



# DATA IMAGE CORPORATION

## TFT Module Specification

Preliminary

ITEM NO.: FG040392DSSWBGT1

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	JACK	JOE	GARY	KEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	2	14/JUN/12'		18

**2. RECORD OF REVISION**

Rev	Date	Item	Page	Comment
1	27/FEB/12'			Initial preliminary
2	14/JUN/12'	4 14 15	3 17 18	1.Modify Overall dimension & Add Weight 2.Modify OUTLINE DRAWING from Rev: 1 to 2 3.Modify PACKAGE INFORMATION

### 3. FEATURE

- 64 gray level with 2 bit dithering function to realize 16M colors

### 4. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Display resolution	480X R.G.B x 272	dot
Active area	95.04(W) x 53.856(H)	mm
Screen size	4.3(Diagonal)	inch
Dot pitch	0.066 (W) x 0.198(H)	mm
Color configuration	R.G.B. Stripe	
Overall dimension	105.5 (W) x 67.2 (H) x 5.45(D)	mm
Weight	50	g
Surface treatment	Anti-glare and hard coating (3H)	
View Angle direction	6 o'clock	
Our components and processes are compliant to RoHS standard		

### 5. ELECTRICAL CHARACTERISTICS

GND=0V, Ta=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	VDD	3.0	3.3	3.6	V	Note1
Power Supply Current	I <sub>DD</sub>		17	20	mA	VDD =3.3V
Ripple Voltage	V <sub>RPVDD</sub>			100	mVp-p	
"H" level logical input voltage	V <sub>IH</sub>	0.8VDD	--	VDD	V	
"L" level logical input voltage	V <sub>IL</sub>	0	--	0.2VDD	V	
Operating temperature	Topa	-20	--	70	°C	Ambient temperature
Storage temperature	Tstg	-30	--	80	°C	Ambient temperature
Vcom voltage	Vcom-AC	--	5.56	--	V	Note 2
	Vcom-DC	--	1.60	--	V	-

Note1:VDD Absolute Maximum Ratings -0.3V~+6V

Note2: This voltage is the amplitude of vibration

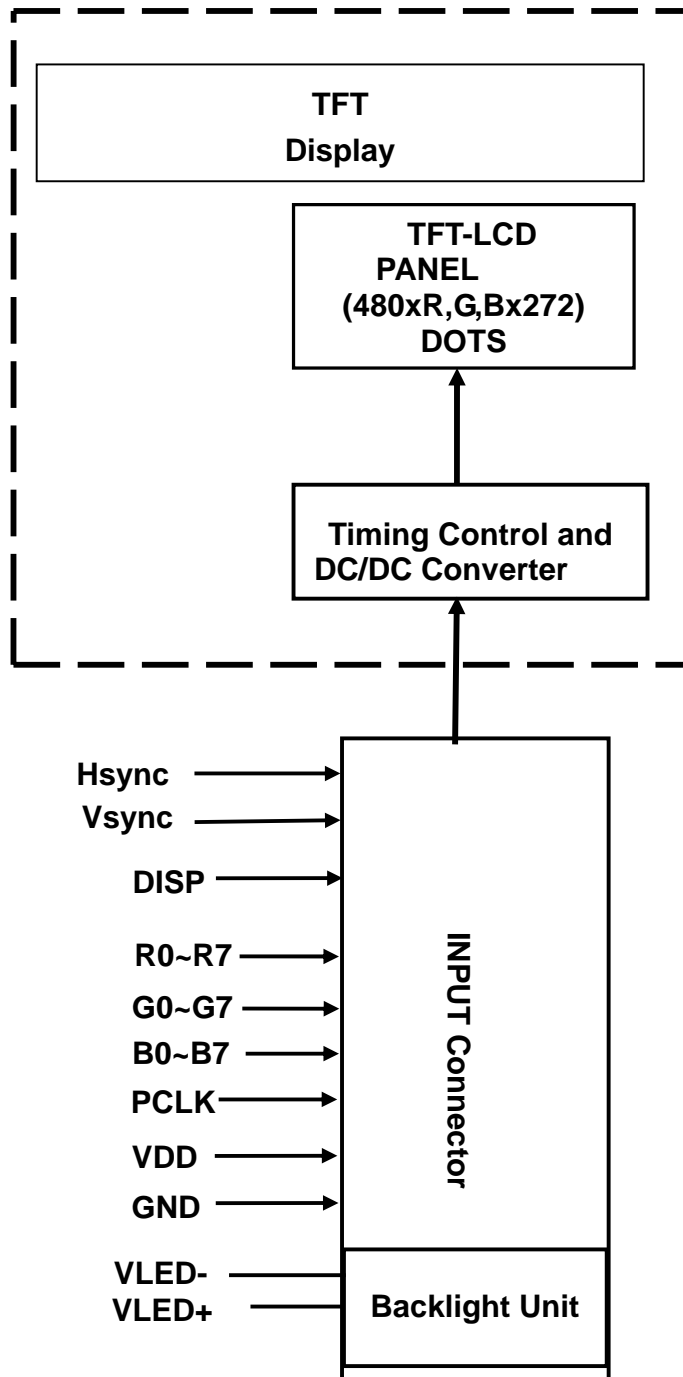
#### 5.1 Backlight driving for power conditions

Ta= 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I <sub>L</sub>	--	20	--	mA	
VLED voltage	V <sub>L</sub>	19.6		26.6	V	I <sub>L</sub> =20 mA



**6. BLOCK DIAGRAM**



## 7. PIN CONNECTIONS

### 7.1 Input Pins Connection

Pin No	Symbol	Function	Remark
1	VLED-	LED Power Supply Cathode.	
2	VLED+	LED Power Supply Anode.	
3	NC	No Connection	
4	VDD	Power Supply : +3.3V	
5	R0	Digital data input. R0 is LSB and R7 is MSB	
6	R1		
7	R2		
8	R3		
9	R4		
10	R5		
11	R6		
12	R7		
13	G0	Digital data input. G0 is LSB and G7 is MSB	
14	G1		
15	G2		
16	G3		
17	G4		
18	G5		
19	G6		
20	G7		
21	B0	Digital data input. B0 is LSB and B7 is MSB	
22	B1		
23	B2		
24	B3		
25	B4		
26	B5		
27	B6		
28	B7		
29	GND	Ground	
30	PCLK	clock signal to sample each data	
31	DISP	Display ON/OFF Control ON=H(VDD), OFF=L(GND)	
32	HSYNC	Horizontal synchronous signal or NC	
33	VSYNC	Vertical synchronous signal or NC	
34	NC	No Connection	
35	NC	No Connection	
36	GND	Ground	
37	X+	Touch panel Right	
38	Y-	Touch panel Bottom	
39	X-	Touch panel Left	
40	Y+	Touch panel Top	

