10.4 inch TFT LCD
without Touch Panel
SPECIFICATION

MODEL NAME: LMTAA104BS12

Date: 2013 / 05 / 30

Customer Signature		
Customer		
Approved Date	Approved By	Reviewed By

1. 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) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.

10) 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.

2. General Description

2.1, Overview

This LMTAA104BS12 specification applies to the Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display a LED backlight system. The screen format is intended to support SVGA (800(H) x 600(V)) screen and 16.2M (RGB 8-bits) or 262k colors (RGB 6-bits).

LED driving board for backlight unit is not included. All input signals are 1 channel LVDS interface.

2.2 Features

- Sunlight readable display, 1100nits by LED backlight.
- Wide viewing angle
- Wide operation temperature
- RoHS Compliance

2.3 Application

Industrial Application; especial kiosk and digital signage display.

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2.4 Display Specifications

Items	Unit	Specification
Screen Diagonal	inch	10.4
Active Area	mm	211.2 (H) x 158.4 (V)
Pixels H x V	pixels	800 x3(RGB) x 600
Pixels Pitch	um	264 (per one triad) x 264
Pixel Arrangement		RGB Vertical stripe
Display mode		TN mode, normally white
White luminance (center)	Cd/m^2	1100 (Typ.)
Contrast ratio		700 (Typ.)
Optical Response Time	msec	30 ms (Typ. on/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (VDD Line + LED backlight)	Watt	7.3 (TBD)
Weight	Grams	360 max.
Physical size	mm	243.0(H) x 184.0(V) x 8.0(D) (Max.)
Electrical Interface		One Chanel LVDS
Support Colors		16.2M / 262K colors
Surface Treatment		Anti-Glare, 3H
Temperature range		
Operating	^0C	-30 ~ 85(LCD surface temperature
Storage (Shipping)	^0C	-30 ~ 85
RoHS Compliance		RoHS Compliance

2.5 Optical Characteristics

The following optical characteristics are measured under stable condition at 25 ^{0}C

| Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)	70	80		2
		CR=10 (Left)	70	80		
		Vertical (Up)	50	60		
		CR=10 (Down)	70	80		
Contrast Ratio		Normal Direction	500	700		3
Response Time	msec	Raising time (T_{rR})		20		4
		Falling time (T_{rF})		10		
		Raising + Falling		30		
Color / Chromaticity Coordinates (CIE)		Red x	-0.03	0.540	+0.03	5
		Red y		0.313		
		Green x		0.351		
		Green y		0.580		
		Blue x		0.165		
		Blue y		0.135		
Color coordinates (CIE) White		White x		0.31		
		White y		0.33		
Center Luminance	Cd/m^2		900	1100		6
Luminance Uniformity	%		70	75		7
Crosstalk (in 60 Hz)	%				1.5	
Flicker	dB				-20	

Note 1: 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.
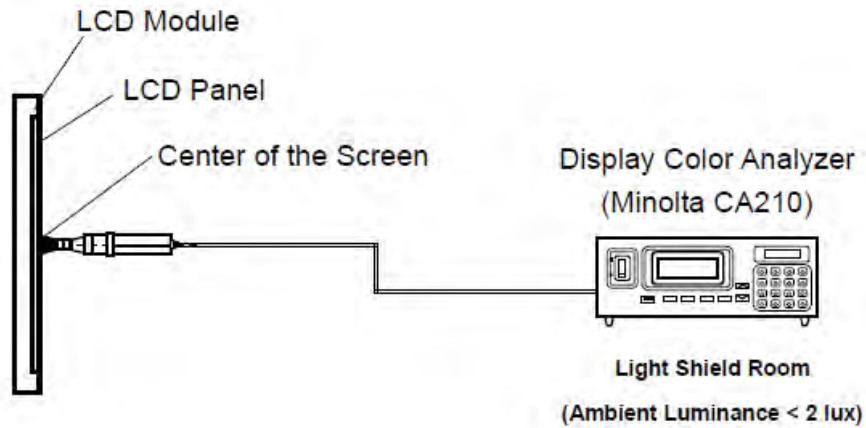
Note 2: Definition of viewing angle
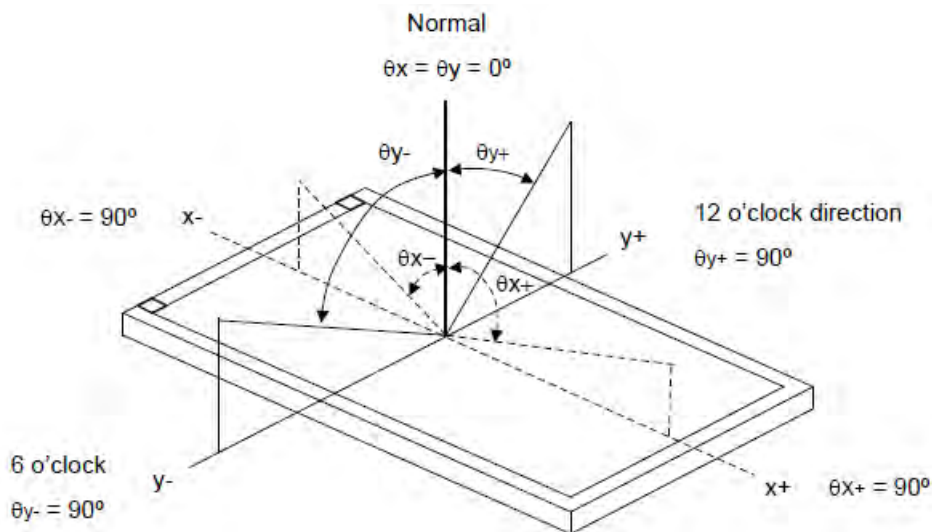
Note 3: Contrast ratio is measured by Minta BM-7

