TFT-Display Datenblatt

Modell   FX020240DWSWDGT1

Kurzdaten

Hersteller	Data Image
Diagonale	2,2" / 5,6cm
Format	3:4
Auflösung	240x320
Backlight	LED/ 400cd/m²
Interface	RGB
Touchscreen	nein
Temperatur	-20…+70°C (Betrieb)

K7DATA IMAGE   CORPORATION

TFT Module Specification
PRELIMINARY
ITEM NO.:   FX020240DWSWDGT1

Table of Contents

Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	ALEX	ERIC	PAUL	HELEN
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	2	2008/7/2		16

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	8/May/08			Initial Release.
2	2/Jul/08	5	3	Modify: DC CHARACTERISTICS
		6	6	Modify: OPTICAL CHARACTERISTICS
		7	9	Modify: BACKLIGHT CHARACETRISTIC
		14	16	Modify: OUTLINE DRAWING

3. GENERAL SPECIFICATIONS

The FX020240DWSWDGT1 is a kind of transmissive TFT, active matrix color liquid crystal display (LCD) comprising an amorphous silicon TFT attached to each signal electrode. This module is consisting of TFT-LCD module, a driver circuit, a back-light unit. The resolution of a 2.2'' contains 240x320 pixels and can display 65k colors.

Parameter		Specifications	Unit
Screen Size		2.2"TFT (diagonal)	inch
Resolution		240 × 320	Pixel
Active Area		33.48 (W) ×44.64 (H)	mm
Pixel Size		0.1395(W)×0.1395(H)	um
Outline Dimension		40.6(W) ×56.6(H) ×4.2(Max)	mm
View direction		12 o'clock	
Temperature Range	Operation	-20~70	℃
	Storage	-30~80	℃

4. ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	MIN	Typ	MAX	Unit	Comment
Power Supply Voltage	DVDD	-0.3	--	+4.6	V	Notes 1,2

Notes:
1. If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.
2. DVDD, GND must be maintained.

5. ELECTRICAL CHARACTERISTICS
5.1 DC CHARACTERISTICS

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Power Supply Voltage	DVDD	--	2.5	2.8	3.0	V
Input high voltage	VIH	--	0.8DVDD	--	DVDD	V
Input low voltage	VIL	--	-0.3	--	0.2DVDD	V
Current consumption	IDD	DVDD=2.8V	--	5.5	--	mA

5.2 RGB Interface Timing Characteristics

(DVDD=2.5~3.0)

