10.4 inch TFT LCD
without Touch Panel
SPECIFICATION

MODEL NAME: LMWG3104EX11

Date: 2016 / 01 / 30

Customer Signature		
Customer		
Approved Date	**Approved By**	**Reviewed By**

Contents

RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2015/12/28	All	First Edition for customer		
0.2 2016/01/30			Brightness: 1600nits	

0. HANDLING PRECAUTIONS

1) Since front polarizer is easily damaged, pay attention not to scratch it.
2) Be sure to turn off power supply when inserting or disconnecting from input connector.
3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
7) Do not open or modify the Module Assembly.
8) Do not press the reflector sheet at the back of the module to any directions.
9) In case if a Module has to be put back into the packing container slot after once it was taken out from the container, do not press the center of TFTLCD panel.
10) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
11) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

1.General Specifications

No.	Item	Specification	Remark
1	LCD size	10.4 inch	
2	Driver element	a-Si TFT active matrix	
3	Resolution	1024 × 3(RGB) × 768	
4	Display mode	Normally white, TN	
5	Pixel pitch	0.20625 × 0.20625(H) mm	
6	Active area	211.2(W) × 158.4(H) mm	
7	Module size	236.0(W) × 176.9(H) × 7.7(D) mm	Note 1
8	Surface treatment	Anti-Glare	
9	Color arrangement	RGB-vertical stripe	
10	Display colors	262K / 16.2 M (RGB 6-bit / 8-bit)	
11	Brightness	1600 nits	Note 2,3
12	Contrast Ratio	900:1	
12	Interface	LVDS	
13	Backlight power consumption	8.93 W	
14	Panel power consumption	0.84 W (max.)	
15	Weight	290 g (Typ.)	

Note 1: Refer to Mechanical Drawing.

Note 2: Refer to sec.4 Optical Specifications.

2. Absolute maximum ratings.

2.1. Absolute ratings of environment

Item	Symbol	Value		Unit	Note
		Max.	Min.		
Storage Temperature	TST	-30	80	^{0}C	(1)
Operating Ambient Temperature	TOP	-20	70	^{0}C	(1), (2)

Note (1) (a) 90 %RH Max. (Ta <= 40 ºC).

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

(c) No condensation.

2.2. Electrical absolute ratings

TFT LCD module

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Logic Supply Voltage	VDD	-0.3	3.96	V	(1)

Backlight Unit

Item	Symbol	Value			Unit	Note
		Min	Typ	Max.		
LED Forward Current	IF	0		480	mA	(1), (2) Duty=100%
LED Reverse Voltage	VR			70	V	(1), (2) Duty=100%

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) Specified values are for input pin of LED light bar at Ta=25±2 ℃ (Refer to 4.3.3 and 4.3.4 for further information).

3. Electrical Specification

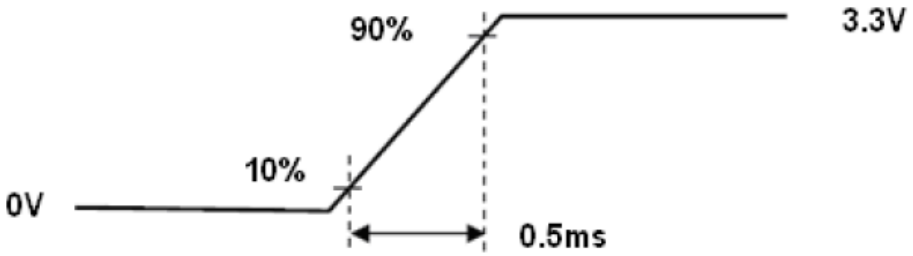
3.1 TFTLCD Module

Item		Symbol	Min.	Typ.	Max.	Units	Note
LCD Drive Voltage (Logic)		VDD	3.0	3.3	3.6	V	(2), (4)
VDD Current	Black Pattern	IDD	-	TBD	(0.25)	A	(3),(4)
VDD Power Consumption	Black Pattern	PDD	-	-	(0.84)	W	
Rush Current		Irush	-	-	1.5	A	(1),(4)
Allowable Logic/LCD Drive Ripple Voltage		VDDrp	-	-	(200)	mV	(4)

Note (1) The ambient temperature is Ta = 25 ± 2 ºC.

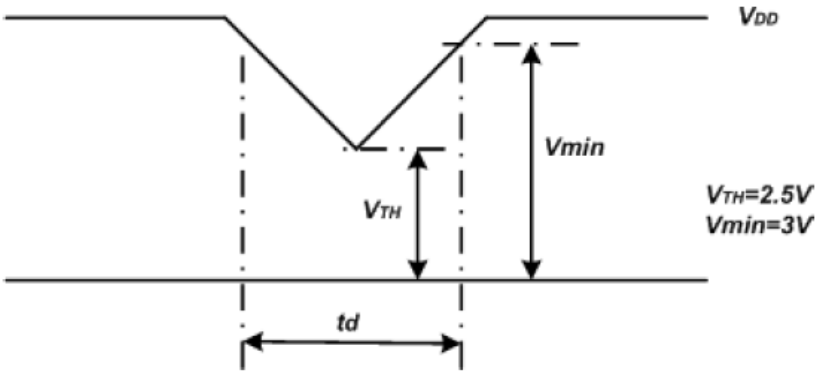
Note (2) Measurement Conditions:

VDD rising time is 470 μs



Note (3) VDD Power Dip Condition

If VTH＜VDD≤Vmin，then td≤10ms； when the voltage return to normal our panel must revive automatically.



Note (4) Frame Rate=60Hz, VDD=3.3V,DC Current.

