



WINSTAR Display Co.,Ltd.
華凌光電股份有限公司

Distributed by:





Winstar Display Co., LTD
華凌光電股份有限公司

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SPECIFICATION

CUSTOMER : _____

MODULE NO.: **WF35UTYAIDNNO#**

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: 2017/08/03			

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



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MODLE NO :

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	SUMMARY
0	2017/08/03		First issue

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1.Module Classification Information

W F 35 U T Y A I 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 : 3.5” 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 X→Transmissive, W.T, VA TFT Y→Transmissive, W.T, IPS TFT Z→Transmissive, W.T, O-TFT				
⑦	A : TFT LCD B : TFT+FR+CONTROL BOARD C : TFT+FR+A/D BOARD D : TFT+FR+A/D BOARD+CONTROL BOARD E : TFT+FR+POWER BOARD						F : TFT+CONTROL BOARD G : TFT+FR H : TFT+D/V BOARD I : TFT+FR+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						
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)											
⑫	Version											
⑬	Special Code		#:Fit in with ROHS directive regulations									

2.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.

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3.General Specifications

Item	Dimension	Unit
Size	3.5	inch
Dot Matrix	320 x RGBx 480(TFT)	dots
Module dimension	54.5 (W) x83.0 (H) x 2.46(D)	mm
Active area	48.96 x 73.44	mm
LCD type	TFT, Normally Black, Transmissive	
View Direction	Wide View	
Aspect Ratio	Portrait	
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. $\leq 60^{\circ}\text{C}$, 90% RH MAX. Temp. $> 60^{\circ}\text{C}$, Absolute humidity shall be less than 90% RH at 60°C

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5. Electrical Characteristics

5.1. Operating conditions:

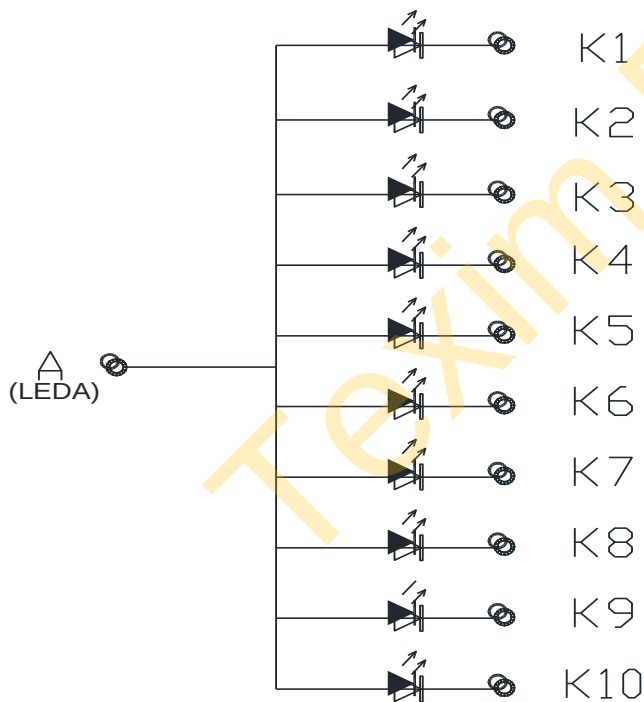
Item	Symbol	Condition	Min	Typ	Max	Unit
Supply Voltage for digital	IOVCC	—	—	1.8/2.8	3.3	V
Supply Voltage for analog	VCI	—	—	2.8	3.3	V
Power Supply for Current	ICC	IOVCC=VCI =VCC=3.3V	—	13.6	—	mA

5.2. LED driving conditions

Parameter	Symbol	Min	Typ	Max	Unit	Remark
LED current	—	—	160	—	mA	—
LED voltage	LEDA	2.6	3.0	3.4	V	Note 1
LED Life Time	—	—	50000	—	Hr	Note 2,3

Note 1 : There are 1 Groups LED

Note 2 : Ta = 25°C



(K1~K10 conector to LEDK)

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

6.DC CHARATERISTICS

Parameter	Symbol	Rating			Unit	Condition
		Min	Typ	Max		
Low level input voltage	V_{IL}	0	-	0.2VCC	V	
High level input voltage	V_{IH}	0.8VCC	-	VCC	V	

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7.AC CHARACTERISTICS

7.1. DBI Type C Option 1 (3-Line Serial Interface)

The 3-line/9-bit serial bus interface of the ILI9488 can be used by setting external pin IM [2:0] as 101. Figure 1 describes an interface with 8080 MCU system interface.

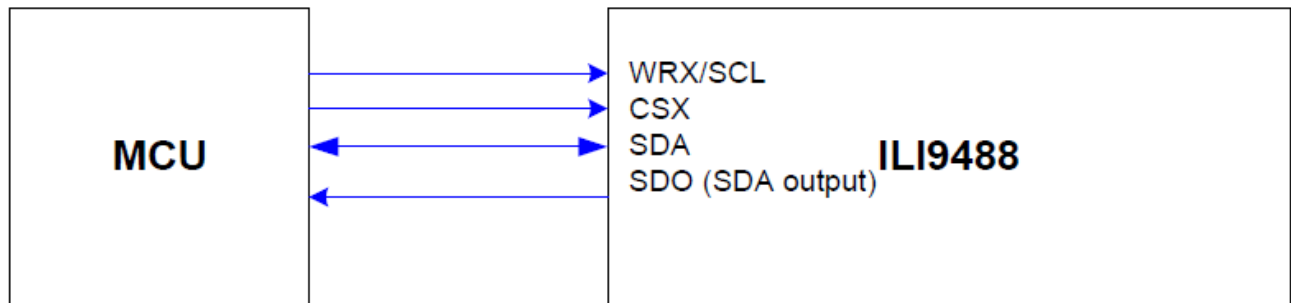


Figure 1: 3-Line Serial Interface

The available display data formats are:

*8 colors, RGB 1, 1, 1 bits input (set Standard Command 3Ah, DBI [2:0] as 001)

*262K-Colors, RGB 6, 6, 6 bits input data (set Standard Command 3Ah, DBI [2:0] as 110)

