HY-LINE®
COMPUTER COMPONENTS

Inselkammerstr. 10
82008 Unterhaching
Tel: +49 89 614 503 40
www.hy-line.de/computer

DATA IMAGE

Confidential Document

DATA IMAGE   CORPORATION

TFT Module Specification

ITEM NO.:   FG050722DSSWDG01

Table of Contents

Customer Companies	R&D Dept.	Q.C. Dept.	Eng. Dept.	Prod. Dept.
	Jack	Joe	Gang.	Ben
Approved by	Version:	Issued Date:	Sheet Code:	Total Pages:
	C	16/MAR/11'		20

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

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	27/AUG/07'			Initial preliminary
A	29/NOV/07'	4,6,10, 16	3,12,19	1. Add Weight. 2. Add Power Supply Current for LCD. 3. Add Power Supply Current for LED. 4. Modify LED life time 40000hours to LED Dice life time 50000hours. 5. Change Note1, ambient temperature: from 25 to 22 . 6. Add Chromaticity data. 7. Change PACKAGE INFORMATION.
B	25/FEB/09'	15	18	Modify outline drawing
C	6/MAY/11'	12 14	16 19	1.Modify: LCM PRODUCT LABEL DEFINE 2.Modify: OUTLINE DRAWING from Rev. B to C

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 8.9Max.(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}		123	150	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}		333	400	mA	V_{LED} =5.0V
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	
ADJ frequency		19K	20K	21K	Hz	
ADJ input voltage	VIH	3.0	-	3.3	V	
	VIL	0	-	0.3	V	
LED Dice life time		--	50000	--	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
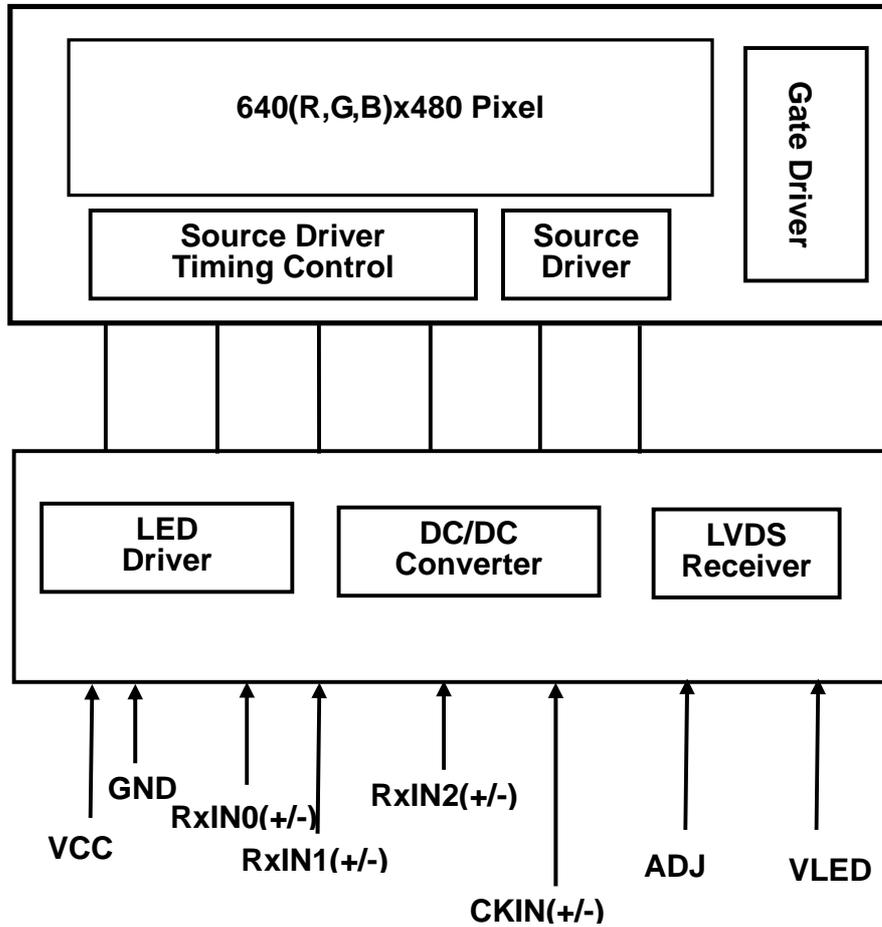
8. PIN CONNECTIONS

