

TFT-DISPLAY DATASHEET

Sharp
Model: LQ123B5LWxx

BRIEF SPEC.:

Main Feature	Wide Screen High resolution
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Active Screen Area	291.6 x 109.35 [mm]
Diagonal Format	10.4" 8:3
Resolution	1440 X 540
Colors	8 Bit
Backlight	LED, Black
Brightness	800 cd/m ²
LED Life Time	15,000h [Typ.]
Interface	LVDS
Viewing Angle	80/80 L/R 80/80
Touchscreen	No
Power Supply	3,3V [Typ.]
Module Outline	311.4 x 130.2 x 19.2 [mm]
Operation Temperature	-30... +85 °C
Storage Temperature	-40... +90 °C
Surface Treatment	Anti Glare

SHARP

No.	LCY-W-15156A
DATE	Feb.,26 th ,2015

TECHNICAL LITERATURE
FOR
TFT - LCD module

MODEL No. LQ123B5LWxx

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DISPLAY DEVICE BUSINESS GROUP

SHARP CORPORATION



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TFT-LCD MODULE

LQ123B5LW_{xx}

SPECIFICATION

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1. Application

The SHARP Color TFT-LCD module is an active matrix LCD (Liquid Crystal Display) produced by making the most of Sharp's expertise in liquid-crystal and semiconductor technologies. The active device is amorphous silicon TFT (Thin Film Transistor).

2. Summary and Features

- 8bit LVDS interface is adopted in this module.
- Utilizes a panel with a 8:3 aspect ratio, which makes the module suitable for use in wide-screen systems.
- The 12.3 screen produces a high resolution image that is composed of 777,600 pixels elements in a stripe arrangement.
- Graphics and texts can be displayed on a 1440×RGB×540 dots panel with 16,777,216 colors by supplying 24 bit data signals(8 bit/color).
- By adopting an active matrix drive, a picture with high contrast is realized.
- Reduced reflection as a result of low reflection black matrix and an antiglare (AG) polarizer being adopted.
- By COG method, realized a slim, lightweight, and compact module.
- Through the MVA –normally black mode, an image with highly natural color reproduction is realized.
- The LED backlight has excellent performance even at low temperatures.

3. Construction and Outline

The module consists of a TFT-LCD panel, drivers, FPC, PWB, backlight unit, shielding cases.

4. Mechanical specifications

Table 4-1

Parameter	Specifications	Units	Remarks
Screen size (Diagonal)	31.24[12.3"]	cm	
Active area	291.6 (W) × 109.35 (H)	mm	
Display format	777,600	pixels	
	1440 × RGB × 540	dots	
Dot pitch	0.0675(H) × 0.2025 (V)	mm	
Pixel configuration	R,G,B stripe configuration		
Display mode	MVA Normally black		
Outline dimension	311.4 (W) × 130.2(H) × 19.2(D)	mm	[Note4-1]
Mass	(720)(MAX)	g	

[Note4-1] Please refer to Fig.4 "Outline Dimensions"

5. Input terminal

Pin arrangement, name and description of the module are shown in Table 5-1 , Table 5-2.

Table 5-1 : Pin arrangement / Name / Description.

Input connector : 04 6288 050 000 846+ (KYOCERA)

Pin No.	Symbol	Description	Remarks
1	Continuity1	Continuity Test pin	[Note5-1]
2	NC	OPEN	
3	GND		
4	GND		
5	VDD	Power supply [+3.3V]	
6	GND		
7	CLKN	LVDS Clock [Negative polarity]	[Note5-3]
8	CLKP	LVDS Clock [Positive polarity]	[Note5-3]
9	GND		
10	DATA3N	LVDS data [Negative polarity]	[Note5-3]
11	DATA3P	LVDS data [Positive polarity]	[Note5-3]
12	GND		
13	DATA2N	LVDS data [Negative polarity]	[Note5-3]
14	DATA2P	LVDS data [Positive polarity]	[Note5-3]
15	GND		
16	DATA1N	LVDS data [Negative polarity]	[Note5-3]
17	DATA1P	LVDS data [Positive polarity]	[Note5-3]
18	GND		
19	DATA0N	LVDS data [Negative polarity]	[Note5-3]
20	DATA0P	LVDS data [Positive polarity]	[Note5-3]
21	GND		
22	UD	Up /Down inversion setting for Gate driver	[Note5-2]/Fig.5-1
23	LR	Left/Right inversion setting for Source driver	[Note5-2]/Fig.5-1
24	VDD	Power supply [+3.3V]	
25	VDD	Power supply [+3.3V]	
26	GND		
27	AVDDM	Power supply for source driver [-6.37 V]	
28	V13	Power supply voltage of gray image [L0]	
29	V12	Power supply voltage of gray image [L32]	
30	V11	Power supply voltage of gray image [L80]	
31	V10	Power supply voltage of gray image [L128]	
32	V9	Power supply voltage of gray image [L176]	
33	V8	Power supply voltage of gray image [L252]	
34	V7	Power supply voltage of gray image [L255]	
35	V6	Power supply voltage of gray image [L255]	
36	V5	Power supply voltage of gray image [L252]	
37	V4	Power supply voltage of gray image [L176]	
38	V3	Power supply voltage of gray image [L128]	
39	V2	Power supply voltage of gray image [L80]	
40	V1	Power supply voltage of gray image [L32]	
41	V0	Power supply voltage of gray image [L0]	
42	AVDDP	Power supply for source driver [+6.37V]	
43	GND		
44	VCOM	VCOM voltage input	
45	VCOM	VCOM voltage input	
46	NC	OPEN	
47	VGL	Power supply voltage of Gate driver	
48	NC	OPEN	
49	VGH	Power supply voltage of Gate driver	
50	Continuity2	Continuity Test pin	[Note5-1]

*To obtain the proper relation between LVDS signals and actual digital data signals,

The digital signals should be inputted into the transmitter as described in the next table 5-2.

*The shielding case is connected with GND

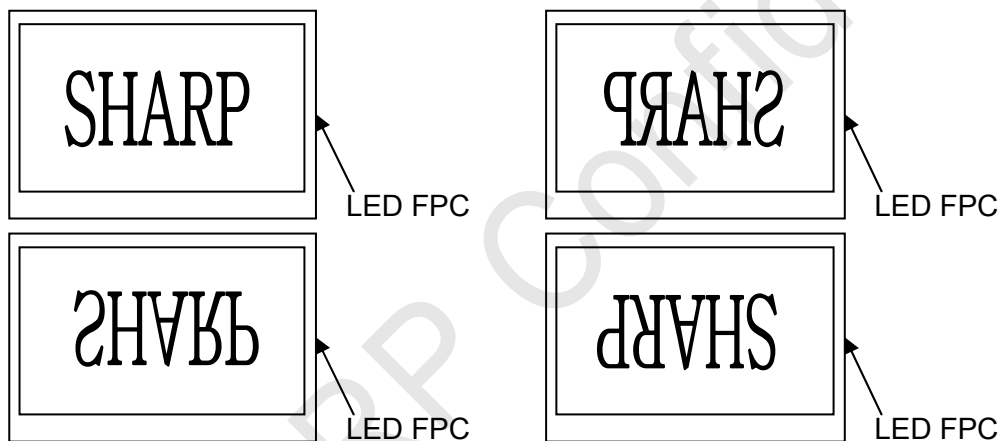
【Note 5-1】 (Continuity test pin) : Pin No.1 and Pin No.50 are connected on our PCB.

【Note 5-2】 LR: Selects the output direction of source driver. UD: Selects the output direction of gate driver.

