Confidential Document

DATA IMAGE CORPORATION

TFT Module Specification

ITEM NO.: FG030523ANCWA-01

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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:
	A	2004/12/03		20

2. RECORD OF REVISION

Rev	Date	Item	Page	Comment
1	01/OCT/04			Initial PRELIMINARY
A	03/DEC/04			New Release

3. Application

This technical specification applies to 3.5” color TFT-LCD panel. The 3.5” color TFT-LCD panel is designed for camcorder, digital camera application and other electronic products which require high quality flat panel displays.

4. Features

. High Resolution :112,320 Dots (480 x 234)

. Image Reversion: Up/Down and Left/Right

5. GENERAL Specifications

Parameter		Specifications	Unit
Screen Size		3.5 (diagonal)	inch
Display Format		480 x 234	dot
Active Area		72 (H) x 50.54 (V)	mm
Dot Pitch		0.150 (H) x 0.216 (V)	mm
Surface Treatment		Anti-Glare	
Pixel Configuration		Delta	
Outline Dimension		82.8(W) x 60 (H) x 6.0 (T)	mm
Weight		60±5	g
View Angle direction		6 o’clock	
Temperature Range	Operation	0~60	℃
	Storage	-20~70	℃

6. Absolute Maximum Ratings:

GND = 0 V， Ta = 25 ℃

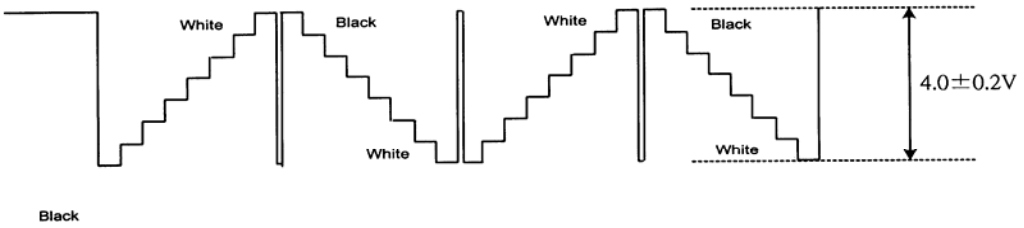
Parameter		Symbol	MIN.	MAX.	Unit	Remark
Supply Voltage for Source Driver	Analog	AV_{DD}	-0.3	7.0	V	
	Digital	V_{CC}	-0.3	7.0		
Supply Voltage for Gate Driver	Positive	V_{GH}	-0.3	32	V	
	Negative	V_{GL}	-22	0.3	V	
		V_{GH}-V_{GL}	-0.3	45	V	
Analog input voltage (V_R,V_G,V_B)		V_{RGB}	-0.2	AV_{DD}+0.2	V	

7. Electrical Characteristics

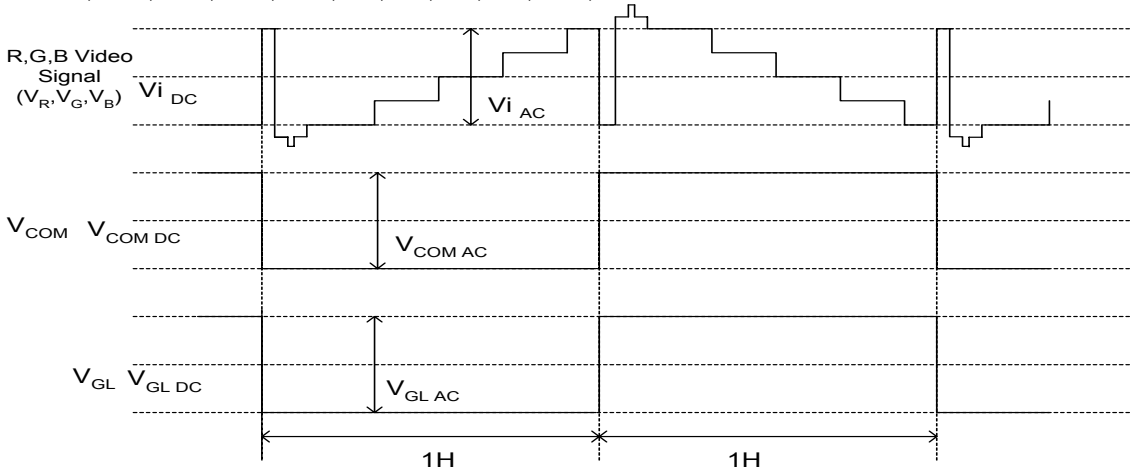
7-1 Operating Conditions:

Parameter		Symbol	MIN.	TYP	MAX.	Unit	Remark
Power Supply		V_{CC}	4.5	5.0	5.5	V	
		AV_{DD}	4.5	5.0	5.5	V	
		V_{GH}	14.5	15	15.5	V	
		$V_{GL\ AC}$	--	6.0	--	V_{P-P}	AC component of V_{GL}
		$V_{GL\ DC}$	-12.5	-11.0	-10.0	V	DC component of V_{GL}
Video Signal (V_R,V_G,V_B)		$V_{i\ AC}$	--	4.0	4.2	V_{P-P}	AC component Note7-1
		$V_{i\ DC}$	--	2.5	--	V	DC component
V_{COM}		$V_{COM\ AC}$	--	6.0	--	V_{P-P}	AC component of V_{COM}
		$V_{COM\ DC}$	1.0	1.5	2.0	V	DC component of V_{COM}
	H Level	V_{IH}	+0.7 V_{CC}	--	V_{CC}	V	Note 7-2
	L level	V_{IL}	0	--	+0.3 V_{CC}	V	Note 7-2

Note 7-1: Both NTSC and PAL system Video Signal input waveform is based on 8 steps gray scale.



Note 7-2: STHL,STHR,CPH1,CPH2,CPH3,Q1H,OEV,CKV,OEH,STVR,STVL



Liquid crystal transmission of the video signal input, V_{COM} and timing

	V_{COM}	
	H Level	L level
Video Signal input Maximum	Black	White
Video Signal input Minimum	White	Black

White: maximum transmission / Black: minimum transmission

7-2 Current Consumption

Ta= 25 °C

Parameter	Symbol	Conditions	Min	TYP.	Max.	Unit	Remark
Current for Driver	I_{GH}	V_{GH} = +15V	--	0.057	0.1	mA	
	I_{GL}	V_{GL} = -12V	--	0.06	0.26	mA	
	I_{CC}	V_{CC} = +5V	--	0.2	0.3	mA	
	AI_{DD}	AV_{DD} = +5V	--	2.77	3.0	mA	

7-3 Backlight Driving for Power Consumption

Ta= 25 °C

Pin Name	Description	Remark
HI	Input terminal (Hi voltage side)	
GND	Input terminal(Low voltage side)	Note7-3

Note7-3 : Low voltage side of backlight inverter connects with ground of inverter circuits.

