



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. : PT0282432-B902

FOR MESSRS. : _____

CONTENTS

<i>NO.</i>	<i>ITEM</i>	<i>PAGE</i>
1.	COVER	1
2.	RECORD OF REVISION	2
3.	GENERAL FEATURES	3
4.	ABSOLUTE MAXIMUM RATINGS	4
5.	ELECTRICAL SPECIFICATION	5
6.	OPTICAL SPECIFICATIONS	6~8
7.	BLOCK DIAGRAM	9
8.	PIN DESCRIPTION	10
9.	TIMING CHARACTERISTICS	11
10.	OUTLINE DIMENSION	12
11.	RELIABILITY AND INSPECTION STANDARD	13
12.	PRECAUTIONS FOR USING LCD MODULES	14~15
13.	INSPECTION SPECIFICATIONS	16~26



ACCEPTED BY : _____

PROPOSED BY : _____

RECORD OF REVISION

DATE	PAGE	SUMMARY
2012/11/14	ALL	-
2013/03/12	P12	Modify Outline Dimension
2013/03/20	P12	Modify Outline Dimension

1. General Features

Item	Spec	Remark
Display Mode	Normally White transmissive	
Viewing Direction	6 O'CLOCK	
Input Signals	8/16/18 bits	
Outside Dimensions	50.0 (W) x69.2(H) x2.55(D) Max.	
Active Area	43.2mm(H)×57.6mm(W)	
Number of Pixels	240×RGB×320 Pixels	
Dot Pitch	0.18mm(H)×0.18mm(W)	
Pixel Arrangement	RGB Vertical stripes	
Drive IC	HX8347G	

2. Absolute Maximum Ratings

The following are maximum values which, if exceeded may cause operation or damage to the unit.

ITEM	Sym.	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	V _{CC}	-0.3	-	4.6	V	
Power for Circuit Logic	V _t	-0.3	-	V _{CC} +0.3	V	
Storage Humidity	H _{ST}	10	-		%RH	At 25±5°C
Storage Temperature	T _{ST}	-30	-	70	°C	
Operating Ambient Humidity	H _{OP}	10	-		%RH	
Operating Ambient temperature	T _{OP}	-20	-	60	°C	

3. Electrical Specification

3.1 Driving TFT LCD Panel

Item	Sym.	Min	Typ.	Max	Unit	Note	
Power for Circuit Driving	VCC	2.5	2.8	3.3	V		
Power for Circuit Logic	IOVCC	1.65	1.8	3.3	V		
Logic Input Voltage	Low Voltage	V _{IL}	-0.3	-	0.2V _{cc}	V	
	High Voltage	V _{IH}	0.8V _{cc}	-	V _{cc}	V	
Logic Output Voltage	Low Voltage	V _{OL}	0	-	0.2V _{cc}	V	
	High Voltage	V _{OH}	0.8V _{cc}	-	-	V	
Power Consumption	Black Mode	P _b	T.B.D	T.B.D	T.B.D	mW	
	Standby Mode	P _w	T.B.D	T.B.D	T.B.D	mW	

3.2 Driving Backlight

Item	Sym.	Min	Typ.	Max	Unit	Note
Backlight driving voltage	V _F	-	12.8	-	V	
Backlight driving current	I _F	-	15	-	mA	
Backlight Power Consumption	W _{BL}	-	192	-	mW	
Life Time	-	-	20,000	-		Note 3

Note 1: (Unless specified, the ambient temperature Ta=25°C)

Note 2: The recommended operating conditions refer to a range in which operation of this product is guaranteed. Should this range is exceeded, the operation cannot be guaranteed even if the values may be without the absolute maximum ratings.

Note 3: If LED is driven by high current, high ambient temperature & humidity condition. The life time of LED will be reduced. Operating life means brightness goes down to 50% initial brightness. Typical operating life time is estimated data.

4. Optical Specifications

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of Φ and θ equal to 0°.

Item	Sym.	Values			Unit	Note
		Min.	Typ.	Max.		
1) Contrast Ratio	C/R	400	500	-		FIG.1
2) Module Luminance	L	200	250	-	cd/m ²	FIG.1
3) Response time	Tr+Tf	-	25	30	ms	FIG.2
4) Viewing Angle	θ_T	50	60	-	Degree	FIG.3
	θ_B	60	70	-		
	θ_L	60	70	-		
	θ_R	60	70	-		
5) Chromaticity	Wx	0.287	0.302	0.317		
	Wy	0.324	0.339	0.354		
	Rx	0.605	0.620	0.635		
	Ry	0.316	0.331	0.346		
	Gx	0.272	0.287	0.302		
	Gy	0.568	0.583	0.598		
	Bx	0.124	0.139	0.154		
	By	0.148	0.163	0.178		

◆ Measurement System

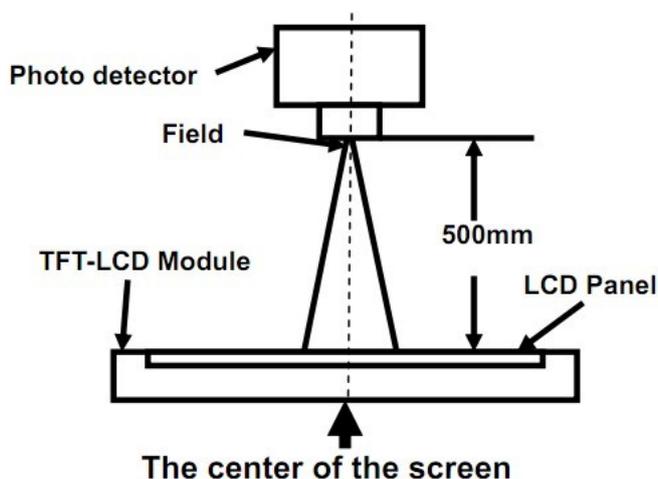
Notes:

1. Contrast Ratio(CR) is defined mathematically as :

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

2. Surface luminance is the center point across the LCD surface 500mm from the surface with all pixels displaying white. For more information see FIG 1.
3. Response time is the time required for the display to transition from white to black (Rising Time, Tr) and from black to white (Falling Time, Tf). For additional information see FIG 2.
4. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information see FIG 3.

