

**4.3" WQVGA**  
**High brightness color TFT-LCD module**

**Model: VM04B1 VB**

**Date: May. 09<sup>th</sup>, 2022**

**Note: This specification is subject to change  
without notice**

**Customer :** \_\_\_\_\_

**Date :** \_\_\_\_\_

**Approved**

**Prepared**

**Date:**

**Date:**

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## RECORD OF REVISION

Version and Date	Page	Old description	New description	Remark
0.1 2022/05/09	All	First Edition for customer		

## 1. Handling Precautions

- 1) Since front polarizer is easily damaged, pay attention not to scratch it.
- 2) Be sure to turn off power supply when inserting or disconnecting from input connector.
- 3) Wipe off water drop immediately. Long contact with water may cause discoloration or spots.
- 4) When the panel surface is soiled, wipe it with absorbent cotton or other soft cloth.
- 5) Since the panel is made of glass, it may break or crack if dropped or bumped on hard surface.
- 6) Since CMOS LSI is used in this module, take care of static electricity and insure human earth when handling.
- 7) Do not open or modify the Module Assembly.
- 8) Do not press the reflector sheet at the back of the module to any directions.
- 9) At the insertion or removal of the Signal Interface Connector, be sure not to rotate nor tilt the Interface Connector of the TFT Module.
- 10) After installation of the TFT Module into an enclosure, do not twist nor bend the TFT Module even momentary. At designing the enclosure, it should be taken into consideration that no bending/twisting forces are applied to the TFT Module from outside. Otherwise the TFT Module may be damaged.

## 2. General Description

### 2.1 Overview

This specification applies to the Color Active Matrix Liquid Crystal Display composed of a TFT-LCD display a LED backlight system. The screen format is intended to support WQVGA (480(H) x 272(V)) screen and 16.7M colors.

### 2.2 Features

- High brightness display, 900nits by LED backlight.
- Long operation lifetime BLU design
- RoHS Compliance

### 2.3 Application

Industrial applications.

### 2.4 Display specifications

Items	Unit	Specification
Screen Diagonal	mm	4.3
Active Area	mm	95.04 (H) X 53.86 (V)
Pixels H x V	pixels	480 x3(RGB) x 272
Pixels Pitch	um	198 (per one triad) x 198
Pixel Arrangement		RGB Vertical stripe
Display mode		Normally Black
White luminance (center)	Cd/m <sup>2</sup>	900 (Typ)
Contrast ratio		800:1 (Typ.)
Optical Response Time	msec	30 ms (Typ. On/off)
Normal Input Voltage VDD	Volt	3.3
Power Consumption (Vcc Line + LED backlight)	Watt	TBD (VDD line=TBD; LED lines= 0.792 W)
Weight	Grams	TBD
Physical size	mm	105.5 (W)×67.2 (H)×2.9 (D)
Electrical Interface		RGB 24bits
Support colors		16.7M colors
Surface Treatment		Anti-glare and hard-coating 3H
Temperature range		
Operating	°C	-30 ~ 85 (TFT Surface)
Storage	°C	-30 ~ 85
RoHS Compliance		RoHS Compliance

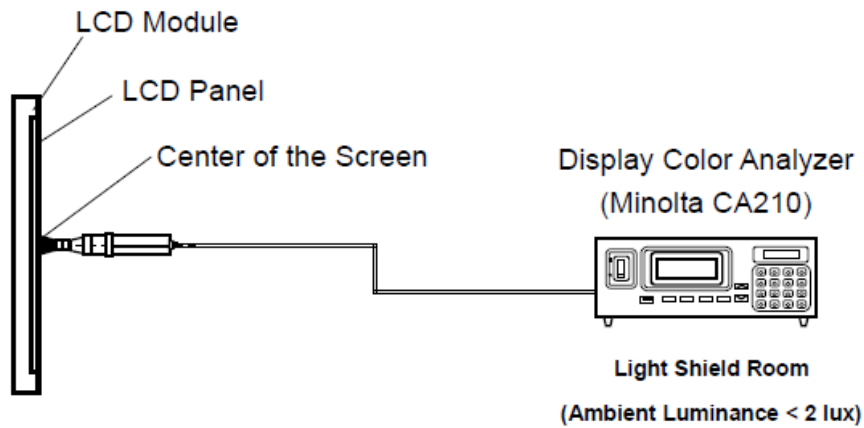
### 2.5 Optical characteristics

The following optical characteristics are measured under stable condition at 25 °C

