PALM TECHNOLOGY CO., LTD.

The LCD(M) Specialist

CONTACT ADDRESS : 14F-15F, No.383, Yangming Rd.,Sanmin District, Kaohsiung
City 807, Taiwan, R.O.C.
Tel: 886-7-3983966
Fax: 886-7-3982966
E-mail: sales@palmtech.com.tw

PART NO. :   PT0352432T-A601

FOR MESSRS. :

CONTENTS

NO.	ITEM	PAGE
1.	**Cover**	1
2.	**Record Of Reversion**	2
3.	**LCD Module Physical Data**	3
4.	**External Dimensions**	4
5.	**Block Diagram**	5
6.	**Absolute Maximum Ratings**	6
7.	**Electrical Characteristics**	7~10
8.	**Interface PIN Connection**	11~12
9.	**Recommand Initial Code**	13
10.	**Electro-Optical Characteristics**	14
11.	**Inspection Criterion**	20~23
12.	**Precautions For Using LCD Modules**	24~26

08.12.12

ACCEPTED BY :   PROPOSED BY :

RECORD OF REVISION

DATE	PAGE	SUMMARY
2008/12/12	P14	Update electro-optical characteristics

◆ LCD MODULE PHYSICAL DATA

● **General Description**

Display Type	**262 K TFT**
Display Mode	**POSITIVE**
Viewing Direction	**6 o'clock**
Connection Type	**COG**
Operation temperature	**-20℃ ~70℃**
Storage temperature	**-30℃ ~80℃**
Driving IC	**HX8238**

● **Mechanical Description**

Item	Standard Value	Unit
Number of dots	**320RGB×240 dots**	**-**
LCM dimension	**77.10 (W)×64.00 (H)×3.3 (T)**	**mm**
Active area	**70.08(W)×52.56(H)**	**mm**
Dot size	**0.209 (W)×0.209 (H)**	**mm**
Dot pitch	**0.219 (W)×0.219(H)**	**mm**
Backlight	**6-CHIP LEDS series**	**/**
The KEY and accessory materials of our product according with ROHS standard		

◆ EXTERNAL DIMENSIONS

No:	PIN NAME	No:	PIN NAME
1	VBL−	28	R0
2	VBL−	29	R1
3	VBL+	30	R2
4	VBL+	31	R3
5	NC	32	R4
6	NC	33	R5
7	NC	34	R6
8	/RESET	35	R7
9	SPENA(nCS)	36	HSYNC
10	SPCLK(SCL)	37	VSYNC
11	SPDAT(SDI)	38	DCLK(DOTCLK)
12	B0	39	NC
13	B1	40	NC
14	B2	41	VCC
15	B3	42	VCC
16	B4	43	NC
17	B5	44	NC
18	B6	45	NC
19	B7	46	NC
20	G0	47	NC
21	G1	48	NC
22	G2	49	NC
23	G3	50	NC
24	G4	51	NC
25	G5	52	ENB(OEN)
26	G6	53	GND
27	G7	54	AVSS

BACKLIGHT CIRCUIT

(K)VBL−
(K)VBL−
VBL+(A)
VBL+(A)

"A"(60:1)

P=0.219
P=0,073
W=0,063
S=0,01

S=0,01
W=0,209
P=0,219

DIRECTION B(5:1)
CON:MOLEX 51296-5494

P0.50
W0.35
0.50
3.00±0.50

*3.35MAX
B Direction
0.30±0.05

VIEWING DIRECTION

PF4281L−V0
*64.00±0.20(LCM OUTLINE)
(0.50) 63.10±0.30(PF)
(1.80) 55.40(BE OPENING)
(3.22) 52.56(A.A)
(29.50)
*56.25±0.50
16.55±0.50

BENDING AREA
PIT4106J−V0
12X12X0.065
5.75
(18.00)
ø1.00
1.50

*77.10±0.20(LCM OUTLINE)
76.20±0.30(PF)
72.86(BE OPENING)
70.08(A.A)

DOTS:320(RGB)*240

9.00
24.50
27.50±0.10

(38.55)
"A"

(0.50)
(2.12)
(3.51)

SP4252D−V0
46.2*1.5*0.3
PI TAPE PIT5096A7.5*4*0.065
花元件將面貼好背光要避暹

COMPONENT AREA
H:1.2MAX

BENDING AREA

54
5.00±0.50
6.00

PI TAPE
PIT5146A1
18.0*3.0*0.065

NOTES:
1. DISPLAY TYPE: 262K TFT−LCD, TRANSMISSIVE,POSITIVE
2. OPERATING TEMP: −20°C∼70°C
3. STORAGE TEMP: −30°C∼80°C
4. DRIVER IC: COG HX8238−A
5. GENERAL TOLERANCE: ±0.2
6. BACKLIGHT: 6 CHIP−WHITE LEDS SERIES
7. MARK * MEANS IMPORTANT DIMENSION
8. MARK ▲ MEANS MODIFICATION RECORD
9. ALL MATERIALS MUST BE BHS−001 COMPLIANT

Palm Technology Co., Ltd.

