


MDT0350D18ISR-RGB	320 x 240	RGB Interface	TFT Module
Specification			
Version: 1		Date: 15/01/2025	
Revision			
1	13/01/2025	First issue	

Display Features			
Display Size			3.50"
Resolution			320 x 240
Orientation			Landscape
Appearance			RGB
Supply Voltage			3.3V
Interface			RGB
Brightness			300 cd/m ²
Touchscreen			RTP
Module Size	76.84 x 63.84 x 4.37mm		Created By
Operating Temperature	-30°C ~ +85°C		Checked By
Pinout	40 way FFC		TSB
Pitch	0.50 mm		WE
		Box Quantity	Weight / Display
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RoHS
compliant

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* - For full design functionality, please use this specification in conjunction with the ST7272A display driver specification.(Provided Separately)

Display Accessories	
Part Number	Description
MBID-40FP	40 Way FFC to cable and wires. Driven by any driver board that can be wired to a 1mm pitch SHDR-40V-S-B receptacle.
MDIB-CC1	Interconnect board for standard pitch pinouts to fine pitch wires. Providing pinouts for 2.54 pinout. 1.27, 1, 0.845, 0.8, 0.7, 0.65, 0.62, 0.6, 0.5 & 0.3 pads.

Optional Variants	
Appearances	Voltage



Summary

TFT 3.5" is a IPS transmissive type color active matrix TFT liquid crystal display that use amorphous silicon TFT as switching devices. This module is a composed of a TFT_LCD module, It is usually designed for industrial application and this module follows RoHs.

General Specifications

- Size: 3.5 inch
- Dot Matrix: 320 x RGBx240(TFT) dots
- Module dimension: 76.84(W) x 63.84(H) x 4.37(D) mm
- Active area: 70.08 x 52.56 mm
- Dot pitch: 0.073 x 0.219 mm
- LCD type: TFT, Normally black, Transmissive
- View Direction: Wide View
- Driver IC: ST7272A or equivalent
- Interface : 24-bit RGB
- Aspect Ratio: 4:3
- Backlight Type: LED, Normally White
- With /Without TP: With RTP
- Surface: Anti-glare

*Color tone slight changed by temperature and driving voltage.



Interface

1. LCM PIN Definition

Pin No.	Symbol	Function	Remark
1	VLED-	Power for LED backlight cathode	
2	VLED+	Power for LED backlight anode	
3	GND	Ground	
4	VCC	Power Supply	
5	R0	Data bus	
6	R1	Data bus	
7	R2	Data bus	
8	R3	Data bus	
9	R4	Data bus	
10	R5	Data bus	
11	R6	Data bus	
12	R7	Data bus	
13	G0	Data bus	
14	G1	Data bus	
15	G2	Data bus	
16	G3	Data bus	
17	G4	Data bus	
18	G5	Data bus	
19	G6	Data bus	
20	G7	Data bus	
21	B0	Data bus	
22	B1	Data bus	
23	B2	Data bus	
24	B3	Data bus	
25	B4	Data bus	
26	B5	Data bus	
27	B6	Data bus	



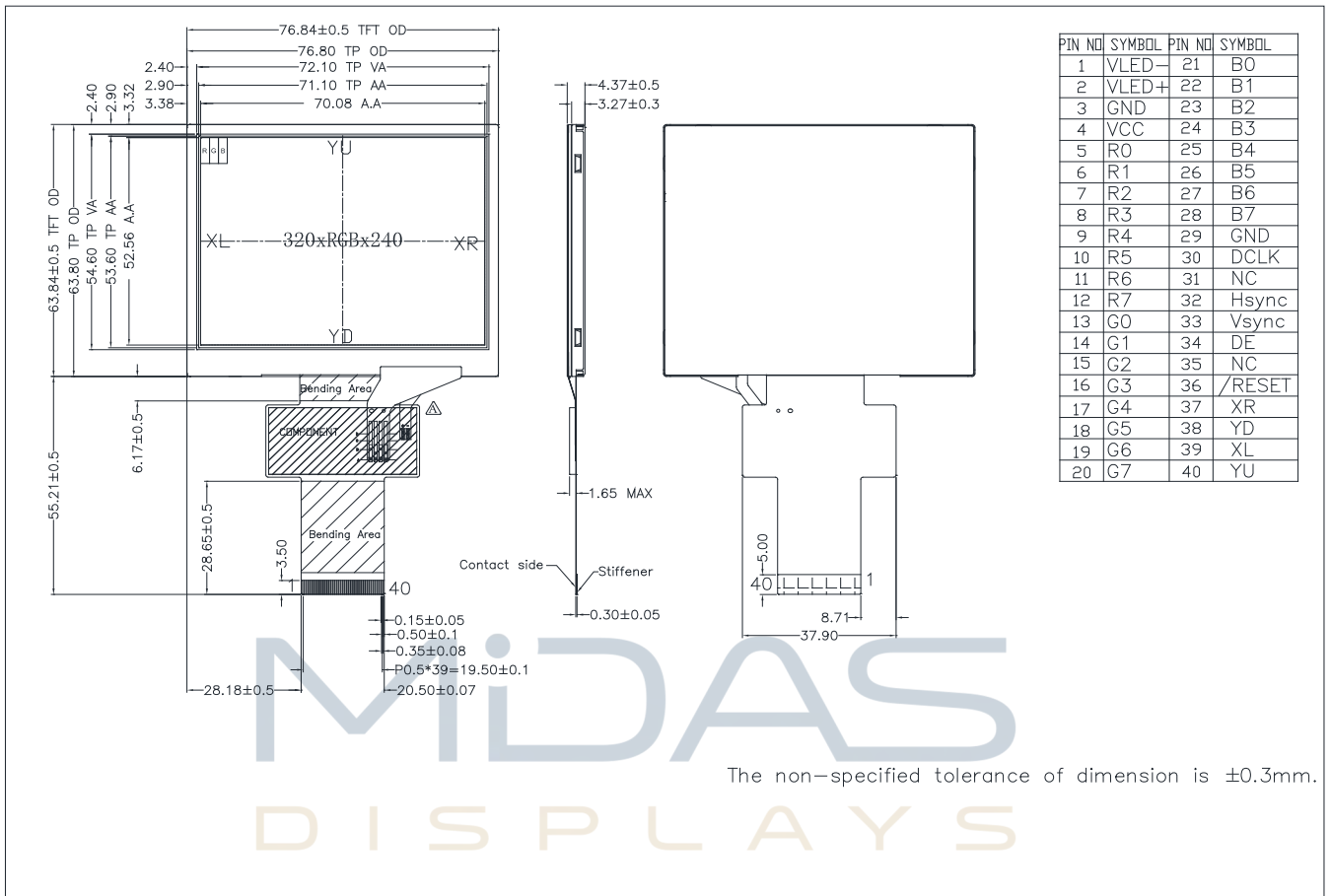
28	B7	Data bus	
29	GND	Ground	
30	DCLK	Dot-clock signal and oscillator source	
31	NC	No connect	
32	HSYNC	Horizontal sync signal, default is negative polarity.	
33	VSYNC	Vertical sync signal, default is negative polarity.	
34	DE	Data input enable. Display access is enabled when DE is "H".	
35	NC	No connect	
36	/RESET	Hardware reset	
37	XR	Right electrode	
38	YD	Bottom electrode	
39	XL	Left electrode	
40	YU	Top electrode	

