

ET1620 - Dot Matrix LED Driver

General Description

ET1620 is a high reliability matrix LED driver IC with 8 segments output (SEG), 4 commons output (GRID), 2 segments/commons output (SEG/GRID), display memory, control circuit, key scan circuit , using 3-line serial interface communication.

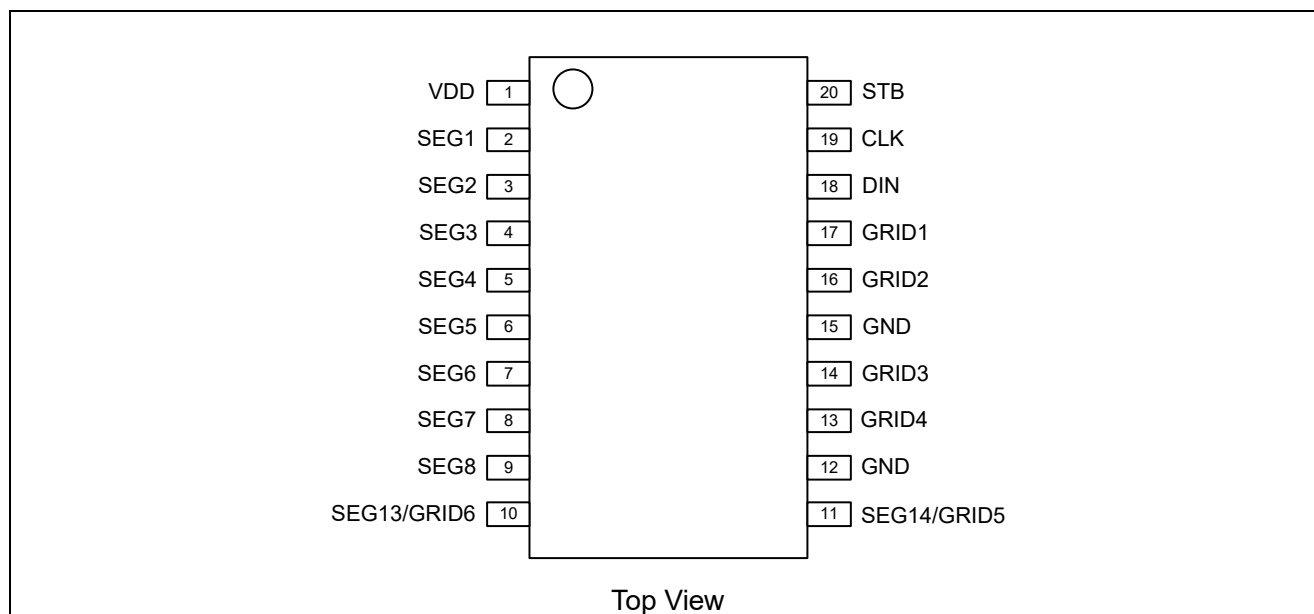
Features

- High performance CMOS process, low power consumption
- Display Mode: 8 Segs x 6 Grids ~10 Segs x 4 Grids ,Max support 48 LED matrix
- Dimming adjustment: 8 step
- 3-line serial interface
- Built in RC oscillation
- Package: SOP20