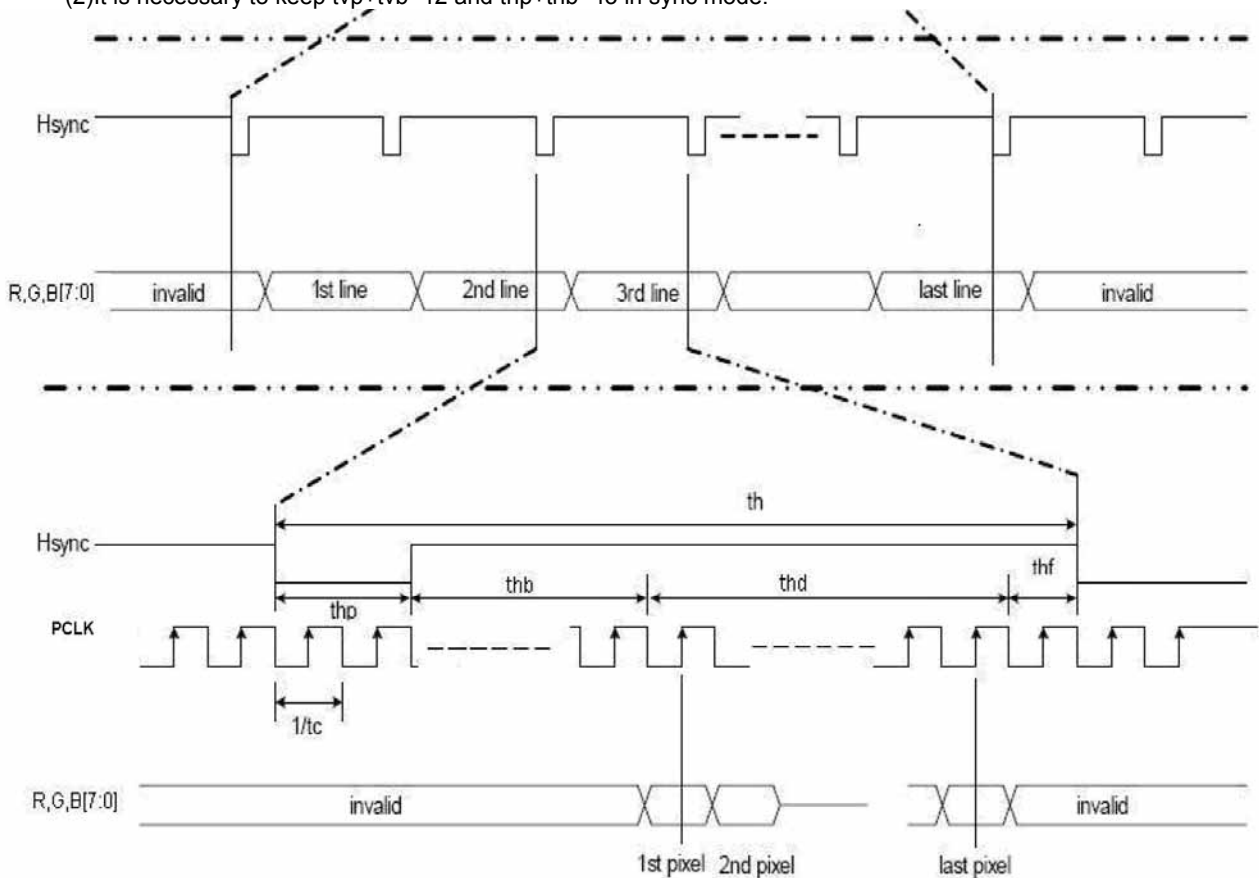
## 8. AC CHARACTERISTICS

### 8.1 Input Timing Requirement

 (480RGBx272,  $T_a = 25^\circ\text{C}$ ,  $V_{DD} = 3.3\text{V}$  GND= 0V)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
Clock cycle	$F_{clk(1)}$	-	9	15	MHz
Hsync cycle	$1/th$	-	17.14	-	KHz
Vsync cycle	$1/tv$	-	59.94	-	Hz
Horizontal Signal					
Horizontal cycle	th	525	525	605	CLK
Horizontal display period	thd	480	480	480	CLK
Horizontal front porch	thf	2	2	82	CLK
Horizontal pulse width	$thp_{(2)}$	2	41	41	CLK
Horizontal back porch	$thb_{(2)}$	2	2	41	CLK
Vertical Signal					
Vertical cycle	tv	285	286	511	$H_{(1)}$
Vertical display period	tvd	272	272	272	$H_{(1)}$
Vertical front porch	tvf	1	2	227	$H_{(1)}$
Vertical pulse width	$tvp_{(2)}$	1	10	11	$H_{(1)}$
Vertical back porch	$tvb_{(2)}$	1	2	11	$H_{(1)}$

**Note:** (1) Unit:  $\text{CLK} = 1/F_{clk}$ ,  $H = th$ ,

 (2) It is necessary to keep  $tvp + tvb = 12$  and  $thp + thb = 43$  in sync mode.

