

深圳市兆驰昇科技有限公司

THX050BT4007

TFT LCD Display Datasheet

REV 1.0

29<sup>th</sup> May 2023

## Revision History

REVISION	DATE	COMMENT	REMARKS
1.0	29/05/2023	Initial Draft	Initial Draft Version

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# THX050BT4007

## 1. General Specification

THX050BT4007 is a colour active matrix LCD module incorporating amorphous silicon TFT (Thin Film Transistor). It is composed of a colour TFT-LCD panel, driver IC, FPC and a back light unit. The module display area contains 800 x 480 pixels. This product accords with RoHS environmental criterion.

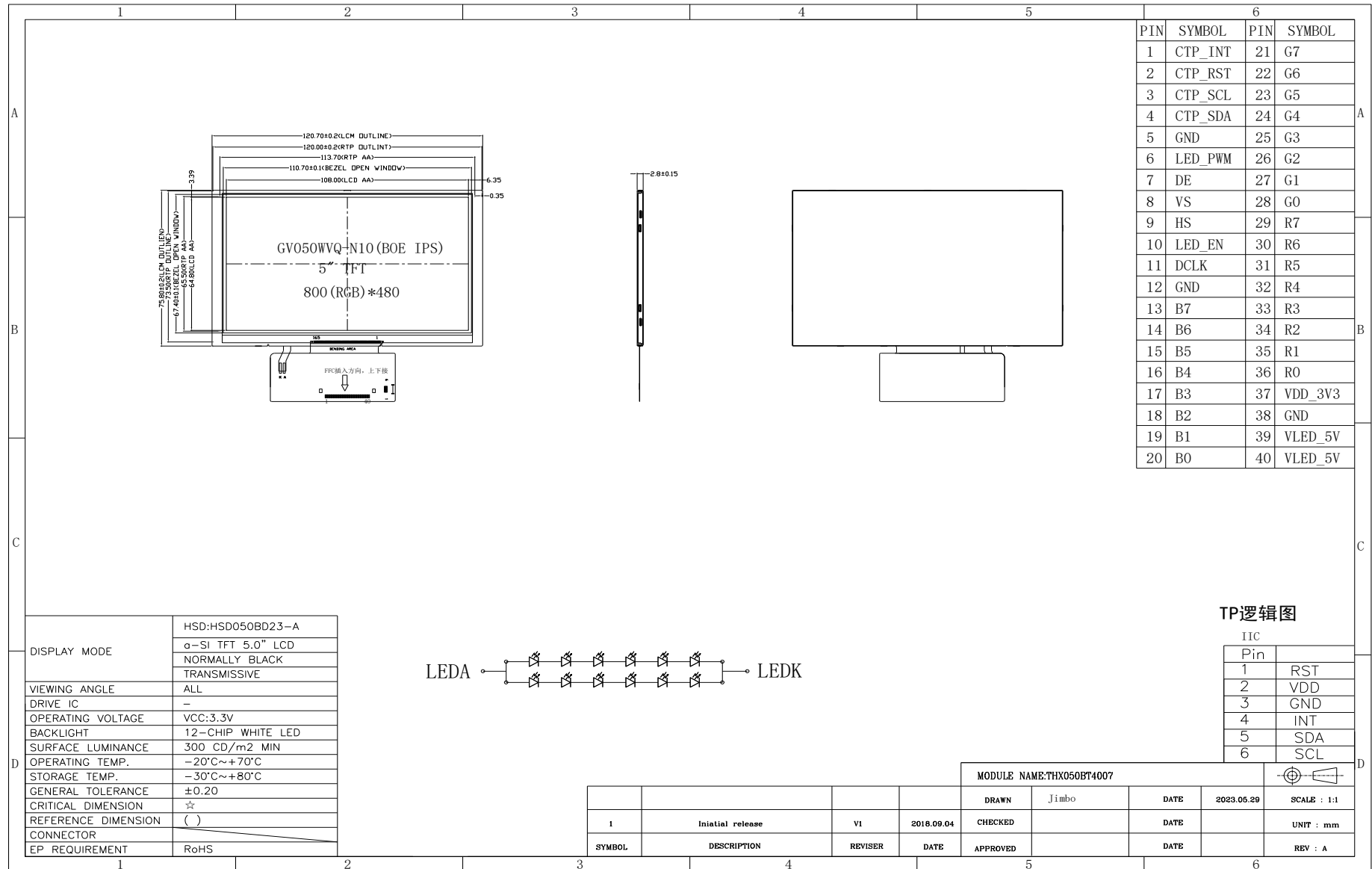
ITEM	CONTENTS	UNIT	
LCD Type	TFT / IPS / Normally black		
Size	5.0	Inch	
Viewing Direction	ALL	O'Clock	
Gray Scale Inversion Direction	NA	O'Clock	
LCM (W × H)	120.70 x 75.80	mm <sup>3</sup>	
Active Area (W × H)	108.00 x 64.80	mm <sup>2</sup>	
Dot Pitch (W × H)	0.198 × 0.198	mm <sup>2</sup>	
Number of Dots (Pixels)	800 (RGB) × 480		
Driver IC	ST7265		
Backlight Type	12 LEDs		
Surface Luminance	300 (typical)	cd/m <sup>2</sup>	
Interface Type	TTL		
Color Depth	16.7M		
Pixel Arrangement	RGB Vertical Stripe		
Surface Treatment	AG		
Input Voltage	3.3 (typical)	V	
With/Without TP (Touch Panel)	Without TP		
Weight	-	g	

