



☒ Preliminary Specifications

☐ Final Specifications

Module	15 Inch Color TFT-LCD
Model Name	G150XTK01.1
Note	oTP display

Customer	Date	Approved by	Date
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Record of Revision

Version and Date	Page	Old description	New Description
0.0 2016/06/16	All	First Edition	

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

G150XTK01.1 is a Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display, a driver circuit, and a LED backlight system. The screen format is intended to support 4:3 XGA (1024(H) x 768(V)) screen and 16.2M or 262K colors. All input signals are LVDS interface compatible.

G150XTK01.1 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]	15
Active Area	[mm]	304.128(H) x 228.096(V)
Pixels H x V		1024x3(RGB) x 768
Pixel Pitch	[mm]	0.297 x 0.297
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	[Volt]	3.3 typ.
Typical Power Consumption	[Watt]	6.9w (typ. @ black pattern)
Weight	[Grams]	TBD (Max.)
Physical Size	[mm]	326.5(H)x 253.5(V) x 10.0(D) (max.)
Electrical Interface		1 Lane eDP1.2
Surface Treatment		Anti-glare
Support Color		16.2M/262K
Temperature Range Operating Storage (Non-Operating)	[°C] [°C]	-30 to +85 -30 to +85
RoHS Compliance		RoHS Compliance
Light Bar Unit		LED, Non-replaceable

2.2 Touch Characteristics

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

Item		Unit	Specifications
Type of Touch Sensor			Projective Capacity Touch (on-cell touch)
Cover Lens	Outline Dimension	[mm]	NA
	Material		
	Thickness	[mm]	
	Visual Area	[mm]	
Touch Sensor	Outline Dimension		on cell touch
	Thickness		on cell touch
	Active Area		306.130 (W) x 230.092 (H)
Touch Controller			ILITEK 2312
Channel (X * Y)		[ch]	55 * 41
Interface			USB 2.0 full speed
Surface Hardness		[H]	3
Multi-Touch Point		Points	5
Single/Multi-points Accuracy		[mm]	Center : +/- 1.5mm Edge : +/- 2.5mm
Linearity		[mm]	Center : +/- 1.5mm Edge : +/- 2.5mm
The smallest distance between 2 points		[mm]	22mm
Report Rate			>100 Hz
OS support			Win 7, Win 8

2.3 Optical Characteristics

The optical characteristics are measured under stable conditions at 25°C (Room Temperature):

Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	[cd/m2]		280	350	-	1
Uniformity	%	9 Points	75	80	-	1, 2, 3
Contrast Ratio			400	700	-	4
Cross talk	%		-	1.2	1.5	5
Response Time	[msec]	Rising	-	5.7		6
	[msec]	Falling	-	2.3		
	[msec]	Raising + Falling	-	8		
Viewing Angle	[degree]	Horizontal (Right)	70	80	-	7
	[degree]	CR = 10 (Left)	70	80	-	

	[degree] [degree]	Vertical CR = 10	(Upper) (Lower)	60 70	70 80	- -
Color / Chromaticity Coordinates (CIE 1931)		Red x		0.567	0.617	0.667
		Red y		0.296	0.346	0.396
		Green x		0.286	0.336	0.386
		Green y		0.562	0.612	0.662
		Blue x		0.109	0.159	0.209
		Blue y		0.015	0.065	0.115
		White x		0.263	0.313	0.363
		White y		0.279	0.329	0.379
Color Gamut	%				60	-

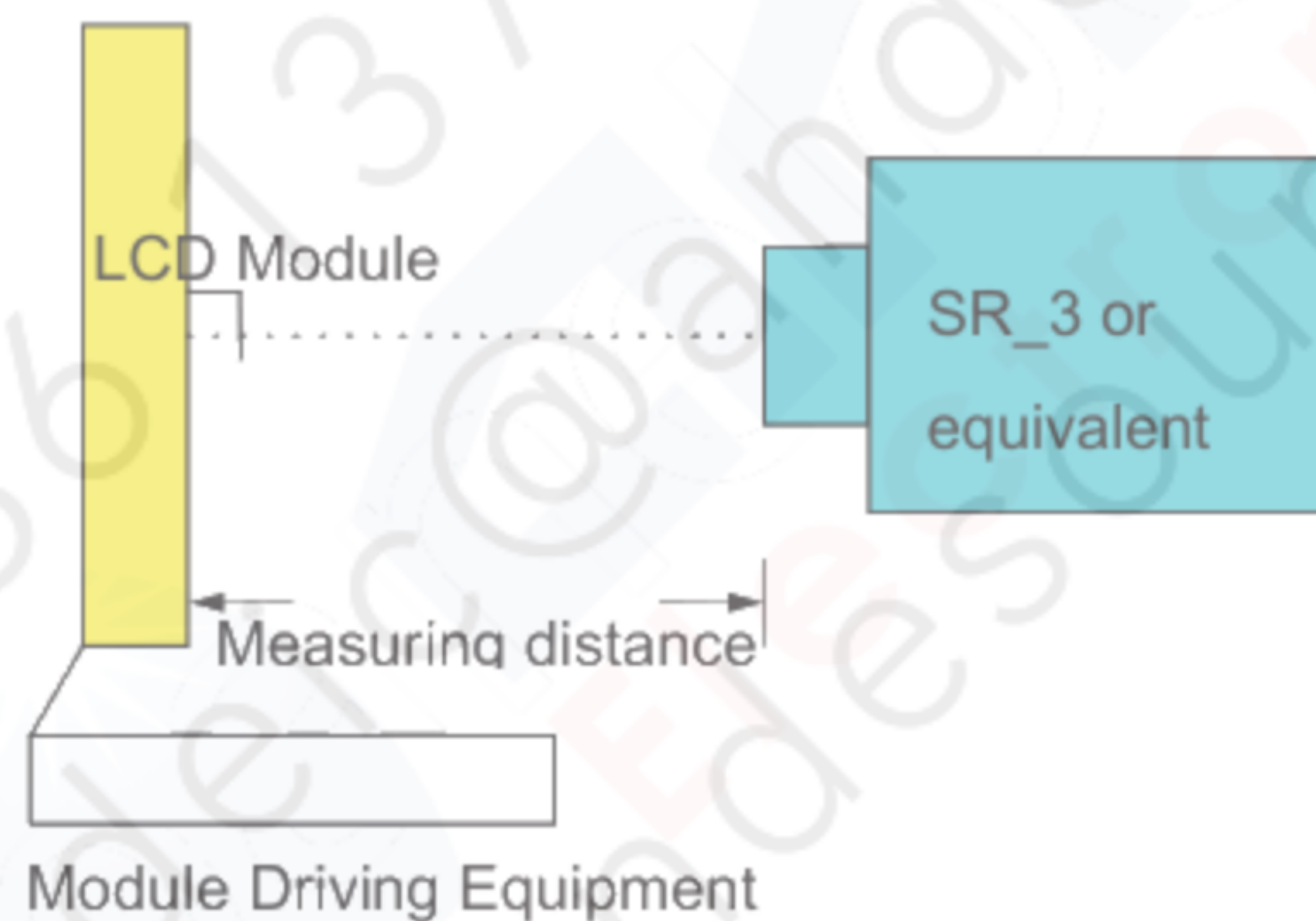
Note 1: Measurement method

Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)

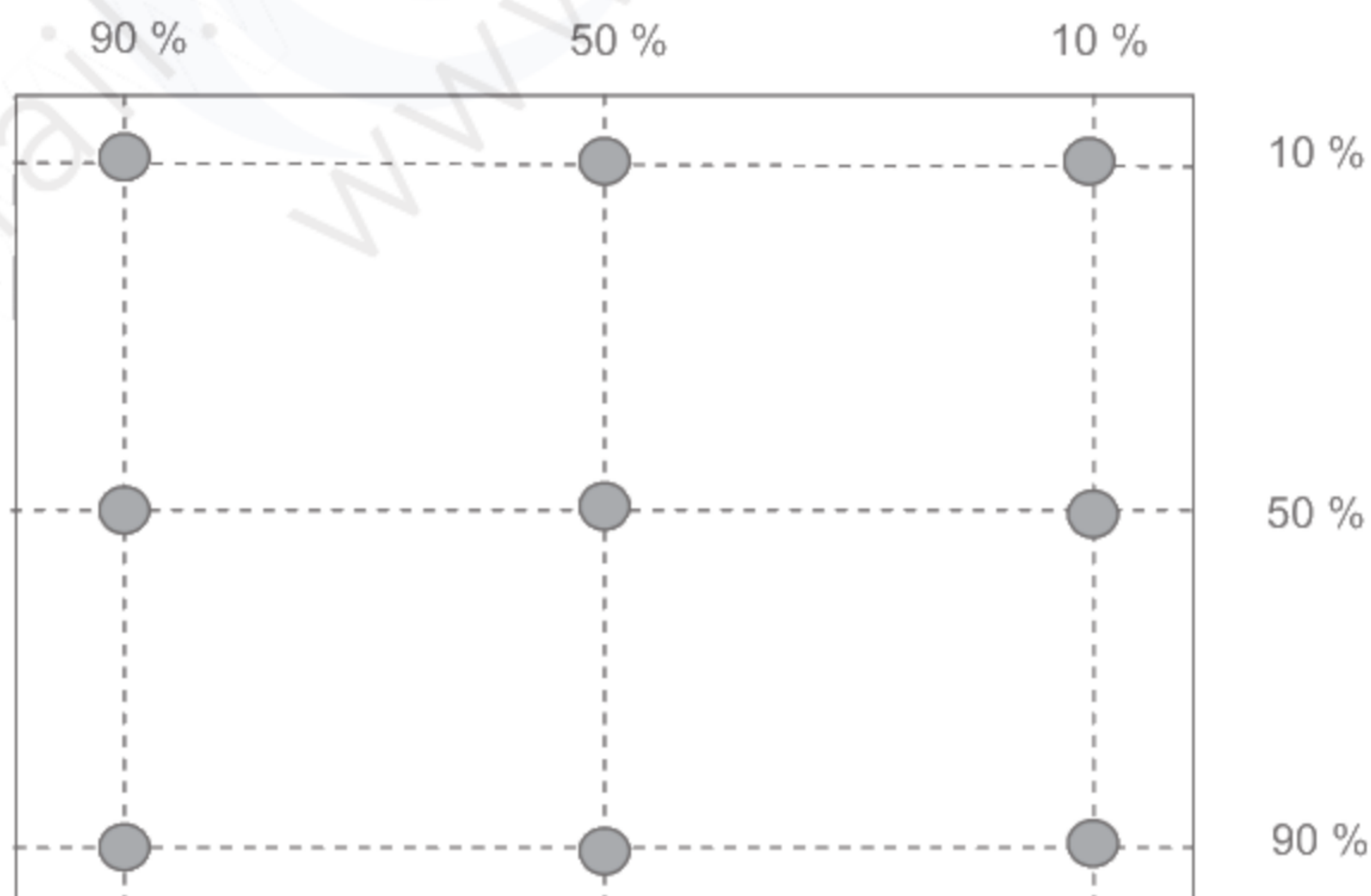
Aperture 1° with 50cm viewing distance

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):

