



# SPECIFICATION

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*easy* **TOUCH  
DISPLAY**

**easyTOUCH DISPLAY Advanced (12024710)**

18,5" - FHD – eTD215W3302-AUA-A

Version: 1.0  
Date: 08.06.2020

Note: This specification is subject to change without prior notice

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## ADVANCED LEVEL

**21.5 inch (54.6cm)**

**Part-No. 12024710**

**G215HVN01.1 incl.easyTOUCH eTD215W3302-AUA-A**

### Display

Panel Type	AUOG215HVN01.1
Resolution (pixel) / format	1920 x 1080 / wide
Brightness (typical)	250 cd/m <sup>2</sup>
Display Mode	VA, Normally black
Customer Interface Display	LVDS
Contrast ratio (typical)	5000:1
Backlight	LED

### Glass and Touch

Cover glass	3mm Glare Glass, thermally strengthened, no treatment Printing RAL9005 ceramic, light-tight Dimensions according to outline drawing
Touch sensor type	21.5" easyTOUCH 12014893
Active area touch sensor (W x H)	480.0 (H) x 271.5 (V)
Optical Specification	according to DATA MODUL Outgoing Specification 12005965
Touch Interface	USB mXT2952T2

### Assembling

Glass to touch	Optically bonded
Glass/Touch assembly to display	AirGap-Bonding with 4 stripes industrial double-sided adhesive tape
Touch Controllerboard	mounted on rear side of TFT with metal bracket

### Accessories

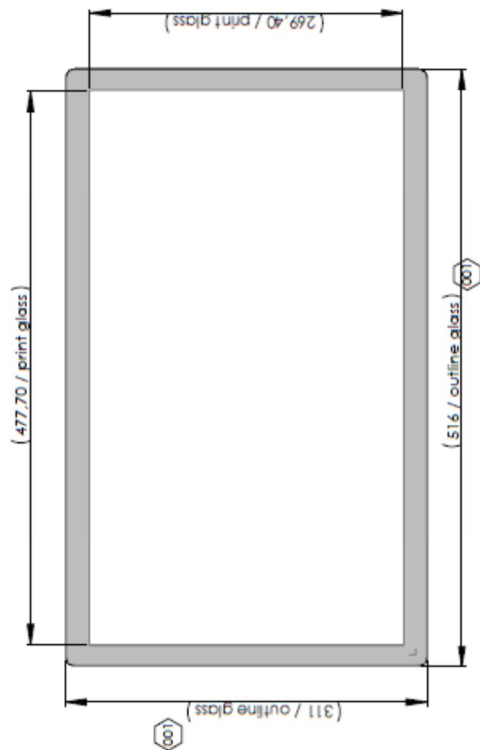
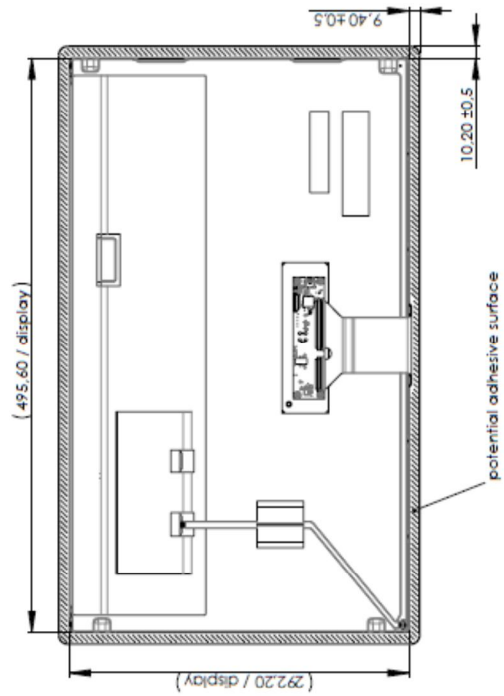
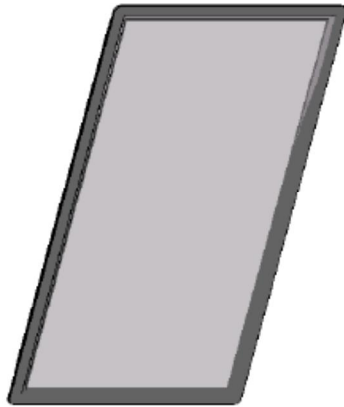
Touch Controller	easyTOUCH mXT2952T2 Driverless USB
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### Environmental conditions

Temperature (operating)	0 - 60 °C
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### Mechanical dimensions

Outline dimensions (W x H x T)	516.0 (H) x 311.0 (V) x 25.0 (T) Detailed dimensions according to outline drawing
Weight	approx. 3.8 kg





Preliminary Specification

Final Specification

<b>Module</b>	21.5" Color TFT-LCD
<b>Model Name</b>	G215HVN01.1

Customer	Date
_____	_____
<b>Checked &amp; Approved by</b>	
_____	_____
<p>Note: This Specification is subject to change without notice.</p>	

Approved by	Date
<u>Floosie Chuang</u>	<u>2019/10/17</u>
<b>Prepared by</b>	
<u>Jet Huang</u>	<u>2019/10/17</u>
<p>Audio-Video Business Unit / AU Optronics corporation</p>	

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Record of Revision

Version and Date	Page	Old description	New Description																																																																																																																																																																								
0.1 2013/05/30	All	First Edition																																																																																																																																																																									
0.2 2014/02/06	5	Typical Power Consumption: TBD	Typical Power Consumption: 18.14W																																																																																																																																																																								
	5	Physical Size <sup>Ⓐ</sup> [mm] <sup>Ⓐ</sup> 495.6(W) × 292.2(H) × 12.0(D) Max <sup>Ⓐ</sup>	Physical Size <sup>Ⓐ</sup> [mm] <sup>Ⓐ</sup> 495.6(W) × 292.2(H) × 10.7(D) Max <sup>Ⓐ</sup>																																																																																																																																																																								
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	PWM Dimming High Voltage <sup>Ⓐ</sup>	200 <sup>Ⓐ</sup>	200 <sup>Ⓐ</sup>	20K <sup>Ⓐ</sup>	Hz <sup>Ⓐ</sup>																																																																																																																																																																						
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	Dimming Duty Cycle <sup>Ⓐ</sup>	5 <sup>Ⓐ</sup>	5 <sup>Ⓐ</sup>	100 <sup>Ⓐ</sup>	% <sup>Ⓐ</sup>																																																																																																																																																																						
I <sub>F</sub> <sup>Ⓐ</sup>	LED Forward Current <sup>Ⓐ</sup>	60 <sup>Ⓐ</sup>	60 <sup>Ⓐ</sup>	mA <sup>Ⓐ</sup>	mA <sup>Ⓐ</sup>	Ta = 25°C <sup>Ⓐ</sup>																																																																																																																																																																					
Operating <sup>Ⓐ</sup>		30000 <sup>Ⓐ</sup>	30000 <sup>Ⓐ</sup>	Hrs <sup>Ⓐ</sup>	Hrs <sup>Ⓐ</sup>	Ta = 25°C <sup>Ⓐ</sup>																																																																																																																																																																					
Symbol <sup>Ⓐ</sup>	Parameter <sup>Ⓐ</sup>	Min <sup>Ⓐ</sup>	Typ <sup>Ⓐ</sup>	Max <sup>Ⓐ</sup>	Unit	Remark <sup>Ⓐ</sup>																																																																																																																																																																					
V <sub>LED</sub> <sup>Ⓐ</sup>	Input Voltage <sup>Ⓐ</sup>	10.8 <sup>Ⓐ</sup>	12.2 <sup>Ⓐ</sup>	13.2 <sup>Ⓐ</sup>	Volt <sup>Ⓐ</sup>																																																																																																																																																																						
I <sub>LED</sub> <sup>Ⓐ</sup>	Input Current <sup>Ⓐ</sup>			A <sup>Ⓐ</sup>	mA <sup>Ⓐ</sup>	100% Dimming <sup>Ⓐ</sup>																																																																																																																																																																					
P <sub>LED</sub> <sup>Ⓐ</sup>	Power Consumption <sup>Ⓐ</sup>	13.17 <sup>Ⓐ</sup>	14.64 <sup>Ⓐ</sup>	16.10 <sup>Ⓐ</sup>	Wat <sup>Ⓐ</sup>	100% Dimming <sup>Ⓐ</sup>																																																																																																																																																																					
I <sub>rush</sub> <sup>Ⓐ</sup>	Inrush Current <sup>Ⓐ</sup>			2 <sup>Ⓐ</sup>	A <sup>Ⓐ</sup>																																																																																																																																																																						
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0.3 2014/06/24	6	Contrast Ratio <sup>Ⓐ</sup> 3000 <sup>Ⓐ</sup> / 5000 <sup>Ⓐ</sup> Cross talk <sup>Ⓐ</sup> % <sup>Ⓐ</sup> Response Time <sup>Ⓐ</sup> [msec] <sup>Ⓐ</sup> Rising <sup>Ⓐ</sup> Falling <sup>Ⓐ</sup> Raising + Falling <sup>Ⓐ</sup>	Contrast Ratio <sup>Ⓐ</sup> 2000 <sup>Ⓐ</sup> / 3000 <sup>Ⓐ</sup> Cross talk <sup>Ⓐ</sup> % <sup>Ⓐ</sup> Response Time <sup>Ⓐ</sup> [msec] <sup>Ⓐ</sup> Rising <sup>Ⓐ</sup> Falling <sup>Ⓐ</sup> Raising + Falling <sup>Ⓐ</sup>																																																																																																																																																																								
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	22	Thickness = 10.7 mm (typ.)	Update drawing (t=11.7 mm)																																																																																																																																																																								
	24	Max capacity : 12 pcs TFT-LCD module per carton. Max weight: TBD kg per carton. Outside dimension of carton: 560 mm x 269 mm x 369 mm Pallet size : 1140mm x 830mm x 140mm	Max capacity : 12 TFT-LCD module per carton. Max weight: 24.5 kg per carton. Outside dimension of carton: 570mm*275mm*395mm Pallet size : 1150mm*840mm*132mm																																																																																																																																																																								
1.1 2014/09/05	7	Contrast ratio: 3,000 (typ.)	Contrast ratio: 5,000 (typ.)																																																																																																																																																																								

