



# Specification for Approval

Customer: \_\_\_\_\_

Model Name: \_\_\_\_\_

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		



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## 1. General Specifications

No.	Item	Specification	Unit
1	Panel Size	7.84	Inch
2	Resolution	400(RGB)x 1280	Dot
3	Driver Method	A-Si TFT active matrix	-
4	Active Area	59.4(H) x190.08(V)	mm
5	Pixel Arrangement	RGB Vertical Stripe	-
6	Module Size	67.8(H) x206.18(V)x 4.74(T)	mm
7	Display Mode	Normally Black	-
8	Display Color	16.7M	-
9	Viewing Direction	ALL' clock	-
10	TFT Driver IC	GC9703C	
11	Pixel pitch	0.0495(H) x 0.1485(V)	um
12	Interface	MIPI	-

## 2. Pin Assignment

No.	Symbol	Function
1	GND	Ground.
2	D0N	Negative polarity of low voltage differential data 0 signal
3	D0P	Positive polarity of low voltage differential data 0 signal
4	GND	Ground.
5	D1N	Negative polarity of low voltage differential data 1 signal
6	D1P	Positive polarity of low voltage differential data 1 signal
7	GND	Ground.
8	CLKN	Negative polarity of low voltage differential clock signal
9	CLKP	Positive polarity of low voltage differential clock signal
10	GND	Ground.
11	D2N	Negative polarity of low voltage differential data 2 signal
12	D2P	Positive polarity of low voltage differential data 2 signal
13	GND	Ground.
14	D3N	Negative polarity of low voltage differential data 3 signal
15	D3P	Positive polarity of low voltage differential data 3 signal
16	GND	Ground.
17	VDDI	Analog power supply (VCI): 2.5V to 3.3V
18	VDDI	Analog power supply (VCI): 2.5V to 3.3V
19	GND	Ground.
20	VSP	Analog power supply(AVDD): 4.5V to 6.0V
21	VSP	Analog power supply(AVDD): 4.5V to 6.0V
22	GND	Ground.
23	VSN	Analog power supply(AVEE):-4.5V to -6.0V
24	VSN	Analog power supply(AVEE):-4.5V to -6.0V
25	A	Power Supply For LED Backlight Anode Input.
26	TE	Frame head pulse for tearing effect.
27	NC	No Connection.
28	NC	No Connection.
29	NC	No Connection.

30	RESX	Reset Signal input pin.
31	GND	Ground.
32	NC	No Connection.
33	NC	No Connection.
34	K	Power Supply For LED Backlight Cathode Input.

### 3. Operation Specifications

#### 3.1 Absolute Maximum Ratings

Condition: Ta=25°C

Parameter	Min.	Max.	Unit
Supply voltage(Analog)	-0.3	+4.6	V
Supply voltage VSP	-0.3	+8	V
Supply voltage VSN	0.3	-8	V
Operating Temperature	-20	70	°C
Storage Temperature	-30	80	°C

Note: If one of the above items is exceeded its maximum limitation momentarily, the quality of the product may be degraded. Absolute maximum limitation, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the recommend range.

### 3.1.1 TFT DC Characteristics

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Supply Voltage	VDDI	2.5	2.8	3.3	V
Supply voltage	VSP	-	5	-	V
Supply voltage	VSN	-	-5	-	V
Input voltage "L" level	VIL	-0.3	-	0.3*VDDI	V
Logic-High Output Voltage	VOH	0.8VDDI	-	VDDI	V
Logic-Low Output Voltage	VOL	0	-	0.2VDDI	V
Logic High level input voltage	VIH	0.7VDDI	-	VDDI	V
Gate Driver High Voltage	VGH	10	-	16	V
Gate Driver Low Voltage	VGL	-12	-	-8	V
Driver Supply Voltage	VGH-VGL	18	-	28	V
DC VCOM Amplitude Voltage	VCOM	-3.5	-1.5	0	V
Source Output Range	VSOUT	VGMIN+0.1	-	VGMP-0.1	V
Positive Gamma Reference Voltage	VGMP	3.3	4.5	5.6	V
Negative Gamma Reference Voltage	VGMIN	-5.6	-4.5	-3.3	V

