

TFT DISPLAY SPECIFICATION



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司



Winstar Display Co., LTD

華凌光電股份有限公司



WEB: <https://www.winstar.com.tw> E-mail: sales@winstar.com.tw

SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF18FTLAADNNO#**

APPROVED BY: (FOR CUSTOMER USE ONLY)	PCB VERSION:	DATA:
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SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2021/01/19			

TFT Display Inspection Specification: <https://www.winstar.com.tw/technology/download.html>

Precaution in use of TFT module: <https://www.winstar.com.tw/technology/download/declaration.html>



RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2017/09/28		First issue
A	2017/12/15		Modify Summary.
B	2018/11/09		Add Uniformity.
C	2021/01/19		Modify B/L information

Contents

- 1.Module Classification Information
- 2.Summary
- 3.General Specifications
- 4.Absolute Maximum Ratings
- 5.Electrical Characteristics
- 6.Data Color Coding
- 7.Optical Characteristics
- 8.Interface
- 9.Reliability
- 10.Contour Drawing
- 11.Other

1.Module Classification Information

W F 18 F T L A A D N N 0 #
 ① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩ ⑪ ⑫ ⑬

①	Brand : WINSTAR DISPLAY CORPORATION											
②	Display Type : F→TFT Type, J→Custom TFT											
③	Display Size : 1.8" TFT											
④	Model serials no.											
⑤	Backlight Type :	F→CCFL, White S→LED, High Light White					T→LED, White Z→Nichia LED, White					
⑥	LCD Polarize Type/ Temperature range/ Gray Scale Inversion Direction	A→Transmissive, N.T, IPS TFT C→Transmissive, N. T, 6:00 ; F→Transmissive, N.T,12:00 ; I→Transmissive, W. T, 6:00 K→Transflective, W.T,12:00 L→Transmissive, W.T,12:00 N→Transmissive, Super W.T, 6:00					Q→Transmissive, Super W.T, 12:00 R→Transmissive, Super W.T, O-TFT V→Transmissive, Super W.T, VA TFT W→Transmissive, Super W.T, IPS TFT X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT					
⑦	A : TFT LCD B : TFT+SCREW HOLES+CONTROL BOARD C : TFT+ SCREW HOLES +A/D BOARD D : TFT+ SCREW HOLES +A/D BOARD+CONTROL BOARD E : TFT+ SCREW HOLES +POWER BOARD					F : TFT+CONTROL BOARD G : TFT+ SCREW HOLES H : TFT+D/V BOARD I : TFT+ SCREW HOLES +D/V BOARD J : TFT+POWER BD						
⑧	Resolution:											
	A	128160	B	320234	C	320240	D	480234	E	480272	F	640480
	G	800480	H	1024600	I	320480	J	240320	K	800600	L	240400
	M	1024768	N	128128	P	1280800	Q	480800	R	640320	S	480128
	T	800320	U	8001280	V	176220	W	1280398	X	1024250	Y	1920720
	Z	800200	2	1024324	3	7201280	4	19201200	5	1366768	6	1280320
⑨	D: Digital L : LVDS M:MIPI											
⑩	Interface:											
	N	Without control board			A	8Bit		B	16Bit		H	HDMI
	I	I2C Interface			R	RS232		S	SPI Interface		U	USB
⑪	TS:											
	N	Without TS			T	Resistive touch panel			C	Capacitive touch panel (G-F-F)		
	G	Capacitive touch panel (G-G)					C1	Capacitive touch panel (G-F-F)+OCA				
	C2	Capacitive touch panel (G-F-F)+OCR					G1	Capacitive touch panel (G-G)+OCA				
	G2	Capacitive touch panel (G-G)+OCR					B	CTP+GG+USB				
⑫	Version: X:Raspberry pi											
⑬	Special Code	#:Fit in with ROHS directive regulations										

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2.Summary

WF18F is a color active matrix thin film transistor (TFT) liquid crystal display with polarizer.

This model is composed of amorphous silicon TFT as a switching device. It is a transmissive type display operating in the normally white mode.

This TFT LCD has a 1.77-inch diagonally measured active display area with 384 x 160 dot (128 vertical by 160 horizontal pixel) resolution. Each pixel is divided into Red, Green, Blue dots which are arranged in vertical stripes.

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3.General Specifications

Item	Dimension	Unit
Size	1.77	inch
Dot Matrix	128 x RGB x 160(TFT)	dots
Module dimension	34.0(W) x 45.83(H) x 2.65(D)	mm
Active area	28.03 x 35.04	mm
Dot pitch	0.073 x 0.219	mm
LCD type	TFT, Normally White, Transmissive	
View Direction	6 o'clock	
Gray Scale Inversion Direction	12 o'clock	
Aspect Ratio	Portrait	
IC	ST7735S	
Backlight Type	LED, Normally White	
With /Without TP	Without TP	
Surface	Anti-Glare	

*Color tone slight changed by temperature and driving voltage.

4. Absolute Maximum Ratings

Item	Symbol	Min	Typ	Max	Unit
Operating Temperature	TOP	-20	—	+70	°C
Storage Temperature	TST	-30	—	+80	°C

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

1. Temp. 60°C, 90% RH MAX. Temp. > 60°C, Absolute humidity shall be less than 90% RH at 60°C

5. Electrical Characteristics

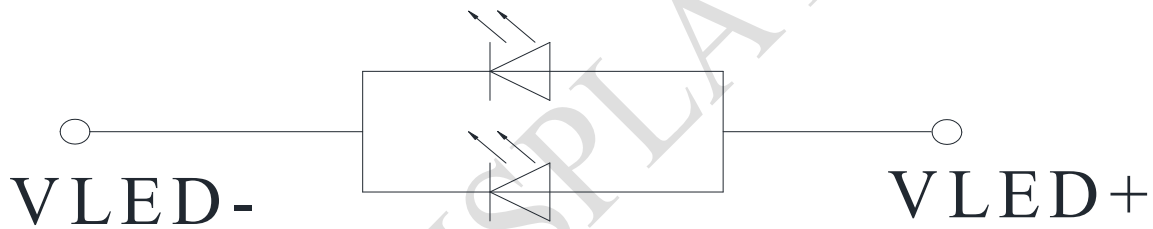
5.1. Operating conditions:

Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage For Analog	VCI	—	2.5	2.75	4.8	V
Interface Operation Voltage	IOVCC	—	1.65	1.8	3.7	V
Supply LCM current	ICI(mA)	—	-	0.9	2	mA

5.2. LED driving conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED current		-	40	-	mA	
Power Consumption		-	124	-	mW	
LED voltage	VBL+	2.9	3.1	3.4	V	Note 1
LED Life Time		-	50,000	-	Hr	Note 2,3,4

