



DATA IMAGE CORPORATION

TFT Module Specification

Preliminary

ITEM NO.: FG030582DSSWBGT1

Table of Contents

1. COVER & CONTENTS	1
2. RECORD OF REVISION	2
3. FEATURES.....	3
4. GENERAL SPECIFICATIONS	3
5. ABSOLUTE MAXIMUM RATINGS	3
6. ELECTRICAL CHARACTERISTICS	4
7. BLOCK DIAGRAM	5
8. INPUT / OUTPUT TERMINALS.....	6
9. AC CHARACTERISTICS	8
10. COMMAND DESCRIPTION	15
11. OPTICAL CHARACTERISTIC	16
12. TOUCH PANEL CHARACTERISTICS.....	18
13. QUALITY ASSURANCE	19
14. LOT NUMBERING SYSTEM	20
15. LCM NUMBERING SYSTEM	20
16. PRECAUTIONS IN USE LCM	21
17. OUTLINE DRAWING	22
18. PACKAGE INFORMATION	23

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	2010/1/26		23

3. FEATURES

- ◆ Support 24 bit parallel RGB.
- ◆ Support the SPI commands setting, the operation parameters setting internally.
- ◆ Our components and processes are compliant to RoHS standard
- ◆ On-chip voltage generator.
- ◆ On-chip DC-DC converter up to 6x / -6x.
- ◆ Programmable gamma correction curve.

4. GENERAL SPECIFICATIONS

Parameter	Specifications	Unit
Screen Size	3.45" (diagonal)	inch
Surface Treatment	TBD	
Display Format	320 X RGB X 240	dots
Active Area	70.08 (W) x 52.56 (H)	mm
Pixel Pitch	0.219(W) x 0.219 (H)	mm
Pixel Configuration	Stripe	
Outline Dimension	76.9 (W) x 63.9 (H) x 4.45(T)Max	mm
Weight	34	g
View Angle direction	6 o'clock	
Temperature Range	Operation	-20~70 °C
	Storage	-30~80 °C

5. ABSOLUTE MAXIMUM RATINGS

(GND=0V)

Parameter	Symbol	MIN.	MAX.	Unit
Power supply voltage	VCI	-0.3	+4.6	V
Power supply voltage	VDD	-0.3	+4.6	V

Note:

*All of the voltages listed above are with respect to GND= 0V.

*Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above.

6. ELECTRICAL CHARACTERISTICS

6.1 DC Electrical Characteristics

(Unless otherwise specified, Voltage Referenced to GND=0V, $V_{DD}=V_{CI} = 3.3V$, $T_a = 25^\circ C$)

Symbol	Parameter	Test condition	Min	Typ	Max	Unit
Power supply	Booster Reference Supply Voltage Range	Recommend Operating Voltage Possible Operating Voltage	3.0	3.3	3.4	V
Current	Operating current	$V_{DD} = 3.3V$	--	10	--	mA

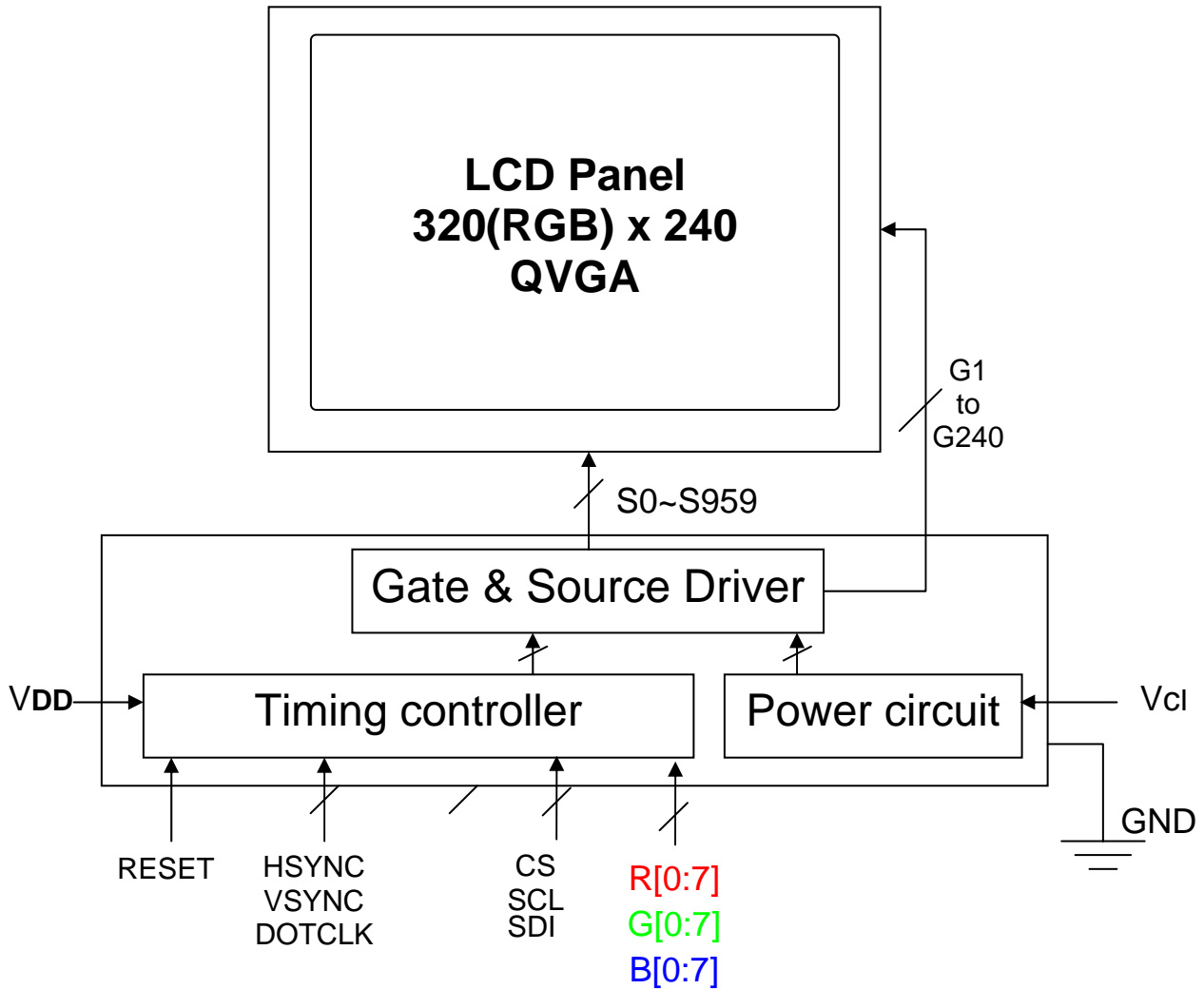
6.2 LED Back-light Driving Section

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED voltage	V_L	16.8	--	21	V	$I_L=20\text{ mA } T_a=25^\circ C$
LED current	I_L	--	20	--	mA	$T_a=25^\circ C$