Device Information

Part No.	Package
ET1620	SOP20

Pin Assignments

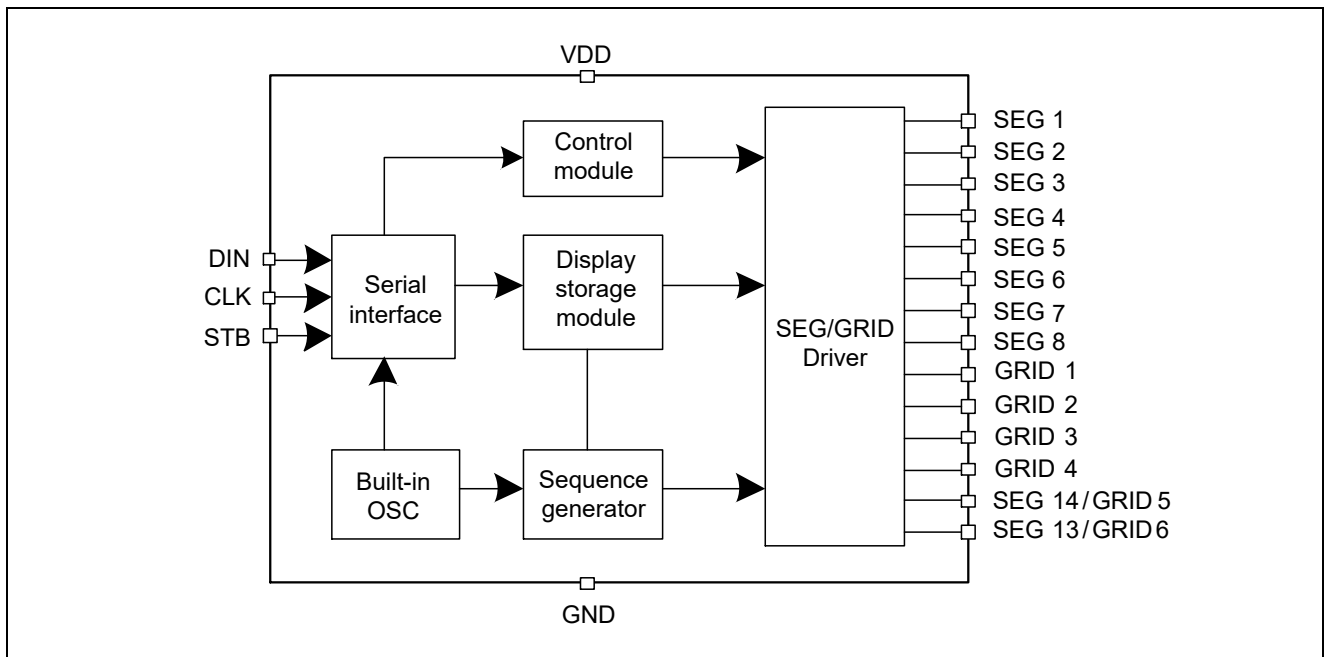


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Pin. Function

Pin No.	Symbol	I/O	Description
1	VDD	-	Power Input
2~9	SEG1~SEG8	O	Segment output port (Connected LED positive pole)
10~11	SEG13/GRID6, SEG14/GRID5	O	Segment/Grid output port, select segment or grid output through registers.
12,15	GND	-	Ground
13, 14, 16, 17	GRID4~GRID1	O	Grid output port, Connected LED negative pole
18	DIN	I	Serial data input port.
19	CLK	I	Serial clock input port.
20	STB	I	Serial data strobe port.

Function Diagram



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Functions Description

Command

After the STB port status changes from high to low, input command bytes through the DIN port. If the STB port is set to high for some reason while the data or command is being transmitted, the serial communication is initialized and the data/command being entered is considered invalid.

Command 1: display mode setting command

The display mode setting command determines the number of segments (4~6 grids, 10~8 segments) used. A display command must be executed to continue the display. If the same mode is selected, the command is not executed. When the power is turned on, 8 Segs×6 Grids are selected by default mode.

MSB				LSB				Function	Description
B7	B6	B5	B4	B3	B2	B1	B1		
0	0	NC, Set to 0 please				0	0	Display segment and grid setting	10Segs×4Grids
0	0					0	1		9 Segs×5 Grids
0	0					1	0		8 Segs×6 Grids

Command2: Data Command Setting

Data setup commands perform write display data or read keys. When the power supply is powered on, bits 4 to 1 (B3 to B0) should be set to 0.

MSB				LSB				Function	Description
B7	B6	B5	B4	B3	B2	B1	B0		
0	1	NC, Set to 0 please		0				Mode setting	Normal mode
				1					Test mode
					0			Address mode	Automatic address increase
					1				Fixed address
						0	0	Data write	Display data input mode

Command3: Display Address Setting

The address setting command is used to set the display memory address. If the address ranges from 00H to 0DH, the address is valid. If the address is 0EH or higher, the data is invalid unless the correct address is set again. When the power supply is powered on, the address is 00H.

MSB				LSB				Description
B7	B6	B5	B4	B3	B2	B1	B0	
1	1	NC, fill in 0		0	0	0	0	Display address 00H
1	1			0	0	0	1	Display address 01H
1	1			0	0	1	0	Display address 02H
1	1			0	0	1	1	Display address 03H
1	1			0	1	0	0	Display address 04H
1	1			0	1	0	1	Display address 05H
1	1			0	1	1	0	Display address 06H
1	1			0	1	1	1	Display address 07H

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1	1		1	0	0	0	Display address 08H
1	1		1	0	0	1	Display address 09H
1	1		1	0	1	0	Display address 0AH
1	1		1	0	1	1	Display address 0BH

Address assignment:

SG1.....SG4	SG5.....SG8	SG9.....SG12	SG13.....SG14	Matrix Address
00H _L	00H _U	01H _L	01H _U	GRID1
02H _L	02H _U	03H _L	03H _U	GRID2
04H _L	04H _U	05H _L	05H _U	GRID3
06H _L	06H _U	07H _L	07H _U	GRID4
08H _L	08H _U	09H _L	09H _U	GRID5
0AH _L	0AH _U	0BH _L	0BH _U	GRID6

