

() Preliminary Specifications

(V) Final Specifications

Module	6.5 Inch Color TFT-LCD
Model Name	G065VN01 V0

Customer _____ Date _____ Checked & Approved by _____	Approved by _____ Date _____ Debbie Chiu 2008/03/07 Prepared by David Hsing 2008/03/07
Note: This Specification is subject to change without notice.	General Display Business Division / AU Optronics corporation

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Record of Revision

Version and Date	Page	Old description	New Description	Remark																																																																								
0.1 July 17, 2006	All	First edition final specifications to all customers																																																																										
0.2 Mar 10, 2007	4		Revision & add 15, 16, 17, 18	Section 1																																																																								
0.3 Jan 18, 2008	5	Temperature Range Operating: -10 to +70	Temperature Range Operating: -20 to +70	Section 2.1																																																																								
	10	Absolute Ratings of Environment Operating Temperature: Min -10	Absolute Ratings of Environment Operating Temperature: Min -20	Section 4.2																																																																								
	5	Support color: 16.2M (RGB 8-bit)	Support color:16.2M (RGB 6-bits+FRC)	Section 2																																																																								
	5	No description	The most suitable view angle: 6 o'clock	Section 2.1																																																																								
	9	No description	Absolute Ratings of TFT-LCD Module CCFL Current: 6.5 mA (rms)	Section 4.1																																																																								
	11	No description	Add Input Voltage Characteristics for DPS and SEL68	Section 5.1.2																																																																								
	12	<table><tr><th>Symbol</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr><tr><td>IRCFL</td><td>3.5</td><td>5</td><td>7</td><td>[mA] rms</td></tr><tr><td>FCFL</td><td>50</td><td>60</td><td>70</td><td>[KHz]</td></tr><tr><td>ViCFL (-10°C) (reference)</td><td>-</td><td>-</td><td>1430</td><td>[Volt] rms</td></tr><tr><td rowspan="2">VCFL</td><td>-</td><td>365</td><td>-</td><td rowspan="2">[Volt] rms</td></tr><tr><td>-</td><td>386</td><td>-</td></tr><tr><td rowspan="2">PCFL</td><td>-</td><td>3.65</td><td>-</td><td rowspan="2">[Watt]</td></tr><tr><td>-</td><td>2.95</td><td>-</td></tr></table>	Symbol	Min.	Typ.	Max.	Unit	IRCFL	3.5	5	7	[mA] rms	FCFL	50	60	70	[KHz]	ViCFL (-10°C) (reference)	-	-	1430	[Volt] rms	VCFL	-	365	-	[Volt] rms	-	386	-	PCFL	-	3.65	-	[Watt]	-	2.95	-	Revise Parameter Guideline for CCFL <table><tr><th>Symbol</th><th>Min.</th><th>Typ.</th><th>Max.</th><th>Unit</th></tr><tr><td>IRCFL</td><td>2</td><td>5</td><td>6.5</td><td>mA (rms)</td></tr><tr><td>FCFL</td><td>40</td><td>50</td><td>60</td><td>KHz</td></tr><tr><td>ViCFL (-20°C) (reference)</td><td>-</td><td>-</td><td>1430</td><td>V (rms)</td></tr><tr><td rowspan="2">VCFL</td><td>342</td><td>380</td><td>418</td><td rowspan="2">Volt (rms)</td></tr><tr><td>360</td><td>400</td><td>440</td></tr><tr><td rowspan="2">PCFL</td><td>-</td><td>3.80</td><td>-</td><td rowspan="2">W</td></tr><tr><td>-</td><td>3.04</td><td>-</td></tr></table>	Symbol	Min.	Typ.	Max.	Unit	IRCFL	2	5	6.5	mA (rms)	FCFL	40	50	60	KHz	ViCFL (-20°C) (reference)	-	-	1430	V (rms)	VCFL	342	380	418	Volt (rms)	360	400	440	PCFL	-	3.80	-	W	-	3.04	-	Section 5.2.1
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17	No description		Add H/V mode timing characteristics	Section 6.5.1																																																																								
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18	No description		Add H/V mode input timing diagram	Section 6.5.2																																																																								
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21			Revise PIN 1 definition of CN1 and CN2	Section 7.3																																																																								
22	Cold Start Test: -10°C		Cold Start Test: -20°C	Section 8																																																																								
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23			Revise 2D drawing <table><tr><th>Item</th><th>Before</th><th>After</th><th>Remark</th></tr><tr><td>1</td><td>29.5</td><td>29.5±0.3</td><td>Add tolerance</td></tr><tr><td>2</td><td>59</td><td>59.0±0.3</td><td>Add tolerance</td></tr><tr><td>3</td><td>31.0±0.3</td><td>31.0±0.03</td><td>Adjust tolerance</td></tr><tr><td>4</td><td>71.6</td><td>(71.6)</td><td>Change to reference value</td></tr><tr><td>5</td><td>33.2</td><td>(33.2)</td><td>Change to reference value</td></tr><tr><td>6</td><td>132.48</td><td>132.48±0.3</td><td>Add tolerance</td></tr><tr><td>7</td><td>99.36</td><td>99.36±0.3</td><td>Add tolerance</td></tr><tr><td>8</td><td>102.8±0.1</td><td>102.8±0.3</td><td>Adjust tolerance</td></tr><tr><td>9</td><td>135.9±0.5</td><td>135.9±0.3</td><td>Adjust tolerance</td></tr><tr><td>10</td><td>25.4</td><td>25.4±0.3</td><td>Add tolerance</td></tr><tr><td>11</td><td>7.1</td><td>7.1±0.3</td><td>Add tolerance</td></tr></table>	Item	Before	After	Remark	1	29.5	29.5±0.3	Add tolerance	2	59	59.0±0.3	Add tolerance	3	31.0±0.3	31.0±0.03	Adjust tolerance	4	71.6	(71.6)	Change to reference value	5	33.2	(33.2)	Change to reference value	6	132.48	132.48±0.3	Add tolerance	7	99.36	99.36±0.3	Add tolerance	8	102.8±0.1	102.8±0.3	Adjust tolerance	9	135.9±0.5	135.9±0.3	Adjust tolerance	10	25.4	25.4±0.3	Add tolerance	11	7.1	7.1±0.3	Add tolerance	Section 9																								
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1. Operating Precautions

- 1) Display area (Polarizer) of TFT-LCD Module is easily to be damaged, please be cautious and not to scratch it.
- 2) Be sure to power off your machine before connecting or disconnecting your signal cable to TFT-LCD Module.
- 3) Wipe off water drop on display area 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) Display area (Glass) of TFT-LCD Module may be broken or cracked if bump Module against hard object.
- 6) To avoid ESD (Electro Static Discharge) damage, be sure to ground yourself before handling TFT-LCD Module.
- 7) Do not open nor modify the TFT-LCD Module assembly.
- 8) Do not press the reflector sheet at the back of the module to any direction.
- 9) In case if a TFT-LCD 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 CCFL Reflector edge. Instead, press at the far ends of the CCFL Reflector edge softly. Otherwise the TFT-LCD Module may be damaged.
- 10) When inserting or removing of your signal cable to TFT-LCD Module, be sure not to apply abnormal force (rotate, tilt...etc.) to the Connector of the TFT-LCD 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) Cold cathode fluorescent lamp (CCFL) in TFT-LCD Module contains a small amount of mercury. Please follow local ordinances or regulations for disposal.
- 13) Small amount of materials having no flammability grade is used in the TFT-LCD Module. The TFT-LCD Module should be supplied by power complied with requirements of Limited Power Source (IEC60950 or UL1950), or be applied exemption.
- 14) The CCFL in TFT-LCD Module should be supplied by inverter complied with Limited Current Circuit (IEC60950 or UL1950). Do not connect the CCFL with Hazardous Voltage Circuit.
- 15) Severe temperature condition may result in different luminance, response time and lamp ignition voltage.
- 16) Continuous operating TFT-LCD Module under low temperature environment may accelerate lamp exhaustion and reduce luminance dramatically.
- 17) The data on this specification sheet is applicable when TFT-LCD Module is placed in landscape position.
- 18) 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

G065VN01 V0 is designed for industrial display applications with VGA (640 x RGB x 480) resolution and 16.2M (RGB 6-bits + FRC) or 262k colors (RGB 6-bits). It is composed of a TFT-LCD panel, driver ICs, control and power supply circuits and a backlight unit. G065VN01 V0 offers LVDS interface for display signal input. Inverter board of backlight is not included.

2.1 Display Characteristics

The following items are G065VN01 V0 characteristics summary at 25 °C condition.

Items	Unit	Specifications
Screen Diagonal	inch	6.5
Active Area	mm	132.48(H) x 99.36(V)
Pixels H x V		640x3(RGB) x 480
Pixel Pitch	mm	0.207 x 0.207
Pixel Arrangement		R.G.B. Vertical Stripe
Display Mode		TN, Normally White
Nominal Input Voltage VDD	V	3.3 typ.
Typical Power Consumption	W	4.26W (IRCFL=5.0mA) 3.56W (IRCFL=3.8mA) All black pattern
Weight	Grams	200g(typ.)
Physical Size	mm	153.0(H)x 118.0(V) x 10.7(D) (typ.)
Electrical Interface		1 channel LVDS
Surface Treatment		Anti-glare, Hardness 3H
Support Color		16.2M / 262K colors
The most suitable view angle		6 o'clock
Temperature Range Operating Storage (Non-Operating)	°C °C	-20 to +70 -20 to +80
RoHS Compliance		RoHS Compliance

