



DATA IMAGE CORPORATION

TFT Module Specification

preliminary

ITEM NO.: FG050720DSSWDGL4

Table of Contents

1. COVER & CONTENTS	1
2. RECORD OF REVISION	2
3. APPLICATION.....	3
4. GENERAL SPECIFICATIONS	3
5. ABSOLUTE MAXIMUM RATINGS	3
6. ELECTRICAL CHARACTERISTICS	3
7. BLOCK DIAGRAM	4
8. PIN CONNECTIONS	5
9. INTERFACE SPECIFICATIONS	7
10. OPTICAL CHARACTERISTIC	12
11. QUALITY ASSURANCE	15
12. LCM PRODUCT LABEL DEFINE	16
13. PRECAUTIONS IN USE LCM	18
14. OUTLINE DRAWING	19
15. PACKAGE INFORMATION	20

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:
	1	20/DEC/11'		20



2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	20/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	V _{CC}	-0.3	5.0	V	
Logic input voltage	V _I	-0.3	V _{CC} +0.3	V	
Operating temperature	Top	-20	+70	°C	Ambient temperature
Storage temperature	T _{st}	-30	+80	°C	Ambient temperature

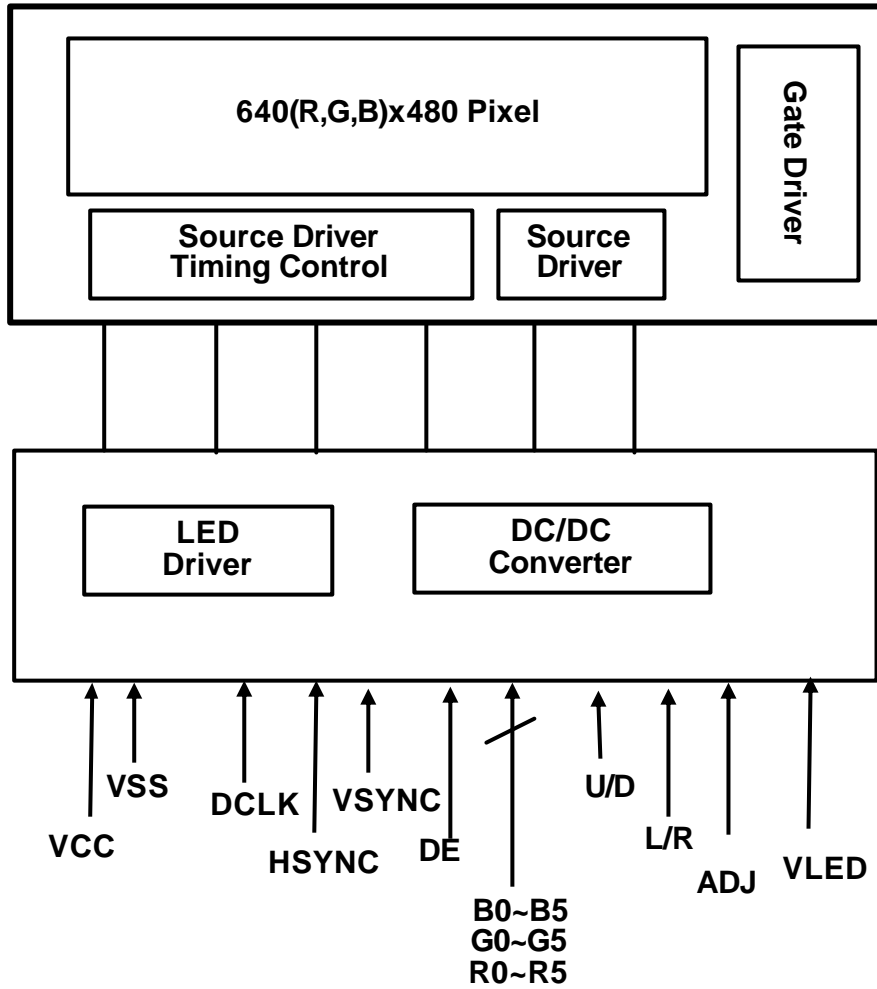
6. ELECTRICAL CHARACTERISTICS

VSS=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
Power Supply voltage for LED	V _{LED}	4.5	5	5.5	V	
Power Supply Current for LED	I _{LED}		T.B.D	T.B.D	mA	V _{LED} =5.0V
Ripple voltage	V _{RF}	-	-	100	mV _{P-P}	
“H” level logical input voltage	V _{IH}	0.7V _{CC}	--	V _{CC}	V	
“L” level logical input voltage	V _{IL}	0	--	0.3V _{CC}	V	
ADJ frequency		19K	20K	21K	Hz	
ADJ input voltage	V _{IH}	3.0	-	3.3	V	
	V _{IL}	0	-	0.3	V	
LED Dice life time		TBD			Hr	Note 1

