



PRODUCT SPECIFICATION

Part Number

PT322435-TLMWD-E25A

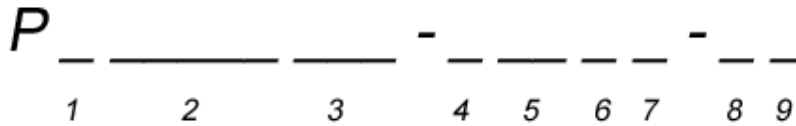
CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	
APPROVED BY	
DATE	

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3. Module Numbering System



1. LCD TYPE

- C = Character
- G = Graphic
- T = TFT
- COG = Chip on Glass
- COF = Chip on Flex
- TAB = Tape Automated Bonding

2. LENGTH x WIDTH

in pixels. Zeroes removed from this section.

3. DIAGONAL DIMENSION

Product size in inches

4. LCD MODE

T = TN

5. POLARIZER

- LF = Transflective
- LM = Transmissive

6. BACKLIGHT COLOR

- B = Blue
- Y = Yellow
- G = Green
- S = Yellow-Green
- W = White

7. VIEWING DIRECTION

- D = 6 o'clock
- U = 12 o'clock
- F = Full v/a

8. A ~ Z CODE

Assigned by P-tec

9. TOUCH PANEL TYPE

- None = Blank
- R = Resistive
- C = Capacitive

10. SPECIAL CHARACTERS

Characters assigned by P-tec to reflect special customer 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
- SYNC mode is supported for digital RGB input data format.

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 and Hard Coating(3H)	-
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	(32.5)	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	I _f	-	(50)	mA	(1)
Reverse voltage	V _R	-	(25)	V	(1)

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



8. Electrical Characteristics

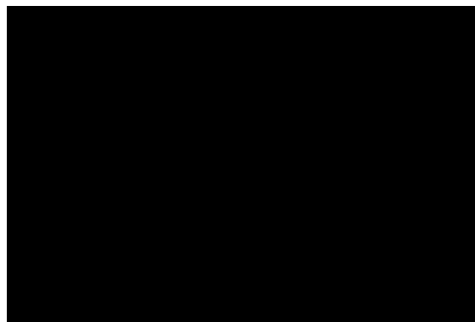
8.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Supply Voltage	V _{CC}	2.5	3.3	3.6	V	-
Power Supply Current	I _{CC}	-	15.6	22.0	mA	(1)
Input High Threshold Voltage	V _{IH}	0.8V _{CC}	-	V _{CC}	V	-
Input Low Threshold Voltage	V _{IL}	0	-	0.2V _{CC}	V	-
Power Consumption	P _L	-	51.48	72.6	mW	(1)
VSYNC Frequency	F _V	-	60	90	Hz	-
HSYNC Frequency	F _H	-	15.72	22.35	KHz	-
DCLK Frequency	DCLK	-	6.5	10	MHz	-

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)

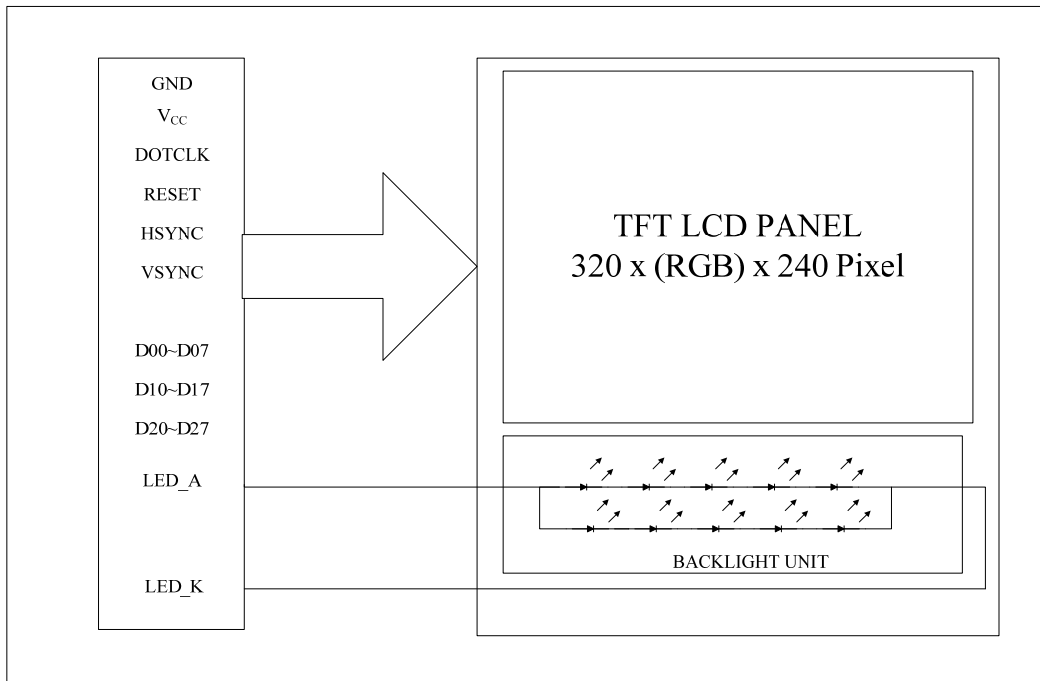
Item	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
LED Voltage	VL	-	(16.5)	-	V	(1)
LED Current	IL	-	(40)	-	mA	(1)
Power Consumption	P _{BL}	-	(660)	-	mW	(1)
LED Life Time(25°C)	-	10000	30000	-	hr	(2)

Note (1) The driving design of backlight unit is dependent on serial consideration of 5S2P LEDs.