MODEL	PT0353224−A601	VER	A
DWG NO	BM4281L	DATE	2008/04/09

◆ BLOCK DIAGRAM
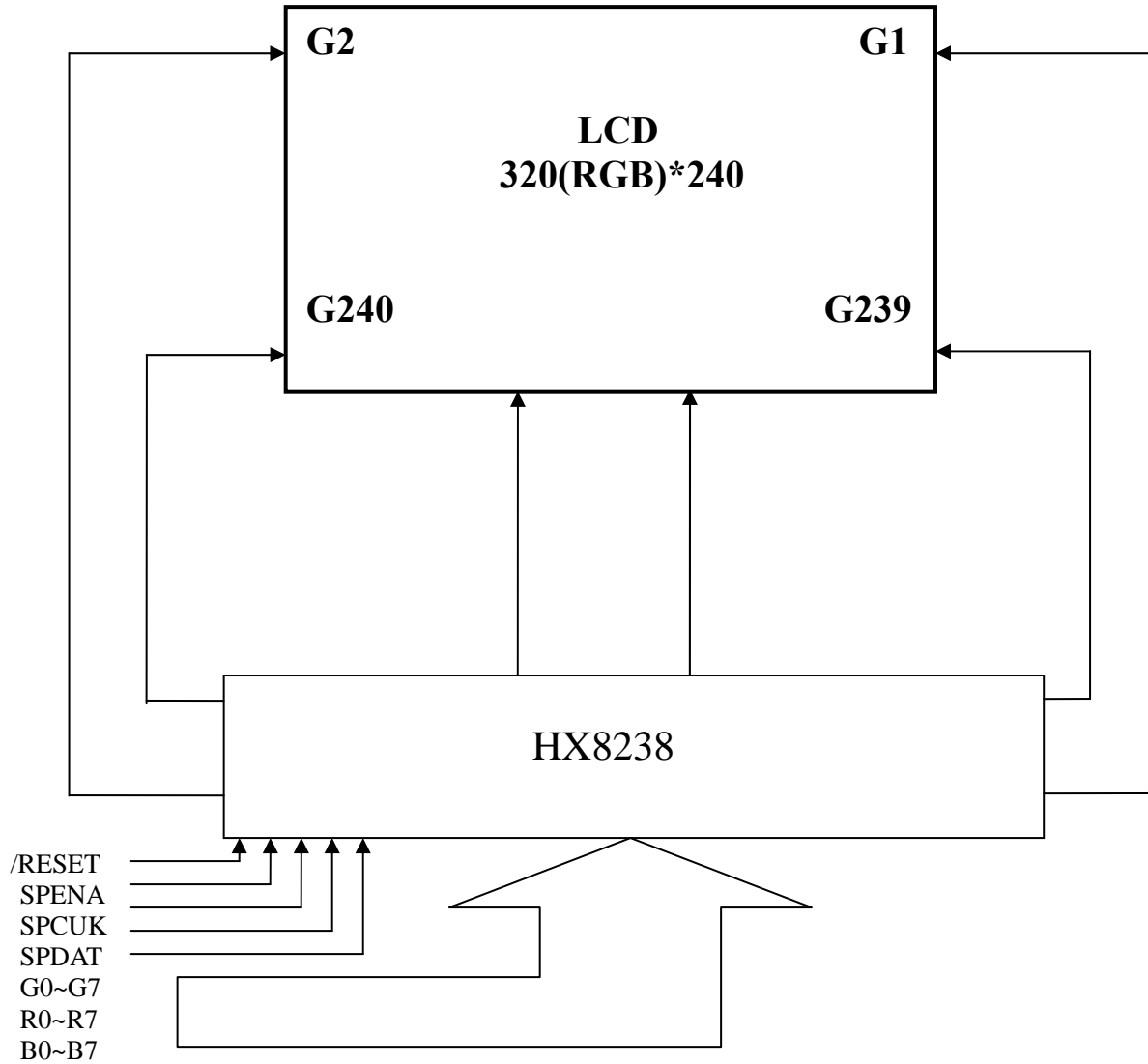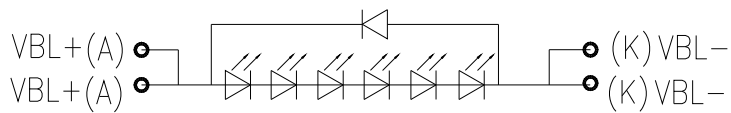
◆ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	℃
Storage temperature	Tst	-30 to 80	℃
Input voltage	Vin	VSS-0.3 to 5	V
Supply voltage for logic	VCC	-0.3 to 4.0	V

NOTE:
1. **If the module is used above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.**
2. **VDD>GND must be maintained.**

◆ ELECTRICAL CHARACTERISTICS

● DC Characteristics

Vss= 0V, Ta= 25℃

Item	Symbol	Condition	Min	Typ	Max	Unit
Power supply:	V_{DD3}	Ta=25℃	-	3.3	-	V
Current consumption for LCD normal operation	I_{DD}	V_{DD3} =3.3V	-	-	9	mA

● Back-Light unit

Item	Symbol	Min	Typ	Max	Unit	Remark
Current	I_{BL}	-	20	-	mA	1 LED
CIE	X	0.250	-	0.285	-	x>y
	Y	0.240	-	0.275	-	
Brightness	-	3800	-	-	cd/m²	-
Luminance Uniformity Ratio	-	80	-	-	%	-
Bezel(BE) must be connected to ground of the main board						

Note:

1. Average Luminous Uniformity of P1 ~ P5（Using a luminance meter BM-7）
2. Luminous Uniformity Ratio = min/max * 100%

Measured Method (X*Y: Light Area).
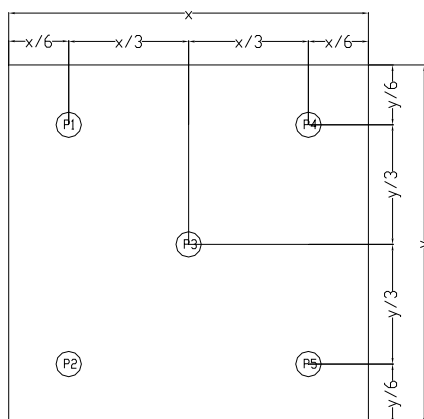
● **AC Characteristics**
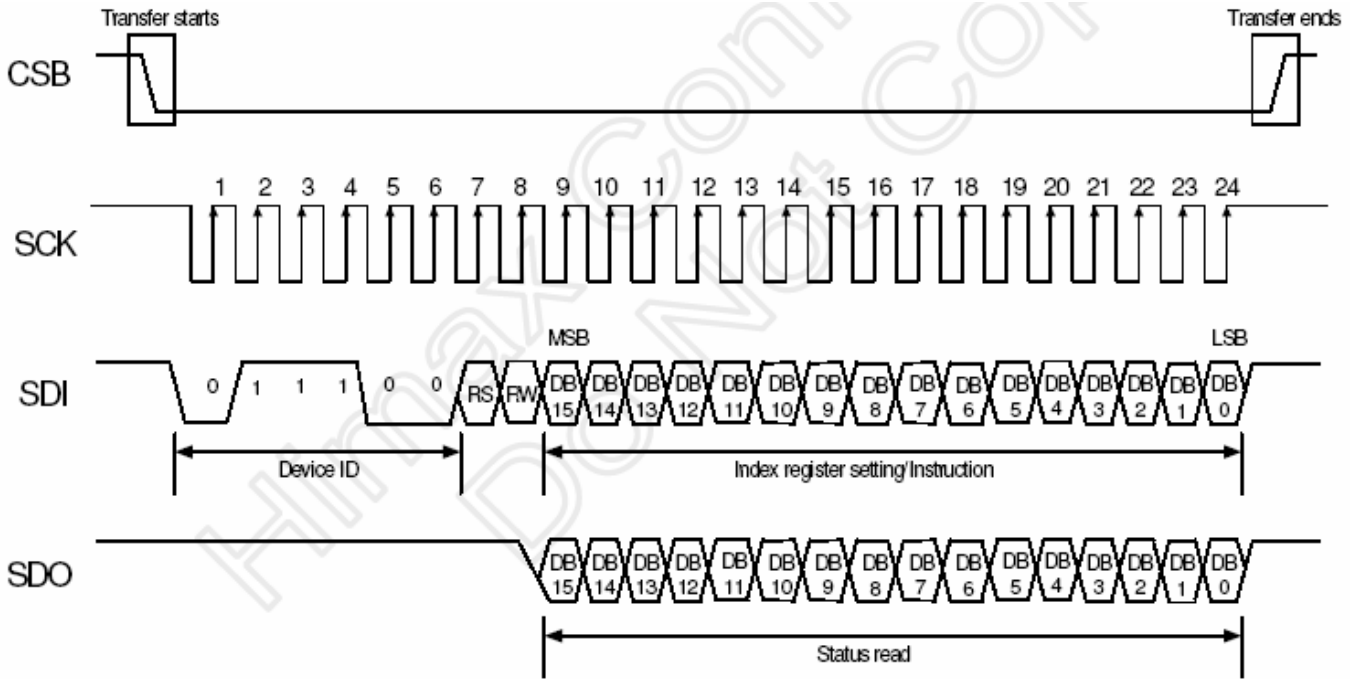
Figure 7. 1 SPI Timing

