P-TEC

PRODUCT SPECIFICATION

Part Number

PT804870A-TLMWD-EMX16

CUSTOMER	
CUSTOMER PART NUMBER	
DESCRIPTION	7.0" TFT LCD, Medium Brightness
APPROVED BY	
DATE	

1. Table of Contents

2. Record of Revisions

Rev.	Comments	Page	Date
1	Preliminary Specification was first issued.	All	9/5'13
2	Modify 6. General Specifications	5	7/23'15
2	Modify 7.1 Absolute Ratings of Environment	6	7/23'15
2	Add 15.4 Caution	22	7/23'15
2	Modify 17.Definition of Labels	24	7/23'15

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 7 inch WVGA supported TFT-LCD module, and can display true 16.2M colors (8 bit/ color). The module is designed for OA, Car TV application and other electronic products which require flat panel display of digital signal interface. This module is composed of a 7" TFT-LCD panel, a driver circuit and LED backlight unit.

5. Features

    - WVGA (800×480 pixels) resolution.
    - LVDS Receiver 6/8 bit Interface
    - Dot inversion mode with stripe type.
    - Wide operating temperature

6. General Specifications

| Item	Specifications	Unit
Screen Size	7 (Diagonal)	inch
Display Format	800RGB(H)×480(V)	dot
Active Area	152.4(H)×91.44(V)	mm
Pixel Pitch	0.1905(H)×0.1905(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	165(W)×104(H)×9.53(D)	mm
Weight	147	g
RoHS Compliance	P-tec certifies this product to be in compliance with European Union Directive 2011/65/EU on the restriction of certain hazardous substances in electrical and electronic equipment.	-

7. Absolute Maximum Ratings

7.1 Absolute Ratings of Environment

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-40	+95	°C	
Operating Ambient Temperature	T_{OP}	-30	+85	°C	

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

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

(3) No condensation.
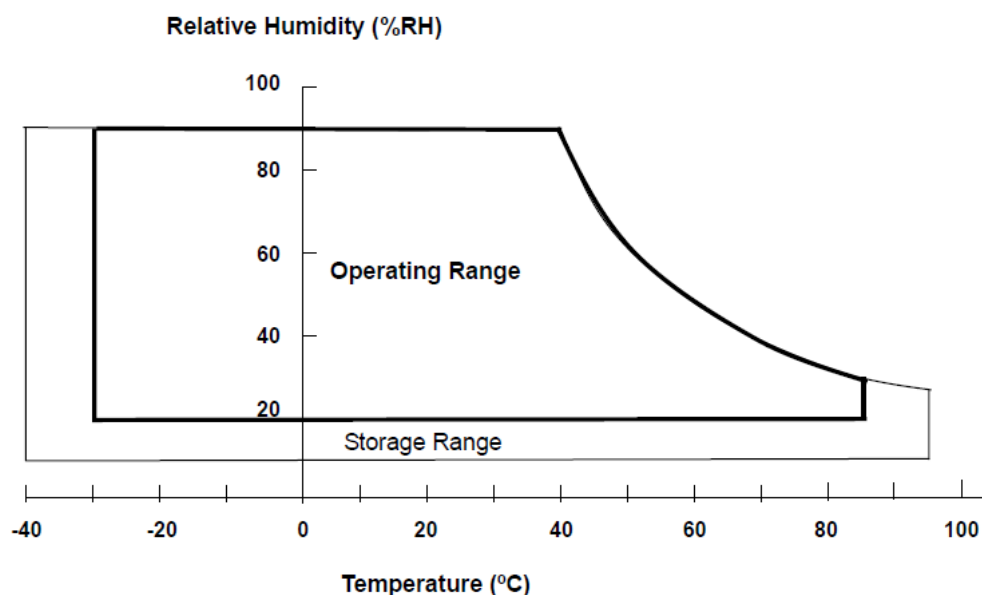
7.2 Electrical Absolute Ratings

7.2.1 TFT-LCD Module

(Ta=25±2°C)

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	V_{CC}	-0.3	4.0	V	-

7.2.2 LED CONVERTER

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Converter Voltage	V_i	-0.3	18	V	(1) , (2)
Enable Voltage	EN	---	5	V	
Backlight Adjust	ADJ	---	5	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation
should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED converter (Refer to 3.2 for further information).

8. Electrical Characteristics
8.1 TFT-LCD Module

(Ta=25±2°C)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power supply for voltage	VCC	3.0	3.3	3.6	V	(1)
Rush Current	I_{RUSH}	-	-	1.5	A	(2)
Power Supply Current	I_{VCC}	-	270	-	mA	(3)
LVDS Differential Input High Threshold	$V_{TH(LVDS)}$	-	-	100	mV	-
LVDS Differential Input Low Threshold	$V_{TL(LVDS)}$	-100	-	-	mV	-
LVDS Common Mode Voltage	V_{cm}	-	1.2	-	V	-

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:

Vcc

Q1 2SK1475

FUSE

C3
1uF

Vcc
(LCD Module Input)

R1
47K

(High to Low)
(Control Signal)

