PALM TECHNOLOGY CO., LTD.

The LCD(M) Specialist

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PART NO. :   PT0322432T-A601

FOR MESSRS. :

CONTENTS

09.05.06

ACCEPTED BY :   PROPOSED BY :

PALM TECHNOLOGY CO., LTD. *Tel:886-7-3983966 Fax:886-7-3982966*	**PT0322432T-A601**	**VER:B**	PAGE:1/23

RECORD OF REVISION

DATE	PAGE	SUMMARY
2009/05/06	P12	Update electro-optical characteristics

◆ LCD MODULE PHYSICAL DATA

● **General Description**

Display Type	262K TFT
Viewing Direction	12 o'clock
Connection Type	COG
Operation temperature	-10℃ ~60℃
Storage temperature	-20℃ ~70℃
Driving IC	HX8347
Polarizer	TRANSMISSIVE /NORMAL WHITE

Note: Be sure that you are grounded when handling LCM to prevent Static Electricity

● **Mechanical Description**

Item	Standard Value	Unit
Number of dots	240RGB X320dots	-
LCM dimension	57.54(W) X79.20(H) X4.60(T)	mm
TP outline	55.74 (W) X77.40(H)	mm
LCD outline	52.60(W) X73.40(H) X1.50(T)	mm
TP active area	49.20(W) X69.70(H)	mm
Active area	48.60(W) X64.80 (H)	mm
Dot size	0.0575 (W) X0.1925 (H)	mm
Dot pitch	0.0675(W) X0.2025(H)	mm
Approx. weight	TBD	g
Backlight	5-chip WHITE LED parallel	/

