




深圳市华显美科技有限公司

- Tentative Specification
- Preliminary Specification
- Approval Specification

SPECIFICATION

Product Model: HXM-M698-001A

DESIGNED	CHECKED	Approved
		

For Customer's Acceptance:

Comments:	Approved by:
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Table of Contents

List	Description	Page No.
	Cover	1
	Revision Record	2
	Table of Contents	3
1	Scope	4
2	General Information	4
3	External Dimensions	5
4	Interface Description	6
5	Absolute Maximum Ratings	7
6	DC Characteristics	8
7	Timing Characteristics	8
8	Backlight Characteristics	9
9	Optical Characteristics	9
10	Reliability Test Conditions and Methods	12
11	Inspection Standard	13
12	Handling Precautions	17
13	Precaution for Use	18
14	Packing Method	18

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1. Scope

This specification defines general provisions as well as inspection standards for TFT module supplied by HUAXIANMEI electronics.

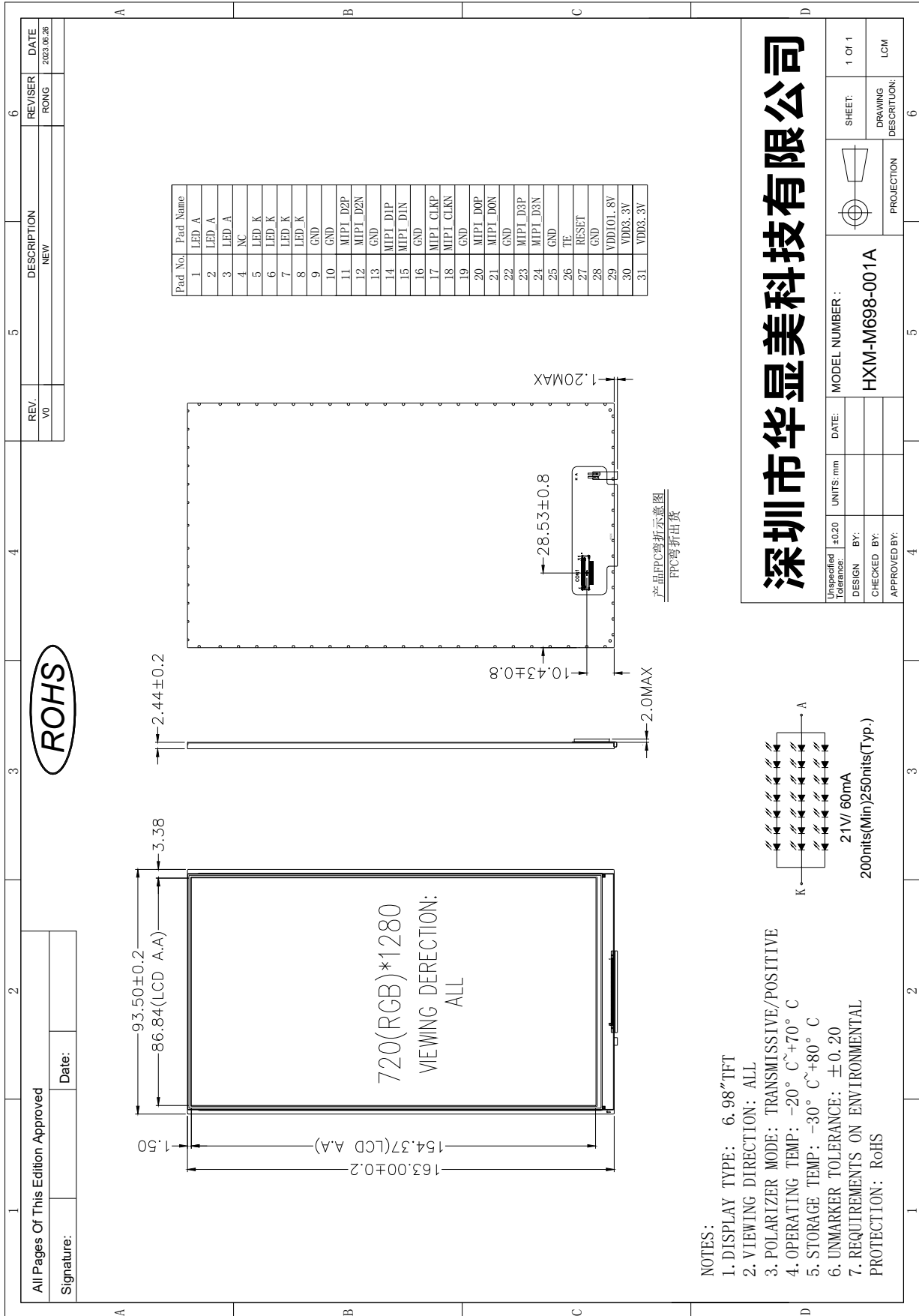
If the event of unforeseen problem or unspecified items may occur, naturally shall negotiate and agree to solution

2. General Information

ITEM	STANDARD VALUES	HUAXIA NMEITS
LCD type	6.98" TFT	--
Dot arrangement	720×3(RGB)×1280	dots
Color filter array	RGB vertical stripe	--
Display mode	IPS/Normally Black	--
Viewing Direction	80/80/80/80	--
Module size	93.50(W) × 163.00(H) × 2.44(T)	mm
Active area	86.84*154.37	mm
Interface	2&4 Lanes MIPI Interface	--
Backlight	White LED x21	--
Operating temperature	-20 ~ +70	°C
Storage temperature	-30 ~ +80	°C
Weight	TBD	g

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3. External Dimensions



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4. Interface Description

LCM

PIN	PIN NAME	DESCRIPTION	Remark
1,2,3	LEDA	Anode for light bar	
4	NC	NC	
5,6,7,8	LEDK	Cathode for light bar	
9	GND	Ground	
10	GND	Ground	
11	MIPI_D2+	MIPI differential data2 input(Positive)	
12	MIPI_D2-	MIPI differential data2 input(Negative)	
13	GND	Ground	
14	MIPI_D1+	MIPI differential data1 input(Positive)	
15	MIPI_D1-	MIPI differential data1 input(Negative)	
16	GND	Ground	
17	MIPI_CLK+	MIPI differential clock input(Positive)	
18	MIPI_CLK-	MIPI differential clock input(Negative)	
19	GND	Ground	
20	MIPI_D0+	MIPI differential data0 input(Positive)	
21	MIPI_D0-	MIPI differential data0 input(Negative)	
22	GND	Ground	
23	MIPI_D3+	MIPI differential data3 input(Positive)	
24	MIPI_D3-	MIPI differential data3 input(Negative)	
25	GND	Ground	
26	ID	NC	
27	RESET	Device reset signal	
28	GND	Ground	
29	VDDIO	1.8V/3.3V input	
30	VDD	3.3V input	
31	VDD	3.3V input	

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5. Absolute Maximum Ratings

Item	Symbol	Min.	Max.	HUAXIA NMEIt	Remark
Digital Supply Voltage	VDD	-0.3	3.6	V	
Digital Supply Voltage	VDDIO	-0.3	3.6	V	
Operating Temperature	TOP	-10	60	°C	
Storage Temperature	TST	-20	70	°C	

6. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	HUA XIAN MEIt	Remark
Digital Supply Voltage	VDD	3.0	3.3	3.6	V	
I/O Supply Voltage	VDDIO	1.7	1.8	3.6	V	
Input logic high voltage	V _{IH}	0.7*VDD/ VDDIO	-	VDD/ VDDIO	V	
Input logic low voltage	V _{IL}	GND	-	0.3*VDD/ VDDIO	V	

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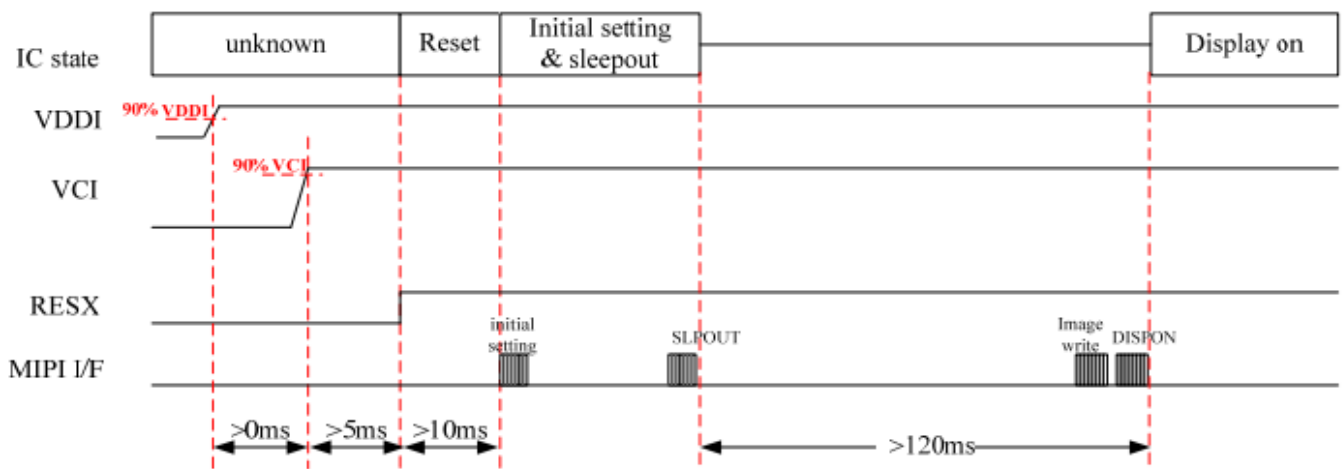
7. Timing Characteristics

7.1. Power ON/OFF Sequence

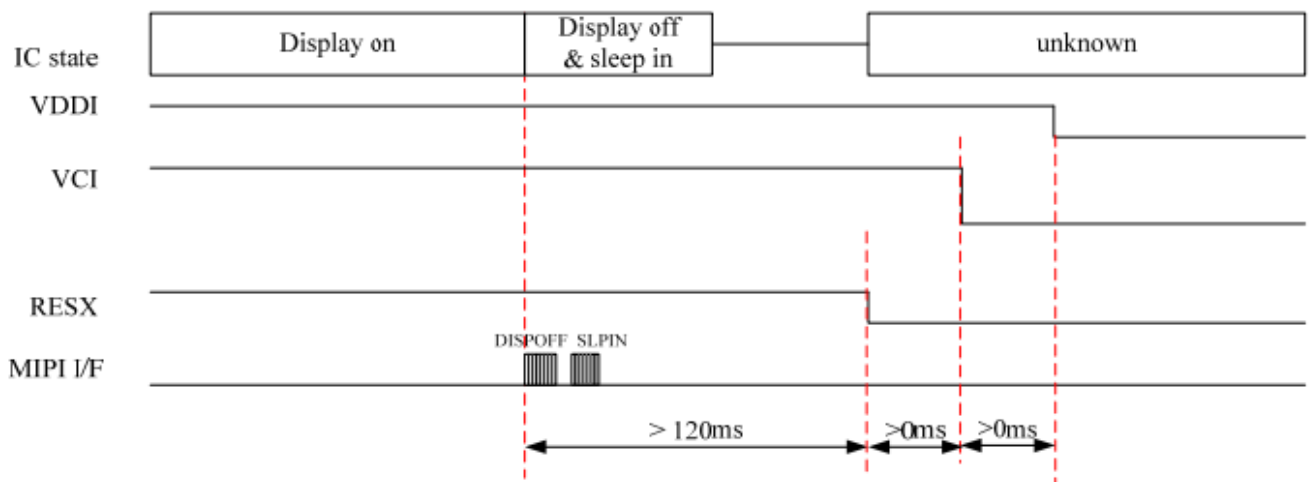
2-Power mode with Power IC or PFM mode

The power on/off sequence for 2-power mode, in which input powers are VCI and VDDI, is depicted in the following. Please follow the power input sequence to avoid triggering any abnormal state.

Power On sequence



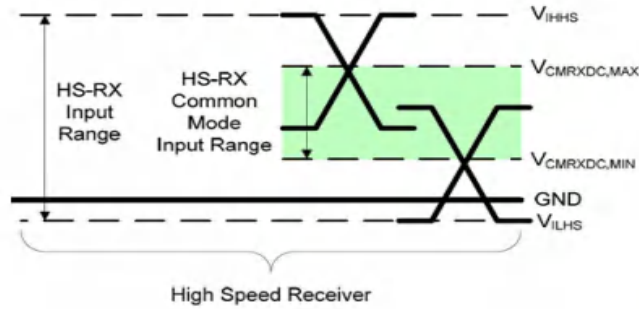
Power Off sequence



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7.2 MIPI Characteristics

7.2.1 DC Specifications High-Speed Receiver Specification



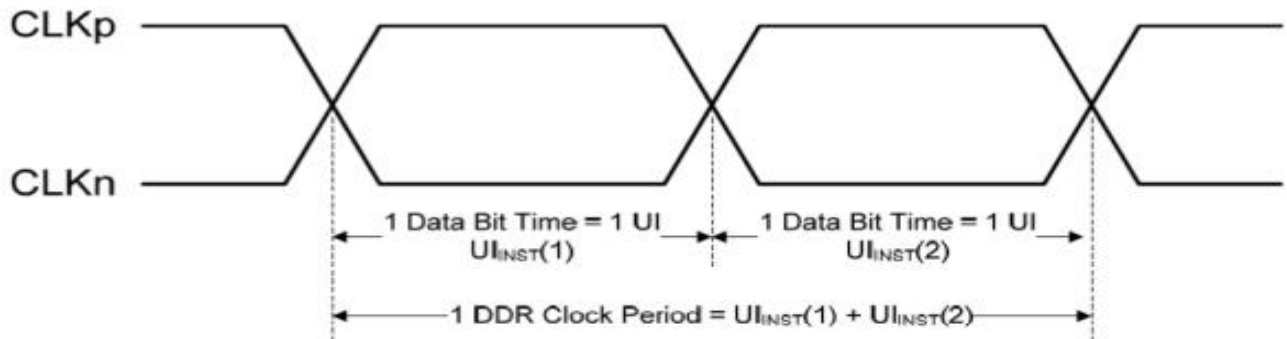
Parameter	Description	Min	Nom	Max	Units	Note
VCMRX(DC)	Common-mode voltage for HS receiver	70		330	mV	1,2
VIDTH	Differential input high threshold			70	mV	
VIDTL	Differential input low threshold	-70			mV	
VIHHS	Single-ended input high voltage			460	mV	1
VILHS	Single-ended input low voltage	-40			mV	1
ZID	Differential input impedance	80	100	125	Ω	