Note (2) LED life time is defined as under 25±2°C, when the average brightness decrease to 50% of original brightness



9. Block Diagram TFT-LCD Module with Backlight Unit



**10. Input / Output Terminals Pin Assignment****10.1 TFT-LCD Module (CVILUX CF25541D0R0-05)**

Pin No.	Symbol	I/O	Description
1	LED_K	I	LED_cathode
2	LED_K	I	LED_cathode
3	LED_A	I	LED_anode
4	LED_A	I	LED_anode
5	NC	I	No connection
6	NC	I	No connection
7	NC	I	No connection
8	RESET	I	Reset
9	NC	I	No connection
10	NC	I	No connection
11	NC	I	No connection
12	D20	I	Blue data(LSB)
13	D21	I	Blue data
14	D22	I	Blue data
15	D23	I	Blue data
16	D24	I	Blue data
17	D25	I	Blue data
18	D26	I	Blue data
19	D27	I	Blue data(MSB)
20	D10	I	Green data(LSB)
21	D11	I	Green data
22	D12	I	Green data
23	D13	I	Green data
24	D14	I	Green data
25	D15	I	Green data
26	D16	I	Green data
27	D17	I	Green data(MSB)
28	D00	I	Red data(LSB)
29	D01	I	Red data
30	D02	I	Red data



Pin No.	Symbol	I/O	Description
31	D03	I	Red data
32	D04	I	Red data
33	D05	I	Red data
34	D06	I	Red data
35	D07	I	Red data(MSB)
36	HSYNC	I	Line synchronization signal.
37	VSYNC	I	Frame synchronization signal.
38	DOTCLK	I	Dot Colck signal
39	NC	I	No connection
40	NC	I	No connection
41	V _{CC}	I	For system power supply.
42	V _{CC}	I	For system power supply.
43	NC	I	No connection
44	NC	I	No connection
45	NC	I	No connection
46	NC	I	No connection
47	NC	I	No connection
48	NC	I	No connection
49	NC	I	No connection
50	NC	I	No connection
51	NC	I	No connection
52	NC	I	No connection
53	GND	I	Ground
54	GND	I	Ground



