DATA IMAGE CORPORATION

TFT Module Specification

Preliminary

ITEM NO.: FG050728DSSWDG01

Table of Contents

Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	JACK	ERIC	PAUL	HELEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	1	2011/12/8		20

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	12/Dec/11			Initial preliminary

3. APPLICATION

Digital equipments which need color display, such as P.O.S, medical equipments and industrial equipments.

4. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Display resolution	(640X R.G.B) (W) x480(H)	dot
Active area	115.2(W) x 86.4(H)	mm
Screen size	5.7(Diagonal)	inch
Dot pitch	0.06(W) x 0.18(H)	mm
Color configuration	R.G.B. Stripe	
Overall dimension	127 (W) x 98.43(H) x 7Max.(T)	mm
Weight	110	g
Surface treatment	Clear	
View Angle direction	12 o'clock	
Our components and processes are compliant to RoHS standard		

5. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	MIN.	MAX.	Unit	Remark
Power supply voltage	Vcc	-0.3	5.0	V	
Logic input voltage	VI	-0.3	V_{CC}+0.3	V	
Operating temperature	Top	-20	+70	°C	Ambient temperature
Storage temperature	Tst	-30	+80	°C	Ambient temperature

6. ELECTRICAL CHARACTERISTICS

GND=0V,DCLK=25MHz,Ta=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}		111	140	mA	V_{CC} =3.3V
Ripple voltage	V_{RF}	-	-	100	mV $_{P-P}$	
"H" level logical input voltage	V_{IH}	0.7Vcc	--	Vcc	V	
"L" level logical input voltage	V_{IL}	0	--	0.3Vcc	V	
LED Voltage	VL		9.9		V	Note 1
LED Current	IL	-	140	-	mA	
LED Dice life time		--	50000	--	Hr	Note 2

Note 1: VL=(VLED+)-(VLED-)

Note 2: The "LED dice life time" is defined as the brightness decrease to 50% original brightness that the ambient temperature is 22℃ and LED dice current=20mA.

7. BLOCK DIAGRAM

640(R,G,B)x480 Pixel

**Source Driver
Timing Control**

**Source
Driver**

Gate Driver

**DC/DC
Converter**

GND

VCC

DCLK

HSYNC

VSYNC

DE

**B0~B7
G0~G7
R0~R7**

DISP
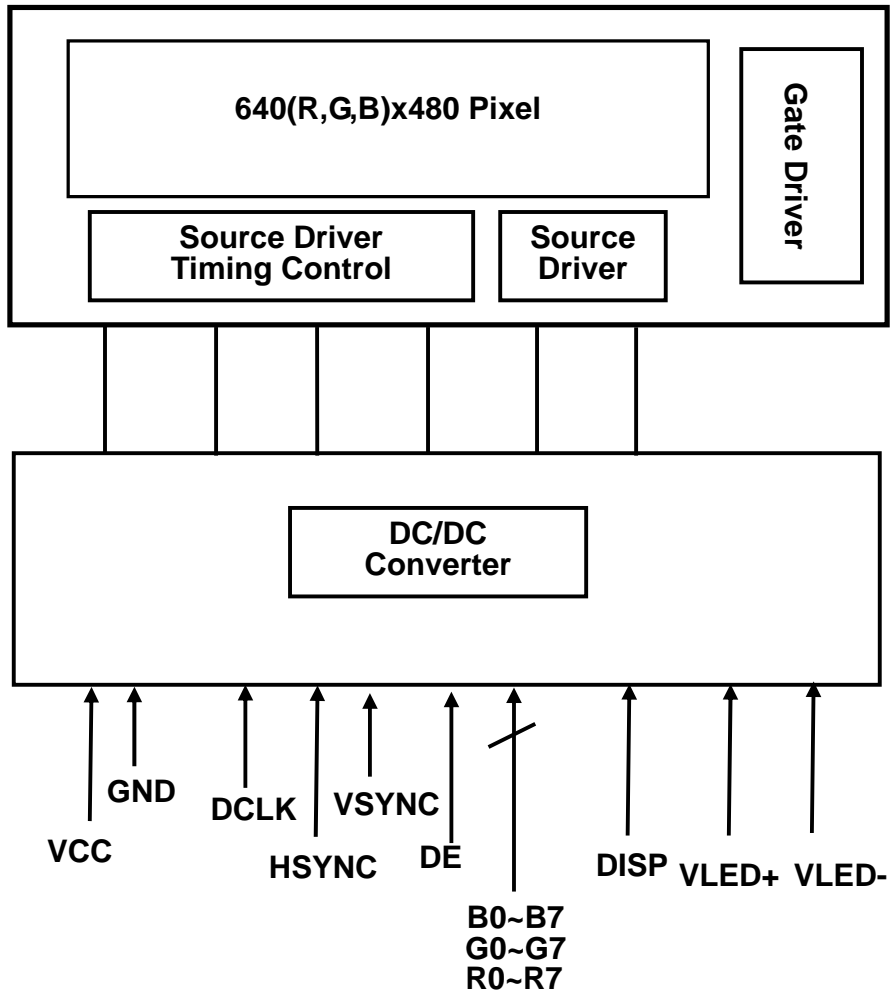
VLED+

VLED-

8. PIN CONNECTIONS

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

Remarks:

1) If DE signal is fixed low, SYNC mode is used. Otherwise, DE mode is used.

