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TFT-Display Datasheet

FG1004D0DSSWVG01 | DataImage

Features

■ Active Screen Area	210.4x157.8 [mm]
■ Size Format	10,4" 4:3
■ Resolution	1024x768
■ Backlight	LED
■ Brightness	500 cd/m ²
■ LED Life Time	50K (h)
■ Interface	LVDS
■ Viewing Angle	L/R 88/88 - U/D 88/88
■ Touchscreen	no
■ Power Supply	3.3V [Typ.]
■ Module Outline	225.5x176.3x8.7 [mm]
■ Operation Temperature	-30... + 70°C
■ Storage Temperature	-30... + 80°C

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DATA IMAGE CORPORATION

TFT Module Specification

PRELIMINARY

ITEM NO.: FG1004D0DSSWMG01

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Customer Approved by	Version:	Issued Date:	Total Pages:	Prepared
	2	10/DEC/15'	23	<i>Rudy</i>



2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	29/NOV/12'			Initial Preliminary	ESR0111018
2	10/DEC/15'	9.2	15	Modify Pin.5, from Vi to VGND.	ECR110-FC0014

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	10.4 (diagonal)	inch
Display Format	1024(H) x (R,G,B) x 768(V)	dot
Active Area	210.4(H) x 157.8 (V)	mm
Pixel Pitch	0.0685 (H) x 0.2055 (V)	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension	225.5(W) x 176.3(H) x8.7(D)	mm
Surface treatment	Anti-Glare	
Back-light	LED	
Display mode	Normally Black	
Display Colors	16.2 M	color
Interface	LVDS	
Our components and processes are compliant to RoHS standard		

4. ABSOLUTE MAXIMUM RATINGS

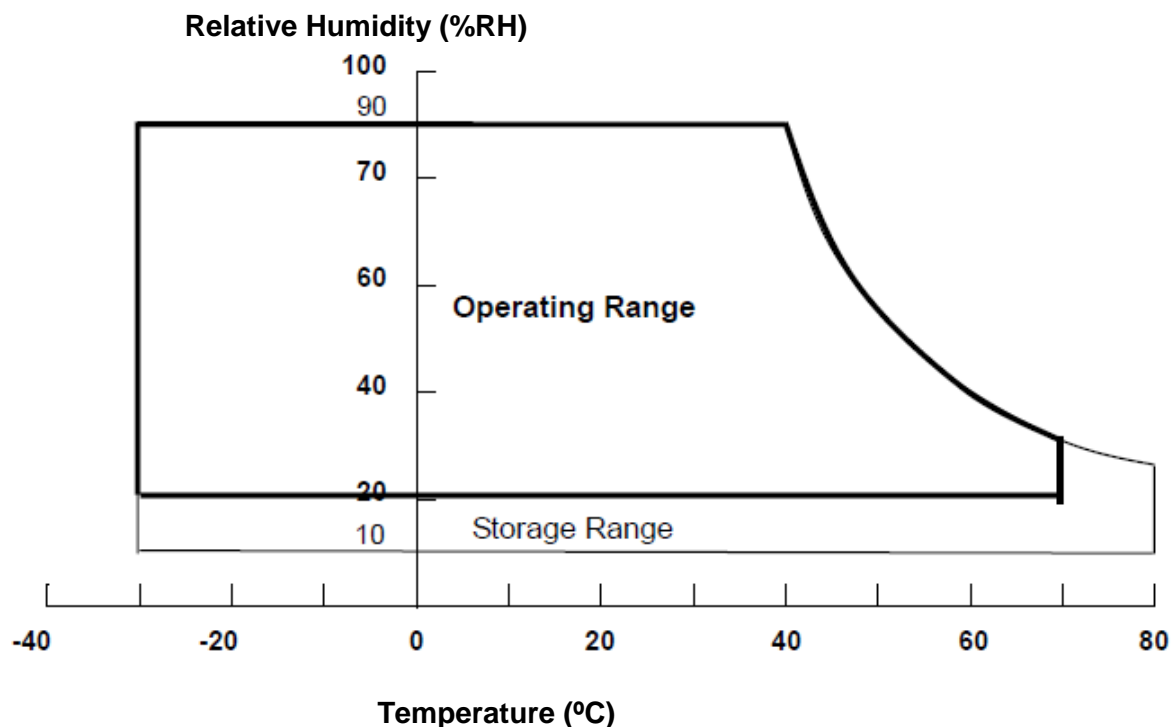
Parameter	Symbol	MIN.	MAX.	Unit	Remark
Operating Ambient Temperature	T _{OP}	-30	+70	°C	
Storage Temperature	T _{ST}	-30	+80	°C	

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ($T_a \leq 40$ °C).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40$ °C).

(c) No condensation



5. ELECTRICAL ABSOLUTE RATINGS

5.1 TFT LCD MODULE

Parameter	Symbol	MIN.	MAX.	Unit	Note
Power Supply Voltage	VCC	-0.3	7	V	(1)

5.2 LED CONVERTER

Parameter	Symbol	MIN.	MAX.	Unit	Note
Converter Voltage	V _i	-0.3	18	V	(1),(2)
Enable Voltage	EN	--	5.5	V	
Backlight Adjust	ADJ	--	5.5	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED light bar (Refer to 6.2 for further information).

6. ELECTRICAL CHARACTERISTICS

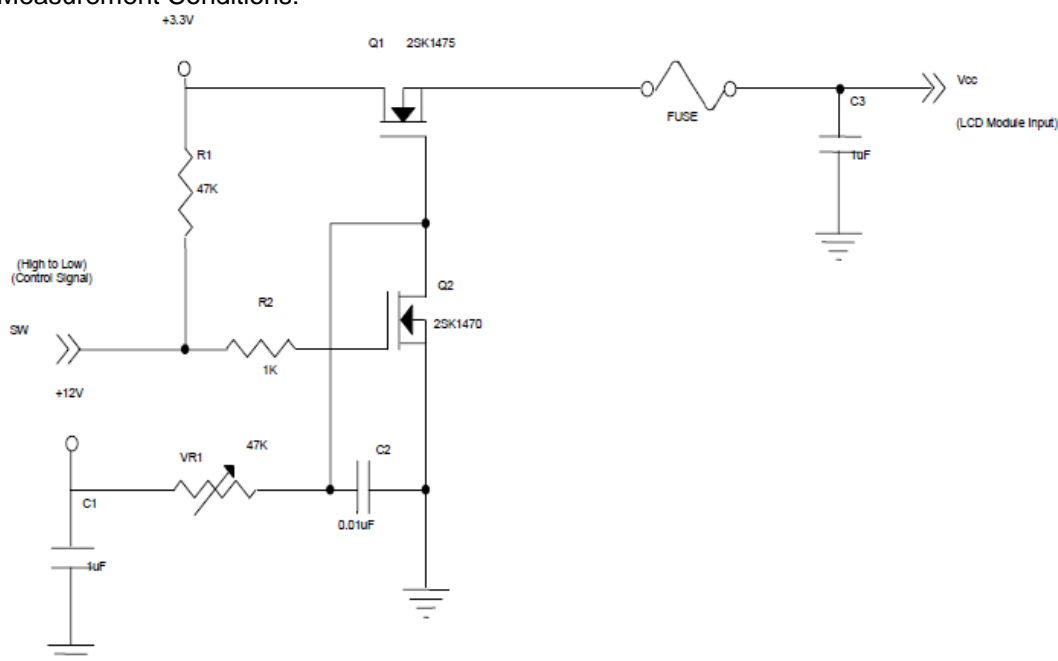
6.1 TFT LCD MODULE

T_a = 25 ± 2 °C

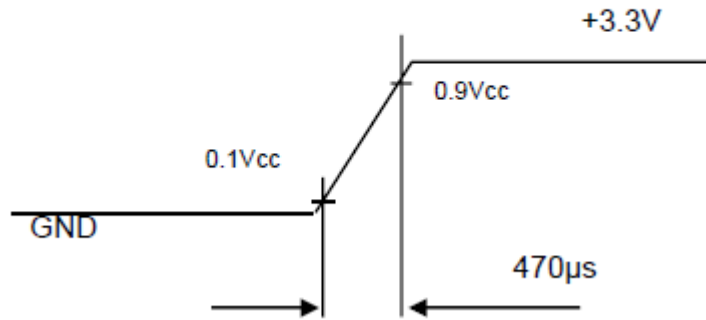
Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	(1)
Rush Current	I _{RUSH}	--	--	4.0	A	(2)
Power Supply Current	White	530	570	620	mA	(3)
	Black	380	420	460		
Power Consumption	P _L	--	1.9	--	W	
LVDS differential input voltage	V _{ID}	100	--	600	mV	
LVDS common input voltage	V _{ICM}	0.7	--	1.6	V	

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:



VCC rising time is 470us



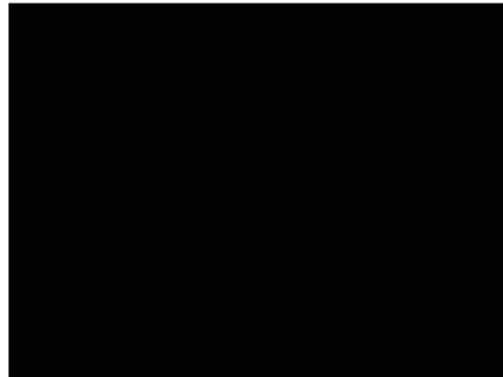
Note (3) The specified power supply current is under the conditions at $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



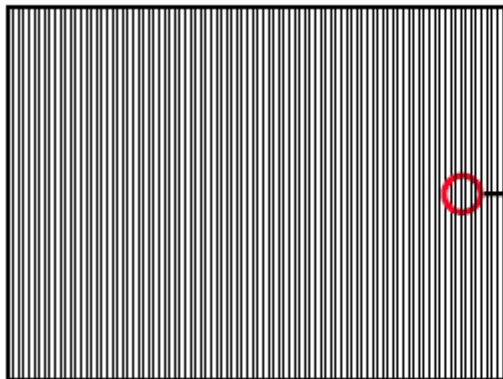
Active Area

b. Black Pattern

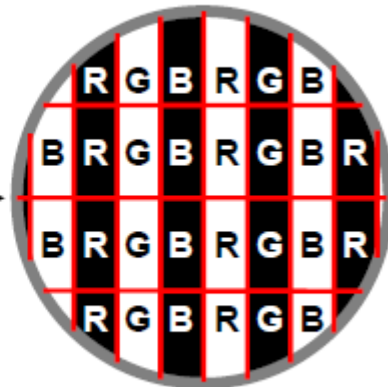


Active Area

c. Vertical Stripe Pattern



Active Area



6.2 LED CONVERTER
 $T_a = 25 \pm 2 \text{ } ^\circ\text{C}$

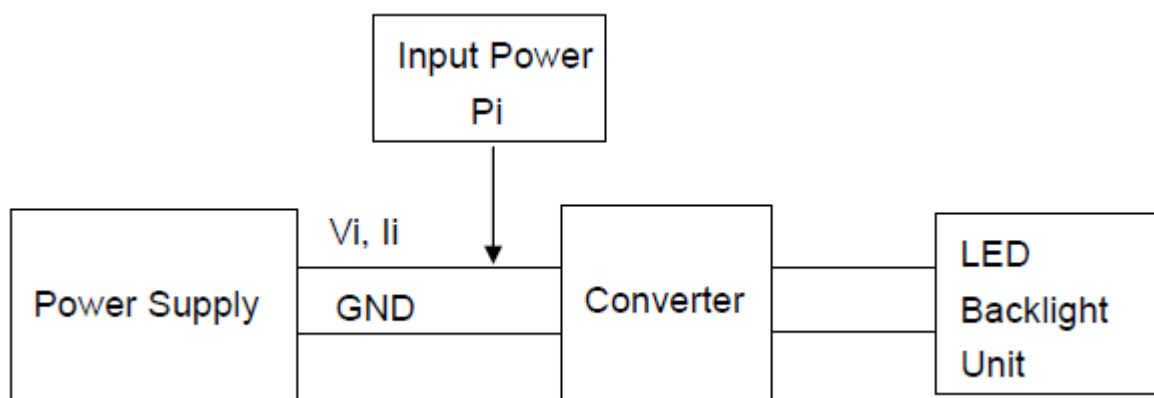
Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Note
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	(Duty 100%)
Converter Power Supply Current		I_i	--	0.7	--	A	@ $V_i = 12\text{V}$ (Duty 100%)
LED Power Consumption		P_{LED}	--	8	--		
EN Control Level	Backlight on		2.0	--	5	V	
	Backlight off		0	--	0.8	V	
PWM Control Level	PWM High Level		2.0	--	5	V	
	PWM Low Level		0	--	0.15	V	
PWM Control Duty Ratio			2		100	%	(2)
PWM Control Frequency		f_{PWM}	190	200	20k	Hz	(2)
LED Life Time		LL	50,000			Hrs	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) :At 190 ~1KHz PWM control frequency, duty ratio range is restricted from 2% to 100%.

1K ~20KHz PWM control frequency · minimum duty on-time $\geq 20 \text{ } \mu\text{s}$.

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2 \text{ } ^\circ\text{C}$ and $I_{LED} = 80\text{mA}_{DC}$ (LED forward current) until the brightness becomes $\leq 50\%$ of its original value. And minimum LED lifetime is estimated and provided by Nichia in Japan. Operating LED under high temperature environment will reduce life time and lead to color shift.



