



**SPECIFICATIONS  
FOR  
LCM+HDMI Module**

MODULE No:	KD055FHFID004_HDMI
CUSTOMER:	

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		

Part. No	KD055FHFID004_HDMI	REV	V1.0	Page 1 of 37
常备库存 Stock For Sale	长期供货 Long Time supply	支持小量 NO MOQ	品种齐全 In Full Range	





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## 1. Scope

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This model is composed of a Transmissive type TFT-LCD Panel, driver circuit, HDMI board and back-light unit. The resolution of a 5.5" TFT-LCD contains 1080x1920 pixels, and can display up to 16.7M colors.

### 1.1 Basic Description

General Information	Items	Specifications	Unit	Note
		Main Panel		
	Display area(AA)	68.04(H)*120.96(V) (5.5inch)	mm	
	Driver element	TFT active matrix	-	
	Display colors	16.7M	colors	
	Number of pixels	1080RGB)*1920	dots	
	TFT Pixel arrangement	RGB vertical stripe	-	
	Pixel pitch	0.063(H)*0.063(V)	mm	
	Viewing angle	ALL	o'clock	
	TFT Controller IC	NT35532	-	
	Operating temperature	-20~+70	°C	
	Storage temperature	-30~+80	°C	
	LCM Luminance	380 nits (Typ.)		
	Video Input	HDMI		
	HDMI it Firmware Version	KD055FHFID004_HDMI_V01		



## 1.2 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)		74.28		mm	-
	Vertical(V)		133.21		mm	-
	Depth(D)		2.6		mm	-
Weight			39		g	-

## 1.3 Recommended Resolution

Recommended Resolution	1080(RGB)*1280 @55~60 Hz
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## 1.4 Plug & Play

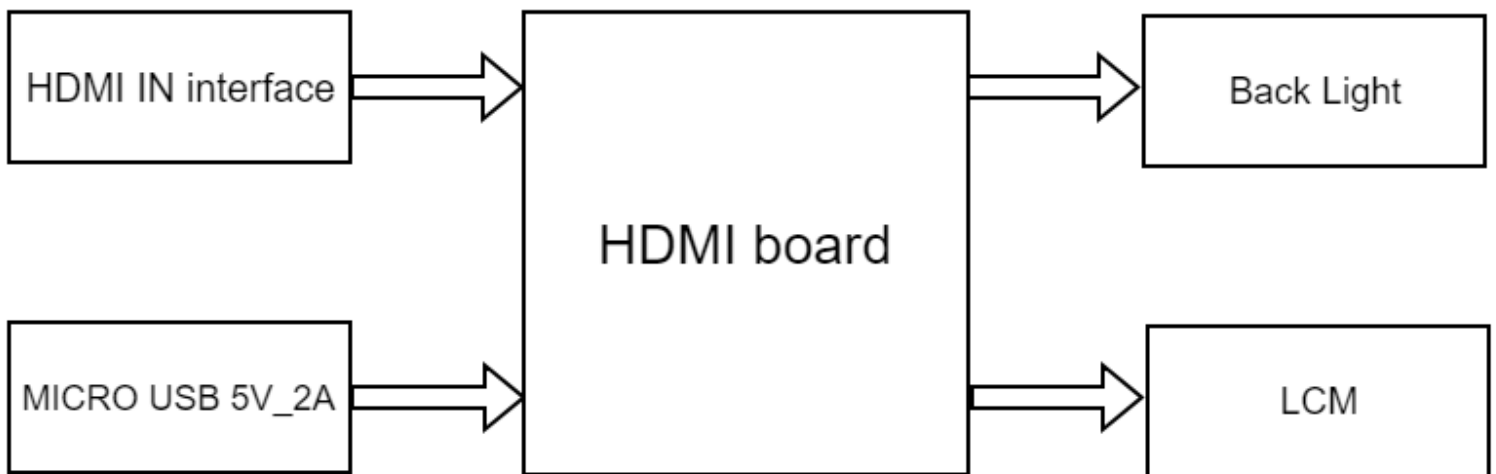
DDC2B /VESA Standard
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## 1.5 Power Supply Rating

Power Consumption	2.7W Watt (Typ.)
MICRO USB DC POWER	5V 2A(Typ.)