Note 1 : There are 1 Groups LED



Note 2 : Ta = 25 °C

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

Note 4 : The single LED lamp case

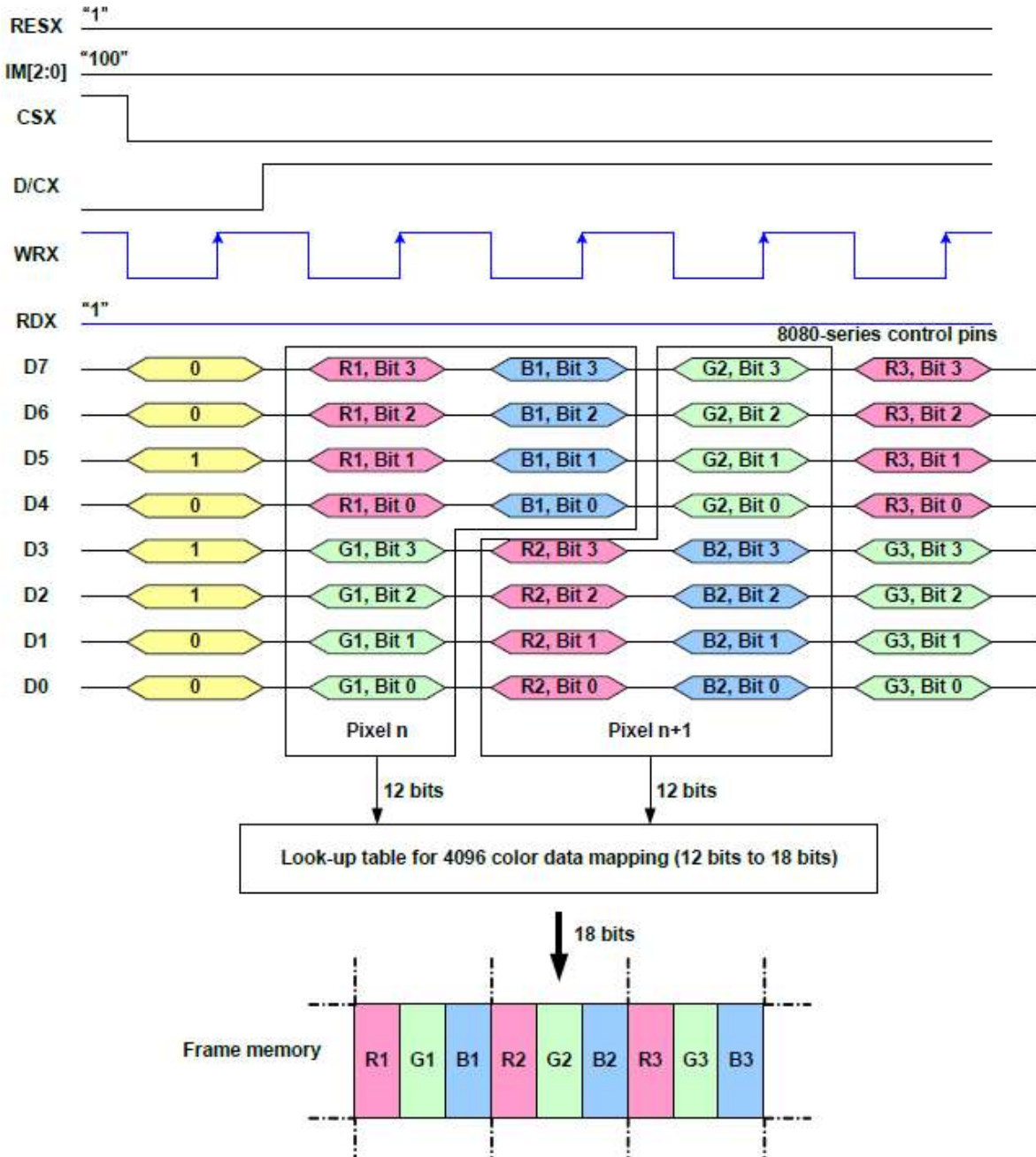
6.Data Color Coding

6.1. 8-bit Parallel Interface (IM2, IM1, IM0= "100")

Different display data formats are available for three Colors depth supported by listed below.

- 4k Colors, RGB 4,4,4-bit Input.
- 65k Colors, RGB 5,6,5-bit Input.
- 262k Colors, RGB 6,6,6-bit Input.

8-bit Data Bus for 12-bit/Pixel (RGB 4-4-4-bit Input), 4K-Colors, 3AH= "03h"



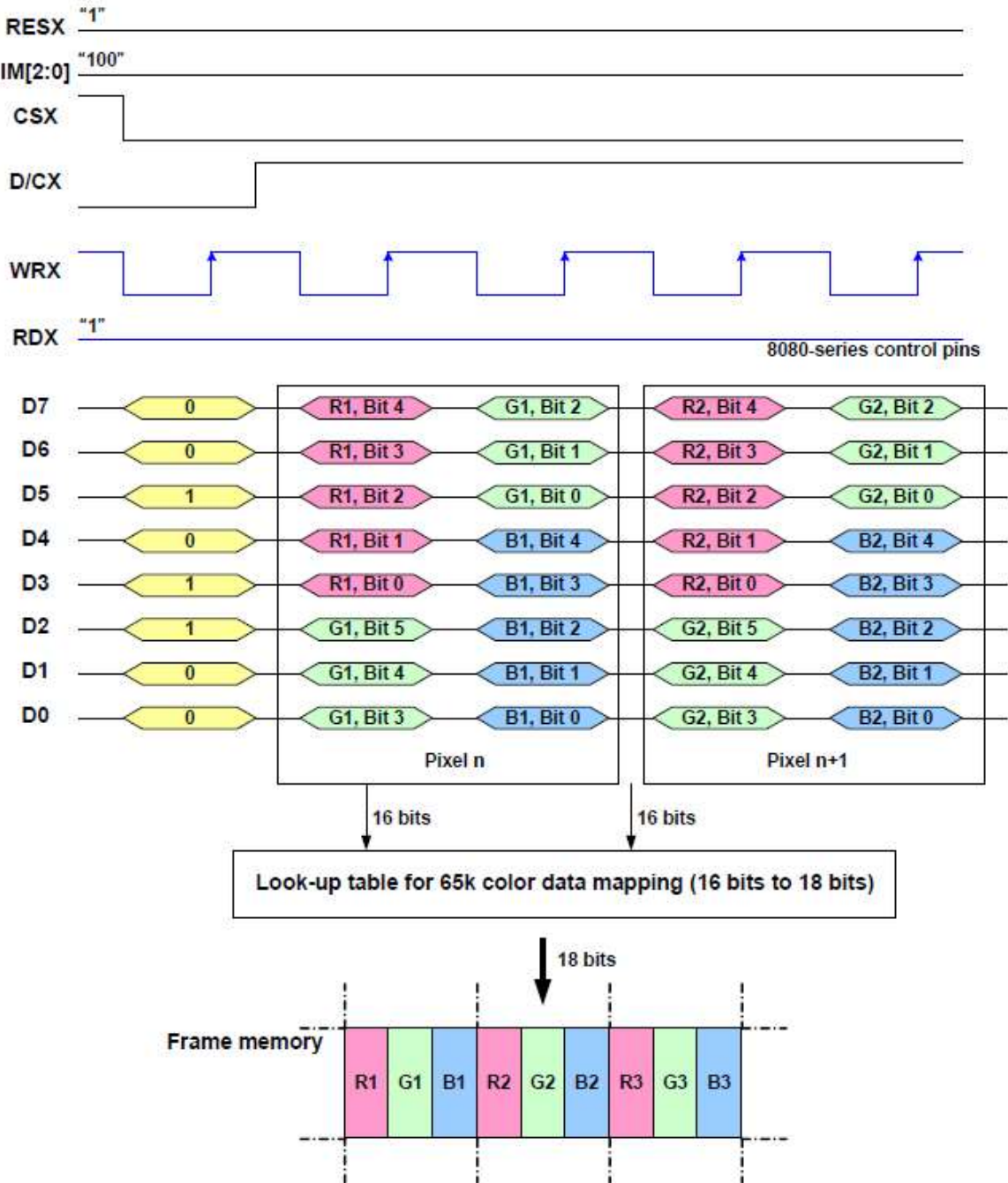
Note1: The data order is as follows, MSB=D7, LSB=D0 and picture data is MSB=Bit 3, LSB=Bit 0 for Red, Green and Blue data.