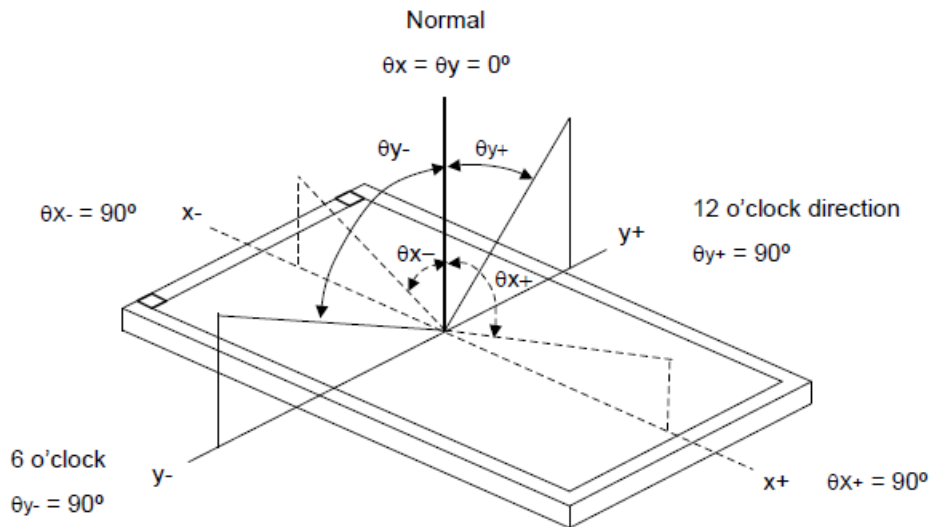
Items	Unit	Conditions	Min.	Typ.	Max.	Note
Viewing angle	Deg.	Horizontal (Right)	70	80		2
		CR=10 (Left)	70	80		
		Vertical (Up)	70	80		
		CR=10 (Down)	70	80		
Contrast Ratio		Normal Direction	640	800		3
Response Time	msec	Raising + Falling		30	40	4
Color / Chromaticity Coordinates (CIE)		Red x	-0.05	0.590	+0.05	5
		Red y		0.360		
		Green x		0.387		
		Green y		0.564		
		Blue x		0.139		
		Blue y		0.099		
Color coordinates (CIE) White		White x		0.336		
		White y		0.354		
Center Luminance	Cd/m <sup>2</sup>		800	900		6
Luminance Uniformity	%		70	75		7
Crosstalk (in 60 Hz)	%				1.5	
Flicker	dB				-20	

**Note 1: Measurement method**

The LCD module should be stabilized at given temperature for 0.5 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.



**Note 2: Definition of viewing angle**

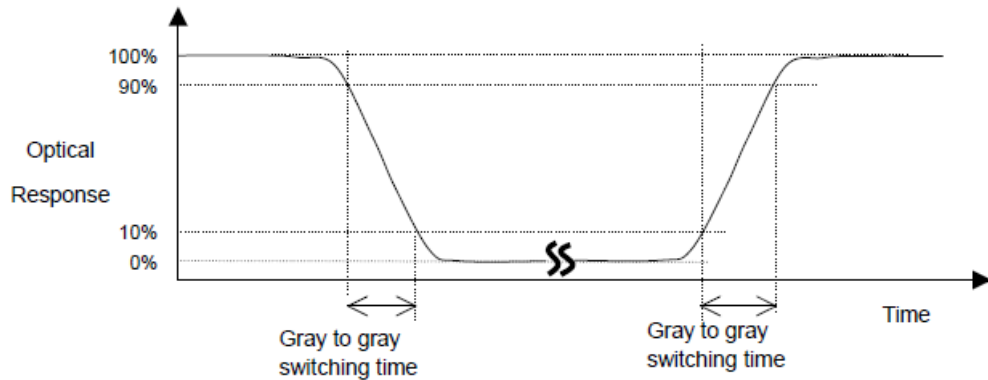


**Note 3: Contrast ratio is measured by Minolta CA210**



Note 4: Definition of Response time

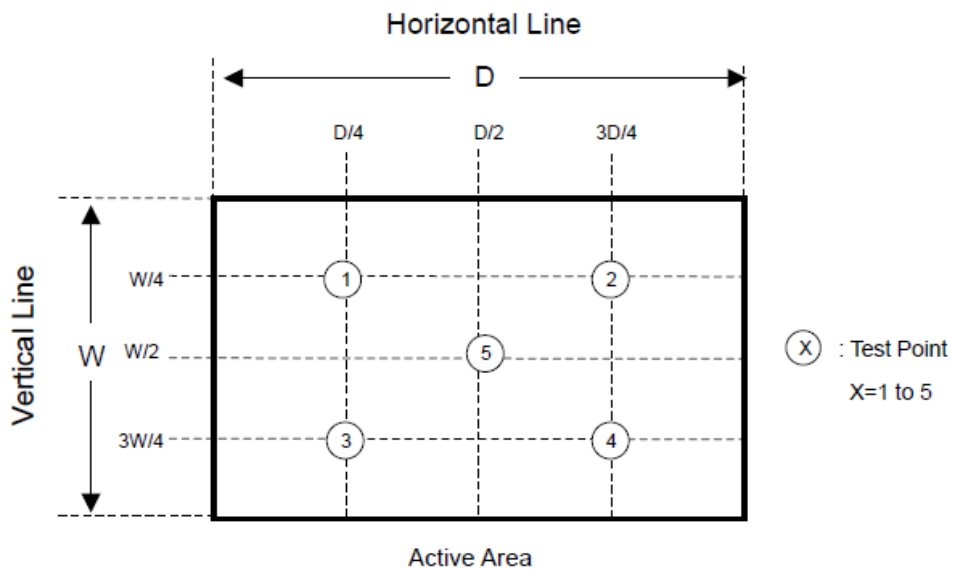
The output signals of photo detector are measured when the input signals are changed from “Full Black” to “Full White” (rising time), and from “Full White” to “Full Black” (falling time), respectively. The response time is interval between the 10% and 90% of amplitudes. Please refer to the figure as below.



