ends of the SDO is designed with strong push-pull type drive circuits, Tests show that it can drive more than 10M signal line. To protect the chips and avoid the signal reflection, pls series connect a about 33ohms to 100ohms resistor at the end, and then output to the next level during your application. If using in led guardrail tubes, there is only need to have protecting resistors at the into tube place and out tube place.

Dimensions (SOP8)



Symbol	Dimensions In Millimeters			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°