

TFT-Display Datenblatt

Modell FG040310DSSWBGT2

Kurzdaten

Hersteller	Datimage
Diagonale	4,3" / 10,9cm
Format	16:9
Auflösung	480x272
Backlight	LED/200cd/m ²
Temperatur	-20...+70°C (Betrieb)



DATA IMAGE CORPORATION

TFT Module Specification

PRELIMINARY

ITEM NO.: FG040310DSSWBGT2

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Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
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Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	1	2006/12/14		18

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	15/DEC/06			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	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 5.15(D)	mm
Weight	TBD	g
Surface treatment	Clear hard coat	
View Angle direction	6 o'clock	
Our components and processes are compliant to RoHS standard		

5. Electrical Characteristics

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

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V_{CC}	2.3	2.5	3.6	V	Note1
	AV_{DD}	4.8	5	5.2	V	Note2
Power Supply Current	I_{CC}		3	5	mA	$V_{CC}=2.5V$
	I_{AVDD}		16.7	25	mA	$AVDD=5V$
Ripple Voltage	V_{RFVCC}			100	mVp-p	
	V_{RFVDD}			100	mVp-p	
"H" level logical input voltage	V_{IH}	0.7V _{CC}	--	--	V	
"L" level logical input voltage	V_{IL}	--	--	0.3V _{CC}	V	
Input Current (Low)	I_{OL}			(80)	μA	
Input Current (high)	I_{OH}			(80)	μA	
Operating temperature	Topa	-20	--	70	$^{\circ}\text{C}$	Ambient temperature
Storage temperature	Tstg	-30	--	80	$^{\circ}\text{C}$	Ambient temperature

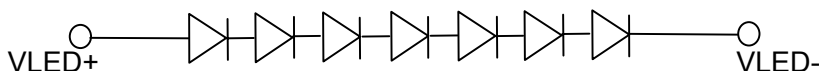
Note1:VCC Absolute Maximum Ratings -0.3V~+6V

Note2:AVDD Absolute Maximum Ratings -0.3V~+6V

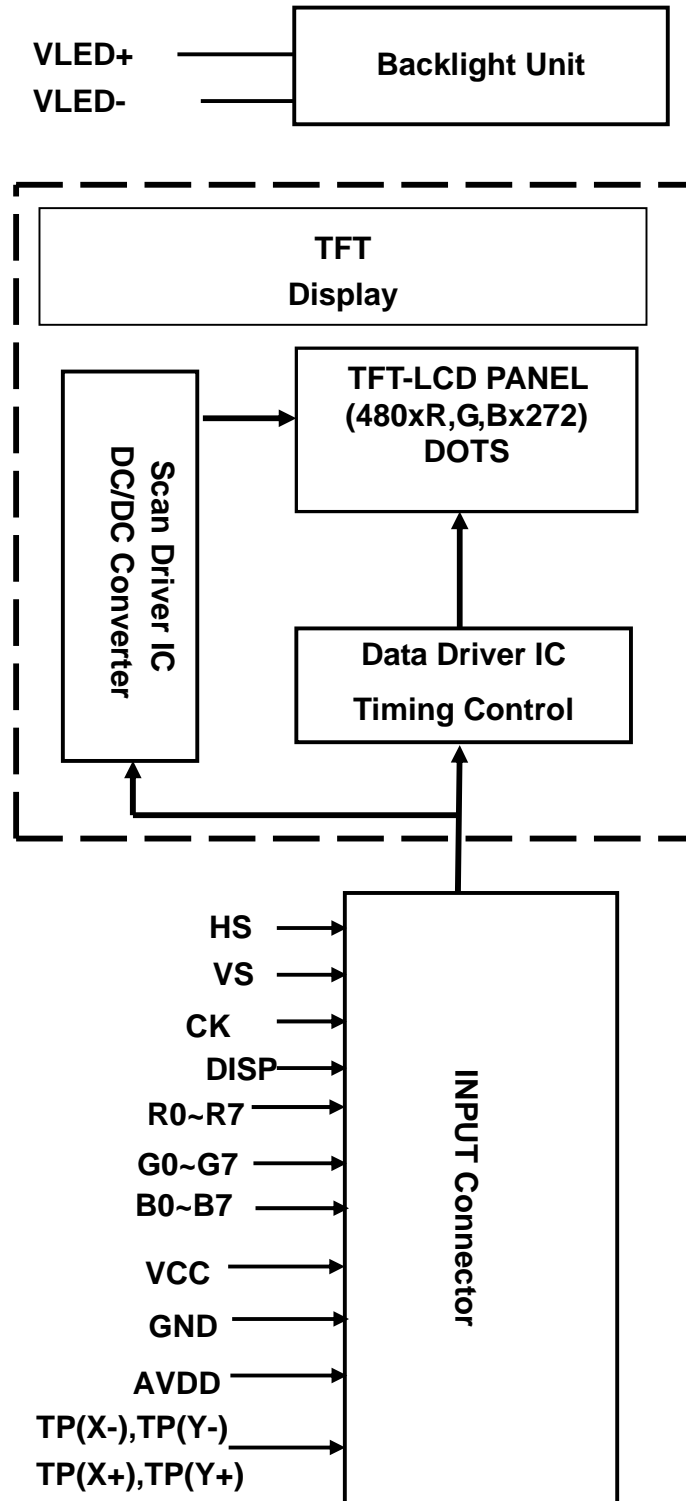
5.1 Backlight driving for power conditions

