HTM12864D

LCD Module User Manual

Shenzhen HOT Display Technology Co., Ltd.

Rev.	Descriptions	Date
01	Prelimiay Release	2008-12-09

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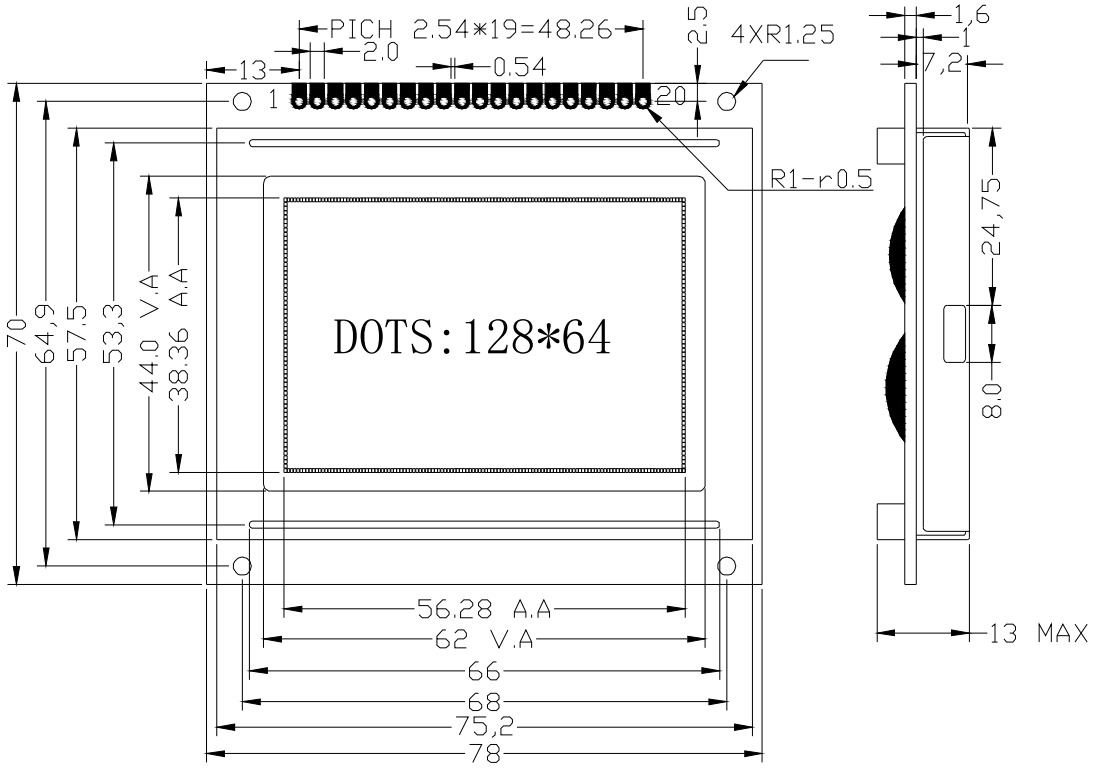
1. Basic Specifications

1.1 Display Specifications

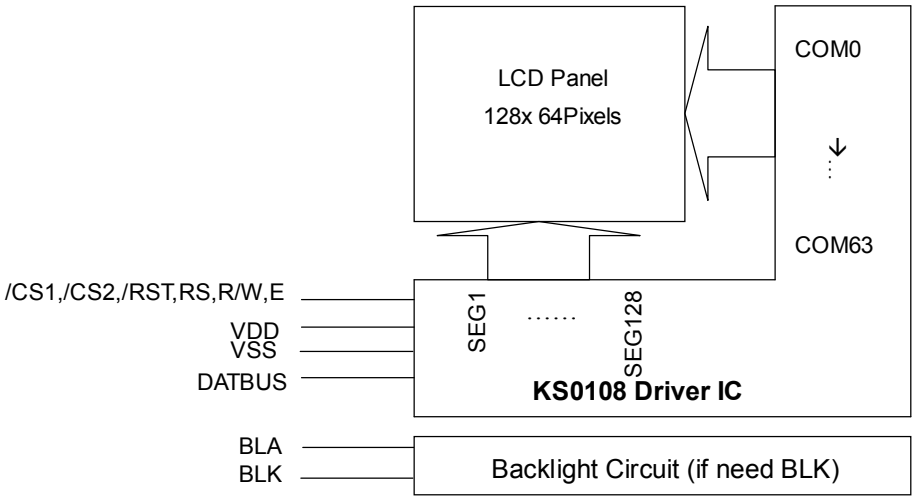
1>LCD Display Mode : STN, Positive, Yellow-Green,Transmissive
2>Viewing Angle : 6H
3>Driving Method : 1/64 Duty, 1/9 Bias
4 >Backlight : Yellow Green