7. INTERFACE TIMING

7.1 INPUT SIGNAL TIMING SPECIFICATIONS

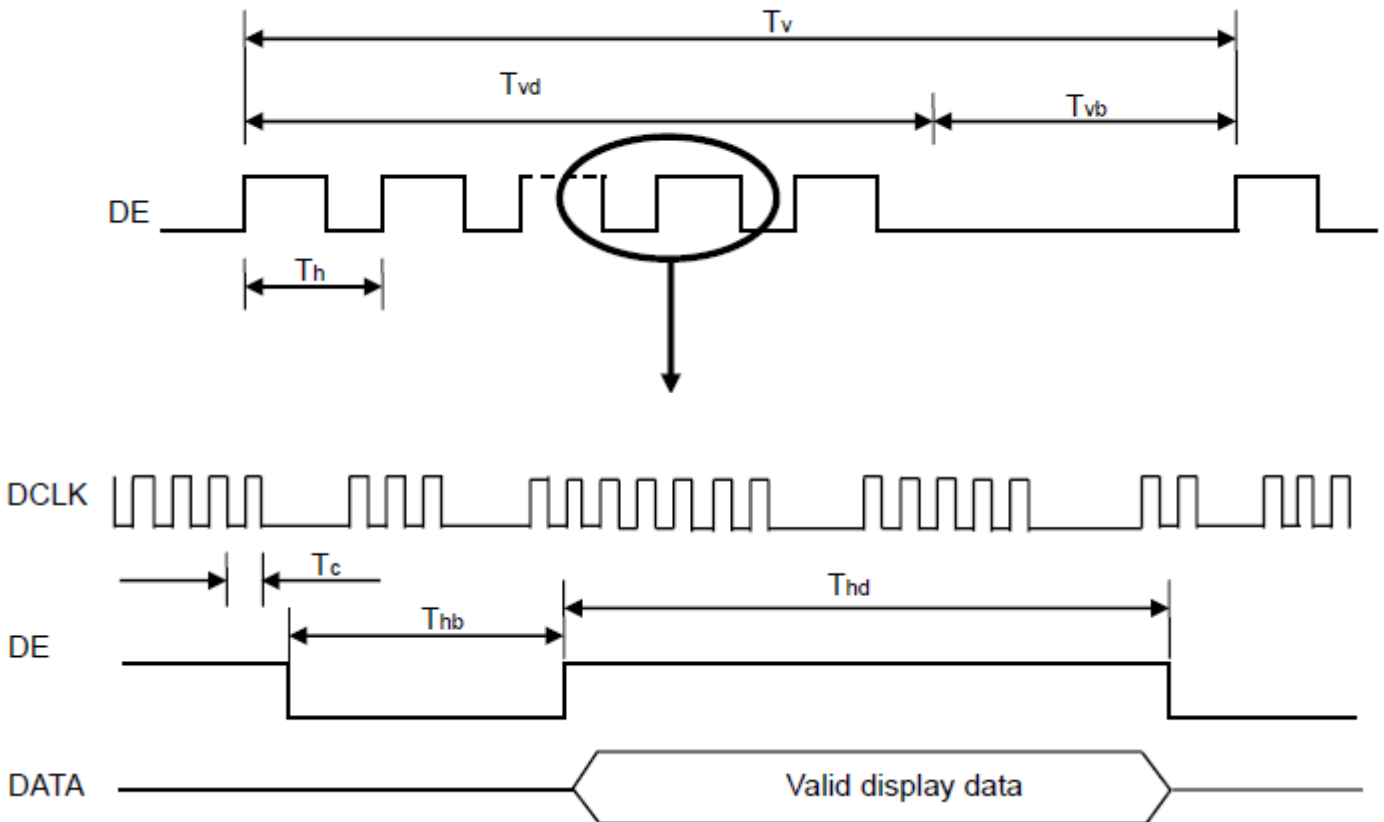
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	MIN.	TYP.	MAX.	Unit	Note
DCLK	Frequency	Fc	55	65	75	MHZ	
Vertical Active Display Term	Total	Tv	770	806	950	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768		
	Blank	Tvb	2	38	182		
Horizontal Active Display Term	Total	Tvb	1104	1344	1800	Tc	Th=Thd+Thb
	Display	Thd	1024	1024	1024		
	Blank	Thb	76	320	776		

Note (1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

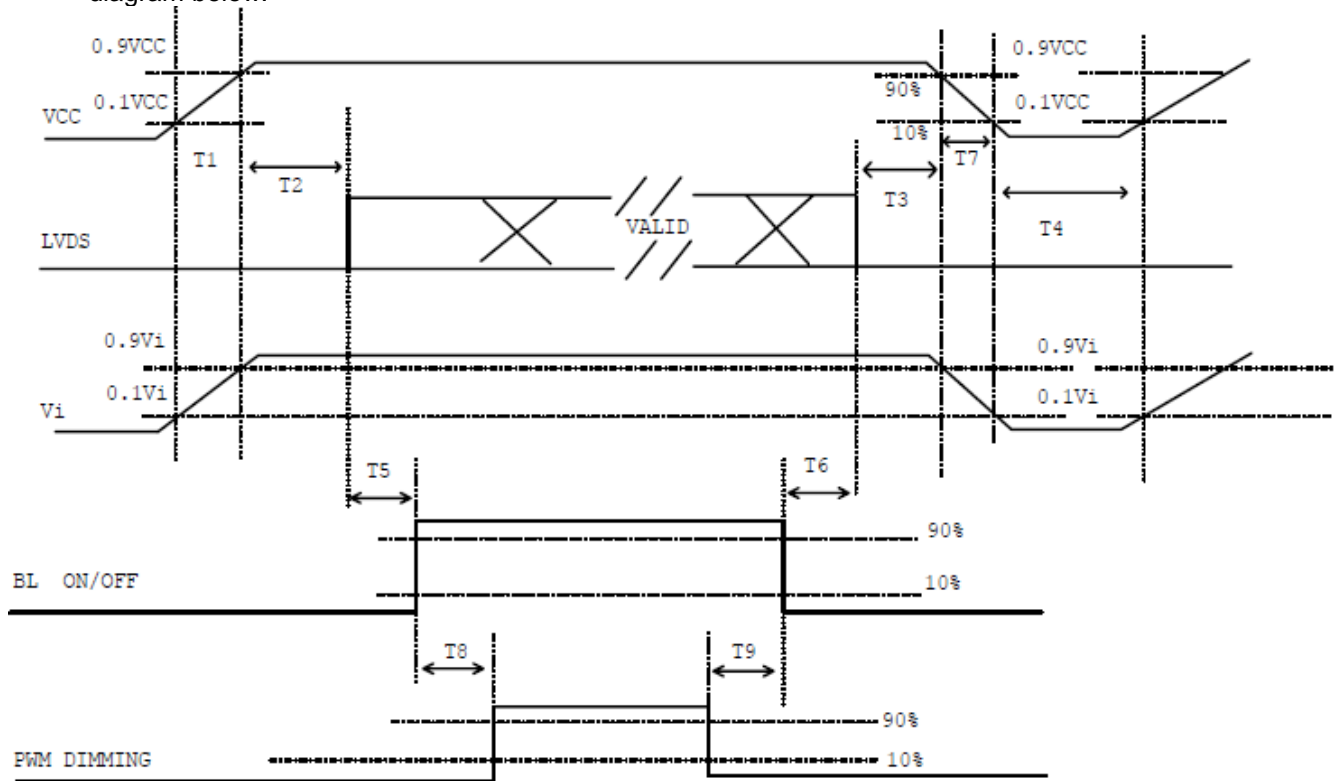
(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

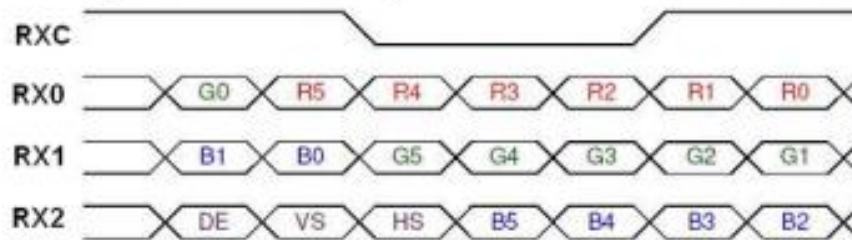
Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

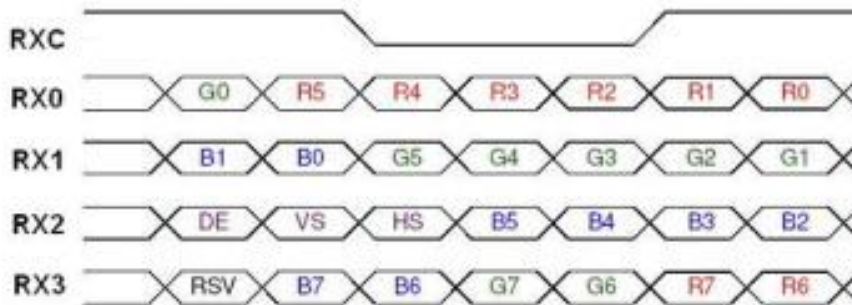
Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	--	10	ms
T2	0	--	50	
T3	0	--	50	
T4	500	--	--	
T5	200	--	--	
T6	20	--	--	
T7	5	--	300	
T8	10	--	--	
T9	10	--	--	

7.3 THE INPUT DATA FORMAT

SEL 6/8 = "High" for 6 bits LVDS Input



SEL 6/8 = "Low" or "NC" for 8 bits LVDS Input



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

Note (2) Please follow PSWG

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	Red-pixel Data
R6	Red Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
R5	Red Data 5	
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Data 7 (MSB)	
G6	Green Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
G5	Green Data 5	
G4	Green Data 4	
G3	Green Data 3	
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0 (LSB)	
B7	Blue Data 7 (MSB)	
B6	Blue Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
B5	Blue Data 5	
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
RXCLKIN+	LVDS Clock Input	
RXCLKIN-		
DE	Display Sync	
VS	Vertical Sync	
HS	Horizontal Sync	

Note (3) Output signals from any system shall be low or Hi-Z state when VCC is off

7.4 SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.



RPFI = Low/floating; normal display (default)



RPFI = high: display with 180degree rotation

8. OPTICAL CHARACTERISTIC

8.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	Vcc	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	IL	80mA	mA

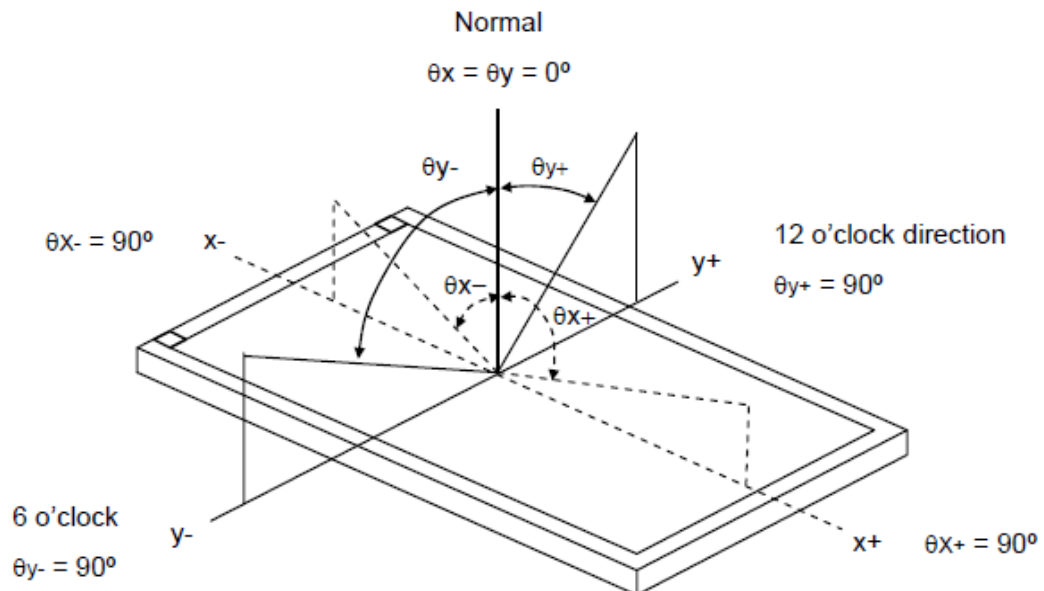
8.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 8.2. The following items should be measured under the test conditions described in 8.1 and stable environment shown in Note (6).