Note 1: 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



8. PIN CONNECTIONS

Pin NO.	SYMBOL	DESCRIPTION
1	U/D	Up or Down Display Control
2	NC	No Connection
3	Hsync	Horizontal SYNC.
4	VLED	Power Supply for LED Driver circuit
5	VLED	Power Supply for LED Driver circuit
6	VLED	Power Supply for LED Driver circuit
7	Vcc	Power Supply for LCD
8	Vsync	Vertical SYNC.
9	DE	Data Enable
10	VSS	Power Ground
11	VSS	Power Ground
12	ADJ	Brightness control for LED B/L
13	B5	Blue Data 5 (MSB)
14	B4	Blue Data 4
15	B3	Blue Data 3
16	Vss	Power Ground
17	B2	Blue Data 2
18	B1	Blue Data 1
19	B0	Blue Data 0 (LSB)
20	Vss	Power Ground
21	G5	Green Data 5 (MSB)
22	G4	Green Data 4
23	G3	Green Data 3
24	Vss	Power Ground
25	G2	Green Data 2
26	G1	Green Data 1
27	G0	Green Data 0 (LSB)
28	Vss	Power Ground
29	R5	Red Data 5 (MSB)
30	R4	Red Data 4
31	R3	Red Data 3
32	Vss	Power Ground
33	R2	Red Data 2
34	R1	Red Data 1
35	R0	Red Data 0
36	VSS	Power Ground
37	VSS	Power Ground
38	DCLK	Clock Signals ; Latch Data at the Falling Edge
39	Vss	Power Ground
40	L/R	Left or Right Display Control

Remarks :

- 1) ADJ is brightness control Pin. The larger of the pulse duty is, the higher of the brightness.
- 2) ADJ signal is 0~3.3V.Operation frequency is 20KHz
- 3) VSS PIN must be grounding, can not be floating.

4) U/D and L/R control Function

L/R	U/D	Function
1	0	Normally display
0	0	Left and Right opposite
1	1	Up and Down opposite
0	1	Left and Right opposite , Up and Down opposite

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

8.1 Power Signal Sequence

Remarks:

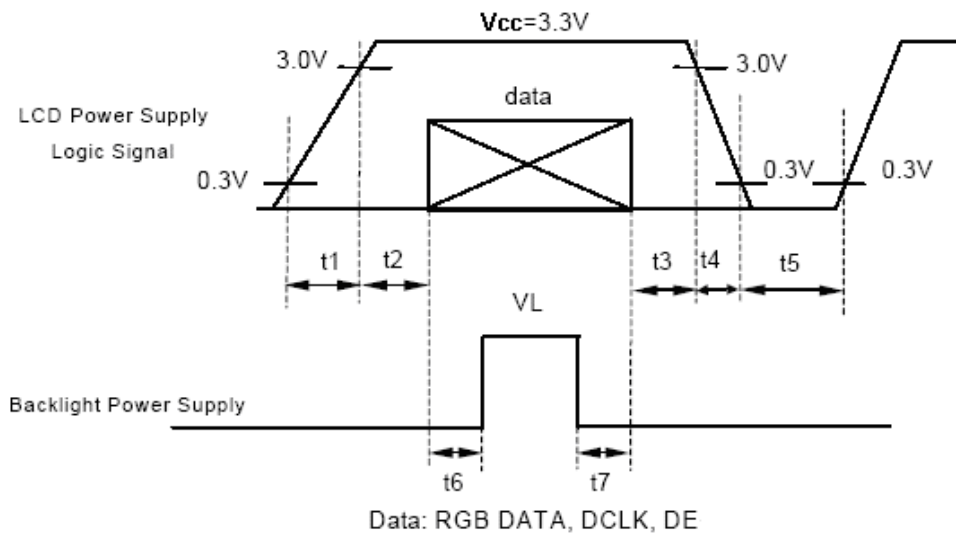
*1) Power Signal sequence:

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

$50\text{ms} \leq t2$: $200\text{ms} \leq t6$

$0 < t3 \leq 50\text{ms}$: $200\text{ms} \leq t7$

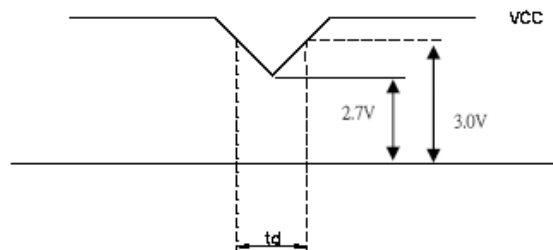
$0 < t4 \leq 10\text{ms}$



*2) VCC-dip condition:

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

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



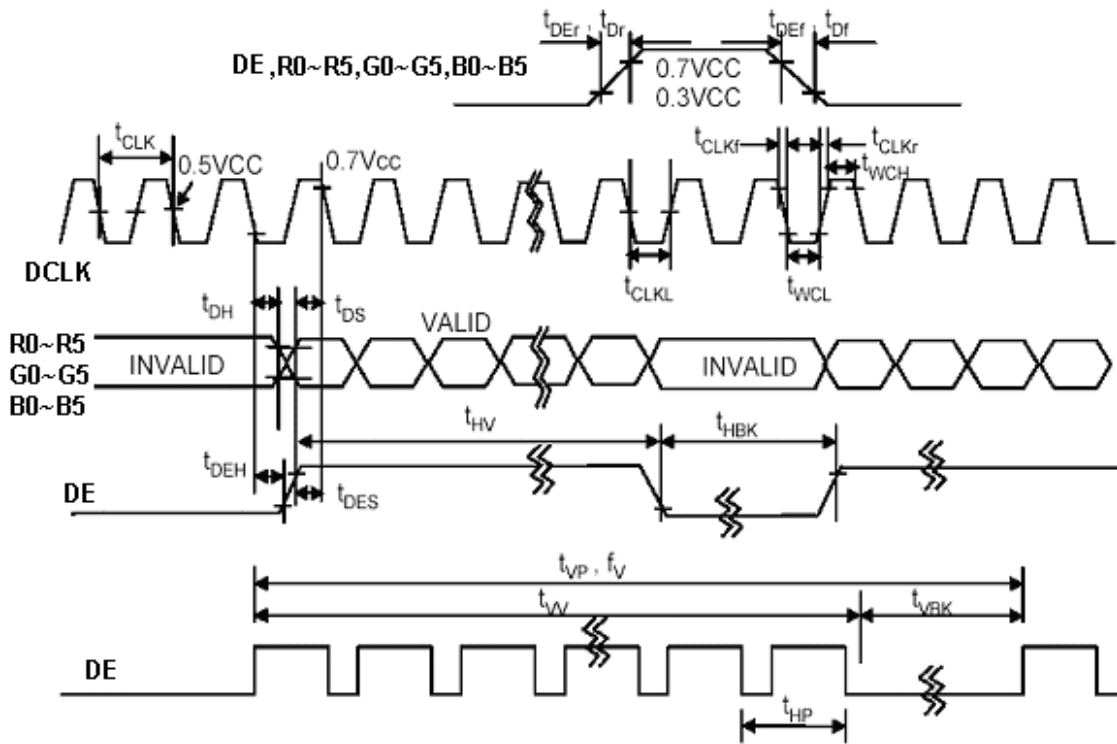
9. INTERFACE SPECIFICATIONS

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_{V}	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) t_{CLKL} / t_{CLK}

9.1.1 DE mode timing waveform



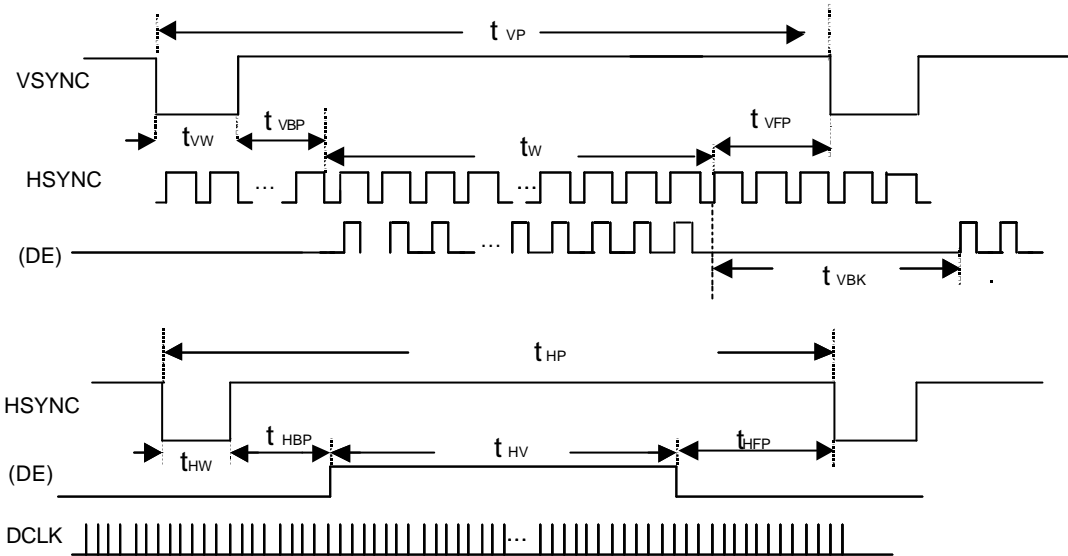
9.2 SYNC mode Input signal characteristics

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) $t_{HBK} = t_{HFP} + t_{HW} + t_{HBP}$

