



Doc. Version	2
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Product Specification

12.3" COLOR TFT-LCD MODULE

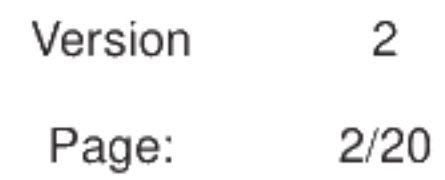
MODEL NAME: C123VAN01.1

- < >Preliminary Specification
- < >Final Specification

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

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A. General Description

C123VAN01.1 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, the FPC (flexible printed circuit), a backlight unit, and the PCBA (Printed Circuit Board Assembly)

B. Features

- 12.3-inch (8:3) display
- 1440RGB x 540 resolution in RGB stripe dot arrangement
- Interfaces: LVDS
- Advanced Hyper View Angle – Normal Black wide view technology, AHVA
- RoHs compliance
- AG surface treatment

C. Physical Specifications

NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	1440 RGB (H)×540(V)	
2	Active Area	mm	291.6(H)×109.35(V)	
3	Screen Size	inch	12.3(Diagonal)	
4	Dot Pitch	mm	0.0675(H)×RGBx0.2025(V)	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	16.7M Colors	
7	Overall Dimension	mm	308.5mm (W) x 129 mm (H) x 11.53 mm (D)	Note 2
8	Weight	g	TBD	
9	Display Mode	--	Normally Black	
10	Surface Treatment		AG, 3H	

Note 1: Below figure shows dot stripe arrangement.



Note 2: Please refer to the drawing in page 6 for further information

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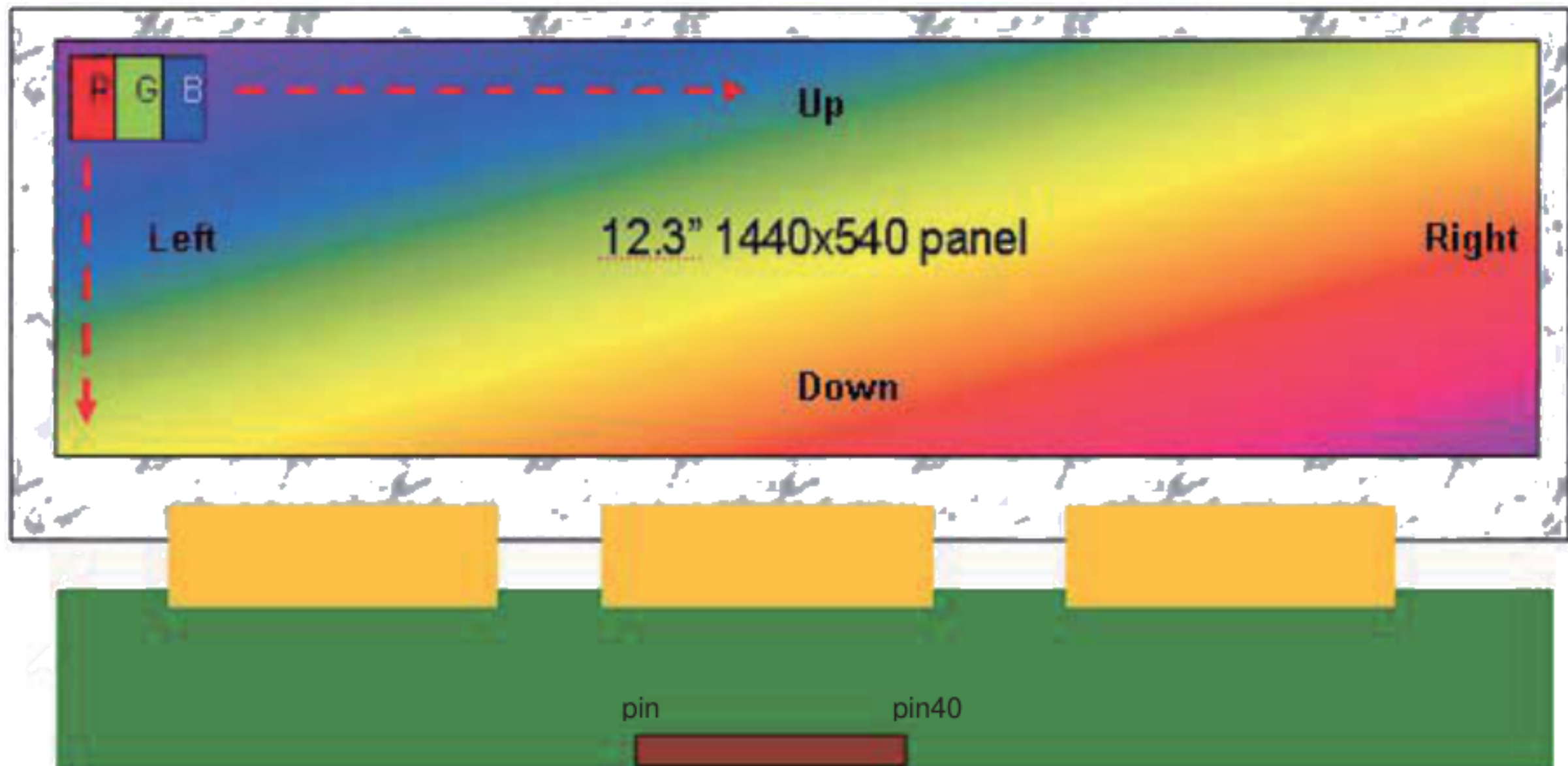
E. Electrical Specifications

1. Pin Assignment

a. Main FPC

Connector=Hirose FH28-40S-0.5SH

Pin No.	Symbol	I/O	Function
1	UDLR	I	Scan direction select
			UDLR='H'
			UDLR='L'
			Horizontal direction
			Left to Right
			Right to Left
			Vertical direction
			Up to Down
			Down to Up
2	LVDS_MAP	I	JEIDA / NS mode select
3	Test_pin1	T	Not Connected
4	Test_pin2	T	Not Connected
5	RSTB	I	Reset
6	GND1	I	Ground
7	GND2	I	Ground
8	D3+	I	LVDS input data3
9	D3-	I	LVDS input data3
10	GND3	I	Ground
11	GND4	I	Ground
12	CLK+	I	LVDS clock -
13	CLK-	I	LVDS clock +
14	GND5	I	Ground
15	GND6	I	Ground
16	D2+	I	LVDS input data2
17	D2-	I	LVDS input data2
18	GND7	I	Ground
19	GND8	I	Ground
20	D1+	I	LVDS input data1
21	D1-	I	LVDS input data1
22	GND9	I	Ground
23	GND10	I	Ground
24	D0+	I	LVDS input data0
25	D0-	I	LVDS input data0
26	GND11	I	Ground
27	GND12	I	Ground
28	Test_pin3	T	Not Connected
29	Test_pin4	T	Not Connected
30	Test_pin5	T	Not Connected
31	GND13	I	Ground
32	NC1	-	Not Connected
33	VDD1	I	power
34	VDD2	I	power
35	VDD3	I	power
36	VDD4	I	power
37	VDD5	I	power
38	NC2	-	Not Connected
39	Gamma_SCL	I	Digital gamma CLK pin, if not use, let it open
40	Gamma_SDA	I	Digital gamma Data pin, if not use, let it open



