

EXAMINED BY : Kevin Kuo	EMERGING DISPLAY TECHNOLOGIES CORPORATION	FILE NO . CAS-0009044
APPROVED BY : Vincent Wu		ISSUE :MAR.08, 2022
		TOTAL PAGE : 23
		VERSION : 8
CUSTOMER ACCEPTANCE SPECIFICATIONS MODEL NO. : ET070023UDBA (RoHS) FOR MESSRS : _____ CUSTOMER'S APPROVAL DATE : _____ BY : _____		

<https://www.edtc.com/>

<https://smartembeddeddisplay.com/>

RECORDS OF REVISION

DOC . FIRST ISSUE

JUL.28, 2020

DATE

REVISED
PAGE
NO.

SUMMARY

AUG.03, 2020

2

3.1 TFT MODULE ELECTRICAL ABSOLUTE MAXIMUM RATINGS
POWER SUPPLY VOLTAGE FOR LED DRIVER: UNIT: mW→V

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)

ITEM	OPERATING		STORAGE		REMARK
	MIN.	MAX.	MIN.	MAX.	
AMBIENT TEMPERATURE	-30 °C	80 °C	-30 °C	80 °C	NOTE (1), (2), (3), (4)

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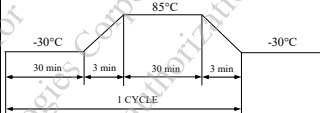
5.3 RESET TIMING
RESETB→/RESET

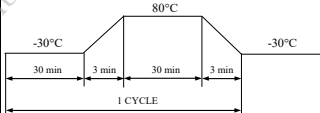
6,7

5.4 POWER ON/OFF SEQUENCE
VDD1/2→VDD, RESETB→/RESET

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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
3	HIGH TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +85°C FOR 240 HRS
6	THERMAL SHOCK (NOT OPERATED)	THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION : 

NO.	ITEM	DESCRIPTION
1	HIGH TEMPERATURE OPERATION	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 HRS
3	HIGH TEMPERATURE STORAGE	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 HRS
6	THERMAL SHOCK (NOT OPERATED)	THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION : 

SEP.04, 2020

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3.2 ENVIRONMENTAL ABSOLUTE MAXIMUM RATINGS
AMBIENT TEMPERATURE: REMARK: DELETE NOTE (4)
DELETE NOTE (4)

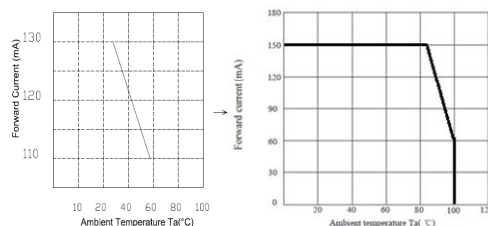
3

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	VBL+VSS	—	9.0	12.0	15.0	V	
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+VSS=12.0V	—	(496)	(645)	mA	

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.0	3.3	3.6	V	
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+VSS	—	5.0	12.0	15.0	V	
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+VSS=5.0V	—	(951)	(1240)	mA	
		VBL+VSS=12.0V	—	(496)	(645)	mA	

NOTE (3) :



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7. OUTLINE DIMENSIONS

MARK $\triangle$: MODIFY FRAME OPENING & ADD POLARIZER DIMENSION
MODIFY FPC PAD WIDTH TOLERANCE & ADD PULL TAPE

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8. BLOCK DIAGRAM

45.NC→45.CS(NC)/ID1, 46.NC→46.SDIN(NC)/ID2, 47.NC→47.SCK(NC)/ID3,
48.NC→48.DISPLAY CONTROL/ID4

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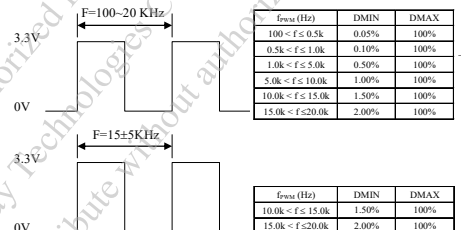
10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
45	NC	NON CONNECTION (THIS PIN IS RESERVED FOR CSB, AND CLIENT SIDE SHOULD NOT CONNECT TO THIS PIN)
46	NC	NON CONNECTION (THIS PIN IS RESERVED FOR SDA, AND CLIENT SIDE SHOULD NOT CONNECT TO THIS PIN)
47	NC	NON CONNECTION (THIS PIN IS RESERVED FOR SCL, AND CLIENT SIDE SHOULD NOT CONNECT TO THIS PIN)
48	NC	NON CONNECTION (THIS PIN IS RESERVED FOR VDDOTP, AND CLIENT SIDE SHOULD NOT CONNECT TO THIS PIN)

PIN NO.	SYMBOL	FUNCTION
45	CS(NC)/ID1	CS FOR LCM-DRIVER SPI-PORT/ID1(NC)
46	SDIN(NC)/ID2	SDIN FOR LCM-DRIVER SPI-PORT/ID2(PULL HIGH TO VDD)
47	SCK(NC)/ID3	SCK FOR LCM-DRIVER SPI-PORT/ID3(PULL HIGH TO VDD)
48	DISPLAY CONTROL/ID4	DISPLAY ENABLE/ID4(NC)

11.1 POWER SUPPLY FOR LCM

NOTE (2) : PWM SIGNAL=0~3.3V , OPERATION FREQUENCY :
100~20KHz→OPERATION FREQUENCY : 15±5KHz



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13.1 STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE
DELETE NOTE (2)

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13.2 TESTING CONDITIONS AND INSPECTION CRITERIA→
NOTE (2): TESTING CONDITIONS AND INSPECTION CRITERIA

OCT.28, 2020

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4. ELECTRICAL CHARACTERISTICS

ITEM	CONDITION	TYP.	MAX.	ITEM	CONDITION	TYP.	MAX.
POWER SUPPLY CURRENT FOR LED DRIVER	VBL+-VSS=5.0V	(951)	(1240)	POWER SUPPLY CURRENT FOR LED DRIVER	VBL+-VSS=5.0V	(871)	(1133)
LED LIFE TIME	VBL+-VSS=12.0V I _{LED} =60mA (PER LED)	(496)	(645)	LED LIFE TIME	VBL+-VSS=12.0V I _{LED} =40mA (PER LED)	(416)	(541)

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10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
45	CS(NC)/ID1	CS FOR LCM-DRIVER SPI-PORT/ID1(NC)
46	SDIN(NC)/ID2	SDIN FOR LCM-DRIVER SPI-PORT/ID2(PULL HIGH TO VDD)
47	SCK(NC)/ID3	SCK FOR LCM-DRIVER SPI-PORT/ID3(PULL HIGH TO VDD)
48	DISPLAY CONTROL/ID4	DISPLAY ENABLE/ID4(NC)