(Unless otherwise specified, Voltage Referenced to Vss, V_{DDIO} = 2.2V, T_A = 25℃)
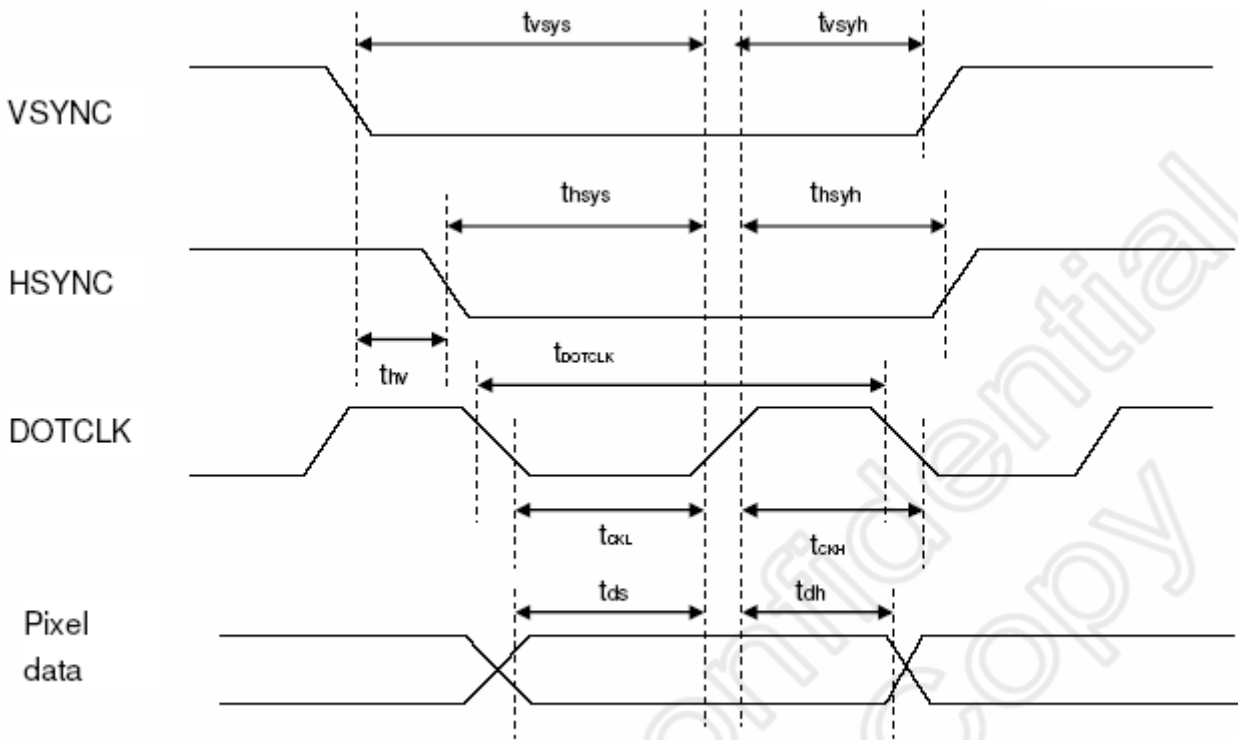
Figure 14. 1 Pixel timing

Characteristics	Symbol	Min		Typ		Max		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-		6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-		ns
Vertical Sync Setup Time	tvsys	20	10	-		-		ns
Vertical Sync Hold Time	tvsyh	20	10	-		-		ns
Horizontal Sync Setup Time	thsys	20	10	-		-		ns
Horizontal Sync Hold Time	thsyh	20	10	-		-		ns
Phase difference of Sync Signal Falling Edge	thv	1		-		240		tDOTCLK
DOTCLK Low Period	tCKL	50	15	-		-		ns
DOTCLK High Period	tCKH	50	15	-		-		ns
Data Setup Time	tds	12	10	-		-		ns
Data hold Time	tdh	12	10	-		-		ns
Reset pulse width	tRES	10		-		-		us

Note: External clock source must be provided to DOTCLK pin of HX8238-A. The driver will not operate if absent of the clocking signal.