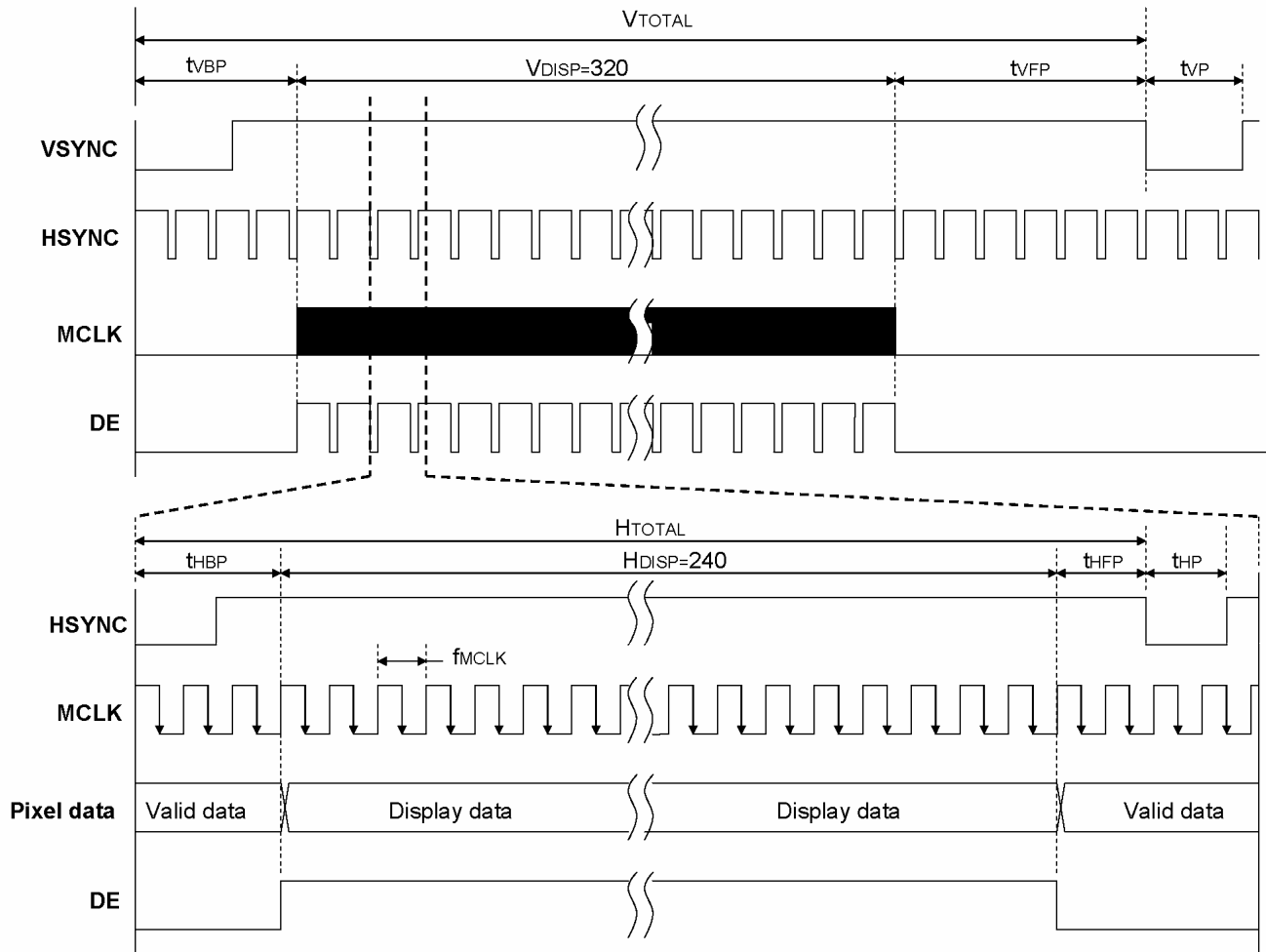| Item	Symbol	Min.	Typ.	Max.	Unit
VSYNC/HSYNC Setup time	tSYNCS	0	--	1	clock
ENABLE (DE) Setup time	tENS	10	--	--	ns
ENABLE (DE) Hold time	tENH	20	--	--	ns
DOTCLK low-level pulse width	PWDL	40	--	--	ns
DOTCLK high-level pulse width	PWDH	40	--	--	ns
DOTCLK Cycle time	tCYCD	100	--	--	ns
DATA setup time	tPDS	10	--	--	ns
DATA hold time	tPDH	40	--	---	ns
DOTCLK, VSYNC/ and HSYNC rise/fall time	trgbr / trgbf	--	--	25	ns
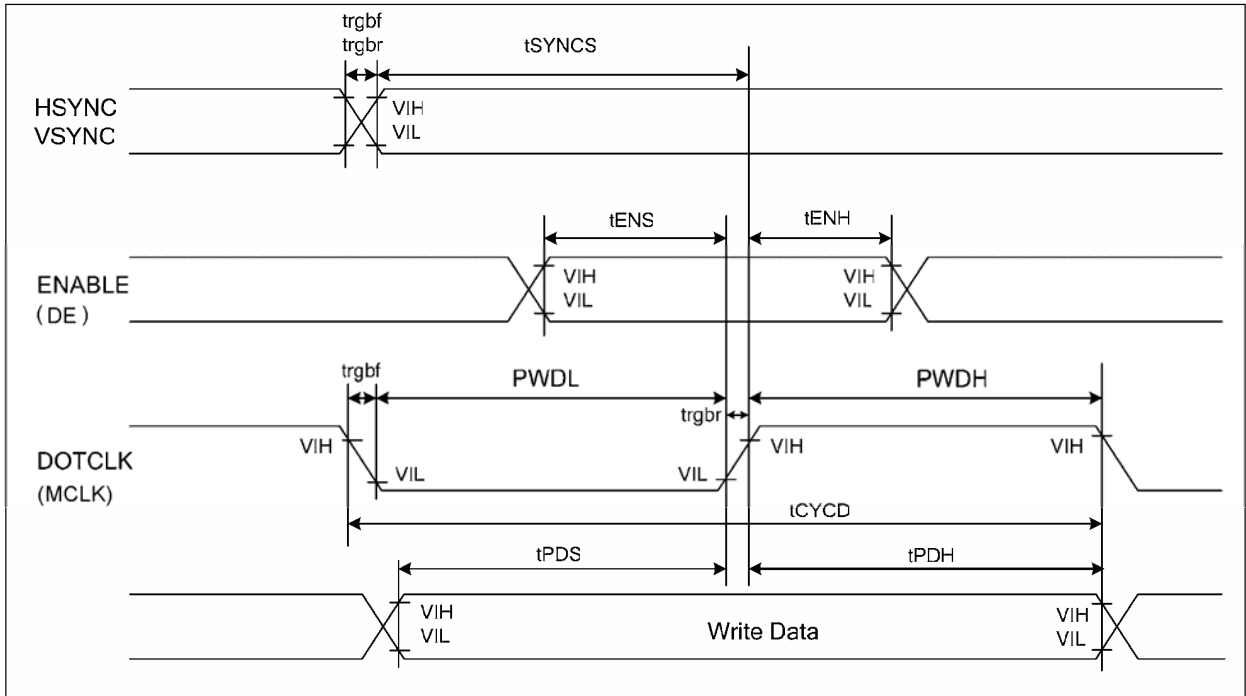
RGB interface AC timing Diagram

