

EXAMINED BY :	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-0009076
Lucica Lu		ISSUE : JUN.06, 2023
APPROVED BY:		TOTAL PAGE : 24
Vincent Wu		VERSION : 5

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :

ET035023UDBA

(RoHS)

FOR MESSRS :

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CUSTOMER'S APPROVAL

DATE :

\_\_\_\_\_

BY :

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RECORDS OF REVISION	DOC . FIRST ISSUE	SEP.21, 2020
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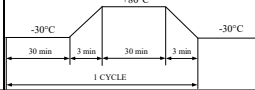
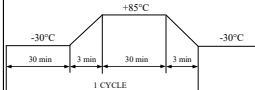
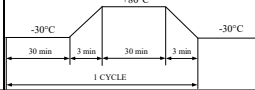
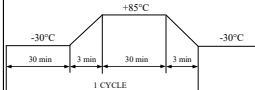
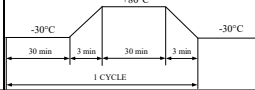
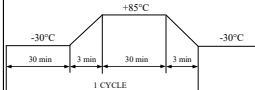
DATE	REVISED PAGE NO.	SUMMARY																																																		
OCT.28, 2020	11	8. BLOCK DIAGRAM NO.45 CN(NC)/ID1→CN/ID1;NO.46 SDIN(NC)/ID2→SDIN/ID2 NO.47 SCK(NC)/ID3→SCK/ID3																																																		
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MAR.11, 2022	3	4. ELECTRICAL CHARACTERISTICS ITEM:POWER SUPPLY CURRENT FOR LED DRIVER TYP.=(100)→100,MAX.=(130)→130																																																		
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## 1. GENERAL SPECIFICATIONS

### 1.1 DATA SHEET FOR CONTROLLER/DRIVER PLEASE REFER TO :

SITRONIX ST7272A-G4

### 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), BIS(2-ETHYLHEXYL) PHTHALATE (DEHP), BUTYL BENZYL PHTHALATE (BBP), DIBUTYL PHTHALATE (DBP), DIISOBUTYL PHTHALATE (DIBP).

## 2. MECHANICAL SPECIFICATIONS

( 1 ) DISPLAY SIZE	-----	3.5 inch
( 2 ) NUMBER OF DOTS	-----	320W * (RGB) * 240H DOTS
( 3 ) MODULE SIZE	-----	76.8W * 63.8H * 4.3D mm (WITHOUT FPC)
( 4 ) VIEWING AREA	-----	71.6W * 54.0H mm
( 5 ) ACTIVE AREA	-----	70.08W * 52.56H mm
( 6 ) DOT SIZE	-----	0.073W * 0.219H mm
( 7 ) PIXEL SIZE	-----	0.219W * 0.219H mm
( 8 ) LCD TYPE	-----	TFT , IPS , TRANSMISSIVE, NORMALLY BLACK
( 9 ) COLOR	-----	16.7M
( 10 ) VIEWING DIRECTION	-----	SUPER WIDE VIEW
( 11 ) BACK LIGHT	-----	LED , COLOR : WHITE
( 12 ) INTERFACE MODE	-----	RGB 24BIT PARALLEL (DE/SYNC MODE)

### 3. ABSOLUTE MAXIMUM RATINGS

#### 3.1 LCD MODULE ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	4.0	V	—
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VSS	5.0	15.0	V	
STATIC ELECTRICITY	—	—	—	V	NOTE (1)

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

NOTE (2) : THE ABSOLUTE MAXIMUM RATING VALUES OF THIS PRODUCT ARE NOT ALLOWED TO BE EXCEEDED AT ANY TIMES. SHOULD A MODULE BE USED WITH ANY OF THE ABSOLUTE MAXIMUM RATINGS EXCEEDED, THE CHARACTERISTICS OF THE MODULE MAY NOT BE RECOVERED, OR IN AN EXTREME CASE, THE MODULE MAY BE PERMANENTLY DESTROYED.

#### 3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-30°C	85°C	-30°C	85°C	NOTE (1), (2), (3), (4)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s <sup>2</sup> (0.25 G)	—	11.76 m/s <sup>2</sup> (1.2 G)	10~100 Hz XYZ DIRECTIONS 1 HR EACH
SHOCK	—	29.4 m/s <sup>2</sup> (3 G)	—	490 m/s <sup>2</sup> (50 G)	10 ms XYZ DIRECTIONS 1 TIME EACH
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

NOTE (1) : THE ABSOLUTE MAXIMUM RATINGS OF THIS PRODUCT SHOULD NOT BE EXCEEDED AT ANY TIME. IF THESE RATINGS ARE EXCEEDED, THE PRODUCT'S PERFORMANCE IS NOT GUARANTEED AND THE PRODUCT MAY EXPERIENCE PERMANENT DAMAGE.

NOTE (2) : 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.)

NOTE (3) : BACKGROUND COLOR CHANGES SLIGHTLY DEPENDING ON AMBIENT TEMPERATURE THIS PHENOMENON IS REVERSIBLE.

NOTE (4) : WHEN THE LCD MODULE IS OPERATED AT A HIGHER AMBIENT TEMPERATURE THAN 80°C, THE PWM DUTY CYCLE OF THE LED BACKLIGHT SHOULD BE ADJUSTED TO BE LESS THAN TBD. IF THE MODULE IS OPERATED AT A HIGHER DUTY CYCLE THAN TBD, THEN THERE IS A POSSIBILITY OF DISTORTION AND IRREGULARITY OF THE PICTURE DUE TO LIQUID CRYSTAL BEHAVIOR.

4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

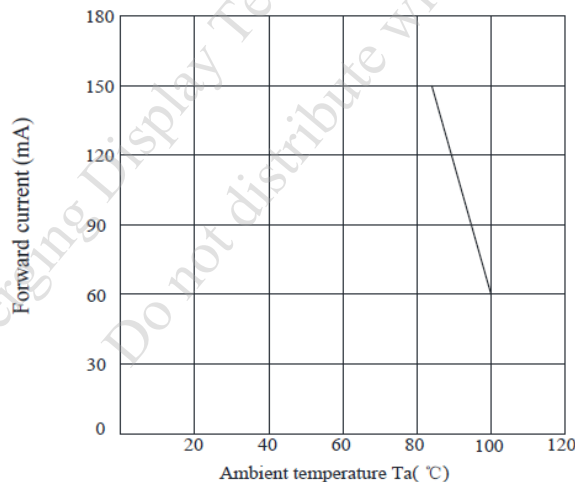
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.0	3.3	3.6	V	
POWER SUPPLY CURRENT	IDD	VDD-VSS =3.3V	—	20	30	mA	NOTE ( 1 )
LOGIC HIGH INPUT VOLTAGE	V <sub>IH</sub>	—	0.7*VDD	—	—	V	
LOGIC LOW INPUT VOLTAGE	V <sub>IL</sub>	—	—	—	0.3*VDD	V	
LOGIC HIGH OUTPUT VOLTAGE	V <sub>OH</sub>	I <sub>OH</sub> = -1.0mA	VDD-0.4	—	VDD	V	
LOGIC LOW OUTPUT VOLTAGE	V <sub>OL</sub>	I <sub>OL</sub> = +1.0mA	VSS	—	VSS+0.4	V	
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VSS	—	5	12	15	V	
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+-VSS =12V LED B/L=ON	—	100	130	mA	
LED LIFE TIME	—	IF=50mA (PER LED)	50K	—	—	HRS	NOTE ( 4 ) NOTE ( 5 )