	18	<table border="1"> <tr> <td>Vsync Timing</td> <td>Vertical-Section</td> <td>Period</td> <td>T<sub>VP</sub></td> <td>1088</td> <td>1120</td> <td>2047</td> <td rowspan="2">T<sub>Line</sub></td> </tr> <tr> <td></td> <td>Active</td> <td>T<sub>VP</sub></td> <td>1080</td> <td>1080</td> <td>1080</td> </tr> <tr> <td></td> <td>Blanking</td> <td>T<sub>VB</sub></td> <td>8</td> <td>40</td> <td>967</td> <td></td> </tr> <tr> <td>Hsync Timing</td> <td>Horizontal-Section</td> <td>Period</td> <td>T<sub>HP</sub></td> <td>1034</td> <td>1060</td> <td>2047</td> <td rowspan="2">T<sub>Clock</sub></td> </tr> <tr> <td></td> <td>Active</td> <td>T<sub>HP</sub></td> <td>960</td> <td>960</td> <td>960</td> </tr> <tr> <td></td> <td>Blanking</td> <td>T<sub>HB</sub></td> <td>74</td> <td>100</td> <td>1087</td> <td></td> </tr> </table>	Vsync Timing	Vertical-Section	Period	T <sub>VP</sub>	1088	1120	2047	T <sub>Line</sub>		Active	T <sub>VP</sub>	1080	1080	1080		Blanking	T <sub>VB</sub>	8	40	967		Hsync Timing	Horizontal-Section	Period	T <sub>HP</sub>	1034	1060	2047	T <sub>Clock</sub>		Active	T <sub>HP</sub>	960	960	960		Blanking	T <sub>HB</sub>	74	100	1087		<table border="1"> <tr> <td>Vsync Timing</td> <td>Vertical-Section</td> <td>Period</td> <td>T<sub>VP</sub></td> <td>1092</td> <td>1130</td> <td>1653</td> <td rowspan="2">T<sub>Line</sub></td> </tr> <tr> <td></td> <td>Active</td> <td>T<sub>VP</sub></td> <td>1080</td> <td>1080</td> <td>1080</td> </tr> <tr> <td></td> <td>Blanking</td> <td>T<sub>VB</sub></td> <td>12</td> <td>50</td> <td>573</td> <td></td> </tr> <tr> <td>Hsync Timing</td> <td>Horizontal-Section</td> <td>Period</td> <td>T<sub>HP</sub></td> <td>1004</td> <td>1050</td> <td>1100</td> <td rowspan="2">T<sub>Clock</sub></td> </tr> <tr> <td></td> <td>Active</td> <td>T<sub>HP</sub></td> <td>960</td> <td>960</td> <td>960</td> </tr> <tr> <td></td> <td>Blanking</td> <td>T<sub>HB</sub></td> <td>44</td> <td>90</td> <td>140</td> <td></td> </tr> </table>	Vsync Timing	Vertical-Section	Period	T <sub>VP</sub>	1092	1130	1653	T <sub>Line</sub>		Active	T <sub>VP</sub>	1080	1080	1080		Blanking	T <sub>VB</sub>	12	50	573		Hsync Timing	Horizontal-Section	Period	T <sub>HP</sub>	1004	1050	1100	T <sub>Clock</sub>		Active	T <sub>HP</sub>	960	960	960		Blanking	T <sub>HB</sub>	44	90	140	
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1.2	2016/08/17	6	Weight: [Grams] 1950 (max)	Weight: [Grams] 1,750 (± 175 g)																																																																																			
1.3	2018/11/15	12																																																																																					
1.4	2019/10/17	25	<p><b>10.2 Carton Package</b></p> <p>Max capacity : 12 pcs per carton          Max weight: 24.5 kg per carton          Outside dimension of carton: 570mm*275mm*395mm          Pallet size : 1150mm*840mm*132mm</p> <p><b>10.3 Palletizing</b></p> <p>Module by air : (2*3)*3 layers + one pallet put 18 boxes + total 216pcs          Module by sea (I) : One pallet (2*3)*3 layers + One pallet (2*3)*1 layers + total 288pcs          Module by sea (II) : One pallet (2*3)*3 layers + One pallet (2*3)*2 layers, total 360 pcs</p>	<p><b>10.2 Carton Package</b></p> <p>Max capacity : 9 pcs per carton          Max weight: 24.5 kg per carton          Outside dimension of carton: 570mm*275mm*395mm          Pallet size : 1150mm*840mm*132mm</p> <p><b>10.3 Palletizing</b></p> <p>Module by air : (2*3)*3 layers + one pallet put 18 boxes + total 162pcs          Module by sea (I) : One pallet (2*3)*3 layers + One pallet (2*3)*1 layers + total 216 pcs          Module by sea (II) : One pallet (2*3)*3 layers + One pallet (2*3)*2 layers, total 270 pcs</p>																																																																																			



## 1. Operating Precautions

- 1) Since front polarizer is easily damaged, please be cautious and 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 soft cloth.
- 5) Since the panel is made of glass, it may be broken or cracked 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 nor modify the module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if a module has to be put back into the packing container slot after it was taken out from the container, do not press the center of the LED Reflector edge. Instead, press at the far ends of the LED Reflector edge softly. Otherwise the TFT Module may be damaged.
- 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) TFT-LCD Module is not allowed to be twisted & bent even force is added on module in a very short time. Please design your display product well to avoid external force applying to module by end-user directly.
- 12) Small amount of materials without flammability grade are used in the TFT-LCD module. The TFT-LCD module should be supplied by power complied with requirements of Limited Power Source (IEC60950-1 or UL60950-1), or be applied exemption.
- 13) Severe temperature condition may result in different luminance, response time.
- 14) Continuous operating TFT-LCD Module under high temperature environment may accelerate LED light bar exhaustion and reduce luminance dramatically.
- 15) The data on this specification sheet is applicable when TFT-LCD module is placed in landscape position.
- 16) Continuous displaying fixed pattern may induce image sticking. It's recommended to use screen saver or moving content periodically if fixed pattern is displayed on the screen.

## 2. General Description

This specification applies to the 21.5 inch-wide Color TFT-LCD Module G215HVN01.1. The display supports the Full HD - 1920(H) x 1080(V) screen format and 16.7M colors (RGB 8-bits data). All input signals are dual channel LVDS interface.

LED driver board is included. G215HVN01.1 is designed for industrial display applications.

### 2.1 Display Characteristics

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

Items	Unit	Specifications
Screen Diagonal	[inch]	21.5
Active Area	[mm]	476.64 (H) x 268.11 (V)
Pixels H x V		1920(x3) x 1080
Pixel Pitch	[mm]	0.24825 x 0.24825
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		VA Mode, Normally Black
Nominal Input Voltage (VDD)	[Volt]	+5.0 V
Typical Power Consumption	[Watt]	18.14 W (Cell 3.5W + LED 14.64W) (with LED driver board, all white pattern)
Weight	[Grams]	1,750 (± 175 g)
Physical Size	[mm]	495.6(W) × 292.2(H) × 11.7(D)
Electrical Interface		Dual channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.7M colors (RGB 8 bits)
Temperature Range Operating Storage (Non-Operating)	[°C] [°C]	0~60 °C -20~60 °C
RoHS Compliance		RoHS Compliance
Light Bar Unit		LED, Non-Replaceable

## 2.2 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C.

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m <sup>2</sup> ]	100% Dimming (center point)	200	250	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			3000	5000	-	4
Cross talk	%		-	-	1.5	5
Response Time	[msec]	Rising	-	20	25	6
	[msec]	Falling	-	5	10	
	[msec]	Raising + Falling	-	25	35	
Viewing Angle	[degree]	Horizontal (Right)	75	89	-	7
	[degree]	CR = 10 (Left)	75	89	-	
	[degree]	Vertical (Upper)	75	89	-	
	[degree]	CR = 10 (Lower)	75	89	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.609	0.639	0.669	
		Red y	0.303	0.333	0.363	
		Green x	0.304	0.334	0.364	
		Green y	0.593	0.623	0.653	
		Blue x	0.125	0.155	0.185	
		Blue y	0.018	0.048	0.078	
		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Color Gamut	%		-	72		

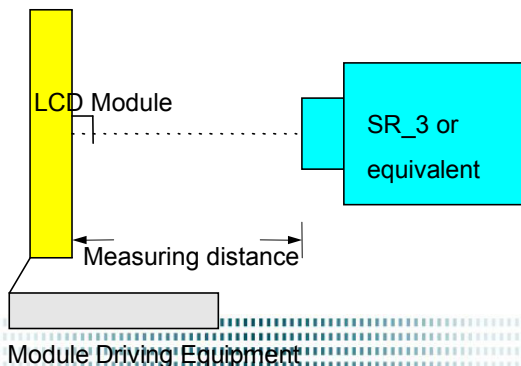
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR\_3 or equivalent)

