PRODUCT SPECIFICATION

3.8” TN TFT LCD MODULE
MODEL: YDP LCD TN 12 380 R

ROHS

< ◇> Preliminary Specification

< ◆> Finally Specification

CUSTOMER’S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY

knitter-switch

Revision History

Revision	Date	Originator	Detail	Remarks
1.0	2016.01.06	ZFY	Initial Release	
1.1	2018.04.23	ZDT	Add LED working life Modify many details	P5 P31-P32
1.2	2018.10.17	ZDT	Add weight Modify Optical Characteristics	P4 P6

Table of Contents

1. General Description

The specification is a transmissive type color active matrix liquid crystal display (LCD) which uses amorphous thin film transistor (TFT) as switching devices. This product is composed of a TFT-LCD panel, driver Ics I and a backlight unit.

2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	3.8”	
LCD type	TN TFT	
Display Mode	Transmissive /normally white	
Resolution	240 RGB x 320	Pixels
View Direction	12 O’CLOCK	Best Image
Gray Scale Inversion direction	6 O’CLOCK	
Module Outline	70.9(H) x 92 (V) x 3.25 (T) (Note1)	mm
Active Area	57.6(H) x 76.8(V)	mm
Pixel Size	240(H) x240(V)	um
Pixel Arrangement	R.G.B Vertical Stripe	
Display Colors	262K	
Interface	18-bit RGB Interface + 3-wire 9bit data serial interface Ⅱ	
Driver IC	ILI9341V	-
With or Without Touch Panel	Without	
Operating Temperature	**-20～70**	ºC
Storage Temperature	**-30～80**	ºC
Weight	37	g

Note 1: Exclusive hooks, posts, FFC/FPC tail etc.

3. Absolute Maximum Ratings

V_{SS}=0V, Ta=25ºC

Item		Symbol	Min.	Max.	Unit
Supply Voltage	Digital	IOVCC	-0.3	4.6	V
	Analog	VCI	-0.3	4.6	V
Storage temperature		T_{stg}	-30	+80	ºC
Operating temperature		T_{op}	-20	+70	ºC

Note 1: If Ta below 50ºC, the maximal humidity is 90%RH, if Ta over 50ºC, absolute humidity should be less than 60%RH.

Note 2: The response time will be extremely slow when the operating temperature is around -10℃, and the back ground will become darker at high temperature operating.

4. DC Characteristics

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	Digital	IOVCC	1.65	1.8	3.3	V
	Analog	VCI	2.5	2.8	3.3	V
Logic Low input voltage		V_{IL}	0	-	0.3*IOVCC	V
Logic High input voltage		V_{IH}	0.7* IOVCC	-	IOVCC	V
Logic Low output voltage		V_{OL}	0	-	0.2* IOVCC	V
Logic High output voltage		V_{OH}	0.8* IOVCC	-	IOVCC	V
Current Consumption All Black	Logic	I_{CC+} I_{IN}	-	20	-	mA
	Analog					

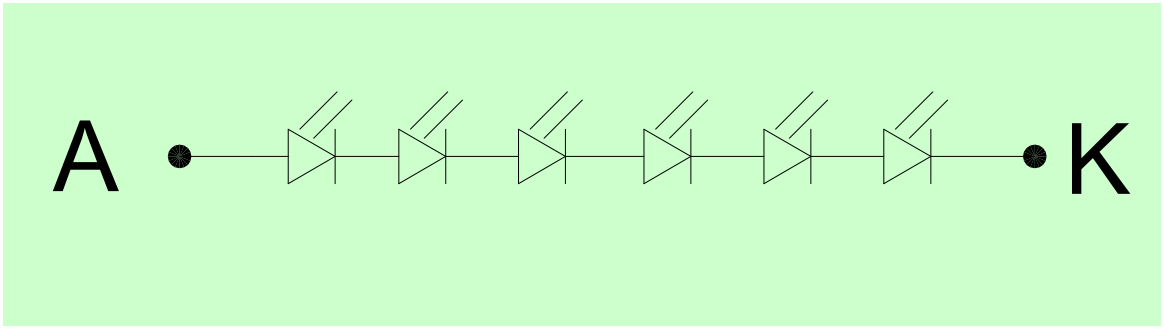
5. Backlight Characteristic

5.1. Backlight Characteristic

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V_F	Ta=25 ºC, I_F=20mA/LED	16.8	19.2	20.4	V
Forward Current	I_F	Ta=25 ºC, V_F=3.2V/LED	-	20		mA
Power dissipation	Pd		-	384	-	mW
Uniformity	Avg		-	80	-	%
LED working life(25℃)	-		-	30,000	-	Hrs
Drive method	Constant current					
LED Configuration	6 White LEDs in series					

Note1：LED life time defined as follows: The final brightness is at 50% of original brightness.
The environmental conducted under ambient air flow, at Ta=25±2 ºC,60%RH±5%, I_F=20mA/LED.

5.2. Backlighting circuit



6. Touch Screen Panel Specifications

Without touch panel

7. Optical Characteristics

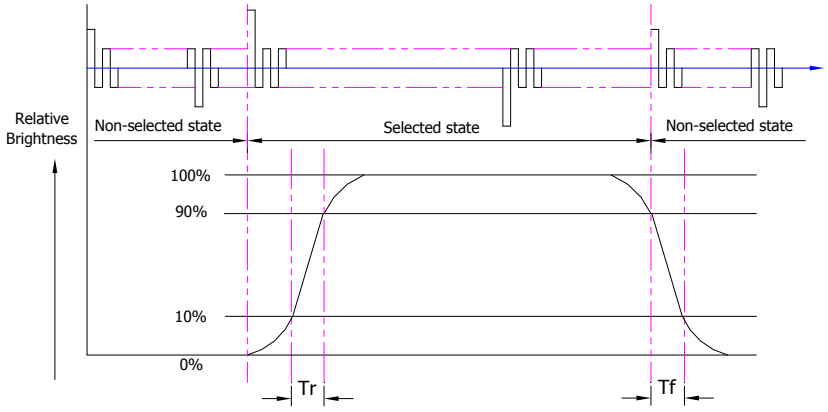
7.1. Optical Characteristics

Ta=25ºC, VDD=2.8V

	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
Backlight On (Transmissive Mode)	Luminance on TFT(I_f =20mA/LED)		Lv	Normally viewing angle θX = φY =0º	280	360	-	cd/m²
	Contrast ratio(See 7.4)		CR		250	350	-	
	Response time (See 7.3)		(TR+TF)/2		24	30	-	ms
	Chromaticity Transmissive (See 7.6)	Red	XR		0.582	**0.632**	0.682	
			YR		0.307	**0.357**	0.407	
		Green	XG		0.278	**0.328**	0.378	
			YG		0.560	**0.610**	0.660	
		Blue	XB		0.096	**0.146**	0.196	
			YB		0.055	**0.105**	0.155	
		White	XW		0.247	**0.297**	0.347	
			YW		0.274	**0.344**	0.374	
	Viewing Angle (See 7.5)	Horizontal	θX+	Center CR≥10	-	60	-	Deg.
			θX-		-	60	-	
		Vertical	φY+		-	40	-	
			φY-		-	60	-	
	NTSC Ratio(Gamut)				-	58.2	-	%

7.2. Definition of Response Time

7.2.1. Normally Black Type (Negative)



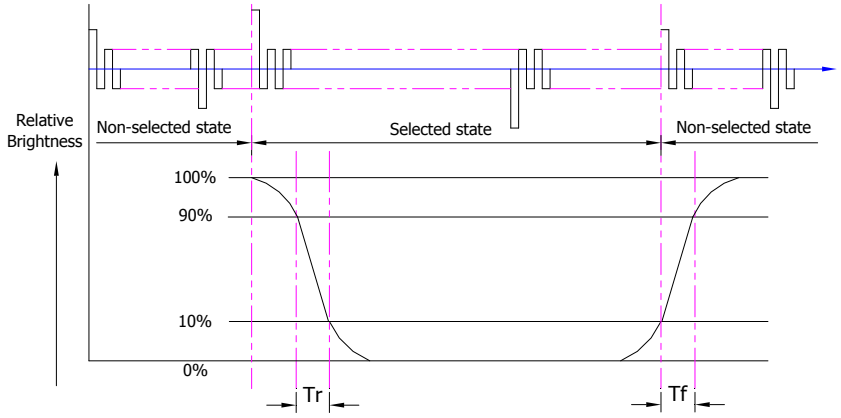
Tr is the time it takes to change form non-selected stage with relative luminance 10% to selected state with relative luminance 90%;

Tf is the time it takes to change from selected state with relative luminance 90% to

non-selected state with relative luminance 10%.

Note: Measuring machine: LCD-5100

7.2.2. Normally White Type (Positive)



Tr is the time it takes to change form non-selected stage with relative luminance 90% to selected state with relative luminance 10%;

Tf is the time it takes to change from selected state with relative luminance 10% to non-selected state with relative luminance 90%;

Note: Measuring machine: LCD-5100 or EQUI

7.3. Definition of Contrast Ratio

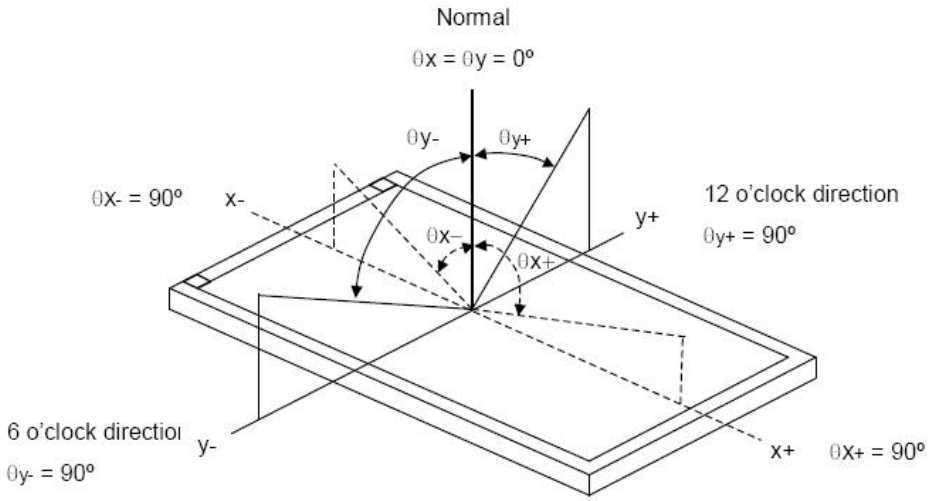
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	3mm//1mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

