Specification for Approval

Customer:_____

Model Name:_____

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
Peter	Peng Jun		

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2016-02-24	NEW ISSUE	

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1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by AMSON electronics.
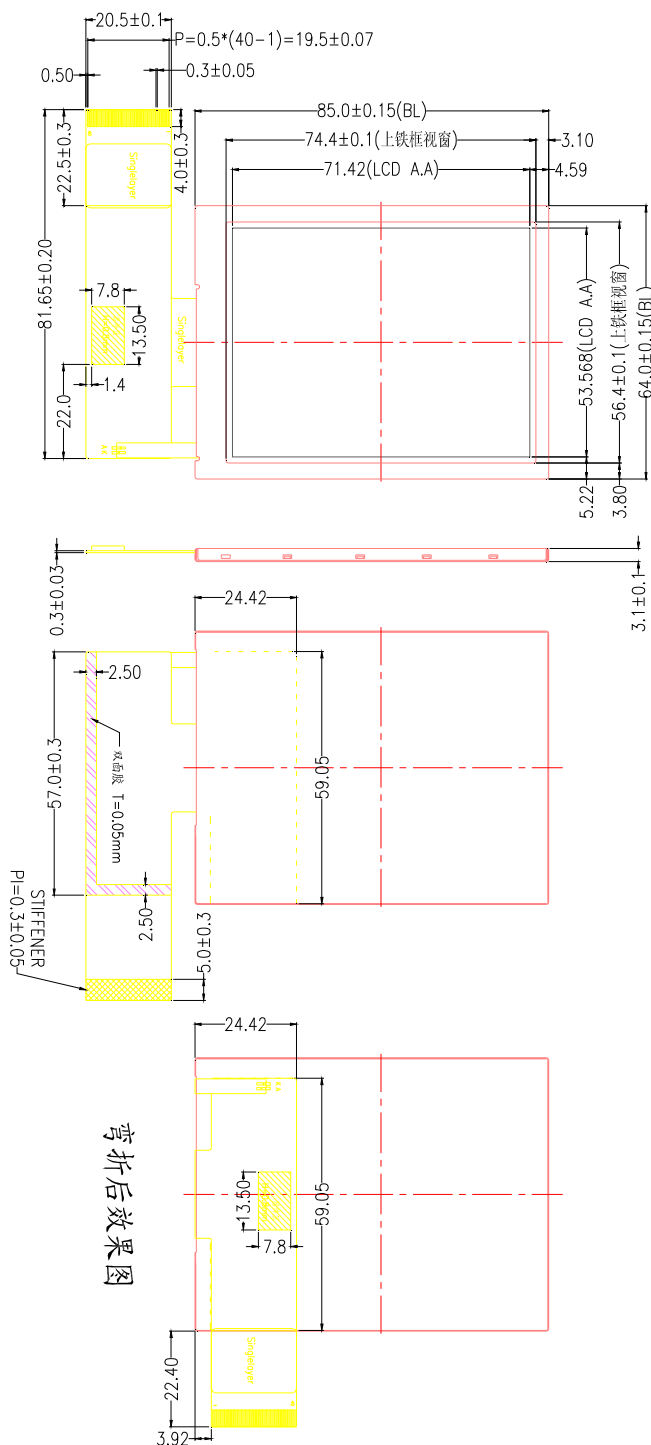If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution.

2. General Information

ITEM	STANDARD VALUES	UNITS
LCD type	3.5"TFT	--
Dot arrangement	480(RGB)×640	dots
Color filter array	RGB vertical stripe	--
Display mode	a_Si TFT / Transflective / Normally Black	--
Viewing Direction	ALL(IPS)	--
Driver IC	HX8363A	--
Module size	64.0(W)×85.0(H)×3.0(T)	mm
Active area	53.568(W)×71.424(H)	mm
Dot pitch	0.0372(W)×0.1116(H)	mm
Interface	24 bits RGB with Serial Interface / CCIR656	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	6 White LED	--
Weight	TBD	g

3.External Dimensions

Specification:
1). Luminance: 200cd/m2(TYP) In Transmissive
2). Display mode: a_Si TFT/Transflective/Normal Black
3). Viewing Direction: ALL (IPS)
4). Operating temp.: -20°C~+70°C
   Storage temp.: -30°C~+80°C
5). IC: HX8363A
6). All the raw material are Rohs complicant

Title block:

Amson
于都上晴电子有限公司
SHANGQING ELECTRONIC CO.,LTD
Tel:0797-6330063   Fax:0797-6330055
Web:http://www.amson-lcd.com/

SCALE: FIT
SHEET: 1 OF 1
GENERAL TOL: ±0.2MM
APP: DATE:
CHK: DATE:
DWN: DATE:

MODEL NO: LD035H18-40NA-A1
PART NO:
TITLE: LCM OUTLINE

REV 版本: A00
DESCRIPTION 描述: First issue
DATE 日期:

Pin assignments:

Pin	Signal
1	ENB(DEN)
2	GND
3	GND
4	GND
5	NC
6	R0
7	R1
8	R2
9	R3
10	R4
11	R5
12	G0
13	G1
14	G2
15	G3
16	G4
17	G5
18	B0
19	B1
20	B2
21	B3
22	B4
23	B5
24	SCL
25	SDA
26	/CS
27	DOTCLK
28	/RESET
29	HSYNC
30	VSYNC
31	VCC
32	VCC
33	GND
34	LED_A
35	LED_A
36	GND
37	LED_K
38	NC
39	NC
40	NC

