

EXAMINED BY :	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-0008805
Sam Chou		ISSUE : JUN.10, 2020
APPROVED BY:		TOTAL PAGE : 32
<i>Chris Wu</i>		VERSION : 4
<div>CUSTOMER ACCEPTANCE SPECIFICATIONS</div>		
<div style="text-align: center;"> <div> <div>MODEL NO. :</div> <div>ET043011DHA</div> <div>(RoHS)</div> <div>FOR MESSRS :</div> </div> </div>		
<div>CUSTOMER'S APPROVAL</div> <div>DATE :</div> <div>BY :</div>		

RECORDS OF REVISION

DOC . FIRST ISSUE

APR.23, 2019

DATE

REVISED
PAGE
NO.

SUMMARY

SEP.09, 2019

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3.1 LCD MODULE ELECTRICAL ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VCC-VSS	-0.3	4.6	V	—
LED BACKLIGHT FORWARD CURRENT	IF	—	25	mA	FOR EACH LED

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	4.6	V	—
POWER DISSIPATION FOR LED BACKLIGHT	PD	—	1224	mW	—
FORWARD CURRENT FOR LED BACKLIGHT	ILED	—	60	mA	—

3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS

ITEM	REMARK	ITEM	REMARK
VIBRATION	5~20Hz, 1HR 20~500Hz(20Hz), 1HR 20~500Hz(500Hz), 1HR X,Y,Z,TOTAL 3HRS	VIBRATION	10~100 Hz XYZ DIRECTIONS 1 HR EACH

ADD NOTE (1)

3

4. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY	VCC-VSS	—	3.15	3.3	3.45	V	—
OPERATING CURRENT	ICC	VCC-VSS =3.3V	—	190	250	mA	NOTE (1)
INPUT LOW VOLTAGE	V _{IL}	—	VSS	—	0.3*VDD	V	—
INPUT HIGH VOLTAGE	V _{IH}	—	0.7*VDD	—	VDD	V	—
OUTPUT LOW VOLTAGE	V _{OL}	I _{OL} = +1.0mA	VSS	—	VSS+0.4	V	—
OUTPUT HIGH VOLTAGE	V _{OH}	I _{OH} = -1.0mA	VDD-0.4	—	VDD	V	—
POWER SUPPLY FOR LED BACKLIGHT	VLED	ILED=40mA	16.8	19.2	20.4	V	NOTE (2)
LED LIFE TIME	—	IF=20mA (PER LED)	20K	—	—	hrs	NOTE (3) NOTE (4)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.15	3.3	3.45	V	—
POWER SUPPLY CURRENT	IDD	VDD-VSS =3.3V	—	190	250	mA	NOTE (1)
LOGIC HIGH INPUT VOLTAGE	V _{IH}	—	0.7*VDD	—	VDD	V	NOTE (2)
LOGIC LOW INPUT VOLTAGE	V _{IL}	—	VSS	—	0.3*VDD	V	NOTE (2)
LOGIC HIGH OUTPUT VOLTAGE	V _{OH}	I _{OH} = -1.0mA	VDD-0.4	—	VDD	V	—
LOGIC LOW OUTPUT VOLTAGE	V _{OL}	I _{OL} = +1.0mA	VSS	—	VSS+0.4	V	—
POWER SUPPLY VOLTAGE FOR LED BACKLIGHT	VLED-VLSS	ILED=40mA	16.8	19.2	20.4	V	NOTE (3)
LED LIFE TIME	—	IF=20mA (PER LED)	30K	—	—	HRS	NOTE (4) NOTE (5)

ADD NOTE (2) & NOTE (6)

4,7

5.1.1 AC ELECTRICAL CHARACTERISTICS &

5.1.2 PARALLEL 24-BIT RGB MODE & 5.1.3 TIMING CHARACTERISTIC
PARAMETER→ITEM

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6.1 OPTICAL CHARACTERISTICS

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
COLOR CHROMATICITY (CENTER)	WHITE	W _x	θ _x =0°, θ _y =0° ILED = 40mA (NTSC : 50%)	0.29	0.34	0.39	—	NOTE (5)
		W _y		0.30	0.35	0.40		
	RED	R _x		0.56	0.61	0.66	—	
	GREEN	G _x		0.34	0.39	0.44		
	BLUE	B _x		0.10	0.15	0.20		
		B _y		0.05	0.10	0.15		
THE BRIGHTNESS OF MODULE (CENTER)		B		(360)	(400)	—	cd/m ²	NOTE (6)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
COLOR CHROMATICITY (CENTER)	WHITE	W _x	θ _x =0°, θ _y =0° VDD-VSS=3.3V ILED = 40mA (NTSC : 50%)	0.25	0.30	0.35	—	NOTE (5)
		W _y		0.26	0.31	0.36		
	RED	R _x		0.54	0.59	0.64	—	
	GREEN	G _x		0.31	0.36	0.41	—	
	BLUE	B _x		0.14	0.19	0.24	—	
		B _y		0.04	0.09	0.14		
THE BRIGHTNESS OF MODULE (CENTER)			B	360	400	—	cd/m2	NOTE (6)

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SEP.09, 2019	13	8. BLOCK DIAGRAM MODIFY BLOCK DIAGRAM																																																																																																
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JUN.10, 2020	9	5.3 POWER ON/OFF SEQUENCE STBYB→DISP																																																																																																

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1. GENERAL SPECIFICATIONS

1.1 DATA SHEETS FOR CONTROLLER/DRIVER

PLEASE REFER TO :

SITRONIX ST5625CA
SITRONIX ST5091CA

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) DIAGONALS	4.3 inch
(2) NUMBER OF DOTS	800W * (RGB) * 480H DOTS
(3) MODULE SIZE	105.5W * 67.2H * 3.7D mm (NOT INCLUDED FPC)
(4) VIEWING AREA	96.9W * 55.5H mm
(5) ACTIVE AREA	95.04W * 53.856H mm
(6) DOT SIZE	0.0396W * 0.1122H mm
(7) PIXEL PITCH	0.1188W * 0.1122H mm
(8) LCD TYPE	TFT , TRANSMISSIVE , NORMALLY BLACK , ANTI-GLARE
(9) COLOR	16.2M
(10) VIEWING DIRECTION	SUPER WIDE VIEW
(11) BACK LIGHT	LED , COLOR : WHITE
(12) INTERFACE MODE	RGB(24 BIT) PARALLEL (DE 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	4.6	V	—
POWER DISSIPATION FOR LED BACKLIGHT	PD	—	1224	mW	—
FORWARD CURRENT FOR LED BACKLIGHT	ILED	—	60	mA	—

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 (2)		NOTE (2)		WITHOUT CONDENSATION
VIBRATION	—	2.45 m/s ² (0.25 G)	—	11.76 m/s ² (1.2 G)	10~100 Hz XYZ DIRECTIONS 1 HR EACH
SHOCK	—	29.4 m/s ² (3 G)	—	490 m/s ² (50 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

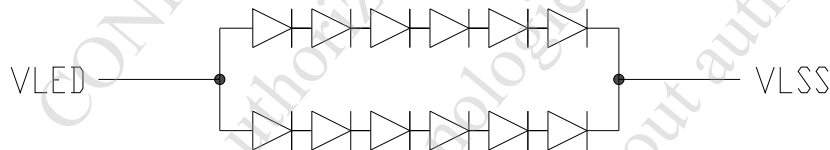
Ta = 25 °C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.15	3.3	3.45	V	
POWER SUPPLY CURRENT	IDD	VDD-VSS =3.3V	—	190	250	mA	NOTE (1)
LOGIC HIGH INPUT VOLTAGE	VIH	—	0.7*VDD	—	VDD	V	NOTE (2)
LOGIC LOW INPUT VOLTAGE	VIL	—	VSS	—	0.3*VDD	V	NOTE (2)
LOGIC HIGH OUTPUT VOLTAGE	VOH	IOH= -1.0mA	VDD-0.4	—	VDD	V	
LOGIC LOW OUTPUT VOLTAGE	VOL	IOL= +1.0mA	VSS	—	VSS+0.4	V	
POWER SUPPLY VOLTAGE FOR LED BACKLIGHT	VLED-VLSS	ILED=40mA	16.8	19.2	20.4	V	NOTE (3)
LED LIFE TIME	—	IF=20mA (PER LED)	30K	—	—	HRS	NOTE (4) NOTE (5)

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

NOTE (2) : APPLIED TO TERMINALS, R0~R7, G0~G7, B0~B7, CLK, DISP, HSD, VSD, DE.

