Winstar Display Co., LTD
華凌光電股份有限公司
WEB: http://www.winstar.com.tw *E-mail: winstar@winstar.com.tw*

SPECIFICATION

CUSTOMER : _____

MODULE NO.: WF32CTLAJDNN0#

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

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2016/10/05			

TFT Display Inspection Specification: http://www.winstar.com.tw/technology/download.html

MODLE NO：

RECORDS OF REVISION			DOC. FIRST ISSUE
VERSION	DATE	REVISED PAGE NO.	**SUMMARY**
0	2016/08/01		First issue
A	2016/08/10		Modify Vibration test.
B	2016/10/05		Modify Summary Add Aspect Ratio

Contents

1.Module Classification Information

W	F	32	C	T	L	A	J	D	N	N	0	#
①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬

①	Brand：WINSTAR DISPLAY CORPORATION		
②	Display Type：F→TFT Type, J→Custom TFT		
③	Display Size：3.2” TFT		
④	Model serials no.		
⑤	Backlight Type：	F→CCFL, White S→LED, High Light White	T→LED, White
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	C→Transmissive, N. T, 6:00 ; I→Transmissive, W. T, 6:00 F→Transmissive, N.T,12:00 ; L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00 Q→Transmissive, Super W.T, 12:00 X→Transmissive, W.T, VA TFT V→Transmissive, Super W.T, VA TFT R→Transmissive, Super W.T, O-TFT Z→Transmissive, W.T, O-TFT A→Transmissive, N.T, IPS TFT Y→Transmissive, W.T, IPS TFT	
⑦	A：TFT LCD B：TFT+FR+CONTROL BOARD C：TFT+FR+A/D BOARD D：TFT+FR+A/D BOARD+CONTROL BOARD E：TFT+FR+POWER BOARD F：TFT+CONTROL BOARD	G：TFT+FR H：TFT+D/V BOARD I：TFT+FR+D/V BOARD J：TFT+POWER BD	
⑧	Resolution:		
	A: 128160	B:320234	C:320240	D:480234	E:480272	F: 640480	G: 800480
	H:1024600	I:320480	J:240320	K:800600	L:240400	M :1024768	P :1280800
	S:480128	T:800320					
⑨	D: Digital L：LVDS						
⑩	Interface： N：without control board A：8Bit B：16Bit						
⑪	TS：N：Without TS T：resistive touch panel C：capacitive touch panel (G-F-F) G：capacitive touch panel(G-G)						
⑫	Version						
⑬	Special Code	#:Fit in with ROHS directive regulations					

2.Summary

TFT 3.2”is a TN transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs.

3.General Specifications

Item	Dimension	Unit
Size	3.2	inch
Dot Matrix	240x RGBx 320(TFT)	dots
Module dimension	55.04 (W) x 77.6 (H) x 2.55(D)	mm
Active area	48.6 x 64.8	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	6 o'clock	
Gray Scale Inversion Direction	12 o'clock	
Aspect Ratio	Portrait	
Backlight Type	LED,Normally White	
With /Without TP	Without TP	
Surface	Glare	

*Color tone slight changed by temperature and driving voltage.

4.Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	℃
Storage Temperature	TST	-30	—	+80	℃

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. ≦60℃, 90% RH MAX. Temp.＞60℃, Absolute humidity shall be less than 90% RH at 60℃

5.Electrical Characteristics

5.1. Operating conditions:

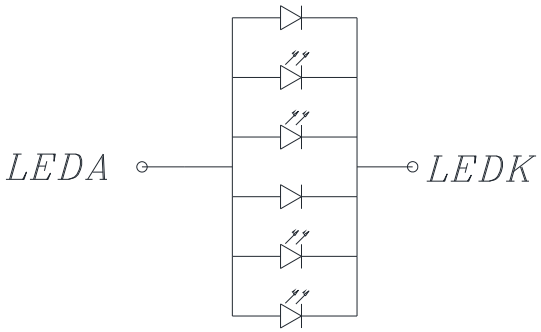
Item	Symbol	Condition	Min	Type	Max	Unit
Power supply voltage	V_{DD}		2.5	-	3.3	V
Power supply voltage	IOVCC		1.65		3.3	V
Input high voltage	Vih		0.7IOVCC	-	IOVCC	V
Input low voltage	Vil		GND	-	0.3IOVCC	V
Output high voltage	Voh	Ioh=-1.0mA	0.8 IOVCC	-	IOVCC	V
Output low voltage	Vol	Iol=1.0mA	GND	-	0.2 IOVCC	V
Current consumption	Idd	-	-	9	-	mA

