Advance Hightech Solutions
Material Pioneer, Technology Navigator

3.5 inch TFT LCD
Without Touch Panel
SPECIFICATION

MODEL NAME: LMWWF035FHN1

Date: 2025 /01/08

Customer Signature		
Customer		
Approved Date	**Approved By**	**Reviewed By**

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Advance Hightech Solutions

RECORD OF REVISION

DATE	REV.	PAGE	SUMMARY

3. General specifications

3.1 General specifications

It is a color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses the amorphous silicon TFT as a switching devices. This model is composed of a Transmissive type TFT-LCD Panel, a driver circuit and a back-light unit.

3.2 Features

- High image quality a-Si TFT LCD module.
- 262K color number.
- Support RGB/8080MCU 8 or 16 bits input mode./4Line SPI
- High contrast, high brightness
- Low power consumption.

4. Mechanical data

No	Item	Specification	Remark
1	Type	Transmissive	--
2	Display Mode	IPS Mode, Normally Black	--
3	Pixel Element	a-Si TFT	--
4	Screen Size	3.5inch	--
5	Resolution	320(RGB) x480	--
6	Color Number	262K	--
7	Active Area	48.96 (W) x 73.44(H) (mm)	--
8	Pixel Size	0.153 x 0.153 (mm)	--
9	Color Arrangement	RGB-stripe	--
10	Assembly Type	COG	--
11	Back Light	LED	--
12	Good Viewing Direction	Free	--
13	Weight	TBD	--
14	Module Dimension	54.5(W) x 84.71(H) x 2.3(D)(mm)	--

5. Absolute maximum ratings

5.1 Electrical absolute maximum ratings

(1) TFT-LCD Panel Absolute Maximum Ratings

Ta=25℃

Item	Symbol	Condition	Standard Value		Unit	Remark
			Min.	Max.		
Power supply for analog operating voltage	VCI	GND=0V	-0.3	3.3	V	--
Power supply for Logic operating voltage	IOVCC		-0.3	3.3	V	--
Logic Input Signal	VIN		-0.3	IOVCC~+0.3	V	--

* If the LSI is used above these absolute maximum ratings, it may become permanently damaged. Using the LSI within the following electrical characteristics limit is strongly recommended for normal operation. If these electrical characteristic conditions are also exceeded, the LSI will malfunction and cause poor reliability.

(2) Back-Light Unit

Ta=25℃

Item	Symbol	Min.	Max.	Unit	Remark
Current	I_B	--	150	mA	--

5.2 Environmental absolute maximum ratings

Item	Symbol	Min.	Max.	Unit	Remark
Operation temperature range	Top	-20	70	℃	Ambient
Storage temperature range	Tst	-30	80	℃	Ambient

(1) Corrosive gas environment is not acceptable.
(2) TFT-LCD color will change slightly depending on environment temperature. This phenomenon is reversible.

6. Electrical characteristics

(1)TFT-LCD Module

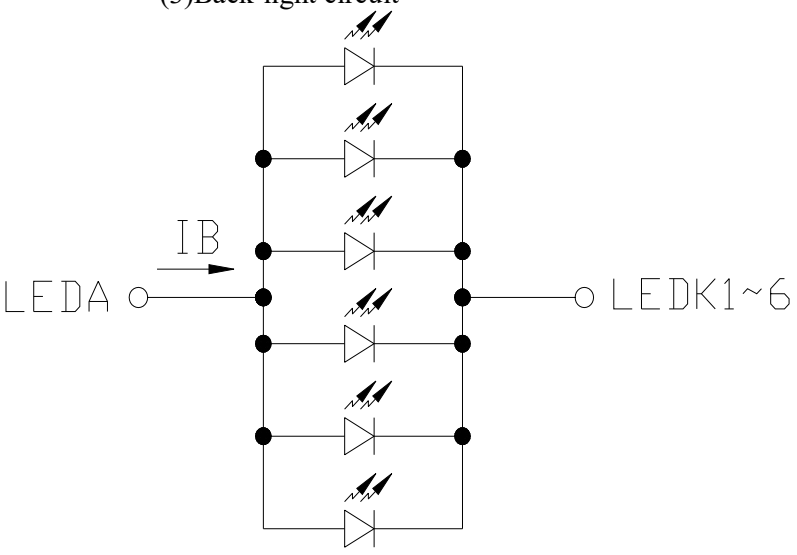
Ta =25℃

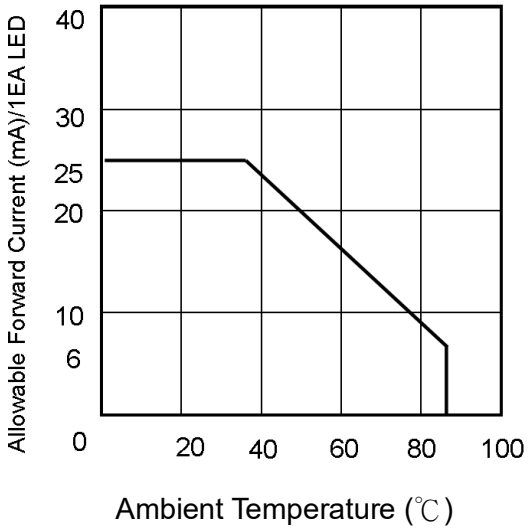
Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Power supply for analog operating voltage	VCI	2.5	2.75	3.3	V	--
Power supply for Logic operating voltage	IOVCC	1.65	1.8	3.3	V	--
Logic Input Voltage	VIH	0.7 IOVCC	--	IOVCC	V	--
	VIL	VSS	--	0.3 IOVCC		
Logic Output Voltage	VOH	0.8 IOVCC	--	IOVCC	V	
	VOL	VSS	--	0.2 IOVCC		

(2) Back-Light Unit

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Forward Voltage	V_B	2.7	3.0	3.4	V	NOTE (1)
Forward current	I_B	--	120	--	mA	--
Power Consumption	P_{BL}	--	(360)	--	mW	--
Life Time	Lf	--	(30,000)	--	Hrs	NOTE (2)

NOTE：(1)The LED is Parallel type.
(2)The “LED life time” is defined as the module brightness decreases to 50% of original brightness that the ambient temperature is 25℃ and IB=120mA . The LED lifetime could be decreased if operating IB is lager than 120mA.
(3)Back-light circuit



