PRODUCT SPECIFICATION

Part Number

PT322435A-TLMWD-E24

CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	
APPROVED BY	
DATE	

1. Table of Contents

2. Record of Revisions

Rev.	Comments	Page	Date
1	Preliminary Specification was first issued	All	11/13’07

3. Module Numbering System

P T ____ __ __ - _ __ _ _ - _ _ _ _ __ _

1. 2. 3. 4. 5. 6. 7. 8. 9 10. 11. 12. 13. 14.

1. P-TEC TFT

2. LENGTH x WIDTH PIXELS
If third character is a zero, it is removed to shorten part number. Example: 240 x 320 = PT3224

3. DIAGONAL DIMENSIONS
Example: 3.5” display = 35 in part number

4. PRODUCT VERSION
Series assigned by P-tec

5. LCD MODE
T: TN
I: IPS
V: VA

6. POLARIZER
LM: Transmissive
LF: Transflective

7. BACKLIGHT COLOR
No Backlight: Left Blank
W: White
B: Blue/Green
S: Yellow/Green

8. VIEWING DIRECTION
D: 6 o’clock
U: 12 o’clock
F: Full Viewing Angle

9. A ~ Z CODE
Assigned by P-tec

11. TEMPERATURE RANGE
Normal: Left Blank
Wide: X

12. LUMINANCE
Blank: Normal (<300 nit)
M: Middle (>/= 300 nit)
H: High (> 600 nit)

13. TOUCH PANEL OPTION
No TP: Left Blank
C: Capacitive TP
R: Resistive TP

14. SPECIAL CHARACTERS
Customer special requirements

4. Application

This specification is applied to the 3.5 inch QVGA supported TFT-LCD module, and can display 262k colors. The module is designed for PMP, GPS application and other electronic products which require flat panel display of digital signal interface.

5. Features

- QVGA (320×240 pixels) resolution.
- Display in 262k colors
- Line inversion mode with stripe type.
- On-chip voltage generator
- CCIR656 interface(Operating Frequency : 27MHz)
- Serial Peripheral Interface (SPI)

6. General Specifications

Item	Specifications	Unit
Screen Size	3.5 (Diagonal)	inch
Display Format	320RGB(H)×240(V)	dot
Active Area	70.08(H)×52.56(V)	mm
Dot Pitch	0.073(H)×0.219(V)	mm
Pixel Configuration	RGB Vertical Stripe	-
Display Mode	TN Type Transmissive Mode Normally White	-
Surface Treatment	Anti-Glare	-
Viewing Direction	6 O'clock (The Gray Inversion will appear at this direction)	-
Outline Dimension	76.9(W)×63.9(H)×3.3(D)	mm
DC to DC circuit	Build-in	-
Weight	(TBD)	g

7. Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-30	+80	°C	(1)
Operating Ambient Temperature	T_{OP}	-20	+70	°C	(1)

Note (1) Temperature and relative humidity range are shown in the figure below.

(a) 90%RH Max. (Ta≦40°C).

(b) Wet-bulb temperature should be 39°C Max. (Ta>40°C).

(c) No condensation.

7.2 Electrical Absolute Ratings

7.2.1 TFT-LCD Module

(Ta=25±2°C, GND=V_{SS}=0V)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Digital Power Supply Voltage	V_{CC}	V_{SS}-0.3	5.0	V	-

7.2.2 Backlight Unit

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Forward current	If	-	(30)	mA	(1)
Reverse voltage	V_R	-	(30)	V	(1)

Note (1) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.

8. Electrical Characteristics

8.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Digital Power Supply Voltage	V_{CC}	2.5	3.3	3.6	V	-
Input High Threshold Voltage	V_{IH}	0.8V_{CC}	-	V_{CC}	V	-
Input Low Threshold Voltage	V_{IL}	0	-	0.2V_{CC}	V	-

(GND=VSS=0V)

Parameter	SYMBOL	Condition	Min	Typ	Max	Unit	Remarks
Digital Current	IV_{CC}	V_{CC} = 3.3V	-	(15.6)	(TBD)	mA	(1)
Total Power Consumption	PC	V_{CC} = 3.3V	-	(51.48)	(TBD)	mW	(1)

Note (1) The specified power consumption is under the conditions at V_{CC}=3.3V, F_V=60Hz, whereas a power dissipation check pattern below is displayed.

