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SPECIFICATION

CUSTOMER : _____

MODULE NO.: WB320240A-YGH-T#P

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION: DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
ISSUED DATE:			

MODLE NO□

DOC. FIRST ISSUE

RECORDS OF REVISION

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2006-11-28		First issue

Contents

1.Module Classification Information

WB 320240 A － YGH－T#P

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Brand：WINSTAR DISPLAY CORPORATION

② Display Type：H→Character Type, G→Graphic Type; B→Cob Type

③ Display Font：320 * 240 Dots

④ Model serials number

⑤ Backlight Type：	N→Without backlight	T→LED, White
	B→EL, Blue green	A→LED, Amber
	D→EL, Green	R→LED, Red
	W→EL, White	O→LED, Orange
	F→CCFL, White	G→LED, Green
	Y→LED, Yellow Green	T→LED, White
⑥ LCD Mode：	B→TN Positive, Gray	T→FSTN Negative
	N→TN Negative,	
	G→STN Positive, Gray	
	Y→STN Positive, Yellow Green	
	M→STN Negative, Blue	
	F→FSTN Positive	
⑦ LCD Polarize Type/ Temperature range/ View direction	A→Reflective, N.T, 6:00	H→Transflective, W.T,6:00
	D→Reflective, N.T, 12:00	K→Transflective,W.T,12:00
	G→Reflective, W. T, 6:00	C→Transmissive, N.T,6:00
	J→Reflective, W.T, 12:00	F→Transmissive, N.T,12:00
	B→Transflective, N.T,6:00	I→Transmissive, W. T, 6:00
	E→Transflective, N.T.12:00	L→Transmissive, W.T,12:00
⑧ Special Code	T: Bulid in Negative Voltage & Temperature Compensation	
	P: Samsung IC	
	#:Fit in with the ROHS Directions and regulations	

2.Precautions 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.

3.General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	160.0(W)x 109.0(H)x 11.0max(T)	mm
View area	122.0(W)x 92.0(H)	mm
Active area	115.18(W)x 86.38(H)	mm
Dot size	0.34(W)x 0.34(H)	mm
Dot pitch	0.36(W)x 0.36(H)	mm
LCD type	STN Positive, Gray, transflective ,	
View direction	6 o’clock	
Backlight	LED , Yellow Green	

4.Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-30	—	+80	℃
Input Voltage	V_I	0	—	V_{DD}	V
Supply Voltage For Logic	V_{DD}	0	—	6.5	V
Supply Voltage For LCD	V_{DD}-V_{EE}	0	—	32	V

5.Electrical Characteristics

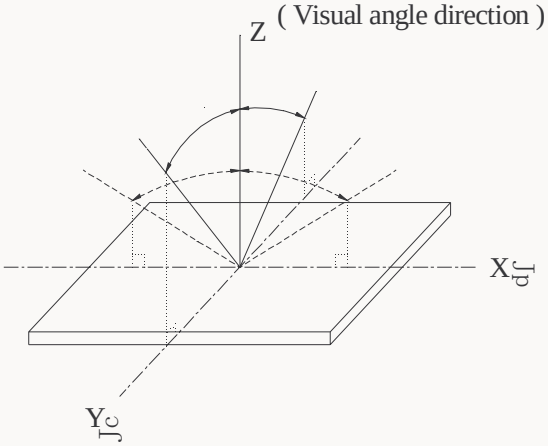
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V_{DD}-V_{SS}	—	2.7	—	5.5	V
Supply Voltage For LCD	V_{EE}-V_{SS}	Ta=-20℃ Ta=25℃ Ta=+70℃	— — 22.1	— 24.0 —	26.2 — —	V V V
Input High Volt.	V_{IH}	—	0.8VDD	—	VDD	V
Input Low Volt.	V_{IL}	—	-0.3	—	0.2VDD	V
Output High Volt.	V_{OH}	—	VDD -0.4	—	VDD	V
Output Low Volt.	V_{OL}	—	0	—	0.4	V
Supply Current	I_{DD}	—		45.0	50.0	mA

6.Optical Characteristics

ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	CR≧2	20	—	40	deg.
	(H) ϕ	CR≧2	-30	—	30	deg.
Contrast Ratio	CR	—	—	3	—	—
Response Time	T rise	—	—	200	300	ms
	T fall	—	—	150	200	ms