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
PIN NO	Symbol	Description
1	ENB(DEN)	Data enable
2-4	GND	GND
5	NC	NC
6-11	R0-R5	Red data 0-5
12-17	G0-G5	Green data 0-5
18-23	B0-B5	Bule data 0-5
24	SCL	Serial clock
25	SDA	Serial data
26	/CS	Serial data enable
27	DOTCLK	Dot(data) Colck
28	/RESET	RESET
29	HSYNC	Horizontal sync
30	VSYNC	Vertical sync
31	VCC	Power supply(3.3V)
32	VCC	Power supply(3.3V)
33	GND	GND
34	LED_A	LED+
35	LED_K	LED-
36	GND	GND
37	NC	NC
38	NC	NC
39	NC	NC
40	NC	NC

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VCC	-0.3	4.6	V
Input Voltage	Vin	-0.3	4.6	V
Operating Temperature	T_{OP}	-20	70	°C
Storage Temperature	T_{ST}	-30	80	°C
Storage Humidity	HD	20	90	%RH

6. DC Characteristics

| Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Logic Supply Voltage	IOVCC	1.65	--	3.3	V	--
Analog Supply Voltage	VCC	2.3	--	3.3	V	--
Input High Voltage	V_{IH}	0.7 IOVCC	--	IOVCC	V	Digital input pins
Input Low Voltage	V_{IL}	GND	--	0.3 IOVCC	V	Digital input pins
Output High Voltage	V_{OH}	0.8 IOVCC	--	IOVCC	V	I_{OH} =-0.1mA
Output Low Voltage	V_{OL}	GND	--	0.2 IOVCC	V	I_{OH} =-0.1Ma IOVCC=1.65-2.4V
Logic Input Current	I_{IL}/I_{IH}	-1	--	1	uA	--

7. Signal timing diagram and Circuit block diagram
7.1 Circuit block diagram
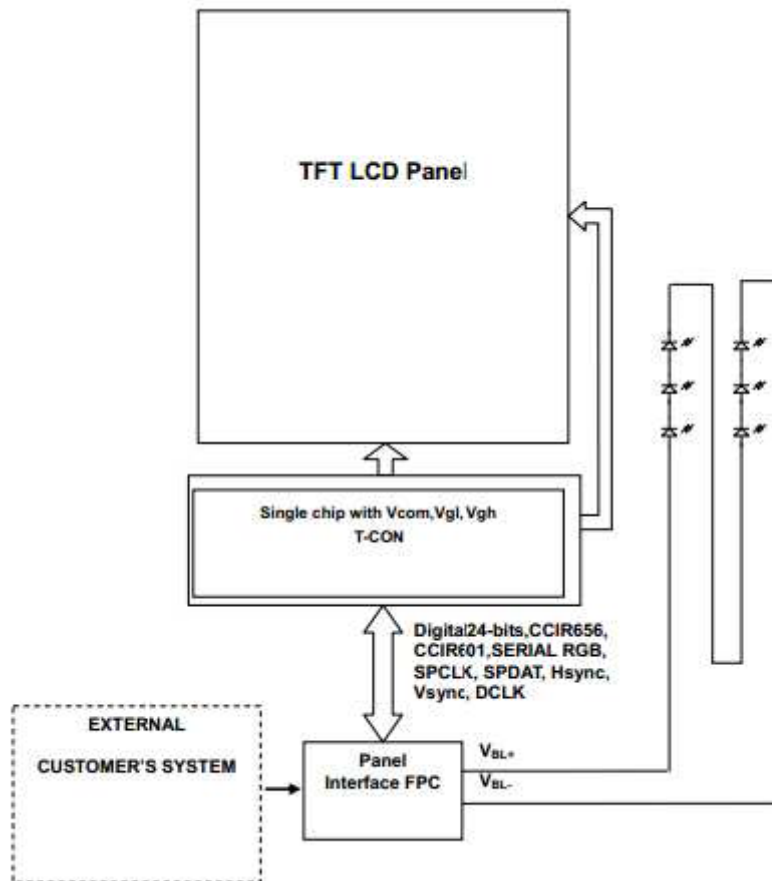
7.2 Timing Diagram
7.2.1 Signal Timing Diagram
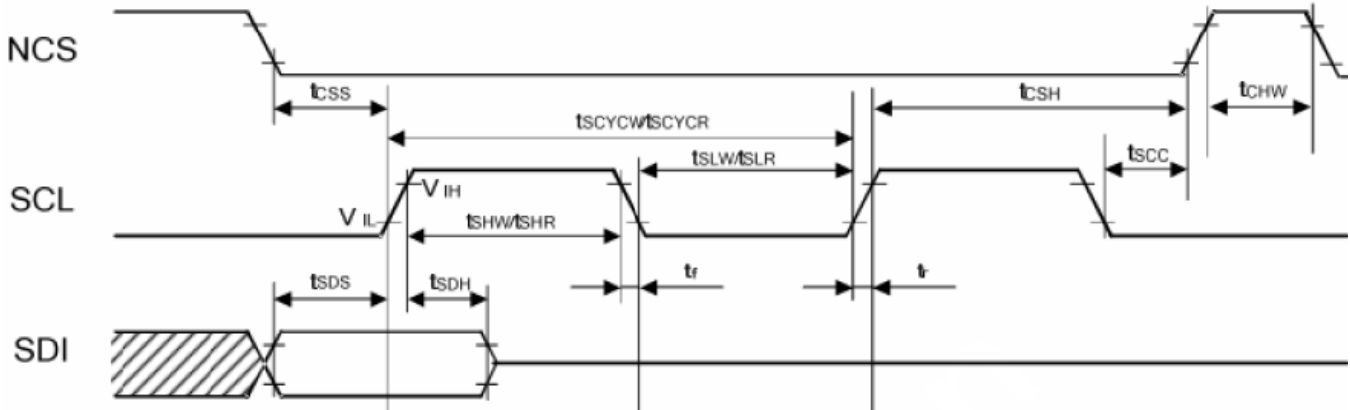
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Serial clock cycle (Write)	t_{SCYCW}	SCL	80	-	-	ns
SCL "H" pulse width (Write)	t_{SHW}		30	-	-	
SCL "L" pulse width (Write)	t_{SLW}		30	-	-	
Data setup time (Write)	t_{SDS}	SDI	10	-	-	ns
Data hold time (Write)	t_{SDH}		10	-	-	
Serial clock cycle (Read)	t_{SCYCR}	SCL	150	-	-	ns
SCL "H" pulse width (Read)	t_{SHR}		60	-	-	
SCL "L" pulse width (Read)	t_{SLR}		60	-	-	
SCL to Chip select	t_{SCC}	NCS	30	-	-	ns
NCS "H" pulse width	t_{CHW}	NCS	60	-	-	ns
NCS-SCL time (write)	t_{CSS}	NCS	30	-	-	ns
NCS-SCL time (write	t_{CSH}		30	-		
NCS-SCL time (Read)	t_{CSS}	NCS	60	-	-	ns
NCS-SCL time (Read)	t_{CSH}		65	-		