SW

R2
1K

Q2
2SK1470

+12V

VR1   47K

C1
1uF

C2
0.01uF

Vcc rising time is 470μs

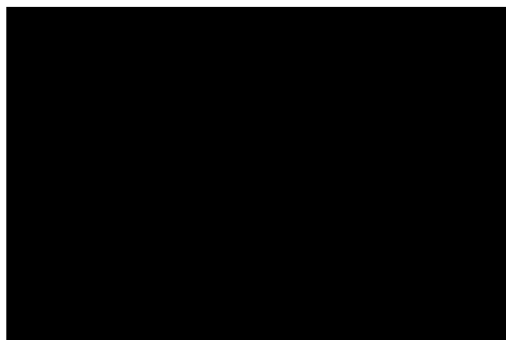**Vcc**

0.9Vcc

0.1Vcc

GND
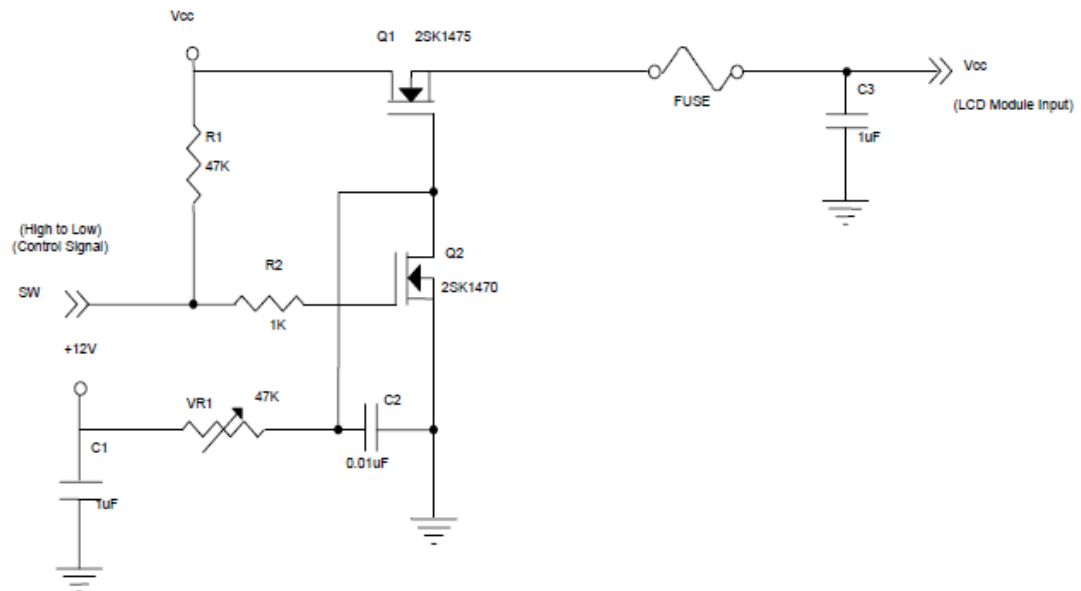
470μs
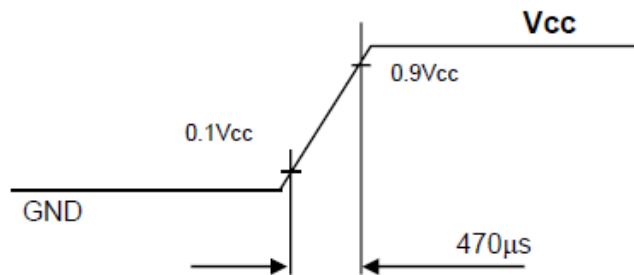
Note (3) The specified power consumption is under the conditions at V_{cc}=3.3V ,F_V=60Hz, whereas a

power dissipation check pattern below is displayed.

Black Pattern / 0 Gray

Active Area

8.2 Backlight Unit

(Ta=25±2°C)

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	
Converter Power Supply Current		I_i	---	0.263	---	A	@ Vi = 12V (Duty 100%)
Converter Power Consumption		P_{LED}	---	3.15	---	W	@ Vi = 12V (Duty 100%)
EN Control Level	Backlight on		2.0	---	5	V	
	Backlight off		0	---	0.8	V	
PWM Control Level	PWM High Level		2.0	---	5	V	
	PWM Low Level		0	---	0.15	V	
PWM Control Duty Ratio			10		100	%	
PWM Control Frequency		f_{PWM}	100	200	300	Hz	
LED Life Time		L_L	50,000			Hrs	(2)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions

at Ta = 25 ±2 ℃ and ILED = 55mADC(LED forward current) until the brightness becomes
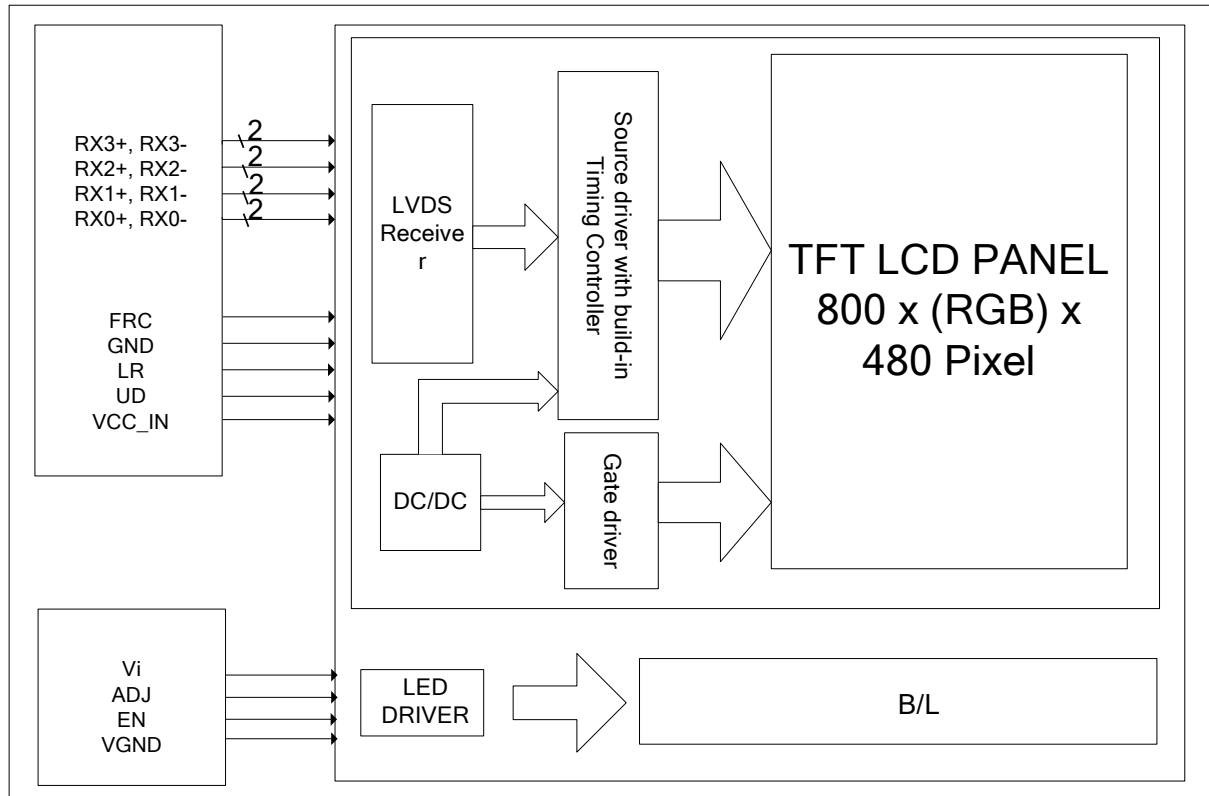
≦ 50% of its original value.

