

## Displays & Touch Screens

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# DATA IMAGE CORPORATION

## TFT Module Specification PRELIMINARY

ITEM NO.: FG1001F1DSSWNG1

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	ALEX	PRETTY	DAVID	KEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	2	8/JAN/15'		22

**2. RECORD OF REVISION**

Rev	Date	Item	Page	Comment	Source
1	8/JAN/15'			Initial preliminary	ESR0312001
2	22/JAN/15'	4 5 6 11	4 8 11 21	1. Modify OPERATIONS SPECIFICATIONS 2. Modify OPTICAL CHARACTERISTICS 3. Modify ELECTRICAL CHARACTERISTICS 4. Modify OUTLINE DRAWING from Rev. 1 to 2.	11S-F10053

### 3. GENERAL DESCRIPTIONS

#### 3.1 Introduction

The FG1001F1DSSWNG1 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. It is composed of a TFT LCD panel, a timing controller, voltage reference, common voltage, column driver, and row driver circuit. This TFT LCD has a 10.1-inch diagonally measured active display area with WXGA resolution (1280 horizontal by 800 vertical pixel array).

#### 3.2 Features

- 10.1" WXGA TFT LCD Panel
- LED Light-bar Backlight System
- Supported WXGA (H:1280 lines, V:800 pixels) resolution
- Compatible with RoHS Standard

#### 3.3 Product Summary

Items	Specifications	Unit
Screen Diagonal	10.1	Inch
Active Area	216.96(H)x135.6(V)	mm
Outline Dimension	229.5x 152.5 x 7.3	mm
Display Format	1,280(H) x (R,G,B) x 800(V)	-
Dot Pitch	0.0565(H)x0.1695(V)	mm
Pixel Arrangement	R.G.B. Stripe	-
Display Mode	Normally Black , Transmissive	-
View direction	ALL	
Interface	LVDS	
LED Life Time	30000	hour
Weight	TBD	

## 4. OPERATION SPECIFICATIONS

### 4.1 Absolute Maximum Ratings

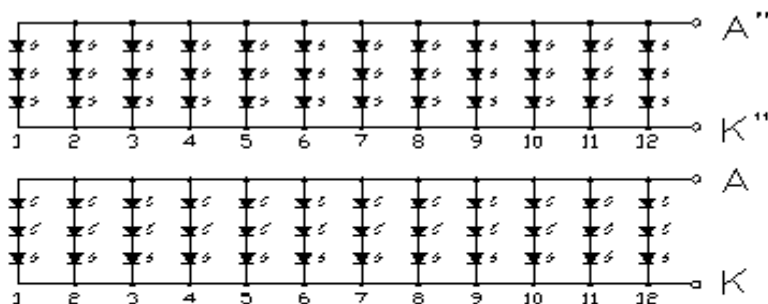
Item	Symbol	Min	Max	Unit	Remark
Power Voltage	VDD	-0.3	5.0	V	
Operating Temperature	TOP	0	50	°C	
Storage Temperature	TST	-20	60	°C	

Note 1:

The absolute maximum rating values of this product are not allowed to be exceeded at any times. Should a module be used with any of the absolute maximum ratings exceeded, the characteristics of the module may not be recovered, or in an extreme case, the module may be permanently destroyed.

### 4.2 Typical Operation Conditions

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Power voltage	VDD	3.0	3.3	3.6	V	
Current for Driver	IVDD	-	-	350	mA	VDD=3.3V
Voltage for LED backlight	VL	9.0	9.9	11	V	
Current for LED backlight	IL		2x360		mA	
Input logic high voltage	VIH	2.0	-	3.6	V	
Input logic low voltage	VIL	0	-	0.5	V	

