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CUSTOMER ACCEPTANCE SPECIFICATIONS MODEL NO.: <u>ETML043023UDRA</u> (RoHS) FOR MESSRS : _____ CUSTOMER'S APPROVAL DATE : _____ BY : _____		

RECORDS OF REVISION

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PAGE
NO.

SUMMARY

OCT.28, 2020

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4.1 LCD MODULE ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.15	3.30	3.45	V	
LED LIFE TIME	—	IF=120mA (PER LED)	50K	—	—	HRS	NOTE (5) NOTE (6)

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD-VSS	—	3.0	3.3	3.6	V	
LED LIFE TIME	—	IF=50mA (PER LED)	50K	—	—	HRS	NOTE (5) NOTE (6)

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4.2 CAPACITIVE TOUCH PANEL ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY CURRENT	IDD1	VDD1-VSS1 =3.30V	—	(100)	(130)	mA

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY CURRENT	IDD1	VDD1-VSS1 =3.30V REPORT RATE: 125Hz	—	(75)	(98)	mA

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8.1 TFT

MODIFY PIN NO.: 45.CS(NC)/ID1→45.CS/ID1,
46.SDIN(NC)/ID2→46.SDIN/ID2,
47.SCK(NC)/ID3→47.SCK/ID3

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10.1 IF1

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)
47	SCK(NC)/ID3	SCK FOR LCM-DRIVER SPI-PORT/ID3(PULL LOW)
48	DISPLAY CONTROL/ID4	DISPLAY/ID4(NC)

PIN NO.	SYMBOL	FUNCTION
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 HIGH TO VDD, 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)

MAY.19, 2021

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7. OUTLINE DIMENSIONS

MARK △ : MODIFY CTP FPC OUTLINE DIMENSION & BENDING AREA

DEC.06, 2021

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6.1 OPTICAL CHARACTERISTICS

THE BRIGHTNESS OF MODULE (CENTER): TYP.= (800)→(850)

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7. OUTLINE DIMENSIONS

MARK △ : ADD CTP & LCM FPC BENDING AREA DIMENSION

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1. GENERAL SPECIFICATIONS

1.1 DATA SHEET FOR LCD MODULE CONTROLLER/DRIVER

PLEASE REFER TO :

SITRONIX SC7283

1.2 DATA SHEET FOR CAPACITIVE TOUCH PANEL CONTROLLER/DRIVER

PLEASE REFER TO :

ILITEK ILI2130

1.3 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

2.1 LCD MODULE MECHANICAL SPECIFICATIONS

(1) DIAGONALS	-----	4.3 inch
(2) NUMBER OF DOTS	-----	480W * (RGB) * 272H DOTS
(3) MODULE SIZE	-----	125.29W * 84.11H * 7.46D mm (WITHOUT FPC & PROTECT FILM)
(4) VIEWING AREA	-----	95.84W * 54.66H mm
(5) ACTIVE AREA	-----	95.04W * 53.856H mm
(6) DOT SIZE	-----	0.066W * 0.198H mm
(7) PIXEL SIZE	-----	0.198W * 0.198H 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 24 BIT PARALLEL (SYNC/DE/SYNC-DE MODE)

2.2 CAPACITIVE TOUCH PANEL MECHANICAL SPECIFICATIONS

- (1) TOUCH PANEL SIZE ----- 4.3 inch
- (2) OUTER DIMENSION ----- 125.29W * 84.11H * 2.8D mm
(WITHOUT FPC)
- (3) ACTIVE AREA ----- 96.04W * 54.856H mm
- (4) INPUT TYPE ----- MULTI TOUCH
- (5) NUMBER OF TOUCH SENSOR ----- 18*10 SENSORS
- (6) INTERFACE MODE ----- I2C
- (7) RESOLUTION ----- 16384*9600

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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 CAPACITIVE TOUCH PANEL ELECTRICAL ABSOLUTE MAXIMUM RATINGS

ITEM	SYMBOL	MIN.	MAX.	UNIT	REMARK
POWER SUPPLY VOLTAGE	VDD1-VSS1	-0.3	3.6	V	

3.3 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), (4)
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.

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

4.1 LCD MODULE 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	—	25	40	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 DRIVER	VBL+-VSS	—	5	12	15	V	
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+-VSS =12V LED B/L=ON	—	(120)	(160)	mA	
LED LIFE TIME	—	IF=50mA (PER LED)	50K	—	—	HRS	NOTE (5) NOTE (6)

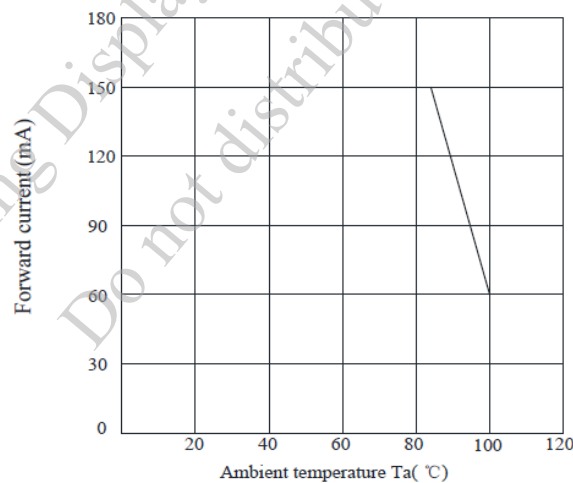
NOTE (1) : THE DISPLAY PATTERN IS ALL “WHITE”.

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

NOTE (3) : INTERNAL CIRCUIT DIAGRAM OF BACKLIGHT



NOTE (4) : AMBIENT TEMPERATURE VS. ALLOWABLE FORWARD CURRENT.(PER LED)



NOTE (5) : CONDITIONS; Ta=25 °C, CONTINUOUS LIGHTING

NOTE (6) : DEFINITIONS OF LIFE TIME :

LCM LUMINANCE BECOMES HALF OF THE INITIAL VALUE.

4.2 CAPACITIVE TOUCH PANEL ELECTRICAL CHARACTERISTICS

Ta=25°C

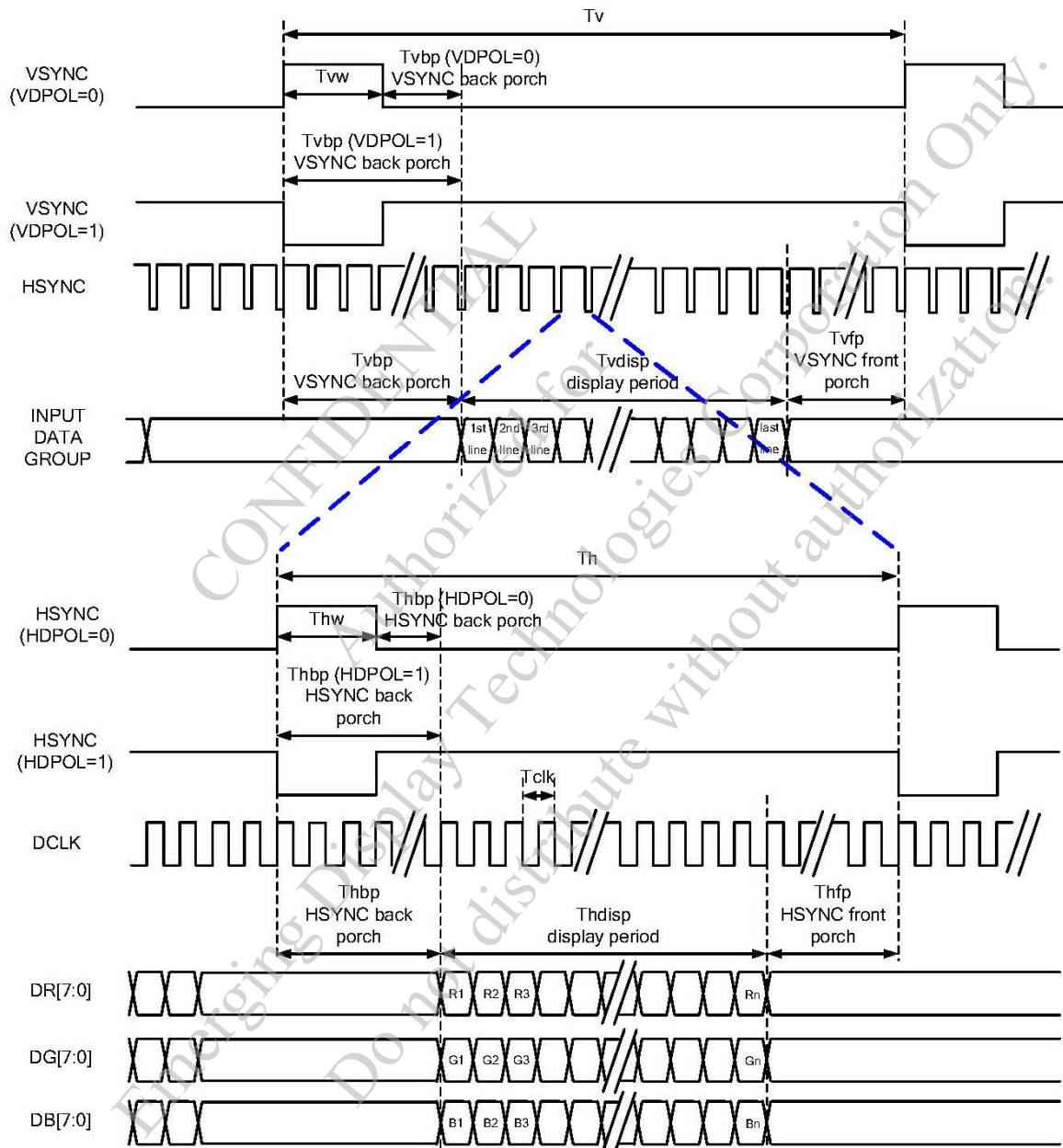
ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
POWER SUPPLY VOLTAGE	VDD1-VSS1	—	3.15	3.30	3.45	V
LOGIC HIGH INPUT VOLTAGE	VIH	—	—	0.7*VDD1	—	V
LOGIC LOW INPUT VOLTAGE	VIL	—	—	0.3*VDD1	—	V
POWER SUPPLY CURRENT	IDD1	VDD1-VSS1 =3.30V REPORT RATE: 125Hz	—	(75)	(98)	mA

