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	LIQUID CRYSTAL DISPLAY GROUP SHARP CORPORATION SPECIFICATION	APPLICABLE GROUP AVC LIQUID CRYSTAL DISPLAY GROUP

DEVICE SPECIFICATION FOR

TFT - LCD module

MODEL No. LQ197V3DZ81

CUSTOMER'S APPROVAL

DATE

BY

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MODEL No : LQ197V3DZ81

SPEC No : LD-17220

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1. Application

This specification sheets applies to the color 19.7" VGA TFT-LCD module LQ197V3DZ81.

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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 640×RGB×480 dots panel with about 16 million colors by supplying date signal of 24 bit(8 bit x RGB), 2 kind of timing signal, +5V of 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. Control circuit driving

CN1 Using connector : 50FLZX-RSM1-A-GB-TB(JST)

Pin No.	Symbol	Function	Remarks
1	GND		
2	CK	Clock signal(sampling each data)	
3	GND		
4	GND		
5	GND		
6	DE	Data enable signal (Signal to settle the display position)	
7	GND		
8	R0	Red data signal (LSB)	
9	R1	Red data signal	
10	R2	Red data signal	
11	R3	Red data signal	
12	GND		
13	R4	Red data signal	
14	R5	Red data signal	
15	R6	Red data signal	
16	R7	Red data signal (MSB)	
17	GND		
18	G0	Green data signal (LSB)	
19	G1	Green data signal	
20	G2	Green data signal	
21	G3	Green data signal	
22	GND		
23	G4	Green data signal	
24	G5	Green data signal	
25	G6	Green data signal	
26	G7	Green data signal (MSB)	
27	GND		
28	B0	Blue data signal (LSB)	
29	B1	Blue data signal	
30	B2	Blue data signal	
31	B3	Blue data signal	
32	GND		
33	B4	Blue data signal	
34	B5	Blue data signal	
35	B6	Blue data signal	
36	B7	Blue data signal (MSB)	
37	GND		
38	GND		
39	GND		
40	GND		
41	GND		
42	GND		
43	GND		
44	VDD	+5V Power Supply	
45	VDD	+5V Power Supply	
46	VDD	+5V Power Supply	
47	VDD	+5V Power Supply	
48	L/R	Reverse terminal of Right and Left	【Note 1】
49	U/D	Reverse terminal of Up and Down	【Note 1】
50	GND		

Shield case contacts GND(Ground) of LCD module. Recommended dimensions of FPC/FFC are shown in Fig.2.

4-2. FPC/FFC

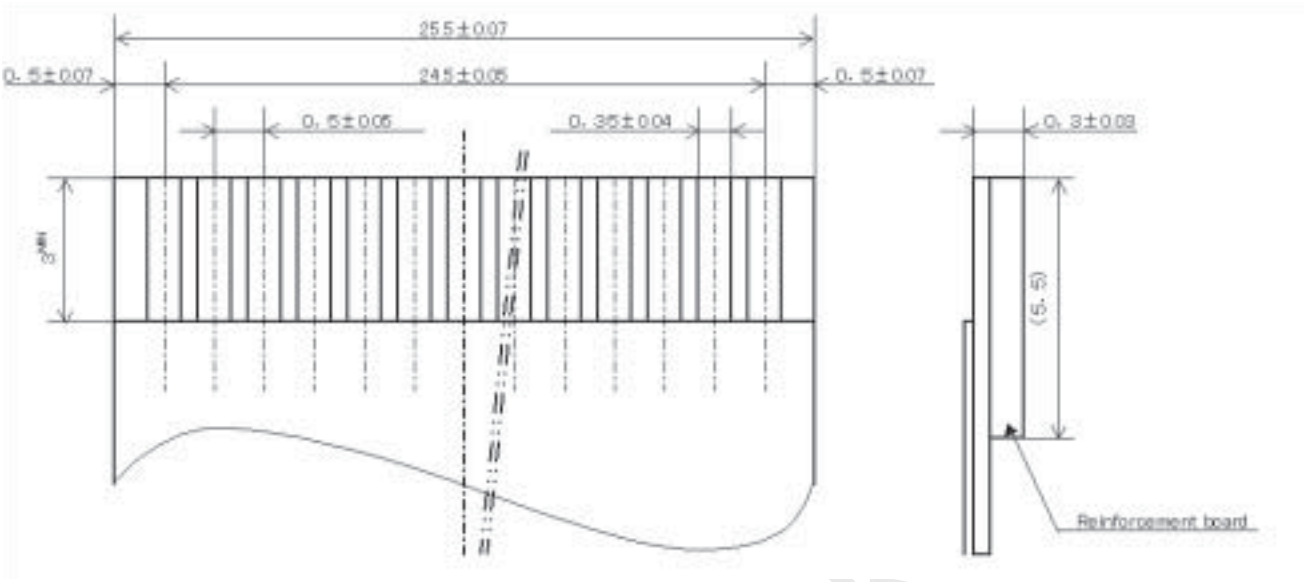


Fig.2 Recommended FPC/FFC dimensional diagram

【Note】 Use FFC/FPC which contact point is gold-plated.

Contact resistance may increase due to bimetallic corrosion if contact point of FFC/FPC is not gold-plated.

【Note 1】

R/L : L
U/D : L

R/L : H
U/D : L

R/L : L
U/D : H

R/L : H
U/D : H

4-3. Inverter driving for back light

CN3 Supplying for Inverter Power Using connector : S12B-PH-SM3-TB(JST)

Matching connector : PHR-12(JST)

Terminal #	Signal	Functions	Remarks
1	V_{ON}	Back light ON／OFF	【Note 1】
2	N.C.	This is electrically opened.	
3	N.C.	This is electrically opened.	
4	V_{BRT}	PWM light adjustment analogue input	【Note 2】
5	N.C.	This is electrically opened.	
6	GND	GND	
7	V_{INV}	Inverter power supply voltage (+12V)	
8	V_{INV}		
9	V_{INV}		
10	GND	GND	
11	GND		
12	GND		

＊ GND(Ground) of Inverter does not contact GND(Ground) of LCD module.