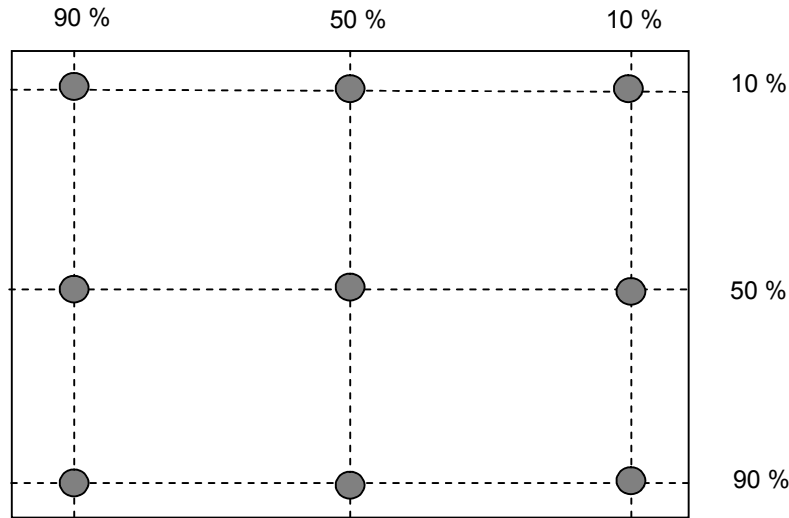
Aperture 1□ with 50cm viewing distance

Test Point Center

Environment < 1 lux



Note 2: Definition of 9 points position (Display active area : 304.128(H) x 228.096(V))



Note 3: The luminance uniformity of 9 points is defined by dividing the minimum luminance values by the maximum test point luminance

$$\delta_{w9} = \frac{\text{Minimum Brightness of nine points}}{\text{Maximum Brightness of nine points}}$$

Note 4 : Definition of contrast ratio (CR):

$$\text{Contrast ratio (CR)} = \frac{\text{Brightness on the "White" state}}{\text{Brightness on the "Black" state}}$$

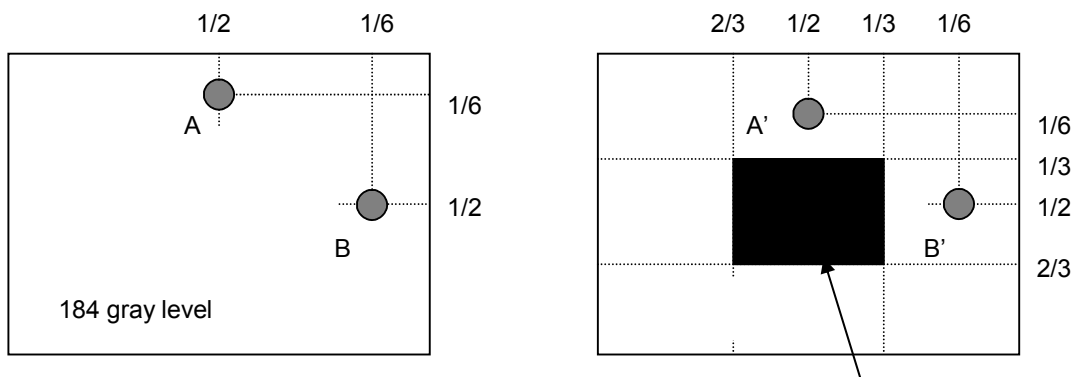
Note 5 : Definition of cross talk (CT)

$$CT = | YB - YA | / YA \times 100 (\%)$$

Where

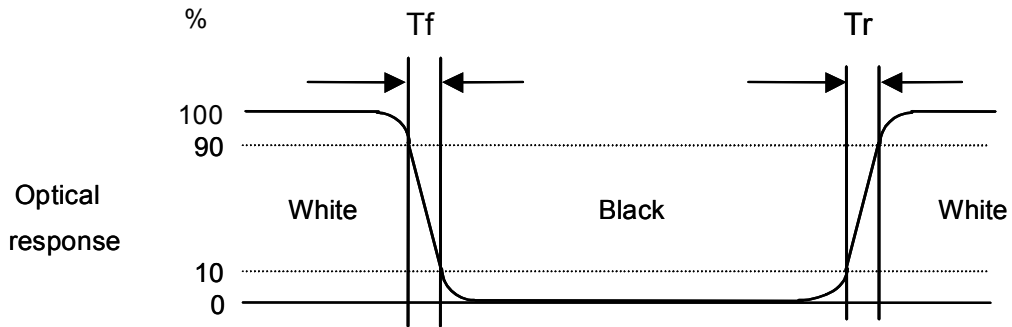
YA = Luminance of measured location without gray level 0 pattern (cd/m<sup>2</sup>)

YB = Luminance of measured location with gray level 0 pattern (cd/m<sup>2</sup>)



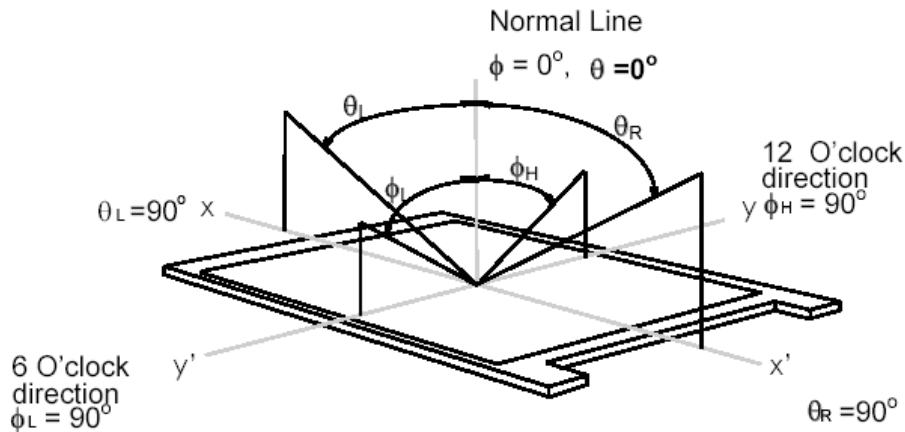
Note 6: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “White” to “Black” (falling time) and from “Black” to “White” (rising time), respectively. The response time interval is between 10% and 90% of amplitudes. Please refer to the figure as below.



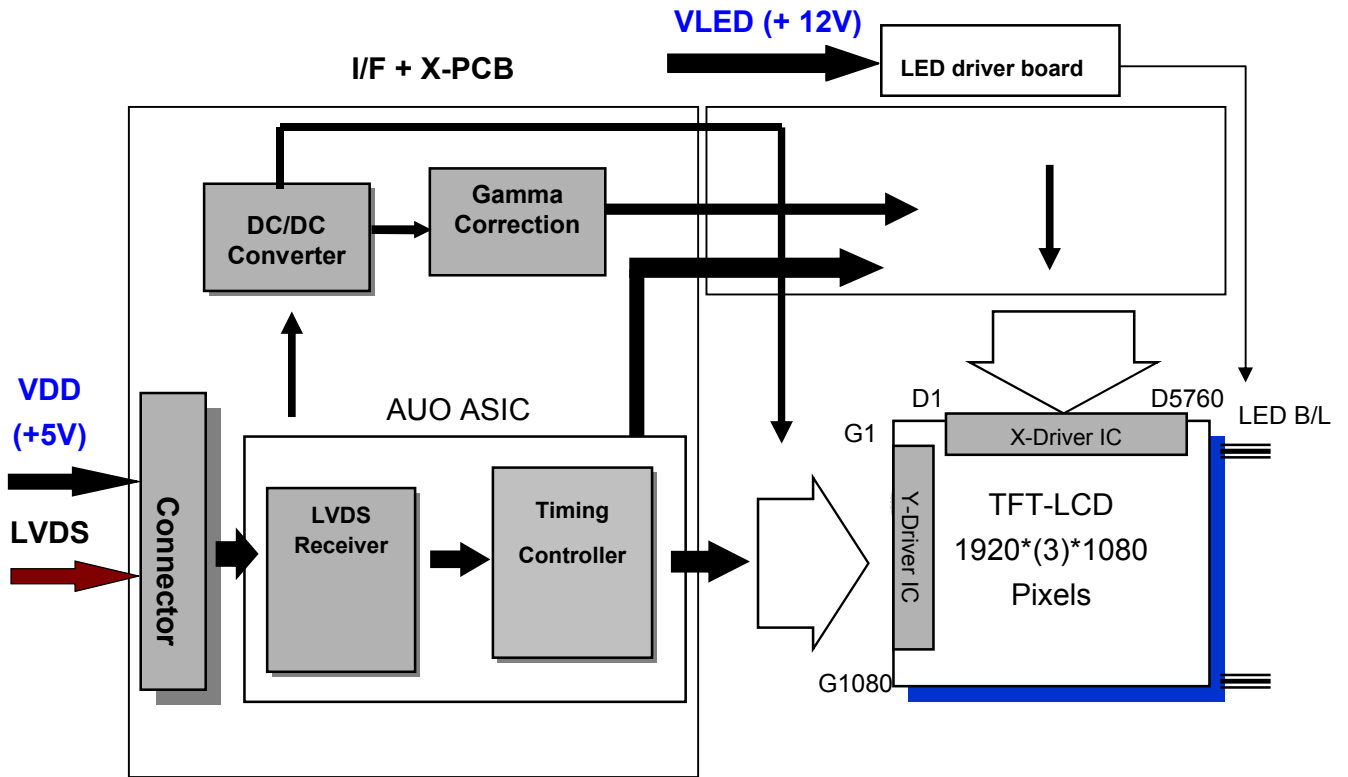
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio  $\geq 10$ , at the screen center, over a  $180^\circ$  horizontal and  $180^\circ$  vertical range (off-normal viewing angles). The  $180^\circ$  viewing angle range is broken down as below:  $90^\circ$  ( $\theta$ ) horizontal left and right, and  $90^\circ$  ( $\phi$ ) vertical high (up) and low (down). The measurement direction is typically perpendicular to the display surface with the screen rotated to its center to develop the desired measurement viewing angle.



