Winstar Display Co., LTD

華凌光電股份有限公司

SPECIFICATION

CUSTOMER :

MODULE NO.: **WG320240BX-TMI-VZ#**

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

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

VERSION	DATE	REVISED PAGE NO.	SUMMARY
A	2008/9/3	14	Modify backlight information.

Winstar Display Co., LTD
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MODLE NO：

DOC. FIRST ISSUE

RECORDS OF REVISION

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2007/7/11		First issue
A	2008/9/3	14	Modify backlight information.

Contents

1.Module Classification Information

<u>W</u><u>G</u>　<u>3 2 0 2 4 0</u>　<u>B X</u>　－　<u>T</u><u>M</u><u>I</u>　－　<u>V Z #</u>

　① ②　　　　③　　　④　　　⑤ ⑥ ⑦　　　⑧

① Brand：WINSTAR DISPLAY CORPORATION

② Display Type：H→Character Type, G→Graphic Type

③ Display Font：320 * 240 Dots

④ Model serials number

⑤ Backlight Type：　　N→Without backlight　　　A→LED, Amber

　　　　　　　　　　　B→EL, Blue green　　　　R→LED, Red

　　　　　　　　　　　D→EL, Green　　　　　　O→LED, Orange

　　　　　　　　　　　W→EL, White　　　　　　G→LED, Green

　　　　　　　　　　　F→CCFL, White　　　　　T→LED, White

　　　　　　　　　　　Y→LED, Yellow Green

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 Polarizer Type/　A→Reflective, N.T, 6:00　　　H→Transflective, W.T,6:00

　　Temperature range/　D→Reflective, N.T, 12:00　　K→Transflective,W.T,12:00

　　View direction　　　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　　　　V：Build in negative voltage　　Z:ICNT7086

　　　　　　　　　　　#: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.

(8)Winstar have the right to change the passive components

(9)Winstar have the right to change the PCB Rev.

3.General Specification

| ITEM	STANDARD VALUE	UNIT
Number of dots	320x240	dots
Outline dimension	160.0(W)x 109.0(H)x 13.0max(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 Negative ,Blue　Transmissive (In LCD production, It will occur slightly color difference. We can only　guarantee the same color in the same batch.)	
View direction	6 o'clock	
Backlight	LED, White	

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	$V_{DD}-V_{SS}$	—	4.5	5.0	5.5	V
Supply Voltage For LCD *Note	$V_{DD}-V_{O}$	Ta=-20℃	—	—	26.1	V
		Ta=25℃	—	23.8	—	V
		Ta=+70℃	22.2	—	—	V
Input High Volt.	V_{IH}	—	3.5	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	—	—	1.0	V
Output High Volt.	V_{OH}	—	-	0.4	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{DD}	—	65.0	75.0	80.0	mA

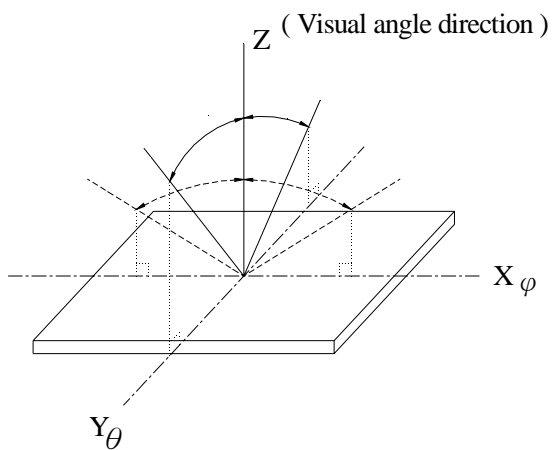* Note: Please design the VOP adjustment circuit on customer's main board
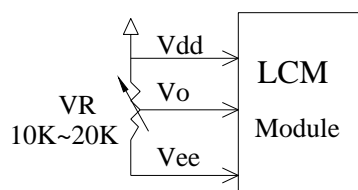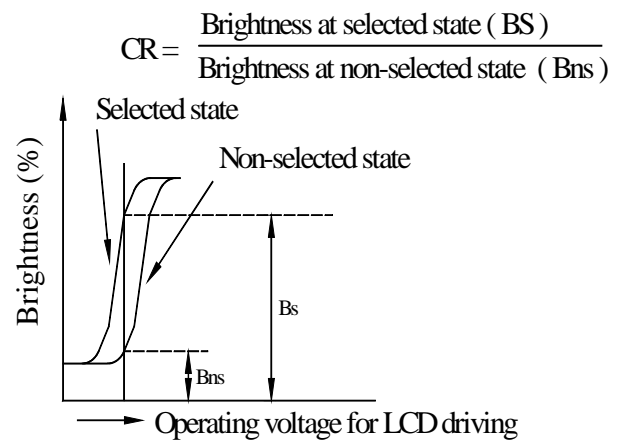
6.Optical Characteristics

ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	CR $\geqq$ 2	20	—	40	deg.
	(H) φ	CR $\geqq$ 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**

Z (Visual angle direction)

X φ

Y θ

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

Brightness (%)

Selected state

Non-selected state

Bs

Bns

Operating voltage for LCD driving

■**Response time**

Nonselected Condition

Selected Condition

Nonselected Condition

Brightness

100 %

10 %

90 %

tr

Rise Time

td

Decay Time (fall time tf)
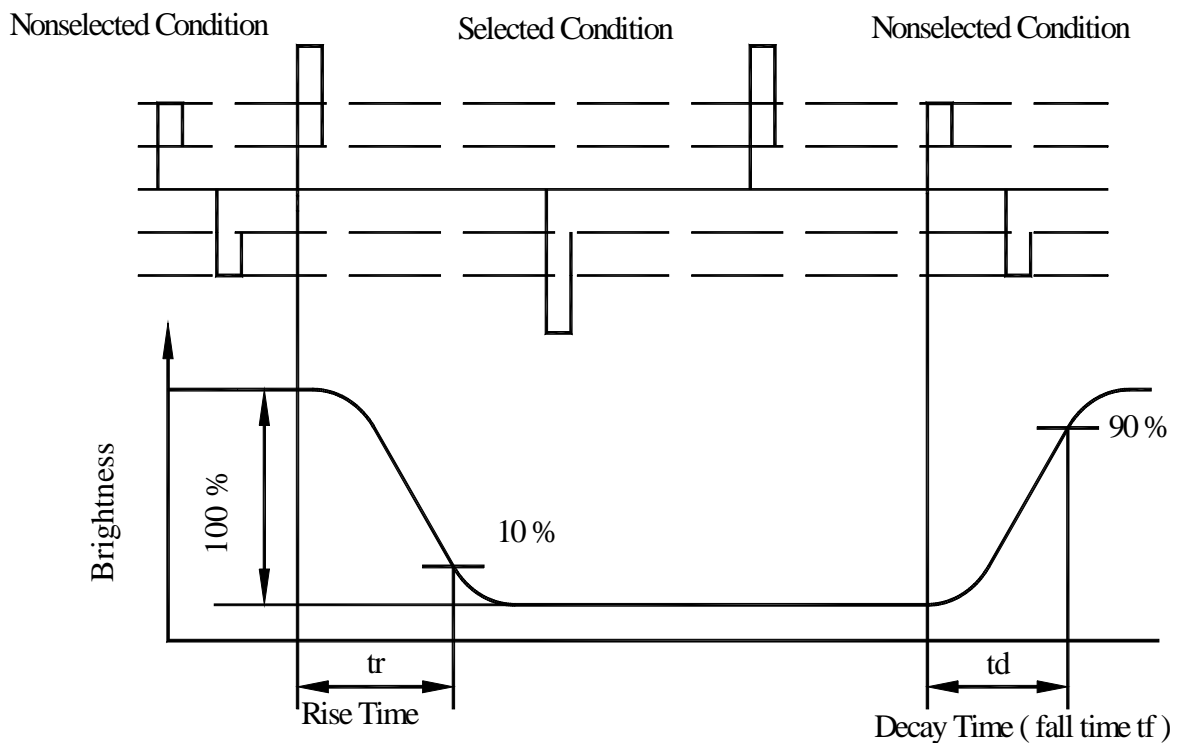
7.Interface Description