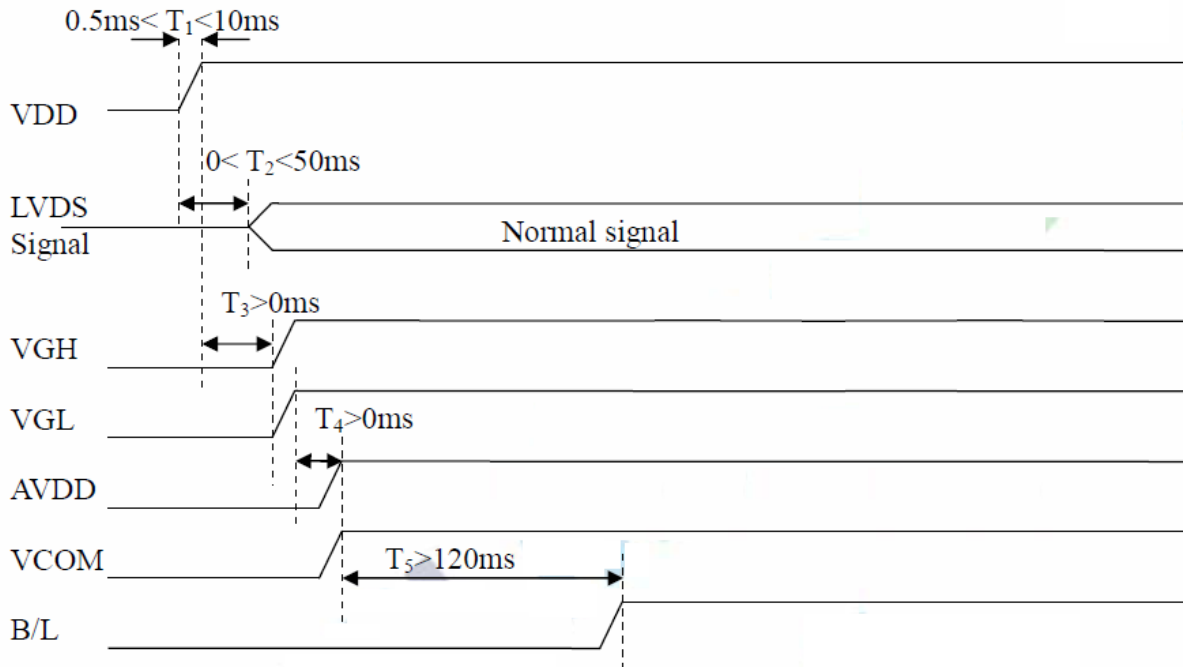


LED circuit

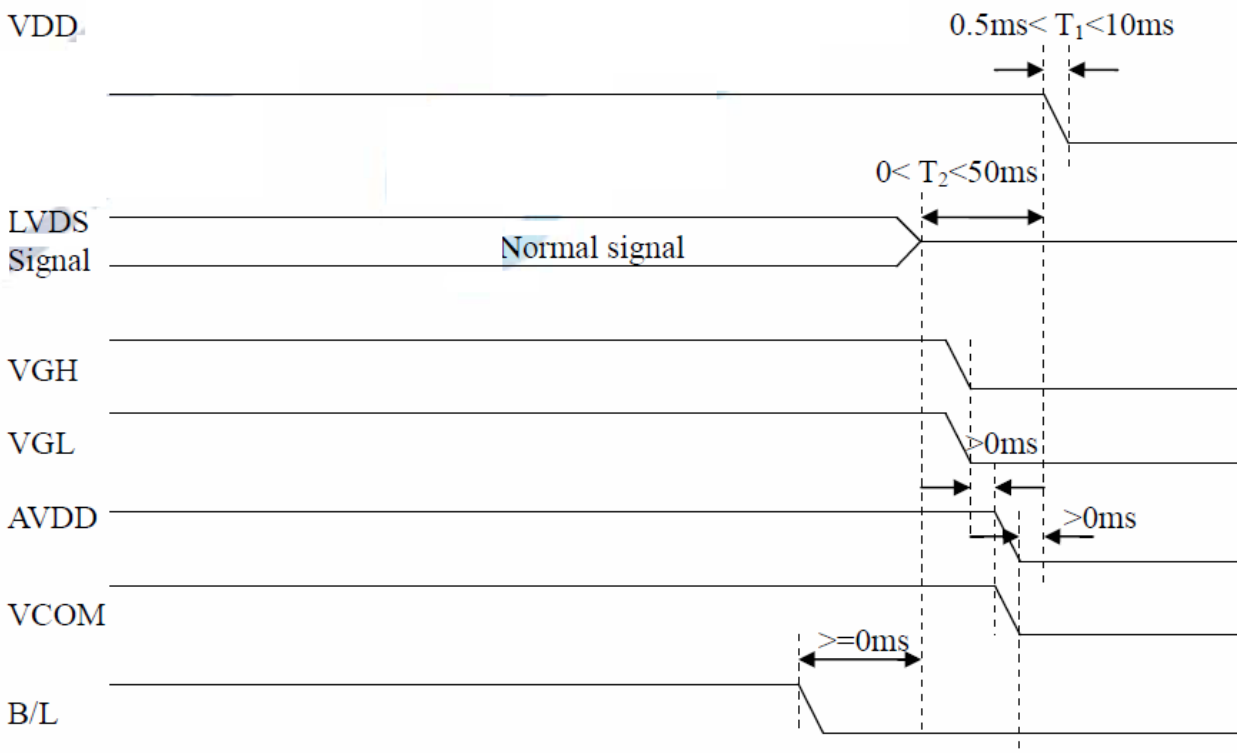
VF:9.0V(Min);9.9V(Typ);11V(Max);  
IF:2x360mA(Fix)

### 4.3 Power Sequence

#### a. Power on:



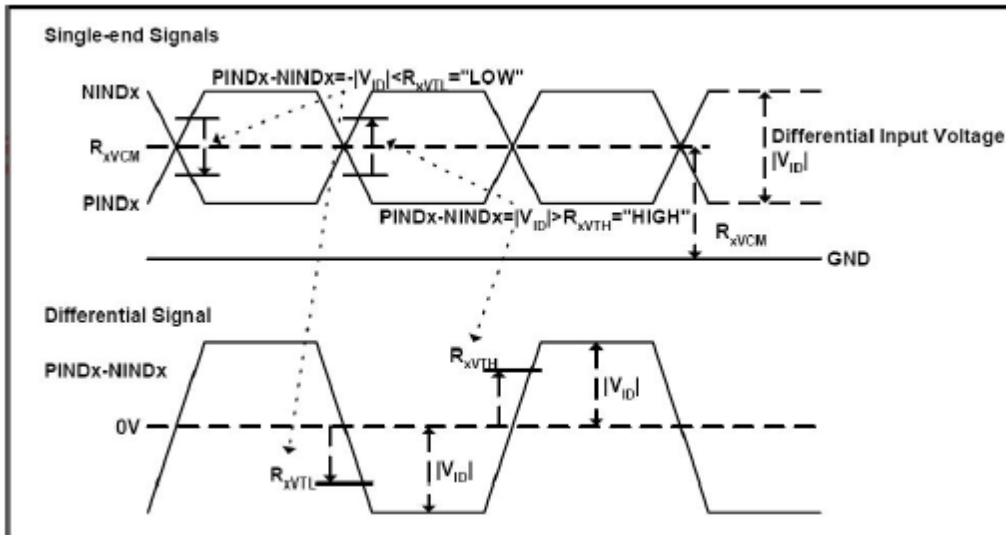
#### b. Power off:



## 4.4 LVDS Signal Timing Characteristics

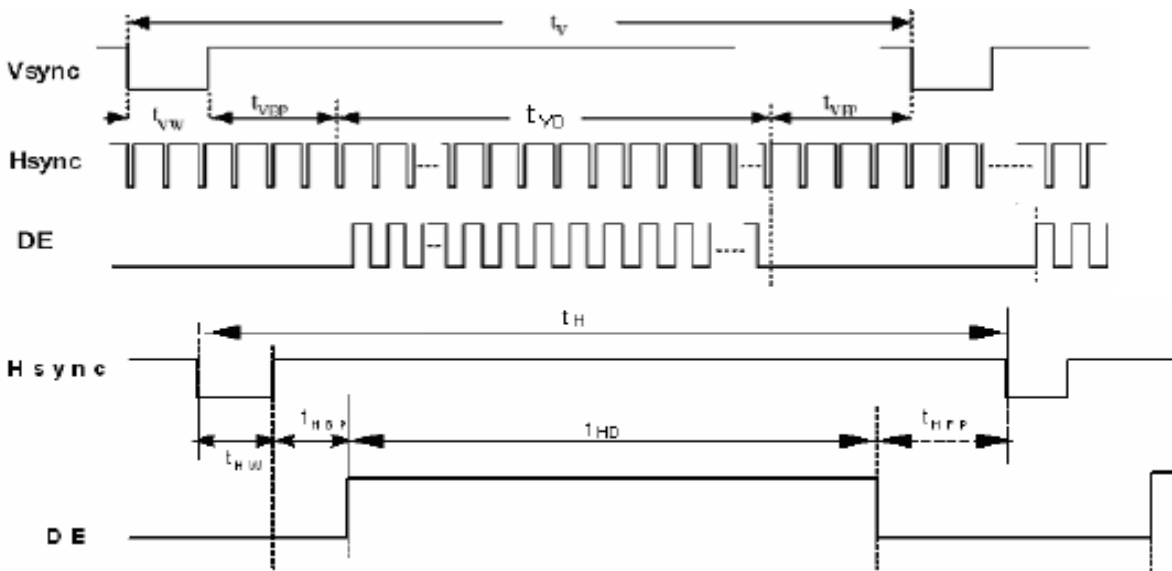
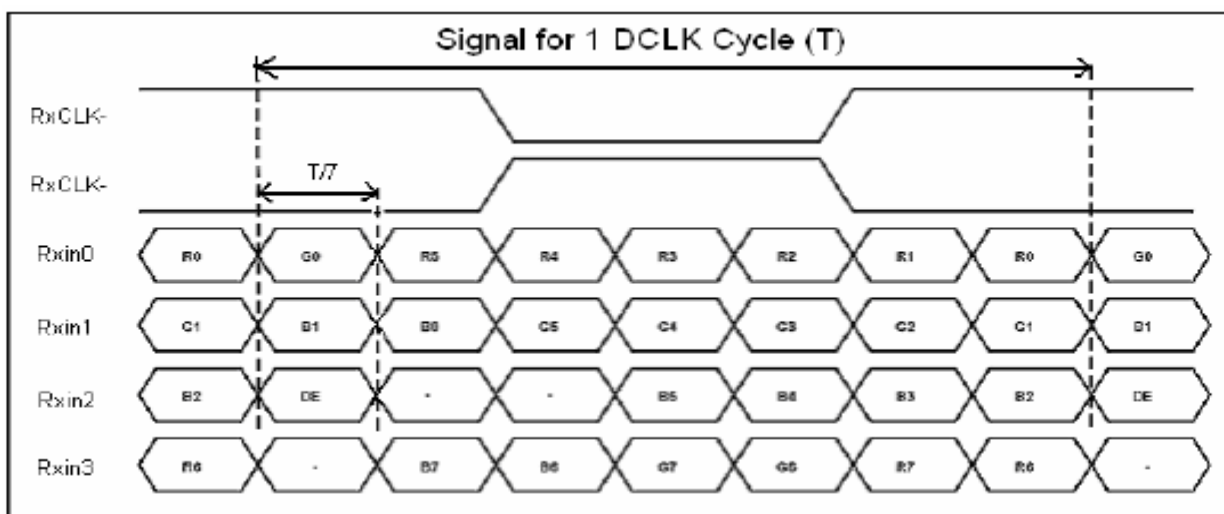
### 4.4.1 AC Electrical Characteristics