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Contour Drawing



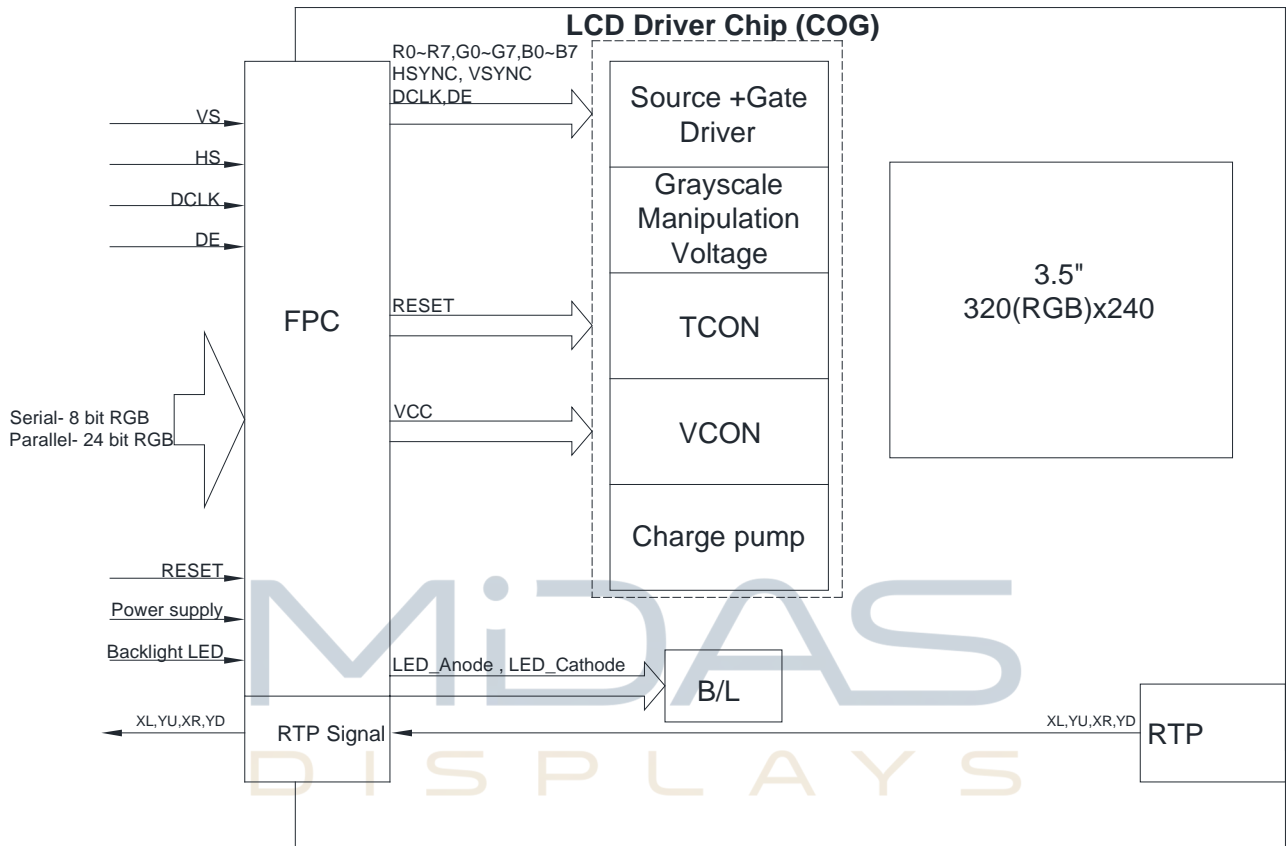
The non-specified tolerance of dimension is ±0.3mm.

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Block Diagram

LCD Panel



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Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-30	—	+85	°C
Storage Temperature	TST	-40	—	+85	°C

Note: Device is subject to be damaged permanently if stresses beyond those absolute maximum ratings listed above

1. Temp. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

Electrical Characteristics

1. Operating conditions:

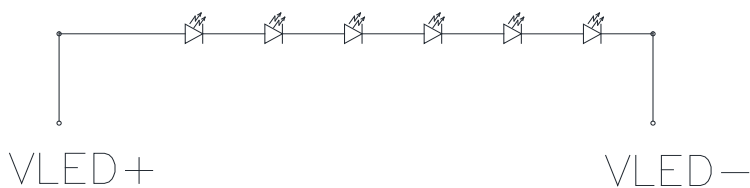
Item	Symbol	Min	Typ	Max	Unit	Remark
Supply Voltage For LCM	VCC	3.0	3.3	3.6	V	
Supply Current For LCM	ICC	—	20	30	mA	Note 1

Note 1 : This value is test for VCC =3.3V , Ta=25 °C only

2. LED driving conditions

Item	Symbol	Min	Typ	Max	Unit	Remark
LED current		-	20	-	mA	
Power Consumption		324	384	408	mW	
LED voltage	VLED+	16.2	19.2	20.4	V	Note 1
LED Life Time		50,000	-	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM

Note 2 : Ta = 25 °C

Note 3 : Brightness to be decreased to 50% of the initial value

Note 4 : The single LED lamp case



AC Characteristics

1. System Operation AC Characteristics

PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C, Bare Chip

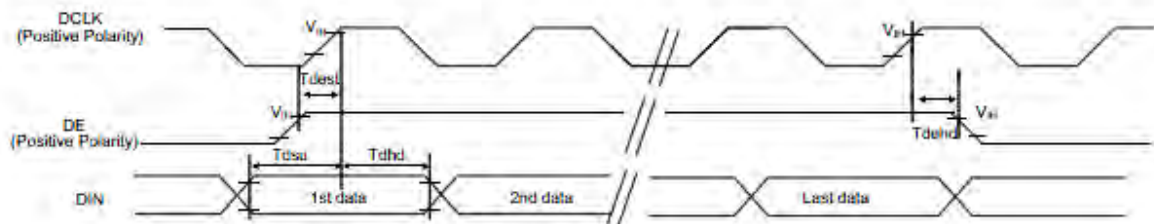
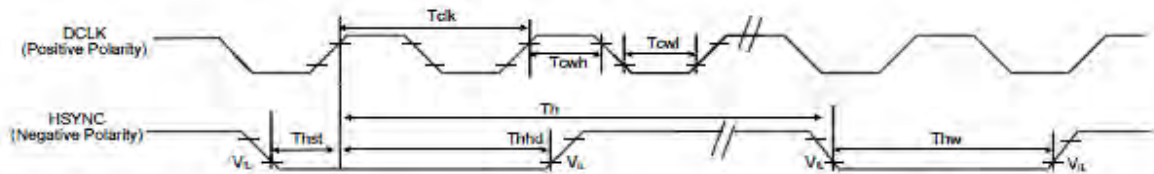
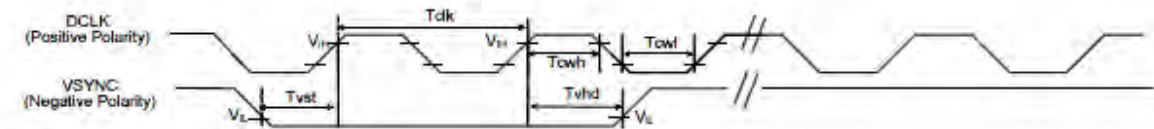
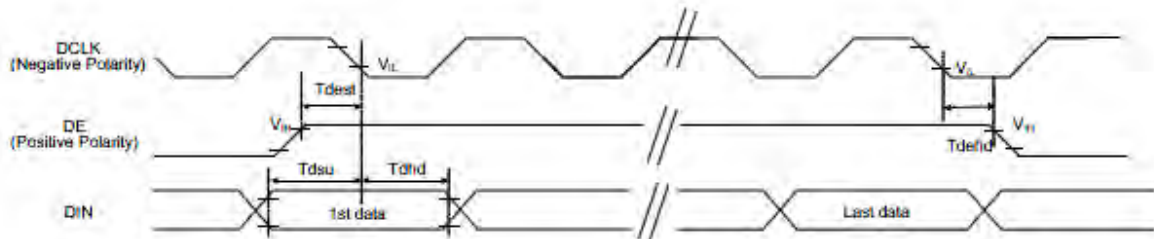
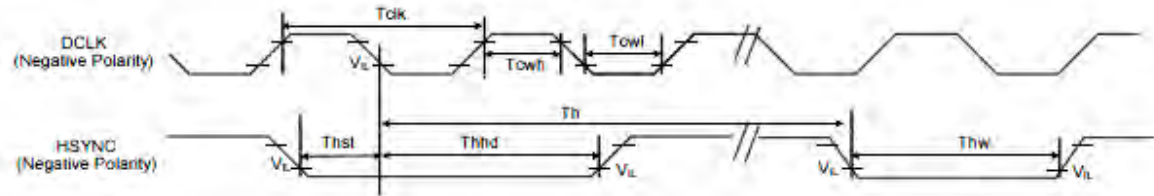
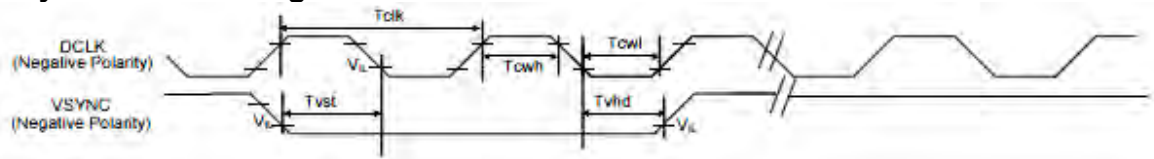
Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
VDD Power Source Slew Time	TPOR	-	-	20	ms	From 0V to 99% VDD
GRB Pulse Width	tRSTW	10	50	-	us	R=10Kohm, C=1uF
SD Output Stable Time	Tst	-	-	12	us	Output settled within +20mV Loading = 6.8k+28.2pF.
GD Output Rise and Fall Time	Tgst	-	-	6	us	Output settled (5%~95%), Loading = 4.7k+29.8pF



