

# USER'S MANUAL FOR

## LCD MODULE HTM256128A

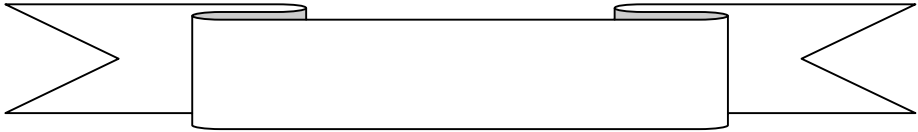
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## 1. Scope

This specification defines general provisions as well as inspection standards for LCD module supplied by our company.

If the event of unforeseen problem or unspecified items may occur, please contact the nearest supplier or our company.

## 2. Warranty

If module is not stored or used as specified in this manual, it will be void the 12 months warranty.

## 3. Features

### 3-1.General Specifications

Operating Temp. : min. 10°C ~ max. 40°C

Storage Temp. : min. -20°C ~ max. 60°C

Dot Pixels : 256 (W) × 128 (H) dots

Dot Size : 0.43 (W) × 0.43 (H) mm

Dot Pitch : 0.47 (W) × 0.47 (H) mm

Viewing Area : 127.0 (W) × 70.0 (H) mm

Outline Dimensions : 167.0 (W) × 116.0 (H) × 24.0 (D) mm

Weight : Approx.250g

LCD Type : STN / Blue-mode / Transflective

Viewing Angle : 6:00

Data Transfer : 4-bit parallel data transfer

Backlight : LED

### 3-2.Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Note
Supply Voltage	Logic	Vdd	0	7.0	V
	LCD drive	Vdd – Vee	0	28	V
Input voltage	Vi	0	Vdd	V	
Operating Temperature	Top	10	40	°C	
Storage Temperature	Tstg	-20	60	°C	
Humidity	—	—	90	%RH	

### 3-3.Electrical Characteristics

Item	Symbol	Conditions	Min.	Typ.	Max.	Unit
Supply Voltage	Logic	—	2.7	—	5.5	V
	LCD drive	T=25°C	12.8	13.8	14.8	

Input Voltage	"H" Level	Vih	Vdd=5V±5%	0.8Vdd	—	Vdd	
	"L" Level	Vil	—	0	—	0.2Vdd	
Output Voltage	"H" Level	Voh	—	Vdd-0.4	—	—	
	"L" Level	Vol	—	—	—	0.4	
Current Consumption	Logic	Idd	Vdd-Vss=5V	—	5	20.0	mA
	LCD drive	Iee	Vdd-V <sub>EE</sub> =13.8V	—	4.7	15.0	

