



**ASI-T-430FA5SPN/W  
REV 2**

<b>No</b>	<b>Item</b>	<b>Specification</b>	<b>Remark</b>
1	Type	Transmissive	--
2	Display Mode	Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	4.3inch	--
5	Resolution	480(RGB) x 272	--
6	Active Area	95.04 (W) x 53.856(H) (mm)	--
7	Pixel Size	0.198 x 0.198 (mm)	--
8	Color Arrangement	RGB Vertical stripe	--
9	Assembly Type	COG	--
10	Back Light	LED	--
11	Viewing Direction	FREE	--
12	Weight	TBD	g
13	Module Dimension	105.42(W) x67.07(H) x 6.7 (D) (mm)	--

**RECORD OF REV**

DATE	REV.	PAGE	SUMMARY
2023/2/7	2 ( <u>1</u> )	P.1	Modify the page on contents. Please refer to <u>1</u>
		P.12~17	Modify the timing characteristics. Please refer to <u>1</u>
		P.18~23	Modify the page from P.14~P.19 to P.18~P.23. Please refer to <u>1</u>
		P.24	Modify the page from P.20 to P.24 and add Initialization by instructions(for reference) code. Please refer to <u>1</u>

### 3. General specifications

#### 3.1 General specifications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit.

#### 3.2 Features

- High image quality a-Si TFT LCD module.
- 16.7M color number.
- Support SPI input mode
- High contrast, high brightness.
- Low power consumption.
- TFT-controller: RA8875
- LCD-Driver: SC7283

### 4. Mechanical data

No	Item	Specification	Remark
1	Type	Transmissive	--
2	Display Mode	Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	4.3inch	--
5	Resolution	480(RGB) x 272	--
6	Active Area	95.04 (W) x 53.856(H) (mm)	--
7	Pixel Size	0.198 x 0.198 (mm)	--
8	Color Arrangement	RGB Vertical stripe	--
9	Assembly Type	COG	--
10	Back Light	LED	--
11	Viewing Direction	FREE	--
12	Weight	TBD	g
13	Module Dimension	105.42(W) x67.07(H) x 6.7 (D) (mm)	--

## 5. Absolute maximum ratings

### 5.1 Electrical absolute maximum ratings

#### (a) TFT-LCD Panel Absolute Maximum Ratings

Ta=25°C

Item	Symbol	Condition	Standard Value		Unit	Remark
			Min.	Max.		
Power supply voltage	V <sub>DD</sub>	GND=0V	-0.3	4.0	V	--
Logic Input Signal	V <sub>IN</sub>		-0.3	V <sub>DD</sub> +0.3	V	--

- If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

#### (b) Back-Light Unit

Ta=25°C

Item	Symbol	Min.	Max.	Unit	Remark
Power Supply Voltage for LED Driver	V <sub>LED</sub>	-0.3	6.5	V	--

### 5.2 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit	Remark
Operation temperature	Top	-20	70	°C	Ambient
Storage temperature	Tst	-30	80	°C	Ambient

- (a) Corrosive gas environment is not acceptable.
- (b) TFT-LCD color will change slightly depending on environment temperature.  
This phenomenon is reversible.

## 6. Electrical characteristics

### 6.1 TFT-LCD Module

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply For LCD	V <sub>DD</sub>	3.0	3.3	3.6	V	--
LCD Power Current	I <sub>DD</sub>	--	(150)	--	mA	--
Hight level input voltage	V <sub>IH</sub>	0.7 V <sub>DD</sub>	--	V <sub>DD</sub>	V	H level
Low level input voltage	V <sub>IL</sub>	0	--	0.3V <sub>DD</sub>	V	L level

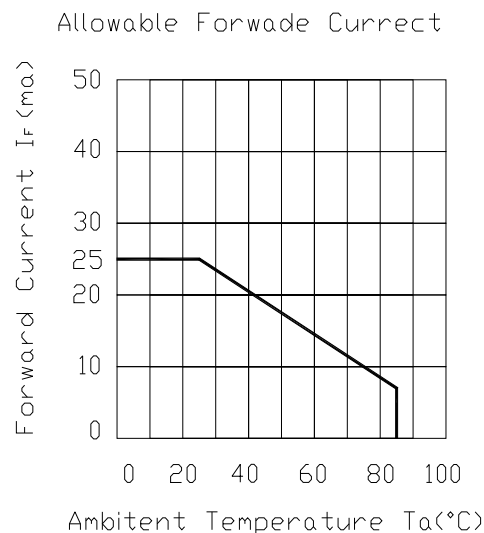
### 6.2 Back-Light Unit

Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power Supply for Backlight Unit with LED Driver	VLED	--	5	--	V	GND=0V
	ILED	--	200	--	mA	VLED=5.0V
PWM Dimming Frequency	F <sub>PWM</sub>	100	--	1k	Hz	-
Life Time	Lf	--	(20,000)	--	hrs	NOTE(1)

NOTE(1): The “LED life time” is defined as the module brightness decreases to 50% of original brightness that the ambient temperature is 25°C, and PWM duty=100%.

NOTE(2): Current reduction rate of LED backlight is according to the graph indicated below :



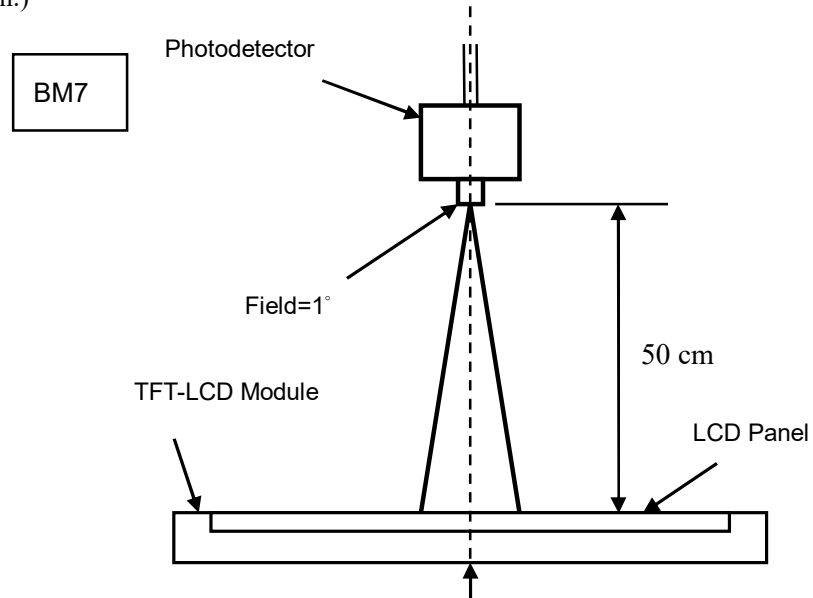
7. *Optical characteristics*

Ta=25°C

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Brightness	B	$\theta=0^\circ$ Normal viewing angle At the center of panel	500	550	--	cd/m <sup>2</sup>	(1)	
Contrast Ratio	C/R		640	800	--	--	(2)	
Response Time	Tr+Tf		--	30	40	ms	(3)	
Color chromaticity	White		Wx	(0.270)	(0.320)	(0.370)	--	--
			Wy	(0.295)	(0.345)	(0.395)		
	Red		Rx	(0.579)	(0.629)	(0.679)	--	--
			Ry	(0.276)	(0.326)	(0.376)		
	Green		Gx	(0.287)	(0.337)	(0.387)	--	--
			Gy	(0.496)	(0.546)	(0.596)		
Blue	Bx		(0.086)	(0.136)	(0.186)	--	--	
	By	(0.093)	(0.143)	(0.193)				
Viewing Angle	Top	$\theta_U$	70	80	--	Deg.	(4)	
	Bottom	$\theta_D$	70	80	--			
	Left	$\theta_L$	70	80	--			
	Right	$\theta_R$	70	80	--			
Uniformity	Un	$\theta=0^\circ$ Normal viewing angle	70	--	--	%	(5)	

