深圳市一众显示科技有限公司

SHEN ZHEN TEAM SOURCE DISPLAY TECH. CO. , LTD

TFT-LCD Module Specification

Module NO.: TST030GN06-01

Version: V1.0

☐ APPROVAL FOR SPECIFICATION ☐ APPROVAL FOR SAMPLE

For Customer's Acceptance:	
Approved by	**Comment**

Team Source Display:		
Presented by	**Reviewed by**	**Approved by**
HCR		

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	09/MAR/21'	All	All	Initial Preliminary	

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	3.0 (Diameter)	inch
Display Format	432(H) x (R,G,B) x 432(V)	dot
Active Area	74.3904(H) x 74.3904(V)	mm
Pixel Pitch	0.1722(H) x 0.1722(V)	mm
Pixel Configuration	Stripe	
Outline Dimension	84.2(H) x 89.2(V) x 6.38(D)	mm
Back-light	LED	
TFT-LCD Display mode	Normally Black	
Weight	50	g
View Angle direction(TFT)	All	
IC Part Number	HX8363-A	
Our components and processes are compliant to RoHS & REACH & Halogen Free standard		

4. ABSOLUTE MAXIMUM RATINGS

Ta-25°C

Parameter	Symbol	Min.	Max.	Unit	Remark
Power supply voltage	VDD	0.3	4.6	V	
	VDDI	0.3	4.6	V	
Operating temperature	Top	-30	85	°C	
Storage temperature	Tst	-30	85	°C	

5. ELECTRICAL CHARACTERISTICS

5.1 Operating Conditions

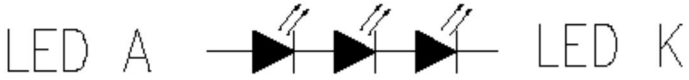
GND=0V,Ta=25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply voltage	VDD	2.5	-	3.3	V	
	VDDI	1.65	-	3.3	V	
Power Supply current	I_{VDD}	-	8	-	mA	VDD=3.3V
	I_{VDDI}	-	0.4	-	mA	VDDI=3.3V
"H" level logical input voltage	V_{IH}	0.7VDD	-	VDD	V	
"L" level logical input voltage	V_{IL}	-	-	0.3VDD	V	

5.2 Backlight Driving Consumption

Ta= 25°C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	V_F	-	-	19.8	V	
LED current	I_F	-	60	-	mA	
LED dice Life Time		-	50,000	-	hr	



VF : 19.8V Max.
IF : 60mA

6. INPUT SIGNAL TIMING

6.1 AC Characteristics

Serial interface characteristic

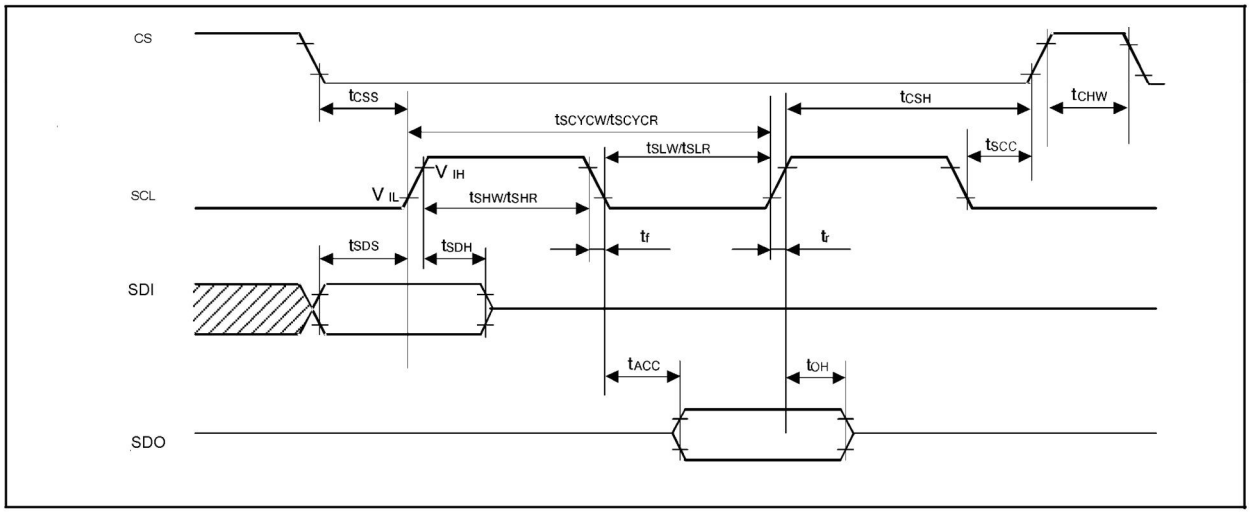
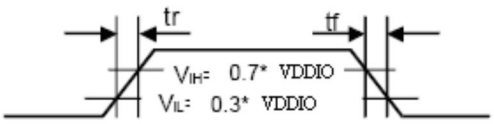


Figure 6.1-1 Serial Interface Characteristics

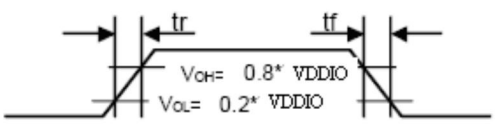
Parameter	Symbol	Conditions	MIN	TYP	MAX	Unit
Serial clock cycle (Write) SCL "H" pulse width (Write) SCL "L" pulse width (Write)	t_{SCYCW} t_{SHW} t_{SLW}	SCL	80 30 30		--	ns
Data setup time (Write) Data hold time (Write)	t_{SDS} t_{SDH}	SDI	10 10		--	ns
Serial clock cycle (Read) SCL "H" pulse width (Read) SCL "L" pulse width (Read)	t_{SCYCR} t_{SHR} t_{SLR}	SCL	150 60 60		--	ns
Access rime	t_{ACC}	SDO For maximum C_L=30pF For maximum C_L=8pF	10		60	ns
Output disable time	t_{OH}	SDO For maximum C_L=30pF For maximum C_L=8pF	15		100	ns
SCL to Chip select	t_{SCC}	CS	30		--	ns
CS "H" pulse width	t_{CHW}	CS	60		--	ns
CS -SCL time (write) CS -SCL time (write)	t_{CSS} t_{CSH}	CS	30 30		--	ns
CS -SCL time (Read) CS -SCL time (Read)	t_{CSS} t_{CSH}	CS	60 65		--	ns

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.
Logic high and low levels are specified as 30% and 70% of VDDIO for Input signals.