**Note 1:** RoHS compliant

**Note 2:** LCD weight tolerance: ± 5%.

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### 2. TFT LCD Display Drawing (Non Touch Version)



### 3. Absolute Maximum Ratings

PARAMETER	SYMBOL	MIN	MAX	UNIT
Supply Voltage for LCD Logic	VDD/VCC	-0.3	4.6	V
Supply Voltage for TP Logic	VDD/VCC-VSS	-	-	V
Input Voltage for Logic	VIN	VSS-0.5	VDD	V
LED forward voltage (each LED)	IF	-	25	mA
Operating Temperature	T <sub>OP</sub>	-20	70	°C
Storage Temperature	T <sub>ST</sub>	-30	80	°C
Humidity	RH	-	90% (Max 60°C)	RH

### 4. Electrical Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Power Voltage	VDD/DCC	3.0	3.3	3.6	V
Input Current	IVDD	-	-	-	mA
Positive Power for TFT	VGH	-	-	-	
Negative Power for TFT	VGL	-	-	-	
Analog Power	AVDD	-	-	-	
Common Voltage	VCOM	-	-	-	
Input Voltage 'H' Level	V <sub>IH</sub>	0.7 VDD	-	VDD	V
Input Voltage 'L' Level	V <sub>IL</sub>	0	-	0.3 VDD	V

### 5. Electro-Optical Characteristics

ITEM	SYM	CONDITION	MIN	TYP	MAX	UNIT	REMARK
Response Time	Tr+Tf	$\theta=0$	-	25	40	ms	Figure 1 (4)
Contrast Ratio	Cr	$^{\circ}$	400	500	-	-	Figure 2 (1)
Luminance Uniformity	$\delta$ WHITE	$\phi=0$	75	80	-	%	Figure 2 (3)
Surface Luminance	Lv		250	300	-	cd/m <sup>2</sup>	Figure 2 (2)
Viewing Angle Range	$\theta$	$\phi = 90^{\circ}$	-	85	-	deg	Figure 3 (6)
		$\phi = 270^{\circ}$	-	85	-		
		$\phi = 0^{\circ}$	-	85	-		
		$\phi = 180^{\circ}$	-	85	-		
CIE (x,y) Chromaticity	Red	x	$\theta=0^{\circ}$ $\phi=0^{\circ}$ Ta=25	0.574	0.624	0.674	Figure 2 (5)
		y		0.318	0.368	0.418	
	Green	x		0.300	0.350	0.400	
		y		0.500	0.550	0.600	
	Blue	x		0.093	0.143	0.193	
		y		0.069	0.119	0.169	
	White	x		0.260	0.310	0.360	
		y		0.283	0.333	0.383	

