SM16703P

Feature

- Synchronous refresh
- High-voltage CMOS technology
- Input voltage: 5~24V@LDO circuit
- OUT withstand voltage: 26V
- Gray scale adjustment circuit (256 levels)
- White LED when powered on (default)
- Output 17mA constant current (default)
- Single-line cascade transmission port (DIN, DOUT)
- Built-in high-precision and high-stability oscillator
- Data Reshape: Automatic data reshape output after receiving the unit data
- Data transmission speed: 800Kbps
- Package: SOP8

Application

- Interior LED decorative lighting
- Architectural LED exterior/scene lighting
- Wash-wall lamp, curtain screen
- Luminous character
- Guardrail tube

Description

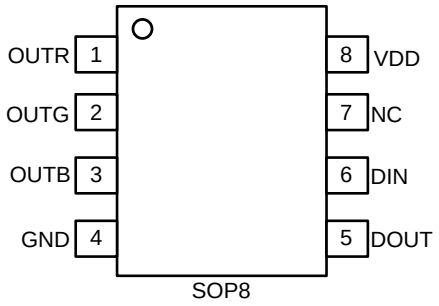
The SM16703P is a single-line transmission tri-channel LED driver, which adopts single-polarity RZ communication protocol.

The chip integrates LDO circuit, signal decoding module, data register, constant current circuit and RC oscillator, and the output drive adopts the patented SPWM technology.

Order Information

Type	Package	Packing		Reel Size
		Tube	Tape	
SM16703P	SOP8	100 pcs/tube	3500 pcs/tape	13 inches

Pin Definition



Pin Definition

Symbol	Pin Name	Pin No.	Pin Description
OUTR	Output port	1	RED output port
OUTG	Output port	2	GREEN output port
OUTB	Output port	3	BLUE output port
GND	Ground	4	Ground
DOUT	Data output	5	Data output port, used in cascade
DIN	Data input	6	Data input port
NC	No connection	7	No connection
VDD	Chip Power	8	Chip Power

Electric Parameter

Absolute Maximum Parameter (Ta = 25℃)

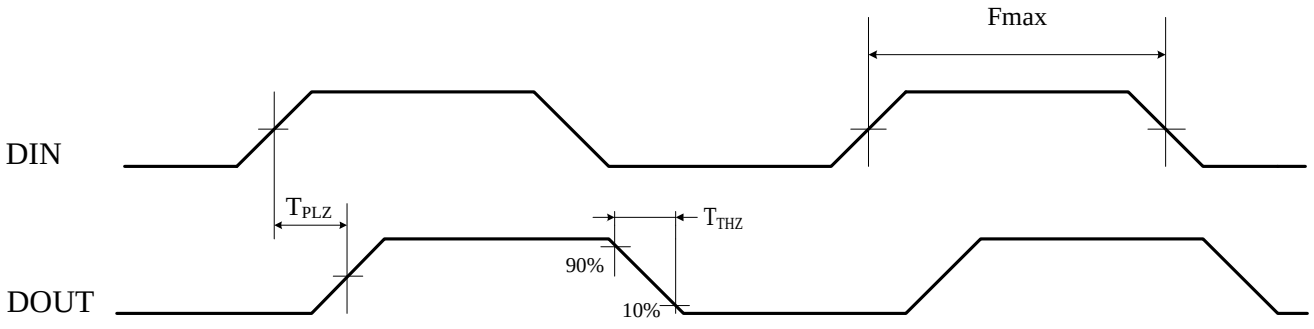
Parameter	Symbol	Range	Unit
Input voltage	V_{IN}	5——24	V
R/G/B current output port withstand voltage	V_{DS}	26	V
Logic	V_{I1}	-0.5——5.5	V
R/G/B output current	I_{OL1}	17	mA
Power consumption	PD	550	mW
Operating temperature	T_{OPT}	-40——+85	℃
Storage temperature	T_{STG}	-50——+150	℃
ESD withstand voltage	V_{ESD}	8K	V

Electric Characteristic (Ta = 25℃)