11. Interface Timing

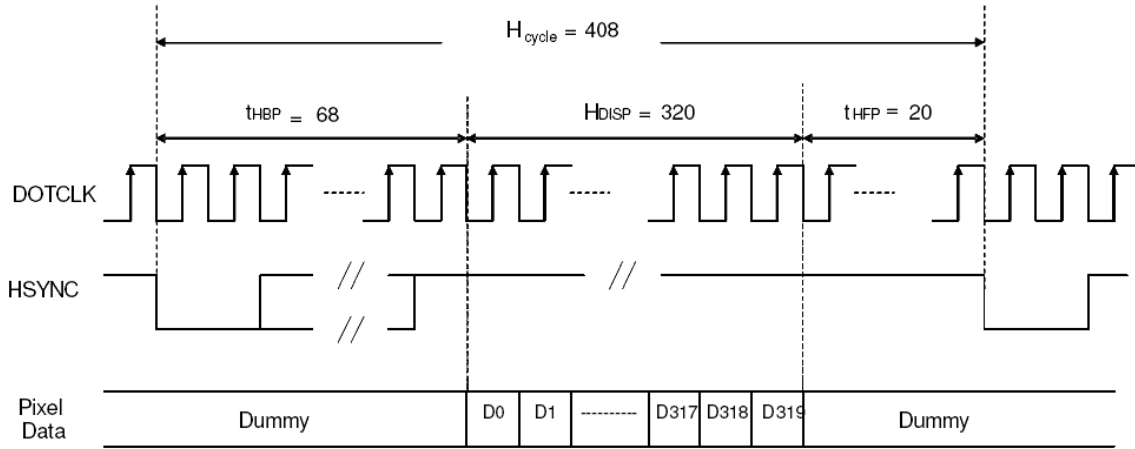
11.1 Input Signal Characteristics

11.1.1 Digital Parallel RGB Interface (960×240 resolution)

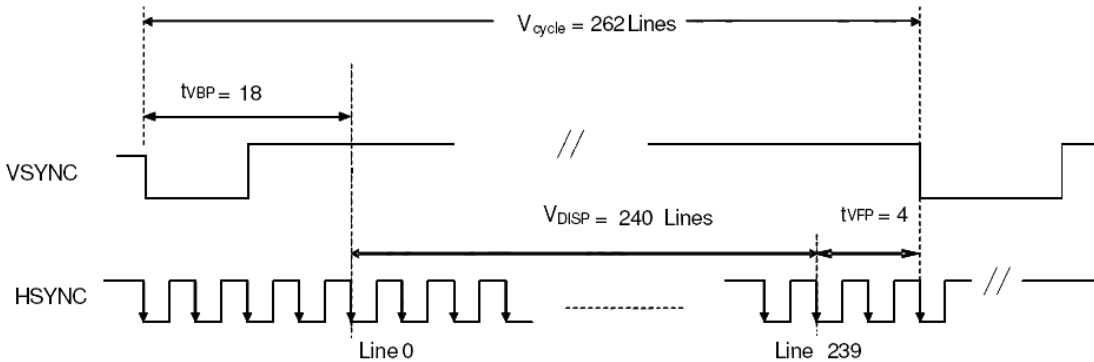
Characteristics	Symbol	Min.	Typ.	Max.	Unit
		24 bit	24 bit	24 bit	
DOTCLK Frequency	fDOTCLK	-	6.5	10	MHz
DOTCLK Period	tDOTCLK	100	154	-	ns
Horizontal Frequency (Line)	fH	-	14.9	22.35	KHz
Vertical Frequency (Refresh)	fV	-	60	90	Hz
Horizontal Back Porch	tHBP	-	68	-	tDOTCLK
Horizontal Front Porch	tHFP	-	20	-	tDOTCLK
Horizontal Data Start Point	tHBP	-	68	-	tDOTCLK
Horizontal Blanking Period	tHBP + tHFP	-	88	-	tDOTCLK
Horizontal Display Area	HDISP	-	320	-	tDOTCLK
Horizontal Cycle	Hcycle	-	408	450	tDOTCLK
Vertical Back Porch	tVBP	-	18	-	Lines
Vertical Front Porch	tVFP	-	4	-	Lines
Vertical Data Start Point	tVBP	-	18	-	Lines
Vertical Blanking Period	tVBP + tVFP	-	22	-	Lines
Vertical Display Area	NTSC	VDISP	240	-	Lines
	PAL		280(PALM=0)		
			288(PALM=1)		
Vertical Cycle	NTSC	Vcycle	262	350	Lines
	PAL		313		



11.2 Waveform



Horizontal Data Transaction Timing

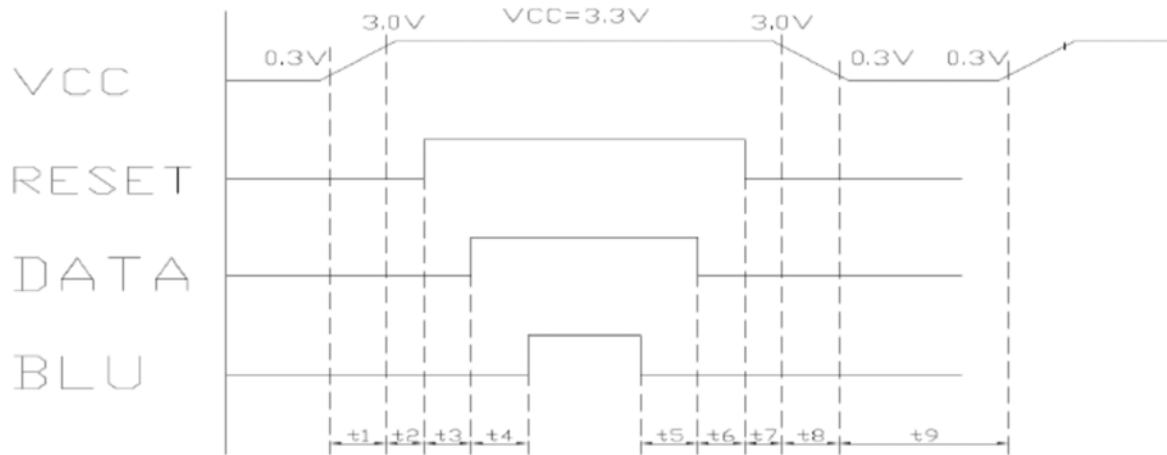


Vertical Data Transaction Timing

Figure 11.2 Data Transaction Timing in Parallel RGB (24 bit) Interface (SYNC Mode)



11.3 Power On / Off Sequence



$T1 \leq 10ms$ $200ms \leq T5$ $1\text{ sec} \leq T9$
 $10\mu s \leq T2$ $50ms \leq T6$
 $50ms \leq T3$ $10\mu s \leq T7$
 $200ms \leq T4$ $T8 \leq 10ms$