FIG. 1 Optical Characteristic Measurement Equipment and Method



Item	Photo detector	Field
Contrast Ratio	SR-3A	1°
Luminance		
Chromaticity		
Lum Uniformity		
Response Time	BM-7A	2°

FIG. 2 The definition of Response Time

The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.

Response Time = Rising Time(T_r) + Falling Time(T_f)

- Rising Time(T_r) : Full White 90% → Full White 10% Transmittance.
- Falling Time(T_f) : Full White 10% → Full White 90% Transmittance.

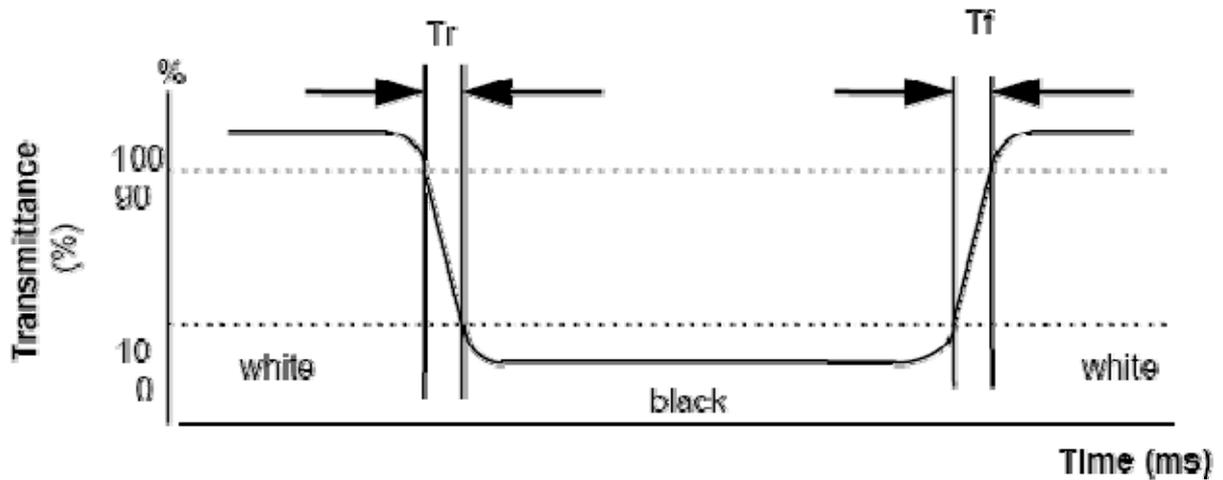
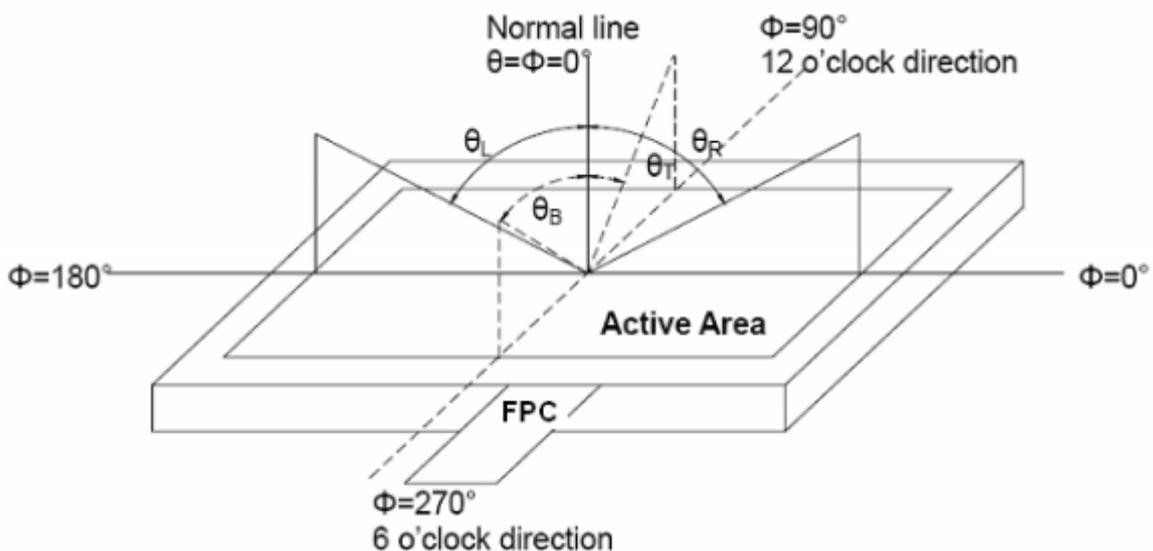
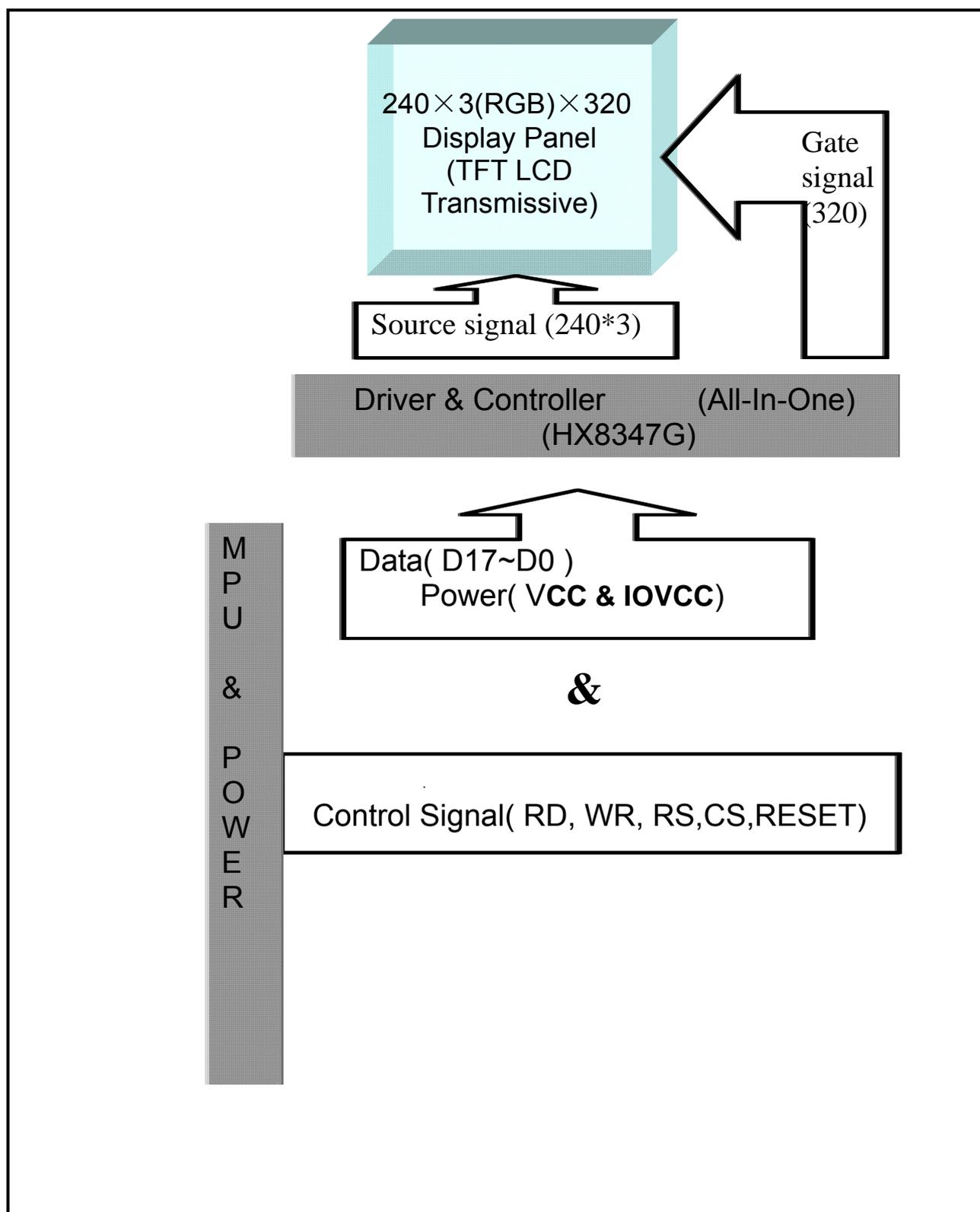