Note 4: Definition of Response time

The output signals of photo detector are measured when the input signals are changed from "Full Black" to "Full White" (rising time), and from "Full White" to "Full Black" (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.
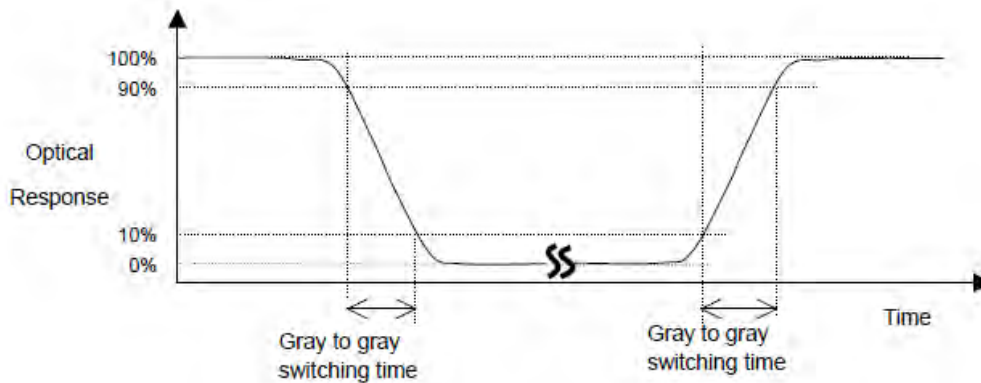
Note 5: Color chromaticity and coordinates (CIE) is measured by Minta BM-7

Note 6: Center luminance is measured by Minta BM-7

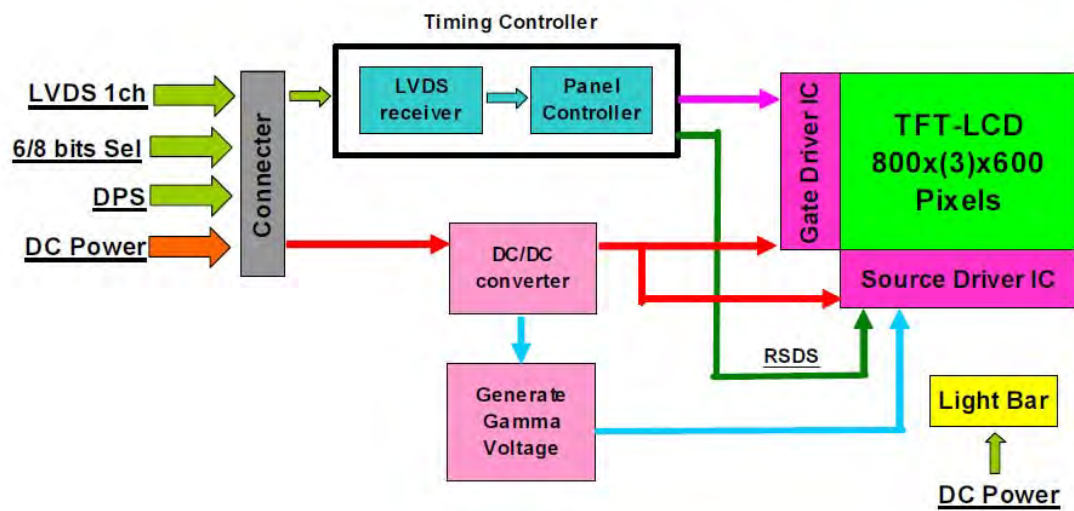Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minta BM-7
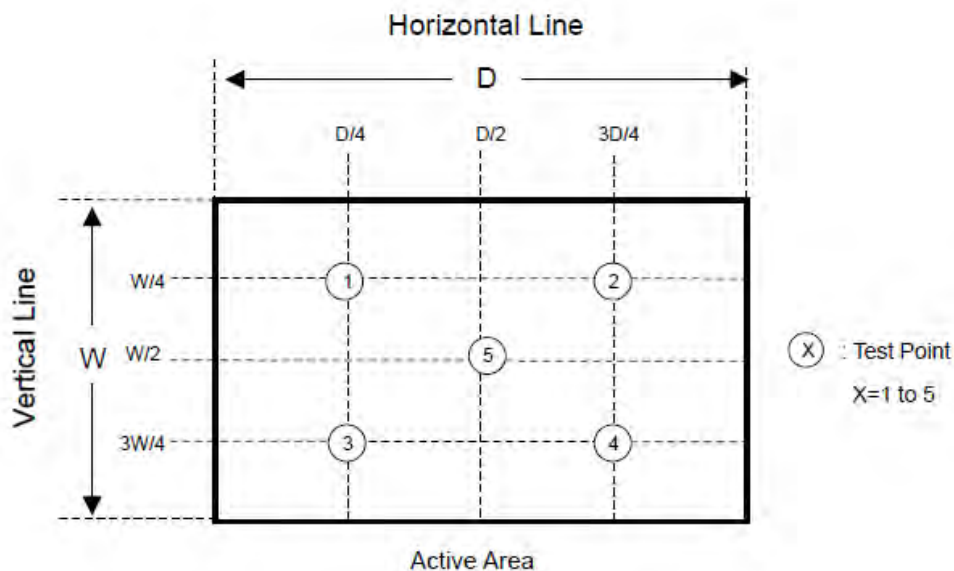
Uniformity = (Min. Luminance of 5 points) / (Max. Luminance of 5 points)

