SHARP

No.	LCY-W-11X52A

DATE 14-Oct-11
REV. -

TECHNICAL LITERATURE

FOR

TFT - LCD module

MODEL No. **LQ104S1LG81**

These parts have corresponded with the RoHS directive.

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DISPLAY DEVICE GROUP
SHARP CORPORATION

RECORDS OF REVISION

LQ104S1LG81

SPEC No.	DATE	REVISED No	PAGE	SUMMARY	NOTE
LCY-W-11X52A	2011/10/14			-	

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1. Application

This technical literature applies to the color TFT-LCD module LQ104S1LG81.

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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 and a White-LED Backlight unit. Graphics and texts can be displayed on a 800×RGB×600dots panel with about 262,144 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.

The TFT-LCD panel used for this module is a low-reflection and higher-color-saturation type.

The maximum viewing angle is in the 6 o'clock direction.

The 12 o'clock direction is difficult to reverse the grayscale.

The LED driver circuit to drive the backlight is built into the module.

3. Mechanical technical literatures

Parameter	technical literatures	Unit
Display size	26(10.4inch)Diagonal	cm
Active area	211.2(H)×158.4(V)	mm
Pixel format	800(H)×600(V) (1pixel=R+G+B dot)	pixel
Aspect ratio	4:3	
Pixel pitch	0.264(H)×0.264(V)	mm
Pixel configuration	R,G,B vertical stripe	
Display mode	Normally white	
Unit outline dimensions	246.5(W)×179.3(H)×12.5(D)	mm
Mass	T.B.D	g
Surface treatment	Anti-glare and hard-coating 3H	

Outline dimensions are shown in Fig.1.

4. Input Terminals

4-1. TFT-LCD panel driving

CN1 (Interface signals and +3.3V power supply)

Corresponding connectors : FI-SE20M or FI-S20S(conector) (JAE)

CN1

Pin	Symbol	Function	Remark
1	VCC	+3.3V Power supply	
2	VCC	+3.3V Power supply	
3	GND		
4	GND		
5	RxIN0-	LVDS receiver signal CH0 (-)	LVDS
6	RxIN0+	LVDS receiver signal CH0 (+)	LVDS
7	GND		
8	RxIN1-	LVDS receiver signal CH1 (-)	LVDS
9	RxIN1+	LVDS receiver signal CH1 (+)	LVDS
10	GND		
11	RxIN2-	LVDS receiver signal CH2 (-)	LVDS
12	RxIN2+	LVDS receiver signal CH2 (+)	LVDS
13	GND		
14	RXCLK IN-	LVDS receiver signal CK (-)	LVDS
15	RXCLK IN+	LVDS receiver signal CK (+)	LVDS
16	GND		
17	NC		
18	SCAN	Horizontal/Vertical display mode select signal	【Note1】
19	GND		
20	GND		

【Note1】 SCAN = LOW

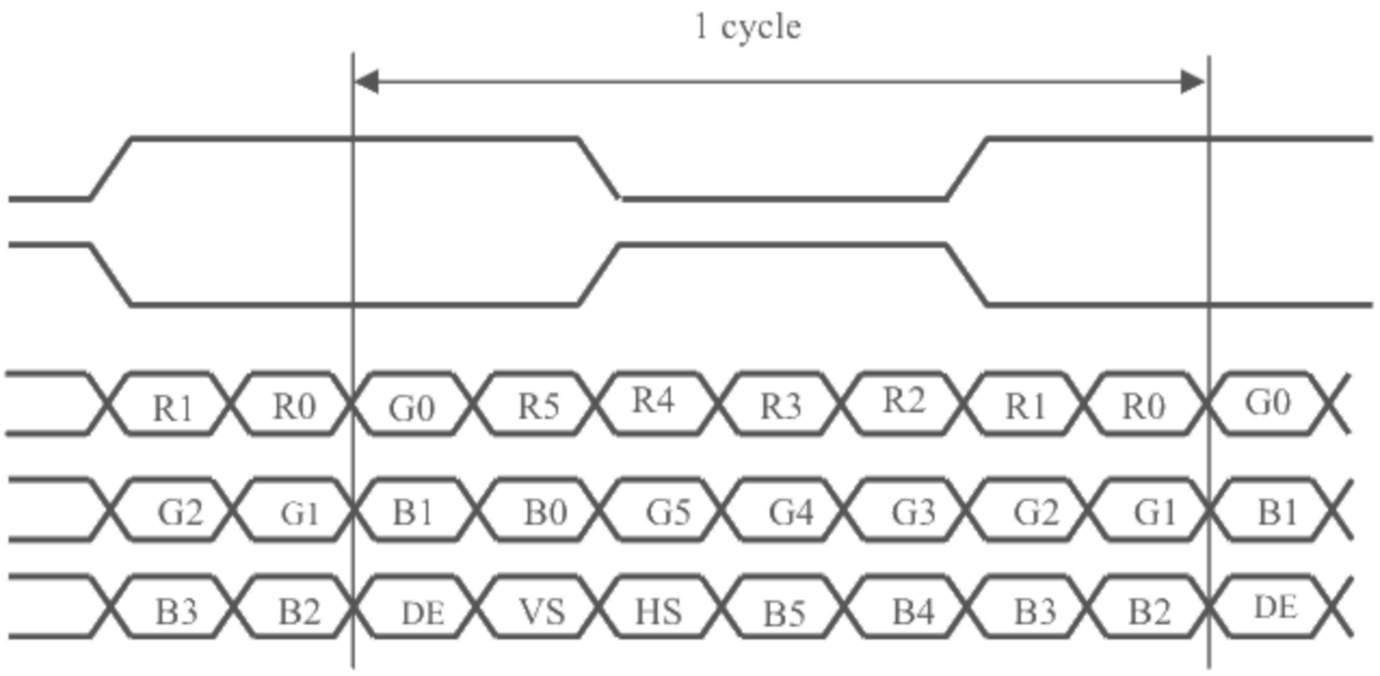


SCAN = HIGH



4-2. Data Mapping

1) data mapping



2) When you use the transmitter in 6bits

Corresponding LVDS Transmitter　　THC63LVDM63A（Thine electronics） or Compatible product

Transmitter		
Pin No	Data	
24	TxIN0	R0 (LSB)
26	TxIN1	R1
27	TxIN2	R2
29	TxIN3	R3
30	TxIN4	R4
31	TxIN5	R5 (MSB)
33	TxIN6	G0 (LSB)
34	TxIN7	G1
35	TxIN8	G2
37	TxIN9	G3
39	TxIN10	G4
40	TxIN11	G5(MSB)
41	TxIN12	B0 (LSB)
43	TxIN13	B1
45	TxIN14	B2
46	TxIN15	B3
47	TxIN16	B4
1	TxIN17	B5(MSB)
2	TxIN18	(NA)
4	TxIN19	(NA)
5	TxIN20	DE