Fig.5-1

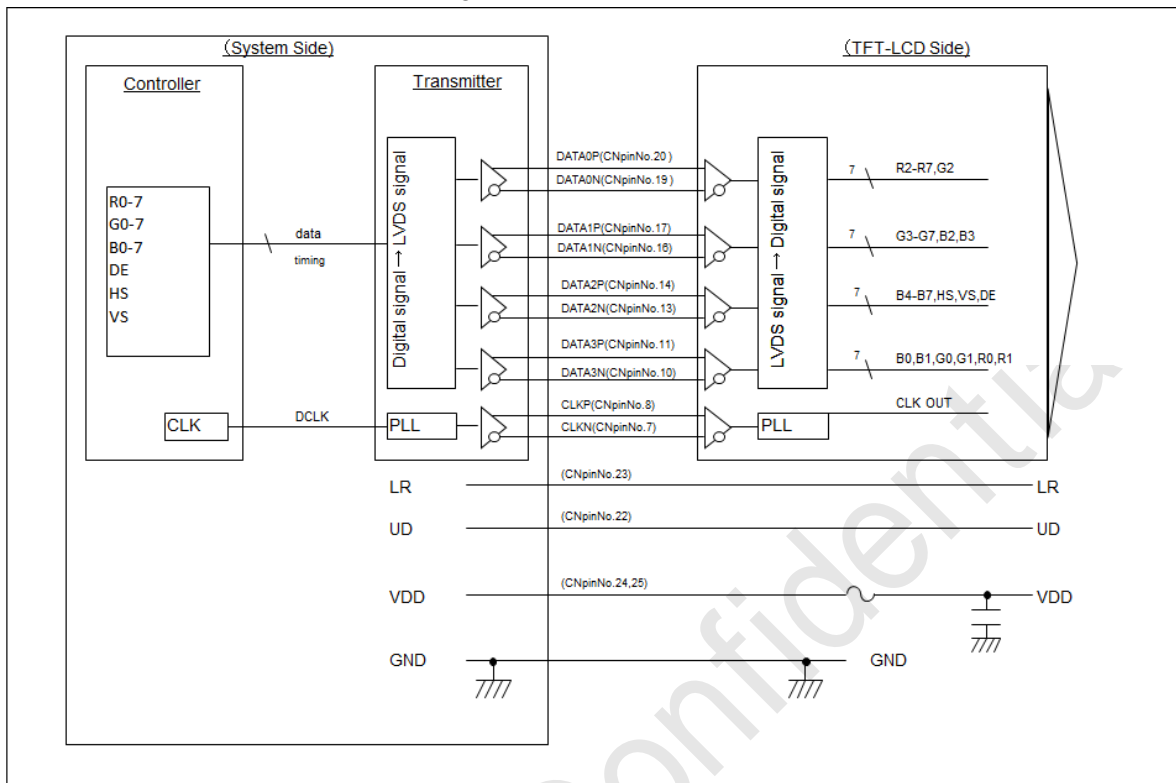
Display mode	UD	LR
Normal displayed	Hi	Hi
Right/Left reverse mode	Hi	Lo
Up/Down reverse mode	Lo	Hi
Right/Left & Up/Down reverse mode	Lo	Lo

Lo = GND, Hi = VDD



【Note 5-3】 : Termination resistor is mounted in LCD module.(100 ohm)

Table 5-2 LVDS Interface block diagram



【Note 5-4】 Known compatible transmitter : DS90CR285 (National Semiconductor)

Table 5-3 Data mapping

For 24bit mode

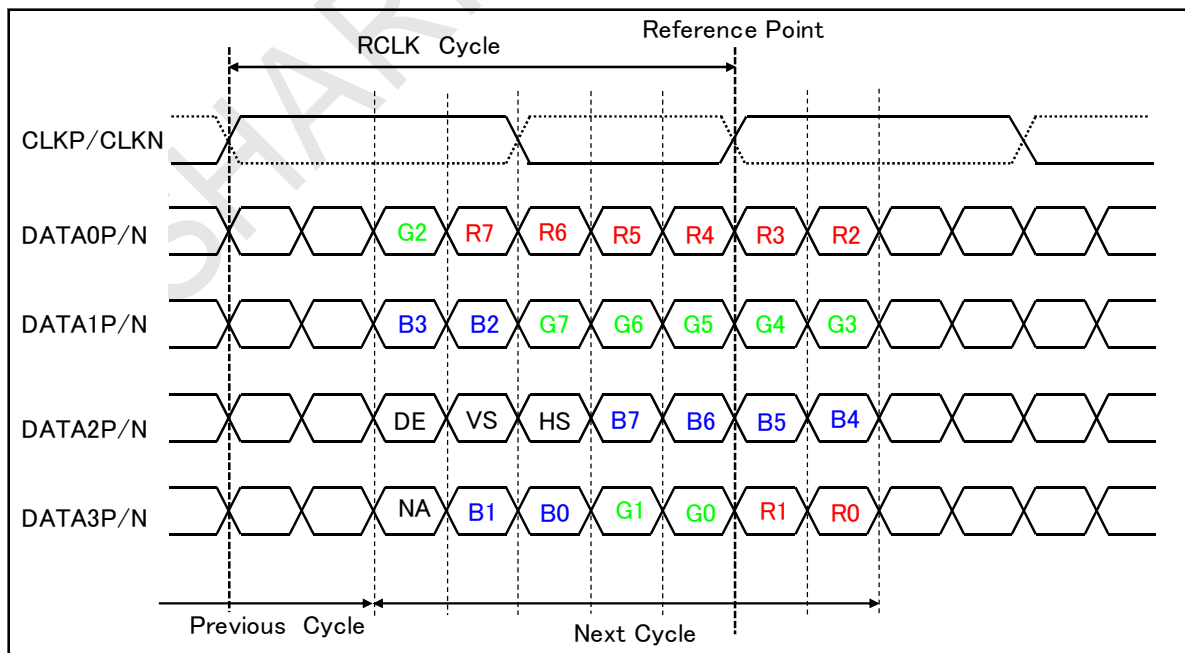
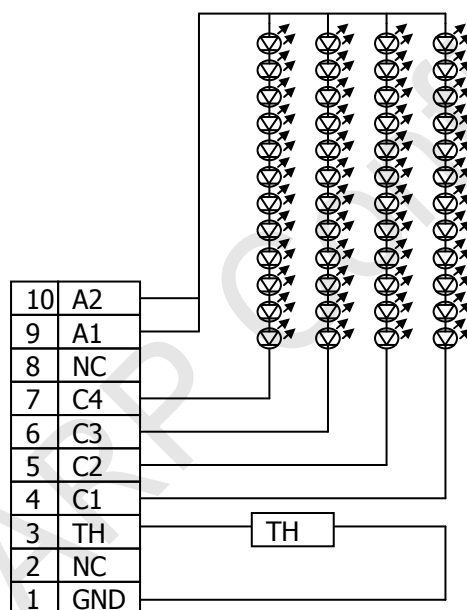


Table 5-4 : Pin arrangement of backlight.

No.	Symbol	function	Remarks
1	GND	GND reference for Pin No.3	
2	N.C.	This is open terminal	
3	RTh	Thermistor	Note) NSS4103F39F(10kΩ)
4	VLC4	LED Power supply input 1(-)	Cathode side 1
5	VLC3	LED Power supply input 2(-)	Cathode side 2
6	VLC2	LED Power supply input 3(-)	Cathode side 3
7	VLC1	LED Power supply input 4(-)	Cathode side 4
8	N.C.	This is open terminal	
9	VLA	LED Power supply input (+)	Anode side
10	VLA	LED Power supply input (+)	Anode side

The figure below shows the circuit chart of each string.



6. Absolute maximum ratings

Absolute maximum ratings of the module are shown in Table 6.

Table 6

GND=0V

Item	Symbol	MIN	MAX	Unit	Remarks
Power supply of source part	VDD	-0.3	+4.6	V	
	AVDDP	-0.3	+7.3	V	
	AVDDM	-0.3	-7.3	V	
Input Signal Voltage	VID	-0.3	VDD+0.3		【Note 6-1】
Power supply of gate part	VGH	-0.3	VGL+42.0	V	
	VGL	-25.0	+0.3	V	
Common electrode driving signal	VCOM	-3.0	+1.0	V	

Power supply of LED Back Light	If	-	100	mA	Ta=25°C/ 【Note 6-8】
Storage temperature	Tstg	-40	+90	°C	【Note 6-2,3】
Operating temperature (LCD panel surface)	Topr1	-30	+85	°C	【Note6-4,6,7】

【Note 6-1】 UD, LR

【Note 6-2】 This rating applies to all parts of the module and should not be exceeded.

【Note 6-3】 Maximum wet-bulb temperature is 57°C. Condensation of dew must be avoided as electrical current leaks will occur, causing a degradation of performance specifications.

【Note 6-4】 The operating temperature is a temperature at which the module is assured to operate. Display quality criteria such as contrast and response speed are evaluated when Ta = +25°C.

【Note 6-5】 Ambient temperature when the backlight is lit (reference value).

【Note 6-6】 Panel temperature is defined as the peak temperature on both the front and rear surfaces of the panel.

【Note 6-7】 The operating temperature guarantees only operation of the circuit. For contrast, response time and other factors related to display quality are determined in the ambient temperature of Ta=+25°C.

【Note 6-8】 LED current must be used in the condition that is lower than a line of Fig 6-1.

Dimming shall operate at Ta ≥ (60 °C).

Countermeasures for heat generation from LCD module are required at customer's system.