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction	700	1000	-	-	(2)	
Response Time	T_R		-	14	19	ms	(3)	
	T_F		-	11	16	ms		
Center Luminance of White	L_C		400	500	-	cd/m ²	(4)	
White Variation	δW		-	1.25	1.4	-	(7)	
Color Chromaticity	Red		Rx	Typ. -0.05	0.617	Typ. +0.05	-	(6)
			Ry		0.357		-	
	Green	Gx	0.336		-			
		Gy	0.567		-			
	Blue	Bx	0.147		-			
		By	0.087		-			
	White	Wx	0.313		-			
Wy		0.329	-					
Viewing Angle	Horizontal	θ_{x+}	80	88	-	Deg.	(1)	
		θ_{x-}	80	88	-			
	Vertical	θ_{y+}	80	88	-			
		θ_{y-}	80	88	-			

Note (1) Definition of Viewing Angle (θ_x, θ_y):

Viewing angles are measured by BM5A



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

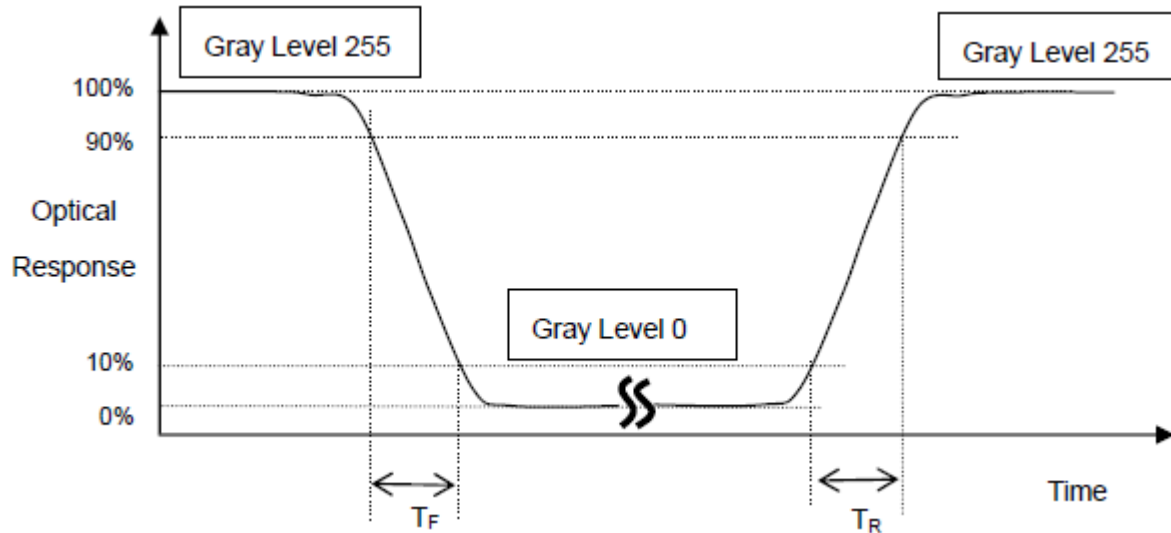
$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note(7).

Note (3) Definition of Response Time (T_R , T_F):



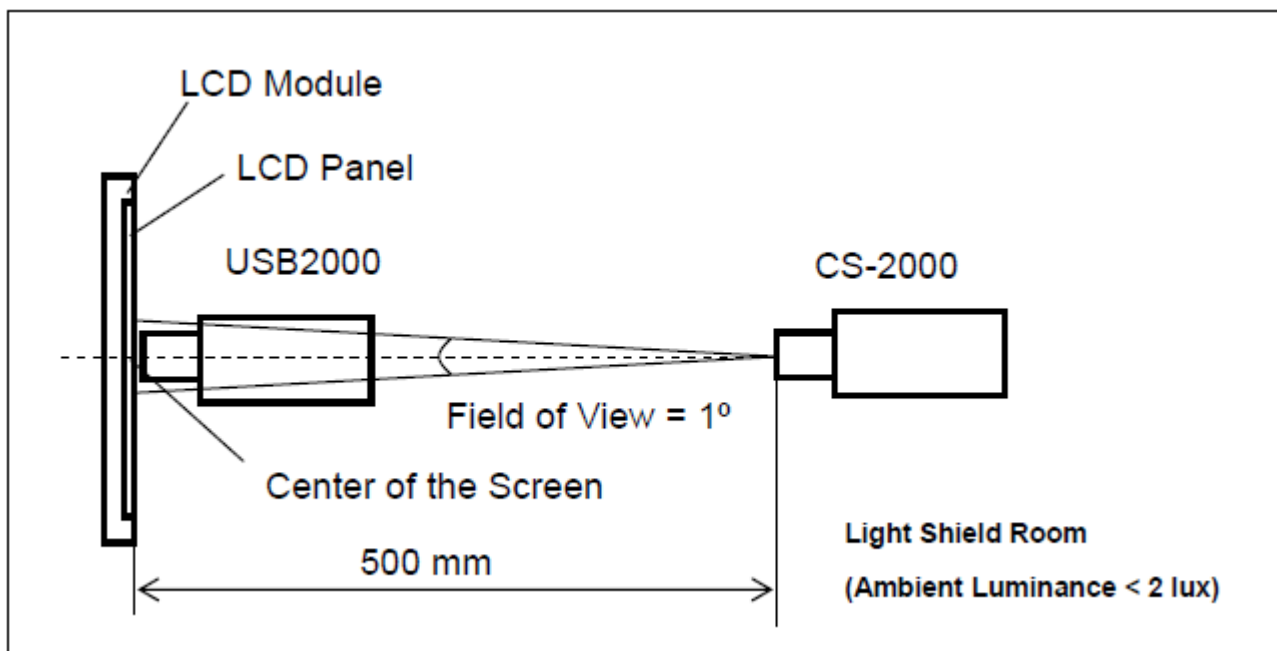
Note (4) Definition of Luminance of White (L_c):

Measure the luminance of gray level 255 at center point and 5 points

$L_c = L(5)$, where L (X) is corresponding to the luminance of the point X at the figure in Note (7).

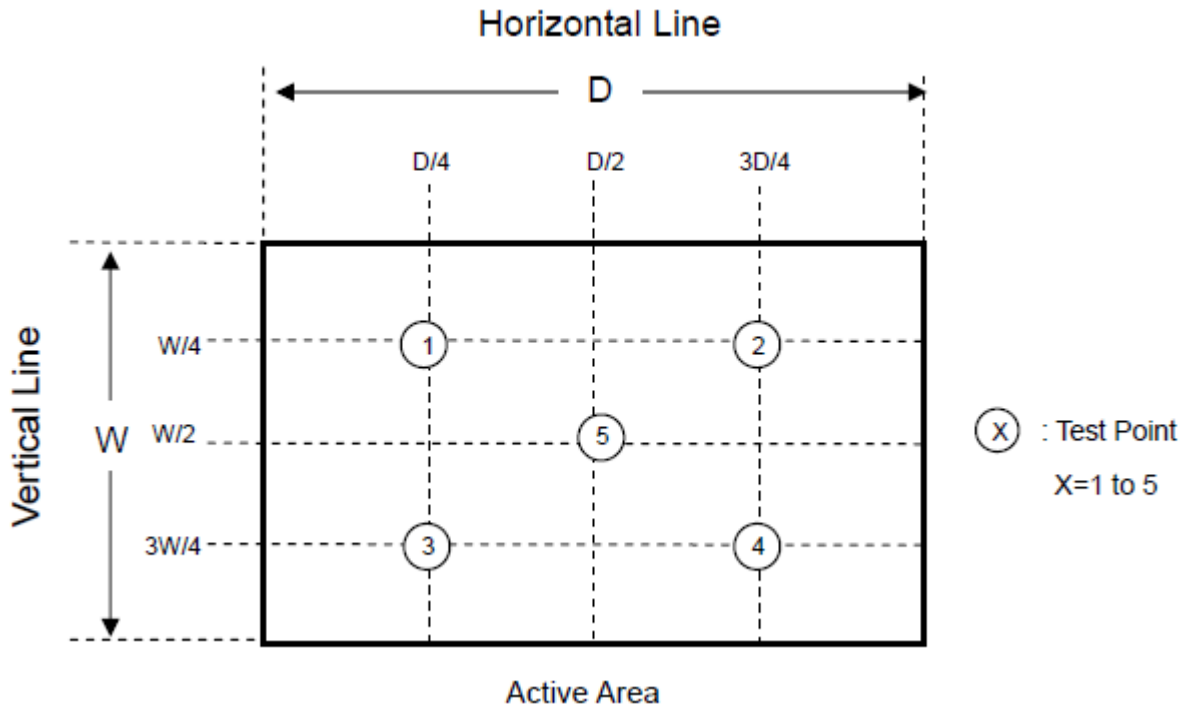
Note (5) Measurement Setup:

The LCD assembly should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (6) Definition of White Variation (δW):
 Measure the luminance of gray level 63 (255) at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



9. PIN CONNECTIONS

9.1 CN1 CONNECTOR PIN ASSIGNMENT

Pin	Name	Description	Note
1	VCC	Power Supply : +3.3V	
2	VCC	Power Supply : +3.3V	
3	VCC	Power Supply : +3.3V	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	RPFI	Reverse Panel Function (Display Rotation)	(2)
8	NC	No connection	
9	NC	No connection	
10	NC	No connection	
11	SEL6/8	LVDS 6/8 bit select function control, Low or NC → 8 bit Input Mode High → 6bit Input Mode	(2)
12	GND	Ground	
13	NC	No connection	
14	NC	No connection	
15	RX0-	Negative transmission data of pixel 0	
16	RX0+	Positive transmission data of pixel 0	
17	GND	Ground	
18	RX1-	Negative transmission data of pixel 1	
19	RX1+	Positive transmission data of pixel 1	
20	GND	Ground	
21	RX2-	Negative transmission data of pixel 2	
22	RX2+	Positive transmission data of pixel 2	
23	GND	Ground	
24	RXCLK-	Negative of clock	
25	RXCLK+	Positive of clock	
26	GND	Ground	
27	RX3-	Negative transmission data of pixel 3	
28	RX3+	Positive transmission data of pixel 3	
29	GND	Ground	
30	NC	No connection	(2)

Note (1) Connector Part No.: JAE, FI-XB30SRL-HF11 or compatible connector

Note (2) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected".

9.2 CN2(Backlight Connector)

Pin	Name	Description	Remark
1	Vi	Converter input voltage	12V
2	Vi	Converter input voltage	12V
3	Vi	Converter input voltage	12V
4	Vi	Converter input voltage	12V
5	VGND	Converter ground	Ground
6	VGND	Converter ground	Ground
7	VGND	Converter ground	Ground
8	VGND	Converter ground	Ground
9	EN	Enable pin	3.3V
10	ADJ	Backlight Adjust	PWM Dimming

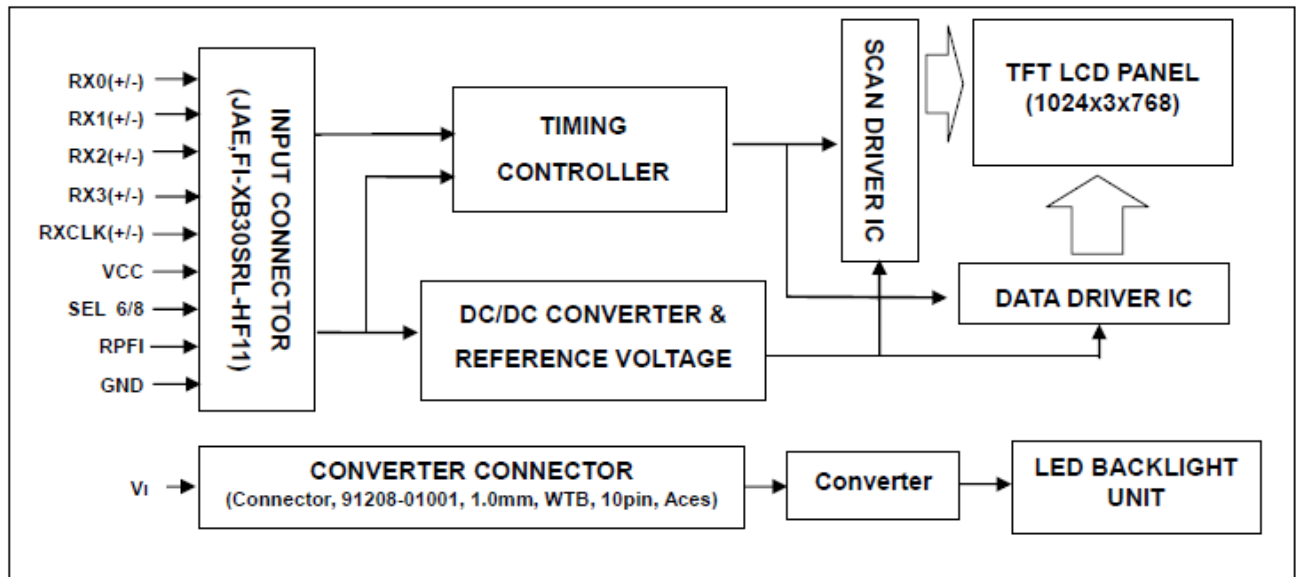
9.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

Note (1) 0: Low Level Voltage, 1: High Level Voltage

9.4. BLOCK DIAGRAM



10. QUALITY ASSURANCE
10.1 RELIABILITY TEST

Test Item	Test Condition	Note
High Temperature Storage Test	80°C, 240 hours	(1) (2)
Low Temperature Storage Test	-30°C, 240 hours	
Thermal Shock Storage Test	-20°C, 0.5hour←→70°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	70°C, 240 hours	
Low Temperature Operation Test	-30°C, 240 hours	
High Temperature & High Humidity Operation Test	60°C, 90%RH, 240hours	
Shock (Non-Operating)	50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z.	(3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)