Notes:

1. Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.
2. Values in this table include a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz

7.2.2 Forward high speed transmissions

DDR Clock Definition



Clock Parameter	Symbol	Min	Typ	Max	Units	Notes
UI instantaneous	U_{INST}			12.5	ns	1,2

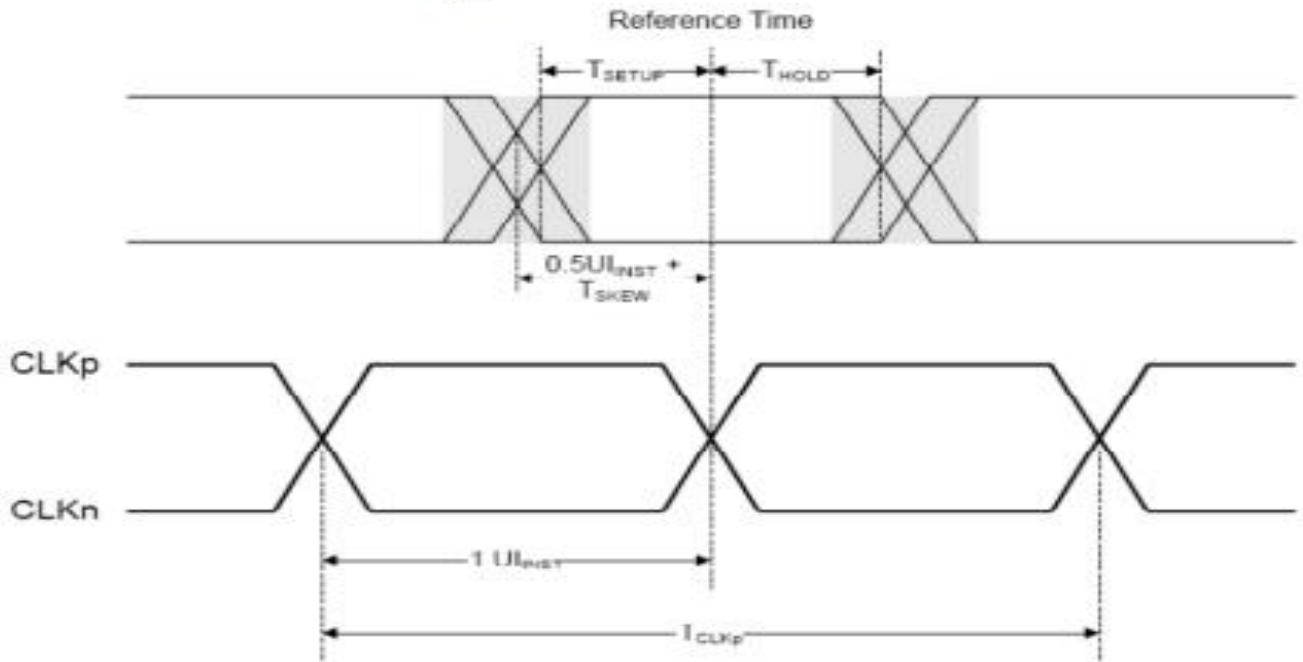
Notes:

1. This value corresponds to a minimum 80 Mbps data rate.

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- The minimum UI shall not be violated for any single bit period, i.e., any DDR half cycle within a data burst.

Data to Clock Timing Definitions



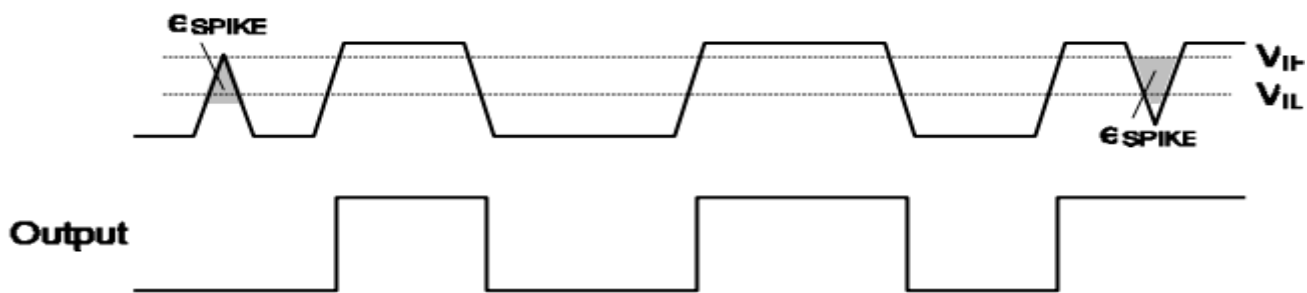
7.2.3 Low power transceiver specifications

Parameters	Symbol	Condition	Min	Typ	Max	Unit
Logic high level input voltage	VIHCD	Contention Detection (Lane_D0)	450		1350	mV
Logic low level input voltage	VILCD	Contention Detection (Lane_D0)	0		200	mV
Logic high level input voltage	VIH-LPRX	LP-Rx (Lane_CK, Lane_D0, Lane_D1)	880	-	1350	mV
Logic low level input voltage	VIL-LPRX	LP-Rx (Lane_CK, Lane_D0, Lane_D1)	0		550	mV
Logic low level input voltage	VIL-ULPS	LP-Rx ULPS (Lane_CK, Lane_D0, Lane_D1)	0		300	mV
Logic high level input voltage	VOH-LPTX	Contention Detection (Lane_D0)	1.1	1.2	1.3	V
Logic low level input voltage	VOL-LPTX	Contention Detection (Lane_D0)	-50	0	50	mV
eSPIKE ^(1,2,3)	Fig. 2	Input pulse rejection			300	V.ps

Notes:

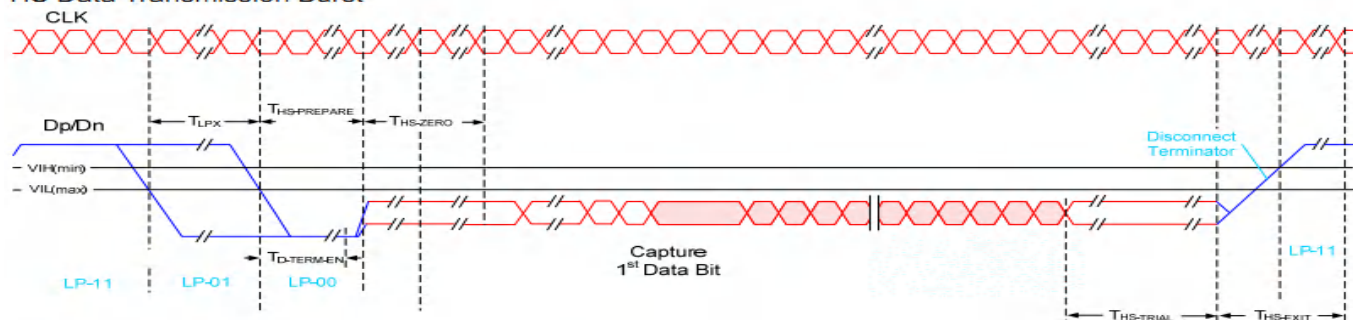
- (1) Time-voltage integration of a spike above VIL when being in LP-0 state or below VIH when being in LP-1 state an impulse less than this will not change the receiver state.
- (2) In addition to the required glitch rejection, implementers shall ensure rejection of known RF-interferers. Input Glitch Rejection of Low Power Receivers as follow.