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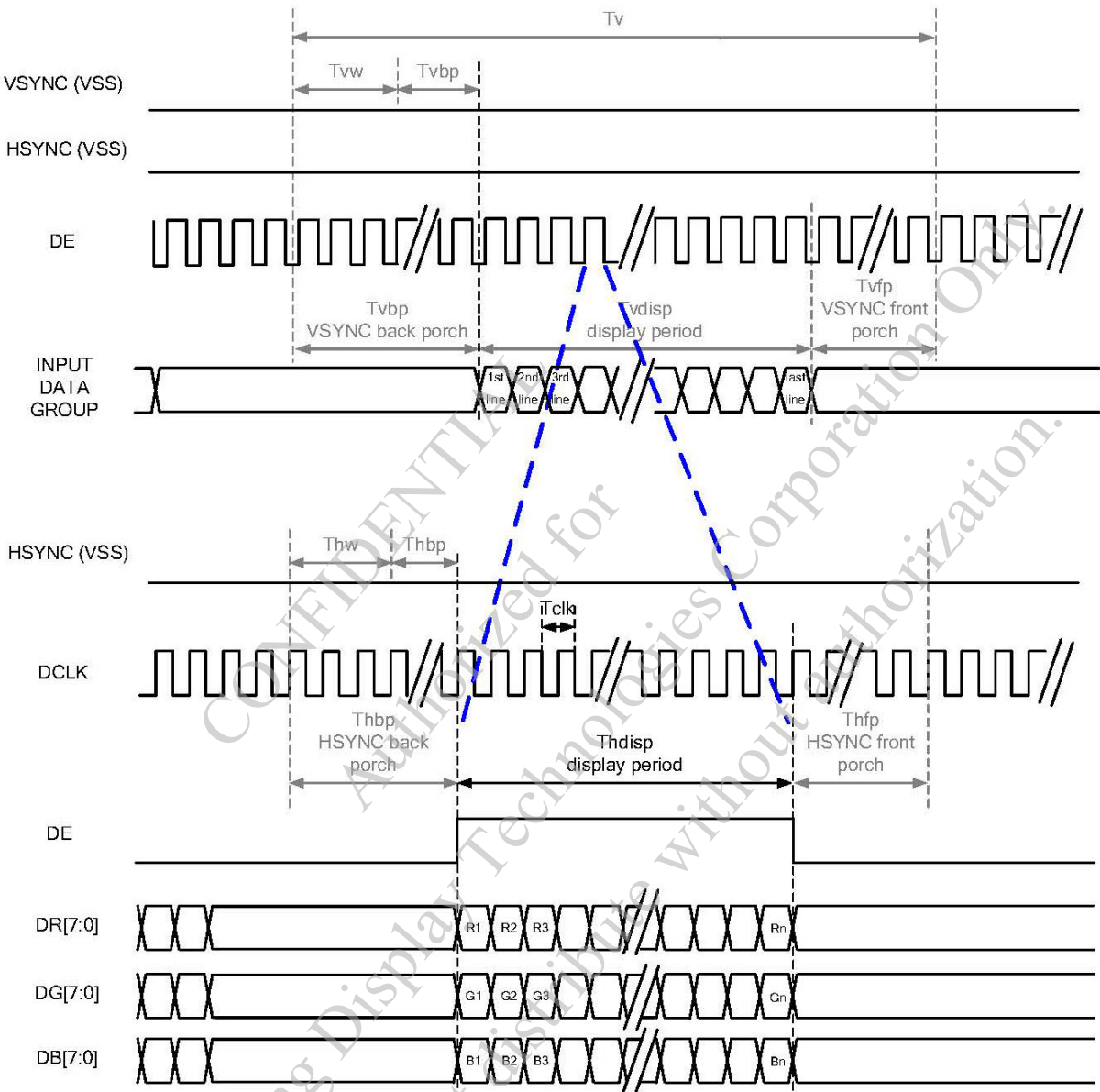
5. TIMING CHARACTERISTICS