3.2 BACKLIGHT UNIT

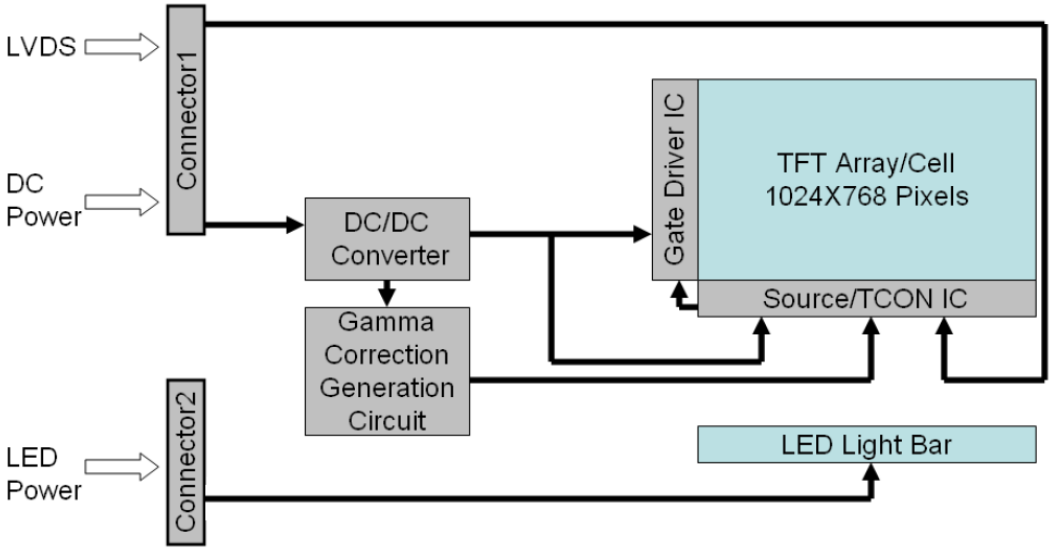
Item	Symbol	Value			Unit	Note
		Min	Typ	Max		
LED Light Bar Input	VPIN		37.2			(1), Duty=100%
LED Light Bar Current	IPIN		240		mA	(1), (2) Duty=100%
LED Life Time	LLED		50,000		Hrs	(3)
Power Consumption	PBL		8.93		W	(1), Duty=100%

Note (1) LED light bar input voltage and current are measured by utilizing a true RMS multi meter as shown below:

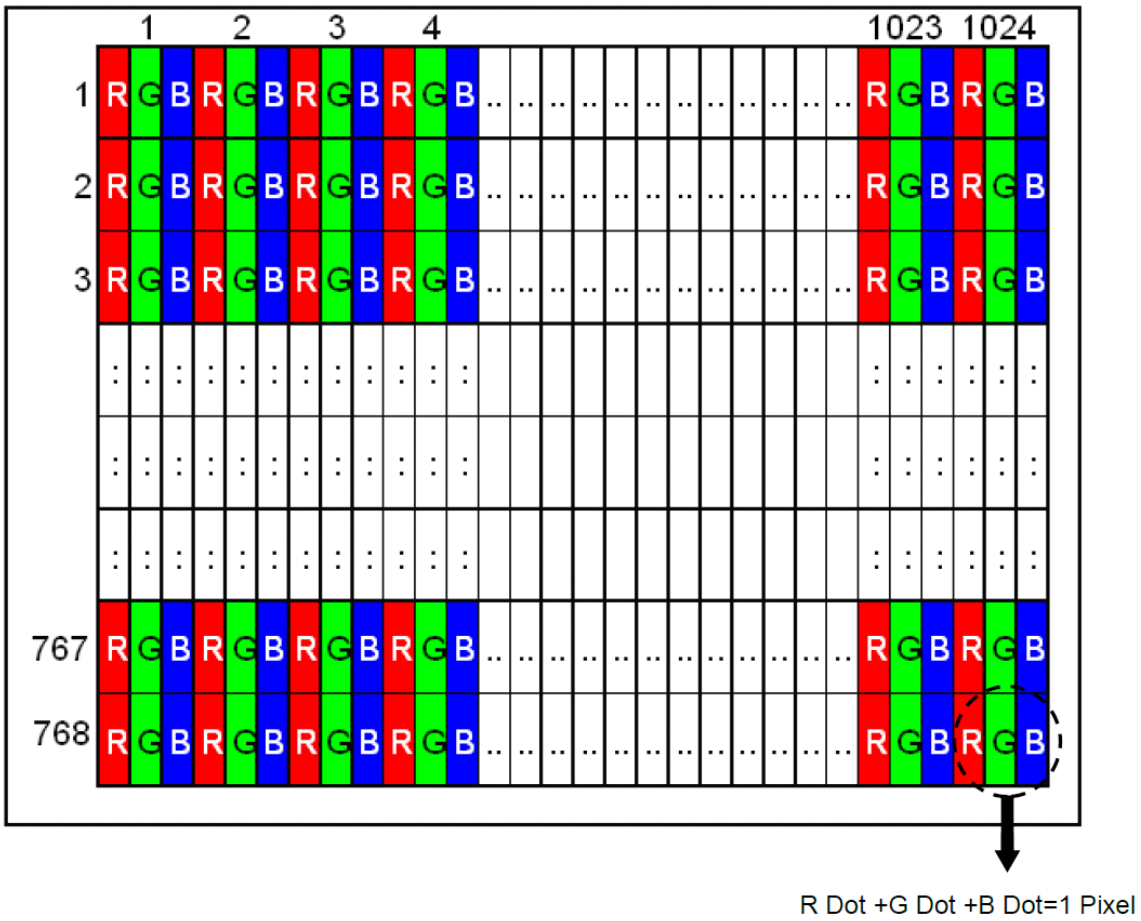
Note (2) PBL = IPIN × VPIN

Note (3) The lifetime of LED is defined as the time when LED packages continue to operate under the conditions at Ta = 25 ±2 ℃ and I= 240 mA until the brightness becomes ≦ 50% of its original value.