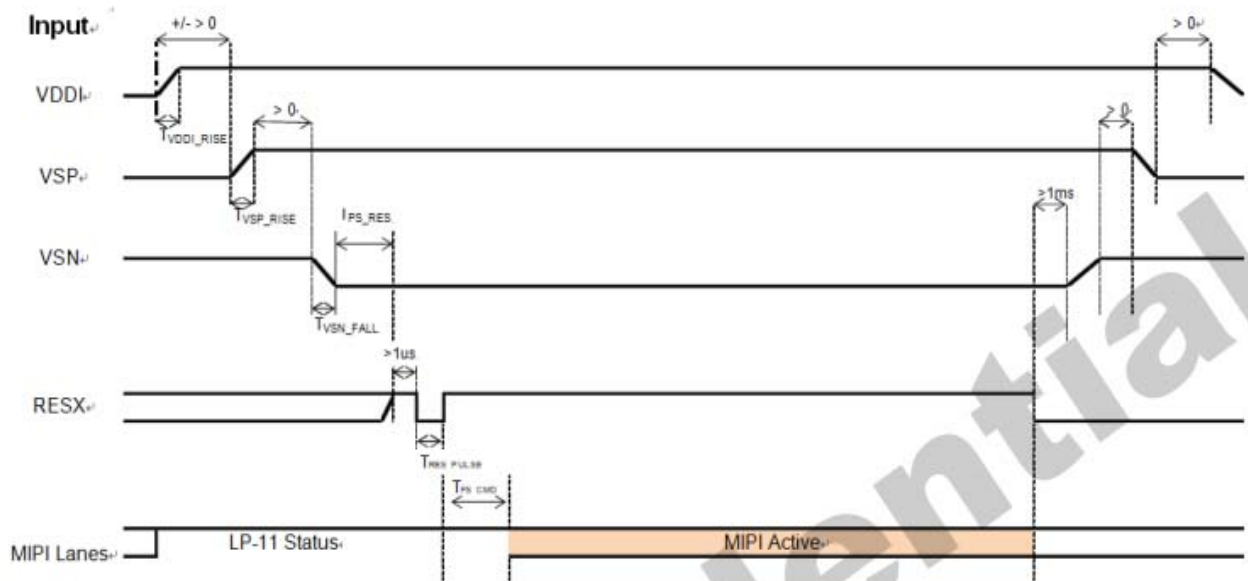
### 3.1.2 Backlight Driving Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit
Forward Voltage	$V_F$	-	18	20.4	V
Positive constant current	$I_F$	-	160	-	mA
Power Consumption	$P_{BL}$	-	2880	-	mW
Uniformity	Avg	75	-	-	%
LED Life Time	$L_L$	-	30,000	-	hours

Note: LED lifetime is defined as the time when Brightness becomes 50% of the original value at  $T_a=25^\circ\text{C}$ .

## 3.2 Display AC Characteristics

### 3.2.1 Power ON/OFF Sequence



Symbol	Characteristics	Min.	Typ.	Max.	Units
$T_{VDDI\_RISE}$	VDDI Rise time	10	-	-	us
$T_{AVDD\_RISE}$	AVDD Rise time	10	-	-	us
$T_{AVEE\_FALL}$	AVEE Fall time	10	-	-	us
$T_{PS\_RES}$	VDDI/AVDD on to Reset high	5	-	-	ms
$T_{RES\_PULSE}$	Reset low pulse time	50	-	-	us
$T_{FS\_CMD}$	Reset to first command	10	-	-	ms

**Power on/off sequence with 3 Power Mode**



## 3.2.2 DSI Timing Characteristics

### 3.2.2.1 High Speed Mode-Clock Channel Timing

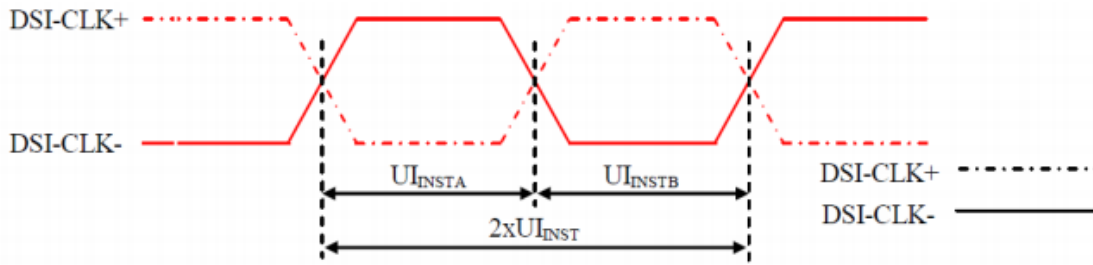


Figure 114 DSI Clock Channel Timing

Table 45 DSI Clock Channel Timing

Signal	Symbol	Parameter	Min	Max	Unit
DSI-CLK+/-	$2xUI_{INST}$	Double UI instantaneous	4	25	ns
DSI-CLK+/-	$UI_{INSTA}, UI_{INSTB}$	UI instantaneous Half	2	12.5	ns