$V_L=(LED\ A)-(LED\ K)$



7. BLOCK DIAGRAM



8. INPUT / OUTPUT TERMINALS

Pin No	Symbol	Description	Remark
1	LED-	Backlight Power (-)	
2	LED-	Backlight Power (-)	
3	LED+	Backlight Power (+)	
4	LED+	Backlight Power (+)	
5	GND	Ground	
6	X1(R)	Touch panel X _Right	
7	Y2(B)	Touch panel Y _Bottom	
8	X2(L)	Touch panel X _Left	
9	Y1(U)	Touch panel Y _Top	
10	GND	Ground	
11	NC	No connection	
12	GND	Ground	
13	NC	No connection	
14	GND	Ground	
15~24	NC	No connection	
25	GND	Ground	
26	NC	No connection	
27	VCI	Main power	
28	VCI	Main power	
29~31	NC	No connection	
32	GND	Ground	
33~36	NC	No connection	
37	GND	Ground	
38	VDD	I/O power	
39	VDD	I/O power	
40	VSYNC	Vertical sync in digital RGB mode.	
41	HSYNC	Horizontal sync in digital RGB mode.	
42	DOTCLK(DCLK)	Dot Data Clock	
43	NC/enable(DE)	Data enable	
44	R7 (D07)	Red Data Bit7	
45	R6 (D06)	Red Data Bit6	
46	R5 (D05)	Red Data Bit5	
47	R4 (D04)	Red Data Bit4	
48	R3 (D03)	Red Data Bit3	
49	R2 (D02)	Red Data Bit2	

50	R1 (D01)	Red Data Bit1	
51	R0 (D00)	Red Data Bit0	
52	G7 (D17)	Green Data Bit7	
53	G6 (D16)	Green Data Bit6	
54	G5 (D15)	Green Data Bit5	
55	G4 (D14)	Green Data Bit4	
56	G3 (D13)	Green Data Bit3	
57	G2 (D12)	Green Data Bit2	
58	G1 (D11)	Green Data Bit1	
59	G0 (D10)	Green Data Bit0	
60	B7 (D27)	Blue Data Bit 7	
61	B6 (D26)	Blue Data Bit 6	
62	B5 (D25)	Blue Data Bit 5	
63	B4 (D24)	Blue Data Bit 4	
64	B3 (D23)	Blue Data Bit 3	
65	B2 (D22)	Blue Data Bit 2	
66	B1 (D21)	Blue Data Bit 1	
67	B0 (D20)	Blue Data Bit 0	
68	SCL	SPI clock signal	
69	CS(CSB)	Chip select signal	
70	SDI(SDA)	SPI data input pin	
71	RESET	Hardware global reset. Low active. Normally pull high.	