Input Signal Slope



Output Signal Slope



6.2 RGB interface characteristic

Vertical Timings for RGB I/F

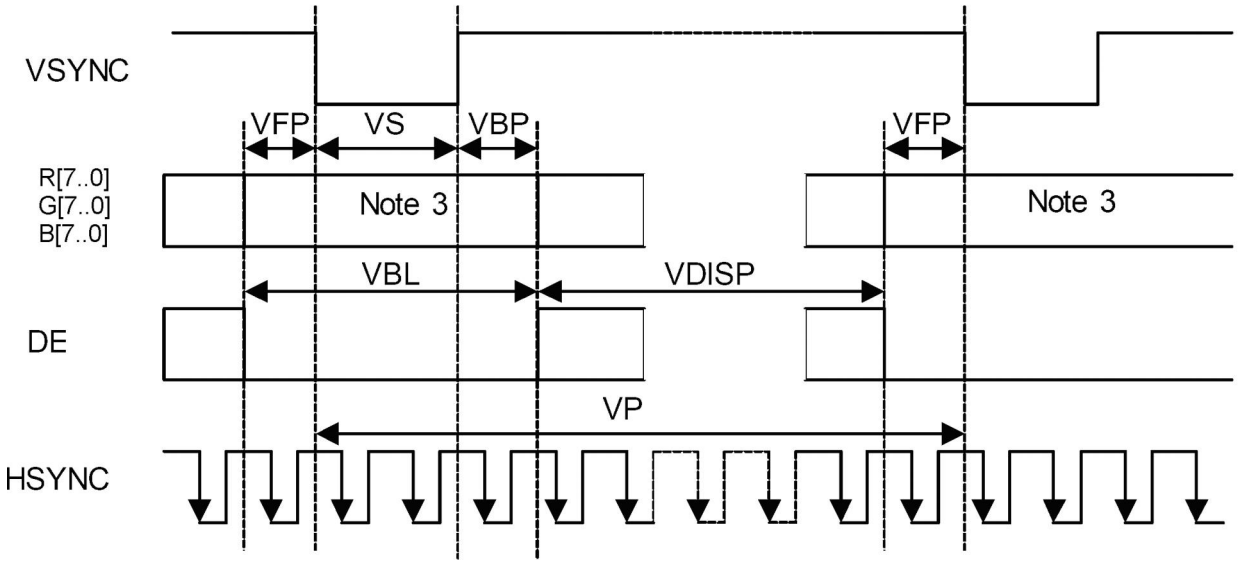


Figure 6.2-1 Vertical Timings for RGB I/F

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical cycle	VP	-	646	-	650	Line
Vertical low pulse width	VS	-	2	-	4	Line
Vertical front porch	VFP	-	2	-	4	Line
Vertical back porch	VBP	-	2	-	4	Line
Vertical data start point	-	VS+VBP	4	-	8	Line
Vertical blanking period	VBL	VS+VBP+VFP	6	-	10	Line
Vertical active area	-	VDISP	-	640	-	Line
Vertical Refresh rate	VRR	-	50	-	70	Hz

Note: (1) Signal rise and fall times are equal to or less than 20 ns.

(2) Input signals are measured by 0.30 x VDDI for low state and 0.70 x VDDI for high state.

(3) Data lines can be set to “High” or “Low” during blanking time – Don’t care.

Horizontal Timings for RGB I/F

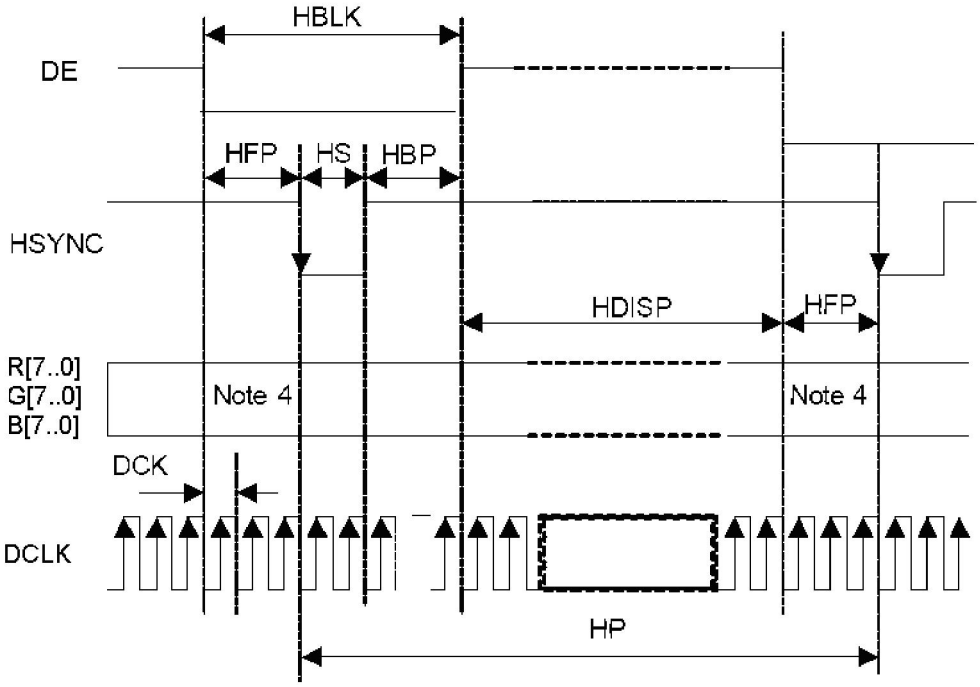


Figure 6.2-2 Horizontal Timing for RGB I/F

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HSYNC cycle	HP	Note 3	504	-	568	DCLK
HSYNC low pulse width	HS	-	5	-	78	DCLK
Horizontal back porch	HBP	-	5	-	78	DCLK
Horizontal front porch	HFP	-	5	-	78	DCLK
Horizontal data start point	-	HS+HBP	19	-	83	DCLK
			700	-	-	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	-	88	DCLK
Horizontal active area	HDISP	-	-	480	-	DCLK
Pixel clock frequency When RGB I/F is running	DCLK	VRR = Min. 50 Hz – Max. 70 Hz	16.3	-	25.8	MHz
			38.7	-	61	ns

Note: (1) Signal rise and fall times are equal to or less than 20 ns.
(2) Input signals are measured by 0.30 x VDDI for low state and 0.70 x VDDI for high state.
(3) HP is multiples of eight DCLK.
(4)Data lines can be set to “High” or “Low” during blanking time – Don’t care.
(5) B3h Command (09h): DPL=1, the data is read on the falling edge of DCLK signal.