FIG. 3 The definition of Viewing Angle

Use Fig. 1 (Test Procedure) under Measurement System to measure the contrast from the measuring direction specified by the conditions as the following figure.



5. Block Diagram



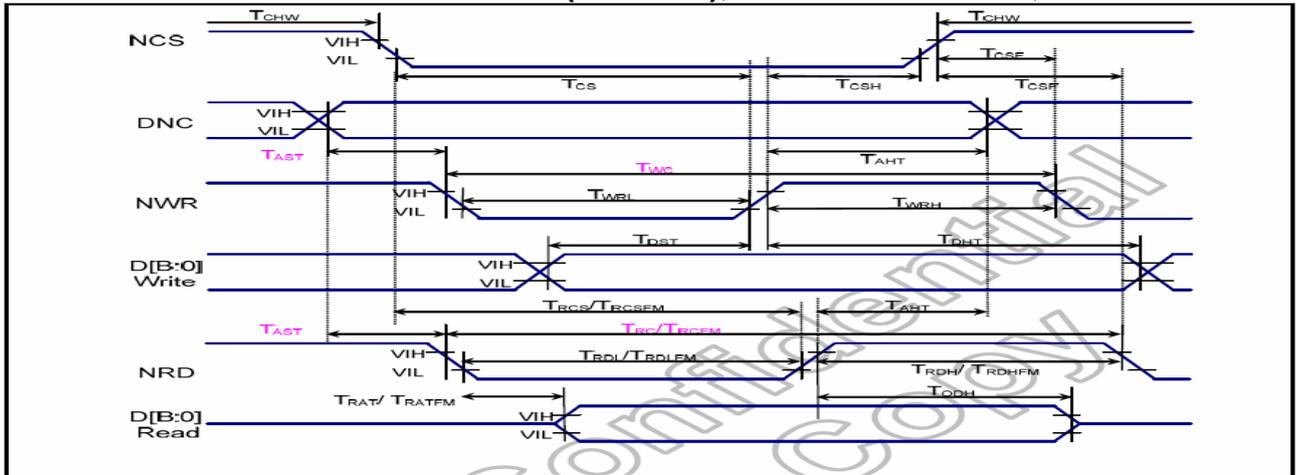
6.Pin Description

Item	Terminal	Functions
1	GND	Power Ground
2	VCI	Analog Power Supply
3	VCC	Logic Power Supply
4	NC	No Connection
5	SDA	Serial bus interface data input and output pin
6	IM0	MPU Interface mode select
7	IM1	MPU Interface mode select
8	IM2	MPU Interface mode select
9	IM3	MPU Interface mode select
10	VSYNC	Vertical synchronization signal input pin
11	HSYNC	Horizontal synchronization signal input pin
12	DOTCLK	Dot clock signal input used in RGB interface circuit
13	DE	Enable signal input used in RGB interface circuit
14-31	D17-D0	Data 17-Data 0
32	NRD	Read
33	NWR_SCL	Write
34	RS	Register Select
35	NCS	Chip Select
36	FLM	No Connection
37	NRESET	System Reset
38	GND	Power Ground
39	LED A	LED Anode
40	LED K	LED Cathode
41	NC	No Connection (Touch Panel Right)
42	NC	No Connection (Touch Panel Bottom)
43	NC	No Connection (Touch Panel Left)
44	NC	No Connection (Touch Panel Top)
45-61	NC	No Connection

7. Timing Characteristics

7.1. Parallel Interface Characteristics

Normal Write Mode(HWM='0'), IOVCC=1.65V~3.3V, VCC=2.5V~3.3V

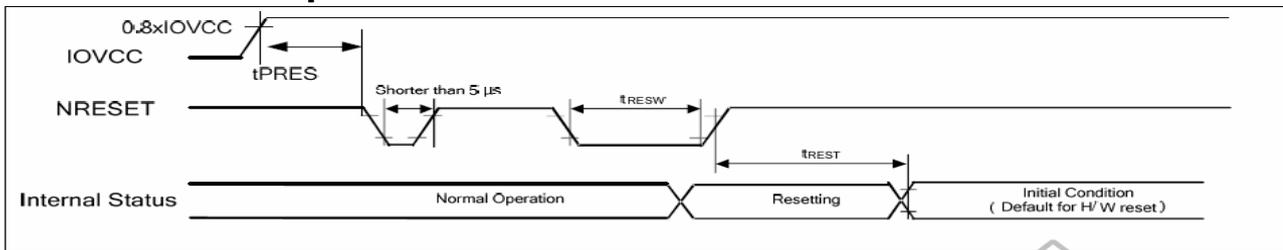


(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T_A = -30 to 70° C)

Signal	Symbol	Parameter	Spec.			Unit	Description
			Min.	Typ	Max.		
DNC_SCL	tAST	Address setup time	10	-	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-	-		
NCS	tCHW	Chip select "H" pulse width	0	-	-	ns	-
	tCS	Chip select setup time (Write)	15	-	-		
	tRCS	Chip select setup time (Read ID)	45	-	-		
	tRCSFM	Chip select setup time (Read FM)	355	-	-		
	tCSF	Chip select wait time (Write/Read)	10	-	-		
	tCSH	Chip select hold time	10	-	-		
NWR_SCL	tWC	Write cycle (1 pixel for one write)	100	-	-	ns	-
	tWRH	Write cycle (1 pixel for 2 or 3 write)	50	-	-		
	tWRH	Control pulse "H" duration	15	-	-		
	tWRL	Control pulse "L" duration	15	-	-		
NRD(ID)	tRC	Read cycle (ID)	160	-	-	ns	When read ID data
	tRDH	Control pulse "H" duration (ID)	90	-	-		
	tRDL	Control pulse "L" duration (ID)	45	-	-		
NRD(FM)	tRCFM	Read cycle (FM) (1 pixel for one read)	600	-	-	ns	When read from frame memory
	tRCFM	Read cycle (FM) (1 pixel for 2 or 3 read)	400	-	-		
	tRDHFM	Control pulse "H" duration (FM)	90	-	-		
	tRDLFM	Control pulse "L" duration (FM)	355	-	-		
DB17 to DB0	tDST	Data setup time	10	-	-	ns	For maximum CL=30pF For minimum CL=8pF
	tDHT	Data hold time	10	-	-		
	tRAT	Read access time (ID)	-	-	100		
	tRATFM	Read access time (FM)	-	-	340		
	tODH	Output disable time	20	-	80		

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of IOVCC for input signals.

7.2 Reset Operation



(VDD1=VDD=2.3~3.3 V, T_a= -40~ +85°C)

Parameter	Symbol	Unit	Min.	Typ.	Max.
Reset rise time	t _{rRES}	μs	-	-	10
Reset LOW-level width	t _{RES}	ms-	1	-	-

9. Reliability and Inspection Standard

No.	Test Item		Test Conditions	Remark
1	High Temperature	Storage	70°C, 120Hr	Note
		Operation	60°C, 120Hr	Note
2	Low Temperature	Storage	-30°C, 120Hr	Note
		Operation	-20°C, 120Hr	
3	High Temperature and High Humidity		60°C, 90%RH, 240Hr	Note
4	Peeling Off (Storage)		≥500gf/cm	Note
5	FPC Bending Test		≥6,000 times, 2/sec	Note
6	Vibration Test(Storage)		50HZ, 30min, Amplitude: 2 cm, X/Y/Z directions	Note
7	Drop Test		60cm/ 3Corner/ 8Face, 1Cycle	Note

Note:

- 1) The test samples should be applied to only one test item.
- 2) Sample size for each test item is 5~10pcs.
- 3) For Damp Proof Test, pure water(Resistance>1MΩ) should be used.
- 4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judged as a good part.
- 5) EL evaluation should be excepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and fluorescence EL has.
- 6) After the reliability test, the test samples should be inspected after 2 hours at least.
- 7) Functional test is OK. Missing segment, shorts, unclear segment, non display, display abnormally, liquid crystal leak are not allowed.
- 8) After testing, the current Idd should be within initial value ±20%.
- 9) No low temperature bubbles ,end seal loose and fall, frame rainbow, ACF bubble growing are allowable in the appearance test.

