DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FG190000DSCWNG01

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
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	A	2008/12/31		20

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
A	31/DEC/08			Release Rev: A for production.

3 GENERAL DESCRIPTION

The display supports the SXGA (1280(H) x 1024(V)) screen format and 16.7M colors 8-bits (RGB 6-bits+HiFRC).All input signals are 2 Channel LVDS interface compatible.

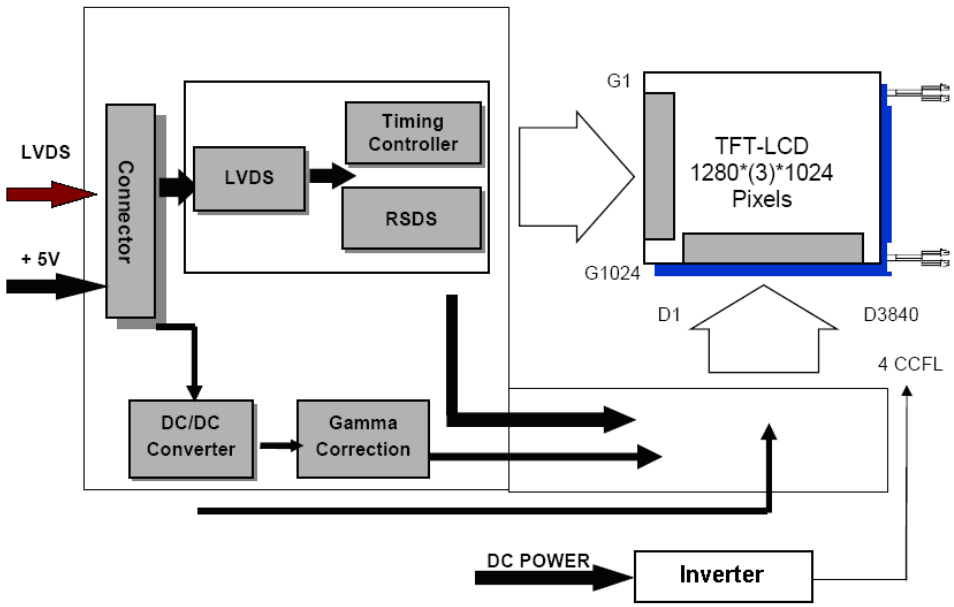
3.1 Display Characteristics

The following items are characteristics summary on the table under 25 ºC condition:

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[inch]	(19")
Active Area	[mm]	376.32(H) × 301.056(V)
Pixels H x V		1280 × (RGB) × 1024
Pixel Pitch	[mm]	0.294(per one triad) × 0.294
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		Normally Black.
Weight	[Grams]	2500(Typ.);2700(Max)
Physical Size (H x V x D)	[mm]	396(H) x 324(V) x 17.5 (D) Typ.
Electrical Interface		Dual Channel LVDS
Surface Treatment		Hard-Coating (3H), Non-Glare treatment
Support Color		16.2M colors (8-bits 6-bits + HiFRC)
Temperature Range Operating Storage (Non-Operating)	 [ºC] [ºC]	 0 to +50 -20 to +60
RoHS Compliance		RoHS Compliance

3.2 Functional Block Diagram

The following diagram shows the functional block of the 19.0 inches Color TFT-LCD Module:



4. ABSOLUTE MAXIMUM RATINGS

Absolute maximum ratings of the module is as following:

4.1 TFT LCD Module

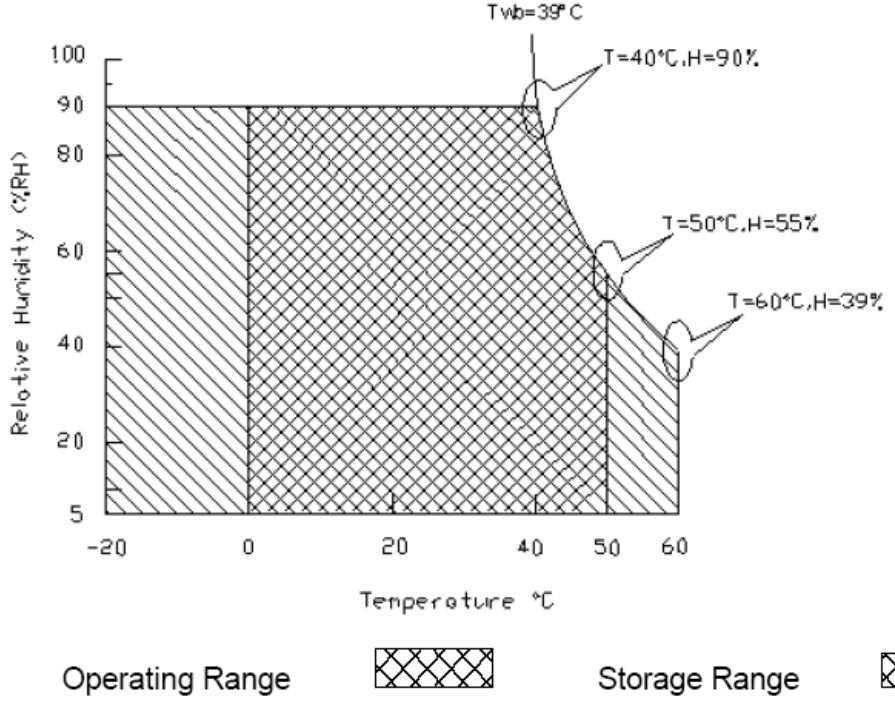
Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive	VIN	-0.3	6	[Volt]	**Note 1,2**
CCFL Current	ICFL	-	8	[mA] rms	**Note 1,2**

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit	Conditions
Operating Temperature	TOP	0	+50	[oC]	
Operating Humidity	HOP	5	90	[%RH]	
Storage Temperature	TST	-20	+60	[oC]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: With in Ta (25℃)