5.2 Power ON/OFF sequence
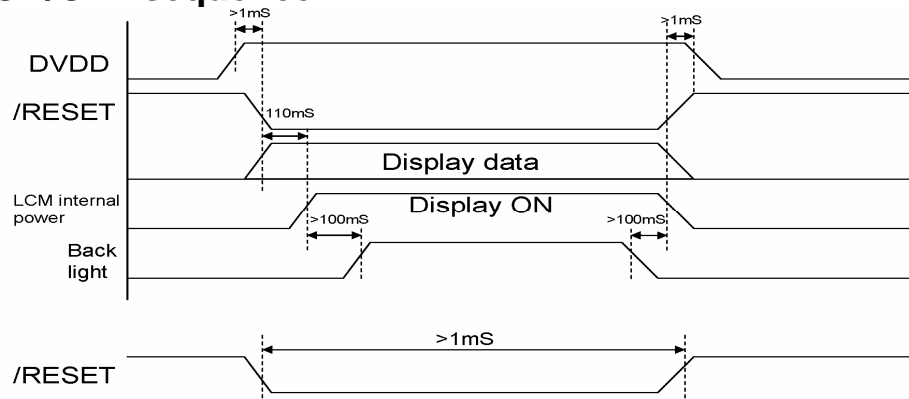
5.3 Data transaction timing

Data transaction timing

Characteristics	Symbol	Min	Typ	Max	Unit
MCLK Frequency	f_{MCLK}	--	4.9	--	MHz
Horizontal Frequency (Line)	f_H	--	19.56	--	KHz
Vertical Frequency (Refresh)	f_V	--	60	--	Hz
Horizontal Back Porch	t_{HBP}	2	3	--	t_{MCLK}
Horizontal Front Porch	t_{HFP}	2	3	--	t_{MCLK}
Horizontal Low Period	t_{HBP}	2	--	--	t_{MCLK}
Horizontal Display Area	H_{DISP}	--	240	--	t_{MCLK}
Horizontal Total	H_{TOTAL}	--	251	--	t_{MCLK}
Vertical Back Porch	t_{VBP}	--	4	--	Lines
Vertical Front Porch	t_{VFP}	--	7	--	Lines
Vertical Low Period	t_{VBP}	2	--	--	Lines
Vertical Display Area	V_{DISP}	--	320	--	Lines
Vertical Total	V_{TOTAL}	--	326	--	Lines