7.1.1 SPI Data for 3-bit/pixel (RGB 1-1-1 Bits Input), 8-color

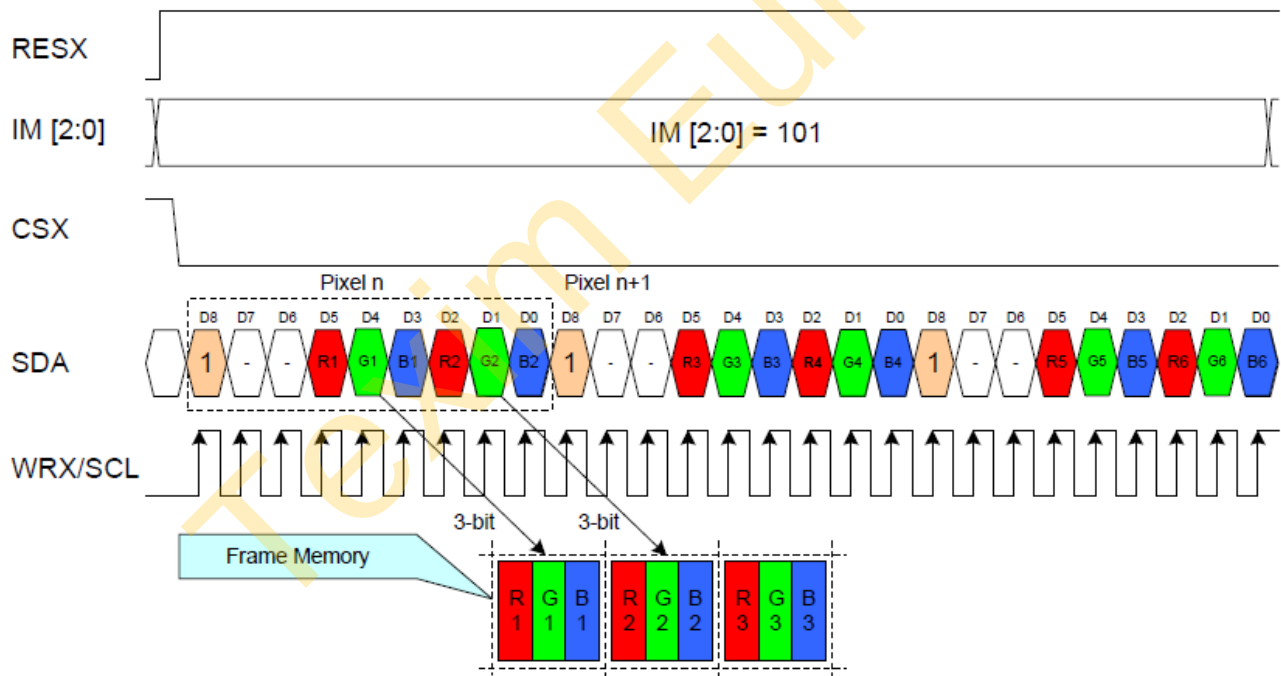


Figure 2: SPI Data for 3 bit/pixel (RGB 1-1-1 Bits Input), 8-color

Notes:

1. One pixel data contains 3-bit color depth information.

7.1.2. SPI Data for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

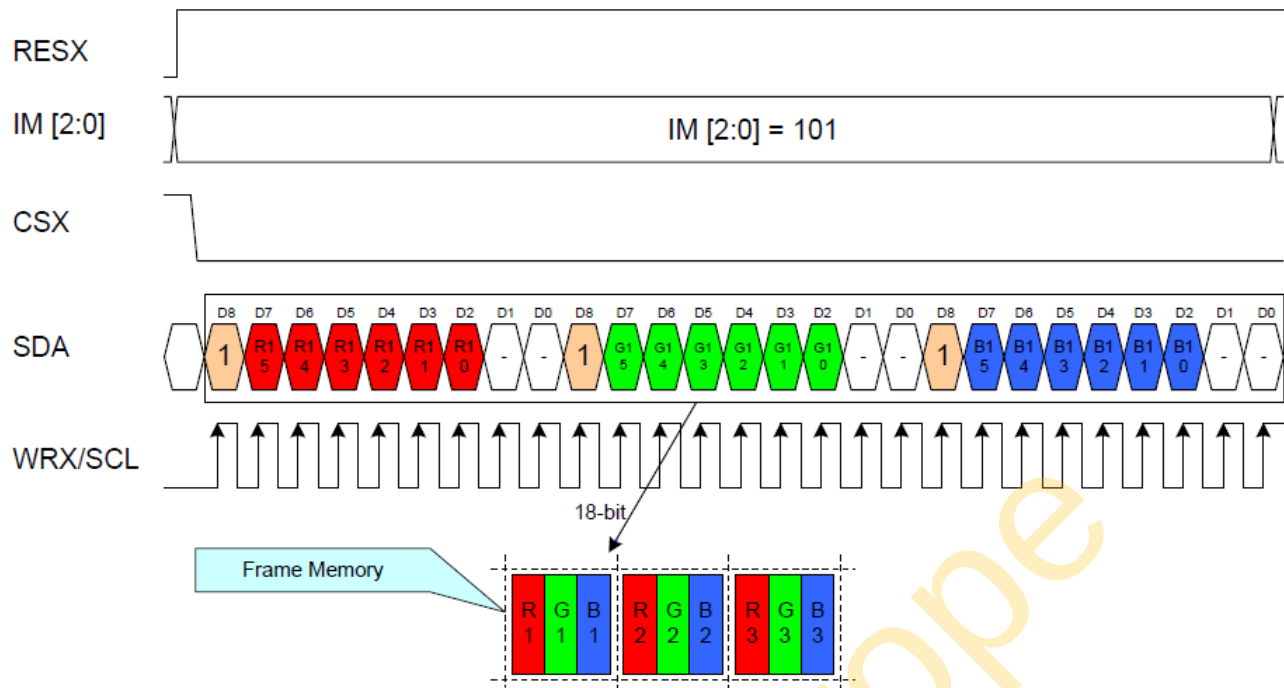


Figure 3: SPI Data for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

Notes:

1. One pixel data contains 18-bit color depth information.
2. The most significant bits are: R x 5, G x 5, and B x 5.
3. The least significant bits are: R x 0, G x 0, and B x 0.