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current	I_L	--	20	--	mA	
VLED voltage	V_L	--	23.1	--	V	$I_L=20\text{ mA}$



6. Block Diagram



7. PIN CONNECTIONS

7.1 Input Pins Connection

Pin No	Symbol	Function	Remark
1	GND	Ground	
2	GND	Ground	
3	Vcc	Power Supply : +2.5V	
4	Vcc	Power Supply : +2.5V	
5	R0	Red pixel data(LSB)	
6	R1	Red pixel data	
7	R2	Red pixel data	
8	R3	Red pixel data	
9	R4	Red pixel data	
10	R5	Red pixel data	
11	R6	Red pixel data	
12	R7	Red pixel data(MSB)	
13	G0	Green pixel data(LSB)	
14	G1	Green pixel data	
15	G2	Green pixel data	
16	G3	Green pixel data	
17	G4	Green pixel data	
18	G5	Green pixel data	
19	G6	Green pixel data	
20	G7	Green pixel data(MSB)	
21	B0	Blue pixel data(LSB)	
22	B1	Blue pixel data	
23	B2	Blue pixel data	
24	B3	Blue pixel data	
25	B4	Blue pixel data	
26	B5	Blue pixel data	
27	B6	Blue pixel data	
28	B7	Blue pixel data(MSB)	
29	GND	Ground	
30	CK	clock signal to sample each data	
31	DISP	Display ON/OFF Signal ON=H, OFF=L	
32	HS (HSYNC)	Horizontal synchronous signal	
33	VS (VSYNC)	Vertical synchronous signal	
34	NC	No Connection	
35	AVDD	+5V Analog power source	
36	AVDD	+5V Analog power source	
37	TP(X-)	X-Left	
38	TP(Y-)	Y-Bottom	
39	TP(X+)	X+ Right	
40	TP(Y+)	Y+ Top	

7.2 Backlight Pins Connection

No.	Signal	Function
1	VLED-	LED Power Source input terminal (Cathode side)
2	NC	No Connection
3	NC	No Connection
4	VLED+	LED Power Source input terminal (Anode side)

