

EXAMINED BY :	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-0008507
Lucica Lu		ISSUE : AUG.23, 2017
APPROVED BY :		TOTAL PAGE : 23
Vincent Wh		VERSION : 1

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

ET104007DSA

(RoHS)

FOR MESSRS :

CUSTOMER'S APPROVAL

DATE :

\_\_\_\_\_

BY :

\_\_\_\_\_

EMERGING DISPLAY  
TECHNOLOGIES CORPORATION

MODEL NO.	VERSION	PAGE
ET104007DSA	1	0-1

RECORDS OF REVISION	DOC . FIRST ISSUE	AUG.23, 2017
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DATE	REVISED PAGE NO.	SUMMARY
		<p style="text-align: center; opacity: 0.5;"> <b>CONFIDENTIAL</b>            Authorized for            Emerging Display Technologies Corporation Only.            Do not distribute without authorization.         </p>

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1. GENERAL SPECIFICATIONS

1.1 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 -----	10.4 inch
( 2 ) NUMBER OF DOTS -----	1024W * (RGB) * 768H DOTS
( 3 ) MODULE SIZE -----	236W * 174.3H * 9.35D (MAX.) mm
( 4 ) ACTIVE AREA -----	211.2W * 158.4H mm
( 5 ) DOT SIZE -----	0.06875W * 0.20625H mm
( 6 ) PIXEL SIZE -----	0.20625W * 0.20625H mm
( 7 ) LCD TYPE -----	TFT , TRANSMISSIVE , ANTI-GLARE
( 8 ) COLOR -----	262K/16.2M
( 9 ) VIEWING DIRECTION -----	SUPER WIDE VIEW
( 10 ) BACK LIGHT -----	LED , COLOR : WHITE
( 11 ) INTERFACE MODE -----	LVDS

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### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	5.0	V	
STATIC ELECTRICITY	—	—	—	V	NOTE ( 1 )

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

#### 3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	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 )	10~100Hz XYZ DIRECTIONS 1 HR EACH
SHOCK	—	29.4 m/s <sup>2</sup> ( 3 G )	—	490 m/s <sup>2</sup> ( 5 0 G )	10 ms XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE ( 1 ) : Ta AT -30°C : WILL BE 48HRS MAX.

80°C : WILL BE 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).

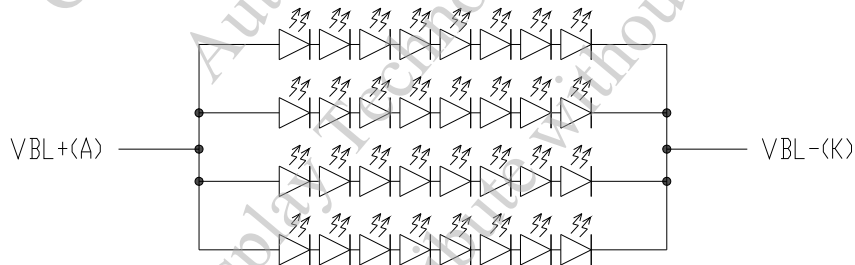
4. ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.15	3.30	3.45	V	
POWER SUPPLY VOLTAGE FOR LED DRIVER	VLED-VLSS	—	11.7	12.0	12.3	V	
POWER SUPPLY CURRENT	IDD	VDD-VSS=3.30V	—	400	500	mA	NOTE (1)
POWER SUPPLY CURRENT FOR LED DRIVER	IVLED	VLED-VLSS=12.0V	—	550	690	mA	
DIFFERENTIAL INPUT HIGH THRESHOLD VOLTAGE	VTH	VCM=1.2V	—	—	0.1	V	
DIFFERENTIAL INPUT LOW THRESHOLD VOLTAGE	VTL		-0.1	—	—	V	
INPUT CURRENT	IIN	—	-10	—	10	μA	
DIFFERENTIAL INPUT VOLTAGE	VID	—	0.1	—	0.6	V	
DIFFERENTIAL INPUT COMMON MODE VOLTAGE OFFSET	VCM	—	0.7	1.2	1.6	V	
POWER SUPPLY FOR LED BACKLIGHT	VF	IF=240mA	23.2	25.6	28.0	V	NOTE (2)
LED LIFE TIME	—	ILED=60mA (PER. LED)	70K	—	—	HOURS	NOTE (4) NOTE (5)

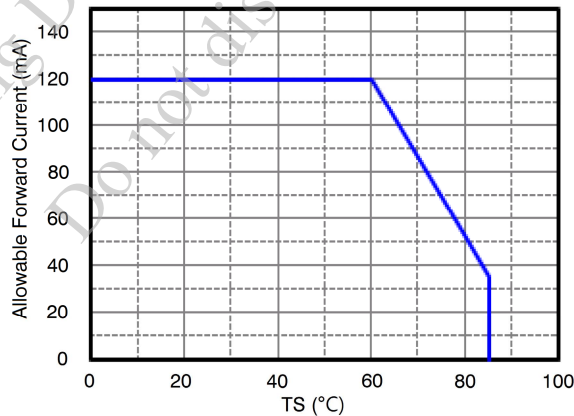
NOTE (1) : THE DISPLAY PATTERN IS ALL "WHITE" & 60Hz.

NOTE (2) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT

$$VF = VBL+(A) - VBL-(K)$$



NOTE (3) : AMBIENT TEMP. VS. ALLOWABLE FORWARD CURRENT. (PER. LED)