Read data through 3 - line SPI mode

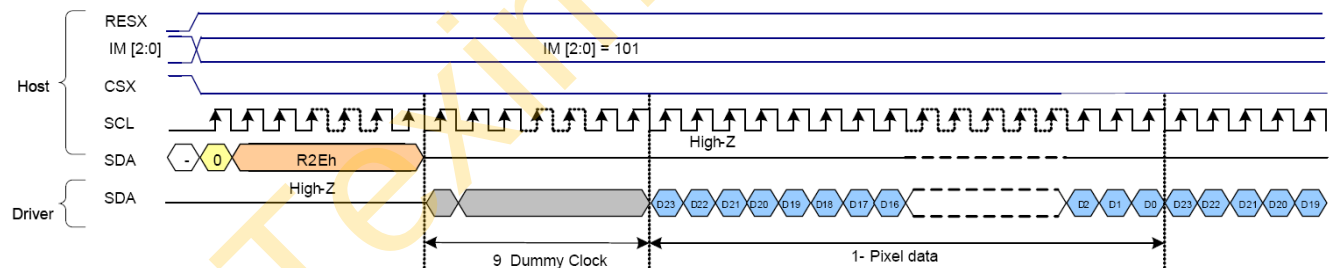


Figure 4: 3-Line SPI Mode Read Data

Note: „-“ = void

7.2. 8-bit Parallel MCU Interface

The DBI TYPE B 8-bit parallel bus interface of the ILI9488 is used by setting the external pin IM [2:0] as 011. Figure 5 shows this system interface.

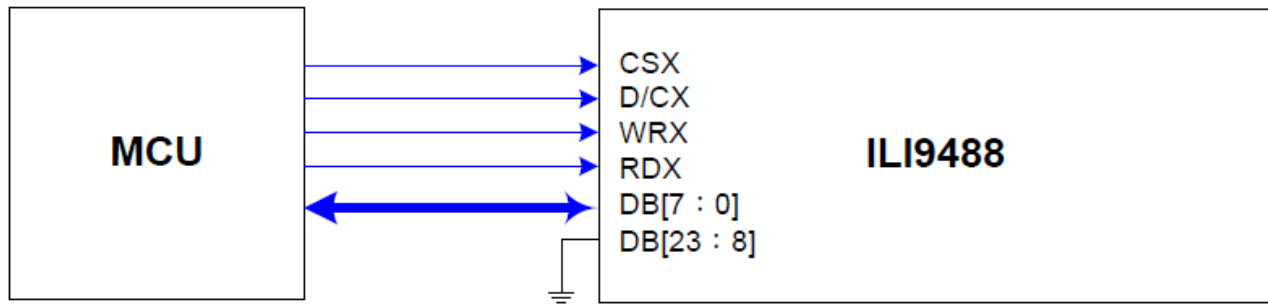


Figure 5: 8-bit Parallel MCU Interface

The available display data formats are:

*65K-Colors, RGB 5, 6, 5 bits input data (set Standard Command 3Ah, DBI [2:0] as 101)

*262K-Colors, RGB 6, 6, 6 bits input data (set Standard Command 3Ah, DBI [2:0] as 110)

