TFT LCD Tentative Specification

MODEL NO.:TP315BT01-MB1 R213 F1006

Customer:_____

Approved by:_____

Note:

Approved By	TV Product Marketing & Management Div

Reviewed By	QA Dept.	Product Development Div.

Prepared By	LCD TV Marketing and Product Management Div.

RECORD OF REVISIONS

Version	DATE	PAGE	Description
Ver 0.0	2012/06/19	ALL	Tentative Specification was first issued.

CONTENTS

1. GENERAL DESCRIPTION

1.1 OVERVIEW

TP315BT01-MB1 is color active matrix LCD Open-cell incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a color TFT-LCD panel, driver ICs, etc. Graphics and texts can be displayed on a 1366×RGB×768 dots panel with about 16,777,216 colors(R/G/B 8bit in each color) by using LVDS(Low Voltage Differential Signaling) to interface, +12V of DC supply voltage.

1.2 FEATURES

- Optimized Brightness 300nits
- Contrast Ratio (3000:1)
- Fast Response Time (6.5 ms)
- Color Saturation NTSC 70%
- Full HDTV (1366 x 768 pixels) resolution, true HDTV format
- DE (Data Enable) Only Mode
- LVDS (Low Voltage Differential Signaling) Interface
- Viewing Angle: 176(H)/176(V) (CR>20) MVA Technology
- Color Reproduction (Nature Color)

1.3 APPLICATION

-TFT LCD TVs

-Optimized Brightness, Multi-Media Displays

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit
Active Area	697.685(H) x 392.265(V)	mm
Bezel Opening Area	705.4(H) x 399.8 (V)	mm
Driver Element	a-si TFT active matrix	-
Pixel Number	1366 x R.G.B. x 768	pixel
Pixel Pitch(Sub Pixel)	0.51075 (H) x 0.51075 (V)	mm
Pixel Arrangement	RGB vertical stripe	-
Display Colors	16.7M	color
Display Operation Mode	Transmissive mode / Normally Black	-
Surface Treatment	Anti-Glare Hard Coating (2H)	-
Power Consumption	28	W

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size Weight	Horizontal (H)	742	743	744	mm	Module Size
	Vertical (V)	448	449	450	mm	
	Depth (D)	18	19	20	mm	To Rear
		34	35	36	mm	To Boss
	Weight		4450		g	

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

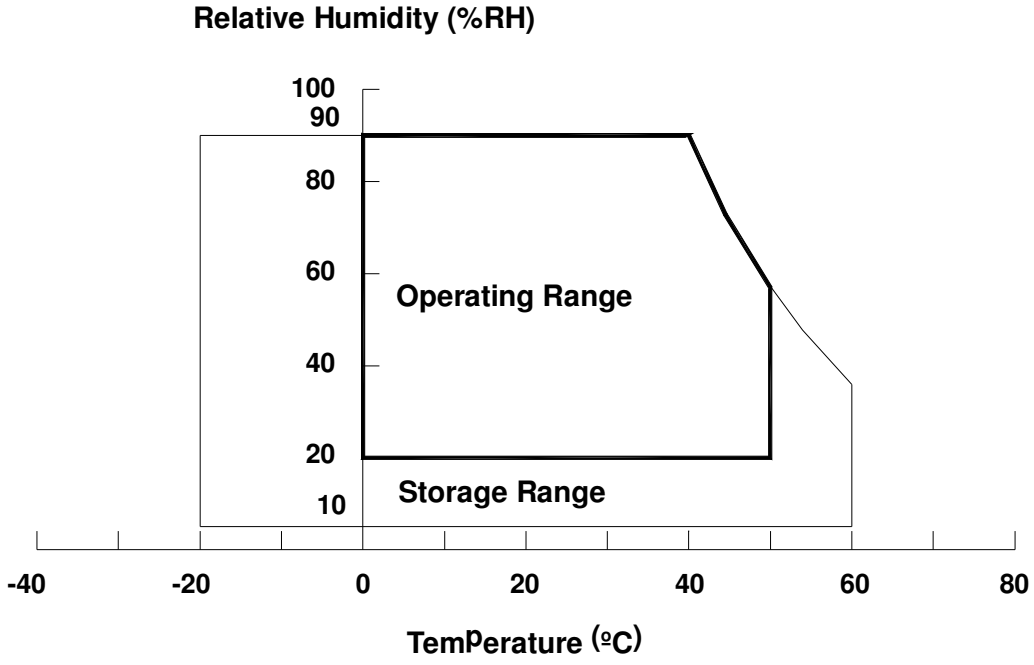
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 30 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 Package storage

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 Absolute Maximum Rating

Parameter	Symbol	Condition	Ratings	Unit	Remark
Input voltage	V_I	Ta=25℃	-0.3 ~ 3.6	V	[Note 1]
+12V supply voltage	V_{CC}	Ta=25℃	0 ~ +15	V	
Storage temperature	T_{stg}	-	-25 ~ +60	℃	
Operation temperature	T_{opa}	-	0 ~ +50	℃	[Note 2]

[Note 1] SELLVDS

[Note 2] Max Humidity: 95%RH. (Ta≦40℃)
Wet-bulb temperature should be 39℃Max. (Ta>40℃).
No condensation.

2.3.2 LED LIGHT BARCHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Light Bar Input Voltage	V_{LED}	29	--	34	V_{DC}	(Duty 100%)
Light Bar Input Current	I_{LED}	--	360	--	mA_{DC}	(Duty 100%) per string
Power Consumption	P_{LED}	10.44	--	12.24	W	(1)
LED Life Time	L_{BL}	(30000)	--	--	Hrs	(2)

Note (1) $P_{LED} = I_{LED} \times V_{LED}$, LED matrix is 10 S6 P.

Note (2) The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ºC and I = 60 mA(Per EA) until the brightness becomes ≦ 50% of its original value.

