PRODUCT SPECIFICATIONS

SHARP

Liquid Crystal Displays Group

LQ197VC1L17

TFT-LCD Module

(Model No.: LQ197V1L17)

Spec No.: LD-15218

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DEVICE SPECIFICATION FOR

TFT - LCD module

MODEL No. LQ197VC1L17

CUSTOMER'S APPROVAL

DATE

BY

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SHARP

1. Application This specification sheets applies to the color 19.7" VGA TFT-LCD module LQ197VC1L17

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2. Overview

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 circuit, power supply circuit, inverter circuit, back light system and etc. Graphics and texts can be displayed on a 640xRGBx480 dots panel with about 16 million colors by
using LVDS and signal, +5V of +3.3 DC supply voltages and supply voltage for back light. Also, this module includes the DC/AC inverter to drive the CCFT lamps.

.3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	50 (Diagonal)	cm
	19.7 (Diagonal)	inch
Active area	401.28 (H) x 298.8 (V)	mm
Pixel Format	640 (H) × 480 (V) (1pixel = R + G + B dot)	pixel
Pixel pitch	0.627 (H) × 0.6225 (V)	mm
Pixel configuration	B, G, R vertical stripe	
Display mode	Normally black	
Unit Outline Dimensions *1	462.6(W) ×338.5(H) × 45.2(D)	mm
Mass	2300±150	g
Surface treatment	Anti Glare, low reflection coating Hard Coating:2H Haze:23 +/− 5 %	

(*1)Outline dimensions are shown in Fig.1

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V DC power supply)

Using connectors : DF14H-20P-1.25H (Hirose Electric Co., Ltd.)

Corresponding connectors : DF14-20S-1.25C(Connector) (Hirose Electric Co., Ltd.)
DF14-2628SCFA(Terminal) (Hirose Electric Co., Ltd.)

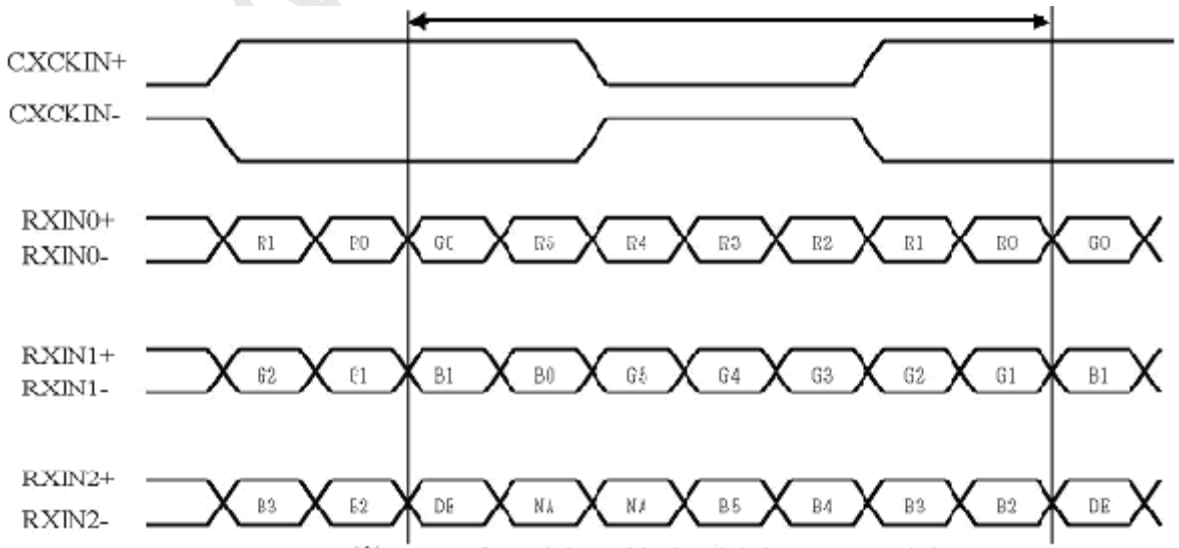
Using LVDS Receiver : Contained in a control IC. [THC63LVDF84A(Thine) compatible]

Corresponding LVDS Transmitter : THC63LVDM83R(Thine) or DSC90C385AMT(NS) or compatible

Pin No.	Symbol	Function	Remark
1	Vcc	+3.3V Power supply	
2	Vcc	+3.3V Power supply	
3	GND	Ground	
4	GND	Ground	
5	RxIN0-	LVDS CH0 data signal (-)	LVDS
6	RxIN0+	LVDS CH0 data signal (+)	LVDS
7	GND	Ground	
8	RxIN1-	LVDS CH1 data signal (-)	LVDS
9	RxIN1+	LVDS CH1 data signal (+)	LVDS
10	GND	Ground	
11	RxIN2-	LVDS CH2 data signal (-)	LVDS
12	RxIN2+	LVDS CH2 data signal (+)	LVDS
13	GND	Ground	
14	RxCLKIN-	LVDS CK- data signal (-)	LVDS
15	RxCLKIN+	LVDS CK+ data signal (+)	LVDS
16	GND	Ground	
17	NC		NC
18	NC		NC
19	GND	Ground	
20	Back	Lighton	

4-2 Data Mapping

Transmitter		20pin LVDS_SET	
Pin No	Data	=L (GND) or Open	=H (3.3V)
51	TA0	R0 (LSB)	R2
52	TA1	R1	R3
54	TA2	R2	R4
55	TA3	R3	R5
56	TA4	R4	R6
3	TA5	R5	R7 (MSB)
4	TA6	G0 (LSB)	G2
6	TB0	G1	G3
7	TB1	G2	G4
11	TB2	G3	G5
12	TB3	G4	G6
14	TB4	G5	G7 (MSB)
15	TB5	B0 (LSB)	B2
19	TB6	B1	B3
20	TC0	B2	B4
22	TC1	B3	B5
23	TC2	B4	B6
24	TC3	B5	B7 (MSB)
27	TC4	(NA)	(NA)
28	TC5	(NA)	(NA)
30	TC6	DE	DE
50	TD0	R6	R0 (LSB)
2	TD1	R7 (MSB)	R1
8	TD2	G6	G0 (LSB)
10	TD3	G7 (MSB)	G1
16	TD4	B6	B0 (LSB)
18	TD5	B7 (MSB)	B1
25	TD6	(NA)	(NA)