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Chip input voltage	V_{IN}	-	-	5	24	V
Chip internal power & voltage	VDD	-	-	5.2	-	V
R/G/B withstand voltage	$V_{DS,MAX}$	OUT R/G/B	-	-	26	V
R/G/B drive current	I_{OUT_R}	V_{DS_R}=1V	-	17	-	mA
DOUT drive capability	ID_{OH}	DOUT short connects to ground, max. drive current	-	49	-	mA
	ID_{OL}	DOUT short connects to VDD, max. sink current	-	-50	-	mA
Data input flip threshold value	V_{IH}	VDD=5.0V	-	3.4	-	V
	V_{IL}		-	1.6	-	V
R/G/B current variation	%VS.V_{DS}	V_{DS}=1~5V,I_{OUT}=17 mA	-	0.5	-	%
	%VS.VDD	VDD=1~5V,I_{OUT}=17 mA	-	0.3	-	%
	%VS.Tem.	V_{DS}=1~5V,I_{OUT}=17 mA,Tem.= -40~+85℃	-	4.0	-	%
R/G/B voltage	V_{DS}	I_{OUT}=17 mA	0.8	-	-	V
PWM frequency	f_{PWM}	-	-	1.2	-	KHZ
Quiescent power consumption	I_{DD}	- I_{OUT} "OFF"	-	2.0	-	mA

Dynamic Parameter (Ta = 25℃)

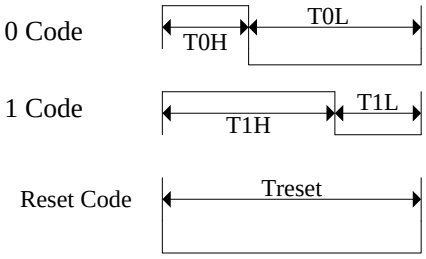
Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Data transmission speed	f_{DIN}	Duty ratio 67% (data 1)	-	800	-	KHZ
DOUT transmission delay	t_{PLZ}	DIN→DOUT	-	-	500	ns
	t_{PLZ}		-	-	500	ns
I_{OUT} rise time	T_r	V_{DS}=1.5	-	32	-	ns
	T_f	I_{OUT}=17mA	-	27	-	ns



Code Description

The protocol of the chip adopts single polarity RZ code, LOW level must be contained in each code element. Each code element in the protocol initiates with HIGH level, and the width of the HIGH level time determines 0 code or 1 code.

Input Code:



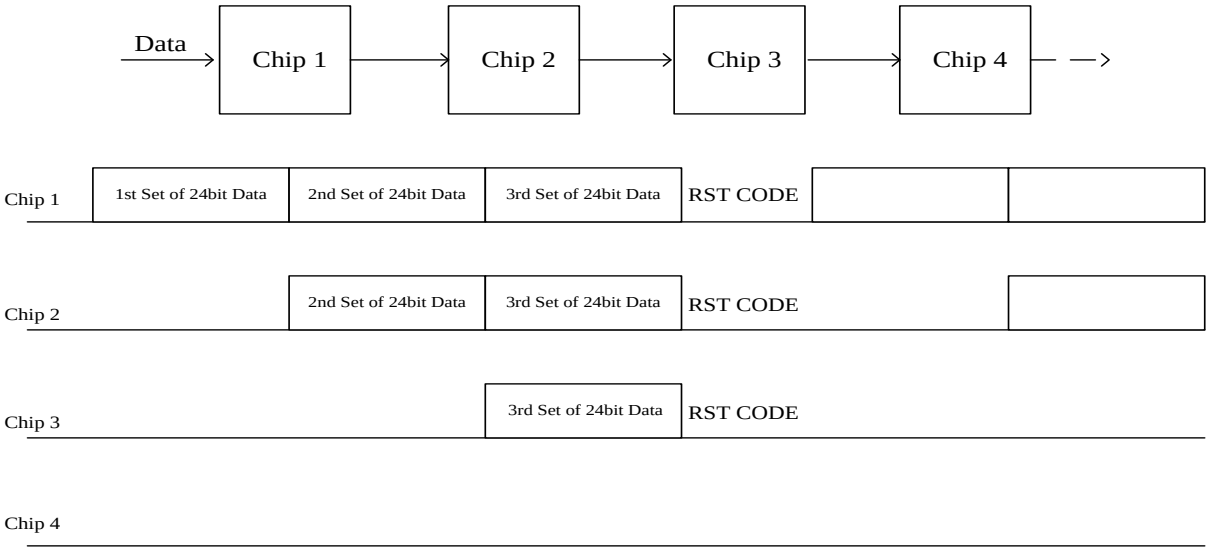
Name	Desription	Min.	Typ.	Max.	Allowable error	Unit
T0H	0, HIGH level	-	0.3	-	±0.05	us
T1H	1, HIGH level	-	0.9	-	±0.05	us
T0L	0, LOW level	-	0.9	-	±0.05	us
T1L	1, LOW level	-	0.3	-	±0.05	us
Trst	Reset, LOW level	-	80	-	-	us

