CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C123HAN02.5
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.0)**

☐ **CUSTOMER REMARK :**

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Doc. Version	0.0
Total Page	TBD
Date	2018/8/17

Product Specification

12.3” COLOR TFT-LCD MODULE

MODEL NAME: C123HAN02.5

< ◆ >Preliminary Specification
< >Final Specification

Model Name:	**C123HAN02.5**
Planned Lifetime:	From 2019/Mar To 2023/Dec
Phase-out Control:	From 2022/Mar To 2023/Dec
EOL Schedule:	2023/Dec

Note: The content of this specification is subject to change.

Record of Revision

Version	Revise Date	Page	Content
0.0	2018/8/17		First draft

Contents

1. General Description

C123HAN02.5 is an a-Si & Transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AHVA (Advanced Hyper View Angle) technology. This model is composed of a TFT-LCD, drivers, PCBA, and a backlight unit with BOSS mounting, and TCON (timing controller).

2. Features

- 12.3-inch (8:3) display
- 1920RGB x 720 resolution in RGB stripe dot arrangement
- High color: NTSC 80%
- Interfaces: 2 port LVDS
- Advanced Hyper View Angle – Normal Black wide view technology
- RoHs compliance
- AG surface treatment

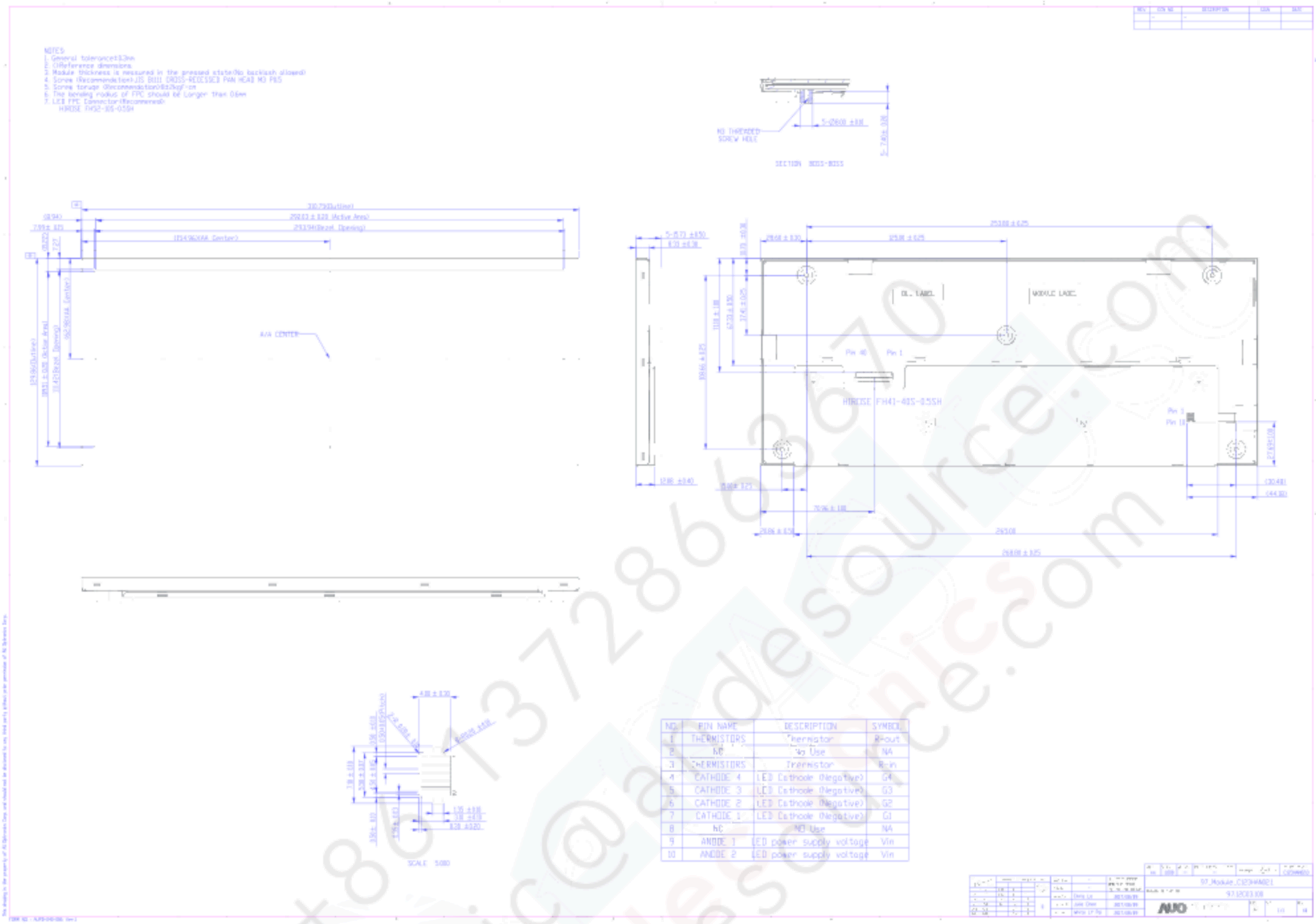
3. Physical Specifications

NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	1920 RGB (H) x 720 (V)	
2	Active Area	mm	292.032 (H)x109.512 (V)	
3	Screen Size	inch	12.3” (Diagonal)	
4	Dot Pitch	μm	152.1x152.1	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	16.7M Colors	
7	Overall Dimension	mm	310.75(H)X129.86(V)X12.08(T)	Note 2
8	Weight	g	570±10%	
9	Display Mode	--	Normally Black	
10	Surface Treatment		AG	

Note 1: Below figure shows dot stripe arrangement.

Note 2: including PCBA cover. Please refer to the drawing in page 6 for further information.

4. Outline Dimension



NO.	PIN NAME	DESCRIPTION	SYMBOL
1	THERMISTOR1	Thermistor	R-out
2	NC	No Use	NA
3	THERMISTOR1	Thermistor	R-in
4	CATHODE 4	LED Cathode (Negative)	G4
5	CATHODE 3	LED Cathode (Negative)	G3
6	CATHODE 2	LED Cathode (Negative)	G2
7	CATHODE 1	LED Cathode (Negative)	G1
8	NC	NO Use	NA
9	ANODE 1	LED power supply voltage	Vin
10	ANODE 2	LED power supply voltage	Vin

5. Electrical Specifications

A. Pin Assignment

1. Main FPC

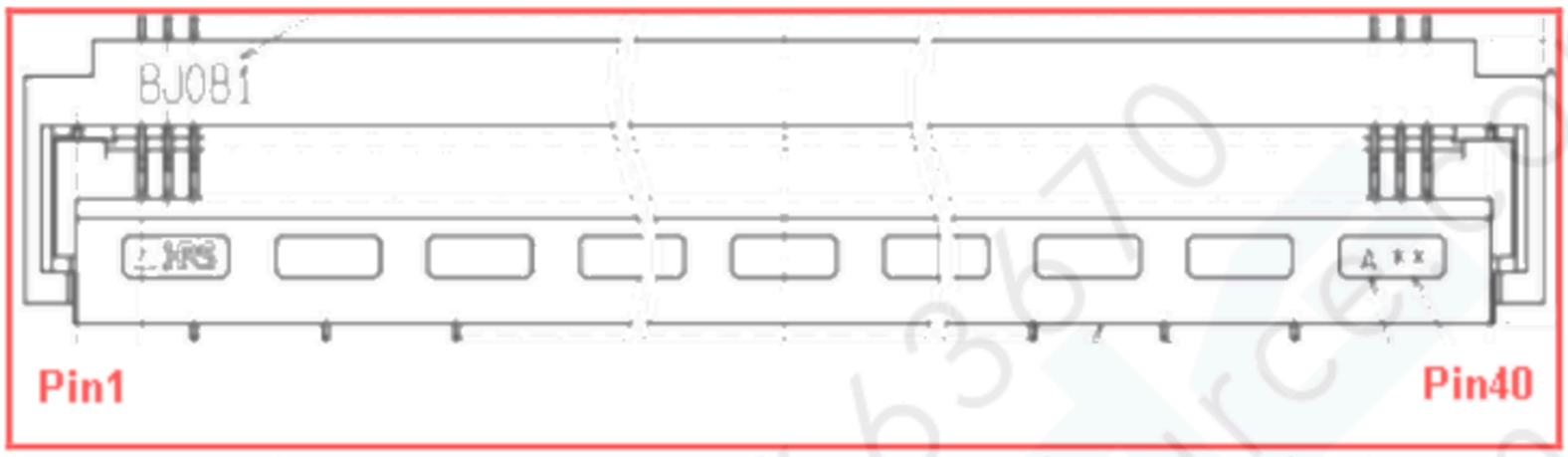
Connector=FH41-40S-0.5SH(05)