Parameter	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
LVDS Differential input high Threshold voltage	RXVTH	-	-	+100	mV	RXVCM=1.2V
LVDS Differential input Low Threshold voltage	RXVTL	-100	-	-	mV	
LVDS Differential input Common mode voltage	RXVCM	0.7	-	1.6	V	
LVDS Differential voltage	VID	200	-	600	mV	



**4.4.2 Timing Table**

Item	Symbol	Values			Unit	Remark
		Min.	Typ.	Max.		
Clock Frequency	1/Tc	(68.9)	71.1	(73.4)	MHz	Frame rate=60Hz
Horizontal display area	tHD	1280			Tc	
HS period time	tH	(1410)	1440	(1470)	Tc	
HS Width + Back Porch + Front Porch	tHW+tHBP+tHFP	(60)	160	(190)	Tc	
Vertical display area	tVD	800			tH	
VS period time	tV	(815)	823	(833)	tH	
VS Width + Back Porch + Front Porch	tVW+tVBP+tVFP	(15)	23	(33)	tH	


**4.4.3 LVDS Data Input Format**




**5. OPTICAL CHARACTERISTICS**

Item	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle (CR $\geq$ 10)	$\theta_L$	$\Phi=180^\circ$ (9 o'clock)	75	85	--	degree	Note 1
	$\theta_R$	$\Phi=0^\circ$ (3 o'clock)	75	85	--		
	$\theta_T$	$\Phi=90^\circ$ (12 o'clock)	75	85	--		
	$\theta_B$	$\Phi=270^\circ$ (6 o'clock)	75	85	--		
Response time	$T_{ON}$	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3
	$T_{OFF}$		-	15	30	msec	
Contrast ratio	CR		600	800	--	--	Note 4
Color chromaticity	$W_X$		0.26	0.31	0.36	--	Note2,5,6
	$W_Y$		0.28	0.33	0.38	--	
Luminance	L		620	780	--	--	Note6
Luminance uniformity	YU		70	75	--	--	Note7

Test Conditions:

- VDD=3.3V, IL=2\*360mA (Backlight current), the ambient temperature is 25°C.
- The test systems refer to Note 2.

Note 1: Definition of viewing angle range

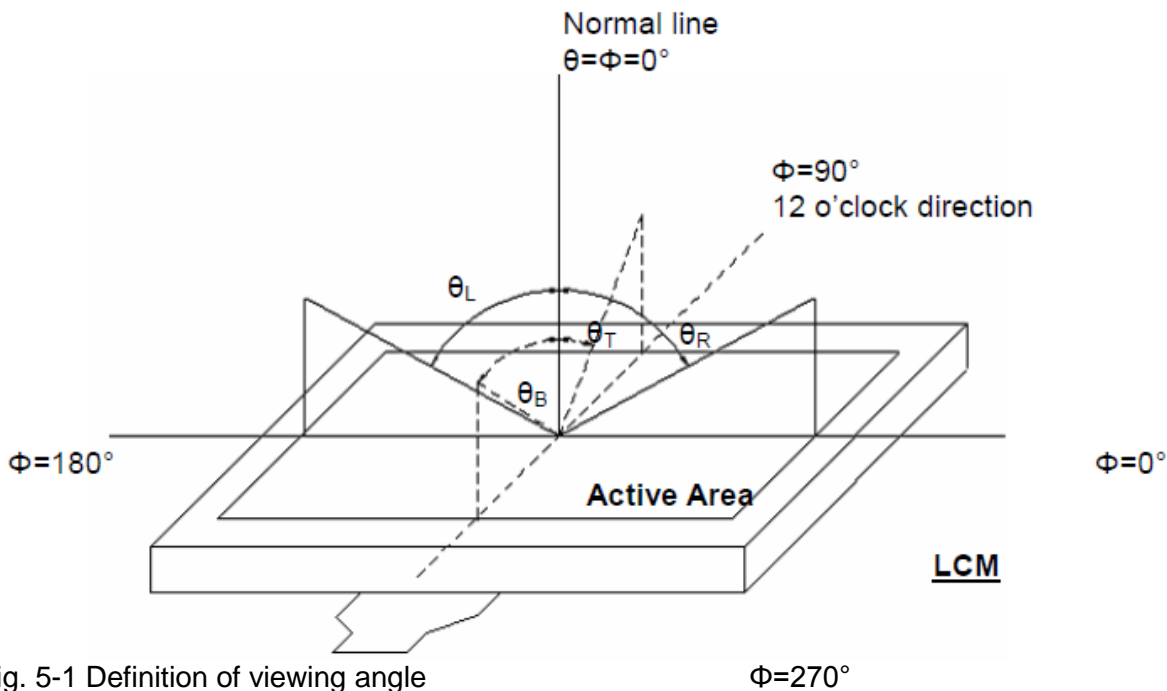


Fig. 5-1 Definition of viewing angle

 $\Phi=270^\circ$ 

Note 2: Definition of optical measurement system.

6 o'clock

The optical characteristics should be measured in dark room. After 30 minutes operation, the optical properties are measured at the center point of the LCD screen. (Viewing angle is measured by ELDIM-EZ contrast/Height :1.2mm, Response time is measured by Photo detector TOPCON BM-7, other items are measured by BM-5A/ Field of view: 1° /Height: 500mm.)