5.1 LCD MODULE AC ELECTRICAL CHARACTERISTICS

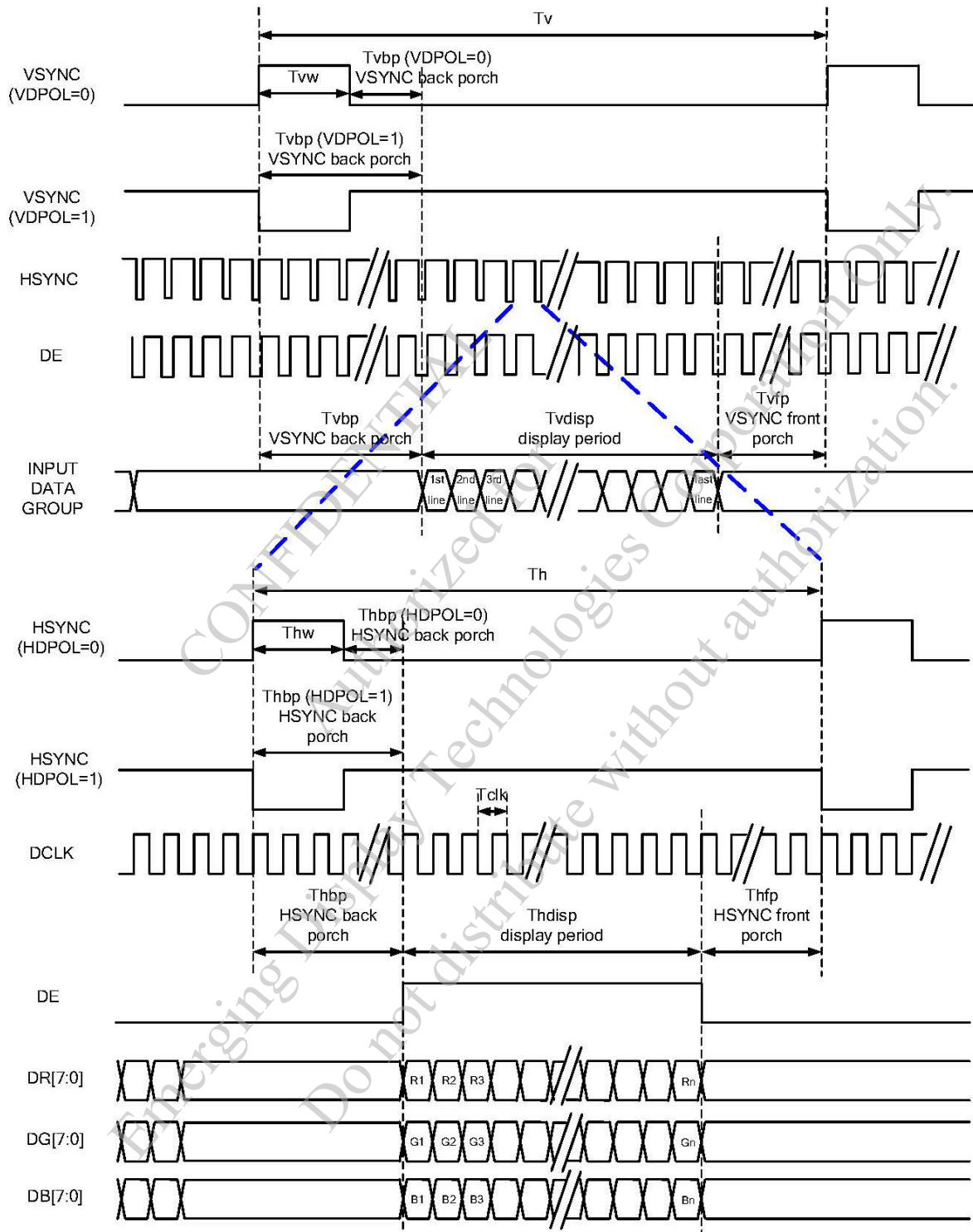
5.1.1 SYNC MODE



5.1.2 DE MODE



5.1.3 SYNC-DE MODE



5.1.4 PARALLEL 24 BIT RGB INPUT TIMING TABLE

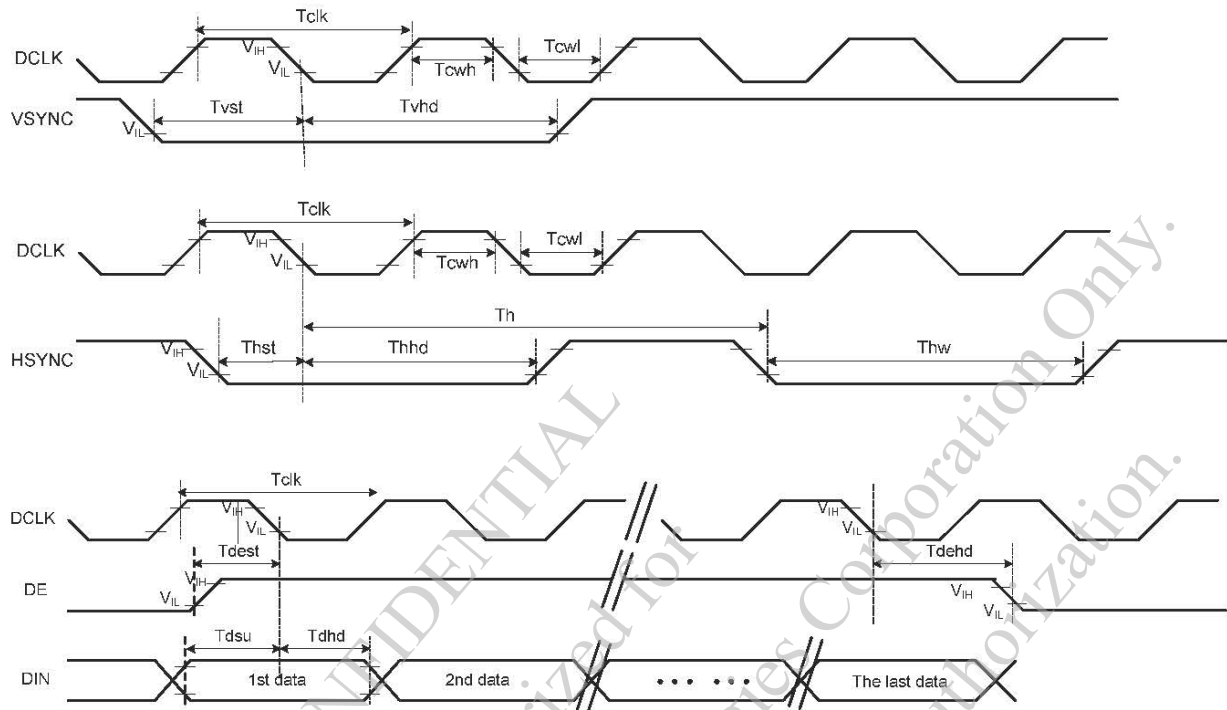
PARALLEL 24-BIT RGB INPUT TIMING

Ta=25°C

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	REMARK
DCLK FREQUENCY	Fclk	8	9	12	MHz	
DCLK PERIOD	Tclk	83	111	125	ns	
HSYNC	PERIOD TIME	Th	485	531	598	DCLK
	DISPLAY PERIOD	Thdisp	—	480	—	DCLK
	BACK PORCH	Thbp	3	43	43	DCLK
	FRONT PORCH	Thfp	2	8	75	DCLK
	PULSE WIDTH	Thw	2	4	43	DCLK
VSYNC	PERIOD TIME	Tv	276	292	321	HSYNC
	DISPLAY PERIOD	Tvdisp		272		HSYNC
	BACK PORCH	Tvbp	2	12	12	HSYNC
	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.

5.1.5 SYSTEM BUS TIMING FOR RGB INTERFACE

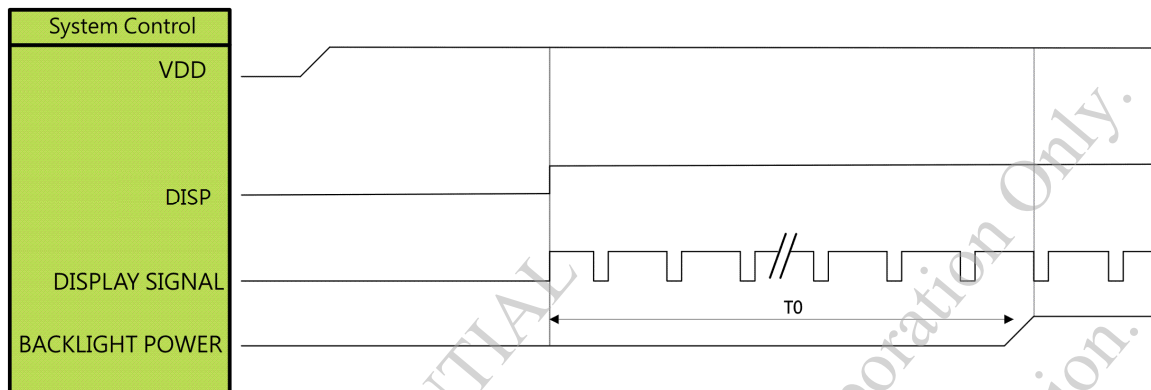


ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT	CONDITIONS
CLK PULSE DUTY	T_{cw}	40	50	60	%	
HSYNC WIDTH	T_{hw}	2	—	—	DCLK	
HSYNC PERIOD	T_h	55	60	65	us	
VSYNC SETUP TIME	T_{vst}	12	—	—	ns	
VSYNC HOLD TIME	T_{vhd}	12	—	—	ns	
HSYNC SETUP TIME	T_{hst}	12	—	—	ns	
HSYNC HOLD TIME	T_{hhd}	12	—	—	ns	
DATA SETUP TIME	T_{dsu}	12	—	—	ns	
DATA HOLD TIME	T_{dhd}	12	—	—	ns	
DE SETUP TIME	T_{dest}	12	—	—	ns	
DE HOLD TIME	T_{dehd}	12	—	—	ns	

5.1.6 POWER ON SEQUENCE

SYMBOL	DESCRIPTION	MIN. TIME	UNIT
T0	DISPLAY SIGNAL OUTPUT TO BACKLIGHT POWER ON	250	ms

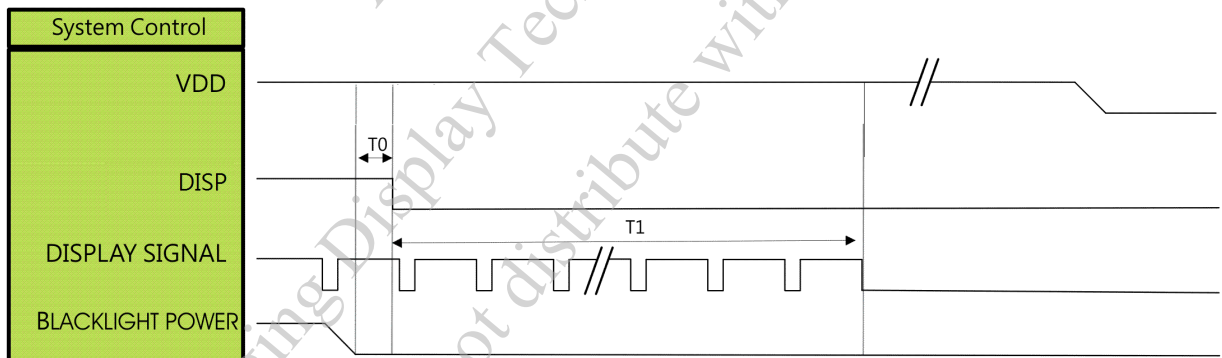
NOTE: RGB INTERFACE DISPLAY SIGNAL: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]



5.1.7 POWER OFF TIMING SEQUENCE

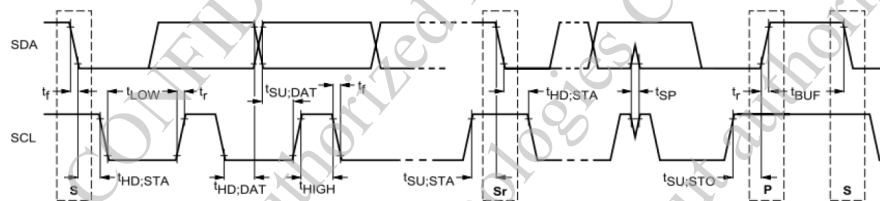
SYMBOL	DESCRIPTION	MIN. TIME	UNIT
T0	BACKLIGHT POWER OFF TO DISP="LOW"	5	ms
T1	DISP="LOW" TO IC INTERNAL VOLTAGE DISCHARGE COMPLETE	100	ms