Pin No.	Symbol	Level	Description
1	V_{SS}	0V	Ground
2	V_{DD}	5.0V	Power supply for Logic
3	V_O	(Variable)	Driving voltage for LCD
4	A0	H/L	RD=L WR=H ,A0=L :Data Read AO=H :Status read RD=H WR=L ,A0=L :Data Write AO=H :Command write
5	$\overline{WR}$	H/L	8080 family: Write signal, 6800 family: R/W signal
6	$\overline{RD}$	H/L	8080 family: Read signal, 6800 family: Enable clock
7~14	DB0~DB7	H/L	Data bus line
15	$\overline{CS}$	H/L	Chip select ,Active L
16	$\overline{RES}$	H/L	Controller reset signal, Active L
17	V_{ee}		Negative Voltage Output
18	SEL		8088 or 6800 interface selection 1:68 0: 80
19	FG		Frame Ground
20	WAIT		Check Busy

8.Contour Drawing & Block diagram
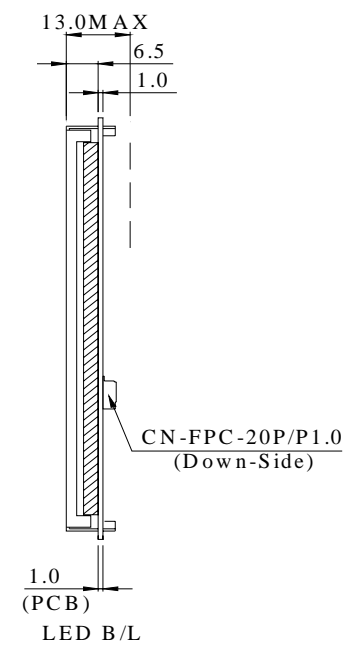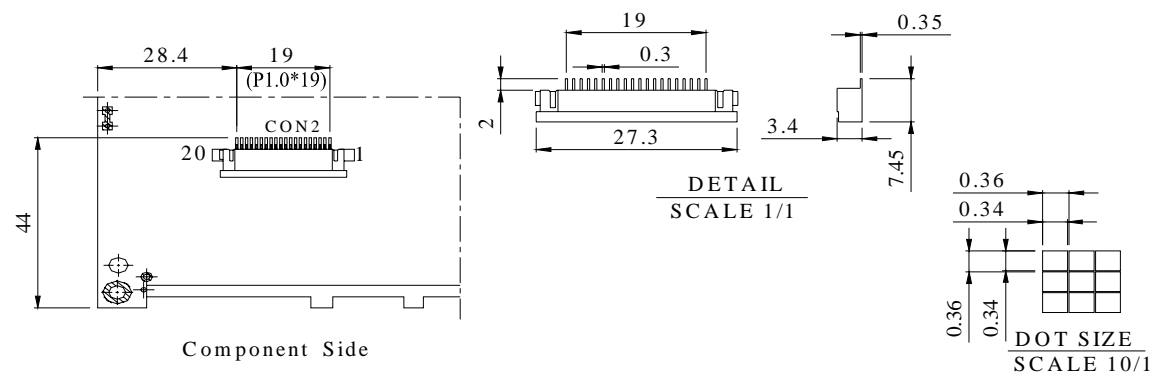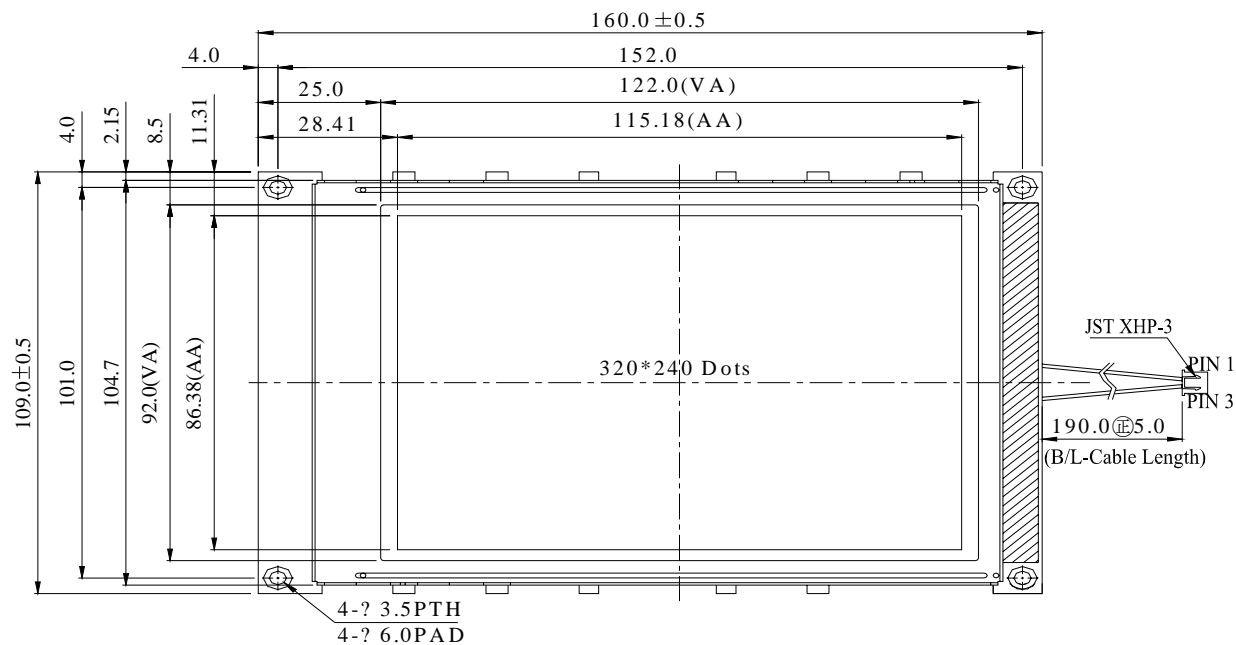
PIN NO.	SYMBOL
1	V ss
2	V dd
3	V o
4	A 0
5	$\overline{WR}$
6	$\overline{RD}$
7	DB 0
8	DB 1
9	DB 2
10	DB 3
11	DB 4
12	DB 5
13	DB 6
14	DB 7
15	$\overline{CS}$
16	$\overline{RES}$
17	V ee
18	SEL
19	FG
20	WAIT