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

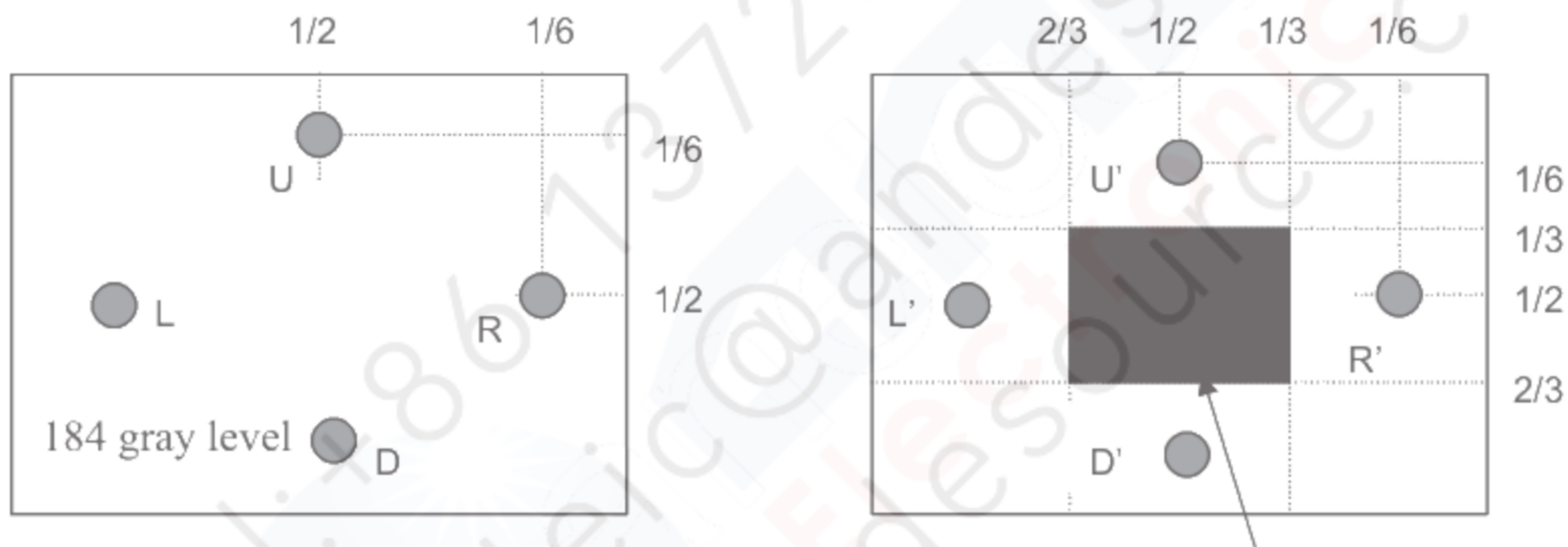
Note 5 : Definition of cross talk (CT)

$$CT = \max(|Y' - Y| / Y \times 100 (\%)), Y = U/D/L/R$$

Where

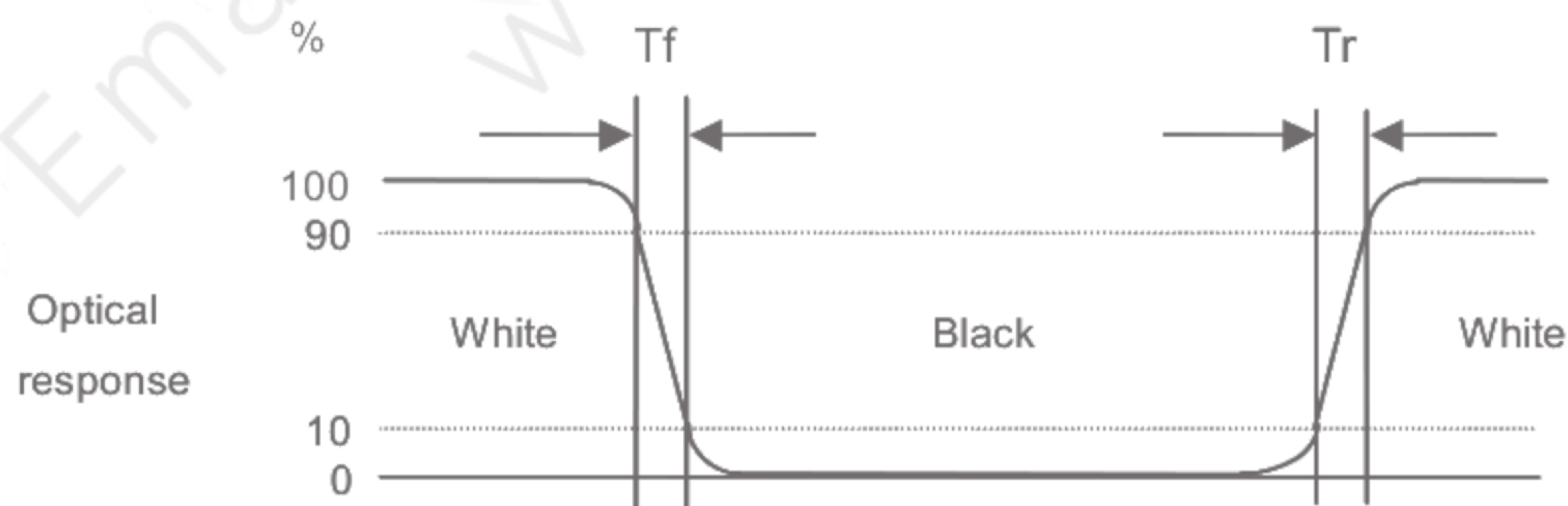
Y = Luminance of measured location without gray level 0 pattern (cd/m2)

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



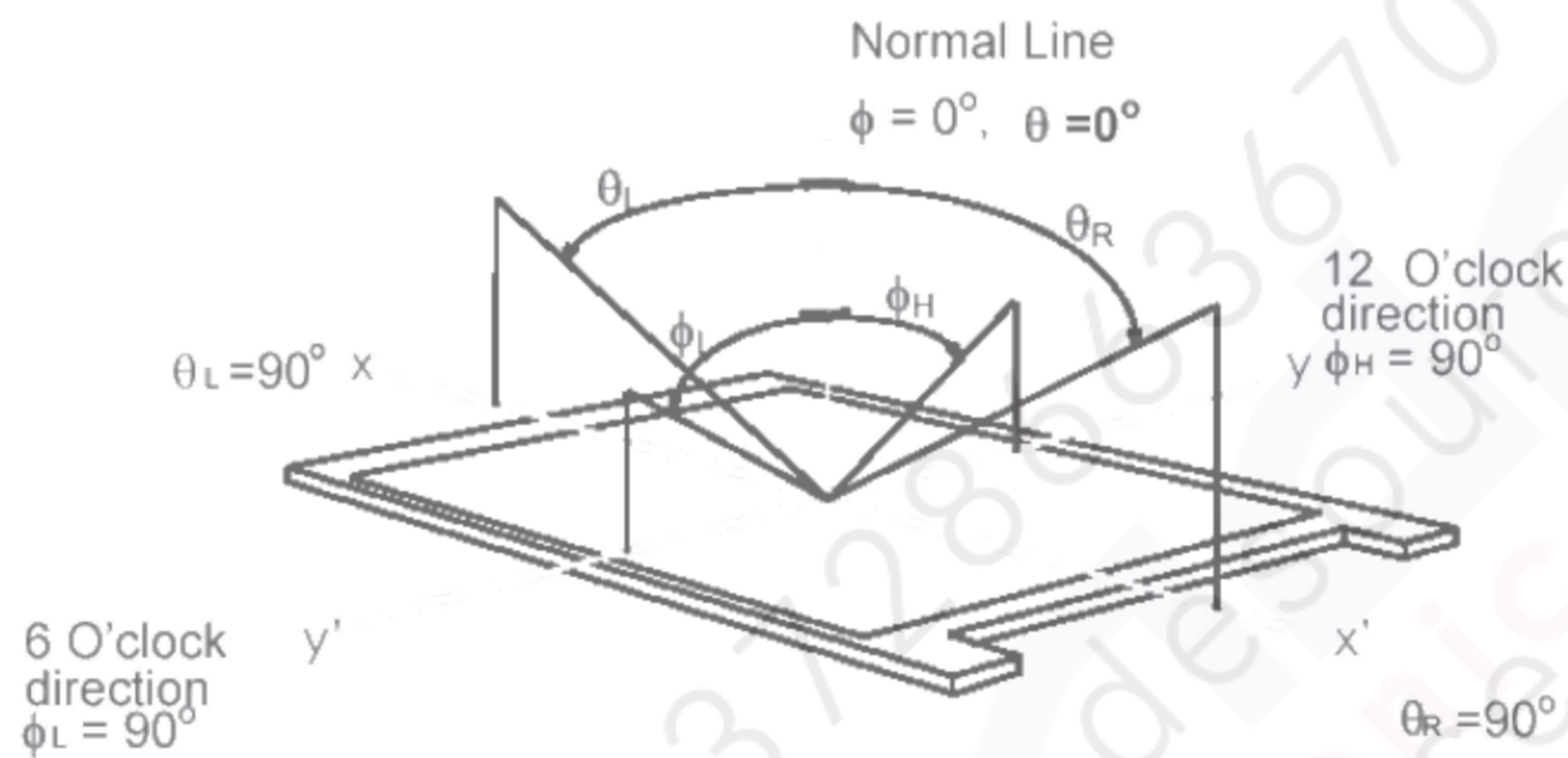
Note 6: Definition of response time:

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.