Note (1): The brightness test equipment setup

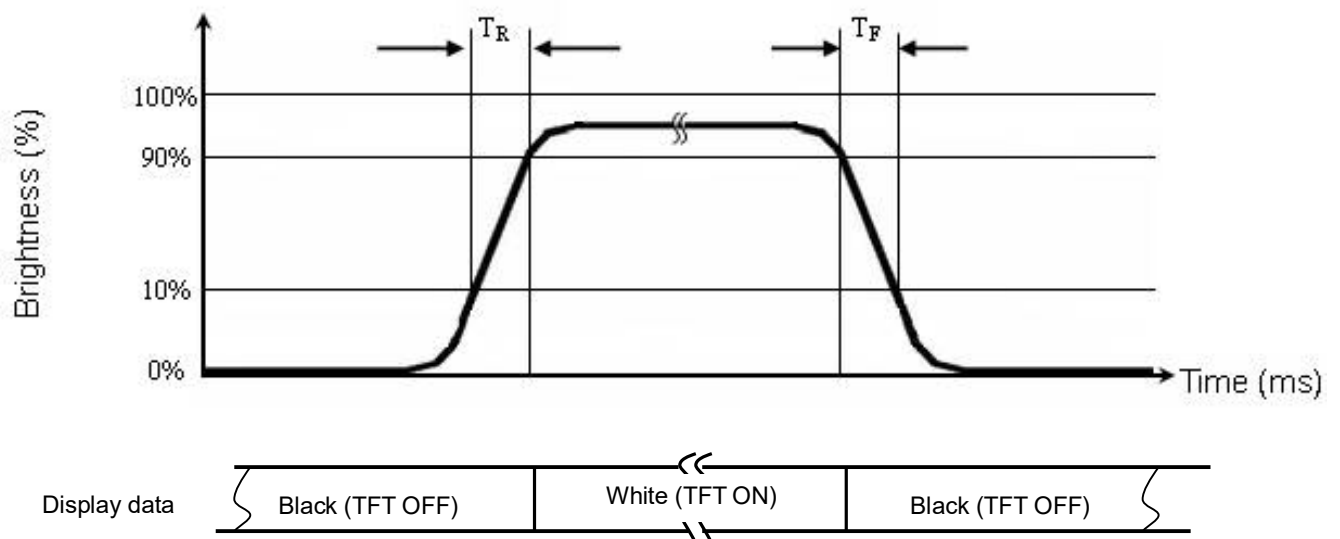
ILED=200mA and PWM duty=100%, Field=1°  
 (As measuring “black” image, field=1°  
 Is the best testing condition.)



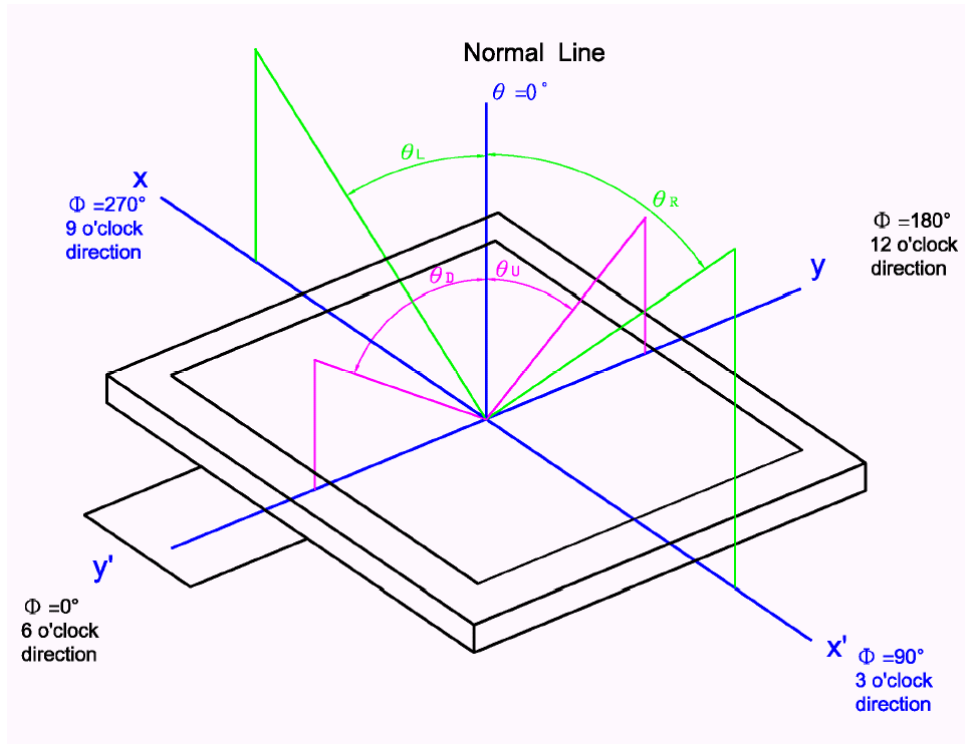
Note (2): Definition of contrast Ratio (C/R)

$$C/R = \frac{\text{Brightness When LCD is at "White" State}}{\text{Brightness When LCD is at "Black" State}}$$

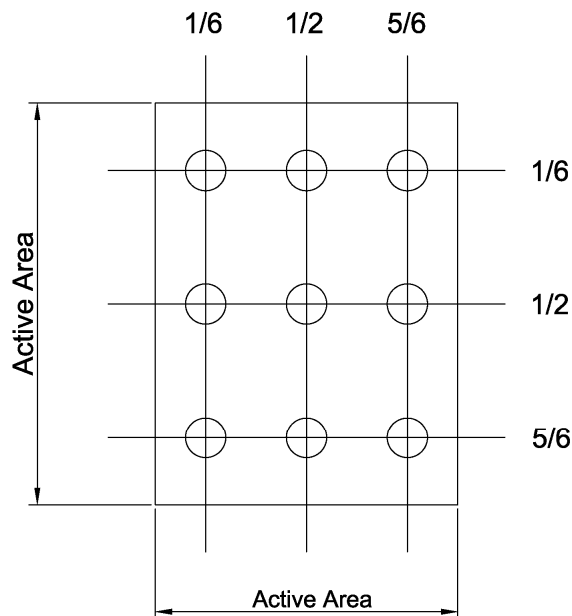
Note (3): Definition of response time



Note (4): Definition of viewing angle



Note (5): Definition of uniformity (Un)