◆ EXTERNAL DIMENSIONS

PINS ASSIGNMENTS

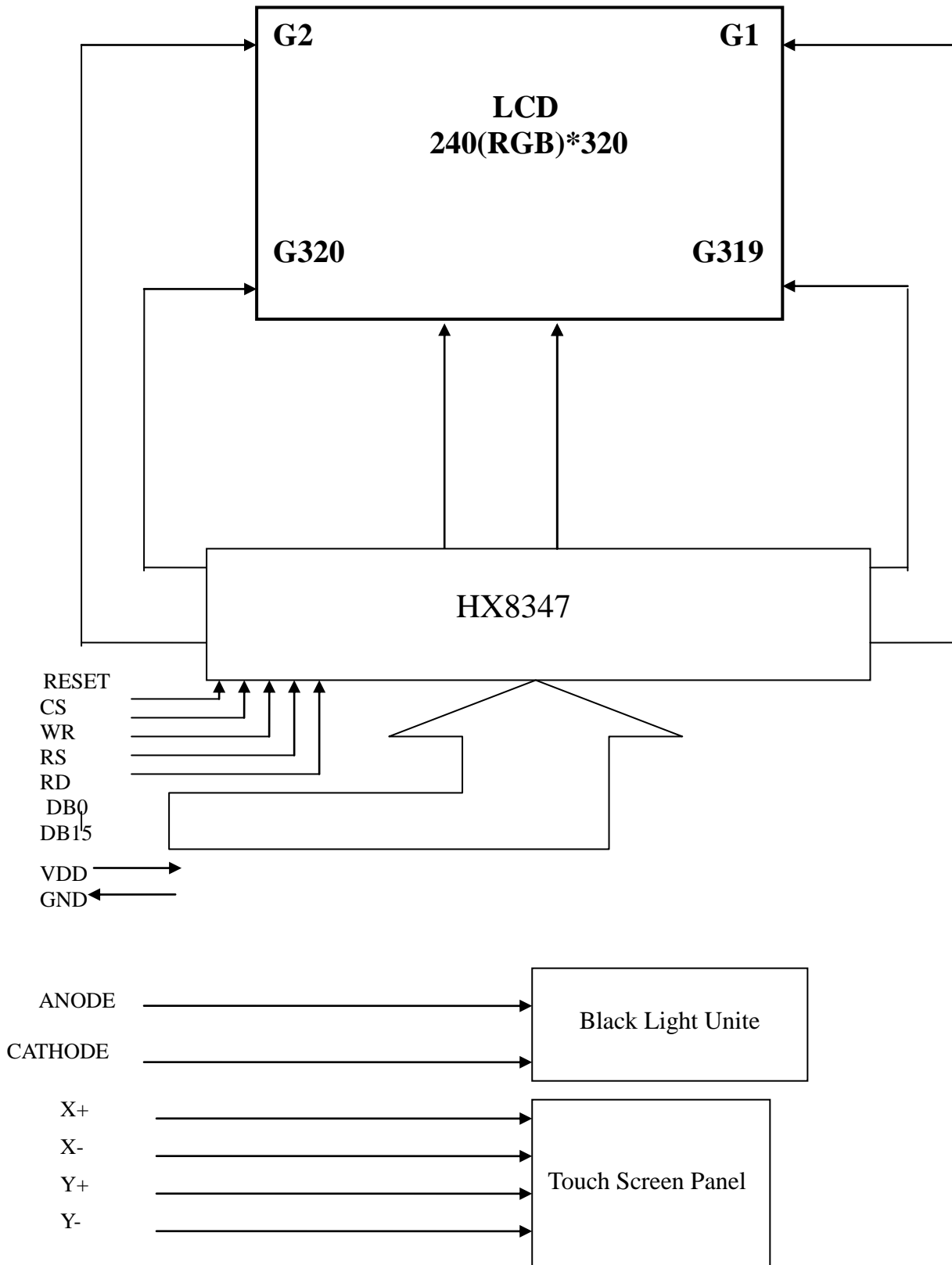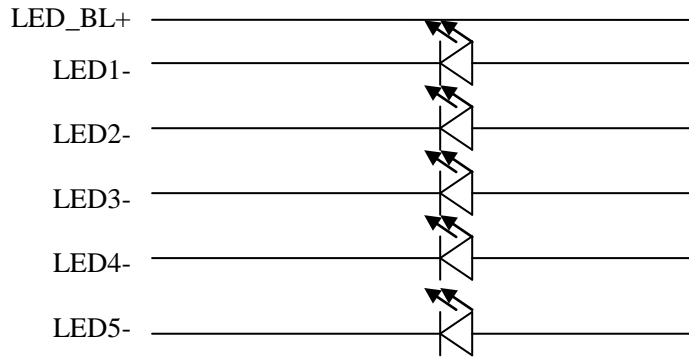| PIN	SYMBOL
1	XL
2	YU
3	XR
4	YD
5	GND
6	GND
7	DB0
8	DB1
9	DB2
10	DB3
11	DB4
12	DB5
13	DB6
14	DB7
15	DB8
16	DB9
17	DB10
18	DB11
19	DB12
20	DB13
21	DB14
22	DB15
23	CS
24	WR
25	RD
26	RS
27	RESET
28	VDD
29	VDD
30	GND
31	LCM_ID
32	GND
33	GND
34	LCD_BL+
35	LCD_BL+
36	LED1-
37	LED2-
38	LED3-
39	LED4-
40	LED5-
41	NC
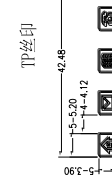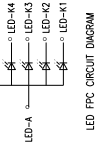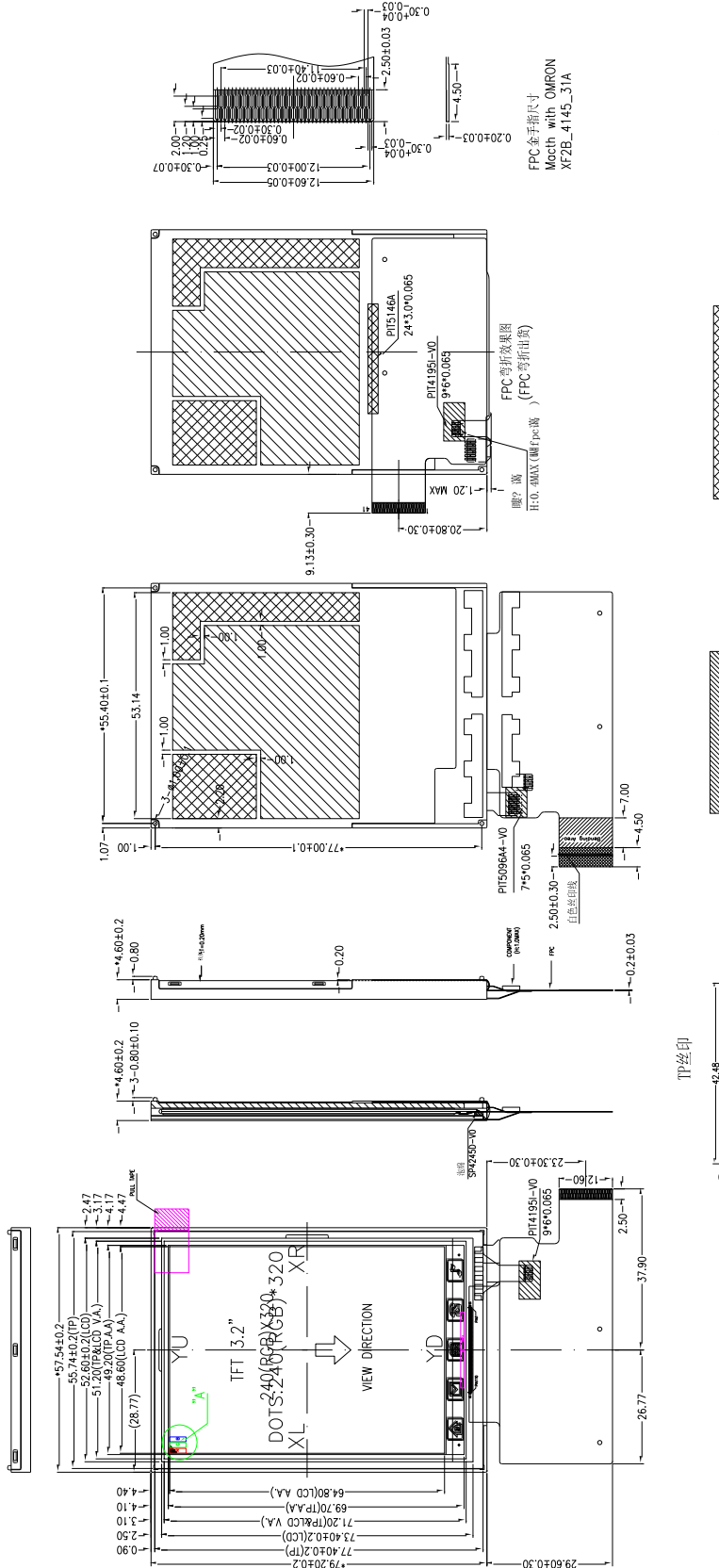
NOTES:
1. DISPLAY TYPE: 262K TFT TRANSMISSIVE NORMAL WHITE
2. OPERATING TEMP: -10°C~60°C
3. STORAGE TEMP: -20°C~70°C
4. LCD DRIVER: COG(IC:HX8347)
5. BACKLIGHT:5 CHIP-WHITE LED Parallel (20mA/LED)
6. GENERAL TOLERANCE:±0.20
7. "*" 为重点尺寸，符合ROHS标准