Note 2: Permanent damage to the device may occur if exceed maximum values

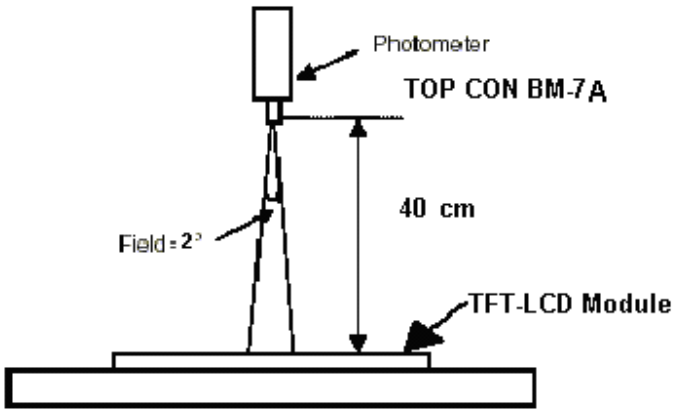


5. OPTICAL CHARACTERISTICS

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR≥10	75	89	--	deg	Note 1,4
		θ_x-		75	89	--		
	Vertical	θ_Y+		75	89	--		
		θ_Y-		75	89	--		
Contrast Ratio		CR	At optimized viewing angle	1000	1300			Note 1,3
Response time	Rise	Tr	Center θx=θy =0°	-	15	25	ms	Note 1,6
	Fall	Tf		-	5	15	ms	
Uniformity		B-uni	θx=θy =0°	75	80	--	%	Note1,5
Brightness		L	θx=θy =0° ISCFL=7.5mA	240	300	--	cd/m²	Note 1,2
Chromaticity		x_W	Center θx=θy =0°	0.283	0.313	0.34		Note 1,7
		y_W		0.299	0.329	0.359		
		x_R		0.617	0.647	0.677		
		y_R		0.31	0.34	0.37		
		x_G		0.263	0.293	0.323		
		y_G		0.571	0.601	0.641		
		x_B		0.112	0.142	0.172		
		y_B		0.037	0.067	0.099		
Image sticking		tis	2 hours			2	Sec	Note 8

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance ≤1 lux, and at room temperature). The operation temperature is 25°C±2°C and CCFL current (ISCFL) =7.5mA (ISCFL*4).
The measurement method is shown in Note1.

Note1: The method of optical measurement:

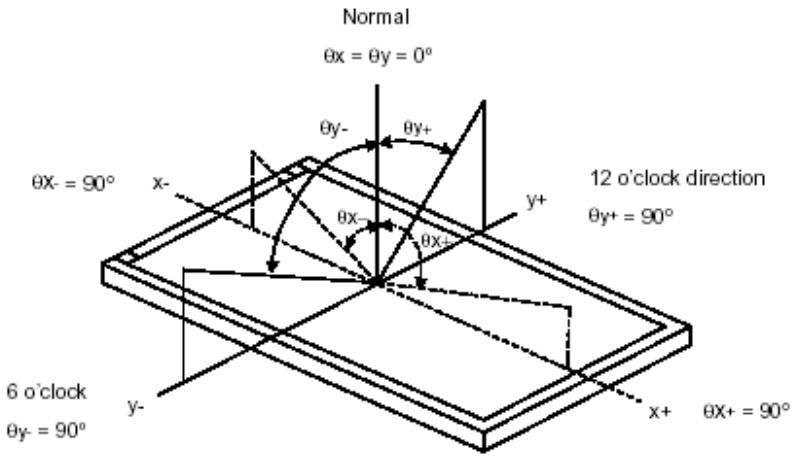


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta x=\theta y=0°$

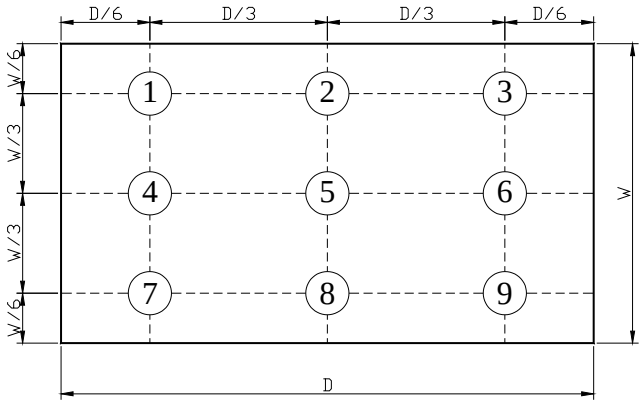
Note3: Definition of Contrast Ratio (CR):

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

Note4: Definition of Viewing Angle



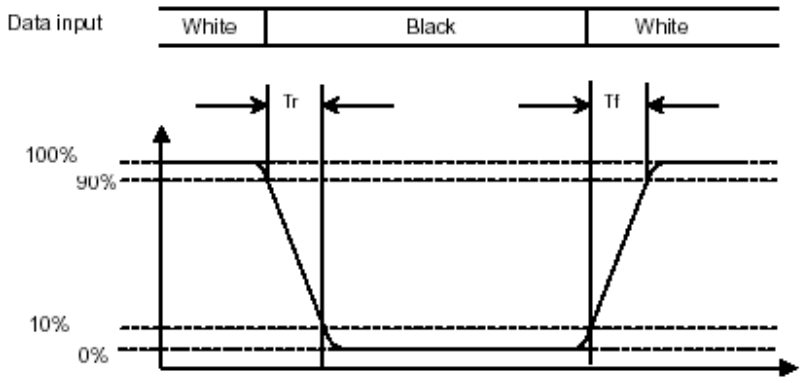
Note 5: Definition of Brightness Uniformity (B-uni):



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

Note6: Definition of Response Time:

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



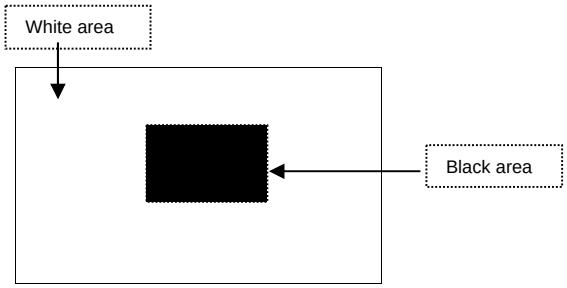
Note 7: Definition of Chromaticity:

The color coordinates (x_W,y_W),(x_R,y_R),(x_G,y_G),and (x_B,y_B) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

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



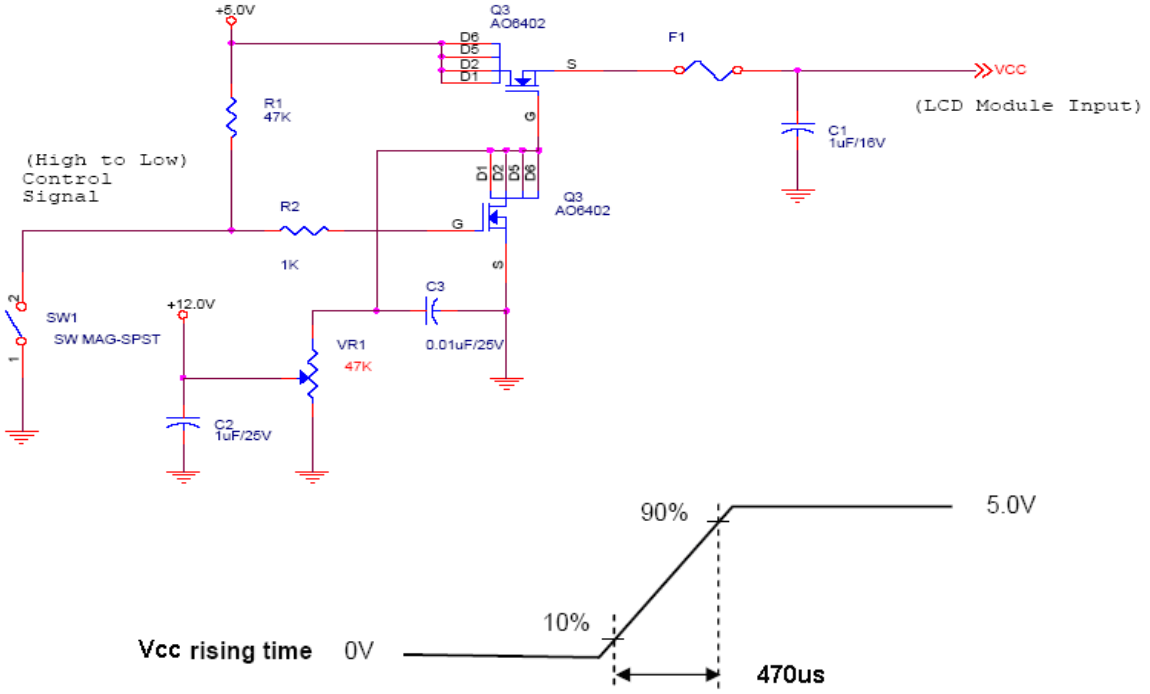
6. ELECTRICAL CHARACTERISTICS

6.1 TFT LCD Driving Conditions

Input power specifications are as follows:

Symbol	Parameter	Min.	Typ.	Max.	Unit	Condition
Vcc	Logic/LCD Drive Voltage	4.5	5.0	5.5	[Volt]	±10%
Icc	Input Current	-	1.5	1.8	[A]	Vcc=5V , All White Pattern, at 75Hz
IRush	Inrush Current	-	2.0	3.0	[A]	Note
PCC	Vcc Power	-	7.5	9.0	[Watt]	Vcc=5V , All White Pattern, at 75Hz

Note: Measurement conditions:



6.2 Backlight driving conditions

Parameter guideline for CCFL Inverter is under stable conditions at 25℃(Room Temperature):

Parameter	Min.	Typ.	Max.	Unit	Condition
CCFL Standard Current (ISCFL)	7.0	7.5	8.0	[mA] rms	Note 2
CCFL Operation Current (IRCFL)	3.0	7.5	8.0	[mA] rms	Note 2
CCFL Frequency (FCFL)	40	60	80	[KHz]	Note 3,4
CCFL Ignition Voltage (ViCFL, Ta=0℃)	1690	-	-	[Volt] rms	Note 5
CCFL Ignition Voltage (ViCF, Ta=25℃)	1300	-	-	[Volt] rms	Note 5
CCFL Operation Voltage (VCFL)	-	653 @7.5mA	796 @3mA	[Volt] rms	Note 6
CCFL Power Consumption (PCFL)	-	19.6	20.56	[Watt]	Note 6
CCFL Life Time (LTCFL)	40,000	50,000	-	[Hour]	Note 7

Note 1: Typ. are the module recommended design points.

*1 All of characteristics listed are measured under the condition using the module test inverter.

*2 In case of using an inverter other than listed, it is recommended to check the inverter carefully. Sometimes, interfering noise stripes appear on the screen, and substandard luminance or flicker at low power may happen.

*3 In designing an inverter, it is suggested to check safety circuit very carefully. Impedance of CCFL, for instance, becomes more than 1 [M ohm] when CCFL is damaged.

*4 Generally, CCFL has some amount of delay time after applying kick-off voltage. It is recommended to keep on applying kick-off voltage for 1 [Sec] until discharge.

*5 Reducing CCFL current increases CCFL discharge voltage and generally increase CCFL discharge frequency. So all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.

Note 2: CCFL standard current is measured at 25±2℃.

Note 3: CCFL discharge frequency should be carefully determined to avoid interference between inverter and TFT LCD.

Note 4: The frequency range will not affect to lamp life and reliability characteristics.

Note 5: CCFL inverter should be able to give out a power than has a generating capacity of over 1,690 voltage. Lamp units need 1,690 voltage minimum for ignition.