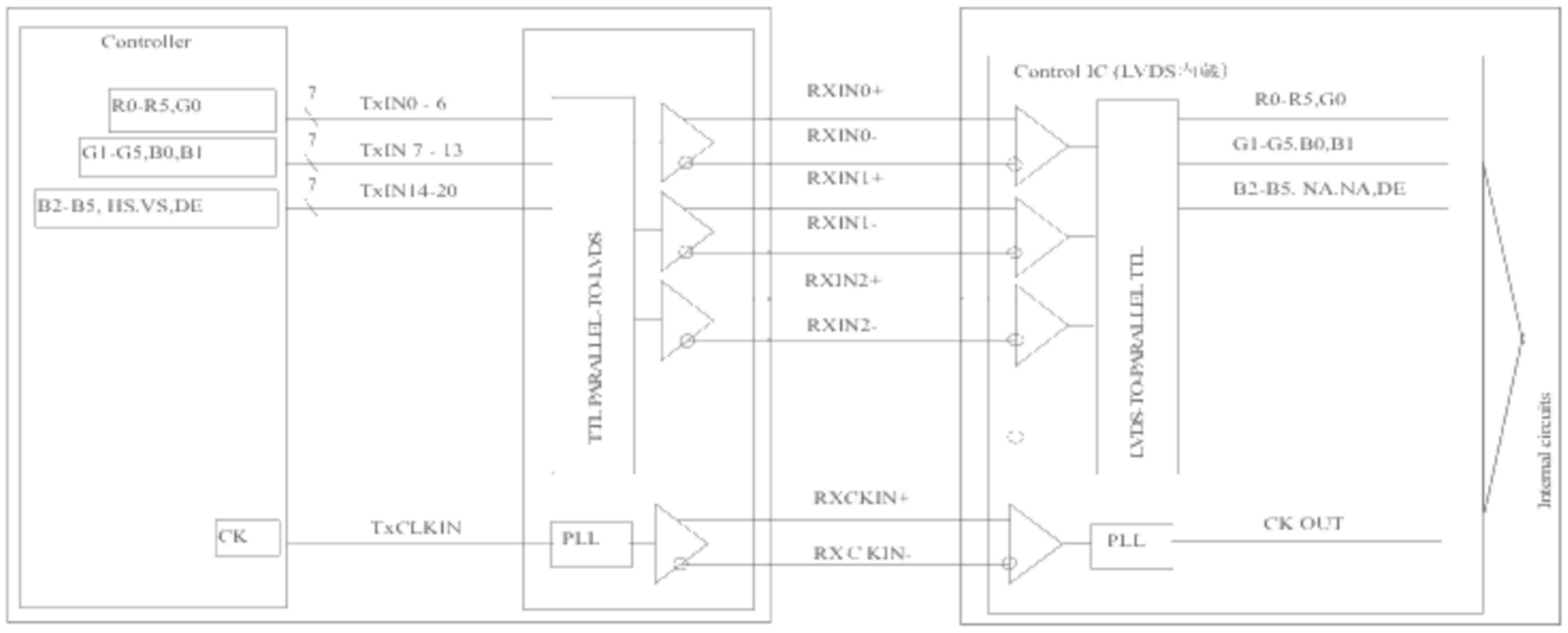
3) When you use the transmitter in 8 bits

Corresponding LVDS Transmitter　　THC63LVDM83R（Thine electronics） or　Compatible product

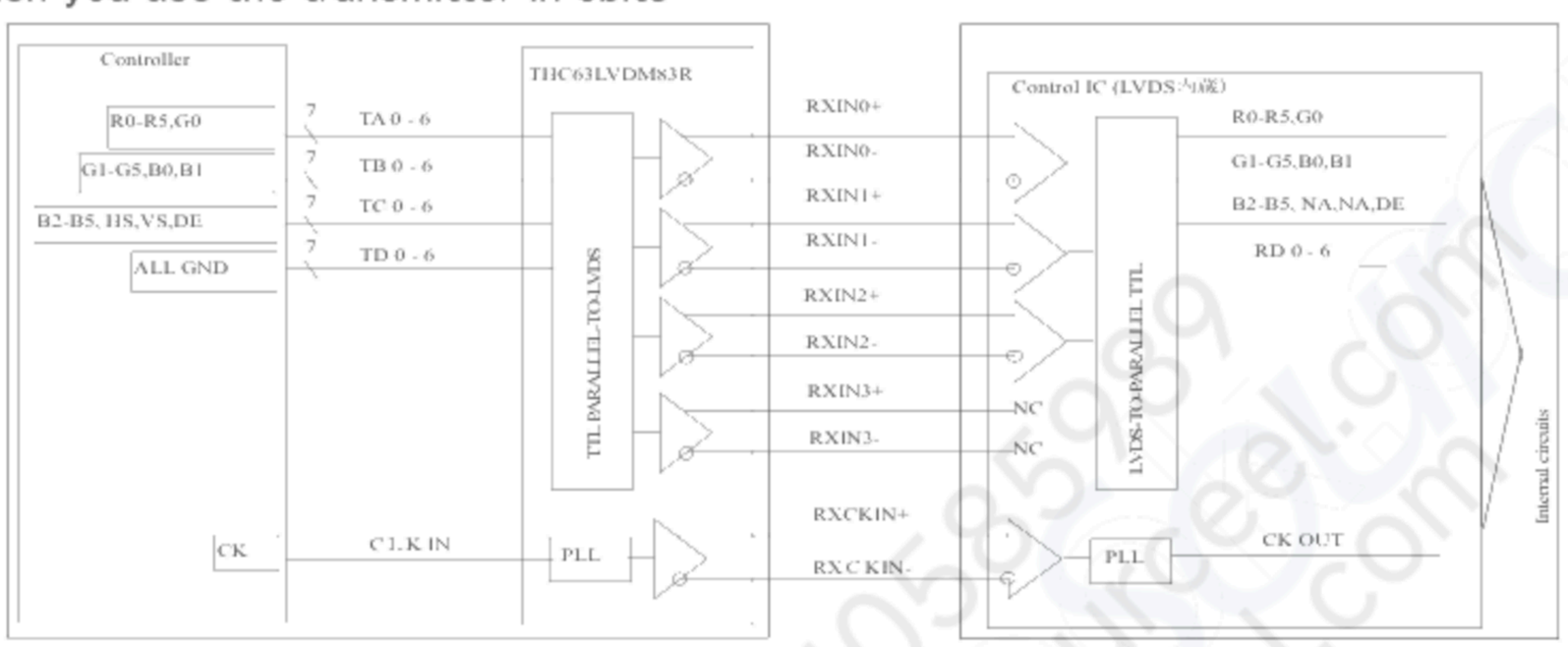
Transmitter		
Pin No	Data	
51	TA0	R0 (LSB)
52	TA1	R1
54	TA2	R2
55	TA3	R3
56	TA4	R4
3	TA5	R5 (MSB)
4	TA6	G0 (LSB)
6	TB0	G1
7	TB1	G2
11	TB2	G3
12	TB3	G4
14	TB4	G5(MSB)
15	TB5	B0 (LSB)
19	TB6	B1
20	TC0	B2
22	TC1	B3
23	TC2	B4
24	TC3	B5(MSB)
27	TC4	(NA)
28	TC5	(NA)
30	TC6	DE
50	TD0	GND
2	TD1	GND
8	TD2	GND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

4-3. Interface block diagram

1) When you use the transmitter in 6bits



2) When you use the transmitter in 8bits



4-4. LED backlight

LED backlight connector

CN2 Used connector : SM06B-SHLS-TF (JAE)

Corresponding connector : SHLP-06V-S-B (JAE)

Connector No.	Pin No.	symbol	function
CN2	1	V_{DD}	+12V power supply
	2	V_{DD}	+12V power supply
	3	GND	GND
	4	GND	GND
	5	XSTABY	Backlight ON/OFF signal
	6	VBR	PWM signal

5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Pin	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	VCC	-0.3 ～ +4.0	V	【Note1,2】
	V_{DD}	Ta=25℃	VDD	-0.3 ～ +40	V	【Note1,2】
Input voltage	V I 1	Ta=25℃	SCAN	-0.3～V_{CC}+0.3	V	
				-0.3～+3.0		
	V I 2	Ta=25℃	RxINi-/+ RXCLK IN-/+	-0.3～+0.3	V	
	V I 3	Ta=25℃	XSTABY, VBR	-0.3～+18	V	
Storage temperature	TSTG	—	-	-30 ～ +80	℃	【Note1】
Operating temperature	TOPA	—	-	-30 ～ +80	℃	【Note1,3,4】

【Note1】 Humidity : 95%RH Max.(Ta≦40℃) Note static electricity.
Maximum wet-bulb temperature at 39℃ or less. (Ta>40℃) No condensation.

【Note2】 The Vcc power supply capacity must use the one of 2A or more.
The Vcc power supply capacity must use the one of 3A or more.

【Note3】 There is a possibility of causing deterioration in the irregularity and others of the screen and the display fineness though the liquid crystal module doesn't arrive at destruction when using it at 65～80℃.

【Note4】 In the operating temperature item, the low temperature side is the ambient temperature regulations.
The high temperature side is the panel surface temperature regulations.

