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TFT LIQUID CRYSTAL DISPLAY GROUP
SHARP CORPORATION

SPECIFICATION

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APPLICABLE GROUP
TFT LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT-LCD module

MODEL No. LQ038J7DH52

☐ CUSTOMER'S APPROVAL

DATA

BY

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(1) Application

This literature applies to color TFT-LCD module, LQ038J7DH52.

(2) Overview

This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor), named AD-TFT (Advanced TFT). It is practicable in both transmissive-type and reflection-type modes. It is composed of a color TFT-LCD panel, driver ICs, an FPC, a back light, a touch panel and a back sealed casing. It isn't composed control circuit. Graphics and texts can be displayed on a 320×3×480 dots panel with 262,144 colors by supplying. Optimum view angle is 1 o'clock.

(3) Mechanical specifications

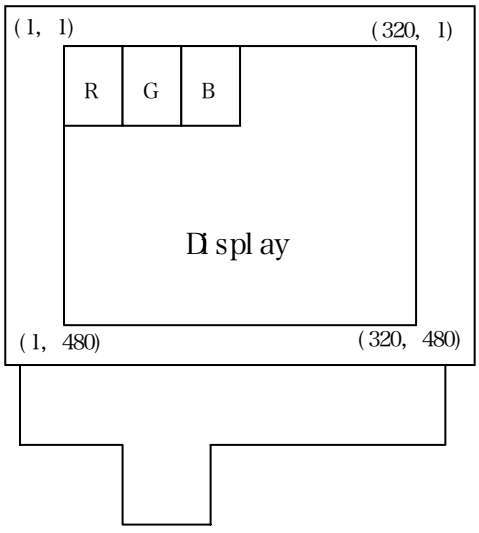
Table 1

Parameter	Specifications	Units	Remarks
Screen size (Diagonal)	9.52 [3.75”] Diagonal	cm	
Display active area	52.8（H）×79.2（V）	mm	
Pixel format	320(H)×480(V) (1 pixel = R+G+B dots)	pixels	
Pixel pitch	0.055（H）×0.165（V）	mm	
Pixel configuration	R,G,B vertical stripe		
Display mode	Normally white		
Unit outline dimension	64.5(W)×92.7(H)×4.4(D)	mm	【Note3-1】
Mass	55	g	
Surface hardness	3H		

【Note 3-1】

Excluding protrusion. For detailed measurements and tolerances, please refer to Fig. 1.

(4) Pixel configuration



(5)Input/Output terminal

5-1)TFT-LCD panel driving section

Table 2

Pin No.	Symbol	I/O	Description	Remarks
1	VDD	-	Power supply of gate driver (high level)	
2	NC	-		
3	MOD	I	Control signal of gate driver	【Note5-1】
4	SPS	I	Start signal of gate driver	
5	CLS	I	Clock signal of gate driver	
6	NC	-		
7	VEE	-	Power supply of gate driver (low level)	
8	VCOM	I	Common electrode driving signal	
9	SPL	I/O	Sampling start signal	
10	R0	I	RED data signal (LSB)	
11	R1	I	RED data signal	
12	R2	I	RED data signal	
13	R3	I	RED data signal	
14	R4	I	RED data signal	
15	R5	I	RED data signal (MSB)	
16	G0	I	GREEN data signal (LSB)	
17	G1	I	GREEN data signal	
18	G2	I	GREEN data signal	
19	G3	I	GREEN data signal	
20	G4	I	GREEN data signal	
21	G5	I	GREEN data signal (MSB)	
22	B0	I	BLUE data signal (LSB)	
23	B1	I	BLUE data signal	
24	B2	I	BLUE data signal	
25	B3	I	BLUE data signal	
26	B4	I	BLUE data signal	
27	B5	I	BLUE data signal (MSB)	
28	VSHD	-	Power supply of digital	
29	DGND	-	Ground (digital)	
30	PS	I	Power save signal	
31	LP	I	Data latch signal of source driver	
32	DCLK	I	Data sampling clock signal	
33	VSHA	-	Power supply (analog)	
34	V0	I	Standard voltage to generate gray scale voltage	
35	V1	I	Standard voltage to generate gray scale voltage	
36	V2	I	Standard voltage to generate gray scale voltage	
37	V3	I	Standard voltage to generate gray scale voltage	
38	V4	I	Standard voltage to generate gray scale voltage	
39	AGND	-	Ground (Analog)	

【Note5-1】See section(7-1)-(A) "※Cautions when you turn on or off the power supply".

5-2)Back light driving section

Table3

Pin No.	Symbol	I/O	Description	Remark
1	VL1	I	Power supply for LED (High voltage)	
2	VL1	I	Power supply for LED (High voltage)	
3	VL2	I	Power supply for LED (Low voltage)	
4	VL2	I	Power supply for LED (Low voltage)	

5-3)Touch panel driving section

Table 4

Pin No.	Symbol	I/O	Description	Remark
1	XL	－	X (left side)	
2	YD	－	Y (6 o'clock side)	
3	YU	－	Y (12 o'clock side)	
4	XR	－	X (Right side)	

(6) Absolute Maximum Ratings

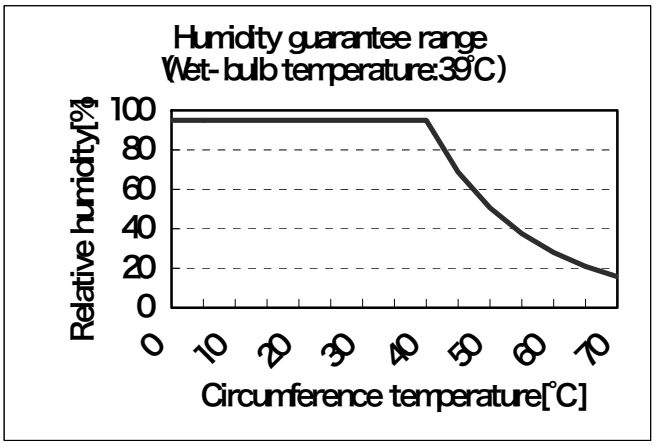
Table 5

Parameter	Symbol	Condition	Ratings	Unit	Remark
Power supply(source/Analog)	VSHA	Ta=25℃	-0.3～+7.0	V	
Power supply(source/Digital)	VSHD	Ta=25℃	-0.3～+7.0	V	
Power supply (gate)	VDD	Ta=25℃	-0.3～+35.0	V	
Power supply (gate)	VDD-VEE	Ta=25℃	-0.3～+35.0	V	
Input voltage (Analog)	VIA	Ta=25℃	-0.3～VSHA+0.3	V	[Terminal①]
Input voltage (Digital)	VID	Ta=25℃	-0.3～VSHD+0.3	V	[Terminal②]
Operating temperature (panel surface)	T opp	－	-10～60	℃	【Note6-1】
Storage temperature	T stg	－	-20～70	℃	【Note6-1】

[Terminal①] V0,V1,V2,V3,V4

[Terminal②] MOD,SPS,CLS,SPL,R0～R5,G0～G5,B0～B5,LP,DCLK,PS

【Note6-1】 Humidity: 95%RH Max.(at Ta ≦ 40℃). Maximum wet-bulb temperature is less than 39℃ (at Ta > 40℃). Condensation of dew must be avoided.