This value is test for VDD=3.3V , Ta=25 ℃ only

5.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	120	150	mA	—
LED voltage	VBL+	2.8	3.2	3.4	V	Note 1
LED Life Time	—	—	20000	—	Hr	Note 2,3

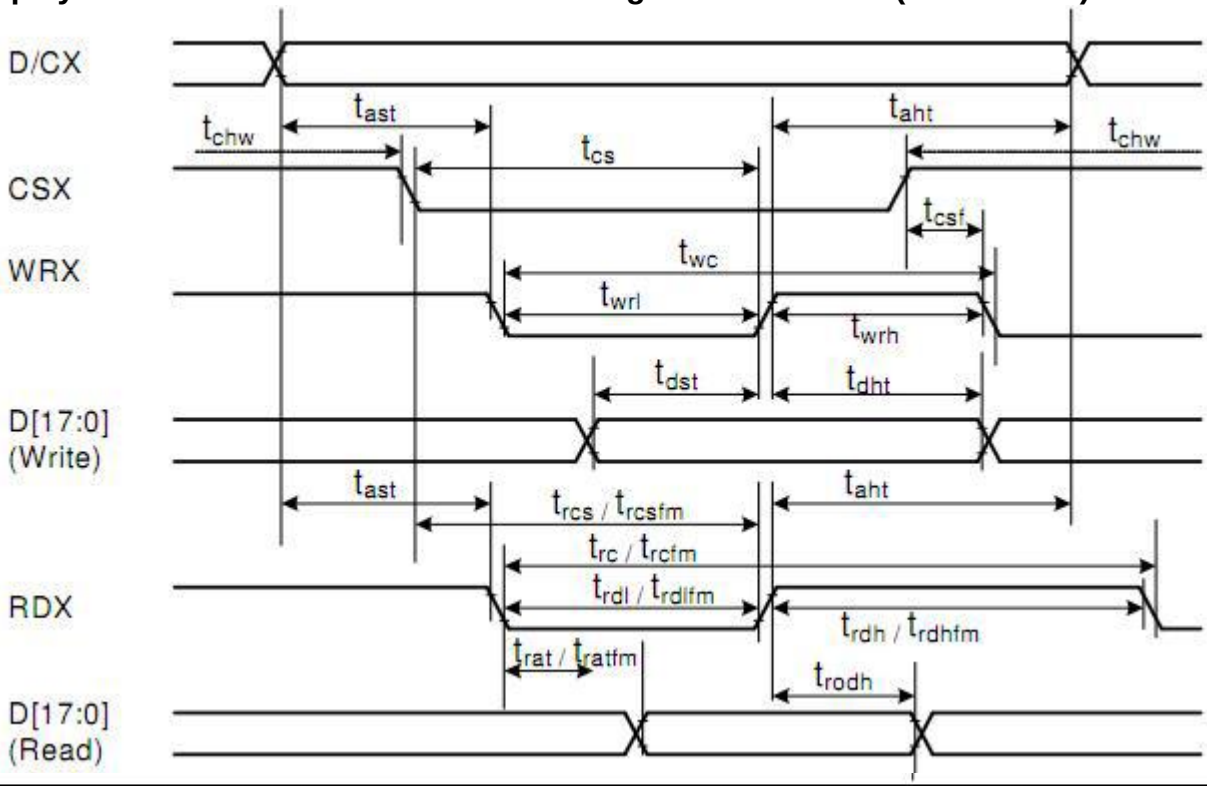
Note 1 : There are 1 Groups LED
Note 2 : Ta = 25°C



Note 3 : Brightness to be decreased to 50% of the initial value

5.3. Time Sequence

Display Parallel 18/16/9/8-bit Interface Timing Characteristics (8080-series)