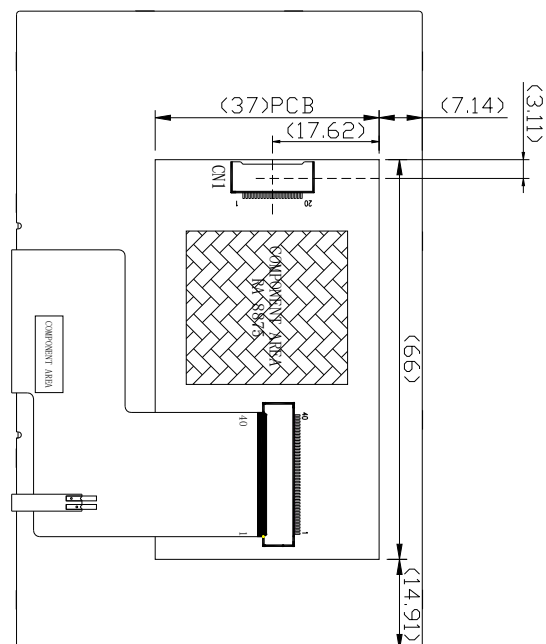
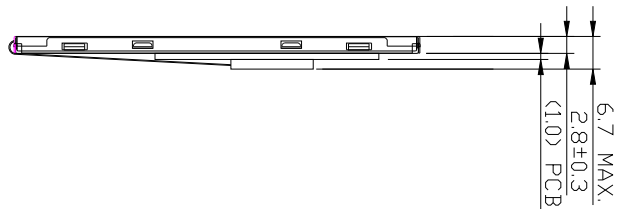
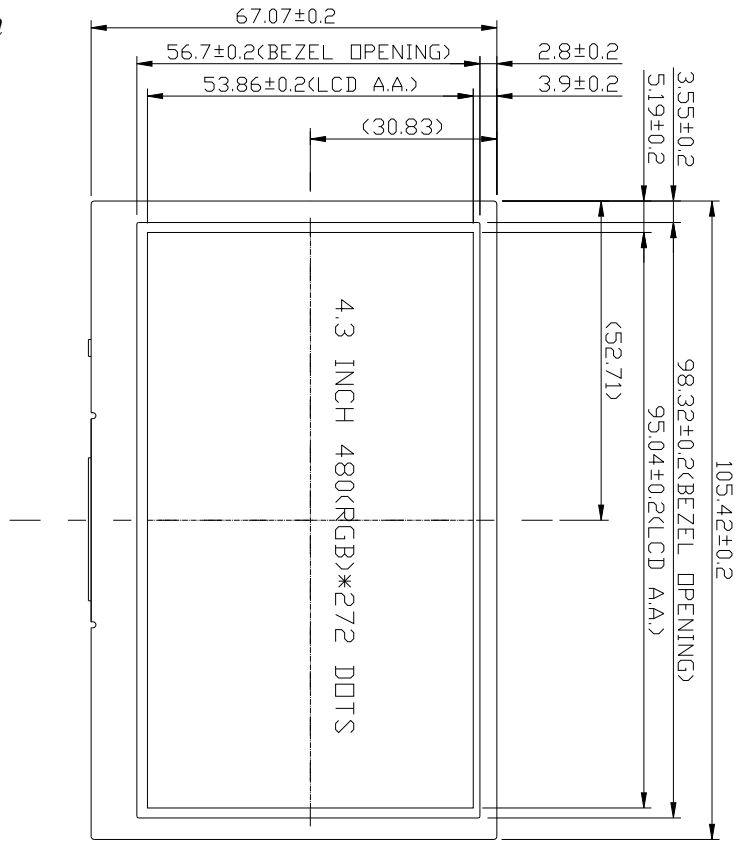


$$U_n = \frac{B_{min}}{B_{max}} \times 100\%$$



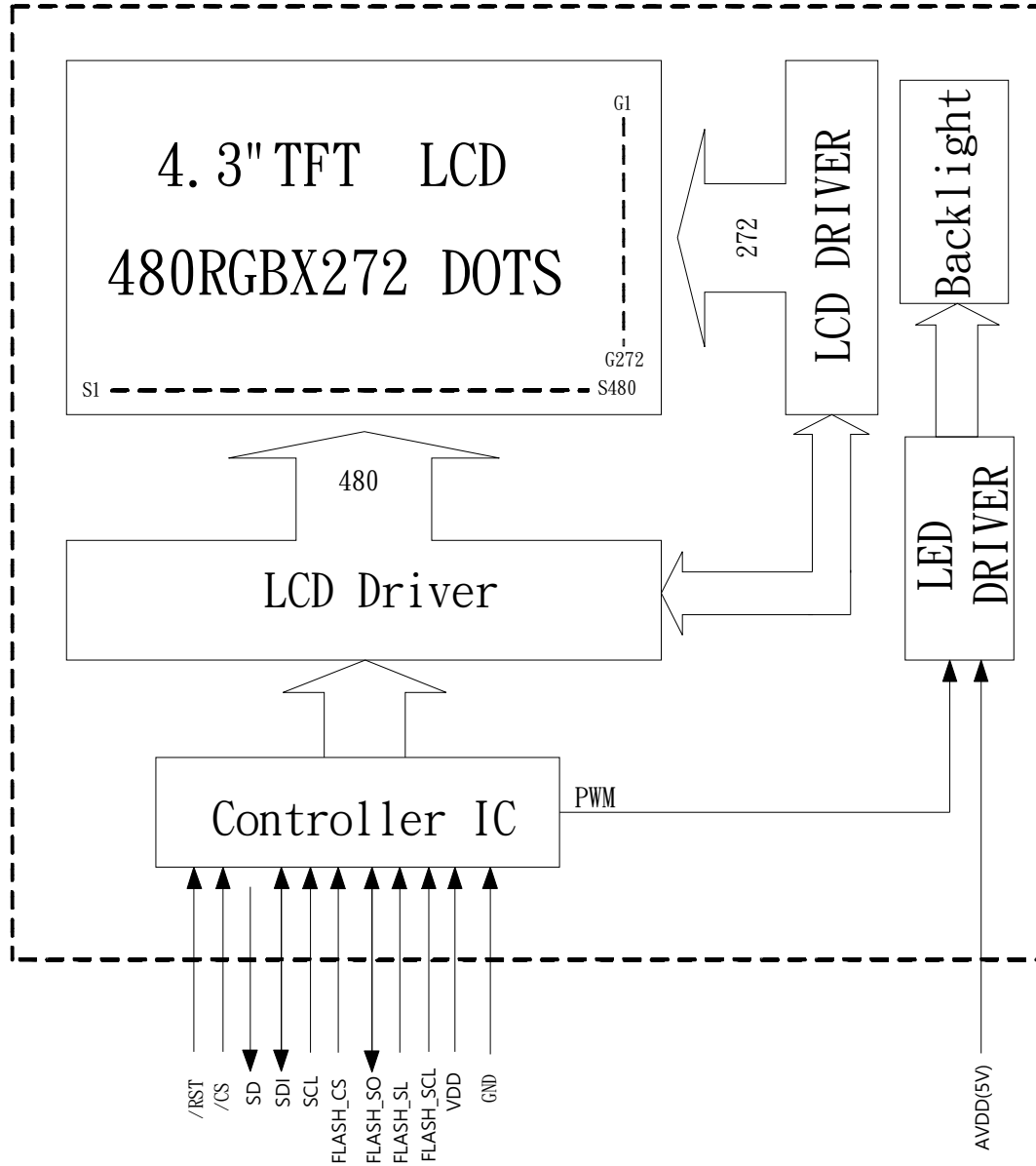
**8. Outline dimension**

NOTE :  
 (1) UNIT : mm  
 (2) SCALE : NTS  
 (3) CONNECTOR : CN1-FC-020520-H or Equivalent