Note 5: Color chromaticity and coordinates (CIE) is measured by Minolta CA210

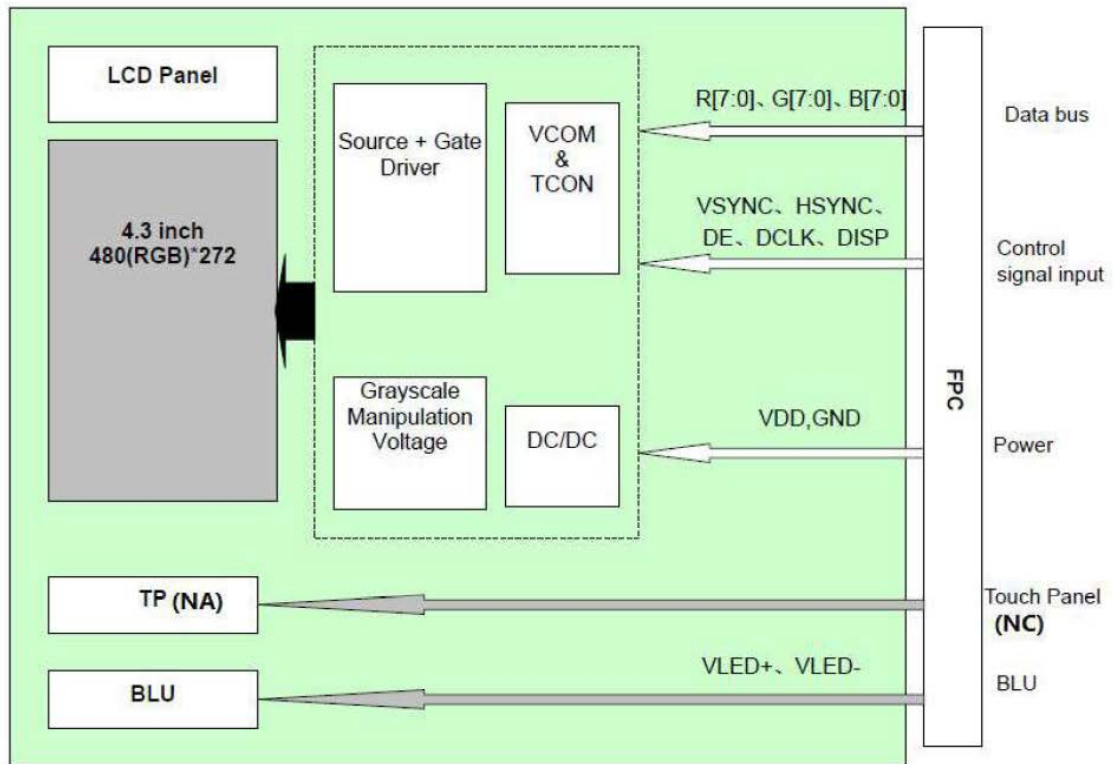
Note 6: Center luminance is measured by Minolta CA210

Note 7: Luminance uniformity of these 5 points is defined as below and measured by Minolta CA210



$$\text{Uniformity} = (\text{Min. Luminance of 5 points}) / (\text{Max. Luminance of 5 points})$$

**3. Function block diagram**



### 4. Absolute Maximum Ratings

Absolute maximum ratings of the module are as following:

#### 4.1 TFT LCD module

Items	Symbol	Min	Max	Unit	Conditions
Power supply voltage	V <sub>DD</sub>	-0.3	4.0	Volt	Note 1, 2

#### 4.2 Backlight unit

Items	Symbol	Min	Max	Unit	Conditions
LED bar input current			40	mA	

#### 4.3 Environment

Items	Symbol	Values			Unit	Conditions
		Min.	Typ.	Max.		
Operation temperature	T <sub>OS</sub>	-30	-	85	°C	Note 3
Operation Humidity	H <sub>OP</sub>	20		85	%	
Storage temperature	T <sub>ST</sub>	-30		85	°C	
Storage Humidity	H <sub>ST</sub>	20		85	%	

Note 1: With in Ta= 25°C

Note 2: Permanent damage to the device may occur if exceed maximum values

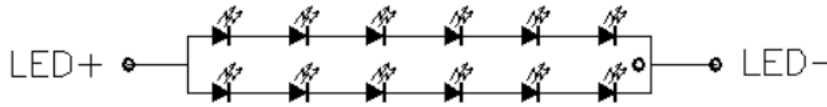
Note 3: For quality performance, please refer to IIS (Incoming Inspection Standard).

**5. Electrical characteristics**

## 5.1 LCD electronics specification

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply	VDD	3.0	3.3	3.6	V	-
Power Supply Current	IVDD	TBD	TBD	TBD	ma	-
Input High Voltage	VIH	0.7VDD	-	VDD	V	-
Input Low Voltage	VIL	GND	-	0.3VDD	V	-
Output High Voltage	VOH	VDD-0.4	-	VDD	V	-
Output Low Voltage	VOL	GND	-	GND+0.4	V	-
I/O Lear Current	ILI	-1	-	1	uA	-

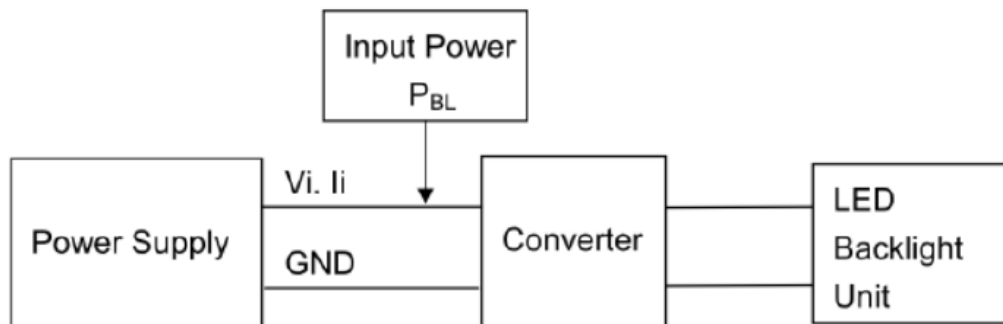
### 5.2 Backlight unit



Parameter	Min	Typ	Max	Unit	Note
LED voltage (VL)		19.8		[V]	2
LED current (IL)		40		[mA]	2
LED power (PL)		0.792		[W]	
LED lite time (MTBF)		20,000		[Hour]	1