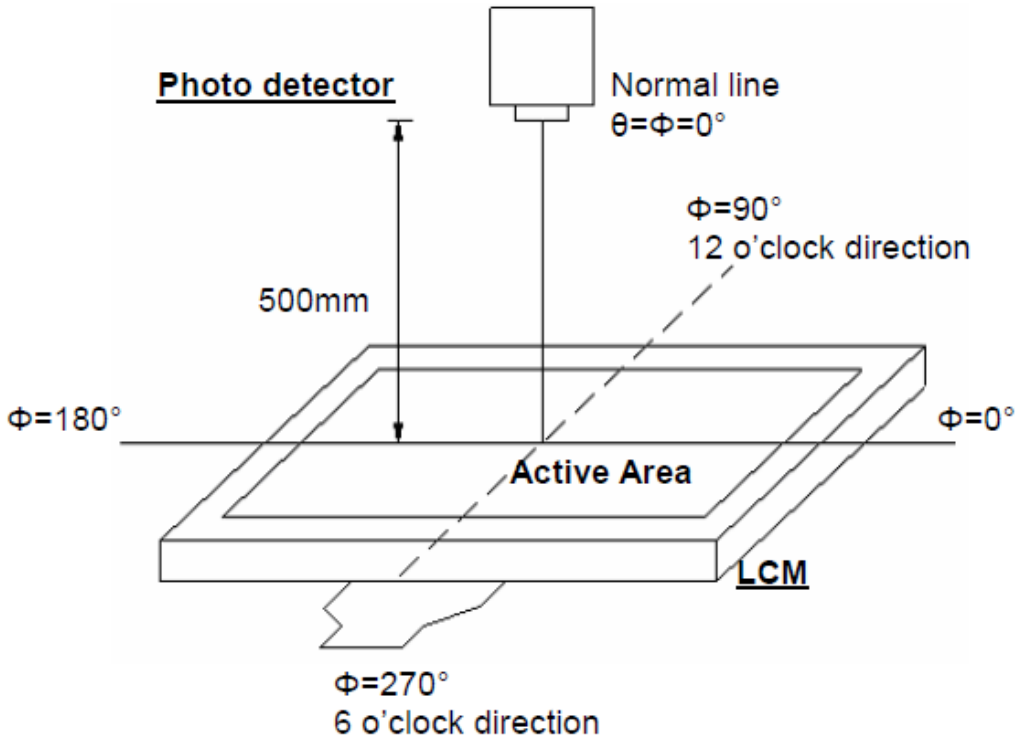


Fig. 5-2 Optical measurement system setup

Note 3: Definition of Response time

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time (TON) is the time between photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is the time between photo detector output intensity changed from 10% to 90%.

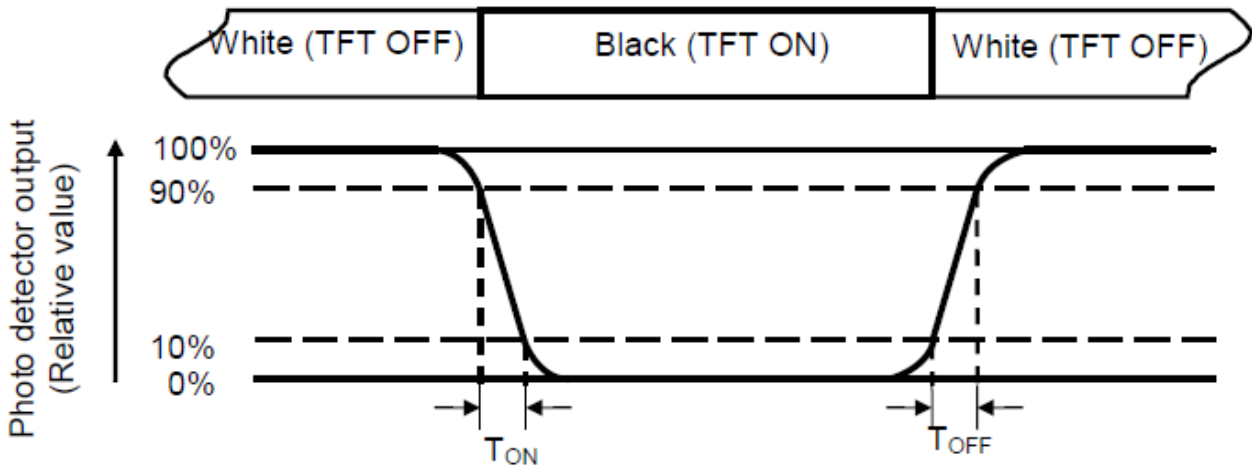


Fig. 4-3 Definition of response time

Note 4: Definition of contrast ratio

$$CR = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

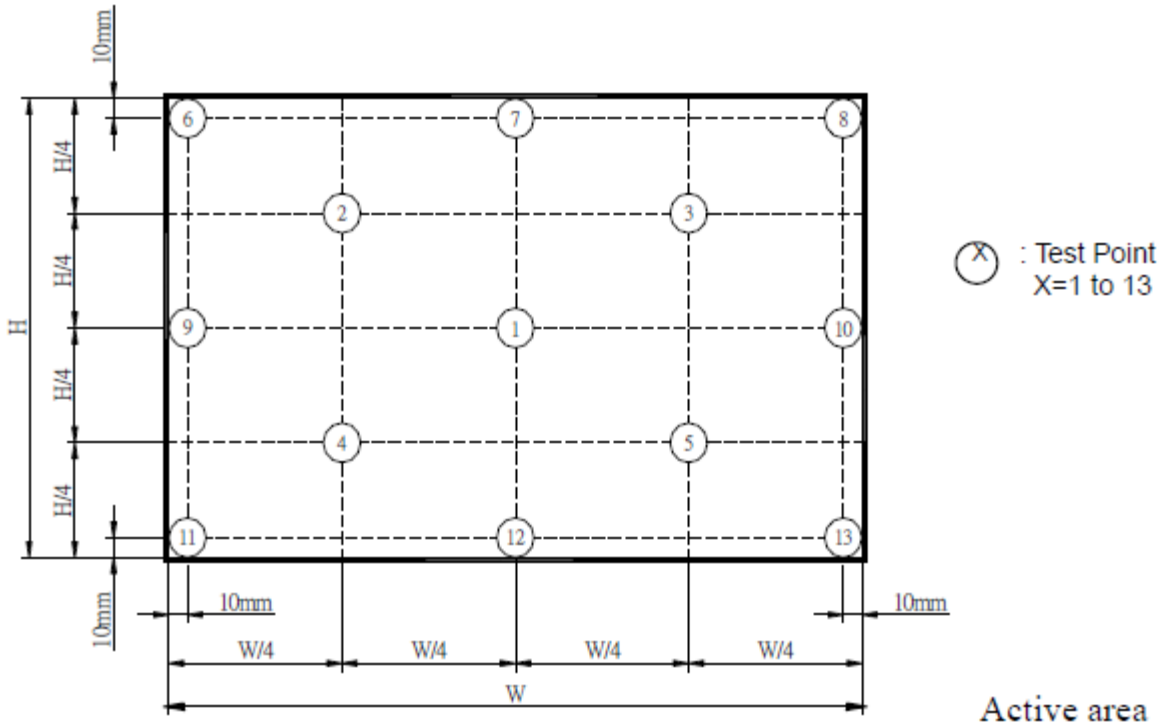
Note 6: All input terminals LCD panel must be ground while measuring the center area of the panel. The LED driving condition is  $IF=2*360mA$ .

