SHARP

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TECHNICAL LITERATURE

FOR

TFT - LCD module

MODEL No. LQ070Y5DR04

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SHARP CORPORATION

MOBILE LIQUID CRYSTAL DISPLAY GROUP

MOBILE LCD DESIGHN CENTER

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1. Application

This technical literature applies to color TFT-LCD module, LQ070Y5DR04.

2. Summary and Features

•This module is a color active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor).
•It is composed of a color TFT-LCD panel, driver ICs, control-PWB, FPC, frame, shielding front case, shielding back case and backlight unit.
•Graphics and texts can be displayed on a 800×3×480 dots panel with 262,144 colors by supplying 18 bit data signals(6 bit/color).
•It isn't composed DC/AC inverter .
•Utilizes a panel with a 15:9 aspect ratio, which makes the module suitable for use in wide-screen systems.
•The 7 screen produces a high resolution image that is composed of 384,000 pixels elements in a stripe arrangement.
•Wide viewing field angle technology is employed. (The most suitable 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) and Low-reflection(LR) polarizer being adopted.
•By COG method, realized a slim, lightweight, and compact module.
•An inverted video display in the vertical and horizontal directions is possible.

3.Mechanical specifications

table 3-1

Parameter	Specifications	Units	Remarks
Display format	384,000	pixels	
	2400(W)×480(H)	dots	
Active area	152.40（W）×91.44（H）	mm	
Screen size (Diagonal)	17.8[7 “]	cm	
Dot pitch	0.064（W）×0.191（H）	mm	
Pixel configuration	R,G,B Stripe configuration		
Outline dimension	165 (W)×105.5 (H)×12 (D)	mm	[Note3-1]
Mass	(TBD)	g	

[Note3-1]
Typical values are given. For detailed measurements and tolerances, please refer to Fig. 1.

4.Input terminal

4-1 TFT-LCD panel driving part

Used connector: 40FLZ-RSM1-R (JST Co. ,Ltd.)

Table 4-1 CN1

Pin No.	Symbol	Description	Remarks
1	GND	Ground	
2	CK	Clock signal for sampling each data signal	
3	GND	Ground	
4	R0	RED data signal(LSB)	
5	R1	RED data signal	
6	R2	RED data signal	
7	R3	RED data signal	
8	R4	RED data signal	
9	R5	RED data signal(MSB)	
10	GND	Ground	
11	G0	GREEN data signal(LSB)	
12	G1	GREEN data signal	
13	G2	GREEN data signal	
14	G3	GREEN data signal	
15	G4	GREEN data signal	
16	G5	GREEN data signal(MSB)	
17	GND	Ground	
18	B0	BLUE data signal(LSB)	
19	B1	BLUE data signal	
20	B2	BLUE data signal	
21	B3	BLUE data signal	
22	B4	BLUE data signal	
23	B5	BLUE data signa(MSB)l	
24	GND	Ground	
25	Hsync	Horizontal Sync	[Note4-1]
26	HENAB	Horizontal Data Enable	[Note4-3]
27	Vsync	Vertical Sync	[Note4-1]
28	GND	Ground	
29	TST1	Terminal for test (Set up “Low”)	[Note4-4]
30	TST2	Terminal for test (Set up “Low”)	[Note4-4]
31	TST3	Terminal for test (Set up “High”)	[Note4-4]
32	TST4	Terminal for test (Set up “Low”)	[Note4-4]
33	GND	Ground	
34	HVR	Horizontally and Vertically inverted	[Note4-2]
35	RST	Reset signal for controlled IC	[Note4-5]
36	VCC	+3.3V power supply	
37	VCC	+3.3V power supply	
38	VCC	+3.3V power supply	
39	GND	Ground	
40	GND	Ground	

[Note4-1]

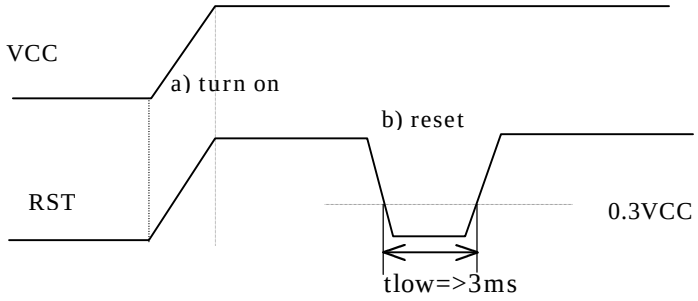
Hsync	Negative
Vsync	Negative

[Note4-2] HVR = "High": Regular video
HVR = "Low" : Horizontally and Vertically inverted video

[Note4-3] The horizontal display start timing is settled in accordance with a rising timing of HENAB signal. (See Fig. A-1, A-2)
In case HENAB is fixed "Low", the horizontal start timing is determined as described in Fig. A-1, A-2. (Don't keep HENAB "High" during operation..)

[Note4-4] TST1,TST2,TST4 = "Low"
TST3 = "High"

[Note4-5]
The purpose of this terminal (No.35 pin) is to provide reset for controlled IC in this module.
a) When the input power (VCC) is turn on, RST is to turn on at the same timing.
b) When RST is reset (High to Low), the resetting (Low) duration should be (tlow=) Min. 3 msec. (See below Fig)



4-2) Backlight fluorescent tube driving part
Used connector :BHR-04VS-1 (JST Co.,Ltd.)
Fit connector : SM04(4.0)B-BHS-1-TB (JST Co.,Ltd.)