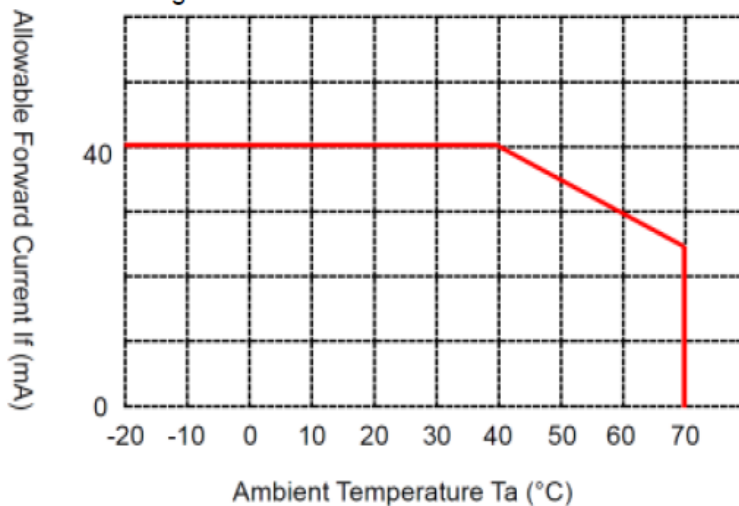
Note 1: The "LED lift time" is defined as the module brightness decrease to 50% original brightness that the ambient temperature is 25°C and typical LED Current at 40 mA

Note 2: The variance of L ED Light Bar power consumption is ±10%. Calculator value for reference ( $I_L \times V_L = P_{LED}$ )



Note 3: The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$  and  $I_f=40\text{mA}$ . The LED lifetime could be decreased if operating  $I_f$  is larger than 40mA.

Note 4: LED light bar circuit:



### 5.3 Interface connector

#### 5.3.1 TFT connector(CN1)

Matched connector:FH19SC-40S-0.5SH(HIROS)

Pin No.	Symbol	I/O	Function	Remark
1	VLED-	P	Back light cathode	
2	VLED+	P	Back light anode	
3	GND	P	Ground	
4	VDD	P	Power supply, VDD=VCI;	
5	R0	I	Red Data input	
6	R1	I	Red Data input	
7	R2	I	Red Data input	
8	R3	I	Red Data input	
9	R4	I	Red Data input	
10	R5	I	Red Data input	
11	R6	I	Red Data input	
12	R7	I	Red Data input	
13	G0	I	Green Data input	
14	G1	I	Green Data input	
15	G2	I	Green Data input	
16	G3	I	Green Data input	
17	G4	I	Green Data input	
18	G5	I	Green Data input	
19	G6	I	Green Data input	
20	G7	I	Green Data input	
21	B0	I	Blue Data input	
22	B1	I	Blue Data input	
23	B2	I	Blue Data input	
24	B3	I	Blue Data input	
25	B4	I	Blue Data input	
26	B5	I	Blue Data input	
27	B6	I	Blue Data input	
28	B7	I	Blue Data input	
29	GND	P	Ground	
30	DCLK	I	Clock signal; latching data at the falling edge	Note 1
31	DISP	I	Display control/standby mode selection, Internal pull low DISP=" Low" : Standby;	

			DISP=" High" : Normal display	
32	HSYNC	I	Horizontal sync signal; (HDPOL=1)	Note 1
33	VSYNC	I	Vertical sync signal; (HDPOL=1)	Note 1
34	DE	I	Data input enable. Active High to enable the data input When not used in SYNC mode, user should connect it to "Low" .	
35	NC(EXTC)	—	No connection. OTP trim function control. Please keep this pin in floating.	
36	GND	P	Ground	
37	NC(CS)	—	No connection. Serial communication chip select, Please keep this pin in floating.	
38	NC(SCL)	—	No connection. Serial communication clock input, Please keep this pin in floating.	
39	NC(SDA)	—	No connection. Serial communication data input and output, Please keep this pin in floating.	
40	NC(VPP)	—	No connection. For OTP, Please keep this pin in floating.	