**Fig 1. Parallel RGB input timing**

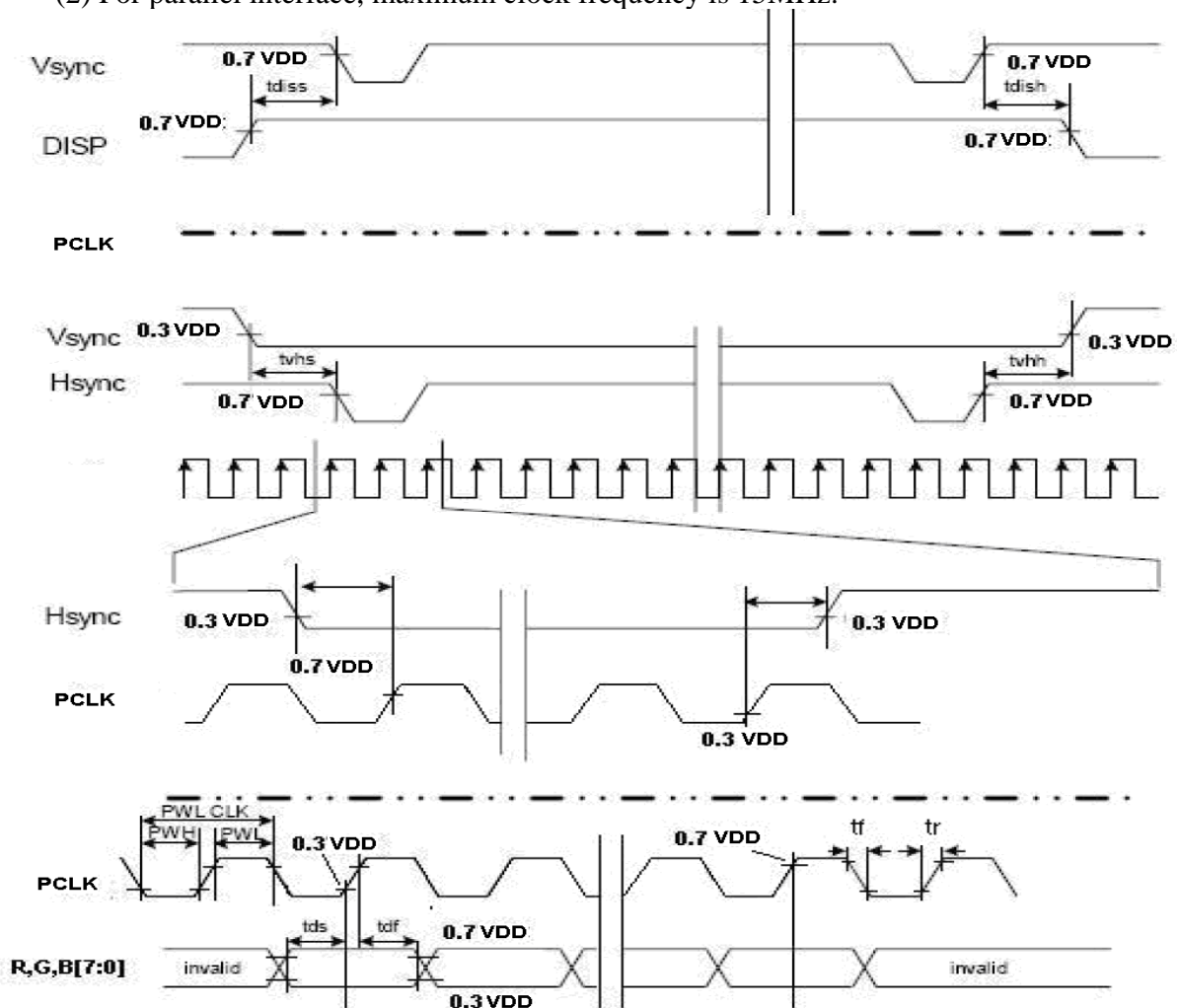
**8.2 Input Setup Timing Requirement**

(Ta = 25°C, VDD = 3.3V, GND = 0V, tr(1) = tf(1) = 2ns)

Parameter	Symbol	MIN.	TYP.	MAX.	Unit
DISP setup time	$t_{diss}$	10	-	-	ns
DISP hold time	$t_{dish}$	10	-	-	ns
Clock period	$PW_{CLK(2)}$	66.7	-	-	ns
Clock pulse high period	$PWH_{(2)}$	26.7	-	-	ns
Clock pulse low period	$PWL_{(2)}$	26.7	-	-	ns
Hs setup time	$t_{hs}$	10	-	-	ns
Hs hold time	$t_{hh}$	10	-	-	ns
Data setup time	$t_{ds}$	10	-	-	ns
Data hold time	$t_{dh}$	10	-	-	ns
Vs setup time	$t_{vhs}$	10	-	-	ns
Vs hold time	$t_{vhh}$	10	-	-	ns

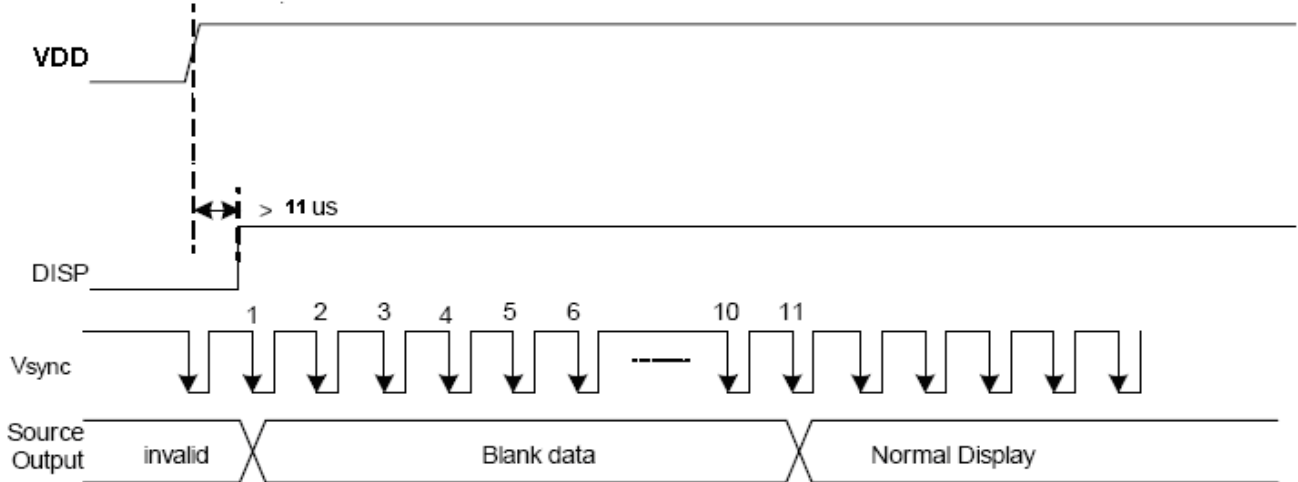
**Note:** (1) tr, tf is defined 10% to 90% of signal amplitude.