Note 2: 3-timetransfer is used to transmit 1 pixel data with the 12-bit color depth information.

Note 3: '-' = Don't care -Can be set to '0' or '1'

8-bit Data Bus for 16-bit/Pixel (RGB 5-6-5-bit Input), 65K-Colors, 3AH= "05h"

There is 1 pixel (3 sub-pixels) per 2-byte



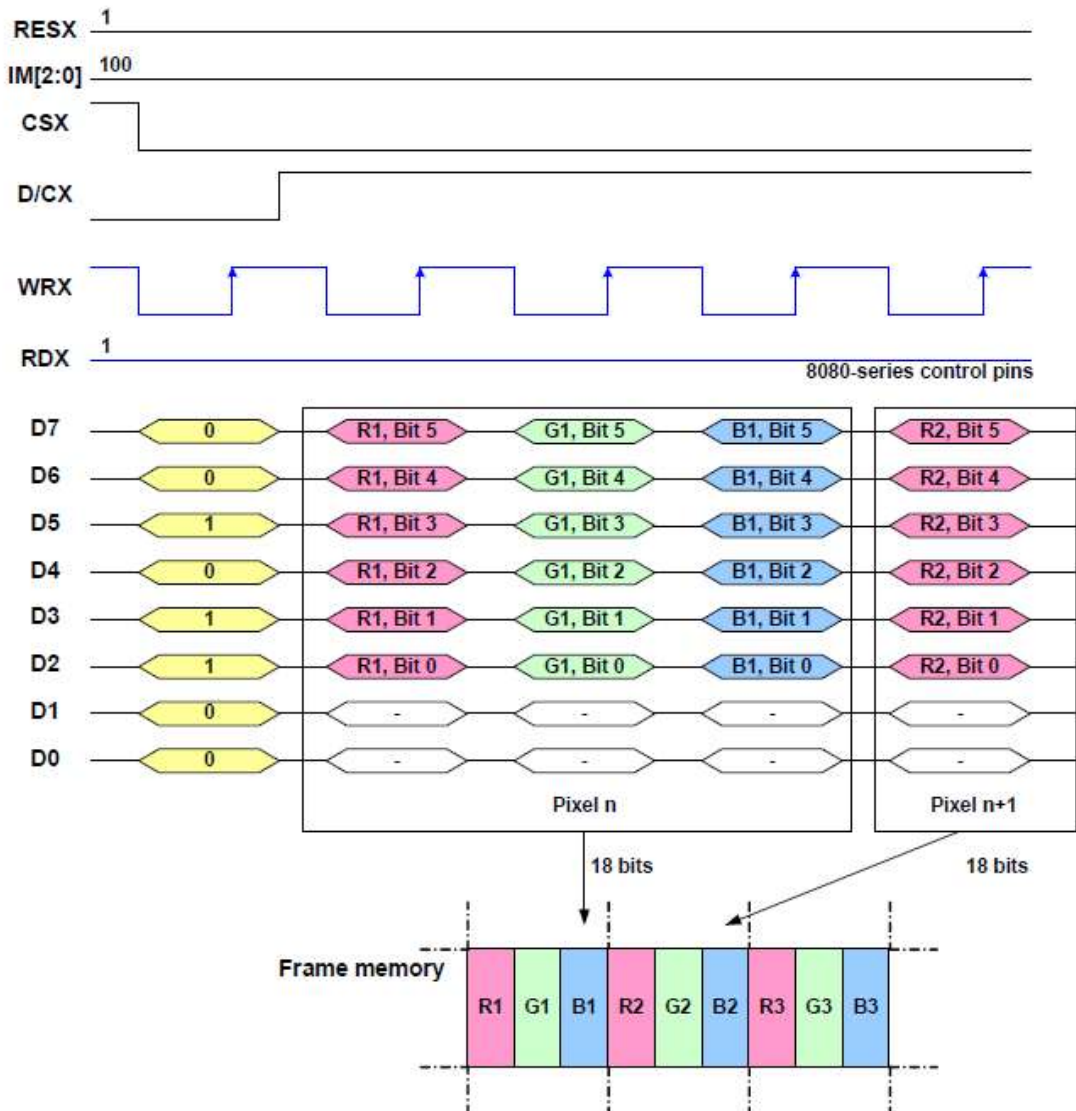
Note 1: The data order is as follows, MSB=D7, LSB=D0 and picture data is MSB=Bit 5, LSB=Bit 0 for Green and MSB=Bit 4, LSB=Bit 0 for Red and Blue data.

Note 2: 2-times transfer is used to transmit 1 pixel data with the 16-bit color depth information.

Note 3: '-' = Don't care -Can be set to '0' or '1'

8-bit Data Bus for 18-bit/Pixel (RGB 6-6-6-bit Input), 262K-Colors, 3AH= "06h"

There is 1 pixel (3 sub-pixels) per 3-bytes.



Note 1: The data order is as follows, MSB=D7, LSB=D0 and picture data is MSB=Bit 5, LSB=Bit 0 for Red, Green and Blue data.

Note 2: 3-times transfer is used to transmit 1 pixel data with the 18-bit color depth information.

Note 3: '-' = Don't care -Can be set to '0' or '1'