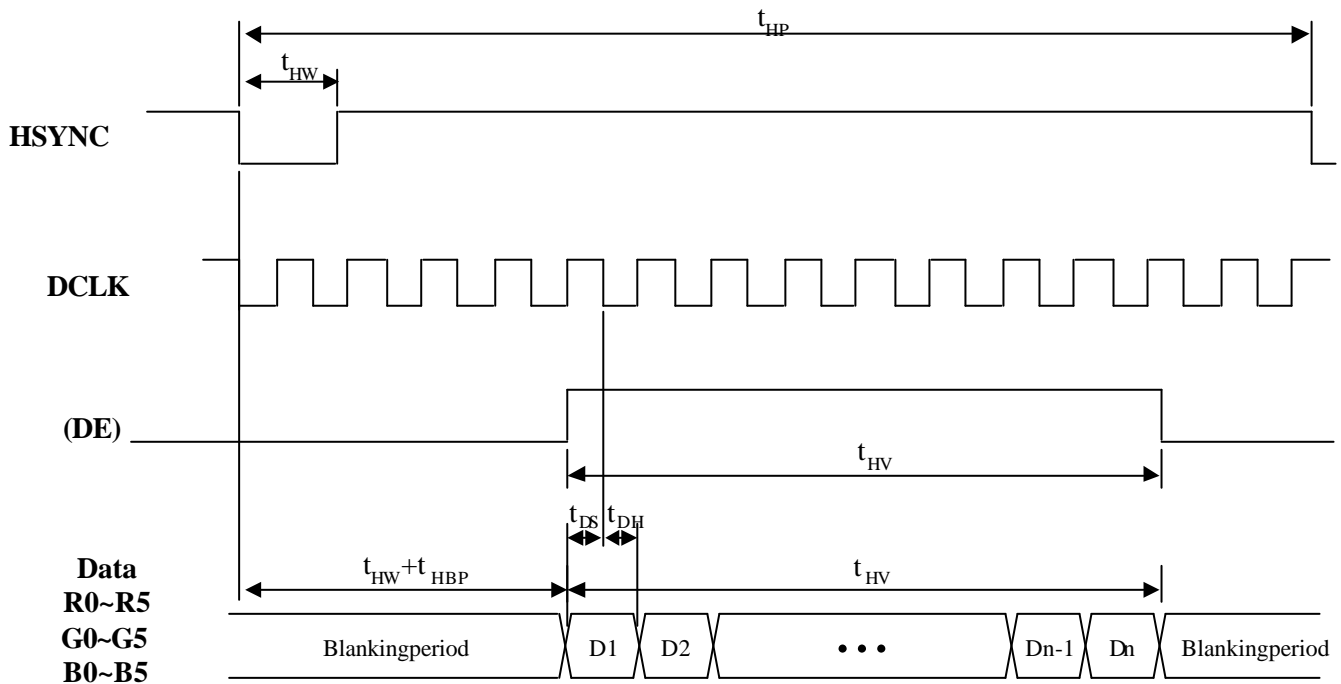
9.2.1 SYNC mode timing waveform

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	INPUT	R DATA						G DATA						B DATA					
	DATA	R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB				LSB	MSB					LSB	
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	1	1	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
RED	RED(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	1	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	
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	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	
GREEN	GREEN(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	1	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	
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	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	
BLUE	BLUE(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	1	
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
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	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	

Remarks:(1) Definition of Gray Scale color(n).n is series of Gray Scale The more n value is, the bright Gray Scale.
 (2)Data:1 -High,0-Low

Correspondence between Data and Display Position

	S0001	S0002	S0003	S0004	S0005	S0006	S0007	S0008	-----	S1919	S1920
C001	R001	G001	B001	R002	G002	B002	R003	G003		G640	B640
C480	R001	G001	B001	R002	G002	B002	R003	G003		G640	B640

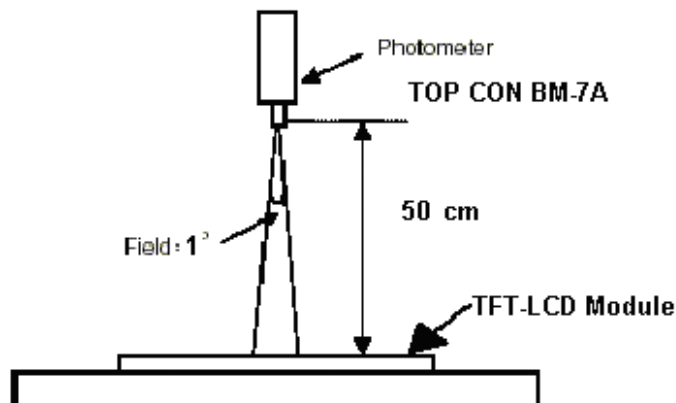
10. OPTICAL CHARACTERISTIC

10-1. Specification:

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks	
Viewing Angle	Horizontal	θ_{x+}	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	T_r	-	15		ms	Note 1,6	
	Fall	T_f	-	35		ms		
Uniformity		B-uni	$\theta_x = \theta_y = 0^\circ$	70	80	--	%	Note 1,5
Brightness		L	$\theta_x = \theta_y = 0^\circ$ ADJ=3.3V	800	900	--	cd/m ²	Note 1,2
Chromaticity	x_w	Center $\theta_x = \theta_y = 0^\circ$	Typ- 0.05	TBD	Typ+ 0.05		Note 1,7	
	y_w			TBD				
	x_R			TBD				
	y_R			TBD				
	x_G			TBD				
	y_G			TBD				
	x_B			TBD				
	y_B			TBD				
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 $25^\circ\text{C} \pm 2^\circ\text{C}$. The measurement method is shown in Note1.

Note1: The method of optical measurement:

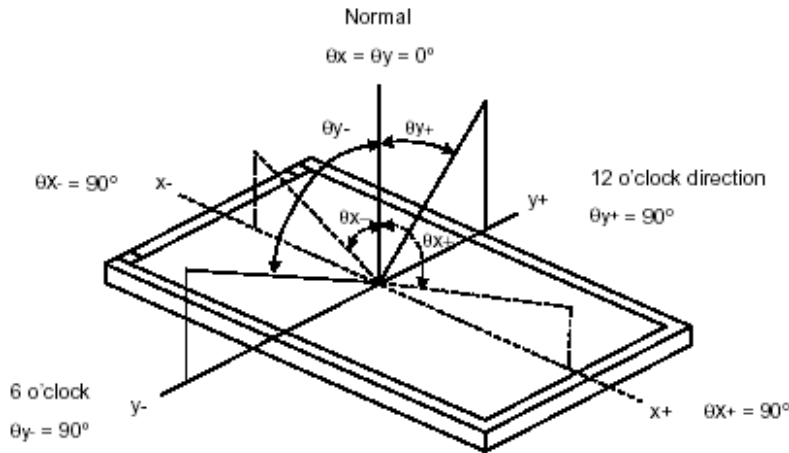


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta_x = \theta_y = 0^\circ$

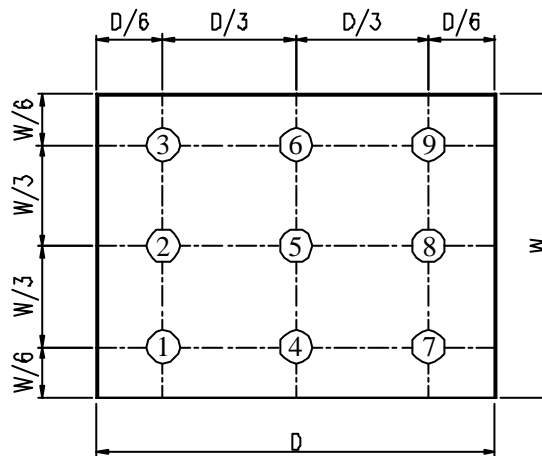
Note3: Definition of Contrast Ratio (CR):

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

Note4: Definition of Viewing Angle



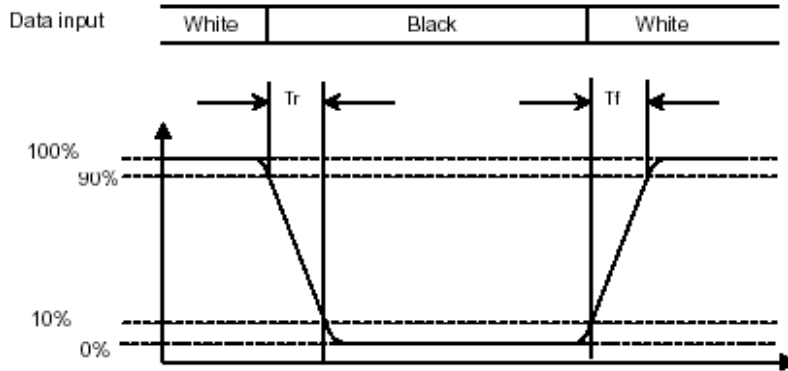
Note 5: Definition of Brightness Uniformity (B-uni):



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

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.