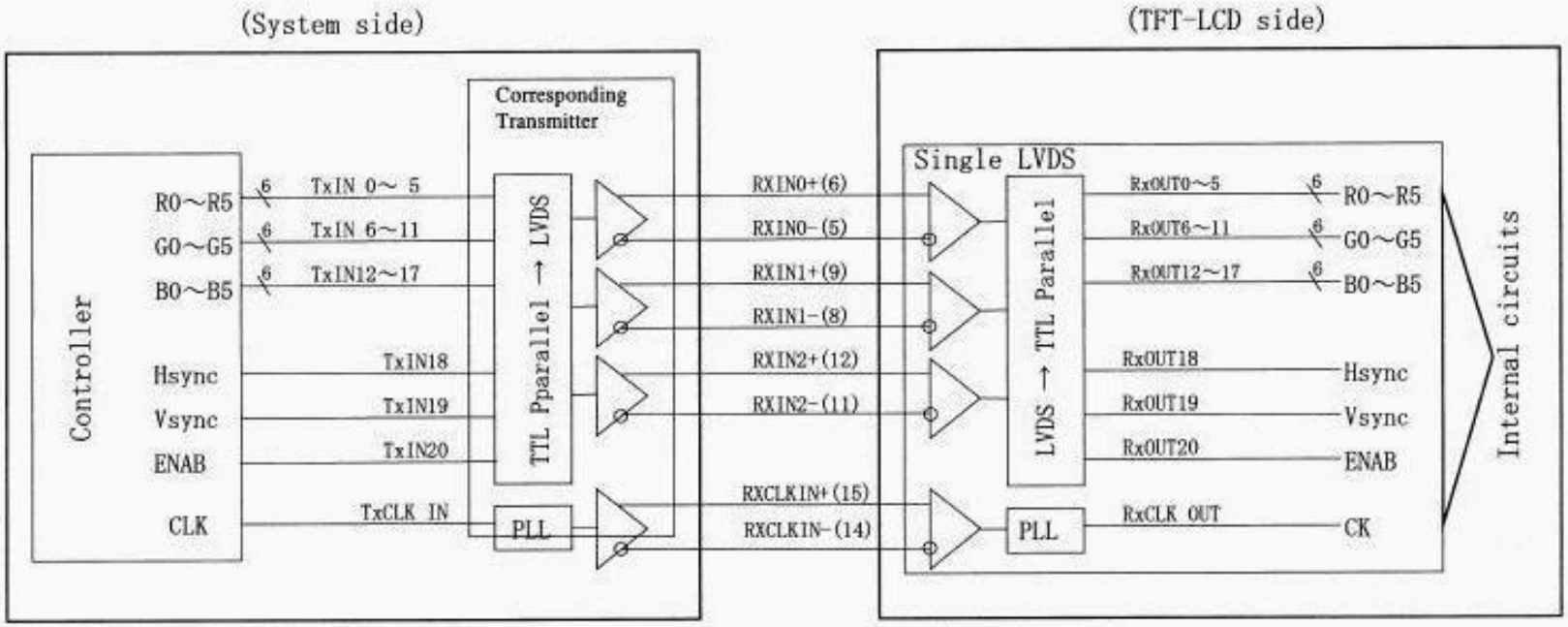
DE : Display Enable
NA : Not Available

※In case of supplying 6 bit signal, it is recommended to connect pin No.17(RXIN3-) with H(3.3V), and No.15(RXIN3+) with L(GND).

4-3 Interface block diagram

Using receiver:Single LVDS interface,which equals THC63LVDF64A(THine),contained in a control IC

Corresponding Transmitter:DS90C363,DS90C383,DS90C363A,DS90C383A,DS90CF563,DS90CF583(National semiconductor), THC63LVDM63R,THC63LVDM83R(THine), SN75LVDS84(Ti)



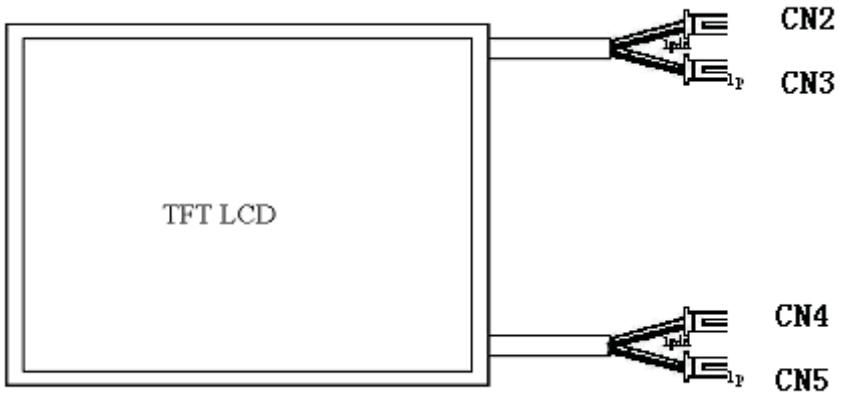
4-4. Backlight

CN 2, 3, 4, 5

The module-side connector：BHSR-02VS-1 (JST)

The user-side connector：SM02-BHSS-1-TB (JST)

Pin no.	symbol	Function	I / O	Cable color
1	VHIGH	Power supply for lamp 1 (High voltage side)	I	Blue or Pink
2	VLOW	Power supply for lamp 1 (Low voltage side)	I	Brown or White



5. Absolute Maximum Ratings 5-1 module

Parameter	Symbol	Condition	Applied pin	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	Vcc	- 0.3 ~ + 4.0	V	【Note1 】
Lamp Input voltage	VHIGH	-	-	0 ~ + 2000	V rms	
Storage temperature	TSTG	-	-	- 30 ~ + 70	℃	
Operating temperature	TOPA	Panel surface	-	0 ~ + 60	℃	
Input voltage	VI1	Ta=25℃	RxIN-/+(i=0,1,2) RxCLKIN-/+	- 0.3 ~ + 0.3	V	
	VI2	Ta=25℃	LVDS_SET	- 0.3 ~ Vcc + 0.3	V	

【Note1 】Humidity：95%RH Max. （ Ta≦40℃ ）Take care of static electricity.

