SHARP

No.	LCY- 07007
DATE	Feb. 19. 2007

TECHNICAL LITERATURE

FOR

TFT - LCD module

MODEL No. LQ058Y5DG01

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MOBILE LIQUID CRYSTAL DISPLAY GROUP I

SHARP CORPORATION

RECORDS OF REVISION

MODUL NO. : LQ058Y5DG01

SPEC No.	Date	NO.	PAGE	SUMMARY	NOTE
LCY-07007	Feb. 19. 2007	-	-	-	1st Issue

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1. Application

The SHARP Color TFT-LCD module is an active matrix LCD (Liquid Crystal Display) produced by making the most of Sharp's expertise in liquid-crystal and semiconductor technologies.
The active device is amorphous silicon TFT (Thin Film Transistor).
Module geometry(Mechanical specification) : Table 4-1

2. Summary and Features

- Utilizes a panel with a 16:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
- The 6.5 screen produces a high resolution image that is composed of 384,000 pixels elements in a stripe arrangement.
- Graphics and texts can be displayed on a 800×RGB×480 dots panel with 262,144 colors by supplying 18 bit data signals(6 bit/color).
- Wide viewing field angle technology is employed. (The most maximum viewing angle is in the 6 o'clock direction.)
- By adopting an active matrix drive, a picture with high contrast is realized.
- Reduced reflection as a result of low reflection black matrix and an antiglare (AG) polarizer being adopted.
- By COG method, realized a slim, lightweight, and compact module.
- Through the use of TN-normally white mode, an image with highly natural color reproduction is realized.
- An inverted video display in the vertical and horizontal directions is possible.
- The backlight is excellent of brightness rising characteristics at low temperature in consideration of automotive application.

3. Construction and Outline

- The construction form figure : See Fig.1
- The module consists of a TFT-LCD panel, drivers, FPC, backlight unit, front shielding cases.

4. Mechanical specifications

Table 4-1

Parameter	Specifications	Units	Remarks
Screen size (Diagonal)	[5.8"]	cm	
Active area	128.4 (W) × 72.24 (H)	mm	
Display format	384,000	pixels	
	800×RGB×480	dots	
Dot pitch	0.0535 (W) ×0.1505 (H)	mm	
Pixel configuration	R,G,B Stripe configuration		
Outline dimension	141.1 (W) × 82.9 (H) × 7.2 (D)	mm	【Note4-1】
Mass	(MAX :)	g	

【Note 4-1】
Excluding protrusions. Typical values are given.
For detailed measurements and tolerances, please refer to Fig. 1.

5. Input terminal

5-1)TFT-LCD panel driving part

Table 5-1

Pin No.	Symbol	Description	Remarks
1	GND	Ground	
2	SPL	Start signal1 for source driver.	【Note5-1】
3	V0	The Power supply for gray image	
4	NC	This is open terminal	
5	NC	This is open terminal	
6	V3	The Power supply for gray image	
7	NC	This is open terminal	
8	V5	The Power supply for gray image	
9	NC	This is open terminal	
10	V7	The Power supply for gray image	
11	NC	This is open terminal	
12	V9	The Power supply for gray image	
13	V10	The Power supply for gray image	
14	B0	BLUE data signal(LSB)	
15	B1	BLUE data signal	
16	B2	BLUE data signal	
17	B3	BLUE data signal	
18	B4	BLUE data signal	
19	B5	BLUE data signal(MSB)	
20	G0	GREEN data signal(LSB)	
21	G1	GREEN data signal	
22	G2	GREEN data signal	
23	G3	GREEN data signal	
24	G4	GREEN data signal	
25	G5	GREEN data signal(MSB)	
26	R0	RED data signal(LSB)	
27	R1	RED data signal	
28	R2	RED data signal	
29	R3	RED data signal	
30	R4	RED data signal	
31	R5	RED data signal(MSB)	
32	LS	Data transfer signal in source driver.	
33	LBR	Selection for horizontal scanning direction	【Note5-1】
34	GND	Ground	
35	NC	This is open terminal	
36	VSHA	Power supply for source driver (Analog).	
37	VSHA	Power supply for source driver (Analog).	
38	NC	This is open terminal	
39	GND	Ground	
40	GND	Ground	
41	CLD	Clock signal for source driver.	
42	GND	Ground	
43	NC	This is open terminal	
44	VSHD	Power supply for source driver (Digital).	
45	VCC	Power supply for gate driver (Digital).	
46	SPR	Start signal2 for source driver.	【Note5-1】
47	NC	This is open terminal	
48	VDD	Power supply for gate driver(High level).	
49	NC	This is open terminal	
50	GND	Ground	

Pin No.	Symbol	Description	Remarks
51	CS	CS electrode driving signal	
52	MODE	Control signal for gate driver.	
53	CLS	Clock signal for gate driver.	
54	U/L	Selection for vertical scanning direction	【Note5-1】
55	SPS	Start signal for gate driver.	
56	NC	This is open terminal	
57	VEE	Power supply for gate driver(Low level).	
58	NC	This is open terminal	
59	VCOM	Common electrode driving signal	
60	VCOM	Common electrode driving signal	

【Note 5-1】

The control of scanning direction

Table 5-2

Mode	U/L	LBR	SPL	SPR
Normal mode	Lo	Hi	Input	Output
Right/Left reverse mode	Lo	Lo	Output	Input
Up/Down reverse mode	Hi	Hi	Input	Output
Right/Left & Up/Down reverse mode	Hi	Lo	Output	Input

【caution】 Lo=GND , Hi=VSHD

5-2)Backlight fluorescent tube driving part

Table 5-3

No.	Symbol	function	Remarks
1	A1	LED Power supply input (+)	Anode side
2	A2	LED Power supply input (+)	Anode side
3	NC	This is open terminal	
4	K1	LED Power supply input 1(−)	Cathode side1
5	K2	LED Power supply input 2(−)	Cathode saide2
6	NC	This is open terminal	
7	NC	This is open terminal	
8	NC	This is open terminal	
9	TH	Sensor (+)	Terminal for temperature sensor
10	GND	Sensor (−)	Terminal for temperature sensor

6. Absolute maximum ratings

Table 6-1 GND=0V

Parameter		Symbol	MIN	MAX	Unit	Note
Power supply (source driver)	Analog voltage	VSHA	−0.3	+6.0	V	Ta=25℃
	Digital voltage	VSHD	−0.3	+4.0	V	〃
Power supply (gate driver)		VDD	−0.3	+35.0	V	〃
		VEE	−20	+0.3	V	〃
		VDD-VEE	−0.3	+35.0	V	〃
Input signal voltage (source driver)	Digital input signal	VID	−0.3	VSHD+0.3	V	〃 【Note 6-1】
	Analog input signal	VIA	−0.3	VSHA+0.3	V	〃 【Note 6-2】
Common electrode driving signal		COM	−4	+6	V	〃
Storage temperature		Tstg	−40	+85	℃	【Note 6-3,4】
Operating temperature (panel surface)		Topr1	−30	+85	℃	【Note 6-5,6】
Operating temperature(Ambient temperature)		Topr2	−30	(+65)	℃	【Note 6-6】

【Note 6-1】 SPL , SPR , R0～R5 , G0～G5 , B0～B5 , LS , CLD , LBR , MODE ,U/L , SPS , CLS

【Note 6-2】 V0 , V3 , V5 , V7 , V9 , V10

【Note 6-3】 This rating applies to all parts of the module and should not be exceeded.