**9. Block diagram**

**9.1 TFT-LCD Module (Interface System Structure)**



## 10. Input Terminal Pin Assignment

### 10.1 Input Signal & Power

Pin no	Symbol	Description	Remark
1	/RST	System Reset	-
2	CS	Chip Select Input	-
3	SD	Data output pin in serial mode.	-
4	SDI	Data input pin in serial mode.	-
5	SCL	Clock pin of serial interface.	-
6	GND	Power Ground.	-
7	NC	No connect	-
8	FLASH_CS	External Flash/ROM SPI Chip Select	-
9	FLASH_SO	External Flash/ROM SPI Data Output	-
10	FLASH_SL	External Flash/ROM SPI Data Input	-
11	FLASH_SCL	External Serial Flash/ROM Clock	-
12	VDD(3.3V)	Power supply for digital circuit	-
13	AVDD(5V)	Power supply for LED driver	-
14	GND	Power Ground.	-
15	NC	No connect	-
16	NC	No connect	-
17	NC	No connect	-
18	NC	No connect	-
19	NC	No connect	-
20	GND	Power Ground.	-

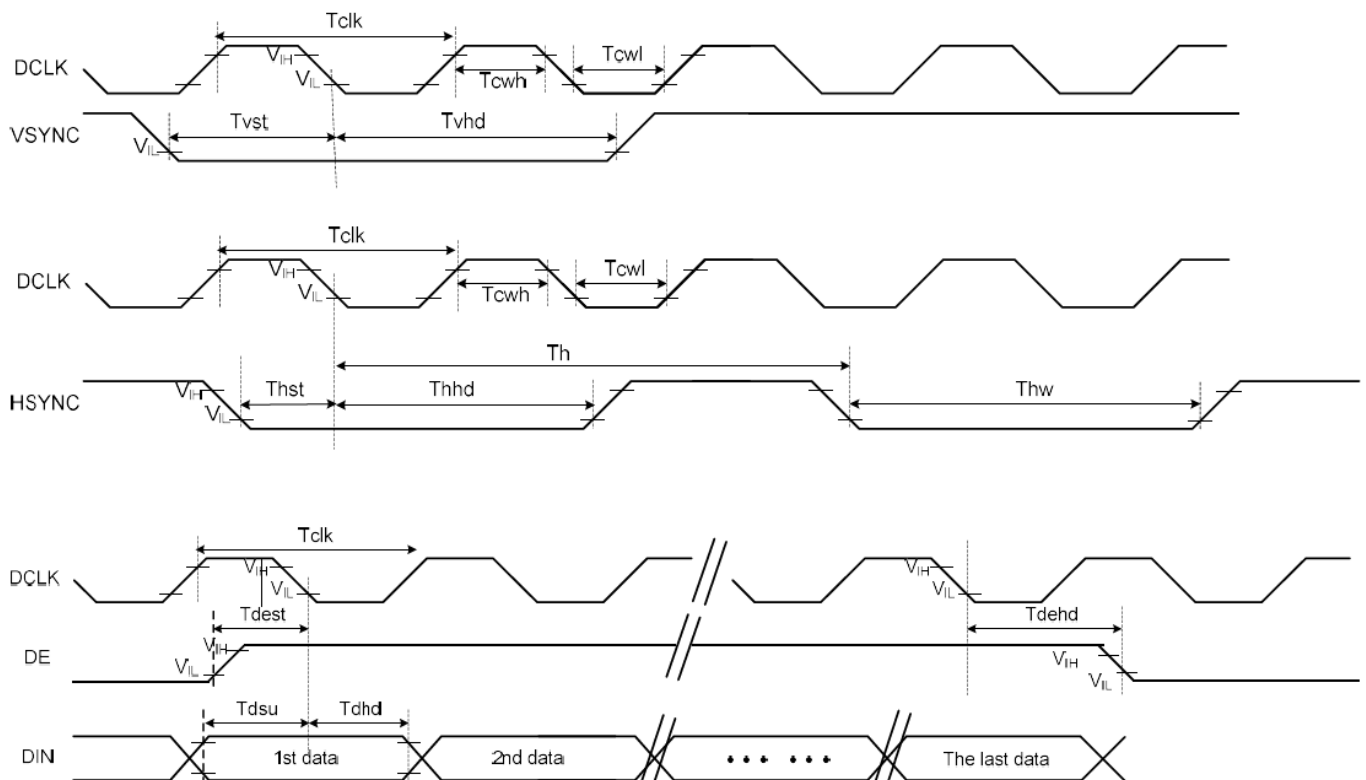
## 11. Timing Characteristics

### 11.1 AC Characteristics

AC Electrical Characteristics (PVDD=VDD=VDDI= 3.3V, AGND= 0V, TA=25 °C, Bare Chip)

Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	T <sub>cd</sub>	40	50	60	%	
HSYNC Width	T <sub>hw</sub>	2	-	-	DCLK	
HSYNC Period	T <sub>h</sub>	55	60	65	us	
VSYNC Setup Time	T <sub>vst</sub>	12	-	-	ns	
VSYNC Hold Time	T <sub>vhd</sub>	12	-	-	ns	
HSYNC Setup Time	T <sub>hst</sub>	12	-	-	ns	
HSYNC Hold Time	T <sub>hhd</sub>	12	-	-	ns	
Data Setup Time	T <sub>dsu</sub>	12	-	-	ns	
Data Hold Time	T <sub>dhhd</sub>	12	-	-	ns	
DE Setup Time	T <sub>ddest</sub>	12	-	-	ns	
DE Hold Time	T <sub>ddehd</sub>	12	-	-	ns	