NOTE (3) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT

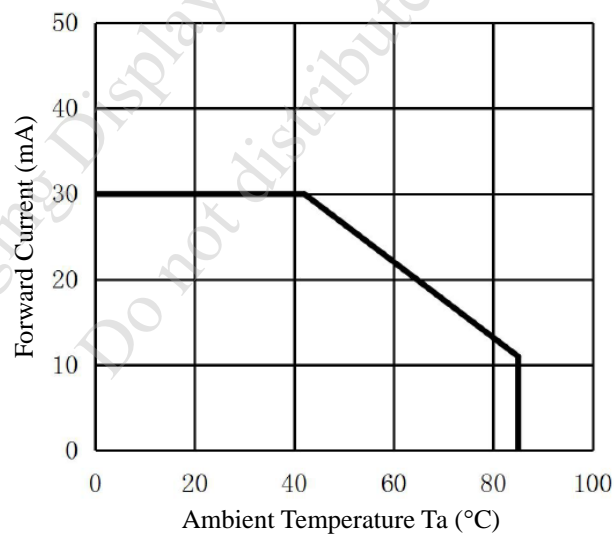


NOTE (4) : CONDITIONS; Ta=25 °C, CONTINUOUS LIGHTING

NOTE (5) : DEFINITIONS OF LIFE TIME :

LCM LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

NOTE (6) : AMBIENT TEMP. VS. ALLOWABLE FORWARD CURRENT.(PER LED)



5. TIMING CHARACTERISTICS

5.1 LCD MODULE AC ELECTRICAL CHARACTERISTICS

5.1.1 AC ELECTRICAL CHARACTERISTICS

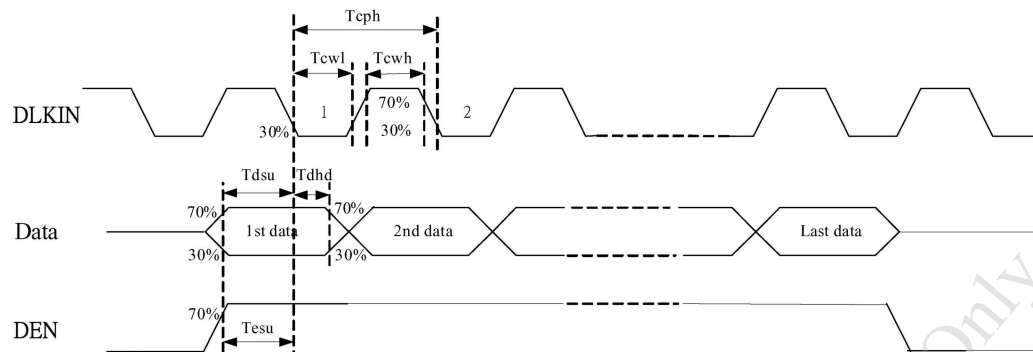
Ta = 25 °C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
VDD POWER ON SLEW RATE	T _{POR}	—	—	20	ms	FROM 0V TO 90% VDD
RSTB PULSE WIDTH	T _{RST}	50	—	—	us	CLKIN=50MHz
CLKIN CYCLE TIME	T _{cph}	20	—	—	ns	
CLKIN PULSE DUTY	T _{cwh}	40	50	60	%	
VSD SETUP TIME	T _{vst}	8	—	—	ns	
VSD HOLD TIME	T _{vhd}	8	—	—	ns	
HSD SETUP TIME	T _{hst}	8	—	—	ns	
HSD HOLD TIME	T _{hhd}	8	—	—	ns	
DATA SETUP TIME	T _{dsu}	8	—	—	ns	D[7:0], D1[7:0], D2[7:0] TO CLKIN
DATE HOLD TIME	T _{dhd}	8	—	—	ns	D[7:0], D1[7:0], D2[7:0] TO CLKIN
DE SETUP TIME	T _{esu}	8	—	—	ns	
DE HOLD TIME	T _{ehd}	8	—	—	ns	
OUTPUT STABLE TIME	T _{sst}	—	—	6	us	10% TO 90% TARGET VOLTAGE. CL=120pF, R=10Kohm

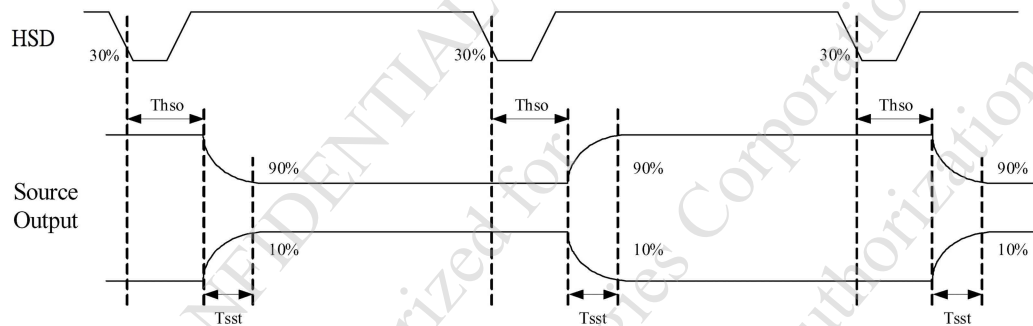
5.1.2 PARALLEL 24-BIT RGB MODE

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
DCLK FREQUENCY	F _{clk}	—	40	50	MHz	
DCLK CYCLE TIME	T _{clk}	20	25	—	ns	
DCLK PULSE DUTY	T _{cwh}	40	50	60	%	T _{clk}
TIME FROM HSYNC TO SOURCE OUTPUT	T _{hso}	—	64	—	DCLK	
TIME FROM HSD TO SOURCE OUTPUT	T _{hso}	—	64	—	CLKIN	
TIME FROM HSD TO LD	T _{hld}	—	64	—	CLKIN	
TIME FROM HSD TO STV	T _{hstv}	—	2	—	CLKIN	
TIME FROM HSD TO CKV	T _{hckv}	—	20	—	CLKIN	
TIME FROM HSD TO OEV	T _{hoev}	—	4	—	CLKIN	
LD PULSE WIDTH	T _{wld}	—	10	—	CLKIN	
CKV PULSE WIDTH	T _{wckv}	—	66	—	CLKIN	
OEV PULSE WIDTH	T _{woev}	—	74	—	CLKIN	

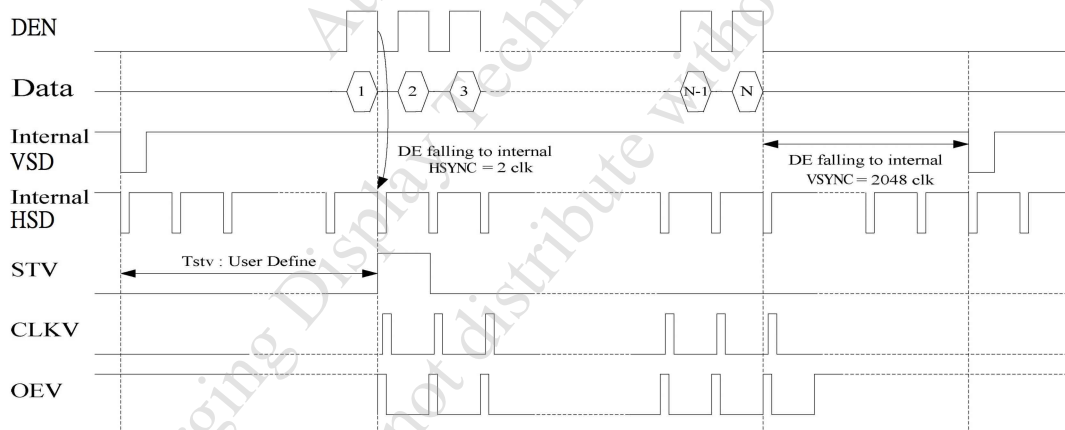
INPUT CLOCK AND DATA TIMING DIAGRAM



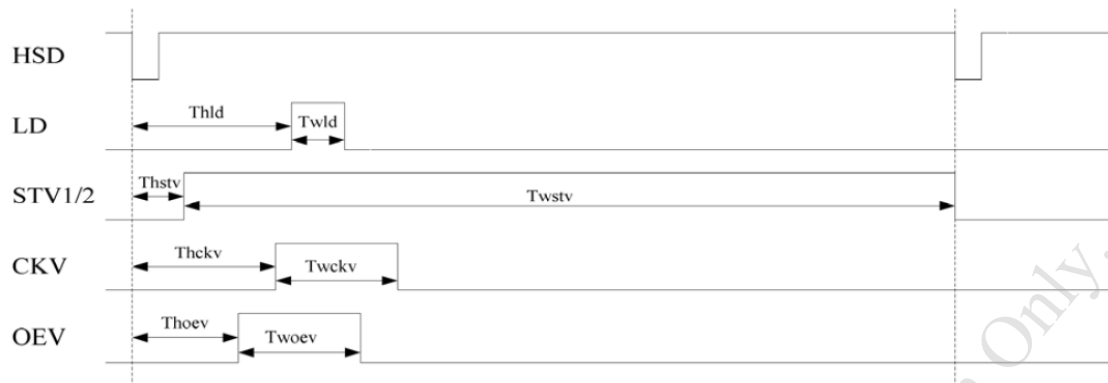
SOURCE OUTPUT TIMING DIAGRAM



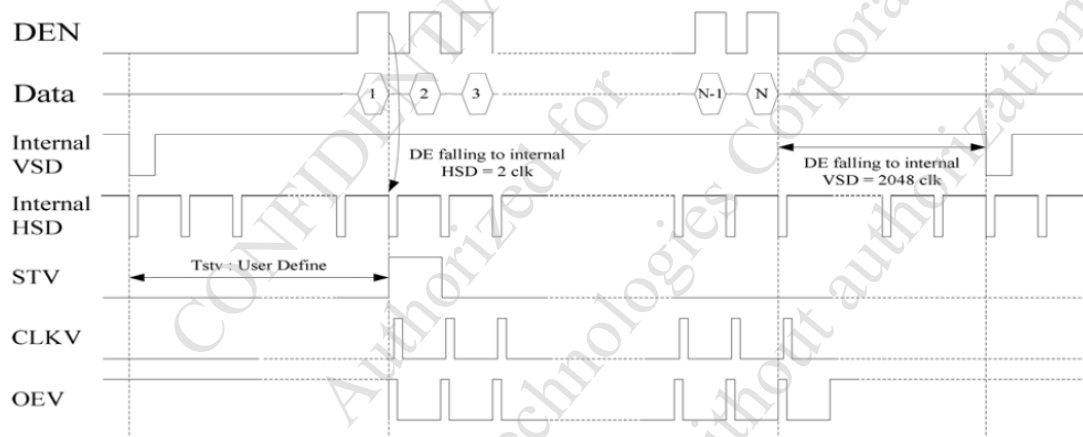
VERTICAL TIMING DIAGRAM DE (TCON + SOURCE MODE)