10.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 alcoholDo 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 solventsWipe 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) 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.

SPECIFICATION OF QUALITY ASSURANCE

● Summary

The customer should check and accept the products of Palm Tech within one month after reception. This standard for quality assurance should affirm the quality of LCD products to supply to purchaser by Palm Tech. Entire process is controlled according to ISO9001.

● Warranty period

Warranty period of this product is 12 months from manufacture code.

● Standard for quality test

- 1、 Inspection
Before delivering, the supplier should take the following test, and confirm the quality of product.
- 2、 Electro-Optical Characteristics
According to the individual specification to test the product.
- 3、 Test of Appearance Characteristics:
According to the individual specification to test the product.
- 4、 Test of Reliability Characteristics
According to the definition of reliability on specification for test product.
- 5、 Delivery Test
Before delivering, the supplier should take the delivery test
- 6、 Sampling Method: MIL-STD-105E, Level II
- 7、 The defects classify of AQL as following
Major defect : AQL=0.65
Minor defect:: AQL= 1.0

● Nonconforming Analysis & Deal With Manners

◇ Nonconforming Analysis

- 1、 Purchaser should supply the detail data of nonconforming sample and the non-suitable state.
- 2、 After accepting the detail data from purchaser ,the analysis of nonconforming should be finished in two weeks.
- 3、 If supplier can not finish analysis on time ,must announce purchaser before two weeks.

◇ Disposition of nonconforming

- 1、 If find any supplier defect during assembly line, supplier must change the good product for every defect after recognition.
- 2、 Both supplier and customer should analysis the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

● Agreement items.

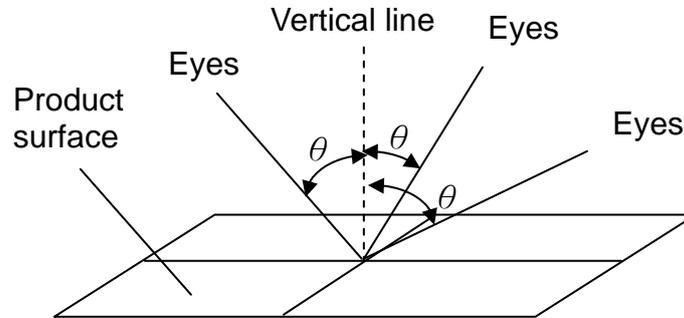
Both sides should discuss together when the following problems happen:

- 1、 There is any problem of standard of quality assurance, and both sides think that must be modifier.
- 2、 There is any argument item which does not record in the quality assurance.
- 3、 Any other special problem.

● **Standard of the Product Appearance Test**

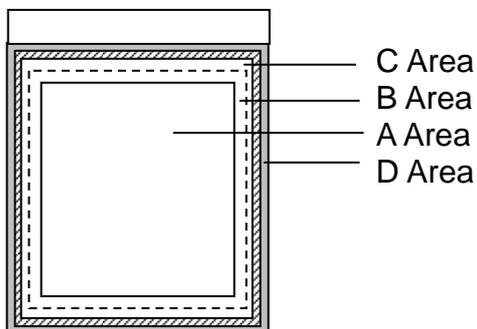
■ **Manner of appearance test**

- 1、 The test must be under 20W*2 or 40W fluorescent light ,and the distance of view must be at 35±5 cm;
- 2、 When test the model of Transmissive product must add the reflective plate.
- 3、 The test direction is base on about around 30 degree(within θ range)of vertical line, and the test time is below 5s.



4、 Definition of Area:

- A Area: Active area
- B Area: Viewing area
- C Area: Out of viewing area
- D Area: Seal area



Note:

- A: Active Area is drawn in the drawing
- B: Viewing Area border is 2mm from Active Area border

■ **Basic principle:**

- 1、 It will accord to the AQL when the standard can not be described.
- 2、 The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.
- 3、 Must add new item on time when it is necessary.

Bright/Dark Dots

Defect Type	Specification	Major	Minor
Bright Dots	$N \leq 2$		●
Dark Dots	$N \leq 3$		●
Total Bright and Dark Dots	$N \leq 4$		●

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

Bright dot: Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

The bright dot defect must be visible through 2% ND filter

Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue pattern.

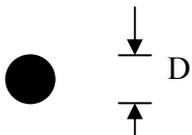
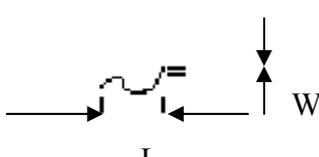
Pixel Definition:

R		B	R	G	B	R	G	B		Dot Defect
R	G	B	R		B	R	G	B		Adjacent Dot Defect
			R	G		R	G	B		Cluster

1: If pixel or partial sub-pixel defects exceed 50% of the affected pixel or sub-pixel area, it shall be considered as 1 defect

Note 2: There should be no distinct non-uniformity visible through 2% ND Filter within 2 sec inspection times.