NOTE (4) : CONDITIONS; TA=25 °C, CONTINUOUS LIGHTING

NOTE (5) : DEFINITIONS OF LIFE TIME

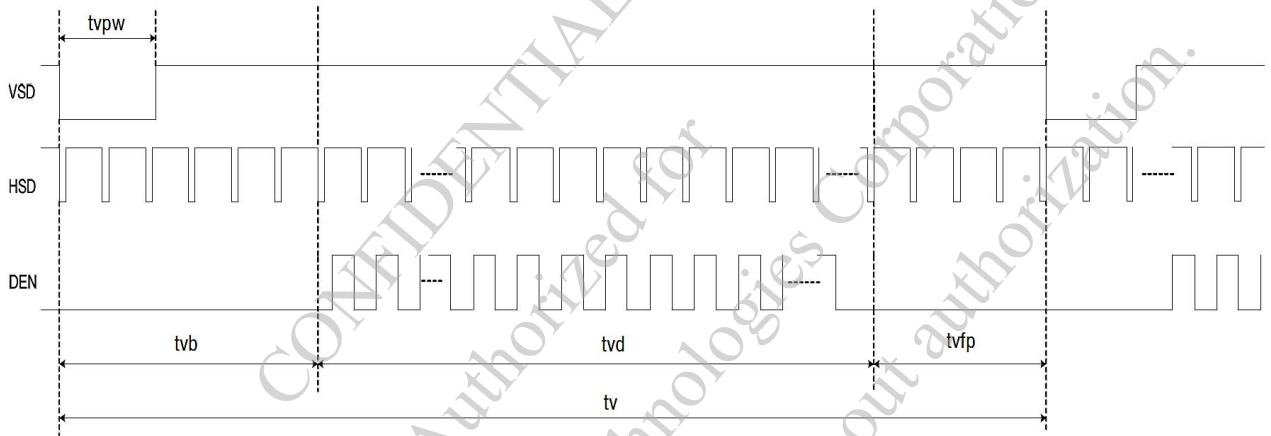
LCM LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

5. TIMING CHARACTERISTICS

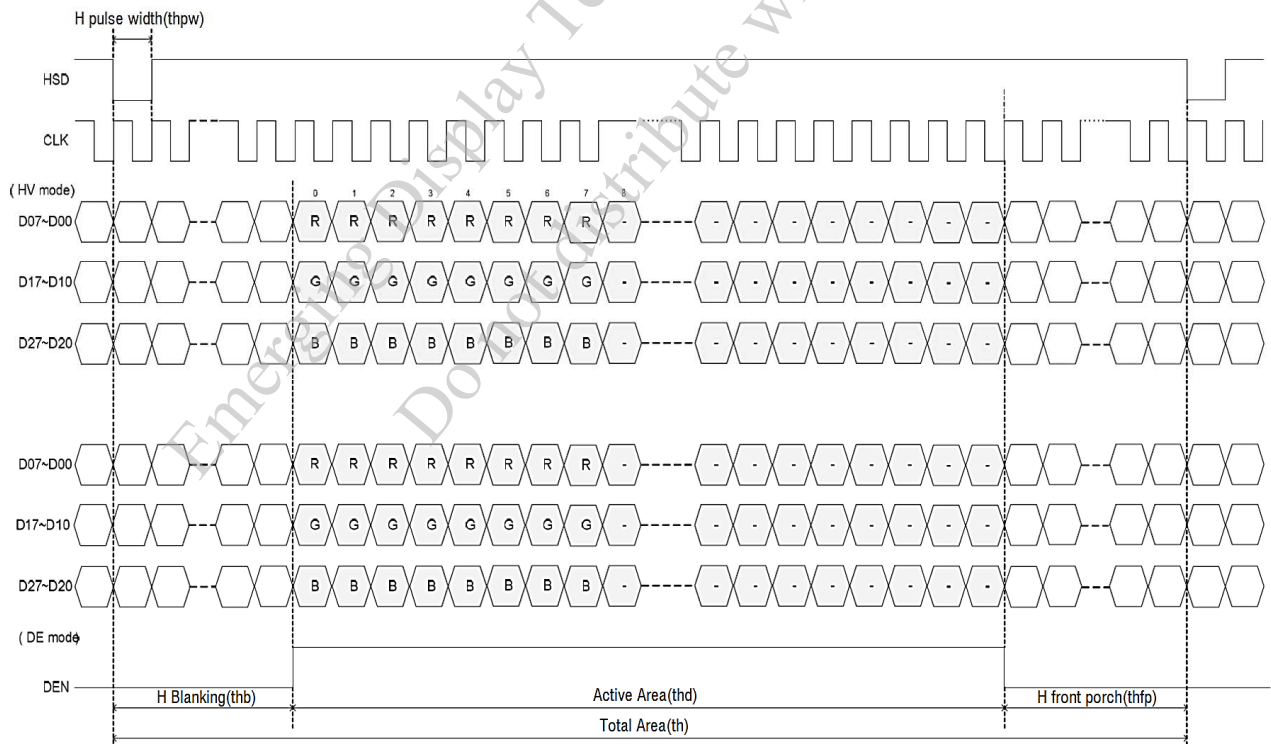
5.1 LCD MODULE TIMING CHARACTERISTICS (DE MODE)

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE
DCLK FREQUENCY	fclk	52	65	71	MHz	FRAME RATE=60Hz
HORIZONTAL DISPLAY AREA	thd	1024			DCLK	
HSYNC PERIOD TIME	th	1114	1344	1400	DCLK	
HSYNC BLANKING	thb+thfp	90	320	376	DCLK	
VERTICAL DISPLAY AREA	tvd	768			H	
VSYNC PERIOD TIME	tv	778	806	845	H	
VSYNC BLANKING	tvb+tvfp	10	38	77	H	