b. BACK LIGHT UNIT FPC

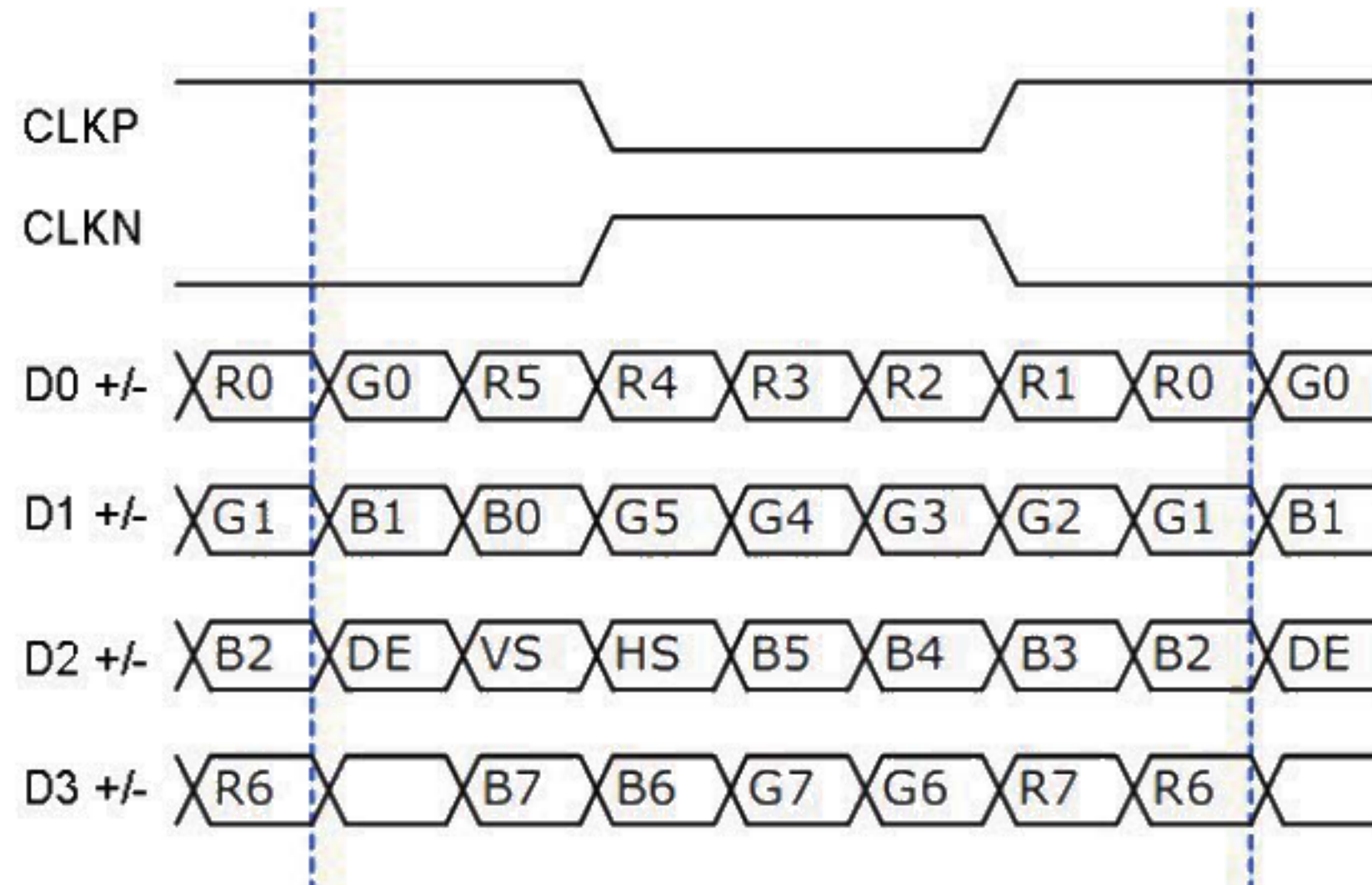
Connector=HRS FH28-10S-0.5SH(05)

No.	Pin Name	I/O	Description	Remarks
1	Anode	V _{in}	LED power supply voltage	
2	Anode	V _{in}	LED power supply voltage	
3	NC	NA	No Use	
4	RTh	RTh	Thermistor	
5	RTh	RTh	Thermistor	
6	Cathode 1	G1	Ground of string 1	
7	Cathode 2	G2	Ground of string 2	
8	Cathode 3	G3	Ground of string 3	
9	NC	NA	No Use	
10	NC	NA	No Use	

R: Resistance, G: GND, V_{in} : Power input
Gold finger side: back to back bezel

2. Differential Input Data Format

NS mode (LVDS_MAP='L')



JEIDA mode (LVDS_MAP='H')