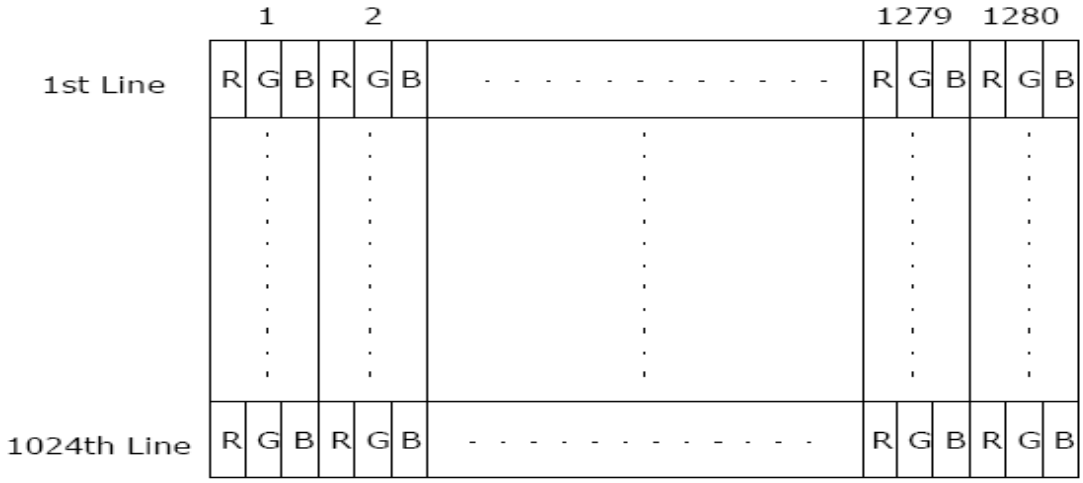
Note 6: The variance of CCFL power consumption is ±10%. Calculator value for reference (ISCFL x VCFL x 4=PCFL)

Note 7: Definition of life : brightness becomes 50%. The typical life time of CCFL is on the condition at 7.5 mA lamp current.

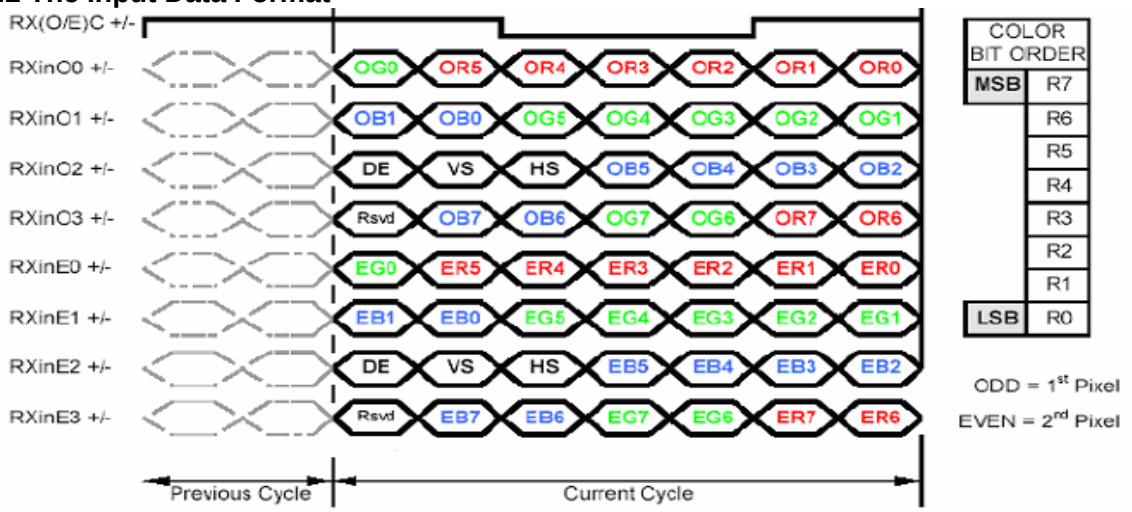
7. SIGNAL CHARACTERISTICS

7.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



7.2 The Input Data Format



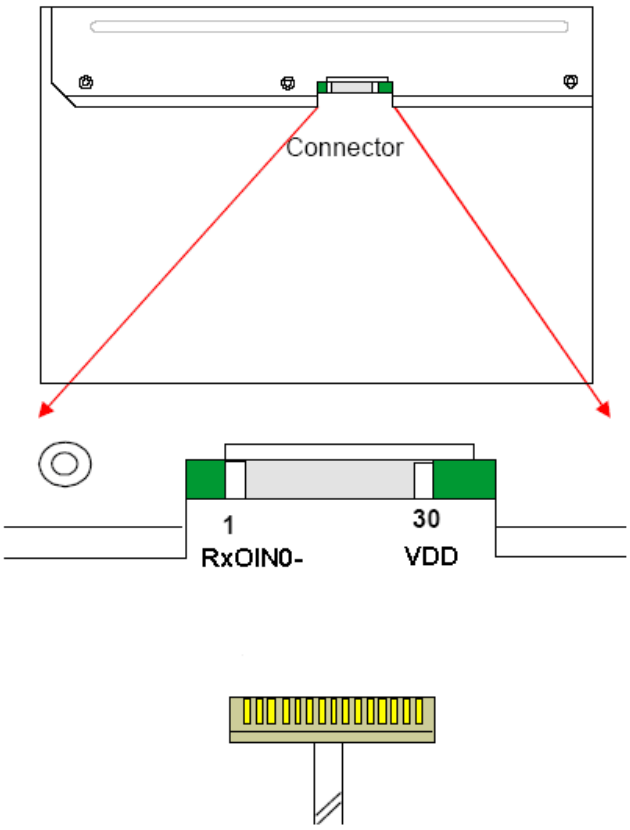
Note1: Normally, DE, VS, HS on EVEN channel are not used.
Note2: Please follow VESA.
Note3: 8-bit in

7.3 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible**.** The first LVDS port (RxOxxx) transmits odd pixels while the second LVDS port (RxExxx) transmits even pixels.