Ta= 25 °C

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp voltage	V_L	211	235	259	Vrms	I_L=3.0mA
Lamp current	I_L	2.8	3.0	3.2	mA	
Lamp frequency	P_L	55	60	65	KHz	Note7-4
Kick –off voltage(25 °C)	V_S	--	355	555	Vrms	Note7-5
Kick –off voltage(0 °C)	V_S	--	450	695	Vrms	Note7-5
Lamp Life Time		15000	--	--	hr	

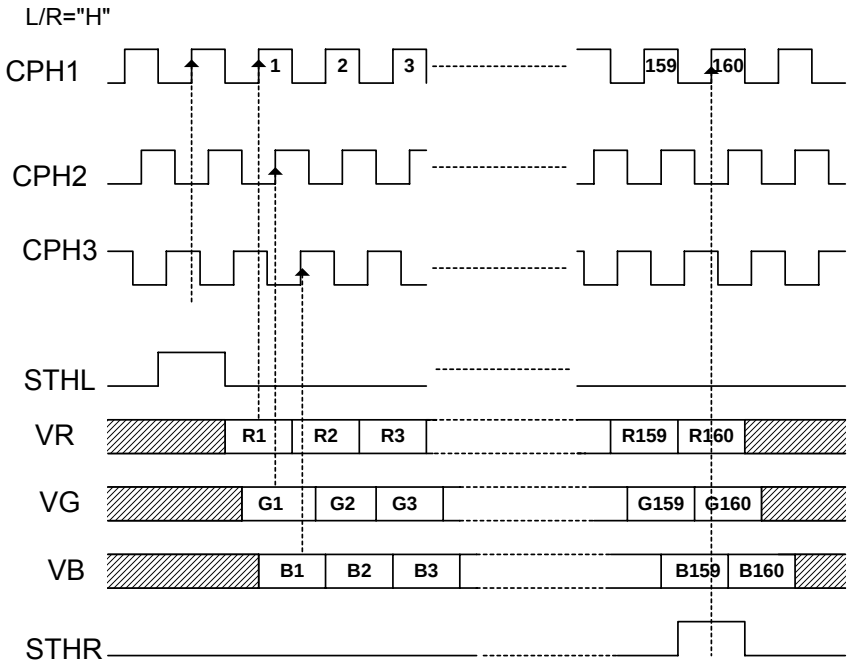
Note7-4 :The waveform of lamp driving voltage should be as closed to a perfect SIN wave as possible.

Note7-5 :The Kick-off times≥ 1sec

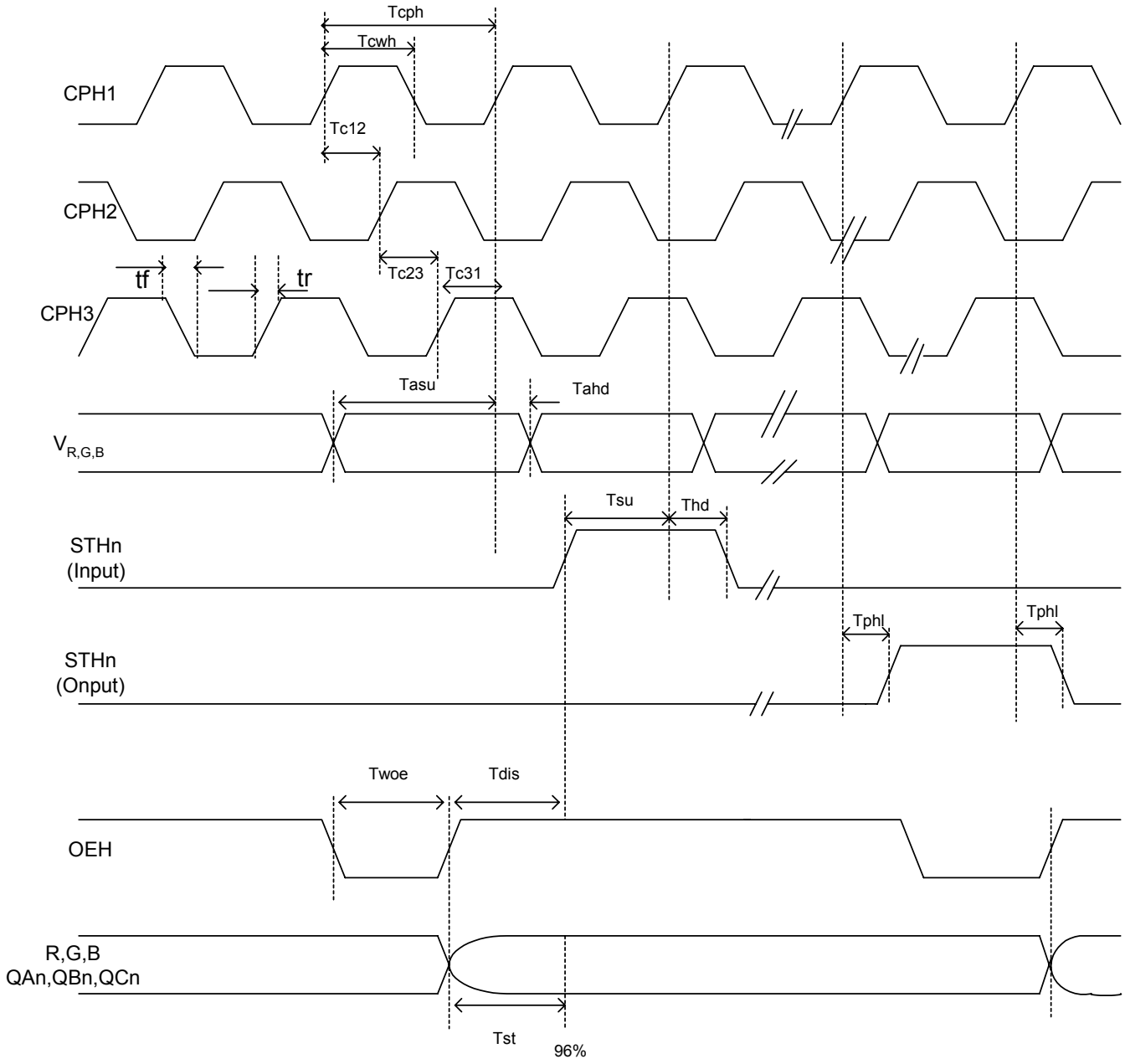
7-4 AC Characteristics Source Driver (V_{CC}=2.5~5.5V, V_{DD}=5V,Ta=25°C)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Clock cycle time	Tcph	100	-	2,000	ns	CPHn
CPHn pulse duty	Tcwh	40	-	60	%	CPHn
CPHn phase delay	T_{C12} T_{C23} T_{C31}	20	-	Tcph	ns	CPH1-CPH2 CPH2-CPH3 CPH3-CPH1
Input logic signal rise & fall time	tr(tf)		50	100	ns	All input logic signal.
Set-up time of analog signals	Tasu	60	-	-	ns	VR,VG,VB-CPHn
Hold time of analog signals	Tahd	40	-	-	ns	CPHn-VR,VG,VB
STHn set-up time	Tsu	20	-	-	ns	STHn-CPHn
STHn hold time	Thd	10	-	-	ns	CPHn-STHn
Propagation delay of STHn	Tphl	10	35	50	ns	CL=25pF
Sample and hold disable time	Tdis	1	-	-	Tcph	OEH-STHn
OEH pulse width	Twoe	1	-	-	Tcph	
Settling time	Tst	-	12	20	us	96% final value or precision ≤ 30mV,CL=60pF