● **Inspection specification**

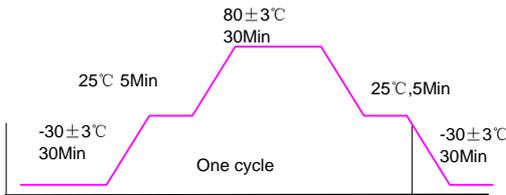
NO	Item	Criterion	AQL																			
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Contrast defect	0.65																			
02	LCM black spots, white spots, bright spots, contamination, (display/non-display)	As following drawing $D = (x+y)/2$  <table border="1" data-bbox="448 875 1374 1122"> <thead> <tr> <th></th> <th>Size</th> <th>Acceptable QTY</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td rowspan="3">Common dots defect</td> <td>$D \leq 0.25$</td> <td>Ignore</td> <td>/</td> </tr> <tr> <td>$0.25 < D \leq 0.5$</td> <td>$N \leq 3$</td> <td>/</td> </tr> <tr> <td>$D > 0.5$</td> <td>$N = 0$</td> <td>/</td> </tr> </tbody> </table>		Size	Acceptable QTY	Remark	Common dots defect	$D \leq 0.25$	Ignore	/	$0.25 < D \leq 0.5$	$N \leq 3$	/	$D > 0.5$	$N = 0$	/	1.5					
	Size	Acceptable QTY	Remark																			
Common dots defect	$D \leq 0.25$	Ignore	/																			
	$0.25 < D \leq 0.5$	$N \leq 3$	/																			
	$D > 0.5$	$N = 0$	/																			
03	Scratches, line type contamination (display/non-display)	As following drawing  <table border="1" data-bbox="464 1559 1326 1962"> <thead> <tr> <th>Length</th> <th>Width</th> <th>Acceptable QTY</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td>---</td> <td>$W \leq 0.03$</td> <td>Ignore</td> <td>/</td> </tr> <tr> <td>$L \leq 3.5$</td> <td>$0.03 < W \leq 0.05$</td> <td>3</td> <td rowspan="2">More than 5mm between two defects</td> </tr> <tr> <td>$L \leq 3$</td> <td>$0.05 < W \leq 0.08$</td> <td>3</td> </tr> <tr> <td>---</td> <td>$0.08 < W$</td> <td>0</td> <td>/</td> </tr> </tbody> </table>	Length	Width	Acceptable QTY	Remark	---	$W \leq 0.03$	Ignore	/	$L \leq 3.5$	$0.03 < W \leq 0.05$	3	More than 5mm between two defects	$L \leq 3$	$0.05 < W \leq 0.08$	3	---	$0.08 < W$	0	/	
Length	Width	Acceptable QTY	Remark																			
---	$W \leq 0.03$	Ignore	/																			
$L \leq 3.5$	$0.03 < W \leq 0.05$	3	More than 5mm between two defects																			
$L \leq 3$	$0.05 < W \leq 0.08$	3																				
---	$0.08 < W$	0	/																			

04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.		1.5	
		Size	Acceptable QTY		Remark
		$\Phi \leq 0.5$	ignore		/
		$0.5 < \Phi \leq 1.0$	2		More than 5mm between two defects
		$1.0 < \Phi$	0	/	
05	TP black spots, white spots, concavo-convex spots, scratches (display/non-display)	5.1 spots			1.5
		Size	Acceptable QTY		
		$\Phi \leq 0.2$	ignore		
		$0.2 < \Phi \leq 0.3$	2	More than 5mm between two defects	
		$0.3 < \Phi$	0		
	5.2 lines(not scratch): L:Length; W:Width			1.5	
	$L \leq 10$	$W \leq 0.05$	Ignore /		
	$L \leq 10$	$0.05 < W \leq 0.10$	2 More than 5mm between two defects		
		-----	$0.1 < W$	0 /	
	5.3 lines(scratch): L:Length; W:Width			1.5	
$W \leq 0.03$		Ignore /			
$L \leq 2.0, 0.03 < W \leq 0.05$		2 More than 5mm between two defects			
$L \leq 1.0, 0.05 < W \leq 0.1$		2			
$L \geq 2.0, W \geq 0.05$ or $L \geq 1.0, W \geq 0.1$		0	/		
TP Newton's ring and Interference fringes	a: Area of Newton's ring and Interference fringes A: Whole TP surface $a \leq 1/2 * A$			1.5	
TP Position disabled or losing	Not allowed			1.5	

06	Backlight elements	<p>6.1 Illumination source flickers when lit.</p> <p>6.2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards.</p> <p>6.3 Backlight doesn't light or color is wrong</p>	<p>0.65</p> <p>1.5</p> <p>0.65</p>
07	Soldering	<p>7.1 No unmelted solder paste may be present on the PCB.</p> <p>7.2 No cold solder joints, missing solder connections, oxidation or icicle.</p> <p>7.3 No residue or solder balls on PCB.</p> <p>7.4 No short circuits in components on PCB.</p>	<p>0.65</p> <p>0.65</p> <p>1.5</p> <p>0.65</p>
08	General appearance	<p>8.1 No oxidation, contamination, curves or, bends on interface pin (OLB) of FPC</p> <p>8.2 No cracks on interface pin(OLB) of FPC</p> <p>8.3 NO contamination, solder residue or solder balls on product.</p> <p>8.4 The IC on the FPC may not be damaged, circuits.</p> <p>8.5 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color.</p> <p>8.6 Sealant on top of the ITO circuit has not hardened</p> <p>8.7 Pin type must match type in specification sheet.</p> <p>8.8 LCD pin loose or missing pins.</p> <p>8.9 Product packaging must the same as specified on packaging specification sheet.</p> <p>8.10 Product dimension and structure must conform to product specification sheet.</p>	<p>1.5</p> <p>0.65</p> <p>1.5</p> <p>0.65</p> <p>1.5</p> <p>1.5</p> <p>0.65</p> <p>1.5</p> <p>1.5</p>

