



DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FG070060DNCWAG02

Table of Contents

- 1. COVER & CONTENTS 1
- 2. RECORD OF REVISION 2
- 3. APPLICATION..... 3
- 4. GENERAL SPECIFICATIONS 3
- 5. ELECTRICAL CHARACTERISTICS 3
- 6. BLOCK DIAGRAM 4
- 7. PIN CONNECTIONS 5
- 8. INTERFACE SPECIFICATIONS 6
- 9. OPTICAL CHARACTERISTIC 9
- 10. QUALITY ASSURANCE 11
- 11. LOT NUMBERING SYSTEM 12
- 12. LCM NUMBERING SYSTEM 12
- 13. PRECAUTIONS IN USE LCM 13
- 14. OUTLINE DRAWING 14
- 15. PACKAGE INFORMATION 15

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	A	2006/7/21		15

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	8/MAY/06			Initial PRELIMINARY
A	21/JUL/06	5.1,9.1,14	3,9,14	1.Modify backlight : VL typ. from 560 to 637,max from 620 to -. VS Ta=25°C max from 1050 to 855. VS Ta=0°C max from - to 1065. 2.Change vertical viewing angle: θ_v + typ. from 40 to 45 degree 3.Change Brightness min from 320 to 300. 4.Change OUTLINE DRAWING.

3. Application

Digital equipments which need color display, such as P.O.S, medical equipments and industrial equipments

4. GENERAL Specifications

Parameter	Specifications	Unit
Screen size	7.0 (16:9 diagonal)	inch
Display resolution	1440(H) x 234(V)	dot
Active area	154.08 (H) x 86.58 (V)	mm
Dot pitch	0.107 (H) x 0.37 (V)	mm
Pixel Configuration	Stripe	
Outline Dimension	164.9 (W) x 100 (H) x 10 (D)	mm
Surface treatment	Anti-glare	
Weight	238±20	g
View Angle direction	6 o'clock	

5. Electrical Characteristics

T_a=25°C

Parameter	Symbol	MIN.	Typ.	MAX.	Unit	Remark
Power Supply voltage	V _{CC}	+3.0	+3.3	+3.6	V	
Power Supply Current	I _{CC}		150	200	mA	V _{CC} =3.3V
"H" level logical input voltage	V _{IH}	0.7V _{CC}	--	--	V	
"L" level logical input voltage	V _{IL}	--	-	0.3V _{CC}	V	
Operating temperature	Topa	-10		60	°C	Ambient temperature
Storage temperature	Tstg	-20		70	°C	Ambient temperature