PIN #	SIGNAL NAME	DESCRIPTION
1	RxOIN0-	Negative LVDS differential data input (Odd data)
2	RxOIN0+	Positive LVDS differential data input (Odd data)
3	RxOIN1-	Negative LVDS differential data input (Odd data)
4	RxOIN1+	Positive LVDS differential data input (Odd data)
5	RxOIN2-	Negative LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
6	RxOIN2+	Positive LVDS differential data input (Odd data, H-Sync,V-Sync,DSPTMG)
7	VSS	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RxOIN3-	Negative LVDS differential data input (Odd data)
11	RxOIN3+	Positive LVDS differential data input (Odd data)
12	RxEIN0-	Negative LVDS differential data input (Even clock)
13	RxEIN0+	Positive LVDS differential data input (Even data)
14	VSS	Power Ground
15	RxEIN1-	Positive LVDS differential data input (Even data)
16	RxEIN1+	Negative LVDS differential data input (Even data)
17	VSS	Power Ground
18	RxEIN2-	Negative LVDS differential data input (Even data)
19	RxEIN2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)
22	RxEIN3-	Negative LVDS differential data input (Even data)
23	RxEIN3+	Positive LVDS differential data input (Even data)
24	VSS	Power Ground
25	VSS	Power Ground
26	NC	No contact
27	VSS	Power Ground
28	Vcc	+5.0V Power Supply
29	Vcc	+5.0V Power Supply
30	Vcc	+5.0V Power Supply

Note1: Start from left side



Note2: Input signals of odd and even clock shall be the same timing.
Note3: Please follow PSWG.

7.4 Timing Characteristics

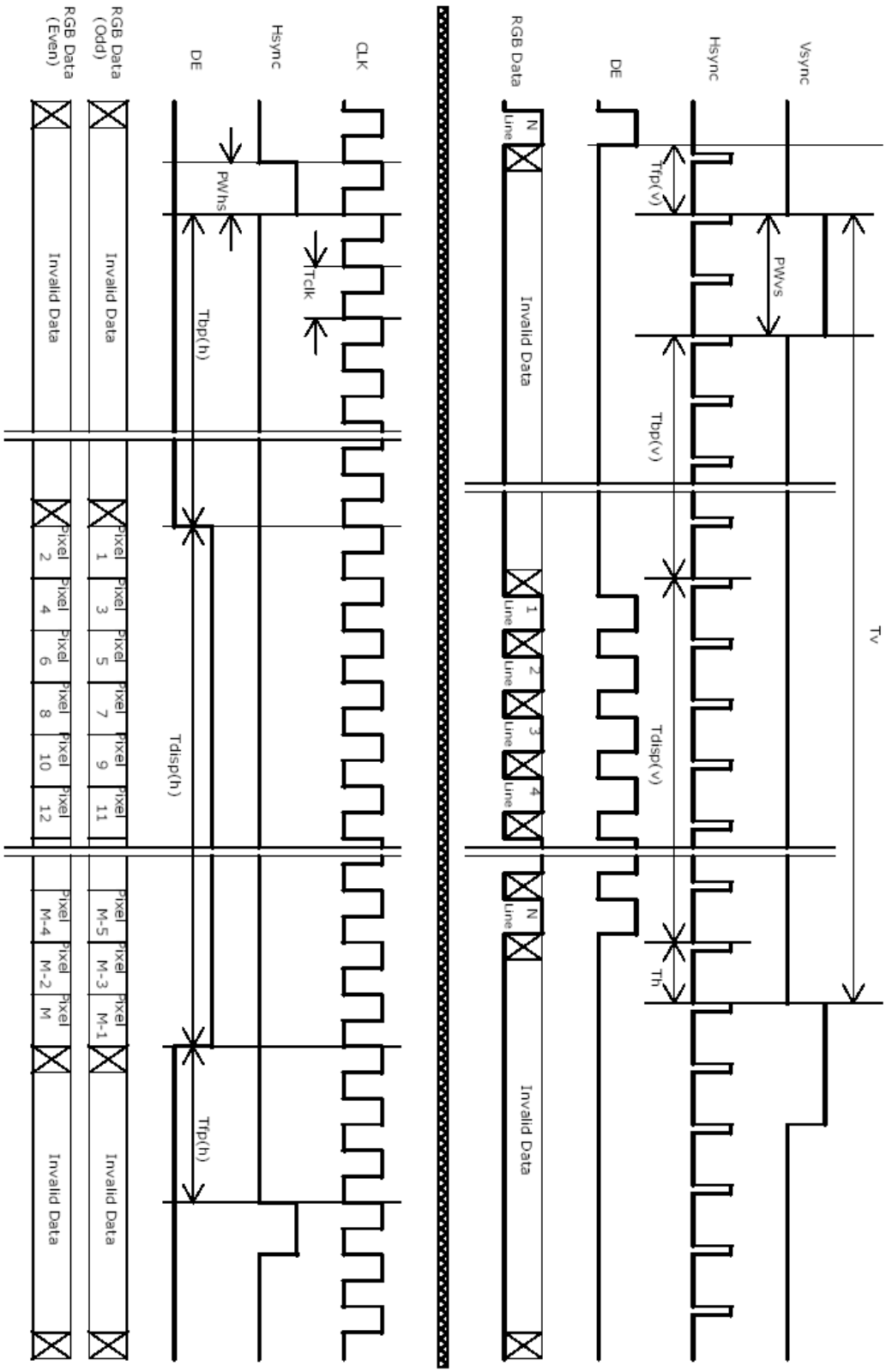
7.4.1 Timing Characteristics

Basically, interface timings described here is not actual input timing of LCD module but output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

Signal	Item	Symbol	Min	Typ	Max	Unit
Vertical Section	Period	Tv	1035	1066	2048	Th
	Active	Tdisp(v)	1024	1024	1024	Th
	Blanking	Tbp(v)+Tfp(v)+PWvs	11	42	1024	Th
Horizontal Section	Period	Th	720	844	1024	Tclk
	Active	Tdisp(h)	640	640	640	Tclk
	Blanking	Tbp(h)+Tfp(h)+PWhs	80	204	384	Tclk
Clock	Period	Tclk	33.33	18.52	12.05	ns
	Frequency	Freq	30	54	83	MHz
Frame rate	Frame rate	F	50	60	75	Hz