Pin No	Symbol	Function	Remark
1	VCC	power supply for Digital Circuit	
2	VCC	power supply for Digital Circuit	
3	GND	Ground	
4	GND	Ground	
5	RxIN0-	Differential Data Input ,CH0(Negative)	
6	RxIN0+	Differential Data Input ,CH0(Positive)	
7	GND	Ground	
8	RxIN1-	Differential Data Input ,CH1(Negative)	
9	RxIN1+	Differential Data Input ,CH1(Positive)	
10	GND	Ground	
11	RxIN2-	Differential Data Input ,CH2(Negative)	
12	RxIN2+	Differential Data Input ,CH2(Positive)	
13	GND	Ground	
14	CKIN-	Differential Clock Input (Negative)	
15	CKIN+	Differential Clock Input (Positive)	
16	GND	Ground	
17	VLED	Power Supply for LED Driver Circuit	
18	VLED	Power Supply for LED Driver Circuit	
19	GND	Ground	
20	ADJ	Brightness control for LED B/L	

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) GND PIN must be grounding, can not be floating.
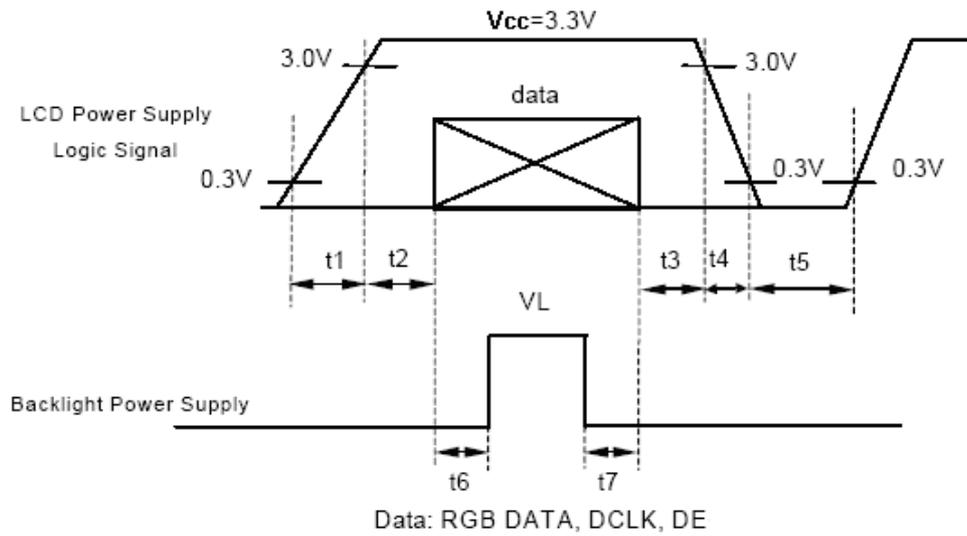
8.1 Power Signal Sequence
Remarks:
*1) Power Signal sequence:
$t1 \leq 10ms$: $1\ sec \leq t5$
$50ms \leq t2$: $200ms \leq t6$
$0 < t3 \leq 50ms$: $200ms \leq t7$
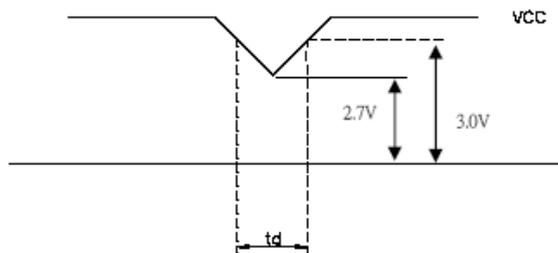$0 < t4 \leq 10ms$