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

DETAIL
SCALE 1/1

DOT SIZE
SCALE 10/1

Component Side

LED B/L

MPU

RD
WR
A0
DB0~DB7
CS
RES
SEL1 *

S1D13700

Controller

CL1
M
FLM

Driver Com1~80

Driver Com81~160

Driver Com161~240

320X240 DOT

Vdd
Vo

Bias and Power Circuit

Power ON Reset

VR
10K~20K

-25V   Vee

N.V. Generator

External contrast adjustment.

Seg1~80 Driver

Seg81~160 Driver

Seg161~240 Driver

Seg241~320 Driver

CL2
DB0~DB3

FGND

Frame PAD

*:6800 family or 8080family interface selectable.

9.Timing Characteristics

The relative timing diagram please see the spec of S1D13700.

9.1 Differences Between SED1335 and S1D13700

1. S1D13700 almost can replace SED1335，and it can drive 240*160 dots in 16 gray level,or 320*240 dots in 4 gray level.

2. There are 2 Main differences and being described as below:

(1). The Check Busy method of SED1335 is reading the D6 of **STATUS resister.**

Please

14. STATUS FLAG

The SED1335 series has a single bit status flag.
D6: X line standby
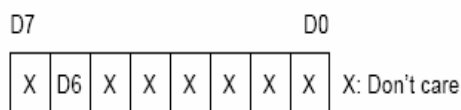
The D6 status flag is HIGH for the TC/R-C/R cycles at the end of each line where the SED1335 series is not reading the display memory. The microprocessor may use this period to update display memory without affecting the display, however it is recommended that the display be turned off when refreshing the whole display.