No.	Pin Name	I/O	Description	Remarks
1	GND	G	Power ground	
2	GND	G	Power ground	
3	RxOIN0-	I	Negative LVDS differential data input (Odd data)	
4	RxOIN0+	I	Positive LVDS differential data input (Odd data)	
5	GND	G	Power ground	
6	RxOIN1-	I	Negative LVDS differential data input (Odd data)	
7	RxOIN1+	I	Positive LVDS differential data input (Odd data)	
8	GND	G	Power ground	
9	RxOIN2-	I	Negative LVDS differential data input (Odd data)	
10	RxOIN2+	I	Positive LVDS differential data input (Odd data)	
11	GND	G	Power ground	
12	RxOCLK-	I	Negative LVDS differential clock input (Odd clock)	
13	RxOCLK+	I	Positive LVDS differential clock input (Odd clock)	
14	GND	G	Power ground	
15	RxOIN3-	I	Negative LVDS differential data input (Odd data)	
16	RxOIN3+	I	Positive LVDS differential data input (Odd data)	
17	GND	G	Power ground	
18	RxEIN0-	I	Negative LVDS differential data input (Even data)	
19	RxEIN0+	I	Positive LVDS differential data input (Even data)	
20	GND	G	Power ground	
21	RxEIN1-	I	Negative LVDS differential data input (Even data)	
22	RxEIN1+	I	Positive LVDS differential data input (Even data)	
23	GND	G	Power ground	
24	RxEIN2-	I	Negative LVDS differential data input (Even data)	
25	RxEIN2+	I	Positive LVDS differential data input (Even data)	
26	GND	G	Power ground	
27	RxECLK-	I	Negative LVDS differential clock input (Even clock)	
28	RxECLK+	I	Positive LVDS differential clock input (Even clock)	
29	GND	G	Power ground	
30	RxEIN3-	I	Negative LVDS differential data input (Even data)	
31	RxEIN3+	I	Positive LVDS differential data input (Even data)	
32	GND	G	Power ground	
33	AB_IND	O	Abnormal signal detection. Combine the source driver & gate driver detection result. AB_IND="H",IC is at normal operation. AB_IND="L",IC is at abnormal states.	
34	RESET	I	Global reset pin	
35	VDD	P	Power input	

36	VDD	P	Power input
37	VDD	P	Power input
38	VDD	P	Power input
39	GND	G	Power ground
40	GND	G	Power ground

I: Digital signal input, G: GND, P: Power input, O: Digital signal output

Connector Pin1 position:



Note: B_Pin1 and B_Pin42 are connected metal of connector surface, please fixed to ground.

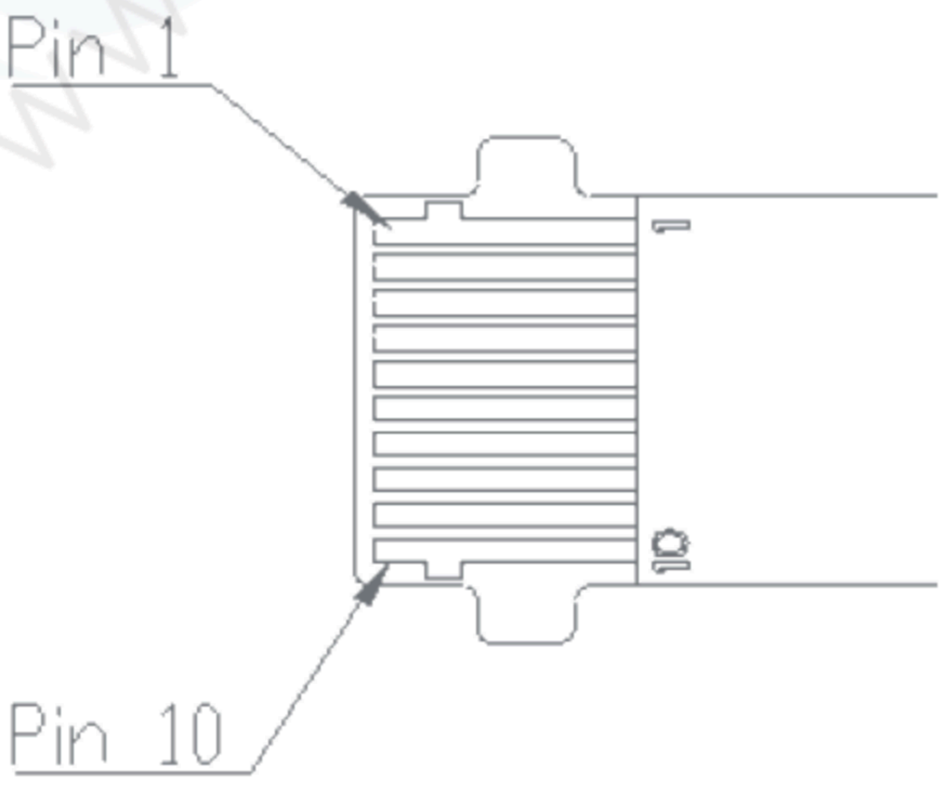
2. Back Light Unit FPC

Connector=HRS FH52-10S-0.5SH(05)

No.	Pin Name	I/O	Description	Remarks
1	THERMISTORS	Rout	Thermistor	
2	NC	NA	No Use	
3	THERMISTORS	Rin	Thermistor	
4	CATHODE 4	G4	LED Cathode (Negative)	
5	CATHODE 3	G3	LED Cathode (Negative)	
6	CATHODE 2	G2	LED Cathode (Negative)	
7	CATHODE 1	G1	LED Cathode (Negative)	
8	NC	NA	No Use	
9	ANODE 1	Vin	LED power supply voltage	
10	ANODE 1	Vin	LED power supply voltage	

R: Resistance, V_{in}: Power input

Gold finger side:



B. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	-0.3	4	V	Note 1
Input Signal Voltage	Vi	-0.3	VDD+ 0.3	V	Note 1
Operation Temperature	Topa	-30	+85	℃	
Storage Temperature	Tstg	-40	+95	℃	

Note 1: Functional operation should be restricted under normal ambient temperature.

C. DC Electrical Characteristics

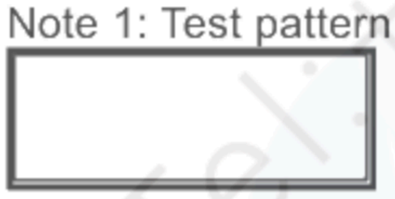
The following items are measured under stable condition and suggested application circuit.

a. Power Specification

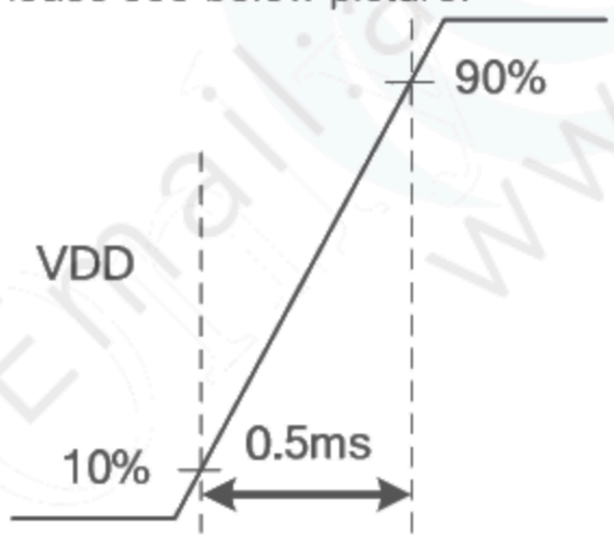
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply	VDD	3.0	3.3	3.6	V	
	IVDD	-	**655.9**	**1219.2**	**mA**	Note1
	IVDD Inrush	-	-	1.2	A	Note 2
Input high voltage	Vh	0.7*VDD	-	VDD	V	
Input low voltage	Vl	GND	-	0.3*VDD	V	

*** The limitation range of Minima and Maxima is derived base on operating at ambient temp 25°C
All conditions should be set typical value.
The panel can operate normally in the recommended operating condition.

Note 1: Test pattern is the following picture (white pattern).



