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.: WF101NTYA4LNN0#000

APPROVED BY: **(FOR CUSTOMER USE ONLY)**	**PCB VERSION: DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY
			葉虹蘭
ISSUED DATE: 2023/07/14			

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

MODLE NO：

RECORDS OF REVISION

DOC. FIRST ISSUE

VERSION	DATE	REVISED PAGE NO.	**SUMMARY**
0	2023/03/21		First issue
A	2023/05/05		Correct Pixel pitch
B	2023/06/14		Modify Backlight Type ,Power Sequence & Definition of Color of CIE Coordinate and NTSC Ratio
C	2023/07/14		Modify Driver IC & Surface

Contents

1.Module Classification Information

W	F	101	N	T	Y	A	4	L	N	N	0	#000
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：10.1” 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:		
⑨	D: Digital L：LVDS M:MIPI		
⑩	Interface:		
⑪	TS:		
⑫	Version: X:Raspberry pi		
⑬	Special Code	#:Fit in with ROHS directive regulations 00：Sales code 0：Version	

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

N	Without control board	A	8Bit	B	16Bit	H	HDMI
I	I2C Interface	R	RS232	S	SPI Interface	U	USB

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		

2.Summary

TFT 10.1" is a color active matrix TFT LCD using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices. This module has a 10.1 inch diagonally measured active area with WUXGA resolutions (1920 horizontal by 1200 vertical pixel array). Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.

3.General Specifications

Item	Dimension	Unit
Size	10.1	inch
Dot Matrix	1920(H) X RGB X 1200(V)	dots
Module dimension	231.40 x152.3 x 9.1 Max	mm
Active area	216.8064(H) x 135.504(V)	mm
Pixel pitch	0.11292(H) x 0.11292(V)	mm
LCD type	TFT, Normally Black, Transmissive	
Interface	2ch-LVDS	
Driver IC	FL5893DA or equivalent	
Viewing Angle	80/80/80/80	
Aspect Ratio	16:10	
Backlight Type	Normally White (Blue LED with QD)	
With /Without TP	Without TP	
Surface	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	℃
Storage Temperature	TST	-30	—	+80	℃

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

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

5.Electrical Characteristics

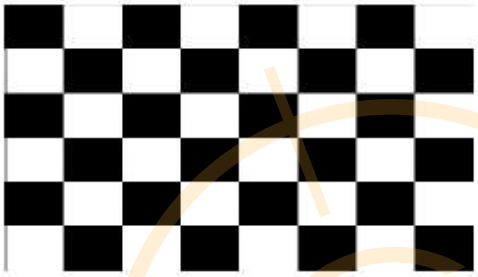
5.1. Typical Operation Conditions (At Ta = 25 °C,)

Item	Symbol	Min	Typ.	Max.	Unit	Unit
Power Supply Voltage	VDDIN	3.0	3.3	3.6	V	
	VRP	-	-	300	mV	Ripple
Power Supply Current	IDD	-	300	360	mA	Note 1
Power Consumption	PLCD	-	1	1.2	W	
Rush current	IRUSH	-	-	3.0	A	Note 2

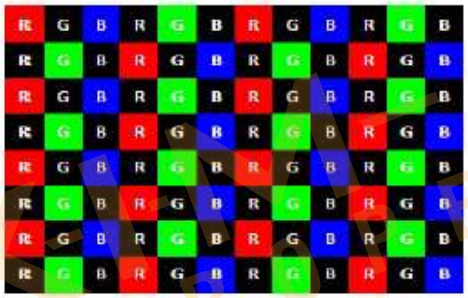
Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.

The current draw and power consumption specified is for VDDIN=3.3V, Frame rate fV=60Hz and Clock frequency = 80MHz. Test Pattern of power supply current

a) Typ : Mosaic 8 x 6 Pattern(L0/L255)



b) Max : skip subPixel(L255)

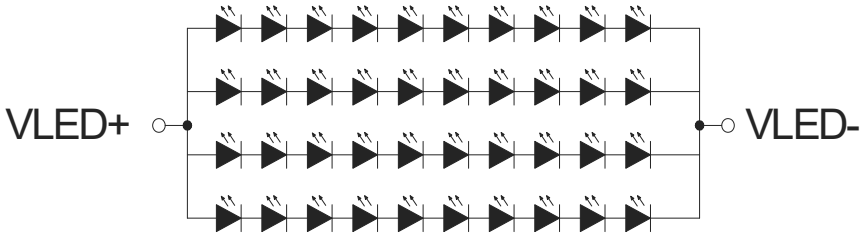


2. The duration of rush current is about 2ms and rising time of Power Input is 1ms(min)

5.2. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Note
Supply voltage of LED backlight	VL	26.0	29.0	33.0	V	Note 1
Current for LED backlight	IL	-	200	-	mA	
LED life time	-	50,000	-	-	Hr	Note2