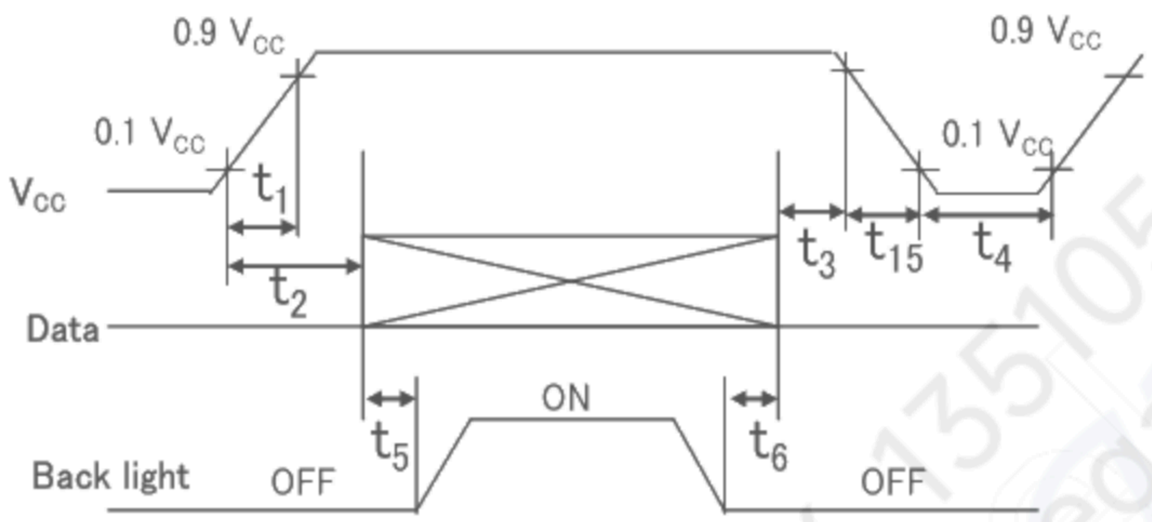
6. Electrical Characteristics

6-1. TFT-LCD panel driving

T_a=+25℃

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{CC}		3.0	3.3	3.6	V	【Note1】
Current dissipation		I_{CC}	Vcc=3.3V	-	TBD	TBD	mA	【Note2】
Permissive input ripple voltage		V_{RP}		—	—	100	mV_{P-P}	Vcc = 3.3V
Input voltage		V_{IH}		2.0	-	Vcc+0.3	V	【Note3】
		V_{IL}		-0.3	-	0.8	V	
Input leak current		I_{OH}		—	—	400	μA	VI2 =+3.3V【Note3】
		I_{OL}		-5	—	—	μA	V_{I2} =0V 【Note3】
LVDS Input voltage		V_L		0	—	2.5	V	【Note4】
Terminal resistor		R_T		—	100	—	Ω	Differential input
Differential input Threshold voltage	High	V_{TH}		—	—	+100	mV	V_{CM} =+1.2V 【Note4】
	Low	V_{TL}		-100	—	—	mV	

【Note1】 On-off conditions for supply voltage



$20\mu s < t_1 \leqq 10ms$

$0 < t_2 \leqq 20ms$

$0 < t_3 \leqq 1s$

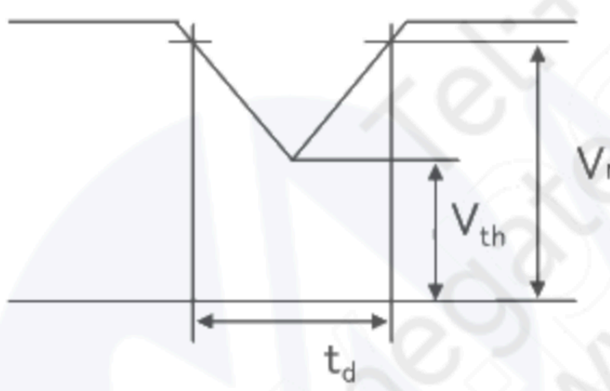
$1s \leqq t_4$

$300ms \leqq t_5$

$300ms \leqq t_6$

$t_{15} \leqq 100ms$

Vcc-dip conditions



V_{th} = 2.5V

V_{min} = 3.0V

- $V_{th} < V_{CC} \leqq V_{min}$

  $t_d \leqq 10ms$

- $V_{CC} < V_{th}$

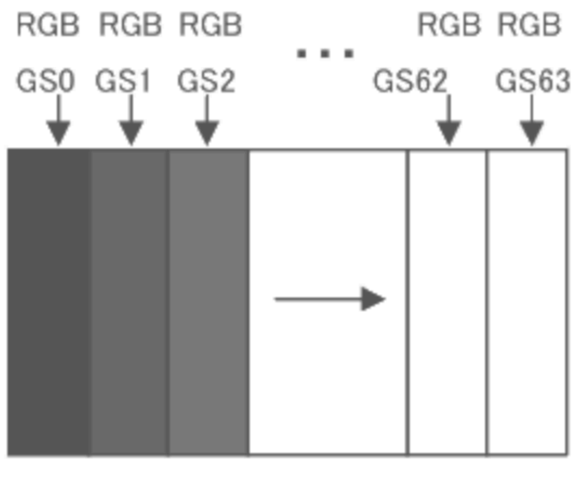
Vcc-dip conditions should also follow the On-off conditions for supply voltage

- The relation between the data input and the backlight lighting will recommend the above-mentioned input sequence. When the backlight is turned on before the panel operates, there is a possibility of abnormally displaying. The liquid crystal module is not damaged.

【Note2】 Current dissipation

Typical current situation : 64-gray-bar pattern

（ Vcc=+3.3V、fck = 40MHz、Ta=25℃）



【Note3】 SCAN

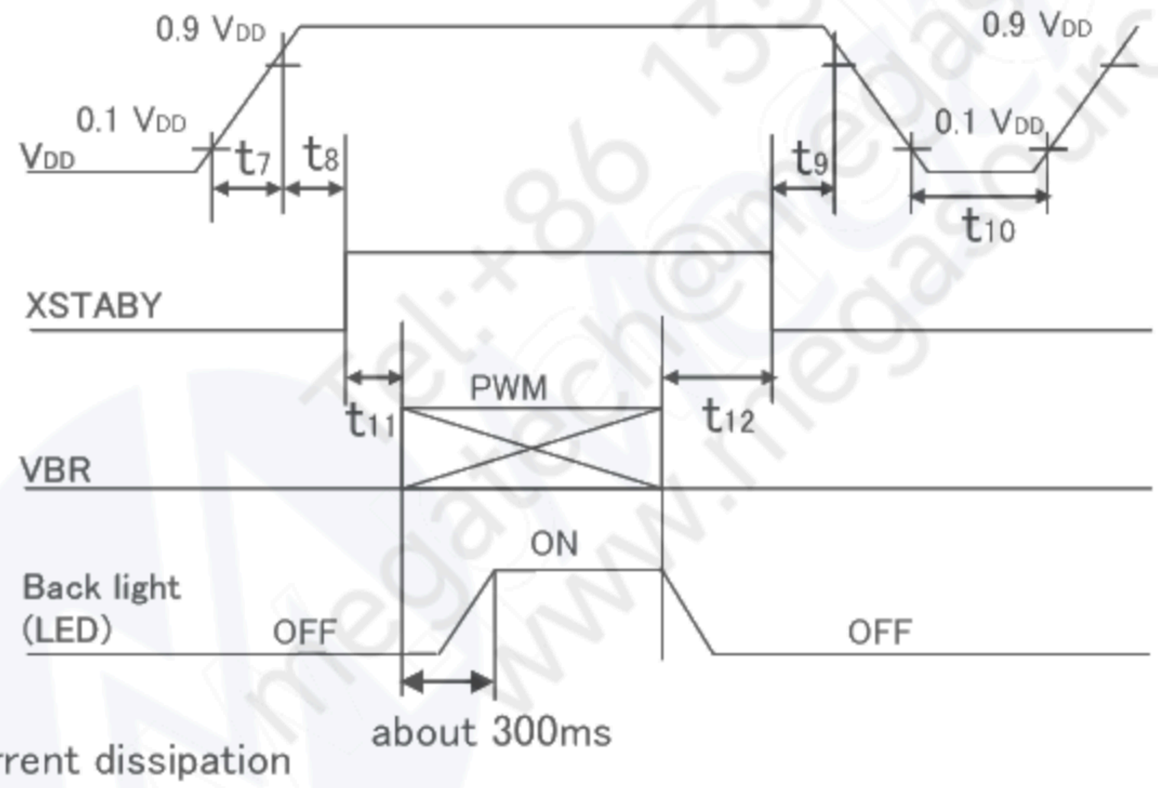
【Note4】 RXIN0-,RXIN0+,RXIN1-,RXIN1+,RXIN2-,RXIN2+,RXCLK IN-,RXCLK IN+