Note (3) Please note that LED life will be shorter than the average life described in the specification if

operate in higher ambient temperature.

9. Block Diagram
9.1 TFT-LCD Module with Backlight Unit

10. Input / Output Terminals Pin Assignment
10.1 TFT-LCD Module

Pin	Name	I/O	Description
1	RX3+	I	LVDS differential data input Pair 3.
2	RX3-	I	
3	NC	I	No Connected
4	FRC	I	Dithering control setting When FRC=H, the width of data input 8 bits When FRC=L, the width of data input 6 bits and set Dx0 and Dx1 to logical low (Default pull low)
5	GND	I	Ground
6	RXC+	I	LVDS differential Clock input Pair
7	RXC-	I	
8	GND	I	Ground
9	RX2+	I	LVDS differential data input Pair 2
10	RX2-	I	
11	GND	I	Ground
12	RX1+	I	LVDS differential data input Pair 1
13	RX1-	I	
14	GND	I	Ground
15	RX0+	I	LVDS differential data input Pair 0
16	RX0-	I	
17	LR	I	Shift direction of Source Driver IC internal shift register is controlled by this pin as show below: LR=H SO1→ ......SO1200 (Default pull high) LR=L SO1200→.......SO1
18	UD	I	Gate Driver Up/down scan setting When UD=H, reverse scan When UD=L, normal scan (Default pull low)
19	VCC_IN	I	Digital power supply (+3.3V)
20	VCC_IN	I	Digital power supply (+3.3V)

Note (1) User's connector Part No.: 076B20-0048RA-G4,Starconn or equivalent

10.2 BACKLIGHT Pin Assignment

No	Symbol	I/O	Description
1	Vi	I	Converter input voltage
2	ADJ	I	Backlight Adjust
3	EN	I	Enable pin
4	V_{GND}		Converter ground

Note (1) User's connector Part No: LM123S004HTF13,4 PIN,UNE

SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.
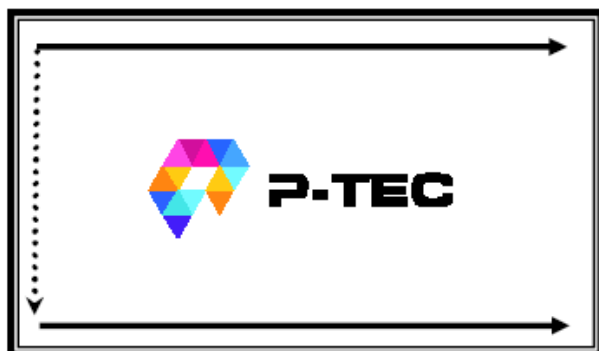
Fig.1 Normal Scan

Fig.2 Reverse Scan

Fig.3 Reverse Scan

Fig.4 Reverse Scan

Fig. 1 Normal scan (pin 17, LR = High ; pin 18, UD = Low)

Fig. 2 Reverse scan (pin 17, LR = Low ; pin 18, UD = Low)

Fig. 3 Reverse scan (pin 17, LR = High ; pin 18, UD = High)

Fig. 4 Reverse scan (pin 17, LR = Low ; pin 18, UD = High)

10.3 Color Data Input Assignment

The brightness of each primary color(red, green and blue) is based on the 8 bit gray scale data input for the color. The higher the binary input, the brighter the color. The table provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of RED	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

11. Interface Timing
11.1 Input Signal Characteristics

The input signal timing specifications are shown as the following table and timing diagram

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Vertical Display	Period	T_v	490	500	550	T_h	Tv=Tvd+Tvb
	Active	T_{vd}	-	480	-	T_h	-
	Blanking	T_{vb}	10	20	70	T_h	-
Horizontal Display	Period	T_h	930	992	1090	Tclock	Th=Thd+Thb
	Active	T_{hd}	-	800	-	Tclock	-
	Blanking	T_{hb}	130	192	290	Tclock	-
Clock Frequency		$1/T_{clock}$	28	29.5	32	MHz	-

Note (1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM
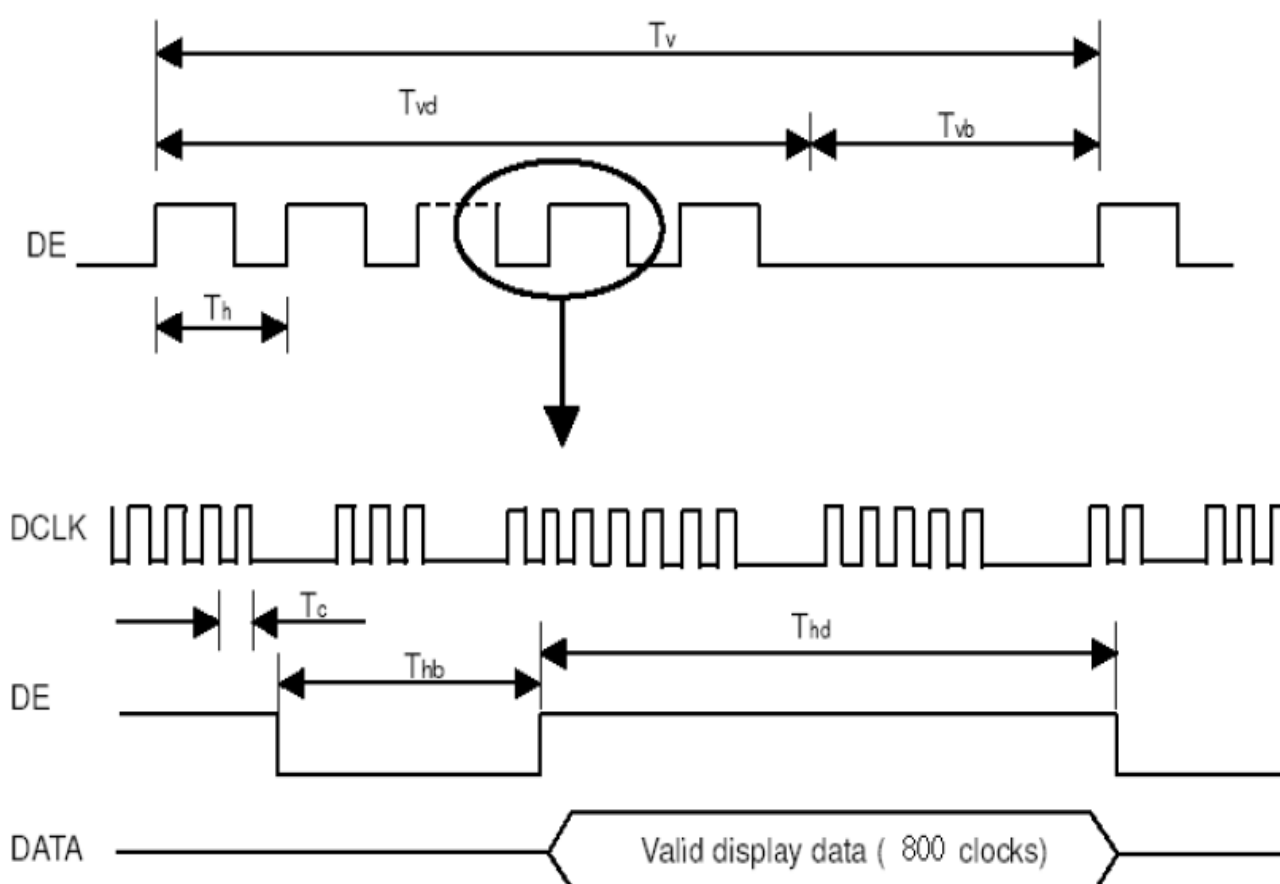
11.2 Waveform
11.2.1 LVDS INPUT DATA FORMAT

