HM185HD111A V.R Rel.1

18.5" Color TFT-LCD

Release Date
04th Nov 2020

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1.0 General Description

This specification applies to the 18.5 inch-wide Color a-Si TFT-LCD Module HM185HD111A V.R Rel.1. The display supports the WXGA - 1366(H) x 768(V) screen format and 16.7M colors (RGB 6-bits + Hi-FRC data). All input signals are 1-channel LVDS interface and this module doesn't contain an inverter board for backlight.

2.0 Display Characteristics

The following items are characteristics summary on the table under 25 ℃ condition:

ITEMS	Unit	SPECIFICATIONS
Screen Diagonal	[mm]	470.1(18.51")
Active Area	[mm]	409.8 (H) x 230.4 (V)
Pixels H x V		1366(x3) x 768
Pixel Pitch	[um]	300 (per one triad) × 300
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN Mode, Normally White
White Luminance (Center)	[cd/m^2]	400 cd/m^2 (Typ.)
Contrast Ratio	[CR]	1000 (Typ.)
Dynamic Contrast Ratio	[DCR]	10000
Optical Response Time	[msec]	5ms (Typ., on/off)
Nominal Input Voltage VDD	[Volt]	+5.0 V (Typ)
Power Consumption (VDD line + LED line)	[Watt]	VDD line: PDD (typ)= 1.75W, All black pattern at 60Hz LED line : PBLU (typ) = 7.2W Total: 8.95W
Weight	[Grams]	1290 (Typ)
Physical Size	[mm]	430.4 (W) x 254.6 (H) Typ. x 9.9 (D) Typ
Interface		One channel LVDS
Support Color		16.7M colors (RGB 6-bit + Hi FRC)
Surface Treatment		Anti-Glare, 3H
Temperature Range Operating Storage	 [°C] [°C]	 -20 to +70 -20 to +70
TCO6.0 Compliance		Yes

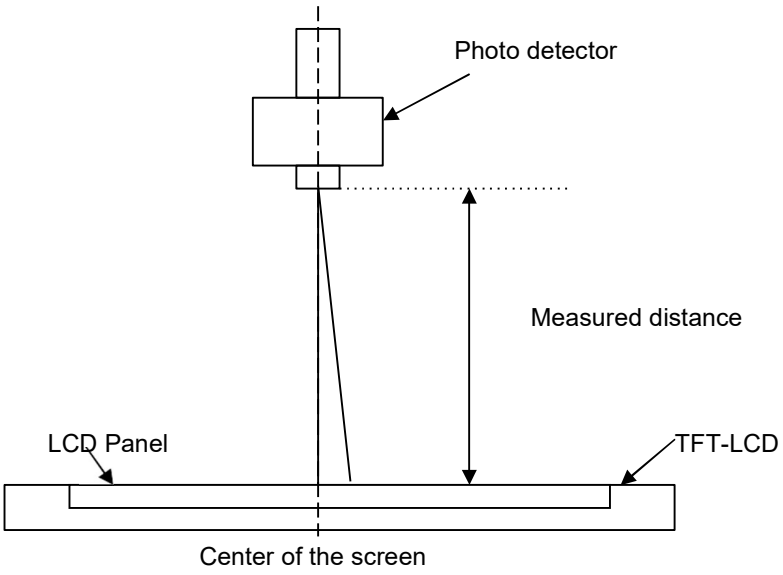
2.1 Optical Characteristics

The optical characteristics are measured under stable conditions at 25 ℃:

Item	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing Angle	[degree]	Horizontal (Right) CR = 10 (Left)	75 75	85 85	- -	***2***
		Vertical (Up) CR = 10 (Down)	70 70	80 80	- -	
Contrast ratio	[CR]		600	1000	-	***3***
	[DCR]		-	10000	-	
Response Time	[msec]	Raising Time (T_{rR})	-	3.6	-	***4***
		Falling Time (T_{rF})	-	1.4	-	
		Raising + Falling	-	5	-	
Color / Chromaticity Coordinates (CIE)		Red x	0.616	0.646	0.676	***5***
		Red y	0.303	0.333	0.363	
		Green x	0.287	0.317	0.347	
		Green y	0.595	0.625	0.655	
		Blue x	0.124	0.154	0.184	
		Blue y	0.031	0.061	0.091	
Color Coordinates (CIE) White		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Central Luminance	[cd/m^2]		300	400	-	***6***
Luminance Uniformity	[%]		75	80	-	***7***
Crosstalk (in 60Hz)	[%]				1.5	***8***
Flicker	dB				-20	***9***

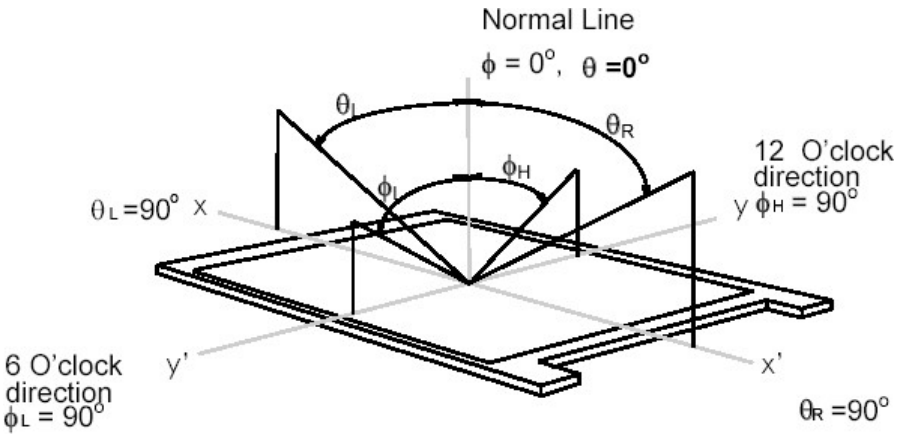
Note 1: **Measurement method**

The LCD module should be stabilized at given temperature for 30 minutes to avoid abrupt temperature change during measuring (at surface 35 ℃). In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 30 minutes in a stable, windless and dark room.