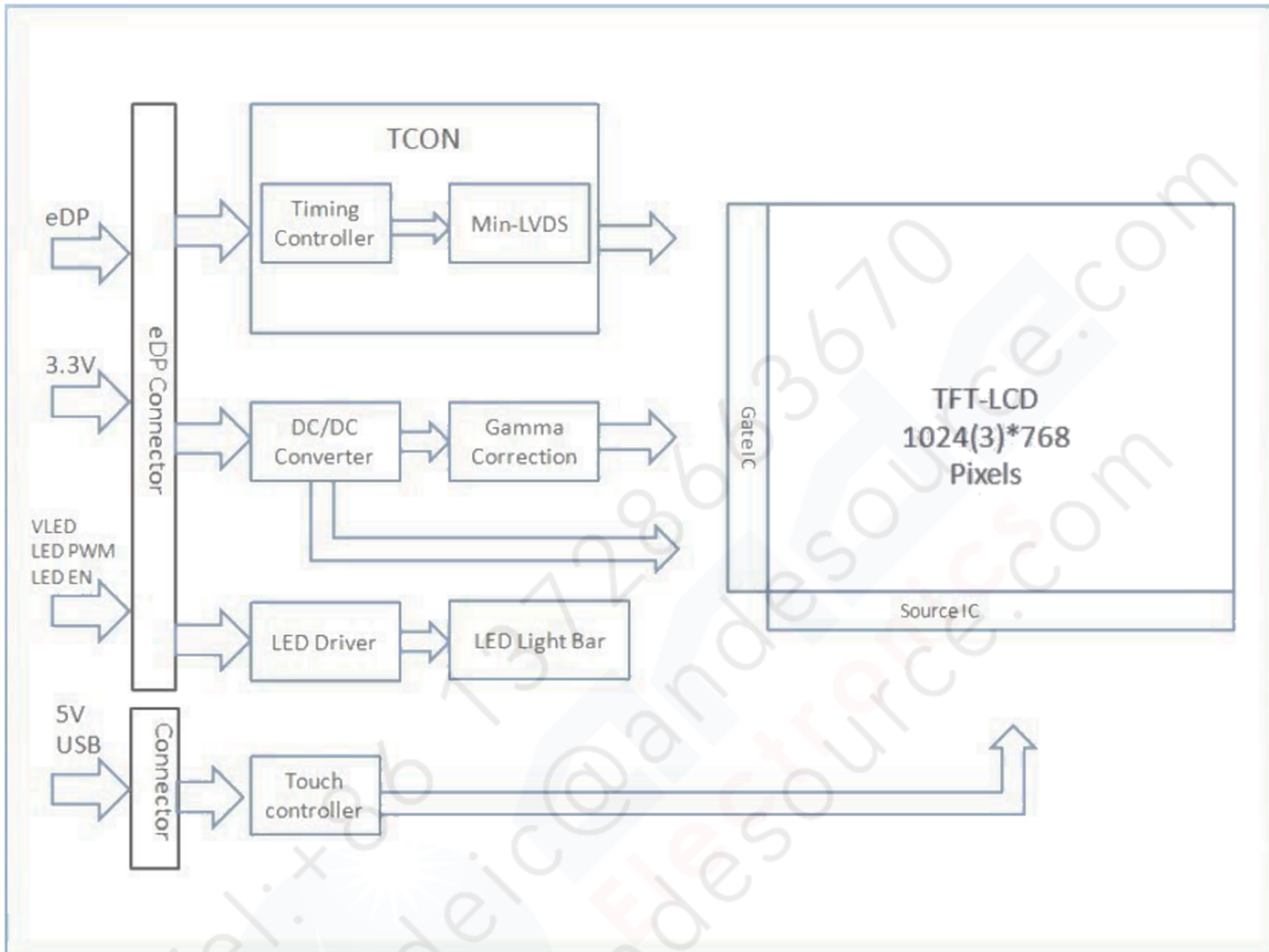
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 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 below: 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 to its center to develop the desired measurement viewing angle.



3. Functional Block Diagram

The following diagram shows the functional block of the 15 inch color TFT/LCD module:



4. Absolute Maximum Ratings

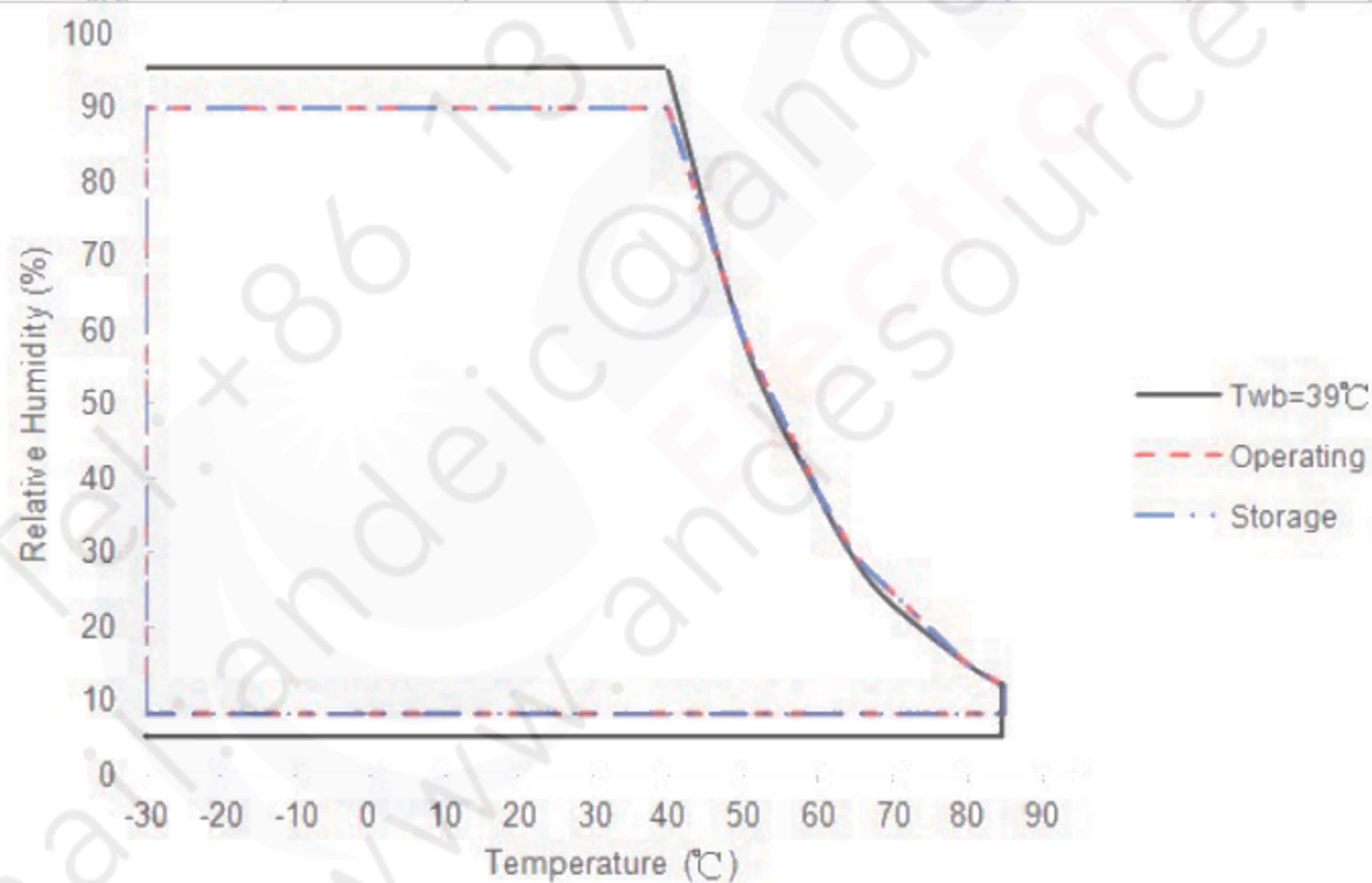
4.1 Absolute Ratings of TFT LCD Module

Item	Symbol	Min	Max	Unit
Logic/LCD Drive Voltage	Vin	-0.3	+3.6	[Volt]

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-30	+85	[oC]
Operation Humidity	HOP	8	90	[%RH]
Storage Temperature	TST	-30	+85	[oC]
Storage Humidity	HST	8	90	[%RH]

