

# PRODUCT SPECIFICATION

## 4.0" TFT LCD MODULE MODEL: YDP LCD I R 400 MI



< ◇ > Preliminary Specification

< ◆ > Finally Specification

CUSTOMER'S APPROVAL	
CUSTOMER :	
SIGNATURE:	DATE:

APPROVED BY	PM REVIEWED	PD REVIEWED	PREPARED BY
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**knitter-switch**

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## Table of Contents

No.	Item	Page
1.	General Description .....	4
2.	Module Parameter .....	4
3.	Absolute Maximum Ratings .....	4
4.	DC Characteristics .....	5
5.	Backlight Characteristic .....	5
5.1.	Backlight Characteristics .....	5
5.2.	Backlighting circuit .....	5
6.	Optical Characteristics .....	6
6.1.	Optical Characteristics .....	6
6.2.	Definition of Response Time .....	6
6.3.	Definition of Contrast Ratio .....	7
6.4.	Definition of Viewing Angles .....	7
6.5.	Definition of Color Appearance .....	8
6.6.	Definition of Surface Luminance, Uniformity and Transmittance .....	8
7.	Block Diagram and Power Supply .....	9
8.	Interface Pins Definition .....	10
9.	AC Characteristics .....	11
9.1.	Timing Characteristics .....	11
9.2.	Reset Input Timing .....	14
9.3.	Power ON/OFF Sequence .....	15
10.	Quality Assurance .....	19
10.1.	Purpose .....	19
10.2.	Standard for Quality Test .....	19
10.3.	Nonconforming Analysis & Disposition .....	19
10.4.	Agreement Items .....	19
10.5.	Standard of the Product Visual Inspection .....	19
10.6.	Inspection Specification .....	20
10.7.	Classification of Defects .....	24
10.8.	Identification/marketing criteria .....	24
10.9.	Packaging .....	24
11.	Reliability Specification .....	25
12.	Precautions and Warranty .....	26
12.1.	Safety .....	26
12.2.	Handling .....	26
12.3.	Storage .....	26
12.4.	Metal Pin (Apply to Products with Metal Pins) .....	26
12.5.	Operation .....	27
12.6.	Static Electricity .....	27
12.7.	Limited Warranty .....	27
13.	Packaging .....	28
14.	Outline Drawing .....	29

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## 1. General Description

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

## 2. Module Parameter

Features	Details	Unit
Display Size(Diagonal)	4.0"	
LCD type	IPS TFT	
Display Mode	Transmissive /Normally Black	
Resolution	720 RGB x 720	Pixels
View Direction	Full viewing	Best Image
Module Outline	105.60(H) x 109.87(V) x 2.09(T) (Note1 )	mm
Active Area	101.52(H) x 101.52(V)	mm
Pixel Pitch	141.0(H) x 141.0(V)	um
Pixel Arrangement	RGB Vertical stripe	
Polarizer Surface Treatment	Glare	
Display Colors	16.7M	
Interface	4 LANE MIPI	
Driver IC	SC7706	
With or without the touch panel	Without	
Operating Temperature	<b>-20~70</b>	°C
Storage Temperature	<b>-30~80</b>	°C
Weight	42	g

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

## 3. Absolute Maximum Ratings

GND=0V, Ta=25°C

Item	Symbol	Min.	Max.	Unit
Analog Operating voltage	VCI	-0.3	6.6	V
I/O operating voltage	IOVCC	-0.3	5.5	V
Storage temperature	T <sub>STG</sub>	<b>-30</b>	<b>+80</b>	°C
Operating temperature	T <sub>OP</sub>	<b>-20</b>	<b>+70</b>	°C

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

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

#### 4. DC Characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Analog Operating voltage	V <sub>CI</sub>	2.5	2.8	3.3	V
I/O operating voltage	IOVCC	1.65	1.8	2.0	V
Logic Low input voltage	V <sub>IL</sub>	GND	-	0.3*IOVCC	V
Logic High input voltage	V <sub>IH</sub>	0.7*IOVCC	-	IOVCC	V
Logic Low output voltage	V <sub>OL</sub>	GND	-	0.2*IOVCC	V
Logic High output voltage	V <sub>OH</sub>	0.8*IOVCC	-	IOVCC	V
Current Consumption All White	I <sub>VCI</sub>	-	20	-	mA

#### 5. Backlight Characteristic

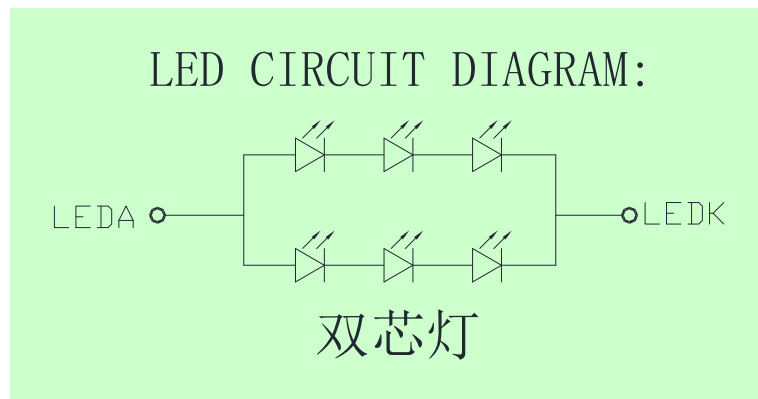
##### 5.1. Backlight Characteristics

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Forward Voltage	V <sub>F</sub>	Ta=25 °C, I <sub>F</sub> =20mA/LED	16.5	<b>18.0</b>	19.5	V
Forward Current	I <sub>F</sub>	Ta=25 °C, V <sub>F</sub> =6.0V/LED	-	<b>40</b>	-	mA
Power dissipation	P <sub>D</sub>	-	-	<b>720</b>	-	mW
Uniformity	Avg	-	-	80	-	%
LED working life(25°C)			-	15000	-	Hrs
Drive method	<b>Constant current</b>					
LED Configuration	6 White LEDs ( 3 LEDs in one string and 2 groups in parallel)					

Note1: LED life time defined as follows: The final brightness is at 50% of original brightness.

The environmental conducted under ambient air flow, at Ta=25±2 °C,60%RH±5%, I<sub>F</sub>=20mA/LED.

##### 5.2. Backlighting circuit



## 6. Optical Characteristics

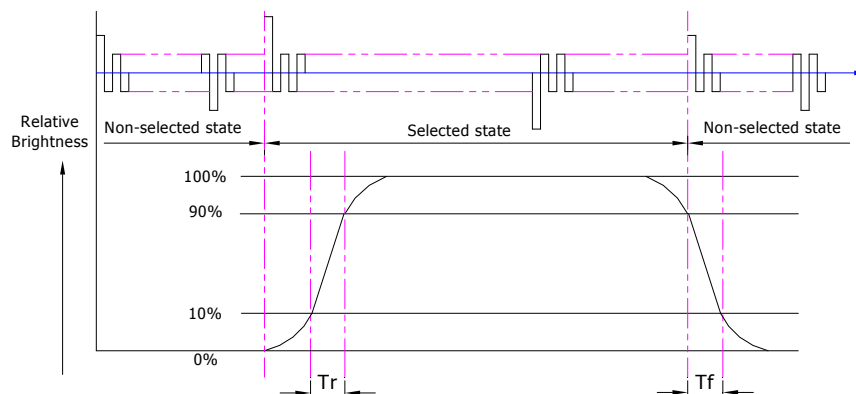
### 6.1. Optical Characteristics

Ta=25°C, VCI=2.8V

Backlight On (Transmissive Mode)	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
	Luminance on TFT( $I_f$ =20mA)		Lv	Normally viewing angle $\theta_x = \varphi_y = 0^\circ$	240	300	-	cd/m <sup>2</sup>
	Contrast ratio(See 6.3)		CR		1000	1200	-	
	Response time (See 6.2)		T <sub>R</sub> +T <sub>F</sub>		-	30	35	ms
	Chromaticity Transmissive (See6.5)	Red	X <sub>R</sub>		0.600	<b>0.650</b>	0.700	
			Y <sub>R</sub>		0.280	<b>0.330</b>	0.380	
		Green	X <sub>G</sub>		0.268	<b>0.318</b>	0.368	
			Y <sub>G</sub>		0.565	<b>0.615</b>	0.665	
		Blue	X <sub>B</sub>		0.085	<b>0.135</b>	0.185	
Y <sub>B</sub>			0.055		<b>0.105</b>	0.155		
White		X <sub>W</sub>	0.247		<b>0.297</b>	0.347		
		Y <sub>W</sub>	0.303		<b>0.353</b>	0.403		
Viewing Angle (See 6.4)	Horizontal	θ <sub>x</sub> +	Center CR≥10	80	<b>85</b>	-	Deg.	
		θ <sub>x</sub> -		80	<b>85</b>	-		
	Vertical	φ <sub>y</sub> +		80	<b>85</b>	-		
		φ <sub>y</sub> -		80	<b>85</b>	-		
NTSC Ratio(Gamut)				55	60	-	%	