PIN NO.	SYMBOL	FUNCTION
45	CS/ ID1	CS FOR SERIAL PORT/ ID1(SIZE INFO, NOT USED)
46	SDIN/ ID2	SDIN FOR SERIAL PORT/ ID2(SIZE INFO, PULL HIGH TO VDD, INTERNAL: 10KΩ)
47	SCK/ ID3	SCK FOR SERIAL PORT/ ID3(SIZE INFO, PULL HIGH TO VDD, INTERNAL: 10KΩ)
48	DISPLAY CONTROL (STAND BY)/ ID4	DISPLAY CONTROL(STAND BY)/ ID4(SIZE INFO, NOT USED)

NOV.10, 2020

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3.1 TFT MODULE ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	+4.0
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VSS	+9.0	+15.0

ITEM	SYMBOL	MIN.	MAX.
POWER SUPPLY VOLTAGE	VDD-VSS	-0.3	4.0
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VSS	5.0	15.0

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	8	6.1 OPTICAL CHARACTERISTICS THE BRIGHTNESS OF MODULE (CENTER): MIN.=(1000)→(800) , TYP.= (1050)→(1000)																																																																																																																	
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7	7. OUTLINE DIMENSIONS NOT SPECIFIED TOLERANCE IS ± 0.5 → ± 0.3																																																																																																																		

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1. GENERAL SPECIFICATIONS

1.1 DATA SHEETS FOR CONTROLLER/DRIVER

PLEASE REFER TO :

HIMAX HX8249-A
HIMAX HX8678-C

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	7 inch
(2) NUMBER OF DOTS	800W * (RGB) * 480H DOTS
(3) MODULE SIZE	165W * 104.44H *5.5D mm
(4) VIEWING AREA	154.6W * 93.64H mm
(5) ACTIVE AREA	152.4W * 91.44H mm
(6) DOT SIZE	0.0635W * 0.1905H mm
(7) PIXEL SIZE	0.1905W * 0.1905H 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 MODE ONLY)
(13) WEIGHT	TBD

3. ABSOLUTE MAXIMUM RATINGS

3.1 TFT 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	80 °C	-30 °C	80 °C	NOTE (1), (2), (3)
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)	—	490.0 m/s ² (50 G)	10 ms XYZ DIRECTIONS 1 TIME EACH

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.

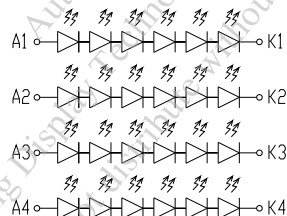
4. ELECTRICAL CHARACTERISTICS

Ta = 25 °C

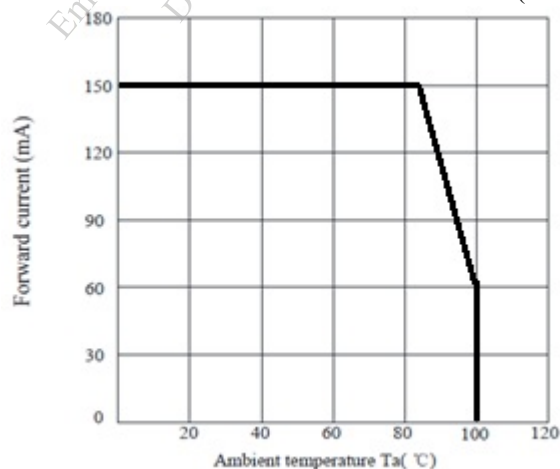
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.0	3.3	3.6	V	
POWER SUPPLY CURRENT	IDD	VDD-VSS=3.3V	—	200	260	mA	NOTE (1)
LOGIC HIGH INPUT VOLTAGE	VIH	—	0.7*VDD	—	VDD+0.3	V	
LOGIC LOW INPUT VOLTAGE	VIL	—	VSS-0.3	—	0.3*VDD	V	
LOGIC HIGH OUTPUT VOLTAGE	VOH	—	VDD-0.4	—	—	V	
LOGIC LOW OUTPUT VOLTAGE	VOL	—	VSS	—	VSS+0.4	V	
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VSS	—	5.0	12.0	15.0	V	
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+-VSS=5.0V	—	700	910	mA	
		VBL+-VSS=12.0V	—	270	350		
LED LIFE TIME	—	I _{LED} =40mA (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 TEMP. VS. ALLOWABLE FORWARD CURRENT.(PER LED)



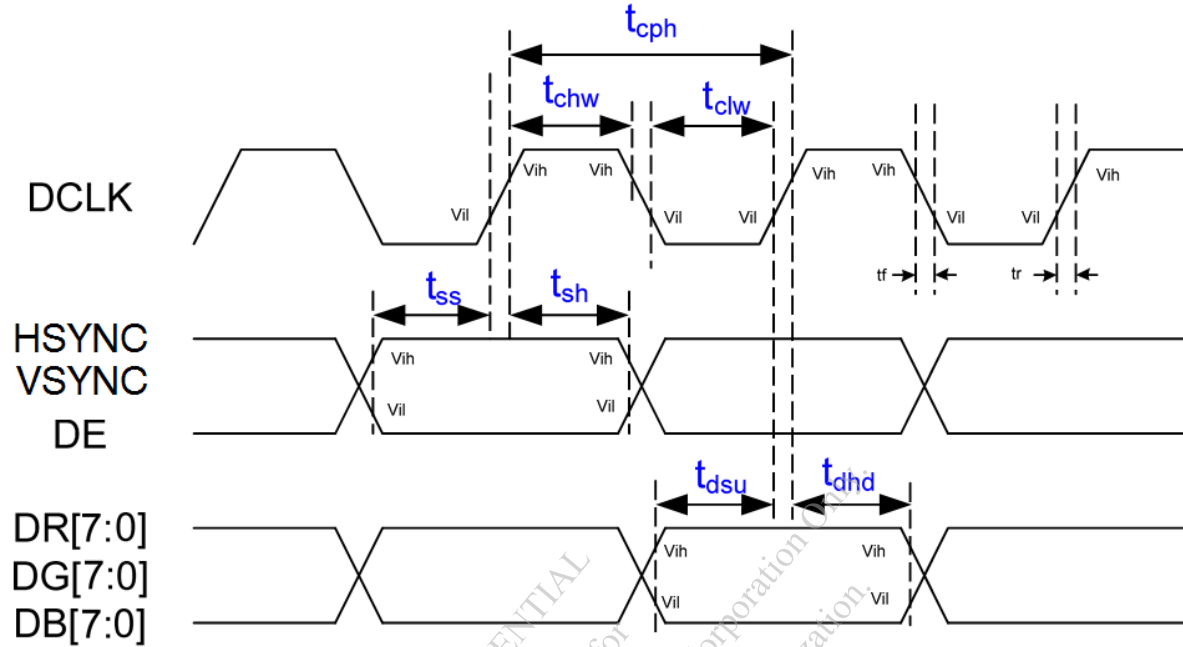
NOTE (4) : CONDITIONS; TA=25 °C, CONTINUOUS LIGHTING.

