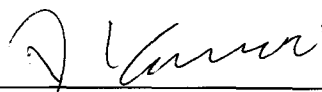DEVICE SPECIFICATION FOR

TFT-LCD Module

MODEL No.

LQ150X1LG55

These parts have corresponded with the RoHS directive.

☐ CUSTOMER'S APPROVAL

BY _____

BY _~~~~~~_

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SHARP CORPORATION

RECORDS OF REVISION

LQ150X1LG55

SPEC No.	DATE	REVISED No.	PAGE	SUMMARY	NOTE
LD-19512A	May. 18. 2007	-	-	-	1 st Issue

1. Application

   This specification applies to the color 15.0 XGA TFT-LCD module LQ150X1LG55.

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   The device listed in these specification sheets was designed and manufactured for use in general electronic equipment.

   In case of using the device for applications such as control and safety equipment for transportation (controls of aircraft, trains, automobiles, etc.), rescue and security equipment and various safety related equipment which require higher reliability and safety, take into consideration that appropriate measures such as fail-safe functions and redundant system design should be taken.

   Do not use the device for equipment that requires an extreme level of reliability, such as aerospace applications, telecommunication equipment(trunk lines), nuclear power control equipment and medical or other equipment for life support.

   SHARP assumes no responsibility for any damage resulting from the use of the device which does not comply with the instructions and the precautions specified in these specification sheets.

   Confirm "11. Handling Precautions " item when you use the device.

   Contact and consult with a SHARP sales representative for any questions about this device.

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 and a back light unit. Graphics and texts can be displayed on a 1024× RGB× 768 dots panel with about 16 million colors by using LVDS (Low Voltage Differential Signaling) and supplying +3.3V DC supply voltages for TFT-LCD panel driving and supply voltage for backlight. Backlight-driving DC/AC inverter is not built in this module.
This TFT-LCD module conforms to PSWG. Viewing angle is 6 o'clock direction.

3. Mechanical Specifications

Parameter	Specifications	Unit
Display size	38 (Diagonal)	cm
	15.0 (Diagonal)	Inch
Active area	304.1 (H)× 228.1 (V)	mm
Pixel format	1024 (H)× 768 (V)	Pixel
	(1 pixel　R+G+B dots)	
Pixel pitch	0.297 (H)× 0.297 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally white	
Unit outline dimensions *1	326.5(W)× 253.5(H)× 11.2(D)	mm
Mass	1000 (Max)	g
Surface treatment	Anti-glare and hard-coating 3H (Haze value = 25)	

*1.Note: excluding back light cables, cover and pet sheet.

The thickness of module (D) doesn't contain the projection.

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(Hirose Electric Co., Ltd.)

Please do not use it besides corresponding conector

Pin No.	Symbol	Function	Remark
1	Vcc	+3.3V Power supply	
2	Vcc	+3.3V Power supply	
3	GND		
4	GND		
5	RXIN0-	Receiver signal (-)	LVDS
6	RXIN0+	Receiver signal (+)	LVDS
7	GND		
8	RXIN1-	Receiver signal (-)	LVDS
9	RXIN1+	Receiver signal (+)	LVDS
10	GND		
11	RXIN2-	Receiver signal (-)	LVDS
12	RXIN2+	Receiver signal (+)	LVDS
13	GND		
14	RXCKIN-	Clock signal (-)	LVDS
15	RXCKIN+	Clock signal (+)	LVDS
16	GND		
17	RXIN3-	Receiver signal (-)	LVDS
18	RXIN3+	Receiver signal (+)	LVDS
19	HANTEN	Horizontal/Vertical display mode select signal	note2
20	LVDS_SET	LVDS_SET	note1

note2

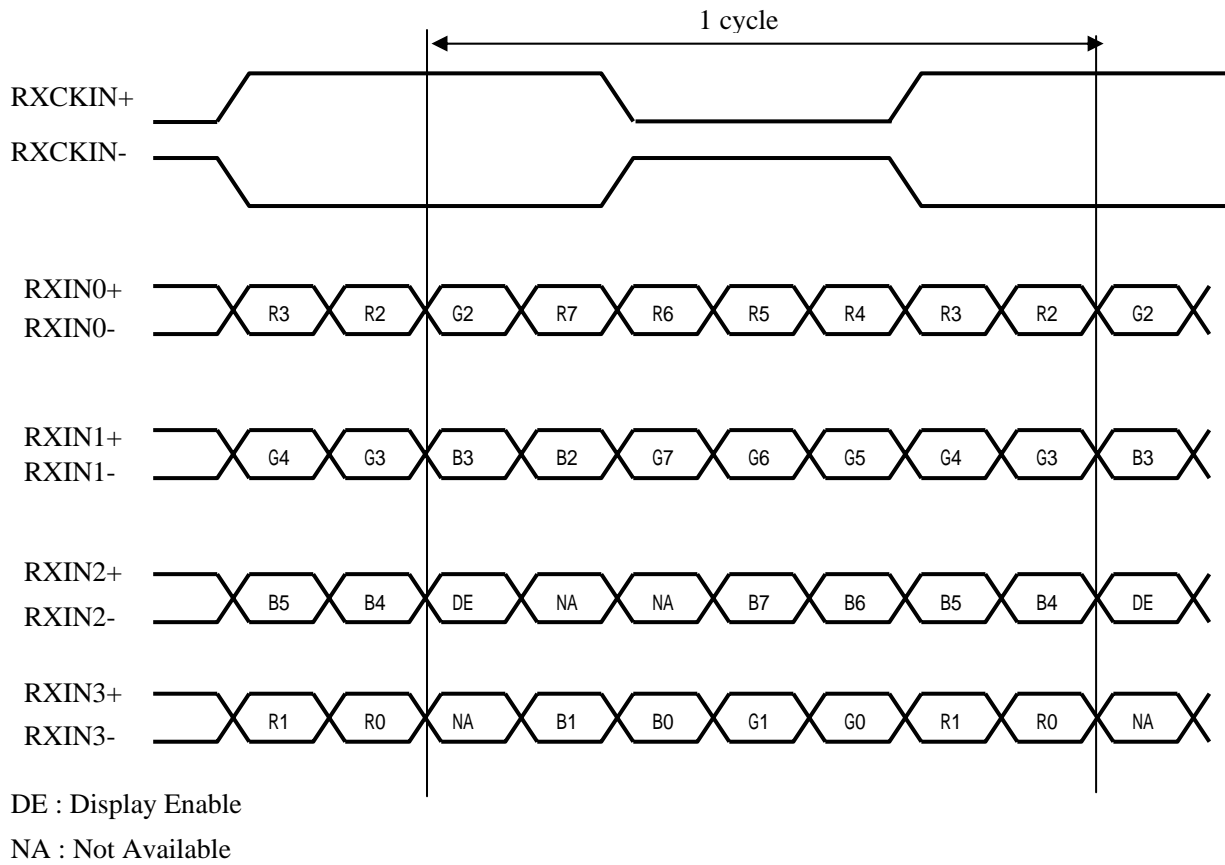"　　　"   "　　　"

4-2. Data Mapping

1) 8 bit input

note1　pin assignment with LVDS_SET pin (Thine: THC63LVDF83A)

