



Specification for Approval

Customer: _____

Model Name: _____

Supplier Approval			Customer approval
R&D Designed	R&D Approved	QC Approved	
<i>Peter</i>	<i>Peng Jun</i>		

Revision Record

REV NO.	REV DATE	CONTENTS	Note
A	2018-11-12	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	5.0" TFT	--
Dot arrangement	480(RGB)×272	dots
Color filter array	RGB vertical stripe	--
Display mode	TN / Transmission / Normally White	-
Eyes Viewing Direction	6 O'clock	--
Driver IC	ILI6480	--
Module size	120.7(W)×75.8(H)×3.0(T)(Exclude FPC)	mm
Active area	110.88(W)×62.83(H)	mm
Interface	RGB	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Back Light	White LED*18	--

4. Interface Description

PIN NO.	PIN NAME	DESCRIPTION
2	LEDK	LED backlight (Cathode).
2	LEDA	LED backlight (Anode).
3	GND	Ground.
4	VDD	Power supply.
5-12	R0-R7	Red Data.
13-20	G0-G7	Green Data.
21-28	B0-B7	Blue Data.
29	GND	Ground
30	PCLK	Dot clock signal input. Latching input data at its rising edge.
31	DISP	Display on/off.
32	HSYNC	Horizontal sync input. Negative polarity.
33	VSYNC	Vertical sync input. Negative polarity.
34	DE	Data enable input. Active high to enable the input data bus.
35	NC	No connection
36	GND	Ground.
37	NC	No connection
38	NC	No connection
39	NC	No connection
40	NC	No connection

5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit
supply voltage	VDD	-0.3	5	V
Operating Temperature	TOP	-20	70	°C
Storage Temperature	TST	-30	80	°C
Storage Humidity	HD	20	90	%RH

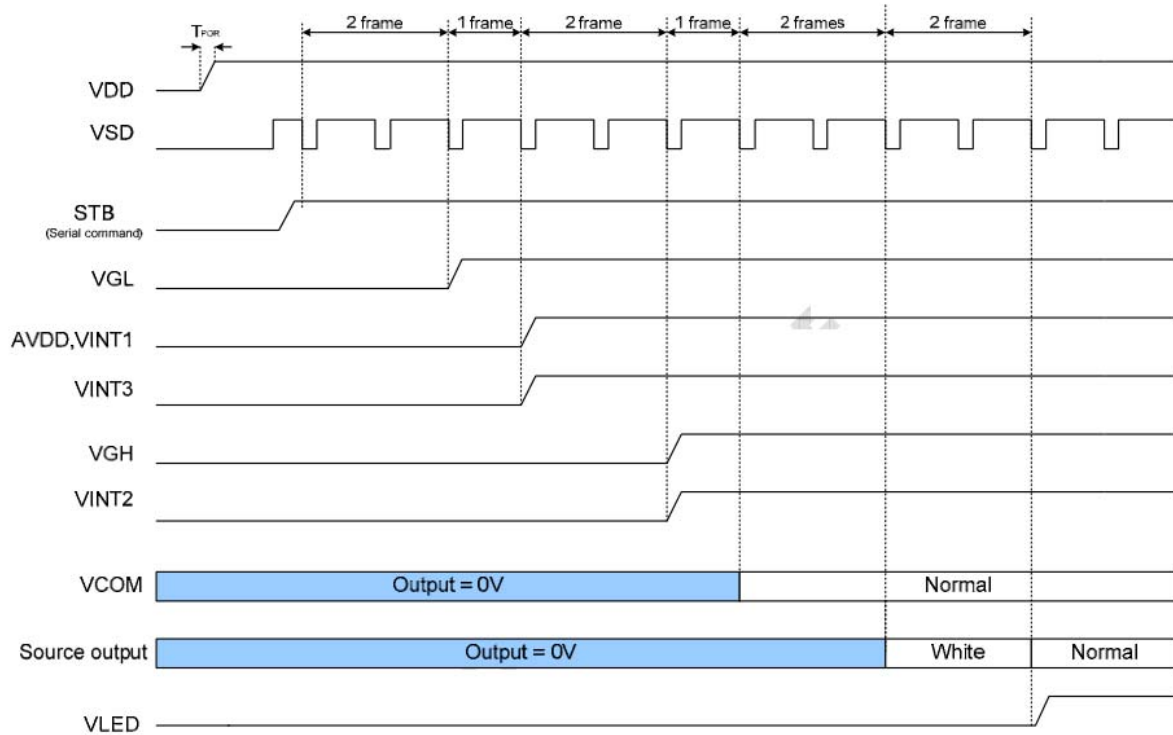
6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
supply voltage	VDD	2.7	3.3	3.6	V	-
Input High Voltage	VIH	0.7VDD	-	VDD	V	-
Input Low Voltage	VIL	GND	-	0.3 VDD	V	-
Output High Voltage	VOH	0.8 VDD	-	VDD	V	-
Output Low Voltage	VOL	GND	-	0.2 VDD	V	-
I/O Leak Current	ILI	-1	-	1	uA	-