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

NOTE ( 2 ) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT



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



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

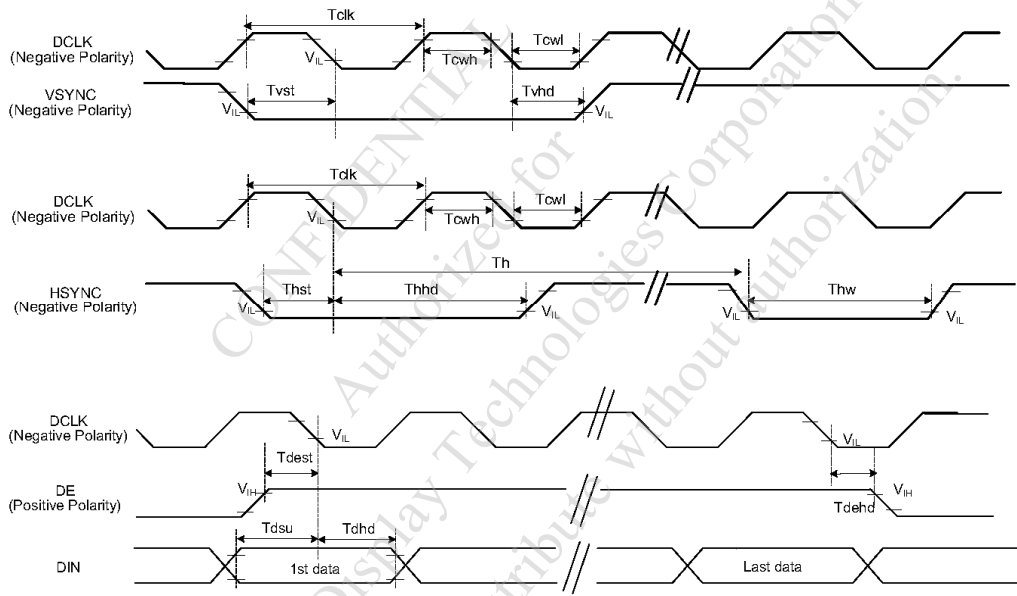
NOTE ( 5 ) : DEFINITIONS OF LIFE TIME :

LCM LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

5. TIMING CHARACTERISTICS

5.1 PIXEL TIMING

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
CLK PULSE DUTY	Tclk	40	50	60	%
HSYNC WIDTH	Thw	2	—	—	DCLK
HSYNC PERIOD	Th	55	60	65	us
VSYNC SETUP TIME	Tvst	12	—	—	ns
VSYNC HOLD TIME	Tvhd	12	—	—	ns
HSYNC SETUP TIME	Thst	12	—	—	ns
HSYNC HOLD TIME	Thhd	12	—	—	ns
DATA SETUP TIME	Tdsu	12	—	—	ns
DATA HOLD TIME	Tdhd	12	—	—	ns
DE SETUP TIME	Tdest	12	—	—	ns
DE HOLD TIME	Tdehd	12	—	—	ns



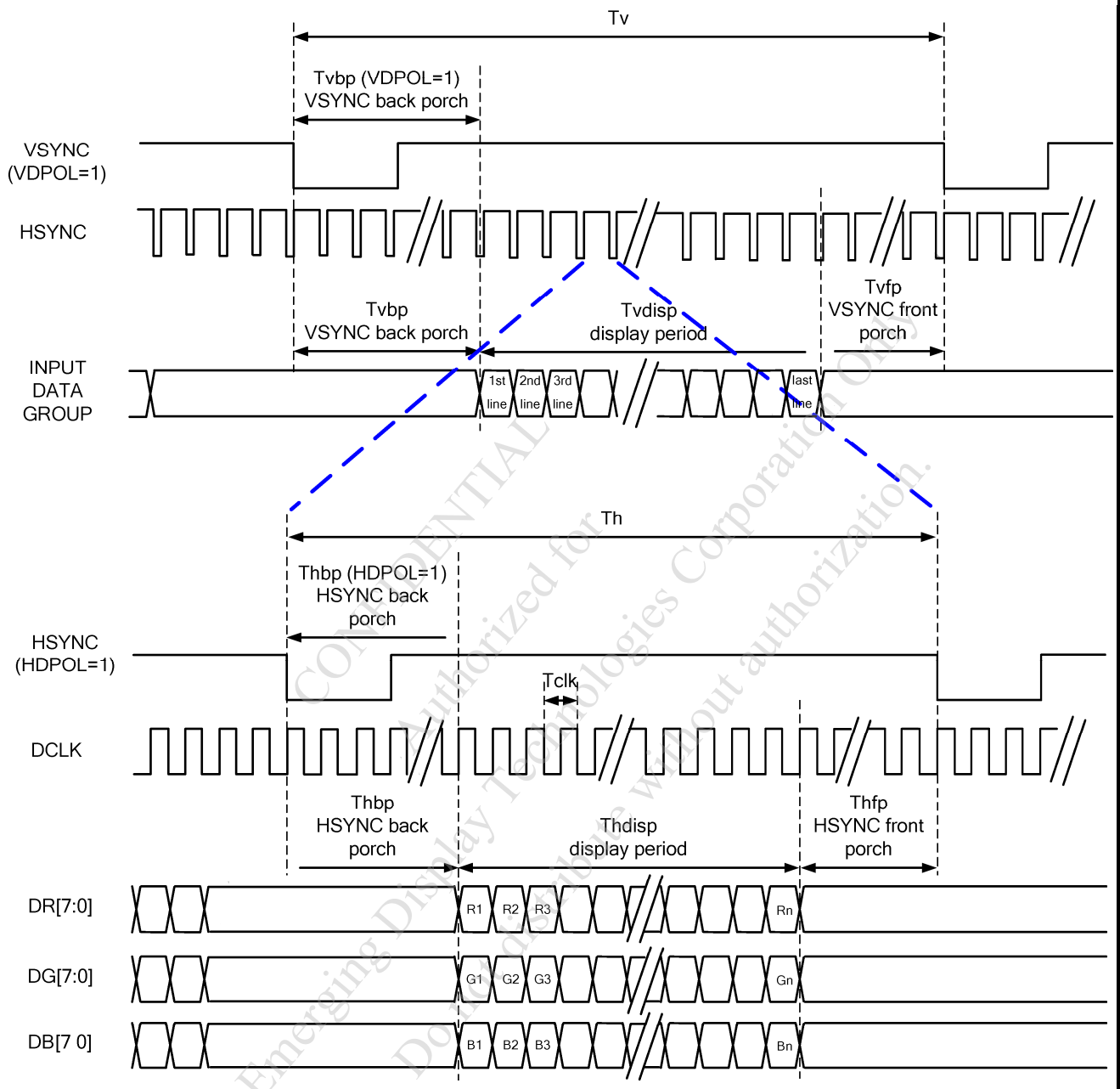
5.2 PARALLEL 24-bit RGB INPUT TIMING TABLE