VERTICAL INPUT TIMING

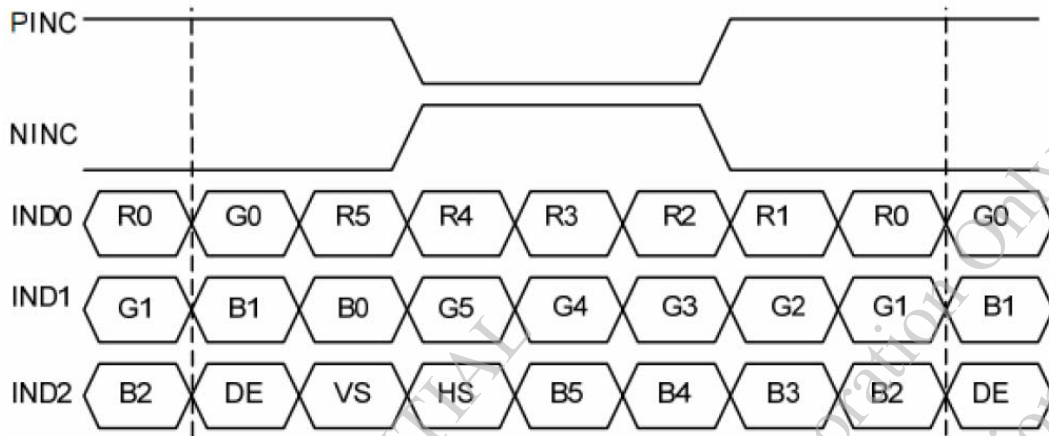


HORIZONTAL INPUT TIMING

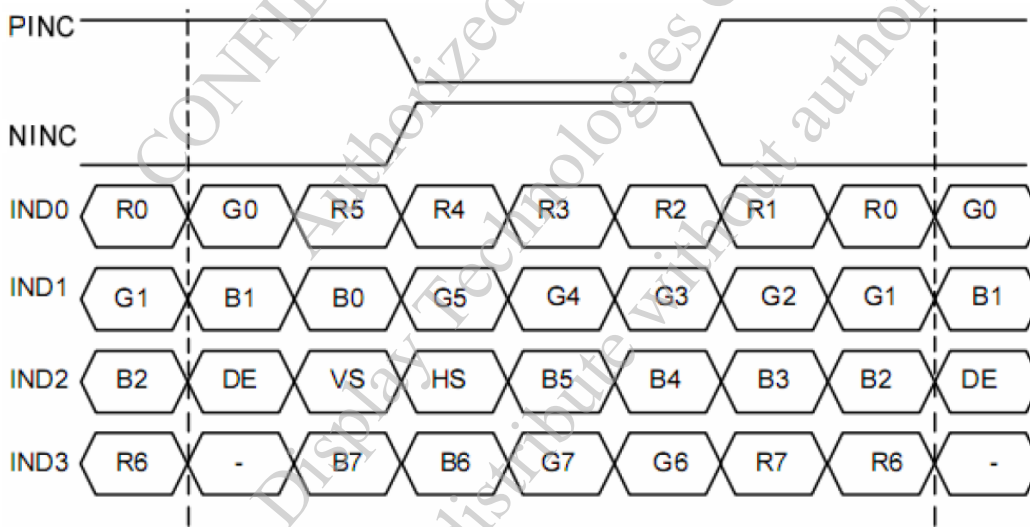


5.2 BIT LVDS INPUT

5.2.1 6BIT LVDS INPUT



5.2.2 8BIT LVDS INPUT





5.3 RELATIONSHIP BETWEEN DISPLAYED COLOR AND INPUT

	Display	MSB						LSB						Gray scale Level								
		R7	R6	R5	R4	R3	R2	G7	G6	G5	G4	G3	G2		B7	B6	B5	B4	B3	B2		
Basic color	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Light Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-	
	Red	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	
	Purple	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	
	Yellow	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-	
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	-		
Gray scale of Red	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	Light	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
Red	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	Red L255	
Gray scale of Green	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	Light	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
Green	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Green L255	
Gray scale of Blue	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	Light	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
Blue	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	Blue L255	
Gray scale of White & Black	Black	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L0	
	Dark	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L1
		L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L2
	Light	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	L3...L251
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L252
		H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L253
	H	H	H	H	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L254
White	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	H	White L255	