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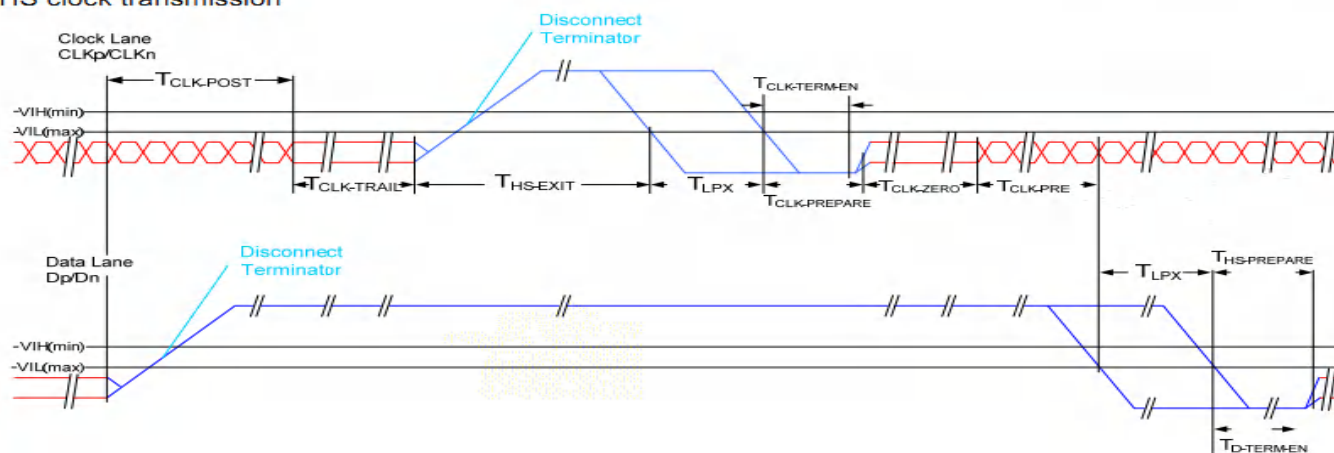


7.3 DSI Timing Characteristics

HS Data Transmission Burst



HS clock transmission

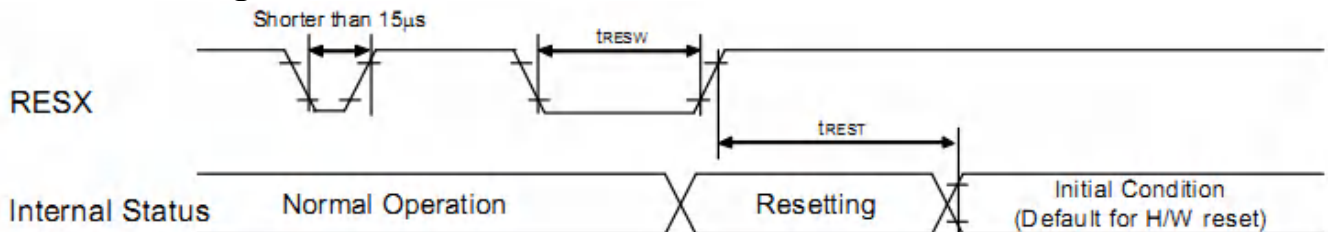


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Timing Parameters:

Parameter	Description	Min	Typ	Max	Unit
$T_{CLK-POST}$	Time that the transmitter continues to send HS clock after the last associated Data Lane has transitioned to LP Mode. Interval is defined as the period from the end of $T_{HS-TRAIL}$ to the beginning of $T_{CLK-TRAIL}$.	$60ns + 52*UI$			ns
$T_{CLK-TRAIL}$	Time that the transmitter drives the HS-0 state after the last payload clock bit of a HS transmission burst.	60			ns
$T_{HS-EXIT}$	Time that the transmitter drives LP-11 following a HS burst.	300			ns
$T_{CLK-TERM-EN}$	Time for the Clock Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		38	ns
$T_{CLK-PREPARE}$	Time that the transmitter drives the Clock Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	38		95	ns
$T_{CLK-PRE}$	Time that the HS clock shall be driven by the transmitter prior to any associated Data Lane beginning the transition from LP to HS mode.	8			UI
$T_{CLK-PREPARE} + T_{CLK-ZERO}$	$T_{CLK-PREPARE}$ + time that the transmitter drives the HS-0 state prior to starting the Clock.	300			ns
$T_{D-TERM-EN}$	Time for the Data Lane receiver to enable the HS line termination, starting from the time point when Dn crosses $V_{IL,MAX}$.	Time for Dn to reach $V_{TERM-EN}$		$35 ns + 4*UI$	
$T_{HS-PREPARE}$	Time that the transmitter drives the Data Lane LP-00 Line state immediately before the HS-0 Line state starting the HS transmission.	$40ns + 4*UI$		$85 ns + 6*UI$	ns
$T_{HS-PREPARE} + T_{HS-ZERO}$	$T_{HS-PREPARE}$ + time that the transmitter drives the HS-0 state prior to transmitting the Sync sequence.	$145ns + 10*UI$			ns
$T_{HS-TRAIL}$	Time that the transmitter drives the flipped differential state after last payload data bit of a HS transmission burst.	$60ns + 4*UI$			ns

7. Reset Timing Characteristics



Reset timing:

IOVCC=1.65V to 3.6V, AGND=DGND=0V, Ta=-40 to 85°C

Symbol	Parameter	Related Pins	MIN	TYP	MAX	Note	Unit
t_{RESW}	*1) Reset low pulse width	RESX	15	-	-		µs
t_{REST}	*2) Reset complete time	-	-	-	5	When reset applied during sleep-in mode	ms
		-	-	-	120	When reset applied during sleep-out mode	ms

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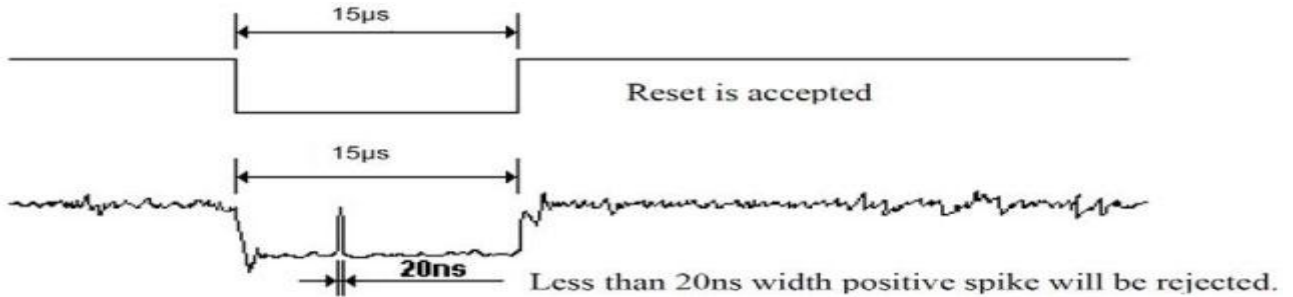
RESX Pulse	Action
Shorter than 5 μ s	Reset Rejected
Longer than 15 μ s	IC Reset
Between 5 μ s and 15 μ s	Reset starts (It depends on voltage and temperature condition.)