Table 4-2
CN2

No.	Symbol	Function
1	NC	
2	VL2	Input terminal 2(Low voltage side)
3	NC	
4	VL4	Input terminal 4 (Hi voltage side)

5.Absolute maximum ratings

Table 5-1 GND=0V

Parameter	Symbol	MIN	MAX	Unit	Note
Input voltage	V_I	-0.3	Vcc+0.3	V	[Note 5-1]
+3.3V power supply	Vcc	-0.3	+5.0	V	
Storage temperature	Tstg	-40	85	℃	[Note 5-2,3]
Operating temperature (panel surface)	Topr1	-30	85	℃	[Note 5-2,3,4]
Operating temperature (Ambient temperature)	Topr2	-30	(60)	℃	[Note 5-5]

[Note 5-1] CK,R0～R5,G0～G5,B0～B5,Hsync,Vsync,HENAB,HVR,RST

[Note 5-2] This rating applies to all parts of the module and should not be exceeded.

[Note 5-3] Maximum wet-bulb temperature is less than 58℃. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

[Note 5-4] 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 5-5] Ambient temperature when the backlight is lit (reference value).

6.Electrical characteristics

6-1)TFT-LCD panel driving section

Table 6-1 Ta= 25℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
+3.3V	Supply voltage	VCC	+3.0	+3.3	+3.6	V	[Note 6-1]
	Current dissipation	ICC	—	( )	( )	mA	[Note 6-2]
Permissive input ripple		V_{RF}	—	—	200	mVpp	
Input Low voltage		V_{IL}	−0.3	—	0.3Vcc	V	
Input High voltage		V_{IH}	0.7	—	3.6	V	[Note 6-3]
Input current (Low)		I_{IL}	—	—	( )	μA	V_I=0V [Note 6-3]
Input current (High)		I_{IH}	—	—	( )	μA	V_I=3.3V [Note 6-3]

[Note 6-1]

Vcc-turn-on conditions

0<t1<=10ms

0<t2<=10ms

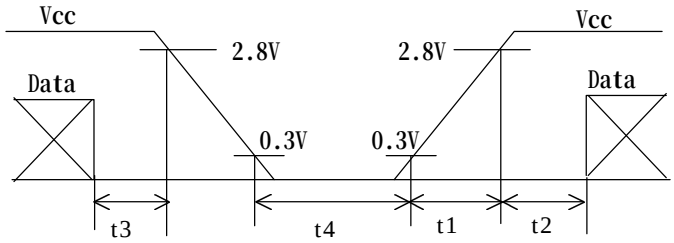
0<t3<=1s

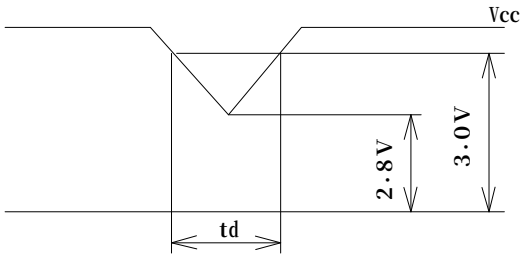
t4 > 1s

Vcc-dip conditions

1) In case 2.8V<=Vcc<3.0V, td<=10ms

2) In case Vcc<2.8V,
Vcc-dip conditions should also follow
the Vcc-turn-on conditions.





[Note 6-2]

Timing: Typical

Vcc : 3.3V

Set up serial data : Value in resetting

Situation: Typical current ; Black (V0) pattern

Max current ; Vertical stripe pattern alternating 21 gray scale (GS21) with 42 gray scale (GS42) every 1 dot.

Typical current situation

Max current situation

[Caution] The stated data is current dissipation when the supply voltage stabilizes, is not momentary current dissipation when the supply voltage turn-on.

[Note 6-3] CK,R0～R5,G0～G5,B0～B5,Hsync,Vsync,HENAB,HVR,RST

6-2)Backlight driving section

The backlight system is an edge-lighting type with one CCFT (Cold Cathode Fluorescent Tube). The characteristics of Lamp are shown in the following table.

Table 6-2

Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
lamp voltage	VL7	(780)	(870)	(960)	Vrms	IL=(6.0)mArms
lamp current	IL	(6.0)	(6.5)	(7.0)	mArms	In case normal
Discharge pipe electric power	WL	—	(5.66)	(—)	W	When the fixed case lights up
lamp frequency	fL	(40)	—	(70)	kHz	
kick-off voltage	VS	—	—	(3000)	Vrms	Ta=+25℃
		—	—	(3350)	Vrms	Ta=-30℃

Inverter(HIU-766 13.5pF 52kHz)

[Caution]

Please use the inverter which has the one of the sine wave. With regards to the inverter, it should be negative/positive wave symmetry and the spike wave should not be occurred.

