SPECIFICATION

MODULE NO	G128641-KBW-VA10
VERSION	A
CUSTOMER	
APPROVE by	

Sale by	Check by	Prepare by
工程部 2012.07.13 Emily	工程部 2012.07.13 Emma	工程部 2012.07.13 Gigi

INDEX

ISSUE RECORD

NO.	VER.	DATE	MODIFY REASON	MODIFY CONTENTS
1	A	2012/07/13	New issued	

1. Precaution in use of LCD Module

(1) Avoid applying excessive shocks to the module or making any alterations or modifications to it.
(2) Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD module.
(3) Don't disassemble the LCM.
(4) Don't operate it above the absolute maximum rating.
(5) Don't drop, bend or twist LCM.
(6) Soldering: only to the I/O terminals.
(7) Storage: please storage in anti-static electricity container and clean environment.
(8) Don't touch the elastomer connecter, especially insert a backlight panel (EL or CCFL)

2. General Specification

2.1 Mechanical Dimension

Item	Dimension	Unit
Number of Dots	128 x 64	dots
Module dimension (L x W x H)	93.0 x 70.0 x 13.6(MAX)-LED B/L	mm
View area	72.0 x 40.0	mm
Active area	66.52 x 33.24	mm
Dot size	0.48x 0.48	mm
Dot pitch	0.52 x 0.52	mm
LCD TYPE	STN BLUE	
Viewing Direction	6H	
Backlight	LED WHITE	
Controller IC	SBN6400G/SBN0064G controller	

3. Electrical Characteristics

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Logic	Vdd-Vss	—	4.5	—	5.5	V
Supply Voltage For LCD	Vdd-Vo	Ta=-20℃ Ta=25℃ Ta=+70℃	— — —	8.6	— — —	V V V
Input High Volt.	V_{IH}	—	0.7Vdd	—	Vdd	V
Input Low Volt.	V_{IL}	—	0	—	0.3Vdd	V
Output High Volt.	V_{OH}	—	2.4	—	—	V
Output Low Volt.	V_{OL}	—	0	—	0.4	V
Supply Current	Idd	Vdd=5V	—	4	—	mA

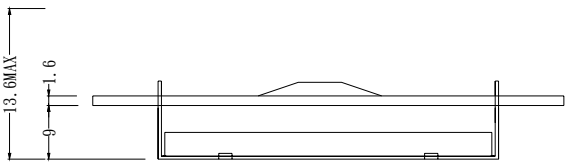
3.1 Electrical Absolute Maximum Ratings

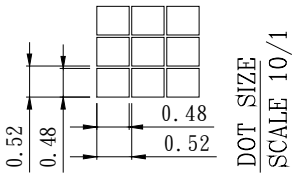
(Vss=0V, Ta=25℃)

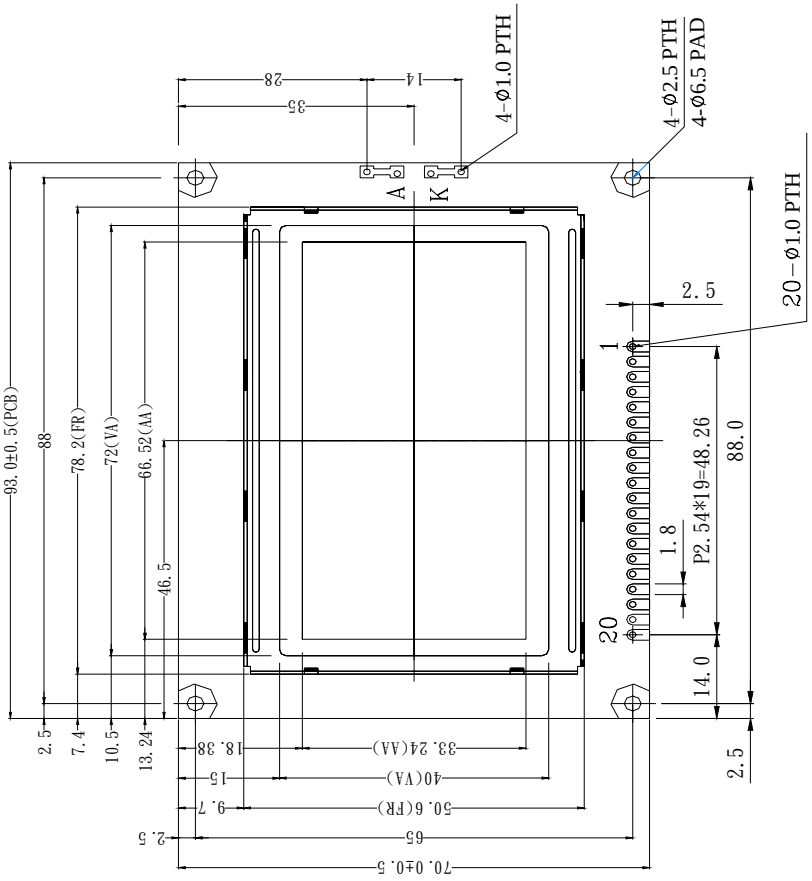
Item		Symbol	Min	Max	Unit
Supply Voltage (Logic)		Vdd- Vss	-0.3	6.7	V
Supply Voltage(LCD driver)		Vdd-Vo	-0.3	13.0	V
Input Voltage		VI	Vss	Vdd	V
Normal Temp. Type	Operation Temp.	TOP	0	50	℃
	Storage Temp.	TSTG	-10	60	℃
Wide Temp. Type	Operation Temp.	TOP	-20	70	℃
	Storage Temp.	TSTG	-30	80	℃