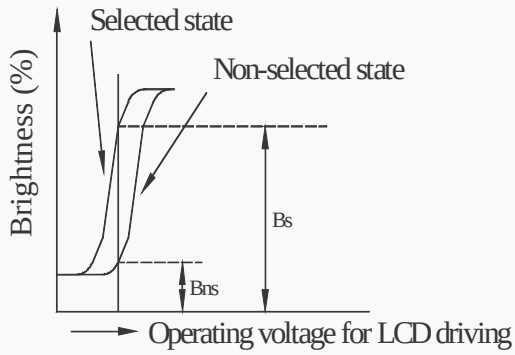
6.1 Definitions

■View Angles

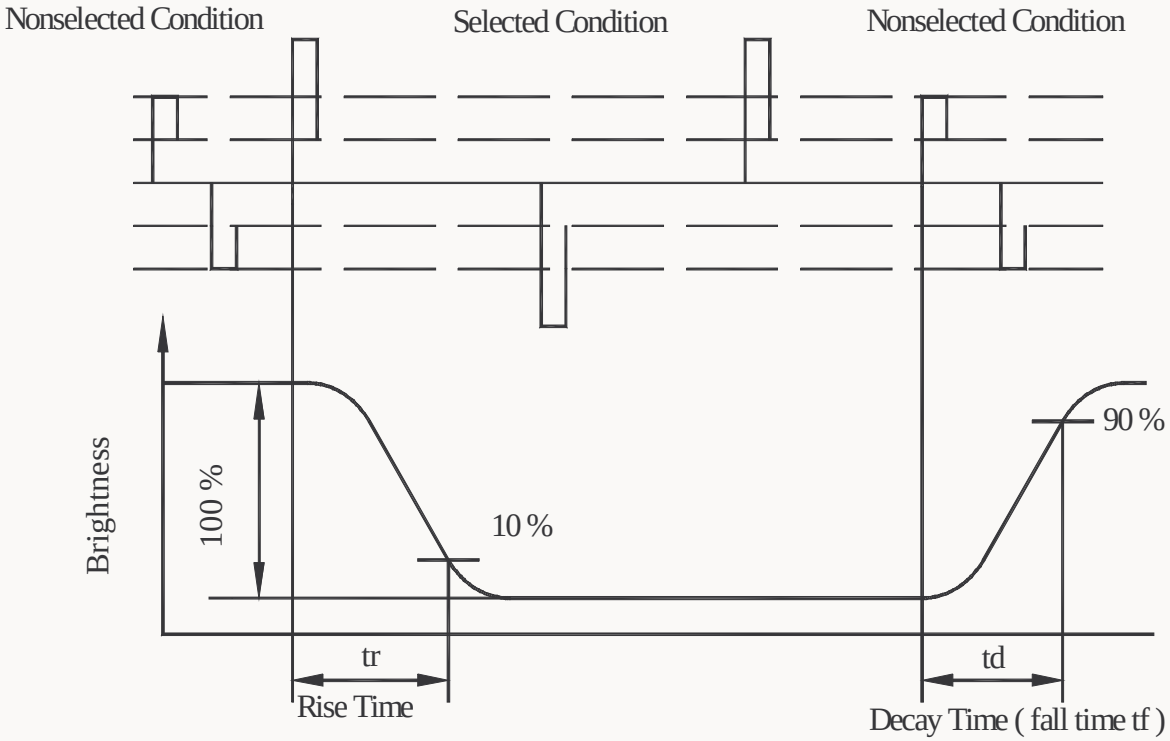


■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$



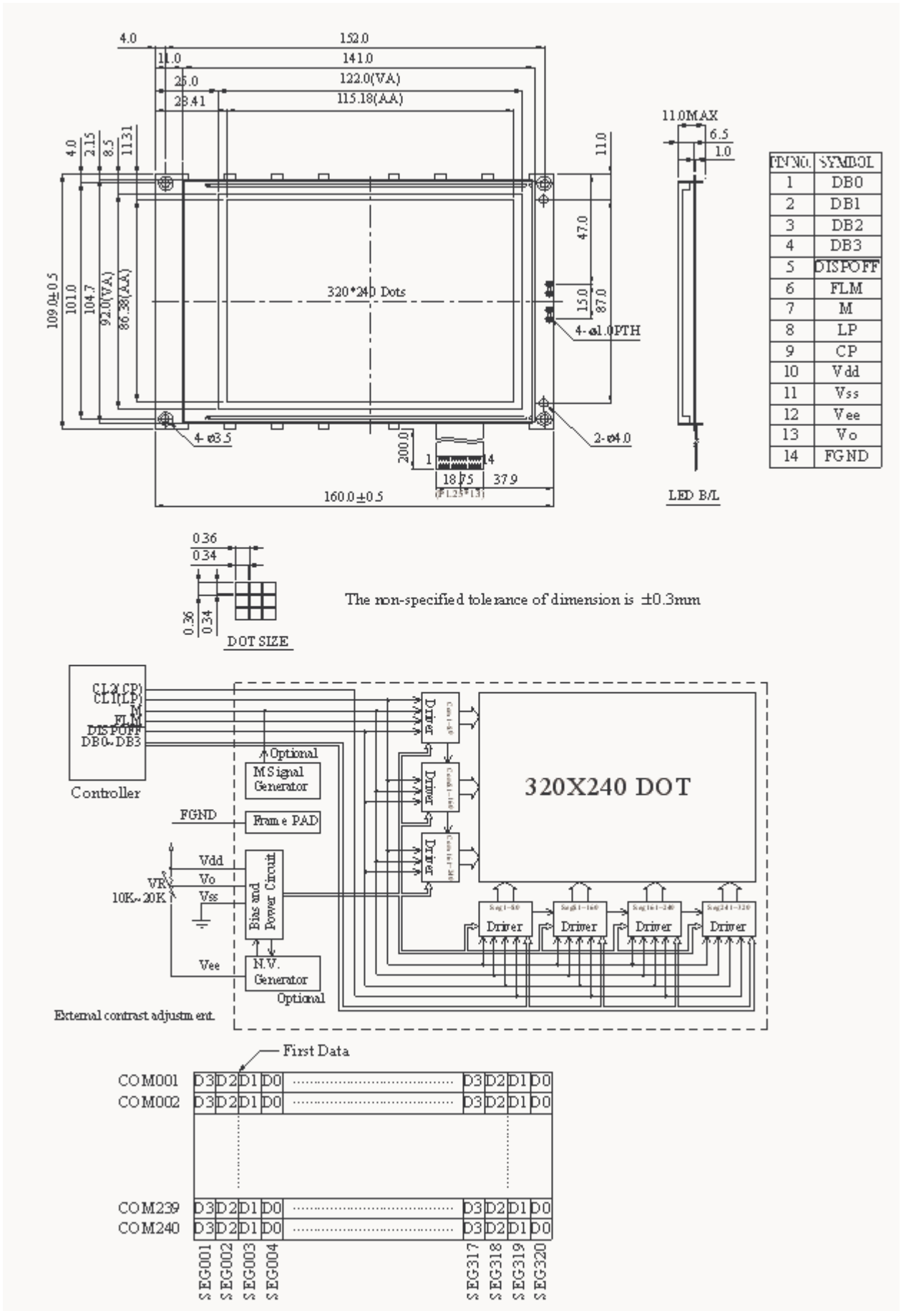
■Response time



7.Interface Description

Pin No.	Symbol	Level	Description
1	D0	H/L	Display data, bit0
2	D1	H/L	Display data, bit1
3	D2	H/L	Display data, bit2
4	D3	H/L	Display data, bit3
5	$\overline{\text{DISPOFF}}$	H/L	H: Display ON, L: Display OFF
6	FLM	H/L	Scan start-up signal
7	M(N.C.)	H/L	Frame reverse signal(alternate signal)
8	CL1(LP)	H to L	Data latch pulse
9	CL2(CP)	H to L	Data shift pulse
10	V_{DD}	5.0V	Power supply for Logic
11	V_{SS}	0V	Ground
12	V_{EE}	-25v	Negative voltage output (Built-in)
13	V_O	(Variable)	Driving voltage for LCD