## 6. Backlight Characteristics

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT
Voltage for LED backlight	$V_i$	-	19.2	20.4	V
Current for LED backlight	$I_i$	-	40	46	mA
LED Life Time	-	30000	-	-	Hrs

**Note:** The LED life time is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$ .

**Note 1:** Contrast Ratio(CR) is defined mathematically as below, for more information see Figure 1.

$$\text{Contrast Ratio} = \frac{\text{Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Average Surface Luminance with all black pixels (P1, P2, P3, P4, P5)}}$$

**Note 2:** Surface luminance is the LCD surface from the surface with all pixels displaying white. For more information, see Figure 2.

$L_v$  = Average Surface Luminance with all white pixels (P1, P2, P3, P4, P5)

**Note 3:** The uniformity in surface luminance  $\delta$  WHITE is determined by measuring luminance at each test position 1 through 5, and then dividing the maximum luminance of 5 points luminance by minimum luminance of 5 points luminance. For more information, see Figure 2.

$$\delta \text{ WHITE} = \frac{\text{Minimum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}{\text{Maximum Surface Luminance with all white pixels (P1, P2, P3, P4, P5)}}$$

**Note 4:** Response time is the time required for the display to transition from white to black (Rise Time,  $T_r$ ) and from black to white (Decay Time,  $T_f$ ). For additional information see FIG 1. The test equipment is Autronic-Melchers ConoScope series.

**Note 5:** CIE (x, y) chromaticity, the x, y value is determined by measuring luminance at each test position 1 through 5, and then make average value.

**Note 6:** Viewing angle is the angle at which the contrast ratio is greater than 2. For TFT module the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information, see Figure3.

**Note 7:** For viewing angle and response time testing, the testing data is based on Autronic-Melchers ConoScope series. Instruments for Contrast Ratio, Surface Luminance, Luminance Uniformity, CIE the test data is based on TOPCONs BM-5 photo detector.

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Figure 1. The definition of response time

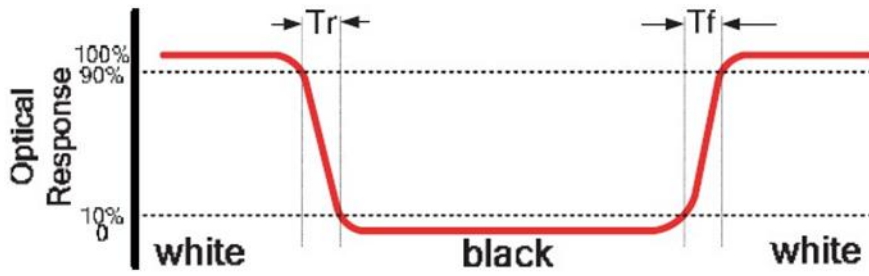


Figure 2. Measuring method for Contrast ratio, surface luminance, Luminance uniformity, CIE (x, y) chromaticity

A : 5 mm  
 B : 5 mm  
 H, V : Active Area  
 Light spot size  $\varnothing=5\text{mm}$ , 500mm distance from the LCD surface to detector lens  
 measurement instrument is TOPCON's luminance meter BM-5