Fig. 6-1 : Ambient temperature -LED current

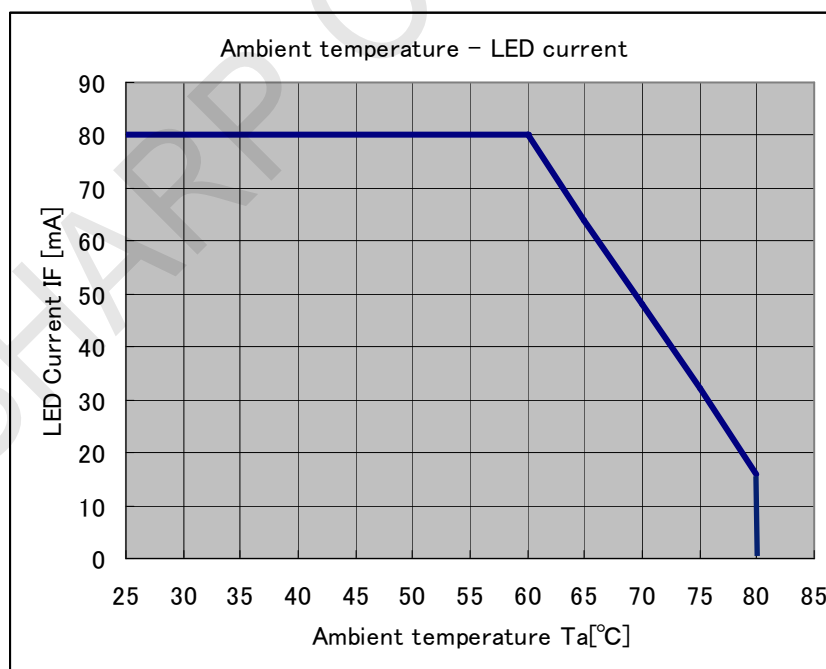
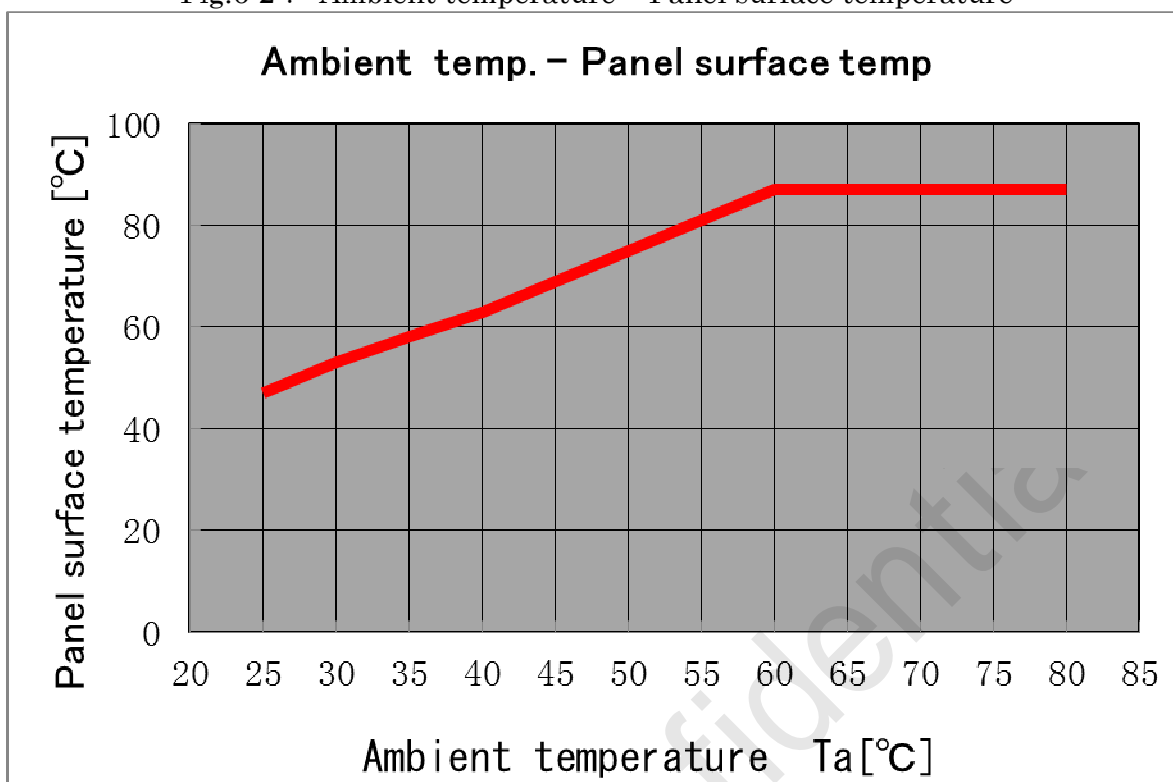


Fig.6-2 : Ambient temperature – Panel surface temperature



Note) Fig.6-2 is a result when it drives by Fig6-1

7. Electrical characteristics

7-1) TFT-LCD panel driving section

Table7-1 Recommended conditions

GND=0V , Ta=25 °C

Parameter		Symbol	MIN	TYP	MAX	Unit	Remarks	
Power supply of source part	Analog	AVDDM	-6.50	-6.37	-6.24	V		
		AVDDP	+6.24	+6.37	+6.50	V		
	Digital	VDD	+3.0	+3.3	+3.6	V		
Power supply of gate driver	TFT driving	Hi	VGH	+17.0	+17.5	+18.0	V	
		Lo	VGL	-15.0	-14.5	-14.0	V	
		VGH-VGL	-	-	+40.0	V		
Logic	Hi	VDD	+3.0	+3.3	+3.6	V		
Power supply of gray image		V0~V13				V	【Note 7-1】	
VCOM voltage		VCOM	-1.5	-0.85	0	V		

【Note 7-1】 AVDDP-0.1 > V0 > V1 > V2 > V3 > V4 > V5 > V6 > 0.1

-0.1 > V7 > V8 > V9 > V10 > V11 > V12 > V13 > AVDDM+0.1

Table 7-2 Reference of gray scale voltage for Gamma2.2

Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
Gray scale voltage for gamma 2.2 *TBD	V0	-	+6.27	AVDDP-0.1	V	
	V1	-	(+4.70)	-	V	
	V2	-	(+3.88)	-	V	
	V3	-	(+3.44)	-	V	
	V4	-	(+3.10)	-	V	
	V5	-	(+2.27)	-	V	
	V6	0.1	(+1.79)	-	V	
	V7	-	(-1.69)	-0.1	V	
	V8	-	(-2.17)	-	V	
	V9	-	(-3.11)	-	V	
	V10	-	(-3.44)	-	V	
	V11	-	(-3.89)	-	V	
	V12	-	(-4.74)	-	V	
	V13	AVDDM+0.1	-6.27	-	V	

Table7-3 Electric characteristic

GND=0V , Ta=25 °C

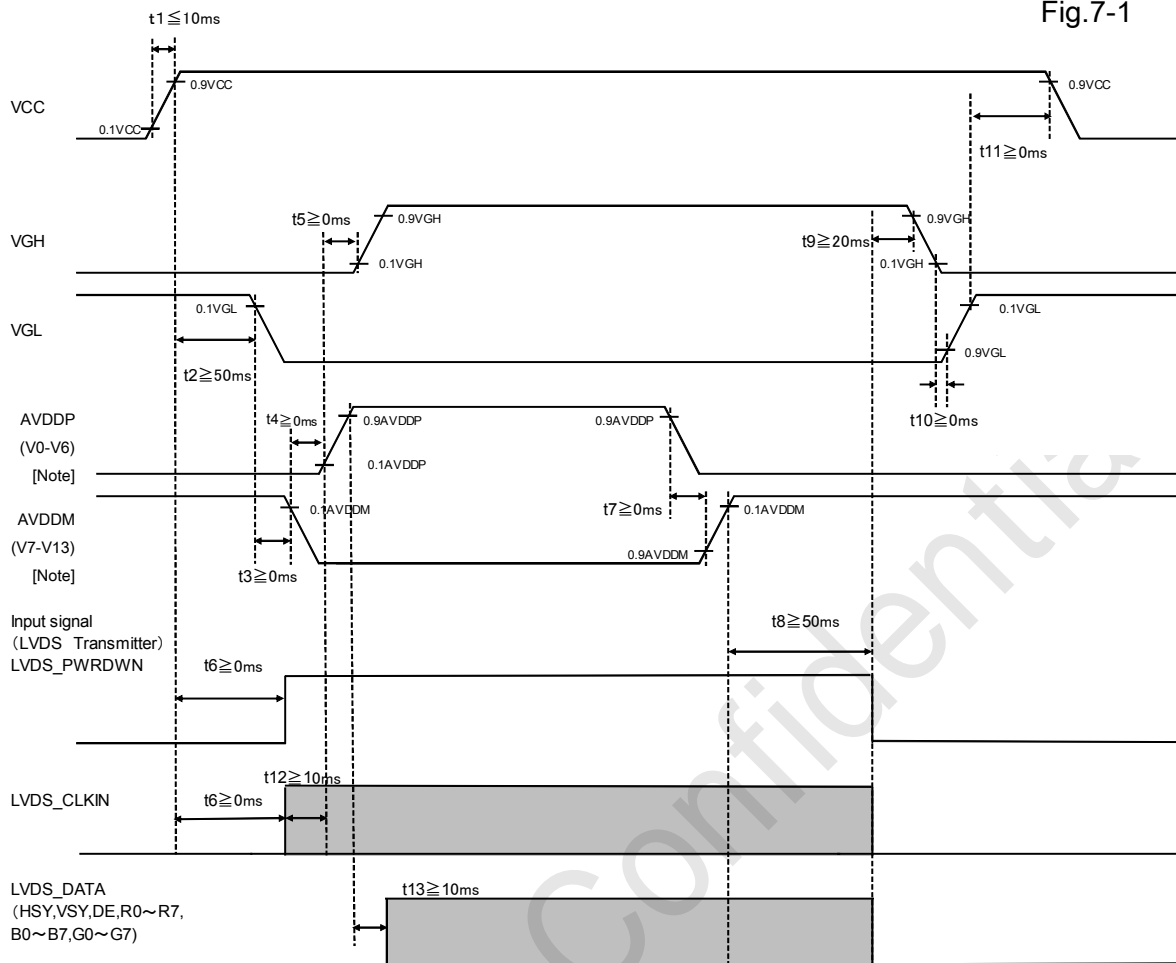
Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks	
input voltage of source part	High level	VIHS	0.7×VDD	—	VDD	V	[Note7-2]
	Low level	VILS	GND	—	0.3×VDD	V	
	LVDS differential voltage	VID	250	350	450	mV	[Note7-3]
		VTH	-	-	50	mV	
		VTL	-50	-	-	mV	
	LVDS center level	VCM	1.1	1.2	1.3	V	
	Voltage drop	Vth	2.5	-	-	V	
Voltage drop time	Tvth	-	-	10	ms		
Voltage rise time	Trise			10	ms		
Re-supply voltage	Voff	0	-	0.1VDD	V		
Time of re-power supply	Tpon	700	-	-	ms		
input current	High	IIH		(150)	uA	[Note7-2]	
	Low	IIL	(-10)		uA		