7.2.1. 8-bit Data Bus for 16-bit/pixel (RGB 5-6-5 Bits Input), 65K-color

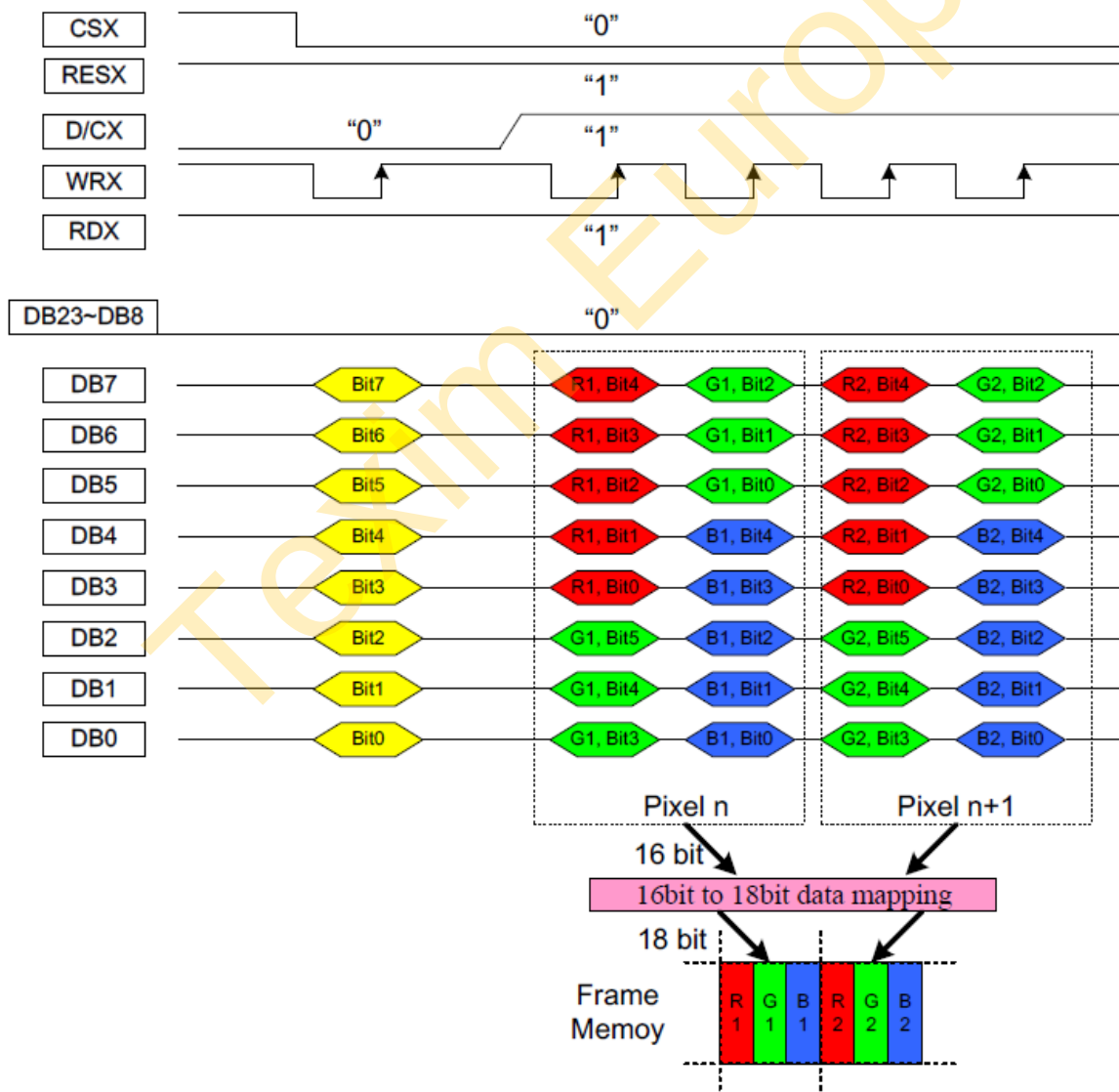


Figure 6: 8-bit Data Bus for 16-bit/pixel (RGB 6-5-6 Bits Input), 65K-color

1. The data order is as follows: MSB = DB7, LSB = DB0, and picture data is MSB = Bit 5, LSB = Bit 0 for Green data, and MSB = Bit 4, LSB = Bit 0 for Red and Blue data.
2. 2-times transfer is used to transmit 1 pixel data to the 16-bit color depth information.

7.2.2. 8-bit Data Bus for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

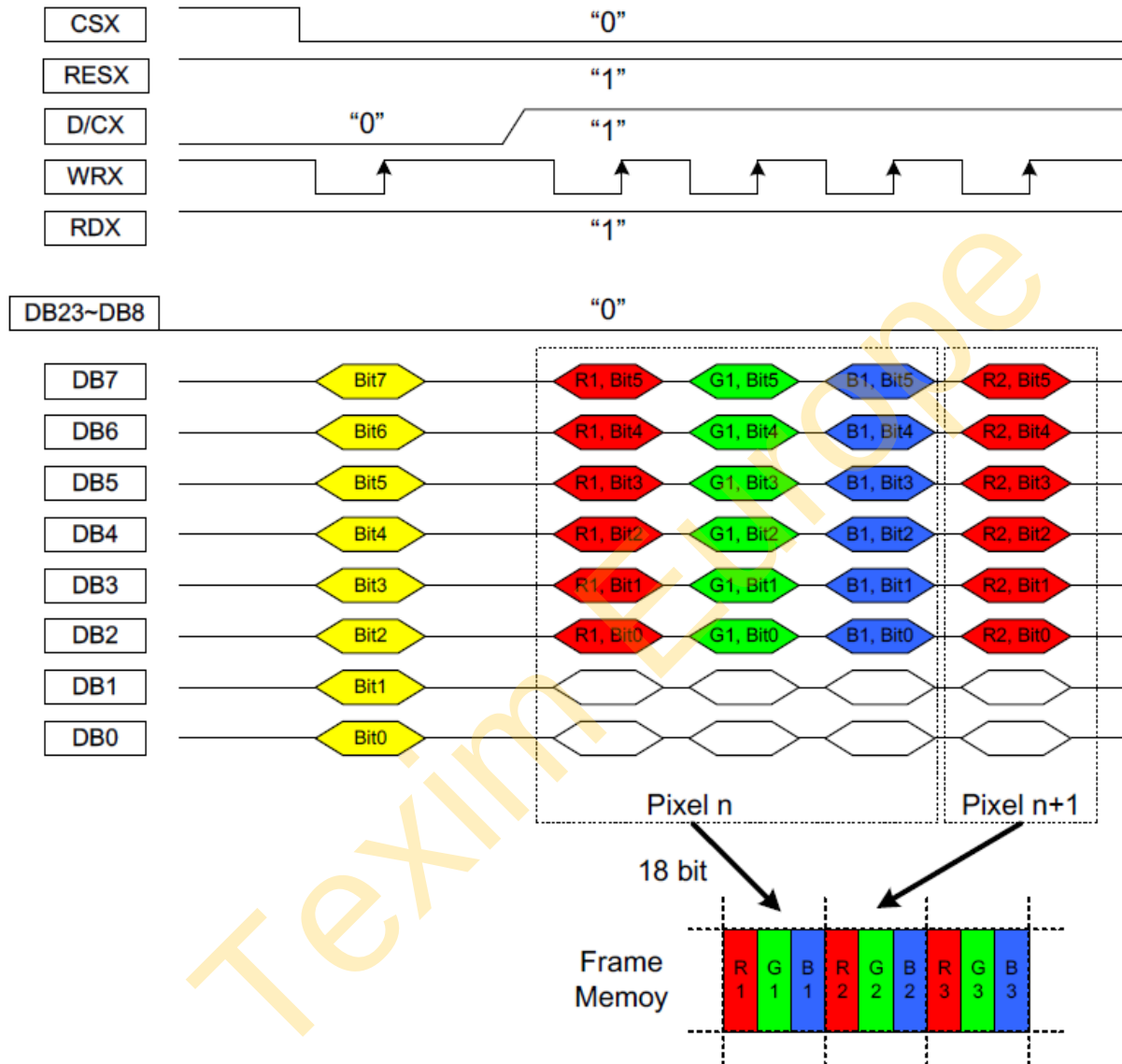


Figure 7: 8-bit Data Bus for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

Notes:

1. The data order is as follows: MSB = DB7, LSB = DB0, and picture data is MSB = Bit 5, LSB = Bit 0 for Green, Red and Blue data.
2. 3-times transfer is used to transmit 1 pixel data to the 18-bit color depth information.

7.3. 16-bit Parallel MCU Interface

The 8080-system 16-bit parallel bus interface of the ILI9488 can be used by setting external pin IM [2:0] as 010.

Figure 8 shows this system interface.

