KOE
JDI Group

Kaohsiung Opto-Electronics Inc.

FOR MESSRS : _____

DATE : Jan. 10th ,2014

CUSTOMER'S ACCEPTANCE SPECIFICATIONS

TX14D25VM1BPA

Contents

ACCEPTED BY : _____

PROPOSED BY : S.Z Lin.

2. RECORD OF REVISION

DATE	SHEET No.	SUMMARY			
Oct.21,'13	7B64PS 2706- TX14D25VM1BPA-2 PAGE 6-1/2	6. OPTICAL CHARACTERISTICS Correction : Fig 6.2			
	7B64PS 2711- TX14D25VM1BPA-2 PAGE 11-1/2	11 TOUCH PANEL 11.2 ELECTRICAL CHARACTERISTICS Correction :			

11 TOUCH PANEL
  11.2 ELECTRICAL CHARACTERISTICS
Correction :

Item		Specification
Circuit resistance	X-axis	$210\,\Omega \sim 880\,\Omega$
	Y-axis	$230\,\Omega \sim 650\,\Omega$

↓

Item		Specification
Circuit resistance	X-axis	$230\,\Omega \sim 650\,\Omega$
	Y-axis	$320\,\Omega \sim 980\,\Omega$

DATE	SHEET No.	SUMMARY
Jan. 10,'14	7B64PS 2712 – TX14D25VM1BPA-3 PAGE 12 – 3/4	12.2 LCD APPEARANCE SPECIFICATION Removed : LED BACKLIGHT APPEARANCE

3. GENERAL DATA

3.1 DISPLAY FEATURES

This module is a 5.7" QVGA of 4:3 format amorphous silicon TFT. The pixel format is vertical stripe and sub pixels are arranged as R(red), G(green), B(blue) sequentially. This display is RoHS compliant, and COG (chip on glass) technology and LED backlight are applied on this display

Part Name	TX14D25VM1BPA
Module Dimensions	131.0(W) mm x 102.2(H) mm x 12.4(D) mm typ.
LCD Active Area	115.2(W) mm x 86.4(H) mm
Dot Pitch	0.12(W) mm x 3(R, G, B)(W) x 0.36(H) mm
Resolution	320 x 3(RGB)(W) x 240(H) dots
Color Pixel Arrangement	R, G, B Vertical stripe
LCD Type	Transmissive Color TFT; Normally White
Display Type	Active Matrix
Number of Colors	262k Colors
Backlight	15 LEDs (3 serial x 5)
Weight	200g typ.
Interface	C-MOS; 18-bit RGB; 40 pins
Power Supply Voltage	3.3V for LCD and Backlight
Power Consumption	380mW for LCD; 1030mW for B/L
Viewing Direction	6 O'clock (without image inversion and least brightness change) 12 O'clock (contrast peak located at)
Touch Panel	4 wire resistive type ; film on glass ; antiglare surface.

4. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Remarks
Supply Voltage	V_{DD}	-0.3	5.0	V	-
Input Voltage of Logic	V_I	-0.2	V_{DD} +0.2	V	Note 1
Operating Temperature	Top	-20	70	$^\circ$C	Note 2
Storage Temperature	Tst	-30	80	$^\circ$C	Note 2

Note 1: The rating is defined for the signal voltages of the interface such as DE, DCLK and RGB data bus.

Note 2: The maximum rating is defined as above based on the chamber temperature, which might be different from ambient temperature after assembling the panel into the application. Moreover, some temperature-related phenomenon as below needed to be noticed:

- Background color, contrast and response time would be different in temperatures other than 25 $^\circ$C.

- Operating under high temperature will shorten LED lifetime.

5. ELECTRICAL CHARACTERISTICS

5.1 LCD CHARACTERISTICS

$T_a = 25 \,^{\circ}C, \; V_{SS} = 0V$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	-	3.0	3.3	3.6	V	-
Input Voltage of Logic	V_I	"H" level	$0.7V_{DD}$	-	V_{DD}	V	Note 1
		"L" level	V_{SS}	-	$0.3V_{DD}$		
Power Supply Current	I_{DD}	V_{DD}-V_{SS}=3.3V	-	115	130	mA	Note 2
Vsync Frequency	f_v	-	52	60	68	Hz	-
Hsync Frequency	f_H	VGA	25.22	29.46	36.24	KHz	-
		QVGA	12.84	15.18	36.38		
DCLK Frequency	f_{CLK}	VGA	17.12	20.9	26.78	MHz	-
		QVGA	4.6	5.85	16.48		

Note 1: The rating is defined for the signal voltages of the interface such as DE, DCLK, DIM and RGB data bus.

Note 2: An all black check pattern is used when measuring I_{DD}, f_v is set to 60 Hz.

Note 3: 1.0A fuse is applied in the module for I_{DD}. For display activation and protection purpose, power supply is recommended larger than 2.5A to start the display and break fuse once any short circuit occurred.

5.2 BACKLIGHT CHARACTERISTICS

$T_a = 25 \,^{\circ}C$

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Power Supply Voltage	V_{DD}	Backlight Unit	3.0	3.3	3.6	V	Note1
LED Forward Current (Dim Control)	I_{LED}	0V;0% duty	-	312	342	mA	Note2
		3.3VDC;100% duty	-	120	132		
LED Lifetime	-	312mA	-	50K	-	hrs	Note 3

Note 1: Fig. 5.1 shows the LED backlight circuit. The circuit has 15 LEDs in total and R is 200 Ω .

Note 2: Dimming function can be obtained by applying DC voltage or PWM signal from the display interface CN1. The recommended PWM signal is 1K~10KHz with 3.3V amplitude.

Note 2: The estimated lifetime is specified as the time to reduce 50% brightness by applying 60mA at 25 $^{\circ}C$.
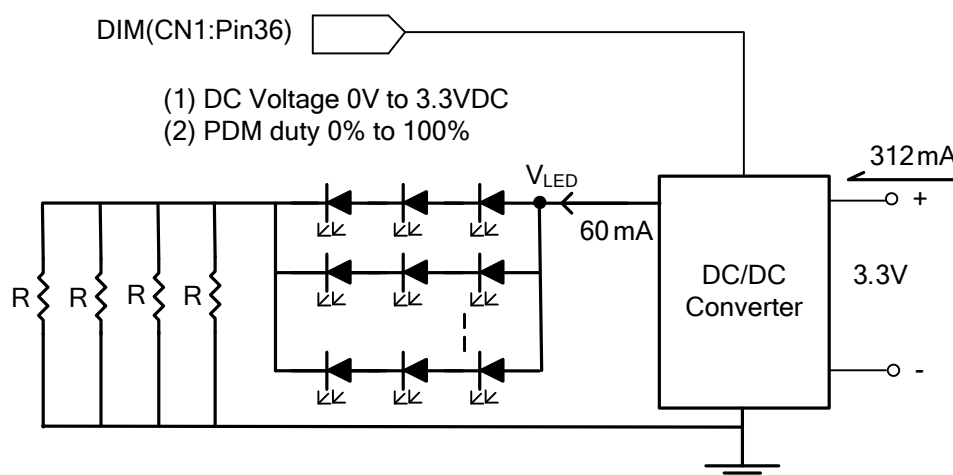

Fig. 5.1

6. OPTICAL CHARACTERISTICS

The optical characteristics are measured based on the conditions as below:

- Supplying the signals and voltages defined in the section of electrical characteristics.