3. **Functional Block Diagram**

The following diagram shows the functional block of the 10.4 inches Color TFT-LCD Module:

4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Items	Symbol	Min	Max	Unit	Conditions
Logic/ LCD drive voltage	Vin	-0.3	4.0	Volt	Note 1, 2

4.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED Current	I LED	--	640	mA	Note 1, 2

4.3 Absolute Ratings of Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T_{OP}	-30	-	85	^{0}C	
Operation Humidity	H_{OP}	5		90	%	Note 3
Storage temperature	T_{ST}	-30		85	^{0}C	
Storage Humidity	H_{ST}	5		90	%	

Note 1: With in Ta= 25℃

Note 2: Permanent damage to the device may occur if exceed maximum values

Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).
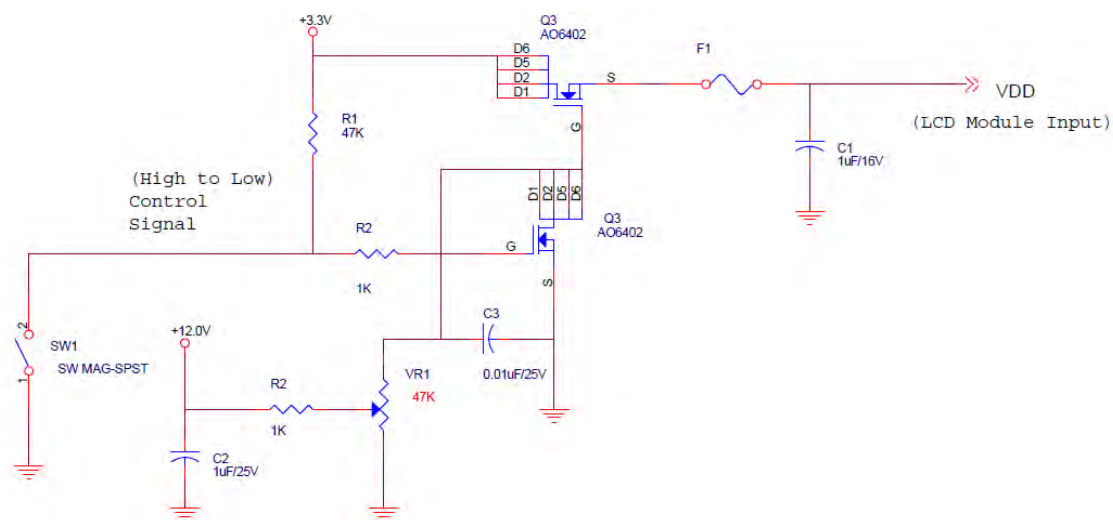
5. Electrical characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Input power specifications are as follows

Symbol	Parameter	Min	Typ.	Max	Unit	Conditions
VDD	Logic/ LCD Drive Voltage	3	3.3	3.6	Volt	+/- 10%
IDD	Input current		280		mA	VDD=3.3V, All black pattern.
PDD	VDD power		0.924		W	VDD=3.3V, All black pattern.
IRush	Inrush current			1.5	A	
VDDrp	Allowable Logic/LCD Drive Ripple Voltage			100	mV p-p	VDD=3.3V, All black pattern.

Note 1: Measurement condition:

VDD rising time

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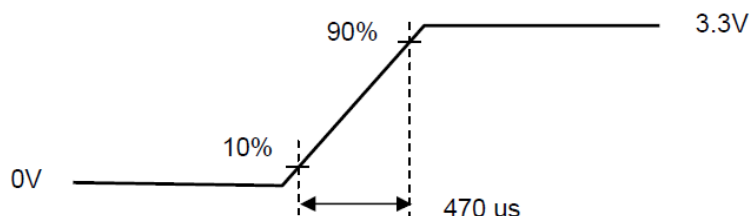
5.1.2 Signal Electrical Characteristics

Input signal shall be low or Hi-Z state when VDD is off. Please refer to specification of SN75LVDS82DGG (Texas Instruments) in detail.