Black Pattern / 0 Gray

Active Area

8.2 Backlight Unit

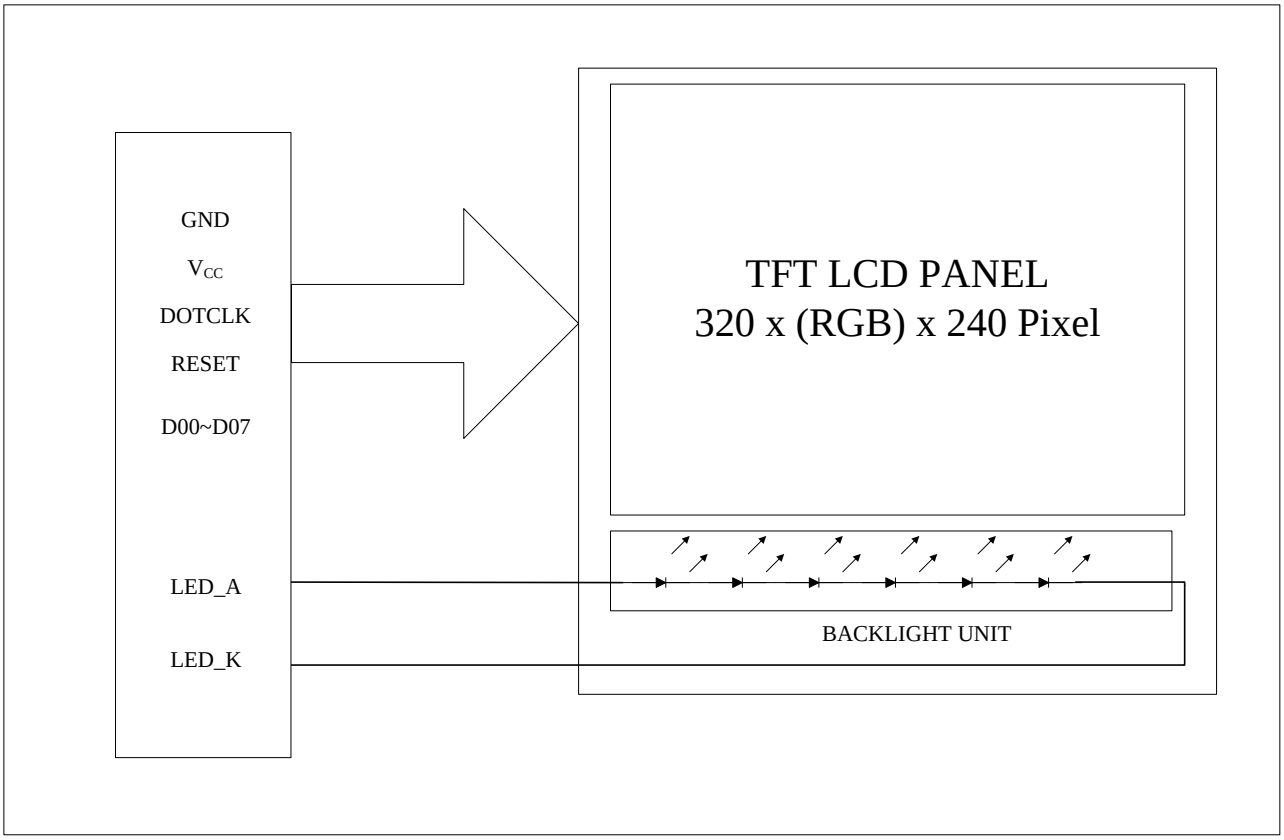
(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Voltage	VL	-	(18.6)	-	V	(1)
LED Current	IL	-	(20)	-	mA	(1)
Power Consumption	P_{BL}	-	(372)	-	mW	(1)

Note (1) The driving design of backlight unit is dependent on serial consideration of six LEDs.

9. Block Diagram

TFT-LCD Module with Backlight Unit



10. Input / Output Terminals Pin Assignment

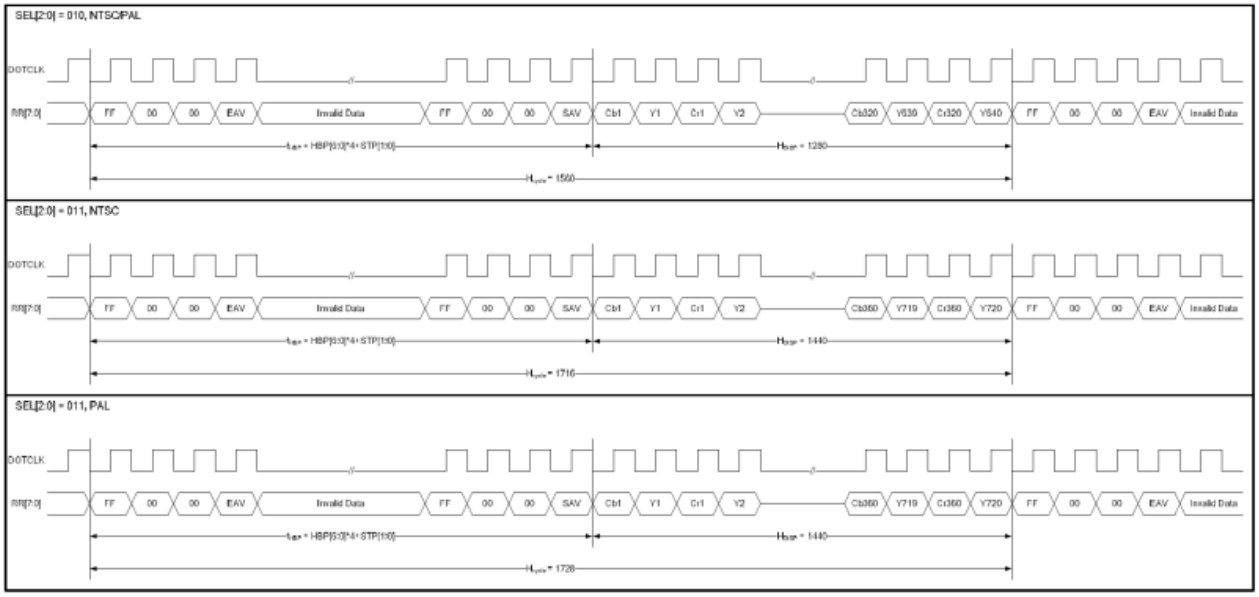
10.1 TFT-LCD Module

Pin No.	Symbol	I/O	Description
1	LED_K	I	LED_cathode
2	LED_A	I	LED_anode
3	NC	I	Not connection
4	NC	I	Not connection
5	V_{SS}	I	Ground
6	NC	I	Not connection
7	NC	I	Not connection
8	RESET	I	Hardware global reset
9	NC	I	Not connection
10	NC	I	Not connection
11	NC	I	Not connection
12	CSB	I	Serial port data enable signal
13	SCK	I	Serial port clock
14	SDI	I	Serial port data input
15	NC	I	Not connection
16	NC	I	Not connection
17	TEST	I	Not connection
18	TEST	I	Not connection
19	TEST	I	Not connection
20	TEST	I	Not connection
21	TEST	I	Not connection
22	TEST	I	Not connection
23	TEST	I	Not connection
24	TEST	I	Not connection
25	TEST	I	Not connection
26	TEST	I	Not connection
27	TEST	I	Not connection
28	TEST	I	Not connection

