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	SPECIFICATION	APPLICABLE GROUP AVC Liquid Crystal Display Group

DEVICE SPECIFICATION

TFT-LCD Panel

MODEL No.

LQ170E1FG21F

Control PWB

MODEL No.

LQ0DZC5010

CUSTOMER : AM TECHNOLOGY CO., LTD.

☐ CUSTOMER'S APPROVAL **TENTATIVE**

DATE _____

BY _____

PRESENTED BY K. Shiono

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RECORDS OF REVISION

LQ170E1FG21F

SPEC No.	DATE	REVISED		SUMMARY	NOTE
		No.	PAGE		
LD-17307	March 10. 2005				1st Issue

1. Application

This specification applies to the color 17.0 SXGA TFT-LCD Panel LQ170E1FG21F and Control PWB LQ0DZC5010.

◎The device listed in this specification was designed and manufactured for use in OA equipment.

◎In case of using the device for applications such as control and safety equipment for transportation(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 This specification sheets.

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

2. Overview

This panel (LQ170E1FG21F) is a color active matrix LCD panel incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, a front polarizer, a back polarizer and driver ICs. Graphics and texts can be displayed on a 1280×RGB×1024 dots panel with about 16 million colors (6bit + 2bitFRC) by using Control PWB(LQ0DZC5010).

This control PWB (LQ0DZC5010) is composed of a LVDS (Low Voltage Differential Signaling) interface, control circuit and power supply circuit.

3. Mechanical Specifications

3.1. TFT panel (LQ170E1FG21F) specification

Parameter	Specifications	Unit
Display size	43 (Diagonal)	cm
	17.0 (Diagonal)	Inch
Active area	337.9 (H)×270.3 (V)	mm
Pixel format	1280 (H)×1024 (V)	Pixel
	(1 pixel=R+G+B dots)	
Pixel pitch	0.264 (H)×0.264 (V)	mm
Pixel configuration	R, G, B vertical stripe	
Display mode	Normally white	
Unit outline dimensions *1	350.2(W)×286.2(H)×1.89(D) typ.	mm
Mass *2	430 typ	g
Surface treatment	Anti-glare and hard-coating 3H (Haze value = 25)	

*1.Note: including polarizers and excluding FPC, TCP and protection sheets for panel surface. Outline dimensions are shown in Fig.3-1.

*2.Note: including polarizers, FPC, TCP and protection sheets for panel surface.

3.2. Control PWB (LQ0DZC5010) specification

Parameter	Specifications	Unit
PWB outline dimensions	220(W)×48.6(H)×2.1(D) typ.	mm
Mass	32 typ.	g

Outline dimensions are shown in Fig.3-2.

4. Input Terminals

4-1. TFT-LCD panel driving

4-1-1.FPC1, (Panel driving signals and power supply)

This FPC must be connected to CN2 that mounted on LQ0DZC5010.

【Note1】 RSDS (Reduced Swing Differential Signaling)

Pin No.	Symbol	Function	Remark
1	COM2	LCD power supply	
2	COM2	LCD power supply	
3	CS2	GND	
4	GOE	Panel driving signal	
5	GCK	Panel driving signal	
6	GSP	Panel driving signal	
7	VCC3.3	+3.3V power supply	
8	GND	GND	
9	VGH	LCD power supply	
10	VGL	LCD power supply	
11	VGL	LCD power supply	
12	COM1	LCD power supply	
13	CS	GND	
14	CS	GND	
15	REV	Panel driving signal	
16	LS	Panel driving signal	
17	SPOI	Panel driving signal	
18	FS	Panel driving signal	
19	Z2P	Positive (+) RSDS CHZ_2 differential data input (R port)	RSDS*1
20	Z2N	Negative (-) RSDS CHZ_2 differential data input (R port)	RSDS*1
21	Z1P	Positive (+) RSDS CHZ_1 differential data input (R port)	RSDS*1
22	Z1N	Negative (-) RSDS CHZ_1 differential data input (R port)	RSDS*1
23	Z0P	Positive (+) RSDS CHZ_0 differential data input (R port)	RSDS*1
24	Z0N	Negative (-) RSDS CHZ_0 differential data input (R port)	RSDS*1
25	Y2P	Positive (+) RSDS CHY_2 differential data input (R port)	RSDS*1
26	Y2N	Negative (-) RSDS CHY_2 differential data input (R port)	RSDS*1
27	Y1P	Positive (+) RSDS CHY_1 differential data input (R port)	RSDS*1
28	Y1N	Negative (-) RSDS CHY_1 differential data input (R port)	RSDS*1
29	Y0P	Positive (+) RSDS CHY_0 differential data input (R port)	RSDS*1
30	Y0N	Negative (-) RSDS CHY_0 differential data input (R port)	RSDS*1
31	X2P	Positive (+) RSDS CHX_0 differential data input (R port)	RSDS*1
32	X2N	Negative (-) RSDS CHX_0 differential data input (R port)	RSDS*1
33	X1P	Positive (+) RSDS CHX_1 differential data input (R port)	RSDS*1
34	X1N	Negative (-) RSDS CHX_1 differential data input (R port)	RSDS*1
35	X0P	Positive (+) RSDS CHX_2 differential data input (R port)	RSDS*1
36	X0N	Negative (-) RSDS CHX_2 differential data input (R port)	RSDS*1
37	CKP	Positive (+) RSDS differential clock input (R port)	RSDS*1
38	CKN	Negative (-) RSDS differential clock input (R port)	RSDS*1
39	VL0	LCD power supply	
40	VL20	LCD power supply	
41	VL56	LCD power supply	
42	VL63	LCD power supply	
43	VH63	LCD power supply	
44	VH56	LCD power supply	
45	VH20	LCD power supply	
46	VH0	LCD power supply	
47	VLS2	LCD power supply	
48	VLS2	LCD power supply	
49	AGND2	GND	

50	AGND2	GND	
51	VCC3.3	+3.3V power supply	
52	VCC3.3	+3.3V power supply	
53	DGND	GND	
54	DGND	GND	
55	VLS1	LCD power supply	
56	VLS1	LCD power supply	
57	AGND1	GND	
58	AGND1	GND	
59	COM3	LCD power supply	
60	CS3	GND	

4-1-2.FPC2 (Panel driving signals and power supply)

This FPC must be connected to CN3 that mounted on LQ0DZC5010.

【Note1】 RSDS (Reduced Swing Differential Signaling)

Pin No.	Symbol	Function	Remark
1	VL0	LCD power supply	
2	VL20	LCD power supply	
3	VL56	LCD power supply	
4	VL63	LCD power supply	
5	VH63	LCD power supply	
6	VH56	LCD power supply	
7	VH20	LCD power supply	
8	VH0	LCD power supply	
9	VLS2	LCD power supply	
10	AGND2	GND	
11	VLS1	LCD power supply	
12	AGND1	GND	
13	COM	LCD power supply	
14	COM	LCD power supply	
15	REV	Panel driving signal	
16	LS	Panel driving signal	
17	SPOI	Panel driving signal	
18	FS	Panel driving signal	
19	Z2P	Positive (+) RSDS CHZ_2 differential data input (L port)	RSDS*1
20	Z2N	Negative (-) RSDS CHZ_2 differential data input (L port)	RSDS*1
21	Z1P	Positive (+) RSDS CHZ_1 differential data input (L port)	RSDS*1
22	Z1N	Negative (-) RSDS CHZ_1 differential data input (L port)	RSDS*1
23	Z0P	Positive (+) RSDS CHZ_0 differential data input (L port)	RSDS*1
24	Z0N	Negative (-) RSDS CHZ_0 differential data input (L port)	RSDS*1
25	Y2P	Positive (+) RSDS CHY_2 differential data input (L port)	RSDS*1
26	Y2N	Negative (-) RSDS CHY_2 differential data input (L port)	RSDS*1
27	Y1P	Positive (+) RSDS CHY_1 differential data input (L port)	RSDS*1
28	Y1N	Negative (-) RSDS CHY_1 differential data input (L port)	RSDS*1
29	Y0P	Positive (+) RSDS CHY_0 differential data input (L port)	RSDS*1
30	Y0N	Negative (-) RSDS CHY_0 differential data input (L port)	RSDS*1
31	X2P	Positive (+) RSDS CHX_0 differential data input (L port)	RSDS*1
32	X2N	Negative (-) RSDS CHX_0 differential data input (L port)	RSDS*1
33	X1P	Positive (+) RSDS CHX_1 differential data input (L port)	RSDS*1
34	X1N	Negative (-) RSDS CHX_1 differential data input (L port)	RSDS*1
35	X0P	Positive (+) RSDS CHX_2 differential data input (L port)	RSDS*1
36	X0N	Negative (-) RSDS CHX_2 differential data input (L port)	RSDS*1
37	CKP	Positive (+) RSDS differential clock input (L port)	RSDS*1
38	CKN	Negative (-) RSDS differential clock input (L port)	RSDS*1
39	VL0	LCD power supply	
40	VL20	LCD power supply	
41	VL56	LCD power supply	
42	VL63	LCD power supply	
43	VH63	LCD power supply	
44	VH56	LCD power supply	
45	VH20	LCD power supply	
46	VH0	LCD power supply	
47	VLS2	LCD power supply	
48	VLS2	LCD power supply	
49	AGND2	GND	
50	AGND2	GND	
51	VCC3.3	+3.3V power supply	
52	VCC3.3	+3.3V power supply	

53	DGND	GND	
54	DGND	GND	
55	VLS1	LCD power supply	
56	VLS1	LCD power supply	
57	AGND1	GND	
58	AGND1	GND	
59	COM3	LCD power supply	
60	CS3	GND	

4-1-3.CN1 (Interface signals and +5.0V DC power supply)