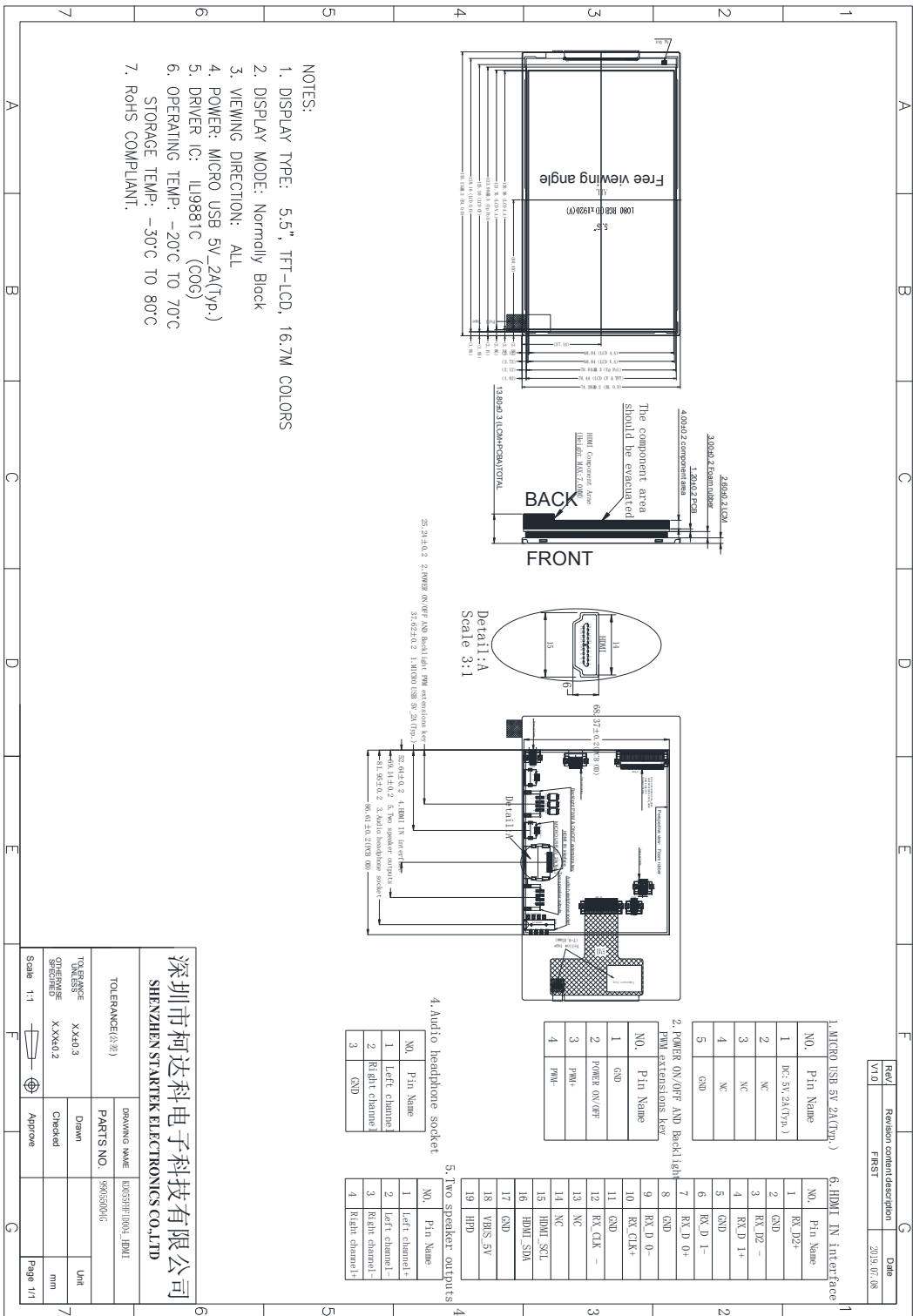
## 1.6 Block Diagram



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1.7 Outline Dimension



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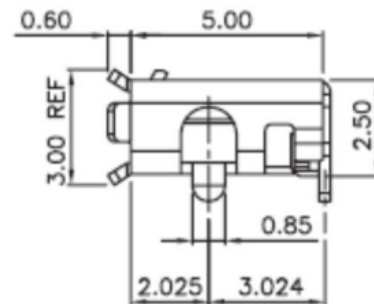
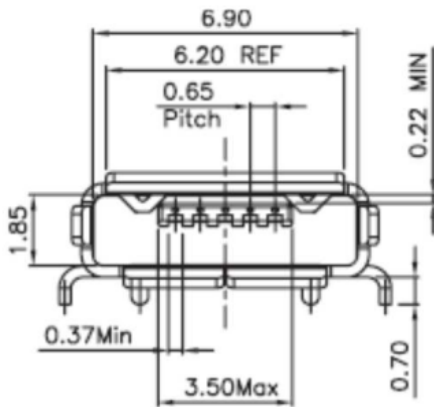
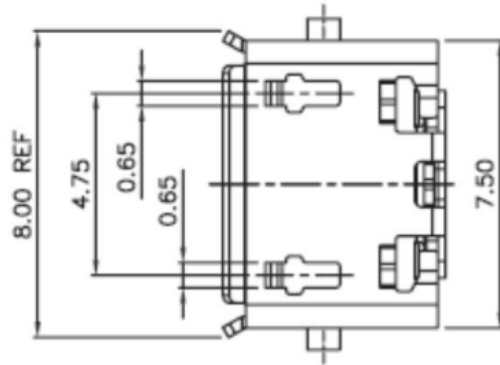


## 2. Input Terminal Pin Assignment

### 2.1 MICRO USB 5V\_2A(Typ.) PIN Definition & Signal Connector

NO.	SYMBOL	DISCRIPTION	I/O
1	DC:5V,2A(Typ.)	Supply voltage(5.0V,2A Typ.).	P
2	NC	No Connection.	
3	NC	No Connection.	
4	NC	No Connection.	
5	GND	Ground.	P

Note: Mirco-USB Connector Dimension:



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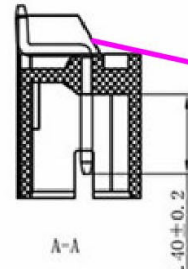
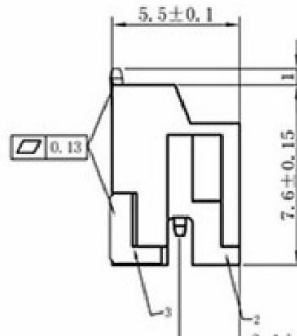
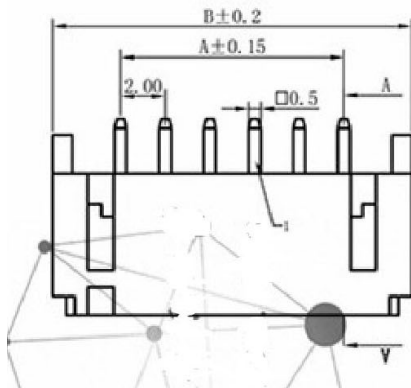
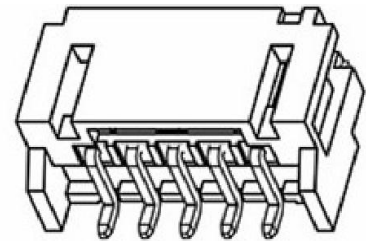
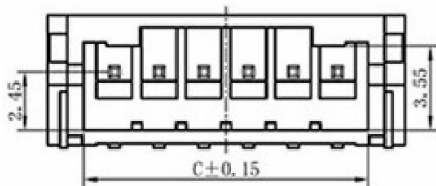




## 2.2 POWER ON/OFF AND Backlight PWM extensions key PIN Definition & Signal Connector

note: SMT PH2.0mm spacing connector 4p

NO.	SYMBOL	DISCRIPTION
1	GND	Ground
2	POWER ON/OFF	ON/OFF KEY
3	PWM+	The backlight brightness of each button is increased by one level until the maximum brightness reaches (9 level).
4	PWM-	The backlight brightness of each button is reduced by one level until the lowest brightness reaches (level 9).