Note 2: **Definition of viewing angle** measured by ELDIM

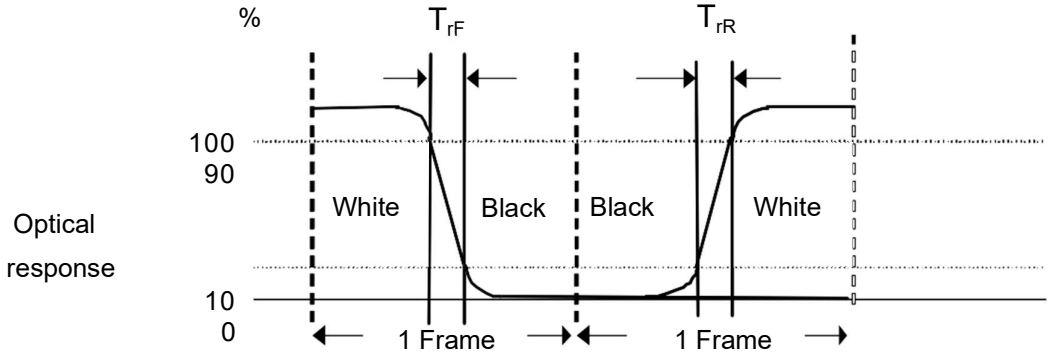
Viewing angle is the measurement of contrast ratio ≧ 10, at the screen center, over a 180° horizontal and 180° vertical range (off-normal viewing angles). The 180° viewing angle range is broken down as follows: 90° (θ) horizontal left and right and 90° (Φ) vertical, high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated about its center to develop the desired measurement viewing angle.



Note 3: **Contrast ratio is** measured

Note 4: **Definition of Response time** measured

The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time, T_{rR}), and from “Full White” to “Full Black” (falling time, T_{rF}), respectively. The response time is interval between the 10% and 90% (1 frame at 60 Hz) of amplitudes.

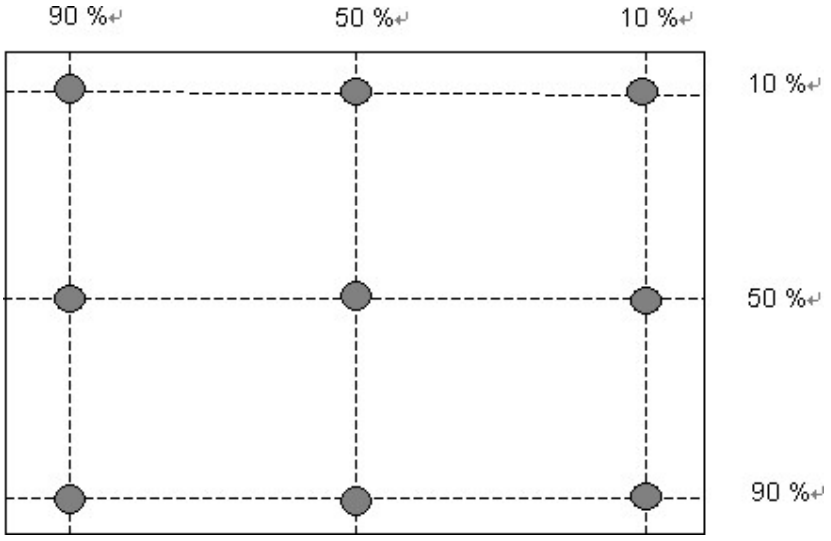


T_{rR} + T_{rF} = 5 msec (typ.).

Note 5: **Color chromaticity and coordinates (CIE) is** measured

Note 6**: Central luminance is** measured

Note 7: **Luminance uniformity of these 9 points is defined as below and** measured



$$\text{Uniformity} = \frac{\text{Minimum Luminance in 9 points (1 -9)}}{\text{Maximum Luminance in 9 Points (1- 9)}}$$

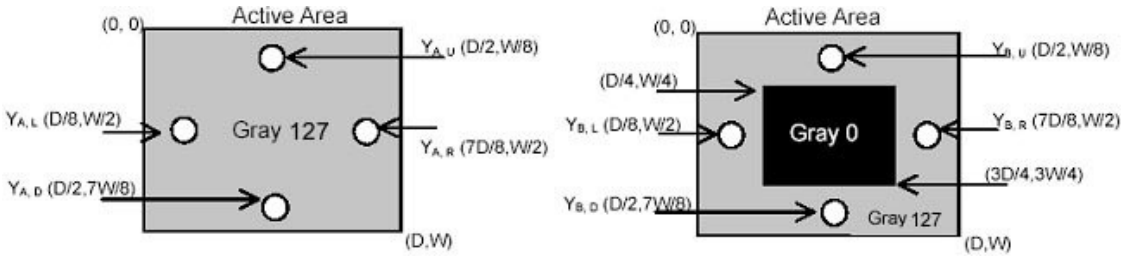
Note 8: **Crosstalk is defined as below and** measured

CT = | YB – YA | / YA × 100 (%)