14	FGND		Frame Ground

8.Contour Drawing & Block diagram



PIN NO.	SYMBOL
1	DB0
2	DB1
3	DB2
4	DB3
5	DISPOFF
6	FLM
7	M
8	LP
9	CP
10	Vdd
11	Vss
12	Vee
13	Vo
14	FGND

9.Timing Characteristics

9.1.Common & Segment interface timing:

ITEM	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	100	—	—	ns
CP Pulse Width	tWC	Fig.1	50	—	—	ns
LP Pulse Width	tWL	Fig.1	50	—	—	ns
Data Set Up Time	tDSU	Fig.1	30	—	—	ns
Data Hold Time	tDHD	Fig.1	30	—	—	ns
CP Rise/Fall Time	tr,tf	Fig.1	—	—	50	ns
CP to LOAD	tCL	Fig.1	80	—	—	ns
LOAD to CP	tLC	Fig.1	110	—	—	ns
LP Pulse Width	tLW	Fig.1	50	—	—	ns
CL1 Pulse Width	tCW	Fig.2	63	—	—	ns
Data Set Up Time	tDSU2	Fig.2	100	—	—	ns
Data Hold Time	tDHD2	Fig.2	100	—	—	ns
CL1 Rise/Fall Time	tr2,tf2	Fig.2	—	—	50	ns