Signal	Symbol	Parameter	min	max	Unit	Description
DCX	tast	Address setup time	0	-	ns	
	taht	Address hold time (Write/Read)	0	-	ns	
CSX	tchw	CSX "H" pulse width	0	-	ns	
	tcs	Chip Select setup time (Write)	15	-	ns	
	trcs	Chip Select setup time (Read ID)	45	-	ns	
	trcsfm	Chip Select setup time (Read FM)	355	-	ns	
	tcsf	Chip Select Wait time (Write/Read)	10	-	ns	
WRX	twc	Write cycle	66	-	ns	
	twrh	Write Control pulse H duration	15	-	ns	
	twrl	Write Control pulse L duration	15	-	ns	
RDX (FM)	trcfm	Read Cycle (FM)	450	-	ns	
	trdhfm	Read Control H duration (FM)	90	-	ns	
	trdlfm	Read Control L duration (FM)	355	-	ns	
RDX (ID)	trc	Read cycle (ID)	160	-	ns	
	trdh	Read Control pulse H duration	90	-	ns	
	trdl	Read Control pulse L duration	45	-	ns	
D[17:0], D[15:0], D[8:0], D[7:0]	tdst	Write data setup time	10	-	ns	For maximum CL=30pF For minimum CL=8pF
	tdht	Write data hold time	10	-	ns	
	trat	Read access time	-	40	ns	
	tratfm	Read access time	-	340	ns	
	trod	Read output disable time	20	80	ns	

6.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr	θ =0°、Φ=0°	-	4	-	.ms	Note 3,5
		Tf		-	12	-	.ms	
Contrast ratio		CR	At optimized viewing angle	-	500	-	-	Note 4,5
Color Chromaticity	White	Wx	θ =0°、Φ=0	0.253	0.303	0.353		Note 2,6,7
		Wy		0.265	0.325	0.385		
Viewing angle (Gray Scale Inversion Direction)	Hor.	Θ R	CR≧10	-	45	-	Deg.	Note 1
		Θ L		-	45	-		
	Ver.	Φ T		-	45	-		
		Φ B		-	20	-		
Brightness		-	-	200	250	-	cd/m2	Center of display

Ta=25±2℃

Note 1: Definition of viewing angle range

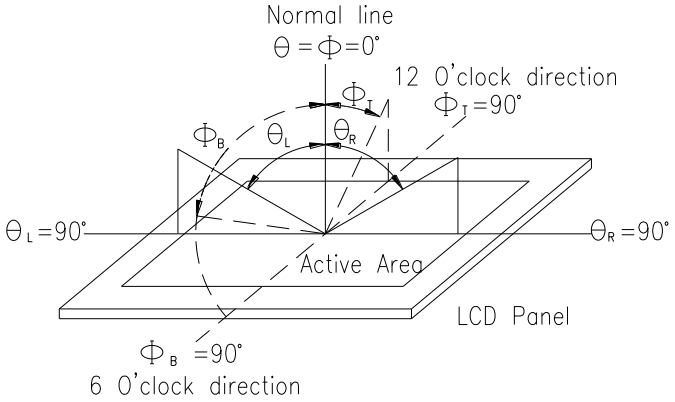


Fig. 6.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

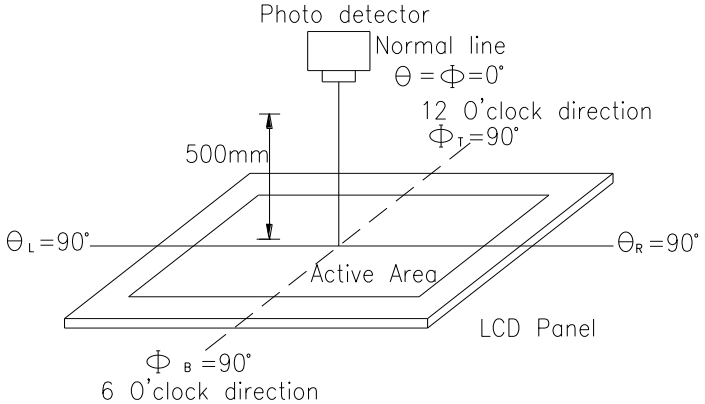
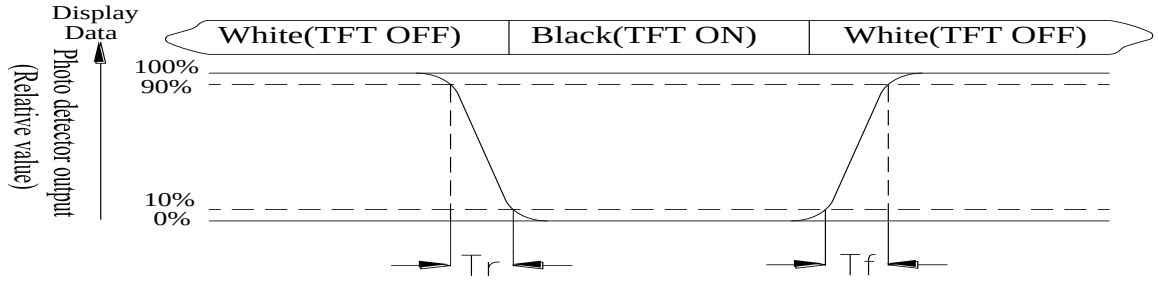