8. INTERFACE SPECIFICATIONS

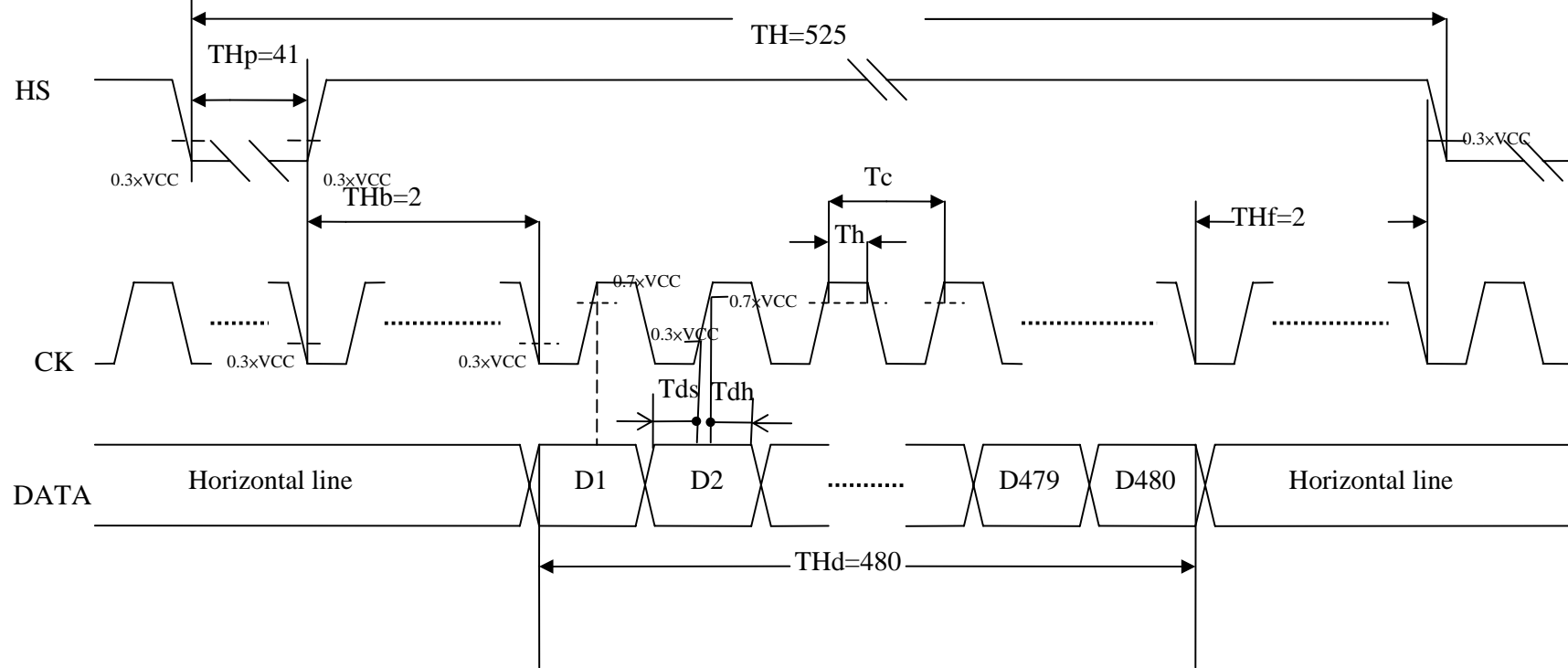
8.1 INPUT SIGNAL TIMING SPECIFICATIONS

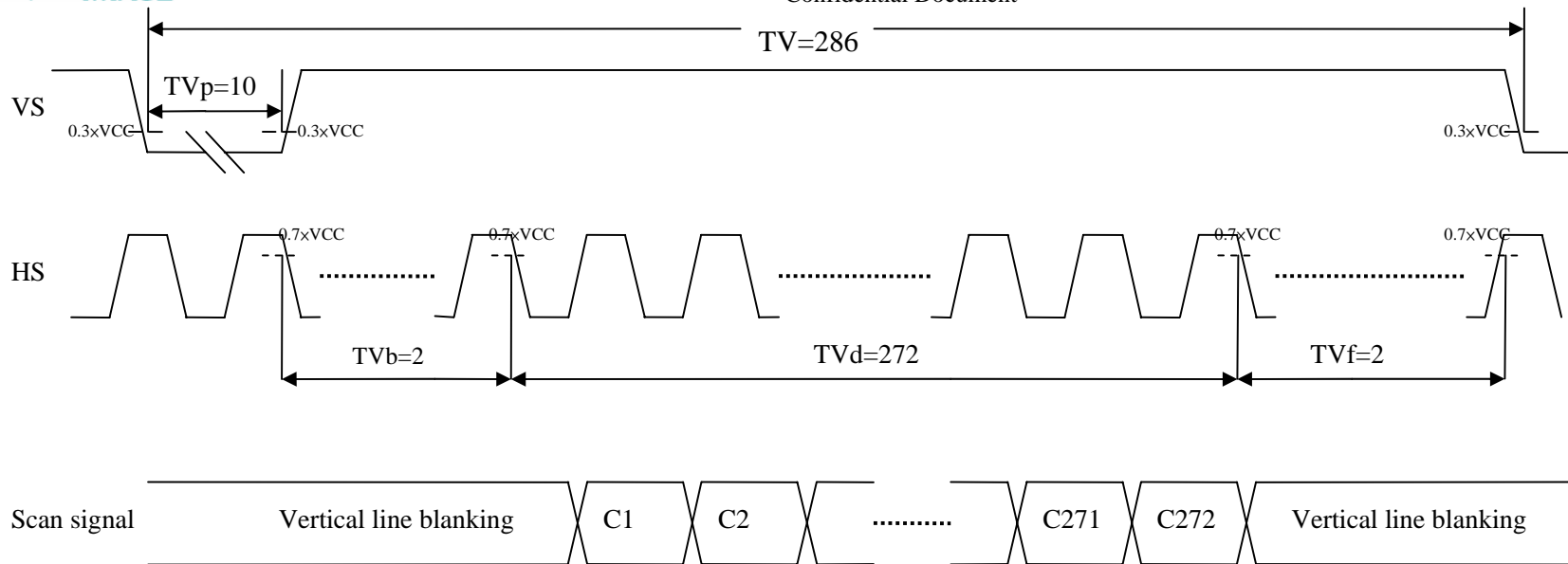
The specification of input signals timing is as the following table and timing diagram.