4. BLOCK DIAGRAM



Pixel Format


1
2
3
4
1023
1024
1
2
3
767
768
R Dot +G Dot +B Dot=1 Pixel

5. INTERFACE PIN ASIGNMENT

5.1 TFTLCD Module

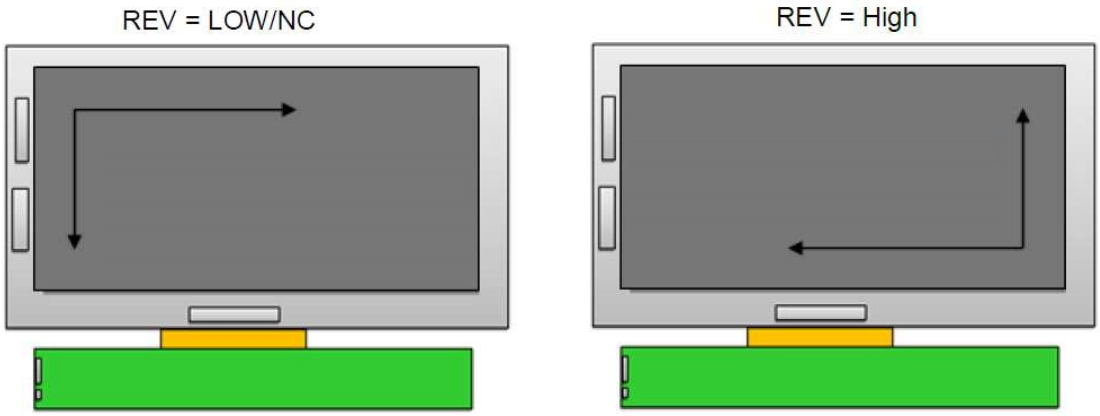
5.1.1 Interface Connector

Item	Description
Type/Part Number	MSB24013P20HA (Manufacture by STM)
Mating Receptacle / Type (Reference)	P24013P20 or compatible

5.1.2 Signal Connector Pin Assignment

Pin No.	Symbol	Description	Note
1	VDD	Power Supply, 3.3V (typical)	-
2	VDD	Power Supply, 3.3V (typical)	-
3	VSS	Ground	-
4	REV	Reverse Scan selection {High:2.5(min), 3.3(typ),3.6(max); Low: 0.5(max)}	(1)
5	Rin1-	-LVDS differential data input (R0-R5,G0)	-
6	Rin1+	+LVDS differential data input (R0-R5,G0)	-
7	VSS	Ground	-
8	Rin2-	-LVDS differential data input (G1-G5,B0-B1)	-
9	Rin2+	+LVDS differential data input (G1-G5,B0-B1)	-
10	VSS	Ground	-
11	Rin3-	-LVDS differential data input (B2-B5,HS,VS,DE)	-
12	Rin3+	+LVDS differential data input (B2-B5,HS,VS,DE)	-
13	VSS	Ground	-
14	ClkIN-	-LVDS differential clock input	-
15	ClkIN+	+LVDS differential clock input	-
16	GND	Ground	-
17	Rin4-	-LVDS differential data input (R6-R7,G6-G7,B6-B7)	-
18	Rin4+	+VDS differential data input (R6-R7,G6-G7,B6-B7)	-
19	SEL68	6/8 bits LVDS data input selection(H:8bits L/NC:6bits)	-
20	Bist	Internal use	-

Note:



5.2 BACKLIGHT UNIT

Recommended connector: JOIN TEK JT1025-1021

(BHSR-02VS-1 manufactured by JST.)

Pin no	Symbol	I/O	Description	Remark
1	VLED+	P	Backlight LED anode	
2	VLED-	P	Backlight LED cathode	

5.3 LVDS Receiver

5.3.1 Signal Electrical Characteristics For LVDS Receiver

The built-in LVDS receiver is compatible with (ANSI/TIA/TIA-644) standard.

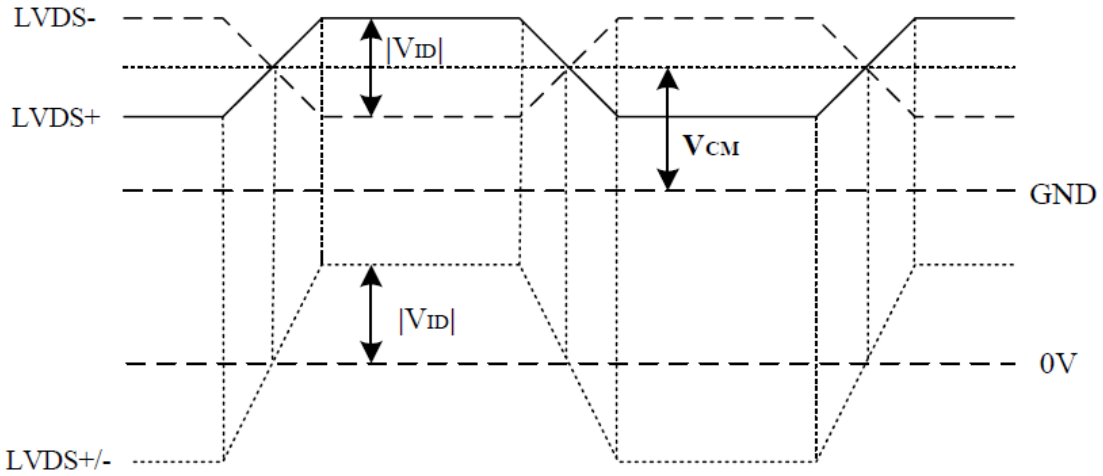
LVDS Receiver Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions
Differential Input High Threshold	Vth	-	-	+100	mV	V_{CM} =+1.2V
Differential Input Low Threshold	Vtl	-100	-	-	mV	V_{CM} =+1.2V
Magnitude Differential Input	$\|V_{ID}\|$	200	-	600	mV	-
Common Mode Voltage	V_{CM}	1.0	1.2	1.4	V	Vth – Vtl=200 mV
Common Mode Voltage Offset	ΔV_{CM}	-50	-	+50	mV	Vth – Vtl=200 mV

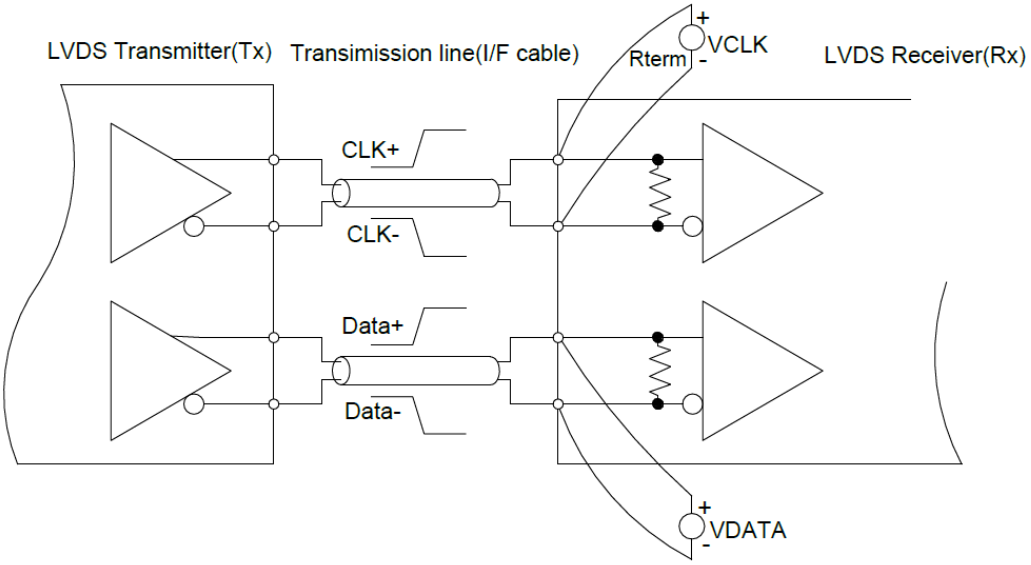
Note: (1) Input signals shall be low or Hi- resistance state when VDD is off.