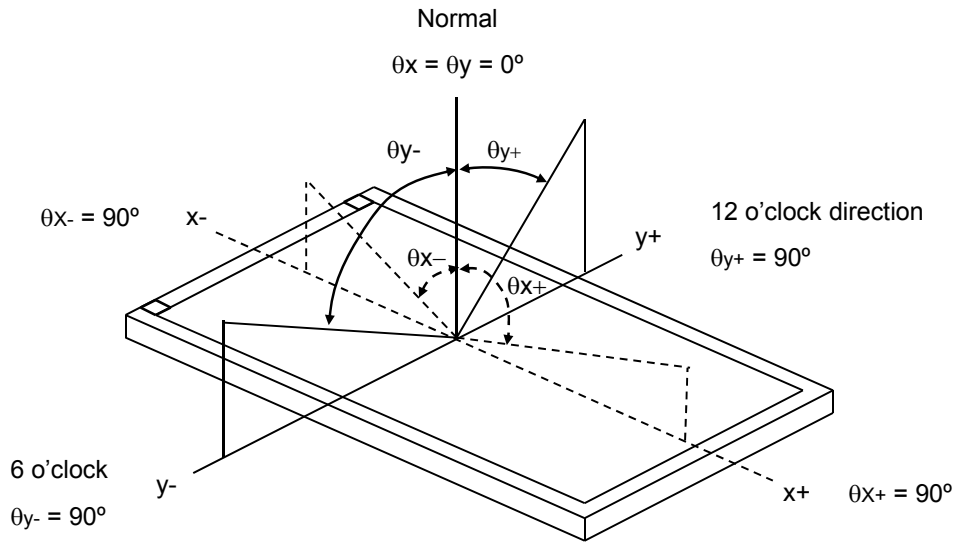
12. Optical Characteristics

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	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing Normal Angle	300	(450)	-	-	(2)
Response Time		T_{R+T_F}		-	50	-	ms	(3)
Luminance(Center)		Y		700	(800)	-	cd/m ²	(4)
Brightness uniformity		BUNI		75	(80)	-	%	(5)
Color Chromaticity	Red	Rx		0.562	0.612	0.662	-	(1),(4)
		Ry	0.303	0.353	0.403	-		
	Green	Gx	0.268	0.318	0.368	-		
		Gy	0.525	0.575	0.625	-		
	Blue	Bx	0.088	0.138	0.188	-		
		By	0.050	0.100	0.150	-		
	White	Wx	0.265	0.315	0.365	-		
		Wy	0.311	0.361	0.411	-		
Viewing Angle	Horizontal	θ_{x+}	CR \geq 10	55	(70)	-	deg.	
		θ_{x-}		55	(70)	-		
	Vertical	θ_{y+}		40	(55)	-		
		θ_{y-}		50	(70)	-		



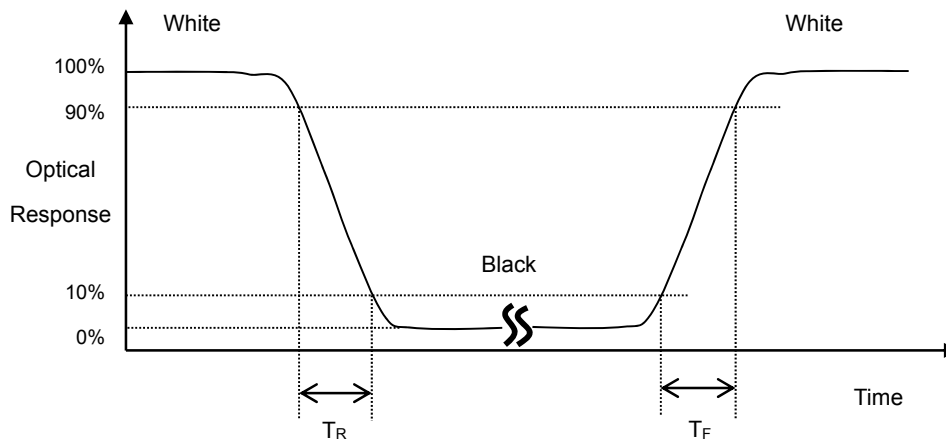
Note (1) Definition of Viewing Angle (θ_x, θ_y):



