

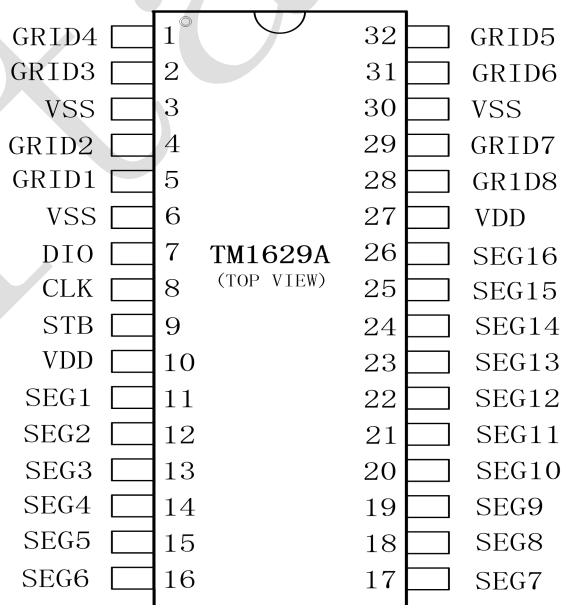
## 1 Overview

TM1629A is a special circuit for LED (light-emitting diode) driver control. It integrates with different circuits such as MCU digital port, data latch, LED high-voltage drive, etc. The product has good performance and reliable quality, and is mainly applied in display drive of VCR, VCD, DVD, home theater and other similar products.

## 2 Features

- Low power consumption CMOS workmanship
- Display mode (16segment × 8positions)
- Luminance adjustment circuit (8-level adjustable duty cycle)
- Serial port (DIO,CLK,STB)
- Oscillation mode: built-in RC oscillation (450KHz±5%)
- Built-in power-on reset circuit
- Data latch circuit in internal design
- Strong anti-interference ability
- Built-in optimization circuit for slight bright problem caused by LED reverse leakage current
- Packaging:SOP32

## 3 Pin definitions



#### 4 Pin description

Sign	Name	Pin	Description
DIO	Data input	7	I/O serial data at rising edge of clock, starting from low order.
CLK	Clock input	8	I/O serial data at rising edge of clock.
STB	Chip selection	9	Initialize serial port at rising/falling edge, and then wait for receiving command. The first byte after the STB becomes low is taken as the command. When treating the command, other current treatments are stopped. When STB is high, CLK is ignored.
SEG1~SEG16	Output (segment)	11~26	Segment output, P pipe open-drain output, built-in pull down resistor with 3.6K $\Omega$
GRID1~GRID2 GRID3~GRID4 GRID5~GRID6 GRID7~GRID8	Output (position)	4~5 1~2 31~32 28~29	Position output, N pipe open-drain output, built-in pull up resistor with 2.8K $\Omega$
VDD	Logical power supply	10、27	5V power positive
VSS	Logic ground	3、6、30	Ground system

#### 5 Commands description

Commands are used to set display mode and state of LED driver.

The first byte input by DIO at the falling edge of STB is taken as the first command. Through decoding, take the highest two bits B7 and B6 to distinguish different commands.

B7	B6	Command
0	1	Data setting command
1	0	Display control command
1	1	Address setting command

If STB is set to high level during command or data transmission, the serial communication will be initialized, and the command or data being transmitted are invalid (previously transmitted commands or data are still valid).

## 5.1 Data command setting

The command is used to set the data write, B1 and B0 bit is set to 01 or 11 is not allowed.

MSB				LSB				Function	Description
B7	B6	B5	B4	B3	B2	B1	B0		
0	1	N/A, fill in 0				0	0	Data writing mode setting	Write data to display register
0	1				0			Address mode setting	Auto increase of address
0	1				1				Fixed address
0	1			0					Mode setting

## 5.2 Address command setting

MSB				LSB				Display address
B7	B6	B5	B4	B3	B2	B1	B0	
1	1	N/A, fill in 0		0	0	0	0	00H
1	1			0	0	0	1	01H
1	1			0	0	1	0	02H
1	1			0	0	1	1	03H
1	1			0	1	0	0	04H
1	1			0	1	0	1	05H
1	1			0	1	1	0	06H
1	1			0	1	1	1	07H
1	1			1	0	0	0	08H
1	1			1	0	0	1	09H
1	1			1	0	1	0	0AH
1	1			1	0	1	1	0BH
1	1			1	1	0	0	0CH
1	1			1	1	0	1	0DH
1	1			1	1	1	0	0EH
1	1			1	1	1	1	0FH

This command is used to set the address of display register.

When the address is set as 10H or higher, the data are ignored until a valid address is set.

When powered, the address is set as 00H.

For example, MCU need to send 0xC6 to TM1629A when control the content of 06H address.