D7							D0	
X	D6	X	X	X	X	X	X	X: Don't care

Figure 53.   Status flag
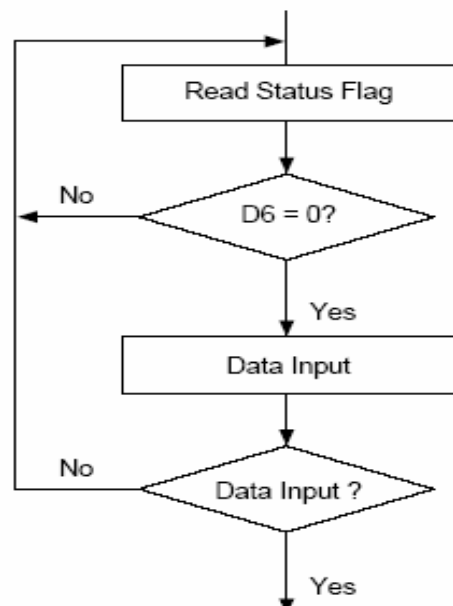
Figure 55.   Flowchart for busy flag checking

The Check Busy method of S1D13700 is checking the "WAIT" pin directly.。
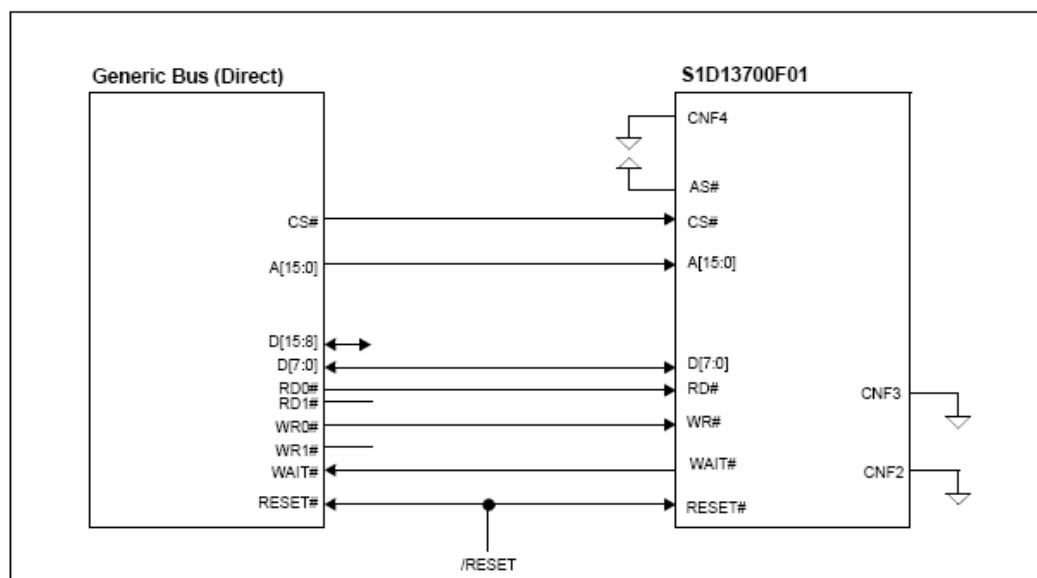
Figure 3-2 Direct Generic to S1D13700F01 Interface Example

(2) Owing to S1D13700 having 32K*8 SRAM inside,so It doesn't need to set the bit "M1" in "SYSTEM SET". For S1D13700, we doesn't set M1(bit1)，the setting for SED 1335 is shown as below:

8.2.1.1. C

This control byte performs the following:
1. Resets the internal timing generator
2. Disables the display
3. Cancels sleep mode

Parameters following P1 are not needed if only canceling sleep mode.

8.2.1.2. M0

Selects the internal or external character generator ROM. The internal character generator ROM contains 160, 5 × 7 pixel characters, as shown in figure 70. These characters are fixed at fabrication by the metallization mask. The external character generator ROM, on the other hand, can contain up to 256 user-defined characters.

M0 = 0: Internal CG ROM
M0 = 1: External CG ROM

Note that if the CG ROM address space overlaps the display memory address space, that portion of the display memory cannot be written to.

8.2.1.3. M1

Selects the memory configuration for user-definable characters. The CG RAM codes select one of the 64 codes shown in figure 46.

M1 = 0: No D6 correction.
The CG RAM1 and CG RAM2 address spaces are not contiguous, the CG RAM1 address space is treated as character generator RAM, and the CG RAM2 address space is treated as character generator ROM.