Maximum wet-bulb temperature at 39℃ or less. （ Ta>40℃ ）No condensation.

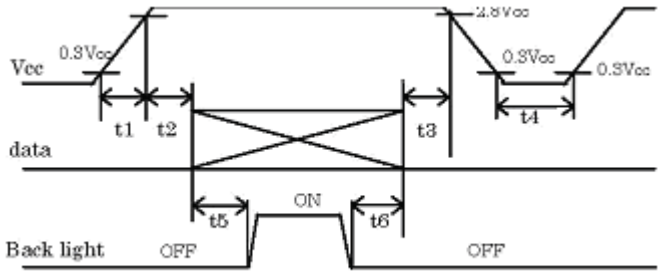
6. Electrical Characteristics

6-1. TFT-LCD panel driving Ta＝25℃

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remark
＋3.3V	Supply voltage		Vcc	+3.0	+3.3	+3.6	V	【Note1 】
	Current dissipation		Icc	—	290	450	mA	【Note2 】
Permissive input ripple voltage			VRF	—	—	100	mVp-p	Vcc=+3.3V
Differential input threshold voltage		High	VTH	—	—	100	mV	VCM=+1.2V 【Note3 】
		Low	VTL	−100	—	—	mV	
Input current (High)			IOH	—	—	±10	μA	VI=2.4V, Vcc=3.6V 【Note4 】
Input current (Low)			IOL	—	—	±10	μA	VI=0V, Vcc=3.6V 【Note4 】
Terminal resistor			RT	—	100	—	Ω	Differential input

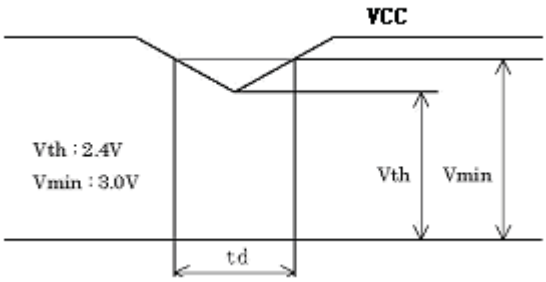
【Note1 】

On-off sequences of Vcc and data



0＜t1≦10ms
0＜t2≦10ms
0＜t3≦1s
1s≦t4
200ms≦t5
200ms≦t6

Dip conditions for supply voltage

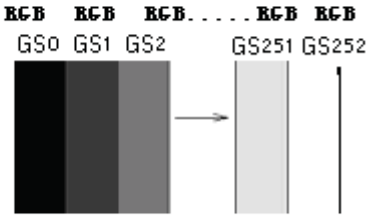


1) Vth ≦ Vcc ≦ Vmin
td ≦ 10ms
2) Vcc ＜ Vth
Vcc-dip conditions should also follow the on-off conditions

It is recommended to consider some timing difference between LVDS input and Backlight input as shown above.

If the Backlight lights on before LCD starting, or if the Backlight is kept on after LCD stopping, the screen may look white for a moment or abnormal image may be displayed. This is caused by variation in output signal from timing generator at LVDS input on or off. It does not cause the damage to the LCD module.

【Note2】 Typical current situation : 253-gray-bar pattern
Vcc= +3.3V, fck= 65MHz, Ta=25℃
Gray scale : GS(n)
n=0～252
The explanation of each gray scale, GS(n), is Described below section 8.



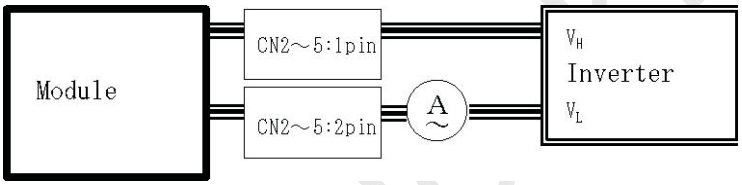
【Note3】 VCM: LVDS Common mode voltage.

【Note4】 VI : Input voltage to LVDS_SET.

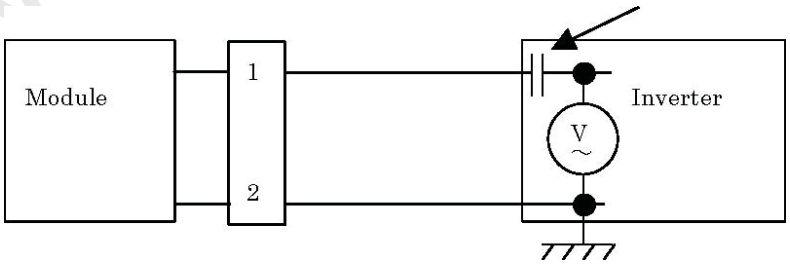
6-2. Backlight The back light system is an edge-lighting type with four CCFTs (Cold Cathode Fluorescent Tube). The characteristics of the lamp are shown in the following table. The value mentioned below is at the case of one CCFT.
CCFT Model Name：KTBE222MSTF-320MA262-Z (STANLEY ELECTRIC CO., LTD.)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Lamp current range	IL	3.5	6.0	7.5	mArms	(Note 1)
Lamp voltage	VL		625	720	Vrms	Ta=25℃, IL =6.0mArms
Lamp powe consumption	PL		3.75	4.32	W	(Note 2) IL =6.0mArms
Lamp frequency	FL	40	60	70	kHz	(Note 3)
Kick-off voltage	Vs			1480	Vrms	Ta=0℃(Note 4)
Lamp life time	TL	50,000			hour	(Note 5)

【Note1 】A lamp can be light in the range of lamp current shown above.
Maximum rating for current is measured by high frequency current measurement equipment connected to VLOW at circuit showed below. (Note : To keep enough kick-off voltage and necessary steady voltage for CCFT.) Lamp frequency : 40～70kHz Ambient temperature : 0～50℃



【Note2 】Referential data per one CCFT by calculation (IL × VL) . The data don't include loss at inverter.
【Note3 】Lamp frequency may produce interference with horizontal synchronous frequency, and this may cause beat on the display. Therefore lamp frequency shall be detached as much as possible from the horizontal synchronous frequency and from the harmonics of horizontal synchronous to avoid interference.
【Note4 】This is transformer output voltage at 27pF for the ballast capacitor of a DC-AC inverter. The kick-off voltage may rise up in the user set, please decide the open output voltage by checking not to occur lighting failure under operating state. The open output voltage should be applied to the lamp for more than 1 second to startup. Otherwise the lamp may not be turned on.