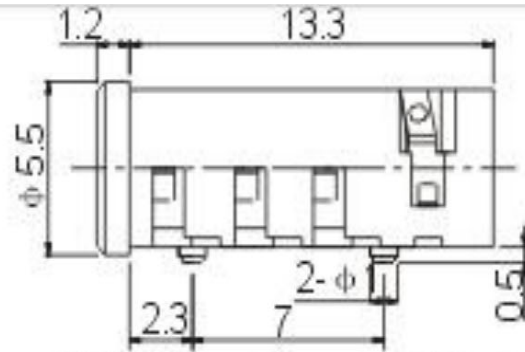
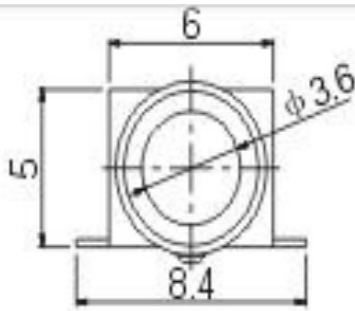
孔位 poles	A	B	C
2	2.00	8.00	4.75
3	4.00	10.00	6.75
4	6.00	12.00	8.75
5	8.00	14.00	10.75
6	10.00	16.00	12.75
7	12.00	18.00	14.75
8	14.00	20.00	16.75
9	16.00	22.00	18.75

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### 2.3 Audio headphone socket PIN Define & Input Signal Connector

NO.	SYMBOL	DISCRIPTION
1	Left channel	Audio output left channel
2	Right channel	Audio output right channel
3	GND	Ground
4	GND	Ground

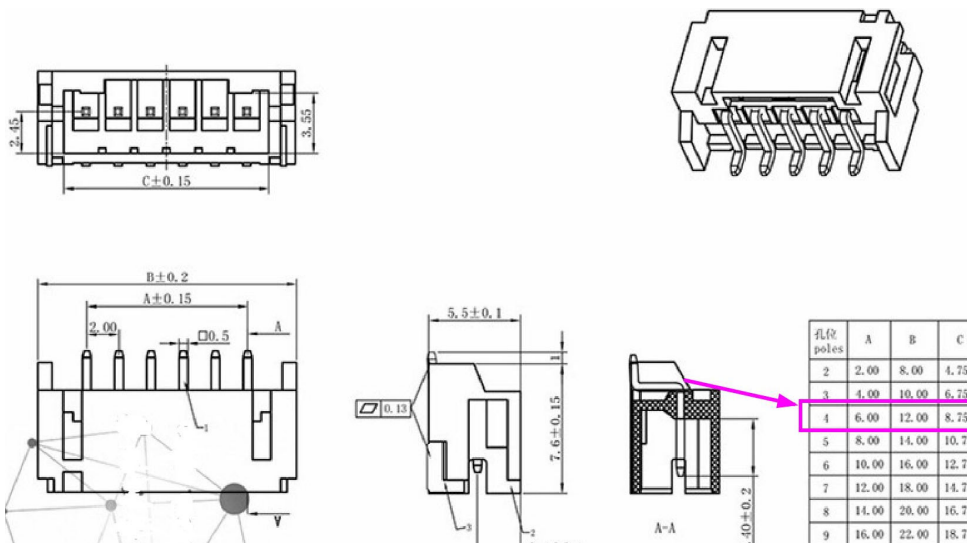


P.C.B Layout(copper-sided view)

### 2.4 Two speaker outputs PIN Define & Input Signal Connector

note: SMT PH2.0mm spacing connector 4p

NO.	SYMBOL	DISCRIPTION
1	Left channel+	Audio output left channel
2	Left channel-	
3	Right channel-	Audio output right channel
4	Right channel+	



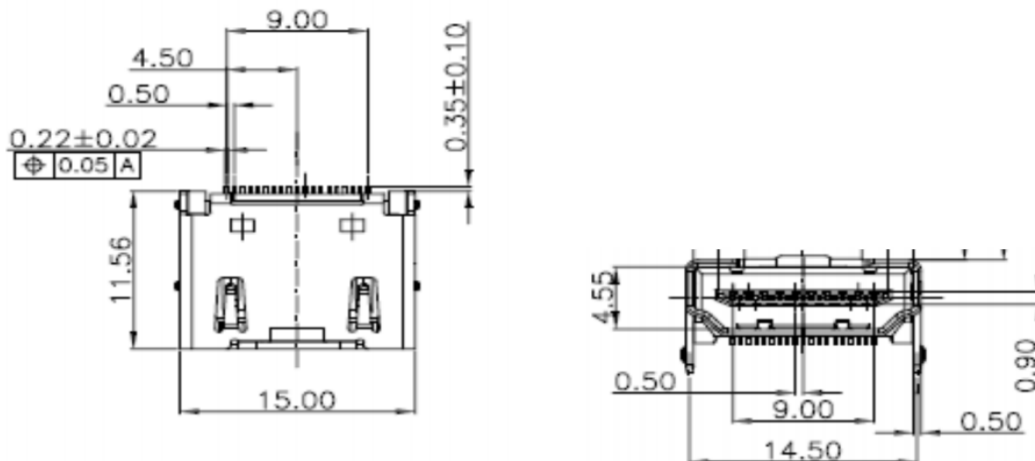
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**2.5 HDMI PIN Defintion & Signal Connector**

NO.	SYMBOL	DISCRIPTION	I/O
1	RX_D2+	HDMI Receiver channel 2 positive analog input.	I
2	GND	Ground.	P
3	RX_D2-	HDMI Receiver channel 2 negative analog input.	I
4	RX_D1+	HDMI Receiver channel 1 positive analog input.	I
5	GND	Ground.	P
6	RX_D1-	HDMI Receiver channel 1 negative analog input.	I
7	RX_D0+	HDMI Receiver channel 0 positive analog input.	I
8	GND	Ground.	P
9	RX_D0-	HDMI Receiver channel 0 negative analog input.	I
10	RX_CLK+	HDMI Receiver clock positive analog input.	I
11	GND	Ground.	P
12	RX_CLK-	HDMI Receiver clock negative analog input.	I
13	NC	No connect	
14	NC	No connect	
15	HDMI_SCL	HDMI Receiver DDC data channel.	I/O
16	HDMI_SDA	HDMI Receiver DDC clock channel.	I
17	GND	Ground.	P
18	HDMI_5V	HDMI Supply voltage (5.0V).	P
19	HPD	HDMI Receiver hot plug detect output	O

Note : HDMI Connector Dimension:



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### 3. Operating Instructions:

- 3.1 This product supports the following operating systems: Windows 7/8/10, Raspberry Pi, Ubuntu, Android.
- 3.2 Connect the HDMI cable to Windows 7/8/10 or Raspberry Pi or Ubuntu or Android.
- 3.3 Connect the micro USB DC POWER.