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

<LVDS_SET=H>

1 cycle

RXCKIN+
RXCKIN-

RXIN0+
RXIN0-

| R3 | R2 | G2 | R7 | R6 | R5 | R4 | R3 | R2 | G2 |

RXIN1+
RXIN1-

| G4 | G3 | B3 | B2 | G7 | G6 | G5 | G4 | G3 | B3 |

RXIN2+
RXIN2-

| B5 | B4 | DE | NA | NA | B7 | B6 | B5 | B4 | DE |

RXIN3+
RXIN3-

| R1 | R0 | NA | B1 | B0 | G1 | G0 | R1 | R0 | NA |

DE : Display Enable

NA : Not Available

<LVDS_SET = L or Open>

1 cycle

RXCXIN+
RXCXIN-

RXIN0+
RXIN0-

| R1 | R0 | G0 | R5 | R4 | R3 | R2 | R1 | R0 | G0 |

RXIN1+
RXIN1-

| G2 | G1 | B1 | B0 | G5 | G4 | G3 | G2 | G1 | B1 |

RXIN2+
RXIN2-

| B3 | B2 | DE | NA | NA | B5 | B4 | B3 | B2 | DE |

RXIN3+
RXIN3-

| R7 | R6 | NA | B7 | B6 | G7 | G6 | R7 | R6 | NA |

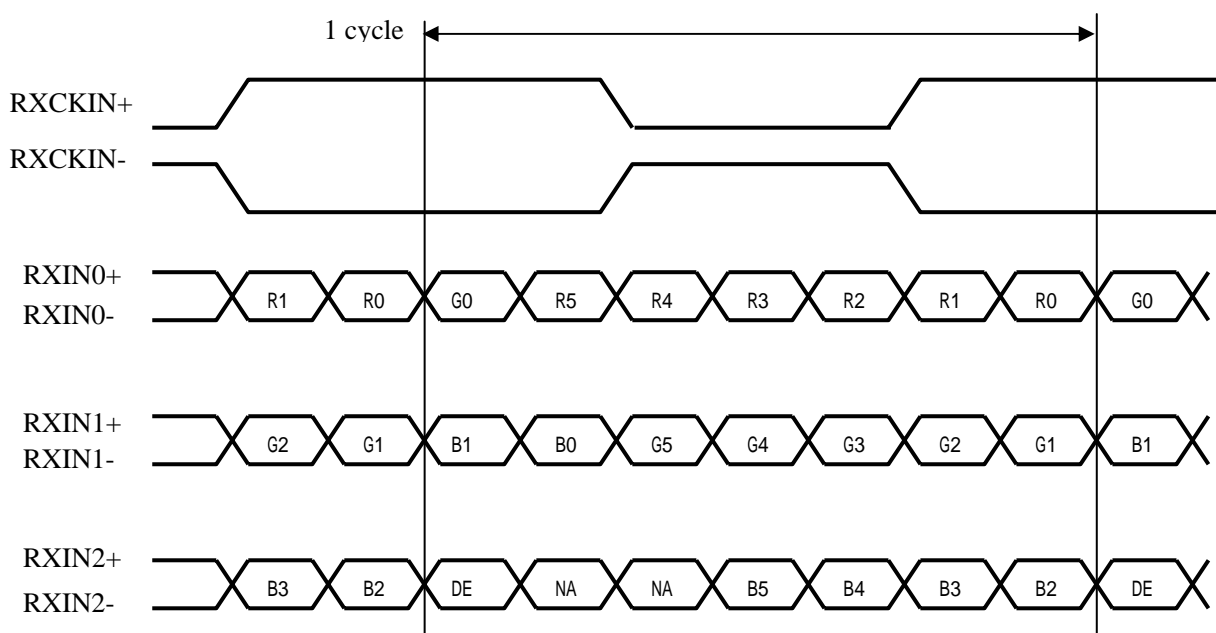DE : Display Enable

NA : Not Available
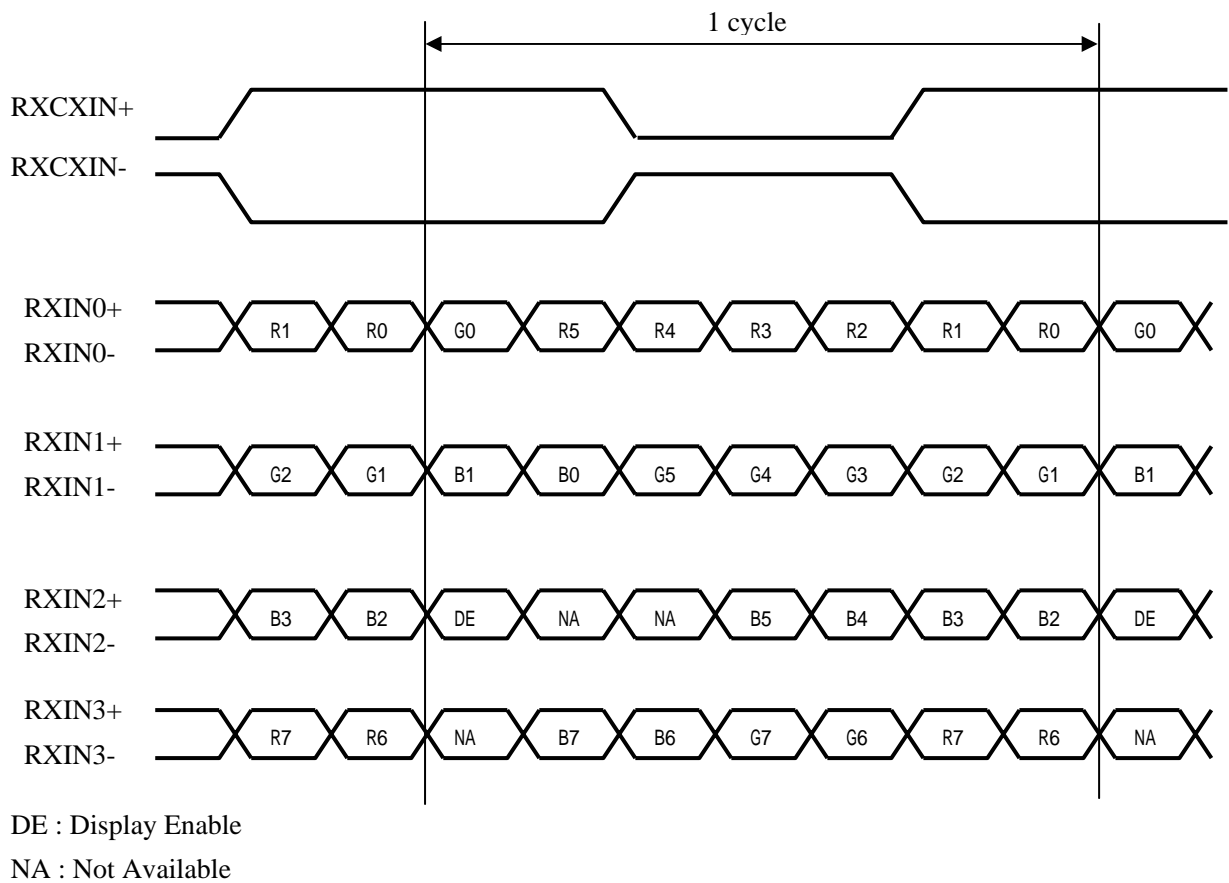
2) 6 bit input

note1　pin assignment with LVDS_SET pin (Thine: THC63LVDF83A)

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

DE : Display Enable

NA : Not Available

(Computer Side)   (TFT-LCD side)

8Bit Mode
LVDS_SET=L (20 pin=GND or OPEN)

Controller	THC63LVDM83R		Single LVDS interface contained in a control

Controller

R0-R5,G0 — 7 — TA 0 - 6
G1-G5,B0,B1 — 7 — TB 0 - 6
B2-B5, NA,NA,DE — 7 — TC 0 - 6
R6,R7,G6,G7, B6,B7,NA — 7 — TD 0 - 6

THC63LVDM83R
TTL PARALLEL-TO-LVDS

RXIN0+(6)
RXIN0-(5)
RXIN1+(9)
RXIN1-(8)
RXIN2+(12)
RXIN2-(11)
RXIN3+(18)
RXIN3-(17)

Single LVDS interface contained in a control
LVDS-TO-PARALLEL TTL
RA 0 - 6
RB 0 - 6
RC 0 - 6
RD 0 - 6

Internal circuits

CK — C K IN — PLL
RXCKIN+(15)
RX KIN-(14)
PLL — CK OUT

8Bit Mode
LVDS_SET=H (20 pin=3.3[V])