Note:  $UI = UI_{INSTA} = UI_{INSTB}$

### 3.2.2.2 High Speed Mode -Data Clock Channel Timing

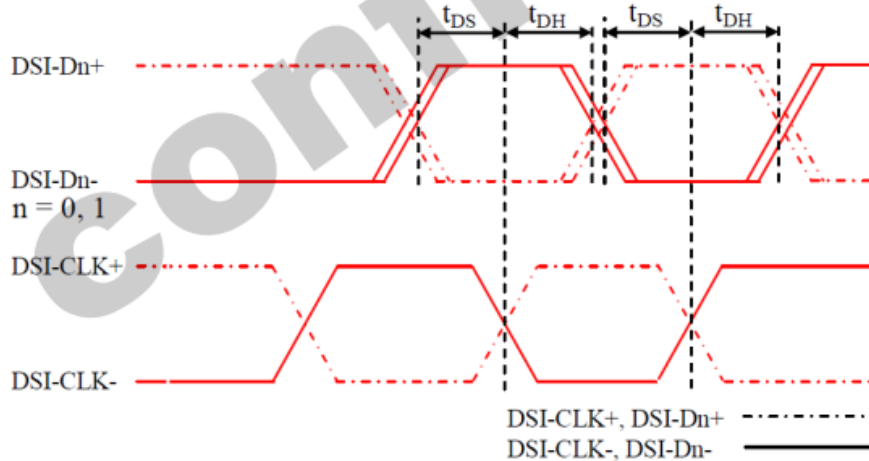
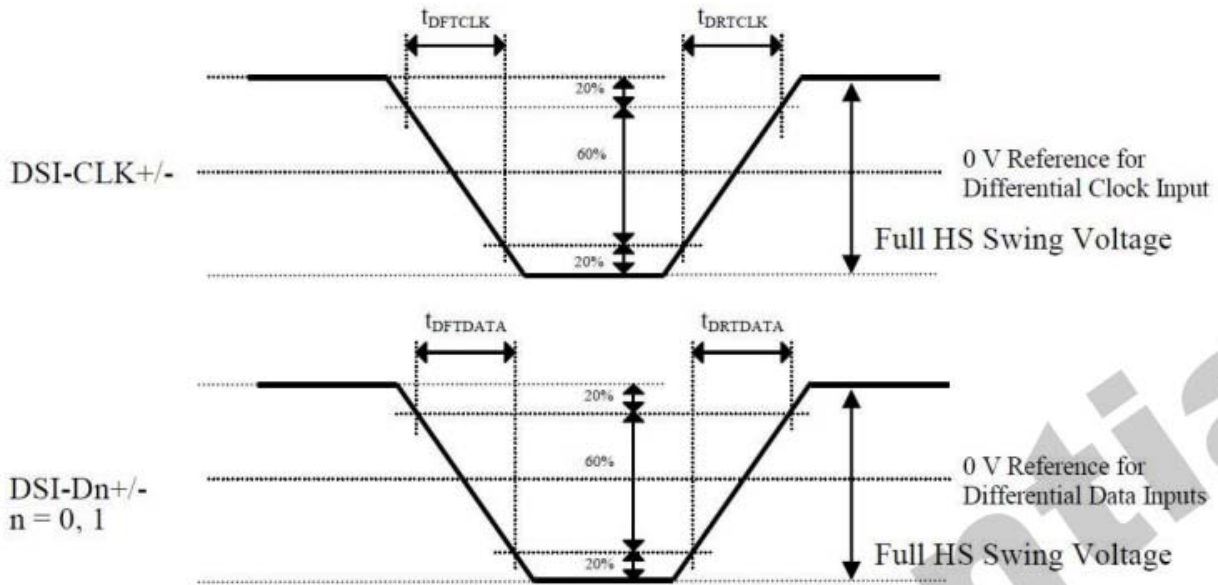


Figure 115 DSI Data to Clock Channel Timings

Table 46 DSI Data to Clock Channel Timings

Signal	Symbol	Parameter	Min	Max
DSI-Dn+/-, n=0 and 1	$t_{DS}$	Data to Clock Setup time	$0.15xUI$	-
	$t_{DH}$	Clock to Data Hold Time	$0.15xUI$	-