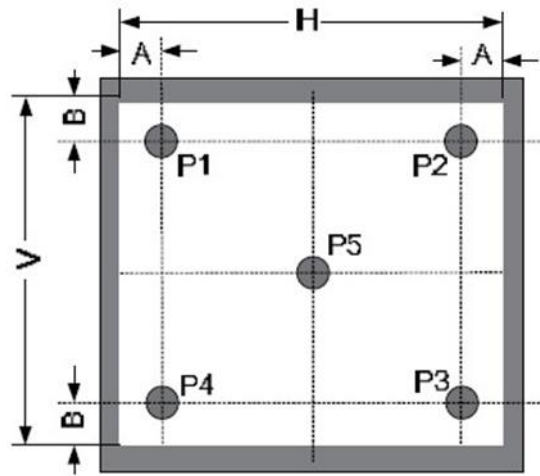
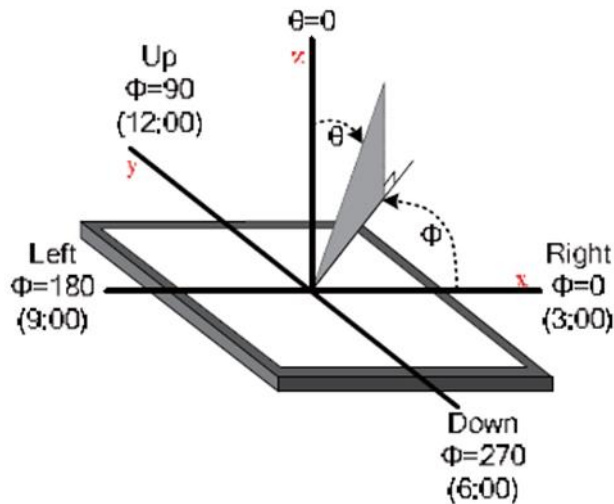


Figure 3. The definition of viewing angle



## 7. Interface Descriptions

### 7.1. LCD Interface

PIN NO.	SYMBOL	DESCRIPTION	REMARK
1	CTP_INT	Interrupt signal from TP	
2	CTP_RST	Reset pin for TP	
3	CTP_SCL	I2C SCL for TP	
4	CTP_SDA	I2C SDA for TP	
5	GND	Ground	
6	LED_PWM	PWM signal for LCD backlight	
7	DE	Input data enable control. When DE mode, active High to enable data input (Normally pull low)	
8	VS	Vertical sync input	
9	HS	Horizontal sync input	
10	LED_EN	enable signal for LCD backlight	
11	DCLK	Clock for input data. Data latched at rising/falling edge of this signal. Default is falling edge.	
12	GND	Ground	
13	B7	Blue data input B7.	
14	B6	Blue data input B6.	
15	B5	Blue data input B5.	
16	B4	Blue data input B4.	
17	B3	Blue data input B3.	
18	B2	Blue data input B2.	
19	B1	Blue data input B1.	
20	B0	Blue data input B0.	
21	G7	Green data input G7.	
22	G6	Green data input G6.	
23	G5	Green data input G5.	
24	G4	Green data input G4.	
25	G3	Green data input G3.	
26	G2	Green data input G2.	
27	G1	Green data input G1.	
28	G0	Green data input G0.	
29	R7	Red data input R7.	
30	R6	Red data input R6.	
31	R5	Red data input R5.	
32	R4	Red data input R4.	
33	R3	Red data input R3.	
34	R2	Red data input R2.	
35	R1	Red data input R1.	
36	R0	Red data input R0.	
37	VDD_3V3	Power supply for LCD and TP. (3.3V typ)	
38	GND	Ground	
39	VLED_5V	Power supply for LED.(5V typ)	
40	VLED_5V	Power supply for LED.(5V typ)	