【Note 1】Inverter ON／OFF

Input Voltage	Functions
3.0～5.0V	Inverter in action
0～0.5V	Inverter at still

【Note 2】PWM light adjustment analogue input

By 0～5 V analogue input voltage, brightness control is adjusted.

Input Voltage	Functions
5.0V	Brightness Control(20%): Dark
0V	Brightness Control(100%): Bright

Note) 0～(0.3) V: Duty is 100%.

Do not adjust the voltage between 0.3～0.7 V, as the range cannot be detected.

4-4. Back light driving

The back light system is under-lighting type with 5 CCFTs(Cold Cathode Fluorescent Tube).

The characteristics of the lamp are shown in the following table. The value mentioned below is applicable to each individual CCFT.

Item	Symbol	Min.	Typ.	Max.	Unit	Remarks
Lamp Life time	T_L	50000	–	–	Hour	【Note 1,2】

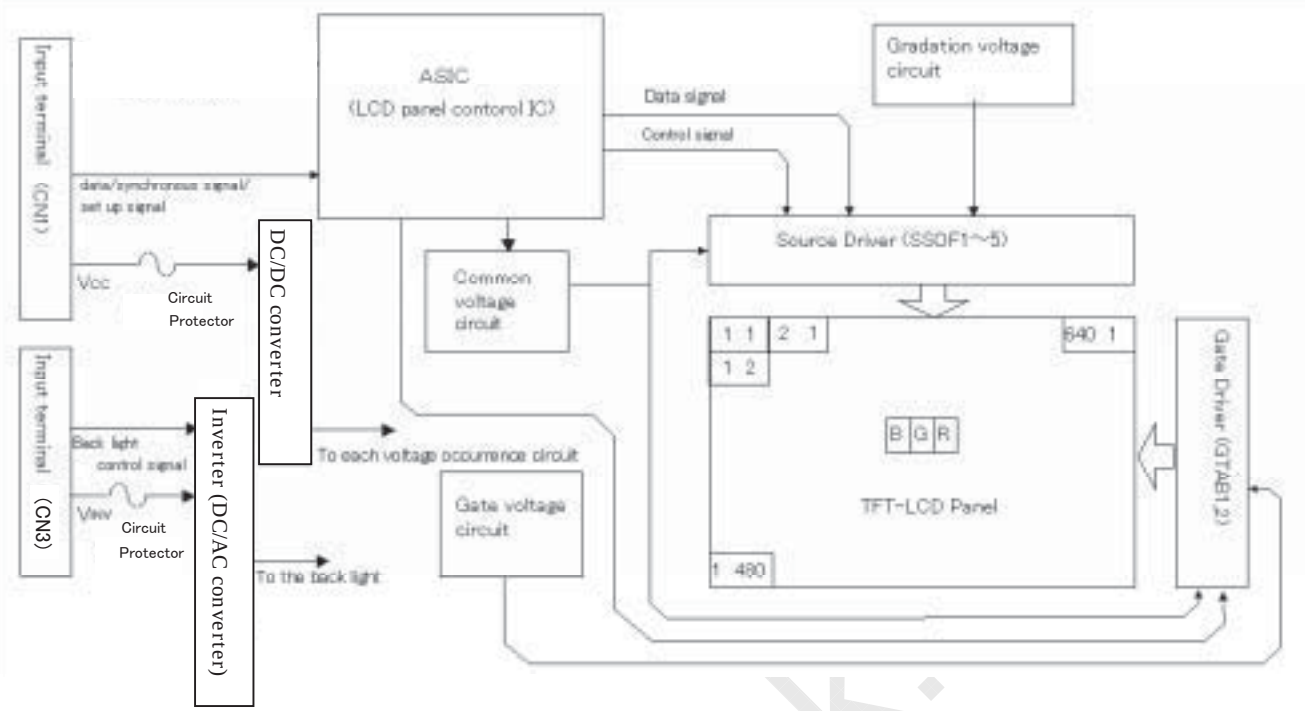
【Note 1】Lamp life time is defined as below in the continuous operation under the condition of Ta=25℃.

- Brightness becomes 50% of the original value under standard condition.

【Note 2】 Definition is based upon when the longer edge of the LCD module is placed horizontally (in landscape position).

The length of LCD module's life time may vary if the module is placed vertically (in a portrait position), due to the lopsided mercury in the CCFT lamps.

4-5 LCD Module Block Diagram



5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage (for Control)	V_{IC}	Ta=25 ℃	−0.3～+3.6	V	【Note 1】
5V supply voltage (for Control)	Vcc	Ta=25 ℃	0～+ 6	V	
Input voltage (for Inverter)	V_I	Ta=25 ℃	0～+ 6	V	【Note 2】
12V supply voltage (for Inverter)	V_{INV}	Ta=25 ℃	0～+14	V	
Storage temperature	T_{stg}	−	−25～+60	℃	【Note 3】
Operation temperature (Ambient)	T_{opa}	−	0～+50	℃	【Note 3】

【Note 1】 CK, R0～R7, G0～G7, B0～B7, DE, R/L, U/D

【Note 2】 V_{ON} ,V_{BRT}

【Note 3】 Humidity 95%RH Max.(Ta≦40 ℃)

Maximum wet-bulb temperature at 39 ℃ or less.(Ta>40℃)

No condensation.

