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Lucica Lu		ISSUE : FEB.07, 2025
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Vincent Wu		VERSION : 1

CUSTOMER ACCEPTANCE SPECIFICATIONS

MODEL NO. :  
ETML043013DDRA  
 (RoHS)  
 FOR MESSRS :  
 \_\_\_\_\_

CUSTOMER'S APPROVAL

DATE :

\_\_\_\_\_

BY :

\_\_\_\_\_

EMERGING DISPLAY  
TECHNOLOGIES CORPORATION

MODEL NO.	VERSION	PAGE
ETML043013DDRA	1	0-1

RECORDS OF REVISION	DOC . FIRST ISSUE	FEB.07, 2025
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DATE	REVISED PAGE NO.	SUMMARY
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1. GENERAL SPECIFICATIONS

1.1 DATA SHEET FOR LCD MODULE CONTROLLER/DRIVER  
PLEASE REFER TO :

SITRONIX ST7282A

1.2 DATA SHEET FOR CAPACITIVE TOUCH PANEL CONTROLLER/DRIVER  
PLEASE REFER TO :

ILITEK ILI2118A

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	-----	480(RGB)W * 272H DOTS
(3) MODULE SIZE	-----	105.5W * 67.2H * 4.76D mm (WITHOUT FPC & PROTECT FILM)
(4) VIEWING AREA	-----	99W * 56H 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) BACKLIGHT	-----	LED , COLOR : WHITE
(12) INTERFACE MODE	-----	RGB 24 BIT PARALLEL (SYNC/DE/SYNC-DE MODE)
(13) WEIGHT	-----	71g

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## 2.2 CAPACITIVE TOUCH PANEL MECHANICAL SPECIFICATIONS

- (1) TOUCH PANEL SIZE ----- 4.3 inch
- (2) OUTER DIMENSION ----- 105.5W \* 66.98H \* 1.8D mm  
(WITHOUT FPC)
- (3) ACTIVE AREA ----- 96.04W \* 54.86H mm
- (4) INPUT TYPE ----- MULTI TOUCH
- (5) NUMBER OF TOUCH SENSOR ----- 18\*10 SENSORS
- (6) RESOLUTION ----- 2048\*2048
- (7) INTERFACE MODE ----- I2C

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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+-VBL-	11.4	12.6	V	
STATIC ELECTRICITY	—	—	—	V	NOTE (1)

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

#### 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	-20°C	70°C	-30°C	80°C	NOTE (1), (2), (3), (4)
HUMIDITY	NOTE (2)		NOTE (2)		WITHOUT CONDENSATION
CORROSIVE GAS	NOT ACCEPTABLE		NOT ACCEPTABLE		

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

NOTE (2) :  $T_a \leq 60^\circ\text{C}$  : 90%RH MAX. (96HRS MAX.)

$T_a > 60^\circ\text{C}$  : ABSOLUTE HUMIDITY MUST BE LOWER THAN THE HUMIDITY OF 90%RH AT  $60^\circ\text{C}$ . (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  $60^\circ\text{C}$ , 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	—	3.15	3.30	3.45	V	
POWER SUPPLY VOLTAGE FOR LED DRIVER	VBL+-VBL-	—	11.4	12.0	12.6	V	
POWER SUPPLY CURRENT	IDD	VDD-VSS =3.30V	—	30	40	mA	NOTE ( 1 )
POWER SUPPLY CURRENT FOR LED DRIVER	IBL	VBL+-VBL- =12.0V LED B/L=ON	—	100	120	mA	
LOGIC HIGH INPUT VOLTAGE	V <sub>IH</sub>	—	0.7*VDD	—	VDD	V	NOTE ( 2 )
LOGIC LOW INPUT VOLTAGE	V <sub>IL</sub>	—	VSS	—	0.3*VDD	V	NOTE ( 2 )
LOGIC HIGH OUTPUT VOLTAGE	V <sub>OH</sub>	—	VDD-0.4	—	VDD	V	
LOGIC LOW OUTPUT VOLTAGE	V <sub>OL</sub>	—	VSS	—	VSS+0.4	V	
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 B7~B0, G7~G0, R7~R0, DCLK, HSYNC, VSYNC, 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.

### 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	V <sub>IH</sub>	NOTE ( 1 )	1	—	VDD1	V
LOGIC LOW INPUT VOLTAGE	V <sub>IL</sub>	—	VSS1	—	0.5	V
LOGIC HIGH OUTPUT VOLTAGE	V <sub>OH</sub>	—	—	NOTE ( 2 )	—	V
LOGIC LOW OUTPUT VOLTAGE	V <sub>OL</sub>	—	VSS1	—	0.1	V
POWER SUPPLY CURRENT	IDD1	VDD1-VSS1 =3.30V	—	25	35	mA

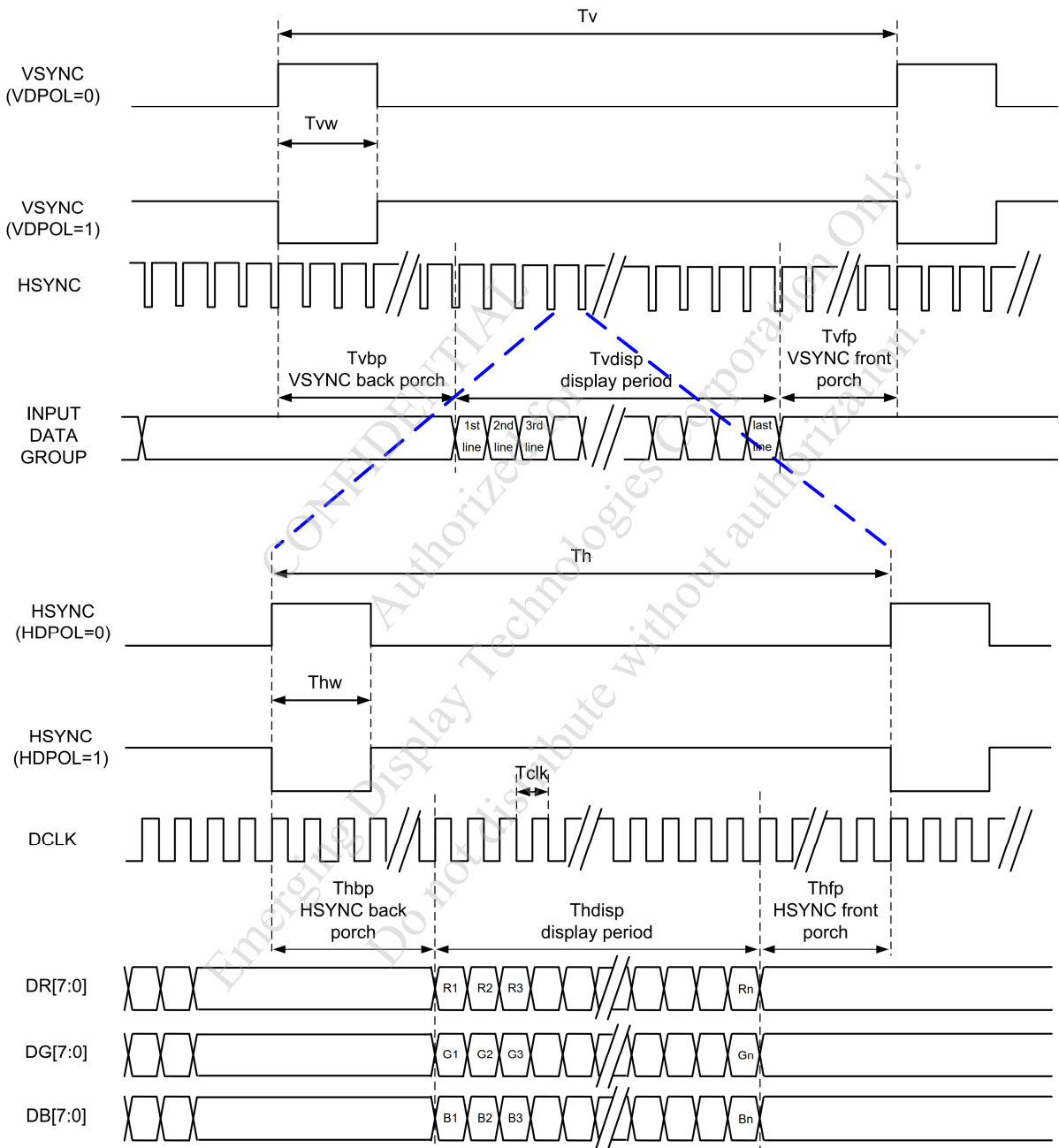
NOTE ( 1 ) : V<sub>IH</sub> INCLUDES PIN /RST, SDA, SCL, /INT.

NOTE ( 2 ) : V<sub>OH</sub> IS FOR /INT OUTPUT VOLTAGE LEVEL WHICH IS PROGRAMMABLE BY REGISTERS  
TYPICAL VALUES ARE 1.2V/1.5V/1.8V/V<sub>VDD</sub>.