6-2. LED backlight

Ta＝+25°C

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Supply voltage		V_{DD}	10.8	12.0	13.2	V	【Note1】
Current dissipation		I_{DD1}	–	TBD	TBD	mA	【Note2】
		I_{DD2}	–	–	10.0	μA	【Note3,4】
Permissive input ripple voltage		V_{RP_BL}	–	–	200	mV_{P-P}	VDD=+12.0V
XSTABY	High voltage	V_{IH_BL1}	9.0	–	VDD	V	【Note3】
	Low voltage	V_{IL_BL1}	–	–	0.4	V	【Note3】
	Leak current	IIL_XST	–	–	12.0	V	【Note3】
VBR	High voltage	V_{IH_BL2}	9.0	–	VDD	V	【Note4】
	Low voltage	V_{IL_BL2}	–	–	0.4	V	【Note4】
	Leak current	IIL_VBR	–	–	12.0	V	【Note4】 VDD=12V
PWM frequency		f_{PWM}	200	–	1,000	Hz	【Note4,5】
PWM duty ratio		D_{PWM}	10	–	100	%	【Note4,5】
Life time		L	–	50,000 (Module)	–	h	【Reference】 【Note6】

【Note1】 On-off conditions for supply voltage



20μs ≦ t7 ≦ 200ms

0ms ≦ t8

0ms ≦ t9

1ms ≦ t10

10ms ≦ t11

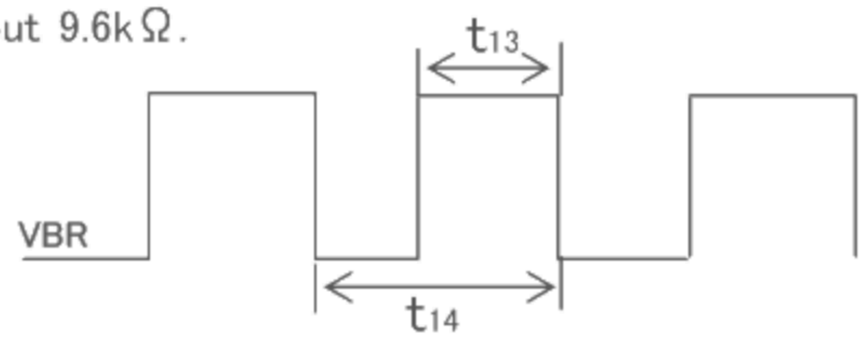
0ms ≦ t12

【Note2】 Current dissipation

Typ. value： V_{DD}= +12V、Duty=100%

【Note3】 XSTABY is connected by the pull-down resistor of about2.8kΩ.

【Note4】 VBR is connected by the pull-down resistor of about 9.6kΩ.



【Note5】 PWM

fPWM ＝ 1/t14 、 DPWM=t13/t14

Duty 10% : Min. Luminance

Duty 100% : Max. Luminance

Luminance changes in proportion to the duty ratio.

When the frequency slows, the display fineness might decrease.

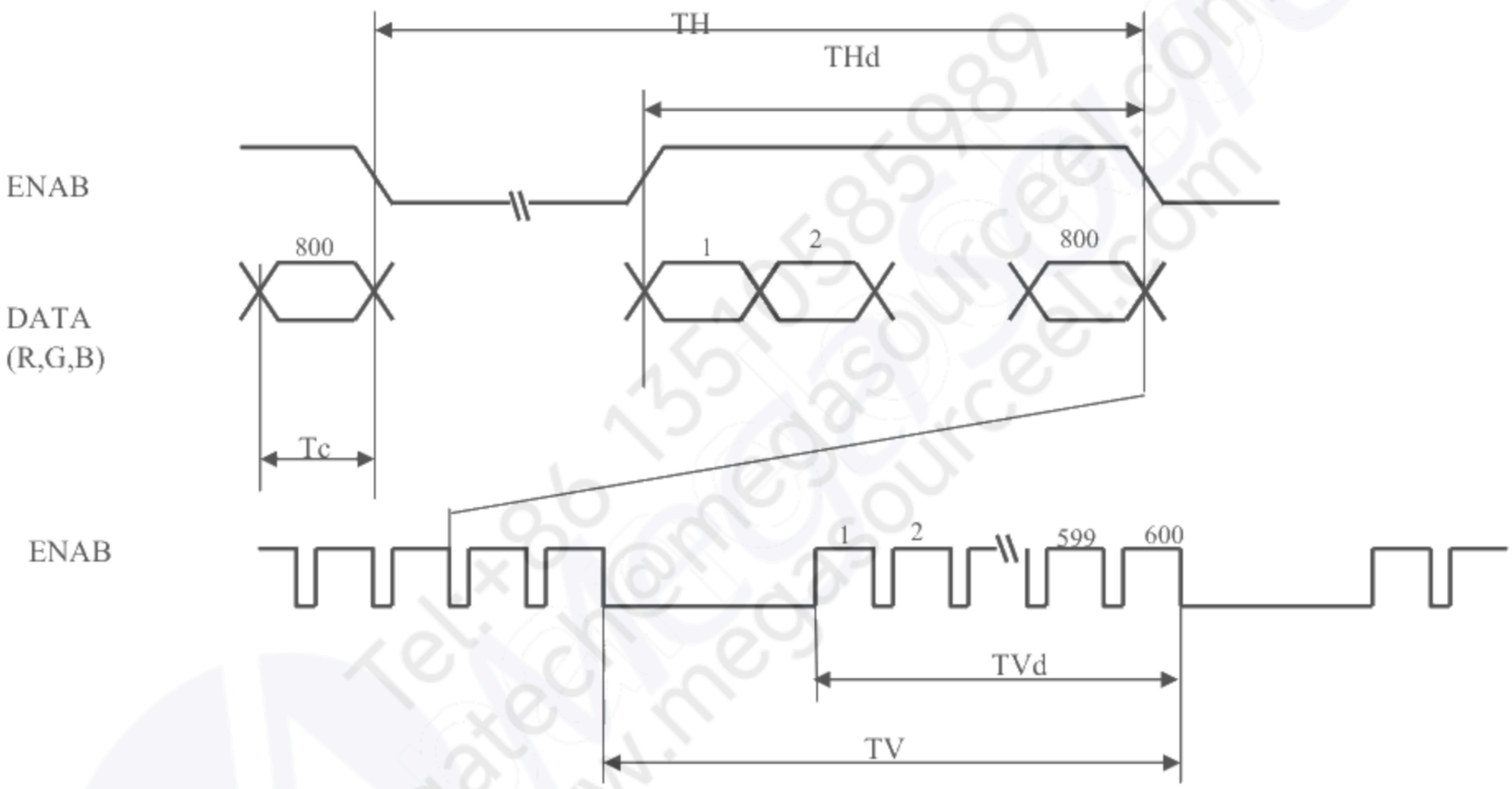
【*6】 Luminance becomes 50% of an initial value. (Ta＝25°C, PWM=100%)