### 6.2. Definition of Response Time

#### 6.2.1. Normally Black Type (Negative)

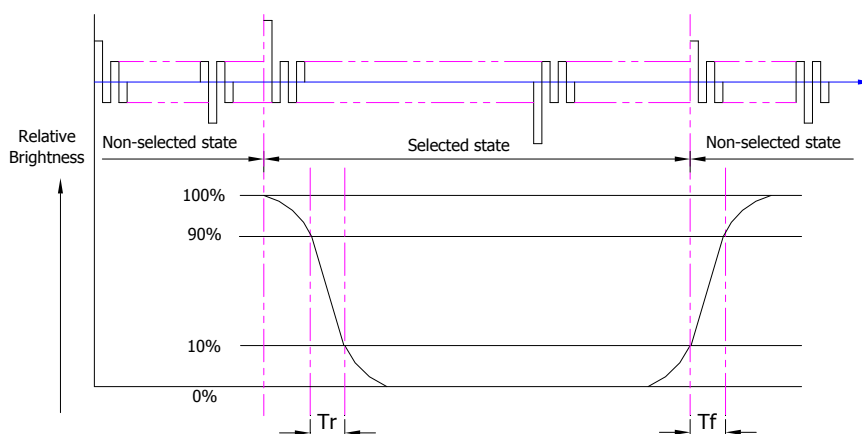


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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

Note: Measuring machine: LCD-5100

### 6.2.2. Normally White Type (Positive)



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

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

Note: Measuring machine: LCD-5100 or EQUI

### 6.3. Definition of Contrast Ratio

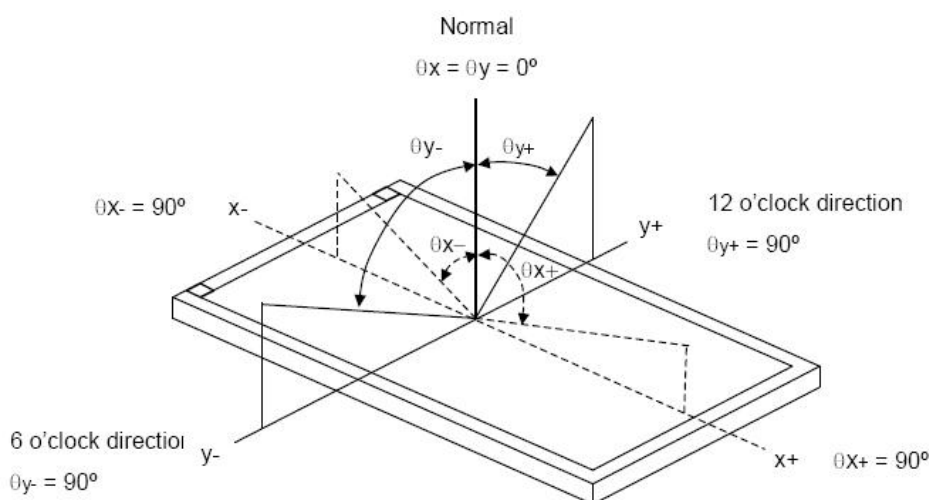
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

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

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

### 6.4. Definition of Viewing Angles



Measuring machine: LCD-5100 or EQUI

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## 6.5. Definition of Color Appearance

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

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

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



## 6.6. Definition of Surface Luminance, Uniformity and Transmittance

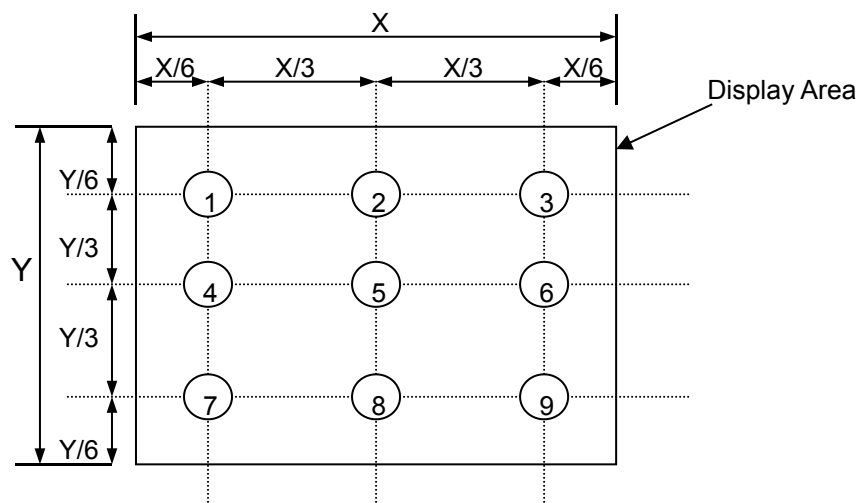
Using the transmissive mode measurement approach, measure the white screen luminance of the display panel and backlight.

6.6.1. Surface Luminance:  $L_V = \text{average } (L_{P1}:L_{P9})$

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

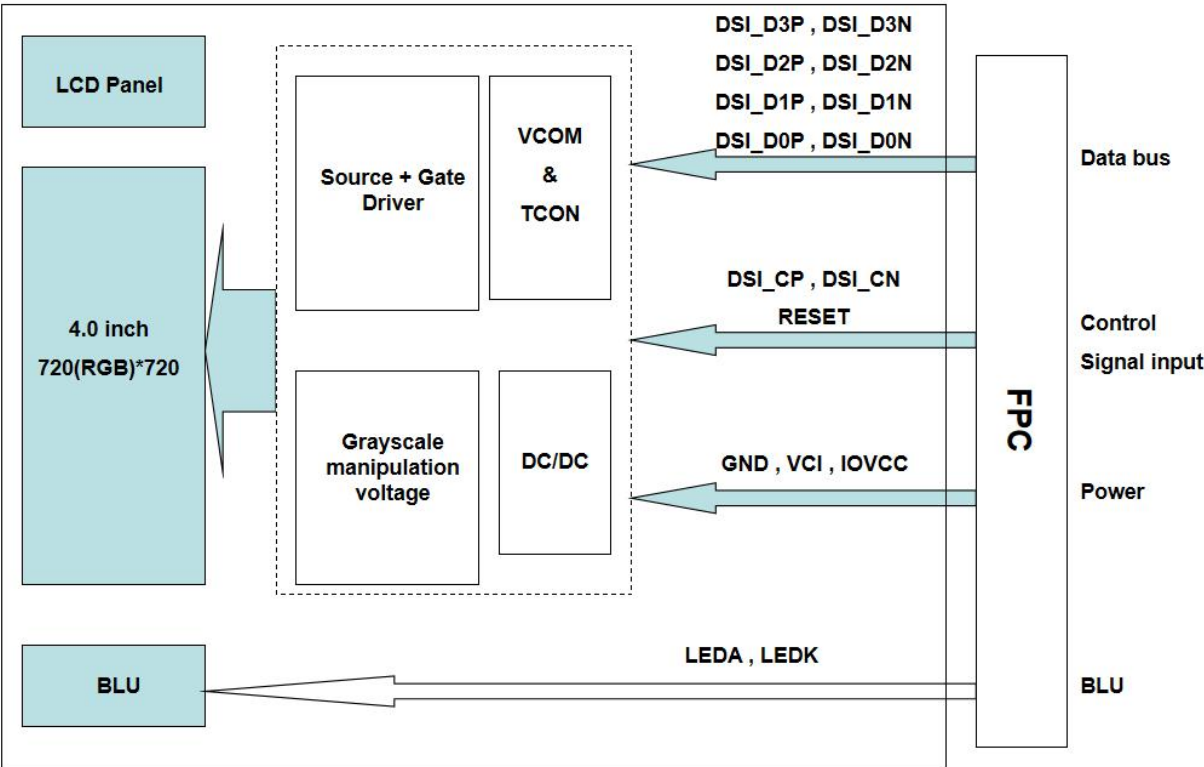
6.6.3. Transmittance =  $L_V$  on LCD /  $L_V$  on Backlight \* 100%