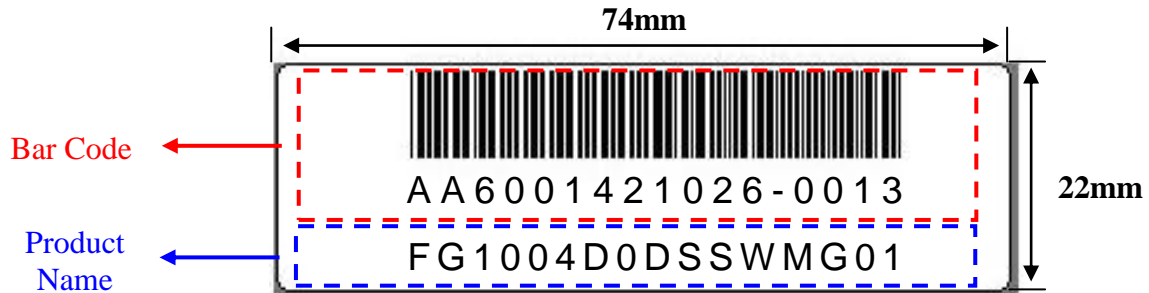
Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 80 °C Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

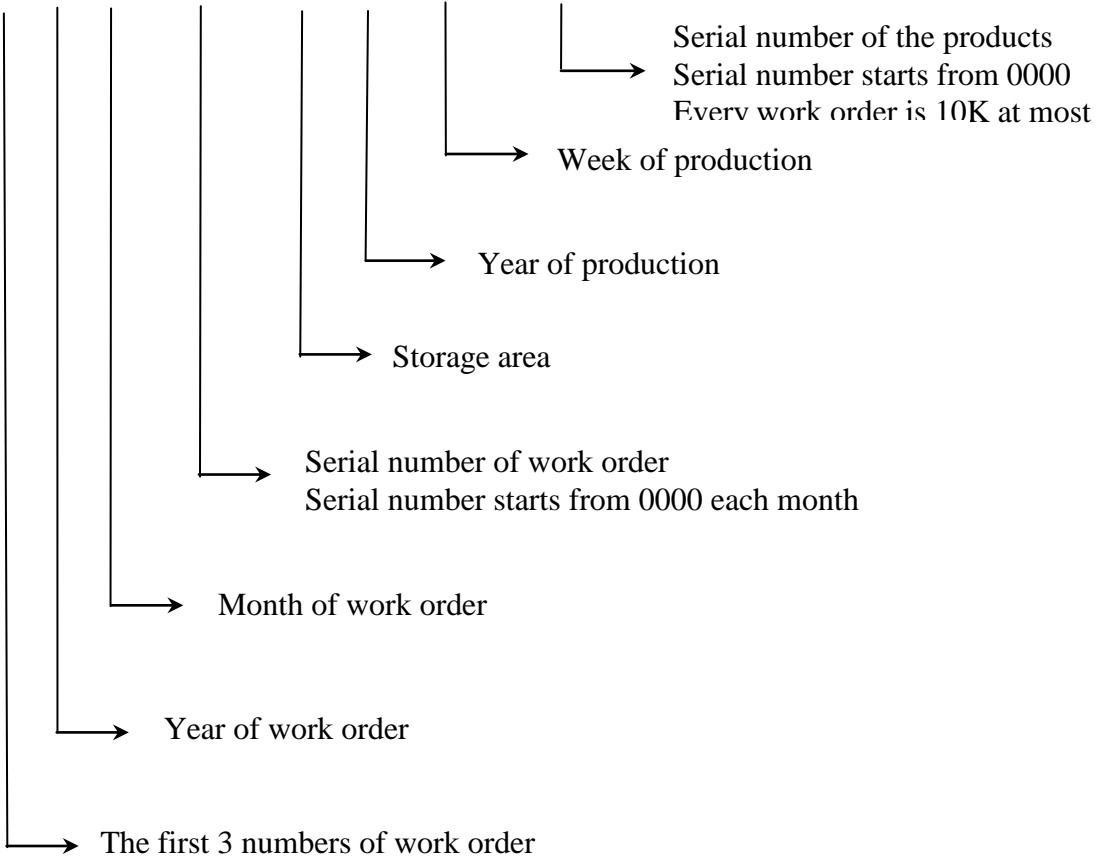
11. LCM Product Label Define

Product Label style:

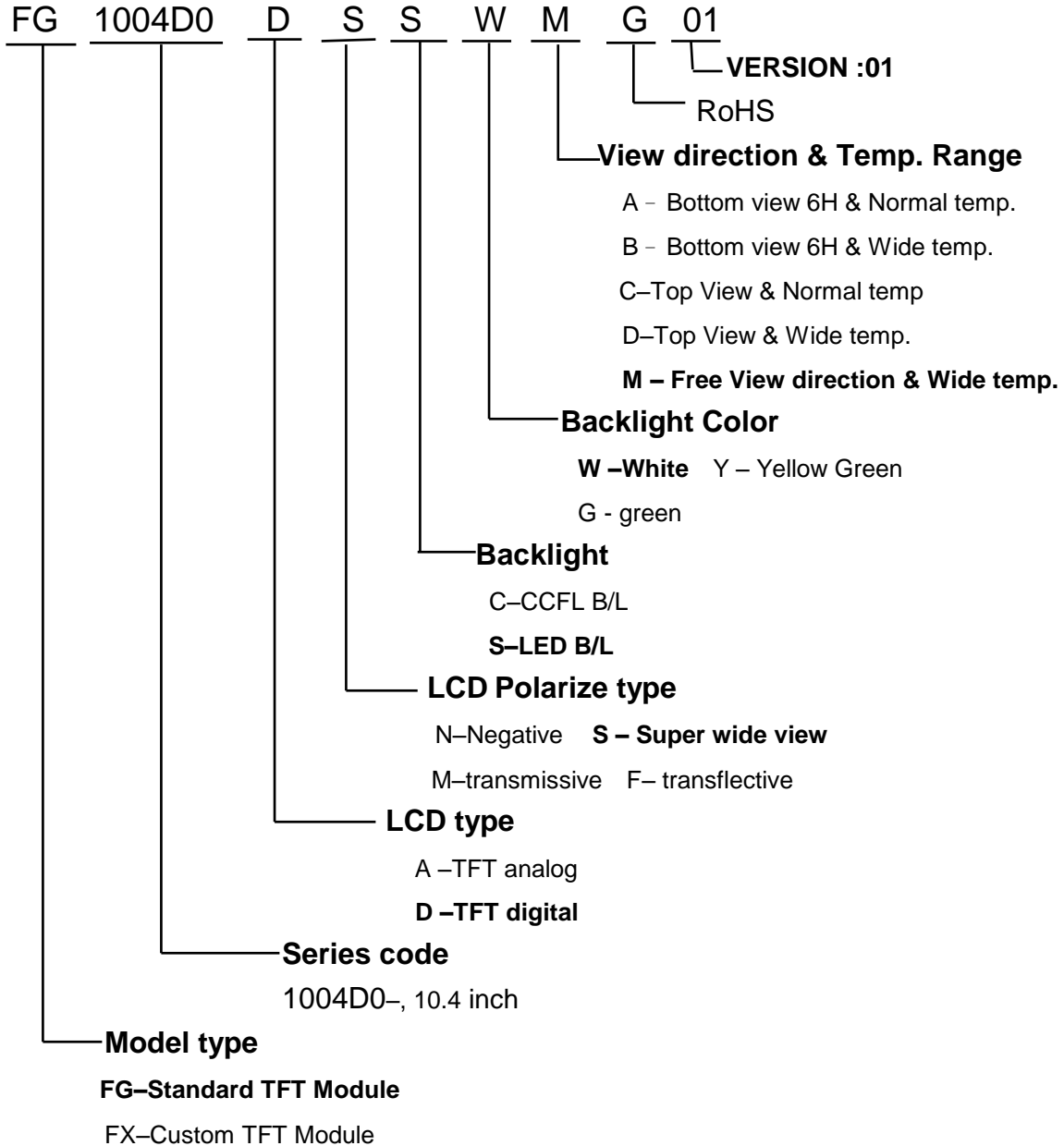


BarCode Define:

A A 6 0014 2 10 26-0013



Product Name Define:



12. 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.

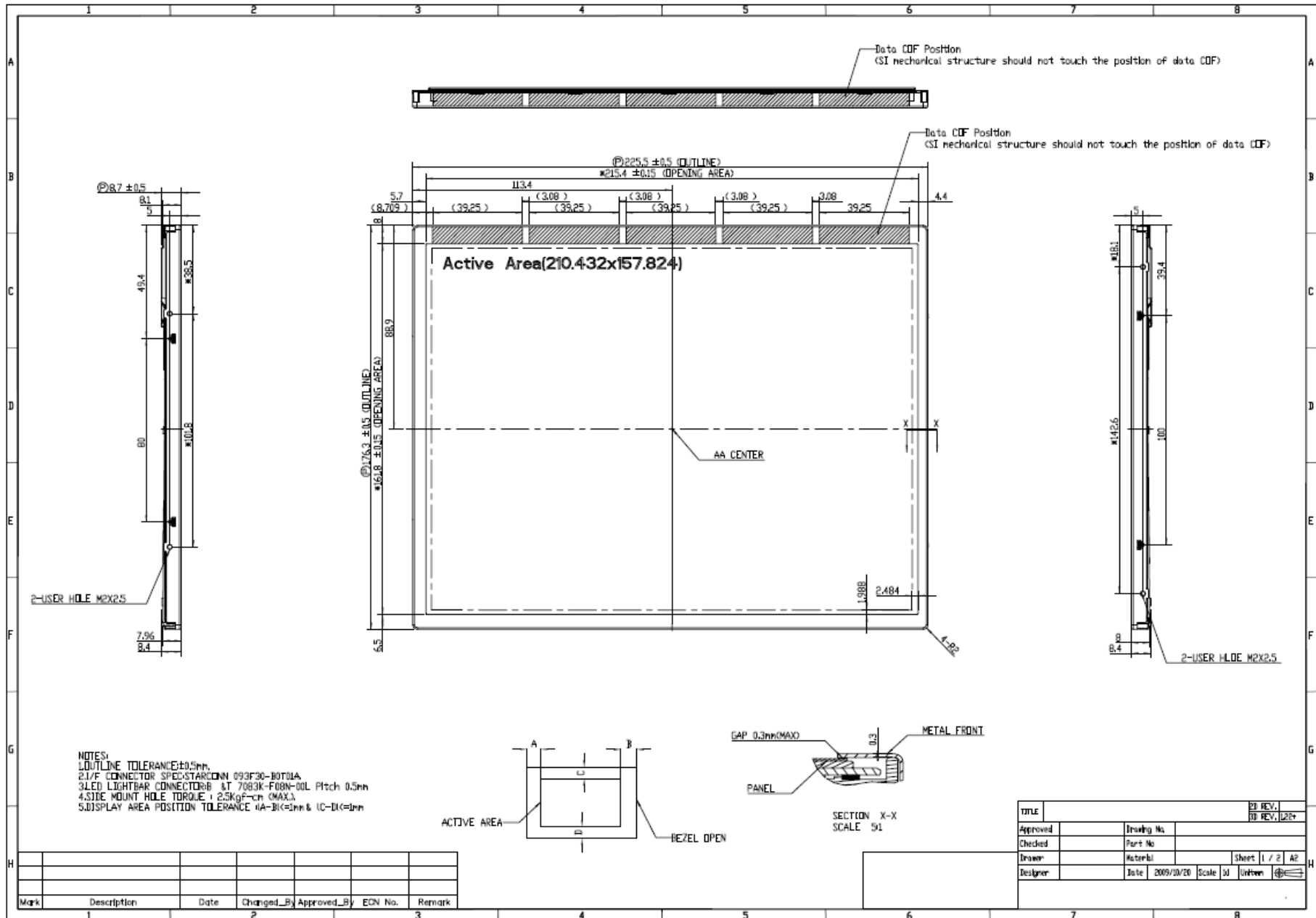
5. OTHERS

- (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.