FRC = "Low" or "NC" for 6 bits LVDS Input
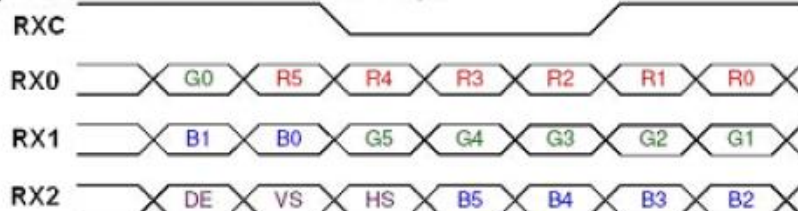
FRC = "High" for 8 bits LVDS Input

Note (1)   R/G/B data 7: MSB, R/G/B data 0: LSB

Note (2)   Please follow PSWG

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	Red-pixel Data
R6	Red Data 6	Each red pixel's brightness data consists of these
R5	Red Data 5	8 bits pixel data.
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Data 7 (MSB)	Green-pixel Data
G6	GreenData 6	Each green pixel's brightness data consists of these
G5	GreenData 5	8 bits pixel data.
G4	GreenData 4	
G3	GreenData 3	
G2	GreenData 2	
G1	GreenData 1	
G0	GreenData 0 (LSB)	
B7	Blue Data 7 (MSB)	Blue-pixel Data
B6	Blue Data 6	Each blue pixel's brightness data consists of these
B5	Blue Data 5	8 bits pixel data.
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
RXCLKIN+ RXCLKIN-	LVDS Clock Input	
DE	Display Enable	
VS	Vertical Sync	
HS	Horizontal Sync	

Note (3) Output signals from any system shall be low or Hi-Z state when VCC is off.

11.3 Power ON/OFF Sequence

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below
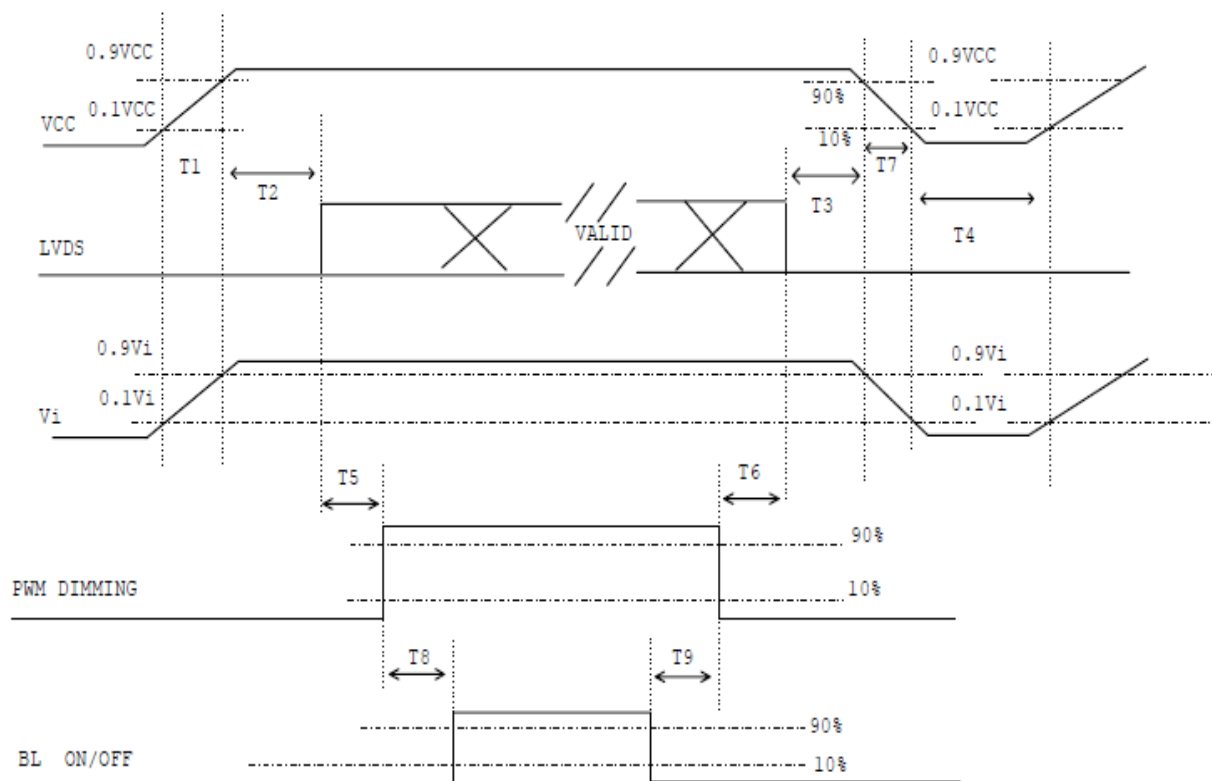
Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Value			Units
	Min	Typ	Max	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	20	-	-	ms
T6	10	-	-	ms
T7	5		300	ms
T8	10	-	-	ms
T9	10	-	-	ms