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
+12V supply voltage	Supply voltage	V_{CC}	+10.8	+12.0	+13.2	V	[Note 1]
	Current dissipation	I_{CC}	-	350	600	mA	[Note 2]
		I_{RUSH}	-	-	5	A	[Note 5]
Differential input threshold voltage	High	V_{TH}		-	100	mV	[Note 4]
	Low	V_{TL}	-100	-	-	mV	
Input Low voltage		V_{IL}	0		0.7	V	[Note 3]
Input High voltage		V_{IH}	2.6	-	3.3	V	
Input leak current (Low)		I_{IL}	-	-	400	μA	V_I=0V [Note 3]
Input leak current (High)		I_{IH}	-	-	100	μA	V_I =3.3V [Note 3]
Terminal resistor		RT	-	100	-	Ω	Differential input
Input Differential voltage		|VID|	200	400	600	mV	[Note 4]
Differential input common mode voltage		VCM	|VID|/2	1.2	2.4-|VID|/2	V	[Note 4]

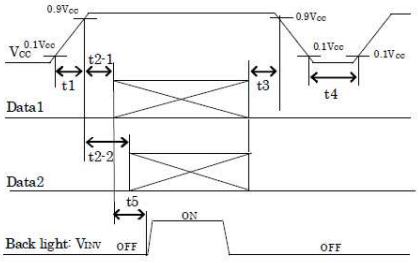
[VCM]: Common mode voltage of LVDS driver

[Note 1] Input voltage sequences

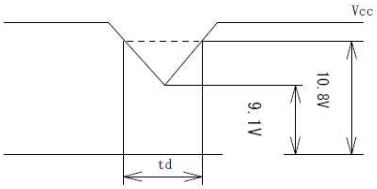
50us ≦ t1 ≦ 20ms
20ms < t2-1
20ms < t2-2
0 < t3-1≦1s
0 < t3-2≦1s
1s ≦ t4
300ms ≦ t5-1
300ms ≦ t5-2

Dip conditions for supply voltage

a) 9.1V ≦ VCC < 10.8V
td ≦ 10ms
b) VCC < 9.1V
Dip conditions for supply voltage is based on input voltage sequence.



Input voltage sequences



Dip conditions for supply voltage

※ Data1: CLKIN±,RIN0±,RIN1±, RIN2±, RIN3±

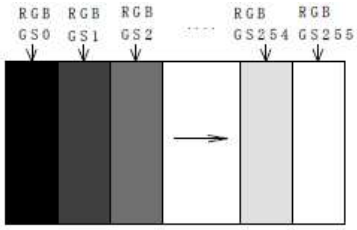
※ Data2: SELLVDS

※ About the relation between data input and back light lighting, please base on the above-mentioned input sequence.

When back light is switched on before panel operation or after a panel operation stop, it may not display normally. But this phenomenon is not based on change of an incoming signal, and does not give damage to a liquid crystal display.

[Note 2] Typical current situation: 256 gray-bar pattern (VCC = +12.0V).

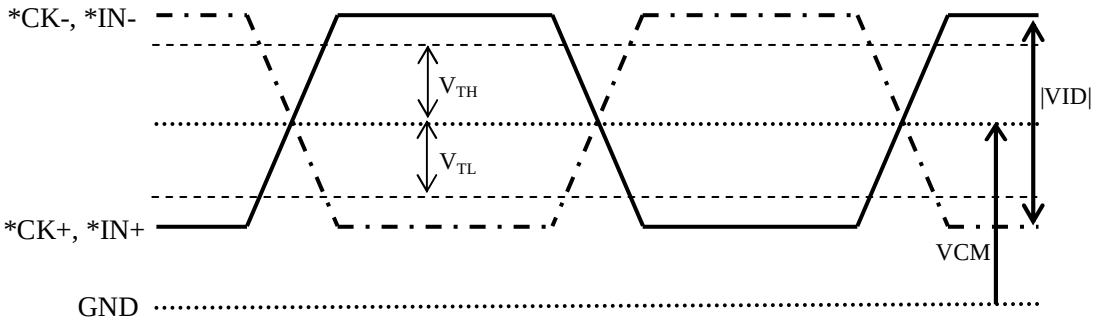
The explanation of RGB gray scale is seen in section 8.



Typical current situation

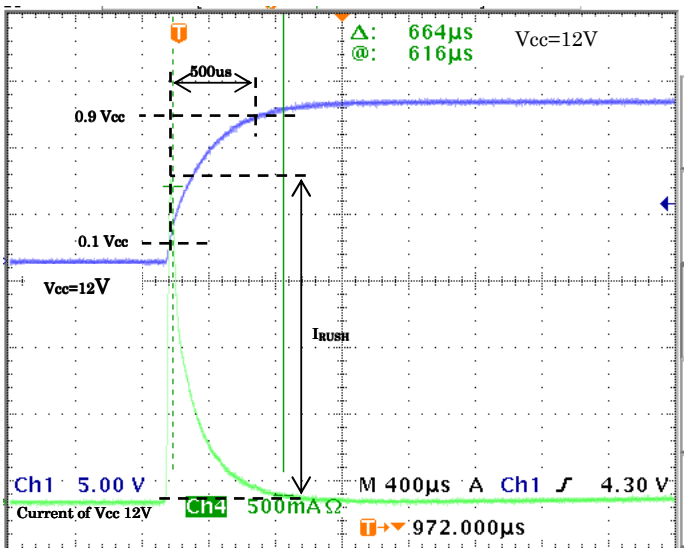
[Note 3] SELLVDS

[Note 4] CLKIN+/CLKIN-, RIN0+/RIN0-, RIN1+/RIN1-, RIN2+/RIN2-, RIN3+/RIN3-



LVDS input characteristics

[Note 5] The Rush current corrugation at the time of power on.



Ton: Vcc(+12V) Rising Time
From 10%Vcc to 90%Vcc
I: Current of Vcc(+12V)
IRUSH: The max current
After Vcc rose.

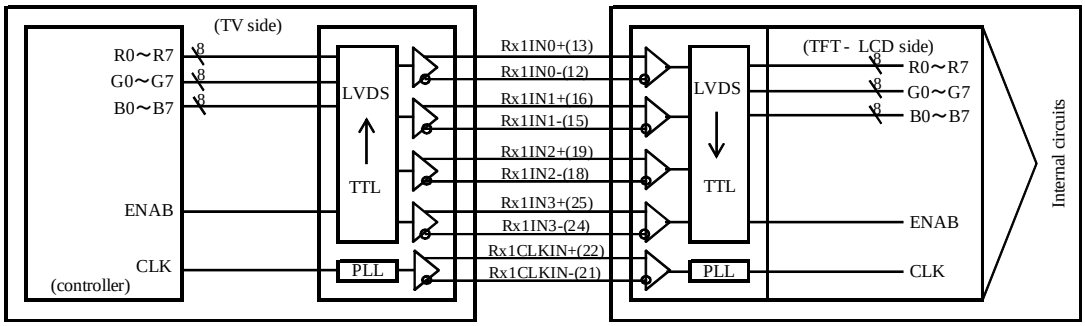
[HOW TO]
Measure the Vcc(12V) when you turn the power on. At the same time, measure the current of Vcc(12V).
The single mode of the oscilloscope is useful in this case.