(2) For parallel interface, maximum clock frequency is 15MHz.

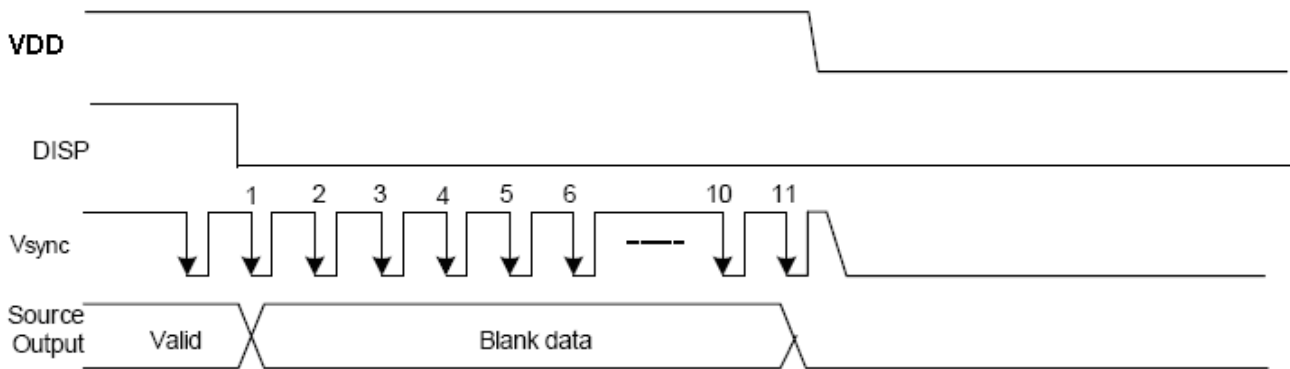

**Fig 2. Input setup timing requirement**

### 8.3 TCON Power ON/OFF Control

The TCON IC has a power ON/OFF sequence control function. When DISP pin is pulled “H”, blank data is outputted for 10-frames first, from the falling edge of the following VSYNC signal. Similarly, when DISP is pulled “L”, 10-frames of blank data will be outputted from the falling edge of the following VSYNC, too.



**Fig 3. Power On Sequence**



**Fig 4. Power Off Sequence**



**9. OPTICAL CHARACTERISTIC**

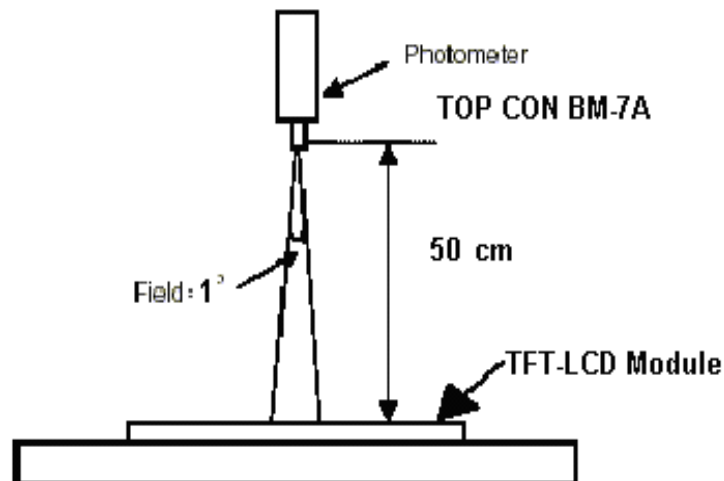
Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	$\theta_{x+}$	Center CR $\geq$ 10	60	70	--	deg	Note 1,4
		$\theta_{x-}$		60	70	--		
	Vertical	$\theta_{y+}$		50	60	--		
		$\theta_{y-}$		50	60	--		
Contrast Ratio		CR	at optimized viewing angle	320	400	--		Note 1,3
Response time	Rise+ Fall	Tr+ Tf	Center $\theta_x=\theta_y=0^\circ$		25	40	ms	Note 1,6
Uniformity		B-uni	$\theta_x=\theta_y=0^\circ$	80		--	%	Note1,5
Center Brightness		L	$\theta_x=\theta_y=0^\circ$	--	250	--	cd/m <sup>2</sup>	Note 1,2
Chromaticity		$x_W$	Center $\theta_x=\theta_y=0^\circ$	0.262	0.312	0.362		Note 1,7
		$y_W$		0.289	0.339	0.389		
		$x_R$		0.552	0.602	0.652		
		$y_R$		0.285	0.335	0.385		
		$x_G$		0.281	0.331	0.381		
		$y_G$		0.521	0.571	0.621		
		$x_B$		0.099	0.149	0.199		
		$y_B$		0.088	0.138	0.188		
Image sticking		tis	2 hours			2	Sec	Note 8

The following optical specifications shall be measured in a darkroom or equivalent state (ambient luminance  $\leq$ 1 lux, and at room temperature).

The operation temperature is 25°C $\pm$ 2°C and LED Backlight Current IL=15Ma.

The measurement method is shown in Note1.