7.2.2 Serial Data Transfer interface

Serial Interface protocol 3 wire serial interface (write mode)
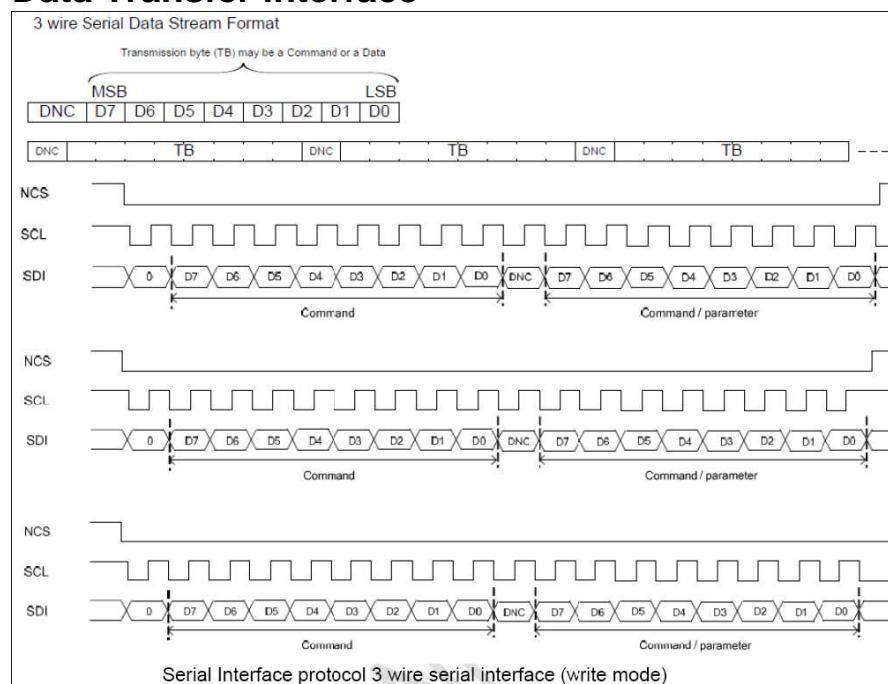
7.2.3 RGB interface
Vertical timing for RGB
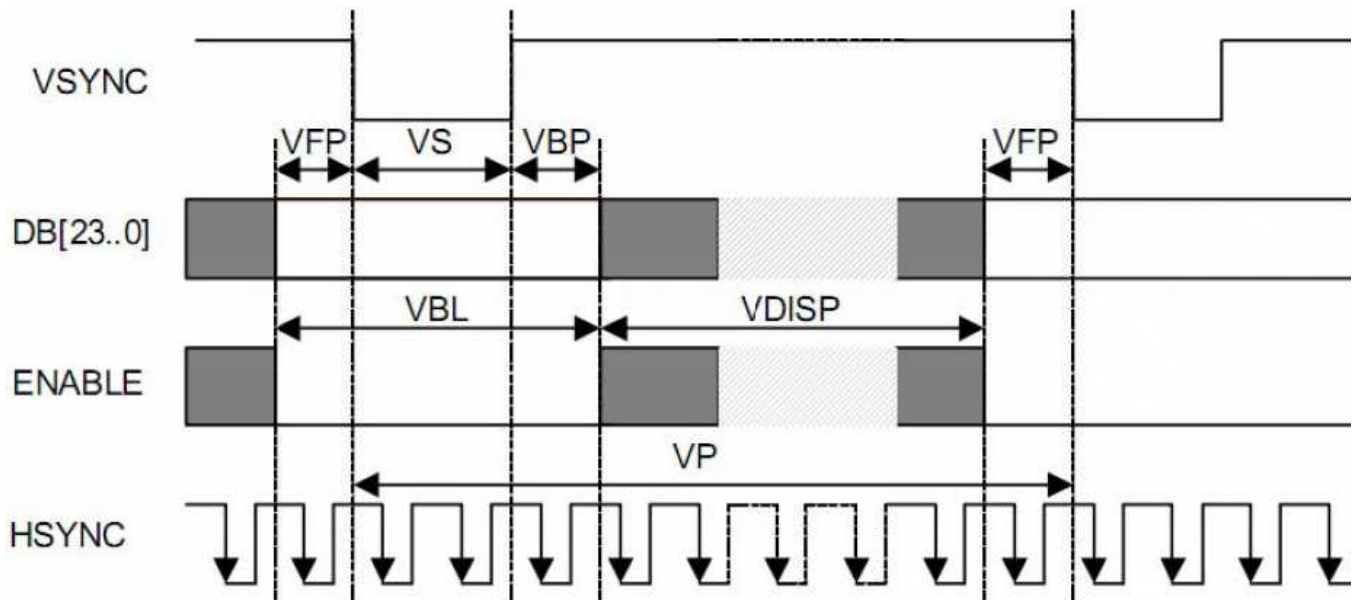
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
VS cycle	VP	-	646	649	652	Line
VS low pulse width	VS	-	2	3	4	Line
Vorizontal back porch	VBP	-	2	3	4	Line
Vorizontal front porch	VFP	-	2	3	4	Line
Vorizontal data start point	-	VS+VBP	4	6	8	Line
Vorizontal blanking period	VBLK	VS+VBP+VFP	6	9	12	Line
Vertical active area	-	VDISP	-	640	-	Line
Vertical Refresh rate	VRR	-	50	60	70	Hz