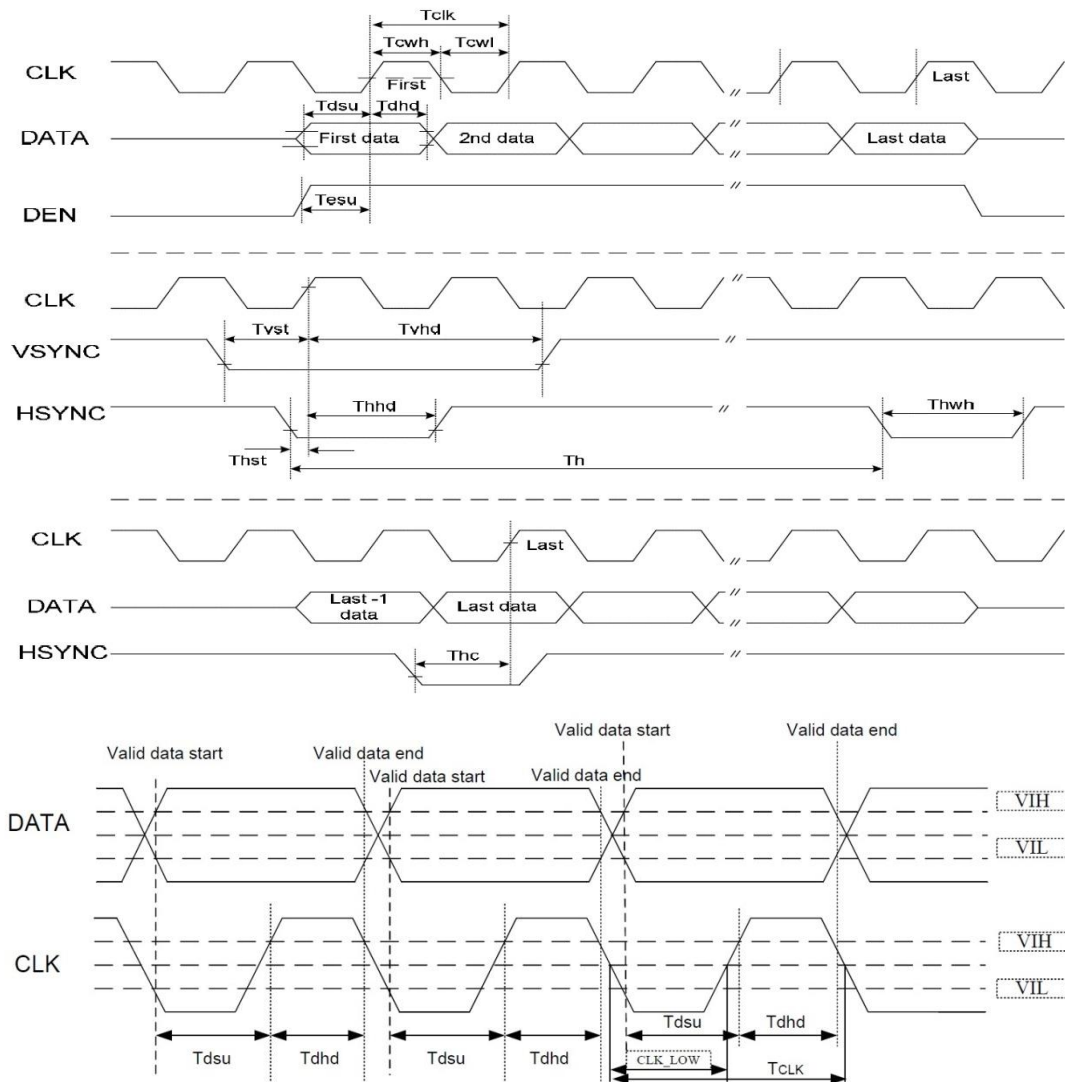


## 8. LCD Timing Details

### 8.1. Timing Chart

PARAMETER	SYMBOL	MIN	TYP	MAX	UNIT	CONDITION
CLK Clock Time	$T_{clk}$	$1/\text{Max}(F_{CLK})$	-	$1/\text{Min}(F_{CLK})$	ns	-
CLK Pulse Duty	$T_{chw}$	40	50	60	%	$T_{CLK}$
HSYNC to CLK	$T_{hc}$	-	-	1	CLK	-
HSYNC Width	$T_{hwh}$	1	-	-	CLK	-
VSYNC Width	$T_{vwh}$	1	-	-	ns	-
HSYNC Period Time	$T_h$	60	63.56	67	ns	-
VSYNC Set-up Time	$T_{vst}$	12	-	-	ns	-
VSYNC Hold Time	$T_{vhd}$	12	-	-	ns	-
HSYNC Setup Time	$T_{hst}$	12	-	-	ns	-
HSYNC Hold Time	$T_{hhd}$	12	-	-	ns	-
Data Set-up Time	$T_{dsu}$	12	-	-	ns	D00~D23 to CLK
Data Hold Time	$T_{dhd}$	12	-	-	ns	D00~D23 to CLK
DEN Set-up Time	$T_{esu}$	12	-	-	ns	DEN to CLK