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



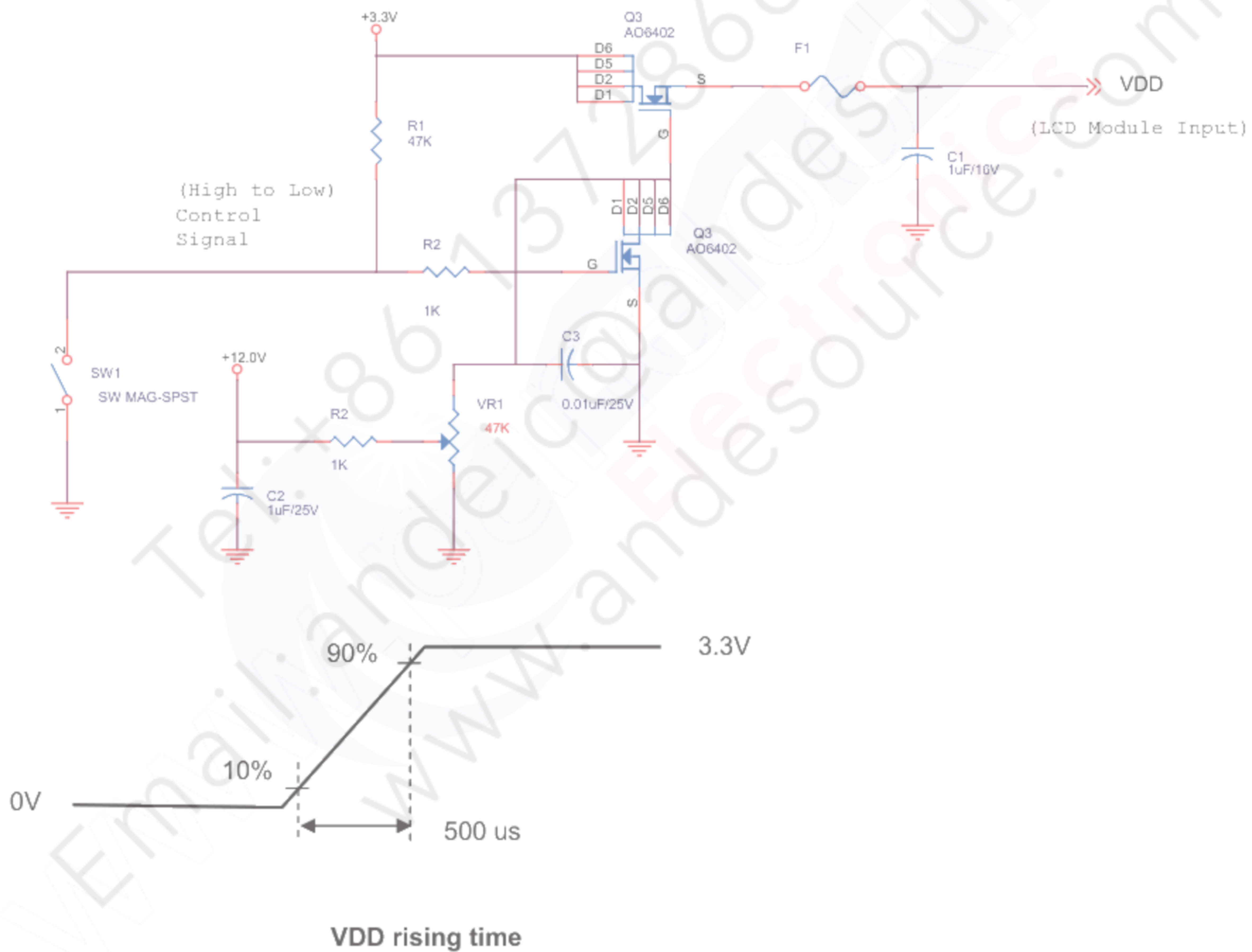
5. Electrical Characteristics

5.1 TFT LCD Module

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	[Volt]	±10%
IDD	VDD Current	-	1	1.5	[A]	
Irush	LCD Inrush Current	-	-	3	[A]	Note 1
PDD	VDD Power	-	3.3	5	[Watt]	

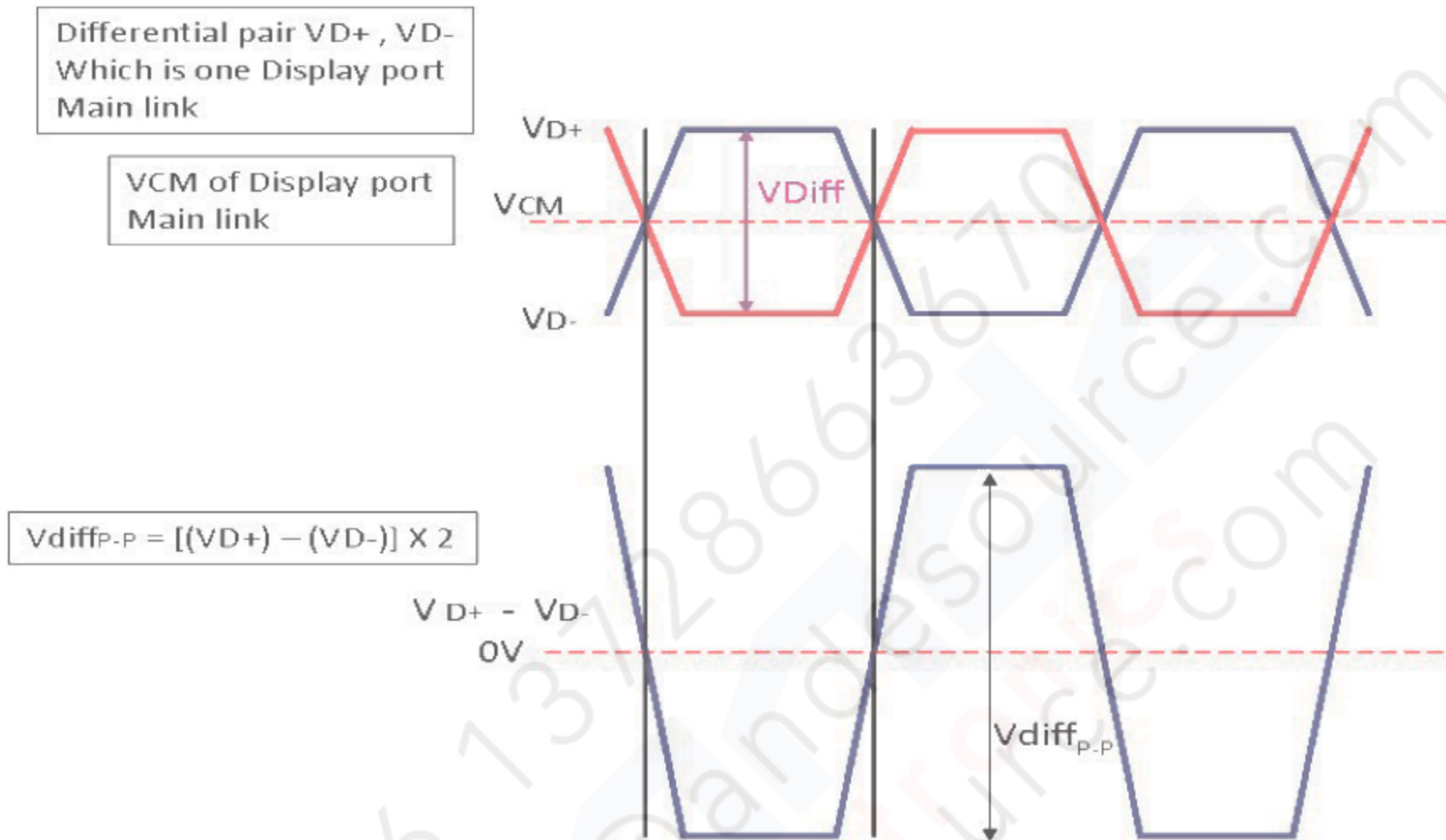
Note 1: Measurement condition:



5.1.2 Signal Electrical Characteristics

Signal electrical characteristics are as follows:

Display Port main link signal:

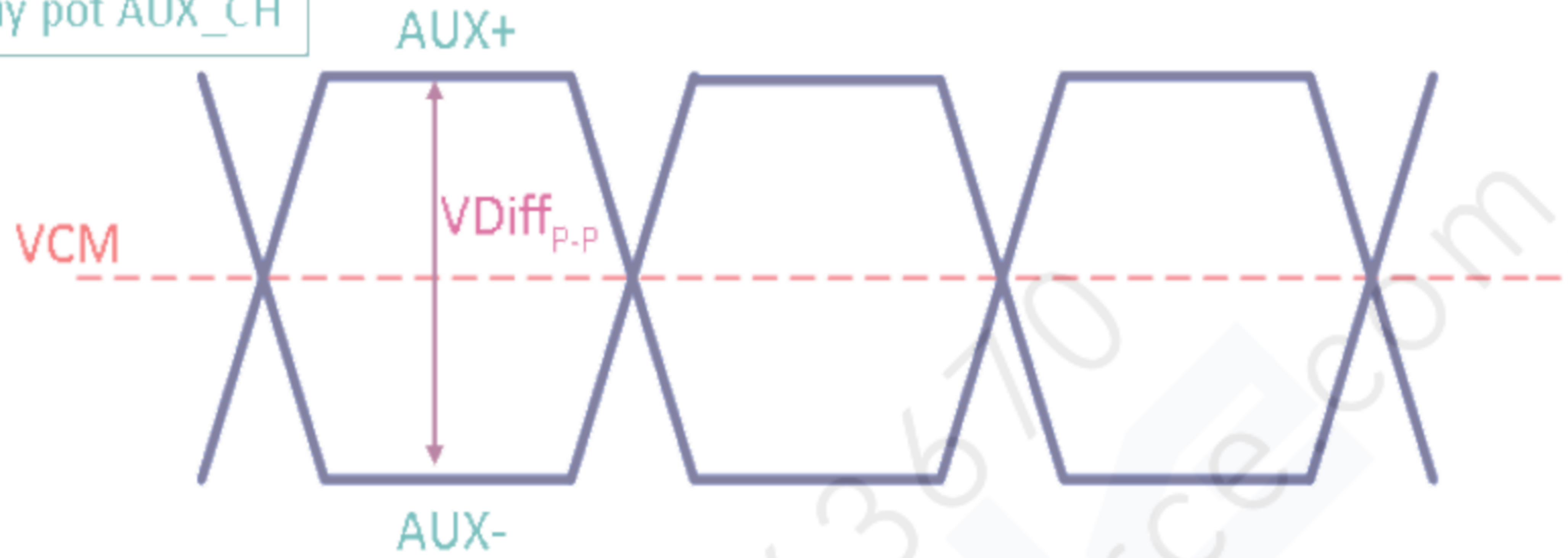


Display port main link					
		Min	Typ	Max	unit
VCM	RX input DC Common Mode Voltage		0		V
VDiff _{P-P}	Peak-to-peak Voltage at a receiving Device	120		1320	mV