5.1 Backlight driving conditions

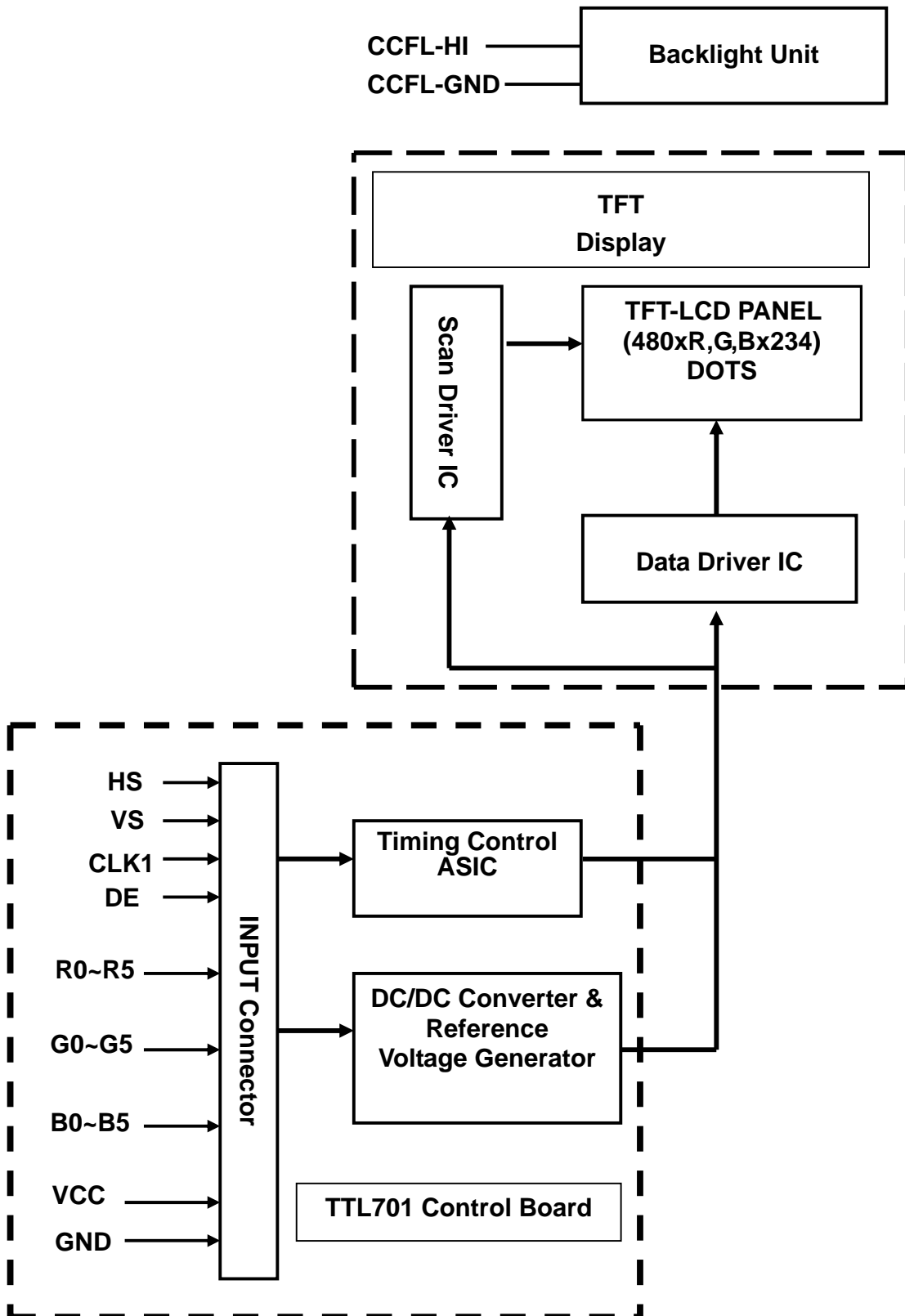
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V _L		--	637	--	V _{rms}	Note 1
Lamp current	I _L		5	6	7	mA _{rms}	
Frequency	F _L	-	45	--	60	kHz	Note 1,2
Lamp starting voltage	V _S	T _a = 25°C	--	--	855	V _{rms}	Note1,3
		T _a = 0°C	--	--	1065	V _{rms}	Note 1,3
Lamp life time		T _a = 25°C	10,000	15,000	--	hrs	

Note 1: Reference value, correct value is subject to final backlight specification which will be decided in the future.

Note 2: The lamp frequency should be selected as different as possible from display horizontal synchronous signal to avoid interference.

Note 3: For starting the backlight unit, the output voltage of DC/AC's transformer should be larger than the maximum lamp starting voltage.

6. Block Diagram



7. PIN CONNECTIONS

7.1 P1 Input Pins Connection (To TTL562 control board)

Pin No	Symbol	Function	Remark
1	GND	Ground for logic circuit	
2	CLK1	Data sampling clock	
3	HS (HSYNC)	Horizontal synchronous signal	
4	VS (VSYNC)	Vertical synchronous signal	
5	GND	Ground for logic circuit	
6	R0	Red pixel data(LSB)	
7	R1	Red pixel data	
8	R2	Red pixel data	
9	R3	Red pixel data	
10	R4	Red pixel data	
11	R5	Red pixel data(MSB)	
12	GND	Ground for logic circuit	
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(MSB)	
19	GND	Ground for logic circuit	
20	B0	Blue pixel data(LSB)	
21	B1	Blue pixel data	
22	B2	Blue pixel data	
23	B3	Blue pixel data	
24	B4	Blue pixel data	
25	B5	Blue pixel data(MSB)	
26	GND	Ground for logic circuit	
27	DE	Data Enable (connected to GND, if sync mode)	
28	Vcc	Power Supply : +3.3V	
29	Vcc	Power Supply : +3.3V	
30	NC	No Connection	
31	NC	No Connection	
32	GND	Ground for logic circuit	