4. Dimensional Outlines

PIN NO.	SYMBOL
1	Vss
2	Vdd
3	Vo
4	D/I
5	R/$\overline{W}$
6	E
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	CS1
16	CS2
17	$\overline{RES}$
18	Vout
19	A
20	K







The tolerance of non-specified dimension is ±0.3mm.

			UNIT:	mm	
			SCALE:	1/1	
APPROVE			MODEL	G128641	A1
CHECK			TITLE	LCM DRAWING	
DRAW	Alex	2008/02/11	DWG NO.	LCM-070203-A1	

5. Interface Description

Pin No.	Symbol	Level	Description
1	Vss	0V	Ground
2	Vdd	5.0V	Supply voltage for logic (option +3V)
3	V_O	(Variable)	Operating voltage for LCD
4	D/I	H/L	H: Data , L: Instruction
5	R/W	H/L	H: Read(MPU←Module) , L :Write(MPU→Module)
6	E	H	Enable signal
7	DB0	H/L	Data bus line
8	DB1	H/L	Data bus line
9	DB2	H/L	Data bus line
10	DB3	H/L	Data bus line
11	DB4	H/L	Data bus line
12	DB5	H/L	Data bus line
13	DB6	H/L	Data bus line
14	DB7	H/L	Data bus line
15	CS1	H/L	Chip Select for IC1
16	CS2	H/L	Chip Select for IC2
17	/RST	L	Reset signal
18	Vee		Negative Voltage output –4.8V
19	A	—	Power supply for B/L (+)
20	K	—	Power supply for B/L (GND)

6. Backlight Information

6. 1 Specification

- LED edge white

Parameter	Symbol	Min	Typical	Max	Unit	Test Condition
Supply Current	ILED	—	60	—	mA	V_{LED}=3.0V
Supply Voltage	V		3.0	3.2	V	—
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity	IV	60	—	—	cd/m^2	ILED=60mA
Chromaticity	X	—	0.30	—		ILED=60mA
	Y		0.31			
Life Time	—	—	20,000	—	Hr.	V≦3.2V
Color	white					