Note 1 : There are 1 Groups LED



CIRCUIT DIAGRAM(LED 4*10=40 DIES)

Note 2 : Ta = 25 ℃
Note 3 : Brightness to be decreased to 50% of the initial value
Note 4 : The single LED lamp case

6.Interface timing Parameter and AC/DC Parameter

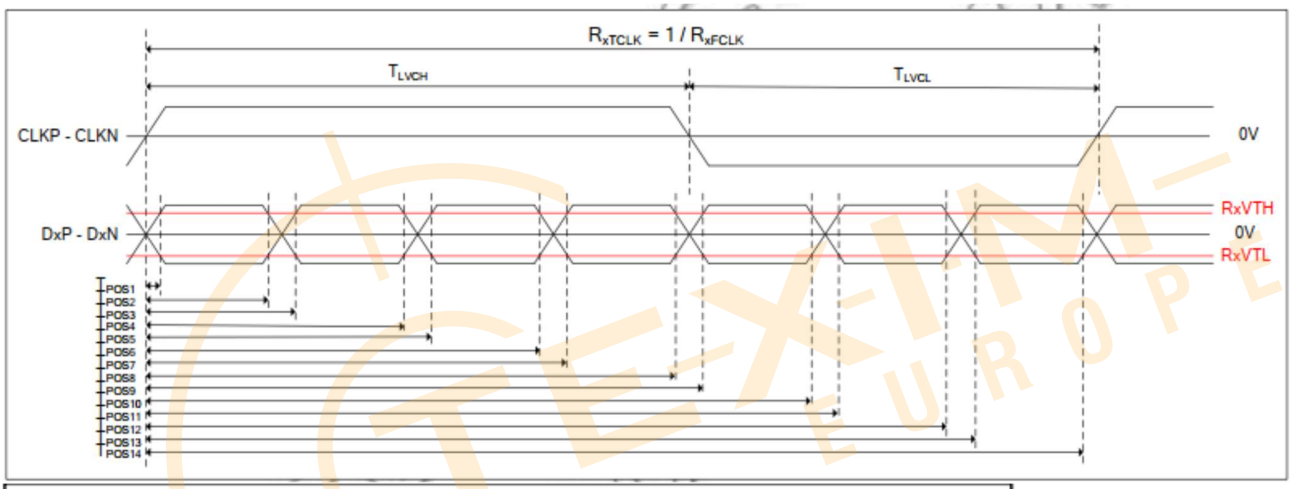
The 10.1” is operated by the DE only

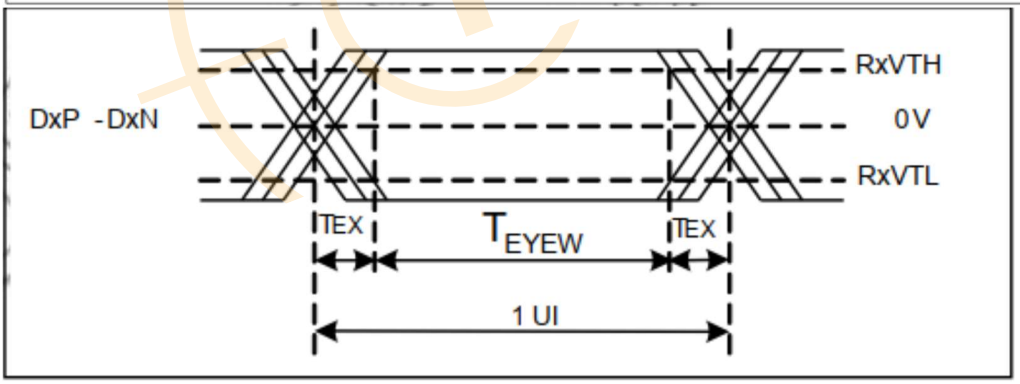
Table1. LVDS Timing Parameter

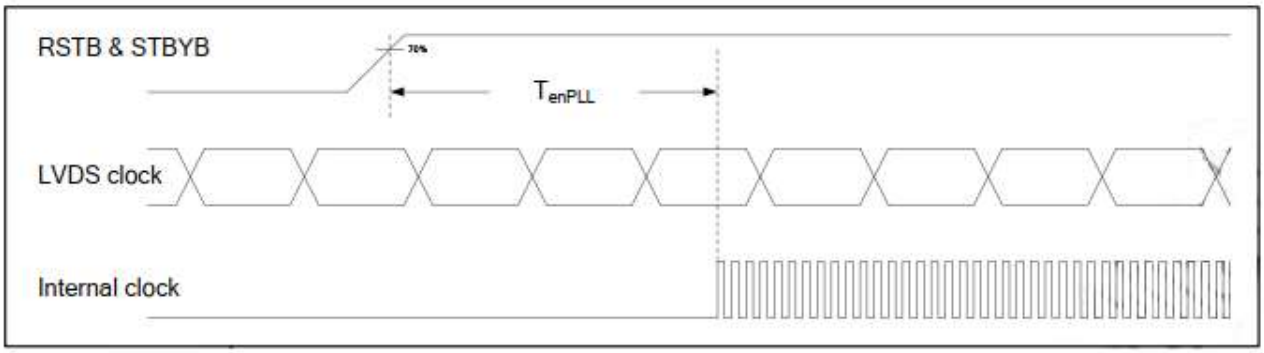
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK Frequency	Fdclk	74.5	77.56	85	MHz
Horizontal display area	Thd		960		DCLK
HSYNC period time	Th	989	1040	1248	DCLK
Horizontal Blank	THB	29	80	288	DCLK
HSYNC pulse width	Thp	2	10	255	DCLK
HSYNC back porch	thbp	3	6	255	DCLK
HSYNC Front porch	thfp	24	64	260	DCLK
Vertical display area	Tvd		1200		H
VSYNC period time	Tv	1243	1243	1560	H
Vertical Blank	TVB	43	43	360	H
VSYNC Pluse width	Tvp	4	4	20	H
VSYNC back porch	Tvbp	20	20	255	H