- The backlight unit needs to be turned on for 30 minutes.

- The ambient temperature is $25\,^{\circ}\mathrm{C}$.

- In the dark room around 500~1000 lx, the equipment has been set for the measurements as shown in Fig 6.1.

$T_a = 25\ ^{\circ}C, f_v = 60$ Hz, $V_{DD} = 3.3V$

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Brightness of White		-	$\phi = 0\,^{\circ}, \theta = 0\,^{\circ},$ I_{LED}= 312mA	280	360	-	cd/m^2	Note 1
Brightness Uniformity		-		70	-	-	%	Note 2
Contrast Ratio		CR		300	600	-	-	Note 3
Response Time			$\phi = 0\,^{\circ}, \theta = 0\,^{\circ}$	-	45	-	ms	-
NTSC Ratio		-	$\phi = 0\,^{\circ}, \theta = 0\,^{\circ}$	-	60	-	%	-
Viewing Angle		θ x	$\phi = 0\,^{\circ}, CR \geq 10$	50	60	-	Degree	Note 5
		θ x$'$	$\phi = 180\,^{\circ}, CR \geq 10$	50	60	-		
		θ y	$\phi = 90\,^{\circ}, CR \geq 10$	65	75	-		
		θ y$'$	$\phi = 270\,^{\circ}, CR \geq 10$	45	55	-		
Color Chromaticity	Red	X	$\phi = 0\,^{\circ}, \theta = 0\,^{\circ}$	0.58	0.63	0.68	-	Note 6
		Y		0.29	0.34	0.39		
	Green	X		0.32	0.37	0.42		
		Y		0.54	0.59	0.64		
	Blue	X		0.10	0.15	0.20		
		Y		0.04	0.09	0.14		
	White	X		0.26	0.31	0.36		
		Y		0.28	0.33	0.38		

Note 1: The brightness is measured from the center point of the panel, P5 in Fig. 6.2, for the typical value.

Note 2: The brightness uniformity is calculated by the equation as below:

$$\text{Brightness uniformity} = \frac{\text{Min. Brightness}}{\text{Max. Brightness}} \times 100\%$$

, which is based on the brightness values of the 9 points measured by BM-5 as shown in Fig. 6.2.

Photo detector:BM-5A
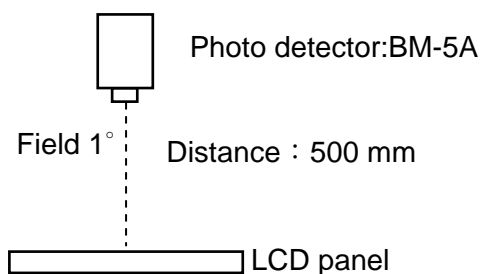
Field 1°

Distance：500 mm
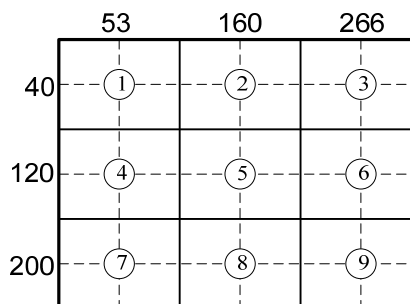
LCD panel

Fig. 6.1

Fig. 6.2

Note 3: The Contrast ratio is measured from the center point of the panel, P5, and defined as the following equation:

$$CR = \frac{\text{Brightness of White}}{\text{Brightness of Black}}$$

Note 4: The definition of response time is shown in Fig. 6.3. The rising time is the period from 90% brightness to 10% brightness when the data is from white to black. Oppositely, Falling time is the period from 10% brightness rising to 90% brightness.
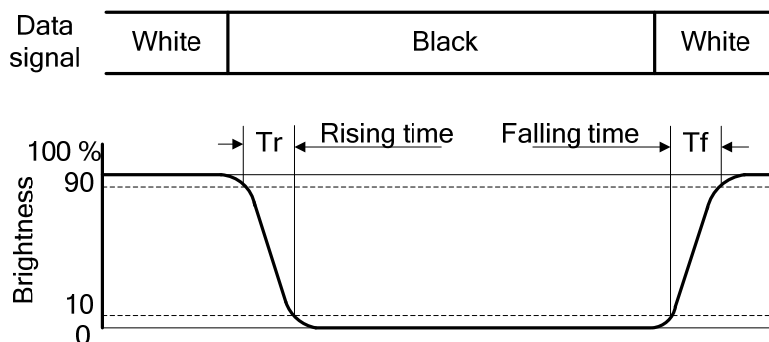
Data signal	White	Black	White

Fig. 6.3

Note 5: The definition of viewing angle is shown in Fig. 6.4. Angle ϕ is used to represent viewing directions, for instance, $\phi = 270°$ means 6 o'clock, and $\phi = 0°$ means 3 o'clock. Moreover, angle θ is used to represent viewing angles from axis Z toward plane XY.