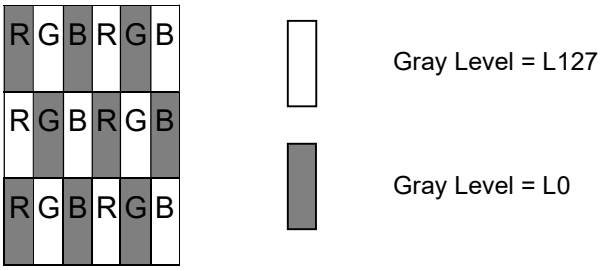
Where

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

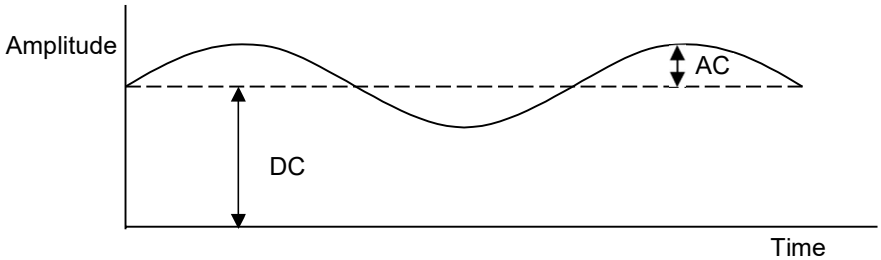
YB = Luminance of measured location with gray level 0 pattern (cd/m2)



Note 9: **Test Patern: Subchecker Pattern** measured



Method: Record dBV & DC value with TRD-100



$$\text{Flicker (dB)} = 20\log \frac{\text{AC Level(at 30 Hz)}}{\text{DC Level}}$$

2.2 Mechanical Characteristics

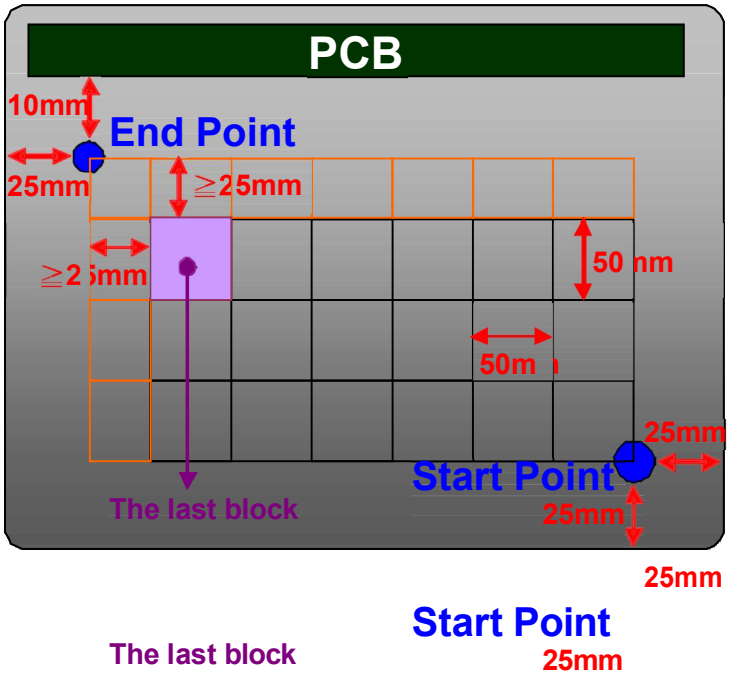
Item	Unit	Min.	Note
Compression Endurance	[Kgf]	2.5	1

Note 1: Test Method

- The point is at a distance from right-downside 25mm x 25mm defined as the Start Point of Measure Points, and the point is at a distance 25mm from left-side & around 10mm from PCB defined as the End Point.

- Align 50mm x 50mm block from Start Point on the Bezel Back, and the corners of each block are Measure Points.

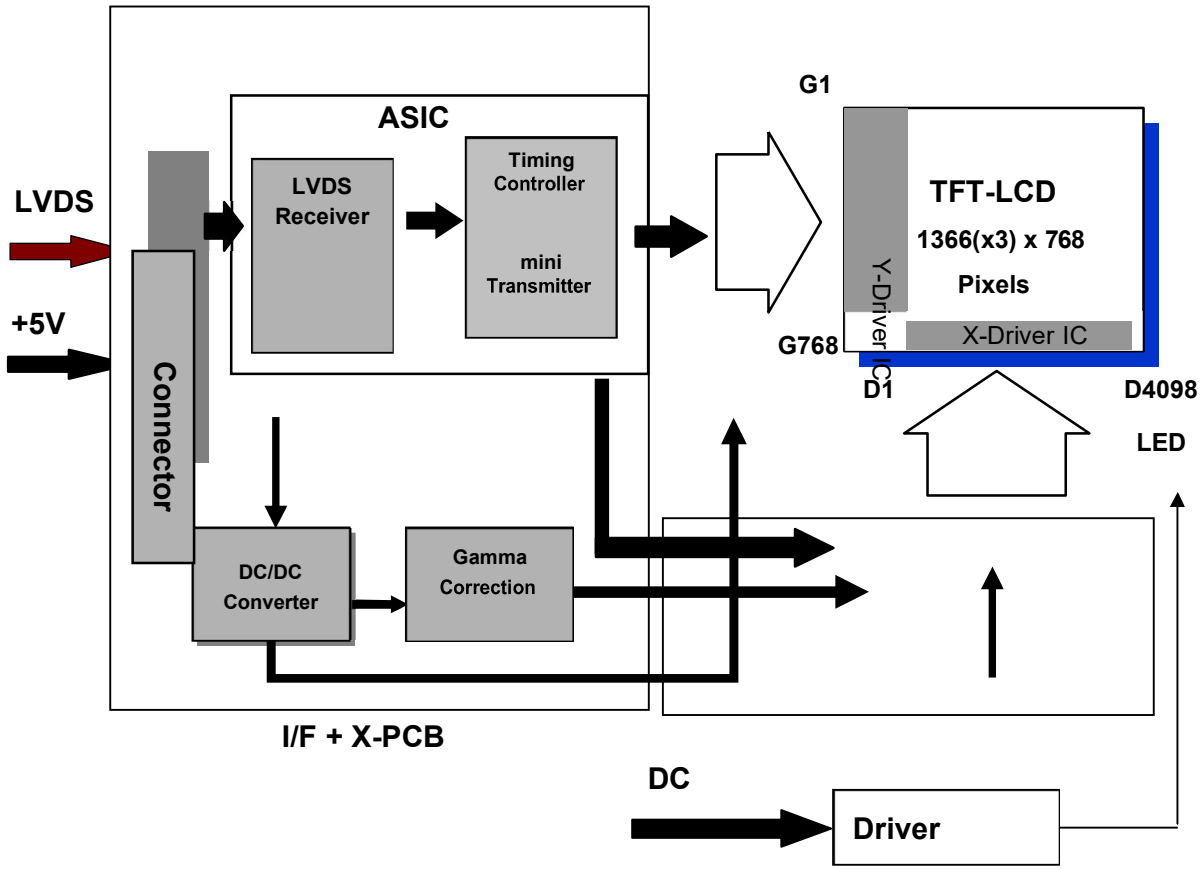
- If the distance from the last block to each side of the End Point ≧25mm, add other blocks to make sure that most area of Bezel Back can be measured.