## 5.3 Display control command setting

The command is used to set the display brightness and on/off. There are 8 levels of brightness.

MSB				LSB				Function	Description
B7	B6	B5	B4	B3	B2	B1	B0		
1	0	N/A, fill in 0			0	0	0	Extinction number setting	Set the pulse width to 1/16
1	0				0	0	1		Set the pulse width to 2/16
1	0				0	1	0		Set the pulse width to 4/16
1	0				0	1	1		Set the pulse width to 10/16
1	0				1	0	0		Set the pulse width to 11/16
1	0				1	0	1		Set the pulse width to 12/16
1	0				1	1	0		Set the pulse width to 13/16
1	0				1	1	1		Set the pulse width to 14/16
1	0			0				Display switch setting	Display is off
1	0			1					Display is on

## 6 Display register address

The storage of this register is transferred from external component to TM1629A through serial port, with an address of 16 bytes unit in total from 00H-0FH, corresponding to the LED lamps connected to the chip's SGE and GRID pin respectively. The distribution is shown as the following figure:

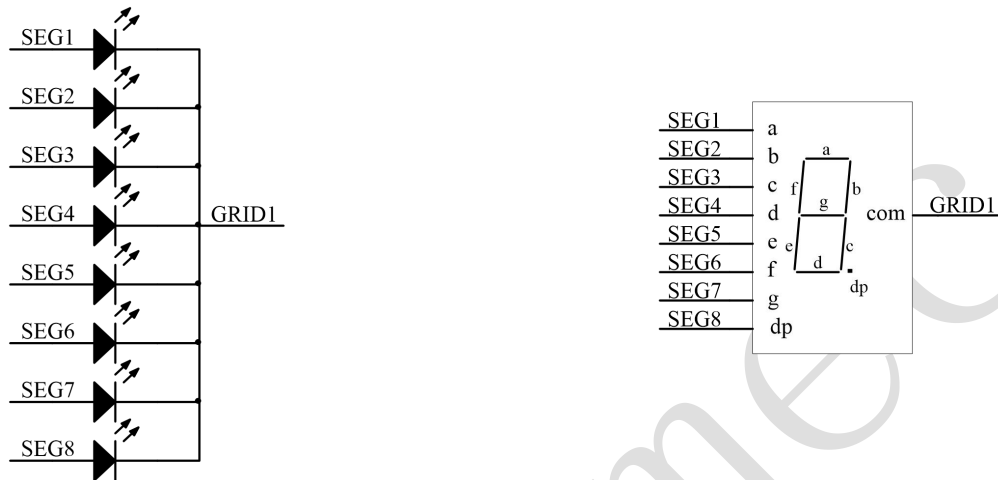
When writing LED display data, operate in the order from lower bit to higher bit of the display address and the data byte. No using SEG output ports please write 0 to the corresponding bit address.

SEG1	SEG2	SEG3	SEG4	SEG5	SEG6	SEG7	SEG8	SEG9	SEG10	SEG11	SEG12	SEG13	SEG14	SEG15	SEG16	
xxHL (four low bits)				xxHU (four high bits)				xxHL (four low bits)				xxHU (four high bits)				
B0	B1	B2	B3	B4	B5	B6	B7	B0	B1	B2	B3	B4	B5	B6	B7	
00HL				00HU				01HL				01HU				GRID1
02HL				02HU				03HL				03HU				GRID2
04HL				04HU				05HL				05HU				GRID3
06HL				06HU				07HL				07HU				GRID4
08HL				08HU				09HL				09HU				GRID5
0AHL				0AHU				0BHL				0BHU				GRID6
0CHL				0CHU				0DHL				0DHU				GRID7
0EHL				0EHU				0FHL				0FHU				GRID8

**▲ Note:** Maybe the display random when power on, Suggest to send 16 bytes of 0x00 to the display register address(00H-0FH) before send the display on command.

## 7 Display

### 7.1 Drive common cathode digital tube



The figure shows the connection diagram of common cathode digital tube, to make the digital tube display “0” , set SEG1, SEG2, SEG3, SEG4, SEG5 and SEG6 to high level and SEG7, SEG 8 to low level when GRID1 is low level, view the address table shown as below, and write data 0x3FH in 00H address unit.

SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1	
0	0	1	1	1	1	1	1	GRID1(00H)
B7	B6	B5	B4	B3	B2	B1	B0	

## 7.2 Drive common anode digital tube



The figure shows the connection diagram of common anode digital tube, to make the digital tube display “0”, set SEG1 to high level when GRID1, GRID2, GRID3, GRID4, GRID5 and GRID6 are low level, and set SEG1 to low level when GRID7, GRID8 is low level, write data 01H to address unit 00H, 02H, 04H, 06H, 08H and 0AH respectively and write data 00H to other address units.