Note 1: The method of optical measurement:

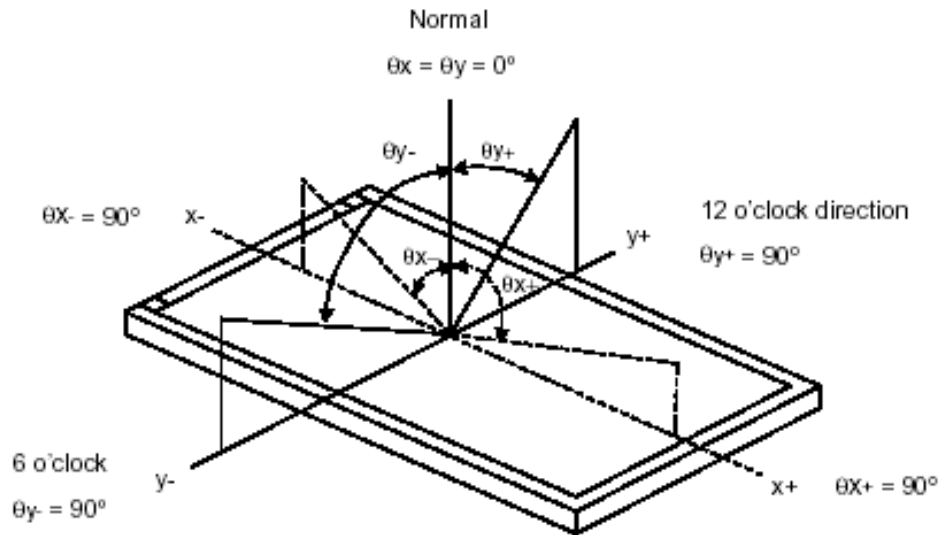


Note 2: Measured at the center area of the panel and at the viewing angle of the  $\theta_x = \theta_y = 0^\circ$

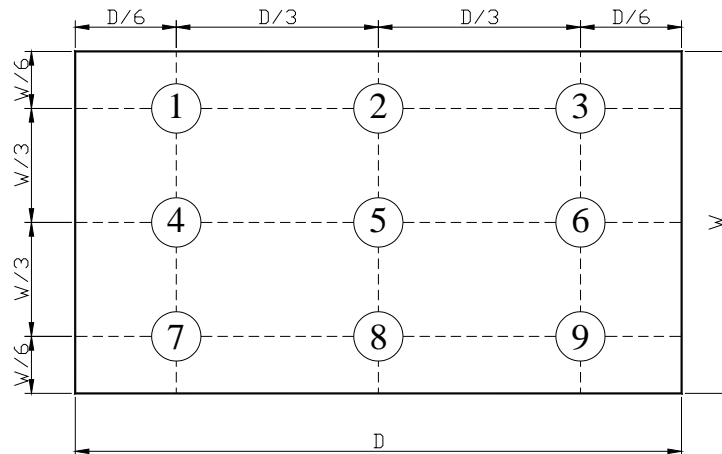
Note 3: Definition of Contrast Ratio (CR):

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

Note 4: Definition of Viewing Angle



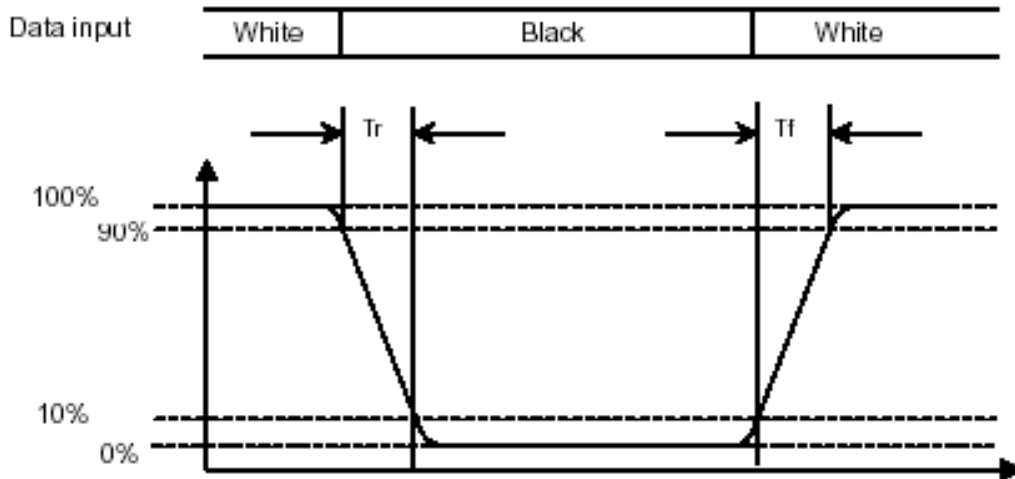
Note 5: Definition of Brightness Uniformity (B-uni):



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

**Note 6: Definition of Response Time:**

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


**Note 7: Definition of Chromaticity:**

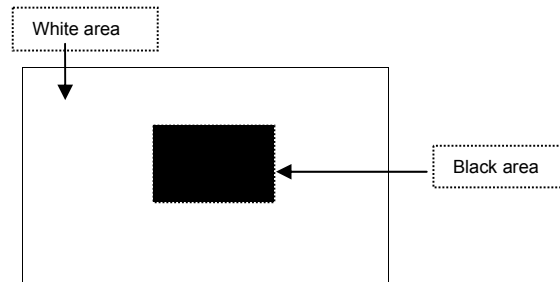
The color coordinates  $(x_W, y_W)$ ,  $(x_R, y_R)$ ,  $(x_G, y_G)$ , and  $(x_B, y_B)$  are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

**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**



## 10. TOUCH PANEL CHARACTERISTICS

### 1. Input Method and Activation Force

Input Method	Average Activation Force
0.8mm dia. Delrin stylus	60~100g

### 2. Typical Optical Characteristics

ITEM	Parameter
Visible Light Transmission	82%
Haze	<7%

### 3. Electrical Specification

ITEM	Parameter
Operating Voltage	10V
Contact current	According to individual design
Circuit close resistance	X 350Ω~1300Ω
	Y 70Ω~800Ω
Circuit open resistance	> 20MΩ at DC25V
Contact bounce	<10ms