Definitions: CR (Contrast) = Luminance of White Pixel / Luminance of Black Pixel

7.4. Definition of Viewing Angles



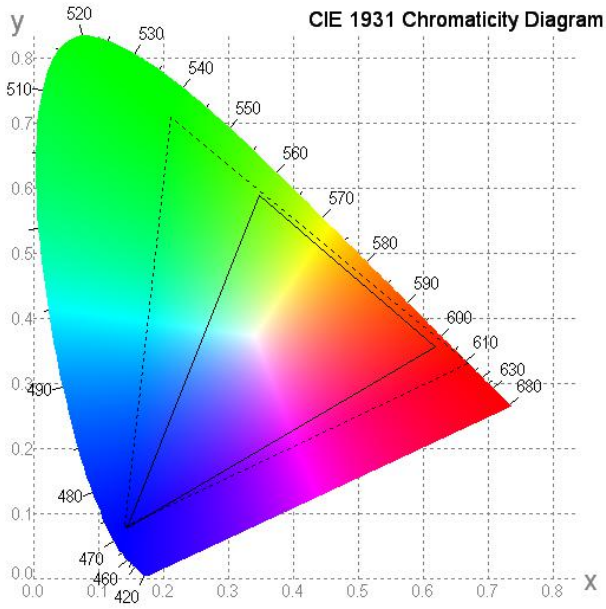
Measuring machine: LCD-5100 or EQUI

7.5. Definition of Color Appearance

R,G,B and W are defined by (x, y) on the IE chromaticity diagram

NTSC=area of RGB triangle/area of NTSC triangleX100%

Measuring picture: Red, Green, Blue and White (Measuring machine: BM-7)



7.6. Definition of Surface Luminance, Uniformity and Transmittance

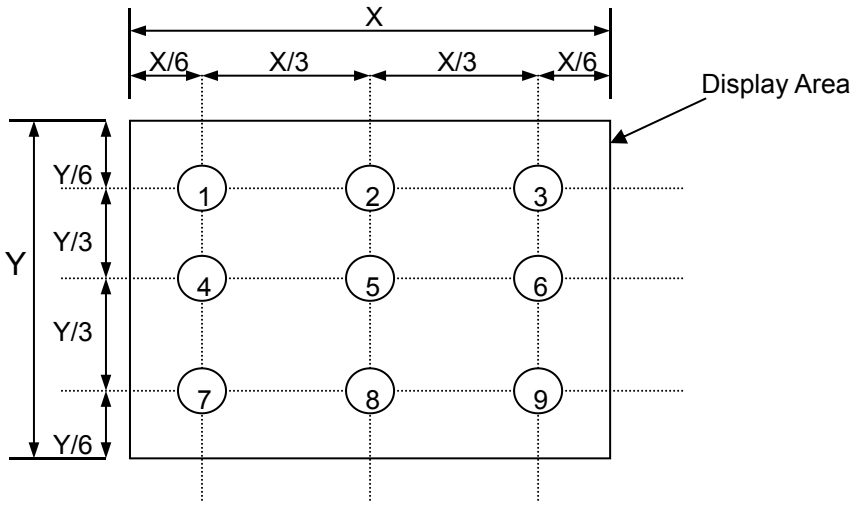
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

7.6.1. Surface Luminance: L_V = average (L_{P1}:L_{P9})

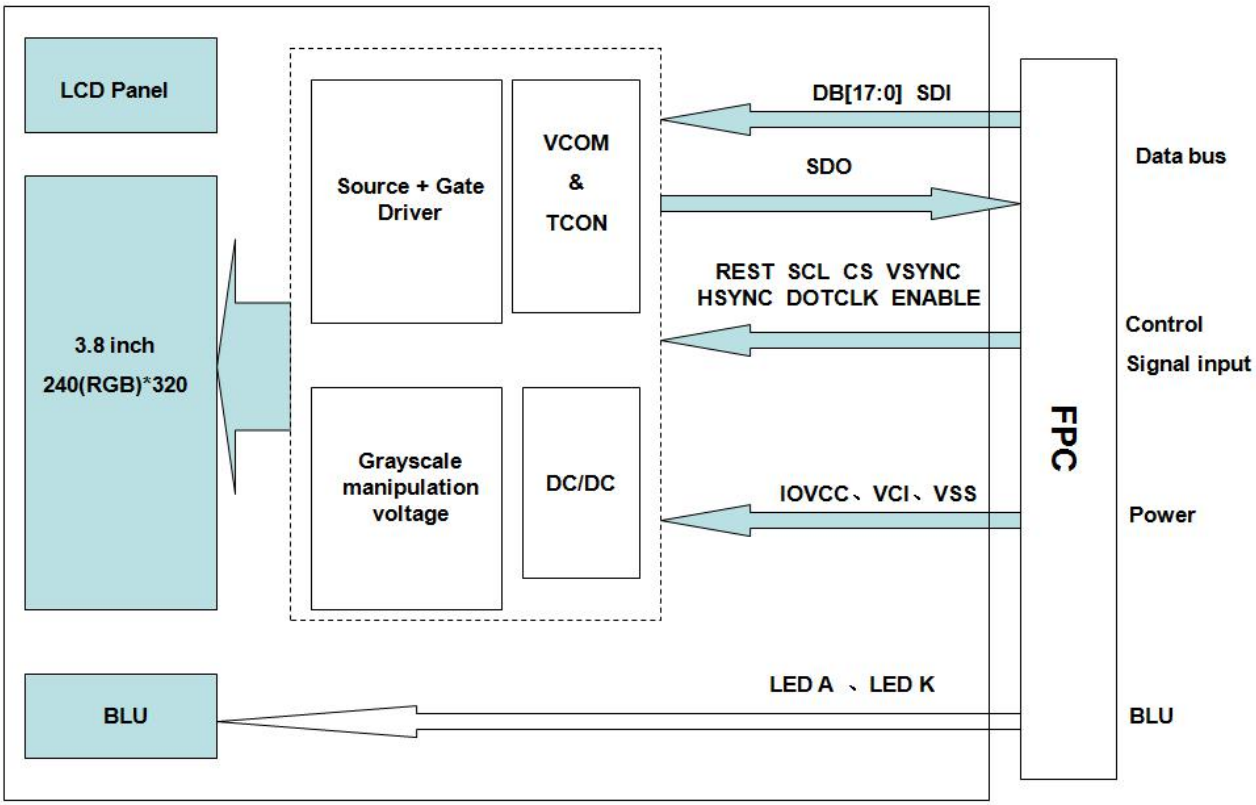
7.6.2. Uniformity = Minimal (L_{P1}:L_{P9}) / Maximal (L_{P1}:L_{P9}) * 100%

7.6.3. Transmittance = L_V on LCD / L_V on Backlight * 100%

Note: Measuring machine: BM-7



8. Block Diagram and Power Supply

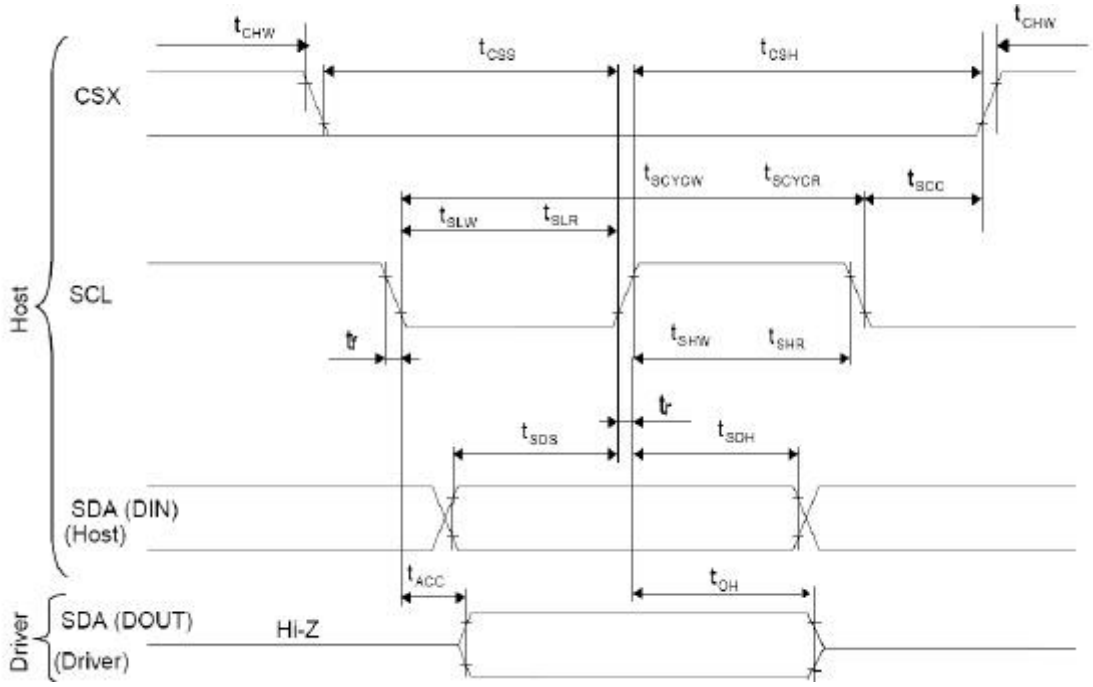


9. Interface Pins Definition

No.	Symbol	Function	Remark
1	NC/TP_R	No connection	
2	NC/TP_U	No connection	
3	NC/TP_L	No connection	
4	NC/TP_B	No connection	
5	VSS	Ground.	
6	VCI	Analog Voltage.	
7	IOVCC	Digital Voltage.	
8	VSS	Ground.	
9	REST	Reset pin.	
10 ~ 27	DB17 ~ DB0	Data bus 17~0.	
28	SCL	This pin is used as the serial interface clock in 3-wire9-bit serial data interface Ⅱ	
29	CS	Chip select signal.	
30	TE	Tearing effect output.	
31	VSYNC	Frame synchronizing signal.	
32	HSYNC	Line synchronizing signal.	
33	DOTCLK	Dot clock signal.	
34	ENABLE	A data ENABLE signal in RGB I/F mode.	
35	SDO	Serial data output.	
36	SDI	Serial data input.	
37	NC	No connection.	
38	VSS	Ground.	
39	LED A	Backlight LED Anode.	
40	LED K	Backlight LED Cathode.	