Timing parameter (VDD=3.3V, GND=0V, Ta=25°C)

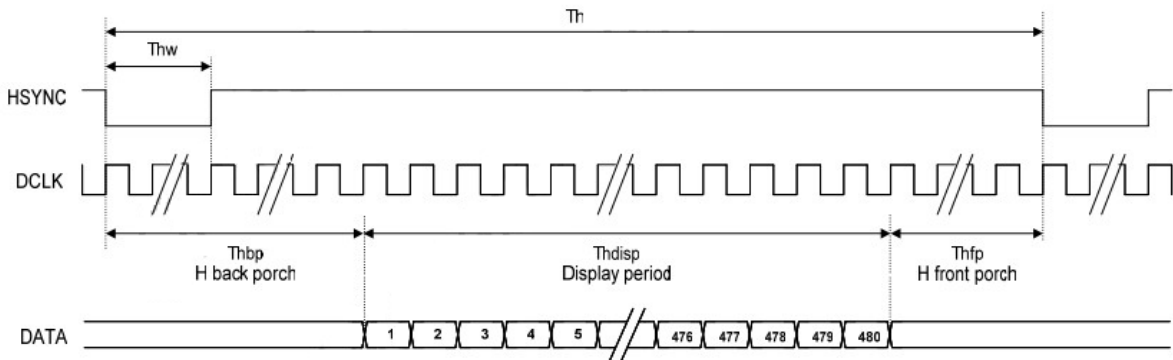


Timing parameter (VDD=3.3V, GND=0V, Ta=25°C)

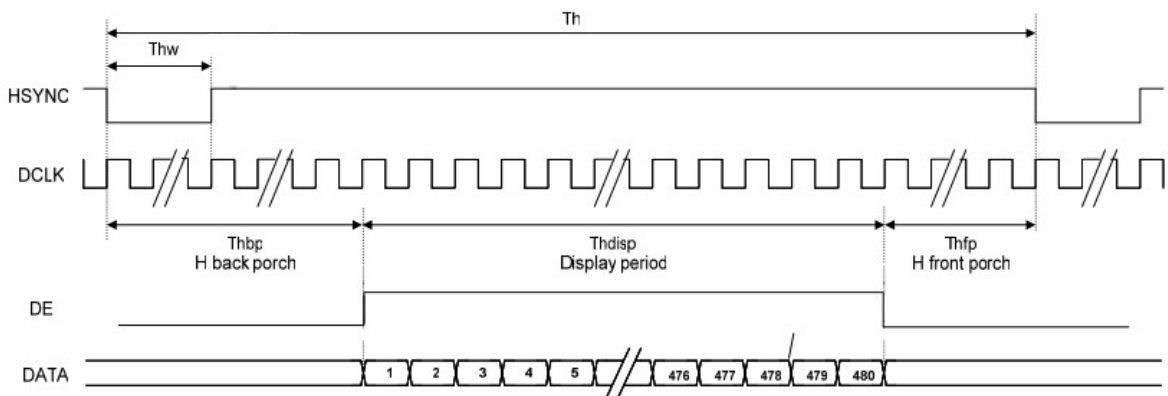
### 8.2. Timing Characteristic

ITEM	SYMBOL	MIN	TYP	MAX	UNIT		
DCLK Frequency	Fclk	-	51	67	MHz		
DCLK Period	Tclk	-	-	-	Ns		
Hsync	Period Time	Th	-	1056	-	DCLK	
	Display Period	Thdisp		800	-	DCLK	
	To 1st Data input	Thbp	-	46	-	DCLK	By H BLANKING setting
	Front Porch	Thfp	-	210	-	DCLK	
	Pulse Width	Thw	-	4	-	DCLK	
Vsync	Period Time	Tv	-	525	-	H	
	Display Period	Tvdisp	-	480	-	H	
	Delay to 1st Gate output	Tvbp	-	23	-	H	By V BLANKING setting
	Front Porch	Tvfp	-	22	-	H	
	Pulse Width	Tvw	-	5	-	H	