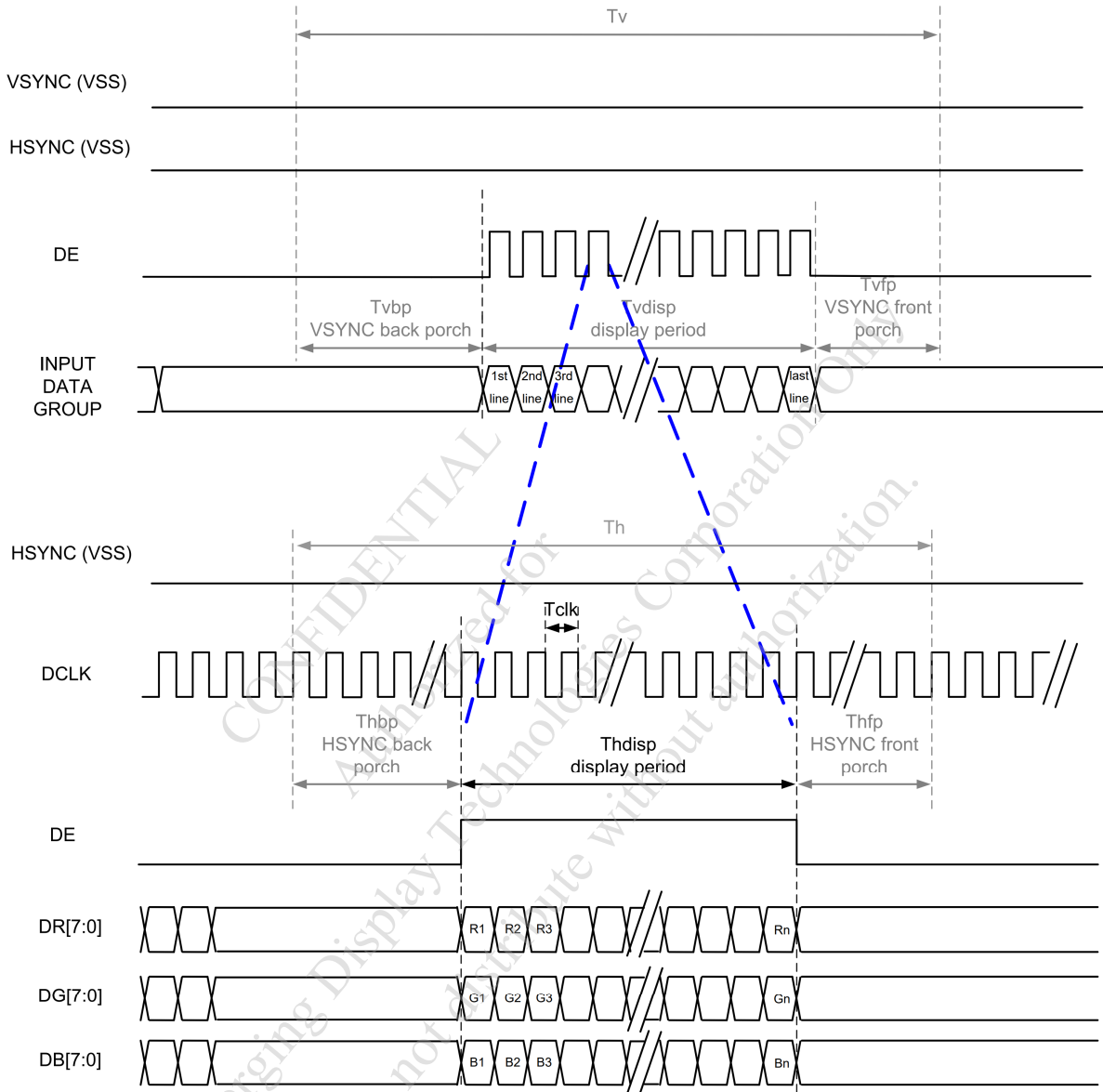
5. TIMING CHARACTERISTICS

5.1 FOR LCD MODULE

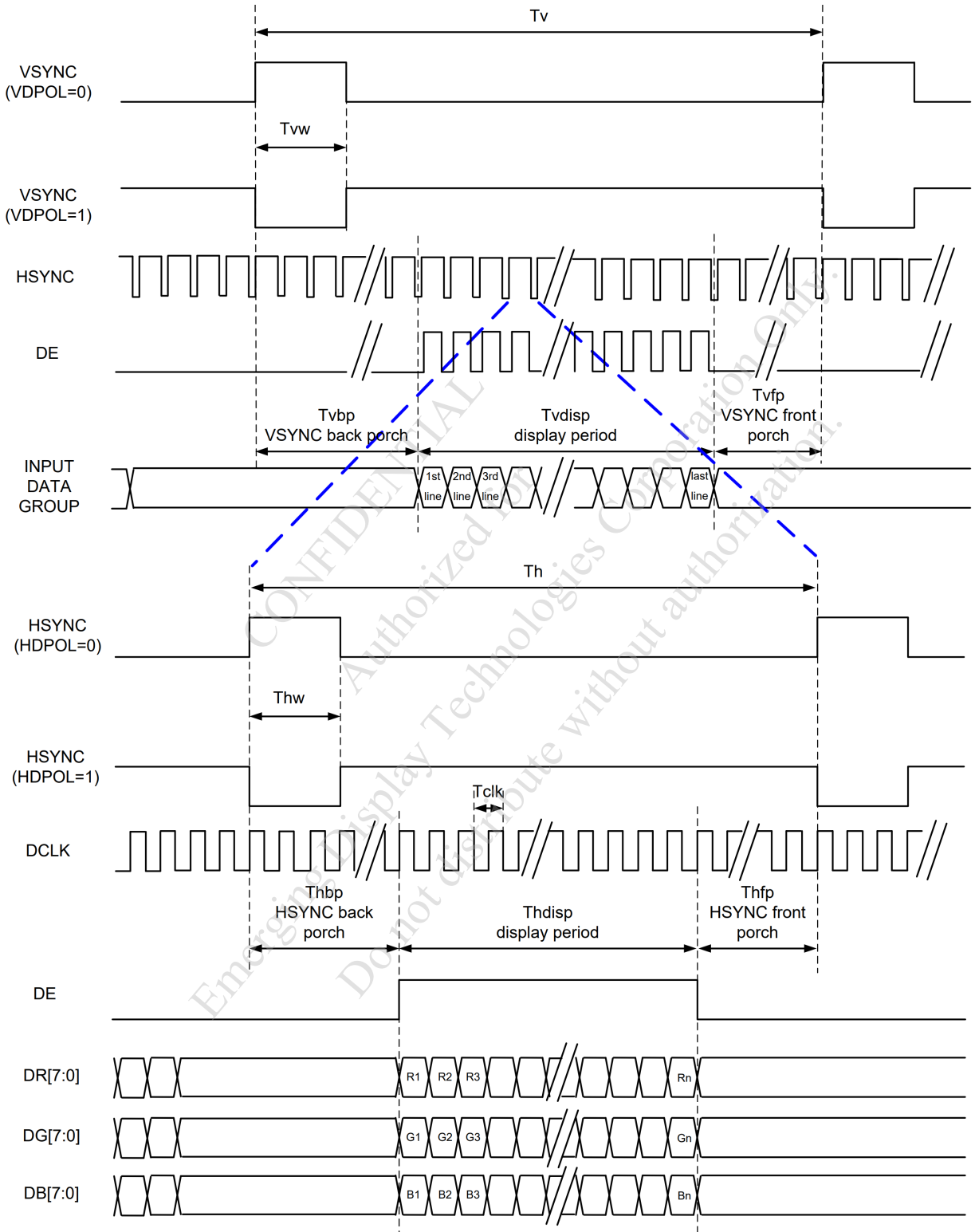
5.1.1 SYNC MODE



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

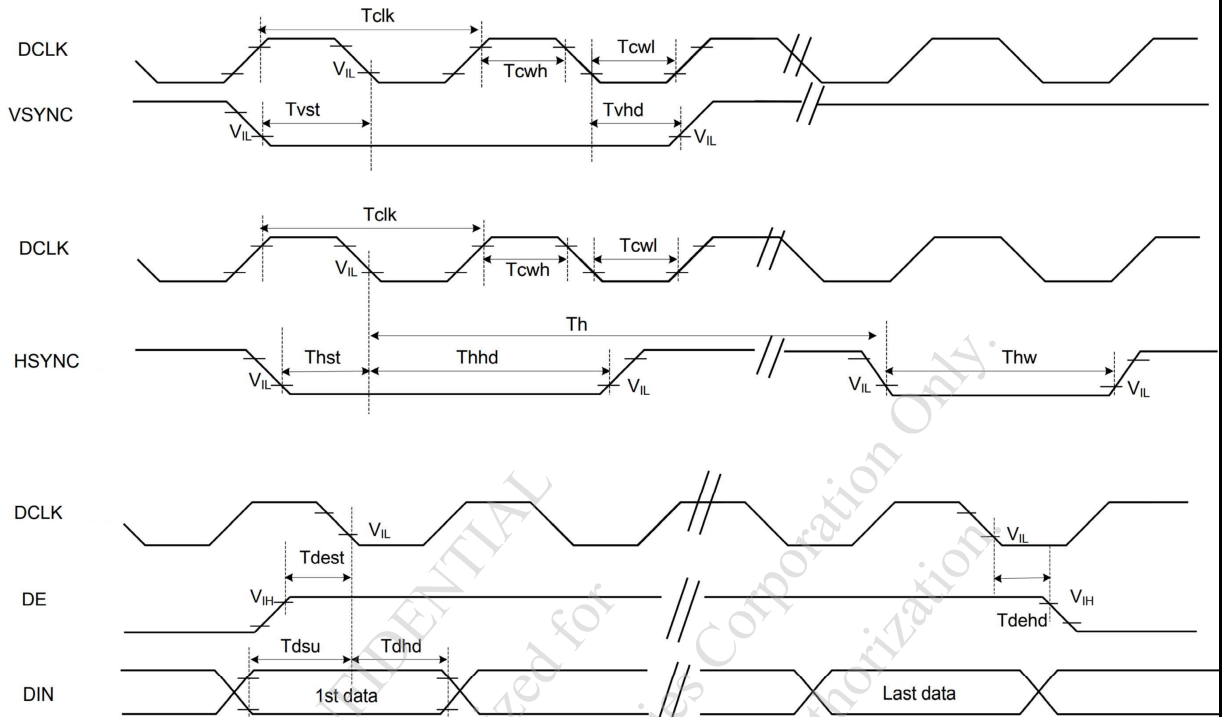
Ta=25°C

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	BY H_BLANKING SETTING
	FRONT PORCH	Thfp	2	8	75	DCLK	
	PULSE WIDTH	Thw	2	4	75	DCLK	
VSYNC	PERIOD TIME	Tv	276	292	321	HSYNC	
	DISPLAY PERIOD	Tvdisp	—	272	—	HSYNC	
	BACK PORCH	Tvbp	2	12	12	HSYNC	BY V_BLANKING SETTING
	FRONT PORCH	Tvfp	2	8	37	HSYNC	
	PULSE WIDTH	Tvw	2	4	37	HSYNC	

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

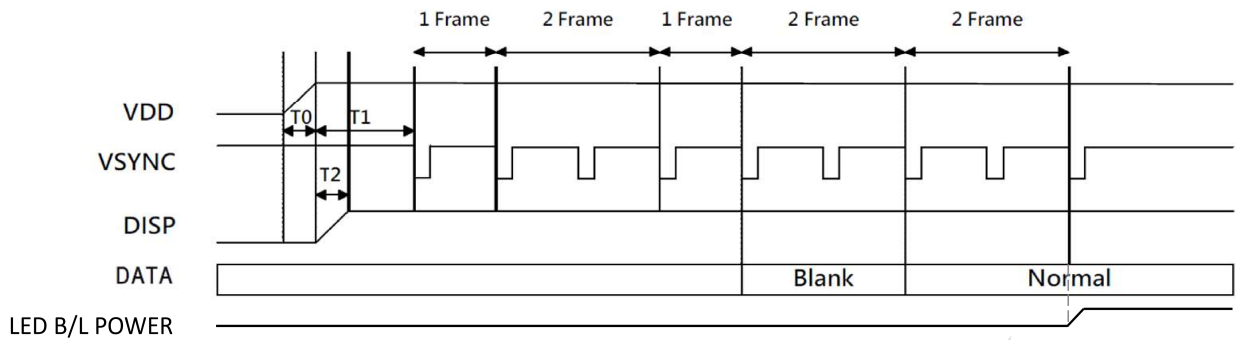
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5.1.5 SYSTEM BUS TIMING FOR RGB INTERFACE