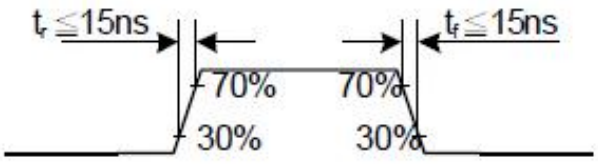
10. AC Characteristics

10.1. Display Serial Interface Timing Characteristics (3-line SPI system)

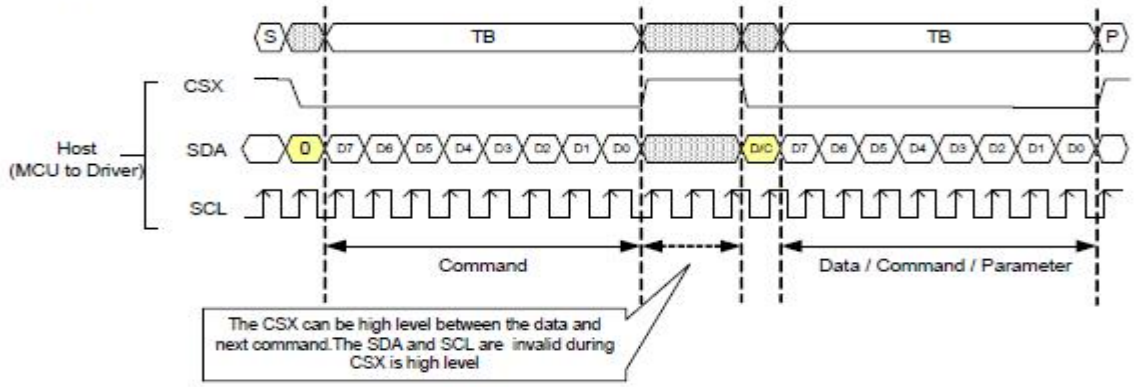


Signal	Symbol	Parameter	min	max	Unit	Description
SCL	tscycw	Serial Clock Cycle (Write)	100	-	ns	
	tshw	SCL "H" Pulse Width (Write)	40	-	ns	
	tslw	SCL "L" Pulse Width (Write)	40	-	ns	
	tscycr	Serial Clock Cycle (Read)	150	-	ns	
	tshr	SCL "H" Pulse Width (Read)	60	-	ns	
	tslr	SCL "L" Pulse Width (Read)	60	-	ns	
SDA / SDI (Input)	tsds	Data setup time (Write)	30	-	ns	
	tsdh	Data hold time (Write)	30	-	ns	
SDA / SDO (Output)	tacc	Access time (Read)	10	-	ns	
	toh	Output disable time (Read)	10	50	ns	
CSX	tscc	SCL-CSX	20	-	ns	
	tchw	CSX "H" Pulse Width	40	-	ns	
	tcss	CSX-SCL Time	60	-	ns	
	tcsh		65	-	ns	

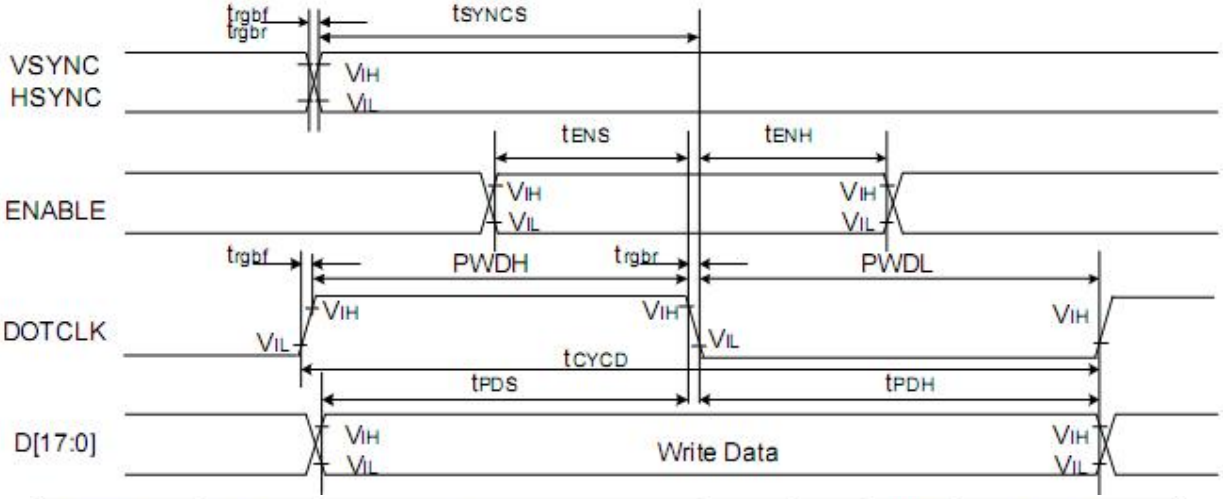
Note: Ta = 25 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



3-line Serial Interface Protocol

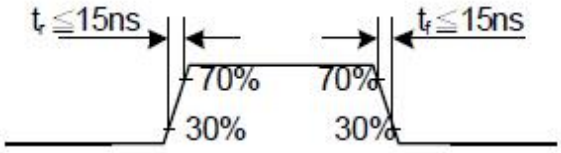


10.2. Parallel 18-bit RGB Interface Timing Characteristics

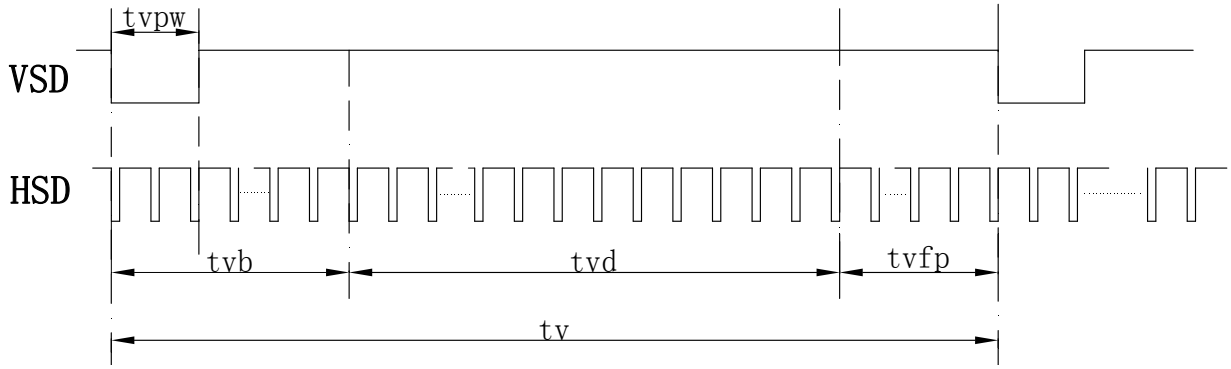


Signal	Symbol	Parameter	min	max	Unit	Description
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	18/16-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level period	15	-	ns	
	PWDL	DOTCLK low-level period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	100	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	
VSYNC / HSYNC	t_{SYNCS}	VSYNC/HSYNC setup time	15	-	ns	6-bit bus RGB interface mode
	t_{SYNCH}	VSYNC/HSYNC hold time	15	-	ns	
DE	t_{ENS}	DE setup time	15	-	ns	
	t_{ENH}	DE hold time	15	-	ns	
D[17:0]	t_{PDS}	Data setup time	15	-	ns	
	t_{PDH}	Data hold time	15	-	ns	
DOTCLK	PWDH	DOTCLK high-level pulse period	15	-	ns	
	PWDL	DOTCLK low-level pulse period	15	-	ns	
	t_{CYCD}	DOTCLK cycle time	50	-	ns	
	t_{rgbr} , t_{rgbf}	DOTCLK,HSYNC,VSYNC rise/fall time	-	15	ns	

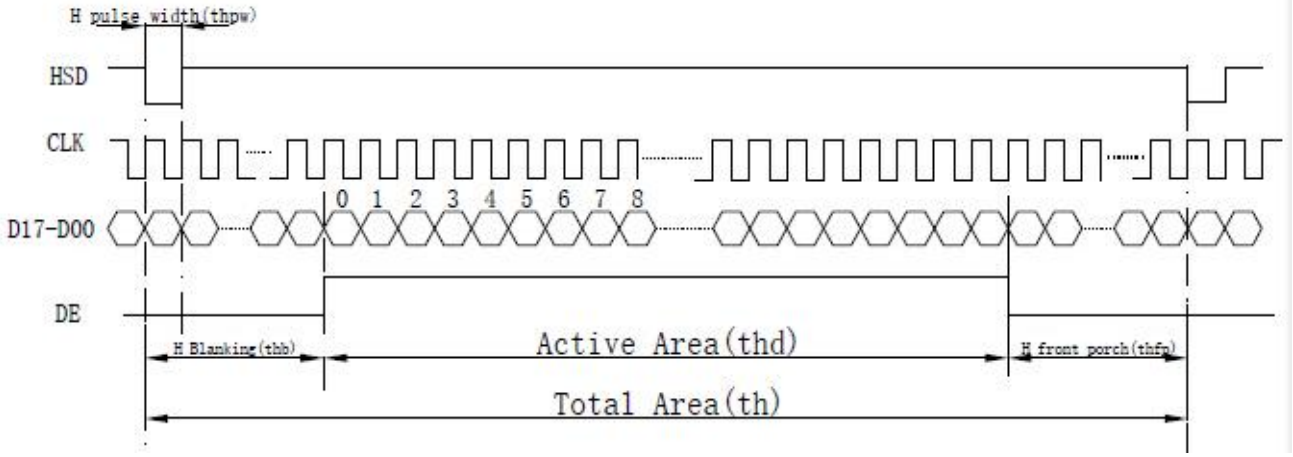
Note: Ta = -30 to 70 °C, VDDI=1.65V to 3.3V, VCI=2.5V to 3.3V, AGND=VSS=0V



Vertical input Format



Horizontal input timing



Horizontal input timing

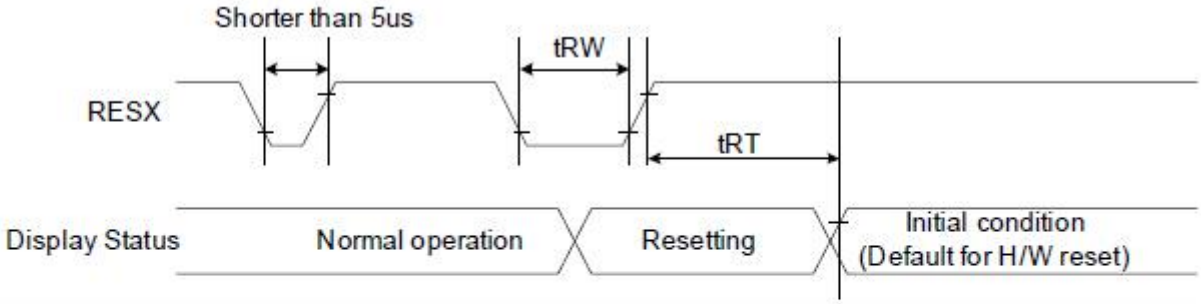
Parameter		Symbol	Value			Unit
			Min.	Typ.	Max.	
Horizontal display area		thd		240		DCLK
DCLK frequency		fclk	-	8	-	MHZ
1 Horizontal Line		th		330		DCLK
HSD pulse width	Min.	thpw		1		
	Typ.			10		
	Max.			-		
HSD Back Porch(Blanking)		thb	-	70	-	
HSD Front Porch		thfp	-	20	-	