The waveform of rush current

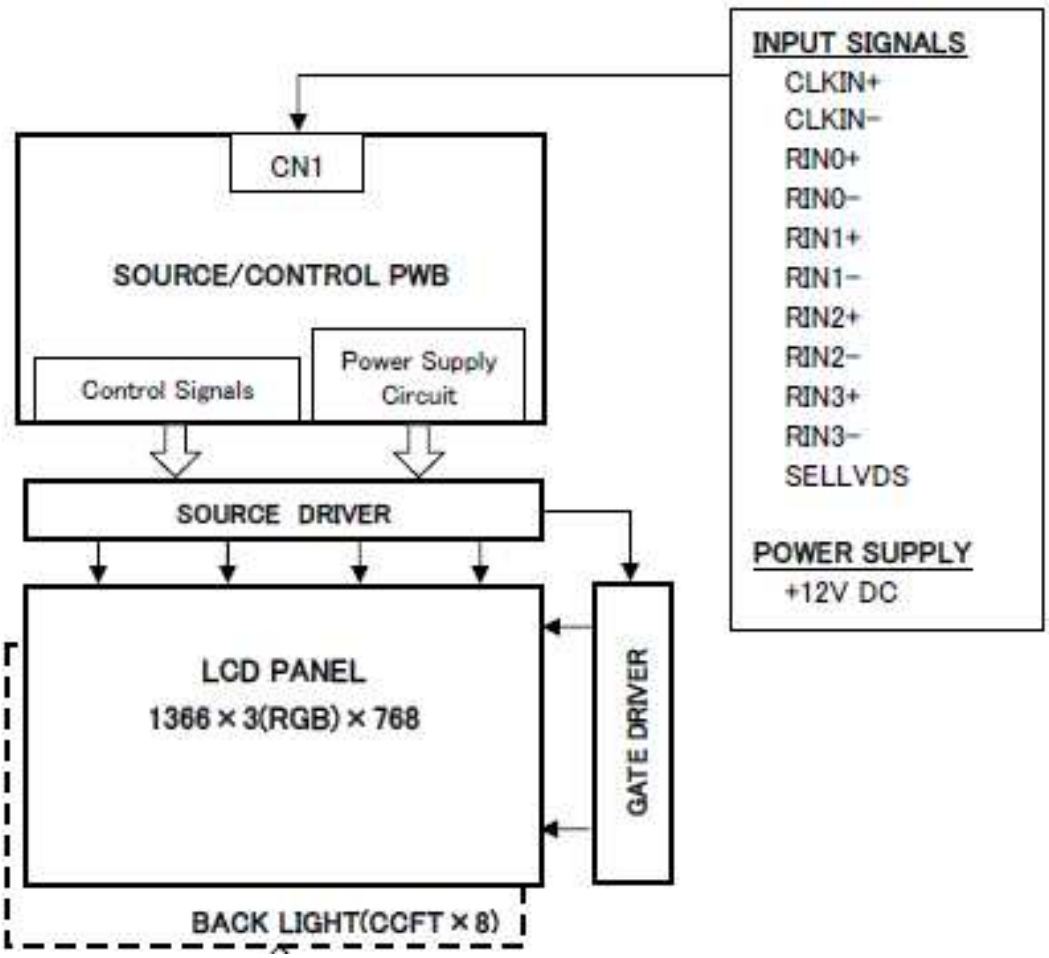
4. BLOCK DIAGRAM OF INTERFACE

4-1 Interface block diagram

Corresponding Transmitter: THC63LVDM83R (THine) or equivalent device.