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	NOTE	
DCLK FREQUENCY	Fclk	5	6	8	MHz		
DCLK PERIOD	Tclk	125	167	200	ns		
HSYNC	PERIOD TIME	Th	325	371	438	DCLK	
	DISPLAY PERIOD	Thdisp	—	320	—	DCLK	
	BACK PORCH	Thbp	3	43	43	DCLK	SYNC MODE BACK PORCH CONTROL BY H_BLANKING[7:0] SETTING Thbp=H_BLANKING[7:0]
	FRONT PORCH	Thfp	2	8	75	DCLK	
	PULSE WIDTH	Thw	2	4	43	DCLK	
VSYNC	PERIOD TIME	Tv	244	260	289	HSYNC	
	DISPLAY PERIOD	Tvdisp	—	240	—	HSYNC	
	BACK PORCH	Tvbp	2	12	12	HSYNC	SYNC MODE BACK PORCH CONTROL BY V_BLANKING[7:0] SETTING Tvbp=V_BLANKING[7:0]
	FRONT PORCH	Tvfp	2	8	37	HSYNC	
	PULSE WIDTH	Tvw	2	4	12	HSYNC	

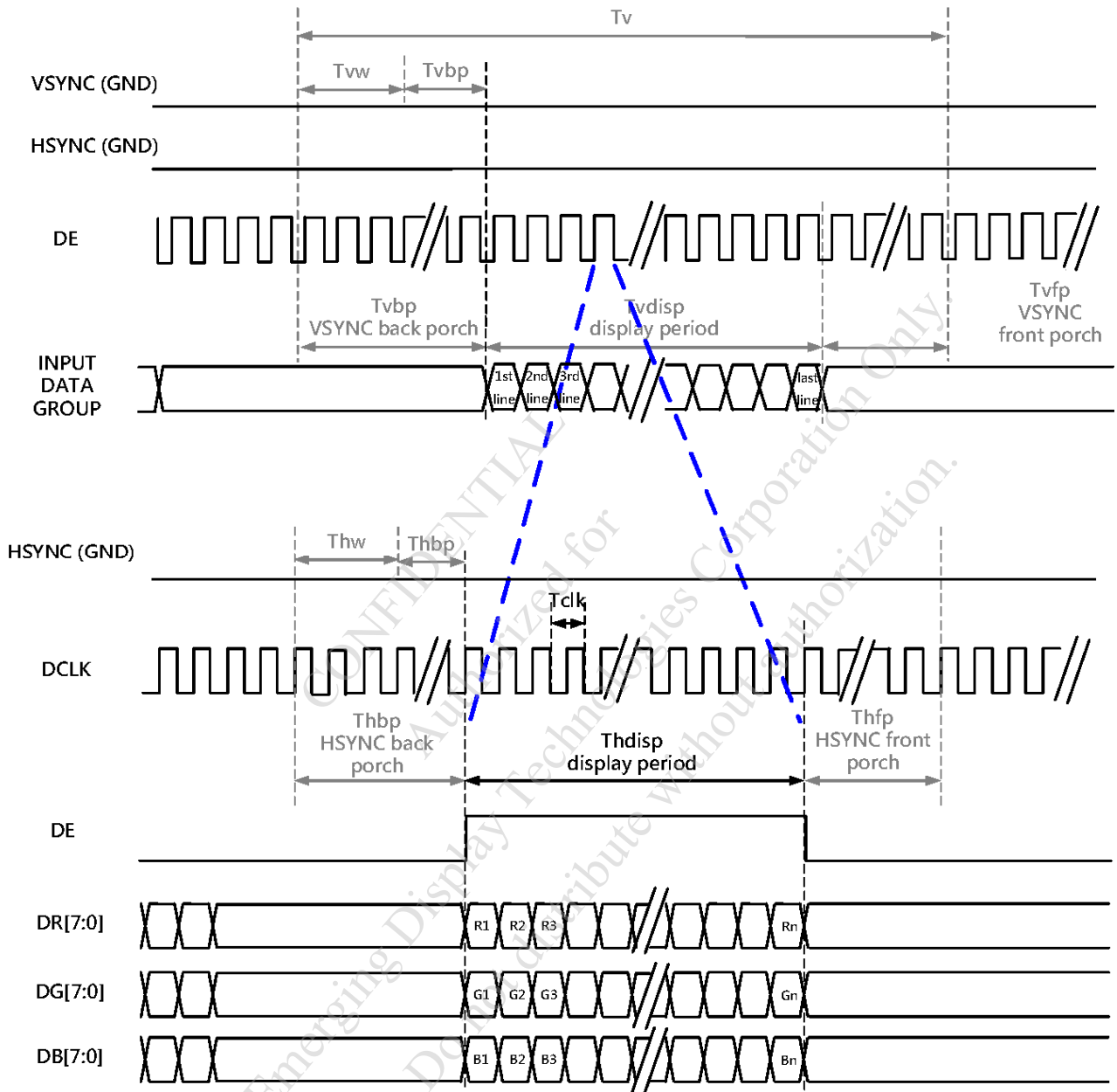
NOTE: IT IS NECESSARY TO KEEP Tvbp =12 AND Thbp =43 IN SYNC MODE. DE MODE IS UNNECESSARY TO KEEP IT.



