

EXAMINED BY :	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-0006810
<i>Vincent Wu</i>		ISSUE : AUG.21, 2009
APPROVED BY:		TOTAL PAGE : 22
<i>David Chang</i>		VERSION : 4

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

ETQ570G2DM6  
(RoHS)

FOR MESSRS :  
\_\_\_\_\_

CUSTOMER'S APPROVAL

DATE :  
\_\_\_\_\_

BY :  
\_\_\_\_\_

DOC . FIRST ISSUE

RECORDS OF REVISION

JAN.23, 2009

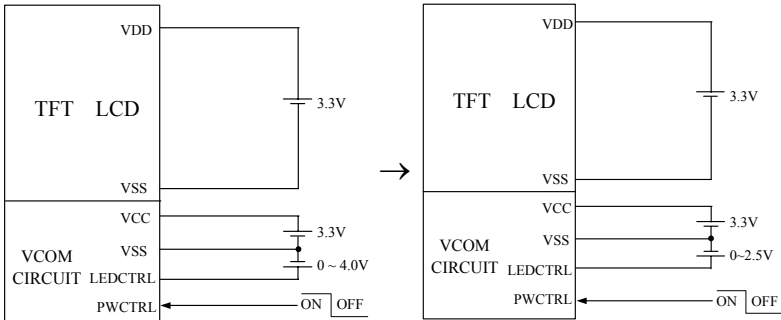
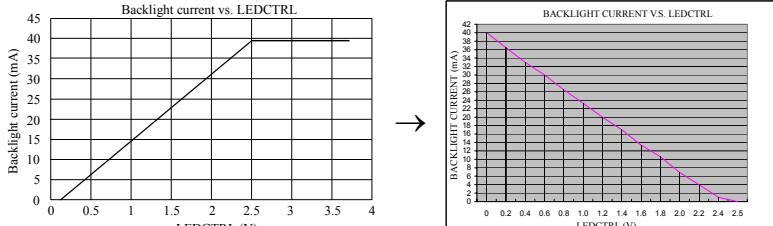
DATE	REVISED PAGE NO.	SUMMARY																																
MAR.04, 2009	1	2. MECHANICAL SPECIFICATIONS (9) COLOR ----- 16.7M → 262K																																
	3	4. ELECTRICAL CHARACTERISTICS <table border="1" data-bbox="590 555 1284 627"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR VCOM DRIVER</td> <td>ICC</td> <td>VCC-VSS = 3.3V LED B/L=ON</td> <td>—</td> <td>630</td> <td>720</td> <td>mA</td> <td></td> </tr> </tbody> </table> <p style="text-align: center;">↓</p> <table border="1" data-bbox="590 645 1284 716"> <thead> <tr> <th>PARAMETER</th> <th>SYMBOL</th> <th>CONDITION</th> <th>MIN.</th> <th>TYP.</th> <th>MAX.</th> <th>UNIT</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>POWER SUPPLY CURRENT FOR VCOM DRIVER</td> <td>ICC</td> <td>VCC-VSS = 3.3V LED B/L=ON</td> <td>—</td> <td>(630)</td> <td>(720)</td> <td>mA</td> <td></td> </tr> </tbody> </table>	PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	POWER SUPPLY CURRENT FOR VCOM DRIVER	ICC	VCC-VSS = 3.3V LED B/L=ON	—	630	720	mA		PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	POWER SUPPLY CURRENT FOR VCOM DRIVER	ICC	VCC-VSS = 3.3V LED B/L=ON	—	(630)	(720)	mA	
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	7	7. OUTLINE DIMENSIONS MARK △ : ADDING PULL TAPE																																
	8	8. BLOCK DIAGRAM ADD FRAME GROUND																																
	12	11.1 POWER SUPPLY FOR LCM  11.2 THE BRIGHTNESS CONTROLLED BY BACKLIGHT CURRENT OF LEDCTRL 																																
APR.15, 2009	7	7. OUTLINE DIMENSIONS MARK △ : MODIFY CN1 TYPE																																
AUG.21, 2009	3	4. ELECTRICAL CHARACTERISTICS POWER SUPPLY CURRENT FOR VCOM DRIVER : TYP.=(630) → 450, MAX.=(720) → 580																																

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1. GENERAL SPECIFICATIONS

1.1 APPLICATION NOTES FOR CONTROLLER/DRIVER

PLEASE REFER TO :

HIMAX HX8218

HIMAX HX8615

1.2 MATERIAL SAFETY DESCRIPTION

ASSEMBLIES SHALL COMPLY WITH EUROPEAN ROHS REQUIREMENTS, INCLUDING PROHIBITED MATERIALS/COMPONENTS CONTAINING LEAD, MERCURY, CADMIUM, HEXAVALENT CHROMIUM, POLYBROMINATED BIPHENYLS (PBB) AND POLYBROMINATED DIPHENYL ETHERS (PBDE)

2. MECHANICAL SPECIFICATIONS

- (1) DIAGONALS ----- 5.7 inch
- (2) NUMBER OF DOTS ----- 320W \* (RGB) \* 240H DOTS
- (3) MODULE SIZE ----- 142.1W \* 100.4H \* 11D (MAX.) mm  
(WITHOUT FPC)
- (4) EFFECTIVE AREA ----- 117.2W \* 88.4H mm
- (5) ACTIVE AREA ----- 115.2W \* 86.4H mm
- (6) DOT SIZE ----- 0.12W \* 0.36H mm
- (7) PIXEL SIZE ----- 0.36W \* 0.36H mm
- (8) LCD TYPE ----- TFT , TRANSMISSIVE
- (9) COLOR ----- 262K
- (10) VIEWING DIRECTION ----- 6 O'CLOCK
- (11) BACK LIGHT ----- LED , COLOR : WHITE
- (12) INTERFACE MODE ----- RGB 18 BIT PARALLEL

### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS.

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	7.0	V	
	VCC-VSS	-0.3	7.0	V	
INPUT SIGNAL VOLTAGE	VL-VSS	-0.3	VCC+0.3	V	
STATIC ELECTRICITY	—	—	—	V	NOTE (1)
LED BACKLIGHT POWER DISSIPATION	PD	—	1.28	W	
LED BACKLIGHT FORWARD CURRENT	IF	—	0.06	A	
LED BACKLIGHT REVERSE VOLTAGE	VR	—	45	V	

NOTE (1) : LCM SHOULD BE GROUNDED DURING HANDING LCM.

#### 3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS.

I T E M	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-20°C	70°C	-30°C	80°C	NOTE (1), (2)
HUMIDITY	NOTE (3)		NOTE (3)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s <sup>2</sup> (0.25 G)	—	11.76 m/s <sup>2</sup> (1.2 G)	5~20Hz, 1HR 20~500Hz(20Hz), 1HR 20~500Hz(500Hz), 1HR X, Y, Z, TOTAL 3HRS
SHOCK	—	29.4 m/s <sup>2</sup> (3 G)	—	490 m/s <sup>2</sup> (50 G)	10 m SECONDS XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) : Ta AT -30°C : 48HRS MAX.  
80°C : 168HRS MAX.

NOTE (2) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

NOTE (3) : Ta ≤ 60°C : 90%RH MAX (96HRS MAX).

Ta > 60°C : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90%RH AT 60°C(96HRS MAX).