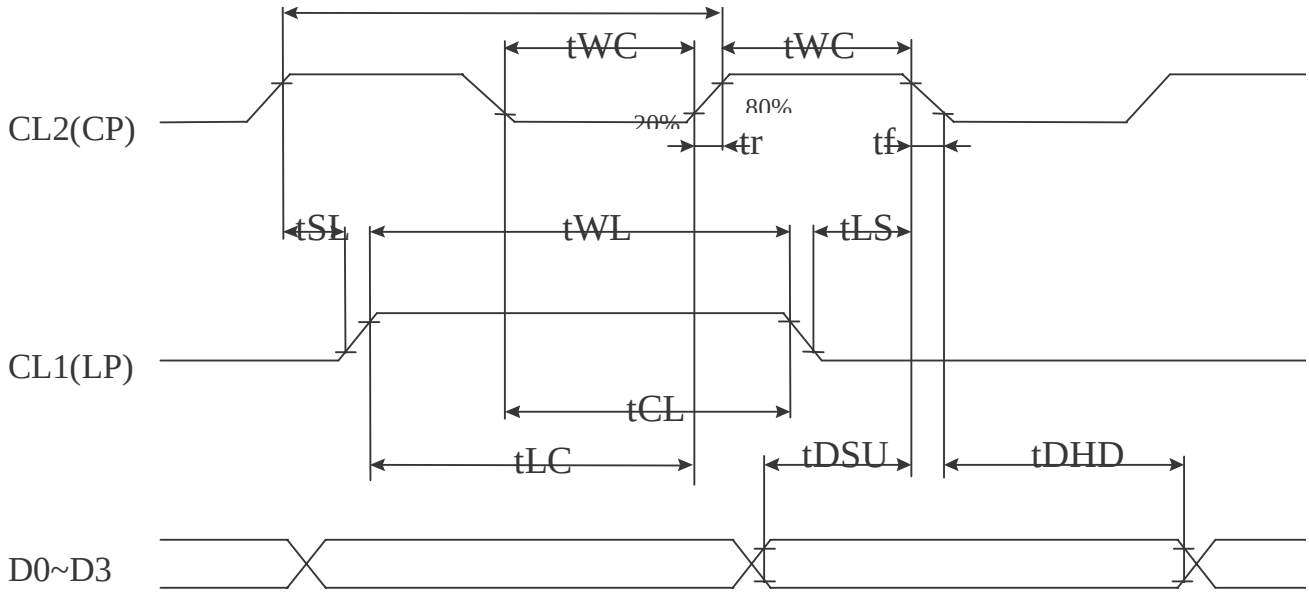


Fig 1. SEGMENT TIMING

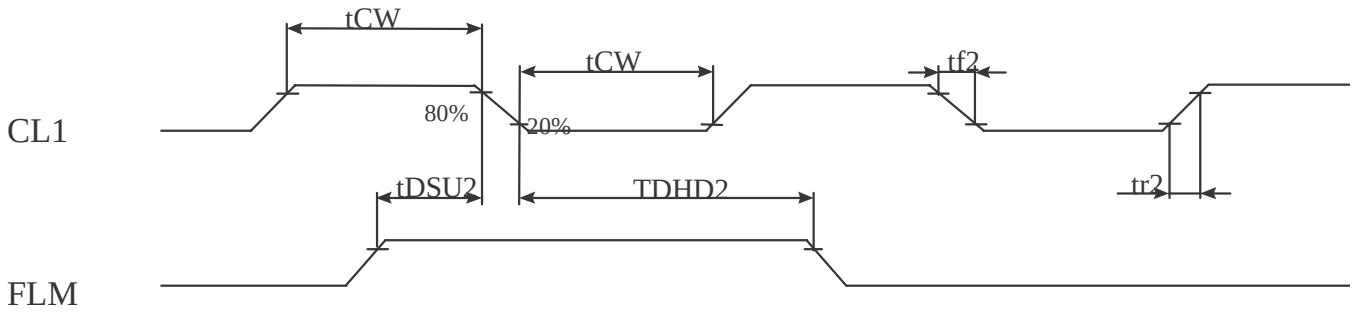
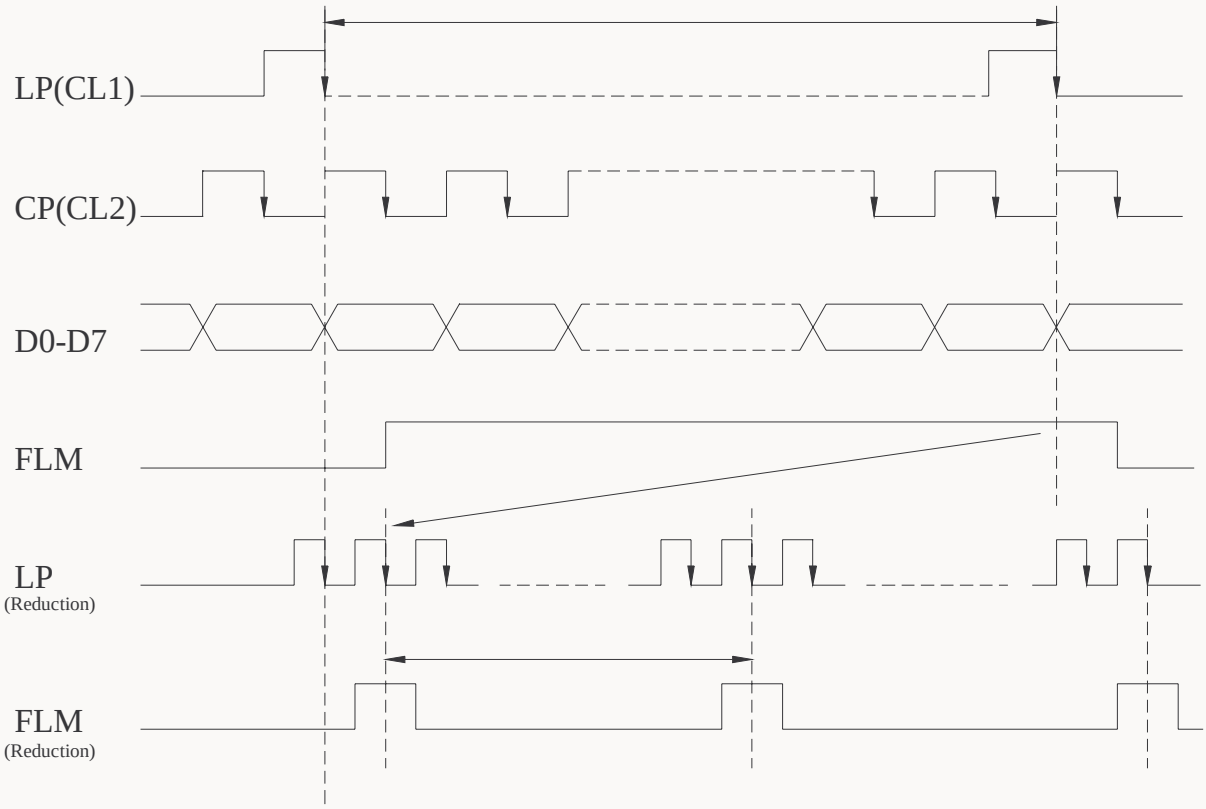
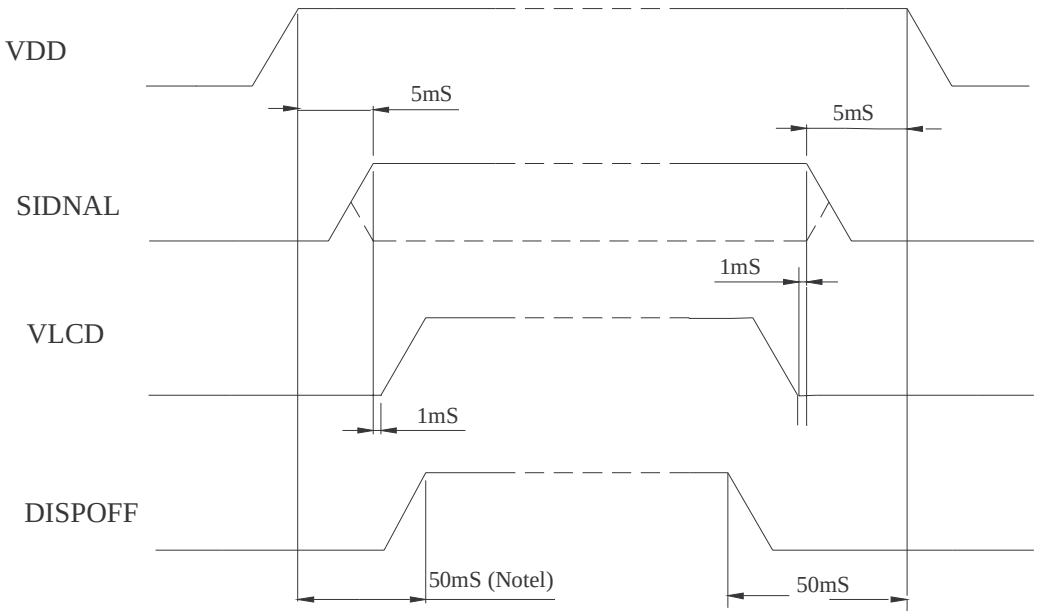


Fig 2 COMMON TIMING

TIMING CHART OF INPUT SIGNAL



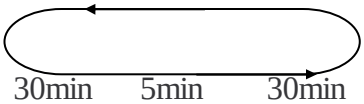
POWER ON/OFF TIMING



* /DISPOFF signal delay time must be over 50ms in order to waiting for **INPUT POWER** in stable.

10.RELIABILITY

Content of Reliability Test (wide temperature, -20℃~70℃)

Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 200hrs	2
Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-30℃ 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max For 96hrs under no-load condition excluding the polarizer, Then taking it out and drying it at normal temperature.	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃  30min 5min 30min 1 cycle	-20℃/70℃ 10 cycles	——
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	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

Note1: No dew condensation to be observed.

Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: Vibration test will be conducted to the product itself without putting it in a container.