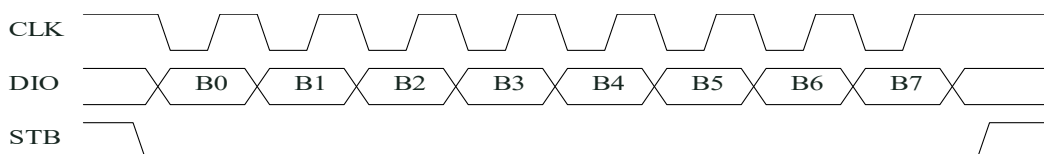
SEG8	SEG7	SEG6	SEG5	SEG4	SEG3	SEG2	SEG1	
0	0	0	0	0	0	0	1	GRID1(00H)
0	0	0	0	0	0	0	1	GRID2(02H)
0	0	0	0	0	0	0	1	GRID3(04H)
0	0	0	0	0	0	0	1	GRID4(06H)
0	0	0	0	0	0	0	1	GRID5(08H)
0	0	0	0	0	0	0	1	GRID6(0AH)
0	0	0	0	0	0	0	0	GRID7(0CH)
0	0	0	0	0	0	0	0	GRID8(0EH)
B7	B6	B5	B4	B3	B2	B1	B0	

▲ **Note:** SEG1-16 is P pipe open-drain output, and GRID1-7 is N pipe open-drain output; while operating, SEG1-16 only can be connected to LED anode, GRID1-7 only can be connected to LED cathode, and shouldn't be connected reversely.

## 8 Serial data transmission format

Receiving 1 bit happened at the rising edge of the clock.

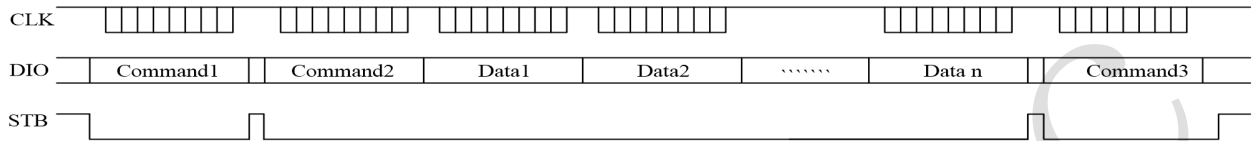
### 8.1 Data receiving (writing data)



## 9 Transmission of serial data in application

### 9.1 Address increase mode

In the address auto +1 mode, to set an address actually means to set the initial address stored in the transferred data flow. When the initial address command is completely sent, send the data (16 bytes at most) immediately without having to set "STB" to high level, and only do it when data sending completes.



Command1: display mode setting command

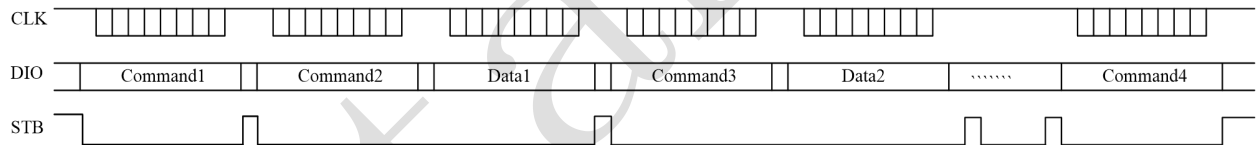
Command2: display address setting command

Data1~ n: display data or content (no more than 16 bytes)

Command3: display control setting command (brightness or display on/off)

### 9.2 Fixed address mode

In the fixed address mode, to set the address actually means to set the address stored in the to-be-transferred 1 byte data. When the address is sent completely, send the 1 byte data immediately without having to set "STB" to high level (only do it when data sending completes); then, set the address to be stored in the second data, and when the data (16 bytes at most) sending completes, set "STB" to high position.