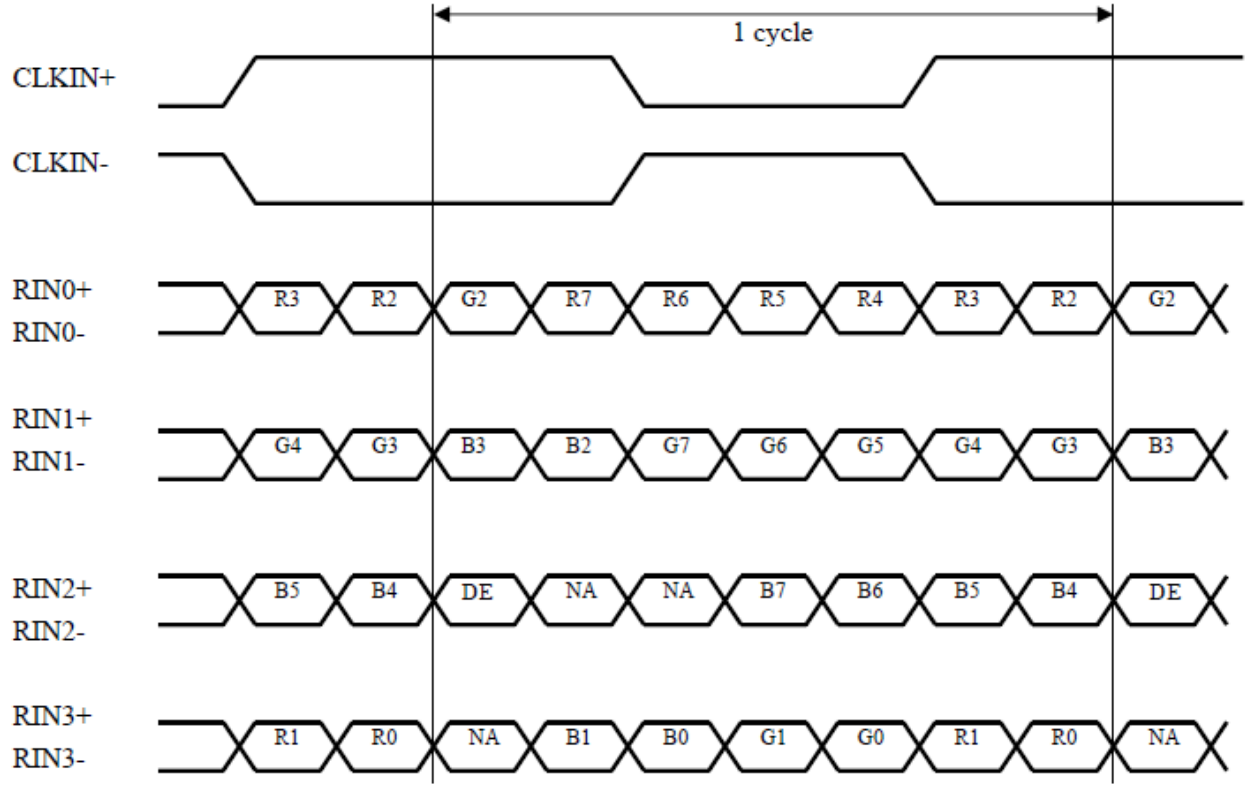


4-2 Block Diagram(OPEN-CELL)

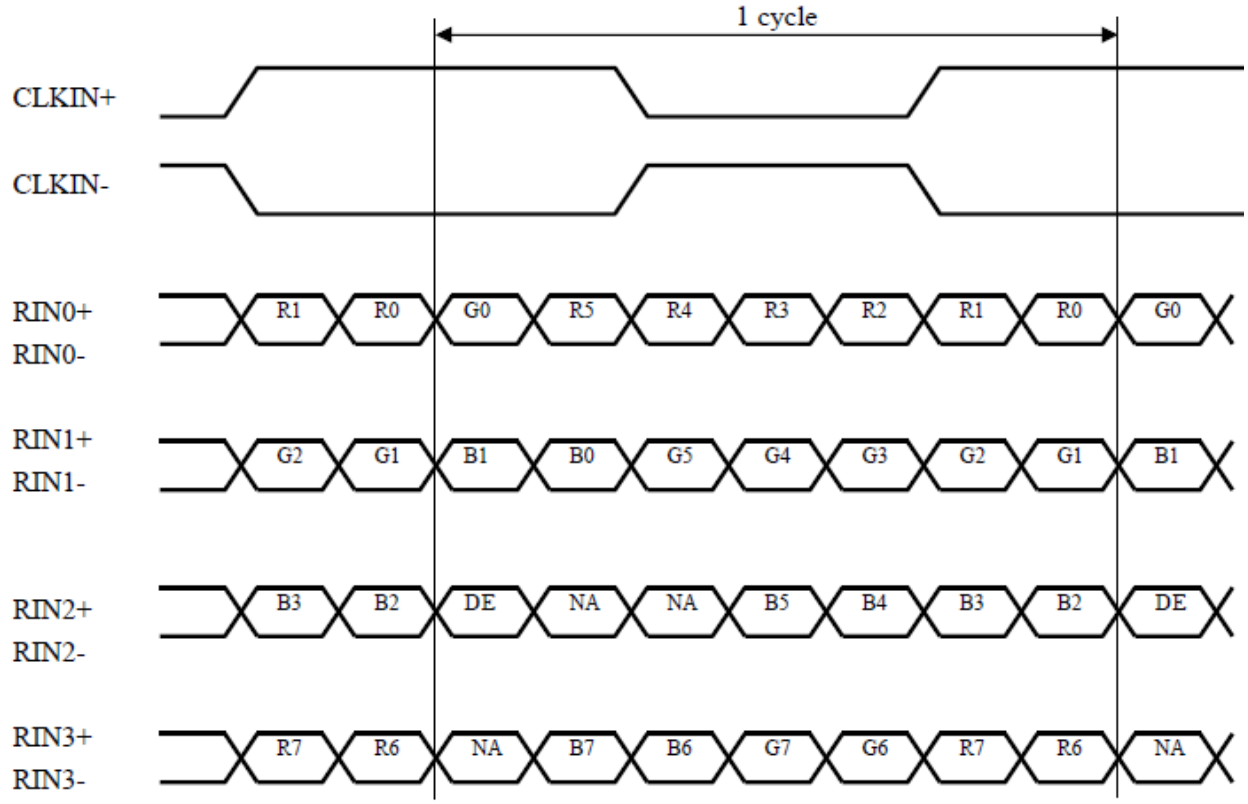


block diagram (Open-cell)

SELLVDS= High (3.3V)



SELLVDS= LOW (GND) or OPEN



DE: Display Enable

NA: Not Available (Fixed Low)

4-3 Input Terminals

TFT panel driving

CN1 (Interface signals and +12V DC power supply) shown on the next table.

Using connector: IS100-L30B-C23 (UJU)

Matching connector: FI-X30C2L or Equivalent (Japan Aviation Electronics Ind., Ltd)

Matching LVDS transmitter: THC63LVDM83R (THine) or equivalent device

Pin No.	Symbol	Function	Remark
1	VCC	+12V Power Supply	
2	VCC	+12V Power Supply	
3	VCC	+12V Power Supply	
4	VCC	+12V Power Supply	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	SELLVDS	Select LVDS data order[Note1]	Default: pull down (L:GND) [Note2]
10	Reserved	Not Available	
11	GND	Ground	
12	RIN0-	Negative(-) LVDS differential data input	LVDS
13	RIN0+	Positive(+) LVDS differential data input	LVDS
14	GND	Ground	
15	RIN1-	Negative(-) LVDS differential data input	LVDS
16	RIN1+	Positive(+) LVDS differential data input	LVDS
17	GND	Ground	
18	RIN2-	Negative(-) LVDS differential data input	LVDS
19	RIN2+	Positive(+) LVDS differential data input	LVDS
20	GND	Ground	
21	CLKIN-	Clock Signal(-)	LVDS
22	CLKIN+	Clock Signal(+)	LVDS
23	GND	Ground	
24	RIN3-	Negative(-) LVDS differential data input	LVDS
25	RIN3+	Positive(+) LVDS differential data input	LVDS
26	GND	Ground	
27	Reserved	Not Available	
28	Reserved	Not Available	
29	GND	Ground	
30	GND	Ground	

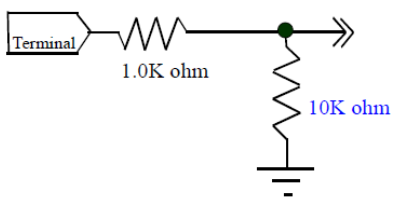
[Note 1] SELLVDS

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

NA: Not Available

(*)The display position is prescribed by the rise of DE (Display Enable) signal, please do not fix DE signal during operation at "High."