【Note 7-2】 UD, LR

【Note 7-3】 DATA0P /DATA0N, DATA1P / DATA1N, DATA2P / DATA2N , DATA3P / DATA3N ,
CKP/CKN

【Caution】 Power ON/OFF sequence must be done by the following sequence.

Fig.7-1



[Note]: AVDDP-0.1 > V0 > V1 > V2 > V3 > V4 > V5 > V6 > GND
 GND > V7 > V8 > V9 > V10 > V11 > V12 > V13 > AVDDM+0.1

Please refer to the following for VID, VTH, VTL and VCM.

(DATA0P / DATA0N, DATA1P / DATA1N, DATA2P / DATA2N, DATA3P / DATA3N, CKP / CKN)

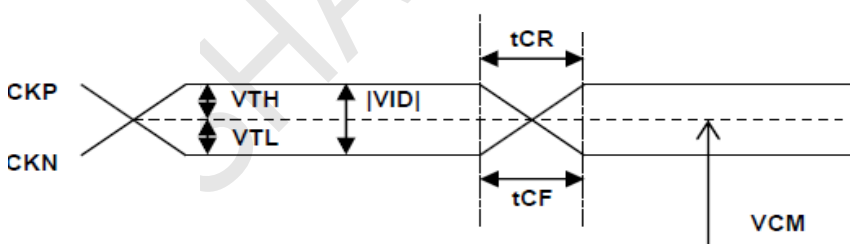


Fig.7-2

*VCM: LVDS Receiver common voltage of LVDS signal.
 *VID: Difference of LVDS Receiver input differential signal.

Fig. 7-3: VDD waveforms

* If VDD drops below Vth then follow sequence as defined in Fig 7-4

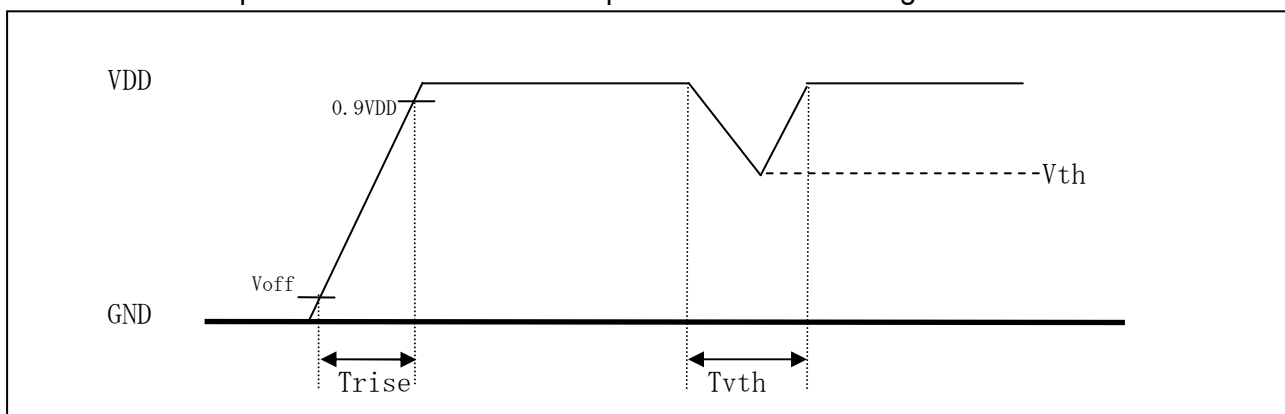
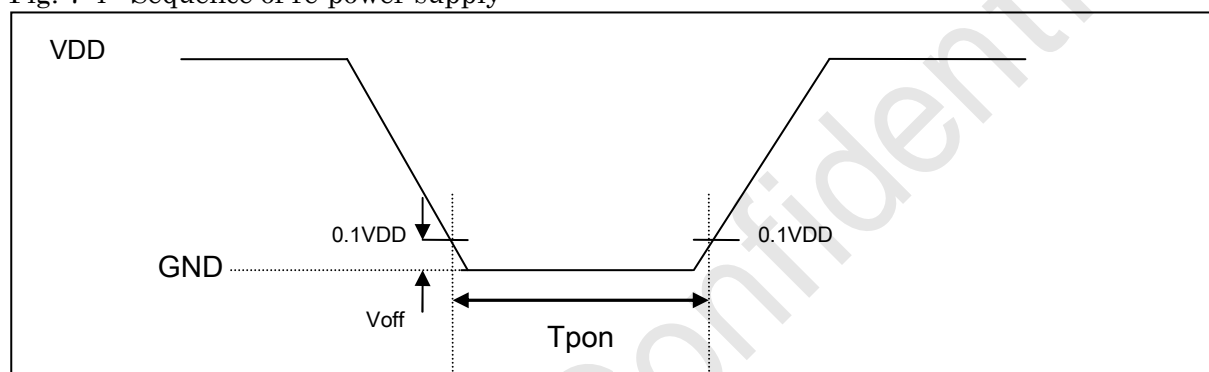


Fig. 7-4 : Sequence of re-power supply



7-2) Backlight driving section

Table 7-4 Recommended condition

Ta = +25°C

Parameter	Symbol	MIN	TYP	MAX	Unit	Remarks
Input voltage	Vf	(33.6)	(36.6)	(39.6)	V	Ta = +25°C [Note7-4]
	Vf-30	—	—	(42.12)	V	Ta = -30°C [Note7-5]
	Vf+85	(31.8)	—	—	—	Ta = +85°C [Note7-5]
Current consumption	If	—	80	90	mA	one line [Note7-6]
Power consumption	Wf	—	(11.7)	—	W	[Note7-7]

[Note7-4] In this case heat is balanced If=80mA by one line (twelve series).

(Reference value based on LED specifications)

[Note7-5] In this case If=80mA power supply ON by one line (twelve series).

(Reference value based on LED specifications)

[Note7-6] Please use the LED current within Fig 6-1.

[Note7-7] Reference, Wf = Vf x If x parallel qty.

8 Timing characteristics

Timing diagrams of input signal are shown in Table 8.

Table 8 : Input signal timing

Ta = +25°C

Parameter	Symbol	MIN	TYP	MAX	Unit	
DCLK	Frequency	fCLK	(44.58)	54.15	(59.37)	MHz
Horizontal synchronous signal (HSY)	Period (time)	tH(t)	(27.39)	30.03	(36.47)	us
	Period (clock)	tH(clk)	-	1626	-	clk
	Pulse width	tHPW	-	5	--	clk
Vertical synchronous signal (VSY)	Period	tV	-	555	-	line
	Pulse width	tVPW	-	2	-	line
DE signal	Pulse width	tEPWB	-	tHA	-	clk
Horizontal display period	tHA	-	1440	-	clk	
Horizontal Front Porch	tHFP	-	86	-	clk	
Horizontal display start position (Horizontal Back Porch)	tHBP	-	100	-	clk	
HSY-VSY phase difference	tHV	-10	-	10	clk	
Vertical Front Porch	tVFP	-	7	-	line	
Vertical display start position (Vertical Back Porch)	tVBP	-	8	-	line	
Vertical display period	tVA	-	540	-	line	

Remark: DCLK must be constant and continuous during operating.