### 4. LCD Optical Characteristics

#### 4.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio	CR	$\Theta=0$	700	1000	--		(1)(2)
Response time	Rising	Normal viewing angle	--	--	35	msec	(1)(3)
	Falling						
Color gamut	S(%)			80		%	(1)
Color Filter Chromaticity	White	$W_X$	0.2529	0.2929	0.3329		(1)(4)
		$W_Y$	0.2706	0.3106	0.3506		
	Red	$R_X$	0.5952	0.6352	0.6752		
		$R_Y$	0.2998	0.3398	0.3798		
	Green	$G_X$	0.2638	0.3038	0.3438		
		$G_Y$	0.5487	0.5887	0.6287		
	Blue	$B_X$	0.1041	0.1441	0.1841		
		$B_Y$	0.0135	0.0535	0.0935		
Viewing angle	Hor.	$\Theta_L$	--	85	--		(1)(4)
		$\Theta_R$	--	85	--		
	Ver.	$\Theta_U$	--	85	--		
		$\Theta_D$	--	85	--		
Option View Direction	ALL						(5)



## 4.2 Measuring Condition

- Measuring surrounding: dark room
- Ambient temperature:  $25 \pm 2^{\circ}\text{C}$
- 15min. warm-up time.

[Note 1] Definitions of viewing angle range:

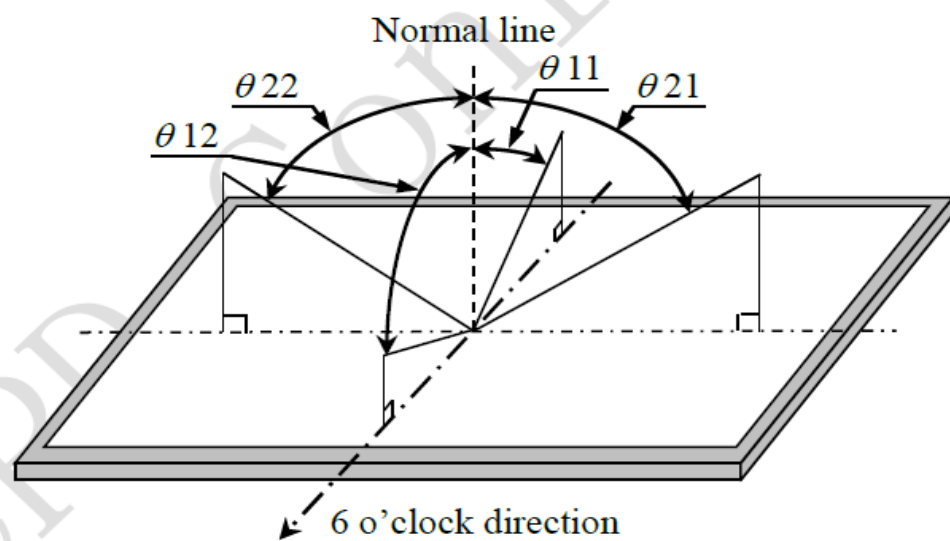


Fig.8-1 Viewing angle

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[Note 2] Brightness is measured as shown in Fig.10-4, and is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

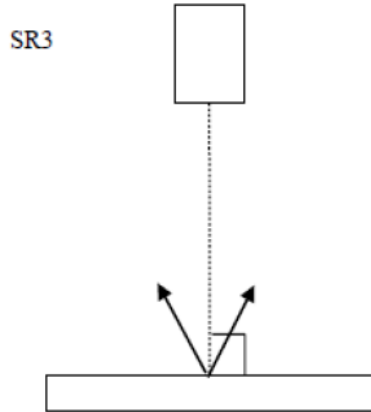


Fig.8-2 Optical characteristics Test Method (Brightness)

[Note 3] Definition of contrast ratio:

The contrast ratio is defined as the following.

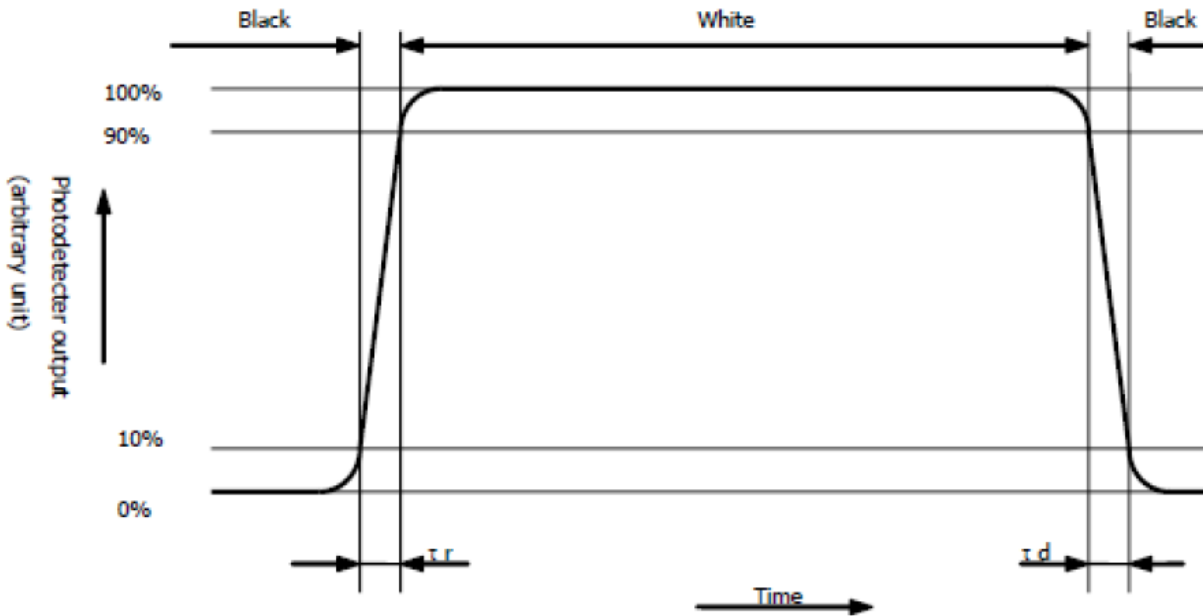
$$\text{Contrast Ratio} = \frac{\text{Luminance(Brightness) with all pixels white}}{\text{Luminance(Brightness) with all pixels Black}}$$

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[Note 4] Definition of response time:

Definition of response time: The response time is defined as the following figure and shall be measured by switching the input signal for "black" and "white"



[Note 5] This result was measured by CEC Backlight.