The viewing direction of this display is 6 o'clock, which means that a photograph with gray scale would not be reversed in color and the brightness change would be less from this direction. However, the best contrast peak would be located at 12 o'clock.
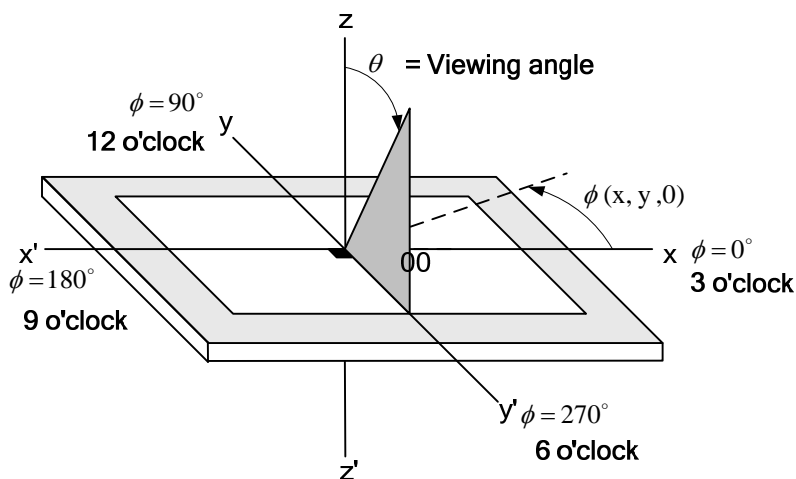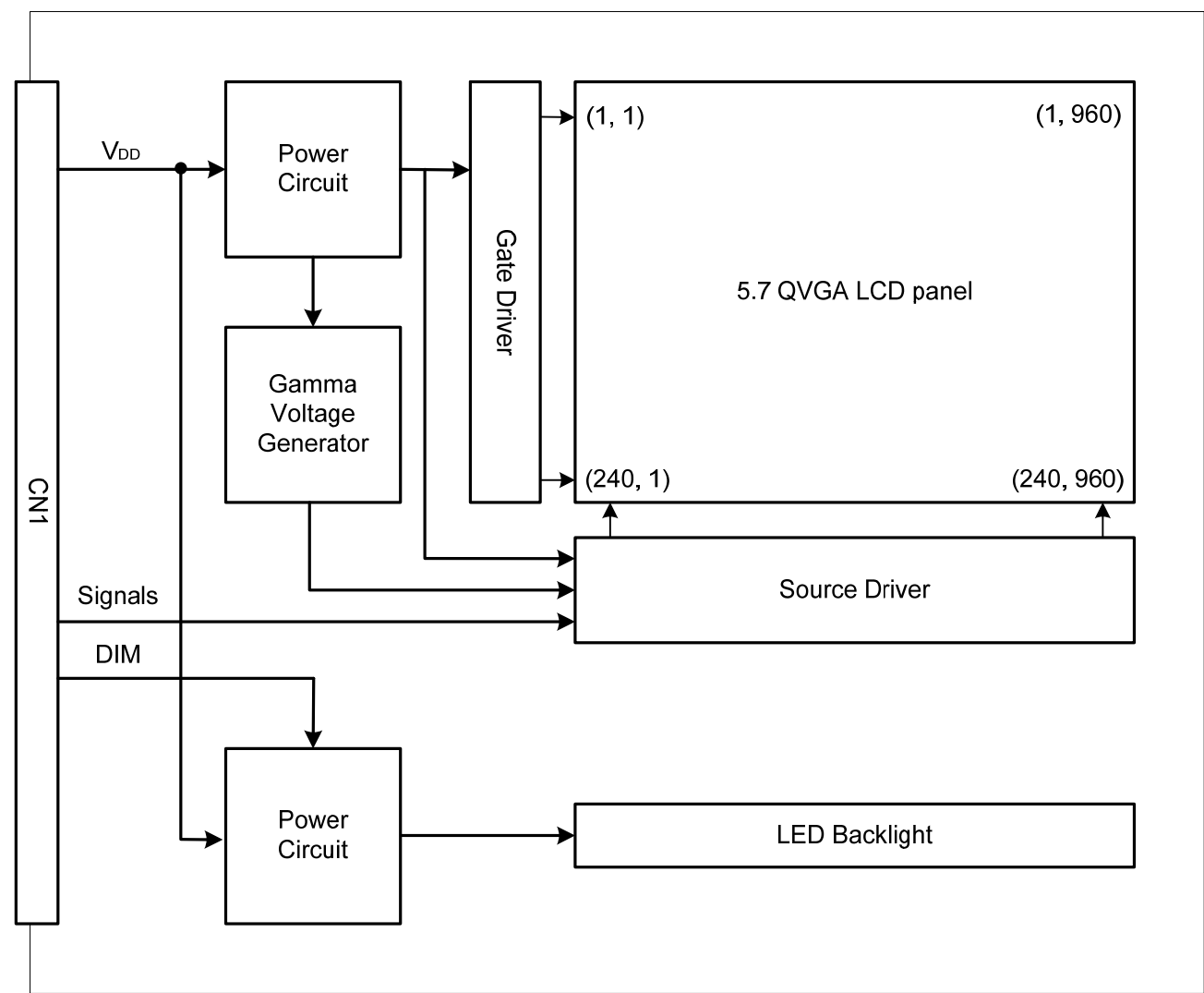

Fig. 6.4

Note 6: The color chromaticity is measured from the center point of the panel, P5, as shown in Fig. 6.2.

7. BLOCK DIAGRAM

Note 1: Signals are DCLK, DIM, DE and RGB data bus.

8. RELIABILITY TESTS

Test Item	Condition	
High Temperature	1) Operating 2) 70 °C	240 hrs
Low Temperature	1) Operating 2) -20 °C	240 hrs
High Temperature	1) Storage 2) 80 °C	240 hrs
Low Temperature	1) Storage 2) -30 °C	240 hrs
Heat Cycle	1) Operating 2) −20 °C~70 °C 3) 3hrs~1hr~3hrs	240 hrs
Thermal Shock	1) Non-Operating 2) -35 °C ↔ 85 °C 3) 0.5 hr ↔ 0.5 hr	240 hrs
High Temperature & Humidity	1) Operating 2) 40 °C& 85%RH 3) Without condensation (Note3)	240 hrs
Vibration	1) Non-Operating 2) 20~200 Hz 3) 2G 4) X, Y, and Z directions	1 hr for each direction
Mechanical Shock	1) Non-Operating 2) 10 ms 3) 50G 4) $\pm X, \pm Y$ and $\pm Z$ directions	Once for each direction
ESD	1) Operating 2) Tip: 150 pF, 330 Ω 3) Air discharge for glass: $\pm$ 8KV 4) Contact discharge for metal frame: $\pm$ 8KV	1) Glass: 9 points 2) Metal frame: 8 points (Note4)

Note 1: There is no display functionality failure occurred after the reliability tests.

Note 2: The display is not guaranteed for use in corrosive gas environments.

Note 3: Under the condition of high temperature & humidity, if the temperature is higher than 40 °C, the humidity needs to be reduced as Fig. 8.1 shown.

Note 4: All pins of LCD interface (CN1) have been tested by $\pm$100V contact discharge of ESD under non-operating condition.
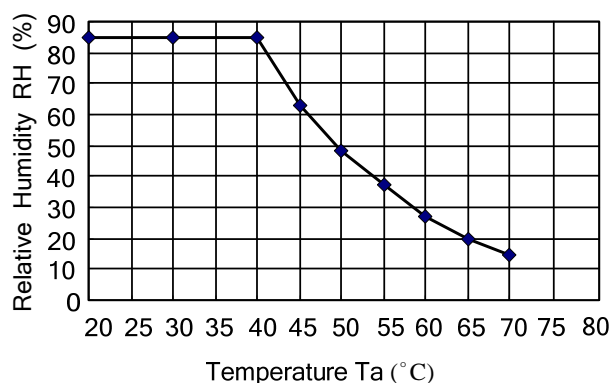

Fig. 8.1

9. LCD INTERFACE

9.1 INTERFACE PIN CONNECTIONS

The display interface connector is FA5B040HP1 made by JAE (Thickness: 0.3 ± 0.05mm; Pitch: 0.5 ± 0.05mm) and more details of the connector are shown in the section of outline dimension.

Pin assignment of LCD interface is as below:

Pin No.	Signal	Function	Pin No.	Signal	Function
1	V_{DD}	Power Supply for Logic	21	G4	Green Data
2	V_{DD}		22	G3	
3	V_{DD}		23	V_{SS}	GND
4	V_{DD}		24	G2	Green Data
5	NC	No Connection	25	G1	
6	DE	Timing Signal for Data	26	G0	
7	V_{SS}	GND	27	V_{SS}	GND
8	DCLK	Dot Clock	28	R5	Red Data
9	V_{SS}	GND	29	R4	
10	NC	No Connection	30	R3	
11	V_{SS}	GND	31	V_{SS}	GND
12	B5	Blue Data	32	R2	Red Data
13	B4		33	R1	
14	B3		34	R0	
15	V_{SS}	GND	35	NC	No Connection
16	B2	Blue Data	36	DIM	Note1
17	B1		37	XT	Analog Signal From Digitizer TOP
18	B0		38	YL	Analog Signal From Digitizer LEFT
19	V_{SS}	GND	39	XB	Analog Signal From Digitizer BOTTOM
20	G5	Green Data	40	YR	Analog Signal From Digitizer RIGHT

Note 1: Normal brightness: 0V or 0% PWM duty ; Brightness Control: 0V to 3.3V DC or 0% to 100% PWM duty.