9. AC CHARACTERISTICS

9.1 24-bit Parallel RGB Interface

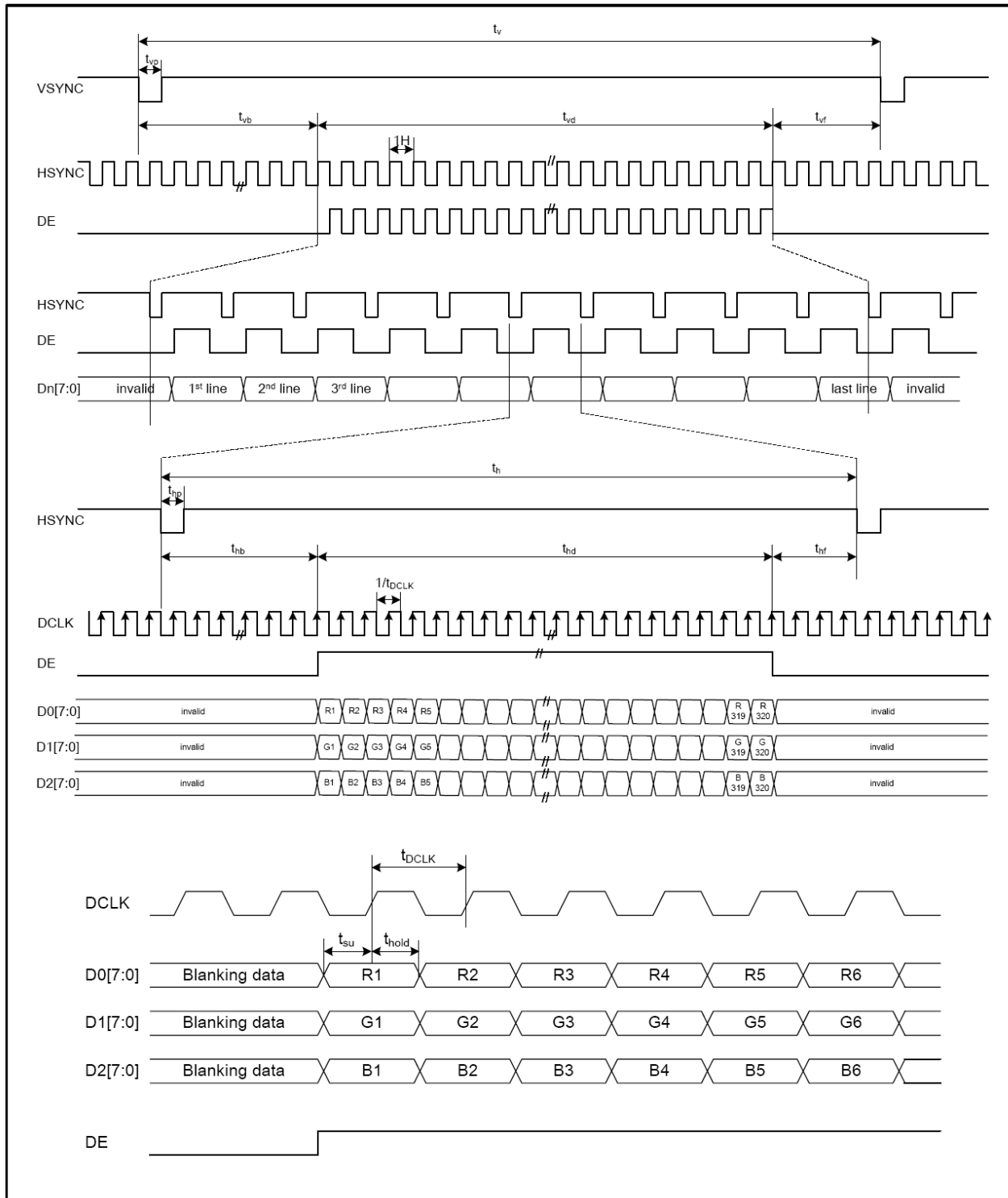


Figure1. Parallel RGB Input Signal Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit.	Note
DCLK Frequency	$1/t_{DCLK}$	-	6.4	11	MHz	
Horizontal Period	t_h	-	408	-	t_{DCLK}	
Horizontal Display Period	t_{hd}	320	320	320	t_{DCLK}	
Horizontal Back Porch	t_{hb}	2	38	-	t_{DCLK}	
Horizontal Front Porch	t_{hf}	2	-	-	t_{DCLK}	
Horizontal Pulse Width	t_{hp}	1	1	-	t_{DCLK}	
Vertical Period	t_v	-	262	-	t_h	
Vertical Display Period	t_{vd}	240	240	240	t_h	
Vertical Back Porch	t_{vb}	2	18	-	t_h	
Vertical Front Porch	t_{vf}	2	4	-	t_h	
Vertical Pulse Width	t_{vp}	1	1	-	t_h	
Data setup time	t_{su}	12	-	-	ns	
Data hold time	t_{hold}	12	-	-	ns	

