DEVICE SPECIFICATION FOR

TFT - LCD module

MODEL No. LQ197V3DZ31

CUSTOMER'S APPROVAL

DATE _____

BY _____

PRESENTED

BY *Makoto Takeda*
M. TAKEDA
Department General manager
Development Engineering Dept. 2
AVC LIQUID CRYSTAL DISPLAY Division
AVC LIQUID CRYSTAL DISPLAY GROUP
SHARP CORPORATION

RECORDS OF REVISION

MODEL No : LQ197V3DZ31

SPEC No : LD-14402

	NO.	PAGE	SUMMARY	NOTE
2002.09.06		-	-	1st Issue

1. Application
This specification applies to the color 19.7" VGA TFT-LCD module LQ197V3DZ31.

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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 and back light system etc. Graphics and texts can be displayed on a 640× RGB× 480 dots panel with 262,144 colors by supplying data signal of 18 bit(6 bit x RGB), 4 kinds of timing signal, +5V of DC supply voltages and supply voltage for back light.
This module also 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) x 480 (V)	pixel
	1pixel = B + G + R dot	
Pixel pitch	0.627 (H) x 0.6225 (V)	mm
Pixel configuration	B, G, R vertical stripe	
Display mode	Normally black	
Unit Outline Dimensions *1	462.6 (W) x 338.5 (H) x 45.2 (D)	mm
Mass	3910± 50	
Surface treatment	Anti glare, low reflection coating Hard coating: 2H Haze: 23 +/- 5%	

(*1)Outline dimensions are shown in Fig.5

4. Input Terminals

4-1. TFT panel driving

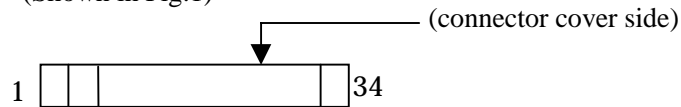CN3 (Using connector) : 34FLZX-RSM1-A-TB (JST)

(Shown in Fig.1)

(connector cover side)

1 [ ][ ][ ][   ][ ] 34

Fig.1 Location sketch of input terminals.

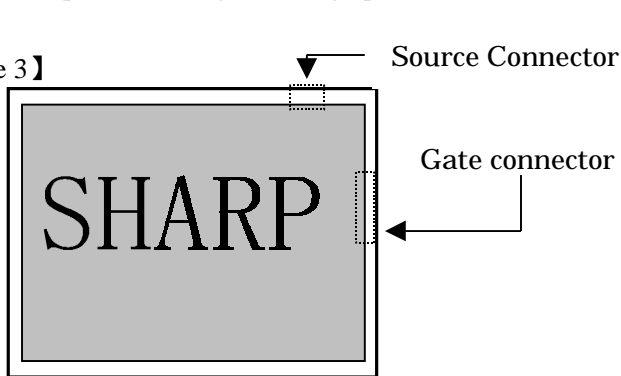| Pin No.	Symbol	Function	Remarks
1	GND		
2	GND		
3	CK	Clock signal(sampling each data)	
4	Hsync	Horizontal synchronized signal	Note 1
5	Vsync	Vertical synchronized signal	Note 1
6	GND		
7	R0	Red data signal (LSB)	
8	R1	Red data signal	
9	R2	Red data signal	
10	R3	Red data signal	
11	R4	Red data signal	
12	R5	Red data signal (MSB)	
13	GND		
14	G0	Green data signal (LSB)	
15	G1	Green data signal	
16	G2	Green data signal	
17	G3	Green data signal	
18	G4	Green data signal	
19	G5	Green data signal (MSB)	
20	GND		
21	B0	Blue data signal (LSB)	
22	B1	Blue data signal	
23	B2	Blue data signal	
24	B3	Blue data signal	
25	B4	Blue data signal	
26	B5	Blue data signal (MSB)	
27	GND		
28	ENAB	Data enable signal(horizontal position)	Note 2
29	Vcc	+5V Power Supply	
30	Vcc	+5V Power Supply	
31	Vcc	+5V Power Supply	
32	Vcc	+5V Power Supply	
33	R/L	Reverse terminal of Right and Left	Note 3
34	U/D	Reverse terminal of Up and Down	Note 3

*Contorol circuit's shield case contacts GND(Ground) of LCD module electrically.

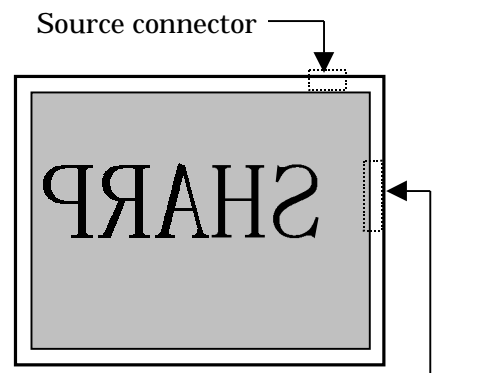Note 1   The polarity combination of the Hsync.,Vsync.