9.2 TIMING CHART

A. Timing of QVGA

th = 385 CLK (1H)

DE

DCLK   1 2 3   35 36   355   385 1 2

5.85M Hz (typ.)

35 CLK (typ.)   thd = 320 CLK (fixed)   30CLK (typ.)
Invalid data   Display data   Invalid data

R [0:5]   R R R R R   R R R R

G [0:5]   G G G G G   G G G G

B [0:5]   B B B B B   B B B B

Fig. 9.1 Horizontal Timing

tv = 253 H (60 Hz)

DE

7H (typ.)   tvd = 240 H (fixed)   6H (typ.)
Invalid lines   Display lines   Invalid lines

RGB   1 2 3   240
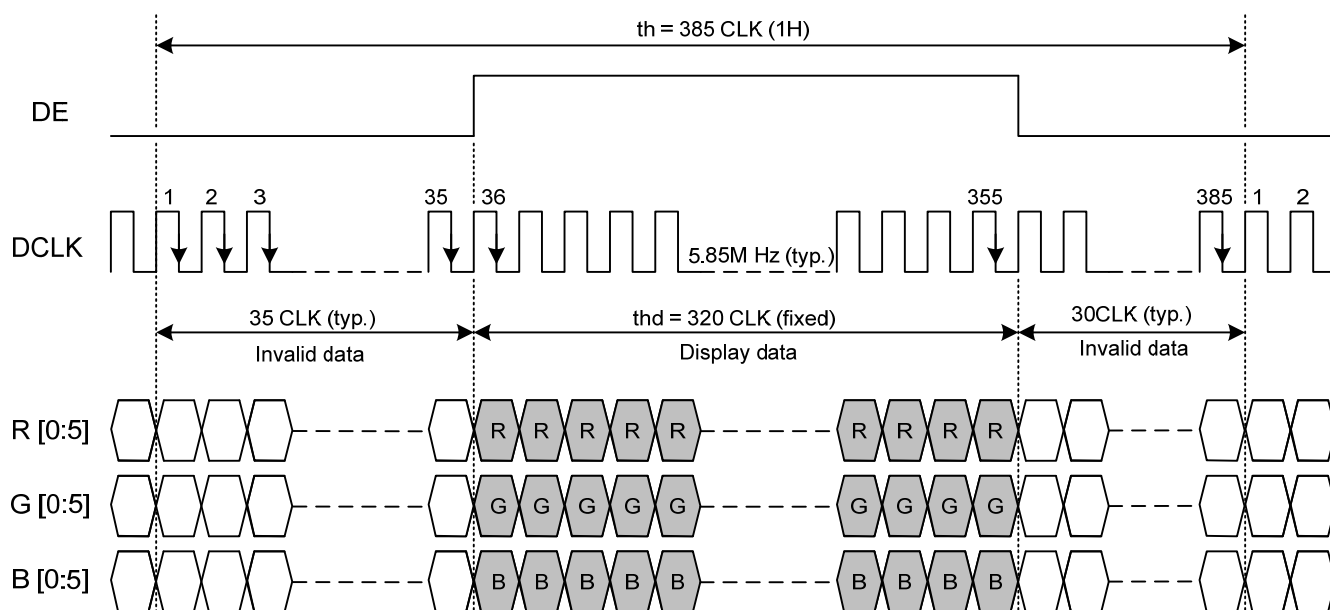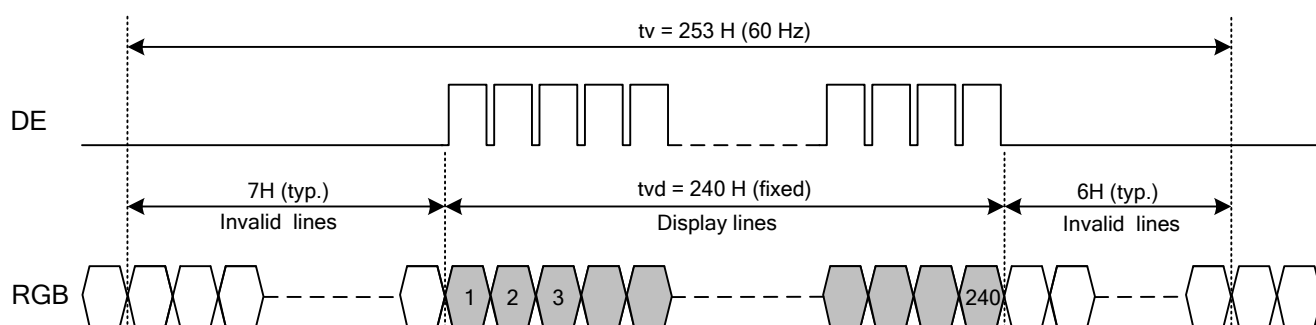
Fig. 9.2 Vertical Timing

B. Timing of VGA

th = 709 CLK (1H)

DE

CLK

1 2 3   37 38   677   709 1 2

20.9M Hz (typ.)

37 CLK (typ.)   thd = 640 CLK (fixed)   32CLK (typ.)
Invalid data   Display data   Invalid data

R [0:5]   R R R R R   R R R R

G [0:5]   G G G G G   G G G G

B [0:5]   B B B B B   B B B B

Fig. 9.3 Horizontal Timing

tv = 491 H (60 Hz)

DE

7H (typ.)   tvd = 480 H (fixed)   4H (typ.)
Invalid lines   Display lines   Invalid lines