Command1: display mode setting command

Command2: first display address setting command

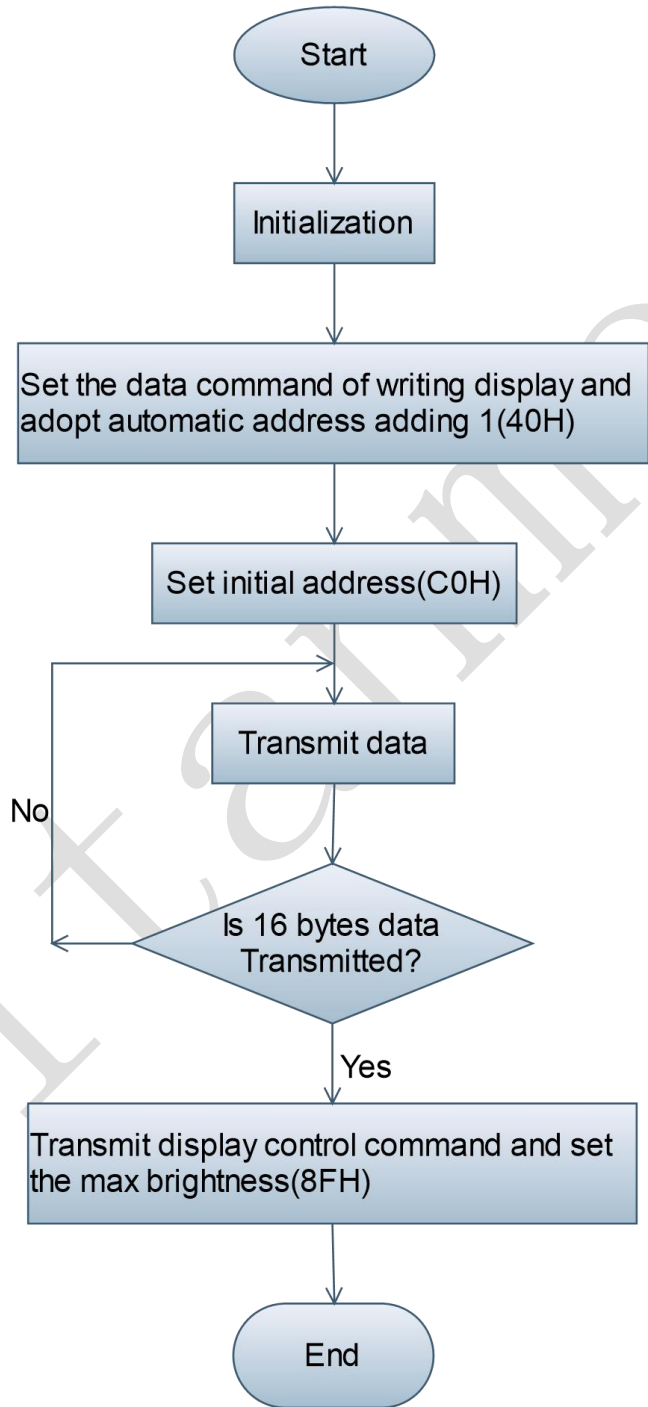
Data1: display data 1, save to the Command2 address

Command3: second display address setting command

Data2: display data 2, save to the Command3 address

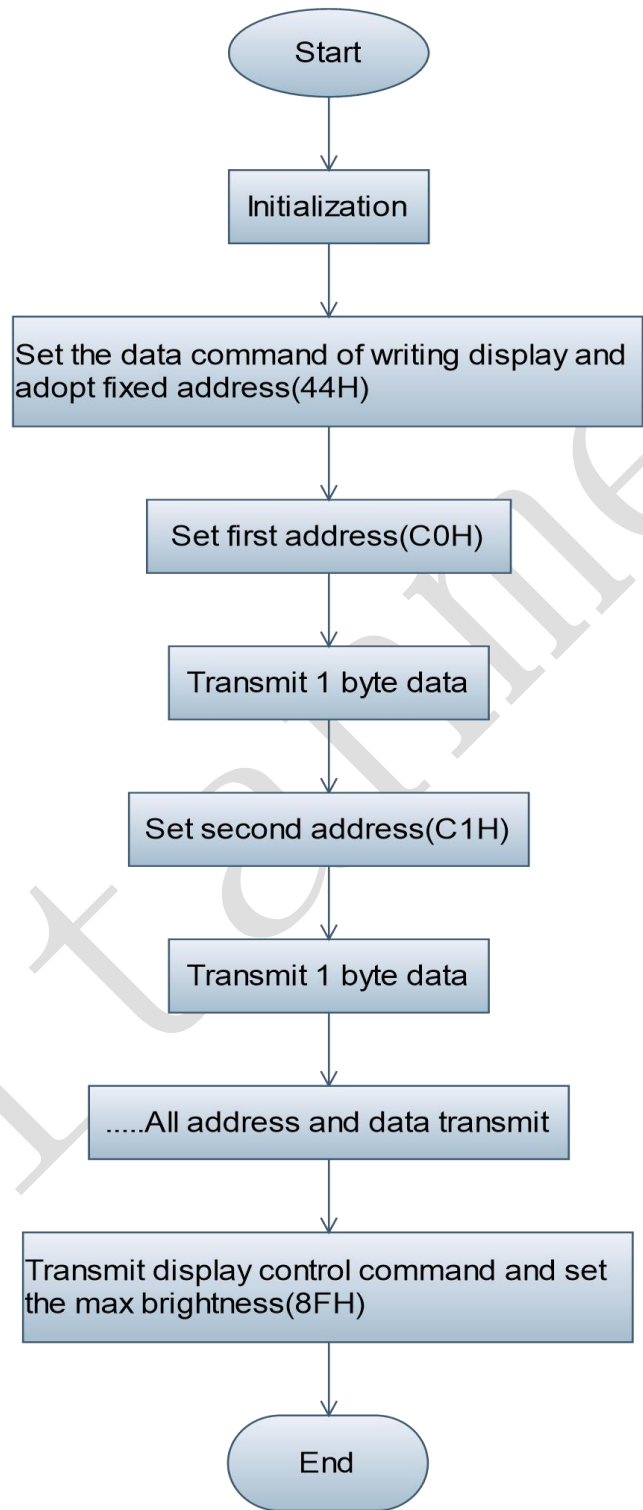
Command4: display control setting command (brightness or display on/off)