【Note 6-4】 Maximum wet-bulb temperature is 57℃.Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

【Note 6-5】 The operating temperature only guarantees operation of the circuit. For contrast, speed response, and other factors related to display quality, determine operating temperature using the formula Ta=+25℃

【Note 6-6】 Ambient temperature when the backlight is lit (reference value).

7. Electrical characteristics

7-1)TFT-LCD panel driving section

Table 7-1 GND=0V, Ta=25℃

Parameter				Symbol	MIN	TYP	MAX	Unit	Remarks
Power supply (source driver)	Analog voltage			VSHA	+5.0	+5.3	+5.6	V	
	Digital voltage			VSHD	+3.0	+3.3	+3.6	V	
Power supply (gate driver)	TFT driving circuit	High level		VDD	+14.8	+15.0	+15.2	V	
		Low level	AC	VEE AC	—	COM AC	—	Vp-p	【Note7-1】
			DC	VEE DC	−11.8	−12.0	−12.2	V	
Power supply (gray image)				V0～V10	0.1	—	VSHA - 0.1	V	【Note7-2】
Input signal voltage for source driver	High level			VIHS	0.8×VSHD	—	VSHD	V	【Note7-3】
	Low level			VILS	GND	—	0.2×VSHD	V	
Input signal current for source driver	High level			IIHS	—	—	(15)	μA	【Note7-3】
	Low level			IILS	—	—	(15)	μA	【Note7-4】
Input signal voltage for gate driver	High level			VIHG	0.8×VSHD	—	VSHD	V	【Note7-5】
	Low level			VILG	GND	—	0.2×VSHD	V	
Input signal current for gate driver	High level			IIHG	—	—	(2.0)	μA	
	Low level			IILG	—	—	(2.0)	μA	
Common electrode driving signal	AC component			COMAC	—	(±3.4)	(±4.0)	Vp-p	【Note7-6】
	DC component			COMDC	(+0.5)	—	(+2.5)	V	
Cs electrode driving signal	AC component			CSAC	—	COMAC	(±4.0)	Vp-p	【Note7-1】
	DC component			CSDC	(−4.8)	(−5.0)	(−5.2)	V	

- Notes at the time of a power supply turning on

  Please turn on and turn off power supply in simultaneous or the following order.

  <Turn on> VSHD → VSHA → VEE → Logic signal → VDD

  <Turn off> VDD → VEE → Logic signal → VSHA → VSHD

【Note 7-1】 Please carry out polar reversal in the same amplitude and the same phase as VCOM.

【Note 7-2】 It is a standard power supply for gray scale. Whenever the polarity of common electrode drive signal (VCOM) is changed, please also change this standard voltage. V0 (black) power supply becomes the reverse characteristic of VCOM, and V10 (white) becomes the same polarity as VCOM.

Please shift the center value of each power supply amplitude to the plus(+) direction according to the characteristic of liquid crystal as it will go to white side like V3, V5, V7, V9, V10, if the center value of each power supply amplitude is based on the center value of V0 (black).

After DC adjustment of VCOM signal is adjusted in case of the V0 gray scale display, please adjust this amount of shifts so that a flicker does not occur in the power supply display of each gray scale.

【Note 7-3】 Apply to the terminal R0-R5 , G0-G5 , B0-B5 , SPR , SPL , CLD , LS, and LBR

【Note 7-4】 Apply to the terminal R0-R5 , G0-G5 , B0-B5 , SPR , SPL , CLD , LS, and LBR

【Note 7-5】 Apply to the terminal CLS , SPS , MODE1 ,and U/L

【Note 7-6】 Please switch polarity of amplitude COMAC by center value of amplitude that is COMDC for every one level scan and every one vertical scan. Moreover, please adjust COMDC so that contrast becomes the maximum and a flicker becomes the minimum for every module.

7-2)Backlight driving section

Table 7-2

Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
Input voltage	VLED	(TBD)	(TBD)	(TBD)	V	
Current consumption	ILED	—	(0.27)	(TBD)	A	
PMW frequency	fL	—	(TBD)	—	W	【Note7-7】
Power consumption	WLED	—	(TBD)	(TBD)	Hz	
Specification of LED-Type	White LED					
Detection of defect LEDs	by current detection					

【Note7-7】 This value is reference value, Please refer to your LED backlight driving circuit.

7-3) LED Monitoring interface

Temperature Sensor Thermister Type :

Table 7-3

Temperature ℃	R-Thermister kΩ (typ)	Remarks	Temperature ℃	R-Thermister kΩ (typ)	Remarks
−50	(108.4)		40	(12.0)	
−40	(581.3)		50	(8.2)	
−30	(324.1)		60	(5.8)	
−20	(186.7)		70	(4.1)	
−10	(110.8)		80	(3.0)	
0	(67.7)		90	(2.2)	
10	(42.3)		100	(1.6)	
20	(27.2)		110	(1.2)	
30	(17.9)		120	(0.98)	

7-4) Timing characteristics

Timing diagrams of input signal are shown in Fig3-1 , Fig3-2

Table 7-4 VSHA = +5.3V , VSHD = 3.3V , GND = 0V , Ta = 25℃

	Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
SOURCE	Operating Clock frequency	fck	—	33.2	34.6	MHz	CLD
	High level clock width	Tcwh	12	—	—	ns	
	Low level clock width	Tcwl	13	—	—	ns	
	Clock rise time	Tcr	—	—	4	ns	
	Clock fall time	Tcf	—	—	4	ns	
	Start pulse frequency	fsp	—	31.5	31.8	kHz	SPR · SPL 【Note7-8】
	Start pulse set up time	Tsusp	4	—	—	ns	
	Start pulse hold time	Thsp	0	—	—	ns	
	Stapt pulse width	Twsp	—	1/fck	1.5/fck	ns	
	LS pulse frequency	flp	—	fsp	—	kHz	LS
	LS pulse set up time (CLS)	Tsulp	5.0	—	—	μs	
	LS pulse set up time (SPL,SPR)	Tsulpsp	1/fck	—	—	ns	
	LS pulse hold time (CLD)	Thlpck	7	—	—	ns	
	High level LS pulse wide	Twlp	1/fck	—	—	ns	
	Data set up time	Tsud	15	—	—	ns	R0～R5 , G0～G5 , B0～B5
	Data hold time	Thd	10	—	—	ns	
GATE	Operating Clock frequency	fcls	—	fsp	—	kHz	CLS
	Clock pulse with	Twl	5.5	—	(1/fcls)-53	μs	
	Clock rise time	Trcl	—	—	1/fck	ns	
	Clock fall time	Tfcl	—	—	1/fck	ns	
	Start pulse frequency	fsps	—	60	65	Hz	SPS
	Start pulse set up time	Tsusps	100	—	—	ns	
	Start pulse hold time	Thsps	300	—	—	ns	
	Start pulse rise time	Trsps	—	—	100	ns	
	Start pulse fall time	Tfsps	—	—	100	ns	
COM signal set up time		Tsucom	3	—	—	μs	VCOM CS
COM signal hold time		Thcom	0	—	—	μs	
COM signal rise time		Trcom	—	—	2	μs	
COM signal fall time		Tfcom	—	—	2	μs	
V0～V10 signal set up time		Tsuv0	3	—	—	μs	V0,V3,V5 V7,V9,V10
V0～V10 signal hold time		Thv0	0	—	—	μs	
V0～V10 signal rise time		Trv0	—	—	2	μs	
V0～V10 signal fall time		Tfv0	—	—	2	μs	

【Note7-8】

The rising pulse in CLD is existed only 1 time during Hi period (Twsp) on start pulse.