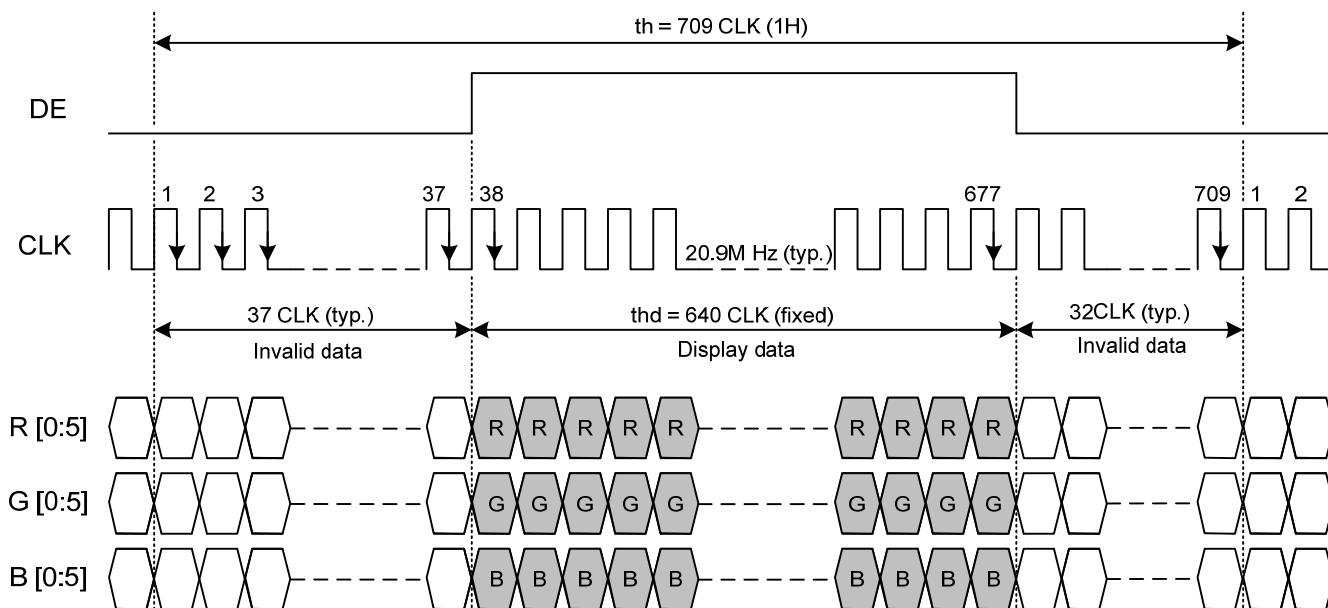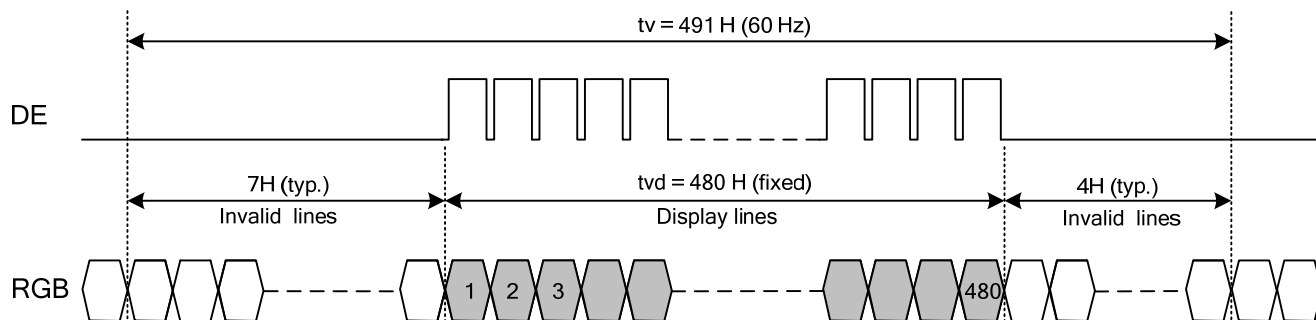RGB   1 2 3   480

Fig. 9.4 Vertical Timing
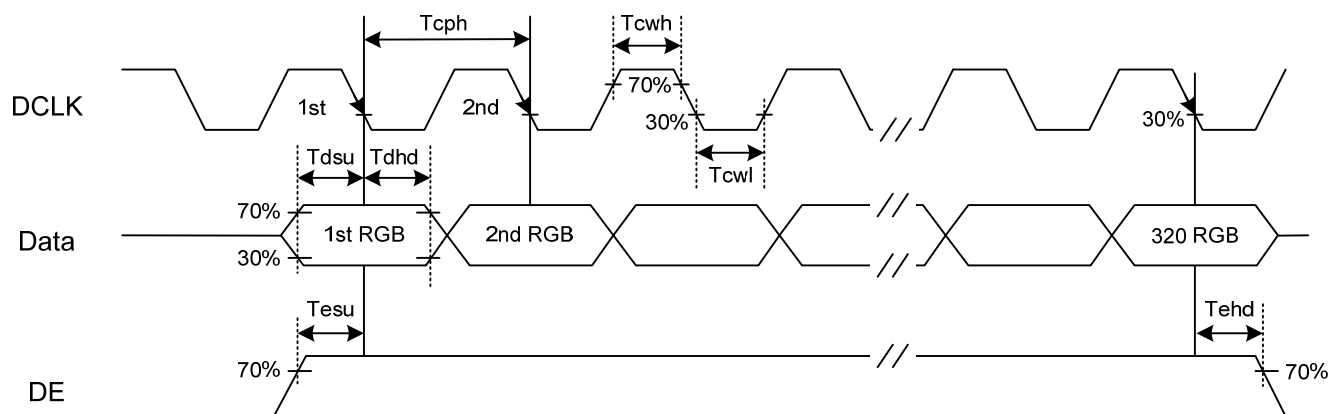
B. CLOCK AND DATA INPUT TIMING

Fig. 9.5 Setup & Hold Time

9.3 TIME TABLE

The column of timing sets including minimum, typical, and maximum as below are based on the best optical performance, frame frequency (Vsync) = 60 Hz to define. If 60 Hz is not the aim to set, 52~68 Hz for Vsync is recommended to apply for better performance by other parameter combination as the definitions in section 5.1.

A. TIMING CHART

Item			Symbol	Min.	Typ.	Max.	Unit
QVGA	Horizontal	CLK Frequency	fclk	5.31	5.85	14.5	M Hz
		Display Data	thd	320	320	320	CLK
		Cycle Time	th	358	385	453	
	Vertical	Display Data	tvd	240	240	240	H
		Cycle Time	tv	247	253	535	
VGA	Horizontal	CLK Frequency	fclk	19.8	20.9	23.6	M Hz
		Display Data	thd	640	640	640	CLK
		Cycle Time	th	679	709	739	
	Vertical	Display Data	tvd	480	480	480	H
		Cycle Time	tv	485	491	533	

B. CLOCK AND DATA INPUT TIMING

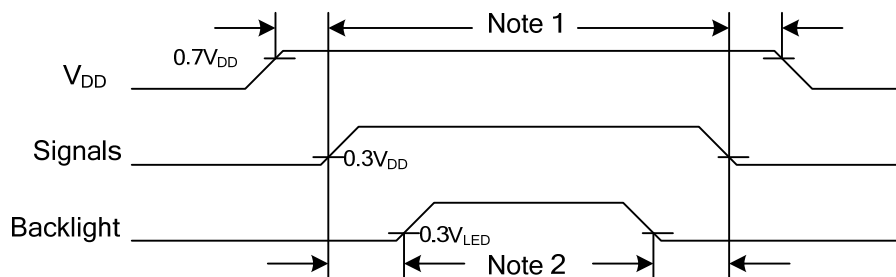| Item		Symbol	Min.	Typ.	Max.	Unit
DCLK	Duty	Tcwh	40	50	60	%
	Cycle Time(QVGA)	Tcph	69	171	188	
	Cycle Time(VGA)	Tcph	42.4	47.8	50.5	
Data	Setup Time	Tdsu	8	-	-	
	Hold Time	Tdhd	8	-	-	
DE	Setup Time	Tesu	8	-	-	
	Hold Time	Tehd	8	-	-	