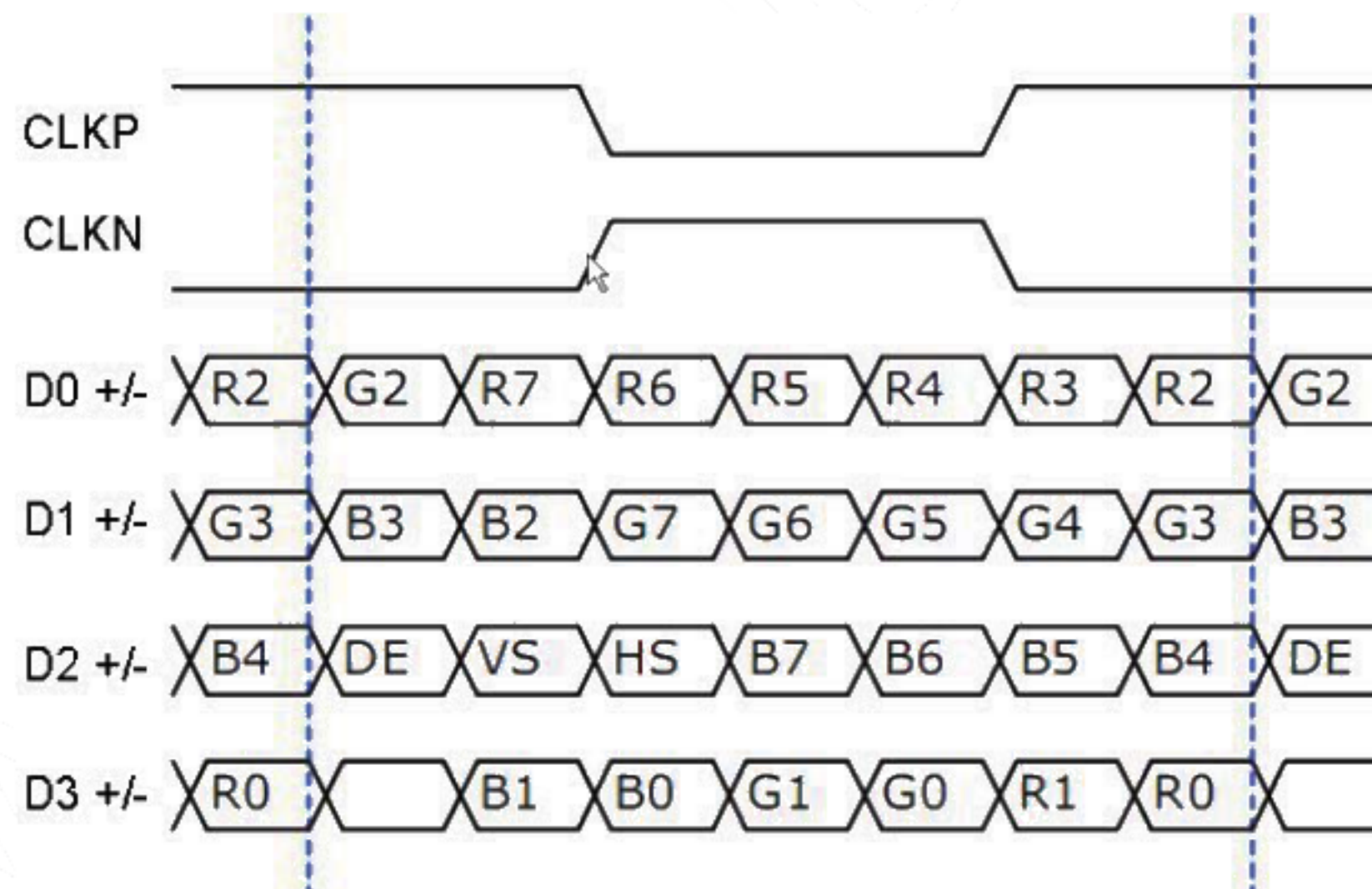


Fig. 1. LVDS Format

3. Input Timing Diagram

Parameter		Symbol	Min.	Typ.	Max.	Unit.	Remark
CLK Frequency		F_{CLK}		(55.1)		MHz	
HSYNC	Period	T_H		(1640)		CLK	
	Horizontal display area	T_{HD}		1440		CLK	
	Blanking	$T_{HBP} + T_{HFP}$		(200)		CLK	
VSYNC	Period	T_V		(560)		HS	
	Vertical display area	T_{VD}		540		HS	
	Blanking	$T_{VBP} + T_{VFP}$		(20)		HS	

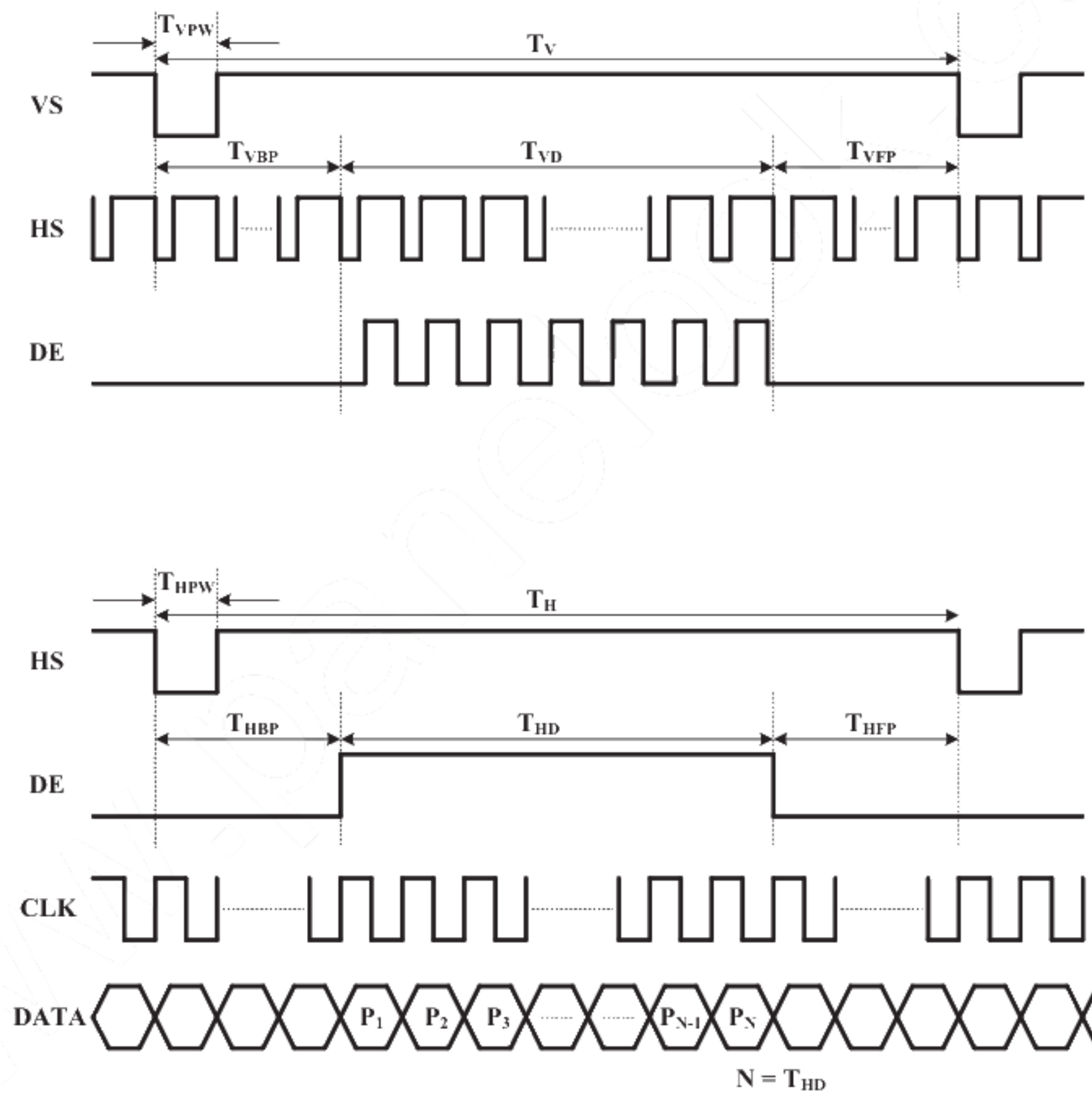


Fig. 2. Input Timing Diagram

4. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Digital Power Voltage	VDD	-0.3	4	V	Note 1
Operation Temperature	T _{op}	-30	+85	°C	
Storage Temperature	T _{stg}	-40	+95	°C	