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	$T_{dh}$	12	—	—	ns	
DE SETUP TIME	$T_{dest}$	12	—	—	ns	
DE HOLD TIME	$T_{dehd}$	12	—	—	ns	

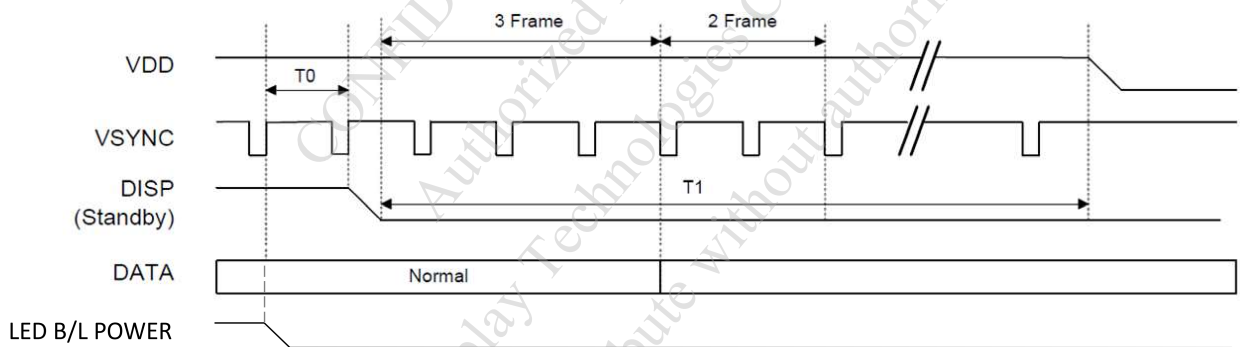
5.1.6 POWER ON TIMING SEQUENCE



ITEM	DESCRIPTION	MIN. TIME
T0	DETERMINED BY THE EXTERNAL POWER	
T1	TIME FROM STABLE VDD, SET-UP TO THE FIRST VSYNC	T1=0
T2	TIME FROM STABLE VDD SET-UP TO DISP ASSERTED	T2=0

NOTE : RECOMMEND THE LCM POWER ON RISE TIME T0= 0~ 1ms.

5.1.7 POWER OFF TIMING SEQUENCE

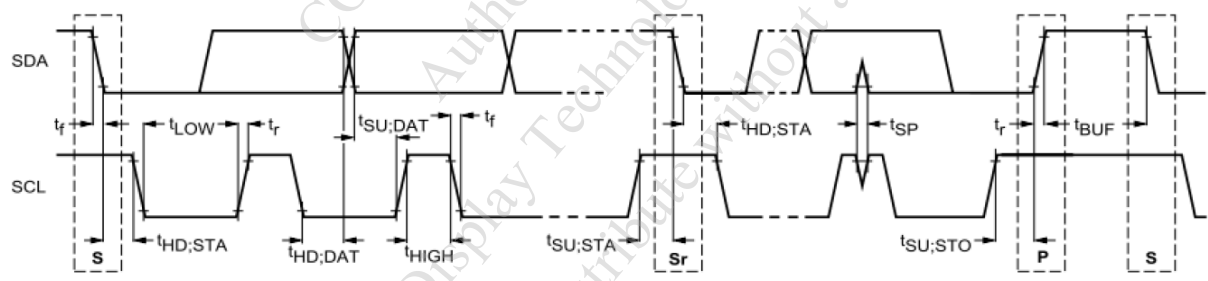


ITEM	DESCRIPTION	MIN. TIME
T0	TIME FROM BACKLIGHT POWER OFF TO DISP="L"	1*Frame
T1	TIME FROM DISP="L" TO LCM POWER OFF	5*Frame

5.2 FOR CTP MODULE

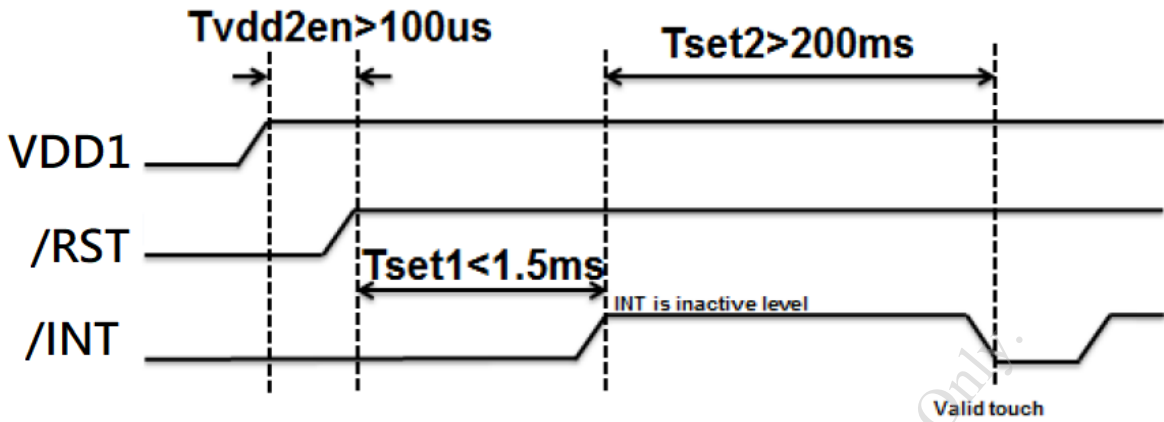
5.2.1 I2C INTERFACE TIMING CHARACTERISTICS

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	—	$\mu s$	0.6	—	$\mu s$
LOW PERIOD OF THE SCL CLOCK	$t_{LOW}$	4.7	—	$\mu s$	1.3	—	$\mu s$
HIGH PERIOD OF THE SCL CLOCK	$t_{HIGH}$	4.0	—	$\mu s$	0.6	—	$\mu s$
SET-UP TIME FOR A REPEATED START CONDITION	$t_{SU;STA}$	4.7	—	$\mu s$	0.6	—	$\mu s$
DATA HOLD TIME	$t_{HD;DAT}$	0	3.45	$\mu s$	0	0.9	$\mu s$
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	—	$\mu s$	0.6	—	$\mu s$
BUS FREE TIME BETWEEN A STOP AND START CONDITION	$t_{BUF}$	4.7	—	$\mu s$	1.3	—	$\mu s$



THE TIMING OF I2C INTERFACE

5.2.2 POWER ON SEQUENCE

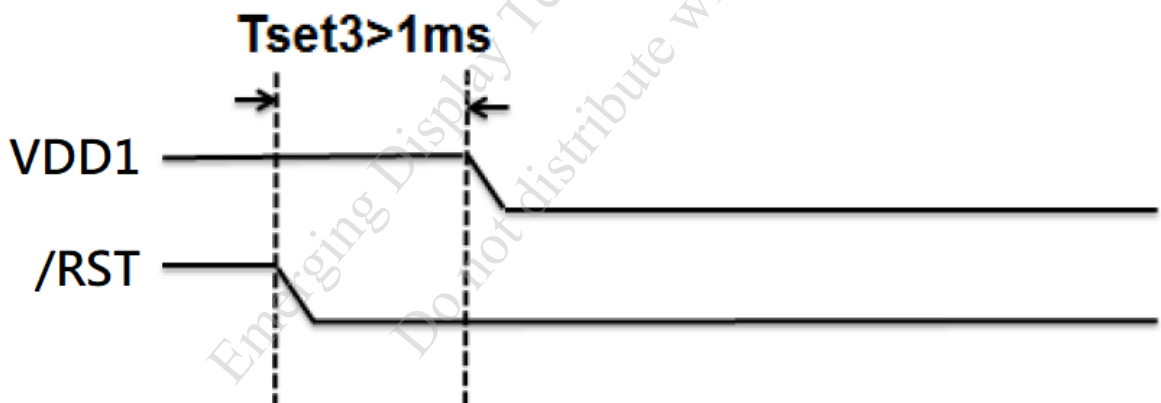


NOTE ( 1 ) : AFTER TP\_RST SET TO HIGH, TP\_INT REQUIRES Tset1 TO SET TO INACTIVE STATE

NOTE ( 2 ) : THE TP\_INT PIN CAN BE DEFINED BY TOUCH FIRMWARE DESIGN. IT CAN BE ACTIVE HIGH OR ACTIVE LOW.

ITEM	STANDARD MODE		UNIT
	MIN.	MAX.	
Tset1	—	1.5	ms
Tset2	200	—	ms
Tvdd2en	100	—	us

5.2.3 POWER OFF SEQUENCE



ITEM	STANDARD MODE		UNIT
	MIN.	MAX.	
Tset3	1	—	ms

6. OPTICAL CHARACTERISTICS

6.1 OPTICAL CHARACTERISTICS(NOTE 1)

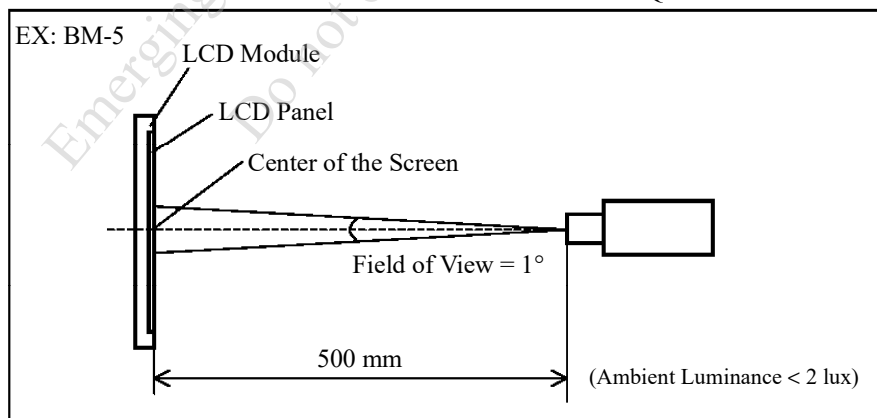
Ta=25±2°C

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK	
VIEWING ANGLE	$\theta_{y+}$	$CR \geq 10$	$\theta_x=0^\circ$	80	85	—	deg.	NOTE ( 2 ) NOTE ( 3 )
	$\theta_{y-}$			80	85	—		
	$\theta_{x+}$		$\theta_y=0^\circ$	80	85	—		
	$\theta_{x-}$			80	85	—		
CONTRAST RATIO (CENTER)	CR	$\theta_x=0^\circ, \theta_y=0^\circ$	800	1000	—	—	NOTE ( 3 )	
RESPONSE TIME	tr ( rise )+ tf ( fall )	$\theta_x=0^\circ, \theta_y=0^\circ$	—	30	35	msec	NOTE ( 4 )	
COLOR CHROMATICITY (CENTER)	WHITE	Wx	$\theta_x=0^\circ, \theta_y=0^\circ$ VDD-VSS =3.30V VBL+-VBL- =12.0V	0.25	0.30	0.35	—	NOTE ( 5 )
		Wy		0.28	0.33	0.38	—	
	RED	Rx		0.54	0.59	0.64	—	
		Ry		0.27	0.32	0.37	—	
	GREEN	Gx		0.30	0.35	0.40	—	
		Gy		0.54	0.59	0.64	—	
	BLUE	Bx		0.10	0.15	0.20	—	
		By		0.06	0.11	0.16	—	
THE BRIGHTNESS OF MODULE (CENTER)	B		680	850	—	cd/m <sup>2</sup>	NOTE ( 6 )	
THE BRIGHTNESS OF UNIFORMITY	—		70	—	—	%	NOTE ( 7 )	