VSYNC front porch	Tvfp	19	19	260	H
Frequency	fV	-	60	-	Hz

<Table 2. LVDS AC Timing Specification>

Item	Signal	Symbol	Rating			Unit
			Min.	Typ.	Max.	
Clock Frequency	CLK	R_{xFCLK}	20	-	100	MHz
Clock Period		R_{xTCLK}	10	-	50	ns
1 data bit time		UI	-	1/7	-	R_{xTCLK}
Clock high time	CLK	T_{LVCH}		4		UI
Clock low time		T_{LVCL}		3		UI
Position 1	DATA	T_{POS1}	-0.25	0	0.25	UI
Position 2		T_{POS2}	0.75	-	1.25	
Position 3		T_{POS3}	0.75	1	1.25	
Position 4		T_{POS4}	1.75	-	2.25	
Position 5		T_{POS5}	1.75	2	2.25	
Position 6		T_{POS6}	2.75	-	3.25	
Position 7		T_{POS7}	2.75	3	3.25	
Position 8		T_{POS8}	3.75	-	4.25	
Position 9		T_{POS9}	3.75	4	4.25	
Position 10		T_{POS10}	4.75	-	5.25	
Position 11		T_{POS11}	4.75	5	5.25	
Position 12		T_{POS12}	5.75	-	6.25	
Position 13		T_{POS13}	5.75	6	6.25	
Position 14		T_{POS14}	6.75	-	7.25	
Input eye width		T_{EYEW}	0.5	-	-	
Input eye border		T_{EX}	-	-	0.25	
PLL wake-up time		TenPLL	-	-	150	us