Note: Measuring machine: BM-7





7. Block Diagram and Power Supply



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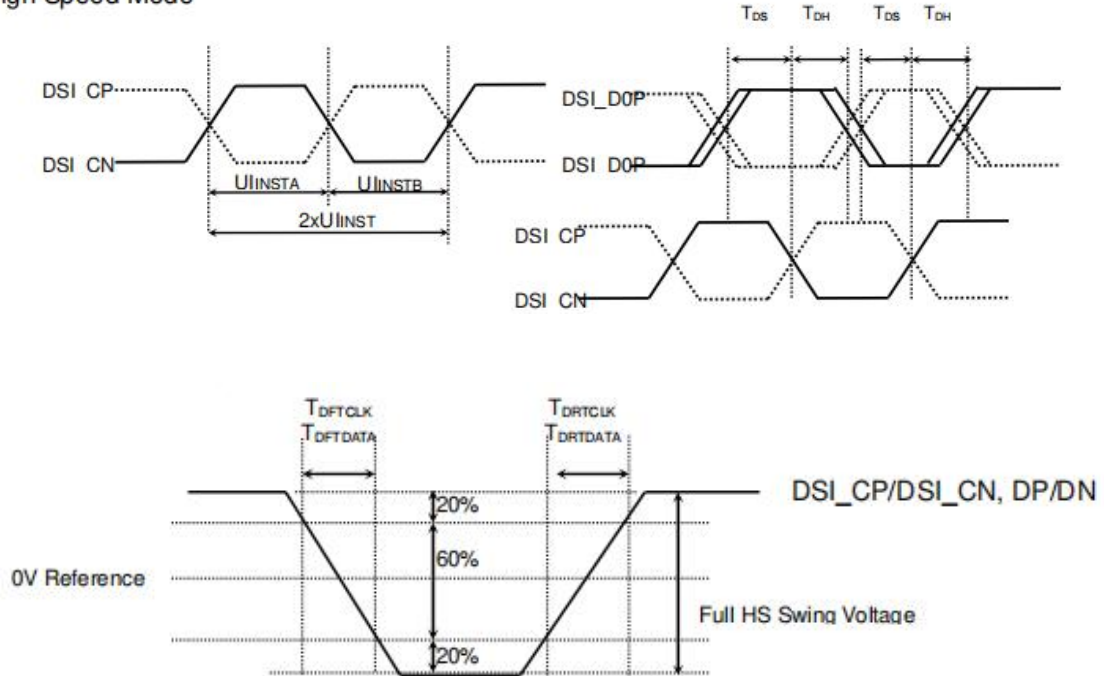
## 8. Interface Pins Definition

No.	Symbol	Function	Remark
1	GND	Ground	
2	LEDA	Led anode	
3	LEDK	Led cathode	
4	GND	Ground	
5	VCI	Power supply	
6	IOVCC	I/O Supply Voltage	
7	GND	Ground	
8	RESET	The external reset input	
9	PWM	No Connector	
10	GND	Ground	
11	DSI_D3P	MIPI data differential signal input+	
12	DSI_D3N	MIPI data differential signal input-	
13	GND	Ground	
14	GND	Ground	
15	DSI_D2P	MIPI data differential signal input+	
16	DSI_D2N	MIPI data differential signal input-	
17	GND	Ground	
18	DSI_CP	MIPI clock differential signal input+	
19	DSI_CN	MIPI clock differential signal input-	
20	GND	Ground	
21	DSI_D1P	MIPI data differential signal input+	
22	DSI_D1N	MIPI data differential signal input-	
23	GND	Ground	
24	DSI_D0P	MIPI data differential signal input+	
25	DSI_D0N	MIPI data differential signal input-	
26	GND	Ground	

## 9. AC Characteristics

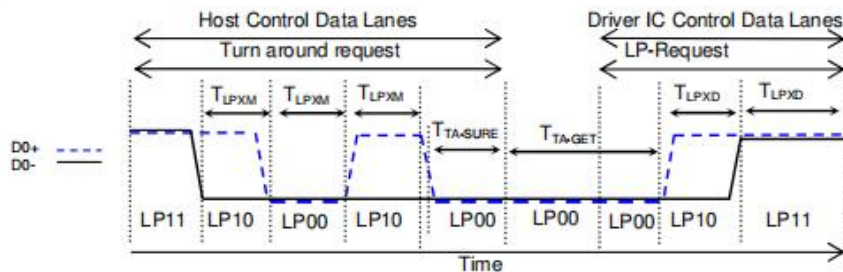
### 9.1. Timing Characteristics

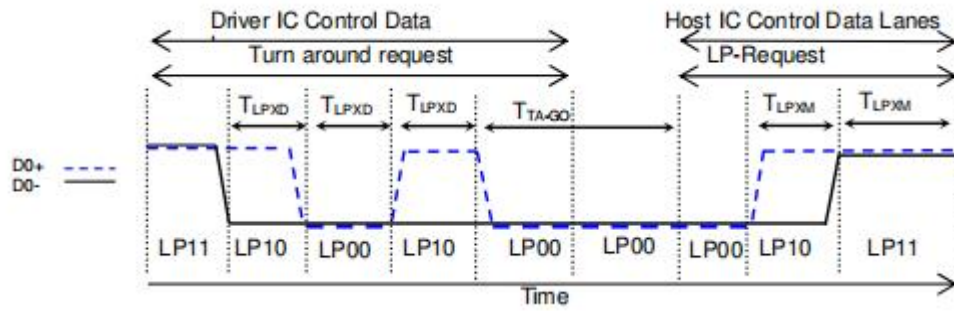
#### High Speed Mode



Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Double UI instantaneous	2xUINST	TBD	-	25	ns
	UI instantaneous	UINSTA UINSTB	TBD	-	12.5	ns
DP/DN	Data to clock setup time	$T_{DS}$	0.15xUI	-	-	ps
	Data to clock hold time	$T_{DH}$	0.15xUI	-	-	ps
DSI_CP/ DSI_CN	Differential rise time for clock	$T_{DRTCLK}$	150	-	0.3UI	ps
	Differential fall time for clock	$T_{DFTCLK}$	150	-	0.3UI	ps
DP/DN	Differential rise time for data	$T_{DRTDATA}$	150	-	0.3UI	ps
	Differential fall time for data	$T_{DFTDATA}$	150	-	0.3UI	ps

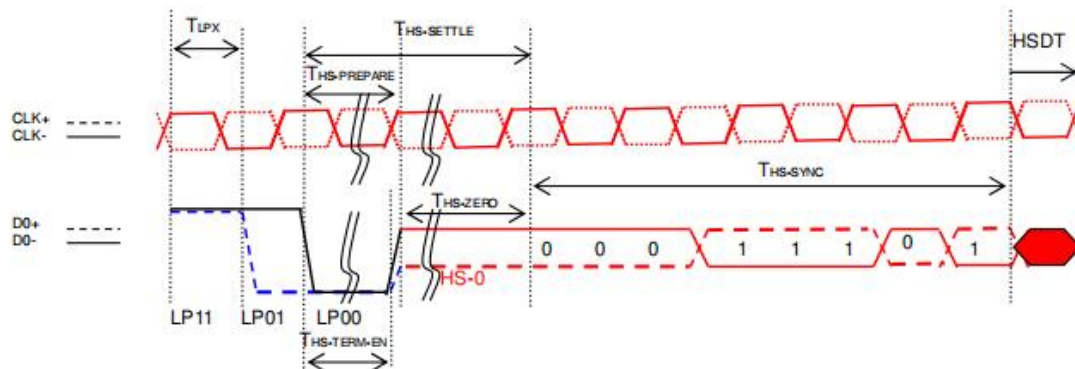
#### Low Power Mode



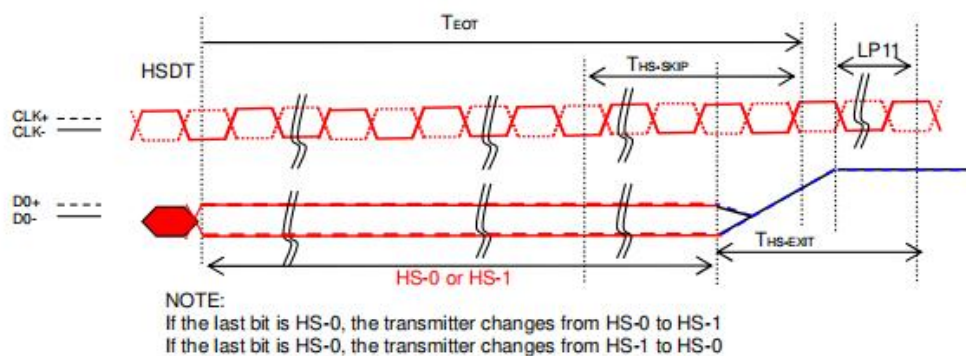


Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11 Host→ Display module	TLPXM	50	-	-	ns
	Length of LP-00/LP01/LP10/LP11 Display module →Host	TLPXD	50	-	-	ns
	Time-out before the MPU start driver	T <sub>TA-SURE</sub>	TLPXD	-	2xTLPXD	ns
	Time to drive LP-00 by display module	T <sub>TA-GET</sub>	5xTLPXD	-	-	ns
	Time to drive LP-00 after turnaround request Host	T <sub>TAGO</sub>	4xTLPXD	-	-	ns