Confidential Document
13. OUTLINE DRAWING



14. PACKAGE INFORMATION

TBD

DATA IMAGE CORPORATION

TFT Module Specification

PRELIMINARY

ITEM NO.: FG1004D0DSSWMG01

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Customer Companies	QA Approved	DQA Check	R&D Approved	R&D Check
	<i>Beth Jui</i>	<i>Huong</i>	<i>Alex</i>	<i>Nomo</i>
Customer Approved by	Version:	Issued Date:	Total Pages:	Prepared
	2	10/DEC/15'	23	<i>Rudy</i>

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment	Source
1	29/NOV/12'			Initial Preliminary	ESR0111018
2	10/DEC/15'	9.2	15	Modify Pin.5, from Vi to VGND.	ECR110-FC0014

3. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	10.4 (diagonal)	inch
Display Format	1024(H) x (R,G,B) x 768(V)	dot
Active Area	210.4(H) x 157.8 (V)	mm
Pixel Pitch	0.0685 (H) x 0.2055 (V)	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension	225.5(W) x 176.3(H) x8.7(D)	mm
Surface treatment	Anti-Glare	
Back-light	LED	
Display mode	Normally Black	
Display Colors	16.2 M	color
Interface	LVDS	
Our components and processes are compliant to RoHS standard		

4. ABSOLUTE MAXIMUM RATINGS

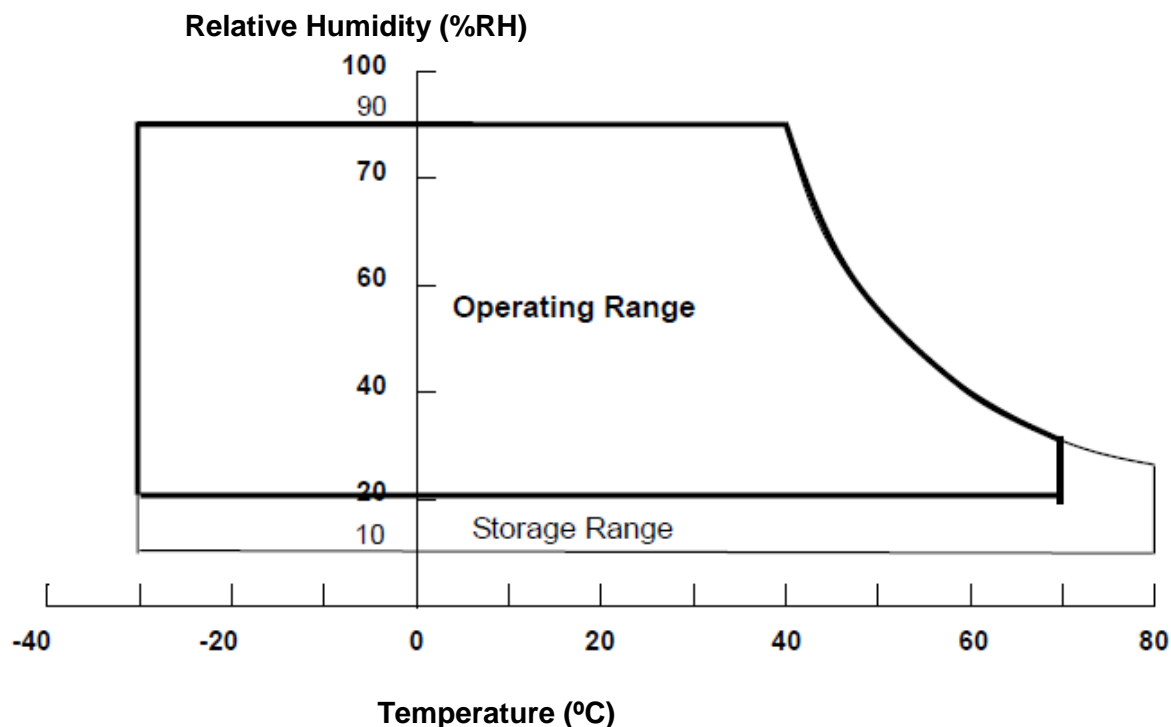
Parameter	Symbol	MIN.	MAX.	Unit	Remark
Operating Ambient Temperature	T _{OP}	-30	+70	°C	
Storage Temperature	T _{ST}	-30	+80	°C	

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. ($T_a \leq 40$ °C).

(b) Wet-bulb temperature should be 39 °C Max. ($T_a > 40$ °C).

(c) No condensation



5. ELECTRICAL ABSOLUTE RATINGS

5.1 TFT LCD MODULE

Parameter	Symbol	MIN.	MAX.	Unit	Note
Power Supply Voltage	VCC	-0.3	7	V	(1)

5.2 LED CONVERTER

Parameter	Symbol	MIN.	MAX.	Unit	Note
Converter Voltage	V _i	-0.3	18	V	(1),(2)
Enable Voltage	EN	--	5.5	V	
Backlight Adjust	ADJ	--	5.5	V	

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for LED light bar (Refer to 6.2 for further information).

6. ELECTRICAL CHARACTERISTICS

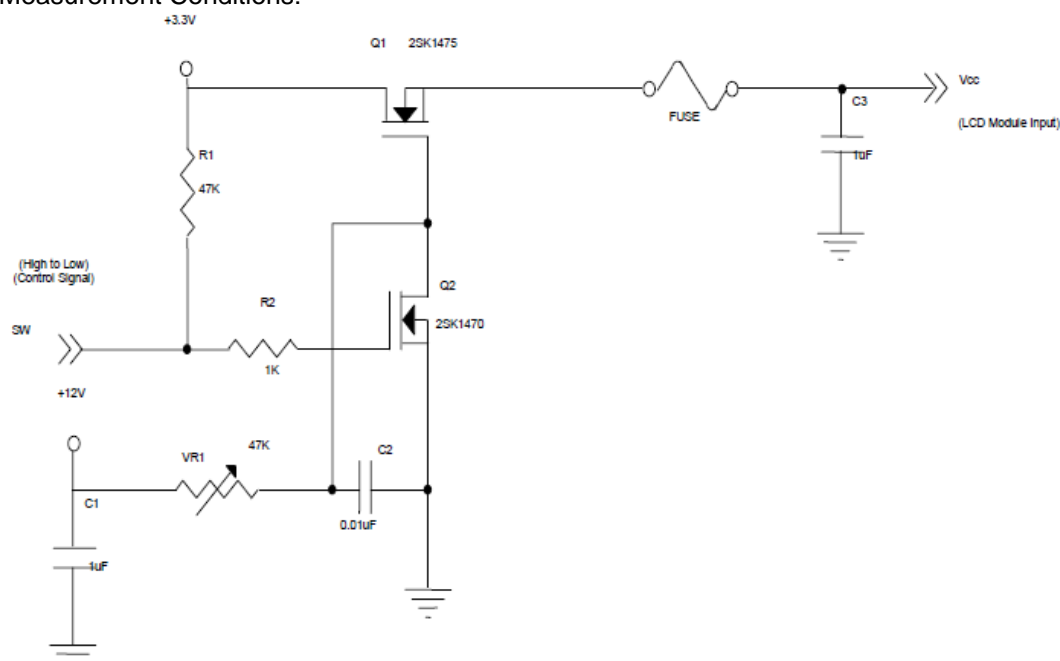
6.1 TFT LCD MODULE

T_a = 25 ± 2 °C

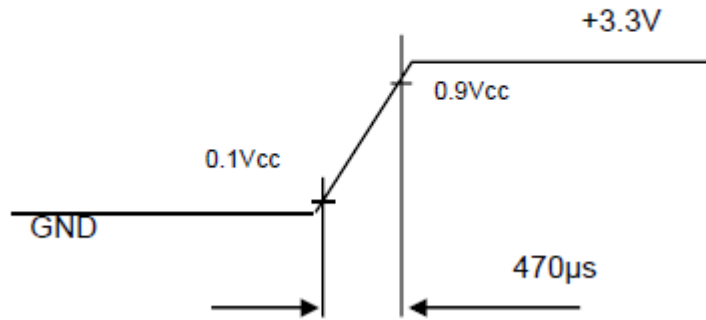
Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Note
Power Supply Voltage	V _{CC}	3.0	3.3	3.6	V	(1)
Rush Current	I _{RUSH}	--	--	4.0	A	(2)
Power Supply Current	White	530	570	620	mA	(3)
	Black	380	420	460		
Power Consumption	P _L	--	1.9	--	W	
LVDS differential input voltage	V _{ID}	100	--	600	mV	
LVDS common input voltage	V _{ICM}	0.7	--	1.6	V	

Note (1) The assembly should be always operated within above ranges.

Note (2) Measurement Conditions:



VCC rising time is 470us



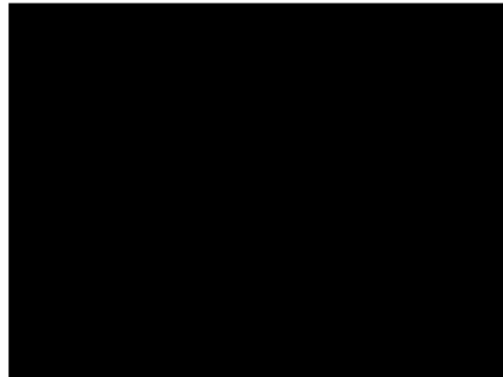
Note (3) The specified power supply current is under the conditions at $V_{cc} = 3.3\text{ V}$, $T_a = 25 \pm 2\text{ }^\circ\text{C}$, $f_v = 60\text{ Hz}$, whereas a power dissipation check pattern below is displayed.

a. White Pattern



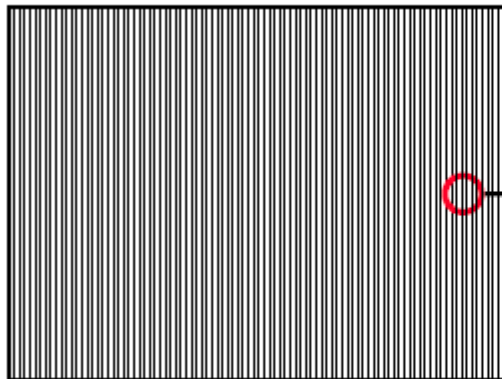
Active Area

b. Black Pattern

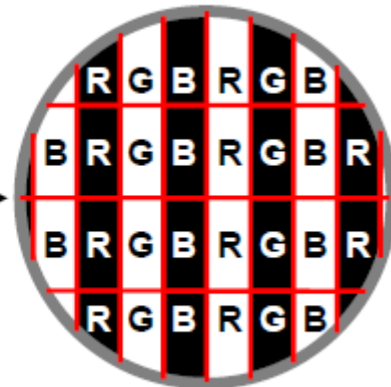


Active Area

c. Vertical Stripe Pattern



Active Area



6.2 LED CONVERTER
 $T_a = 25 \pm 2 \text{ }^\circ\text{C}$

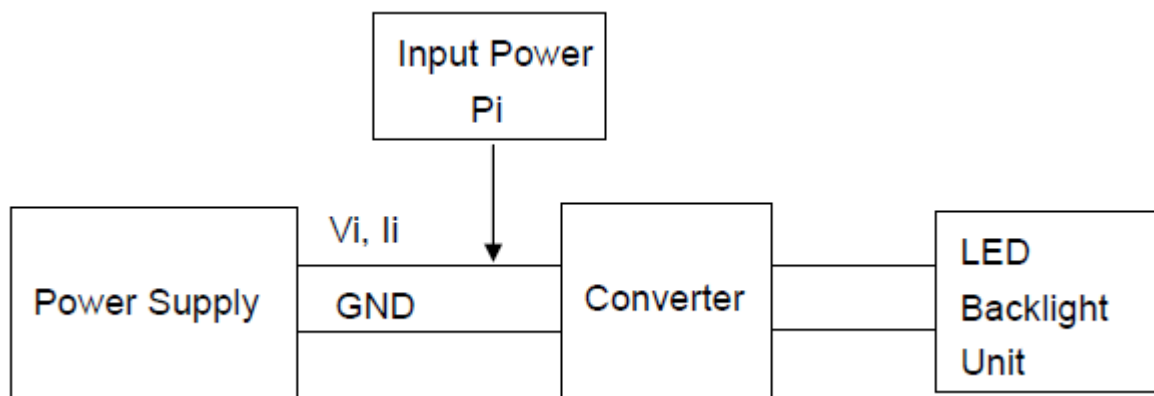
Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Note
Converter Power Supply Voltage		V_i	10.8	12.0	13.2	V	(Duty 100%)
Converter Power Supply Current		I_i	--	0.7	--	A	@ $V_i = 12\text{V}$ (Duty 100%)
LED Power Consumption		P_{LED}	--	8	--		
EN Control Level	Backlight on		2.0	--	5	V	
	Backlight off		0	--	0.8	V	
PWM Control Level	PWM High Level		2.0	--	5	V	
	PWM Low Level		0	--	0.15	V	
PWM Control Duty Ratio			2		100	%	(2)
PWM Control Frequency		f_{PWM}	190	200	20k	Hz	(2)
LED Life Time		LL	50,000			Hrs	(3)

Note (1) LED current is measured by utilizing a high frequency current meter as shown below:

Note (2) :At 190 ~1KHz PWM control frequency, duty ratio range is restricted from 2% to 100%.

1K ~20KHz PWM control frequency · minimum duty on-time $\geq 20 \text{ } \mu\text{s}$.

Note (3) The lifetime of LED is defined as the time when it continues to operate under the conditions at $T_a = 25 \pm 2 \text{ }^\circ\text{C}$ and $I_{LED} = 80\text{mA}_{DC}$ (LED forward current) until the brightness becomes $\leq 50\%$ of its original value. And minimum LED lifetime is estimated and provided by Nichia in Japan. Operating LED under high temperature environment will reduce life time and lead to color shift.