6.3 RGB interface General Timing

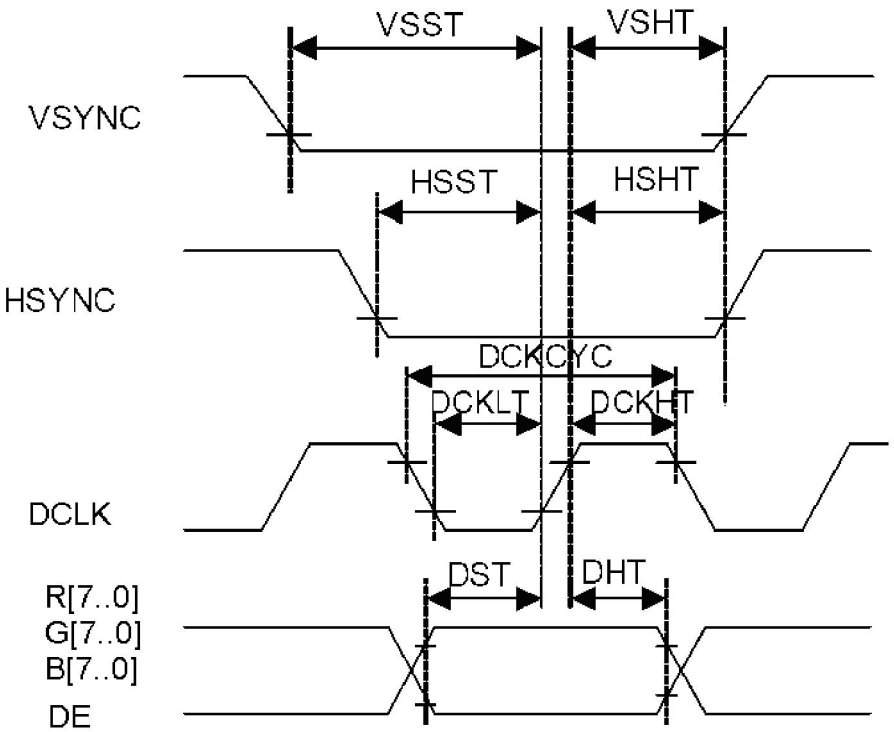


Figure 6.3-1 General Timings for RGB I/F

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical sync. Setup time	VSST	-	5	-	-	ns
Vertical sync. Hold time	VSHT	-	5	-	-	ns
Horizontal sync. Setup time	HSST	-	5	-	-	ns
Horizontal sync. Hold time	HSHT	-	5	-	-	ns
Pixel clock cycle When RGB I/F is running	DCKCYC	VRR = Min. 50 Hz Max. 70 Hz	38.7 (Note1)	-	61 (Note 2)	ns
Pixel clock low time	DCKLT	-	5	-	-	ns
Pixel clock high time	DCKHT	-	5	-	-	ns
Data setup time DB[23:0]	DST	-	5	-	-	ns
Data Hold time DB[23:0]	DHT	-	5	-	-	ns

Note: (1) 25.8 MHz
(2) 16.3 MHz

6.4 Reset Input Timing

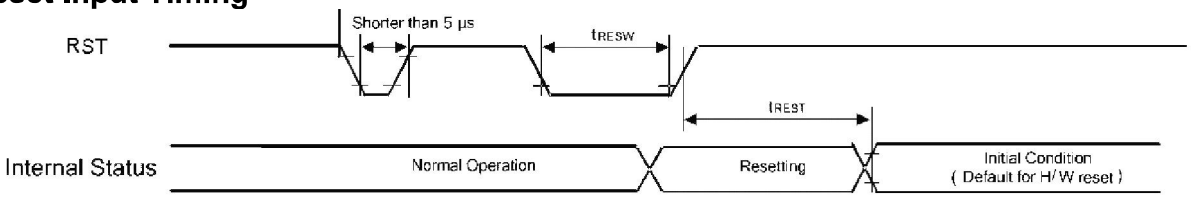


Figure 6.4-1Write to Read and Read to Write Timing

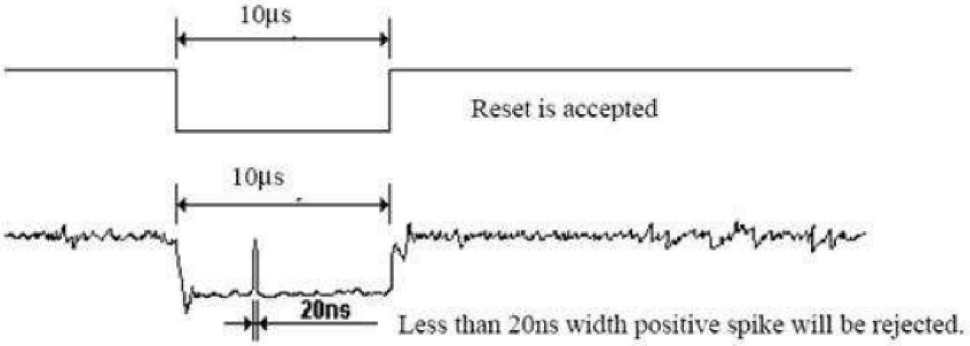
Symbol	Parameter	Related Pins	Min.	Typ.	Max.	Note	Unit
tRESW	Reset low pulse width	RST	10	-	-	-	µs
tREST	Reset complete time	-	-	-	5	When reset applied during STB mode	ms
		-		-	120	When reset applied during STB mode	ms

Note:

1. Spike due to an electrostatic discharge on RST line does not cause irregular system reset according to the table below.

NRESET Pulse	Action
Shorter than 5 µ	Reset Rejected
Longer than 10 µs	Reset
Between 5 µs and 10 µs	Reset Start

2. During the resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then returns to Default condition for H/W reset.
3. During Reset Complete Time, ID2 value in OTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RST.
4. Spike Rejection also applies during a valid reset pulse as shown below:



5. When Reset is applied during Sleep In Mode.
6. When Reset is applied during Sleep Out Mode.
7. It is necessary to wait 5msec after releasing RST before sending commands. Also Sleep Out command cannot be sent for 120msec.