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2. System Bus Timing for RGB Interface



Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	Tclk	40	50	60	%	
HSYNC Width	Thw	2	-	-	DCLK	
VSYNC Setup Time	Tvst	12	-	-	ns	
VSYNC Hold Time	Tvhd	12	-	-	ns	
HSYNC Setup Time	Thst	12	-	-	ns	
HSYNC Hold Time	Thhd	12	-	-	ns	
Data Setup Time	Tdsu	12	-	-	ns	
Data Hold Time	Tdhd	12	-	-	ns	
DE Setup Time	Tdest	12	-	-	ns	
DE Hold Time	Tdehd	12	-	-	ns	

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Communication Interface

1. RGB Interface

1.Pin Assignment for RGB Interface

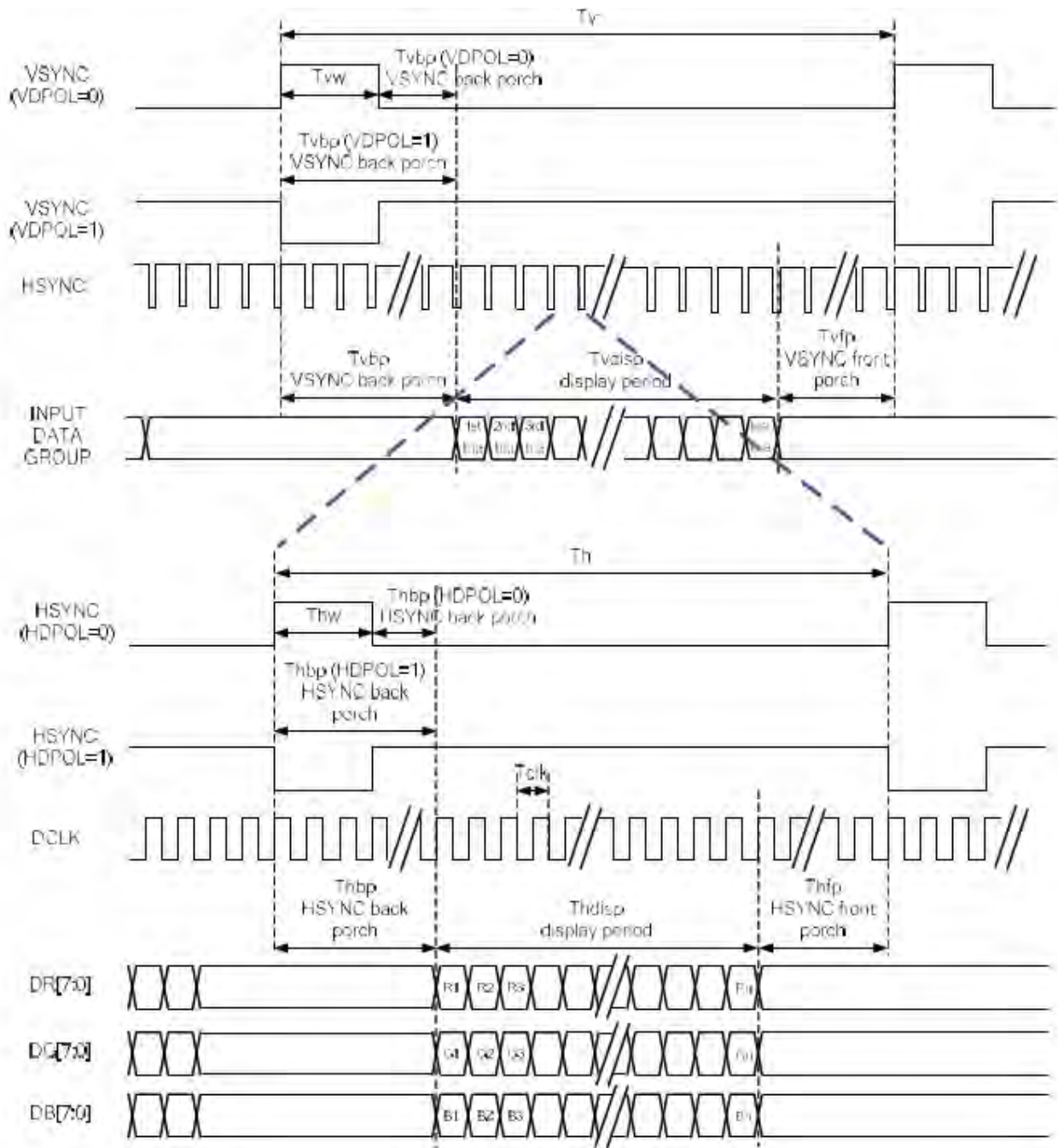
Pin		Parallel RGB			Serial RGB		
		888	666	565	888	666	565
VSYNC	SYNC Mode	VSYNC	VSYNC	VSYNC	VSYNC	VSYNC	VSYNC
	DE Mode	x	x	x	x	x	x
HSYNC	SYNC Mode	HSYNC	HSYNC	HSYNC	HSYNC	HSYNC	HSYNC
	DE Mode	x	x	x	x	x	x
DE	SYNC Mode	x	x	x	x	x	x
	DE Mode	DE	DE	DE	DE	DE	DE
CLK		CLK	CLK	CLK	CLK	CLK	CLK
DR0		R0	x	x	x	x	x
DR1		R1	x	x	x	x	x
DR2		R2	R0	x	x	x	x
DR3		R3	R1	R0	x	x	x
DR4		R4	R2	R1	x	x	x
DR5		R5	R3	R2	x	x	x
DR6		R6	R4	R3	x	x	x
DR7		R7	R5	R4	x	x	x
DG0		G0	x	x	D0	x	x
DG1		G1	x	x	D1	x	x
DG2		G2	G0	G0	D2	D0	D0
DG3		G3	G1	G1	D3	D1	D1
DG4		G4	G2	G2	D4	D2	D2
DG5		G5	G3	G3	D5	D3	D3
DG6		G6	G4	G4	D6	D4	D4
DG7		G7	G5	G5	D7	D5	D5
DB0		B0	x	x	x	x	x
DB1		B1	x	x	x	x	x
DB2		B2	B0	x	x	x	x
DB3		B3	B1	B0	x	x	x
DB4		B4	B2	B1	x	x	x
DB5		B5	B3	B2	x	x	x
DB6		B6	B4	B3	x	x	x
DB7		B7	B5	B4	x	x	x