Function operation Timing Diagram



Source Driver Timing Diagram

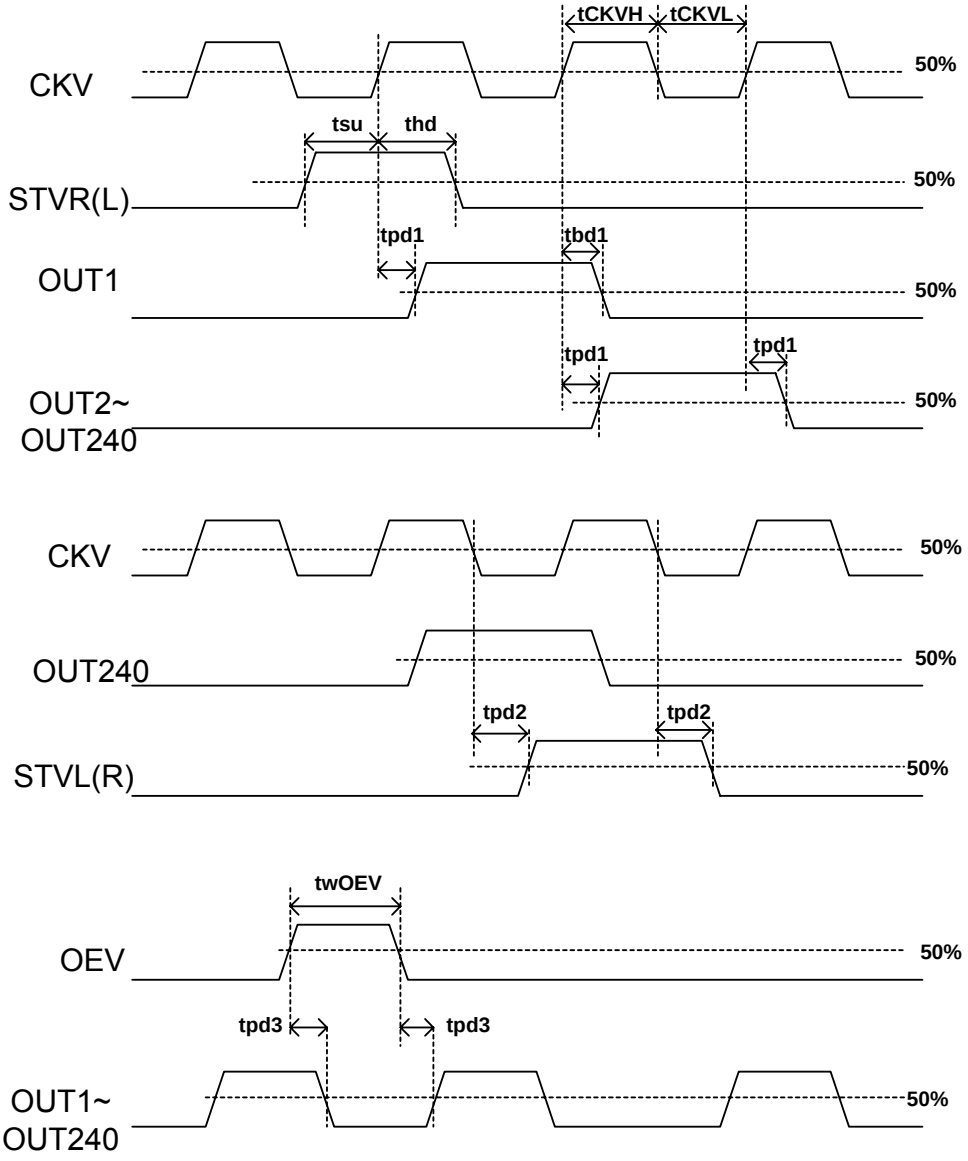


7-5 AC Characteristics Gate Driver

Parameter	Symbol	Condition	Spec		Unit
			Min.	Max.	
Operation frequency	tckv		5		μs
CKV pulse width	tCKVH ,tCKVL	50% duty cycle	2.5		
OEV pulse width	twOEV		1		
Data setup time	tsu		400		ns
Data hold time	thd		700		
Output delay time (1)	tpd1	CL=300pF		1000	
Output delay time (2)	tpd2	CL=30pF		800	
Output delay time (3)	tpd3	CL=300pF		800	

Note: The measurement point for all of above signals is at 50% of input/output amplitude.