6. Electrical Characteristics

6-1. Control circuit driving Ta=25 degree

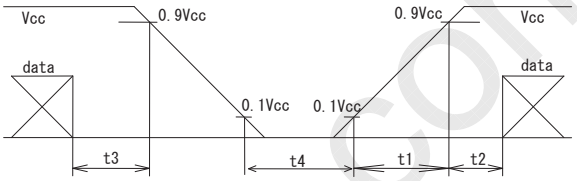
Parameter		Symbol	Min.	Typ.	Max.	Uniit	Remark
+5V supply voltage	Supply voltage	Vcc	+4.5	+5.0	+5.5	V	【Note 1】
	Current dissipation	Icc	–	340	500	mA	【Note 2】
Permissive input ripple voltage		V_{RP}	–	–	100	mV_{P-P}	Vcc=+5.0V
Input Low voltage		V_{IL}	GND	–	0.9	V	【Note 3】
Input High voltage		V_{IH}	3.0	–	3.6	V	
Input leak current (Low)		I_{OL1}	–	–	1.0	μA	V_I =0V 【Note 3】
Input leak current (High)		I_{OH1}	–	–	1.0	μA	V_I =Vcc 【Note 3】

【Note 1】

1) Input voltage sequences

0 < t1 ≦ 10ms, 0 < t2 ≦ 10ms

0 < t3 ≦ 1s, t4 ≧ 1s



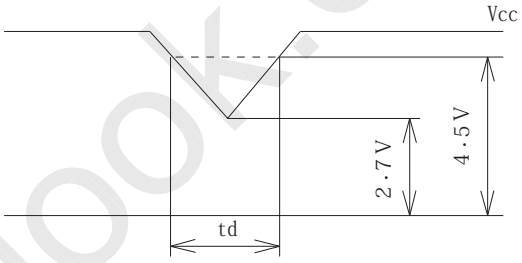
2) Dip conditions for supply voltage

a) (2.7V) ≦ Vcc < 4.5V

td ≦ 10ms

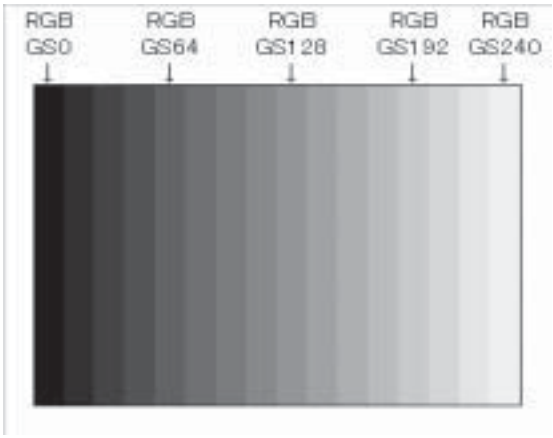
b) Vcc < (2.7V)

Condition of Dip conditions for supply voltage is based on input voltage sequence.



【Note 2】Typical current situation : 16 gray-bar pattern(Vcc=+5.0V)

The explanation of RGB gray scale see section 8.



【Note 3】CK,R0～R7,G0～G7,B0～B7,DE, L/R, U/D

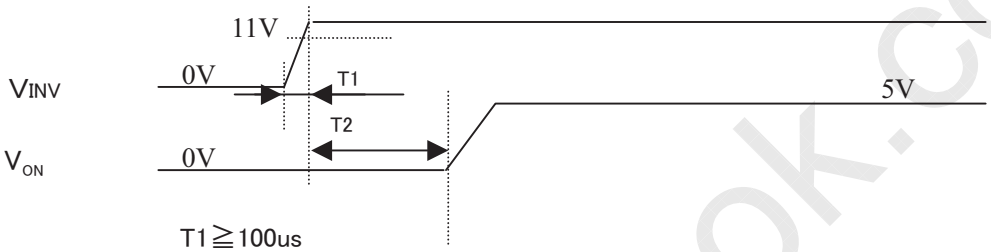
6-2. Inverter driving for back light

The back light system is under-lighting type with 5 CCFTs (Cold Cathode Fluorescent Tube)

Ta=25℃

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
＋12V	Supply Voltage	V_{INV}	11	12	13	V	【Note 1】
	Current dissipation	I_{INV}	－	4.3	5.5	A	V_{INV}=+12V Brightness =MAX V_{ON}=+5V
Permissive input ripple voltage		V_{INVRP}	－	－	200	mV_{P-P}	V_{INV}=+12V
V_{ON}	Input voltage (OFF)	V_{ONL1}	0		0.5	V	【Note 1,2】
	Input voltage (ON)	V_{ONH1}	3.0		5.0	V	
Brightness control (V_{BRT})	Max duty(100%)		0	－	0.3	V	【Note 3】
	Changeable Voltage		0.7	－	5.0	V	Impedance = 26kΩ
Open Voltage		V_{open}	2160	－		Vrms	

【Note 1】1)V_{INV}-turn-on condition

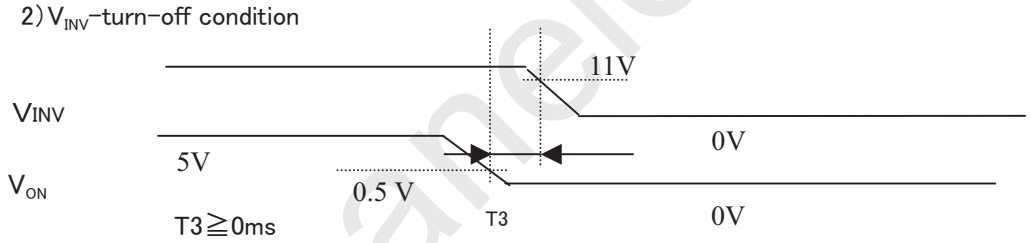


T1≧100us

T2≧0ms

※Set V_{INV} start (rise) up speed 100 micro second and above to prevent inrush current.

2) V_{INV}-turn-off condition



T3≧0ms

【Note 2】Impedance V_{ON}:10kΩ

【Note 3】Refrain from using the device under the condition V_{BRT}=0.3～0.7〔V〕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 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.

