

LX1003 3-Channel, 8-Bit, PWM Constant-Current LED Driver with Single-Wire Interface

1. Features:

- Three Constant Sink Current Channels
- OUT Pins Maximum Voltage: Up to 28 V
- Power-Supply (VCC) Voltage :5~24V(using different resistor)
- Grayscale (GS) Control with PWM: 8-Bit (256 Steps)
- Display Repeat Rate: 250 Hz (typ)
- Single wire interface.
- Data Transfer Maximum Rate:
– Bits per Second (bps): 800 Kbps(High speed)/400 Kbps(Low speed)
- ESD > 8KV
- Unlimited Device Cascading
- Operating Temperature: -40°C to 85°C
- Package type :SOP8

2. Applications:

- LED cluster lamp displays
- LED color lights pot
- LED soft strip
- LED advertising sign

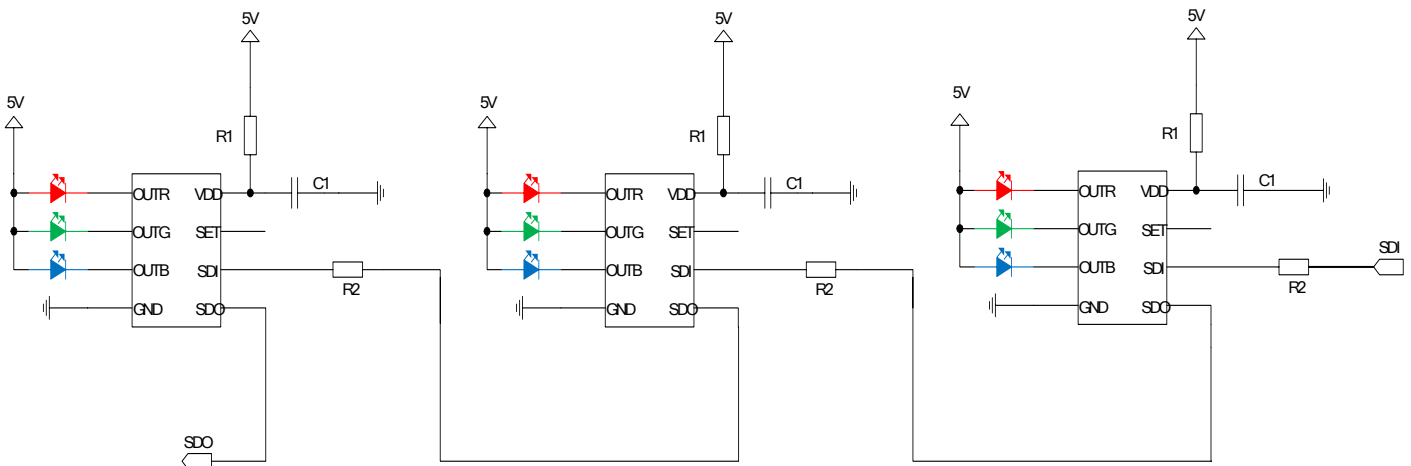
3. Description:

The LX1003 is an easy-to-use, 3-channel, 18-mA constant sink current LED driver. The single-wire serial interface provides a solution for minimizing wiring cost. The LED driver provides 8-bit pulse width modulation (PWM) resolution. The display repeat rate is achieved at 250Hz (typ) .The driver also provides unlimited cascading capability.

Device Information ⁽¹⁾

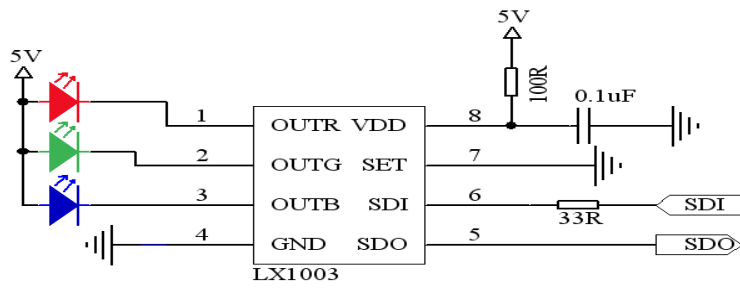
DEVICE NAME	PACKAGE	BODY SIZE
LX1003	SOP8	4.92m X 6 mm

(1).For all available packages, see the orderable addendum at the end of the datasheet.