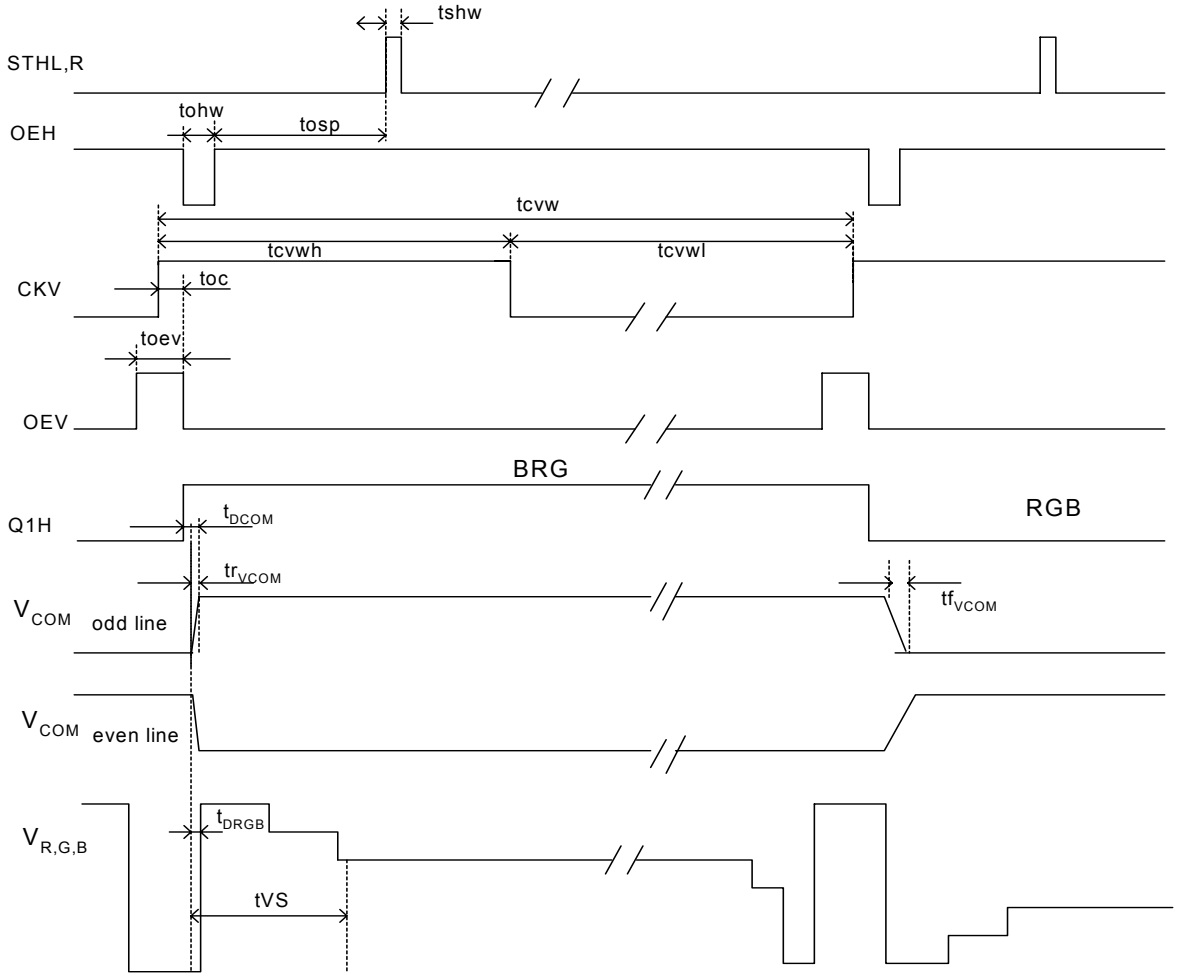
Gate Driver Timing Diagram



7-6. Timing Characteristics of Input Signals

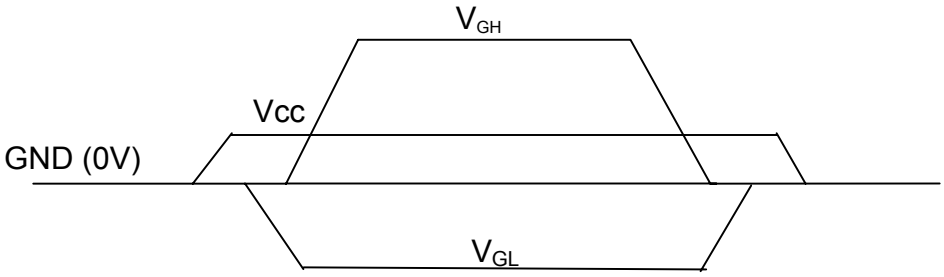
Characteristics	Symbol	Min.	TYP.	Max.	Unit	Remark
Source Start Signal Pulse Width	tshw	90	317.7	630*	ns	*tshset=tshhld
Source Output Enable Pulse Width	tohw	1.0	2.0	-	µs	
RGB Input Signal Start Point	tvs	-	10.0	-	µs	
Phase Difference Between OEH & CKV	toc	0.1	2.3	-	µs	
Gate Clock Period	tcvw	10	63.5	-	µs	
Gate Clock Pulse Width(H)	tcvwh	7	31.7	56.5	µs	
Gate Clock Pulse Width(L)	tcvwl	7	31.7	56.5	µs	
Phase Difference Between OEH & STH	tosp	-	4	-	µs	
Gate Output Enable Pulse Width	toev	-	2.5	-	µs	
V_{COM} Delay Time	t_{DCOM}	-	-	3	µs	
V_{COM} Rise (fall) Time	$tr(tf)_{VCOM}$	-	2	3	µs	
RGB Delay Start	t_{DRGB}	-	-	2	µs	

Detail Horizontal Timing



7-7 Power ON/OFF Sequence

To prevent the device from damage due to latch up, the power ON/OFF sequence shown below must be followed.



When power on: V_{CC}→ V_{GL}→input signals → V_{GH}

When power off: V_{GH}→ input signals →V_{GL}→ V_{cc}

8. Optical Characteristics

8-1. Specification:

Ta = 25°C

Parameter		Symbol	Condition	MIN.	TYP.	MAX.	Unit	Remarks
Viewing Angle	Horizontal	ϕ	CR≥10	±45	±50		deg	Note 8-3
	Vertical	θ (to 12 o'clock)		10	15		deg	
		θ (to 6 o'clock)		30	35		deg	
Contrast Ratio		CR	θ=0°, ϕ=0°	100	120			Note 8-1
Response time	Rise	Tr			15	30	ms	Note 8-4
	Fall	Tf			35	50	ms	
Transmission	Ratio	T		7.5	8.0	8.5	%	
Uniformity		U		70	75	--	%	
Brightness			θ=0°, ϕ=0°	200	250		cd/m^2	Note 8-2
Chromaticity	White	x		0.26	0.31	0.36		Note 8-2
		y		0.28	0.33	0.38		

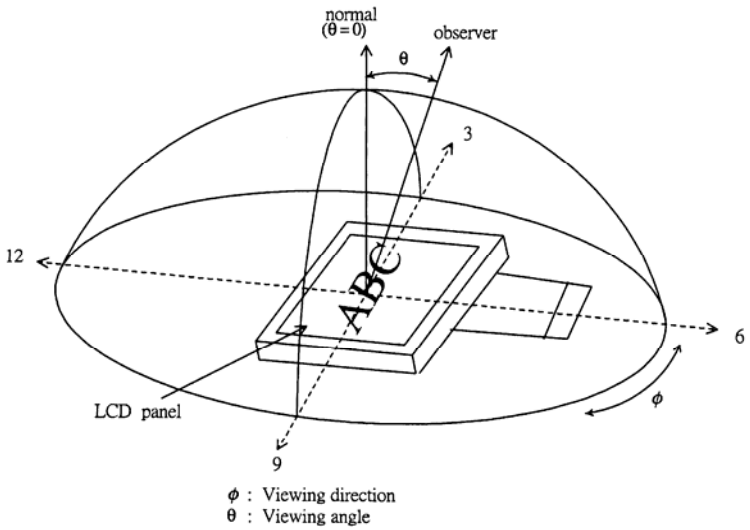
Note 8-1：CR ＝ $\frac{\text{Luminance when LCD is White}}{\text{Luminance when LCD is Black}}$

Contrast Ratio is measured in optimum common electrode voltage.