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

5. 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	-	(800)		mA	Note1

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



Fig. 3. Test pattern for power specification

b. Signal DC Electrical Characteristics

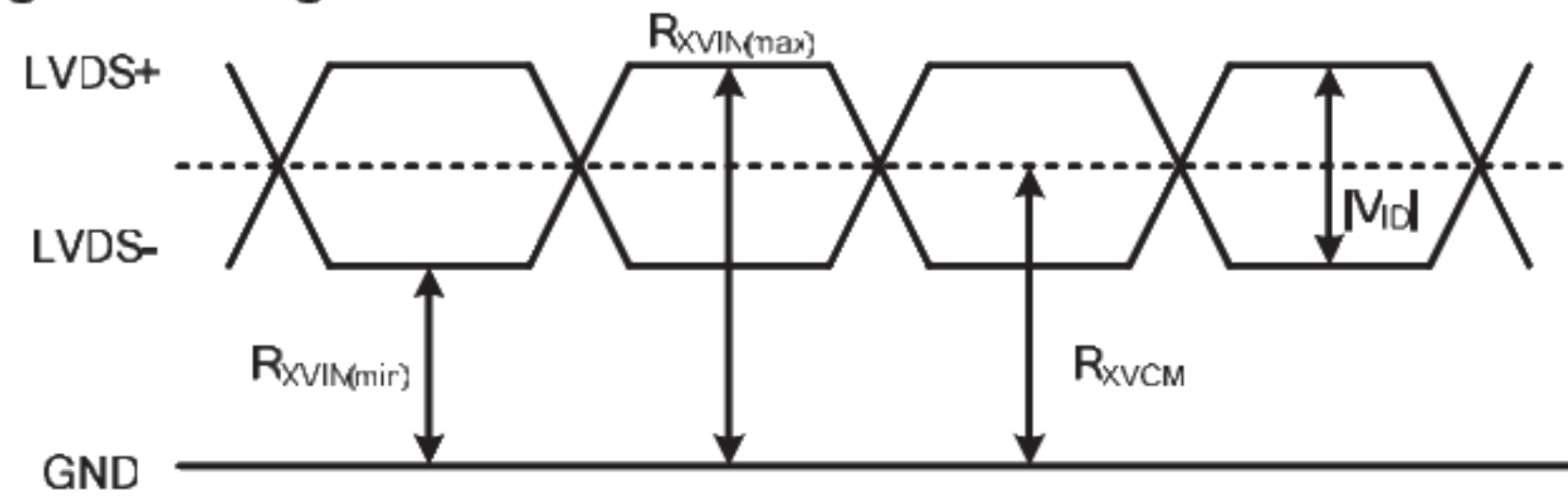
✧ It's the tentative list, need further modification

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Input signal voltage	V _i	-0.3	-	VDD	V	Note 1
Input high level voltage	V _{IH}	0.7VDD	-	VDD	V	Note 1
Input low level voltage	V _{IL}	GND	-	0.3VDD	V	Note 1
Differential input high threshold	R _{XVTH}	0.1	-	-	V	Note 2
Differential input low threshold	R _{XVTL}	-	-	-0.1	V	Note 2
Input voltage range (singled-end)	R _{XVIN}	0.8	-	1.6	V	Note 2
Input differential voltage	V _{ID}	0.2	-	0.6	V	Note 2
Differential Input Common Mode Voltage	R _{XVCM}	1.1	1.2	1.4	V	Note 2