7.Timing Characteristics of input signals

Timing diagrams of input signal are shown in Fig.A-1,A-2

7-1) 1/TV=60Hz In case W-VGA mode

7-1-1) Timing characteristics

Table 7-1 Tp = −30～+85℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Clock	frequency	1/Tc	31.95	33.26	34.60	MHz	
	High time	Tch	12	−	−	ns	
	Low time	Tcl	13	−	−	ns	
Data	Setup time	Tds	5	−	−	ns	
	Hold time	Tdh	5	−	−	ns	
Horizontal sync. signal	Cycle	TH	31.45	31.75	32.05	μs	
			1024	1056	1088	clock	
	Pulse width	THp	5	128	186	clock	
Vertical sync. signal	Cycle	TV	520	525	530	line	
	Pulse width	TVp	2	−	TV-515	line	
Horizontal display period		THd	−	800	−	clock	
Hsync-Clock phase difference		THc	8	−	Tc-10	ns	
Hsync-Vsync phase difference		TVh	-8	0	8	ns	
Vertical display invalid line		TVs	−	33	−	line	
Vertical display period		TVd	−	480	−	line	

7-1-2) Horizontal display position

The horizontal display position is determined by HENAB signal.

Table 7-2 Tp = −30～+85℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
HENAB signal	Setup time	Tes	5	−	Tc-10	ns	
	Pulse width	Tep	−	800	−	clock	
Hsync-HENAB signal phase Difference		THe	88	−	216	clock	

[Note7-1]

In case HENAB is “Low”, the display starts from the data of 216 clock [C216] as shown in Fig.A-1.

In case HENAB is “active”, THe≧TH [clock]−1000 [clock]

7-2) 1/TV=50Hz In case W-VGA mode

7-2-1) Timing characteristics

Table 7-3 Tp = −30～+85℃

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks
Clock	frequency	1/Tc	−	−	34.59	MHz	
	High time	Tch	12	−	−	ns	
	Low time	Tcl	13	−	−	ns	
Data	Setup time	Tds	5	−	−	ns	
	Hold time	Tdh	5	−	−	ns	
Horizontal sync. signal	Cycle	TH	31.45	−	−	μs	
			1024	1056	1088	clock	
	Pulse width	THp	5	128	186	clock	
Vertical sync. signal	Cycle	TV	520	525	530	line	
	Pulse width	TVp	2	−	TV-515	line	
Horizontal display period		THd	−	800	−	clock	
Hsync-Clock phase difference		THc	8	−	Tc-10	ns	
Hsync-Vsync phase difference		TVh	-8	0	8	ns	
Vertical display invalid line		TVs	−	33	−	line	
Vertical display period		TVd	−	480	−	line	

7-2-2) Horizontal display position

The horizontal display position is determined by HENAB signal.

Table 7-4 Tp = −30～+85℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
HENAB signal	Setup time	Tes	5	—	Tc-10	ns	
	Pulse width	Tep	—	800	—	clock	
Hsync-HENAB signal phase Difference		THe	88	—	216	clock	

[Note7-2]

In case HENAB is “Low”, the display starts from the data of 216 clock [C216] as shown in Fig.A-1.

In case HENAB is “active”, THe≧TH [clock]−1000 [clock]

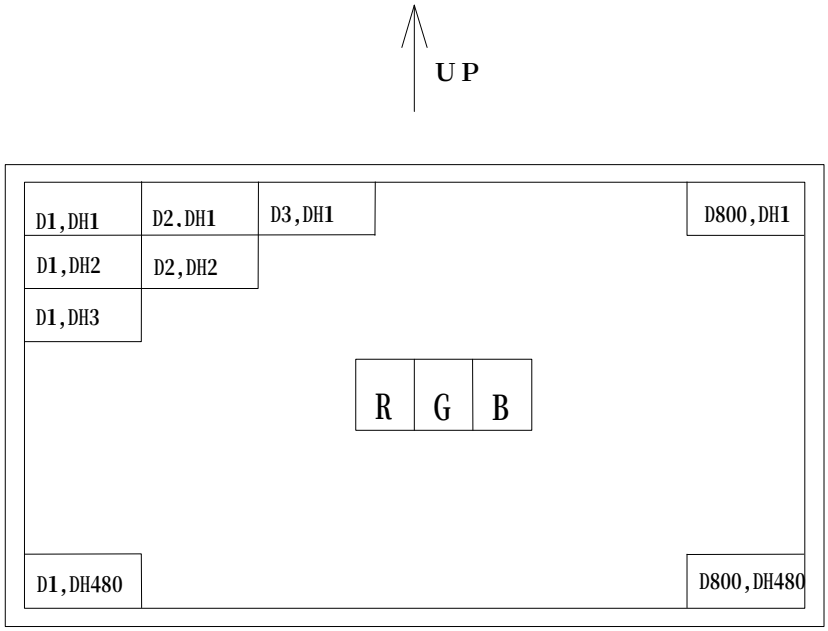
7-3) Vertical display position

Vertical display invalid line [TVs] is fixed 33 line.

HENAB signal must be input during Vertical invalid data period as well as Vertical display period.