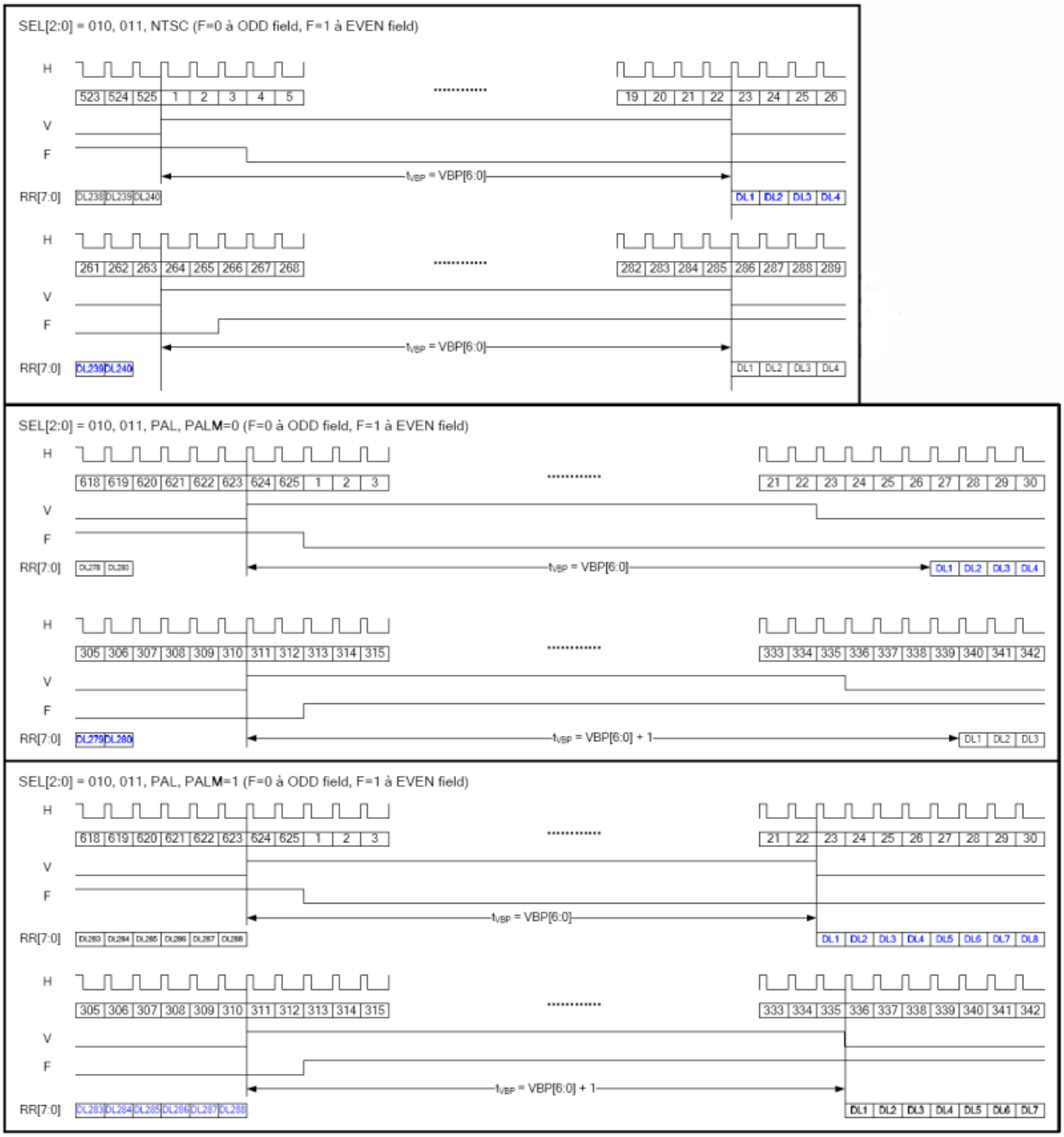
Pin No.	Symbol	I/O	Description
29	TEST	I	Not connection
30	TEST	I	Not connection
31	TEST	I	Not connection
32	TEST	I	Not connection
33	NC	I	Not connection
34	NC	I	Not connection
35	NC	I	Not connection
36	NC	I	Not connection
37	NC	I	Not connection
38	NC	I	Not connection
39	NC	I	Not connection
40	NC	I	Not connection
41	NC	I	Not connection
42	V_{SS}	I	Ground
43	RR7	I	CCIR656 input data
44	RR6	I	
45	RR5	I	
46	RR4	I	
47	RR3	I	
48	RR2	I	
49	RR1	I	
50	RR0	I	
51	DOTCLK	I	Clock signal
52	TEST	I	Not connection
53	TEST	I	Not connection
54	NC	I	Not connection
55	V_{CC}	I	Digital power