NOTE (5) : DEFINITIONS OF LIFE TIME

LCD LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

5. TIMING CHARACTERISTICS

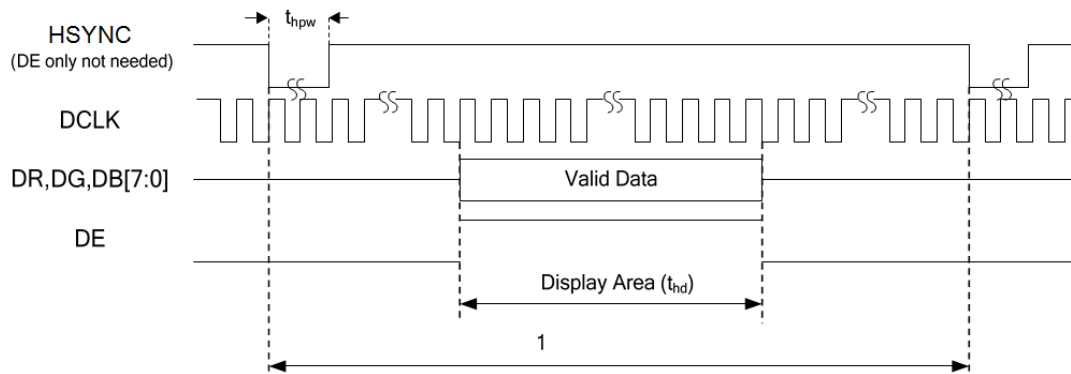
5.1 INPUT SIGNAL TIMING



ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK PERIOD	T_{cph}	16.8	—	—	ns
DCLK CLOCK HIGH WIDTH	T_{chw}	6	—	—	ns
DCLK CLOCK LOW WIDTH	T_{clw}	6	—	—	ns
VSYNC SETUP TIME	T_{ss}	5	—	—	ns
VSYNC HOLD TIME	T_{sh}	5	—	—	ns
HSYNC SETUP TIME	T_{ss}	5	—	—	ns
HSYNC HOLD TIME	T_{sh}	5	—	—	ns
DE SETUP TIME	T_{ss}	5	—	—	ns
DE HOLD TIME	T_{sh}	5	—	—	ns
DATA SETUP TIME	T_{dsu}	5	—	—	ns
DATA HOLD TIME	T_{dhd}	5	—	—	ns
INPUT SIGNAL RISING TIME	T_r	—	—	10	ns
INPUT SIGNAL FALLING TIME	T_{tf}	—	—	10	ns