### 3.2.2.3 High Speed Mode-Rise and Fall Timings



**Figure 116 Rise and Fall Timings on Clock and Data Channels**

**Table 47 Rise and Fall Timings on Clock and Data Channels**

Parameter	Symbol	Condition	Specification			Unit
			Min	Typ	Max	
Differential Rise Time for Clock	t <sub>DRTCLK</sub>	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Rise Time for Data	t <sub>DRTDATA</sub>	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps
Differential Fall Time for Clock	t <sub>DFTCLK</sub>	DSI-CLK+/-	-	-	150 (Note)	ps
Differential Fall Time for Data	t <sub>DFTDATA</sub>	DSI-Dn+/- n=0 and 1	-	-	150 (Note)	ps

Note: The display module has to meet timing requirements, what are defined for the transmitter (MPU) on MIPI D-Phy standard

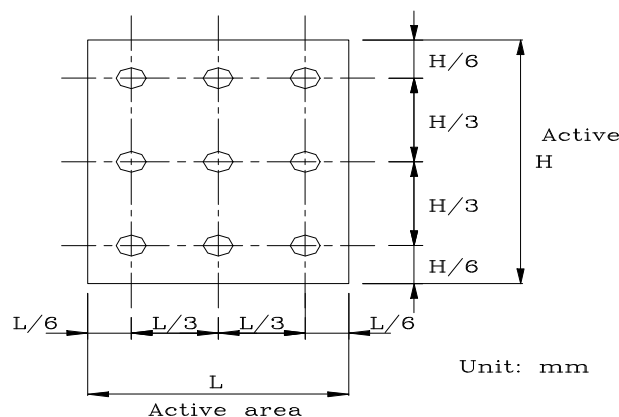
## 4. Optical Specifications

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Viewing Angle	Horizontal	$\theta_{x+}$	$CR \geq 10$	70	80	-	degree	
		$\theta_{x-}$		70	80	-		
	Vertical	$\theta_{y+}$		70	80	-		
		$\theta_{y-}$		70	80	-		
Contrast Ratio		CR	Normal $\theta = \Phi = 0^\circ$	700	900	-	-	
Color Gamut (NTSC ratio)		%		65	70	-	%	
Response Time		$T_r + T_f$		-	30	40	ms	
Color Chromaticity (CIE 1931)	White	X		+0.05	0.28	-0.05	-	
		Y			0.31			
Uniformity		U	70	80		%		
Luminance		L	$I_F = \text{Typ.}$	400	500	-	cd/m <sup>2</sup>	

### a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of  $2^\circ$  at a distance of 50cm and normal direction.

### b. The Brightness Test Point Setup



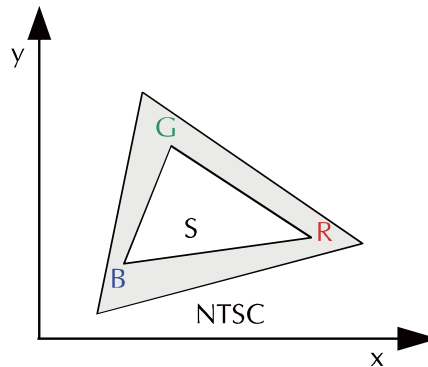
c. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

d. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

$$\text{Color Gamut: NTSC(\%)} = (\text{RGB Triangle Area} / \text{NTSC Triangle Area}) \times 100$$

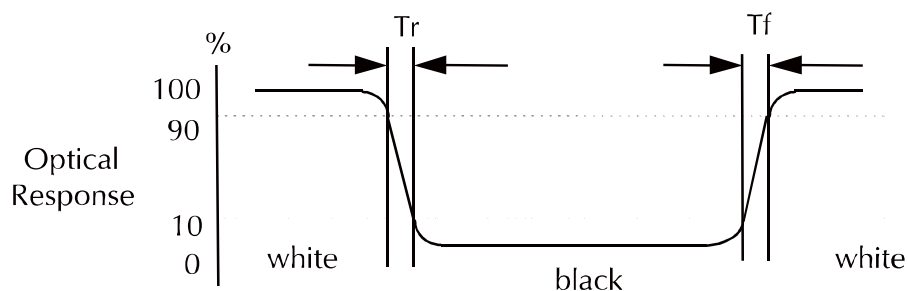


e. Test equipment setup:

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of 2° at a distance of 50cm and normal direction.