Fig.8-1

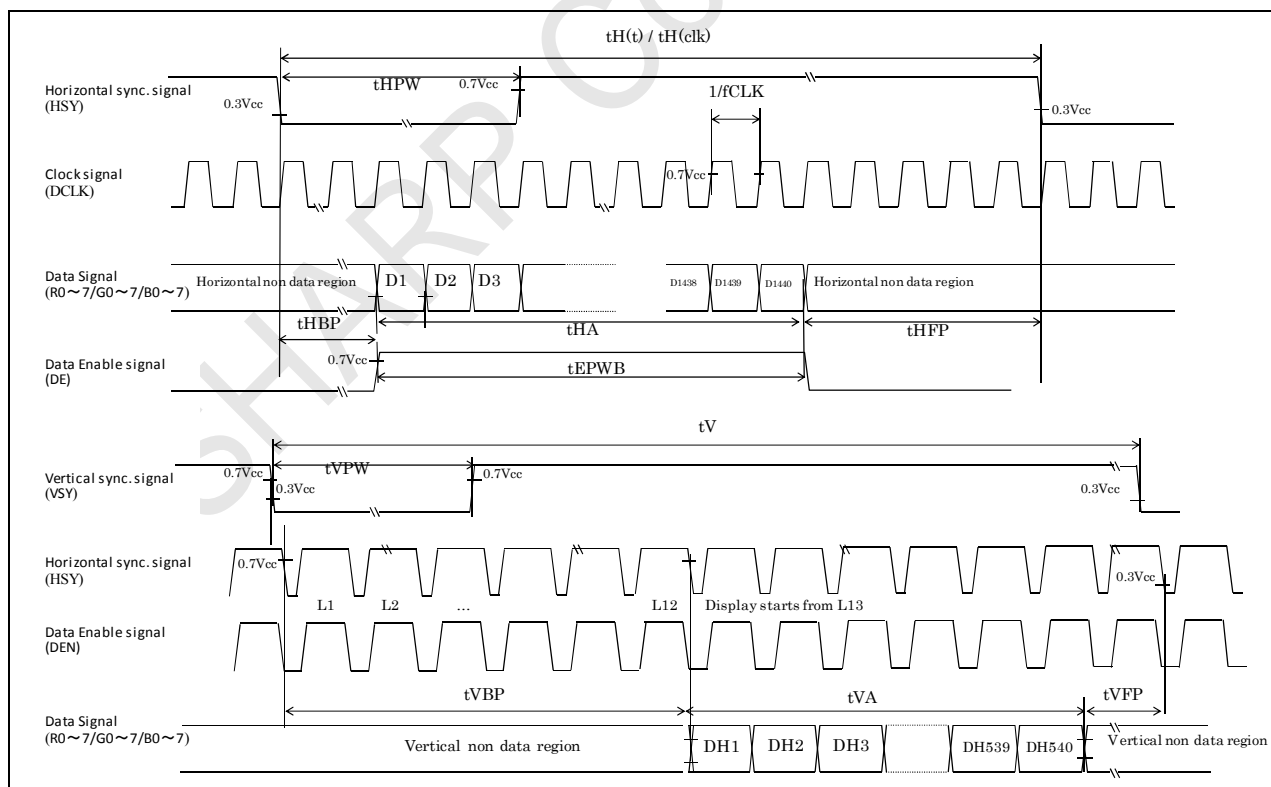


Table8-2 Below table shows LVDS timing

Parameter	Symbol	min	typ	max	unit
Clock Period	tPWCK	16.84	18.47	22.43	ns
High level Clock Width	tPWCK_H	-	4/7	-	tPWCK
Low level Clock Width	tPWCK_L	-	3/7	-	tPWCK
Clock rise & fall time	tCR & tCF	-	-	0.2×tPWCK	ns
Data Width time	tDW	-	1/7	-	tPWCK
Data rise & fall time	tDR & tDF	-	-	0.2×tPWCK	ns

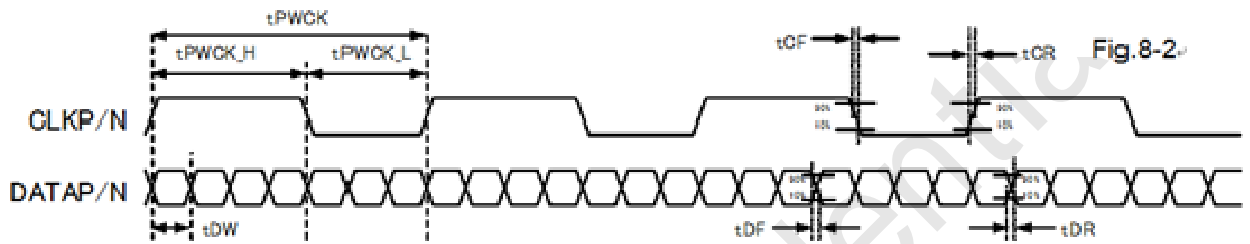


Table.8-3 Data input signal timing chart

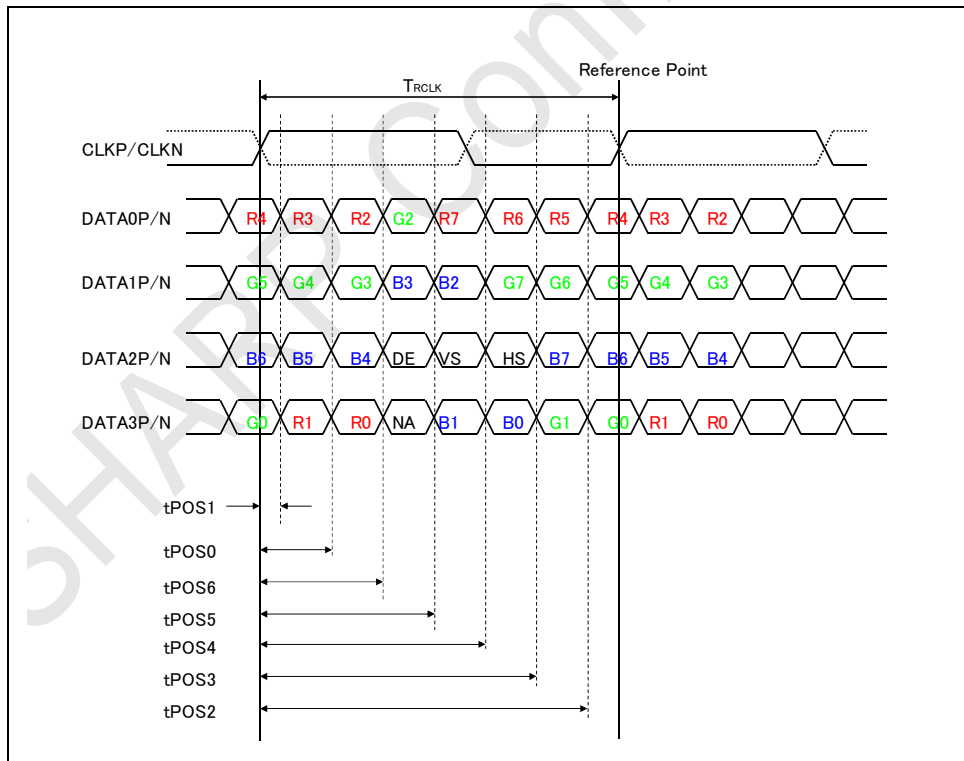


Fig.8-3

9. Current consumption

A rule about the Current consumption is shown in Table9

Table9 Ta = 25°C

Parameter	symbol	Voltage conditions	Min	Typ	Max	Unit
Current for source driver	IDD	VDD= +3.3V	(15)	(34)	(50)	mA
	IDDP	AVDDP= +6.37V	-	(34)	(50)	mA
	IDDM	AVDDM= -6.37V	-	(36)	(50)	mA
Current for gate driver	IGH	VGH= +17.5V	-	(0.7)	(1.0)	mA
	IGL	VGL= -14.5V	-	(0.7)	(1.0)	mA
Panel	ICOM	COM= -0.85V	-	(0.02)	(0.1)	mA

Max current condition :

【Note 9-1】 Display pattern : White screen

【Note 9-2】 reference value

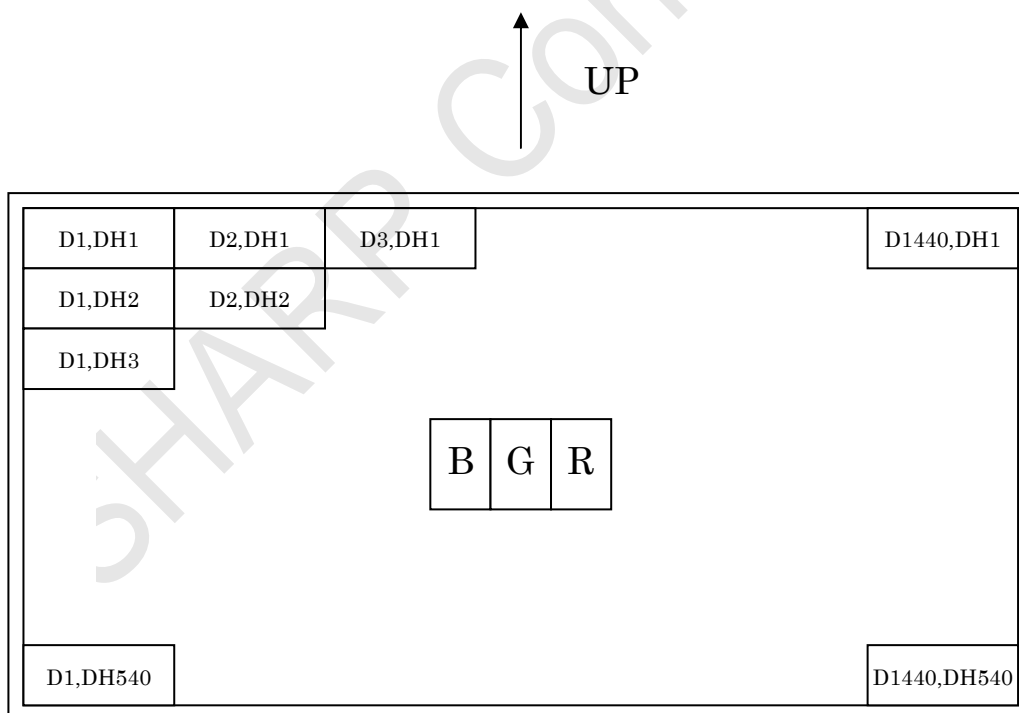
Timing: DCLK=54.15MHz, fH=33.3kHz, fV=60Hz,