Vertical input timing

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Vertical display area	tvd		320		H

VSD period time	tv	-	346	-	H
VSD pulse width	tvpw	-	4	-	H
VSD Back Porch(Blanking)	tvb	-	16	-	H
VSD Front Porch	tvfp	-	10	-	H

10.3. Reset Timing



Signal	Symbol	Parameter	Min	Max	Unit
RESX	tRW	Reset pulse duration	10		uS
	tRT	Reset cancel		5 (note 1,5)	mS
				120 (note 1,6,7)	mS

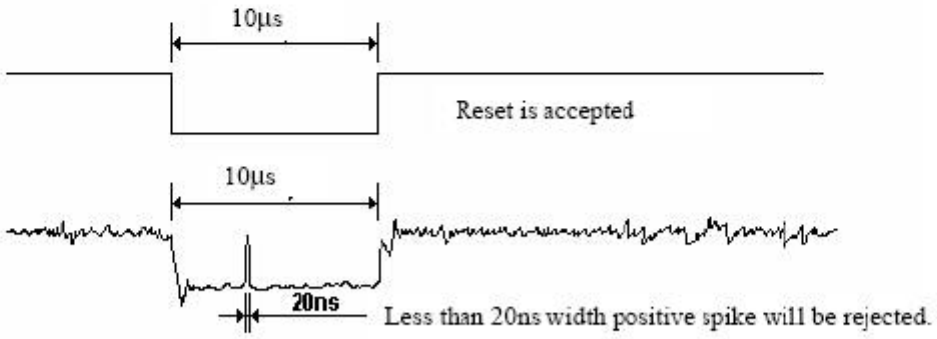
Note 1: The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NV memory to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note 2: Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below: -

RESX Pulse	Action
Shorter than 5us	Reset Rejected
Longer than 10us	Reset
Between 5us and 10us	Reset starts

Note 3: During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In -mode.) And then return to Default condition for Hardware Reset.

Note 4: Spike Rejection also applies during a valid reset pulse as shown below:



Note 5: When Reset applied during Sleep In Mode.

Note 6: When Reset applied during Sleep Out Mode.

Note 7: It is necessary to wait 5msec after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120msec.

11. Command Table

Regulative Command Set													
Command Function	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex
No Operation	0	1	↑	XX	0	0	0	0	0	0	0	0	00h
Software Reset	0	1	↑	XX	0	0	0	0	0	0	0	1	01h
Read Display Identification Information	0	1	↑	XX	0	0	0	0	0	1	0	0	04h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	ID1 [7:0]								XX
	1	↑	1	XX	ID2 [7:0]								XX
	1	↑	1	XX	ID3 [7:0]								XX
Read Display Status	0	1	↑	XX	0	0	0	0	1	0	0	1	09h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	D [31:25]							0	00
	1	↑	1	XX	0	D [22:20]			D [19:16]				61
	1	↑	1	XX	D [15]	0	D [13]	0	0	D [10:8]			00
	1	↑	1	XX	D [7:5]			D [4:1]				0	00
Read Display Power Mode	0	1	↑	XX	0	0	0	0	1	0	1	0	0Ah
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	D [7:2]						0	0	08
Read Display MADCTL	0	1	↑	XX	0	0	0	0	1	0	1	1	0Bh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	D [7:2]						0	0	00
Read Display Pixel Format	0	1	↑	XX	0	0	0	0	1	1	0	0	0Ch
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	DPI [2:0]		0	DBI [2:0]				06
Read Display Image Format	0	1	↑	XX	0	0	0	0	1	1	0	1	0Dh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	0	0	0	0	D [2:0]			00
Read Display Signal Mode	0	1	↑	XX	0	0	0	0	1	1	1	0	0Eh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	D [7:2]						0	0	00
Read Display Self-Diagnostic Result	0	1	↑	XX	0	0	0	0	1	1	1	1	0Fh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	D [7:6]		0	0	0	0	0	0	00
Enter Sleep Mode	0	1	↑	XX	0	0	0	1	0	0	0	0	10h
Sleep OUT	0	1	↑	XX	0	0	0	1	0	0	0	1	11h
Partial Mode ON	0	1	↑	XX	0	0	0	1	0	0	1	0	12h
Normal Display Mode ON	0	1	↑	XX	0	0	0	1	0	0	1	1	13h
Display Inversion OFF	0	1	↑	XX	0	0	1	0	0	0	0	0	20h
Display Inversion ON	0	1	↑	XX	0	0	1	0	0	0	0	1	21h
Gamma Set	0	1	↑	XX	0	0	1	0	0	1	1	0	26h
	1	1	↑	XX	GC [7:0]								01
Display OFF	0	1	↑	XX	0	0	1	0	1	0	0	0	28h
Display ON	0	1	↑	XX	0	0	1	0	1	0	0	1	29h
Column Address Set	0	1	↑	XX	0	0	1	0	1	0	1	0	2Ah
	1	1	↑	XX	SC [15:8]								XX
	1	1	↑	XX	SC [7:0]								XX
	1	1	↑	XX	EC [15:8]								XX
	1	1	↑	XX	EC [7:0]								XX
Page Address Set	0	1	↑	XX	0	0	1	0	1	0	1	1	2Bh
	1	1	↑	XX	SP [15:8]								XX
	1	1	↑	XX	SP [7:0]								XX
	1	1	↑	XX	EP [15:8]								XX
	1	1	↑	XX	EP [7:0]								XX

Memory Write	0	1	↑	XX	0	0	1	0	1	1	0	0	2Ch
	1	1	↑	D [17:0]									XX
Color SET	0	1	↑	XX	0	0	1	0	1	1	0	1	2Dh
	1	1	↑	XX	0	0	R00 [5:0]						XX
	1	1	↑	XX	0	0	Rnn [5:0]						XX
	1	1	↑	XX	0	0	R31 [5:0]						XX
	1	1	↑	XX	0	0	G00 [5:0]						XX
	1	1	↑	XX	0	0	Gnn [5:0]						XX
	1	1	↑	XX	0	0	G64 [5:0]						XX
	1	1	↑	XX	0	0	B00 [5:0]						XX
	1	1	↑	XX	0	0	Bnn [5:0]						XX
	1	1	↑	XX	0	0	B31 [5:0]						XX
Memory Read	0	1	↑	XX	0	0	1	0	1	1	1	0	2Eh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	D [17:0]									XX
Partial Area	0	1	↑	XX	0	0	1	1	0	0	0	0	30h
	1	1	↑	XX	SR [15:8]								00
	1	1	↑	XX	SR [7:0]								00
	1	1	↑	XX	ER [15:8]								01
	1	1	↑	XX	ER [7:0]								3F
Vertical Scrolling Definition	0	1	↑	XX	0	0	1	1	0	0	1	1	33h
	1	1	↑	XX	TFA [15:8]								00
	1	1	↑	XX	TFA [7:0]								00
	1	1	↑	XX	VSA [15:8]								01
	1	1	↑	XX	VSA [7:0]								40
	1	1	↑	XX	BFA [15:8]								00
	1	1	↑	XX	BFA [7:0]								00
Tearing Effect Line OFF	0	1	↑	XX	0	0	1	1	0	1	0	0	34h
Tearing Effect Line ON	0	1	↑	XX	0	0	1	1	0	1	0	1	35h
	1	1	↑	XX	0	0	0	0	0	0	0	M	00
Memory Access Control	0	1	↑	XX	0	0	1	1	0	1	1	0	36h
	1	1	↑	XX	MY	MX	MV	ML	BGR	MH	0	0	00
Vertical Scrolling Start Address	0	1	↑	XX	0	0	1	1	0	1	1	1	37h
	1	1	↑	XX	VSP [15:8]								00
	1	1	↑	XX	VSP [7:0]								00
Idle Mode OFF	0	1	↑	XX	0	0	1	1	1	0	0	0	38h
Idle Mode ON	0	1	↑	XX	0	0	1	1	1	0	0	1	39h
Pixel Format Set	0	1	↑	XX	0	0	1	1	1	0	1	0	3Ah
	1	1	↑	XX	0	DPI [2:0]			0	DBI [2:0]			66
Write Memory Continue	0	1	↑	XX	0	0	1	1	1	1	0	0	3Ch
	1	1	↑	D [17:0]									XX
Read Memory Continue	0	1	↑	XX	0	0	1	1	1	1	1	0	3Eh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	D [17:0]									XX

Set Tear Scanline	0	1	↑	XX	0	1	0	0	0	1	0	0	44h
	1	1	↑	XX	0	0	0	0	0	0	0	STS [8]	XX
	1	1	↑	XX	STS [7:0]								XX
Get Scanline	0	1	↑	XX	0	1	0	0	0	1	0	1	45h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	0	0	0	0	0	GTS [9:8]		XX
	1	↑	1	XX	GTS [7:0]								XX
Write Display Brightness	0	1	↑	XX	0	1	0	1	0	0	0	1	51h
	1	1	↑	XX	DBV [7:0]								00

Read Display Brightness	0	1	↑	XX	0	1	0	1	0	0	1	0	52h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	DBV [7:0]								00
Write CTRL Display	0	1	↑	XX	0	1	0	1	0	0	1	1	53h
	1	1	↑	XX	0	0	BCTRL	0	DD	BL	0	0	00
Read CTRL Display	0	1	↑	XX	0	1	0	1	0	1	0	0	54h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	0	BCTRL	0	DD	BL	0	0	00
Write Content Adaptive Brightness Control	0	1	↑	XX	0	1	0	1	0	1	0	1	55h
	1	1	↑	XX	0	0	0	0	0	0	C [1:0]		00
Read Content Adaptive Brightness Control	0	1	↑	XX	0	1	0	1	0	1	1	0	56h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	0	0	0	0	0	C [1:0]		00
Write CABC Minimum Brightness	0	1	↑	XX	0	1	0	1	1	1	1	0	5Eh
	1	1	↑	XX	CMB [7:0]								00
Read CABC Minimum Brightness	0	1	↑	XX	0	1	0	1	1	1	1	1	5Fh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	CMB [7:0]								00
Read ID1	0	1	↑	XX	1	1	0	1	1	0	1	0	DAh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	Module's Manufacture [7:0]								XX
Read ID2	0	1	↑	XX	1	1	0	1	1	0	1	1	DBh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	LCD Module / Driver Version [7:0]								XX
Read ID3	0	1	↑	XX	1	1	0	1	1	1	0	0	DCh
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	LCD Module / Driver ID [7:0]								XX