f. Definition of response time: Tr and Tf

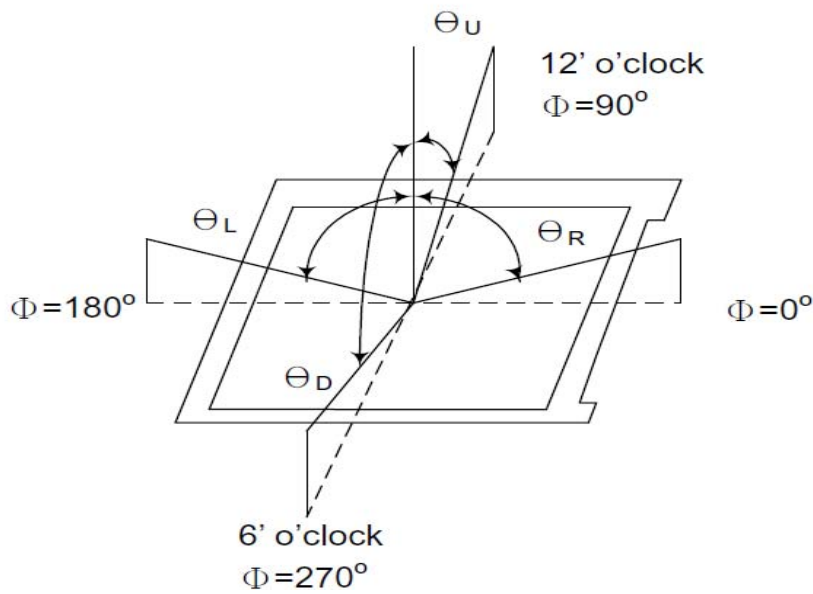
The response time is defined as the following figure and shall be measured by switching the input signal for “black” and “white”.



g. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

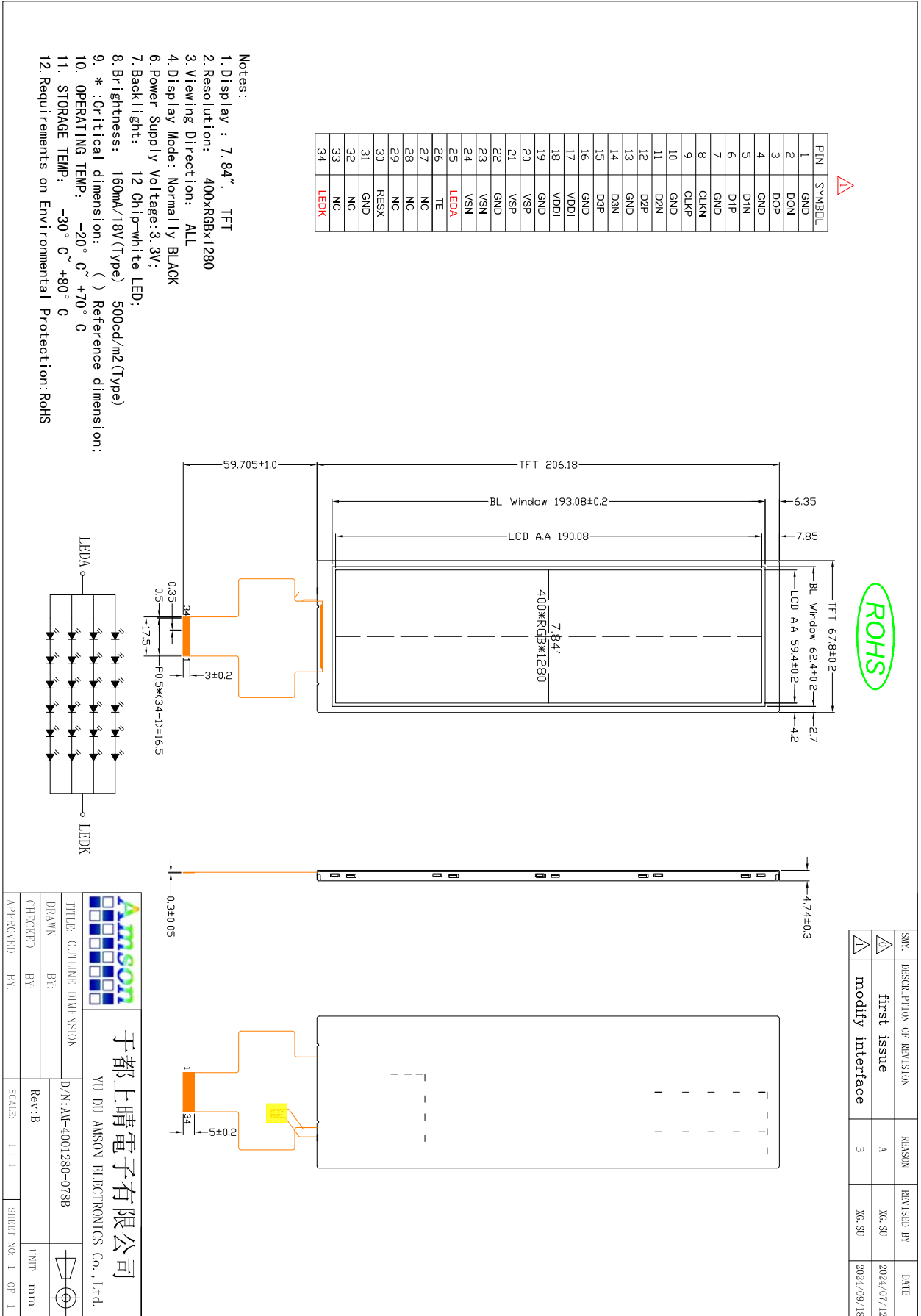
h. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