RGB Mode Selection Table	DCLK	HSYNC	VSYNC	DE
SYNC - DE Mode	Input	Input	Input	Input
SYNC Mode	Input	Input	Input	GND
DE Mode	Input	GND	GND	Input

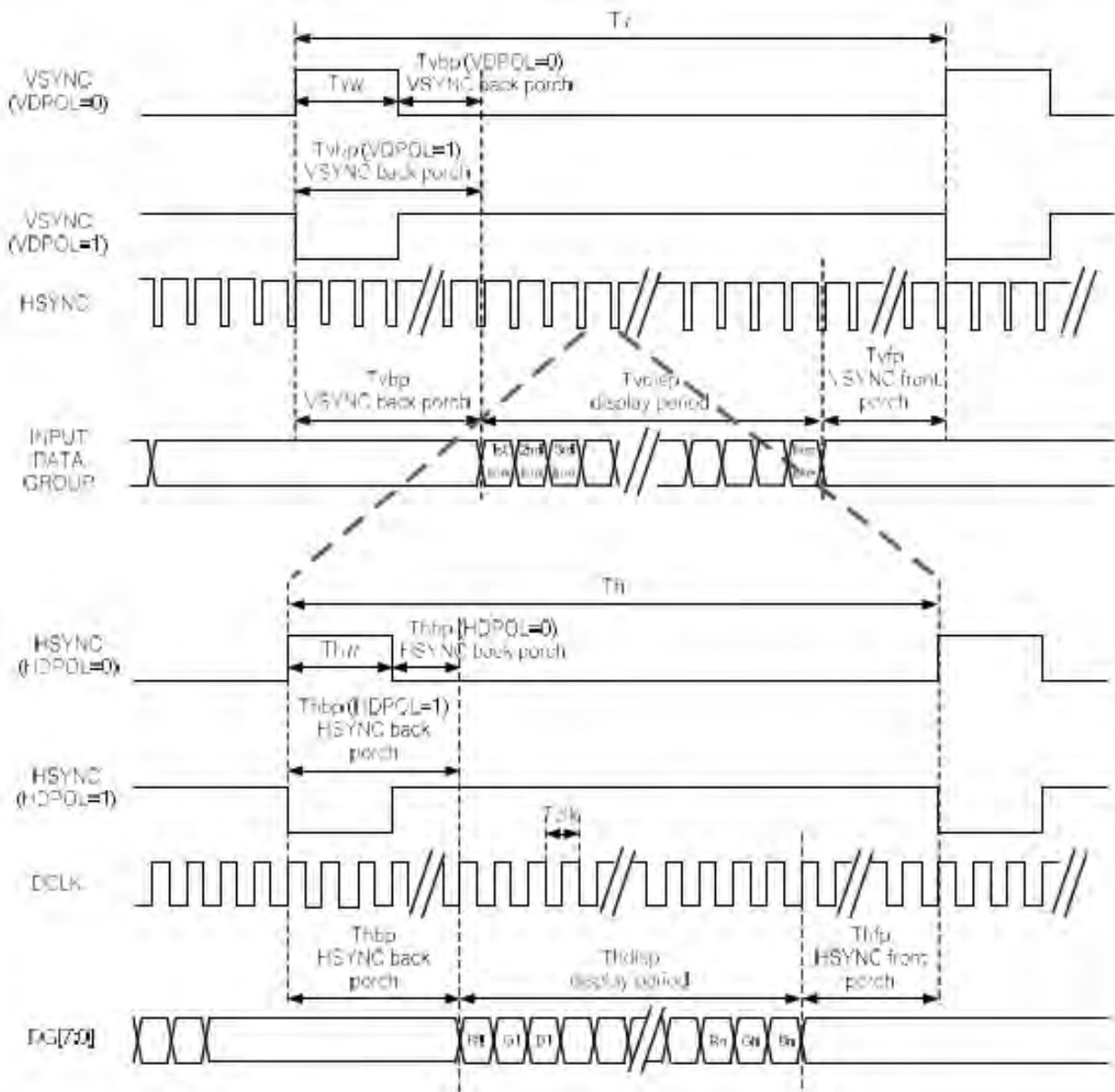
Note: "Input" means these signals are driven by host side