Controller

R2-R7,G2 — 7 — TA 0 - 6
G3-G7,B2,B3 — 7 — TB 0 - 6
B4-B7, NA,NA,DE — 7 — TC 0 - 6
R0,R1,G0,G1, B0,B1,NA — 7 — TD 0 - 6

THC63LVDM83R
TTL PARALLEL-TO-LVDS

RXIN0+(6)
RXIN0-(5)
RXIN1+(9)
RXIN1-(8)
RXIN2+(12)
RXIN2-(11)
RXIN3+(18)
RXIN3-(17)

Single LVDS interface contained in a control IC
LVDS-TO-PARALLEL TTL
RA 0 - 6
RB 0 - 6
RC 0 - 6
RD 0 - 6

Internal circuits

CK — C K IN — PLL
RXCKIN+(15)
RX KIN-(14)
PLL — CK OUT

6Bit Mode
LVDS_SET=H (20 pin=3.3[V])

Controller

R0-R5,G0 — 7 — TA 0 - 6
G1-G5,B0,B1 — 7 — TB 0 - 6
B2-B5, NA,NA,DE — 7 — TC 0 - 6
ALL NA — 7 — TD 0 - 6

THC63LVDM83R
TTL PARALLEL-TO-LVDS

RXIN0+(6)
RXIN0-(5)
RXIN1+(9)
RXIN1-(8)
RXIN2+(12)
RXIN2-(11)
RXIN3+(18)
RXIN3-(17)

Single LVDS interface contained in a control IC
LVDS-TO-PARALLEL TTL
RA 0 - 6
RB 0 - 6
RC 0 - 6
RD 0 - 6

Internal circuits

CK — C K IN — PLL
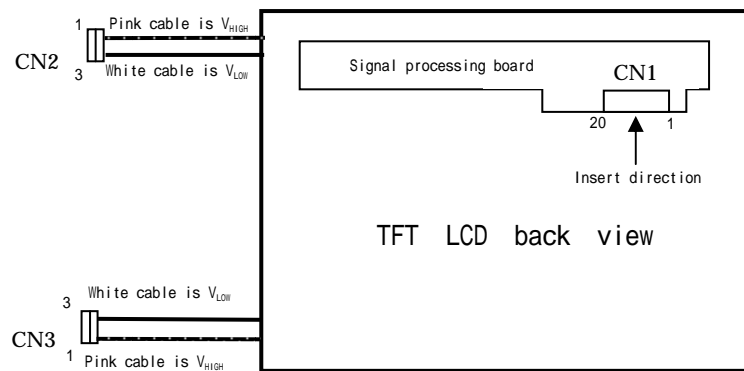RXCKIN+(15)
RX KIN-(14)
PLL — CK OUT

4-4. Backlight

CN 2, 3

The module-side connector BHR-03VS-1 (JST)

The user-side connector SM02(8.0)B-BHS-1-TB(LF)(SN) (JST)

Pin no.	symbol	I/O	Function	Color
1	HIGH	I	Power supply for lamp (High voltage side)	Pink
2	N.C.			
3	LOW	I	Power supply for lamp (Low voltage side)	White

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings		Unit	Remark
Supply voltage	Vcc	Ta=25	-0.3	+4.0		
Input voltage(LVDS Signal)	VI1	Ta=25	-0.3	Vcc		
Input voltage(LVDS_SET)	VI2	Ta=25	-0.3	Vcc+0.3		
Storage temperature	T_{STG}		-25	+60		Note1
Operating temperature	T_{OPA}	Panel surface	0	+60		
Lamp Voltage	VLa		2000		rms	

Note1 Humidity 95%RH Max. (Ta 40)

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

No condensation.

6. Recommended operation condition

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage	Vcc	3.0	+3.3	3.6		Note1
LVDS Signals	V_L	0		2.4		Note2
Input voltage	VI	0		Vcc		Note3
Surface temperature	Topa	0		+60		Note4

Note1   On-off conditions for supply voltage

     0<t1   15ms

     0<t2   10ms

     0<t3   100ms

     0<t4   1s

     200ms<t5

   Vcc-dip conditions

   1)   2.5V   Vcc

      td   10ms

   2)   Vcc<2.5V

      Vcc-dip conditions should also follow the On-off

      conditions for supply voltage
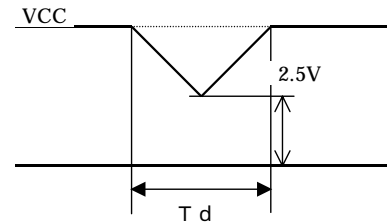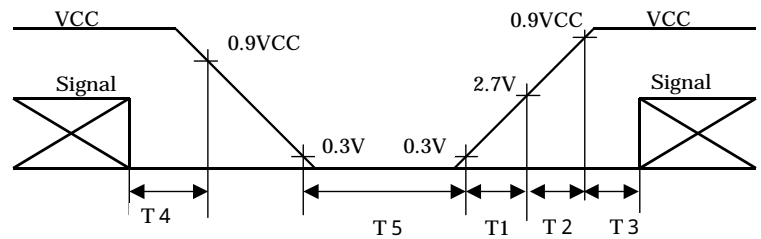
Note2   RXIN0-, RXIN0+,RXIN1-,RXIN1+,RXIN2-,RXIN2+,

      RXCKIN-,RXCKIN+,RXIN3-,RXIN3+

Note3   LVDS_SET

Note4   Humidity: 95%RH Max. at Ta=<40°C.

      Maximum wet-bulb temperature at 39°C or less at Ta>40°C.

      No condensation.

7. Electrical Characteristics

7-1. TFT-LCD panel driving   Ta   25

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply voltage	Vcc	+3.0	+3.3	+3.6	V	
	Current dissipation	Icc		300	400	mA	Note2
Permissive input ripple voltage		V_{RF}			100	mVp-p	Vcc=+3.3V
Differential input	High	V_{TH}			+100	mV	V_{CM}=+1.2V
Threshold voltage	Low	V_{TL}	−100			mV	Note1
Input voltage width for LVDS receiver		Vi	0		2.4	V	
Input voltage	High	V_{IH}	2.1			V	
	Low	V_{IL}			0.8	V	
Terminal resistor		R_T		100			Differential input

Note1 V_{CM} : Common mode voltage of LVDS driver.

Note2   Typical current situation : 253-gray-bar pattern

        Vcc=+3.3V, fck=65MHz, Ta=25

        Gray scale : GS(n)
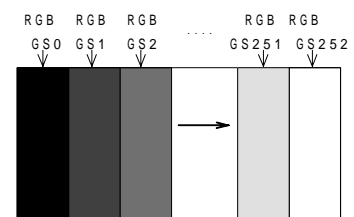
7-2. Backlight
   The back light system is an edge-lighting type with 2 CCFTs (Cold Cathode Fluorescent Tube).
   The characteristics of the lamp are shown in the following table.
   The value mentioned below is at the case of one CCFT.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark	
Lamp current range	I_L	3.5	6.5	7.0	mArms	Note1	
Lamp voltage	V_L		660		Vrms	I_L=6.5 mArms Ta=25 60kHz	
Lamp power consumption	P_L		4.3		W	Note2	
Lamp frequency	F_L	40	55	70	kHz	Note3	
Kick-off voltage	Vs			1400	Vrms	Inverter output Note4 Ta=0	
Life time	T_L	50,000			hour	Lamp (When not mounted into LCD module.	Note5
			(25,000)		hour	When mounted into LCD module (Reference value)	