Note: <1>t=25°C      <2> Vss=0V

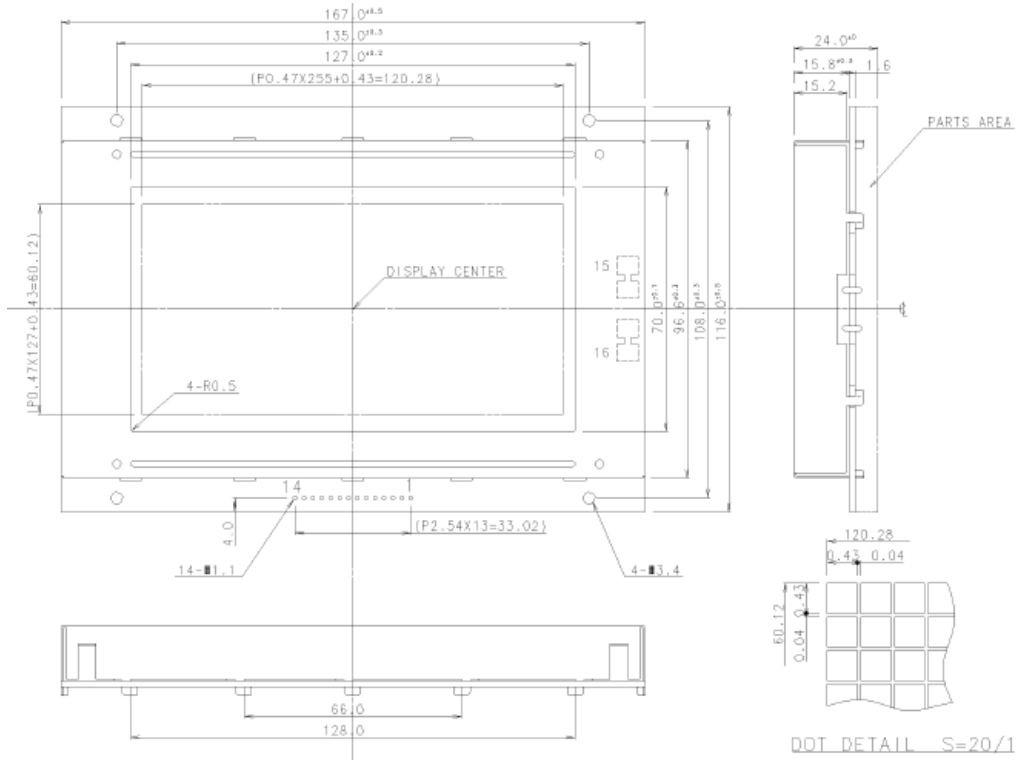
### 3-3 Electro-optical Characteristics

Item		Symbol	Temp.	Conditions	Min.	Typ.	Max.	Unit	Note
Response Time	Rise Time	tr	25°C	$\phi = 0^\circ, \theta = 0^\circ$	—	200	300	mS	
	Decay Time	td	25°C		—	250	350		
Viewing Angle		$\Delta \phi$	25°C	Vertical	-25	—	40	deg.	
				Horizontal	-30	—	35		
Contrast Ratio		K	25°C	$\phi = 0^\circ, \theta = 0^\circ$	5	8	—	—	

## 4. I/O Terminal

### 4-1 I/O Terminal

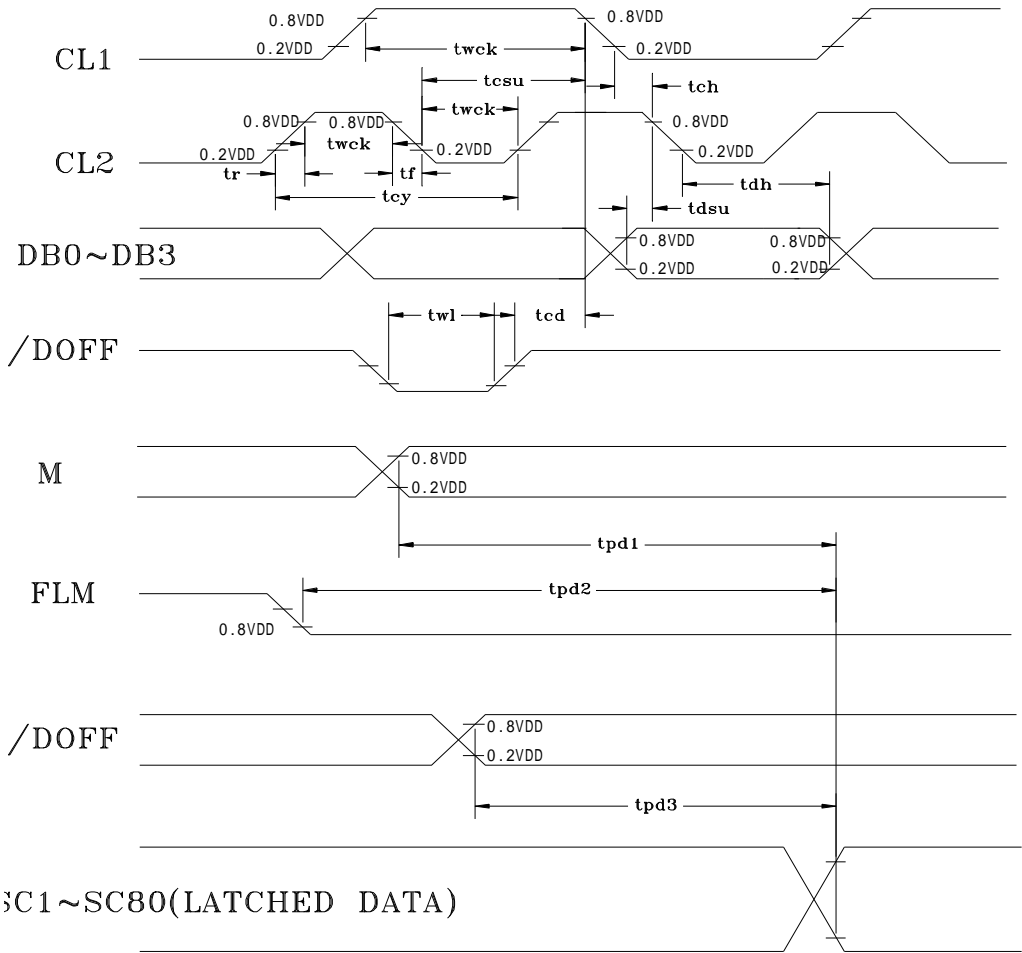
Pin No.	Symbol	Function
1	VDD	Power supply for logic (Positive)
2	VSS	Ground
3	VEE	Power supply for LCD driver (Negative)
4	LP	Data latch signal
5	M	Alternate Signal for LCD Drive
6	DISPOFF	Display Control Signal H : Display on L : Display off
7	NC	
8	FLM	First Line Marker
9	CP	Clock Signal for Shifting Data
10	NC	
11	D0	DATA BUS
12	D1	DATA BUS
13	D2	DATA BUS
14	D3	DATA BUS
15	LED+	Power supply for LED+
16	LED-	Power supply for LED-