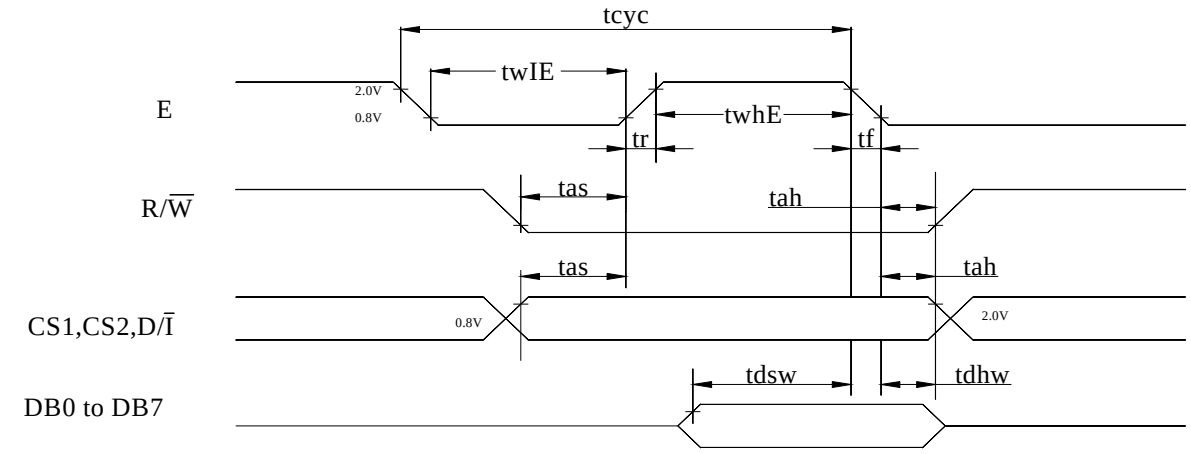
6.2 Backlight driving methods

LED B/L drive from pin19 (LED+) pin20 (LED-) 5.0V 點亮

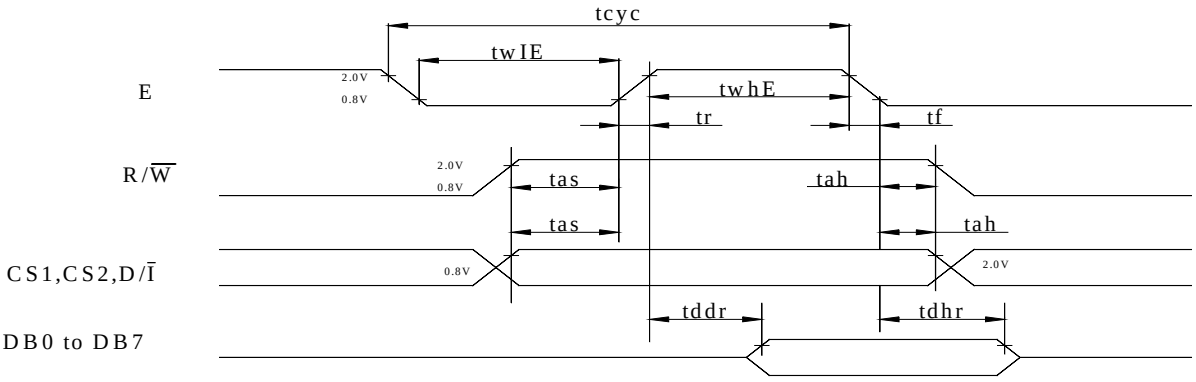
7.Timing Characteristics

MPU Interface (T=25℃, VDD=+5.0V±0.5)

Characteristic	Symbol	Min	Typ	Max	Unit
E cycle	tcyc	1000	—	—	ns
E high level width	twhE	450	—	—	ns
E low level width	twlE	450	—	—	ns
E rise time	tr	—	—	25	ns
E tall time	tf	—	—	25	ns
Address set-up time	tas	140	—	—	ns
Address hold time	tah	10	—	—	ns
Data set-up time	tdsw	200	—	—	ns
Data delay time	tddr	—	—	320	ns
Data hold time (write)	tdhw	10	—	—	ns
Data hold time (read)	tdhr	20	—	—	ns



MPU Write Timing



MPU Read Timing

8.SBN0064G controller data

The display control instructions control the internal state of the SBN0064G. Instruction is received from MPU to SBN0064G for the display control. The following table shows various instructions.

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

8.1 Detailed Explanation

Display On/Off

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	1	1	1	1	D

The display data appears when D is and disappears when D is 0. Though the data is not on the screen with D = 0, it remains in the display data RAM. Therefore, you can make it appear by changing D = 0 into D = 1.

Display Start Line

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	1	A	A	A	A	A	A

Z address AAAAAA (binary) of the display data RAM is set in the display start line register and displayed at the top of the screen. Figure 2. shows examples of display (1/64 duty cycle) when the start line = 0-3. When the display duty cycle is 1/64 or more (ex. 1/32, 1/24 etc.), the data of total line number of LCD screen, from the line specified by display start line

Set Page (X Address)

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	1	0	1	1	1	A	A	A

X address AAA (binary) of the display data RAM is set in the X address register.After that, writing or reading to or from MPU is executed in this specified page until the next page is set. See Figure 1.

Set Y Address

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	1	A	A	A	A	A	A

Y address AAAAAA (binary) of the display data RAM is set in the Y address counter. After that, Y address counter is increased by 1 every time the data is written or read to or from MPU.

Status Read

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	Busy	0	On/Off	RESET	0	0	0	0

∅ •Busy

When busy is 1, the LSI is executing internal operations. No instruction are accepted while busy is 1, so you should make sure that busy is 0 before writing the next instruction.

∅ •ON/OFF

Shows the liquid crystal display condition: on condition or off condition.

When on/off is 1, the display is in off condition.

When on/off is 0, the display is in on condition.

∅ •RESET

RESET = 1 shows that the system system is being initialized. In this condition, no instructions except status read can be accepted.

RESET = 0 shows that initializing has system is in the usual operation condition.

Write Display Data

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	D	D	D	D	D	D	D	D

Writes 8-bit data DDDDDDDD (binary) into the display data RAM. The Y address is increased by 1 automatically.

Read Display Data

R/W	D/I	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	D	D	D	D	1	D	D	D

Reads out 8-bit data DDDDDDDD (binary) from the display data RAM. Then Y address is increased by 1 automatically.

One dummy read is necessary right after the address setting. For details, refer to the explanation of output register in “Function of Each Block”.