Note 1: TTL interface signal DC characteristics

Note 2: LVDS interface signal DC characteristic

Single-end Signal



Differential Signal

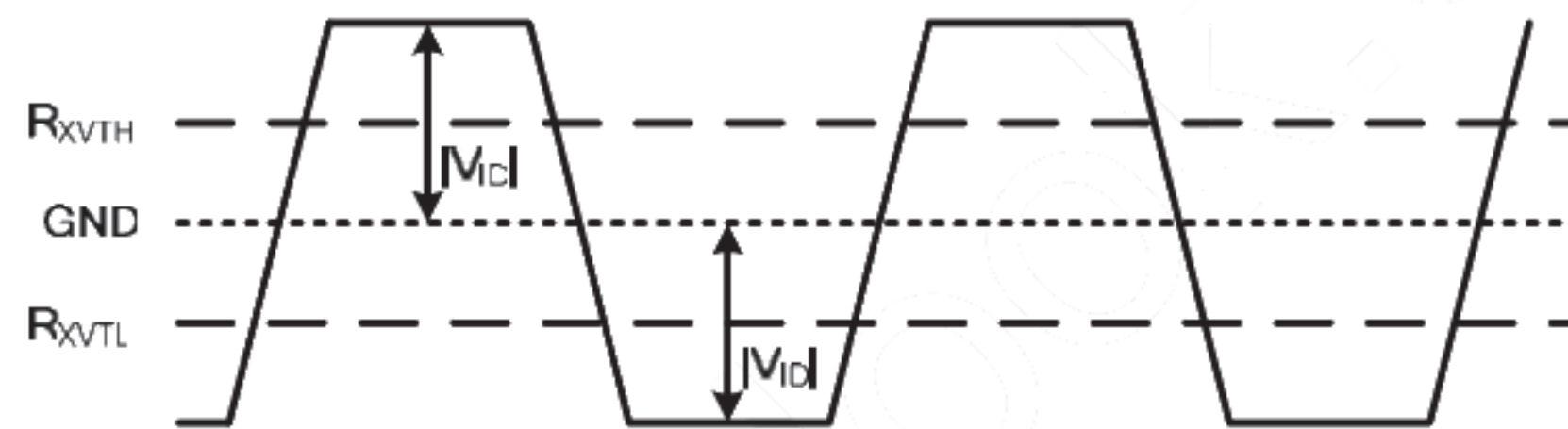


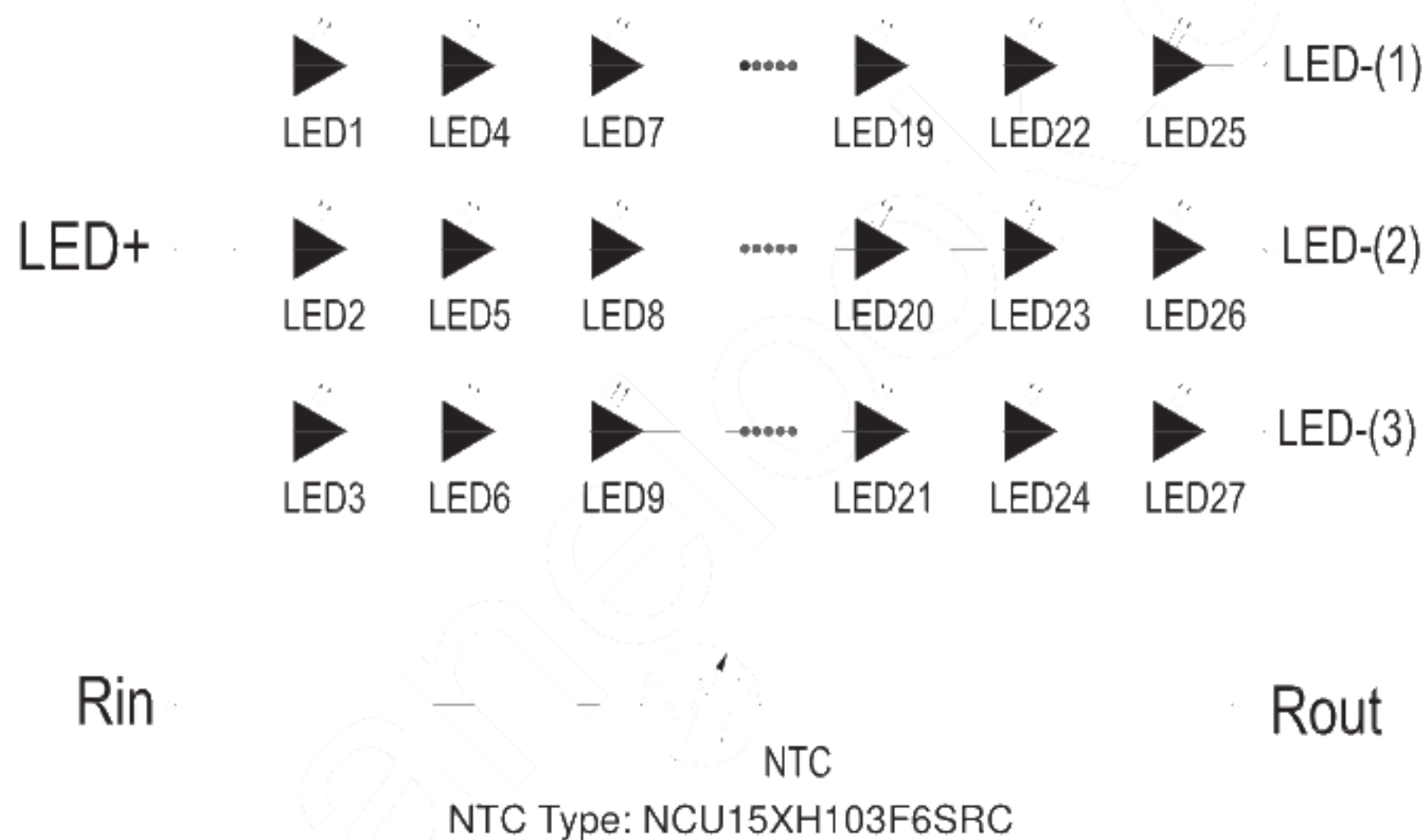
Fig. 4. LVDS DC characteristics diagram

c. Backlight Driving Conditions (Note 1)

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Remark
Forward Current	I_F	at 25°C	---	80	85	mA	Single serial (Note 2)
Forward Voltage	V_F	$I_F=80(\text{mA})$, at 25°C	---	(27)	30.6	V	$3.4\text{V} \times 9\text{pcs} = 30.6\text{V}$ (Note 3)
NTC Thermistor Resistance	R	at 25°C	9.9	10	10.1	ohm	Non-lighting (Note 5)
LED Life Time	T_{LED}	at 25°C	20000	---	---	Hrs	Note4 (Reference)

Note 1: LED backlight has one light-bar.

Light-bar has 27 LEDs (3 strings, 9pcs for each string).



Note 2: The LED supply power is for 3 string of LED

Note 3: Be sure your system can provide enough voltage driving capability (larger than 30.6V is recommended) to provide 80mA for each LED or the brightness is possible to be below spec.

Note 4: The LED lifetime 20000hrs means , after normal use at 80mA, under +25 ° C, the brightness decreases to 50% of original level.

Note 5: The NTC Thermistor Resistance is MURATA NCU15XH103F6SRC

6. AC Electrical Characteristics

a. Differential signal AC characteristics

✘ It's the tentative list, need further modification

b. Input AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
VDD power on slew time	T_{POR}			15	ms	From 0V to 90% VDD Note 1
RSTB active pulse width	T_{RSTB}	1		20	ms	VDD=3.3V

Note 1: the inrush current spec should follow VDD power on slew time min value is 1ms and max value is 15ms. Inrush current maybe out of spec. (max:500mA)

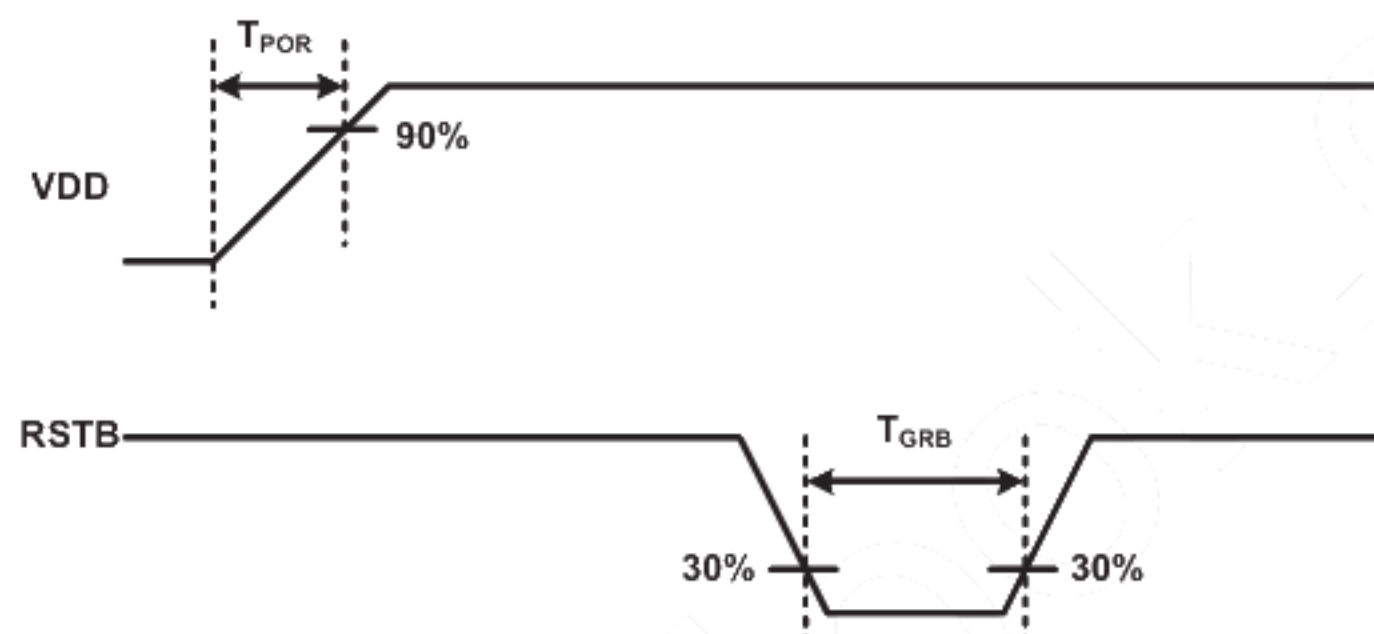


Fig. 6. VDD and GRB timing diagram

c. Differential signal AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	R_{XFCLK}	45	-	70	MHz	
Input data skew margin	T_{RSKM}	400			ps	