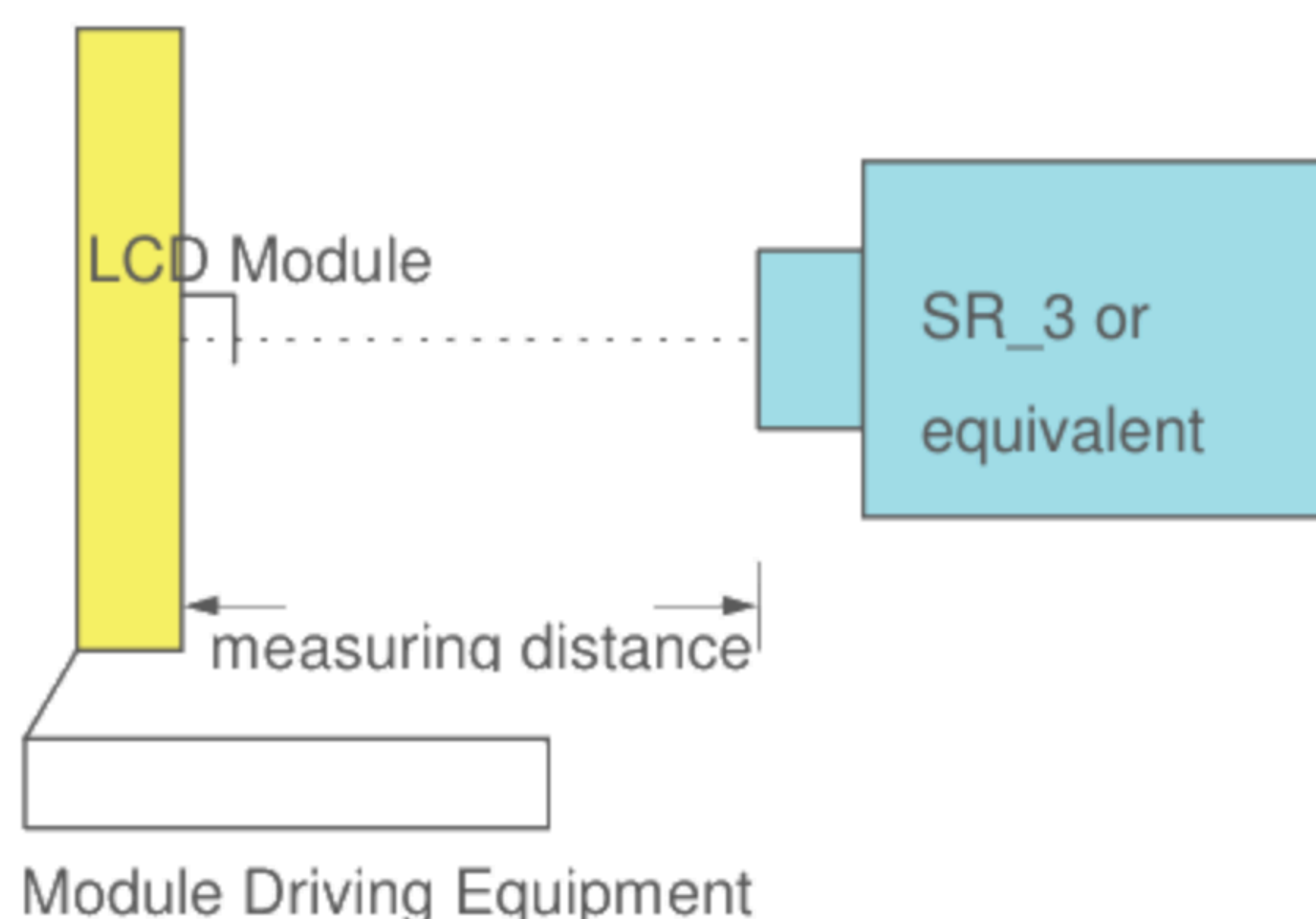
2.2 Optical Characteristics

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

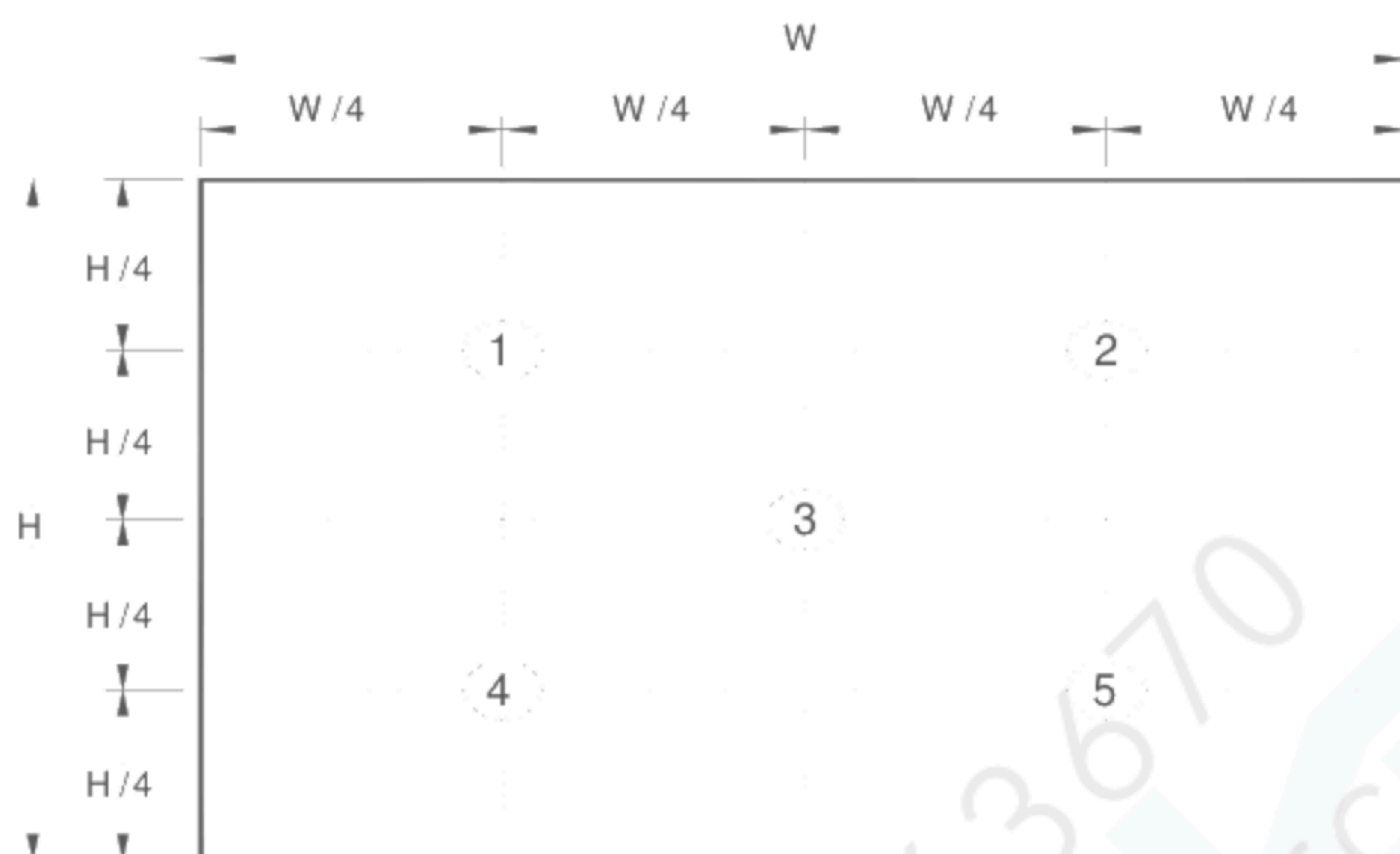
Item	Unit	Conditions	Min.	Typ.	Max.	Note
White Luminance	cd/m2	IRCFL= 5.0mA (center point)	400	500	-	1
		IRCFL= 3.8mA (center point)	320	400	-	
Uniformity	%	5 Points	-	-	1.25	1, 2, 3, 4
		13 Points	-	-	1.67	
Contrast Ratio			300	600	-	5
Response Time	msec	Rising	-	15	20	6
	msec	Falling	-	10	15	
	msec	Raising + Falling	-	25	35	
Viewing Angle	degree	Horizontal (Right) CR = 10 (Left)	60	70	-	7
	degree		60	70	-	
	degree	Vertical (Upper) CR = 10 (Lower)	50	60	-	
	degree		50	60	-	
Color / Chromaticity Coordinates (CIE 1931)		Red x	0.590	0.620	0.650	
		Red y	0.320	0.350	0.380	
		Green x	0.275	0.305	0.335	
		Green y	0.550	0.580	0.610	
		Blue x	0.115	0.145	0.175	
		Blue y	0.085	0.115	0.145	
		White x	0.283	0.313	0.343	
		White y	0.299	0.329	0.359	
Color Gamut	%		50	55	-	

Note 1: Measurement method

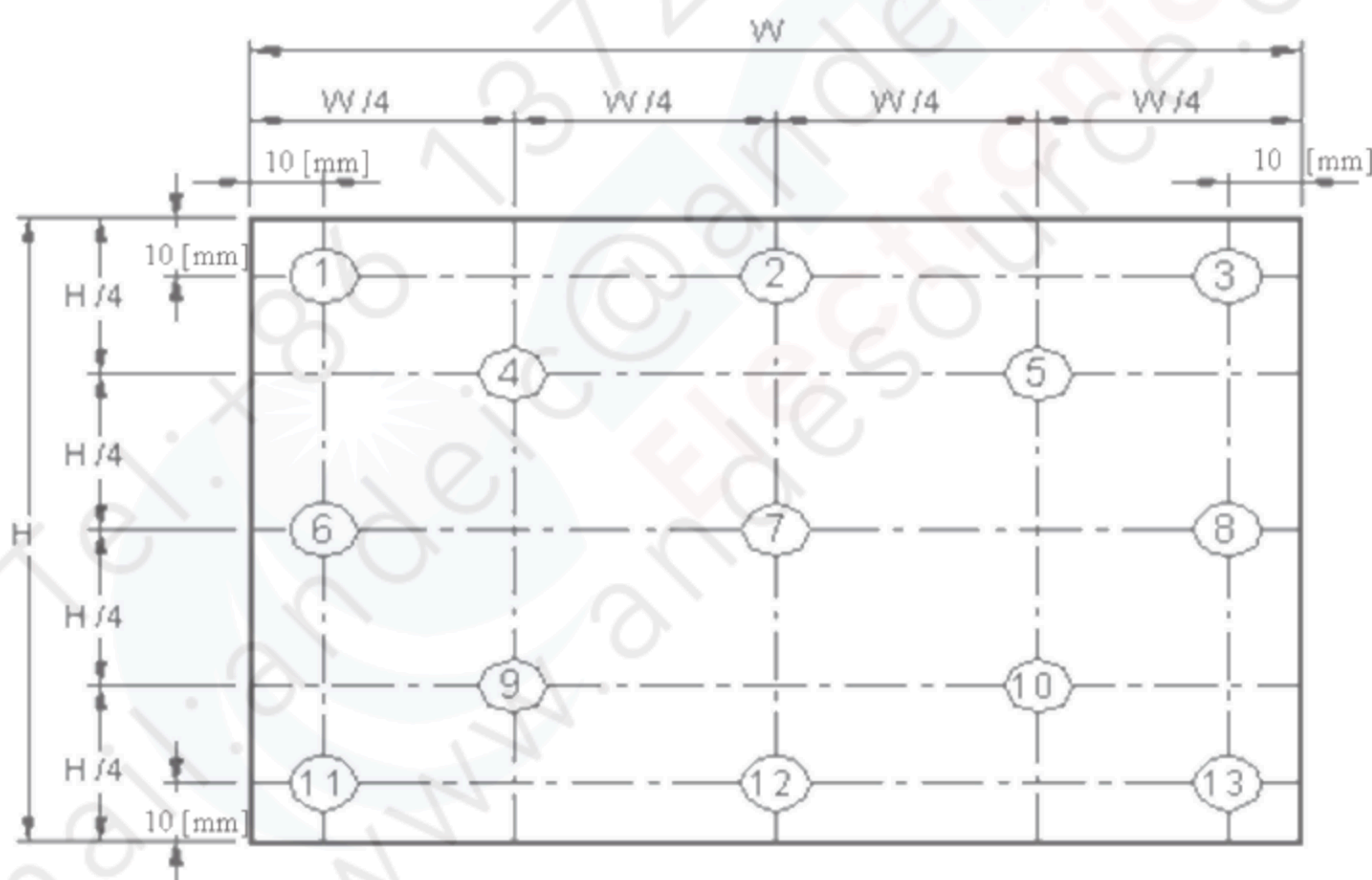
Equipment Pattern Generator, Power Supply, Digital Voltmeter, Luminance meter (SR_3 or equivalent)
Aperture 1" with 50cm viewing distance
Test Point Center
Environment < 1 lux