6. OPTICAL CHARACTERISTICS

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Contrast Ratio		C/R	θ=ψ= 0°	--	99	--		Note3,5
Response Time		TR		--	9.80	--	ms	Note1,4
		TF		--	22.40	--	ms	
Chromaticity	Red	XR		0.58	0.61	0.64	--	Note 3
		YR		0.29	0.32	0.35	--	
	Green	XG		0.28	0.31	0.34	--	
		YG		0.55	0.58	0.61	--	
	Blue	XB		0.10	0.13	0.16	--	
		YB		0.09	0.12	0.15	--	
	White	XW		0.27	0.30	0.33	--	
		YW		0.29	0.32	0.35	--	
Viewing Angle	Hor.	x+	Center CR>10	--	62	--	deg.	Note 2
		x-		--	68	--		
	Ver.	y+		--	65	--		
		y-		--	68	--		

Note 1: Electro-Optical Characteristics Test Method
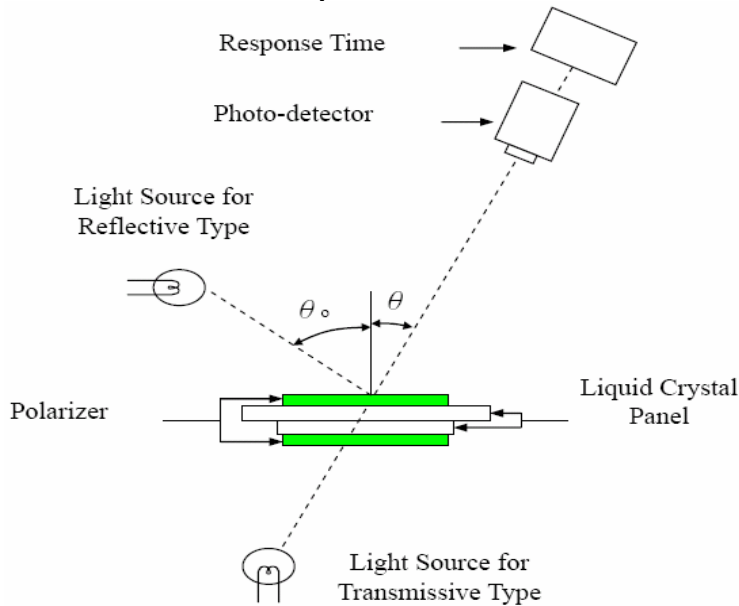
Note 2: Definition of Viewing Angel

Viewing angle is the angle at which the contrast ratio is greater than 2, for TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface.

Normal: θ =0°
12 O'clock Direction
φ =180
φ =270°
9 O'clock Direction
φ =90°
3 O'clock Direction
L
φ =0°
Viewing Direction
6 O'clock Direction
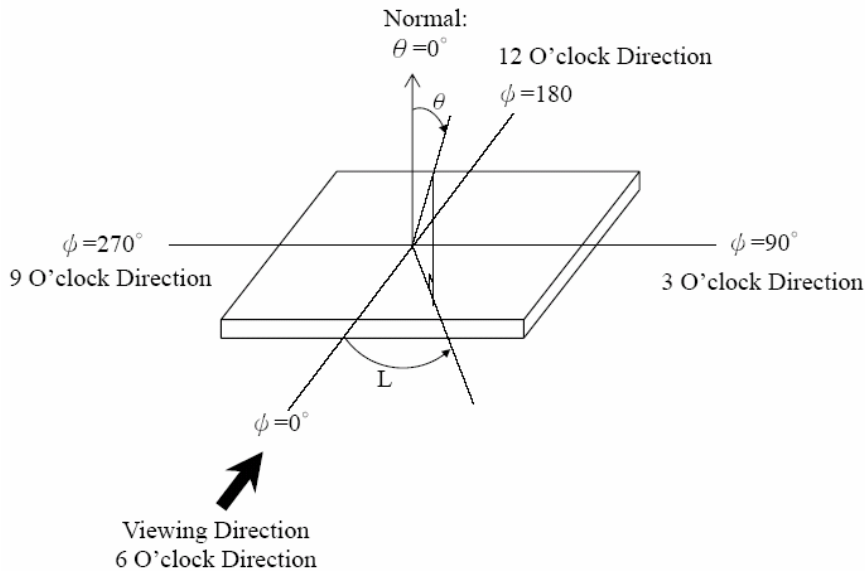
Note 3: **Optical measurement equipment setup**