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE FOR DIGITAL	VDD-VSS	—	3	3.3	3.6	V	
POWER SUPPLY VOLTAGE FOR VCOM DRIVER	VCC-VSS	—	3	3.3	3.6	V	
POWER SUPPLY CURRENT FOR DIGITAL	IDD	VDD-VSS = 3.3V	—	8	11	mA	NOTE (1)
POWER SUPPLY CURRENT FOR VCOM DRIVER	ICC	VCC-VSS = 3.3V LED B/L=ON	—	450	580	mA	
LOW LEVEL INPUT VOLTAGE	VIL	—	0	—	0.3*VDD	V	NOTE (2)
HIGH LEVEL INPUT VOLTAGE	VIH	—	0.7*VDD	—	VDD	V	
LOW LEVEL OUTPUT VOLTAGE	VOL	IOL = 400µA	0	—	0.2*VDD	V	NOTE (3)
HIGH LEVEL OUTPUT VOLTAGE	VOH	IOH = -400µA	0.8*VDD	—	VDD	V	
FRAME FREQUENCY	fFRAME	—	—	83	92	Hz	
DOT DATA CLOCK	DCLK	—	—	6.4	7.1	MHz	
POWER SUPPLY FOR LED BACKLIGHT	V <sub>F</sub>	I <sub>F</sub> =40mA	28	30	32	V	NOTE (4)
LED LIFE TIME	—	—	30000	40000	—	HRS	

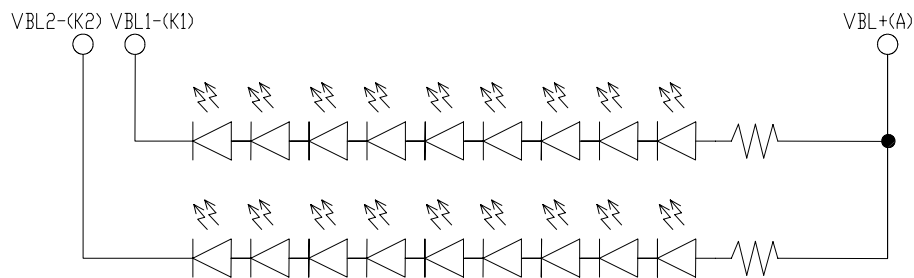
NOTE (1) : THE DISPLAY PATTERN IS ALL "WHITE".

NOTE (2) : APPLIED TO TERMINALS /RESET, HSYNC, VSYNC, ENB, DCLK, B5~B0, G5~G0, R5~R0.

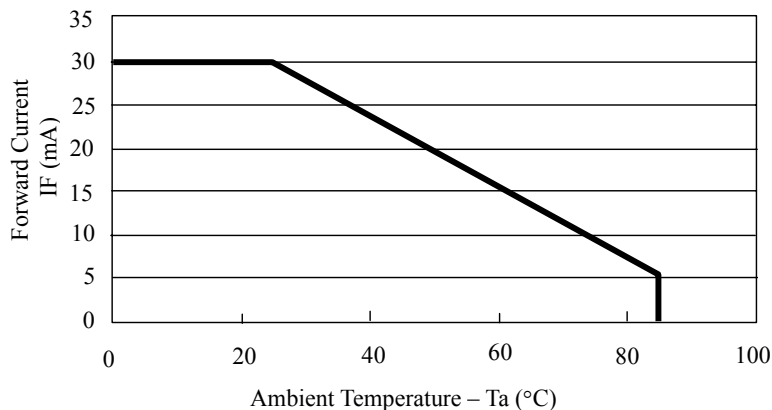
NOTE (3) : APPLIED TO TERMINALS B5~B0, G5~G0, R5~R0.

NOTE (4) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT

$$(V_F = V_{BL} + (A) - V_{BL1} - (K1) = V_{BL} + (A) - V_{BL2} - (K2))$$



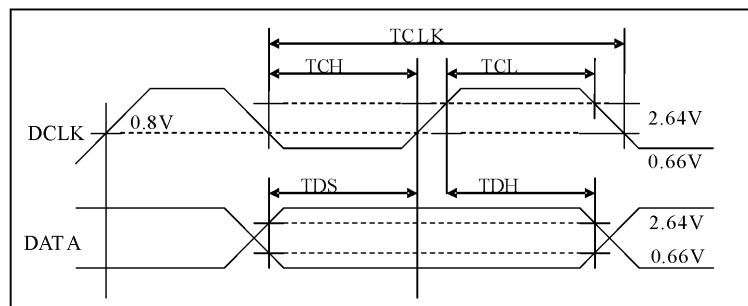
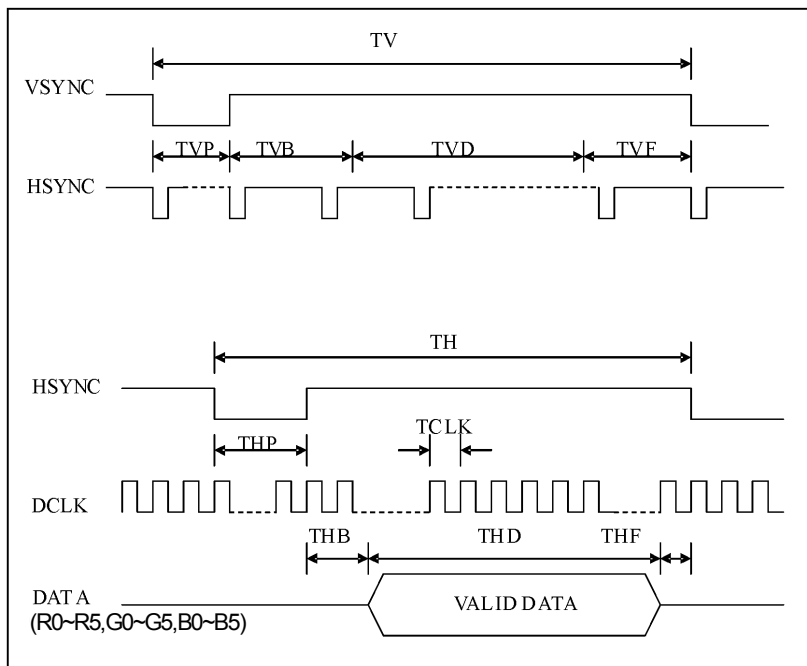
NOTE (5) : AMBIENT TEMP. VS. ALLOWABLE FORWARD CURRENT.(PER LED)



5. TIMING CHARACTERISTICS

5.1 DIGITAL PARALLEL RGB INTERFACE

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK	FREQUENCY	TCLK	—	6.4	7.1	MHz
	HIGH TIME	TCH	—	78	—	ns
	LOW TIME	TCL	—	78	—	ns
DATA	SETUP TIME	TDS	12	—	—	ns
	HOLD TIME	TDH	12	—	—	ns
HSYNC	PERIOD	TH	—	408	—	DCLK
	PULSE WIDTH	THP	—	30	—	DCLK
	BACK-PORCH	THB	—	38	—	DCLK
	DISPLAY PERIOD	THD	—	320	—	DCLK
	FRONT-PORCH	THF	—	20	—	DCLK
VSYNC	PERIOD	NTSC	—	262.5	—	TH
		PAL		312.5		
	PULSE WIDTH	TVP	1	3	5	TH
	BACK-PORCH	NTSC	—	15	—	TH
		PAL		23		
	DISPLAY PERIOD	TVD	—	240	—	TH
	FRONT-PORCH	NTSC	—	4.5	—	TH
PAL		46.5				



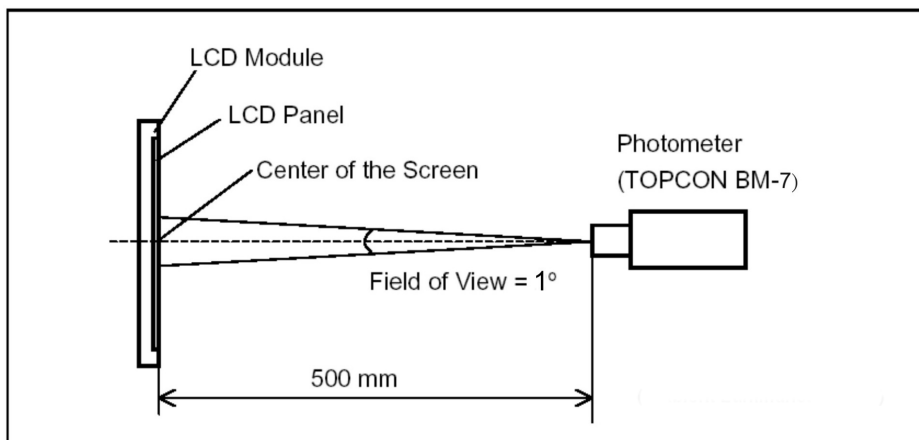
6. OPTICAL CHARACTERISTICS (NOTE 1)  
6.1 OPTICAL CHARACTERISTICS