7-4) Input Data Signals and Display Position on the screen

Refer to the following figure



Display position of input data (H,V)

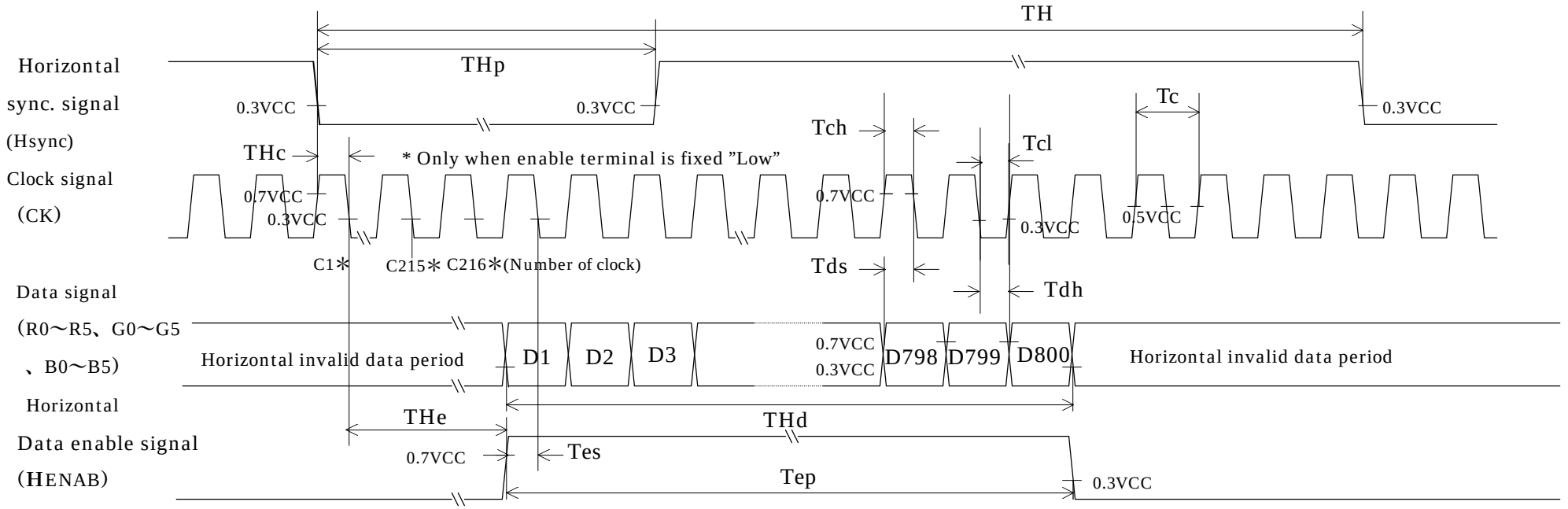


Fig.A－1 Input horizontal signal waveform

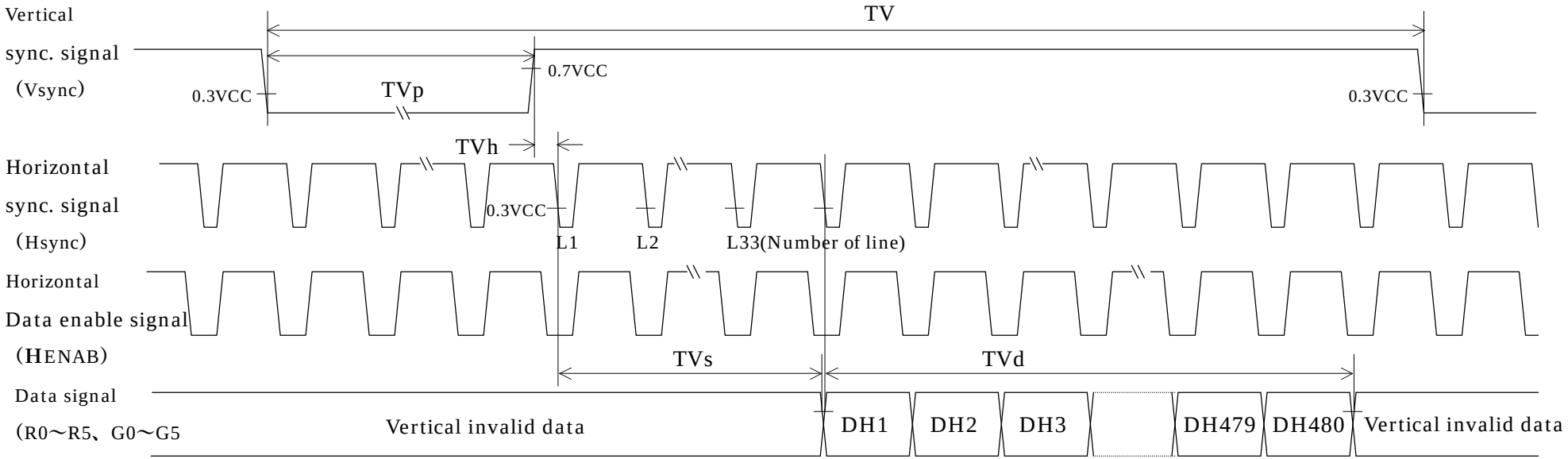


Fig.A－2 Input vertical signal waveform

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

Table 8-1

	Colors &		Data signal												0 :Low level voltage						1 :High level voltage					
	Gray scale	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 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						