Hsync	Negative
Vsync	Negative

Note 2   The horizontal display start timing is settled in accordance with a rising timing of ENAB signal.

In case of ENAB being fixed at "Low", the horizontal start timing is determined as described in 7-2.
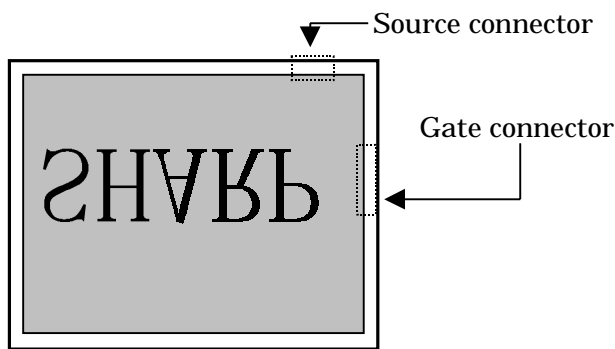
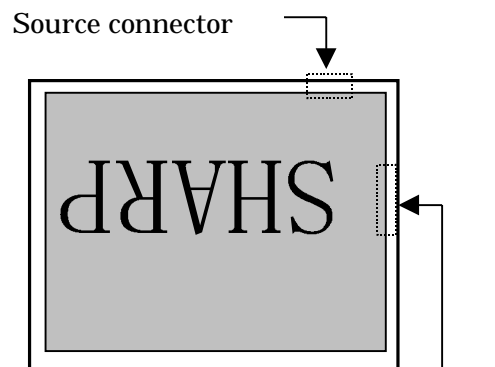Don't keep ENAB " High " during operation.

Note 3

R/L : L
U/D : L

R/L : H
U/D : L

R/L : L
U/D : H

R/L : H
U/D : H

4-2. Backlight driving

CN1 (Inverter control)   Using connector: S3B-PH-SM3-TB (JST).

Corresponding connector: PHR-3 (JST).

Pin No.	Symbol	Function	Remark
1	V_{ON}	ON/OFF	Note 1
2	V_{BRT}	Brightness Control	Note 2
3	GND	GND	

Note 1   ON/OFF Function

Input voltage	Function
5V	Inverter: ON
0V	Inverter: OFF

Note 2   Brightness control function

Brightness control is available for 0 – 5 V analog input voltage.

Input voltage	Function
5V	Brightness Control (7%): (Dark)
0V	Brightness Control (100%): (Bright)

CN2 (Inverter power)   Using connector: S6B-PH-SM3-TB (JST).
                            Corresponding connector: PHR-3 (JST).

Pin No.	Symbol	Function
1	V_{INV}	12V
2	V_{INV}	12V
3	V_{INV}	12V
4	GND	GND
5	GND	GND
6	GND	GND

   *Inverter circuit's GND separates from GND(Ground) of LCD module electrically ,
    though its Shield case contacts.

4-3. Lamp characteristics

   The backlight system is under-lighting type with 10 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.

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lifetime	T_L	50000	-	-	hour	Note 1

Note 1: Lamp lifetime is defined as the time when the situation 1 occurs in the continuous operation under the
         condition of Ta=25 degree and brightness control (100%).
         1. Brightness becomes 50% of the original value under standard condition.

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage (for Control)	V_I	Ta=25 degree	-0.3 ~ 3.6	V	Note 1
5V supply voltage (for Control)	Vcc	Ta=25 degree	0 ~ + 6	V	
Input voltage (for Inverter)	V	Ta=25 degree	0 ~ + 6	V	
12V supply voltage (for Inverter)	V_{INV}	Ta=25 degree	0 ~ +14	V	
Storage temperature	Tstg	-	-25 ~ +60	Degree	Note 2
Operation temperature (Ambient)	Topa	-	0 ~ +40	Degree	

   Note 1: CK, R0 R5, G0 G5, B0 B5, Hsync, Vsync, ENAB, R/L, U/D

   Note 2: Humidity 95%RH Max. (Ta 40 degree)
            Maximum wet-bulb temperature is 39 degree or less. (Ta>40 degree)
            No condensation.