[Note 2] The equivalent circuit figure of the terminal



4-4 Input Signal, 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	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	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
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	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
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	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.

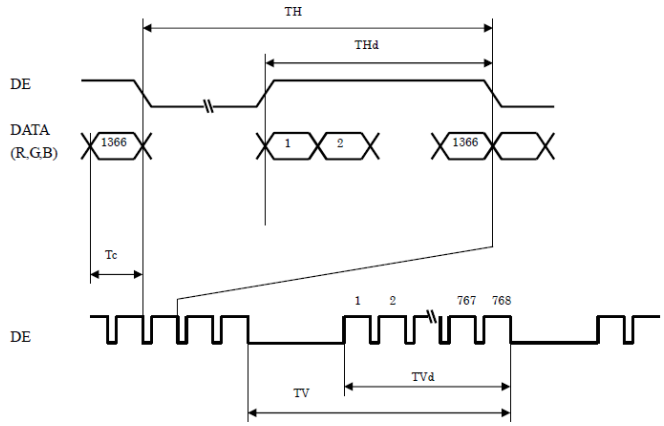
Each basic color can be displayed in 256 gray scales from 8 bit data signals. According to the combination of total 24 bit data signals, the 16,777,216 colors display can be achieved on the screen.

5.TIMING CHARACTERISTICS OF INPUT SIGNALS

5-1 Timing Characteristics

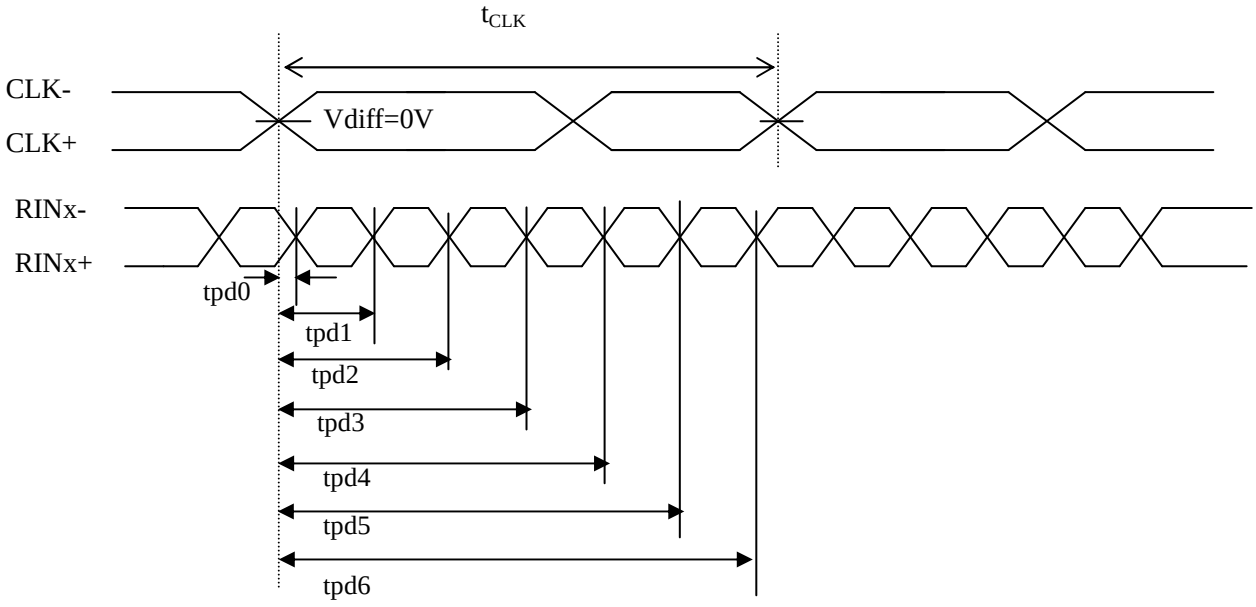
Parameter		Symbol	Min	Typ.		Max.	Unit
				NTSC	PAL		
Clock	Frequency	1/Tc	72	82	82	85	MHz
Data enable signal	Horizontal period	TH	1540	1696	1696	1940	clock
			17.15	20.68	20.68	21.42	μs
	Horizontal period (High)	THd	1366	1366	1366	1366	clock
	Vertical period	TV	778	806	967	972	line
	Vertical period (High)	TVd	768	768	768	768	line

[Note] Timing diagrams of input signal are shown in Fig. 1.



Timing characteristics of input signals

5-2 LVDS signal characteristics



LVDS signal characteristics

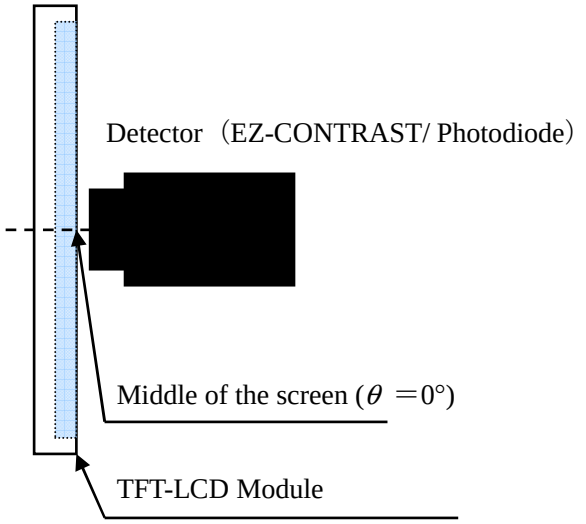
The item		Symbol	min.	typ.	Max.	unit
Data position	Delay time, CLK rising edge to serial bit position 0	tpd0	-0.40	0	0.40	ns
	Delay time, CLK rising edge to serial bit position 1	tpd1	typ-0.40	1* t_{CLK} /7	typ+0.40	
	Delay time, CLK rising edge to serial bit position 2	tpd2	typ-0.40	2* t_{CLK} /7	typ+0.40	
	Delay time, CLK rising edge to serial bit position 3	tpd3	typ-0.40	3* t_{CLK} /7	typ+0.40	
	Delay time, CLK rising edge to serial bit position 4	tpd4	typ-0.40	4* t_{CLK} /7	typ+0.40	
	Delay time, CLK rising edge to serial bit position 5	tpd5	typ-0.40	5* t_{CLK} /7	typ+0.40	
	Delay time, CLK rising edge to serial bit position 6	tpd6	typ-0.40	6* t_{CLK} /7	typ+0.40	