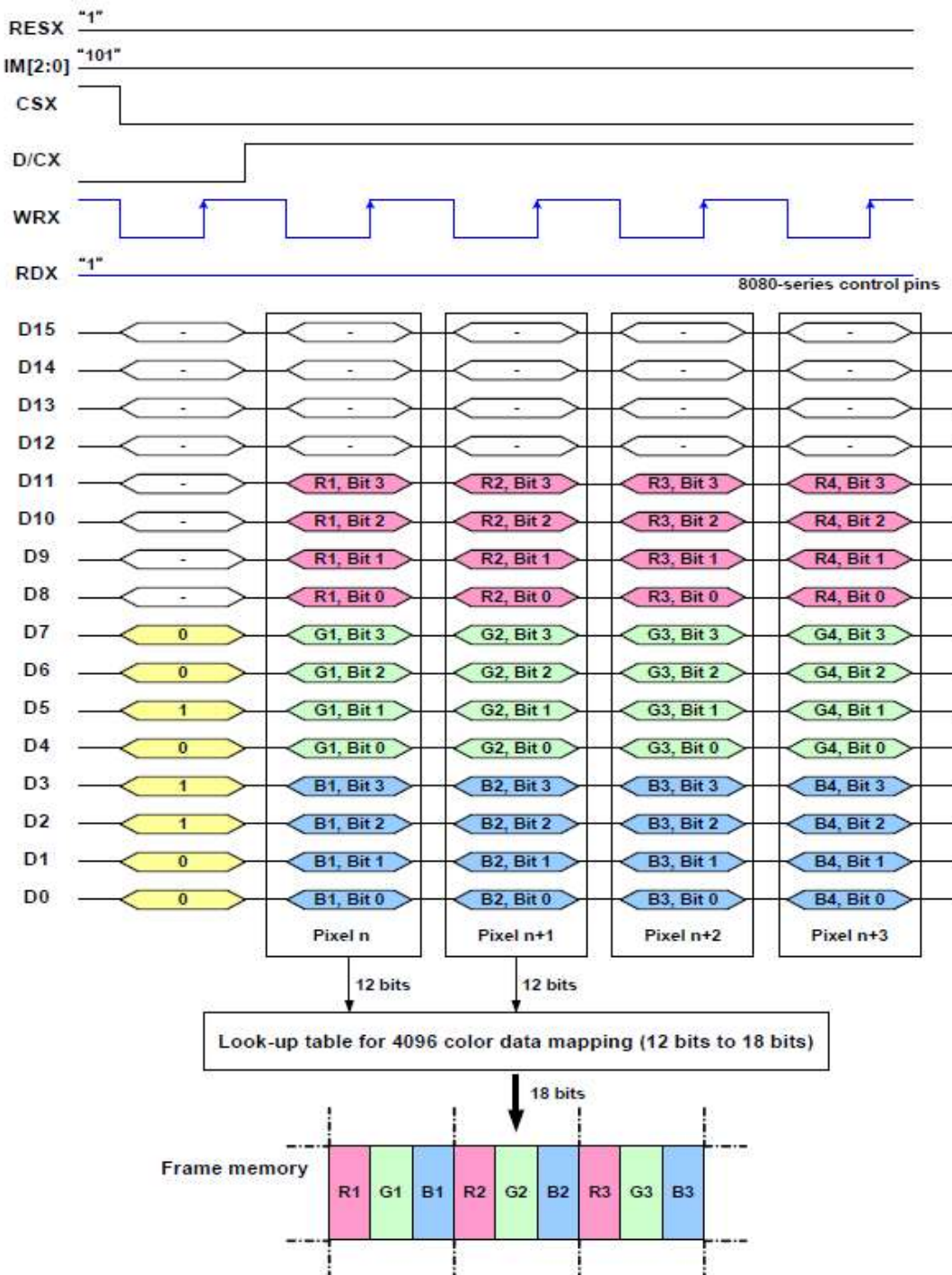
6.2. 16-Bit Parallel Interface (IM2,IM1, IM0= "101")

Different display data formats are available for three colors depth supported by listed below.

- 4k Colors, RGB 4,4,4-bit Input
- 65k Colors, RGB 5,6,5-bit Input
- 262k Colors, RGB 6,6,6-bit Input

16-bit Data Bus for 12-bit/Pixel (RGB 4-4-4-bit Input), 4K-Colors, 3AH= "03h"

There is 1 pixel (3 sub-pixels) per 1 byte

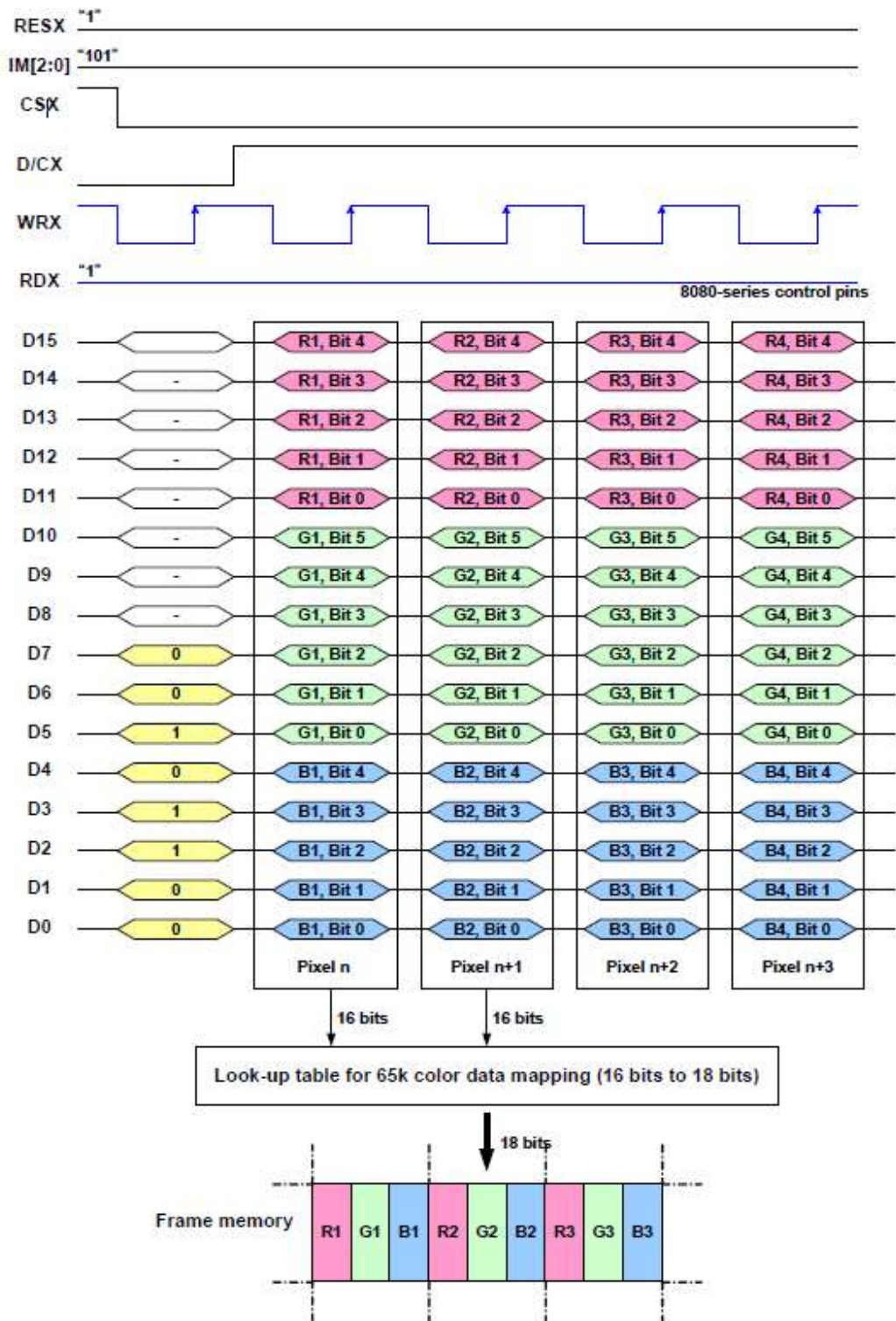


Note1: The data order is as follows, MSB=D11, LSB=D0 and picture data is MSB=Bit 3, LSB=Bit 0 for Red, Green and Blue data.

Note 2: 1-times transfer (D11 to D0) is used to transmit 1 pixel data with the 12-bit color depth information.