8.1 Power Signal Sequence
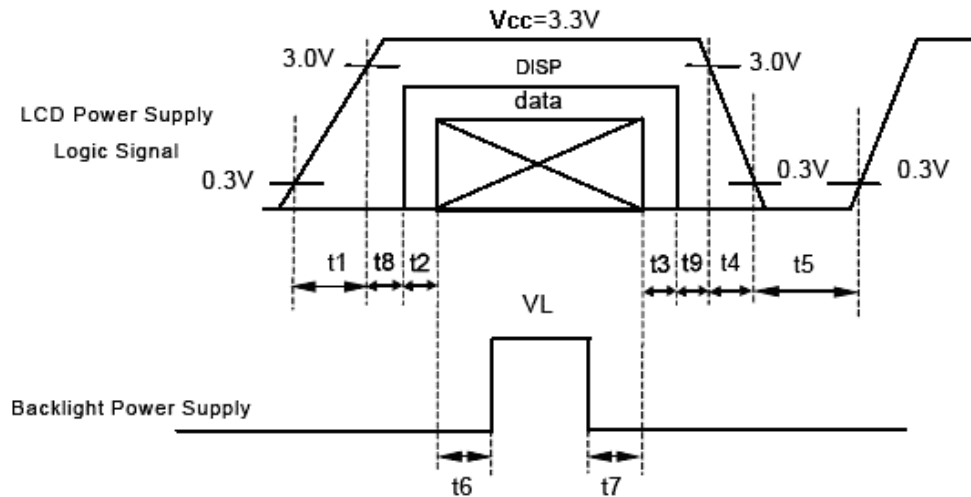
Remarks:

*1) Power Signal sequence:

t1 ≤10ms : 1 sec≤ t5

50ms≤ t2 : 200ms ≤t6

0<t3 ≤50ms: 200ms≤ t7

0<t4 ≤10ms ; 0< t8 ;

0< t9 ≤ 50ms

Data : RGB DATA, DCLK, DE, HSYNC, VSYNC

*2) VCC-dip condition:

(1) 2.7 V ≤ VCC <3.0V, td ≤ 10 ms

(2) VCC＞3.0V,VCC-dip condition should be the same with VCC-turn-on condition。
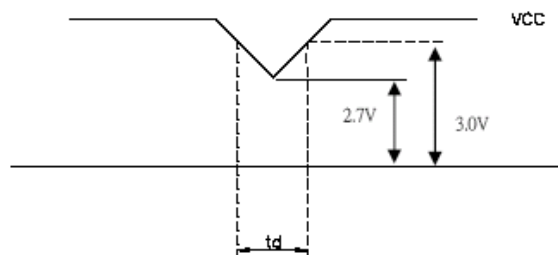
9. INTERFACE SPECIFICATIONS
9.1 DE mode Input signal characteristics

Signal	Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
DCLK	Period	t_{CLK}	33	40	43	ns	
	Frequency	f_{CLK}	23	25	30	MHz	
	Low Level Width	t_{WCL}	6	-	-	ns	
	High Level Width	t_{WCH}	6	-	-	ns	
	Rise, Fall Time	t_{CLKr}, t_{CLKf}	-	-	3	ns	
	Duty (1)	-	0.45	0.50	0.55	-	
DE (Data Enable)	Setup Time	t_{DES}	5	-	-	ns	
	Hold Time	t_{DEH}	10	-	-	ns	
	Rise, Fall Time	t_{DEr}, t_{DEf}	-	-	16	ns	
	Horizontal Period	t_{HP}	750	800	900	t_{CLK}	
	Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
	Horizontal Blank	t_{HBK}	110	160	260	t_{CLK}	
	Vertical Period	t_{VP}	515	525	560	t_{HP}	
	Vertical Valid	t_{W}	480	480	480	t_{HP}	
	Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
	Vertical Frequency	f_{v}	55	60	65	Hz	
Data R,G,B	Setup Time	t_{DS}	5	-	-	ns	
	Hold Time	t_{DH}	10	-	-	ns	
	Rise, Fall Time	t_{Dr}, t_{Df}	-	-	3	ns	

Note: (1) tCLKL / tCLK.