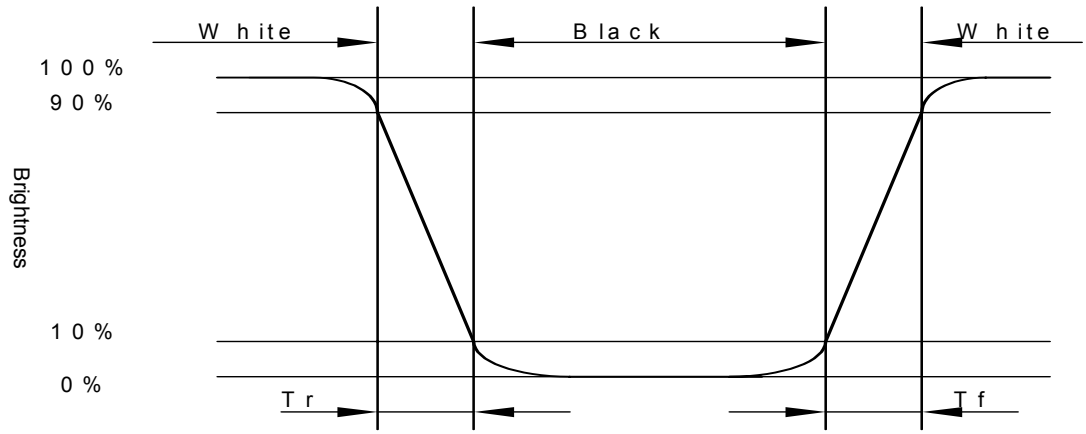
The test configurations of contrast ratio see section 8-2 .

Note 8-2 :Topcon BM-7(fast) luminance meter 2.0° field of view is used in the testing (after 20~30 minutes operation).Lamp Current 3.0mA.

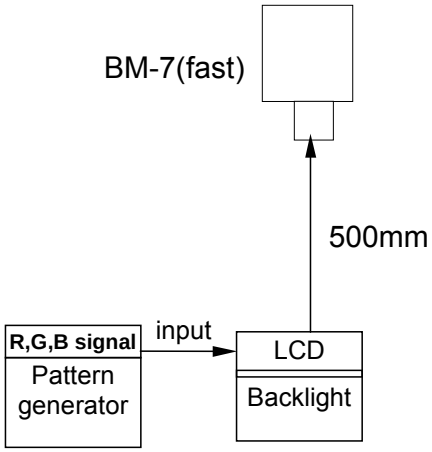
Note 8-3 : The definitions of viewing angles diagrams:



Note 8-4: The definition of response time:

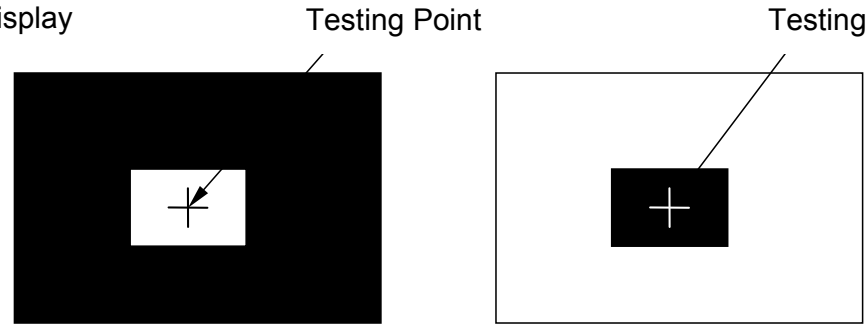


8-2. Testing configuration



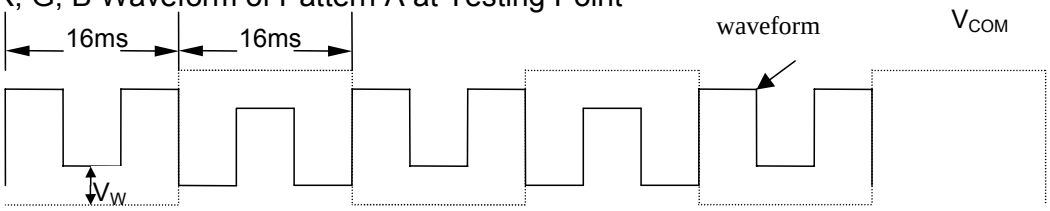
Caution: 1. Environmental illumination ≦ 1 lux
2. Before test CR, Vcom voltage must be adjusted carefully to get the best CR.

- LCD Display



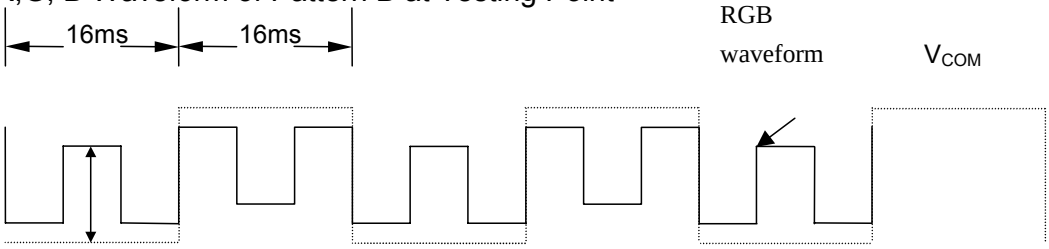
Pattern A Pattern B

- R, G, B Waveform of Pattern A at Testing Point



V_W=1.1V +/- 0.2V

- R,G, B Waveform of Pattern B at Testing Point



V_b=5.2V +/-0.2V

9. Input / Output Terminals

9.1 PIN Connections

Pin No	Symbol	I/O	Description	Remark
1	STHL	I/O	Start Pulse for Source Driver	Note 9-1
2	OEH	I	Output Enable for Source Driver	
3	Q1H	I	Video Input Rotation Control	
4	CPH1	I	Sampling and Shift Clock for Source Driver	
5	CPH2	I	Sampling and Shift Clock for Source Driver	
6	CPH3	I	Sampling and Shift Clock for Source Driver	
7	GND		Ground	
8	V_B	I	Video Input B	Note 9-4
9	V_G	I	Video Input G	Note 9-4
10	V_R	I	Video Input R	Note 9-4
11	NC	-	No Connection	
12	L/R	I	Left / Right for Source Driver	Note 9-1
13	STHR	I/O	Start Pulse for Source Driver	Note 9-1
14	AV_{DD}	I	Analog Power Input for Source Driver	Note 9-2
15	V_{COM}	I	Common Electrode Voltage	Note 9-4
16	V_{GH}	I	Gate on Voltage	Note 9-6
17	V_{CC}	I	Logic Power for Gate Driver	Note 9-3
18	STVL	I	Vertical Start Pulse	Note 9-5
19	OEV	I	Output Enable for Gate Driver	
20	CKV	I	Clock input for gate driver	
21	U/D	I	Up / Down Control for Gate Driver	Note 9-5
22	STVR	I	Vertical Start Pulse	Note 9-5
23	NC	-	No Connection	
24	V_{GL}	I	Gate off Voltage (Alternative Every 1-H)	