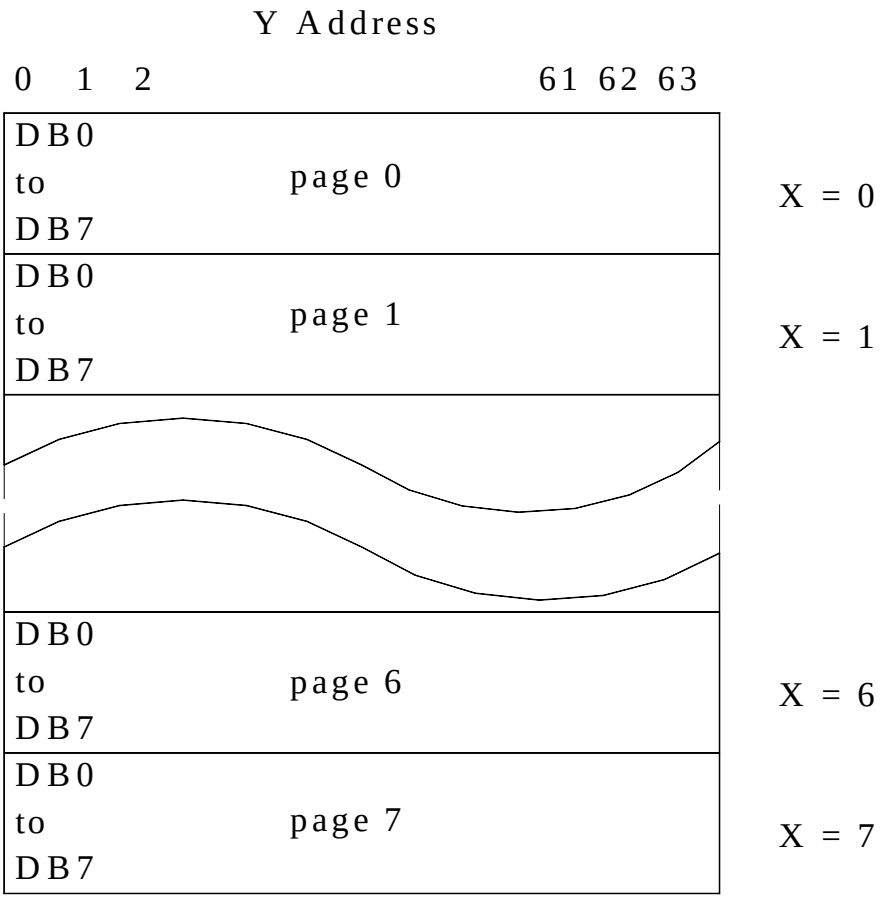
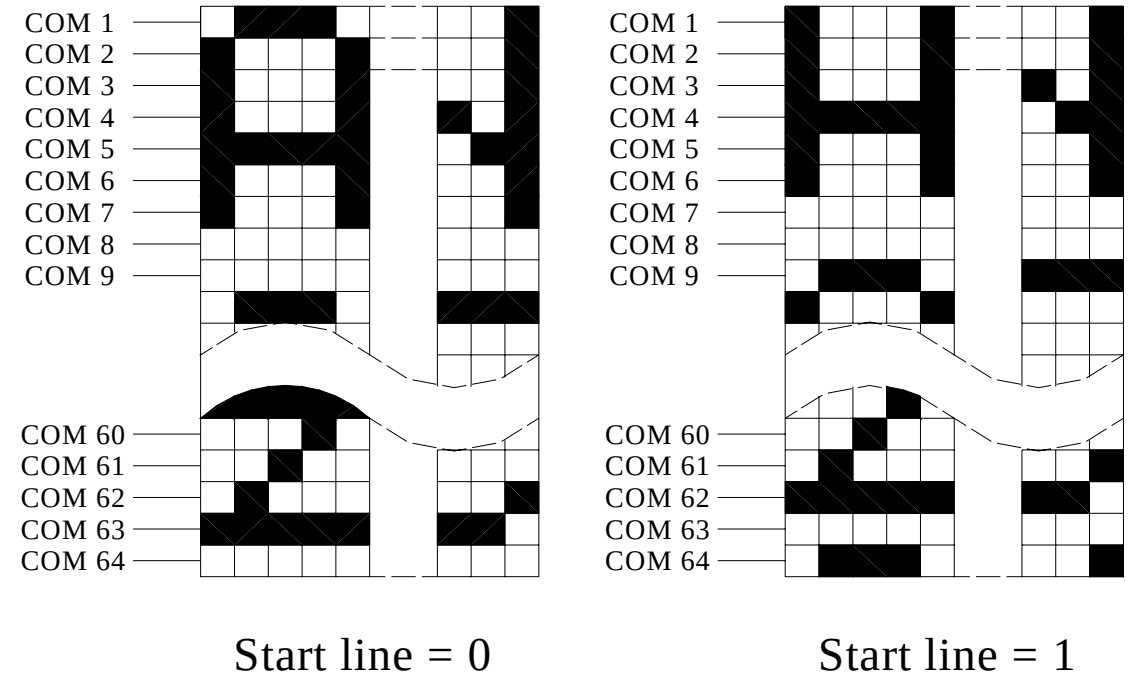


Figure 1.