Note 7: Definition of Luminance Uniformity

Measure the luminance of gray level 63 at 9 points

$$\delta W9p = \frac{\{\text{Minimum } [L(1) + L(6) + L(7) + L(8) + L(9) + L(10) + L(11) + L(12) + L(13)] /$$

$$\text{Maximum } [L(1) + L(6) + L(7) + L(8) + L(9) + L(10) + L(11) + L(12) + L(13)]\} * 100\%$$



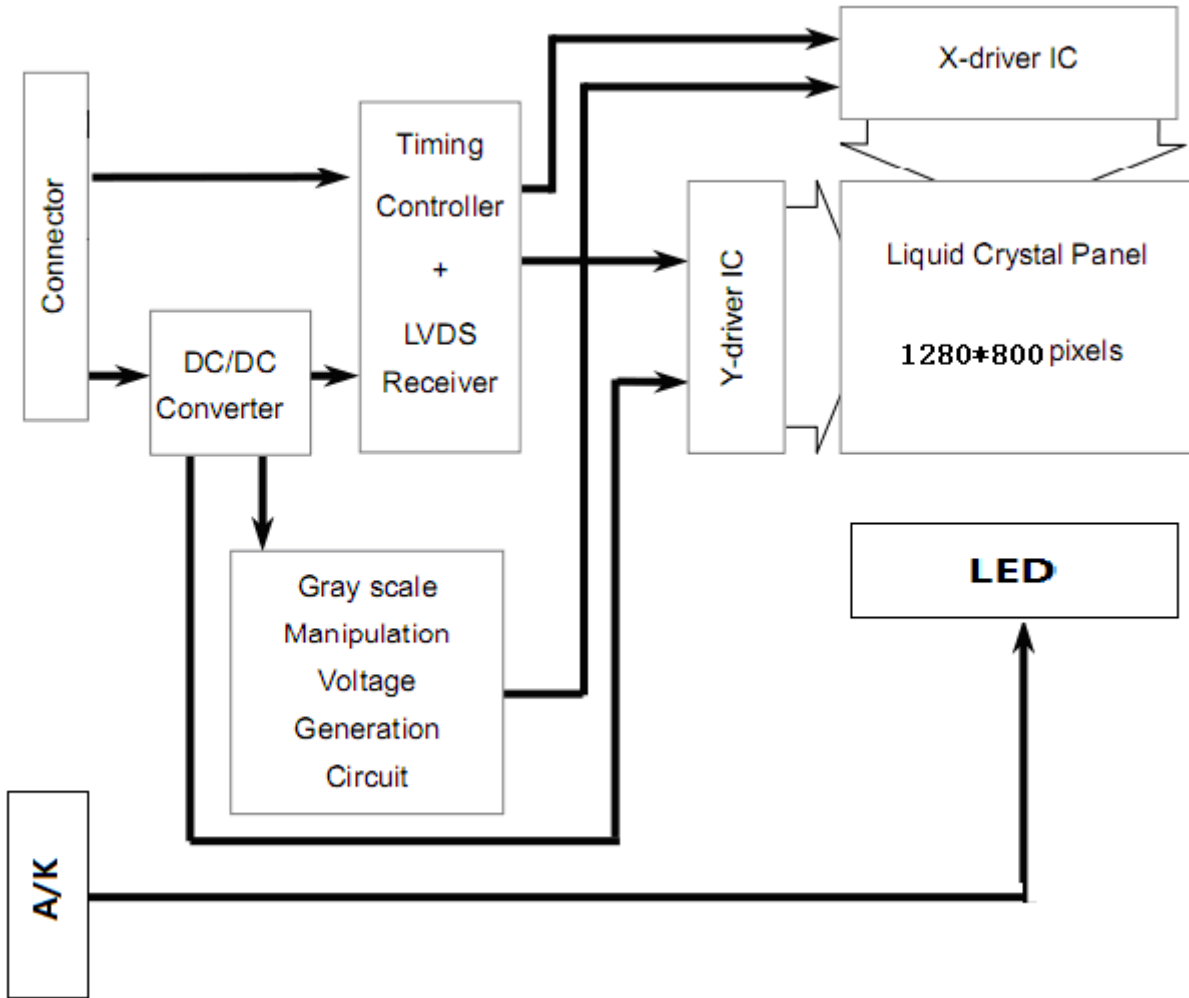
## 6. ELECTRICAL CHARACTERISTICS

Pin #	Signal Name	I/O	Description	Remarks
1	NC	--	No connection	
2	VDD	P	Power Supply	
3	VDD	P	Power Supply	
4	NC	--	No connection	
5	NC	--	No connection	
6	NC	--	No connection	
7	NC	--	No connection	
8	Rxin0-	I	-LVDS Differential Data Input	
9	Rxin0+	I	+LVDS Differential Data Input	
10	VSS	P	Ground	
11	Rxin1-	I	-LVDS Differential Data Input	
12	Rxin1+	I	+LVDS Differential Data Input	
13	VSS	P	Ground	
14	Rxin2-	I	-LVDS Differential Data Input	
15	Rxin2+	I	+LVDS Differential Data Input	
16	VSS	P	Ground	
17	RxCLK-	I	-LVDS Differential Clock Input	
18	RxCLK+	I	+LVDS Differential Clock Input	
19	VSS	P	Ground	
20	Rxin3-	I	-LVDS Differential Data Input	
21	Rxin3+	I	+LVDS Differential Data Input	
22	VSS	P	Ground	
23	NC	--	No connection	
24	NC	--	No connection	
25	NC	--	No connection	
26	NC	--	No connection	
27	NC	--	No connection	
28	NC	--	No connection	
29	NC	--	No connection	
30	NC	--	No connection	
31	NC	--	No connection	
32	NC	--	No connection	
33	NC	--	No connection	
34	NC	--	No connection	
35	NC	--	No connection	
36	NC	--	No connection	
37	NC	--	No connection	
38	NC	--	No connection	
39	NC	--	No connection	

40	NC	--	No connection	
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I: input, O: output, P: Power

## 7. BLOCK DIAGRAM



## 8. RELIABILITY TEST ITEMS

### 8.1 Test Method

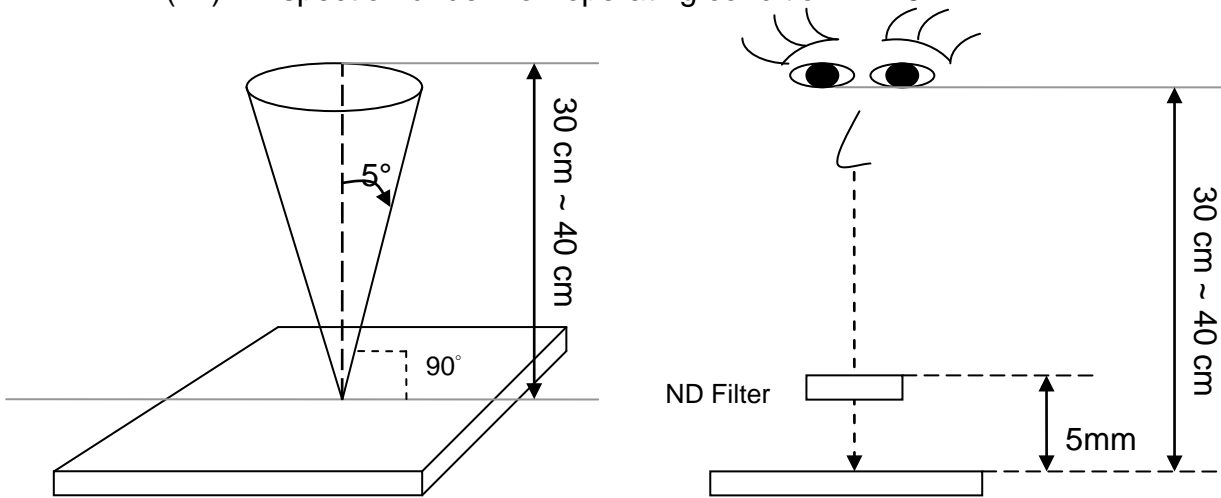
No.	Reliability Test Item & Level	Test Level	Remark
1	High Temperature Storage Test	T=60°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	T=-20°C,240hrs	IEC68-2-1
3	High Temperature Operation Test	T=50°C,240hrs	IEC68-2-2
4	Low Temperature Operation Test	T=-0°C,240hrs	IEC68-2-1
5	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs	IEC68-2-3
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +80°C,200 Cycles 30 min 5min 30 min	IEC68-2-14
7	Vibration Test	Frequency:10~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z	IEC68-2-6
8	Shock test	100G,6ms,Direction:±X±Y±Z Cycle:3times	IEC68-2-27
9	Drop test	Height:60cm 1 conner,3edges,6surfaces	IEC68-2-32
10	ESD test	State: operating Standard: IEC 61000-4-2 Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 8kV Air +/-15kV Criteria: Class C	IEC61000-4-2