Note 9-1: STHL,STHR and L/R mode

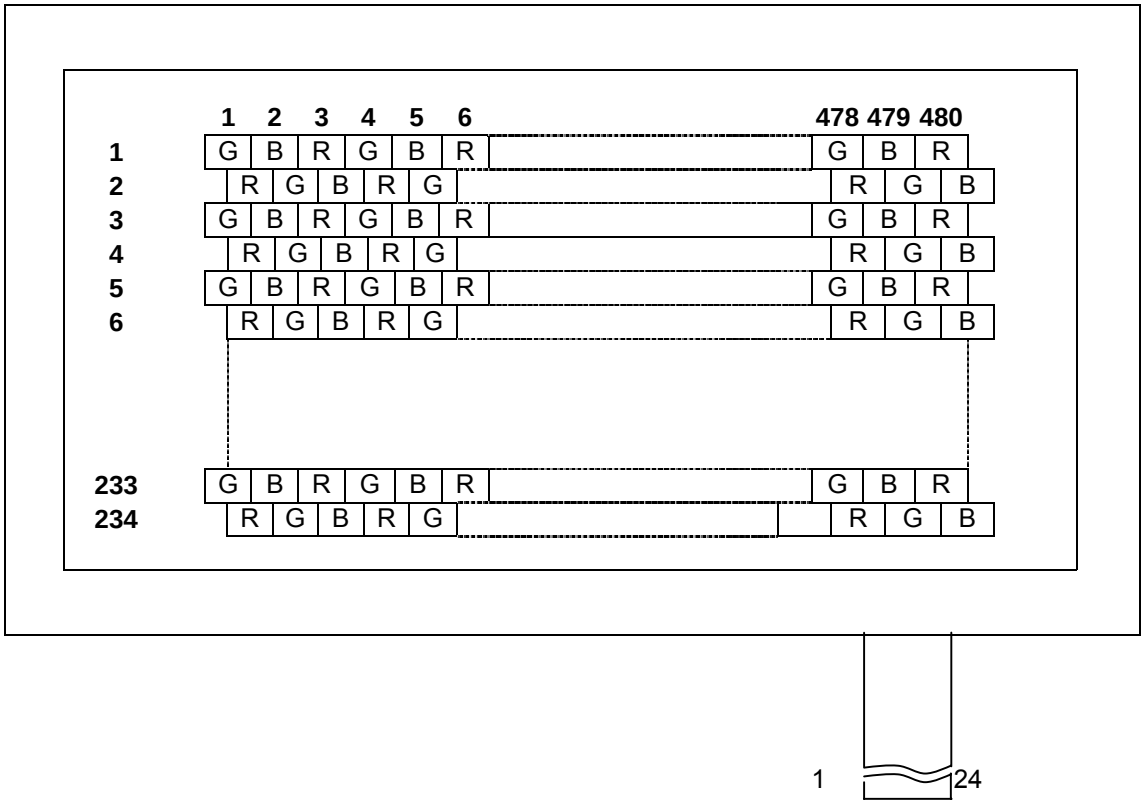
L/R	STHL	STHR	Remark
Hi(Vcc)	Input	Output	Left to Right
Low(GND)	Output	Input	Right to Left

Note 9-2: AV_{DD} = +5V (Typ.)
Note 9-3: V_{CC} = +5V (Typ.)
Note 9-4 : V_{COM} =6V_{PP}.
Note 9-5 : STVR, STVL and U/D mode

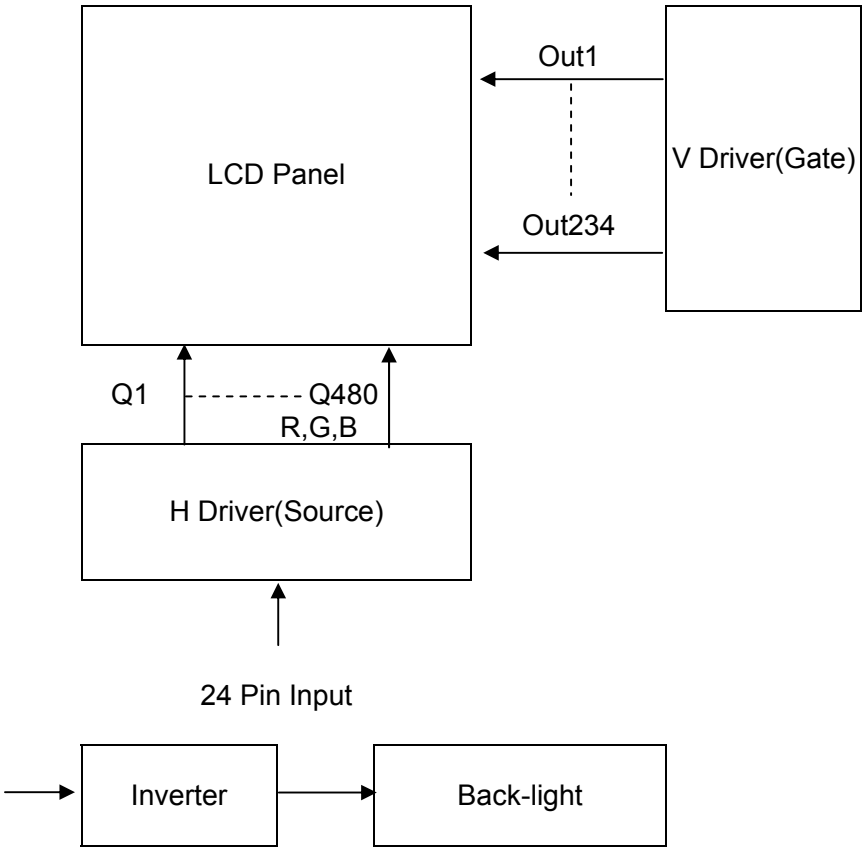
U/D	STVR	STVL	Remark
Hi(Vcc)	Input	Output	Down to Up
Low(GND)	Output	Input	Up to Down

Note 9-6 : V_{GH} = +15V (Typ.)

9-2 Pixel Arrangement and input connector pin NO.



10. Block Diagram



11. QUALITY ASSURANCE

Test Condition

11.1.1 Temperature and Humidity(Ambient Temperature)

Temperature : 20 ± 5°C
Humidity : 65 ± 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.