### 4. Linearity

ITEM	Parameter
Linear Test Specification Direction	X 1.5%
	Y 1.5%

### 5. Specification

ITEM	Parameter
Operating Temperature	-20°C~+70°C
Storage Temperature	-30°C~+80°C

### 6. Durability test:

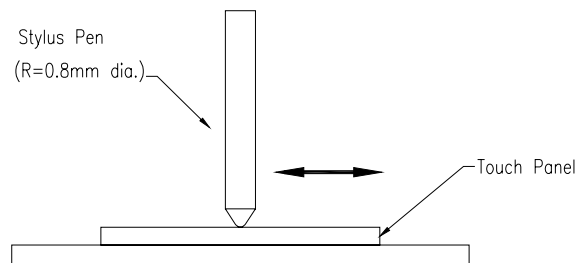
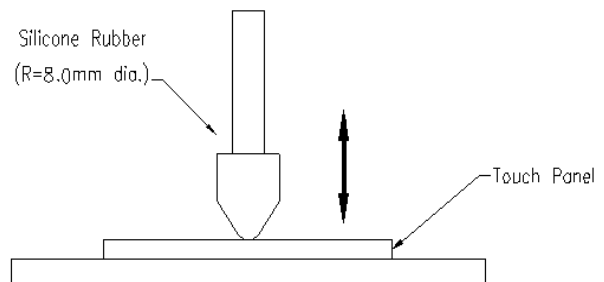
6.1 Touch panel is hit 1 millions times with a silicone rubber of R8, hitting rate is by 250g at 2 times per second. The measurement must satisfy the following:

- Circuit close resistance: X=350Ω~1300Ω ;  
Y=70Ω~800Ω
- Circuit open resistance: > 20MΩ at DC25V
- Contact bounce: <10ms
- Linearity test: 1.5%

#### 6.2 Stylus writing

Touch panel is drawn by R0.8 Delrin stylus pen, at 250g forces, 60 mm/sec. by 100k times. The measurement must satisfy the following:

- Circuit close resistance: X=350Ω~1300Ω ;  
Y=70Ω~800Ω
- Circuit open resistance: > 20MΩ at DC25V
- Contact bounce: <10ms
- Linearity test: 1.5%



## 11. 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

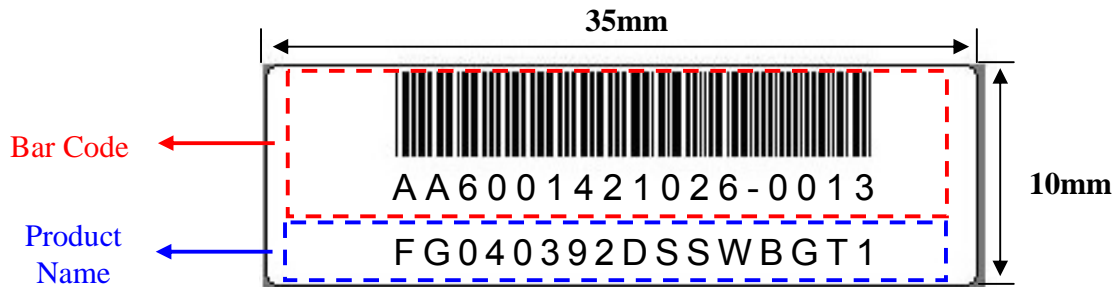
In case of related to deterioration such as shock test. It will be conducted only once.

#### 10.1.5 Test Method

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	T=80°C,240hrs
2	Low Temperature Storage Test	T=-30°C,240hrs
3	High Temperature Operation Test	T=70°C,240hrs
4	Low Temperature Operation Test	T=-20°C,240hrs
5	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs
6	Thermal Cycling Test (No operation)	-30°C → +25°C → +80°C,200 Cycles 30 min 5min 30 min
7	Electrostatic Discharge Test (No operation)	150pF,330Ω Air:± 15KV;Contact: ± 8KV 10 times/point;4 points/panel face

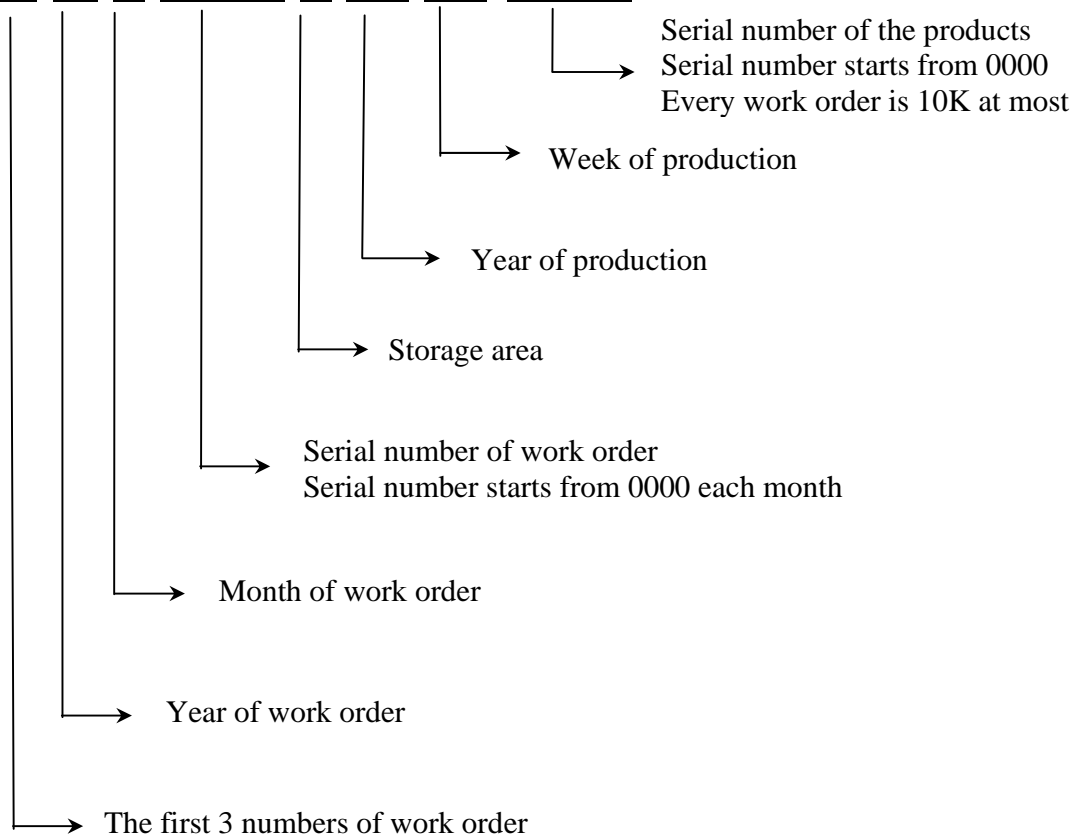
## 12. LCM PRODUCT LABEL DEFINE

Product Label style:

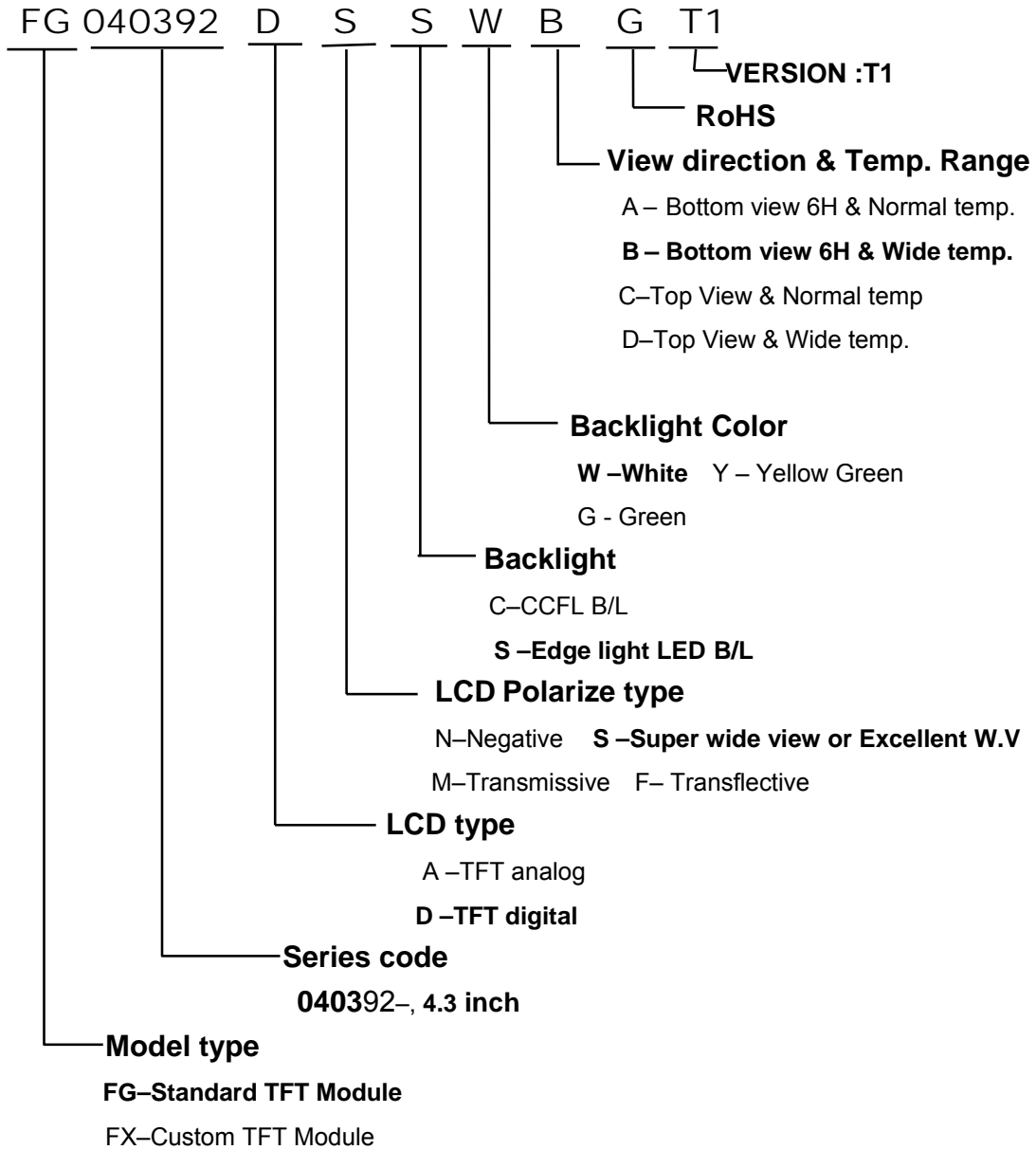


BarCode Define:

**A A 6 0014 2 10 26-0013**



**Product Name Define:**



### 13. PRECAUTIONS 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 handling,

- (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 :  $280^{\circ}\text{C} \pm 10^{\circ}\text{C}$
- (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 afterwards.

##### 2.4 Operation

- (1). The viewing angle can be adjusted by varying the LCD driving voltage  $V_0$ .
- (2). Driving voltage should be kept within specified range; excess voltage shortens display life.
- (3). Response time increases with decrease in temperature.
- (4). 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".
- (5). Mechanical disturbance during operation (such as pressing on the viewing area) may cause the segments to appear "fractured".