NOTE: RGB INTERFACE DISPLAY SIGNAL: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]



5.2 CAPACITIVE TOUCH PANEL I2C INTERFACE TIMING CHARACTERISTICS

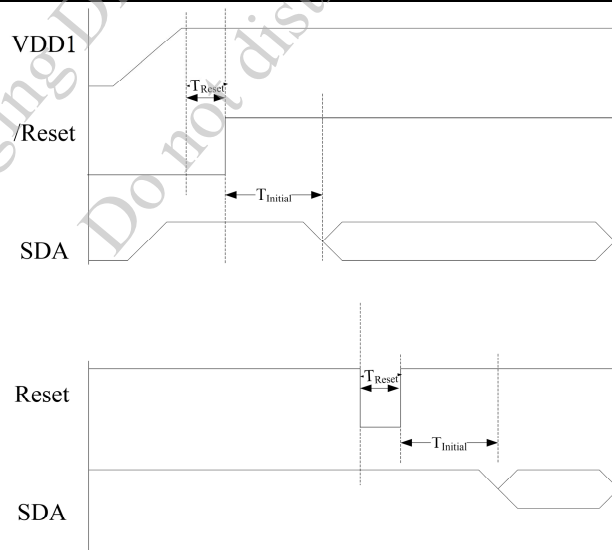
ITEM	SYMBOL	STANDARD MODE			FAST MODE		
		MIN.	MAX.	UNIT	MIN.	MAX.	UNIT
SCL CLOCK FREQUENCY	f_{SCL}	0	100	kHz	0	400	kHz
HOLD TIME (REPEATED) START CONDITION. AFTER THIS PERIOD, THE FIRST CLOCK PULSE IS GENERATED	$t_{HD;STA}$	4.0	—	μs	0.6	—	μs
LOW PERIOD OF THE SCL CLOCK	t_{LOW}	4.7	—	μs	1.3	—	μs
HIGH PERIOD OF THE SCL CLOCK	t_{HIGH}	4.0	—	μs	0.6	—	μs
SET-UP TIME FOR A REPEATED START CONDITION	$t_{SU;STA}$	4.7	—	μs	0.6	—	μs
DATA HOLD TIME	$t_{HD;DAT}$	5.0	—	μs	0	0.9	μs
DATA SET-UP TIME	$t_{SU;DAT}$	250	—	ns	100	—	ns
RISE TIME OF BOTH SDA AND SCL SIGNALS	t_r	—	1000	ns	—	300	ns
FALL TIME OF BOTH SDA AND SCL SIGNALS	t_f	—	300	ns	—	300	ns
SET-UP TIME FOR STOP CONDITION	$t_{SU;STO}$	4.0	—	μs	0.6	—	μs
BUS FREE TIME BETWEEN A STOP AND START CONDITION	t_{BUF}	4.7	—	μs	1.3	—	μs



THE TIMING OF I2C INTERFACE

5.3 CAPACITIVE TOUCH PANEL POWER SEQUENCE

ITEM	SYMBOL	MIN.	MAX.	UNIT
AFTER POWERING-ON OR RESETTING THE DEVICE, THE DEVICE NEEDS INITIAL TIME TO CONFIGURE THE SYSTEM.	$T_{Initial}$	—	100	ms
/RESET PIN LOW HOLD TIME	T_{Reset}	50	—	μs



POWER UP SEQUENCE AND RESET DIAGRAM

6. OPTICAL CHARACTERISTICS

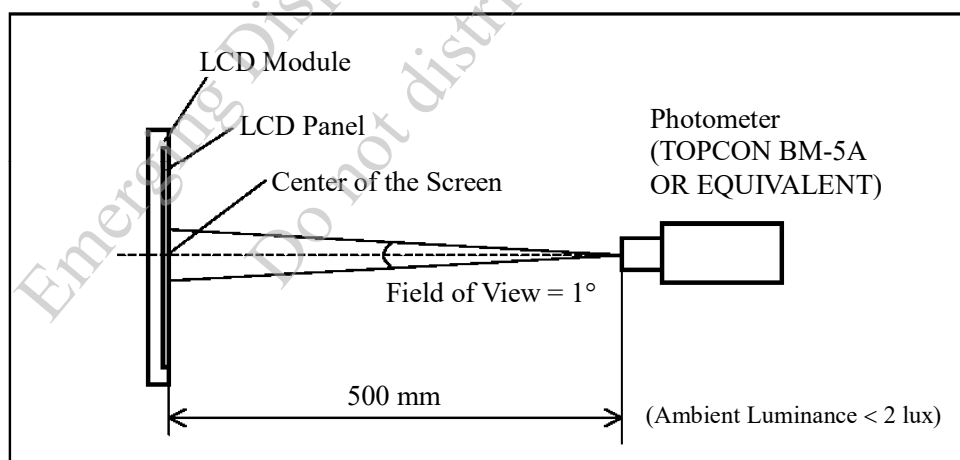
6.1 OPTICAL CHARACTERISTICS

Ta=25±2°C

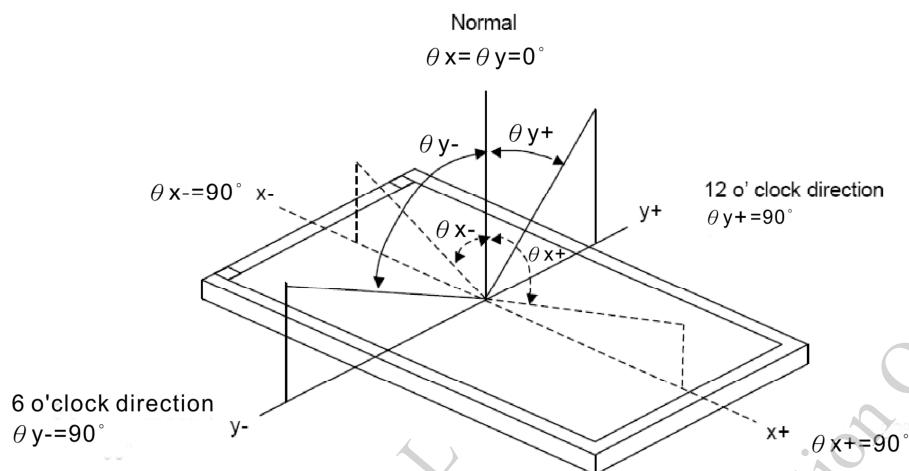
ITEM		SYMBOL	CONDITION		MIN.	TYP.	MAX.	UNIT	REMARK
VIEWING ANGLE		θ_{y+}	CR≥10	$\theta_x=0^\circ$	70	80	—	deg.	NOTE (2) NOTE (3)
		θ_{y-}			70	80	—		
		θ_{x+}		$\theta_y=0^\circ$	70	80	—		
		θ_{x-}			70	80	—		
CONTRAST RATIO (CENTER)		CR	$\theta_x=0^\circ$, $\theta_y=0^\circ$		640	800	—	—	NOTE (3)
RESPONSE 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 VBL+-VSS=12.0V (NTSC : 45%)		(0.27)	(0.32)	(0.37)	—	NOTE (5)
		W _y			(0.30)	(0.35)	(0.40)		
	RED	R _x			(0.55)	(0.60)	(0.65)	—	
		R _y			(0.31)	(0.36)	(0.41)		
	GREEN	G _x			(0.32)	(0.37)	(0.42)	—	
		G _y			(0.52)	(0.57)	(0.62)		
	BLUE	B _x			(0.10)	(0.15)	(0.20)	—	
		B _y			(0.04)	(0.09)	(0.14)		
THE BRIGHTNESS OF MODULE (CENTER)		B			(680)	(850)	—	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 :



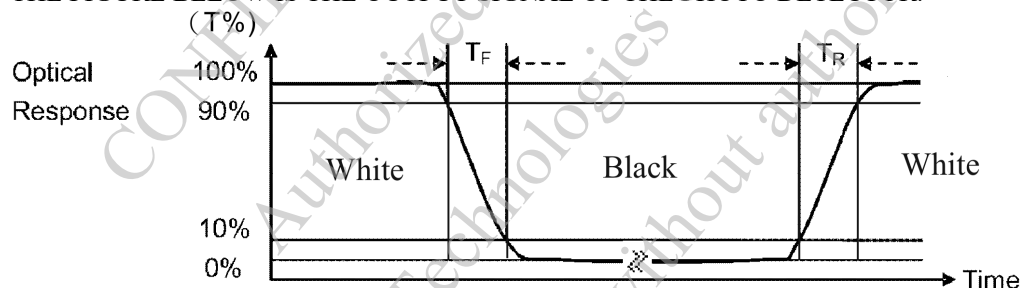
NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :

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.