Follow as VESA display port standard V1.1a

Display Port AUX CH signal:

Differential AUX+ , AUX-
Which is Display port AUX_CH



Display port AUX_CH					
		Min	Typ	Max	unit
VCM	AUX DC Common Mode Voltage		0		V
VDiffP-P	AUX Peak-to-peak Voltage at a receiving Device	0.4	0.6-	0.8	V

Follow as VESA display port standard V1.1a.

Display Port VHPD signal:

Display port VHPD					
		Min	Typ	Max	unit
VHPD	HPD Voltage	2.25	-	3.6	V

Follow as VESA display port standard V1.1a.

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°C (Room Temperature).

Symbol	Parameter	Min	Typ	Max	Unit	Remark
V _{cc}	Input Voltage	10.8	12	13.2	Volt	
I _{vcc}	Input Current	-	0.45	-	A	100% Dimming
P _{LED}	Power Consumption	-	5.4	-	Watt	100% Dimming
I _{rush}	Inrush Current	-		2	A	
V _{LED on/off}	On Control Voltage	3.0		5.5	Volt	
	Off Control Voltage	-		0.8	Volt	
F _{PWM}	PWM Dimming Frequency	200	-	20k	Hz	
	High Voltage	3.0		5.5	Volt	
	Low Voltage	-		0.8	Volt	
	Dimming Duty Cycle	5	-	100	%	
I _F	LED Forward Current	-	60		mA	Ta = 25°C
LED Life time		50000	70000	-	Hrs	Ta = 25°C

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

Note 2: If G150XTK01.0 module is driven at high ambient temperature & humidity condition. The operating life will be reduced.

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

5.3 Touch Sensor Module

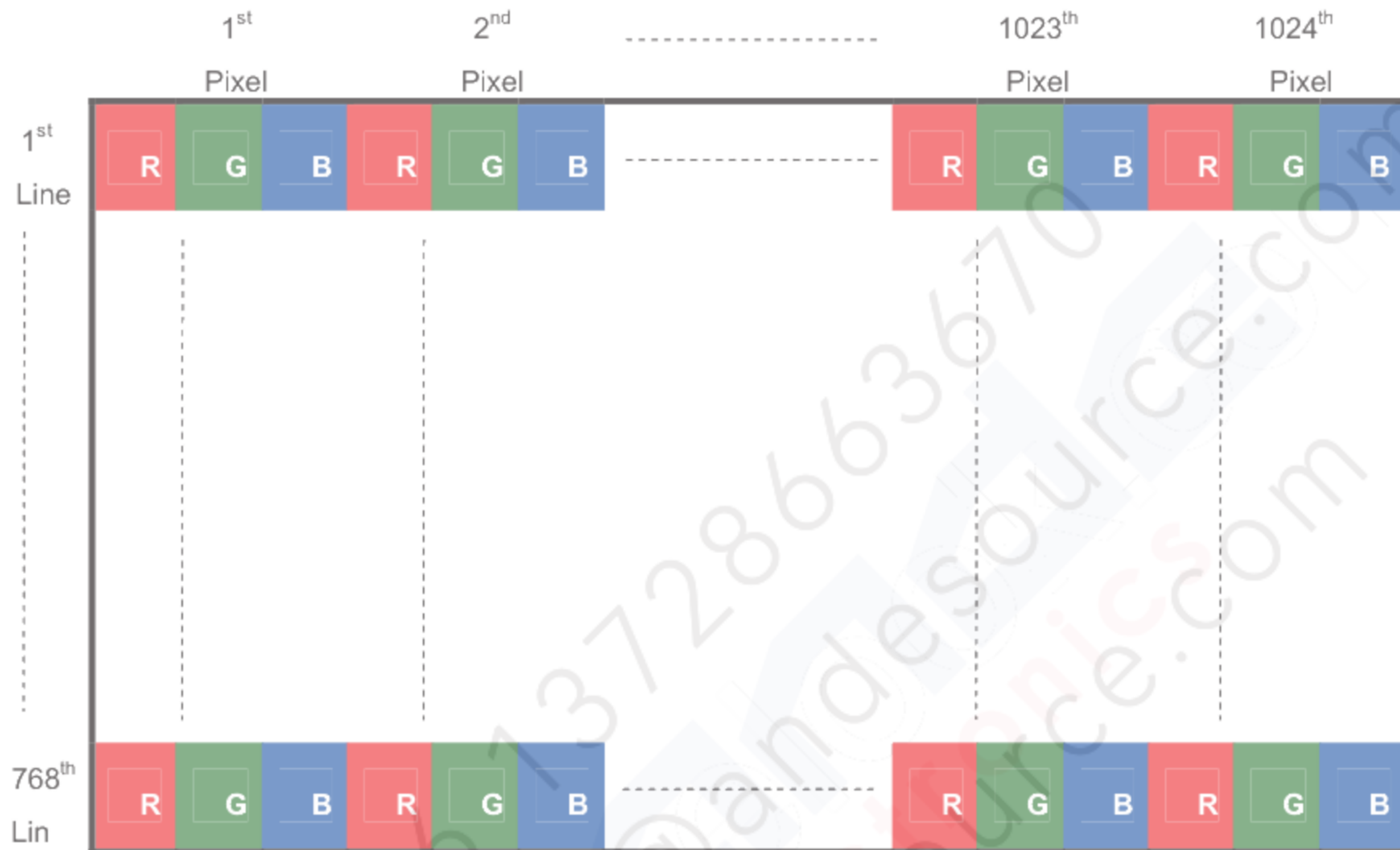
5.3.1 Power Specification

Items	Symbol	Specifications			Unit	Notes
		Min.	Typ.	Max.		
Touch Panel Power Supply	VTSP	4.5	5	5.5	V	Ripple <100mV
Input Voltage	V _{IH}	0.65V _{DD}	-	V _{DD} +0.5	V	V _{DD} =3.3
	V _{IL}	-0.5	-	0.3V _{DD}	V	
Normal mode Current consumption @ Report rate 100Hz		130	140	150	mA	
Idle mode Current consumption		75	85	95	mA	

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

6.3.1 Timing Characteristics

Basically, interface timings should match the 1024x768 /60Hz manufacturing guide line timing.

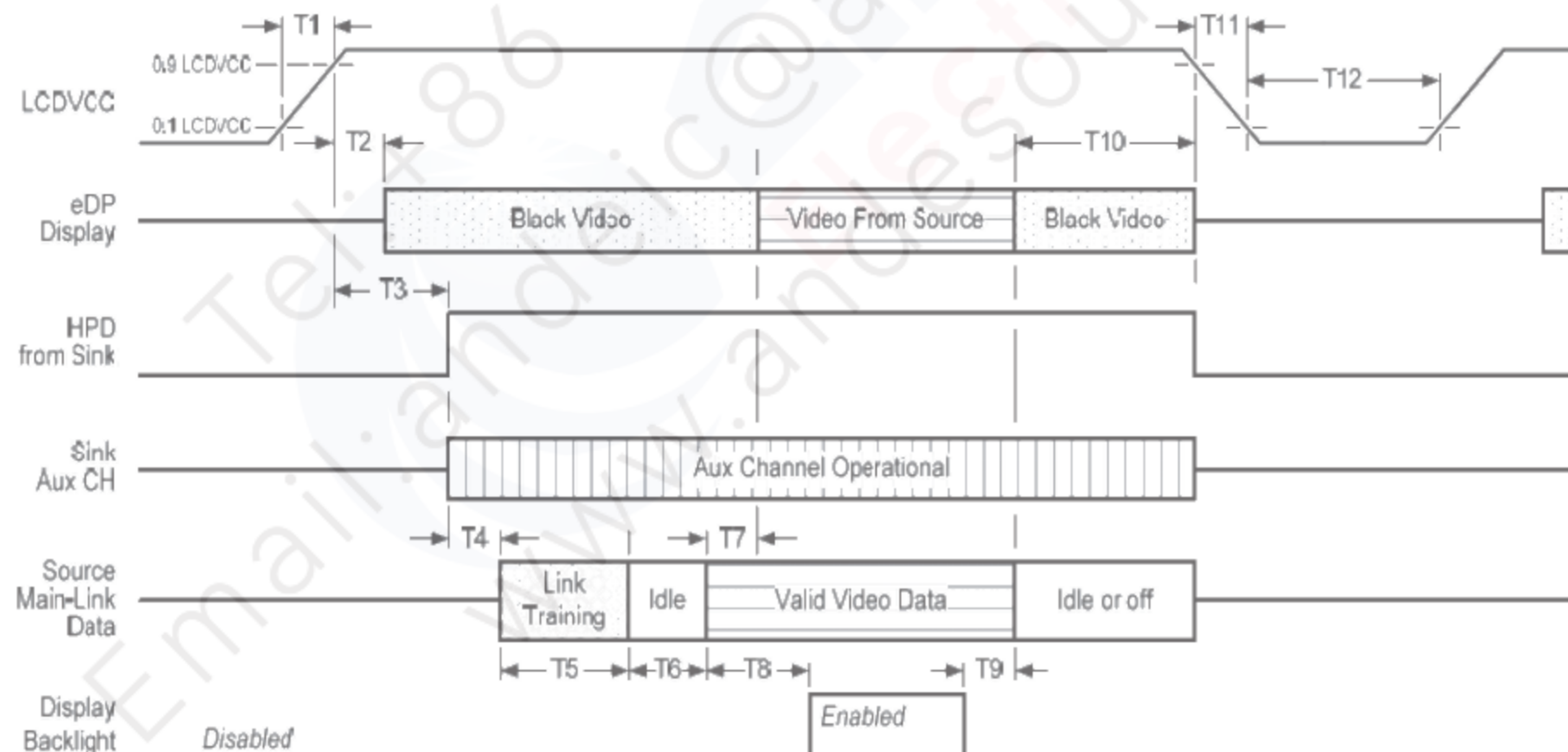
Parameter		Symbol	Min.	Typ.	Max.	Unit
Frame Rate		-		60	-	Hz
Clock frequency		1/ TClock	50	65	75	MHz
Vertical Section	Period	TV	783	806	968	TLine
	Active	TVD	768			
	Blanking	TVB	15	38	200	
Horizontal Section	Period	TH	1224	1344	2024	TClock
	Active	THD	1024			
	Blanking	THB	200	320	1000	