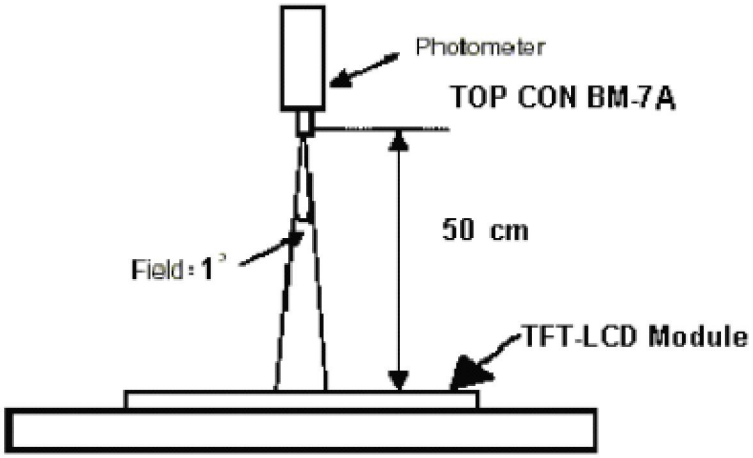
7. OPTICAL CHARACTERISTIC

Ta= 25°C

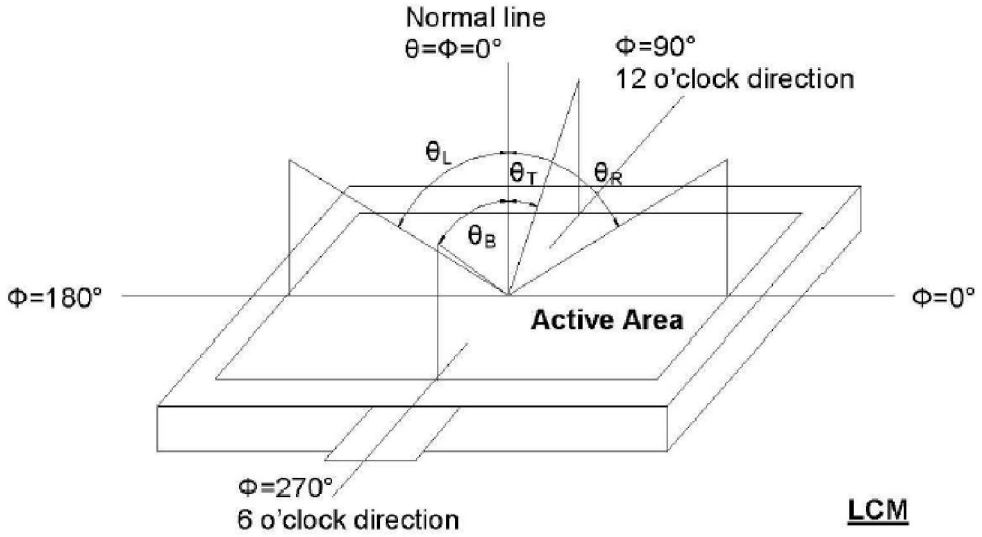
Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing Angle		θL	Center CR≥10	70	80	-	deg	Note 1,2
		θR		70	80	-		
		θT		70	80	-		
		θB		70	80	-		
Contrast Ratio		CR	at optimized viewing angle	600	800	-		Note 1,4
Response time		Tr+Tf	Center θx=θy =0°	-	25	-	ms	Note 1,6
Uniformity		B-uni	θx=θy =0°	70	-	-	%	Note 1,5
Brightness		L	θx=θy =0°	800	1000	-	cd/㎡	Note 1,3
Chromaticity	W	Wx	Center θx=θy =0°	Typ. -0.05	0.301	Typ. +0.05		Note 1,7
		Wy			0.338			

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C and LED Backlight Current IF=60mA. The measurement method is shown in Note1.

Note 1: The method of optical measurement:



Note 2: Definition of viewing angle range

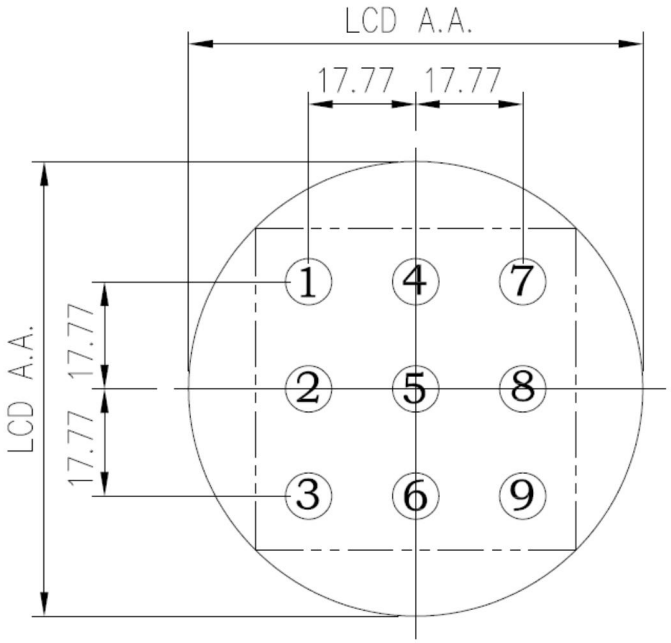


Note 3: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°

Note 4: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$

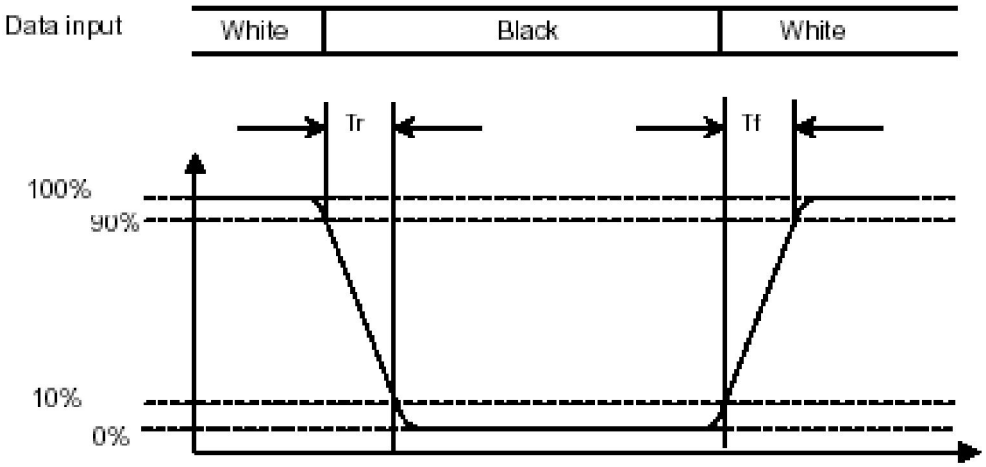
Note 5: Definition of Brightness Uniformity (B-uni):



$$\text{B-uni} = \frac{\text{Minimum luminance of 9 points}}{\text{Maximum luminance of 9points}} \quad \text{(Note 5).}$$

Note 6: Definition of Response Time:

The Response Time is set initially by defining the "Rising Time (Tr)" and the "Falling Time (Tf)" respectively. Tr and Tf are defined as following figure.