8. INTERFACE SPECIFICATIONS

8.1 INPUT SIGNAL TIMING SPECIFICATIONS

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

Signal	Parameter	Symbol	MIN.	TYP.	MAX.	Unit	Remarks
CLK1	Pixel clock Frequency	fclk1	8	10.125	12.5	MHz	
	Pixel clock period	Tck	80	99	125	ns	
	Rise time	Trck		4.5		ns	
	Fall time	Tfck		4.5		ns	
VS	Vertical Frequency	fv		64		Hz	
	Vertical period	Tvp		262		Thp	
	Vertical display blank period	Tvdb		28		Thp	
	Vertical display active period	Tvda	234	234	234	Thp	
	Vertical sync. front porch	Vfp		9		Thp	
	Vertical sync. back porch	Vbp		11		Thp	
	Vertical sync. pulse width	Vpw	3	8		Thp	
HS	Horizontal period	Thp		600		Tck	
	Horizontal display blank period	Thdb		120		Tck	
	Horizontal display active period	Thda	480	480	480	Tck	
	Horizontal sync. front porch	Hfp		33		Tck	
	Horizontal sync. back porch	Hbp		78		Tck	
	Horizontal sync. pulse width	Hpw	5	9		Tck	
DATA	Setup time	Tsd	10			ns	
R.G.B	Hold time	Thd	10			ns	

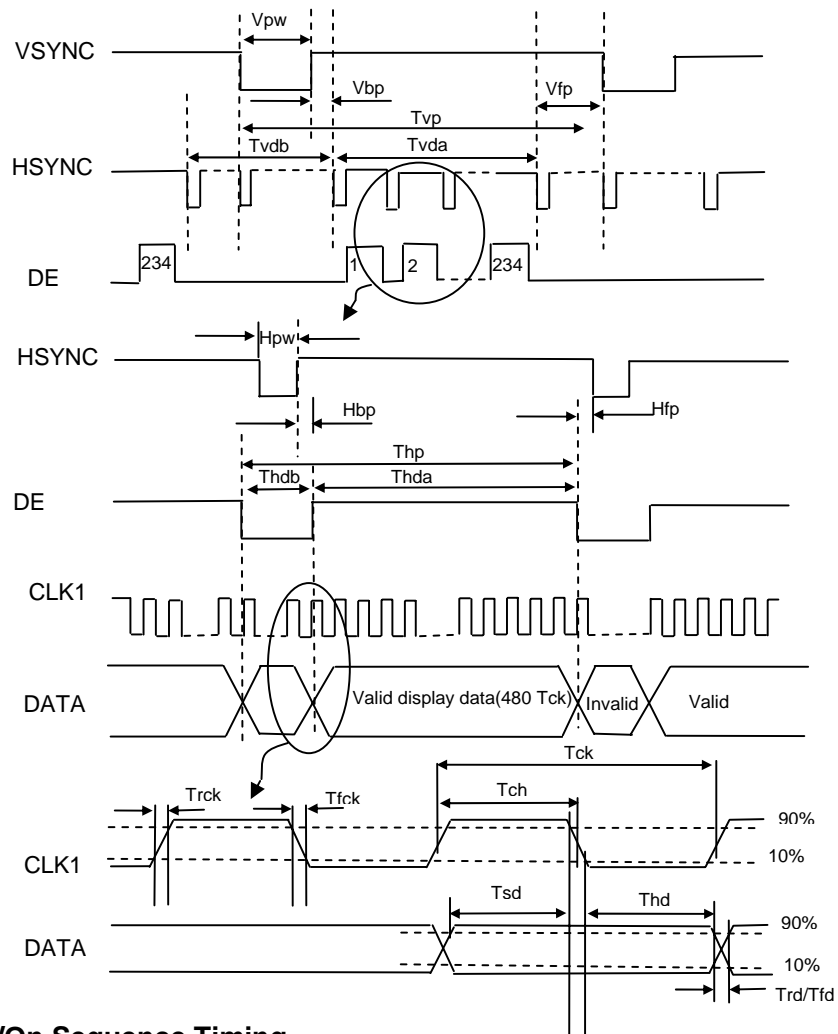
Note: 1.Data is latched at falling edge of CLK1 in the spec. CLK1 should appear during all blanking period.

2.VS and HS are negative polarity in the spec.