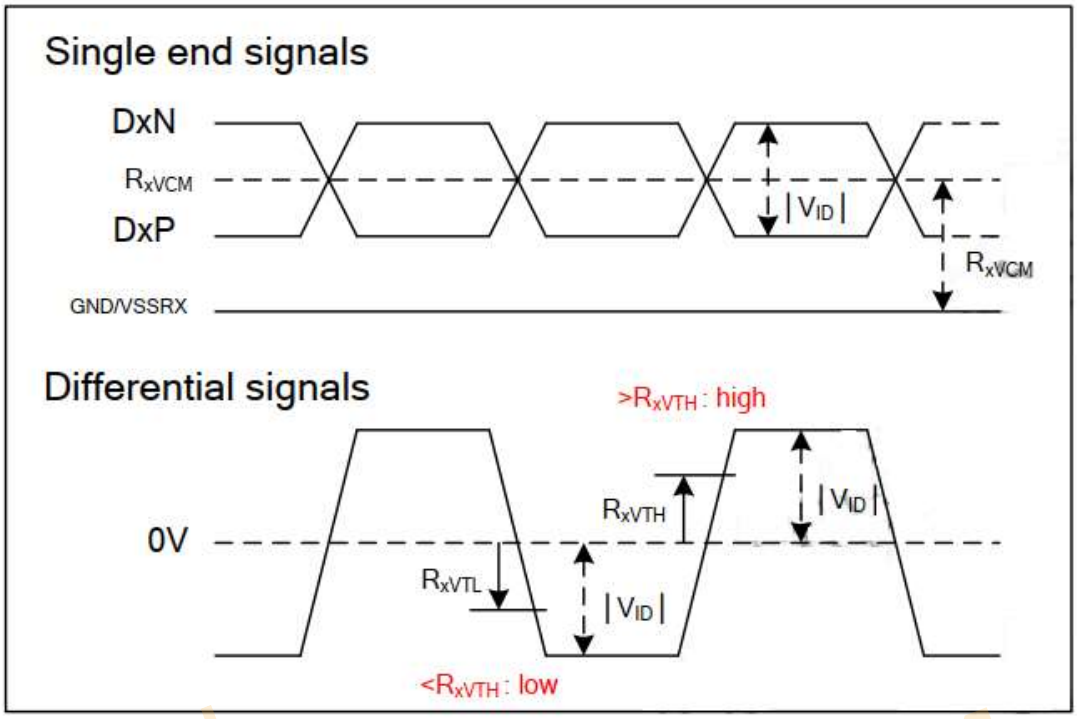


<Table 3. LVDS DC Timing Specification>

VSSI = VSSRX = VSSP = 0V; Temp = Ta;

Item	Symbol	Condition	Rating			Unit	Applicable Pin
			Min.	Typ.	Max.		
Operating Voltage	VDDI	External Supply	3.0	3.3	3.6	V	VDDI
Operating Voltage	VDDRX	External Supply	3.0.	3.3	3.6	V	VDDRX
Operating Voltage	VDDP	External Supply	3.0	3.3	3.6	V	VDDP
Operating Voltage	VDD_PFM	External Supply	3.0	3.3	3.6	V	VDD_PFM
Operating Voltage	VDD_OTP	External Supply	8.0	8.25	8.5	V	VDD_OTP
Operating Voltage	VSP	External Supply	5	-	6.4	V	VSP
Operating Voltage	VSN	External Supply	-6.4	-	-5	V	VSN
Operating Voltage	V15D	Built-in Power Supply		1.5		V	V15D
Operating Voltage	V15D_RX	Built-in Power Supply		1.5		V	V15D_RX
Operating Voltage	VRSP	Built-in Power Supply	4.5	-	6.0	V	VRSP
Operating Voltage	VRSN	Built-in Power Supply	-6.0	-	-4.5	V	VRSN
Operating Voltage	VRNL	Built-in Power Supply		-2.5		V	VRNL
Operating Voltage	VGMPHO	Built-in Power Supply	4.3	-	5.8	V	VGMPHO
Operating Voltage	VGMPMO	Built-in Power Supply	2.2		3.7	V	VGMPMO
Operating Voltage	VGMPLO	Built-in Power Supply	0.1	-	1.6	V	VGMPLO
Operating Voltage	VGMNHO	Built-in Power Supply	-5.8	-	-4.3	V	VGMNHO
Operating Voltage	VGMNMO	Built-in Power Supply	-3.7		-2.2	V	VGMNMO
Operating Voltage	VGMNLO	Built-in Power Supply	-1.6	-	-0.1	V	VGMNLO
Operating Voltage	VGH	Built-in Power Supply	7		22.5	V	VGH
Operating Voltage	VGL	Built-in Power Supply	-14.5	-	-7.5	V	VGL
Operating Voltage	VCOM	Built-in Power Supply	-1.80	-	0.75	V	VCOM
Input High-level Voltage	V_{IH}		0.8 VDDI	—	VDDI	V	SPI Interface
Input Low-level Voltage	V_{IL}		VSS	—	0.2 VDDI	V	SPI Interface
Output High-level Voltage	V_{OH}	VDDI=3.0V, IOL=1mA	0.8 VDDI	—	VDDI	V	SPI Interface
Output Low-level Voltage	V_{OL}	VDDI=3.0V, IOL=1mA	VSS	—	0.2 VDDI	V	SPI Interface
Input Leakage Current	I_{LI}	VIN=VDDI or DGND	-1.0	—	1.0	μA	SPI Interface
Differential Input high threshold voltage	R_{VITH}	RxVCM=1.2V (Note1)			0.1	V	LVDS Interface
Differential Input low threshold voltage	R_{VITL}		-0.1			V	LVDS Interface
Input voltage range (singled-end)	R_{VIN}	(Note1)	0		VDD-1.0	V	LVDS Interface
Differential Input common mode voltage	R_{VICM}	(Note1)	0.6	1.2	2.4-|VID|/2	V	LVDS Interface
Differential Input voltage	|VID|	(Note1)	0.2	0.4	0.6	V	LVDS Interface
Differential Input leakage current	RV_{ID}	(Note1)	-10		10	uA	LVDS Interface
Output Voltage Deviation	ΔVS	Ta=25°C	—	TBD	TBD	mV	Source Pad