Horizontal timing for RGB
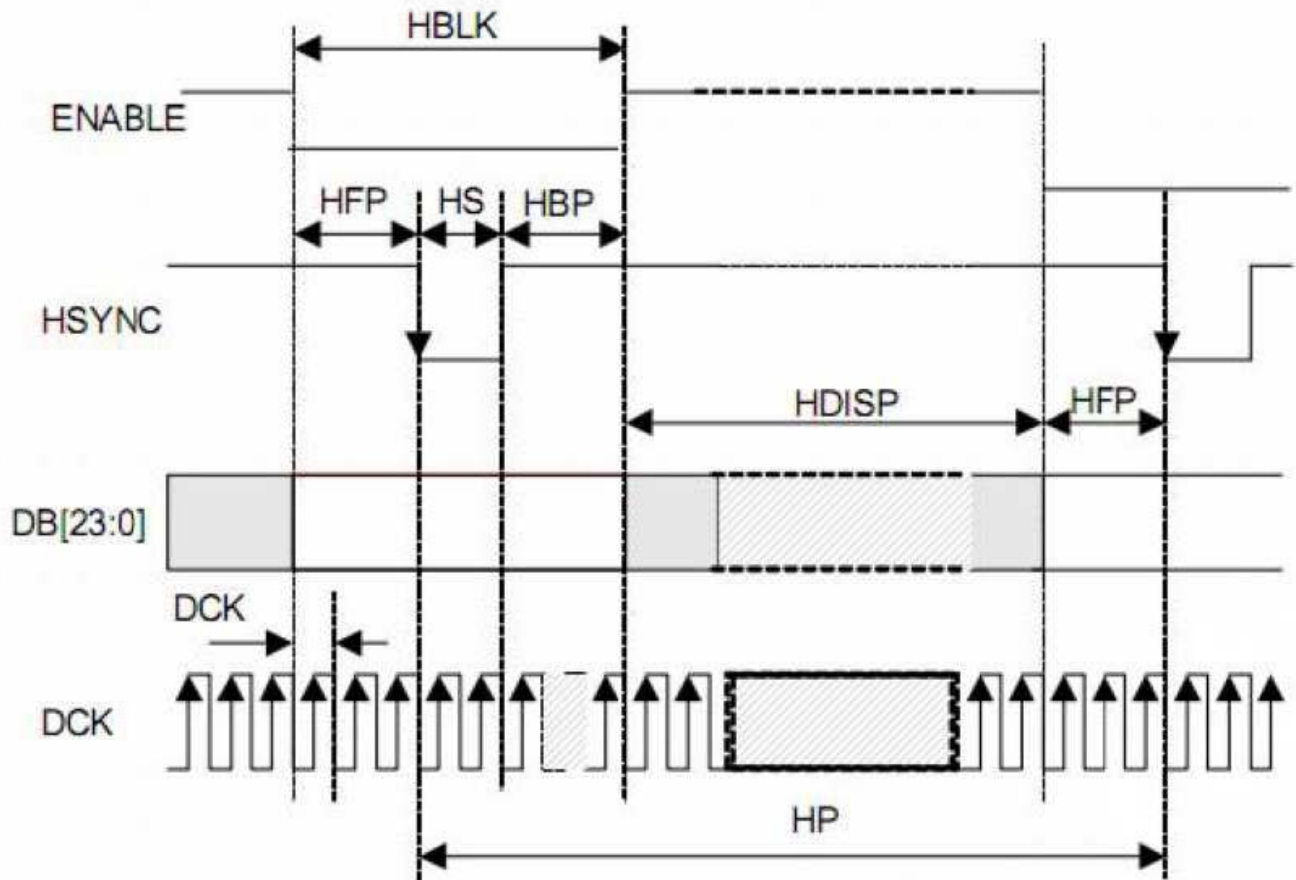
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
HS cycle	HP	–	504	520	568	DCK
HS low pulse width	HS	–	5	10	78	DCK
Horizontal back porch	HBP	–	5	10	78	DCK
Horizontal front porch	HFP	–	5	20	78	DCK
Horizontal data start point	–	HS+HBP	19	20	83	DCK
			700	–	–	ns
Horizontal blanking period	HBLK	HS+HBP+HFP	24	40	88	DCK
Horizontal active area	HDISP	–	–	480	–	DCK
Pixel clock frequency When RGB I/F is running	DCK	VRR = Min. 50Hz – Max. 70Hz	16.3	22.2	25.8	MHZ
			38.7	45.0	61.3	ns