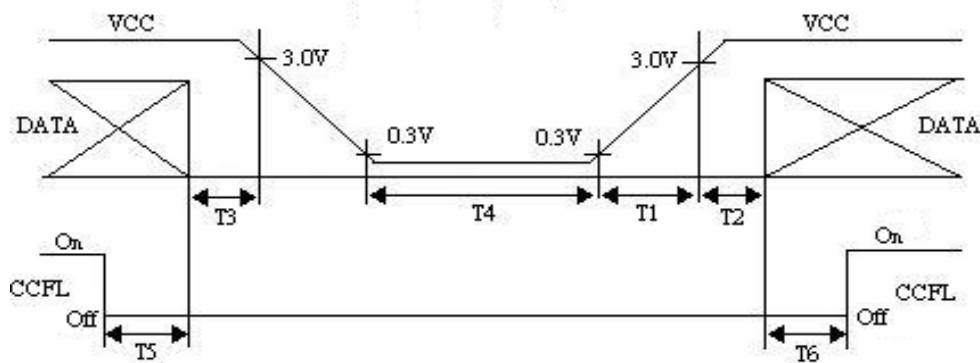
3.HS should appear during blanking period of frame cycle.

4. $Tvp = Tvdb + Tvda$, $Tvdb = Vbp + Vfp + Vpw$

5. $Thp = Thdb + Thda$, $Thdb = Hbp + Hfp + Hpw$



8.2 Power Off/On Sequence Timing



Timing Specifications:

$0 < T1 \leq 15\text{mS}$

$T2 > 0.5\text{S}$

$0 < T3 \leq 0.1\text{S}$

$T4 > 1\text{S}$

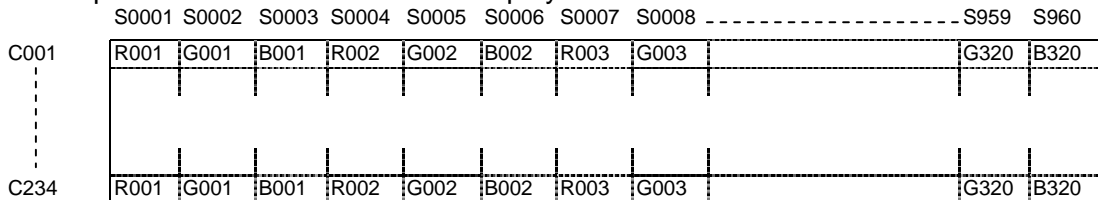
$T5 > 0.1\text{S}$

$T6 > 0.1\text{S}$

8.3 Color DATA INPUT ASSIGNMENT

Color		Data Signal																	
		Red					Green					Blue							
		R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	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
Gray Scale of Red	Red(0) / Dark	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(61)	1	1	1	1	0	1	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	
Gray Scale of Green	Green(0)/ Dark	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(61)	0	0	0	0	0	0	1	1	1	1	0	1	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	
Gray Scale of Blue	Blue(0)/ Dark	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 (61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	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	

Correspondence between Data and Display Position



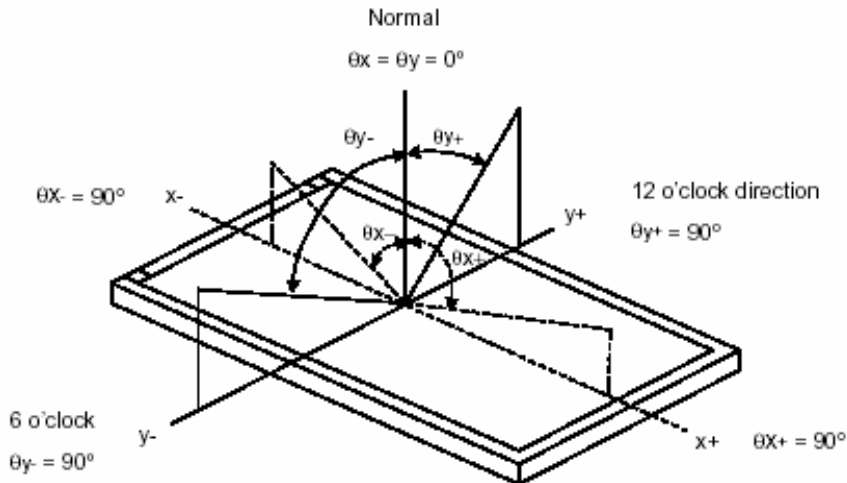
9. Optical Characteristics

9-1. Specification:

Ta = 25°C

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	θ_{x+}	CR \geq 10	--	60	--	deg	Note 9-1
		θ_{x-}		--	60	--	deg	Note 9-1
	Vertical	θ_{y+}		--	45	--	deg	Note 9-1
		θ_{y-}		--	60	--	deg	Note 9-1
Contrast Ratio		CR		150	200	--		Note 9-2
Brightness				300	350	--	cd/m ²	Note 9-3,9-5
Response time	Rise	Tr	$\theta=0^\circ$	--	15	30	ms	Note 9-4
	Fall	Tf		--	35	50	ms	
Chromaticity	White	x		0.26	0.31	0.36	--	Note 9-3,9-5
		y		0.28	0.33	0.38	--	

Note 9-1: The definitions of viewing angles

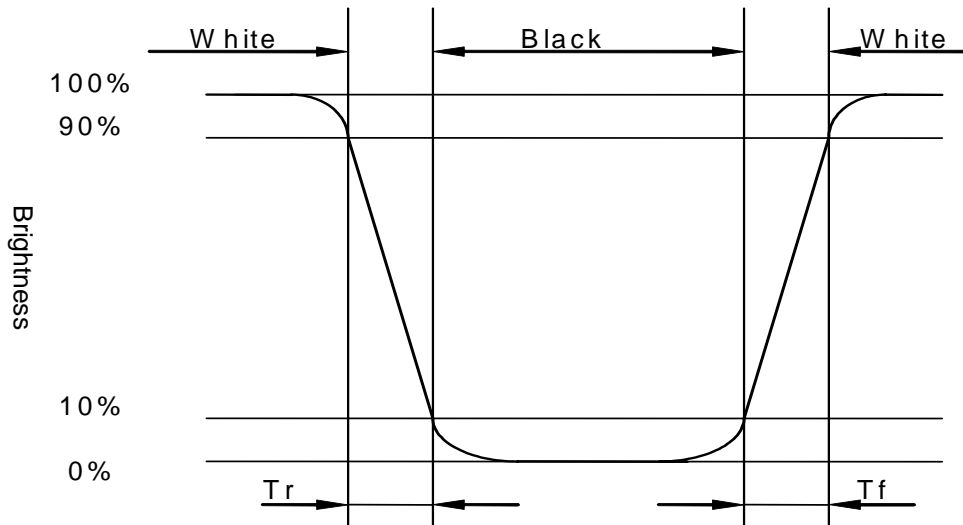


Note 9-2 : CR =
$$\frac{\text{Luminance With all pixels in white state}}{\text{Luminance With all pixels in Black state}}$$

(Testing configuration see 9-2) Contrast Ratio is measured in optimum common electrode voltage, and at optimized Viewing angle.

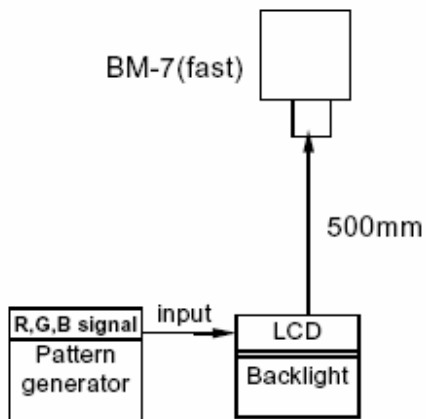
Note 9-3 : Topcon BM-7(fast) luminance meter 1°field of view is used in the testing (after 20~30 minutes operation).Lamp Current 6mA.

Note 9-4: The definition of response time:



Note 9-5: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

9-2. Testing configuration



Caution: 1. Environmental illumination ≤ 1 lux
 2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