### Clock and Data Input Timing Diagram



## 11.2 RGB Input Timing Table

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

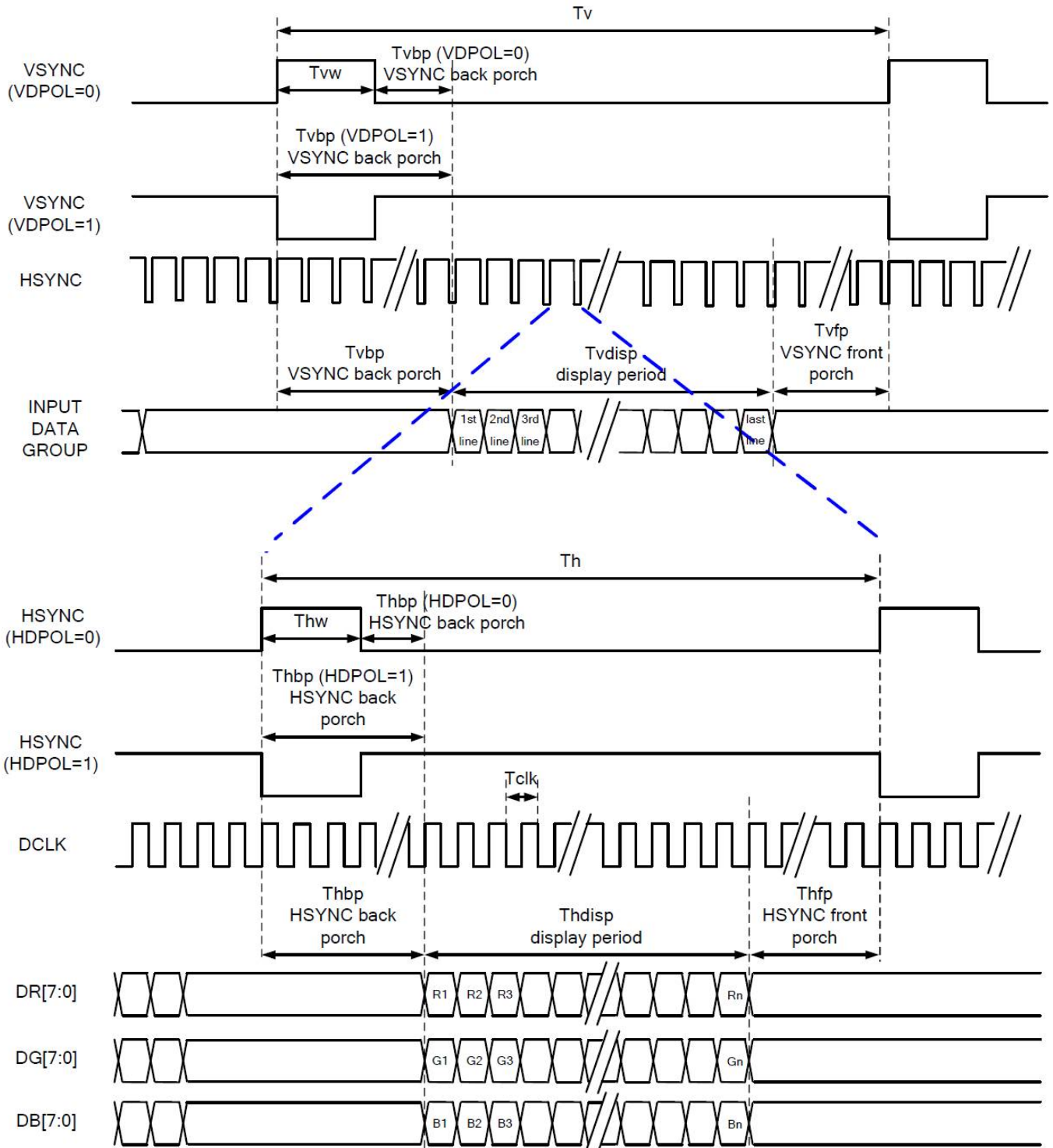
480RGB X 272 Resolution Timing Table							
Item	Symbol	Min.	Typ.	Max.	Unit	Remark	
DCLK Frequency	Fclk	8	9	12	MHz		
DCLK Period	Tclk	83	111	125	ns		
HSYNC	Period Time	Th	485	531	598	DCLK	
	Display Period	Thdisp		480		DCLK	
	Back Porch	Thbp	3	43	43	DCLK	By H_BLANKING setting
	Front Porch	Thfp	2	8	75	DCLK	
	Pulse Width	Thw	2	4	43	DCLK	
VSYNC	Period Time	Tv	276	292	321	HSYNC	
	Display Period	Tvdisp		272		HSYNC	
	Back Porch	Tvbp	2	12	12	HSYNC	By V_BLANKING setting
	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.

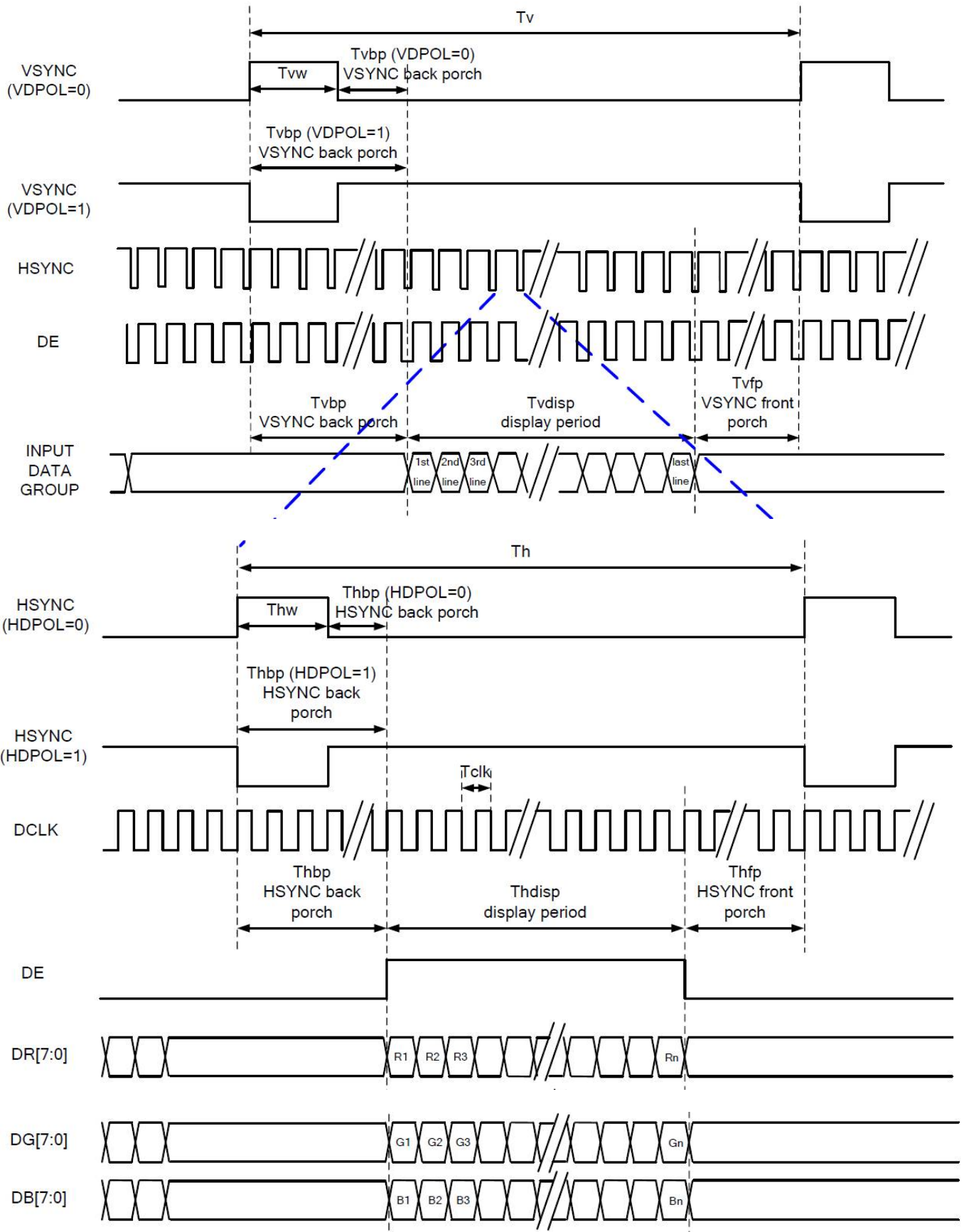


**SYNC MODE**

(VDPOL=1, HDPOL=1)