Note 2: Definition of 5 points position (Display active area: 132.48mm(W) x 99.36mm(H))



Note 3: Definition of 13 points position



Note 4:

The luminance uniformity of 5 and 13 points is defined by dividing the maximum luminance value by the minimum luminance value at full white condition.

$$\delta_{W5} = \frac{\text{Maximum Brightness of five points}}{\text{Minimum Brightness of five points}}$$

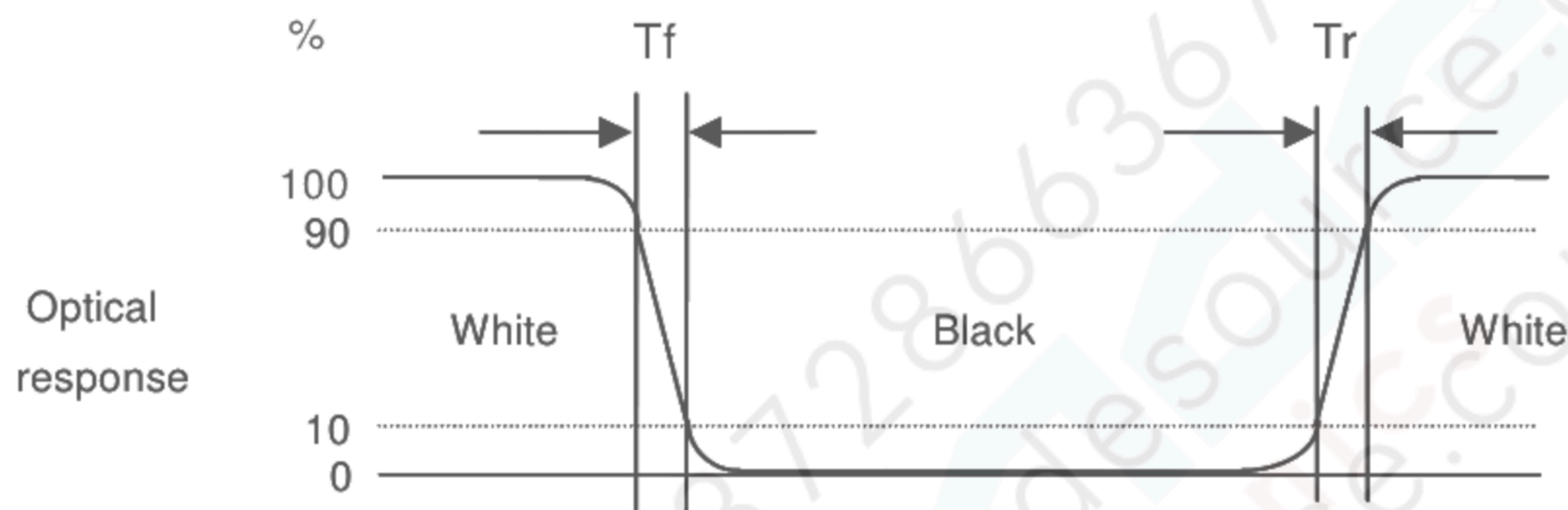
$$\delta_{W13} = \frac{\text{Maximum Brightness of thirteen points}}{\text{Minimum Brightness of thirteen points}}$$

Note 5: Definition of contrast ratio (CR):

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

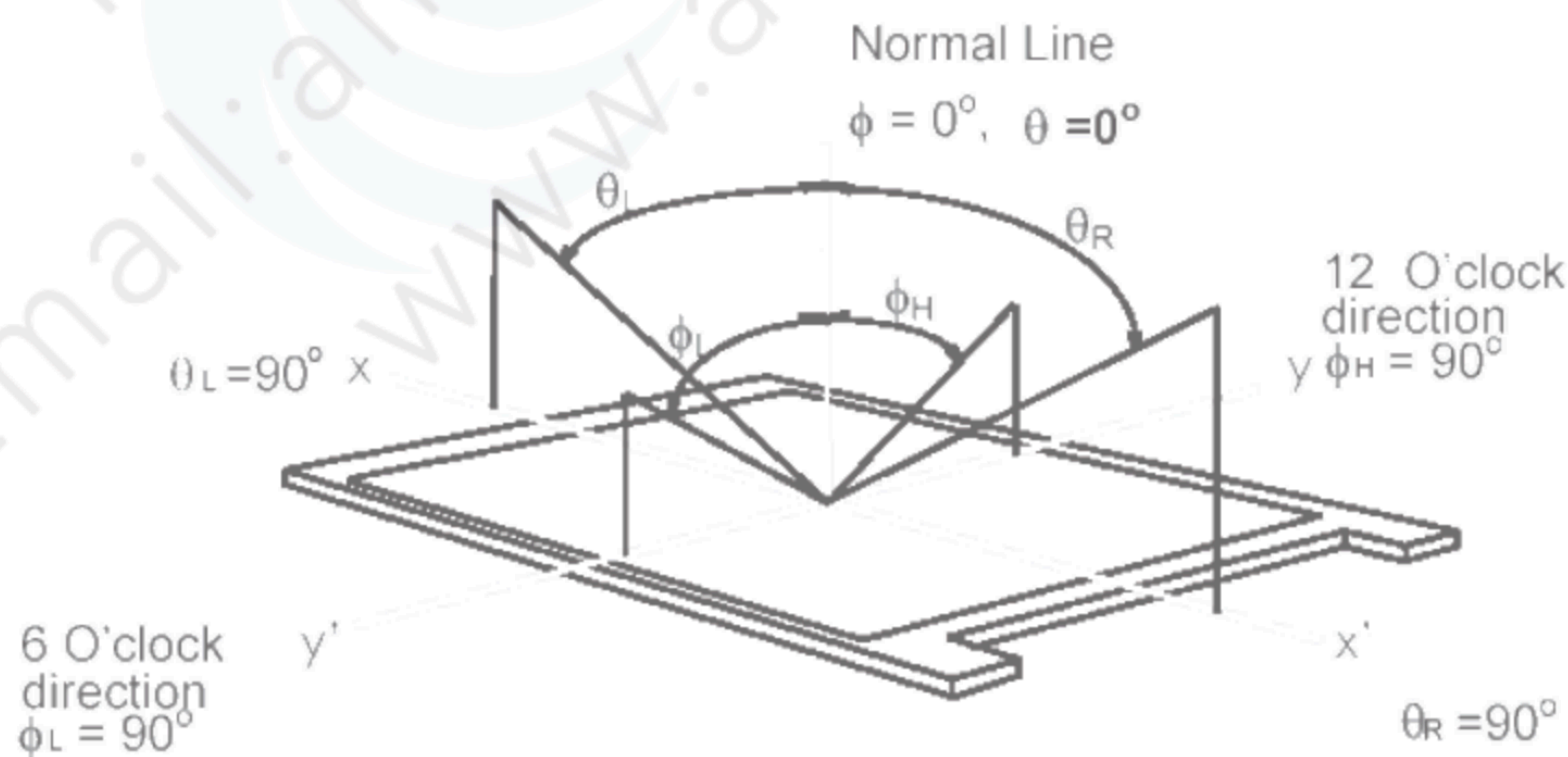
Note 6: Definition of response time:

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 definition is between 10% and 90% of amplitude. Please refer to the figure as below.



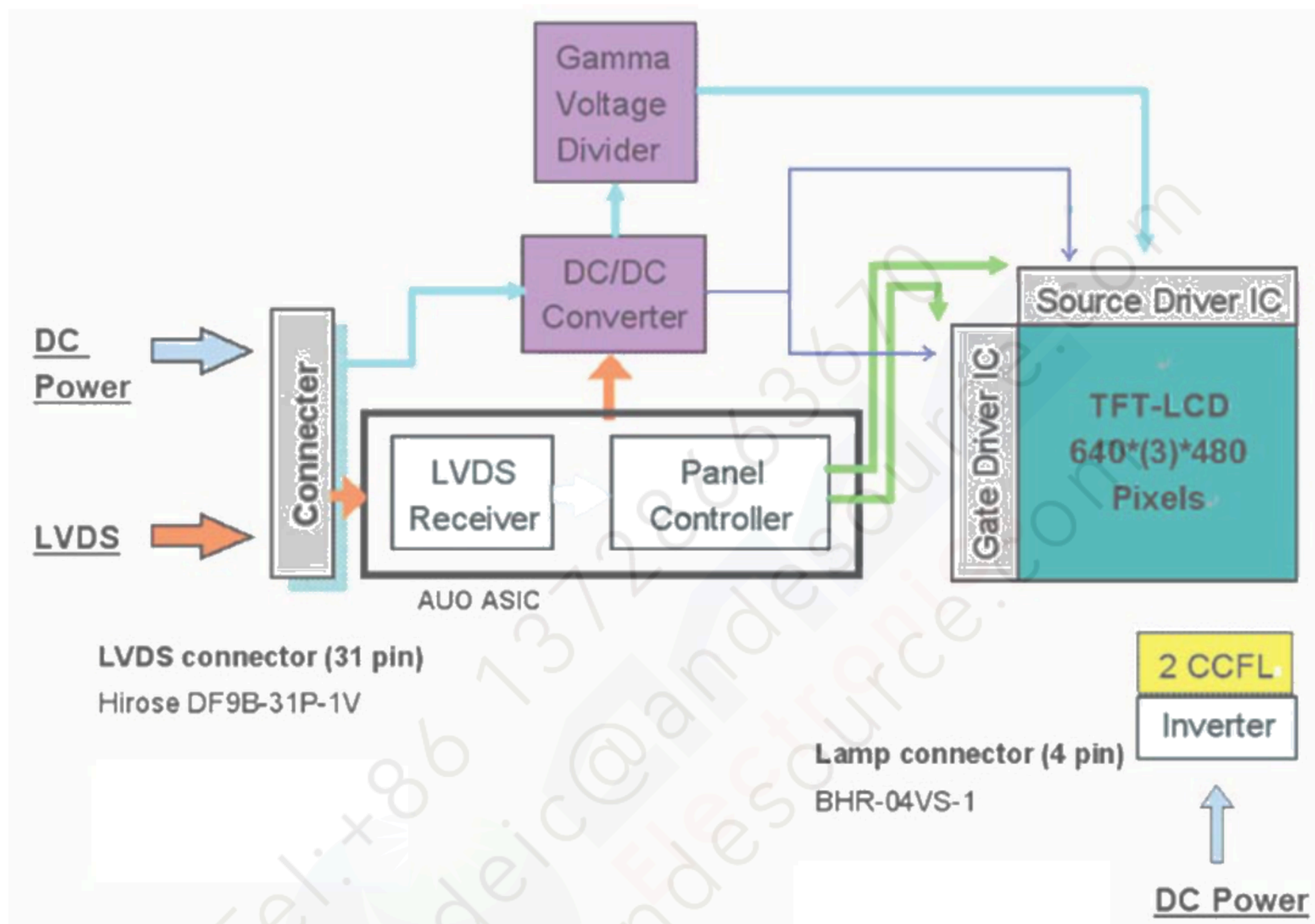
Note 7: Definition of viewing angle

Viewing angle is the measurement of contrast ratio ≥ 10 , at the screen center, over 180° horizontal and 180° vertical range. The 180° horizontal (θ_L, θ_R) and 180° vertical (ϕ_H, ϕ_L) range are illustrated as following figure.