- Measurement should be executed in a stable, windless, and dark room. After lighting the backlight for 30mins.
- Environment condition : Common air conditioner cleanness
  Ta=25±5   Humidity=60±15%
- Distance : 50cm
- Photo detector : BM-7 (Field 1°)

Photodetector

Field

50cm

LCD panel

LCM
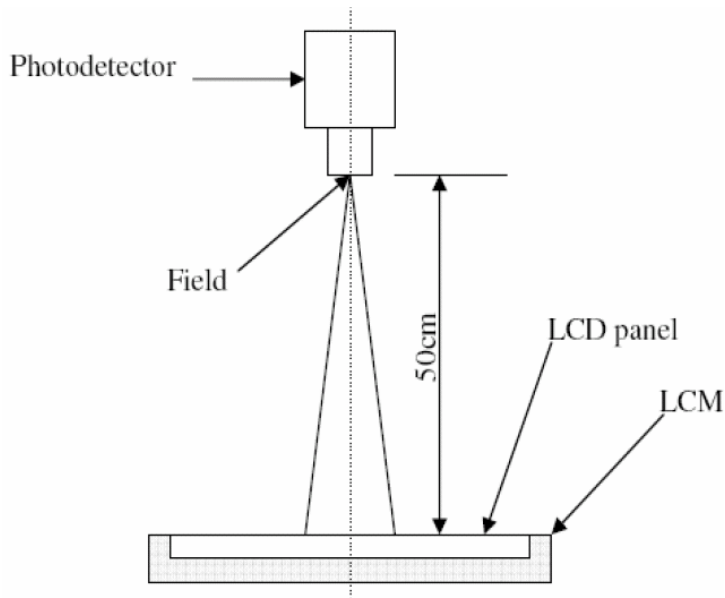
Note 4: Definition of Optical Response Time

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively. The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below:
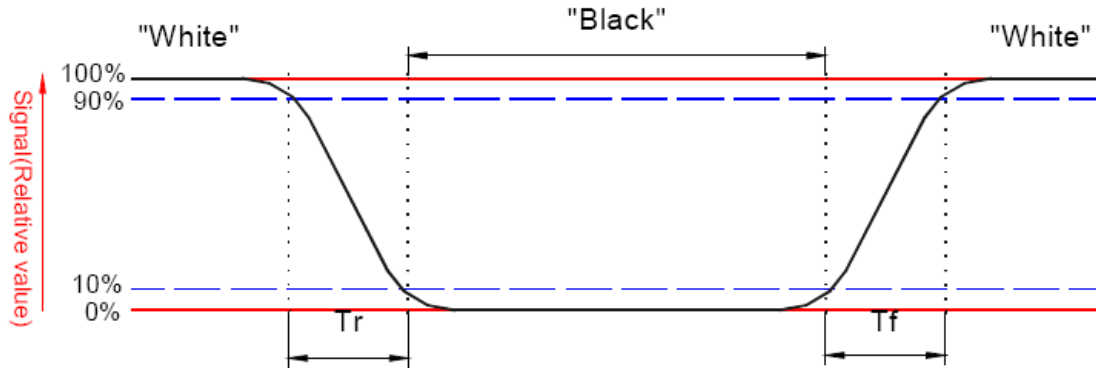
Note 5: Definition of Contrast Ratio (CR)

Contrast ratio is calculated with the following formula.

$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

7. BACKLIGHT CHARACETRISTIC

Item	Symbol	Min.	Typical	Max.	Unit
LED module Forward voltage	VLED	--	13.2	--	V
LED module current	ILED	--	20	--	mA
LCM Luminance of center point	LS	370	400	--	cd/m2

1 Internal Circuit Diagram:
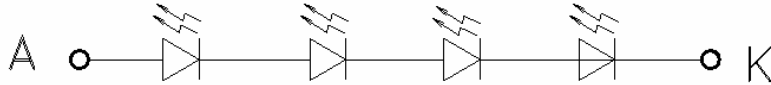
2 Test condition:
   (a) Center point on active area
   (b) Best Contrast