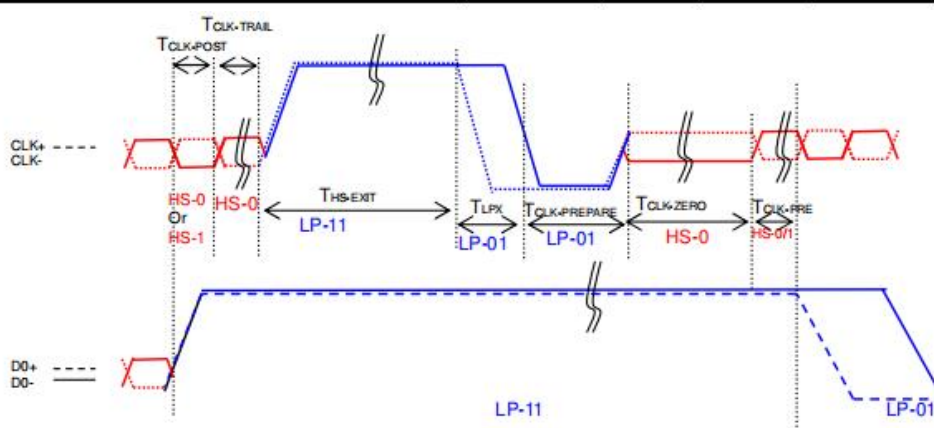
## DSI BURSTS



Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0P	Length of LP-00/LP01/LP10/LP11	TLPX	50	-	-	ns
	Time to Driver LP-00 to prepare for HS transmission	T <sub>HS-PREPARE</sub>	40+4UI	-	85+6UI	ns
	Time to enable data receiver line termination	T <sub>HS-TERM-EN</sub>	-	-	35+4xUI	ns
	Time to drive LP-00 by display module	T <sub>TA-GET</sub>	5xTLPXD	-	-	ns
	Time to drive LP-00 after turnaround request Host	T <sub>TAGO</sub>	4xTLPXD	-	-	ns



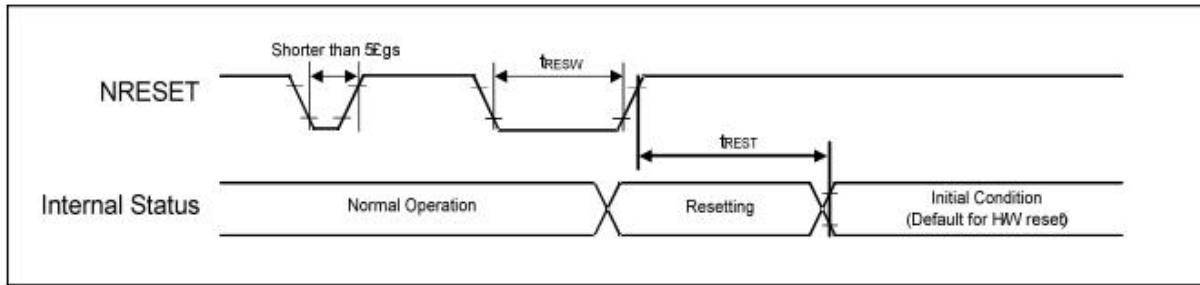
Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_D0P/ DSI_D0N	Time-Out at Display Module to Ignore Transition Period of EoT	T <sub>HS-SKIP</sub>	40	-	55+4xUI	ns
	Time to Driver LP-11 after HS Burst	T <sub>HS-EXIT</sub>	100	-	-	ns



Signal	Item	Symbol	Spec.			Unit
			Min.	Typ.	Max.	
DSI_CP/ DSI_CN	Time that the MCU shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	T <sub>CLK-POST</sub>	60+52xUI	-	-	ns
	Time to drive HS differential state after last payload clock bit of a HS transmission burst	T <sub>CLK-TRAIL</sub>	60	-	-	ns
	Time to drive LP-11 after HS burst	T <sub>HS-EXIT</sub>	100	-	-	ns
	Time to drive LP-00 to prepare for HS transmission	T <sub>CLK-PREPARE</sub>	38	-	95	ns
	Time-out at Clock Lane Display Module to enable HS Termination	T <sub>CLK-TERM-EN</sub>	-	-	38	ns
	Minimum lead HS-0 drive period before starting Clock	T <sub>CLK-PREPARE</sub> + T <sub>CLK-ZERO</sub>	300	-	-	ns
	Time that the HS clock shall be driven prior to any associated data Lane beginning the transition from LP to HS mode	T <sub>CLK-PRE</sub>	8xUI			



## 9.2. Reset Input Timing

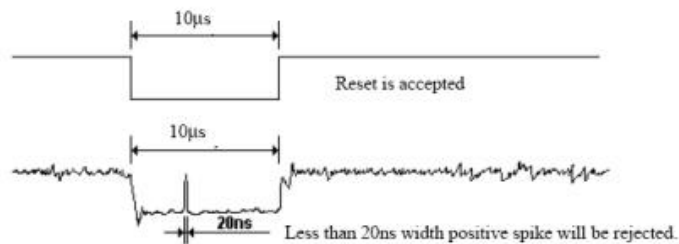


Symbol	Parameter	Related Pins	Spec.			Note	Unit
			Min.	Typ.	Max.		
tRESW	Reset low pulse width <sup>(1)</sup>	NRESET	10	-	-	-	µs
tREST	Reset complete time <sup>(2)</sup>	-	15	-	-	When reset applied during SLPIN mode	ms
		-	120	-	-	When reset applied during SLPOUT mode	ms

**Note:** (1) Spike due to an electrostatic discharge on NRESET line does not cause irregular system reset according to the following table.

NRESET Pulse	Action
Shorter than 5 µs	Reset Rejected
Longer than 10 µs	Reset
Between 5 µs and 10 µs	Reset Start

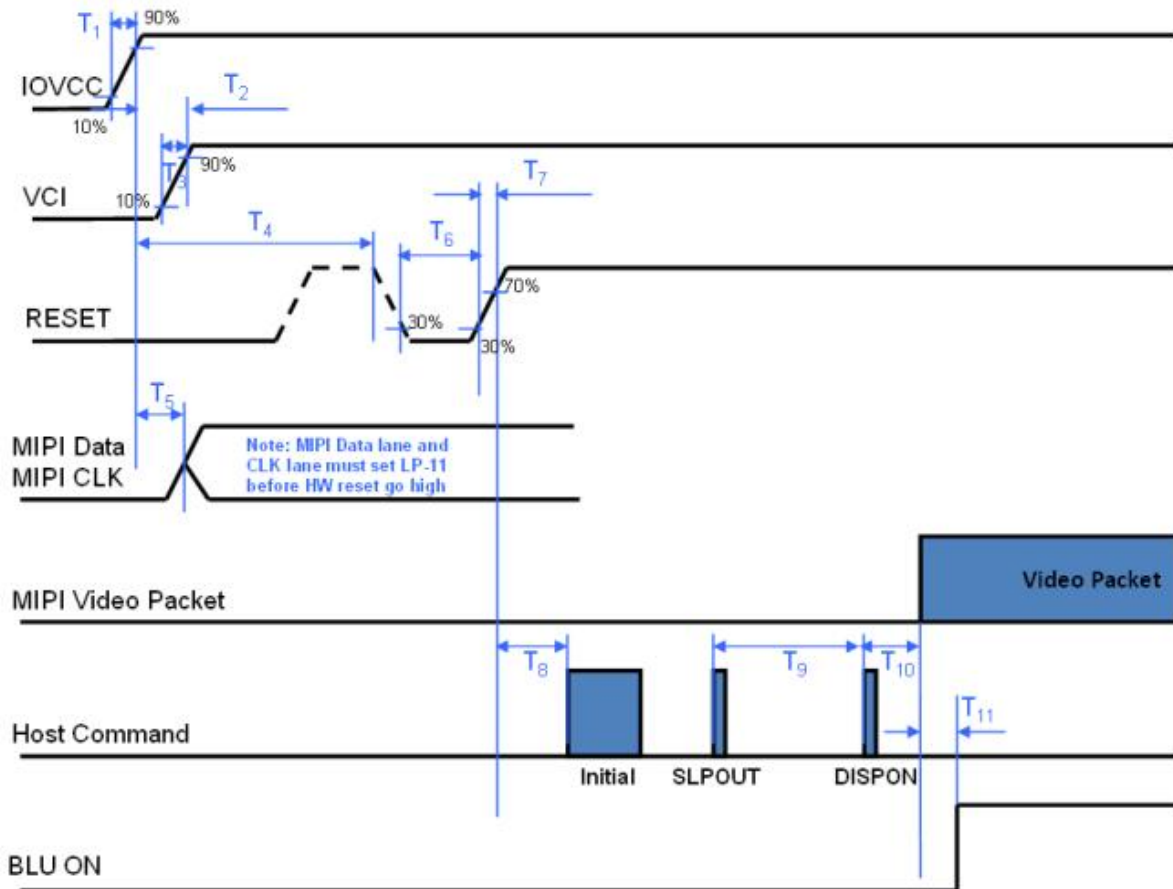
- (2) During the resetting period, the display will be blanked (The display is entering blanking sequence, which Maximum time is 120 ms, when Reset Starts in Sleep Out –mode. The display remains the blank state in Sleep In –mode) and then return to Default condition for H/W reset.
- (3) During Reset Complete Time, ID and VCOM value in OTP 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 15ms after a rising edge of NRESET.
- (4) Spike Rejection also applies during a valid reset pulse as shown as below:



- (5) It is necessary to wait 15msec after releasing NRESET before sending commands. Also Sleep Out command cannot be sent for 120msec.