1.2 Mechanical Specifications

1>Outline Dimension : 78.0X70.0 X13.0mm (See attached Outline Drawing for Deta)



1.3 Circuit Diagram



1.4 Terminal Function

Pin No.	Pin Name	Function
1	/CS1	Chip selection input 1
2	/CS2	Chip selection input 2
3	VSS	LCD Negtive(VSS)
4	VDD	LCD Positive(5.0V)
5	V0	LCD Adjust
6	RS	H:Data; L: Instruction
7~14	R/W	H:Read ; L: Write.
15	E	Enable signal.
16	D0~D7	Data Buss
17	REST	Reset Signal input
18	VEE	About(-12)V
19	BLA	Bcaklight Positive(5.0V)
20	BLK	Bcaklight Negtive(VSS)

2. Absolute Maximum Ratings

Characteristic	Symbol	Value	Unit	Note
Operating Voltage	V_{DD}	-0.3~+7.0	V	*1
Supply Voltage	V_{EE}	V_{DD}-19.0~V_{DD}+0.3	V	*4
Driver Supply Voltage	V_B	-0.3~V_{DD}+0.3	V	*1,3
	V_{LCD}	V_{EE}-0.3~V_{DD}+0.3	V	*2
Operating Temperature	T_{OPR}	-30~+85	℃	
Storage Temperature	T_{STG}	-55~+125	℃	

3. Electrical Characteristics

3.1 DC Characteristics

DC Characteristics(V_{DD}=4.5~5.5V, V_{SS}=0V, V_{DD}-V_{EE}=8~17V, T_a=-30~+85°C)

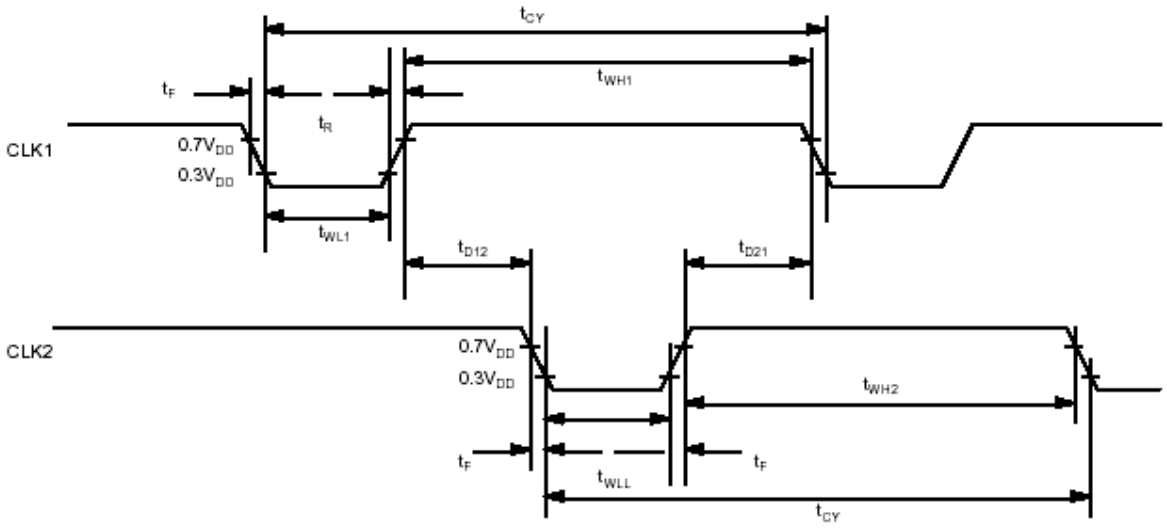
Characteristic	Symbol	Condition	Min	Typ	Max	Unit	Note
Input High Voltage	V_{IH1}	-	0.7V_{DD}	-	V_{DD}	V	*1
	V_{IH2}	-	2.0	-	V_{DD}	V	*2
Input Low Voltage	V_{IL1}	-	0	-	0.3V_{DD}	V	*1
	V_{IL2}	-	0	-	0.8	V	*2
Output High Voltage	V_{OH}	I_{OH}=-200μA	2.4	-	-	V	*3
Output Low Voltage	V_{OL}	I_{OL}=1.6mA	-	-	0.4	V	*3
Input Leakage Current	I_{LKG}	V_{IN}=V_{SS}~V_{DD}	-1.0	-	1.0	μA	*4
Three-state(OFF) Input Current	I_{TSL}	V_{IN}=V_{SS}~V_{DD}	-5.0	-	5.0	μA	*5
Driver Input Leakage Current	I_{DIL}	V_{IN}=V_{EE}~V_{DD}	-2.0	-	2.0	μA	*6
Operating Current	I_{DD1}	During Display	-	-	100	μA	*7
	I_{DD2}	During Access Access Cycle=1MHz	-	-	500	μA	*7
On Resistance	R_{ON}	V_{DD}-V_{EE}=15V ¡¾I_{LOAD}=0.1mA	-	-	7.5	KΩ	*8