(2) All electrical characteristics for LVDS signal are defined and shall be measured at the interface connector of LCD.

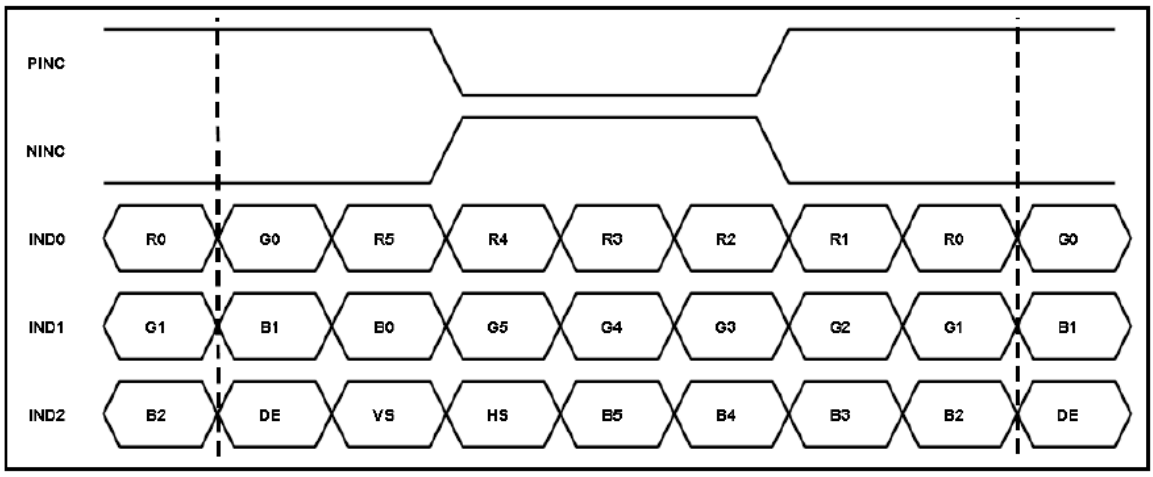
Voltage Definitions



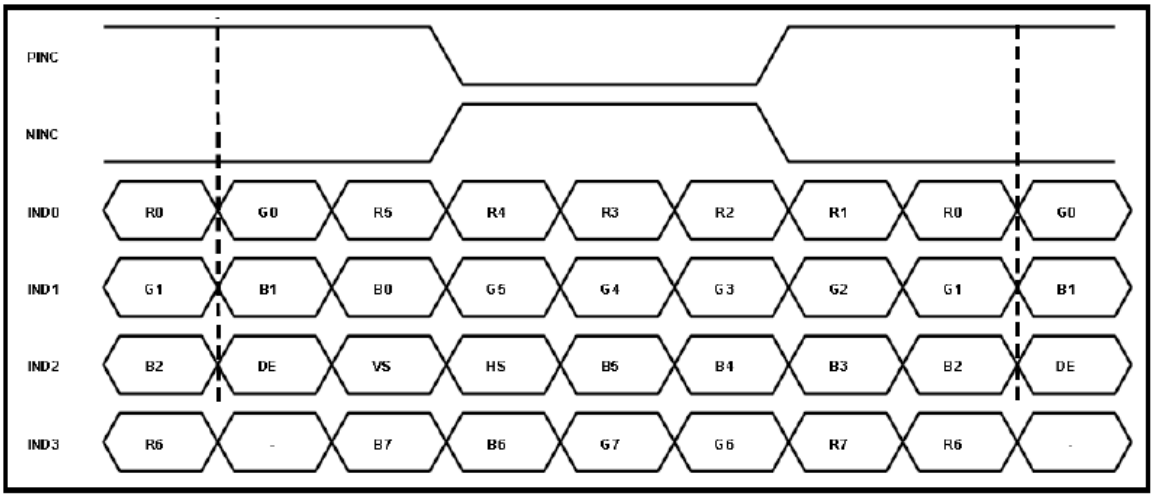
Measurement System



Data Mapping (6 Bit)