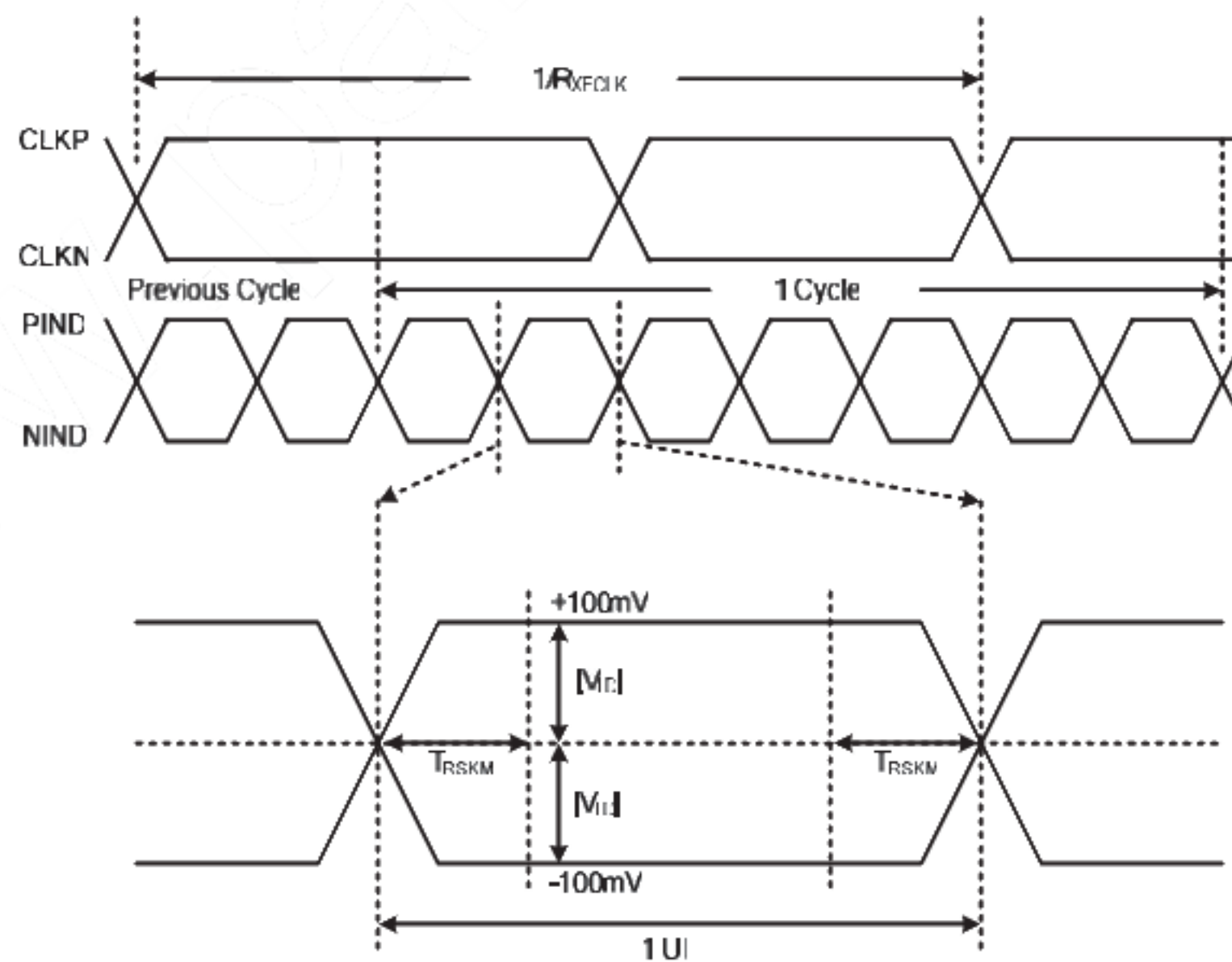


Fig. 7 LVDS AC characteristics diagram

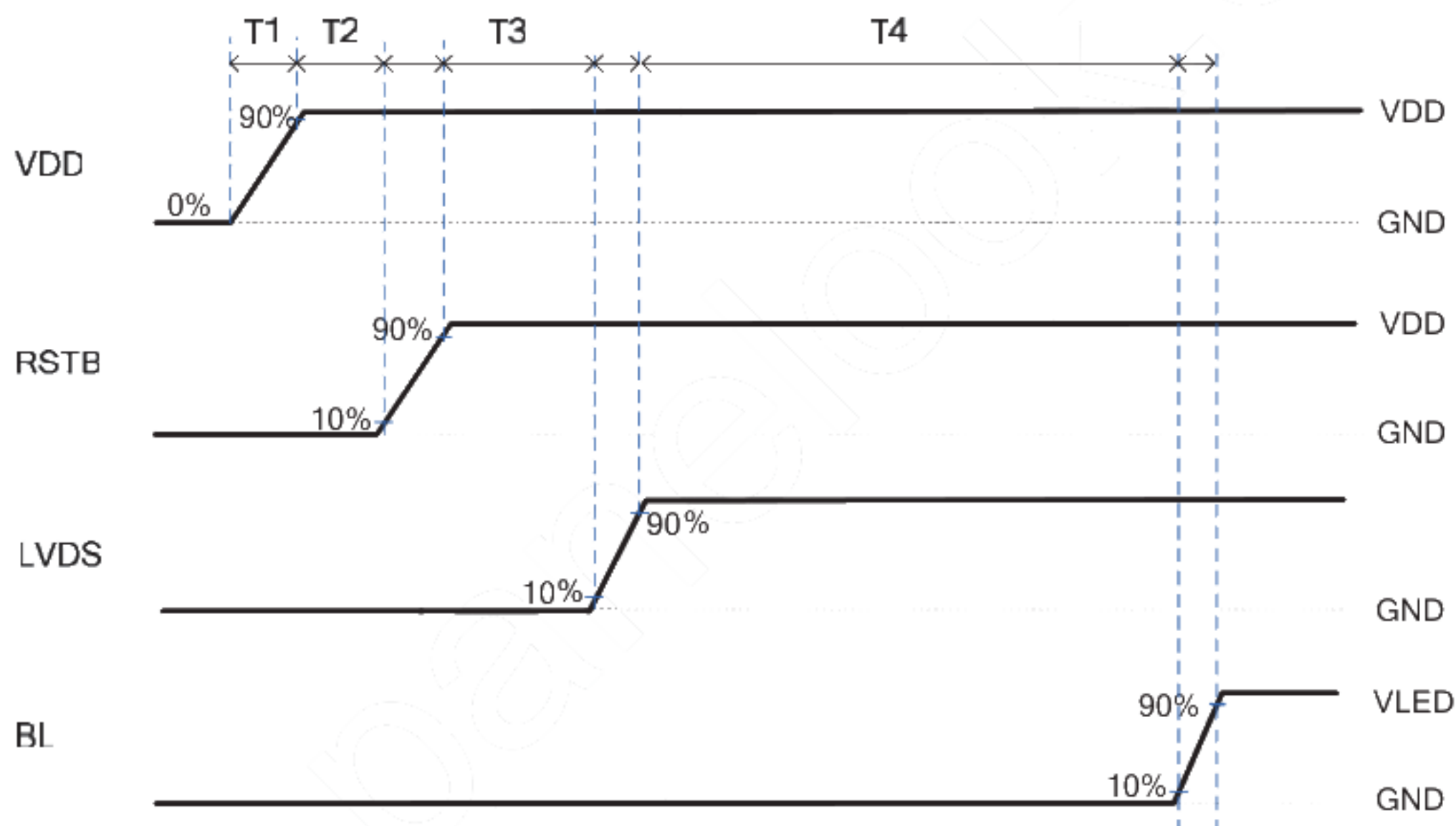
7. Power ON / OFF timing

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)	--	--	ms
T3	(1)	--	--	ms
T4	(300)	--	--	ms