6. OPTICAL CHARACTERISTICS (NOTE 1)

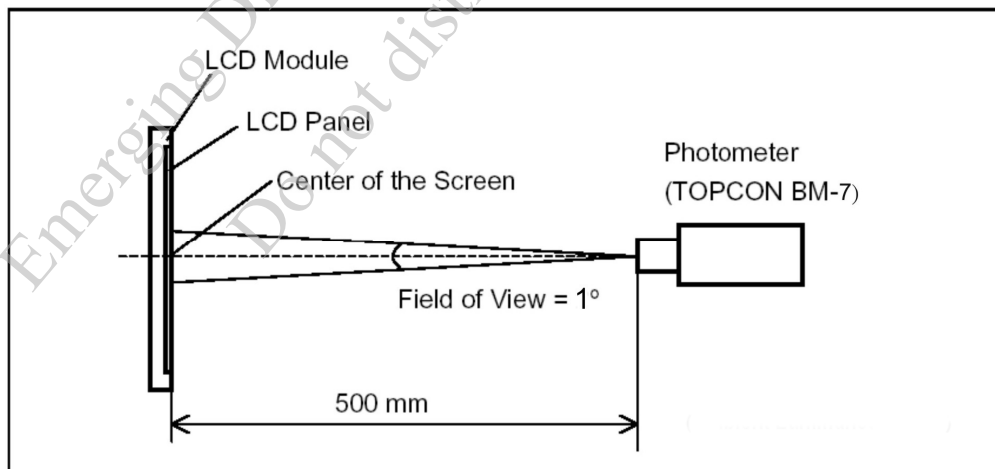
6.1 OPTICAL CHARACTERISTICS

Ta = 25 ± 2 °C

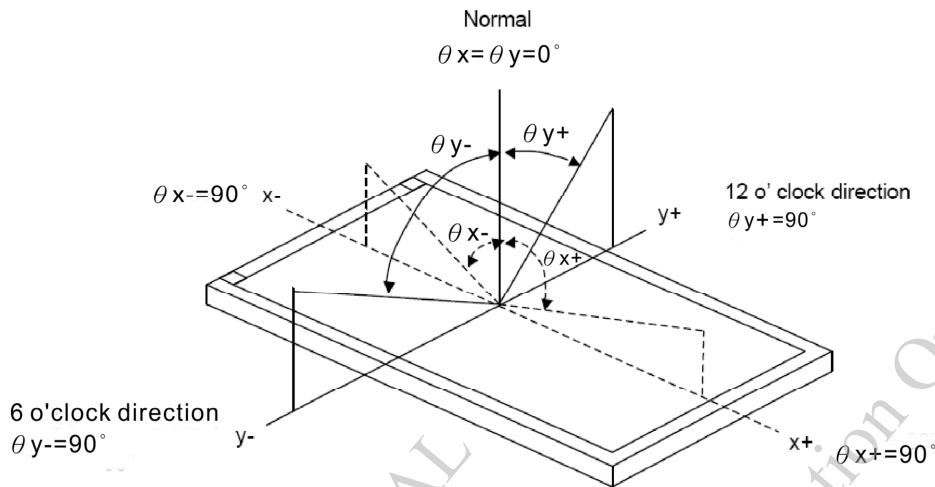
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
VIEWING ANGLE	$\theta_{y+}$	CR ≥ 10	$\theta_x=0^\circ$	80	85	—	deg.	NOTE (2) NOTE (3)
	$\theta_{y-}$			80	85	—		
	$\theta_{x+}$		$\theta_y=0^\circ$	80	85	—		
	$\theta_{x-}$			80	85	—		
CONTRAST RATIO	CR	$\theta_x=0^\circ, \theta_y=0^\circ$	600	900	—	—	NOTE (3)	
RESPONSE TIME	TR(rise)+TF(rise)	$\theta_x=0^\circ, \theta_y=0^\circ$	—	30	40	msec	NOTE (4)	
COLOR OF CIE COORDINATE	WHITE	Wx	$\theta_x=0^\circ, \theta_y=0^\circ$ VLED-VLSS=12.0V LED_PWM=DUTY 100%	0.25	0.30	0.35	—	NOTE (5)
		Wy		0.32	0.37	0.42		
	RED	Rx		0.59	0.64	0.69	—	
		Ry		0.31	0.36	0.41		
	GREEN	Gx		0.26	0.31	0.36	—	
		Gy		0.60	0.65	0.70		
	BLUE	Bx		0.11	0.16	0.21	—	
		By		0.05	0.10	0.15		
THE BRIGHTNESS OF MODULE (CENTER)	B	$\theta_x=0^\circ, \theta_y=0^\circ$ VLED-VLSS=12.0V LED_PWM=DUTY 100%	800	1000	—	cd/m <sup>2</sup>	NOTE (6)	
THE UNIFORMITY OF MODULE	—		70	—	—	%		

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 (AMBIENT LUMINANCE < 2LUX) 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 :

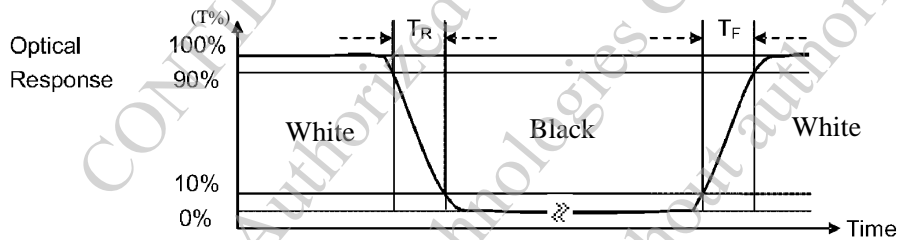


NOTE (3) : DEFINITION OF CONTRAST RATIO :

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

NOTE (4) : DEFINITION OF RESPONSE TIME :  $T_R$  AND  $T_F$

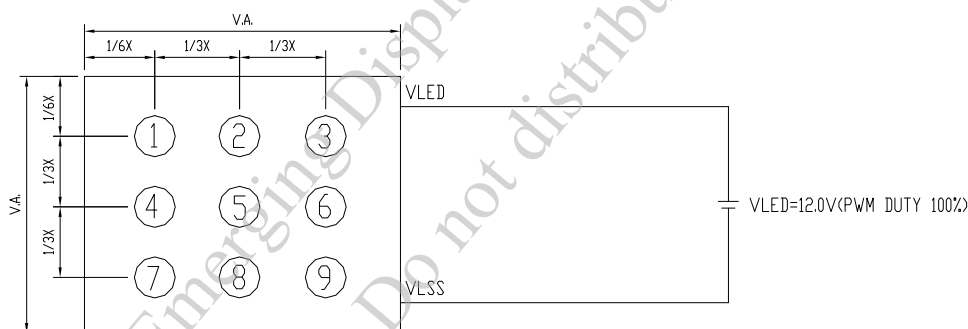
THE FIGURE BELOW IS THE OUTPUT SIGNAL OF THE PHOTO DETECTOR.