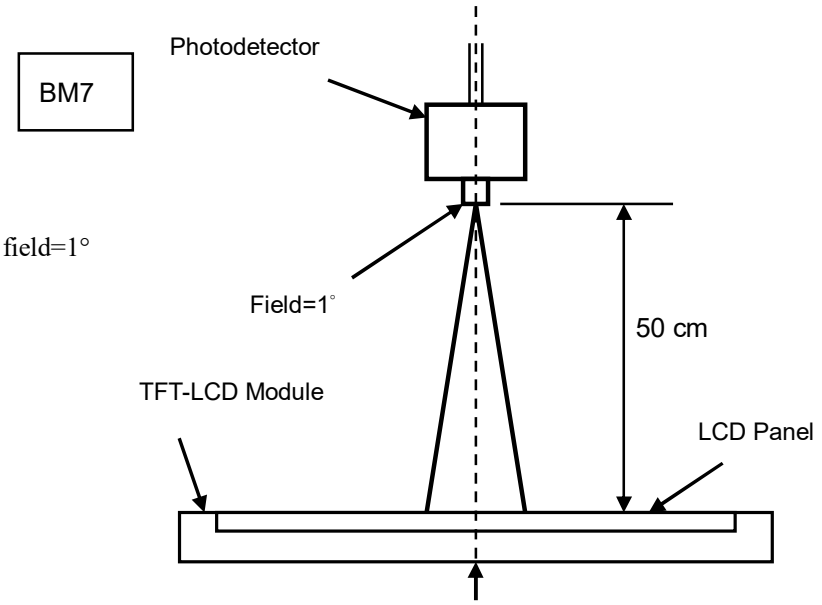


7. Optical characteristics

Ta = 25°C , I_B=120mA

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Brightness		B	θ=0° Normal viewing angle At the center of panel	300	350	--	cd/m^2	(1)
Contrast Ratio		C/R		500	700	--	--	(2)
Response Time		Tr+Tf		--	25	35	ms	(3)
Color chromaticity (CIE 1931)	White	Wx		--	--	--	--	The color rank of LED is Unlimited.
		Wy		--	--	--		
	Red	Rx		--	--	--		
		Ry		--	--	--		
	Green	Gx		--	--	--		
		Gy		--	--	--		
	Blue	Bx		--	--	--		
		By		--	--	--		
Viewing Angle	Top	θ_U		70	80	--	--	(4)
	Bottom	θ_D		70	80	--		
	Left	θ_L		70	80	--		
	Right	θ_R		70	80	--		
Uniformity		Un	θ=0° Normal viewing angle	70	--	--	%	(5)

Note 1: The brightness test equipment setup

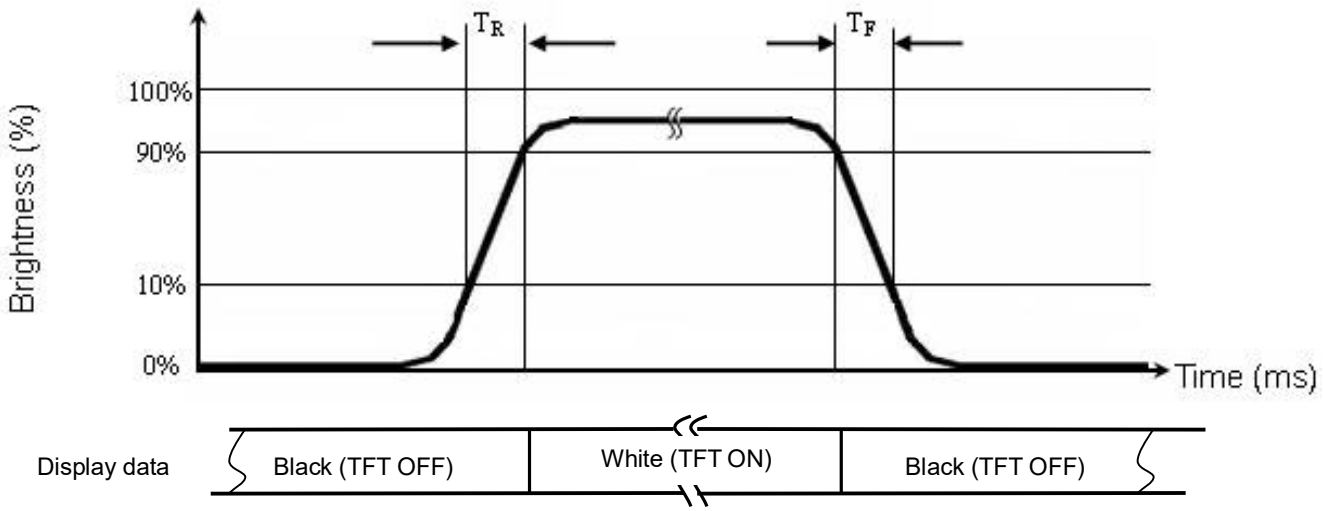


I_B=120mA, Field=1°
(As measuring "black" image, field=1°
Is the best testing condition.)

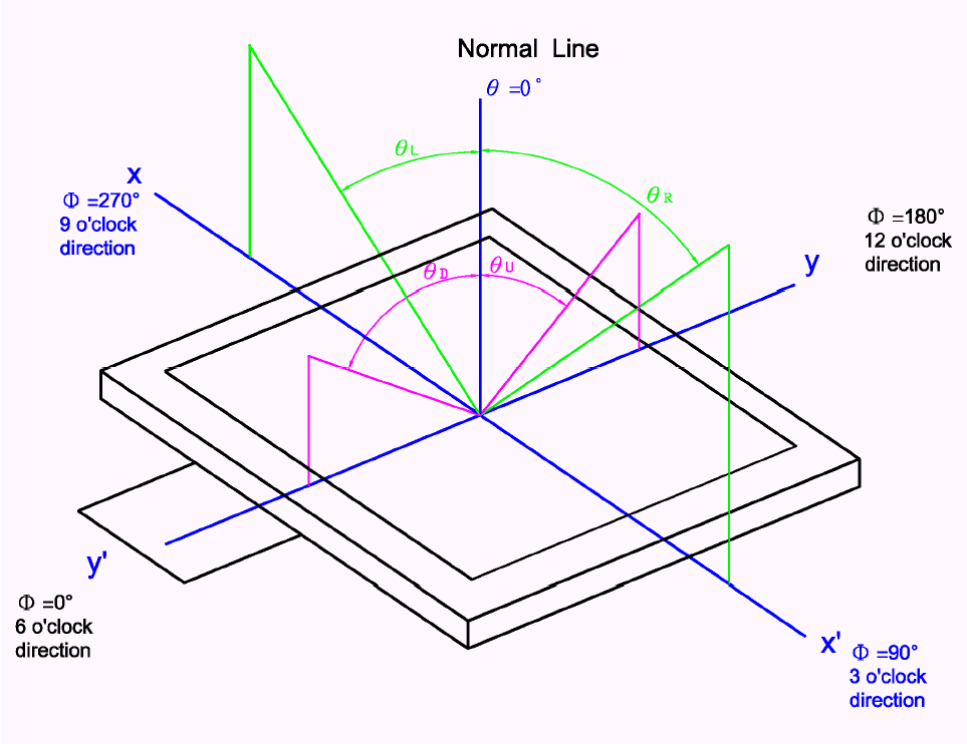
Note 2: Definition of contrast Ratio (C/R)

$$C/R = \frac{\textbf{Brightness When LCD is at "White" State}}{\textbf{Brightness When LCD is at "Black" State}}$$