7. INTERFACE TIMING

7.1 INPUT SIGNAL TIMING SPECIFICATIONS

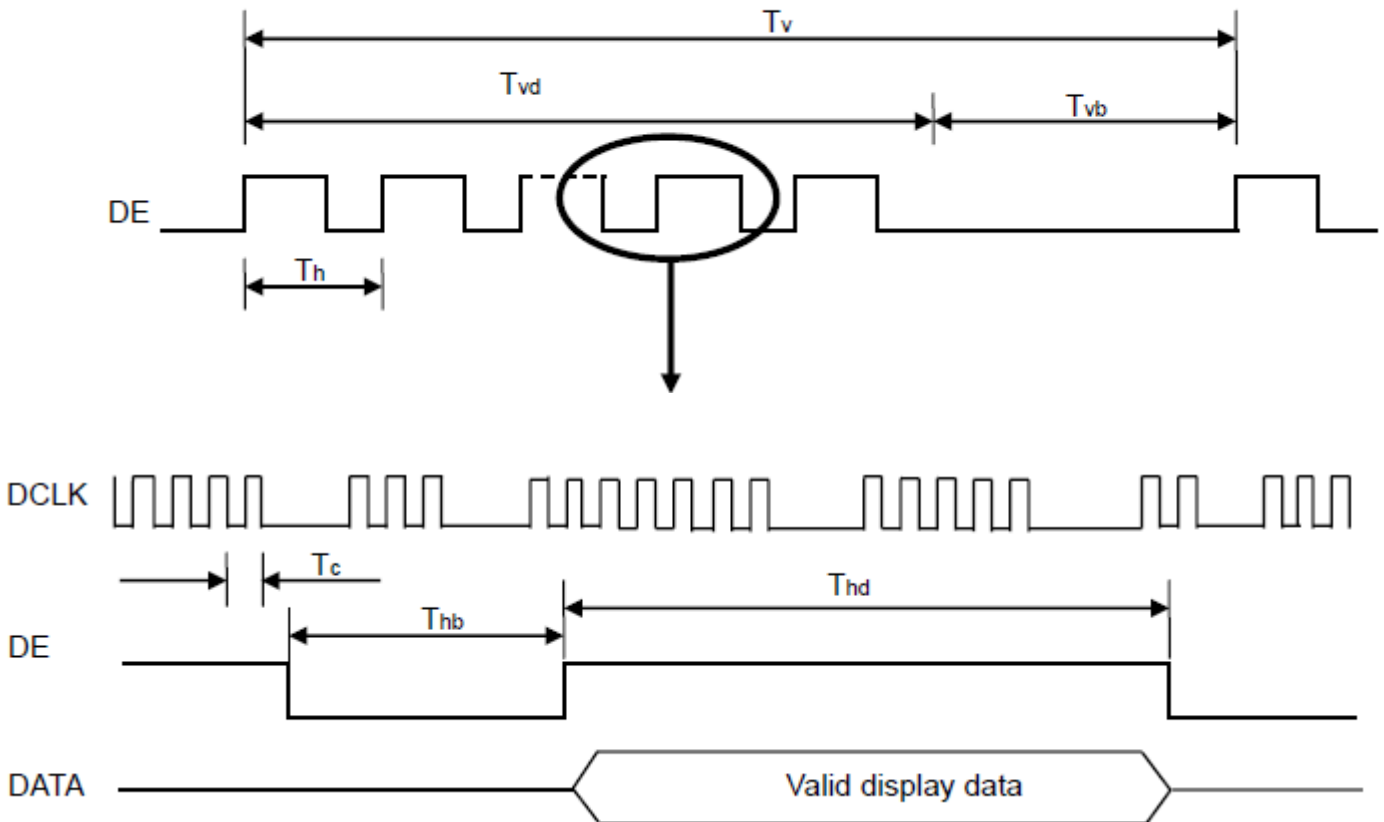
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	MIN.	TYP.	MAX.	Unit	Note
DCLK	Frequency	Fc	55	65	75	MHZ	
Vertical Active Display Term	Total	Tv	770	806	950	Th	Tv=Tvd+Tvb
	Display	Tvd	768	768	768		
	Blank	Tvb	2	38	182		
Horizontal Active Display Term	Total	Tvb	1104	1344	1800	Tc	Th=Thd+Thb
	Display	Thd	1024	1024	1024		
	Blank	Thb	76	320	776		

Note (1) Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.

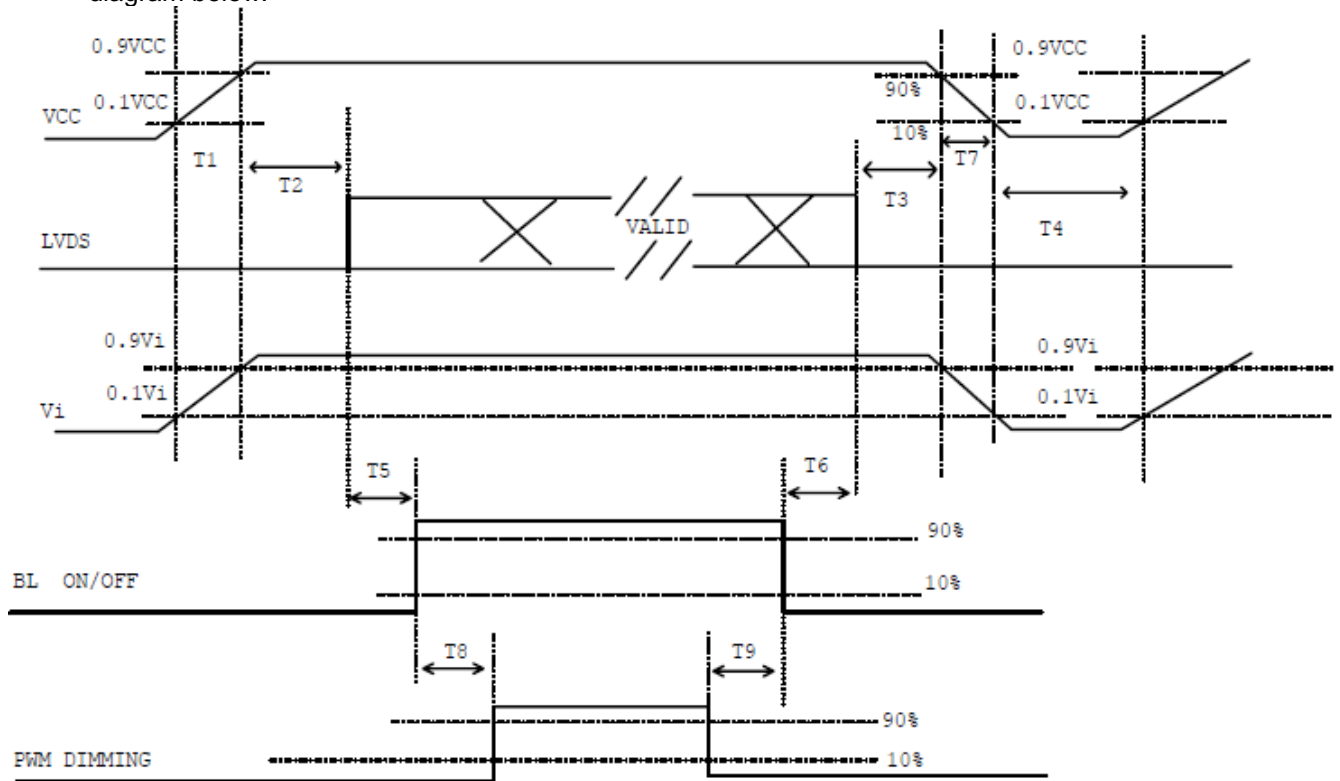
(2) Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM



7.2 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.



Power ON/OFF sequence

Note (1) Please avoid floating state of interface signal at invalid period.

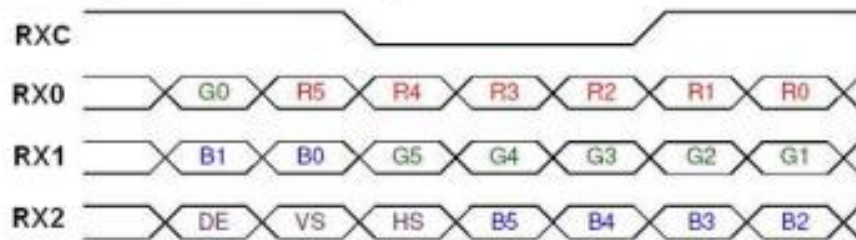
Note (2) When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.

Note (3) The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

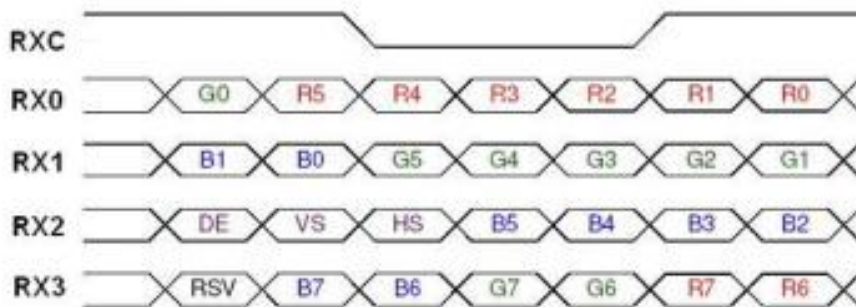
Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	--	10	ms
T2	0	--	50	
T3	0	--	50	
T4	500	--	--	
T5	200	--	--	
T6	20	--	--	
T7	5	--	300	
T8	10	--	--	
T9	10	--	--	

7.3 THE INPUT DATA FORMAT

SEL 6/8 = "High" for 6 bits LVDS Input



SEL 6/8 = "Low" or "NC" for 8 bits LVDS Input



Note (1) R/G/B data 7: MSB, R/G/B data 0: LSB

Note (2) Please follow PSWG

Signal Name	Description	Remark
R7	Red Data 7 (MSB)	Red-pixel Data
R6	Red Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
R5	Red Data 5	
R4	Red Data 4	
R3	Red Data 3	
R2	Red Data 2	
R1	Red Data 1	
R0	Red Data 0 (LSB)	
G7	Green Data 7 (MSB)	
G6	Green Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
G5	Green Data 5	
G4	Green Data 4	
G3	Green Data 3	
G2	Green Data 2	
G1	Green Data 1	
G0	Green Data 0 (LSB)	
B7	Blue Data 7 (MSB)	
B6	Blue Data 6	Each red pixel's brightness data consists of these 8bits pixel data.
B5	Blue Data 5	
B4	Blue Data 4	
B3	Blue Data 3	
B2	Blue Data 2	
B1	Blue Data 1	
B0	Blue Data 0 (LSB)	
RXCLKIN+	LVDS Clock Input	
RXCLKIN-		
DE	Display Sync	
VS	Vertical Sync	
HS	Horizontal Sync	

Note (3) Output signals from any system shall be low or Hi-Z state when VCC is off

7.4 SCANNING DIRECTION

The following figures show the image see from the front view. The arrow indicates the direction of scan.



RPFI = Low/floating; normal display (default)



RPFI = high: display with 180degree rotation

8. OPTICAL CHARACTERISTIC

8.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	°C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	Vcc	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Inverter Current	IL	80mA	mA

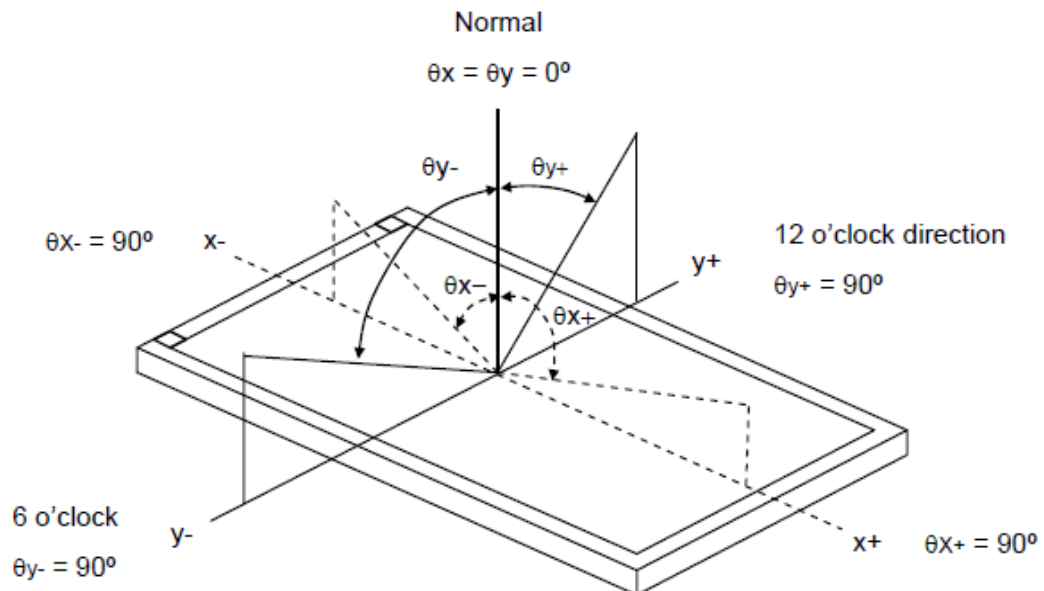
8.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 8.2. The following items should be measured under the test conditions described in 8.1 and stable environment shown in Note (6).