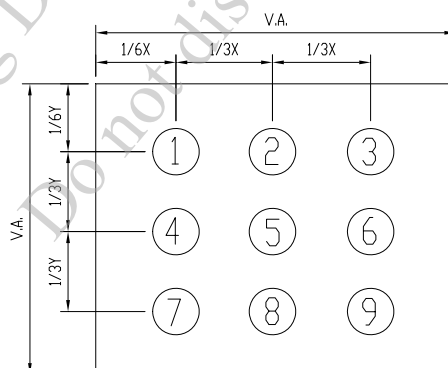
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

(a) 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

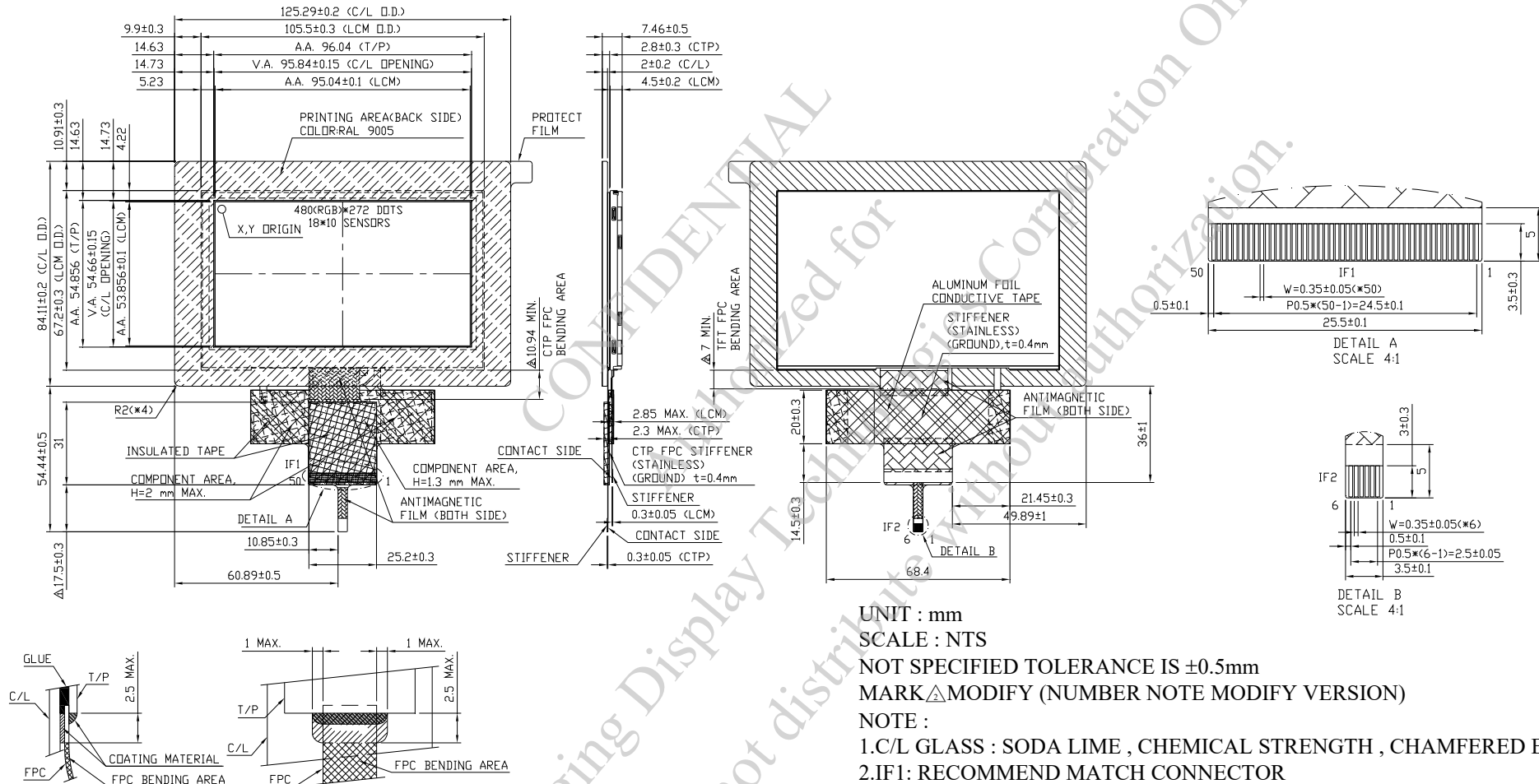


UNIT : mm

(b) THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

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

7. OUTLINE DIMENSIONS



FPC COATING DRAWING

UNIT : mm

SCALE : NTS

NOT SPECIFIED TOLERANCE IS ±0.5mm

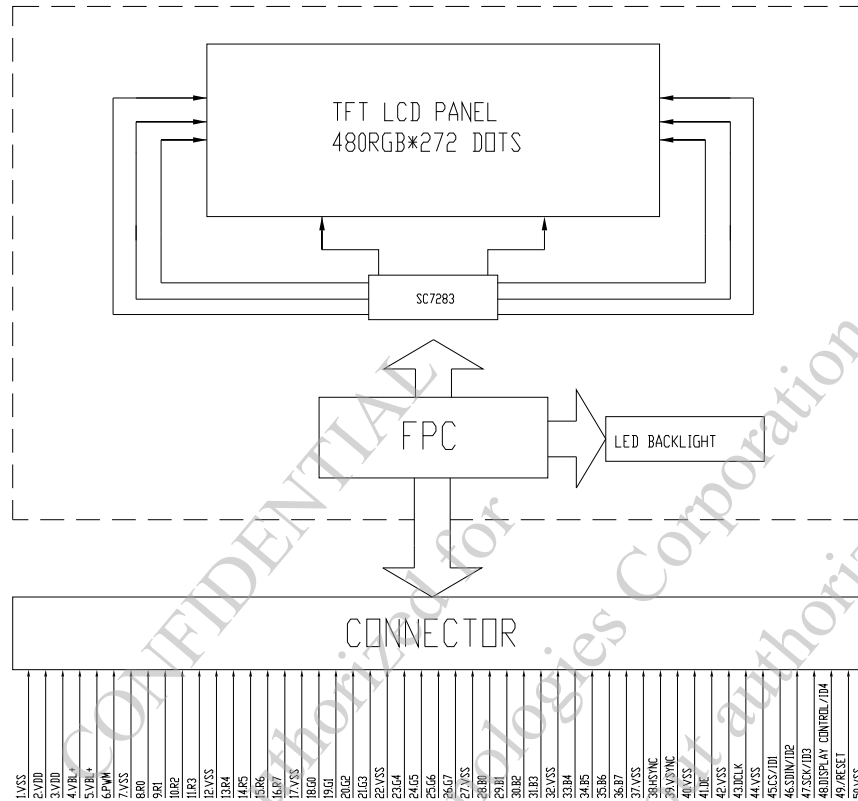
MARK Δ MODIFY (NUMBER NOTE MODIFY VERSION)

NOTE :

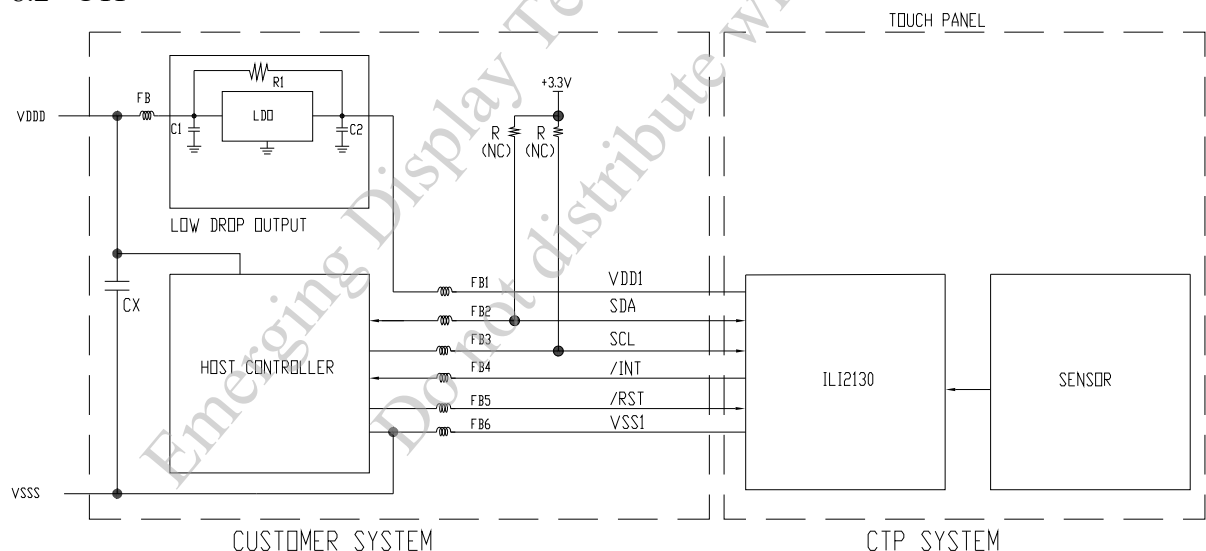
- 1.C/L GLASS : SODA LIME , CHEMICAL STRENGTH , CHAMFERED EDGES
- 2.IF1: RECOMMEND MATCH CONNECTOR
KYOCERA : 04 6240 050 SERIES
- 3.IF2: RECOMMEND MATCH CONNECTOR
KYOCERA : 04 6240 006 SERIES