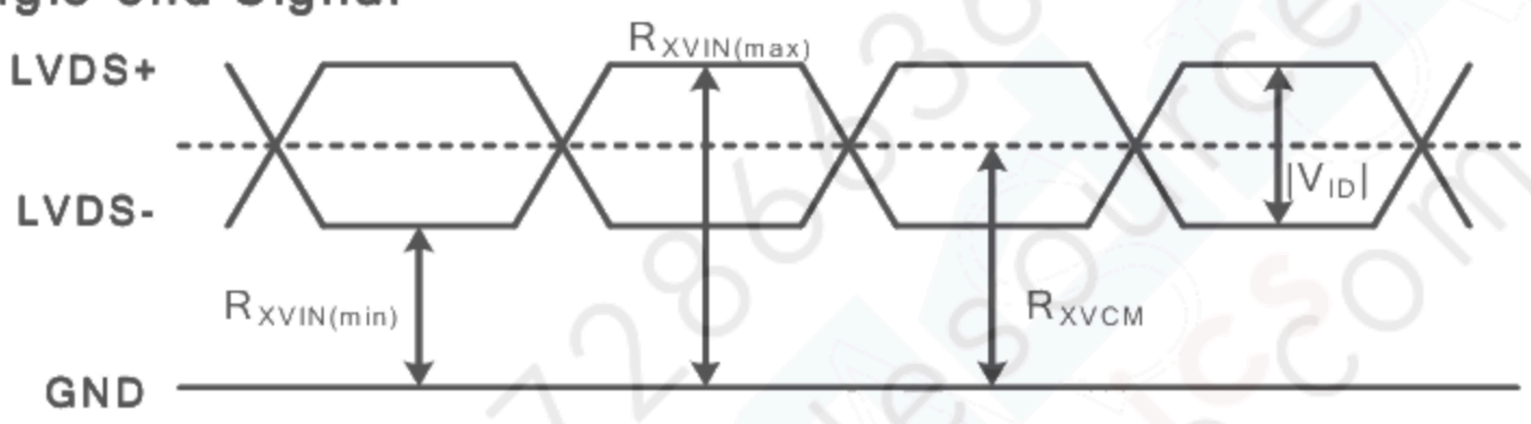
Note 2: Test condition is the VDD voltage range between 3.0V~3.6V on the rising time 0.5ms, Please see below picture.



b. Signal DC Electrical Characteristics

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Differential input high threshold	R_{XVTH}	-	-	200	mV	R_{XVCM}=1.2V
Differential input low threshold	R_{XVTL}	-200	-	-	mV	R_{XVCM}=1.2V
Input voltage range (singled-end)	R_{XVIN}	0.7	-	1.6	V	
Input differential voltage	$\|V_{ID}\|$	200	-	600	mV	
Differential Input Common Mode Voltage	R_{XVCM}	1.0	1.2	1.3	V	

Single-end Signal



Differential Signal

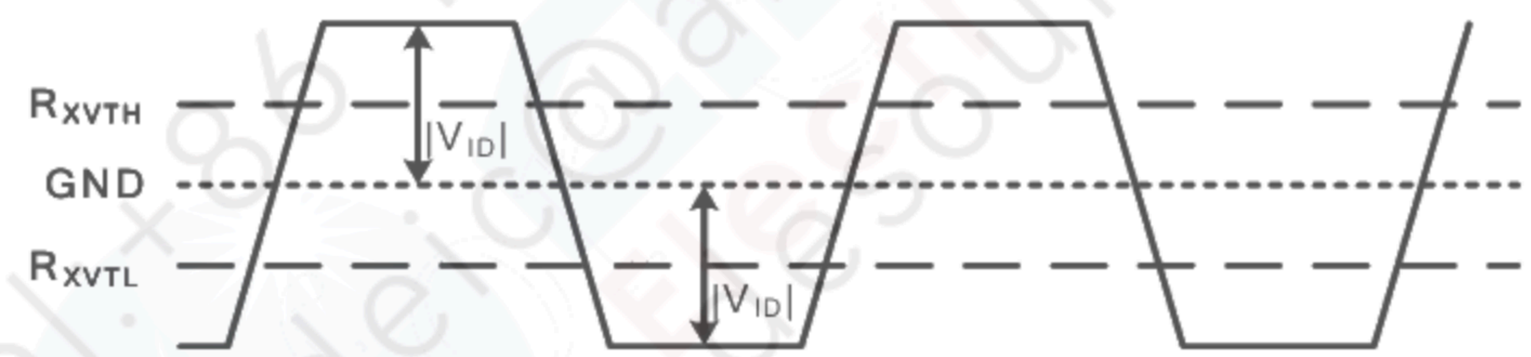


Fig. 4 LVDS DC characteristics diagram

c. Backlight Driving Conditions (Note 1)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
Forward Current	I_F	at 25℃	---	80	---	mA	Single serial (Note 2)
Forward Voltage	V_F	I_F=80 mA	---	(24)	(27.2)	V	One string (Note 3)
NTC Thermistor Resistance	R	at 25℃	9.99k	10k	10.1k	ohm	Zero-power resistance (Note 5)
LED Life Time	T_{LED}	at 25℃	10000	---	---	Hrs	Note4 (Reference)

Pin Assignment

PIN 1	Thermistors(-)	—
PIN 2	NC	
PIN 3	Thermistors(+)	+
PIN 4	LED (-) 4,8,12,16,20,24,28,32	—
PIN 5	LED (-) 3,7,11,15,19,23,27,31	—
PIN 6	LED (-) 2,6,10,14,18,22,26,30	—
PIN 7	LED (-) 1,5,9,13,17,21,25,29	—
PIN 8	NC	
PIN 9	LED +	+
PIN 10	LED +	+

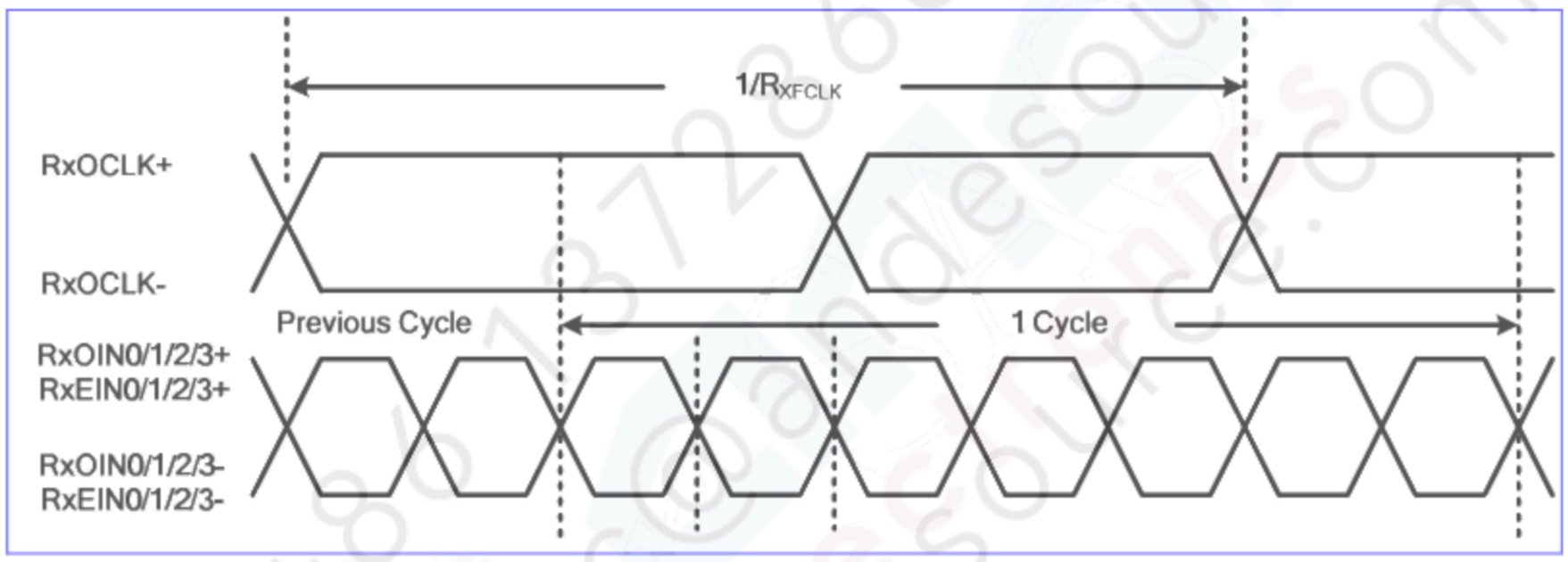
Note 1: LED backlight has one light-bar.
The light-bar has 32 LEDs (4 strings, 8pcs for each string).
Note 2: The LED supply power is for 4 string of LED
Note 3: Be sure your system can provide enough voltage driving capability (larger than 27.2V is recommended) to provide 80mA for each LED or the brightness is possible to be below spec.
Note 4: The LED lifetime 10000hrs means , after normal use at 80mA, under +25 ° C, the brightness decreases to 75% of original level.
Note 5: The NTC Thermistor Resistance is MURATA NCU15XH103F6SRC