2pin VLOW

【Note5 】Above value is applicable when lamp (the long side of LCD module) is placed horizontally. (Landscape position)
Lamp life time is defined as the time when either ① or ② occurs in the continuous operation under the condition of Ta=25℃ and IL=6.0 mA rms.
① Brightness becomes 50% of the original value under standard condition.
② Kick-off voltage at Ta=0℃ exceeds 1480 Vrms value.
(Lamp lifetime may vary if lamp is in portrait position due to the change of mercury density inside the lamp.)

《Note 》

The performance of the backlight, for example lifetime or brightness, is much influenced by the characteristics of the DC-AC inverter for the lamp. When you design or order the inverter, please make sure that a poor lighting caused by the mismatch of the backlight and the inverter (miss-lighting, flicker, etc.) never occurs. When you confirm it, the module should be operated in the same condition as it is installed in your instrument.

Use the lamp inverter power source incorporating such safeguard as overvoltage / overcurrent protective circuit or lamp voltage waveform detection circuit, which should have individual control of each lamp. In case one circuit without such individual control is connected to more than two lamps, excessive current may flow into one lamp when the other one is not in operation.

Under the environment of 101x or less,miss-lighting or lighting delay may occur..

7. Timing characteristics of input signals

Timing diagrams of input signal are shown in Fig.3

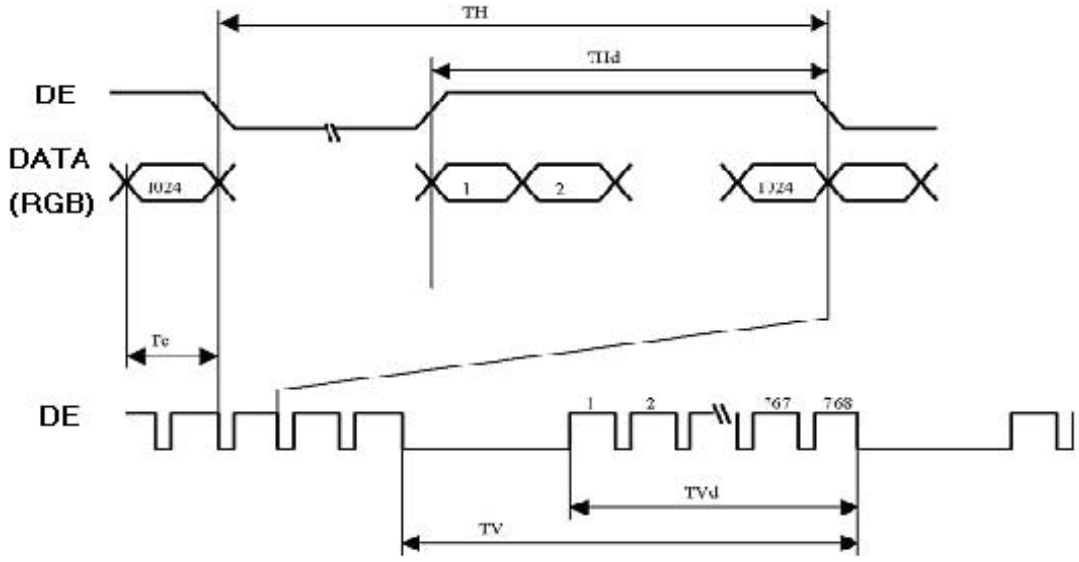
7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
CK(Clock)	Frequency	1/Tc	20.0	25.17	30.0	MHz	【Note 1】
	High time	Tch	10	–	–	ns	
	Low time	Tc1	10	–	–	ns	
Data	Set up time	Tds	5	–	–	ns	
	Hold time	Tdh	10	–	–	ns	
DE(Data Enable) signal	Set up time	Tes	7	–	Tc-15	ns	
	Horizontal period	TH	790	800	1620	Clock	
	Horizontal period (High)	THd	640	640	640	Clock	
	Vertical period	TV	517	525	1000	Line	【Note 2】
	Vertical period (High)	TVd	480	480	480	Line	

【Note 1】 In case of lower frequency, the deterioration of display quality, flicker, and etc, may occur.