16-bit Data Bus for 16-bit/Pixel (RGB 5-6-5-bit Input), 65K-Colors, 3AH= "05h"

There is 1 pixel (3 sub-pixels) per 1 byte



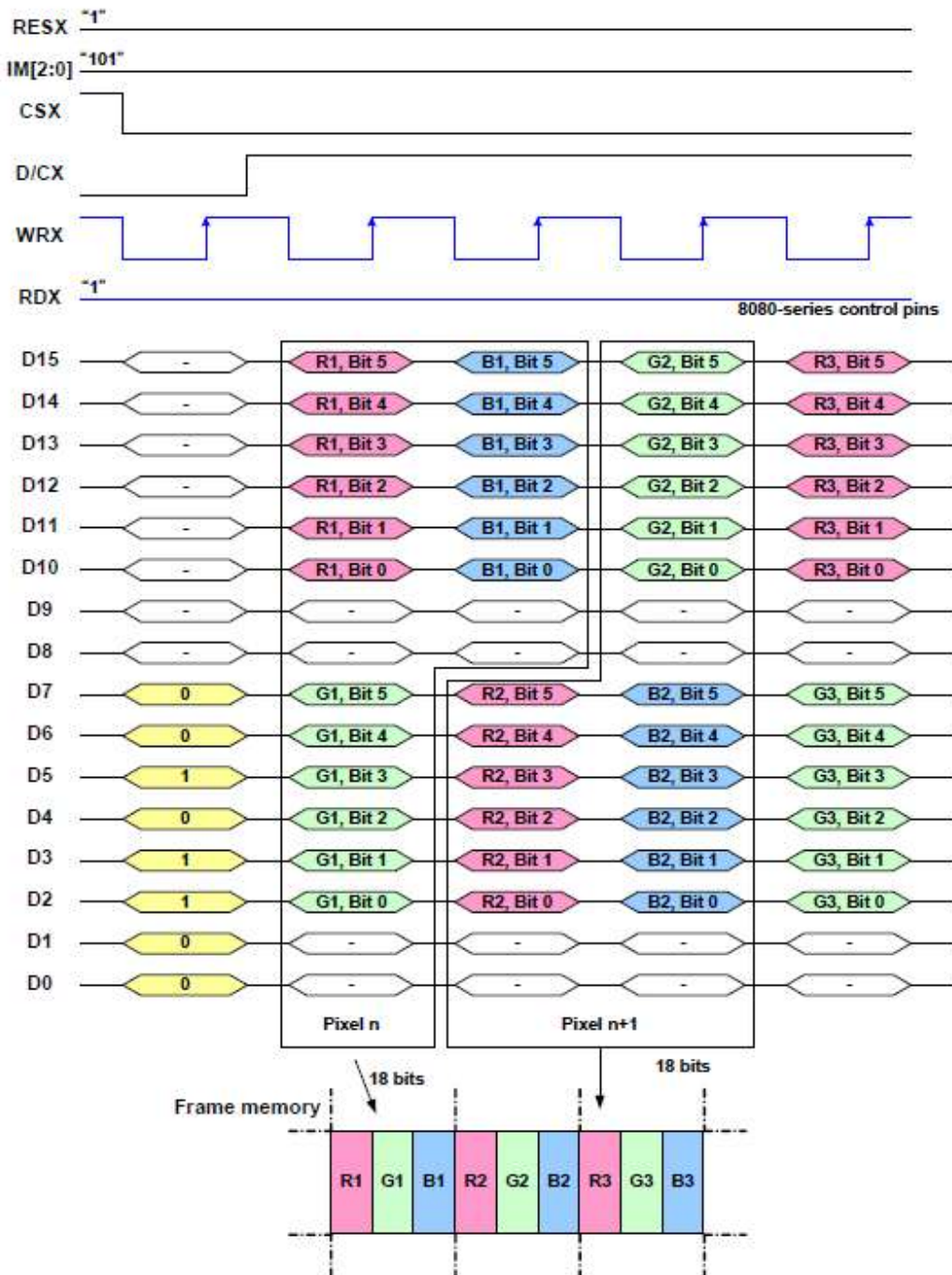
Note 1: The data order is as follows, MSB=D15, LSB=D0 and picture data is MSB=Bit 5, LSB=Bit 0 for Green, and MSB=Bit 4, LSB=Bit 0 for Red and Blue data.

Note 2: 1-times transfer (D15 to D0) is used to transmit 1 pixel data with the 16-bit color depth information.

Note 3: '-' = Don't care -Can be set to '0' or '1'

16-bit Data Bus for 18-bit/Pixel (RGB 6-6-6-bit Input), 262K-Colors, 3AH= "06h"

There are 2 pixels (6 sub-pixels) per 3 bytes



Note 1: The data order is as follows, MSB=D15, LSB=D0 and picture data is MSB=Bits 5, LSB=Bit 0 for Red, Green and Blue data.

Note 2: 3-times transfer is used to transmit 1 pixel data with the 18-bit color depth information.

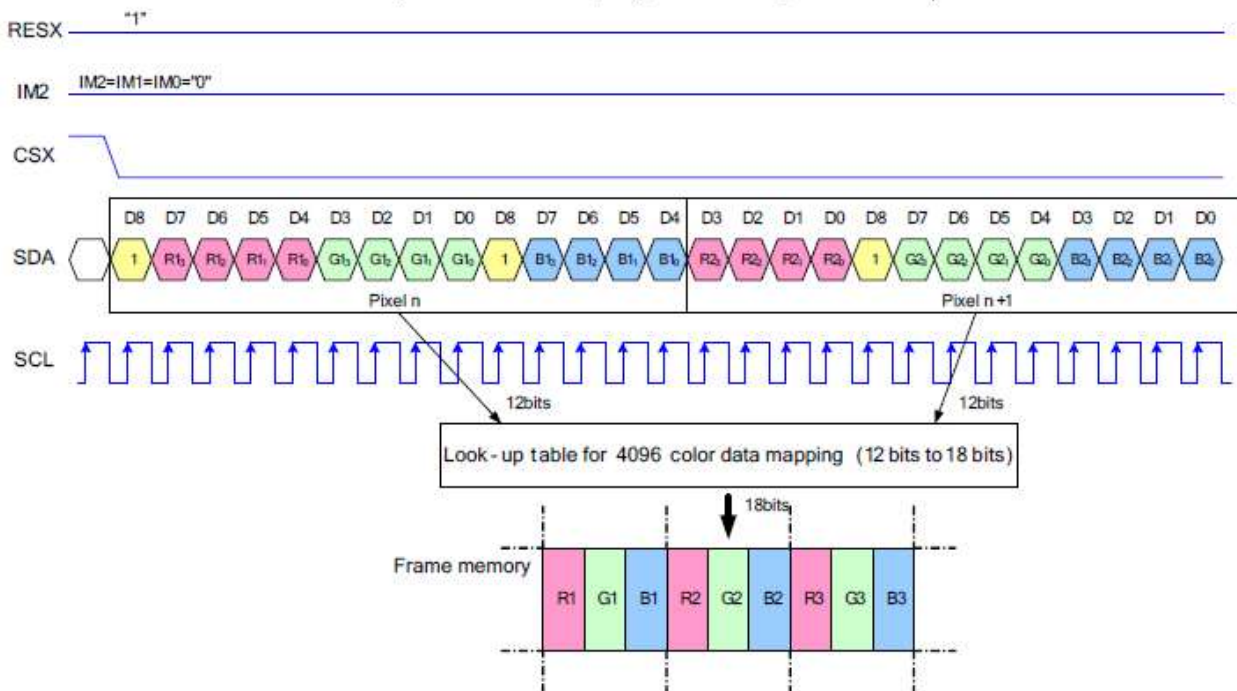
Note 3: '-' = Don't care -Can be set to '0' or '1'

6.3. 3-line Serial Interface

Different display data formats are available for three colors depth supported by the LCM listed below.