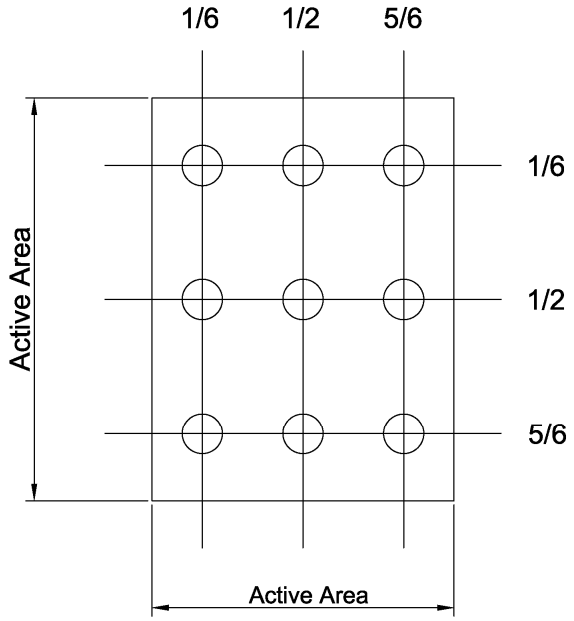
Note 3: Definition of response time



Note 4: Definition of viewing angle

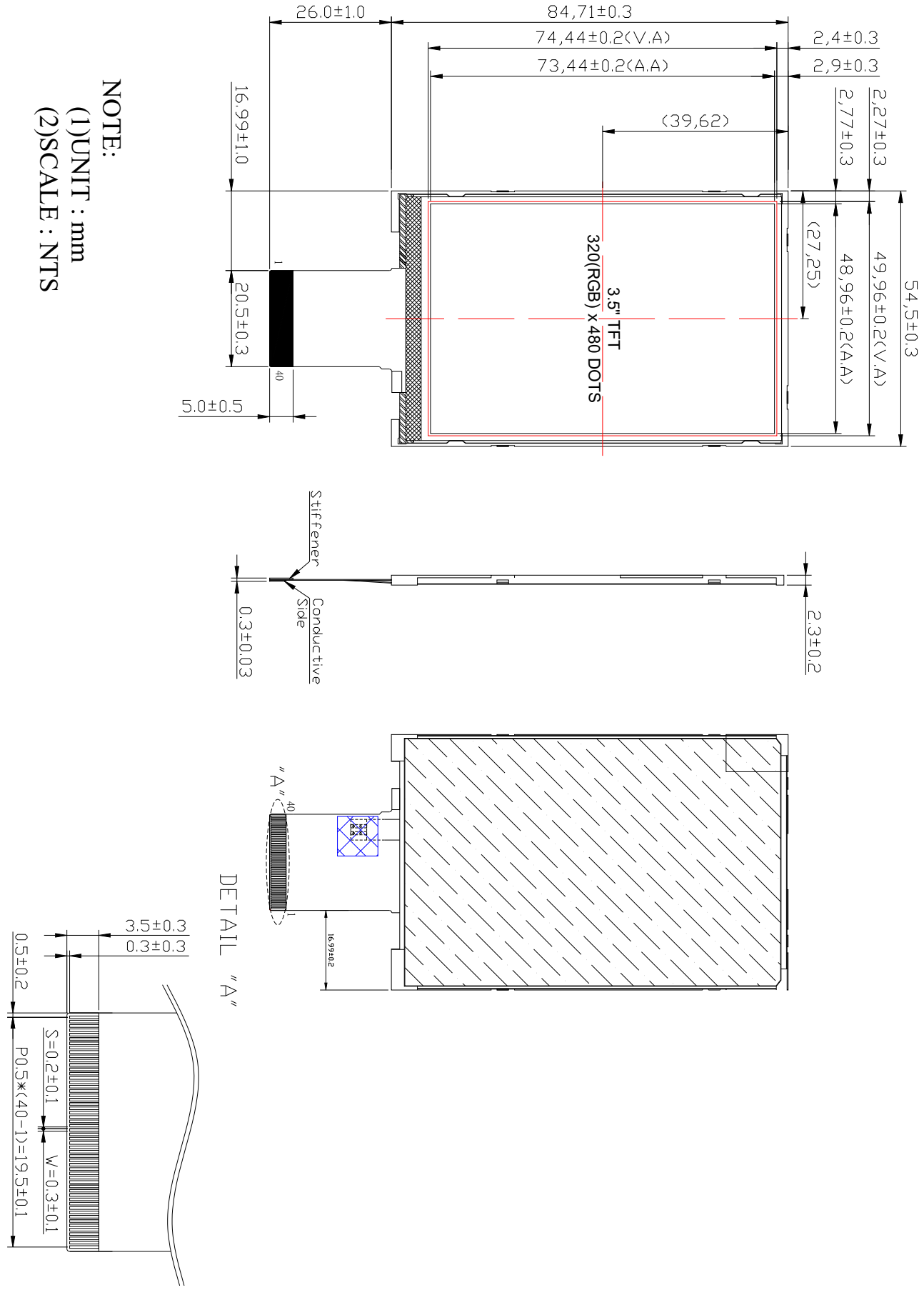


Note 5: Definition of uniformity (Un)