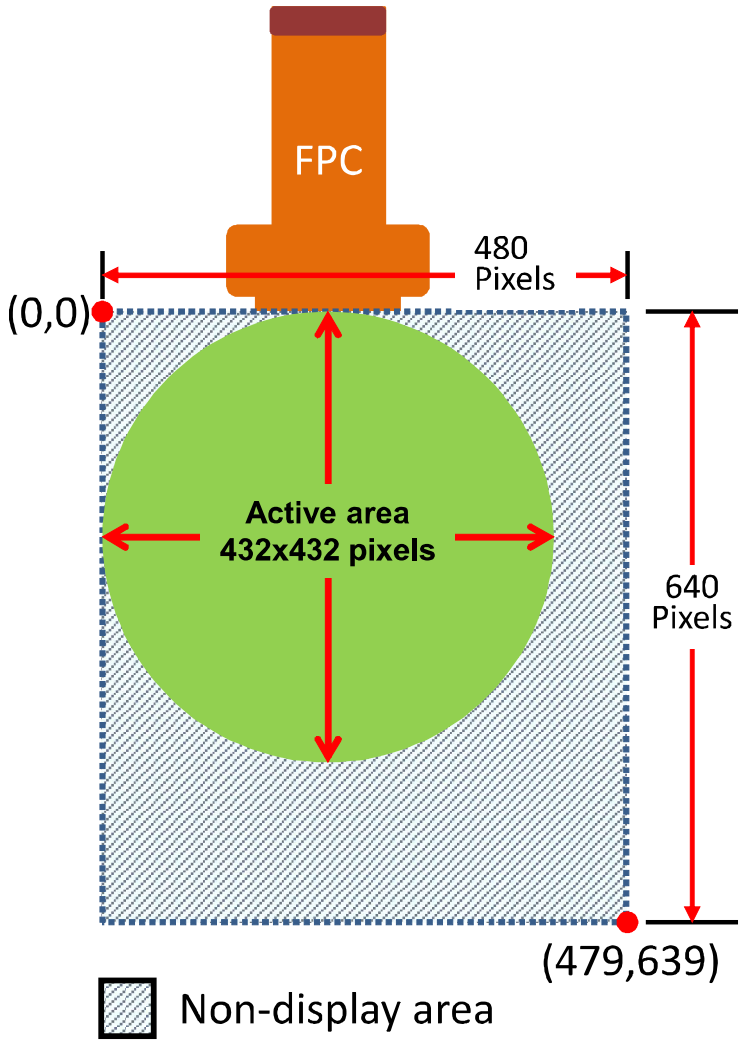
Note 7: The color coordinates (Xw,Yw) is obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

8. PIN CONNECTIONS

Pin No	Symbol	Description	Remark
1	VDDI	Power supply for interface system	
2	VDD	Power supply for analog system	
3	VDD		
4	GND	Ground	
5	/RESX	This signal will reset the device and must be applied to properly initialize the chip. Signal is active low.	
6	SDI	Serial data input signal.	
7	SDO	Serial data output signal.	
8	SCL	Serial data clock signal.	
9	CSX	Chip select input pin (“Low” enable).	
10	DCLK	Pixel clock signal.	
11	DE	Data enable signal.	
12	VSYNC	Vertical sync.	
13	HSYNC	Horizontal sync.	
14	GND	Ground	
15	DB0		
16	DB1	RGB data bus.	
17	DB2		
18	DB3		
19	DB4		
20	DB5		
21	DB6		
22	DB7		
23	GND	Ground	
24	DG0	RGB data bus.	
25	DG1		
26	DG2		
27	DG3		
28	DG4		
29	DG5		
30	DG6		
31	DG7		
32	GND	Ground	
33	DR0	RGB data bus.	
34	DR1		
35	DR2		
36	DR3		
37	DR4		
38	DR5	RGB data bus.	
39	DR6		
40	DR7		

41	GND	Ground	
42	LEDA	Power Supply for LED+	
43	LEDA		
44	LEDK	Power Supply for LED-	
45	LEDK		

Pixel mapping



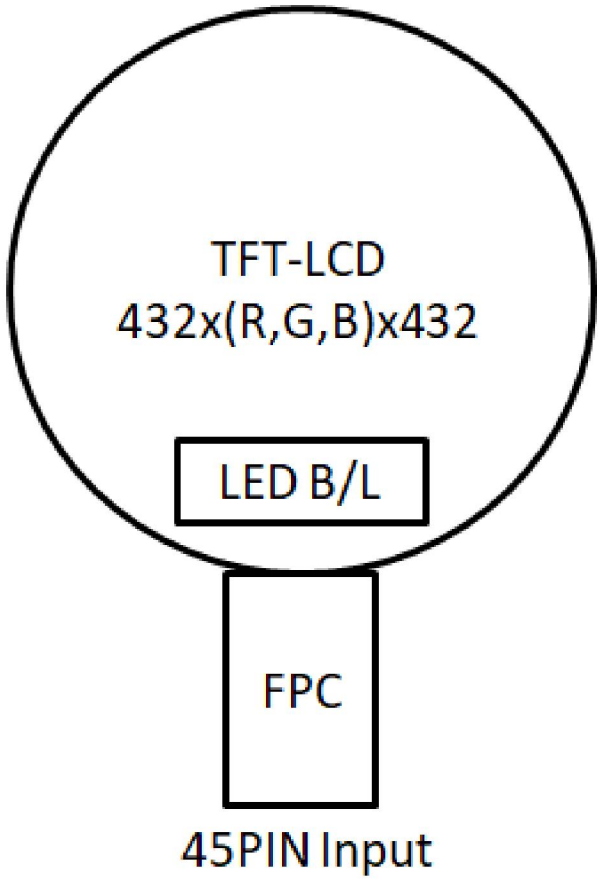
SPI Initial Code

```
SPI_Start();
        SPI_3W_SET_CMD(0xB9);
        SPI_3W_SET_PAs(0xFF);
        SPI_3W_SET_PAs(0x83);
        SPI_3W_SET_PAs(0x63);
        SPI_Stop();
        DelayX1ms(1);

        SPI_Start();
        SPI_3W_SET_CMD(0x11);
        SPI_Stop();
        DelayX1ms(120);

        SPI_Start();
        SPI_3W_SET_CMD(0xB9);
        SPI_3W_SET_PAs(0xFF);
        SPI_3W_SET_PAs(0x83);
        SPI_3W_SET_PAs(0x63);
        SPI_Stop();
        DelayX1ms (1);

        SPI_Start();
        SPI_3W_SET_CMD(0xB1);
        SPI_3W_SET_PAs(0x78);//
        SPI_3W_SET_PAs(0x34);//
        SPI_3W_SET_PAs(0x07);//BT=7h
        SPI_3W_SET_PAs(0x33);//
        SPI_3W_SET_PAs(0x02);//
        SPI_3W_SET_PAs(0x13);//
        SPI_3W_SET_PAs(0x10);//
        SPI_3W_SET_PAs(0x10);//
        SPI_3W_SET_PAs(0x2C);//
        SPI_3W_SET_PAs(0x34);//
        SPI_3W_SET_PAs(0x22);//
        SPI_3W_SET_PAs(0x22);//
        SPI_Stop();
        DelayX1ms (1);

        SPI_Start();
        SPI_3W_SET_CMD(0x3A);
        SPI_3W_SET_PAs(0x70);
        SPI_Stop();

        SPI_Start();
        SPI_3W_SET_CMD(0xB3);
        SPI_3W_SET_PAs(0x01);
```

```
SPI_Stop();

SPI_Start();
SPI_3W_SET_CMD(0xB4);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x12);
SPI_3W_SET_PAs(0x72);
SPI_3W_SET_PAs(0x12);
SPI_3W_SET_PAs(0x06);
SPI_3W_SET_PAs(0x03);
SPI_3W_SET_PAs(0x54);
SPI_3W_SET_PAs(0x03);
SPI_3W_SET_PAs(0x4E);
SPI_Stop();

SPI_Start();
SPI_3W_SET_CMD(0xB6);
SPI_3W_SET_PAs(0x36);
SPI_Stop();

SPI_Start();
SPI_3W_SET_CMD(0xCC);
SPI_3W_SET_PAs(0x07);
SPI_Stop();
DelayX1ms(1);

SPI_Start();
SPI_3W_SET_CMD(0xE0);   // For GP2.9" panel Gamma2.2
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x1F);
SPI_3W_SET_PAs(0x3E);
SPI_3W_SET_PAs(0x3F);
SPI_3W_SET_PAs(0x05);
SPI_3W_SET_PAs(0x0B);
SPI_3W_SET_PAs(0x0D);
SPI_3W_SET_PAs(0xCF);
SPI_3W_SET_PAs(0x10);
SPI_3W_SET_PAs(0x90);
SPI_3W_SET_PAs(0xD1);
SPI_3W_SET_PAs(0x5C);
SPI_3W_SET_PAs(0x1F);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x00);
SPI_3W_SET_PAs(0x1F);
SPI_3W_SET_PAs(0x3E);
```

```
SPI_3W_SET_PAs(0x3F);
SPI_3W_SET_PAs(0x05);
SPI_3W_SET_PAs(0x0B);
SPI_3W_SET_PAs(0x0D);
SPI_3W_SET_PAs(0xCF);
SPI_3W_SET_PAs(0x10);
SPI_3W_SET_PAs(0x90);
SPI_3W_SET_PAs(0xD1);
SPI_3W_SET_PAs(0x5C);
SPI_3W_SET_PAs(0x1F);
SPI_Stop();
DelayX1ms(1);

SPI_Start();
SPI_3W_SET_CMD(0x29);
SPI_Stop();
```