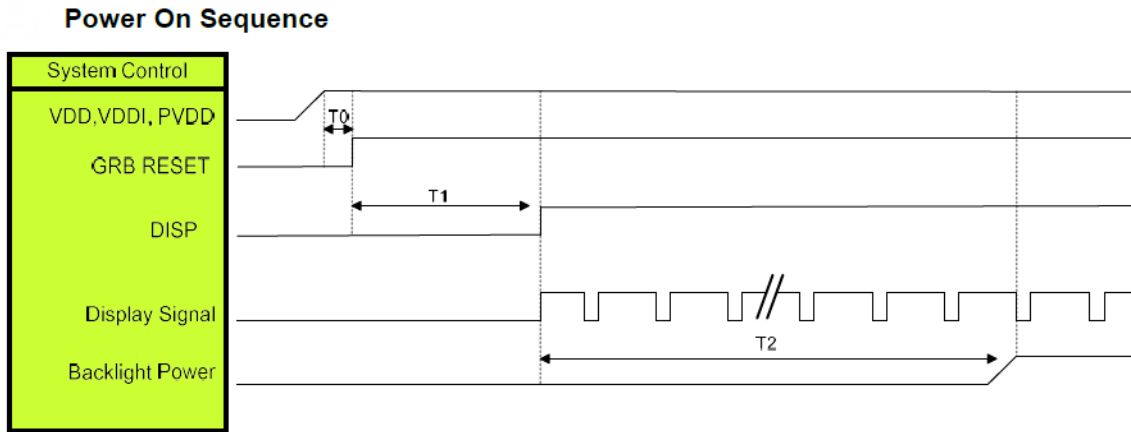
Note 1:A combination of hardware and software is required to determine the state of the clock polarity of these pins.

Note 2: Please add the FPC connector type and matched one if necessary.