*1. CL, FRM, M, RSTB, CLK1, CLK2
2. CS1B, CS2B, CS3, E, R/W, RS, DB0~DB7
3. DB0~DB7
4. Excepted DB0~DB7
5. DB0~DB7 at High Impedance
6. V0L(R), V2L(R), V3L(R), V5L(R)
7. 1/64 duty, FCLK=250KHZ, Frame Frequency=70HZ, Output: No Load
8. V_{DD}~V_{EE}=15.5V
   V0L(R)>V2L(R)=V_{DD}-2/7 (V_{DD}-V_{EE})>V3L(R)=V_{EE}+2/7(V_{DD}-V_{EE})>V5L(R)

3.2 AC Characteristics

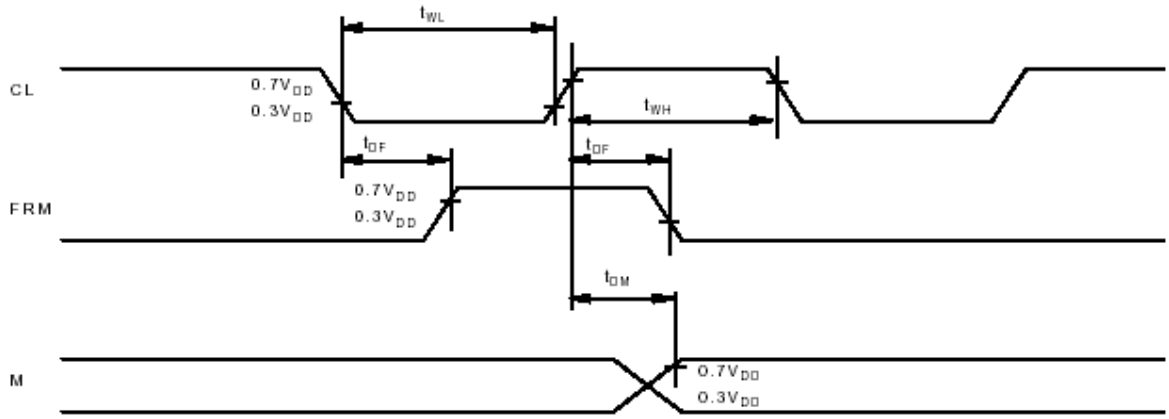
(1) Clock Timing

Characteristic	Symbol	Min	Typ	Max	Unit
CLK1, CLK2 Cycle Time	t_{CY}	2.5	-	20	us
CLK1 'LOW' Level Width	t_{WL1}	625	-	-	ns
CLK2 'LOW' Level Width	t_{WL2}	625	-	-	
CLK1 'HIGH' Level Width	t_{WH1}	1875	-	-	
CLK2 'HIGH' Level Width	t_{WH2}	1875	-	-	
CLK1-CLK2 Phase Difference	t_{D12}	625	-	-	
CLK2-CLK1 Phase Difference	t_{D21}	625	-	-	
CLK1, CLK2 Rise Time	t_R	-	-	150	
CLK1, CLK2 Fall Time	t_F	-	-	150	