The maximum humidity in the temperature

(7) Electrical characteristics

7-1) Recommended operating conditions

A) TFT-LCD panel driving section

Table 6 GND=0V

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remarks
Supply voltage for source driver (Analog)		VSHA	+4.5	+5.0	+5.5	V	
Supply voltage for source driver (Digital)		VSHD	+2.7	+3.3	+3.6	V	
Standard input voltage		V0～V4	0	-	VSHA	V	【Note 7-1】
Supply voltage for gate driver	High voltage	VDD	+14.3	+15.0	+15.7	V	
	Low voltage	VEE	-10.5	-10.0	-9.5	V	
Input voltage for Source driver (Low)		VILS	GND	-	0.2VSHD	V	【Note 7-2】
Input voltage for Source driver (High)		VIHS	0.8VSHD	-	VSHD	V	【Note 7-2】
Input current for Source driver (Low)		IILS	-	-	30	μA	【Note 7-2】
Input current for Source driver (High)		IIHS1	-	-	30	μA	【Note 7-3】
		IIHS2	-	-	1200	μA	【Note 7-4】
Input voltage for Gate driver (Low)		VILG	GND	-	0.2VSHD	V	【Note 7-5】
Input voltage for Gate driver (High)		VIHG	0.8VSHD	-	VSHD	V	【Note 7-5】
Input current for Gate driver (Low)		IILG	-	-	15	μA	【Note 7-5】
Input current for Gate driver (High)		IIHG	-	-	15	μA	【Note 7-5】
Common electrode driving signal	AC component	VCOMAC	-	±2.5	±2.6	Vp-p	【Note 7-6】
	DC component	VCOMDC	+0.1	+1.1	+2.1	V	【Note 7-6】

※Cautions when you turn on or off the power supply

① Turn on or off the power supply with simultaneously or the following sequence.

Turn on ⋯ VSHD → VSHA → VEE → VDD

Turn off ⋯ VDD → VEE → VSHA → VSHD

② The input signal of "MOD" Terminals (Pin No.3) must be low voltage when turning on the power supply, and it is held until more than double vertical periods after VSHD is turned on completely. After then, it must be held high voltage until turning off the power supply.

【Note 7-1】 These are standard input voltages for gray scale. When VCOM is alternated polarity, these voltage should be alternated polarity. V0 (black) is different polarity alternating signal of VCOM. V4 (white) is the same polarity alternating signal of VCOM. Center voltage of each standard input voltage shift positive way for LCD characteristics (V0→V1→V2→V3→V4). This sift amount is adjusted so as to no flicker of each standard input voltage after DC bias voltage of VCOM and V0 is adjusted.

【Note 7-2】 DCLK,SPL,LP,PS,R0～R5,G0～G5 and B0～B5 terminals are applied.

【Note 7-3】 DCLK,SPL,LP,R0～R5,G0～G5 and B0～B5 terminals are applied.

【Note 7-4】 PS terminal is applied.

【Note 7-5】 MOD,CLS and SPS terminals are applied.

【Note 7-6】 VCOMAC should be alternated on VCOMDC every 1 horizontal period and 1 vertical period. VCOMDC bias is adjusted so as to minimize flicker or maximum contrast every each module.

B) Back light driving section

Table 7 Ta=25℃

Parameter	Symbol	MIN	TYP	MAX	Units	Remarks terminal
LED voltage	V_L	－	14.4	16	V	
LED current	I_L	－	15	20	mA	
Power consumption	W_L	－	0.216	－	W	【Note 7-7】

【Note 7-7】Calculated reference value($I_L \times V_L$)

7-2) Timing Characteristics of input signals

Table 8 AC Characteristics (1) (VSHA=+5.0V, VSHD=+3.3V, Ta=25℃)

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency of source driver		Fck	9.3	-	12.1	MHz	
Source driver	Rising time of clock	Tcr	-	-	20	ns	DCLK
	Falling time of clock	Tcf	-	-	20	ns	
	Pulse width (High level)	Tcwh	40	-	-	ns	
	Pulse width (Low level)	Tcwl	40	-	-	ns	
	Frequency of start pulse	Fsp	25.8	-	33.7	kHz	SPL,SPR 【Note 7-8】
	Setup time of start pulse	Tsusp	15	-	-	ns	
	Hold time of start pulse	Thsp	10	-	-	ns	
	Pulse width of start pulse	Twsp	-	-	1.5/fCK	ns	
	Setup time of latch pulse	Tsulp	20	-	-	ns	LP
	Hold time of latch pulse	Thlp	20	-	-	ns	
	Pulse width of latch pulse	Twlp	60	-	-	ns	
	Setup time of PS	Tsups	0	-	-	μs	PS
	Hold time of PS	Thps	0	-	-	μs	
Set up time of data		Tsud	15	-	-	ns	R0～R5,G0～G5 , B0～B5
Hold time of data		Thd	10	-	-	ns	
Gate driver	Clock frequency	Fcls	25.8	-	33.7	kHz	CLS
	Pulse width of clock(Low)	Twlcls	5	-	(1/fcls)-25	μs	
	Pulse width of clock(High)	Twhcls	25	-	-	μs	
	Rising time of clock	Trcls	-	-	100	ns	
	Falling time of clock	Tfcls	-	-	100	ns	
	Setup time of clock	Tsucls	3	-	-	μs	
	Hold time of clock	Thcls	0	-	-	μs	
	Frequency of start pulse	Fsps	52		68	Hz	SPS
	Setup time of start pulse	Tsusps	100	-	-	ns	
	Hold time of start pulse	Thsps	300	-	-	ns	
	Rising time of start pulse	Trsps	-	-	100	ns	
	Falling time of start pulse	Tfsps	-	-	100	ns	
Vcom	Setup time of Vcom	Tsuvcom	3	-	-	μs	Vcom
	Hold time of Vcom	Thvcom	1	-	-	μs	

【Note 7-8】There must be only one up-edge of DCLK (includes Tsusp and Thsp time) in the period of SPL="Hi".