Extended Command Set													
Command Function	D/CX	RDX	WRX	D17-8	D7	D6	D5	D4	D3	D2	D1	D0	Hex
RGB Interface Signal Control	0	1	↑	XX	1	0	1	1	0	0	0	0	B0h
	1	1	↑	XX	ByPass MODE	RCM [1:0]		0	VSPL	HSPL	DPL	EPL	00
Frame Control (In Normal Mode)	0	1	↑	XX	1	0	1	1	0	0	0	1	B1h
	1	1	↑	XX	0	0	0	0	0	0	DIVA [1:0]		00
	1	1	↑	XX	0	0	0	RTNA [4:0]					1B
Frame Control (In Idle Mode)	0	1	↑	XX	1	0	1	1	0	0	1	0	B2h
	1	1	↑	XX	0	0	0	0	0	0	DIVB [1:0]		00
	1	1	↑	XX	0	0	0	RTNB [4:0]					1B
Frame Control (In Partial Mode)	0	1	↑	XX	1	0	1	1	0	0	1	1	B3h
	1	1	↑	XX	0	0	0	0	0	0	DIVC [1:0]		00
	1	1	↑	XX	0	0	0	RTNC [4:0]					1B
Display Inversion Control	0	1	↑	XX	1	0	1	1	0	1	0	0	B4h
	1	1	↑	XX	0	0	0	0	0	NLA	NLB	NLC	02
Blanking Porch Control	0	1	↑	XX	1	0	1	1	0	1	0	1	B5h
	1	1	↑	XX	0	VFP [6:0]							02
	1	1	↑	XX	0	VBP [6:0]							02
	1	1	↑	XX	0	0	0	HFP [4:0]					0A
	1	1	↑	XX	0	0	0	HBP [4:0]					14

Display Function Control	0	1	↑	XX	1	0	1	1	0	1	1	0	B6h
	1	1	↑	XX	0	0	0	0	PTG [1:0]		PT [1:0]		0A
	1	1	↑	XX	REV	GS	SS	SM	ISC [3:0]				82
	1	1	↑	XX	0	0	NL [5:0]						27
	1	1	↑	XX	0	0	PCDIV [5:0]						04
Entry Mode Set	0	1	↑	XX	1	0	1	1	0	1	1	1	B7h
	1	1	↑	XX	0	0	0	0	0	GON	DTE	GAS	06
Backlight Control 1	0	1	↑	XX	1	0	1	1	1	0	0	0	B8h
	1	1	↑	XX	0	0	0	0	TH_UI [3:0]				0C
Backlight Control 2	0	1	↑	XX	1	0	1	1	1	0	0	1	B9h
	1	1	↑	XX	TH_MV [3:0]				TH_ST [3:0]				CC
Backlight Control 3	0	1	↑	XX	1	0	1	1	1	0	1	0	BAh
	1	1	↑	XX	0	0	0	0	DTH_UI [3:0]				04
Backlight Control 4	0	1	↑	XX	1	0	1	1	1	0	1	1	BBh
	1	1	↑	XX	DTH_MV [3:0]				DTH_ST [3:0]				65
Backlight Control 5	0	1	↑	XX	1	0	1	1	1	1	0	0	BCh
	1	1	↑	XX	DIM2 [3:0]				0	DIM1 [2:0]			44
Backlight Control 7	0	1	↑	XX	1	0	1	1	1	1	1	0	BEh
	1	1	↑	XX	PWM_DIV [7:0]								0F
Backlight Control 8	0	1	↑	XX	1	0	1	1	1	1	1	1	BFh
	1	1	↑	XX	0	0	0	0	0	LEDONR	LEDONPOL	LEDPWMOPL	00
Power Control 1	0	1	↑	XX	1	1	0	0	0	0	0	0	C0h
	1	1	↑	XX	0	0	VRH [5:0]						21
Power Control 2	0	1	↑	XX	1	1	0	0	0	0	0	1	C1h
	1	1	↑	XX	0	0	0	1	0	BT [2:0]			10
VCOM Control 1	0	1	↑	XX	1	1	0	0	0	1	0	1	C5h
	1	1	↑	XX	0	VMH [6:0]							31
	1	1	↑	XX	0	VML [6:0]							3C
VCOM Control 2	0	1	↑	XX	1	1	0	0	0	1	1	1	C7h
	1	1	↑	XX	nVM	VMF [6:0]							C0
NV Memory Write	0	1	↑	XX	1	1	0	1	0	0	0	0	D0h
	1	1	↑	XX	0	0	0	0	0	PGM_ADR [2:0]			00
	1	1	↑	XX	PGM_DATA [7:0]								XX
NV Memory Protection Key	0	1	↑	XX	1	1	0	1	0	0	0	1	D1h
	1	1	↑	XX	KEY [23:16]								XX
	1	1	↑	XX	KEY [15:8]								XX
	1	1	↑	XX	KEY [7:0]								XX
NV Memory Status Read	0	1	↑	XX	1	1	0	1	0	0	1	0	D2h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	ID2_CNT [2:0]			0	ID1_CNT [2:0]			XX
	1	↑	1	XX	BUSY	VMF_CNT [2:0]			0	ID3_CNT [2:0]			XX

Read ID4	0	1	↑	XX	1	1	0	1	0	0	1	1	D3h
	1	↑	1	XX	X	X	X	X	X	X	X	X	XX
	1	↑	1	XX	0	0	0	0	0	0	0	0	00
	1	↑	1	XX	1	0	0	1	0	0	1	1	93
	1	↑	1	XX	0	1	0	0	0	0	0	1	41
Positive Gamma Correction	0	1	↑	XX	1	1	1	0	0	0	0	0	E0h
	1	1	↑	XX	0	0	0	0	VP0 [3:0]				0F
	1	1	↑	XX	0	0	VP1 [5:0]						16
	1	1	↑	XX	0	0	VP2 [5:0]						14
	1	1	↑	XX	0	0	0	0	VP4 [3:0]				0A
	1	1	↑	XX	0	0	0	VP6 [4:0]					0D
	1	1	↑	XX	0	0	0	0	VP13 [3:0]				06
	1	1	↑	XX	0	VP20 [6:0]							43
	1	1	↑	XX	VP36 [3:0]				VP27 [3:0]				75
	1	1	↑	XX	0	VP43 [6:0]							33
	1	1	↑	XX	0	0	0	0	VP50 [3:0]				06
	1	1	↑	XX	0	0	0	VP57 [4:0]					0E
	1	1	↑	XX	0	0	0	0	VP59 [3:0]				00
	1	1	↑	XX	0	0	VP61 [5:0]						0C
	1	1	↑	XX	0	0	VP62 [5:0]						09
	1	1	↑	XX	0	0	0	0	VP63 [3:0]				08
Negative Gamma Correction	0	1	↑	XX	1	1	1	0	0	0	0	1	E1h
	1	1	↑	XX	0	0	0	0	VN0 [3:0]				08
	1	1	↑	XX	0	0	VN1 [5:0]						2B
	1	1	↑	XX	0	0	VN2 [5:0]						2D
	1	1	↑	XX	0	0	0	0	VN4 [3:0]				04
	1	1	↑	XX	0	0	0	VN6 [4:0]					10
	1	1	↑	XX	0	0	0	0	VN13 [3:0]				04
	1	1	↑	XX	0	VN20 [6:0]							3E
	1	1	↑	XX	VN36 [3:0]				VN27 [3:0]				24
	1	1	↑	XX	0	VN43 [6:0]							4E
	1	1	↑	XX	0	0	0	0	VN50 [3:0]				04
	1	1	↑	XX	0	0	0	VN57 [4:0]					0F
	1	1	↑	XX	0	0	0	0	VN59 [3:0]				0E
	1	1	↑	XX	0	0	VN61 [5:0]						35
	1	1	↑	XX	0	0	VN62 [5:0]						38
	1	1	↑	XX	0	0	0	0	VN63 [3:0]				0F

Digital Gamma Control 1	0	1	↑	XX	1	1	1	0	0	0	1	0	E2h
1st Parameter	1	1	↑	XX	RCA0 [3:0]				BCA0 [3:0]				XX
2nd Parameter	1	1	↑	XX	RCA1 [3:0]				BCA1 [3:0]				XX
3rd Parameter	1	1	↑	XX	RCA2 [3:0]				BCA2 [3:0]				XX
4th Parameter	1	1	↑	XX	RCA3 [3:0]				BCA3 [3:0]				XX
5th Parameter	1	1	↑	XX	RCA4 [3:0]				BCA4 [3:0]				XX
6th Parameter	1	1	↑	XX	RCA5 [3:0]				BCA5 [3:0]				XX
7th Parameter	1	1	↑	XX	RCA6 [3:0]				BCA6 [3:0]				XX
8th Parameter	1	1	↑	XX	RCA7 [3:0]				BCA7 [3:0]				XX
9th Parameter	1	1	↑	XX	RCA8 [3:0]				BCA8 [3:0]				XX
10th Parameter	1	1	↑	XX	RCA9 [3:0]				BCA9 [3:0]				XX
11th Parameter	1	1	↑	XX	RCA10 [3:0]				BCA10 [3:0]				XX
12th Parameter	1	1	↑	XX	RCA11 [3:0]				BCA11 [3:0]				XX
13th Parameter	1	1	↑	XX	RCA12 [3:0]				BCA12 [3:0]				XX
14th Parameter	1	1	↑	XX	RCA13 [3:0]				BCA13 [3:0]				XX
15th Parameter	1	1	↑	XX	RCA14 [3:0]				BCA14 [3:0]				XX
16th Parameter	1	1	↑	XX	RCA15 [3:0]				BCA15 [3:0]				XX