Parameter		Symbol	MIN.	TYP.	MAX.	Unit	Remarks
CLK	Frequency	1/Tc	--	9.6	15	MHz	
	Duty ratio	Th/Tc	40	--	--	%	
DATA	Setup time	Tds	10	--	--	ns	
	Hold time	Tdh	10	--	--	ns	
Horizontal synchronizing	Period	TH	--	525	--	Clock	
	Pulse width	THp	2	41	--	Clock	
	Horizontal period	THd	--	480	--	Clock	
	Blank porch	THb	2	2	--	Clock	
	Front porch	THf	2	2	--	Clock	
Vertical synchronizing	Period	TV	--	286	--	Line	
	Pulse width	TVp	1	10	--	Line	
	Vertical period	TVd	--	272	--	Line	
	Blank porch	TVb	1	2	--	Line	
	Front porch	TVf	1	2	--	Line	

Note:

- ◇ In case of using the slow frequency, the deterioration of display flicker etc may occur.
- ◇ The timing characteristics are basically fixed as above.





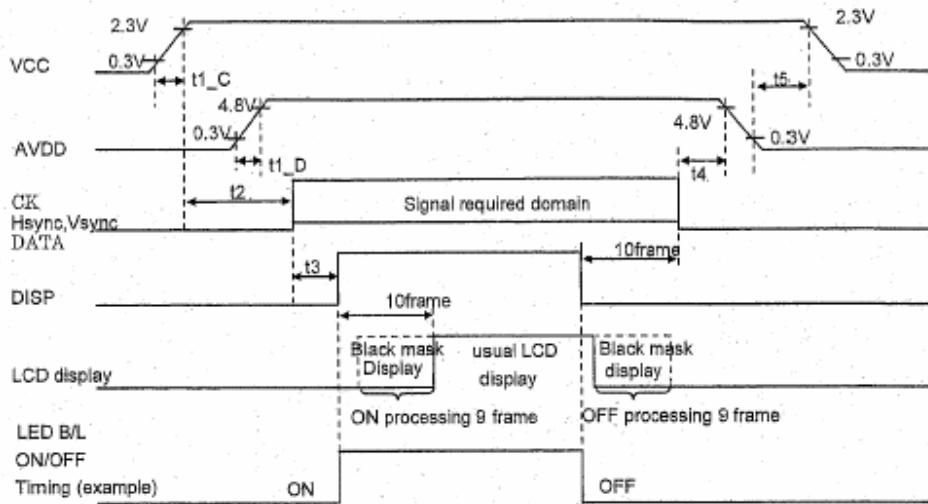
8.2 Color DATA INPUT ASSIGNMENT

Colors & Gray Scale	Date signal																											
	Gray Scale	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7			
		LSB	MSB							LSB	MSB							LSB	MSB									
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	0	
	Blue	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	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	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	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	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	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	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	1	
Gray Scale of Red	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	↑	GS1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	↑	↓																										
	↓	↓																										
	Brighter	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	↓	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Gray Scale of Green	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	↑	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0			
	↑	↓																										
	↓	↓																										
	Brighter	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
	↓	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0		
Gray Scale Blue	Black	GS0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
	↑	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0			
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0			
	↑	↓																										
	↓	↓																										
	Brighter	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1			
	↓	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1			
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1			