Note 1 : DE mode only

Note 2 : The maximum clock frequency = TV*TH*Frame Rate < 75MHz

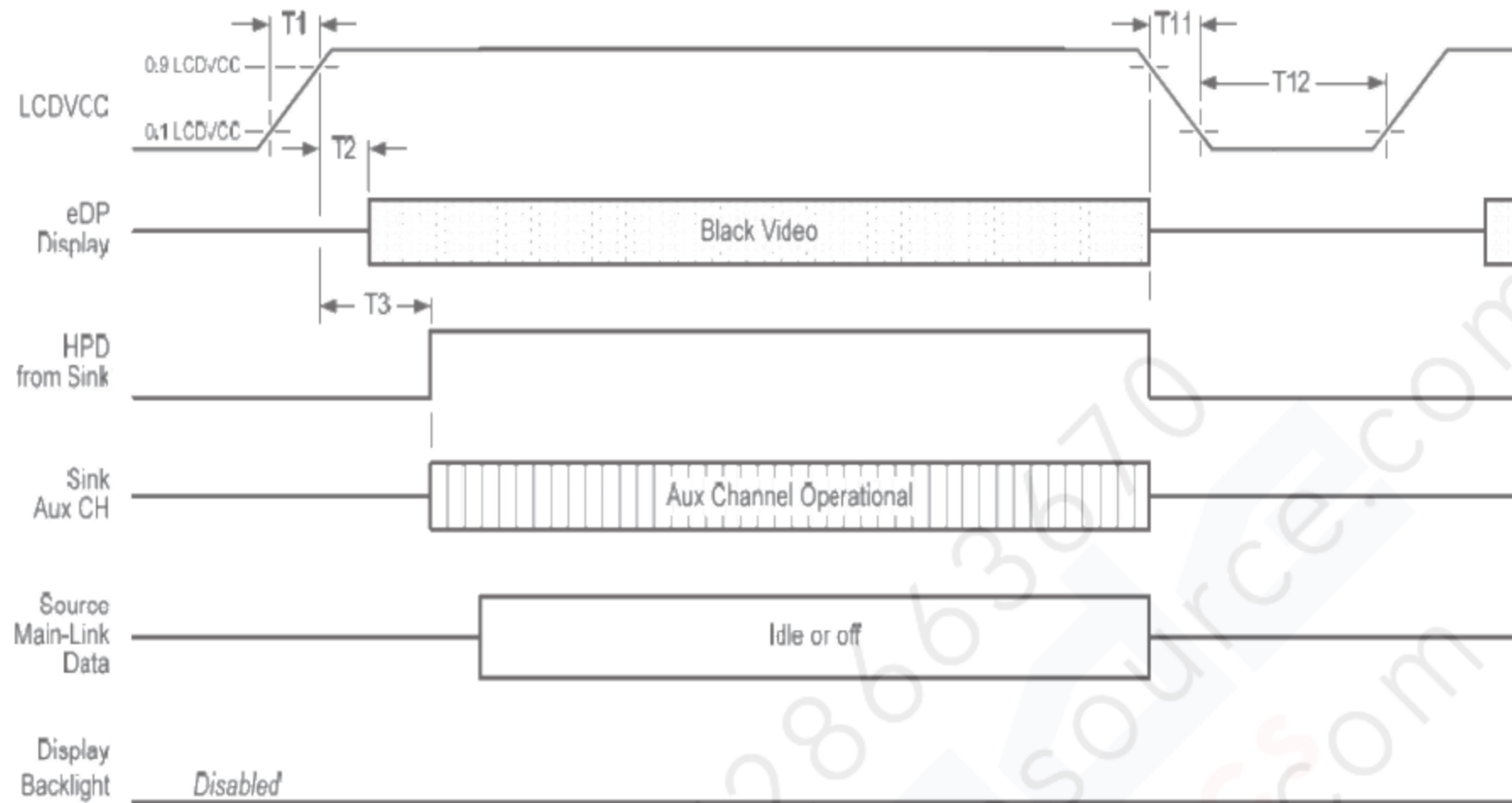
6.4 Power ON/OFF Sequence

6.4.1 Display Port panel power sequence:



Display port interface power up/down sequence, normal system operation

6.4.2 Display Port AUX_CH transaction only:



Display port interface power up/down sequence, AUX_CH transaction only

6.4.3 Display Port panel power sequence timing parameter:

Timing parameter	Description	Reqd. by	Limits			Notes
			Min.	Typ.	Max.	
T1	power rail rise time, 10% to 90%	source	0.5ms		10ms	
T2	delay from LCDVDD to black video generation	sink	0ms		200ms	prevents display noise until valid video data is received from the source
T3	delay from LCDVDD to HPD high	sink	0ms		200ms	sink AUX_CH must be operational upon HPD high.
T4	delay from HPD high to link training initialization	source				allows for source to read link capability and initialize.
T5	link training duration	source				dependant on source link to read training protocol.
T6	link idle	source				Min accounts for required BS-Idle pattern. Max allows for source frame synchronization.
T7	delay from valid video data from source to video on display	sink	0ms		50ms	max allows sink validate video data and timing.
T8	delay from valid video data from source to backlight enable	source				source must assure display video is stable.
T9	delay from backlight disable to end of valid video data	source				source must assure backlight is no longer illuminated.
T10	delay from end of valid video data from source to power off	source	0ms		500ms	
T11	power rail fall time, 90% to 10%	source			10ms	
T12	power off time	source	500ms			

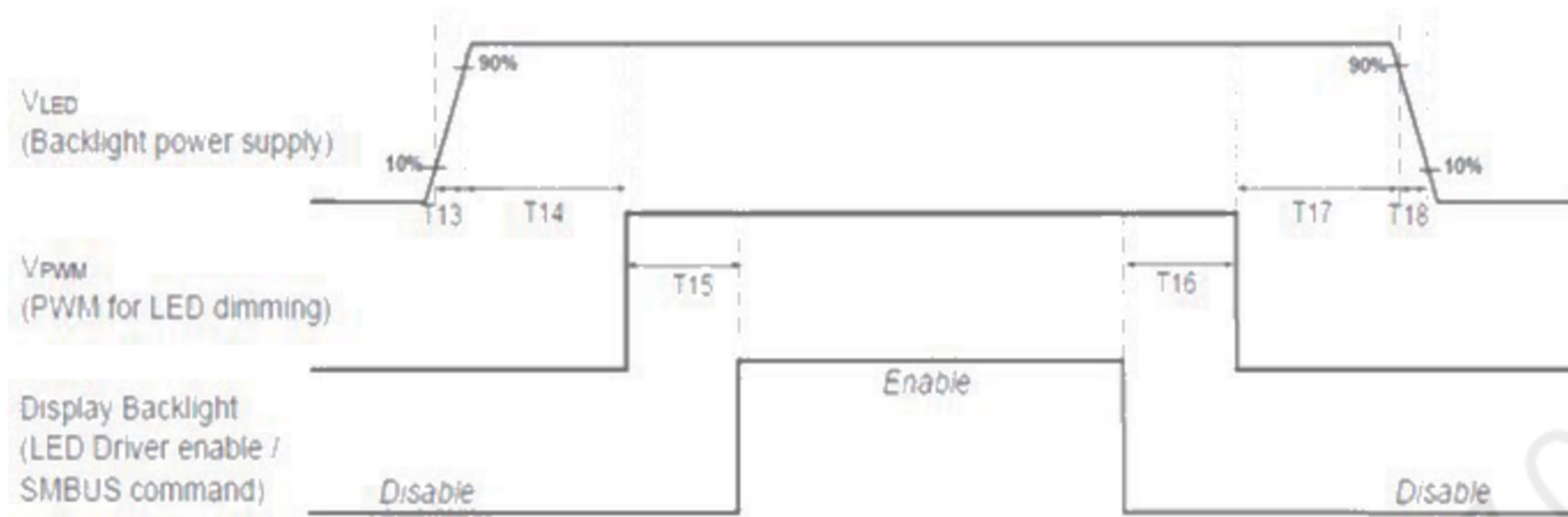
Note1: The sink must include the ability to generate black video autonomously. The sink must automatically enable black video under the following conditions:

- upon LCDVDD power on (within T2 max)-when the "Novideostream_Flag" (VB-ID Bit 3) is received from the source (at the end of T9).
- when no main link data, or invalid video data, is received from the source. Black video must be displayed within 64ms (typ) from the start of either condition. Video data can be deemed invalid based on MSA and timing information, for example.