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 V_{LOW} at circuit showed below.
       (Note : To keep enough kick-off voltage and necessary steady voltage for CCFT.)
       Panel surface temperature : 0 60
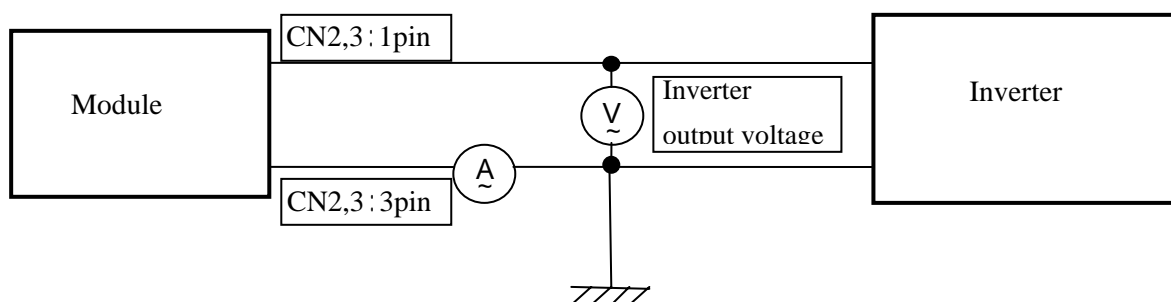
Note2   Referential data per one CCFT by calculation (I_L × V_L) .
       The data don't include loss at inverter. (I_L=6.0 mArms)
Note3   Lamp frequency of inverter may produce interference with horizontal synchronous frequency, and this
       may cause horizontal beat on the display. Therefore, adjust lamp frequency, and keep inverter as far as
       from module or use electronic shielding between inverter and module to avoid interference.
Note4   The open output voltage of the inverter shall be maintained for more than 1s; otherwise
       the lamp may not be turned on.
Note5   Above value is applicable when lamp (the long side of LCD module) is placed horizontally.
        (Landscape position)
       Lamp life time is defined that it applied either   or   under this condition
       (Continuous turning on at Ta=25 ^{o}C, I_L=6.5mArms)
            Brightness becomes 50% of the original value under standard condition.
            Kick-off voltage at Ta=0 ^{o}C exceeds maximum value, (1,400)Vrms.
       (Lamp life time may vary if lamp is in portrait position due to the change of mercury density inside
        the lamp.)
       Lamp life time shortens according to the used state and environment.
       In case of operating under lower temp environment, the lamp exhaustion is accelerated
       and the brightness becomes lower.(Continuous operating for around 1 month under lower temp
       condition may reduce the brightness to half of the original brightness.)
       The life of a lamp is accelerated when using it in the environment where a lamp cannot get warm easily.
         When using it outdoors and ON/OFF is repeated frequently
       In case of such usage under lower temp environment, periodical lamp check and exchange is
         recommended.

Note6　The performance of the backlight, for example life time 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 occur. when you confirm it, the module should
be operated in　the same condition as it is installed in your instrument.
Be sure to use a back light power supply with the safety protection circuit such as the detection circuit
for the excess voltage, excess current and or electric discharge waveform.
Be sure to use the detect circuit by which one side of the CCFT lamps can be controlled
independently. Otherwise, when one side of the CCFT is open, the excess current may possibly
be applied to the other side of the lamp.

Note7　It is required to have the inverter designed so that to allow the impedance deviation of the two CCFT
lamps and the capacity deviation of barast capacitor.

Note8　Under the environment of 10 lx or less, miss-lighting delay may occur.

Note9　A lamp waveform should satisfy the following conditions.

| Wave efficiency | 1.20 | $Ip(P) / Irms$ or $Ip(N) / Irms$ | 1.63 |
| Imbalanced value: | 0.95 | $Ip(P) / Ip(N)$ | 1.05 |
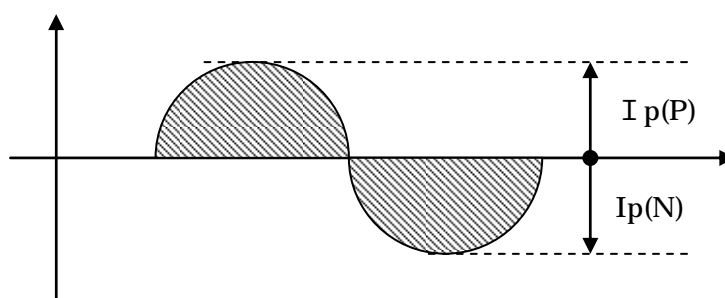
8. Timing characteristics of input signals

8-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit
Clock signal	Frequency	1/Tc	50.0	65.0	80.0	MHz
ENAB signal	Horizontal period	TH	1056	1344	1720	clock
			16.0	20.7	23.4	μs
	Horizontal period (High)	THd	1024	1024	1024	clock
	Vertical Frequency	fv	54	60	77	Hz
	Vertical period	TV	773	806	990	line
			12.98	16.66	18.51	ms
	Vertical period (High)	TVd	768	768	768	line

Note　In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.

DE

DATA
(R,G,B)

| 1024 | | 1 | 2 | | 1024 | |

TH

THd

DE

Tc

1 2 767 768

TVd

TV
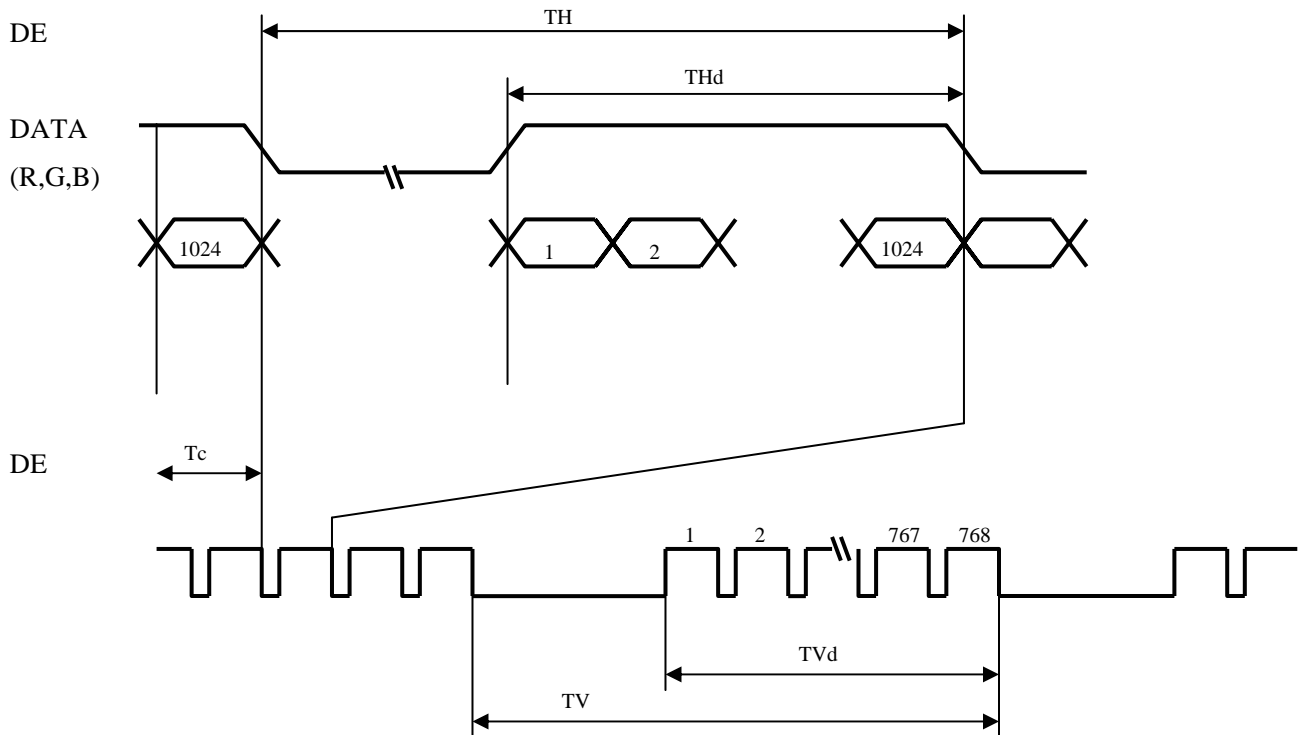
8-2. Input Data Signals and Display Position on the screen