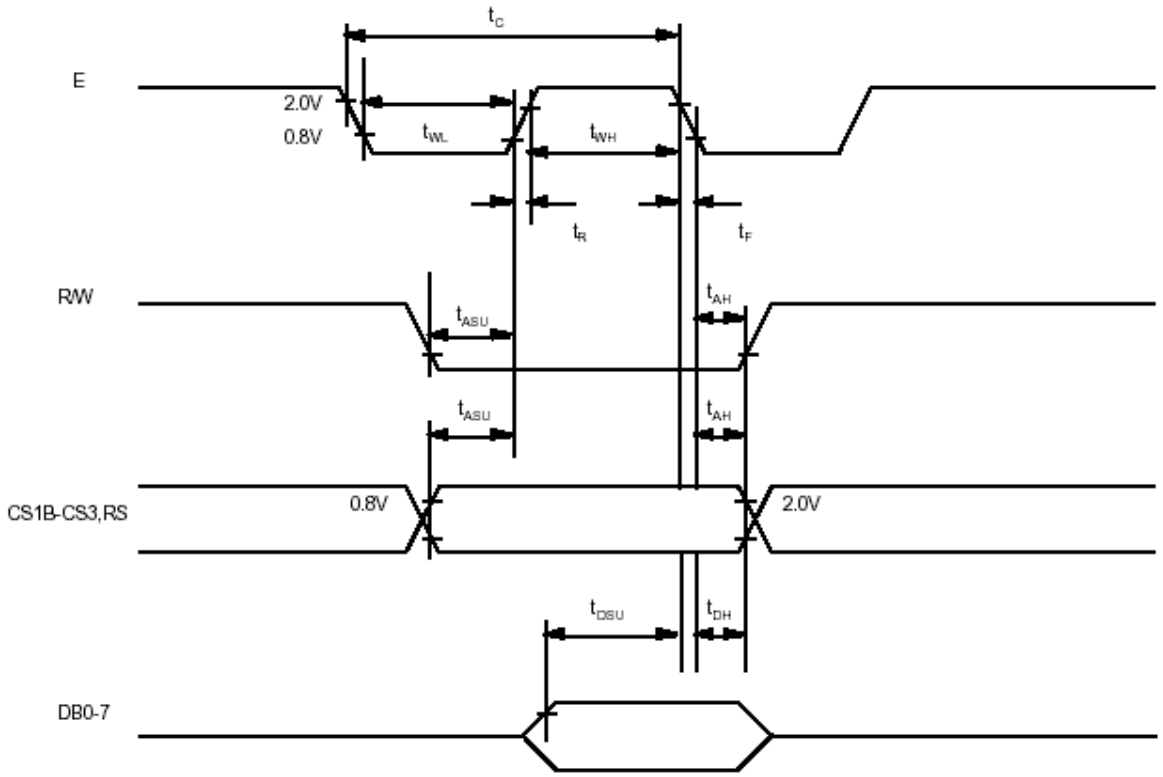
(2) Display Control Timing

Characteristic	Symbol	Min	Typ	Max	Unit
FRM Delay Time	t_{DF}	-2	-	+2	us
M Delay Time	t_{DM}	-2	-	+2	us
CL 'LOW' Level Width	t_{WL}	35	-	-	us
CL 'HIGH' Level Width	t_{WH}	35	-	-	us

