

TFT-DISPLAY DATASHEET

DATA IMAGE

Model: FG0900B1DSSWBG01

BRIEF SPEC.:

Main Feature

Landscape Type

Anti Glare

Normali Withe

Active Screen Area

198 x 111.69 [mm]

Diagonal | Format

9" | 15:9

Resolution

800 X 480

Colors

8Bit

Backlight

Normally White

Brightness

500 cd/m²

LED Life Time

20K (H)

Interface

RGB

Viewing Angle

70/70 L/R 50/70

Touchscreen

No

Power Supply

5V (Typ.)

Module Outline

211.1 x 126.5 x 9.6 [mm]

Operation Temperature

-20 ... +70 °C

Storage Temperature

-30... +80 °C

Surface Treatment

Anti-Glare



DATA IMAGE CORPORATION

TFT Module Specification

Preliminary

ITEM NO.: FG0900B1DSSWBG01

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Customer Companies	QA Approval	QA Check	R&D Approval	R&D Check
	<i>pretty</i>	<i>Seven</i>	<i>Gromer</i>	<i>Terry</i>
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	1	12/JAN/16'		21

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	9 (diagonal)	inch
Display Format	800(H) x (R,G,B) x 480(V)	dot
Active Area	198(H) x 111.696(V)	mm
Pixel Pitch	0.2475 (H) x 0.2327 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	211.1(H) x 126.5(V) x 9.6(D)	mm
Surface treatment	Anti-glare	
Back-light	LED	
Display mode	Normally white , Transmissive	
View direction(Gray Inversion)	6 O'Clock	
Weight	TBD	g
Our components and processes are compliant to RoHS standard		

4. ABSOLUTE MAXIMUM RATINGS

VSS=0V

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	V _{CC}	-0.3	5.0	V	
Logic input voltage	V _I	-0.3	V _{CC} +0.3	V	
Power supply voltage	V _{DD}	-0.3	6.0	V	
Operating temperature	T _{op}	-20	70	°C	
Storage temperature	T _{st}	-30	80	°C	
Humidity	Operation	20%~90% relative humidity			T _a ≤40°C
	Non Operation	10%~90% relative humidity			T _a ≤40°C

5. ELECTRICAL CHARACTERISTICS

 VSS=0V, fV=60Hz, fCLK=33.3MHz, T_a=25°C

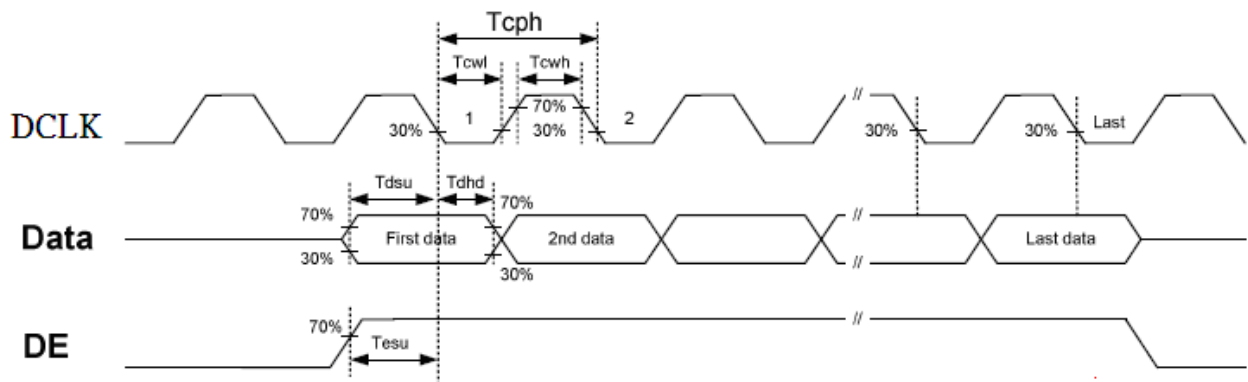
Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage for LCD	V _{CC}	+3.0	+3.3	+3.6	V	
Power Supply Current for LCD	I _{CC}		150	200	mA	V _{CC} = 3.3V
Power Supply voltage for LED	V _{DD}	4.8	5	5.5	V	
Power Supply Current for LED	I _{DD}	--	1200	1600	mA	V _{DD} = 5V
Ripple voltage	V _{RF}	-	-	100	mV _{P-P}	
"H" level logical input voltage	V _{IH}	0.7V _{CC}	--	V _{CC}	V	
"L" level logical input voltage	V _{IL}	0	--	0.3V _{CC}	V	
ADJ frequency		18K	20K	22K	Hz	
ADJ input voltage	V _{IH}	3.0	-	3.3	V	
	V _{IL}	0	-	0.3	V	
LED life time		20000	--	--	Hr	Note 1

Note 1: The "LED life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is at 25°C.