3 Uniform measure condition:
   (1) Measure 9 point. Measure location is show below:
   (2) Uniform = (Min. brightness / Max. brightness) × 100%
   (3) Best Contrast.
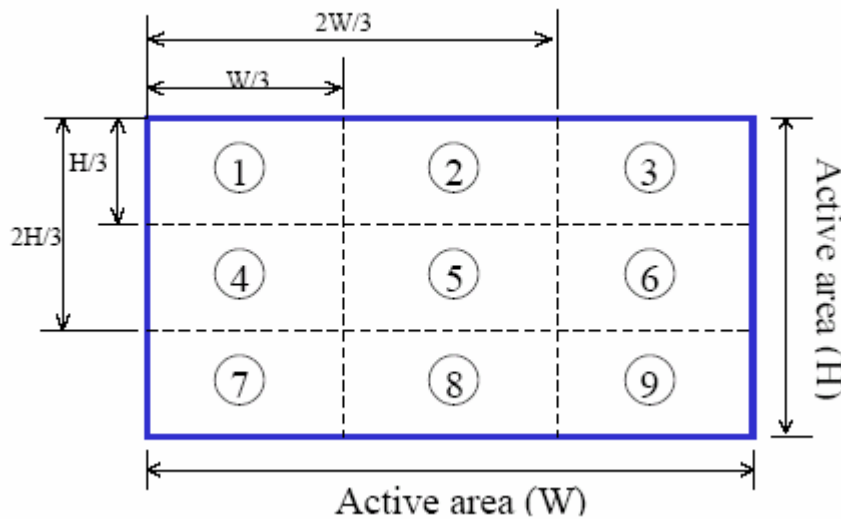
8. PIN CONNECTIONS

No.	Pin Name	I/O	Description	Note
1	/RESETB	I	Global reset, active Low	
2	NC	-	No Connection	
3	NC	-	No Connection	
4	NC	-	No Connection	
5	GND	P	Ground	
6	MCLK(DOTCLK)	I	The pixel clock signal of the RGB interface	
7	GND	P	Ground	
8	GND	P	Ground	
9	GND	P	Ground	
10	B1	I	RGB data Bit B1	
11	B2	I	RGB data Bit B2	
12	B3	I	RGB data Bit B3	
13	B4	I	RGB data Bit B4	
14	B5	I	RGB data Bit R5(MSB)	
15	GND	P	Ground	
16	G0	I	RGB data Bit G0	
17	G1	I	RGB data Bit G1	
18	G2	I	RGB data Bit G2	
19	G3	I	RGB data Bit G3	
20	G4	I	RGB data Bit G4	
21	G5	I	RGB data Bit G5(MSB)	
22	GND	P	Ground	
23	R1	I	RGB data Bit R1	
24	R2	I	RGB data Bit R2	
25	R3	I	RGB data Bit R3	
26	R4	I	RGB data Bit R4	
27	R5	I	RGB data Bit B5(MSB)	
28	GND	P	Ground	
29	HSYNC	I	The horizontal sync signal of the RGB interface	
30	VSYNC	I	The vertical sync signal of the RGB interface	
31	DE	I	Data Enable	
32	GND	P	Ground	
33	DVDD	P	Power supply	

No.	Pin Name	I/O	Description	Note
34	DVDD	P	Power supply	
35	LED+	P	LED+	
36	LED+	P	LED+	
37	LED-	P	LED-	
38	LED-	P	LED-	
39	GND	P	Ground	