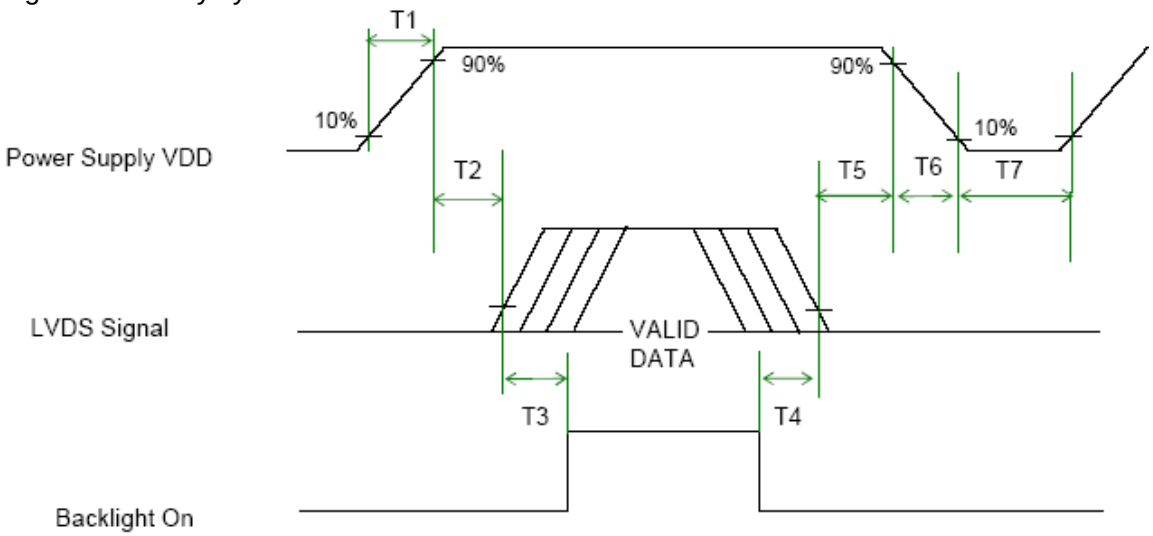
Note : DE mode only

7.4.2 Timing Diagram



7.5 Power ON/OFF Sequence

Power and lamp on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when is off.



Power Sequence Timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	200	-	-	ms
T5	0	16	50	ms
T6	-	-	10	ms
T7	500	-	-	ms

Note: The values of the table are follow VESA.

8. CONNECTOR & PIN ASSIGNMENT

8.1 TFT LCD Module

8.1.1 Input Connector

Connector Name / Designa	Interface Connector / Interface card
Manufacturer	JAE or compatible
Type Part Number	FI-XB30SSL-HF15
Mating Housing Part Number	JAE FI-X30HL

8.1.2 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	RxOIN0-	2	RxOIN0+
3	RxOIN1-	4	RxOIN1+
5	RxOIN2-	6	RxOIN2+
7	VSS	8	RxOCLKIN-
9	RxOCLKIN+	10	RxOIN3-
11	RxOIN3+	12	RxEIN0-
13	RxEIN0+	14	VSS
15	RxEIN1-	16	RxEIN1+
17	VSS	18	RxEIN2-
19	RxEIN2+	20	RxECLKIN-
21	RxECLKIN+	22	RxEIN3-
23	RxEIN3+	24	VSS
25	VSS	26	NC
27	VSS	28	VCC
29	VCC	30	VCC

8.2 Backlight Unit

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

Connector Name / Designation	Lamp Connector / Backlight lamp
Manufacturer	JST
Type part Number	BHSR-02VS-1
Mating Type Part Number	SM02B-BHSS-1-TB

8.2.1 Signal for Lamp connector

	Connector No.	Pin No.	Input	Color	Function
Upper	CN1	1	Hot 1	Pink	High Voltage
		2	Cold 1	Black	Low Voltage
	CN2	1	Hot 2	Blue	High Voltage
		2	Cold 2	White	Low Voltage

	Connector No.	Pin No.	Input	Color	Function
Upper	CN3	1	Hot 1	Pink	High Voltage
		2	Cold 1	Black	Low Voltage
	CN4	1	Hot 2	Blue	High Voltage
		2	Cold 2	White	Low Voltage