11. Interface Timing

11.1 Input Signal Characteristics

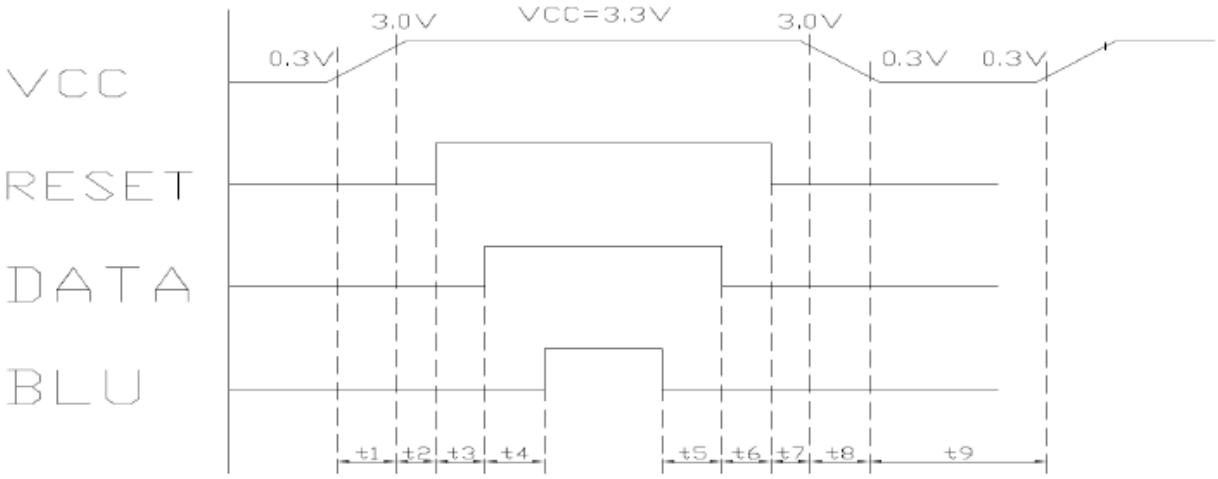


CCIR656 Horizontal Timing



CCIR656 Vertical Timing

11.3 Power On / Off Sequence



T1≦10ms　　200ms≦T5　　1 sec≦T9

10us≦T2　　50ms≦T6

50ms≦T3　　10us≦T7

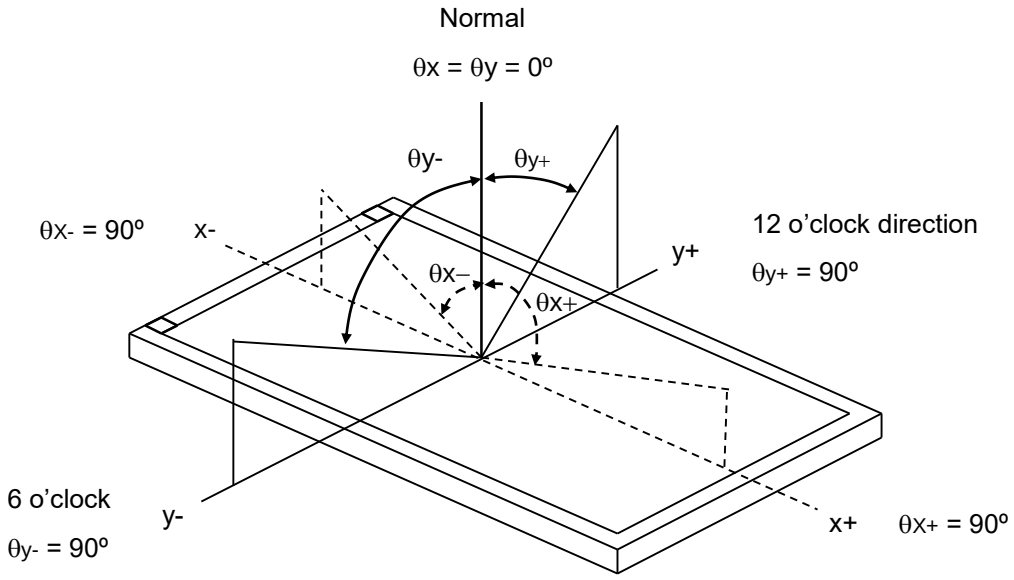
200ms≦T4　　T8≦10ms

12. Optical Characteristics

The optical characteristics should be measured in a dark environment (≦ 1 lux) or equivalent state with the methods shown in Note (4).

Item		Symbol	Conditions	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θ_x=0°, θ_Y =0° Viewing Normal Angle	200	(TBD)	-	-	(2)
Response Time		$T_{R+}T_F$		-	50	-	ms	(3)
Luminance(Center)		Y		220	(TBD)	-	cd/m^2	(4)
Brightness uniformity		BUNI		80	-	-	%	(5)
Color Chromaticity	Red	Rx		-	(0.560)	-	-	(1),(4)
		Ry		-	(0.420)	-	-	
	Green	Gx		-	(0.270)	-	-	
		Gy		-	(0.670)	-	-	
	Blue	Bx		-	(0.140)	-	-	
		By		-	(0.080)	-	-	
	White	Wx		-	(0.260)	-	-	
		Wy		-	(0.350)	-	-	
Viewing Angle	Horizontal	θ_x+	CR≥10	(55)	(70)	-	deg.	
		θ_x-		(55)	(70)	-		
	Vertical	θ_Y+		(40)	(65)	-		
		θ_Y-		(50)	(70)	-		

Note (1) Definition of Viewing Angle (θx, θy):



Note (2) Definition of Contrast Ratio (CR):