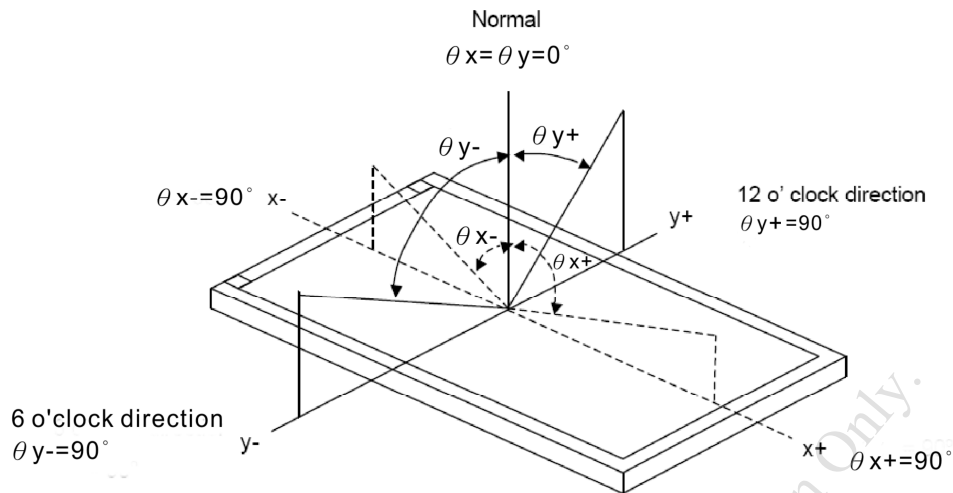
NOTE ( 1 ) : TEST CONDITION :

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.

THE MEASUREMENT CRITERIA AND CONDITION FOR EITHER BM-5 OR CA-210 OR EQUIVALENT LUMINANCE METER IS BASED ON THE EQUIPMENT'S MANUAL.



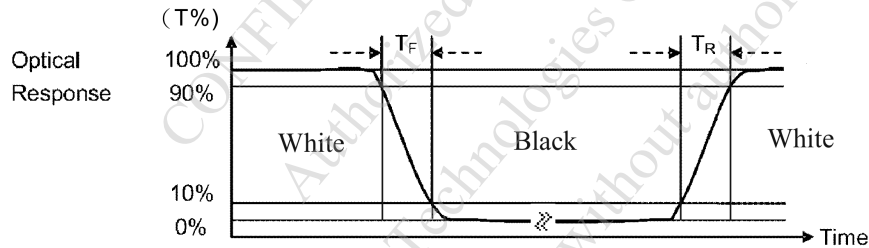
NOTE (2) : DEFINITION OF VIEWING ANGLE :



NOTE (3) : DEFINITION OF CONTRAST RATIO (CR) :  
MEASURED AT THE CENTER POINT OF MODULE

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

NOTE (4) : DEFINITION OF RESPONSE TIME :  $T_R$  AND  $T_F$   
THE FIGURE BELOW IS THE OUTPUT SIGNAL OF THE PHOTO DETECTOR.



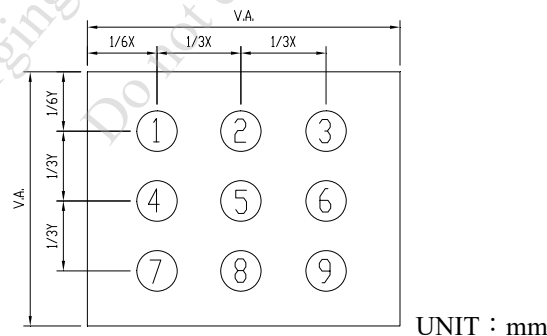
NOTE (5) : DEFINITION OF COLOR CHROMATICITY

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

(b) MEASURED AT THE CENTER POINT OF MODULE

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

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

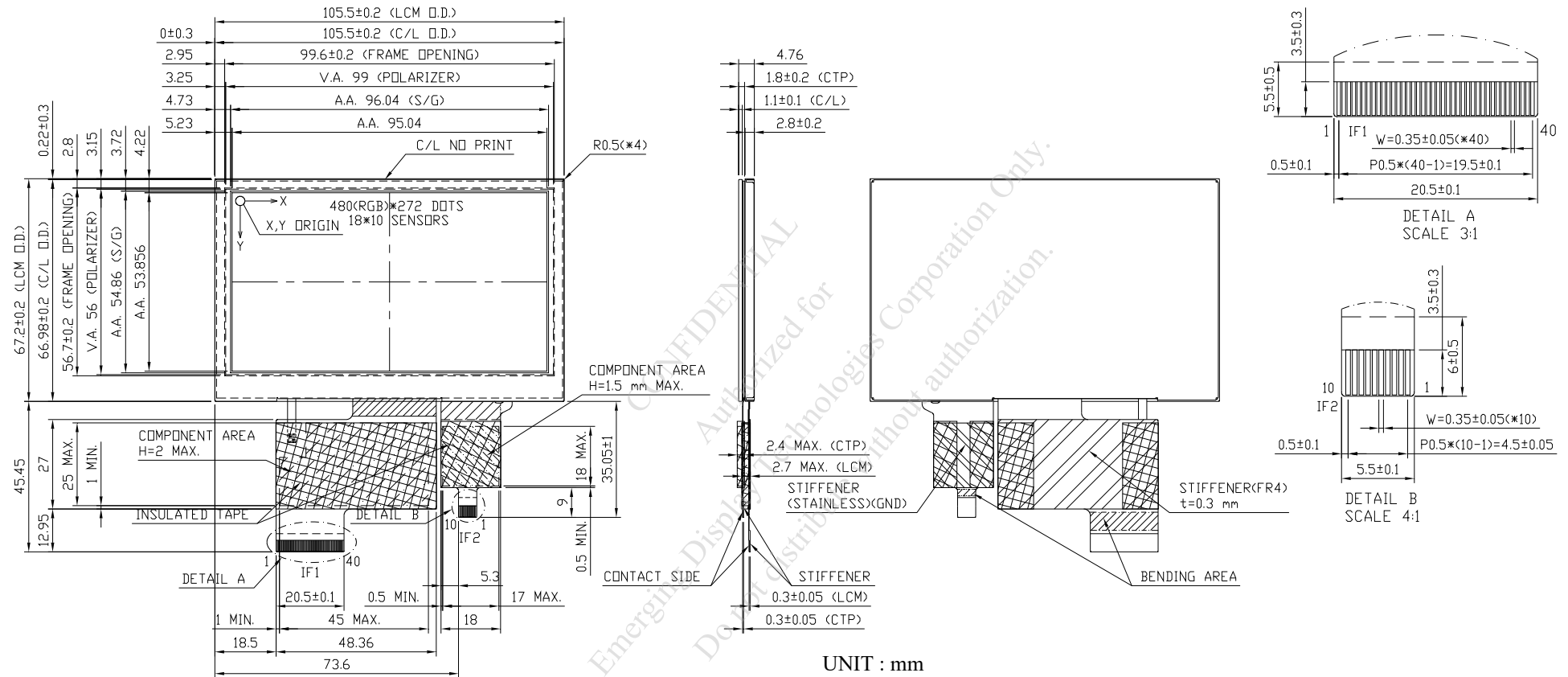


UNIT : mm

(b) THE BRIGHTNESS UNIFORMITY CALCULATING METHOD

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

7. OUTLINE DIMENSIONS



UNIT : mm

SCALE : NTS

THIRD ANGLE PROJECTION

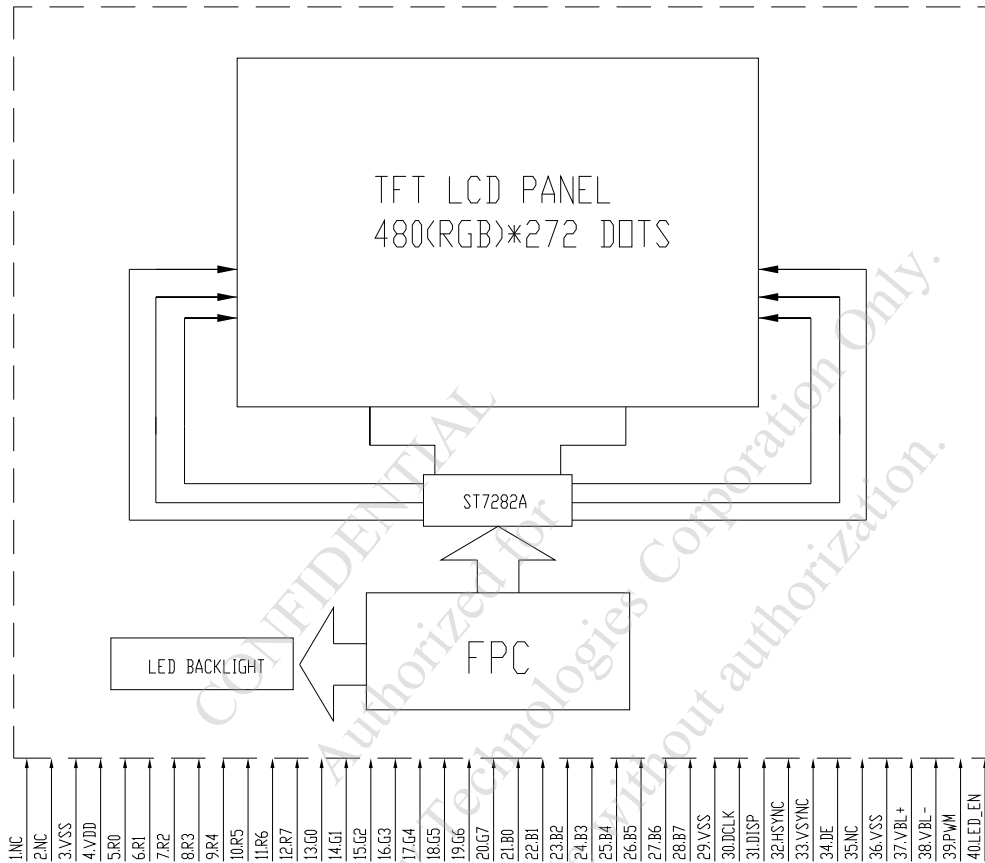
NOT SPECIFIED TOLERANCE IS ±0.5mm

NOTE :