8.1 BLOCK DIAGRAM



9. QUALITY ASSURANCE

9.1 Test Condition

9.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 25 ± 5°C
Humidity : 65 ± 5%

9.1.2 Operation

Unless specified otherwise, test will be conducted under function state.

9.1.3 Container

Unless specified otherwise, vibration test will be conducted to the product itself without putting it in a container.

9.1.4 Test Frequency

In case of related to deterioration such as shock test. It will be conducted only once.

9.1.5 Test Method

Reliability Test Item & Level			Remark
No.	Test Item	Test Level	
1	High Temperature Storage Test	Ta=85°C,240hrs	IEC60068-2-2
2	Low Temperature Storage Test	Ta=-30°C,240hrs	IEC60068-2-1
3	High Temperature Operation Test	Ta=85°C,240hrs	IEC60068-2-2
4	Low Temperature Operation Test	Ta=-30°C,240hrs	IEC60068-2-1
5	High Temperature and High Humidity (No operation)	T=60°C,90%RH,240hrs	IEC60068-2-3
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +85°C ,100 Cycles 30 min 5 min 30 min	IEC60068-2-14
7	Vibration test (Package)	Frequency:10~55HZ Amplitude:1.5mm Sweep time:11min Test period:6Cycles for each direction of X,Y,Z	IEC60068-2-6
8	Drop test (Package)	Height :60cm 1 conner,3edges,6surfaces	IEC60068-2-32
9	Electrostatic Discharge Test	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 6kV Air +/-8kV Criteria: Class C	IEC61000-4-2

9.2 Inspection condition

9.2.1 Inspection conditions

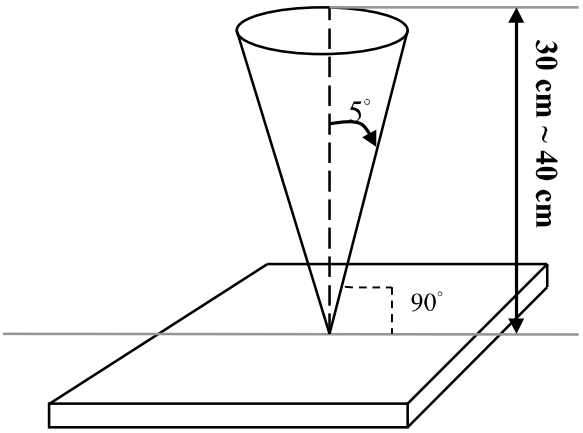
9.2.1.1 Inspection Distance : 35 ± 5 cm

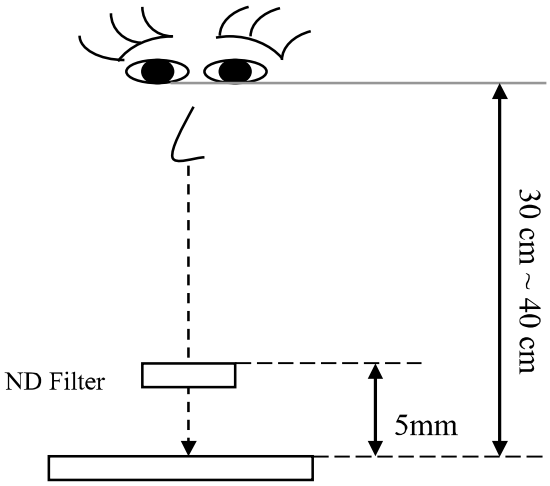
9.2.1.2 View Angle :

(1) Inspection under operating condition : ±5°

(2) Inspection under non-operating condition : ± 45°

9.2.1.3 Appearance inspection time: ≦15 second

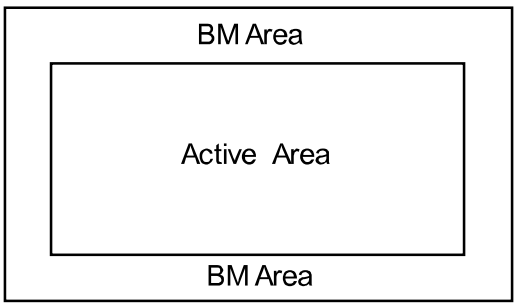




9.2.2 Environment conditions :

Ambient Temperature :		25±5°C
Ambient Humidity :		65±5%
Ambient Illumination	Cosmetic Inspection	600 ~ 800lux
	Functional Inspection	300 ~ 500lux