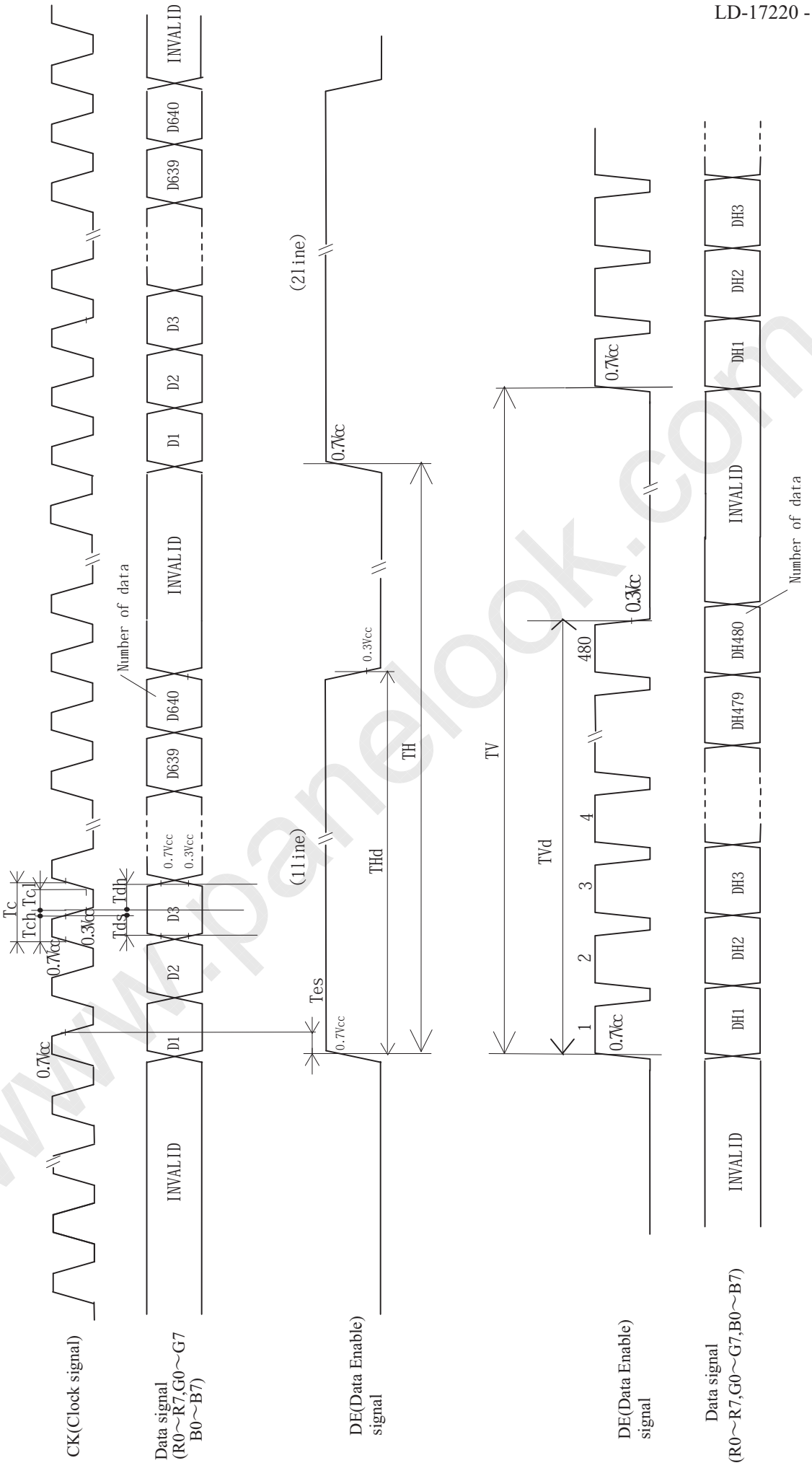


Fig3. Timing diagrams of input signals

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

	Color & Gray scale	Data signal																							
	Gray Scale	R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7
Basic Color	Black	—	0	0	0	0	0	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	0	0	0	X	X	1	1	1	1	1	1
	Green	—	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan	—	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	X	X	1	1	1	1	1	1
	Red	—	X	X	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta	—	X	X	1	1	1	1	1	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1
	Yellow	—	X	X	1	1	1	1	1	X	X	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	—	X	X	1	1	1	1	1	X	X	1	1	1	1	1	1	X	X	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	0	0	0	0	0
	⇧	GS1	1	0	0	0	0	0	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	0	0	0	0	0
	⇧	↓				↓							↓								↓				
	⇩	↓				↓							↓								↓				
	Brighter	GS250	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇩	GS251	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	GS252	X	X	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	⇧	↓				↓							↓								↓				
	⇩	↓				↓							↓								↓				
	Brighter	GS250	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	⇩	GS251	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
	Green	GS252	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1	0	0	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	0	0	0	0	0	0
	⇧	GS1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	Darker	GS2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	⇧	↓				↓							↓								↓				
	⇩	↓				↓							↓								↓				
	Brighter	GS250	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1
	⇩	GS251	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	1	1	1
	Blue	GS252	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	X	X	1	1	1	1	1	1

0 :Low level voltage, 1 :High level voltage,

Each basic color can be displayed in 253 gray scales with 8 bit data signals. According to the combination of total 18 bit data signals, the 16-million-color display can be achieved on the screen. (X: don't care)

9. Optical characteristics

Ta=25 ℃, Vcc=+5V , V_{INV}=＋12V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21, θ 22	CR≧10	80	85	－	Deg.	【Note1,4】 Brightness=MAX
	Vertical	θ 11 θ 12		80	85	－	Deg.	
Contrast ratio		CRn	Best Viewing Angle	500	600	－		【Note2,4】 Brightness=MAX
Response time		T r+Td		－	20	26	ms	【Note3,4,5】 Brightness=MAX
Chromaticity of white		X	θ =0 deg.	0.242	0.272	0.302	－	【Note 4】 Brightness=MAX
		Y		0.248	0.278	0.308	－	
Chromaticity of Red		X		0.610	0.640	0.67	－	
		Y		0.307	0.337	0.367	－	
Chromaticity of Green		X		0.240	0.270	0.300	－	
		Y		0.576	0.606	0.636	－	
Chromaticity of Blue		X		0.114	0.144	0.174	－	
		Y		0.040	0.070	0.100	－	
Luminance of white		YL1		360	450	－	cd/m^2	【Note 4】 Brightness=MAX
Luminance uniformity		δ W		－	－	1.25		【Note 6】 Brightness=MAX

*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.4 below.