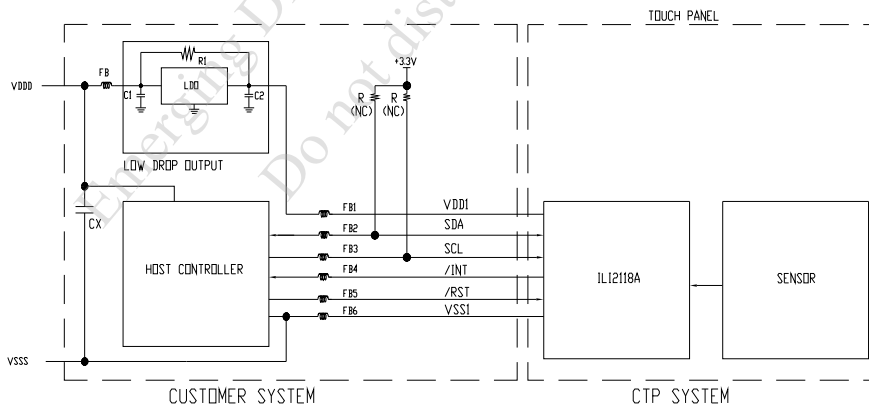
- 1.C/L GLASS : SODA LIME, NON-STRENGTHEN, CHAMFERED EDGES.
- 2.RECOMMEND MATCH CONNECTOR (IF1) : KYOCERA 04 6240 040 SERIES.
- 3.RECOMMEND MATCH CONNECTOR (IF2) : KYOCERA 04 6240 010 SERIES.
- 4.FPC BENDING RADIUS SHOULD BE MORE THAN 1.0 mm.

8. BLOCK DIAGRAM

8.1 TFT



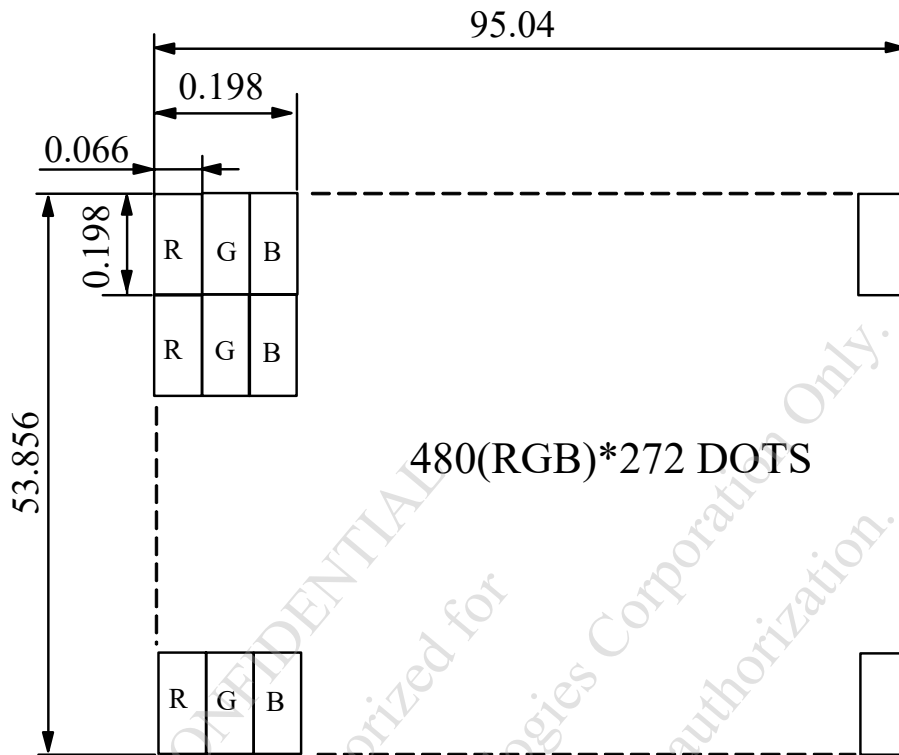
8.2 CTP



NOTE (1) : VALUE OF PULL-UP RESISTORS(R) DEPENDS ON CLOCK SPEED , NUMBER OF CHIPS ON THE I2C BUS AND NOISE LEVEL. LOW SPEED 4.7K TO 10K OR HIGHER, HIGH SPEED 1K TO 4.7K OR HIGHER. SIGNALS SHOULD BE MEASURED WITH AN OSCILLOSCOPE TO VERIFY WAVEFORM AND HIGH / LOW LEVELS.

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 : 4.7 $\mu$ F OR 10  $\mu$ F.

9. DETAIL DRAWING OF DOT MATRIX



UNIT : mm

SCALE : NTS

NOT SPECIFIED TOLERANCE IS  $\pm 0.1$

DOTS MATRIX TOLERANCE IS  $\pm 0.01$

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## 10. INTERFACE SIGNALS

### 10.1 IF1

PIN NO.	SYMBOL	FUNCTION
1	NC	NON CONNECTION
2	NC	NON CONNECTION
3	VSS	GROUND
4	VDD	POWER SUPPLY VOLTAGE
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	DCLK	CLOCK SIGNAL; LATCHING DATA AT THE FALLING EDGE
31	DISP	DISPLAY CONTROL / STANDBY MODE SELECTION. DISP="LOW": STANDBY; DISP="HIGH" : NORMAL DISPLAY
32	HSYNC	HORIZONTAL SYNC SIGNAL
33	VSYNC	VERTICAL SYNC SIGNAL
34	DE	DATA INPUT ENABLE. ACTIVE HIGH TO ENABLE THE DATA INPUT.
35	NC	NON CONNECTION
36	VSS	GROUND
37	VBL+	POWER SUPPLY VOLTAGE FOR LED DRIVER CIRCUIT
38	VBL-	GROUND
39	PWM	DIMMING CONTROL INPUT FOR BACKLIGHGT.DO NOT ALLOW THIS PIN TO FLOAT.
40	LED_EN	LED ENABLE PIN

RGB MODE SELECTION TABLE	DCLK	HSYNC	VSYNC	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.

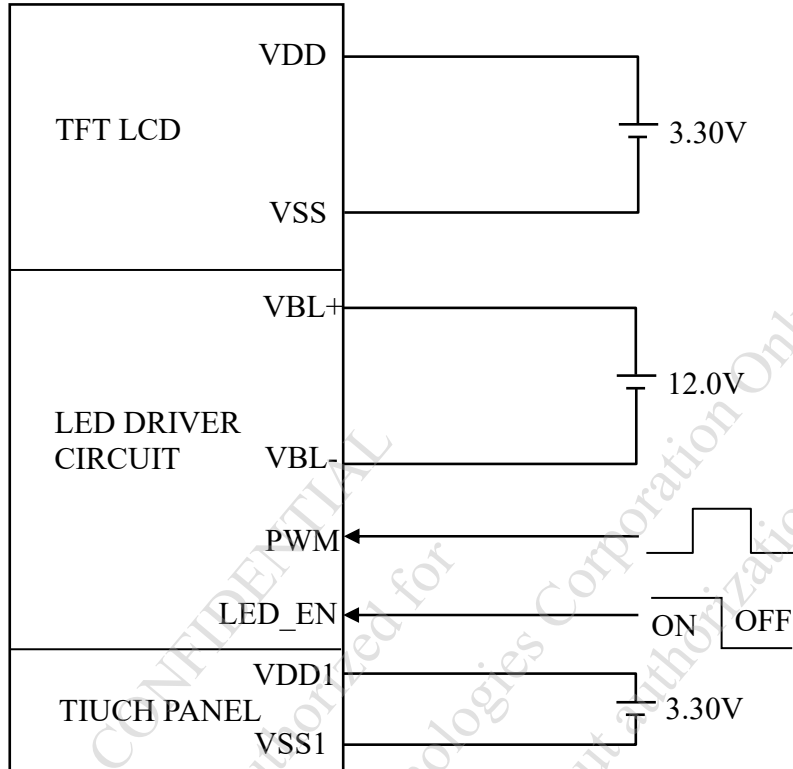
10.2 IF2

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

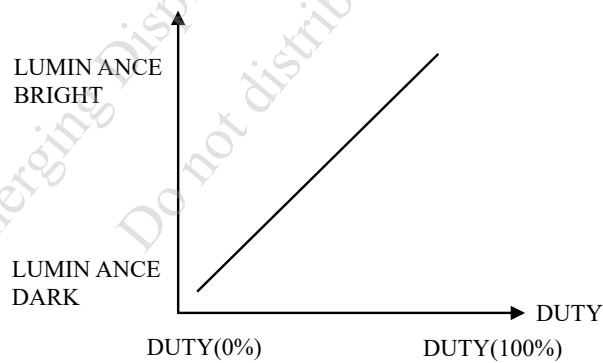
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11. POWER SUPPLY

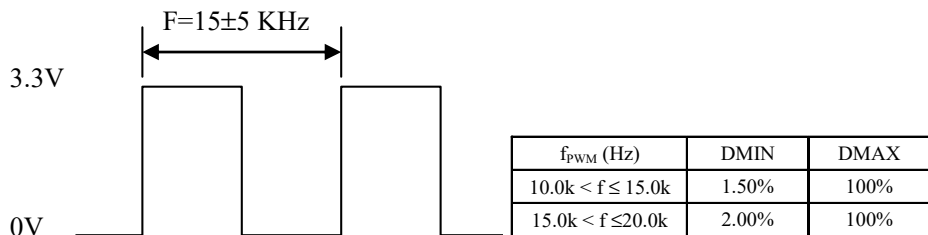
11.1 POWER SUPPLY FOR LCM



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) : OPERATION FREQUENCY : 15±5KHz



12. CAPACITIVE TOUCH PANEL SPECIFICATION

12.1 OPTICAL CHARACTERISTICS

ITEM	CONDITION	MIN.	TYP.	MAX.	UNIT
TRANSPARENCY NOTE (1)	Ta = 25°C λ=550 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.

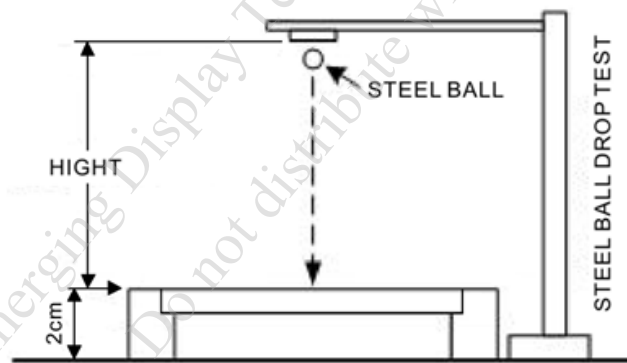
12.2 HARDNESS

ITEM	DESCRIPTION
SURFACE HARDNESS	7H (MIN.)