COM 1
COM 2
COM 3
COM 4
COM 5
COM 6
COM 7
COM 8
COM 9
COM 60
COM 61
COM 62
COM 63
COM 64
Start line = 0
COM 1
COM 2
COM 3
COM 4
COM 5
COM 6
COM 7
COM 8
COM 9
COM 60
COM 61
COM 62
COM 63
COM 64
Start line = 1

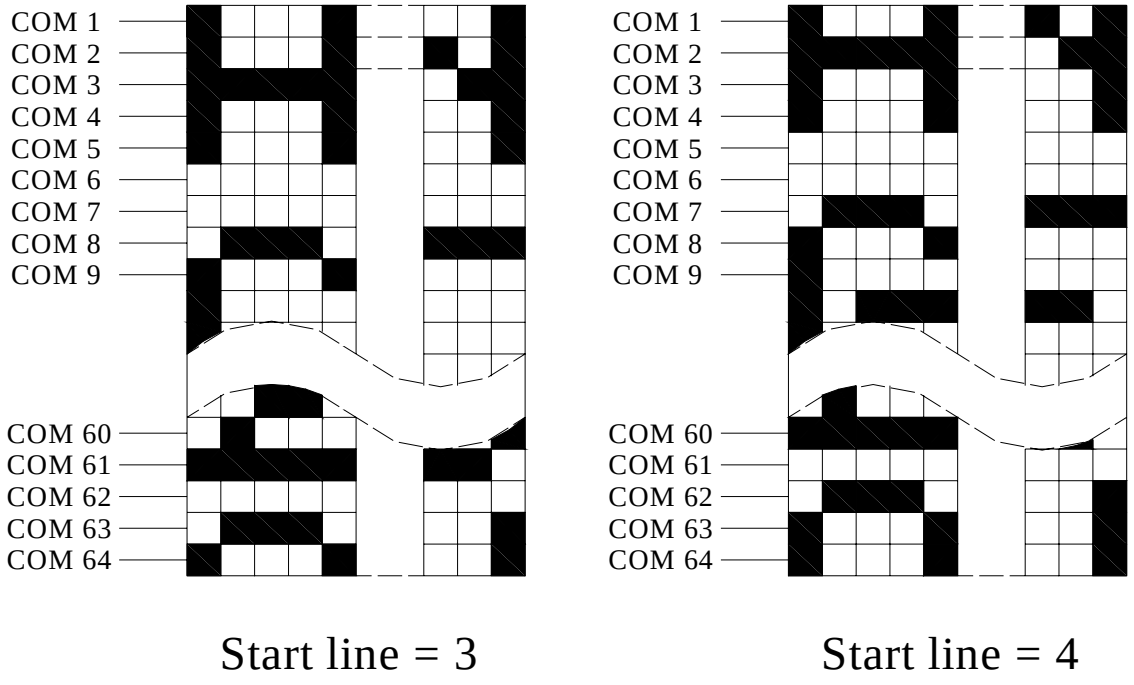

COM 1
COM 2
COM 3
COM 4
COM 5
COM 6
COM 7
COM 8
COM 9
COM 60
COM 61
COM 62
COM 63
COM 64
Start line = 3
COM 1
COM 2
COM 3
COM 4
COM 5
COM 6
COM 7
COM 8
COM 9
COM 60
COM 61
COM 62
COM 63
COM 64
Start line = 4

Figure 2

9. Optical Characteristics

9.1 OPTICAL CHARACTERISTICS

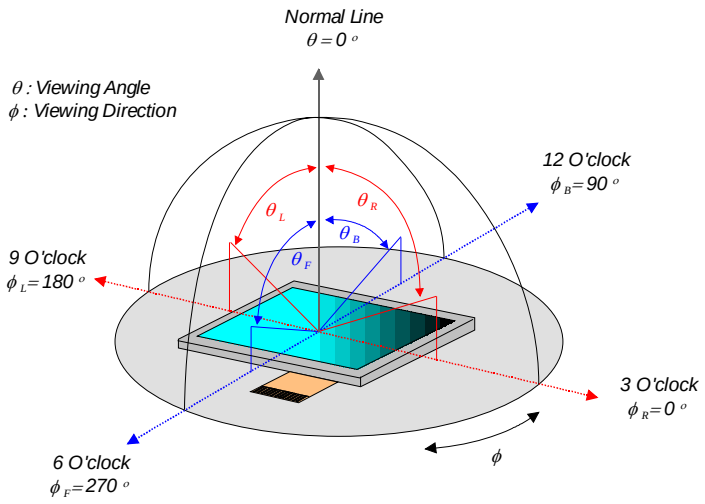
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
View Angle	(V) θ	CR≧2	10		45	deg
	(H) φ	CR≧2	-30		30	deg
Contrast Ratio	CR	—	2			—
Response Time 25℃	T rise	—		150	250	ms
	T fall	—		180	250	ms