Note: Horizontal Back porch + Horizontal front porch \geq 50

9.2 Power ON/OFF Timing

Power ON Sequence

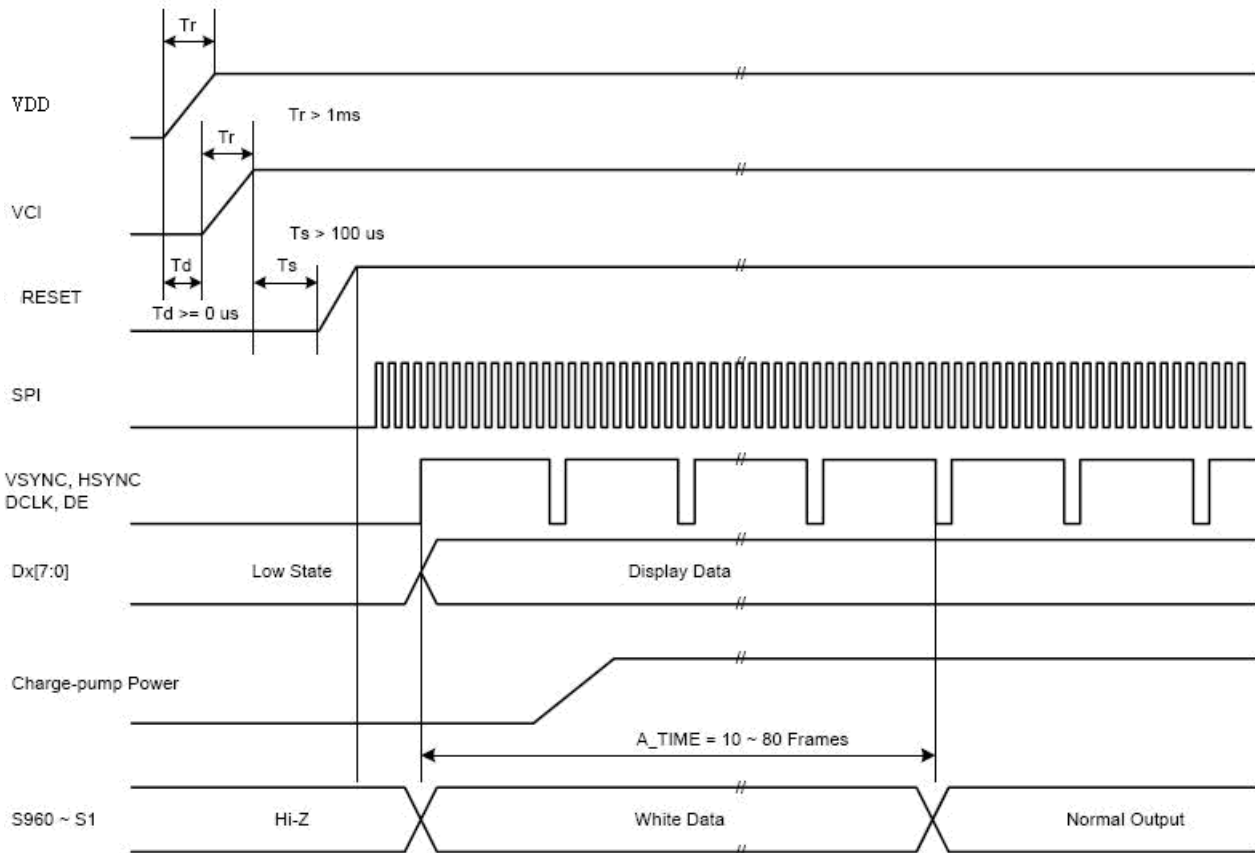


Figure 9.2-1 Power on Sequence

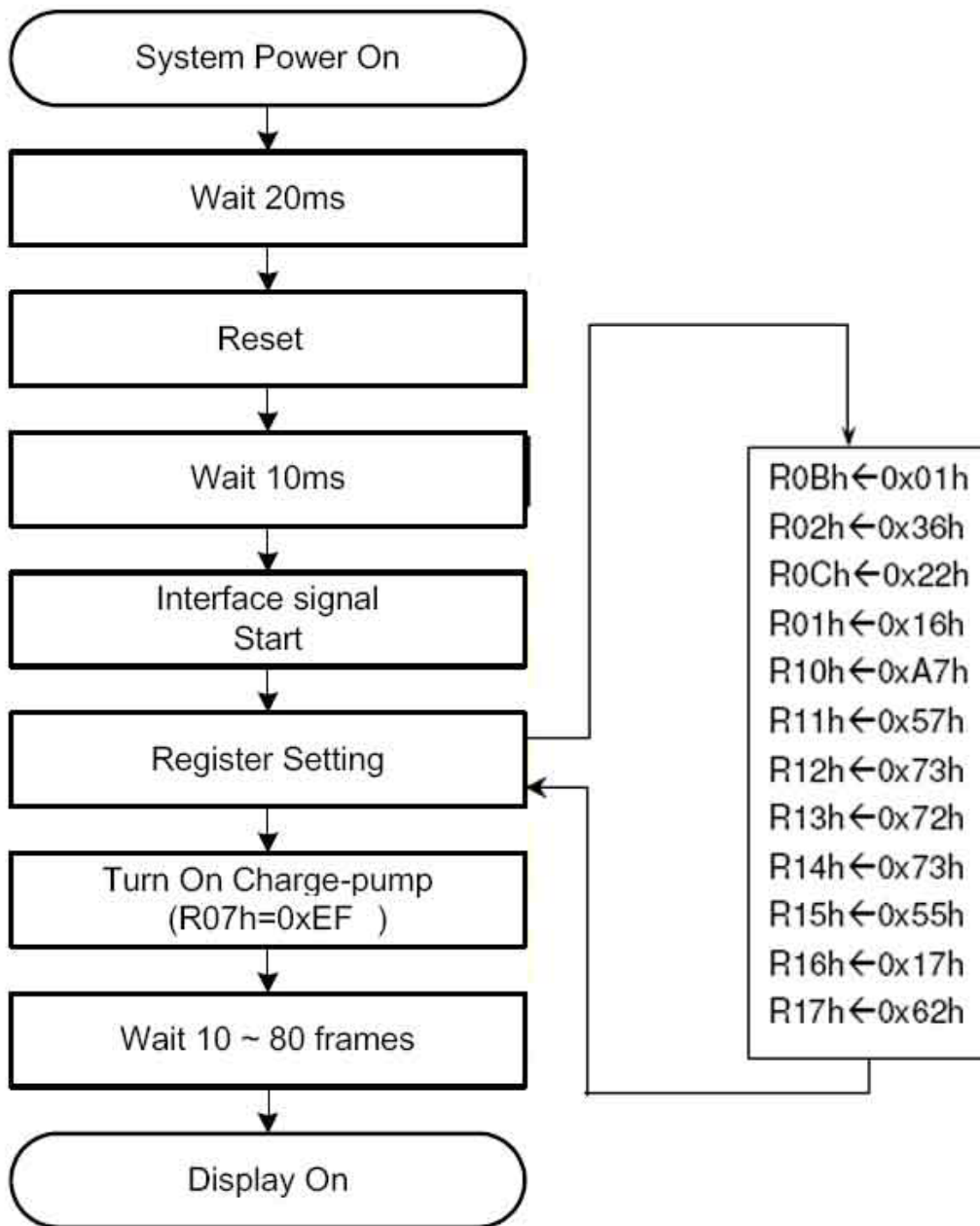


Figure 9.2-2 Power On Sequence Flow Chart

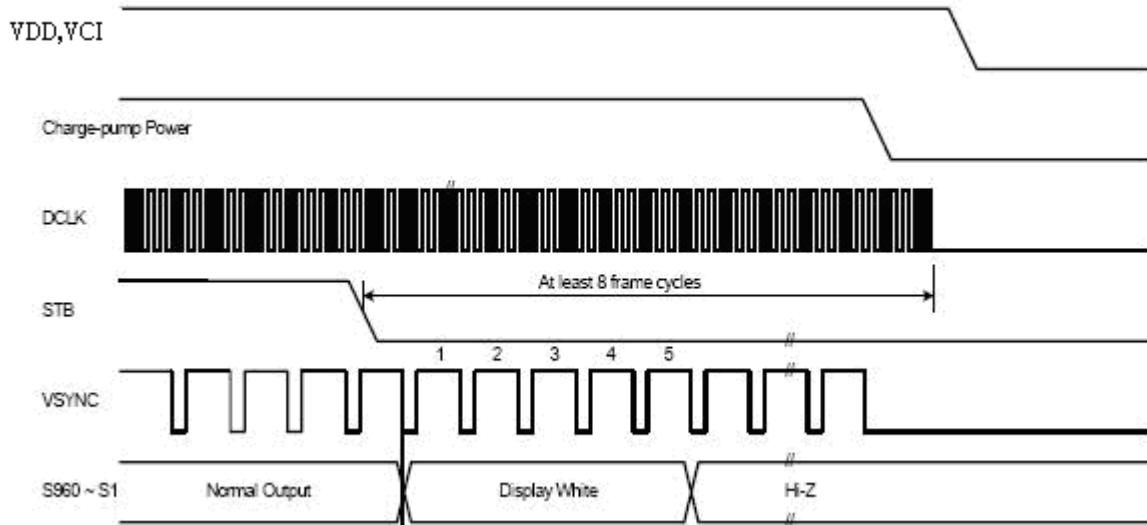


Figure 9.2-3 Power Off Sequence

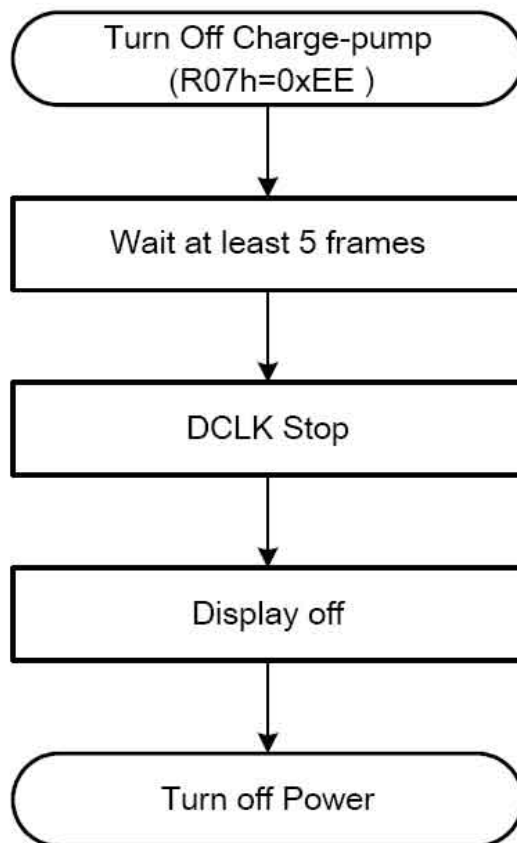


Figure9.2-3 Power Off Sequence Flow Chart

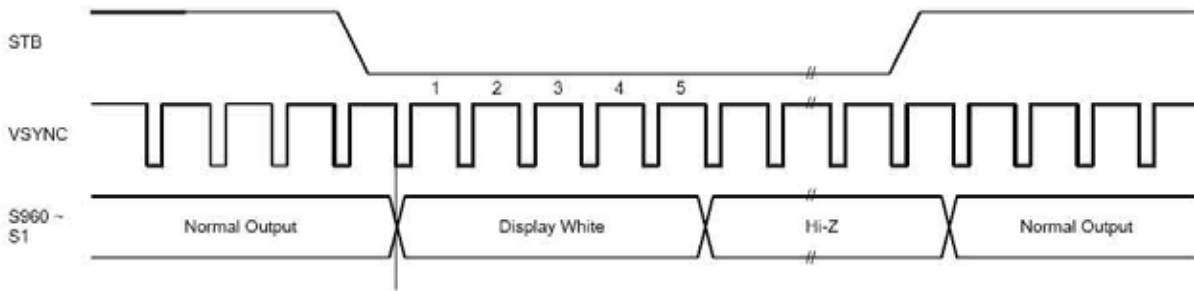


Figure12 Standby On/Off Sequence