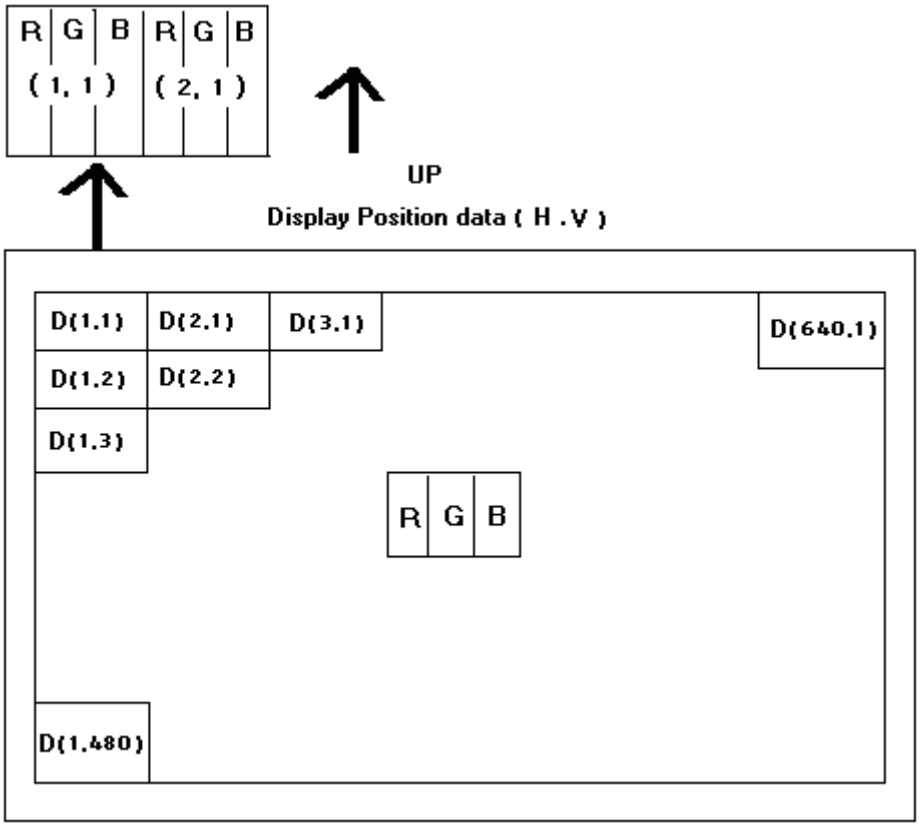
【Note 2】 Be sure to input V0 data during Vertical blanking period.

【Note 3】 It is recommend making sure that length of vertical period is an integral multiple of horizontal length of period. Otherwise, the screen may not display properly.



7-2 Input Data Signals and Display Position on the screen

Graphics and texts can be displayed on a 640 × RGB × 480 dots panel with 16M colors by supplying 18 bit data signal (6bit/color [253 gray scales] × 3).



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

6bit input

	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
	Blue	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. X :Don't care.

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 Ta=25℃, Vcc =+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Vertical	θ 11	CR≧5	40	55	—	Deg.	
		θ 12		70	80	—	Deg.	
	Horizontal	θ 21, θ 22		70	80	—	Deg.	
	Vertical	θ 11	CR≧10	30	45	—	Deg.	
		θ 12		45	55	—	Deg.	
	Horizontal	θ 21, θ 22		50	60	—	Deg.	
Contrast ratio		C R	θ =0°	250	350	—	—	【Note2,4】
Response time		τ d+ τ r	θ =0°	—	16	20	ms	【Note3,4】
Chromaticity of White		Wx	θ =0°	0.283	0.313	0.343	—	【Note4】
		Wy		0.299	0.329	0.359	—	
Chromaticity of Red		Rx	θ =0°	0.551	0.581	0.611	—	
		Ry		0.292	0.322	0.352	—	
Chromaticity of Green		Gx	θ =0°	0.277	0.307	0.337	—	
		Gy		0.516	0.546	0.576	—	
Chromaticity of Blue		Bx	θ =0°	0.121	0.151	0.181	—	
		By		0.097	0.127	0.157	—	
Luminance of white		YL	θ =0°	400	450	—	cd/m²	IL=6.0mArms, f=60kHz 【Note4】
White Uniformity		δ w	θ =0°	—	—	1.25	—	【Note5】

※The measurement shall be executed 30 minutes after lighting at rating.

The optical characteristics shall be measured in a dark room or equivalent state with the method shown in Fig.2 below.

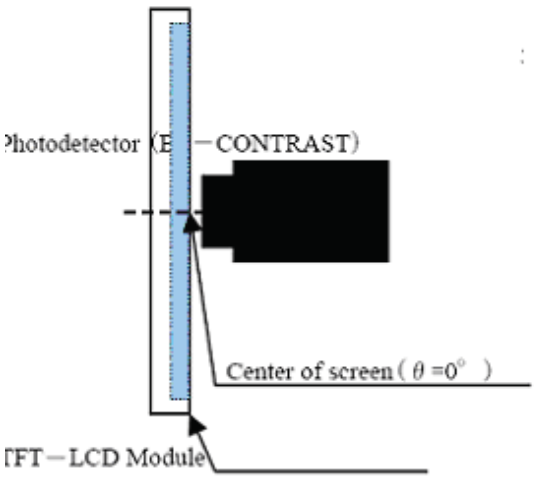


Fig2-1 Viewing angle measurement method

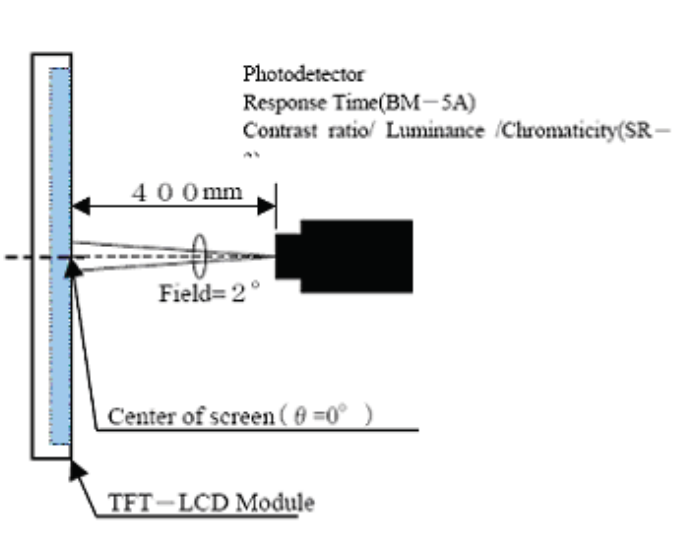
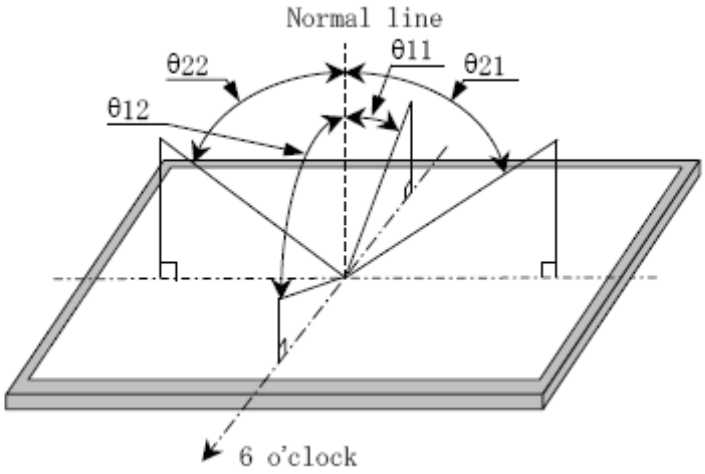