Note 1) Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below.

Note 2. 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 H/W reset.

Note 3. During Reset Complete Time, data in MTP will be latched to internal register during this period. This loading is done every time when there is H/W reset complete time (tREST) within 5ms after a rising edge of RESX.

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



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

8. Backlight Characteristic

Item	Symbol	MIN	TYP	MAX	HUAXI ANMEI T	Test Condition
Supply Voltage	Vf	19	21	24	V	If=60mA
Supply Current	If	-	60	-	mA	-
Luminous Intensity for LCM	-	200	250	-	cd/m ²	If=60mA
HUAXIANMEIformity for LCM	-	-	80	-	%	If=60mA
Life Time	-	-	50000	-	Hr	If=60mA
Backlight Color	White					

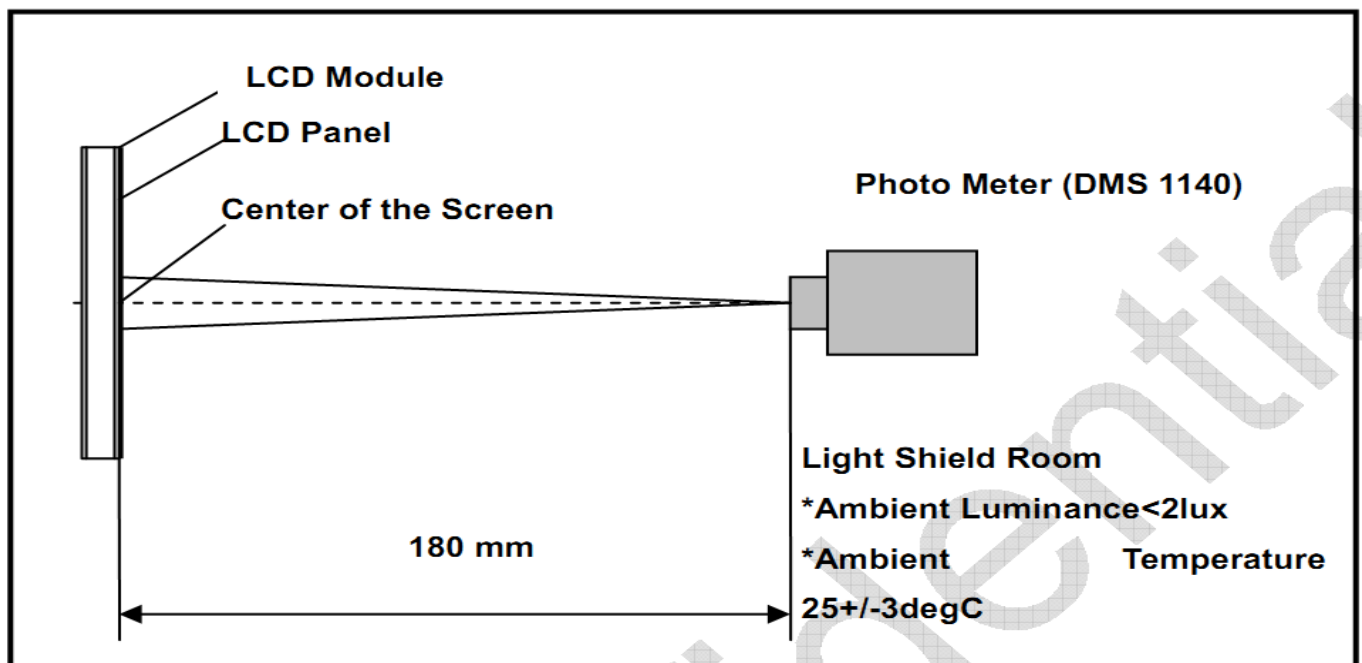
9. Optical Characteristics

Item	Conditions	Min.	Typ.	Max.	HUAXI ANMEI t	Note
Viewing Angle	Horizontal θ_L	-	80	-	degree	(1),(2),(6)

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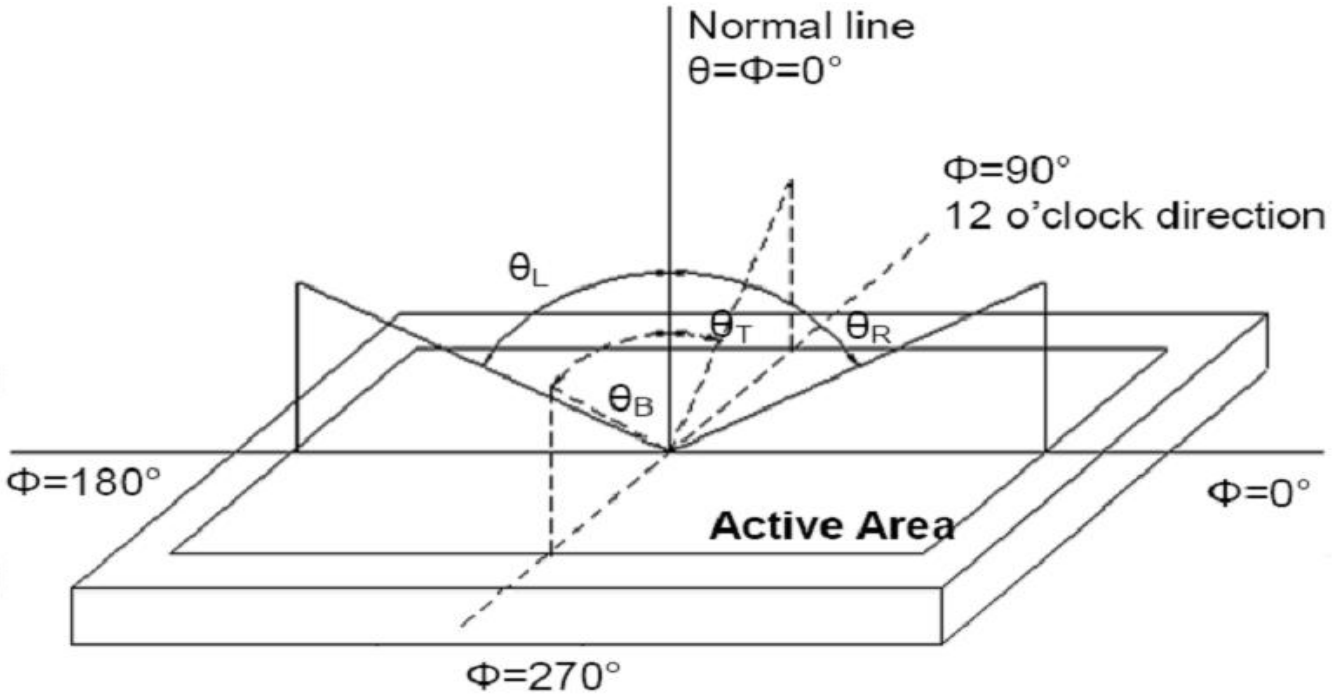
(CR>10)		θ_R	-	80	-		
	Vertical	θ_T	-	80	-		
		θ_B	-	80	-		
Contrast Ratio	Center		640	800	-	-	(1),(3),(6)
Response Time	Rising		-	30	35	ms	(1),(4),(6)
	Falling						
CF Color Chromaticity (CIE1931)	Red x	Typ. -0.05		-	Typ. +0.05		(1), (6)
	Red y			-			
	Green x			-			
	Green y			-			
	Blue x			-			
	Blue y			-			
	White x			0.309			
	White y			0.320			