Note 3:I—Input, O—Output, P—Power/Ground

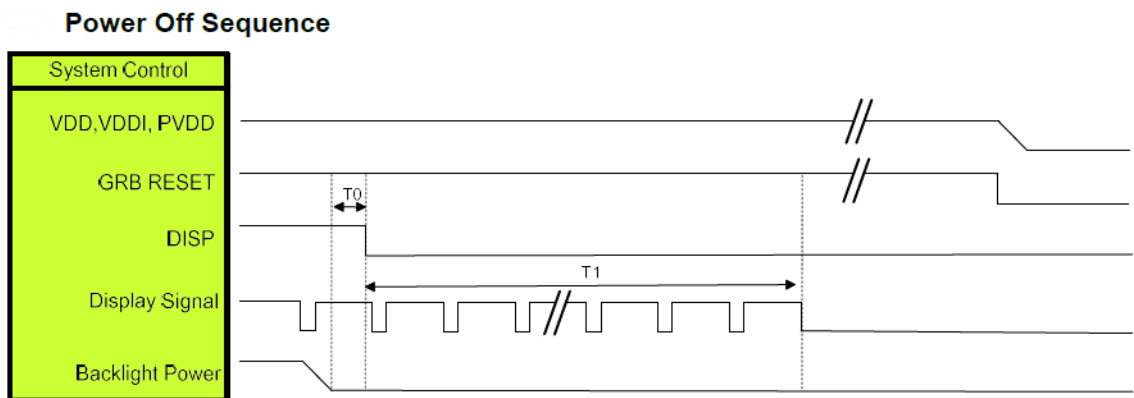
### 6. Timing chart

#### 6.1 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

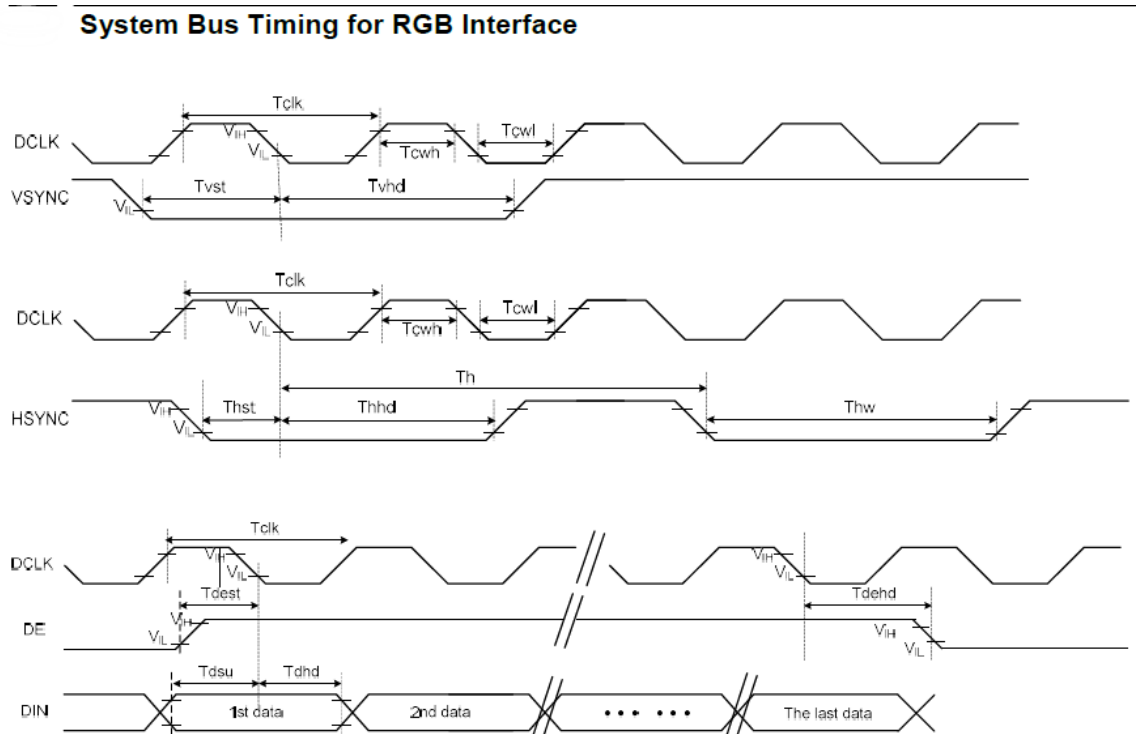
#### 6.2 Power OFF sequence



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

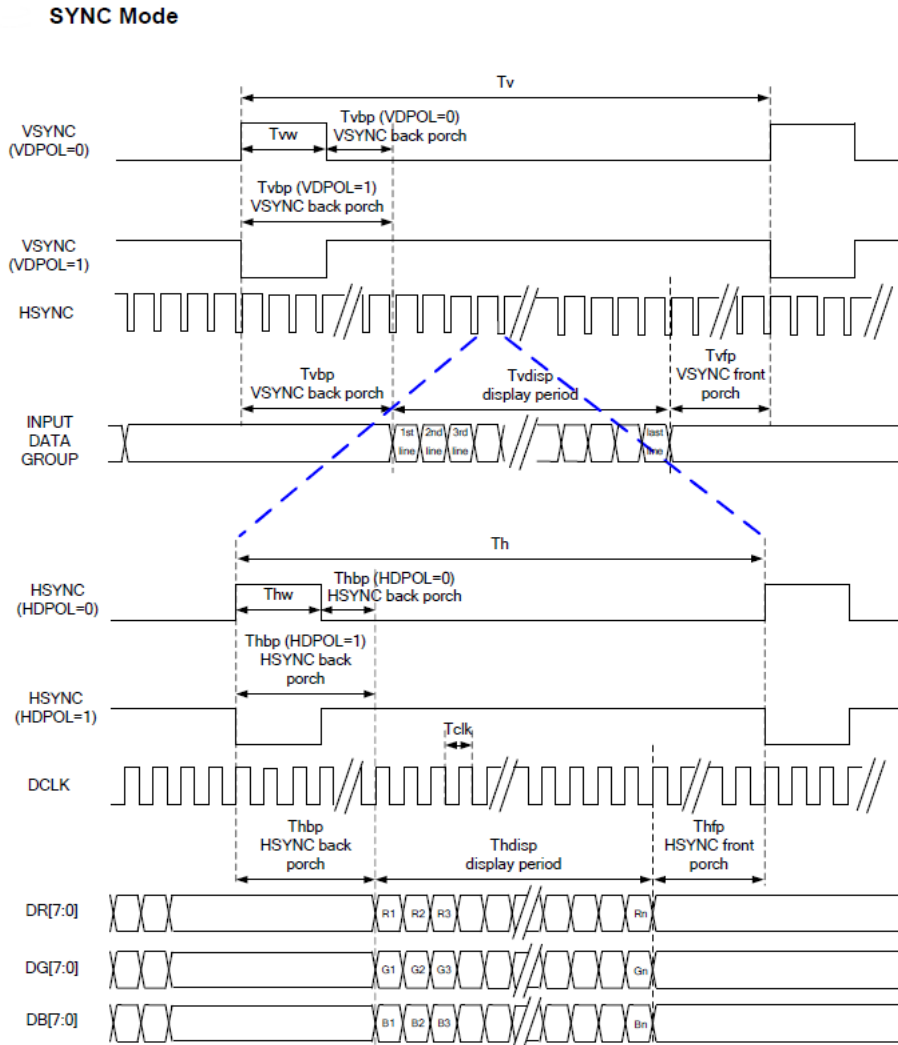


6.3 Clock and data input timing diagram

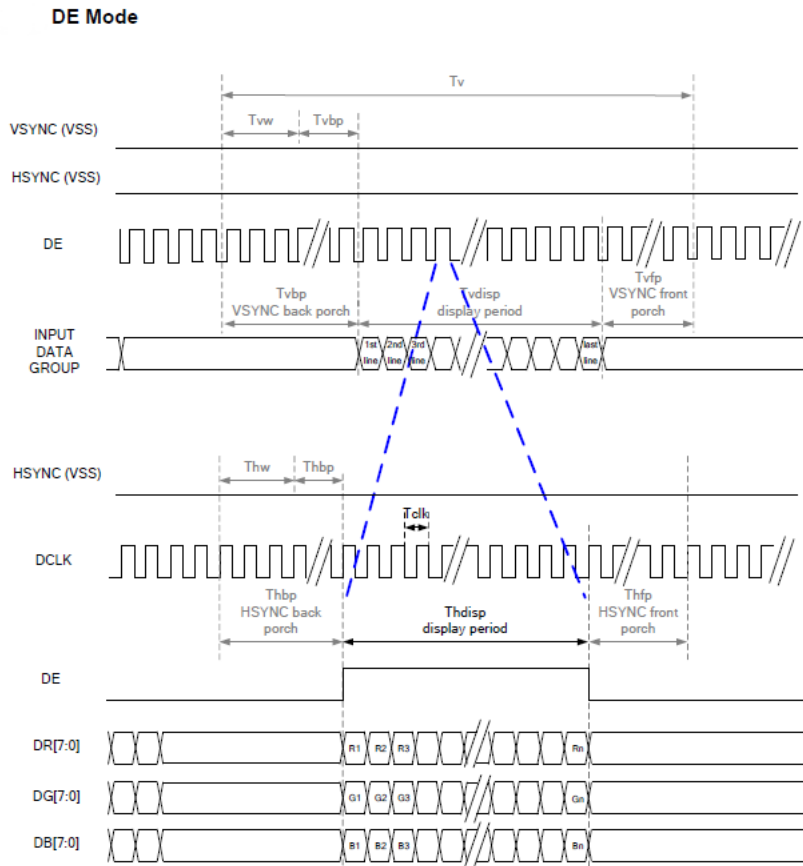


Item	Symbol	Min.	Typ.	Max.	Unit	Conditions
CLK Pulse Duty	$T_{cw}$	40	50	60	%	
HSYNC Width	$T_{hw}$	2	-	-	DCLK	
HSYNC Period	$T_h$	55	60	65	us	
VSYNC Setup Time	$T_{vst}$	12	-	-	ns	
VSYNC Hold Time	$T_{vhd}$	12	-	-	ns	
HSYNC Setup Time	$T_{hst}$	12	-	-	ns	
HSYNC Hold Time	$T_{hhd}$	12	-	-	ns	
Data Setup Time	$T_{dsu}$	12	-	-	ns	
Data Hold Time	$T_{dhd}$	12	-	-	ns	
DE Setup Time	$T_{dest}$	12	-	-	ns	
DE Hold Time	$T_{dehd}$	12	-	-	ns	

6.4 SYNC mode timing diagram



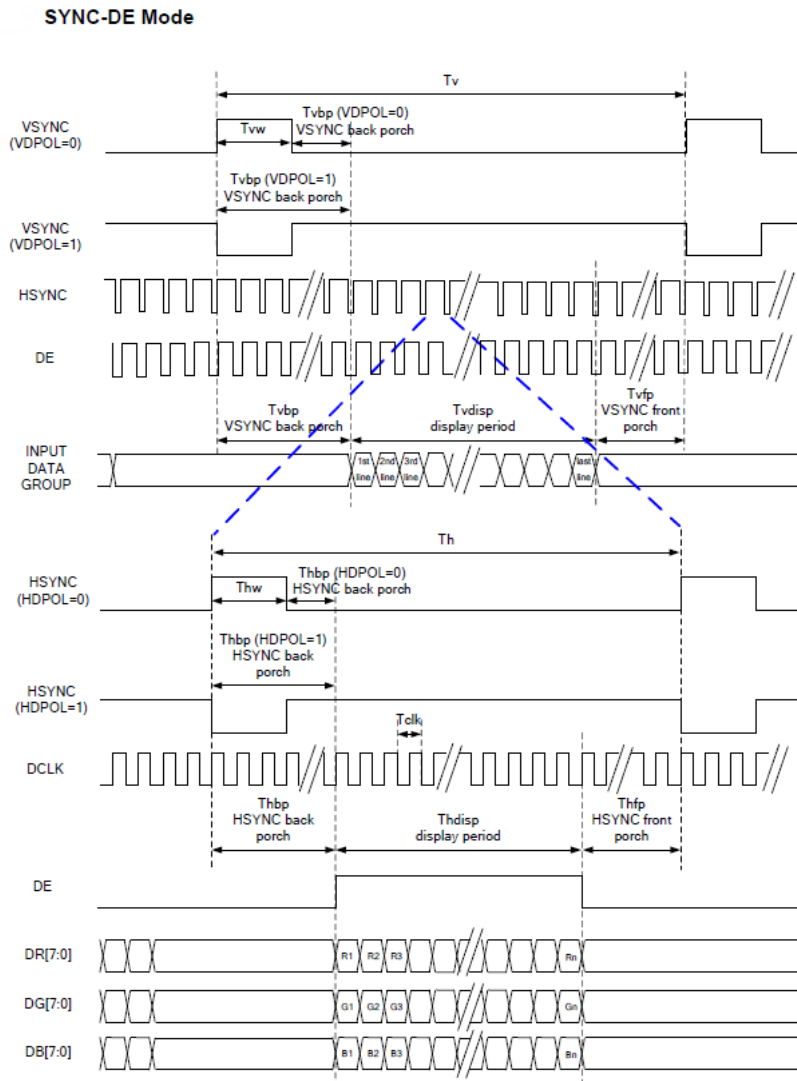
### 6.5 DE mode timing diagram



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.

6.6 SYNC-DE mode timing diagram



### 6.7 Parallel 24-bit RGB input table

**Parallel 24 bit 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.

**Serial 8 bit RGB Input Timing Table**

Serial 8-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	24	27	30	MHz		
DCLK Period	Tclk	33	37	42	ns		
HSYNC	Period Time	Th	1445	1491	1558	DCLK	
	Display Period	Thdisp		1440		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.