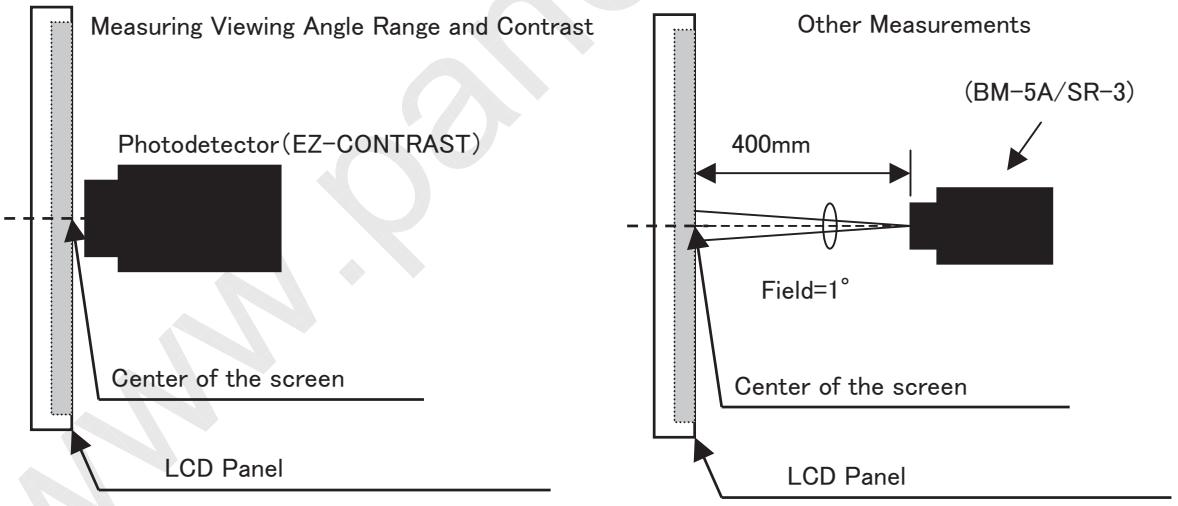
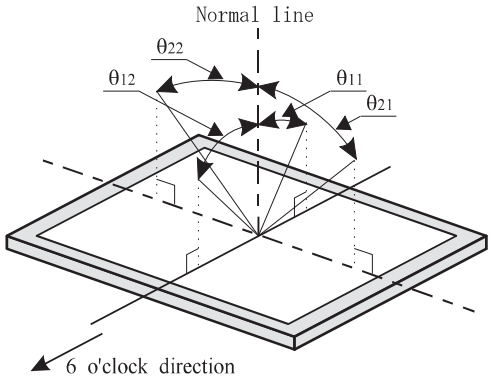


Fig.4 Optical characteristics measurement method

【Note 1】Definitions of viewing angle range :



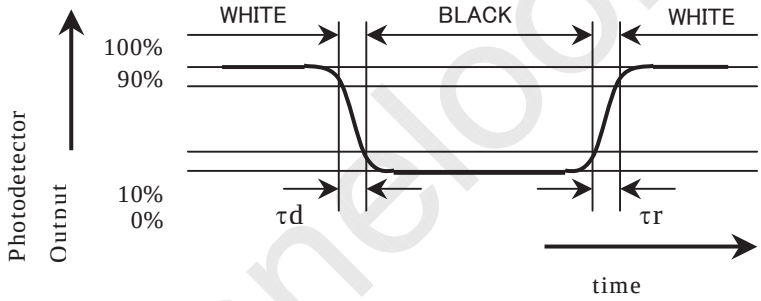
【Note 2】Definition of contrast ratio :

The contrast ratio is defined as the following.

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

【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".



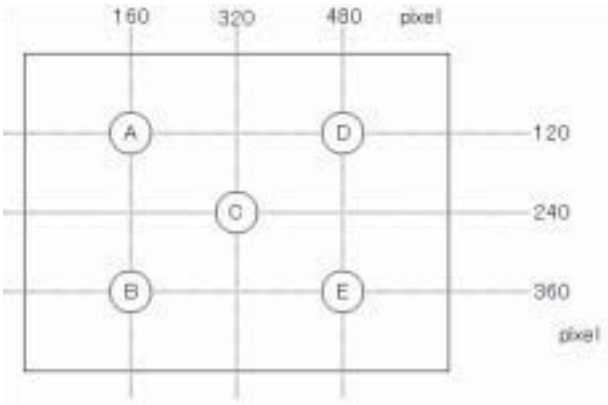
【Note 4】This shall be measured at center of the screen.

【Note 5】Temperature of panel surface shall be 40 degree.

【Note 6】Definition of white uniformity ;

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

$$\delta W = \frac{\text{maximum Luminance of five points(brightness)}}{\text{minimum Luminace of five points(brightness)}}$$



10. Display Quantity

The display quality of the color TFT-LCD module shall be in 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 when inverter is turning on. Please alert "Don't touch it",if someone may touch.

12 Handling Precautions of the module

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

b) This product is using the parts(inverter, CCFT etc) which generate the high voltage. Therefore, during operating, please don't touch these parts.

c) Brightness control voltage is switched for "ON" and "OFF", as shown in Fig.5. Voltage difference generated by this switching, ΔV_{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.