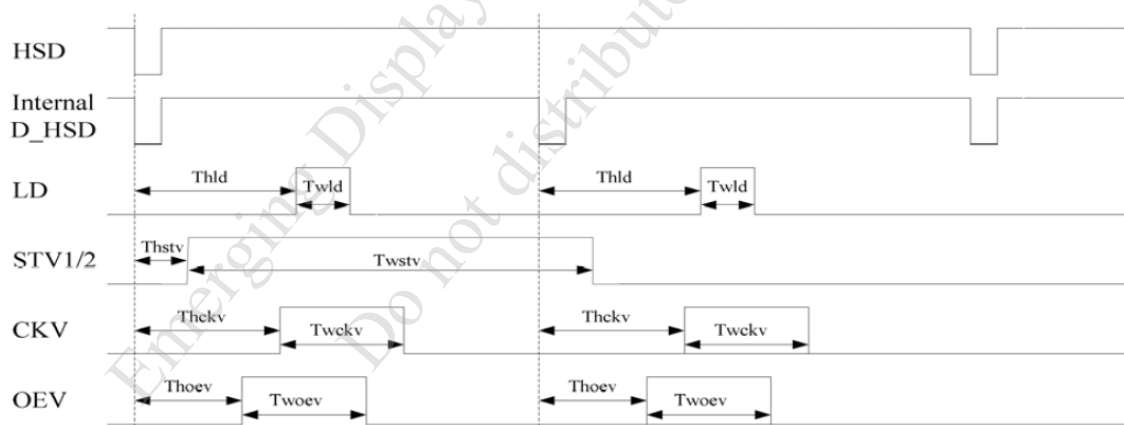
GATE OUTPUT TIMING DIAGRAM (TCON + SOURCE MODE)



VERTICAL TIMING DIAGRAM DE (DUAL GATE MODE)



GATE OUTPUT TIMING DIAGRAM (DUAL GATE MODE)



5.1.3 TIMING CHARACTERISTIC

HORIZONTAL INPUT TIMING

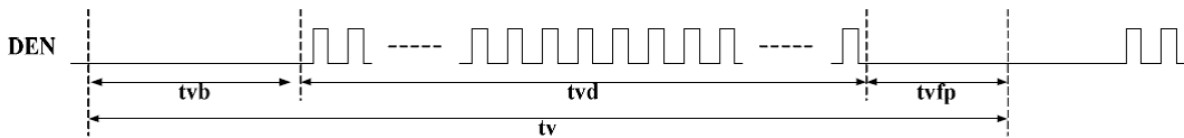
ITEM	SYMBOL	VALUE			UNIT
		MIN.	TYP.	MAX.	
HORIZONTAL DISPLAY AREA	thd	800			DCLK
DCLK FREQUENCY	fclk	—	30	50	MHZ
ONE HORIZONTAL LINE	th	889	928	1143	DCLK
HS PULSE WIDTH	thpw	1	48	255	DCLK
HS BACK PORCH (BLANKING)	thb	88			DCLK
HS FRONT PORCH	thfb	1	40	255	DCLK
DE MODE BLANKING	th-thd	85	128	512	DCLK

VERTICAL INPUT TIMING

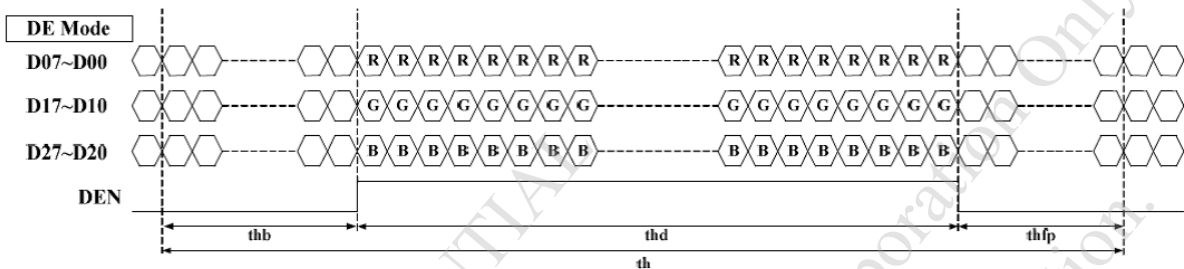
ITEM	SYMBOL	VALUE			UNIT
		MIN.	TYP.	MAX.	
VERTICAL DISPLAY AREA	tvd	480			H
VS PERIOD TIME	tv	513	525	767	MHZ
VS PULSE WIDTH	tvpw	3	3	255	DCLK
VS BACK PORCH (BLANKING)	tvb	32			DCLK
VS FRONT PORCH	tvfb	1	13	255	DCLK
DE MODE BLANKING	tv-tvd	4	45	255	DCLK

5.2 DATA INPUT FORMAT

VERTICAL INPUT TIMING



HORIZONTAL INPUT TIMING

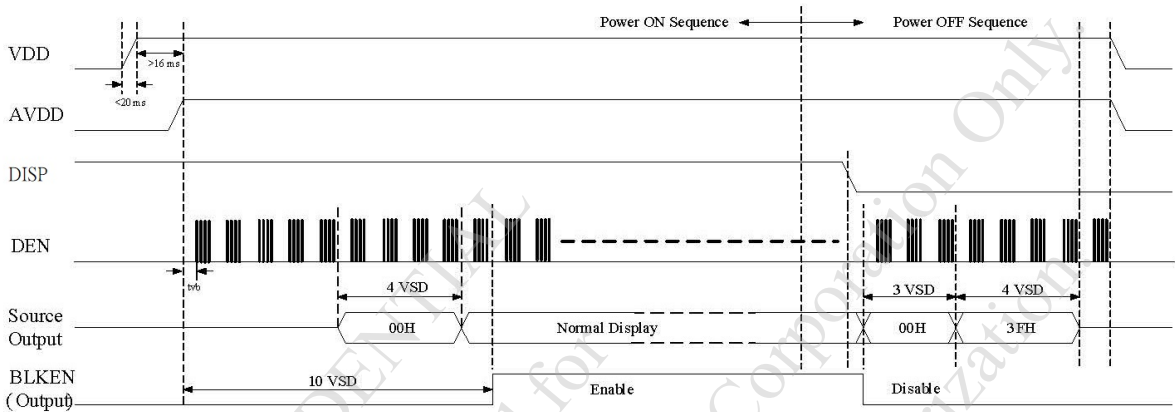


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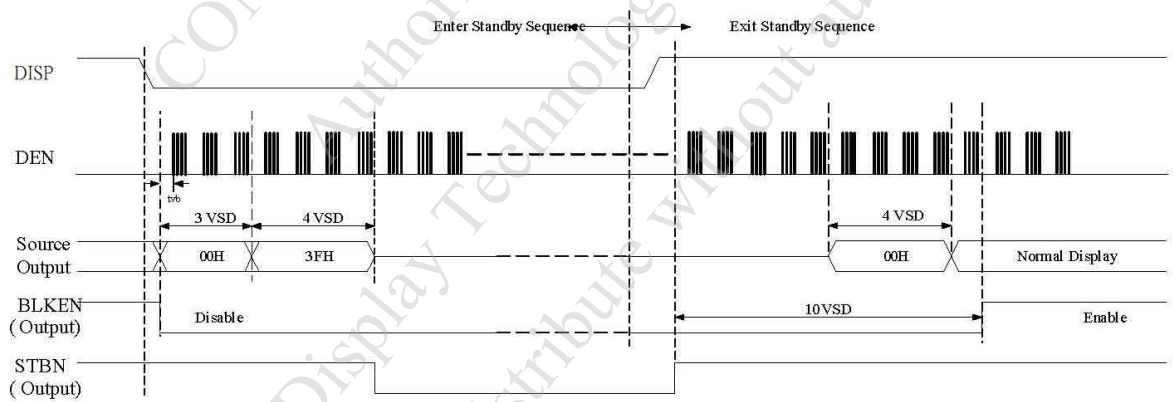
5.3 POWER ON/OFF SEQUENCE

IN ORDER TO PREVENT IC FROM POWER ON RESET FAIL, THE RISING TIME (TPOR) OF THE DIGITAL POWER SUPPLY VDD SHOULD BE MAINTAINED WITHIN THE GIVEN SPECIFICATIONS. REFER TO “AC CHARACTERISTICS” FOR MORE DETAIL ON TIMING.