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

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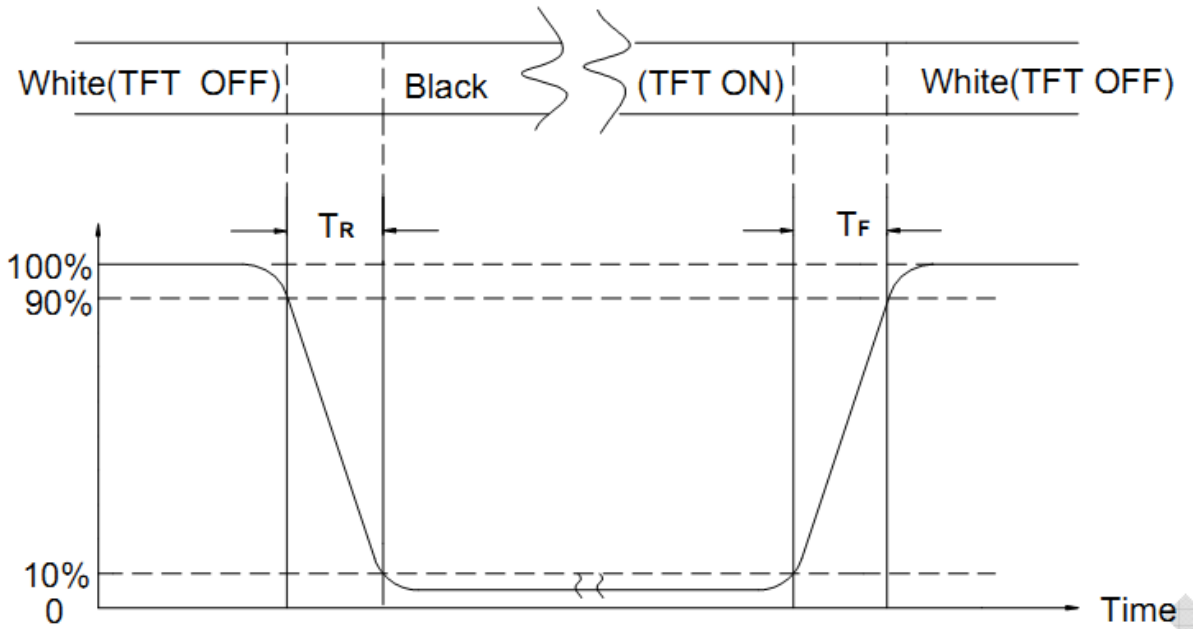
Note (3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

$$\text{Contrast Ratio (CR)} = L_{63} / L_0$$

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

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10. Reliability Test Conditions and Methods

NO.	TEST ITEMS	TEST CONDITION	INSPECTION AFTER TEST
①	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. 9. Auxiliary materials are not included in the scope of testing
②	Low Temperature Storage	-30° C±2° C×96Hours	
③	High Temperature Operating	70° C±2° C×96Hours	
④	Low Temperature Operating	-20° C±2° C×96Hours	
⑤	Temperature Cycle (Storage)	-10° C \longleftrightarrow 50° C (30min) (5min) (30min) ← 1cycle → Total 48cycle	
⑥	Damp Proof Test (Storage)	60° C±5° C×90%RH×96Hours	
⑦	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)	
⑧	Drooping Test	Drop to the ground from 1M height one time every side of carton. (packing condition test will be tested by a carton)	

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⑨	ESD Test	Air Discharge: ± 8 kv 5 times each test location: LCD surface around the distance of 5 mm contact discharge: ± 4 kv 5 times each test location: Product Four Corners, center point 150pF, 330 Ω	
<p>Reference Range of experimental project:①②③④⑤⑥⑦ : MIL-STD-202E ⑧: MIL-STD-810E ⑨: IEC-61000-4-2</p> <p>REMARK: 1, The Test samples should be applied to only one test item. 2, Sample side for each test item is 3~10pcs. 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.</p>			

11. Inspection Standards

11.1. Quality

The quality of goods supplied to purchaser shall come up to the following standards:

11.1.1. Inspection Tools and Instruments

Vernier calipers, film scales, multimeter, magnifying eyepiece, ND5%, luminance meter and so on.

11.1.2. The Method of Preserving Goods

After delivery of goods from HUAXIANMEI Display to purchaser, purchaser shall keep the LCM at -10°C to 30°C, and it might be desirable to keep at the normal room temperature and humidity until incoming inspection or throwing into process line.

11.1.3. Incoming Inspection

(A) The methods of Inspection

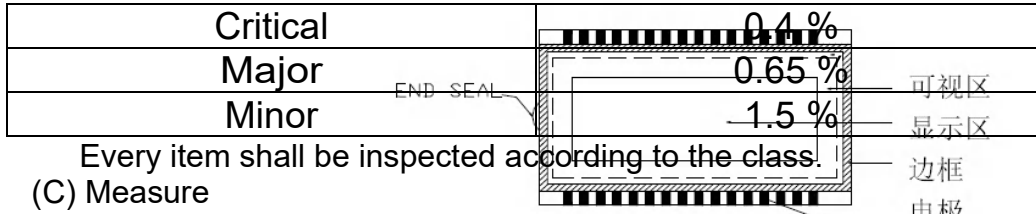
If purchaser makes an incoming inspection, a sampling plan shall be applied on the condition that quality of one delivery shall be regarded as one lot.

(B) The standard of quality:

ISO-2859-1 (same as MIL-STD-105E), Level: II

CLASS	AQL (%)
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(C) Measure

If as the result of above receiving inspection, a lot out is discovered, purchaser Shall inform seller of it within seven days. But first shipment within fourteen days.

11.1.4. Warranty Policy

under HUAXIANMEI Display will provide one-year warranty for the products only if

Specification operating conditions. HUAXIANMEI Display will replace new products for these defect products which are under warranty period and belong to the responsibility of HUAXIANMEI Display.

11.2. Checking Condition

11.2.1 Checking direction shall be in the 45 degree area to face the sample.

11.2.2 Inspector shall see from over 300±25mm with bare eyes far from the sample.

11.2.3 Ambient Illumination:
 0 ~30 Lux for functional inspection
 500 ~ 1200 Lux for external appearance inspection.

11.2.4 Test Area:

11.2.5 Inspection should be carried out with rope electrostatic ring and static finger cover (both hands except small fingers must be worn)

11.2.6 The inspector may make a visual inspection or a comparative examination with a film ruler and a magnifying eyepiece. Individual defects shall be determined according to the limited samples.