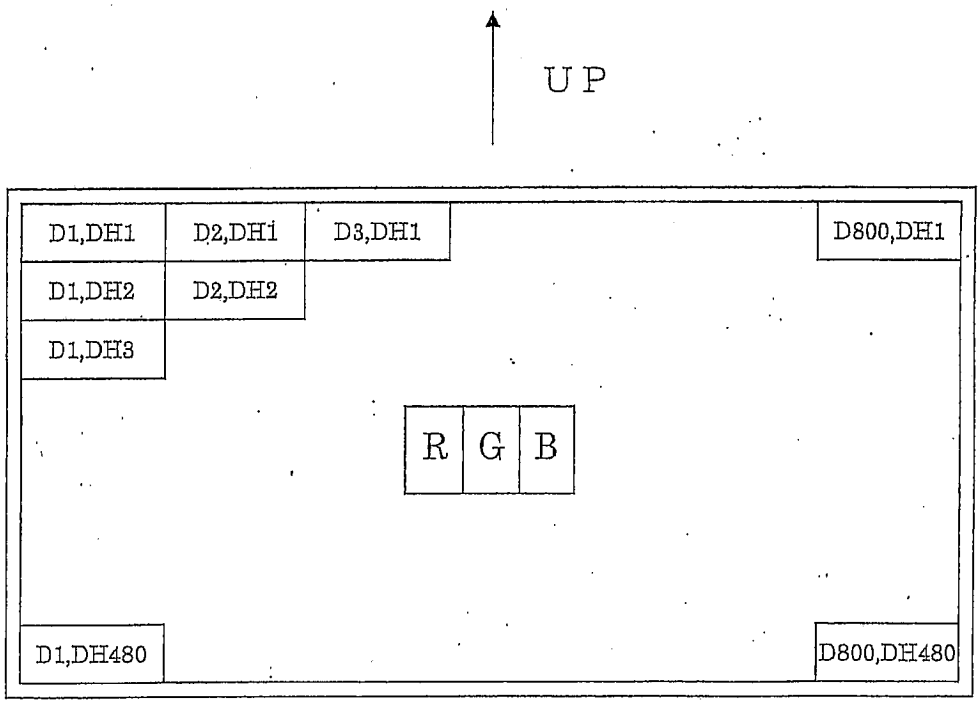
7-5) Current dissipations

Table7-5 Ta=25℃

Parameter		Symbol	Conditions	MIN	TYP	MAX	Unit
Current for source driver	Analog	ISHA	VSHA=+5.3V	–	(TBD)	(TBD)	mA
	Digital	ISHD	VSHD =+3.3V	–	(TBD)	(TBD)	mA
Current for gate driver	Hi	IDD	VDD =+15.0V	–	(TBD)	(TBD)	mA
	Lo	IEE	VEE=(−12.0±3.4V)	–	(TBD)	(TBD)	mA

＊Max current situation :
Vertical stripe pattern alternating 21 gray scale (GS21) with 42 gray scale (GS42) every 1 dot.
Timing : fck=33.2MHz , fsp=31.5kHz , fsps=60Hz
In case of using exclusive control-IC (LZ9JG17A).

7-5) Input Data Signals and Display Position on the screen



Display position of input data (H,V)

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

Table8-1

	Colors & Gray scale	Data signal																	
		Gray Scale	R0	R1	R2	R3	R4	R5	G0	G1	G2	G3	G4	G5	B0	B1	B2	B3	B4	B5
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 blue	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

Table 9-1

Ta=25℃ (initial characteristics)

Parameter		Symbol	Condition	MIN	TYP	MAX	Unit	Remarks
Viewing angle range		θ 21, θ 22	CR≧5	(60)	(65)	—	° (degree)	【Note 9-1,2】
		θ 11		(60)	(65)	—	° (degree)	
		θ 12		(40)	(55)	—	° (degree)	
Contrast ratio		CRmax	Maximum viewing angle	(100)	—	—		【Note 9-2】
Response time	Rise	τ r	θ =0°	—	(20)	(60)	ms	【Note 9-3】
	Fall	τ d		—	(30)	(100)	ms	
Luminance		Y	ILED=(TBD)	(TBD)	(TBD)	—	cd/m²	【Note 9-4】
White chromaticity		x	ILED=(TBD)	(TBD)	(TBD)	(TBD)		【Note 9-4】
		y		(TBD)	(TBD)	(TBD)		
Luminance Distribution		—		(70)	—	—	%	【Note 9-5】
LED life time	+25℃	—	continuation	(TBD)	—	—	hour	【Note 9-6】
	−30℃	—	intermission	(TBD)	—	—	time	【Note 9-7】

*Measuring after 30minutes operation. The measurement of the optical character is measured by using the method of fig.9-1 and fig.9-2 under the condition which is equal to the darkroom or the darkroom.

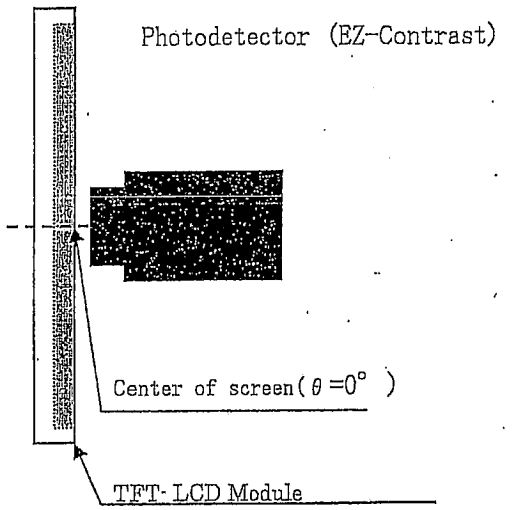


Fig9-1 Viewing angle / Range / Contrast / Response time measurement method

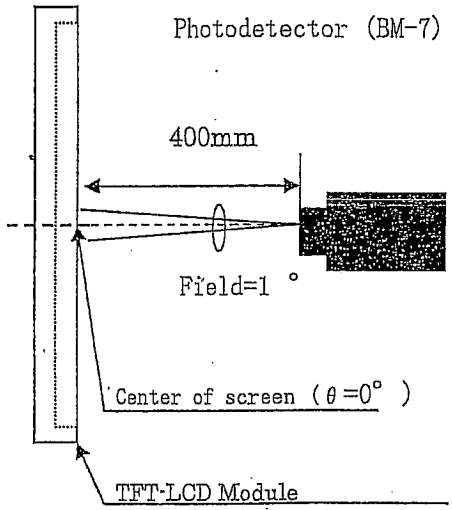
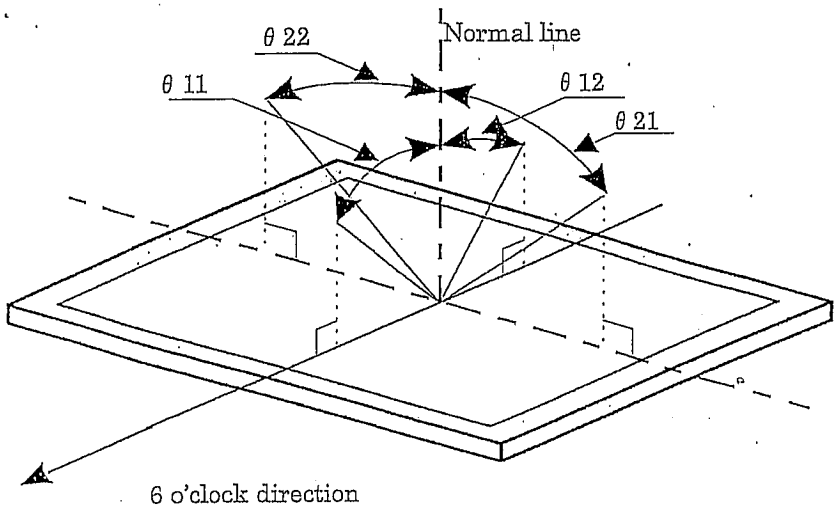