B0	B1	B2	B3	B4	B5	B6	B7
xxH _L				xxH _U			
Low 4bits				High 4bits			

Command4: Display Control Setting

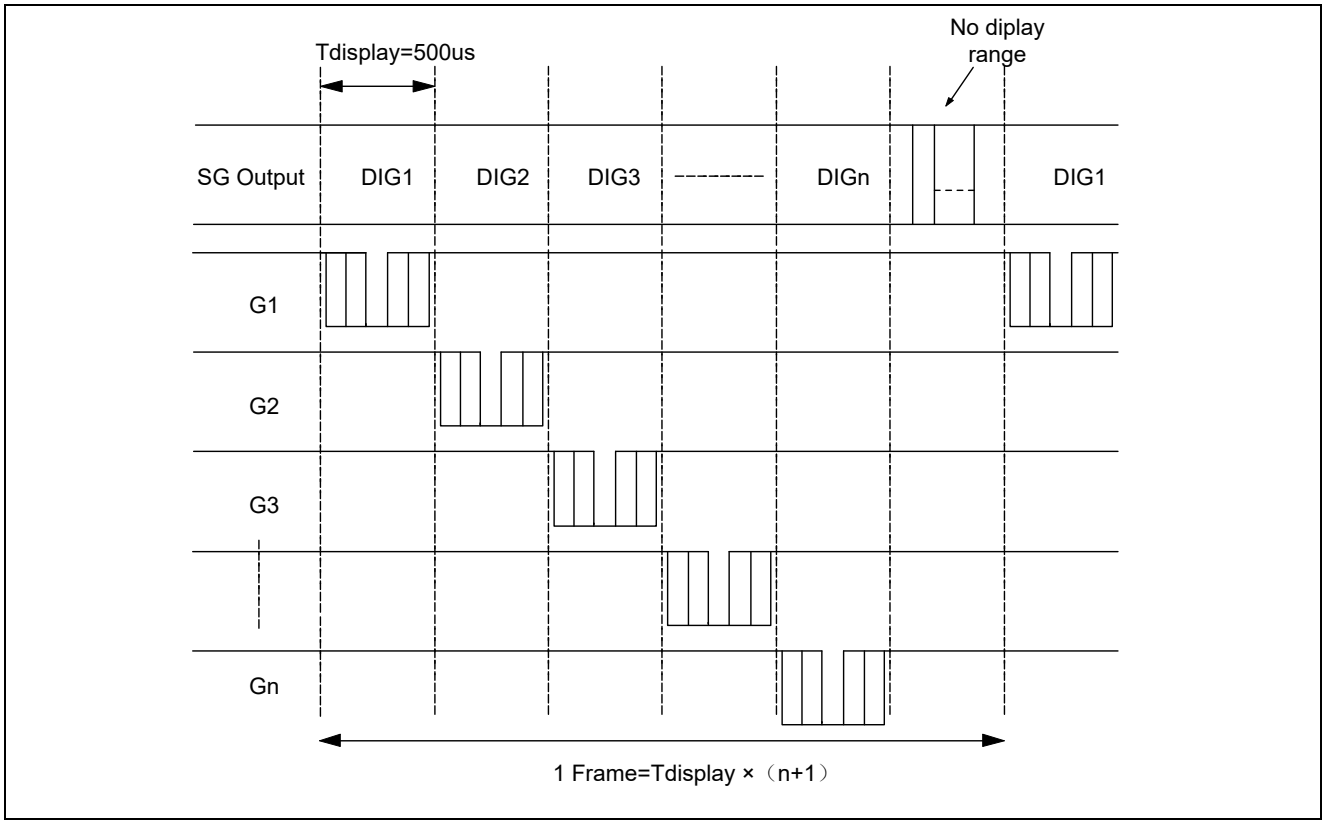
MSB

LSB

B7	B6	B5	B4	B3	B2	B1	B0	Function	Description
1	0	NC, fill in 0			0	0	0	Display duty cycle setting	Duty cycle is 1/16
1	0				0	0	1		Duty cycle is 2/16
1	0				0	1	0		Duty cycle is 4/16
1	0				0	1	1		Duty cycle is 10/16
1	0				1	0	0		Duty cycle is 11/16
1	0				1	0	1		Duty cycle is 12/16
1	0				1	1	0		Duty cycle is 13/16
1	0				1	1	1		Duty cycle is 14/16
1	0			0				Display ON / OFF setting	Display OFF
1	0			1					Display ON

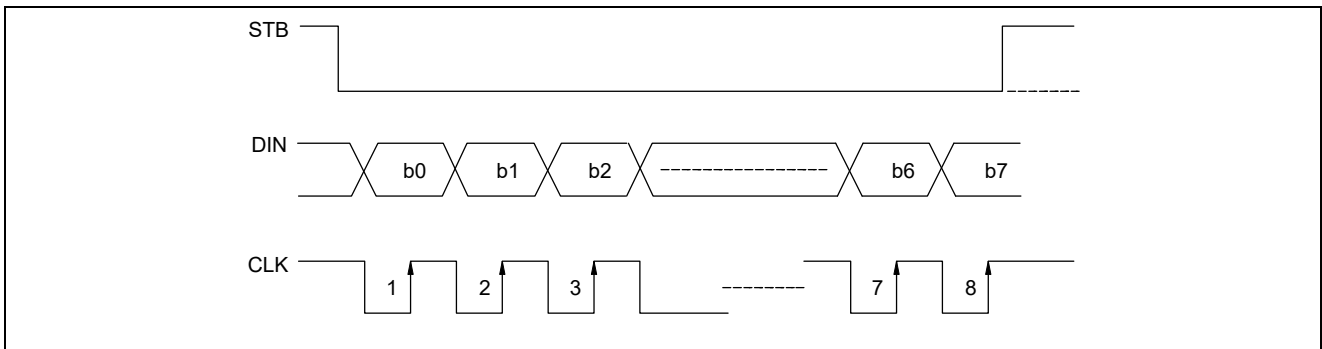
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Display timing