12.3 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)



## 12.4 I2C INTERFACE DATA STRUCTURE

### DEVICE ADDRESS

THE DEVICE ADDRESSES ARE 7-BINARY BITS LONG AND ARE CONVENTIONALLY EXPRESSED AS 4 BITS FOLLOWED BY 3 BITS FOLLOWED BY THE LETTER 'b', 0100 110b. THESE ADDRESSES OCCUPY THE HIGH SEVEN BITS OF AN EIGHT-BIT FIELD ON THE BUS.

MSB	LSB
0 1 0 0 1 1 0	0/1
Device Address	R/W

7-BIT DEVICE ADDRESS:  
0x26

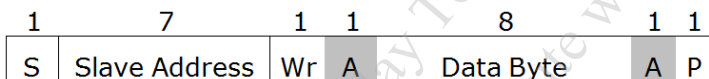
8-BIT DEVICE READ  
ADDRESS:0x4D

8-BIT DEVICE WRITE  
ADDRESS:0x4c

I2C DEVICE ADDRESS

### DATA TRANSFER

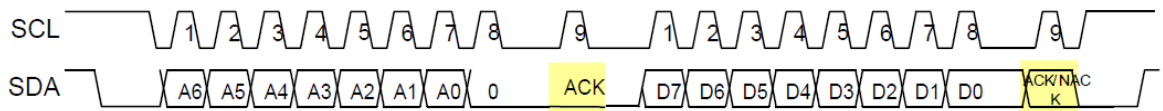
DATA IS TRANSFERRED OVER THE I<sup>2</sup>C BUS WITH 8-BIT ADDRESS AND 8-BIT DATA. THE RELATED PROTOCOL AND TIMING DIAGRAMS ARE SHOWN AS BELOW.



- S      START CONDITION
  - Sr     REPEATED START CONDITION
  - Rd     READ (BIT VALUE OF 1)
  - Wr     WRITE (BIT VALUE OF 0)
  - A      ACKNOWLEDGE (THIS BIT POSITION MAY BE '0' FOR AN ACK OR '1' FOR A NACK)
  - P      STOP CONDITION
- |     |                 |
|-----|-----------------|
|     | MASTER-TO-SLAVE |
|     | SLAVE-TO-MASTER |
| --- | CONTINUE        |

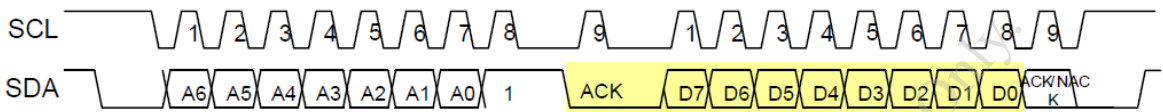
GENERIC TRANSACTION DIAGRAM

I2C WRITE TIMING



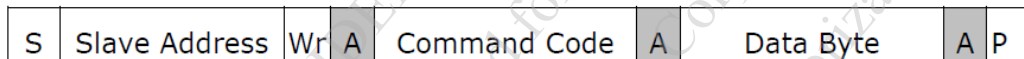
=> slave to master

I2C READ TIMING

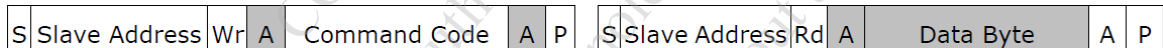


=> slave to master

BYTE WRITE

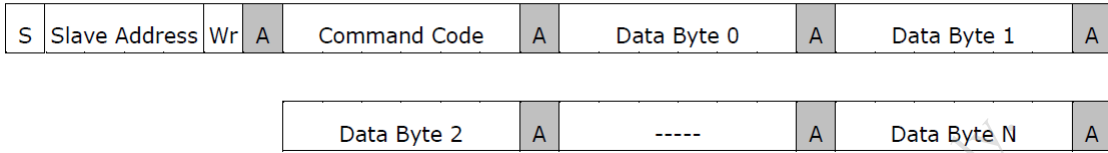
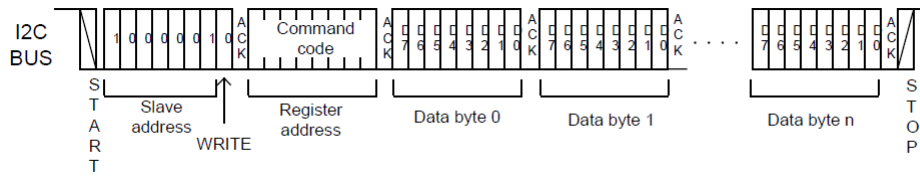


BYTE READ

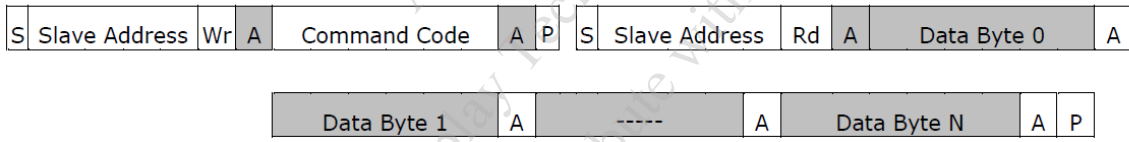
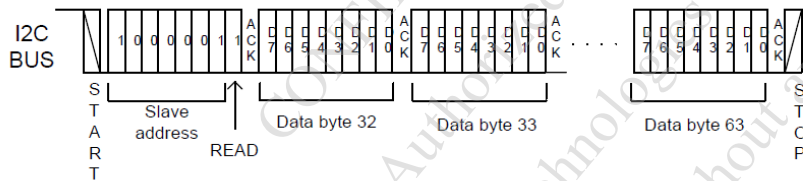
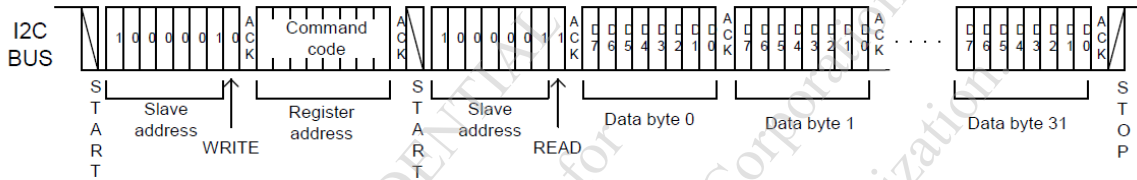


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MULTI-BYTE WRITE



MULTI-BYTE READ



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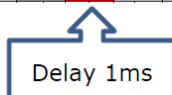
## 12.5 COMMUNICATION PROTOCOL

### COMMAND LIST

NAME	DESCRIPTION
READ FIRMWARE INFORMATION	READ FIRMWARE INFORMATION

NOTICE: AFTER HOST WRITES OR READ I2C COMMAND PLEASE DELAY 1ms.

S	Slave Address	Wr	A	Data Byte	A	P	S	Slave Address	Wr	A	Data Byte	A
---	---------------	----	---	-----------	---	---	---	---------------	----	---	-----------	---



## 12.6 PROTOCOL DATA FORMAT

### READ FIRMWARE INFORMATION

THE HOST SENDS I2C “MULTI-BYTE READ” FORMAT WITH COMMAND CODE “0x03” TO READ TOUCH FIRMWARE INFORMATION.

THE TOUCH DEVICE RESPONDS DATA WITH FOLLOWING DATA FORMAT.

BYTE	NAME OF BYTES	DESCRIPTION
0	Par_0	VENDER_ID
1	Par_1	RESERVED
2	Par_2	FIRMWARE VERSION: Par_2.Par_3
3	Par_3	
4	Par_4	RESERVED
5	Par_5	
6	Par_6	
7	Par_7	

## 12.7 DATA REPORT

ILI2118A USE INTERRUPT PIN TO SIGNAL THE HOST WHEN DETECTING TOUCH EVENTS ON THE SENSOR. WHEN A FINGER TOUCHES ON THE SENSOR SURFACE, THE TP\_INT PIN WILL BE ACTIVE HIGH. THE WILL BE ENABLED AFTER EN PIN PULL HIGH 300ms

THE TP\_INT PIN CAN BE DEFINED BY TOUCH FIRMWARE DESIGN. IT CAN BE ACTIVE HIGH OR ACTIVE LOW.

### REPORT FORMAT

THE HOST SENDS I2C “MULTI-BYTE READ” FORMAT AFTER TOUCH DEVICE ISSUES INT TO READ TOUCH REPORTED DATA. THE TOUCH RESOLUTION IS 2048 X 2048.

THE TOUCH DEVICE RESPONDS DATA WITH THE FOLLOWING DATA FORMAT. TOUCH COORDINATE DATA IS 0xFF, IT MEANS THERE IS NO TOUCH.

BYTE	NAME OF BYTES	DESCRIPTION	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0
0	Packet ID	0x5A								
1	X0 HIGH COORDINATE Y00 HIGH COORDINATE	X00[11:8] Y00[11:8]	X00[11:8]=Bit[7:4] Y00[11:8]=Bit[3:0]							
2	X00 LOW COORDINATE	X00[7:0]								
3	Y00 LOW COORDINATE	Y00[7:0]								
4	RESERVED	RESERVED								
5	X01 HIGH COORDINATE Y01 HIGH COORDINATE	X01[11:8] Y01[11:8]	X01[11:8]=Bit[7:4] Y01[11:8]=Bit[3:0]							
6	X01 LOW COORDINATE	X01[7:0]								
7	Y01 LOW COORDINATE	Y01[7:0]								
8	RESERVED	RESERVED								
9	X02 HIGH COORDINATE Y02 HIGH COORDINATE	X02[11:8] Y02[11:8]	X02[11:8]=Bit[7:4] Y02[11:8]=Bit[3:0]							
10	X02 LOW COORDINATE	X02[7:0]								
11	Y02 LOW COORDINATE	Y02[7:0]								
12	RESERVED	RESERVED								
13	X03 HIGH COORDINATE Y03 HIGH COORDINATE	X03[11:8] Y03[11:8]	X03[11:8]=Bit[7:4] Y03[11:8]=Bit[3:0]							
14	X03 LOW COORDINATE	X03[7:0]								
15	Y03 LOW COORDINATE	Y03[7:0]								