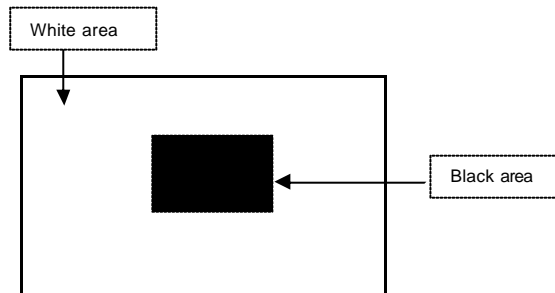
Note 7: Definition of Chromaticity:

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

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,3300 Air:± 12KV;Contact: ±6KV 10 times/point;4 points/panel face

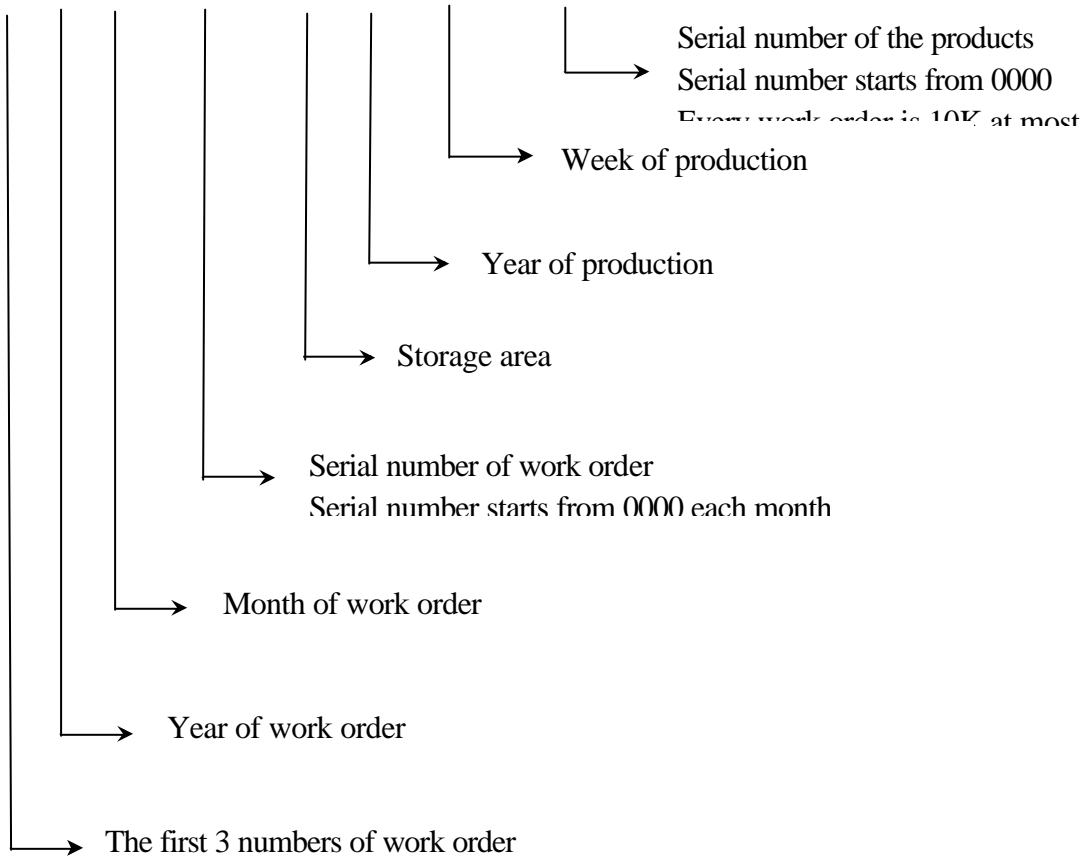
12. LCM PRODUCT LABEL DEFINE

Product Label style:

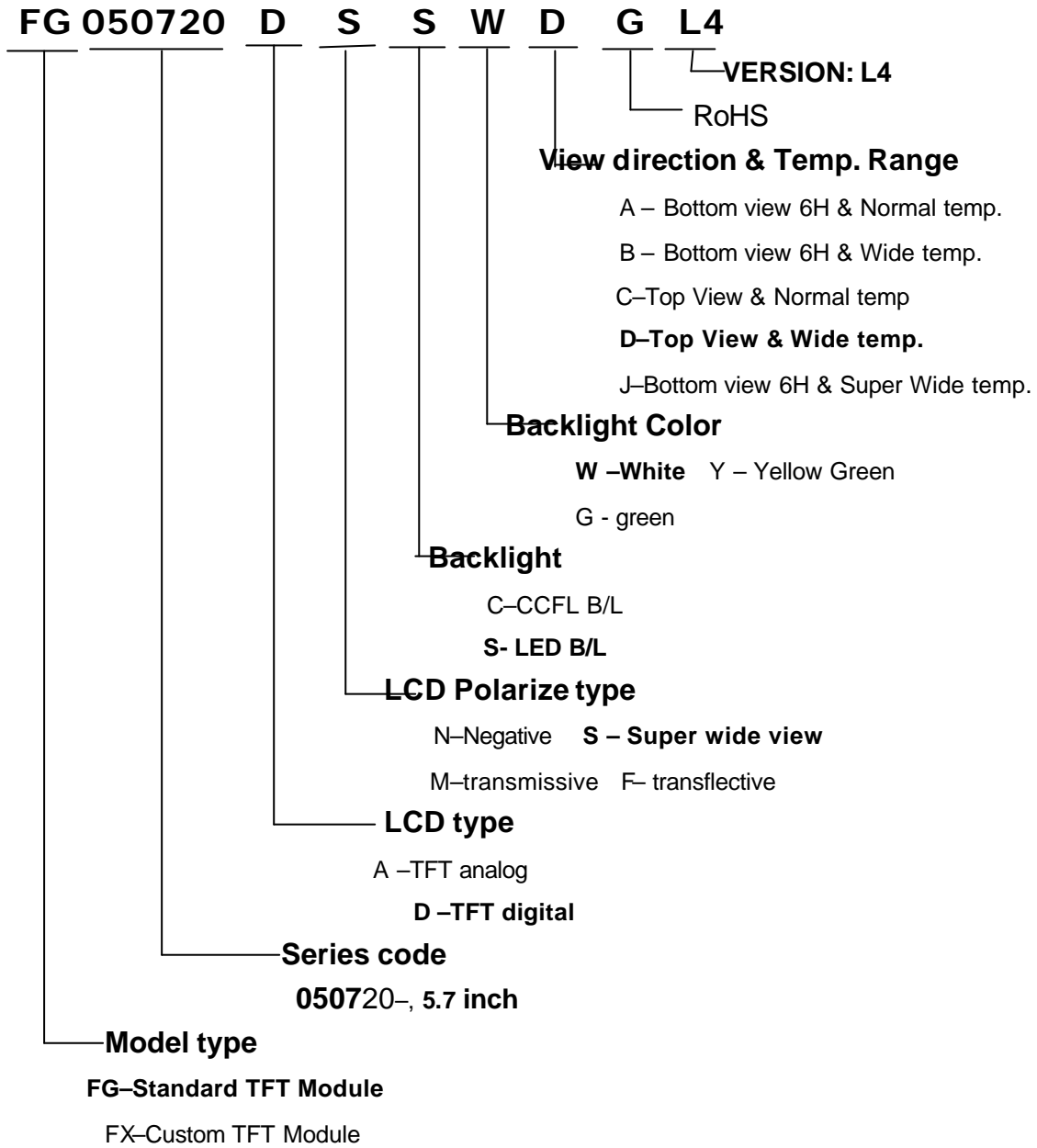


BarCode Define:

A A 6 0014 2 10 26-0013



Product Name Define:



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.