D. AC Electrical Characteristics

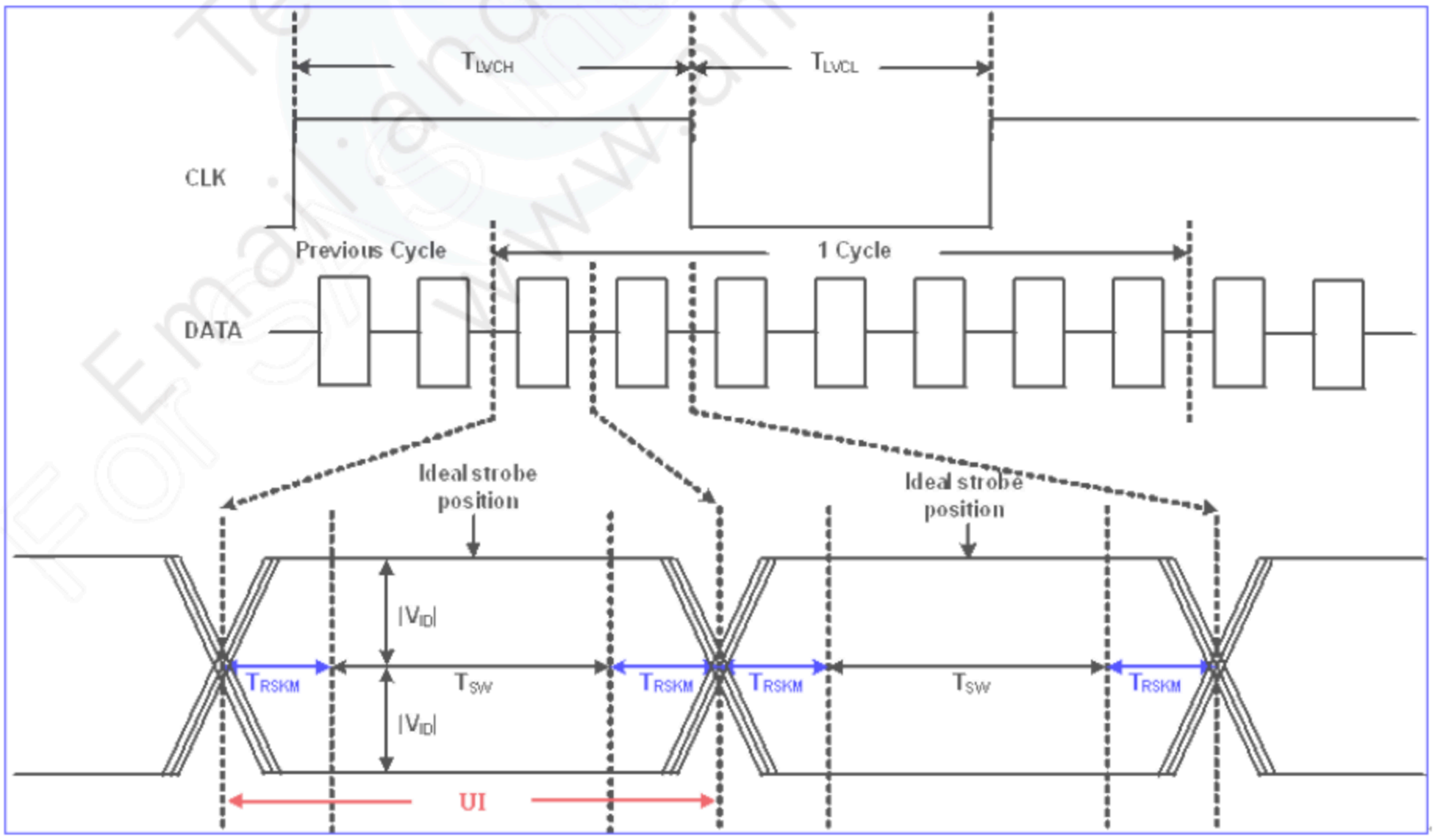
a. Differential signal AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	R_{XFCLK}	44.7	47.5	61	MHz	
Input data skew margin	T_{RSKM}	-	-	1/4	UI	|VID|=200mV RXVCM =1.2V Note1
Clock strobe width	T_{SW}	1/2	-	-	UI	
Clock High Time	T_{LVCH}	-	$4/(7* R_{XFCLK})$	-	ns	
Clock Low Time	T_{LVCL}	-	$3/(7* R_{XFCLK})$	-	ns	

Note1.For the Data Skew Margin, “Input Signal Skew + Input Signal Jitter” must be smaller than TRSKM.