11. Backlight Information

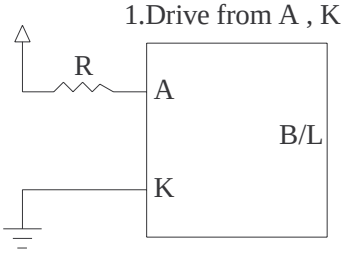
(Ta=25℃)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	288	360	540	mA	V=4.2V
Supply Voltage	V	4.0	4.2	4.4	V	—
Reverse Voltage	VR	—	—	10	V	—
Luminous Intensity	IV	—	60	—	CD/M^2	ILED=180mA
Wave Length	λp	—	570	—	nm	ILED=180mA
Life Time	—	—	100000	—	Hr.	ILED≦180mA
Color	Yellow Green					

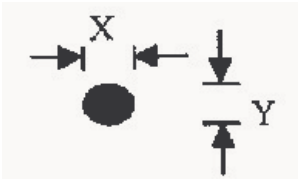
Note: The LED of B/L is drive by current only, drive voltage is for reference only. drive voltage can make driving current under safety area (current between minimum and maximum).

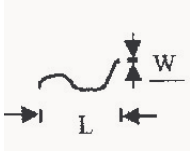
LED B\L Drive Method

1.Drive from A , K



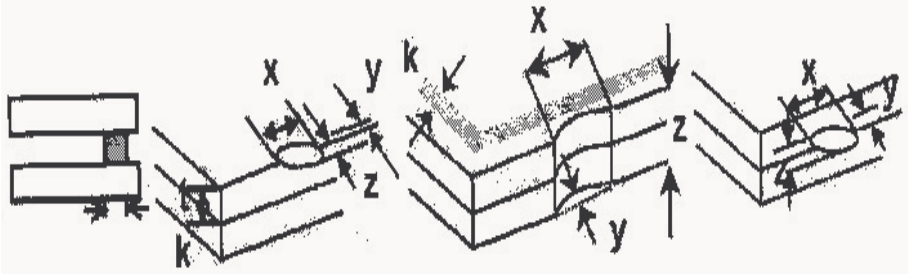
12. Inspection specification

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>01</td><td>Electrical Testing</td><td>1.1 Missing vertical, horizontal segment, segment contrast defect.
1.2 Missing character , dot or icon.
1.3 Display malfunction.
1.4 No function or no display.
1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Mixed product types.
1.8 Contrast defect.</td><td>0.65</td></tr>
<tr><td>02</td><td>Black or white spots on LCD (display only)</td><td>2.1 White and black spots on display ≦0.25mm, no more than three white or black spots present.
2.2 Densely spaced: No more than two spots or lines within 3mm</td><td>2.5</td></tr>
<tr><td>03</td><td>LCD black spots, white spots, contamination (non-display)</td><td>3.1 Round type : As following drawing
Φ=(x + y) / 2
 

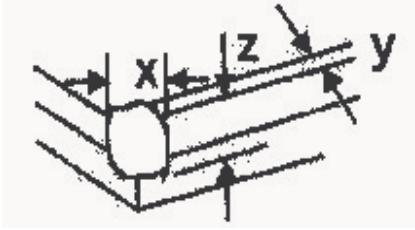
<table>
<tr><th>SIZE</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≦0.10</td><td>Accept no dense</td></tr>
<tr><td>0.10＜ Φ ≦0.20</td><td>2</td></tr>
<tr><td>0.20＜ Φ ≦0.25</td><td>1</td></tr>
<tr><td>0.25＜Φ</td><td>0</td></tr>
</table>
3.2 Line type : (As following drawing)
 

<table>
<tr><th>Length</th><th>Width</th><th>Acceptable Q TY</th></tr>
<tr><td>---</td><td>W≦0.02</td><td>Accept no dense</td></tr>
<tr><td>L≦3.0</td><td>0.02＜W≦0.03</td><td rowspan="2">2</td></tr>
<tr><td>L≦2.5</td><td>0.03＜W≦0.05</td></tr>
<tr><td>---</td><td>0.05＜W</td><td>As round type</td></tr>
</table></td><td>2.5</td></tr>
<tr><td>04</td><td>Polarizer bubbles</td><td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><th>Size Φ</th><th>Acceptable Q TY</th></tr>
<tr><td>Φ ≦0.20</td><td>Accept no dense</td></tr>
<tr><td>0.20＜ Φ ≦0.50</td><td>3</td></tr>
<tr><td>0.50＜ Φ ≦1.00</td><td>2</td></tr>
<tr><td>1.00＜Φ</td><td>0</td></tr>
<tr><td>Total Q TY</td><td>3</td></tr>
</table></td><td>2.5</td></tr>
</table>

<table>
<tr><th>NO</th><th>Item</th><th>Criterion</th><th>AQL</th></tr>
<tr><td>05</td><td>Scratches</td><td>Follow NO.3 LCD black spots, white spots, contamination</td><td></td></tr>
<tr><td>06</td><td>Chipped glass</td><td>
Symbols Define:
x: Chip length y: Chip width z: Chip thickness
k: Seal width t: Glass thickness a: LCD side length
L: Electrode pad length:

6.1 General glass chip :
6.1.1 Chip on panel surface and crack between panels:


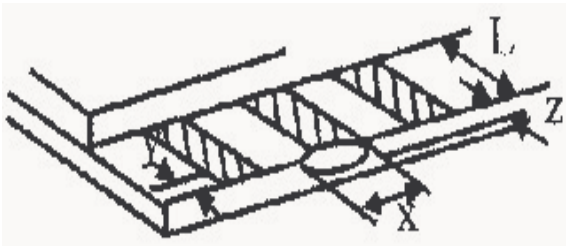
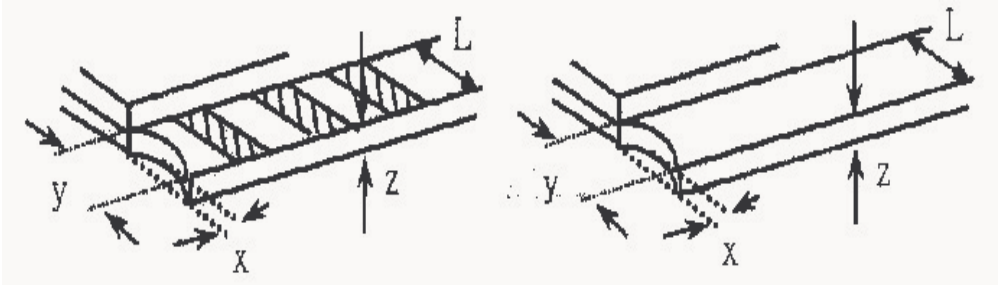
<table>
<tr><th>z: Chip thickness</th><th>y: Chip width</th><th>x: Chip length</th></tr>
<tr><td>Z≦1/2t</td><td>Not over viewing area</td><td>x≦1/8a</td></tr>
<tr><td>1/2t＜z≦2t</td><td>Not exceed 1/3k</td><td>x≦1/8a</td></tr>
</table>
⊙If there are 2 or more chips, x is total length of each chip.

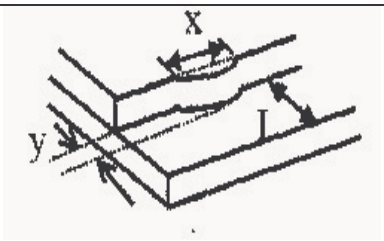
6.1.2 Corner crack:


</td><td>2.5</td></tr>
</table>

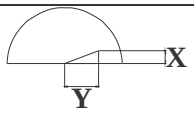
z: Chip thickness	y: Chip width	x: Chip length	
Z≦1/2t	Not over viewing area	x≦1/8a	
1/2t＜z≦2t	Not exceed 1/3k	x≦1/8a	

⊙If there are 2 or more chips, x is the total length of each chip.

NO	Item	Criterion	AQL
06	Glass crack	Symbols : x: Chip length y: Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L: Electrode pad length 6.2 Protrusion over terminal : 6.2.1 Chip on electrode pad :  y: Chip width / x: Chip length / z: Chip thickness y≦0.5mm / x≦1/8a / 0 ＜ z ≦ t 6.2.2 Non-conductive portion:  y: Chip width / x: Chip length / z: Chip thickness y≦ L / x≦1/8a / 0 ＜ z ≦ t ⊙If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications. ⊙If the product will be heat sealed by the customer, the alignment mark not be damaged. 6.2.3 Substrate protuberance and internal crack.	2.5

		 y: width / x: length y≦1/3L / x ≦ a	

NO	Item	Criterion	AQL
07	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
08	Backlight elements	8.1 Illumination source flickers when lit. 8.2 Spots or scratched that appear when lit must be judged. Using LCD spot, lines and contamination standards. 8.3 Backlight doesn't light or color wrong.	0.65 2.5 0.65
09	Bezel	9.1 Bezel may not have rust, be deformed or have fingerprints, stains or other contamination. 9.2 Bezel must comply with job specifications.	2.5 0.65
10	PCB、COB	10.1 COB seal may not have pinholes larger than 0.2mm or contamination. 10.2 COB seal surface may not have pinholes through to the IC. 10.3 The height of the COB should not exceed the height indicated in the assembly diagram. 10.4 There may not be more than 2mm of sealant outside the seal area on the PCB. And there should be no more than three places. 10.5 No oxidation or contamination PCB terminals. 10.6 Parts on PCB must be the same as on the production characteristic chart. There should be no wrong parts, missing parts or excess parts. 10.7 The jumper on the PCB should conform to the product characteristic chart. 10.8 If solder gets on bezel tab pads, LED pad, zebra pad or screw hold pad, make sure it is smoothed down. 10.9 The Scraping testing standard for Copper Coating of PCB	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5

		 **X * Y<=2mm^2**	
11	Soldering	11.1 No un-melted solder paste may be present on the PCB. 11.2 No cold solder joints, missing solder connections, oxidation or icicle. 11.3 No residue or solder balls on PCB. 11.4 No short circuits in components on PCB.	2.5 2.5 2.5 0.65

NO	Item	Criterion	AQL
12	General appearance	12.1 No oxidation, contamination, curves or, bends on interface Pin (OLB) of TCP.	2.5
		12.2 No cracks on interface pin (OLB) of TCP.	0.65
		12.3 No contamination, solder residue or solder balls on product.	2.5 2.5
		12.4 The IC on the TCP may not be damaged, circuits.	2.5
		12.5 The uppermost edge of the protective strip on the interface pin must be present or look as if it cause the interface pin to sever.	2.5
		12.6 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.	2.5 0.65 0.65
		12.7 Sealant on top of the ITO circuit has not hardened.	0.65
		12.8 Pin type must match type in specification sheet.	
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on	

		packaging specification sheet. 12.11 Product dimension and structure must conform to product specification sheet.	