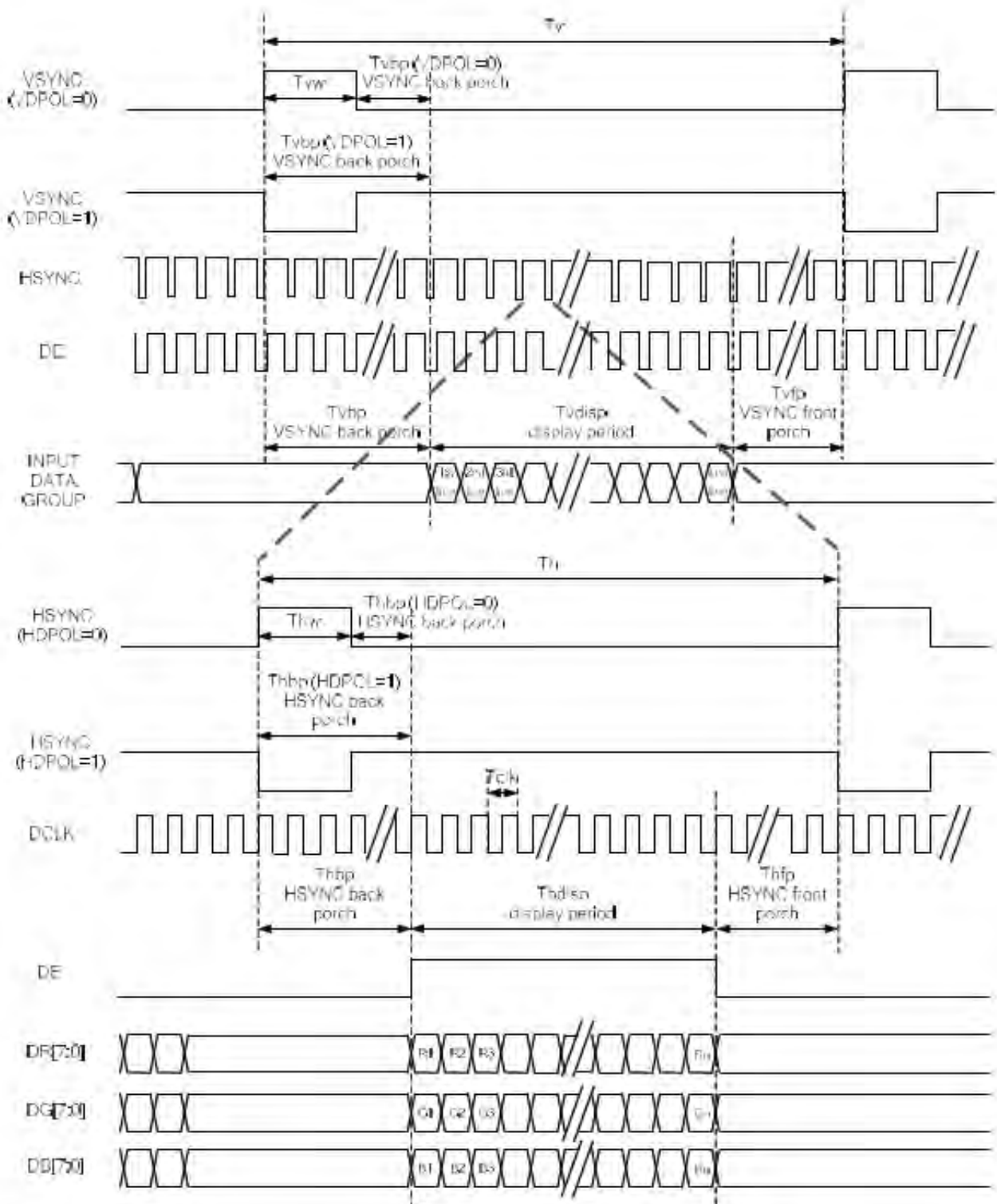
2. Parallel RGB SYNC Mode



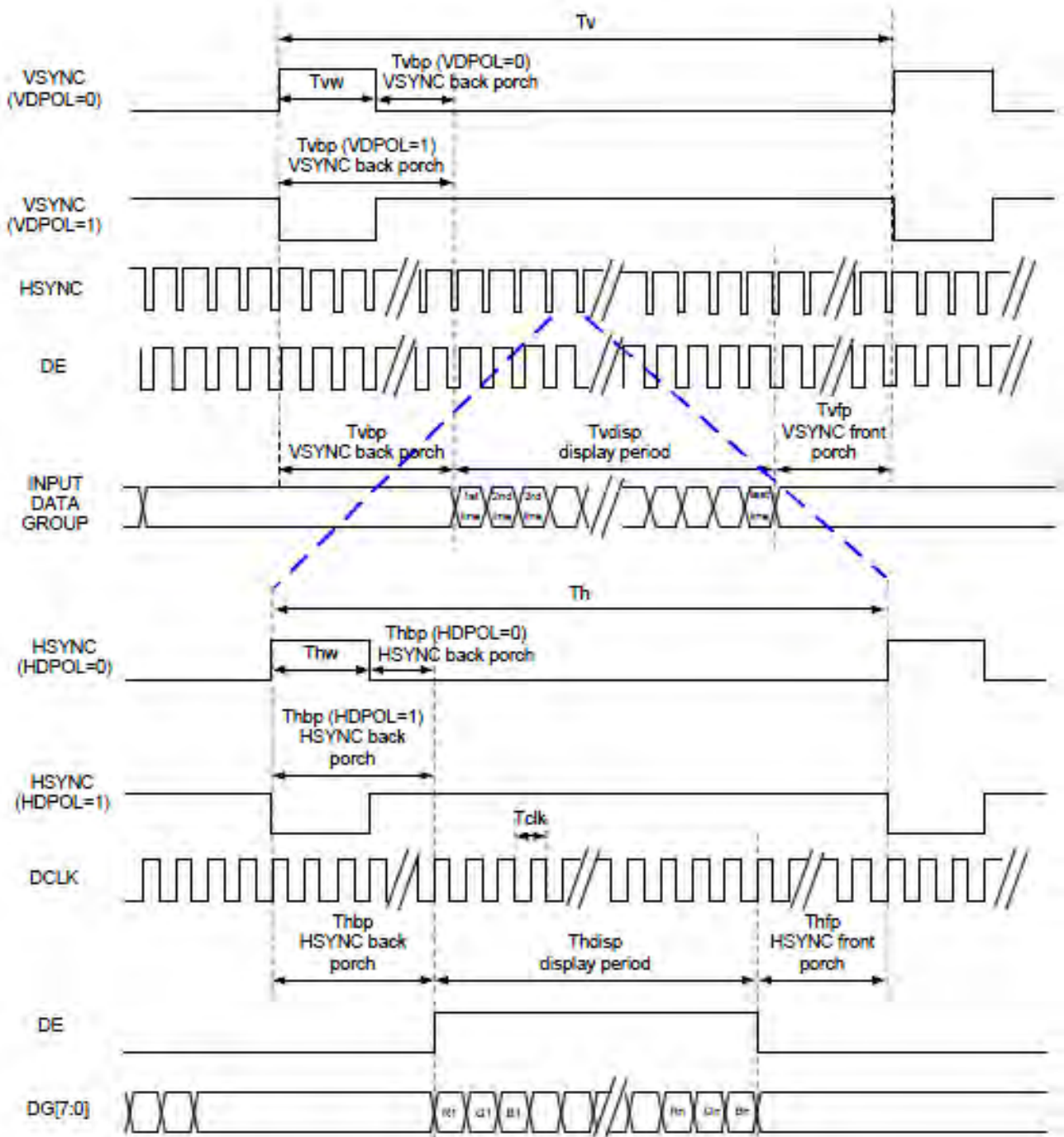
3. Serial RGB SYNC Mode



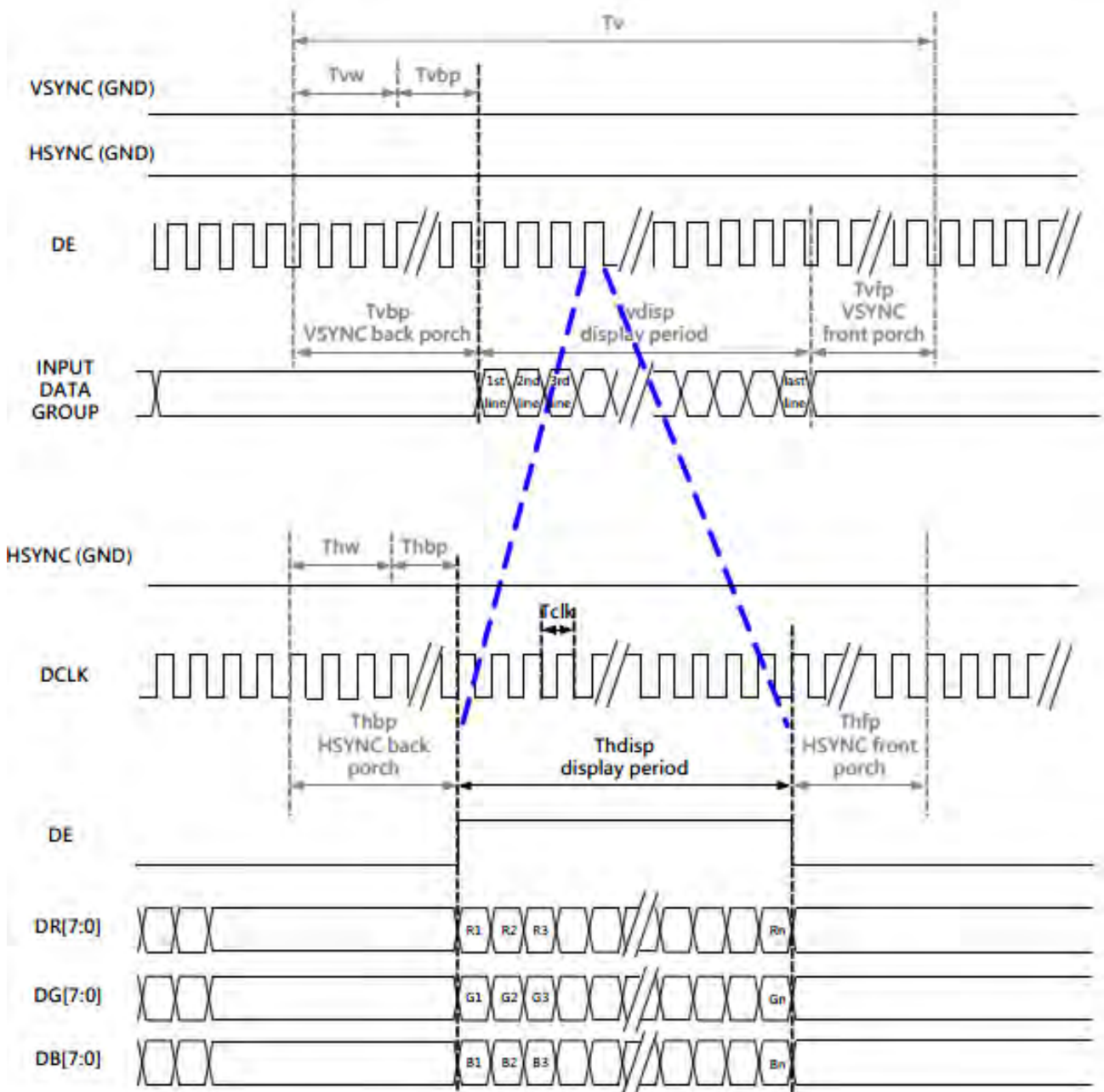
4. Parallel RGB SYNC-DE Mode



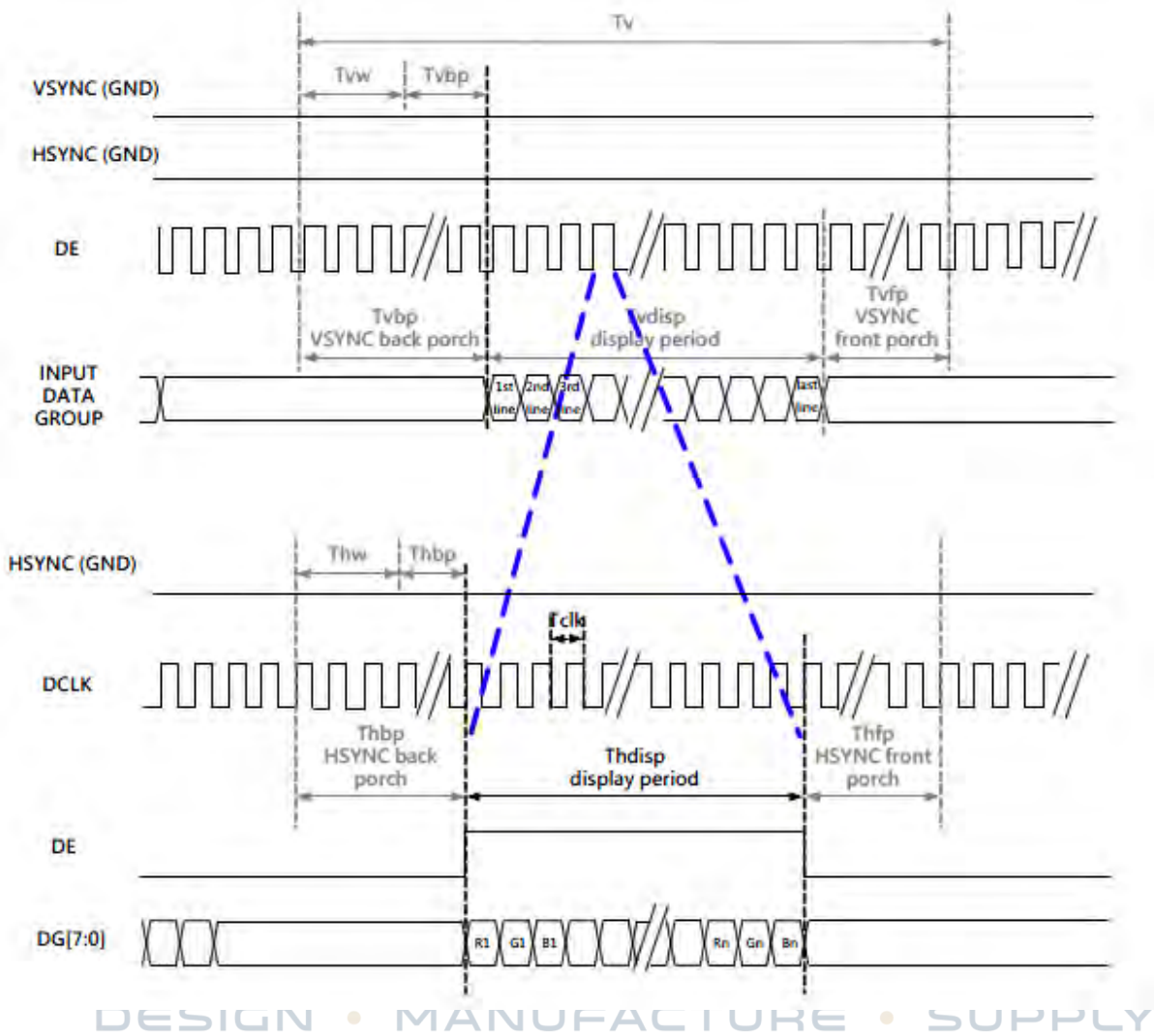
5. Serial RGB SYNC-DE Mode



6. Parallel RGB DE Mode



7. Serial RGB DE Mode



8. Parallel RGB Input Timing Table

Parallel 24-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Parallel 24-bit RGB Input Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Note	
DCLK Frequency	Fclk	5	6	8	MHz		
DCLK Period	Tclk	125	167	200	ns		
HSYNC	Period Time	Th	325	371	438	DCLK	
	Display Period	Thdisp		320		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

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9. Serial RGB Input Timing Table