Characteristics of each signal are as following:

Symbol	Parameter	Min	Typ	Max	Unit	Condition
VTH	Differential Input High Threshold			+100	mV	VICM = 1.25V
VTL	Differential Input Low Threshold	-100			mV	VICM = 1.25V
│VID│	Input Differential Voltage	100	400	600	mV	
VICM	Differential Input Common Mode Voltage	+1.1		+1.45	V	VTH/VTL = 100mV

Note: LVDS Signal Waveform.
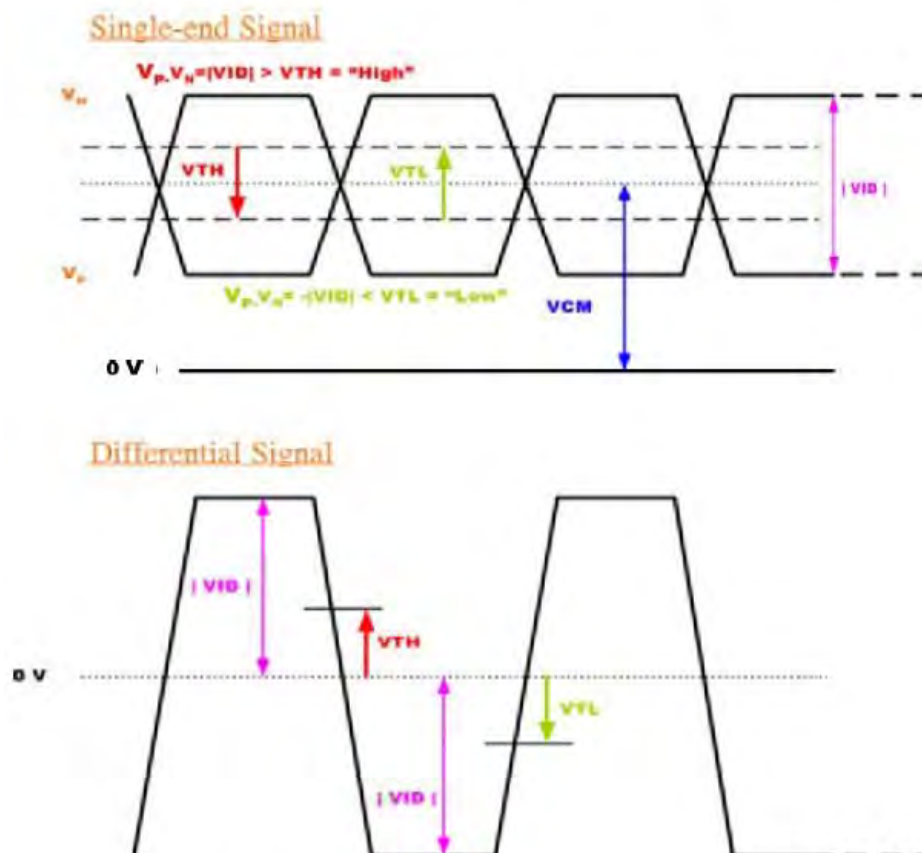
5.2 Backlight Unit

Parameter guideline is under stable conditions at 25℃ (Room Temperature):

| Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		19.8	21	[V]	2
LED current (IL)		330		[mA]	2,
LED Life Time(LTLED)		50,000		[Hour]	1

Note 1: The "LED lift time" is defined as the module brightness decrease to 50% original
brightness that the ambient temperature is 25℃.

6. Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.
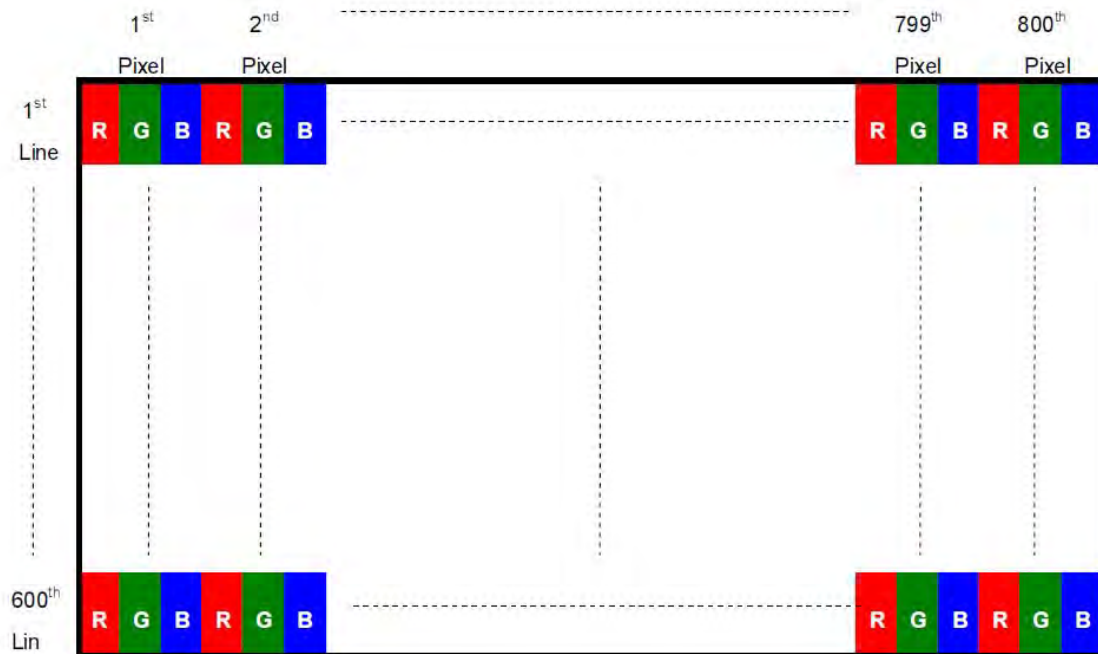
6.2 TFT-LCD Interface Signal Description

The module using a LVDS receiver embedded in ASIC. LVDS is a differential signal technology for LCD interface and a high-speed data transfer device.