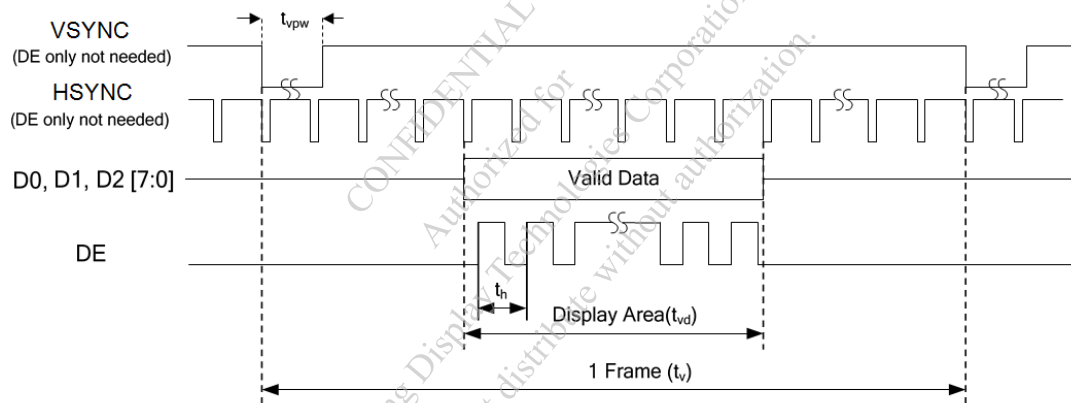
5.2 DE MODE SIGNAL CHARACTERISTICS

HORIZONTAL



HORIZONTAL INPUT TIMING AT DE ONLY MODE

VERTICAL

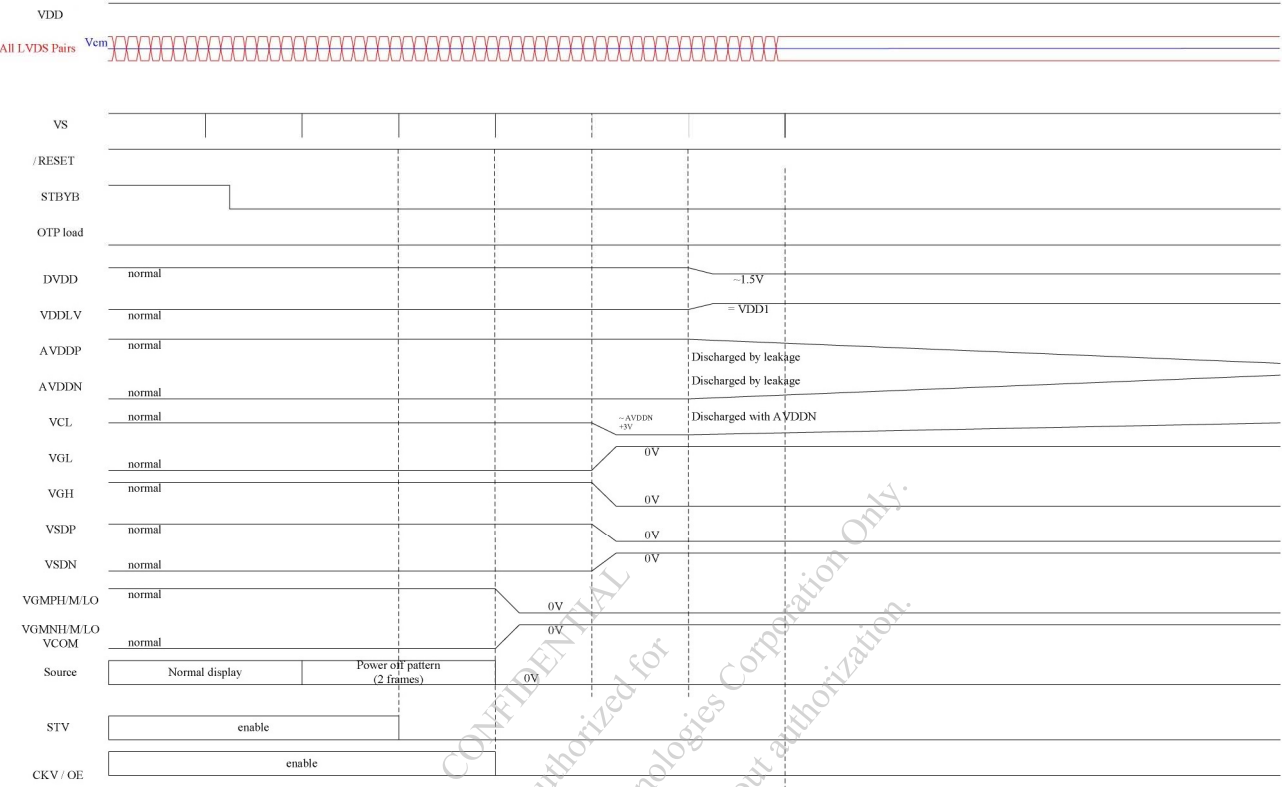


VERTICAL INPUT TIMING AT DE ONLY MODE

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
DCLK FREQUENCY	F_{DCLK}	25.2	27.2	30.5	MHz
HORIZONTAL VALID DATA	t_{hd}		800		DCLK
1 HORIZONTAL LINE	t_h	856	860	920	DCLK
VERTICAL VALID DATA	t_{vd}		480		H
1 VERTICAL FIELD	t_v	490	528	552	H

NOTE (1) : DCLK FREQUENCY MIN/MAX VALUE IS BASE ON FRAME RATE 60 Hz.

POWER OFF SEQUENCE



6. OPTICAL CHARACTERISTICS (NOTE 1)

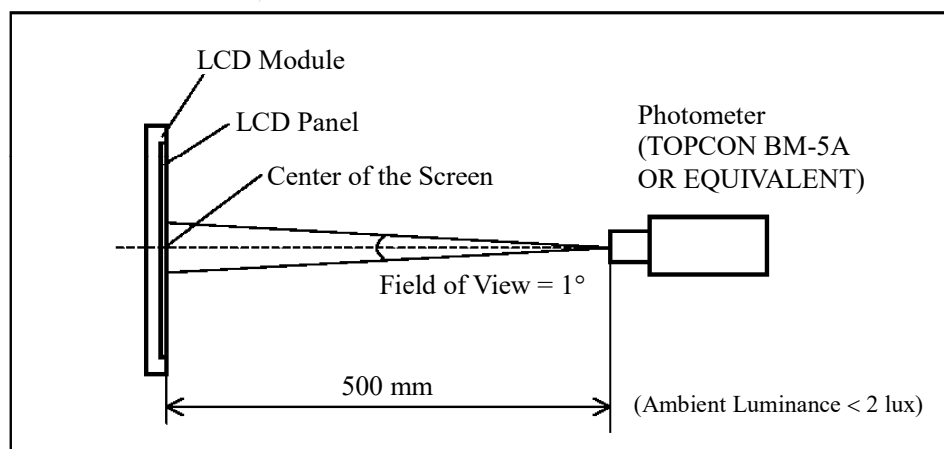
6.1 OPTICAL CHARACTERISTICS

Ta = 25 ± 2 °C

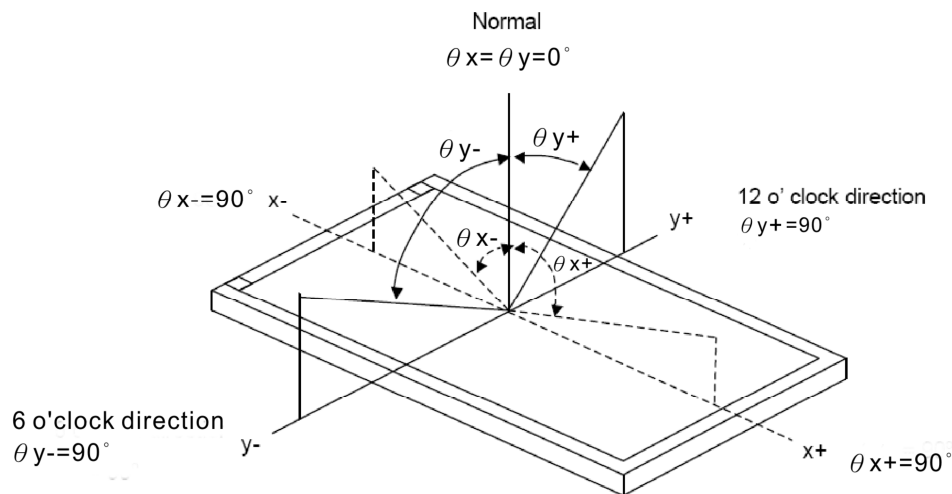
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	REMARK
VIEWING ANGLE		θ_{y+}	CR ≥ 10	$\theta_x=0^\circ$	70	80	—	d e g .	NOTE (2) NOTE (3)
		θ_{y-}			70	80	—		
		θ_{x+}		$\theta_y=0^\circ$	70	80	—		
		θ_{x-}			70	80	—		
CONTRAST RATIO (CENTER)		CR	$\theta_x=0^\circ$, $\theta_y=0^\circ$		800	1000	—	—	NOTE (3)
RESPONSE TIME		T _R (rise) + T _F (fall)	$\theta_x=0^\circ$, $\theta_y=0^\circ$		—	25	35	ms	NOTE (4)
COLOR CHROMATICITY (CENTER)	WHITE	W _x	$\theta_x=0^\circ$, $\theta_y=0^\circ$ VDD-VSS=3.3V VBL+-VSS=12V NTSC : 68%	0.27	0.32	0.37	—	NOTE (5)	
		W _y		0.31	0.36	0.41			
	RED	R _x		0.60	0.65	0.70	—		
		R _y		0.29	0.34	0.39			
	GREEN	G _x		0.28	0.33	0.38	—		
		G _y		0.60	0.65	0.70			
	BLUE	B _x		0.08	0.13	0.18	—		
		B _y		0.02	0.07	0.12			
THE BRIGHTNESS OF MODULE (CENTER)		B		800	1000	—	cd/m ²	NOTE (6)	
THE UNIFORMITY OF MODULE		—		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 :



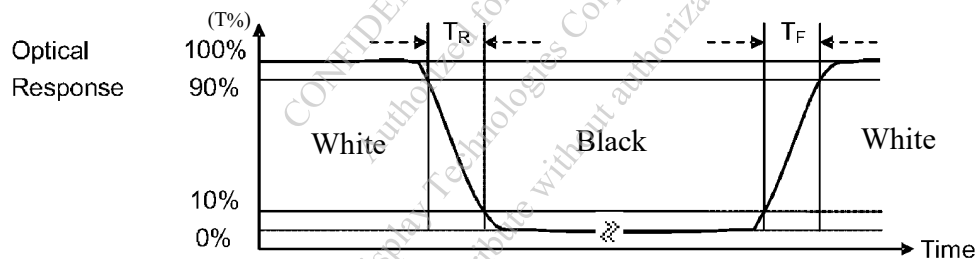
NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :

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.