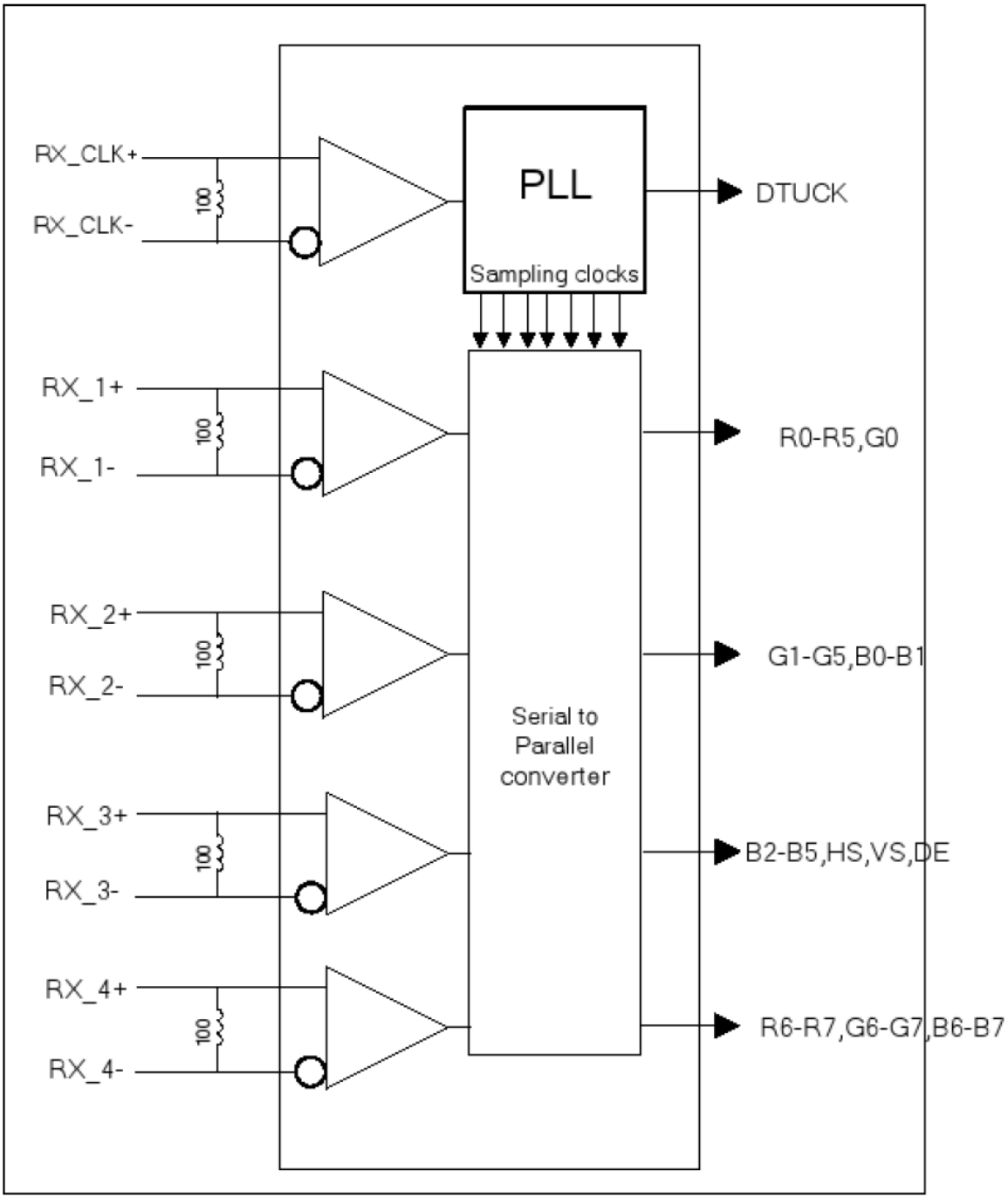
Data Mapping (8 Bit)


PINC
NINC
IND0
R0
G0
R5
R4
R3
R2
R1
R0
G0
IND1
G1
B1
B0
G5
G4
G3
G2
G1
B1
IND2
B2
DE
VS
HS
B5
B4
B3
B2
DE
IND3
R6
-
B7
B6
G7
G6
R7
R6
-

5.3.2 LVDS Receiver Internal Circuit

LVDS Receiver Internal Circuit shows the internal block diagram of the LVDS receiver. This LCD module equips termination resistors for LVDS link.

LVDS Receiver Internal Circuit



6. Interface Timings

6.1 Timing Characteristics

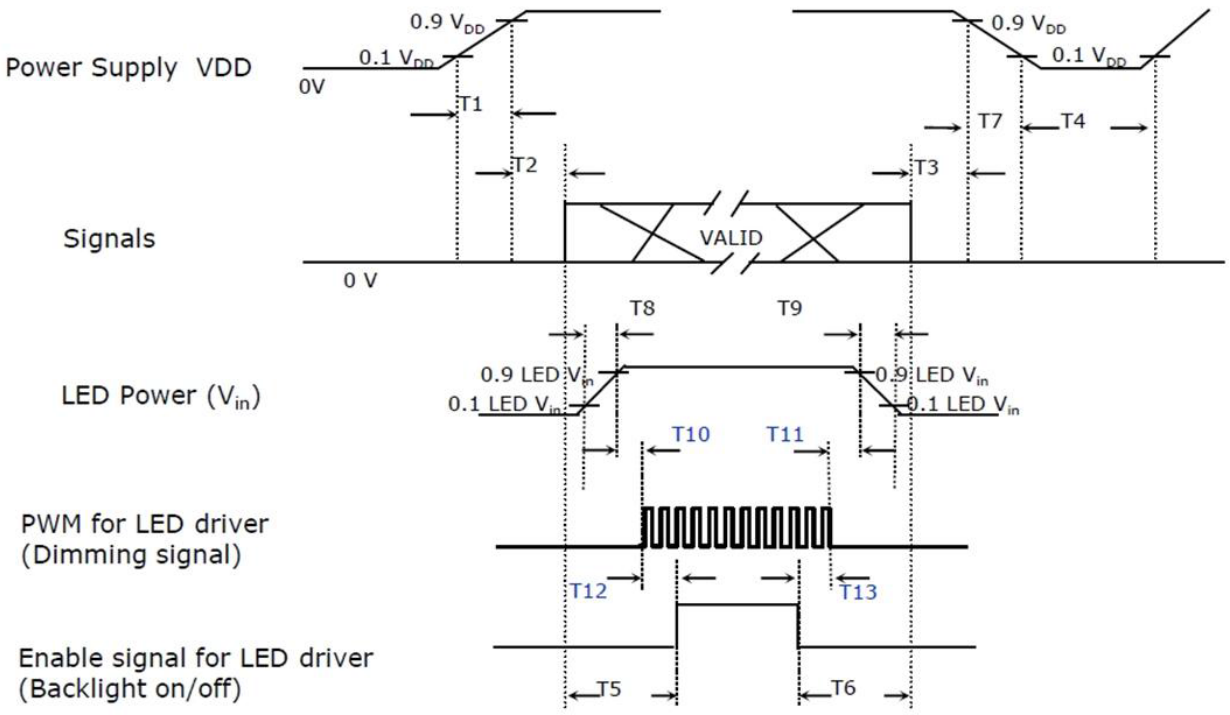
Synchronization method should be DE mode.