Digital Gamma Control 2	0	1	↑	XX	1	1	1	0	0	0	1	1	E3h
1st Parameter	1	1	↑	XX	RFA0 [3:0]				BFA0 [3:0]				XX
2nd Parameter	1	1	↑	XX	RFA1 [3:0]				BFA1 [3:0]				XX
3rd Parameter	1	1	↑	XX	RFA2 [3:0]				BFA2 [3:0]				XX
4th Parameter	1	1	↑	XX	RFA3 [3:0]				BFA3 [3:0]				XX
5th Parameter	1	1	↑	XX	RFA4 [3:0]				BFA4 [3:0]				XX
6th Parameter	1	1	↑	XX	RFA5 [3:0]				BFA5 [3:0]				XX
7th Parameter	1	1	↑	XX	RFA6 [3:0]				BFA6 [3:0]				XX
8th Parameter	1	1	↑	XX	RFA7 [3:0]				BFA7 [3:0]				XX
9th Parameter	1	1	↑	XX	RFA8 [3:0]				BFA8 [3:0]				XX
10th Parameter	1	1	↑	XX	RFA9 [3:0]				BFA9 [3:0]				XX
11th Parameter	1	1	↑	XX	RFA10 [3:0]				BFA10 [3:0]				XX
12th Parameter	1	1	↑	XX	RFA11 [3:0]				BFA [3:0]				XX
13th Parameter	1	1	↑	XX	RFA12 [3:0]				BFA12 [3:0]				XX
14th Parameter	1	1	↑	XX	RFA13 [3:0]				BFA13 [3:0]				XX
15th Parameter	1	1	↑	XX	RFA14 [3:0]				BFA14 [3:0]				XX
16th Parameter	1	1	↑	XX	RFA15 [3:0]				BFA15 [3:0]				XX
17th Parameter	1	1	↑	XX	RFA16 [3:0]				BFA16 [3:0]				XX
18th Parameter	1	1	↑	XX	RFA17 [3:0]				BFA17 [3:0]				XX
19th Parameter	1	1	↑	XX	RFA18 [3:0]				BFA18 [3:0]				XX
20th Parameter	1	1	↑	XX	RFA19 [3:0]				BFA19 [3:0]				XX
21st Parameter	1	1	↑	XX	RFA20 [3:0]				BFA20 [3:0]				XX
22nd Parameter	1	1	↑	XX	RFA21 [3:0]				BFA21 [3:0]				XX
23rd Parameter	1	1	↑	XX	RFA22 [3:0]				BFA22 [3:0]				XX
24th Parameter	1	1	↑	XX	RFA23 [3:0]				BFA23 [3:0]				XX
25th Parameter	1	1	↑	XX	RFA24 [3:0]				BFA24 [3:0]				XX
26th Parameter	1	1	↑	XX	RFA25 [3:0]				BFA25 [3:0]				XX
27th Parameter	1	1	↑	XX	RFA26 [3:0]				BFA26 [3:0]				XX
28th Parameter	1	1	↑	XX	RFA27 [3:0]				BFA27 [3:0]				XX
29th Parameter	1	1	↑	XX	RFA28 [3:0]				BFA28 [3:0]				XX
30th Parameter	1	1	↑	XX	RFA29 [3:0]				BFA29 [3:0]				XX
31st Parameter	1	1	↑	XX	RFA30 [3:0]				BFA30 [3:0]				XX
32nd Parameter	1	1	↑	XX	RFA31 [3:0]				BFA31 [3:0]				XX
33rd Parameter	1	1	↑	XX	RFA32 [3:0]				BFA32 [3:0]				XX
34th Parameter	1	1	↑	XX	RFA33 [3:0]				BFA33 [3:0]				XX
35th Parameter	1	1	↑	XX	RFA34 [3:0]				BFA34 [3:0]				XX
36th Parameter	1	1	↑	XX	RFA35 [3:0]				BFA35 [3:0]				XX
37th Parameter	1	1	↑	XX	RFA36 [3:0]				BFA36 [3:0]				XX
38th Parameter	1	1	↑	XX	RFA37 [3:0]				BFA37 [3:0]				XX

39th Parameter	1	1	↑	XX	RFA38 [3:0]				BFA38 [3:0]				XX
40th Parameter	1	1	↑	XX	RFA39 [3:0]				BFA39 [3:0]				XX
41st Parameter	1	1	↑	XX	RFA40 [3:0]				BFA40 [3:0]				XX
42nd Parameter	1	1	↑	XX	RFA41 [3:0]				BFA41 [3:0]				XX
43rd Parameter	1	1	↑	XX	RFA42 [3:0]				BFA42 [3:0]				XX
44th Parameter	1	1	↑	XX	RFA43 [3:0]				BFA43 [3:0]				XX
45th Parameter	1	1	↑	XX	RFA44 [3:0]				BFA44 [3:0]				XX
46th Parameter	1	1	↑	XX	RFA45 [3:0]				BFA45 [3:0]				XX
47th Parameter	1	1	↑	XX	RFA46 [3:0]				BFA46 [3:0]				XX
48th Parameter	1	1	↑	XX	RFA47 [3:0]				BFA47 [3:0]				XX
49th Parameter	1	1	↑	XX	RFA48 [3:0]				BFA48 [3:0]				XX
50th Parameter	1	1	↑	XX	RFA49 [3:0]				BFA49 [3:0]				XX
51st Parameter	1	1	↑	XX	RFA50 [3:0]				BFA50 [3:0]				XX
52nd Parameter	1	1	↑	XX	RFA51 [3:0]				BFA51 [3:0]				XX
53rd Parameter	1	1	↑	XX	RFA52 [3:0]				BFA52 [3:0]				XX
54th Parameter	1	1	↑	XX	RFA53 [3:0]				BFA53 [3:0]				XX
55th Parameter	1	1	↑	XX	RFA54 [3:0]				BFA54 [3:0]				XX
56th Parameter	1	1	↑	XX	RFA55 [3:0]				BFA55 [3:0]				XX
57th Parameter	1	1	↑	XX	RFA56 [3:0]				BFA56 [3:0]				XX
58th Parameter	1	1	↑	XX	RFA57 [3:0]				BFA57 [3:0]				XX
59th Parameter	1	1	↑	XX	RFA58 [3:0]				BFA58 [3:0]				XX
60th Parameter	1	1	↑	XX	RFA59 [3:0]				BFA59 [3:0]				XX
61st Parameter	1	1	↑	XX	RFA60 [3:0]				BFA60 [3:0]				XX
62nd Parameter	1	1	↑	XX	RFA61 [3:0]				BFA61 [3:0]				XX
63rd Parameter	1	1	↑	XX	RFA62 [3:0]				BFA62 [3:0]				XX
64th Parameter	1	1	↑	XX	RFA63 [3:0]				BFA63 [3:0]				XX
Interface Control	0	1	↑	XX	1	1	1	1	0	1	1	0	F6h
	1	1	↑	XX	MY_EOR	MX_EOR	MV_EOR	0	BGR_EOR	0	0	WEMODE	01
	1	1	↑	XX	0	0	EPF [1:0]		0	0	MDT [1:0]		00
	1	1	↑	XX	0	0	ENDIAN	0	DM [1:0]		RM	RIM	00
Power Control A	0	1	↑	XX	1	1	0	0	1	0	1	1	CBh
	1	1	↑	XX	0	0	1	1	1	0	0	1	39
	1	1	↑	XX	0	0	1	0	1	1	0	0	2C
	1	1	↑	XX	0	0	0	0	0	0	0	0	00
	1	1	↑	XX	0	0	1	1	0	REG_VD[2:0]			30
	1	1	↑	XX	0	0	0	0	0	VBC[2:0]			01
Power Control B	0	1	↑	XX	1	1	0	0	1	1	1	1	CFh
	1	1	↑	XX	0	0	0	0	0	0	0	0	00
	1	1	↑	XX	1	PCEQ	DRV_ena	Power control[1:0]		0	0	1	81
	1	1	↑	XX	DRV_vml[2:1]		1	DC_ena	DRV_vml[0]	DRV_vmh[2:0]			30
Driver timing control A	0	1	↑	XX	1	1	1	0	1	0	0	0	E8h
	1	1	↑	XX	CR/EQ/PC	SDT[1:0]		0	0	1	0	NOW	84
	1	1	↑	XX	0	0	EQ[2:0]			CR[2:0]			11

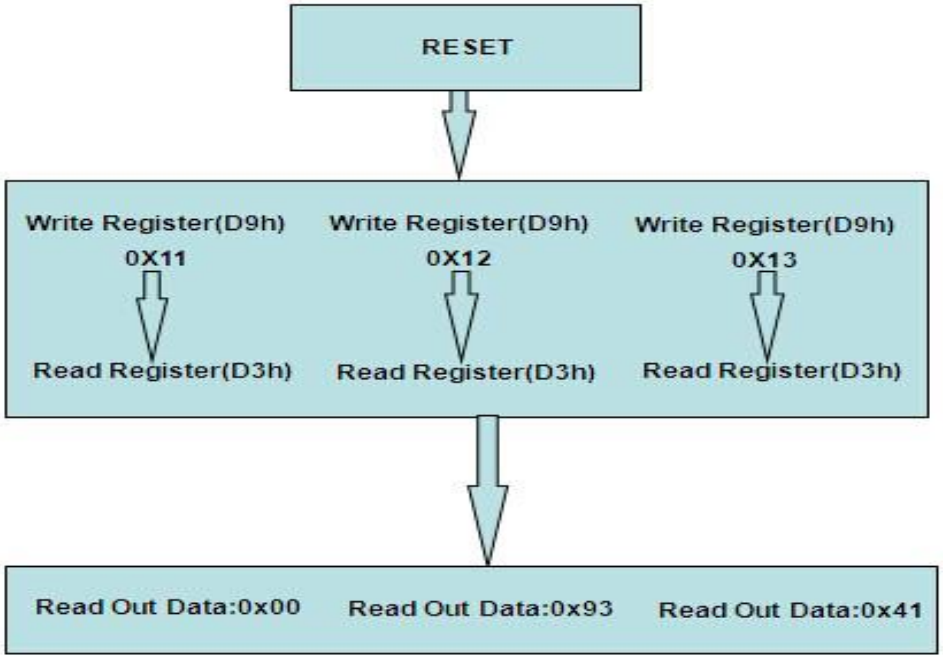
	1	1	↑	XX	0	1	1	1	1	PC[1:0]			7A
Driver timing control B	0	1	↑	XX	1	1	1	0	1	0	0	1	E9h
	1	1	↑	XX	CRE/EQE /PCE	SDT[1:0]		0	0	1	0	NOWE	04
	1	1	↑	XX	0	0	EQ[2:0]			CR[2:0]			11
	1	1	↑	XX	0	1	1	1	1	PC[1:0]			7A
Driver timing control C	0	1	↑	XX	1	1	1	0	1	0	1	0	EAh
	1	1	↑	XX	VG_SW_T4		VG_SW_T3		VG_SW_T2	VG_SW_T1			66
Power on sequence control	0	1	↑	XX	1	1	1	0	1	1	0	1	EDh
	1	1	↑	XX	0	1	CP1 soft start		0	1	CP23 soft start		55
	1	1	↑	XX	0	0	En_vcl		0	0	En_ddvdh		01
	1	1	↑	XX	0	0	En_vgh		0	0	En_vgl		23
	1	1	↑	XX	DDVDH_ENH		0	0	0	0	0	1	01
Enable 3G	0	1	↑	XX	1	1	1	1	0	0	1	0	F2h
	1	1	↑	XX	0	0	0	0	0	0	1	3G_enb	02

Note 1: Undefined commands are treated as NOP (00h) command.