Conditions :

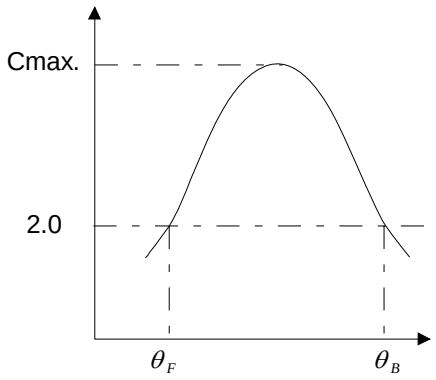
Operating Voltage : Vop　　Viewing Angle(θ ， φ) : 0°， 0°

Frame Frequency : 64 HZ　　Driving Waveform : 1/N duty , 1/a bias

9.2 Definition of Viewing Angle and Optimum Viewing Area



9.3 Definition of Viewing Angle θ_F and θ_B

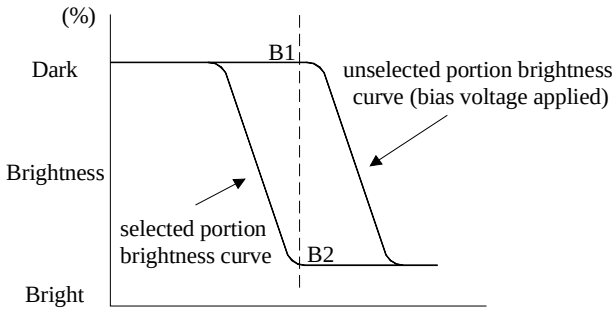


Viewing angles θ (ϕ fixed)

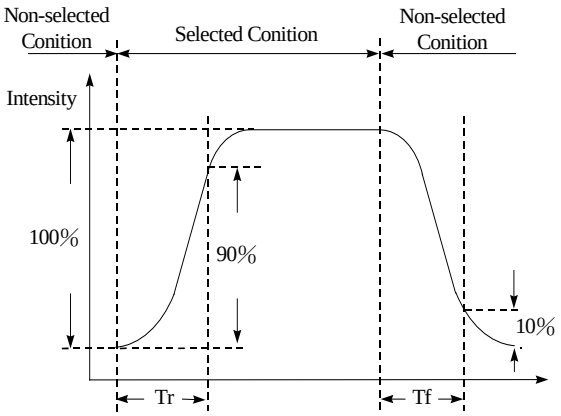
Optimum viewing angle with the naked eye and viewing angle θ at Cmax. Above are not always the same.

9.4 Definition of Contrast CR

CR= Brightness of selected dot (B1)/ Brightness of unselected dot (B2)

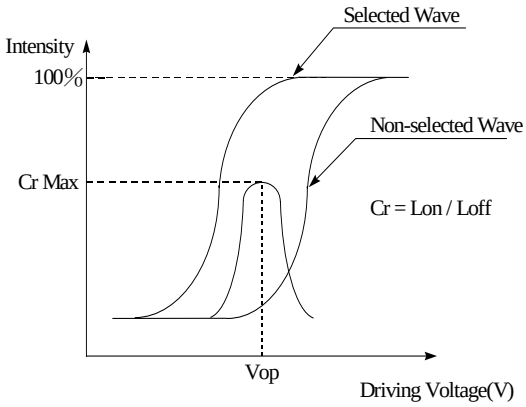


9.5 Definition of Response Time (Tr , Tf)



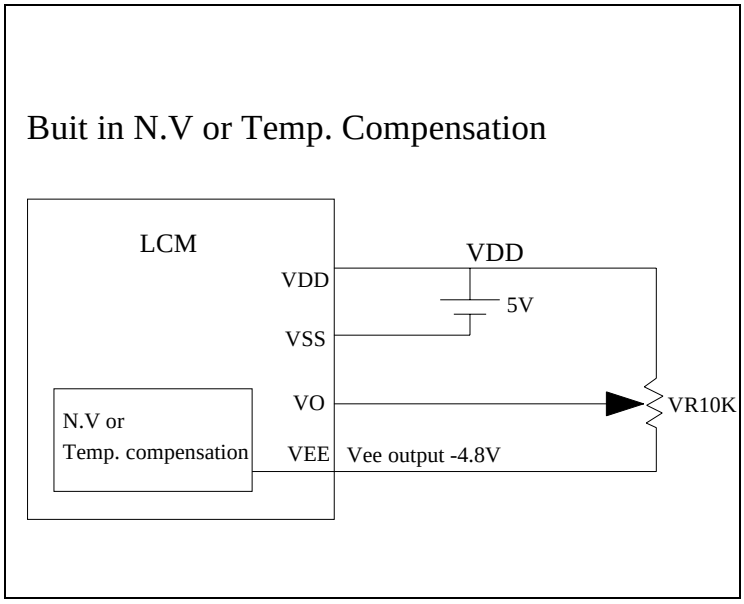
[Negative type]