### 7. Reliability Test

Environment test conditions are listed as following table.

Items	Required Condition	Note
Temperature Humidity Bias (THB)	Ta=50°C, 85%RH, 96hours	
High Temperature Operation (HTO)	Ta= 85°C, 96hours	
Low Temperature Operation (LTO)	Ta= -30°C, 96hours	
High Temperature Storage (HTS)	Ta= 85°C, 96hours	
Low Temperature Storage (LTS)	Ta= -30°C, 96hours	
Thermal Shock Test (TST) (Storage)	<p style="text-align: center;"> <math>-20^{\circ}\text{C} \xleftrightarrow{(30\text{min})} 25^{\circ}\text{C} \xleftrightarrow{(5\text{min})} 70^{\circ}\text{C} \xleftrightarrow{(30\text{min})}</math>                      1cycle                      Total 10cycle                 </p>	
ESD (Electrostatic Discharge)	Voltage: $\pm 8\text{KV}$ , R:330 $\Omega$ , C:150PF, Air Mode, 10times	
Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5mm X, Y, Z direction for total 3hours (Packing condition test will be tested by a carton)	
Dropping Test	Drop to the ground from 1M height one time every side of carton. (Packing condition test will be tested by a carton)	

Note 1: Inspection after 2~4hours storage at room temperature, the samples should be free from defects:

- 1, Air bubble in the LCD.
- 2, Seal leak.
- 3, Non-display.
- 4, Missing segments.
- 5, Glass crack.
- 6, Current IDD is twice higher than initial value.
- 7, The surface shall be free from damage.
- 8, The electric characteristic requirements shall be satisfied.