TFT 3.2"

DOTS:240(RGB)X320

VIEW DIRECTION

◆ BLOCK DIAGRAM

● **TFT-LCD Module (Interface System Structure)**

G2	**G1**
LCD	
240(RGB)*320	
G320	**G319**

HX8347

RESET
CS
WR
RS
RD
 DB0
DB15

VDD
GND

ANODE → Black Light Unite

CATHODE →

X+
X-
Y+
Y-

Touch Screen Panel

● **Black Light Unite**

LED_BL+

LED1-

LED2-

LED3-

LED4-

LED5-

● **Touch Screen Panel(Top View)**

YU

XL   XR

YD

YU XL YD XR
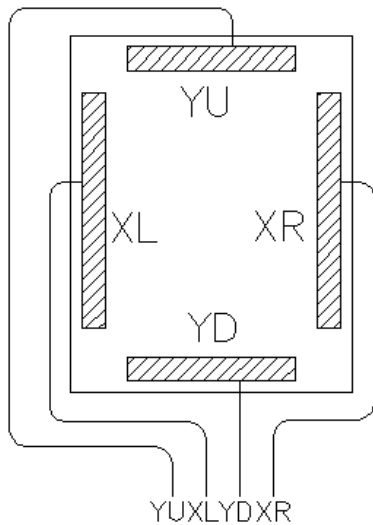
◆ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Operation temperature	Top	-10 ~ 60	℃
Storage temperature	Tst	-20 ~ 70	℃
Input voltage	Vin	-0.3 to VDD+0.3	V
Supply voltage for Logic	VDD	-0.3 to 3.3	V
Supply voltage for LCD	VGH ~ VSSA	-0.3 to 16.5	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
Input high voltage	V_{IH}	-	0.8 VDD	-	VDD	V
Input low voltage	V_{IL}	-	VSS	-	0.2VDD	V
Output high voltage	V_{OH}	-	0.7 VDD	-	VDD	V
Output low voltage	V_{OL}	-	VSS	-	0.3VDD	V
Operating voltage	V_{DD3}	Ta=25℃		3.0		V
LCD driving voltage	V_{GH}	Ta=25℃	12	-		V
Current consumption for LCD normal operation	I_{DD}	VDD=2.8V	-	-	10	mA