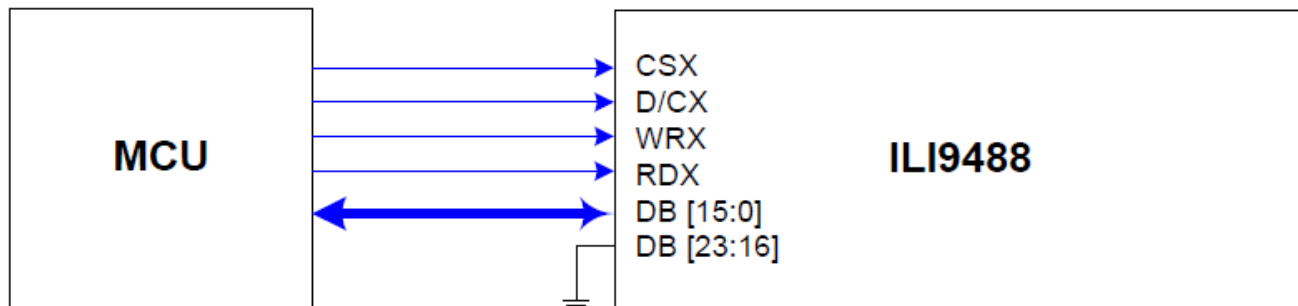


Figure 8: 16-bit Parallel MCU Interface

The available display data formats are:

65K-Colors, RGB 5, 6, 5 bits input data (set Standard Command 3Ah, DBI [2:0] as 101)

262K-Colors, RGB 6, 6, 6 bits input data (set Standard Command 3Ah, DBI [2:0] as 110)

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7.3.1 16-bit Data Bus for 16-bit/pixel (RGB 5-6-5 Bits Input), 65K-color

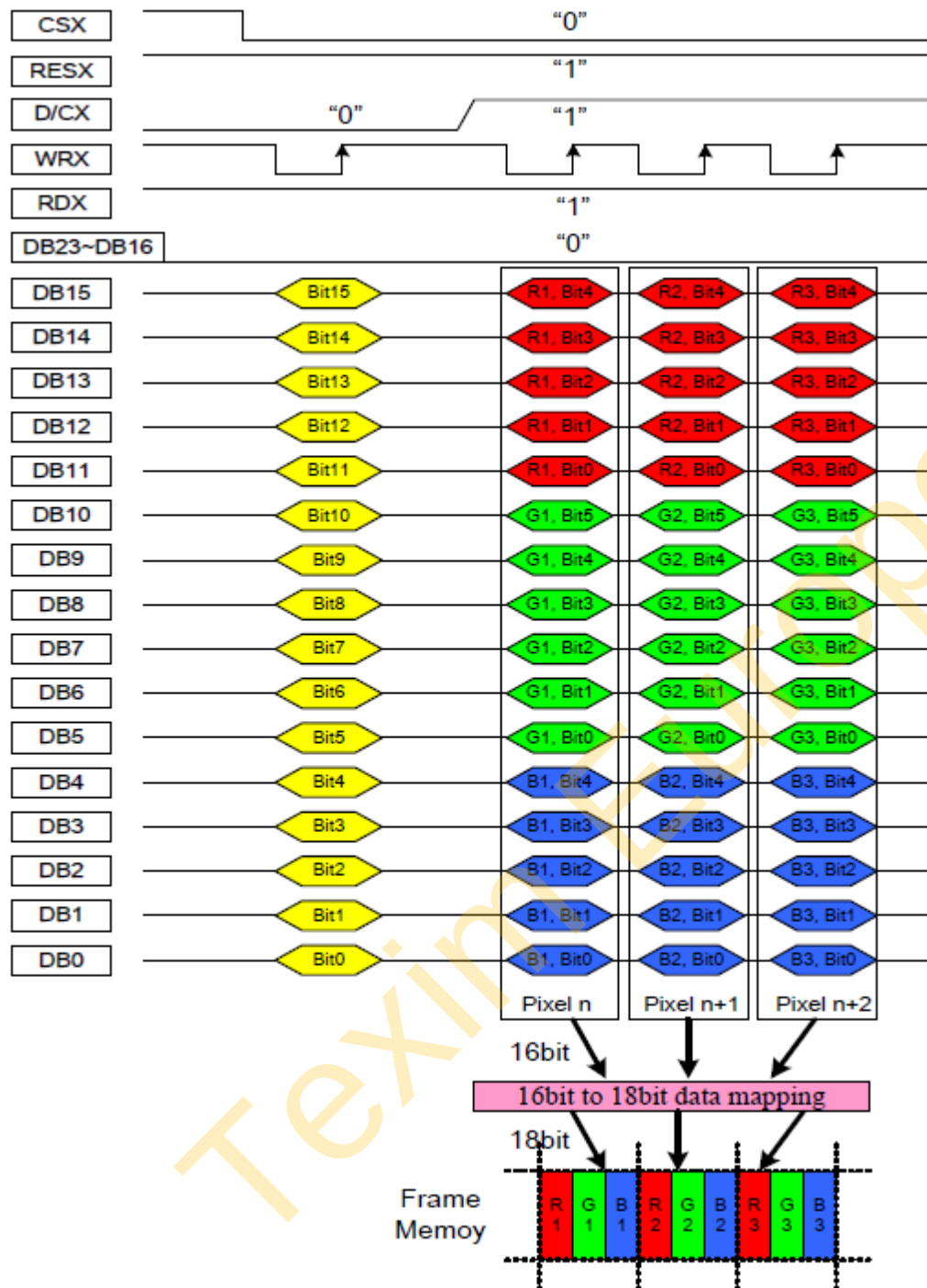


Figure 9: 16-bit Data Bus for 16-bit/pixel (RGB 5-6-5 Bits Input), 65K-color

Notes:

1. The data order is as follows: MSB = DB15, LSB = DB0, and picture data is MSB = Bit 5, LSB = Bit 0 for Green data, and MSB = Bit 4, LSB = Bit0 for Red and Blue data.
2. 1-time transfer is used to transmit 1 pixel data to the 16-bit color depth information.