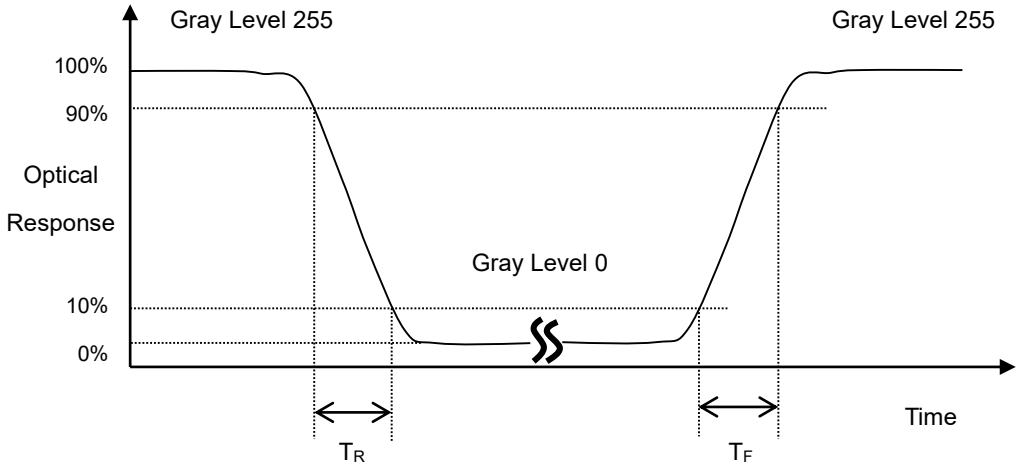
Measured at the center point of panel

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

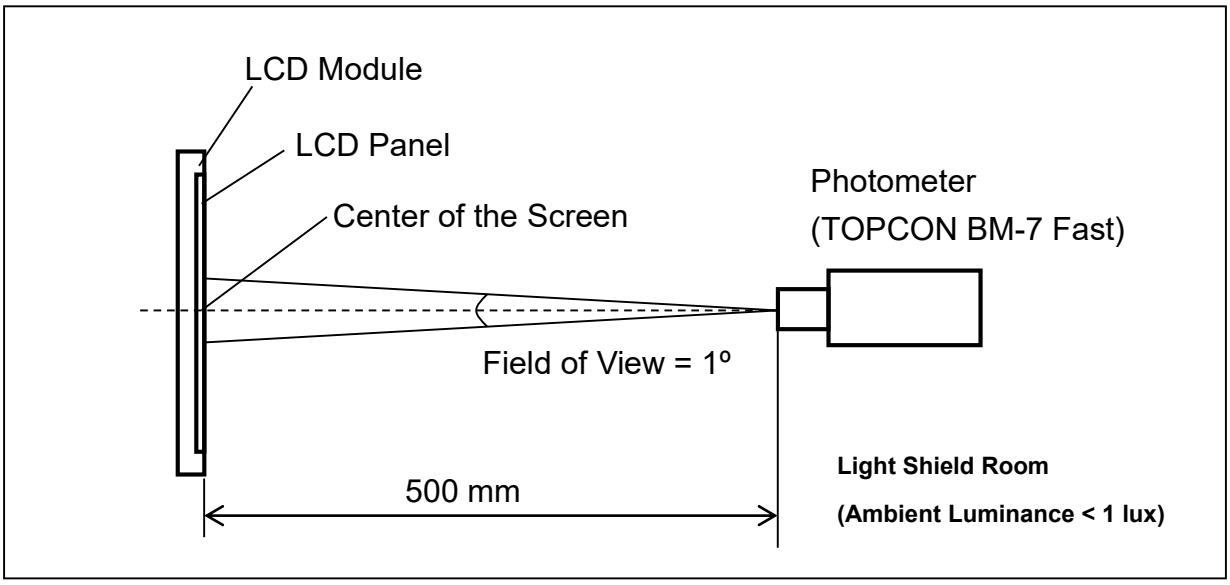
L 0: Luminance of gray level 0.

Note (3) Definition of Response Time (T_R, T_F):



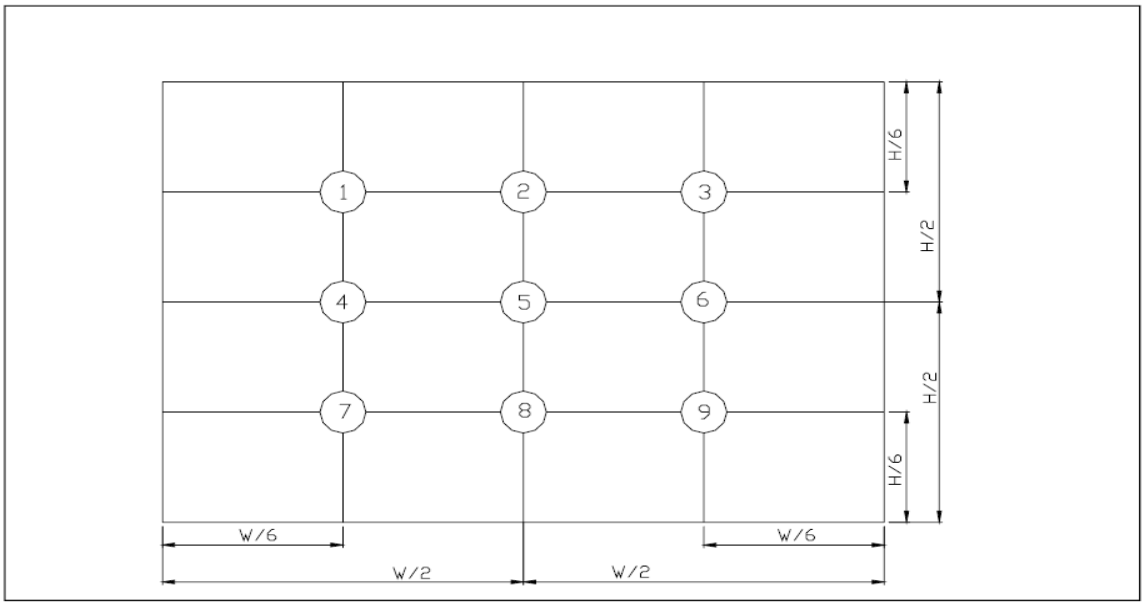
Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (5) Definition of brightness uniformity

Brightness uniformity=(Min Luminance of 9 points)/(Max Luminance of 9 points)×100%