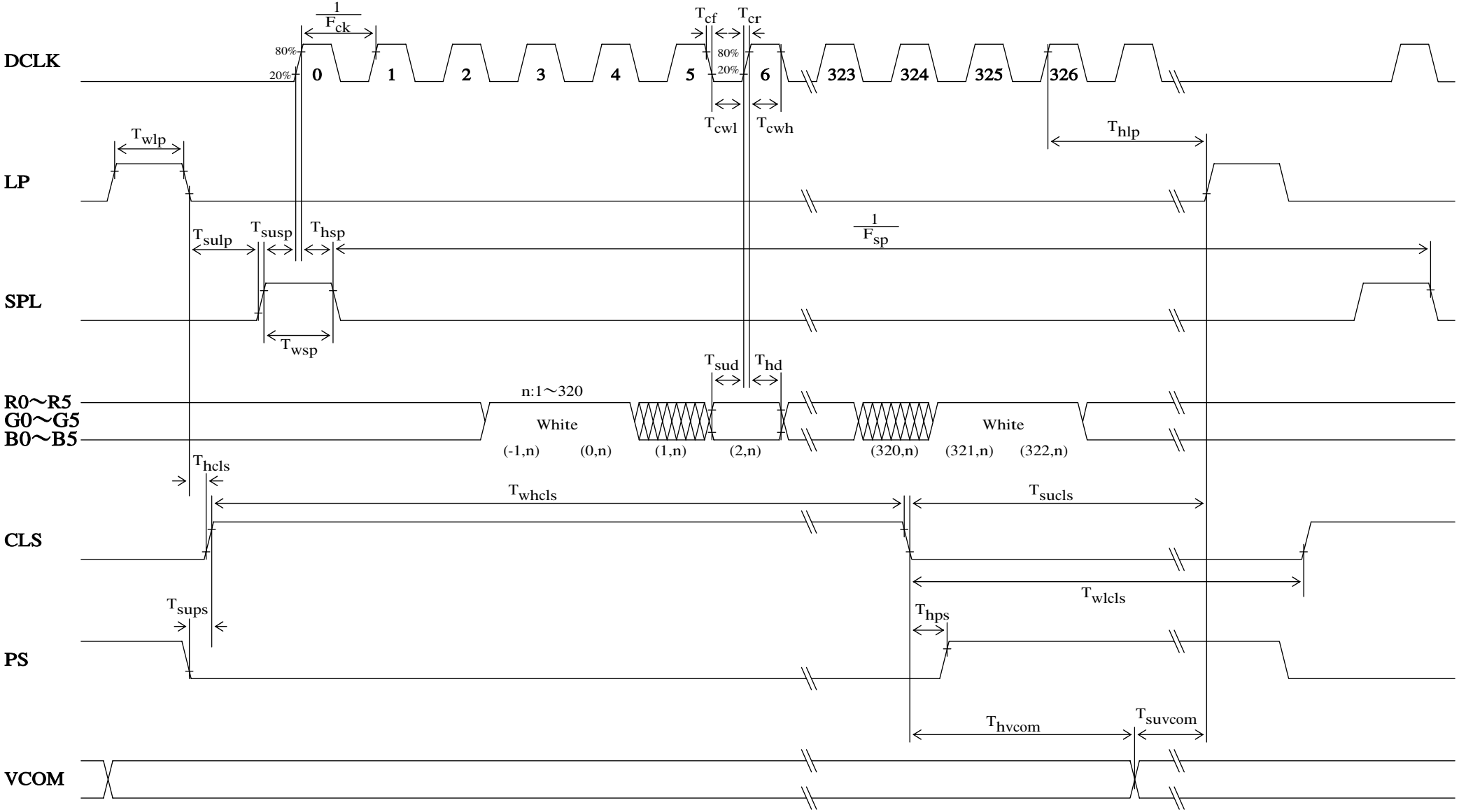


Fig.(a) Horizontal timing chart

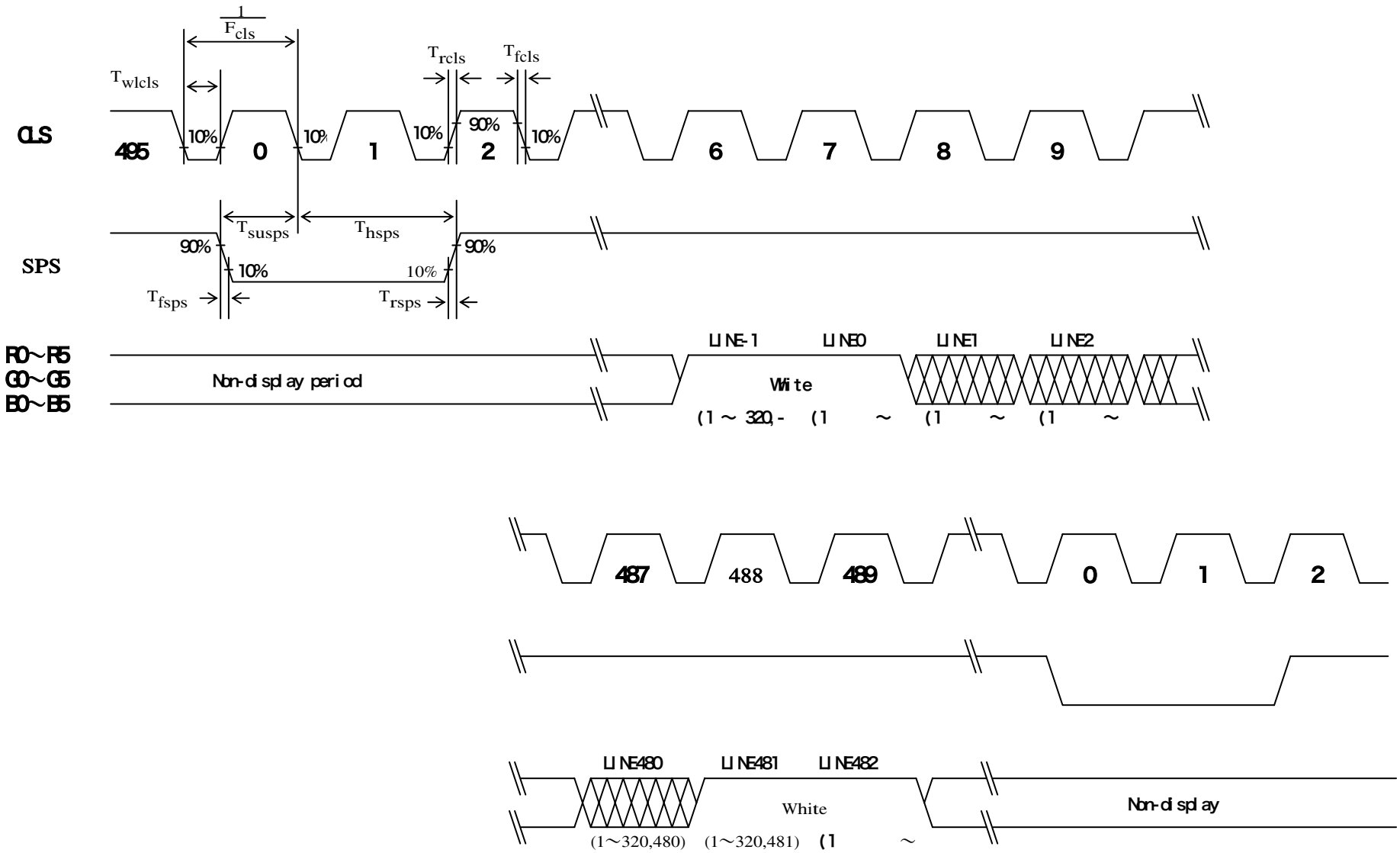


Fig.(b) Vertical timing chart

7-3) Power consumption

Measurement condition : SPS=60Hz, CLS=29.76kHz, SPL=29.76kHz, DCLK=10.71MHz

The term of PS="Lo" in one horizontal period … 30.1μsec(322DCLK)

Ta=25℃

Table 9

Parameter		Symbol	Conditions	MIN	TYP	MAX	Unit	Remarks
Source current	Analog	ISHA	VSHA=+5.0V	-	5.5	9.5	mA	【Note 7-9】
	Digital	ISHD	VSHD=+3.3V	-	2.9	5.0	mA	【Note 7-9】
Gate current	High	IDD	VDD=+15.0V	-	0.1	0.2	mA	【Note 7-10】
	Low	IEE	VEE=-10.0V	-	-0.1	-0.2	mA	【Note 7-10】

【Note 7-9】Vertical stripe pattern alternating 21 gray scale (GS21) with 42 gray scale (GS42) every 1 dot.

【Note 7-10】64-Gray-bar vertical pattern (GS0 ～ GS63 for horizontal way)

(8) Input Signals, Basic Display Color and Gray Scale of Each Color

Table 10

	Colors & Gray scale	Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
			Data signal																	
Basic color	Black	−	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	1	1	1	1	1	1
	Green	−	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Cyan	−	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Red	−	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	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	Black	GS0	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
	Darker	GS2	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	1	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS62	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS63	1	1	1	1	1	1	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
	⇧	GS1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0
	⇩	GS62	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0
	Green	GS63	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale of bleu	Black	GS0	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	1	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
	⇧	↓				↓						↓						↓		
	⇩	↓				↓						↓						↓		
	Brighter	GS61	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1
	⇩	GS62	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	Bleu	GS63	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage 1 : High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. According to the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