11.2.7 Functional testing uses electrical testing fixtures or test fixtures required by customers.

11.2.8 The ion fan should be used when testing.

11.2.9 The principle of judgement:

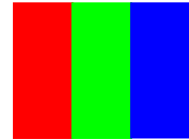
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11.2.9.1 If the defect outside the visual area does not affect the assembly and display, it will be judged as a good product.

11.2.9.2 Poor definition:

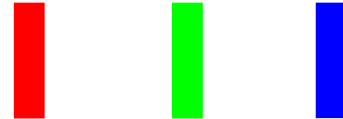
Pixel:

A combination of three sub-pixels
(Red + Green + Blue).



Dot:

Any of the sub-pixels
(Red or Green or Blue).



Bright and dark dots:

A point pixel (sub-pixel: R, G, B pixels) is lit or turned off during the display function test.

Highlights:

Usually considered to be shown on a black screen.

Dark spots:

They are generally considered to be shown on R, G, B solid colors or white images.

Neighborhood:

Two or three adjacent point pixels (dot: sub-pixel) connected together
(R, G or G, B or B, R or RGB).

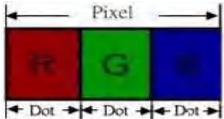
11.3 / 11.4 / 11.5 Inspection Plans:

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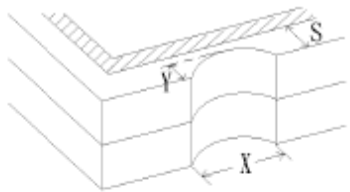
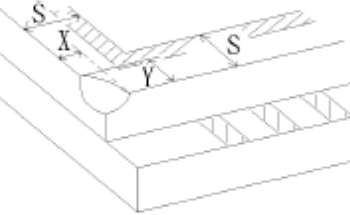
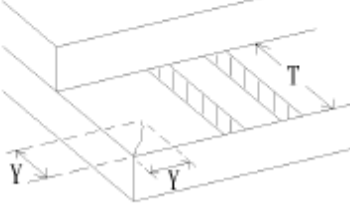
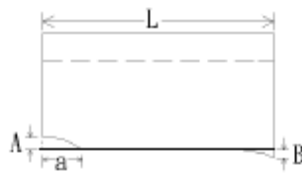
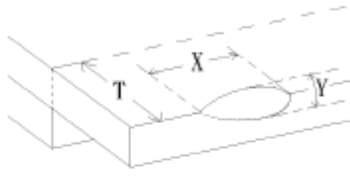
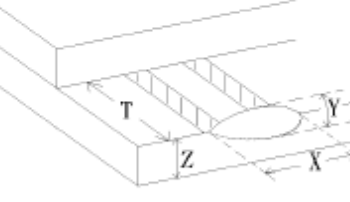
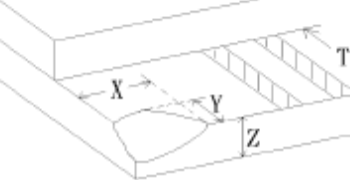
CLASS	ITEM	JUDGEMENT	CLASS
PACKING & INDICATE	1. OUTSIDE AND INSIDE PACKAGE	"MODEL NO.", "LOT NO." AND "QUANTITY" SHOULD INDICATE ON THE PACKAGE.	Minor
	2. MODEL MIXED AND QUANTITY	OTHER MODEL MIXED.....REJECTED QUANTITY SHORT OR OVER.....REJECTED	Critical
	3. PRODUCT INDICATION	"MODEL NO." SHOULD INDICATE ON THE PRODUCT	Major
ASSEMBLY	4. DIMENSION, LCD GLASS SCRATCH AND SCRIBE DEFECT.	ACCORDING TO SPECIFICATION OR DRAWING.	Major
APPEARANCE	5. VIEWING AREA	POLARIZER EDGE OR LCD'S SEALING LINE IS VISABLE IN THE VIEWING AREAREJECTED	Minor
	6. BLEMISH · BLACK SPOT · WHITE SPOT IN THE LCD AND LCD GLASS CRACKS	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	7. BLEMISH · BLACK SPOT · WHITE SPOT AND SCRATCH ON THE POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	8. BUBBLE IN POLARIZER	ACCORDING TO STANDARD OF VISUAL INSPECTION(INSIDE VIEWING AREA)	Minor
	9. LCD'S RAINBOW COLOR	STRONG DEVIATION COLOR (OR NEWTON RING) OF LCD.....REJECTED. OR ACCORDING TO LIMITED SAMPLE (IF NEEDED, AND INSIDE VIEWING AREA)	Minor
ELECTRICAL	10. ELECTRICAL AND OPTICAL CHARACTERISTICS (CONTRAST · VOP · CHROMATICITY ... ETC)	ACCORDING TO SPECIFICATION OR DRAWING . (INSIDE VIEWING AREA)	Critical
	11.MISSING LINE	MISSING DOT · LINE · CHARACTERREJECTED	Critical
	12.SHORT CIRCUIT · WRONG PATTERN DISPLAY	NO DISPLAY · WRONG PATTERN DISPLAY · CURRENT CONSUMPTION OUT OF SPECIFICATION..... REJECTED	Critical
	13. DOT DEFECT (FOR COLOR AND TFT)	ACCORDING TO STANDARD OF VISUAL INSPECTION	Minor