| R1 | G1 | B1 | R2 | G2 | B2 |
| (| |) | (| , |) |

1 1024

R G B

768 1024

768 1
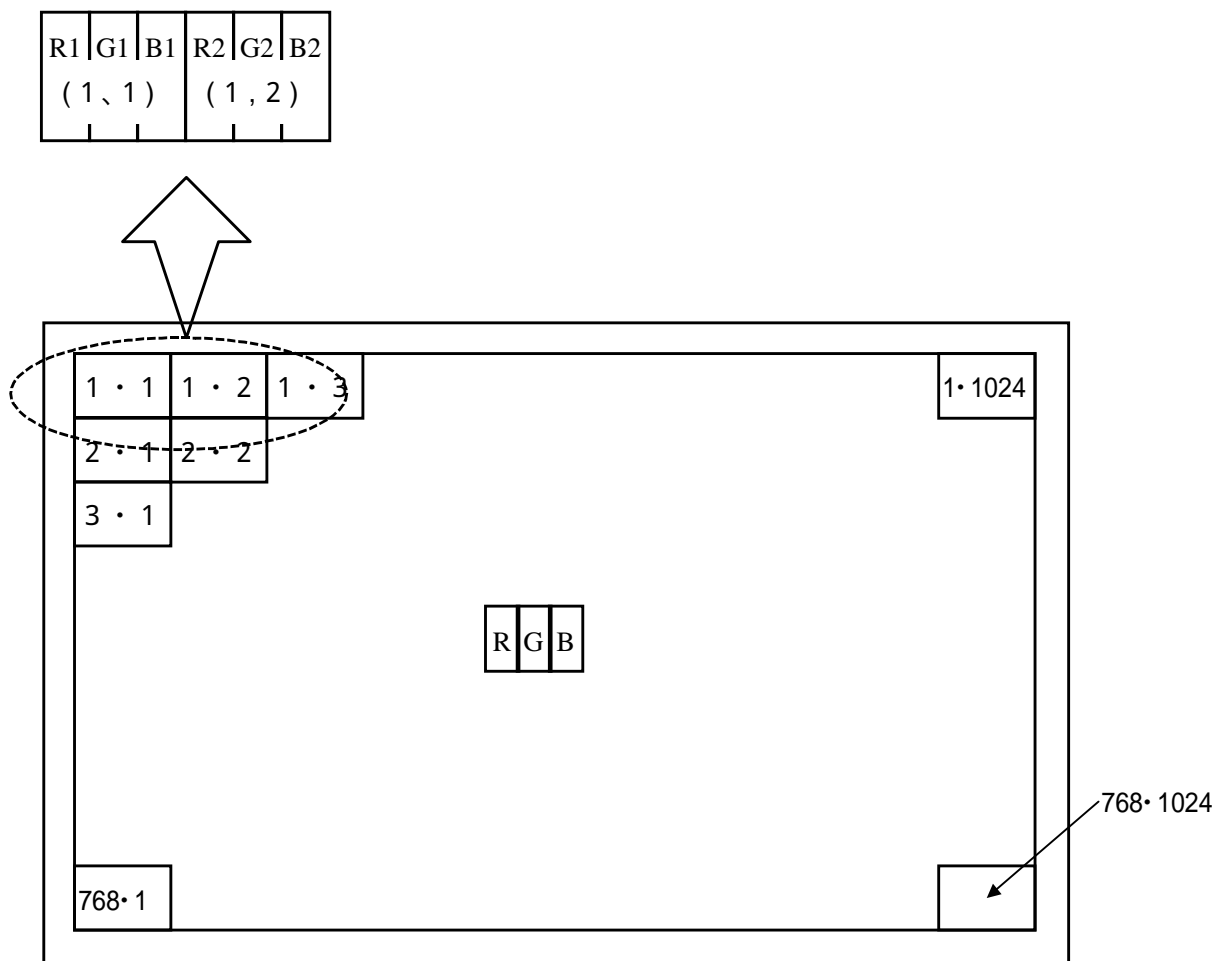
Display Position of Data (V, H)

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

9-1. 8bit input

	Colors & Gray scale	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	0
	Blue		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Cyan		0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Red		1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Magenta		1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	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	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	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. : Don't care

Each basic color can be displayed in 253 gray scales from 8 bit data signals. According to the combination of

total 24 bit data signals, the 16-million-color display can be achieved on the screen.

9-2. 6bit input

Colors & Gray scale		Gray Scale	Data signal																	
			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.

10. Optical Characteristics

Ta=25 , Vcc =+3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Vertical	11	CR 10	30	45		Deg.	Note1,4
		12		45	55		Deg.	
	Horizontal	21, 22		50	60		Deg.	
Contrast ratio			=0°	400	550			Note2,4
Response Time	Rise	r			2		ms	Note3,4
	Fall	d			6		ms	
Chromaticity of White		x	=0°	0.283	0.313	0.343		Note4
		y		0.299	0.329	0.359		
Chromaticity of Red		x		0.567	0.597	0.627		
		y		0.297	0.327	0.357		
Chromaticity of Green		x		0.292	0.322	0.352		
		y		0.525	0.555	0.585		
Chromaticity of Blue		x		0.123	0.153	0.183		
		y		0.103	0.133	0.163		
Luminance of white		Y_L		280	350		cd/m^2	I$_L$=6.5mA rms f$_L$=60kHz Note4
White Uniformity		w				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.
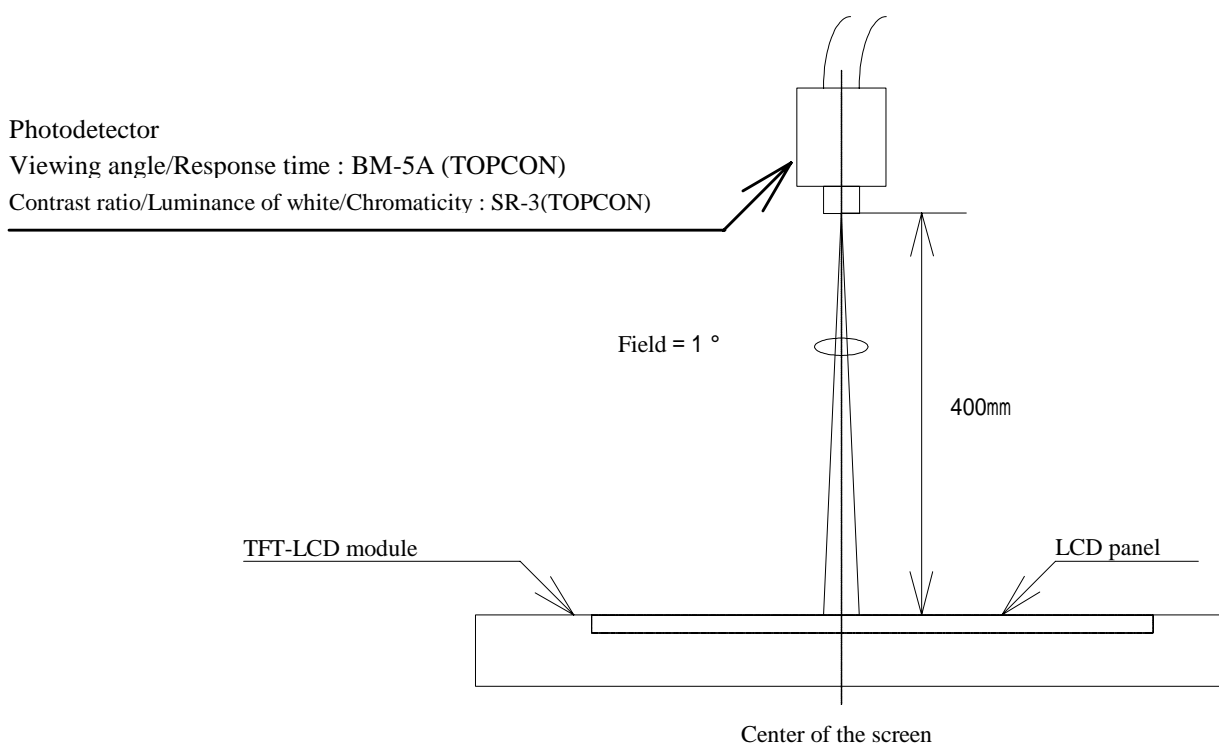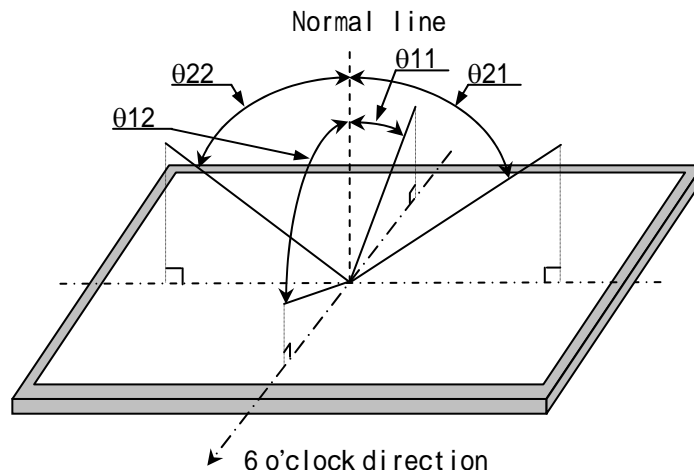