Table 14. 1 Pixel timing
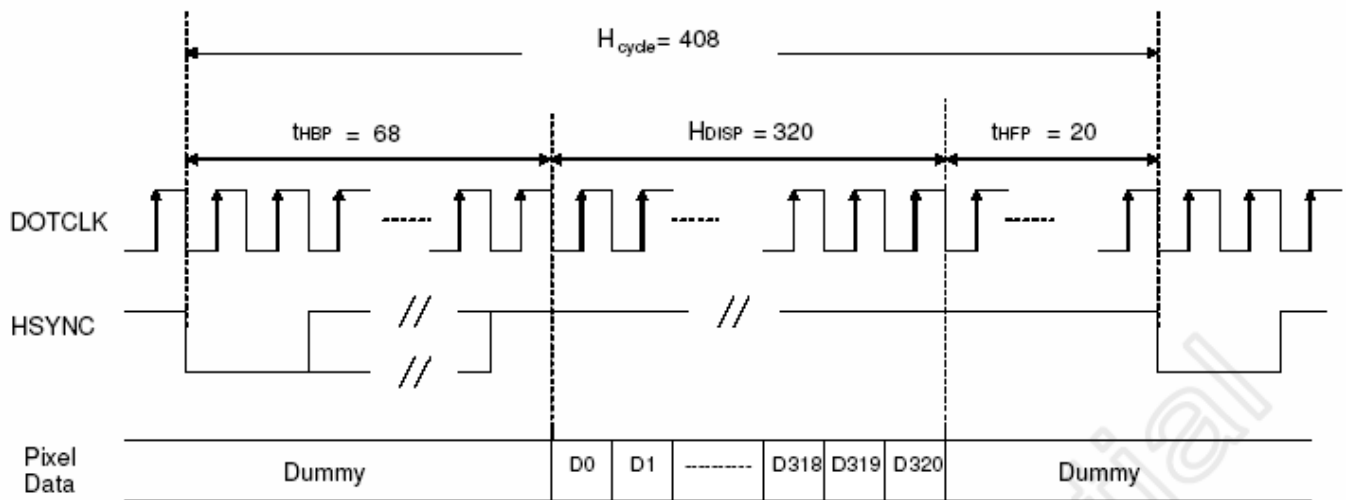
a) Horizontal Data Transaction Timing
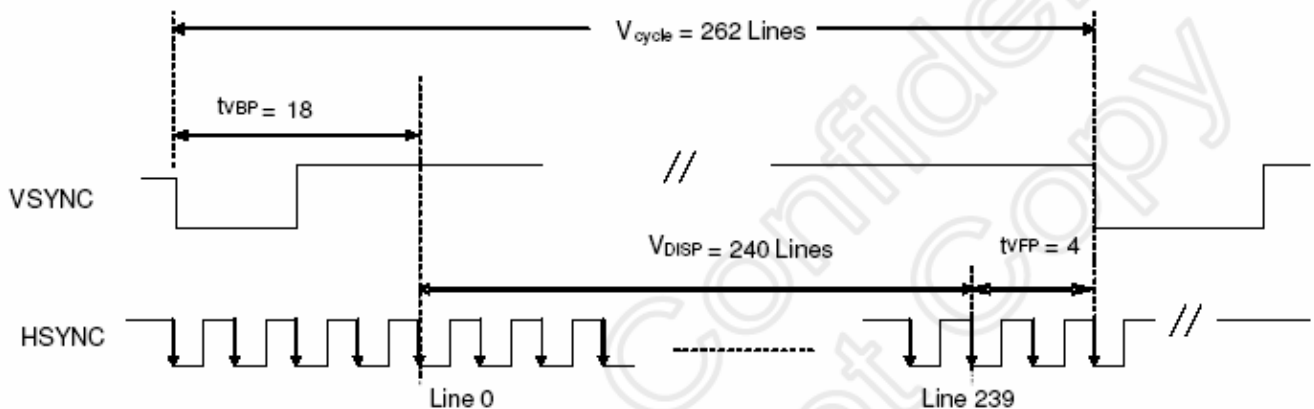
b) Vertical Data Transaction Timing

Figure 14. 2 Data transaction timing in parallel RGB (24 bit) interface (SYNC mode)

Characteristics	Symbol	Min		Typ		Max		Unit
		24 bit	8 bit	24 bit	8 bit	24 bit	8 bit	
DOTCLK Frequency	fDOTCLK	-	-	6.5	19.5	10	30	MHz
DOTCLK Period	tDOTCLK	100	33.3	154	51.3	-	-	ns
Horizontal Frequency (Line)	fH	-		14.9		22.35		KHz
Vertical Frequency (Refresh)	fV	-		60		90		Hz
Horizontal Back Porch	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Front Porch	tHFP	-	-	20	60	-	-	tDOTCLK
Horizontal Data Start Point	tHBP	-	-	68	204	-	-	tDOTCLK
Horizontal Blanking Period	tHBP + tHFP	-	-	88	264	-	-	tDOTCLK
Horizontal Display Area	HDISP	-	-	320	960	-	-	tDOTCLK
Horizontal Cycle	Hcycle	-	-	408	1224	450	1350	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	VDISP	-		240		-		Lines
Vertical Cycle	Vcycle	-		262		350		Lines

Table 14. 2 Data transaction timing in normal operating mode

◆ INTERFACE PIN CONNECTION

NO.	Symbol	Function
1	VBL-	Backlight negative
2	VBL-	
3	VBL+	Backlight positive
4	VBL+	
5	NC	No connection
6	NC	
7	NC	
8	/RESET	system reset
9	SPENA(nCS)	Chip Selet
10	SPCLK(SCL)	Serial Clock
11	SPDAT(SDI)	Serial Data
12	B0	Blue Data
13	B1	
14	B2	
15	B3	
16	B4	
17	B5	
18	B6	
19	B7	
20	G0	Green Data
21	G1	
22	G2	
23	G3	
24	G4	
25	G5	
26	G6	
27	G7	
28	R0	Red Data
29	R1	
30	R2	
31	R3	
32	R4	

33	R5	
34	R6	**Red Data**
35	R7	
36	HSYNC	**line Synchronous Signal**
37	VSYNC	**Frame Synchronous Signal**
38	DOLK(DOTCLK)	**Dot-clock signal and oscillator source.**
39	NC	**No connection**
40	NC	
41	VCC	**Power Supply**
42	VCC	
43	NC	
44	NC	
45	NC	
46	NC	
47	NC	**No connection**
48	NC	
49	NC	
50	NC	
51	NC	
52	ENB(DEN)	**Display enable signal**
53	GND	**Ground**
54	AVSS	**Ground**

SEL2-0: Define the input interface mode.