6. Electrical Characteristics

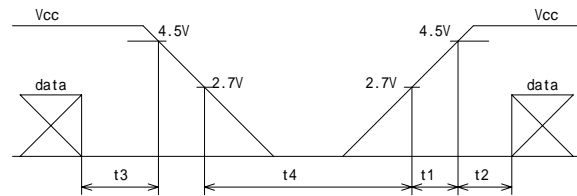6-1. Control circuit driving   Ta=25 degree

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+5V supply voltage	Supply voltage	Vcc	+4.5	+5.0	+5.5	V	Note 1
	Current dissipation	Icc	-	450	540	mA	Note 2
Permissive input ripple voltage		V$_{RP}$	-	-	100	mV$_{P-P}$	Vcc=+5.0V
Input Low voltage		V$_{IL}$	-	-	1.0	V	Note 3
Input High voltage		V$_{IH}$	2.3		3.6	V	
Input leak current (Low)		I$_{OL1}$	-	-	5.0	μ A	V$_I$=0V Note 4
		I$_{OL2}$	-	-	10	μ A	V$_I$=0V Note 5
Input leak current (High)		I$_{OH1}$	-	-	1.0	μ	V$_I$ =5V Note 6
		I$_{OH2}$	-	-	550	μ	V$_I$ =5V Note 7

Note 1

  1) Input voltage sequences

  $0 < t1$ 10ms, $0 < t2$ 10ms,
  $0 < t3$ 1s,   t4   1s.

  2) Dip conditions for supply voltage
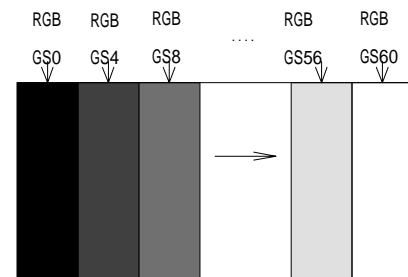   a) 2.7V   Vcc < 4.5V
       td   10ms.

   b) Vcc < 2.7V

      Dip conditions for supply voltage
      are based on input voltage sequences.

Note 2   Typical current situation: 16 gray-bar pattern(below figure 480 line mode, Vcc=+5.0V).
         The explanation of RGB gray scale is seen in section 8.

Note 3   CK   R0   R5   G0   G5   B0   B5   Hsync   Vsync
         ENAB   R/L, U/D
Note 4   CK   R0   R5   G0   G5   B0   B5   Hsync   Vsync, ENAB
Note 5   R/L
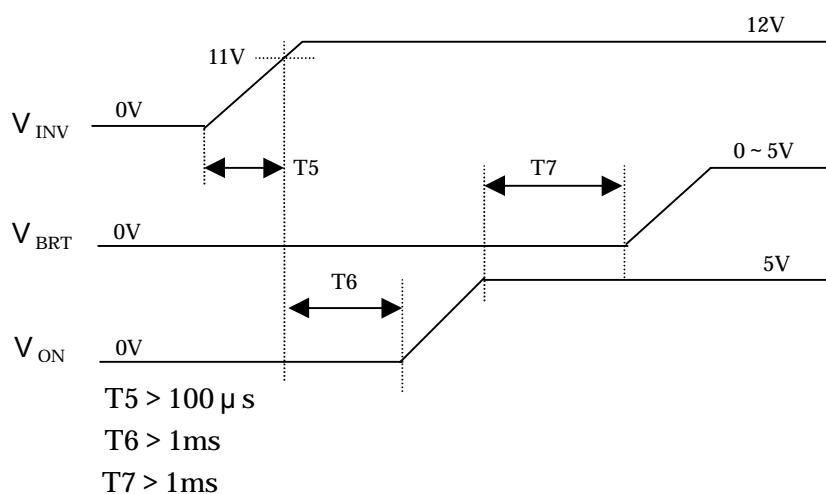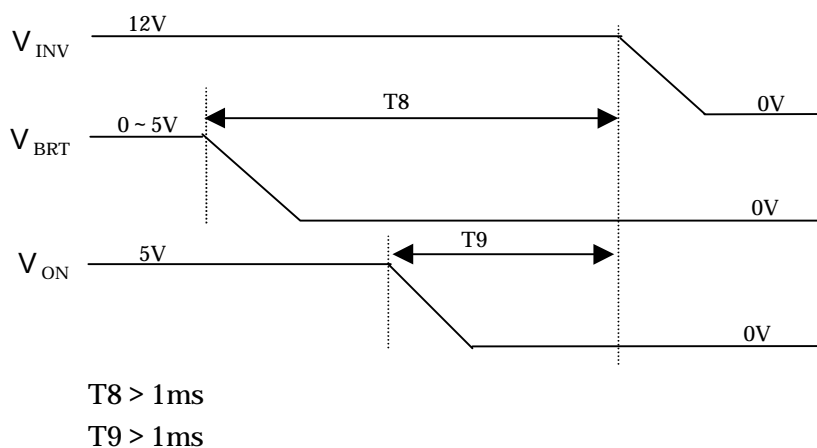Note 6   CK,R0   R5   G0   G5   B0   B5   Hsync   Vsync
Note 7   ENAB, U/D

6-2. Inverter driving for back light

The back light system is under-lighting type with 10 CCFTs (Cold Cathode Fluorescent Tube).