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		500	600	-	-	(2),(6)
Response Time		T_R		-	5	10	ms	(3)
		T_F		-	11	16	ms	
Luminance(Center)		Y		400	500	-	cd/m^2	(4),(6)
White Variation		δW			1.25	1.4	%	(5),(6)
Color Chromaticity	Red	Rx	$\theta_x=0°$, $\theta_Y=0°$ Viewing Normal Angle	0.595	0.645	0.695	-	(1),(6)
		Ry		0.291	0.341	0.391	-	
	Green	Gx		0.262	0.312	0.362	-	
		Gy		0.575	0.625	0.675	-	
	Blue	Bx		0.103	0.153	0.203	-	
		By		0.003	0.053	0.103	-	
	White	Wx		0.263	0.313	0.363	-	
		Wy		0.279	0.329	0.379	-	
Viewing Angle	Horizontal	θ_x+	CR≥10	60	70	-	deg.	
		θ_x-		60	70	-		
	Vertical	θ_Y+		50	60	-		
		θ_Y-		50	60	-		

Note (1) Definition of Viewing Angle (θx, θy):
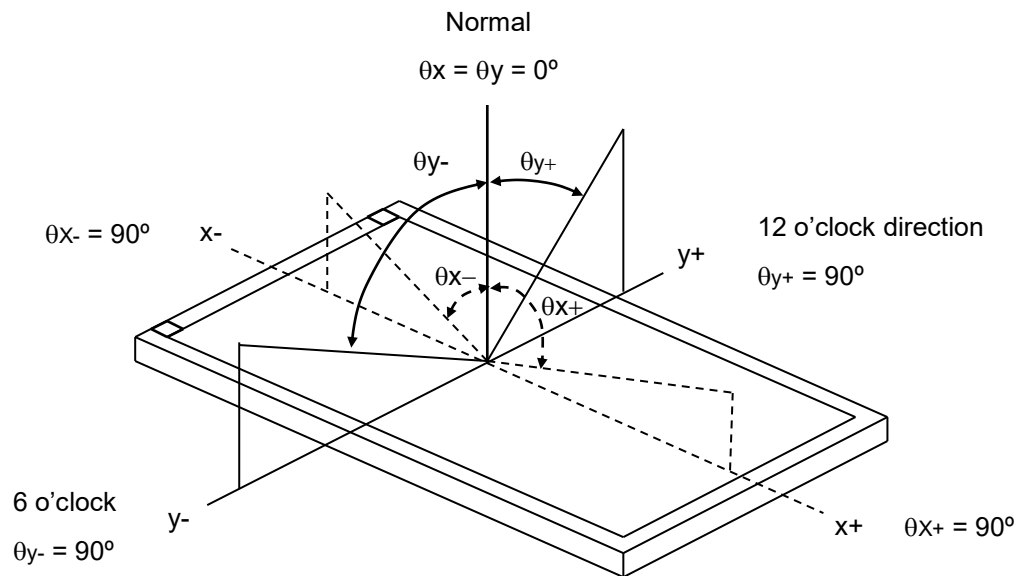
Note (2) Definition of Contrast Ratio (CR）:

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L63 / L0

L63：Luminance of gray level 63

L 0：Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

Note (3) Definition of Response Time (TR, TF) and measurement method：
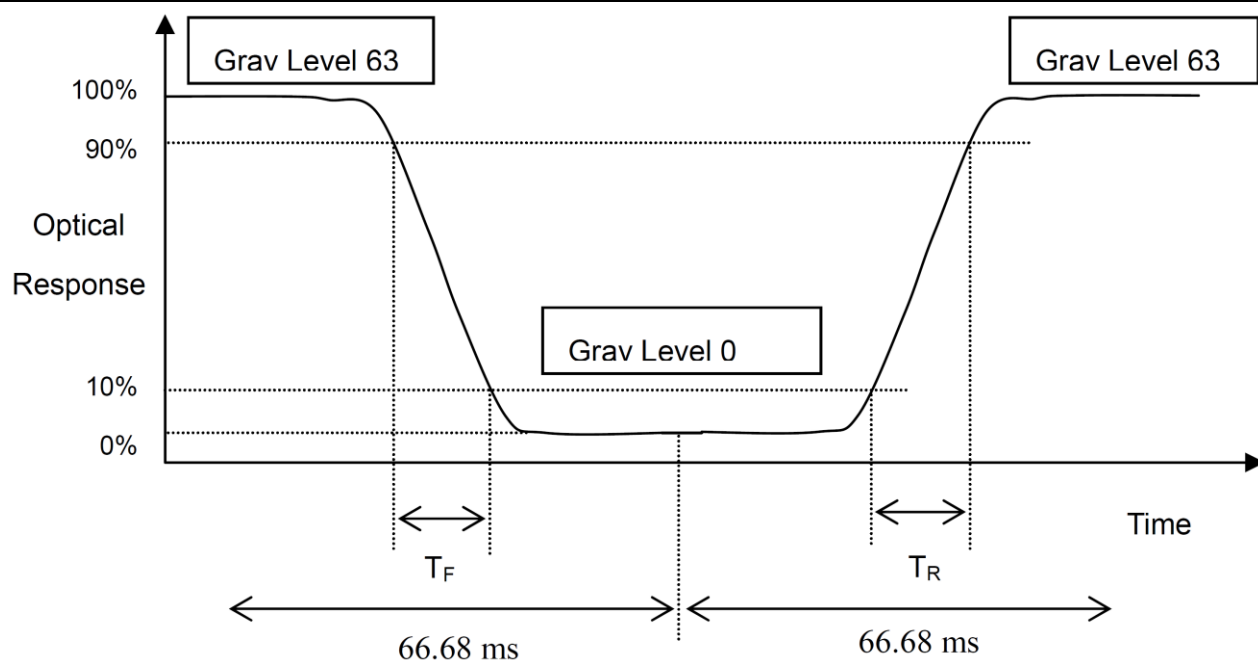
Note (4) Definition of Luminance of White (LC):

Measure the luminance of gray level 63 at center point

LC = L (5)

L (x) is corresponding to the luminance of the point X at Figure in Note (5).