3. Functional Block Diagram

The following diagram shows the functional block of the G065VN01 V0 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	VDD	-0.3	+4.0	V
CCFL Current	IRCFL	-	6.5	mA (rms)

4.2 Absolute Ratings of Environment

Item	Symbol	Min	Max	Unit
Operating Temperature	TOP	-20	+70	°C
Operation Humidity	HOP	5	95	%RH
Storage Temperature	TST	-20	+80	°C
Storage Humidity	HST	5	95	%RH

Note 1: Maximum Wet-Bulb should be 39°C and no condensation.

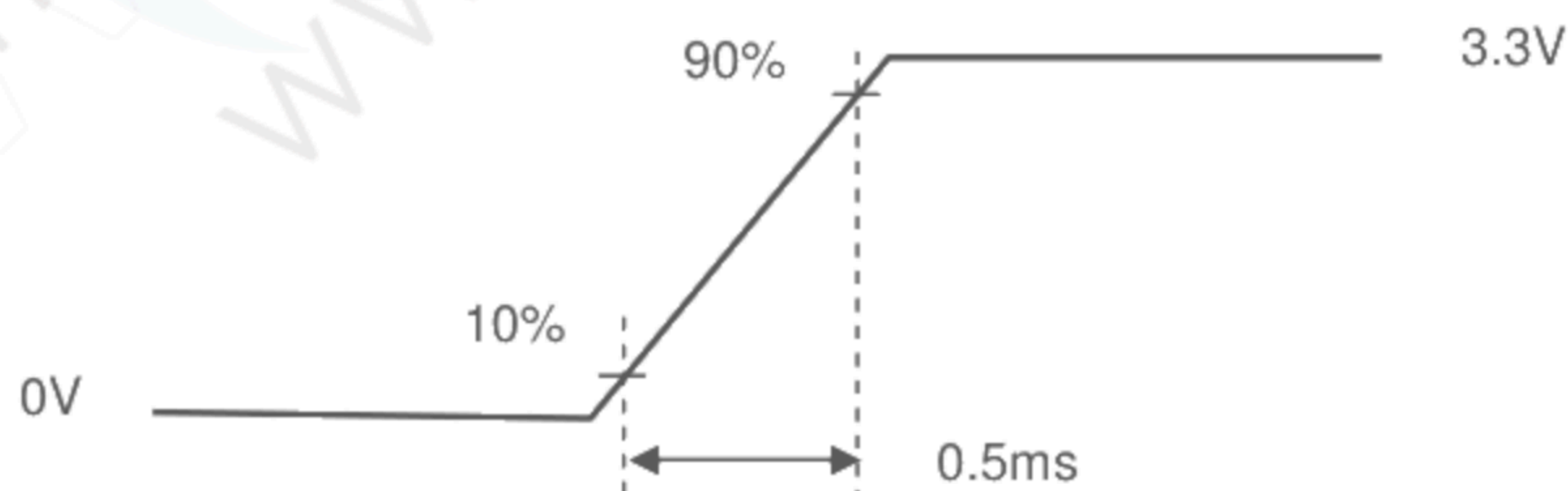
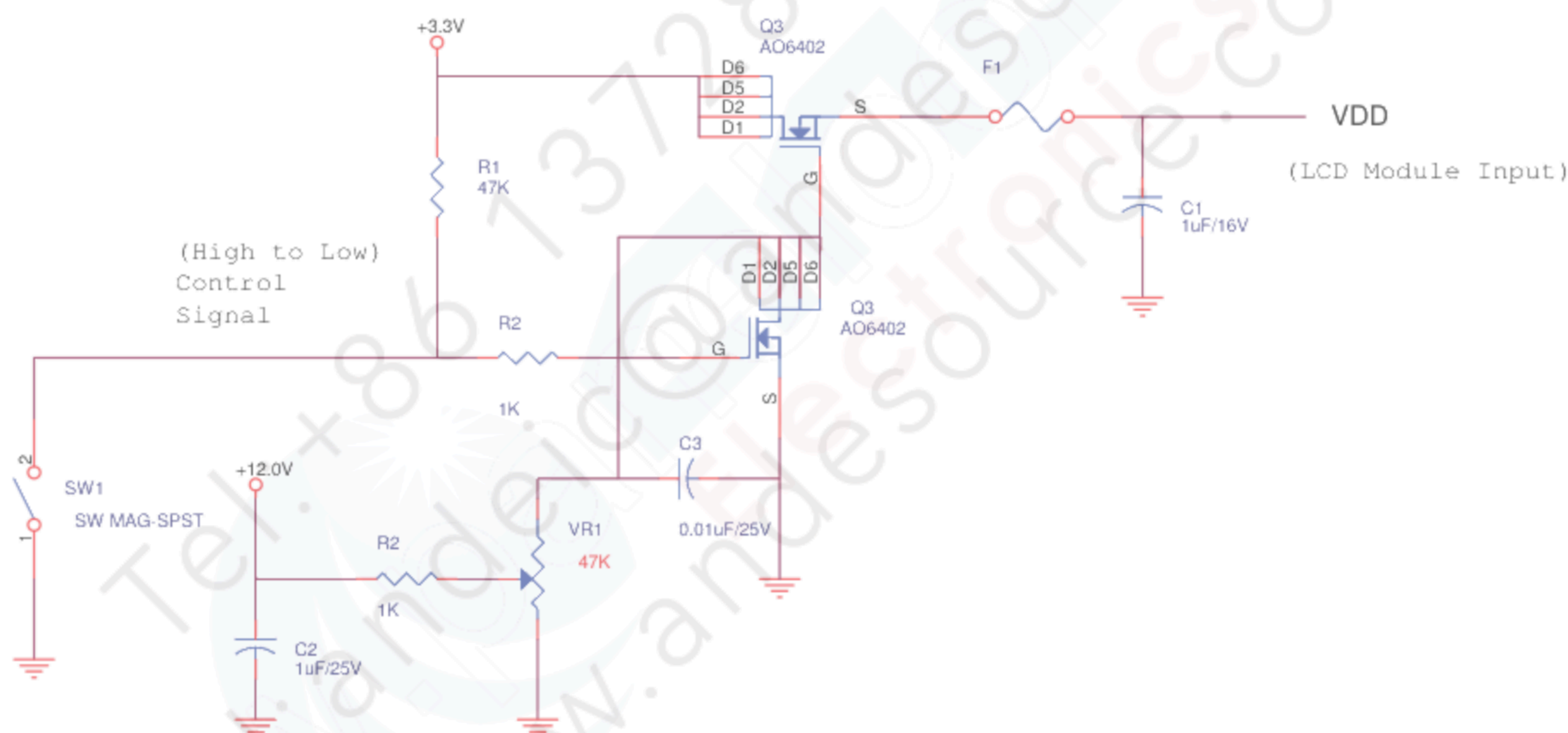
5. Electrical Characteristics

5.1 TFT-LCD Driving

5.1.1 Power Specification

Symbol	Parameter	Min	Typ	Max	Units	Remark
VDD	Logic/LCD Drive Voltage	3.0	3.3	3.6	V	
IDD	VDD Current	-	185	-	mA	All Black Pattern (VDD=3.3V, at 60Hz)
Irush	LCD Inrush Current	-	-	1.5	A	Note 1
PDD	VDD Power	-	0.61	-	W	All Black Pattern (VDD=3.3V, at 60Hz)
VDDrp	Allowable Logic/LCD Drive Ripple Voltage	-	-	100	mVp-p	All Black Pattern (VDD=3.3V, at 60Hz)

Note 1: Measurement condition:



VDD rising time

5.1.2 Signal Electrical Characteristics

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

LVDS signal (Note 1)

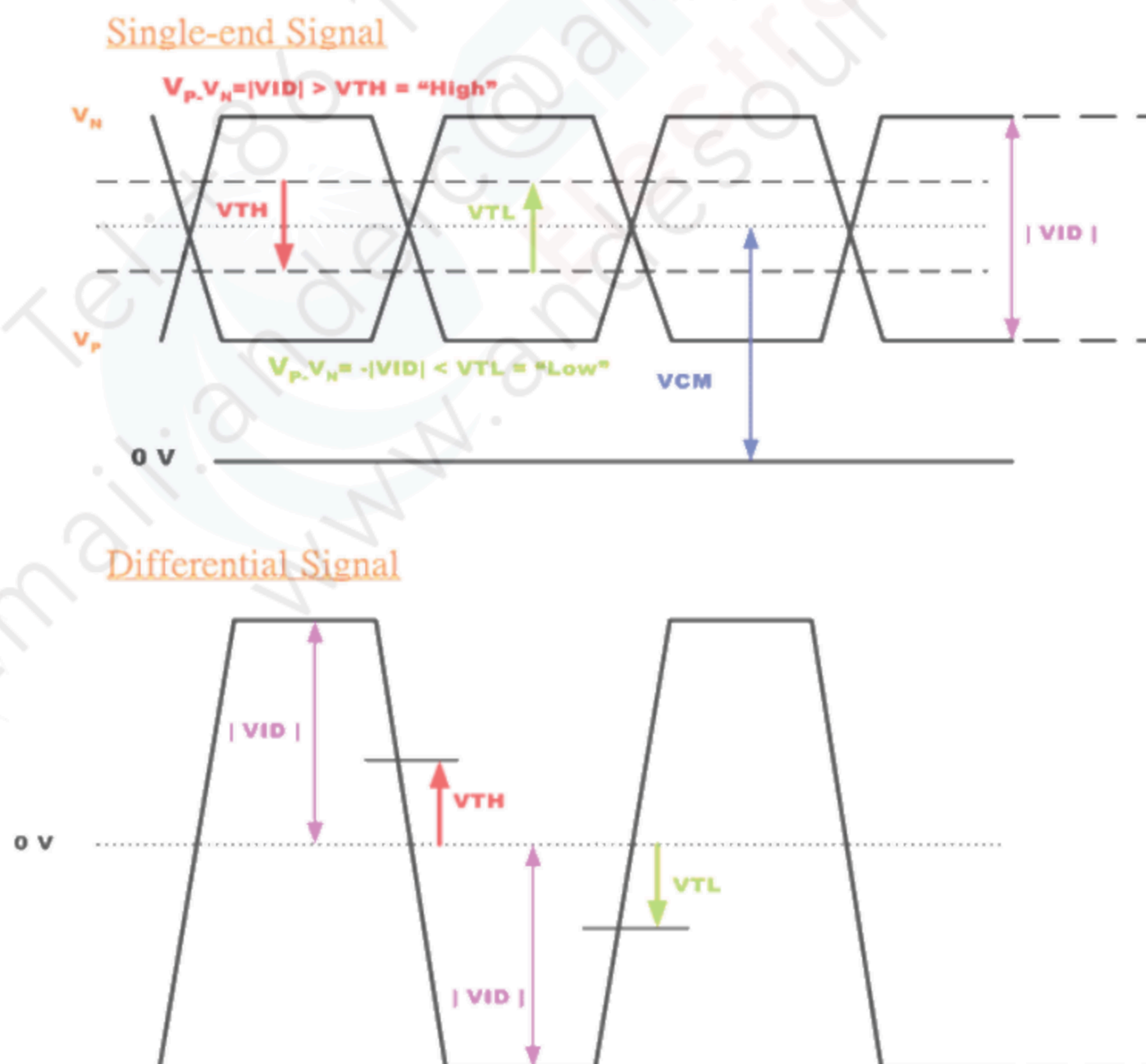
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Differential Input High Threshold	V _{TH}	-	-	100	mV	V _{CM} =1.25V
Differential Input Low Threshold	V _{TL}	-100	-	-	mV	V _{CM} =1.25V
Input Differential Voltage	V _{ID}	100	400	600	mV	
Differential Input Common Mode Voltage	V _{CM}	1.1	-	1.45	V	V _{TH} /V _{TL} = ±100mV