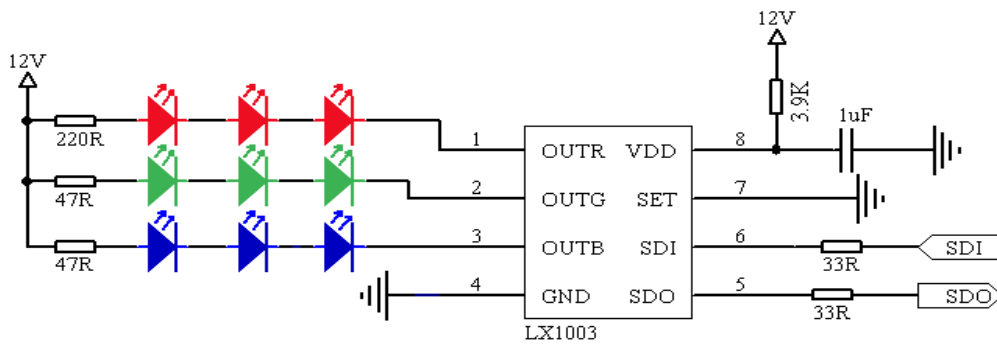


Typical Application Circuit Example

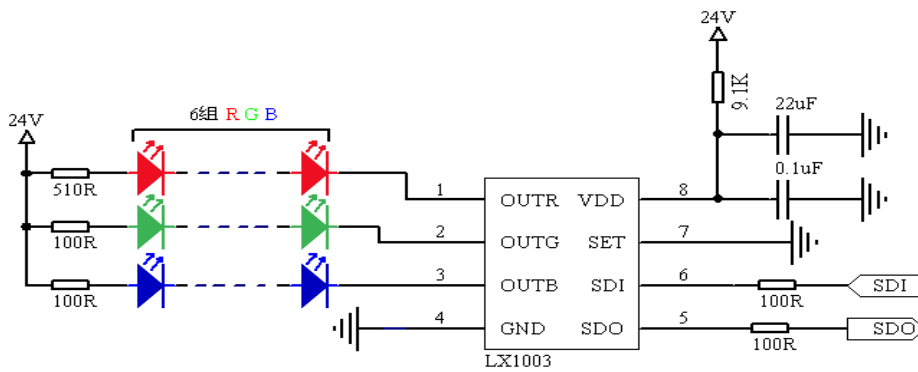




Picture2 Typical Application Circuit Example2 —5V application



Picture3 Typical Application Circuit Example3 —12V application



Picture4 Typical Application Circuit Example4 —24V application

Table of Contents

1. Features: 1

2. Applications: 1

3. Description: 1

4.92m X 6 mm..... 1

4. Revision History 3

5. Pin Configuration and Functions: 4

6. Electrical Characteristics: 5

6.1 Absolute Maximum Ratings⁽¹⁾ 5

6.2 DC CHARACTERISTICS (Ta = -40 ~ +85°C, VDD = 4.5 ~ 5.5 V, Vss = 0 V) 5

6.3 Recommended Operating Conditions (Ta = -20 ~ +70°C, Vss = 0 V) 5

6.4 Switching Characteristics (Ta = -40 ~ +85°C, VDD = 4.5 ~ 5.5 V) 5

7. Data communication protocol: 6

7.1 Waveform figure: 6

7.2 Zero code、One code、Reset frame Definition : 6

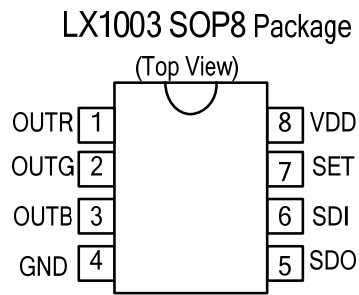
7.3 Data transmission and data structure 7

8. Applications and Implementation..... 8

4. Revision History

Changes from Original (May 2012) to Revision 1.0

5. Pin Configuration and Functions:



Pin Functions

PIN NO.	NAME	I/O	DESCRIPTION
1	OUTR	Output	Constant sink current driver outputs. Multiple outputs can be configured in parallel to increase the sink drive current capability. Different voltages can be applied to each output.
2	OUTG	Output	
3	OUTB	Output	
4	GND	-	Power ground
5	SDO	Output	Serial data output
6	SDI	Input	Serial data input.
7	SET	Input	High speed mode (SET=GND, default) . Low speed mode (SET=VDD)
8	VDD	-	Power-supply voltage

6. Electrical Characteristics:

6.1 Absolute Maximum Ratings ⁽¹⁾

PARAMETER	SYMBOL	RANGE	UNIT
Supply voltage ⁽²⁾	VDD	+3.3~+5.5	V
Output range	VOUT	28 V	V
Input range	VI1	-0.5~VDD+0.5	V
Output (dc)	IO1	18	mA
operation temperature	Topt	-40~+85	°C
storing temperature	Tstg	-55~+150	°C
ESD	HBM	8000	V
	MM	400	V

(1).Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2).All voltages are with respect to network ground pin.