Note 2: The sink may implement the ability to disable the black video function, as described in Note 1, above, for system development and debugging purpose.

Note 3: The sink must support AUX_CH polling by the source immediately following LCDVDD power on without causing damage to the sink device (the source can re-try if the sink is not ready). The sink must be able to respond to an AUX_CH transaction with the time specified within T3 max.

6.4.4 Display Port panel B/L power sequence timing parameter:



	Min (ms)	Max (ms)
T13	0.5	10
T14	10	-
T15	10	-
T16	10	-
T17	10	-
T18	0.5	10
T19	1*	-
T20	1*	-

Note : When the adapter is hot plugged, the backlight power supply sequence is shown as below.



Seamless change: $T19/T20 = 5 \times T_{PWM}^*$
 $*T_{PWM} = 1/PWM \text{ Frequency}$

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: eDP Connector & Pin Assignment

Connector Name / Designation	Signal Connector
Manufacturer	IPEX or Compatible
Type / Part Number	IPEX 20455-030E-12 or Compatible
Mating Housing/Part Number	IPEX 20453-030T-11 or Compatible

eDP lane is a differential signal technology for LCD interface and high speed data transfer device.

PIN NO	Symbol	Function
1	NC	No Connect
2	H_GND	High Speed Ground
3	Lane 1_N	NC
4	Lane 1_P	NC
5	H_GND	High Speed Ground
6	Lane0_N	Comp Signal Link Lane 0
7	Lane0_P	True Signal Link Lane 0
8	H_GND	High Speed Ground
9	AUX_CH_P	True Signal Auxiliary Ch.
10	AUX_CH_N	Comp Signal Auxiliary Ch.
11	H_GND	High Speed Ground
12	LCD_VCC	LCD logic and driver power
13	LCD_VCC	LCD logic and driver power
14	NC	No connect
15	LCD_GND	LCD logic and driver ground
16	LCD_GND	LCD logic and driver ground
17	HPD	HPD signale pin
18	BL_GND	Backlight_ground
19	BL_GND	Backlight_ground
20	BL_GND	Backlight_ground
21	BL_GND	Backlight_ground
22	BL_Enable	Backlight On / Off
23	BL PWM DIM	System PWM signal Input
24	NC	No connect
25	NC	No connect

26	BL_PWR	Backlight power
27	BL_PWR	Backlight power
28	BL_PWR	Backlight power
29	BL_PWR	Backlight power
30	NC	No Connect

7.2 Touch Unit: Touch Driver Connector & Pin Assignment

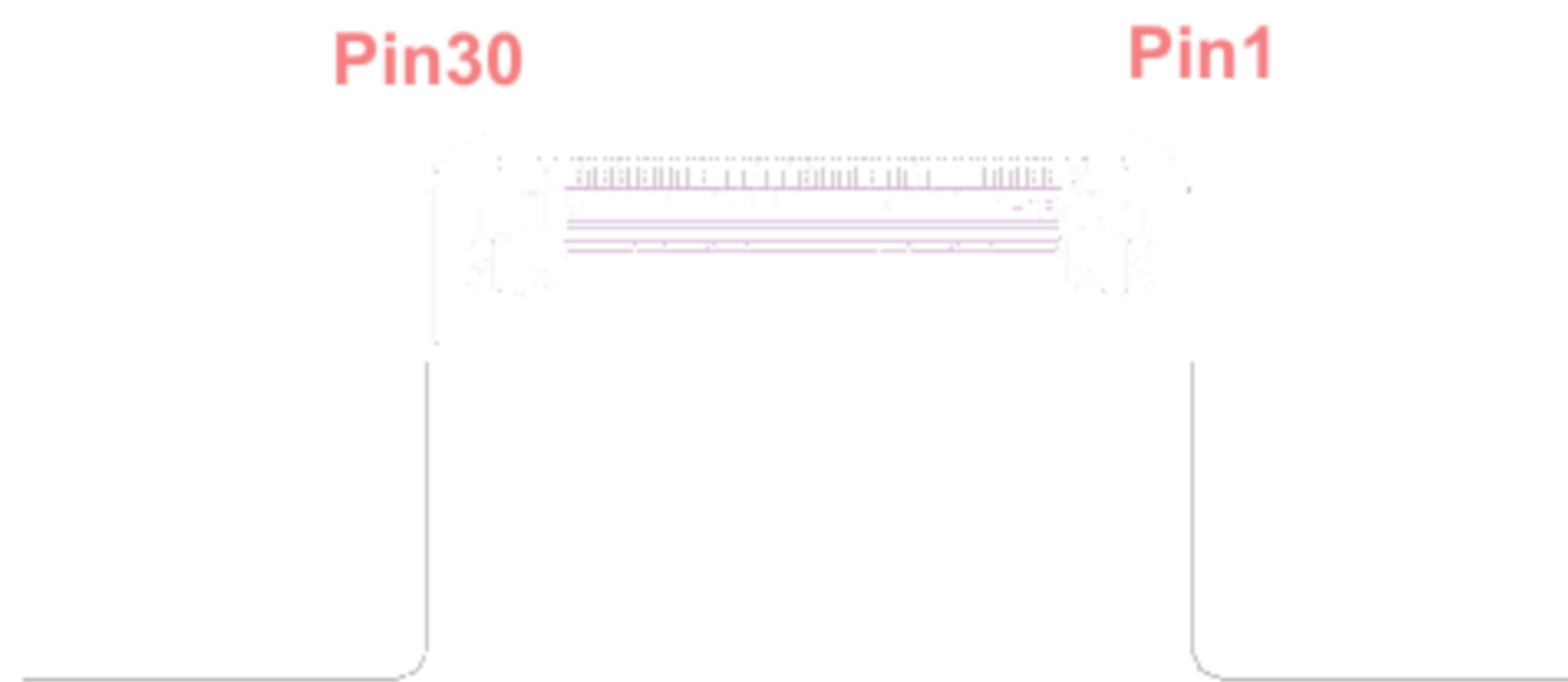
Connector Name / Designation	Touch Driver Connector
Manufacturer	ENTERY or compatible
Connector Model Number	3808K-F06N-12R or compatible
Mating Model Number	H208K-D06N-22B or compatible

Pin#	Symbol	Signal Name
1	VDD	5V
2	D-	USB D-
3	D+	USB D+
4	GND	GND
5	GND	GND
6	GND	GND

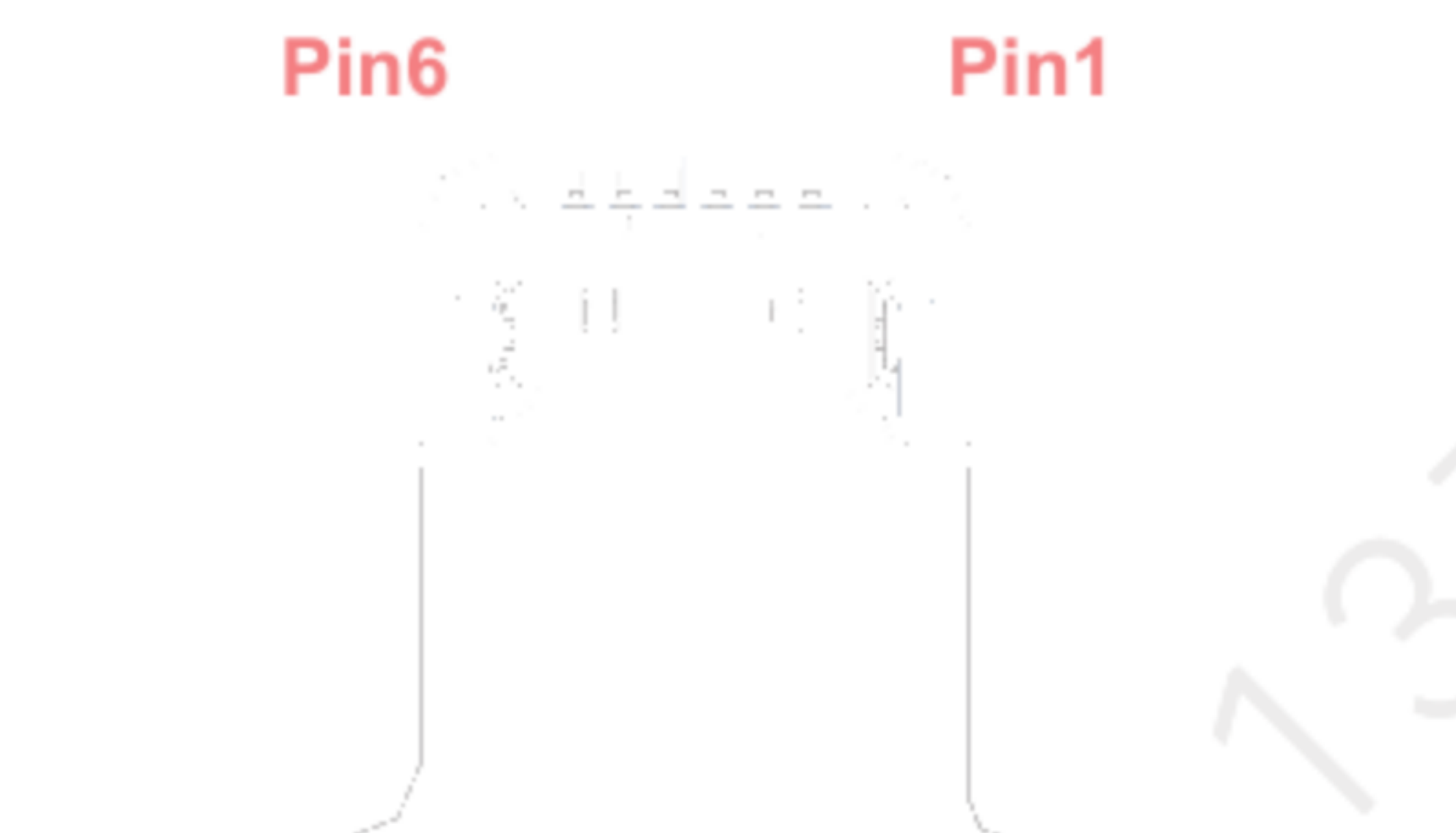
7.3 Connector Illustration



eDP (CN1):



Touch Connector (CN2):



8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	50°C/80%,300 hours	
High Temperature Operation	85°C,300 hours	
Low Temperature Operation	-30°C,300 hours	
Hot Storage	85°C,300 hours	
Cold Storage	-30°C,300 hours	
Thermal Shock Test	-20°C/30 min ,60°C/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

Note1: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost

. Self-recoverable. No hardware failures.