0 : Low level voltage 1 : High level voltage

Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of 24 bit data signals, the 16-million-color display can be achieved on the screen.

8.3 Sequences of supply voltage and signals



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.

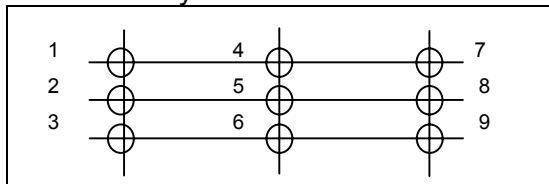
Parameter	MIN.	TYP.	MAX.	Unit
t1_C	1m			s
t1_D	1m			s
t2	100u			s
t3	100u			s
t4	0			s
t5	1m			s

9. Optical Characteristics

9-1. Specification:

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response time	Rise	$\theta=0^\circ$	-	15	30	ms	Note 4,6
	Fall		-	35	50	ms	
Contrast ratio	CR	At optimized viewing angle	100	400			Note 5,6
Viewing angle	Top	$CR \geq 10$	70	80	-	Deg.	Note 6,7
	Bottom		70	80	-		
	Left		70	80	-		
	Right		70	80	-		
Luminance of white		$\theta=0^\circ$	--	200	--		
Uniformity			70	--		%	
White chromaticity	X	$\theta=0^\circ$		0.32			Note 8
	y			0.33			

Measured by :TOPCON BM-7



$$\text{Brightness} = \frac{1+2+3+4+5+6+7+8+9}{9}$$

Note 1~5: See next page.

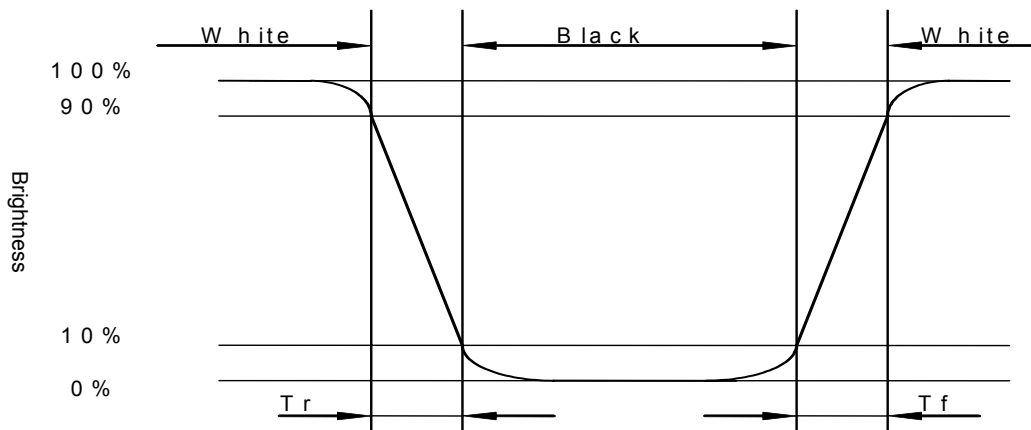
Note 1: Ambient temperature =25°C. LED current = 20 mA.

Note 2: To be measured in the dark room.

Note 3: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-7, after 2 minutes operation.

Note 4: Definition of response time:

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


Note5: Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

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

Note 6. White $V_i = V_{i50} \pm 1.5V$ Black $V_i = V_{i50} \pm 2.0V$

" \pm " means that the analog input signal swings in phase with COM signal.