9.6 Definition of Operation Voltage (Vop)



[Negative type]

10. Power Supply for LCD Module and LCD Operating Voltage Adjustment



11. Reliability

■Content of Reliability Test

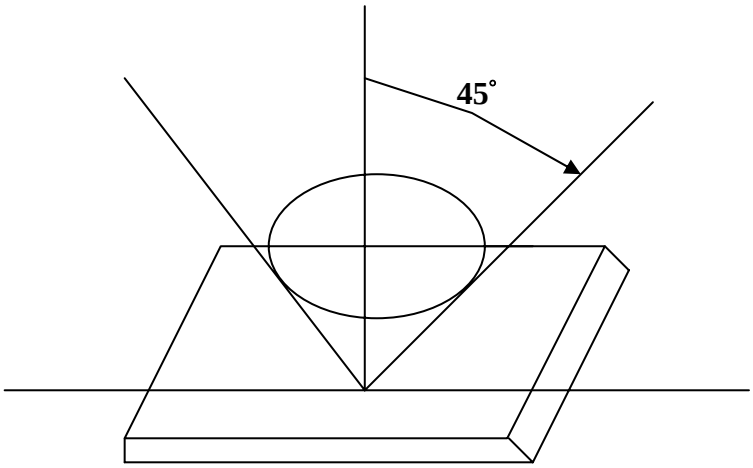
Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 96hrs	——
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 96hrs	——
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 96hrs	——
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 96hrs	——
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	70℃,90%RH 96hrs	——
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	40℃,90%RH 96hrs	——
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. -30℃ 25℃ 80℃ 30min 5min 30min 1 cycle	-30℃/80℃ 5 cycles	——
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency :10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	——
Others				
9	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃

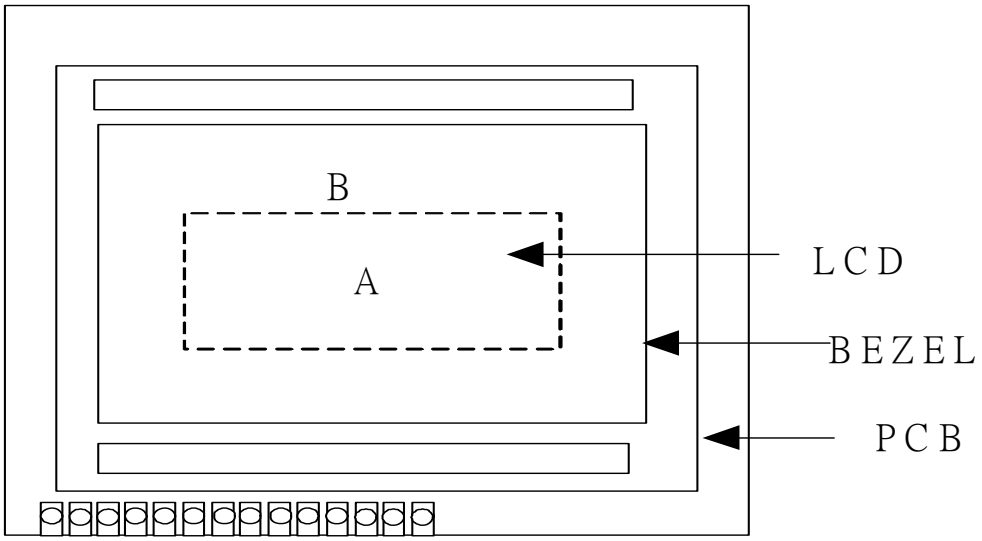
12. Quality Assurance

12.1 Inspection conditions

The LCD shall be inspected under 40W white fluorescent light. The distance between the eyes and the sample shall be more than 30cm. All directions for inspecting the sample should be within 45° against perpendicular line.