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℃, Vcc=+3.3V

Parameter		Symbol	Condition	Min	Typ	Max	Unit	Remarks
Viewing angle range		θ21, θ22	CR=> 5	60	65	—	° (degree)	[Note9-1,4]
		θ11		60	65	—	° (degree)	
		θ12		50	55	—	° (degree)	
Contrast ratio		CRmax	Optimal	100	—	—		[Note9-2]
Response time	Rise	τr	θ=0 °	—	30	60	ms	[Note9-3]
	Fall	τd		—	50	100	ms	
Whit e chromaticity		x	IL=( )mArms θ=0 °	(0.263)	(0.313)	(0.363)		[Note9-4]
		y		(0.279)	(0.329)	(0.379)		
Luminance		Y		(300)	(400)	—	cd/m^2	
Lamp lifetime	+25℃	—	continuation	(10,000)	—	—	hour	[Note9-5]
	-30℃	—	intermission	(2,000)	—	—	time	[Note9-6]

DC/AC inverter for external connection shown in following.
Inverter：(TBD)
※measuring after 30 minutes. It does the optical measurement of the characteristic in the condition which is equal to the darkroom or this using the way of measuring the following Fig B, Fig C.

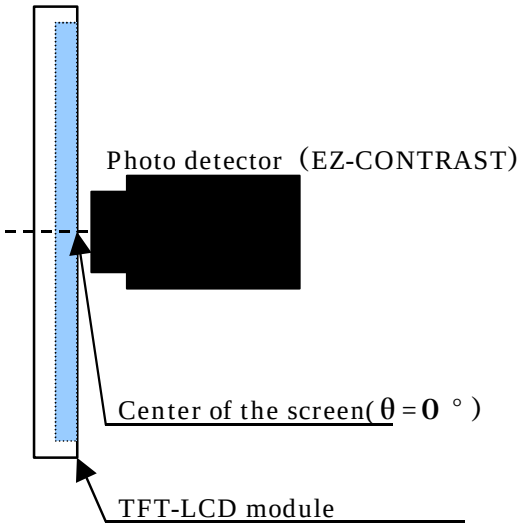


Fig B The way of measuring
Viewing angle range/ Contrast/ Response time

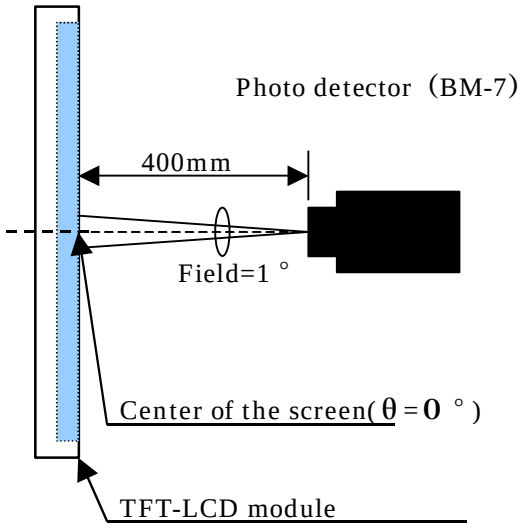
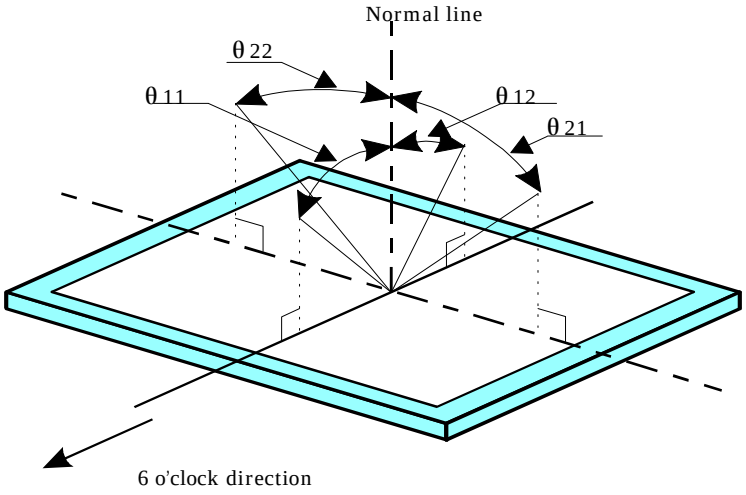


Fig C The way of measuring
Luminance/ Chromaticity

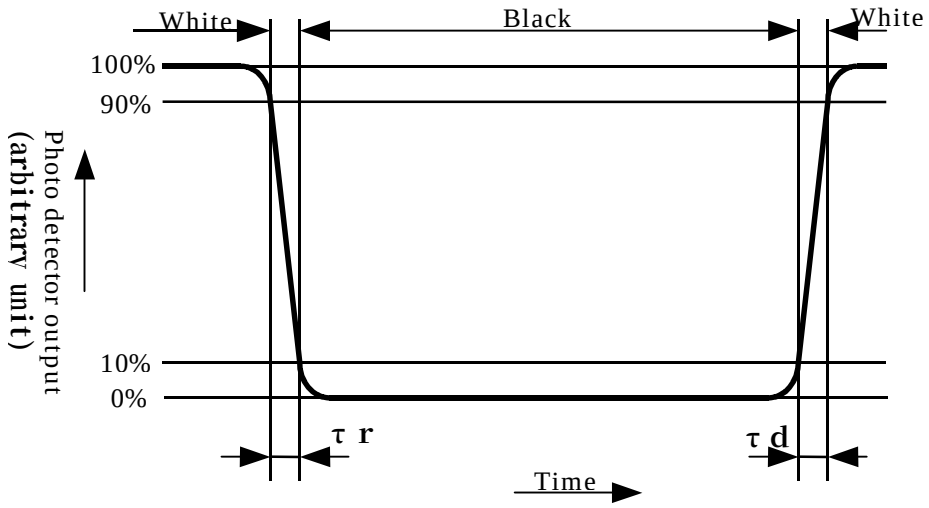
[Note 9-1] Viewing angle range is defined as follows.