BYTE	NAME OF BYTES	DESCRIPTION	BIT 7	BIT 6	BIT 5	BIT 4	BIT 3	BIT 2	BIT 1	BIT 0	
16	RESERVED	RESERVED									
17	X04 HIGH COORDINATE Y04 HIGH COORDINATE	X04[11:8] Y04[11:8]	X04[11:8]=Bit[7:4] Y04[11:8]=Bit[3:0]								
18	X04 LOW COORDINATE	X04[7:0]									
19	Y04 LOW COORDINATE	Y04[7:0]									
20	RESERVED	RESERVED									
21	X05 HIGH COORDINATE Y05 HIGH COORDINATE	X05[11:8] Y05[11:8]	X05[11:8]=Bit[7:4] Y05[11:8]=Bit[3:0]								
22	X05 LOW COORDINATE	X05[7:0]									
23	Y05 LOW COORDINATE	Y05[7:0]									
24	RESERVED	RESERVED									
25	X06 HIGH COORDINATE Y06 HIGH COORDINATE	X06[11:8] Y06[11:8]	X06[11:8]=Bit[7:4] Y06[11:8]=Bit[3:0]								
26	X06 LOW COORDINATE	X06[7:0]									
27	Y06 LOW COORDINATE	Y06[7:0]									
28	RESERVED	RESERVED									
29	X07 HIGH COORDINATE Y07 HIGH COORDINATE	X07[11:8] Y07[11:8]	X07[11:8]=Bit[7:4] Y07[11:8]=Bit[3:0]								
30	X07 LOW COORDINATE	X07[7:0]									
31	Y07 LOW COORDINATE	Y07[7:0]									
32	RESERVED	RESERVED									
33	X08 HIGH COORDINATE Y08 HIGH COORDINATE	X08[11:8] Y08[11:8]	X08[11:8]=Bit[7:4] Y08[11:8]=Bit[3:0]								
34	X08 LOW COORDINATE	X08[7:0]									
35	Y08 LOW COORDINATE	Y08[7:0]									
36	RESERVED	RESERVED									
37	X09 HIGH COORDINATE Y09 HIGH COORDINATE	X09[11:8] Y09[11:8]	X09[11:8]=Bit[7:4] Y09[11:8]=Bit[3:0]								
38	X09 LOW COORDINATE	X09[7:0]									
39	Y09 LOW COORDINATE	Y09[7:0]									
40	RESERVED	RESERVED									
41	P SENSOR[3:0] TOUCH KEY[3:0]	PROXIMITY & TOUCH KEY DATA	P SENSOR[3:0]=Bit[7:4]				Key 3	Key 2	Key 1	Key 0	
42	CHECKSUM	RESERVED	CHECKSUM= ADD DATA FROM BYTE0 TO BYTE41								

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

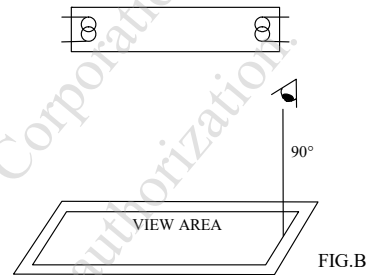
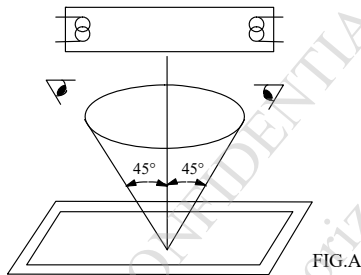
13.2 INSPECTION CONDITIONS

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

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

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

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



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

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

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 INSPECTION METHOD

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

(a)APPLICABLE STANDARD :

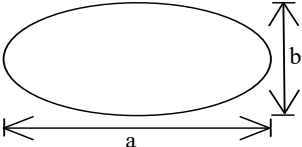
ANSI/ ASQ Z1.4 NORMAL INSPECTION LEVEL II

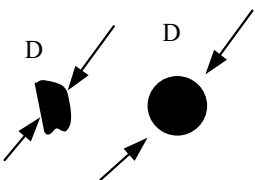
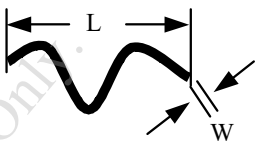
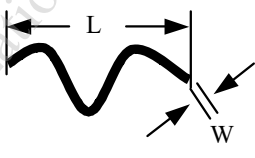
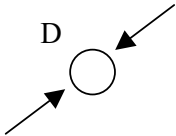
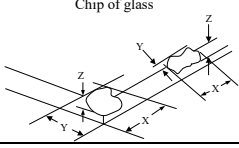
(b)AQL : MAJOR DEFECT : AQL 0.65

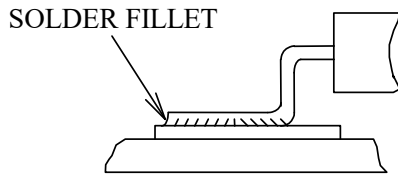
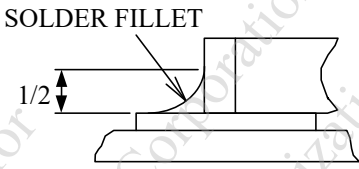
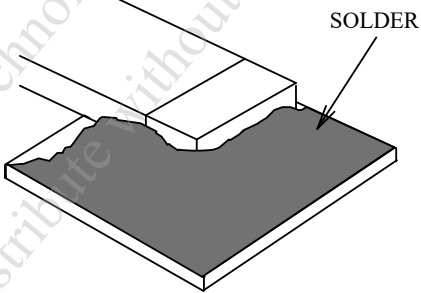
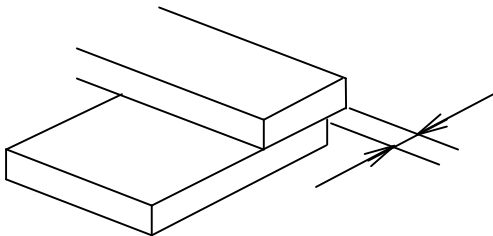
MINOR DEFECT : AQL 1.0

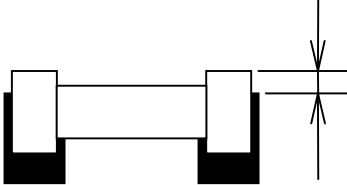
13.3 DEFECTS CLASSIFICATION

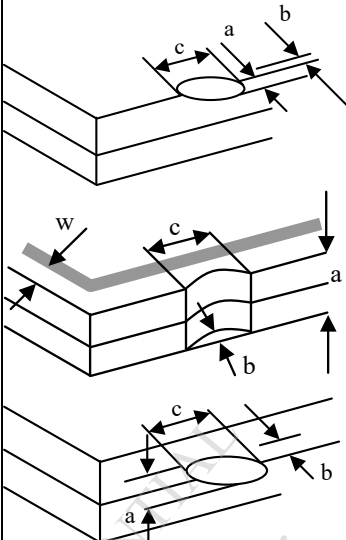
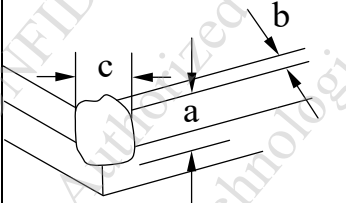
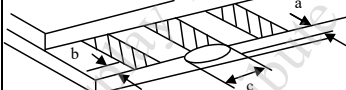
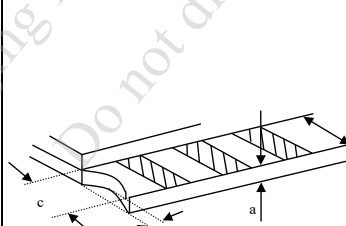
TYPE OF DEFECT	INSPECTION ITEM	DEFECT FEATURE	AQL
MAJOR DEFECT	1.DISPLAY ON	<ul style="list-style-type: none"> <li>• DEFECT TO MISS SPECIFIED DISPLAY FUNCTION, FOR ALL AND SPECIFIED DOTS</li> <li>EX: DISCONNECTION, SHORT CIRCUIT ETC</li> </ul>	0.65
	2.CTP FUNCTION	<ul style="list-style-type: none"> 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

NO.	ITEM	CRITERIA																								
1	DISPLAY ON INSPECTION	1.INCORRECT PATTERN 2.MISSING SEGMENT 3.DIM SEGMENT 4.OPERATING VOLTAGE BEYOND SPEC																								
2	OVERALL DIMENSIONS	1.OVERALL DIMENSION BEYOND SPEC																								
3	DOT DEFECT	<p>1.INSPECTION PATTERN: FULL WHITE, FULL BLACK, RED, GREEN AND BLUE SCREENS.</p> <p>2.</p> <table border="1"> <thead> <tr> <th>ITEMS</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <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> </tbody> </table> <p>NOTE :</p> <p>(1)THE DEFINITION OF DOT : THE SIZE OF A DEFECTIVE DOT OVER 1/2 OF WHOLE DOT IS REGARDED AS ONE DEFECTIVE DOT.</p> <p>(2)BRIGHT DOT : DOTS APPEAR BRIGHT AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER BLACK PATTERN. THE BRIGHT DOT DEFECT MUST BE VISIBLE THROUGH 5% ND FILTER.</p> <p>(3)DARK DOT : DOTS APPEAR DARK AND UNCHANGED IN SIZE IN WHICH LCD PANEL IS DISPLAYING UNDER PURE RED, GREEN, BLUE PICTURE.</p>	ITEMS	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 border="1"> <thead> <tr> <th></th> <th>AVERAGE DIAMETER (mm) : D</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td rowspan="3">BUBBLE ON POLARIZER</td> <td>D ≤ 0.25</td> <td>IGNORE</td> </tr> <tr> <td>0.25 &lt; D ≤ 0.5</td> <td>N ≤ 5</td> </tr> <tr> <td>0.5 &lt; D</td> <td>NONE</td> </tr> <tr> <td rowspan="3">SURFACE STAINS / DIRT ON POLARIZER</td> <td>D &lt; 0.25</td> <td>IGNORE</td> </tr> <tr> <td>0.25 &lt; D ≤ 0.4</td> <td>N ≤ 3</td> </tr> <tr> <td>0.4 &lt; D</td> <td>NONE</td> </tr> <tr> <td rowspan="3">CF FAIL / SPOT</td> <td>D &lt; 0.1</td> <td>IGNORE</td> </tr> <tr> <td>0.1 &lt; D ≤ 0.3</td> <td>N ≤ 3</td> </tr> <tr> <td>0.3 &lt; D</td> <td>NONE</td> </tr> </tbody> </table> <p>NOTE : (1)POLARIZER BUBBLE IS DEFINED AS THE BUBBLE APPEARS ON ACTIVE DISPLAY AREA. THE DEFECT OF POLARIZER BUBBLE SHALL BE IGNORED IF THE POLARIZER BUBBLE APPEARS ON THE OUTSIDE OF ACTIVE DISPLAY AREA.</p> <p>(2)THE EXTRANEIOUS SUBSTANCE IS DEFINED AS IT CAN BE OBSERVED WHEN THE MODULE IS POWER ON.</p> <p>(3)THE DEFINITION OF AVERAGE DIAMETER, D IS DEFINED AS FOLLOWING. AVERAGE DIAMETER (D)=(a+b)/2</p> 		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
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	0.1 < D ≤ 0.3	N ≤ 3																								
	0.3 < D	NONE																								