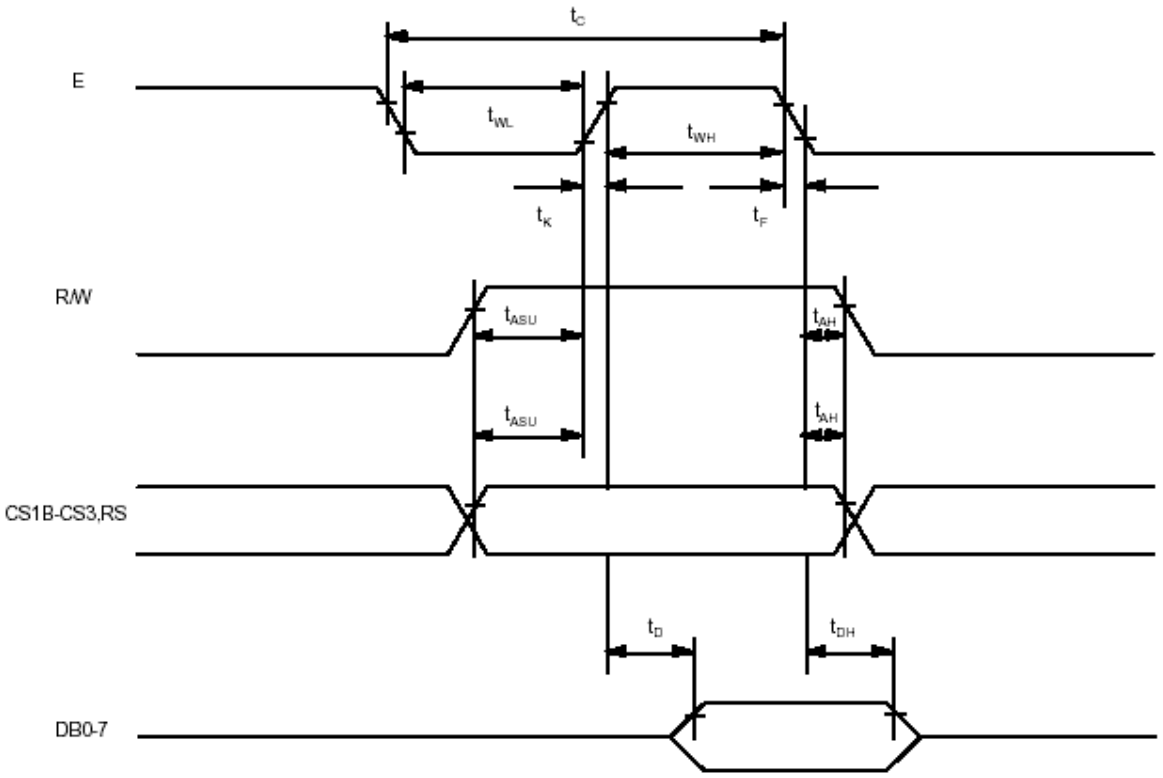


(3) MPU Interface

Chatacteristic	Symbol	Min	Typ	Max	Unit
E Cycle	t_C	1000	-	-	ns
E High Level Width	t_{WH}	450	-	-	ns
E Low Level Width	t_{WL}	450	-	-	ns
E Rise Time	t_R	-	-	25	ns
E Fall Time	t_F	-	-	25	ns
Address Set-Up Time	t_{ASU}	140	-	-	ns
Address Hold Time	t_{AH}	10	-	-	ns
Data Set-Up Time	t_{SU}	200	-	-	ns
Data Delay Time	t_D	-	-	320	ns
Data Hold Time (Write)	t_{DHW}	10	-	-	ns
Data Hold Time (Read)	t_{DHR}	20	-	-	ns