LVDS Transmitter: THC63LVDM83A (THINE) or equivalent

CMOS signal

Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Input Voltage for DPS	High	V _{IH}	0.7V _{DD}	-	V _{DD}	V	
	Low	V _{IL}	0	-	0.3V _{DD}	V	
Input Voltage for SEL68	High	V _{IH}	0.7V _{DD}	-	V _{DD}	V	
	Low	V _{IL}	0	-	0.3V _{DD}	V	

Note 1: LVDS Signal Waveform.



5.2 Backlight Unit

5.2.1 Parameter Guideline for CCFL

Following characteristics are measured under a stable condition using an inverter at 25°C (Room Temperature).

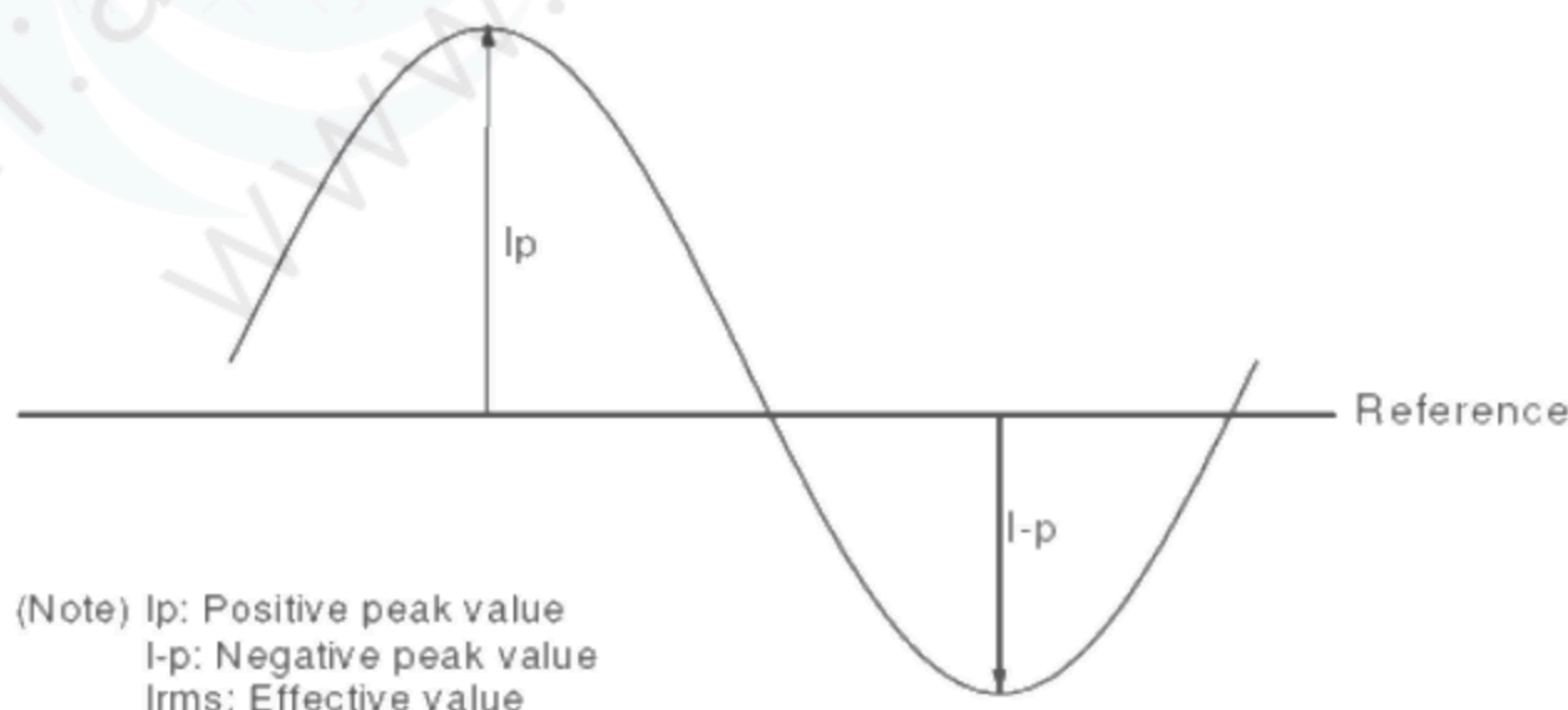
Symbol	Parameter	Min.	Typ.	Max.	Unit	Remark
IRCFL	CCFL Operation Current	2	5	6.5	mA (rms)	(Ta=25°C) Note 1, 5
FCFL	CCFL Operation Frequency	40	50	60	KHz	(Ta=25°C) Note 2
ViCFL (-20°C) (reference)	CCFL Ignition Voltage	-	-	1430	V (rms)	(Ta= -20°C)
ViCFL (25°C) (reference)	CCFL Ignition Voltage	-	-	650	Volt (rms)	(Ta=25°C)
VCFL	CCFL Operation Voltage	342	380	418	Volt (rms)	(Ta=25°C) IRCFL=5mA
		360	400	440		(Ta=25°C) IRCFL=3.8mA
PCFL	CCFL Power Consumption (inverter excluded)	-	3.80	-	W	(Ta=25°C) Note 3 IRCFL=5mA
		-	3.04	-		(Ta=25°C) Note 3 IRCFL=3.8mA
Lamp Life		50,000			Hrs	(Ta=25°C) Note 4 IRCFL= 5mA

Note 1: IRCFL is defined as the return current of an inverter. (In Figure. 1)



(Figure. 1: Measurement of return current)

A stable IRCFL is a current without flicker or biasing waveform provided by inverter that ensures the backlight perform to its specification. The ideal sine waveform should be symmetric in positive and negative polarities and the asymmetry rate of the inverter waveform should be below 10%.



$$\text{DC Bias} = (|Ip - I-p| / Irms) \times 100 \% < 10\%$$

$$\text{Crest Factor} = Ip \text{ or } (I-p) / Irms \text{ should have the range within } 1.414 \pm 10\%$$

It is recommended to use the inverter with detection circuit (ie: balance and protection circuit) to avoid over voltage, over current, or mismatching waveform.

Note 2: CCFL operation frequency should be carefully determined to avoid interference between inverter and TFT-LCD.

Higher frequency will induce higher leakage current and further impact lamp life.

Note 3: Calculation value for reference ($IRCFL \times VCFL \times 2 = PCFL$).

Note 4: The definition of lamp life means when any of following conditions happen:

- Luminance falls to 50% or less of the initial value.
- Normal lighting is no more available (flickering, pink lighting, no lighting, etc.)
- Lamp operation voltage or ignition voltage exceeds the specified value.

Lamp life time shortens according to,

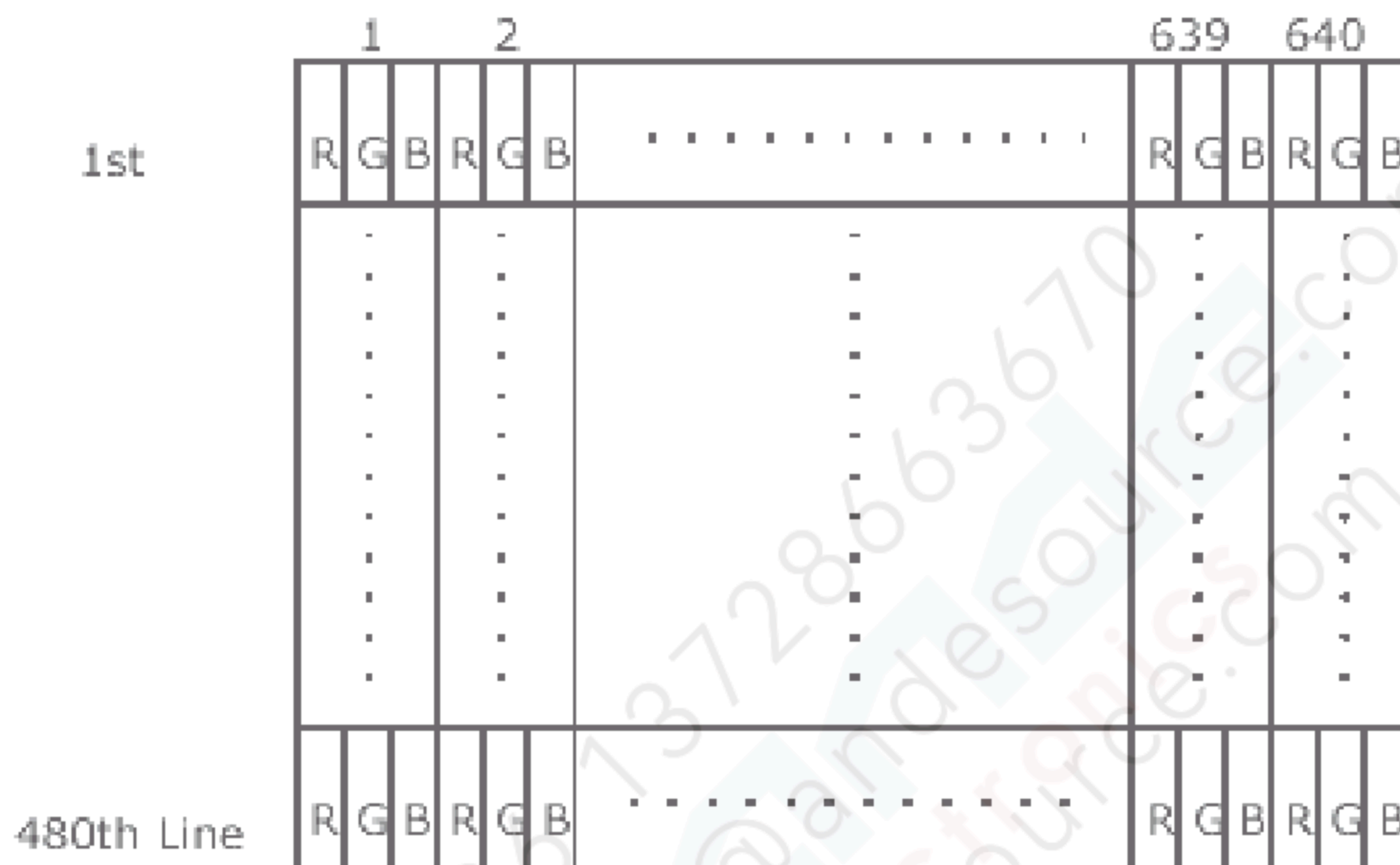
- ◆ Placing methodology: mercury is unevenly distributed in portrait mounting.
- ◆ Environmental condition: mercury vapor quantity contained in lamp is reduced at low temperature condition, which results in approximately 1,000 hours lamp life.
- ◆ CCFL surface temperature: Temperature gradient on lamp surface causes uneven mercury migration.
- ◆ Inverter design: its resonance capacitor should be fine-tuned according to the impedance of CCFL.
- ◆ Over driving current (> 5.5 mA) shortens lamp life time dramatically.