8. BLOCK DIAGRAM

8.1 TFT



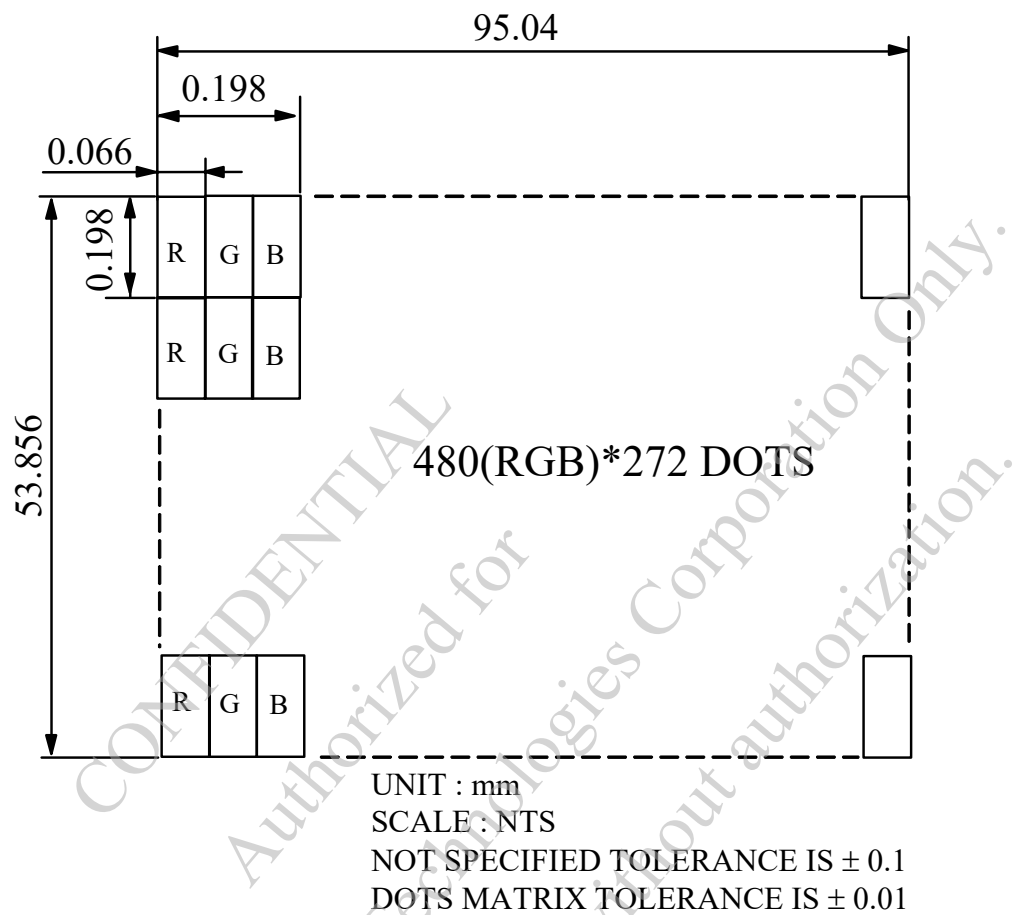
8.2 CTP



NOTE (1) : THE STANDARD I2C COMMUNICATION INTERFACE, SUPREME SCL CLOCK IS 400 KHz, SLAVE ADDRESS CAN BE SET UP, SUPPORTS VDD LEVEL POWER, RECOMMEND RESERVING PULL HIGH RESISTANCE FOR SPECIAL APPLICATION.

NOTE (2) : POWER SUPPLY SHALL BE CLEAN AND NOISE FREE. ADDITIONAL FILTERING OR A SEPARATE LDO (LOW DROP OUT) REGULATOR CAN BE REQUIRED. C1 AND C2 CAPACITORS RECOMMENDATION : 4.7μF OR 10 μF

9. DETAIL DRAWING OF DOT MATRIX



10. INTERFACE SIGNALS

10.1 IF1

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	VSNC	VERTICAL SYNC SIGNAL
40	VSS	GROUND

PIN NO.	SYMBOL	FUNCTION
41	DE	INPUT DATA ENABLE CONTROL, WHEN DE MODE, ACTIVE HIGH TO ENABLE DATA INPUT, NORMALLY PULL LOW
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 HIGH TO VDD, INTERNAL: 10K Ω)
47	SCK/ID3	SCK FOR LCM-DRIVER SPI-PORT/ID3(SIZE INFO, PULL LOW TO VSS, INTERNAL: 10K Ω)
48	DISPLAY CONTROL/ID4	DISPLAY/ID4(SIZE INFO, NOT USED)
49	/RESET	GLOBAL RESET(LOW ACTIVE).
50	VSS	GROUND

RGB MODE SELECTION TABLE	DCLK	HSYNC	VSYSN	DE
SYNC-DE MODE	INPUT	INPUT	INPUT	INPUT
SYNC MODE	INPUT	INPUT	INPUT	VSS
DE MODE	INPUT	VSS	VSS	INPUT

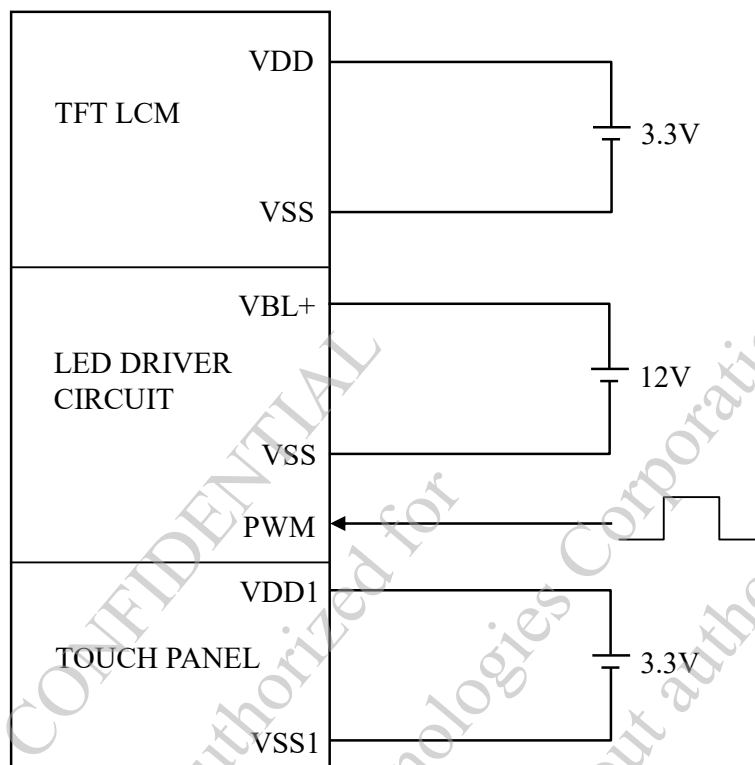
NOTE: "INPUT" MEANS THESE SIGNALS ARE DRIVEN BY HOST SIDE.

10.2 IF2

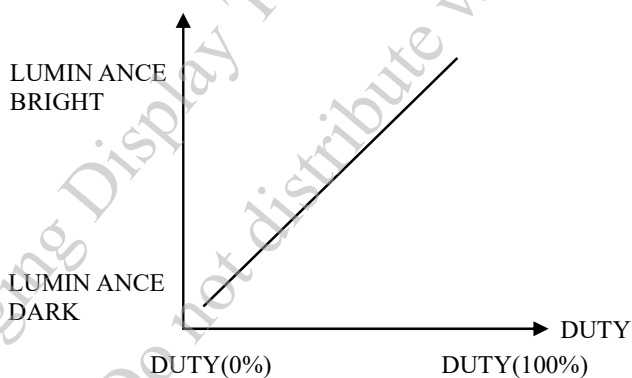
PIN NO.	SYMBOL	FUNCTION
1	VSS1	GROUND
2	VDD1	POWER SUPPLY VOLTAGE
3	SCL	I2C CLOCK INPUT
4	SDA	I2C DATA INPUT AND OUTPUT
5	/INT	EXTERNAL INTERRUPT TO THE HOST
6	/RST	EXTERNAL RESET, LOW IS ACTIVE