Photodetector
Viewing angle/Response time : BM-5A (TOPCON)
Contrast ratio/Luminance of white/Chromaticity : SR-3(TOPCON)

Field 1°

400mm

TFT-LCD module

LCD panel

Center of the screen

Fig.3 Optical characteristics measurement method

Note1   Definitions of viewing angle range:

Normal line

$\theta 22$ $\theta 11$ $\theta 21$

$\theta 12$

6 o'clock direction

Note2   Definition of contrast ratio:

The contrast ratio is defined as the following.

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

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".

White   black   white

Photodetector Output
(Relative Value)

100%
90%

10%
0%

τr τd

time
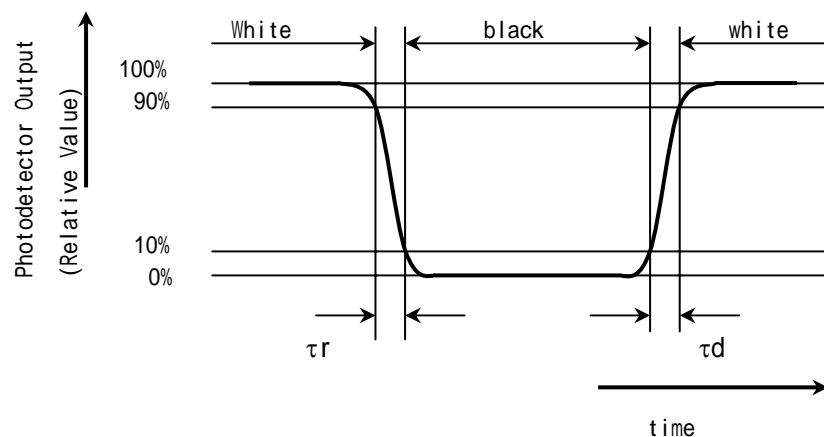
Note4   This shall be measured at center of the screen.

Note5   Definition of white uniformity:

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

256   512   768   pixel

A   D   192

C   384

B   E   576
pixel
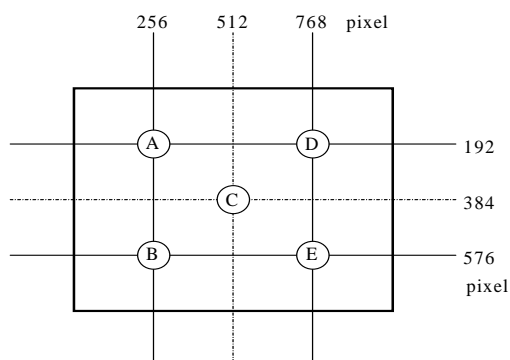
$$W \quad \frac{\text{Maximum Luminance of five points (brightness)}}{\text{Minimum Luminance of five points (brightness)}}$$

11. 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 polarizer is easily damaged, pay attention not to scratch it.
       Blow away dust on the polarizer with antistatic $_2$ blow. It is undesirable to wipe off because a polarizer
       is sensitive.
       It is recommended to peel off softly using the adhesive tape when soil or finger oil is stuck to the polarizer.
       When unavoidable, wipe off carefully with a cloth for wiping lenses.

    d) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.

    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 injure the human earth
       when handling.Observe all other precautionary requirements in handling components.

    h) Since there is a circuit board in the module back, stress is not added at the time of a design assembly.
       Please make it like. If stress is added, there is a possibility that circuit parts may be damaged.

    i) Protection film is attached to the module surface to prevent it from being scratched .
       Peel the film off slowly , just before the use, with strict attention to electrostatic charges.
       Blow off 'dust' on the polarizer by using an ionized nitrogen.

    j) The polarizer surface on the panel is treated with Anti-Glare for low reflection. In case of attaching
       protective board over the LCD, be careful about the optical interface fringe etc. which degrades
       display quality.

    k) Do not expose the LCD panel to direct sunlight. Lightproof shade etc. should be attached when LCD
       panel is used under such environmentl

    l) Connect GND to 4 place of mounting holes to stabilize against EMI and external noise.

    m) There are high voltage portions on the backlight and very dangerous. Careless touch may lead to
       electrical shock. When exchange lamps or service, turn off the power without tail.

    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) Cold cathode fluorescent lamp in LCD panel contains a small amount of mercury, please follow local
       ordinances or regulations for disposal.

    p) Be careful of a back light lead not to pull by force at the time of the wiring to an inverter,
       or line processing.

    q) When install LCD modules in the cabinet, please tighten with "torque=0.294± 0.02N m(3.0± 0.2kgf cm)".
       Be sure to confirm it in the same condition as it is installed in your instrument.

    r) Liquid crystal contained in the panel may leak if the LCD is broken. Rinse it as soon as possible if it gets
       inside your eye or mouth by mistake.

    s) Notice:Never dismantle the module , because it will cause failure.
       Please don't remove the fixed tape, insulateing tape etc that was pasted on the original module.
       (except for protection film of the panel and the crepe tape(yellow tape) of fixing lamp
       cable temporarily.)

t) Be careful when using it for long time with fixed pattern display as it may cause afterimage.

Please use a screen saver etc., in order to avoid an afterimage.

u) 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.

v) If a minute particle enters in the module and adheres to an optical material, it may cause display non-uniformity issue, etc. Therefore, fine-pitch filters have to be installed to cooling and inhalation hole if you intend to install a fan.

w)The lamp used for this product is very sensitive to the temperature.

Luminance decreases rapidly when it is used for a long time or repeatedly under the environment of the low temperature or the module is being cooled.

Please avoid the continuous or repeating use of it under such an environment.

It may decrease up to 50% of the initial luminance in about one month under the low temperature environment.

Please consult our company when it is used under the environment like the above mentioned.

x) In case of operating under lower temp environment, the lamp exhaustion is accelerated and the brightness becomes lower.(Continuous operating for around 1 month under lower temp condition may reduce the brightness to half of the original brightness.)
The life of a lamp is accelerated when using it in the environment where a lamp cannot get warm easily.
When using it outdoors and ON/OFF is repeated frequently
In case of such usage under lower temp environment, periodical lamp check and exchange is recommended.