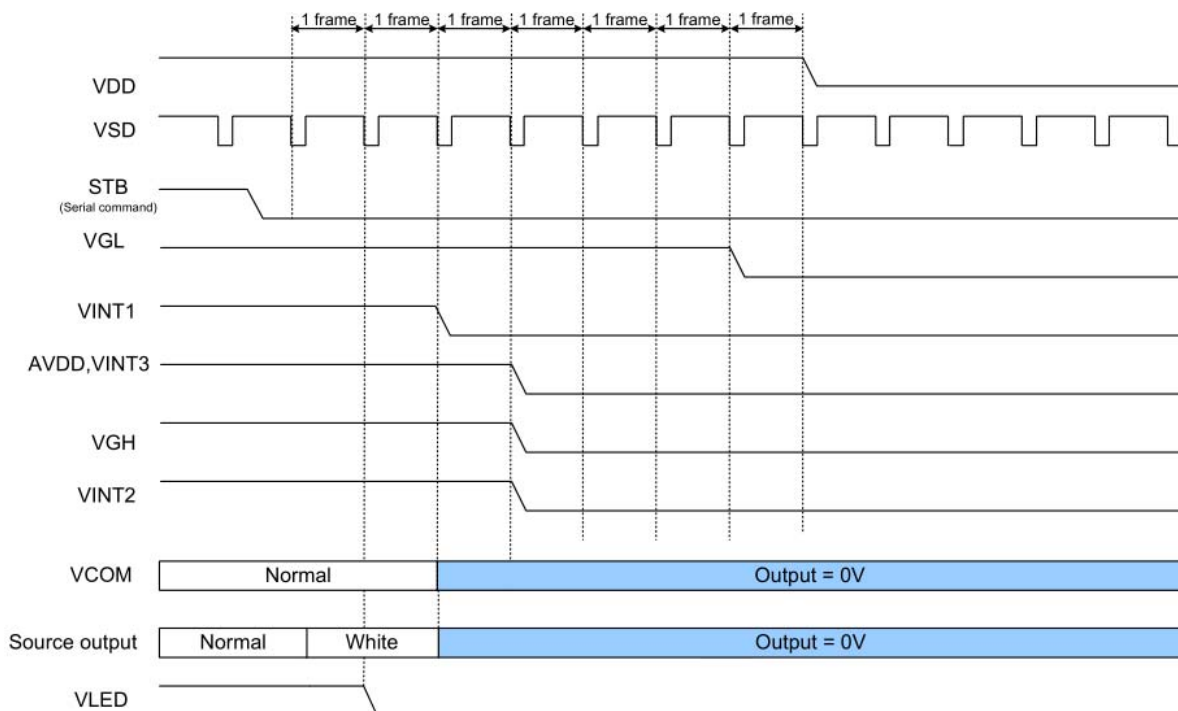
7. Timing Characteristics

7.1 Power on/off control

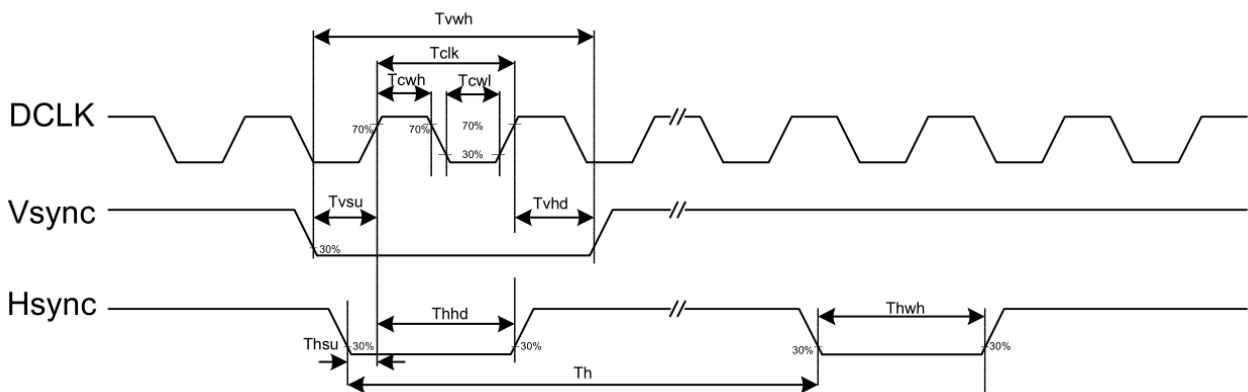
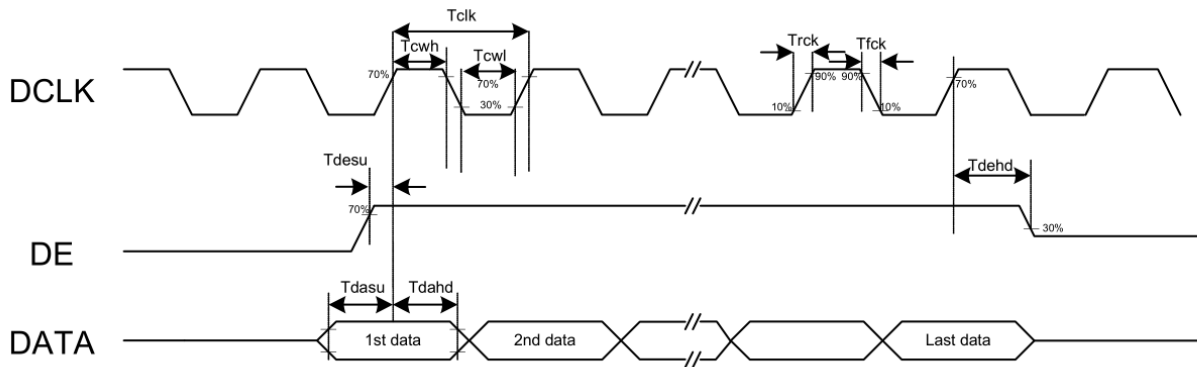
Power On Sequence