Serial 8-bit RGB Input Timing (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25°C)

Serial 8-bit RGB Input Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
DCLK Frequency	Fclk	15	18	21	MHz		
DCLK Period	Tclk	47	55	66	ns		
HSYNC	Period Time	Th	965	1011	1078	DCLK	
	Display Period	Thdisp		960		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	SYNC mode back porch control by H_BLANKING[7:0] setting Thbp= H_BLANKING[7:0]
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	244	260	289	HSYNC	
	Display Period	Tvdisp		240		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	SYNC mode back porch control by V_BLANKING[7:0] setting Tvbp= V_BLANKING[7:0]
	Front Porch	Tvfp	2	8	37	HSYNC	
	Pulse Width	Tvw	2	4	12	HSYNC	

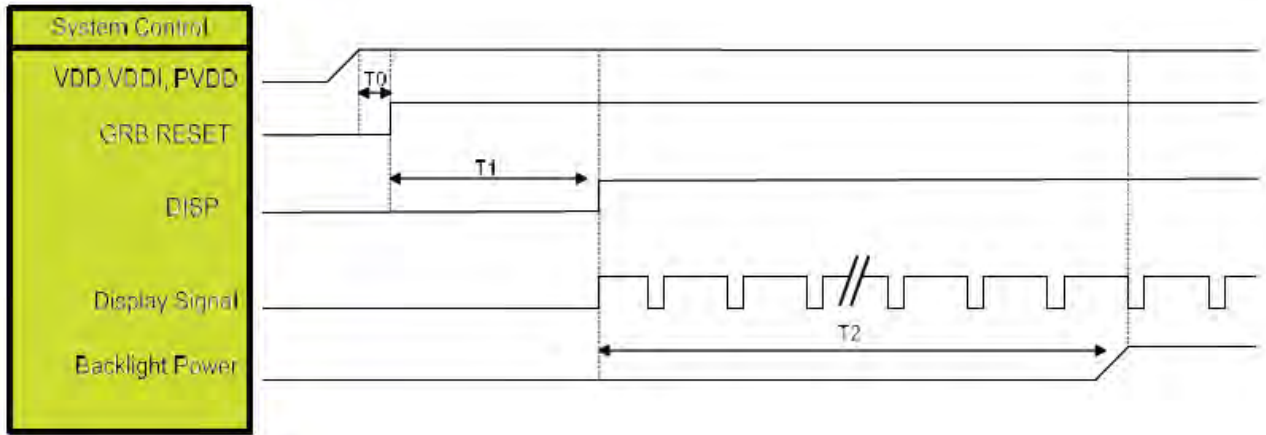
Note: It is necessary to keep Tvbp =12 and Thbp =43 in sync mode. DE mode is unnecessary to keep it.