(9) Optical characteristics

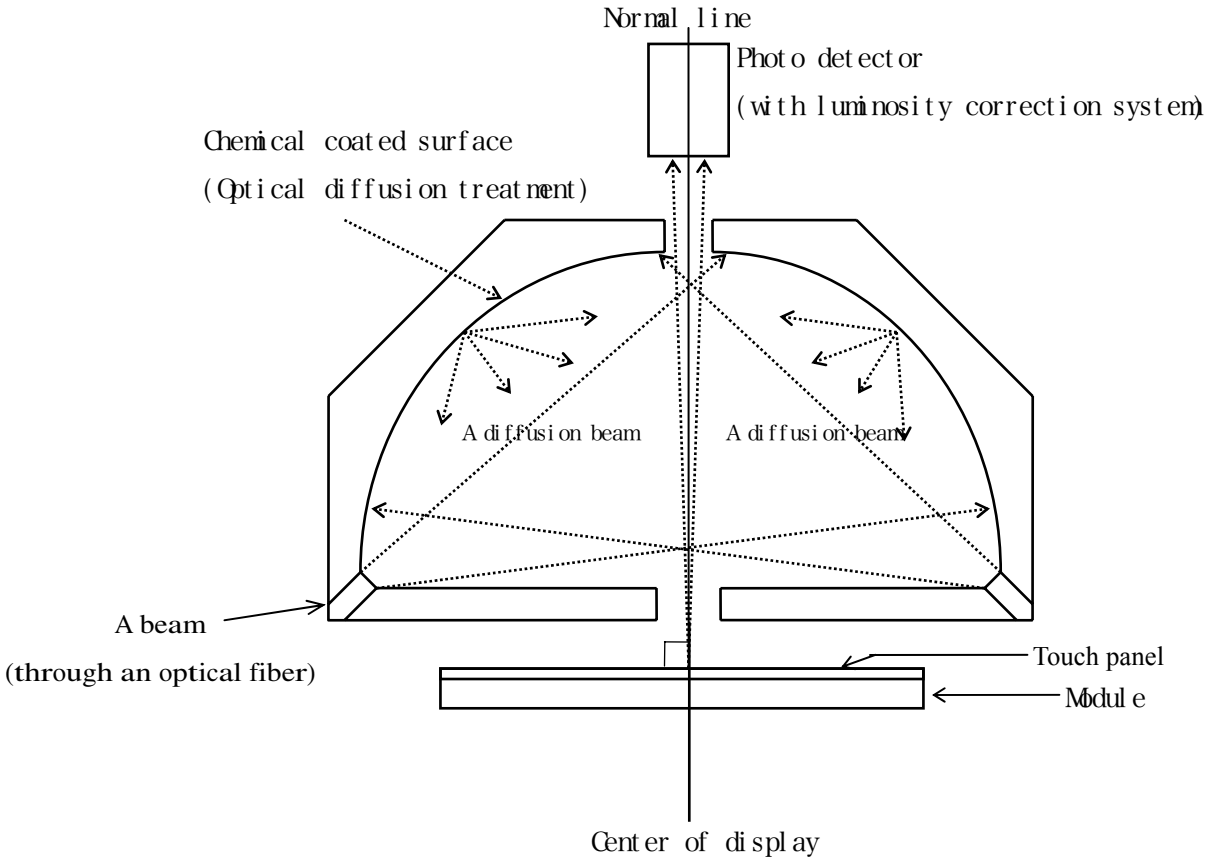
9-1) Reflective mode

Table 11 Ta=25℃

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing angle range		θ21,22	CR≧1.2	30	40	-	degree	【Note 9-1,2】
		θ11		30	40	-	degree	
		θ12		30	40	-	degree	
Contrast ratio		CR	θ=0°	1.2	2.0	-		【Note 9-2】
Response time	Rise	τr		-	20	40	ms	【Note 9-3】
	Fall	τd		-	35	70	ms	
White chromaticity		x		0.27	0.32	0.37		【Note 9-4】
		y		0.30	0.35	0.40		
Reflection ratio		R		2.8	4.0	-		【Note 9-5】

※The measuring method of the optical characteristics is shown by the following figure.

※A measurement device is Otsuka luminance meter LCD5200. (With the diffusion reflection unit.)



Measuring method (a) for optical characteristics

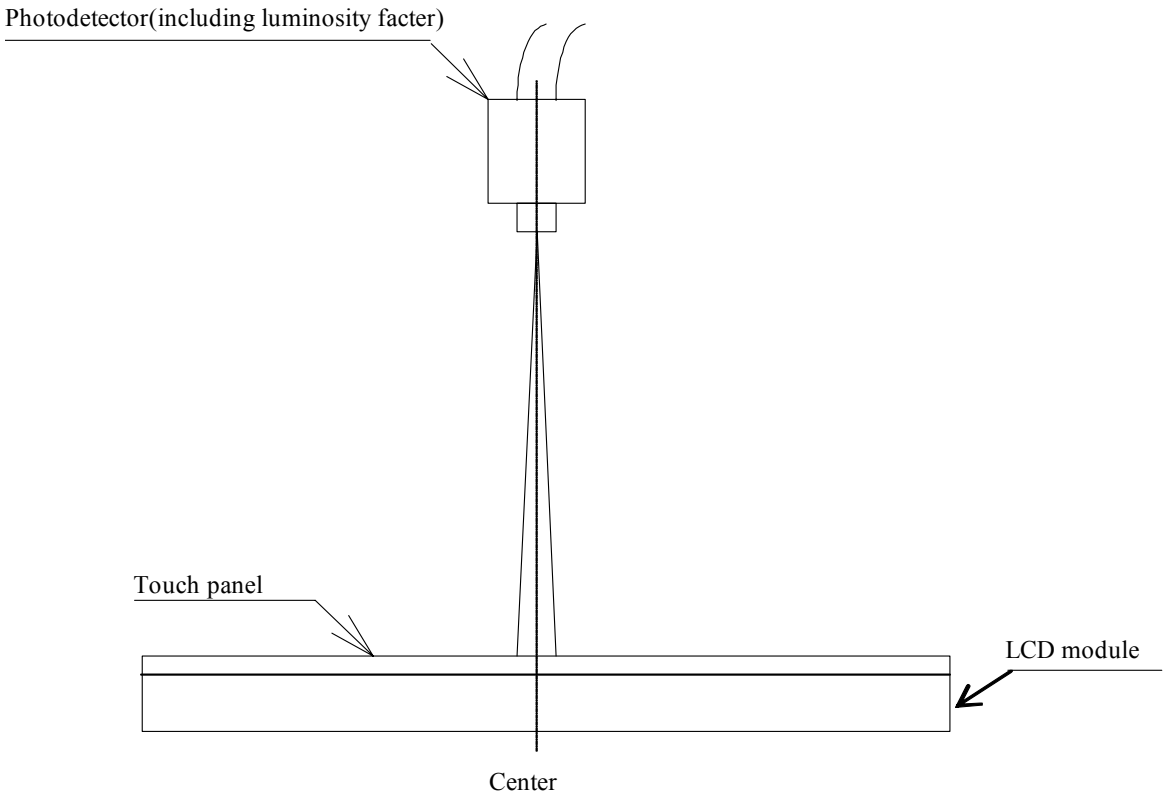
9-2) Transmisive mode

Table 12 Ta=25°C

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remarks
Viewing angle range		θ21,22	CR≥2	45	55	-	degree	[Note 9-1,2,6]
		θ11		45	55	-	degree	
		θ12		45	55	-	degree	
Contrast ratio		CR	θ = 0°	40	60	-		[Note 9-2]
Response time	Rise	τ r		-	20	40	ms	[Note 9-3]
	Fall	τ d		-	35	70	ms	
White chromaticity		x		0.25	0.30	0.35		
		y		0.28	0.33	0.38		
Brightness		Y		56	80	-	cd/m2	IL=20mA

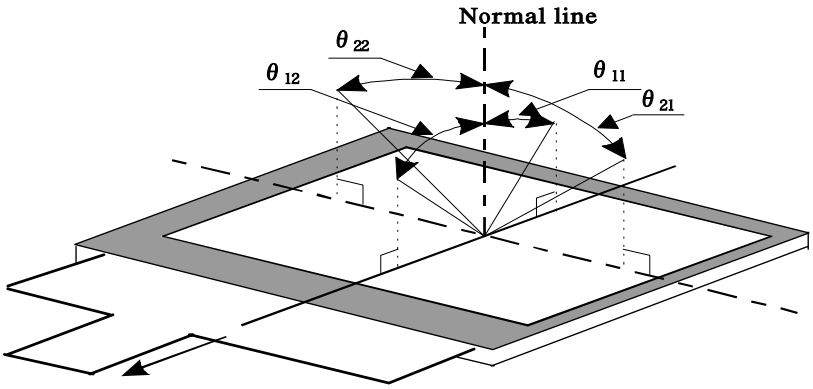
* The measuring method of the optical characteristics is shown by the following figure.

* A measurement device is TOPCON luminance meter BM-5(A).(Viewing cone 1)



Measuring method (b) for optical characteristics

【Note 9-1】 Viewing angle range is defined as follows.