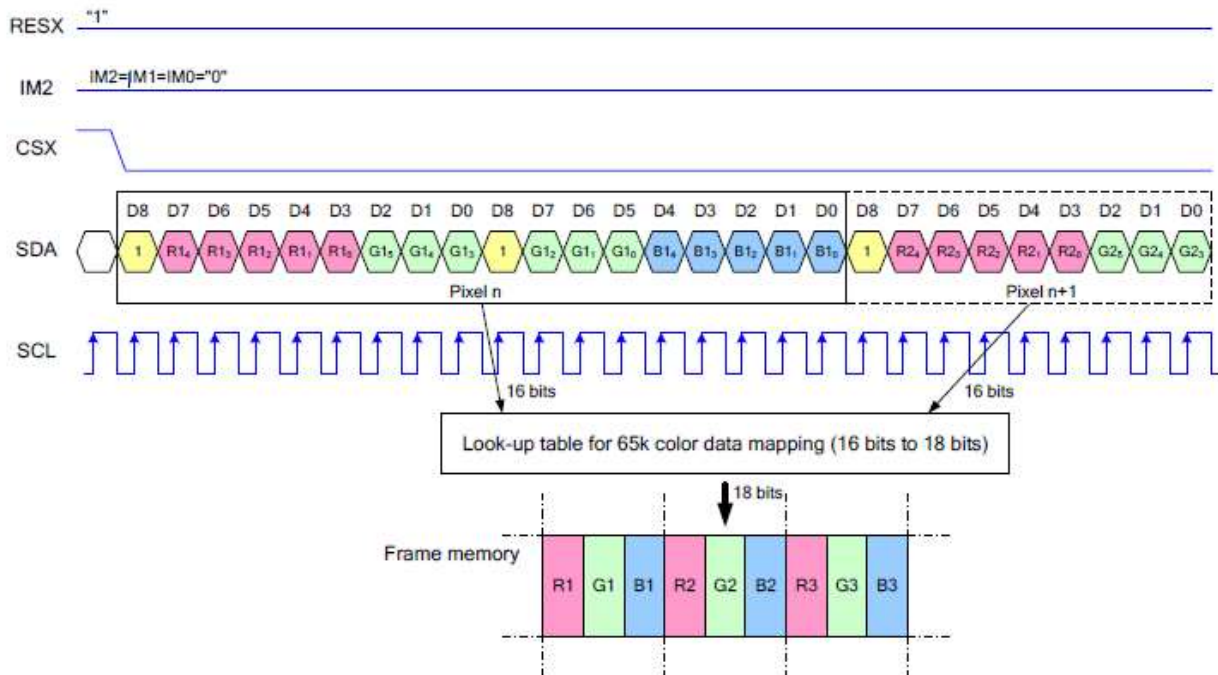
- 4k Colors, RGB 4-4-4-bit Input
- 65k Colors, RGB 5-6-5-bit Input
- 262k Colors, RGB 6-6-6-bit Input

Write Data for 12-bit/Pixel (RGB 4-4-4-bit Input), 4K-Colors, 3AH="03h"



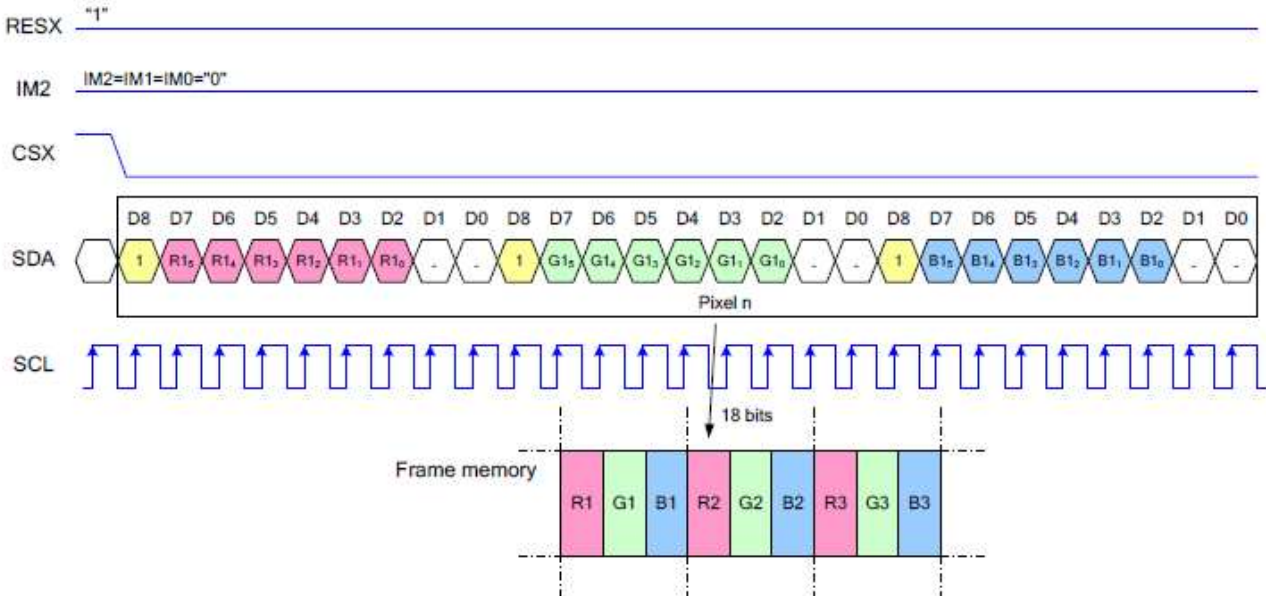
- Note 1: Pixel data with the 12-bit color depth information
- Note 2: The most significant bits are: Rx3, Gx3 and Bx3
- Note 3: The least significant bits are: Rx0, Gx0 and Bx0

Write Data for 16-bit/Pixel (RGB 5-6-5-bit Input), 65K-Colors, 3AH="05h"



- Note 1: Pixel data with the 16-bit color depth information
- Note 2: The most significant bits are: Rx4, Gx5 and Bx4
- Note 3: The least significant bits are: Rx0, Gx0 and Bx0

Write Data for 18-bit/Pixel (RGB 6-6-6-bit Input), 262K-Colors, 3AH="06h"



- Note 1: Pixel data with the 18-bit color depth information
- Note 2: The most significant bits are: Rx5, Gx5 and Bx5
- Note 3: The least significant bits are: Rx0, Gx0 and Bx0

7. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark	
Response time	Tr	$\theta=0^\circ$ 、 $\Phi=0^\circ$	-	2	4	.ms	Note 3,5	
	Tf			6	12	.ms		
Contrast ratio	CR	At optimized viewing angle	400	500	-	-	Note 4,5	
Color Chromaticity	White	$\theta=0^\circ$ 、 $\Phi=0^\circ$	Wx	0.26	0.31	0.36		Note 2,6,7
			Wy	0.28	0.33	0.38		
Viewing angle (Gray Scale Inversion Direction)	Hor.	$CR \geq 10$	Θ_R	35	45		Deg.	Note 1
			Θ_L	35	45			
	Ver.		Φ_T	35	45			
			Φ_B	10	20			
Brightness	-	-	450	500	-	Cd/m ²	Center of display	
Uniformity	(U)	-	75	-	-	%	Note 5	

Ta=25±2°C

Note 1: Definition of viewing angle range

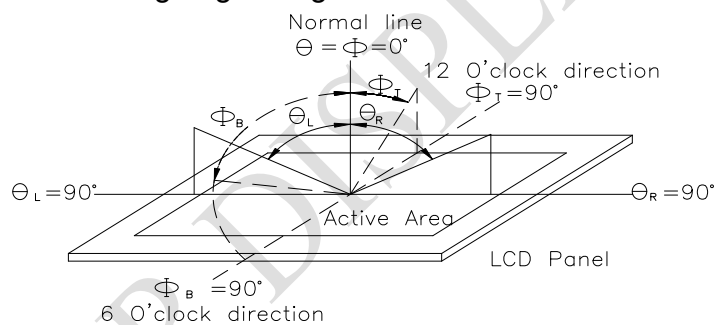


Fig.7.1. Definition of viewing angle

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-7 or BM-5 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

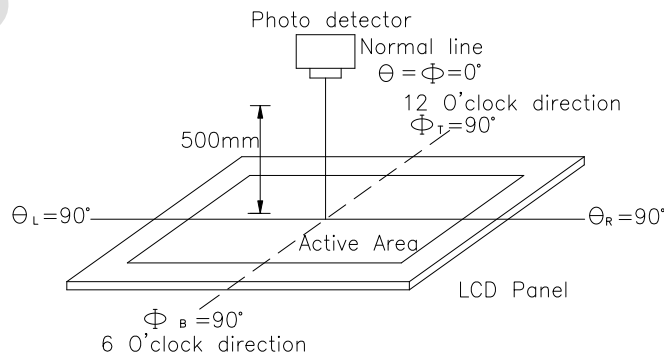
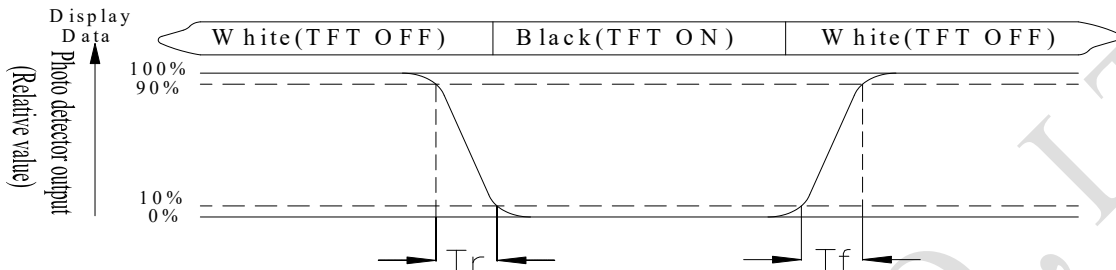


Fig. 7.2. Optical measurement system setup

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

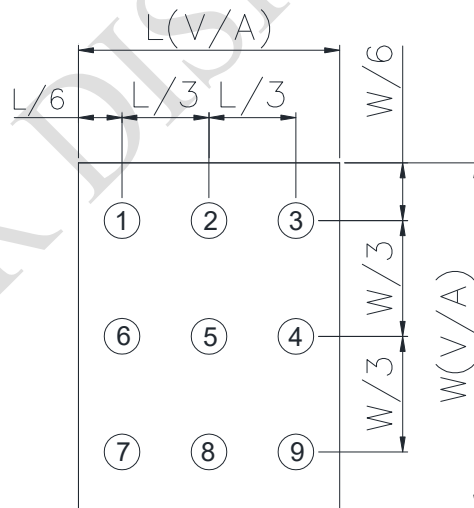


Fig7.3. Definition of uniformity

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.

8.Interface

8.1. LCM PIN Definition

Pin	Symbol	I/O	Function	Remark															
1	VLED-	P	Back light cathode																
2	VLED+	P	Back light anode																
3	IM0	I	- MCU Parallel Interface Type Selection -If Not Used, Please Fix this Pin at VDDI or DGND Level.																
4	IM1																		
			<table border="1"> <thead> <tr> <th>IM1</th> <th>IM0</th> <th>Parallel Interface</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>MCU 8-bit Parallel</td> </tr> <tr> <td>0</td> <td>1</td> <td>MCU 16-bit Parallel</td> </tr> <tr> <td>1</td> <td>0</td> <td>MCU 9-bit Parallel</td> </tr> <tr> <td>1</td> <td>1</td> <td>MCU 18-bit Parallel</td> </tr> </tbody> </table>	IM1	IM0	Parallel Interface	0	0	MCU 8-bit Parallel	0	1	MCU 16-bit Parallel	1	0	MCU 9-bit Parallel	1	1	MCU 18-bit Parallel	
IM1	IM0	Parallel Interface																	
0	0	MCU 8-bit Parallel																	
0	1	MCU 16-bit Parallel																	
1	0	MCU 9-bit Parallel																	
1	1	MCU 18-bit Parallel																	
5	IM2	I	MCU Parallel Interface Bus and Serial Interface select IM2='1', Parallel Interface IM2='0', Serial Interface																
6	RESET	P	Reset signal																
7-12	NC	-	No Connect																
13-28	DB15-DB0(SPI_SDA)	I/O	DB15:0] are used as MCU parallel interface data bus. -DBis the serial input/output signal in serial interface mode. -In serial interface, DB15:1] are not used and should be fixed at VDDI or DGND level.																
29	NC	-	No Connect																
30	RD	I	Read Enable in 8080 MCU Parallel Interface. -If not used, please fix this pin at VDDI or DGND level.																
31	WR	I	Serial clock -Write Enable in MCU Parallel Interface. -If not used, please fix this pin at VDDI or DGND level.																
32	D/C(SPI_SCL)	I	-Display data/command Selection Pin in MCU Interface. -D/CX='1': Display Data or Parameter. -D/CX='0': Command Data. -In Serial Interface, this is used as SCL. -If not used, please fix this pin at VDDI or DGND level.																
33	CS(SPI_CS)	I	Chip enable																
34	IOVCC	P	Interface Operation Voltage																
35	VCI	P	Analog Supply Voltage																
36	GND	P	Ground																
37-40	NC	-	No Connect																

9. Reliability

Content of Reliability Test (Wide temperature, -20°C~70°C)