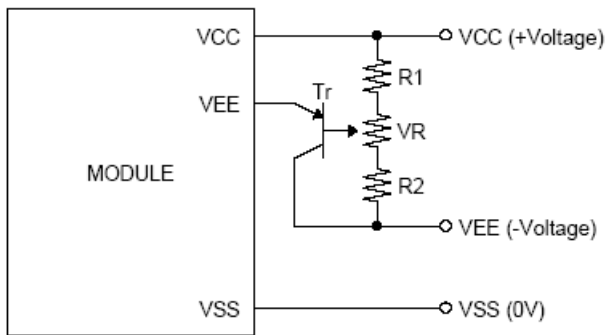
4-2 Timing and timing diagram  
 4-2-1 Timing Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Clock Cycle Time	tCY	250	—	—	ns
Clock Pulse Width	tWCK	45	—	—	
Clock Rise/Fall Time	tR/tF	-	—	50	
Data Set-Up Time	tDSU	30	—	--	
Data Hold Time	tDH	30	—	--	us
DISPOFFB Low Pulse Time	tWL	1.2	--	--	
DISPOFFB Clear Time	tCD	100	--	--	
M-OUT Propagation Delay Time	tPD1	--	--	1.0	us
CL1-OUT Propagation Delay Time	TPD2	--	--	1.0	
DISPOFFB-OUT Propagation Delay Time	TPD3	--	--	1.0	