Fig. 6.2. Optical measurement system setup

Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between “White” state and “Black” state. Rise time, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, is the time between photo detector output intensity changed from 10%to 90%



Note 4: Definition of contrast ratio:
The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: White Vi = Vi50 ± 1.5V
Black Vi = Vi50 ± 2.0V
“±” means that the analog input signal swings in phase with VCOM signal.
“±” means that the analog input signal swings out of phase with VCOM signal.
The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

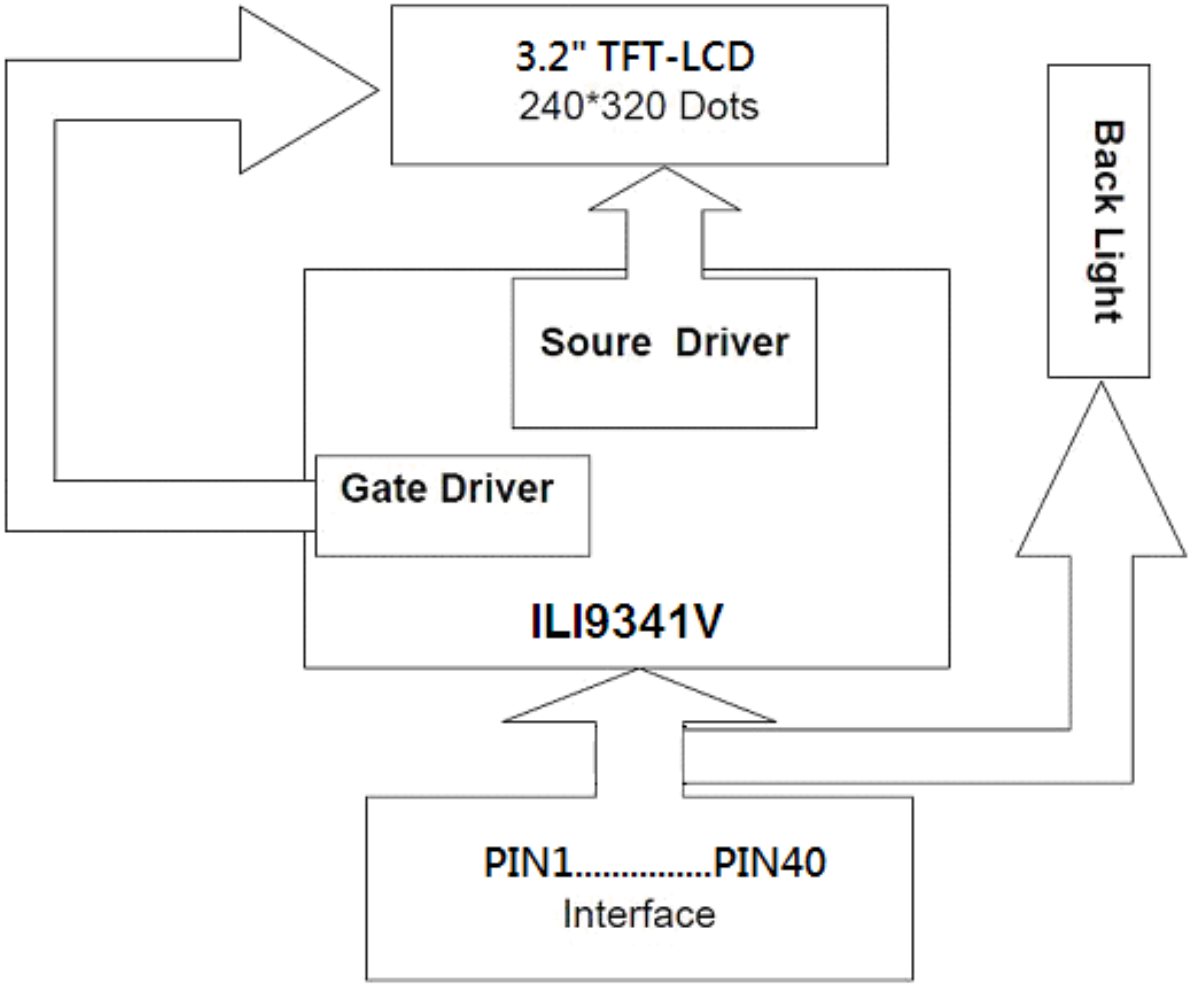
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