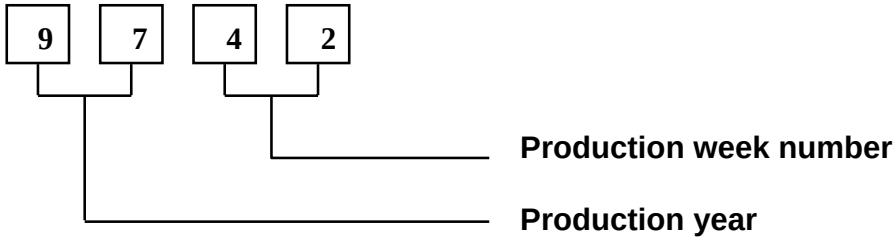
11.1.4 Test Frequency

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

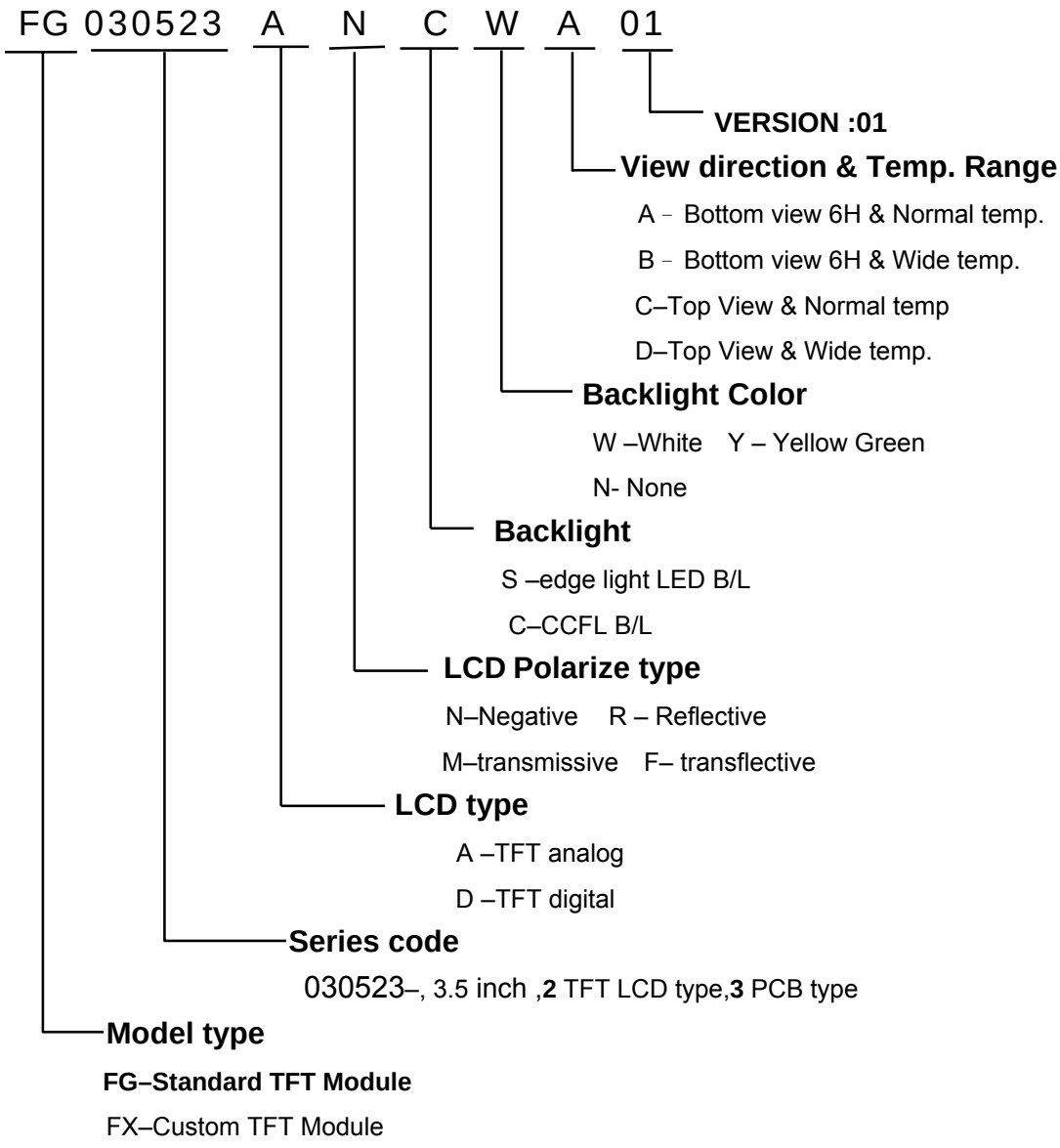
11.1.5 Test Method

No.	Reliability Test Item & Level	Test Level
1	High Temperature Storage Test	T=70°C,240hrs
2	Low Temperature Storage Test	T=-20°C,240hrs
3	High Temperature Operation Test	T=60°C,240hrs
4	Low Temperature Operation Test	T=0°C,240hrs
5	High Temperature and High Humidity Operation Test	T=60°C,90% RH,240hrs
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:1.0 mm Sweep Time:11min 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,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 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.