Ta = 25 ± 2 °C

I T E M		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
VIEWING ANGLE		$\theta_{y+}$	CR ≥ 10	55	60	—	deg.	NOTE (2) NOTE (3)	
		$\theta_{y-}$		$\theta_x=0^\circ$	70	75			—
		$\theta_{x+}$		$\theta_y=0^\circ$	70	75			—
		$\theta_{x-}$			70	75			—
CONTRAST RATIO		CR	$\theta_x=0^\circ, \theta_y=0^\circ$	300	400	—	—	NOTE (3)	
RESPONSE TIME		T <sub>R</sub> ( rise )	$\theta_x=0^\circ, \theta_y=0^\circ$	—	15	30	msec	NOTE (4)	
		T <sub>F</sub> ( fall )		—	35	50			
COLOR OF CIE COORDINATE	WHITE	W <sub>x</sub>	$\theta_x=0^\circ, \theta_y=0^\circ$ I <sub>F</sub> =40mA NTSC:60%	0.27	0.32	0.37	—	NOTE (5)	
		W <sub>y</sub>		0.30	0.35	0.40			
	RED	R <sub>x</sub>		0.58	0.63	0.68	—		
		R <sub>y</sub>		0.31	0.36	0.41			
	GREEN	G <sub>x</sub>		0.28	0.33	0.38	—		
		G <sub>y</sub>		0.55	0.60	0.65			
	BLUE	B <sub>x</sub>		0.09	0.14	0.19	—		
		B <sub>y</sub>		0.06	0.11	0.16			
THE BRIGHTNESS OF MODULE		B	$\theta_x=0^\circ, \theta_y=0^\circ$ I <sub>F</sub> =40mA	450	500	—	cd/m <sup>2</sup>	NOTE (6)	
THE UNIFORMITY OF MODULE		—		75	80	—			%

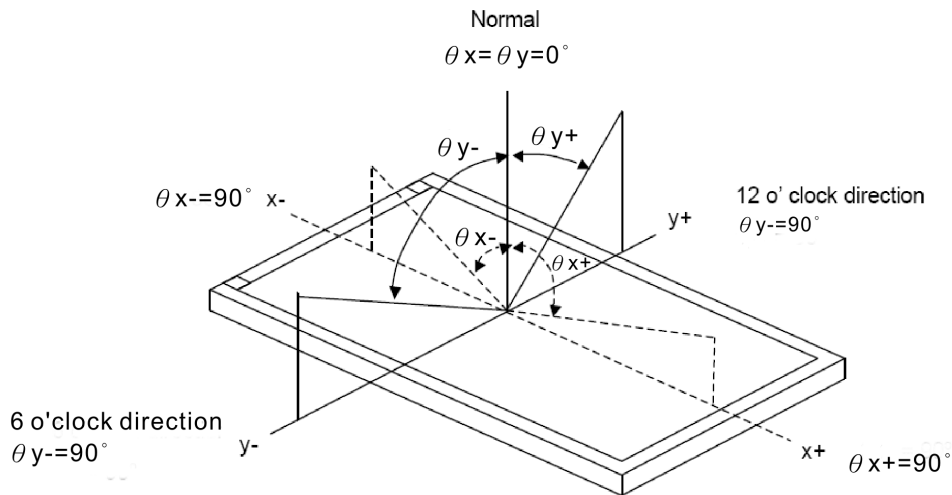
NOTE (1) : TEST EQUIPMENT SETUP :

AFTER STABILIZING AND LEAVING THE PANEL ALONE AT A GIVEN TEMPERATURE FOR 30 MINUTES, THE MEASUREMENT SHOULD BE EXECUTED. MEASUREMENT SHOULD BE EXECUTED IN A STABLE, WINDLESS, AND DARK ROOM. OPTICAL SPECIFICATIONS ARE MEASURED BY TOPCON BM-7 (FAST) WITH A VIEWING ANGLE OF 1° AT A DISTANCE OF 50cm AND NORMAL DIRECTION.





NOTE (2) : DEFINITION OF VIEWING ANGLE :

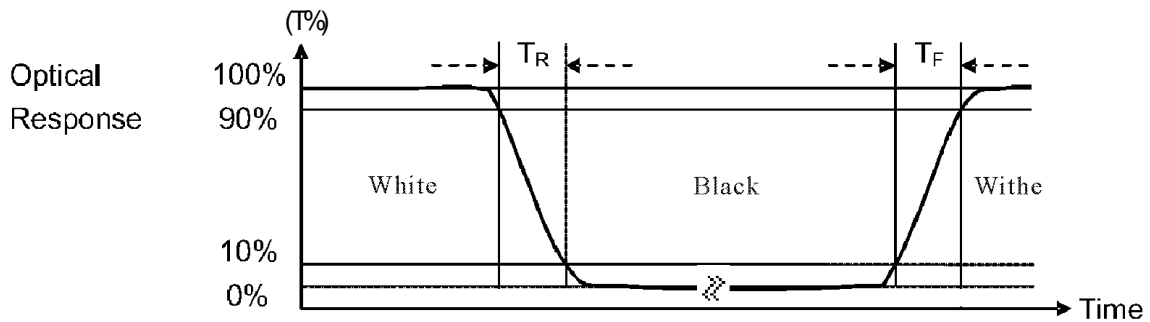


NOTE (3) : DEFINITION OF CONTRAST RATIO :

$$\text{CONTRAST RATIO(CR)} = \frac{\text{BRIGHTNESS MEASURED WHEN LCD IS AT "WHITE STATE"}}{\text{BRIGHTNESS MEASURED WHEN LCD IS AT "BLACK STATE"}}$$

NOTE (4) : DEFINITION OF RESPONSE TIME : TR AND TF

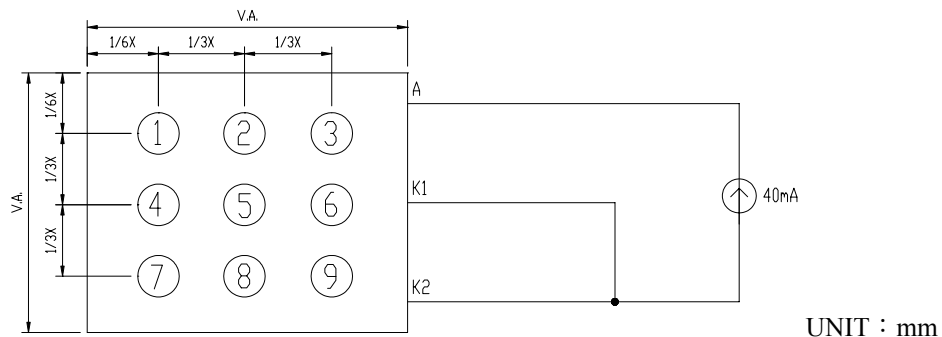
THE FIGURE BELOW IS THE OUTPUT SIGNAL OF THE PHOTO DETECTOR.



NOTE (5) : THE 100% TRANSMISSION IS DEFINED AS THE TRANSMISSION OF LCD PANEL WHEN ALL THE INPUT TERMINALS OF MODULE ARE ELECTRICALLY OPENED.

NOTE (6) : BRIGHTNESS MEASURED WHEN LCD IS AT " WHITE STATE "

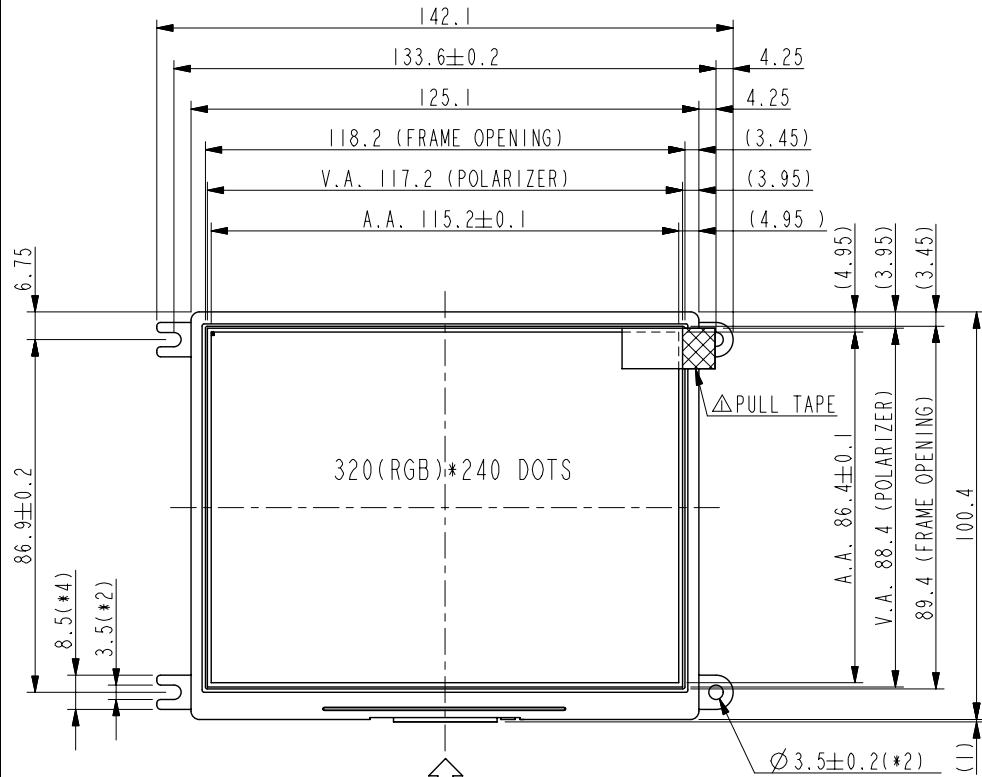
## 6.2 THE TEST METHOD OF BRIGHTNESS AND UNIFORMITY