[Note 6] This value is valid when O/S driving is used at typical input time value.

[Note 7] 
$$\text{Uniformity} = \frac{\text{Min luminance of 9 points (Brightness)}}{\text{Max luminance of 9 points (Brightness)}} * 100\%$$

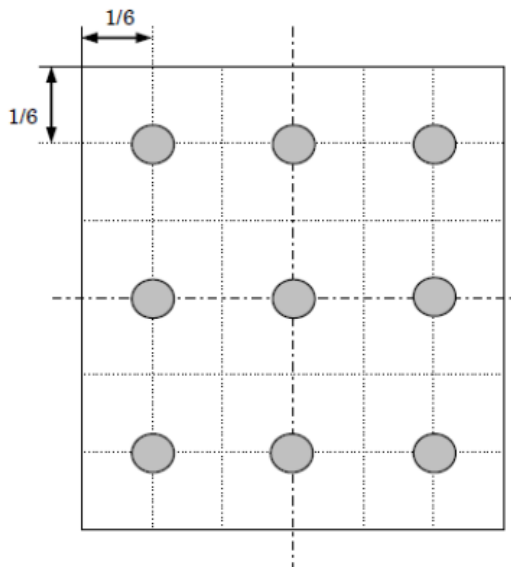


Fig.8-4 Measurement locations of Uniformity

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**5. Electrical Characteristics:**

**5.1 Absolute Maximum Rating**

Item	Symbol	Min.	Max.	Unit	Remake
Power supply voltage (Analog)	VDD-GND	-0.3	6.0	V	
	VDDp.GND	-0.3	6.0	V	
Input signal voltage (LED)	V <sub>(LED)</sub>	-0.3	6.0	V	LED_EN
Input signal voltage (PWR)	V <sub>(PWR)</sub>	-0.3	5.5	V	DCDC EN
Operating temperature	T <sub>OP</sub>	-20	+70	°C	
Storage temperature	T <sub>ST</sub>	-30	+80	°C	

NOTE1: If the products are exceeding the above range, they may be permanently damaged.

**5.2 DC Electrical Characteristics**

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	V <sub>CI</sub>	2.5	3.3	6.6	V	--
Supply Voltage (Logic)	IOVCC	1.65	1.8	3.6	V	--
Normal mode Current consumption	IDD	--	31	--	mA	--
Level input voltage	V <sub>IH</sub>	0.7I <sub>ovcc</sub>	--	I <sub>ovcc</sub>	V	--
	V <sub>IL</sub>	-0.3	--	0.3 I <sub>ovcc</sub>	V	--
Level output voltage	V <sub>OH</sub>	0.8I <sub>ovcc</sub>	--	I <sub>ovcc</sub>	V	--
	V <sub>OL</sub>	GND	--	0.2I <sub>ovcc</sub>	V	--





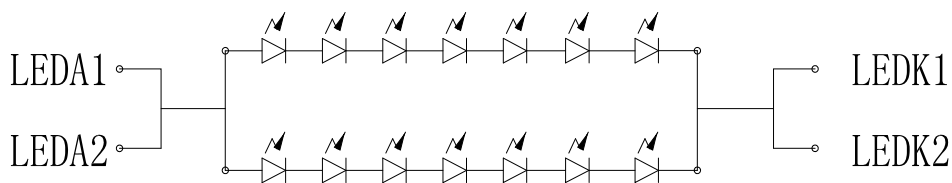
### 5.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 14 chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	$I_F$	30	40	--	mA	--
Forward Voltage	$V_F$	--	22.4	--	V	--
LCM Luminance	$L_V$	330	380	--	cd/m <sup>2</sup>	Note3
LED life time	Hr	50000			Hour	Note1,2
Uniformity	AVg	80	--	--	%	Note3

Note (1) LED life time (Hr) can be defined as the time in which it continues to operate under the condition:  $T_a=25\pm3\text{ }^\circ\text{C}$ , typical IL value indicated in the above table until the brightness becomes less than 50%.

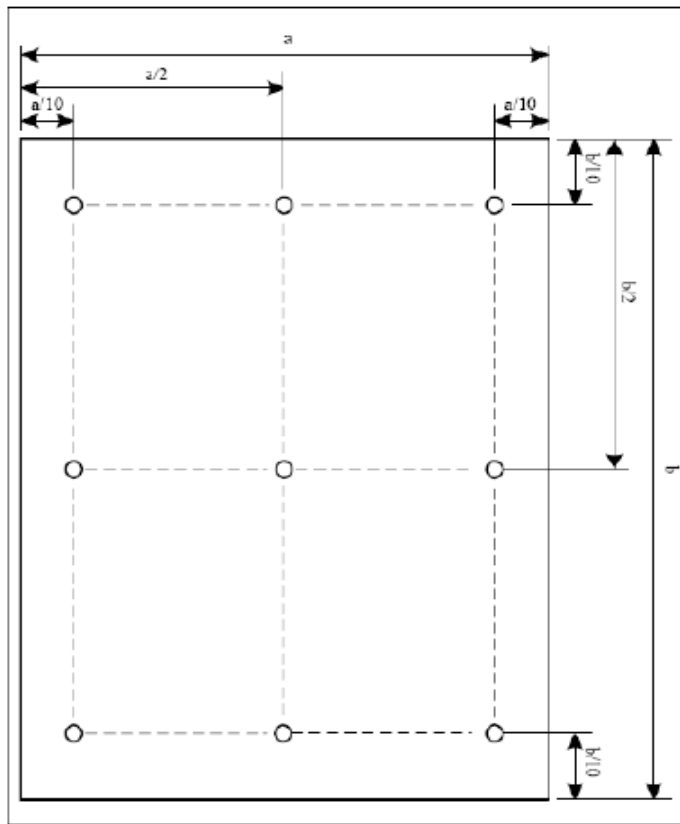
Note (2) The "LED life time" is defined as the module brightness decrease to 50% original brightness at  $T_a=25^\circ\text{C}$  and  $I_L=40\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 40mA. The constant current driving method is suggested.