25mm
Start Point
25mm
The last block

3.0 Functional Block Diagram

The following diagram shows the functional block of the 18.5 inch Color TFT-LCD Module:



I/F PCB Interface:

MSCKT2407P30HB (STM) / AL230F-A0G1D-P (P-TWO)

Mating Type:

FI-X30HL(JAE) (Locked Type)

FI-X30H (JAE)(Unlocked Type)

4.0 Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

4.1 TFT LCD Module

Item	Symbol	Min	Max	Unit	Conditions
Logic/LCD Drive Voltage	VDD	0	+6.0	[Volt]	***Note 1,2***

4.2 Backlight Unit
(To be advised)

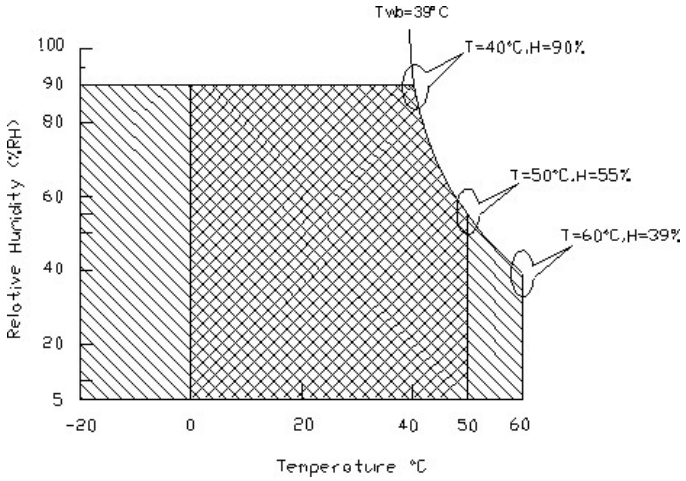
4.3 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
Operating Temperature	TOP	-20	+70	[°C]	***Note 3***
Glass surface temperature (operation)	TGS	0	+75	[°C]	***Note 3, Note 4***
Operation Humidity	HOP	5	90	[%RH]	***Note 3***
Storage Temperature	TST	-20	+70	[°C]	
Storage Humidity	HST	5	90	[%RH]	

Note 1: With in Ta (25℃)
Note 2: Permanent damage to the device may occur if exceeding maximum values
Note 3: Temperature and relative humidity range are shown as the below figure.

1. 90% RH Max (Ta ≦39℃)
2. Max wet-bulb temperature at 39℃ or less. (Ta ≦39℃)
3. No condensation

Note 4: *Function Judged only*
Note 5: IRLED1,2,3,4 and IPLED1,2,3,4 define as per strings LED current.