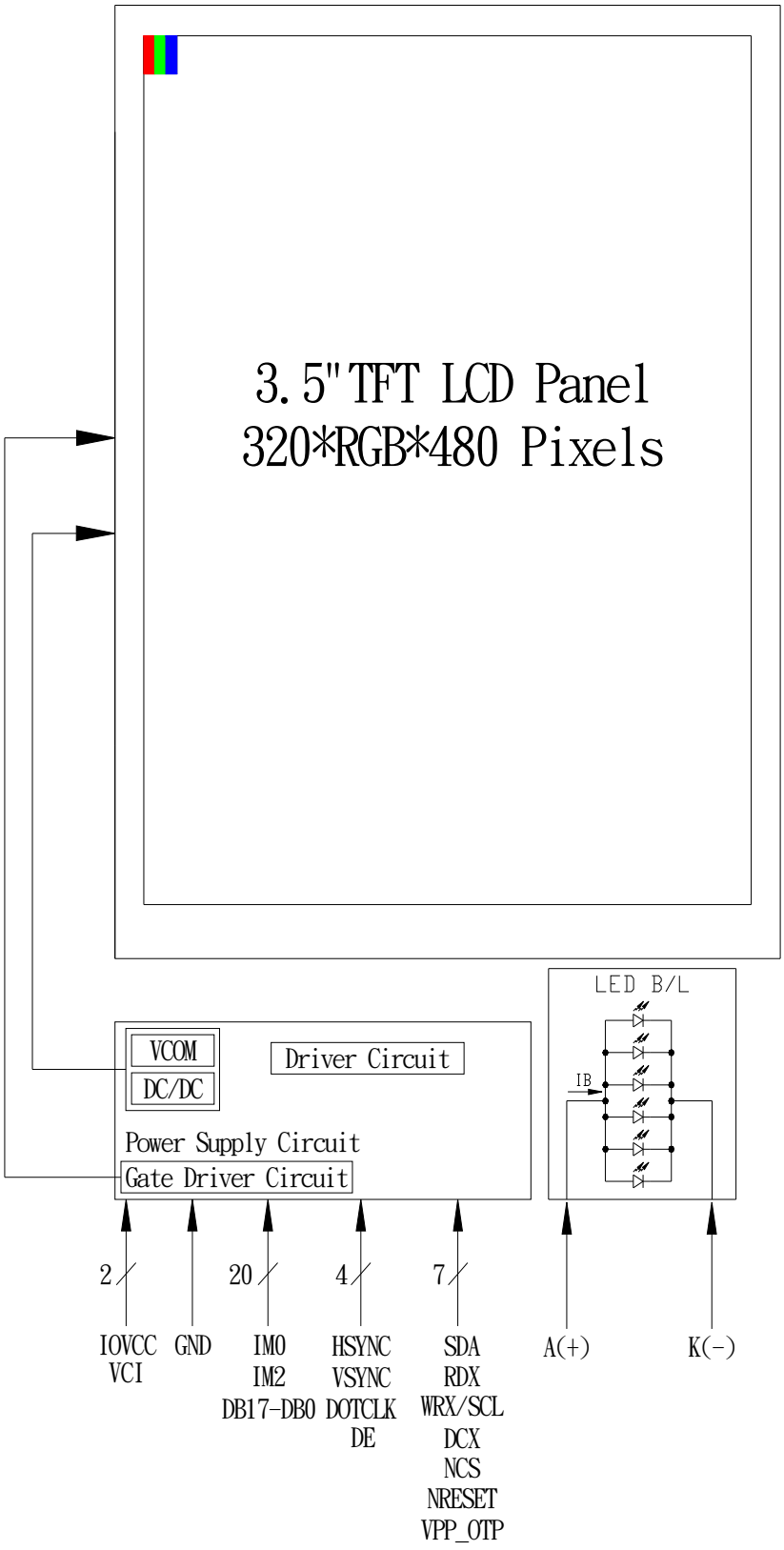
$$Un = \frac{\mathbf{Bmin}}{\mathbf{Bmax}} x100\%$$