7.3.2 16-bit Data Bus for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

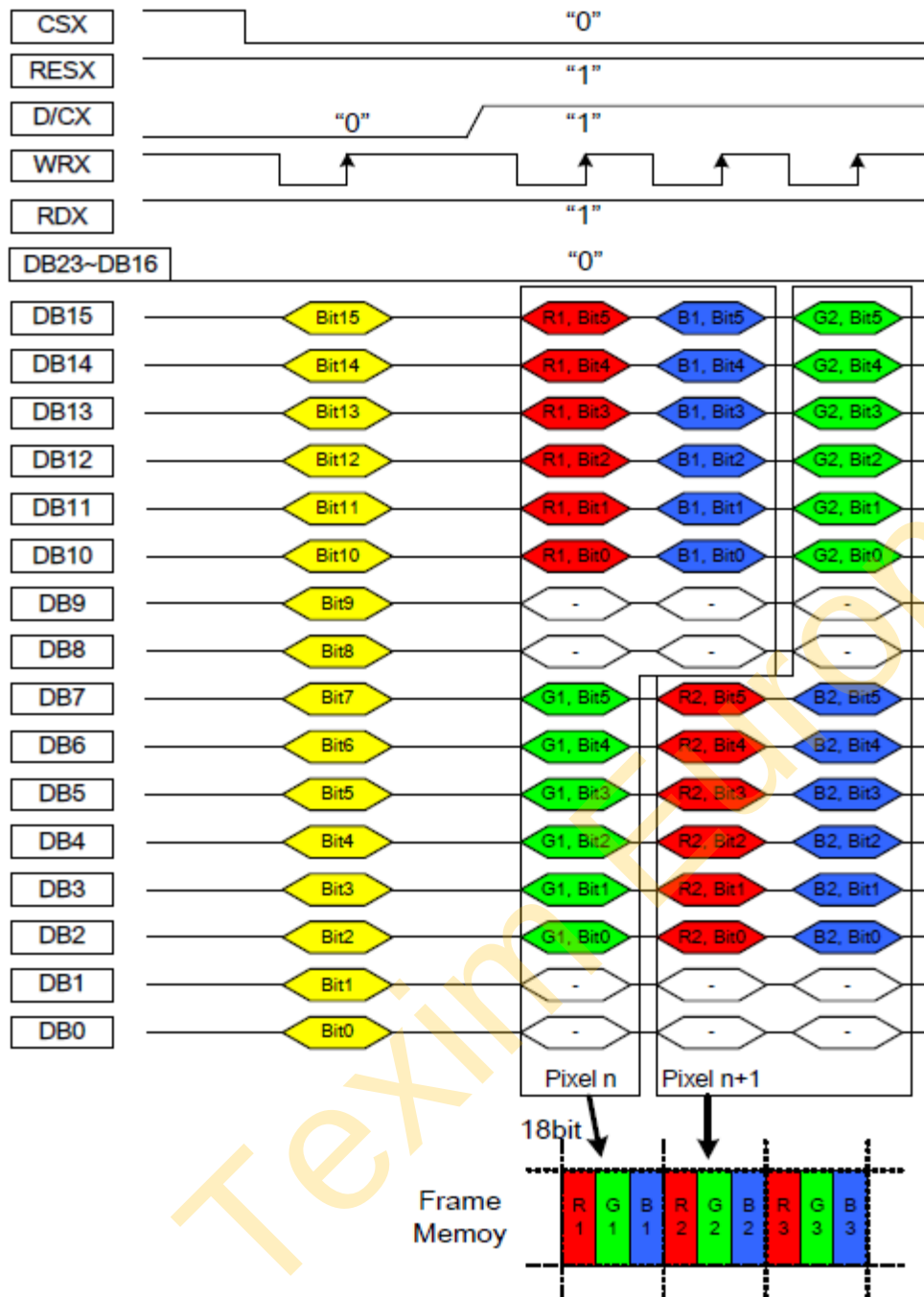


Figure 10: 16-bit Data Bus for 18-bit/pixel (RGB 6-6-6 Bits Input), 262K-color

Notes:

1. The data order is as follows: MSB = DB15, LSB = DB0, and picture data is MSB = Bit 5, LSB = Bit 0 for Green, Red and Blue data.
2. 3-times transfer is used to transmit 2 pixel data to the 18-bit color depth information.

7.4. Other display data format, Please reference the ILI9488 Spec

8. Optical Characteristics

Item	Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time	Tr	$\theta = 0^\circ \cdot \Phi = 0^\circ$	-	30	-	.ms	Note 3,5
	Tf						
Contrast ratio	CR	At optimized viewing angle	-	700	-	-	Note 4,5
Color Chromaticity	White	$\theta = 0^\circ \cdot \Phi = 0$	0.26	0.31	0.36		Note 2,6,7
	Wy						
Viewing angle	Hor.	ΘR	$CR \geq 10$	-	80	Deg.	Note 1
		ΘL		-	80		
	Ver.	ΦT		-	80		
		ΦB		-	80		
Brightness	-	-	500	600	-	cd/m2	Center of display

Ta=25±2°C (ILED=160mA)

Note 1: Definition of viewing angle range

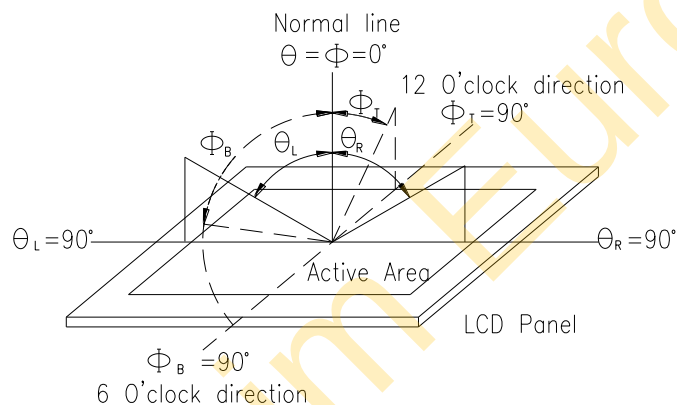


Fig. 8.1. Definition of viewing angle

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 luminance meter 1.0° field of view at a distance of 50cm and normal direction.