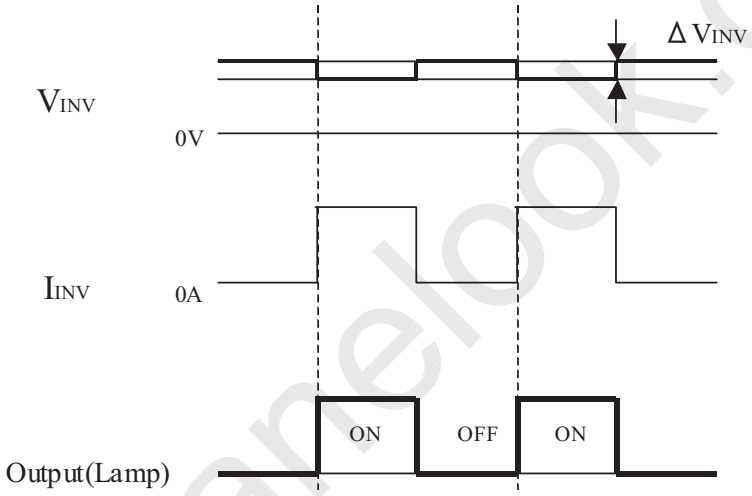


Fig.5 Brightness control and ripple of V_{INV}

d) 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.

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

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

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

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

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

j) Ground attachment to the LCD module should be considered, so that influences from EMI and outer noise is minimized.

k) 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.

l) Observe all other precautionary requirements in handling components.

m) 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

n) 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.

o) Blow off dust with N_2 blower for which static electricity preventive measure has been taken. Ionized air gun is recommended.

p) Please connect from the product side to the inverter's power source ground line, as the PWB's ground for inverter is not connected to module's bezel.

13. Packing form

a) Piling number of cartons: 3(maximum)

b) Packing quantity in one carton : 10

c) Carton size : 706mm(W) × 532mm(D) × 421mm(H)

d) Total mass of one carton filled with full modules : 25.5Kg

14. Reliability test items

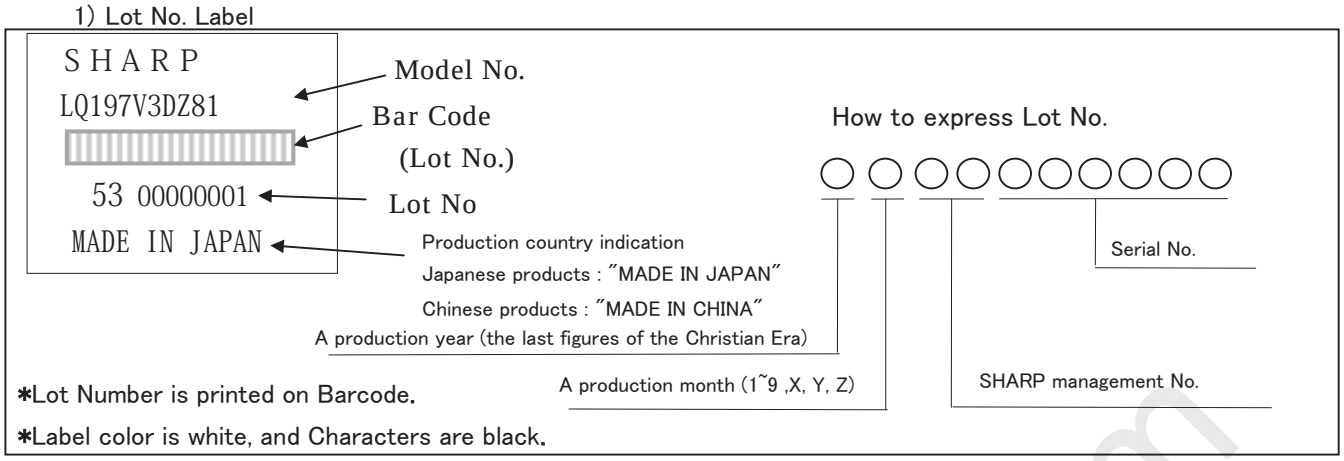
No	Test item	Conditions
1	High temperature storage test	Ta = 60℃ 240h
2	Low temperature storage test	Ta = -25℃ 240h
3	High temperature & high humidity operation test	Ta = 40℃ ; 95%RH 240h (No condensation)
4	High temperature operation test	Ta = 50℃ 240h (The panel temperature must be less than 60℃)
5	Low temperature operation test	Ta = 0℃ 240H
6	Vibration test (non- operating)	Waveform : Sine wave Frequency : 10～57Hz/Vibration width (one side) : 0.075mm : 57～500Hz/Gravity : 9.8m/s^2 Sweep time : 11minutes Test period : 3 hours (1 hour for each direction of X,Y,Z)
7	Shock test (non- operating)	Max. gravity : 490m/s^2 Pulse width : 11ms, sine wave Direction : ±X, ±Y, ±Z, once for each direction.
8	Thermal shock test (non- operating)	Ta=-25℃～60℃ ; 5 cycles Test period : 10 hours (1 hour for each temperature)
9	ESD test	Contact discharge method : C=150pF,R=330Ω (non- operating) Pass +/- 15kV (operating) Pass +/- 8kV Air discharge method : C=150pF,R=330Ω (non- operating) Pass +/- 20kV (operating) Pass +/- 10kV

【Result evaluation criteria】

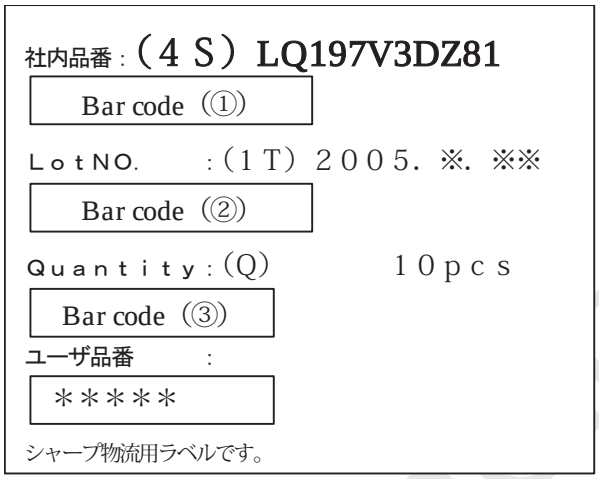
Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function.