Definition for viewing angle

【Note 9-2】 Definition of contrast ratio:

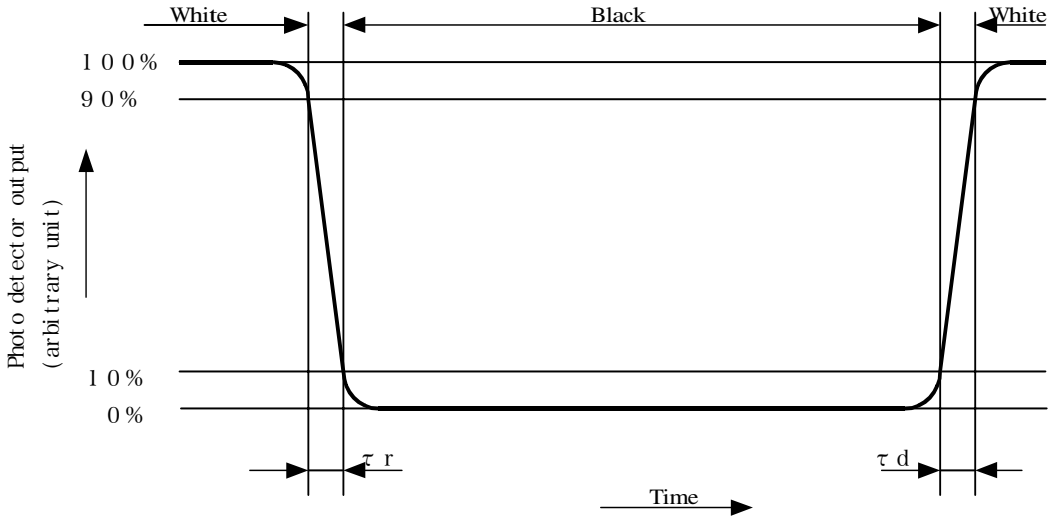
The contrast ratio is defined as follows:

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output with all pixels white(GS63)}}{\text{Photo detector output with all pixels black(GS0)}}$$

V_{COMAC}=5.0Vp-p,V0=4.0Vp-p,V9=-4.0Vp-p

【Note 9-3】 Definition of response time:

The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



【Note 9-4】 A measurement device is Minolta CM-2002.

【Note 9-5】 Definition of reflection ratio

$$\text{Reflection ratio} = \frac{\text{Light detected level of the reflection by the LCD module}}{\text{Light detected level of the reflection by the standard white board}}$$

【Note 9-6】 A measurement device is ELDIM EZContrast.

(10)Touch panel characteristics

Table 13

Parameter	Min.	Typ.	Max.	Unit	Remark
Input voltage	－	3.3	7.0	V	
Resistor between terminals(XL-XR)	160	－	710	Ω	Provisional specification
Resistor between terminals(YU-YD)	200	－	880	Ω	
Line linearity(X direction)	－	－	1.5	%	
Line linearity(Y direction)	－	－	1.5	%	
Insuration resistance	20	－	－	MΩ	at DC15V
Minimum tension for detecting	－	－	0.79	N	

(11) Display quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standards for TFT-LCD.

(12) Mechanical characteristics

12-1) External appearance

See Fig. 1

12-2) FPC characteristics

①Specific connector

FF0239SS1(JAE)

② Bending endurance of the bending slits portion(See Fig.1) :

No line of the FPC is broken for the bending test (Bending radius=0.6mm and angle=90°) in 30 cycles.

12-3) Design guidance for touchpanel(T/P)

12-3-1)Example of housing design

(1)If an consumer will put a palm on housing in normal usage, care should be taken as follows.

(2)Keep the gap, for example 0.3 to 0.7mm,between bezel edge and T/P surface.

The reason is to avoid the bezel edge from contacting T/P surface that may cause a “short” with bottom layer(See Fig.2)

(3)Insertion a cushion material is recommended.

(4)The cushion material should be limited just on the busbar insulation paste area.

If it is over the transparent insulation paste area, a ”short” may be occurred.

(5)There is one where a resistance film is left in the T/P part of the end of the pole.

Design to keep insulation from the perimeter to prevent from mis-operation and so on.

12-3-2)Mounting on display and housing bezel

(1)In all cases, the T/P should be supported from the backside of the glass.

(2)Do not to use an adhensive-tape to bond it on the front of T/P and hang it to the housing bezel.

(3)Never expand the T/P top layer(PET-film) like a balloon by internal air pressure.
The life of the T/P will be extremely short.

(4)Top layer, PET, dimension is changing with environmental temperature and humidity.
Avoid a stress from housing bezel to top layer, because it may cause “waving”.

(5)The input to the Touchpanel sometimes distorts touch panel itself.

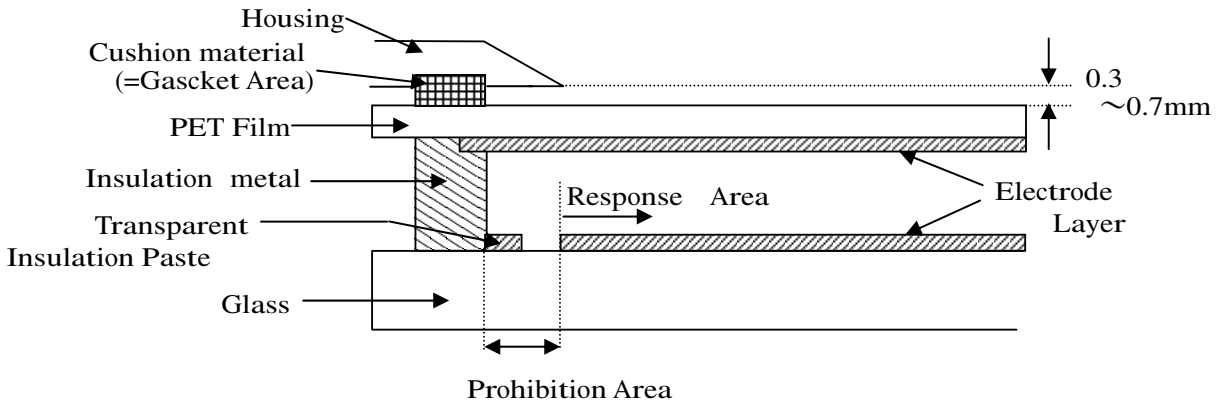


Fig.2

(13) Handling Precautions

13-1) Insertion and taking out of FPC

Be sure insert and take out of the FPC into the connector of the set after turning off the power supply on the set side.

13-2) Handling of FPC

FPC shall be bent only slit portion. The bending slit ①shall be bent uniformly on the whole slit portion with bending radius larger than 0.6mm ,and only inner side (back side of the module).

Don't bend it outer side (display surface side).