In addition, It is defined by follows.

fH : Frequency of Horizontal synchronous signal (Frequency of HSY) $fH=1/tH(t)$

fV : Frequency of Vertical synchronous signal (Frequency of VSY) $fV=1/(tH(t)*tV)$

10. Input Data Signals and Display Position on the screen



Display position of input data (H,V)

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

Table11

	Colors & Grey scale	Data signal																									
		Grey 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	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	
Grey 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	GS253	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	↓	GS254	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Red	GS255	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Grey 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	GS253	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	↓	GS254	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	Green	GS255	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
Grey 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	GS253	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	
	↓	GS254	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	Blue	GS255	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

0 : Low level voltage 1 : High level voltage

Each basic color can be displayed in 255 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16,777,216-color display can be achieved on the screen.

12. Optical characteristics [initial value]

Table 12

Ta=25°C

Parameter		Symbol	Condition	MIN	TYP	MAX	Unit	Notes	
Viewing angle range		θ21,θ22	10 ≤ CR	70	80	-	°(degree)	【Note 12-1,2】	
		θ11, θ12		70	80	-	°(degree)		
Contrast ratio		CR	Perpendicular	700	1800	-		【Note 12-2】	
Response time	Ta=+25°C	τ r+ τ d	θ = 0°	-	15	40	ms	【Nte 12-3】	
Luminance uniformity (White)		Lmin/Lmax	θ = 0° 9point	75	-	-	%	【Note 12-6】	
White Luminance		Y		650	800	-	cd/m ²	【Note 12-4】	
Chromaticity	White	x	If=80mA (per one line) θ = 0°	0.263	0.293	0.323		【Note 12-4】	
		y		0.287	0.317	0.350			
	Red	x		-	(0.640)	-		【Note 12-4】	
		y		-	(0.330)	-			
	Green	x		-	(0.300)	-			
		y		-	(0.606)	-			
	Blue	x		-	(0.151)	-			
		y		-	(0.054)	-			
NTSC ratio		-		-	(72)	-	%		【Note 12-4】
LED Life Time		-	continuation	15,000	-	-	hour		【Note 12-5】

*Measuring after 30minutes operation. The measurement of the optical character is measured by using the method of fig.12-1 and fig.12-2 under the condition which is equal to the darkroom or the darkroom.

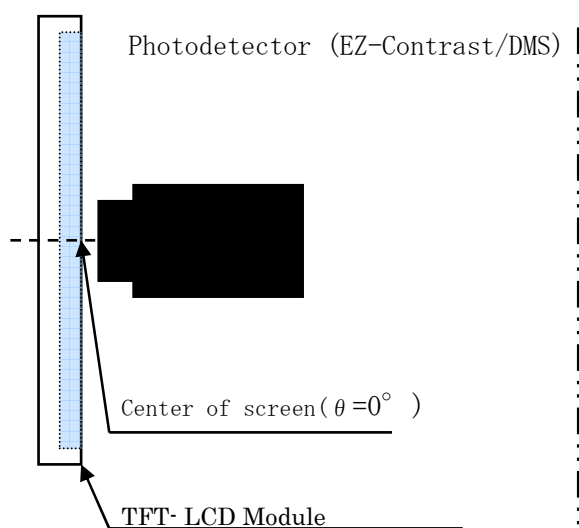


fig.12-1 Viewing angle / Range measurement method

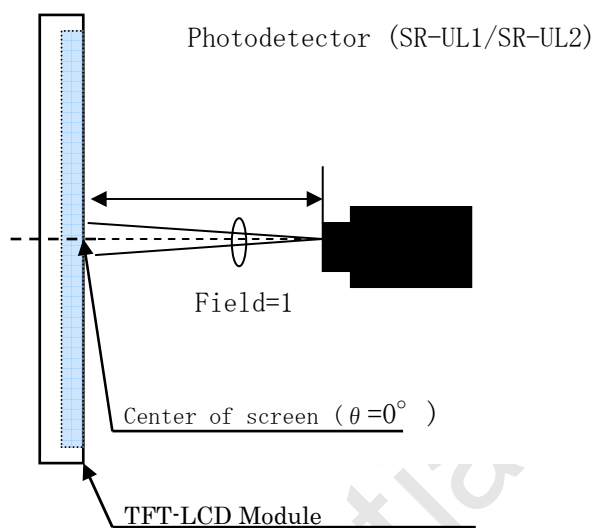
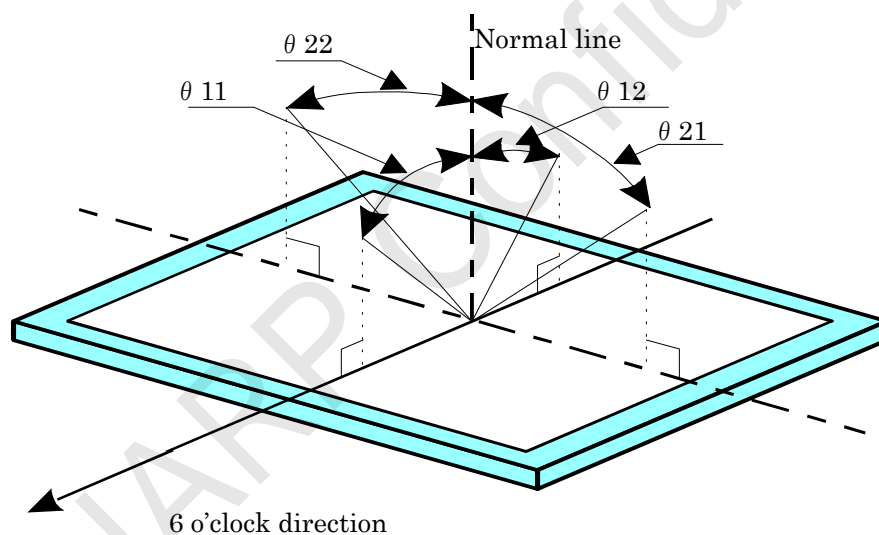


fig.12-2 Luminance / Chromaticity / Contrast measurement method

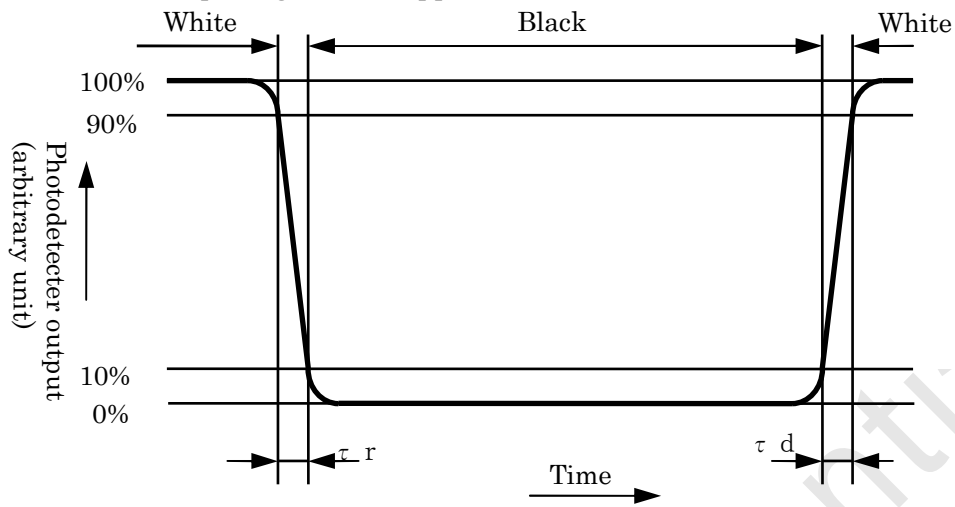
【Note 12-1】 Viewing angle range is defined as follows.