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Contrast Ratio	CR	$\theta_x=0^\circ, \theta_y=0^\circ$ Viewing angle at normal direction	700	1000	-	-	(2)	
Response Time	T_R		-	14	19	ms	(3)	
	T_F		-	11	16	ms		
Center Luminance of White	L_C		400	500	-	cd/m ²	(4)	
White Variation	δW		-	1.25	1.4	-	(7)	
Color Chromaticity	Red		Rx	Typ. -0.05	0.617	Typ. +0.05	-	(6)
			Ry		0.357		-	
	Green	Gx	0.336		-			
		Gy	0.567		-			
	Blue	Bx	0.147		-			
		By	0.087		-			
	White	Wx	0.313		-			
Wy		0.329	-					
Viewing Angle	Horizontal	θ_{x+}	80	88	-	Deg.	(1)	
		θ_{x-}	80	88	-			
	Vertical	θ_{y+}	80	88	-			
		θ_{y-}	80	88	-			

Note (1) Definition of Viewing Angle (θ_x, θ_y):

Viewing angles are measured by BM5A



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

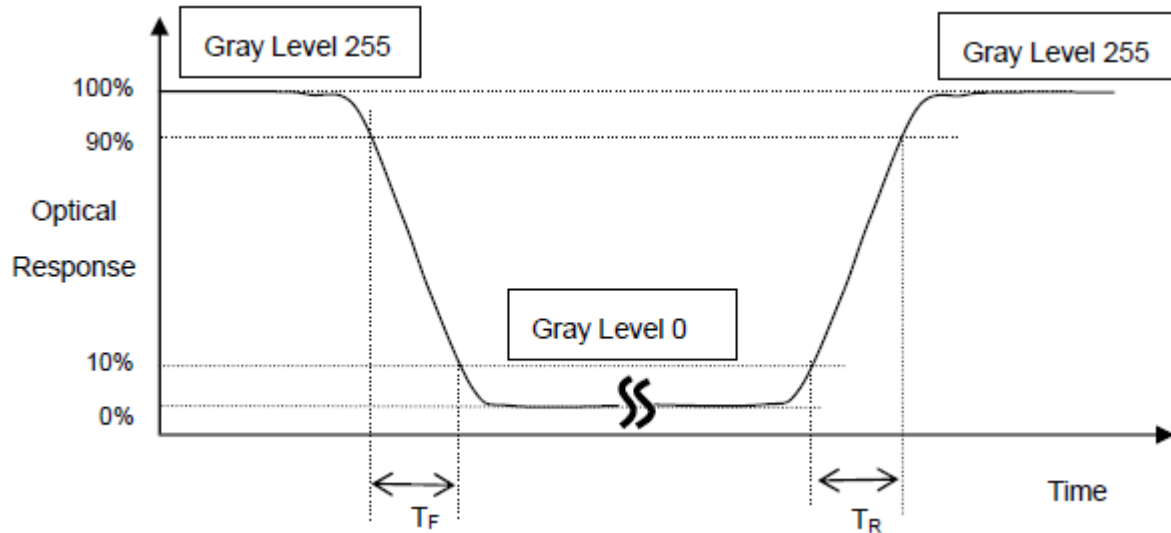
$$\text{Contrast Ratio (CR)} = L_{255} / L_0$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note(7).

Note (3) Definition of Response Time (T_R , T_F):



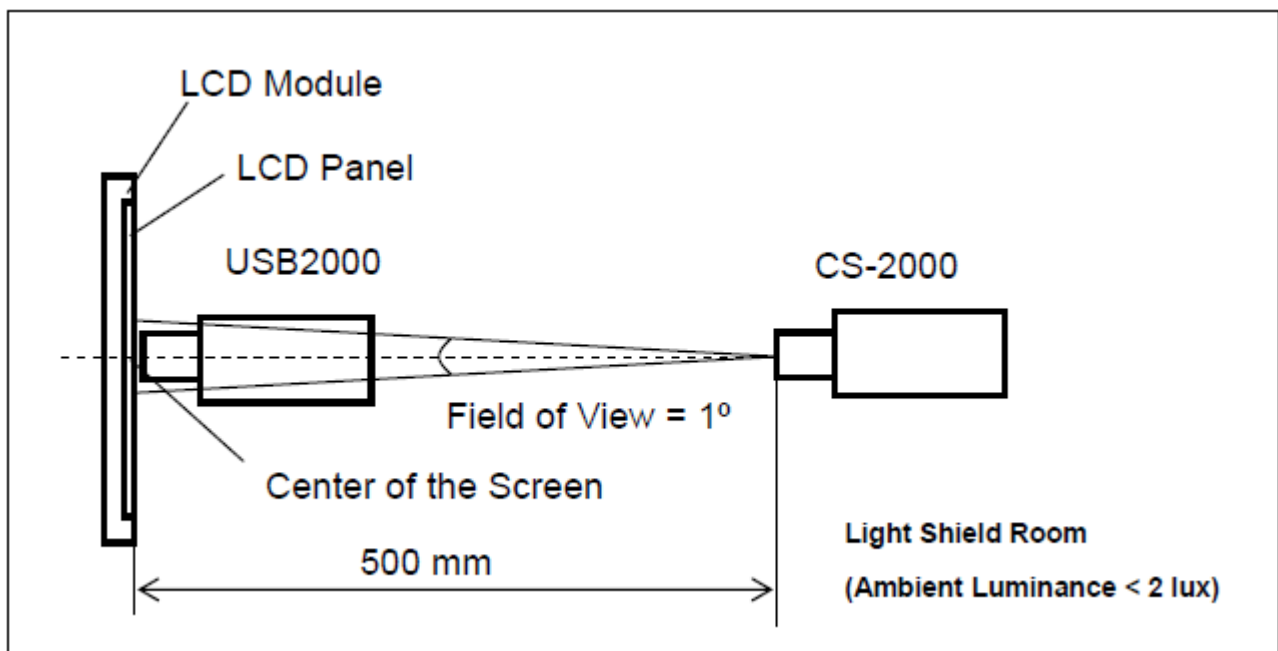
Note (4) Definition of Luminance of White (L_c):

Measure the luminance of gray level 255 at center point and 5 points

$L_c = L (5)$, where L (X) is corresponding to the luminance of the point X at the figure in Note (7).

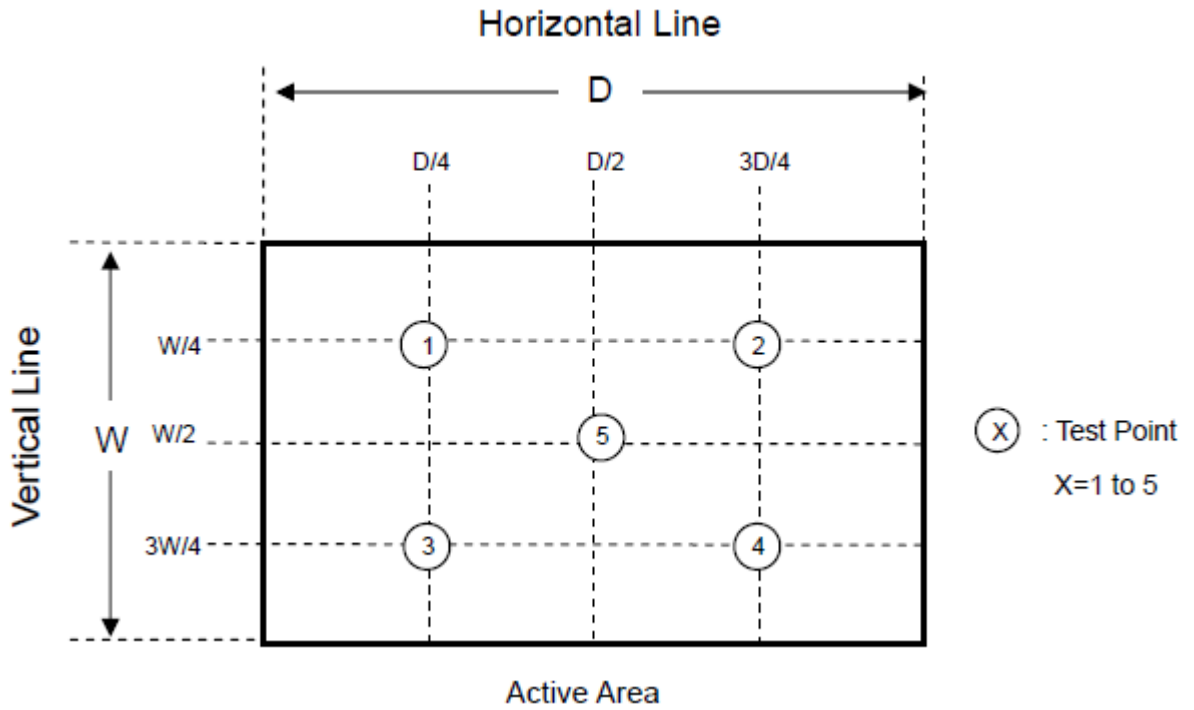
Note (5) Measurement Setup:

The LCD assembly should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a windless room.



Note (6) Definition of White Variation (δW):
 Measure the luminance of gray level 63 (255) at 5 points

$$\delta W = \frac{\text{Maximum [L (1), L (2), L (3), L (4), L (5)]}}{\text{Minimum [L (1), L (2), L (3), L (4), L (5)]}}$$



9. PIN CONNECTIONS

9.1 CN1 CONNECTOR PIN ASSIGNMENT

Pin	Name	Description	Note
1	VCC	Power Supply : +3.3V	
2	VCC	Power Supply : +3.3V	
3	VCC	Power Supply : +3.3V	
4	GND	Ground	
5	GND	Ground	
6	GND	Ground	
7	RPFI	Reverse Panel Function (Display Rotation)	(2)
8	NC	No connection	
9	NC	No connection	
10	NC	No connection	
11	SEL6/8	LVDS 6/8 bit select function control, Low or NC → 8 bit Input Mode High → 6bit Input Mode	(2)
12	GND	Ground	
13	NC	No connection	
14	NC	No connection	
15	RX0-	Negative transmission data of pixel 0	
16	RX0+	Positive transmission data of pixel 0	
17	GND	Ground	
18	RX1-	Negative transmission data of pixel 1	
19	RX1+	Positive transmission data of pixel 1	
20	GND	Ground	
21	RX2-	Negative transmission data of pixel 2	
22	RX2+	Positive transmission data of pixel 2	
23	GND	Ground	
24	RXCLK-	Negative of clock	
25	RXCLK+	Positive of clock	
26	GND	Ground	
27	RX3-	Negative transmission data of pixel 3	
28	RX3+	Positive transmission data of pixel 3	
29	GND	Ground	
30	NC	No connection	(2)

Note (1) Connector Part No.: JAE, FI-XB30SRL-HF11 or compatible connector

Note (2) "Low" stands for 0V. "High" stands for 3.3V. "NC" stands for "No Connected".

9.2 CN2(Backlight Connector)

Pin	Name	Description	Remark
1	Vi	Converter input voltage	12V
2	Vi	Converter input voltage	12V
3	Vi	Converter input voltage	12V
4	Vi	Converter input voltage	12V
5	VGND	Converter ground	Ground
6	VGND	Converter ground	Ground
7	VGND	Converter ground	Ground
8	VGND	Converter ground	Ground
9	EN	Enable pin	3.3V
10	ADJ	Backlight Adjust	PWM Dimming

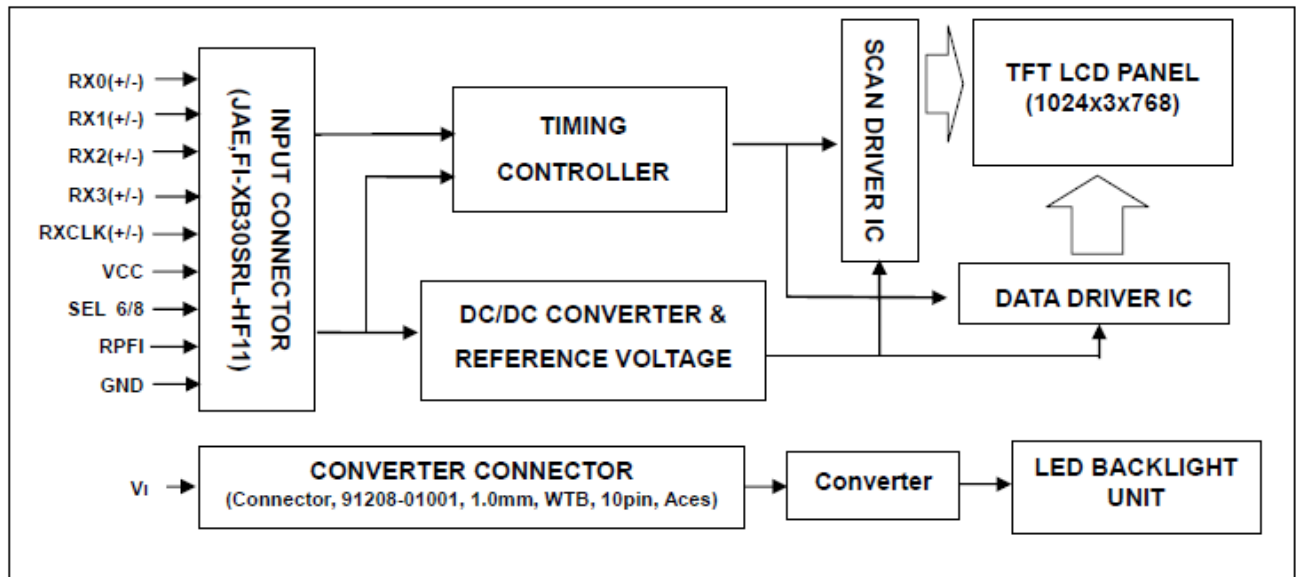
9.3 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Red(253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Gray Scale Of Green	Green(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Green(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	Green(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Green(253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	
	Green(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Green(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
Gray Scale Of Blue	Blue(0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	Blue(253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	
	Blue(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	Blue(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