8. Outline dimension



9.Block diagram

9.1 TFT-LCD Module (Interface System Structure)



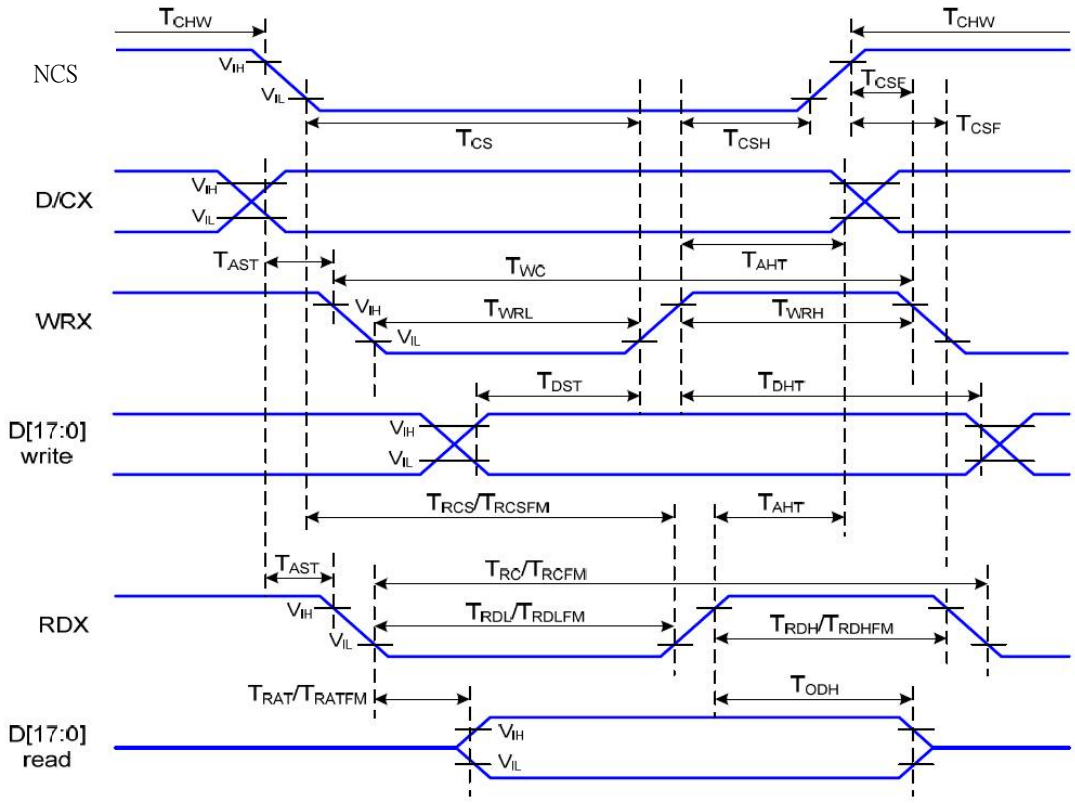
10. Input Terminal Pin Assignment

10.1 Input Signal & Power

<table>
<tr><th>Pin no</th><th>Symbol</th><th>Description</th><th>Remark</th></tr>
<tr><td>1</td><td>－－</td><td>No connection</td><td>--</td></tr>
<tr><td>2</td><td>IOVCC</td><td>Power supply for I/O system.</td><td>Power</td></tr>
<tr><td>3~20</td><td>DB17~DB0</td><td>Data 17 ~ Data 0</td><td>Input/Output</td></tr>
<tr><td>21</td><td>SDA</td><td>SPI interface input/output pin.</td><td>Input/Outpu</td></tr>
<tr><td>22</td><td>DOTCLK</td><td>Dot clock signal for RGB interface operation.</td><td>Input</td></tr>
<tr><td>23</td><td>DE</td><td>Data enable signal for RGB interface operation.</td><td>Input</td></tr>
<tr><td>24</td><td>HSYNC</td><td>Horizontal synchronizing input signal for RGB interface operation</td><td>Input</td></tr>
<tr><td>25</td><td>VSYNC</td><td>Vertical synchronizing input signal for RGB interface operation</td><td>Input</td></tr>
<tr><td>26</td><td>RDX</td><td>Read enable in 8080 MCU parallel interface. Low-active</td><td>Input</td></tr>
<tr><td>27</td><td>WRX/SCL</td><td>Write enable in MCU parallel interface
In SPI mode, this pin is used as SCL.</td><td>Input</td></tr>
<tr><td>28</td><td>DCX</td><td>Display data/command selection (RS) pin in MCU interface
DCX=’1’: display data or parameter.
DCX=’0’: register index / command</td><td>Input</td></tr>
<tr><td>29</td><td>NCS</td><td>Chip selection pin. Low-active</td><td>Input</td></tr>
<tr><td>30</td><td>NRESET</td><td>System Reset</td><td>Input</td></tr>
<tr><td>31</td><td>IM0</td><td rowspan="3"><table><tr><th>IM2</th><th>IM0</th><th>MPU Interface Mode</th><th>Data pin</th></tr><tr><td>0</td><td>0</td><td>8080 16-bit interface</td><td>DB[15:0]</td></tr><tr><td>0</td><td>1</td><td>8080 8-bit interface</td><td>DB[7:0]</td></tr><tr><td>1</td><td>1</td><td>4Line SPI</td><td>SDA,SDO</td></tr></table></td><td rowspan="3">Input</td></tr>
<tr><td>32</td><td>－－</td></tr>
<tr><td>33</td><td>IM2</td></tr>
<tr><td>34</td><td>－－</td><td>No connection</td><td>--</td></tr>
<tr><td>35</td><td>－－</td><td>No connection</td><td>--</td></tr>
<tr><td>36</td><td>GND</td><td>Power Ground</td><td>Power</td></tr>
<tr><td>37</td><td>VCI</td><td>Analog power supply</td><td>Power</td></tr>
<tr><td>38</td><td>VPP_OTP</td><td>Power supply pin used in OTP program mode</td><td>-</td></tr>
<tr><td>39</td><td>A(+)</td><td>POWER SUPPLY FOR LOGIC LED (+)</td><td>Power</td></tr>
<tr><td>40</td><td>K(-)</td><td>POWER SUPPLY FOR LOGIC LED (-)</td><td>Power</td></tr>
</table>

11. Timing Characteristics

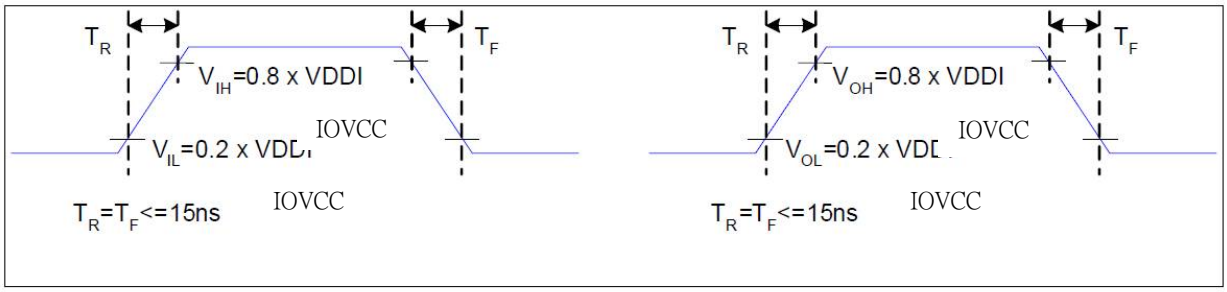
11.1 8080 Series MCU Parallel Interface Characteristics: 18/16/9/8-bit Bus



VDDI=1.8V,VDDA=2.8V, AGND=DGND=0V, Ta=25 ℃

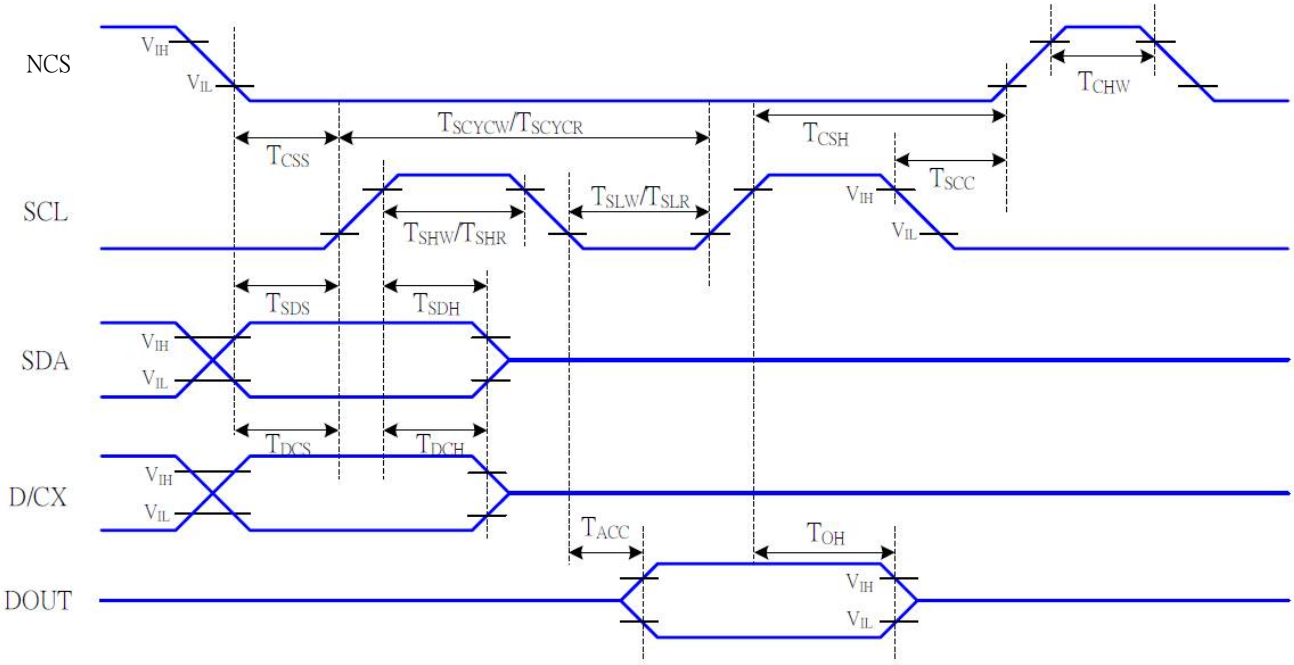
Signal	Symbol	Parameter	Min	Max	Unit	Description
D/CX	T_{AST}	Address setup time	0		ns	-
	T_{AHT}	Address hold time (Write/Read)	10		ns	
NCS	T_{CHW}	Chip select "H" pulse width	0		ns	-
	T_{CS}	Chip select setup time (Write)	15		ns	
	T_{RCS}	Chip select setup time (Read ID)	45		ns	
	T_{RCSFM}	Chip select setup time (Read FM)	355		ns	
	T_{CSF}	Chip select wait time (Write/Read)	10		ns	
	T_{CSH}	Chip select hold time	10		ns	
WRX	T_{WC}	Write cycle	66		ns	
	T_{WRH}	Control pulse "H" duration	15		ns	
	T_{WRL}	Control pulse "L" duration	15		ns	
RDX (ID)	T_{RC}	Read cycle (ID)	160		ns	When read ID data
	T_{RDH}	Control pulse "H" duration (ID)	90		ns	
	T_{RDL}	Control pulse "L" duration (ID)	45		ns	
RDX (FM)	T_{RCFM}	Read cycle (FM)	450		ns	When read from frame memory
	T_{RDHFM}	Control pulse "H" duration (FM)	90		ns	
	T_{RDLFM}	Control pulse "L" duration (FM)	355		ns	