Fig9-2 Luminance / Chromaticity measurement method

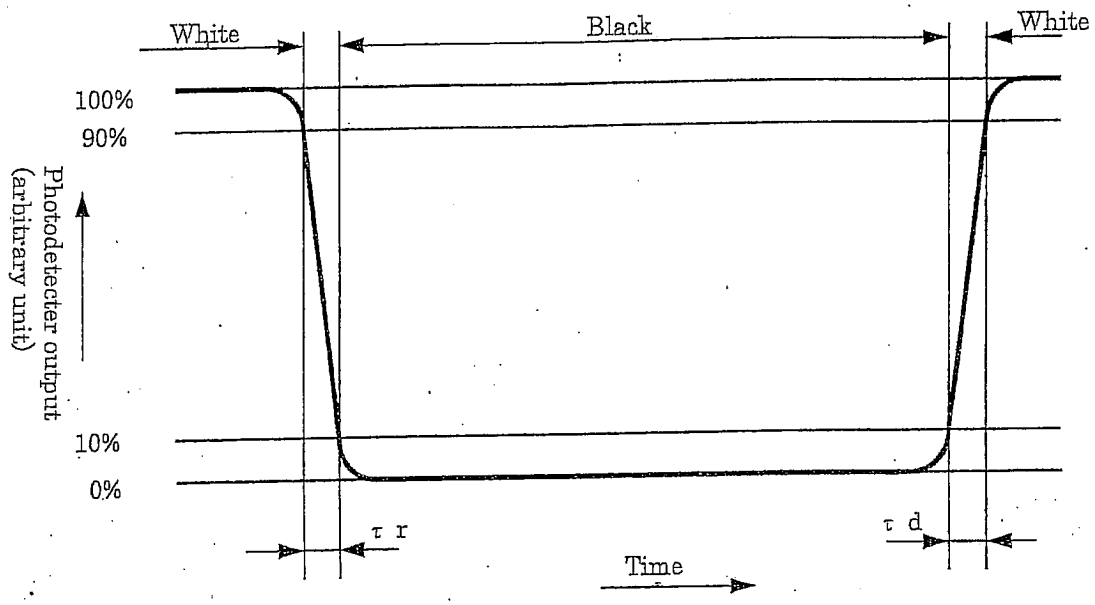
【Note 9-1】 Viewing angle range is defined as follows.



【Note 9-2】 Contrast ratio of transmission is defined as follows:

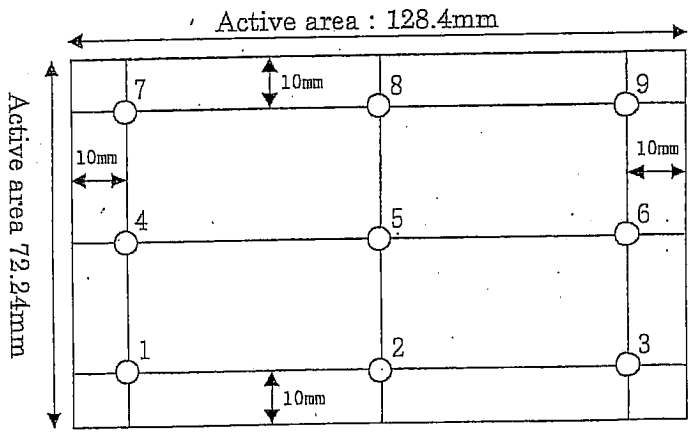
$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"(GS63)}}{\text{Photo detector output with LCD being "black"(GS0)}}$$

【Note 9-3】 Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".



【Note 9-4】 Measured on the center area of the panel at a viewing cone 1° by TOPCON luminance meter BM-7.(After 30 minutes operation)DC/AC inverter driving frequency: 49kHz

【Note 6-5】 Luminance Distribution is defined as follows.



The measurement of Luminance measures nine points of the above figure.

The maximum and minimum luminance are chosen as a result.

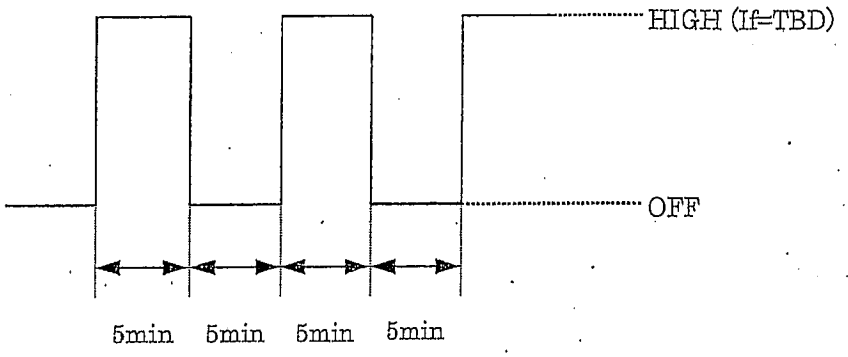
Luminance distribution = Maximum Luminance / Minimum Luminance (%)

Measurement condition : No input signal, Ambient temperature : 25□

【Note 9-6】 LED life time is defined as the time when the brightness of the panel not to become less than 50% of the original value in the continuous operation under the condition of LED current ILED=0.27A and PWM dimming 100%~5% .

【Note 9-7】 The intermittent cycles is defined as a time when brightness not to become under 50% of the original value under the condition of following cycle.

(Lighting condition) Ambient temperature:—30℃



10. Display quality

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

11. Mechanical characteristics

11-1) External appearance

Do not exist extreme defects. (See Fig.1)

11-2) Panel toughness

The panel shall not be broken ,when 19N is pressed on the center of the panel by a smooth sphere having 15 mm diameter.

【Caution】 In spite of very soft toughness, if, in the long-term, add pressure on the active area, it is possible to occur the functional damage.

11-3) Main composition parts (See Fig.5)

11-4) Input terminal performance

A) FPC for LCD panel

1) Applicable connector :

2) FPC flexibility : I. Slit on the film cover lay (Fig.1 ①)

If it had been tested bending under radius 0.6 mmR and bending angle 90 degrees condition, the FPC should not be cut at 30 times in or less.

II. Slit on the film cover lay coat part of one side printing (Fig.1 ②)

If it had been tested bending under radius nothingness and bending angle 180degrees, the FPC should not be cut.

(It should be bend by hand and only at once)

3)LCD-FPC contact mating area plating : Gold 0.5~1.5μm (Composition ratio : Au=100%)

B)I/O connector of backlight driving circuit

12. Handling instructions

12-1) Handling of FPC

① Please bend FPC only at a film cover lay slit part (Fig.1 A)

② Please do not hang a LCD module or do not apply excessive power for FPC.