[Note 9-2] Contrast ratio of transmission is defined as follows:

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

[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".

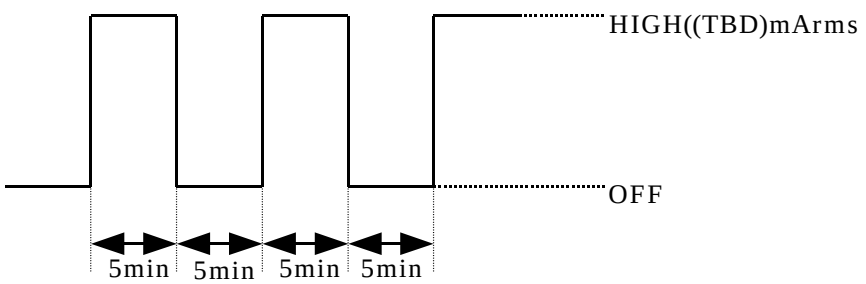


[Note 9-4] Measured on the center area of the panel (After(30) minutes operation)
DC/AC inverter driving frequency: (TBD)kHz

[Note 9-5] Lamp 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 lamp current IL=(TBD)mArms and PWM dimming 100%~5% (Ta=25℃).

[Note 9-6] 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.

Ambient temperature:-30℃



10. Display quality

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

11. Handling instructions

11-1) Mounting of module

The TFT-LCD module is designed to be mounted on equipment using the mounting tabs in the four corners of the module at the rear side.

On mounting the module, as the M2.6 tapping screw fastening torque is 0.25 through 0.30N•m is recommended, 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.

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

Please connect the metallic shielding cases of the module and the ground pattern of the inverter circuit surely. If that connection is not perfect, there may be a possibility that the following problems happen.

a) The noise from the backlight unit will increase.

b) The output from inverter circuit will be unstable. Then, there may be a possibility that some problems happen.

c) In some cases, a part of module will heat.

d) Don't pull a CCFT lead line with the power beyond 10N. It has the possibility of the breakage in the lamp, the connection part of the lead line, and so on.

11-2) 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.

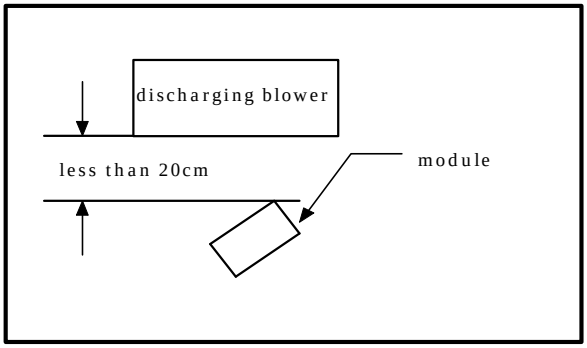
B) Working procedures

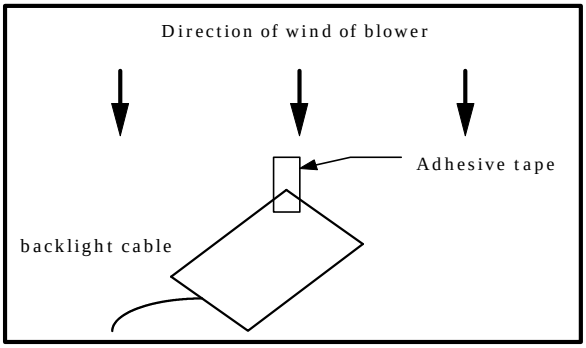
a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently. Keep the distance between module and discharging blower within 20 cm.

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.

11-3) Precautions in adjusting module

Adjusting volumes on the rear face of the module have been set optimally before shipment. Therefore, do not change any adjusted values. If adjusted values are changed, the specifications described here may not be satisfied.

11-4) Caution of product design

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.