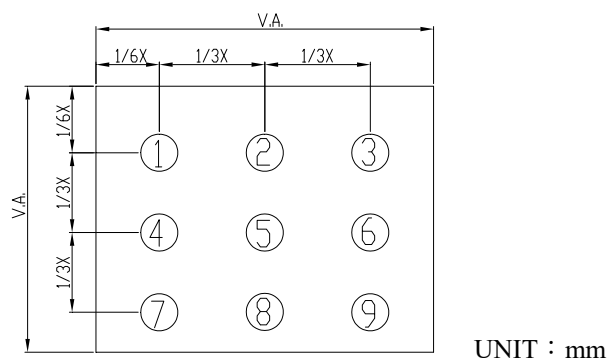
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

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

(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

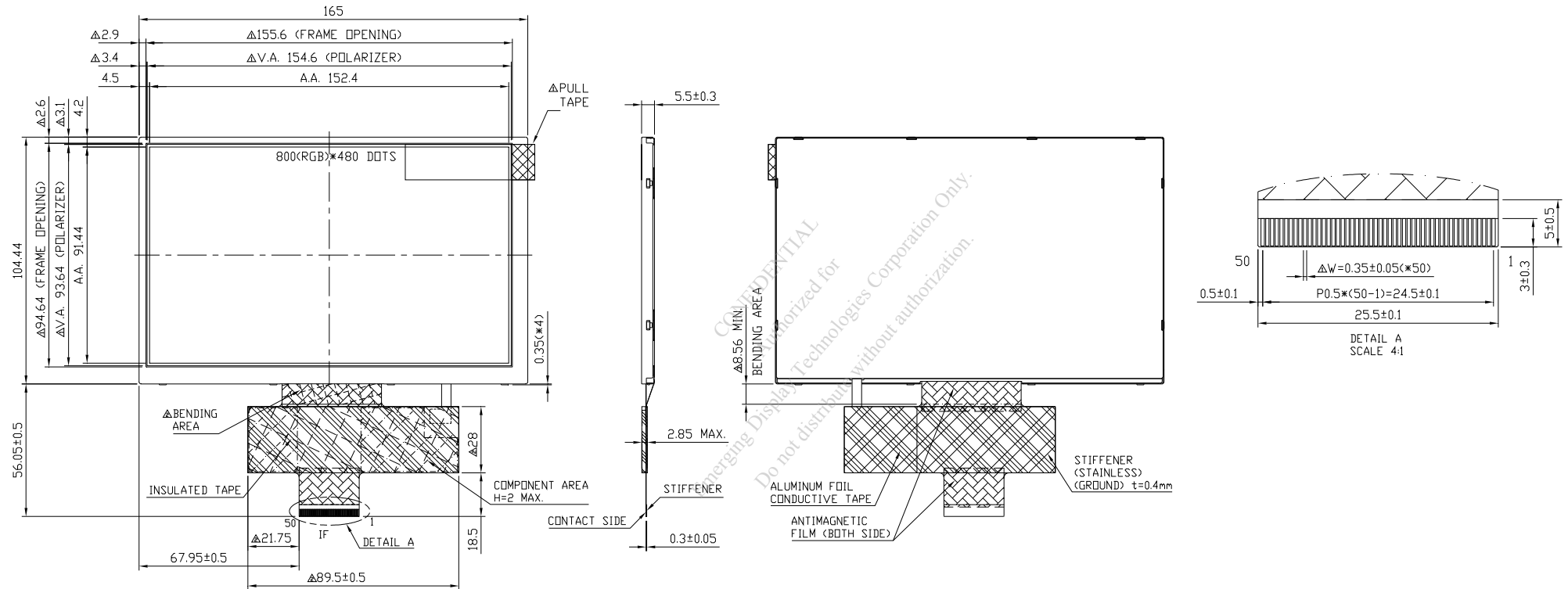


UNIT : mm

(b) THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

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

7. OUTLINE DIMENSIONS



UNIT : mm

SCALE : NTS

THIRD ANGLE PROJECTION

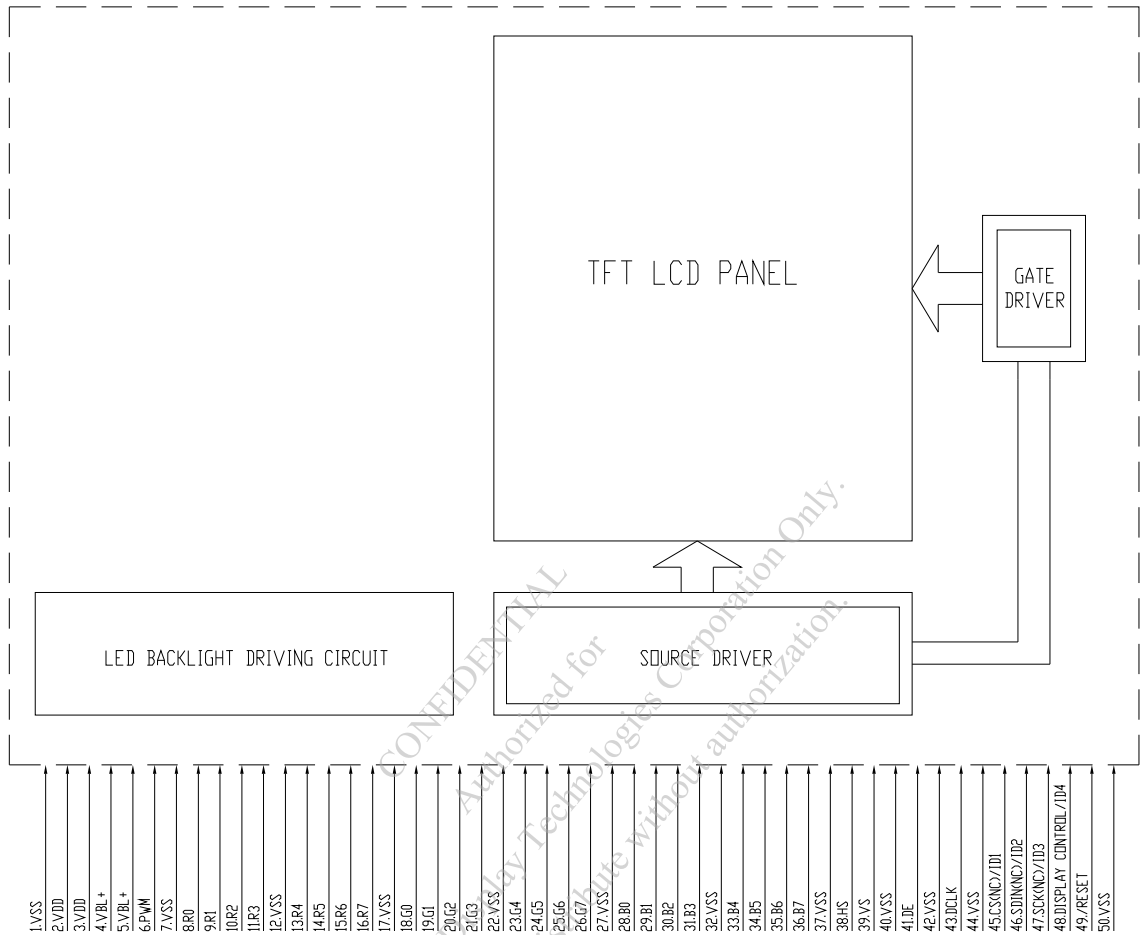
NOT SPECIFIED TOLERANCE IS ± 0.3

MARK Δ MODIFY (NUMBER NOTE MODIFY VERSION)

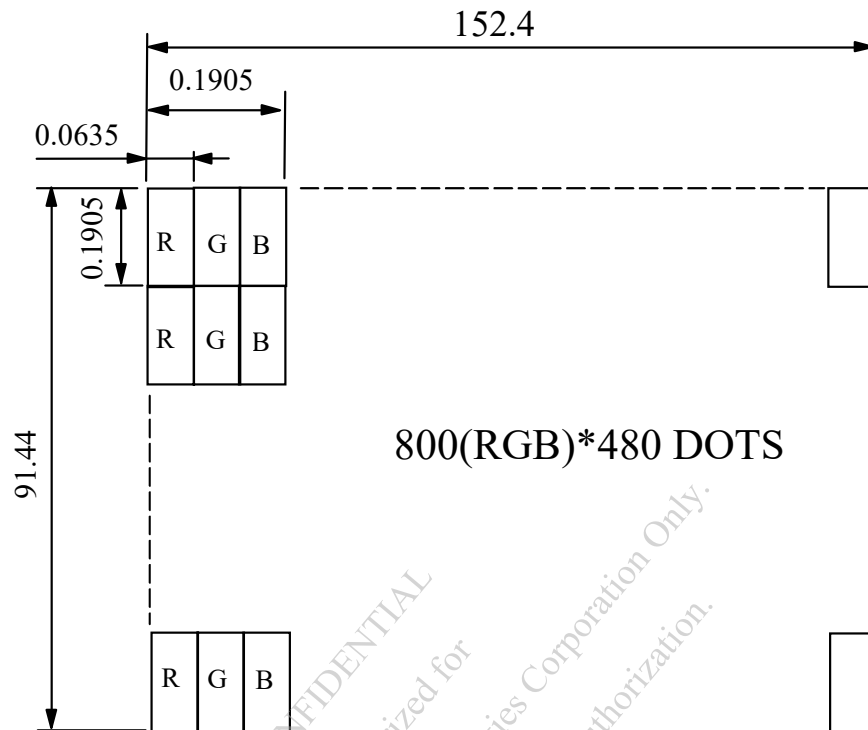
NOTE :

1.RECOMMEND MATCH CONNECTOR KYOCERA : 04 6240 050 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

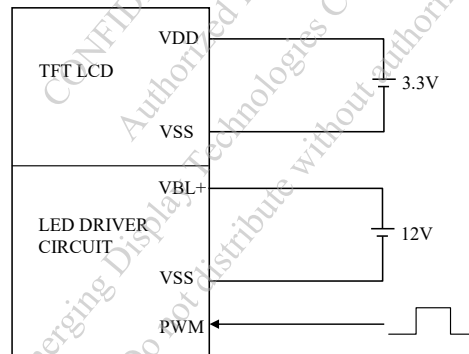
10. INTERFACE SIGNALS