NO.	ITEM	CRITERIA											
5	BLACK/WHITE SPOT CIRCULAR TYPE	<p>THE FOLLOWING BLACK/WHITE SPOT ARE WITHIN THE VIEWING AREA. AVERAGE DIAMETER : D (mm)</p> <table border="1"> <thead> <tr> <th>SIZE D</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.15</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.15 &lt; D \leq 0.3</math></td> <td>4</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>D &gt; 0.5</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE ( 1 ) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 10mm APART.</p>	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.												
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$0.3 < D \leq 0.5$	2												
$D > 0.5$	0												
6	SCRATCH	<p>THE FOLLOWING SCRATCH IS WITHIN THE VIEWING AREA. WIDTH : W (mm) , LENGTH : L (mm)</p> <table border="1"> <thead> <tr> <th>SIZE W &amp; L</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.05</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.08, L \leq 8</math></td> <td>3</td> </tr> <tr> <td><math>0.08 &lt; W \leq 0.1, L \leq 5</math></td> <td>3</td> </tr> <tr> <td><math>W &gt; 0.1</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE ( 1 ) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 5mm APART.</p>	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	
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$W > 0.1$	0												
7	BLACK / WHITE LINE LINEAR TYPE / FOREIGN FIBER	<p>THE FOLLOWING BLACK LINE, WHITE LINE IS WITHIN THE VIEWING AREA. WIDTH : W (mm) , LENGTH : L (mm)</p> <table border="1"> <thead> <tr> <th>SIZE W &amp; L</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>W \leq 0.05</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.08, L \leq 8</math></td> <td>3</td> </tr> <tr> <td><math>0.08 &lt; W \leq 0.1, L \leq 5</math></td> <td>3</td> </tr> <tr> <td><math>W &gt; 0.1</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE ( 1 ) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 5mm APART.</p>	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	
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$W > 0.1$	0												
8	BUBBLE / DENT FOR OPTICAL BONDING	<p>BUBBLES WITHIN VIEWING AREA. AVERAGE DIAMETER : D (mm)</p> <table border="1"> <thead> <tr> <th>SIZE D</th> <th>PERMISSIBLE NO.</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.2</math></td> <td>IGNORE</td> </tr> <tr> <td><math>0.2 &lt; D \leq 0.3</math></td> <td>3</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>2</td> </tr> <tr> <td><math>D &gt; 0.5</math></td> <td>0</td> </tr> </tbody> </table> <p>NOTE ( 1 ) : THE DISTANCE BETWEEN DEFECTS SHOULD BE MORE THAN 10mm APART.</p>	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	
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9	CHIPPING	<table border="1"> <tbody> <tr> <td>CORNER</td> <td><math>X \leq 3\text{mm} \cdot Y \leq 3\text{mm} \cdot Z \leq t</math> (t : THICKNESS)</td> </tr> <tr> <td>EDGE</td> <td><math>X \leq 6\text{mm} \cdot Y \leq 1\text{mm} \cdot Z &lt; t</math> (t : THICKNESS)</td> </tr> </tbody> </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)	<p>Chip of glass</p> 						
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 5% ND FILTER.											
13	UNEVEN COLOR SPREAD, COLORATION	TO BE DETERMINED BASED UPON THE LIMITED SAMPLE.											
14	BEZEL APPEARANCE	<p>1. BEZEL MAY NOT HAVE RUST, BE DEFORMED OR HAVE FINGER PRINTS STAINS OF OTHER CONTAMINATION.</p> <p>2. BEZEL MUST COMPLY WITH JOB SPECIFICATIONS.</p>											

NO.	ITEM	CRITERIA
15	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
15	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>
16	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>
17	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									
18	CRACKED GLASS	<p>THE LCD WITH EXTENSIVE CRACK IS NOT ACCEPTABLE</p> <p>GENERAL GLASS CHIP :</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>t/2 &gt;, \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$t/2 >, \leq 2t$	$\leq W/2$	$\leq 1/8X$
		a	b	c							
		$\leq t/2$	< VIEWING AREA	$\leq 1/8X$							
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<p>CORNER PART :</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t/2</math></td> <td>&lt; VIEWING AREA</td> <td><math>\leq 1/8X</math></td> </tr> <tr> <td><math>&gt; t/2, \leq 2t</math></td> <td><math>\leq W/2</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>*W=DISTANCE BETWEEN SEALANT AREA AND LCD PANEL EDGE X = LCD SIDE LENGTH t = GLASS THICKNESS</p>	a	b	c	$\leq t/2$	< VIEWING AREA	$\leq 1/8X$	$> t/2, \leq 2t$	$\leq W/2$	$\leq 1/8X$		
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$\leq t/2$	< VIEWING AREA	$\leq 1/8X$									
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<p>CHIP ON ELECTRODE PAD</p>  <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 0.5\text{mm}</math></td> <td><math>\leq 1/8X</math></td> </tr> </tbody> </table> <p>* X=LCD SIDE WIDTH t=GLASS THICKNESS</p>	a	b	c	$\leq t$	$\leq 0.5\text{mm}$	$\leq 1/8X$					
a	b	c									
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 <table border="1"> <thead> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td><math>\leq t</math></td> <td><math>\leq 1/8X</math></td> <td><math>\leq L</math></td> </tr> </tbody> </table> <p>*X=LCD SIDE WIDTH t = GLASS THICKNESS L=ELECTRODE PAD LENGTH ①IF GLASS CHIPPING THE ITO TERMINAL, OVER 2/3 OF THE ITO MUST REMAIN AND BE, INSPECTED ACCORDING TO ELECTRODE TERMINAL SPECIFICATIONS ②IF THE PRODUCT WILL BE HEAT SEALED BY THE CUSTOMER, THE ALIGNMENT MARK MUST NOT BE DAMAGED</p>	a	b	c	$\leq t$	$\leq 1/8X$	$\leq L$					
a	b	c									
$\leq t$	$\leq 1/8X$	$\leq L$									

## 14. RELIABILITY TEST

### 14.1 STANDARD SPECIFICATIONS FOR RELIABILITY OF LCD MODULE

NO.	ITEM	DESCRIPTION
1	HIGH TEMPERATURE TEST (OPERATION)	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +70°C FOR 240 HRS
2	LOW TEMPERATURE TEST (OPERATION)	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -20°C FOR 240 HRS
3	HIGH TEMPERATURE TEST (STORAGE)	THE SAMPLE SHOULD BE ALLOWED TO STAND AT +80°C FOR 240 HRS
4	LOW TEMPERATURE TEST (STORAGE)	THE SAMPLE SHOULD BE ALLOWED TO STAND AT -30°C FOR 240 HRS
5	HIGH TEMPERATURE / HUMIDITY TEST (OPERATION)	THE SAMPLE SHOULD BE ALLOWED TO STAND AT 60°C, 90% RH 240 HRS
6	THERMAL SHOCK TEST (NOT OPERATED)	<p>THE SAMPLE SHOULD BE ALLOWED TO STAND THE FOLLOWING 10 CYCLES OF OPERATION :</p> <p>The diagram shows a temperature cycle starting at -30°C. It rises to +80°C over a 30-minute period, remains at +80°C for 30 minutes, and then falls back to -30°C over another 30-minute period. The total duration of one cycle is 100 minutes (30 min + 30 min + 30 min). The label '1 CYCLE' spans the entire duration.</p>
7	VIBRATION (NOT OPERATED)	11.76 m/s <sup>2</sup> (1.2G), 10~100 Hz XYZ DIRECTIONS, 1 HR EACH
8	SHOCK (NOT OPERATED)	490.0 m/s <sup>2</sup> (50G), 10 ms XYZ DIRECTIONS, 1 TIME EACH
9	ESD (ELECTROSTATIC DISCHARGE) (NOT OPERATED)	AIR DISCHARGE ± 8KV CONTACT DISCHARGE ± 4KV (ACCORDING TO IEC-61000-4-2)

NOTE ( 1 ) : THE TEST SAMPLES HAVE RECOVERY TIME FOR 2 HOURS AT ROOM TEMPERATURE BEFORE THE FUNCTION CHECK. IN THE STANDARD CONDITIONS, THERE IS NO DISPLAY FUNCTION NG ISSUE OCCURRED.

NOTE ( 2 ) : WHEN THE LCD MODULE IS OPERATED AT A HIGHER AMBIENT TEMPERATURE THAN 60°C, POWER SUPPLY CURRENT OF LED BACKLIGHT SHOULD BE ADJUSTED TO BE LESS THAN TBD%. IF THE MODULE IS OPERATED AT A HIGHER CURRENT THAN TBD%, THEN THERE IS A POSSIBILITY OF DISTORTION AND IRREGULARITY OF THE PICTURE DUE TO LIQUID CRYSTAL BEHAVIOR.

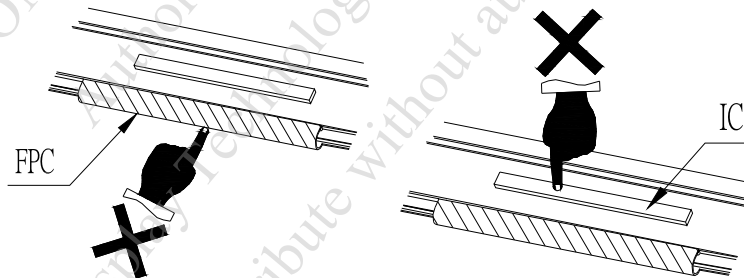
NOTE ( 3 ) : TESTING CONDITIONS AND INSPECTION CRITERIA

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

## 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 STORAGE

- 15.2.1 STORE THE MODULE IN A DARK ROOM OR KEEP IN ORIGINAL PACKAGE WHERE MUST KEEP AT  $25\pm 10^{\circ}\text{C}$  AND 65%RH OR LESS.
- 15.2.2 DO NOT STORE THE MODULE IN SURROUNDINGS CONTAINING ORGANIC SOLVENT OR CORROSIVE GAS.
- 15.2.3 STORE THE MODULE IN AN ANTI-ELECTROSTATIC CONTAINER OR BAG.

15.3 NOTICE

- 15.3.1 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.
- 15.3.2 DO NOT DISASSEMBLE . EDT SHALL NOT BE HELD RESPONSIBLE IF THE MODULE IS DISASSEMBLED AND UPON THE REASSEMBLY THE MODULE FAILED.
- 15.3.3 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.
- 15.3.4 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.
- 15.3.5 DON'T GIVE EXTERNAL SHOCK.
- 15.3.6 DON'T APPLY EXCESSIVE FORCE ON THE SURFACE.
- 15.3.7 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.
- 15.3.8 DON'T OPERATE IT ABOVE THE ABSOLUTE MAXIMUM RATING.
- 15.3.9 STORAGE IN A CLEAN ENVIRONMENT, FREE FROM DUST, ACTIVE GAS, AND SOLVENT.
- 15.3.10 STORE WITHOUT ANY PHYSICAL LOAD.
- 15.3.11 REWIRING: NO MORE THAN 3 TIMES.