7.3 Waveform
7.3.1 Genaral Timings for RGB
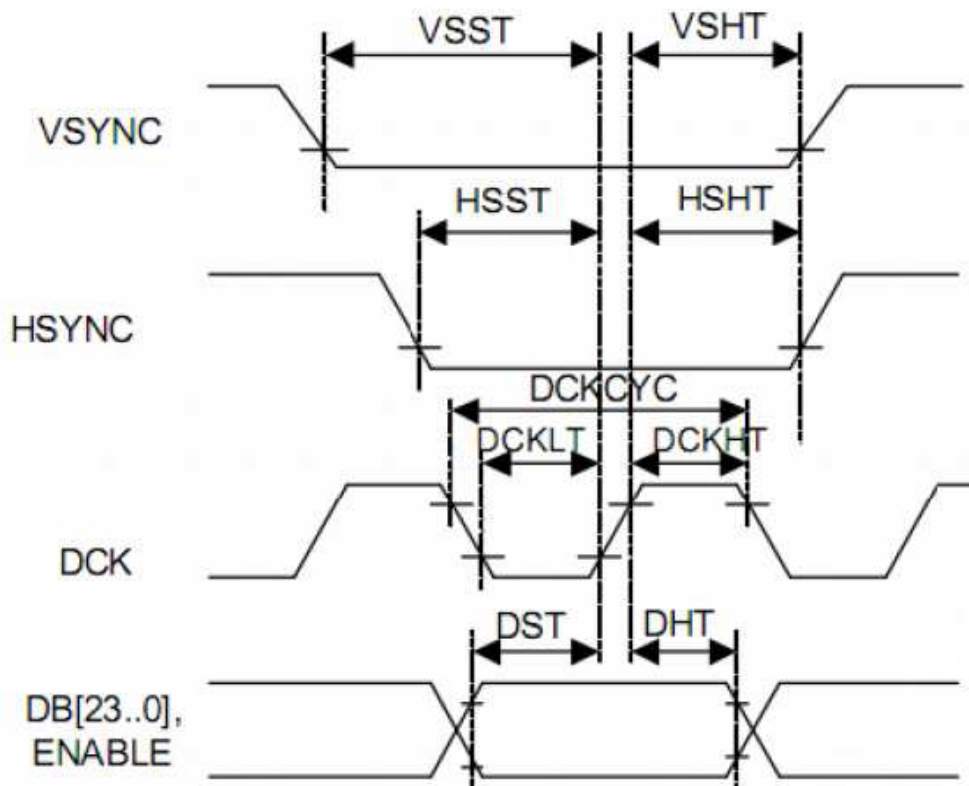
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Vertical sync. Setup time	VSST	-	5	-	-	ns
Vertical sync. Hold time	VSHT	-	5	-	-	ns
Horizontal sync. Setup time	HSST	-	5	-	-	ns
Horizontal sync. Hold time	HSHT	-	5	-	-	ns
Pixel clock low time	DCKLT	-	5	-	-	ns
Pixel clock high time	DCKHT	-	5	-	-	ns
Data setup time DB[23:0]	DST	-	5	-	-	ns
Data Hold time DB[23:0]	DHT	-	5	-	-	ns

7.3.2 Reset Timing Chart
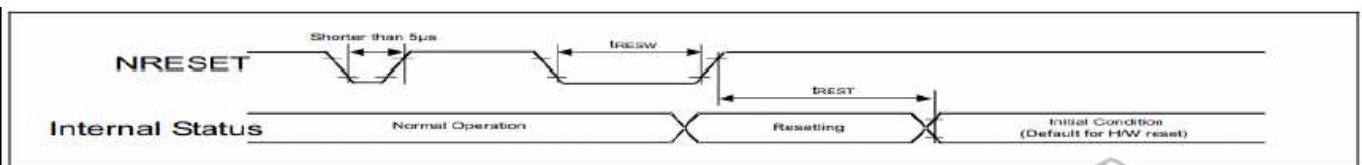
Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t_{RESW}	Reset low pulse width[1]	NRESET	10	-	-	-	μs
t_{REST}	Reset complete time[2]	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

7.4 Power ON/OFF Timing
7.4.1 Power ON

VDD1
VDD2
VDD3

RESX

Wait until power stable

10us (min) Effective reset pulse

6ms (min)

V synchronous time , max 1 frame

Sleep out command

Standard command input (Note1)