11-5) Others

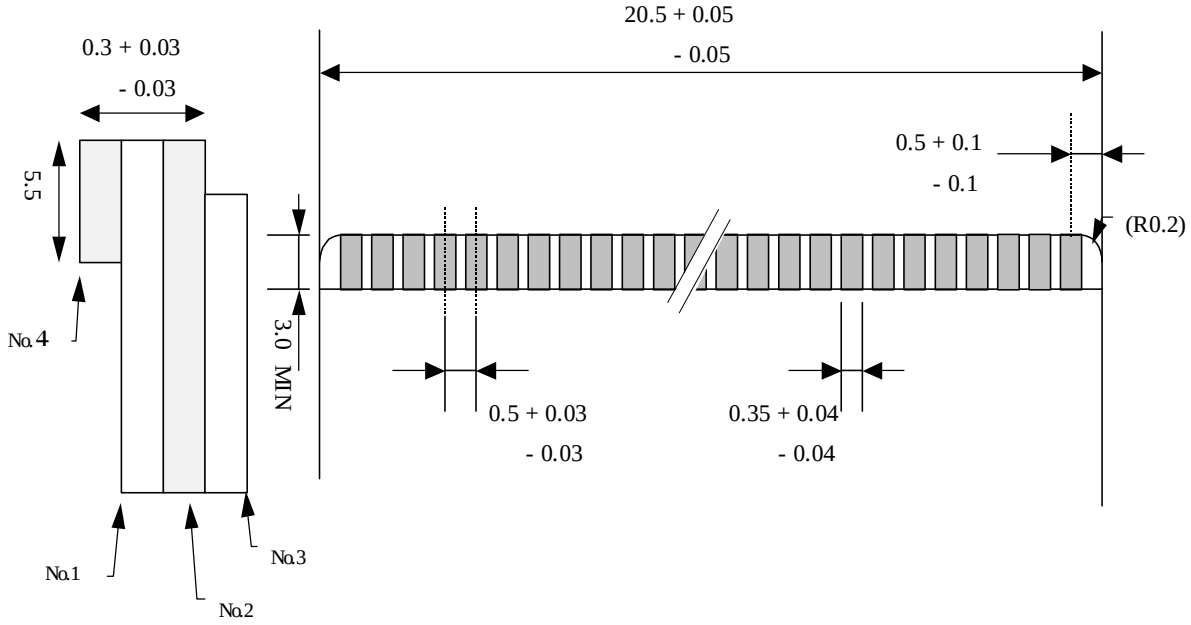
Do not expose the module to direct sunlight or intensive ultraviolet rays for several hours; liquid crystal is deteriorated by ultraviolet rays. Store the module at a temperature near the room temperature. At lower than the rated storage temperature, liquid crystal solidifies, causing the panel to be damaged. At higher than the rated storage temperature, liquid crystal turns into isotropic liquid and may not recover. 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. Observe all other precautionary requirements in handling general electronic components.

12. Packing form

a)Piling number of cartons : MAX (TBD)
b)Package quantity in one carton (TBD) pcs
c)Carton size: (TBD)(W)×(TBD)(H)×(TBD)(D) mm
d)Total mass of one carton filled with full modules: (TBD) kg
e)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.
④Period : about 3 months
⑤Opening 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.

13.Others

a) Adjusting volume have been set optimally before shipment, so do not change any adjusted value. If adjusted value is changed, the specification may not be satisfied.
b) Disassembling the module can cause permanent damage and should be strictly avoided.
c) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.
d) Input/Output connector for TFT-LCD panel driving part
1) Fit FPC : Refer to the following figure
2) Keeping power of terminal : 0.9N/pin or more
[Every terminal is pulled out 25±3 mm/minute]
3) Endurance of insert/ pull out : Double the beginning or less
[In case repeat 20 times to insert/ pull out with fit FPC, changed electrical resistance data of contact]



No.	Parameter	Material
1	Base material	Polyimide or the equivalent [25um thickness]
2	Copper leaf	Copper leaf [35um thickness] solder leaf [2um or less thickness]
3	Coverlay	Polyimide or the equivalent
4	Reinforced sheet	Polyester/ poriimide or the equivalent [188um thickness]

Fit FPC for Input/ Output connecter: 0.5mm pitch

14.Indication of lot number

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

②Indicated contents of the label

LQ070Y5DR04	○○○○○○○○
model No.	lot No.

contents of lot No. the 1st figure ‥ production year (ex. 2003 : 3)
the 2nd figure ‥ production month 1,2,3,‥‥‥,9,X,Y,Z
the 3rd～7th figure ‥ serial No. 00001～
the 8th figure ‥ revision marks A,B,C‥

15. Reliability Test Conditions for TFT-LCD Module

Table 15-1

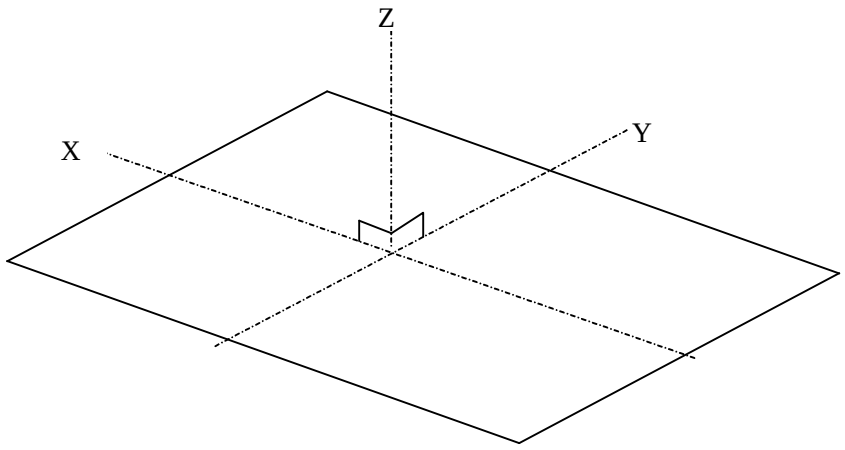
Remark) Temperature condition is based on operating temperature conditions on 5.Table 5-1.