5.3 PARALLEL RGB INTERFACE (SYNC MODE)



5.4 PARALLEL RGB INTERFACE (DE MODE)



6. OPTICAL CHARACTERISTICS (NOTE 1)

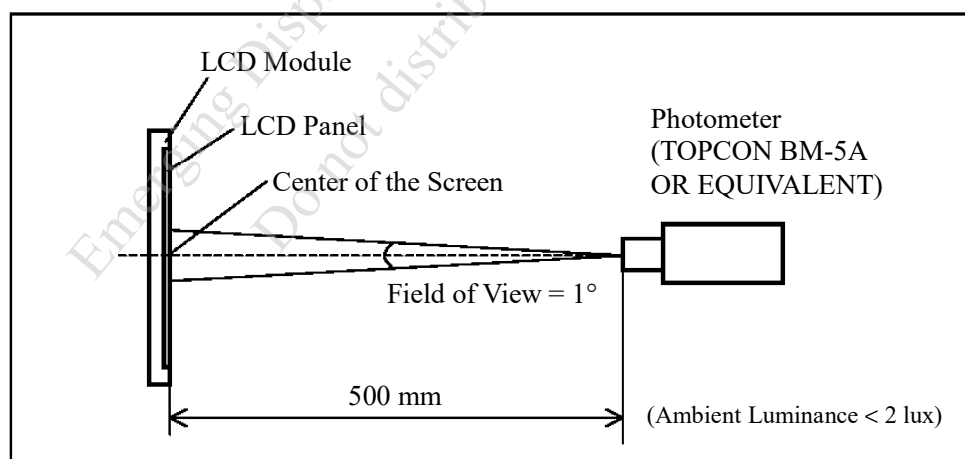
6.1 OPTICAL CHARACTERISTICS

Ta=25±2°C

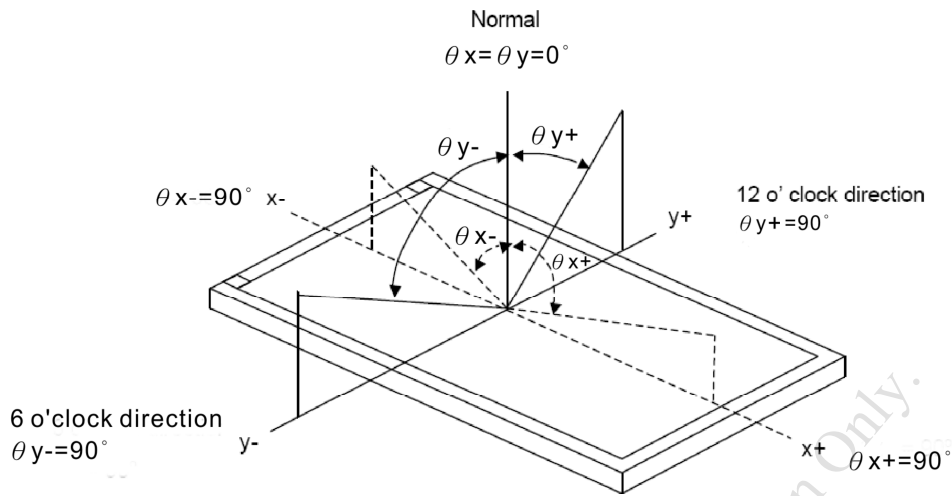
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
VIEWING ANGLE	$\theta_{y+}$	CR≥10	$\theta_{x=0^\circ}$	70	80	—	deg	NOTE (2)
	$\theta_{y-}$			70	80	—	deg	
	$\theta_{x+}$		$\theta_{y=0^\circ}$	70	80	—	deg	NOTE (3)
	$\theta_{x-}$			70	80	—	deg	
CONTRAST RATIO (CENTER)	CR	$\theta_{x=0^\circ}, \theta_{y=0^\circ}$	600	800	—	—	NOTE (3)	
RESPONSE TIME	T <sub>R</sub> (rise)		—	10	20	msec	NOTE (4)	
	T <sub>F</sub> (fall)		—	15	30	msec	NOTE (4)	
COLOR OF CIE COORDINATE (CENTER)	WHITE	W <sub>x</sub>	$\theta_{x=0^\circ}, \theta_{y=0^\circ}$ VDD-VSS=3.3V VBL+-VSS=12.0V	0.27	0.32	0.37	—	NOTE (5)
		W <sub>y</sub>		0.30	0.35	0.40		
	RED	R <sub>x</sub>		0.60	0.65	0.70	—	
		R <sub>y</sub>		0.28	0.33	0.38		
	GREEN	G <sub>x</sub>		0.32	0.37	0.42	—	
		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>		0.07	0.12	0.17		
THE BRIGHTNESS OF MODULE(CENTER)	B		800	1000	—	cd/m <sup>2</sup>	NOTE (6)	
THE UNIFORMITY OF MODULE	—		70	—	—	%	NOTE (6)	

NOTE (1) : TEST EQUIPMENT SETUP :

AFTER STABILIZING AND LEAVING THE PANEL ALONE AT A GIVEN TEMPERATURE FOR 30 MINUTES. MEASUREMENT SHOULD BE EXECUTED IN A STABLE, WINDLESS, AND DARK ROOM.



NOTE (2) : DEFINITION OF VIEWING ANGLE :



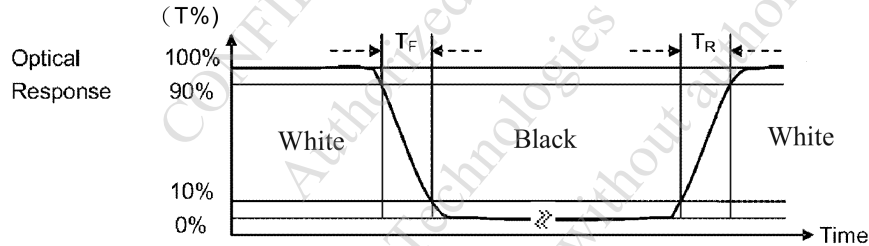
NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :

MEASURED AT THE CENTER POINT OF MODULE

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

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

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



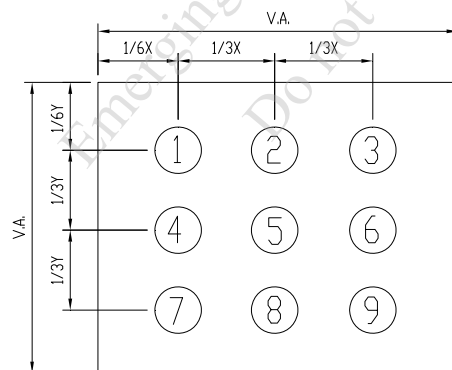
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

(a) 100% RGB PIXEL DATA TRANSMISSION WHEN ALL THE INPUT TERMINALS OF MODULE ARE ELECTRICALLY POWERED ON.

(b) MEASURED AT THE CENTER POINT OF MODULE

NOTE (6) : MEASURED THE BRIGHTNESS OF WHITE STATE AT CENTER POINT.