● AC Characteristics
Refer to the SPEC of **HX8347**

● Back-Light unit

Item	Symbol	Min	Typ	Max	Unit	Remark
Current	I_{BL}	-	100	-	mA	-
CIE	X	0.25	-	0.29	-	X>Y
	Y	0.24	-	0.28	-	
Brightness	-	4200	-	-	-	-
Luminous Intensity Ratio	-	80	-	-	%	-

Note:

1. Average Luminous Intensity of P1 ~ P5（Using a luminance meter BM-7）
2. Luminous Intensity Ratio = (max-min)/max * 100%
Measured Method (X*Y: Light Area).
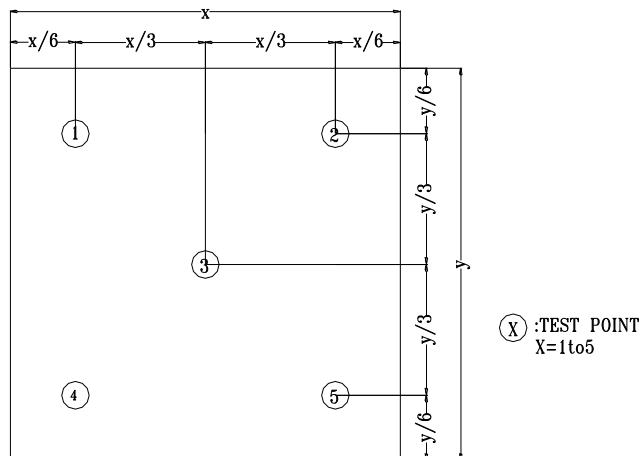
◆ Touch Screen Panel Specifications

1.Electrical Characteristics

Item	Min	Typ	Max	Unit	Note
Linearity	-	-	1.5	%	X-Axis,Y-Axis
Terminal Resistance	260		520	Ω	X(Glass side)
	510		960	Ω	Y(Film side)
Insulation Resistance	10	-	-	MΩ	DC 25V
Operating voltage	-	5	7	V	DC
Response Time	-		10	Ms	-
Transmittance	80		-	%	-

Note 1) : Do not operate it with a thing except a polyacetal pen(tip R0.8mm or less) or
a finger, especially those with hard or sharp tips such as a ball point pen or
a mechanical pencil

2.Mechanical & Durability Characteristics

Item	Min	Typ	Max	Unit	Note
Operating Force	10	-	100	G	(1)
Touch Test	1，000,000	-	-	Times	(2)
Handwriting Friction Test	100,000	-	-	Times	(3)
Surface hardness	3	-	-	H	(4)

Note (1) Pen : 0.8N or less (R0.8mm)
　　　　Finger : 0.8N or less (0.8mm)
　　(2) Measusuement for Center part of Panel
　　　　-Hitting Pad : Tip R8mm Silicon Rubber & Tip R0.8mm Stylus pen
　　　　-Lode :250gf
　　　　-Speed :3times/sec
　　　　-Electric lode :None
　　 (3) Measuremenf for 2.0mm inside of transparent insulation
　　　　-Sliding Pen : Tip R0.8mm Stylus pen
　　　　-Lode :250gf
　　　　-Speed :150mm/sec
　　　　-Sliding Length :25mm
　　　　-Electric lode : None
　　(4) Pressure 500gf , 45deg

3. Integration Design Guide
- Avoid the design that Front-case overlap and press on the active area of
  the touch-panel.
- Give enough gap (over 0.5mm at compressed) between the front case and
  touch-panel to protect wrong operating.
- Use a buffer material(Gasket) between the touch-panel and Front-case to
  protect damage and wrong operating.
- Avoid the design that buffer material overlap and press on the inside of
  touch-panel viewing area.