Ta=25

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
12V	Current dissipation	I_{INV}	-	3.4	4.1	A	$V_{BRT}=0V$, $V_{INV}=12V$, $V_{ON}=5V$
	Supply voltage	V_{INV}	11.0	12.0	13.0	V	Note 1
Input voltage (Low)		V_{ONL}	0	-	0.5	V	Note 2
Input voltage (High)		V_{ONH}	3.0	-	5.0	V	impedance =24.7k
Brightness control voltage (100%)		V_{BRT}	0	-	0.3	V	Note 3　Note 4
Brightness control voltage		V_{BRT}	0.7	-	5.0	V	impedance =20.6k

Note 1　1)V_{INV}-turn-on condition

T5　100μ s
T6　1ms
T7　1ms

V_{INV}-turn-off condition

T8　1ms
T9　1ms

Note 2　V_{ON}

Note 3　V_{BRT}

Note 4　Refrain from using the device under the condition of $V_{BRT} = 0.5± 0.2V$ because of the possibility of flicker on display. In case of $V_{BRT} > 5.0V$, the protective circuit may stop driving the inverter.

7. Timing characteristics of input signal

Timing diagrams of input signal are shown in Fig.2.

7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	-	25.2	30.0	MHz	
	High time	Tch	5	-	-	ns	
	Low time	Tc1	10	-	-	ns	
Data	Set up time	Tds	5	-	-	ns	
	Hold time	Tdh	10	-	-	ns	
Horizontal synchronized signal	Cycle	TH	30.00	31.78	-	μ s	
			770	800	900	Clock	
	Pulse width	THp	2	96	200	Clock	
Vertical synchronized signal	Cycle	TV	515	525	560	Line	
	Pulse width	TVp	2	-	34	Line	
Horizontal display area		THd	640	640	640	Clock	
Hsync-Clock phase difference		THc	10		Tc-10	ns	
Hsync-Vsync phase difference		TVh	0		TH-THp	Clock	

Note 1: In case of lower frequency, the deterioration of display quality, flicker etc, may be occurred.

Note 2: In case of turn-off, turn-off may be after input signal for "black".

7-2. Horizontal display position

The horizontal display position is determined by the rising edge of ENAB signal.

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Enable signal	Set up time	Tes	5	-	Tc-10	ns	
	Pulse width	Tep	2	640	640	Clock	
Hsync-ENAB signal phase difference		THe	44	-	TH-664	Clock	

Note) When ENAB is fixed at "Low", the display starts from the data of C104 (clock) as shown in Fig.2.

7-3. Input data signal and display position on the screen

Display position of input data(H, V)

Fig.2 Input signal waveforms

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

Color & 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 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

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 degree, Vcc=+5V , V_{INV}=   12V

Ta=25 degree, Vcc=+5V , V_{INV}=   12V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	21 22	CR 10	80	85	-	Deg.	Note1,4 V_{BRT}=0V
	Vertical	11 12		80	85	-	Deg.	
Contrast ratio		CRn	Best Viewing Angle	400	500	-		Note2,4 V_{BRT}=0V
Response time	Rise	r		-	10	-	ms	Note3,4 V_{BRT}=0V
	Decay	d		-	15	-	ms	
Chromaticity of white		x	=0 deg.	0.283	0.308	0.333	-	Note 4 V_{BRT}=0V
		y		0.281	0.306	0.331		
		x		0.276	0.301	0.326	-	Note 4 V_{BRT}=5V
		y		0.270	0.295	0.320	-	
Luminance of white		Y_{L1}		357	450	-	Cd/	Note 4 V_{BRT}=0V
		Y_{L1}		-	30	-	Cd/	Note 4 V_{BRT}=5V
Luminance uniformity				-	-	1.25		Note 5 V_{BRT}=0V

*The measurement, in a dark room or equivalent condition, shall be executed 30 minutes after lighting at rating.
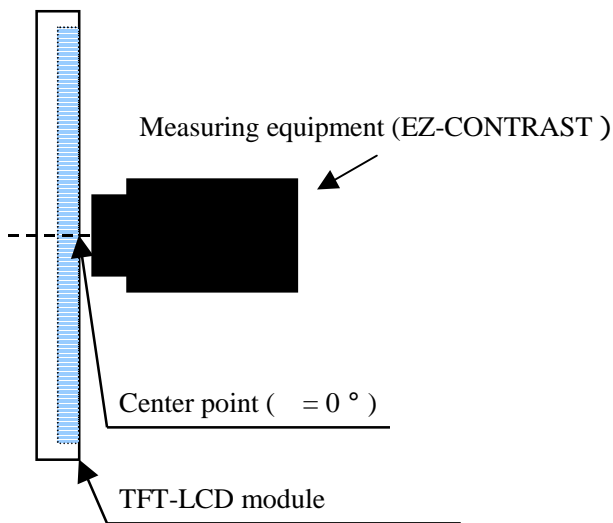