## 6.3 THE CALCULATING METHOD OF UNIFORMITY

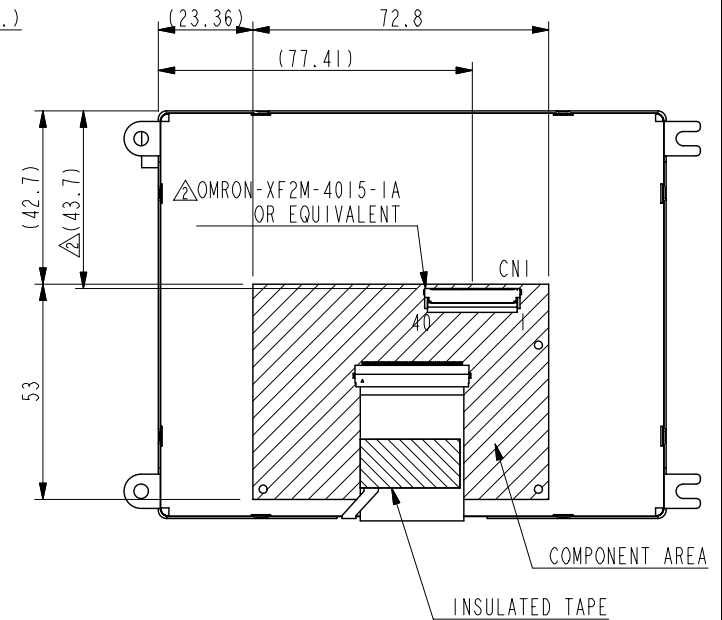
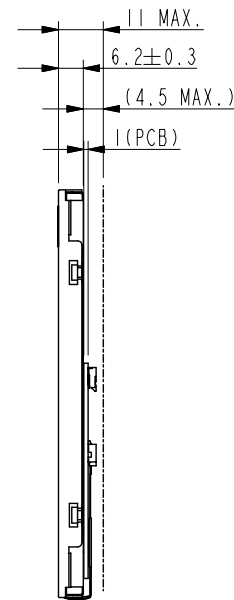
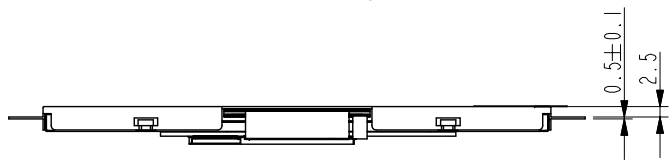
$$\text{UNIFORMITY: } \left[ 1 - \frac{\text{MAXIMUM BRIGHTNESS} - \text{MINIMUM BRIGHTNESS}}{\text{AVERAGE BRIGHTNESS}} \right] \times 100\%$$