NOTE (7) : (a) DEFINITION OF BRIGHTNESS UNIFORMITY

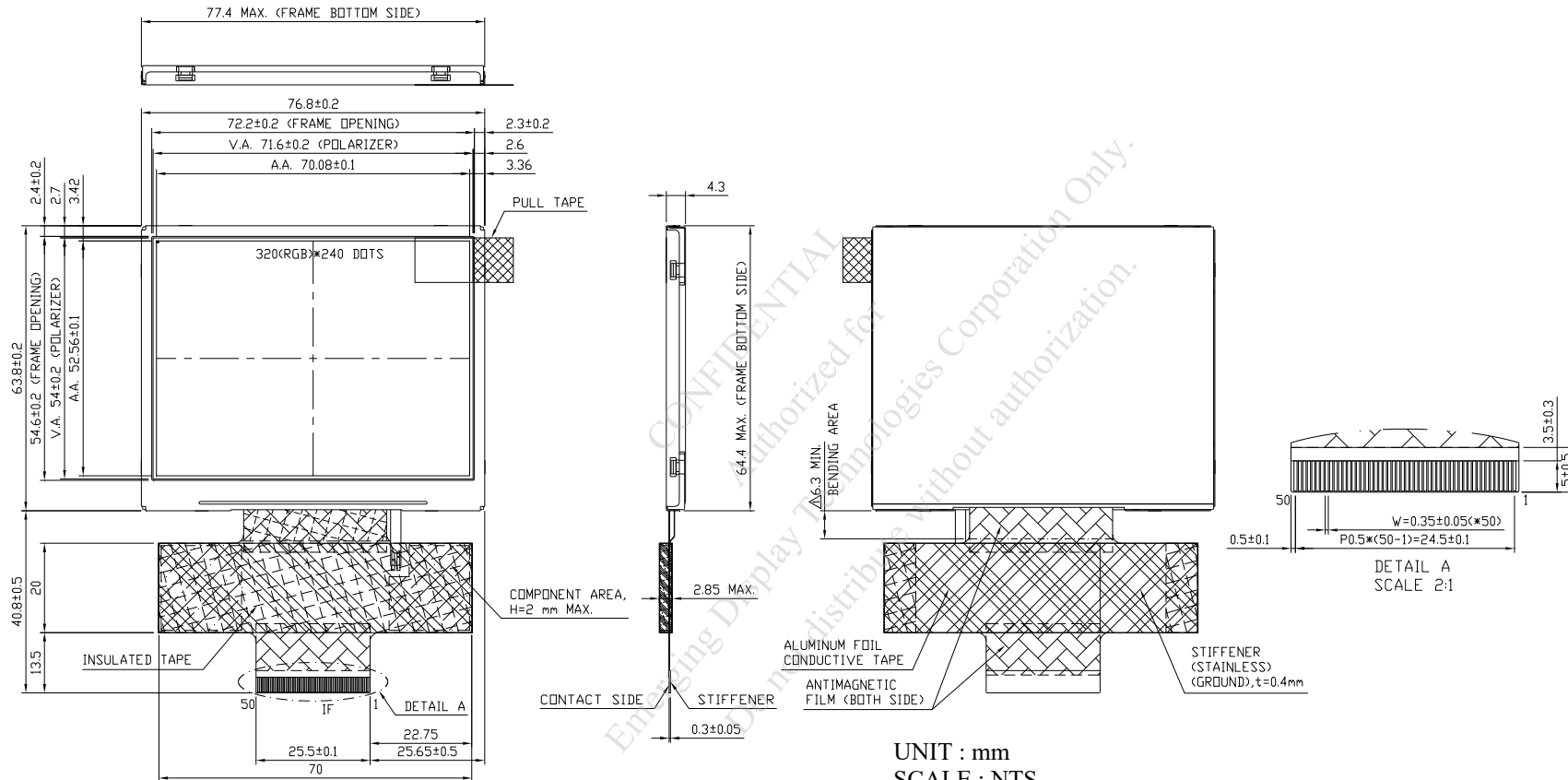


UNIT : mm

(b) THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

$$\text{UNIFORMITY} : \frac{\text{MINIMUM BRIGHTNESS}}{\text{MAXIMUM BRIGHTNESS}} * 100\%$$