5. Reliability Test Items

Item	Test Conditions		Remark
High Temperature Storage	80°C	96hrs	Note1, Note2
Low Temperature Storage	-30°C	96hrs	Note1, Note2
High Temperature Operation	70°C	96hrs	Note1, Note2
Low Temperature Operation	-20°C	96hrs	Note1, Note2
Operation at High Temperature and Humidity	+60°C, 90%RH	96hrs	Note1, Note2
Thermal Shock	-20°C/30min ~ +60°C /30minforatotal10cycles. Start with cold temperature and endwith hightemperature.		
Package DropTest	Height60cm 1corner, 3edges, 6surfaces		
Elect or Static Discharge	±2KV, Human Body Mode, 150pF/330Ω		

## 6. Drawing



## 7. Incoming Inspection Standards

### 7.1.1 Visual & Function Inspection Standard

#### 7.1.1 Inspection Conditions

Inspection performed under the following conditions is recommended.

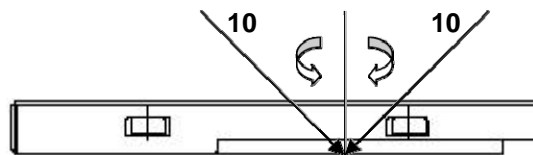
Temperature:  $25\pm 5^{\circ}\text{C}$

Humidity:  $65\%\pm 10\%\text{RH}$

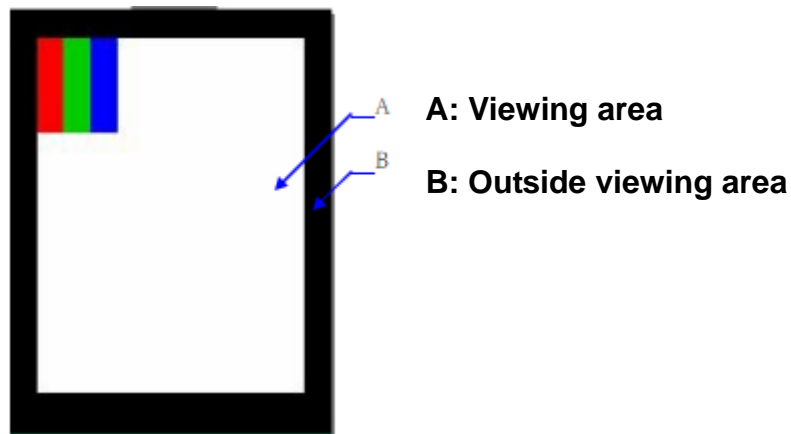
Viewing Angle: Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance: 30-50cm



#### 7.1.2 Definition





## 7.2 Sampling Plan

The defects classify of AQL as following:

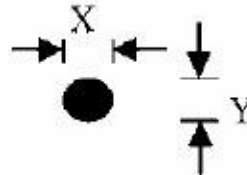
AQL:

Major defect	Minor defect
0.65	2.5

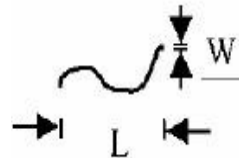
- a. When the standard cannot be described, AQL will be applied.
- b. The sample of the lowest acceptable quality level must be negotiated by both supplier and customer when any dispute happened.
- c. New item must be added on time when it is necessary**