7. OUTLINE DIMENSIONS



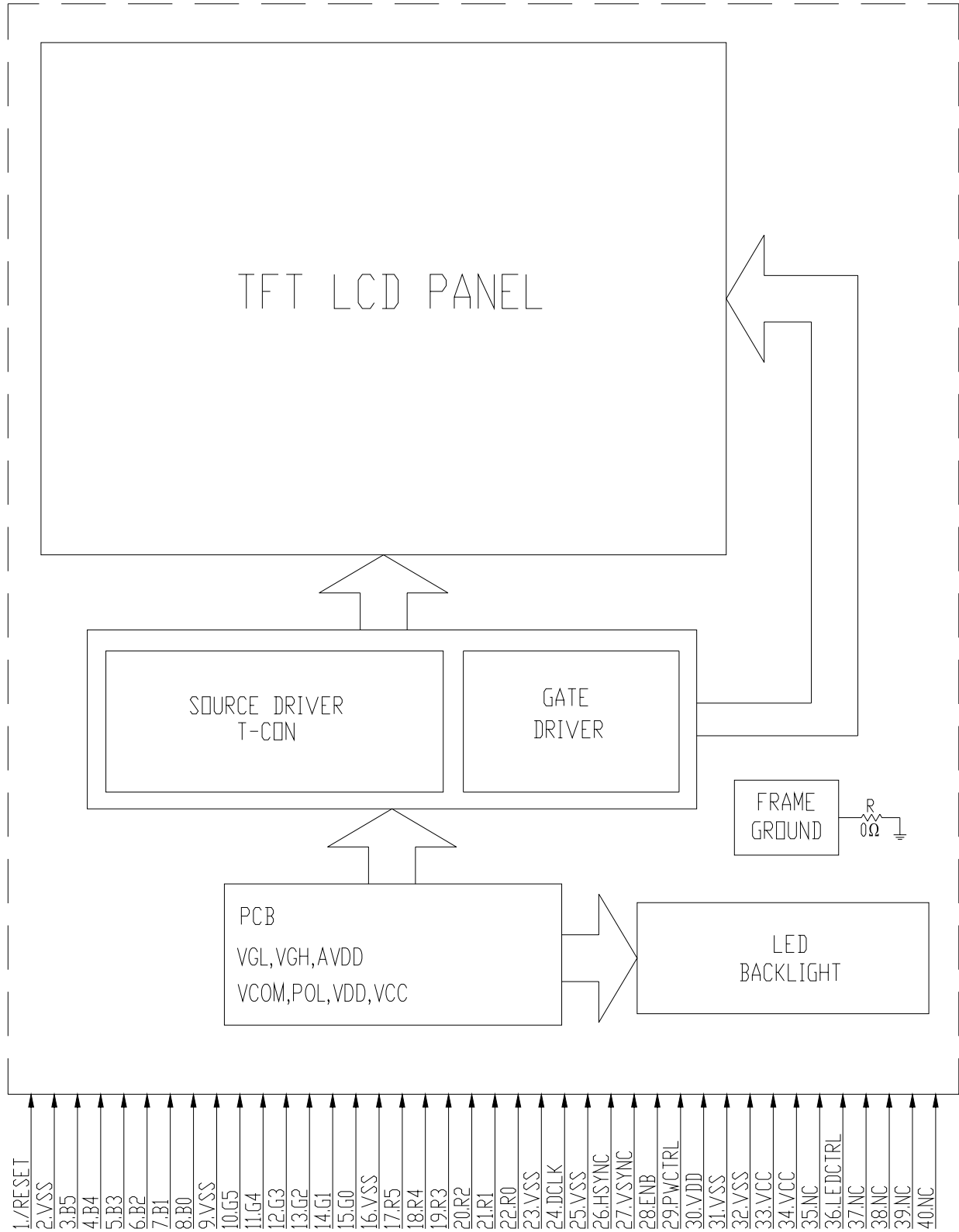
VIEWING DIRECTION

Best Contrast but with Gray Level Inversion

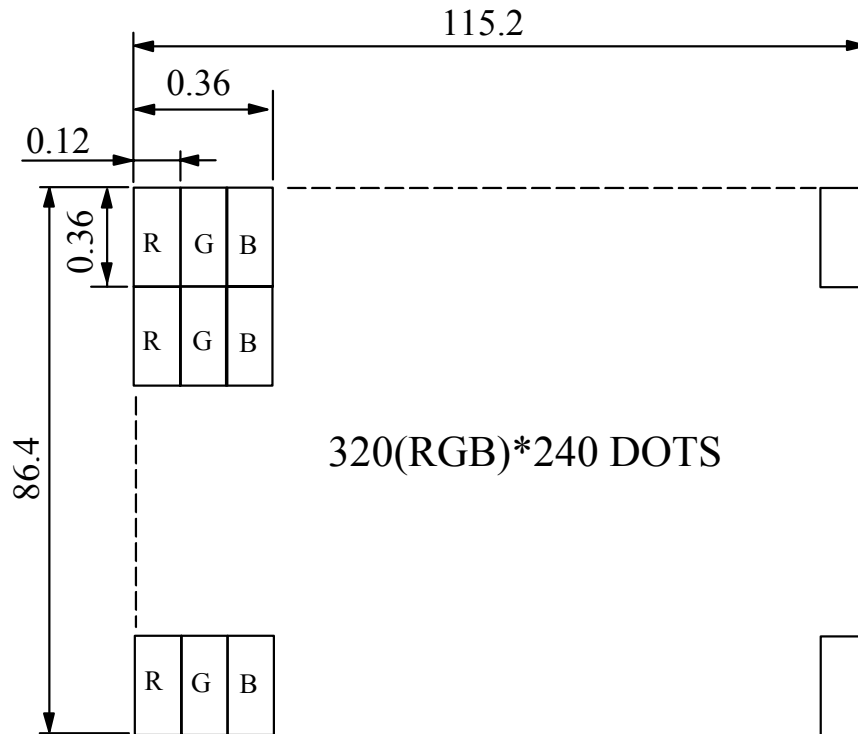


UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS ± 0.5  
NOTE: MARK  $\Delta$  MODIFY (NUMBER NOTE MODIFY VERSION)

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



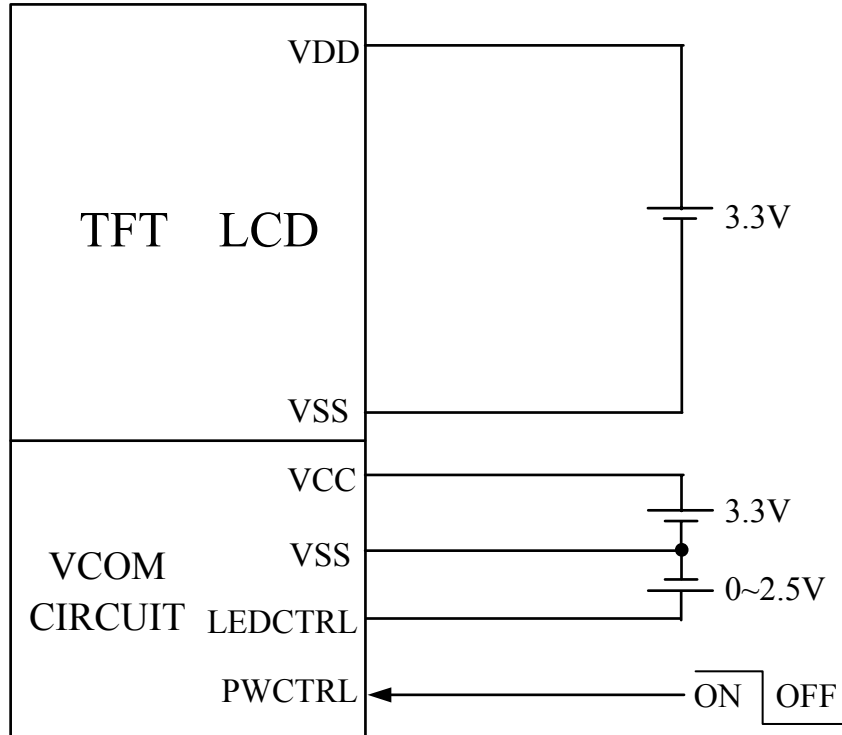
UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS  $\pm 0.1$   
DOTS MATRIX TOLERANCE IS  $\pm 0.01$

10. INTERFACE SIGNALS

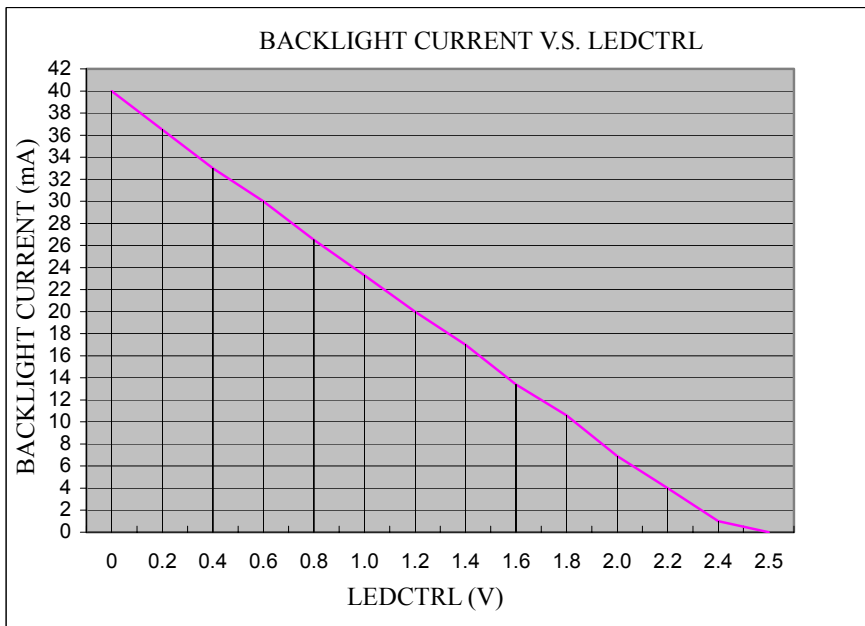
PIN NO	SYMBOL	I/O	FUNCTION									
1	/RESET	I	HARDWARE RESET									
2	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)									
3	B5	I	BLUE DATA BIT 5									
4	B4	I	BLUE DATA BIT 4									
5	B3	I	BLUE DATA BIT 3									
6	B2	I	BLUE DATA BIT 2									
7	B1	I	BLUE DATA BIT 1									
8	B0	I	BLUE DATA BIT 0									
9	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)									
10	G5	I	GREEN DATA BIT 5									
11	G4	I	GREEN DATA BIT 4									
12	G3	I	GREEN DATA BIT 3									
13	G2	I	GREEN DATA BIT 2									
14	G1	I	GREEN DATA BIT 1									
15	G0	I	GREEN DATA BIT 0									
16	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)									
17	R5	I	RED DATA BIT 5									
18	R4	I	RED DATA BIT 4									
19	R3	I	RED DATA BIT 3									
20	R2	I	RED DATA BIT 2									
21	R1	I	RED DATA BIT 1									
22	R0	I	RED DATA BIT 0									
23	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)									
24	DCLK	I	DOT DATA CLOCK									
25	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)									
26	HSYNC	I	HORIZONTAL SYNC INPUT									
27	VSNC	I	VERTICAL SYNC INPUT									
28	ENB	I	DATA ENABLE INPUT									
29	PWCTRL	I	<table border="1"> <thead> <tr> <th>LOGIC LEVEL</th> <th>PWCTRL</th> <th>REMARK</th> </tr> </thead> <tbody> <tr> <td>H=3.3V</td> <td>H</td> <td>POWER ON</td> </tr> <tr> <td>L=0V</td> <td>L</td> <td>SHUTDOWN</td> </tr> </tbody> </table>	LOGIC LEVEL	PWCTRL	REMARK	H=3.3V	H	POWER ON	L=0V	L	SHUTDOWN
			LOGIC LEVEL	PWCTRL	REMARK							
H=3.3V	H	POWER ON										
L=0V	L	SHUTDOWN										
<p>WHEN INTERNAL LED DRIVER : JP15 1-2(DEFAULT) WHEN EXTERNAL LED DRIVER : JP15 2-3</p>												

PIN NO	SYMBOL	I/O	FUNCTION
30	VDD	P	POWER SUPPLY FOR DIGITAL CIRCUIT
31	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)
32	VSS	P	GROUND (VSS IS CONNECTED TO METAL HOUSING WITH CONDUCTIVE TAPE)
33	VCC	P	POWER SUPPLY FOR VCOM DRIVER CIRCUIT
34	VCC	P	POWER SUPPLY FOR VCOM DRIVER CIRCUIT
35	NC	—	NON CONNECTION (USING INTERNAL LED DRIVER) OR ANODE (USING EXTERNAL LED DRIVER) WHEN INTERNAL LED DRIVER : JP5 1-2 (DEFAULT) WHEN EXTERNAL LED DRIVER : JP5 2-3
36	LEDCTRL	I	BRIGHTNESS CONTROL FOR LED BACKLIGHT ; LEDCTRL (USING INTERNAL LED DRIVER) OR CATHODE (USING EXTERNAL LED DRIVER) WHEN INTERNAL LED DRIVER : JP6 1-2 (DEFAULT) JP14 1-2 (DEFAULT) WHEN EXTERNAL LED DRIVER : JP6 2-3 JP14 NON CONNECTION
37	NC	—	NON CONNECTION
38	NC	—	NON CONNECTION
39	NC	—	NON CONNECTION
40	NC	—	NON CONNECTION