10. QUALITY ASSURANCE

10.1 Test Condition

10.1.1 Temperature and Humidity(Ambient Temperature)

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

Humidity : $65 \pm 5\%$

10.1.2 Operation

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

10.1.3 Container

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

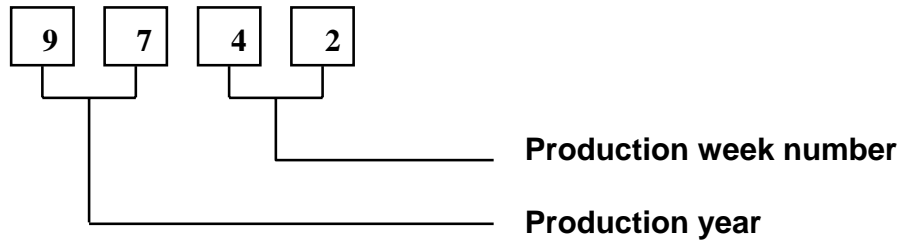
10.1.4 Test Frequency

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

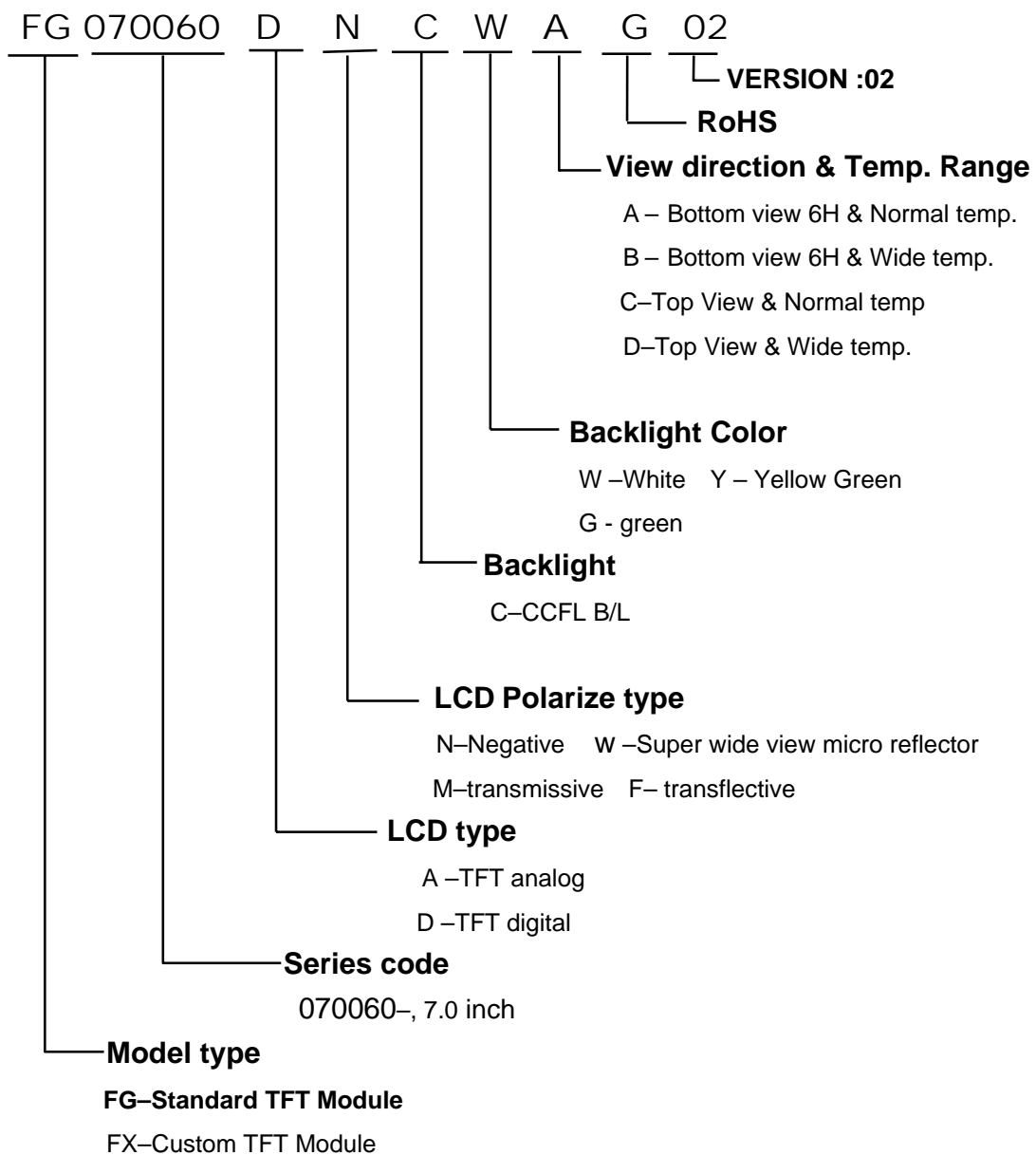
10.1.5 Test Method

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	Ta = +70 °C, 240 hrs
2	Low Temperature Storage Test	Ta = -20°C, 240 hrs
3	High Temperature Operation Test	Ta = +60 °C, 240 hrs
4	Low Temperature Operation Test	Ta = -10°C, 240 hrs
5	High Temperature and High Humidity Operation Test	Ta = +60°C, 90%RH, 240 hrs
6	Thermal Cycling Test (No operation)	-20°C → +25°C → +70°C, 200 Cycles 30 min 5min 30 min
7	Vibration Test (No operation)	Frequency :10 ~ 55 Hz Amplitude :1.5 mm Sweep time : 11 mins Test Period: 6 Cycles for each direction of X, Y, Z
8	Shock Test (No operation)	100G, 6ms Direction: ±X, ±Y, ±Z Cycle: 3 times
9	Electrostatic Discharge Test (No operation)	150pF, 330 Contact: ±8KV, Air: ±15KV 10 times/point, 9 points/panel face

11. LOT NUMBERING SYSTEM



12. LCM NUMBERING SYSTEM



13. 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".