SEL2	SEL1	SEL0	Format	Operating Frequency
0	0	0	Parallel-RGB data format (only support stripe type color filter)	6.5MHz
0	0	1	Serial-RGB data format	19.5MHz
0	1	0	CCIR 656 data format (640RGB)	24.54MHz
0	1	1	CCIR 656 data format (720RGB)	27MHz
1	0	0	YUV mode A data format (Cr-Y-Cb-Y)	24.54MHz
1	0	1	YUV mode A data format (Cr-Y-Cb-Y)	27MHz
1	1	0	YUV mode B data format (Cb-Y-Cr-Y)	27MHz
1	1	1	YUV mode B data format (Cb-Y-Cr-Y)	24.54MHz

Input format	DOTCLK Freq (MHz)	Display Data	Active Area (DOTCLK)
YUV mode	24.54	640	1280
	27	720	1440

◆ RECOMMAND INITIAL CODE

```
void LCD_init(void)
{
        Reset();

        WriteCmd(0x0001);WriteData(0x633f);        //driver output
        WriteCmd(0x0002);WriteData(0x0200);        //LCD driving waveform

        WriteCmd(0x0003);WriteData(0xa164);        //power control 1
        WriteCmd(0x0004);WriteData(0x0447);        //input data and color filter
        WriteCmd(0x0005);WriteData(0xfcd4);        //function control

        WriteCmd(0x000A);WriteData(0x4008);        //contrast/brightness
        WriteCmd(0x000B);WriteData(0xc470);        //frame cycle control
        WriteCmd(0x000d);WriteData(0x123A);        //power control 2
        WriteCmd(0x000e);WriteData(0x2c00);        //power control 3
        WriteCmd(0x000f);WriteData(0x0000);        //gata scan position
        WriteCmd(0x0016);WriteData(0x9f86);        //horizontal porch
        WriteCmd(0x0017);WriteData(0x2212);        //vertical porch
        WriteCmd(0x001e);WriteData(0x00d0);        //power control 4

        WriteCmd(0x0030);WriteData(0x0507);        //gamma control
        WriteCmd(0x0031);WriteData(0x0004);        //
        WriteCmd(0x0032);WriteData(0x0707);        //
        WriteCmd(0x0033);WriteData(0x0000);        //
        WriteCmd(0x0034);WriteData(0x0000);        //
        WriteCmd(0x0035);WriteData(0x0307);        //
        WriteCmd(0x0036);WriteData(0x0405);        //
        WriteCmd(0x0037);WriteData(0x0703);        //
        WriteCmd(0x003a);WriteData(0x140B);        //
        WriteCmd(0x003b);WriteData(0x140B);        //
}
```

◆ ELECTRO-OPTICAL CHARACTERISTICS

Driving condition: VDD=3.3V，Temperature =23℃±5℃，Humidity=60%±20%RH

Item		Light angle (°)	Temp (°C)	Symbol	Min.	Typ.	Max.	Unit	Conditions	Note
Transmissive		0	25	-	-	7.5	-	%		(1)
Contrast ratio		0	25	Cr	-	584	-	-		(2)
Brightness		0	25	-	200	260	-	-		-
Luminance uniformity (surface within panel)		0	25	Lu	70	80	-	%		(3)
Cross talk		0	25	CTV	-	-	20	%		(4)
Chromaticity	R x	0	25	Rx	0.5800	0.6300	0.6800	-	(Equipment :BM-7/CS-200)	-
	R y			Ry	0.2945	0.3445	0.3945			
	G x			Gx	0.2641	0.3141	0.3641			
	G y			Gy	0.5313	0.5813	0.6313			
	B x			Bx	0.0918	0.1418	0.1918			
	B y			By	0.0244	0.0744	0.1244			
	W x			Wx	0.2212	0.2712	0.3212			
	W y			Wy	0.2250	0.2750	0.3250			
Color Reproduction Area(NTSC)		0	25	-	-	64	-	%	CIE1931(x,y)	(5)
Response time	Tr	0	25	-	-	15	20	ms	Viewing normal angle $\theta_X = \theta_Y = 0^0$	-
	Tf				-	35	50			
Viewing angle	Hor. θ_{X+}	0	25		-	-	45	-	deg	Center CR≥10	-
	θ_{x-}				-	-	45	-			
	Ver. θ_{Y+}				-	-	15	-			
	θ_{Y-}				-	-	35	-			

Note：

(1). Transmittance
Introduction
Transmittance (diffuse transmission factor) is a measure for the LCD panel transparency.
The Light Source for this measurement is the accompanying LCD-module backlight system (LEDs, Lightguide…)

Measurement conditions:

Measuring Equipment	BM-7/CS-200
Measurement Point Diameter	3mm
Measurement Point Location	Active Area Center Point
Light source	LCD module backlight
Reflectance Plate	Reflectance Standard(cal. plate)
Test pattern	All pixels white
Contrast setting	Maximum

Measuring procedure:
Transmittance:

The light source is located at the backside of the panel.

1、 **Measure the light source**

2、 **Place the LCD panel in front of the light source. Measure the luminance on the LCD panel surface**

Definitions

$$\tau = \frac{Lv_{LCD-panel}}{Lv_{lightsource}} * 100\%$$

(2) Definition of Contrast Ratio (C/R): Ratio of gray max (Gmax) & gray min (Gmin) at the center point.

$$CR = \frac{G(Max)}{G(Min)}$$

Where

Gmax: Luminance with all pixels white
Gmin: Luminance with all pixels black

(3). Surface luminance uniformity within panel

Measurement conditions:

Measuring Equipment	CS200 // BM-7
Measurement Point Diameter	3mm // 1mm
Measurement Point Location	Active Area
Light Source	Transmissive Mode: Internal (Backlight)
Test pattern	White

Measuring procedure:
Measure the luminance Li with the points in figure 1.
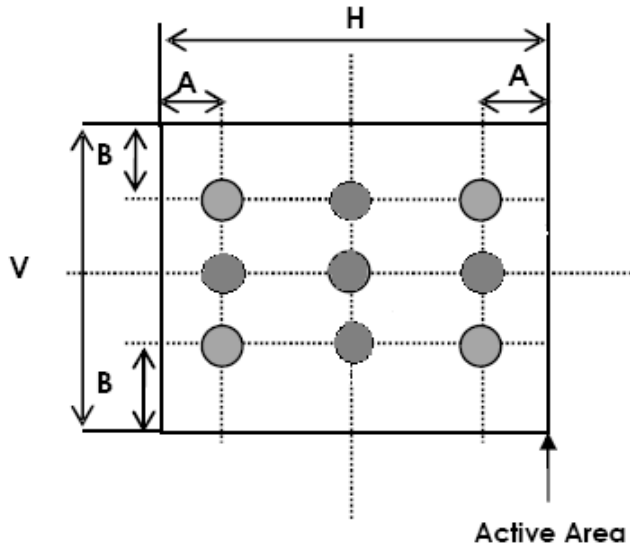
Figure 1

A: **5** mm   B: **5** mm
H, V: Active Area

Uniformity value (Lu):

$$Lu = \frac{\min(Li)}{\max(Li)} * 100\%$$

(4)．CROSS-TALK

Introduction：

Crosstalk is an effect where the contrast of a display pixel is influenced by the state of the related pixels. A measure for this effect is the Cross Talk Value (CTV)

Measurement conditions:

Measuring Equipment	CS200 // BM-7
Measurement Point Diameter	3mm // 1mm
Measurement Point Location	
Light Source	Transmissive Mode: Internal (Backlight)
Contrast setting	Maximum