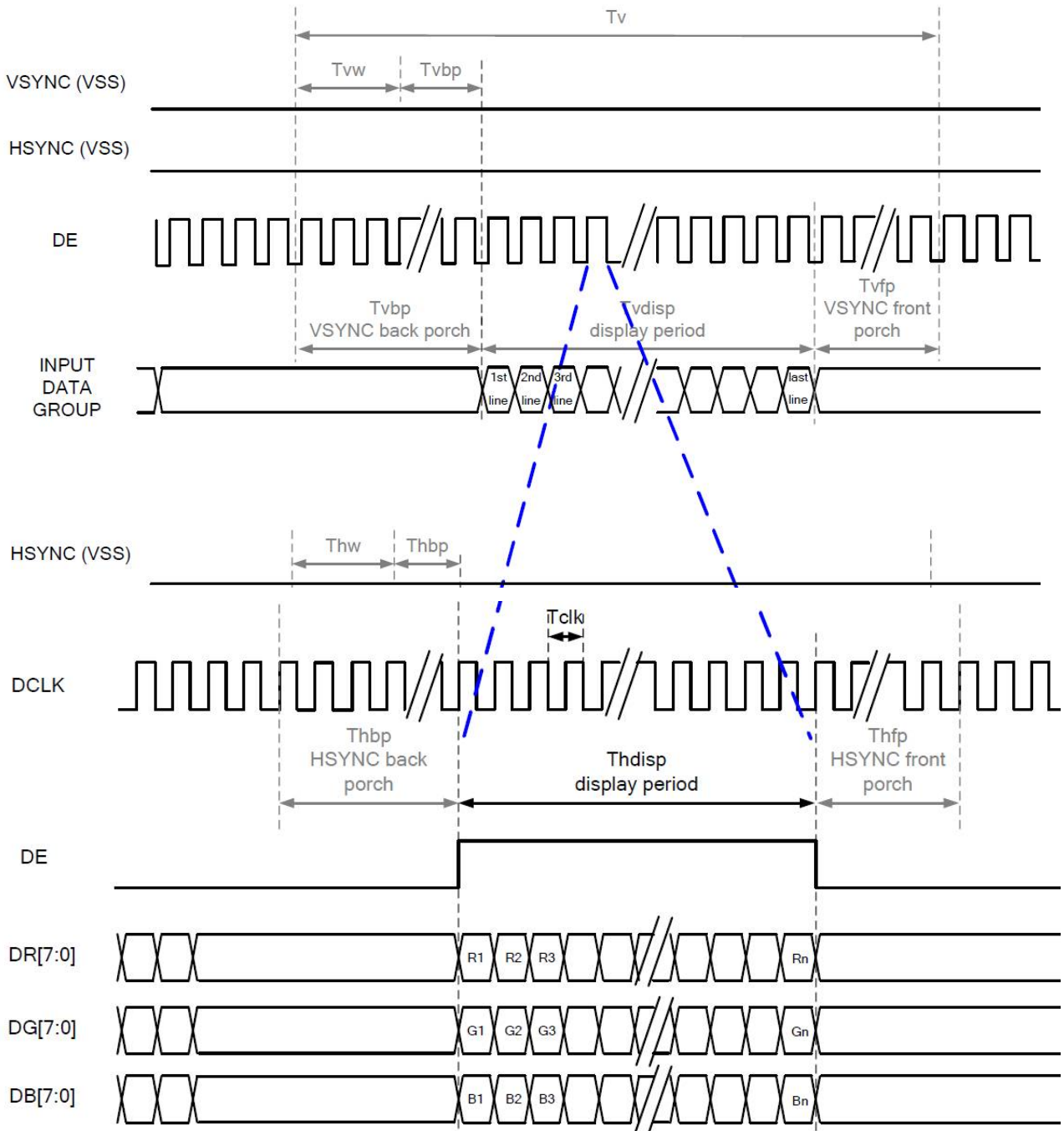
**SYNC - DE MODE**  
(VDPOL=1,HDPOL=1)





**DE MOD**

(VDPOL=1,HDPOL=1)



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

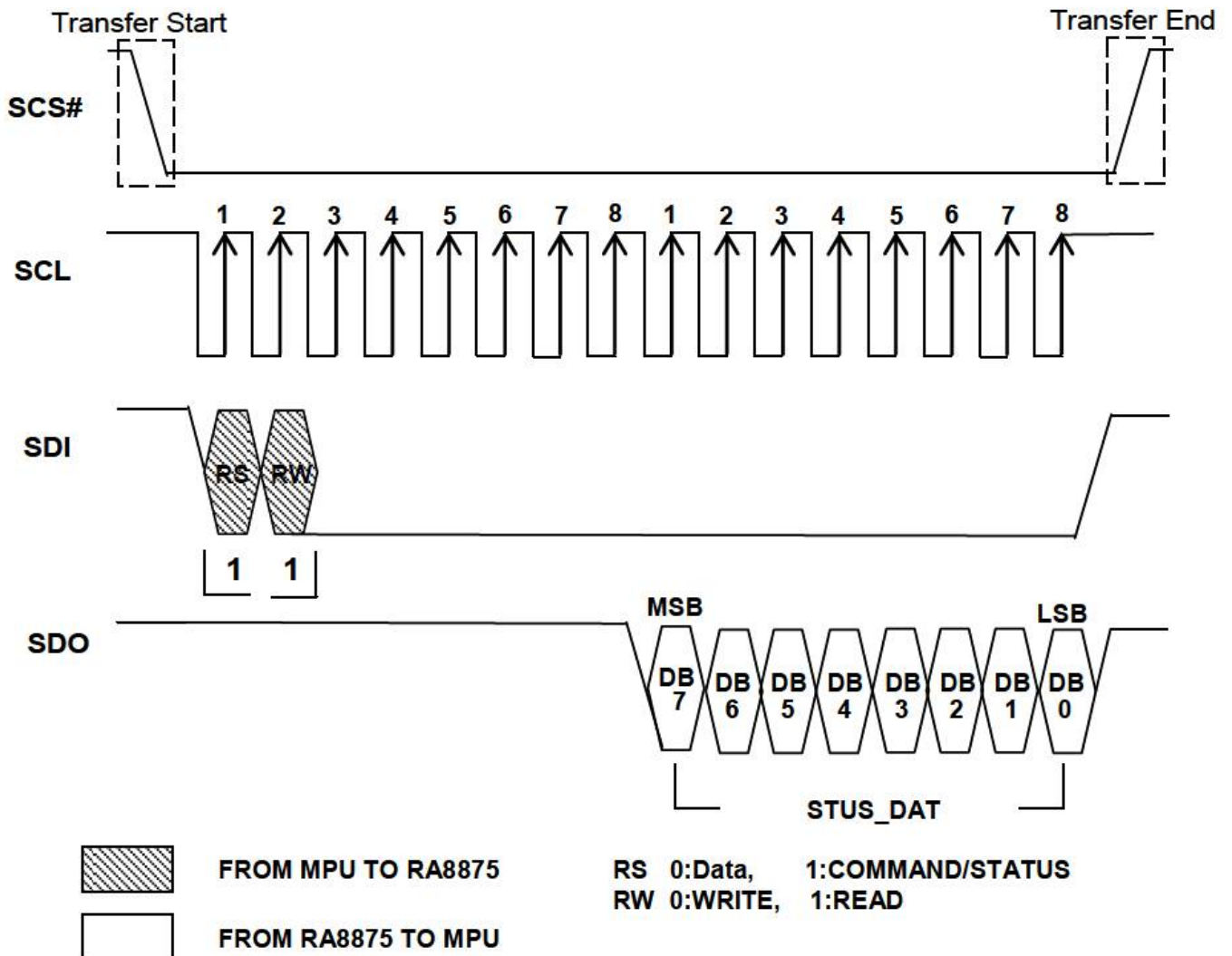
Note: "Input" means these signals are driven by host side.