12-2) Mounting of module

① The TFT-LCD module is be sure to fix the module on the same plane,taking care not to wrap or twist the module.
Don't reach the pressure of touch-switches of the set side to a module directly , because images may be disturbed

② Please power off the module when you connect the input/output connector.

12-3) Precautions in mounting

Polarizer which is made of soft material and susceptible to flaw must be handled carefully. Protective film (Laminator) is applied on the surface to protect it against scratches and dirties. It is recommended to peel off the laminator immediately before the use, taking care of static electricity.
Precautions in peeling off the laminator.

A) Working environment

When the laminator is peeled off, static electricity may cause dust to stick to the polarizer surface.
To avoid this, the following working environment is desirable.

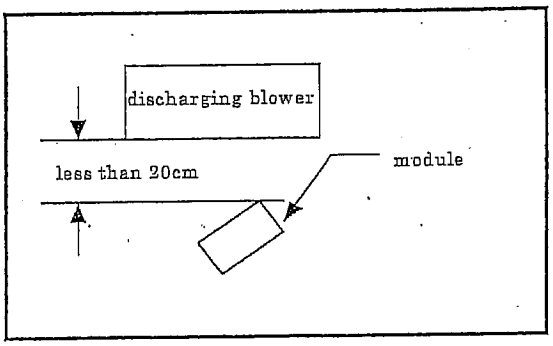
a) Floor: Conductive treatment of 1MΩ or more on the tile.
(conductive mat or conductive paint on the tile)

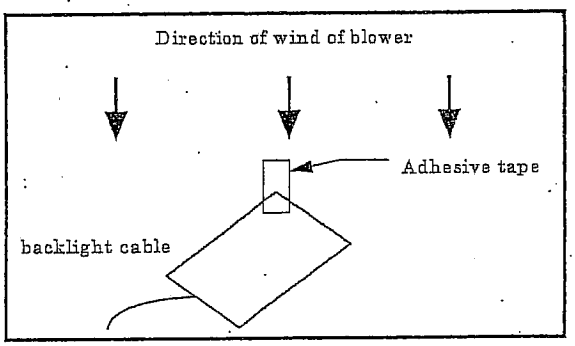
b) Clean room free form dust and with an adhesive mat on the doorway.

c) Advisable humidity:50%~70% Advisable temperature:15℃~27℃

d) Workers shall wear conductive shoes, conductive work clothes, conductive gloves and an earth band.

B) Working procedures





a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently.
Keep the distance between module and discharging blower within 20 cm.

b) Attach adhesive tape to the laminator part near discharging blower so as to protect polarizer against flaw.

c) Peel off laminator, pulling adhesive tape slowly to your side taking 5 or more second.

d) On peeling off the laminator, pass the module to the next work process to prevent the module to get dust.

e) Method of removing dust from polarizer

- Blow off dust with N2 blower for which static electricity preventive measure has been taken.
- Since polarizer is vulnerable, wiping should be avoided.
  But when the panel has stain or grease, we recommend to use adhesive tape to softly remove them from the panel.

When metal part of the TFT-LCD module (shielding lid and rear case) is soiled, wipe it with soft dry cloth. For stubborn dirties, wipe the part, breathing on it.
Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots.
TFT-LCD module uses glass which breaks or cracks easily if dropped or bumped on hard surface. Handle with care. Since CMOS LSI is used in this module, take care of static electricity and earth your body when handling.

12-4) Caution of product design

Please following items strictly when the product is designed by using this module.

- The LCD module shall be protected against water salt-water by the waterproof cover.
- Please take measures to interferential radiation from module, to do not interfere surrounding appliances.

12-5) Others

① Do not expose the module to direct sunlight or intensive ultraviolet rays for several hours; liquid crystal is deteriorated by ultraviolet rays.

② Store the module at a temperature near the room temperature. At lower than the rated storage temperature, liquid crystal solidifies, causing the panel to be damaged. At higher than the rated storage temperature, liquid crystal turns into isotropic liquid and may not recover.

③ If LCD panel breaks, there may be a possibility that the liquid crystal escapes from the panel. Since the liquid crystal is injurious, do not put it into the eyes or mouth. When liquid crystal sticks to hands, feet or clothes, wash it out immediately with soap.

④ Please adjust the Common electrode drive signal DC bias(COM DC) in the final state of the product. Causes the display fineness decrease when not adjusting COM DC.

⑤ Observe all other precautionary requirements in handling general electronic components.

13. Packing form

13-1) The packing form figure: See Fig.4

13-2)

a)Piling number of cartons : MAX (TBD)

b)Conditions for storage

Environment

①Temperature : 0~40℃

②Humidity : 60%RH or less (at 40℃)
No dew condensation at low temperature and high humidity.

③Atmosphere :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.

14. Others

14-1)Indication of lot number

①Attached location of the label : See Fig.1 (Outline Dimensions).

②Indicated contents of the label

LQ058Y5DG01	OOOOOOOOO
model No.	lot No.

contents of lot No.
the 1st figure ·· production year (ex. 2006: 6)
the 2nd figure ·· production month 1,2,3,·····,9,X,Y,Z
the 3rd~8th figure ·· serial No. 000001~
the 9th figure ·· revision marks A,B,C··

14-2)About RoHS

This TFT-LCD module corresponds to the RoHS..

14-3) Environmental burden material management.

This item conforms to pioneer group regulations 『GGP-001』.

14-4) The country of origin of the TFT-LCD module.

JAPAN

14-5) The manufacturing site of TFT-LCD

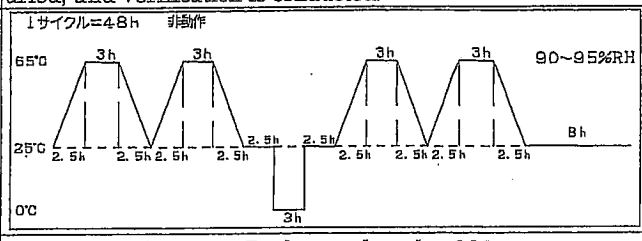
SHARP CORPORATION
1177-1, GOSANA, TAKI-CHO, TAKI-GUNN MIE
MOBILE LIOUID CRYSTAL DISPLAY GROUP 1
MIE PLANT 2

14-6) The manufacturing sute of TFT-LCD module

TBD

15. Reliability Test Conditions for TFT-LCD Module

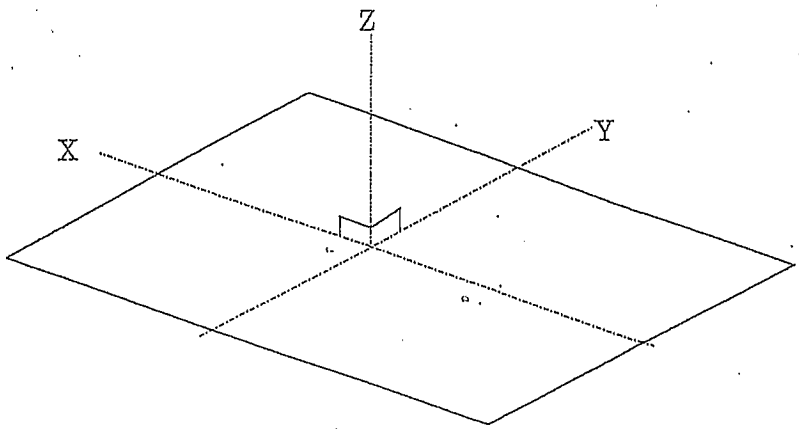
Table 12 Temperature condition is based on operating temperature condition