11. POWER SUPPLY

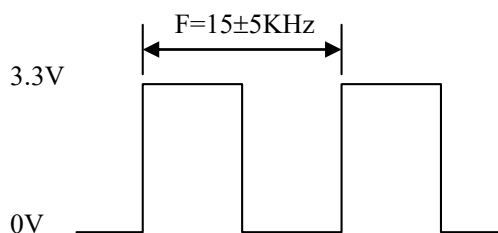
11.1 POWER SUPPLY FOR LCM



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



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. PROTOCOL

CMD	NAME	SET/GET	DESCRIPTION
0x20	GET_PANEL_INFORMATION	GET	THE MAXIMUM REPORT VALUE AND CHANNEL NUMBER.
0x40	GET_FIRMWARE_VERSION	GET	FIRMWARE VERSION
0x61	GET_KERNEL_VERSION	GET	KERNEL VERSION
0xF0	MODE_CONTROL	SET	ENABLED/DISABLE TEST MODE
0xF1	SET_CDC_INITIAL	SET	INITIAL COMMAND FOR READ ALL NODE DATA.
0xF2	GET_CDC_DATA	GET	READ DATA
0x80	GET_SYSTEM_STATUS	GET	READ SYSTEM BUSY STATUS
0x60	RESET	SET	WHOLE CHIP RESET
0xC0	GET_MODE_CHECK	GET	READ FW CURRENT MODE
0xC1	SET_AP_MODE	SET	SWITCH FW INTO AP MODE
0xC2	SET_BL_MODE	SET	SWITCH FW INTO BL MODE
0xC3	SET_ROM_CODE	SET	WRITE DATA INTO ROM
0xCC	SET_FLASH_ENABLED	SET	UNLOCK AND SET ADDRESS OF FLASH
0xC7	GET_AP_CRC	GET	READ AP CODE CRC
0xCD	GET_BLOCK_CRC	GET	READ BLOCK CODE CRC
0x30	SET_SLEEP	SET	INTO SLEEP MODE
0x31	SET_WAKEUP	SET	TOUCH DEVICE WAKEUP

13. CAPACITIVE TOUCH PANEL SPECIFICATION

13.1 OPTICAL CHARACTERISTICS

ITEM	CONDITION	MIN.	TYP.	MAX.	UNIT
TRANSPARENCY NOTE (1)	Ta = 25°C $\lambda=550 \text{ nm}$	(85)	—	—	%

NOTE (1) : OPTICAL MEASUREMENT SHOULD BE EXECUTED AFTER PANEL IS SECURED.
MEASUREMENT PROCESS SHOULD BE EXECUTED IN A STABLE, WINDLESS, AND DARK ROOM.
OPTICAL SPECIFICATIONS SHOULD BE MEASURED BY SPECTROPHOTOMETER.

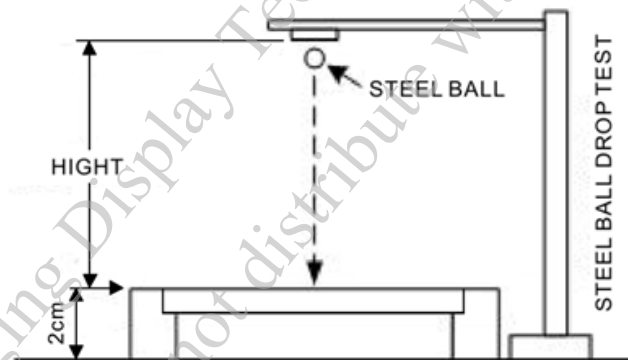
13.2 HARDNESS

ITEM	DESCRIPTION
SURFACE HARDNESS	(7)H (MIN.)

13.3 DURABILITY

USING STEEL BALL AND FALLING ON TOUCH PANEL SURFACE, FROM THE HEIGHT MUST PASS BELOW CONDITIONS :

ITEM	CONDITION	INSPECTION METHOD	DESCRIPTION
STEEL BALL DROP TEST	WEIGHT : 67g HEIGHT OF FALL : 30 cm	VISUAL INSPECTION	SIGN OF FRACTURE OR DAMAGE IS NOT ACCEPTABLE 3 TIME/ 1 POINTS, 25°C (CENTER POINT)



14. INSPECTION CRITERIA

14.1 APPLICATION

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

14.2 INSPECTION CONDITIONS

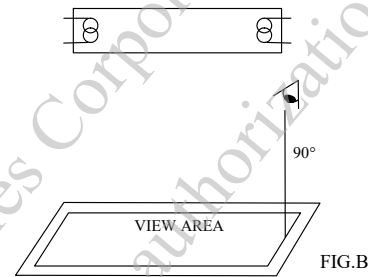
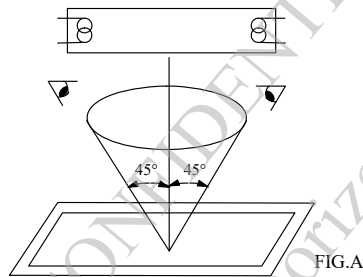
14.2.1 (1)OBSERVATION DISTANCE : $45 \pm 5\text{cm}$

(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°



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.

14.2.2 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

14.2.3 INSPECTION LOT

QUANTITY PER DELIVERY LOT FOR EACH MODEL

14.2.4 INSPECTION METHOD

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

(a)APPLICABLE STANDARD :

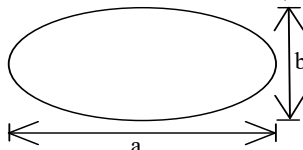
ANSI/ ASQ Z1.4 NORMAL INSPECTION LEVEL II

(b)AQL : MAJOR DEFECT : AQL 0.65

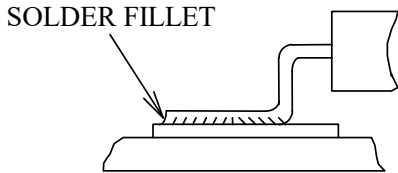
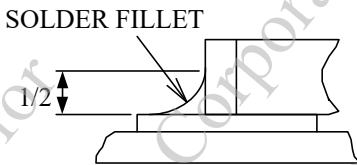
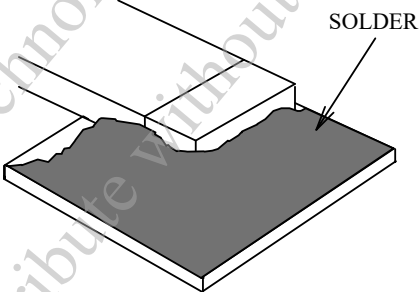
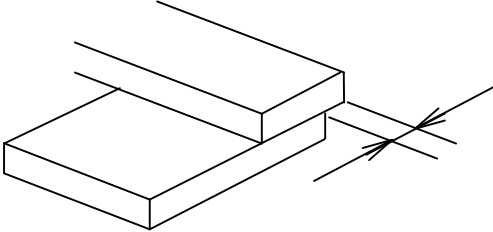
MINOR DEFECT : AQL 1.0

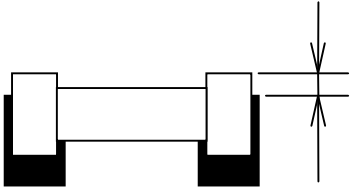
14.3 DEFECTS CLASSIFICATION

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.CTP FUNCTION	• NO FUNCTION • BROKEN LINE • FALSE TOUCH	
	3.BACKLIGHT	• NO LIGHT • FLICKERING AND OTHER ABNORMAL ILLUMINATION	
	4.DIMENSIONS	• SUBJECT TO INDIVIDUAL ACCEPTANCE SPECIFICATIONS	
MINOR DEFECT	1.DISPLAY ZONE	• BLACK/WHITE SPOT • BUBBLES ON POLARIZER • NEWTON RING • BLACK/WHITE LINE • SCRATCH • CONTAMINATION • LEVER 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	

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>ITEMS</th><th>PERMISSIBLE NO.</th></tr><tr><td>BRIGHT DOT</td><td>N ≤ 2</td></tr><tr><td>DARK DOT</td><td>N ≤ 3</td></tr><tr><td>TOTAL BRIGHT AND DARK DOTS</td><td>N ≤ 4</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. (2)BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN. THE BRIGHT DOT DEFECT MUST BE VISIBLE THROUGH 5% ND FILTER. (3)DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.	ITEMS	PERMISSIBLE NO.	BRIGHT DOT	N ≤ 2	DARK DOT	N ≤ 3	TOTAL BRIGHT AND DARK DOTS	N ≤ 4																
ITEMS	PERMISSIBLE NO.																									
BRIGHT DOT	N ≤ 2																									
DARK DOT	N ≤ 3																									
TOTAL BRIGHT AND DARK DOTS	N ≤ 4																									
4	BUBBLES ON POLARIZER /SURFACE STAINS /DIRT/CF FAIL/SPOT	<table><tr><th></th><th>AVERAGE DIAMETER (mm) : D</th><th>PERMISSIBLE NO.</th></tr><tr><td rowspan="3">BUBBLE ON 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 ON POLARIZER</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> 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 		AVERAGE DIAMETER (mm) : D	PERMISSIBLE NO.	BUBBLE ON POLARIZER	D ≤ 0.25	IGNORE	0.25 < D ≤ 0.5	N ≤ 5	0.5 < D	NONE	SURFACE STAINS / DIRT ON POLARIZER	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	PERMISSIBLE NO.																								
BUBBLE ON POLARIZER	D ≤ 0.25	IGNORE																								
	0.25 < D ≤ 0.5	N ≤ 5																								
	0.5 < D	NONE																								
SURFACE STAINS / DIRT ON POLARIZER	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																								