Data: RGB DATA, DCLK, DE

*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
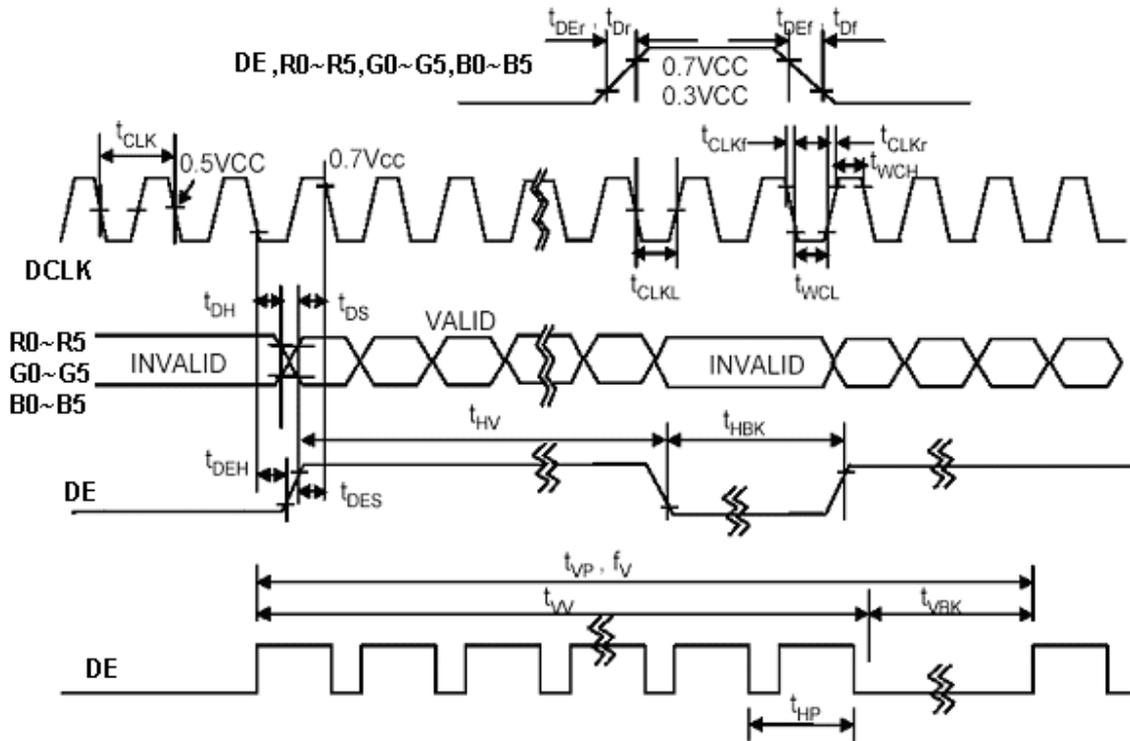
9.2 SYNC mode Input signal characteristics