12. Packing form

Product countries / Areas	JAPAN , TAIWAN, CHINA
Piling number of cartons	6
Package quantity in one carton	10pcs
Carton size(TYP)	434 x 395 x 338
Total mass of one carton filled with full modules	13Kg(TYP)
Packing form is shown	Fig.4

13 Reliability test items

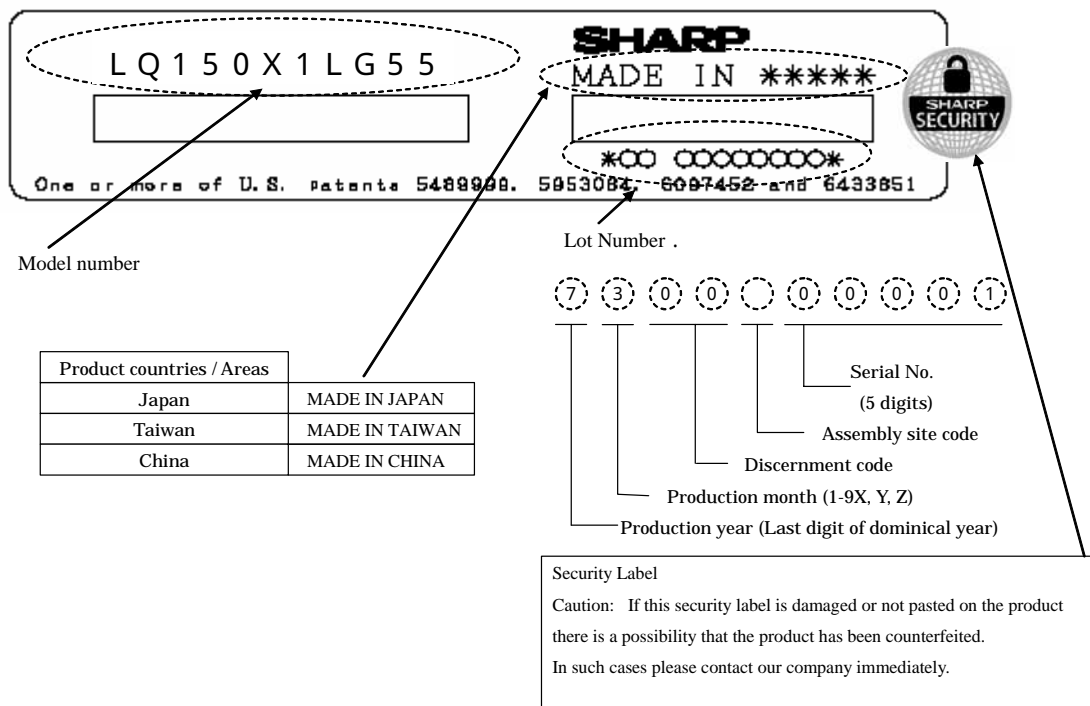| No	Test item	Conditions	
	High temperature & high humidity operation test	Ta = 40℃ ; 95%RH 240h (No condensation)	
	High temperature operation test	Ta = 60℃ (Panel surface) 240h (The panel temp. must be less than 60℃)	
	High temperature storage test	Ta = 60℃ 240h	
	Low temperature operation test	Ta = 0℃ 240h	
	Low temperature storage test	Ta = -25℃ 240h	
	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)	Note
	Shock test (non- operating)	Max. gravity : 490m/s^2 Pulse width : 11ms, half-sine wave Direction : ± X, ± Y, ± Z, once for each direction.	
	Thermal shock test (Storage)	Ta=-25～60℃ ; 5 cycles Test period : 10 hours (1 hour for each temperature)	Note
	Altitude	Ta=50℃,70kPa,3,048m(10,000ft), t=24h (Operating) Ta=70℃,12kPa,15,240m(50,000ft), t=24h (Storage)	

Note
  A gap of panel shall not occur by vibration or the shock.
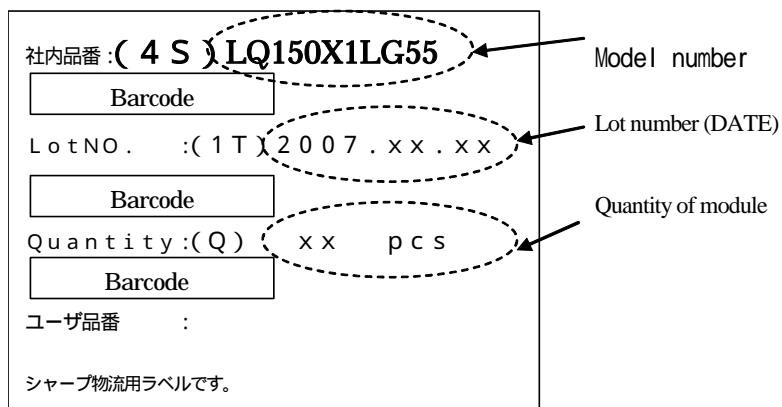
Result Evaluation Criteria
  Under the display quality test conditions with normal operation state, these shall be no change
 which may affect practical display function. (normal operation state Temperature:15～35℃,
  Humidity:45～75﹪, Atmospheric pressure:86～106kpa)

14. Others

14-1. Lot No. Label:

```
┌─────────────────────────────────────────────────────────────┐
│   ╭─────────────────────╮      SHARP           ╭─────╮       │
│   ╰─────────────────────╯    MADE IN *****      │SHARP│       │
│   ┌─────────────────────┐    ┌──────────────┐   │SECU-│       │
│   └─────────────────────┘    └──────────────┘   │RITY │       │
│                              ╭ *○○ ○○○○○○○* ╮    ╰─────╯       │
│   One or more of U.S. patents 5489998. 5953084, 6097452 and 6433851 │
└─────────────────────────────────────────────────────────────┘
```

Model number

Lot Number

○ ○ ○ ○ ○ ○ ○ ○ ○

Product countries / Areas	
Japan	MADE IN JAPAN
Taiwan	MADE IN TAIWAN
China	MADE IN CHINA

Serial No.
(5 digits)

Assembly site code

Discernment code

Production month (1-9X, Y, Z)

Production year (Last digit of dominical year)

Security Label

Caution: If this security label is damaged or not pasted on the product
there is a possibility that the product has been counterfeited.
In such cases please contact our company immediately.

14-2. Packing box Label:

```
┌──────────────────────────────┐
│        ╭ LQ150X1LG55 ╮        │      Model number
│  ┌──────────┐ ╰───────╯       │
│  │ Barcode  │                 │
│  └──────────┘ ╭─────────╮     │      Lot number (DATE)
│               ╰─────────╯     │
│  ┌──────────┐                 │
│  │ Barcode  │ ╭─────────╮     │      Quantity of module
│  └──────────┘ ╰─────────╯     │
│  ┌──────────┐                 │
│  │ Barcode  │                 │
│  └──────────┘                 │
│                               │
└──────────────────────────────┘
```

╭─────────────────────╮
│ Internal Use Only │
│   .   .   │
╰─────────────────────╯

R.C.   RoHS Compliance   means these parts have corresponded with the RoHS directive.