REMARK:

- 1, The Test samples should be applied to only one test item.
- 2, Sample side for each test item is 5~10pcs.
- 3, For Damp Proof Test, Pure water(Resistance > 10M $\Omega$ ) should be used.

4, In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.

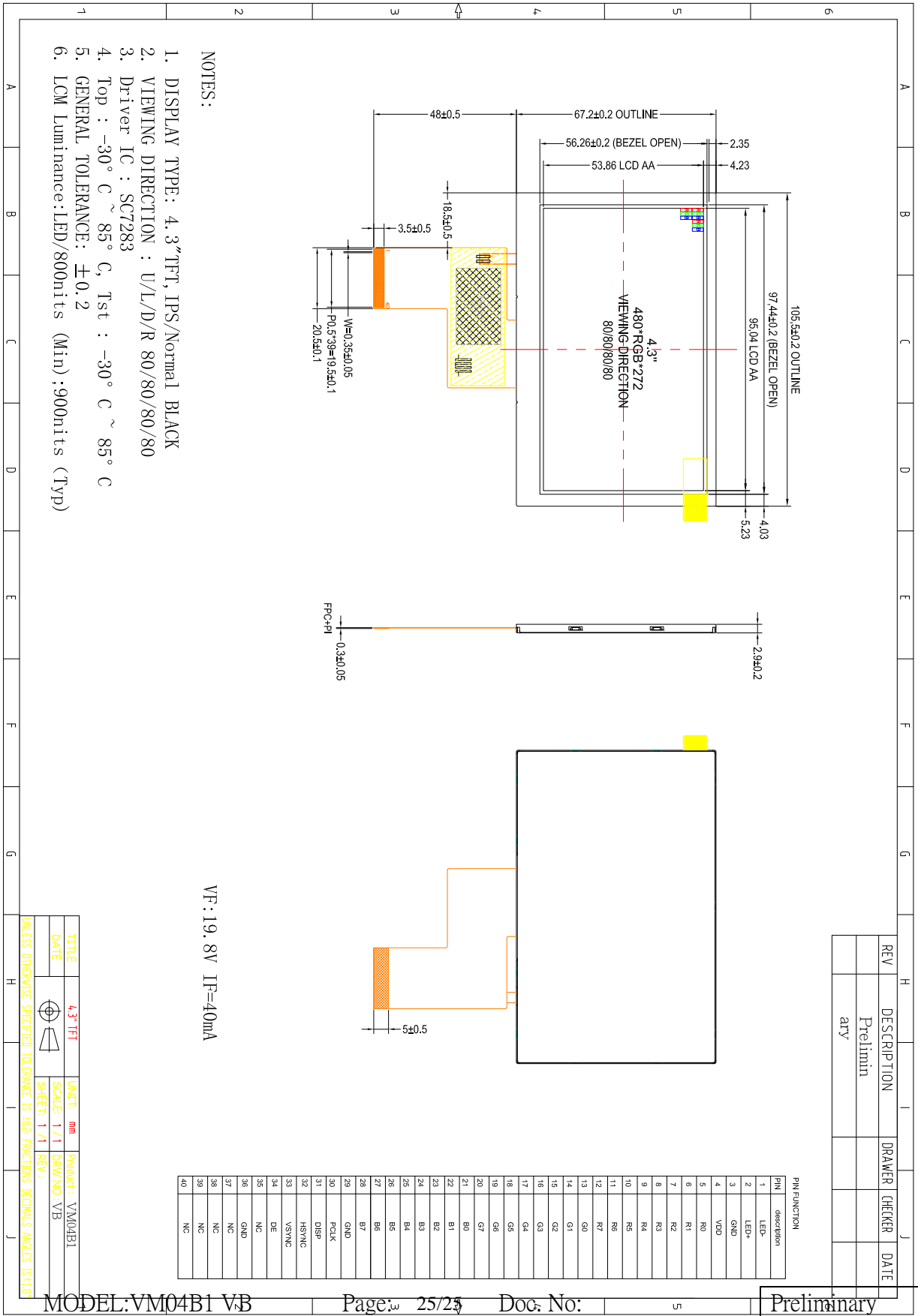
5, The evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence has.

6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

**8. Shipping package  
(TBD)**



**9. Mechanical Characteristics**



- NOTES:
1. DISPLAY TYPE: 4.3" TFT, IPS/Normal BLACK
  2. VIEWING DIRECTION : V/L/D/R 80/80/80/80
  3. Driver IC : SC7283
  4. Top : -30° C ~ 85° C, Tst : -30° C ~ 85° C
  5. GENERAL TOLERANCE: ±0.2
  6. LCM Luminance: LED/800nits (Min); 900nits (Typ)

VF: 19. 8V IF=40mA

TITLE	4.3" TFT	UNIT: mm	Product: VM04B1
DATE		SCALE: 1/1	DRW. NO.: VB
UNLESS OTHERWISE SPECIFIED TOLERANCE IS 0.2 FRACTIONS DECIMALS ANGLES IS 1/16°		SHEET: 1/1	REV: /