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POWER ON/OFF SEQUENCE

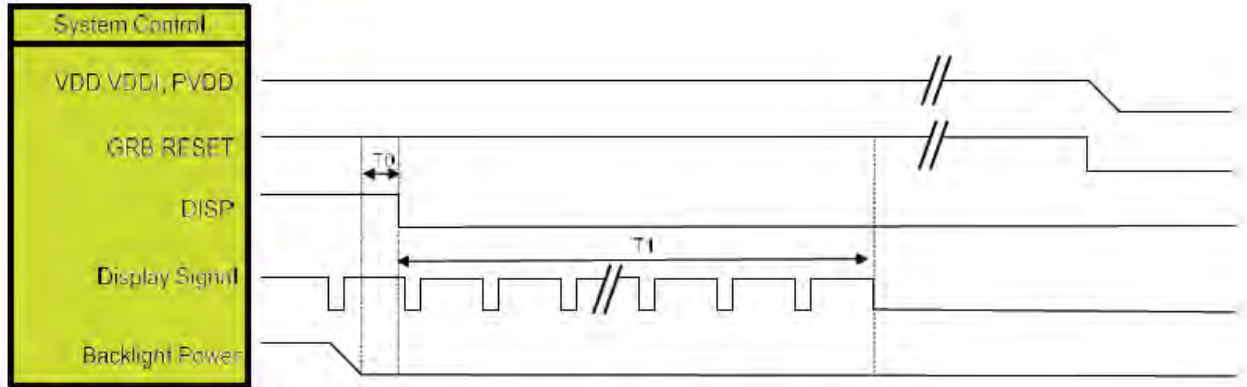
1. Power On Sequence



Symbol	Description	Min. Time	Unit
T0	System power stability to GRB RESET signal	0	ms
T1	GRB RESET= "High" to DISP="High"	10	ms
T2	Display Signal output to Backlight Power on	250	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]

2. Power Off Sequence



Symbol	Description	Min. Time	Unit
T0	Backlight Power off to DISP="Low"	5	ms
T1	DISP="Low" to IC internal voltage discharge complete	80	ms

Note: Display signal: DCLK; VSYNC; HSYNC; DE; DR[7:0]; DG[7:0]; DB[7:0]



Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr+ Tf	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	30	40	ms	Note 3	
Contrast ratio	CR	At optimized viewing angle	640	800	-	-	Note 4	
Color Chromaticity	White	Wx	$\theta=0^\circ$ 、 $\Phi=0$	0.267	0.317	0.367	-	Note 2,6,7
		Wy		0.289	0.339	0.389	-	
Viewing angle	Hor.	Θ_R	$CR \geq 10$	70	80	-	Deg.	Note 1
		Θ_L		70	80	-		
	Ver.	Φ_T		70	80	-		
		Φ_B		70	80	-		
Brightness	-	-	250	300	-	cd/m ²	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25±2°C, IL=20mA

Note 1: Definition of viewing angle range

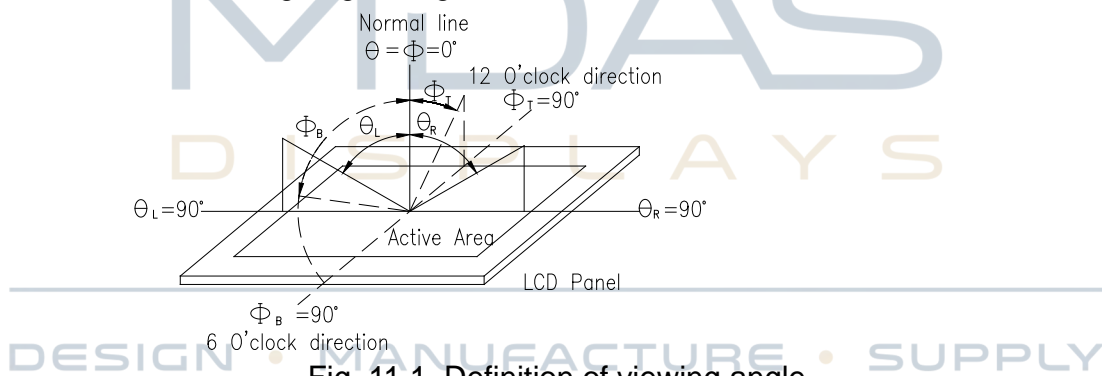


Fig. 11.1. Definition of viewing angle

Note 2: Test equipment setup:

After stabilizing and leaving the panel alone at a driven temperature for 10 minutes, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7orBM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

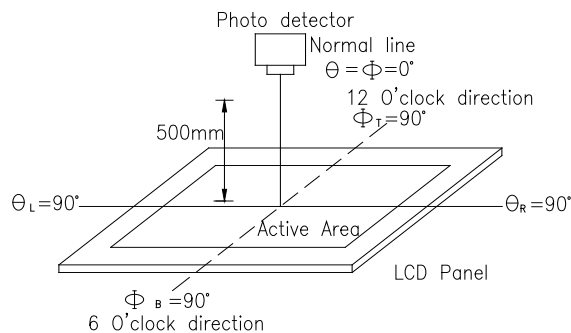
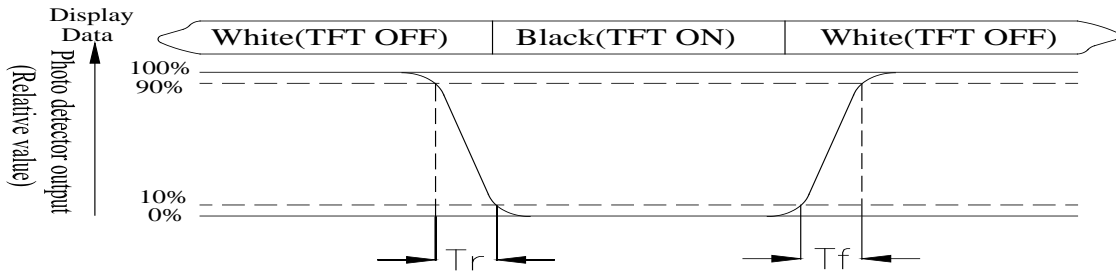


Fig. 11.2. Optical measurement system setup



Note 3: Definition of Response time:

The response time is defined as the LCD optical switching time interval between "White" state and "Black" state. Rise time, T_r , is the time between photo detector output intensity changed from 90% to 10%. And fall time, T_f , is the time between photo detector output intensity changed from 10% to 90%



Note 4: Definition of contrast ratio:

The contrast ratio is defined as the following expression.

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD on the "White" state}}{\text{Luminance measured when LCD on the "Black" state}}$$

Note 5: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (reference the picture in below). Every measuring point is placed at the center of each measuring area.