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

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

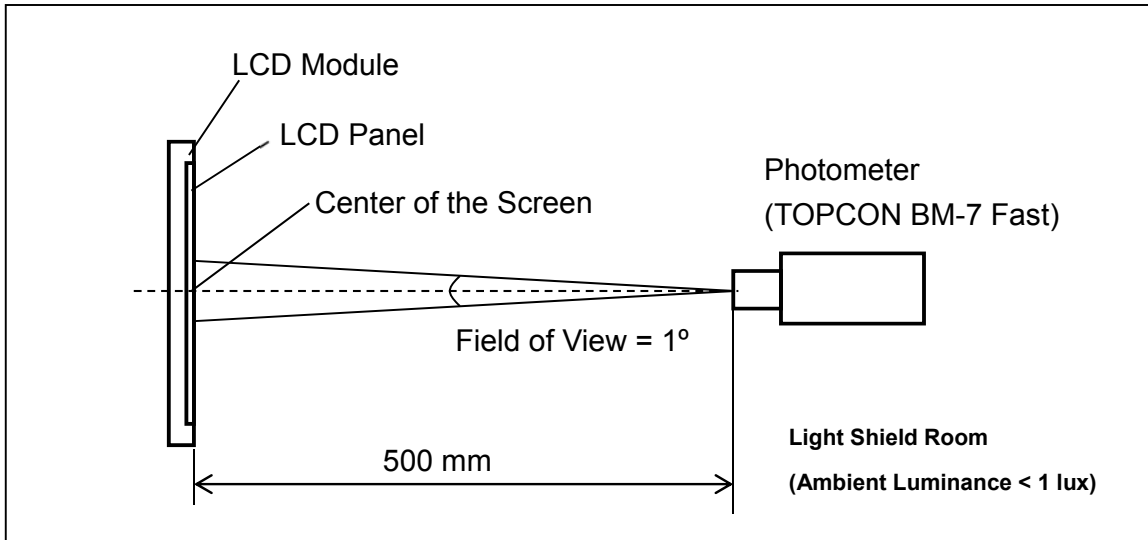
Note (3) Definition of Response Time (T_R, T_F):





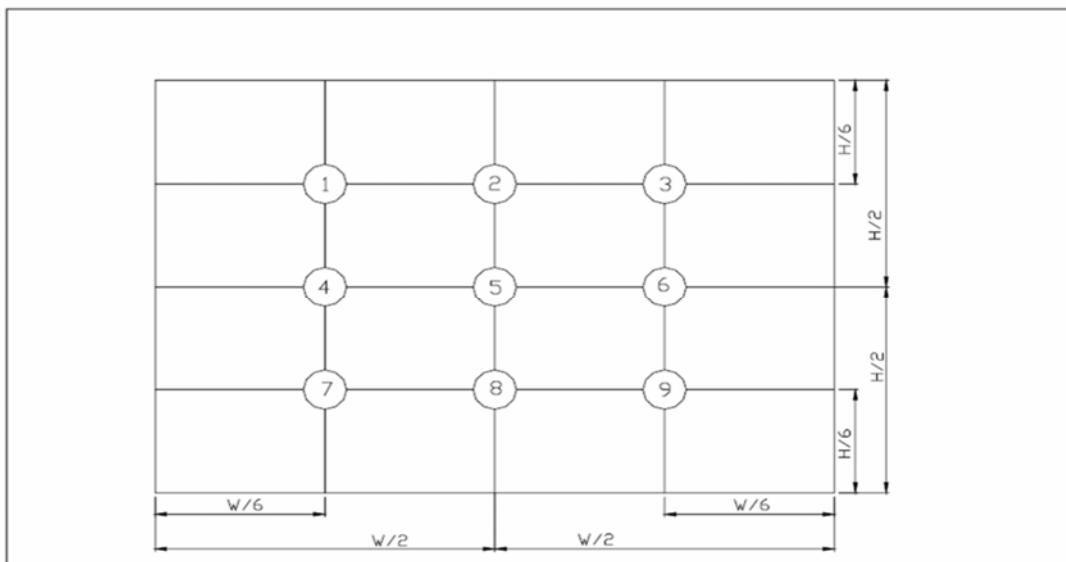
Note (4) Measurement Set-Up:

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

$$\text{Brightness uniformity} = (\text{Min Luminance of 9 points}) / (\text{Max Luminance of 9 points}) \times 100\%$$



(單位 : mm)