NO.	ITEM	CRITERIA											
5	BLACK/WHITE SPOT CIRCULAR TYPE	THE FOLLOWING BLACK/WHITE SPOT ARE WITHIN THE VIEWING AREA. AVERAGE DIAMETER : D (mm) <table><tr><th>SIZE D</th><th>PERMISSIBLE NO.</th></tr><tr><td>$D \leq 0.15$</td><td>IGNORE</td></tr><tr><td>$0.15 < D \leq 0.3$</td><td>4</td></tr><tr><td>$0.3 < D \leq 0.5$</td><td>2</td></tr><tr><td>$D > 0.5$</td><td>0</td></tr></table> NOTE (1) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 10mm APART.	SIZE D	PERMISSIBLE NO.	$D \leq 0.15$	IGNORE	$0.15 < D \leq 0.3$	4	$0.3 < D \leq 0.5$	2	$D > 0.5$	0	
SIZE D	PERMISSIBLE NO.												
$D \leq 0.15$	IGNORE												
$0.15 < D \leq 0.3$	4												
$0.3 < D \leq 0.5$	2												
$D > 0.5$	0												
6	SCRATCH	THE FOLLOWING SCRATCH IS WITHIN THE VIEWING AREA. WIDTH : W (mm) , LENGTH : L (mm) <table><tr><th>SIZE W & L</th><th>PERMISSIBLE NO.</th></tr><tr><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$0.05 < W \leq 0.08, L \leq 8$</td><td>3</td></tr><tr><td>$0.08 < W \leq 0.1, L \leq 5$</td><td>3</td></tr><tr><td>$W > 0.1$</td><td>0</td></tr></table> NOTE (1) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 5mm APART.	SIZE W & L	PERMISSIBLE NO.	$W \leq 0.05$	IGNORE	$0.05 < W \leq 0.08, L \leq 8$	3	$0.08 < W \leq 0.1, L \leq 5$	3	$W > 0.1$	0	
SIZE W & L	PERMISSIBLE NO.												
$W \leq 0.05$	IGNORE												
$0.05 < W \leq 0.08, L \leq 8$	3												
$0.08 < W \leq 0.1, L \leq 5$	3												
$W > 0.1$	0												
7	BLACK / WHITE LINE LINEAR TYPE / FOREIGN FIBER	THE FOLLOWING BLACK LINE, WHITE LINE IS WITHIN THE VIEWING AREA. WIDTH : W (mm) , LENGTH : L (mm) <table><tr><th>SIZE W & L</th><th>PERMISSIBLE NO.</th></tr><tr><td>$W \leq 0.05$</td><td>IGNORE</td></tr><tr><td>$0.05 < W \leq 0.08, L \leq 8$</td><td>3</td></tr><tr><td>$0.08 < W \leq 0.1, L \leq 5$</td><td>3</td></tr><tr><td>$W > 0.1$</td><td>0</td></tr></table> NOTE (1) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 5mm APART.	SIZE W & L	PERMISSIBLE NO.	$W \leq 0.05$	IGNORE	$0.05 < W \leq 0.08, L \leq 8$	3	$0.08 < W \leq 0.1, L \leq 5$	3	$W > 0.1$	0	
SIZE W & L	PERMISSIBLE NO.												
$W \leq 0.05$	IGNORE												
$0.05 < W \leq 0.08, L \leq 8$	3												
$0.08 < W \leq 0.1, L \leq 5$	3												
$W > 0.1$	0												
8	BUBBLE / DENT FOR OPTICAL BONDING	BUBBLES WITHIN VIEWING AREA. AVERAGE DIAMETER : D (mm) <table><tr><th>SIZE D</th><th>PERMISSIBLE NO.</th></tr><tr><td>$D \leq 0.2$</td><td>IGNORE</td></tr><tr><td>$0.2 < D \leq 0.3$</td><td>3</td></tr><tr><td>$0.3 < D \leq 0.5$</td><td>2</td></tr><tr><td>$D > 0.5$</td><td>0</td></tr></table> NOTE (1) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 10mm APART.	SIZE D	PERMISSIBLE NO.	$D \leq 0.2$	IGNORE	$0.2 < D \leq 0.3$	3	$0.3 < D \leq 0.5$	2	$D > 0.5$	0	
SIZE D	PERMISSIBLE NO.												
$D \leq 0.2$	IGNORE												
$0.2 < D \leq 0.3$	3												
$0.3 < D \leq 0.5$	2												
$D > 0.5$	0												
9	CHIPPING	<table><tr><td>CORNER</td><td>$X \leq 3\text{mm} \cdot Y \leq 3\text{mm} \cdot Z \leq t$ (t : THICKNESS)</td></tr><tr><td>EDGE</td><td>$X \leq 6\text{mm} \cdot Y \leq 1\text{mm} \cdot Z < t$ (t : THICKNESS)</td></tr></table>	CORNER	$X \leq 3\text{mm} \cdot Y \leq 3\text{mm} \cdot Z \leq t$ (t : THICKNESS)	EDGE	$X \leq 6\text{mm} \cdot Y \leq 1\text{mm} \cdot Z < t$ (t : THICKNESS)	Chip of glass						
CORNER	$X \leq 3\text{mm} \cdot Y \leq 3\text{mm} \cdot Z \leq t$ (t : THICKNESS)												
EDGE	$X \leq 6\text{mm} \cdot Y \leq 1\text{mm} \cdot Z < t$ (t : THICKNESS)												
10	CRACKED GLASS	NOT ACCEPTABLE											
11	LINE DEFECT ON DISPLAY	OBVIOUS VERTICAL OR HORIZONTAL LINE DEFECT IS NOT ALLOWED.											
12	MURA ON DISPLAY	IT'S ACCEPTABLE, IF MURA IS SLIGHT VISIBLE THROUGH 6% ND FILTER.											
13	UNEVEN COLOR SPREAD, COLORATION	TO BE DETERMINED BASED UPON THE LIMITED SAMPLE.											
14	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.											

NO.	ITEM	CRITERIA
15	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  (b)CHIP COMPONENT · SOLDER IS LESS THAN 50% OF SIDES AND FRONT FACE WETTING  · 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
15	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.
16	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.
17	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.

15. RELIABILITY TEST

15.1 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 : The diagram illustrates a thermal shock cycle. It begins at -30°C, ramps up to +80°C over a 30-minute period. At +80°C, it holds for 3 minutes. Then, it ramps down to -30°C over another 30-minute period. Finally, it holds at -30°C for 3 minutes. This entire sequence is designated as one cycle.
7	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	AIR DISCHARGE $\pm 12\text{KV}$ CONTACT DISCHARGE $\pm 8\text{KV}$ (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.

15.2 TESTING CONDITIONS AND INSPECTION CRITERIA

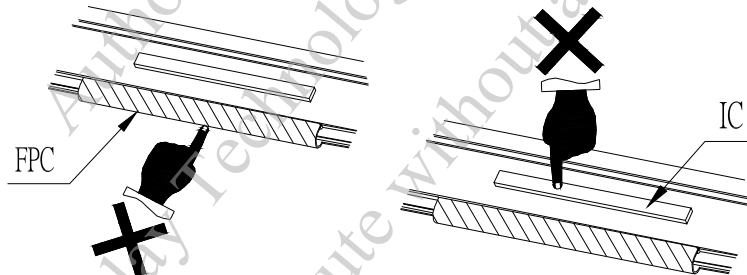
FOR THE FINAL TEST THE TESTING SAMPLE MUST BE STORED AT ROOM TEMPERATURE FOR 24 HOURS, AFTER THE TESTS LISTED IN TABLE 15.1, STANDARD SPECIFICATIONS FOR RELIABILITY HAVE BEEN EXECUTED IN ORDER TO ENSURE STABILITY.

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

16. CAUTION

16.1 OPERATION

- 16.1.1 DO NOT CONNECT OR DISCONNECT MODULES TO OR FROM THE MAIN SYSTEM WHILE POWER IS BEING SUPPLIED.
- 16.1.2 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.
- 16.1.3 ADJUST THE LC DRIVING VOLTAGE TO OBTAIN THE OPTIMUM CONTRAST.
- 16.1.4 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.
- 16.1.5 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!



16.2 NOTICE

- 16.2.1 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.
- 16.2.2 DO NOT DISASSEMBLE. EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED.
- 16.2.3 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.
- 16.2.4 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.
- 16.2.5 DON'T GIVE EXTERNAL SHOCK.
- 16.2.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 16.2.7 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.
- 16.2.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 16.2.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.
- 16.2.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 16.2.11 REWIRING: NO MORE THAN 3 TIMES.