9. BLOCK DIAGRAM

240 pixels

G
G

**2.2" TFT
Panel**

32

G31
G32
S   S2 .... S71   S72

DC/DC
converter

Source Driver Circuit

SPFD5408B

MCU

Gate

T-con

DVDD   GND

1

4

B1~B5
G0~G5
RI~R5

VSYNC
HSYNC
MCL
DE

/RESETB
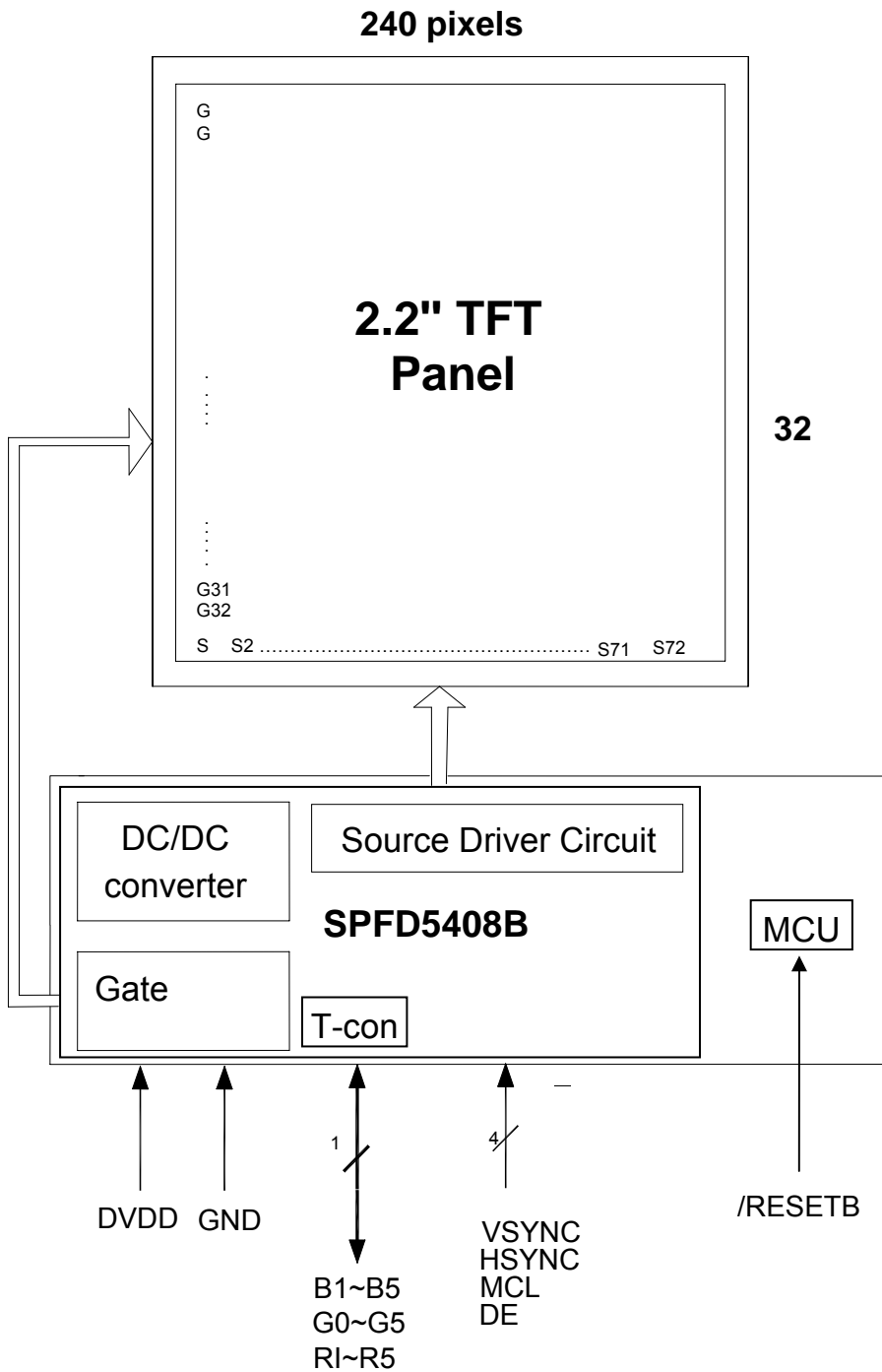
10. QUALITY   ASSURANCE

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 Storage Test	T=60°C,90% RH,240hrs (No condensation of dew)
6	Thermal circle Test	T=-30°C(0.5H)~70°C (0.5H)/32 Cycles
7	Electrostatic Discharge Test	± 6 KV,200Pf(0Ω),1 time for each terminal

Note:

1.Evaluation should be tested after storage at room temperature for one hour.

2.There should be no change that might affect the practical display function when the display quality test is conducted under normal operating conditions.

3.Judgment:

a. In the standard condition, there shall be no practical problems that may affect the display function.

b. No serious image quality degradation.

11. LOT NUMBERING SYSTEM

| 0 | 7 | 2 | 5 |

Production week number

Production year

12. LCM NUMBERING SYSTEM

FX 020240 D W S W D G T1

Version:T1

ROHS

View direction & Temp. Range

A–Bottom view 6H & Normal temp.

B–Bottom view 6H & Wide temp.

C–Top View 12H & Normal temp

D–Top View 12H & Wide temp.