Note 5: The display is with dual lamp design, and the CCFL operation current in above table is for each lamp.

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.



Fig. 1 Normal scan (Pin8, DPS = Low or NC)



Fig. 2 Reverse scan (Pin8, DPS = High)

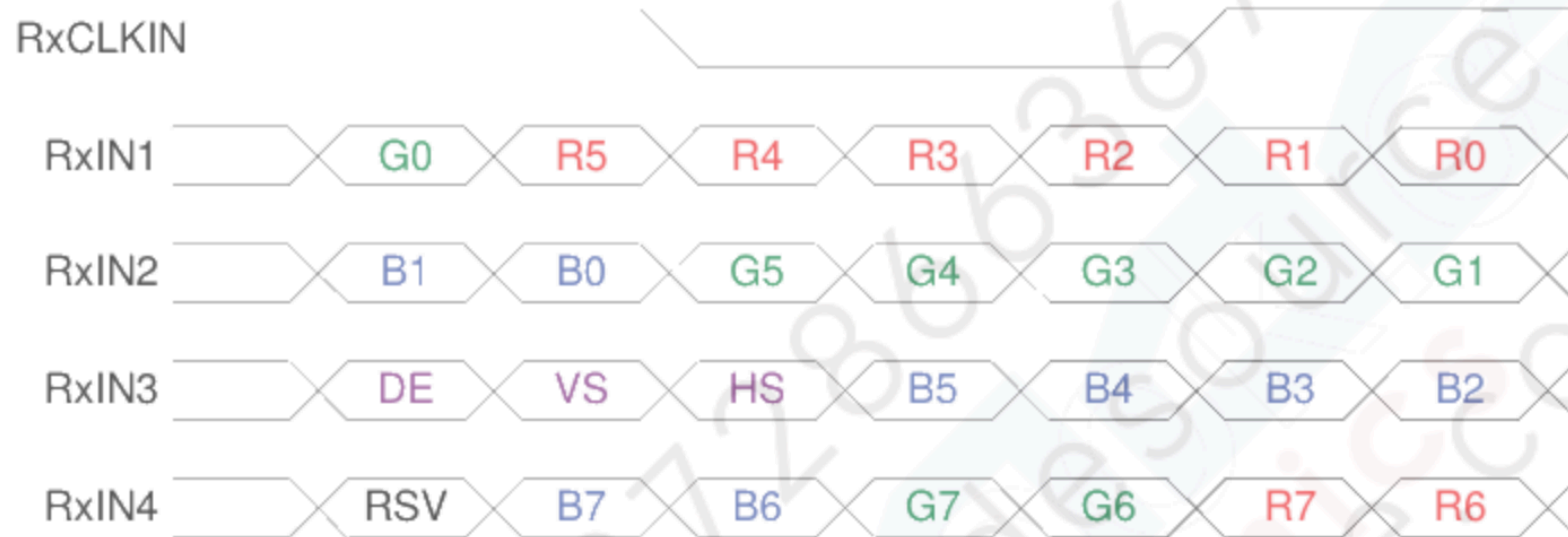
Note 1: TFT-LCD interface signal description is shown in section 6.4.

6.3 The Input Data Format

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



SEL68 = "Low" for 8 bits LVDS Input



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

Note 1: Output signals from any system shall be low or Hi-Z state when VDD is off.

6.4 TFT-LCD Interface Signal Description

G065VN01 V0 TFT-LCD module includes LVDS receiver. LVDS is a differential signal technology for high-speed data transfer LCD interface. LVDS Transmitter shall be THC63LVDM83A (THINE) or equivalent.

Pin No.	Symbol	Pin Description
1	GND	Ground
2	GND	Ground
3	RxIN4+	LVDS differential input (Red 6-Red 7, Green 6-Green 7, Blue 6-Blue 7, RSV) NC for 6bit LVDS input.
4	NC	No connection
5	RxIN4-	LVDS differential input (Red 6-Red 7, Green 6-Green 7, Blue 6-Blue 7, RSV) NC for 6bit LVDS input.
6	NC	No connection
7	GND	Ground
8	DPS	Selection of scan direction DPS = "Low" or "NC", normal scan. DPS = "High", reverse scan.
9	RxCLKIN+	LVDS differential clock input
10	NC	No connection
11	RxCLKIN-	LVDS differential clock input
12	NC	No connection
13	GND	Ground
14	GND	Ground
15	RxIN3+	LVDS differential input(Blue2-Blue5, Hsync, Vsync, DE)
16	GND	Ground
17	RxIN3-	LVDS differential input(Blue2-Blue5, Hsync, Vsync, DE)
18	NC	No connection
19	GND	Ground
20	NC	No connection
21	RxIN2+	LVDS differential input(Green1-Green5, Blue0-Blue1)
22	NC	No connection
23	RxIN2-	LVDS differential input(Green1-Green5, Blue0-Blue1)
24	NC	No connection
25	GND	Ground
26	SEL68	Selection for either 6bit or 8bit LVDS input: SEL68 = "High" or "NC", accepts 6bit LVDS data input; SEL68 = "Low", accepts 8bit LVDS data input.
27	RxIN1+	LVDS differential input(Red0-Red5, Green0)
28	VDD	Power supply, 3.3V (typical)
29	RxIN1-	LVDS differential input(Red0-Red5, Green0)
30	VDD	Power supply, 3.3V (typical)
31	GND	Ground

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

6.5 TFT-LCD Interface Timing

6.5.1 Timing Characteristics

DE mode

Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock Timing	Clock frequency (DOTCLK)		$1/T_{\text{CLOCK}}$	20	25.2	50	MHz	Note1, 2
Hsync Timing	Horizontal Section	Period	T_H	770	800	1070	T_{CLOCK}	Note1, 2
		Active	T_{HD}	640	640	640		
		Blanking	T_{HB}	130	160	430		
Vsync Timing	Vertical Section	Period	T_V	520	525	622	T_{LINE}	Note1, 2
		Active	T_{VD}	480	480	480		
		Blanking	T_{VB}	40	45	142		