7. OUTLINE DIMENSIONS



UNIT : mm  
SCALE : NTS

☉ ———— THIRD ANGLE PROJECTION

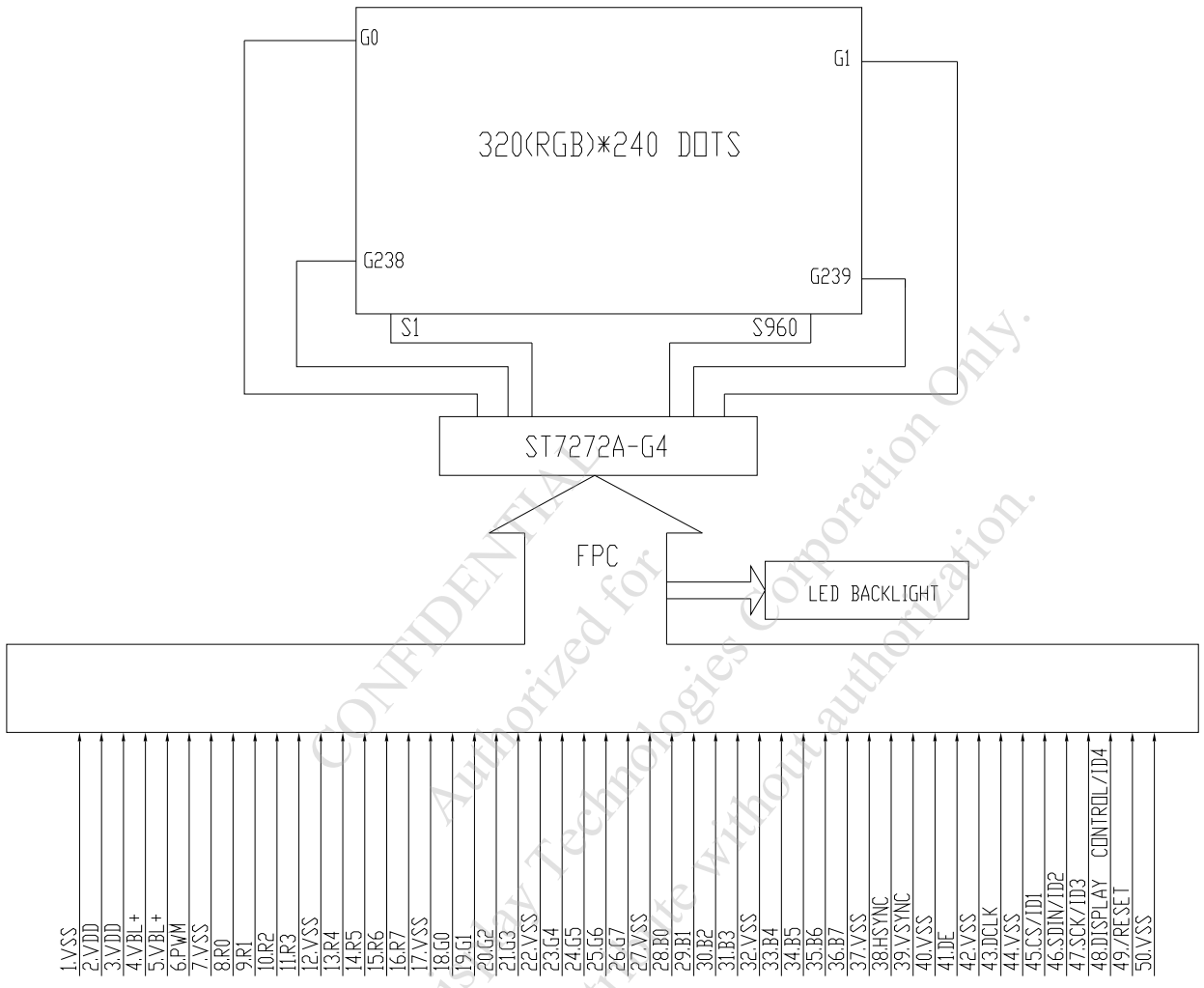
NOT SPECIFIED TOLERANCE IS ±0.3mm

MARK△MODIFY (NUMBER NOTE MODIFY VERSION)

NOTE:

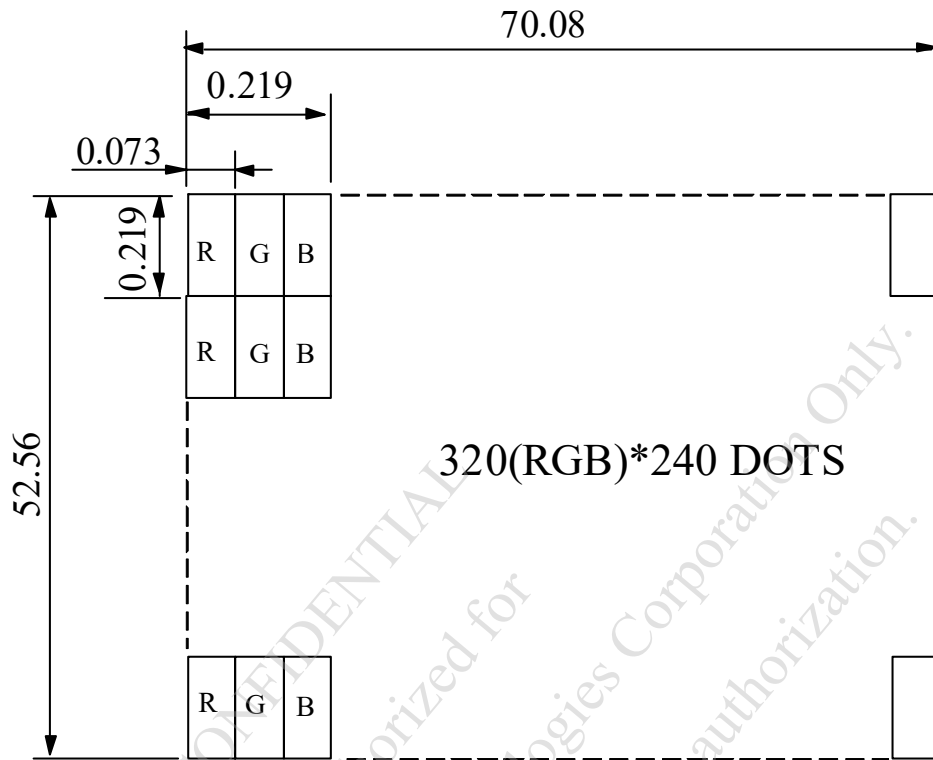
1. RECOMMEND MATCH CONNECTOR KYOCERA : 04 6240 050 SERIES

8. BLOCK DIAGRAM



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9. DETAIL DRAWING OF DOT MATRIX



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	VSS	GROUND
2	VDD	POWER FOR DIGITAL CIRCUIT.
3	VDD	POWER FOR DIGITAL CIRCUIT.
4	VBL+	POWER SUPPLY FOR LED DRIVER CIRCUIT
5	VBL+	POWER SUPPLY FOR LED DRIVER CIRCUIT
6	PWM	DIMMING CONTROL INPUT FOR BACKLIGHT. DO NOT ALLOW THIS PIN TO FLOAT.
7	VSS	GROUND
8	R0	RED DATA.
9	R1	RED DATA.
10	R2	RED DATA.
11	R3	RED DATA.
12	VSS	GROUND
13	R4	RED DATA.
14	R5	RED DATA.
15	R6	RED DATA.
16	R7	RED DATA.
17	VSS	GROUND
18	G0	GREEN DATA.
19	G1	GREEN DATA.
20	G2	GREEN DATA.
21	G3	GREEN DATA.
22	VSS	GROUND
23	G4	GREEN DATA.
24	G5	GREEN DATA.
25	G6	GREEN DATA.
26	G7	GREEN DATA.
27	VSS	GROUND
28	B0	BLUE DATA.
29	B1	BLUE DATA.
30	B2	BLUE DATA.
31	B3	BLUE DATA.
32	VSS	GROUND
33	B4	BLUE DATA.
34	B5	BLUE DATA.
35	B6	BLUE DATA.
36	B7	BLUE DATA.
37	VSS	GROUND
38	HSYNC	HORIZONTAL SYNC SIGNAL
39	VSYNC	VERTICAL SYNC SIGNAL
40	VSS	GROUND

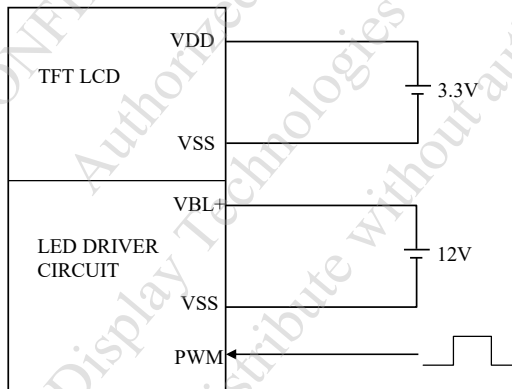
MODE SELECTION	DCLK	HSYNC	VSYNC	DE
SYNC MODE	INPUT	INPUT	INPUT	VSS
DE MODE	INPUT	VSS	VSS	INPUT