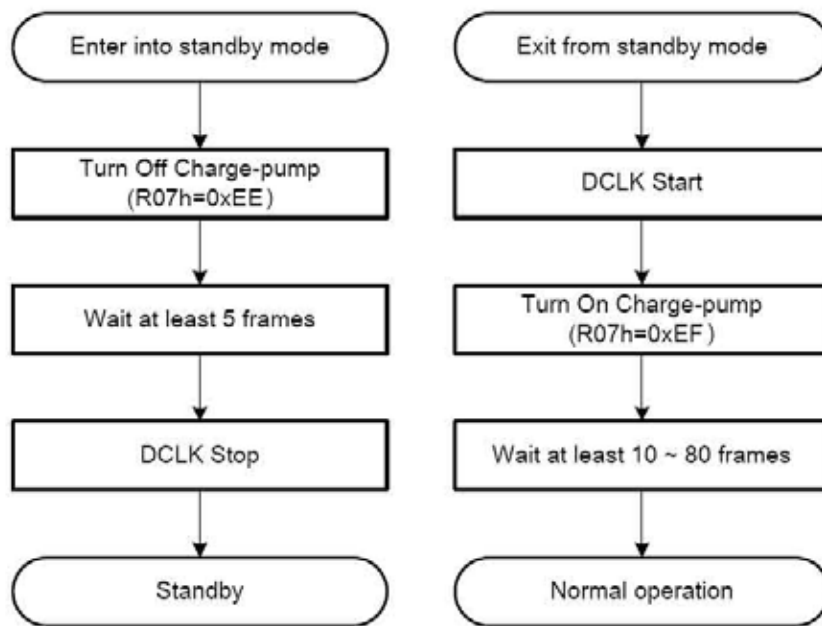
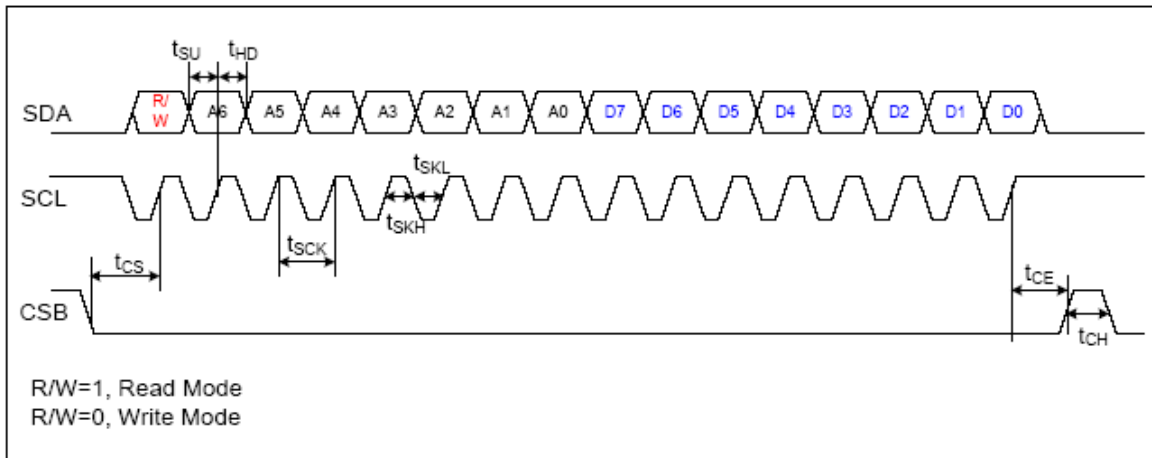


Figure9.2-4 Standby On/Off Flow Chart

9.3 Serial Peripheral Interface (SPI)



SPI Interface Input Signal Timing

Items	Symbol	Min.	Typ.	Max.	Unit	Note
CSB to SCL Setup time	T_{CS}	50	-	-	ns	
CSB to SCL Hold time	T_{CE}	50	-	-	ns	
SCL Period	T_{SCK}	50	-	-	ns	
SCL High Period	T_{SKH}	25	-	-	ns	
SCL Low Period	T_{SKL}	25	-	-	ns	
Data Setup Time	T_{SU}	15	-	-	ns	
Data Hold Time	T_{HD}	15	-	-	ns	
CSB High Pulse Period	T_{CH}	50	-	-	ns	