##### 2.5 Storage

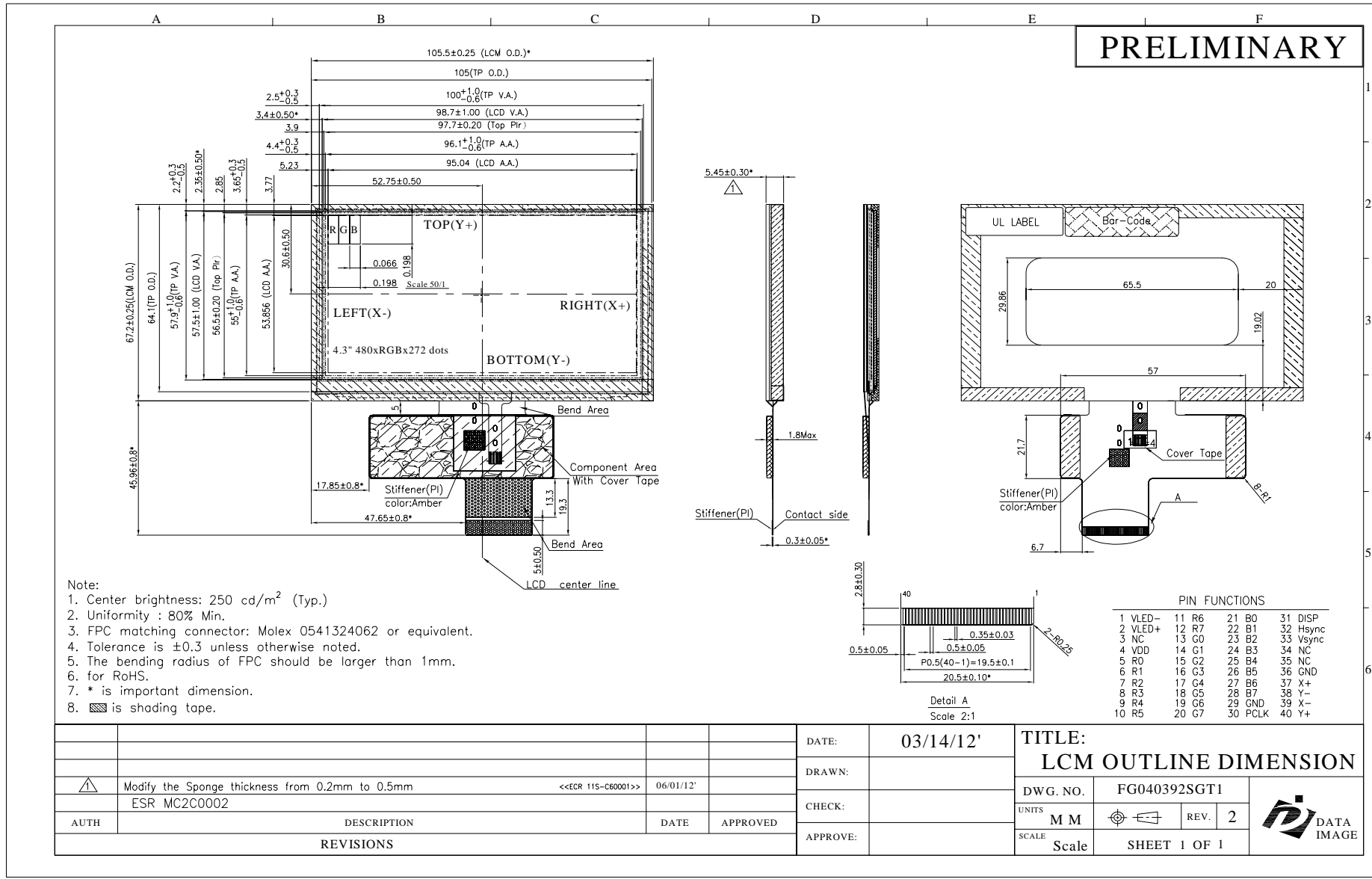
If any fluid leaks out of a damaged glass cell, wash off any human part that comes into contact with soap and water. Never swallow the fluid. The toxicity is extremely low but caution should be exercised at all the time.

##### 2.6 Limited Warranty

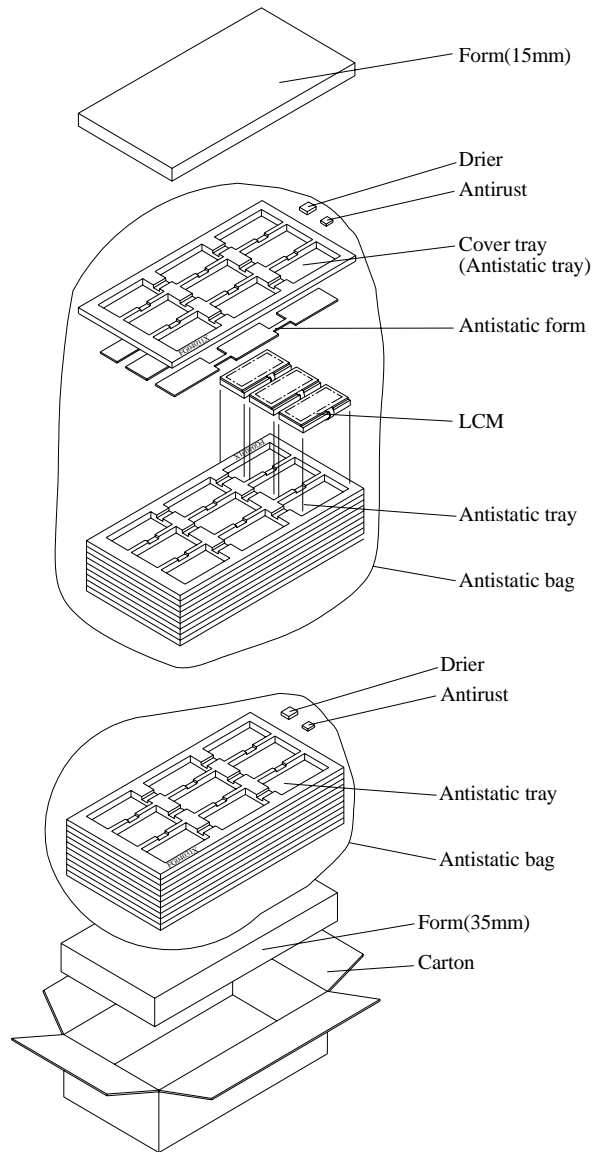
Unless otherwise agreed between DATA IMAGE and customer, DATA IMAGE will replace or repair any of its LCD and LCM which is found to be defective electrically and visually when inspected in accordance with DATA IMAGE acceptance standards, for a period on one year from date of shipment. Confirmation of 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 be responsible for any subsequent or consequential events.



Confidential Document  
**14. OUTLINE DRAWING**



## 15. PACKAGE INFORMATION



### Material

1 Carton + 1 Form (15mm) + 2 Anti-static bag + 20 Anti-static tray  
+ 2 Drier + 2 Antirust + 1 Form (35mm)

### Total pcs

1 Antistatic tray = 9 pcs (modules)

1 Anti-static bag = 9 Anti-static tray + cover tray =  $9*9 + 1*0 = 81$  pcs

1 Carton = 2 Anti-static bag =  $2*81 = 162$  pcs

1 Carton = 162 pcs

Carton size : 482L x 282W x 279H (mm)

Total Weight  $\div$  11.6 kgw

FG040392+TP TFT LCM PACKING