●Test Pattern (valid for all greyscales):

W: The width of the rectangle in the following pictures;

5mm

2*w=10mm   central line

w*h=5*5mm^2 in the centre

     Pattern A   Pattern B   Pattern C
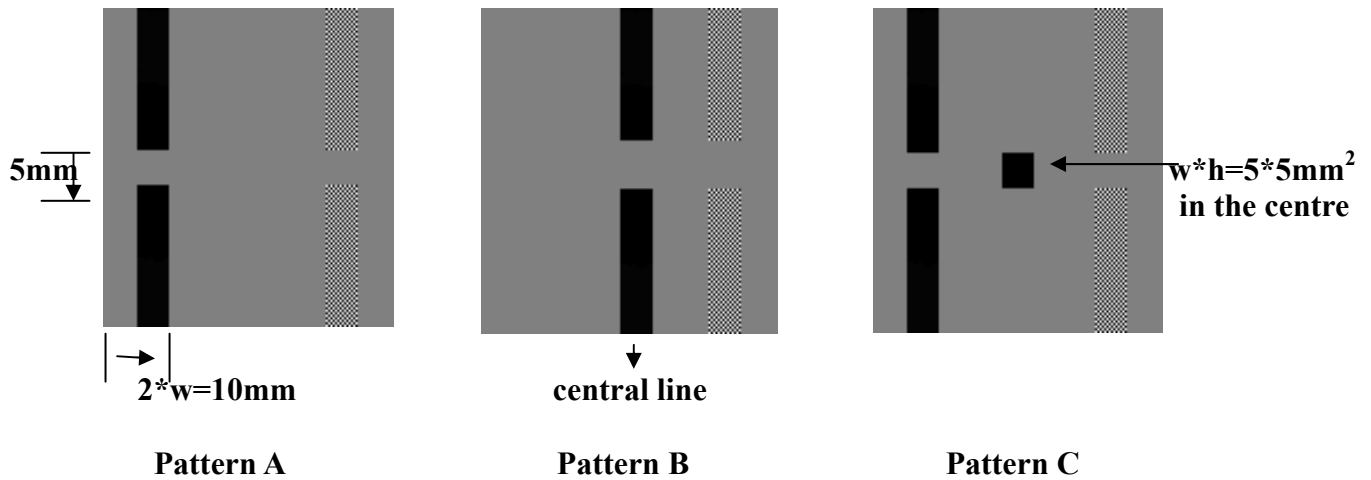
● Definitions：

Cross Talk Value：

CTV = |LvA - LvB| / LvA * 100%

Where：

LvA: Luminance measured with the centre test point of pattern A

LvB: Luminance measured with the centre test point of pattern B.

● Measuring procedure：

Adaptation of the display to the highest contrast ratio (CR = LvA/LvC) as defined by the test patterns and a test area of 14 x 14 dots.

Measurement of Luminance with test point A, B.

Determination of Crosstalk value (CTV)

(5). NTSC

Measurement conditions:

Measuring Equipment	LCD-5200
Measuring Point Diameter	3mm//1mm
Measuring point location	Active Area center point
Light source	Transmissive Mode: internal(Backlight)
Test pattern	All Pixels White Red.Green.Blue.White: Maximum colour saturation (maximum gradation level)
Contrast setting	Maximum

Definitions
Panel colour coordinates according the CIE colour system (CIE 1931). In general,
It is always requested to measure the X, Y and Z values.
Here u´, v´ and L* are according CIE 1931:

$$x' = \frac{4 \cdot X}{X + 15 \cdot Y + 3 \cdot Z}$$

$$y' = \frac{9 \cdot Y}{X + 15 \cdot Y + 3 \cdot Z}$$

$$L^* = 116 \cdot \left(\frac{Y}{Y_n}\right)^{1/3} - 16$$

Colour distance definition (maximum allowed colour distance to specified typical colour coordinate):

$$\Delta x'y' = \sqrt{\Delta x'^2 + \Delta y'^2}$$

Where:

$$\Delta x' = Max\left\{\left|x'_{typ} - x'_{max}\right|, \left|x'_{typ} - x'_{min}\right|\right\}$$

$$\Delta y' = Max\left\{\left|y'_{typ} - y'_{max}\right|, \left|y'_{typ} - y'_{min}\right|\right\}$$
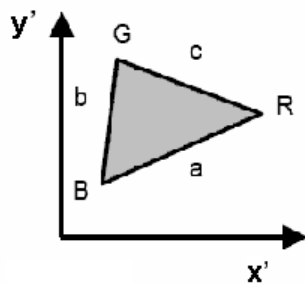
Color Gamut definition:

$$F = \sqrt{s(s-a)(s-b)(s-c)} * 1000$$

Where

$$s = \frac{(a+b+c)}{2}$$

$$a = \sqrt{\left(x'_{blue} - x'_{red}\right)^2 + \left(y'_{blue} - y'_{red}\right)^2}$$

$$b = \sqrt{\left(x'_{blue} - x'_{green}\right)^2 + \left(y'_{blue} - y'_{green}\right)^2}$$

$$c = \sqrt{\left(x'_{red} - x'_{green}\right)^2 + \left(y'_{red} - y'_{green}\right)^2}$$

Color Gamut Ratio (NTSC) related to NTSC':
NTSC: =F (display)/F (NTSC')
NTSC' primaries:

	x'	y'
Red	0.67	0.33
Green	0.21	0.71
Blue	0.14	0.08

F (NTSC') =74.42

Perpendicular line ($\theta=90°$)
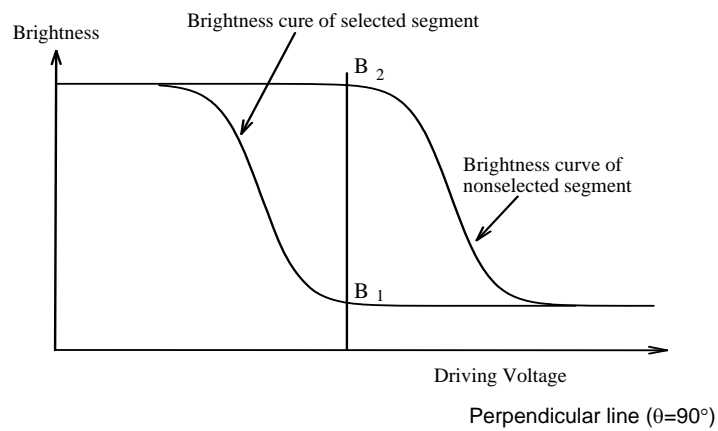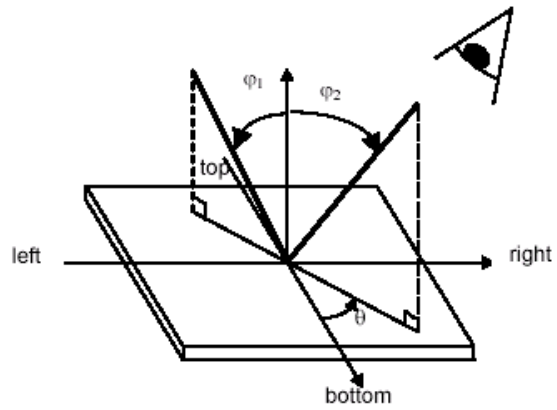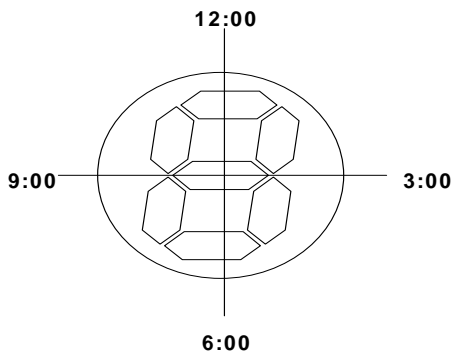
◆ INSPECTION CRITERION

This specification is made to be used as the standard acceptance/rejection criteria for Color mobile phone LCM.

1 Sample plan

Sampling method shall be in accordance with MIL-STD-105D, inspection level II and based on:

Major defect: AQL 0.65

Minor defect: AQL 1.5

2. Inspection condition

Viewing distance for cosmetic inspection is about 30cm with bare eyes, and under an environment of 20~40W light intensity, all directions for inspecting the sample should be within 45° against perpendicular line.

3. Definition of inspection zone in LCD.
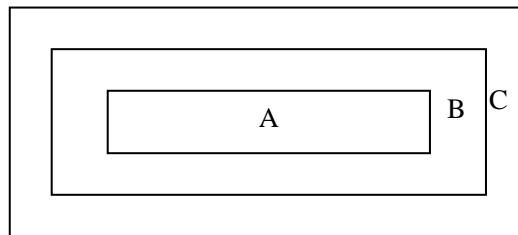
Zone A: character/Digit area

Zone B: viewing area except Zone A (ZoneA+ZoneB=minimum Viewing area)

Zone C: Outside viewing area (invisible area after assembly in customer's product)

Fig.1 Inspection zones in an LCD.
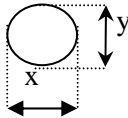
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

4. Inspection standards

4.1 Major Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.1.1	All functional defects	1) No display 2) Display abnormally 3) Missing vertical，horizontal segment 4) Short circuit 5) Back-light no lighting, flickering and abnormal lighting.	Major
4.1.2	Missing	Missing component	
4.1.3	Outline dimension	Overall outline dimension beyond the drawing is not allowed.	
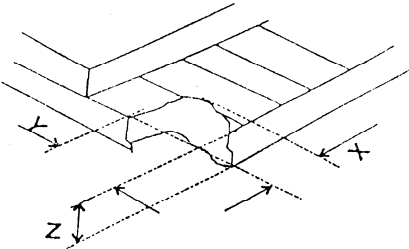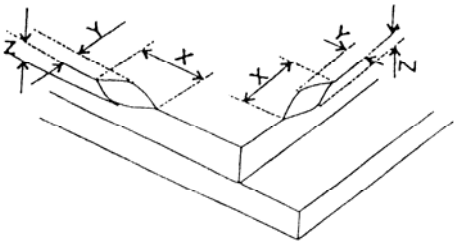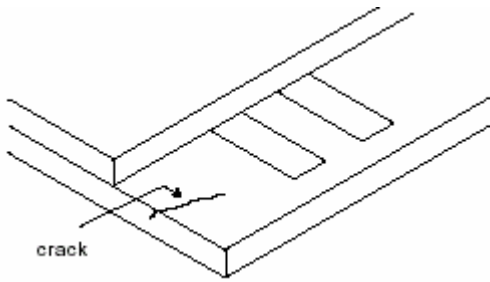
4.2 Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.2.1	Clear Spots Black and white Spot defect Pinhole, Foreign Particle, Dirt under polarizer	For dark/white spot, size Φ is defined as $\Phi = \dfrac{(x+y)}{2}$ 1. <table><tr><td>Zone Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leqslant 0.1$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.10 < \Phi \leqslant 0.2$</td><td colspan="2">3</td></tr><tr><td>$0.2 < \Phi \leqslant 0.3$</td><td colspan="2">2</td></tr><tr><td>$\Phi > 0.3$</td><td colspan="2">0</td></tr></table>	Minor
	Dim Spots Circle shaped and dim edged defects	2. <table><tr><td>2. Zone Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>$\Phi \leqslant 0.2$</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>$0.20 < \Phi \leqslant 0.40$</td><td colspan="2">2</td></tr><tr><td>$0.40 < \Phi \leqslant 0.60$</td><td colspan="2">1</td></tr><tr><td>$0.60 < \Phi$</td><td colspan="2">0</td></tr></table>	Minor

4.2. Cosmetic Defect

Item No	Items to be inspected	Inspection Standard		Classification of defects
4.2.2	Line defect Black line, White line, Foreign material under polarizer,	<table><tr><td colspan="2">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Ignore</td><td>W≤0.02</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>L≤3.0</td><td>0.02＜W≤0.03</td><td colspan="2">2</td></tr><tr><td>L≤2.0</td><td>0.03＜W≤0.05</td><td colspan="2">1</td></tr><tr><td></td><td>0.05＜W</td><td colspan="2">Define as spot defect</td></tr></table>		Minor
4.2.3	Polarizer scratch	If the Polarizer scratch can be seen after mobile phone cover assembling or in the operating condition, judge by the line defect of 4.2.2. If the Polarizer scratch can be seen only in non-operating condition or some special angle, judge by the following. <table><tr><td colspan="2">Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><td rowspan="2">L(Length)</td><td rowspan="2">W(Width)</td><td colspan="3">Zone</td></tr><tr><td>A</td><td>B</td><td>C</td></tr><tr><td>Ignore</td><td>W≤0.03</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>5.0＜L≤10.0</td><td>0.03＜W≤0.05</td><td colspan="2">2</td></tr><tr><td>L≤5.0</td><td>0.05＜W≤0.08</td><td colspan="2">1</td></tr><tr><td></td><td>0.08＜W</td><td colspan="2">0</td></tr></table>		Minor
4.2.4	Polarize Air bubble	Air bubbles between glass & polarizer <table><tr><td>2. Zone / Size(mm)</td><td>A</td><td colspan="2">Acceptable Qty</td></tr><tr><td></td><td>A</td><td>B</td><td>C</td></tr><tr><td>Φ≤0.2</td><td colspan="2">Ignore</td><td rowspan="4">Ignore</td></tr><tr><td>0.20＜Φ≤0.30</td><td colspan="2">2</td></tr><tr><td>0.30＜Φ≤0.50</td><td colspan="2">1</td></tr><tr><td>0.50＜Φ</td><td colspan="2">0</td></tr></table>		Minor