1.1. POWER SUPPLY  
1.1.1 POWER SUPPLY FOR LCM



1.1.2 THE BRIGHTNESS CONTROLLED BY BACKLIGHT CURRENT OF LEDCTRL



12. INSPECTION CRITERION

12.1 APPLICATION

THIS INSPECTION STANDARD IS TO BE APPLIED TO THE LCD MODULE DELIVERED FROM EMERGING DISPLAY TECHNOLOGIES CORP.( E.D.T ) TO CUSTOMERS

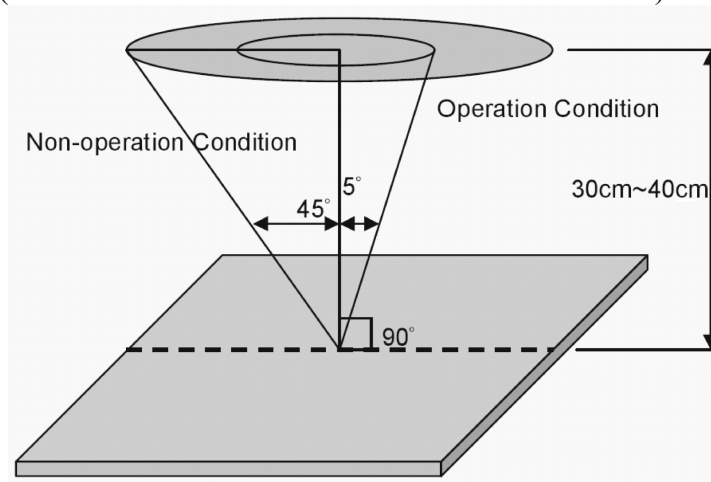
12.2 INSPECTION CONDITIONS

12.2.1 (1)OBSERVATION DISTANCE : 35cm±5cm

(2)VIEW ANGLE :

NON-OPERATION CONDITION : ±5°  
(PERPENDICULAR TO LCD PANEL SURFACE)

OPERATION CONDITION : ±45°  
(PERPENDICULAR TO LCD PANEL SURFACE)



12.2.2 ENVIRONMENT CONDITIONS :

AMBIENT TEMPERATURE		20°C~25°C
AMBIENT HUMIDITY		65±20%RH
AMBIENT ILLUMINATION	COSMETIC INSPECTION	MORE THAN 600Lux
	FUNCTIONAL INSPECTION	300~500 Lux

12.2.3 INSPECTION LOT

QUANTITY PER DELIVERY LOT FOR EACH MODEL

12.2.4 INSPECTION METHOD

A SAMPLING INSPECTION SHALL BE MADE ACCORDING TO THE FOLLOWING PROVISIONS TO JUDGE THE ACCEPTABILITY

(a)APPLICABLE STANDARD :

MIL-STD-105E  
NORMAL INSPECTION, SINGLE SAMPLING  
LEVEL II

(b)AQL : MAJOR DEFECT : AQL 0.65  
MINOR DEFECT : AQL 1.0

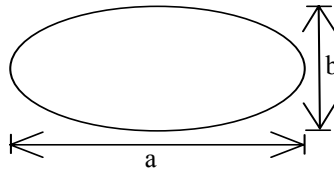


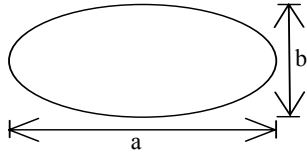
12.3 INSPECTION STANDARDS

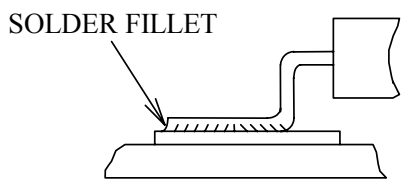
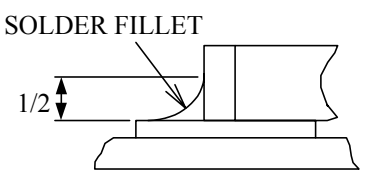
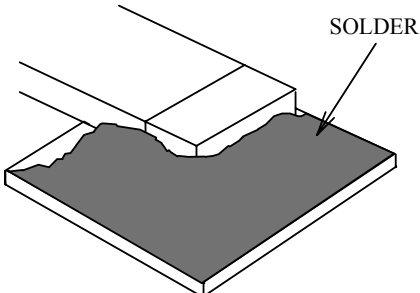
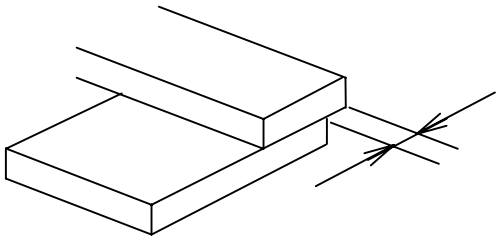
12.3.1 VISUAL DEFECTS CLASSIFICATION

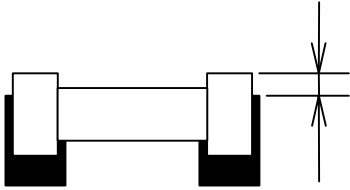
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> <li>• DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS</li> <li>EX: DISCONNECTION, SHORT CIRCUIT ETC</li> </ul>	0.65
	2.BACKLIGHT	<ul style="list-style-type: none"> <li>• NO LIGHT</li> <li>• FLICKERING AND OTHER ABNORMAL ILLUMINATION</li> </ul>	
	3.DIMENSIONS	<ul style="list-style-type: none"> <li>• SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS</li> </ul>	
MINOR DEFECT	1.DISPLAY ZONE	<ul style="list-style-type: none"> <li>• BLACK/WHITE SPOT</li> <li>• BUBBLES ON POLARIZER</li> <li>• NEWTON RING</li> <li>• BLACK/WHITE LINE</li> <li>• SCRATCH</li> <li>• CONTAMINATION</li> <li>• LEVER COLOR SPREED</li> </ul>	1.0
	2.BEZEL ZONE	<ul style="list-style-type: none"> <li>• STAINS</li> <li>• SCRATCHES</li> <li>• FOREIGN MATTER</li> </ul>	
	3.SOLDERING	<ul style="list-style-type: none"> <li>• INSUFFICIENT SOLDER</li> <li>• SOLDERED IN INCORRECT POSITION</li> <li>• CONVEX SOLDERING SPOT</li> <li>• SOLDER BALLS</li> <li>• SOLDER SCRAPS</li> </ul>	
	4.DISPLAY ON (ALL ON)	<ul style="list-style-type: none"> <li>• LIGHT LINE</li> </ul>	

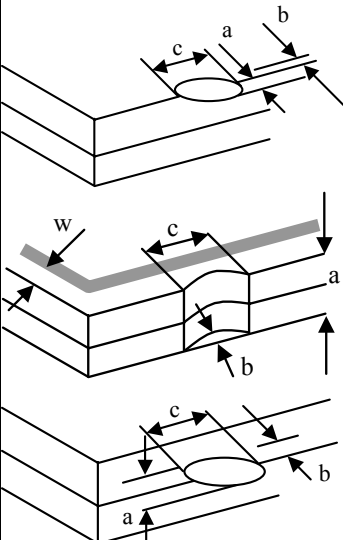
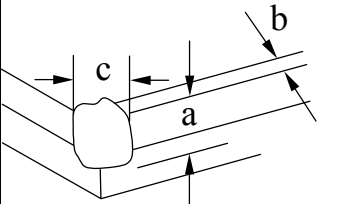
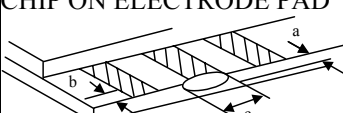
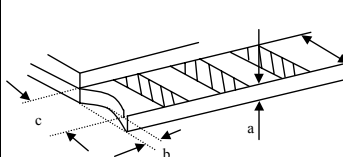
12.3.2 MODULE DEFECTS CALSSIFICATION