No.	Test items	Test condition	Judgment time	
1	Hi temperature operating test	Tp = +85℃ (Ta = +70℃)	500h	[Note1]
2	High temperature and high humidity operation test	Ta = +60℃, Humidity 90%	500h	[Note1]
3	Low temperature operating test	Ta = −30℃	500h	[Note1]
4	High temperature storage test	Ta = +85℃	500h	[Note1]
5	Low temperature storage test	Ta = −40℃	500h	[Note1]
6	Heat shook test	Ta = −30℃(1h)～+85℃(1h)	500cycle	[Note1]
7	Dew condensation test	Ta=−30℃(0.5h)～Ta=25℃,95%(10 minutes operating) After designated cycle of the procedure, sample parts are dried, and verification is conducted.	10cycle	[Note1]
8	Thermal humidity cycle test		5cycle	[Note1]
9	Sunshine carbon arc	Sunshine carbon arc · Peak wave length : 380nm BPT(Black Panel Temperature) =63±3℃	300h	
10	High temperature operation life	Tp = +85℃ (Ta = +70℃)	1000h	
11	Electro static discharge test For terminal	±200V · 200p F (0Ω) 1 time for each terminals	1 time	
12	Electro static discharge test For display	Contact : non-operating ±10kv, operating ±8kv Air : non-operating ±20kv, operating ±15kv	1 time	
13	Vibration test	Frequency : 8.3±1(Hz)⇒200±4(Hz)⇒8.3±1(Hz) Maximum acceleration : 43.2 m/s² (4.4G) Maximum stroke : 10mm Cycle : 20inutes logarithm sweep or same sweep	12 cycle for each direction X,Y,Z	[Note2]
14	Shock test	980m/s² · 6ms, Direction : ±X ; ±Y ; ±Z Non-operating	3 times for each direction	[Note2]
15	Panel toughness	The panel should not be broken, when press to the center of the panel by 5×9.8N power using smooth surface with 12.7mm diameter.	1 times	
16	Atmospheric pressure test	5×10 Pa non-operating	2h	
17	The bending number of times	FPC is bent ±90 degrees in the direction of Y from Z. Non-operation	5 times	[Note2]

Ta = Ambient temperature, Tp = Panel surface temperature

【Note 1】 In order to check ability, it tests to 1000h or 1000 cycle on the same conditions.
However, the test excepts the damage of Polarizing Film

【Note 2】 Definition of X, Y, Z direction is shown as follows



		Electrical and Optical characteristics				Display quality
		contrast	Luminance	Response time	Current Consumption	
1	Hi temperature operating test [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
2	High temperature and high humidity operation test[Note 3]	Within -20% [Note 2]	within spec	within spec	+30% or less [Note 2]	[Note 1]
3	Low temperature operating test [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
4	High temperature storage test [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
5	Low temperature storage test [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
6	Heat shook test [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
7	Dew condensation test [Note 3]	Within -20% [Note 2]	within spec	within spec	+30% or less [Note 2]	[Note 1]
8	Thermal hmidity cycle test [Note 3]	Within -20% [Note 2]	within spec	within spec	+30% or less [Note 2]	[Note 1]
9	Sunshine carbon arc [Note 3]	Within -20% [Note 2]	within spec	within spec	+30% or less [Note 2]	[Note 1]
10	High temperature operation life [Note 3]	within spec	within spec	within spec	+30% or less [Note 2]	[Note 1]
11	Electro static discharge test For terminal	There shall be no problems that may affect the display function				
12	Electro static discharge test For display	There shall be no problems that may affect the display function				
13	Vibration test	There shall be no problems that may affect the display function				
14	Shock test	There shall be no problems that may affect the display function				
15	Panel toughness	No panel crack				
16	Atmospheric pressure test	There shall be no problems that may affect the display function				
17	The bending number of times	There shall be no problems that may affect the display function				

[Note 1] In the standard condition, there shall be no practical problems that may affect the display function. But the muddiness, shadow , TEKARI, and waterdrop adhesion marks on the surface of a polarizing plate are taken as exclusion.

[Note 2] It compares with an initial value.

[Note 3] After taking out From the testing chamber, Measure it after it leaves it at the normal temperature for 24 hours or more.

* Satisfy "Electric part performance evaluation regulations" (GER-D103) about the guarantee item of reliability. The item that cannot be satisfied obtain acknowledgment in a pioneer technological section and the authorization section beforehand.

(Appendix)

Adjusting method of optimum DC bias voltage of common electrode driving signal

Photoelectric devices are very effective to obtain optimum DC bias voltage of common electrode driving signal accurately, and theaccuracy is with 0.1V. (In visual examination method, the accuracy is about 0.5V because of the difference among individuals.)

Adjusting method of DC bias voltage using the photoelectric devices is as follows

Measurement of flicker

Adjust the DC baias voltage so as to minimize flicker at NTSC : 60Hz(30Hz) / PAL : 50Hz(25Hz).

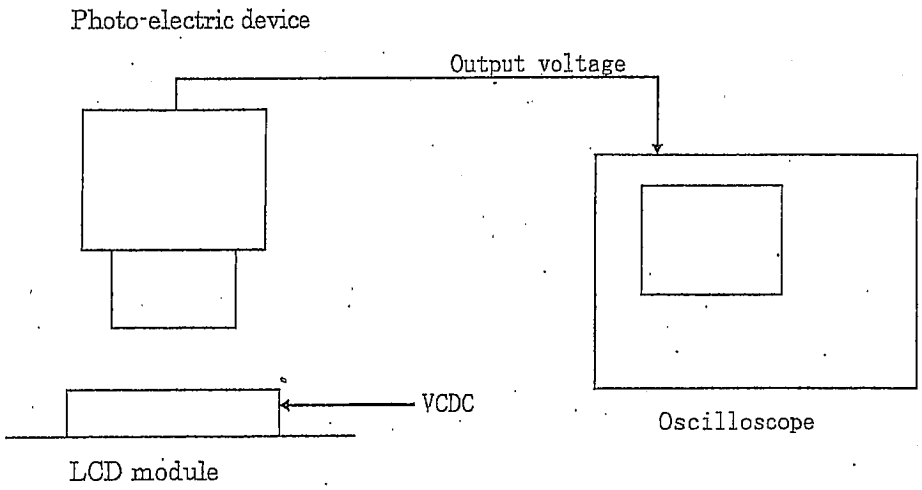
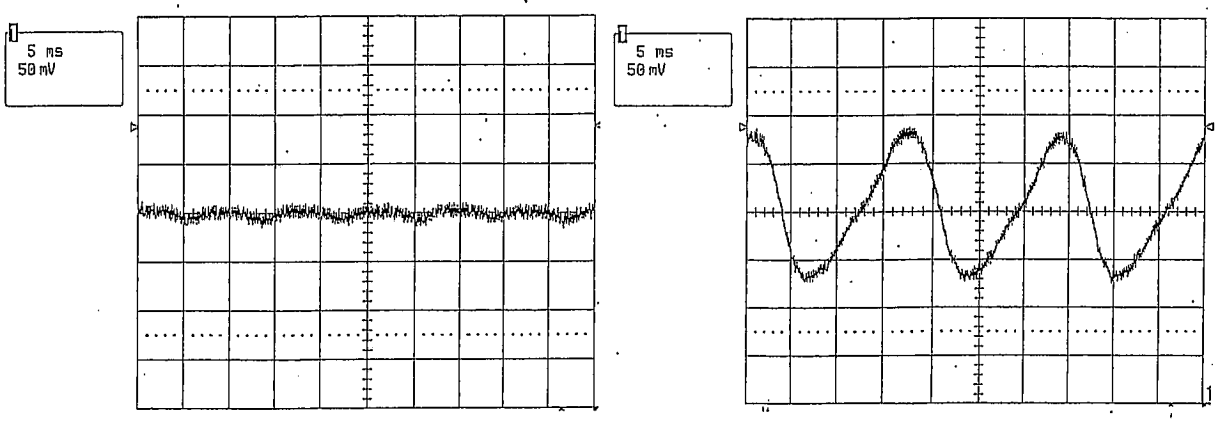


Fig. A Measurement system

Adjusting method of DC bias voltage

Measure the output voltage from Photoelectric device using the oscilloscope at the measurement system of Fig. A.