E. Fig. 7 Data skew margin Differential Input Data Format



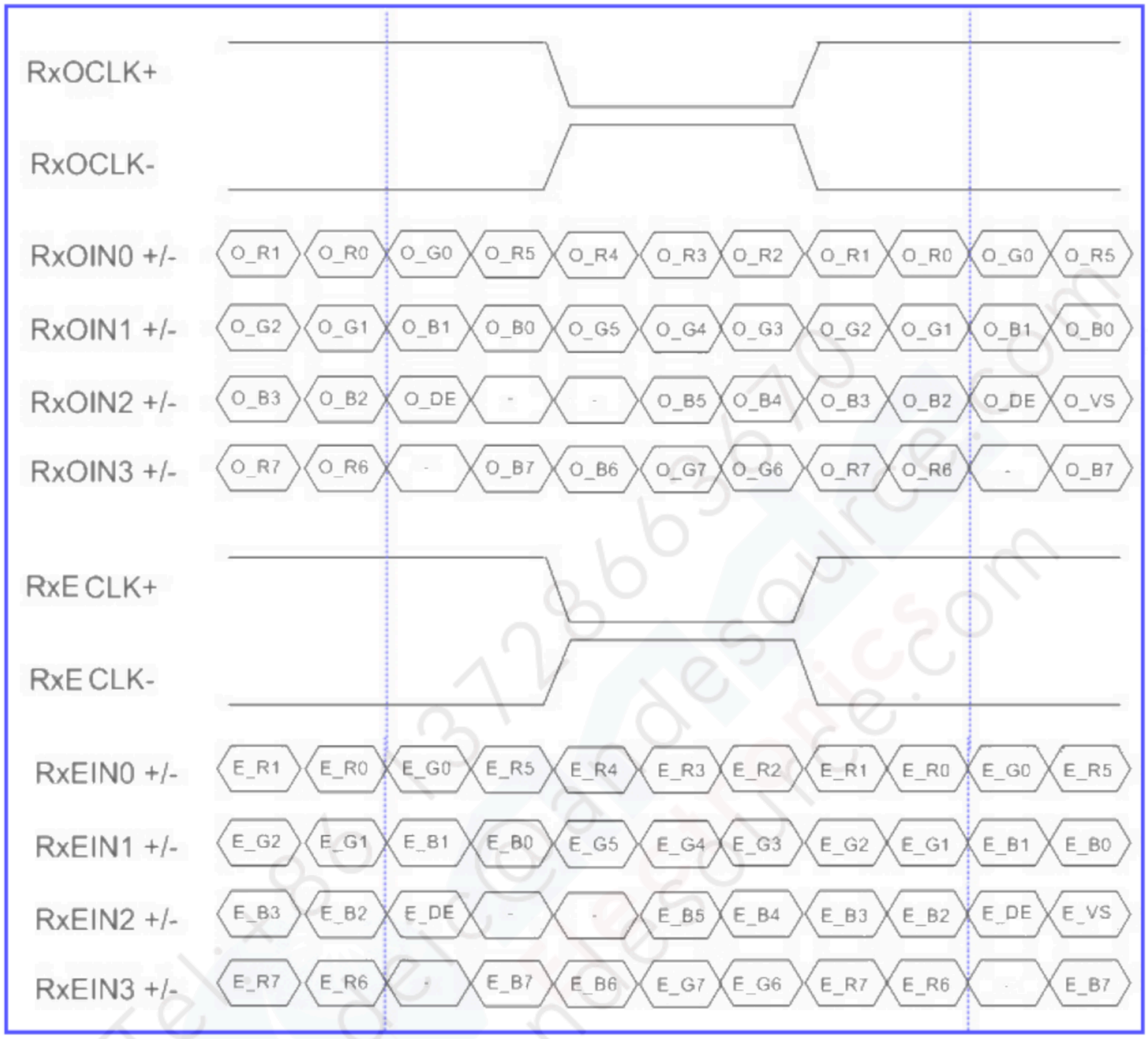


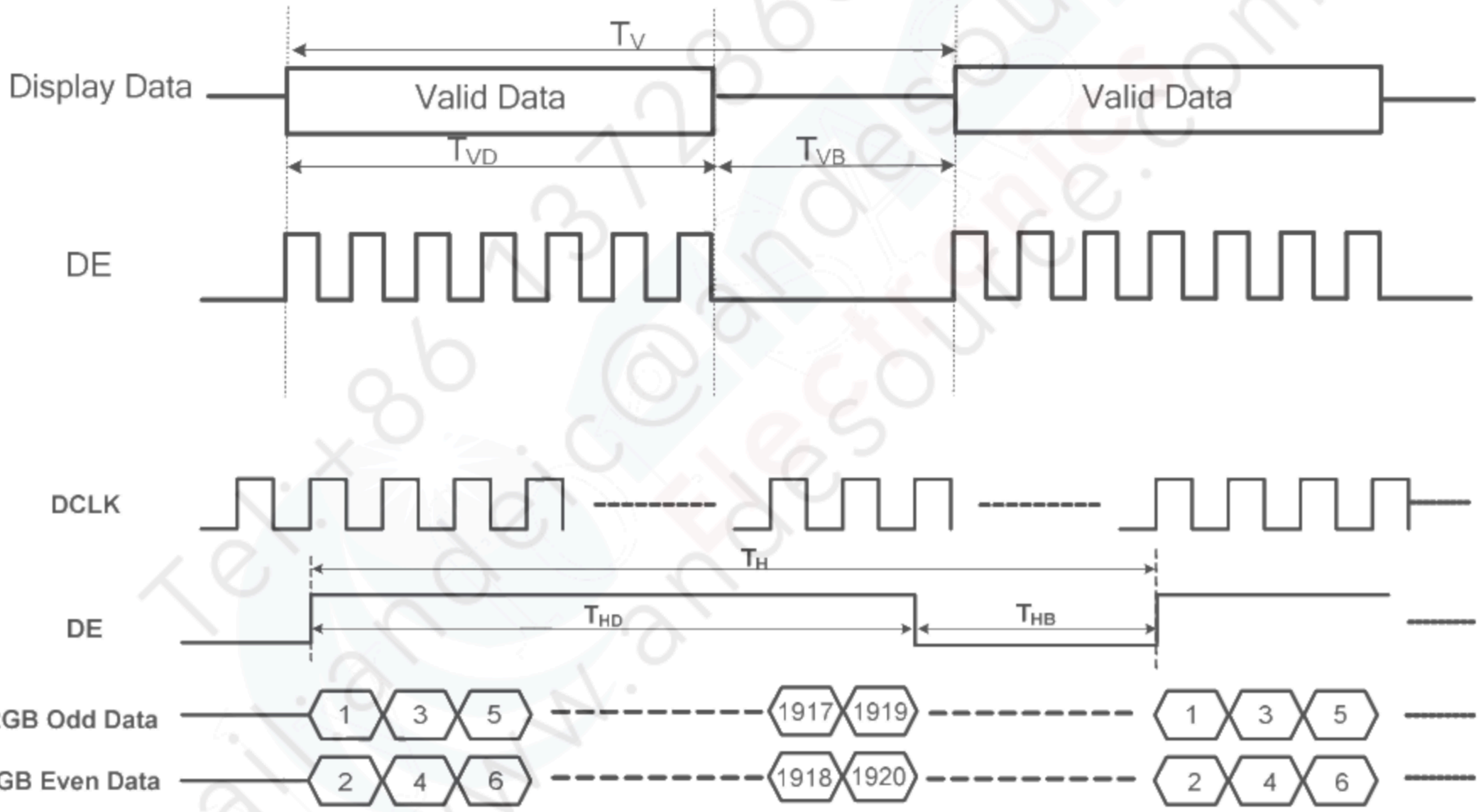
Fig.1 LVDS input data VESA format

F. Timing Condition

a. DE Mode

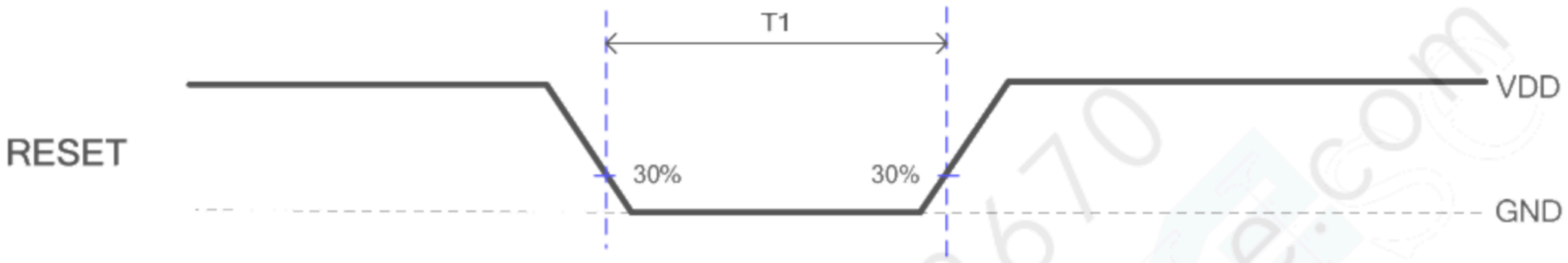
Item	Symbol	Min	Typ.	Max	Unit	Remark
Clock frequency	F_{DCLK}	44.7	47.5	61	MHz	
Horizontal period area	T_H	1020	1040	1200	DCLK	
Horizontal display area	T_{HD}	960	960	960	DCLK	
Horizontal blanking area	T_{HB}	60	80	240	DCLK	
Vertical period area	T_V	730	760	840	T_H	
Vertical display area	T_{VD}	720	720	720	T_H	
Vertical blanking area	T_{VB}	10	40	120	T_H	
Frame rate	F_R	55	60	65	Hz	