6.2 DC CHARACTERISTICS (Ta = -40 ~ +85°C, VDD = 4.5 ~ 5.5 V, Vss = 0 V)

PARAMETER	SYMBOL	MIN	NOM	MAX	UNIT	TEST CONDITIONS
Low-level output current	IOL	17.5	18	18.5	mA	
	Idout	10	-	-	mA	VO = 0.4V, DOUT
Supply current	II	-	-	±1	µA	VI = VDD / VSS
High-level input voltage	VIH	0.7VDD	-		V	SDI
Low-level input voltage	VIL	-	-	0.3VDD	V	SDI
Input voltage hysteresis	VH	-	0.35	-	V	SDI
Dynamic current loss	IDDdyn	-	-	2	mA	no load , display off
power consumption	PD			180	mW	(Ta=25°C)
thermal resistance	Rth(j-a)	79.2		190	°C/W	

6.3 Recommended Operating Conditions (Ta = -20 ~ +70°C, Vss = 0 V)

PARAMETER	SYMBOL	MIN	NOM	MAX	UNIT	TEST CONDITIONS
Supply voltage	VDD		5		V	-
High-level input voltage	VIH	0.7 VDD	-	VDD	V	-
Low-level input voltage	VIL	0	-	0.3 VDD	V	-

6.4 Switching Characteristics (Ta = -40 ~ +85°C, VDD = 4.5 ~ 5.5 V)

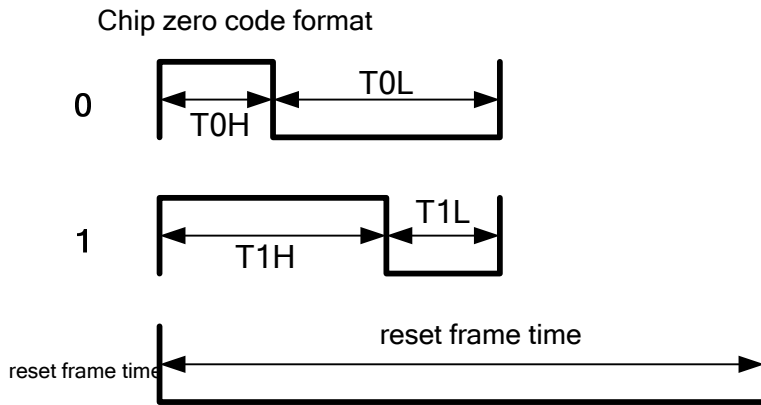
PARAMETER	SYMBOL	MIN	NOM	MAX	UNIT	TEST CONDITIONS
Propagation delay	tPLZ	-	-	300	ns	DIN → DOUT CL = 15pF, RL = 10K Ω
Fall time	TTHZ	-	-	120	µs	CL = 300pF, OUTR/OUTG/OUTB
input capacitor	CI	-	-	15	pF	-

7. Data communication protocol:

Chip adopt single to 0 code communication mode,when the chip power-on reset,SDI receive the data from the controller, 24bit data be extracted by first chip,then send to data latch which inside the chip,remaining data after internal shaped processing circuit amplification by SDO port began to forward to the next cascade chip,every chip transmission,signal to reduce 24bit.Chip adopts automatic shaped dispatching technology, makes the chip cascade number is not restricted by the signal transmission, only affected by signal transmission speed.

According to the received 24bit data,data latch which inside the chip in OUTF、OUTG、OUTB control system produce different duty ratio control signals.Waiting for DIN port input RESET signal , all chip synchronization will receive the data sent to each section,the chip will be at the end of the signal to accept new data.After receive the 24bit data,through the SDO port,chip didn't accept to RESET code.OUTF、OUTG、OUTB pin original output unchanged. When receiving more than 10 μ s low level RESET code,chip will output just received 24bit PWM data pulse width to OUTF、OUTG、OUTB pin

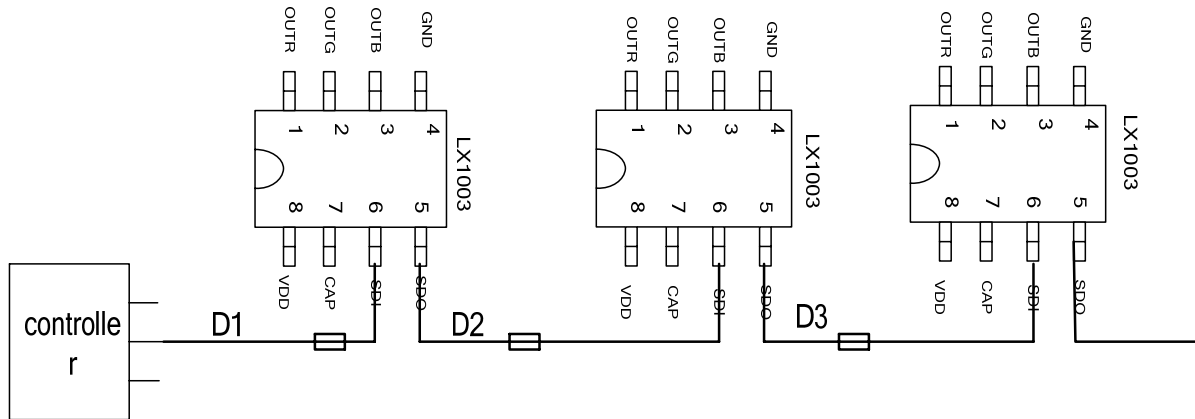
7.1 Waveform figure:



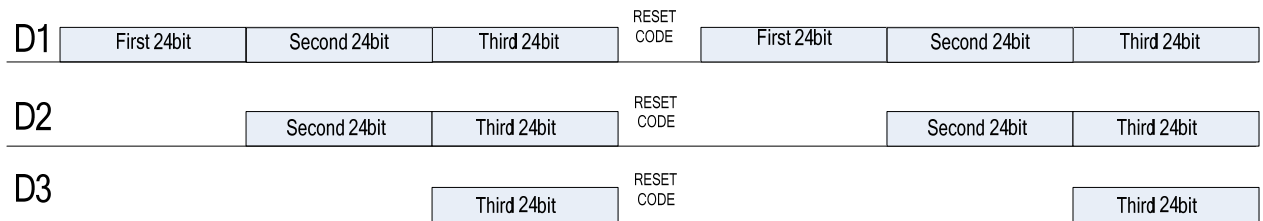
7.2 Zero code、One code、Reset frame Definition :

Name	Description	Typical Value	Allowable Error
T0H	Zero code,high level	300ns	±100ns
T0L	Zere code,low level	600ns	±100ns
T1H	One code, high level	600ns	±100ns
T1L	One code, low level	300ns	±100ns
RES	Reset frame time	above 10us	

7.3 Data transmission and data structure



Data transmission method



Single chip 24 BIT data structure

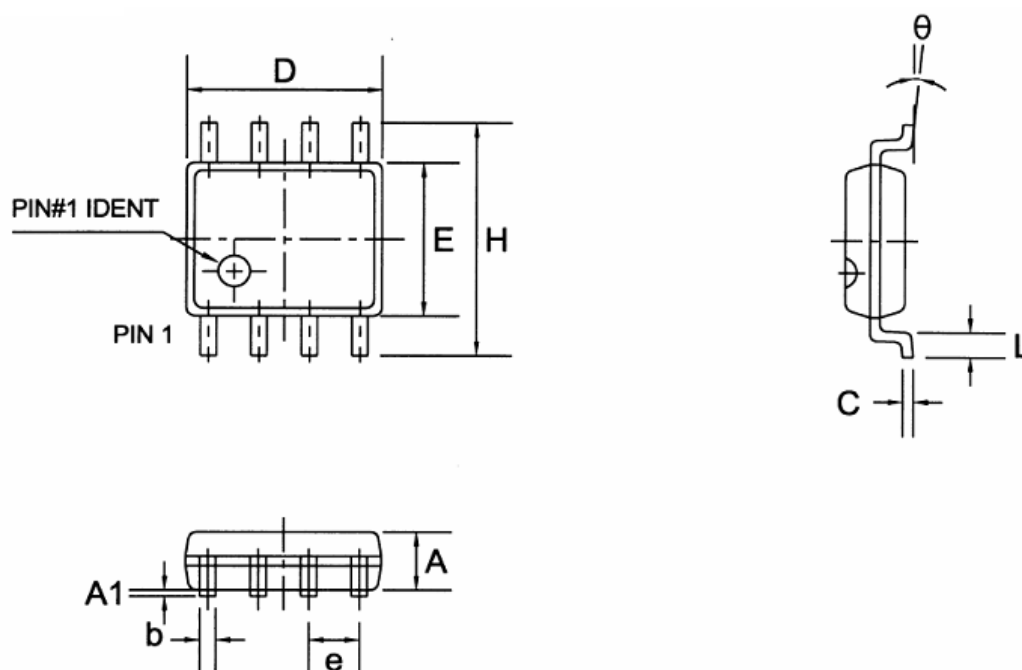


8. Applications and Implementation

LX1003 can be configured to 5 ~ 24 v voltage of power supply, 104p capacitance between power supply and ground as close to the IC ontology, and the loop is the shortest, but according to the input voltage is different, should configure different source resistance R, the value list as follows:

VDD	recommend power interface and connection resistance between VDD
5V	0.1K
9V	1.5K
12V	2.7K
15V	3.9K
24V	6.8K

SOP8 PACKAGING INFORMATION



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°