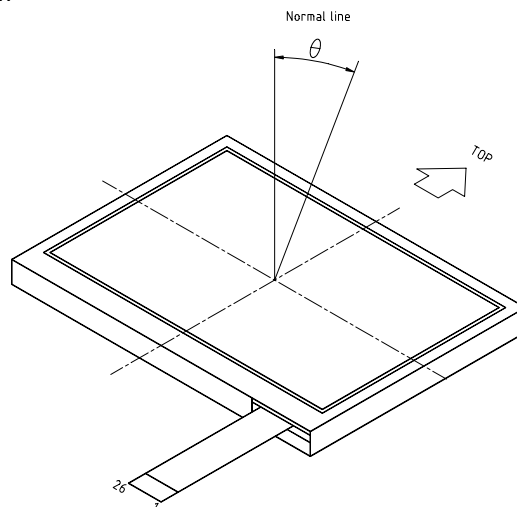
" \mp " means that the analog input signal swings out of phase with COM signal.

V_{i50} : The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 7. Definition of viewing angle:

Refer to figure as below.



Note 8. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

10. TOUCH PANEL CHARACTERISTICS

1. Input Method and Activation Force

Input Method	Average Activation Force
1.6mm dia. Delrin stylus	TBD
1.6mm dia .Silicon "finger"	TBD

2. Typical Optical Characteristics

ITEM	Parameter
Visible Light Transmission	>80%
Haze	<10%

3. Electrical Specification

ITEM	Parameter	
Operating Voltage	TBD	
Contact current	TBD	
Circuit close resistance	X	TBD
	Y	TBD
Circuit open resistance	20MΩ	
Contact bounce	<10ms	
Linear Test	<1.5%	
Capacitance	<100nF	

4. Linearity

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

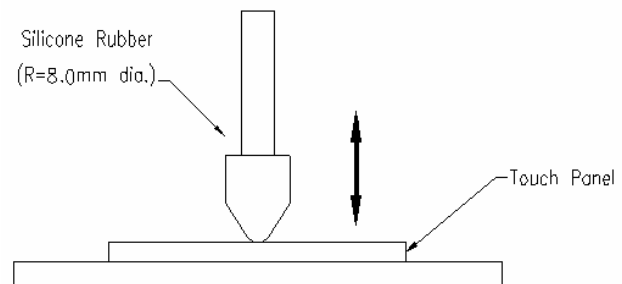
5. Specification

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

6. Durability test:

6.1 Touch panel is hit 10 millions times with a silicone rubber of R8 finger, hitting rate is by 200g at 2 times per second. The measurement must satisfy the following:

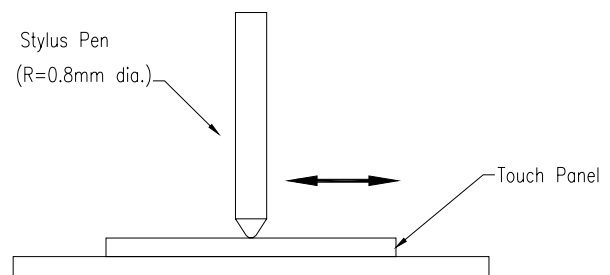
- Circuit close resistance: x TBDΩ ;
y TBDΩ
- Circuit open resistance: >20MΩ
- Contact bounce: <10ms
- Linearity test: <1.5%



6.2 Stylus writing

Touch panel is drawn by R0.8 Darling stylus pen, at 200g forces, repeat one inch by 100k times. The measurement must satisfy the following:

- Circuit close resistance: x TBDΩ ;
y TBDΩ
- Circuit open resistance: >20MΩ
- Contact bounce: <10ms
- Linearity test: <1.5%



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.