Input Signal Interface		
Pin No.	**Symbol**	**Description**
1	VDD	Power Supply, 3.3V (typical)
2	VDD	Power Supply, 3.3V (typical)
3	GND	Ground
4	DPS	Reverse Scan Function [H: Enable; L/NC: Disable]
5	RxIN0-	LVDS receiver signal channel 0
6	RxIN0+	LVDS Differential Data Input (R0, R1, R2, R3, R4, R5, G0)
7	GND	Ground
8	RxIN1-	LVDS receiver signal channel 1
9	RxIN1+	LVDS Differential Data Input (G1, G2, G3, G4, G5, B0, B1)
10	GND	Ground
11	RxIN2-	LVDS receiver signal channel 2
12	RxIN2+	LVDS Differential Data Input (B2, B3, B4, B5, DE)
13	GND	Ground
14	RxCLKIN-	LVDS receiver signal clock
15	RxCLKIN+	
16	GND	Ground
17	RxIN3-	LVDS receiver signal channel 3, NC for 6 bit LVDS Input
18	RxIN3+	LVDS Differential Data Input (R6, R7, G6, G7, B6, B7, RSV)
19	RSV	Reserved for internal test. Please treat it as NC.
20	SEL68	6/8bits LVDS data input selection [H: 8bits L/NC: 6bit]

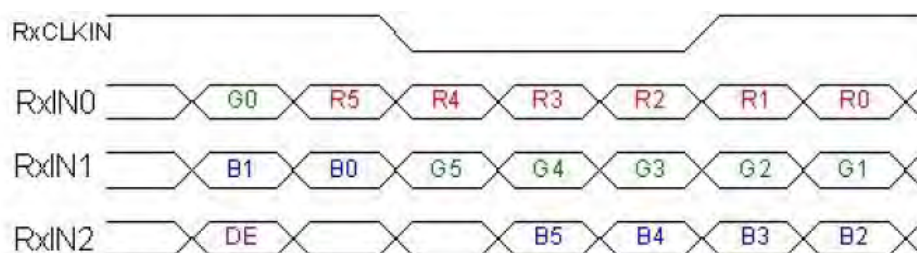Note 1: Input Signals shall be in low status when VDD is off.

Note 2: High stands for "3.3V", Low stands for "0V", NC stands for "No Connection".
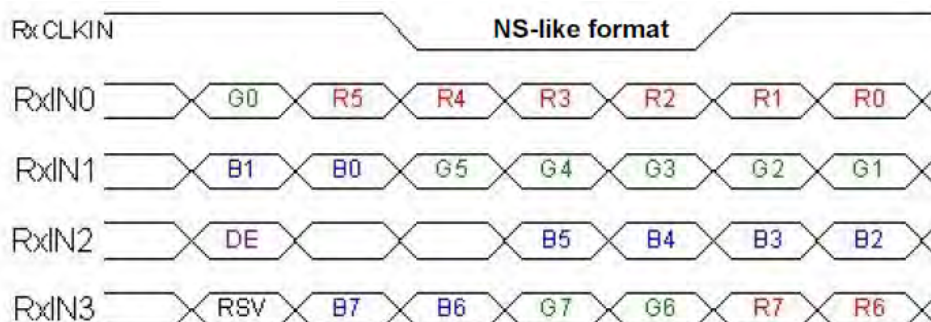
Note 3: RSV stands for "Reserved".

6.3 LVDS Signal Format:

SEL68 ="Low" or "NC" for 6 bits LVDS Input

SEL68 = "High" for 8 bits LVDS Input

Note1: Please follow PSWG.

Note2: R/G/B data 7:MSB, R/G/B data 0:LSB

Signal Name	Description	Remark
R7	Red Data 7	Red-pixel Data
R6	Red Data 6	
R5	Red Data 5	For 8Bits LVDS input
R4	Red Data 4	MSB: R7 ; LSB: R0
R3	Red Data 3	
R2	Red Data 2	For 6Bits LVDS input
R1	Red Data 1	MSB: R5 ; LSB: R0
R0	Red Data 0	
G7	Green Data 7	Green-pixel Data
G6	Green Data 6	
G5	Green Data 5	For 8Bits LVDS input
G4	Green Data 4	MSB: G7 ; LSB: G0
G3	Green Data 3	
G2	Green Data 2	For 6Bits LVDS input
G1	Green Data 1	MSB: G5 ; LSB: G0
G0	Green Data 0	
B7	Blue Data 7	Blue-pixel Data
B6	Blue Data 6	
B5	Blue Data 5	For 8Bits LVDS input
B4	Blue Data 4	MSB: B7 ; LSB: B0
B3	Blue Data 3	
B2	Blue Data 2	For 6Bits LVDS input
B1	Blue Data 1	MSB: B5 ; LSB: B0
B0	Blue Data 0	
RxCLKIN	LVDS Data Clock	
DE	Data Enable Signal	When the signal is high, the pixel data shall be valid to be displayed.