RELIABILITY

1. Environmental Test

No	Test Item	Test Condition& Criteria	Sample Size	Determinant Stand.
1-1	High Temperature Operation	Temperature: $70\pm 3^{\circ}\text{C}$; Humidity: Except; Test method: Operation Duration: 96Hrs	Sample Do: $\geq 2\text{PCS}$ On Going: $\geq 3\text{PCS}/\text{LOT}$	TS
1-2	Low temperature Operation	Temperature: $-20\pm 3^{\circ}\text{C}$; Humidity: Except; Test method: Operation Duration: 96Hrs	Sample Do: $\geq 2\text{PCS}$ On Going: $\geq 3\text{PCS}/\text{LOT}$	TS
1-3	High Temperature / High Humidity Operation	Temperature: $60\pm 3^{\circ}\text{C}$; Humidity: $95\%\pm 3\%\text{RH}$; Test method: Operation Duration: 96Hrs	Sample Do: $\geq 2\text{PCS}$ On Going: $\geq 3\text{PCS}/\text{LOT}$	TS
1-4	Temperature Shock test	Shock Temperature & Time:  Duration: 20cycles	Sample Do: $\geq 2\text{PCS}$ On Going: $\geq 3\text{PCS}/\text{LOT}$	TS
1-5	Temperature Cycle test	Normal temperature 2H \rightarrow $-30\pm 3^{\circ}\text{C}$, 10H(3H) \rightarrow $60\pm 3^{\circ}\text{C}$, $90\pm 3\%\text{RH}$ 10H(3H) \rightarrow $80\pm 3^{\circ}\text{C}$, 10H(2H) \rightarrow (25°C) 5 cycles.	Sample Do: $\geq 2\text{PCS}$ On Going: $\geq 3\text{PCS}/\text{LOT}$	TS

Item	FAULT JUDGMENT CRITERIA
TS	1. No clearly visible defects or deterioration of display quality allowed. 2. No function – related abnormalities.

NOTE:

1. When temperature moves, LCD's valve voltage will be influenced by it, which leads to LCD's contrast and chroma change.
2. In high temperature operation and storage tests in MQE test will make LCD's power consumption increase. The reason is that a few crystal molecules are apart because of high temperature when there is a long time storage and operation in high temperature, which leads to decrease of gross resistance ratio of crystal molecules. Hence, LCD's power consumption go up than that of before test.

2. Mechanical Reliability Test

No.	Test Item	Test Condition & Criteria	Sample Size	Determinant Spec.
2-1	ESD test	Discharge modality: Contact voltage: ±1KV、 ±2KV; Air voltage: ±2KV、 ±4KV、 ±6KV; (Discharge R=330Ω;C=150PF)	2PCS	No software error

3. Soldering

- (1) Soldering temperature: 340+/-10°C.
- (2) Available times for repeated soldering: 5 times
- (3) Attentions paid when soldering:
 - A. FPC's golden finger and soldering pad are butt-jointed before soldered. Tolerance is within the 1/3 width of golden finger and 0.5~1mm of FPC's length is allowed to be exposed in the jointed soldering pad.
 - B. Coat proper tin in the iron-head when soldering, with dragging speed of 2.5cm/sec.
 - C. The soldering part is warmed up first with iron-head when there is a rework. Then heat it up from one side until tin is melted, last, take off FPC.

4. FPC cable flexing and bending test

- Number of Bending / Flexing Cycles: <10 times
Radius of the Bend Mandrels: >0.4 mm
Degree of Bend: <180°

SUGGESTIONS FOR USING LCD MODULES

● Handling of LCM

- (1) The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.
- (2) If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.
- (3) Don't apply excessive force on the surface of the LCM.
- (4) If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents are especially prohibited: water, ketone Aromatic solvents etc.
- (5) 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.
- (6) 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.

(7) Don't disassemble the LCM.

(8) To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- 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.

(9) Do not alter, modify or change the shape of the tab on the metal frame.

(10) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(11) Do not damage or modify the pattern writing on the printed circuit board.

(12) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

(13) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(14) Do not drop, bend or twist LCM.

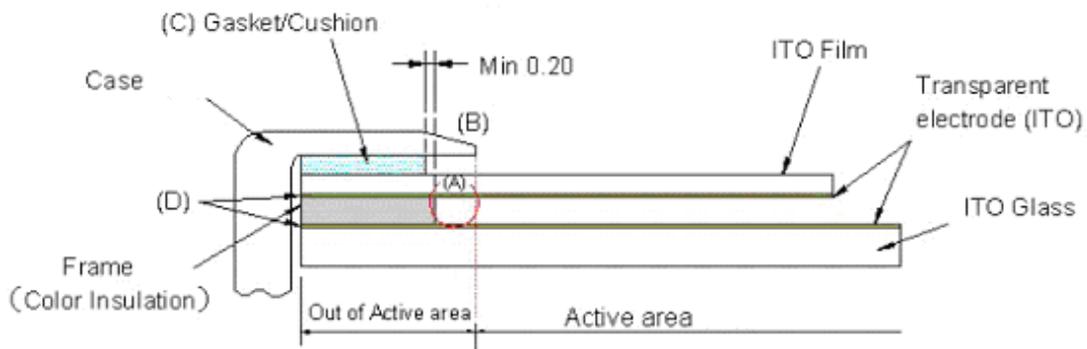
(15) If the LCM is assembled with touch panel, pay more attention to using touch panel.