B1 CIRCUIT DIAGRAM



NOTE 3: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

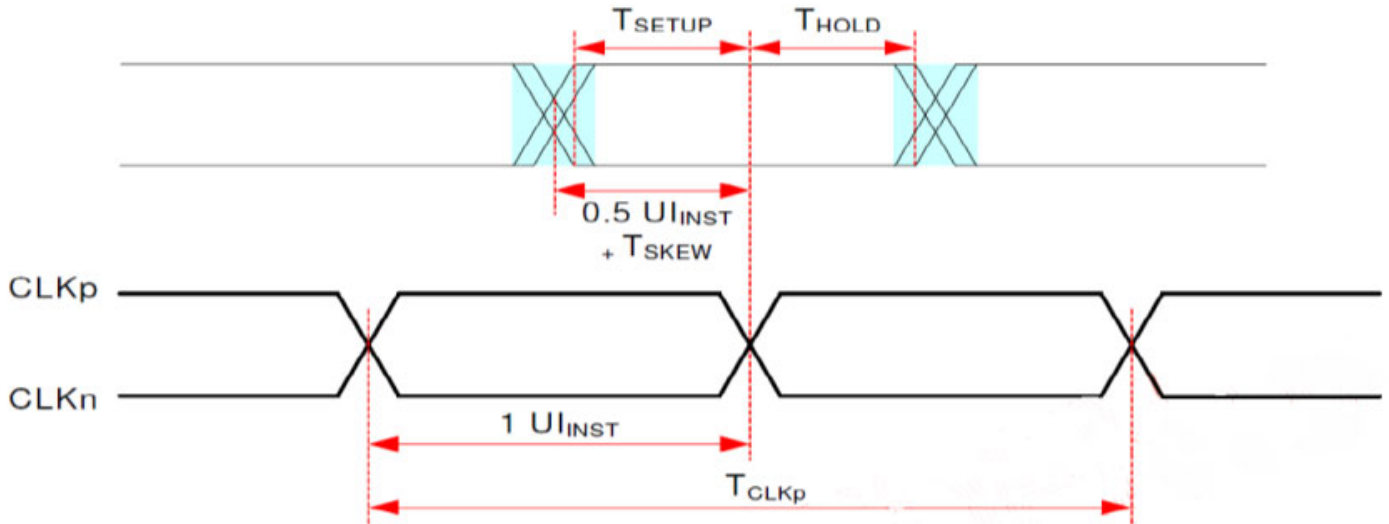
$$\text{Luminance} = \frac{\text{Total Luminance of 9 points}}{9}$$

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## 6. TFT AC Characteristic

### 6.1 High Speed Data Transmission: Data-Clock Timing



$T_a = +25^\circ\text{C}$ , GND=0V

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
UI instantaneous	UIINST	1		12.5	ns	1,2,10
Data to Clock Skew [measured at tansmitter]	TSKEW[TX]	-0.15		0.15	UIINST	3
		-0.2		0.2	UIINST	4
Data to Clock Setup Time [measured at receiver]	TSETUP[RX]	-0.15		0.15	UIINST	5
		-0.2		0.2	UIINST	6
Data to Clock Hold Time [measured at reciever]	T HOLD[RX]	-0.15		0.15	UIINST	5
		-0.2		0.2	UIINST	6
20% -80% rise time and fall time	tR / tF	100			ps	9
				0.3	UIINST	7
				0.35	UIINST	8

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Note:

1. This value corresponds to a minimum 80 MHz data rate.
2. The minimum UI shall not be violated for any single bit period, i.e.,any DDR half cycle within a data burst.
3. Total silicon and package delay budget of 0.3\* UIINST when D-PHY is supporting maximum data rate = 1Gbps.
4. Total silicon and package delay budget of 0.4\* UIINST when D-PHY is supporting maximum data rate > 1Gbps.
5. Total setup and hole window for receiver of 0.3\* UIINST when D-PHY is supporting maximum data rate = 1Gbps.
6. Total setup and hole window for receiver of 0.4\* UIINST when D-PHY is supporting maximum data rate > 1Gbps.
7. Applicable when operating at HS bit rates ≤ 1 Gbps (UI ≥ 1 ns).
8. Applicable when operating at HS bit rates > 1 Gbps (UI < 1 ns).
9. Applicable for all HS bit rates. However, to avoid excessive radiation, bit rates ≤ 1 Gbps (UI ≥ 1 ns), should not use values below 150 ps.
10. For MIPI speed limitation:  
 [1] Per lane bandwidth is 1Gbps,  
 [2] Total Bit Rate: 4Gbps for 8-8-8; 3Gbps for 6-6-6; and 2.67Gbps for 5-6-5.