◆ INTERFACE PIN CONNECTIONS

NO.	Symbol	Function
1	XL	
2	YU	TP pin
3	XR	
4	YD	
5	GND	Ground
6	GND	
7	DB0	
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	
15	DB8	16-bit data bus
16	DB9	
17	DB10	
18	DB11	
19	DB12	
20	DB13	
21	DB14	
22	DB15	
23	CS	Chip　select
24	WR	Write　signal
25	RD	Read　signal
26	RS	Register　select pin
27	RESET	Reset　signal
28	VDD	Power supply
29	VDD	
30	GND	Ground
31	LCM_ID	LCM Identify=GND
32	GND	Ground
33	GND	
34	LCD_BL+	Backlight positive
35	LCD_BL+	
36	LED1-	
37	LED2-	
38	LED3-	Backlight negative
39	LED4-	
40	LED5-	
41	NC	No connection

◆ Recommend Initial Code

```
void initial()
{
    reset=0;
    delay(50);
    reset=1;
    delay(50);

DelayX1ms(150); // After Inter-MicroP Program (load OTP)
//Gamma for CMO 3.2"
Set_LCD_8B_REG(0x0046,0x00A4);//91
Set_LCD_8B_REG(0x0047,0x0053);//11
Set_LCD_8B_REG(0x0048,0x0000);
Set_LCD_8B_REG(0x0049,0x0044);//66
Set_LCD_8B_REG(0x004A,0x0004);//37
Set_LCD_8B_REG(0x004B,0x0067);//04
Set_LCD_8B_REG(0x004C,0x0033);//11
Set_LCD_8B_REG(0x004D,0x0077);
Set_LCD_8B_REG(0x004E,0x0012);//00
Set_LCD_8B_REG(0x004F,0x004C);//1F
Set_LCD_8B_REG(0x0050,0x0046);//0F
Set_LCD_8B_REG(0x0051,0x0044);//00
//240x320 window setting
Set_LCD_8B_REG(0x0002,0x0000); // Column address start2
Set_LCD_8B_REG(0x0003,0x0000); // Column address start1
Set_LCD_8B_REG(0x0004,0x0000); // Column address end2
Set_LCD_8B_REG(0x0005,0x00EF); // Column address end1
Set_LCD_8B_REG(0x0006,0x0000); // Row address start2
Set_LCD_8B_REG(0x0007,0x0000); // Row address start1
Set_LCD_8B_REG(0x0008,0x0001); // Row address end2
Set_LCD_8B_REG(0x0009,0x003F); // Row address end1
// Display Setting
Set_LCD_8B_REG(0x0001,0x0006); // IDMON=0, INVON=1, NORON=1, PTLON=0
Set_LCD_8B_REG(0x0016,0x0088); // MY=0, MX=0, MV=0, ML=1, BGR=0, TEON=0    48
Set_LCD_8B_REG(0x0023,0x0095); // N_DC=1001 0101
Set_LCD_8B_REG(0x0024,0x0095); // PI_DC=1001 0101
Set_LCD_8B_REG(0x0025,0x00FF); // I_DC=1111 1111
Set_LCD_8B_REG(0x0027,0x0002); // N_BP=0000 0010
Set_LCD_8B_REG(0x0028,0x0002); // N_FP=0000 0010
Set_LCD_8B_REG(0x0029,0x0002); // PI_BP=0000 0010
Set_LCD_8B_REG(0x002A,0x0002); // PI_FP=0000 0010
Set_LCD_8B_REG(0x002C,0x0002); // I_BP=0000 0010
Set_LCD_8B_REG(0x002D,0x0002); // I_FP=0000 0010
Set_LCD_8B_REG(0x003A,0x0001); // N_RTN=0000, N_NW=001
Set_LCD_8B_REG(0x003B,0x0001); // PI_RTN=0000, PI_NW=001
Set_LCD_8B_REG(0x003C,0x00F0); // I_RTN=1111, I_NW=000
Set_LCD_8B_REG(0x003D,0x0000); // DIV=00
```

```
DelayX1ms(20);
Set_LCD_8B_REG(0x0035,0x0038); // EQS=38h
Set_LCD_8B_REG(0x0036,0x0078); // EQP=78h
Set_LCD_8B_REG(0x003E,0x0038); // SON=38h
Set_LCD_8B_REG(0x0040,0x000F); // GDON=0Fh
Set_LCD_8B_REG(0x0041,0x00F0); // GDOFF=F0
// Power Supply Setting
Set_LCD_8B_REG(0x0019,0x0049); // CADJ=0100, CUADJ=100, OSD_EN=1 ,60Hz//49
Set_LCD_8B_REG(0x0093,0x000F); // RADJ=1111, 100%
DelayX1ms(10);
Set_LCD_8B_REG(0x0020,0x0040); // BT=0100----------10
Set_LCD_8B_REG(0x001D,0x0007); // VC1=111
Set_LCD_8B_REG(0x001E,0x0000); // VC3=000
Set_LCD_8B_REG(0x001F,0x0004); // VRH=0011--------03
Set_LCD_8B_REG(0x0044,0x004D); // VCM=101 0000-------50
Set_LCD_8B_REG(0x0045,0x0011); // VDV=1 0001
DelayX1ms(10);
Set_LCD_8B_REG(0x001C,0x0004); // AP=100 04
DelayX1ms(20);
Set_LCD_8B_REG(0x0043,0x0080); //set VCOMG=1
DelayX1ms(5);
Set_LCD_8B_REG(0x001B,0x0008); // GASENB=0, PON=0, DK=1, XDK=0, VLCD_TRI=0, STB=0
DelayX1ms(40);
Set_LCD_8B_REG(0x001B,0x0010); // GASENB=0, PON=1, DK=0, XDK=0, VLCD_TRI=0, STB=0
DelayX1ms(40);
//Set_LCD_8B_REG(0x0070,0x0000);------zanshi
// Display ON Setting
Set_LCD_8B_REG(0x0090,0x007F); // SAP=0111 1111  7F
Set_LCD_8B_REG(0x0026,0x0004); //GON=0, DTE=0, D=01
DelayX1ms(40);
Set_LCD_8B_REG(0x0026,0x0024); //GON=1, DTE=0, D=01
Set_LCD_8B_REG(0x0026,0x002C); //GON=1, DTE=0, D=11
DelayX1ms(40);
Set_LCD_8B_REG(0x0026,0x003C); //GON=1, DTE=1, D=11
Set_LCD_8B_REG(0x0057,0x0002);
Set_LCD_8B_REG(0x0055,0x0000);
Set_LCD_8B_REG(0x0057,0x0000);

write_command(0x22);
}
```