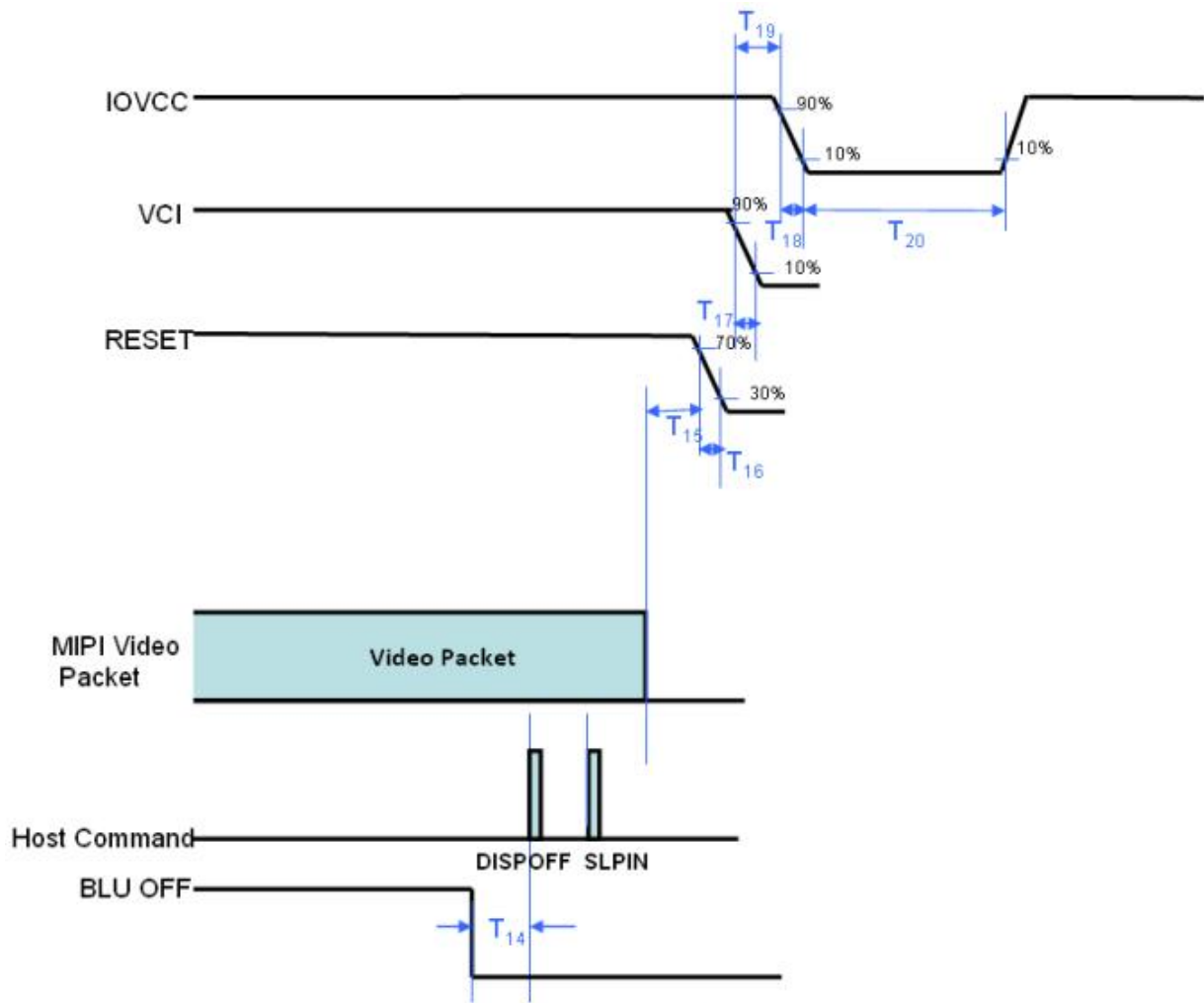
### 9.3. Power ON/OFF Sequence

#### Power ON Sequence



	Min.	Typ.	Max.	Unit
<b>T1</b>	0.01	-	10	ms
<b>T2</b>	No Limit			ms
<b>T3</b>	0.01	-	10	ms
<b>T4</b>	1	-	-	ms
<b>T5</b>	1	-	-	ms
<b>T6</b>	10	-	-	us
<b>T7</b>	No Limit			ns
<b>T8</b>	15	-	-	ms
<b>T9</b>	120	-	-	ms
<b>T10</b>	No Limit			ms
<b>T11</b>	100	150	-	ms

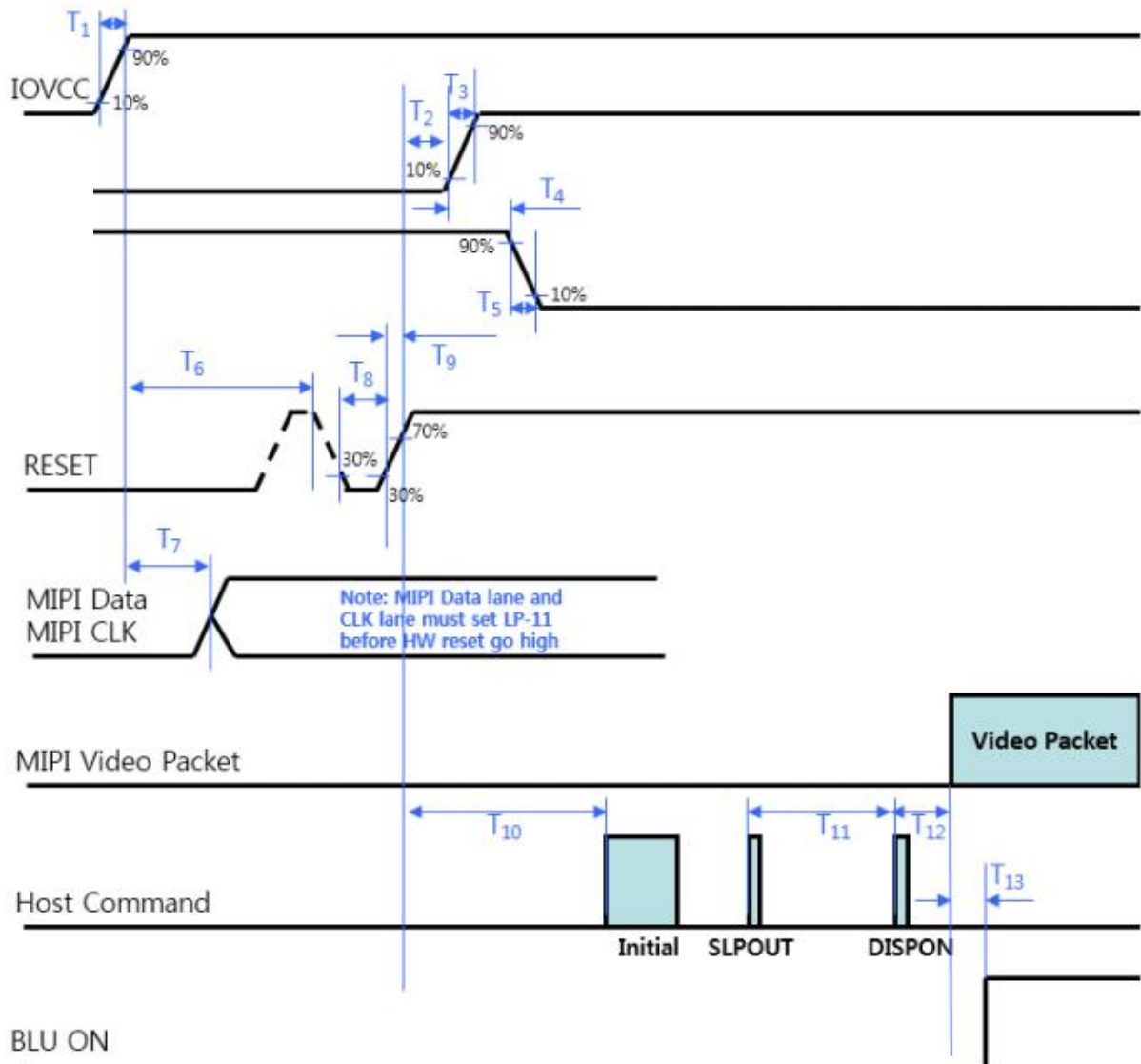
## Power OFF Sequence



	Min.	Typ.	Max.	Unit
T14	40	100	-	ms
T15	10	-	-	ms
T16	No Limit			ms
T17	No Limit			ms
T18	No Limit			ms
T19	No Limit			ms
T20	100			ms