Power Off Sequence

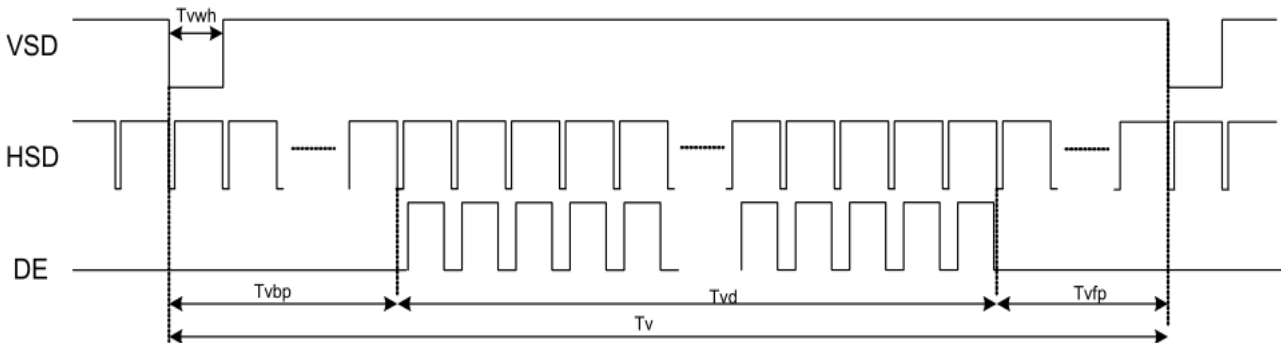


7.2 Clock and Data Input Waveforms

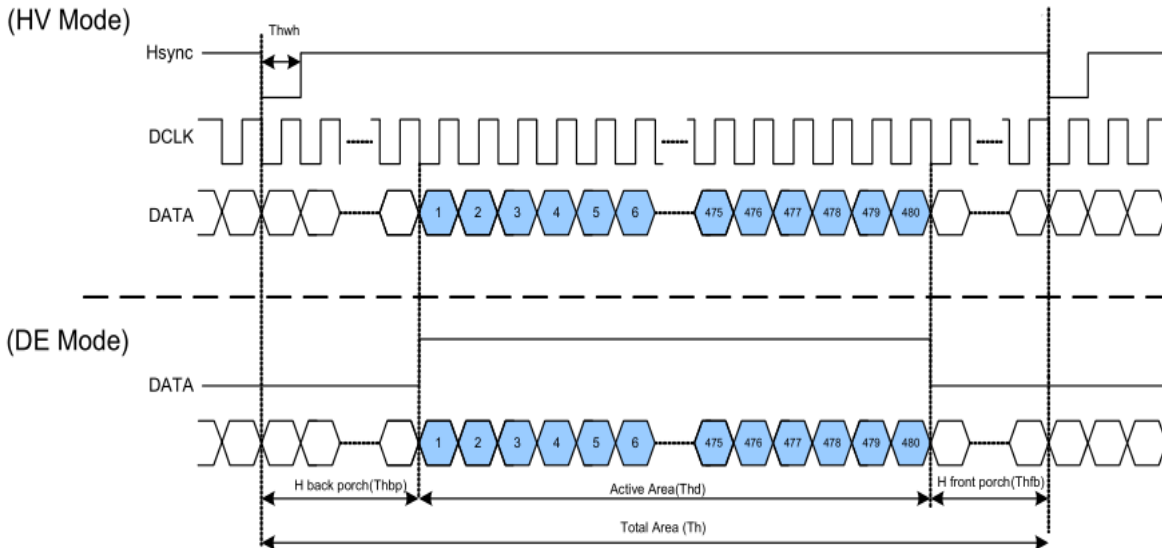


7.3 Data Input Format

Vertical input timing



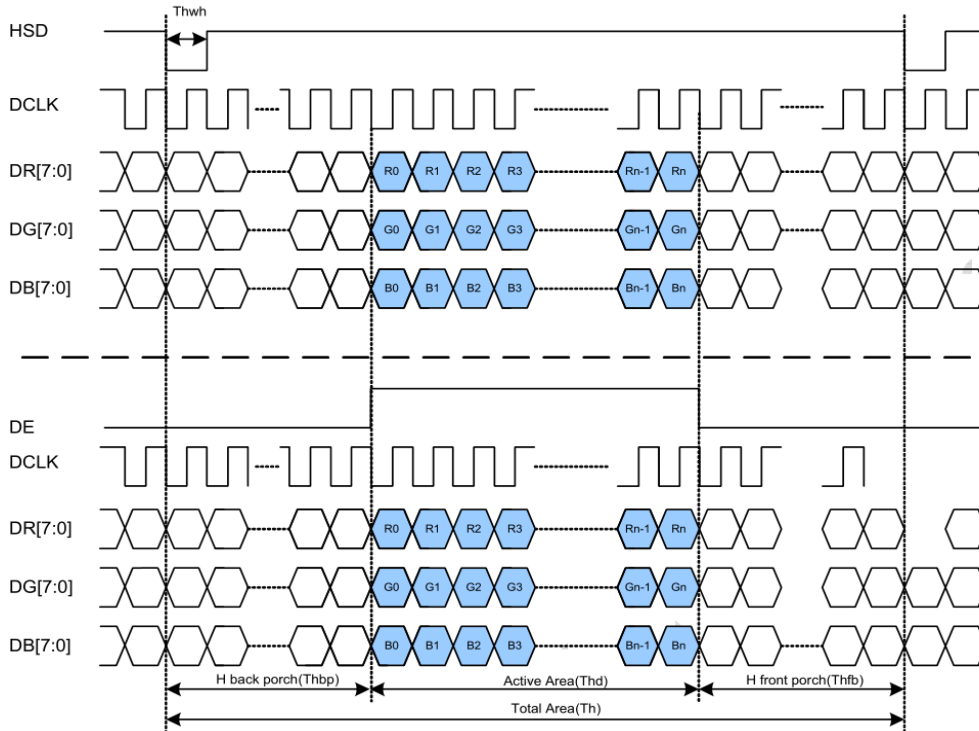
Serial 8-bit RGB Mode Data format



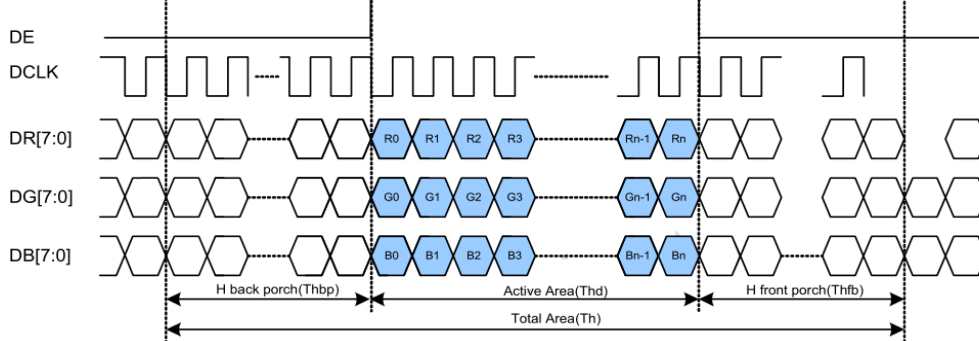
Parameters	Symbol	Min.	Typ.	Max.	Unit	Conditions
DCLK frequency	Fclk	24	27	30	MHz	
DCLK cycle time	Tclk	83	110	200	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
Time from HSD to source output	Thso	-	13	-	DCLK	
Time from HSD to gate output	Thgo	-	27	-	DCLK	