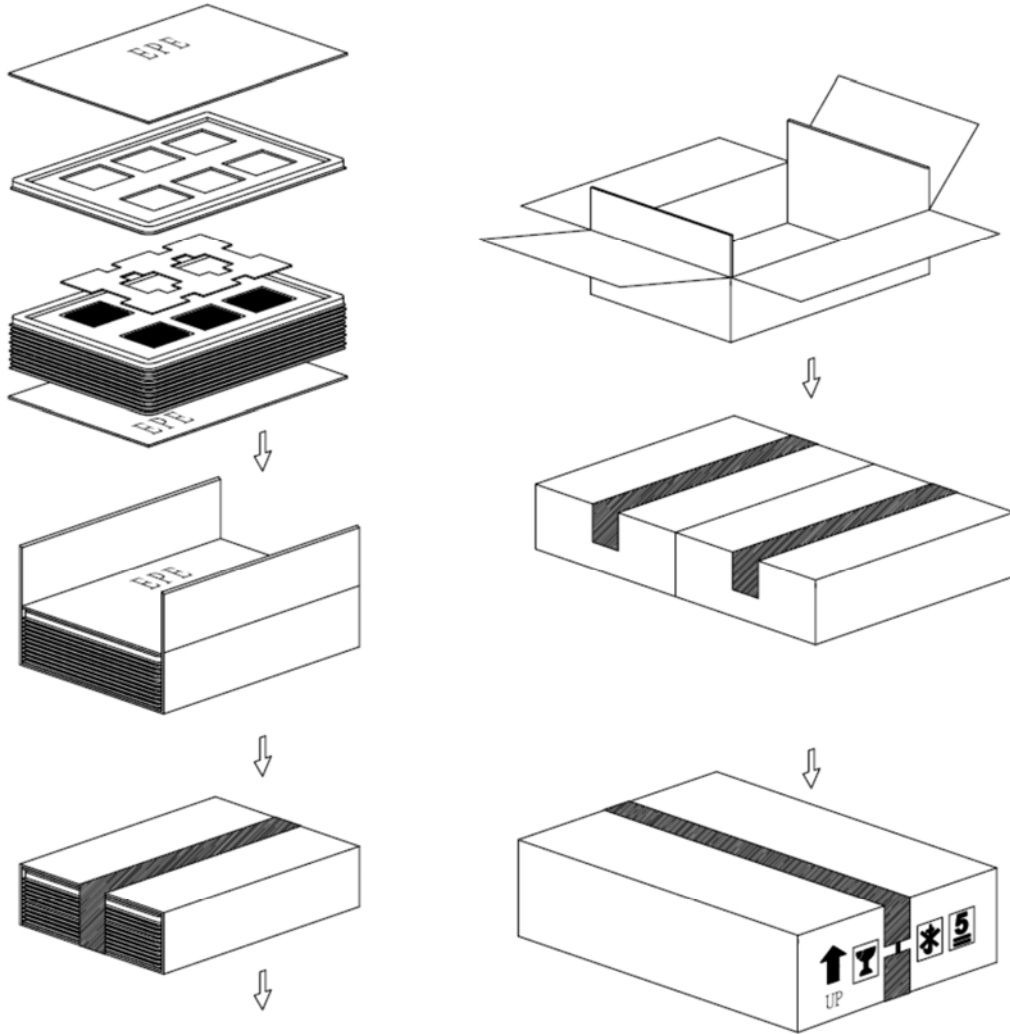
**13. Reliability Test**

No.	Test Items	Test Condition	Remark
1	High Temperature Storage Test	T _a = 80°C 240 hours	-
2	Low Temperature Storage Test	T _a = -30°C 240 hours	-
3	High Temperature Operation Test	T _a = 70°C 240 hours	-
4	Low Temperature Operation Test	T _a = -20°C 240 hours	-
5	High Temperature and High Humidity Operation Test	T _a =60°C 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°C(30min) ~ 70°C(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

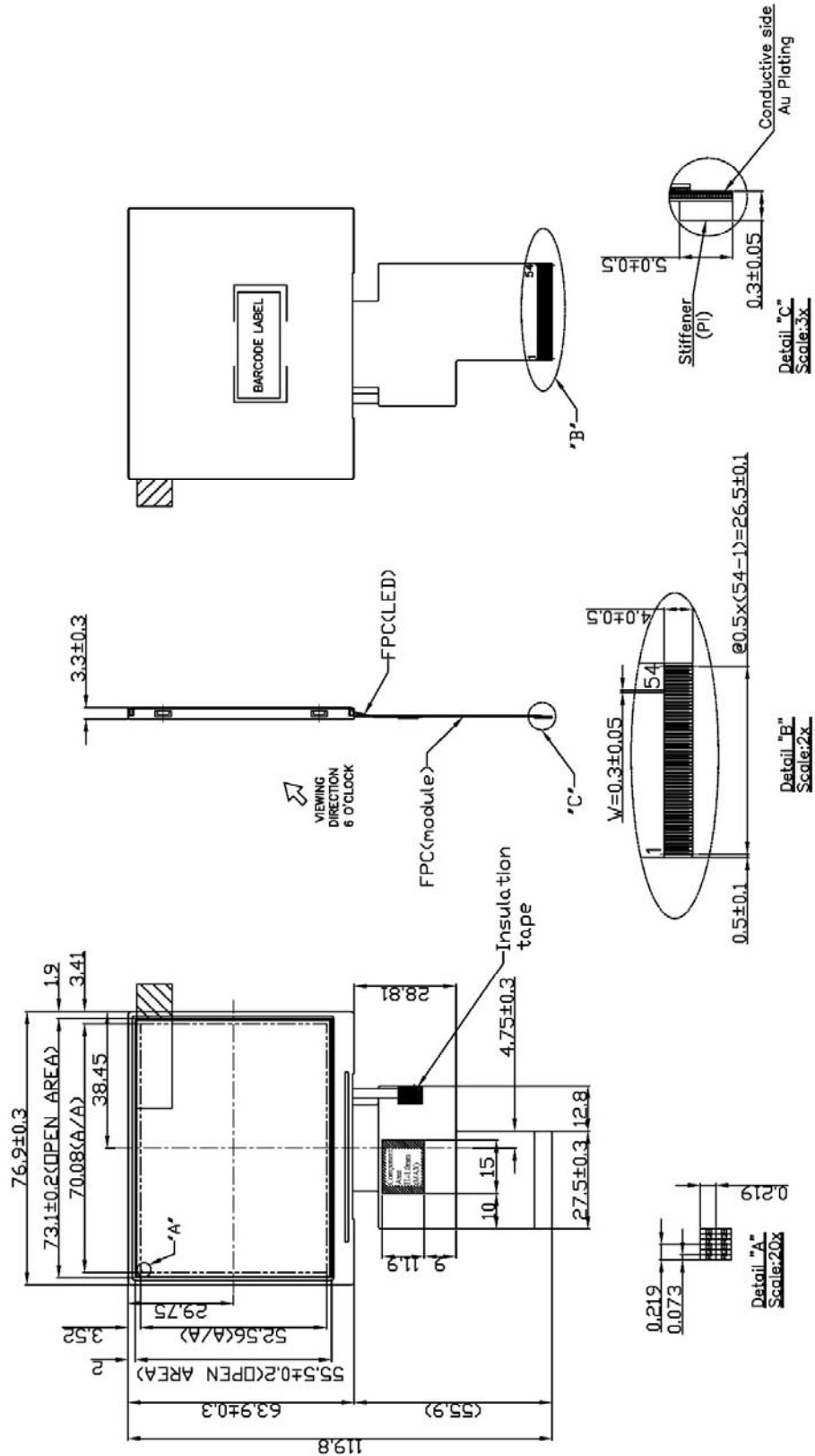
- (1) Do not apply rough force such as bending or twisting to the module during assembly.
- (2) It's recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
- (3) Don't apply pressure or impulse 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 10°C, 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.