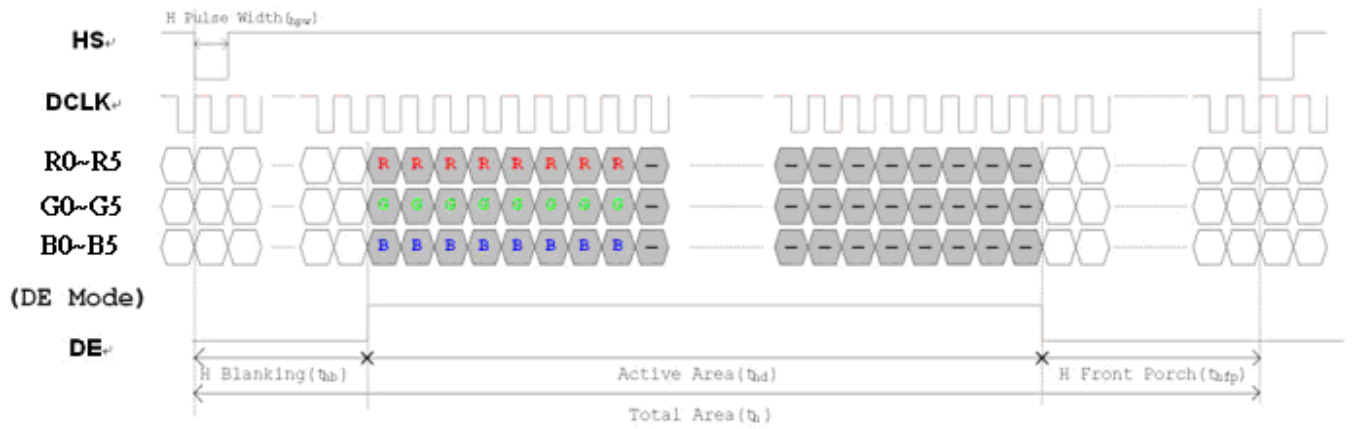
6. INTERFACE SPECIFICATIONS

6.1 AC Electrical Characteristics

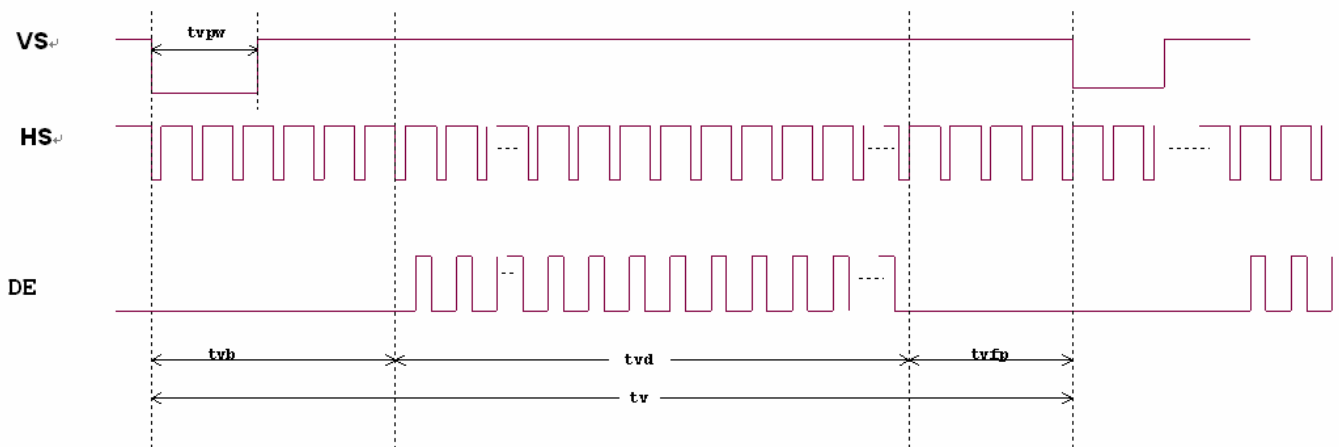
Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Data setup time	Tdsu	8	-	-	ns	
Data hold time	Tdhd	8	-	-	ns	
DE setup time	Tesu	8	-	-	ns	
DE hole time	Tehd	8	-	-	ns	
VCC Power On Slew rate	TPOR	-	-	20	ms	From 0 to 90% DVDD
DCLK cycle time	Tcph	20	-	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	



6.2 Data Input Format



Horizontal input timing diagram



Vertical input timing diagram

Note : HS, VS signal is for reference only

6.3 Timing Characteristics

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Horizontal Display Area	thd	-	800	-	DCLK	
DCLK Frequency	fclk	26.4	33.3	40	MHz	
One Horizontal Line	th	862	1056	1200	DCLK	
HS pulse width	thpw	1	-	4	DCLK	
HS Blanking	thb	46	46	46	DCLK	
HS Front Porch	thfp	16	210	354	DCLK	

Item	Symbol	Value			Unit	Remark
		Min.	Typ.	Max.		
Vertical Display Area	tvd	-	480	-	TH	
VS period time	tv	510	525	650	TH	
VS pulse width	tvpw	1	-	20	TH	
VS Blanking	tvb	23	23	23	TH	
VS Front Porch	tvfp	7	22	147	TH	

7. OPTICAL CHARACTERISTIC

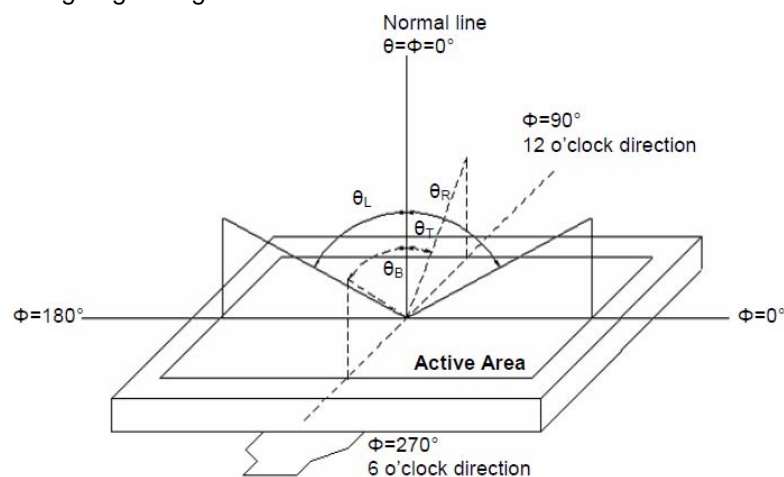
Item	Symbol	Condition	Values			Unit	Remark	
			Min.	Typ.	Max.			
Viewing angle (Center CR \geq 10)	θ_L	$\Phi=180^\circ$ (9 o'clock)	60	70	-	degree	Note 1	
	θ_R	$\Phi=0^\circ$ (3 o'clock)	60	70	-			
	θ_T	$\Phi=90^\circ$ (12 o'clock)	40	50	-			
	θ_B	$\Phi=270^\circ$ (6 o'clock)	60	70	-			
Response time	TON	Normal $\theta=\Phi=0^\circ$	-	10	20	msec	Note 3	
	TOFF		-	15	30	msec	Note 3	
Contrast ratio	CR		400	500	-	-	Note 4	
Color chromaticity	Xw		0.26	0.31	0.36	-	Note 2	
	Yw		0.28	0.33	0.38	-	Note 5 Note 6	
Luminance(Center point)	L		400	500	-	cd/m ²	Note 6	
Uniformity	Yu		70	75	-	%	Note 7	
Image sticking	tis		2 hours			2	Sec	Note 8