No.	Test items	Test conditions
1	High temperature storage test	Ta= +85℃ 240h
2	Low temperature storage test	Ta= -40℃ 240h
3	High temperature and high humidity operating test	Tp=+60℃ 90%RH 240h
4	High temperature operating test	Tp= +85℃ 240h
5	Low temperature operating test	Ta= -30℃ 240h
6	Electro static discharge test	±200V • 200pF(0Ω) 1 time for each terminals
7	Shock test	980m/s² • 6ms, ±X；±Y；±Z 3 times for each direction （JIS C0041, A-7 Condition C)
8	Vibration test	Frequency：8～33.3Hz, Stroke：1.3mm Frequency：33.3Hz～400Hz, Acceleration：29.4m/s² Sweep cycle：15 minutes X,Z 2 hours for each directions, 4 hours for Y direction (total 8 hours) （JIS D1601）
9	Heat shock test	Ta= -30℃ ～ +85℃ / 200 cycles (0.5h) (0.5h)

[Note] Ta= Ambient temperature, Tp= Panel temperature

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

X,Y,Z directions are shown as follows:



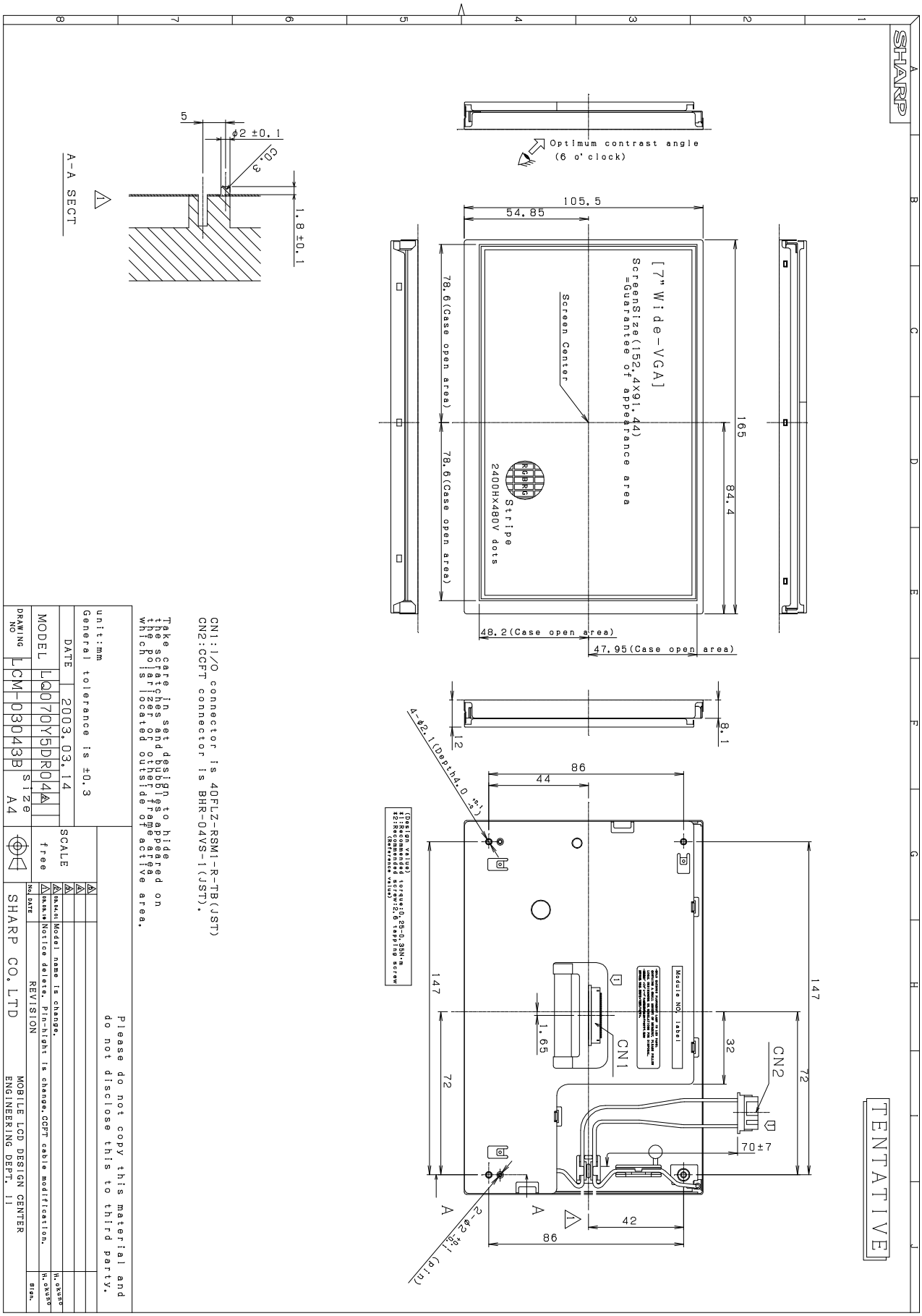


Fig. 1 Outline dimensions