| 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
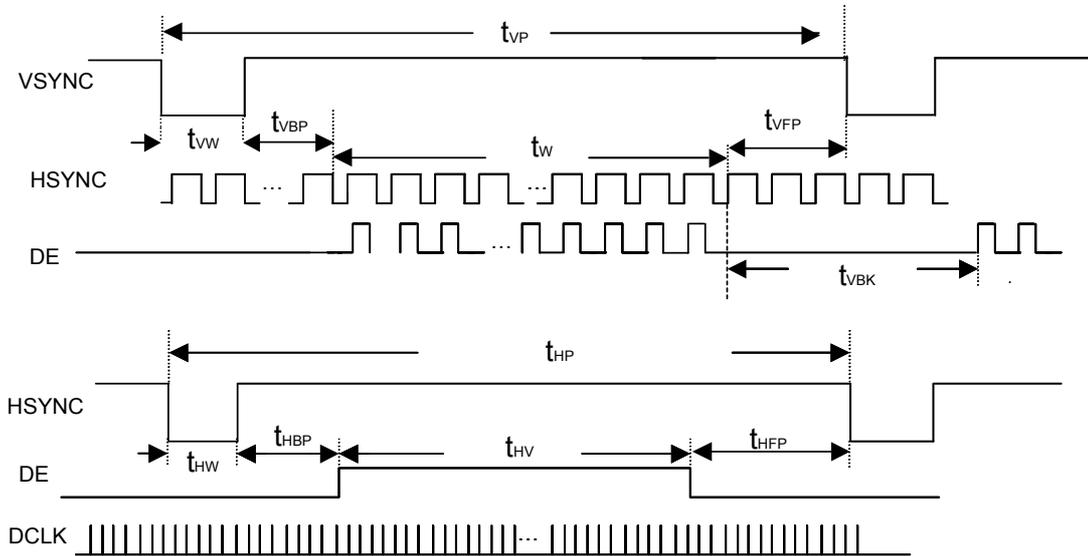
9.2.1.2 Input horizontal timing
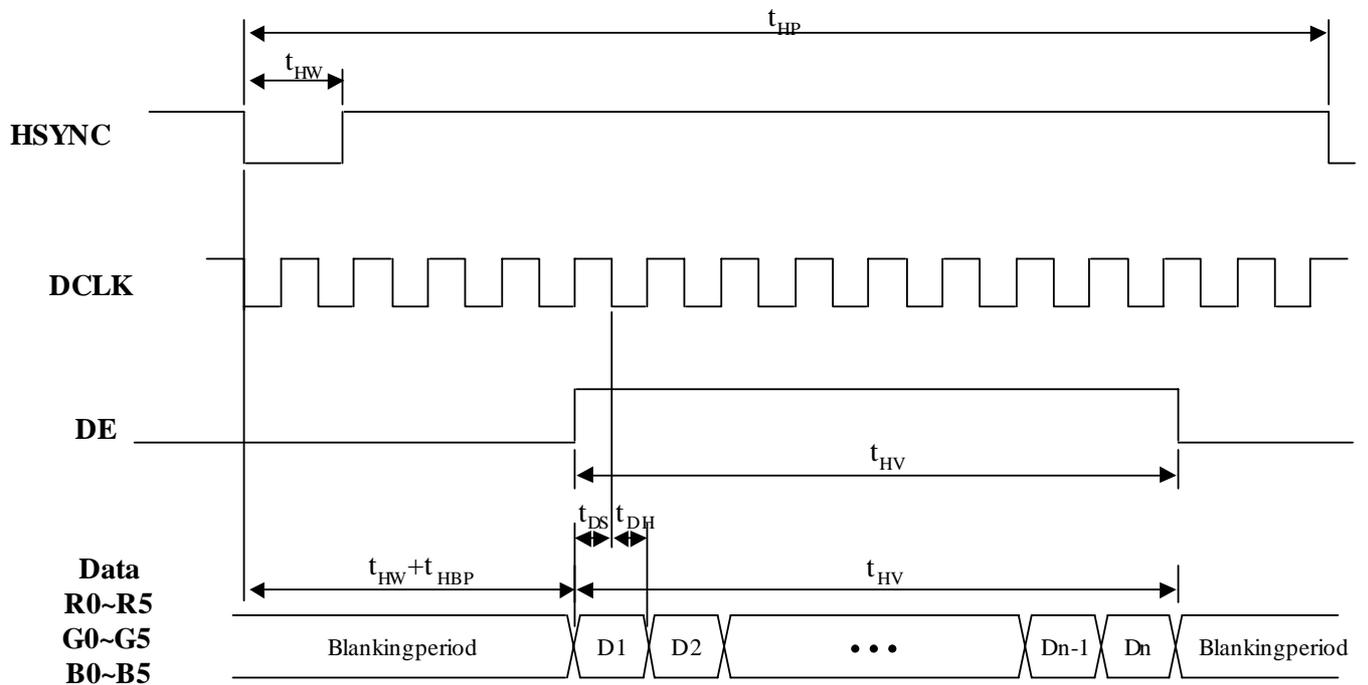
9.3 Color Data Assignment