PIN NO.	SYMBOL	FUNCTION
1	VSS	POWER 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	POWER GROUND.
8	R0	RED DATA.
9	R1	RED DATA.
10	R2	RED DATA.
11	R3	RED DATA.
12	VSS	POWER GROUND.
13	R4	RED DATA.
14	R5	RED DATA.
15	R6	RED DATA.
16	R7	RED DATA.
17	VSS	POWER GROUND.
18	G0	GREEN DATA.
19	G1	GREEN DATA.
20	G2	GREEN DATA.
21	G3	GREEN DATA.
22	VSS	POWER GROUND.
23	G4	GREEN DATA.
24	G5	GREEN DATA.
25	G6	GREEN DATA.
26	G7	GREEN DATA.
27	VSS	POWER GROUND.
28	B0	BLUE DATA.
29	B1	BLUE DATA.
30	B2	BLUE DATA.
31	B3	BLUE DATA.
32	VSS	POWER GROUND.
33	B4	BLUE DATA.
34	B5	BLUE DATA.
35	B6	BLUE DATA.
36	B7	BLUE DATA.
37	VSS	POWER GROUND.
38	HS	LINE SYNCHRONIZATION SIGNAL. HORIZONTAL SYNC INPUT.
39	VS	FRAME SYNCHRONIZATION SIGNAL. VERTICAL SYNC INPUT.
40	VSS	POWER GROUND.