5ms (min)

User Define command input (Note2)

Min 120ms

Display on command (Note3)

RGB Interface

2 frames before SLPOUT

RGB Signals

See "Power On Timing - 2"

Mode — Not define | Sleep in | Sleep out | Sleep out + Display on

Function — All power off | Load OTP <6ms | Load OTP <6ms | Display off | Clear screen | Normal display

2 frames (33ms)

OSC — OFF | Operation

Driver boost — Not defined | Power sequential turn on | Normal operation

67ms (min)

Regulator VCOM/ VSPR/ VSNR — OFF | Normal operation

S[1440.1] — V0/V255 | Gray

Sleep out command

Display on command

VGH — 2ms (min)

VGL — DT+5ms(min) (Note4)

VSP (for PFM) — DT+15ms(min) (Note4)

VSN (for PFM) — DTms (Note4)

VSP (for 5186) — DTms (Note4)

VSN (for 5186) — DT+15ms(min) (Note4)

VCOM/ VSPR/ VSNR — 3DT+15ms(at least) (Note4)

Note1:
"Standard" command except "01h" & "10h" command must wait 5ms after "Sleep out" command then can be sent. "01h" & "10h" command must wait 100ms after "Sleep out" command then can be sent.

Note2:
"User Define" command must wait 100ms after "Sleep out" command then can be sent. "B9h" command must be sent first then other command can be sent after "B9h" command.
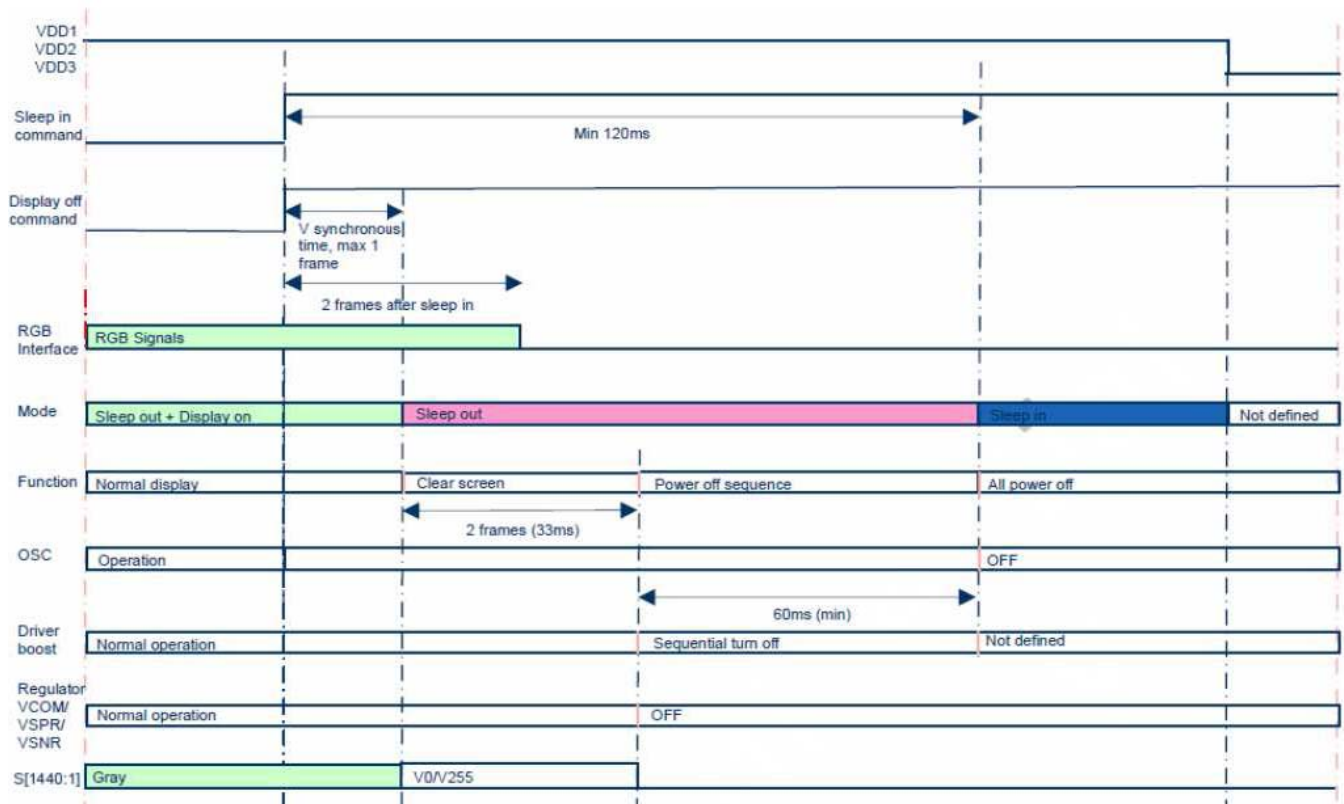
Note3:
"Display on" command must send after "User Define" command or at the same time.

Note4:

DT[1:0]:Delay time of power on and power off sequence.