Parameter	Symbol	Unit	Min.	Typ.	Max.
LVDS Clock Frequency	Fclk	MHz	(52)	(65)	(71)
H Total Time	HT	Clocks	(1,114)	(1,344)	(1,400)
H Active Time	HA	Clocks	1,024	1,024	1,024
H Blanking Time	HBL	Clocks	(90)	(320)	(376)
V Total Time	VT	Lines	(778)	(806)	(845)
V Active Time	VA	Lines	768	768	768
V Blanking Time	VBL	Lines	(10)	(38)	(77)
Frame Rate	Vsync	Hz	55	60	65

Note: H Blanking Time and V Blanking Time can not be changed at every frame.

6.2 POWER ON/OFF SEQUENCE

VDD power on/off sequence is as follows. Interface signals are also shown in the chart.
Signals from any system shall be Hi- resistance state or low level when VDD is off.



Power ON/OFF sequence

Power Sequencing Requirements

Power ON/OFF Sequence					
Items	Symbol	MIN	TYP	MAX	Unit
VDD rising time from 10% to 90%	T1	0.5	-	10	ms
Delay from VDD to valid data at power ON	T2	30	-	50	ms
Delay from valid data OFF to VDD OFF at power OFF	T3	0	-	50	ms
VDD OFF time for windows restart	T4	500	-	-	ms
Delay from valid data to B/L enable at power ON	T5	200	-	-	ms
Delay from valid data off to B/L disable at power Off	T6	200	-	-	ms
VDD falling time from 90% to 10%	T7	0.5	-	10	ms
LED Vin rising time from 10% to 90%	T8	0.5	-	10	ms
LED Vin falling time from 90% to 10%	T9	0.5	-	10	ms
Delay from LED driver Vin rising time 90% to PWM ON	T10	0	-	-	ms
Delay from PWM Off to LED driver Vin falling time 10%,Must keep rule	T11	0	-	-	ms
Delay from PWM ON to B/L Enable ON,Must keep rule	T12	0	-	-	ms
Delay from B/LEnable Off to PWM Off	T13	0	-	-	ms

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

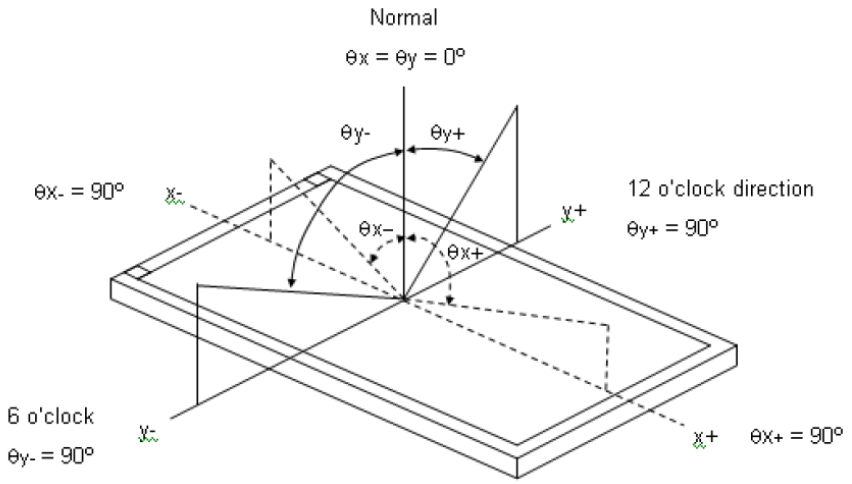
Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{0}C
Ambient Humidity	Ha	50±10	% RH
Supply Voltage	Vcc	5	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Converter Current	I_L	TBD	mA

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Values			Unit	Note
				Min.	Typ.	Max.		
Color Chromaticity (CIE 1931)	Red	Rx	$\theta_X=0^0$, $\theta_Y=0^0$	Typ-0.04	TBD	Ty+0.04		(5)
		Ry			TBD			
	Green	Gx			TBD			
		Gy			TBD			
	Blue	Bx			TBD			
		By			TBD			
	White	Wx			0.31			
		Wy			0.33			
Center Luminance of White (Center of Screen)		L_C		1300	1600		Cd/m^2	(4)
Contrast Ratio		CR		700	900			(2)
Response Time		TR	$\theta_X=0^0$, $\theta_Y=0^0$		11		ms	(3)
		TF			5			
View angle	Horizontal	θ_{X-} -θ_{X+}	CR ≧10	140	150		Deg.	(1)
	Vertical	θ_{Y-} - θ_{Y+}		130	150			

Note (1) Definition of Viewing Angle (θ_X , θ_Y)



Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

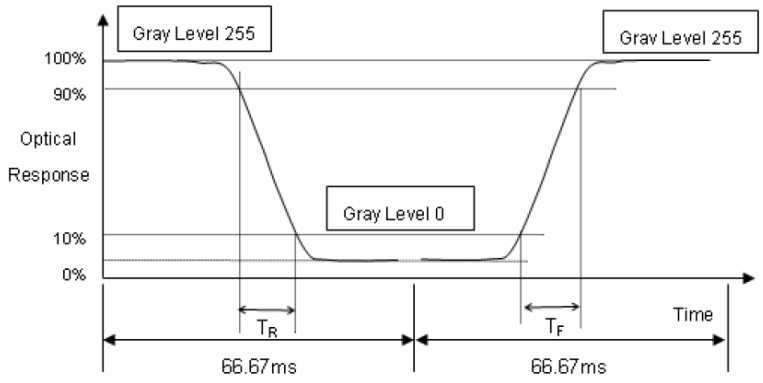
L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (LC):

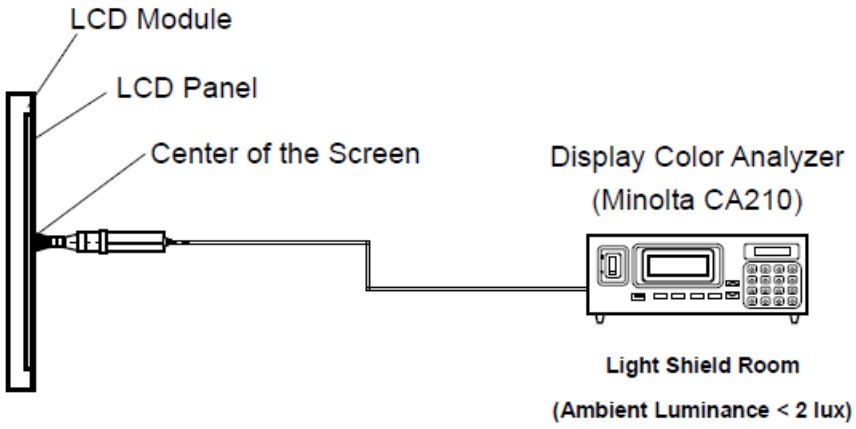
Measure the luminance of gray level 255 at center point