Serial Communication Format

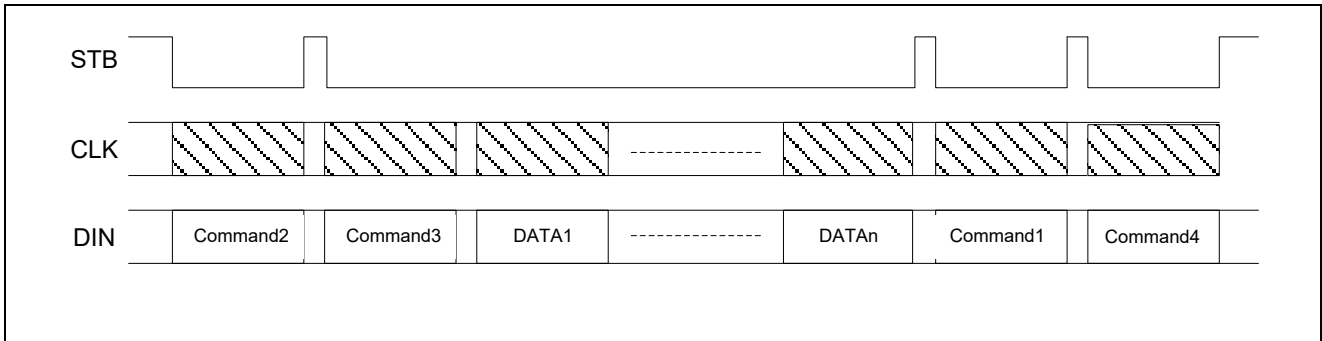
The following figure shows the serial communication format of ET1620. It is recommended to connect a pull-up resistor (1K ~ 10K) to the DIO port.



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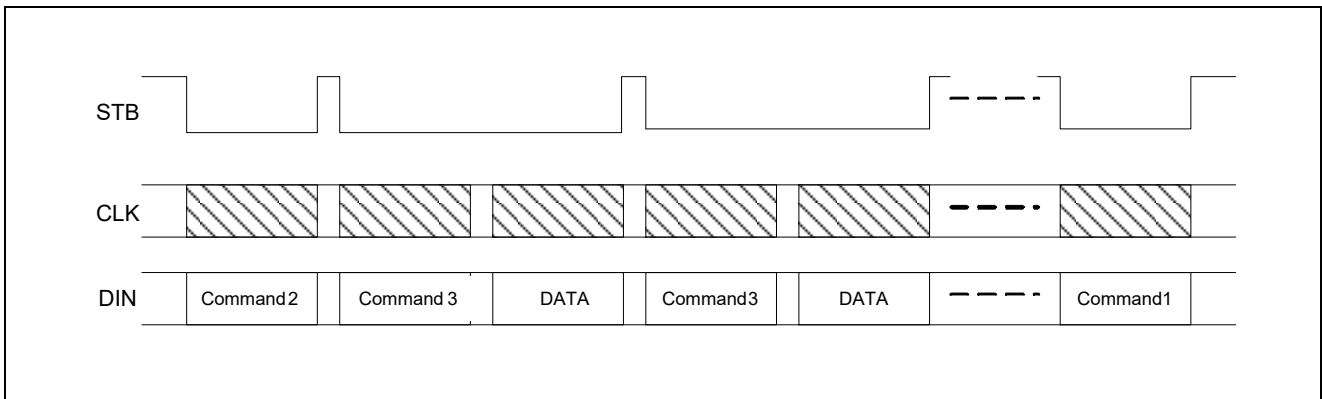
Communication application time series

Continuous display data writing (Automatic address increase)



- Command1: Display mode setting
- Command2: Data command setting
- Command3: Address command setting
- DATA1~n: Display data(MAX 12bytes)
- Command4: Display control command