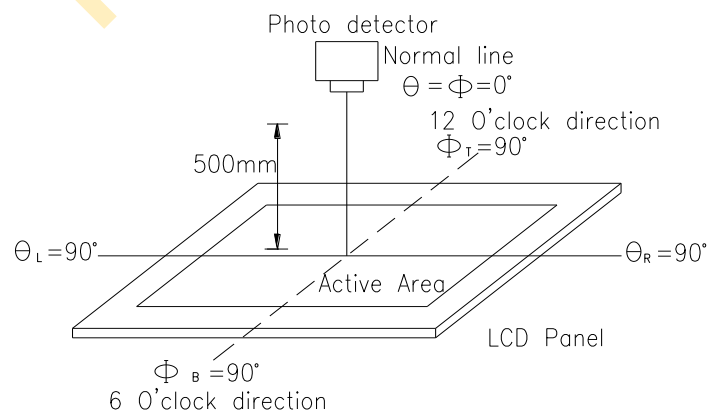
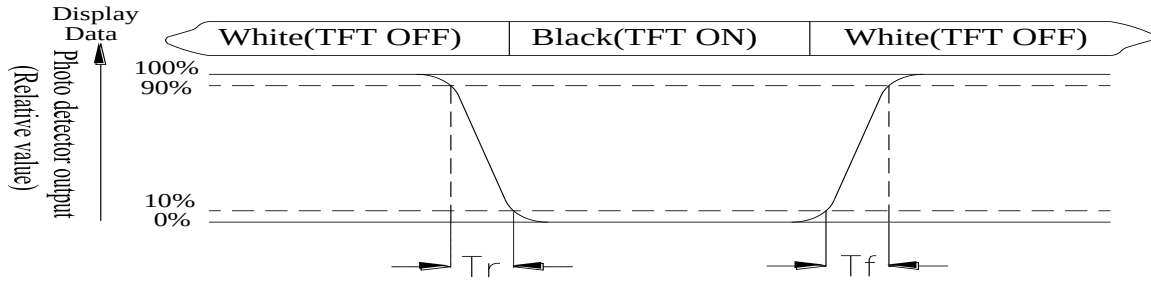


Fig. 8.2. Optical measurement system setup

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: White $V_i = V_{i50} \pm 1.5V$

Black $V_i = V_{i50} \pm 2.0V$

“±” means that the analog input signal swings in phase with VCOM signal.

“±” means that the analog input signal swings out of phase with VCOM signal.

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

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.

9.Interface

LCM PIN Definition

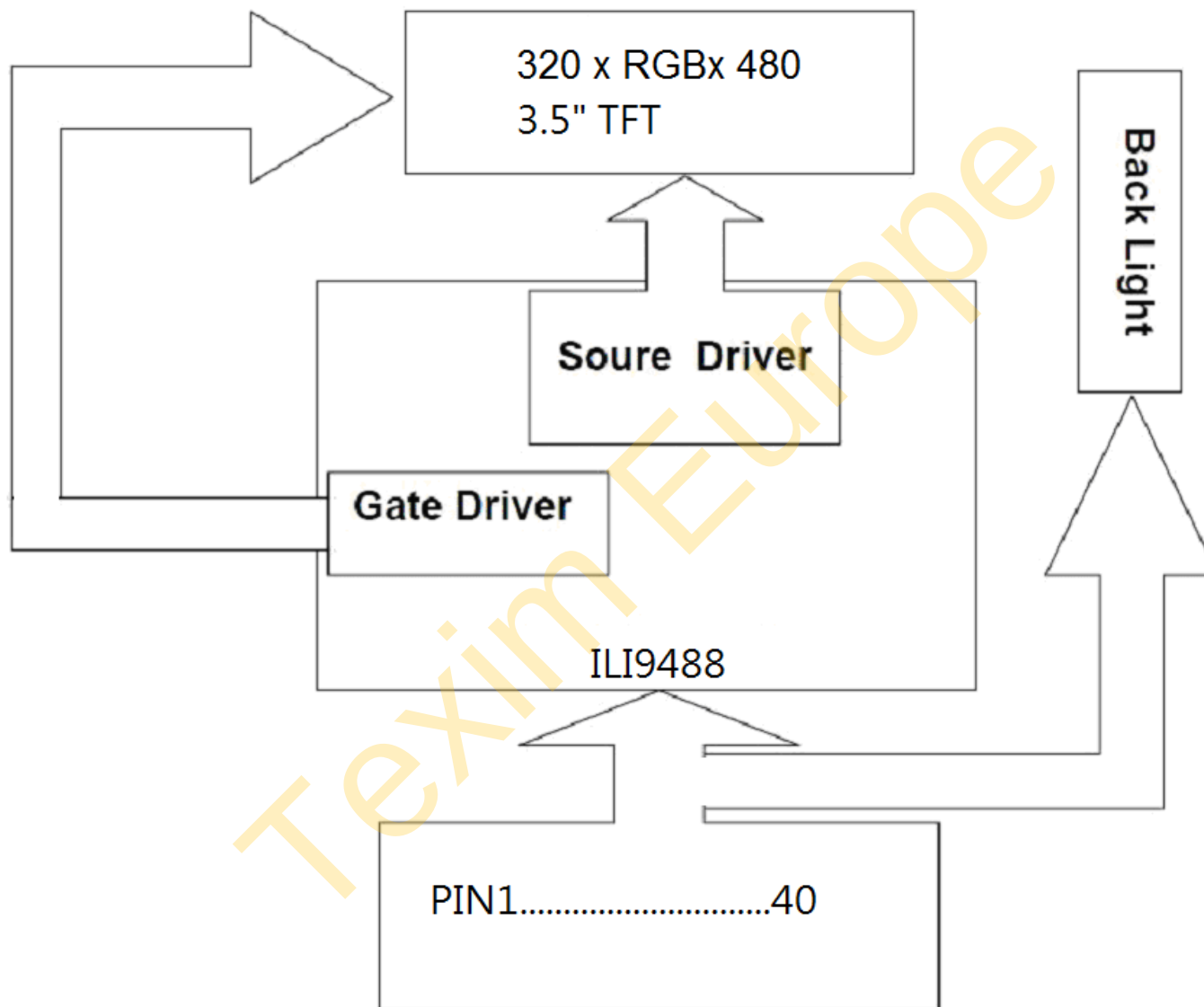
NO	Symbol	Function	I/O
1	LEDK	Cathode of LED backlight	P
2	LEDA	Anode of LED backlight.	P
3	IM0	Note 1	I
4	IM1	Note 1	I
5	IM2	Note 1	I
6	RESET	System reset pin.	I
7	NC	No connection	
8	NC	No connection	
9	NC	No connection	
10	NC	No connection	
11-28	DB17-0	Data bus	I/O
29	NC (SDA)	Connection (serial data input/output pin)	I/O
30	RD	Read strobe signal. Read out data when RDX is Low.	I
31	WR (SCL)	Write data when WRX is Low.(serial clock input pin)	I
32	D/C	register select	I
33	CS (NCS)	Chip select signal (serial chip select input pin)	I
34	IOVCC	Power supply(TYP:1.8V/2.8V).	P
35	VCI	Power supply(TYP:2.8V).	P
36	GND	Ground	P
37	NC (YD)	No connection	
38	NC (XR)	No connection	
39	NC (YU)	No connection	
40	NC (XL)	No connection	