Test Conditions:

1. VDD=5V,ADJ=3.3V, the ambient temperature is 25°C

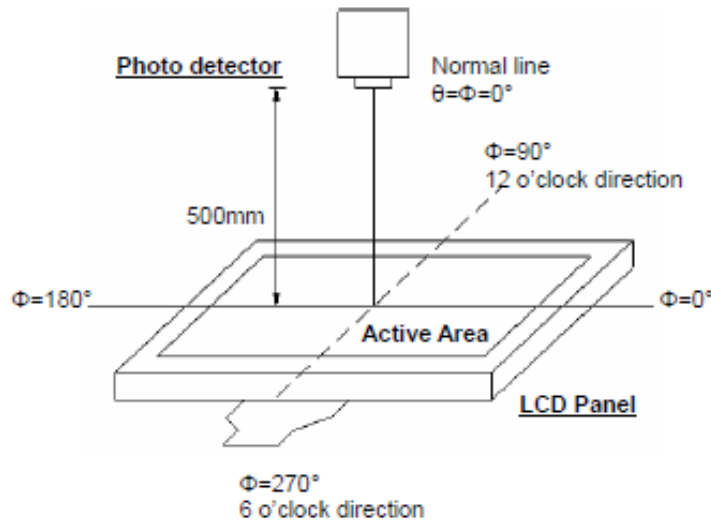
2. The test systems refer to Note 2.

Note 1: Definition of viewing angle range


Definition of viewing angle

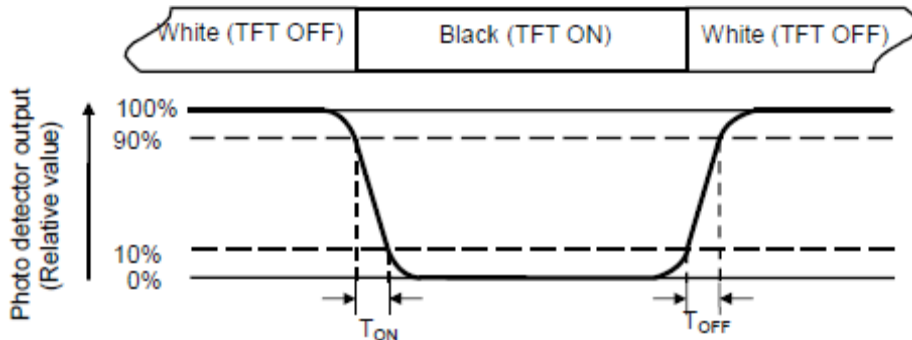
Note 2: Definition of optical measurement system.

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. (measured by BM-7A/Field of view: 1° /Distance: 500mm.)



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 (T_{ON}) is the time between photo detector output intensity changed from 90% to 10%. And fall time (T_{OFF}) is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio

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

Note 5: Definition of color chromaticity (CIE1931) Color coordinates measured at center point of LCD.

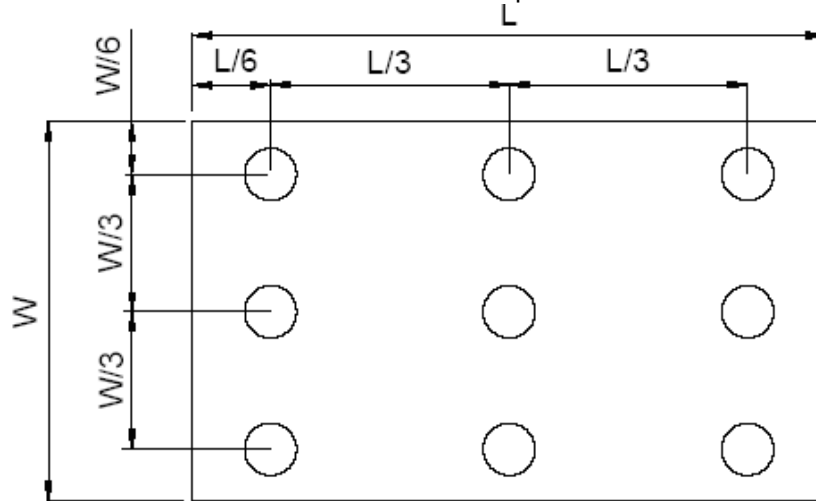
Note 6: Measure at the center area of the panel.

Note 7: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas. Every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity (Yu)} = \frac{B_{min}}{B_{max}}$$

Bmax: The measured maximum luminance of all measurement position
 Bmin: The measured minimum luminance of all measurement position

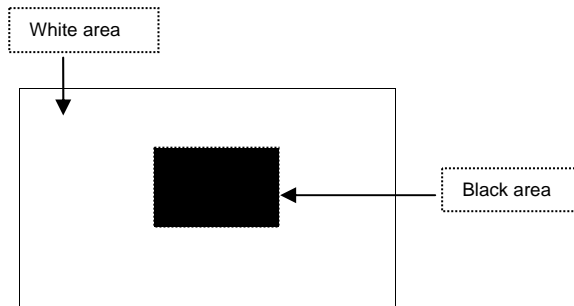


L : Active area length W : Active area width

Note 8: Definition of Image sticking (tis):