DT1	DT0	Delay time of power on and power off sequence on
0	0	5ms
0	1	10ms
1	0	15ms
1	1	20ms

Default DT=5ms

7.4.2 Power OFF

8. Backlight Characteristics

BL Circuit Diagram:

LEDA ⟶ LEDK
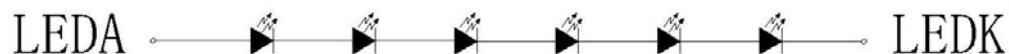
Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	--	19.8	--	V	If=20mA
Supply Current	If	--	20	--	mA	--
Luminous Intensity for LCM	--	170	200	--	Cd/m^2	If=20mA
Uniformity for LCM	--	80	--	--	％	If=20mA
Life Time	--	--	--	--	Hr	If=20mA
Backlight Color	White					

9. Optical Characteristics

(Note1，Note2) (Using Normal Polarizer +CPT Backlight, reference only)

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Luminance for LCM		Lv	$\theta =\varphi= 0°$	170	200	--	cd/m²	Note2
Color gamut of CF(NTSC%)		S		58			%	
Contrast Ratio		CR	$\theta =\varphi= 0°$	-	250	--	--	Note3
Response Time		Tr+ Tf	$\theta =\varphi= 0°$	--	30	50	ms	Note4
Viewing Angle	Upper	θ	CR$\geqq$10	60	80	--	--	Note 5
	Down			60	80	--	--	
	Right	φ		60	80	--	--	
	Left			60	80	--	--	
Color Filter Chromaticity	White	X	$\theta =\varphi= 0°$		0.314		--	Note 6
		y			0.346		--	
	Red	X	$\theta =\varphi= 0°$	0.623	0.643	0.663	--	
		y		0.313	0.333	0.353	--	
	Green	X	$\theta =\varphi= 0°$	0.284	0.304	0.324	--	
		y		0.558	0.578	0.598	--	
	Blue	X	$\theta =\varphi= 0°$	0.121	0.141	0.161	--	
		y		0.117	0.137	0.157	--	

Note1: Definition of Operation Voltage (Vop)

Intensity
100%

Selected Wave

Non-selected Wave

Cr Max

Cr = Loff / Lon

Vop   Driving Voltage (V)
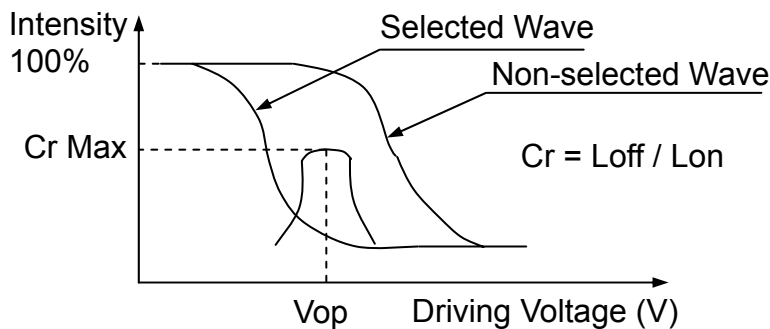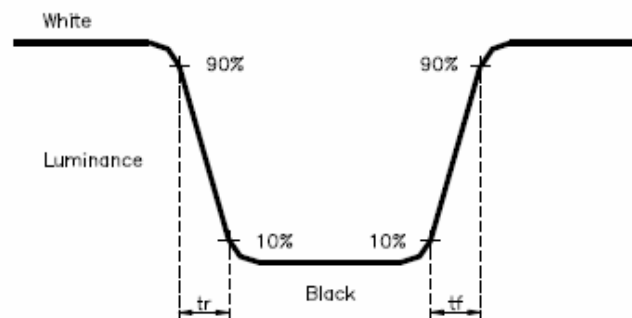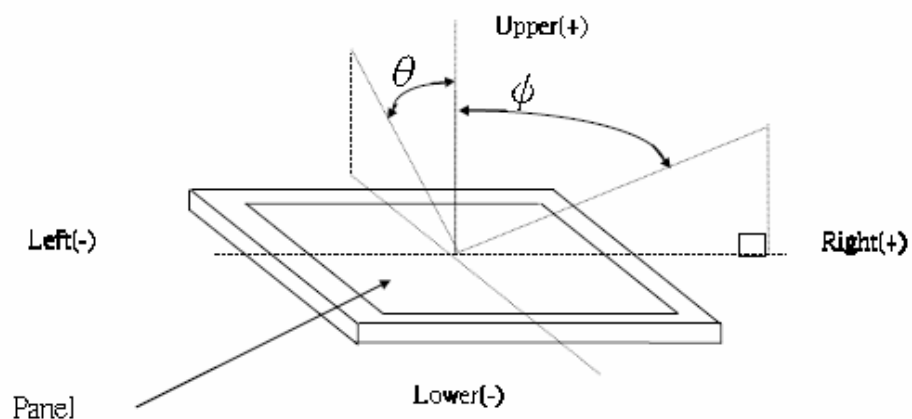
Note2: Definition of Luminance Uniformity：L = L(MIN) / L (MAX) × 100%
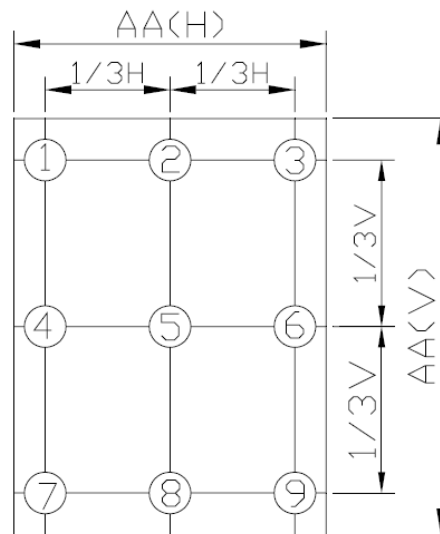
Note 3. Definition of Contrast Ratio;

CR = White Luminance (ON) / Black Luminance (OFF)

Note 4. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.