9. QUALITY ASSURANCE

9.1 Test Condition

9.1.1 Temperature and Humidity(Ambient Temperature)

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

9.1.2 Operation

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

9.1.3 Container

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

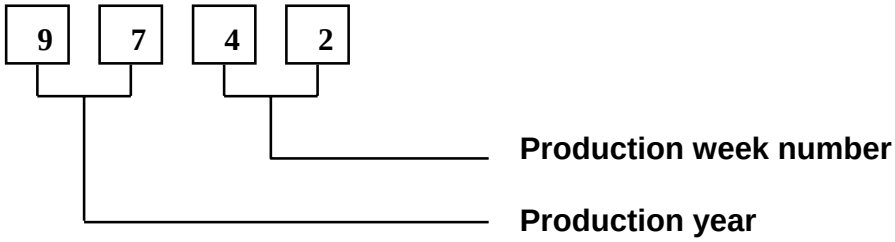
9.1.4 Test Frequency

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

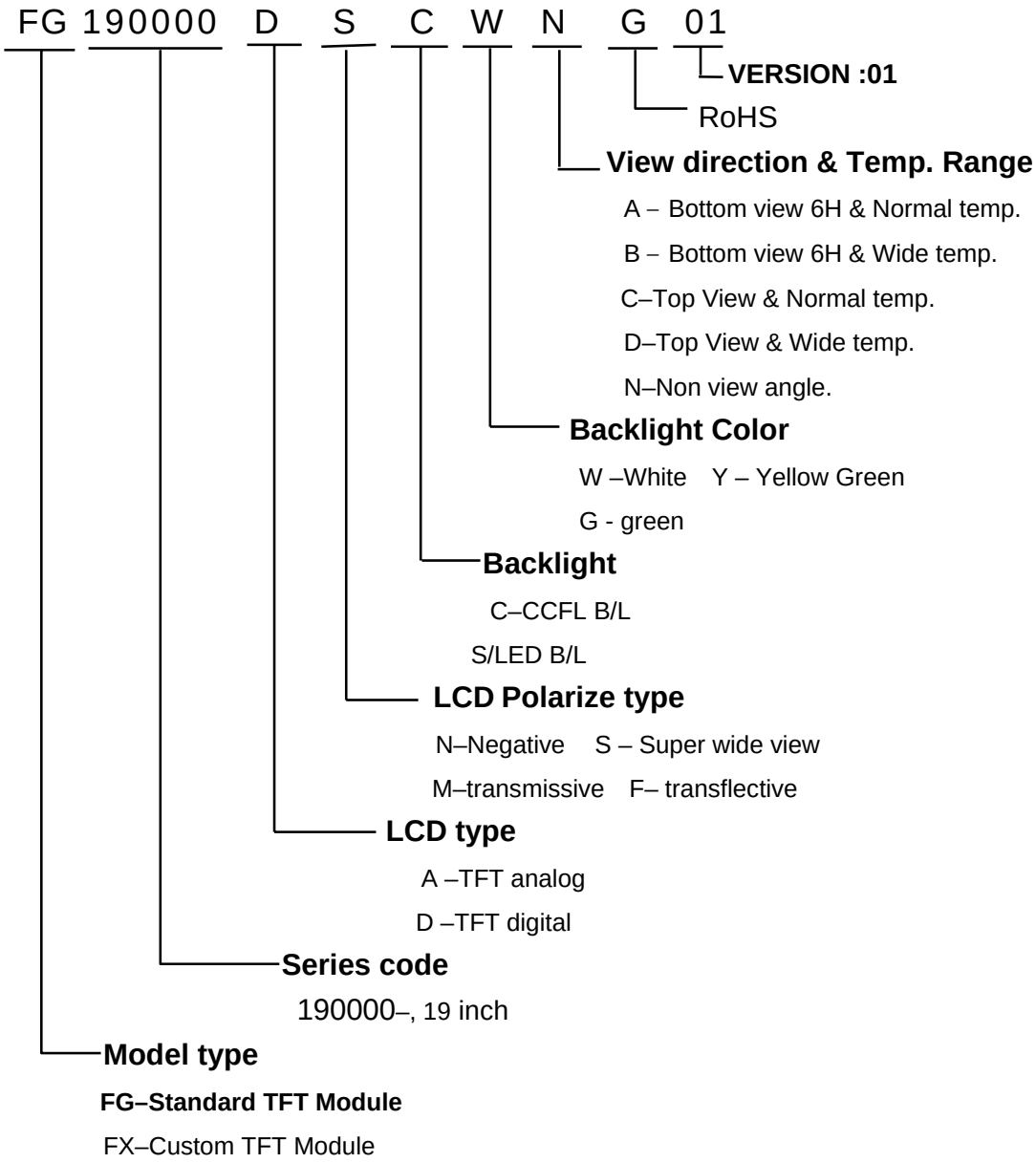
9.1.5 Test Method

Reliability Test Item & Level		Test Level
No.	Test Item	
1	High Temperature Storage Test	T=60°C,300hrs
2	Low Temperature Storage Test	T=-20°C,300hrs
3	High Temperature Operation Test	T=50°C,300hrs
4	Low Temperature Operation Test	T=0°C,300hrs
5	High Temperature and High Humidity Operation Test	T=50°C ,80%RH ,300hrs
6	Thermal Cycling Test (No operation)	-20°C → +60°C ,100 Cycles 30 min 30 min
7	Vibration Test (No operation)	Frequency：10 ~200~10 Hz Acceleration: 1.5G Wave: Random Sweep: 30 Minutes each Axis (X,Y,Z)
8	Shock Test (No operation)	50G, 20ms Direction：± X,± Y,± Z Cycle：1 times

10. LOT NUMBERING SYSTEM



11. LCM NUMBERING SYSTEM



12. PRECAUTION IN USE LCM

1. LIQUID CRYSTAL DISPLAY (LCD)

LCD is made up of glass, organic sealant, organic fluid, and polymer based polarizers. The following precautions should be taken when handing,

(1). Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degradation, polarizer peel off or bubble.

(2). Do not contact the exposed polarizers with anything harder than an HB pencil lead. To clean dust off the display surface, wipe gently with cotton, chamois or other soft material soaked in petroleum benzin.

(3). Wipe off saliva or water drops immediately. Contact with water over a long period of time may cause polarizer deformation or color fading, while an active LCD with water condensation on its surface will cause corrosion of ITO electrodes.

(4). Glass can be easily chipped or cracked from rough handling, especially at corners and edges.

(5). Do not drive LCD with DC voltage.

2. Liquid Crystal Display Modules

2.1 Mechanical Considerations

LCM are assembled and adjusted with a high degree of precision. Avoid excessive shocks and do not make any alterations or modifications. The following should be noted.

(1). Do not tamper in any way with the tabs on the metal frame.

(2). Do not modify the PCB by drilling extra holes, changing its outline, moving its components or modifying its pattern.

(3). Do not touch the elastomer connector, especially insert an backlight panel (for example, EL).

(4). When mounting a LCM make sure that the PCB is not under any stress such as bending or twisting . Elastomer contacts are very delicate and missing pixels could result from slight dislocation of any of the elements.

(5). Avoid pressing on the metal bezel, otherwise the elastomer connector could be deformed and lose contact, resulting in missing pixels.

2.2. Static Electricity

LCM contains CMOS LSI's and the same precaution for such devices should apply, namely

(1). The operator should be grounded whenever he/she comes into contact with the module. Never touch any of the conductive parts such as the LSI pads, 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.

2.3 Soldering

(1). Solder only to the I/O terminals.

(2). Use only soldering irons with proper grounding and no leakage.

(3). Soldering temperature : 280°C ± 10°C

(4). Soldering time: 3 to 4 sec.

(5). Use eutectic solder with resin flux fill.