### 3. Functional Block Diagram

The following diagram shows the functional block of this model.



## 4. Absolute Maximum Ratings

### 4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive	VDD	0	5.5	[Volt]

### 4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating	TOP	0	60	[°C]
Operation Humidity	HOP	5	90	[%RH]
Storage	TST	-20	60	[°C]
Storage Humidity	HST	5	90	[%RH]

Note: Maximum Wet-Bulb should be 39° and no condensation.

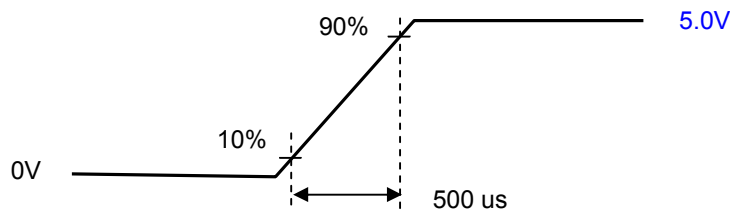
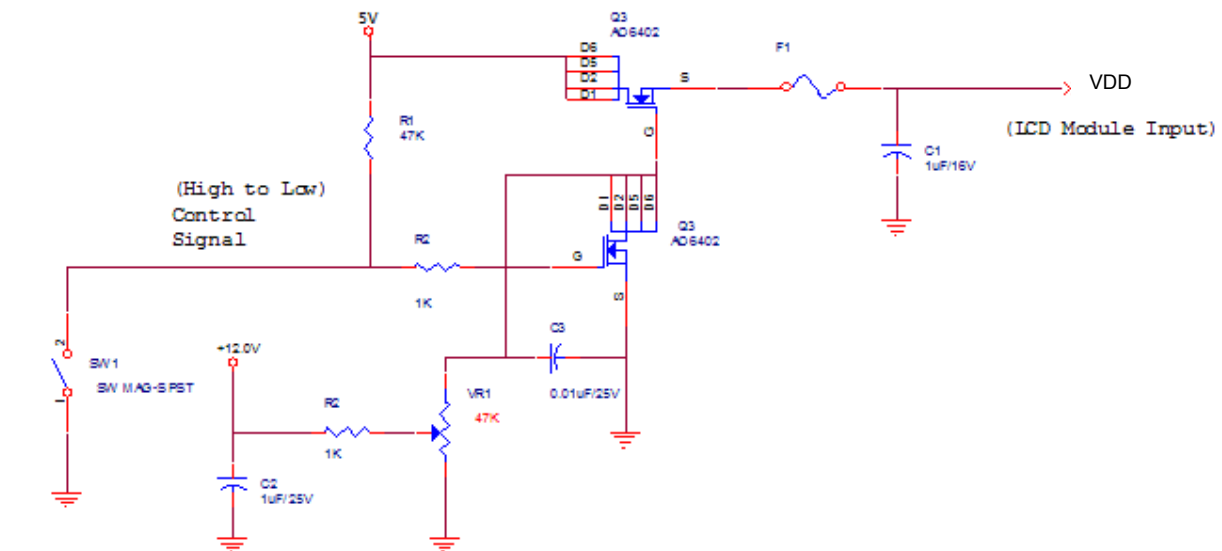
## 5. Electrical Characteristics

### 5.1 TFT LCD Module

#### 5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Unit	Remark
VDD	Logic/LCD Drive Voltage	4.5	5.0	5.5	[V <sup>s</sup> olt]	± 10%
IDD	VDD Current	-	0.7	0.8	[A]	All White Pattern (VDD=5 V, at 60Hz)
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	3.5	4.4	[Watt]	All White Pattern (VDD=5 V, at 60Hz)

Note 1: Measurement condition:



VDD rising time



64 Gray pattern

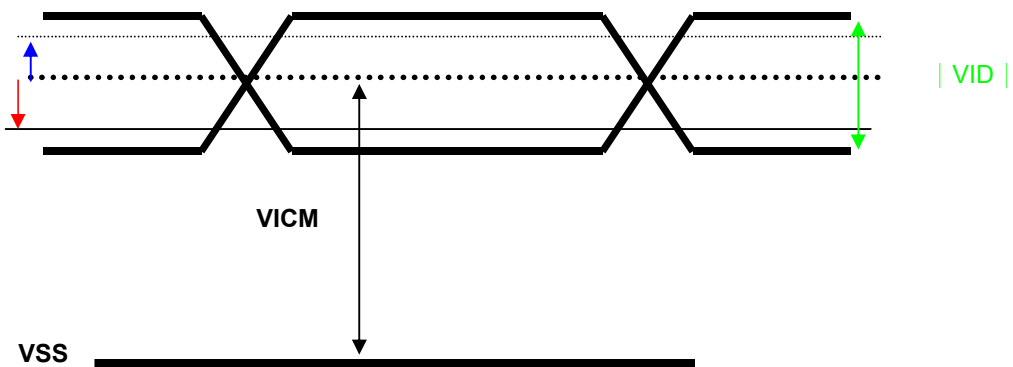


### 5.1.2 Signal Electrical Characteristics

Input signals shall be low or Hi-Z state when VDD is off.

Symbol	Item	Min.	Typ.	Max.	Unit	Remark
VTH	Differential Input High Threshold	-	-	+100	[mV]	VCM=1.2V
VTL	Differential Input Low Threshold	-100	-	-	[mV]	VCM=1.2V
VID	Input Differential Voltage	100	-	600	[mV]	
VICM	Differential Input Common Mode Voltage	+1.0	+1.2	+1.5	[V]	VTH/VTL= ± 100mV

Note: LVDS Signal Waveform.



## 5.2 Backlight Unit

### 5.2.1 Parameter guideline for LED

Following characteristics are measured under stable condition using a LED driving board at 25□. .

Symbol	Parameter	Min	Typ	Max	Unit	Remark
VLED	Input Voltage	10.8	12	13.2	Volt	
ILED	Input Current	-	1.22	-	A	100% Dimming
PLED	Power Consumption	13.17	14.64	16.10	Wat	100% Dimming
Irush	Inrush Current	-	-	3	A	
Backlight on/off	On Control Voltage	3	-	5.5	Volt	
	Off Control Voltage	0	-	0.8	Volt	
Backlight Dimming (PWM dimming)	PWM Dimming	200	-	20K	Hz	
	High Voltage	4.5	5	5.5	Volt	
	Low Voltage	0	-	0.8	Volt	
	Dimming Duty Cycle	5	-	100	%	
I <sub>F</sub>	LED Forward Current		60		mA	Ta = 25°C
Operating		30000	-	-	Hrs	Ta = 25°C

Note 1: Ta means ambient temperature of TFT-LCD module.

Note 2: If TFT-LCD module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

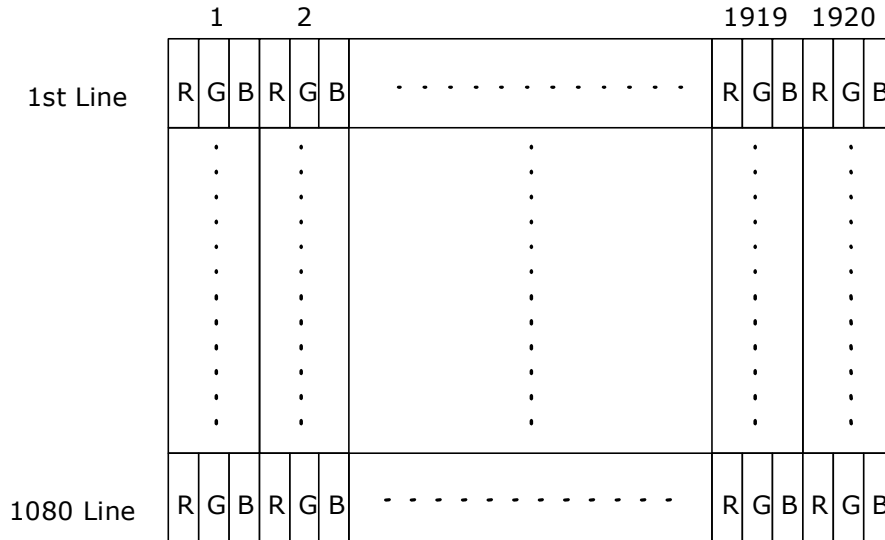
Note 3: Operating life means brightness goes down to 50% initial brightness. Min. operating life time is estimated data.