Using connectors : FI-XB30SL-HF10 (Japan Aviation Electronics Ind, Ltd) or MDF76KBW-30S-1H (Hirose Electric Co., Ltd.) or Equivalent

Corresponding connectors : FI-X30C＊, FI-X30H＊, FI-X30M＊(Japan Aviation Electronics Ind, Ltd) or MDF76G-30P-1SD (Hirose Electric Co., Ltd.) or equivalent

Corresponding LVDS Transmitter : THC63LVDM83R(Thine) or compatible

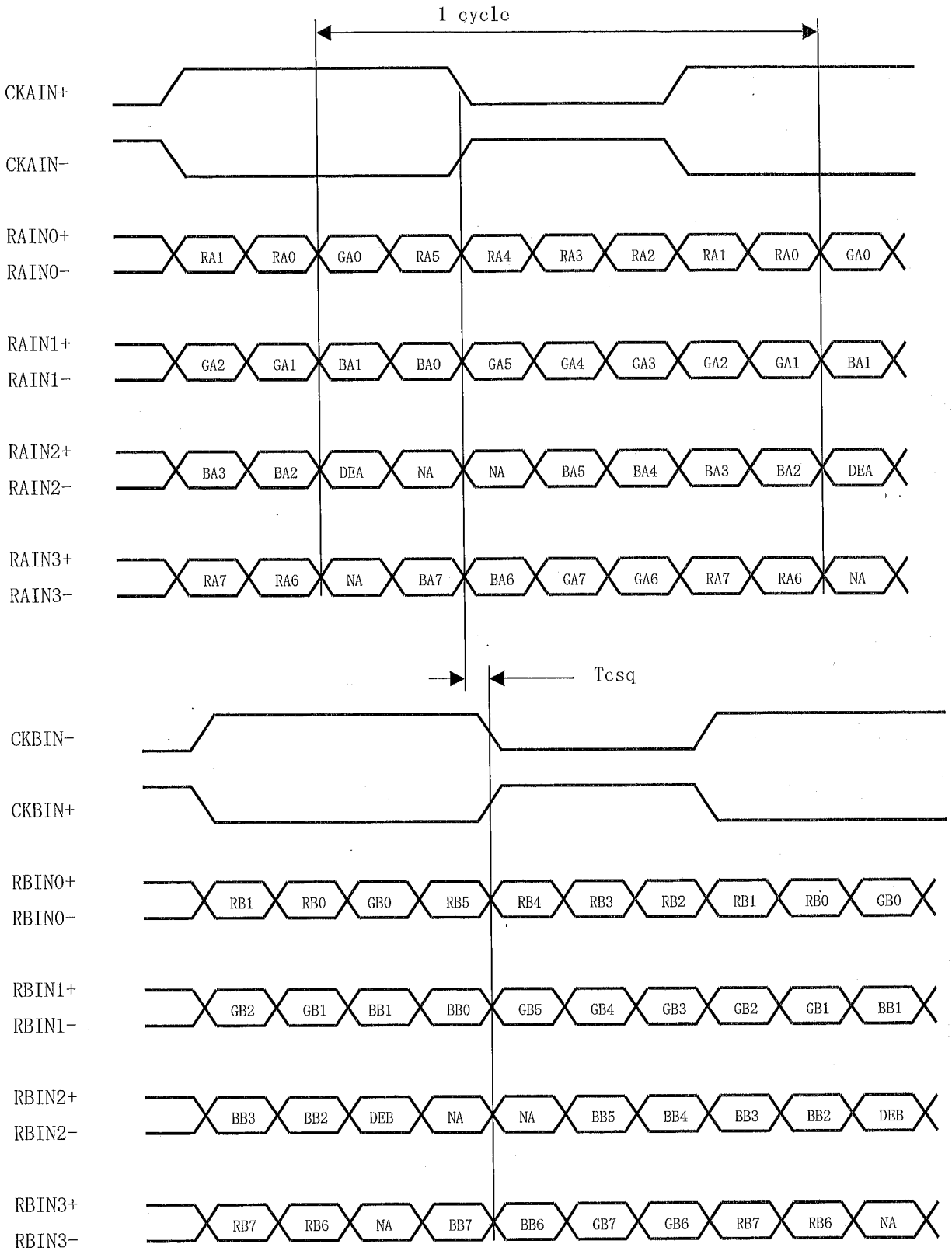
Pin No.	Symbol	Function	Remark
1	RAin0-	Negative (-) LVDS CH0 differential data input (A port)	LVDS
2	RAin0+	Positive (+) LVDS CH0 differential data input (A port)	LVDS
3	RAin1-	Negative (-) LVDS CH1 differential data input (A port)	LVDS
4	RAin1+	Positive (+) LVDS CH1 differential data input (A port)	LVDS
5	RAin2-	Negative (-) LVDS CH2 differential data input (A port)	LVDS
6	RAin2+	Positive (+) LVDS CH2 differential data input (A port)	LVDS
7	GND	GND	
8	CKAin-	Negative (-) LVDS differential clock input (A port)	LVDS
9	CKAin+	Positive (+) LVDS differential clock input (A port)	LVDS
10	RAin3-	Negative (-) LVDS CH3 differential data input (A port)	LVDS
11	RAin3+	Positive (+) LVDS CH3 differential data input (A port)	LVDS
12	RBin0-	Negative (-) LVDS CH0 differential data input (B port)	LVDS
13	RBin0+	Positive (+) LVDS CH0 differential data input (B port)	LVDS
14	GND	GND	
15	RBin1-	Negative (-) LVDS CH1 differential data input (B port)	LVDS
16	RBin1+	Positive (+) LVDS CH1 differential data input (B port)	LVDS
17	GND	GND	
18	RBin2-	Negative (-) LVDS CH2 differential data input (B port)	LVDS
19	RBin2+	Positive (+) LVDS CH2 differential data input (B port)	LVDS
20	CKBin-	Negative (-) LVDS differential clock input (B port)	LVDS
21	CKBin+	Positive (+) LVDS differential clock input (B port)	LVDS
22	RBin3-	Negative (-) LVDS CH3 differential data input (B port)	LVDS
23	RBin3+	Positive (+) LVDS CH3 differential data input (B port)	LVDS
24	GND	GND	
25	NC	No Connection	
26	NC	No Connection	
27	NC	No Connection	
28	VCC	+5V power supply	
29	VCC	+5V power supply	
30	VCC	+5V power supply	

【Note1】 This Control PWB has dual pixel port to receive dual pixel data at the same time . A port receives first pixel data and B port receives second pixel data in dual pixel data.

4-2 Data Mapping

【note1】 pin assignment with LVDS_SET pin (Thine:THC63LVDM83R)

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

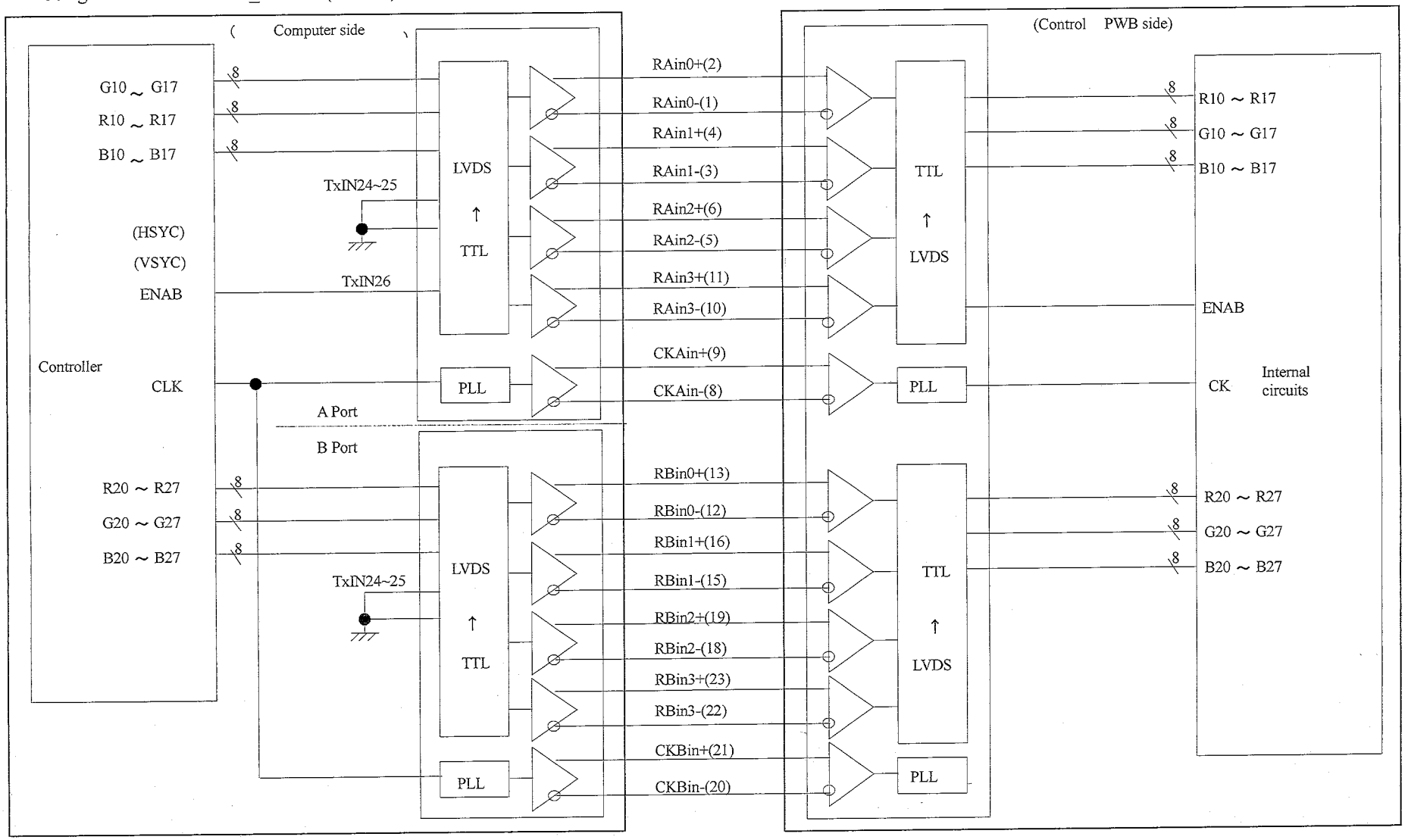


DE: Display Enable

NA: Not Available

Interface block diagram

Using receiver: LVDS6CP_BU72**(ROHM)/THC63LVD824(Thine) built-in control IC, Corresponding Transmitter:THC63LVDM83R(THine electronics) or compatible



5. Absolute Maximum Ratings

Parameter	Symbol	Condition	Ratings	Unit	Remark
Supply voltage	Vcc	Ta=25℃	0 ～ +6.0	V	
Storage temperature	T_{STG}	—	−25 ～ +60	℃	【Note1】
Operating temperature (Ambient)	T_{OPA}	—	0 ～ +50	℃	

【Note1】 Humidity：95%RH Max. (Ta≦40℃)

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

No condensation.