## 8.2 Inspection condition

8.2.1 Inspection Distance:  $35 \pm 5$  cm

8.2.2 View Angle:

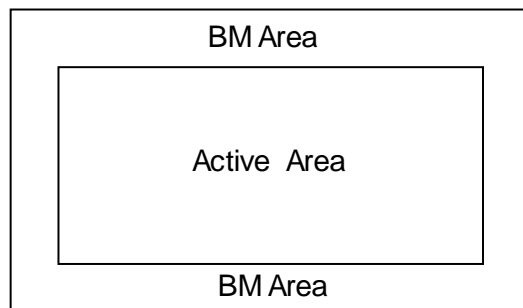
- (1) Inspection under operating condition :  $\pm 5^\circ$
- (2) Inspection under non-operating condition :  $\pm 45^\circ$



8.2.3 Environment conditions:

Ambient Temperature :		$25 \pm 5^\circ\text{C}$
Ambient Humidity :		$65 \pm 5\%$
Ambient Illumination	Cosmetic Inspection	More than 600lux
	Functional Inspection	300 ~ 800lux

8.2.4 Definition of applicable Zones





8.2.5 Inspection Parameters

No.	Parameter	Criteria																		
1	Operating	Display function: No Display malfunction (Major)																		
		Contrast ratio (Black, White): Does not meet specified range in the spec. (Major) (Note:3)																		
		Line Defect: No obvious Vertical and Horizontal line defect in bright, dark and colored. (Major) (Note:1)																		
		Point Defect (Red, green, blue, dark): Active area $\leq 8$ dots (Minor)(Note:1)																		
		<table border="1"> <thead> <tr> <th>Item</th> <th>Acceptable number</th> <th>Total</th> <th>Class Of Defects</th> <th>AQL Level</th> </tr> </thead> <tbody> <tr> <td>Bright</td> <td>4</td> <td rowspan="2">8</td> <td rowspan="4">Minor</td> <td rowspan="4">1.5</td> </tr> <tr> <td>Dark</td> <td>4</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> </tbody> </table>	Item	Acceptable number	Total	Class Of Defects	AQL Level	Bright	4	8	Minor	1.5	Dark	4	Adjacent Bright	1	1	Adjacent Dark	1	1
		Item	Acceptable number	Total	Class Of Defects	AQL Level														
		Bright	4	8	Minor	1.5														
		Dark	4																	
		Adjacent Bright	1	1																
		Adjacent Dark	1	1																
		Non-uniformity: Visible through 2%ND filter white, R, G, B and gray 50%pattern. (Minor)																		
Foreign material in Black or White spots shape ( $W > 1/4L$ ) (Note: 5)																				
<table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Class Of Defects</th> <th>AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.3</math></td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>4</td> </tr> <tr> <td><math>D &gt; 0.5</math></td> <td>0</td> </tr> </tbody> </table>	Dimension	Acceptable number	Class Of Defects	AQL Level	$D \leq 0.3$	*	Minor	1.5	$0.3 < D \leq 0.5$	4	$D > 0.5$	0								
Dimension	Acceptable number	Class Of Defects	AQL Level																	
$D \leq 0.3$	*	Minor	1.5																	
$0.3 < D \leq 0.5$	4																			
$D > 0.5$	0																			
$D = (\text{Long} + \text{Short}) / 2$ * : Disregard																				
Foreign Material in Line or spiral shape ( $W \leq 1/4L$ ) (Note: 4)																				
<table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Class Of Defects</th> <th>AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>W &gt; 0.1\text{mm}, L &gt; 5\text{mm}</math></td> <td>0</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td><math>L \leq 5\text{mm}, 0.07\text{mm} &lt; W \leq 0.1\text{mm}</math></td> <td>4</td> </tr> <tr> <td><math>L \leq 5\text{mm}, W &lt; 0.07\text{mm}</math></td> <td>*</td> </tr> </tbody> </table>	Dimension	Acceptable number	Class Of Defects	AQL Level	$W > 0.1\text{mm}, L > 5\text{mm}$	0	Minor	1.5	$L \leq 5\text{mm}, 0.07\text{mm} < W \leq 0.1\text{mm}$	4	$L \leq 5\text{mm}, W < 0.07\text{mm}$	*								
Dimension	Acceptable number	Class Of Defects	AQL Level																	
$W > 0.1\text{mm}, L > 5\text{mm}$	0	Minor	1.5																	
$L \leq 5\text{mm}, 0.07\text{mm} < W \leq 0.1\text{mm}$	4																			
$L \leq 5\text{mm}, W < 0.07\text{mm}$	*																			
L : Length W : Width * : Disregard																				
2	External Inspection (non-operating)	Dimension: Outline (Major)																		
		Bezel appearance: uneven (Minor)																		
		Scratch on the Polarize & Touch Panel : (Note:2)																		
		<table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Class Of Defects</th> <th>AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>W &gt; 0.1\text{mm}, L &gt; 5\text{mm}</math></td> <td>0</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td><math>L \leq 5\text{mm}, 0.07\text{mm} &lt; W \leq 0.1\text{mm}</math></td> <td>4</td> </tr> <tr> <td><math>L \leq 5\text{mm}, W &lt; 0.07\text{mm}</math></td> <td>*</td> </tr> </tbody> </table>	Dimension	Acceptable number	Class Of Defects	AQL Level	$W > 0.1\text{mm}, L > 5\text{mm}$	0	Minor	1.5	$L \leq 5\text{mm}, 0.07\text{mm} < W \leq 0.1\text{mm}$	4	$L \leq 5\text{mm}, W < 0.07\text{mm}$	*						
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		$L \leq 5\text{mm}, W < 0.07\text{mm}$	*																	
		L : Length W : Width * : Disregard																		
		Dent and spots shape on the polarize (Note:2): (Note: 5)																		
<table border="1"> <thead> <tr> <th>Dimension</th> <th>Acceptable number</th> <th>Class Of Defects</th> <th>AQL Level</th> </tr> </thead> <tbody> <tr> <td><math>D \leq 0.3</math></td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td><math>0.3 &lt; D \leq 0.5</math></td> <td>4</td> </tr> <tr> <td><math>D &gt; 0.5</math></td> <td>0</td> </tr> </tbody> </table>	Dimension	Acceptable number	Class Of Defects	AQL Level	$D \leq 0.3$	*	Minor	1.5	$0.3 < D \leq 0.5$	4	$D > 0.5$	0								
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$0.3 < D \leq 0.5$	4																			
$D > 0.5$	0																			
$D = (\text{Long} + \text{Short}) / 2$ * : Disregard																				

			<b>Definition</b>
Class of defects	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.
	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  $>1/2$  pixel respectively

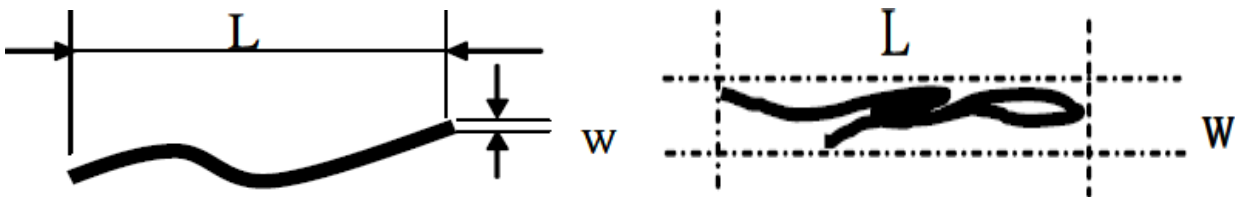
(b)Dark point defect is defined as visible in full white pattern.