Note 4: LED light bar structure: (5 strings x 14pcs / string =70 pcs LED)

## 6. Signal Characteristic

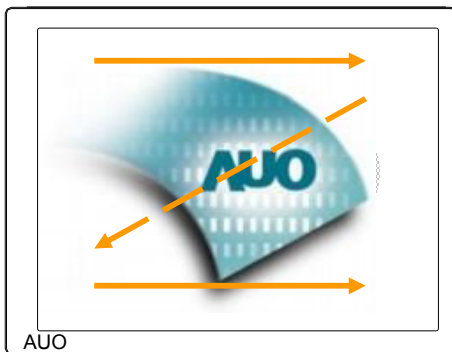
### 6.1 Pixel Format Image

Following figure shows the relationship between input signal and LCD pixel format.



### 6.2 Scanning Direction

The following figures show the image seen from the front view. The arrow indicates the direction of scan.

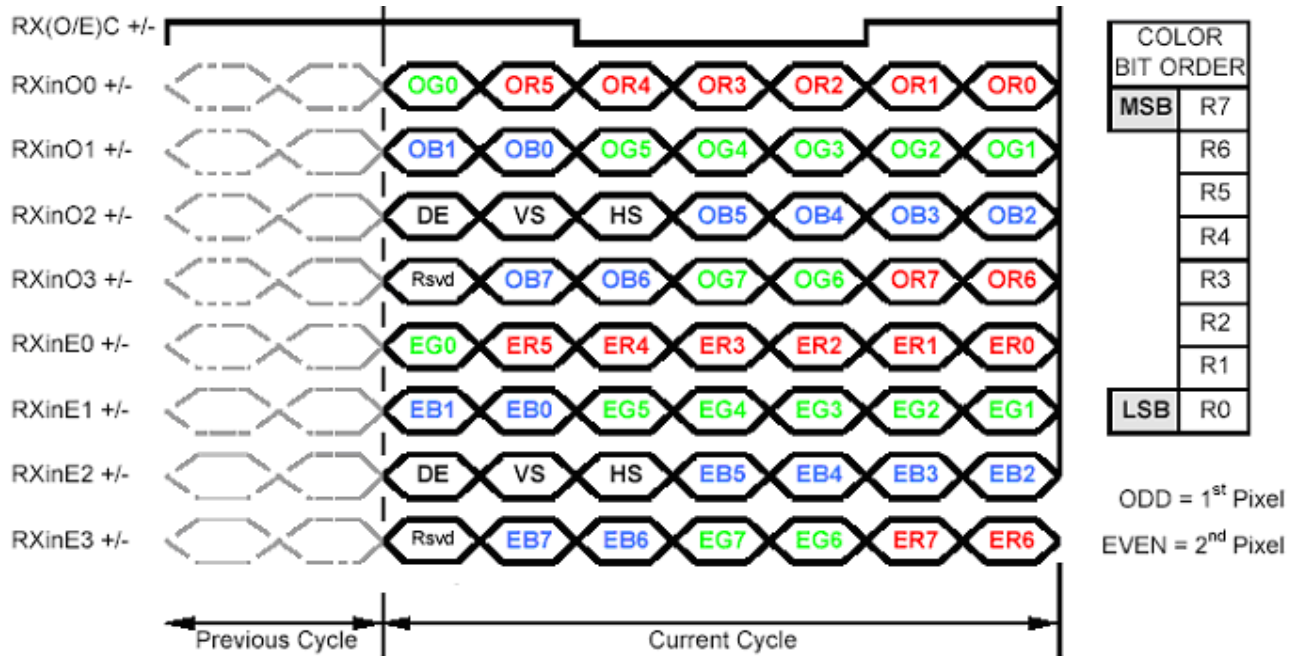


### 6.3 Signal Description

The module using a pair of LVDS receiver SN75LVDS82(Texas Instruments) or compatible. LVDS is a differential signal technology for LCD interface and high speed data transfer device. Transmitter shall be SN75LVDS83(negative edge sampling) or compatible. The first LVDS port(RxOxxx) transmits odd pixels while the second LVDS port(RxExxx) transmits even pixels.

Pin#	Signal Name	Description
1	RXinO0-	Negative LVDS differential data input (Odd data)
2	RXinO0+	Positive LVDS differential data input (Odd data)
3	RXinO1-	Negative LVDS differential data input (Odd data)
4	RXinO1+	Positive LVDS differential data input (Odd data)
5	RXinO2-	Negative LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
6	RXinO2+	Positive LVDS differential data input (Odd data, H-Sync, V-Sync, DSPTMG)
7	GND	Power Ground
8	RxOCLKIN-	Negative LVDS differential clock input (Odd clock)
9	RxOCLKIN+	Positive LVDS differential clock input (Odd clock)
10	RXinO3-	Negative LVDS differential data input (Odd data)
11	RXinO3+	Positive LVDS differential data input (Odd data)
12	RXinE0-	Negative LVDS differential data input (Even data)
13	RXinE0+	Positive LVDS differential data input (Even data)
14	GND	Power Ground
15	RXinE1-	Negative LVDS differential data input (Even data)
16	RXinE1+	Positive LVDS differential data input (Even data)
17	GND	Power Ground
18	RXinE2-	Negative LVDS differential data input (Even data)
19	RXinE2+	Positive LVDS differential data input (Even data)
20	RxECLKIN-	Negative LVDS differential clock input (Even clock)
21	RxECLKIN+	Positive LVDS differential clock input (Even clock)
22	RXinE3-	Negative LVDS differential data input (Even data)
23	RXinE3+	Positive LVDS differential data input (Even data)
24	GND	Power Ground
25	NC	No connection (for AUO test only. Do not connect)
26	NC	No connection (for AUO test only. Do not connect)
27	NC	No connection (for AUO test only. Do not connect)
28	VDD	Power +5V
29	VDD	Power +5V
30	VDD	Power +5V

### 6.4 The Input Data Format



## 6.5 Interface Timing

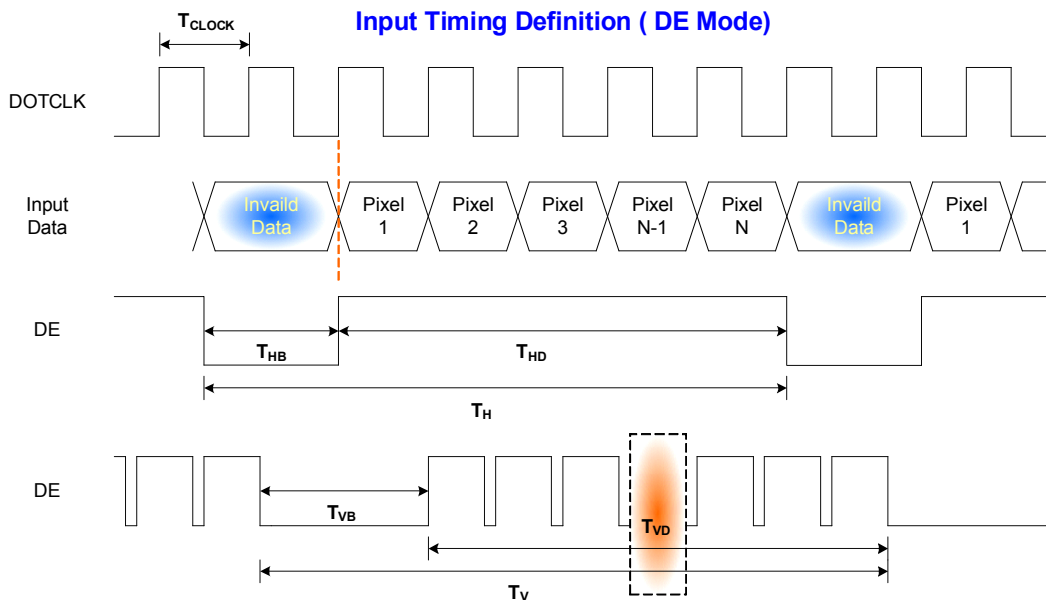
### 6.5.1 Timing Characteristics

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit	
Clock Timing	Clock frequency	$1/T_{\text{Clock}}$	40	72	83	MHz	
Vsync Timing	Vertical Section	Period	$T_V$	1092	1130	1653	$T_{\text{Line}}$
		Active	$T_{VD}$	1080	1080	1080	
		Blanking	$T_{VB}$	12	50	573	
Hsync Timing	Horizontal Section	Period	$T_H$	1004	1050	1100	$T_{\text{Clock}}$
		Active	$T_{HD}$	960	960	960	
		Blanking	$T_{HB}$	44	90	140	
Frame Rate		F	50	60	75	Hz	

Note: DE mode only.