【Note 12-2】 Contrast ratio of transmission is defined as follows:

$$\text{Contrast ratio(CR)} = \frac{\text{Photo detector output with LCD being "white"(GS255)}}{\text{Photo detector output with LCD being "black"(GS0)}}$$

【Note 12-3】 Response time is obtained by measuring the transition time of photo detector output, when input signals are applied so as to make the area "black" to and from "white".

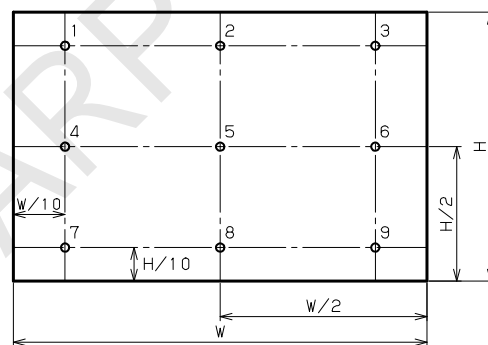


【Note 12-4】 Measured on the center area of the panel at a viewing cone 1° by TOPCON luminance meter SR-UL1/SR-UL2.(After 30 minutes operation)

【Note 12-5】 LED life time is defined as the time when the brightness of the panel not to become less than 70% of the original value in the continuous operation under the following condition.

LED current $I_f=80\text{mA}$ and PWM dimming 100%~5%.

【Note 12-6】 Luminance uniformity is defined as follows



The measurement of Luminance measures nine points of the above figure.

The maximum and minimum luminance is chosen as a result.

Luminance uniformity = Minimum Luminance / Maximum Luminance (%)

13. Display quality

The display quality of the color TFT-LCD module shall be in compliance with the Incoming Inspection Standard.

14. Mechanical characteristics

14-1) External appearance

The appearance security domain becomes the active area. (See Fig.4)

14-2) Panel: Surface Compression Strength

- Panel Fracture: The panel must not break at 19N pressure on the center applied by a smooth surface of 15mm diameter.

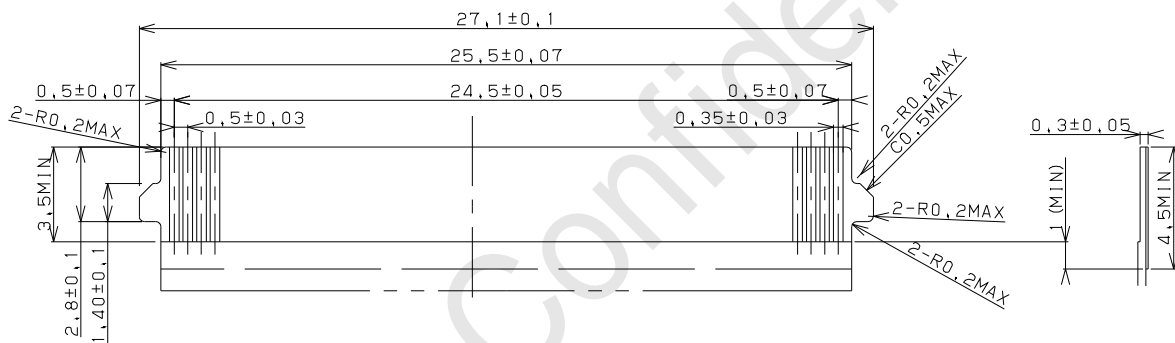
(Note) No matter how little its weight is, it may interfere with the function if any pressure is applied for a long time on the viewing area.

- Surface treatment of Polarizer is Anti-glare(AG). And the surface hardness of polarizer is 3H.

14-3) Input connector performance:

A) FPC for TFT panel driving parts

- (1) Applied Connector: 04_6288_050_000_846+ (KYOCERA).
- (2) Applied FPC(Recommended)



15. Handling instructions

15-1) Handling of LED-FPC

- ① Please do not hang the LCD module by the LED-FPC or apply excessive force on the LED-FPC.
- ② Please do not fold the LED-FPC. Please follow Sharp's FPC handling recommendations for bending the LED-FPC and under all circumstances ensure the minimum bend radius guideline of 0.5mm is observed.

15-2) Mounting of module

- ① The TFT-LCD module is designed to be mounted on equipment using the mounting tabs at the rear side.

On mounting the module, as the M3 screw is recommended, be sure to fix the module on the same plane, taking care not to wrap or twist the module.

(fastening torque is Max 1.5 N·m as design target.)

Don't allow the pressure from the touch switched besides the display module (if any) to impact the module directly. Such external stress can cause image distortion.

- ② Be sure to turn off the power supply when inserting or disconnecting the cable.
- ③ Please ensure that the LCD metal case is grounded in the system design.

15-3) Precautions in mounting

Polarizer which is made of soft material and susceptible to flaw must be handled carefully. Protective sheet is applied on the surface to protect it against scratches and dirties. It is recommended to peel off the protective sheet immediately before the use, taking care of static electricity Precautions in peeling off protective sheet.

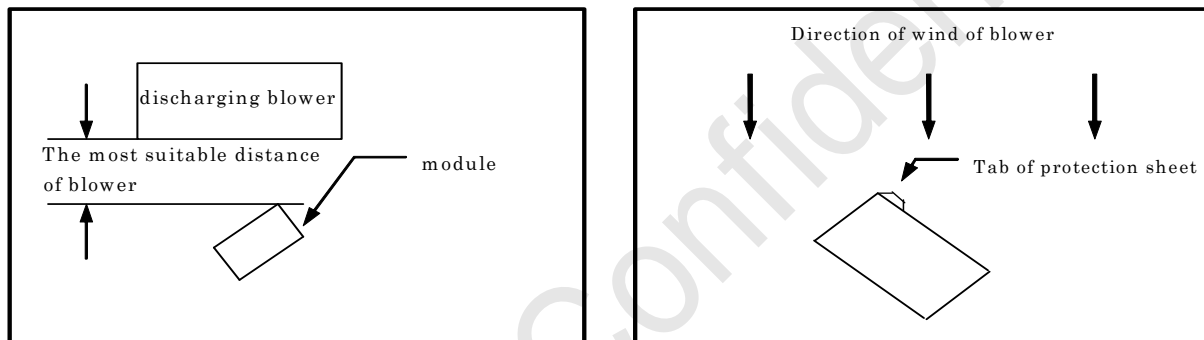
A) Working environment

When the protective sheet is peeled off, static electricity may cause dust to stick to the polarizer surface.

To avoid this, the following working environment is desirable.

- a) Floor: Conductive treatment of $1M\Omega$ or more on the tile.
(conductive mat or conductive paint on the tile)
- b) Clean room free from dust and with an adhesive mat on the doorway.
- c) Advisable humidity: 50%~70% Advisable temperature: 15°C~27°C
- d) Workers shall wear conductive shoes, conductive work clothes, conductive gloves and an earth band.

B) Working procedures



- a) Direct the wind of discharging blower somewhat downward to ensure that module is blown sufficiently.
Please set the distance between module and discharging blower the most suitable distance of blower.
- b) Peel off protective sheet, pulling tab of protection sheet slowly to your side.
- c) On peeling off the protective sheet, pass the module to the next work process to prevent the module to get dust.
- d) Method of removing dust from polarizer
 - Blow off dust with ionized air blower for which static electricity preventive measure has been taken.
 - Since polarizer is vulnerable, wiping should be avoided.
But when the panel has stain or grease, we recommend to use soft cloth like SAVINA MX or equivalent any cloth can be used.

When metal part of the TFT-LCD module (shielding case and rear case) is soiled, wipe it with soft dry cloth. For stubborn dirties, wipe the part, breathing on it. Wipe off water drop or finger grease immediately. Long contact with water may cause discoloration or spots.

TFT-LCD module and Touch panel uses glass which breaks or cracks easily if dropped or bumped on hard surface.

Handle with care. Since CMOS LSI is used in this module, take care of static electricity and earth your body when handling.

15-4) Caution of product design

Please following items strictly when the product is designed by using this module.

- The LCD module shall be protected against water salt-water by the waterproof cover..
- Please take measures to ensure electromagnetic radiation from module does not cause interfere to operation of surrounding appliances.
- About the FPC/FFC design of the LCD panel drive input part, please refer to recommended FPC/FFC dimensions of input connector which 04 6288 050 000 846+ (KYOCERA). In addition, we recommend the terminals of FFC/FPC be of gold or gold plated, because the contact points of the connector are gold plated.
- Customer mechanics should be designed to avoid possible reflection from the cutting surface of front case.
- In order to prevent light leakage , please consider the design of your company set.
- The LCD module is used in landscape.
If you used this LCD module in portrait, it darkens when the liquid crystal display is seen wearing a polarizing sunglasses.