15. Others

1) Lot No. Label



2) Packing Label



① Model No. (LQ197V3DZ81)

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) Turn off the inverter circuit for back light before turning off the power source for the controller.

7) Rust is out of considerations.

8) Regulation on usage of destructible chemical substances for the Ozone layer

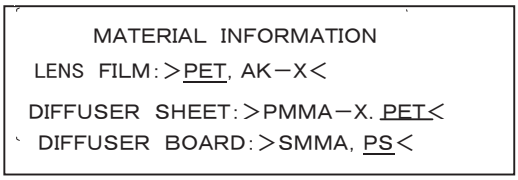
Regulated substances：CFCS、Quadru Carbon Chloride、1,1,1−Tri chloro−ethylene (MethylChloroform)

a) above mentioned substances are not used in the product, and/or assembled unit and parts of this product

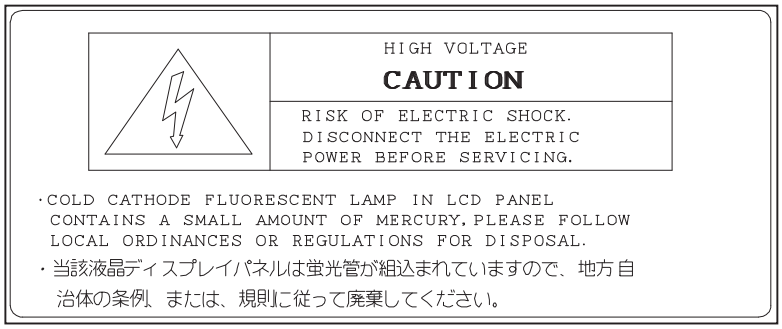
b) above mentioned substances are not used in the process of manufacturing the product and/or assembled unit and parts of this product.

9) Marking of using material information

It is displaying the material of the optical parts with the label in the module back.



10) Cold cathode fluorescent lamp in LCD PANEL contains a small amount of mercury.
Please follow local ordinances or regulations for disposal.



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

16. Storage conditions

<Environmental condition range of storage temperature and humidity>

Temperature 0 to 40 degrees Celsius

Relative humidity 95% and below

【Note】Please refer below as a mean value of the environmental conditions.

Summer time temperature 20 to 35 degrees Celsius
humidity 85% and below

Winter time temperature 5 to 15 degrees Celsius
humidity 85% and below

Please maintain within 240 hours of accumulated length of storage time, with conditions of 40 degrees Celsius and room humidity of 95%.

Direct sun light Please keep the product in a dark room or cover the product to protect from direct sun light.

Atmospheric condition Please refrain from keeping the product with possible corrosive gas or volatile flux.

Prevention of dew
* Please store the product carton either on a wooden pallet or a stand / rack to prevent dew. Do not place directly on the floor. In addition, to obtain moderate ventilation in between the pallet's top and bottom surfaces, pile the cartons up in a single direction and in order.
* Please place the product cartons away from the storage wall.
* Please maintain the storage area with an appropriate ventilation. It is recommendable to furnish the storage area with equipments such as ventilation systems.
* Please maintain the ambient temperature within the range of natural environmental fluctuation.

Storage period Within above mentioned conditions, maximum storage period should be one year.