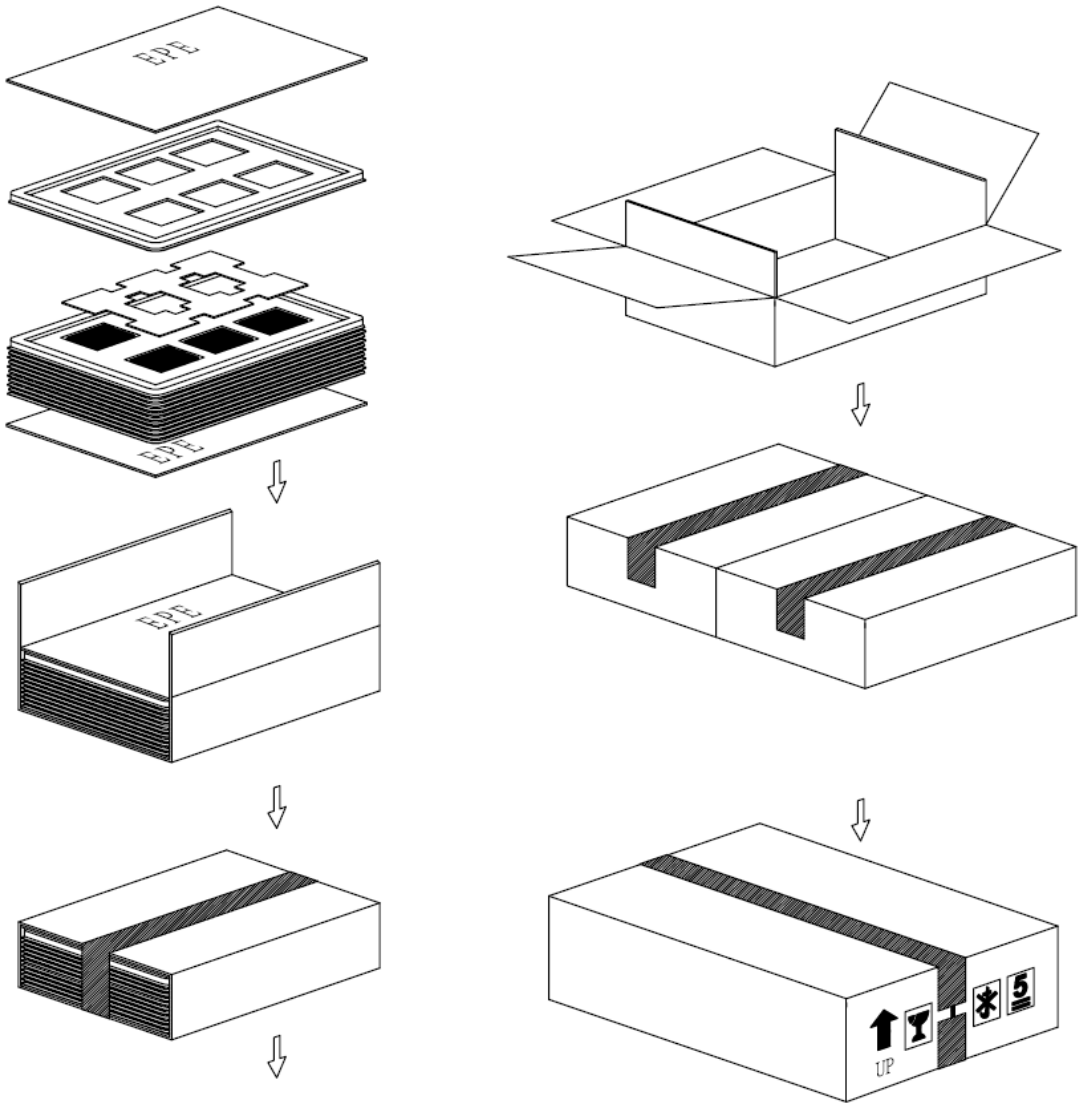
(單位 ：mm)

13. Reliability Test

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T_a= 80℃ 240 hours	-
2	Low Temperature Storage Test	T_a= -30℃ 240 hours	-
3	High Temperature Operation Test	T_a= 70℃ 240 hours	-
4	Low Temperature Operation Test	T_a= -20℃ 240 hours	-
5	High Temperature and High Humidity Operation Test	T_a=60℃ 90%RH 240 hours	-
6	Electro Static Discharge Test (non-operating)	-Panel Surface/Top Case : 150pF, 330Ω Air: ±15kV, Contact: ±8kV	-
7	Mechanical Shock Test (non-operating)	Half sine wave, 80G, 11ms 3 times shock of each six surfaces	-
8	Vibration Test (non-operating)	Sine wave, 10 ~ 55 ~ 10Hz, 3 axis, 2 hours/axis	-
9	Thermal Shock Test (non-operating)	-20℃(30min) ~ 70℃(30min),100 cycles	-
10	Drop Test(with Carton)	Height: 80cm 1 corner, 3 edges, 6 surfaces	-

14. Packaging

Packing Method



	PARTS LIST				
	ITEM	SIZE(LxWxH) unit:mm	MATERIAL	Q.T.Y	NOTE
1	TRAY	372.0x262.0x16.0	PET	28	
2	CARD BOARD(P01)	816.0x375.0x3.5	CARTON	2	
3	CARD BOARD(P02)	945.0x275.0x3.5	CARTON	2	
4	CARD BOARD(P03)	375.0x265.0x3.5	CARTON	4	
5	INTERNAL BOX(S01)	400.0x290.0x150.0	CARTON	2	
6	EXTERNAL BOX(L02)	600.0x420.0x170.0	CARTON	1	
7	EPE Form	285.0x197.0x2.0	EPE	26	
8	PRODUCT	76.9x63.9x3.3		156	

15. Precautions

15.1 Assembly and Handling Precautions

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It's recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Don't apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD module in the specified storage conditions.