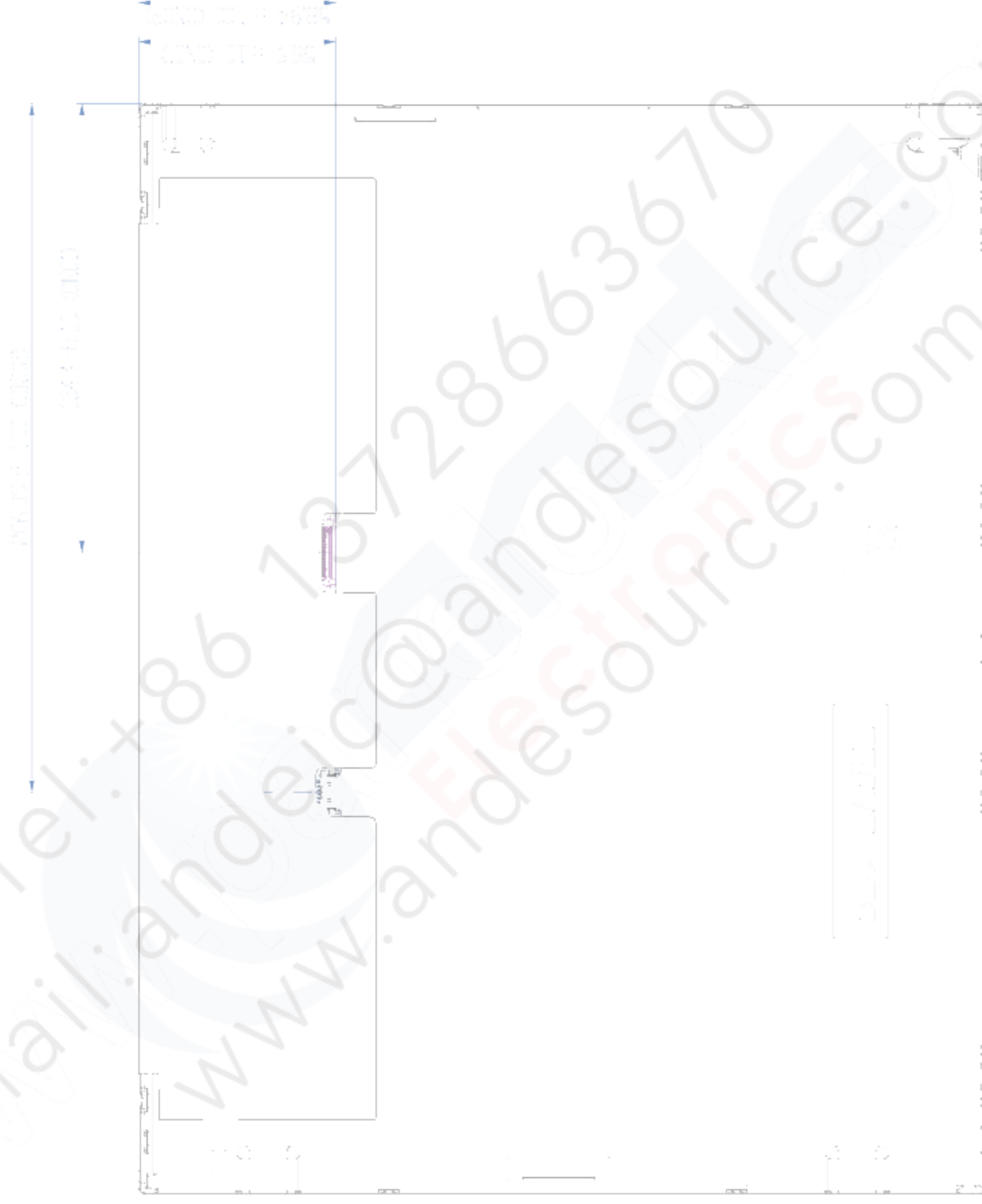
Note 2:

- 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.

9. Mechanical Characteristics

9.1 LCM Outline Dimension (Front View and back view)



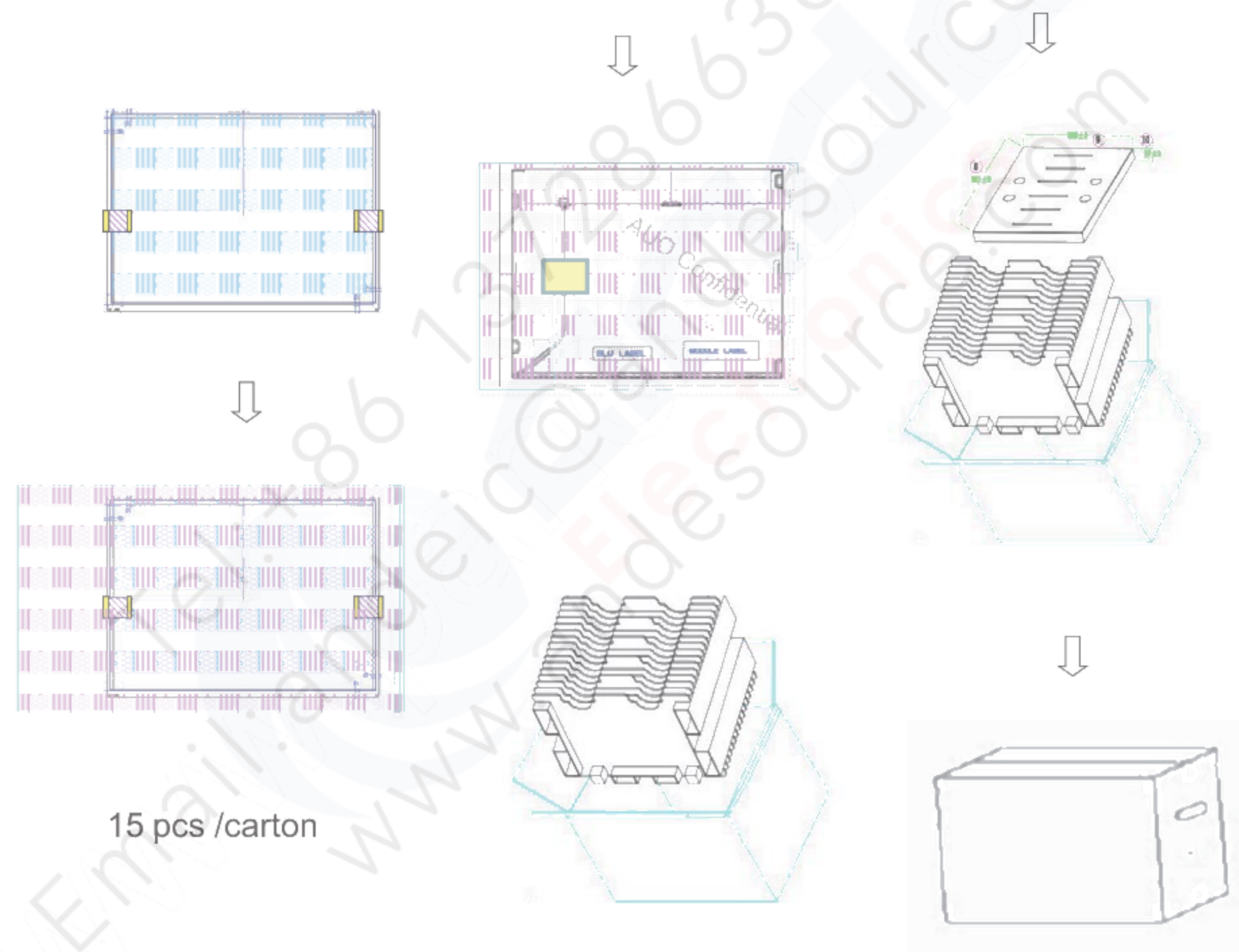


10. Label and Packaging

10.1 Shipping Label (on the rear side of TFT-LCD display)

 *XXXXXXXXXXXX-XXXXX*	Manufactured XX/XX	 E204356	
	Model No: G150XTK01.1		
	AU Optonics		
	MADE IN XXXXX(XXX)		
			

10.2 Carton Package



Max capacity : 15 TFT-LCD module per carton

Max weight: 20.0 kg per carton

Outside dimension of carton: 430(L) mm x 370(W) mm x 350(H) mm

Pallet size : 1140mm*890mm*132mm

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