LC = L (5)

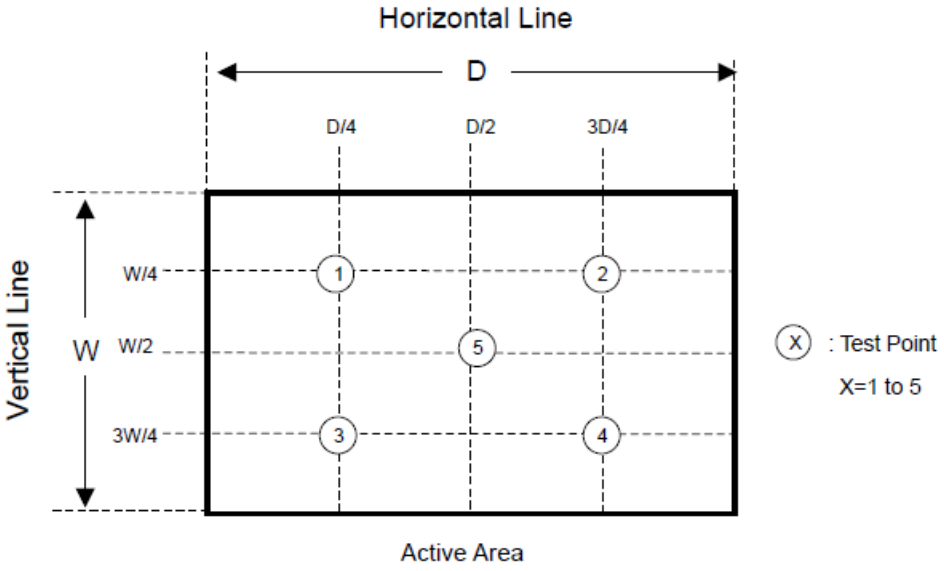
L (x) is corresponding to the luminance of the point X at Figure in Note (6).

Note (5): Measurement method

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



Note (6): Luminance uniformity of these 5 points is defined as below and measured by Topcon BM-7



Uniformity = (Min. Luminance of 5 points) / (Max. Luminance of 5 points)

8. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 50℃, 80%RH, 240hours	
High Temperature Operation (HTO)	Ta= 70℃, 50%RH, 240hours	
Low Temperature Operation (LTO)	Ta= -20℃, 240hours	
High Temperature Storage (HTS)	Ta= 75℃, 240hours	
Low Temperature Storage (LTS)	Ta= -20℃, 240hours	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20℃/30min, 70℃/30min, 100 cycles	1
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	2
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	2

Note 1: The TFT-LCD module will not sustain damage after being subjected to 100 cycles of rapid temperature change. A cycle of rapid temperature change consists of varying the temperature from -20 ℃ to 60℃, and back applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.

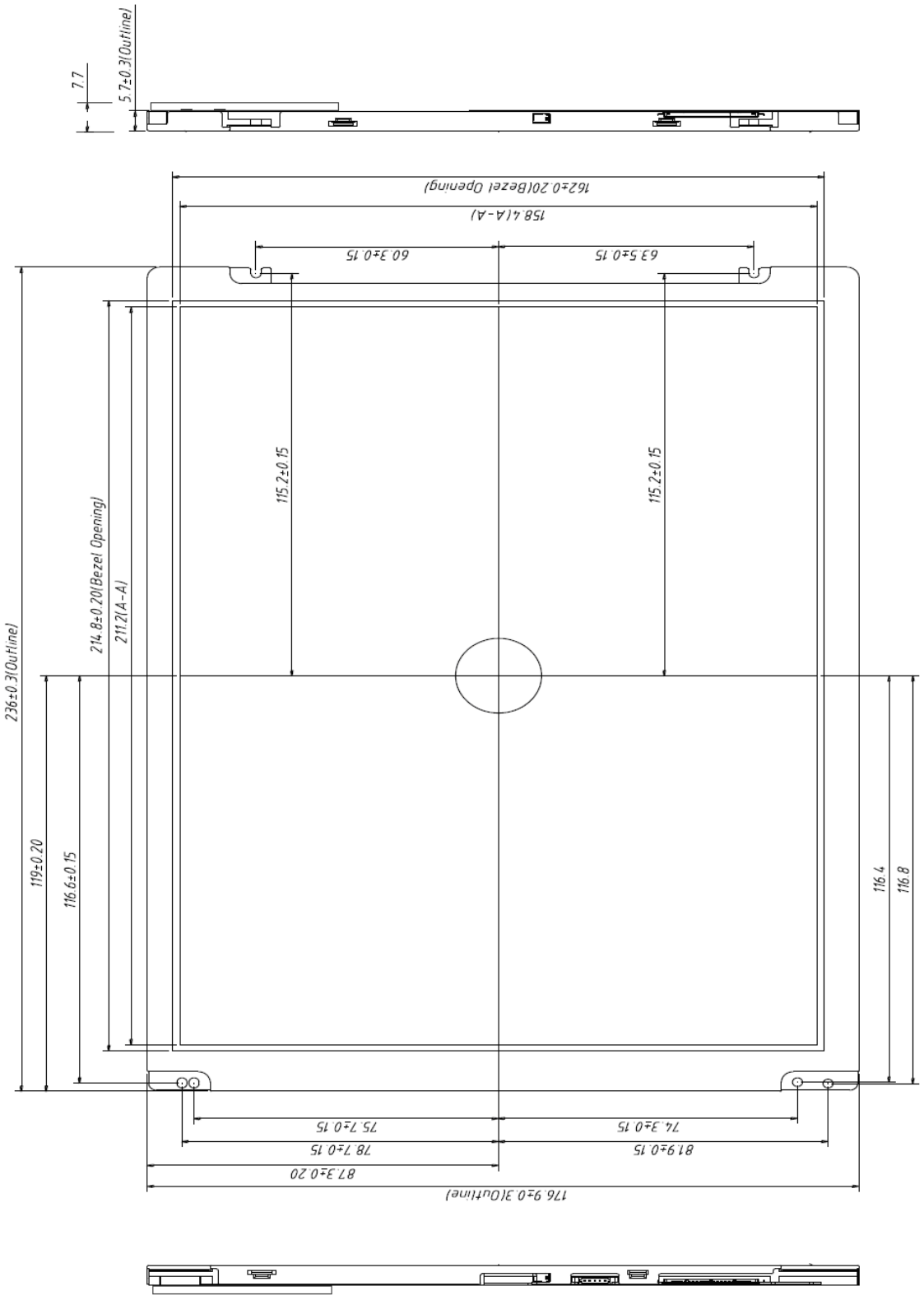
Note 2: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