Operating Range

Storage Range

5.0 Electrical characteristics

5.1 TFT LCD Module

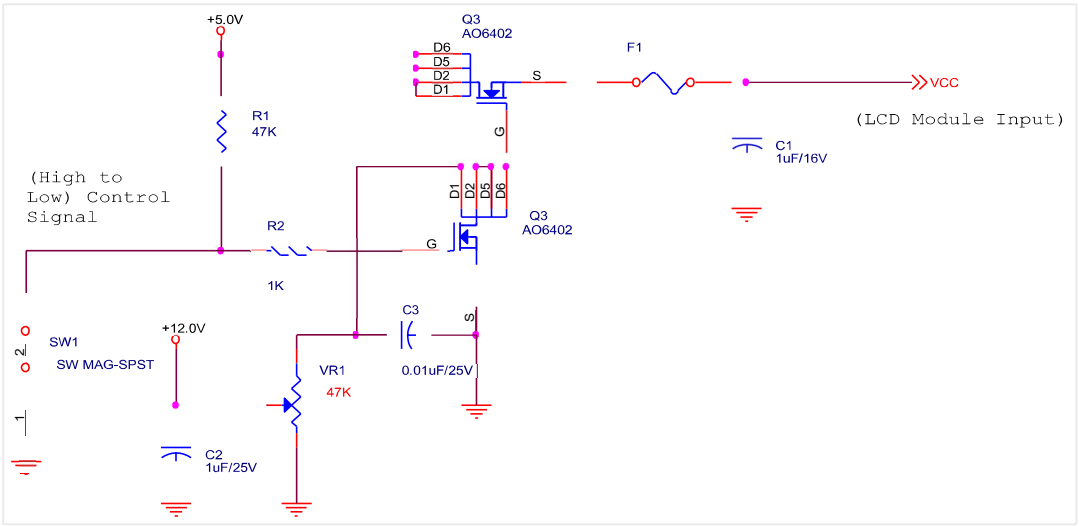
5.1.1 Power Specification

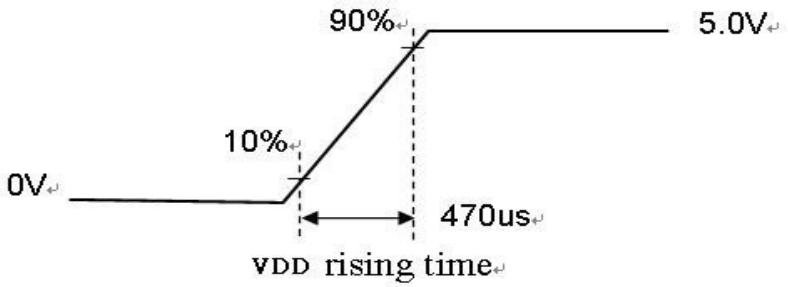
Input power specifications are as following:

Symbol	Parameter	Min	Typ	Max	Unit	Conditions
VDD	Logic/LCD Drive Voltage	4.5	5.0	6	[Volt]	+/-10%
IDD	Input Current	-	0.35	0.42	[A]	VDD= 5.0V, All Black Pattern At 60Hz,
		-	0.42	0.5		VDD= 5.0V, All Black Pattern At 75Hz
PDD	VDD Power	-	1.75	2.1	[Watt]	VDD= 5.0V, All Black Pattern At 60Hz
		-	2.1	2.5		VDD= 5.0V, All Black Pattern At 75Hz
IRush	Inrush Current	-	-	TBD	[A]	Note 1
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	350	[mV] p-p	VDD= 5.0V, All Black Pattern At 75Hz

Note 1: Measurement conditions:

The duration of rising time of power input is 470us.