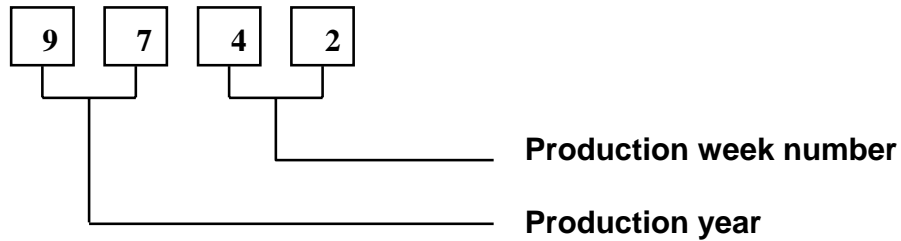
11.1.4 Test Frequency

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

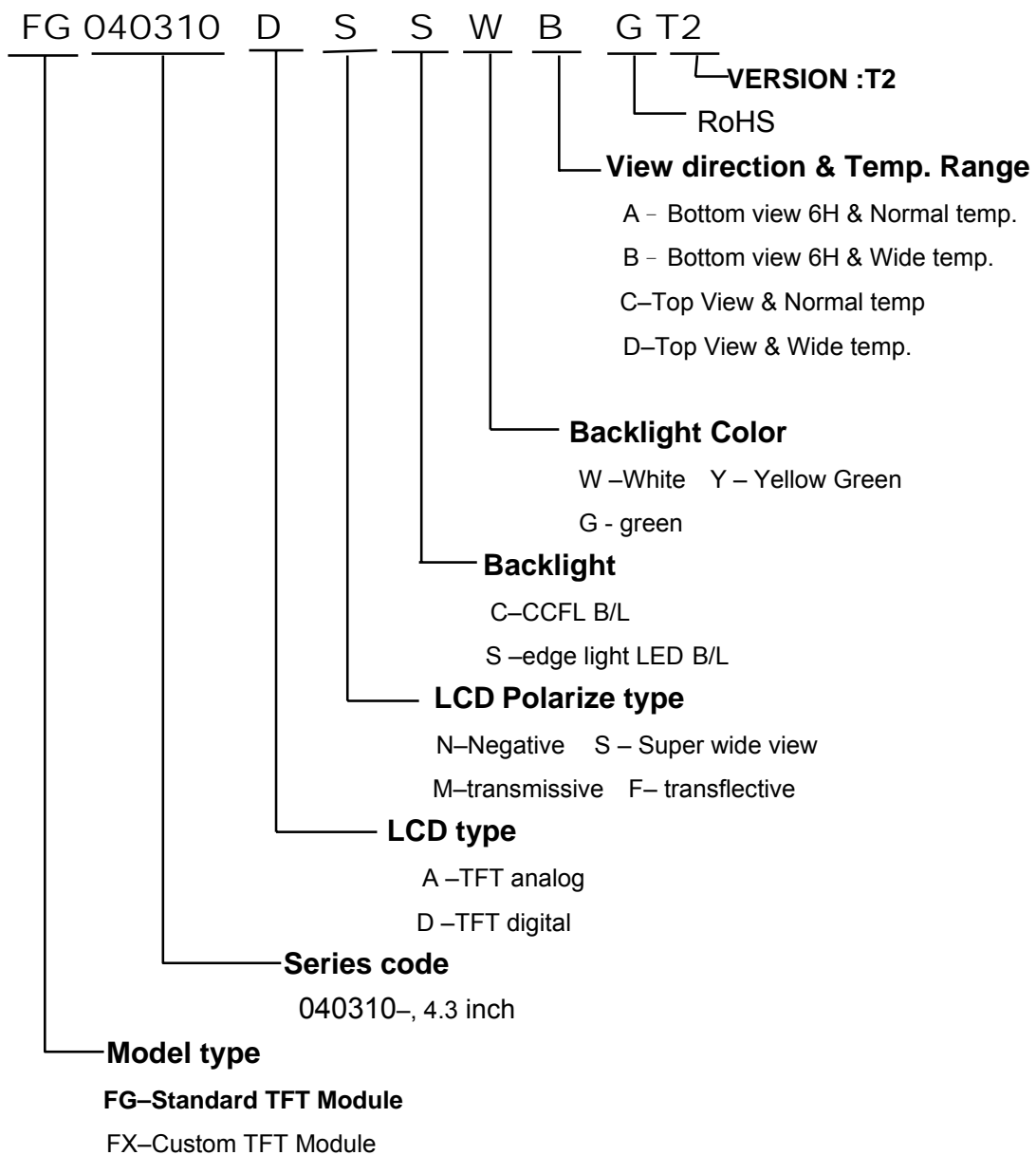
11.1.5 Test Method

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,330Ω Air:± 15KV;Contact: ± 8KV 10 times/point;4 points/panel face

12. LOT NUMBERING SYSTEM



13. LCM NUMBERING SYSTEM



14. PRECAUTION FOR USING 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 after wards.

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".