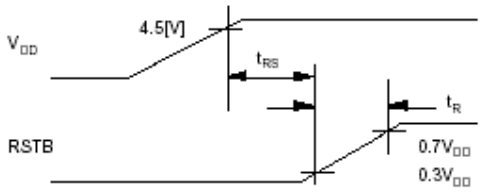
MPU write timing



MPU read timing

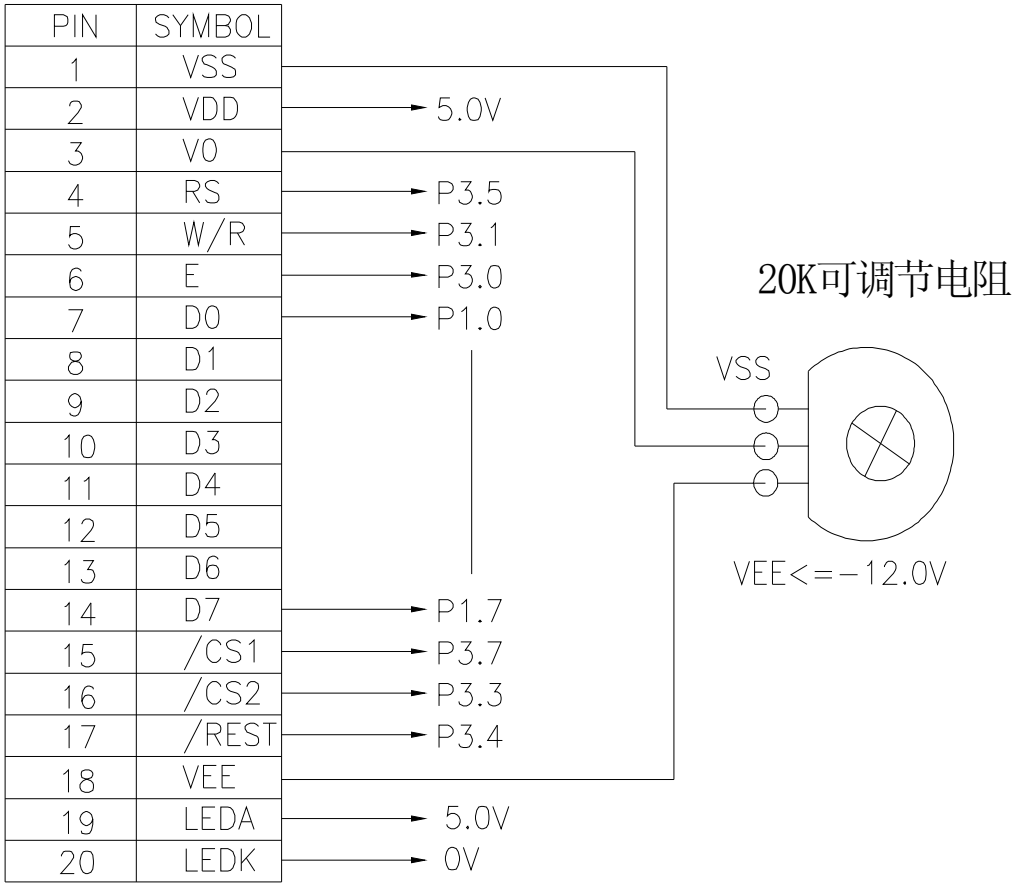
3.3 **Rest Timing**

Item	Symbol	Min	Typ	Max	Unit
Reset Time	t_{RS}	1.0	-	-	us
Rise Time	t_R	-	-	200	ns



4. Function specifications

4.1 The Parallel Interface



4.2 Display Commands

The display control instructions control the internal state of the KS0108B. Instruction is received from MPU to KS0108B for the display control. The following table shows various instructions.

Instruction	RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0	Function
Display ON/OFF	L	L	L	L	H	H	H	H	H	L/H	Controls the display on or off. Internal status and display RAM data is not affected. L:OFF, H:ON
Set Address	L	L	L	H	Y address (0~63)						Sets the Y address in the Y address counter.
Set Page (X address)	L	L	H	L	H	H	H	Page (0~7)			Sets the X address at the X address register.
Display Start Line	L	L	H	H	Display start line (0~63)						Indicates the display data RAM displayed at the top of the screen.
Status Read	L	H	BUSY	L	ON/OFF	RESET	L	L	L	L	Read status. BUSY L: Ready H: In operation ON/OFF L: Display ON H: Display OFF RESET L: Normal H: Reset
Write Display Data	H	L	Write Data								Writes data (DB0:7) into display data RAM. After writing intruction, Y address is increased by 1 automatically.
Read Display Data	H	H	Read Data								Reads data (DB0:7) from display data RAM to the data bus.

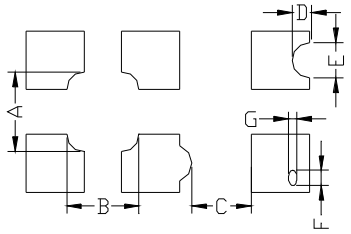
```
WRITE_COMMAND:      //Write Command To CS1、CS2 。6800 模式送数据
SETB    CS1    //片选 H 有效果，可同时向两可驱动 IC 送指令时，要分开送数据
SETB    CS2
CLR     RS   //RS 为 H 时送指令，为 L 时送数据
CLR     R/W    //L 为写，H 为读
MOV     P1,A
SETB    E
NOP
CLR     E
RET
```