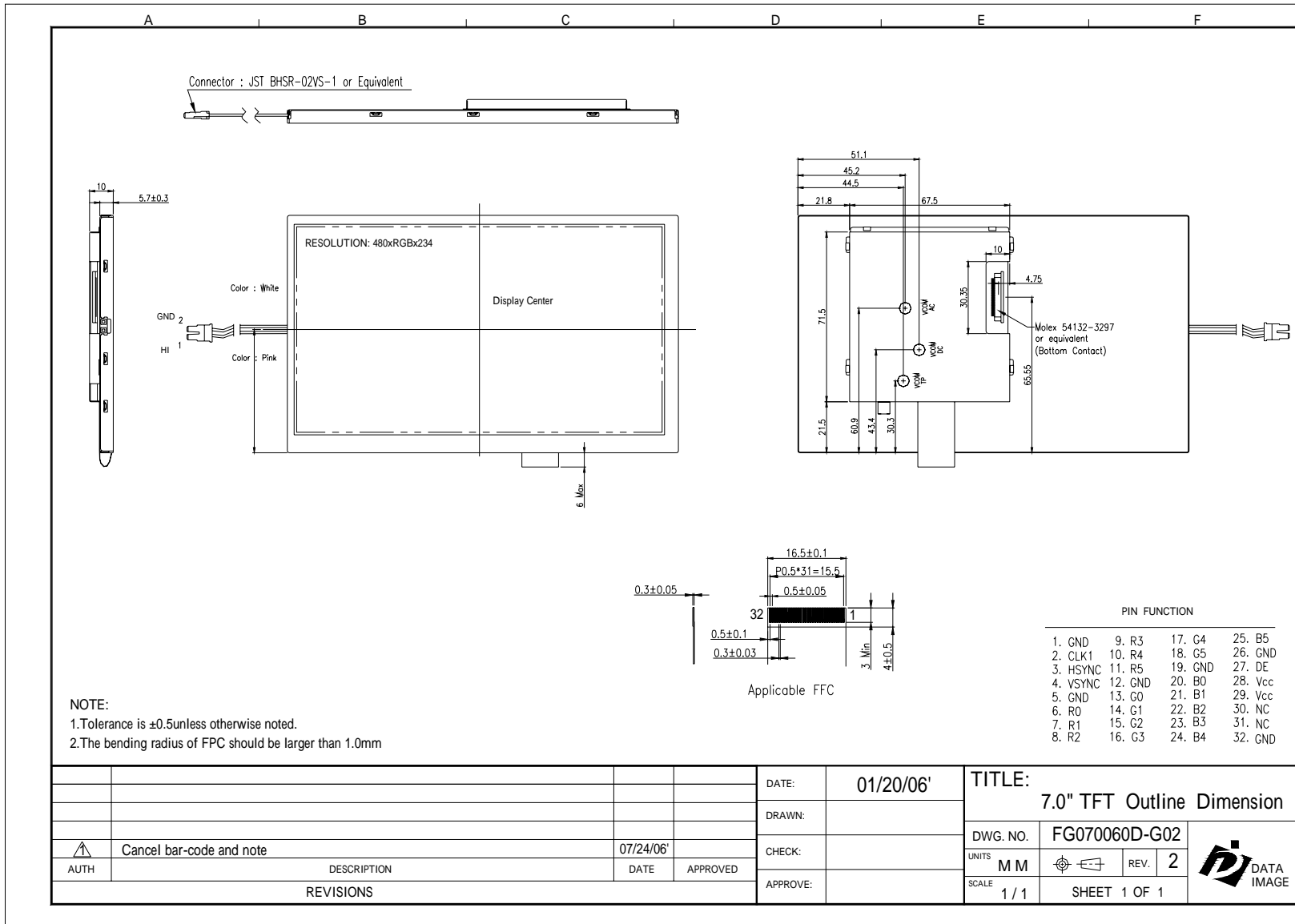
2.5 Storage

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.

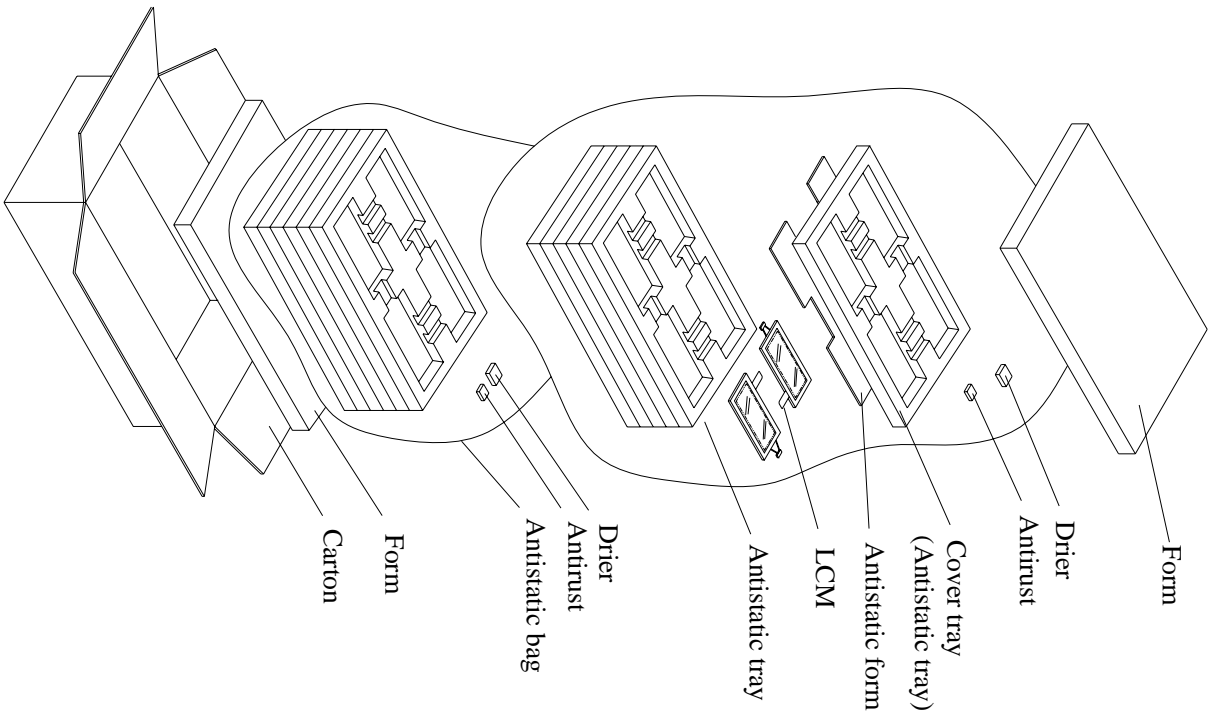
2.6 Limited Warranty

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
14. OUTLINE DRAWING



15.PACKAGE INFORMATION



Material
 1 Carton + 2 Anti-static bag + 2 Form(35mm)
 + 12 Anti-static tray + 2 Drier

Total pcs

- 1 Antistatic tray = 4 panel pcs
- 1 Anti-static bag = 5 Anti-static tray + cover tray = 5*4 +0 = 20 pcs
- 1 Carton = 2 Anti-static bag = 2*20 = 40 pcs
- 1 Carton = 40 pcs
- Carton size : 482L x 282W x 279H (mm)
- Total Weight ÷ 9.3 kgw

7.0" TFT LCM PACKING