Note (5) Definition of White Variation (δW):

Measure the luminance of gray level 63 at 5 points

$$\delta W = \frac{\text{Maximum} \ [L(1), L(2), L(3), L(4), L(5)]}{\text{Minimum} \ [L(1), L(2), L(3), L(4), L(5)]}$$
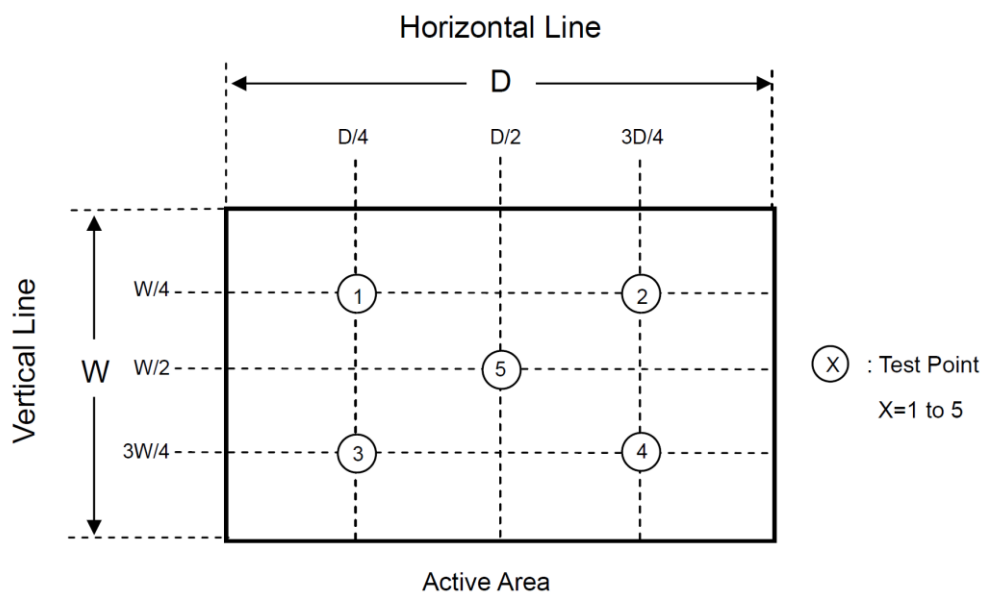
Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a dark room or equivalent condition.
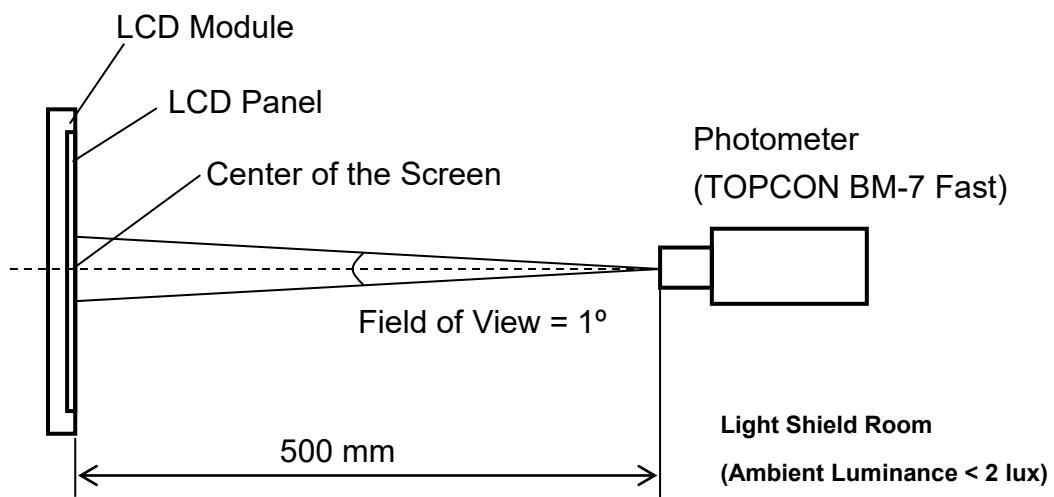
13. Reliability Test

No.	Test Item	Test Condition	Note
1	High Temperature Storage	95℃, 240 hours	(1) (2)
2	Low Temperature Storage	-40℃, 240 hours	
3	Thermal Shock Storage	{(-40℃, 0.5 hour) (85℃, 0.5 hour)}, 100 cycles	
4	High Temperature Operating	85℃, 240 hours	
5	Low Temperature Operating	-30℃, 240 hours	
6	High Temperature & High Humidity Operating	60℃, 90% RH, 240hours	
7	Shock (Non-Operating)	100G, 6ms, half sine wave, 3 times for ± X, ± Y, ± Z.	(3)
8	Vibration (Non-Operating)	3G, 10 ~ 200 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)

Note (1) There should be no condensation on the surface of panel during test.

Note (2) The temperature of panel display surface area should be 95℃ Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough

so that the module would not be twisted or bent by the fixture.

Note (4) In the standard conditions, there is no function failure issue occurred. All the cosmetic specification

is judged before the reliability test.