Backlight Color

W –White   Y – Yellow Green

G - green

Backlight

S –edge light LED B/L

C–CCFL B/L

LCD Polarize type

N–Negative   R – Reflective

M–transmissive   **W –Super wide view & Micro Reflector**

LCD type

A –TFT analog

D-TFT digital

Series code

0202**40**–, 2.2 inch , **4**LCD type, **0** FPC type

Model type

FG–Standard TFT Module

FX–Custom TFT Module

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 handing,

(1).   Keep the temperature within range of use and storage. Excessive temperature and humidity could cause polarization degredation, 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). The viewing angle can be adjusted by varying the LCD driving voltage V0.

(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 responsible for any subsequent or consequential events.

14.OUTLINE DRAWING

PRELIMINARY

40.6±0.2
36.6 (T/P V.A)
34.54 (T/P A.A)
33.48 (LCD A.A)

2.13 3.08 3.77

Y2

2.2" TFT(240RGB x 320 dots)
12 0' CLOCK

X1   X2

56.6±0.2
47.92 (T/P V.A)
46.02 (T/P A.A)
44.64 (LCD A.A)

(26.09)

Y1

15±0.2

GND PAD (Cu)
Single side   4.67
5.8
Components Area
(7.6) Max
23.6±0.5
5   (17.6)   Single side   B

4±0.5
35±0.5

PIN1   PIN39

10±0.5
PIN4 PIN1
14.9±0.5

4.2 MAX
1.2 TP (Max)   2.91±0.2 BL

BAR CODE

Cover Tape
15x64mm   D   GND PAD (Cu)
pull board
4.5 1.5   R2   C
Stiffener   Contact Side   Stiffener
白漆線
17.6±0.5
29.6±0.5

0.1±0.2
(0.2)
+0.04
0.3-0.03   (0.2)
PIN1   PIN39
4.5 2.3 2.05±0.1 1.9±0.1 0.9±0.1 0.1±0.1
0.3+0.04-0.03   0.3±0.2
0.6±0.02
11.4±0.03
12±0.05

Detail B
Scale 2/1

Pull
Contact Side
4.5
0.2±0.03

5±0.5

0.5±0.1
4-0.3±0.1
P0.5x(4-1)=1.5±0.1
2.5±0.2

Detail C
Scale 2/1

ø1±0.05
8.8±0.1 3.8±0.1
ø0.7±0.05 Hole
ø2±0.05 Hole
1.5±0.15

Detail D
Scale 2/1

Note: 1. Tolerance is ±0.2 unless otherwise noted.
2. Luminance of center point: 400 cd/m^2 (Min)
3. For RoHS
4. FPC connector FH26-39S-0.3SHW or local.
5. Sunlight readable.

If : 20 mA
Vf : 13.2V (Typ)

4 LED's location arrangement

0.1395
0.0465
0.1395

Detail A
Scale 30/1

T/P FUNCTIONS

PIN1. X2   PIN3. X1
PIN2. Y1   PIN4. Y2

CON 1

1	/RESETB	11	B2	21	G5	31	DE
2	NC	12	B3	22	GND	32	GND
3	NC	13	B4	23	R1	33	DVDD
4	NC	14	B5	24	R2	34	DVDD
5	GND	15	GND	25	R3	35	LED+
6	MCLK	16	G0	26	R4	36	LED+
7	GND	17	G1	27	R5	37	LED-
8	GND	18	G2	28	GND	38	LED-
9	GND	19	G3	29	HSYNC	39	GND
10	B1	20	G4	30	VSYNC		

			DATE:	01/15/07'	TITLE:
			DRAWN:		LCM OUTLINE DIMENSION
	Change the Stiffener& Cover Tape shape.(ECR110-860036;ECR110-860043)	06/24/08'			DWG. NO. FX020240SGT1
	Change the IF&VF from 15mA 14.4V(Typ) to 20mA 13.2V(Typ). ECR11S-850001	05/06/08'	CHECK:		UNITS M M REV. 3
AUTH	DESCRIPTION	DATE	APPROVED	APPROVE:	SCALE 1/1 SHEET 1 OF 1
	REVISIONS				

DATA IMAGE

HY-LINE Computer Components / www.hy-line.de/computer