NO.	ITEM	CRITERIA												
1.	DISPLAY ON INSPECTION	(1)INCORRECT PATTERN (2)MISSING SEGMENT (3)DIM SEGMENT (4)OPERATING VOLTAGE BEYOND SPEC												
2.	OVERALL DIMENSIONS	(1)OVERALL DIMENSION BEYOND SPEC												
3.	DOT DEFECT	(1) INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS. (2) <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>ITEMS</th> <th>ACCEPTABLE COUNT</th> </tr> </thead> <tbody> <tr> <td>BRIGHT DOT</td> <td>N ≤ 2</td> </tr> <tr> <td>DARK DOT</td> <td>N ≤ 3</td> </tr> <tr> <td>TOAL BRIGHT AND DARK DOTS</td> <td>N ≤ 4</td> </tr> </tbody> </table> <p>NOTE :</p> <p>1. THE DEFINITION OF DOT : THE SIZE OF A DEFECTIVE DOT OVER 1/2 OF WHOLE DOT IS REGARDED AS ONE DEFECTIVE DOT.</p> <p>2. BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN.</p> <p>3. DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.</p>	ITEMS	ACCEPTABLE COUNT	BRIGHT DOT	N ≤ 2	DARK DOT	N ≤ 3	TOAL BRIGHT AND DARK DOTS	N ≤ 4				
ITEMS	ACCEPTABLE COUNT													
BRIGHT DOT	N ≤ 2													
DARK DOT	N ≤ 3													
TOAL BRIGHT AND DARK DOTS	N ≤ 4													
4.	FOREIGN BLACK/WHITE/ BRIGHT LINE/ SCRATCH OF VIEWING AREA	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>LENGTH : L</th> <th>WIDTH : W</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>L \leq 0.3</math></td> <td><math>W \leq 0.05</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.3 &lt; L \leq 2.5</math></td> <td><math>0.05 &lt; W \leq 0.1</math></td> <td>4</td> </tr> <tr> <td><math>2.5 &lt; L</math></td> <td><math>0.1 &lt; W</math></td> <td>NONE</td> </tr> </tbody> </table> <p>WIDTH : W mm, LENGH : L mm</p>	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	$L \leq 0.3$	$W \leq 0.05$	IGNORE	$0.3 < L \leq 2.5$	$0.05 < W \leq 0.1$	4	$2.5 < L$	$0.1 < W$	NONE
LENGTH : L	WIDTH : W	PERMISSIBLE NO.												
$L \leq 0.3$	$W \leq 0.05$	IGNORE												
$0.3 < L \leq 2.5$	$0.05 < W \leq 0.1$	4												
$2.5 < L$	$0.1 < W$	NONE												
5.	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table border="1" style="margin-left: 20px;"> <thead> <tr> <th>AVERAGE DIAMETER (mm): D</th> <th>NUMBER OF PIECES PERMITTED</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.15</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.15 &lt; D \leq 0.5</math></td> <td>4</td> </tr> <tr> <td><math>0.5 &lt; D</math></td> <td>NONE</td> </tr> </tbody> </table> <p>NOTE : DIAMETER <math>D=(a+b)/2</math></p> 	AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED	$D \leq 0.15$	IGNORE	$0.15 < D \leq 0.5$	4	$0.5 < D$	NONE				
AVERAGE DIAMETER (mm): D	NUMBER OF PIECES PERMITTED													
$D \leq 0.15$	IGNORE													
$0.15 < D \leq 0.5$	4													
$0.5 < D$	NONE													

NO.	ITEM	CRITERIA		
			AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED
6.	BUBBLES OF POLARIZER /DIRT/CF FAIL /SURFACE STAINS	BUBBLE ON THE POLARIZER	$D \leq 0.25$	IGNORE
			$0.25 < D \leq 0.5$	$N \leq 5$
			$0.5 < D$	NOTE
		SURFACE STATUS	$D < 0.1 \text{ mm}$	IGNORE
			$0.1 < D \leq 0.3\text{mm}$	$N \leq 3$
		CF FAIL / SPOT	$D < 0.1 \text{ mm}$	IGNORE
$0.1 < D \leq 0.3\text{mm}$	$N \leq 3$			
		<p>NOTE : (1)POLARIZER BUBBLE IS DEFINED AS THE BUBBLE APPEARS ON ACTIVE DISPLAY AREA. THE DEFECT OF POLARIZER BUBBLE SHALL BE IGNORED IF THE POLARIZER BUBBLE APPEARS ON THE OUTSIDE OF ACTIVE DISPLAY AREA.</p> <p>(2)THE EXTRANEIOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON.</p> <p>(3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING.</p> <p>AVERAGE DIAMETER (D)=(a+b)/2</p> 		
7.	LINE DEFECT ON DISPLAY	OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOW		
8.	MURA ON DISPLAY	IT'S OK IF MURA IS SLIGHT VISIBLE THROUG 6% ND FILTER		
9.	UNEVEN COLOR SPREAD, COLORATION	(1)TO BE DETERMINED BASED UPON THE STANDARD SAMPLE.		
10.	BEZEL APPEARANCE	(1)BEZEL MAY NOT HAVE RUST, BE DEFORMED OR HAVE FINGER PRINTS STAINS OF OTHER CONTAMINATION. (2)BEZEL MUST COMPLY WITH JOB SPECIFICATIONS.		
11	PCB	<p>(1)THERE MAY NOT BE MORE THAN 2mm OF SEALANT OUTSIDE THE SEAL AREA ON THE PCB, AND THERE SHOULD BE NO MORE THAN THREE PLACES.</p> <p>(2)NO OXIDATION OR CONTAMINATION PCB TERMINALS.</p> <p>(3)PARTS ON PCB MUST BE THE SAME AS ON THE PRODUCTION CHARACTERISTIC CHART. THERE SHOULD BE NO WRONG PARTS, MISSING PARTS OR EXCESS PARTS.</p> <p>(4)THE JUMPER ON THE PCB SHOULD CONFORM TO THE PRODUCT CHARACTERISTIC CHART.</p> <p>(5)IF SOLDER GETS ON BEZEL TAB PADS, LED PAD, ZEBRA PAD OR SCREW HOLD PAD, MAKE SURE IT IS SMOOTHED DOWN.</p>		

NO.	ITEM	CRITERIA
12.	SOLDERING	<p>(1)NO SOLDERING FOUND ON THE SPECIFIED PLACE</p> <p>(2)INSUFFICIENT SOLDER</p> <p>(a)LSI, IC A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR "HEEL" OF LEAD AND PAD</p>  <p>(b)CHIP COMPONENT • SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING</p>  <p>• SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF SIDES AND FRONT SURFACE AREA ARE COVERED</p>  <p>(3)PARTS ALIGMENT</p> <p>(a)LSI, IC LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE</p> 

NO.	ITEM	CRITERIA
12.	SOLDERING	<p>(b)CHIP COMPONENT COMPONENT IS OFF CENTER, AND MORE THAN 50% OF THE LEADS IS OFF THE PAD OUTLINE</p>  <p>(4)NO UNMELTED SOLDER PASTE MAY BE PRESENT ON THE PCB.  (5)NO COLD SOLDER JOINTS, MISSING SOLDER CONNECTIONS, OXIDATION OR ICICLE.  (6)NO RESIDUE OR SOLDER BALLS ON PCB.  (7)NO SHORT CIRCUITS IN COMPONENTS ON PCB.</p>
13.	BACKLIGHT	<p>(1)NO LIGHT  (2)FLICKERING AND OTHER ABNORMAL ILLUMINATION  (3)SPOTS OR SCRATCHES THAT APPEAR WHEN LIT MUST BE JUDGED USING LCD SPOT, LINES AND CONTAMINATION STANDARDS.  (4)BACKLIGHT DOESN'T LIGHT OR COLOR IS WRONG.</p>
14.	GENERAL APPEARANCE	<p>(1)NO OXIDATION, CONTAMINATION, CURVES OR, BENDS ON INTERFACE PIN (OLB) OF TCP.  (2)NO CRACKS ON INTERFACE PIN (OLB) OF TCP.  (3)NO CONTAMINATION, SOLDER RESIDUE OR SOLDER BALLS ON PRODUCT.  (4)THE IC ON THE TCP MAY NOT BE DAMAGED, CIRCUITS.  (5)THE UPPERMOST EDGE OF THE PROTECTIVE STRIP ON THE INTERFACE PIN MUST BE PRESENT OR LOOK AS IF IT CAUSE THE INTERFACE PIN TO SEVER.  (6)THE RESIDUAL ROSIN OR TIN OIL OF SOLDERING (COMPONENT OR CHIP COMPONENT) IS NOT BURNED INTO BROWN OR BLACK COLOR.  (7)SEALANT ON TOP OF THE ITO CIRCUIT HAS NOT HARDENED.  (8)PIN TYPE MUST MATCH TYPE IN SPECIFICATION SHEET.  (9)LCD PIN LOOSE OR MISSING PINS.  (10)PRODUCT PACKAGING MUST THE SAME AS SPECIFIED ON PACKAGING SPECIFICATION SHEET.  (11)PRODUCT DIMENSION AND STRUCTURE MUST CONFORM TO PRODUCT SPECIFICATION SHEET.  (12)THE APPEARANCE OF HEAT SEAL SHOULD NOT ADMIT ANY DIRT AND BREAK.</p>