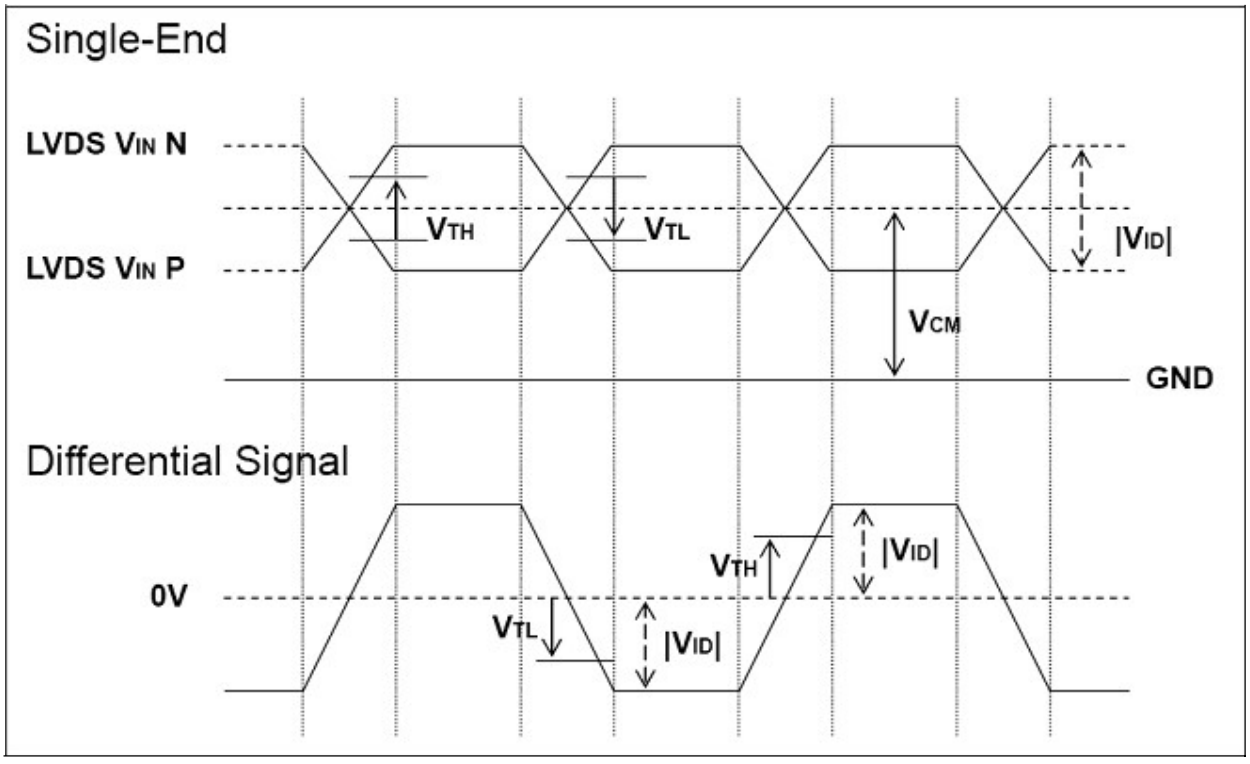
5.1.2 Signal Electrical Characteristics

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

1. DC Characteristics of each signal are as following:

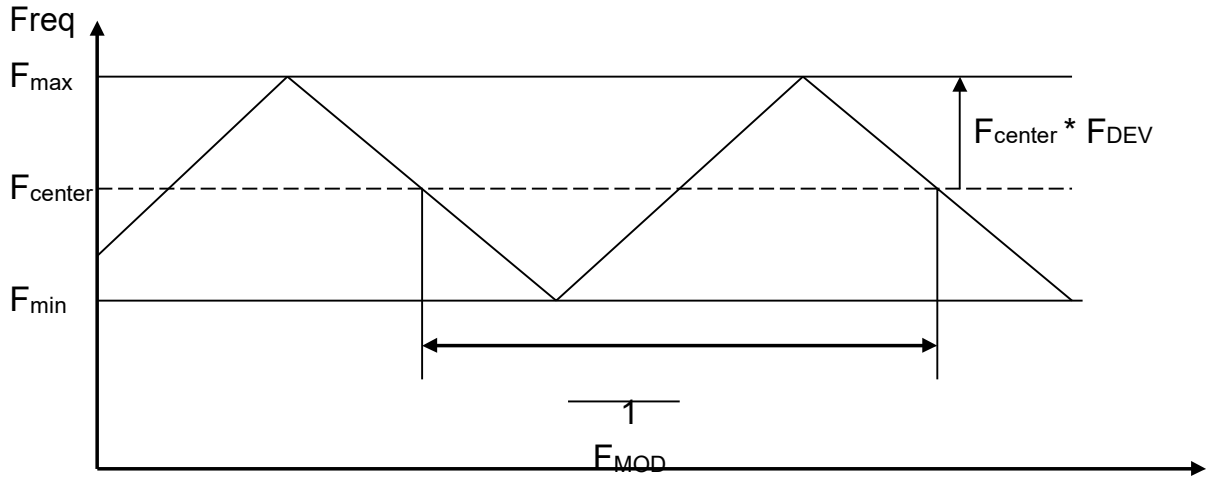
Symbol	Parameter	Min	Typ	Max	Units	Condition
VTH	Differential Input High Threshold	-	-	+100	[mV]	VCM = 1.2V ***Note 1***
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM = 1.2V ***Note 1***
| VID |	Input Differential Voltage	100	-	600	[mV]	***Note 1***
VCM	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH-VTL = 200MV (max) ***Note 1***

Note 1: LVDS Signal Waveform



2. AC Characteristics

Description	Symbol	Min	Max	Unit	Note
Maximum deviation of input clock frequency during SSC	**F_{DEV}**	**-**	**± 3**	**%**	
Maximum modulation frequency of input clock during SSC	**F_{MOD}**	**-**	**200**	**KHz**	



< Spread Spectrum>

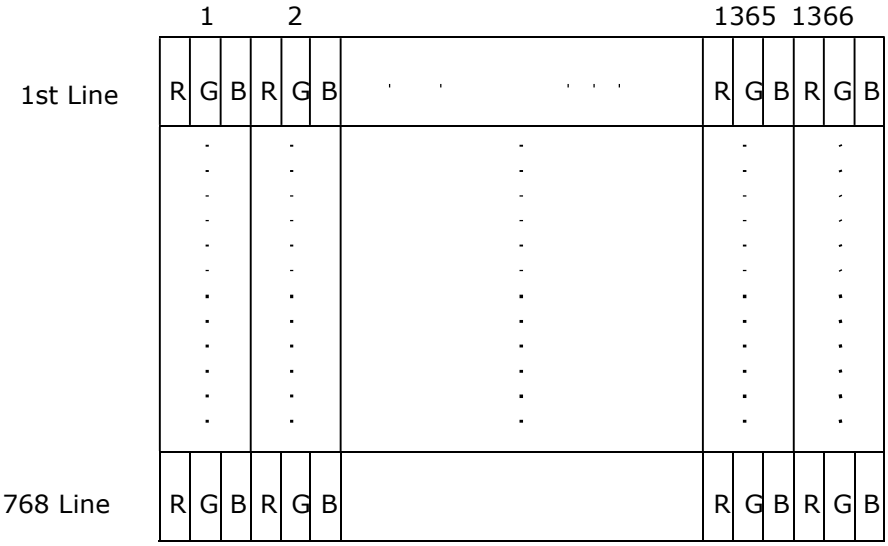
5.2 Backlight Unit

(To be advised)

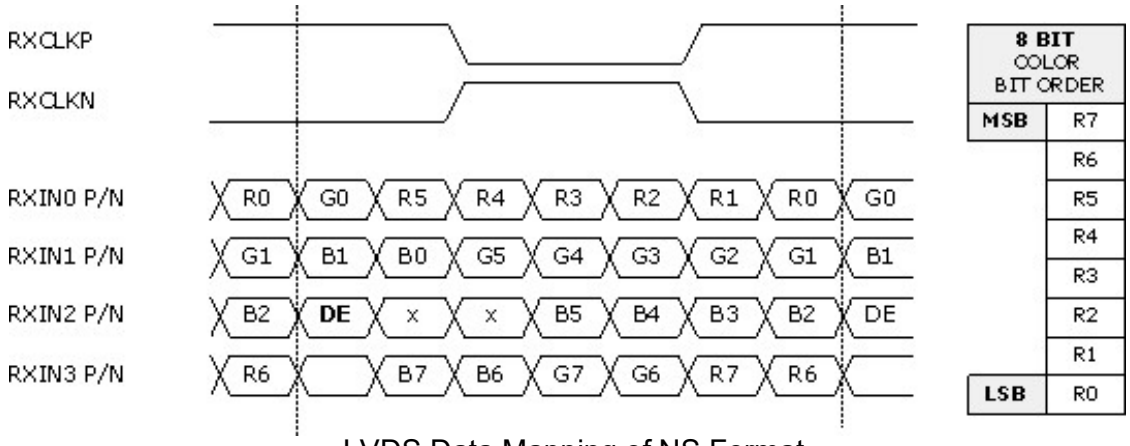
6.0 Signal Characteristic

6.1 Pixel Format Image

Following figure shows the relationship of the input signals and LCD pixel format.