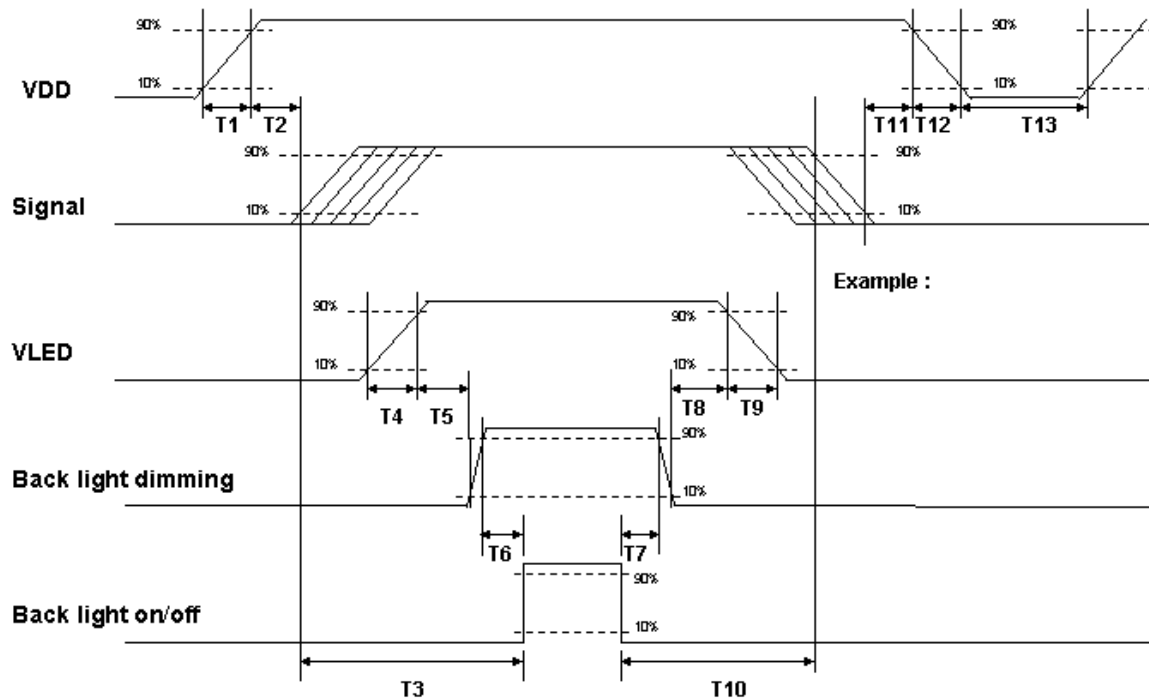
Note : Typical value refer to VESA STANDARD

### 6.5.2 Input Timing Diagram



### 6.6 Power ON/OFF Sequence

VDD power and LED 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.

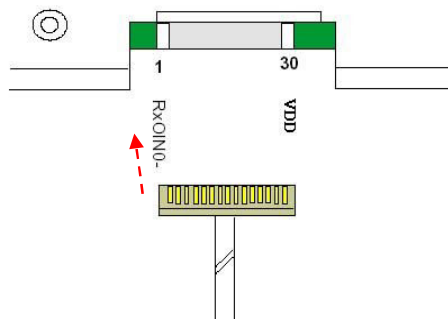
## 7. Connector & Pin Assignment

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: LVDS Connector

Connector Name / Designation	Signal Connector
Manufacturer	JAE or compatible
Connector Model Number	JAE (FI-XB30SRL-HF11) or equivalent
Mating Housing Part Number	FI-X30HL (JAE) or compatible

Pin#	Signal Name	Pin#	Signal Name
1	RXinO0-	16	RXinE1+
2	RXinO0+	17	GND
3	RXinO1-	18	RXinE2-
4	RXinO1+	19	RXinE2+
5	RXinO2-	20	RxECLKIN-
6	RXinO2+	21	RxECLKIN+
7	GND	22	RXinE3-
8	RxOCLKIN-	23	RXinE3+
9	RxOCLKIN+	24	GND
10	RXinO3-	25	NC
11	RXinO3+	26	NC
12	RXinE0-	27	NC
13	RXinE0+	28	VDD
14	GND	29	VDD
15	RXinE1-	30	VDD

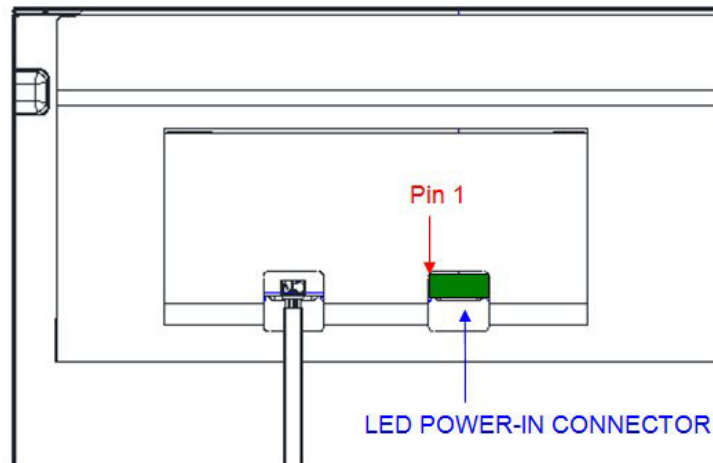




## 7.2 Backlight Unit: LED Connector

Connector Name / Designation	LED Connector
Manufacturer	E&T
Connector Model Number	3806K-F08N-03L or equivalent
Mating Model Number	H208K-P08N-02B or compatible

PIN #	SIGNAL NAME	DESCRIPTION
1	VLED	12V
2	VLED	12V
3	VLED	12V
4	GND	0V
5	GND	0V
6	GND	0V
7	Backlight on\off	5V On / 0V Off
8	Backlight dimming	5V Swing Voltage



## 8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	50□/80%,300 hours	
High Temperature Operation	60□,300 hours	
Low Temperature Operation	0□,300 hours	
Hot Storage	60□,300 hours	
Cold Storage	-20□,300 hours	
Thermal Shock Test	-20□/30 min ,60□/30 min ,100cycles	
Shock Test (Non-Operating)	50G,20ms,Half-sine wave,( ±X, ±Y, ±Z)	
Vibration Test (Non-Operating)	1.5G, (10~200Hz, P-P) 30 mins/axis (X, Y, Z)	
On/off test	On/10 sec, Off/10 sec, 30,000 cycles	
ESD	Contact Discharge: ± 8KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point Air Discharge: ± 15KV, 150pF(330Ω ) 1sec, 8 points, 25 times/ point	Note 1

Note 1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost. Self-recoverable. No hardware failures.

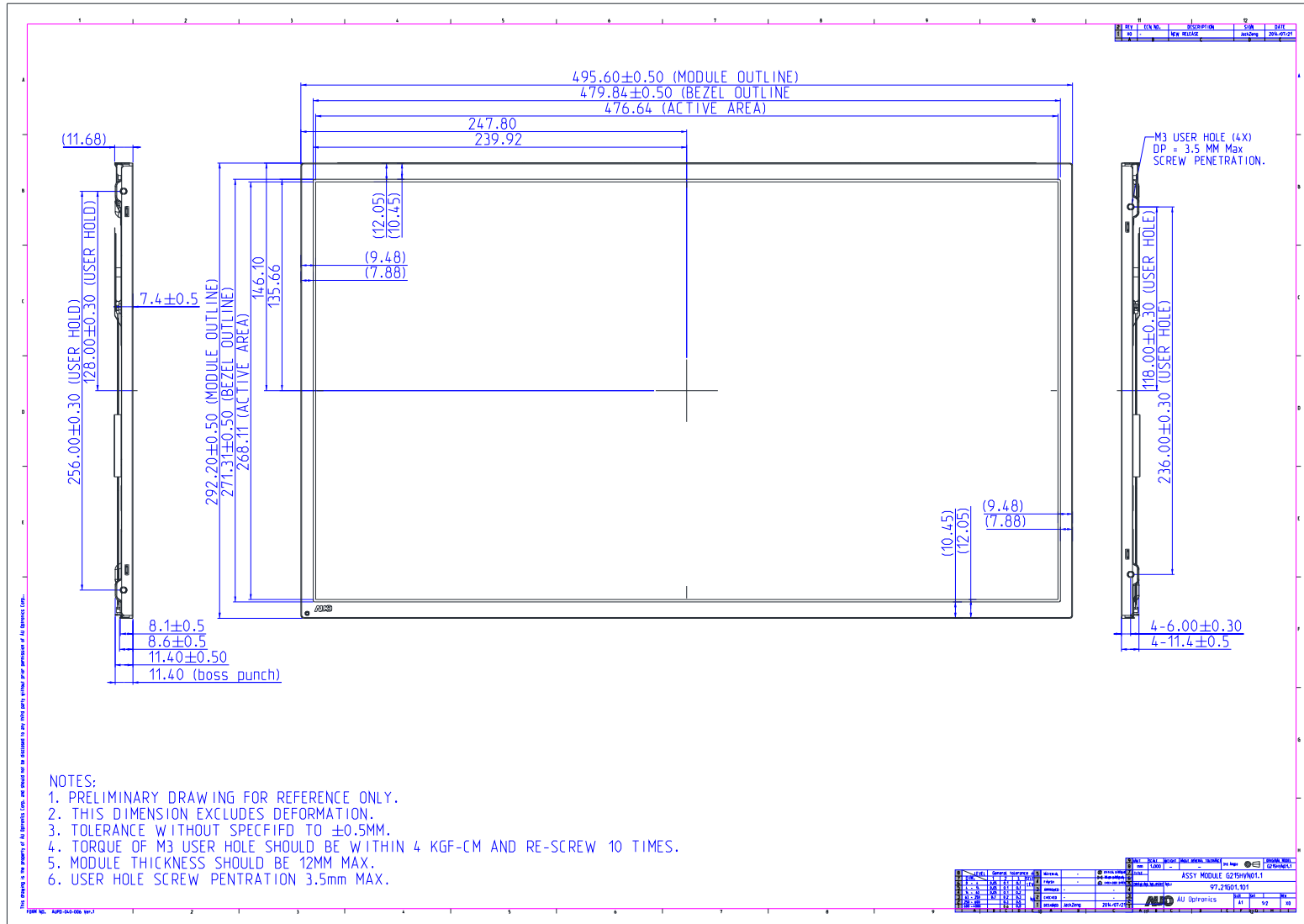
Note 2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module capability.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hours at least in advance.
- No function failure occurs.