NO.	CLASS	ITEM	JUDGEMENT
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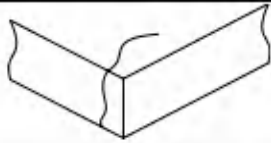
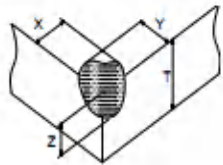
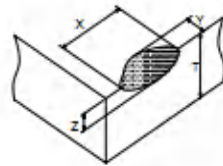
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11.4.1	MIN OR	BLACK AND WHITE SPOT FOREIGN MATERIEL DUST IN THE CELL BLEMISH SCRATCH	(A) ROUND TYPE: HUAXIANMEI t: mm									
			<table border="1"> <tr> <th>DIAMETER (mm.)</th> <th>ACCEPTABLE Q' TY</th> </tr> <tr> <td>$\varnothing \leq 0.2$</td> <td>Disregard (interval $\geq 1\text{mm}$)</td> </tr> <tr> <td>$0.2 < \varnothing \leq 0.4$</td> <td>2 (Distance $\geq 15\text{mm}$)</td> </tr> <tr> <td>$0.4 < \varnothing$</td> <td>0</td> </tr> </table> <p>NOTE: $\varnothing = (\text{LENGTH} * \text{WIDTH}) / 2$</p>	DIAMETER (mm.)	ACCEPTABLE Q' TY	$\varnothing \leq 0.2$	Disregard (interval $\geq 1\text{mm}$)	$0.2 < \varnothing \leq 0.4$	2 (Distance $\geq 15\text{mm}$)	$0.4 < \varnothing$	0	
DIAMETER (mm.)	ACCEPTABLE Q' TY											
$\varnothing \leq 0.2$	Disregard (interval $\geq 1\text{mm}$)											
$0.2 < \varnothing \leq 0.4$	2 (Distance $\geq 15\text{mm}$)											
$0.4 < \varnothing$	0											
11.4.2	MINOR	BUBBLE IN POLARIZER DENT ON POLARIZER	(S) LINEAR TYPE: HUAXIANMEI t: mm									
			<table border="1"> <tr> <th>LENGTH</th> <th>WIDTH</th> <th>ACCEPTABLE QTY</th> </tr> <tr> <td>.....</td> <td>$W \leq 0.1$</td> <td>Disregard</td> </tr> <tr> <td>$L \leq 5.0$</td> <td>$0.1 < W \leq 0.2$</td> <td>3 (Distanced $\geq 15\text{mm}$)</td> </tr> <tr> <td>.....</td> <td>$0.2 < W$</td> <td>FOLLOW ROUND TYPE</td> </tr> </table> <p>NOTE: $\varnothing = (\text{LENGTH} * \text{WIDTH}) / 2$</p>	LENGTH	WIDTH	ACCEPTABLE QTY	$W \leq 0.1$	Disregard	$L \leq 5.0$	$0.1 < W \leq 0.2$	3 (Distanced $\geq 15\text{mm}$)
LENGTH	WIDTH	ACCEPTABLE QTY										
.....	$W \leq 0.1$	Disregard										
$L \leq 5.0$	$0.1 < W \leq 0.2$	3 (Distanced $\geq 15\text{mm}$)										
.....	$0.2 < W$	FOLLOW ROUND TYPE										
11.4.3	MINOR	Dot Defect	<table border="1"> <tr> <th>Items</th> <th>ACC. Q' TY</th> </tr> <tr> <td>Bright dot</td> <td>$N \leq 1$</td> </tr> <tr> <td>Dark dot</td> <td>$N \leq 2$ (Distance $\geq 5\text{mm}$)</td> </tr> </table> <p>Pixel Define :</p>  <p>Note:</p> <ol style="list-style-type: none"> The definition of dot: The size of a defective dot over 1 of whole dot is regarded as one defective dot. Definition: < 1 dot and visible by 5% ND filter Bright dot: Dots appear bright and unchanged in size which LCD panel is displaying under black pattern. Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure Red, Green, Blue pattern. 	Items	ACC. Q' TY	Bright dot	$N \leq 1$	Dark dot	$N \leq 2$ (Distance $\geq 5\text{mm}$)			
Items	ACC. Q' TY											
Bright dot	$N \leq 1$											
Dark dot	$N \leq 2$ (Distance $\geq 5\text{mm}$)											
11.4.3.1	MINOR	Mura	Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary									

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NO.	CLASS	ITEM	JUDGEMENT
11.4.4	MINOR	LCD GLASS CHIPPING	 $Y > S$ Reject
11.4.5	MINOR	LCD GLASS CHIPPING	 $X \text{ or } Y > S$ Reject
11.4.6	MAJOR	LCD GLASS GLASS CRACK	 $Y > (1/2) T$ Reject
11.4.7	MAJOR	LCD GLASS SCRIBE DEFECT	 <ol style="list-style-type: none"> $a > L/3$, $A > 1.5\text{mm}$. Reject B: ACCORDING TO DIMENSION
11.4.8	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL AREA)	 $\Phi = (x+y)/2 > 2.5 \text{ mm}$ Reject
11.4.9	MINOR	LCD GLASS CHIPPING (ON THE TERMINAL SURFACE)	 $Y > (1/3) T$ Reject
11.4.10	MINOR	LCD GLASS CHIPPING	 $Y > T$ Reject

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NO.	CLASS	ITEMS	JUDGEMENT						
11.5.1	MAJOR	Touch Panel Crack	 Reject						
11.5.2	MINOR	Touch Panel Chipping	<div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 10px;"> <tr> <td>Not CNC Products</td> <td>$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$</td> <td>Accept</td> </tr> <tr> <td>CNC Products</td> <td>For CNC Outline Dimension</td> <td>Accept</td> </tr> </table> </div>	Not CNC Products	$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$	Accept	CNC Products	For CNC Outline Dimension	Accept
			Not CNC Products	$X \leq 2\text{mm}, Y \leq 2\text{mm}, Z < 1/2T$	Accept				
CNC Products	For CNC Outline Dimension	Accept							
<div style="display: flex; align-items: center;">  <table border="1" style="margin-left: 10px;"> <tr> <td>Not CNC Products</td> <td>$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$</td> <td>Accept</td> </tr> <tr> <td>CNC Products</td> <td>For CNC Outline Dimension</td> <td>Accept</td> </tr> </table> </div>	Not CNC Products	$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept	CNC Products	For CNC Outline Dimension	Accept			
Not CNC Products	$X \leq 3\text{mm}, Y \leq 3\text{mm}, Z < 1/2T$	Accept							
CNC Products	For CNC Outline Dimension	Accept							
11.5.3	MINOR	Scratch Dust and Foreign materiel (Linear Type)	$W \leq 0.05, L \leq 10\text{mm}$ Accept						
			$0.05\text{mm} < W \leq 0.07\text{mm}; L \leq 5.0\text{mm}$ Distance between scratch $> 5.0\text{mm}$ Accept 3 ea Max.						
			$W > 0.07\text{mm}$ Reject						
11.5.4	MINOR	Scratch Dust and Foreign materiel (Round Type : $\Phi = (\text{Length} + \text{Width})/2$)	$\Phi \leq 0.15\text{mm}$ Accept						
			$0.15\text{mm} < \Phi \leq 0.25\text{mm}$ Distance between scratch $> 5.0\text{mm}$ Accept 5 ea Max.						
			$\Phi > 0.25\text{mm}$ Reject						
11.5.5	MINOR	Touch Panel Dent / Fish Eyes ($\Phi = (\text{Length} + \text{Width})/2$)	$\Phi \leq 0.35\text{mm}$ Accept						
			$0.35\text{mm} < \Phi \leq 1.0\text{mm}$ Distance $> 5.0\text{mm}$ Accept 3 ea Max.						
			$\Phi > 1.0\text{mm}$ Reject						
11.5.6	MINOR	Touch Panel Air Bubble ($\Phi = (\text{Length} + \text{Width})/2$)	$\Phi \leq 0.15\text{mm}$ Accept						
			$0.15\text{mm} < \Phi \leq 0.25\text{mm}$ Distance between bubbles $> 5.0\text{mm}$ Accept 3 ea Max.						
			$\Phi > 0.25\text{mm}$ Reject						
11.5.7	MINOR	Touch Panel Printing area Scratch	$W \leq 0.03, L \leq 10\text{mm}$ Accept						
			$0.03\text{mm} < W \leq 0.05\text{mm}, L \leq 5\text{mm}$ Accept 3 ea Max.						
			$W > 0.05\text{mm}$ or $L > 5\text{mm}$ ($W > 0.05$ Follow 8.5.4 Round type) Reject						
11.5.8	MINOR	Touch Panel White Haze Mark / Dust	Can not be removed Reject						

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12. Handling Precautions

12.1 Mounting method

The LCD panel of HUAXIANMEI Display module consists of two thin glass plates with polarizers which easily be damaged. And since the module is 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 happen 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 use C-MOS LSI drivers, so we recommended 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 direct 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 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.

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- 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 both parties.

- When a question is arisen in this specification
- When a new problem is arisen which is not specified in this specification.
- When an inspection specification change or operating condition change in customer is reported to HUAXIANMEI Display, 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