14. Packaging

LCD Module

Anti-Static Bag

Tape

protect film

Cushion(bottom)

Cushion(up)

carton

carton label

(1) 34pcs Modules/1 box

(2) Carton dimensions : 465(L)x362(W)x314(H)mm
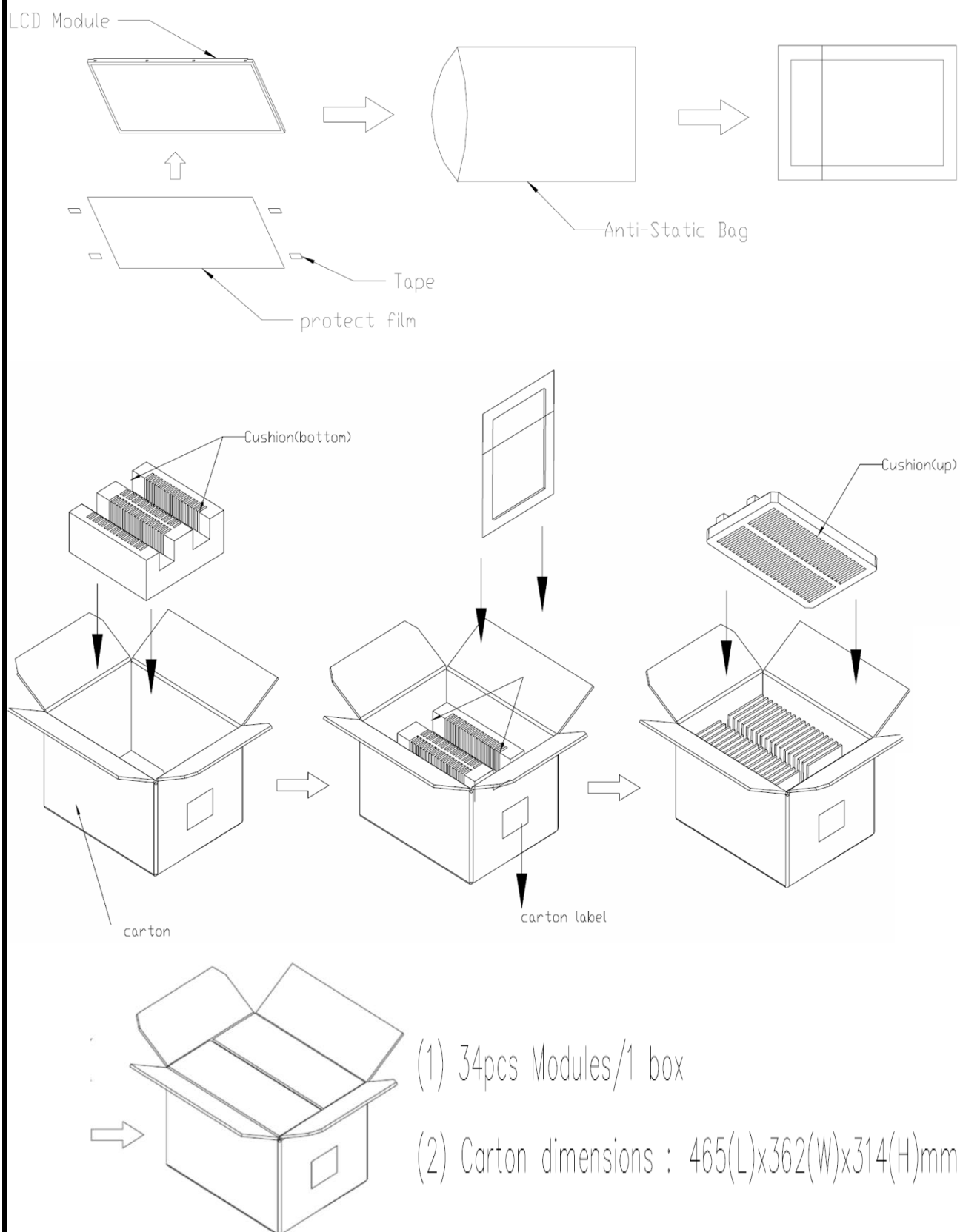
15. Precautions

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.

15.3 Terms of Warrant

(1) Acceptance inspection period
The period is within one month after the arrival of contracted commodity at the buyer's factory site.

(2) Applicable warrant period
The period is within twelve months since the date of shipping out under normal using and storage conditions.

15.4 Caution

This P-tec LCD module has been specifically designed for use only in electronic devices in the areas of audio control, office automation,industrial control, home appliances, etc. The modules should not be used in applications where module failure could result in physical harm or loss of life, and P-tec expressly disclaims any and all liability relating in any way to the use of the module in such applications.

16.Outline Drawing

Detail:"A"
Scale:40X

Total 60pins·
Pitch:0.5mm
Width:0.3mm

NOTE:
1.UNSPECIFIED TOLERANCE:±0.3
2.LVDS CONNECTOR:73B20-0048RA-G4(STARCON)
3.P/I CONNECTOR:LM123S004HTF13(UNICORN)
4.THOSE SCREWS AT PCBA BOARD TO TWIST WITH FORCE IS 0.6 kgf-cm AND REPEAT TIMES:4
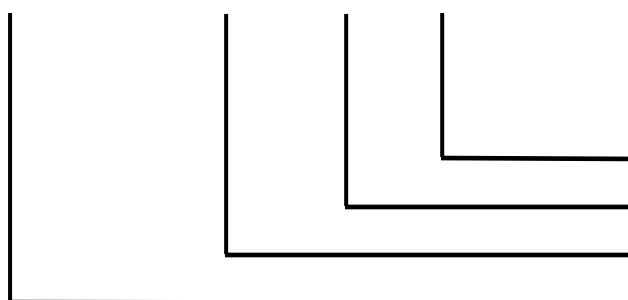5.THE WIRE IS UNDER THE PCB PROTECTOR FILM

17.Definition of Labels

The bar code nameplate is pasted on each module as illustration, and its definitions are as following explanation.
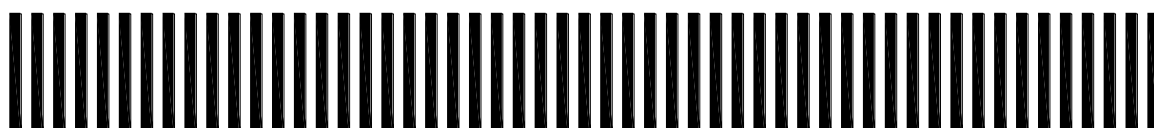
PT804870A-TLMWD-EMX16
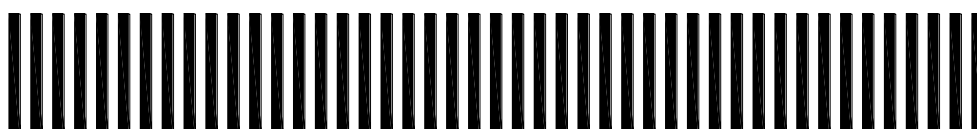
ABCDEFGHIJKL

(a) Module Name: PT804870A-TLMWD-EMX16

(b) Serial ID:

A B C D   E F G   H   IJ K L

Serial No.
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
Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mark	A	B	C	D	E	F	G	H	I	J

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） Serial No. （IJKL）：
Manufacturing sequence of product, for example： 0001~9999.