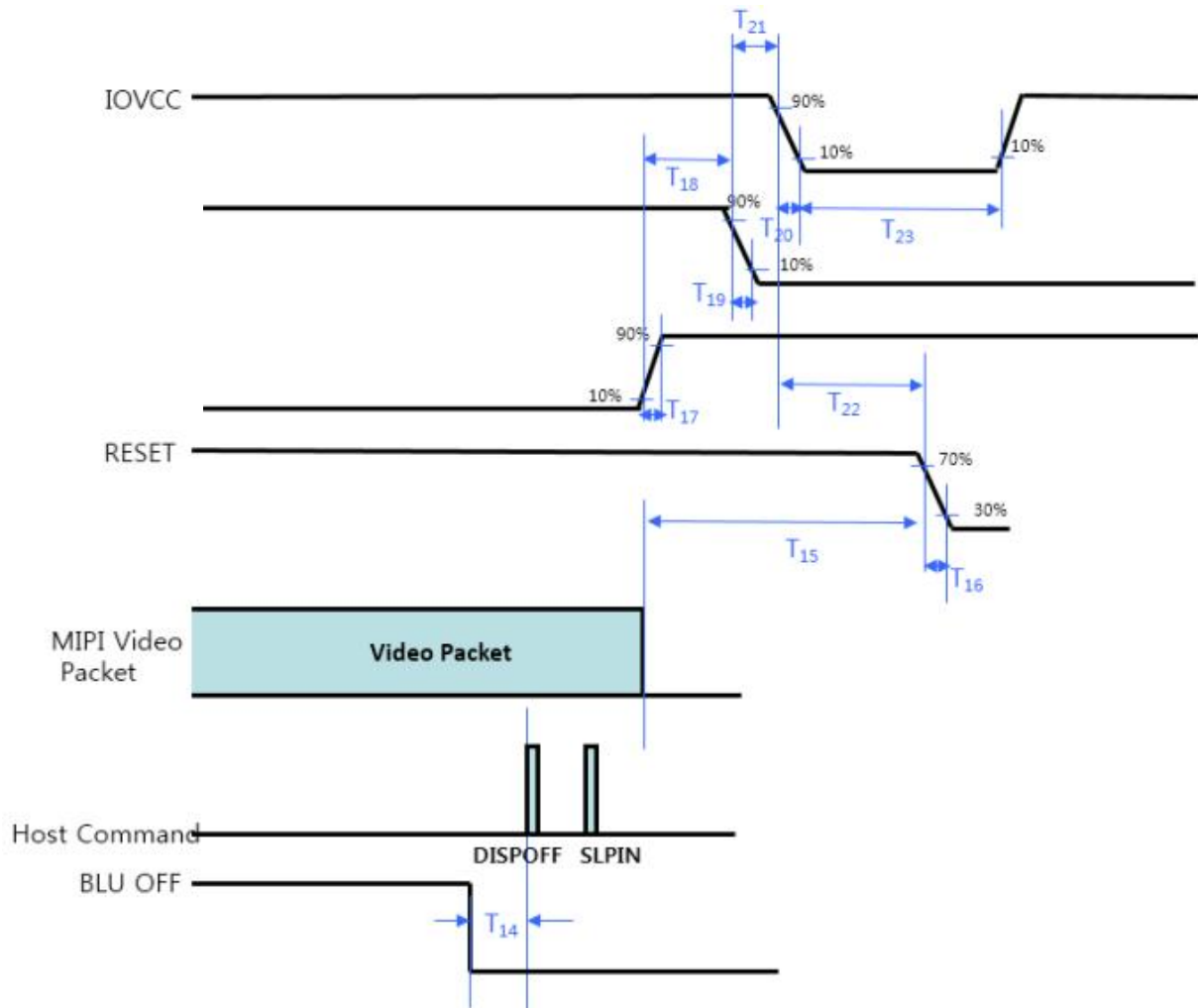


## Power On Timing of 3-Power Mode



	Min.	Typ.	Max.	Unit
T1	0.01	-	10	ms
T2	10	-	-	ms
T3	0.01	-	10	ms
T4	No Limit			ms
T5	0.01	-	10	ms
T6	1	-	-	ms
T7	1	-	-	ms
T8	10	-	-	us
T9	No Limit			ns
T10	15	-	-	ms
T11	120	-	-	ms
T12	No Limit			ms
T13	100	150	-	ms

### Power OFF Timing of 3-Power Mode



	Min.	Typ.	Max.	Unit
T14	40	100	-	ms
T15	10	-	-	ms
T16	No Limit			ms
T17	No Limit			ms
T18	1	-	-	ms
T19	No Limit			ms
T20	No Limit			ms
T21	1	-	-	ms
T22	1	-	-	ms
T23	100	-	-	ms

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## **10. Quality Assurance**

### **10.1.Purpose**

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

### **10.2.Standard for Quality Test**

#### 10.2.1. Sampling Plan:

GB2828.1-2012

Single sampling, general inspection level II

#### 10.2.2. Sampling Criteria:

Visual inspection: AQL 1.5

Electrical functional: AQL 0.65.

#### 10.2.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

### **10.3.Nonconforming Analysis & Disposition**

#### 10.3.1. Nonconforming analysis:

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

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

10.3.1.3. If can not finish the analysis on time, customer will be notified with the progress status.

#### 10.3.2. Disposition of nonconforming:

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

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

### **10.4.Agreement Items**

Shall negotiate with customer if the following situation occurs:

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

10.4.2. Additional requirement to be added in product specification.

10.4.3. Any other special problem.

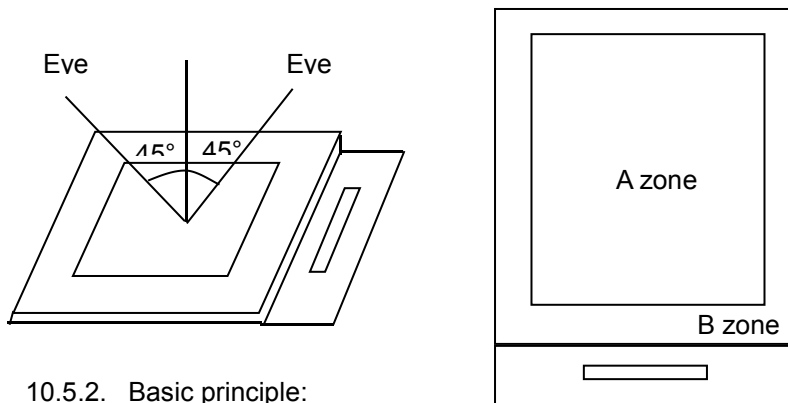
### **10.5.Standard of the Product Visual Inspection**

#### 10.5.1. Appearance inspection:

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

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

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

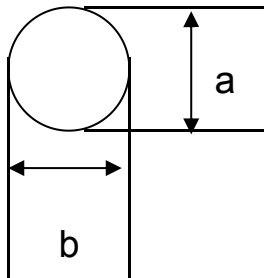


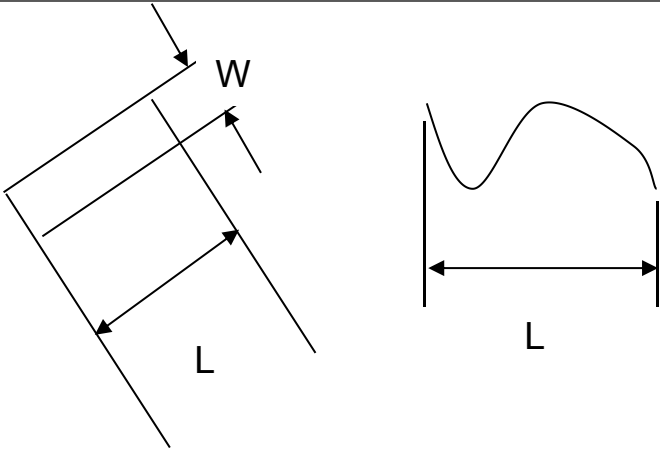
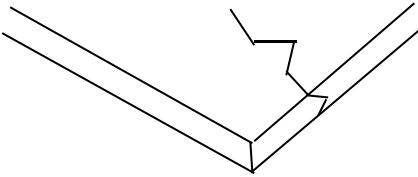
10.5.2. Basic principle:

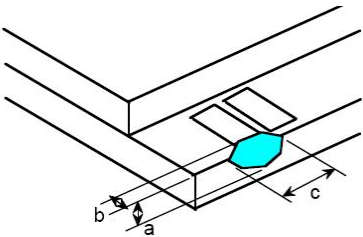
10.5.2.1. A set of sample to indicate the limit of acceptable quality level must be discussed by both us and customer when there is any dispute happened.