◆ ELECTRO-OPTICAL CHARACTERISTICS

Driving condition: VDD=2.8V, I$_{BL}$=20/led, Temperature =23℃±5℃，Humidity=60%±20%RH

Item		Light angle（°）	Temp（℃）	Symbol	Specifications Min.	Specifications Typ.	Specifications Max.	Unit	Conditions	Note
Contrast ratio		0	25	Cr	150	200	-	-		(1)
Brightness(All white)		0	25	-	150	180	-	cd/m²		-
Luminance uniformity (surface within panel)		0	25	Lu	70	80	-	%		(2)
Cross talk		0	25	CTV	-	-	20	%		(3)
Chromaticity	W x	0	25	W x	0.252	0.302	0.352		Conditions	-
	W y			W y	0.296	0.346	0.396			
	R x			R x	0.586	0.636	0.686			
	R y			R y	0.278	0.328	0.378			
	G x			G x	0.250	0.300	0.350			
	G y			G y	0.529	0.579	0.629			
	B x			B x	0.082	0.132	0.182			
	B y			B y	0.087	0.137	0.187			
Color Reproduction Area(NTSC)		0	25	-	-	60	-	%	CIE1931(x,y)	(5)
Response time	Tr	0	25	-	-	15	30	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+}					35				
	θ_{Y-}					15				

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.
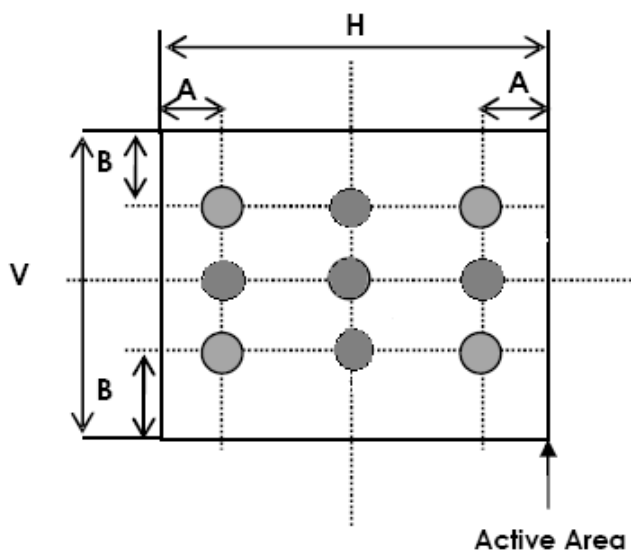
Figure 1