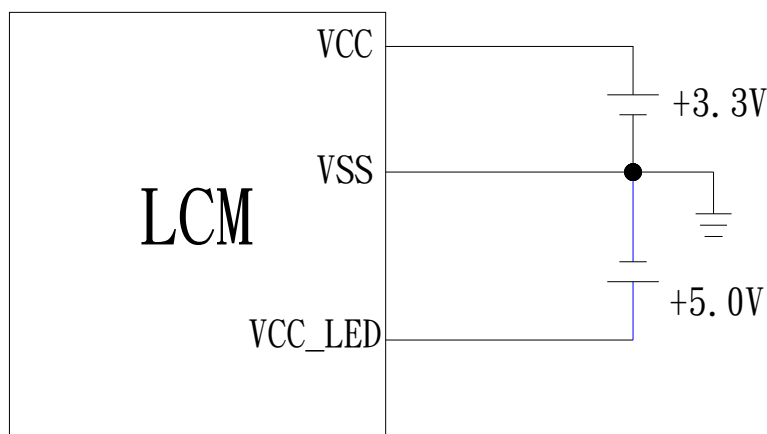


### 11.3. WRITE COMMAND to REGISTER

(In RA8875)



### 11.4. Power supply for LCM



## 12. Controller & Driver IC Control Algorithms

1. Refer to the data Sheet of LCD DRIVER IC SC7283 or equivalent
2. Refer to the data Sheet of LCD CONTROLLER IC RA8875

## 13. Reliability Test Items

No.	Test items	Conditions		Remark
1	High temperature storage	80°C , 240H		--
2	Low temperature storage	-30°C , 240H		--
3	Vibration test	Freq.:10 ~ 55~10 Hz, Amp.:1.5 mm 1H for each direction of X, Y, Z		Non-operation
4	Thermal Shock	-30°C ,30 min /80°C ,30 min , 100 cycles		Static
5	High temperature operation	70°C , 240H		--
6	Low temperature operation	-20°C , 240H		--
7	High temperature & high humidity operation	50°C , 90% RH , 240H		Operating
8	High temperature & high humidity storage	60°C , 90% RH , 240H		--
9	Electrostatic discharge	Terminals	150pF, 0Ω, ±300V, Contact	Non-operation
		Panel	150pF, 330Ω, ±8KV, Air	
<p><b>Criterion:</b> There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.</p>				



## **14. General Precautions**

Please pay attentions to the followings as using the LCD module.

### **14.1 Handling**

- (a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.
- (b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.
- (c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.
- (d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.
- (e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the polarizer permanently. The recommended solvents are water and Isopropyl alcohol.
- (f) Wipe off water droplets or oil immediately.
- (g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.
- (h) Do not touch the output pins directly with bare hands.
- (i) Do not disassemble the LCD module.

### **14.2 Storage**

- (a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.
- (b) Do not expose the LCD modules to sunlight directly.
- (c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.
- (d) Avoid condensation of water. It may cause improper operation.
- (e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.



### ***14.3 Operation***

- (a) When mounting or dismounting the LCD modules, turn the power off.
- (b) Protect the LCD modules from electric shock.
- (c) The Driver IC control algorithms should always be obeyed to avoid damaging the LSI and electronic circuit.
- (d) Be careful to avoid mixing up the polarity of power supply for backlight.
- (e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.
- (f) When a static image is displayed for a long time, remnant image is likely to occur.
- (g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

### ***14.4 Others***

- (a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.
- (b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.
- (c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized.



## 15. Quality and reliability

### 15.1 Test condition

Test should be conducted under the following conditions:

- (a) Ambient temperature:  $25 \pm 5^{\circ}\text{C}$
- (b) Humidity:  $55 \pm 10\% \text{ RH}$

### 15.2 Sampling plan

Sampling method shall be in accordance with MIL-STD-105D, inspection level II, normal inspection, and single sampling plan tables for normal tightened and reduced inspection.

### 15.3 Acceptable quality level

A major defect is a defect that could result in failure or materially reduce that the usability of the unit of product for its intended purpose.

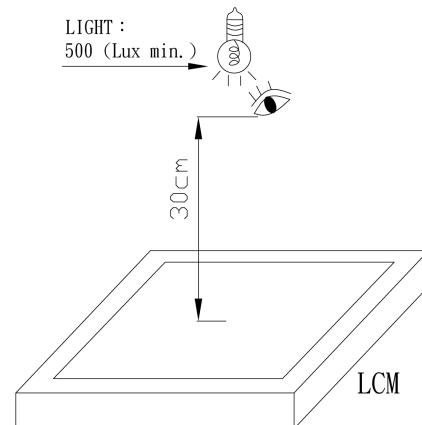
A minor defect is one that does not materially reduce the usability of the unit of product for its intended purpose or is a departure from established standards having no significant bearing on the effective use or operation of the unit.

### 15.4 Appearance

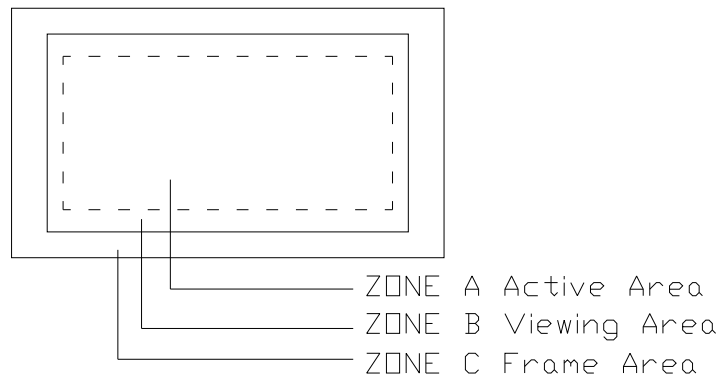
Appearance test is to be conducted by human eyes at approximately 30cm distance from LCD module under the single fluorescent light without reflection.

Condition:

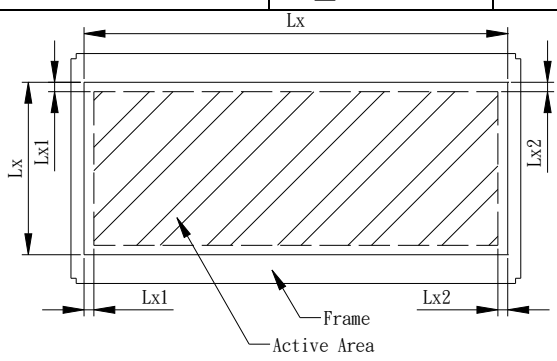
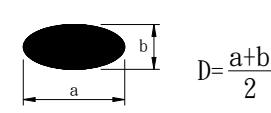
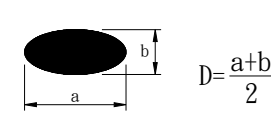
- (a) Illumination: 500 Lux min
- (b) Inspect determination: 30cm
- (c) Inspect direction: above the LCM
- (d) View angle:  $\pm 45^{\circ}$



The inspection area of LCD panel shall be within the range of following limits.



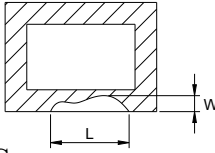
**15.5 Inspection quality criteria for TFT LCM**