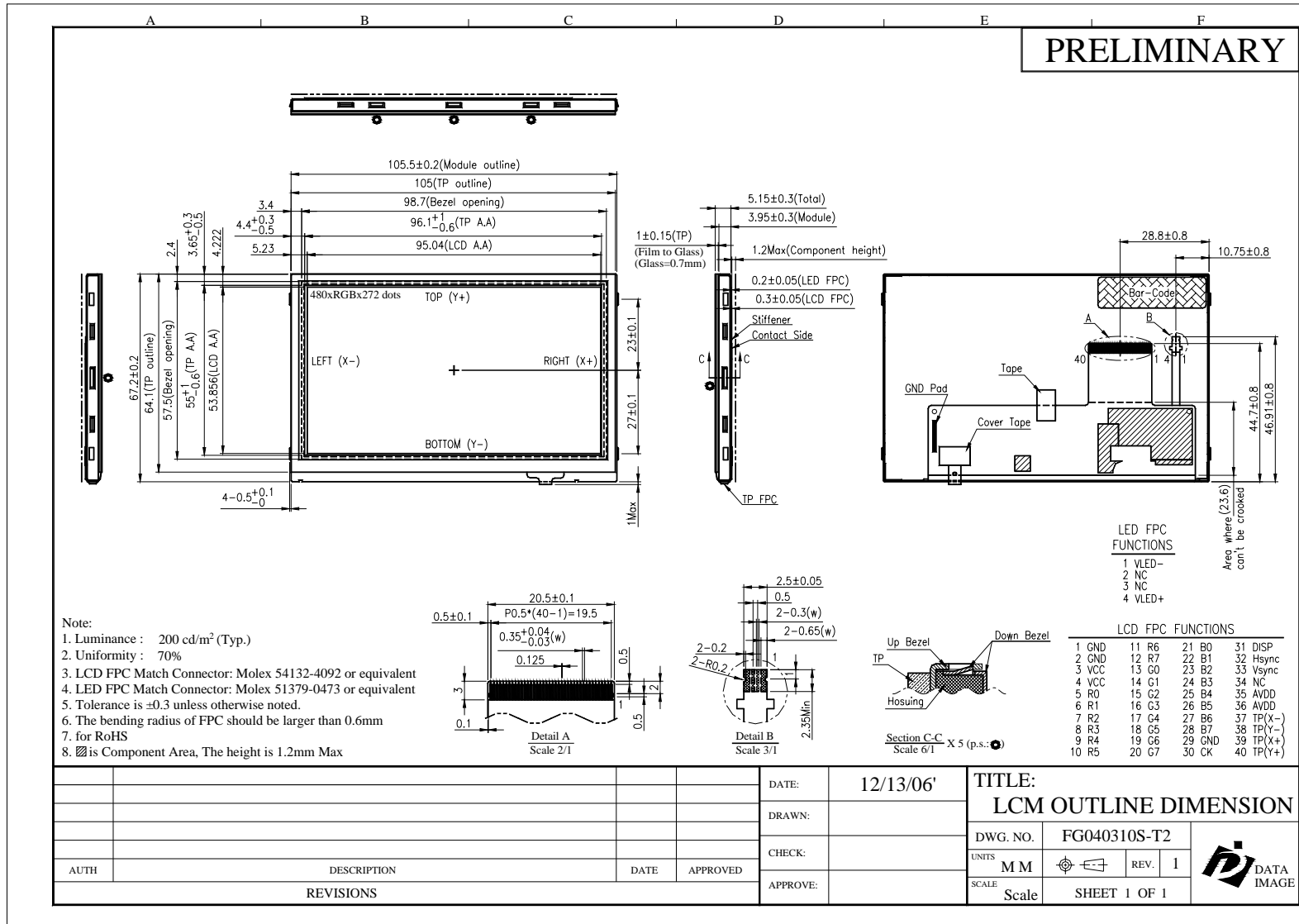
2.5 Storage

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 responsible for any subsequent or consequential events.

Confidential Document
15. OUTLINE DRAWING



16.PACKAGE INFORMATION