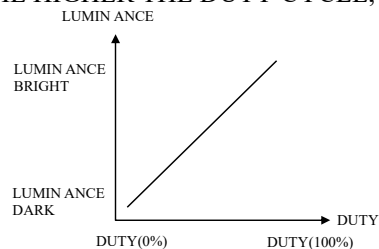
PIN NO.	SYMBOL	FUNCTION
41	DE	DISPLAY ENABLE PIN FROM CONTROLLER. DATA INPUT ENABLE.
42	VSS	POWER GROUND.
43	DCLK	DOT DATA CLOCK
44	VSS	POWER GROUND.
45	CS/ ID1	CS FOR SERIAL PORT/ ID1(SIZE INFO, NOT USED)
46	SDIN/ ID2	SDIN FOR SERIAL PORT/ ID2(SIZE INFO, PULL HIGHT TO VDD) (INTERAL, 10K Ω)
47	SCK/ ID3	SCK FOR SERIAL PORT/ ID3(SIZE INFO, PULL HIGHT TO VDD) (INTERAL, 10K Ω)
48	DISPLAY CONTROL (STAND BY)/ ID4	DISPLAY CONTROL(STAND BY)/ ID4(SIZE INFO, NOT USED)
49	/RESET	GLOBAL RESET(LOW ACTIVE).
50	VSS	POWER GROUND.

11. POWER SUPPLY

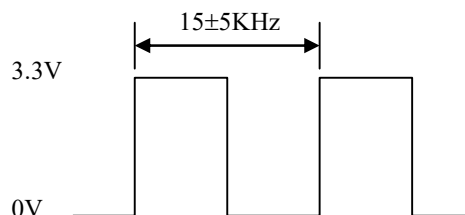
11.1 POWER SUPPLY FOR LCM



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) : OPERATION FREQUENCY : 15 $\pm$ 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 : $45 \pm 5\text{cm}$

(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°

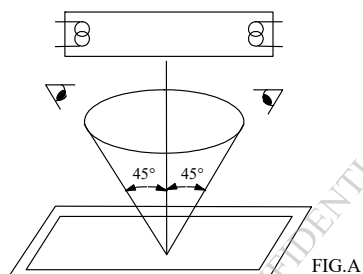


FIG.A

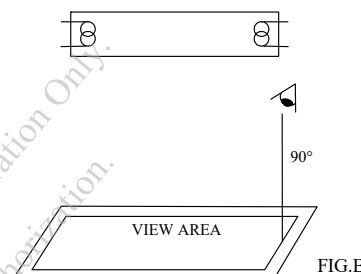


FIG.B

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.

12.2.2 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		15 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

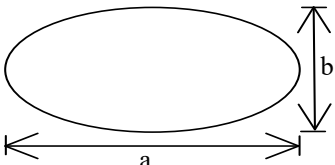
MINOR DEFECT : AQL 1.0

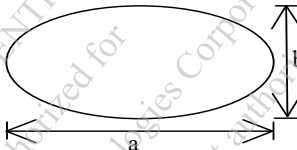
12.3 INSPECTION STANDARDS

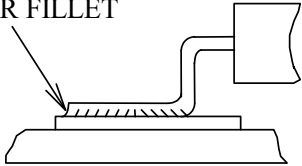
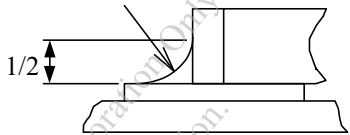
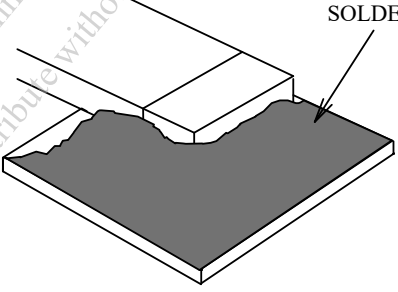
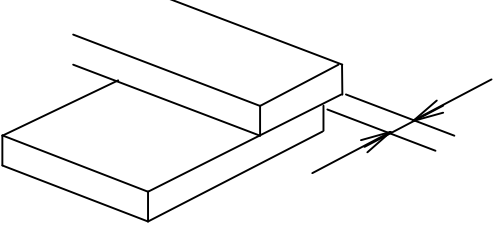
12.3.1 VISUAL DEFECTS CLASSIFICATION

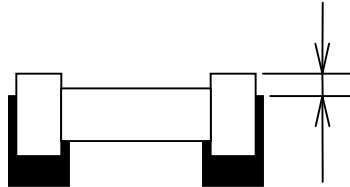
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	• DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS - EX: DISCONNECTION, SHORT CIRCUIT ETC	0.65
	2.BACKLIGHT	• NO LIGHT • FLICKERING AND OTHER ABNORMAL ILLUMINATION	
	3.DIMENSIONS	• SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS	
MINOR DEFECT	1.DISPLAY ZONE	• BLACK/WHITE SPOT • BUBBLES ON POLARIZER • NEWTON RING • BLACK/WHITE LINE • SCRATCH • CONTAMINATION • UNEVEN COLOR SPREAD	1.0
	2.BEZEL ZONE	• STAINS • SCRATCHES • FOREIGN MATTER	
	3.SOLDERING	• INSUFFICIENT SOLDER • SOLDERED IN INCORRECT POSITION • CONVEX SOLDERING SPOT • SOLDER BALLS • SOLDER SCRAPS	
	4.DISPLAY ON (ALL ON)	• LIGHT LINE	