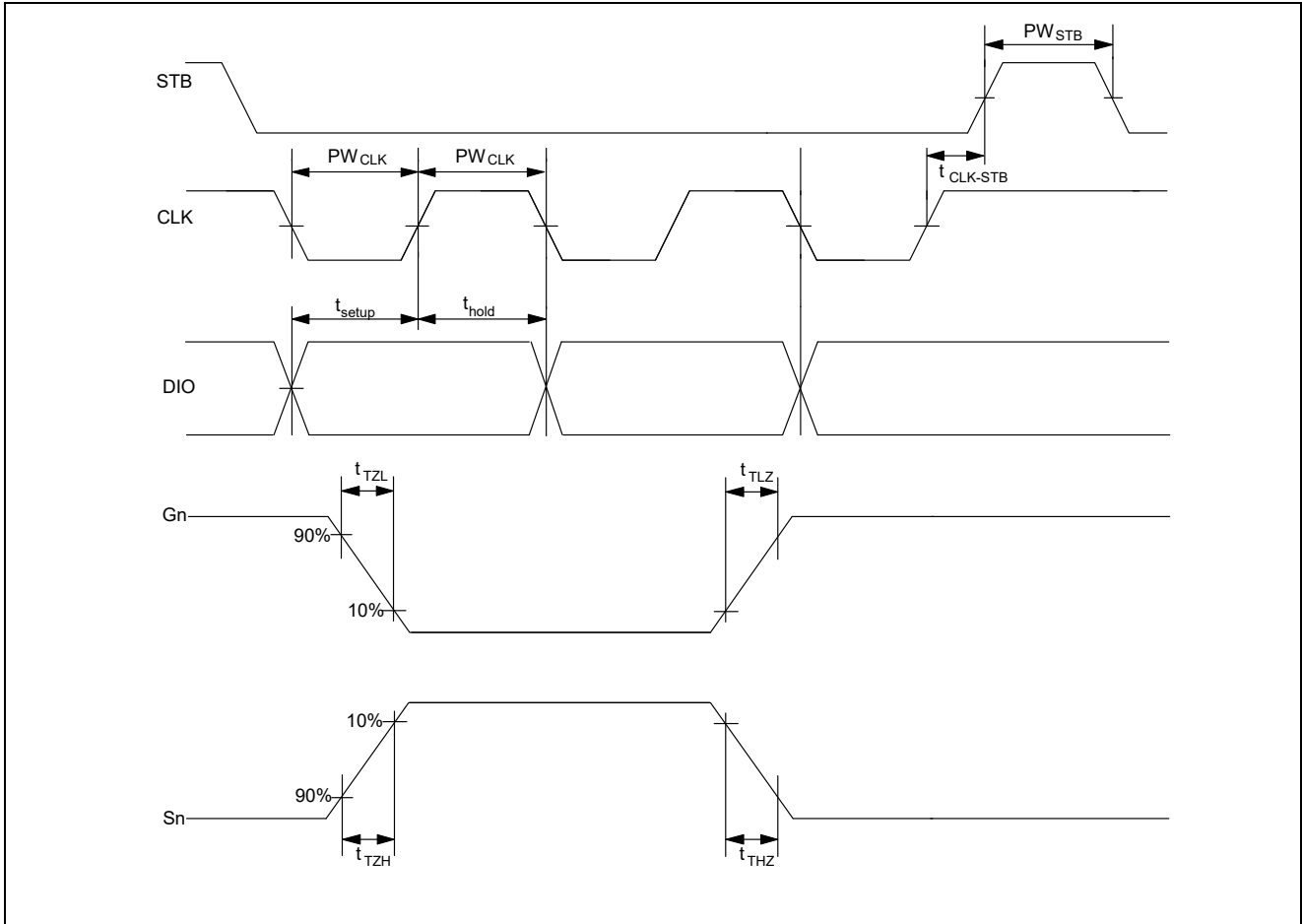
Single display data writing (fixed address mode)



- Command1: Display mode setting
- Command2: Data command setting
- Command3: Address command setting
- DATA: Display data

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Conversion Characteristic Waveform