Continuously display the test pattern shown in the figure below for 2 hours. Then display a completely white screen. The previous image shall not persist more than 2 sec at 25 °C

Image sticking pattern



8. PIN ASSIGNMENT

8.1 Pin Function

Pin No.	Symbol	I/O	Function	Remark
1	Vss	P	Power Ground	
2	Vss	P	Power Ground	
3	ADJ	I	PWM Brightness control for LED B/L	
4	VDD	P	Power Supply for LED Driver circuit	
5	VDD	P	Power Supply for LED Driver circuit	
6	VDD	P	Power Supply for LED Driver circuit	
7	Vcc	P	Power Supply for Digital Circuit	
8	Vcc	P	Power Supply for Digital Circuit	
9	DE	I	Data Enable	
10	Vss	P	Power Ground	
11	Vss	P	Power Ground	
12	Vss	P	Power Ground	
13	B5	I	Blue Data 5 (MSB)	
14	B4	I	Blue Data 4	
15	B3	I	Blue Data 3	
16	Vss	P	Power Ground	
17	B2	I	Blue Data 2	
18	B1	I	Blue Data 1	
19	B0	I	Blue Data 0 (LSB)	
20	Vss	P	Power Ground	
21	G5	I	Green Data 5 (MSB)	
22	G4	I	Green Data 4	
23	G3	I	Green Data 3	
24	Vss	I	Power Ground	
25	G2	I	Green Data 2	
26	G1	I	Green Data 1	
27	G0	I	Green Data 0 (LSB)	
28	Vss	P	Power Ground	
29	R5	I	Red Data 5 (MSB)	
30	R4	I	Red Data 4	
31	R3	I	Red Data 3	
32	Vss	P	Power Ground	
33	R2	I	Red Data 2	
34	R1	I	Red Data 1	
35	R0	I	Red Data 0 (LSB)	
36	Vss	P	Power Ground	
37	Vss	P	Power Ground	
38	DCLK	I	Clock Signals ; Latch Data at the Falling Edge	
39	Vss	P	Power Ground	
40	Vss	P	Power Ground	

I: input, O: output, P: Power

Note1 : ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.