9.3 The flow chart adopting Automatic increase of address mode



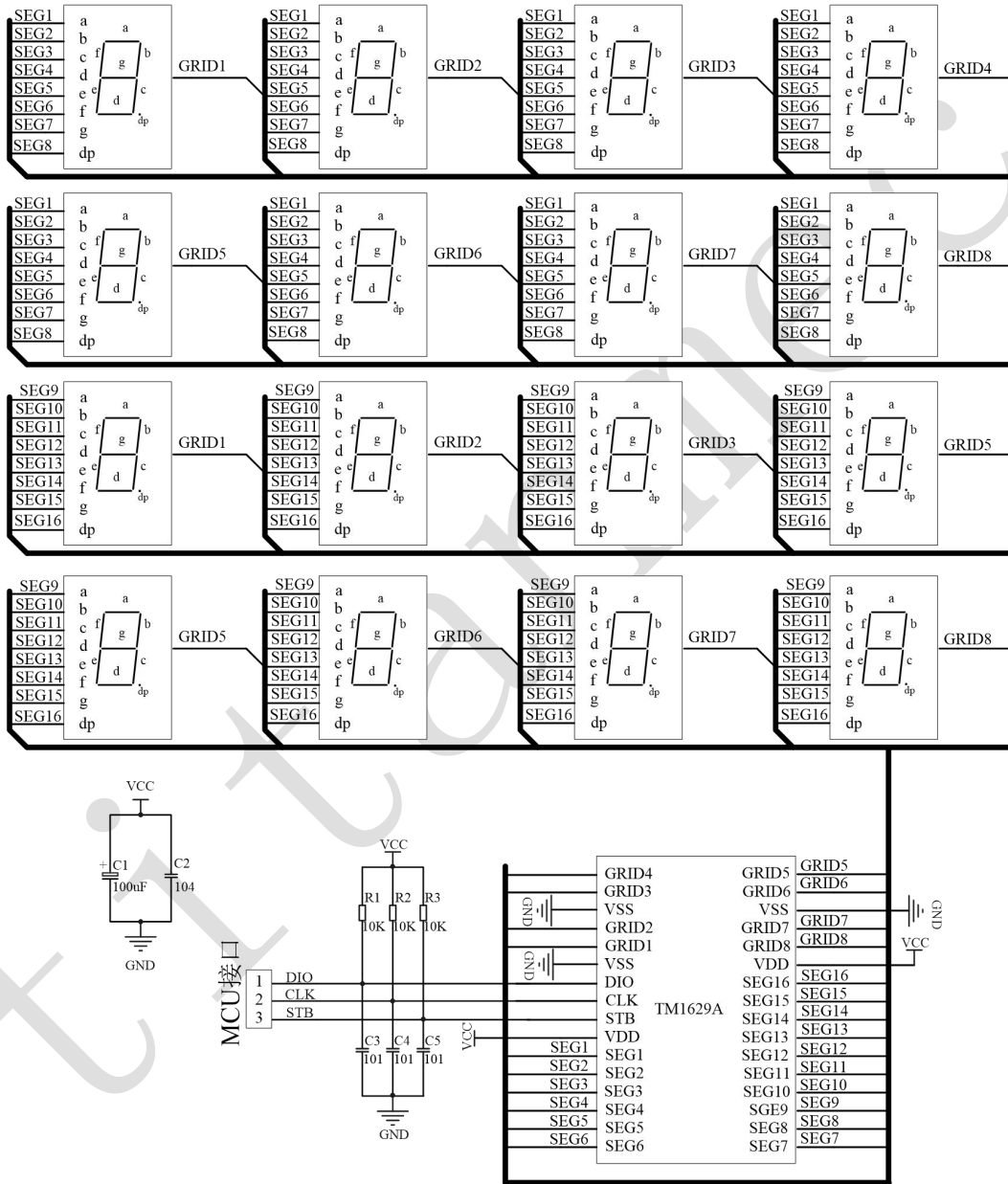


9.4 The flow chart adopting Fixed address mode

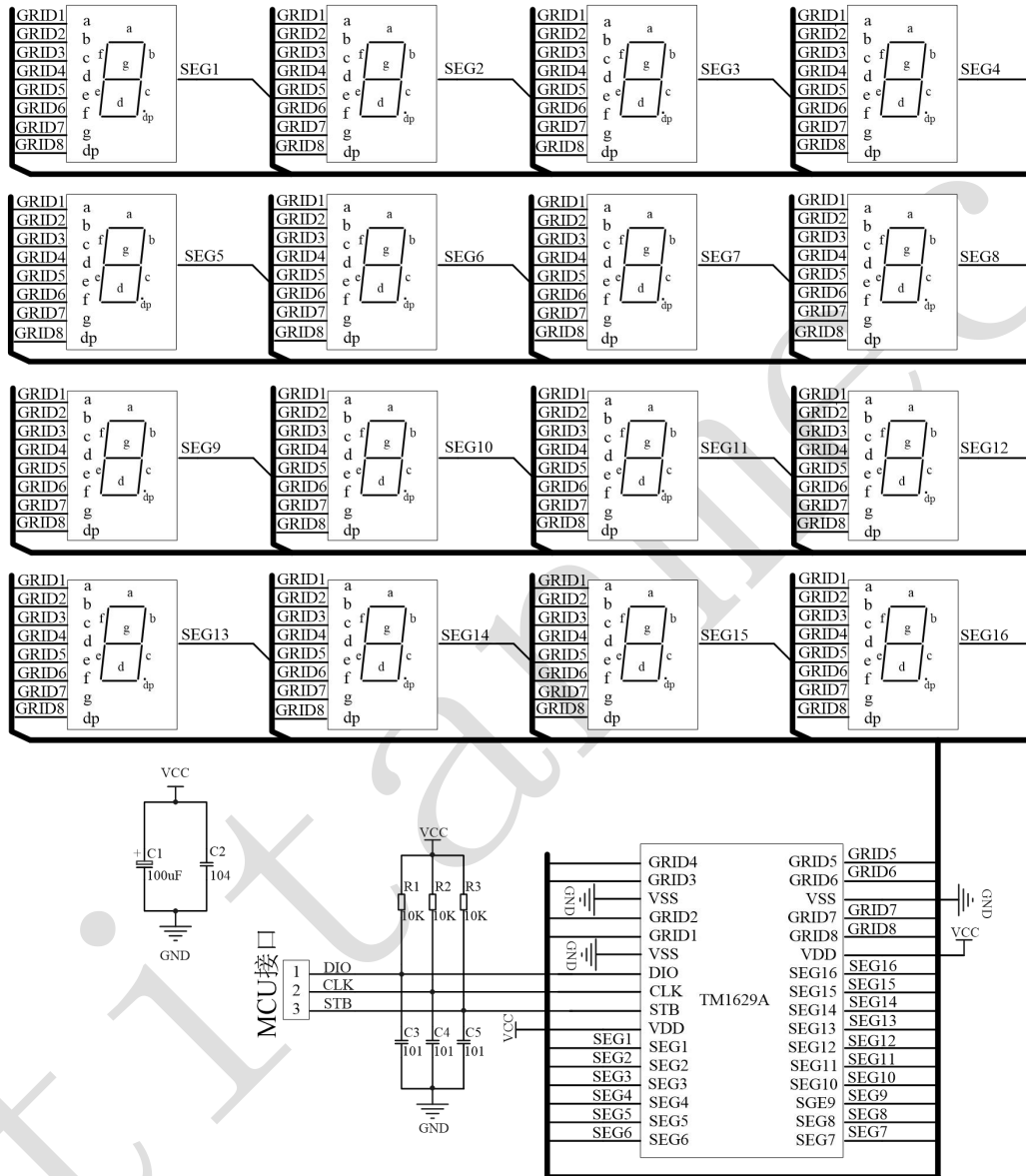


## 10 Application circuit

10.1 Connecting circuit of TM1629A drive common cathode digital tube is shown as below:



10.2 Connecting circuit of TM1629A drive common anode digital tube is shown as below:



- ▲**Note:**
1. The wiring of the filter capacitor between VDD and GND on PCB should be close to the chip of TM1629A to enhance filtering effect.
  2. The three 100PF capacitors connecting to DIO, CLK and STB communication ports can reduce interferences to such ports.
  3. Since the conduction pressure drop of blue light digital tube is 3V, the power supply of TM1629A is 5V.