POWER-ON/OFF TIMING SEQUENCE



STANDBY MODE SEQUENCE



6. OPTICAL CHARACTERISTICS (NOTE 1)

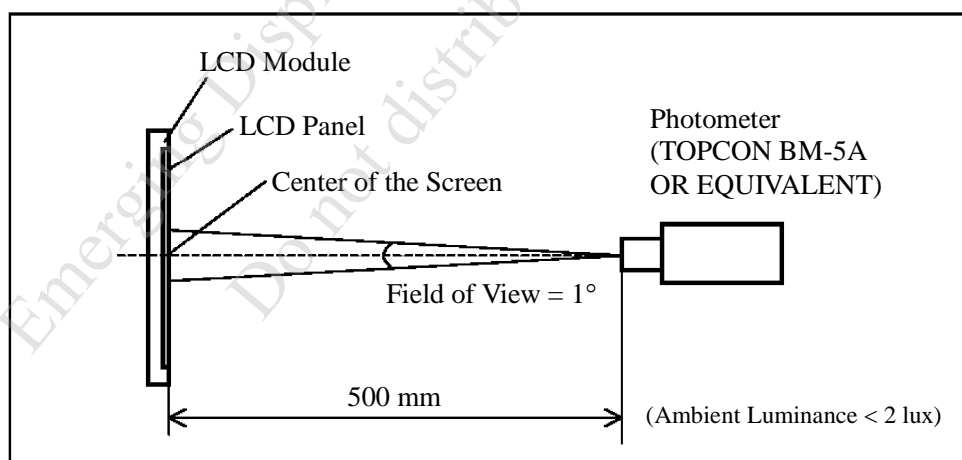
6.1 OPTICAL CHARACTERISTICS

Ta = 25°C

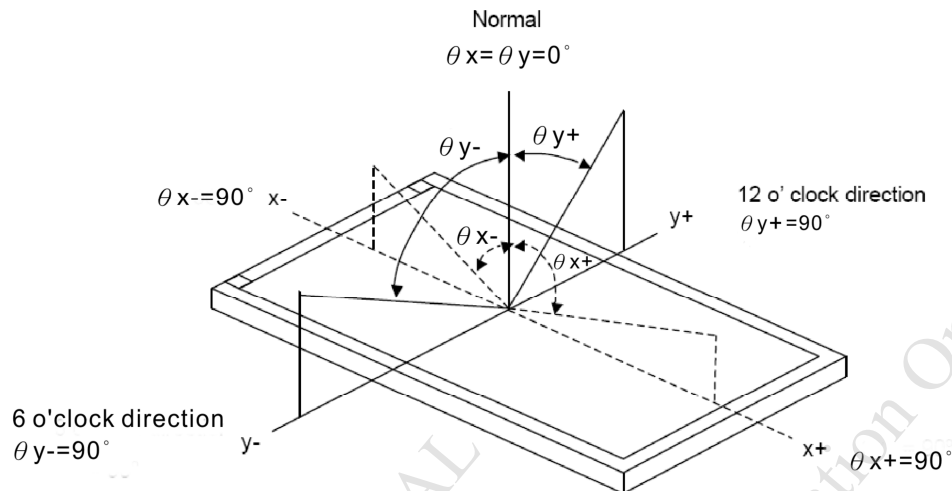
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	REMARK
VIEWING ANGLE		θ_{y+}	CR ≥ 10	$\theta_x=0^\circ$	70	80	—	deg.	NOTE (2) NOTE (3)
		θ_{y-}			70	80	—		
		θ_{x+}		$\theta_y=0^\circ$	70	80	—		
		θ_{x-}			70	80	—		
CONTRAST RATIO (CENTER)		CR	$\theta_x=0^\circ$, $\theta_y=0^\circ$		640	800	—	—	NOTE (3)
RESPONSE TIME		tr (rise)+ tf (fall)	$\theta_x=0^\circ$, $\theta_y=0^\circ$		—	30	40	msec	NOTE (4)
COLOR CHROMATICITY (CENTER)	WHITE	W _x	$\theta_x=0^\circ$, $\theta_y=0^\circ$ VDD-VSS=3.3V ILED = 40mA (NTSC : 50%)		0.25	0.30	0.35	—	NOTE (5)
		W _y			0.26	0.31	0.36		
	RED	R _x			0.54	0.59	0.64	—	
		R _y			0.30	0.35	0.40		
	GREEN	G _x			0.31	0.36	0.41	—	
		G _y			0.52	0.57	0.62		
	BLUE	B _x			0.14	0.19	0.24	—	
		B _y			0.04	0.09	0.14		
THE BRIGHTNESS OF MODULE (CENTER)		B			360	400	—	cd/m ²	NOTE (6)
THE BRIGHTNESS OF UNIFORMITY		—			70	—	—	%	NOTE (7)

NOTE (1) : TEST CONDITION :

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 :



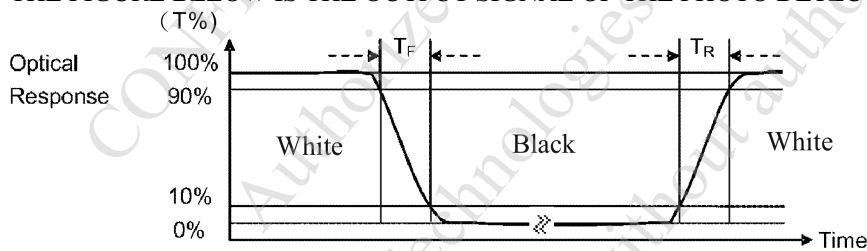
NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :

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.



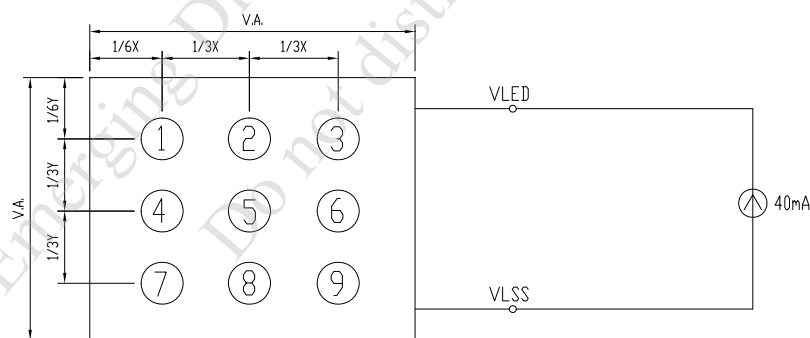
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