Time from HSD to gate output off	Thgz	-	3	-	DCLK	
Time from HSD to VCOM	Thvc	-	12	-	DCLK	

Parallel RGB Mode Data format

(HV Mode)



(DE Mode)



Parallel RGB input timign table

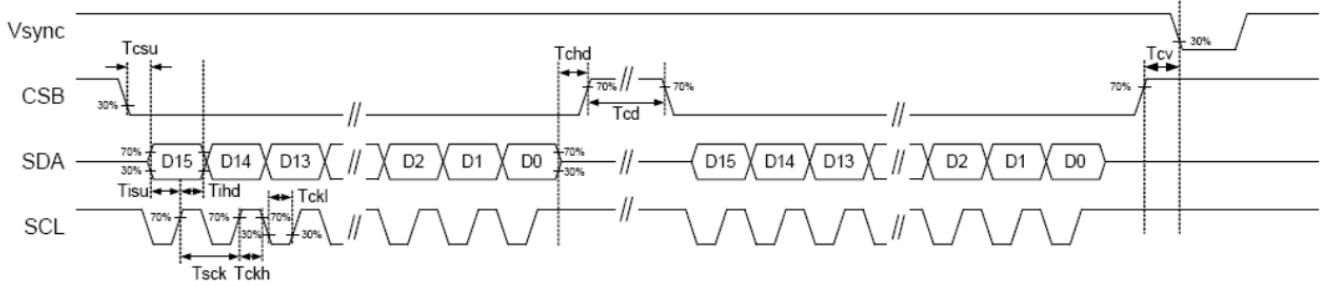
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	5	9	12	MHz
VSD period time	Tv	277	288	400	H
VSD display area	Tvd	272			H
VSD back porch	Tvb	3	8	31	H
VSD front porch	Tvfp	2	8	93	H
HSD period time	Th	520	525	800	DCLK
HSD display area	Thd	480			DCLK
HSD back porch	Thbp	36	40	255	DCLK
HSD front porch	Thfp	4	5	65	DCLK