Note 1:

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

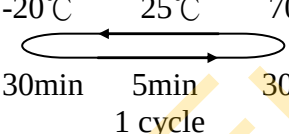
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10. Block Diagram



11. Reliability

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

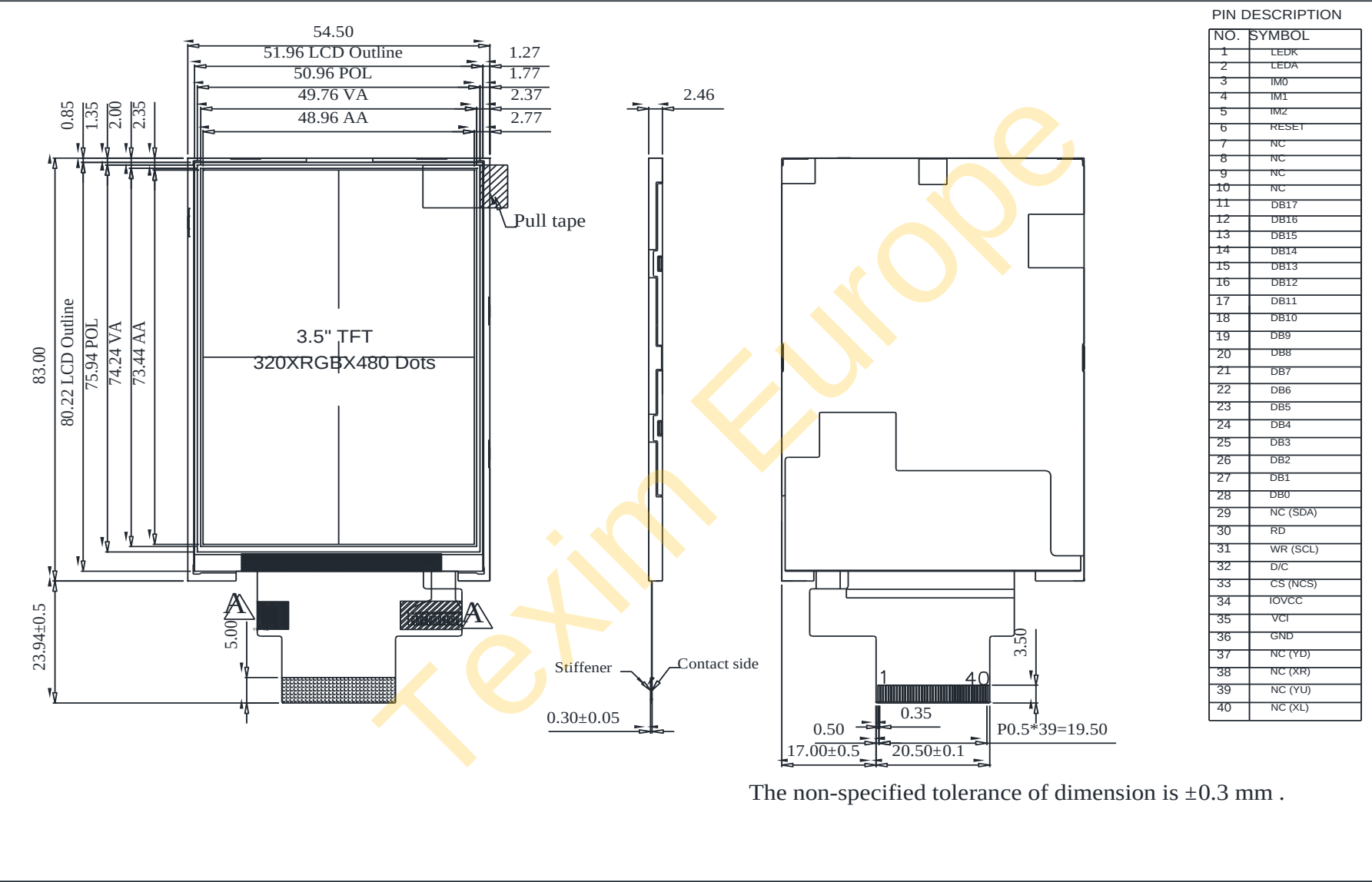
Environmental Test			
Test Item	Content of Test	Test Condition	Note
High Temperature storage	Endurance test applying the high storage temperature for a long time.	80°C 96hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30°C 96hrs	1,2
High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70°C 96hrs	—
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20°C 96hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 40 °C ,90%RH max	40°C ,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation 	-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.

12. Contour Drawing



**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 Specification :

- | | | |
|-----------------------------|-------------------------------|-------------------------------------|
| 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 Type) : | ☐ 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 , _____ |

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Winstar Module Number : _____

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5、Electronic Characteristics of Module :

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

6、Summary :

Sales signature : _____

Customer Signature : _____

Date : / / _____

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