G215HVN01.1

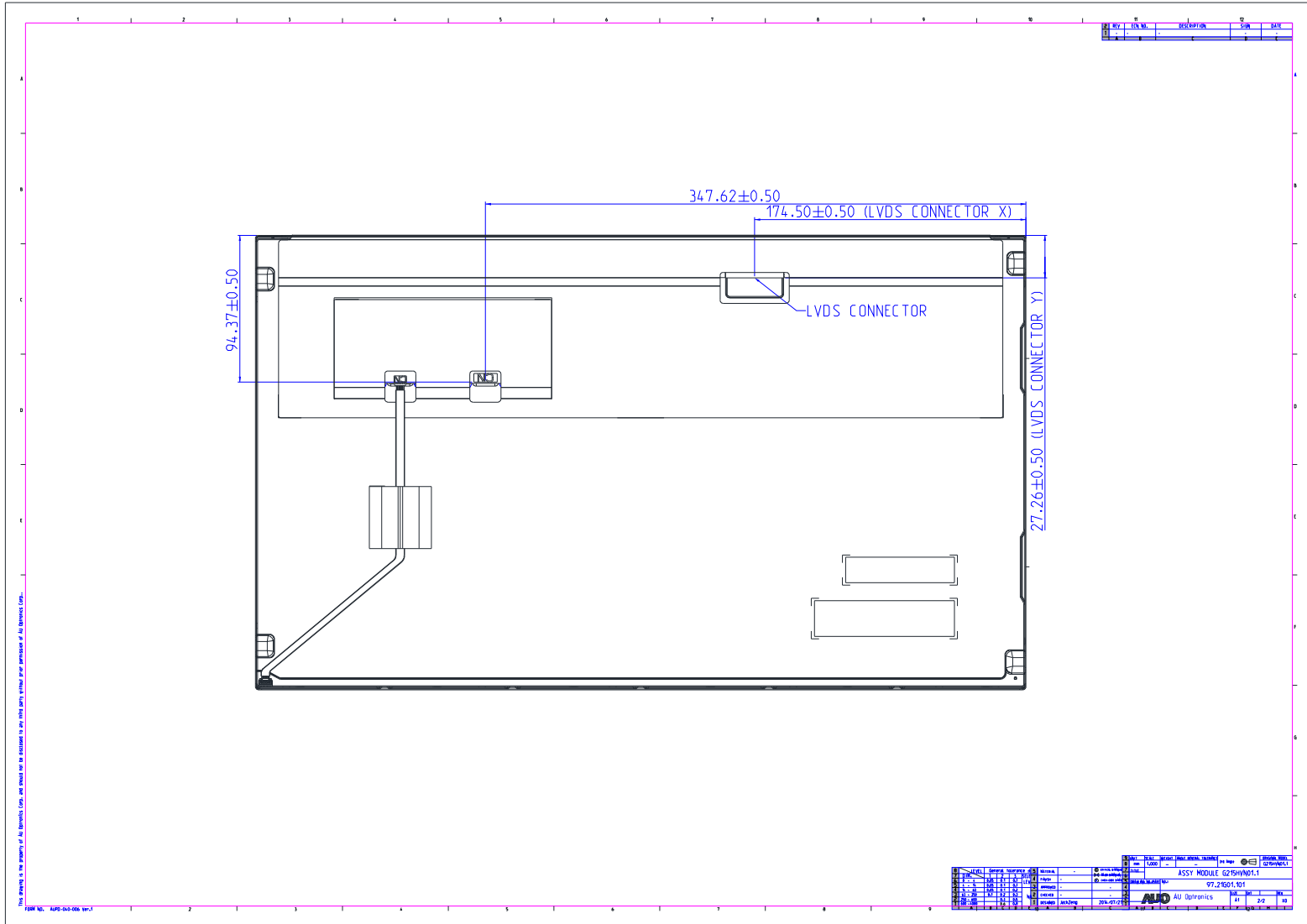
### 9. Mechanical Characteristic



G215HVN01.1 rev 1.4



G215HVN01.1



## **11 Safety**

### **11.1 Sharp Edge Requirements**

There will be no sharp edges or comers on the display assembly that could cause injury.

### **11.2 Materials**

#### **11.2.1 Toxicity**

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible AUO toxicologist.

#### **11.2.2 Flammability**

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process.

The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

### **11.3 Capacitors**

If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

### **11.4 National Test Lab Requirement**

The display module will satisfy all requirements for compliance to:

**UL 60950-1, Second Edition**

**U.S.A. Information Technology Equipment**



**21.5" PCAP Solution  
12014893**

Date: 2/11/2019

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## 1 Scope

DATA MODUL's PCAP solution 12014893 consists of a 21.5" capacitive touch screen. Please note that this is only a sub-assembly of the final product. The specification of the final end product might differ from this specification.

## 2 Touch Sensor and Cover Glass

### 2.1 Technical Parameters

Screen size	21.5 inch /54.6 cm
Format	Wide
Composite	SITO with Tail
Outline dimensions	490.54 x 283.1 x 1.1 mm (WxHxT)
Active area	480 x 271.5 mm (WxH)
Bending radius of tail	R = 2 mm recommended
Transmissivity	90% (min.)
Operating temperature and humidity	-30 to +85°C, < 90% RH
Storage temperature and humidity	-40 to +95°C, < 80 % RH
Tail connector	Hirose FH28H-80S-0.5SH, Hirose FH28H-50S-0.5SH



## 2.2 Reliability Tests

Low Temperature Storage Test	-40°C for 480h
High Temperature Storage Test	95°C for 480h
High Temperature / High Humidity Test	85°C, 85% RH for 480h
Cycle test	-40°C(30min), 85°C(30min), 500cycles

## 3 Recommended Touch Controller

The recommendation for this PCAP solution is a controller based on mXT2952T2. Please ask your local DATA MODUL sales representative for further details.

## 4 Optical Inspection Criteria and Handling Recommendations

### 4.1 Optical Inspection Criteria

For details on the optical inspection criteria, please refer to DATA MODULs Outgoing Spec or ask your local DATA MODUL sales representative.

### 4.2 Handling Recommendations

Precautions for operation

- Do not put a heavy, hard or sharp object on the product
- Do not bend the product in order to assure the reliability
- Do not put one product on the other. Otherwise, it may cause the product to be scratched
- Don't use any organic solvent acid or alkali solution.