6.OPTICAL CHARACTERISTICS

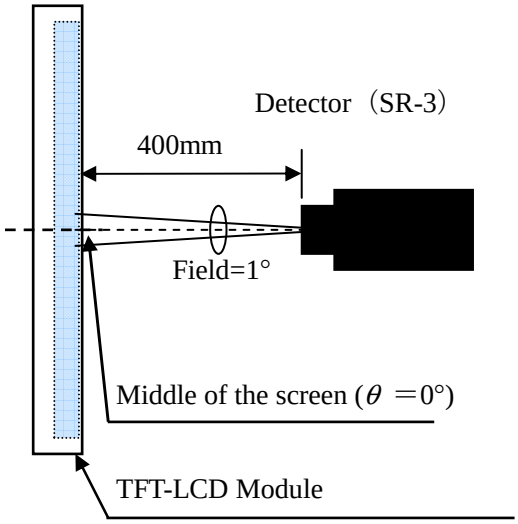
Ta=25°C

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing angle range	Horizontal	θ 21 θ 22	CR ≥10	70	88	-	Deg.	[Note1,4]
	Vertical	θ 11 θ 12		70	88	-	Deg.	
Center Luminance of white		Lc		280	300	-	cd/m^2	
Contrast ratio		CR		2000	3000	-	-	[Note2,4] V_{BRT}=3.15V
Response time		τ_{DRV}		6.5	7	-	ms	[Note3,4,5] V_{BRT}=3.15V
Chromaticity of white		x		Typ.-0.03	0.282	Typ.+0.03	-	[Note 4] V_{BRT}=3.15V
Chromaticity of white		y		Typ.-0.03	0.284	Typ.+0.03	-	
Chromaticity of red		x	θ=0 deg.	Typ.-0.03	0.645	Typ.+0.03	-	
Chromaticity of red		y		Typ.-0.03	0.344	Typ.+0.03	-	
Chromaticity of green		x		Typ.-0.03	0.278	Typ.+0.03	-	
Chromaticity of green		y		Typ.-0.03	0.609	Typ.+0.03	-	
Chromaticity of blue		x		Typ.-0.03	0.142	Typ.+0.03	-	
Chromaticity of blue		y		Typ.-0.03	0.073	Typ.+0.03	-	
White variation		δW		-	-	1.3	-	[Note 6]
White luminance uniformity		T%	-	73	75	-	%	
Color temperature variation		δTc	-	-	-	1.1	-	[Note 4,8]

*The measurement shall be executed 60 minutes after lighting at rating.
*These values are measured with SHARP model's CCFL-back light unit.
*The optical characteristics are measured using the following equipment.

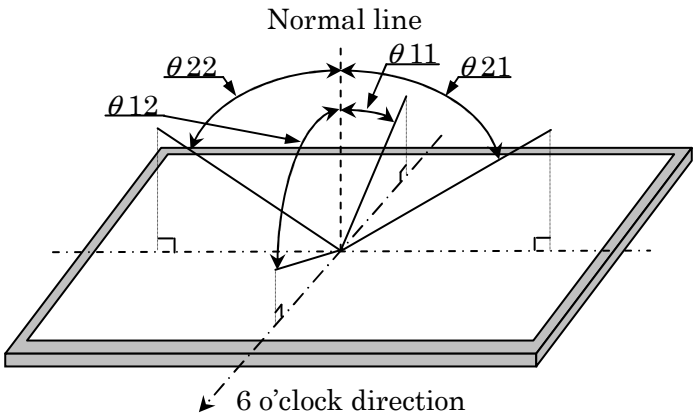


Measurement of viewing angle range and Response time.
(Viewing angle range: EZ-CONTRAST,
Response time: Photodiode)



Measurement of Contrast, Luminance, Chromaticity

[Note 1] Definitions of viewing angle range:



Viewing angle

[Note 2] Definition of contrast ratio:

The contrast ratio is defined as the following.

$$\text{Contrast Ratio} = \frac{\text{Luminance(Brightness) with all pixels white}}{\text{Luminance(Brightness) with all pixels Black}}$$

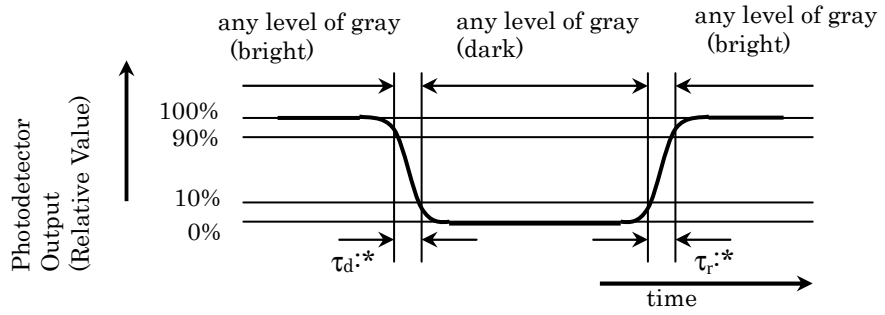
[Note 3] Definition of response time

The response time (τ_{DRV}) is defined as the following figure and shall be measured by switching the input signal for " any level of gray (0%, 25%, 50%, 75% and 100%)" and " any level of gray (0%, 25%, 50%, 75% and 100%)" .

	0%	25%	50%	75%	100%
0%		τ_r:0%– 25%	τ_r:0%– 50%	τ_r:0%– 75%	τ_r:0%– 100%
25%	τ_d:25%– 0%		τ_r:25%– 50%	τ_r:25%– 75%	τ_r:25%– 100%
50%	τ_d:50%– 0%	τ_d:50%– 25%		τ_r:50%– 75%	τ_r:50%– 100%
75%	τ_d:75%– 0%	τ_d:75%– 25%	τ_d:75%– 50%		τ_r:75%– 100%
100%	τ_d:100%– 0%	τ_d:100%– 25%	τ_d:100%– 50%	τ_d:100%– 75%	

τ*:x-y...response time from level of gray(x) to level of gray(y)

τ_{DRV} =Σ (τ*:x-y)/20



Response time

[Note 4] This shall be measured at center of the screen.