7. Timing characteristics of input signals

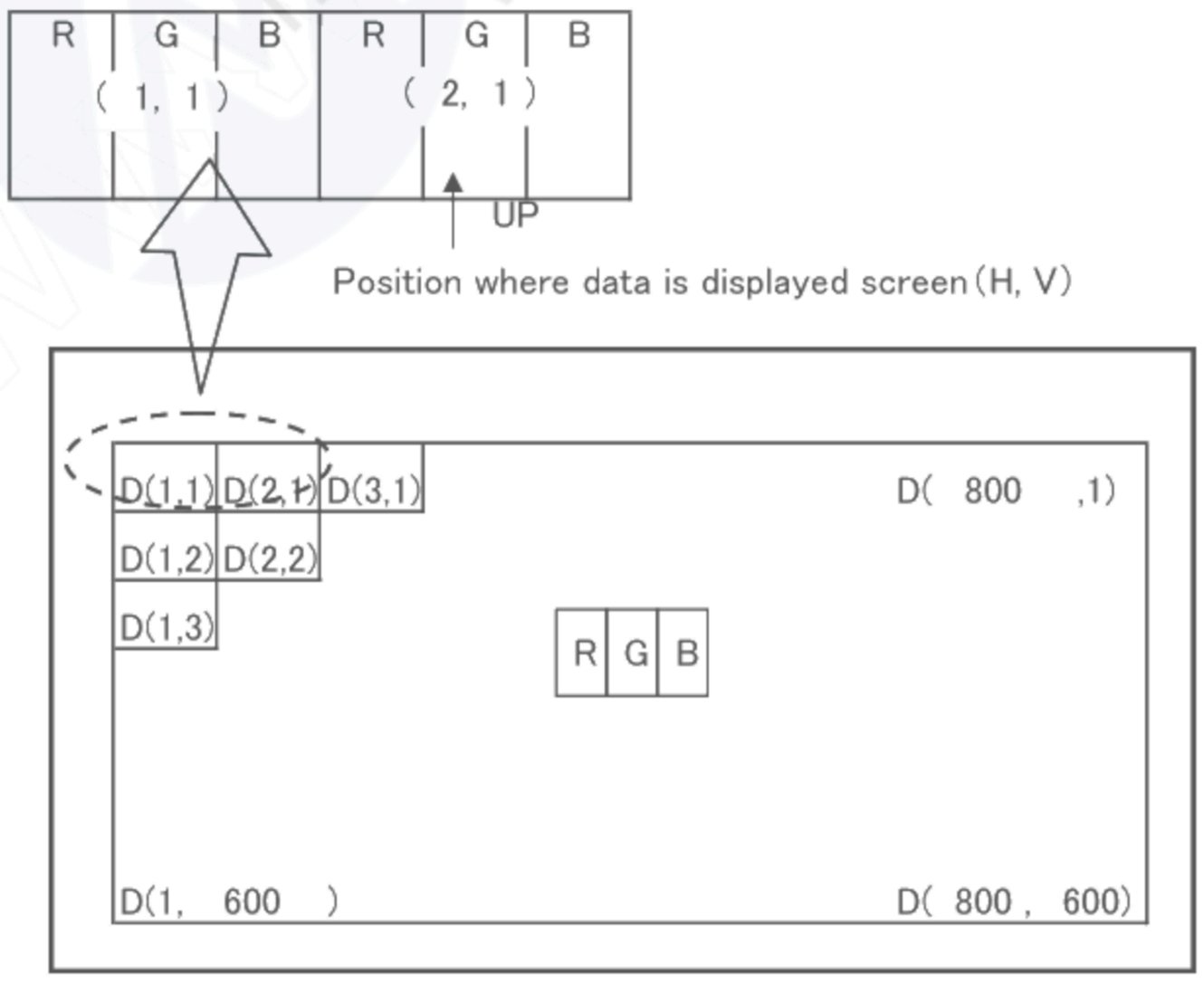
7-1. Timing characteristics

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	35.0	40	42.0	MHz	
Enable signal	Horizontal period	TH	832	1056	1395	clock	
			20.8	26.4	39.9	μs	
	Effective display area	THd	800	800	800	clock	
	Vertical period	TV	628	666	798	clock	【Note1】
			–	17.6	–	ms	
	Effective display area	TVd	600	600	600	clock	

【Note1】 In case of using the long vertical period, the deterioration of display quality, flicker etc. may occur.



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



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

8-1. 6 bit input

	Colors & Gray scale	Data signal																	
		GrayScale	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℃, Vcc=＋3.3V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21, θ 22	CR>10	–	70	–	Deg.	【Note1,2,4】
	Vertical	θ 11		–	50	–	Deg.	
		θ 12		–	60	–	Deg.	
Contrast ratio		CR	optimized angle	–	600	–		【Note2,4】
Response Time	White Black	τ r + τ d	θ =0°	–	35	–	ms	【Note3,4】
Chromaticity of White		Wx		–	(0.310)	–		【Note4】
		Wy		–	(0.335)	–		
Chromaticity of Red		Rx		–	(0.570)	–		
		Ry		–	(0.325)	–		
Chromaticity of Green		Gx		–	(0.336)	–		
		Gy		–	(0.570)	–		
Chromaticity of Blue		Bx		–	(0.170)	–		
		By		–	(0.170)	–		
Luminance of white		Y_{L1}		–	420	–	cd/m^2	【Note4】
White Uniformity				–	–	1.33		【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.

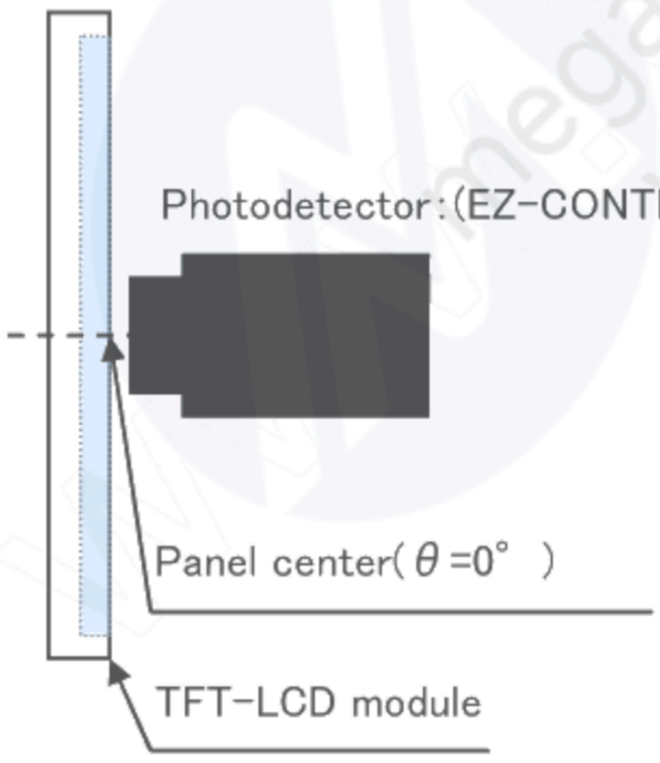


fig.2-1 Measuring method of Viewing angle range.