9.1.1 DE mode timing waveform
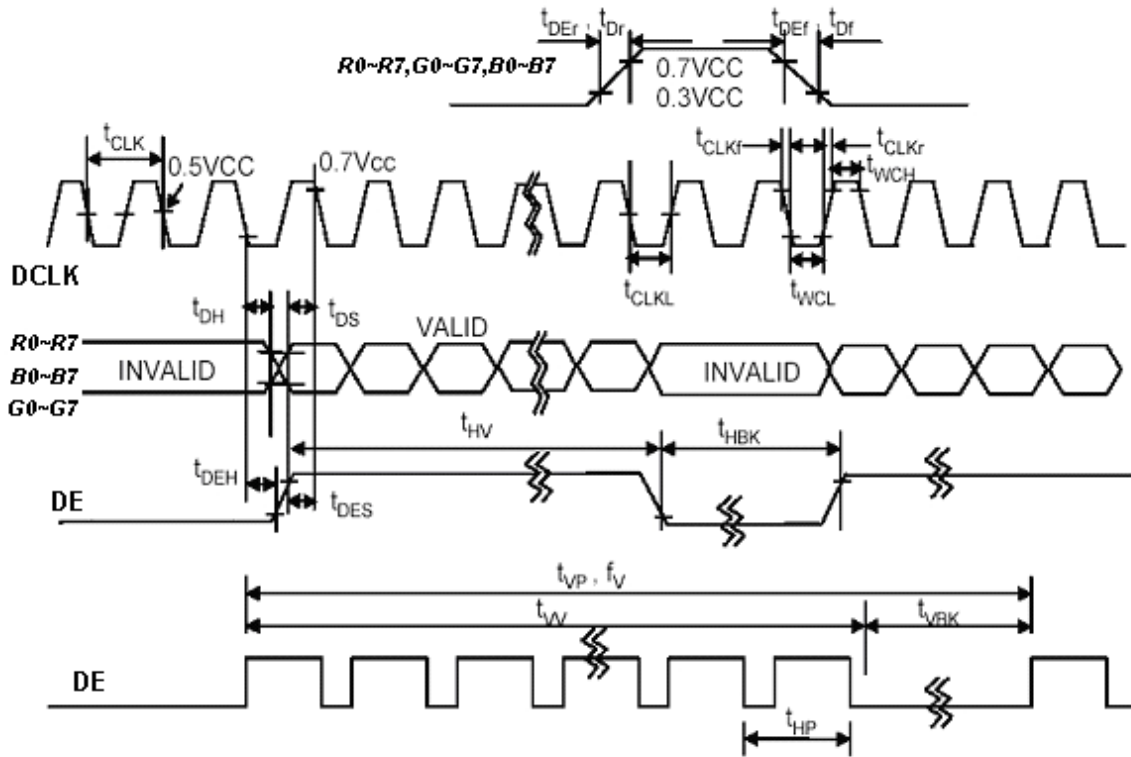
9.2 SYNC mode Input signal characteristics

| Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
Clock Period	t_{CLK}	33	40	43	ns	
Clock Frequency	f_{CLK}	23	25	30	MHz	
Clock Low Level Width	t_{WCL}	6	-	-	ns	
Clock High Level Width	t_{WCH}	6	-	-	ns	
Clock Rise, Fall Time	t_{CLKr}, t_{CLKf}	-	-	3	ns	
HSYNC Period	t_{HP}	750	800	900	t_{CLK}	
HSYNC Pulse Width	t_{HW}	5	30	-	t_{CLK}	
HSYNC Front Porch	t_{HFP}	1	16	116	t_{CLK}	
HSYNC Back Porch	t_{HBP}	1	114	139	t_{CLK}	
HSYNC Width + Back Porch	$t_{HW} + t_{HBP}$	144	144	144	t_{CLK}	
Horizontal Blank	t_{HBK}	1	160	260	t_{CLK}	
Horizontal Valid	t_{HV}	640	640	640	t_{CLK}	
VSYNC Period	t_{VP}	515	525	560	t_{HP}	
VSYNC Pulse Width	t_{VW}	1	3	5	t_{HP}	
VSYNC Front Porch	t_{VFP}	1	10	45	t_{HP}	
VSYNC Back Porch	t_{VBP}	30	32	34	t_{HP}	
VSYNC Width + Back Porch	$t_{VW} + t_{VBP}$	35	35	35	t_{CLK}	
Vertical Blank	t_{VBK}	35	45	80	t_{HP}	
Vaild data Width	t_{W}	480	480	480	t_{HP}	
Data Setup Time	t_{DS}	5	-	-	ns	
Data Hold Time	t_{DH}	10	-	-	ns	

Note: (1) tHBK = tHFP + tHW + tHBP

9.2.1 SYNC mode timing waveform
9.2.1.1 Input vertical timing
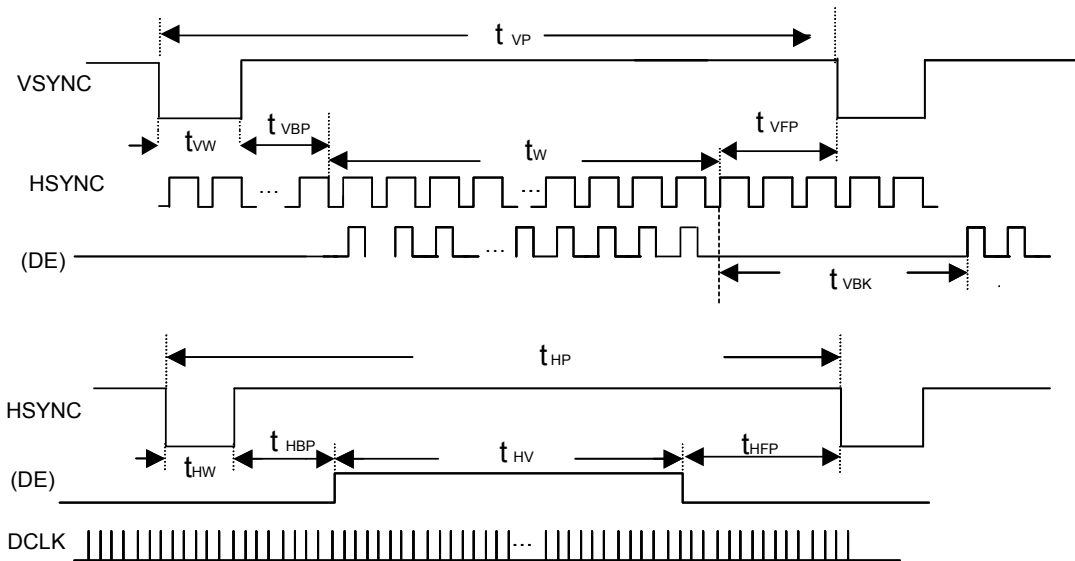
Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