Note2 : ADJ signal is 0~3.3V.Operation frequency is 20KHz

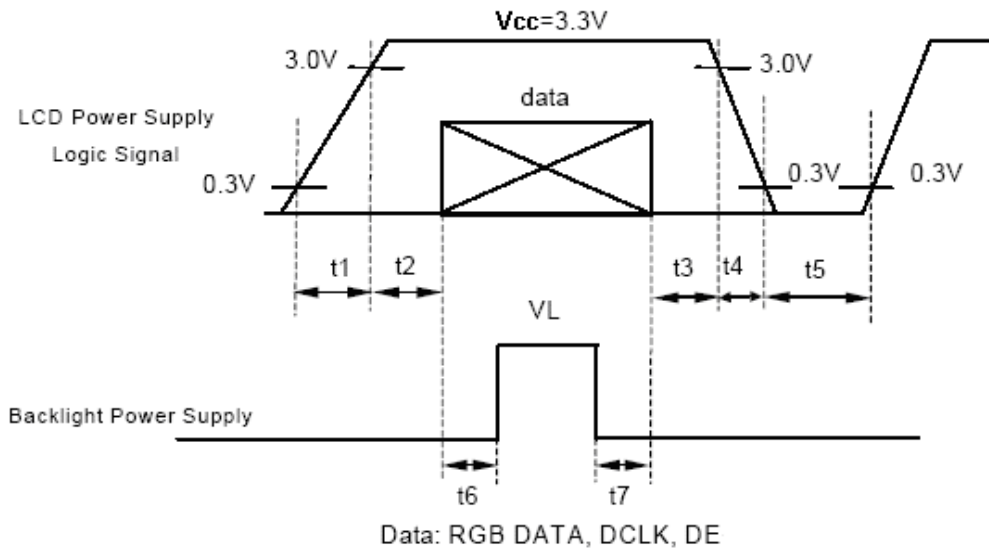
8.2 Power ON/OFF Sequence

$t1 \leq 10ms$; $1 \text{ sec} \leq t5$

$50ms \leq t2$; $200ms \leq t6$

$0 < t3 \leq 50ms$; $200ms \leq t7$

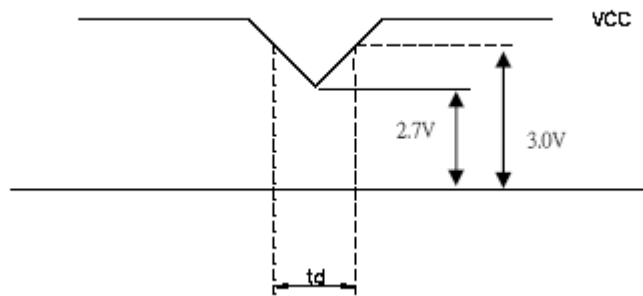
$0 < t_4 \leq 10\text{ms}$



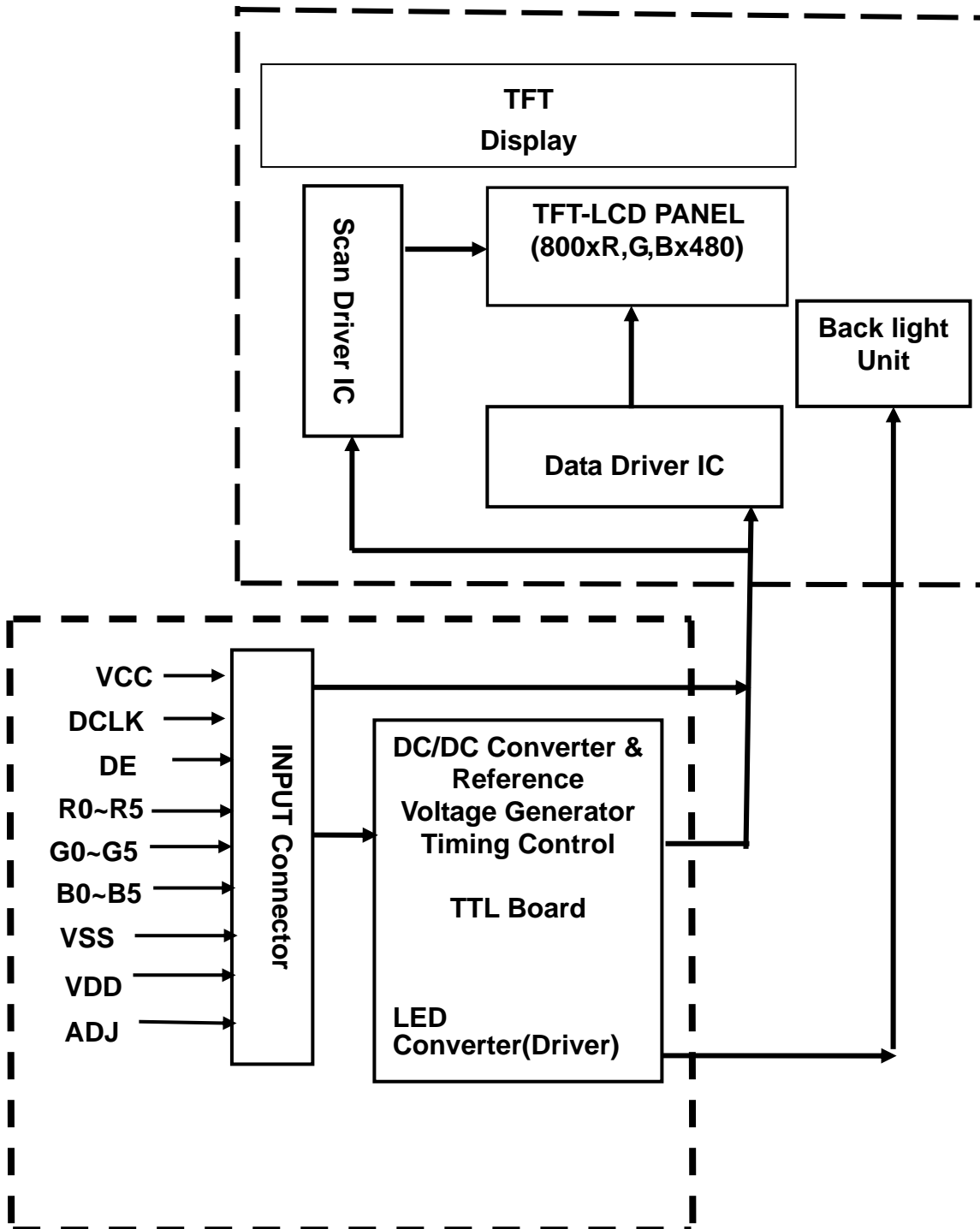
VCC-dip condition :

(1) $2.7\text{ V} \leq V_{CC} < 3.0\text{V}$, $t_d \leq 10\text{ ms}$

(2) $V_{CC} > 3.0\text{V}$, VCC-dip condition should be the same with VCC-turn-on condition .



9. BLOCK DIAGRAM



10. QUALITY ASSURANCE

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

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

Humidity : $65 \pm 5\%$

10.1.2 Operation

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

10.1.3 Container

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

10.1.4 Test Frequency

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

10.1.5 Test Method

Reliability Test Item & Level			Remark
No.	Test Item	Test Level	
1	High Temperature Storage Test	Ta=80°C,240hrs	IEC68-2-2
2	Low Temperature Storage Test	Ta=-30°C,240hrs	IEC68-2-1
3	High Temperature Operation Test	Ta=70°C,240hrs	IEC68-2-2
4	Low Temperature Operation Test	Ta=-20°C,240hrs	IEC68-2-1
5	High Temperature and High Humidity Operation Test	T=60°C,90%RH,240hrs	IEC68-2-2
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +80°C ,100 Cycles 30 min 5 min 30 min	IEC68-2-14
7	vibration test	Frequency:10~55HZ Amplitude:1.5mm Sweep time:11min Test period:6Cycles 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 1conner, 3edges,6surfaces	IEC68-2-32
10	ESD test	Location: LCM/TP surface Condition:150pf 330Ω Contact +/- 8kV Air +/-15kV Criteria: Class C	IEC61000-4-2