Don't give the FPC too much force, for example, hanging the module with holding FPC.

13-3) Installation of the module

On mounting the module, be sure to fix the module on the same plane. Take care not to warp or twist the module.

13-4) Precaution when mounting

① If water droplets and oil attaches to it for a long time, discoloration and staining occurs. Wipe them off immediately.

② Glass is used for the TFT-LCD panel. If it is dropped or bumped against a hard object, it may be broken. Handle it with sufficient care.

③ As the CMOS IC is used in this module, pay attention to static electricity when handling it. Take a measure for grounding on the human body.

13-5) Others

① The liquid-crystal is deteriorated by ultraviolet rays. Do not leave it in direct sunlight and strong ultraviolet rays for many hours.

② If it is kept at a temperature below the rated storage temperature, it becomes coagulated and the panel may be broken. Also, if it is kept at a temperature above the rated storage temperature, it becomes isotropic liquid and does not return to its original state. Therefore, it is desirable to keep it at room temperature as much as possible.

③ If the LCD breaks, don't put internal liquid crystal into the mouth. When the liquid crystal sticks to the hands, feet and clothes, wash it out immediately.

④ Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots.

⑤ Observe general precautions for all electronic components.

⑥ VCOM must be adjusted on condition of your final product. No adjustment causes the deterioration for display quality.

(14)Forwarding form

a)Piling number of cartons: MAX. 8

b) Package quantity in one cartons: 100 pcs.

c) Carton size: 575mm(W) × 360mm(D) × 225mm(H)

d) Total mass of 1 carton filled with full modules: 9500 g

Fig.2 shows packing form.

Environment

(1)Temperature	: 0～40℃
(2)Humidity	: 60%RH or less (at 40℃) No dew condensation at low temperature and high humidity.
(3)Atmosphere	: Harmful gas, such as acid or alkali which bites electronic components and/or wires, must not be detected.
(4)Period	: about 3 months
(5)Opening of the package	: In order to prevent the LCD module from breakdown by electrostatic charges, please control the room humidity over 50%RH and open the package taking sufficient countermeasures against electrostatic charges, such as earth, etc.

(15)Reliability Test Conditions for TFT-LCD Module

Table 14

No.	Test items	Test conditions
1	High temperature storage test	Ta=+70℃ 240h
2	Low temperature storage test	Ta=-20℃ 240h
3	High temperature and high humidity operating test	Tp=+40℃ , 95%RH 240h (But no condensation of dew)
4	High temperature operating test	Tp=+60℃ 240h
5	Low temperature operating test	Tp=-10℃ 240h
6	Electro static discharge test	±200V・200pF(0Ω) 1 time for each terminals
7	Shock test	980 m/s^2, 6 ms ±X, ±Y, ±Z 3 times for each direction (JIS C0041, A-7 Condition C)
8	Vibration test	Frequency range: 10Hz~55Hz Stroke: 1.5 mm Sweep: 10Hz~55Hz X,Y,Z 2 hours for each direction (total 6 hours) (JIS C0040, A-10 Condition A)
9	Heat shock test	Ta=-20℃～+70℃ / 5 cycles (1h) (1h)
10	Point activation test (Touch panel)	Hit it 1,000,000 times with a silicon rubber of R8 HS 60. Hitting force :2.4N Hitting speed : 3 times per second
11	Writing friction resistance test (Touch panel)	Write according to the right illustration in the under –mentioned conditions: Pen : 0.8R Polyacetal stylus Load : 2.4N Speed : 3 strokes per second Stroke : 30mm Frequency : 50000 times Testing apparatus : shown in Fig (I)

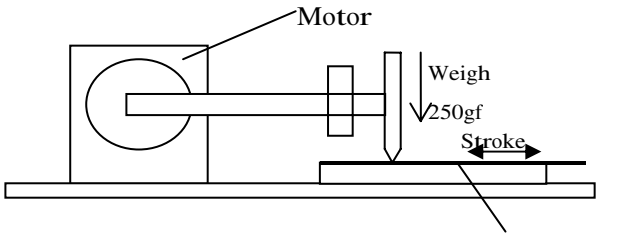


Fig.(I)

【Note】 Ta = Ambient temperature, Tp = Panel temperature

【Check items】

(a)Test No.1～9

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

(b)Test No.10～No.11

The measurements after the tests are satisfied (10)-Table 13 (Touch panel characteristics)

(16) Others

16-1) Indication of lot number

The lot number is shown on a label. Attached location is shown in Fig.1 (Outline Dimensions).

Indicated contents of the label

LQ038J7DH52 ○○○○○○○○
model No. lot No.

16-2) Used Regulation of Chemical Substances Breaking Ozone Stratum

Substances with the object of regulation : CFCS, Carbon tetrachloride, Halon
1,1,1-Trichloro ethane (Methyl chloroform)

(a) This LCD module, Constructed part and Parts don't contain the above substances.

(b) This LCD module, Constructed part and Parts don't contain the above substances in processes of manufacture.

16-3) If some problems arise about mentioned items in this document and other items, the user of the TFT-LCD module and Sharp will cooperate and make efforts to solve the problems with mutual respect and good will.