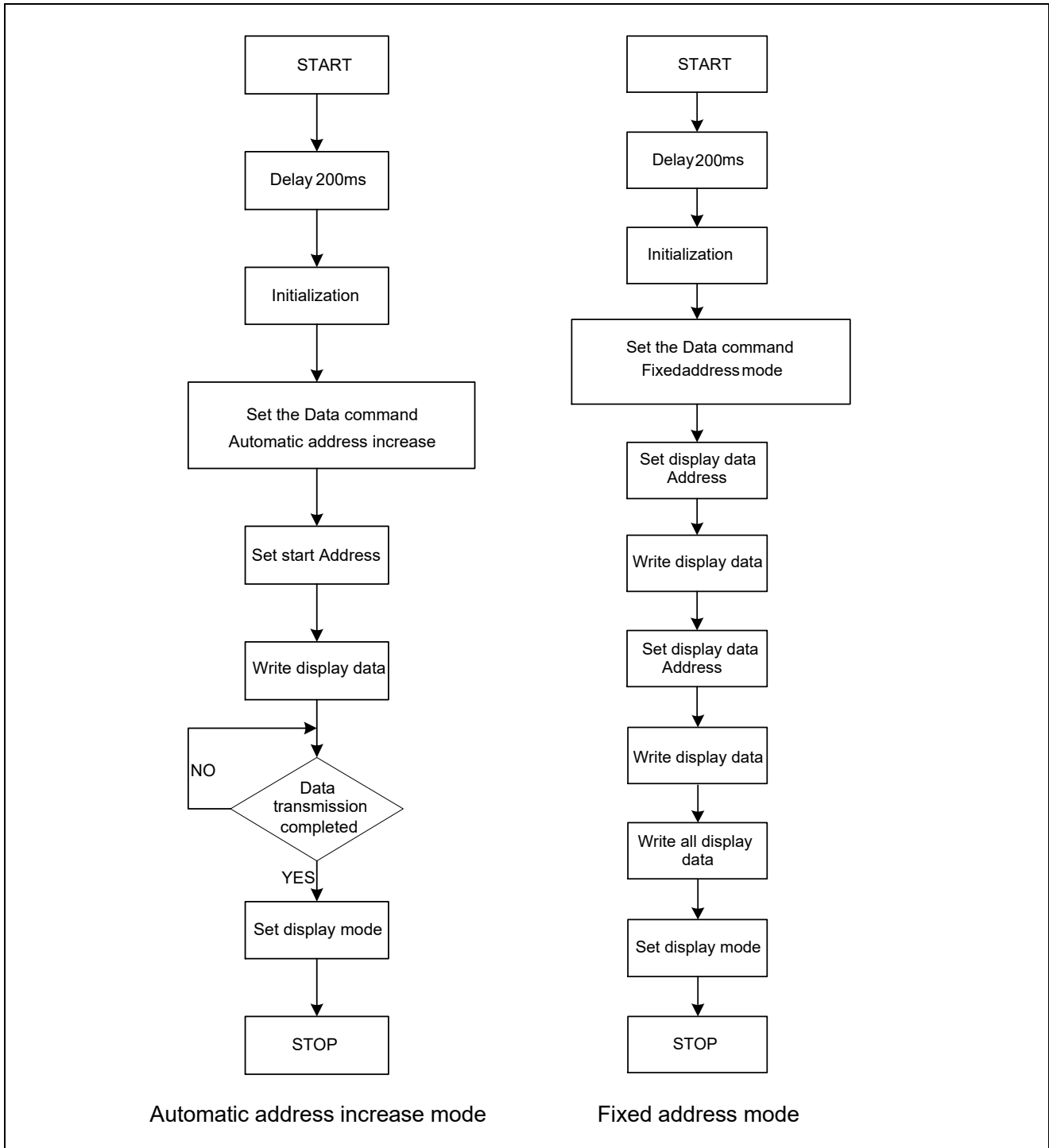
Transformation Characteristic

Symbol	Description	Range	Units
PW_{CLK}	CLK pulse width	≥ 400	ns
PW_{STB}	STB pulse width	≥ 1	us
t_{setup}	Data setup time	≥ 100	ns
t_{hold}	Data hold time	≥ 100	ns
$t_{CLK-STB}$	CLK-STB time	≥ 1	us
t_{THZ}	Falling time	≤ 10	us
t_{TZH}	Rising time	≤ 1	us
t_{TTL}		< 1	us
t_{TLZ}		< 10	us

Note: The test conditions are as follows:

t_{THZ} (pull-down resistance=10k Ω , loading capacitance =300pF), t_{TLZ} (pull-up resistance = 10k Ω , loading capacitance =300pF)

Software flow chart



Note: When the IC is powered on for the first time, the contents of the display RAM are not defined, so be sure to clear the contents of the display RAM in the initialization setting.

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Absolute Maximum Ratings

(Unless otherwise noted , $T_A=25^{\circ}\text{C}$)

Characteristic	Symbol	Rating	Unit
Supply Voltage	V_{DD}	$-0.5\sim+7$	V
Logic Input Voltage	V_I	$-0.5\sim V_{DD}+0.5$	V
Driver Output Current	I_{OLGR}	+250	mA
	I_{OHSG}	-50	mA
Max Output Driver current	I_{TOTAL}	250	mA
Operating Junction Temperature	T_J	$-40\sim+150$	$^{\circ}\text{C}$
Storage Temperature	T_{STG}	$-65\sim+150$	$^{\circ}\text{C}$

Recommended Operating Conditions

(Unless otherwise noted , $T_A = 25^{\circ}\text{C}$)

Characteristic	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{DD}	3	5	5.5	V
Dynamic current	$I_{DD_DYN}^*$	—	—	1	mA
High Level Input Voltage	V_{IH}	$0.8V_{DD}$	—	V_{DD}	V
Low Level Input Voltage	V_{IL}	0	—	$0.25V_{DD}$	V
Operating Temperature	T_A	-40		85	$^{\circ}\text{C}$

Note*: Test condition Set display mode command = 80H (display off & no load).

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Electrical Characteristics

(Unless otherwise noted, $V_{DD}=5V$, $T_A=25^{\circ}C$)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
High Level Output Current	I_{OHSG1}	$V_O=V_{DD}-2V$, SEG1~SEG8, SEG13/GRID6~SEG14/GRID5	-40	-50	-60	mA
	I_{OHSG2}	$V_O=V_{DD}-3V$, SEG1~SEG8, SEG13/GRID6~SEG14/GRID5	-50	-60	-70	mA
Low Level Output Current	I_{OLGR}	$V_O=0.3V$, GRID1~GRID4, SEG13/GRID6~SEG14/GRID5	85	100	—	mA
Percentage of high level output current at segment	I_{TOLSG}	$V_O=V_{DD}-3V$, SEG1~SEG11, SEG13/GRID6~SEG14/GRID5	—	—	+5	%
High Level Input Voltage	V_{IH}	—	$0.8V_{DD}$	—	V_{DD}	V
Low Level Input Voltage	V_{IL}	—	0	—	$0.25V_{DD}$	V
Oscillation Frequency	F_{OSC}		350	500	650	kHz