Note 5. Definition of view angle(θ，ψ)：

Note 6. Light source: C light.

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	High/Low Temperature Storage	80°C/-30°C 120Hours	Inspection after 2~4hours storage at room temperature, the samples should be free from defects: 1, Air bubble in the LCD. 2, Seal leak. 3, Non-display. 4, Missing segments. 5, Glass crack. 6, Current IDD is twice higher than initial value. 7, The surface shall be free from damage. 8, The electric characteristic requirements shall be satisfied.
②	High/Low Temperature Life	70°C/-20°C 120Hours	
③	High Temperature High Humidity Operating	60°C,90%RH,96Hours	
④	Temperature Cycle(Storage)	-30°C ⟷ 25°C ⟷ 80°C (30min) (5min) (30min) 5cycle Total 20cycle	
⑤	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 2hours (Packing Condition)	
⑥	Damp Proof Test (Storage)	50°C±5°C×90%RH×120Hours	
⑦	Drooping Test	Drop to the ground from 1M height one time every side of carton. (Packing Condition)	
⑧	ESD Test	Voltage:±8KV,R:330Ω,C:150PF,Air Mode,10times	

REMARK:
1, The Test samples should be applied to only one test item.
2, Sample side for each test item is 5~10pcs.
3,For Damp Proof Test, Pure water(Resistance > 10MΩ)should be used.
4,In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
5, EL evaluation should be accepted from reliability test with humidity and temperature: Some defects such as black spot/blemish can happen by natural chemical reaction with humidity and Fluorescence EL has.
6, Failure Judgment Criterion: Basic Specification Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

11. Handling Precautions
11.1 Mounting method

   The LCD panel of AMSON TFT module consists of two thin glass plates with polarizes which easily be damaged. And since the module in so constructed as to be fixed by utilizing fitting holes in the printed circuit board.
   Extreme care should be needed when handling the LCD modules.

11.2 Caution of LCD handling and cleaning

When cleaning the display surface, Use soft cloth with solvent
   [Recommended below] and wipe lightly
- Isopropyl alcohol
- Ethyl alcohol

   Do not wipe the display surface with dry or hard materials that will damage the polarizer surface.
   Do not use the following solvent:
- Water
- Aromatics

   Do not wipe ITO pad area with the dry or hard materials that will damage the ITO patterns
   Do not use the following solvent on the pad or prevent it from being contaminated:
- Soldering flux
- Chlorine (Cl) , Sulfur (S)

   If goods were sent without being sili8con coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.
   If ITO corrosion happen by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

11.3 Caution against static charge

The LCD module use C-MOS LSI drivers, so we recommended that you:
   Connect any unused input terminal to VDDIO or GND, do not input any signals before power is turned on, and ground your body, work/assembly areas, and assembly equipment to protect against static electricity.

11.4 packing

- Module employs LCD elements and must be treated as such.
- Avoid intense shock and falls from a height.
- To prevent modules from degradation, do not operate or store them exposed direct to sunshine or high temperature/humidity

11.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage then the limit cause the shorter LCD life.
- An electrochemical reaction due to direct current causes LCD's undesirable deterioration, so that the use of direct current drive should be avoided.
- Response time will be extremely delayed at lower temperature then the operating temperature range and on the other hand at higher temperature LCD's how dark color in them. However those phenomena do not mean malfunction or out of order with LCD's, which will come back in the specified operation temperature.
- If the display area is pushed hard during operation, some font will be abnormally displayed but it resumes normal condition after turning off once.
- Slight dew depositing on terminals is a cause for electro-chemical reaction resulting in terminal open circuit.

Usage under the maximum operating temperature, 50%Rh or less is required.

11.6 storing

In the case of storing for a long period of time for instance, for years for the purpose or replacement use, the following ways are recommended.
- Storage in a polyethylene bag with the opening sealed so as not to enter fresh air outside in it. And with no desiccant.
- Placing in a dark place where neither exposure to direct sunlight nor light's keeping the storage temperature range.
- Storing with no touch on polarizer surface by the anything else.
  [It is recommended to store them as they have been contained in the inner container at the time of delivery from us.

11.7 Safety
- It is recommendable to crash damaged or unnecessary LCD's into pieces and wash off liquid crystal by either of solvents such as acetone and ethanol, which should be burned up later.
- When any liquid leaked out of a damaged glass cell comes in contact with your hands, please wash it off well with soap and water.

12. Precaution for Use

12.1
A limit sample should be provided by the both parties on an occasion when the both parties agreed its necessity. Judgment by a limit sample shall take effect after the limit sample has been established and confirmed by the both parties.

12.2
On the following occasions, the handing of problem should be decided through discussion and agreement between responsible of the both parties.
- When a question is arisen in this specification.
- When a new problem is arisen this is not specified in this specification.
- When an inspection specifications change or operating condition change in customer is reported to AMSON TFT and some problem is arisen in this specification due to the change.
- When a new problem is arisen at the customer's operating set for sample evaluation in the customer site.

13. Packing Method
TBD