14-3.   If any problem occurs in relation to the description of this specification , it shall be resolved
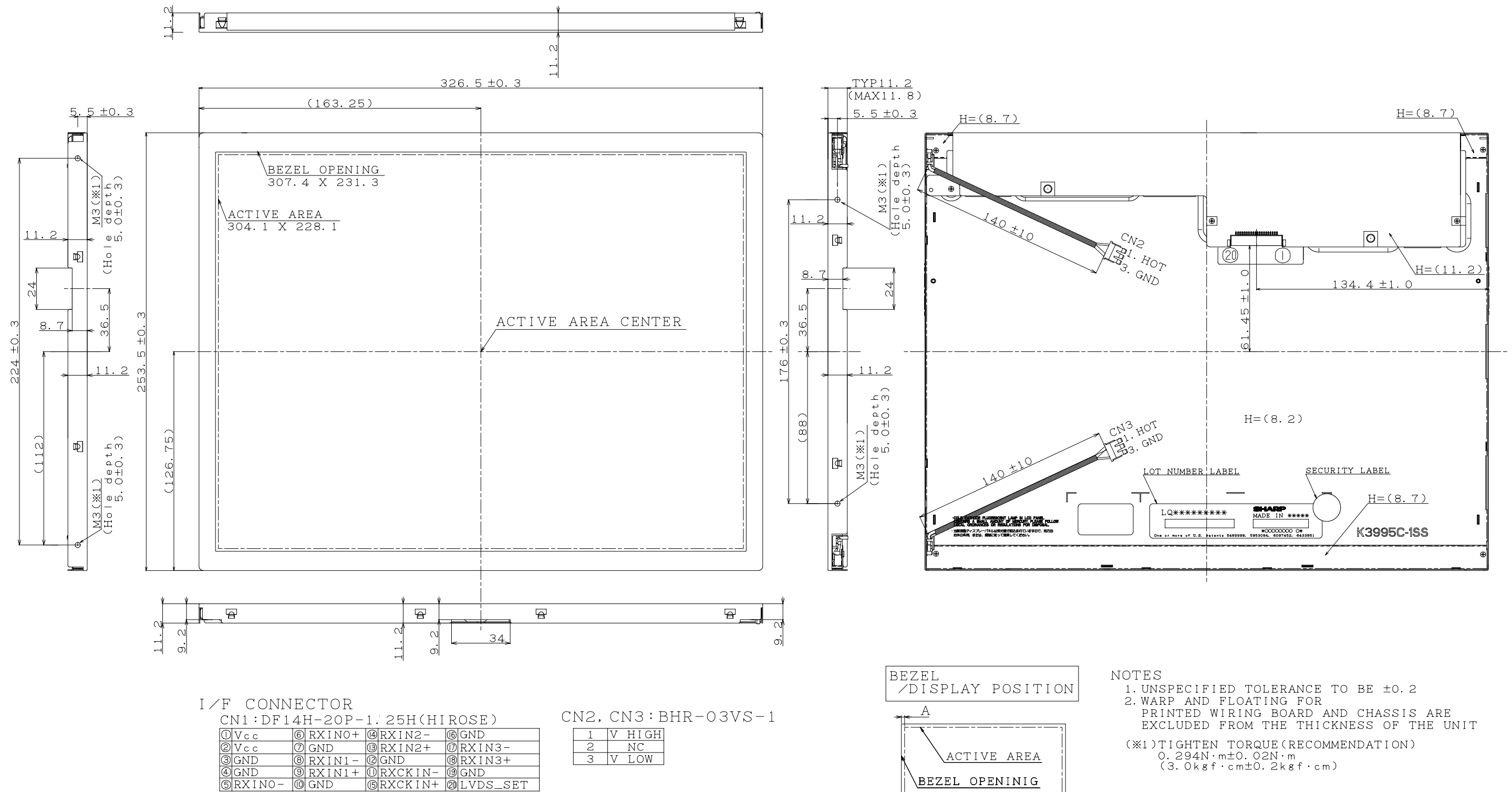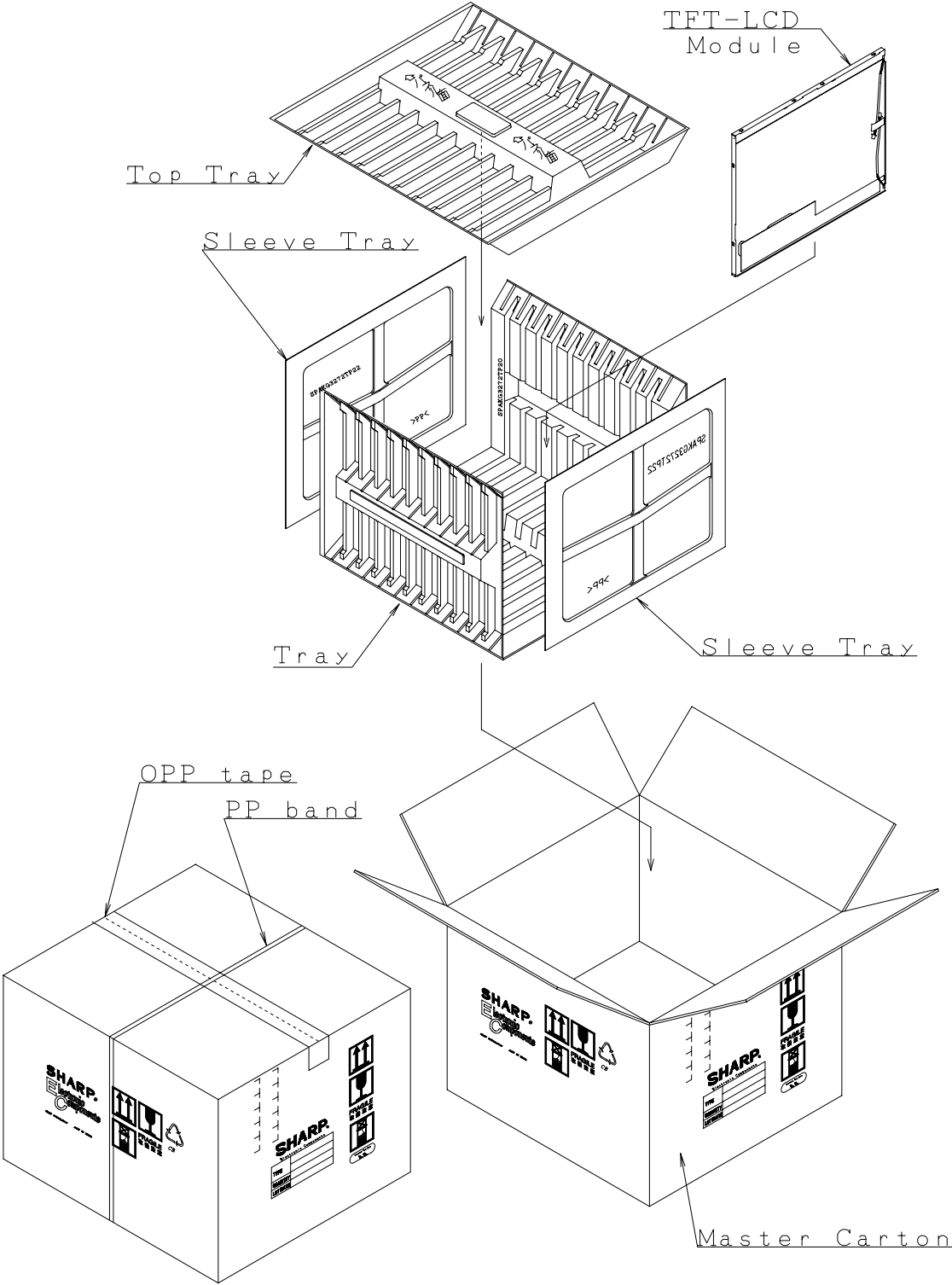   through discussion with spirit of cooperation.

LD-19512A-21

I/F CONNECTOR
CN1:DF14H-20P-1.25H(HIROSE)

①Vcc	⑥RXIN0+	⑪RXIN2-	⑯GND
②Vcc	⑦GND	⑫RXIN2+	⑰RXIN3-
③GND	⑧RXIN1-	⑬GND	⑱RXIN3+
④GND	⑨RXIN1+	⑭RXCKIN-	⑲GND
⑤RXIN0-	⑩GND	⑮RXCKIN+	⑳LVDS_SET

CN2,CN3:BHR-03VS-1

1	V HIGH
2	NC
3	V LOW

Fig. 1 LQ150X1LG55 OUTLINE DIMENSIONS

BEZEL /DISPLAY POSITION

ACTIVE AREA
BEZEL OPENINIG

NOTES
 1.UNSPECIFIED TOLERANCE TO BE ±0.2
 2.WARP AND FLOATING FOR
   PRINTED WIRING BOARD AND CHASSIS ARE
   EXCLUDED FROM THE THICKNESS OF THE UNIT

(※1)TIGHTEN TORQUE(RECOMMENDATION)
   0.294N·m±0.02N·m
   (3.0kgf·cm±0.2kgf·cm)

1)TOLERANCE X-DIRECTION A:1.65±0.8
2)TOLERANCE Y-DIRECTION B:1.6±0.8
3)OBLIQUITY OF DISPLAY AREA |C-D|<0.8

TFT-LCD
Module

Top Tray

Sleeve Tray

Tray

Sleeve Tray

OPP tape

PP band

Master Carton

Fig4. Packing Form