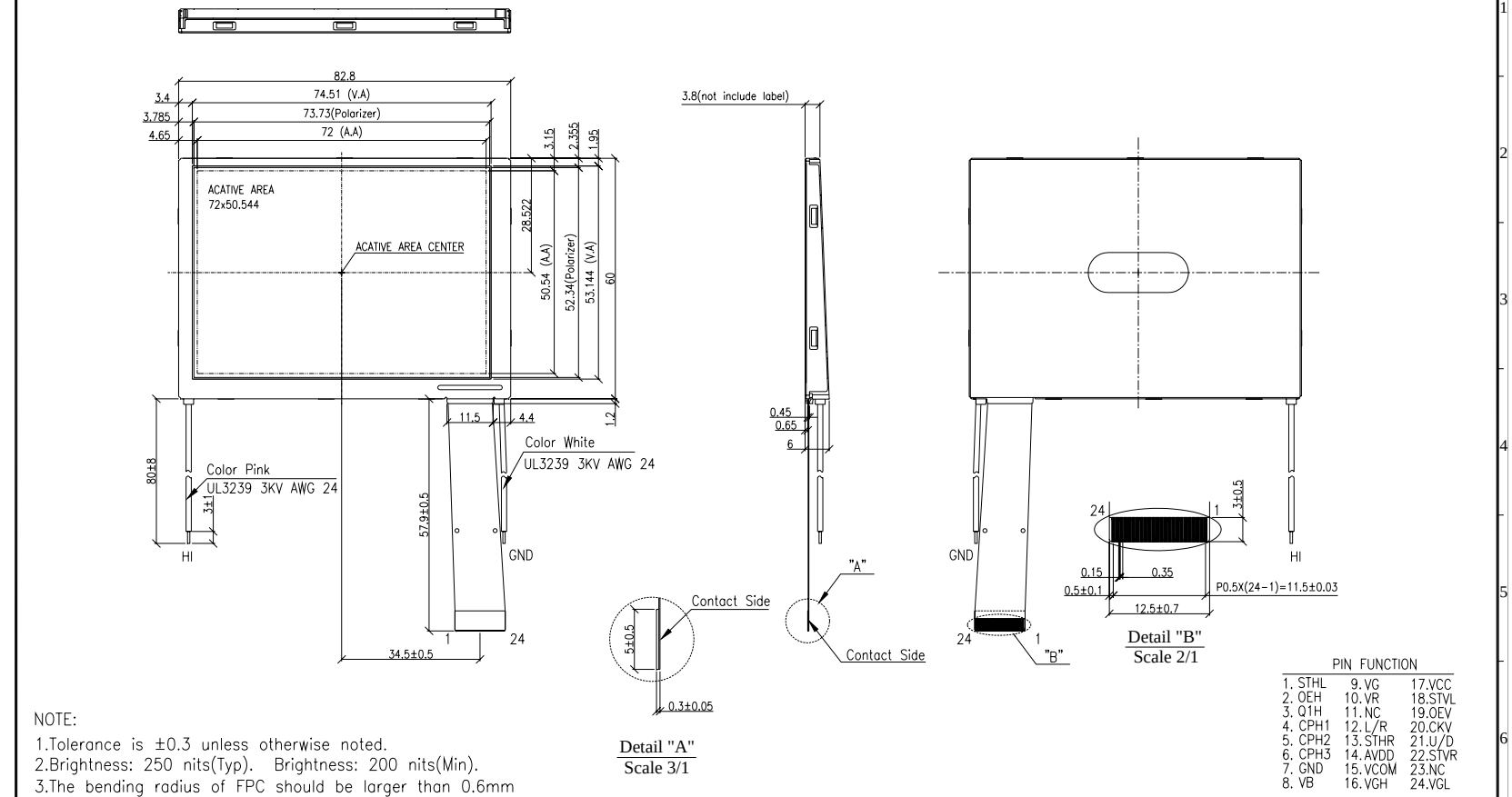
(4). Display may turn black or dark blue at temperatures above its operational range; this is (however not pressing on the viewing area) may cause the segments to appear "fractured".

(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.

15. OUTLINE DRAWING



NOTE:

1.Tolerance is ±0.3 unless otherwise noted.
2.Brightness: 250 nits(Typ). Brightness: 200 nits(Min).
3.The bending radius of FPC should be larger than 0.6mm

PIN FUNCTION

1. STHL	9. VG	17.VCC
2. OEH	10. VR	18.STVL
3. Q1H	11. NC	19.OEV
4. CPH1	12. L/R	20.CKV
5. CPH2	13. STHR	21.U/D
6. CPH3	14. AVDD	22.STVR
7. GND	15. VCOM	23.NC
8. VB	16. VGH	24.VGL

AUTH	DESCRIPTION	DATE	APPROVED

REVISIONS

DATE:	10/27/04'
DRAWN:	
CHECK:	
APPROVE:	

TITLE: TFT MODULE OUTLINE DIMENSION

DWG. NO.	FG030523C-01		
UNITS M M		REV.	A
SCALE 1 / 1	SHEET 1 OF 1		

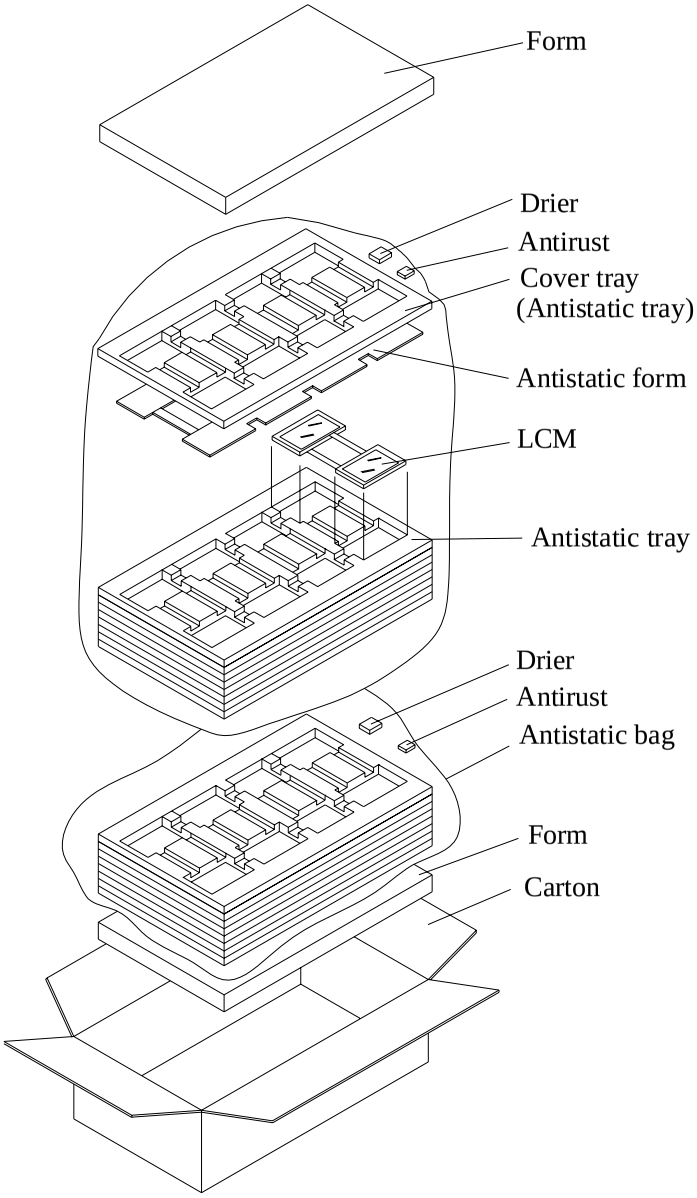
DATA IMAGE

16.PACKAGE INFORMATION

3.5" LCM (36g) = 36 x 128 = 4608 g

Antistatic tray (130g)=130 x 18 = 2340 g

Carton+Form+Antiatatic Form+Drier = 1120 g



Material

1 Carton + 2 Anti-static bag + 2 Form(35mm) + 18 Anti-static tray + 2 Drier + 2 Antirust

Total pcs

1 Antistatic tray = 8 panel pcs

1 Anti-static bag = 8 Anti-static tray + cover tray = 8*8 +0 = 64 pcs

1 Carton = 2 Anti-static bag = 2*64 = 128 pcs

1 Carton = 128 pcs

Carton size : 485L x 285W x 280H (mm)

Total Weight ≒ 8.1 kgw

3.5" CCFL TFT LCM PACKING