4.3 Basic Operating Sequence

Initialization Sequence

	Code Function										Note
	A0	D7	D6	D5	D4	D3	D2	D1	D0	hex	
Turn on Power Supply VDD & VSS While maintaining /RES at LOW	-	-	-	-	-	-	-	-	-	-	-
Wait until power supply is stabilized	-	-	-	-	-	-	-	-	-	-	-
Release the /RES Reset Signal (/RES = High)	-	-	-	-	-	-	-	-	-	-	
START LINE	0	1	1	0	0	0	0	0	0	C0H	Sets the X address at the X address register.
DISPLAY ON	0	0	0	1	1	1	1	1	1	3FH	
SET PAGE	0	1	0	1	1	8	0	0	0	B8H	Sets the X address at the X address register.
SET ADDRESS	0	0	1	0	0	0	0	0	0	40H	Sets the Y address in the Y address counter.
WRITE DATA	1	X	X	X	X	X	X	X	X	XXH	DISPLAY DATA

5. Inspection Standards

Item	Criterion for defects	Defect type
1) Display on inspection	(1) Non display (2) Vertical line is deficient (3) Horizontal line is deficient (4) Cross line is deficient	Major
2) Black / White spot	Size Φ(mm) Acceptable number Φ≤0.3 Ignore (note) 0.3<Φ≤0.45 3 0.45<Φ≤0.6 1 0.6<Φ 0	Minor
3) Black / White line	Length (mm) Width (mm) Acceptable number L≤10 W≤0.03 Ignore 5.0≤L≤10 0.03<W≤0.04 3 5.0≤L≤10 0.04<W≤0.05 2 1.0≤L≤10 0.05<W≤0.06 2 1.0≤L≤10 0.06<W≤0.08 1 L≤10 0.08<W follows 2) point defect Defects separate with each other at an interval of more than 20mm	Minor
4) Display pattern	 $\frac{A+B}{2} \leq 0.28$ 0<C $\frac{D+E}{2} \leq 0.25$ $\frac{F+G}{2} \leq 0.25$ Note: 1) Up to 3 damages acceptable 2) Not allowed if there are two or more pinholes every three-fourth inch.	Minor
5) Spot-like contrast irregularity	Size Φ(mm) Acceptable Number Φ≤0.7 Ignore (note) 0.7<Φ≤1.0 3 1.0<Φ≤1.5 1 1.5<Φ 0 Note: 1) Conformed to limit samples. 2) Intervals of defects are more than 30mm.	Minor
6) Bubbles in polarizer	Size Φ(mm) Acceptable Number Φ≤0.4 Ignore (note) 0.4<Φ≤0.65 2 0.65<Φ≤1.2 1 1.2<Φ 0	Minor
7) Scratches and dent on the polarizer	Scratches and dent on the polarizer shall be in the accordance with "2) Black/white spot", and "3) Black/White line".	Minor
8) Stains on the surface of LCD panel	Stains which cannot be removed even when wiped lightly with a soft cloth or similar cleaning.	Minor
9) Rainbow color	No rainbow color is allowed in the optimum contrast on state within the active area.	Minor
10) Viewing area encroachment	Polarizer edge or line is visible in the opening viewing area due to polarizer shortness or sealing line.	Minor
11) Bezel appearance	Rust and deep damages that are visible in the bezel are rejected.	Minor
12) Defect of land surface contact	Evident crevices that are visible are rejected.	Minor
13) Parts mounting	(1) Failure to mount parts (2) Parts not in the specifications are mounted (3) For example: Polarity is reversed, HSC or TCP falls off.	Minor
14) Part alignment	(1) LSI, IC lead width is more than 50% beyond pad outline. (2) More than 50% of LSI, IC leads is off the pad outline.	Minor
15) Conductive foreign matter (solder ball, solder hips)	(1) 0.45<Φ, N≥1 (2) 0.3<Φ≤0.45, N≥1, Φ: Average diameter of solder ball (unit: mm) (3) 0.5<L, N≥1, L: Average length of solder chip (unit: mm)	Minor
16) Bezel flaw	Bezel claw missing or not bent	Minor
17) Indication on name plate (sampling indication label)	(1) Failure to stamp or label error, or not legible.(all acceptable if legible) (2) The separation is more than 1/3 for indication discoloration, in which the characters can be checked.	Minor

6. Handling Precautions

6.1 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 in 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.

6.2 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
-Trichlorotriflorothane
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

6.3 Caution against static charge

The LCD module use C-MOS LSI drivers. So we recommend you:
Connect any unused input terminal to V_{dd} or V_{ss}. Do not input any signals before power is turned on, and ground your body, work/assembly areas, assembly equipment to protect against static electricity.

6.4 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.

6.5 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.

6.6 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.

6.7 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.