Note: VSS=0V, VDD=5V ± 10%, Ta=-30~+85°C, Duty=50%



4-3 Power supply circuit diagram

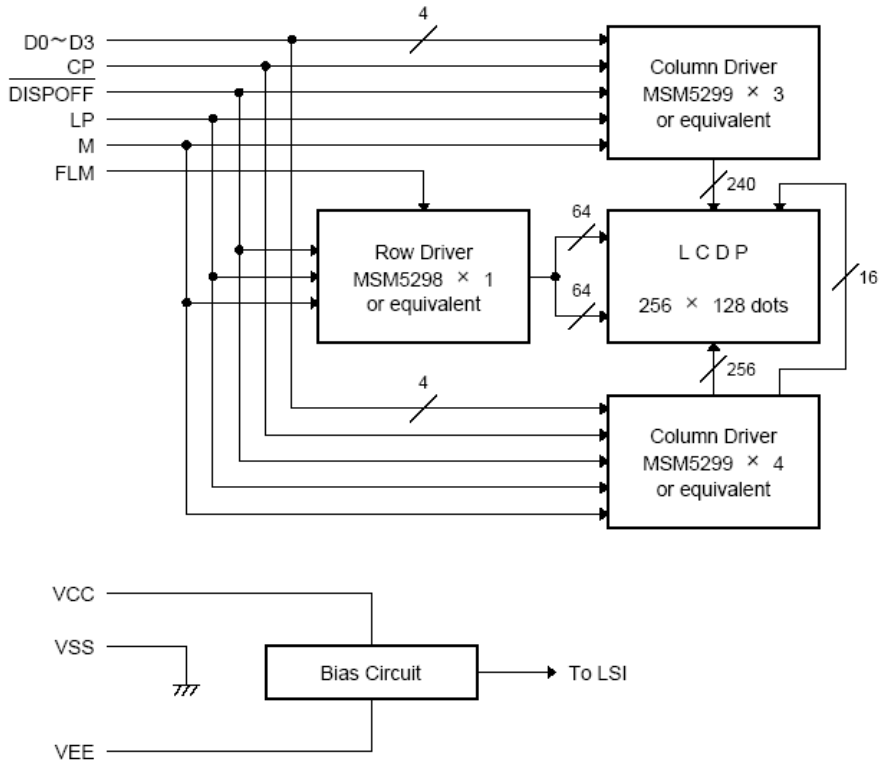


$R1+R2+VR=10\sim 20K\ \Omega$   
 $Tr=2SA1202$  or equivalent

\*VDD-V0: Liquid Crystal driving voltage

VR: 10K $\Omega$  ~20K $\Omega$

4-4 Block Diagram

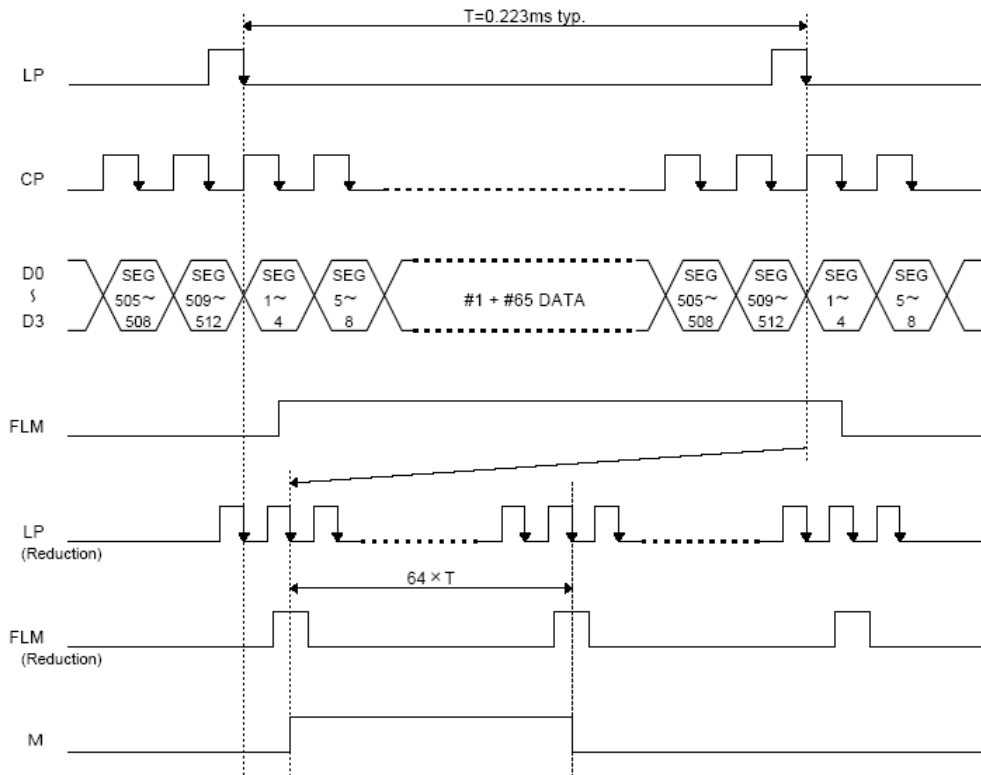


The LCD module needs two power sources:  $V_{CC}$  for logic and  $V_{ee}$  for LCD drive. (See also the above figure.)