(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

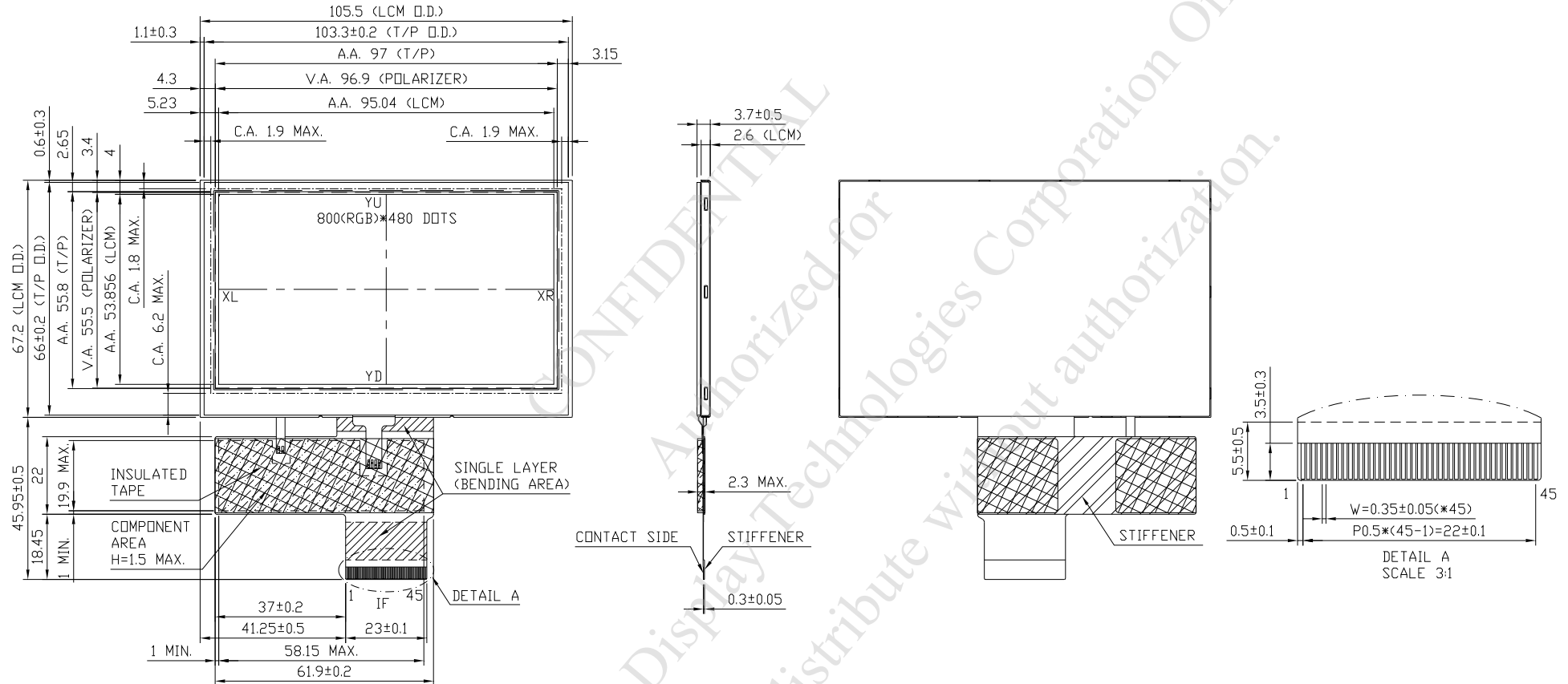


UNIT : mm

(b) THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

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

7. OUTLINE DIMENSIONS



UNIT : mm

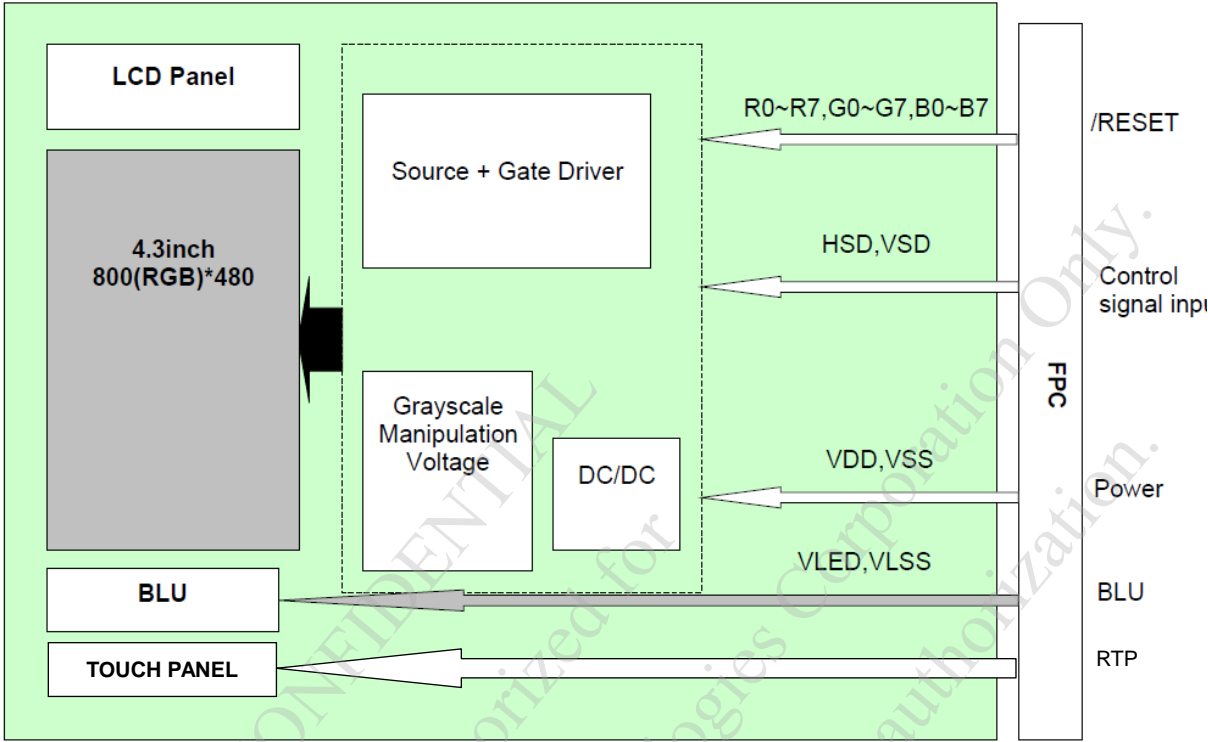
SCALE : NTS

NOT SPECIFIED TOLERANCE IS ±0.3mm

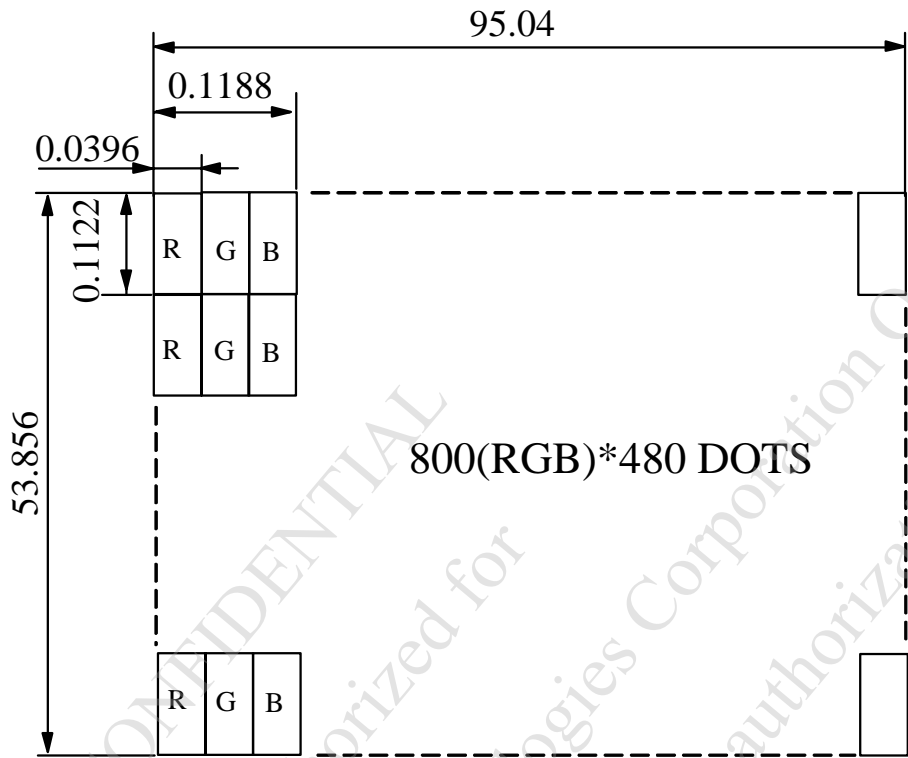
NOTE :

RECOMMEND MATCH CONNECTOR KYOCERA : 04 6240 045 SERIES

8. BLOCK DIAGRAM



9. DETAIL DRAWING OF DOT MATRIX



UNIT : mm
SCALE : NTS
NOT SPECIFIED TOLERANCE IS ± 0.1
DOTS MATRIX TOLERANCE IS ± 0.01

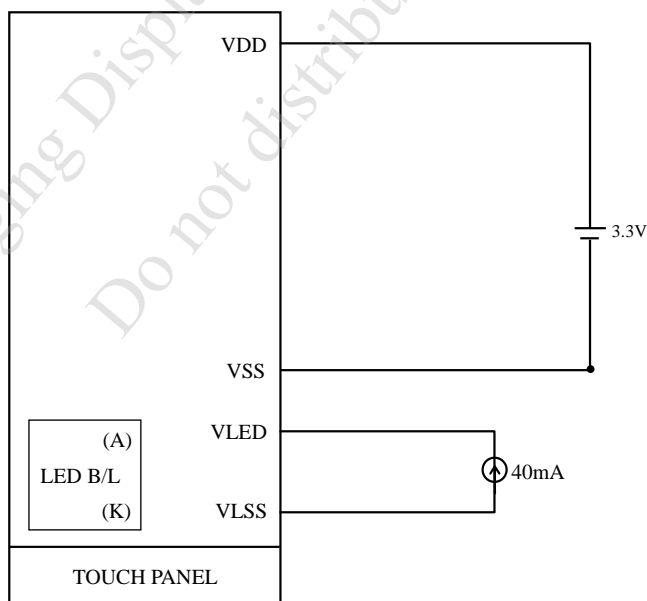
10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
1	VSS	GROUND
2	VSS	GROUND
3	VDD	+3.3V POWER SOURCE
4	VDD	+3.3V POWER SOURCE
5	R0	RED DATA SIGNAL (LSB)
6	R1	RED DATA SIGNAL
7	R2	RED DATA SIGNAL
8	R3	RED DATA SIGNAL
9	R4	RED DATA SIGNAL
10	R5	RED DATA SIGNAL
11	R6	RED DATA SIGNAL
12	R7	RED DATA SIGNAL (MSB)
13	G0	GREEN DATA SIGNAL (LSB)
14	G1	GREEN DATA SIGNAL
15	G2	GREEN DATA SIGNAL
16	G3	GREEN DATA SIGNAL
17	G4	GREEN DATA SIGNAL
18	G5	GREEN DATA SIGNAL
19	G6	GREEN DATA SIGNAL
20	G7	GREEN DATA SIGNAL (MSB)
21	B0	BLUE DATA SIGNAL (LSB)
22	B1	BLUE DATA SIGNAL
23	B2	BLUE DATA SIGNAL
24	B3	BLUE DATA SIGNAL
25	B4	BLUE DATA SIGNAL
26	B5	BLUE DATA SIGNAL
27	B6	BLUE DATA SIGNAL
28	B7	BLUE DATA SIGNAL (MSB)
29	VSS	GROUND
30	CLK	CLOCK SIGNAL; LATCHING DATA AT THE FALLING EDGE
31	DISP	DISPLAY CONTROL / STANDBY MODE SELECTION. DISP = "LOW" : STANDBY; DISP = "HIGH" : NORMAL DISPLAY(DEFAULT)
32	HSD	HORIZONTAL SYNC SIGNAL; NEGATIVE POLARITY

PIN NO.	SYMBOL	FUNCTION			
33	VSD	VERTICAL SYNC SIGNAL; NEGATIVE POLARITY			
34	DE	DATA INPUT ENABLE. ACTIVE HIGH TO ENABLE THE DATA INPUT.			
35	CSX	COLOR ENHANCE FUNCTION CONTROL:			
		CSX	DBCM[1]	DBCM[0]	COLOR FUNCTION
		X	X	X	CE DISABLE
		1	0	0	CE SETTING 0 (STRONG)
		1	0	1	CE SETTING 1 (MIDDLE)
		1	1	0	CE SETTING 2 (WEAKEST)
		1	1	1	CE SETTING 3 (WEAK) [DEFAULT]
36	NC	NC			
37	YU	TOP PANEL		TOUCH PANEL INTERFACE SIGNALS	
38	XL	LEFT PANEL			
39	YD	BOTTOM PANEL			
40	XR	RIGHT PANEL			
41	VSS	GROUND			
42	VLSS	LED POWER SOURCE INPUT TERMINAL (CATHODE SIDE)			
43	VLED	LED POWER SOURCE INPUT TERMINAL (ANODE SIDE)			
44	DBCM(0)	COLOR ENHANCE FUNCTION CONTROL:			
		CSX	DBCM[1]	DBCM[0]	COLOR FUNCTION
		X	X	X	CE DISABLE
		1	0	0	CE SETTING 0 (STRONG)
		1	0	1	CE SETTING 1 (MIDDLE)
		1	1	0	CE SETTING 2 (WEAKEST)
		1	1	1	CE SETTING 3 (WEAK) [DEFAULT]
45	DBCM(1)	COLOR ENHANCE FUNCTION CONTROL:			
		CSX	DBCM[1]	DBCM[0]	COLOR FUNCTION
		X	X	X	CE DISABLE
		1	0	0	CE SETTING 0 (STRONG)
		1	0	1	CE SETTING 1 (MIDDLE)
		1	1	0	CE SETTING 2 (WEAKEST)
		1	1	1	CE SETTING 3 (WEAK) [DEFAULT]

11. POWER SUPPLY

11.1 POWER SUPPLY FOR LCM



12. TOUCH PANEL SPECIFICATION

12.1 ELECTRICAL CHARACTERISTICS

Ta = 25°C

ITEM	CONDITION	SPEC.	UNIT
LINEARITY	—	± 1.5	%
TRANSMISSION	ASTM D1003	80(Min)	%
TERMINAL RESISTANCE	X AXIS	260 ~ 1240	Ω
	Y AXIS	160 ~ 640	
INSULATION RESISTANCE	DC25V	≥ 20	MΩ
INPUT VOLTAGE	—	5(TYP)	V

12.2 PRECAUTIONS IN USE OF TOUCH PANEL

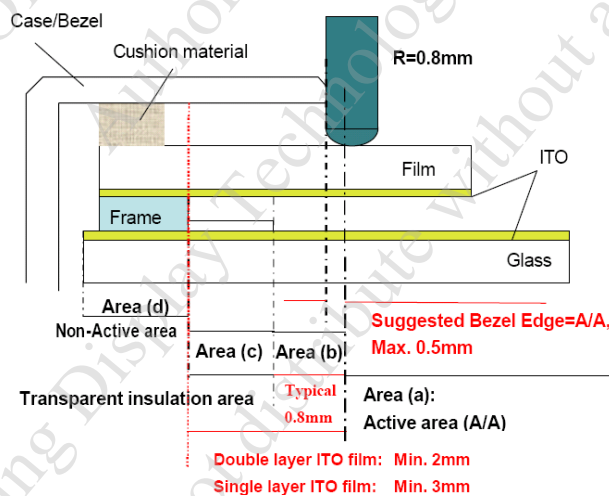
12.2.1 PURPOSE :

IN ORDER TO PREVENT ACCIDENTAL USE AND PERFORMANCE DETERIORATION, PLEASE KEEP THE FOLLOWING PRECAUTIONS AND INHIBITED POINTS.