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

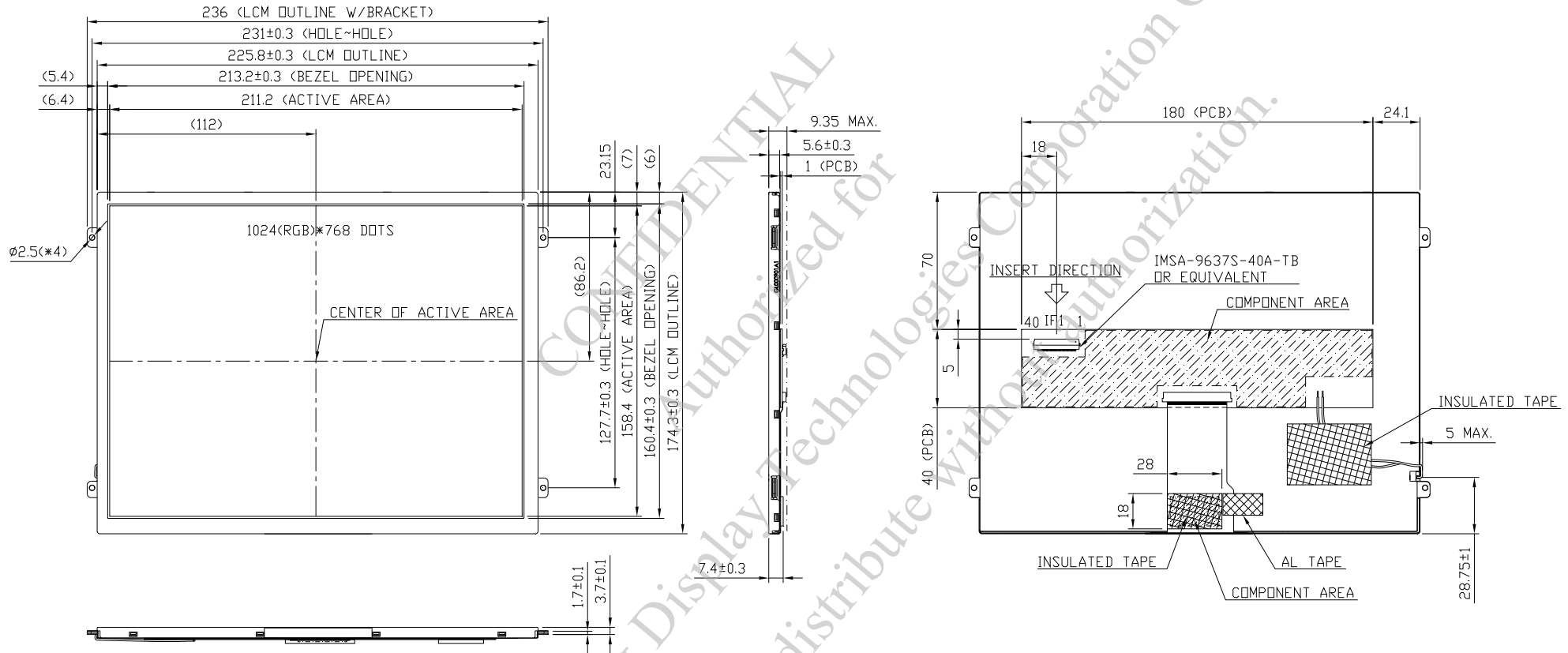


UNIT : mm

## 6.3 THE CALCULATING METHOD OF UNIFORMITY

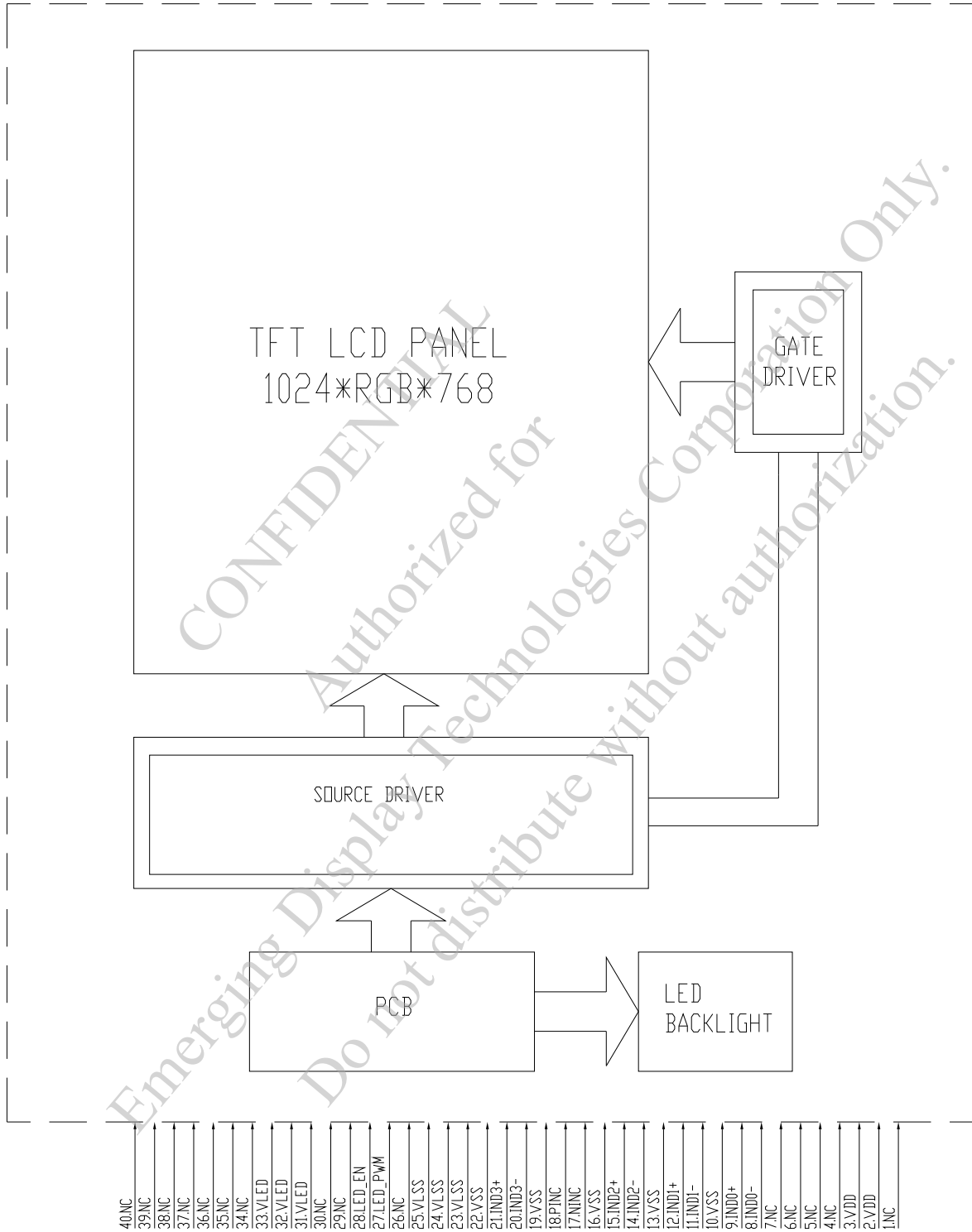
$$\text{UNIFORMITY: } \left[ \frac{\text{MINIMUM BRIGHTNESS}}{\text{MAXIMUM BRIGHTNESS}} \right] \times 100\%$$