D[17:0]	T_{DST}	Data setup time	10		ns	For CL=30pF
	T_{DHT}	Data hold time	10		ns	
	T_{RAT}	Read access time (ID)	-	40	ns	
	T_{RATFM}	Read access time (FM)	-	340	ns	
	T_{ODH}	Output disable time	20	80	ns	



Rising and Falling Timing for I/O Signal

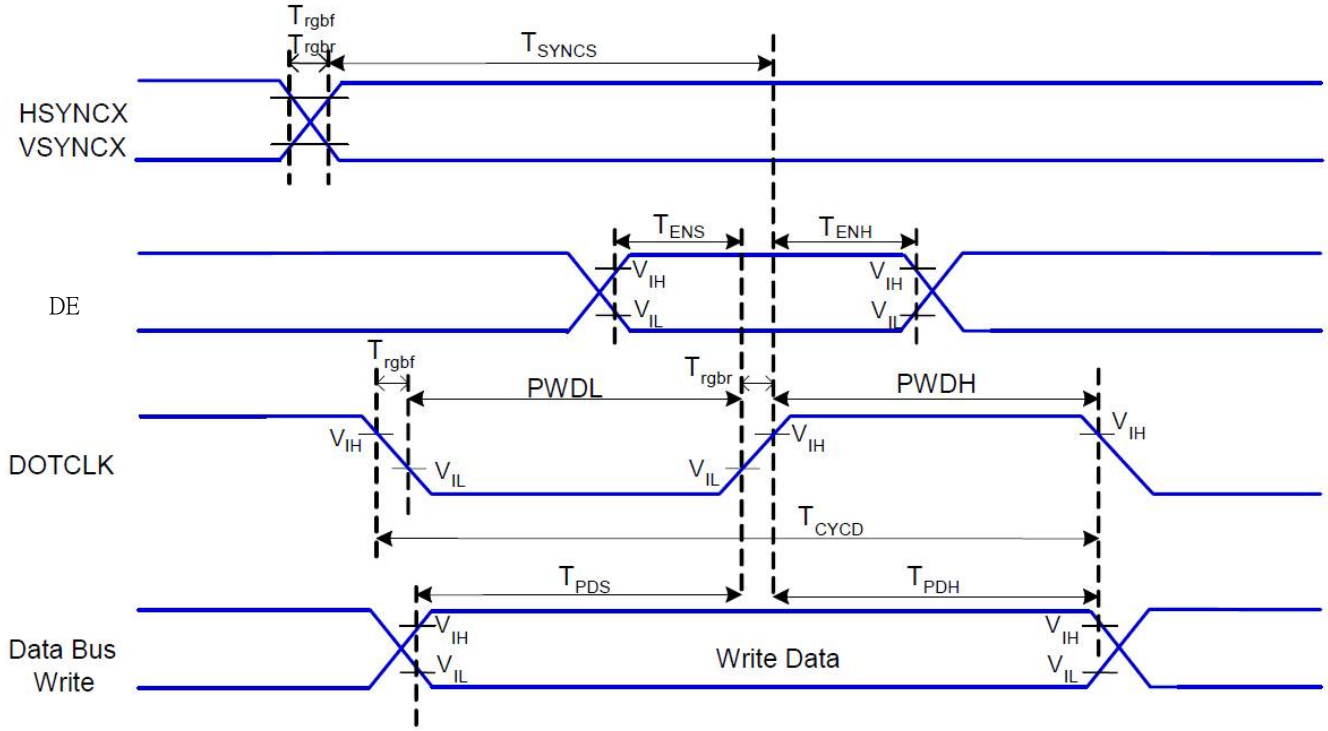
11.2 4-SPI Serial Data Transfer Interface Characteristics:



VDDI=1.8V,VDDA=2.8V, AGND=DGND=0V, Ta=25 ℃

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
NCS	T_{CSS}	Chip select setup time (write)	15		ns	
	T_{CSH}	Chip select hold time (write)	15		ns	
	T_{CSS}	Chip select setup time (read)	60		ns	
	T_{SCC}	Chip select hold time (read)	65		ns	
	T_{CHW}	Chip select "H" pulse width	40		ns	
SCL	T_{SCYCW}	Serial clock cycle (Write)	66		ns	-write command & data ram
	T_{SHW}	SCL "H" pulse width (Write)	15		ns	
	T_{SLW}	SCL "L" pulse width (Write)	15		ns	
	T_{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T_{SHR}	SCL "H" pulse width (Read)	60		ns	
	T_{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T_{DCS}	D/CX setup time	10		ns	
	T_{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T_{SDS}	Data setup time	10		ns	
	T_{SDH}	Data hold time	10		ns	
DOUT	T_{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T_{OH}	Output disable time	15	50	ns	For minimum CL=8pF