Note: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.4 TFT-LCD Interface Timing
6.4.1 Timing Characteristics

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		$1/T_{Clock}$	30	40	50	MHz
Vertical Section	Period	T_V	608	628	1024	T_{Line}
	Active	T_{VD}	—	600	--	
	Blanking	T_{VB}	8	28	424	
Horizontal Section	Period	T_H	960	1056	1060	T_{Clock}
	Active	T_{HD}	—	800	--	
	Blanking	T_{HB}	160	256	260	
Frame Rate		F	50	60	75	Hz

Note 2: DE mode.

6.4.2 Input Timing Diagram

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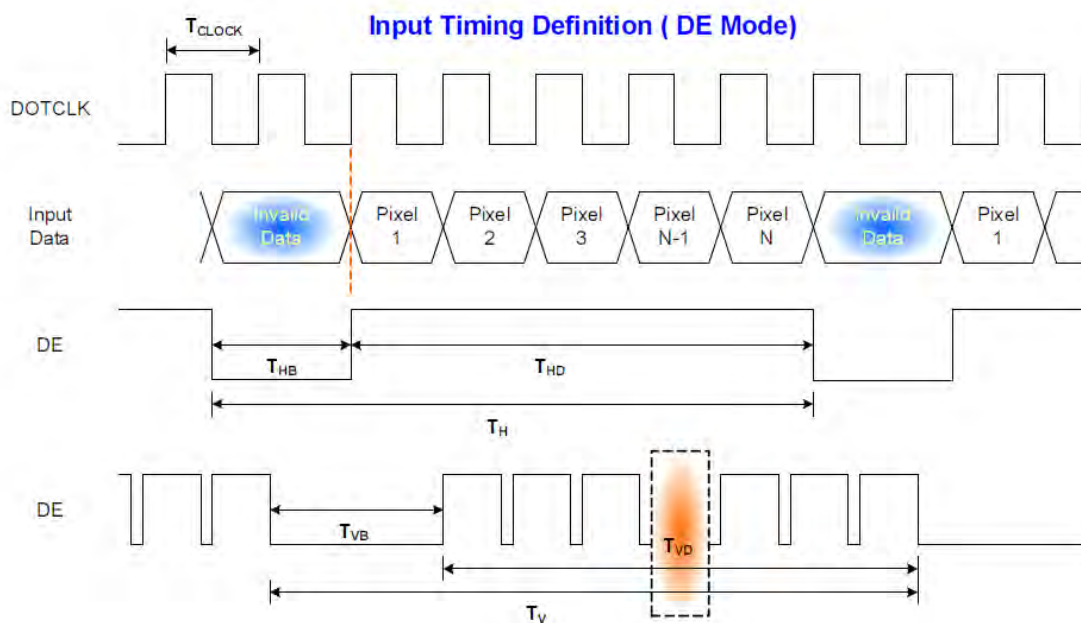
6.5 Power ON/OFF Sequence

VDD power and lamp on/off sequence is as below. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when VDD is off.
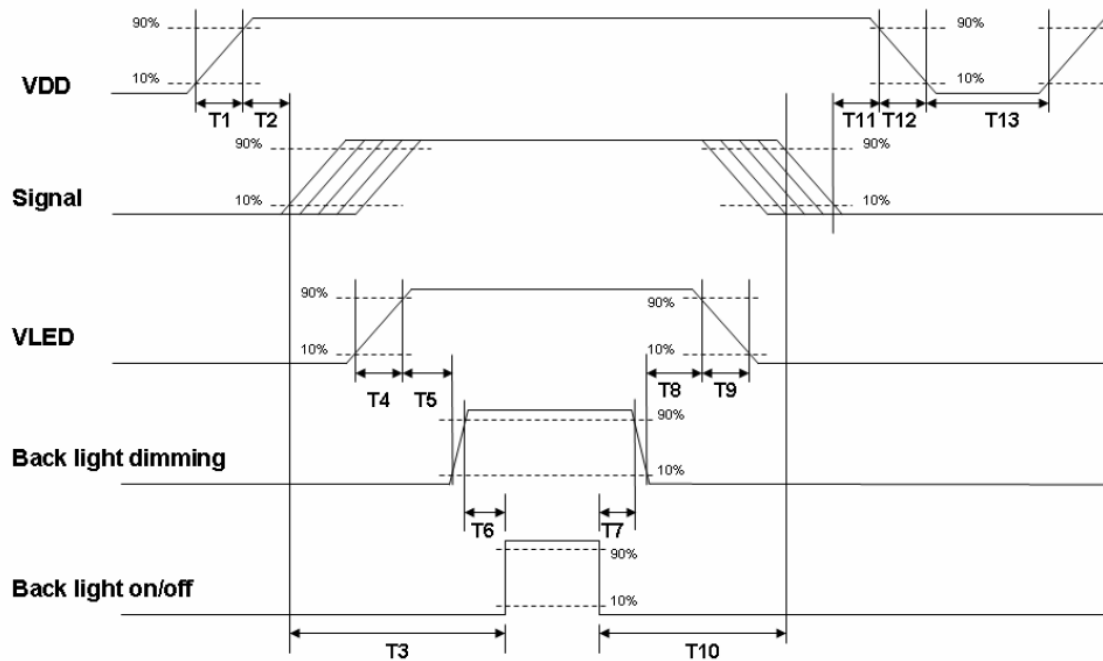
Power ON/OFF sequence timing

Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	–	10	[ms]
T2	30	40	50	[ms]
T3	200	--	–	[ms]
T4	0.5	--	10	[ms]
T5	10	-	-	[ms]
T6	10	-	-	[ms]
T7	0	-	-	[ms]
T8	10	-	-	[ms]
T9	--	--	10	[ms]
T10	110	--	–	[ms]
T11	0	16	50	[ms]
T12	-	-	10	[ms]
T13	1000	-	-	[ms]

The above on/off sequence should be applied to avoid abnormal function in the display. Please make sure to turn off the power when you plug the cable into the input connector or pull the cable out of the connector.