Fig.3-1 Schematic diagram of measurement of Viewing angle and Contrast ratio.
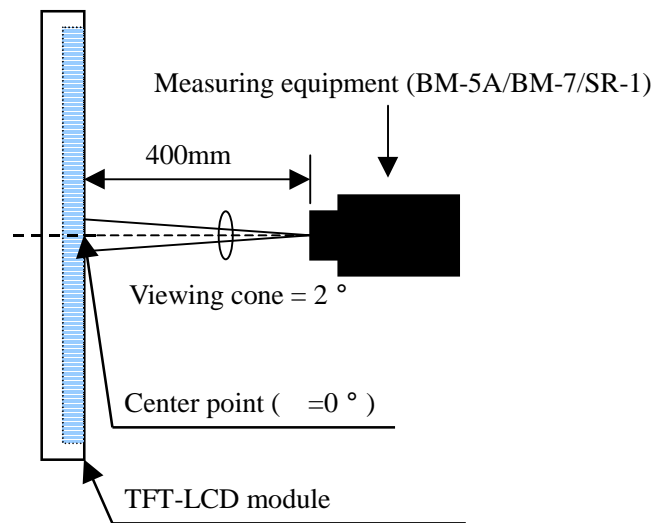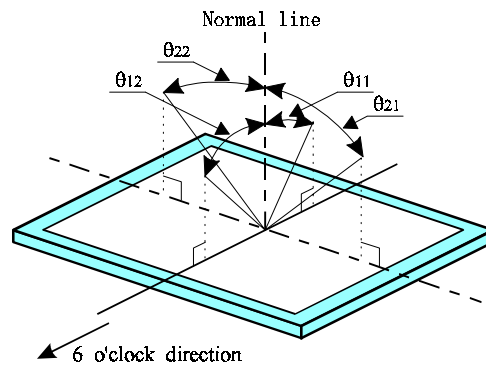

Fig.3-2 Schematic diagram of measurement of Luminance, Chromaticity and Response time.
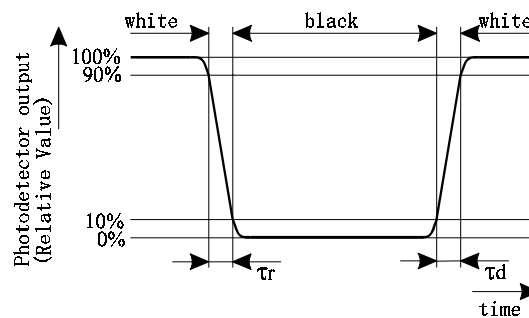
Note 1   Definitions of viewing angle range :

Note 2   Definition of contrast ratio :

The contrast ratio is defined as the following.

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

Note 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".

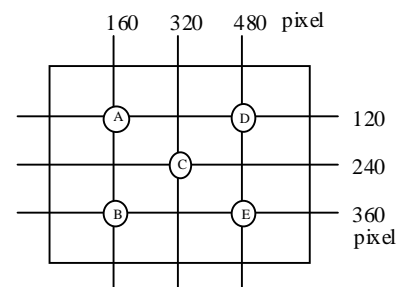

Note 4   This shall be measured at center of the screen.

*Luminance, Response time and Chromaticity are measured on the center area of the panel at a viewing cone 2°
by TOPCON luminance meter BM-7, luminance meter BM-5A and chromaticity meter SR-1.

*Viewing angle and Contrast ratio are measured on the center area by ELDIM photodetector EZ-CONTRAST.

Note 5   Definition of Luminance uniformity;

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

$$\frac{\text{maximum Luminance of five points(brightness)}}{\text{minimum Luminance of five points(brightness)}}$$

10. Display Quality

The display quality of the color TFT-LCD module shall be compliance with the incoming inspection standard.

11. Warning

The module includes the inverter circuit, which generates high voltage. Do not touch the inverter cover and CCFT lamp terminals in current carrying. Clearly, alert the possibility of the inverter touched by someone.