## 11 Electrical parameters

### 11.1 Limit parameters (Ta = 25°C, Vss = 0 V)

Parameter	Sign	Range	Unit
Logic supply voltage	VDD	-0.5 ~ +7.0	V
Logic input voltage	VII	-0.5 ~ VDD + 0.5	V
LED Seg driver output current	IO1	-50	mA
LED Grid driver output current	IO2	+200	mA
Power consumption	PD	400	mW
Operating temperature	Topt	-40 ~ +85	°C
Storage temperature	Tstg	-65 ~ +150	°C

### 11.2 Normal operating range (Vss = 0 V)

Parameter	Sign	Min.	Typical	Max.	Unit	Testing condition
Logic supply voltage	VDD	3	5	6	V	-
High level input voltage	VIH	0.7 VDD	-	VDD	V	-
Low level input voltage	VIL	0	-	0.3 VDD	V	-

### 11.3 Electrical characteristics (VDD = 5 V, Vss = 0 V)

Parameter	Sign	Min.	Typical	Max	Unit	Testing condition
High level input current	Ioh	20	35	50	mA	Seg1~Seg16 Vo = Vdd-3V
Low level input current	IoL1	80	140	-	mA	Grid1~Grid8 Vo=0.3V
High level output current tolerance	Itolsg	-	-	5	%	VO = VDD-3V Seg1~Seg16
High level input voltage	VIH	0.7VDD	-		V	CLK, DIO, STB
Low level input voltage	VIL	-	-	0.3VDD	V	CLK, DIO, STB

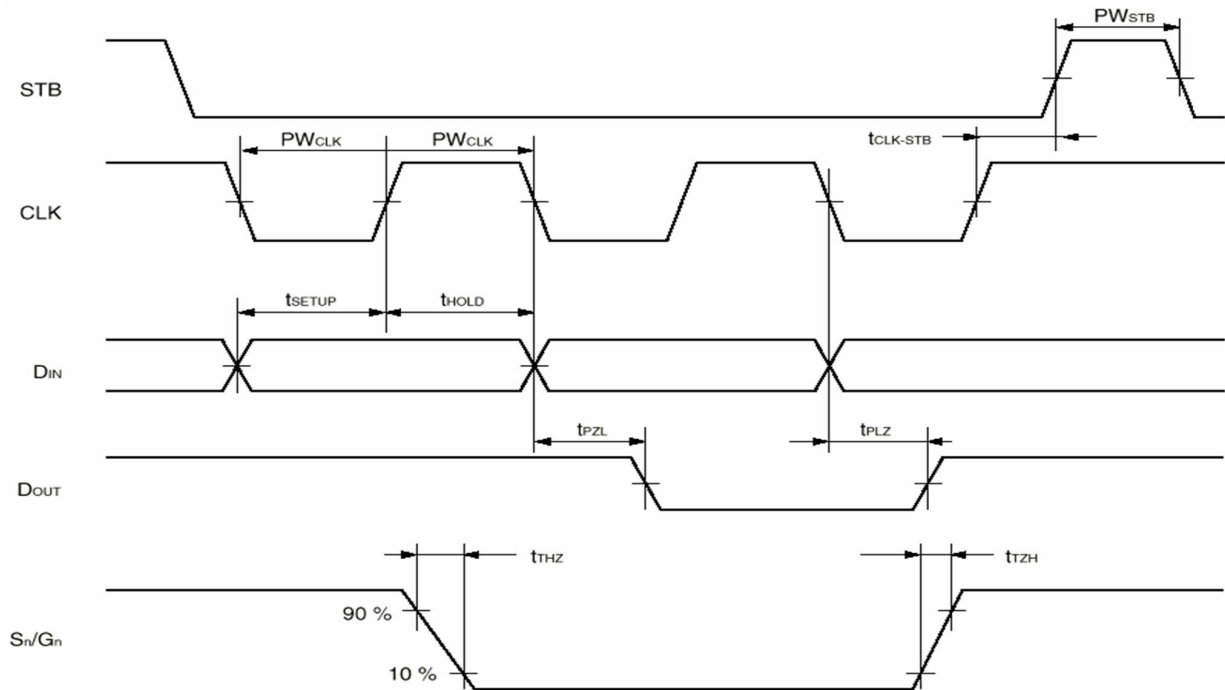
**11.4 Switching characteristics (VDD = 5V)**

Parameter	Symbol	Min	Typical	Max	unit	Testing condition	
Propagation delay time	$t_{PLZ}$	-	-	300	ns	CLK → DIO CL = 15pF, RL = 10KΩ	
	$t_{PZL}$	-	-	100	ns		
Rise time	$t_{TZH 1}$	-	-	2	μs	CL = 300pF	Seg1 ~ Seg16
Fall time	$t_{THZ}$	-	-	1.5	μs	CL = 300pF, Segn, Gridn	
Maximum clock frequency	Fmax	1	-	-	MHz	Duty cycle 50%	
Input capacitance	CI	-	-	15	pF	-	