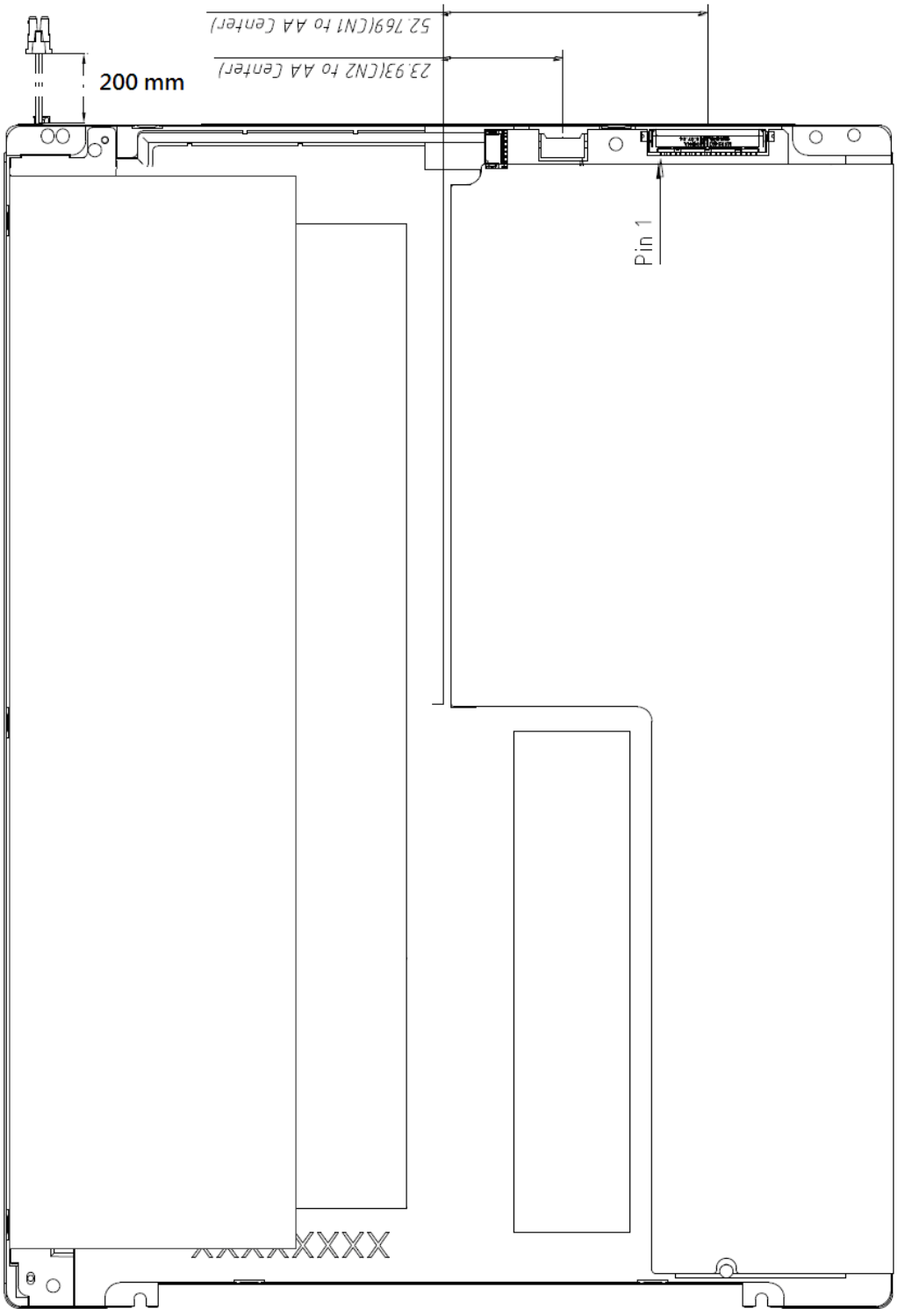
Note 3: The test items are tested by open frame type chassis.

9. Shipping Label & Package

TBD

10. Mechanical Characteristic




200 mm
52.769(CN1 to AA Center)
23.93(CN2 to AA Center)
Pin 1
XXXXXXXX

11 .Inspection Specifications

The buyer (customer) shall inspect the modules within twenty calendar days since the delivery date (the "inspection period") at its own cost. The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to the seller.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved if, within the inspection period, such samples of modules within such lot show an unacceptable number of defects in accordance with this incoming inspection standards, provided however that the buyer must notify the seller in writing of any such rejection promptly, and not later than within three business days of the end of the inspection period.

Should the buyer fail to notify the seller within the inspection period, the buyer's right to reject the modules shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

12. Warranty

Inteltronic Inc. warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase.

Inteltronic Inc. will be limited to replace or repair any of its module which is found and confirmed defective electrically or visually when inspected in accordance with Inteltronic Inc. general module inspection standard.

This warranty does not apply to any products which have been on customer’s production line, repaired or altered by persons other than repair personnel authorized by Inteltronic Inc., or which have been subject to misuse, abuse, accident or improper installation. Inteltronic Inc. assumes no liability under the terms of this warranty as a consequence of such events.

If an Inteltronic Inc. product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. In returning the modules, they must be properly packaged with original package; there should be detailed description of the failures or defect.

13. RMA

Products purchased through Inteltronic Inc. and under warranty may be returned for replacement. Contact support@inteltronicinc.com for RMA number and procedures

Office Locations

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