RGB data transmission in high-order:

R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0

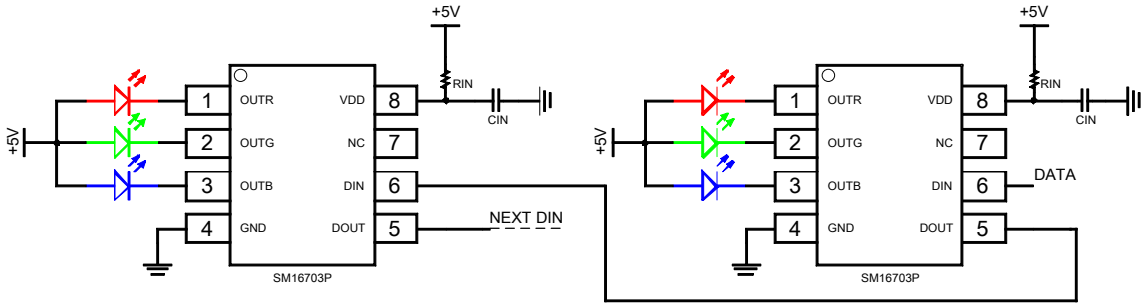
bit23……bit0

DIN format: Trst+1st chip 24bit gray scale data+2nd chip 24bit gray scale+……+Nth chip 24bit gray scale



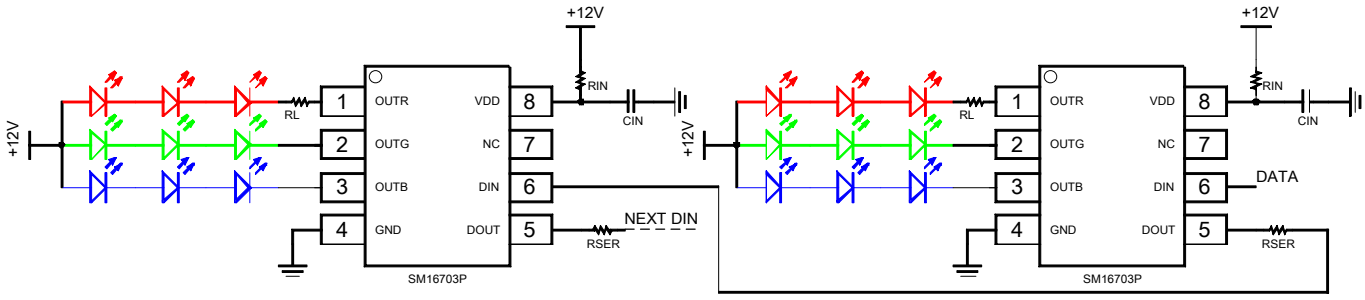
Typical Application Circuit

(1) 5V power supply, single LED



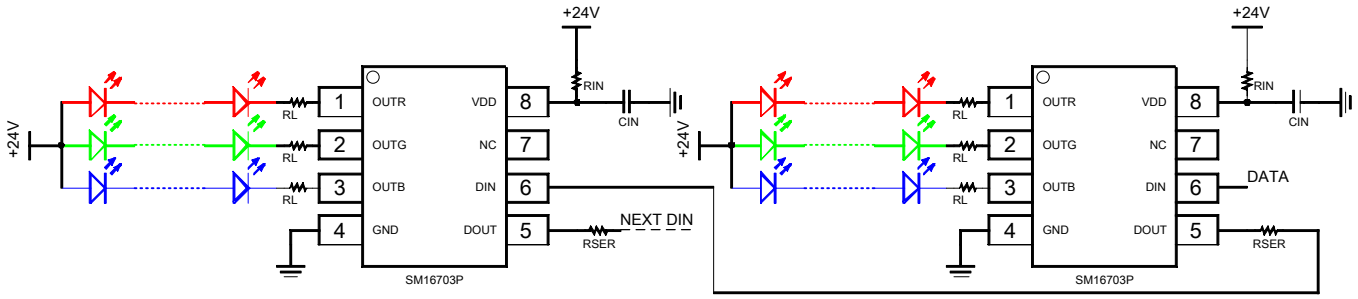
5V application, few peripheral components, transmission distance between two points can be 30m.

(2) 12V power supply, 3 LEDs



12V application, a 180ohmic resistor R_{SER} is recommended to cascaded at the signal output port to avoid the damage of the IC input port caused by the inverse connection between the electric plug and the signal line or between the power supply and signal line, the transmission distance between the two points of the 180ohmic resistor R_{SER} can be 10m.