10. COMMAND DESCRIPTION

Register No.	Setting value	Description
01h	16h	Set the amplitude of Vcom alternating voltage be 1.14 x VREG1OUT.
02h	36h	Set the VCOMH voltage from 0.91 x VREG1OUT.
0Ch	22h	Set the operating frequency of the step-up circuit 1/ circuit 2.
0Bh	01h	Set line inversion Set RGB I/F signal HSYNC+ VSYNC mode
10h	A7h	Set Neg_Gamma1, Pos_Gamma1
11h	57h	Set Neg_Gamma2, Pos_Gamma2
12h	73h	Set Neg_Gamma3, Pos_Gamma3
13h	72h	Set Neg_Gamma4, Pos_Gamma4
14h	73h	Set Neg_Gamma5, Pos_Gamma5
15h	55h	Set Neg_Gamma6, Pos_Gamma6
16h	17h	Set Neg_Gamma7, Pos_Gamma7
17h	62h	Set Neg_Gamma8, Pos_Gamma8

Note:

Interface Control (R0Bh)

R/W	D7	D6	D5	D4	D3	D2	D1	D0
W	0	0	0	0	RGBIF[1]	RGBIF[0]	0	F/L

F/L	Function
0	Frame inversion.
1	Line Inversion. (default)

RGBIF[1:0]	Function
00	HSYNC+VSYNC Mode
01	HSYNC+VSYNC+DE Mode (default)
10	DE Only Mode
11	Setting disabled

11. OPTICAL CHARACTERISTICS

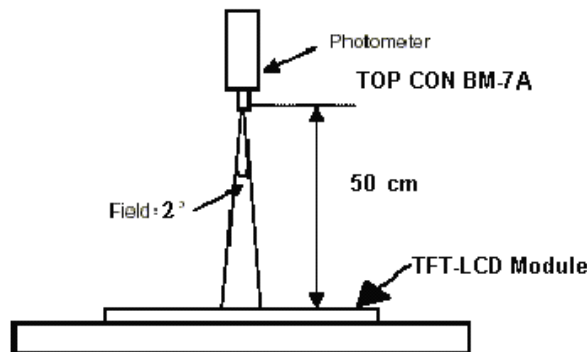
11.1 Specification:

 $T_a = 25^\circ\text{C}$

Parameter	Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_{x+}	55	75	--	deg	Note 1,4
		θ_{x-}	55	75	--		
	Vertical	θ_{y+}	40	55	--		
		θ_{y-}	55	75	--		
Contrast Ratio	CR	at optimized viewing angle	250	300			Note 1,3
Response time	Tr+ Tf		-	25	--	ms	Note 1,6
Brightness	L		240	310	--	cd/m ²	Note 1,2
Chromaticity	x_W	Center $\theta_x=\theta_y=0^\circ$ IL=20mA	0.27	0.31	0.37		Note 1,7
	y_W		0.26	0.30	0.34		
	x_R		0.59	0.63	0.67		
	y_R		0.31	0.35	0.39		
	x_G		0.35	0.39	0.43		
	y_G		0.52	0.56	0.60		
	x_B		0.11	0.15	0.19		
	y_B		0.04	0.08	0.12		
Uniformity	B-uni	$\theta_x=\theta_y=0^\circ$	--	--	--	%	Note1,5

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 LED backlight current IL=20mA. The measurement method is shown in Note1.

Note1: The method of optical measurement:

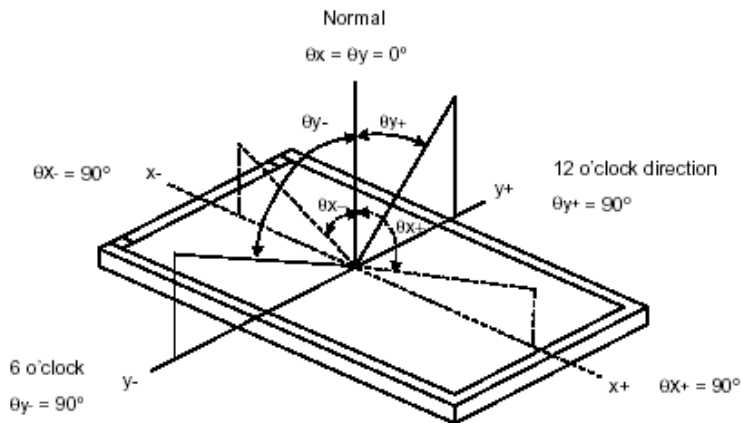


Note2: Measured at the center area of the panel and at the viewing angle of the $\theta_x=\theta_y=0^\circ$

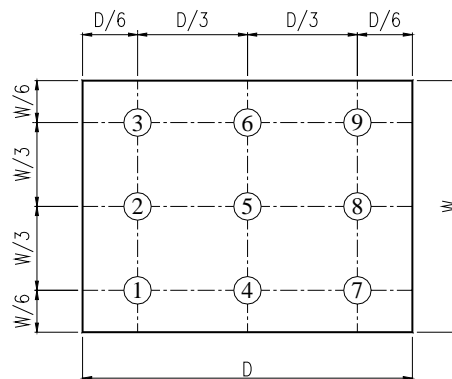
Note3: Definition of Contrast Ratio (CR):

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

Note4: Definition of Viewing Angle



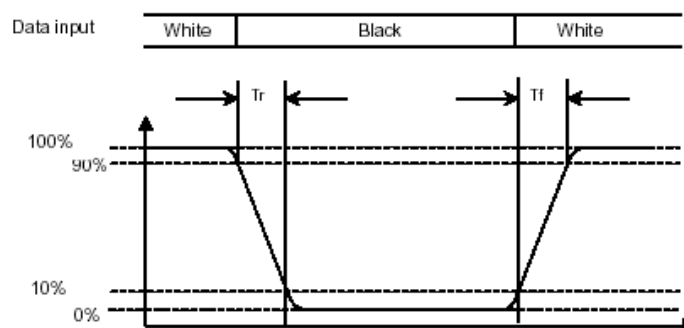
Note 5: Definition of Brightness Uniformity (B-uni):



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

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 (xW,yW),(xR,yR),(xG,yG),and (xB,yB) are obtained with all pixels in the viewing field at white, red, green, and blue states, respectively.