<Table 4. LVDS DC Timing Specification>

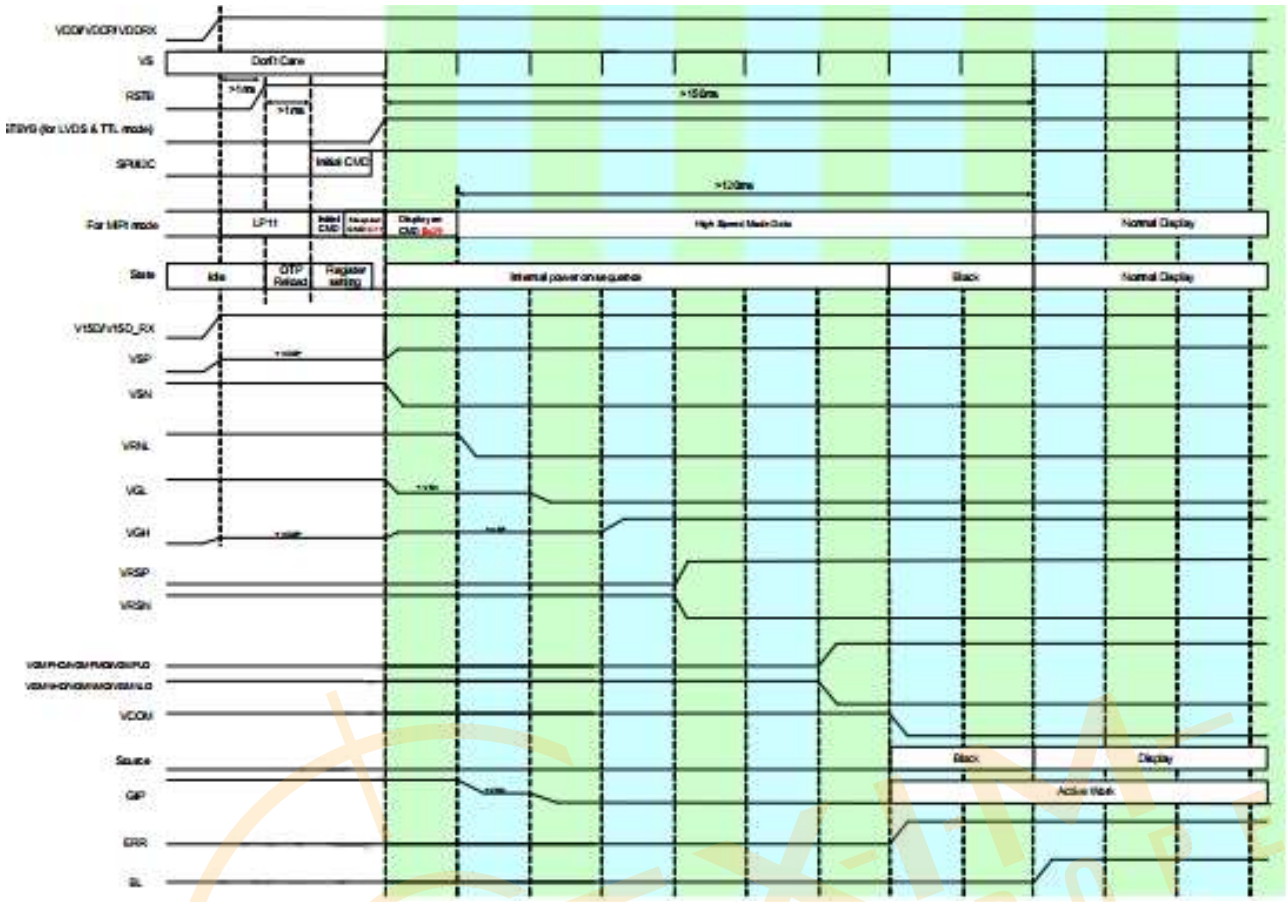


The current consumed by whole IC (bare die) with internal power system:

Item	Symbol	Condition	Rating			Unit
			Min.	Typ.	Max.	
Display Current (Digital)	IDDIO	TBD	–	TBD	–	µA
Display Current (Analog)	IDDP			TBD		
Standby	ISS	VDD_PFM=VDDRX=VDDP=VDDI=3.3V, Internal Power, During Ta temperature	–	TBD	–	µA

Note: The current is DC characteristic of a "Bare Chip".