Then, change the DC bias voltage in small steps, and adjust it so as to minimize the flicker at NTSC 60Hz(30Hz) / PAL : 50Hz(25Hz). (Fig.B)



DC bias : Optimum DC bias : Optimum + 1

Fig. B Waveforms of flicker

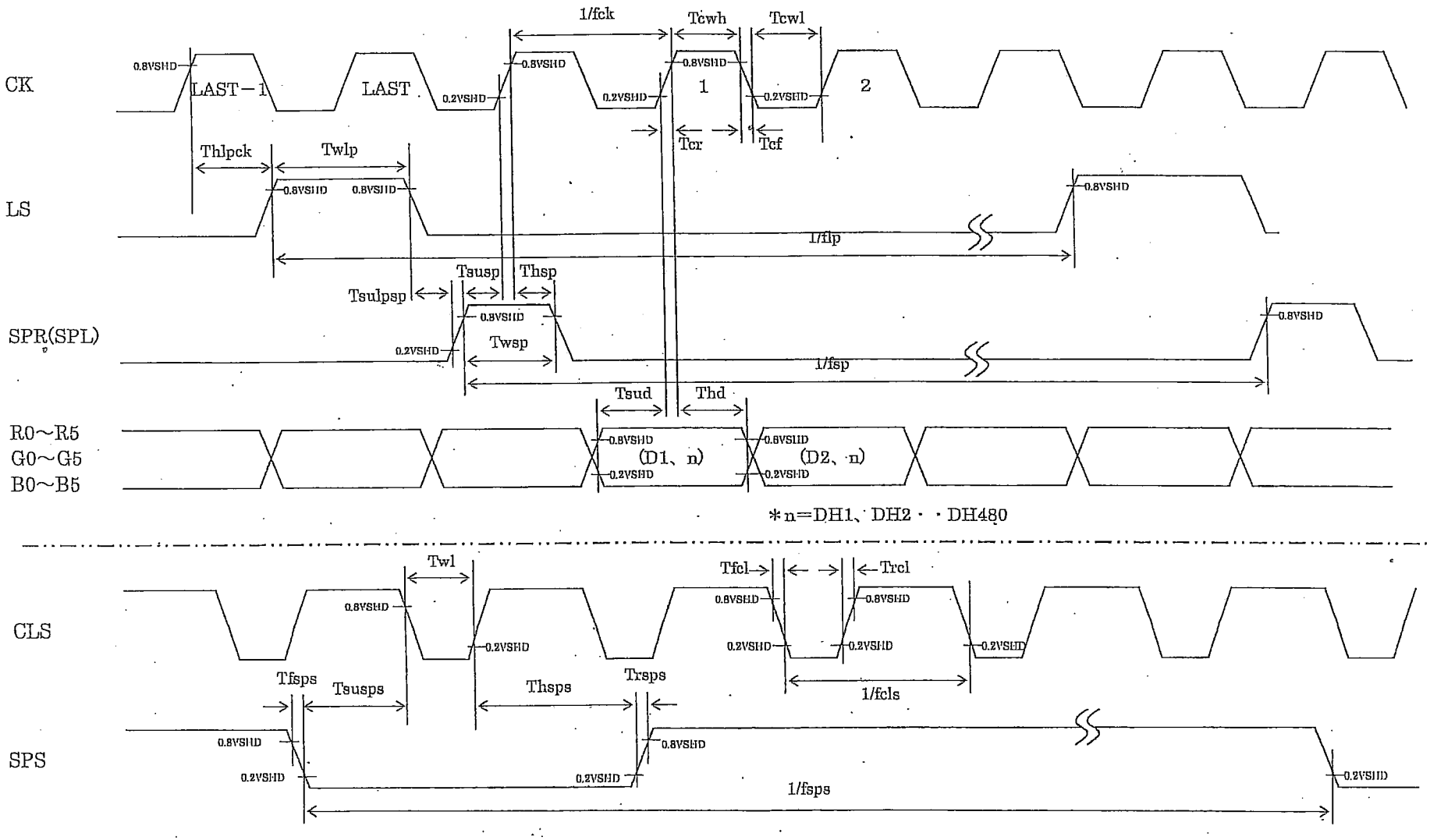


Fig.3-1 Input signal waveform

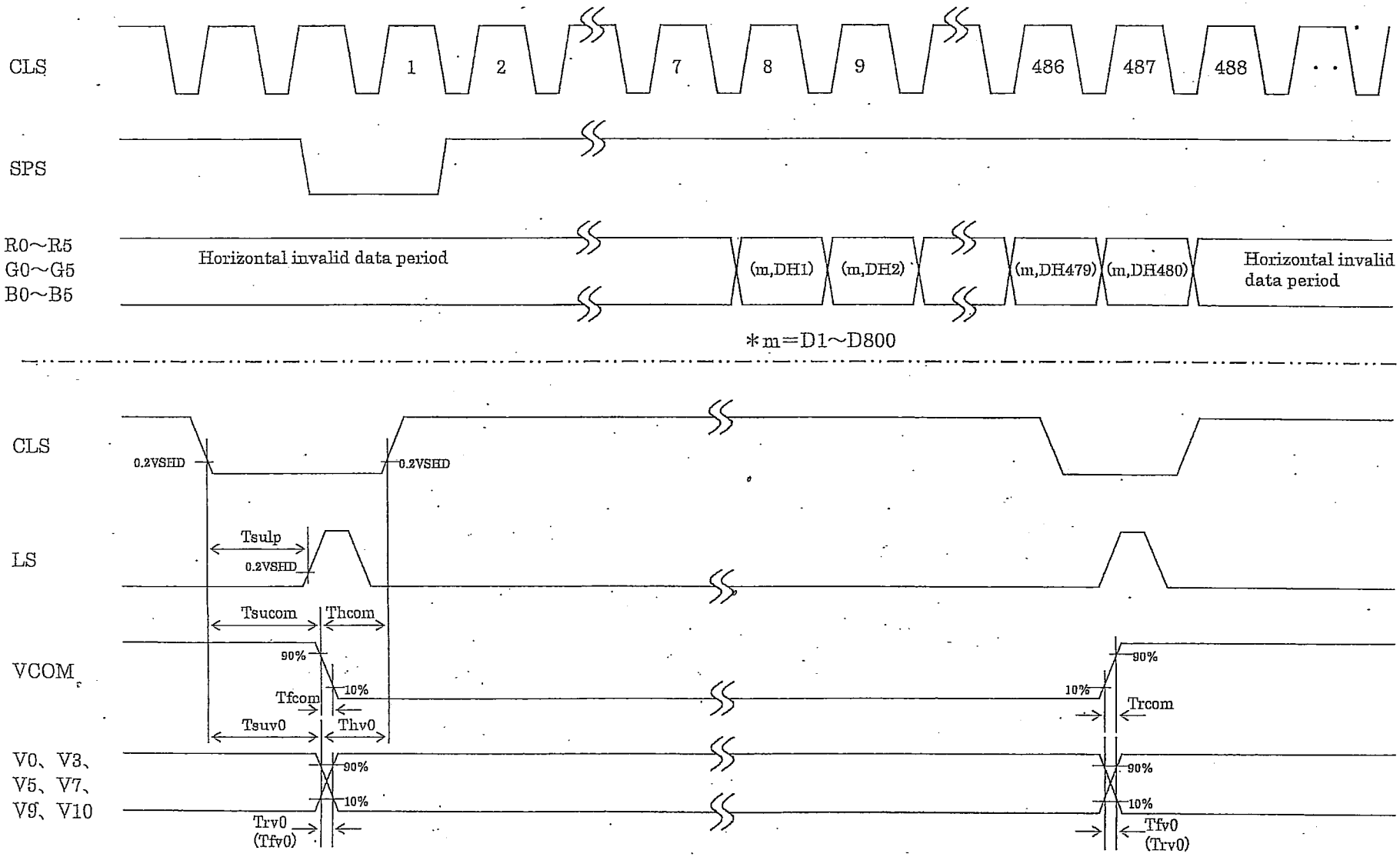
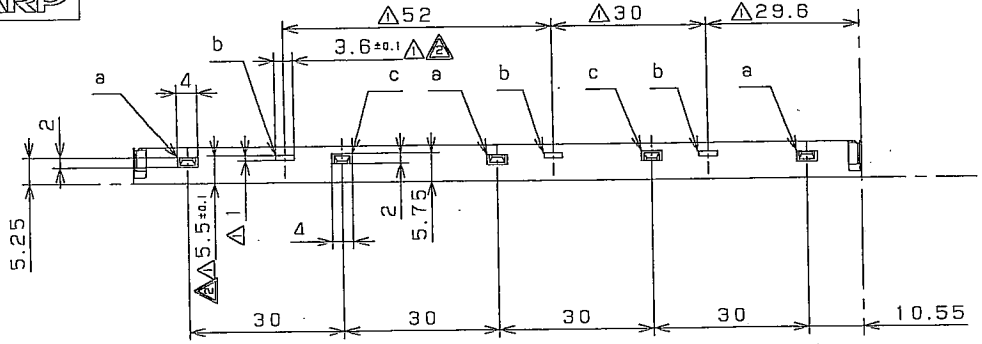
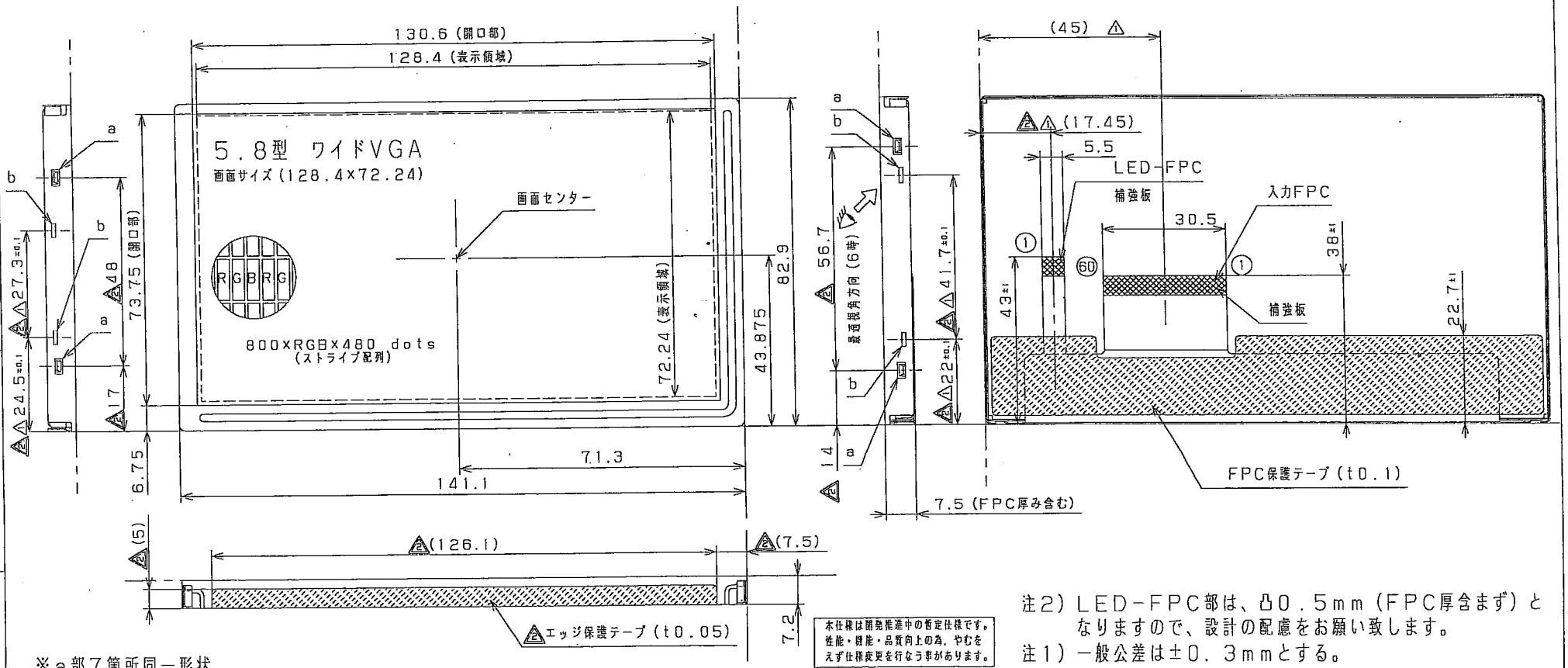


Fig.3-2 Input signal waveform

SHARP

※LED-FPC・・・HRS製FH12-10S-0.5SH(55)
※入力用FPC・・・MOLEX製51296-6092





※a部7箇所同一形状
※b部7箇所同一形状（穴深さ0.6mm）
※c部2箇所同一形状
※a部7箇所、c部2箇所は外形より凸（MAX0.1mm）となる為、
設計のご配慮をお願い致します。

本仕様は開発推進中の暫定仕様です。
性能・機能・品質向上の為、やむを
えず仕様変更を行なう事があります。

注2）LED-FPC部は、凸0.5mm（FPC厚含まず）と
なりますので、設計の配慮をお願い致します。
注1）一般公差は±0.3mmとする。

単位：mm	本資料を複写，又は第3者に公開，公表しない様に願います。				
DATE	2007.02.09	SCALE	1/1	△	
MODEL	LQ058Y5DG01			△ 07.03.09	新規変更（取付け孔角穴寸法、配合反転表、LED-FPC形状変更及び、FPC、エッジ保護テープ追加） 岡
DRAWING NO	LCM-07001B	size	A3	△ 07.02.16	新規変更（取付け孔角穴変更、LED-FPC形状変更） 岡
				No. DATE	変更箇所 担当
				シャープ株式会社	モバイル液晶第1事業本部 設計センター 第2開発部