b. Timing Diagram



G. RESET Function

Item	Symbol	Min	Typ	Max	Unit	Remark
RESET	T1	1	--	10	ms	

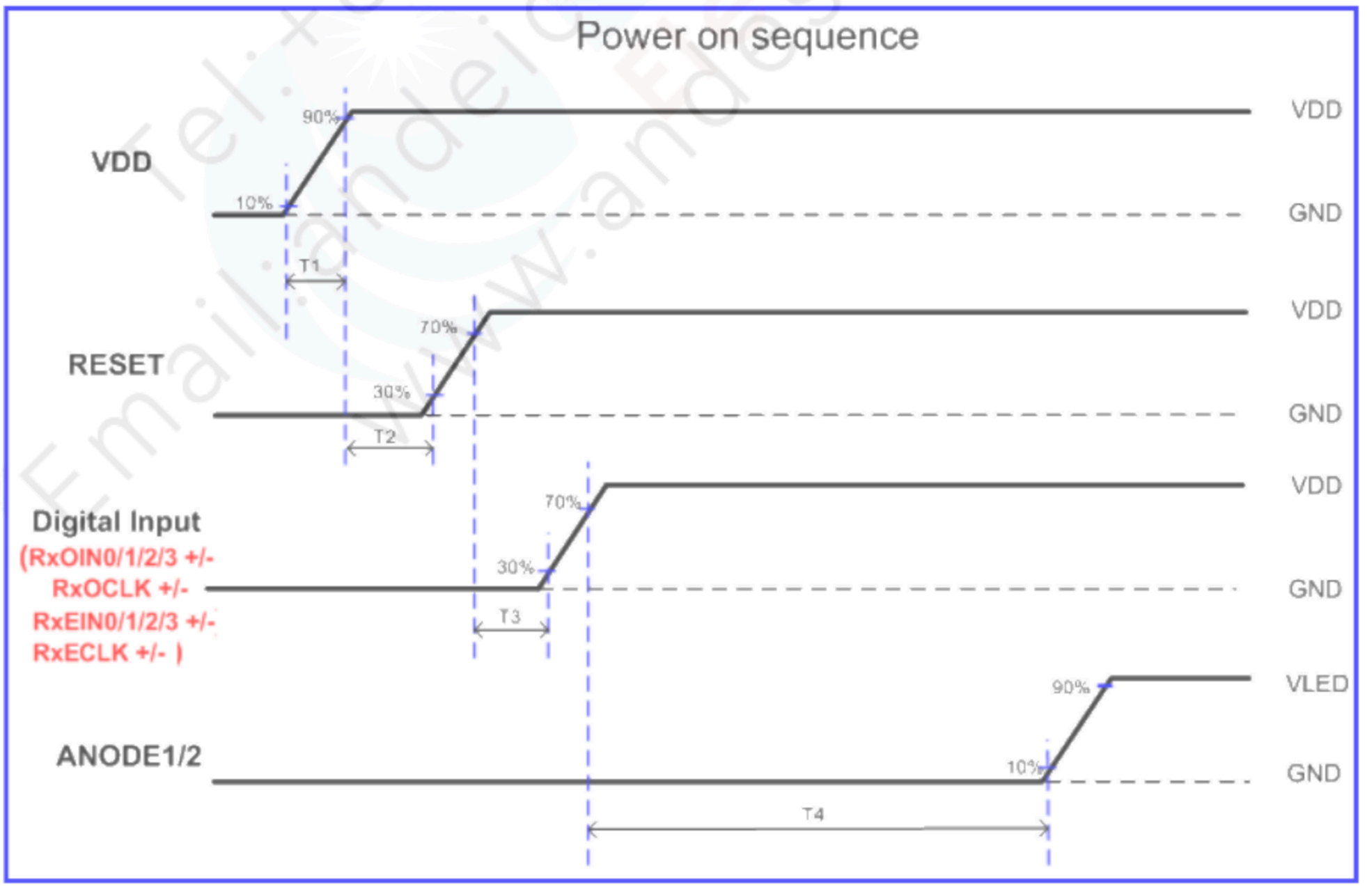


H. Power ON / OFF timing

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:

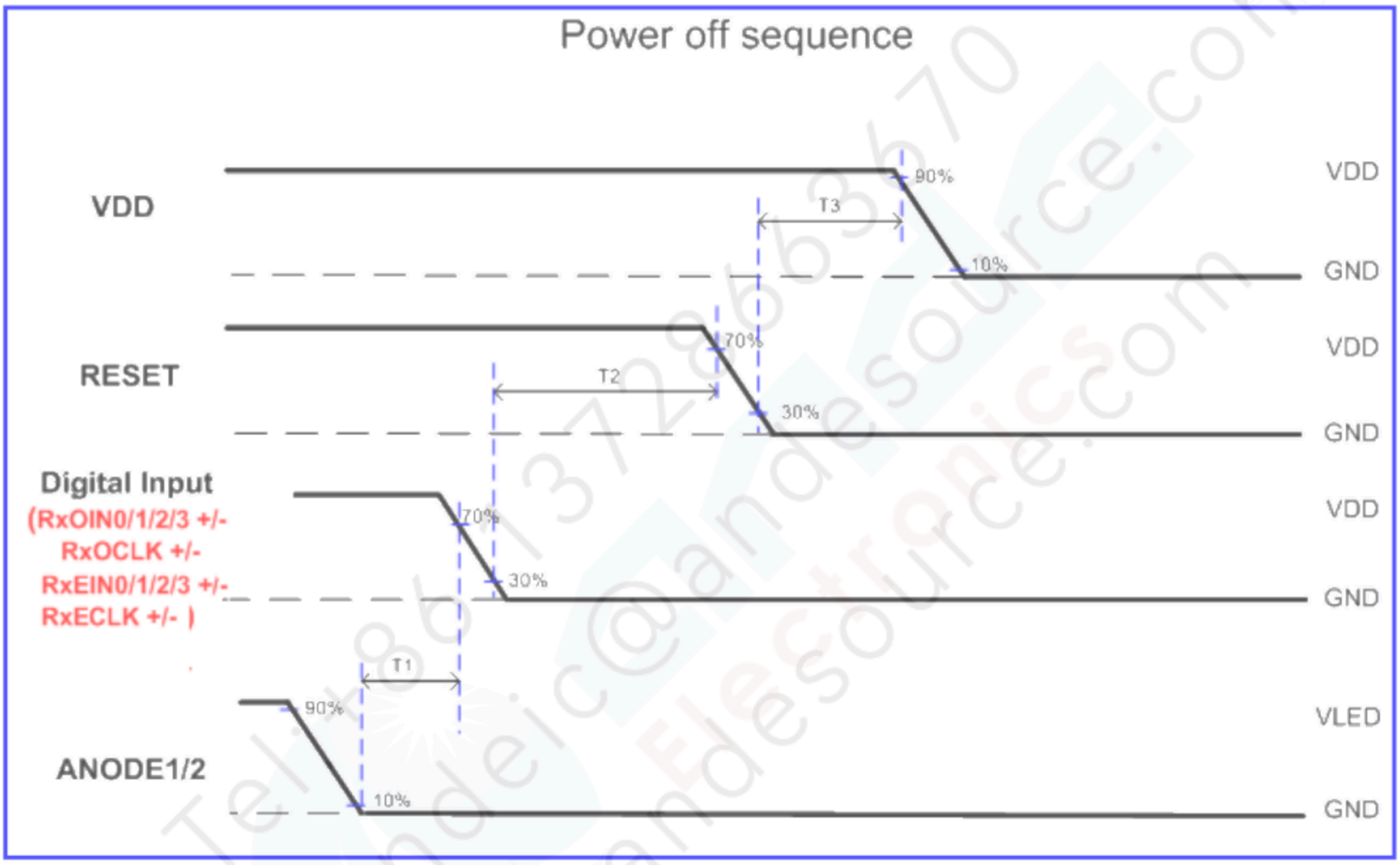
a. Power ON sequence

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	--	--	15	ms
T2	1	--	20	ms
T3	0	--	20	ms
T4	500	--	--	ms



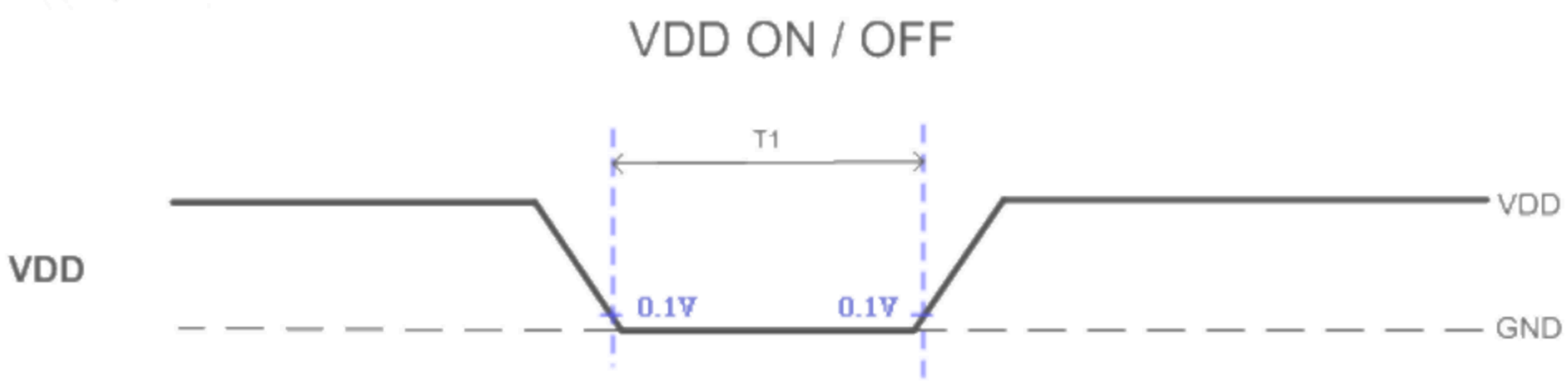
b. Power OFF sequence

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	200	--	--	ms
T2	0	--	20	ms
T3	1	--	20	ms



c. Repower ON / OFF (other signal need to follow normal power on/off sequence)