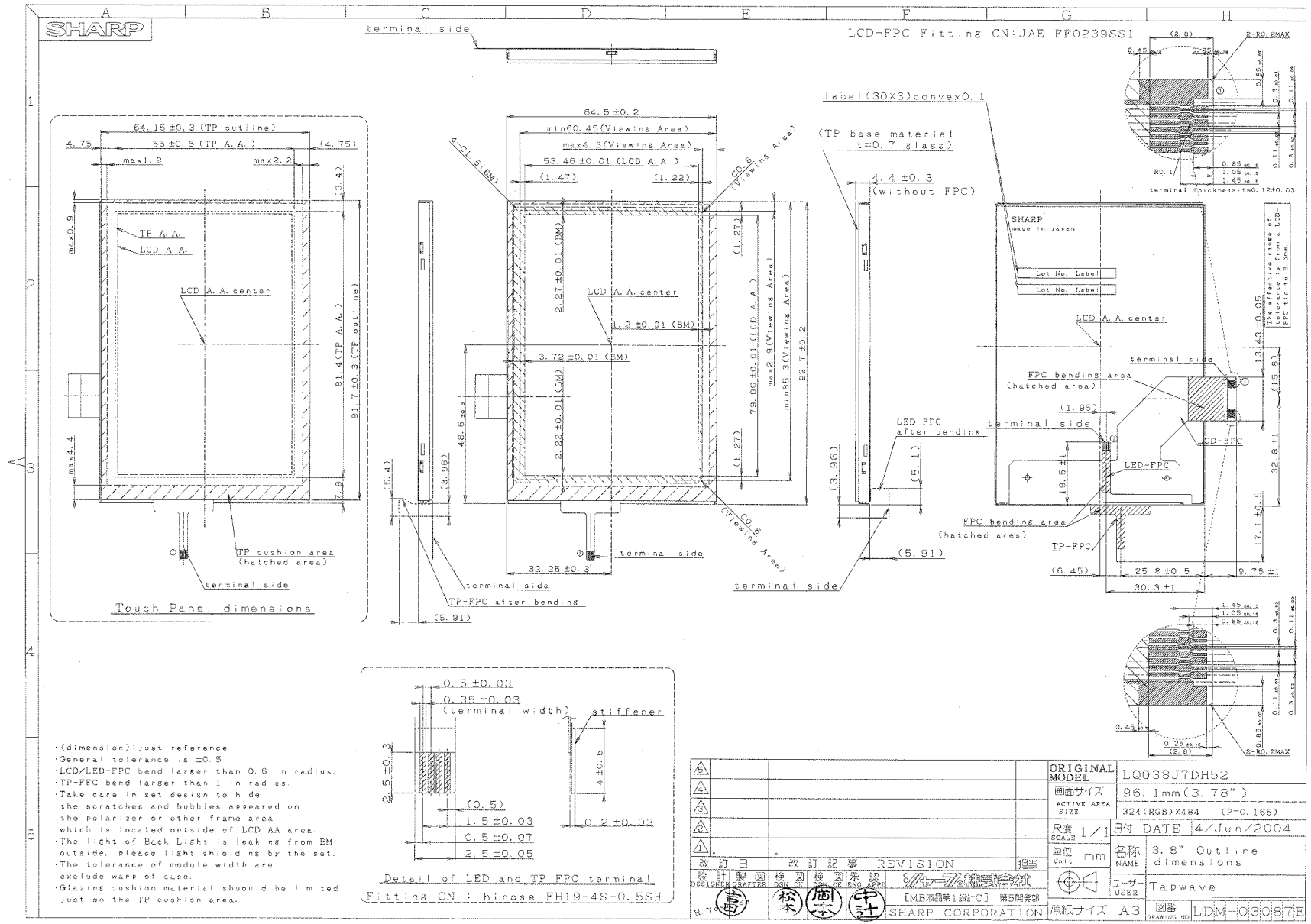


Fig1. Outline dimensions

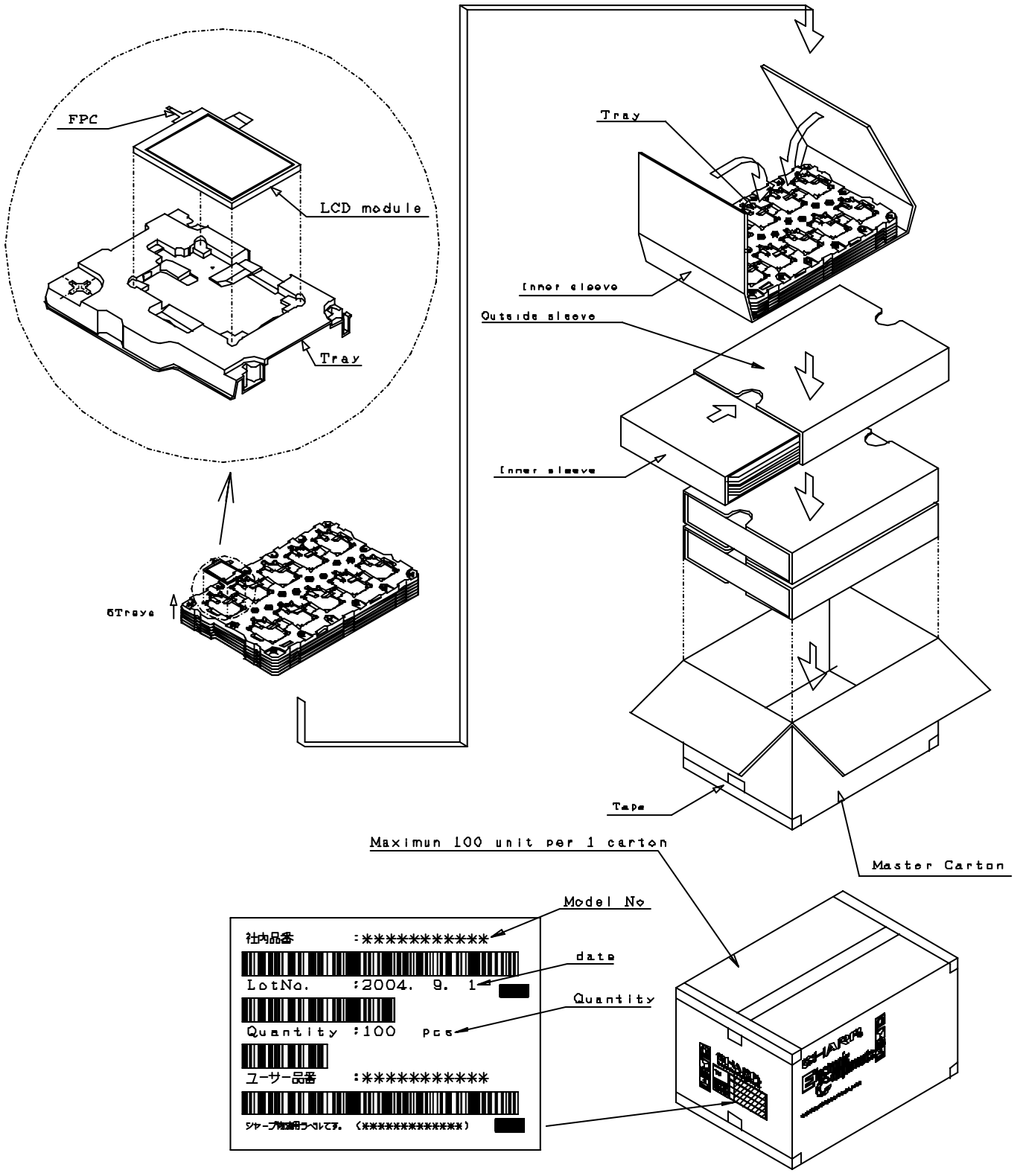


Fig3. Package Form