6. Electrical Characteristics

6-1. TFT-LCD panel driving 【Note1】 Ta=25℃

Parameter			Symbol	Min.	Typ.	Max.	Unit	Remark
Vcc	Supply voltage		Vcc	+4.5	+5.0	+5.5	V	【Note2】
	Current dissipation		Icc	—	590	810	mA	【Note3】
	Rush current		Irush	—	640	—	mA	【Note4】
Permissive input ripple voltage			V_{RF}	—	—	100	mVp-p	Vcc=+5.0V
Differential input Threshold voltage		High	V_{TH}	—	—	+100	mV	V_{CM}=+1.2V 【Note5】
		Low	V_{TL}	-100	—	—	mV	
Terminal resistor			R_T	—	100	—	Ω	Differential input
Common Voltage			Vr	4.61	4.81	5.01	V	【Note6】

【Note1】 Each item is measured under LQ170E1FG21F is connected with LQ0DZC5010.

【Note2】

1) On-off sequences of Vcc and data

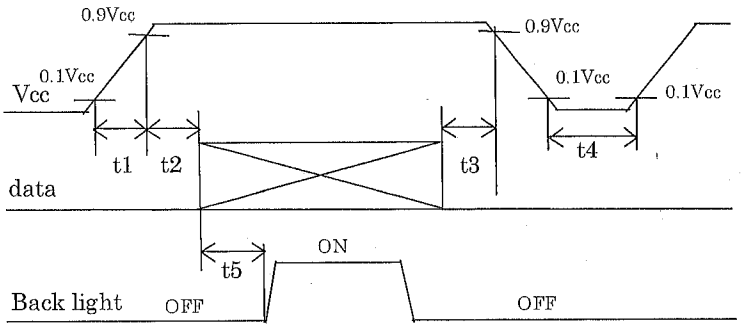
$0 < t1 \leqq 10ms$

$0 < t2 \leqq 10ms$

$0 < t3 \leqq 1s$

$1s \leqq t4$

$200ms \leqq t5$



Power sequence for Backlight is not especially specified, however it is recommended to consider some timing difference between LVDS input and Backlight input as shown above.

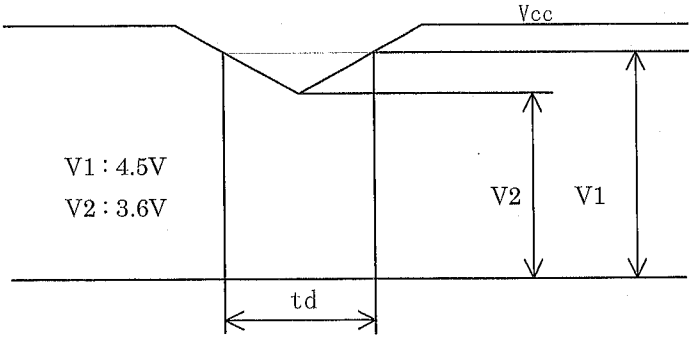
If the Backlight lights on before LCD starting, or if the Backlight is kept on after LCD stopping, the screen may look white for a moment or abnormal image may be displayed.

This is caused by variation in output signal from timing generator at LVDS input on or off. It does not cause the damage to the LCD module.

2) Dip conditions for supply voltage

1) $V2 \leqq Vcc < V1$
$td \leqq 10ms$

2) $Vcc < V2$
Vcc-dip conditions should also follow the on-off conditions.



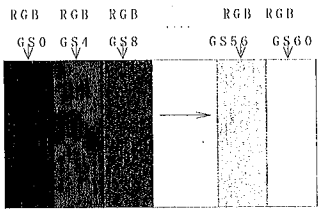
【Note3】 Typical current situation : 16-gray-bar pattern

Vcc=+5.0V, CK=67.5MHz

Horizontal period =12.5 us

Gray scale : GS(4n)

n=0～15



The explanation of each gray scale, GS(4n), is described below section 8-2.

【Note4】 The rush current is measured at this situation. (t1=470 μ sec.)

【Note5】 V_{CM} : Common mode voltage of LVDS driver.

【Note6】 Common voltage is measured at VR1 head. (See Fig3-2)
Common voltage should be adjusted to V32 and to minimal flicker for each panels between Vr range shown in table 6-1.

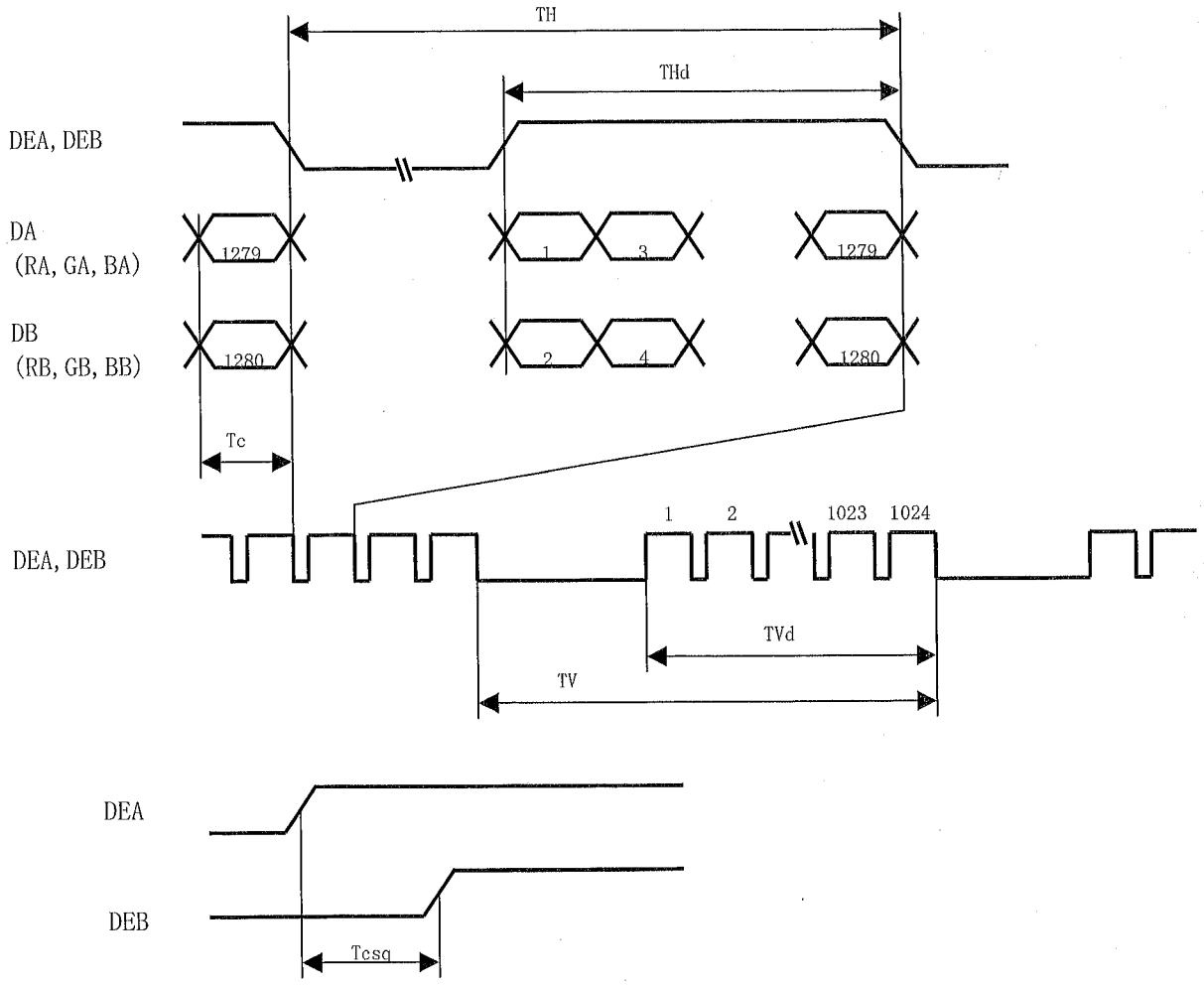
7. Timing characteristics of input signals