7.3 Criteria (Visual)

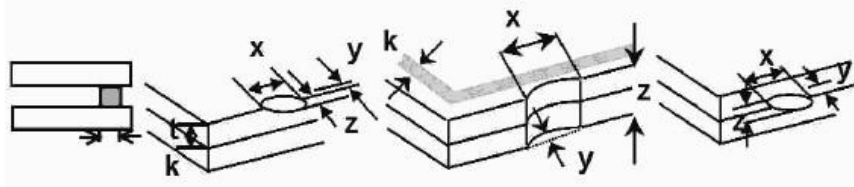
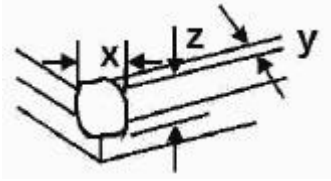
No.	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display mal function. 1.4 No function or no display. 1.5 Current consumption exceeds product specifications. 1.6 LCD viewing angle defect. 1.7 Mixed product types. 1.8 Flicker	0.65
02	Black or White spots or Bright spots or Color spots on LCD( Display only)	2.1 White and black or color spots on display $\leq 0.25\text{mm}$ , no more than Five spots. 2.2 Densely spaced: No more than three spots within 3mm.	2.5
03	LCD and Touch Panel black spots, white spots, contamination (non -display)	3.1 Round type: As following drawing $\Phi = (X+Y)/2$	2.5
		3.2 Line type: (As following drawing)	2.5

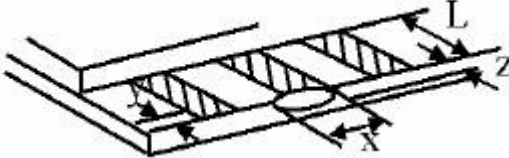
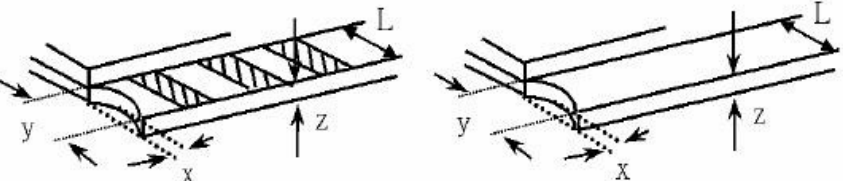


\*Densely spaced: No more than two spots within 3mm.

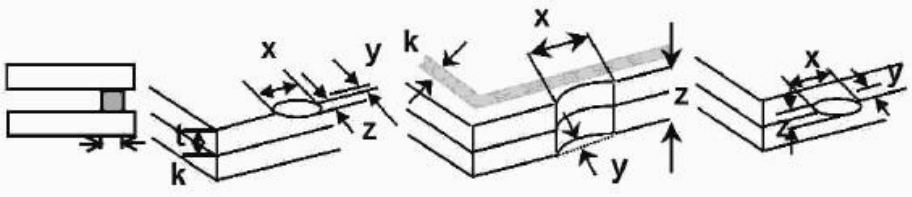
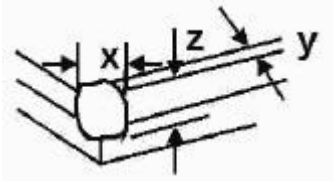
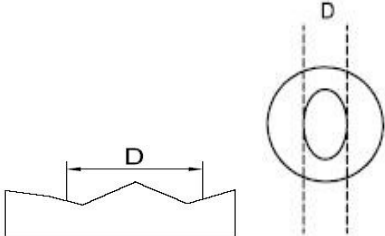


\*Densely spaced: No more than two lines within 3mm.

No.	Item	Criterion		AQL	
04	Polarizer bubbles	If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction	Size $\Phi$ (mm)	Acceptable Q'ty	2.5
			$\Phi \leq 0.20$	Accept no dense	
			$0.20 < \Phi \leq 0.50$	3	
			$0.50 < \Phi \leq 1.00$	2	
			$1.00 < \Phi$	0	
			Total Q'ty	3	
05	Scratches	Follow No.3-2 Linetype.		2.5	
06	Chipped glass	<p>Symbols:  x:Chip length y:Chip width z: Chip thickness  k:Seal width t: Glass thickness a: LCD side length  L:Electrode pad length</p> <p>6.1 General glass chip:  6.1.1 Chip on panel surface and crack between panels:</p> 		2.5	
		<p>6.1.2 Corner crack:</p>  <ul style="list-style-type: none"> <li>● Unit: mm</li> <li>● If there are 2 or more chips, x is the total length of each chip</li> </ul>			