7.Interface

LCM PIN Definition

<table>
<tr><th>NO</th><th>Symbol</th><th>Function</th><th>I/O</th></tr>
<tr><td>1</td><td>NC</td><td>No connection</td><td>—</td></tr>
<tr><td>2</td><td>NC</td><td>No connection</td><td>—</td></tr>
<tr><td>3</td><td>NC</td><td>No connection</td><td>—</td></tr>
<tr><td>4</td><td>NC</td><td>No connection</td><td>—</td></tr>
<tr><td>5</td><td>VCI</td><td>Power supply(TYP: 2.8V).</td><td>P</td></tr>
<tr><td>6</td><td>IOVCC</td><td>Power supply(TYP:1.8V/2.8V).</td><td>P</td></tr>
<tr><td>7-24</td><td>DB17~DB0</td><td>Data bus</td><td>I/O</td></tr>
<tr><td>25</td><td>SDA</td><td>Serial data input/output</td><td>I/O</td></tr>
<tr><td>26</td><td>DOTCLK</td><td>Data enable signal in RGB interface.</td><td>I</td></tr>
<tr><td>27</td><td>DE</td><td>A data ENABLE signal in RGB I/F mode</td><td>I</td></tr>
<tr><td>28</td><td>HSYNC</td><td>Horizontal synchronizing signal in RGB interface</td><td>I</td></tr>
<tr><td>29</td><td>VSYNC</td><td>Vertical synchronizing signal in RGB interface</td><td>I</td></tr>
<tr><td>30</td><td>NRD</td><td>Read enable pin I80 parallel bus system interface</td><td>I</td></tr>
<tr><td>31</td><td>NWR_DNC</td><td>NWR Write enable pin I80 parallel bus system interface
DNC Command/parameter or display data selection pin in serial bus system interface</td><td>I</td></tr>
<tr><td>32</td><td>DNC_SCL</td><td>DNC Command/parameter or display data selection pin in parallel interface
SCL Serial data clock in serial bus system Interface</td><td>I</td></tr>
<tr><td>33</td><td>NCS</td><td>Chip select signal</td><td>I</td></tr>
<tr><td>34</td><td>NRESET</td><td>System Reset</td><td>I</td></tr>
<tr><td>35
36
37</td><td>IM0
IM1
IM2</td><td>System interface select:
<table>
<tr><th rowspan="2">IM2</th><th rowspan="2">IM1</th><th rowspan="2">IM0</th><th rowspan="2">MCU-Interface Mode</th><th colspan="2">DB Pin in use</th></tr>
<tr><th>Register/Content</th><th>GRAM</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>80 MCU 8-bit bus interface I</td><td>D[7:0]</td><td>D[7:0]</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>80 MCU 16-bit bus interface I</td><td>D[7:0]</td><td>D[15:0]</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>80 MCU 9-bit bus interface I</td><td>D[7:0]</td><td>D[8:0]</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>80 MCU 18-bit bus interface I</td><td>D[7:0]</td><td>D[17:0]</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>3-wire 9-bit data serial interface I</td><td colspan="2">SDA: In/OUT</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>4-wire 8-bit data serial interface I</td><td colspan="2">SDA: In/OUT</td></tr>
</table></td><td>I</td></tr>
<tr><td>38</td><td>GND</td><td>Ground</td><td>P</td></tr>
<tr><td>39</td><td>LEDA</td><td>Anode of LED backlight.</td><td>P</td></tr>
<tr><td>40</td><td>LEDK</td><td>Cathode of LED backlight.</td><td>P</td></tr>
</table>