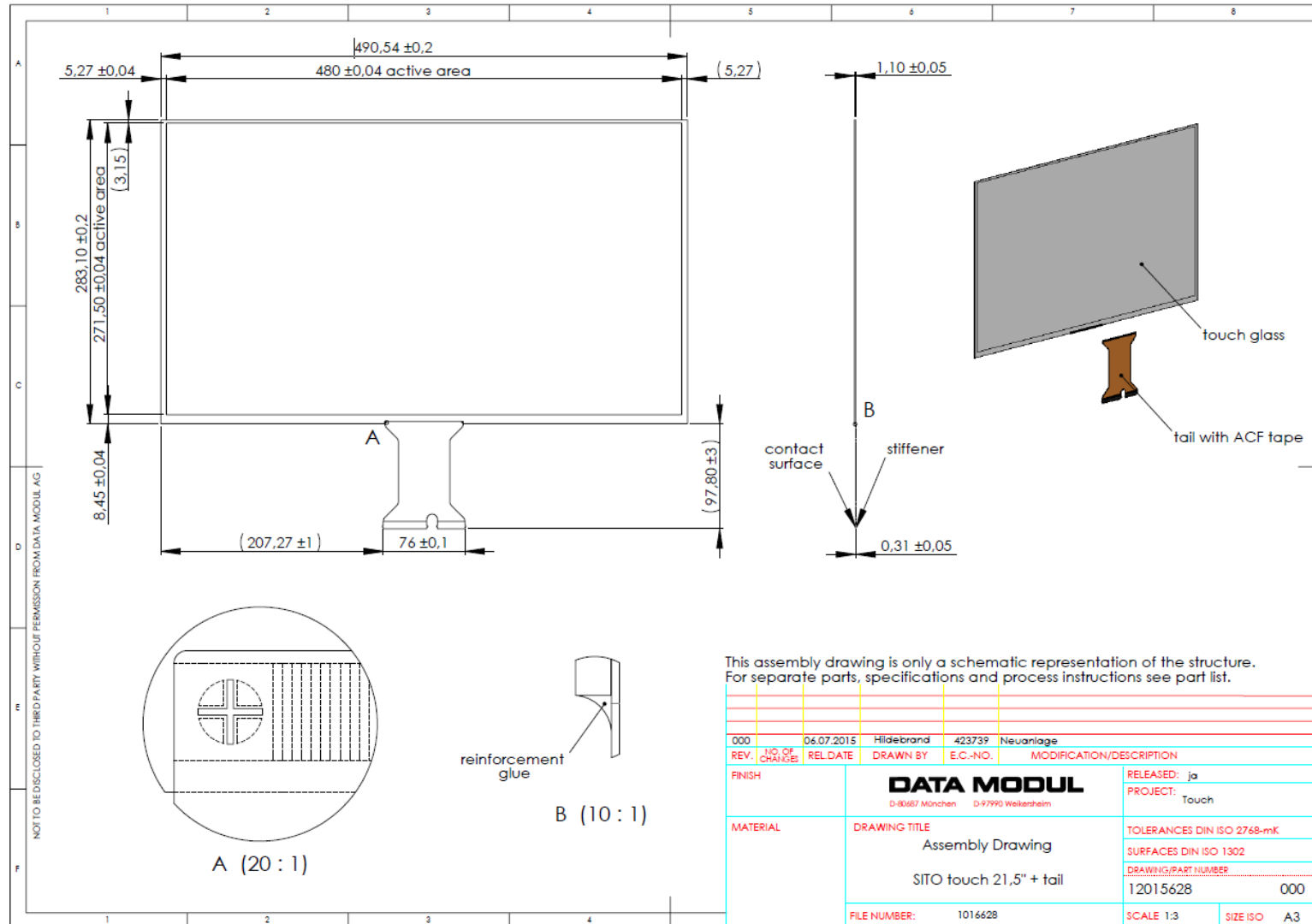
Precautions for mounting

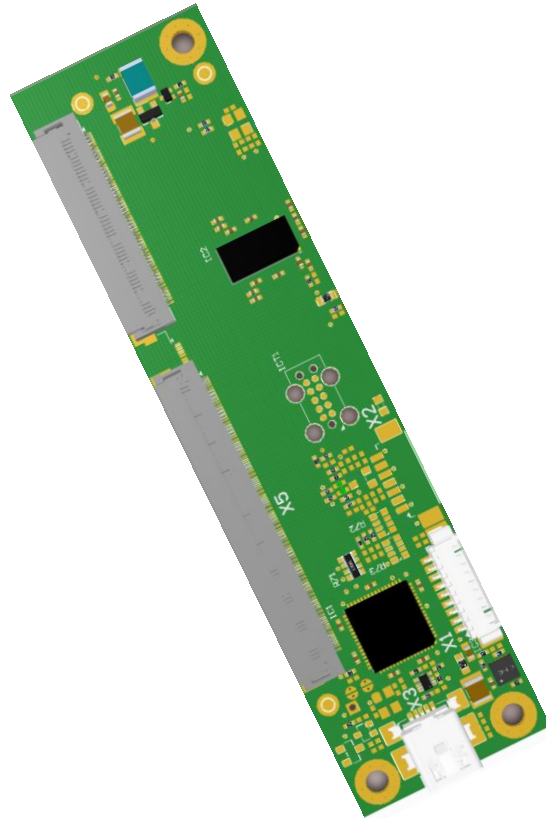
- The panel should be mounted using a configuration that either holds the panel by all four corners or by all four sides
- The bezel edge must be positioned outside the active area. The bezel may cause false activation if the edge overlaps the active area
- Any mounting configuration should ensure that there is no twisting force applied to the panel
- 1mm distance between TFT screen and touch panel is recommended

Precautions for tail

- The flex tail in general can be bent with a min. radius of about 1mm
- In order to avoid damaging and malfunction of the sensor, please don't bend the FPC area next to the panel
- Excess or repeated bending of the FPC connector should also be avoided

## 5 Appendix A: Technical Drawing





## **easyTOUCH mXT2952T2 2-tail PCAP USB controller**

Revision: 003

Date: 2016-03-29

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# 1 Introduction

The easyTouch mXT2952T2 Controller is designed as a part of the capacitive touch systems developed by Data Modul. It offers the possibility to connect a projective capacitive touch sensor to standard computers or embedded systems using USB.

The controller is based on the Atmel maXTouch 2952T2 which offers a very good touch performance and high noise resistance. To get the best touch performance with water and glove usage the mXT2952T2 has integrated self-capacitance technology. In combination with the mutual-capacitance entity the controller is applicable for single- and multi-touch. Together with outstanding filter technology the maXTouch ICs are suitable for industrial, medical and other applications.

For the communication with the OS the controller uses Data Modul's Driverless firmware. The firmware connects as a Human Interface Device (HID) without an additional driver to the most popular operating systems like Windows XP, Windows 7 / 8, Windows CE5/6/7, OSX and Linux. For more information about the Data Modul Driverless firmware please refer to the *Driverless Controller User Guide*.

## 2 Controller specification

### 2.1 Mechanical features

Size	105x27x6 mm
Operating temperature	-40 to +85 °C
Storage temperature	-40 to +85 °C
Temperature slew rate	10 °C /minute (max.)
Relative humidity	95 % at 60 °C no condensation
RoHS compliant	Yes

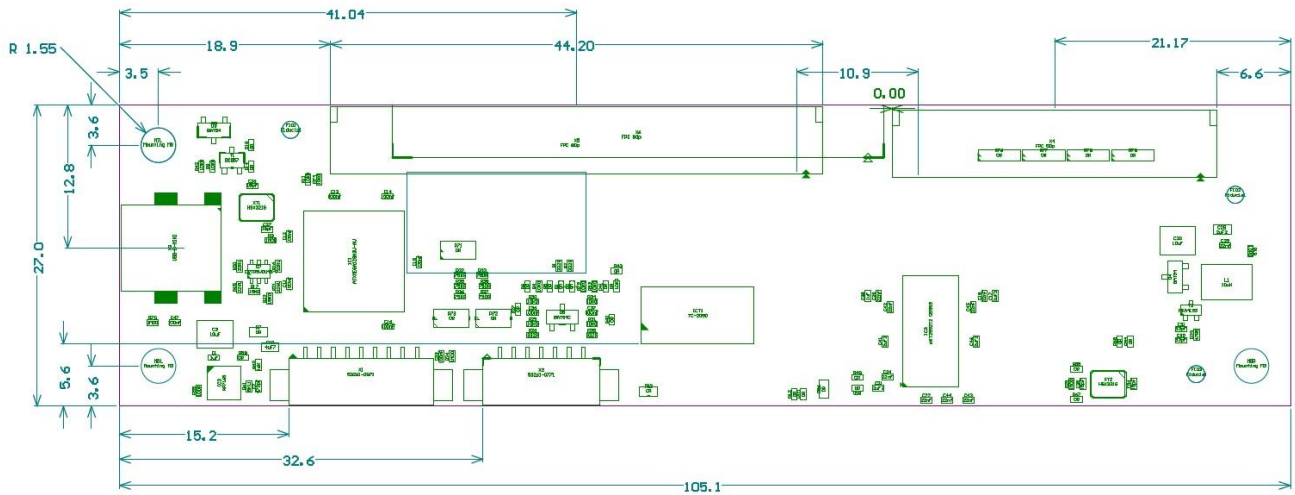
### 2.2 Connection features

Protocol	HID mouse, HID digitizer
Multi touch	16 fingers (max.)
Single touch	HID mouse with right mouse button emulation
Resolution	4096 x 4096 (x/y)
Report rate	>100 Hz for 15 touches, subject to configuration
USB connector	Mini USB or Molex 53261-0971

### 2.3 Electrical features

Power supply	5 V± 5%
Vin ripple	±50 mV peak-peak (max.)
On board voltage	3.3 V and 8.5 V
Power consumption	500 mW (max. subject to configuration)

### 3 Mechanical drawing



Height: 6 mm (including components)

## 4 Connectors and signals

### 4.1 Connectors

Connector	Type	Connection
X1	1.25 mm Pitch 9 pin header Molex 53261-0971 compatible	USB
X3	Mini USB connector	USB
X4	0.5 mm pitch 50 pin header	Flextail to touch sensor
X5	0.5 mm pitch 80 pin header	Flextail to touch sensor

### 4.2 X1 pin assignment

X1	Signal	Description
1	VDD_5V	USB power supply
2	USB DM	USB signal -
3	USB DP	USB signal +
4		Do not use
5		Do not use
6		Do not use
7		Do not use
8		Do not use
9	GND	Ground

Matching USB cable (length 2m): Article number **TP72241**



## 5 UL information

Part	Type	UL number
X1	1.25 mm pitch 9 pin header MOLEX 53261-0971 compatible	Molex 53261-xx71: E29179 or YeonHo 12505WR-xx: E108706
X3	Mini USB connector	FCI 10033526-N3212LF or W+P 8233-2-05-60-FTR/SW: Thermoplastic UL94V-0
X4	0.5 mm pitch 50 pin header	Hirose FH28D-xxS-0.5SH(05): LCP resin (UL94V-0)/gray LCP resin (UL94V-0)/black
X5	0.5 mm pitch 80 pin header	Hirose FH28H-xxS-0.5SH(05): LCP resin (UL94V-0)/gray LCP resin (UL94V-0)/black
PCB		Fastprint: E204460

## 7 Appendix: Frequently asked questions

### Touch coordinates are not stable and the cursor is “jumping around”?

In mains-operated systems this can happen if the touch controller is missing the systems ground reference. Another reason can be an extreme amount of noise present that exceeds the touch threshold set in the controller.

Please connect the system ground reference to one of the mounting holes. For best touch performance the touch controller needs a low impedance AC connection to the person that operates the system to achieve a good current loop back to the controller.

If the instability is caused by a noise source like a display, a switching regulator or a RF antenna your system may have an integration issue. With proper settings the controller can most likely suppress the noise. However, eliminating the noise source should be the first thing to check. If you have any difficulties to find the correct settings, please contact Data Modul.



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