NO.	ITEM	CRITERIA										
15.	CRACKED GLASS	THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE										
		<p>GENERAL GLASS CHIP :</p> 	<table border="1" data-bbox="933 421 1455 497"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>t/2 &gt;, \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$t/2 >, \leq 2t$	$\leq W/2$	$\leq 1/8X$
		a	b	c								
		$\leq t/2$	< VIEWING AREA	$\leq 1/8X$								
		$t/2 >, \leq 2t$	$\leq W/2$	$\leq 1/8X$								
<p>CORNER PART :</p> 	<table border="1" data-bbox="933 1003 1455 1079"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>&gt; t/2, \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$> t/2, \leq 2t$	$\leq W/2$	$\leq 1/8X$		
a	b	c										
$\leq t/2$	< VIEWING AREA	$\leq 1/8X$										
$> t/2, \leq 2t$	$\leq W/2$	$\leq 1/8X$										
<p>CHIP ON ELECTRODE PAD</p> 	<table border="1" data-bbox="933 1276 1455 1330"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 0.5\text{mm}</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>* X=LCD SIDE WIDTH t=GLASS THICKNESS</p>	a	b	c	$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$					
a	b	c										
$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$										
	<table border="1" data-bbox="933 1433 1455 1487"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 1/8X</math></td> <td><math>\leq L</math></td> </tr> </tbody> </table> <p>*X=LCD SIDE WIDTH t = GLASS THICKNESS L=ELECTRODE PAD LENGTH ①IF GLASS CHIPPING THE ITO TERMINAL, OVER 2/3 OF THE ITO MUST REMAIN AND BE, INSPECTED ACCORDING TO ELECTRODE TERMINAL SPECIFICATIONS ②IF THE PRODUCT WILL BE HEAT SEALED BY THE CUSTOMER, THE ALIGNMENT MARK MUST NOT BE DAMAGED</p>	a	b	c	$\leq t$	$\leq 1/8X$	$\leq L$					
a	b	c										
$\leq t$	$\leq 1/8X$	$\leq L$										

## 12.4 RELIABILITY TEST

### 12.4.1 STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE

NO	ITEM	DESCRIPTION
1	HIGH TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +70°C FOR 240 HRS
2	LOW TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -20°C FOR 240 HRS
3	HIGH TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 HRS
4	LOW TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -30°C FOR 240 HRS
5	HIGH TEMP / HUMIDITY TEST STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 60°C , 90% RH 240 HRS
6	THERMAL SHOCK (NOT OPERATED)	THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION: -40°C FOR 30 MINUTES ~ +85°C FOR 30 MINUTES
7	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	AIR DISCHARGE ± 12KV CONTACT DISCHARGE ± 8KV

NOTE (1) : THE TEST SAMPLES HAVE RECOVERY TIME FOR 2 HOURS AT ROOM TEMPERATURE BEFORE THE FUNCTION CHECK. IN THE STANDARD CONDITIONS, THERE IS NO DISPLAY FUNCTION NG ISSUE OCCURRED.

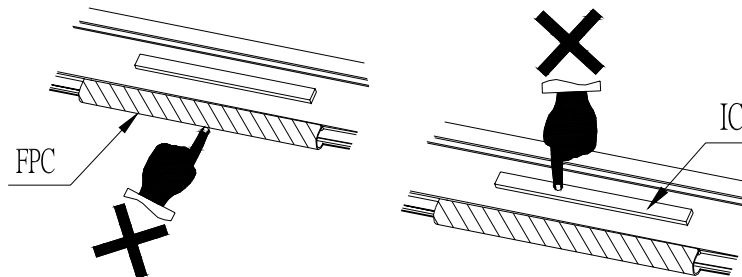
12.5 TESTING CONDITIONS AND INSPECTION CRITERIA

FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 12.5, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

NO	ITEM	TEST MODEL	INSPECTION CRITERIA
1	CURRENT CONSUMPTION	REFER TO SPECIFICATION	THE CURRENT CONSUMPTION SHOULD CONFORM TO THE PRODUCT SPECIFICATION.
2	CONTRAST	REFER TO SPECIFICATION	AFTER THE TESTS HAVE BEEN EXECUTED, THE CONTRAST MUST BE LARGER THAN HALF OF ITS INITIAL VALUE PRIOR TO THE TESTS.
3	APPEARANCE	VISUAL INSPECTION	DEFECT FREE

12.6 OPERATION

- 12.6.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED .
- 12.6.2 USE THE MODULE WITHIN SPECIFIED TEMPERATURE ; LOWER TEMPERATURE CAUSES THE RETARDATION OF BLINKING SPEED OF THE DISPLAY ; HIGHER TEMPERATURE MAKES OVERALL DISPLAY DISCOLOR . WHEN THE TEMPERATURE RETURNS TO NORMALITY, THE DISPLAY WILL OPERATE NORMALLY .
- 12.6.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST .
- 12.6.4 POWER ON SEQUENCE INPUT SIGNALS SHOULD NOT BE SUPPLIED TO LCD MODULE BEFORE POWER SUPPLY VOLTAGE IS APPLIED AND REACHES THE SPECIFIED VALUE .  
IF ABOVE SEQUENCE IS NOT FOLLOWED , CMOS LSIS OF LCD MODULES MAY BE DAMAGED DUE TO LATCH - UP PROBLEM .
- 12.6.5 NOT ALLOWED TO INFLICT ANY EXTERNAL STRESS AND TO CAUSE ANY MECHANICAL INTERFERENCE ON THE BENDING AREA OF FPC DURING THE TAIL BENDING BACKWARDS!  
DO NOT STRESS FPC AND IC ON THE MODULE!





## 12.7 NOTICE

- 12.7.1 USE A GROUNDED SOLDERING IRON WHEN SOLDERING CONNECTOR I/O TERMINALS . FOR SOLDERING OR REPAIRING, TAKE PRECAUTION AGAINST THE TEMPERATURE OF THE SOLDERING IRON AND THE SOLDERING TIME TO PREVENT PEELING OFF THE THROUGH-HOLE-PAD .
- 12.7.2 DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED .
- 12.7.3 DO NOT CHARGE STATIC ELECTRICITY , AS THE CIRCUIT OF THIS MODULE CONTAINS CMOS LSIS. A WORKMAN'S BODY SHOULD ALWAYS BE STATIC-PROTECTED BY USE OF AN ESD STRAP. WORKING CLOTHES FOR SUCH PERSONNEL SHOULD BE OF STATIC-PROTECTED MATERIAL .
- 12.7.4 ALWAYS GROUND THE ELECTRICALLY-POWERED DRIVER BEFORE USING IT TO INSTALL THE LCD MODULE. WHILE CLEANING THE WORK STATION BY VACUUM CLEANER, DO NOT BRING THE SUCKING MOUTH NEAR THE MODULE ; STATIC ELECTRICITY OF THE ELECTRICALLY-POWERED DRIVER OR THE VACUUM CLEANER MAY DESTROY THE MODULE .
- 12.7.5 DON'T GIVE EXTERNAL SHOCK.
- 12.7.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 12.7.7 LIQUID IN LCD IS HAZARDOUS SUBSTANCE. MUST NOT LICK AND SWALLOW.  
WHEN THE LIQUID IS ATTACH TO YOUR, SKIN, CLOTH ETC. WASH IT OUT THOROUGHLY AND IMMEDIATELY.
- 12.7.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 12.7.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.
- 12.7.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 12.7.11 REWIRING: NO MORE THAN 3 TIMES.