7-1. Timing characteristics

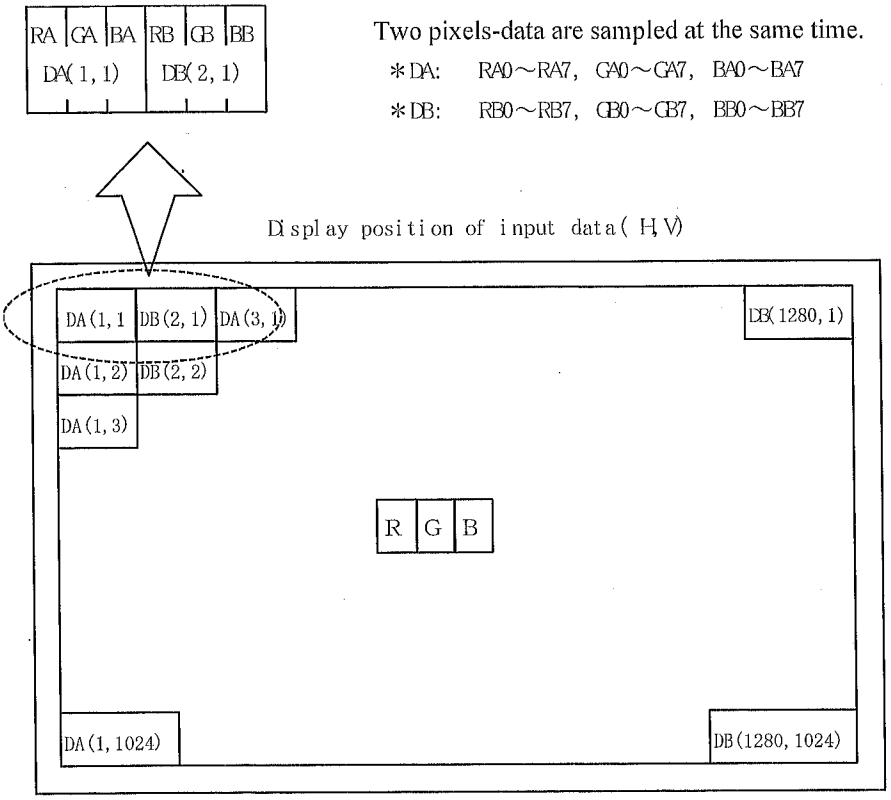
Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock	Frequency	1/Tc	40	54	67.5	MHz	
	Skew	Tcsq	-2	0	+2	ns	【Note1】
Data enable Signal	Horizontal period	TH	676	844	929	clock	
			12.3	15.7	-	μs	
	Horizontal period (High)	THd	640	640	640	clock	
	Vertical period	TV	1031	1066	2043	line	【Note2】
			13.3	16.7	-	ms	
	Vertical period (High)	TVd	1024	1024	1024	line	

【Note1】 Lvds (A Side data)– Lvds (B side data) phase difference

【Note2】 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

	Colors & Gray scale	Gray Scale	Data signal																							
			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	X	X	1	1	1	1	1	1
	Green	—	0	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	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	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	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	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	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	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. X :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. Optical Characteristics 【Note1】

Ta=25℃, Vcc =+5.0V

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Vertical	θ 11	CR≧5	45	65	—	Deg.	【Note3,6】
		θ 12		70	85	—	Deg.	
	Horizontal	θ 21, θ 22		70	80	—	Deg.	
	Vertical	θ 11	CR≧10	35	50	—	Deg.	
		θ 12		50	70	—	Deg.	
	Horizontal	θ 21, θ 22		50	70	—	Deg.	
Transmittance			θ =0°	—	6	—	%	【Note2】
Contrast ratio		C R	θ =0°	300	450	—		【Note4,6】
Response Time		τ d+ τ r		—	16	—	ms	【Note5,6】
Chromaticity of White		x		0.283	0.313	0.343		【Note6】
		y		0.299	0.329	0.359		
Chromaticity of Red		x		0.605	0.635	0.665		
		y		0.307	0.337	0.367		
Chromaticity of Green		x		0.257	0.287	0.317		
		y		0.583	0.613	0.643		
Chromaticity of Blue		x		0.114	0.144	0.174		
		y		0.056	0.086	0.116		
Luminance of white		YL		240	300	—	cd/m^2	IL=6.5mA rms fL=60kHz 【Note5】
White Uniformity		δ w		—	—	1.33	—	【Note6】
Cross Talk		Dsha		—	—	1.8	%	【Note7】
γ Curve		V0		—	0.29	—	%	
		V36		—	0.84	—	%	
		V73		—	4.29	—	%	
		V109		—	12.62	—	%	
		V146		—	28.40	—	%	
		V182		—	51.55	—	%	
		V219		—	81.55	—	%	
		V255		—	100	—	%	

※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.9-1,Fig9-2,Fig9-3 below.

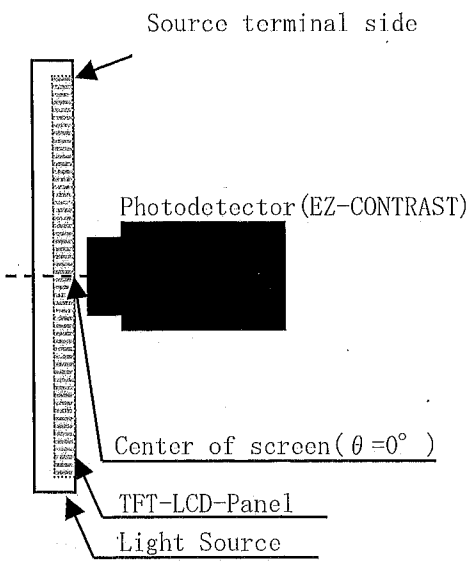


Fig9-1 Viewing angle measurement method

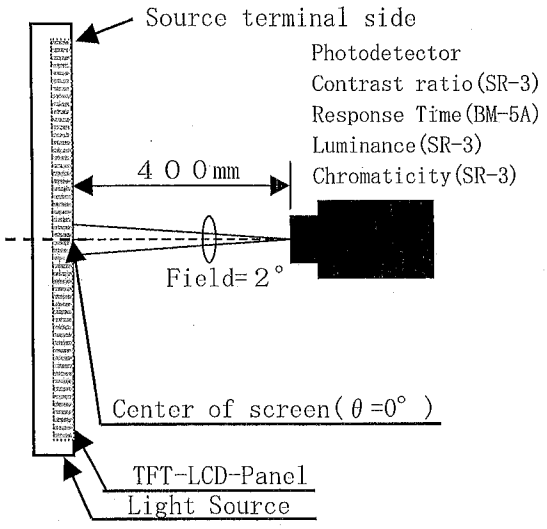


Fig9-2 Luminance/Contrast ratio/Response time/Chromaticity measurement method

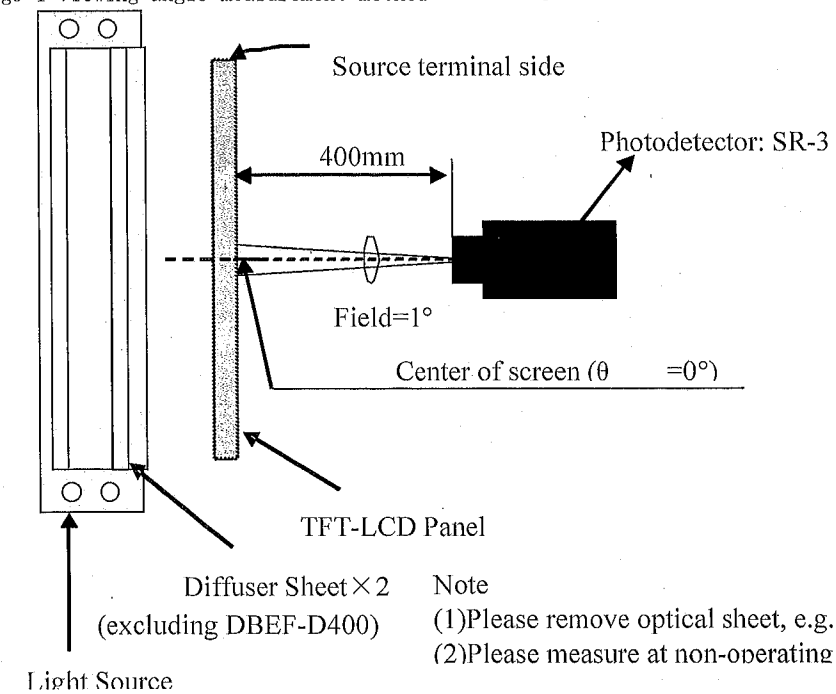
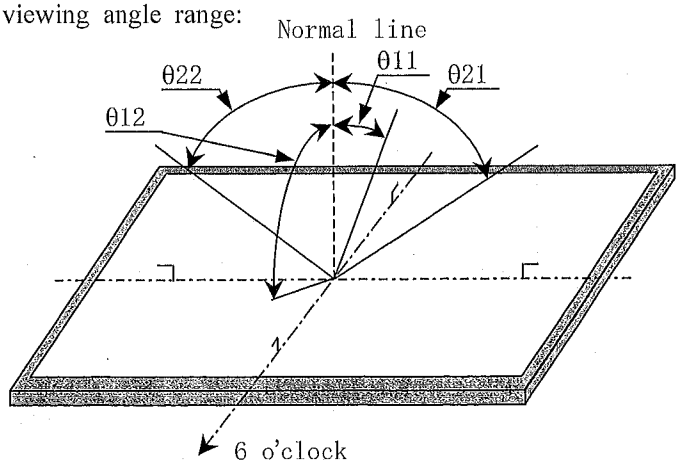


Fig. 9-3: Transmittance measurement method

【Note1】 Each item is measured under LQ170E1FG21F is connected with LQ0DZC5010, with light source that is shown in 【Note9】.