9.2.1.2 Input horizontal timing
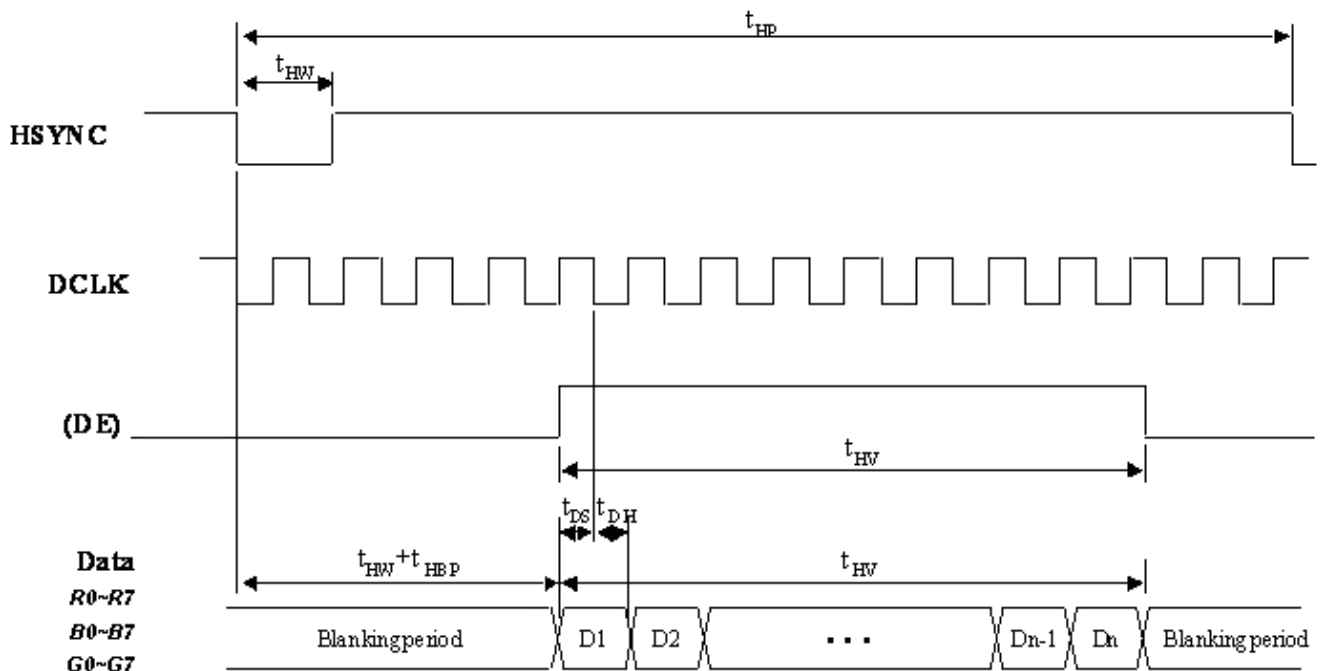
Remark : If SYNC mode is used, please fix DE signal to low, DE timing waveform is for reference only.

9.3 Color Data Assignment

COLOR	DISPLAY	RED								GREEN								BLUE								GRAY SCALE LEVEL
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7	
BASIC COLOR	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	-
	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	-
	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	-
	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	-
	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	-
	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	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	R0
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1
		0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252
	↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	LIGHT	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253
		0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254
	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	R255
GRAY SCALE OF GREEN	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	G0
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1
		0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2
		:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	G3~G252
	↓	:			:	:	:	:	:	:			:	:	:	:	:	:			:	:	:	:	:	
	LIGHT	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253
		0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254
	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	G255
GRAY SCALE OF BLUE	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	B0
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2
		:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252
	↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	
	LIGHT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	B253
		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	B254
	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	B255

Note) Definition of Gray :

Rn : Red Gray,   Gn : Green Gray,   Bn : Blue Gray (n = Gray level)

Input Signal :   0 = Low level voltage,   1 = High level voltage

10. OPTICAL CHARACTERISTIC

10-1. Specification:

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_x+	Center CR$\geq$10	60	70	--	deg	Note 1,4
		θ_x-		60	70	--		
	Vertical	θ_Y+		50	60	--		
		θ_Y-		30	40	--		
Contrast Ratio		CR	at optimized viewing angle	200	300			Note 1,3
Response time	Rise	Tr	Center	-	15		ms	Note 1,6
	Fall	Tf	$\theta x=\theta y =0°$	-	35		ms	
Uniformity		B-uni	$\theta x=\theta y =0°$	70	80	--	%	Note1,5
Brightness		L	$\theta x=\theta y =0°$	360	400	--	cd/m^2	Note 1,2
Chromaticity		x_W	Center $\theta x=\theta y =0°$	0.259	0.309	0.359		Note 1,7
		y_W		0.270	0.320	0.370		
		x_R		0.565	0.615	0.665		
		y_R		0.310	0.360	0.410		
		x_G		0.295	0.345	0.395		
		y_G		0.490	0.540	0.590		
		x_B		0.098	0.148	0.198		
		y_B		0.056	0.106	0.156		
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$1 lux), and at room temperature. The LED backlight current IL=140mA. The operation temperature is 25°C$\pm$2°C. The measurement method is shown in Note1.
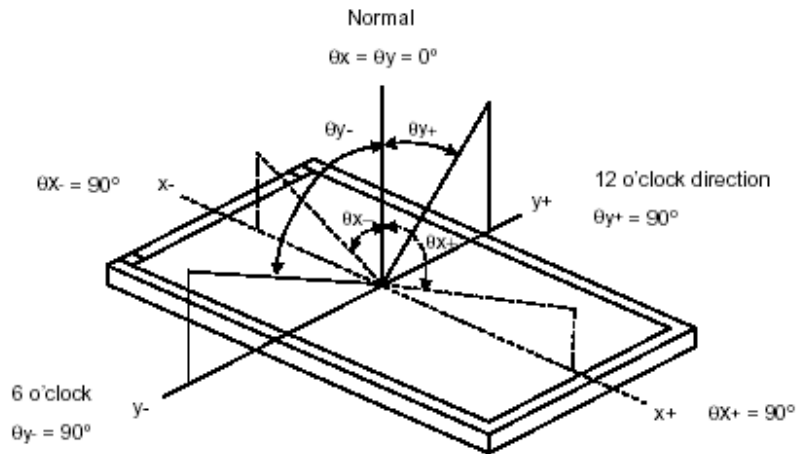
Note1: The method of optical measurement:
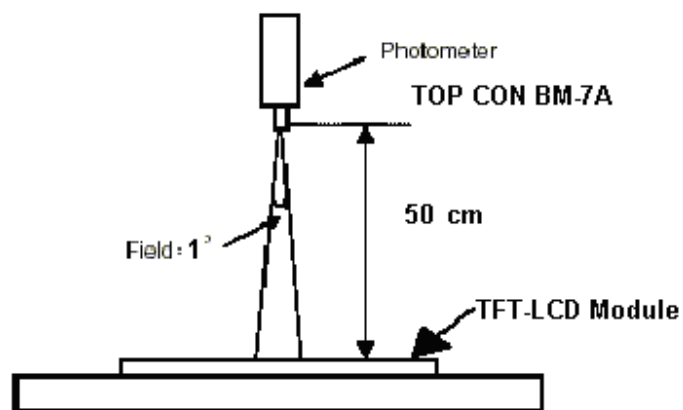
Note2: Measured at the center area of the panel and at the viewing angle of the $\theta x = \theta y = 0°$
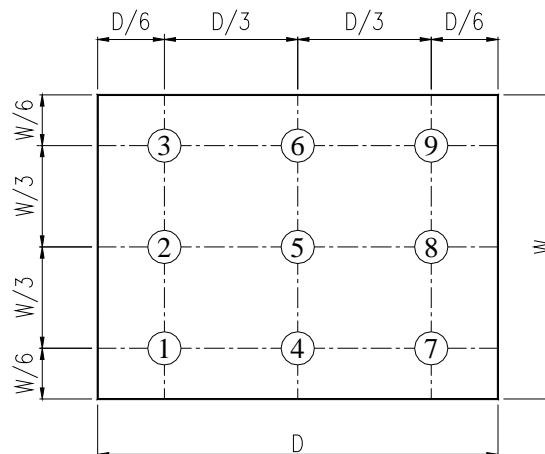
Note3: Definition of Contrast Ratio (CR):

$$CR = \frac{\text{Luminance with all pixels in white state}}{\text{Luminance with all pixels in Black state}}$$
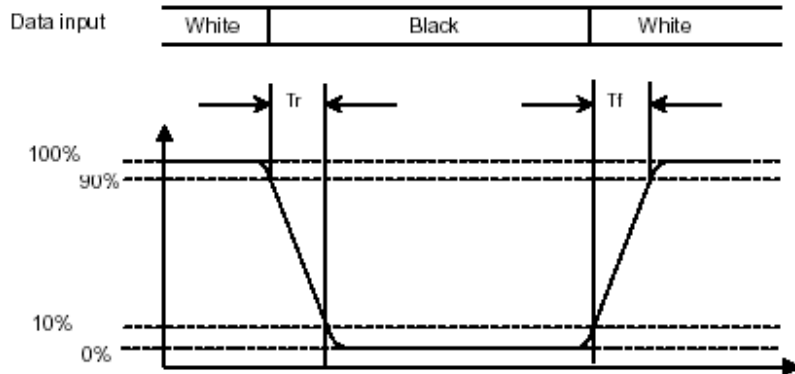
Note4: Definition of Viewing Angle