(6). If flux is used, the LCD surface should be covered to avoid flux spatters. Flux residue should be removed after wards.

2.4 Operation

(1). Driving voltage should be kept within specified range; excess voltage shortens display life.

(2). Response time increases with decrease in temperature.

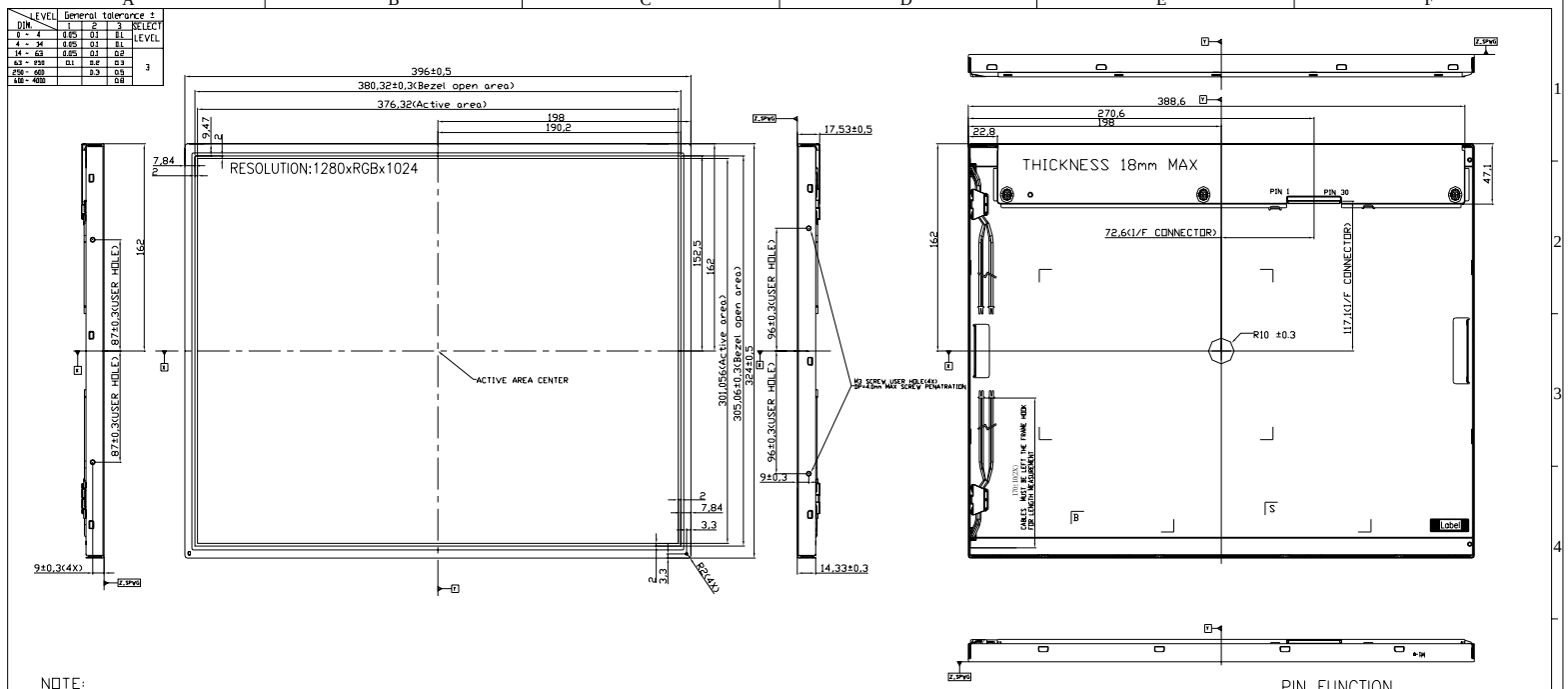
(3). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

(4). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

2.5 Storage

If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

13. OUTLINE DRAWING



NOTE:
1. PRELIMINARY DRAWING FOR REFERENCE ONLY.
2. THE DIMENSION EXCULDES DEFORMATION.
3. MODULE THICKNESS SHOULD BE 18mm MAX.
4. UNSPECIFIED TOLERANCE MUST FOLLOW TOLERANCE TABLE.
5. LAMP CABLE CONNECTOR TO BE JST BHSR-02VS-1 OR COMPATIBLE.
   MATING CONNECTOR : JST SM02B-BHSS-1-TB.
6. I/F CONNECTOR TO BE JAE FI-XB30SSL-HF15 OR COMPATIBLE.
   MATING CONNECTOR : JAE FI-X30HL OR COMPATIBLE.
7. M3 USER HOLE SCREW TORQUE 4.0Kgf-cm MAX.
8. USER HOLE SCREW PENETRATION 4.0mm MAX.
9. CABLE LENGTH IS 170±10.0mm FROM THE END OF HI-VOLTAGE.
10. M3 SCREW LENGTH MUST UNDER 4mm.
11. FOR RoHS

PIN FUNCTION

1. RxOIN0−	11. RxOIN3+	21. RxECLKIN+
2. RxOIN0+	12. RxEIN0−	22. RxEIN3−
3. RxOIN1−	13. RxEIN0+	23. RxEIN3+
4. RxOIN1+	14. Vss	24. Vss
5. RxOIN2−	15. RxEIN1−	25. Vss
6. RxOIN2+	16. RxEIN1+	26. NC
7. Vss	17. Vss	27. Vss
8. RxOCLKIN−	18. RxEIN2−	28. VCC
9. RxOCLKIN+	19. RxEIN2+	29. VCC
10. RxOIN3−	20. RxECLKIN−	30. VCC

AUTH	DESCRIPTION	DATE	APPROVED
	Change FG190000C-G01 from rev: 1 to rev : A.	01/06/09'	

REVISIONS

DATE:	12/29/08'
DRAWN:	
CHECK:	
APPROVE:	

TITLE: LCM OUTLINE DIMENSION

DWG. NO.	FG190000C-G01		
UNITS M M		REV.	A
SCALE 1 / 1	SHEET 1 OF 1		

DATA IMAGE