12. Handling Precautions of the module

a) Be sure to turn off the power supply when inserting or disconnecting the cable.

b) Brightness control voltage is switched for "ON" and "OFF", as shown in Fig.4. Voltage difference generated by this switching, V_{INV}, may affect a sound output, etc. when the power supply is shared between the inverter and its surrounding circuit. So, separate the power supply of the inverter circuit with the one of its surrounding circuit.
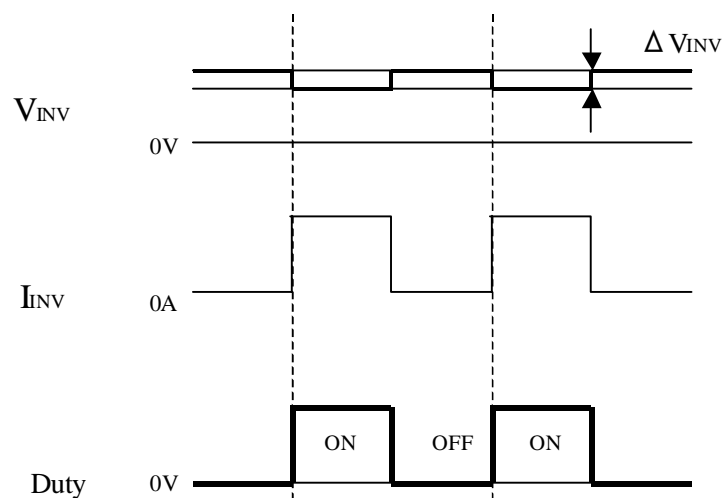
Fig.4 Brightness control voltage.

c) Be sure to fix the module in the same plane so that the module can be installed without any extra stress such as warp or twist.

d) Since the front polarizer is easily damaged, pay attention to treat it.

e) Since long contact with water may cause discoloration or spots, wipe off water drop immediately.

f) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.

g) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface. Handle with care.

h) Since CMOS LSI is used in this module, take care of static electricity and consider wearing the earth personnel when handling.

i) Observe all other precautionary requirements in handling components.

j) Blow off dust with N2 blower for which static electricity preventive measure has been taken. Ionized air gun is recommended.

12. Packing form

a) Piling number of cartons: 4 (maximum)

b) Packing quantity in one carton: 2

c) Carton size: 393mm(W) x 293mm(H) x 515mm(D)

d) Total mass of one carton filled with full modules: 9.38kg

13. Reliability test items

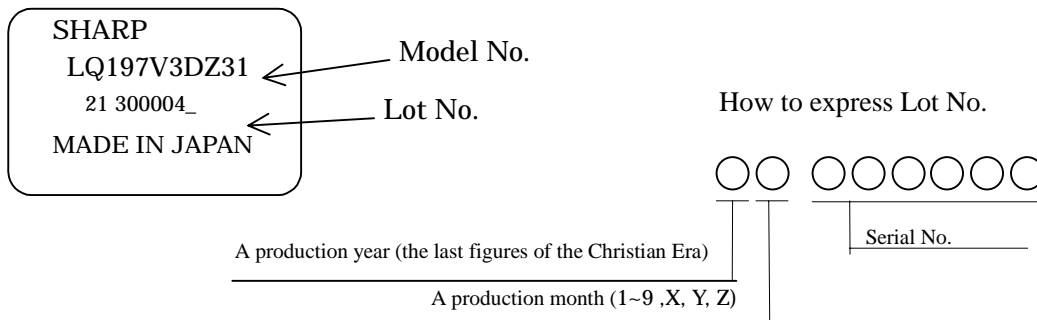| No.	Test item	Conditions
1	High temperature storage test	Ta = 60 240h
2	Low temperature storage test	Ta = - 10 240h
3	High temperature and high humidity operation test	Ta = 40 ; 95%RH 240h (No condensation)
4	High temperature operation test	Tp = 50 240h
5	Low temperature operation test	Ta = 0 240h
6	Vibration test (non-operation)	Frequency : 10 ~ 57Hz/Vibration width(one side) : 0.075mm : 58 ~ 500Hz/Acceleration: 9.8m/s2 Sweep time: 11 minutes Test period : 3 hours(1h for each direction of X, Y, Z)
7	Shock test (non-operation)	Maximum acceleration: 490m/s2 Pulse width: 11ms, sinusoidal half wave Direction: +/-X, +/-Y, +/-Z, once for each direction.

Note   Ta = Ambient temperature,   Tp = Panel surface temperature

Result evaluation criteria

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

14. Others

1) Lot No. Label;

2) 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.

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

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

5) Be sure to turn off the power supply of the inverter circuit before turning off the one of the control circuit.

6) Rust on the module is not taken up as a problem.