11.3 RGB Interface Characteristics:

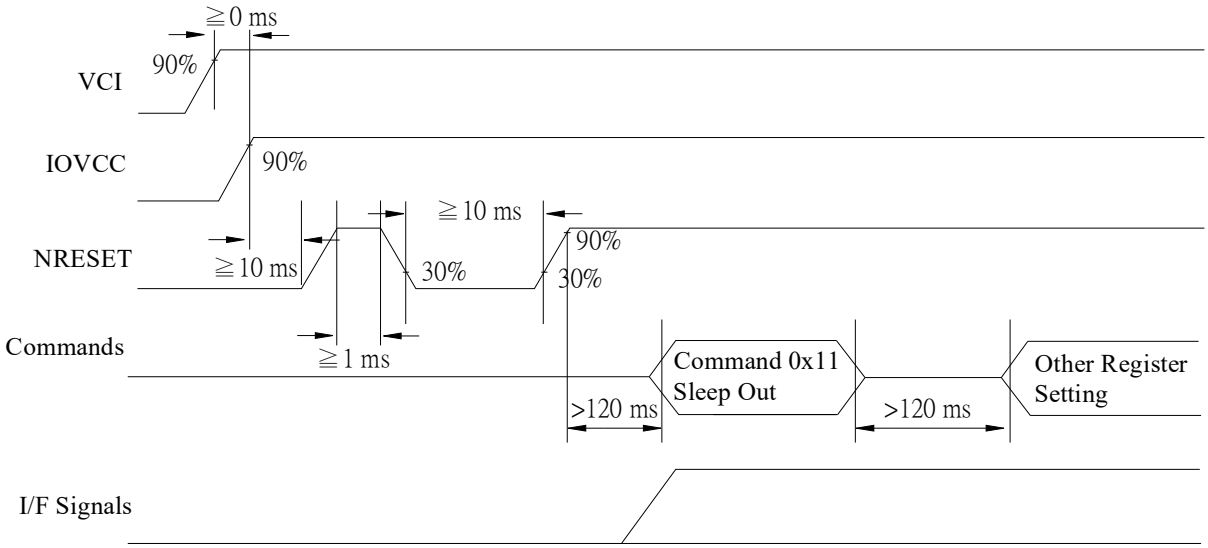


VDDI=1.8V,VDDA=2.8V, AGND=DGND=0V, Ta=25℃

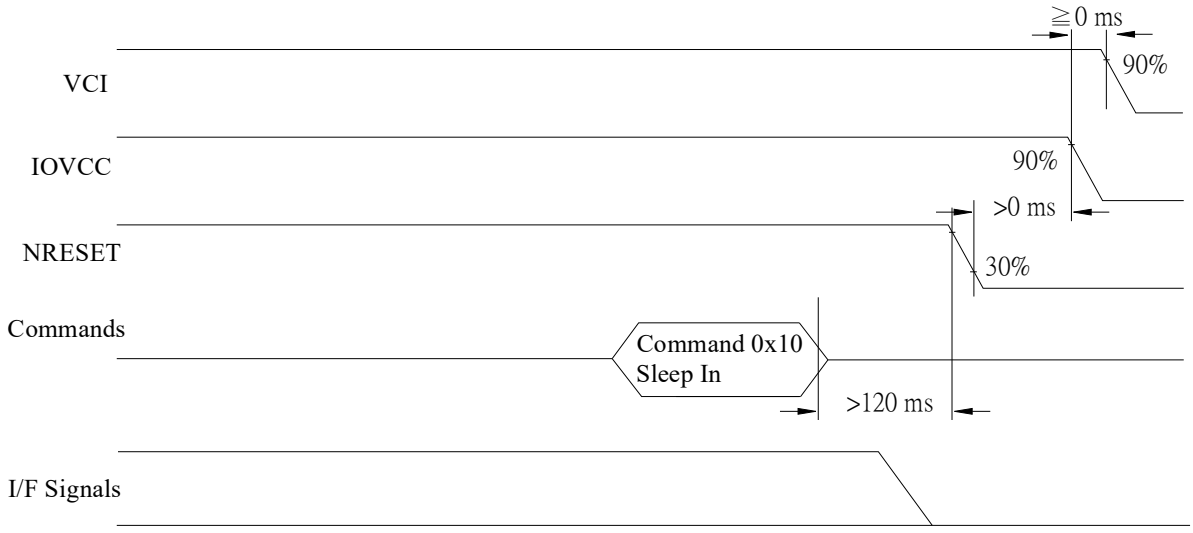
Signal	Symbol	Parameter	MIN	MAX	Unit	Description
HSYNC, VSYNC	T_{SYNCS}	VSYNC, HSYNC Setup Time	15	-	ns	
DE	T_{ENS}	Enable Setup Time	15	-	ns	
	T_{ENH}	Enable Hold Time	15	-	ns	
DOTCLK	PWDH	DOTCLK High-level Pulse Width	30	-	ns	
	PWDL	DOTCLK Low-level Pulse Width	30	-	ns	
	T_{CYCD}	DOTCLK Cycle Time	66	-	ns	
	Trghr, Trghf	DOTCLK Rise/Fall time	-	15	ns	
DB	T_{PDS}	PD Data Setup Time	15	-	ns	
	T_{PDH}	PD Data Hold Time	15	-	ns	