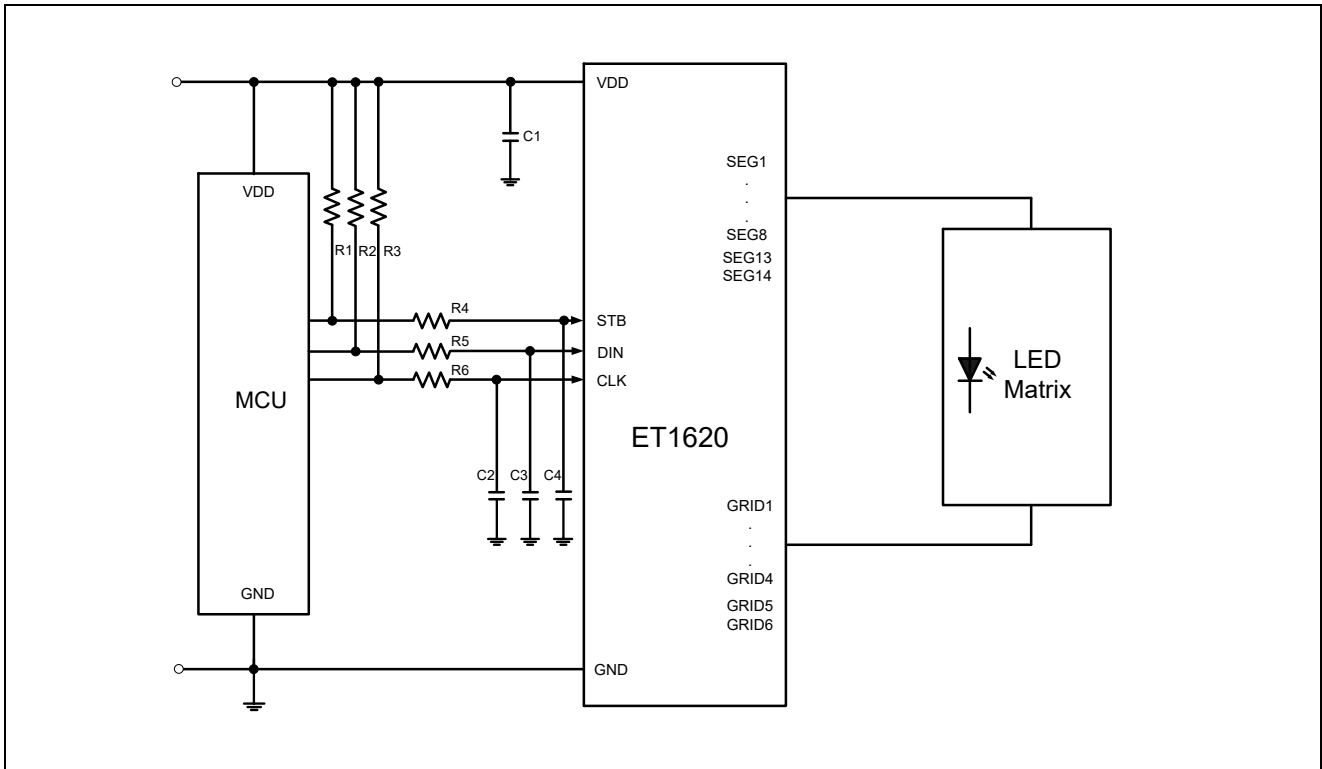
Electrical Characteristics

(Unless otherwise noted, $V_{DD}=3V$, $T_A=25^{\circ}C$)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
High Level Output Current	I_{OHSG1}	$V_O = V_{DD} - 2V$, SEG1~SEG8, SEG13/GRID6~SEG14/GRID5	-15	-20	-35	mA
Low Level Output Current	I_{OLGR}	$V_O=0.3V$, GRID1~GRID4, SEG13/GRID6~SEG14/GRID5	100	140	—	mA
High Level Input Voltage	V_{IH}	—	$0.8V_{DD}$	—	3.3	V
Low Level Input Voltage	V_{IL}	—	0	—	$0.3V_{DD}$	V
Oscillation Frequency	F_{OSC}		300	420	580	kHz

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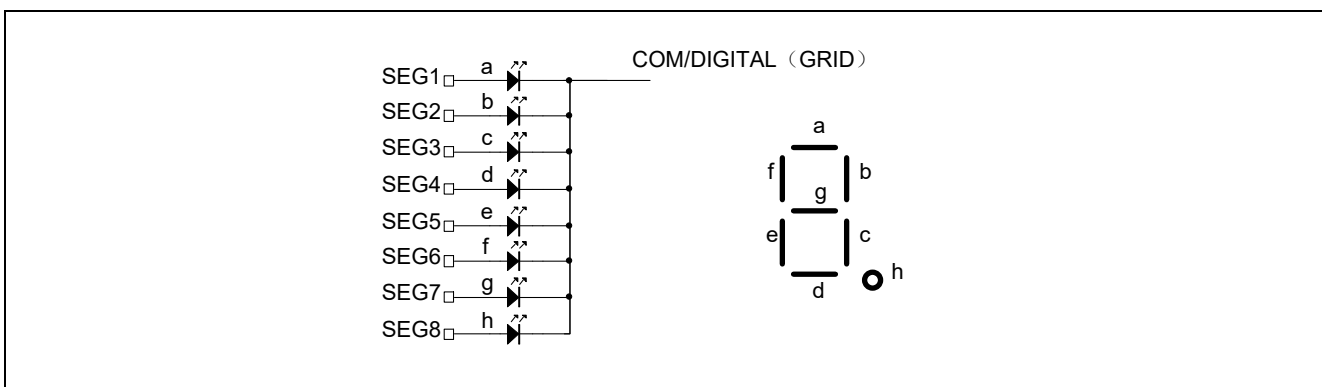
Application circuit



Note:

1. This application circuit is only for reference.
2. C1=1uF and should be placed as close as possible to the VCC.
3. R1~R3= 4.7kΩ; R4~R6 = 100Ω; C2~C4 = 100pF;
4. The series resistance of the communication port and the capacitor for GND should be placed as close as possible to ET1620, and the resistance value and capacitance value should be adjusted according to the actual anti-interference requirements and verification results.