12.2.2 ITEM AND ILLUSTRATION :

(1) STRUCTURE, AREA DEFINITION

THE STRUCTURE AND THE PERFORMANCE GUARANTEED AREA OF THIS TOUCH PANEL ARE DEFINED BELOW :



THE ABOVE FIGURE IS OUR DESIGN RULE OF TOUCH PANEL.

IF IT CANNOT MEET YOUR REQUIREMENT, PLEASE CONTACT WITH OUR ENGINEERS FOR FURTHER DISCUSSION.

ABOVE FIGURE ILLUSTRATES THE RECOMMENDED BEZEL AND CUSHION DESIGN. IN ORDER TO PREVENT UNUSUAL PERFORMANCE DEGRADATION AND MALFUNCTION OF A TOUCH PANEL, PLEASE CARRY OUT THE SET CASE DESIGNING AND A TOUCH PANEL ASSEMBLING METHOD AFTER SURELY CONSIDERING THE DEFINITION OF EACH AREA ILLUSTRATED IN ABOVE FIGURE.

AREA(a) : ACTIVE AREA

THE ACTIVE AREA IS GUARANTEED THE POSITION DATA DETECTABLE PRECISION, OPERATION FORCE AND OTHER OPERATIONS. IT IS STRONGLY RECOMMENDED TO PLACE THE OPERATION BUTTON OR MENU KEYS WITHIN THE ACTIVE AREA. DUE TO STRUCTURE, THE ACTIVE AREA IS LESS DURABLE AT THE EDGE OR CLOSE TO THE EDGE.

AREA(b) : OPERATION NON-GUARANTEED AREA

THIS AREA DOES NOT GUARANTEE A TOUCH PANEL OPERATION AND ITS FUNCTION. WHEN THIS AREA IS PRESSED, TOUCH PANEL SHOWS DEGRADATION OF ITS PERFORMANCE AND DURABILITY SUCH AS A PEN SLIDING DURABILITY BECOMES ABOUT ONE-TENTH COMPARED WITH THE ACTIVE AREA (AREA-(A) AS GUARANTEED AREA) AND ITS OPERATION FORCE REQUIRES ABOUT DOUBLE. ABOUT 0.5 MM OUTSIDE FROM A BOUNDARY OF THE ACTIVE AREA CORRESPONDS TO THIS AREA.

AREA(c) : PRESSING PROHIBITION AREA

THE AREA WHICH FORBIDS PRESSING, BECAUSE AN EXCESSIVE LOAD IS APPLIED TO A TRANSPARENT ELECTRODE (ITO) AND A SERIOUS DAMAGE IS GIVEN TO A TOUCH PANEL FUNCTION BY PRESSING.

AREA(d) : NON-ACTIVE AREA

THE AREA DOES NOT ACTIVATE EVEN IF PRESSED.

(2) CAUTIONS FOR INSTALLING AND ASSEMBLING

(i) DO NOT GIVE EXCESSIVE STRAIN TO THE PRODUCT.

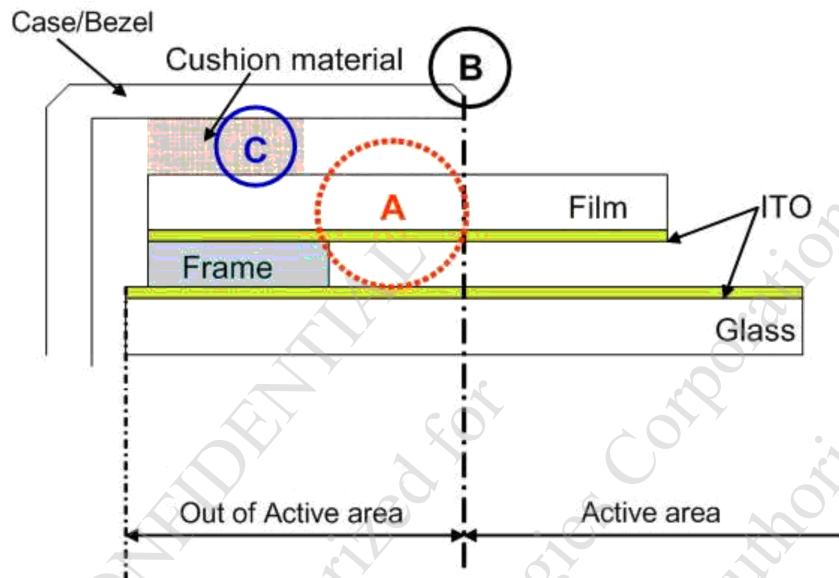
(ii) FLEXIBLE PATTERN CABLE IS CONNECTED TO THE BODY BY THERMAL PRESSURE METHOD. SO, DO NOT APPLY EXCESSIVE FORCES TO THE FLEXIBLE PATTERN. DO NOT ADD AN EXCESSIVE FORCE TO A FPC(FLEX TAIL) THAT MAKES PEELING OFF OF THE FPC FROM THE PRODUCT. DO NOT FIX, ADHERE OR MOUNT ANY ADDITIONAL GOODS ON THE FPC SUCH AS ADDITIONAL FILM/PLATE ON THE FPC, BECAUSE SUCH ADDITIONAL GOODS WILL APPLY A STRESS AT THE FPC BONDING AREA. IT MAY AFFECT THE CONDUCTIVITY OF FPC WITH TOUCH PANEL.

(iii) IN ORDER NOT TO APPLY LOAD ON THE DISPLAY, PROVIDE A CLEARANCE OF AT LEAST 0.3MM BETWEEN THE PRODUCT AND DISPLAY.

(iv) WE RECOMMEND THE DESIGN OF A CASE OR BEZEL SHOULD COVERS THE BOUNDARY OF THE ACTIVE AREA INSIDE IN ORDER TO PREVENT AN OPERATION AT OUTSIDE OF THE ACTIVE AREA WHICH CAN NOT GUARANTEE THE FUNCTION OR DURABILITY (REFER TO ITEM 5.1.2. STRUCTURE, AREA DEFINITION).

BEZEL'S EDGE PART MAY GUIDE THE PEN SLIDING ON THE SAME POSITION REPEATEDLY. IF THE BEZEL IS PLACED OUTSIDE OF THE ACTIVE AREA, IT MAY CAUSE THE DAMAGE OF THE ITO FILM.

- (v) PRESSING INSIDE OF BOUNDARY OF THE FRAME(PART (A) AS SHOWN IN BELOW) MAY CAUSES FAULT OPERATION, SO PLEASE DESIGN TO AVOID PRESSING OF TOUCH PANEL AT PART (A) SUCH AS HAVING GASKET/CUSHION AT PART (C). PARTICULARLY THE AREA (B) SHALL BE FREE FROM BURR. THE GASKET/CUSHION MATERIAL AT THE PART (C) SHOULD NOT BE EXCEEDED TO INSIDE OF THE BOUNDARY OF THE FRAME.



- (vi) TO PREVENT GIVING DISTORTION TO THE FILM OF THE PRODUCT AND PEELING OFF OF THE FILM FROM THE PRODUCT, DO NOT FIX THE FILM AND A SET CASE OR A SHOCK ABSORBING MATERIAL ADHERED TO A SET CASE BY ADHESION.
- (vii) WIPE OFF THE STAIN ON THE PRODUCT BY USING SOFT CLOTH MOISTENED WITH ETHANOL. TAKE CARE NOT TO ALLOW ETHANOL TO SOAK INTO THE JOINT OF UPPER FILM AND BOTTOM GLASS. IT MAY OTHERWISE CAUSE PEELING OR DEFECTIVE OPERATION. DO NOT USE ANY ORGANIC SOLVENT OR DETERGENT OTHER THAN ETHANOL.
- (viii) THE CORNERS OF THE PRODUCT ARE NOT CHAMFERED AND ARE SHARP. WHEN POSITIONING AND FIXING THE PRODUCT ON THE CASE, PROVIDE A ROUND PART ON THE CORNER OF THE CASE SO AS NOT TO APPLY LOAD ON THE CORNER OF THE TRANSPARENT TOUCH PANEL.
- (ix) DO NOT PRESS THE FILM OF THE PRODUCT WHEN THIS PRODUCT IS BUILT INTO A SET.
- (3) CAUTIONS FOR OPERATION
- (i) OPERATE IT WITH A POLYACETAL PEN (TIP R0.8 OR OVER) OR A BELLY OF A FINGER WITHOUT APPLYING EXCESSIVE LOAD. NEVER USE ANY MECHANICAL PENCILS, BALL POINT PENS AND HARD FINGERTIPS WHOSE TIP IS HARD FOR INPUT, OTHERWISE MALFUNCTIONS MAY RESULT.

- (ii) THE INPUT POSITION MAY BE FLUCTUATED A LITTLE THROUGH LONG-TIME USE. IT IS DESIRABLE TO PROVIDE A ZERO-ADJUSTMENT FUNCTION BY USING A CIRCUIT AND SOFTWARE.
- (iii) OPERATION AT THE OUT OF ACTIVE AREA IS OUT OF OUR GUARANTEE. IT CAUSES A SERIOUS DAMAGE OF A TRANSPARENT ELECTRODE. DO NOT OPERATE AT THE OUT OF ACTIVE AREA.
- (iv) IN CASE OF CLEANING THE PART OF THE CASE BOUNDARY OF ACCOMPLISHED SET, USE A SOFT CLOTH WITH A FINGER BERRY OR A COTTON BUD. DO NOT CLEAN WITH A THING OTHER THAN THE FINGER SUCH AS HARD OR SHARP EDGES LIKE A FINGER NAIL ETC. ON THE CLOTH, BECAUSE IT CAUSE TRANSPARENT CONDUCTIVE FILM CRACKS. PLEASE ADVISE THIS PROHIBITION TO YOUR LAST CUSTOMERS.