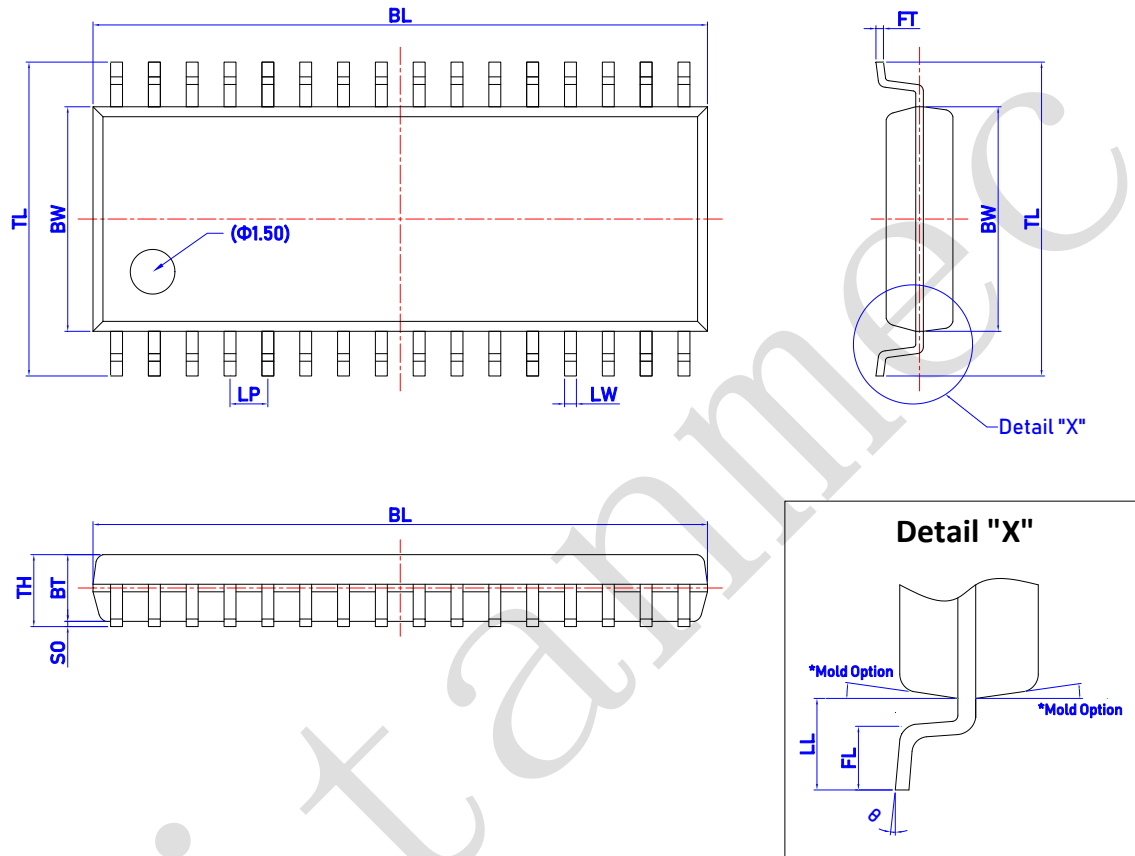
**11.5 Timing characteristics (VDD = 5 V)**

Parameter	Symbol	Min	Typical	Max	Unit	Testing condition
Clock pulse width	PW <sub>CLK</sub>	500	-	-	ns	-
Gating Pulse width	PW <sub>STB</sub>	1	-	-	μs	-
Data setup time	$t_{SETUP}$	100	-	-	ns	-
Data hold time	$t_{HOLD}$	100	-	-	ns	-
CLK → STB time	$t_{CLK-STB}$	1	-	-	μs	CLK ↑ → STB ↑

11.6 Timing waveform



12 Packing Size (SOP32-300)



**Dimensions**

Item	BL	BW	TL	LW	LP	FT	BT	SO	TH	LL	FL	$\theta$
表示	总长	胶体宽度	跨度	脚宽	脚间距	脚厚	胶体厚度	站高	胶体高度	单边长	脚长	脚角度
Unit	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	°
Spec	20.73 (20.63) 20.53	7.64 (7.54) 7.44	10.60 (10.40) 10.20	0.400 TYP	1.270 TYP	0.250 (0.200) 0.170	2.34 (2.24) 2.14	0.250 (0.175) 0.100	2.490 Max.	1.60 (1.50) 1.40	0.95 (0.75) 0.55	8 (4) 0

All specs and applications shown above subject to change without prior notice.