13. Material List of Components for RoHs

1. WINSTAR Display Co., Ltd hereby declares that all of or part of products (with the mark "#"in code), including, but not limited to, the LCM, accessories or packages, manufactured and/or delivered to your company (including your subsidiaries and affiliated company) directly or indirectly by our company (including our subsidiaries or affiliated companies) do not intentionally contain any of the substances listed in all applicable EU directives and regulations, including the following substances.

Exhibit A：The Harmful Material List

.

Material	(Cd)	(Pb)	(Hg)	(Cr6+)	PBBs	PBDEs
Limited Value	100 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm	1000 ppm

Above limited value is set up according to RoHS.

2.Process for RoHS requirement：

(1) Use the Sn/Ag/Cu soldering surface；the surface of Pb-free solder is rougher than we used before.

(2) Heat-resistance temp.：

Reflow：250 ,30 seconds Max.；

Connector soldering wave or hand soldering：320 , 10 seconds max.

(3) Temp. curve of reflow, max. Temp.：235±5 ；

Recommended customer's soldering temp. of connector：280 , 3 seconds.

winstar **LCM Sample Estimate Feedback Sheet**

Module Number： _____ **Page: 1**

1、Panel Specification：

1.	Panel Type：	☐ Pass	☐ NG ,_____
2.	View Direction：	☐ Pass	☐ NG ,_____
3.	Numbers of Dots：	☐ Pass	☐ NG ,_____
4.	View Area：	☐ Pass	☐ NG ,_____
5.	Active Area：	☐ Pass	☐ NG ,_____
6.	Operating Temperature：	☐ Pass	☐ NG ,_____
7.	Storage Temperature：	☐ Pass	☐ NG ,_____
8.	Others：_____		

2、Mechanical Specification：

1.	PCB Size：	☐ Pass	☐ NG ,_____
2.	Frame Size：	☐ Pass	☐ NG ,_____
3.	Materal of Frame：	☐ Pass	☐ NG ,_____
4.	Connector Position：	☐ Pass	☐ NG ,_____
5.	Fix Hole Position：	☐ Pass	☐ NG ,_____
6.	Backlight Position：	☐ Pass	☐ NG ,_____
7.	Thickness of PCB：	☐ Pass	☐ NG ,_____

8. Height of Frame to PCB： ☐ Pass ☐ NG ,_____
9. Height of Module： ☐ Pass ☐ NG ,_____
10. Others： ☐ Pass ☐ NG ,_____

3、Relative Hole Size：

1. Pitch of Connector： ☐ Pass ☐ NG ,_____
2. Hole size of Connector： ☐ Pass ☐ NG ,_____
3. Mounting Hole size： ☐ Pass ☐ NG ,_____
4. Mounting Hole Type： ☐ Pass ☐ NG ,_____
5. Others： ☐ Pass ☐ NG ,_____

4、Backlight Specification：

1. B/L Type： ☐ Pass ☐ NG ,_____
2. B/L Color： ☐ Pass ☐ NG ,_____
3. B/L Driving Voltage (Reference for LED Type)： ☐ Pass ☐ NG ,_____
4. B/L Driving Current： ☐ Pass ☐ NG ,_____
5. Brightness of B/L： ☐ Pass ☐ NG ,_____
6. B/L Solder Method： ☐ Pass ☐ NG ,_____
7. Others： ☐ Pass ☐ NG ,_____

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5、Electronic Characteristics of Module：

1. Input Voltage： ☐ Pass ☐ NG ,_____
2. Supply Current： ☐ Pass ☐ NG ,_____
3. Driving Voltage for LCD： ☐ Pass ☐ NG ,_____
4. Contrast for LCD： ☐ Pass ☐ NG ,_____
5. B/L Driving Method： ☐ Pass ☐ NG ,_____
6. Negative Voltage Output： ☐ Pass ☐ NG ,_____
7. Interface Function： ☐ Pass ☐ NG ,_____
8. LCD Uniformity： ☐ Pass ☐ NG ,_____
9. ESD test： ☐ Pass ☐ NG ,_____
10. Others： ☐ Pass ☐ NG ,_____

6、Summary：

Sales signature： _____

Customer Signature： _____ **Date：** ____/____/____