4.3. Cosmetic Defect

Item No	Items to be inspected	Inspection Standard	Classification of defects
4.3.5	Glass defect	(i) Chips on corner <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤2.0</td><td>≤S</td><td>Disregard</td></tr></table> Notes: S=contact pad length Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal.	Minor
		(ii)Usual surface cracks <table><tr><td>X</td><td>Y</td><td>Z</td></tr><tr><td>≤3.0</td><td><Inner border line of the seal</td><td>Disregard</td></tr></table>	Minor
		(iii) Crack Cracks tend to break are not allowed. crack	Major
4.3.6	Parts alignment	1) Not allow IC and FPC/heat-seal lead width is more than 50% beyond lead pattern. 2) Not allow chip or solder component is off center more than 50% of the pad outline.	Minor
4.3.7	SMT	According to the <Acceptability of electronic assemblies> IPC-A-610C class 2 standard. Component missing or function defect are Major defect, the others are Minor defect.	

◆ PRECAUTIONS FOR USING LCD MODULES

Handing Precautions

(1) The display panel is made of glass and polarizer. As glass is fragile. It tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.

(2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

(3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).

(4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming is contacting with room temperature air.

(5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
- Isopropyl alcohol
- Ethyl alcohol
Do not scrub hard to avoid damaging the display surface.

(6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
- Water
- Ketone
- Aromatic solvents
Wipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.

(7) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(8) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(9) Do not attempt to disassemble or process the LCD module.

(10) NC terminal should be open. Do not connect anything.

(11) If the logic circuit power is off, do not apply the input signals.

(12) Electro-Static Discharge Control，Since this module uses a CMOS LSI, the same careful attention should be paid to electrostatic discharge as for an ordinary CMOS IC. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Before remove LCM from its packing case or incorporating it into a set, be sure the module and your body have the same electric potential.Be sure to ground the body when handling the LCD modules.

- Tools required for assembling, such as soldering irons, must be properly grounded. make certain the AC power source for the soldering iron does not leak. When using an electric screwdriver to attach LCM, the screwdriver should be of ground potentiality to minimize as much as possible any transmission of electromagnetic waves produced sparks coming from the commutator of the motor.

- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions. To reduce the generation of static electricity be careful that the air in the work is not too dried. A relative humidity of 50%-60% is recommended.As far as possible make the electric potential of your work clothes and that of the work bench the ground potential

- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated

（13）Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.

- Do not alter, modify or change the shape of the tab on the metal frame.
    - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
    - Do not damage or modify the pattern writing on the printed circuit board.
    - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
    - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
    - Do not drop, bend or twist LCM.

Storage Precautions

When storing the LCD modules, the following precaution is necessary.
(1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
(2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
(3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

Others

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.
    - Exposed area of the printed circuit board.
    -Terminal electrode sections.

Precautions for Operation

    (1) Viewing angle varies with the change of liquid crystal driving voltage (VLCD). Adjust VLCD to show the best contrast.

    (2) It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
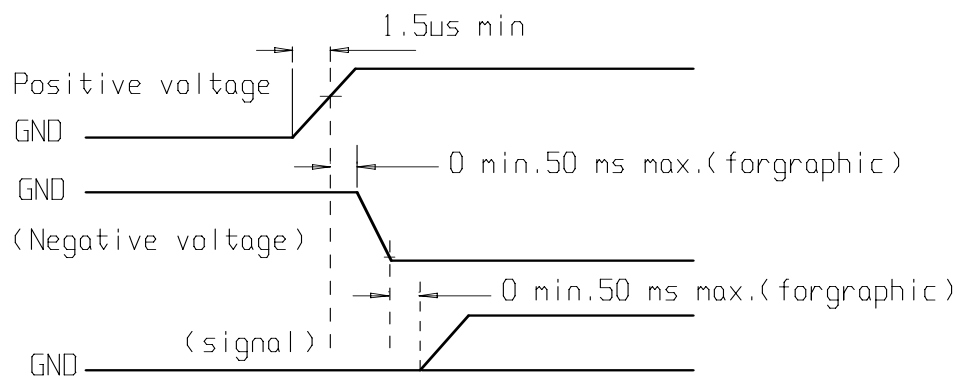
    (3) Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them.However those phenomena do not mean malfunction or out of order with LCD's, Which will come back in the specified operating temperature.

    (4) If the display area is pushed hard during operation, the display will become abnormal. However, it will return to normal if it is turned off and then back on.

    (5) A slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit. Usage under the maximum operating temperature,50%RH or less is required.

    (6) Input each signal after the positive/negative voltage becomes stable.

    (7) Please keep the temperature within specified range for use and storage. Polarization degradation, bubble generation or polarizer peel-off may occur with high temperature and high humidity.

```
                                1.5us min

        Positive voltage  |  _____
        GND  _____/

        GND  _____         0 min.50 ms max.(forgraphic)
                          |  _____
        (Negative voltage)|

                                   0 min.50 ms max.(forgraphic)
                            (signal) |   _____
        GND  _____/
```

Safety

    (1) It is recommended to crush damaged or unnecessary LCDs into pieces and wash them off with solvents such as acetone and ethanol, which should later be burned.

    (2) If any liquid leaks out of a damaged glass cell and comes in contact with the hands, wash off thoroughly with soap and water.

Limited Warranty

    Unless agreed between PALM TECHNOLOGY and customer, PALM TECHNOLOGY will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with PALM TECHNOLOGY LCD acceptance standards (copies available upon request) for a period of one year from date of shipments. Cosmetic/visual defects must be returned to PALM TECHNOLOGY within 90 days of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of PALM TECHNOLOGY limited to repair and/or replacement on the terms set forth above. PALM TECHNOLOGY will not be responsible for any subsequent or consequential events.