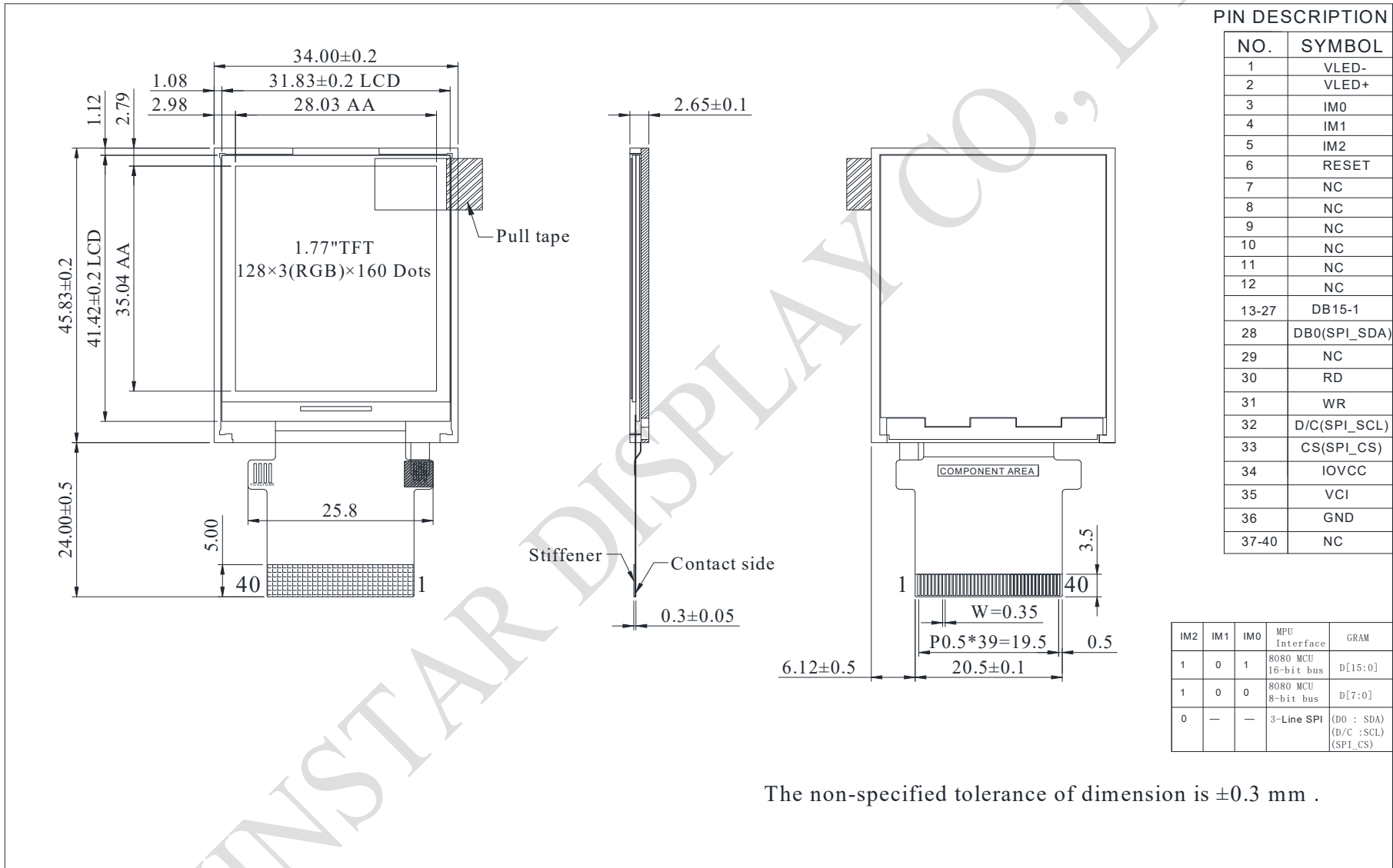
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 200hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 200hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 200hrs	1
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	The sample should be allowed stand the following 10 cycles of operation <div style="text-align: center;"> <p style="margin: 0;">-20°C 25°C 70°C</p> <p style="margin: 0;">30min 5min 30min</p> <p style="margin: 0;">1 cycle</p> </div>	-20°C/70°C 10 cycles	—
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=±600V(contact), ±800v(air), RS=330Ω CS=150pF 10 times	—

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.

10. Contour Drawing



PIN DESCRIPTION

NO.	SYMBOL
1	VLED-
2	VLED+
3	IM0
4	IM1
5	IM2
6	RESET
7	NC
8	NC
9	NC
10	NC
11	NC
12	NC
13-27	DB15-1
28	DB0(SPI_SDA)
29	NC
30	RD
31	WR
32	D/C(SPI_SCL)
33	CS(SPI_CS)
34	IOVCC
35	VCI
36	GND
37-40	NC

IM2	IM1	IM0	MPU Interface	GRAM
1	0	1	8080 MCU 16-bit bus	D[15:0]
1	0	0	8080 MCU 8-bit bus	D[7:0]
0	-	-	3-Line SPI	(DO : SDA) (D/C : SCL) (SPI_CS)

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



winstar

LCM Sample Estimate Feedback Sheet

Module Number : _____

Page: 1

1、Panel Specification :

- 1. Panel Type : Pass NG , _____
- 2. View Direction : Pass NG , _____
- 3. Numbers of Dots : Pass NG , _____
- 4. View Area : Pass NG , _____
- 5. Active Area : Pass NG , _____
- 6. Operating Temperature : Pass NG , _____
- 7. Storage Temperature : Pass NG , _____
- 8. Others : _____

2、Mechanical

- 1. PCB Size : Pass NG , _____
- 2. Frame Size : Pass NG , _____
- 3. Material of Frame : Pass NG , _____
- 4. Connector Position : Pass NG , _____
- 5. Fix Hole Position : Pass NG , _____
- 6. Backlight Position : Pass NG , _____
- 7. Thickness of PCB : Pass NG , _____
- 8. Height of Frame to PCB : Pass NG , _____
- 9. Height of Module : Pass NG , _____
- 10. Others : Pass NG , _____

3、Relative Hole Size :

- 1. Pitch of Connector : Pass NG , _____
- 2. Hole size of Connector : Pass NG , _____
- 3. Mounting Hole size : Pass NG , _____
- 4. Mounting Hole Type : Pass NG , _____
- 5. Others : Pass NG , _____

4、Backlight Specification :

- 1. B/L Type : Pass NG , _____
- 2. B/L Color : Pass NG , _____
- 3. B/L Driving Voltage (Reference for LED) Pass NG , _____
- 4. B/L Driving Current : Pass NG , _____
- 5. Brightness of B/L : Pass NG , _____
- 6. B/L Solder Method : Pass NG , _____
- 7. Others : Pass NG , _____



Winstar Module Number : _____

Page: 2

5、Electronic Characteristics of Module :

- | | | |
|------------------------------|-------------------------------|-------------------------------------|
| 1. Input Voltage : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 2. Supply Current : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 3. Driving Voltage for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 4. Contrast for LCD : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 5. B/L Driving Method : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 6. Negative Voltage Output : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 7. Interface Function : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 8. LCD Uniformity : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 9. ESD test : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |
| 10. Others : | <input type="checkbox"/> Pass | <input type="checkbox"/> NG , _____ |

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / /