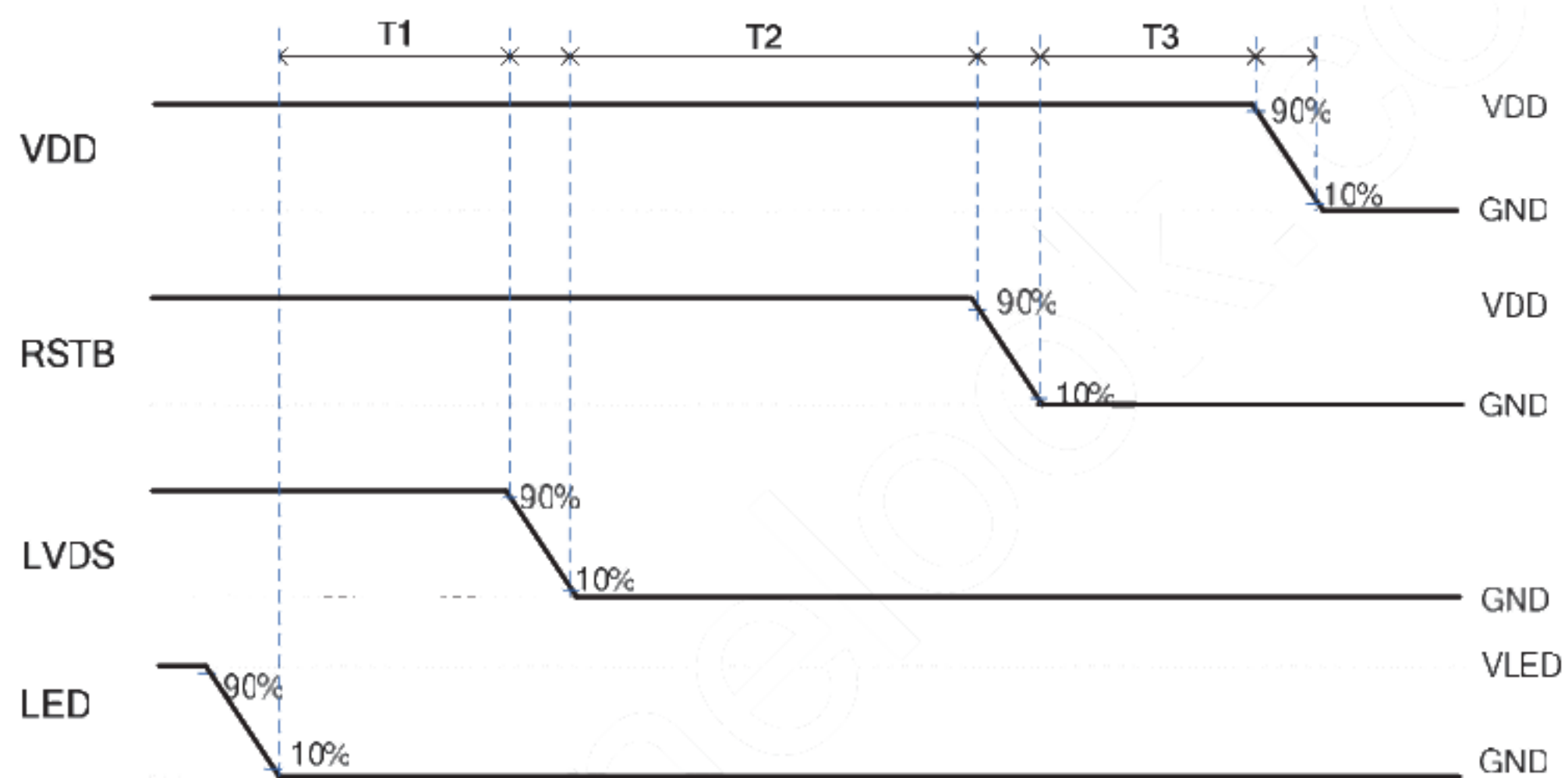
Power on sequence : VDDà RSTBàLVDSàBL



b. Power OFF sequence

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	--	(100)	--	ms
T2	(1)	(30)	(300)	ms
T3	(50)	--	--	ms

Power off sequence : BLà LVDSà RSTB à VDD



All signals must be discharge to zero voltage when power off.

F. Optical specifications (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response	Tr+Tf	$\theta=0^\circ, 25^\circ\text{C}$	-		30	ms	Note 3
		$\theta=0^\circ, 0^\circ\text{C}$	-		80		
		$\theta=0^\circ, -20^\circ\text{C}$	-		200		
		$\theta=0^\circ, -30^\circ\text{C}$	-		400		
Contrast ratio	CR	$\theta=0^\circ$	(800)	1000	-		Note 4, 5, 6
Viewing Angle Top Bottom Left Right		$\text{CR} \geq 10$	70 70 70 70	80 80 80 80	- - - -	deg.	Note 7, 8
Brightness	Y_L	$\theta=0^\circ$	600		-	cd/m^2	Note 1,2,9
White Chromaticity	X	$\theta=0^\circ$	(0.252)	(0.302)	(0.352)		Note 8
	Y	$\theta=0^\circ$	(0.284)	(0.334)	(0.384)		
Red Chromaticity	X	$\theta=0^\circ$	(0.592)	(0.642)	(0.692)		
	Y	$\theta=0^\circ$	(0.284)	(0.334)	(0.384)		
Green Chromaticity	X	$\theta=0^\circ$	(0.255)	(0.305)	(0.355)		
	Y	$\theta=0^\circ$	(0.559)	(0.609)	(0.659)		
Blue Chromaticity	X	$\theta=0^\circ$	(0.100)	(0.150)	(0.200)		
	Y	$\theta=0^\circ$	(0.010)	(0.060)	(0.110)		
Uniformity	Uw	$\theta=0^\circ$		80%			Note 10

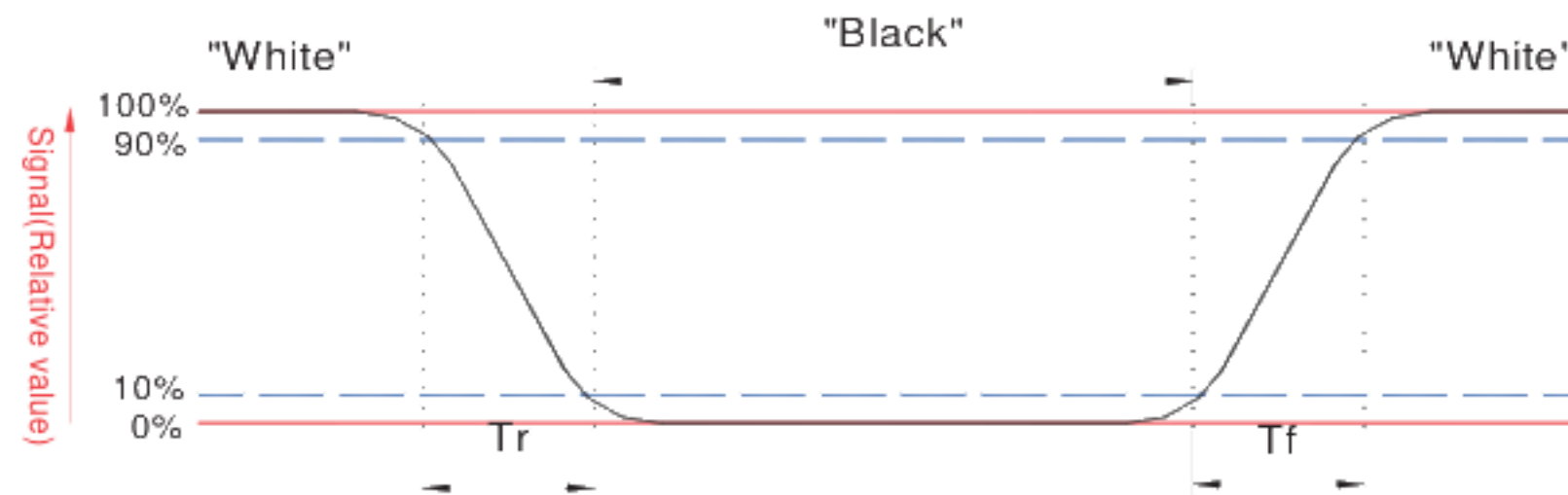
PS. Regarding Color Chromaticity, will be updated after real sample out.