Serial RGB input timign table

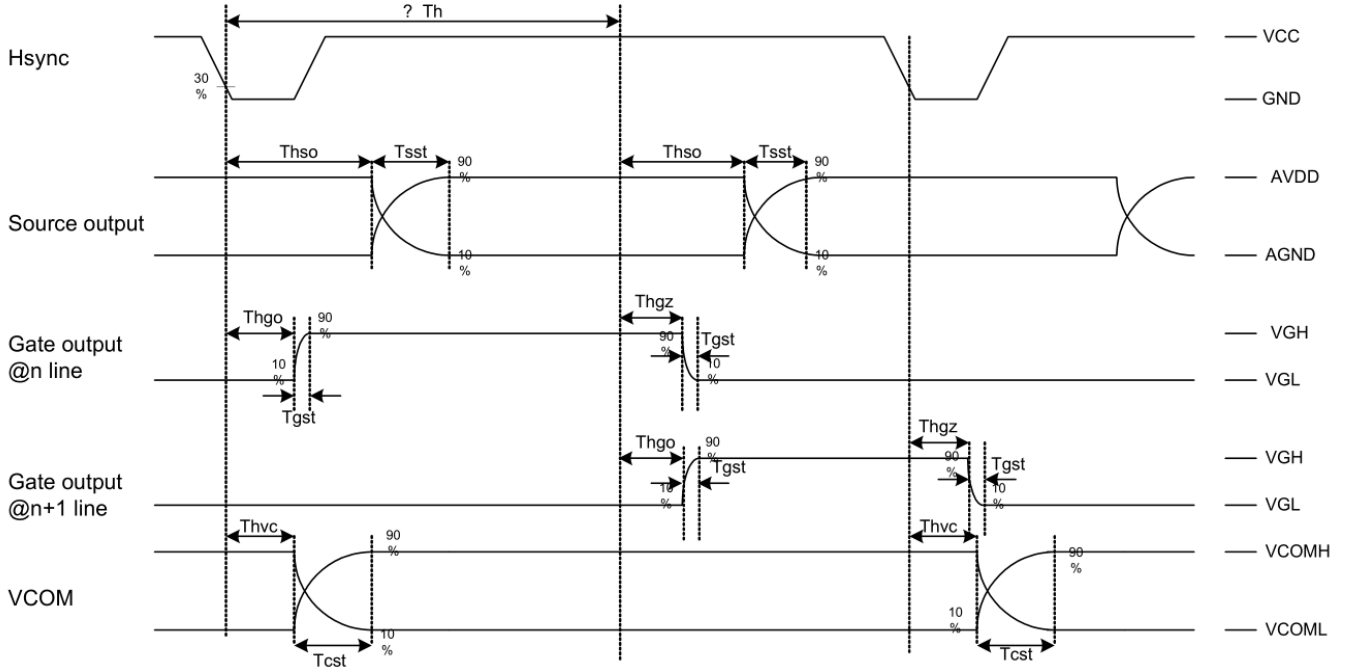
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
DCLK frequency	fclk	-	27	-	MHz
VSD period time	Tv	277	288	400	H
VSD display area	Tvd	272			H
VSD back porch	Tvb	3	8	31	H
VSD front porch	Tvfp	2	8	93	H
HSD period time	Th	-	1575	-	DCLK
HSD display area	Thd	1440			DCLK

HSD back porch	Thbp	-	120	-	DCLK
HSD front porch	Thfp	-	15	-	DCLK

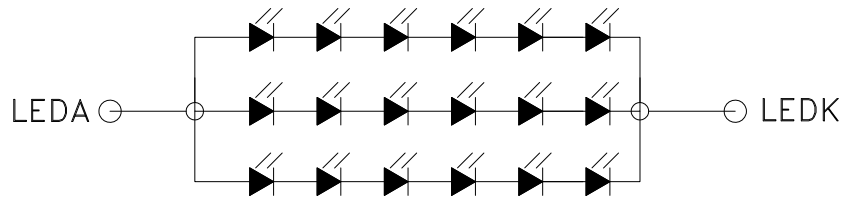
7.4 3-wire Timing Diagram



7.5 Output Timing Diagram



8. Backlight Characteristic



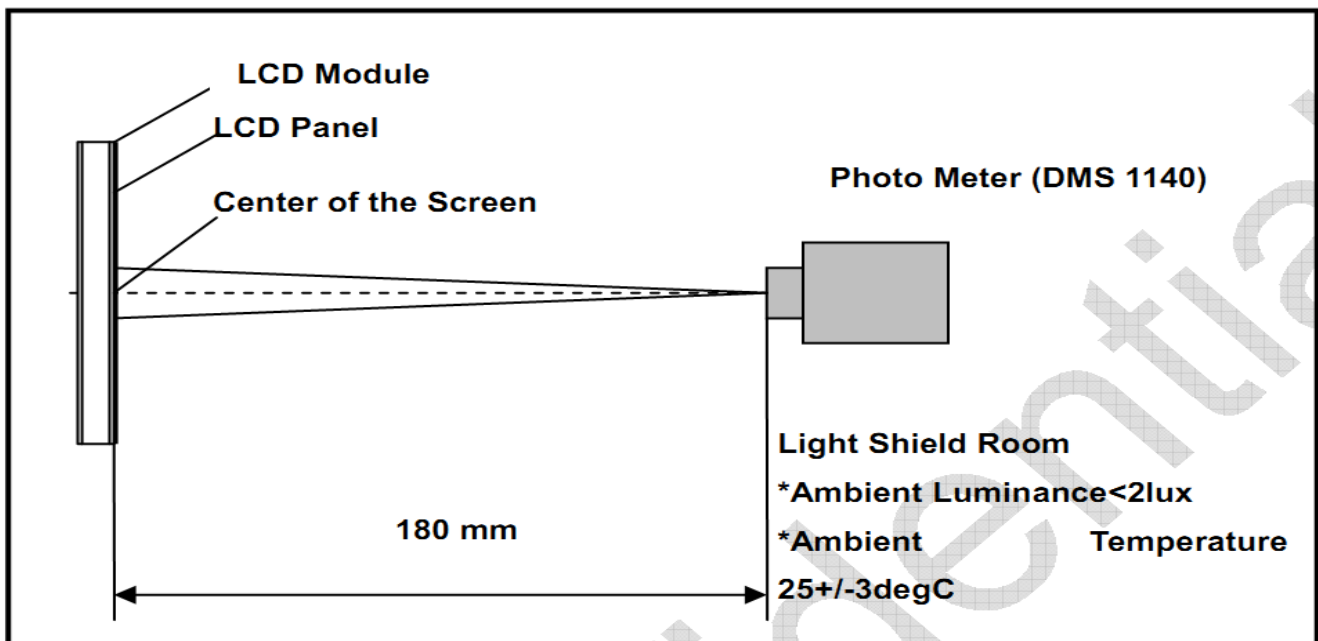
BL CIRCUIT DIAGRAM

Item	Symbol	MIN	TYP	MAX	UNIT	Test Condition
Supply Voltage	Vf	16.8	18	19.8	V	If=60mA
Supply Current	If	-	60	-	mA	-
Luminous Intensity for LCM	-	900	1000	-	cd/m ²	If=60mA
Uniformity for LCM	-	80	-	-	%	If=60mA
Life Time	-	20000	-	-	Hr	If=60mA
Backlight Color	White					