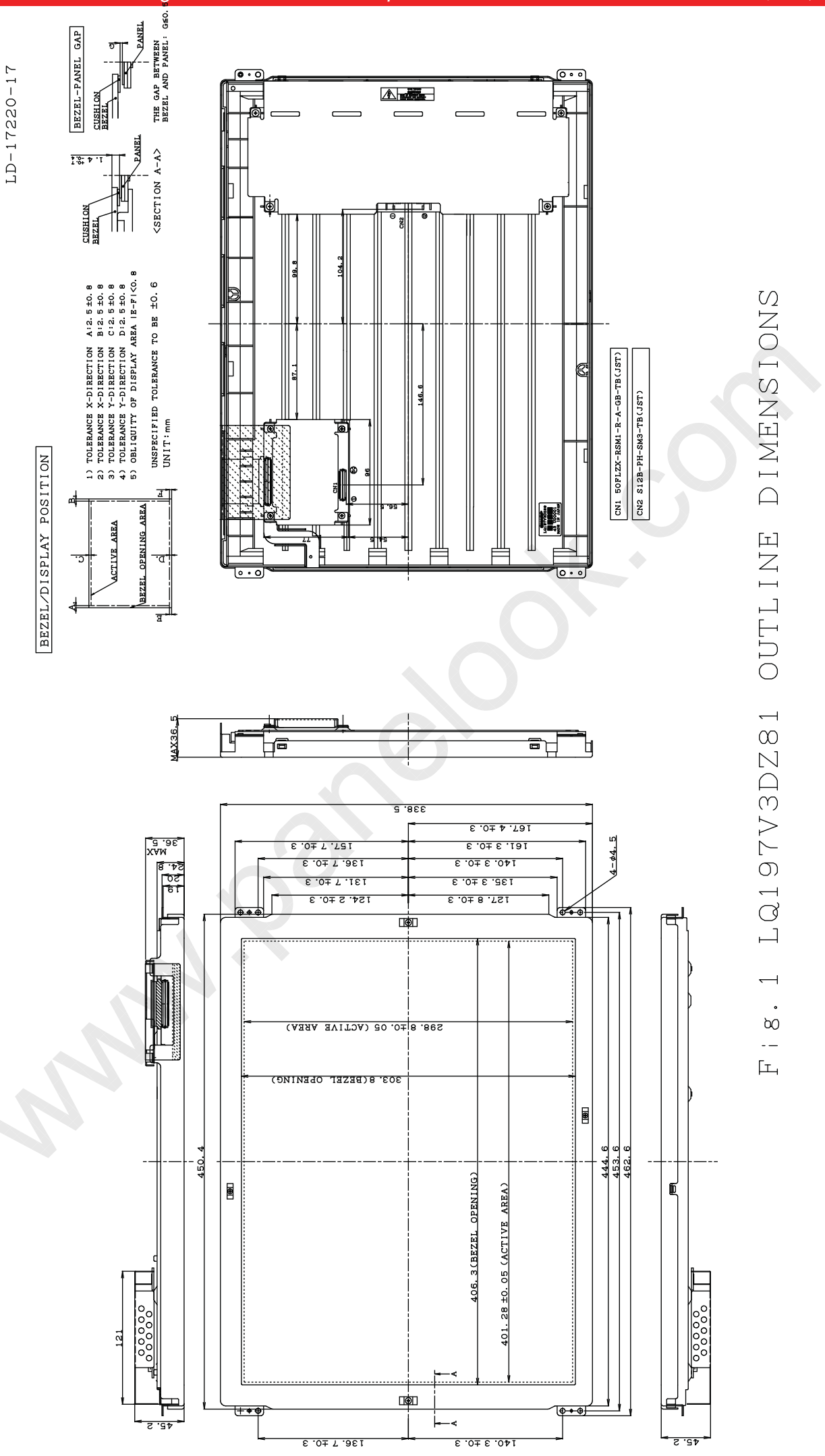


Fig. 1 LQ197V3DZ81 OUTLINE DIMENSIONS

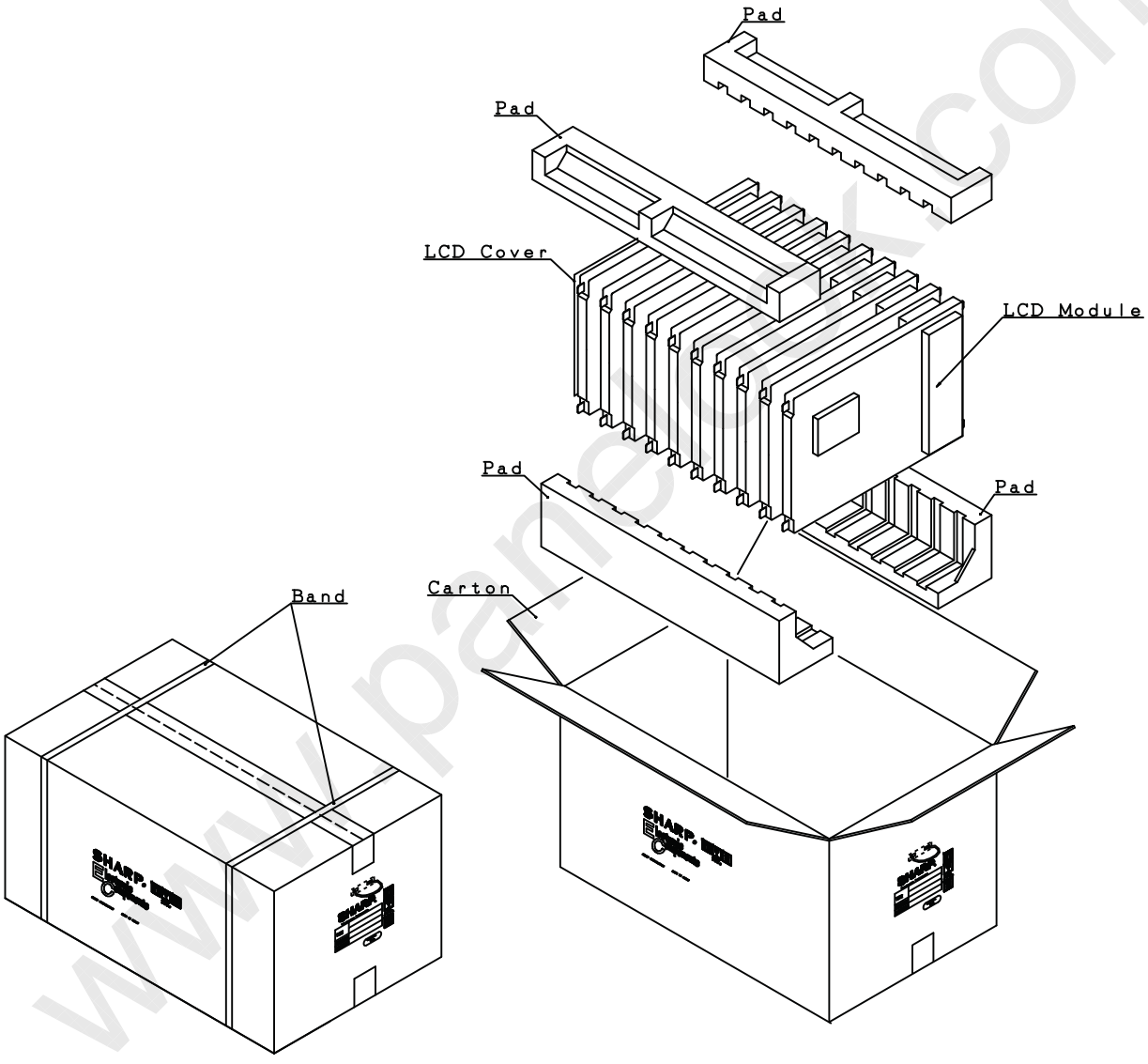


Fig. 6 PACKIG FORM