7.Power Sequence



8.Optical Characteristics

Item		Symbol	Condition.	Min	Typ.	Max.	Unit	Remark
Response time		Tr+Tf	θ=0°、Φ=0°	-	30	35	.ms	Note 3
Contrast ratio		CR	At optimized viewing angle	700	900	-	-	Note 4
Color Chromaticity	White	Wx	θ=0°、Φ=0	0.235	0.285	0.335	-	Note 2,6,7
		Wy		0.277	0.327	0.377	-	
Viewing angle	Hor.	ΘR	CR≧10	70	80	-	Deg.	Note 1
		ΘL		70	80	-		
	Ver.	ΦT		70	80	-		
		ΦB		70	80	-		
Brightness		-	-	400	500	-	cd/m2	Center of display
Uniformity		(U)	-	70	-	-	%	Note 5
NTSC Ratio		NTSC	-	100	-	120	%	Note 8

Ta=25±2℃

Note 1: Definition of viewing angle range

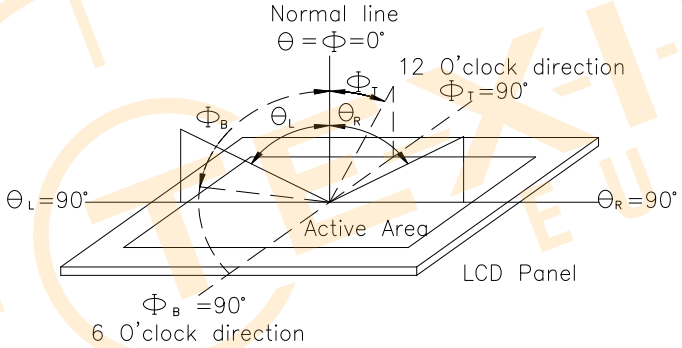


Fig. 8.1. Definition of viewing angle

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

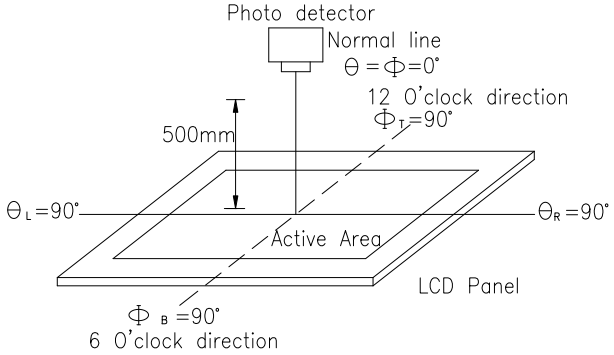
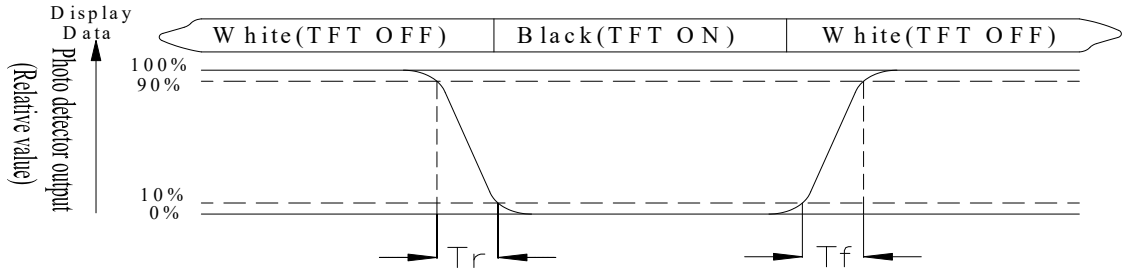


Fig. 8.2. Optical measurement system setup

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, Tr, is the time between photo detector output intensity changed from 90%to 10%. And fall time, Tf, 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) = Lmin/Lmax x100%
L = Active area length
W = Active area width