12.3 DURABILITY

12.3.1 STYLUS HITTING :

ONE MILLION TIMES OR OVER
NO DAMAGE ON FILM SURFACE

PEN : R8 mm SILICON RUBBER

LOAD : 250g

FREQUENCY : 3 times/sec

MEASUREMENT POSITION:

1 POINT OF TOUCH PANEL ACTIVE AREA

REPEATED : OVER 1,000,000 TIMES

12.3.2 PEN TOUCH SLIDING DURABILITY :

100,000 TIMES OR OVER

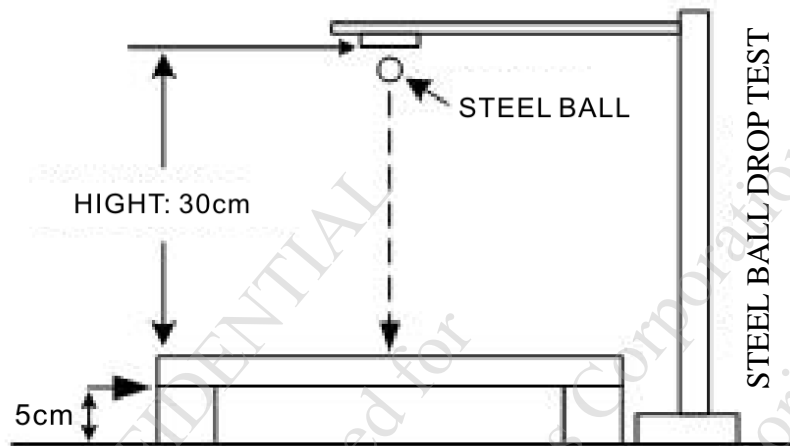
WRITING WITH R0.8mm PLASTIC STYLUS PEN; WRITING FORCE 250g
IN ACTIVE AREA.

SLIDING SPEED IS 150mm/sec.

12.4 STEEL BALL DROP TEST

BY USING $\varnothing 9\text{mm}$ STEEL BALL AND DROPPING ON THE TOUCH PANEL SURFACE FROM THE HEIGHT OF 30cm (AT ONE TIME), MUST PASS BELOW CONDITIONS :

APPEARANCE : THE APPEARANCE WITHOUT ANY CHANGE, INCLUDING THE PANEL BROKEN.



12.5 APPEARANCE INSPECTION

PURPOSE :

TO ESTABLISH APPEARANCE STANDARD AND MAINTAIN PRODUCT QUALITY.

SCOPE :

TOUCH PANEL VIEW AREA WITHIN TOUCH PANEL.

12.5.1 RULE :

INSPECTION CONDITION

(A) ENVIRONMENTAL LUMINANCE : 600~800 LUX.

(B) DISTANCE BETWEEN HUMAN EYES AND PANEL : 45 cm

(PANEL MUST BE TESTED UNDER LIGHT TRANSPARENT).

(C) VISUAL ANGEL : $\pm 45^\circ$.

(D) LIGHT SOURCE : FLUORESCENT LIGHT SOURCE.

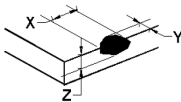
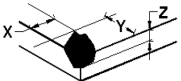
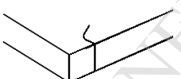
12.5.2 JUDGE CRITERION :

JUDGEMENT UNDER ABOVE MENTIONED CRITERION (PANEL MUST BE TESTED UNDER LIGHT TRANSPARENT),

TESTING GOODS DEFECT CAN BE VISIBLE WITHIN 10 SECONDS, WHICH WILL BE JUDGED AS MAJOR DEFECTS.

SAMPLING STANDARD :

THE SAMPLING STANDARD WILL BE CONFIRMED BY BOTH OF EDT AND CUSTOMER.

ITEM	INSPECTION METHOD	CRITERIA
1.SPOTS AND DOTS	$D \leq 0.15\text{mm}$	IGNORED
	$0.15\text{mm} < D \leq 0.3\text{mm}$	3 OR LESS (DISTANCE 5mm OVER)
	$D > 0.3\text{mm}$	NG
2. SCRATCH	$W \leq 0.05\text{mm}$	IGNORED
	$0.05\text{mm} < W \leq 0.1\text{mm}, L \leq 5.0\text{mm}$	3 OR LESS (DISTANCE 5mm OVER)
	$W > 0.1\text{mm}$	NG
3. LINEAR FOREIGN MATTER	$W \leq 0.05\text{mm}$	IGNORED
	$0.05\text{mm} < W \leq 0.1\text{mm}, L \leq 5.0\text{mm}$	3 OR LESS (DISTANCE 5mm OVER)
	$W > 0.1\text{mm}$	NG
4. GENERAL CRACK 	$X \leq 3\text{mm}, Y \leq 2\text{mm}, Z \leq t$	IGNORED
5. CORNER CRACK 	$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z \leq t$	IGNORED
6. BAD CRACK 	All shall be rejected. By naked eyes.	NG
7. FISH EYE	$\phi \leq 0.2\text{mm}$	IGNORED
	$0.2\text{mm} < \phi \leq 0.4\text{mm}$	3 OR LESS (DISTANCE 5mm OVER)
	$0.4\text{mm} < \phi \leq 0.5\text{mm}$	1 OR LESS (DISTANCE 5mm OVER)
	$\phi > 0.5\text{mm}$	NG

13. INSPECTION CRITERIA

13.1 APPLICATION

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

13.2 INSPECTION CONDITIONS

13.2.1 (1)OBSERVATION DISTANCE : $45 \pm 5\text{cm}$

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

$\pm 45^\circ$ (FOR SECTION WITHIN VIEWING AREA), REFER TO FIG.A

90° (FOR SECTION OUTSIDE OF VIEWING AREA), REF TO FIG.B

PERPENDICULAR TO MODULE SURFACE

VIEWING ANGLE SHOULD BE SMALLER THAN 45°

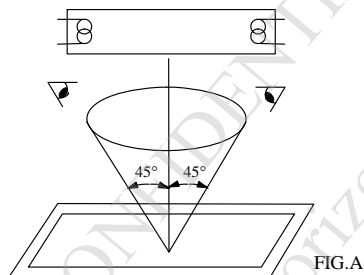


FIG.A

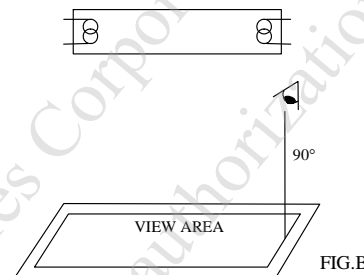


FIG.B

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° 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° WITH RESPECT TO THE VERTICAL AXIS FROM EDGE OF VIEWING AREA.

13.2.2 ENVIRONMENT CONDITIONS :

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

13.2.3 INSPECTION LOT

QUANTITY PER DELIVERY LOT FOR EACH MODEL

13.2.4 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

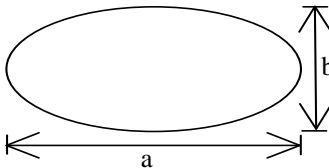
MINOR DEFECT : AQL 1.0

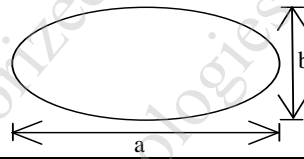
13.3 INSPECTION STANDARDS

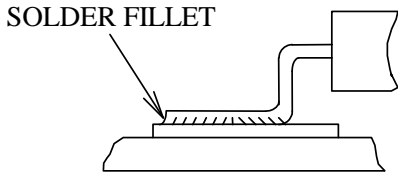
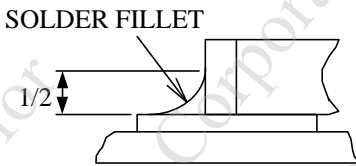
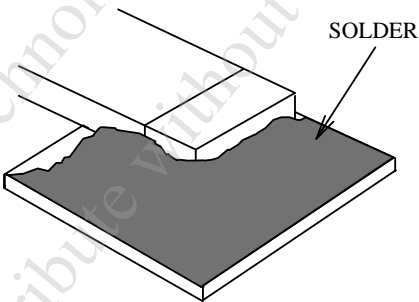
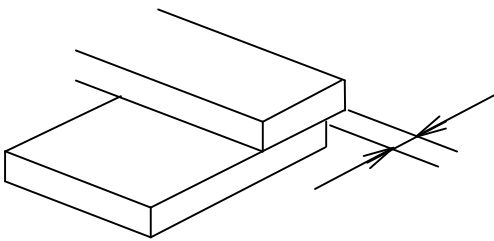
13.3.1 VISUAL DEFECTS CLASSIFICATION

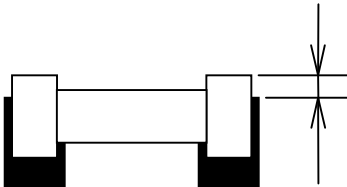
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> • DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS EX: DISCONNECTION, SHORT CIRCUIT ETC 	0.65
	2.BACKLIGHT	<ul style="list-style-type: none"> • NO LIGHT • FLICKERING AND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