M1 = 1: D6 correction.
The CG RAM1 and CG RAM2 address spaces are contiguout and are both treated as character generator RAM

The setting of S1D13700 will show as follow:
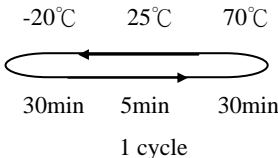
bit 1	Reserved
	The default value for this bit is 0.
bit 0	Character Generator Select (M0)
	This bit determines whether characters are generated by the internal character generator ROM (CGROM) or character generator RAM (CGRAM). The CGROM contains 160, 5x7 pixel characters which are fixed at fabrication. The CGRAM can contain up to 256 user-defined characters which are mapped at the CG Start Address (REG[1Ah] - REG[19h]). However, when the CGROM is used, the CGRAM can only contain up to 64, 8x8 pixel characters.
	When this bit = 0, the internal CGROM is selected.
	When this bit = 1, the internal CGRAM is selected.

Note
    If the CGRAM is used (includes CGRAM1 and CGRAM2), only 1 bpp is supported.

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 :
		
		  15mm
		
		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

Specification (Ta=25℃)

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	TEST CONDITION
Supply Current	ILED	115.2	128	200	mA	V=3.5V
Supply Voltage	V	3.4	3.5	3.6	V	—
Reverse Voltage	VR	—	—	5	V	—
Luminous Intensity	IV	260	280	—	CD/M^2	ILED=128mA
Wave Length	λp	—	—	—	nm	ILED=128mA
LED Life Time (For Reference only)	—	—	50K	—	Hr.	ILED≦128mA 25℃,50-60%RH, (Note 1)
Color	White					
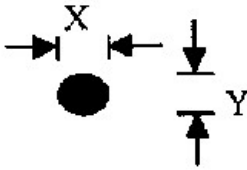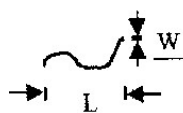
Note: The LED of B/L is drive by current only, drive voltage is for reference only.
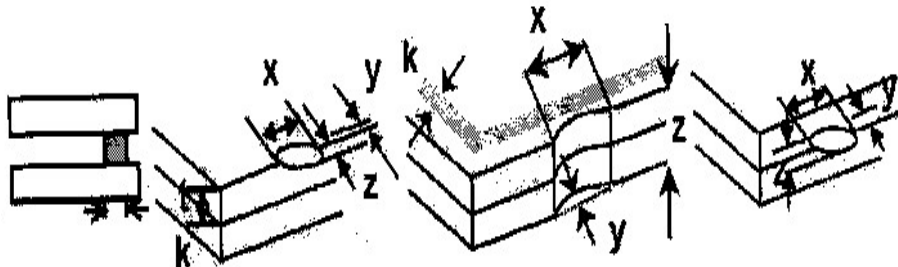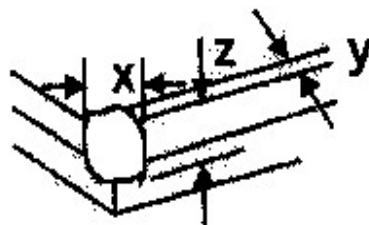
drive voltage can make driving current under safety area (current between

minimum and maximum).

Note 1:50K hours is only an estimate for reference.

LED B\L Drive Method
Drive from A , K
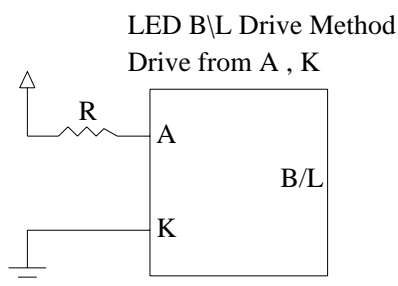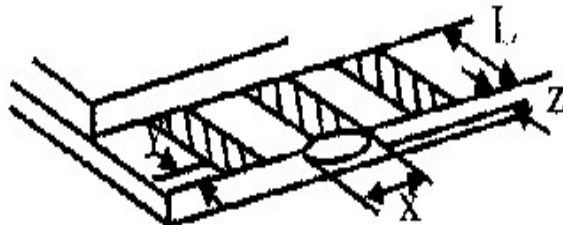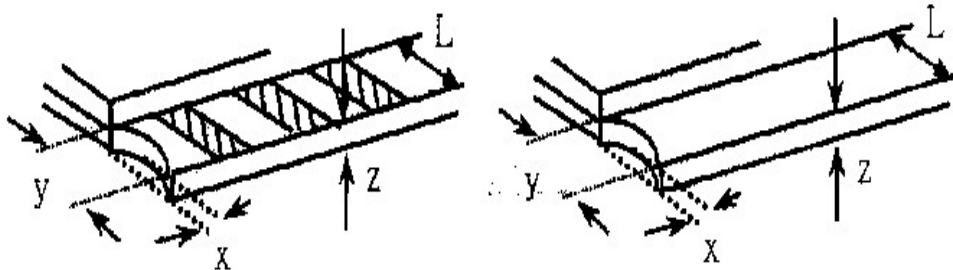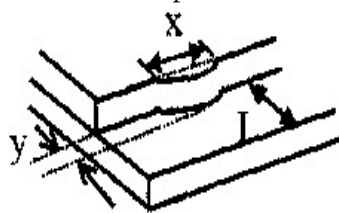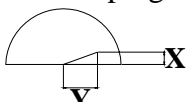
12.Inspection specification