* Please wear clean finger sacks, gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.

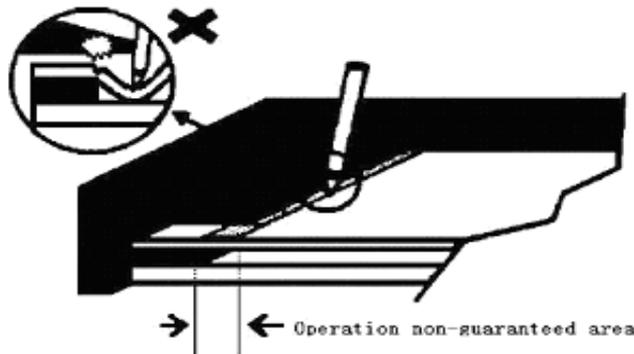
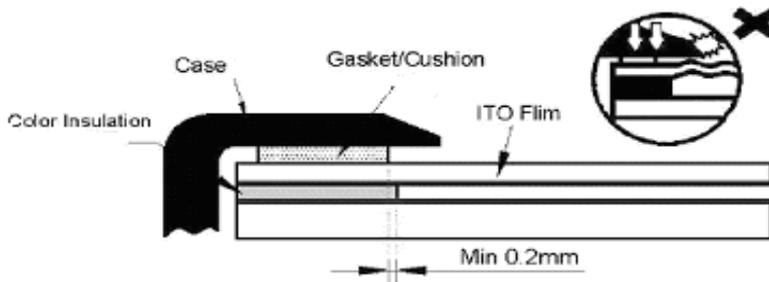
* Please use finger sacks or gloves to avoid injuries by sharp edges when handling the Film-Glass type touch panel because a glass edges are not chamfered.

* Cautions for installing and assembling

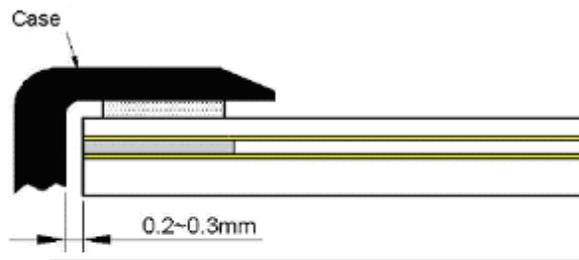
- Do not give excessive strain to the product.
- Flexible pattern cable is connected to the TP body by heat-seal(thermal pressure) method. So, do not apply excessive forces to the flexible pattern.
- In order not to apply load on the surface of the touch panel, please keep a clearance of 0.2mm-0.5mm between product and case.
- Pressing inside of boundary of the frame(part(A) as shown in below) may cause fault operation, so please design to avoid pressing of touch panel at part (A) such as having gasket/cushion at part (C). Particularly the area (B) shall be free from burr. The gasket/cushion material at the part (C) should not be exceeded to inside of the boundary of the frame.



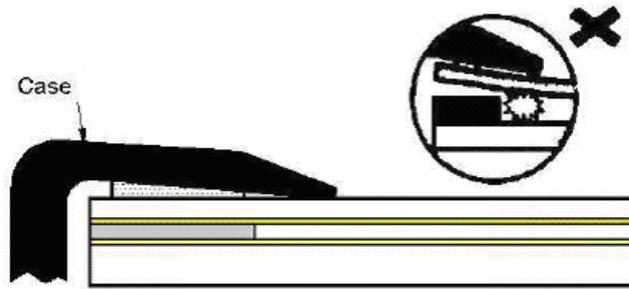
Do not make the following mistakes:



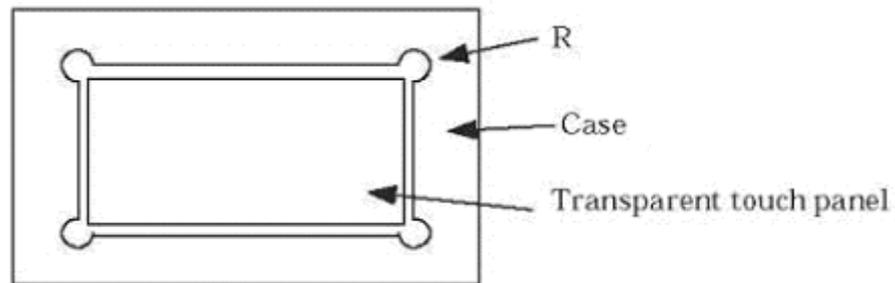
- When designing installment of case and touch panel, you would better consider to keep clearance of 0.2-0.3mm between touch panel and inside boundary of case.



- Please keep your case flat in order not to touch with touch panel directly which causes serious damage of a transparent electrode.



- Do not use any organic solvent or detergent other than ethanol.
- The corners of the product are not chamfered. When positioning and fixing the product on the case, we suggest that you would provide a R part on the corner of the case so as not to apply load on the corner of the transparent touch panel.



- Please confirm its characteristic in advance whether any damage is given to this product when attaching a protection sheet on this product at customer side. Some changes may arise in the characteristics of this product by the protection sheet attachment such as operation, cosmetic, etc.. However, those changes are out of our guarantee.

● **Storage**

- (1) Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.
- (2) Storage in a clean environment, free from dust, active gas, and solvent.
- (3) Store in antistatic container.