Fig2-2 Luminance/Contrast ratio/Response time/Chromaticity measurement method

Fig2 Optical characteristics measurement method

【Note1 】Definitions of viewing angle range:



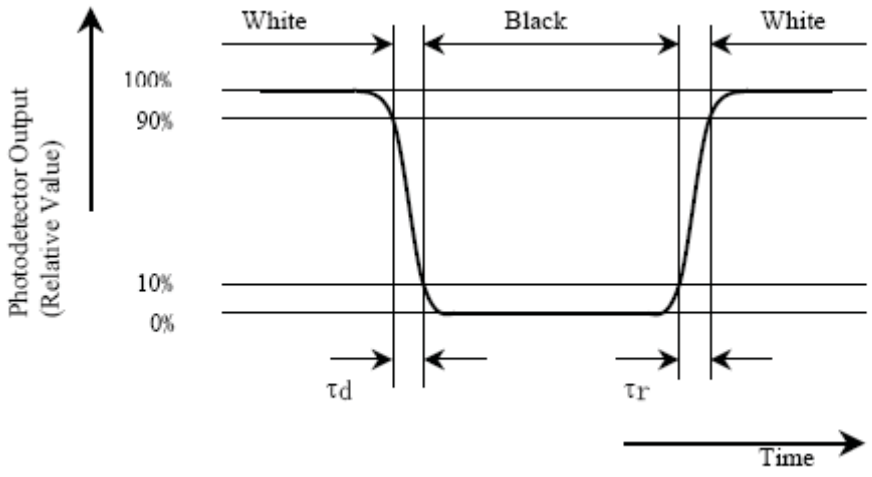
【Note2】Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance (brightness) with all pixels white}}{\text{Luminance (brightness) with all pixels black}}$$

【Note3】Definition of response time:

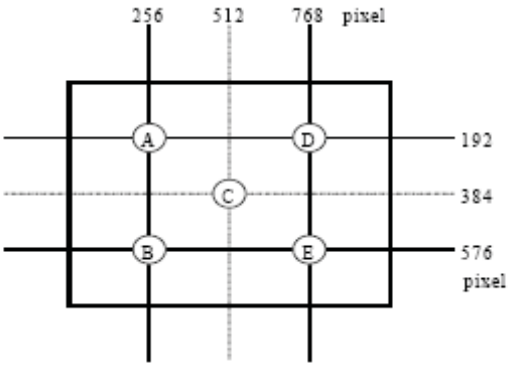
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



【Note4 】This shall be measured at center of the screen.

【Note5 】Definition of white uniformity:

White uniformity is defined as the following with five measurements (A～E).



$$\delta w = \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

10. Handling Precautions

a) Be sure to turn off the power supply when inserting or disconnecting the cable.
b) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.
c) Since the front polarize is easily damaged, pay attention not to scratch it.
d) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.
e) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
f) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care..
g) Since CMOS LSI is used in this module, take care of static electricity and take the human earth into consideration when handling.
h) Make sure the four mounting holes of the module are grounded sufficiently. Take electro-magnetic interference (EMI) into consideration.
i) The module has some printed circuit boards (PCBs) on the back side. Take care to keep them form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.
j) Observe all other precautionary requirements in handling components.
k) Since it is necessary to remove the screw on the back of a module before performing lamp exchange, please take a cabinet design into consideration.
l) When some pressure is added onto the module from rear side constantly, it causes display non-uniformity issue, functional defect, etc. So, please avoid such design.
m) When handling LCD modules and assembling them into cabinets, please be noted that long-term storage in the environment of oxidization or deoxidization gas and the use of such materials as reagent, solvent, adhesive, resin, etc. which generate these gasses, may cause corrosion and discoloration of the LCD modules.

11. Packing form
a) Piling number of cartons : maximum 5 cartons
b) Packing quantity in one carton : 5 module
c) Carton size : 706mm(W) × 532mm(D) × 421mm(H)
d) Total mass of one carton filled with full modules : 25kg.Max
e) Packing form is shown in Fig.3

12. Reliability test items

No	Test item	Conditions	
1	High temperature storage test	Ta = 70℃ 240H	
2	Low temperature storage test	Ta = -30℃ 240H	
3	High temperature & high humidity operation test	Ta = 40℃ , 95%RH 240H (No condensation)	
4	High temperature operation test	Tp = 60℃ 240H (Tp: The temperature of panel surface)	
5	Low temperature operation test	Tp = 0℃ 240H	
6	Vibration test	Waveform : Sine wave Frequency : 10～57Hz/Vibration width (one side) : 0.075mm : 58～500Hz/Gravity : 9.8m/s^2 Sweep time : 11minutes Test period : 3 hours (1 hour for each direction of X,Y,Z)	【Note】
7	Shock test	Max. gravity : 490m/s^2 Pulse width : 11ms, sine wave Direction : ±X, ±Y, ±Z, once for each direction.	【Note】
8	Thermal shock test (non- operating)	Ta=-30℃～70℃ ; 5 cycles Test period : 10 hours (1 hour for each temperature)	
9	Altitude	Ta=50℃,70kPa,3,048m(10,000ft), t=24H (Operating) Ta=70℃,12kPa,15,240m(50,000ft), t=24H (Storage)	
10	ESD test	Contact discharge (150pF 330Ω) non-operating = ±10kV, operating = ±8kV Atmospheric discharge (150pF 330Ω) non-operating = ±20kV, operating = ±15kV	
11	EMI	Measurement in 10m site Display position on the screen = "H" (full-screen), GND to 4 place = un-connect, Vcc / Vsignal = typ.	VCCI (Class B)