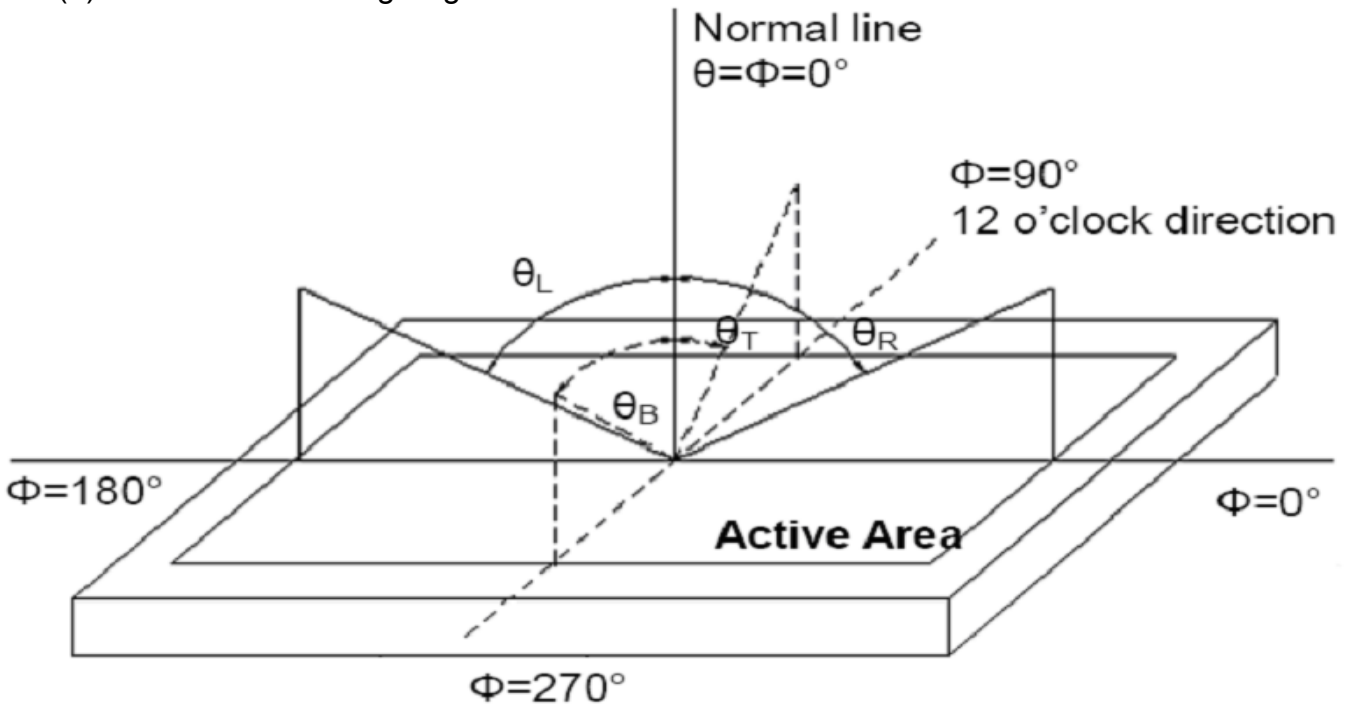
9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	Unit	Note	
Viewing Angle (CR>10)	Horizontal	θL	60	70	-	degree	(1),(2),(6)
		θR	60	70	-		
	Vertical	θT	40	50	-		
		θB	60	70	-		
Contrast Ratio	Center	400	500	-	-	(1),(3),(6)	
Response Time	Rising+Falling	-	25	50	ms	(1),(4),(6)	
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05	0.629	Typ. +0.05	-	(1), (6)	
	Red y		0.347		-		
	Green x		0.320		-		
	Green y		0.551		-		
	Blue x		0.149		-		
	Blue y		0.184		-		
	White x		0.309		-		
	White y		0.347		-		
Transmittance	Without Polarizer	-	19.4	-	%	(1),(6)	

Note (1) Measurement Setup: The LCD module should be stabilized at given temp. 25°C for 15 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 15 minutes in a windless room.