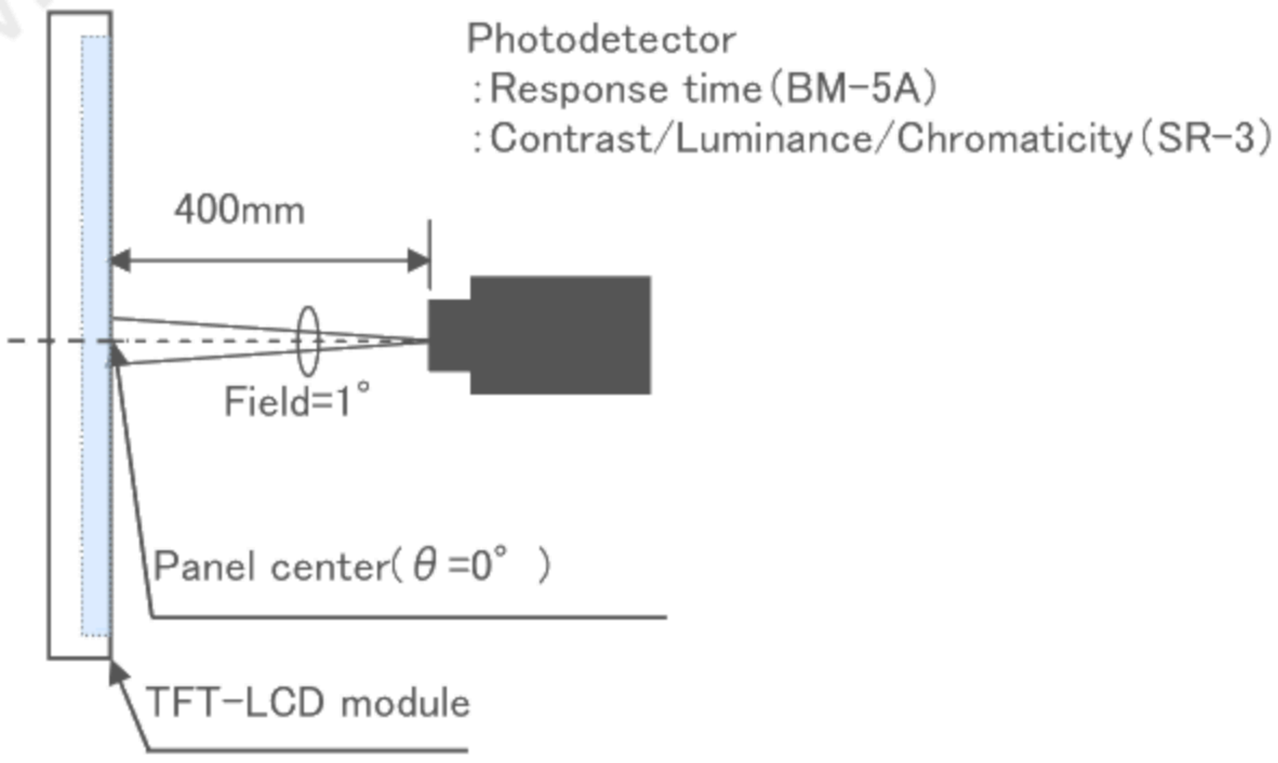
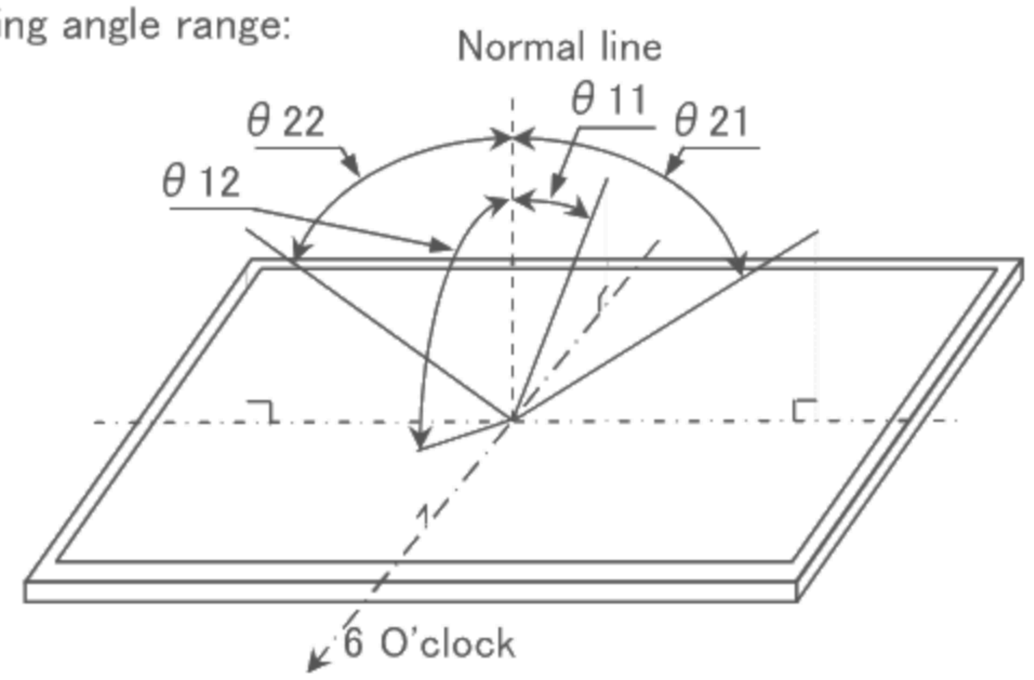


fig.2-2 Measuring method of contrast, luminance, response time, and Chromaticity.

Fig.2 Optical characteristics measurement method

【Note1】Definitions of viewing angle range:

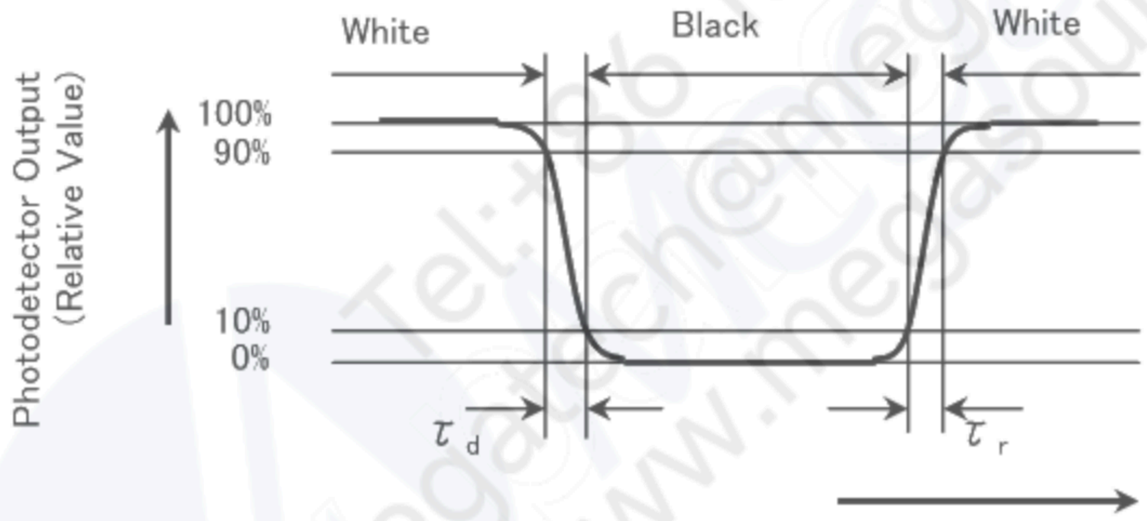


【Note2】Definition of contrast ratio:

The contrast ratio is defined as the following. Contrast (CR) = $\frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$

【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".

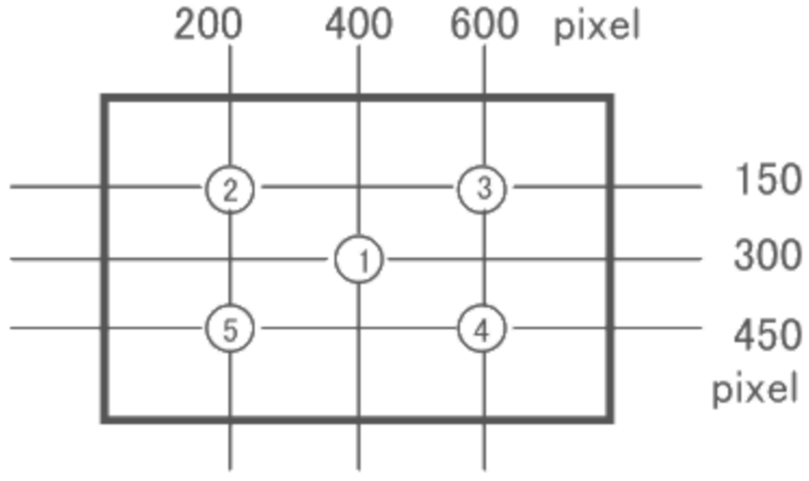


【Note4】This shall be measured at center of the screen.