15-5) Others

- ① Do not expose the module to direct sunlight or intensive ultraviolet rays for several hours; liquid crystal is deteriorated by ultraviolet rays.
- ② Store the module at a temperature near the room temperature. At lower than the rated storage temperature, liquid crystal solidifies, causing the panel to be damaged. At higher than the rated storage temperature, liquid crystal turns into isotropic liquid and may not recover.
- ③ If LCD panel breaks, there may be a possibility that the liquid crystal escapes from the panel. Since the liquid crystal is injurious, do not put it into the eyes or mouth. When liquid crystal sticks to hands, feet or clothes, wash it out immediately with soap.
- ④ Observe all other precautionary requirements in handling general electronic components.
- ⑤ 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.
- ⑥ Be sure to adjust DC bias voltage of common electrode driving signal(VCOM) in the state of the last product. When not adjusted, it becomes the cause of a deterioration of display quality.
- ⑦ Please design the system ensuring that no load is applies directly to the display module. External load when applied directly on the display module can cause display distortion like pooling.
- ⑧ When carrying out PWM Dimming, a display noise may occur depending on Dimming frequency. Please fully inquire in the case of a products design.
Recommendation Dimming frequency : frequency multiplying of Frame rate or high-frequency(over 1k Hz)

16 Packing form

Please refer to Fig.16 “Packing form”

- a) Piling number of cartons : TBD
- b) Package quantity in one carton : TBD
- c) Carton size: TBD
- d) Total mass of one carton filled with full modules: TBD
- e) Recommended warehouse storage conditions

Environment

- ①Temperature : 0~40℃
- ②Humidity : 60%RH or less (at 40℃)
No dew condensation at low temperature and high humidity.
- ③Atmosphere :Harmful gas, such as acid or alkali which corrodes electronic components and/or wires, must not be detected.
- ④Period : about 3 months
- ⑤Opening of the package : In order to prevent the LCD module from breakdown by electrostatic charges, please control the room humidity over 50%RH and open the package taking sufficient countermeasures against electrostatic charges, such as earth, etc.

17.Indication of lot number

- ①Attached location of the label
- ②Indicated contents of the label

TBD

QR code

TBD

Contents of Lot number

TBD

18.Fab locations

Panel production : SHARP CORPORATION(Japan Mie Factory)

LCD Modue assembly : WSEC(China)

19.About RoHS

This TFT-LCD module is RoHS complaint.

20.Disposal of module

Please take care to observe appropriate laws and regulations when disposing of this TFT-LCD product for any reason.

21. Reliability test condition

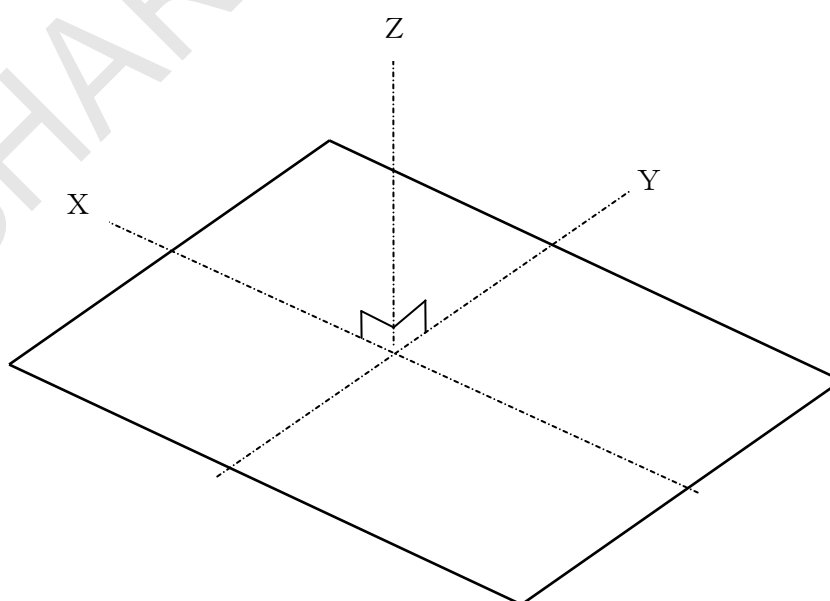
Table 21-1 Reliability test

No.	Test items	Test condition	Notes
1	High temperature storage test	Ta = +90°C 240h	
2	Low temperature storage test	Ta = -40°C 240h	
3	High temperature and high humidity operation test	Ta = +60°C, 90%RH 240h	
4	Hi temperature operating test	Tp = +85°C 240h	
5	Low temperature operating test	Ta = -30°C 240h	
6	Electro static discharge test	±200V · 200pF(0Ω) 1 time for each terminals	
7	Shock test	980m/s ² · 6ms, ±X ; ±Y ; ±Z 10times for each direction	【Note 21-1】
8	Vibration test	Frequency : 8~33.3Hz , Stroke : 1.3mm Frequency : 33.3Hz~400Hz, Acceleration : 29.4m/s ² Cycle : 15 minutes X,Y,Z 8 hours for each directions.	【Note 21-1】
9	Heat shock test	-30°C ~ +85°C , 200 cycles (0.5h) (0.5h)	

Ta = Ambient temperature, Tp = Panel temperature

【Check items】 In the standard condition, there shall be no practical problems that may affect the display function.

【Note 21-1】 Definition of X, Y, Z direction is shown as follows



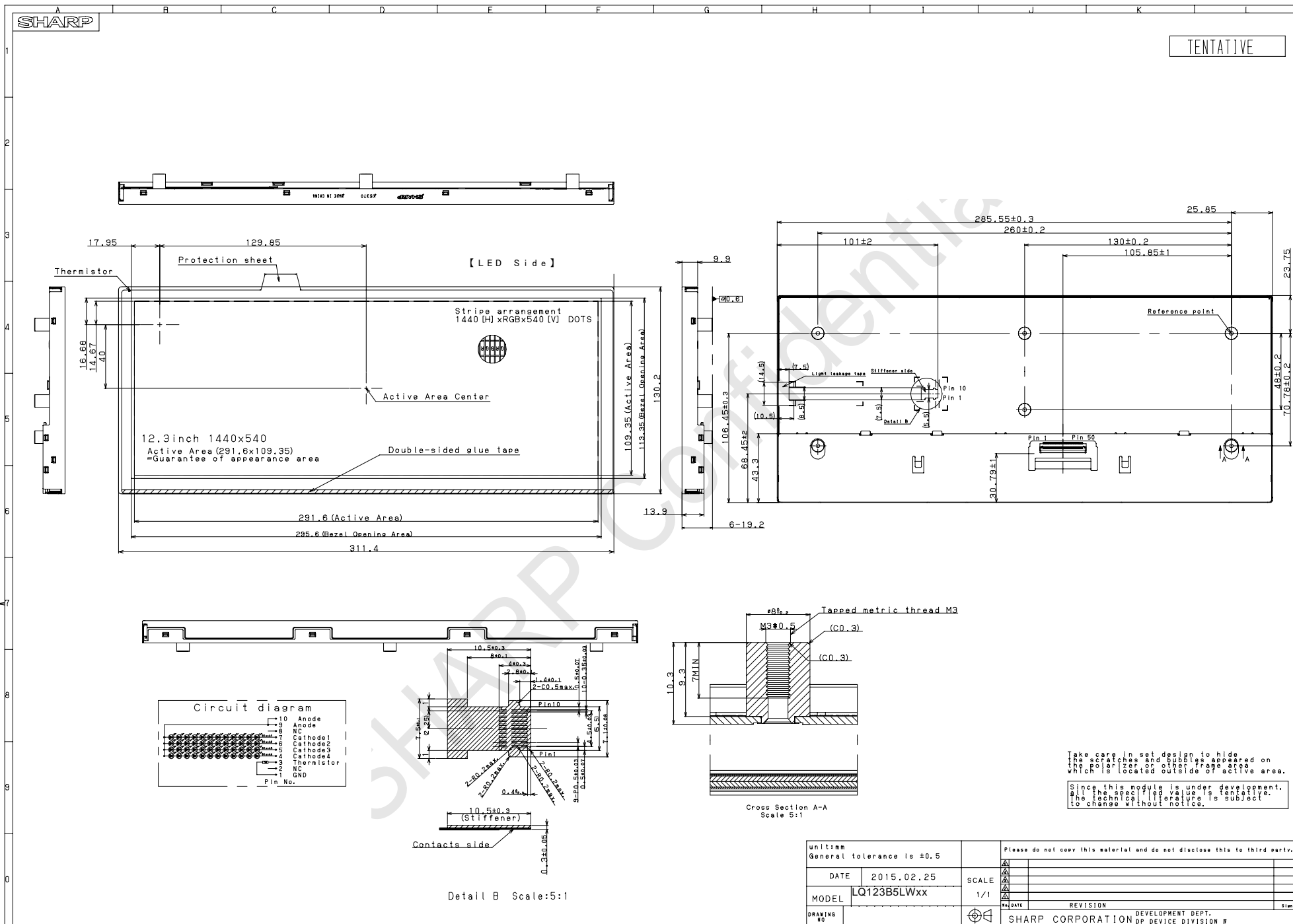


Fig4.Outline Dimension

TBD

LCY-W-15156A-26

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Fig16. Packing Form