9.4 POWER SEQUENCE
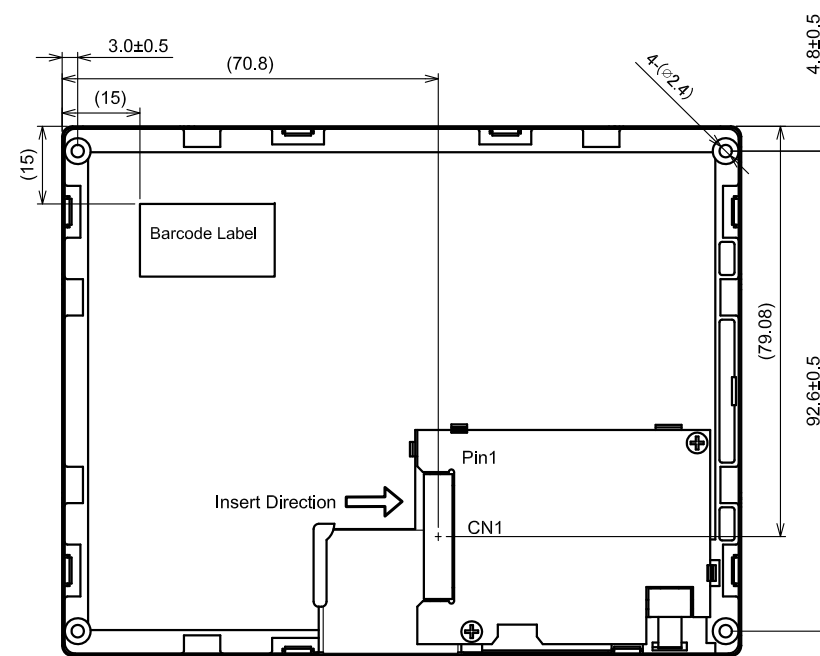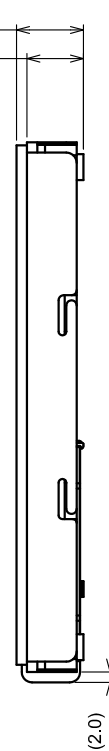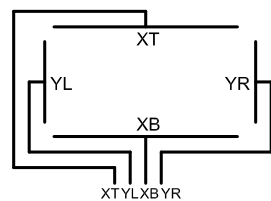

Fig. 9.4 Power Sequence Timing

Note 1: In order to avoid any damages, V_{DD} has to be applied before all other signals. The opposite is true for power Off where V_{DD} has to be remained on until all other signals have been switch off. The recommended time period is 1 second. Hot plugging might cause display damage due to incorrect power sequence, please pay attention on interface connecting before power on.

Note 2: In order to avoid showing uncompleted patterns in transient state. It is recommended that switching the backlight on is delayed for 1 second after the signals have been applied. The opposite is true for power Off where the backlight has to be switched off 1 second before the signals are removed.

9.5 DATA INPUT for DISPLAY COLOR
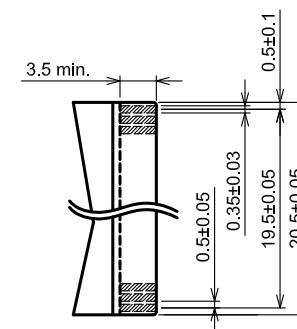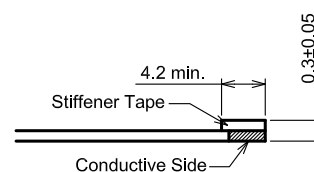
	COLOR & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Red	Black	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	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	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	1	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green (63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	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	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue (63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

10. OUTLINE DIMENSIONS

131.0±0.5(LCM Outline)
129.0±0.5(T/P Outline)
119.4±0.3(Window Bezel & T/P Viewing Area)
116.6±0.3(TP Active Area)
115.2±0.1 (LCD Active Area)

(0.6)
3.3±0.3
4.8±0.5
5.5±0.3

(63.1)

12.4±0.5
10.9±0.5

3.0±0.5
(70.8)
(15)
4(Φ2.4)
4.8±0.5

(15)

Barcode Label

(79.08)

92.6±0.5

320 x 3 (R.G.B) x 240

5.5±0.3
4.8±0.5
3.5±0.3
(0.6)

(48.7)

86.4±0.1 (LCD Active Area)
87.8±0.3(TP Active Area)
90.6±0.3 (Window Bezel & T/P Viewing Area)
100.2±0.5(T/P Outline)
102.2±0.5(LCM Outline)

View Direction

Pin1

Insert Direction →

CN1

(2.0)

Recommended design rule for CN1 FPC

XT
YL   YR
XB

XTYLXBYR

3.5 min.

0.5±0.1

4.2 min.

0.3±0.05

0.5±0.05
0.35±0.03
19.5±0.05
20.5±0.05

Stiffener Tape

Conductive Side

Scale : NTS
Unit : mm

11. TOUCH PANEL

The type of touch panel used on this display is resistive, analog, 4-wire and film on glass, and more characteristics are shown as below:

11.1 OPERATING CONDITIONS

Item	Specification	Remarks
Operating Voltage	5VDC max.	-

11.2 ELECTRICAL CHARACTERISTICS

Item		Specification	Remarks
Resistance	X1-X2	230~650 Ω	-
Between Terminal	Y1-Y2	320~980 Ω	
Insulation Resistance	X-Y	20M Ω min.	At 25V DC
Linearity	X	±1.5% max.	Note 1
	Y	±1.5% max.	
Chattering		10ms max.	-

Note 1: The test conditions and equipments of linearity are as below:

- Material of pen: poly-acetal resin

- End shape: R 0.8 mm

- Test force: 150 gf

- Pitch: 10 mm

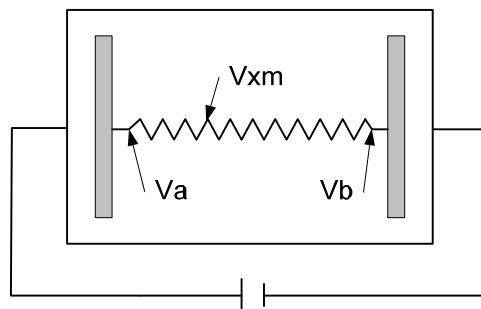- Test area is shown in Fig. 11.1
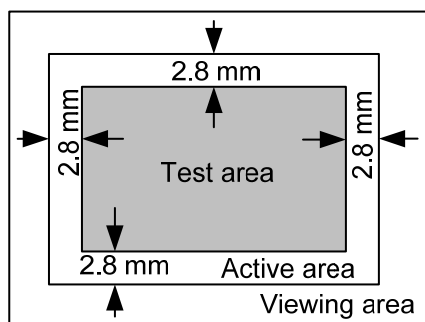
Fig. 11.1

Fig. 11.2

As shown in Fig. 11.2, applying voltage meter to measure Va, Vb and Vxm, where Va is the maximum voltage in the active area; Vb is the minimum voltage in the active area; Vxm is the measured voltage of point x selected by random. Afterwards, the linearity can be calculated by following equation:

$$Linearity = \frac{|Vxi - Vxm|}{Va - Vb} \times 100\% ,$$

where Vxi is the idea voltage of point x.

The method to measure the linearity of Y-axis is the same as above.

11.3 MECHANICAL CHARACTERISTICS

Item	Specification	Remarks
Pen Input Pressure	1.2N max.	R0.8, Polyacetal Pen
Finger	1.2N max.	R8.0, Silicon Rubber
Surface Hardness	2H min.	JIS K 5400

11.4 OPTICAL CHARACTERISTICS

Item	Specification	Remarks
Transmittance	80% min.	-

11.5 SAFETY AND ATTENTIONS

1) Do not put heavy shock or stress on the touch panel.

2) Please use soft cloth or absorbent cotton with ethanol to clean the touch panel by gently wiping. Moreover, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the touch panel's surface.

3) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean the display's surface.