H/V mode

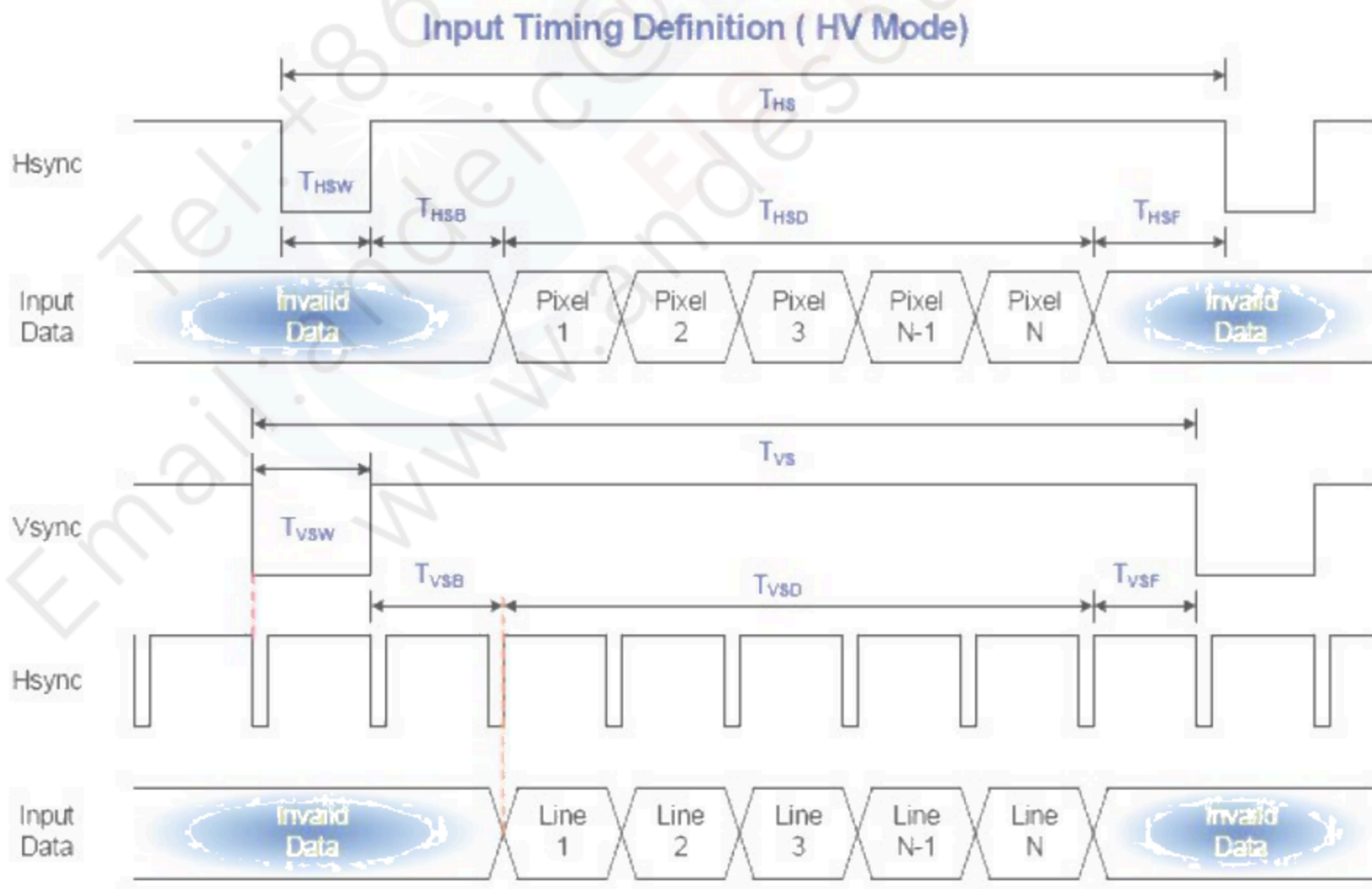
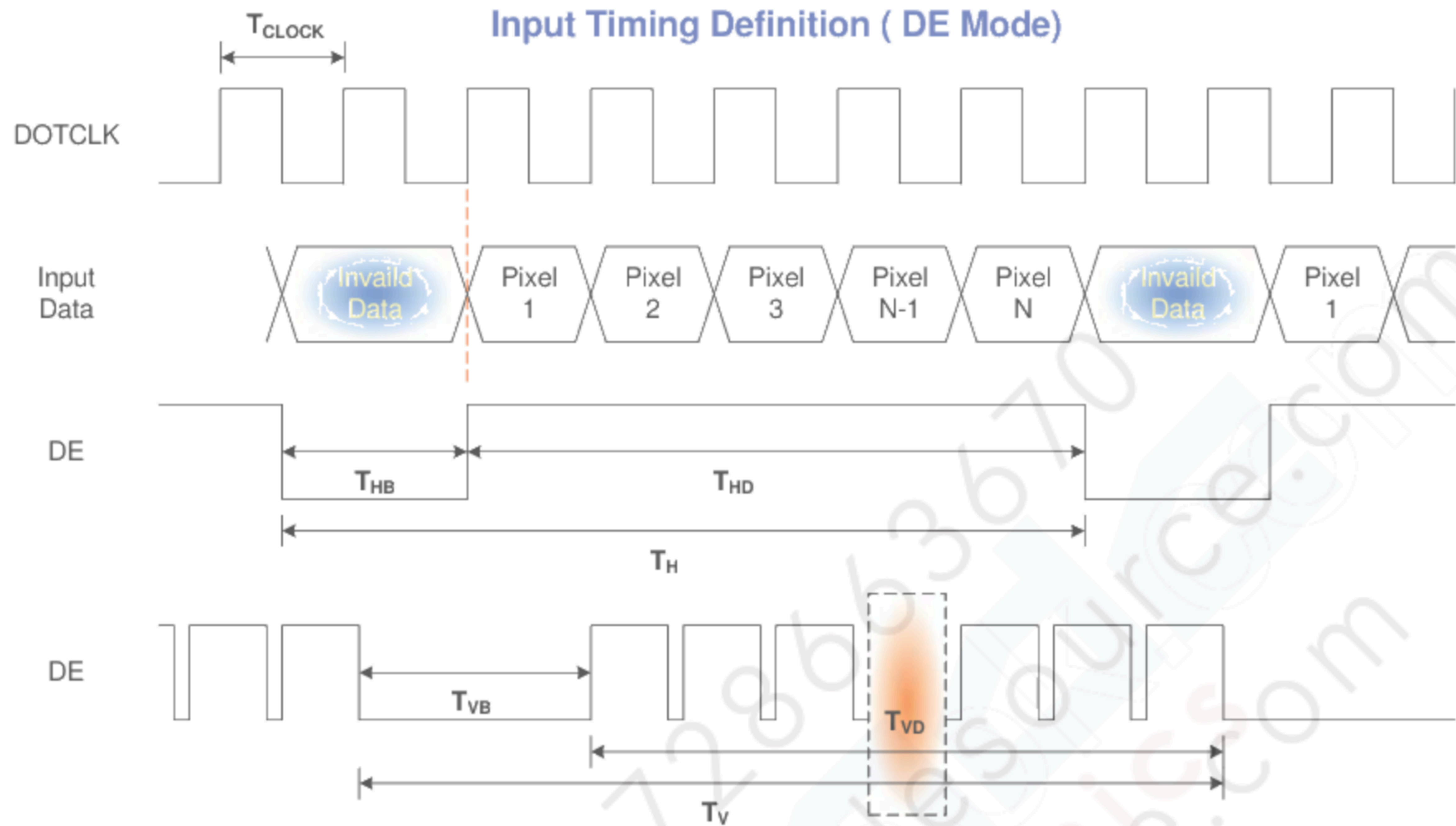
Signal	Parameter		Symbol	Min.	Typ.	Max.	Unit	Remark
Clock Timing	Clock frequency (DOTCLK)		$1/T_{\text{CLOCK}}$	20	25.2	50	MHz	Note 3
Hsync Timing	Horizontal Section	Display period	T_{HSD}		640		T_{CLOCK}	Note 3
		Front porch	T_{HSF}	30	60	330		
		Hsync pulse width + Back porch	$T_{\text{HSW}}+T_{\text{HSB}}$		100			
		Hsync Period	T_{HS}	770	800	1070		
Vsync Timing	Vertical Section	Display period	T_{VSD}		480		T_{LINE}	Note 3
		Front porch	T_{VSF}	5	10	107		
		Vsync pulse width + Back porch	$T_{\text{VSW}}+T_{\text{VSB}}$		35			
		Vsync Period	T_{VS}	520	525	622		

Note 1: Recommended frame rate is 60 Hz.

Note 2: G065VN01 V0 TFT-LCD Module can support DE & H/V mode. When DE and H/V signal are existed simultaneously, G065VN01 V0 TFT-LCD Module is operated in DE mode only.

Note 3: H/V mode is negative polarity.

6.5.2 DE & H/V Mode Input Timing Diagram

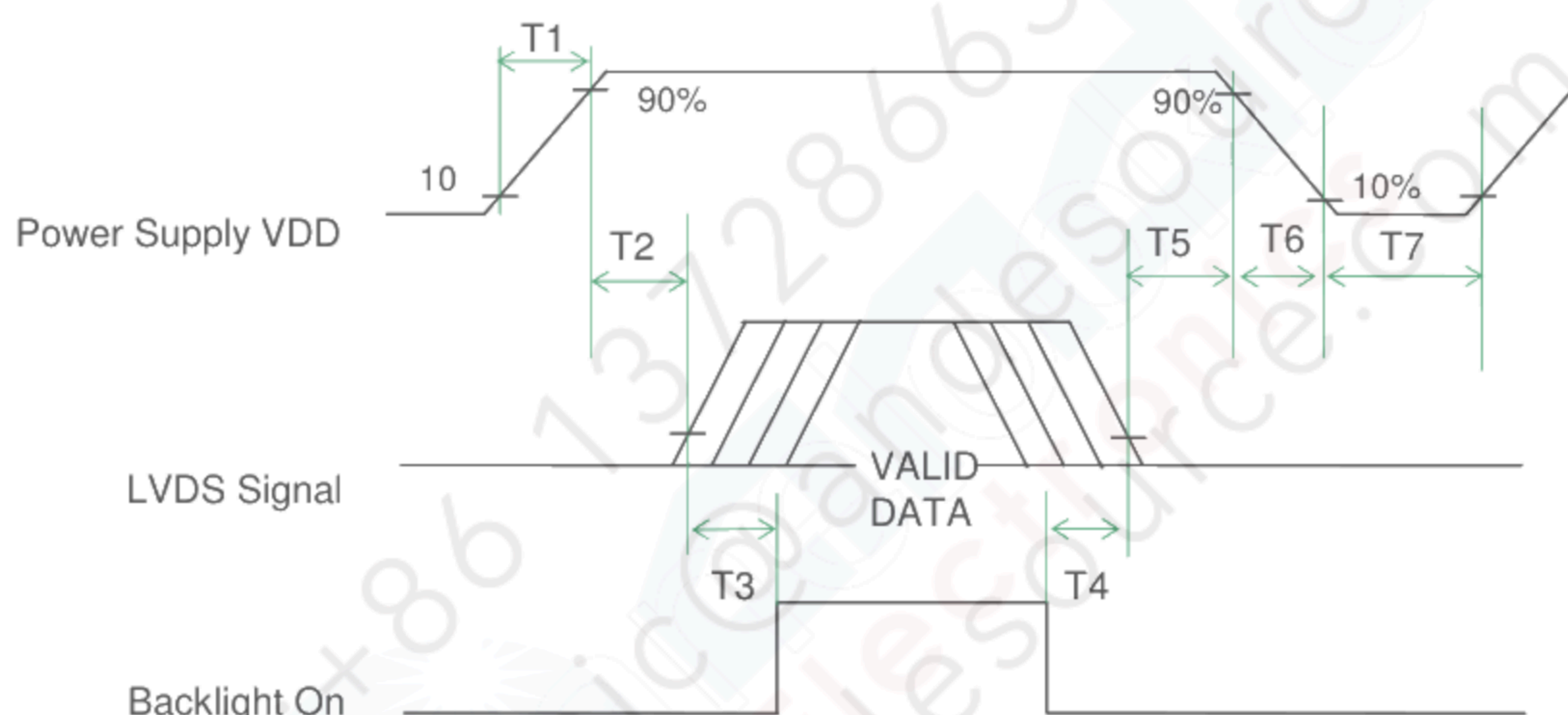


6.6 CCFL Backlight Unit Interface

Pin No.	Cable color	Symbol	Pin Description
1	Pink	Hot1	Lamp High Voltage
2	Pink	Hot2	Lamp High Voltage
3		NC	No Connection
4	White	Cold1	Lamp Low Voltage

6.7 Power ON/OFF Sequence

VDD power, LCD interface signals and backlight on/off sequence are shown in the following 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	0	-	50	ms
T3	180	-	-	ms
T4	180	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

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

7.1 TFT-LCD Signal (CN1): LCD Connector

Connector Name / Designation	Signal Connector
Manufacturer	Hirose or compatible
Connector Model Number	DF9B-31P-1V or compatible
Mating Connector Model Number	DF9B-31S-1V or compatible