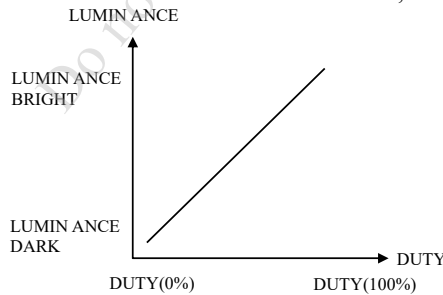
PIN NO.	SYMBOL	FUNCTION
41	DE	DATA ENABLE
42	VSS	GROUND
43	DCLK	DOT DATA CLOCK
44	VSS	GROUND
45	CS/ID1	CS FOR LCM-DRIVER SPI-PORT/ID1(SIZE INFO, NOT USED)
46	SDIN/ID2	SDIN FOR LCM-DRIVER SPI-PORT/ID2(SIZE INFO , PULL LOW TO VSS, INTERNAL:10KΩ)
47	SCK/ID3	SCK FOR LCM-DRIVER SPI-PORT/ID3(SIZE INFO , PULL LOW TO VSS, INTERNAL:10KΩ)
48	DISPLAY CONTROL/ID4	DISPLAY/ID4(SIZE INFO, NOT USED)
49	/RESET	GLOBAL RESET(LOW ACTIVE).
50	VSS	GROUND

11. POWER SUPPLY

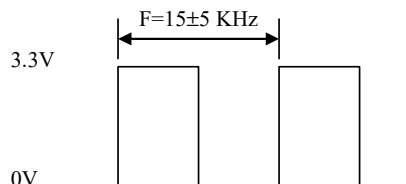
11.1 POWER SUPPLY FOR LCM



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 : 15±5KHz



$f_{PWM}$ (Hz)	DMIN	DMAX
$10.0k < f \leq 15.0k$	1.50%	100%
$15.0k < f \leq 20.0k$	2.00%	100%

12. INSPECTION CRITERIA

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

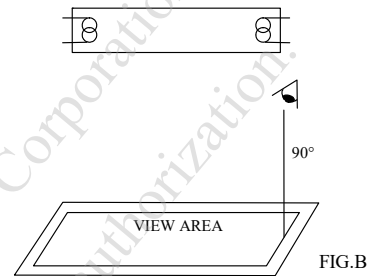
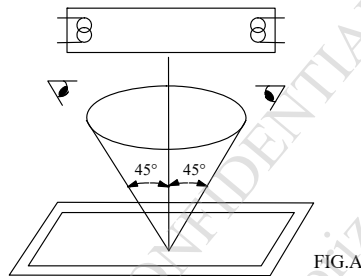
12.2 INSPECTION CONDITIONS

12.2.1 (1)OBSERVATION DISTANCE :  $45\pm 5$ cm

(2)VIEWING ANGLE :  $\pm 45^\circ$

$\pm 45^\circ$  (FOR SECTION WITHIN VIEWING AREA), REFER TO FIG.A  
 $90^\circ$  (FOR SECTION OUTSIDE OF VIEWING AREA), REF TO FIG.B  
 PERPENDICULAR TO MODULE SURFACE

VIEWING ANGLE SHOULD BE SMALLER THAN  $45^\circ$



THE INSPECTION CRITERIA IS ACCORDING TO LINE OF SIGHT. INSPECTION SHALL BE MADE WITHIN THE HALF SECTION OF THE VIEWING CONE GENERATED BY LINE SEGMENT OF  $45^\circ$  WITH RESPECT TO THE VERTICAL AXIS FROM CENTER VERTEX OF LCD, THE FLUORESCENT LAMP AND THE CONE AXIS MUST BE PERPENDICULAR TO THE LCD SURFACE.

IF THE DEFECTS ARE OUTSIDE OF VIEWING AREA, IT SHALL BE INSPECTED BY  $90^\circ$  WITH RESPECT TO THE VERTICAL AXIS FROM EDGE OF VIEWING AREA.

12.2.2 ENVIRONMENT CONDITIONS :

AMBIENT TEMPERATURE		$25\pm 5^\circ\text{C}$
AMBIENT HUMIDITY		$65 \pm 20\%RH$
AMBIENT ILLUMINATION	COSMETIC INSPECTION	600~800 lux
	FUNCTIONAL INSPECTION	300~500 lux
INSPECTION TIME		10 secs

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 :

ANSI/ ASQ Z1.4 NORMAL INSPECTION LEVEL II

(b)AQL : MAJOR DEFECT : AQL 0.65

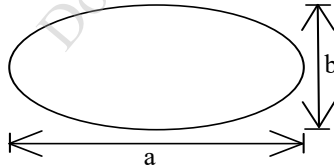
MINOR DEFECT : AQL 1.0

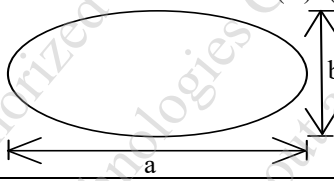
12.3 INSPECTION STANDARDS

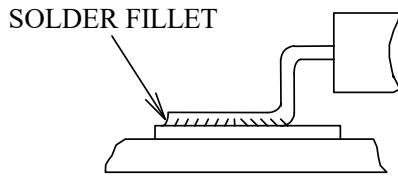
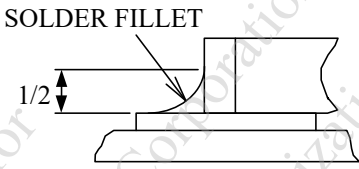
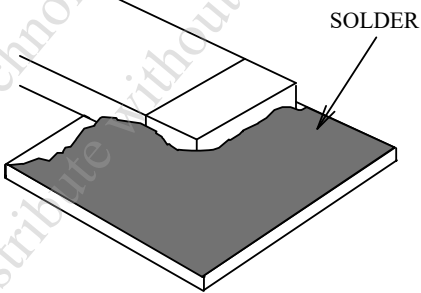
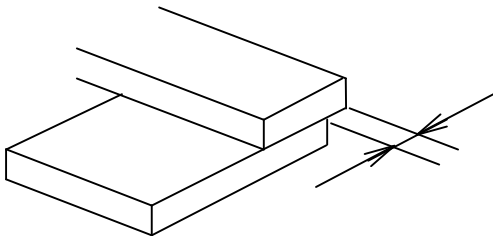
12.3.1 VISUAL DEFECTS CLASSIFICATION