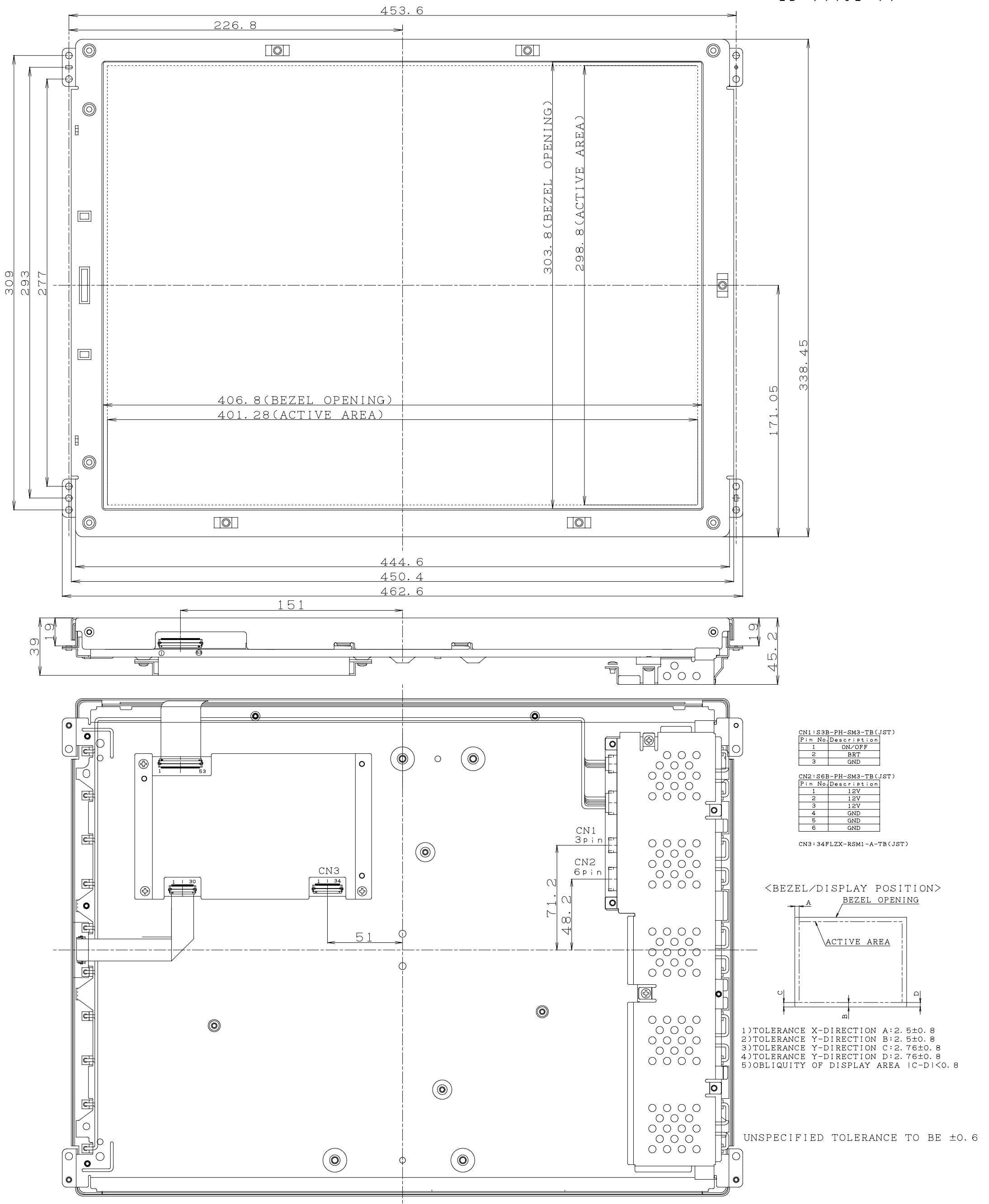7) When any question or issue occurs, it shall be solved by mutual discussion.

453.6
226.8
309
293
277
303.8(BEZEL OPENING)
298.8(ACTIVE AREA)
338.45
171.05
406.8(BEZEL OPENING)
401.28(ACTIVE AREA)
444.6
450.4
462.6

151
39
19
19
45.2

CN3
1 30
CN1
3pin
CN2
6pin
1 34
71.2
48.2
51
1 53

CN1:S3B-PH-SM3-TB(JST)

Pin No.	Description
1	ON/OFF
2	BRT
3	GND

CN2:S6B-PH-SM3-TB(JST)

Pin No.	Description
1	12V
2	12V
3	12V
4	GND
5	GND
6	GND

CN3:34FLZX-RSM1-A-TB(JST)

<BEZEL/DISPLAY POSITION>
BEZEL OPENING
ACTIVE AREA
A
B
C
D

1)TOLERANCE X-DIRECTION A:2.5±0.8
2)TOLERANCE Y-DIRECTION B:2.5±0.8
3)TOLERANCE Y-DIRECTION C:2.76±0.8
4)TOLERANCE Y-DIRECTION D:2.76±0.8
5)OBLIQUITY OF DISPLAY AREA |C-D|<0.8

UNSPECIFIED TOLERANCE TO BE ±0.6

FIG. 5 OUTLINE DIMENSIONS (LQ197V3DZ31)

Top Tray

社内品番: (4S)LQ197V3DZ31 ← ①

LotNO. : (1T)2002.02.04 1 ← ②

Quantity: (Q) 2 pcs ← ③

ユーザー品番 : ← ④

シャープ物流用ラベルです。 ← ⑤

①Model No.