Note 1: Measurement should be performed in the dark room, optical ambient temperature $\approx 25^\circ\text{C}$, and backlight current $I_L=80\text{ mA}$

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°C.

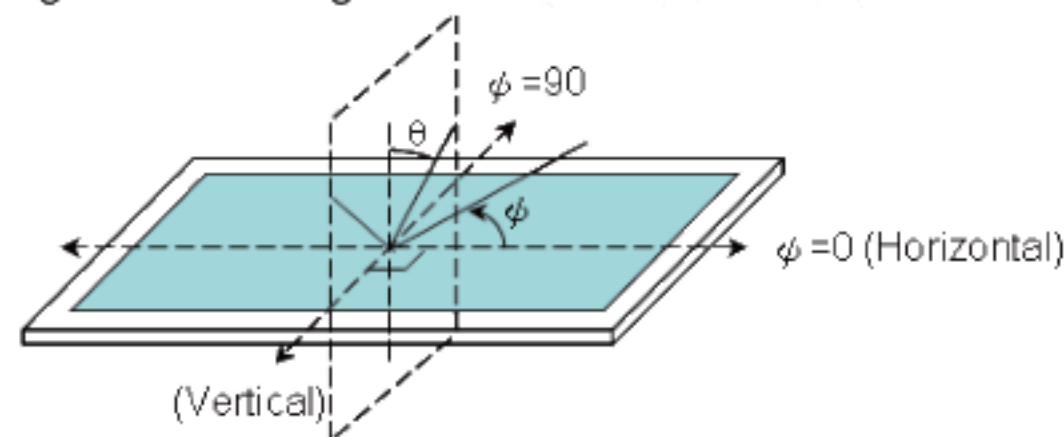
Note 5. Contrast ratio is calculated with the following formula.

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

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]=00000000

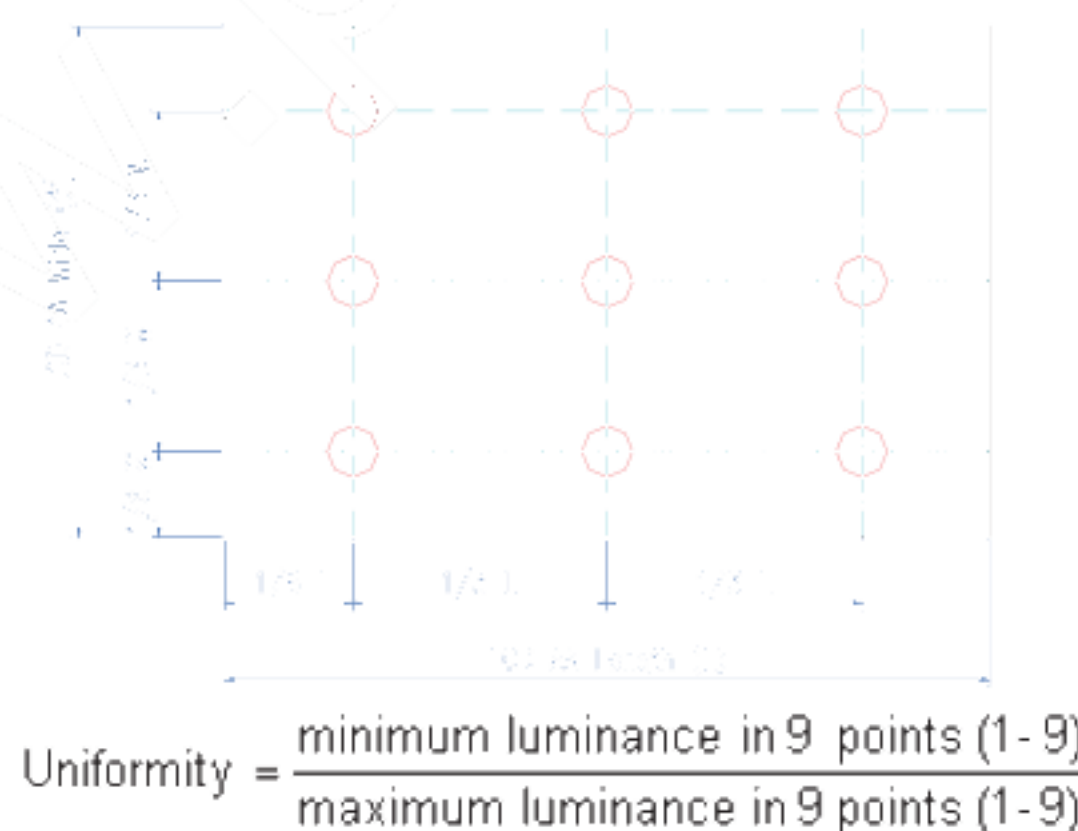
Note 7. Definition of viewing angle: refer to figure as below.



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 of these 9 points is defined as below:



G. Reliability Test Items (Note 2)

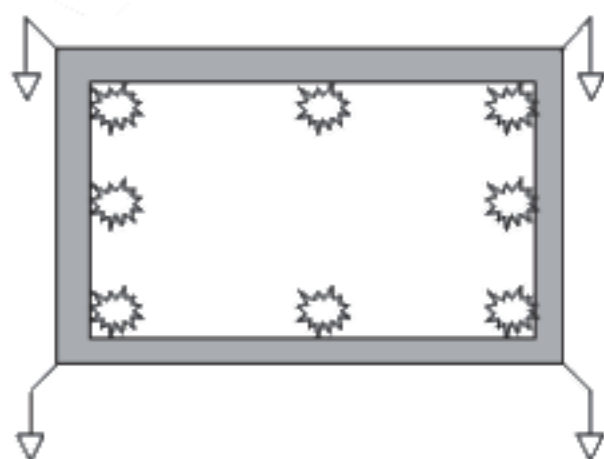
No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95℃	240Hrs	Note1
2	Low temperature storage	Ta= -40℃	240Hrs	
3	High temperature operation	Ta= 85℃	240Hrs	
4	Low temperature operation	Ta= -30℃	240Hrs	Note1, 3
5	High temperature and high humidity	Ta= 60℃ , 90% RH	240Hrs	Operation
6	Heat shock	-30℃~85℃/100 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B		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		

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°C~-30°C 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.



H. Packing Form