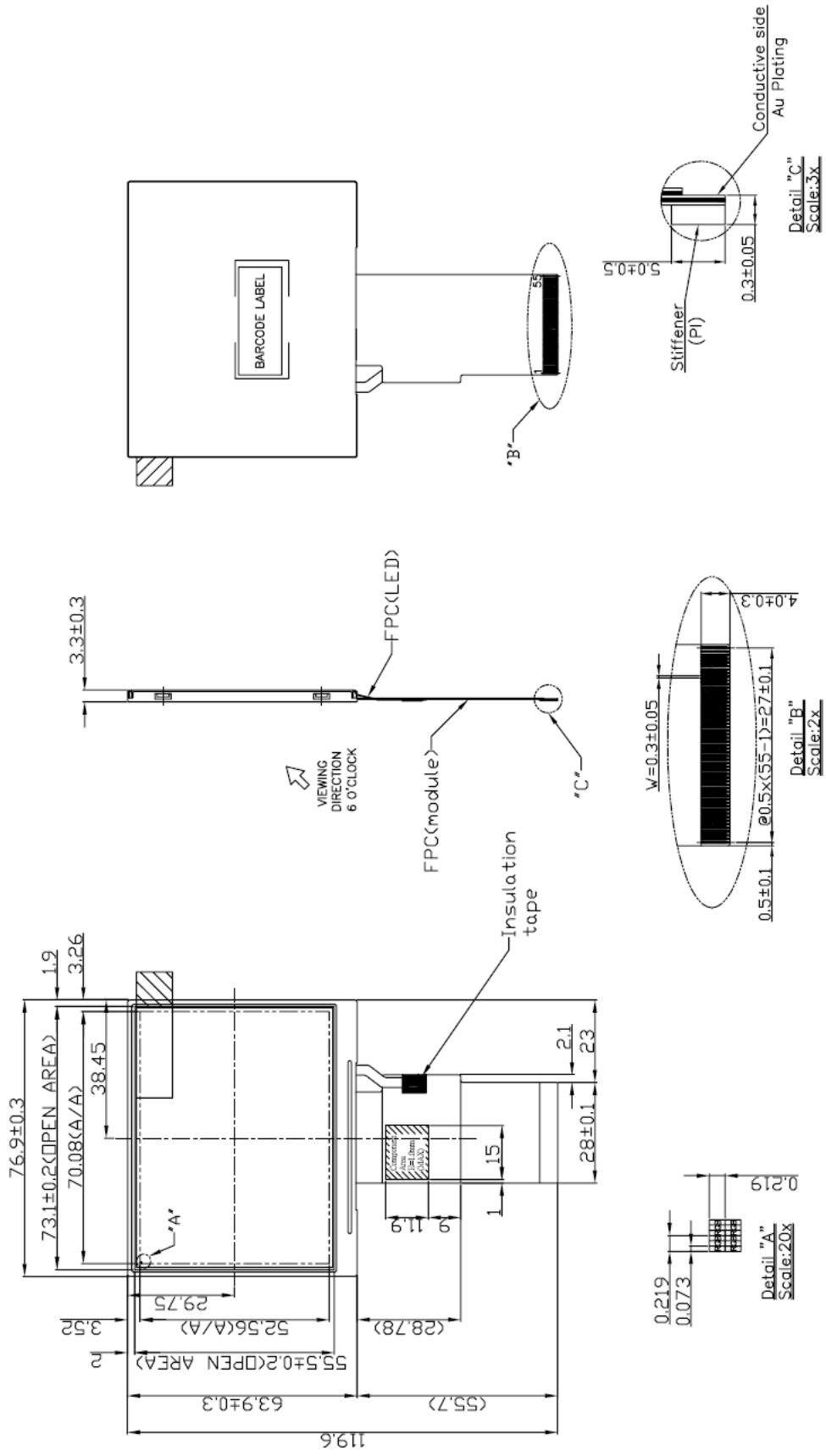
(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow.

15.2 Safety Precautions

(1) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

(2) After the module's end of life, it is not harmful in case of normal operation and storage.

16.Outline Drawing

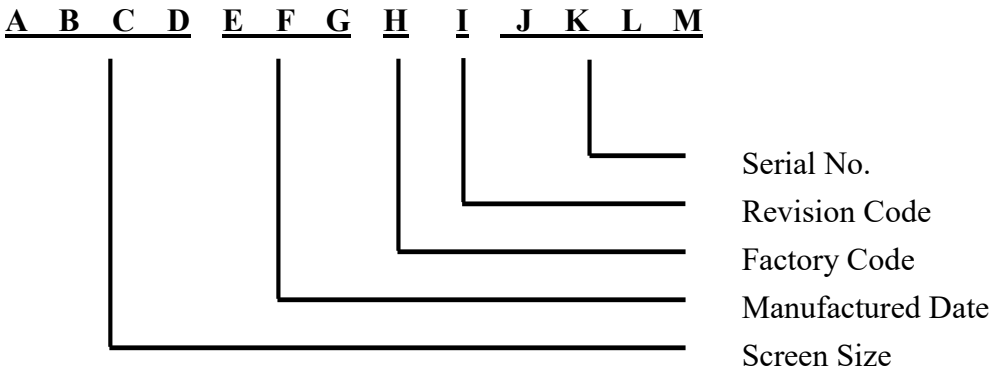


17.Definition of Labels

The bar code nameplate is pasted on each module as illustration, and its definitions are as following explanation.

(a) Module Name: PT322435A-TLMWD-E24

(b) Serial ID:



Serial ID includes the information as below:

(a) Screen size (Diagonal): Inch Code (ABCD)

3.5” → 0350

10.4” → 1040

(b) Manufactured Date: Year, Month, Day (EFG)

Year (E)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Mark	0	1	2	3	4	5	6	7	8	9

Month (F)

Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Mark	1	2	3	4	5	6	7	8	9	A	B	C

Day (G)

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Mark	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G
Day	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
Mark	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	

(c) Factory Code (H):

For internal use.

(d) Revision Code (I):

Cover all the change, for example: 1: Rev.1, 2: Rev.2, 3: Rev.3…etc.

(e) Serial No. (JKLM):

Manufacturing sequence of product, for example: 0001~9999.

18. Incoming Inspection Standards

18.1 The environmental condition of inspection

The environmental condition and visual inspection shall be conducted as below.

(1) Ambient temperature 25 ± 5℃

(2) Humidity: 60 ± 5% RH

(3) Viewing distance is approximately 35 ~ 40 cm

(4) Viewing angle is normal to the LCD panel as Fig _1(10°)

(5) Ambient Illumination: 300 ~ 500 Lux for external appearance inspection

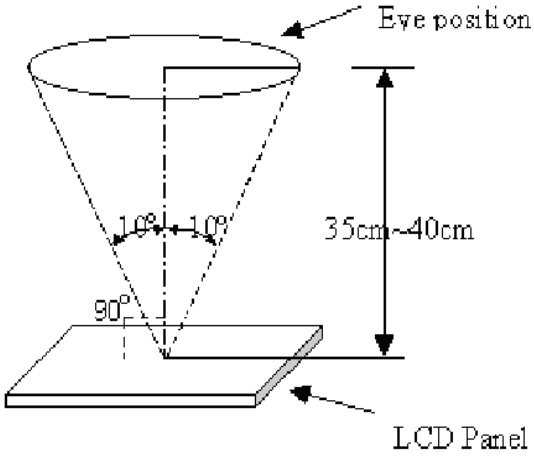


Fig _ 1

18.2 The defects classify of AQL as following:

Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.