Note (2) Definition of Viewing Angle



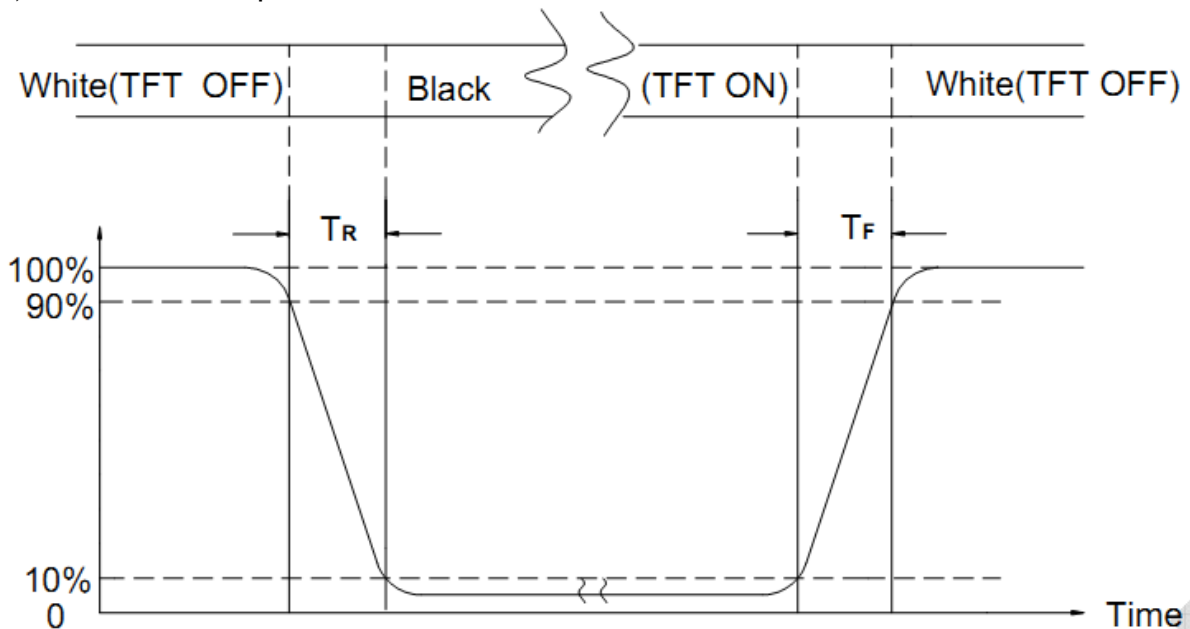
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L63 / L0$$

L63: Luminance of gray level 63, L0: Luminance of gray level 0

Note (4) Definition of response time



Note (5) Definition of Transmittance (Module is without signal input)

$$\text{Transmittance} = \text{Center Luminance of LCD} / \text{Center Luminance of Back Light} \times 100\%$$

Note (6) Definition of color chromaticity (CIE1931)

Color coordinates measured at the center point of LCD

10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
<input type="checkbox"/>	High Temperature Storage	80°C±2°C×96Hours	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.
<input type="checkbox"/>	Low Temperature Storage	-30°C±2°C×96Hours	
<input type="checkbox"/>	High Temperature Operating	70°C±2°C×96Hours	
<input type="checkbox"/>	Low Temperature Operating	-20°C±2°C×96Hours	
<input type="checkbox"/>	Temperature Cycle(Storage)	-20°C ↔ 25°C ↔ 70°C (30min) ← (5min) → (30min) 1cycle Total 10cycle	
<input type="checkbox"/>	Damp Proof Test (Storage)	50°C±5°C×90%RH×96Hours	
<input type="checkbox"/>	Vibration Test	Frequency:10Hz~55Hz~10Hz Amplitude:1.5MM X,Y,Z direction for total 3hours (packing condition test will be tested by a carton)	
<input type="checkbox"/>	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	
<input type="checkbox"/>	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. Inspection Standard

11.1 Incoming Inspection and Standard:

The below incoming inspection are applied to the TFT LCM Modules supplied by AMSON. The customers should inspect the LCM within 14 days after receiving the goods. The result of inspection should be notified to the Seller in the writing copy promptly, if the customer do not send them within 14 days, the seller has the right to judge as acceptance of goods. The inspection lot size is treated as the quantity per shipment and per model. The sampling plan shall be inspected under MIL-STD015E in Level II by single sampling. The acceptable quality level (AQL) are categorized as below grades:

CRITICAL= 0.65%, MAJOR= 0.65%, MINOR= 1.5%

11.2 Inspection condition and Warranty policy:

The delivered LCM should be stored properly, ideally under climate-controlled environment at 25 (±5) degree Celsius as well as 60% (±10) Relative Humidity. The LCM shall be inspected in the viewing angle of 45 degree from the four major angles (U/D/L/R) under the single fluorescent lamp of 20W (equal to 300 to 500 lux). For warranty, AMSON will provide 12 months of warranty period as standard, and provide the new replacement for the defective products which belong to the Seller's responsibility verified by the quality department.

11.3 Inspection Criteria:

11.3.1 Critical defect (重度缺失)

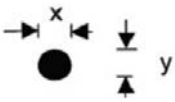
Item No.	Inspection content	Judgement
11.3.1.1	Functional defects	No display, abnormal display, short circuit, missing line, off-contrast and chromaticity, Touch Panel non-function
11.3.1.2	Model mixed	Other model mixed

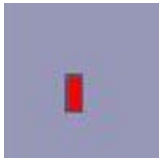
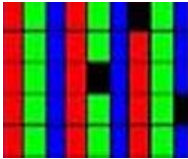
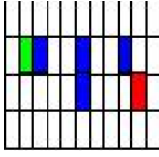
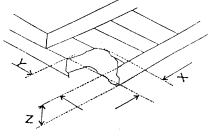
11.3.2 Major defect: (主要缺失)

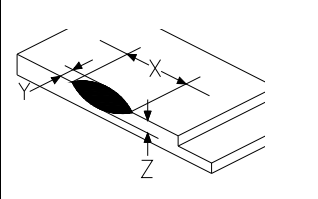
Item No.	Inspection content	Judgement
11.3.2.1	Product indication	Missing model no. and wrong model no. is indicated on the LCM.
11.3.2.2	Glass cracking	The LCD and touch panel glass crack or breakage