12. TOUCH PANEL CHARACTERISTICS

1. Input Method and Activation Force

Input Method	Average Activation Force
1.6mm dia. Delrin stylus	80g Max.
16mm dia .Silicon "finger"	80g Max.

2. Typical Optical Characteristics

ITEM	Parameter
Surface hardness	3H

3. Electrical Specification

ITEM	Parameter
Operating Voltage	Dc 7V Max.
Contact current	According to individual design
Circuit close resistance	X 200Ω~900Ω
	Y 200Ω~900Ω
Circuit open resistance	≥20MΩ at DC25V
Contact bounce	10ms Max.

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:

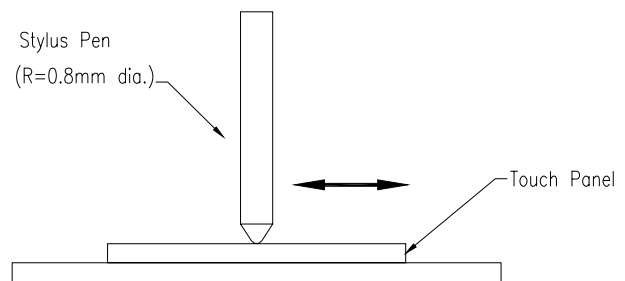
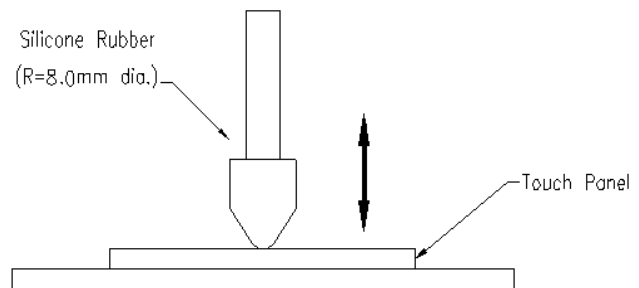
6.1 Touch panel is hit 1 millions times with a silicone rubber of R8 finger, hitting rate is by 250g at 2 times per second. The measurement must satisfy the following:

- Circuit close resistance: x 200Ω~900Ω ;
Y 200Ω~900Ω
- 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, repeat one inch by 1000k times. The measurement must satisfy the following:

- Circuit close resistance: x 200Ω~900Ω ;
y 200Ω~900Ω
- Circuit open resistance: ≥20MΩ at DC25V
- Contact bounce: <10ms
- Linearity test: <1.5%



13. QUALITY ASSURANCE

13.1 Test Condition

13.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : $20 \pm 5^{\circ}\text{C}$