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	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	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	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	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	1
RED	RED(0)	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	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	RED(62)	1	1	1	1	1	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	0
GREEN	GREEN(0)	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	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	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	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	0
	BLUE(1)	0	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	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	BLUE(62)	0	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	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
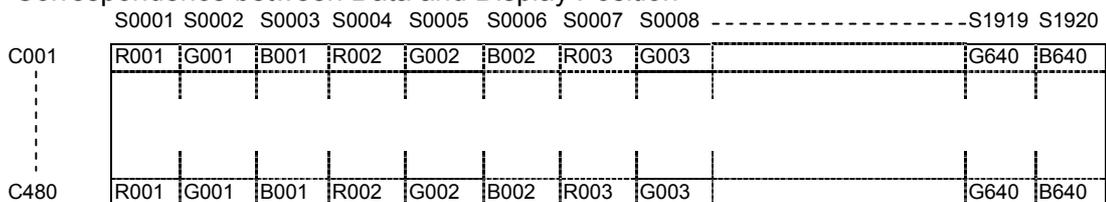
10. OPTICAL CHARACTERISTIC

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	$\theta x=\theta y=0°$ ADJ=3.3V	360	400	--	cd/	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$1 lux, and at room temperature). The operation temperature is 25°C$\pm$2°C. The measurement method is shown in Note1.
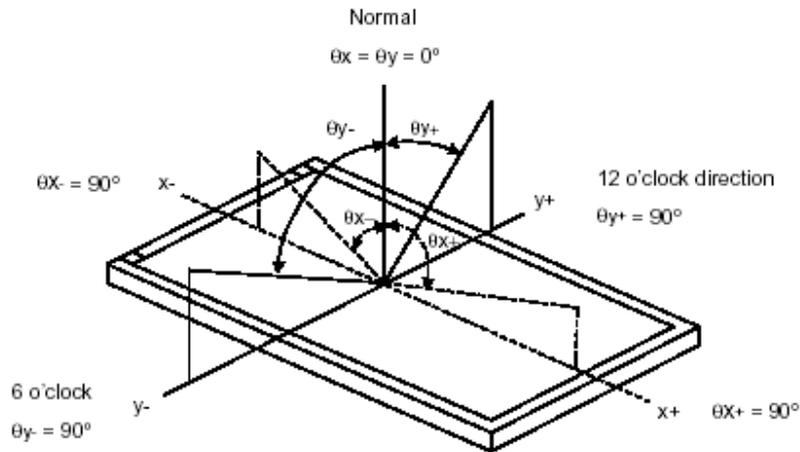
Note1: The method of optical measurement:
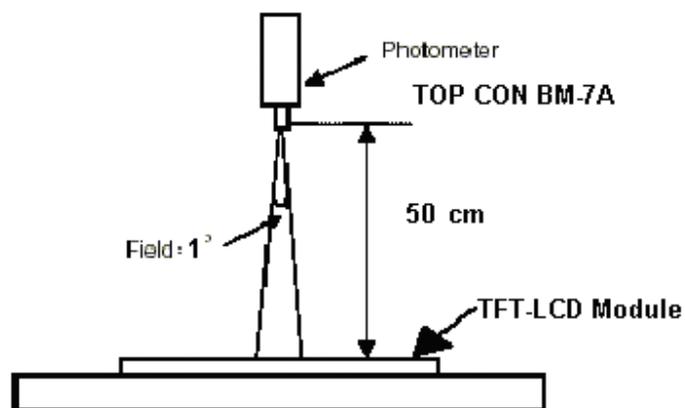
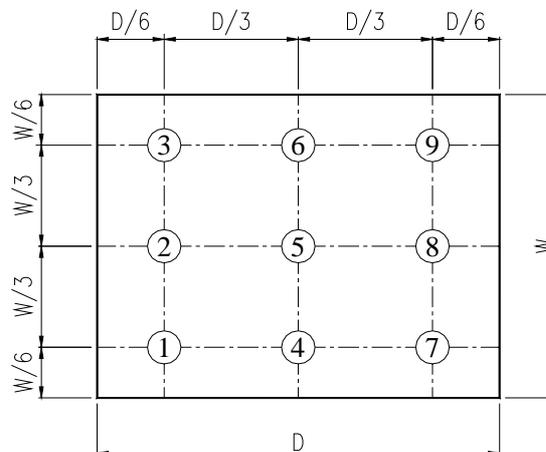Note2: Measured at the center area of the panel and at the viewing angle of the θx=θy =0°