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

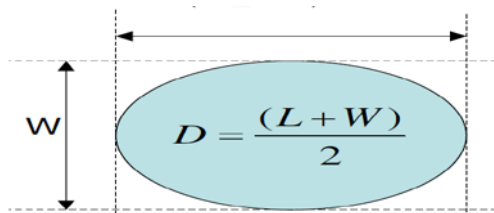
Note:2 The external inspection should be conducted at the distance  $30 \pm 5$ cm between the eyes of inspector and the panel .

Note:3 Luminance measurement for contrast ratio is at the distance  $50 \pm 5$ cm between the detective head and the panel with ambient luminance 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.



Note:5 Spot Foreign Material ( $W \geq L/4$ )



### 8.3 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.

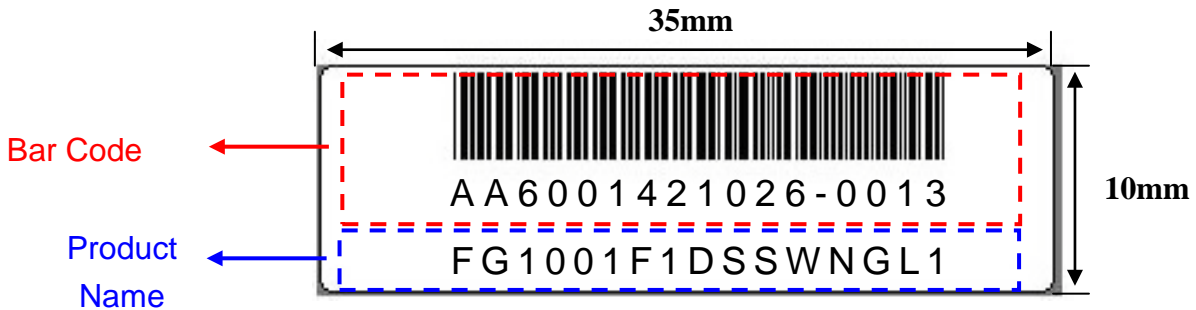
Sampling type: normal inspection, single sampling

Sampling table: MIL-STD-105E

Inspection level: Level II

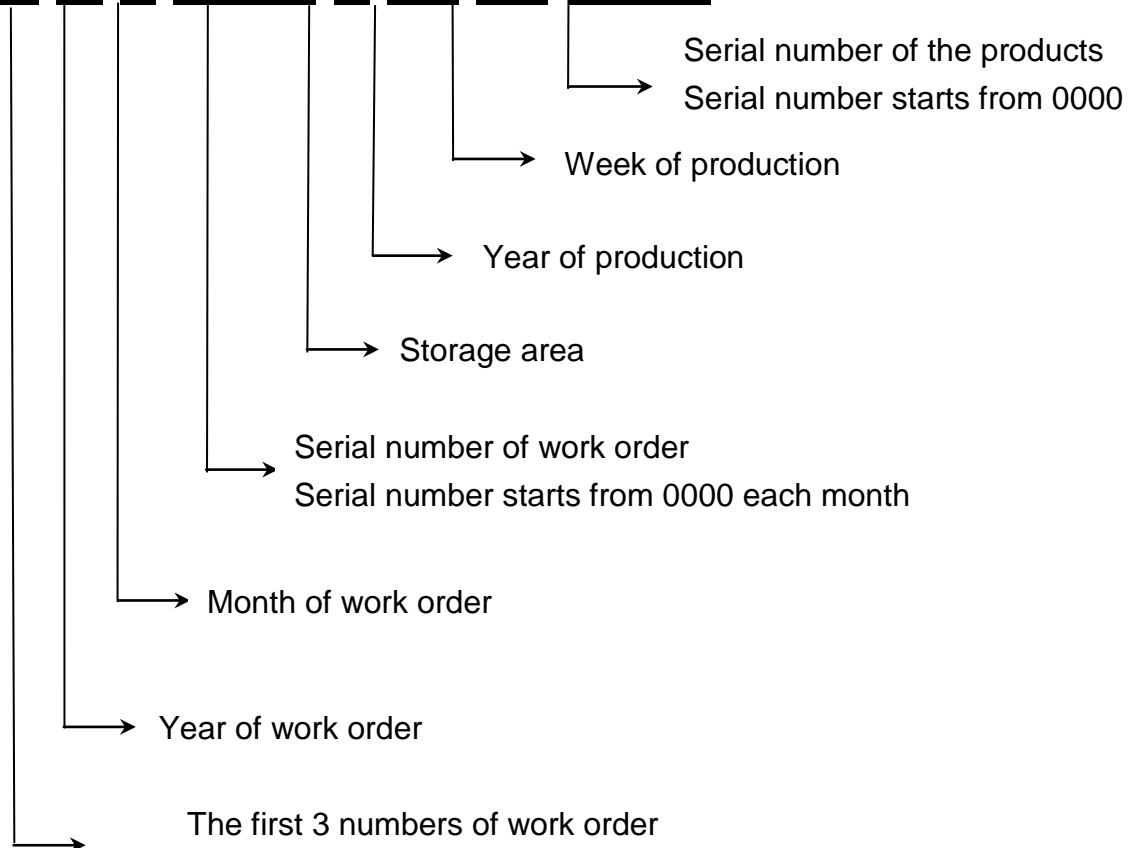
## 9. LCM PRODUCT LABEL DEFINE

Product Label style:

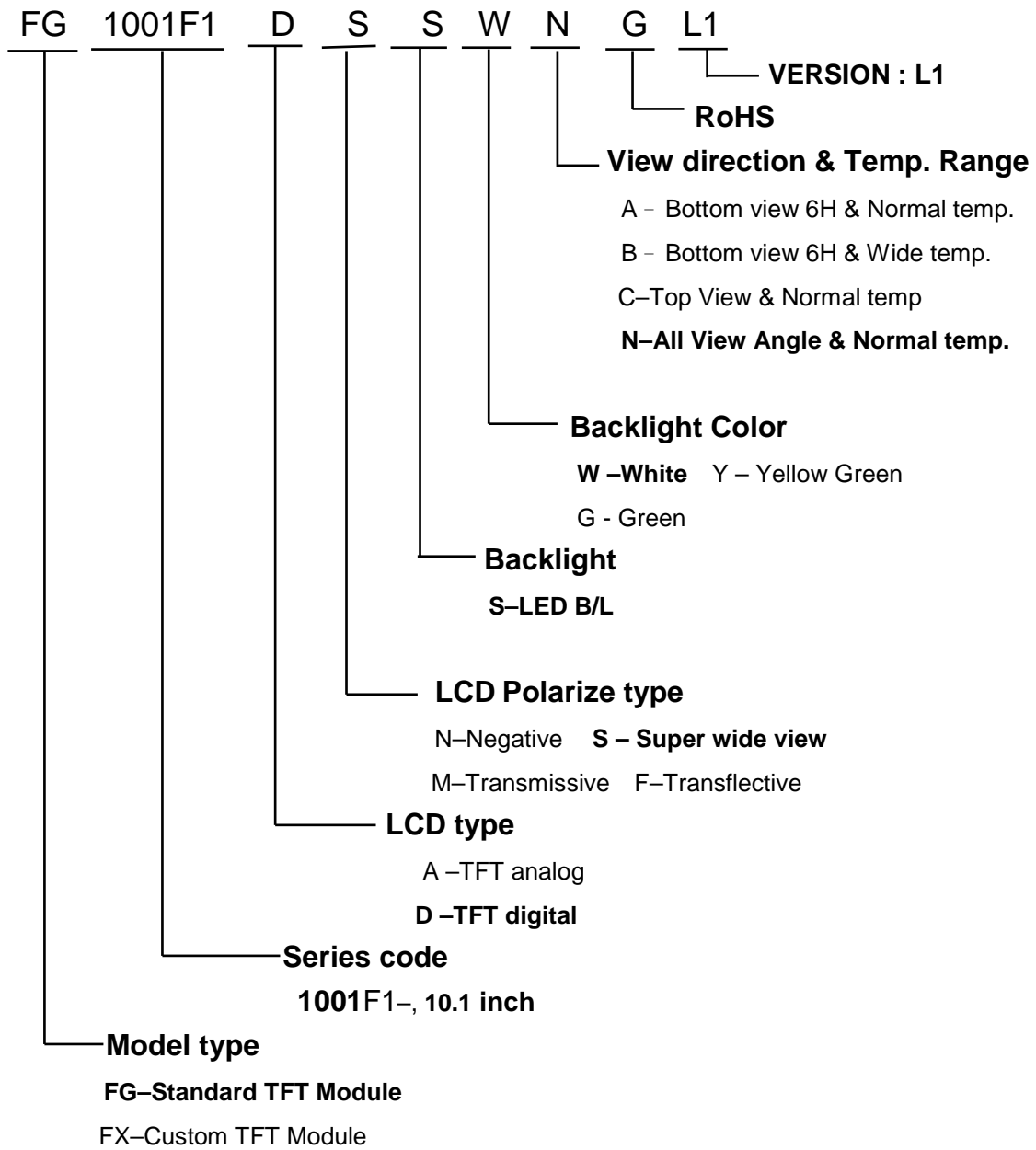


Barcode Define:

**AA6001421026-0013**



**Product Name Define:**



## 10. 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

- (1) 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.

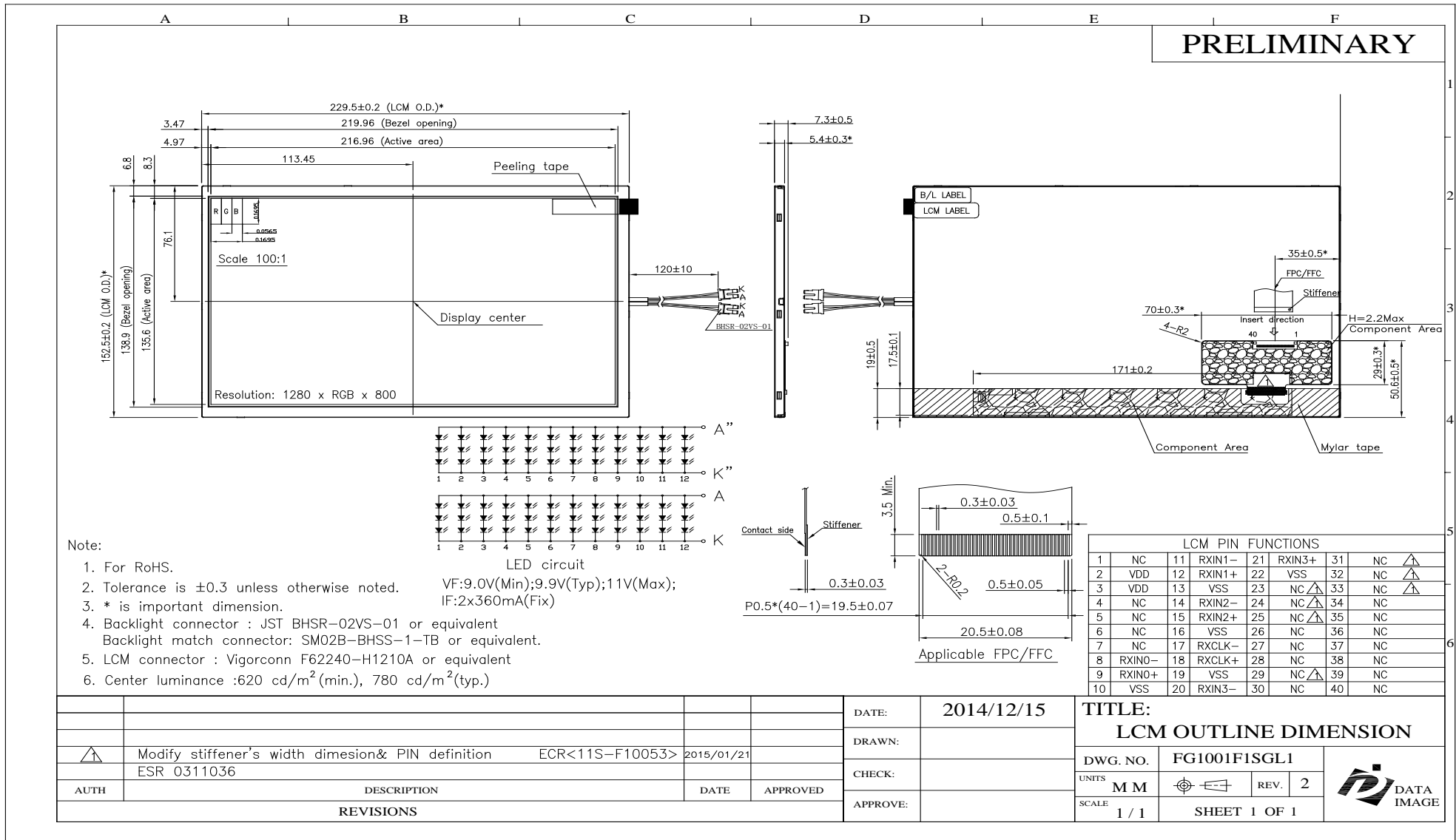
### 5. OTHERS

- (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 and 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.)

### 6. LIMITED WARRANTY

Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE 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 DATA IMAGE is limited to repair and/or replacement on the terms set forth above. DATA IMAGE will not responsible for any subsequent or consequential events.

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**11. OUTLINE DRAWING**



## **12. PACKAGE INFORMATION**

**TBD**