②Lot No. (Date)

③Quantity

④User model No.

⑤Sharp model No.

TYPE	
QUANTITY	
LOT(DATE)	

Barcode label

LCD module
LQ197V3DZ31
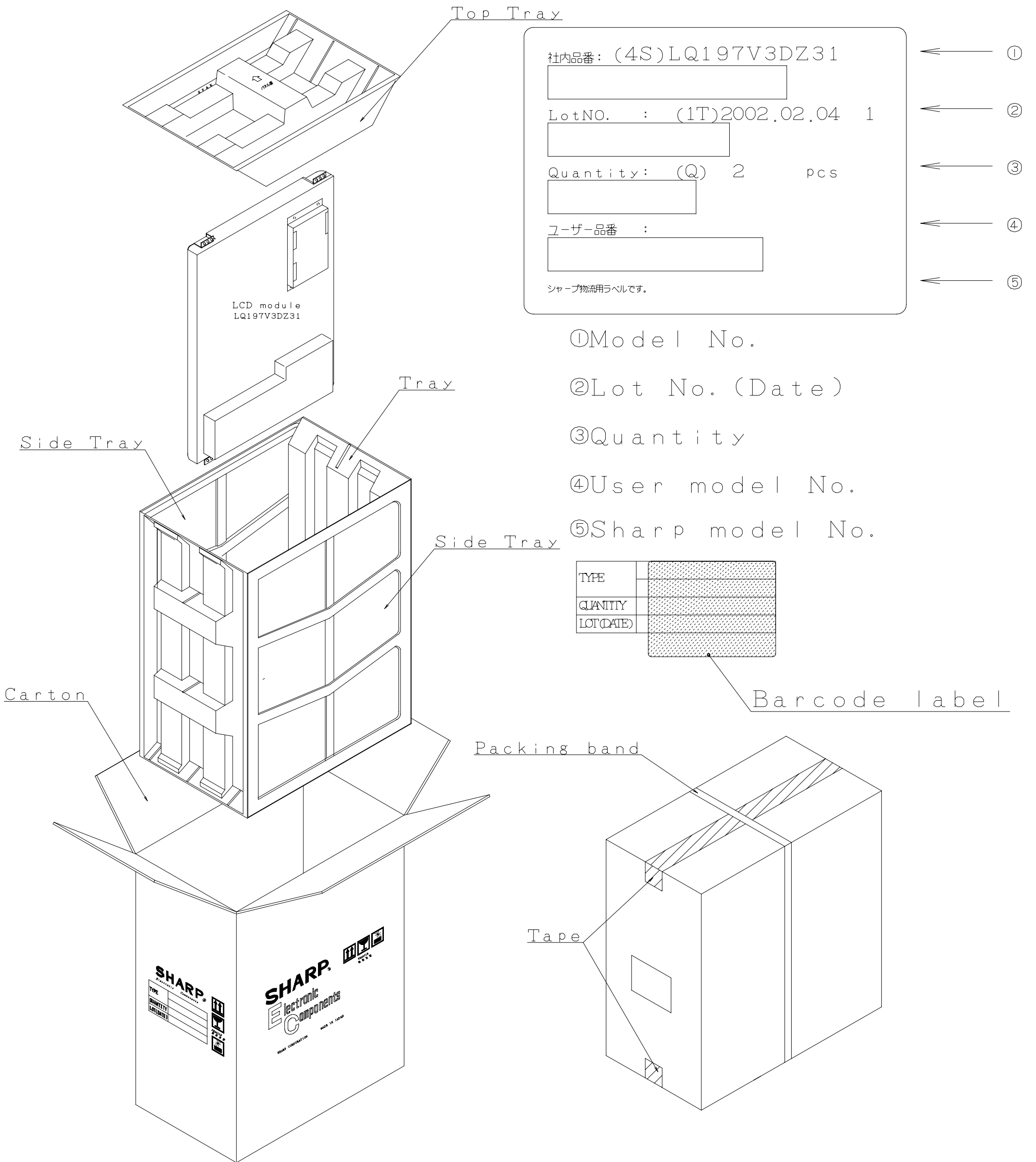
Tray

Side Tray

Side Tray

Carton

Packing band

Tape

SHARP

Electronic Components

Fig.6 PACKING FORM(LQ197V3DZ31)