Note3: Definition of Contrast Ratio (CR):

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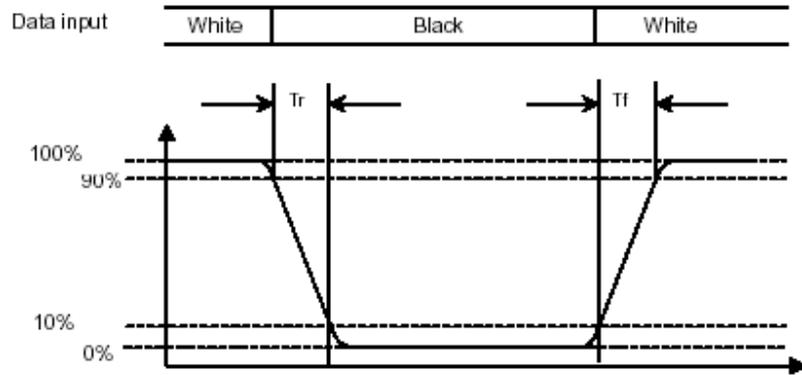
Note4: Definition of Viewing Angle

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

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

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
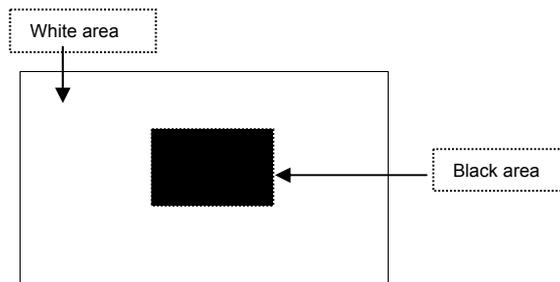
11. QUALITY ASSURANCE
  11.1 Test Condition

       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.
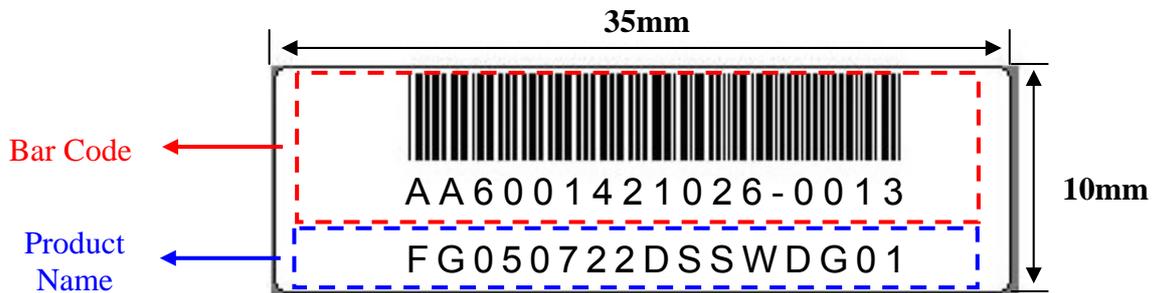
       11.1.4 Test Frequency

          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 $\rightarrow$ +25°C $\rightarrow$ +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:$\pm$ 12KV;Contact:$\pm$6KV 10 times/point;4 points/panel face

12. LCM PRODUCT LABEL DEFINE

Product Label style:

35mm

Bar Code

A A 6 0 0 1 4 2 1 0 2 6 - 0 0 1 3

F G 0 5 0 7 2 2 D S S W D G 0 1

Product Name

10mm

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 050722 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.**
- J–Bottom view 6H & Super Wide temp.