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**
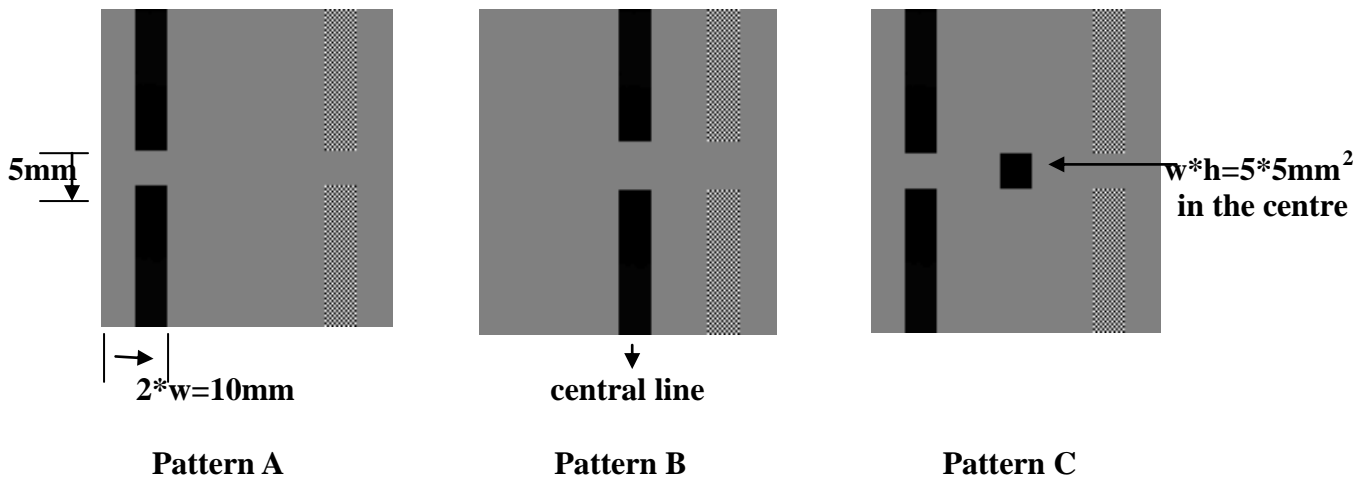
● Definitions：

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:

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

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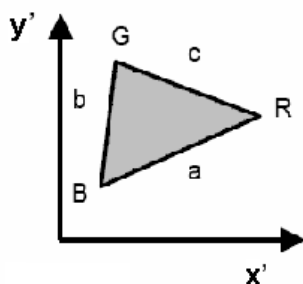
Color Gamut definition:

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

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

Brightness cure of selected segment

Brightness curve of nonselected segmen

Driving Voltage

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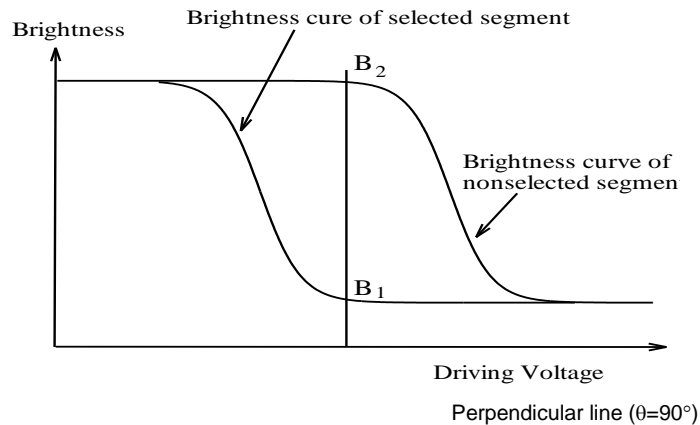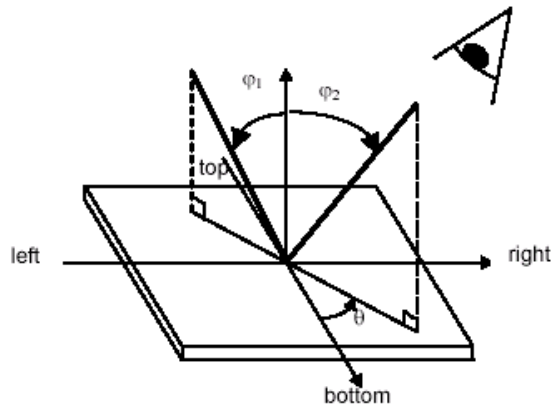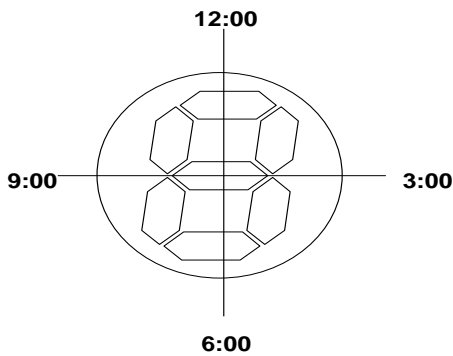
◆ INSPECTION CRITERION