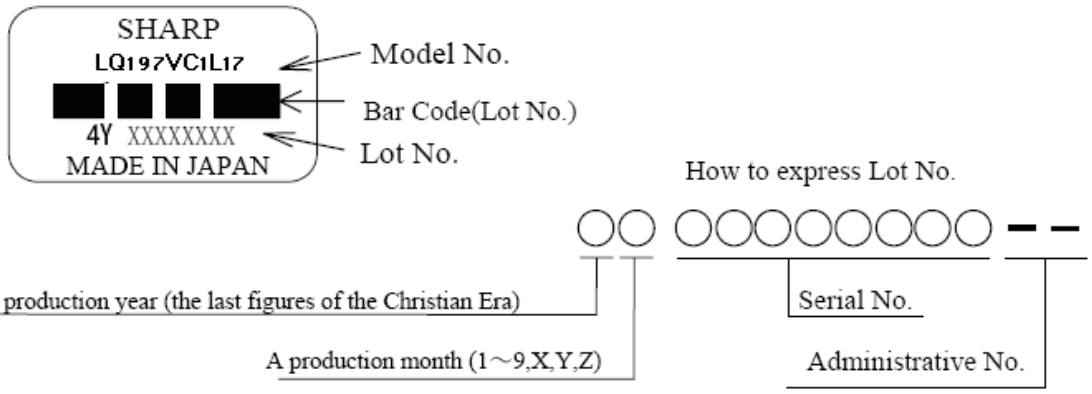
【Note 】 A gap of panel shall not occur by vibration or the shock.

【Result Evaluation Criteria】

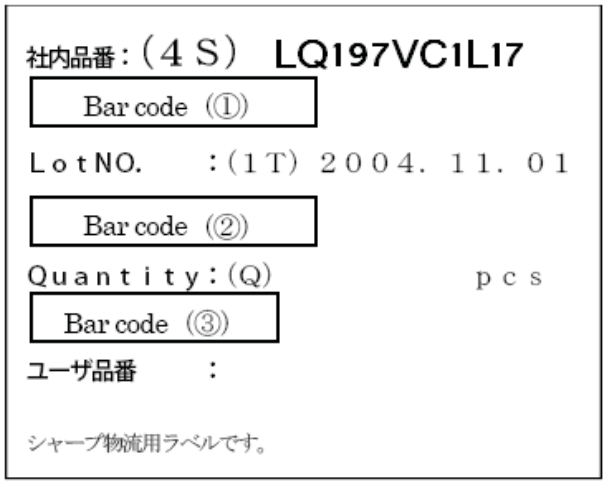
Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

13. Others

1) Lot No. and indication Bar Code Label:



2) Packing Label



① Model No. (LQ197VC1L17)

② Lot No. (Date)

③ Quantity

3) 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.

4) Disassembling the module can cause permanent damage and should be strictly avoided.

5) Please be careful since image retention may occur when a fixed pattern is displayed for a long time.

6) The chemical compound which causes the destruction of ozone layer is not being used.

7) Warning of mercury and material information of LPG (Light Pipe Guide) are labeled on the back of the module.

MATERIAL INFORMATION
>PLASTIC LIGHT GUIDE:PMMA<

8)Cold cathode fluorescent lamp in LCD PANEL contains a small amount of mercury, Please follow local ordinances or regulations for disposal. (put on the back of the module.)

COLD CATHODE FLUORESCENT LAMP IN LCD PANEL
CONTAINS A SMALL AMOUNT OF MERCURY, PLEASE
FOLLOW LOCAL ORDINANCES OR REGULATION FOR DISPOSAL
当該液晶ディスプレイパネルは蛍光管が組み込まれていますので、地方自治体の条例、または、規則に従って廃棄ください。

9) This specification document's Japanese language version is also available. Its Number (SPEC.No.) is LD-15218

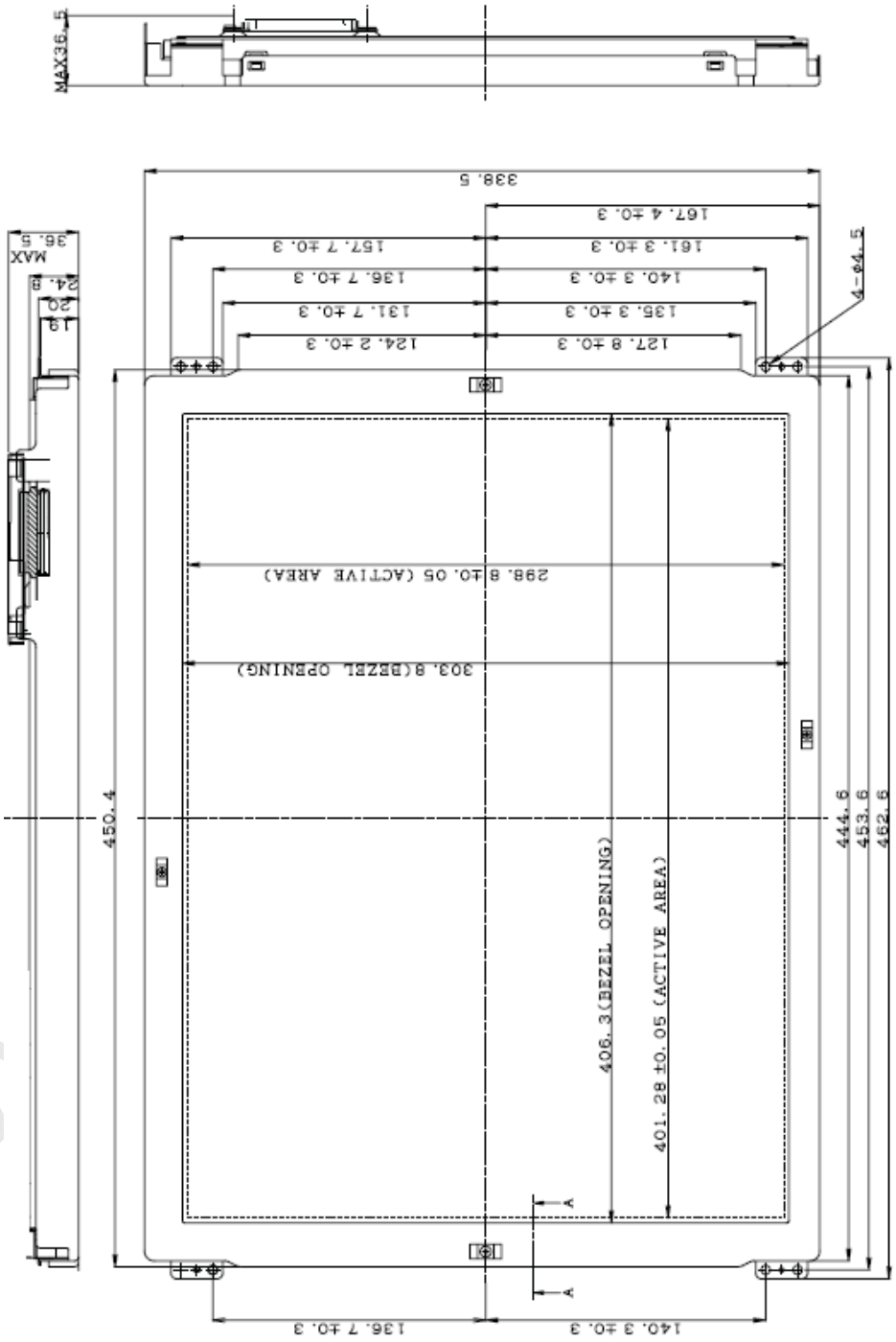
10) When any question or issue occurs, it shall be solved by mutual discussion.