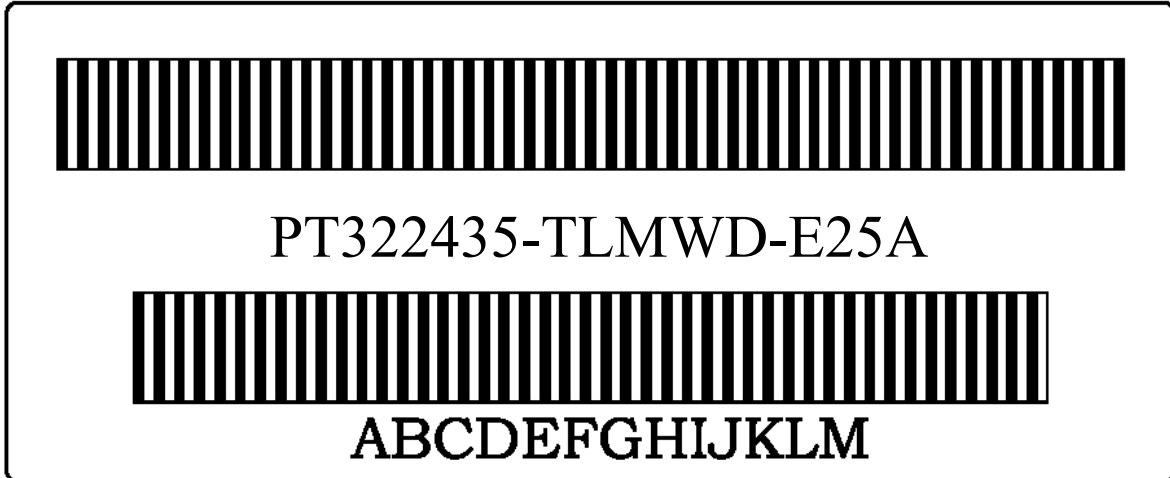
16.Outline Drawing





17. Definition of Labels

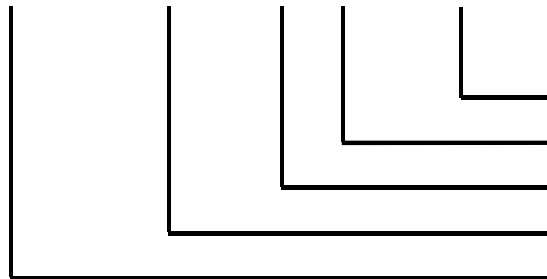
The bar code nameplate is pasted on each module as illustration, and its definitions are as following explanation.



(a) Module Name: PT322435-TLMWD-E25A

(b) Serial ID:

A B C D E F G H I J K L M



Serial No.
Revision Code
Factory Code
Manufactured Date
Screen Size

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 P-TEC 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.