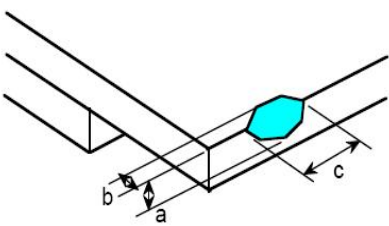
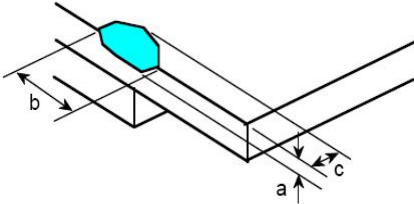
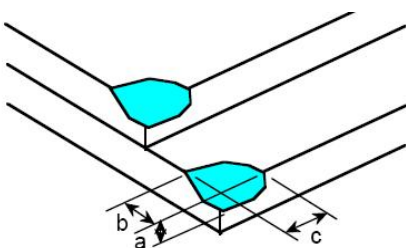
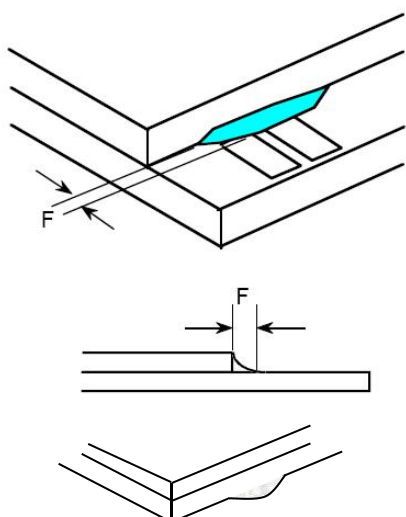
10.5.2.2. New item must be added on time when it is necessary.

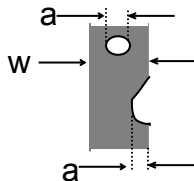
10.6. Inspection Specification

No.	Item	Criteria (Unit: mm)																		
01	Black / White spot Foreign material (Round type) Pinholes Stain Particles inside cell. (Minor defect)	 $\varphi = (a + b) / 2$	<table><tr><th>Size \ Area</th><th>Acc. Qty</th></tr><tr><td><math>\varphi \leq 0.10</math></td><td>Ignore</td></tr><tr><td><math>0.10 &lt; \varphi \leq 0.15</math></td><td>2</td></tr><tr><td><math>0.15 &lt; \varphi \leq 0.25</math></td><td>1</td></tr><tr><td><math>0.25 &lt; \varphi</math></td><td>0</td></tr><tr><td>Total</td><td>2 no include <math>\varphi \leq 0.10</math></td></tr></table>	Size \ Area	Acc. Qty	$\varphi \leq 0.10$	Ignore	$0.10 < \varphi \leq 0.15$	2	$0.15 < \varphi \leq 0.25$	1	$0.25 < \varphi$	0	Total	2 no include $\varphi \leq 0.10$					
		Size \ Area	Acc. Qty																	
$\varphi \leq 0.10$	Ignore																			
$0.10 < \varphi \leq 0.15$	2																			
$0.15 < \varphi \leq 0.25$	1																			
$0.25 < \varphi$	0																			
Total	2 no include $\varphi \leq 0.10$																			
		Distance between 2 defects should more than 3mm apart.																		
02	Electrical Defect (Minor defect)	<table><tr><td></td><td>Display Area</td><td>Total</td><td rowspan="4">Note1</td></tr><tr><td>Bright dot</td><td>0</td><td>0</td></tr><tr><td>Dark dot</td><td><math>N \leq 2</math></td><td><math>N \leq 2</math></td></tr><tr><td>Total dot</td><td><math>N \leq 2</math></td><td><math>N \leq 2</math></td></tr><tr><td>Mura</td><td colspan="2">Not visible through 5% ND filters.</td><td>Note2</td></tr></table>			Display Area	Total	Note1	Bright dot	0	0	Dark dot	$N \leq 2$	$N \leq 2$	Total dot	$N \leq 2$	$N \leq 2$	Mura	Not visible through 5% ND filters.		Note2
			Display Area	Total	Note1															
Bright dot	0	0																		
Dark dot	$N \leq 2$	$N \leq 2$																		
Total dot	$N \leq 2$	$N \leq 2$																		
Mura	Not visible through 5% ND filters.		Note2																	
		Remark: 1. Bright dot caused by scratch and foreign object accords to item 1.																		

03	Black and White line Scratch Foreign material (Line type) (Minor defect)	 <table border="1"> <thead> <tr> <th>Length</th><th>Width</th><th>Acc. Qty</th></tr> </thead> <tbody> <tr> <td>/</td><td><math>W \leq 0.03</math></td><td>Ignore</td></tr> <tr> <td><math>L \leq 2.5</math></td><td><math>0.03 &lt; W \leq 0.05</math></td><td>3</td></tr> <tr> <td><math>L \leq 2.5</math></td><td><math>0.05 &lt; W \leq 0.10</math></td><td>2</td></tr> <tr> <td>/</td><td><math>0.1 &lt; W</math></td><td></td></tr> <tr> <td colspan="2">Total</td><td>3</td></tr> </tbody> </table> <p>Distance between 2 defects should more than 3mm apart. Scratches not viewable through the back of the display are acceptable.</p>	Length	Width	Acc. Qty	/	$W \leq 0.03$	Ignore	$L \leq 2.5$	$0.03 < W \leq 0.05$	3	$L \leq 2.5$	$0.05 < W \leq 0.10$	2	/	$0.1 < W$		Total		3
Length	Width	Acc. Qty																		
/	$W \leq 0.03$	Ignore																		
$L \leq 2.5$	$0.03 < W \leq 0.05$	3																		
$L \leq 2.5$	$0.05 < W \leq 0.10$	2																		
/	$0.1 < W$																			
Total		3																		
04	Glass Crack (Minor defect)	 <p>Crack is potential to enlarge, any type is not allowed.</p>																		

05	<p>Glass Chipping Pad Area: (Minor defect)</p> 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td><math>c &gt; 3.0, b &lt; 1.0</math></td><td>1</td></tr><tr><td><math>c &lt; 3.0, b &lt; 1.0</math></td><td>3</td></tr><tr><td colspan="2"><math>a &lt; \text{Glass Thickness}</math></td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	3	$a < \text{Glass Thickness}$			
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	3											
$a < \text{Glass Thickness}$												
06	<p>Glass Chipping Rear of Pad Area: (Minor defect)</p>	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td><math>c &gt; 3.0, b &lt; 1.0</math></td><td>1</td></tr><tr><td><math>c &lt; 3.0, b &lt; 1.0</math></td><td>2</td></tr><tr><td><math>c &lt; 3.0, b &lt; 0.5</math></td><td>4</td></tr><tr><td colspan="2"><math>a &lt; \text{Glass Thickness}</math></td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												

												
07	<p>Glass Chipping Except Pad Area: (Minor defect)</p> 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td><math>c &gt; 3.0, b &lt; 1.0</math></td><td>1</td></tr><tr><td><math>c &lt; 3.0, b &lt; 1.0</math></td><td>2</td></tr><tr><td><math>c &lt; 3.0, b &lt; 0.5</math></td><td>4</td></tr><tr><td colspan="2"><math>a &lt; \text{Glass Thickness}</math></td></tr></table>	Length and Width	Acc. Qty	$c > 3.0, b < 1.0$	1	$c < 3.0, b < 1.0$	2	$c < 3.0, b < 0.5$	4	$a < \text{Glass Thickness}$	
Length and Width	Acc. Qty											
$c > 3.0, b < 1.0$	1											
$c < 3.0, b < 1.0$	2											
$c < 3.0, b < 0.5$	4											
$a < \text{Glass Thickness}$												
08	<p>Glass Corner Chipping: (Minor defect)</p> 	<table><tr><th>Length and Width</th><th>Acc. Qty</th></tr><tr><td><math>c &lt; 3.0, b &lt; 3.0</math></td><td>Ignore</td></tr><tr><td colspan="2"><math>a &lt; \text{Glass Thickness}</math></td></tr></table>	Length and Width	Acc. Qty	$c < 3.0, b < 3.0$	Ignore	$a < \text{Glass Thickness}$					
Length and Width	Acc. Qty											
$c < 3.0, b < 3.0$	Ignore											
$a < \text{Glass Thickness}$												
09	<p>Glass Burr: (Minor defect)</p> 	<table><tr><th>Length</th><th>Acc. Qty</th></tr><tr><td><math>F &lt; 1.0</math></td><td>Ignore</td></tr></table> <p>Glass burr don't affect assemble and module dimension.</p>	Length	Acc. Qty	$F < 1.0$	Ignore						
Length	Acc. Qty											
$F < 1.0$	Ignore											