7. OUTLINE DIMENSIONS

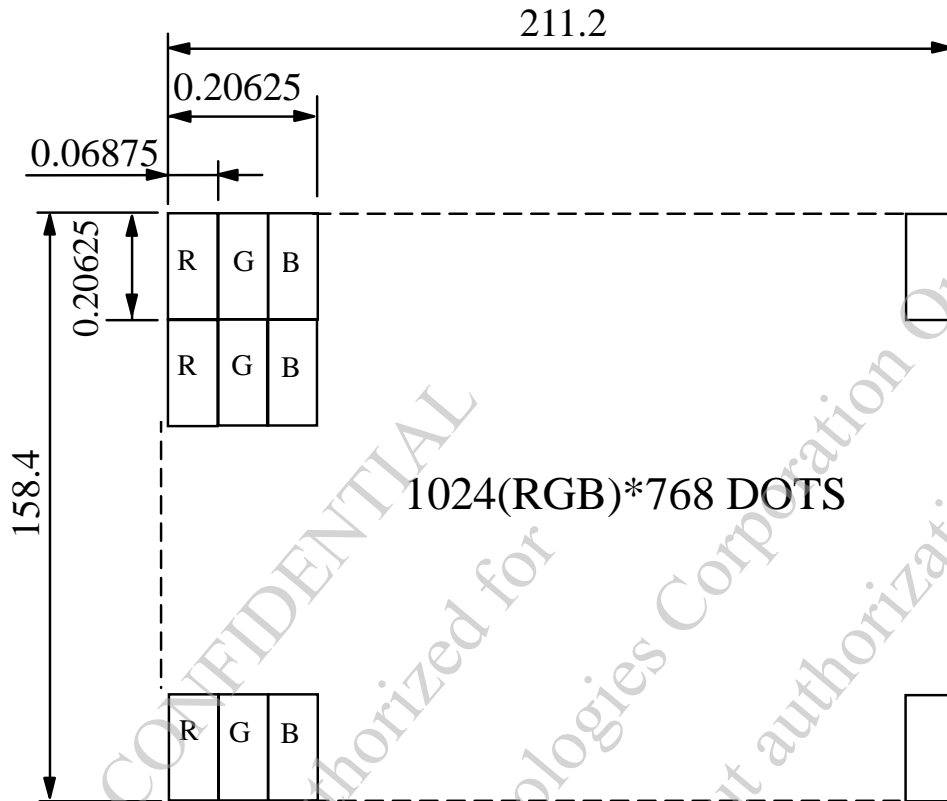


UNIT : mm  
SCALE : NTS  
NOT SPECIFIED TOLERANCE IS ±0.5mm

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



1024(RGB)\*768 DOTS

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

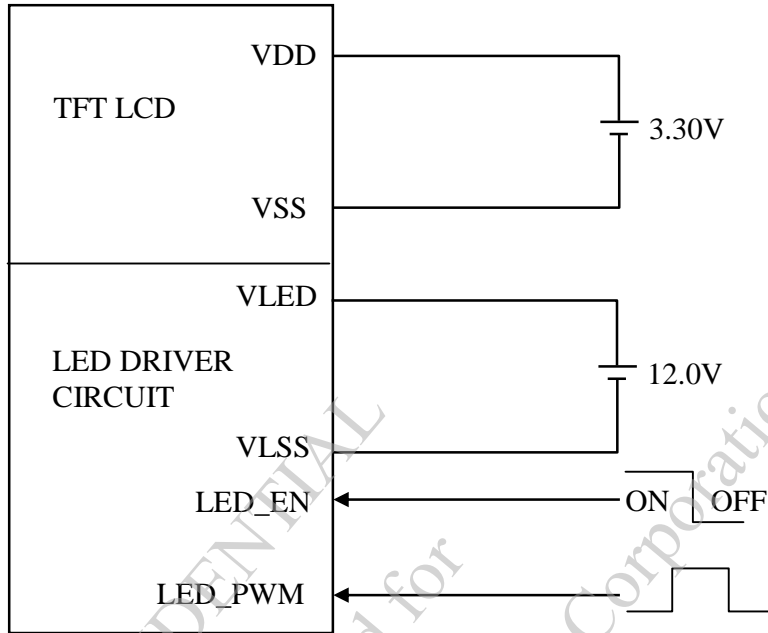
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10. INTERFACE SIGNALS

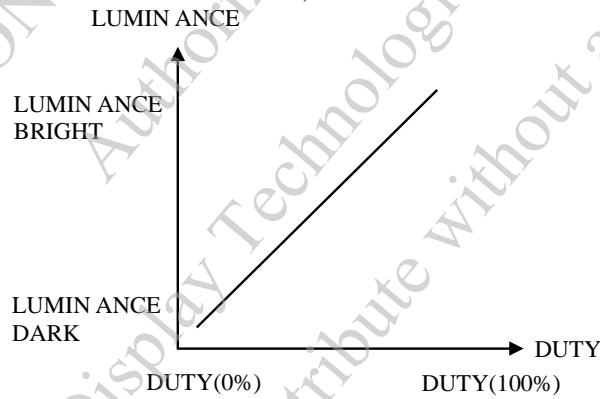
PIN NO.	SYMBOL	FUNCTION
1	NC	NON CONNECTION
2	VDD	POWER SUPPLY VOLTAGE
3	VDD	POWER SUPPLY VOLTAGE
4	NC	NON CONNECTION
5	NC	NON CONNECTION
6	NC	NON CONNECTION
7	NC	NON CONNECTION
8	IND0-	LVDS SIGNAL (-) — CHANNEL 0 (R0~R5,G0)
9	IND0+	LVDS SIGNAL (+) — CHANNEL 0 (R0~R5,G0)
10	VSS	GROUND
11	IND1-	LVDS SIGNAL (-) — CHANNEL 1 (G1~G5,B0,B1)
12	IND1+	LVDS SIGNAL (+) — CHANNEL 1 (G1~G5,B0,B1)
13	VSS	GROUND
14	IND2-	LVDS SIGNAL (-) — CHANNEL 2 (B2~B5,VS,HS,DE)
15	IND2+	LVDS SIGNAL (+) — CHANNEL 2 (B2~B5,VS,HS,DE)
16	VSS	GROUND
17	NINC	LVDS CLOCK SIGNAL (-)
18	PINC	LVDS CLOCK SIGNAL (+)
19	VSS	GROUND
20	IND3-	LVDS SIGNAL (-) — CHANNEL 3 (R6,R7,G6,G7,B6,B7)
21	IND3+	LVDS SIGNAL (+) — CHANNEL 3 (R6,R7,G6,G7,B6,B7)
22	VSS	GROUND
23	VLSS	POWER SUPPLY VOLTAGE FOR LED DRIVER
24	VLSS	POWER SUPPLY VOLTAGE FOR LED DRIVER
25	VLSS	POWER SUPPLY VOLTAGE FOR LED DRIVER
26	NC	NON CONNECTION
27	LED_PWM	PWM INPUT SIGNAL FOR LED DRIVER
28	LED_EN	ENABLE PIN FOR LED DRIVER
29	NC	NON CONNECTION
30	NC	NON CONNECTION
31	VLED	POWER SUPPLY VOLTAGE FOR LED DRIVER
32	VLED	POWER SUPPLY VOLTAGE FOR LED DRIVER
33	VLED	POWER SUPPLY VOLTAGE FOR LED DRIVER
34	NC	NON CONNECTION
35	NC	NON CONNECTION
36	NC	NON CONNECTION
37	NC	NON CONNECTION
38	NC	NON CONNECTION
39	NC	NON CONNECTION
40	NC	NON CONNECTION