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	1000	--	-	ms



6. Optical specifications

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall	Tr+Tf	θ=0°, Ta=25° C		15	20	ms	Note 3
		θ=0°, Ta=0° C		45	150		
		θ=0°, Ta=-30° C		285	350		
Contrast ratio	CR	θ=0°	800	1000	-		Note 4, 5, 6
Viewing Angle Top Bottom Left Right		CR ≧ 10	 70 70 70 70	 80 80 80 80	 - - - -	deg.	Note 7, 8
Brightness	Y_L	θ=0°	600		-	cd/m^2	Note 1,2,9
White Chromaticity	X	θ=0°	0.265	0.305 (TBD)	0.345		Note 8
	Y	θ=0°	0.315	0.355 (TBD)	0.395		
Red Chromaticity	X	θ=0°	0.585	0.625 (TBD)	0.665		
	Y	θ=0°	0.272	0.312 (TBD)	0.352		
Green Chromaticity	X	θ=0°	0.267	0.307 (TBD)	0.347		
	Y	θ=0°	0.615	0.655 (TBD)	0.695		
Blue Chromaticity	X	θ=0°	0.111	0.151 (TBD)	0.191		
	Y	θ=0°	0.034	0.074 (TBD)	0.114		
Uniformity		9-point, θ=0°	80%				Note 10

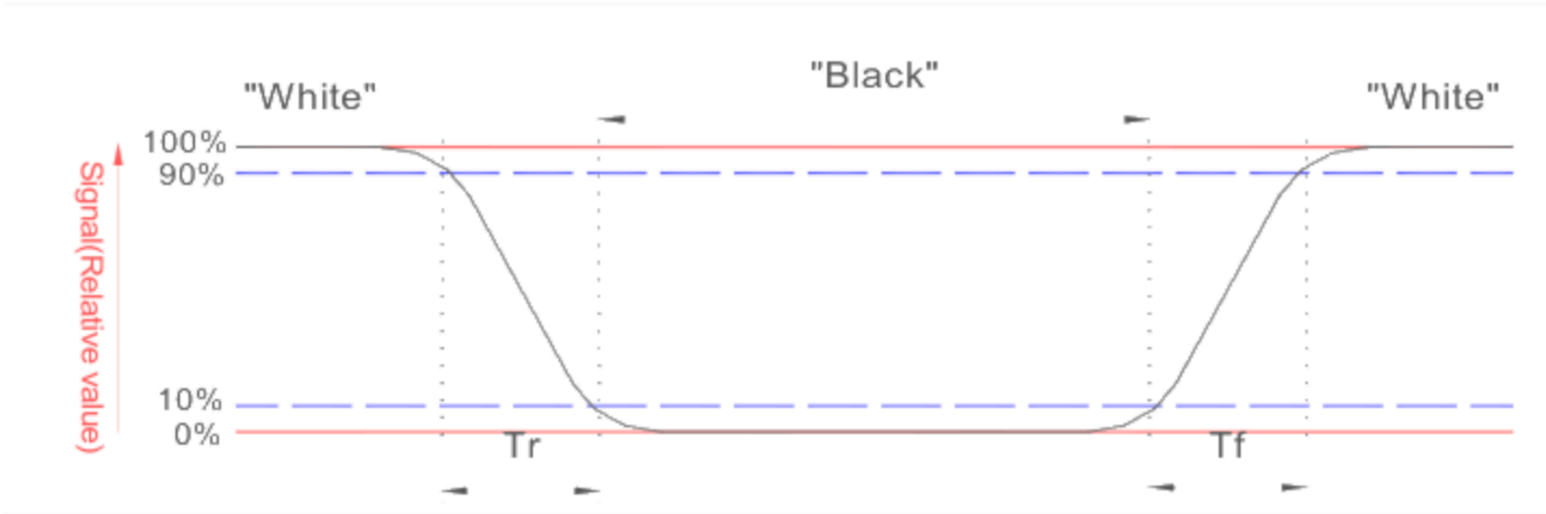
PS. Regarding Color Chromaticity, will be updated after real sample out.

Note 1: Measurement should be performed in the dark room, optical ambient temperature =25°C, and backlight current I_L=80 mA

Note 2: To be measured on the center area of panel with a field angle of 1°by Topcon luminance meter SR-3, after 10 minutes operation.

Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white”(falling time) and from “white” to “black”(rising time), respectively.



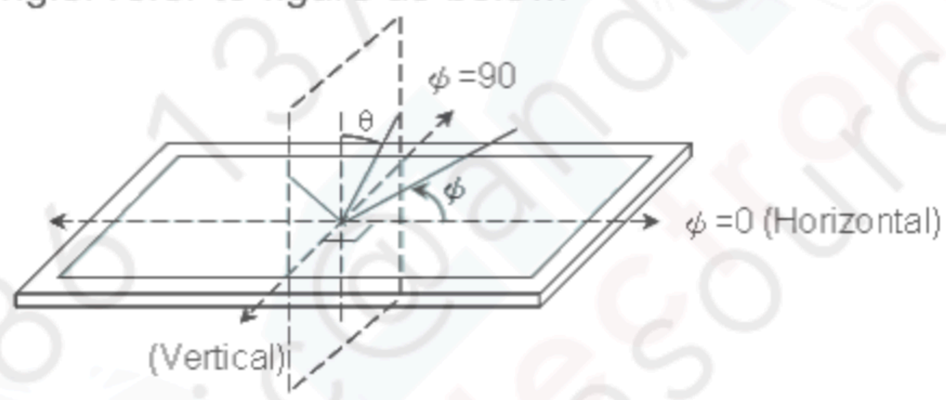
Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25℃.

$$\text{Contrastratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. Contrast ratio is calculated with the following formula.

Note 6. When "White" state, R[7:0]=G[7:0]=B[7:0]=11111111
When "Black" state, R[7:0]=G[7:0]=B[7:0]=0000000

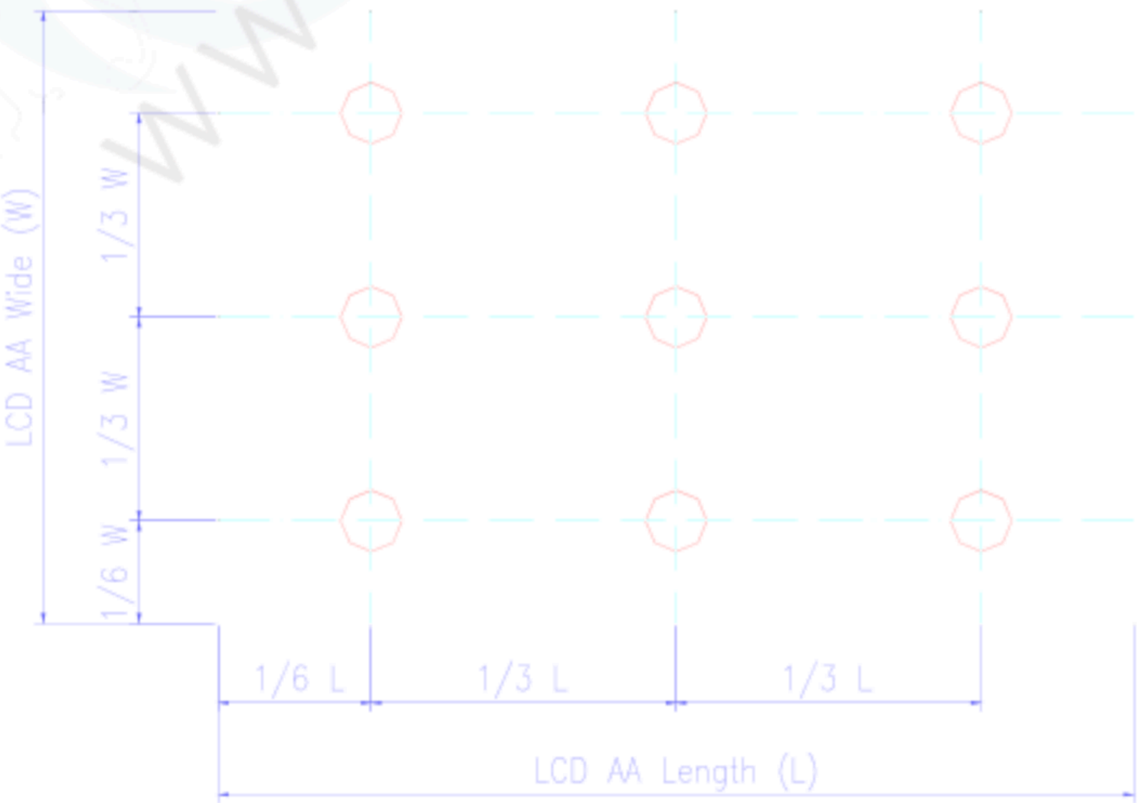
Note 7. Definition of viewing angle: refer to figure as below.