(3) 24 power supply, 6 LEDs



24V application, a 470ohmic resistor R_{SER} is recommended to cascaded at the signal output port to avoid the damage of the IC input port caused by the inverse connection between the electric plug and the signal line or between the power supply and signal line, the transmission distance between the two points of the 470ohmic resistor R_{SER} can be 5m.

The typical application circuit of SM16703P includes V_{IN} (input voltage of power supply), R_{IN} (current-limiting resistor), C_{IN} (filter capacitor of chip VDD) and R_L (current-limiting resistor of R/G/B LED).

Chip power supply voltage VDD: $VDD=V_{IN}-(I_{DD}+I_{IN})*R_{IN}$

I_{IN} is the operating current of the chip interior voltage-stabilizing circuit, I_{DD} is the chip quiescent current (excludes the voltage-stabilizing circuit current), the value of R_{IN} must be VDD > 4V.

The higher the R_{IN} is, the lower the system power consumption is, and the anti-interference capability is weak; the lower the R_{IN} is, the higher the system power consumption is, and the operating temperature is higher, therefore the R_{IN} should be selected compromisingly based on the system application environment in the design. The relation between V_{IN} and R_{IN} is given by:

V_{IN}	5V	6V	9V	12V	15V	18V	24V
R_{IN}	33	100	470	1K	1.5K	2K	3K

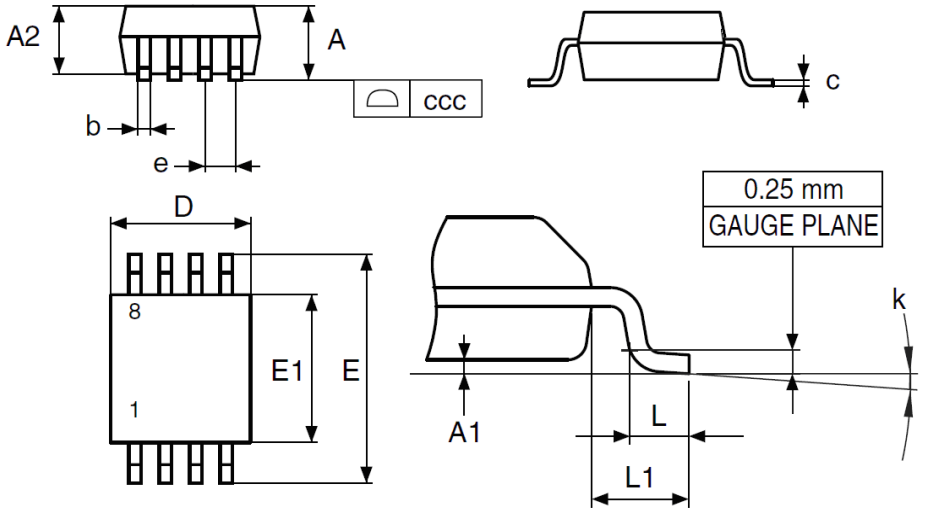
The load of the data output port DOUT of SM16703P equals to capacitor C_L, each data transmission cycle DOUT need to charge C_L, and the transient state of the charging current is 60mA approximately. Therefore, the voltage drop of the current-limiting resistor R_{IN} is increased transiently and the VDD voltage drops, the VDD voltage is stabilized through the filter capacitor C_{IN}. C_{IN} can be 0.1uF when the value of C_L doesn't exceed 1nF.

LED current-limiting resistor R_L : $R_L=\dfrac{V_{IN}-N*V_{LED}-V_{DS}}{I_{LED}}$

V_{IN} is input voltage, V_{LED} is voltage-drop of LED, V_{DS} is port voltage (constant current output when it's 1V), I_{LED} is port output current

Package

SOP8



DEMENSIONS						
REF.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.0689
A1	0.1		0.25	0.0039		0.0098
A2	1.25			0.0492		
b	0.28		0.48	0.011		0.0189
c	0.17		0.23	0.0067		0.0091
ccc			0.1			0.0039
D	4.8	4.9	5	0.189	0.1929	0.1969
E	5.8	6	6.2	0.2283	0.2362	0.2411
E1	3.8	3.9	4	0.1496	0.1535	0.1575
e		1.27			0.05	
h	0.25		0.5	0.0098		0.0197
k	0		8	0		8
L	0.4		1.27	0.0157		0.05
L1		1.04			0.0409	