11. POWER SUPPLY

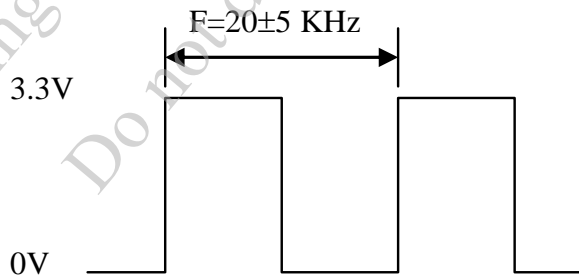
11.1 POWER SUPPLY FOR LCM



NOTE (1) : ADJUST THE PWM SIGNAL IN ORDER TO CONTROL LED BACKLIGHT'S BRIGHTNESS. THE HIGHER THE DUTY CYCLE, THE HIGHER THE BRIGHTNESS



NOTE (2) : PWM SIGNAL=0~3.3V , OPERATION FREQUENCY : 20±5KHz





12. INSPECTION CRITERION

12.1 APPLICATION

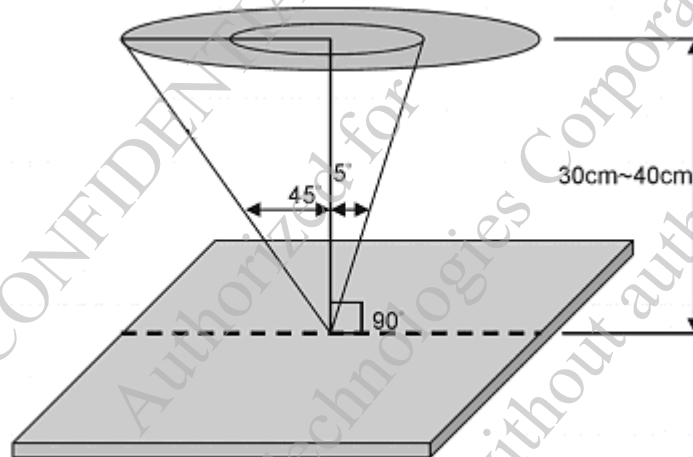
THIS INSPECTION STANDARD IS TO BE APPLIED TO THE LCD MODULE DELIVERED FROM EMERGING DISPLAY TECHNOLOGIES CORP.( E.D.T ) TO CUSTOMERS

12.2 INSPECTION CONDITIONS

12.2.1 (1)OBSERVATION DISTANCE : 35±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		25±5°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

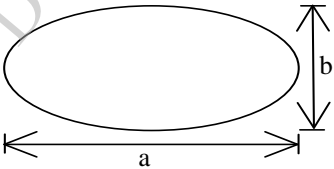
MINOR DEFECT : AQL 1.0

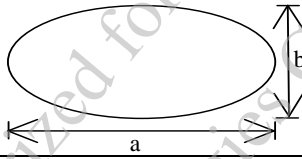
12.3 INSPECTION STANDARDS

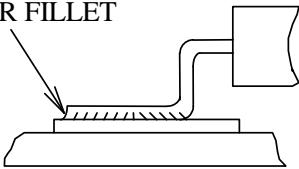
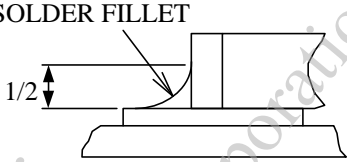
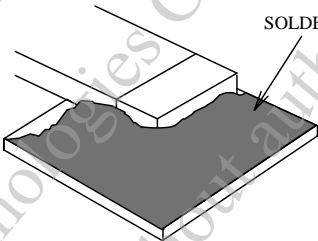
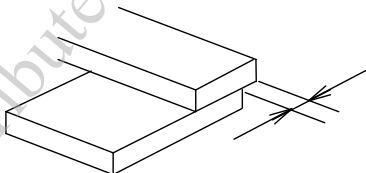
12.3.1 VISUAL DEFECTS CLASSIFICATION

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>• UNEVEN COLOR SPREAD</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>	