4) UV protection is recommended to avoid the possibility of performance degrading when touch panel is likely applied under UV environment for a long period of time.

12. APPEARANCE STANDARD

The appearance inspection is performed in a dark room around 500~1000 lx based on the conditions as below:

- The distance between inspector's eyes and display is 30 cm.

- The viewing zone is defined with angle θ shown in Fig. 12.1 The inspection should be performed within $45°$ when display is shut down. The inspection should be performed within $5°$ when display is power on.
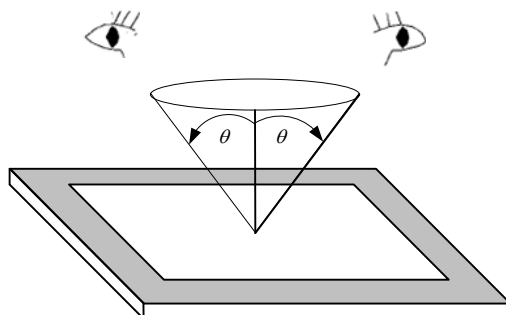

Fig. 12.1

12.1 THE DEFINITION OF LCD ZONE

LCD panel is divided into 2 areas as shown in Fig.12.2 for appearance specification in next section. A zone is the LCD active area (dot area); B zone is the area between A zone and metal frame.

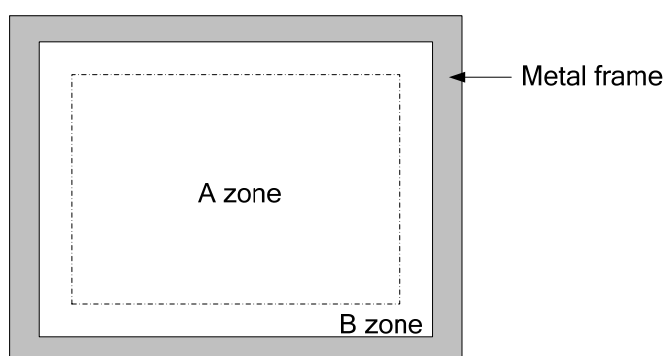In terms of housing design, B zone is the recommended window area customers' housing should be located in.

Fig. 12.2

12.2 LCD APPEARANCE SPECIFICATION

The specification as below is defined as the amount of unexpected phenomenon or material in different zones of LCD panel. The definitions of length, width and average diameter using in the table are shown in Fig. 12.4 and Fig. 12.5.

Item	Criteria				Applied zone
Scratches	Length (mm)	Width (mm)	Maximum number	Minimum space	A
	L≦15	W≦0.02	Ignored	-	
	L≦15	0.02＜W≦0.1	5	-	
	L＞15	0.1＜W	0	-	
Dent	Serious one is not allowed				A
Wrinkles in polarizer	Serious one is not allowed				A
Bubbles on polarizer	Average diameter (mm)		Maximum number		A
	D≦0.3		Ignored		
	0.3＜D≦0.6		4		
	0.6＜D		0		
1) Stains 2) Foreign Materials 3) Dark Spot	Filamentous (Line shape)				A
	Length (mm)	Width (mm)		Maximum number	
	L≦2.0	W≦1.5		5	
	L＞2.0	1.5＜W		0	
	Round (Dot shape)				A
	Average diameter (mm)	Maximum number		Minimum Space	
	D≦0.2	Ignored		-	
	0.2＜D＜0.6	4		-	
	0.6≦D	0		-	
	Those wiped out easily are acceptable				
Dot-Defect		Area①	Area②	Maximum number	A (Note 1)
	Bright dot-defect	1 dot	2 dot	3 dot	
	Dark dot-defect	2 dot	3 dot	4 dot	
	Bright + Dark point	3 dot	4 dot	5 dot	

Note 1: The Dot-Defect inspection within A zone (active area) would be divided into area ①, ② as Fig. 12.3 shown.
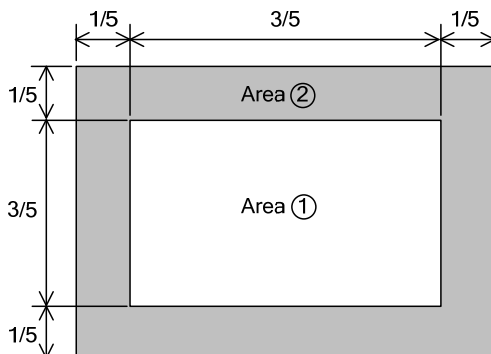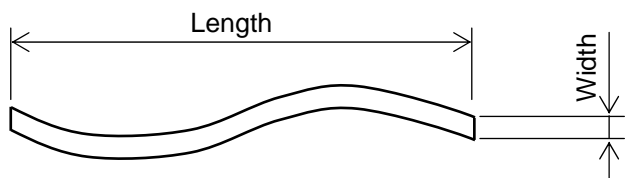

Fig. 12.3

Length

Width

Fig 12.4

a

b

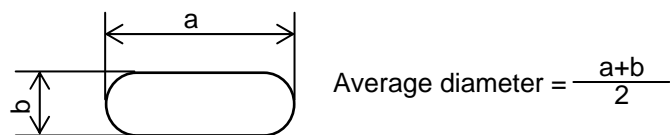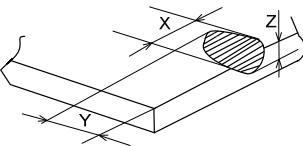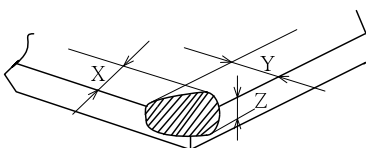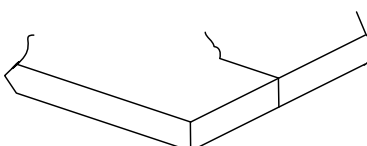Average diameter = $\dfrac{a+b}{2}$

Fig 12.5

12.3 TOUCH PANEL APPEARANCE SPECIFICATION

The specification as below is defined by the amount of unexpected material in different zones of touch panel.

Item	Criteria			Applied zone
Scratches	Width (mm)	Length (mm)	Maximum number	A,B
	W＞0.1	L≧10	Not allowed	
	0.10≧W＞0.05	L＜10	4 pcs max.	
	0.05≧W	L＜10	Ignored	
Foreign Materials	Filamentous　(Line shape)			A,B
	Width (mm)	Length (mm)	Maximum number	
	0.10≧W＞0.05	3＜L	Not allowed	
	0.05≧W	L≦3	Ignored	
	Round (Dot shape)			A,B
	Average diameter (mm)	Maximum number		
	D＞0.35	Not allowed		
	0.35≧D＞0.25	6 pcs max.		B
	D≦0.25	Ignored		A,B

The limitation of glass flaw occurred on touch panel is defined in the table as below.

Item	Specifications	
Edge flaw		X ≤ 5.0 mm Y ≤ 3.0 mm Z ≤ Thickness
Corner flaw		X ≤ 3.0 mm Y ≤ 3.0 mm Z ≤ Thickness
Progressive flaw		Not allowed

13. PRECAUTIONS

13.1 PRECAUTIONS of MOUNTING

1) Please refer to Fig. 13.1 for housing the display with touch panel into applications. The Fig. 13.1 shows some points as below:

- The cushion needs to be designed between housing and touch panel in order to avoid unexpected pressure to cause any wrong reactions, and the cushion should be located in the insulated area.