6.2 The input data format



LVDS Data Mapping of NS Format

Note1: Normally, DE, VS, HS on EVEN channel are not used.
Note2: 8-bits signal input.

6.3 Signal Description

PIN #	SIGNAL NAME	DESCRIPTION
1	NC	No contact (For internal use)
2	NC	No contact (For internal use)
3	NC	No contact (For internal use)
4	GND	Power Ground
5	RXIN0-	Negative LVDS differential data input (0)
6	RXIN0+	Positive LVDS differential data input (0)
7	GND	Power Ground
8	RXIN1-	Negative LVDS differential data input (1)
9	RXIN1+	Positive LVDS differential data input (1)
10	GND	Power Ground
11	RXIN2-	Negative LVDS differential data input (2)
12	RXIN2+	Positive LVDS differential data input (2)
13	GND	Power Ground
14	RXCLKIN-	Negative LVDS differential clock input (clock)
15	RXCLKIN+	Positive LVDS differential data input (clock)
16	GND	Power Ground
17	RXIN3-	Negative LVDS differential data input (3)
18	RXIN3+	Positive LVDS differential data input (3)
19	GND	Power Ground
20	NC	No contact (For internal use)
21	NC	No contact (For internal use)
22	NC	No contact (For internal use)
23	GND	Power Ground
24	GND	Power Ground
25	GND	Power Ground
26	VCC	+5V power supply
27	VCC	+5V power supply
28	VCC	+5V power supply
29	VCC	+5V power supply
30	VCC	+5V power supply

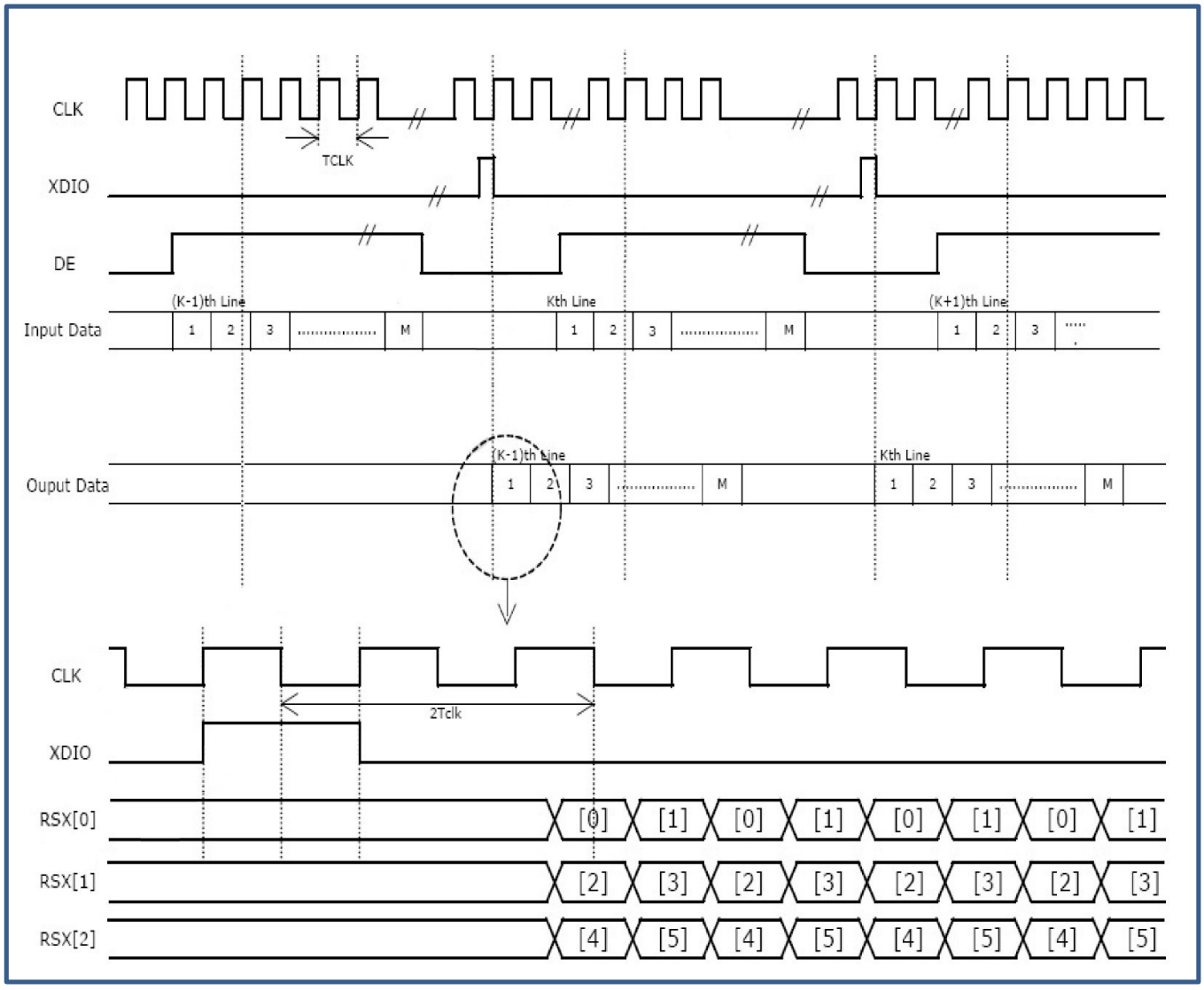
6.4 Timing Characteristics

Basically, interface timing described here is not actual input timing of LCD module but close to output timing of SN75LVDS82DGG (Texas Instruments) or equivalent.