Humidity : $65 \pm 5\%$

13.1.2 Operation

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

13.1.3 Container

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

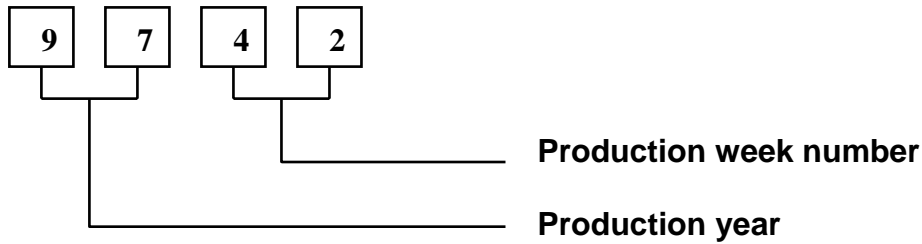
13.1.4 Test Frequency

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

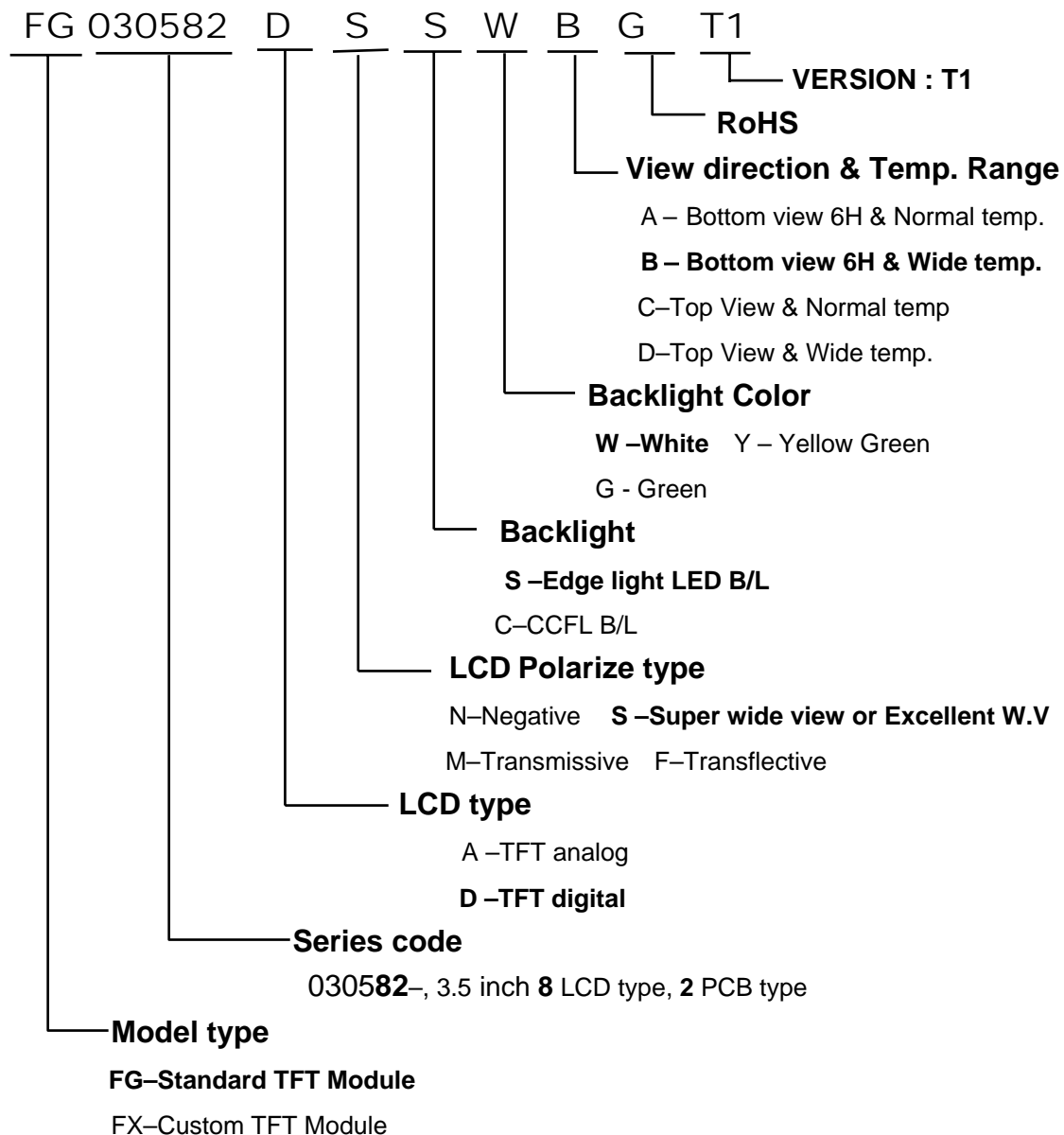
13.1.5 Test Method

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	T=80°C,120hrs
2	Low Temperature Storage Test	T=-30°C,120hrs
3	High Temperature Operation Test	T=70°C,120hrs
4	Low Temperature Operation Test	T=-20°C,120hrs
5	High Temperature and High Humidity (No operation)	T=40°C,90% RH,120hrs
6	Temperature Cycle Test (No operation)	-30°C → +25°C → +85°C,30 Cycles 30 min 5min 30 min
9	Electro-static Discharge	Contact:+/-4KV,150 pF/330 Non-contact:+/-8KV, 150 pF/330 (5 time to LCD 4 comers of active area)

14. LOT NUMBERING SYSTEM



15. LCM NUMBERING SYSTEM



16. 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".

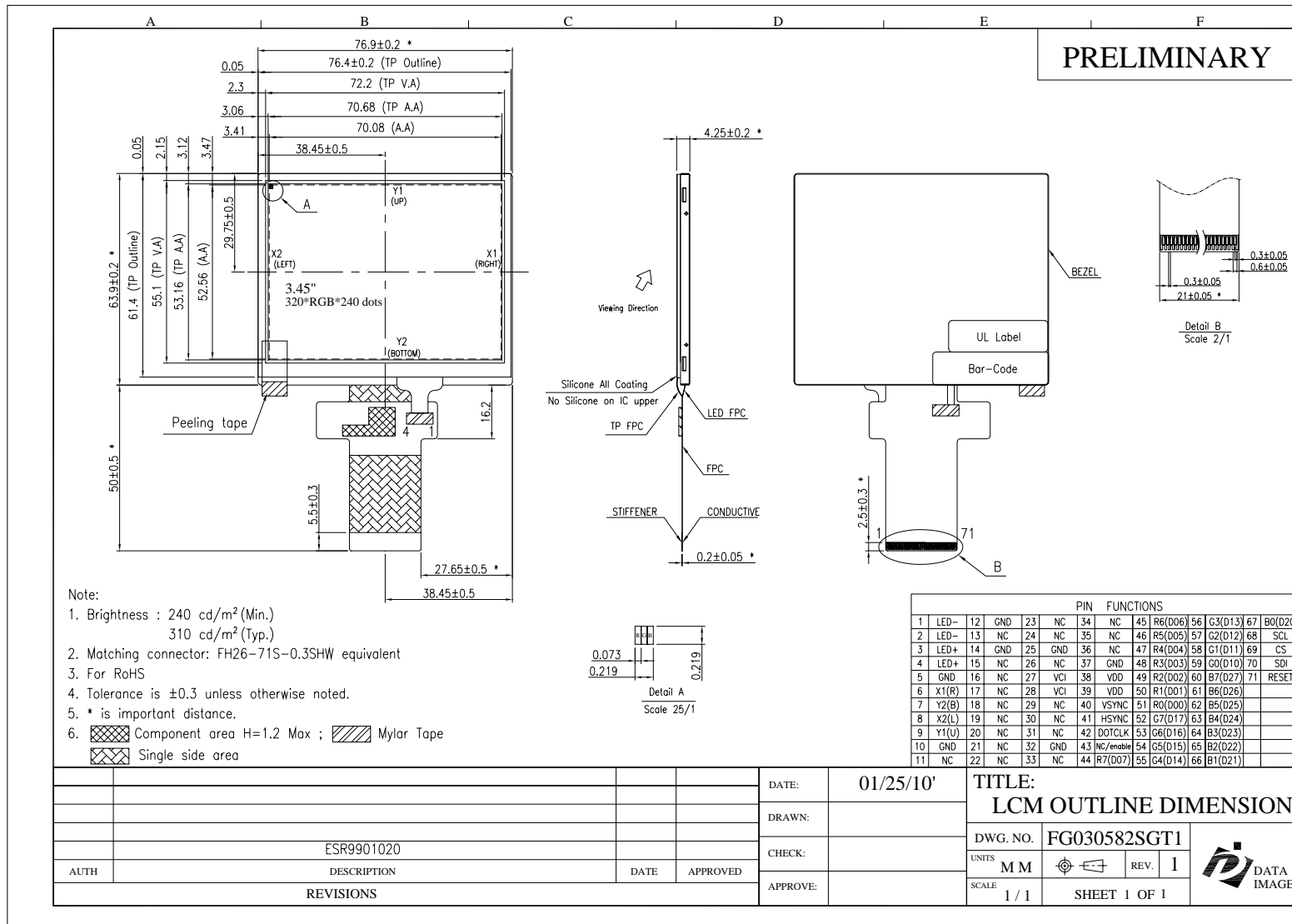
2.5 Storage

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
17. OUTLINE DRAWING



18. PACKAGE INFORMATION

TBD