11.3.2.3	Missing component	The function component missing such as connector, cable, etc.
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11.3.3 Minor defect (LCD) : (次要缺失)

Item No.	Inspection content	Judgement												
11.3.3.1	Black/White spot Foreign particles Dust in the cell	$\phi = (x+y) / 2$  <table border="1" data-bbox="702 761 1404 1108"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.1$</td> <td>Ignore</td> </tr> <tr> <td>$0.1 < \Phi \leq 0.25$</td> <td>3 (Distance>5mm)</td> </tr> <tr> <td>$0.25 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.1$	Ignore	$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)	$0.25 < \Phi$	Not allowed				
Diameter (mm)	Acceptable Q'ty													
$\Phi \leq 0.1$	Ignore													
$0.1 < \Phi \leq 0.25$	3 (Distance>5mm)													
$0.25 < \Phi$	Not allowed													
11.3.3.2	Linear defect Black/white line Black/white scratch	<table border="1" data-bbox="702 1198 1404 1556"> <thead> <tr> <th>Length(mm)</th> <th>Width (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td></td> <td>$W \leq 0.03$</td> <td>Ignore</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.03 < W \leq 0.07$</td> <td>3</td> </tr> <tr> <td></td> <td>$0.07 < W$</td> <td>Follow 11.3.3.1</td> </tr> </tbody> </table>	Length(mm)	Width (mm)	Acceptable Q'ty		$W \leq 0.03$	Ignore	$L \leq 5.0$	$0.03 < W \leq 0.07$	3		$0.07 < W$	Follow 11.3.3.1
Length(mm)	Width (mm)	Acceptable Q'ty												
	$W \leq 0.03$	Ignore												
$L \leq 5.0$	$0.03 < W \leq 0.07$	3												
	$0.07 < W$	Follow 11.3.3.1												
11.3.3.3	Polarizer Bubbles Dent on polarizer	<table border="1" data-bbox="702 1585 1404 1937"> <thead> <tr> <th>Diameter (mm)</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>$\Phi \leq 0.2$</td> <td>Ignore</td> </tr> <tr> <td>$0.2 < \Phi \leq 0.5$</td> <td>2 (Distance>5mm)</td> </tr> <tr> <td>$0.5 < \Phi$</td> <td>Not allowed</td> </tr> </tbody> </table>	Diameter (mm)	Acceptable Q'ty	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)	$0.5 < \Phi$	Not allowed				
Diameter (mm)	Acceptable Q'ty													
$\Phi \leq 0.2$	Ignore													
$0.2 < \Phi \leq 0.5$	2 (Distance>5mm)													
$0.5 < \Phi$	Not allowed													

<p>11.3.3.4</p>	<p>Electrical defect</p> <p>Dot</p>	<p>Bright dot and Dark dot definition:</p>   <p>or</p>  <p>(Two adjacent dot)</p> <p>Inspection pattern: black, white, red, green, and blue screen.</p> <table border="1" data-bbox="699 801 1410 1070"> <thead> <tr> <th>Items</th> <th>Acceptable Q'ty</th> </tr> </thead> <tbody> <tr> <td>Bright dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 4$ (Distance >5mm)</td> </tr> </tbody> </table>	Items	Acceptable Q'ty	Bright dot	$N \leq 4$ (Distance >5mm)	Dark dot	$N \leq 4$ (Distance >5mm)
Items	Acceptable Q'ty							
Bright dot	$N \leq 4$ (Distance >5mm)							
Dark dot	$N \leq 4$ (Distance >5mm)							
<p>11.3.3.5</p>	<p>Glass Defect- Corner chipping</p>	 <table border="1" data-bbox="699 1263 1410 1644"> <thead> <tr> <th>Size(mm)</th> <th>Judgement</th> </tr> </thead> <tbody> <tr> <td> $X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness) </td> <td>Accept</td> </tr> </tbody> </table>	Size(mm)	Judgement	$X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness)	Accept		
Size(mm)	Judgement							
$X \leq 3\text{mm}, Y \leq S,$ $Z \leq T$ (S= ITO length, T=Single glass thickness)	Accept							

<p>11.3.3.6</p>	<p>Glass Defect- Side fragment</p>		<p>Size(mm)</p>	<p>Judgement</p>
			<p>$X \leq 2 \text{ mm}$, $Y \leq \text{border edge}$</p> <p>$Z \leq T$</p> <p>(T= single glass thickness)</p>	<p>Accept</p>

12. Handling Precautions

12.1 Mounting method

The LCD panel of AMSON TFT module consists of two thin glass plates with polarizers which easily be damaged. And since the module is 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.

12.2 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 silicon coated on the pad, ITO patterns could be damaged due to the corrosion as time goes on.

If ITO corrosion happens by miss-handling or using some materials such as Chlorine (Cl), Sulfur (S) from customer, Responsibility is on customer.

12.3 Caution against static charge

The LCD module uses C-MOS LSI drivers, so we recommend that you:

Connect any unused input terminal to power or ground, 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.

12.4 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 directly to sunshine or high temperature/humidity

12.5 Caution for operation

- It is an indispensable condition to drive LCD's within the specified voltage limit since the higher voltage than the limit causes 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 than the operating temperature range and on the other hand at higher temperature LCD's show 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.

12.6 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

12.7 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

13. Precaution for Use

13.1

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.

13.2

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 which is not specified in this specifications
- 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.

14. Packing Method

TBD