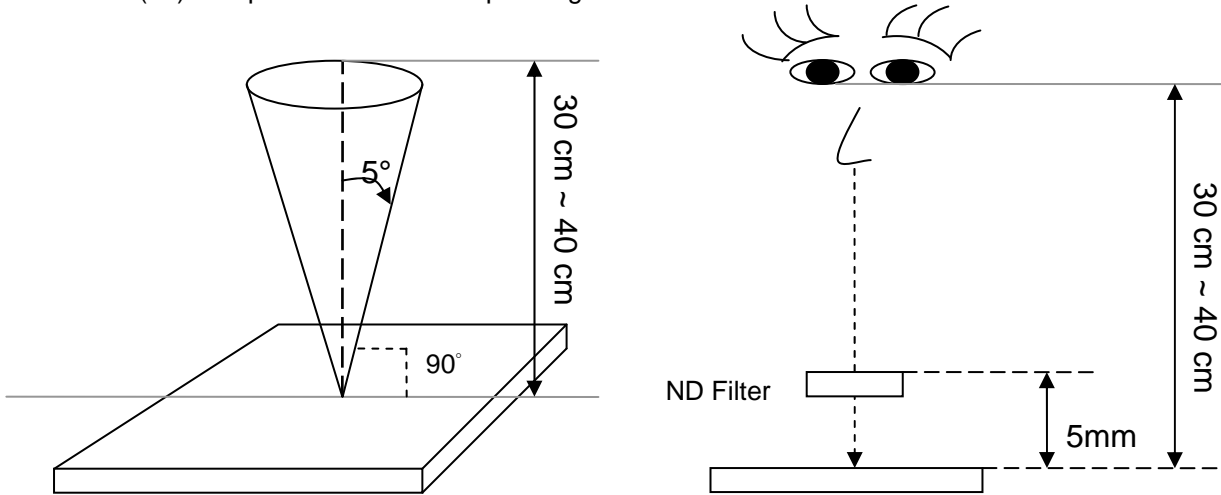
10.2 Inspection condition

10.2.1 Inspection conditions

10.2.1.1 Inspection Distance: 35 ± 5 cm

10.2.1.2 View Angle:

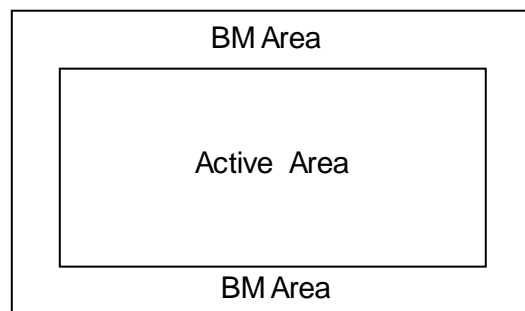
- (1) Inspection under operating condition : $\pm 5^\circ$
- (2) Inspection under non-operating condition : $\pm 45^\circ$



10.2.1.3 Environment conditions:

Ambient Temperature :		$25 \pm 5^\circ\text{C}$
Ambient Humidity :		$65 \pm 5\%$
Ambient Illumination	Cosmetic Inspection	500 ~ 800lux
	Functional Inspection	300 ~ 500lux

10.2.2 Definition of applicable Zones



10.3 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 ≤ 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>$D \leq 0.3$</td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td>$0.3 < D \leq 0.5$</td> <td>4</td> </tr> <tr> <td>$D > 0.5$</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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$D \leq 0.3$	*	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)																				
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$L \leq 5\text{mm}, W < 0.07\text{mm}$	*																			
L : Length W : Width * : Disregard																				
2	External Inspection (non-operating)	Dimension: Outline (Major)																		
		Bezel appearance: uneven (Minor)																		
		Scratch on the 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>$W > 0.1\text{mm}, L > 5\text{mm}$</td> <td>0</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td>$L \leq 5\text{mm}, 0.07\text{mm} < W \leq 0.1\text{mm}$</td> <td>4</td> </tr> <tr> <td>$L \leq 5\text{mm}, W < 0.07\text{mm}$</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 Touch panel: (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>$D \leq 0.3$</td> <td>*</td> <td rowspan="3">Minor</td> <td rowspan="3">1.5</td> </tr> <tr> <td>$0.3 < D \leq 0.5$</td> <td>4</td> </tr> <tr> <td>$D > 0.5$</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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$D > 0.5$	0																			
$D = (\text{Long} + \text{Short}) / 2$ * : Disregard																				
Polarizer flaw or leak out resin : Defect is defined as the active area.																				

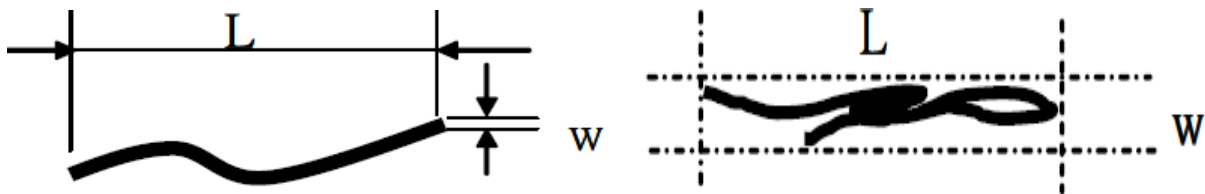
Class of defects		Definition	
	Major	AQL 0.65	It is a defect that is likely to result in failure or to reduce materially the usability of the product for the intended function.
	Minor	AQL 1.5	It is a defect that will not result in functioning problem with deviation classified.

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 .

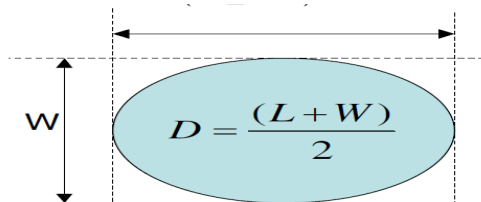
Note:2 The external inspection should be conducted at the distance 35 ± 5 cm between the eyes of inspector and the panel .

Note:3 Luminance measurement for contrast ratio is at the distance 50 ± 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 ($W \geq L/4$)



10.4 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.

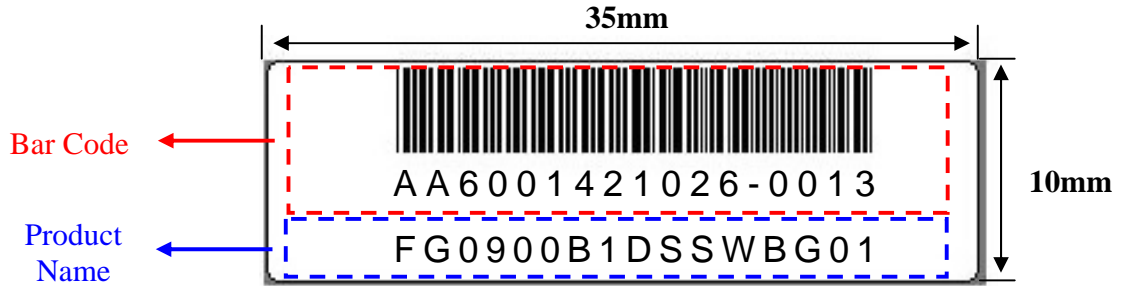
Sampling type: normal inspection, single sampling