【Note2】 Definitions of viewing angle range:



【Note3】 Definition of transmittance:

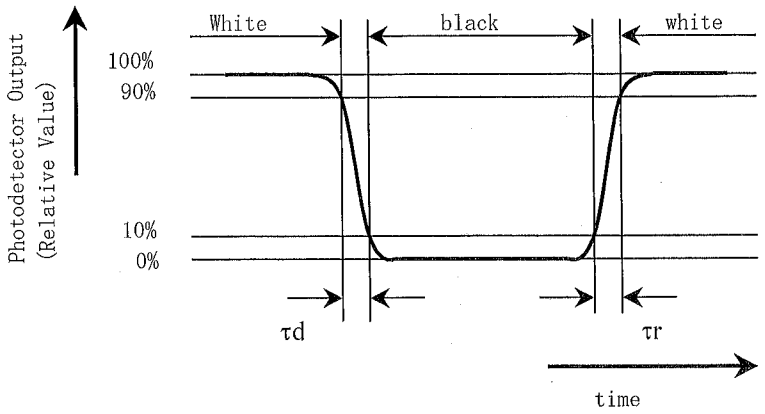
$$\text{Transmittance}(\%) = \frac{\text{Luminance (brightness) of panel while back light is on}}{\text{Luminance (brightness) of backlight}}$$

【Note4】 Definition of contrast ratio:

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

【Note5】 Definition of response time:

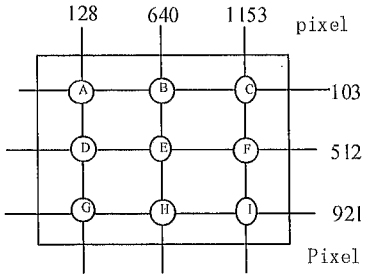
The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white".



【Note6】 This shall be measured at center of the screen.

【Note7】 Definition of white uniformity:

White uniformity is defined as the following with nine measurements (A～I).

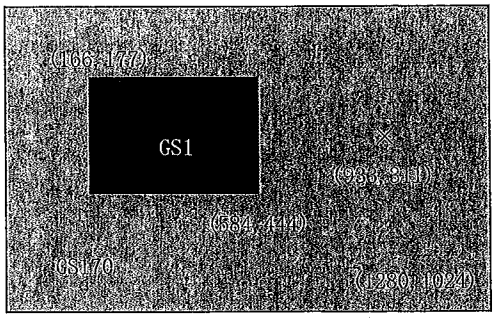


$$\delta w1 = \frac{\text{Maximum Luminance of nine points (brightness)}}{\text{Minimum Luminance of nine points (brightness)}}$$

【Note8】 Definition of corss talk:

We measured luminance in case there are a window frame and in case there are not a window frame with X points of the following figure. Then, we compared the measured values.

$$\text{Dsha}(\%) = \frac{|\text{Luminance with a window frame} - \text{Luminance without a window}|}{\text{Luminance without a window}} \times 100$$

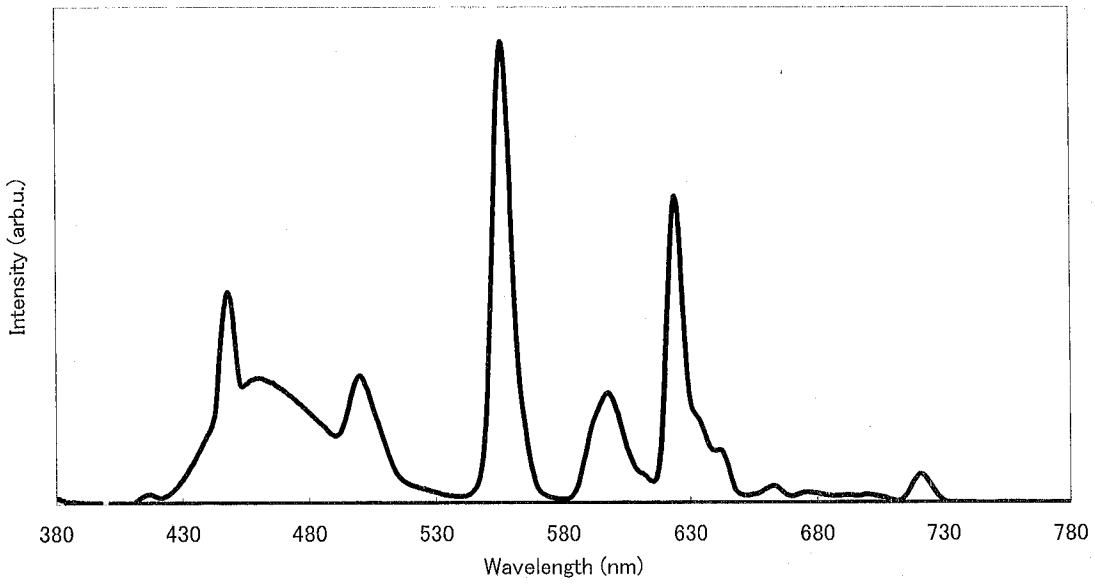


【Note9】 Light Source

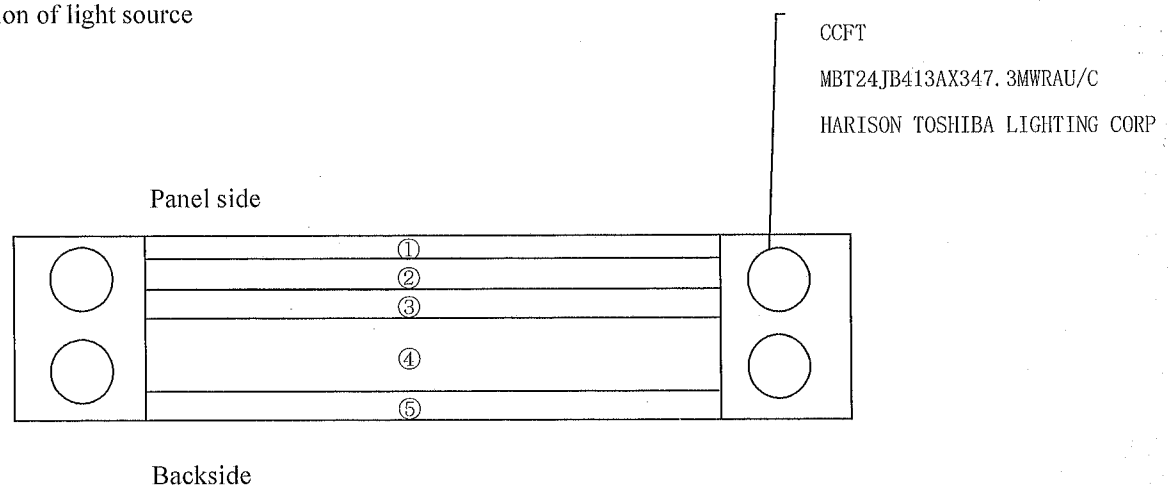
(1) Luminance

2700cd/m^2

(2) Spectrum each wavelength



(3) Composition of light source



①	OPTICAL FILM	:	DBEF-D400/t=0.40	3M COMPANY
②	DIFFUSER	:	D121U /t=0.13	TSUJIDEN CO LTD
③	DIFFUSER	:	D121U /t=0.13	TSUJIDEN CO LTD
④	LIGHT PIPE	:	SUMIPEX E /t=6	SUMITOMO CHEMICAL CO LTD
⑤	REFLECTOR	:	E60L /t=0.188	TORAY INDUSTRIES INC

10. Handling Precautions

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

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 and back polarizer is easily damaged, pay attention not to scratch it.

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

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

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

g) Since CMOS LSI is used in this panel and control PWB, take care of static electricity and take the human earth into consideration when handling.

h) Since static electricity may occur when peel off a protection sheet from the panel, please follow an order described in Fig10-1, Fig10-2.

i) Take care to keep control PWB form any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.

j) Observe all other precautionary requirements in handling components.

k) 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.

l) When handling LCD panel and control PWB 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 panel.

Peel off the front side
protection sheet from the panel
in the direction as above arrow shows.