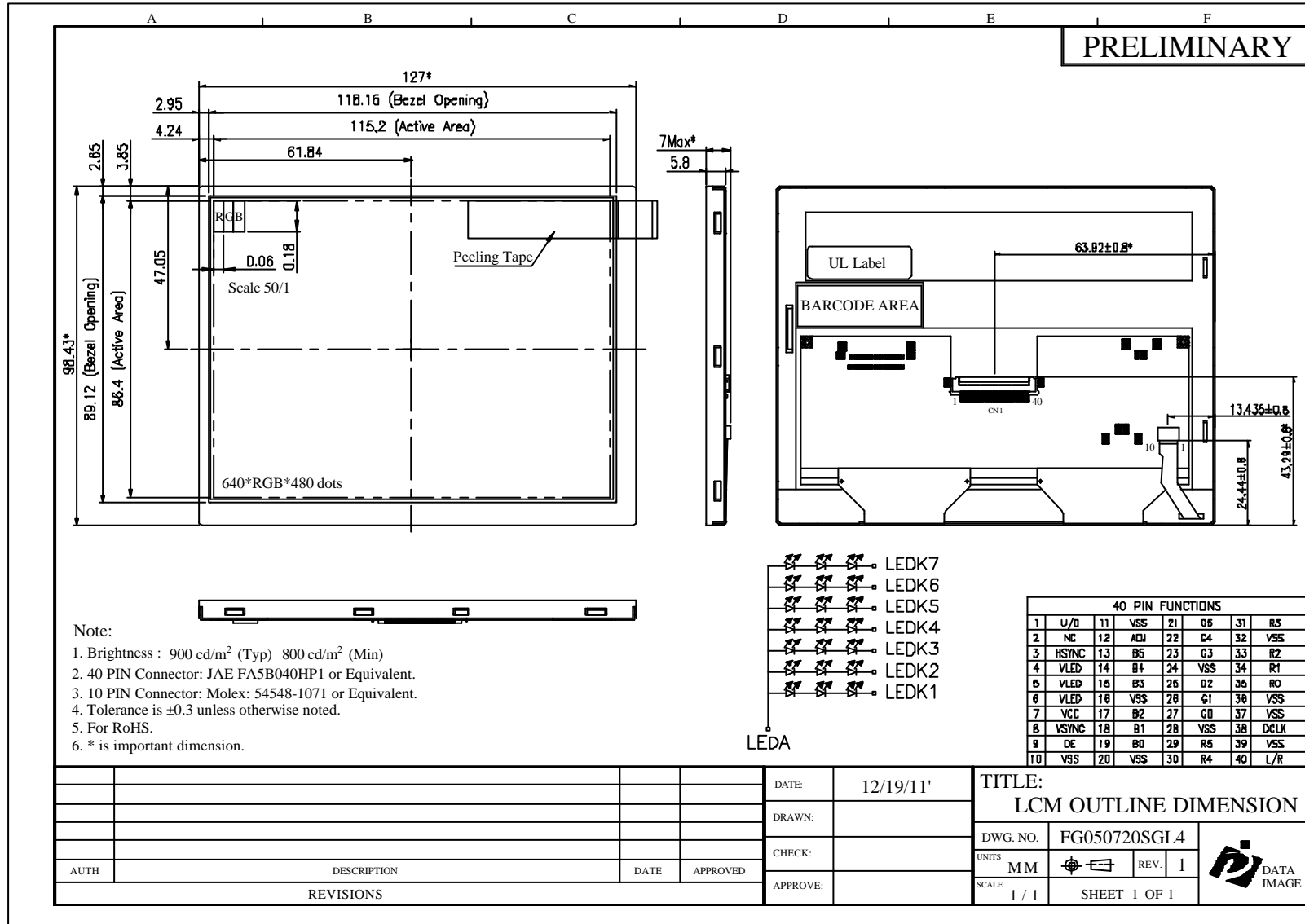
5. OTHERS

- (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 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.)

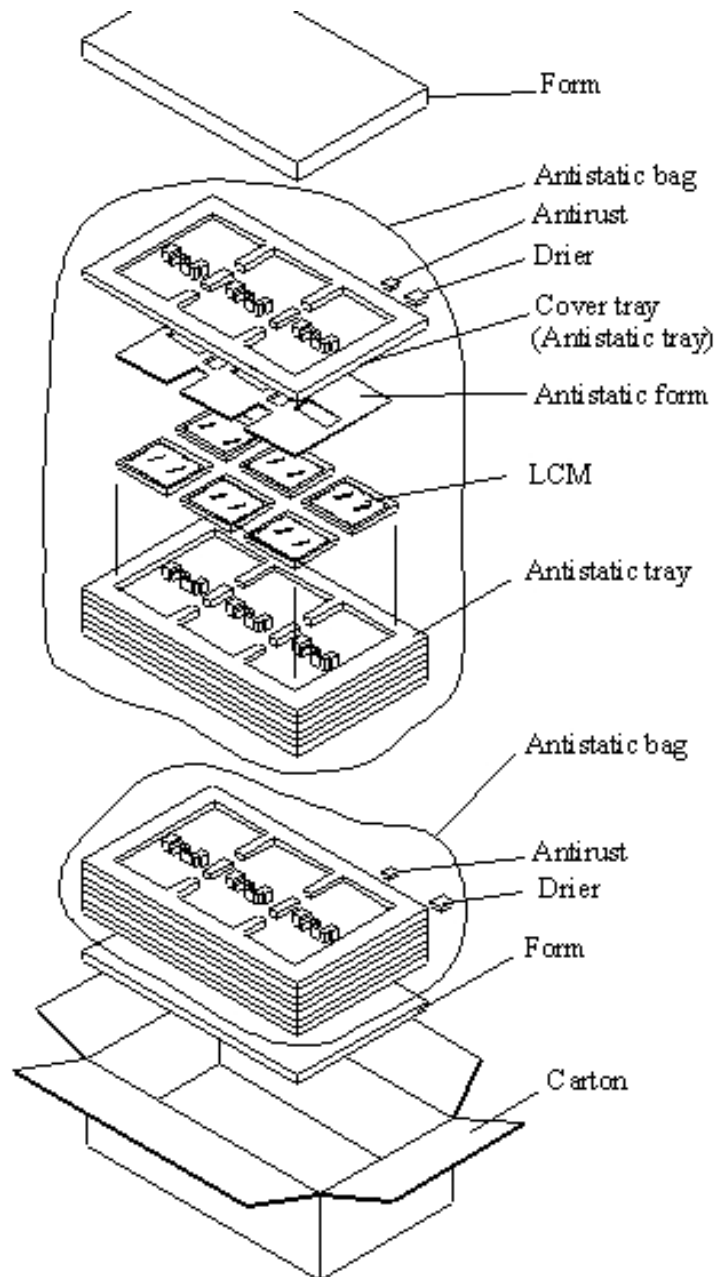
6. LIMITED WARRANTY

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.

14. OUTLINE DRAWING



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 = $6 \times 6 + 1 \times 0 = 36$ pcs

1 Carton = 2 Anti-static bag = $2 \times 36 = 72$ pcs

1 Carton = 72pcs

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

Total Weight \approx 11 kgw

FG050720 TFT LCM PACKING