11.4 Power On/ down Sequence

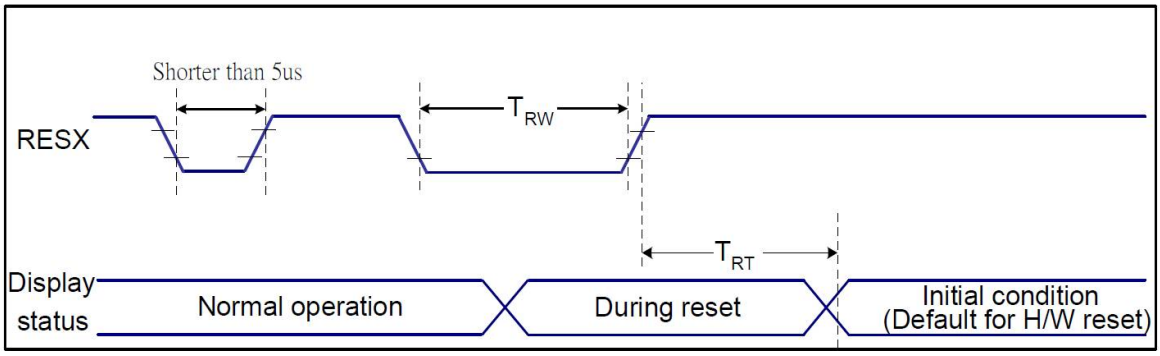
Power ON



Power OFF



11.5 Reset Timinig



VDDI=1.8V,VDDA=2.8V, AGND=DGND=0V, Ta=25℃

Related Pins	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

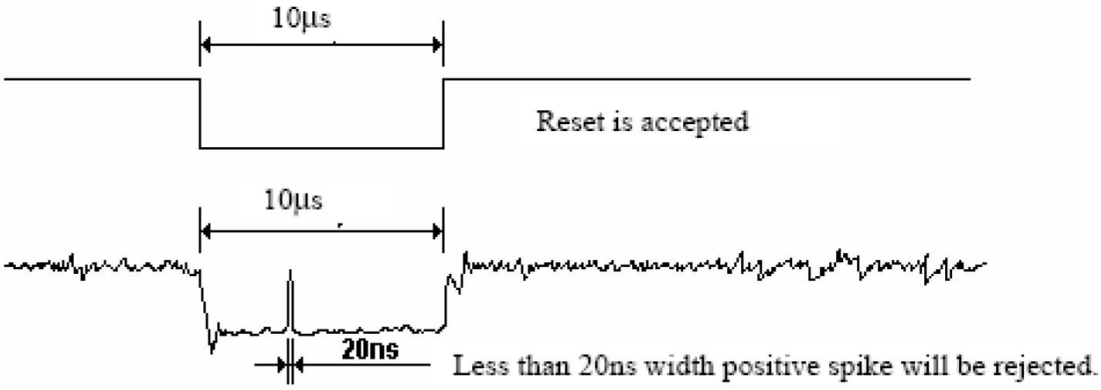
Note1. The reset cancel includes also required time for loading ID bytes, VCOM setting and other settings from NVM (or similar device) to registers. This loading is done every time when there is HW reset cancel time (tRT) within 5 ms after a rising edge of RESX.

Note2.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 9us	Reset
Between 5us and 9us	Reset starts

Note3. During the Resetting period, the display will be blanked (The display is entering blanking sequence, which maximum time is 120ms, 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.

Note4. 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.

12. Reliability Test Items

No.	Test items	Conditions	Remark
1	High temperature operation	70°C , 240hours	--
2	Low temperature operation	-20°C , 240hours	--
3	High temperature storage	80°C , 240hours	
4	Low temperature storage	-30°C , 240hours	
5	High temperature & high humidity storage	40°C , 90% RH , 240 hours	--
6	Thermal Shock storage	-20°C , 30min. ~ 70°C , 30min. , 100 Cycles	--
7	Vibration test	Freq.:10~55~10~55~10 Hz, Amplitude：1.5 mm. 2 hours for each direction of X, Y, Z	Non-operation
8	Electrostatic discharge	±2KV, Human Body Mode, 100pF / 1500Ω	Non-operation
Criterion: There should be no change which might affect the practical display function when the display quality test is conducted under normal operating condition.			

13. General Precautions

Please pay attentions to the followings as using the LCD module.

13.1 Handling

(a) Do not apply strong mechanical stress like drop, shock or any force to LCD module. It may cause improper operation, even damage.

(b) Because the polarizer is very fragile and easy to be damaged, do not hit, press or rub the display surface with hard materials.

(c) Do not put heavy or hard material on the display surface, and do not stack LCD modules.

(d) If the display surface is dirty, please wipe the surface softly with cotton swab or clean cloth.

(e) Avoid using Ketone type materials (e.g. Acetone), Toluene, Ethyl acid or Methyl chloride to clean the display surface. It might damage the polarizer permanently. The recommended solvents are water and Isopropyl alcohol.

(f) Wipe off water droplets or oil immediately.

(g) Protect the LCD module from ESD. It will damage the LSI and the electronic circuit.

(h) Do not touch the output pins directly with bare hands.

(i) Do not disassemble the LCD module.

13.2 Storage

(a) Do not leave the LCD modules in high temperature, especially in high humidity for a long time.

(b) Do not expose the LCD modules to sunlight directly.

(c) The liquid crystal is deteriorated by ultraviolet. Do not leave it in strong ultraviolet ray for a long time.

(d) Avoid condensation of water. It may cause improper operation.

(e) Please stack only up to the number stated on carton box for storage and transportation. Excessive weight will cause deformation and damage of carton box.

13.3 Operation

(a) When mounting or dismounting the LCD modules, turn the power off.

(b) Protect the LCD modules from electric shock.

(c) The Driver IC control algorithms should always obeyed to avoid damaging the LSI and electronic circuit.

(d) Be careful to avoid mixing up the polarity of power supply for backlight.

(e) Absolute maximum rating specified above has to be always kept in any case. Exceeding it may cause non-recoverable damage of electronic components or, nevertheless, burning.

(f) When a static image is displayed for a long time, remnant image is likely to occur.

(g) Be sure to avoid bending the FPC to an acute shape, it might break FPC.

13.4 Others

(a) If the liquid crystal leaks from the panel, it should be kept away from the eyes or mouth.

(b) For the fragility of polarizer, it is recommended to attach a transparent protective plate over the display surface.

(c) It is recommended to peel off the protection film on the polarizer slowly so that the electrostatic charge can be minimized

■ Inspection Specifications

The buyer (customer) shall inspect the modules within twenty calendar days since the delivery date (the "inspection period") at its own cost. The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this writing will be promptly sent to the seller.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved if, within the inspection period, such samples of modules within such lot show an unacceptable number of defects in accordance with this incoming inspection standards, provided however that the buyer must notify the seller in writing of any such rejection promptly, and not later than within three business days of the end of the inspection period.

Should the buyer fail to notify the seller within the inspection period, the buyer's right to reject the modules shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

■ Warranty

AHS warrants to you, the original purchaser, that each of its products will be free from defects in materials and workmanship for one year from the date of purchase.

AHS will be limited to replace or repair any of its module which is found and confirmed defective electrically or visually when inspected in accordance with AHS general module inspection standard.

This warranty does not apply to any products which have been on customer's production line, repaired or altered by persons other than repair personnel authorized AHS, or which have been subject to misuse, abuse, accident or improper installation. AHS assumes no liability under the terms of this warranty as a consequence of such events.

If an AHS product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. In returning the modules, they must be properly packaged with original package; there should be detailed description of the failures or defect.

■ RMA

Products purchased through AHS and under warranty may be returned for replacement. Contact sales@advancehightech.com for RMA number and procedures.

Office Locations

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