10	FPC Defect: (Minor defect) 	10.1 Dent, pinhole width $a < w/3$ . (w: circuitry width.) 10.2 Open circuit is unacceptable. 10.3 No oxidation, contamination and distortion.										
11	Bubble on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td><math>\varphi \leq 0.20</math></td><td>Ignore</td></tr><tr><td><math>0.20 &lt; \varphi \leq 0.30</math></td><td>4</td></tr><tr><td><math>0.30 &lt; \varphi \leq 0.50</math></td><td>1</td></tr><tr><td><math>0.50 &lt; \varphi</math></td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
12	Dent on Polarizer (Minor defect)	<table><tr><th>Diameter</th><th>Acc. Qty</th></tr><tr><td><math>\varphi \leq 0.20</math></td><td>Ignore</td></tr><tr><td><math>0.20 &lt; \varphi \leq 0.30</math></td><td>4</td></tr><tr><td><math>0.30 &lt; \varphi \leq 0.50</math></td><td>1</td></tr><tr><td><math>0.50 &lt; \varphi</math></td><td>None</td></tr></table>	Diameter	Acc. Qty	$\varphi \leq 0.20$	Ignore	$0.20 < \varphi \leq 0.30$	4	$0.30 < \varphi \leq 0.50$	1	$0.50 < \varphi$	None
Diameter	Acc. Qty											
$\varphi \leq 0.20$	Ignore											
$0.20 < \varphi \leq 0.30$	4											
$0.30 < \varphi \leq 0.50$	1											
$0.50 < \varphi$	None											
13	Bezel	13.1 No rust, distortion on the Bezel. 13.2 No visible fingerprints, stains or other contamination.										
14	PCB	14.1 No distortion or contamination on PCB terminals. 14.2 All components on PCB must same as documented on the BOM/component layout. 14.3 Follow IPC-A-600F.										
15	Soldering	Follow IPC-A-610C standard										
16	Electrical Defect (Major defect)	The below defects must be rejected. 16.1 Missing vertical / horizontal segment, 16.2 Abnormal Display. 16.3 No function or no display. 16.4 Current exceeds product specifications. 16.5 LCD viewing angle defect. 16.6 No Backlight. 16.7 Dark Backlight. 16.8 Touch Panel no function.										

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

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## 10.7. Classification of Defects

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

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

## 10.8. Identification/marketing criteria

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

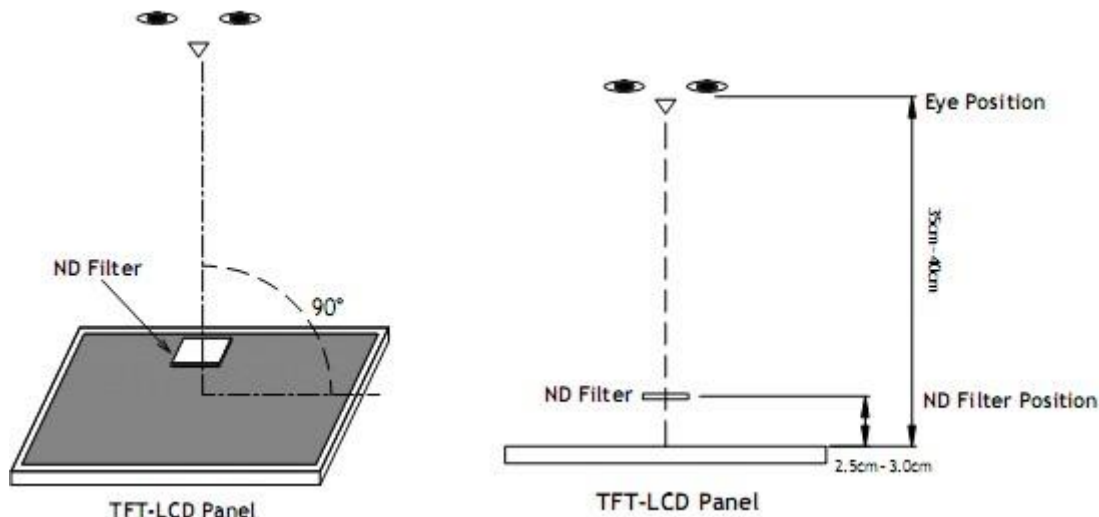
## 10.9. Packaging

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

10.9.2. Modules inside package box should have compliant mark.

10.9.3. All direct package materials shall offer ESD protection.

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



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

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

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



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## 11. Reliability Specification

No	Item	Condition	Quantity	Criteria
1	High Temperature Operating	<b>70℃, 96Hrs</b>	2	GB/T2423.2-2008
2	Low Temperature Operating	<b>-20℃, 96Hrs</b>	2	GB/T2423.1-2008
3	High Humidity Storage	<b>50℃, 90%RH, 96Hrs</b>	2	GB/T2423.3-2016
4	High Temperature Storage	<b>80℃, 96Hrs</b>	2	GB/T2423.2-2008
5	Low Temperature Storage	<b>-30℃, 96Hrs</b>	2	GB/T2423.1-2008
6	Thermal Cycling Test Storage	-20℃, 60min~ 70℃, 60min, 20 cycles.	2	GB/T2423.22-2012
7	Packing vibration	Frequency range:10Hz~50Hz Acceleration of gravity:5G X, Y, Z 30 min for each direction.	-	GB/T5170.14-2009
8	Electrical Static Discharge	Air: $\pm 4KV$ 150pF/330 $\Omega$ 5 times Contact: $\pm 2KV$ 150pF/330 $\Omega$ 5 times	2	GB/T17626.2-2018
9	Drop Test (Packaged)	Height:80 cm,1 corner, 3 edges, 6 surfaces.	-	GB/T2423.8-1995

Note1. No defection cosmetic and operational function allowable.

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

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## 12. Precautions and Warranty

### 12.1. Safety

- 12.1.1. The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.
- 12.1.2. Since the liquid crystal cells are made of glass, do not apply strong impact on them. Handle with care.

### 12.2. Handling

- 12.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 12.2.2. Do not wipe the polarizer with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do not use other chemicals.

### 12.3. Storage

- 12.3.1. Do not store the LCD module beyond the specified temperature ranges.
- 12.3.2. Strong light exposure causes degradation of polarizer and color filter.

### 12.4. Metal Pin (Apply to Products with Metal Pins)

#### 12.4.1. Pins of LCD and Backlight

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

#### 12.4.1.2. Recommended Soldering Conditions

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

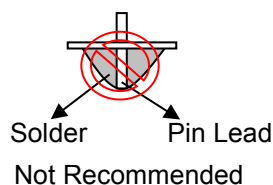
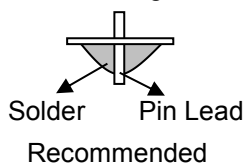
Maximum Solder Temperature: 370℃

Maximum Solder Time: 3s at the maximum temperature

Recommended Soldering Temp: 350±20℃

Typical Soldering Time: ≤3s

#### 12.4.1.3. Solder Wetting



#### 12.4.2. Pins of EL

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

- 12.4.2.2. No Solder Paste on the soldering pad on the motherboard is recommended.

#### 12.4.2.3. Recommended Soldering Conditions

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

Recommended Solder Temperature: 270~290℃

Typical Soldering Time: ≤2s

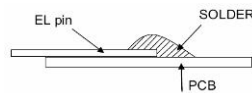
Minimum solder distance from EL lamp (body): 2.0mm

- 12.4.2.4. No horizontal press on the EL leads during soldering.

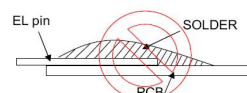
- 12.4.2.5. 180° bend EL leads three times is not allowed.

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#### 12.4.2.6. Solder Wetting

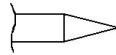


Recommended

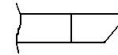


Not Recommended

#### 12.4.2.7. The type of the solder iron:

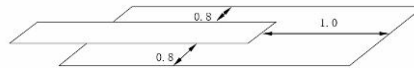


Recommended



Not Recommended

#### 12.4.2.8. Solder Pad



### 12.5. Operation

- 12.5.1. Do not drive LCD with DC voltage
- 12.5.2. Response time will increase below lower temperature
- 12.5.3. Display may change color with different temperature
- 12.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.
- 12.5.5. Do not connect or disconnect the LCM to or from the system when power is on.
- 12.5.6. Never use the LCM under abnormal condition of high temperature and high humidity.
- 12.5.7. Module has high frequency circuits. Sufficient suppression to the electromagnetic interface shall be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.
- 12.5.8. *Do not display the fixed pattern for long time (we suggest the time not longer than one hour) because it will develop image sticking due to the TFT structure.*

### 12.6. Static Electricity

- 12.6.1. CMOS LSIs are equipped in this unit, so care must be taken to avoid the electro-static charge, by ground human body, etc.
- 12.6.2. The normal static prevention measures should be observed for work clothes and benches.
- 12.6.3. The module should be kept into anti-static bags or other containers resistant to static for storage.

### 12.7. Limited Warranty

- 12.7.1. Our warranty liability is limited to repair and/or replacement. We will not be responsible for any consequential loss.
- 12.7.2. If possible, we suggest customer to use up all modules in six months. If the module storage time over twelve months, we suggest that recheck it before the module be used.
- 12.7.3. After the product shipped, any product quality issues must be feedback within three months, otherwise, we will not be responsible for the subsequent or consequential events.

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### 13. Packaging

TBD

14. Outline Drawing