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
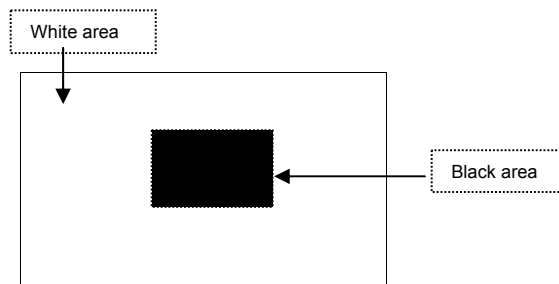
11. QUALITY ASSURANCE
11.1 Test Condition

11.1.1 Temperature and Humidity(Ambient Temperature)
   Temperature   : $25 \pm 5°C$
   Humidity   : $65 \pm 5\%$

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

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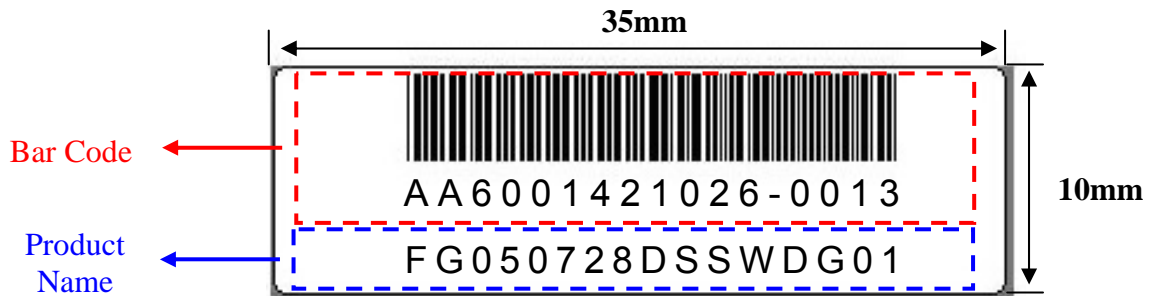
11.1.4 Test Frequency

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

11.1.5 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	Vibration Test (No operation)	Frequency:0 ~ 55 Hz Amplitude:1.5 mm Sweep Time:11min Test Period:6 Cycles for each Direction of X,Y,Z
8	Electrostatic Discharge Test (No operation)	150pF,330Ω Air:± 12KV;Contact: ±6KV 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

- Serial number of the products
  Serial number starts from 0000
  Every work order is 10K at most
- Week of production
- Year of production
- Storage area
- Serial number of work order
  Serial number starts from 0000 each month
- Month of work order
- Year of work order
- The first 3 numbers of work order
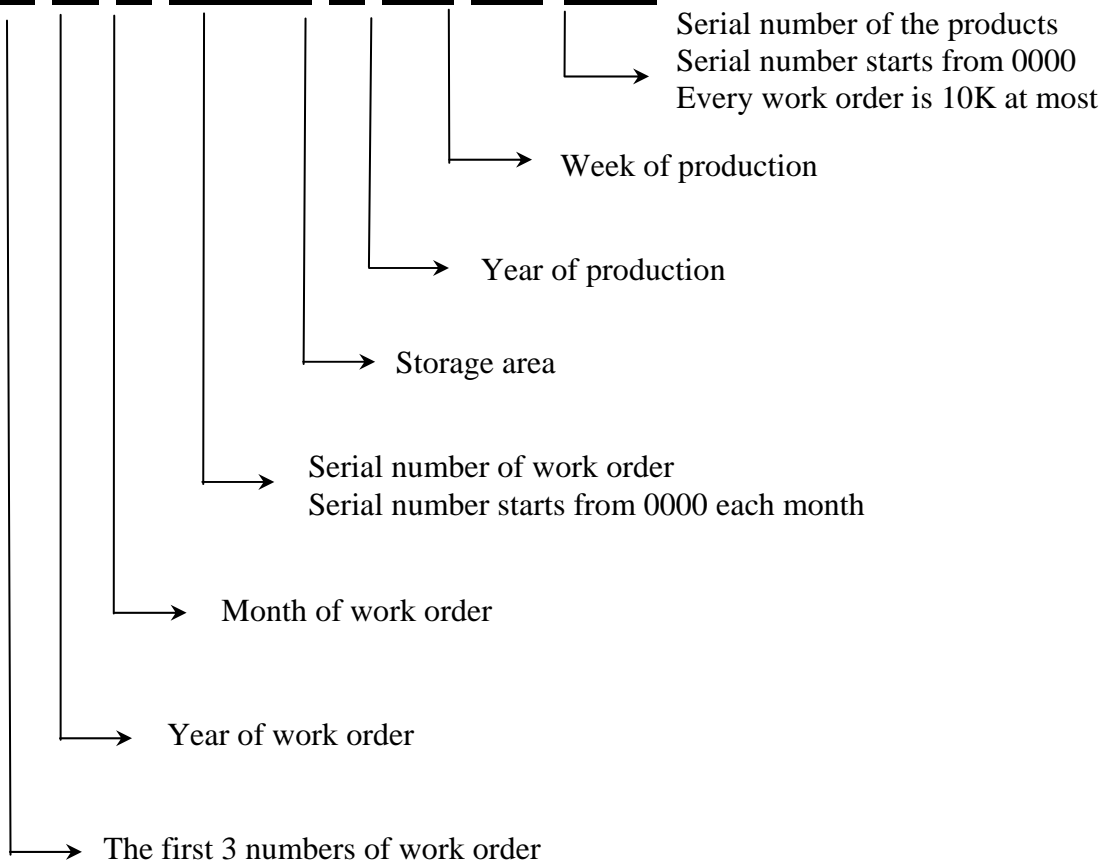
Product Name Define:

FG 050728 _D_ S _S_ W _D_ _G_ 01

└─ **VERSION: 01**

└─ RoHS

└─ **View direction & Temp. Range**

A－ Bottom view 6H & Normal temp.

B－ Bottom view 6H & Wide temp.

C–Top View & Normal temp

D–Top View & Wide temp.

└─ **Backlight Color**

W –White   Y – Yellow Green

G - green

└─ **Backlight**

C–CCFL B/L

S –edge light LED B/L

└─ **LCD Polarize type**

N–Negative   **S – Super wide view or Excellent W.V**

M–transmissive   F– transflective

└─ **LCD type**

A –TFT analog

D –TFT digital

└─ **Series code**

050728–, 5.7 inch

└─ **Model type**

FG–Standard TFT Module

FX–Custom TFT Module

13. PRECAUTION FOR USING 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.
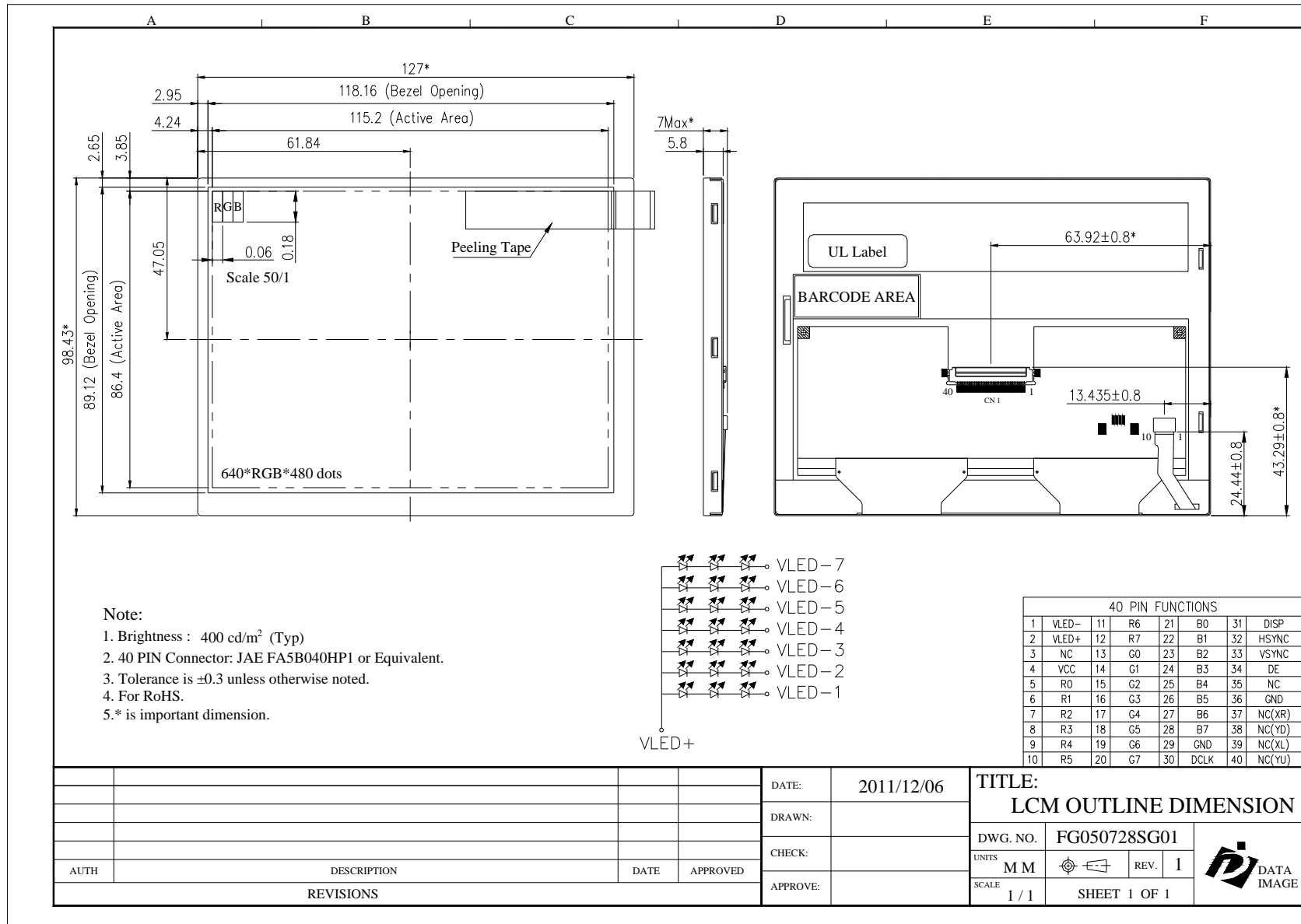
4. STORAGE PRECAUTIONS
   (1) When you store LCDs for a long time, it is recommended to keep the temperature between 0°C-40°C without the exposure of sunlight and to keep the humidity less than 90%RH.
   (2) Please do not leave the LCDs in the environment of high humidity and high temperature such as 60°C 90%RH
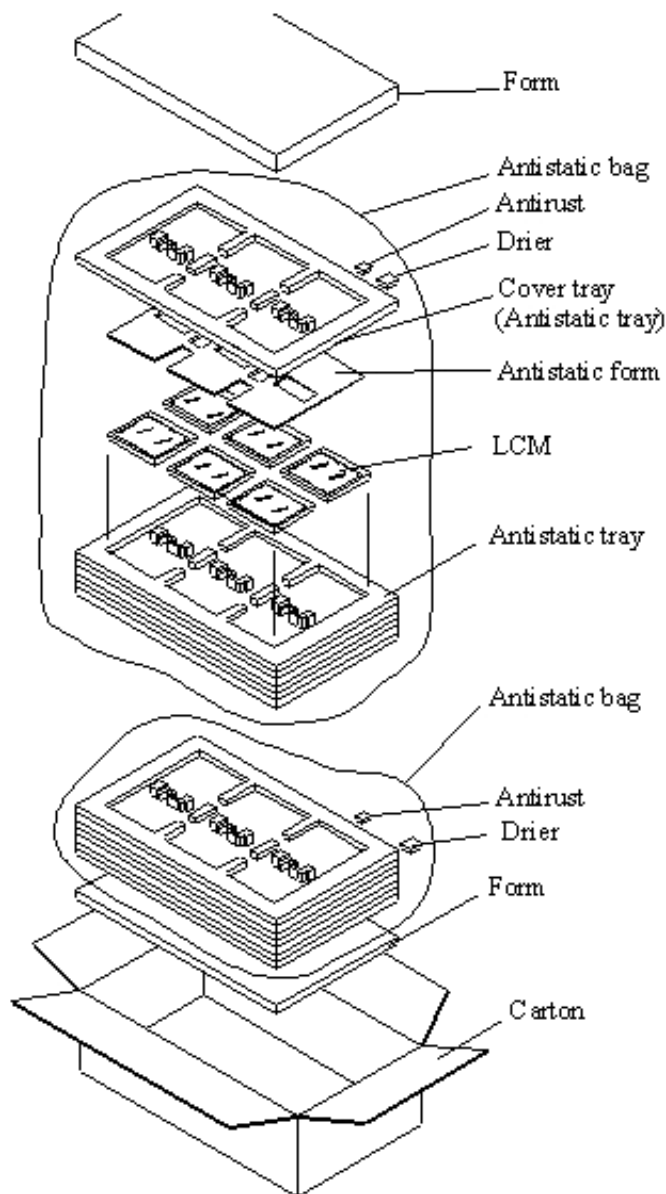   (3) Please do not leave the LCDs in the environment of low temperature; below -20°C.