### 8.3. SYNC Mode Timing Diagram

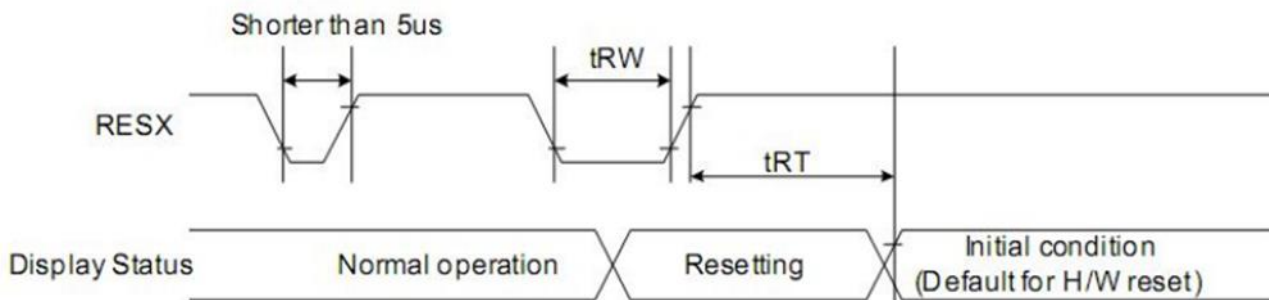


### 8.4. SYNC-DE Mode Timing Diagram



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## 8.5. Reset Timing

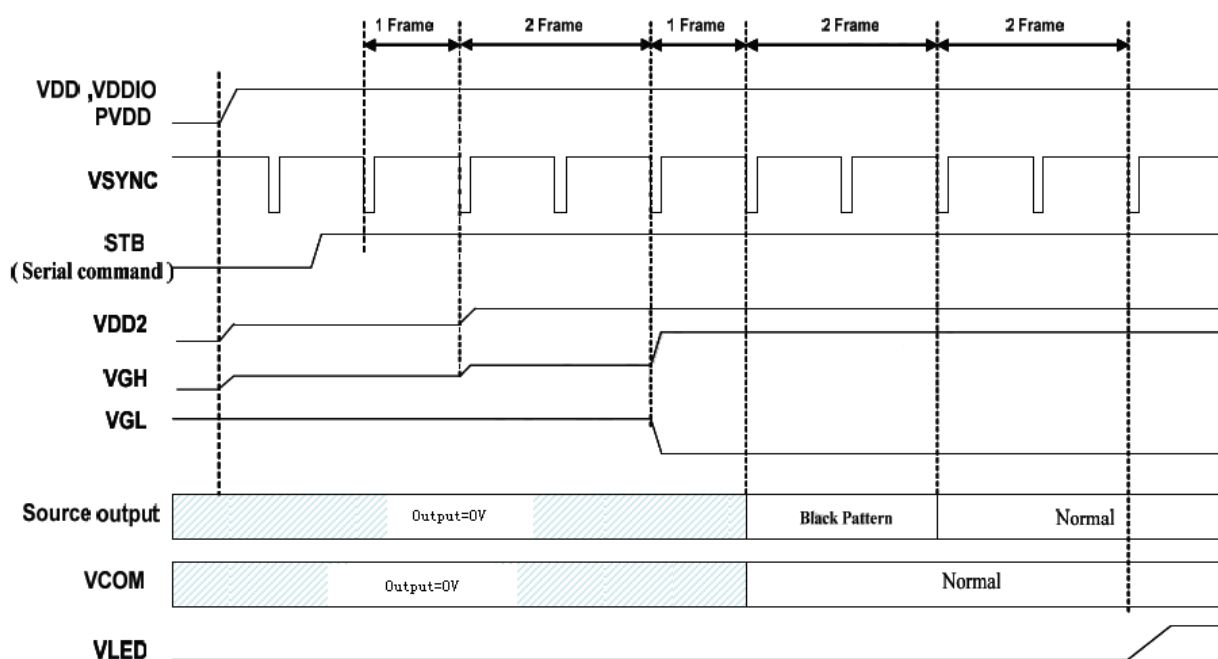


SIGNAL	SYMBOL	PARAMETER	MIN	MAX	UNIT
RESET	$t_{RW}$	Reset low pulse width	40	-	us
	$t_{RT}$	Reset complete time	-	5 (note1)	ms
			-	120 (note2)	ms