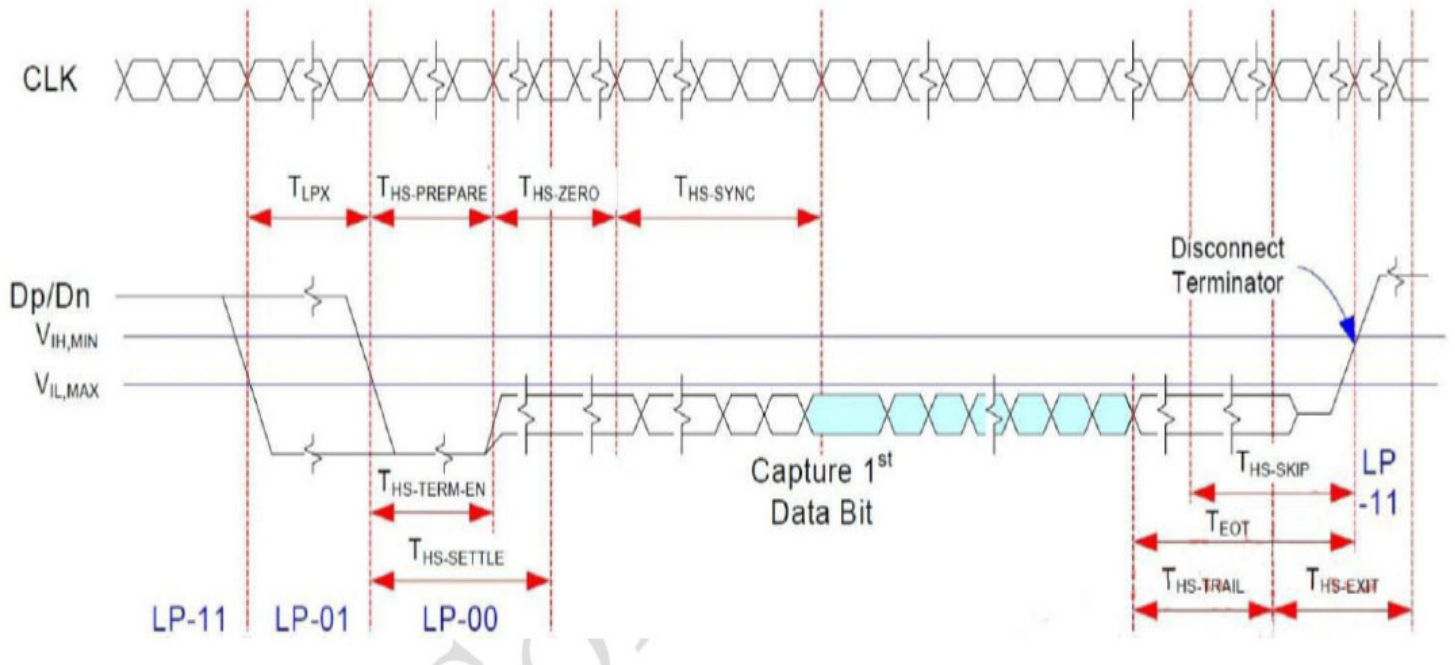


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## 6.2 HS Data Transmission

### High-Speed Data Transmission in Bursts



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Parameter	Symbol	Min.	Typ.	Max.	Unit
Time to drive LP-00 to prepare for HS transmission	THS-PREPARE	40+4UI		85+6UI	ns
Time from start of Ths-TRAIL or Tclk-TRAIL period to start of LP-11 state	TEOT			105+12UI	ns
Time to enable Data Lane receiver line termination measured from when Dn cross VIL,MAX	THS-TERM-EN			35+4UI	ns
Time to drive flipped differential state after last payload data bit of a HS transmission burst	T Hs-TRAIL	60+4UI			ns
Time-out at RX to ignore transition period of EoT	THS-SKIP	40		55+4UI	ns
Time to drive LP-11 after HS burst	THS-EXIT	100			ns
Length of any Low-Power state period	TLPX	50			ns
Sync sequence period	THS-SYNC		8UI		ns
Minimum lead HS-0 drive period before the Sync sequence	THS-ZERO	105+6UI			ns

Note:

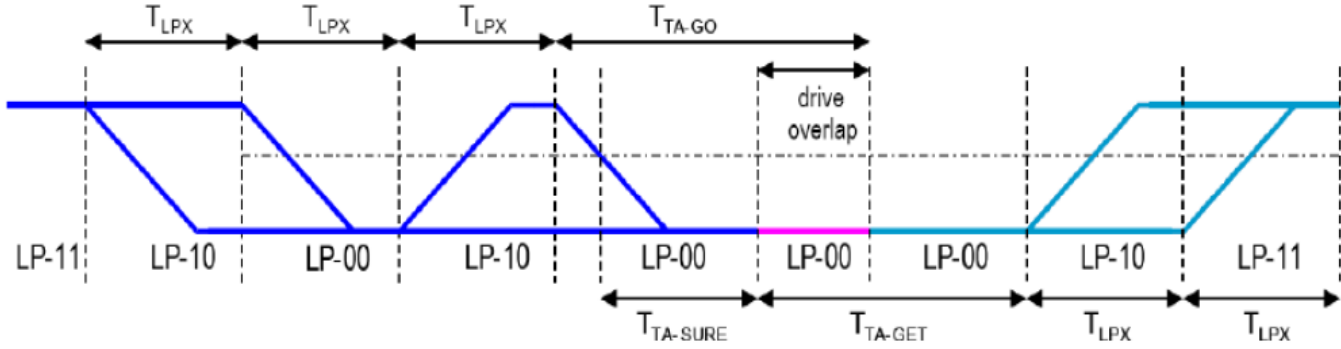
- 1: The minimum value depends on the bit rate. Implementations should ensure proper operation for all the supported bit rates.
- 2: UI means Unit Interval, equal to one half HS the clock period on the Clock Lane.