Luminance Uniformity (U) = $L_{\min}/L_{\max} \times 100\%$

L = Active area length

W = Active area width

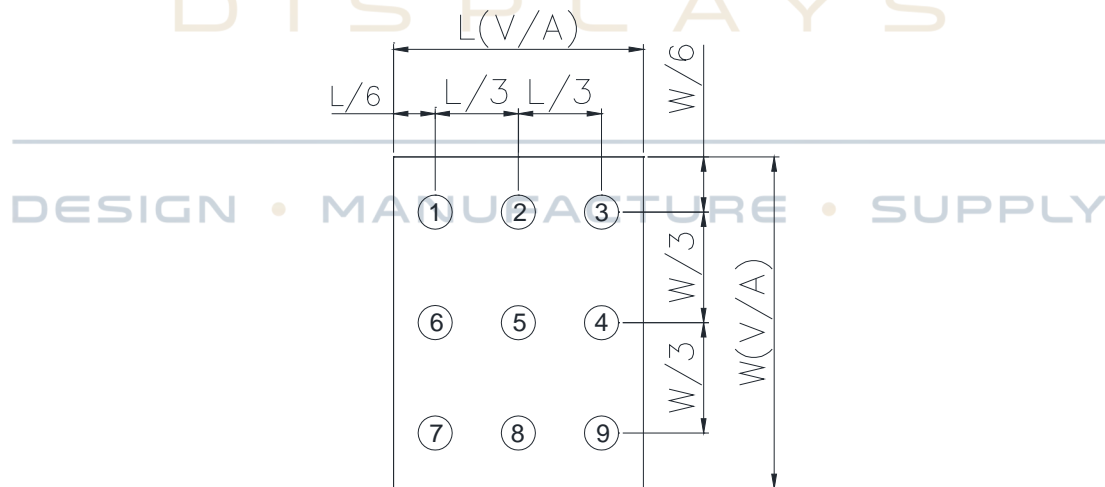


Fig11.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)

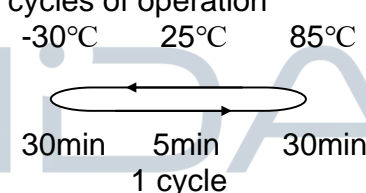
Color coordinates measured at the center point of LCD

Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.



Reliability

Content of Reliability Test (Wide temperature, -30°C~85°C)

Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	85°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-40°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	85°C 200hrs	2
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-30°C 200hrs	1,2
High Temperature/Humidity Operation	The module should be allowed to stand at 60°C,90%RH max	60°C,90%RH 96hrs	1,2
Thermal shock resistance	<p>The sample should be allowed stand the following 10 cycles of operation</p>  <p style="text-align: center;">-30°C 25°C 85°C</p> <p style="text-align: center;">30min 5min 30min</p> <p style="text-align: center;">1 cycle</p>	-30°C/85°C 10 cycles	2
Vibration test	Endurance test applying the vibration during transportation and using.	Total fixed amplitude : 1.5mm Vibration Frequency : 10~55Hz One cycle 60 seconds to 3 directions of X,Y,Z for Each 15 minutes	3
Static electricity test	Endurance test applying the electric stress to the terminal.	VS= TBD (contact), TBD (air), RS=330Ω CS=150pF 10 times	4

Note1: No dew condensation to be observed.

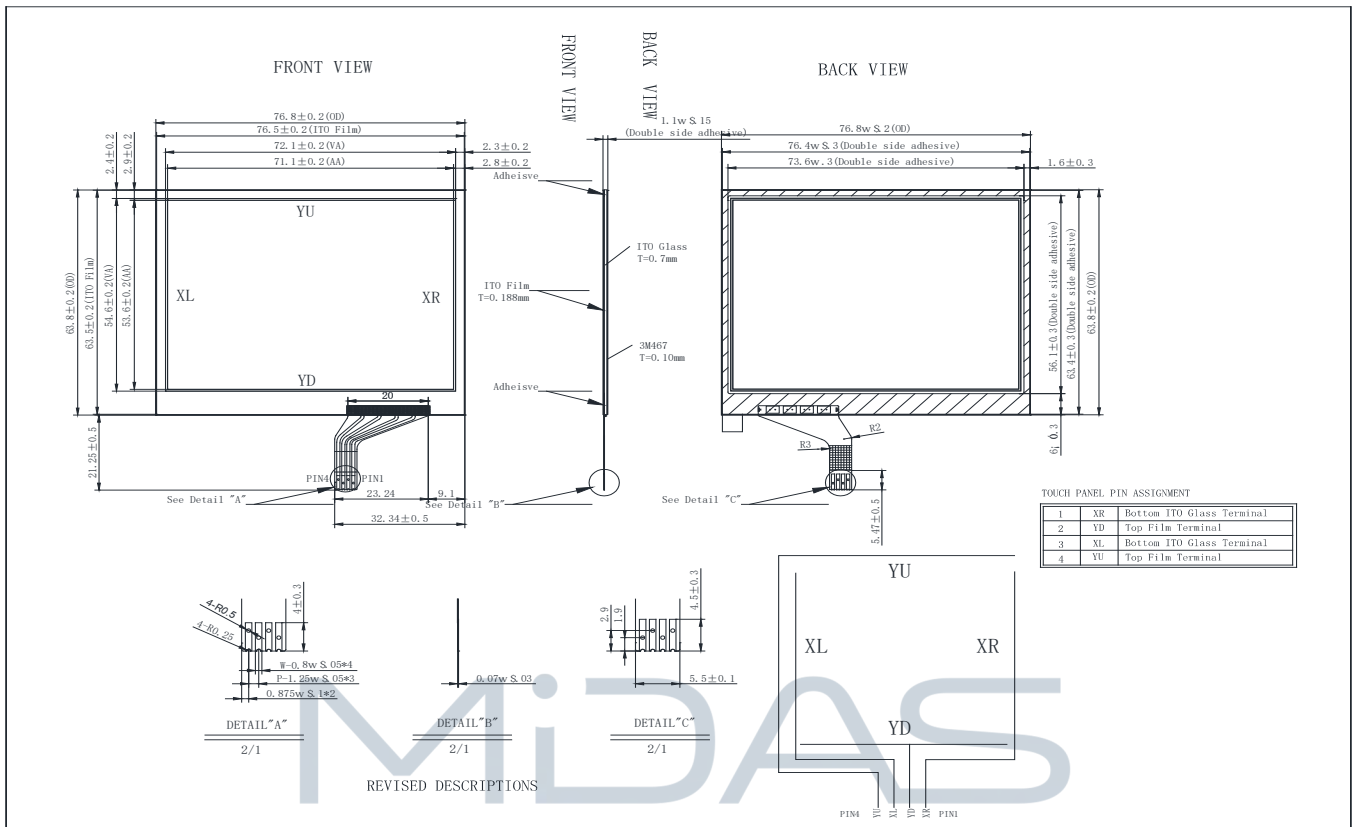
Note2: The function test shall be conducted after 4 hours storage at the normal Temperature and humidity after remove from the test chamber.

Note3: The packing have to including into the vibration testing.

Note4: Endurance test applying the electric stress to the finished product housing



Touch Panel Information



1. Resistance Touch Panel General Specifications

Item	Description
Driving condition	DC5V
Operating force	60~150g
Linearity max	≤±1.5%
Insulating resistance	>20MΩ · 25V(DC)
Light transparence	70%
Structure type	ITO Film/ITO Glass(F/G)
Surface Hardness	3H typ
Pen Hitting Durability (with the silicon rubber)	> 1000,000 times
X resistance	200~1100Ω
Y resistance	200~1100Ω