Signal	Item	Symbol	Min	Typ	Max	Unit
V-section	Period	Tv	776	808	1023	Th
	Active	Tdisp(v)	768	768	768	Th
	Blanking	Tblk(v)	8	40	255	Th
H-section	Period	Th	1416	1606	2047	Tclk
	Active	Tdisp(h)	1366	1366	1366	Tclk
	Blanking	Tblk(h)	50	240	681	Tclk
Clock	Period	Tclk	-	12.8	-	ns
	Frequency	Freq	55	78	94	MHz
Frame Rate	Frame Rate	F	50	60	75	Hz

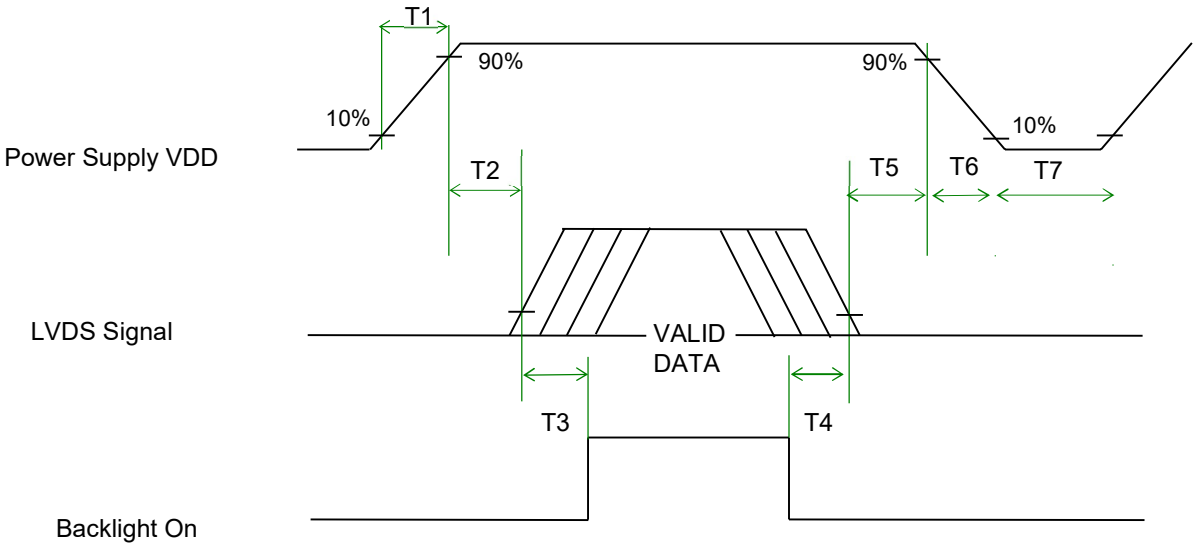
Note1 : DE mode only
Note2 : Clock Frequency 94MHz(Max.)= 1480(H)*847(V)*75Hz

6.5 Timing diagram



6.6 Power ON/OFF Sequence

VDD power and lamp on/off sequence are as follows. 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 Sequence Timing

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	0	-	50	[ms]
T3	500	-	-	[ms]
T4	100	-	-	[ms]
T5	0		50	[ms] *Note1,2*
T6	5	-	100	[ms] *Note1,2*
T7	1000	-	-	[ms]

Note1 : Recommend setting T5 = 0ms to avoid electronic noise when VDD is off.

Note2 : During T5 and T6 period , please keep the level of input LVDS signals with Hi-Z state.

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 P-TWO
Type Part Number	MSCKT2407P30HB (STM) / AL230F-A0G1D-P (P-TWO)
Mating Housing Part Number	FI-X30HL(JAE) (Locked Type) FI-X30H (JAE)(Unlocked Type)

7.1.1 Pin Assignment

Pin#	Signal Name	Pin#	Signal Name
1	NC	2	NC
3	NC	4	GND
5	RXIN0-	6	RXIN0+
7	GND	8	RXIN1-
9	RXIN1+	10	GND
11	RXIN2-	12	RXIN2+
13	GND	14	RXCLKIN-
15	RXCLKIN+	16	GND
17	RXIN3-	18	RXIN3+
19	GND	20	NC
21	NC	22	NC
23	GND	24	GND
25	GND	26	VCC
27	VCC	28	VCC
29	VCC	30	VCC

7.2 LED Connector on Backlight Unit.

(To be advised)

7.2.1 LED Pin assignment

(To be advised)

7.2.2 LED Connector dimension
(To be advised)

7.2.3 LED Mating housing dimension
(To be advised)

8.0 Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta= 70℃, 80%RH, 300hours	
High Temperature Operation (HTO)	Ta= 70℃, 50%RH, 300hours	
Low Temperature Operation (LTO)	Ta= -20℃, 300hours	
High Temperature Storage (HTS)	Ta= 70℃, 300hours	
Low Temperature Storage (LTS)	Ta= -20℃, 300hours	
Vibration Test (Non-operation)	Acceleration: 1.5 Grms Wave: Random Frequency: 10 - 200 Hz Duration: 30 Minutes each Axis (X, Y, Z)	
Shock Test (Non-operation)	Acceleration: 50 G Wave: Half-sine Active Time: 20 ms Direction: ±X, ±Y, ±Z (one time for each Axis)	
Drop Test	Height: 46 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: ± 15KV, 150pF(330Ω) 1sec, 15 points, 25 times/ point.	***2***
	Air Discharge: ± 15KV, 150pF(330Ω) 1sec 15 points, 25 times/ point.	
Altitude Test	Operation:18,000 ft Non-Operation:40,000 ft	

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 70℃, 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: EN61000-4-2, ESD class B:

Certain performance degradation allowed

No data lost

Self-recoverable

No hardware failures.

9.0 Shipping Label

The label is on the panel as shown below:

10.0 Mechanical Characteristics