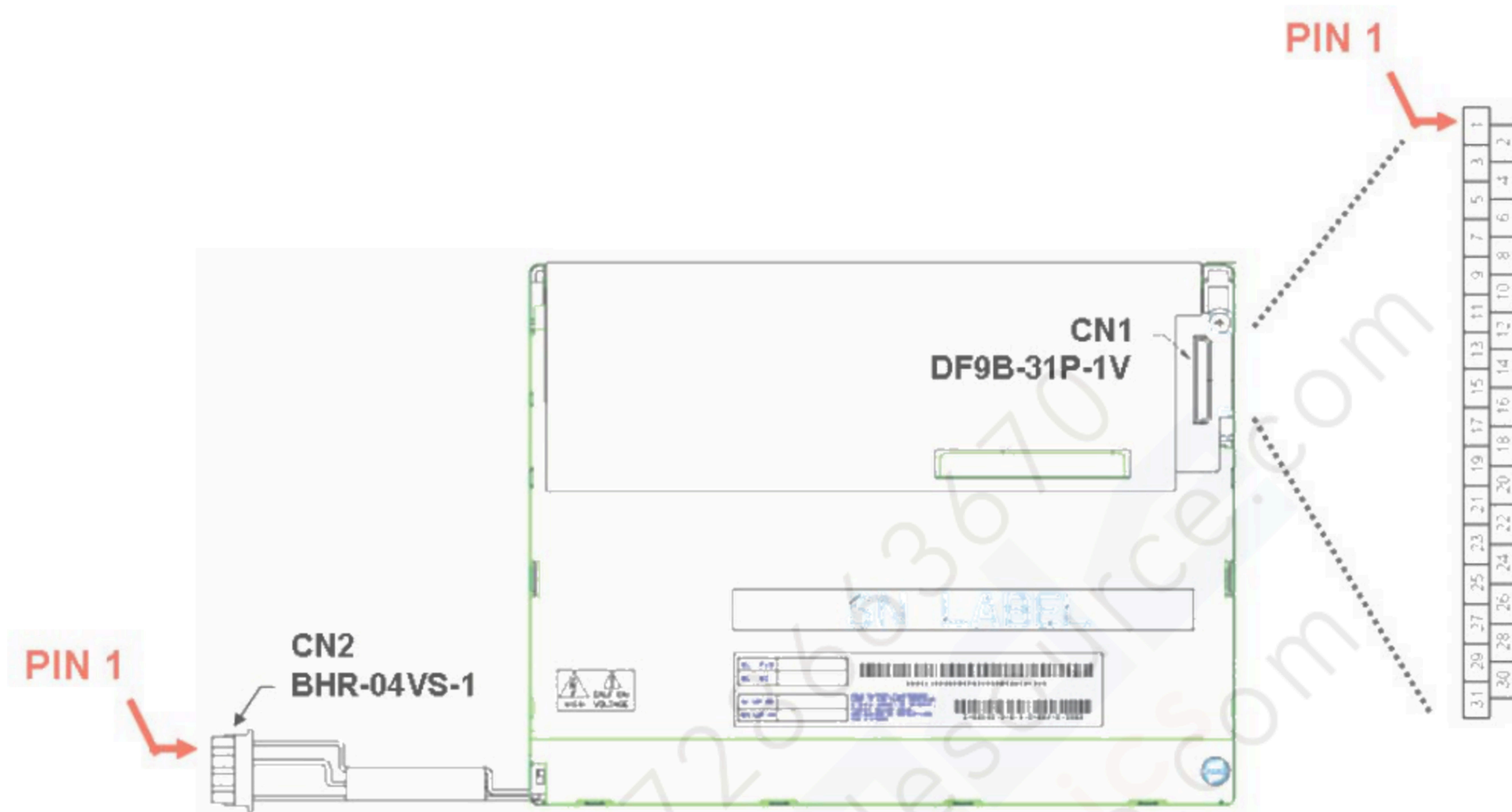
Pin#	Symbol	Pin#	Symbol	Pin#	Symbol
1	GND	12	NC	23	RxIN2-
2	GND	13	GND	24	NC
3	RxIN4+	14	GND	25	GND
4	NC	15	RxIN3+	26	SEL68
5	RxIN4-	16	GND	27	RxIN1+
6	NC	17	RxIN3-	28	VDD
7	GND	18	NC	29	RxIN1-
8	DPS	19	GND	30	VDD
9	RxCLKIN+	20	NC	31	GND
10	NC	21	RxIN2+		
11	RxCLKIN-	22	NC		

7.2 Backlight Unit (CN2): Backlight Connector

Connector Name / Designation	Lamp Connector
Manufacturer	JST or compatible
Connector Model Number	BHR-04VS-1 or compatible
Mating Connector Model Number	SM04(4.0)B-BHS-1-TB or compatible

Pin No.	Symbol
1	Hot1
2	Hot2
3	NC
4	Cold1

7.3 PIN 1 Definition of CN1 and CN2



Rear side of TFT-LCD module

8. Reliability Test Criteria

Items	Required Condition	Note
Temperature Humidity Bias	40°C /90%,300Hr	Note 2
High Temperature Operation	70°C ,300Hr	Note 2
Low Temperature Operation	-20°C ,300Hr	Note 2
High Temperature Storage	80°C ,300 hours	Note 2
Low Temperature Storage	-20°C ,300 hours	Note 2
Thermal Shock Test	-20°C /30 min ,60°C /30 min ,100cycles	Note 2
Hot Start Test	70°C /1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Cold Start Test	-20°C /1 Hr (min.), power on/off per 5 minutes, repeat 5 times	Note 2
Shock Test (Non-Operating)	50G,11ms,Half-sine wave,(±X, ±Y, ±Z)	Note 2
Vibration Test (Non-Operating)	1.5G, 50~500~50Hz, Sine wave, 30mins/axis, 3 direction (X, Y, Z)	Note 2
ESD	Contact Discharge: ±8KV, 150pF(330Ω) 1sec, 8 points, 25 times/point Air Discharge: ±15KV, 150pF(330Ω) 1sec, 8 points, 25 times/point	Note 1,2
Attitude Test	Operating: 14,000 ft, Ramp: 2000 ft/min, 8hrs Non-operating: 40,000 ft, Ramp: 2000 ft/min, 24hrs	Note 2

Note1: According to EN61000-4-2 ESD class B criteria, some performance degradation is allowed. TFT-LCD module is self-recoverable, no data lost and no hardware failures after test.

Note2:

- Water condensation is not allowed for each test items.
- Each test is done by new TFT-LCD module. Please don't use the same TFT-LCD module repeatedly for reliability test.
- The reliability test is performed only to examine the TFT-LCD module.
- To inspect TFT-LCD module after reliability test, please store it at room temperature and room humidity for 24 hour at least in advance.

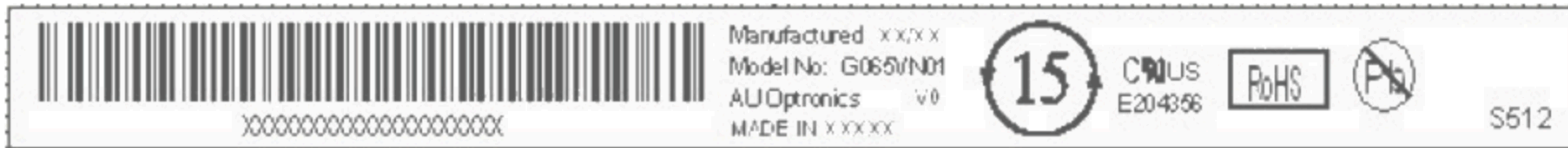
9. Mechanical Characteristics



Note 1: Self-taping Screw suggested torque value: Maximum 2.0 kgf-cm

10. Label and Packaging

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

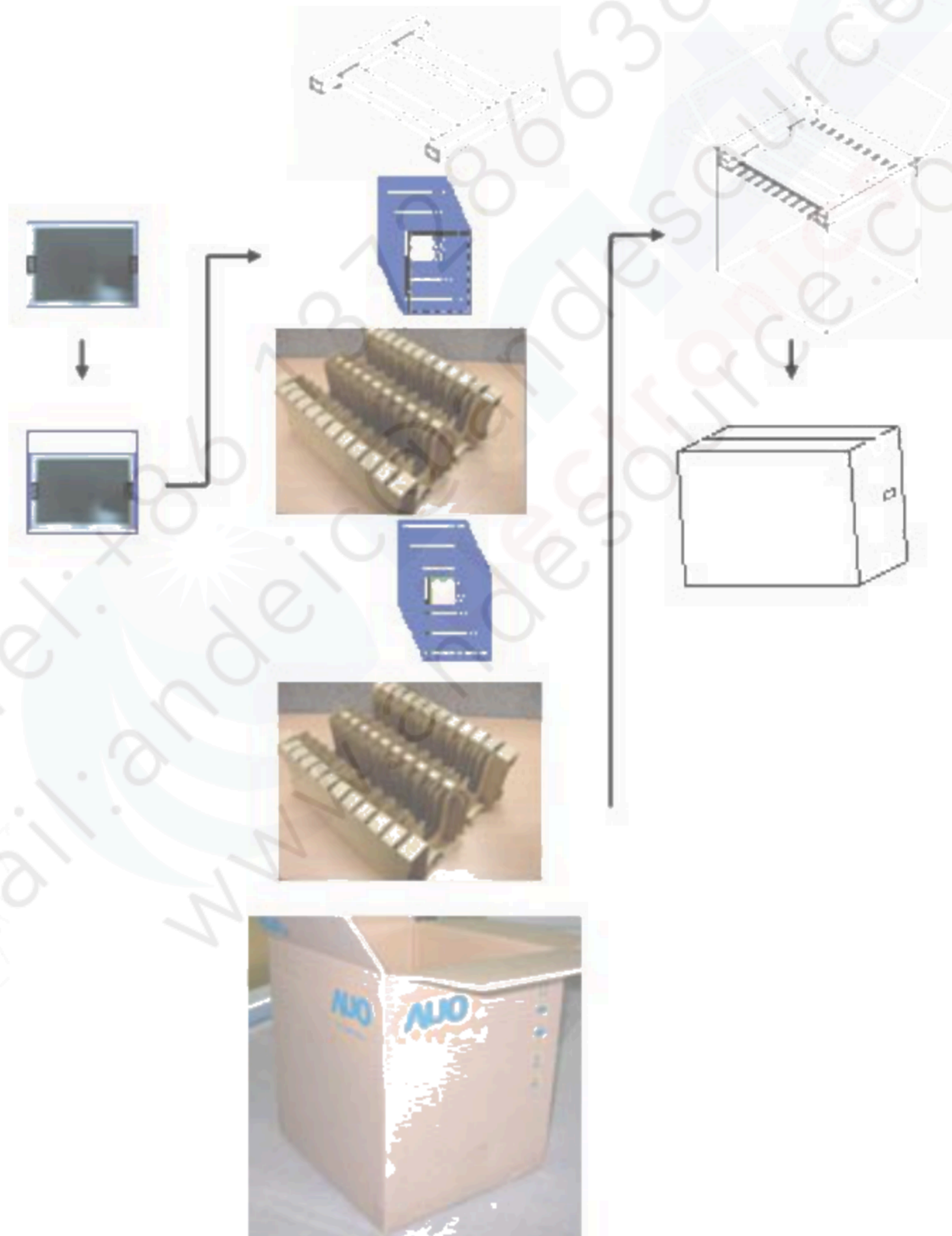


10.2 Carton Package

Max capacity: 80 TFT-LCD module per carton (40pcs * 2 layers)

Max weight: 19 kg per carton

Outside dimension of carton: 425(L)mm* 386(W)mm* 430(H)mm



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 TFT-LCD 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 TFT-LCD 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 TFT-LCD module, provisions will be made to keep them from being inserted backwards.

11.4 National Test Lab Requirement

The TFT-LCD Module will satisfy all requirements for compliance to UL 60950 (U.S.A. Information Technology equipment).