Note 2: B0 to D9 and DE to FF are for factory use of display supplier. USER can decide if these commands are available or they are treated as NOP (00h) commands before shipping to USER. Default value is NOP (00h).

Note 3: Commands 10h, 12h, 13h, 26h, 28h, 29h, 30h, 36h (Bit D4 only), 38h and 39h are updated during V-SYNC when ILI9341V is in Sleep OUT mode to avoid abnormal visual effects. During Sleep IN mode, these commands are updated immediately. Read status (09h), Read display power mode (0Ah), Read display MADCTL (0Bh), Read display pixel format (0Ch), Read display image mode (0Dh), Read display signal mode (0Eh) and Read display self diagnostic result (0Fh) of these commands are updated immediately both in Sleep IN mode and Sleep OUT mode.

12. IC Detecting



13. Quality Assurance

13.1. Purpose

This standard for Quality Assurance assures the quality of LCD module products supplied to customer.

13.2. Standard for Quality Test

13.2.1. Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

13.2.2. Sampling Criteria:

Visual inspection: AQL 1.5%

Electrical functional: AQL 0.65%.

13.2.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

13.3. Nonconforming Analysis & Disposition

13.3.1. Nonconforming analysis:

13.3.1.1. Customer should provide overall information of non-conforming sample for their complaints.

13.3.1.2. After receipt of detailed information from customer, the analysis of nonconforming parts usually should be finished in one week.

13.3.1.3. If cannot finish the analysis on time, customer will be notified with the progress status.

13.3.2. Disposition of nonconforming:

13.3.2.1. Non-conforming product over PPM level will be replaced.

13.3.2.2. The cause of non-conformance will be analyzed. Corrective action will be discussed and implemented.

13.4. Agreement Items

Shall negotiate with customer if the following situation occurs:

13.4.1. There is any discrepancy in standard of quality assurance.

13.4.2. Additional requirement to be added in product specification.

13.4.3. Any other special problem.

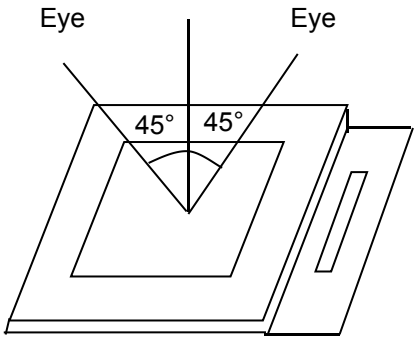
13.5. Standard of the Product Visual Inspection

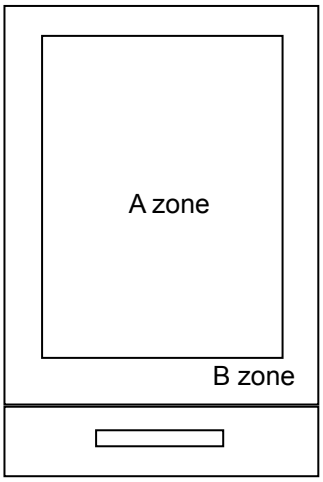
13.5.1. Appearance inspection:

13.5.1.1. The inspection must be under illumination about 1000 – 1500 lx, and the distance of view must be at 30cm ± 2cm.

13.5.1.2. The viewing angle should be 45° from the vertical line without reflection light or follows customer's viewing angle specifications.

13.5.1.3. Definition of area: A Zone: Active Area, B Zone: Viewing Area,



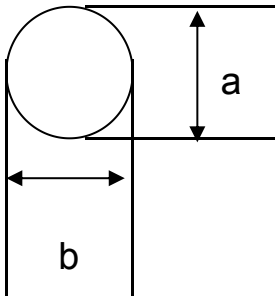


13.5.2. Basic principle:

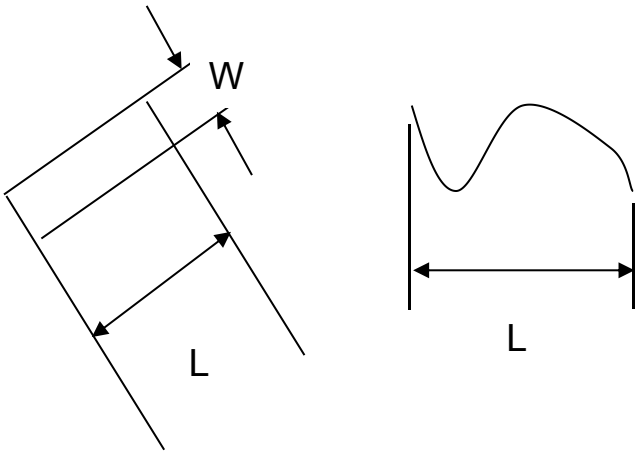
13.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

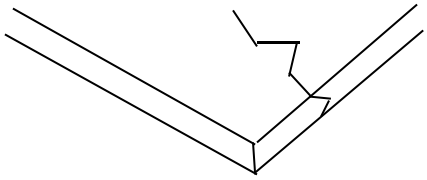
13.5.2.2. New item must be added on time when it is necessary.

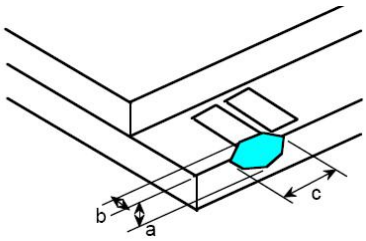
13.6. Inspection Specification for the TFT module

<table>
<tr><th>No.</th><th>Item</th><th>Criteria (Unit: mm)</th></tr>
<tr><td>01</td><td>Black / White spot
Foreign material
(Round type)
Pinholes
Stain
Particles inside cell.
(Minor defect)</td><td>


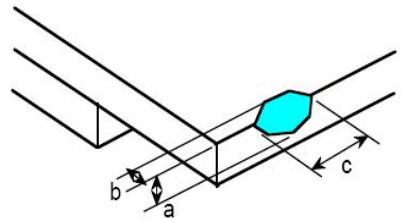
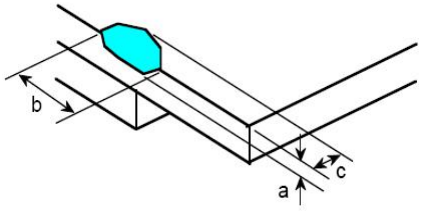
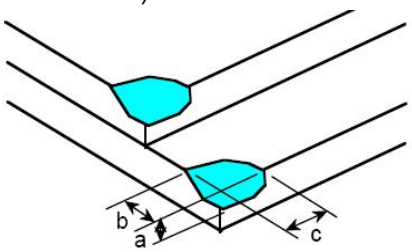
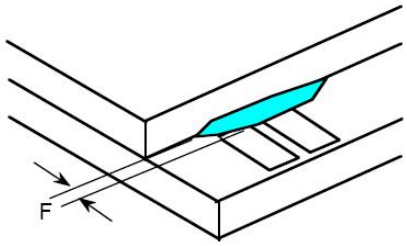
φ= (a + b) /2
<table>
<tr><th>Area / Size</th><th>Acc. Qty</th></tr>
<tr><td>φ≤0.15</td><td>Ignore</td></tr>
<tr><td>0.15<φ≤0.25</td><td>2</td></tr>
<tr><td>0.25<φ≤0.35</td><td>1</td></tr>
<tr><td>0.35<φ</td><td>0</td></tr>
<tr><td>Total</td><td>2 no include φ≤ 0.10</td></tr>
</table>
Distance between 2 defects should more than 3mm apart.
</td></tr>
<tr><td>02</td><td>Electrical Defect
(Minor defect)</td><td>
<table>
<tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr>
<tr><td>Bright dot</td><td>0</td><td>0</td></tr>
<tr><td>Dark dot</td><td>N≤2</td><td>N≤2</td></tr>
<tr><td>Total dot</td><td>N≤2</td><td>N≤2</td></tr>
<tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note 2</td></tr>
</table>
Remark:
1. Bright dot caused by scratch and foreign object accords to item 1.
</td></tr>
</table>

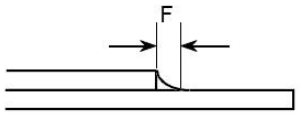
<table>
<tr>
<td>03</td>
<td>Black and White line
Scratch
Foreign material
(Line type)
(Minor defect)</td>
<td>


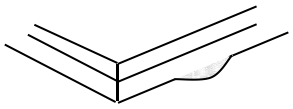
<table>
<tr><th>Length</th><th>Width</th><th>Acc. Qty</th></tr>
<tr><td>/</td><td>W ≦ 0.03</td><td>Ignore</td></tr>
<tr><td>L ≦ 3</td><td>0.03 ＜ W ≦ 0.05</td><td>2</td></tr>
<tr><td>L ≦ 1.5</td><td>0.05 ＜ W ≦ 0.10</td><td>1</td></tr>
<tr><td>/</td><td>0.1 ＜ W</td><td>0</td></tr>
<tr><td colspan="2">Total</td><td>2</td></tr>
</table>
Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.
</td>
</tr>
<tr>
<td>04</td>
<td>Glass Crack
(Minor defect)</td>
<td>

Crack is potential to enlarge, any type is not allowed.
</td>
</tr>
</table>

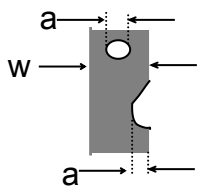
<table>
<tr>
<td>05</td>
<td>Glass Chipping Pad Area:
(Minor defect)


</td>
<td>
<table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>3</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr>
<td>06</td>
<td>Glass Chipping Rear of Pad Area:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>07</td>
<td>Glass Chipping Except Pad Area:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c > 3.0, b< 1.0</td><td>1</td></tr>
<tr><td>c< 3.0, b< 1.0</td><td>2</td></tr>
<tr><td>c< 3.0, b< 0.5</td><td>4</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>08</td>
<td>Glass Corner Chipping:
(Minor defect)
 
</td>
<td><table>
<tr><th>Length and Width</th><th>Acc. Qty</th></tr>
<tr><td>c < 3.0, b< 3.0</td><td>Ignore</td></tr>
<tr><td colspan="2">a<Glass Thickness</td></tr>
</table></td>
</tr>
<tr>
<td>09</td>
<td>Glass Burr:
(Minor defect)
 

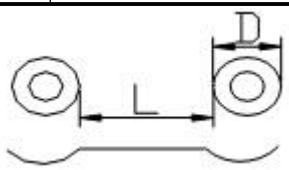
 

  </td>
<td><table>
<tr><th>Length</th><th>Acc. Qty</th></tr>
<tr><td>F < 1.0</td><td>Ignore</td></tr>
</table>
Glass burr don’t affect assemble and module dimension.</td>
</tr>
</table>