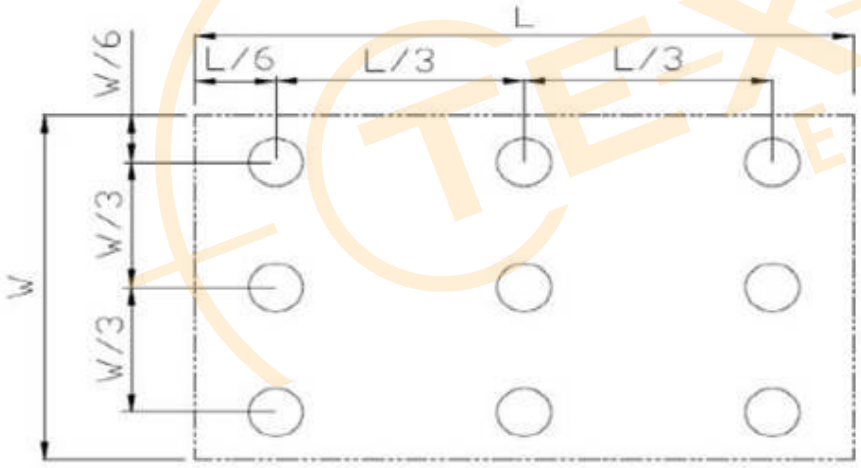


Fig 8.3. Definition of uniformity

Note 6: Definition of color chromaticity (CIE 1931)
Color coordinates measured at the center point of LCD

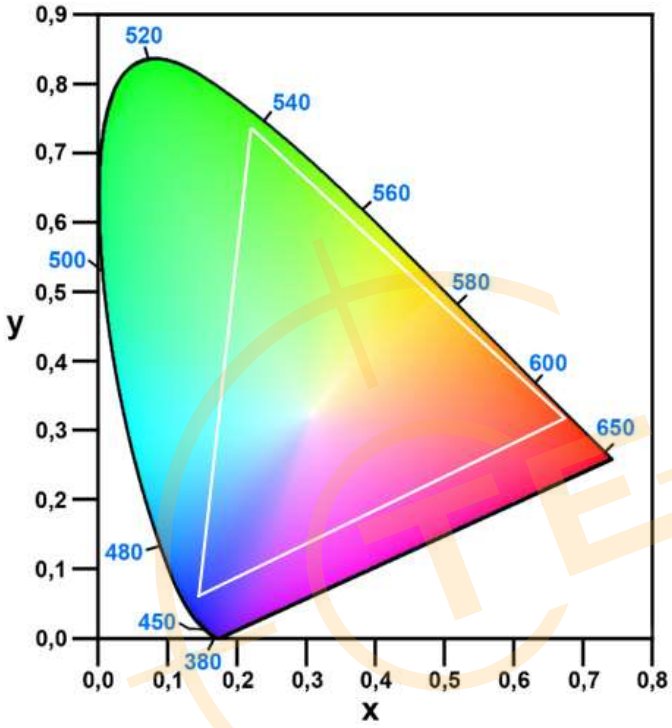
Note 7: Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8: Definition of Color of CIE Coordinate and NTSC Ratio

$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \text{ X } 100\%$$

NTSC Ratio= 111.02%

	x	y
R	0.686	0.306
G	0.221	0.738
B	0.146	0.053



9.Interface

9.1. TFT LCD MODULE

Pin No.	Symbol	Description
1-5	NC	No connection
6	GND	Ground
7	ELV3P	EVEN LVDS Positive data signal (+)
8	ELV3N	EVEN LVDS Negative data signal (-)
9	GND	Ground
10	ELV2P	EVEN LVDS Positive data signal (+)
11	ELV2N	EVEN LVDS Negative data signal (-)
12	GND	Ground
13	ELVCLKP	EVEN LVDS Positive CLK signal (+)
14	ELVCLKN	EVEN LVDS Negative CLK signal (-)
15	GND	Ground
16	ELV1P	EVEN LVDS Positive data signal (+)
17	ELV1N	EVEN LVDS Negative data signal (-)
18	GND	Ground
19	ELV0P	EVEN LVDS Positive data signal (+)
20	ELV0N	EVEN LVDS Negative data signal (-)
21	GND	Ground
22	OLV3P	Odd LVDS Positive data signal (+)
23	OLV3N	Odd LVDS Negative data signal (-)
24	GND	Ground
25	OLV2P	Odd LVDS Positive data signal (+)
26	OLV2N	Odd LVDS Negative data signal (-)
27	GND	Ground
28	OLVCLKP	Odd LVDS Positive CLK signal (+)
29	OLVCLKN	Odd LVDS Negative CLK signal (-)
30	GND	Ground
31	OLV1P	Odd LVDS Positive data signal (+)
32	OLV1N	Odd LVDS Negative data signal (-)
33	GND	Ground
34	OLV0P	Odd LVDS Positive data signal (+)

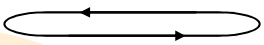
35	OLV0N	Odd LVDS Negative data signal (-)
36	GND	Ground
37 -39	NC	No connection (PIN39 and PIN40 cannot be short-circuited together)
40	NC	No connection alone
41-45	VDDIN	Power supply VDDIN=3.3V (Typ.)