Sampling table: ISO2859

Inspection level: Level II

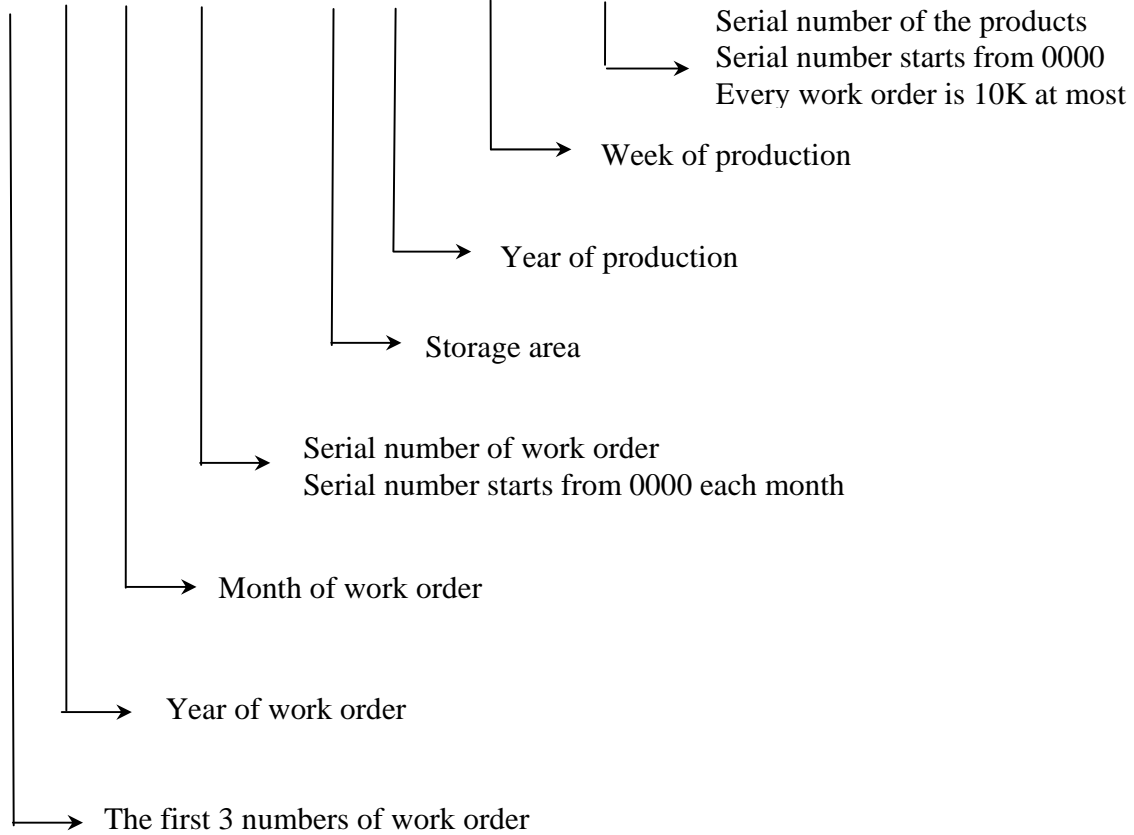
11. LCM PRODUCT LABEL DEFINE

Product Label style:

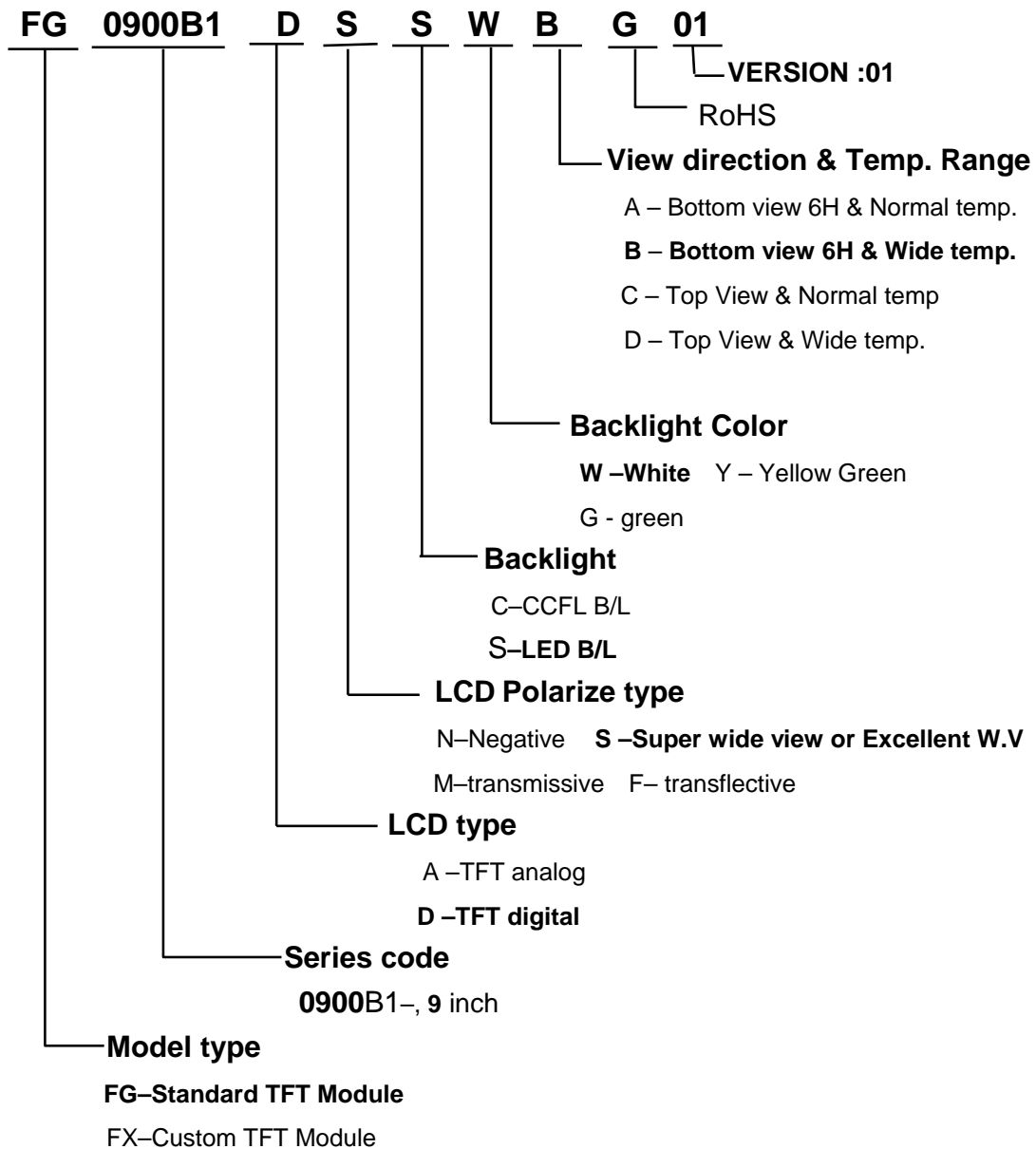


BarCode Define:

A A 6 0014 2 10 26-0013



Product Name Define:



12. PRECAUTION FOR USING LCM

1. ASSEMBLY PRECAUTIONS

- (4) You must mount a module using holes arranged in four corners or four sides.
- (5) 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.
- (6) 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.
- (7) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
- (8) Do not open the case because inside circuits do not have sufficient strength.
- (9) Please do not take a LCD module to pieces and reconstruct it. Resolving and reconstructing modules may cause them not to work well.
- (10) 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.
- (11) 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.

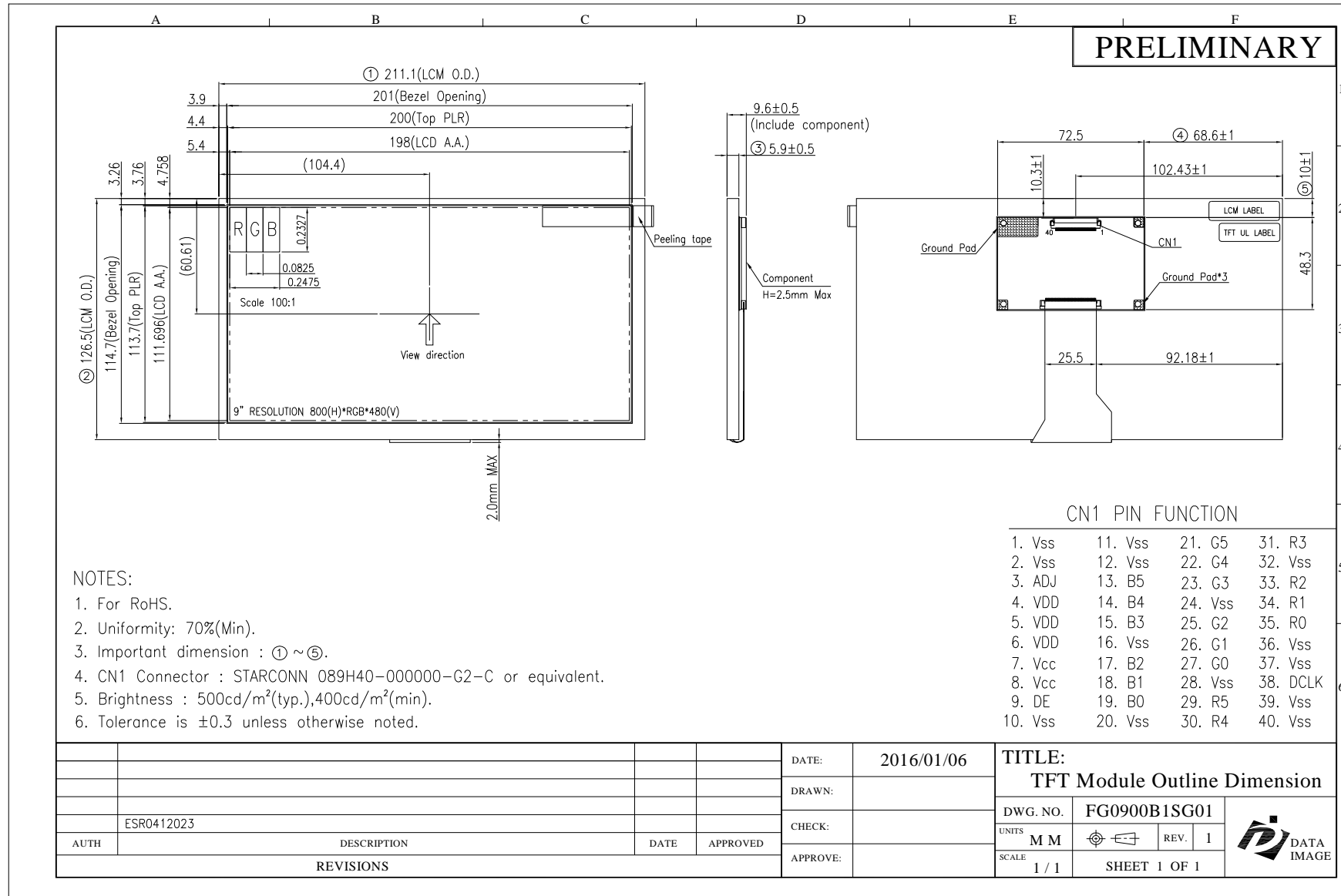
5. OTHERS

- (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:
 - (1) Please do not pile them up more than 5 boxes. (They are not designed so.) And please do not turn over.
 - (2) Please handle packaging box with care not to give them sudden shock and vibrations. And also please do not throw them up.
 - (3) 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.

13. OUTLINE DRAWING





14. PACKAGE INFORMATION

TBD