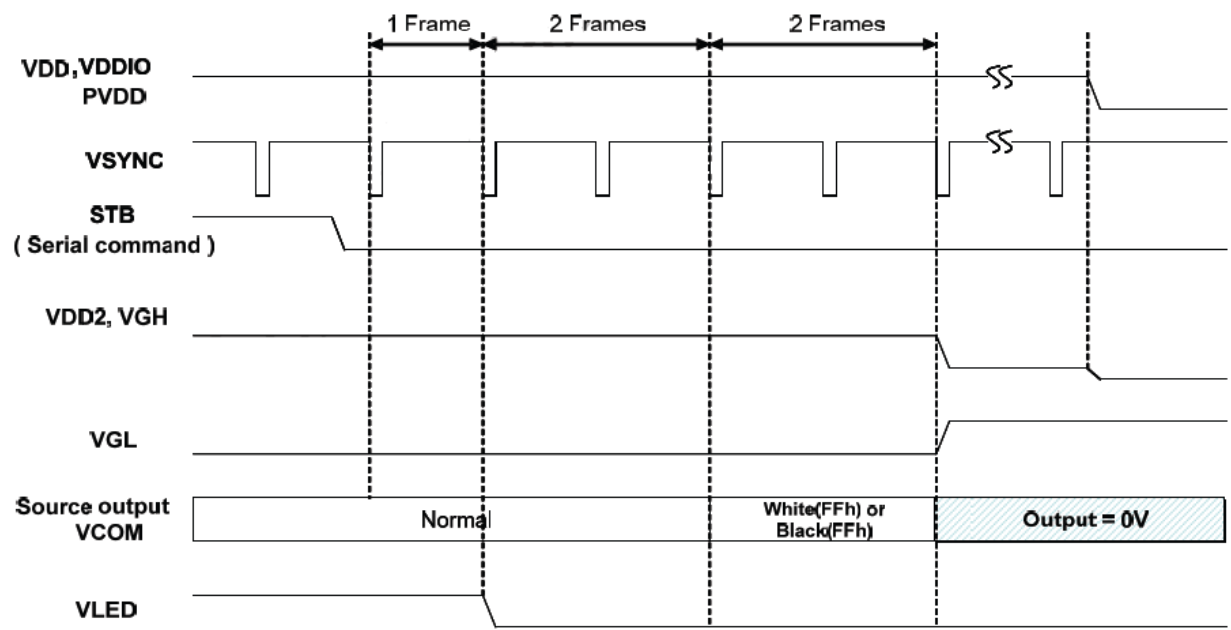
**Note 1:** When reset applied during SLPIN mode

**Note 2:** When reset applied during SLPOUT mode.

## 8.6. Power On Sequence



8.7. Power-off Sequence



Note:

When normally-black LC is used, please send black pattern to discharge the panel.  
 When normally-white LC is used, please send white pattern to discharge the panel

## 9. Reliability Test

No.	SYMBOL	TEST CONDITION	REMARK
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power off	After test cosmetic and electrical defects should not happen.
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	
3	High Temperature Operation	70°C±2°C 96H Power on	
4	Low Temperature Operation	-20°C±2°C 96H Power on	
5	High Temperature & Humidity Operation	60°C±2°C 90%RH 96H Power on	
6	Temperature Cycle	-20°C←→25°C←→70°C 30min 5min 30min  After 10 cycles, restore 2H at 25°C Power off	
7	Vibration Test	10Hz~150Hz, 100m/s <sup>2</sup> , 120min	
8	Shock Test	Half-sinewave, 300m/s <sup>2</sup> , 11ms	

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