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 Land 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.

14. OUTLINE DRAWING

Note:
1. Brightness : 400 cd/m^2 (Typ)
2. 40 PIN Connector: JAE FA5B040HP1 or Equivalent.
3. Tolerance is ±0.3 unless otherwise noted.
4. For RoHS.
5.* is important dimension.

640*RGB*480 dots

Peeling Tape

Scale 50/1

UL Label

BARCODE AREA

40 PIN FUNCTIONS							
1	VLED−	11	R6	21	B0	31	DISP
2	VLED+	12	R7	22	B1	32	HSYNC
3	NC	13	G0	23	B2	33	VSYNC
4	VCC	14	G1	24	B3	34	DE
5	R0	15	G2	25	B4	35	NC
6	R1	16	G3	26	B5	36	GND
7	R2	17	G4	27	B6	37	NC(XR)
8	R3	18	G5	28	B7	38	NC(YD)
9	R4	19	G6	29	GND	39	NC(XL)
10	R5	20	G7	30	DCLK	40	NC(YU)

VLED−7
VLED−6
VLED−5
VLED−4
VLED−3
VLED−2
VLED−1
VLED+

DATE:	2011/12/06	TITLE: LCM OUTLINE DIMENSION	
DRAWN:			
CHECK:		DWG. NO. FG050728SG01	
		UNITS M M	REV. 1
APPROVE:		SCALE 1 / 1	SHEET 1 OF 1

AUTH	DESCRIPTION	DATE	APPROVED
	REVISIONS		

DATA IMAGE

15.PACKAGE INFORMATION

Material

1 Carton + 2 Anti-static bag + 1 Form(35mm) + 1 Form(15mm)

+ 14 Anti-static tray + 2 Drier + 2 Antirust

Total pcs

1 Antistatic tray = 6 pcs

1 Anti-static bag = 6 Anti-static tray + cover tray = 6*6 + 1*0 = 36 pcs

1 Carton = 2 Anti-static bag = 2*36 = 72 pcs

1 Carton = 72pcs

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

Total Weight ≒ 11 kgw

FG050728 TFT LCM PACKING