18. Incoming Inspection Standards
### 18.1 Inspection Standards for LCD Modules

1.Description

These inspection standards shall be applied to LCD Module supplied by P-TEC

Optoelectronics Corporation.

2.The environmental condition of inspection

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

(1) Ambient temperature_15~25℃

(2) Humidity_25~75 %RH

(3) External appearance inspection shall be conducted by using a single 20W fluorescent lamp or equivalent illumination.

(4) Panel visual inspection on the operation condition for cosmetic shall be conducted at the distance35cm or more between the LCD module and eyes of inspector.
   Ambient Illumination_600 ~ 800 Lux for external appearance inspection
   Ambient Illumination_300 ~ 400 Lux for light on inspection

(5) The viewing angle_
   a) 15 degree to the front surface of display panel in vertical direction.
   b) 45 degree to the front surface of display panel in horizontal direction.

(6) ND filter shall be conducted at the distance 2 cm to front surface of display panel and shall be conducted at the distance 35 cm between the LCD module and eyes of inspector.
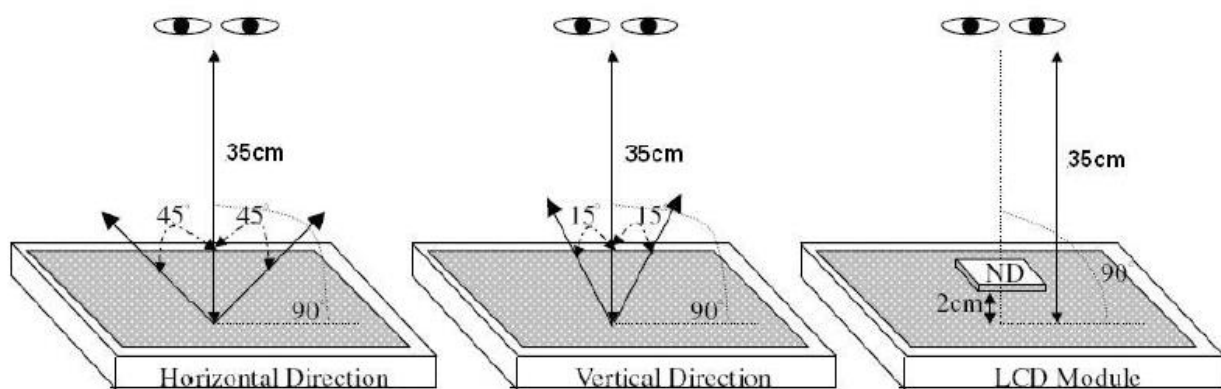
3.Classification of defects

Defects are classified two types, major defect and minor defect according to the defect. And, the definition of defects is classified as below.

(1) Major defect

Any defect may result in functional failure, or reduce the usability of product for its purpose. For example, electrical failure, deformation and etc..

(2) Minor defect

A defect that is not to reduce the usability of product for its intended purpose and un-uniformity, dot defect and etc..

The criteria on major or minor judgment will be according with the classification of defects.

4.Inspection Criteria

(1) Definition of dot defect induced from the panel inside

    a) The definition of dot : The size of a defective dot over 1/2 of whole dot is regarded as one defective dot.

    b) Bright dot : Dots appear bright and unchanged in size in which module is displaying under black pattern.

    c) Dark dot : Dots appear dark and unchanged in size in which module is displaying under pure red, green, blue, white picture.

    d) 2 dot adjacent = 1pair.

    Picture :

2 dot adjacent   2 dot adjacent   2 dot adjacent (vertical)   2 dot adjacent (slant)

(2) Display Inspection standards

Items		Acceptable count
Bright dot	Random	N≦3
	2 dots adjacent	N≦1
	3 dots adjacent or more	N≦0
Dark dot	Random	N≦5
	2 dots adjacent	N≦1
	3 dots adjacent or more	N≦0
Total bright and dark dot		N≦5
Distance	Minimum Distance Between Bright dots	L≧10mm
	Minimum Distance Between Dark dots	L≧10mm
Display failure (V-line/H-line/Cross line etc.)		Not allowable
Mura	Not visible through 3% ND filter or judge by limit sample if necessary	

Note：Bright dot defect must be visible through 6% ND filter.

(3) Appearance inspection

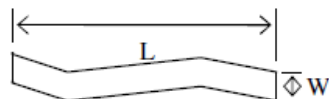| Item	Standards
[Spot] Black spot/White spot/Bright spot/ Pinhole/Particle/Scratch/Surface Stains/Dirt	$D \leq 0.15mm$, Ignore $0.15 < D \leq 0.5$ mm, $N \leq 4$
[Line] Black line/White line/Particle/Scratch	$W \leq 0.05mm$, Ignore $0.05 < W \leq 0.1$ mm, $0.3 < L \leq 2.0$ mm, $N \leq 4$
Polarizer Scratch	$W \leq 0.05mm$, Ignore $0.05 < W \leq 0.1$ mm, $0.3 < L \leq 5.0$ mm, $N \leq 4$
Polarizer Dent/Air Bubble	Avg. $0.15 < D \leq 0.5$ mm, $N \leq 4$
Panel Scratch of Active Area	Not allowable
Panel Crack	Not allowable

Note.1

$D = (a+b)/2$

Note.2

W: width, L：length

5.External Appearance Inspection Criteria

Item		Contents
FPC cable		Cable not continuous 、 Break-off 、 Connector Burn-off /Break-off
Metal frame (Bezel)	Scratch	*Noticeable scratch and exfoliation coating are not permitted. *The oxidized metal is not permitted.
		Incomplete assembly is not permitted.
Backlight	Scratch	The scratch which may causes a problem in practical use is not permitted.
	Break-off	Breaking off is not permitted.
	Crack	The crack is not permitted.
Stain on Polarizer		The stain, which can't be wiped off, is not permitted.
Tape/Label		Incorrect position, missed label is not permitted.
Outline size		Spec. out is not permitted.

18.2 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.