【Note5】Definition of white uniformity:

White uniformity is defined as the following with five measurements. (①～⑤)

$$\delta_w = \frac{\text{Maximum luminance of 5 points(①～⑤).}}{\text{Minimum luminance of 5 points(①～⑤).}}$$



10. Handling Precautions

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

b) Since the front polarizer is easily damaged, pay attention not to scratch it.

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

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

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

f) 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.

g) 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.

h) It causes an irregular display and the defective indication, etc., when always put constant pressure on the back of the module.
Please do not make the structure to press the back of the module.

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

j) Connect GND to stabilize against EMI and external noise.

k) When handling LCD modules and assembling them into cabinets, please avoid that long-terms 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 modules. Do not use the LCD module under such environment.

l) 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.

m) Be careful when using it for long time with fixed pattern display as it may cause accidential image.

n) 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.

o) 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.

p) An abnormal display by changing in quality of the polarizing plate might occur regardless of contact or no contact to the polarizing plate, because of epoxy resin (amine system curing agent) that comes out from the material and the packaging material used for the set side, the silicon adhesive (dealcoholization system and oxime system), and the tray blowing agents (azo-compound), etc.
Please confirm adaptability with your employed material.

q) 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.

r) Notice : Never take to pieces the module , because it will cause failure.
Please do not peel off the Black tape pasted to the product.

s) Be sure to design the cabinet so that the module can be installed without any extra stress such as warp or twist.

11. Packing form

a) Piling number of cartons : MAX. 6

b) Package quantity in one carton: 20pcs

c) Carton size(TYP): 451mm(W) × 440mm(D)×313mm(H)

d) Total mass of one carton filled with full modules(20pcs): TBDkg

Packing form is shown in Fig 3.

12. Reliability test items

No.	Test item	Conditions	Remark
1	High temperature storage test	Ambient temperature 80℃ 240H	【Note1】
2	Low temperature strage test	Ambient temperature -30℃ 240H	【Note1】
3	High temperature & high humidity operation test	Ambient temperature 40℃、Humidity 95% RH 240H (No condensation.)	【Note1】
4	High temperature operation test	Panel surface(Active Area) 80℃ 240H	【Note1】
5	Low temperature operation test	Ambient temperature -30℃ 240H	【Note1】
6	Vibration test	＜Sin wave＞ Frequency :10～57Hz／Vibration width (one side) :0.076mm :57～500Hz／Gravity:9.8m/s2 Sweep time:11minutes Test period :3H(X, Y, Z direction 1H)	【Note1】
7	Shock test	Max. gravity:490m/s2 Pulse width:11ms Direction:±X,±Y,±Z Test period :1time／1direction	【Note1】

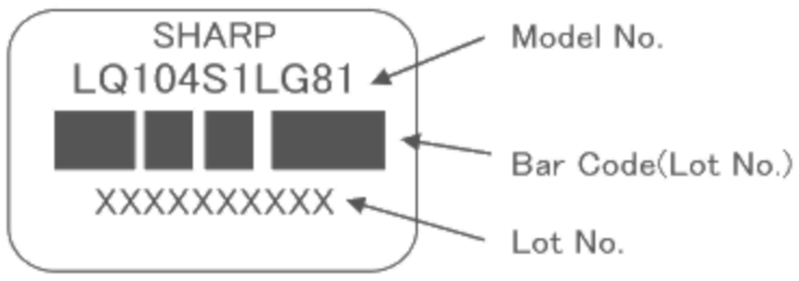
【Note1】 Under the display quality test conditions with normal operation state, these shall be no change which may affect practical display function. (normal operation state:Temperature:15～35℃, Humidity:45～75%, Atmospheric pressure:86～106kpa)

13. Others

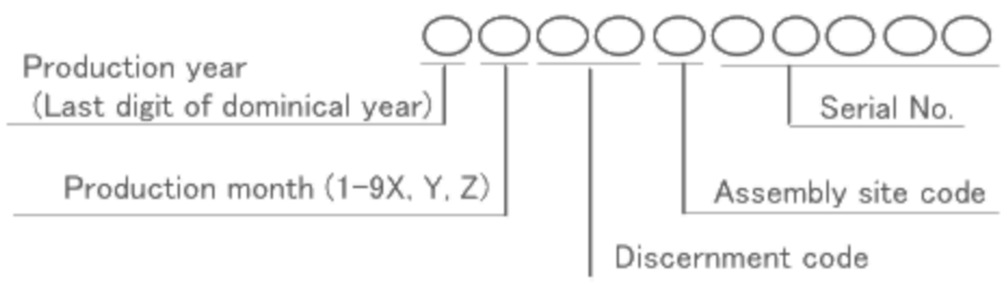
13-1. Lot No Label:

A) Module serial label

The label that displays SHARP・Model No.(LQ104S1LG81)・Lot No. is stuck on the back of the module.

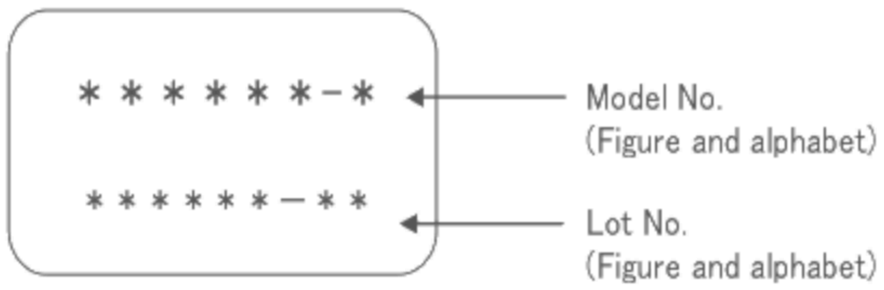


Lot No display method (Figure and alphabet)



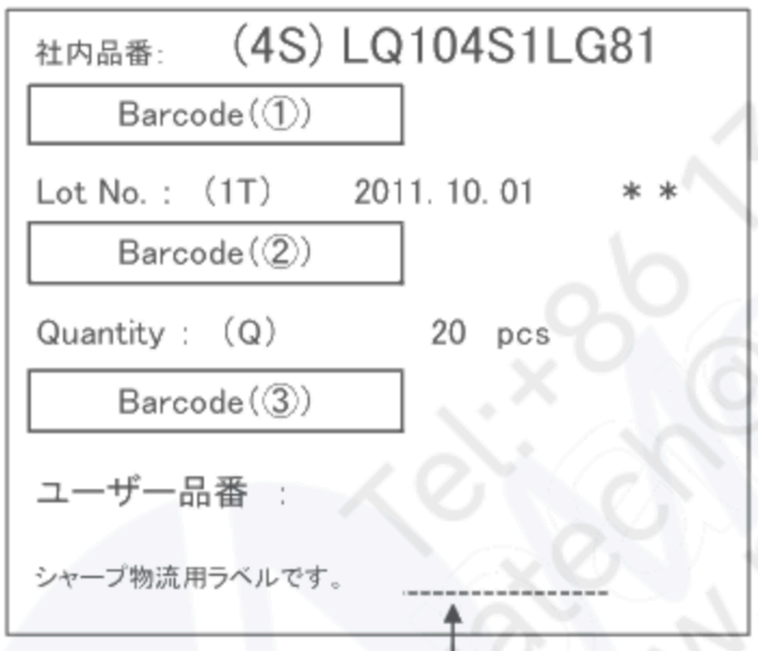
B) Backlight serial label

The label that displays the model No. and lot No. for the backlight is stuck on the back of the module.



13-2. Packing box Label:

The label that displays ①Model number(LQ104S1LG81) ②Lot number ③Quantity of module is stuck on the packing box. Moreover, the display of bar code also applies to this.



① Model number(LQ104S1LG81)

② Lot number (DATA)

③ Quantity of module

A right picture is written to the packing box of module for the RoHS restriction.

※ R.C.(RoHs Compliance) means these parts have corresponded with the RoHs directive.
This module corresponds from the first sample to RoHS Directive.

R.C.

The production country of the figure below is written in the wrapping box.

MADE IN JAPAN OR MADE IN CHINA

13-3. The ozone-depleting substances is not used.