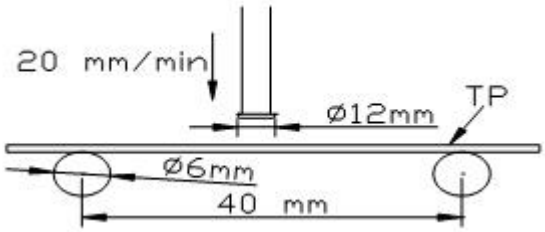
<table>
<tr><td>10</td><td>FPC Defect:
(Minor defect)
 
</td><td>10.1 Dent, pinhole width a<w/3.
(w: circuitry width.)
10.2 Open circuit is unacceptable.
10.3 No oxidation, contamination and distortion.</td></tr>
<tr><td>11</td><td>Bubble on Polarizer
(Minor defect)</td><td><table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td></tr>
<tr><td>12</td><td>Dent on Polarizer
(Minor defect)</td><td><table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td>φ≤0.20</td><td>Ignore</td></tr><tr><td>0.20 <φ≤0.30</td><td>4</td></tr><tr><td>0.30 <φ≤0.50</td><td>1</td></tr><tr><td>0.50 < φ</td><td>None</td></tr></table></td></tr>
<tr><td>13</td><td>LCD Ripple</td><td>Touch the touch panel, cannot see the LCD ripple.
Pen: R 0.8mm silicon rubber.
Operation Force(100)g</td></tr>
<tr><td>14</td><td>Bezel</td><td>14.1 No rust, distortion on the Bezel.
14.2 No visible fingerprints, stains or other contamination.</td></tr>
<tr><td>15</td><td>PCB</td><td>15.1 No distortion or contamination on PCB terminals.
15.2 All components on PCB must same as documented on the BOM/component layout.
15.3 Follow IPC-A-600F.</td></tr>
<tr><td>16</td><td>Soldering</td><td>Follow IPC-A-610C standard</td></tr>
<tr><td>17</td><td>Electrical Defect
(Major defect)</td><td>The below defects must be rejected.
17.1 Missing vertical / horizontal segment,
17.2 Abnormal Display.
17.3 No function or no display.
17.4 Current exceeds product specifications.
17.5 LCD viewing angle defect.
17.6 No Backlight.
17.7 Dark Backlight.</td></tr>
</table>

Remark: LCD Panel Broken shall be rejected. Defect out of LCD viewing area is acceptable.

13.7. Inspection Specification for the Touch Panel

<table>
<tr><th>No.</th><th>Item</th><th>Criteria (Unit: mm)</th></tr>
<tr><td>01</td><td>Fish eye</td><td>
<table>
<tr><td>Size</td><td>Criterion</td></tr>
<tr><td>0.50＜D</td><td>0</td></tr>
<tr><td>0.40＜D≤0.50</td><td>Less than 2, the distance over 5mm</td></tr>
<tr><td>0.20＜D≤0.40</td><td>Less than 5, the distance over 5mm</td></tr>
<tr><td>D≤0.20</td><td>Acceptable</td></tr>
</table>


</td></tr>
<tr><td>02</td><td>Scratch</td><td>W: width L: length
Scratch: W≤0.03, L≤2 is acceptable,
0.03<W≤0.05, L≤2 2 defects is acceptable
0.05<W≤0.10, L≤2 1 defects is acceptable
Distance between 2 defects should more than 10 mm.
W>0.10 is unacceptable.</td></tr>
<tr><td>03</td><td>Puffiness</td><td>Check with the 04mm gauge, the blister of the Touch Panel should not contact measuring surface of the gauge.
 
</td></tr>
<tr><td>04</td><td>Newton ring</td><td>1 piece acceptable (D average diameter=(long axis + short axis)/2 ≤ 7mm). The visual inspection shall be done at a distance 0.3mm minimum and at the angle 60° minimum, between eyes and surface of product. Under the 800LUX Natural color lamp.</td></tr>
<tr><td>05</td><td>Chemical Resistance</td><td>Ethanol, Methanol, Acetone, Aloconox, Cidex and Bleach used after 3 minutes, No cosmetic change.
Drop to surface each liquid of toluene, acetone, methanol, and Petroleum ether and wipe it softly with cloth for 3 minutes. No Irregularity should be observed on the surface.</td></tr>
<tr><td>06</td><td>Impact Resistance</td><td>No glass break when Φ9.0mm steel ball is dropped on the panel film surface which places on the plastic board directly from 30cm height at one time.</td></tr>
</table>

07	Static load test	Min. 5kg at 20mm/min 

Remark: The Foreign materials between RTP and TFT Module accords to the ”Inspection Specification of the TFT module”.

13.8. Classification of Defects

13.8.1. Visual defects (Except no / wrong label) are treated as minor defect and electrical defect is major.

13.8.2. Two minor defects are equal to one major in lot sampling inspection.

13.9. Identification/marking criteria

Any unit with illegible / wrong /double or no marking/ label shall be rejected.

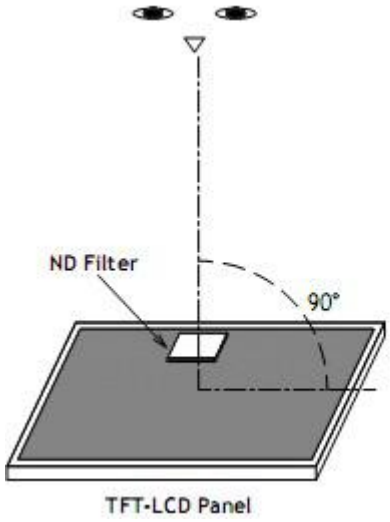
13.10. Packing

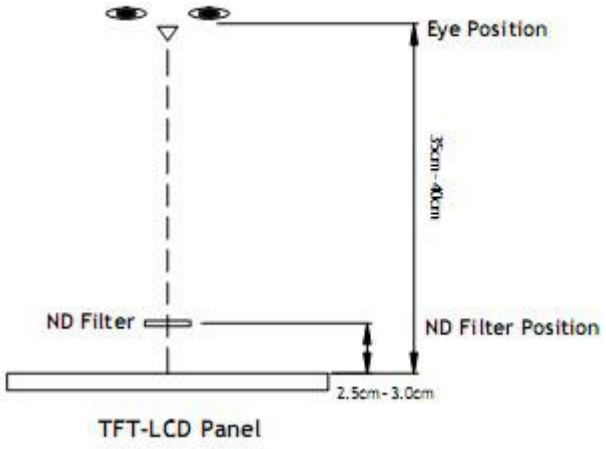
13.10.1. There should be no damage of the outside carton box, each packaging box should have one identical label.

13.10.2. Modules inside package box should have compliant mark.

13.10.3. All direct package materials shall offer ESD protection.

Note1: Bright dot is defined as the defective area of the dot is larger than 50% of one sub-pixel area.





Bright dot: The bright dot size defect at black display pattern. It can be recognized by 2% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Dark dot: Cyan, Magenta or Yellow dot size defect at white display pattern. It can be recognized by 5% transparency of filter when the distance between eyes and panel is 350mm±50mm.

Note2: Mura on display which appears darker / brighter against background brightness on parts of display area.

14. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	**High Temperature Operating**	**70℃, 96Hrs**	2	GB/T2423.2 -2008
2	**Low Temperature Operating**	**-20℃, 96Hrs**	2	GB/T2423.1 -2008
3	**High Humidity**	**50℃, 90%RH, 96Hrs**	2	GB/T2423.3 -2006
4	**High Temperature Storage**	**80℃, 96Hrs**	2	GB/T2423.2 -2008
5	**Low Temperature Storage**	**-30℃, 96Hrs**	2	GB/T2423.1 -2008
6	Thermal Cycling Test	-20℃, 60min~70℃, 60min, 20 cycles.	2	GB/T2423.22 -2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	2	GB/T5170.14 -2009
8	Electrical Static Discharge	Air:±8KV 150pF/330Ω 5 times Contact:±4KV 150pF/330Ω 5 times	2	GB/T17626.2 -2006
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	2	GB/T2423.8 -1995

Note1. No defection cosmetic and operational function allowable.

Note2. Total current Consumption should be below double of initial value

15. Precautions and Warranty

15.1. Safety

15.1.1. The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

15.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

15.2. Handling

15.2.1. Reverse and use within ratings in order to keep performance and prevent damage.

15.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

15.3. Storage

15.3.1. Do not store the LCD module beyond the specified temperature ranges.

15.3.2. Strong light exposure causes degradation of polarizer and color filter.

15.4. Metal Pin (Apply to Products with Metal Pins)

15.4.1. Pins of LCD and Backlight

15.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering

15.4.1.2. Recommended Soldering Conditions

Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1

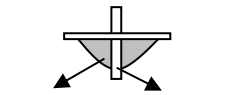
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

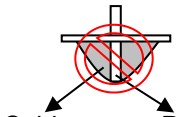
Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

15.4.1.3. Solder Wetting



Recommended



Not Recommended

15.4.2. Pins of EL

15.4.2.1. Solder tip can touch and press on the tip of EL leads during soldering.

15.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

15.4.2.3. Recommended Soldering Conditions

Solder type: Nippon Alimit Leadfree SR-34, size 0.5mm

Recommended Solder Temperature: 270～290℃

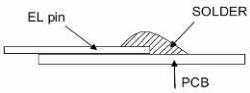
Typical Soldering Time: ≤2s

Minimum solder distance from EL lamp (body):2.0mm

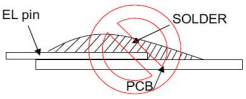
15.4.2.4. No horizontal press on the EL leads during soldering.

15.4.2.5. 180° bend EL leads three times is not allowed.

15.4.2.6. Solder Wetting

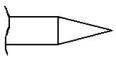


Recommended

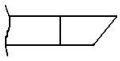


Not Recommended

15.4.2.7. The type of the solder iron:

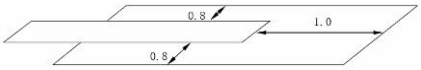


Recommended



Not Recommended

15.4.2.8. Solder Pad



15.5. Operation

15.5.1. Do not drive LCD with DC voltage

15.5.2. Response time will increase below lower temperature

15.5.3. Display may change color with different temperature

15.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

15.5.5. Do not connect or disconnect the LCM to or from the system when power is on.

15.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.

15.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

15.5.8. Do not display the fixed pattern for long time（we suggest the time not longer than one hour） because it may develop image sticking due to the TFT structure.

15.6. Static Electricity

15.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.

15.6.2. The normal static prevention measures should be observed for work clothes and benches.

15.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

15.7. Limited Warranty

15.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.

15.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.

15.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

16. Packaging

TBD

17. Outline Drawing