8.Block Diagram



9.Reliability

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

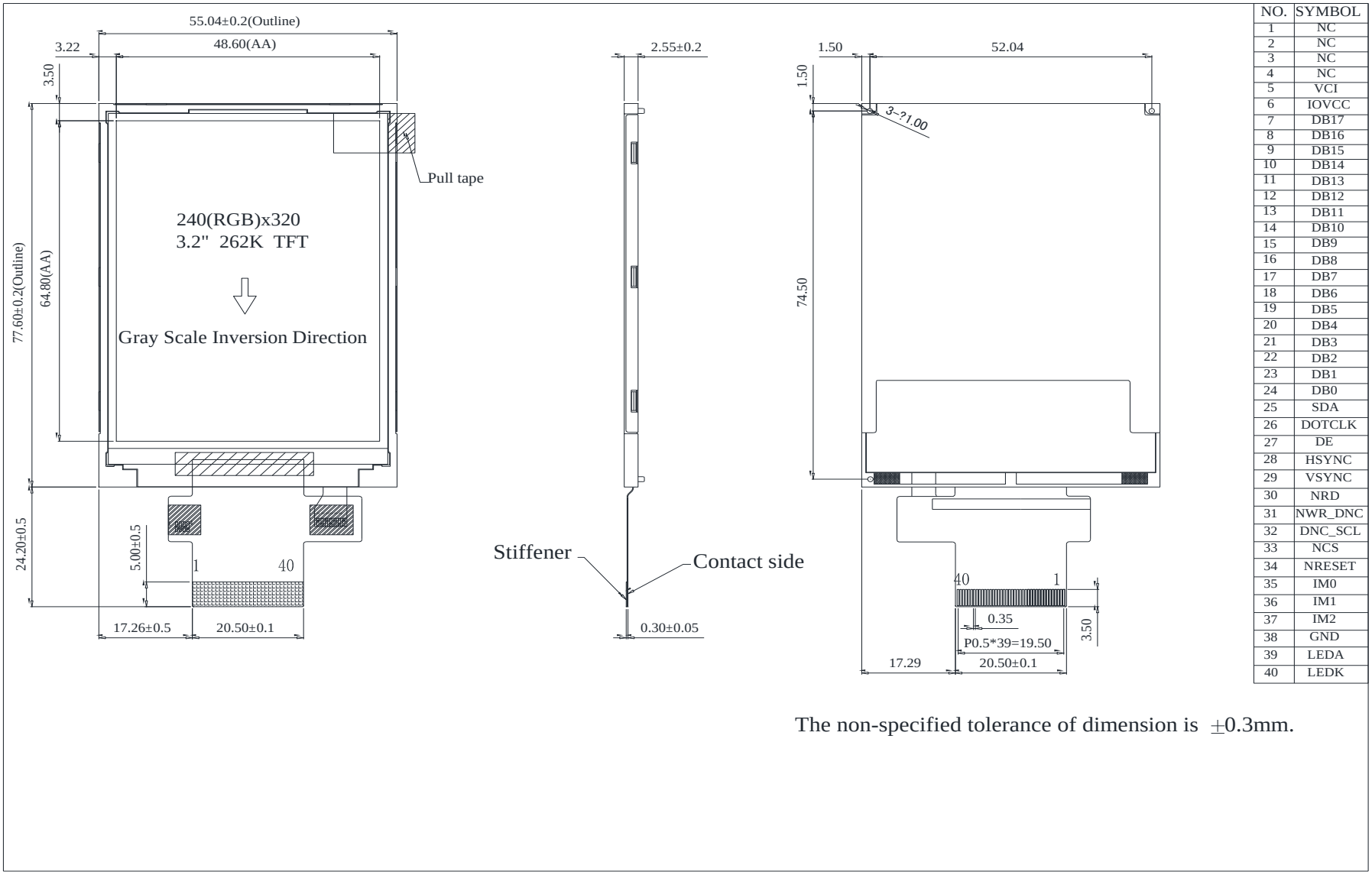
Environmental Test			
Test Item	**Content of Test**	**Test Condition**	**Note**
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80℃ 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 96hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 96hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 40℃,90%RH max	40℃,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=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	——

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: The packing have to including into the vibration testing.

10.Contour Drawing



NO.	SYMBOL
1	NC
2	NC
3	NC
4	NC
5	VCI
6	IOVCC
7	DB17
8	DB16
9	DB15
10	DB14
11	DB13
12	DB12
13	DB11
14	DB10
15	DB9
16	DB8
17	DB7
18	DB6
19	DB5
20	DB4
21	DB3
22	DB2
23	DB1
24	DB0
25	SDA
26	DOTCLK
27	DE
28	HSYNC
29	VSYNC
30	NRD
31	NWR_DNC
32	DNC_SCL
33	NCS
34	NRESET
35	IM0
36	IM1
37	IM2
38	GND
39	LEDA
40	LEDK

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

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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. Material 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 ,_____

>> **Go to page 2** <<

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**：____/____/____