Backlight Color

W –White Y – Yellow Green

G - green

Backlight

C–CCFL B/L

S- 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

050722–, 5.7 inch

Model type

FG–Standard TFT Module

FX–Custom TFT Module

13. PRECAUTION 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 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 : $280°C \pm 10°C$

(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".
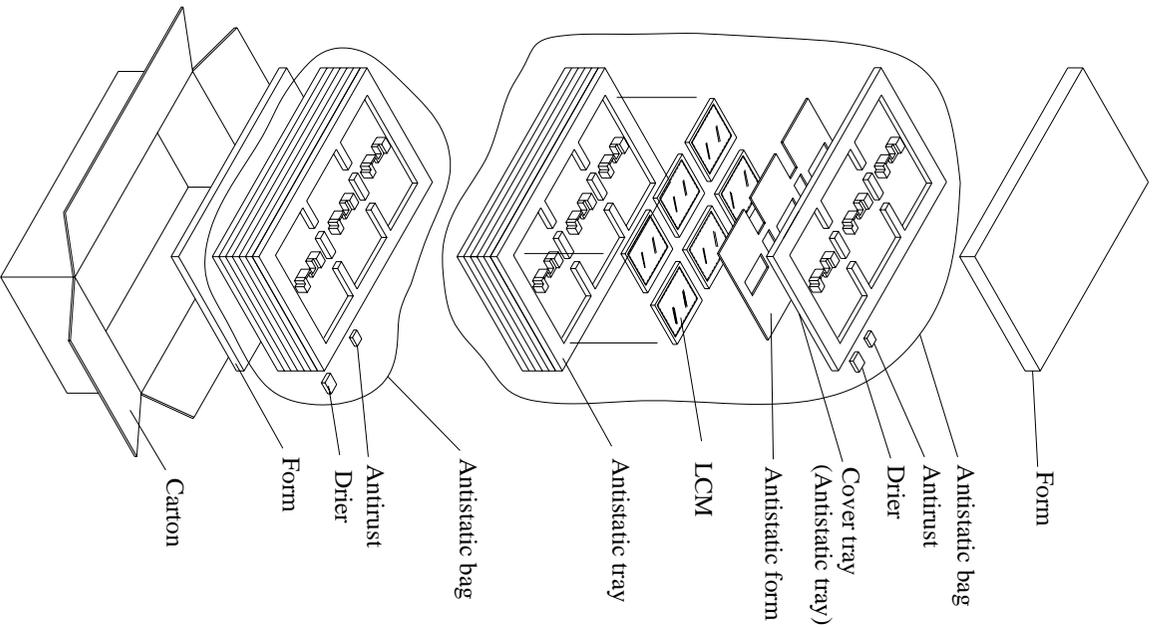
2.5 Storage

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

Note:
1. Brightness : 400 cd/m^2 (Typ)
2. 20 PIN Connector: Hirose DF14A-20P-1.25H or equivalent;
   Mates with Hirose DF14-20S-1.25C or equivalent.
3. 10 PIN Connector: Molex: 54548-1071 or Equivalent.
4. Tolerance is ±0.3 unless otherwise noted.
5. For RoHS.
6. * is important dimension.

20 PIN FUNCTIONS			
1	Vcc	11	RxIN2−
2	Vcc	12	RxIN2+
3	GND	13	GND
4	GND	14	CKIN−
5	RxIN0−	15	CKIN+
6	RxIN0+	16	GND
7	GND	17	VLED
8	RxIN1−	18	VLED
9	RxIN1+	19	GND
10	GND	20	ADJ

AUTH	DESCRIPTION	DATE	APPROVED
⚠	Add the UL Label . <ECR 11S-980027>	06/08/10'	
⚠	Change the location of connector PAD , Add Note 6. < ECR 11S-920023>	02/16/09'	
	REVISIONS		

DATE: 06/30/08'

DRAWN:

CHECK:

APPROVE:

TITLE: LCM OUTLINE DIMENSION

DWG. NO. FG050722S-01

UNITS M M   REV. C

SCALE 1 / 1   SHEET 1 OF 1

DATA IMAGE

15.PACKAGE INFORMATION

FG050722 TFT LCM PACKING

Total Weight ≒ 11 kgw

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

1 Carton = 72pcs

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

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

1 Antistatic tray = 6 pcs

Total pcs

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

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

Material

Carton

Form

Drier

Antirust

Antistatic bag

Antistatic tray

LCM

Antistatic form

Cover tray
(Antistatic tray)

Drier

Antirust

Antistatic bag

Form