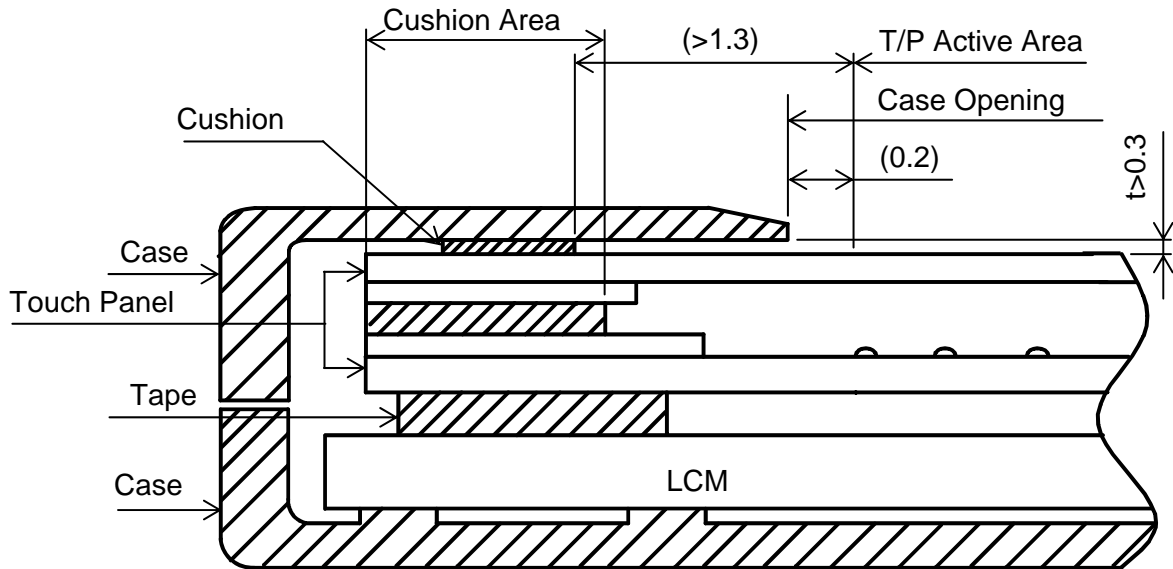- The housing should not cover the active area of touch panel as the figure shown.

Fig 13.1

13.2 PRECAUTIONS of ESD

1) Before handling the display, please ensure your body has been connected to ground to avoid any damages by ESD. Also, do not touch display's interface directly when assembling.

2) Please remove the protection film very slowly before turning on the display to avoid generating ESD.

13.3 PRECAUTIONS of HANDLING

1) In order to keep the appearance of display in good condition, please do not rub any surfaces of the displays by sharp tools harder than 3H, especially touch panel, metal frame and polarizer.

2) Please do not stack the displays as this may damage the surface. In order to avoid any injuries, please avoid touching the edge of the glass or metal frame and wore gloves during handling.

3) Touching the polarizer or terminal pins with bare hand should be avoided to prevent staining and poor electrical contact.

4) Do not use any harmful chemicals such as acetone, toluene, and isopropyl alcohol to clean display's surfaces.

5) Please use soft cloth or absorbent cotton with ethanol to clean the display by gently wiping. Moreover, when wiping the display, please wipe it by horizontal or vertical direction instead of circling to prevent leaving scars on the display's surface, especially polarizer.

6) Please wipe any unknown liquids immediately such as saliva, water or dew on the display to avoid color fading or any permanently damages.

| KAOHSIUNG OPTO-ELECTRONICS INC. | SHEET NO. | 7B64PS 2713- TX14D25VM1BPA-3 | PAGE | 13-1/2 |

7) Maximum pressure to the surface of the display must be less than $1,96 \times 10^4$ Pa. If the area of adding pressure is less than 1 cm^2, the maximum pressure must be less than 1.96N.

13.4 PRECAUTIONS OF OPERATING

1) Please input signals and voltages to the displays according to the values defined in the section of electrical characteristics to obtain the best performance. Any voltages over than absolute maximum rating will cause permanent damages to this display. Also, any timing of the signals out of this specification would cause unexpected performance.

2) When the display is operating at significant low temperature, the response time will be slower than it at $25\,C^\circ$. In high temperature, the color will be slightly dark and blue compared to original pattern. However, these are temperature-related phenomenon of LCD and it will not cause permanent damages to the display when used within the operating temperature.

3) The use of screen saver or sleep mode is recommended when static images are likely for long periods of time. This is to avoid the possibility of image sticking.

4) Spike noise can cause malfunction of the circuit. The recommended limitation of spike noise is no bigger than ± 100 mV.

13.5 PRECAUTIONS of STORAGE

If the displays are going to be stored for years, please be aware the following notices.

1) Please store the displays in a dark room to avoid any damages from sunlight and other sources of UV light.

2) The recommended long term storage temperature is between $10\,C^\circ \sim 35\,C^\circ$ and 55%~75% humidity to avoid causing bubbles between polarizer and LCD glasses, and polarizer peeling from LCD glasses.

3) It would be better to keep the displays in the container, which is shipped from KOE, and do not unpack it.

4) Please do not stick any labels on the display surface for a long time, especially on the polarizer.

14. DESIGNATION of LOT MARK

1) The lot mark is showing in Fig.14.1. First 4 digits are used to represent production lot, T represented made in Taiwan, and the last 6 digits are the serial number.

| 3 | 0 | 5 | 1 | T | | 0 | 0 | 2 | 0 | 1 | 4 |

Serial number

T: Made in Taiwan
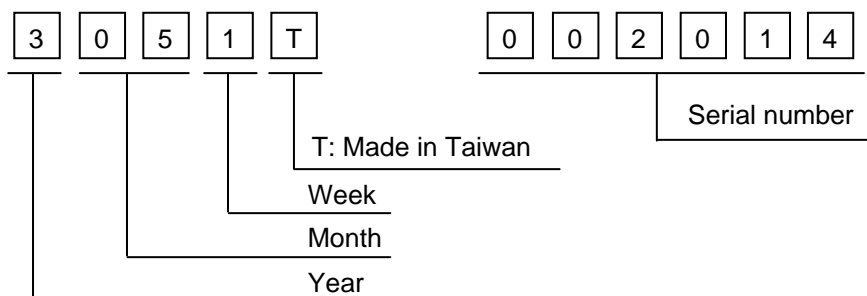
Week

Month

Year

2) The tables as below are showing what the first 4 digits of lot mark are shorted for.

Year	Mark
2013	3
2014	4
2015	5
2016	6
2017	7

Month	Mark	Month	Mark
1	01	7	07
2	02	8	08
3	03	9	09
4	04	10	10
5	05	11	11
6	06	12	12

Week (Days)	Mark
1~7	1
8~14	2
15~21	3
22~28	4
29~31	5

3) Except letters I and O, revision number will be shown on lot mark and following letters A to Z.

4) The location of the lot mark is on the back of the display shown in Fig. 14.1.

TX14D25VM1BPA   REV: A
3051T   (5D)   123456
KOE   MADE IN TAIWAN

Fig 14.1