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><tr><th colspan="2">ITEM</th><th>ACCEPTABLE COUNT</th></tr><tr><td rowspan="3">BRIGHT DOT</td><td>RANDOM</td><td>N = 3</td></tr><tr><td>2 DOTS ADJACENT (PAIR)</td><td>N = 0</td></tr><tr><td>3 DOTS ADJACENT OR MORE</td><td>N = 0</td></tr><tr><td rowspan="3">DARK DOT</td><td>RANDOM</td><td>N ≤ 5</td></tr><tr><td>2 DOTS ADJACENT (PAIR)</td><td>N = 0</td></tr><tr><td>3 DOTS ADJACENT OR MORE</td><td>N = 0</td></tr><tr><td colspan="2">TOTAL BRIGHT AND DARK DOT</td><td>N ≤ 5</td></tr></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 MOST 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.	ITEM		ACCEPTABLE COUNT	BRIGHT DOT	RANDOM	N = 3	2 DOTS ADJACENT (PAIR)	N = 0	3 DOTS ADJACENT OR MORE	N = 0	DARK DOT	RANDOM	N ≤ 5	2 DOTS ADJACENT (PAIR)	N = 0	3 DOTS ADJACENT OR MORE	N = 0	TOTAL BRIGHT AND DARK DOT		N ≤ 5
ITEM		ACCEPTABLE COUNT																				
BRIGHT DOT	RANDOM	N = 3																				
	2 DOTS ADJACENT (PAIR)	N = 0																				
	3 DOTS ADJACENT OR MORE	N = 0																				
DARK DOT	RANDOM	N ≤ 5																				
	2 DOTS ADJACENT (PAIR)	N = 0																				
	3 DOTS ADJACENT OR MORE	N = 0																				
TOTAL BRIGHT AND DARK DOT		N ≤ 5																				
4	FOREIGN BLACK/WHITE/ BRIGHT LINE/ OF VIEWING AREA	<table><tr><th>LENGTH : L</th><th>WIDTH : W</th><th>PERMISSIBLE NO.</th></tr><tr><td>—</td><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$L \leq 5.0$</td><td>$0.05 < W \leq 0.1$</td><td>4</td></tr><tr><td>$5.0 < L$</td><td>$0.1 < W$</td><td>NONE</td></tr></table> WIDTH : W mm, LENGTH : L mm	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	—	$W \leq 0.05$	IGNORE	$L \leq 5.0$	$0.05 < W \leq 0.1$	4	$5.0 < L$	$0.1 < W$	NONE								
LENGTH : L	WIDTH : W	PERMISSIBLE NO.																				
—	$W \leq 0.05$	IGNORE																				
$L \leq 5.0$	$0.05 < W \leq 0.1$	4																				
$5.0 < L$	$0.1 < W$	NONE																				
5	POLARIZER SCRATCHES	<table><tr><th>LENGTH : L</th><th>WIDTH : W</th><th>PERMISSIBLE NO.</th></tr><tr><td>—</td><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$L \leq 5.0$</td><td>$0.05 < W \leq 0.1$</td><td>4</td></tr><tr><td>$5.0 < L$</td><td>$0.1 < W$</td><td>NONE</td></tr></table> WIDTH : W mm, LENGTH : L mm	LENGTH : L	WIDTH : W	PERMISSIBLE NO.	—	$W \leq 0.05$	IGNORE	$L \leq 5.0$	$0.05 < W \leq 0.1$	4	$5.0 < L$	$0.1 < W$	NONE								
LENGTH : L	WIDTH : W	PERMISSIBLE NO.																				
—	$W \leq 0.05$	IGNORE																				
$L \leq 5.0$	$0.05 < W \leq 0.1$	4																				
$5.0 < L$	$0.1 < W$	NONE																				
6	FOREIGN MATTER \ BLACK SPOTS \ WHITE SPOTS \ DENT (INCLUDING LIGHT LEAKAGE DUE TO POLARIZING PLATES PINHOLES, ETC.)	<table><tr><th>AVERAGE DIAMETER (mm): D</th><th>NUMBER OF PIECES PERMITTED</th></tr><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></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																					

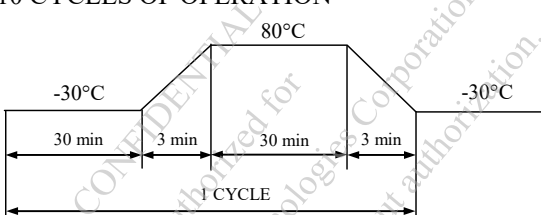
NO.	ITEM	CRITERIA																								
7	BUBBLES OF POLARIZER /DIRT/CF FAIL /SURFACE STAINS	<table><tr><td></td><td>AVERAGE DIAMETER (mm) : D</td><td>NUMBER OF PIECES PERMITTED</td></tr><tr><td rowspan="3">BUBBLE ON THE POLARIZER</td><td>$D \leq 0.25$</td><td>IGNORE</td></tr><tr><td>$0.25 < D \leq 0.5$</td><td>$N \leq 5$</td></tr><tr><td>$0.5 < D$</td><td>NONE</td></tr><tr><td rowspan="3">SURFACE STAINS</td><td>$D \leq 0.1$</td><td>IGNORE</td></tr><tr><td>$0.1 < D \leq 0.5$</td><td>$N \leq 4$</td></tr><tr><td>$0.5 < D$</td><td>NONE</td></tr><tr><td rowspan="3">CF FAIL / SPOT</td><td>$D \leq 0.1$</td><td>IGNORE</td></tr><tr><td>$0.1 < D \leq 0.5$</td><td>$N \leq 4$</td></tr><tr><td>$0.5 < D$</td><td>NONE</td></tr></table>		AVERAGE DIAMETER (mm) : D	NUMBER OF PIECES PERMITTED	BUBBLE ON THE POLARIZER	$D \leq 0.25$	IGNORE	$0.25 < D \leq 0.5$	$N \leq 5$	$0.5 < D$	NONE	SURFACE STAINS	$D \leq 0.1$	IGNORE	$0.1 < D \leq 0.5$	$N \leq 4$	$0.5 < D$	NONE	CF FAIL / SPOT	$D \leq 0.1$	IGNORE	$0.1 < D \leq 0.5$	$N \leq 4$	$0.5 < D$	NONE
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		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	NOT VISIBLE THROUGH 5% ND FILTER OR JUDGED BY LIMIT SAMPLE IF NECESSARY.																								
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	(1)NO SOLDERING FOUND ON THE SPECIFIED PLACE (2)INSUFFICIENT SOLDER (a)LSI, IC A POOR WETTING OF SOLDER IS BETWEEN LOWER BEND OR "HEEL" OF LEAD AND PAD SOLDER FILLET  (b)CHIP COMPONENT · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING SOLDER FILLET  · SOLDER WETS 3 SIDES OF TERMINAL, BUT LESS THAN 25% OF SIDES AND FRONT SURFACE AREA ARE COVERED  (3)PARTS ALIGNMENT (a)LSI, IC LEAD WIDTH IS MORE THAN 50% BEYOND PAD OUTLINE 

NO.	ITEM	CRITERIA
13	SOLDERING	(b)CHIP COMPONENT COMPONENT IS OFF CENTER, AND MORE THAN 50% OF THE LEADS IS OFF THE PAD OUTLINE  (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.
14	BACKLIGHT	(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.
15	GENERAL APPEARANCE	(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.

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 +80°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 +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)	THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION : 
7	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	HUMAN BODY MODEL C=100pF, R=1.5KΩ; DISCHARGE: ±2KV

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.

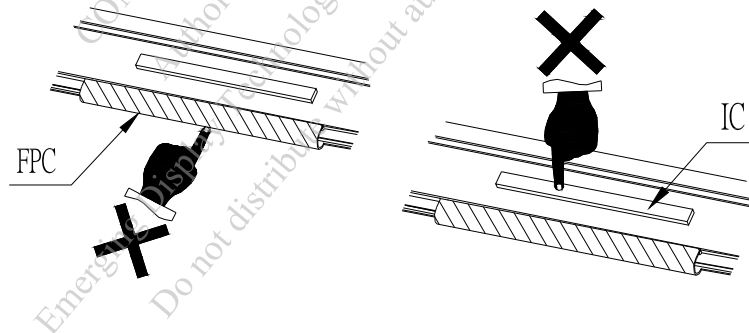
NOTE (2) : TESTING CONDITIONS AND INSPECTION CRITERIA

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 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.