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.
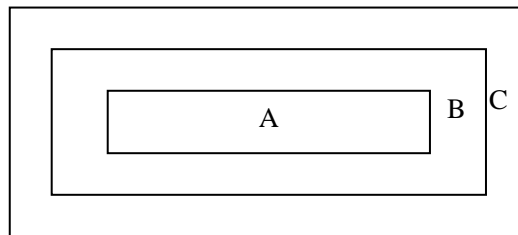
Zone A: character/Digit area

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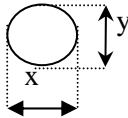
Note: As a general rule, visual defects in Zone C are permissible, when it is no trouble for quality and assembly of customer's product.

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.	
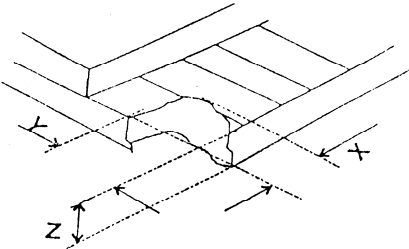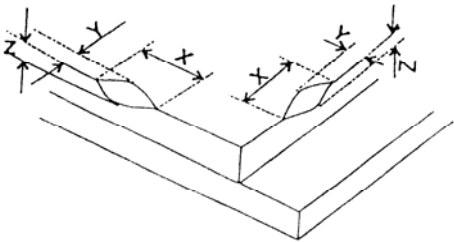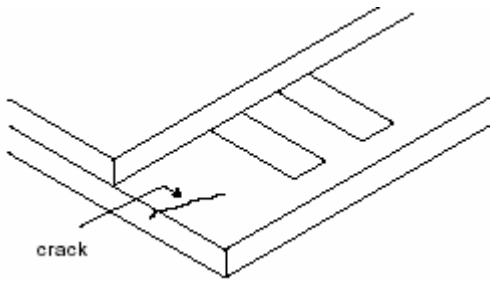
4.2 Cosmetic Defect

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.	Minor

Size(mm) \ Zone	Acceptable Qty		
	A	B	C
$\Phi \leqslant 0.1$	Ignore		Ignore
$0.10 < \Phi \leqslant 0.2$	3		
$0.2 < \Phi \leqslant 0.3$	2		
$\Phi > 0.3$	0		

Dim Spots

Circle shaped and dim edged defects

2.

Size(mm) \ 2. Zone	Acceptable Qty		
	A	B	C
$\Phi \leqslant 0.2$	Ignore		Ignore
$0.20 < \Phi \leqslant 0.40$	2		
$0.40 < \Phi \leqslant 0.60$	1		
$0.60 < \Phi$	0		

Classification of defects: 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 rowspan="2">2. Zone / Size(mm)</td><td colspan="3">Acceptable Qty</td></tr><tr><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 | X	Y	Z | |---|---|---| | ≤2.0 | ≤S | Disregard | 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 | X	Y	Z | |---|---|---| | ≤3.0 | <Inner border line of the seal | Disregard |	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.
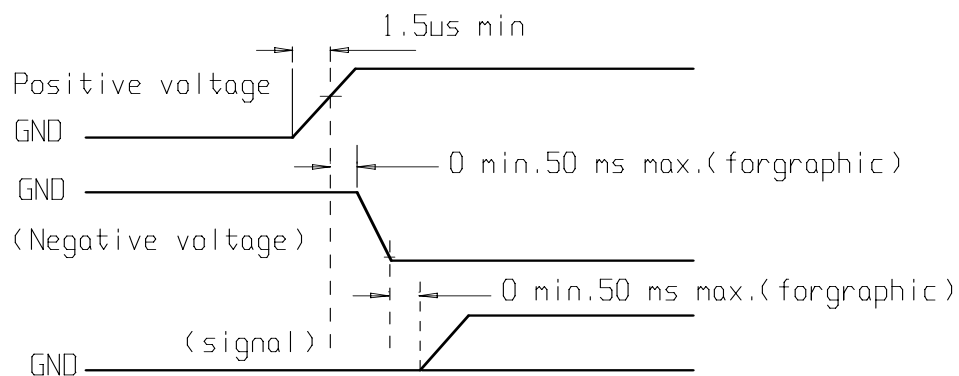
Safety

(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.