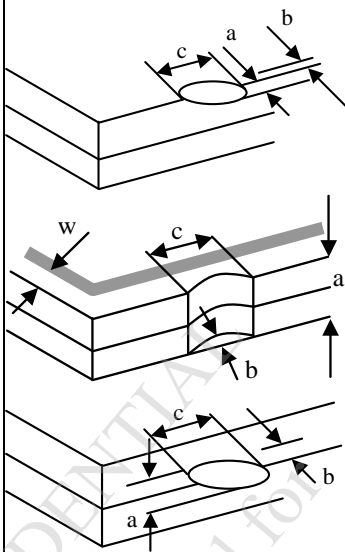
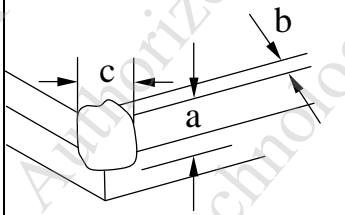
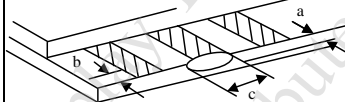
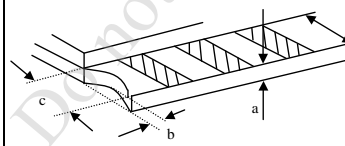
13.3.2 MODULE DEFECTS CLASSIFICATION

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"><thead><tr><th>ITEMS</th><th>ACCEPTABLE COUNT</th></tr></thead><tbody><tr><td>BRIGHT DOT</td><td>$N \leq 2$</td></tr><tr><td>DARK DOT</td><td>$N \leq 3$</td></tr><tr><td>TOTAL BRIGHT AND DARK DOTS</td><td>$N \leq 4$</td></tr></tbody></table> NOTE : 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 MUST BE VISIBLE THROUGH A 5% ND FILTER 2. BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN. 3. DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.	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	<table border="1"><thead><tr><th>LENGTH : L</th><th>WIDTH : W</th><th>PERMISSIBLE NO.</th></tr></thead><tbody><tr><td>$L \leq 0.3$</td><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$0.3 < L \leq 3.0$</td><td>$0.05 < W \leq 0.1$</td><td>4</td></tr><tr><td>$3.0 < L$</td><td>$0.1 < W$</td><td>NONE</td></tr></tbody></table> WIDTH : W mm, LENGTH : L mm	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	POLARIZER SCRATCHES	<table border="1"><thead><tr><th>LENGTH : L</th><th>WIDTH : W</th><th>PERMISSIBLE NO.</th></tr></thead><tbody><tr><td>$L \leq 0.3$</td><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$0.3 < L \leq 3.0$</td><td>$0.05 < W \leq 0.1$</td><td>4</td></tr><tr><td>$3.0 < L$</td><td>$0.1 < W$</td><td>NONE</td></tr></tbody></table> WIDTH : W mm, LENGTH : L mm	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												
6	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>$D \leq 0.15$</td><td>IGNORE</td></tr><tr><td>$0.15 < D \leq 0.5$</td><td>4</td></tr><tr><td>$0.5 < D$</td><td>NONE</td></tr></tbody></table> NOTE : DIAMETER $D=(a+b)/2$ 	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																								
7	BUBBLES OF POLARIZER /DIRT/DENT /SURFACE STAINS /CF FAIL	<table><tr><td></td><td>AVERAGE DIAMETER (mm) : D</td><td>NUMBER OF PIECES PERMITTED</td></tr><tr><td rowspan="3">BUBBLE ON THE POLARIZER</td><td>D ≤ 0.25</td><td>IGNORE</td></tr><tr><td>0.25 < D ≤ 0.5</td><td>N ≤ 5</td></tr><tr><td>0.5 < D</td><td>NONE</td></tr><tr><td rowspan="3">SURFACE STAINS/DIRT/DENT</td><td>D < 0.25</td><td>IGNORE</td></tr><tr><td>0.25 < D ≤ 0.4</td><td>N ≤ 3</td></tr><tr><td>0.4 < D</td><td>NONE</td></tr><tr><td rowspan="3">CF FAIL / SPOT</td><td>D < 0.1</td><td>IGNORE</td></tr><tr><td>0.1 < D ≤ 0.3</td><td>N ≤ 3</td></tr><tr><td>0.3 < D</td><td>NONE</td></tr></table>		AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED	BUBBLE ON THE POLARIZER	D ≤ 0.25	IGNORE	0.25 < D ≤ 0.5	N ≤ 5	0.5 < D	NONE	SURFACE STAINS/DIRT/DENT	D < 0.25	IGNORE	0.25 < D ≤ 0.4	N ≤ 3	0.4 < D	NONE	CF FAIL / SPOT	D < 0.1	IGNORE	0.1 < D ≤ 0.3	N ≤ 3	0.3 < D	NONE
			AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED																						
		BUBBLE ON THE POLARIZER	D ≤ 0.25	IGNORE																						
			0.25 < D ≤ 0.5	N ≤ 5																						
			0.5 < D	NONE																						
		SURFACE STAINS/DIRT/DENT	D < 0.25	IGNORE																						
			0.25 < D ≤ 0.4	N ≤ 3																						
			0.4 < D	NONE																						
		CF FAIL / SPOT	D < 0.1	IGNORE																						
			0.1 < D ≤ 0.3	N ≤ 3																						
0.3 < D	NONE																									
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. (2)THE EXTRANEIOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON. (3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING. AVERAGE DIAMETER (D)=(a+b)/2																										
																										
8	LINE DEFECT ON DISPLAY	OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOWED																								
9	MURA ON DISPLAY	IT'S OK IF MURA IS SLIGHT VISIBLE THROUGH 5% ND FILTER																								
10	UNEVEN COLOR SPREAD, COLORATION	1. TO BE DETERMINED BASED UPON THE STANDARD SAMPLE.																								
11	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.																								
12	PCB	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. 2. NO OXIDATION OR CONTAMINATION PCB TERMINALS. 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. 4. THE JUMPER ON THE PCB SHOULD CONFORM TO THE PRODUCT CHARACTERISTIC CHART. 5. IF SOLDER GETS ON BEZEL TAB PADS, LED PAD, ZEBRA PAD OR SCREW HOLD PAD: MAKE SURE IT IS SMOOTHED DOWN.																								

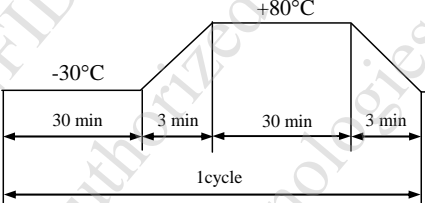
NO.	ITEM	CRITERIA
13	SOLDERING	<p>1. NO SOLDERING FOUND ON THE SPECIFIED PLACE</p> <p>2. INSUFFICIENT SOLDER</p> <p>(a)LSI, IC A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR "HEEL" OF LEAD AND PAD</p>  <p>(b)CHIP COMPONENT · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING</p>  <p>· SOLDER 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
13	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>
14	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>
15	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									
16	CRACKED GLASS	THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE									
		<div>GENERAL GLASS CHIP : </div> <div><table><tr><th>a</th><th>b</th><th>c</th></tr><tr><td>$\leq t/2$</td><td>< VIEWING AREA</td><td>$\leq 1/8X$</td></tr><tr><td>$t/2 > , \leq 2t$</td><td>$\leq W/2$</td><td>$\leq 1/8X$</td></tr></table><p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p></div>	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	$\leq 1/8X$							
$t/2 > , \leq 2t$	$\leq W/2$	$\leq 1/8X$									
<div>CORNER PART : </div> <div><table><tr><th>a</th><th>b</th><th>c</th></tr><tr><td>$\leq t/2$</td><td>< VIEWING AREA</td><td>$\leq 1/8X$</td></tr><tr><td>$> t/2 , \leq 2t$</td><td>$\leq W/2$</td><td>$\leq 1/8X$</td></tr></table><p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p></div>	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	$\leq 1/8X$									
$> t/2 , \leq 2t$	$\leq W/2$	$\leq 1/8X$									
<div>CHIP ON ELECTRODE PAD </div> <div><table><tr><th>a</th><th>b</th><th>c</th></tr><tr><td>$\leq t$</td><td>$\leq 0.5\text{mm}$</td><td>$\leq 1/8X$</td></tr></table><p>* X=LCD SIDE WIDTH t=GLASS THICKNESS</p></div>	a	b	c	$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$					
a	b	c									
$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$									
<div></div> <div><table><tr><th>a</th><th>b</th><th>c</th></tr><tr><td>$\leq t$</td><td>$\leq 1/8X$</td><td>$\leq L$</td></tr></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></div>	a	b	c	$\leq t$	$\leq 1/8X$	$\leq L$					
a	b	c									
$\leq t$	$\leq 1/8X$	$\leq L$									

14 RELIABILITY TEST

14.1 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)	<p>AIR DISCHARGE $\pm 12KV$ CONTACT DISCHARGE $\pm 8KV$ ACCORDING TO IEC-61000-4-2</p>

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.

14.2 TESTING CONDITIONS AND INSPECTION CRITERIA

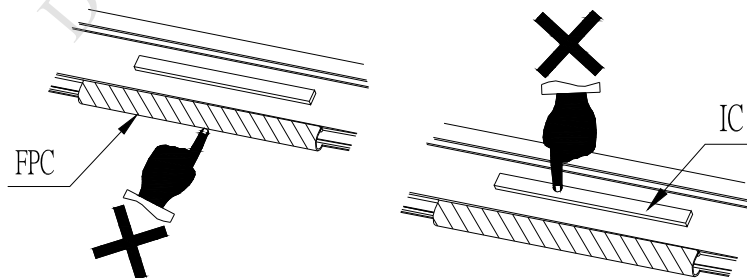
FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 12.5, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

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

15. CAUTION

15.1 OPERATION

- 15.1.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED .
- 15.1.2 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.
- 15.1.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST .
- 15.1.4 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.
- 15.1.5 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!



15.2 HANDLING

- 15.2.1 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.
- 15.2.2 DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED.
- 15.2.3 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.
- 15.2.4 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.
- 15.2.5 DON'T GIVE EXTERNAL SHOCK.
- 15.2.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 15.2.7 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.
- 15.2.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 15.2.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.
- 15.2.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 15.2.11 REWIRING: NO MORE THAN 3 TIMES.