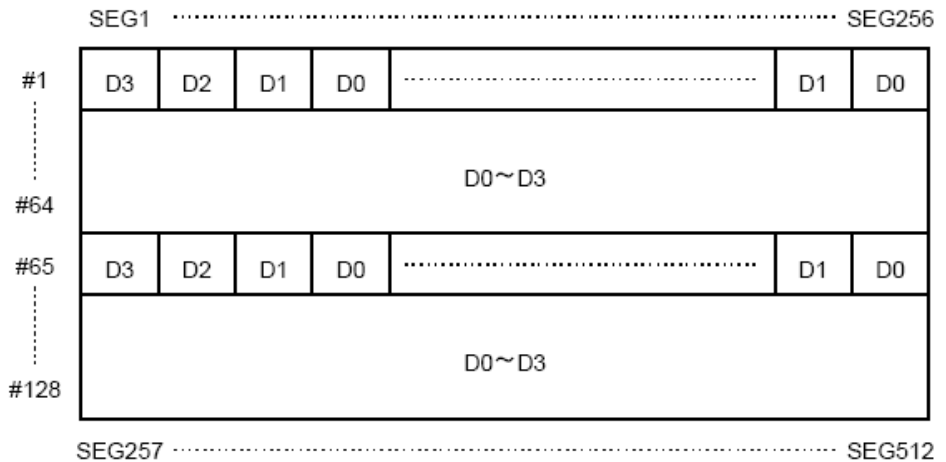
Note: It is necessary to guard all signals from external noise as signal lines are directly connected to CMOS and are not pull-up or pull-down internally.

## 5. PROGRAM

### 5-1 TIMING CHART



### 5-2 COMPARISON OF DISPLAY AND DATA





5-3 PROGRAM

;DISPLAY CONTENT:FILLA,FILLB

;D0-D3 TO P0.0-P0.3

DOFF	BIT	P3.3
LOAD	BIT	P3.4
FRAME	BIT	P3.5
DF	BIT	P3.6
CP	BIT	P3.7

FILL:

```

SETB  LOAD
CLR   LOAD
CLR   FRAME
MOV   R2,#32

```

COM:

```

MOV   R1,#64

```

SEG:

```

MOV   A,FILLA
MOV   P0,A
SETB  CP
CLR   CP
SWAP  A
MOV   P0,A
SETB  CP
CLR   CP
DJNZ  R1,SEG
SETB  LOAD
CLR   LOAD
MOV   R1,#64

```

SEG2:

```

MOV   A,FILLB
MOV   P0,A
SETB  CP
CLR   CP
SWAP  A
MOV   P0,A
SETB  CP
CLR   CP
DJNZ  R1,SEG2
SETB  LOAD

```

CLR LOAD  
 DJNZ R2,COM  
 CPL DF  
 DJNZ R3,FILL

## 6.Back Light

### Electrical Characteristics

Item	Symbol	min	Typ.	max	Unit	Note
Drive Voltage	Vdd	-	5.0	-	V	-
Current	Idd	-	120	160	mA	-
Surface Luminance	L	50	-	-	cd/m <sup>2</sup>	-
Average Life	TAL	-	50000	-	Hrs	-

## 7.Handling precautions

### 7-1 Mounting method

A panel of LCD module made by our company consists of two thin glass plates with polarizers that easily get damaged.

And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board (PCB), extreme care should be used when handling the LCD modules.

### 7-2 Cautions of LCD handling and cleaning

When cleaning the display surface, use soft cloth with solvent (recommended below) and wipe lightly.

- .. Isopropyl alcohol
- .. Ethyl alcohol
- .. Trichlorotrifluoroethane

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- .. Water
- .. Ketene
- .. Aromatics

### 7-3 Caution against static charge

The LCD module uses C-MOS LSI drivers. So we recommend you:

Connect any unused input terminal to V<sub>dd</sub> or V<sub>ss</sub>. Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

### 7-4 Packaging

- Module employs LCD elements, and must be treated as such. Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity.

7-5 Caution for operation

- It is an indispensable condition to drive LCD module within the limits of the specified voltage since the higher voltage over the limits may cause the shorter life of LCD module.

An electrochemical reaction due to DC (direct current) causes LCD undesirable deterioration so that the uses of DC (direct current) drive should be avoided.

- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD module may show dark color in them. However those phenomena do not mean malfunction or out of order of LCD module, which will come back in the specified operating temperature.

7-6 Storage

In the case of storing for a long period of time, the following ways are recommended:

- Storage in polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with not desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light is. Keeping the storage temperature range.
- Storing with no touch on polarizer surface by any thing else.

7-7 Safety

- It is recommendable to crash damaged or unnecessary LCD into pieces and to wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well at once with soap and water.

## 8. Precaution for use

- 8-1 Both parties should provide a limit sample on an occasion when both parties agree its necessity.

The judgement by a limit sample shall take effect after the limit sample has been established and confirmed by both parties

- 8-2 On the following occasions, the handling of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this manual.
- When a new problem is arisen which is not specified in this manual.
- Some problem is arisen due to the change of inspection and operating conditions in users.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.