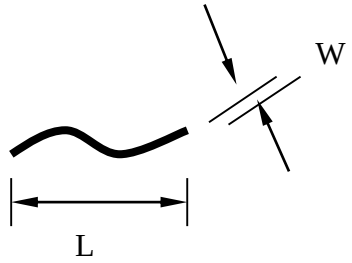
18.3 Inspection Parameters

<table>
<tr><th colspan="2">Item</th><th colspan="5">Specification/Description</th><th>Note</th></tr>
<tr><td rowspan="2">Display</td><td rowspan="2">Function</td><td colspan="5">No Display</td><td>-</td></tr>
<tr><td colspan="5">Malfunction</td><td>-</td></tr>
<tr><td rowspan="6">Operating</td><td>Contrast ratio</td><td colspan="5">Out of Spec</td><td>Note: 3</td></tr>
<tr><td>Line defect</td><td colspan="5">No obvious Vertical and Horizontal line defect in bright , dark and colored.</td><td>-</td></tr>
<tr><td rowspan="6">Point Defect
(red,green,blue,dark)</td><td rowspan="2">Item</td><td colspan="3">Acceptable number</td><td rowspan="2">Note: 1、2、5、6、7</td></tr>
<tr><td>A</td><td>B</td><td>Total</td></tr>
<tr><td>BRIGHT DOT</td><td>N≦0</td><td>N≦2</td><td rowspan="3">N≦6</td></tr>
<tr><td>DARK DOT</td><td>N≦2</td><td>N≦4</td></tr>
<tr><td>TOTAL DOT</td><td>N≦2</td><td>N≦4</td></tr>
<tr><td>TWO ADJACENT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td>THREE OR MORE ADJACENT DOT</td><td colspan="3">NOT ALLOWED</td></tr>
<tr><td rowspan="3">External Inspection
(non-operating)</td><td>Scratch on
the polarizer</td><td colspan="5"><table><tr><td>L(mm)</td><td>W(mm)</td><td>Acceptable number</td></tr><tr><td>L≦2.5</td><td>W≦0.1</td><td>3</td></tr><tr><td>L > 2.5</td><td>W > 0.1</td><td>0</td></tr></table></td><td>Note:3</td></tr>
<tr><td>Dent or bubble
on the polarizer</td><td colspan="5"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.3</td><td>3</td></tr><tr><td>D≦0.1</td><td>Disregard</td></tr></table></td><td>Note:4</td></tr>
<tr><td>Foreign material
on the polarizer</td><td colspan="5"><table><tr><td>Dimension(mm)</td><td>Acceptable number</td></tr><tr><td>D≦0.5</td><td>2</td></tr><tr><td>D≦0.1</td><td>Disregard</td></tr></table></td><td>Note:4</td></tr>
</table>

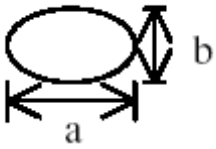
Note1. Distance between point defect distance should be large than 5 mm.

Note2. The definition of dot defect : The dot defect was judged after repair and the size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

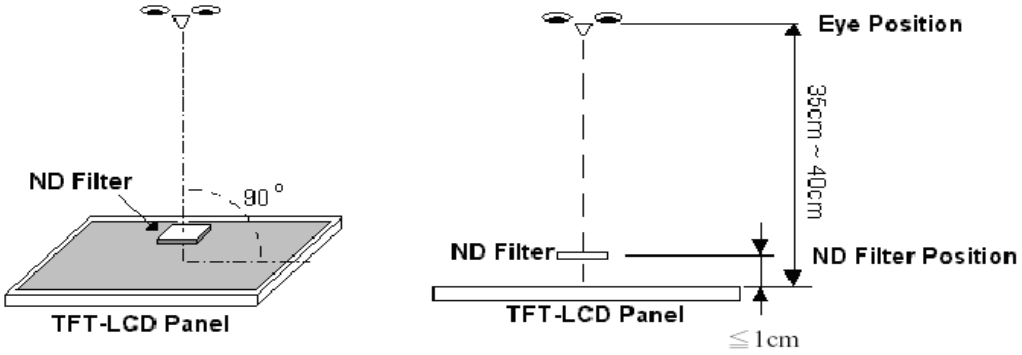
Note3.



Note4. D：Diameter D=(a+b)/2

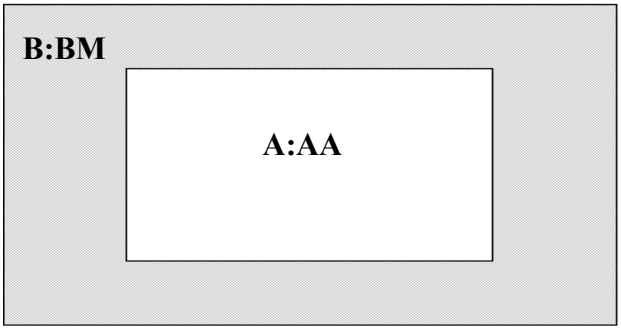


Note5. Bright dot is defined through 6% transmission ND Filter as following.



Note6. ADJACENT DOT

Note7.



18.4. Handling of LCM

(1)Don't give external shock.

(2)Don't apply excessive force on the surface.

(3)Liquid in LCD is hazardous substance. Must not lick and swallow. when the liquid is attach to your hand, skin, cloth etc. Wash it out thoroughly and immediately.

(4)Don't operate it above the absolute maximum rating.

(5)Don't disassemble the LCM.