7.0 Connector & Pin Assignment

Physical interface is described as for the connector on module. These connectors are capable of accommodating the following signals and will be following components.

7.1 TFT LCD Module

Connector Name / Designation	Interface Connector / Interface card
Manufacturer	STM or compatible
Type Part Number	MSB24013P20HA or compatible
Mating Housing Part Number	P24013P20 or compatible

Pin No.	Symbol	Pin No.	Symbol
1	VDD	2	VDD
3	GND	4	DPS
5	RxIN0-	6	RxIN0+
7	GND	8	RxIN1-
9	RxIN1+	10	GND
11	RxIN2-	12	RxIN2+
13	GND	14	RxCKIN-
15	RxCKIN+	16	GND
17	RxIN3-	18	RxIN3+
19	RSV	20	SEL68

7.2 LED Backlight Unit: Light bar Connector

Recommended connector : JOIN TEK JT1025-1021

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

8. Reliability Test

Environment test conditions are listed as following table.

| Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 40℃, 90%RH, 240hours	
High Temperature Operation (HTO)	Ta= 85℃, 50%RH, 300hours	3
Low Temperature Operation (LTO)	Ta= -30℃, 300hours	
High Temperature Storage (HTS)	Ta= 85℃, 300hours	
Low Temperature Storage (LTS)	Ta= -30℃, 300hours	
Drop Test	Height: 60 cm, package test	
Thermal Shock Test (TST)	-20℃/30min, 60℃/30min, 100 cycles	
On/Off Test	On/10sec, Off/10sec, 30,000 cycles	
ESD (ElectroStatic Discharge)	Contact Discharge: ± 8KV, 150pF(330Ω) 1sec, 9 points, 25 times/ point.	
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 9 points, 25 times/ point.	

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 again. Power is not applied during the test. After temperature cycling, the unit is placed in normal room ambient for at least 4 hours before power on.
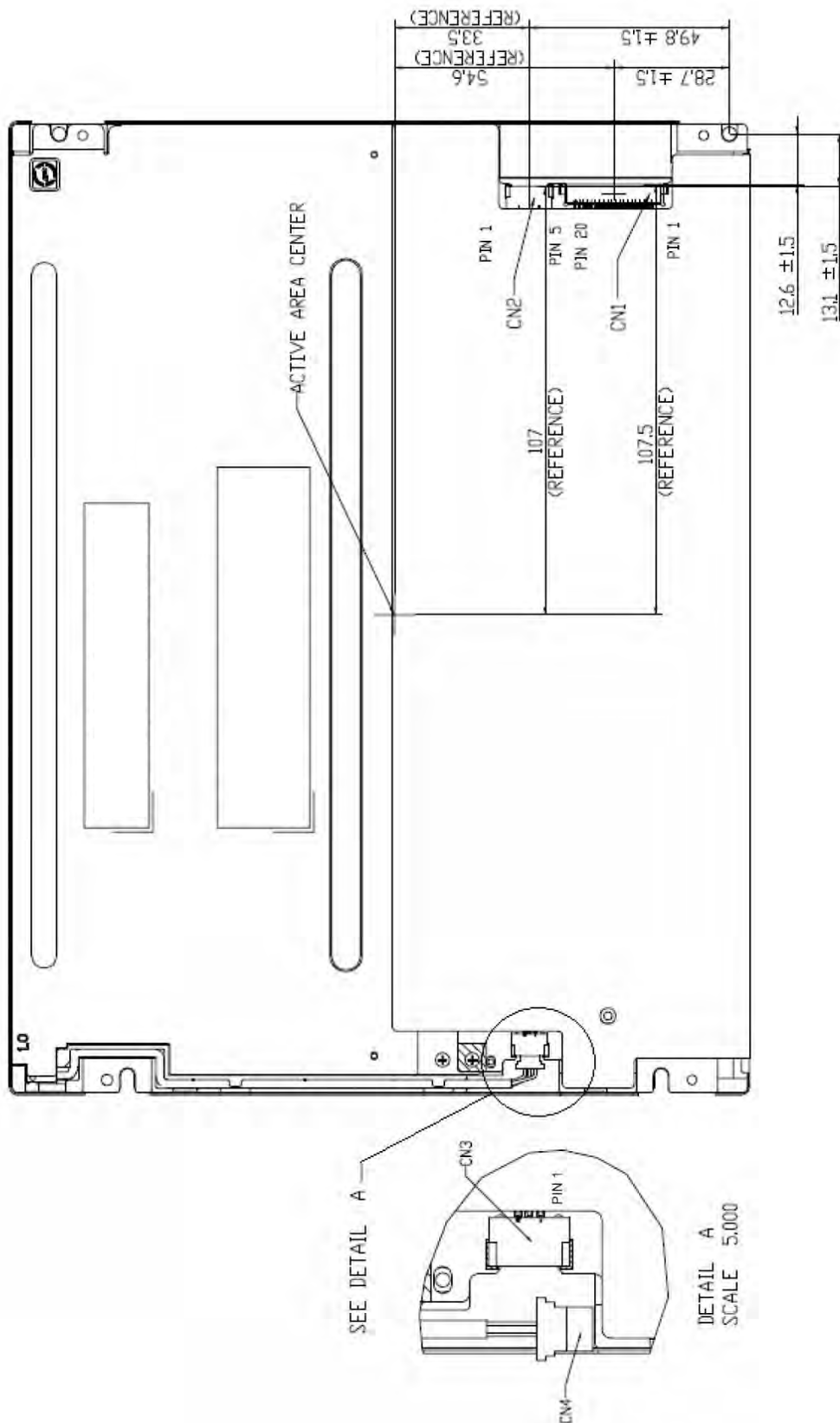
Note 2: According to EN61000-4-2 , ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