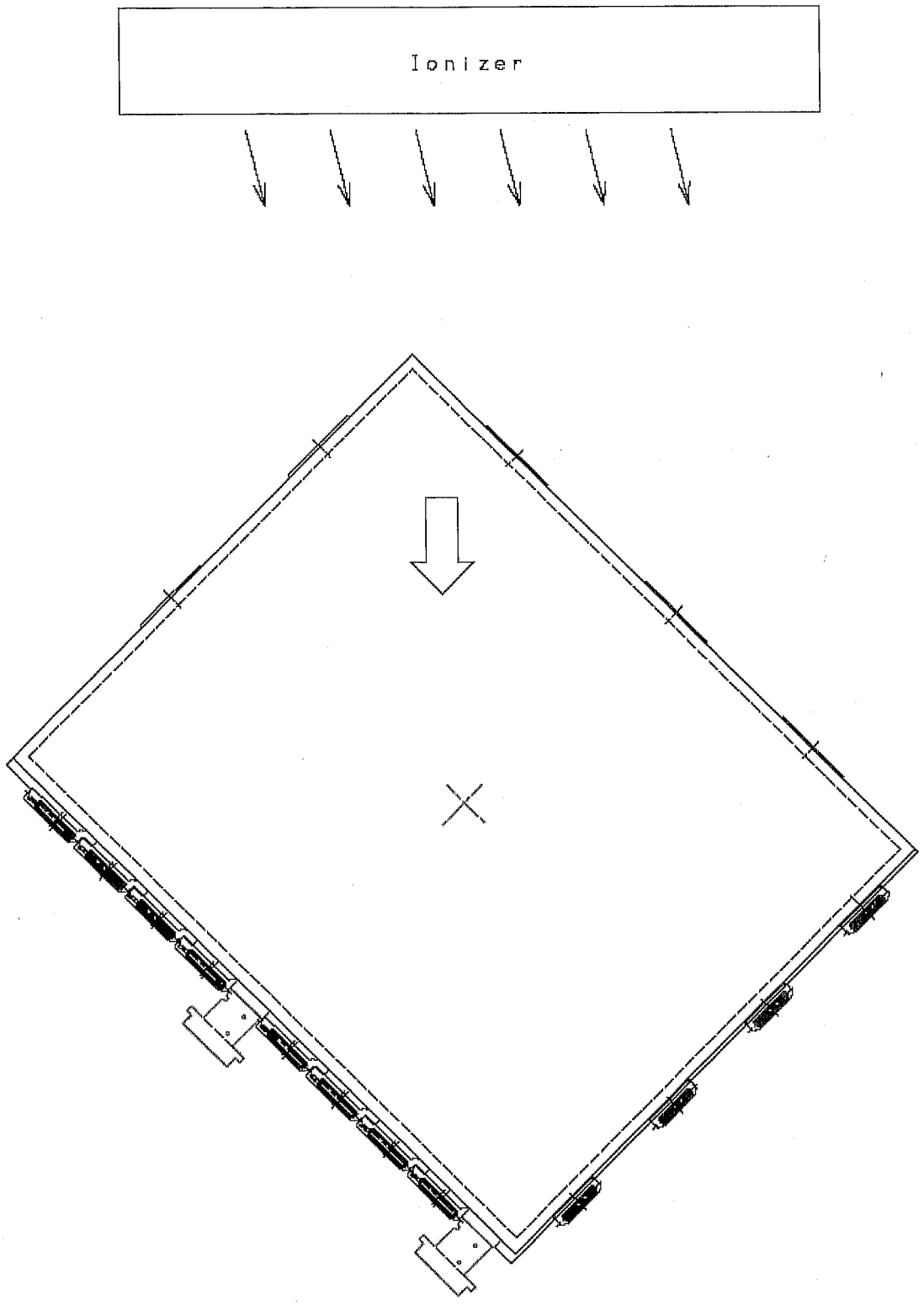


Fig. 10-1

Peel off the back side
protection sheet from the panel
in the direction as above arrow shows.