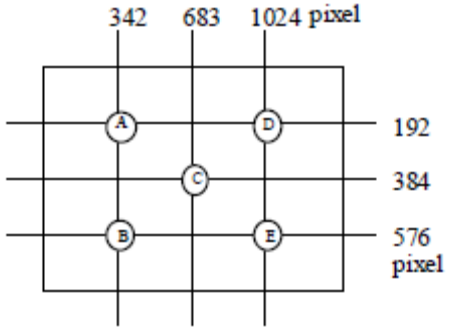
When black brightness is a max value, the specification of the contrast is satisfied.

[Note 5] This value is valid when O/S driving is used at typical input time value.

[Note 6] Definition of white uniformity;

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

$$\delta w = \frac{\text{Maximum luminance of five points (brightness)}}{\text{Minimum luminance of five points (brightness)}}$$



Measurement locations of white variation

[Note 7]

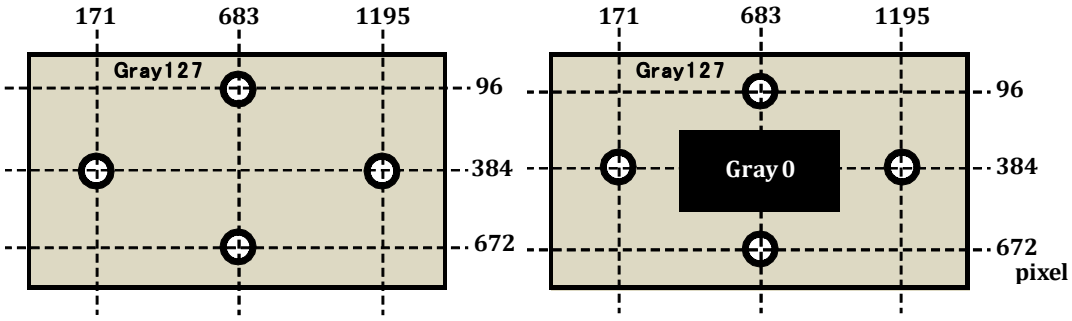
Definition of Crosstalk(CT);

$$CT=|Y_B-Y_A|\ /\ Y_A\times 100(\%)$$

Where;

YA=Luminance of measured location without gray level 0 pattern (cd/m2)

YB=Luminance of measured location with gray level 0 pattern (cd/m2)



Measurement locations of Y_A Measurement locations of Y_B

[Note 8]

Definition of color temperature variation (δTc);

$$\delta Tc=\frac{\text{Maximum color temperature of gray within the range of V63 to V255}}{\text{Minimum color temperature of gray within the range of V63 to V255}}$$

7.DEFINITION OF LABELS

MODULE LABEL

The barcode nameplate is pasted on each module as illustration,and its definitions are as following explanation.