Definition of applicable Zones

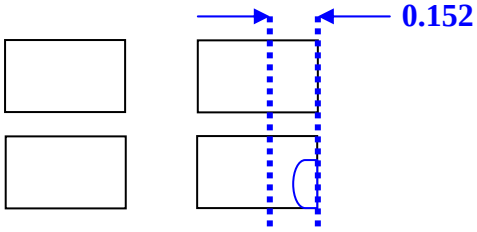
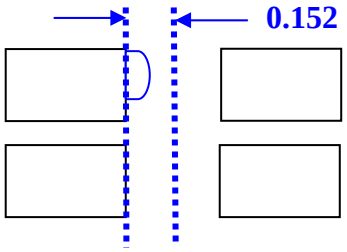
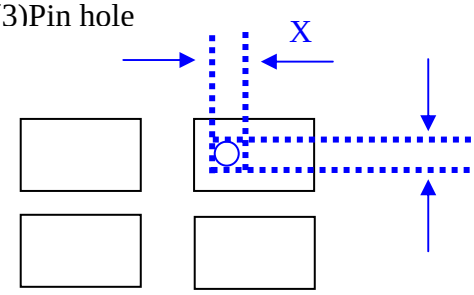
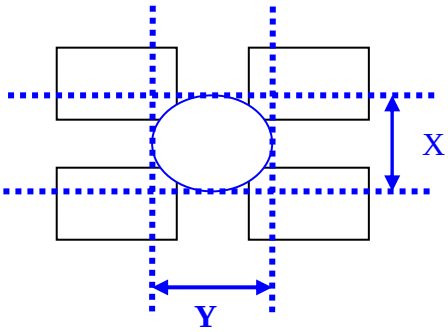


A : Display Area

B : Non-Display Area

12.2 Inspection Parameters

<table>
<tr><th>NO.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td>1</td><td>Black or White spots</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension</th><th colspan="2">Acceptable Number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">Acceptable Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D＜0.15</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>0.15≦D≦0.2</td><td>4</td><td>4</td></tr>
<tr><td>0.2≦D≦0.25</td><td>2</td><td>2</td></tr>
<tr><td>D≦0.3</td><td>0</td><td>1</td></tr>
</table>
D=(Long + Short)/2 *: Disregard
</td></tr>
<tr><td>2</td><td>Scratch, Substances</td><td>
<table>
<tr><th colspan="2">Zone
X(mm) Y(mm)</th><th colspan="2">Acceptable Number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">Acceptable Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>*</td><td>0.04≧ W</td><td>*</td><td>*</td><td rowspan="4">Minor</td><td rowspan="4">2.5</td></tr>
<tr><td>3.0≧ L</td><td>0.06≧ W</td><td>4</td><td>4</td></tr>
<tr><td>2.0≧ L</td><td>0.08≧ W</td><td>2</td><td>3</td></tr>
<tr><td>—</td><td>0.1＜W</td><td>0</td><td>1</td></tr>
</table>
X: Length Y: Width *: Disregard
Total defects should not exceed 4/module
</td></tr>
<tr><td>3</td><td>Air Bubbles
(between glass & polarizer)</td><td>
<table>
<tr><th rowspan="2">Zone
Dimension</th><th colspan="2">Acceptable Number</th><th rowspan="2">Class Of Defects</th><th rowspan="2">Acceptable Level</th></tr>
<tr><th>A</th><th>B</th></tr>
<tr><td>D≦0.15</td><td>*</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">2.5</td></tr>
<tr><td>0.15＜D≦0.25</td><td>2</td><td>*</td></tr>
<tr><td>0.25＜D</td><td>0</td><td>1</td></tr>
</table>
*: Disregard
Total defects shall not excess 3/module.
</td></tr>
</table>

4.	Uniformity	(1)Pixel shape (with Dent)  (2)Pixel shape (with Projection)  (3)Pin hole  (X +Y)/2≦0.02mm (Less than 0.1mm is No counted) (4) Deformation  (X + Y)/2≦0.3mm Total acceptable number: 1/pixel ;.5/cell

13.Numbering system

G	12864	1 -	K	B	W	- VA	10
②	③	④	⑤	⑥	⑦	⑧	⑨

2. Display Type

C	Character Type
G	Graphic Type
O	COG
S	Segment Type

3. Number of Pixels

Character Module	Characters per line × Lines
Graphic Module	Row Dots × Column Dots

4. Series number

1-9	Series Number

5 LCD Polarize

	Normal Temperature		Wide Temperature	
	6:00	12:00	6:00	12:00
Reflective	A	B	C	D
Transflective	E	F	G	H
Transmissive	I	J	K	L

6 LCD Mode:

	TN	STN		FSTN	DFSTN
Positive	P	G	Gray	F	
		Y	Yellow/Green		
Negative	N	B	Blue	W	D

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7. Backlight

None	N	None
EL	I	White
	U	Blue Green
LED	A	Amber
	B	Blue
	E	Yellow/Green, edge
	G	Green
	R	Red
	W	White
	Y	Yellow/Green
CCFL	C	White

8. IC font Character

Cyrillic/English	CC
Japanese/English	JC
European/English	RC , EC

8. Graphic

X	Without Negative Voltage
V	Negative Voltage
T	Temperature Compensation
B	Chinese BIG 5
G	Chinese GB
S	Chinese BIG 5 , Chinese GB , Japanese code
O	Other

9. Special code

10:RA=51R