Note (1) 0: Low Level Voltage, 1: High Level Voltage

9.4. BLOCK DIAGRAM



10. QUALITY ASSURANCE
10.1 RELIABILITY TEST

Test Item	Test Condition	Note
High Temperature Storage Test	80°C, 240 hours	(1) (2)
Low Temperature Storage Test	-30°C, 240 hours	
Thermal Shock Storage Test	-20°C, 0.5hour←→70°C, 0.5hour; 100cycles, 1hour/cycle	
High Temperature Operation Test	70°C, 240 hours	
Low Temperature Operation Test	-30°C, 240 hours	
High Temperature & High Humidity Operation Test	60°C, 90%RH, 240hours	
Shock (Non-Operating)	50G, 11ms, half sine wave, 1 time for ± X, ± Y, ± Z.	(3)
Vibration (Non-Operating)	1.5G, 10 ~ 300 Hz, 10min/cycle, 3 cycles each X, Y, Z	(3)

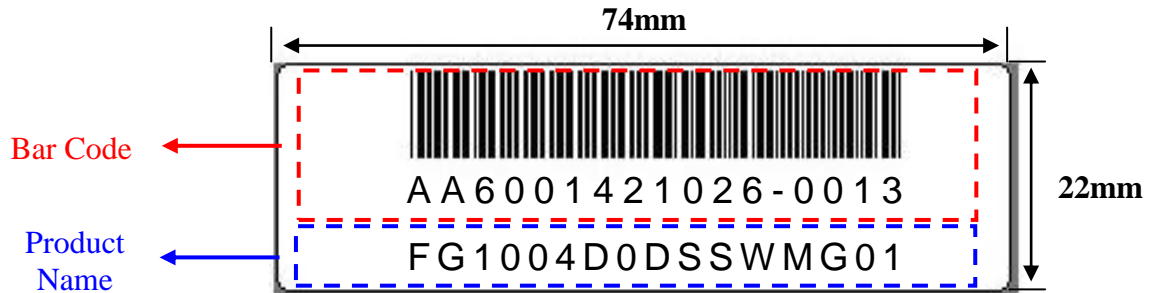
Note (1) There should be no condensation on the surface of panel during test.

Note (2) Temperature of panel display surface area should be 80 °C Max.

Note (3) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.

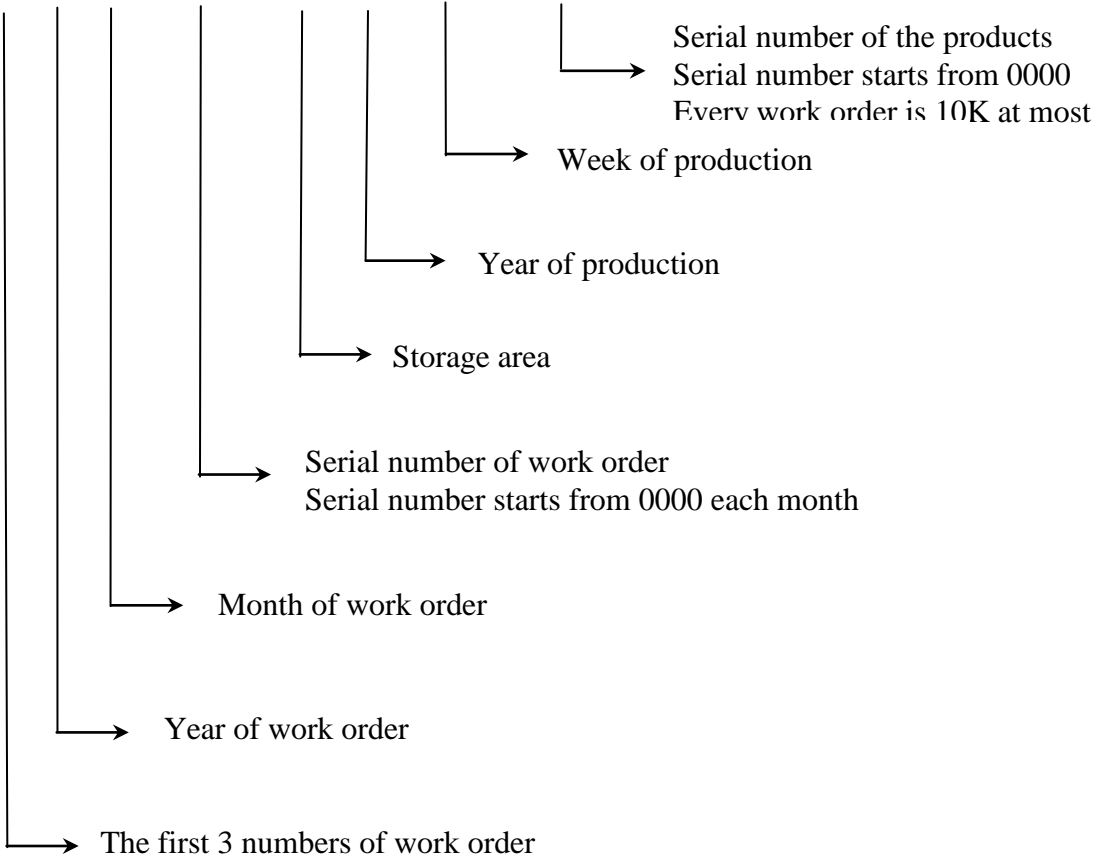
11. LCM Product Label Define

Product Label style:

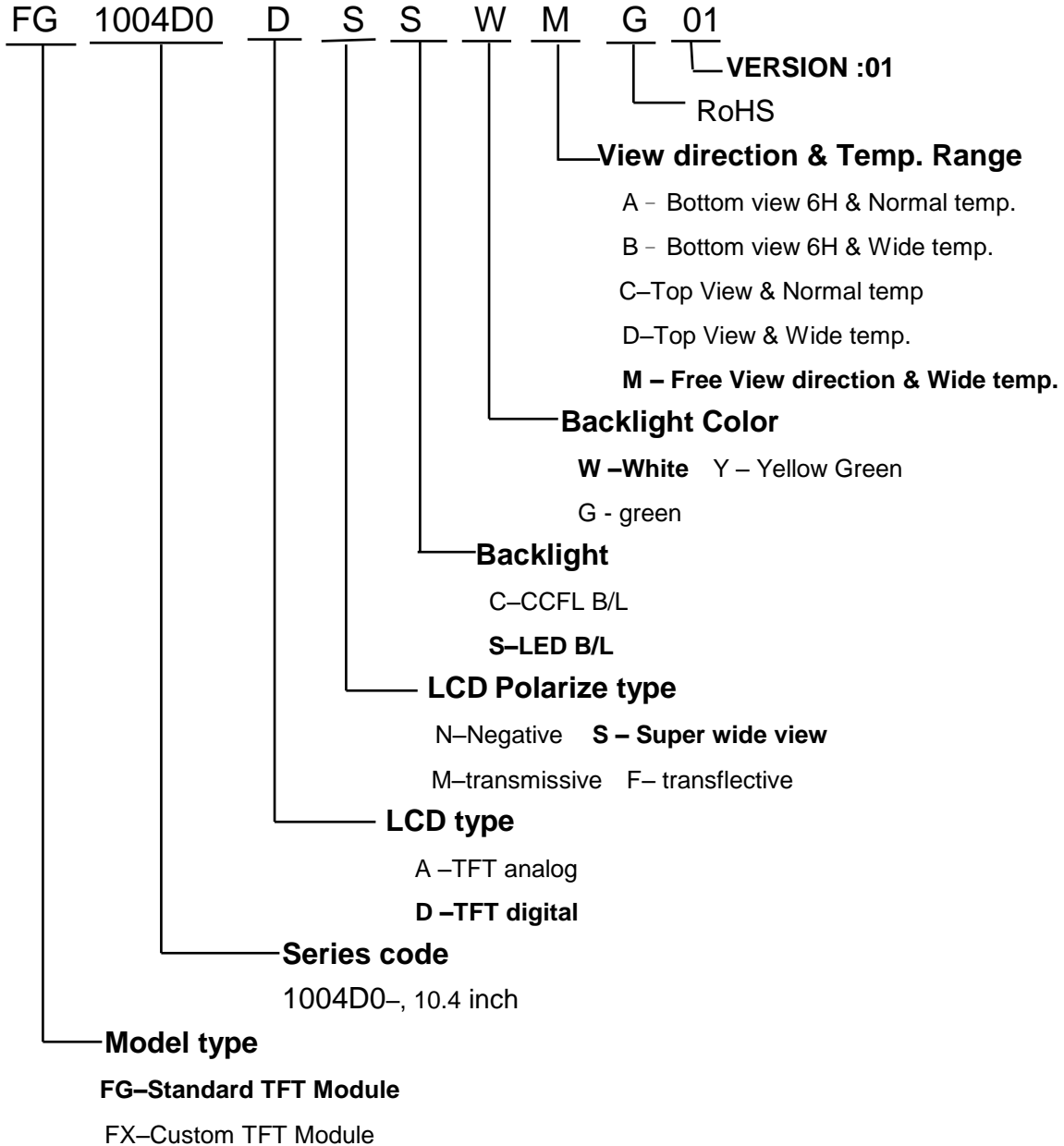


BarCode Define:

A A 6 0014 2 10 26-0013



Product Name Define:



12. 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.

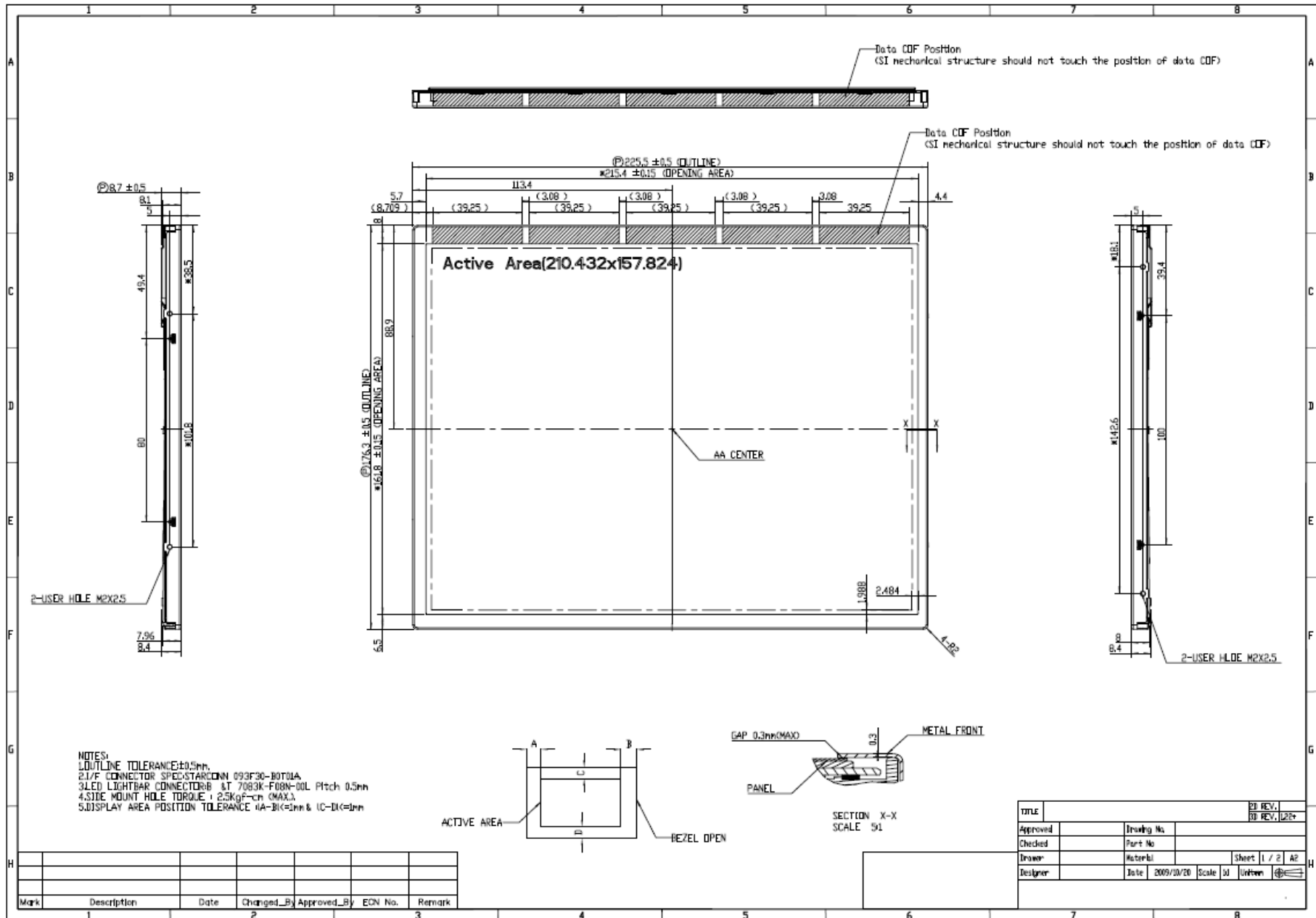
5. OTHERS

- (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.

Confidential Document
13. OUTLINE DRAWING



14. PACKAGE INFORMATION

TBD