9.2.3 Definition of applicable Zones



9.3 Inspection Parameters

<table>
<tr><th>No.</th><th>Parameter</th><th>Criteria</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">Operating</td><td>Display function: No Display malfunction (Major)</td></tr>
<tr><td>Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)</td></tr>
<tr><td>Point Defect (Red, green, blue, dark): Active area ≤5dots (Minor)(Note:1)
<table>
<tr><th>Item</th><th>Acceptable number</th><th>Total</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>Bright</td><td>2</td><td rowspan="2">5</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>Dark</td><td>3</td></tr>
<tr><td>Adjacent Bright</td><td>1</td><td>1</td></tr>
<tr><td>Adjacent Dark</td><td>1</td><td>1</td></tr>
</table></td></tr>
<tr><td>Non-uniformity:
Visible through 2%ND filter white, R, G, B and gray 50%pattern. (Minor)</td></tr>
<tr><td colspan="2">Foreign material in Black or White spots shape (W>1/4L) (Note: 5)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D ≤ 0.3mm</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.3mm < D ≤0.5mm
Distance > 5mm</td><td>4</td></tr>
<tr><td>D> 0.5mm</td><td>0</td></tr>
</table>
D = (Long + Short) / 2 ＊ : Disregard</td></tr>
<tr><td rowspan="2">2</td><td rowspan="2">External Inspection (non-operating)</td><td>Dimension: Outline (Major)</td></tr>
<tr><td>Bezel appearance: uneven (Minor)</td></tr>
<tr><td colspan="2">Scratch on the Polarize: (Note:2)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>W>0.1mm,L>7mm</td><td>0</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>L≦7mm,0.05mm<W≦0.1mm
Distance > 5mm</td><td>4</td></tr>
<tr><td>L≦7mm,W<0.05mm</td><td>*</td></tr>
</table>
L : Length W : Width ＊ : Disregard</td></tr>
</table>

<table>
<tr><td></td><td></td><td>Dent and spots shape on the polarize (Note:2): (Note: 5)
<table>
<tr><th>Dimension</th><th>Acceptable number</th><th>Class Of Defects</th><th>AQL Level</th></tr>
<tr><td>D ≤ 0.3mm</td><td>*</td><td rowspan="3">Minor</td><td rowspan="3">1.5</td></tr>
<tr><td>0.3 mm< D ≤0.5mm</td><td>4</td></tr>
<tr><td>D> 0.5mm</td><td>0</td></tr>
</table>
D = (Long + Short) / 2 ＊ : Disregard
Polarizer flaw or leak out resin : Defect is defined as the active area.</td></tr>
</table>

			Definition
Class of defects	**Major**	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.

Note:1.(a)Bright point defect is defined as point defect of R,G,B with area >1/2 dot respectively

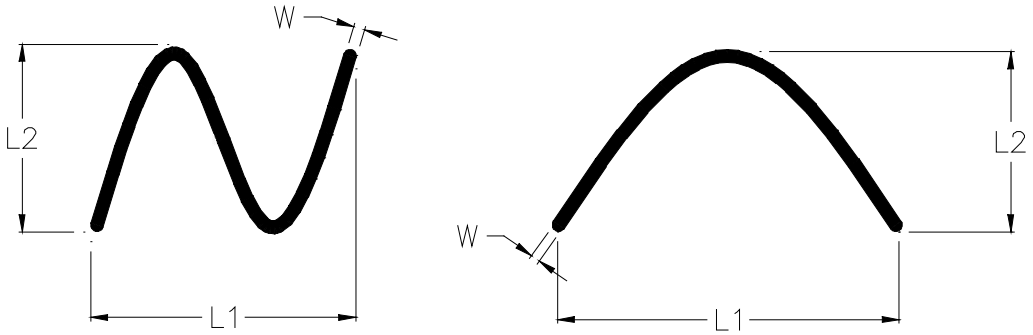
(b)Dark point defect is defined as visible in full white pattern.

(c)The point defect must under 2% ND Filter visible .

Note:2 The external inspection should be conducted at the distance 35± 5cm between the eyes of inspector and the panel .

Note:3 Luminance measurement for contrast ratio is at the distance 50± 5cm between the detective head and the panel with ambient illuminance less than 1 lux. Contrast ratio is obtained at optimum view angle.

Note:4 W-Width in mm , L-length of Max.(L1,L2) in mm.



9.4 Sampling Condition

Unless otherwise agree in written, the sampling inspection shall be applied to the incoming inspection of customer.
Lot size: Quantity of shipment lot per model.
Sampling type: normal inspection, single sampling
Sampling table: ISO 2859
Inspection level: Level II

10. LCM PRODUCT LABEL DEFINE

TBD

11. PRECAUTIONS IN USE LCM

1. ASSEMBLY PRECAUTIONS
   (1) You must mount a module using holes arranged in four corners or four sides.
   (2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
   (3) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
   (4) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
   (5) Do not open the case because inside circuits do not have sufficient strength.
   (6) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
   (7) Please do not touch metal frames with bare hands and soiled gloves. A color change of the metal frames can happen during a long preservation of soiled LCD modules.
   (8) Please pay attention to handling lead wire of backlight so that it is not tugged in connecting with inverter.

2. OPERATING PRECAUTIONS
   (1) Please be sure to turn off the power supply before connecting and disconnecting signal input cable.
   (2) Please do not change variable resistance settings in LCD module. They are adjusted to the most suitable value. If they are changed, it might happen LCD does not satisfy the characteristics specification
   (3) Be careful for condensation at sudden temperature change. Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
   (4) When fixed patterns are displayed for a long time, remnant image is likely to occur.
   (5) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
   (6) Please consider that LCD backlight takes longer time to become stable of radiation characteristics in low temperature than in room temperature.