ITEM	DESCRIPTION OF DEFECTS	Class of defects	Acceptable level (%)	
DIMENSION	Refer to individual acceptance specification	Major	2.5	
SLANT	Viewing Area	$ Lx1-Lx2 $	Judgment	
	$Lx \leq 100mm$	$\leq 0.2mm$	ACC	
	$100mm < Lx \leq 150mm$	$\leq 0.3mm$	ACC	
	$150mm < Lx \leq 200mm$	$\leq 0.4mm$	ACC	
	$200mm < Lx$	$\leq 0.5mm$	ACC	
			Minor	2.5
LINE DEFECT ON SURFACE (SCRATCHES, BLACK/WHITE LINE)	(a) $L \leq 5mm$ & $W \leq 0.015mm$ , disregard (b) $L \leq 2mm$ & $0.015mm < W \leq 0.025mm$ , $N \leq 2$ (c) $L \leq 1mm$ & $0.025mm \leq W \leq 0.05mm$ , $N \leq 1$ (d) $L > 2mm$ or $W > 0.05mm$ , REJ (e) Distance between 2 lines $\geq 15mm$	Minor	2.5	
SPOT DEFECT ON SURFACE (BLACK/WHITE SPOT)	Average diameter, D (a) $D \leq 0.15mm$ , disregard (b) $0.15mm < D \leq 0.3mm$ , $N \leq 2$ .ACC (c) $D > 0.3mm$ , REJ (d) Distance between 2 spots $\geq 15mm$		Minor	2.5
PROTRUDE DOT/ DENT ON SURFACE	Average diameter D (a) $D \leq 0.2mm$ , disregard (b) $0.2mm < D \leq 0.3mm$ , $N \leq 2$ .ACC (c) $0.3mm < D \leq 0.5mm$ , $N \leq 1$ .ACC (d) $D > 0.5mm$ , REJ (e) Distance between 2 protrude dot/ dent $\geq 15mm$		Minor	2.5
RIFT	Not allowed.	Major	0.65	
LIFTED ON POLIZER EDGESIDE	Average diameter D (a) $D > 0.5mm$ , REJ (b) $L > 5mm$ , $W > 0.5mm$ , REJ	Minor	2.5	

NOTE(1): ACC : Accept

NOTE(2): REJ : Reject



ITEM	DESCRIPTION OF DEFECTS	Class of defects	Acceptable level (%)																					
DAMAGE	<p>(a) Lead side of TFT LCM FPC lead electrical line can't be damage, except dummy electrical line and alignment mark.</p>  <p>(b) Non-lead side of TFT LCM Damage area <math>L \leq 2.5\text{mm}</math>, <math>W \leq 0.7\text{mm}</math>, ACC</p>	Major	0.65																					
BRIGHT/ DARK POINT	<table border="1"> <thead> <tr> <th colspan="2">Item</th> <th>Allow number in Area A</th> </tr> </thead> <tbody> <tr> <td rowspan="4">(a) Bright point</td> <td>Single point</td> <td>1</td> </tr> <tr> <td>Two adjacent point</td> <td>0</td> </tr> <tr> <td>Three adjacent point</td> <td>0</td> </tr> <tr> <td>Total point</td> <td>1</td> </tr> <tr> <td rowspan="4">(b) Dark point</td> <td>Single point</td> <td>3</td> </tr> <tr> <td>Two adjacent point</td> <td>0</td> </tr> <tr> <td>Three adjacent point</td> <td>0</td> </tr> <tr> <td>Total point</td> <td>3</td> </tr> </tbody> </table> <p>※ Point : A sub pixel 1R or 1G or 1B            ※ The distance of bright or dark point &gt; 5mm</p>	Item		Allow number in Area A	(a) Bright point	Single point	1	Two adjacent point	0	Three adjacent point	0	Total point	1	(b) Dark point	Single point	3	Two adjacent point	0	Three adjacent point	0	Total point	3	Minor	2.5
Item		Allow number in Area A																						
(a) Bright point	Single point	1																						
	Two adjacent point	0																						
	Three adjacent point	0																						
	Total point	1																						
(b) Dark point	Single point	3																						
	Two adjacent point	0																						
	Three adjacent point	0																						
	Total point	3																						
CHROMA MURA	Not allowed if it can be observed through ND Filter 6%. Refer to individual acceptance limited sample	Minor	2.5																					
COLOR NOT ACCORD	Not allowed if it can be observed through ND Filter 6%. Refer to individual acceptance limited sample	Minor	2.5																					
FOREIGN MATERIAL (SPOT SHAPE)	<p>Average diameter, D</p> <p>(a) <math>D \leq 0.15\text{mm}</math>, disregard            (b) <math>0.15\text{mm} &lt; D \leq 0.3\text{mm}</math>, <math>N \leq 2</math>.ACC            (c) <math>D &gt; 0.3\text{mm}</math>, REJ            (d) Distance between 2 spots <math>\geq 15\text{mm}</math></p>	Minor	2.5																					
FOREIGN MATERIAL (LINE/ SPIRAL SHAPE)	<p>(a) <math>L \leq 5\text{mm}</math> &amp; <math>W \leq 0.015\text{mm}</math>, disregard            (b) <math>L \leq 2\text{mm}</math> &amp; <math>0.015\text{mm} &lt; W \leq 0.025\text{mm}</math>, <math>N \leq 2</math>            (c) <math>L \leq 1\text{mm}</math> &amp; <math>0.025\text{mm} &lt; W \leq 0.05\text{mm}</math>, <math>N \leq 1</math>            (d) <math>L &gt; 2\text{mm}</math> or <math>W &gt; 0.05\text{mm}</math>, REJ            (e) Distance between 2 lines <math>\geq 15\text{mm}</math></p>	Minor	2.5																					
DISPLAY ABNORMAL	<p>(a) Non display            (b) Line defect            (c) Response time, contrast ratio, brightness or viewing angle abnormal            (d) Water ripple            (e) Flicker</p>	Major	0.65																					

NOTE(1): ACC : Accept

NOTE(2): REJ : Reject



## 16. Initialization by instructions(for reference)



```

void ra8875_480272_init()
{
//RA8875_PLL_ini
  ins(0x88);dat(0x08);delay(200);    //6=8.75M 7=10M 8=11.75M
  ins(0x89);dat(0x02);delay(200);
  ins(0x10);dat(0x0c);    // 16-BPP , 8-bit MCU
  ins(0x04);dat(0x82);    // set PCLK invers 20M/4 = 5M
  delay(200);
//Horizontal set
  ins(0x14);dat(0x3B);
  ins(0x15);dat(0x00);    // Horiznotal Non-Display Period Fine Tuning
  ins(0x16);dat(0x00);    // Horizontal Non-
  ins(0x17);dat(0x00);
  ins(0x18);dat(0x00);    // HSYNC Pulse Width      HPW = 8
//Vertical set
  ins(0x19);dat(0x0f);
  ins(0x1a);dat(0x01);    // Vertical Display Height 1
  ins(0x1b);dat(0x03);    // Vertical Non-Display Period 0    VND =4
  ins(0x1c);dat(0x00);    // Vertical Non-
  ins(0x1d);dat(0x0B);
  ins(0x1e);dat(0x00);    // VSYNC Start Position 1
  ins(0x1f);dat(0x03);    // VSYNC Pulse Width  VPW =4

//Active window set
//setting active window X
  ins(0x30);dat(0x00);    // Horizontal Start Point 0
  ins(0x31);dat(0x00);    // Horizontal Start Point 1
  ins(0x34);dat(0xDF);    // Horizontal End Point 0
  ins(0x35);dat(0x01);    // Horizontal End Point 1
//setting active window Y
  ins(0x32);dat(0x00);    // Vertical Start Point 0
  ins(0x33);dat(0x00);    // Vertical Start Point 1
  ins(0x36);dat(0x0F);    // Vertical End Point 0
  ins(0x37);dat(0x01);    // Vertical End Point 1

// PWM1 control
  ins(0x8A);dat(0x80);    // PWM Control 89
  ins(0x8B);dat(0xff);    //

// PWM2 control
  ins(0x8C);dat(0x80);    // PWM Control 89
  ins(0x8D);dat(0xff);    //

  ins(0x20);dat(0x00);    // Dispaly Control
  ins(0x01);dat(0x80);    // display on

// Set Serial Flash configuration
  ins(0x05);dat(0x8C);
  ins(0x06);dat(0x03);
}

```