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

9. Mechanical Characteristic

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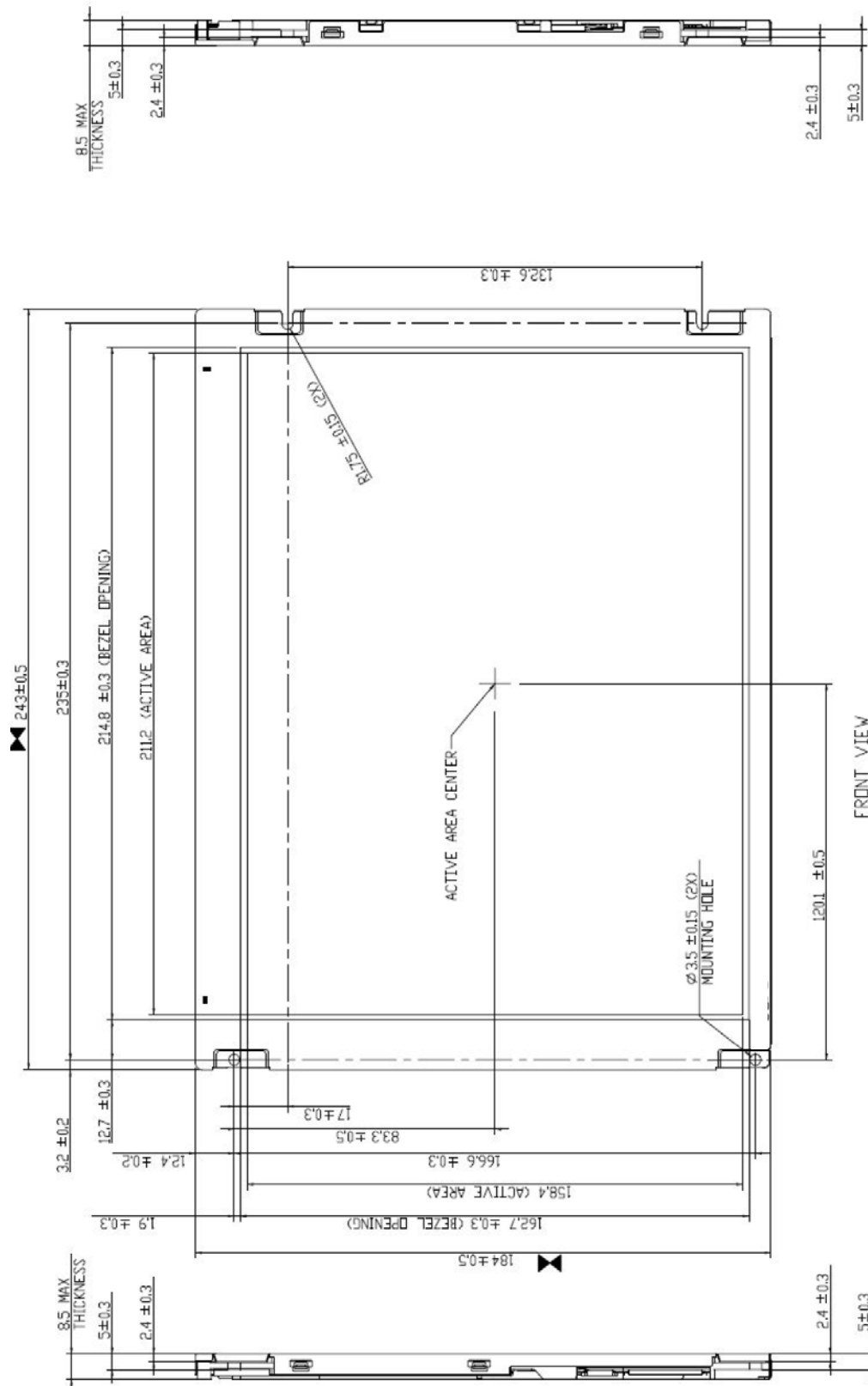
(Note: The LED backlight power cable is not shown)

10. 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.

11. 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.

12. 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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