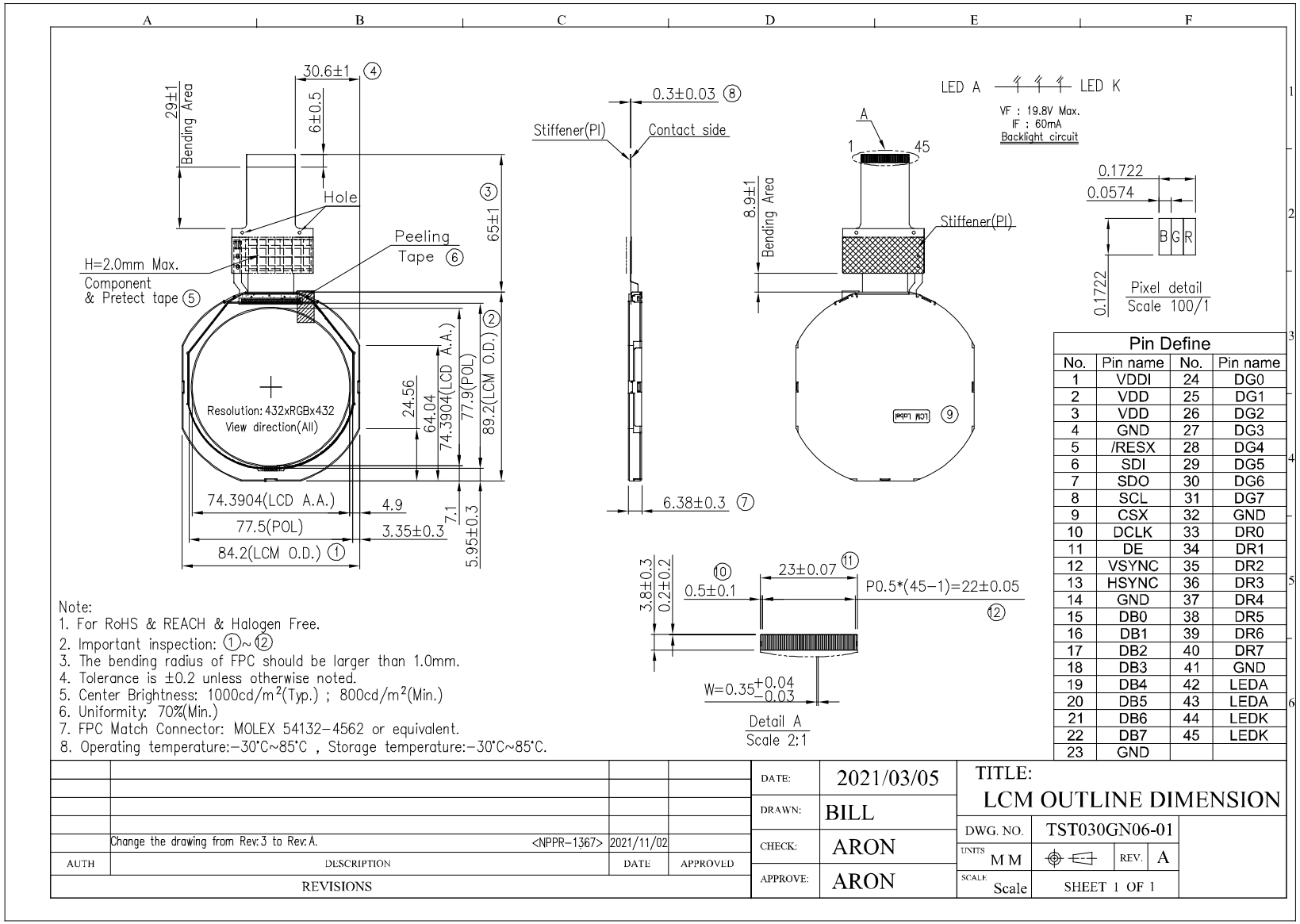
3. ELECTROSTATIC DISCHARGE CONTROL
   The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such the copper leads on the PCB and the interface terminals with any parts of the human body.
   (2) The modules should be kept in antistatic bags or other containers resistant to static for storage.
   (3) Only properly grounded soldering irons should be used.
   (4) If an electric screwdriver is used, it should be well grounded and shielded from commutator sparks.
   (5) The normal static prevention measures should be observed for work clothes and working benches; for the latter conductive (rubber) mat is recommended
   (6) Since dry air is inductive to statics, a relative humidity of 50-60% is recommended.

4. STORAGE PRECAUTIONS
   (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
   (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
   (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

5. OTHERS
   (1) A strong incident light into LCD panel might cause display characteristics' changing inferior because of polarizer film, color filter, and other materials becoming inferior. Please do not expose LCD module direct sunlight Land strong UV rays
   (2) Please pay attention to a panel side of LCD module not to contact with other materials in preserving it alone.
   (3) For the packaging box, please pay attention to the followings:
      a. Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
      b. Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
      c. Packing box and inner case for LCDs are made of cardboard. So please pay attention not to get them wet. (Such like keeping them in high humidity or wet place can occur getting them wet.)
   (4) Waste
   Liquid crystal module products shall not be arbitrarily discarded; the water and soil have a negative impact on the environment, the need to be handled by a qualified unit.

6. LIMITED WARRANTY
   Unless otherwise agreed between TSD and customer, TSD will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with TSD acceptance standards, for a period on one year from date of shipment. Confirmation of such date shall be based on freight documents. The warranty liability of TSD is limited to repair and/or replacement on the terms set forth above. TSD will not responsible for any subsequent or consequential events.

12. OUTLINE DRAWING



Note:
1. For RoHS & REACH & Halogen Free.
2. Important inspection: ①~⑫
3. The bending radius of FPC should be larger than 1.0mm.
4. Tolerance is ±0.2 unless otherwise noted.
5. Center Brightness: 1000cd/m²(Typ.) ; 800cd/m²(Min.)
6. Uniformity: 70%(Min.)
7. FPC Match Connector: MOLEX 54132-4562 or equivalent.
8. Operating temperature:-30°C~85°C , Storage temperature:-30°C~85°C.

Pin Define			
No.	Pin name	No.	Pin name
1	VDDI	24	DG0
2	VDD	25	DG1
3	VDD	26	DG2
4	GND	27	DG3
5	/RESX	28	DG4
6	SDI	29	DG5
7	SDO	30	DG6
8	SCL	31	DG7
9	CSX	32	GND
10	DCLK	33	DR0
11	DE	34	DR1
12	VSYNC	35	DR2
13	HSYNC	36	DR3
14	GND	37	DR4
15	DB0	38	DR5
16	DB1	39	DR6
17	DB2	40	DR7
18	DB3	41	GND
19	DB4	42	LEDA
20	DB5	43	LEDA
21	DB6	44	LEDK
22	DB7	45	LEDK
23	GND		

AUTH	DESCRIPTION	DATE	APPROVED
	Change the drawing from Rev:3 to Rev:A. <NPPR-1367>	2021/11/02	

REVISIONS

DATE:	2021/03/05
DRAWN:	BILL
CHECK:	ARON
APPROVE:	ARON

TITLE: LCM OUTLINE DIMENSION

DWG. NO.	TST030GN06-01		
UNITS M M		REV.	A
SCALE Scale	SHEET 1 OF 1		

13. PACKAGE INFORMATION

TBD.