NO	Item	Criterion		AQL
01	Electrical Testing	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.		0.65
02	Black or white spots on LCD (display only)	2.1 White and black spots on display $\leqq 0.25mm$, no more than three white or black spots present. 2.2 Densely spaced: No more than two spots or lines within 3mm		2.5
03	LCD black spots, white spots, contamination (non-display)	3.1 Round type : As following drawing $\Phi =(x + y) / 2$	SIZE	Acceptable Q TY
			$\Phi \leqq 0.10$	Accept no dense
			$0.10 < \Phi \leqq 0.20$	2
			$0.20 < \Phi \leqq 0.25$	1
			$0.25 < \Phi$	0

Round type table (item 03)

SIZE	Acceptable Q TY
$\Phi \leqq 0.10$	Accept no dense
$0.10 < \Phi \leqq 0.20$	2
$0.20 < \Phi \leqq 0.25$	1
$0.25 < \Phi$	0

3.2 Line type : (As following drawing)

Length	Width	Acceptable Q TY
---	$W \leqq 0.02$	Accept no dense
$L \leqq 3.0$	$0.02 < W \leqq 0.03$	2
$L \leqq 2.5$	$0.03 < W \leqq 0.05$	
---	$0.05 < W$	As round type

(AQL 2.5)

Item 04 — Polarizer bubbles

If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.

Size Φ	Acceptable Q TY
$\Phi \leqq 0.20$	Accept no dense
$0.20 < \Phi \leqq 0.50$	3
$0.50 < \Phi \leqq 1.00$	2
$1.00 < \Phi$	0
Total Q TY	3

(AQL 2.5)

NO	Item	Criterion	AQL
05	Scratches	Follow NO.3 LCD black spots, white spots, contamination	
06	Chipped glass	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: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$ | ⊙If there are 2 or more chips, x is total length of each chip. 6.1.2 Corner crack: | z: Chip thickness	y: Chip width	x: Chip length
---	---	---
$Z \leq 1/2t$	Not over viewing area	$x \leq 1/8a$
$1/2t < z \leq 2t$	Not exceed $1/3k$	$x \leq 1/8a$ | ⊙If there are 2 or more chips, x is the total length of each chip.	2.5

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 : _(diagram)_ | y: Chip width	x: Chip length	z: Chip thickness
$y \leqq 0.5mm$	$x \leqq 1/8a$	$0 < z \leqq t$ | 6.2.2 Non-conductive portion: _(diagram)_ | y: Chip width	x: Chip length	z: Chip thickness
$y \leqq L$	$x \leqq 1/8a$	$0 < z \leqq t$ | ⊙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. _(diagram)_ | y: width	x: length
$y \leqq 1/3L$	$x \leqq a$		2.5

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 $X * Y <= 2mm^2$	2.5 2.5 0.65 2.5 2.5 0.65 0.65 2.5 2.5
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
		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
		12.7 Sealant on top of the ITO circuit has not hardened.	2.5
		12.8 Pin type must match type in specification sheet.	0.65
		12.9 LCD pin loose or missing pins.	0.65
		12.10 Product packaging must the same as specified on packaging specification sheet.	0.65
		12.11 Product dimension and structure must conform to product specification sheet.	0.65

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.

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**： ____ / ____ / ____