Note 8. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 9. Brightness is measured at the center of the display with white pattern in 80mA

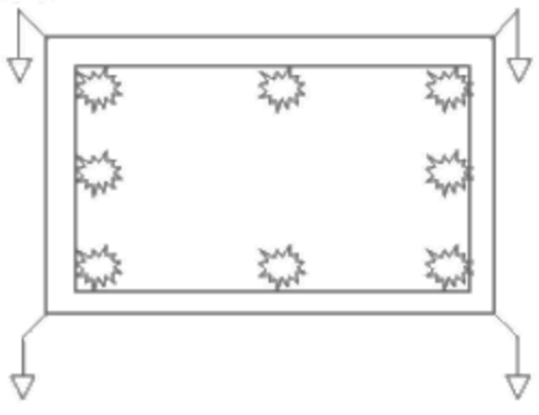
Note 10. Luminance Uniformity is defined as following within the 9 measurements (L1~L9),
Luminance Uniformity(%) =Minimum luminance(brightness)/Maximum luminance(brightness)



7. Reliability Test Items

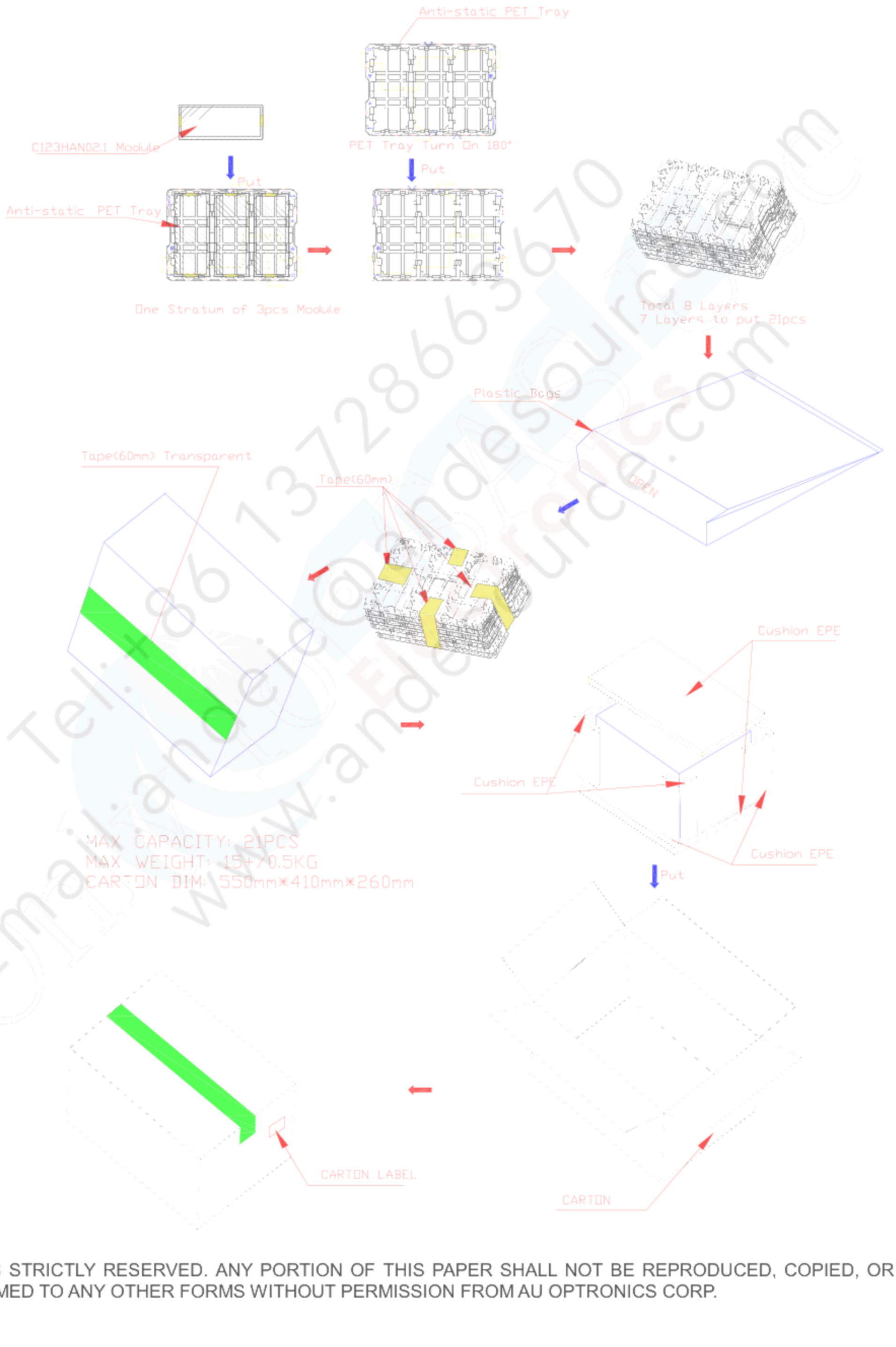
No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95℃	500Hrs	Note1
2	Low temperature storage	Ta= -40℃	500Hrs	
3	High temperature operation	Ta= 85℃	500Hrs	
4	Low temperature operation	Ta= -30℃	500Hrs	Note1, 3
5	High temperature and high humidity	Ta= 60℃, 90% RH	500Hrs	Operation
6	Heat shock	-30℃~85℃/200 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 8 kV, class B (R=330Ω,C=150pF) Air = ± 15 kV, class B (R=330Ω,C=150pF) 1 times for each point.		Operation (Note 4)
8	Vibration	Frequency range	8~33.3Hz	JIS D1601,A10 Condition A
		Stoke	1.3mm	
		Sweep	2.9G, 33.3~400Hz	
		Cycle	15min.	
		2 hours for each direction of X, Z 4 hours for Y direction		
9	Mechanical shock	100G, 6ms, ±X,±Y,±Z 3 times for each direction		
10	Vibration (with carton)	Random vibration: $0.015G^2$/Hz from 5~200Hz –6dB/Octave from 200~500Hz		IEC 68-34
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces		
12	EMS	EMS test criteria and condition varies from customer to customer, therefore EMS performance will not be guaranteed in this model.		

Note 1: Ta: Ambient temperature.
Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.
Note 3: Short time operation between -40℃~-30℃ doesn't provide full performance but a correct image on the LCD. The LCD is guaranteed to suffer no permanent damage.
Note 4: Test techniques follow IEC61000-4-2 standard. Test points and pattern as below.



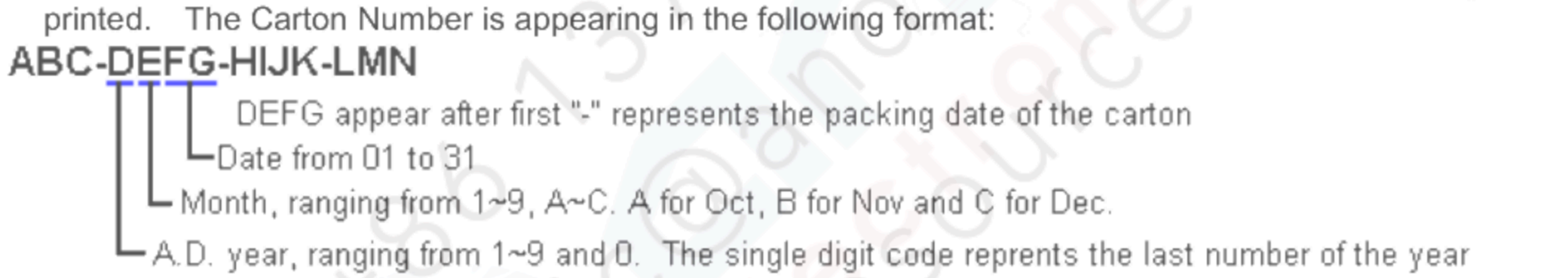
8. Packing and Marking

I. Packing Form



2. Module/Panel Label Information

The module/panel (collectively called as the “Product”) will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 22-digit serial number with the following definition:



Example:
501M06ZL06123456781Z05:
Product Manufacturing Week Code: WK50
Product Version: Version 1
Product Manufacturing Factory: M06

3. Carton Label Information

The packing carton will be attached with a carton label where packing Q’ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:

Refer to the drawing of packing format for the location and size of the carton label.