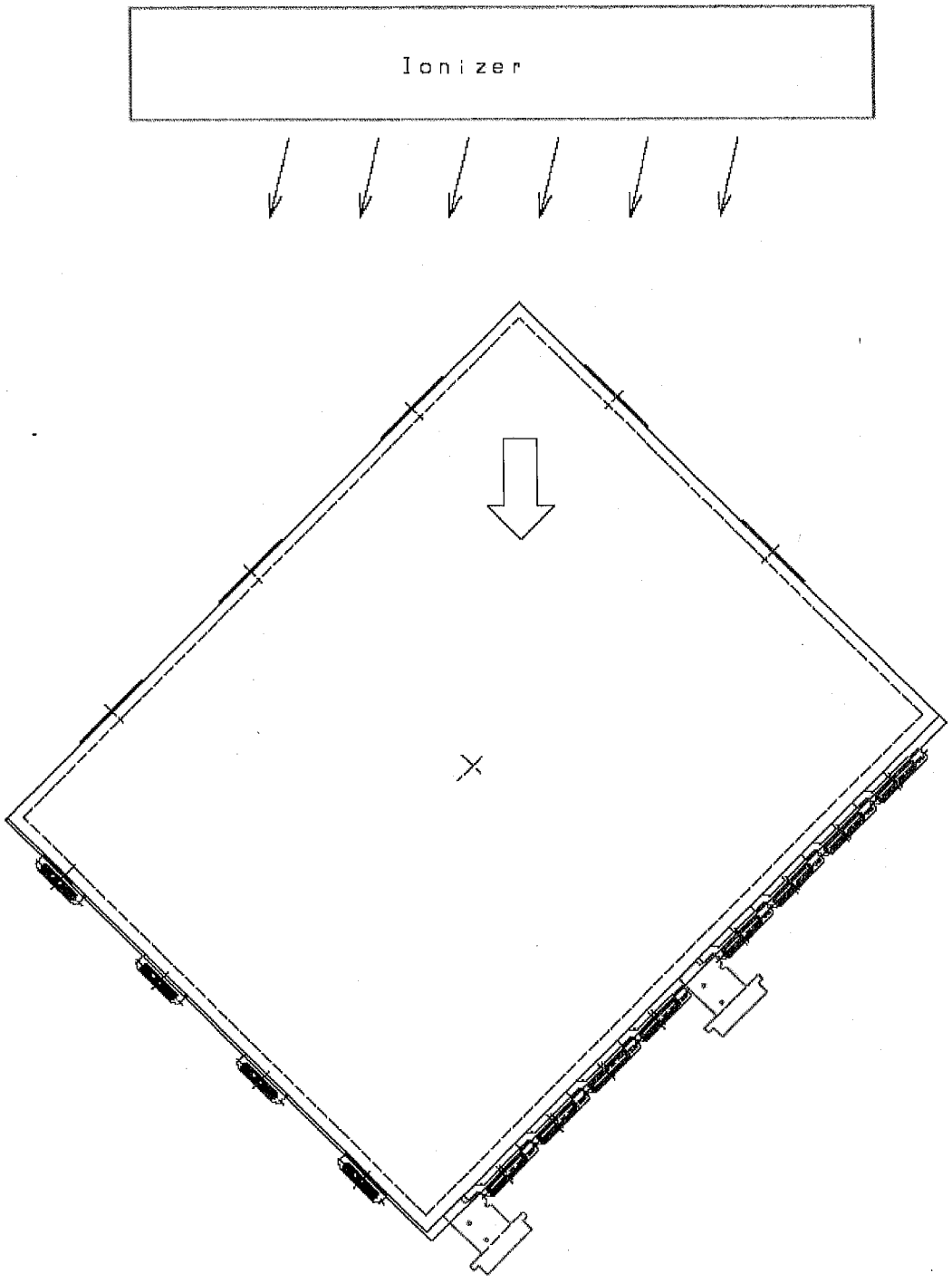


Fig. 10-2

11. Packing form

11-1. Palette

a) Piling number of palette: maximum 2 panel cartons

b) Packing quantity in one palette: 12 panel cartons

c) Palette size : 1230(W) x 860(D) x 1000（H）mm

d) Packing form: Fig.11-1

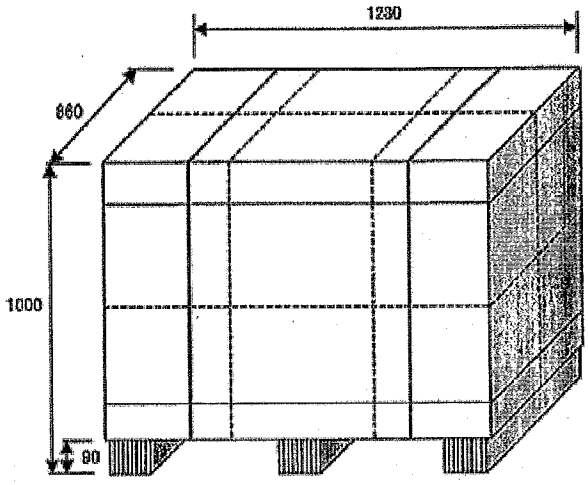


Fig.11-1: Palette packing

11-2. Panel Carton

a) Piling number of carton: maximum 3 cartons

b) Packing quantity in one carton: 20 panels

c) Carton size : 432(W) x 633(D) x 384（H）mm

d) Packing form: Fig.11-2

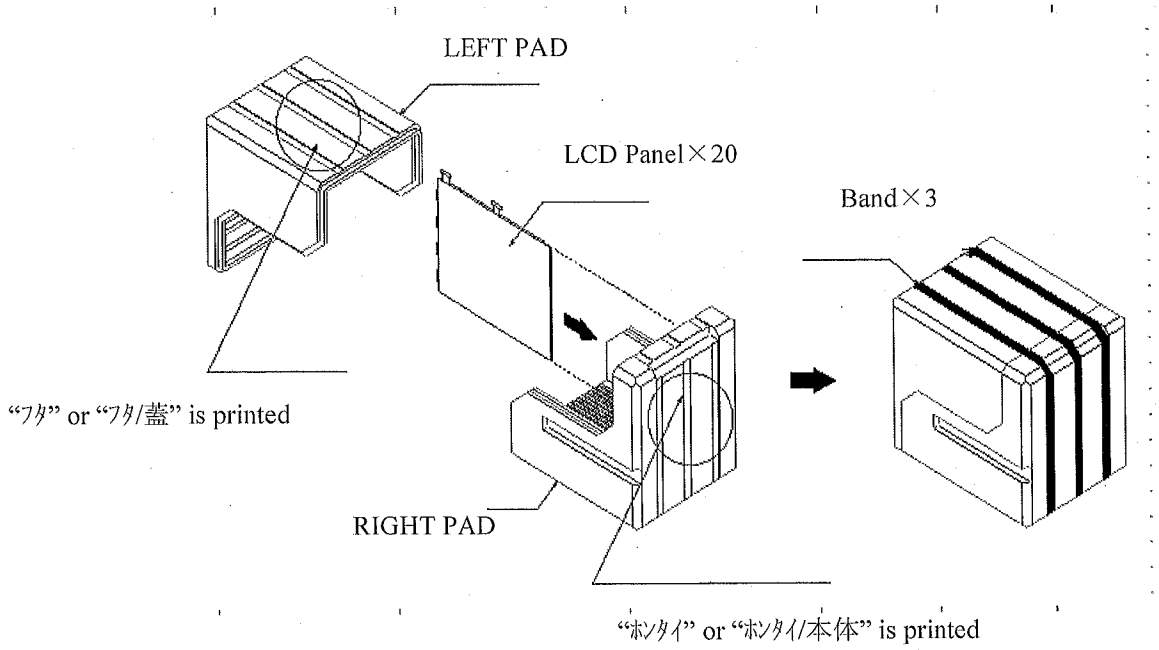


Fig.11-2: Carton packing

11-3. PWB carton

a) Piling number of carton: maximum 4 cartons

b) Packing quantity in one carton: 360 boards

c) Carton size: 440 (W) x 430 (D) x 390 (H) mm

d) Total mass of one carton filled with full boards: 14.5Kg

e) Packing form: Fig.11-3

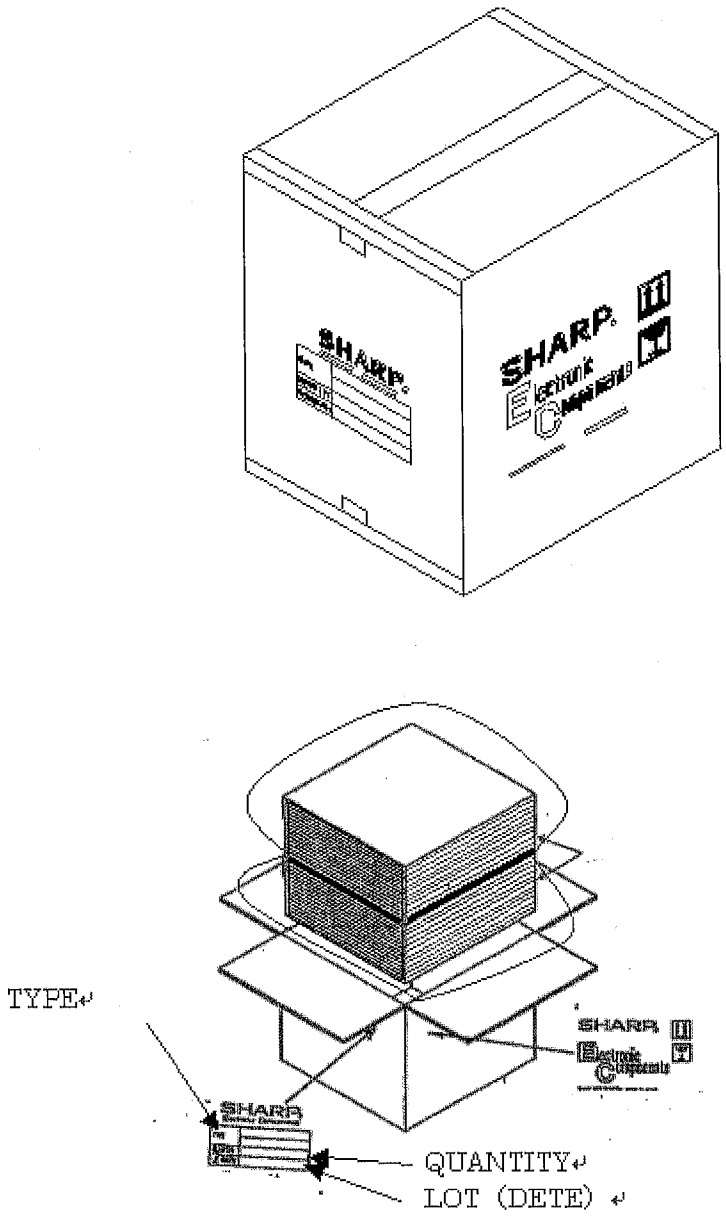


Fig.11-3

12. Reliability test items

Reliability test items for this panel are shown in Table.12-1.

Table.12-1: Reliability test items

No.	Test item	Conditions	Remark
1	High temperature storage test	Ta = 60℃ for 240h	
2	Low temperature storage test	Ta = -25℃ for 240h	
3	High temperature & high humidity storage test	Ta = 50℃ ; 95%RH for 240h (No condensation)	
4	High temperature operation test	Ta = 50℃ for 240h (The panel temp. must be less than 60℃)	
5	Low temperature operation test	Ta = 0℃ for 240h	
6	High temperature & high humidity operation test	Ta = 40℃ ; 95%RH for 240h (No condensation)	
7	Reduced pressure test	Ta = 60℃ ; 12kPa for 240h	
8	Thermal shock test (non-operating)	Ta = -25℃~60℃ ; 50 cycle for 100h (1 hour for each temperature)	
9	Vibration test (non-operating)	Waveform: Sine wave Frequency: 10~57Hz / Vibration width (one side):0.075mm : 58~500Hz / Gravity : 9.8m/s^2 Sweep time : 11 minutes Test period : 3 hours (1 hour for each direction of X, Y, Z)	*1)
10	Vibration test (in package)	Waveform: Sine wave Frequency: 5~50Hz / Gravity : 9.8m/s^2 Sweep time : 3 minutes Test period : 1.5 hours (1 hour for the upper and lower direction and 15 minutes each for front and back direction and left and right direction)	
11	Fall test (in package)	Fall height: (T.B.D) Fall test with below sequence: 1) Drop one corner 2) Drop three edges respectively that would compose the corner mentioned in above 1). 3) Drop all six surfaces Falling times: 10 times	

*1) Fix four edges of the panel onto the vibration table with adhesive tapes so that the vibration would not cause panel to fracture.

【Result Evaluation Criteria】

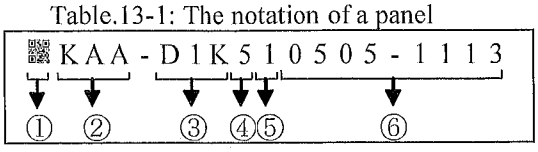
Under the display quality test conditions with normal operation state, there should not be any changes with displays which may affect practical functions.

13. Others

1) Panel Number

1. Panel number is shown at "Laser Marking Mark" as aforesaid on Fig.13-3. The notation of a panel number is shown in Table.13-1.

Table.13-1: The notation of a panel



①	2 dimension Bar Code	QR Code (1.8mm(H)×1.8mm(V)) *1)
②	Model No.	The first two characters "KA" represent the model name, and the third character represents a supplement character
③	Product plant	"D1K" indicates SHARP MIE KAMEYAMA PLANT
④	Product year	Display the last digit of Christian Era as a production year
⑤	Product month	Display product month (Display "A","B" and "C" as to "Oct", "Nov" and "Dec")
⑥	Panel No.	The individual number of the panel

*1) 2 dimension Bar Code is shown in Fig.13-1

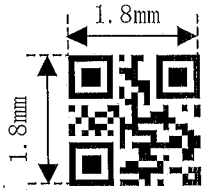
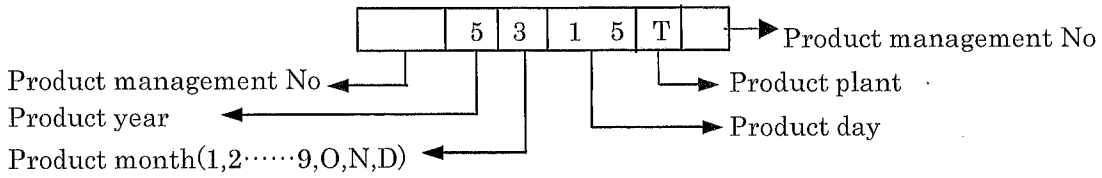


Fig.13-1: 2 dimension Bar Code

2. PWB production number is shown at "Production number" as aforesaid on Fig.13-2.
The notation of a PWB production number is shown in Table.13-2.

Table.13-2: The notation of a PWB



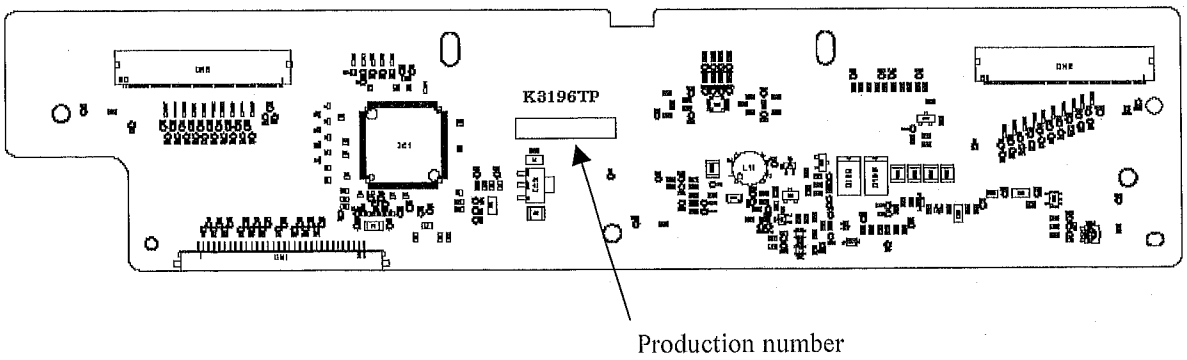
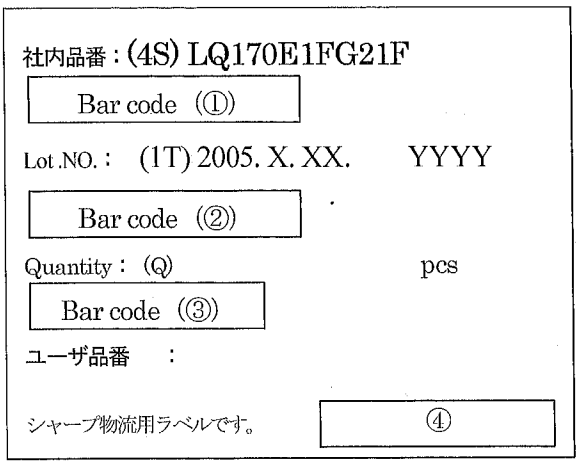


Fig.13-2: Production No

2) Packing Label

1.Panel Label



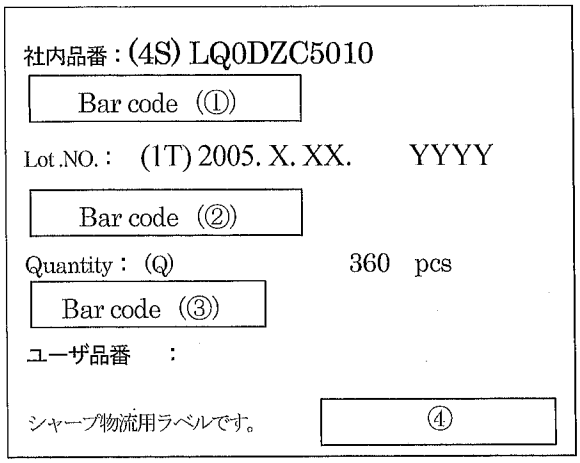
① Model No. (LQ170E1FG21F)

② Lot No.
X. XX･･･Date
YYYY･･･Serial No.

③ Quantity

④ Production Management No.

2.PWB carton Label



① Model No. (LQ0DZC5010)

② Lot No.
X. XX･･･Date
YYYY･･･Serial No.

③ Quantity

④ Production Management No.

3) 5 hours aging is needed under assembled module.

Aging condition.

- VCC: 5.0V±0.1V
- Aging temperature : 53℃±3℃
- Input signal: all pixel black under.
- Timing: Typ. condition mentioned in 7-1. Timing characteristics

Note: Aging with a protection sheets for panel surface may cause discoloration or spots.
Please remove a protection sheets before aging.

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

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

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

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

LD17307-29

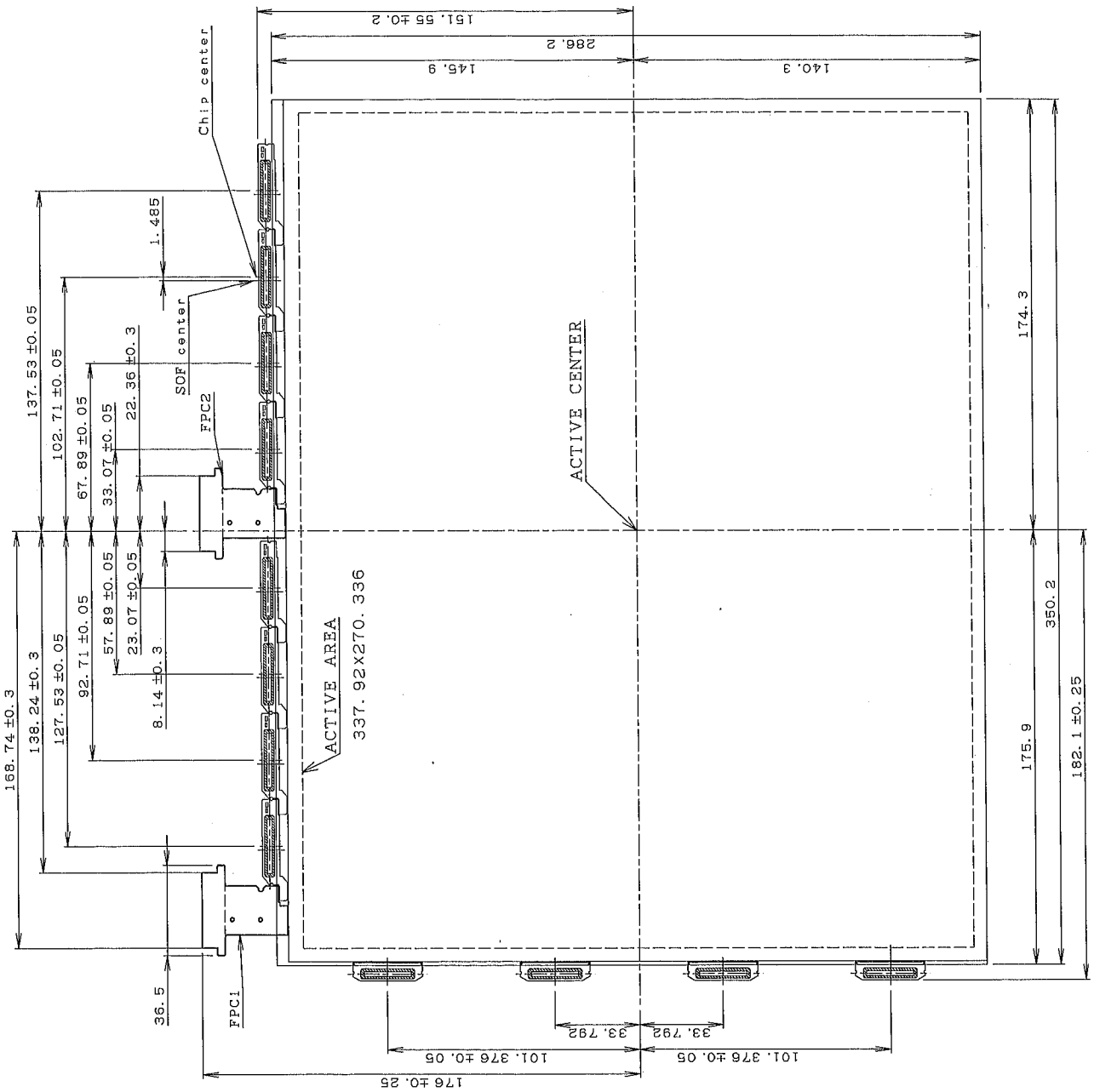
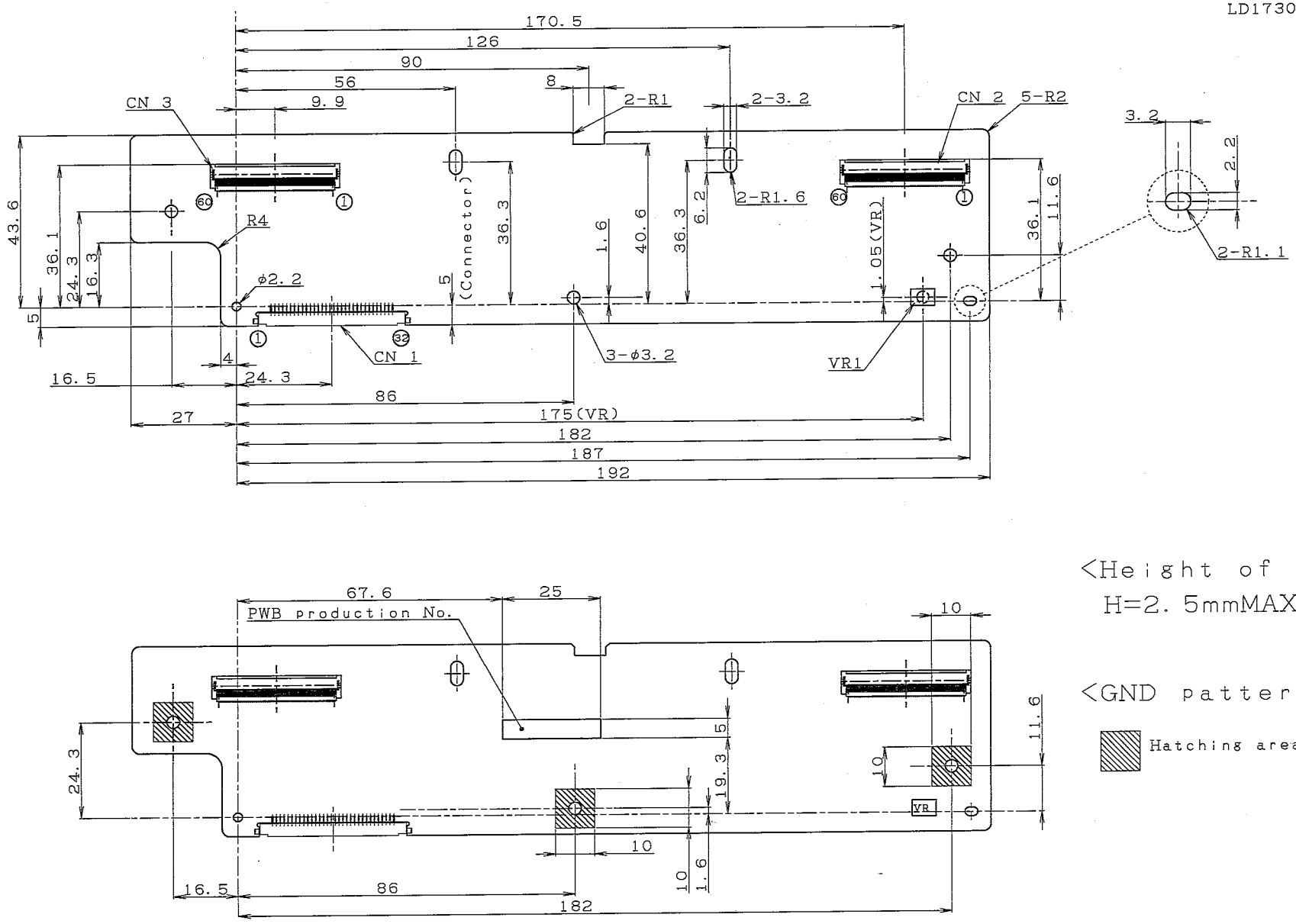


Fig3-1

LD17307-30



<Height of parts>
H=2.5mmMAX

<GND pattern>

Hatching area:GND pattern

Fig3-2