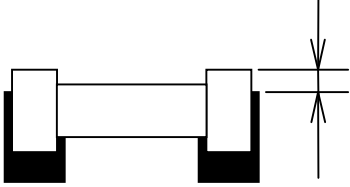
12.3.2 MODULE DEFECTS CLASSIFICATION

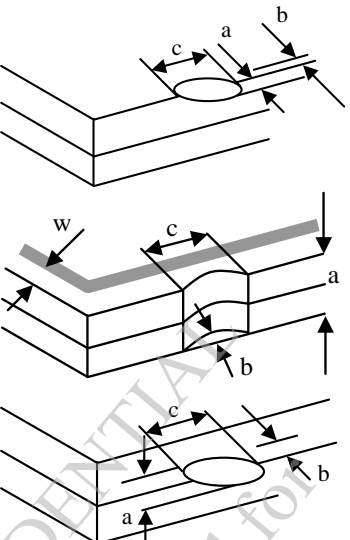
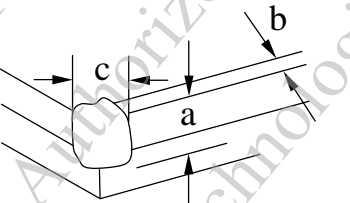
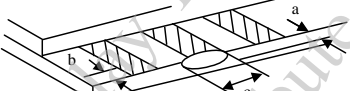
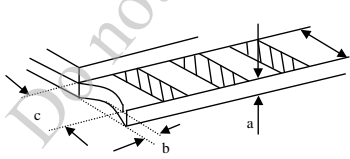
NO.	ITEM	CRITERIA																				
1	DISPLAY ON INSPECTION	(1)INCORRECT PATTERN (2)MISSING SEGMENT (3)DIM SEGMENT (4)OPERATING VOLTAGE BEYOND SPEC																				
2	OVERALL DIMENSIONS	(1)OVERALL DIMENSION BEYOND SPEC																				
3	DOT DEFECT	<p>(1)INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS.</p> <p>(2)</p> <table border="1"> <thead> <tr> <th colspan="2">ITEM</th> <th>ACCEPTABLE COUNT</th> </tr> </thead> <tbody> <tr> <td rowspan="3">BRIGHT DOT</td> <td>RANDOM</td> <td><math>N \leq 0</math></td> </tr> <tr> <td>2 DOTS ADJACENT (PAIR)</td> <td><math>N \leq 0</math></td> </tr> <tr> <td>3 DOTS ADJACENT OR MORE</td> <td><math>N = 0</math></td> </tr> <tr> <td rowspan="3">DARK DOT</td> <td>RANDOM</td> <td><math>N \leq 2</math></td> </tr> <tr> <td>2 DOTS ADJACENT (PAIR)</td> <td><math>N \leq 0</math></td> </tr> <tr> <td>3 DOTS ADJACENT OR MORE</td> <td><math>N = 0</math></td> </tr> <tr> <td colspan="2">TOTAL BRIGHT AND DARK DOT</td> <td><math>N \leq 2</math></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. THE BRIGHT DOT DEFECT MOST BE VISIBLE THROUGH A 5% ND FILTER</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>	ITEM		ACCEPTABLE COUNT	BRIGHT DOT	RANDOM	$N \leq 0$	2 DOTS ADJACENT (PAIR)	$N \leq 0$	3 DOTS ADJACENT OR MORE	$N = 0$	DARK DOT	RANDOM	$N \leq 2$	2 DOTS ADJACENT (PAIR)	$N \leq 0$	3 DOTS ADJACENT OR MORE	$N = 0$	TOTAL BRIGHT AND DARK DOT		$N \leq 2$
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DARK DOT	RANDOM	$N \leq 2$																				
	2 DOTS ADJACENT (PAIR)	$N \leq 0$																				
	3 DOTS ADJACENT OR MORE	$N = 0$																				
TOTAL BRIGHT AND DARK DOT		$N \leq 2$																				
4	FOREIGN BLACK/WHITE/ BRIGHT LINE/ SCRATCH OF VIEWING AREA	<table border="1"> <thead> <tr> <th>LENGTH : L</th> <th>WIDTH : W</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>L \leq 0.5</math></td> <td><math>W \leq 0.05</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.5 &lt; L \leq 5.0</math></td> <td><math>0.05 &lt; W \leq 0.1</math></td> <td>6</td> </tr> <tr> <td><math>5.0 &lt; L</math></td> <td><math>0.1 &lt; W</math></td> <td>NONE</td> </tr> </tbody> </table> <p>WIDTH : W mm, LENGTH : L mm</p>	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	$L \leq 0.5$	$W \leq 0.05$	IGNORE	$0.5 < L \leq 5.0$	$0.05 < W \leq 0.1$	6	$5.0 < L$	$0.1 < W$	NONE								
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$0.5 < L \leq 5.0$	$0.05 < W \leq 0.1$	6																				
$5.0 < L$	$0.1 < W$	NONE																				
5	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table border="1"> <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>8</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	$0.15 < D \leq 0.5$	8	$0.5 < D$	NONE												
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$D \leq 0.15$	IGNORE																					
$0.15 < D \leq 0.5$	8																					
$0.5 < D$	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	$D \leq 0.3$	IGNORE
			$0.3 < D \leq 0.5$	$N \leq 5$
			$0.5 < D$	NONE
		SURFACE STAINS	$D < 0.15$	IGNORE
			$0.15 < D \leq 0.5$	$N \leq 6$
		CF FAIL / SPOT	$D < 0.15$	IGNORE
$0.15 < D \leq 0.5$	$N \leq 4$			
		<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 ALLOWED		
8	MURA ON DISPLAY	IT'S OK IF MURA IS SLIGHT VISIBLE THROUGH 5% ND FILTER		
9	UNEVEN COLOR SPREAD, COLORATION	(1)TO BE DETERMINED BASED UPON THE STANDARD SAMPLE.		
10	BEZEL APPEARANCE	<p>(1)BEZEL MAY NOT HAVE RUST, BE DEFORMED OR HAVE FINGER PRINTS STAINS OF OTHER CONTAMINATION.</p> <p>(2)BEZEL MUST COMPLY WITH JOB SPECIFICATIONS.</p>		
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.</p> <p>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 style="text-align: center;">SOLDER FILLET</p>  <p>(b)CHIP COMPONENT · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING</p> <p style="text-align: center;">SOLDER FILLET</p>  <p>· SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF SIDES AND FRONT SURFACE AREA ARE COVERED</p> <p style="text-align: center;">SOLDER</p>  <p>(3)PARTS ALIGNMENT</p> <p>(a)LSI, IC LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE</p> 

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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	<p>THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE</p> <p>GENERAL GLASS CHIP :</p>  <table border="1" data-bbox="933 414 1452 504"> <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 1452 1086"> <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 1452 1332"> <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 1452 1489"> <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 TEMPERATURE / HUMIDITY TEST STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 60°C, 90% RH 240 HRS
6	THERMAL SHOCK (NOT OPERATED)	<p>THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION:</p>
7	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	AIR DISCHARGE ± 12KV CONTACT DISCHARGE ± 8KV (ACCORDING TO IEC-61000-4-2)

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

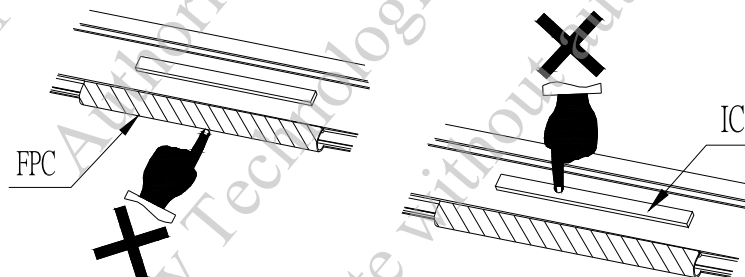
FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 12.5, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

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.