13-4. If any problem occurs in relation to the description of this technical literature, it shall be resolved through discussion with spirit of cooperation.

14. 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.

Storage period

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

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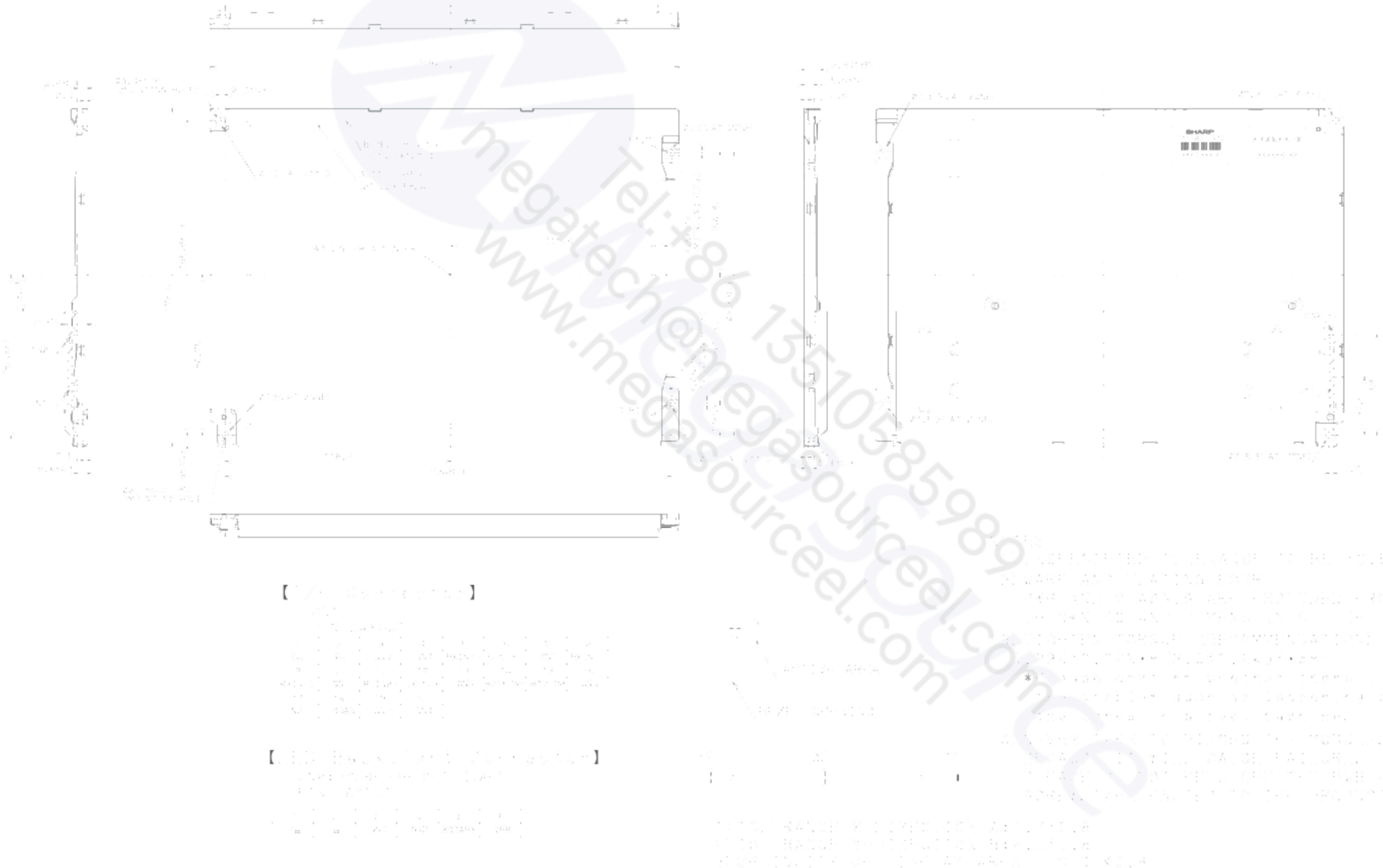


Fig. 1 : LQ104S1LG81 OUTLINE DIMENSIONS

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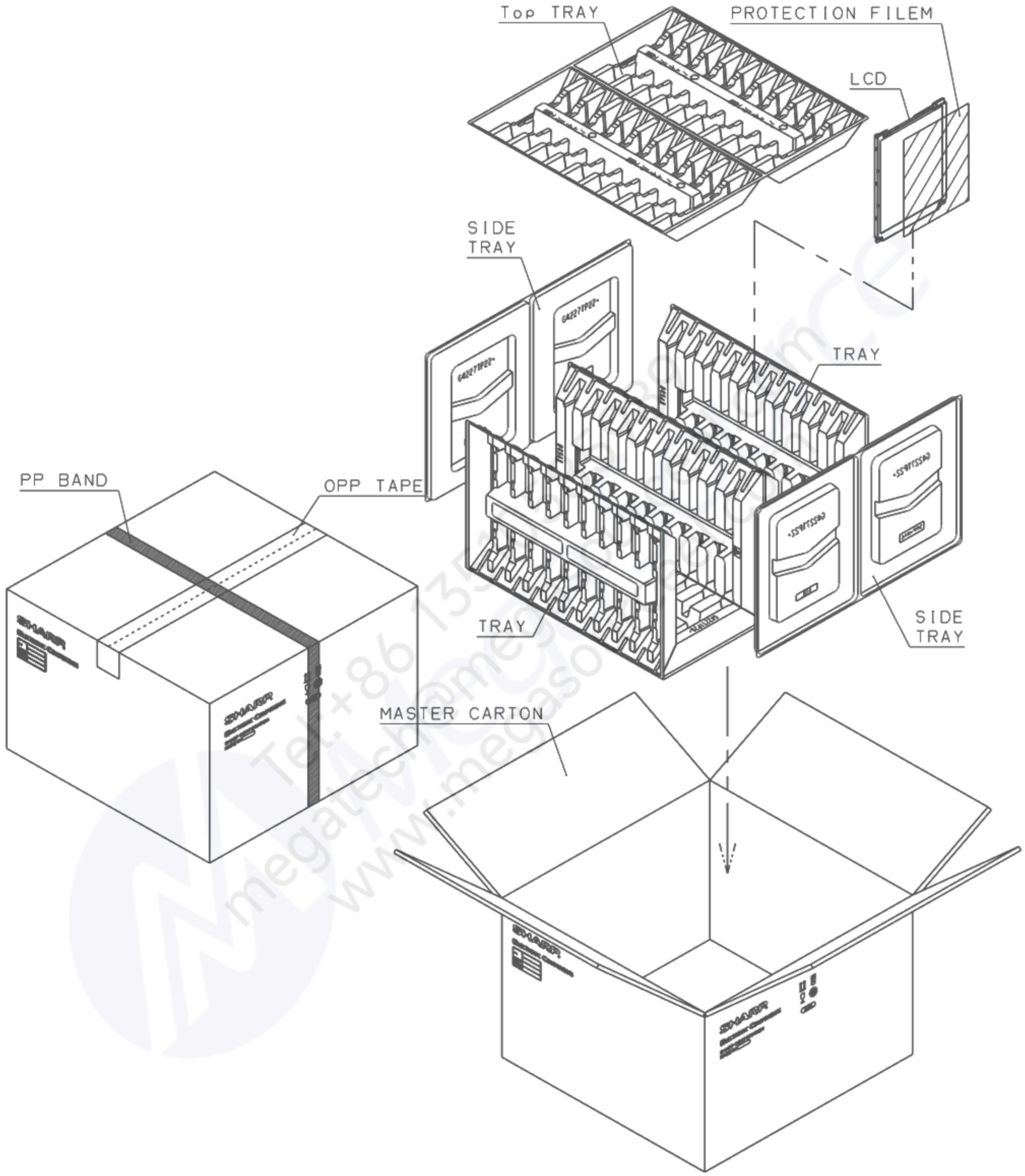


Fig.3 : PACKING FORM