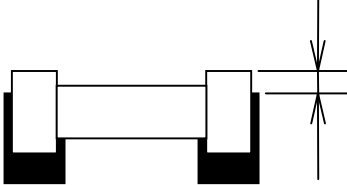
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> <li>• DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS</li> <li>EX: DISCONNECTION, SHORT CIRCUIT ETC</li> </ul>	0.65
	2.BACKLIGHT	<ul style="list-style-type: none"> <li>• 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 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>	

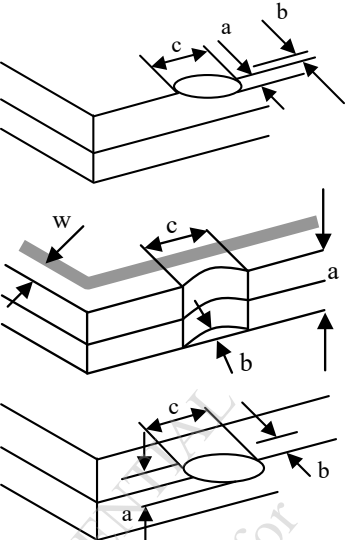
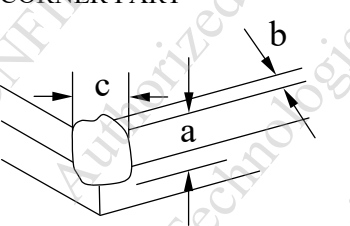
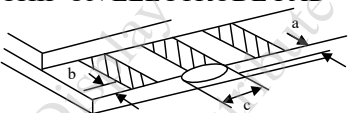
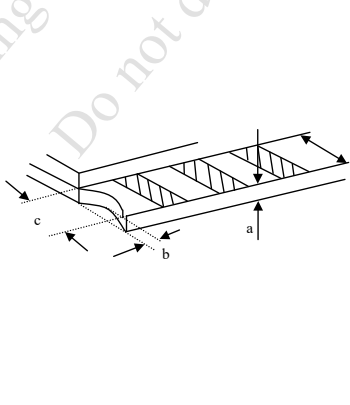
12.3.2 MODULE DEFECTS CLASSIFICATION

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	(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><math>N \leq 2</math></td> </tr> <tr> <td>DARK DOT</td> <td><math>N \leq 3</math></td> </tr> <tr> <td>TOTAL BRIGHT AND DARK DOTS</td> <td><math>N \leq 4</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.</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	$N \leq 2$	DARK DOT	$N \leq 3$	TOTAL BRIGHT AND DARK DOTS	$N \leq 4$				
ITEMS	ACCEPTABLE COUNT													
BRIGHT DOT	$N \leq 2$													
DARK DOT	$N \leq 3$													
TOTAL BRIGHT AND DARK DOTS	$N \leq 4$													
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 3.0</math></td> <td><math>0.05 &lt; W \leq 0.1</math></td> <td>4</td> </tr> <tr> <td><math>3.0 &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.	$L \leq 0.3$	$W \leq 0.05$	IGNORE	$0.3 < L \leq 3.0$	$0.05 < W \leq 0.1$	4	$3.0 < L$	$0.1 < W$	NONE
LENGTH : L	WIDTH : W	PERMISSIBLE NO.												
$L \leq 0.3$	$W \leq 0.05$	IGNORE												
$0.3 < L \leq 3.0$	$0.05 < W \leq 0.1$	4												
$3.0 < L$	$0.1 < W$	NONE												
5	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table border="1" 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/DENT /SURFACE STAINS/ CF FAIL	BUBBLE ON THE POLARIZER	$D \leq 0.25$	IGNORE
			$0.25 < D \leq 0.5$	$N \leq 5$
			$0.5 < D$	NONE
		DIRT / DENT / SURFACE STAINS	$D < 0.25$	IGNORE
			$0.25 < D \leq 0.35$	$N \leq 3$
			$0.35 < D$	NONE
		CF FAIL / SPOT	$D < 0.1$	IGNORE
			$0.1 < D \leq 0.3$	$N \leq 3$
			$0.3 < D$	NONE
<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 EXTRANEOUS 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	(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 ALIGNMENT</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	<p>THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE</p>										
		<p>GENERAL GLASS CHIP :</p> 	<table border="1" data-bbox="938 421 1458 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="938 1003 1458 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="938 1272 1458 1326"> <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="938 1429 1458 1482"> <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										
$\leq t$	$\leq 1/8X$	$\leq L$										



### 13. RELIABILITY TEST

#### 13.1 STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE

NO.	ITEM	DESCRIPTION
1	HIGH TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +85°C FOR 240 HRS
2	LOW TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -30°C FOR 240 HRS
3	HIGH TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +85°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 (NON-OPERATION )	<p>THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION:</p>
7	ESD (ELECTROSTATIC DISCHARGE ) (NON-OPERATION )	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.

NOTE ( 2 ) : WHEN THE LCD MODULE IS OPERATED AT A HIGHER AMBIENT TEMPERATURE THAN 80°C, THE PWM DUTY CYCLE OF THE LED BACKLIGHT SHOULD BE ADJUSTED TO BE LESS THAN TBD. IF THE MODULE IS OPERATED AT A HIGHER DUTY CYCLE THAN TBD, THEN THERE IS A POSSIBILITY OF DISTORTION AND IRREGULARITY OF THE PICTURE DUE TO LIQUID CRYSTAL BEHAVIOR.

#### 13.2 TESTING CONDITIONS AND INSPECTION CRITERIA

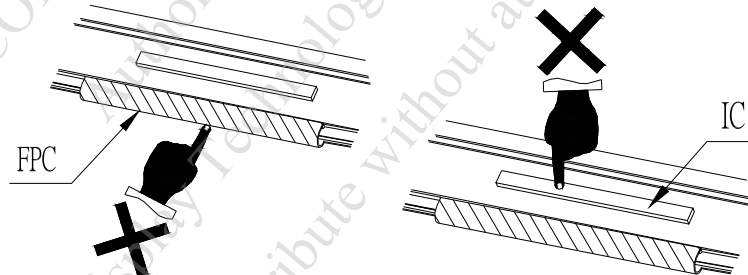
FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 13.1, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

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

## 14. CAUTION

### 14.1 OPERATION

- 14.1.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED .
- 14.1.2 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 .
- 14.1.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST.
- 14.1.4 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 .
- 14.1.5 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!



## 14.2 HANDLING

- 14.2.1 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 .
- 14.2.2 DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED .
- 14.2.3 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 .
- 14.2.4 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 .
- 14.2.5 DON'T GIVE EXTERNAL SHOCK.
- 14.2.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 14.2.7 LIQUID CRISTAL 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.
- 14.2.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 14.2.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.
- 14.2.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 14.2.11 REWIRING: NO MORE THAN 3 TIMES.