14. Carton storage condition

Temperature 0℃ to 40℃
Humidity 95%RH or less

Reference condition : 20℃ to 35℃ , 85%RH or less (summer)
5℃ to 15℃ , 85%RH or less (winter)
the total storage time (40℃,95%RH) : 240H or less

Sunlight	Be sure to shelter a product from the direct sunlight.
Atmosphere	Harmful gas, such as acid and alkali which bites electronic components and/or wires must not be detected.
Notes	Be sure to put cartons on palette or base, don't put it on floor, and store them with removing from wall Please take care of ventilation in storehouse and around cartons, and control changing temperature is within limits of natural environment
Storage period	1 year



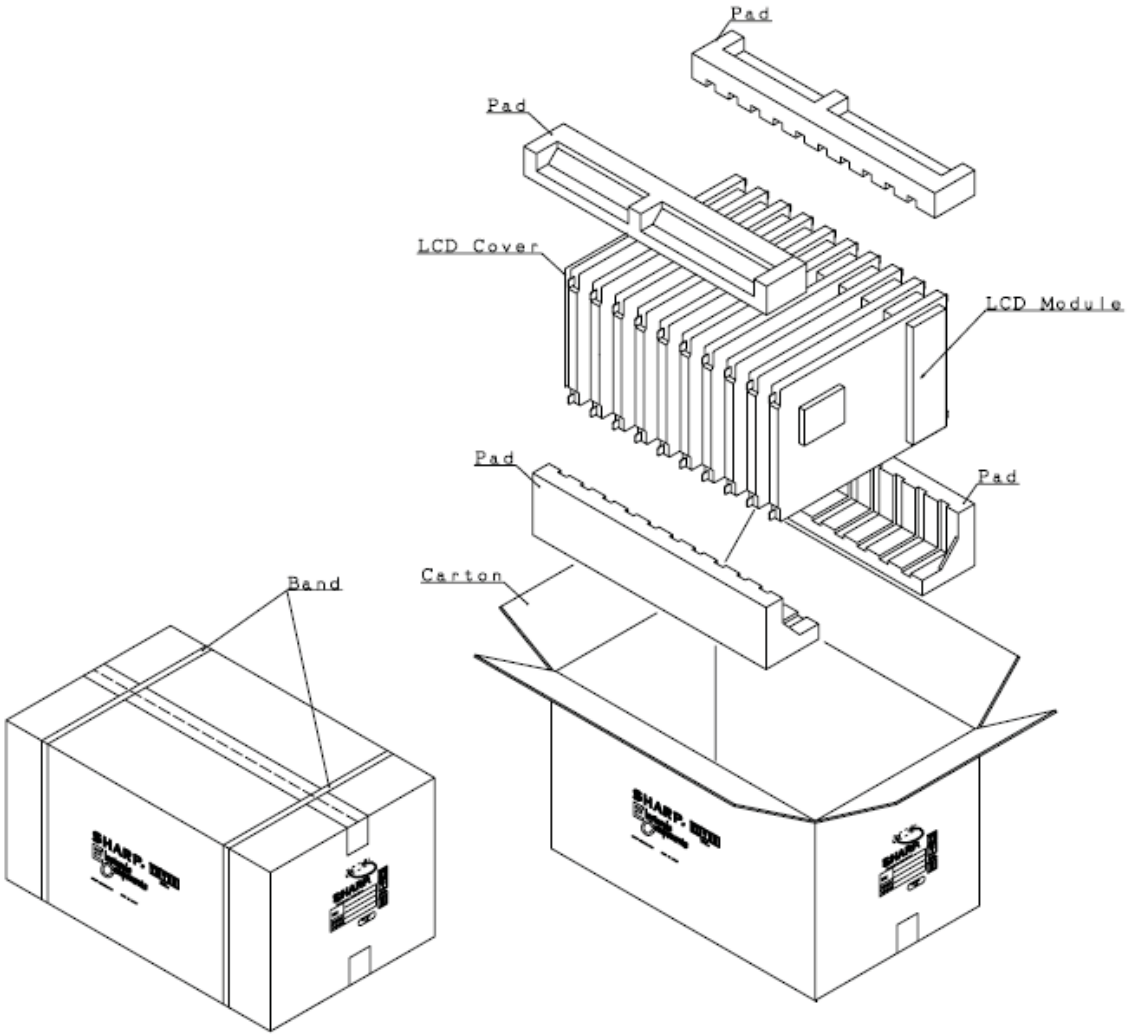


Fig. 6 PACKIG FORM

SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

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