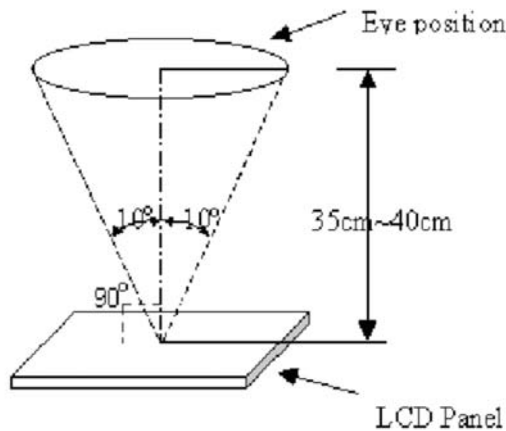


18. Incoming Inspection Standards

18.1 The environmental condition of inspection

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

- (1) Ambient temperature $25 \pm 5^{\circ}\text{C}$
- (2) Humidity: $60 \pm 5\% \text{ RH}$
- (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:

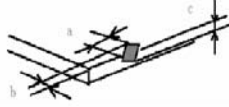
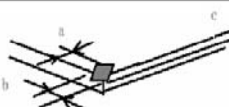
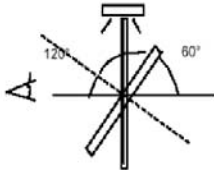
Class of defects	AQL	Definition
Major	0.65%	It is defect that is likely to result in failure or to reduce materially the usability of the intended function.
Minor	1.5%	It is a defect that will not result in functioning problem with deviation classified.



18.3 Inspection Parameters

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

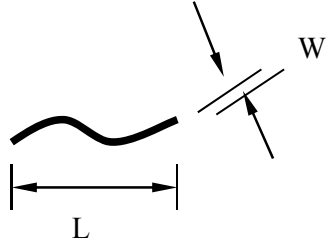


Item		Specification/Description			Note
Touch Panel	Scratch	L(mm)	W(mm)	Acceptable number	Note:2
		$L \leq 10$	$W < 0.05$	Disregard	
			$0.05 \leq W < 0.1$	$N \leq 4$	
			$W \geq 0.1$	0	
	Foreign Materials (Linear shape)	$L \leq 10$	$W < 0.05$	Disregard	Note:2
			$0.05 \leq W < 0.1$	$N \leq 3$	
			$W \geq 0.1$	0	
	Foreign Materials (Circular shape)	Dimension(mm)		Acceptable number	Note:3
		$D \leq 0.25$		Disregard	
		$0.25 < D \leq 0.5$		$N \leq 6$	
$D > 0.5$		0			
Glass chipping		$a \leq 5.0\text{mm}$ $b \leq 3.0\text{mm}$ $c \leq t$ (t : Glass think)		Note:7	
			$a \leq 3.0\text{mm}$ $b \leq 3.0\text{mm}$ $c \leq t$ (t : Glass think)		Note:7
Newton-ring	<p>(In case of doubtful situations) Observe on 60° from the product surface under a white Fluorescent lamp (3-wavelength lamp).</p> 		Average diameter $\leq 1/3$ Touch Panel area Disregard.		Note:7

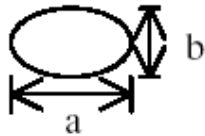


Note1. Distance between point defect distance should be large than 5 mm.

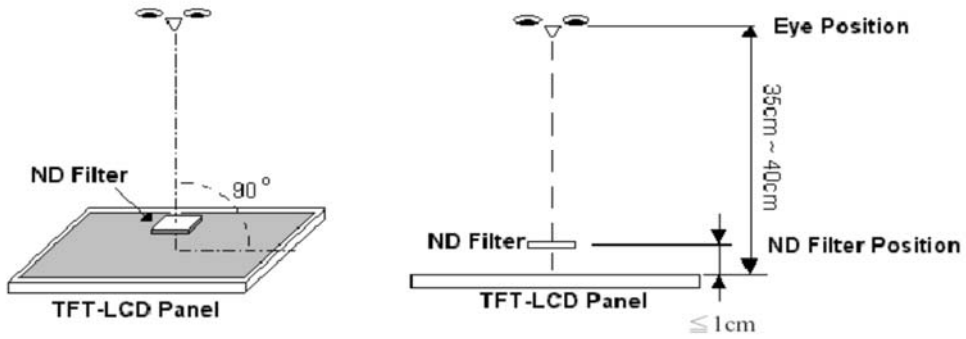
Note2.



Note3. D : Diameter $D=(a+b)/2$



Note4. Bright dot is defined through 6% transmission ND Filter as following.

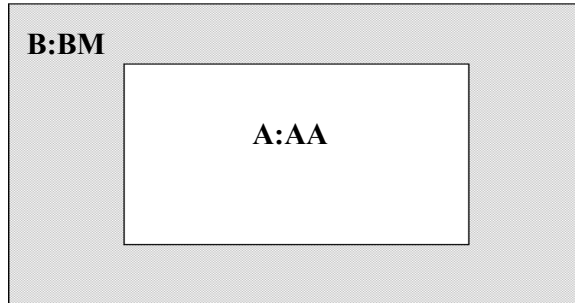


Note5. ADJACENT DOT





Note6.



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.