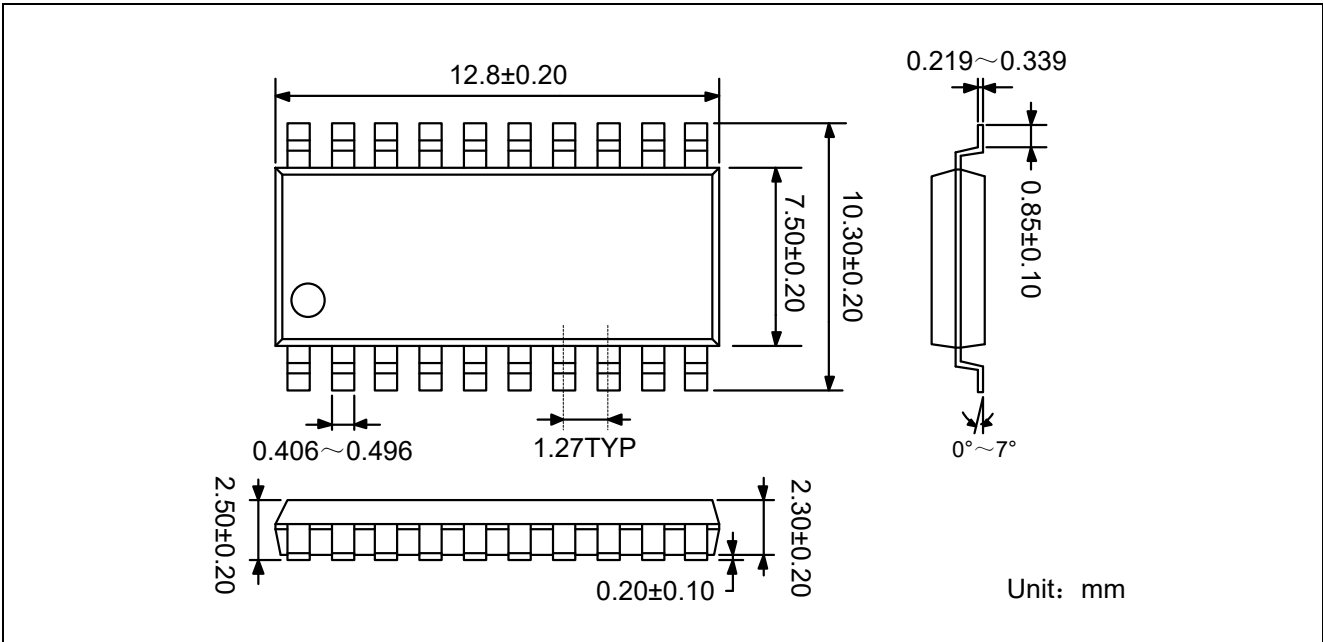
Common cathode LED connection



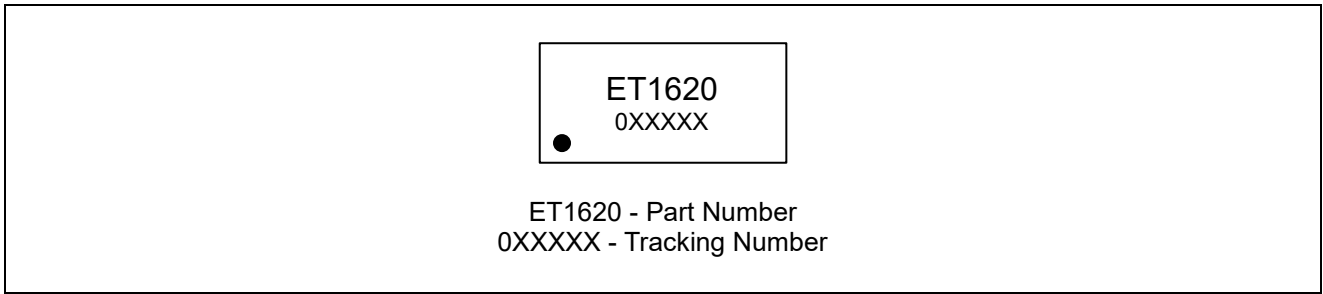
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Package

SOP20



Marking



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2018-01-19		Shilj	Shilj	Zhuji
1.1	2020-04-3	Updated formatting	shibo	Shilj	Zhuji
1.2	2021-02-05	Adding packaging information	Zhuhui	Shilj	Zhuji
1.3	2023-12-19	Update Typeset	Zhuzq	Shibo	Liuji