No.	Item	Criterion	AQL				
07	Glass crack	<p>Symbols:  x:Chip length y:Chip width z: Chip thickness k: Seal width t: Glass thickness a: LCD side length L:Electrode pad length</p> <p>7.1 Protrusion over terminal:  7.1.1 Chip on electrode pad:</p>  <p>7.1.2 Non-conductive portion:</p>  <ul style="list-style-type: none"> <li>• If the chipped area touches the ITO terminal, over 2/3 of the ITO must remain and be inspected according to electrode terminal specifications.</li> <li>• If the product will be heat sealed by the customer, the alignment mark must not be damaged.</li> </ul> <p>7.1.3 Substrate protuberance and internal crack</p> <table border="1" data-bbox="718 1601 1236 1713"> <tr> <td>y:width</td> <td>x:length</td> </tr> <tr> <td><math>y \leq 1/3L</math></td> <td><math>X \leq a</math></td> </tr> </table>	y:width	x:length	$y \leq 1/3L$	$X \leq a$	2.5
y:width	x:length						
$y \leq 1/3L$	$X \leq a$						

No.	Item	Criterion	AQL
08	Cracked glass	The LCD with extensive crack is not acceptable.	2.5
09	Backlight elements	9.1 Illumination source flickers when lit.	2.5
		9.2 Spots or scratches that appear when lit must be judged. Using LCD spot, lines and contamination standards.	2.5
		9.3 Backlight doesn't light or color is wrong.	0.65
10	Bezel	Bezel must comply with product specifications.	2.5
11	PCB、COB	11.1 COB seal may not have pinholes larger than 0.2mm or contamination.	2.5
		11.2 COB seal surface may not have pinholes through to the IC.	2.5
		11.3 The height of the COB should not exceed the height indicated in the assembly diagram.	2.5
		11.4 There may not be more than 2mm of sealant outside the seal area on PCB. And there should be no more than three places.	2.5
		11.5 Parts on PCB must be the same as on the production characteristic chart, there should be no wrong parts, missing parts or excess parts.	0.65
		11.6 The jumper on the PCB should conform to the product characteristic chart.	0.65
12	FPC	12.1 FPC terminal damage $\leq$ 1/2 FPC terminal width and can not affect the function, we judge accept.	2.5
		12.2 FPC alignment hole damage $\leq$ 1/2 alignment area and can not affect the function, we judge accept.	2.5
13	Soldering	13.1 No cold solder joints, missing solder connections, oxidation or icicles.	2.5
		13.2 No short circuit sin components on PCB or FPC.	0.65

No.	Item	Criterion	AQL
14	Touch Panel Chipped glass	<p>Symbols:  x:Chip length y:Chipwidth z: Chip thickness k:Sealwidth t: Touch Panel Total thickness a: LCD side length L:Electrodepadlength</p> <p>14.1 General glass chip:  14.1.1 Chip on panel surface and crack between panels:</p>  <ul style="list-style-type: none"> <li>Unit: mm</li> <li>If there are 2 or more chips, x is the total length of each chip.</li> </ul> <p>14.1.2 Corner crack:</p>  <ul style="list-style-type: none"> <li>Unit: mm</li> <li>If there are 2 or more chips, x is the total length of each chip.</li> </ul>	2.5
15	Touch Panel (Fish eye, dent and bubble on film)		2.5
16	Touch Panel Newton ring	<p>Newton ring dimension <math>\leq 1/2</math> touch panel area and not affect font and line distortion (<math>\leq 2.5\%</math>), it is acceptable.</p>	2.5
17	Touch Panel Linearity	<p>Less than 2.5% is acceptable.</p>	2.5

No.	Item	Criterion	AQL
18	LCD Ripple	Touch the touch panel, cannot see the LCD ripple. Pen: R1.0mm silicon rubber. Operation Force: 80g	2.5
19	General appearance	19.1 Pin type must match type in specification sheet. 19.2 LCD pin looser missing pins. 19.3 Product pack aging must be the same as specified on pack aging specification sheet. 19.4 Product dimension and structure must conform to product specification sheet.	0.65 0.65 0.65 0.65

## 8. Handling Precautions

### 8.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is so constructed as to be fixed by utilizing fitting holes in the printed circuit board.

Extreme care should be needed when handling the LCD modules.

### 8.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent

[Recommended below] and wipe lightly

- Isopropyl alcohol
- Ethyl alcohol

Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.

Do not use the following solvent:

- Water
- Aromatics

Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns

Do not use the following solvent on the pad or prevent it from being contaminated:

- Soldering flux
- Chlorine (Cl) , Sulfur (S)

If goods were sent without being silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

### 8.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to power or ground, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

### 8.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

### 8.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature than the operating temperature range and on the other hand at higher temperature LCD's show dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.



## 8.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.

- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.  
[It is recommended to store them as they have been contained in the inner container at the time of delivery from us.]

## 8.7 Safety

- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

## 9. Precaution for Use

### 9.1

A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

### 9.2

On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.

- When a question is arisen in this specification.
- When a new problem is arisen this is not specified in this specification.
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.