9.2. Backlight PIN Definition

Pin No.	Symbol	Description
1	VLED+	Red, LED_ Anode
2	VLED-	Black, LED_ Cathode

10.Reliability

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

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℃ 200hrs	2
Low Temperature storage	Endurance test applying the low storage temperature for a long time.	-30℃ 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℃ 200hrs	——
Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 200hrs	1
High Temperature/ Humidity Operation	The module should be allowed to stand at 60℃,90%RH max	60℃,90%RH 96hrs	1,2
Thermal shock resistance	The sample should be allowed stand the following 10 cycles of operation -20℃ 25℃ 70℃  30min 5min 30min 1 cycle	-20℃/70℃ 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=±6KV(contact), ±8KV(air), RS=330Ω CS=150pF 10 times	4

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.

Note4: Temporary degradation or loss in operation or function, which is able to be recovered by self-recovery function.

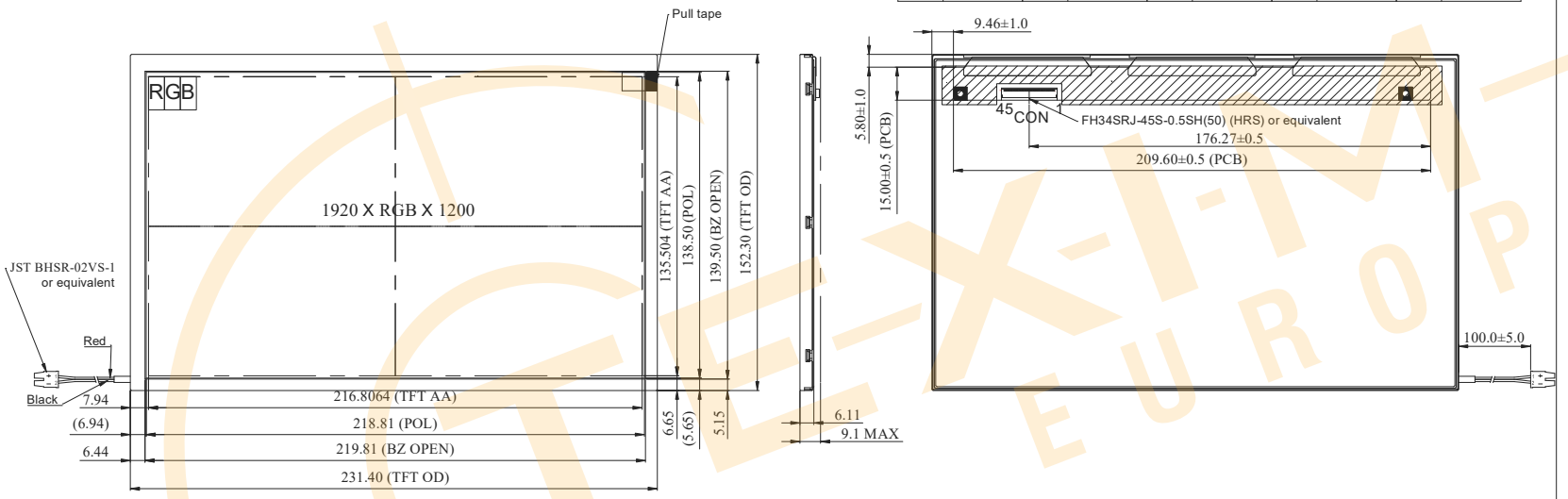
11.Contour Drawing

BL

PIN NO.	SYMBOL
1	VLED+
2	VLED-

CON

PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL	PIN NO.	SYMBOL
1	NC	11	ELV2N	21	GND	31	OLV1P	41	VDDIN
2	NC	12	GND	22	OLV3P	32	OLV1N	42	VDDIN
3	NC	13	ELVCLKP	23	OLV3N	33	GND	43	VDDIN
4	NC	14	ELVCLKN	24	GND	34	OLV0P	44	VDDIN
5	NC	15	GND	25	OLV2P	35	OLV0N	45	VDDIN
6	GND	16	ELV1P	26	OLV2N	36	GND		
7	ELV3P	17	ELV1N	27	GND	37	NC		
8	ELV3N	18	GND	28	OLVCLKP	38	NC		
9	GND	19	ELV0P	29	OLVCLKN	39	NC		
10	ELV2P	20	ELV0N	30	GND	40	NC		



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 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 , _____

>> **Go to page 2** <<

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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Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

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