TP315BT01-MB1 R213 F1006

TLME315908A19270001

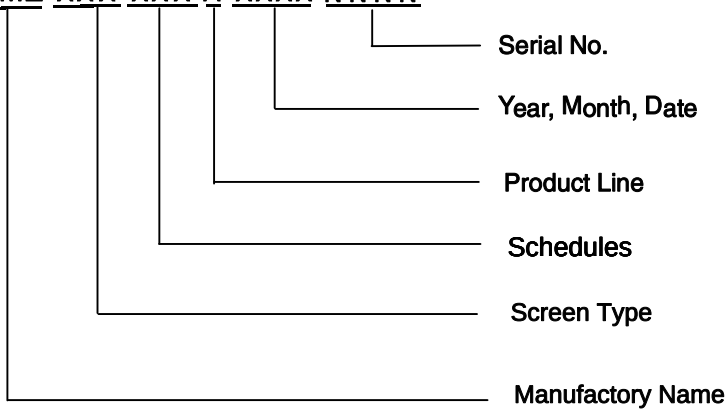
MADE IN CHINA

RoHS

Tianle Micro-electronics

(a) **Model Name:** TP315BT01-MB1 R213 F1006

(b) **Serial ID:** TLME XXX XXX A XXXX NNNN



8. PACKING

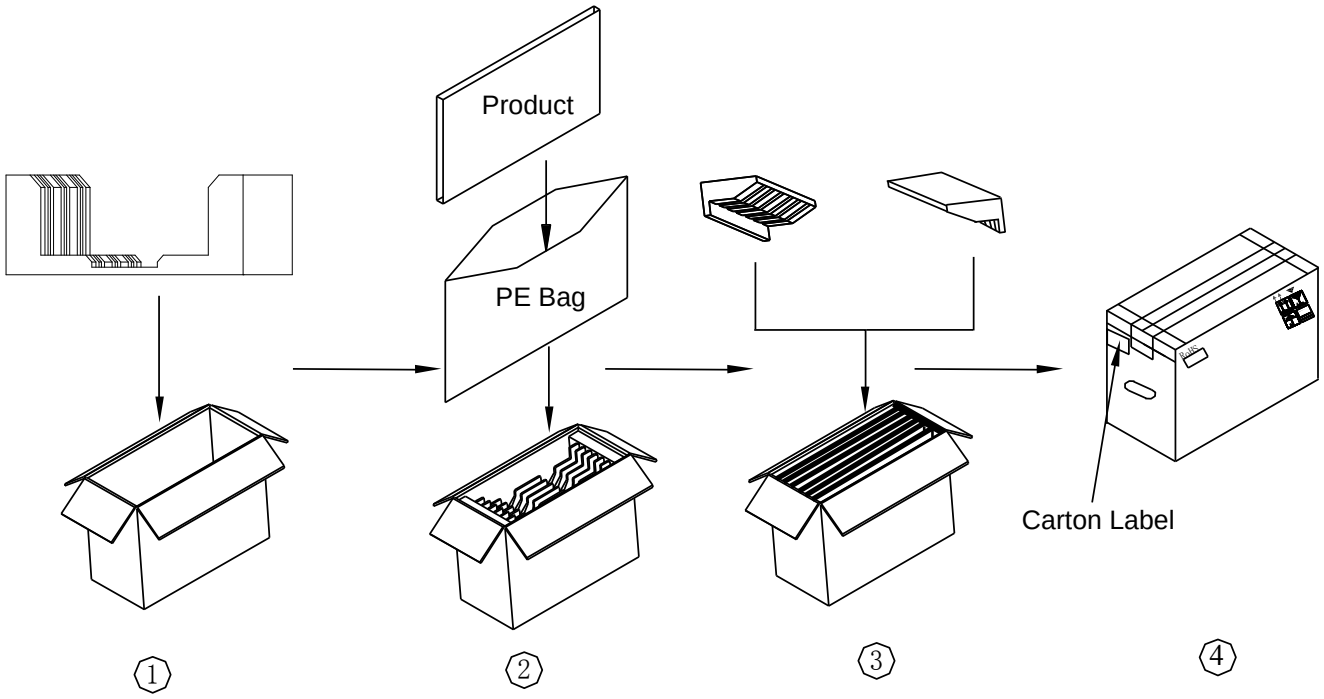
8.1 Packing Specifications

(1) 6 LCD TV modules / 1 Box

(2) Box dimensions : 810(L) X 290 (W) X 515 (H)

(3) Weight : approximately 29 Kg (6 modules per box)

8.2 Packing Method



① Put pads into the box

② Put modules bundled with PE Bag into the box

③ Put cover pad on top of the box

④ Seal the box and stick label to the assigned area

9. 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.

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 module, take care of static electricity and take the human earth into consideration when handling.

h) The module has some printed circuit boards (PCBs) on the back side, take care to keep them from any stress or pressure when handling or installing the module; otherwise some of electronic parts on the PCBs may be damaged.

i) Observe all other precautionary requirements in handling components.

j) 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.

k) When giving a touch to the panel at power on supply, it may cause some kinds of degradation. In that case, once turn off the power supply, and turn on after several seconds again, and that is disappear.

l) 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.

m) This LCD module is designed to prevent dust from entering into it. However, there would be a possibility to have a bad effect on display performance in case of having dust inside of LCD module. Therefore, please ensure to design your TV set to keep dust away around LCD module.

10. MECHANICAL CHARACTERISTIC

Figure 1. TFT-LCD Module Outline Dimensions (Front view)

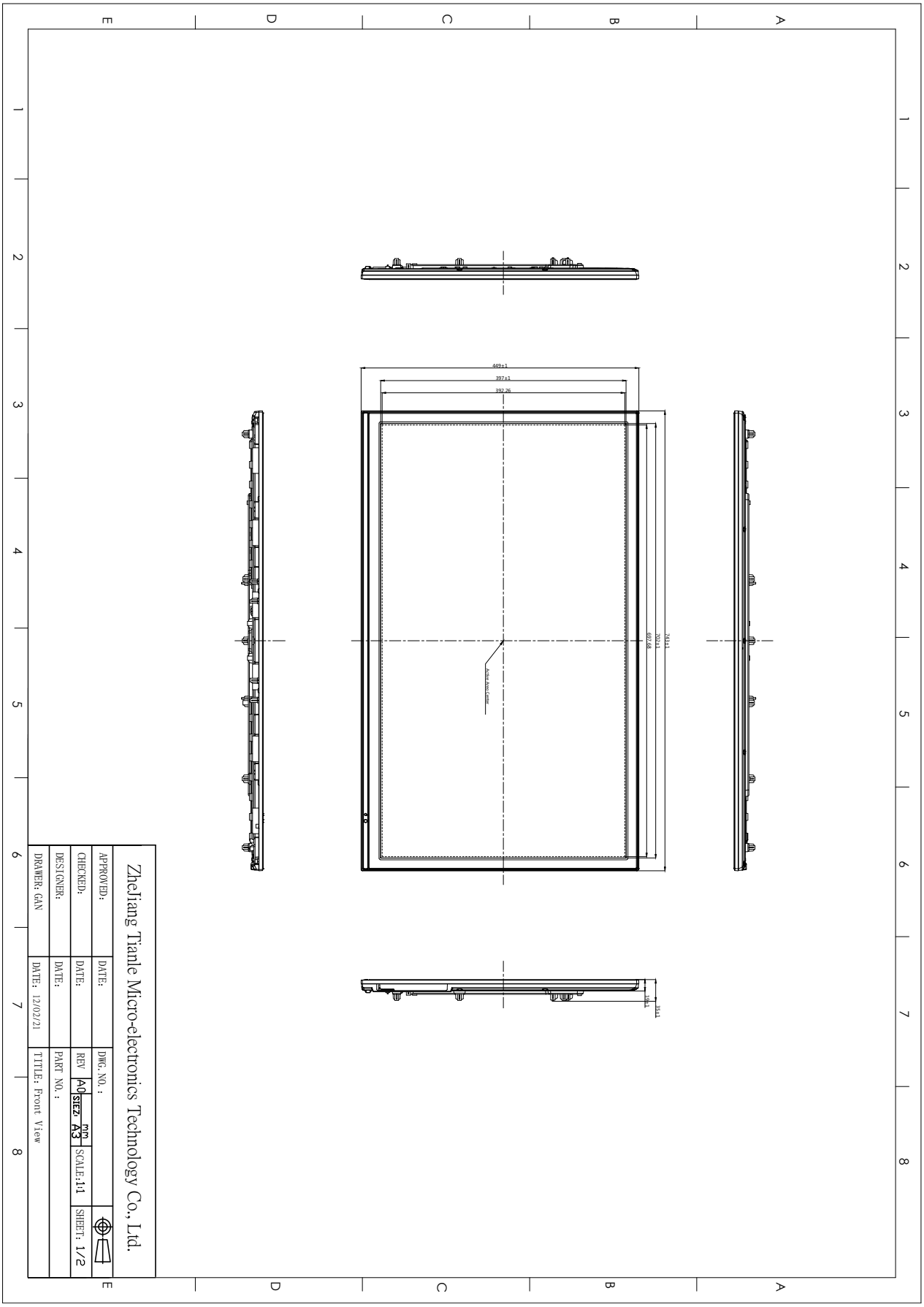


Figure 2. TFT-LCD Module Outline Dimensions (Rear view)