### 6.3 Turnaround Procedure

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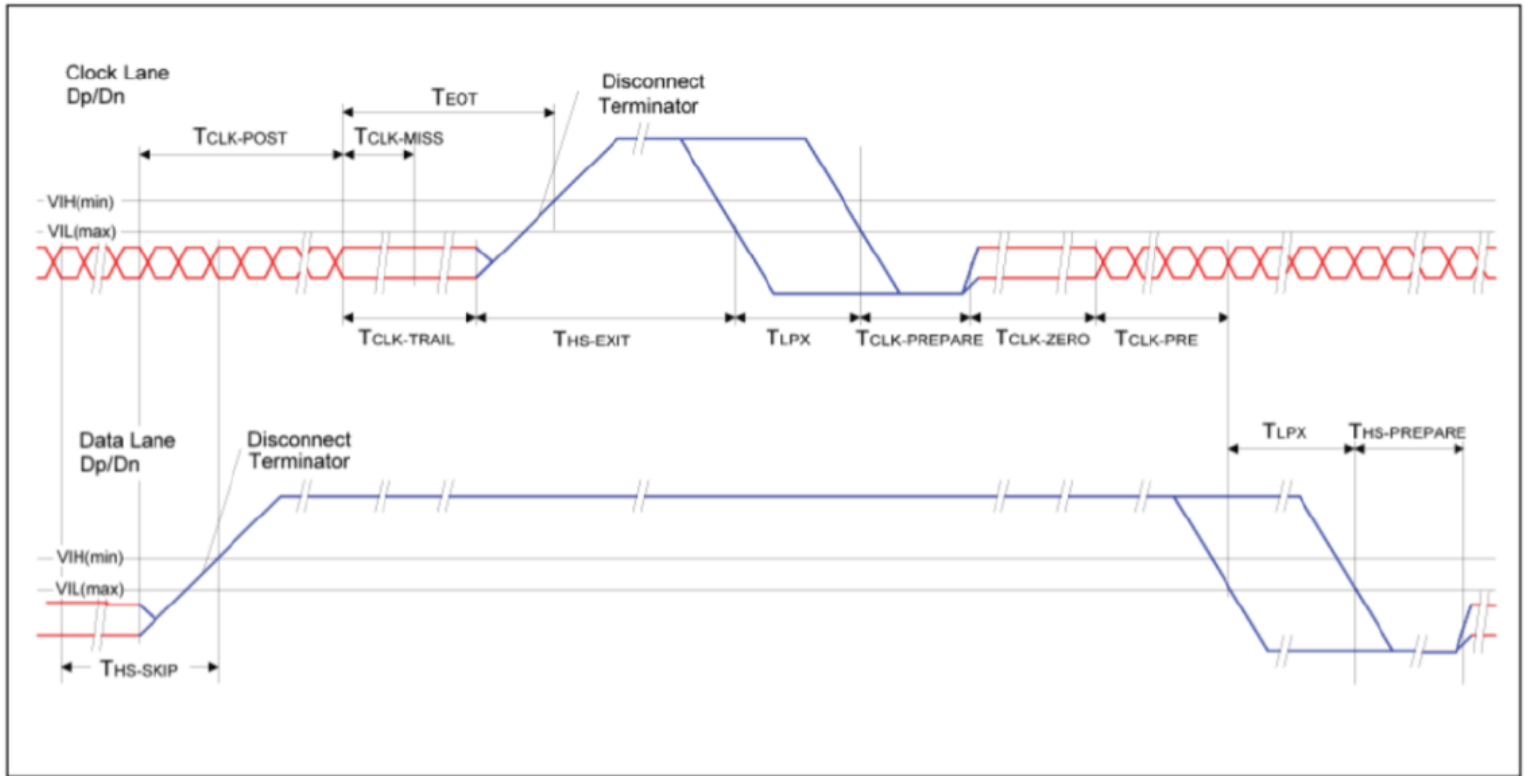
Turnaround Procedure



Parameter	Symbol	Min	Typ	Max	Units
Length of any Low-Power state period : Master side	$T_{LPX}$	50		75	ns
Length of any Low-Power state period : Slave side	$T_{LPX}$	50		75	ns
Ratio of $T_{LPX}$ (MASTER)/ $T_{LPX}$ (SLAVE) between Master and Slave side	Ratio $T_{LPX}$	2/3		3/2	
Time-out before new TX side start driving	$T_{TA-SURE}$	$T_{LPX}$		$2T_{LPX}$	ns
Time to drive LP-00 by new TX	$T_{TA-GET}$		$5T_{LPX}$		ns
Time to drive LP-00 after Turnaround Request	$T_{TA-GO}$		$4T_{LPX}$		ns



## 6.4 Switching the Clock Lane between Clock Transmission and Low-Power Mode



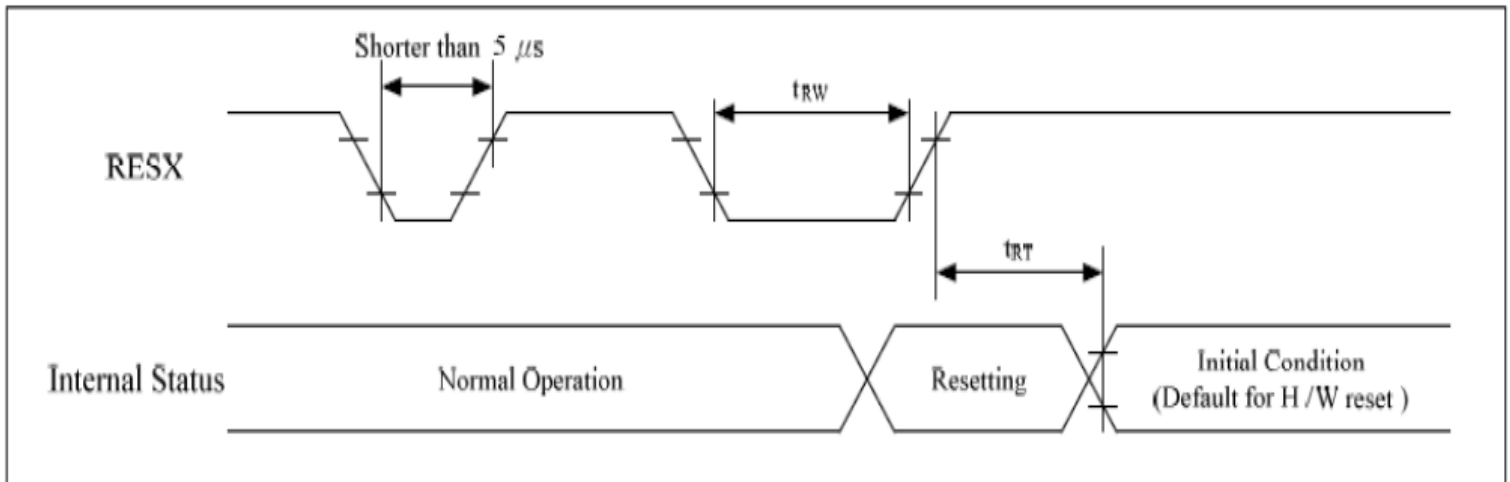
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Parameter	Symbol	Min.	Typ.	Max.	Unit
Time that the transmitter shall continue sending HS clock after the last associated Data Lane has transitioned to LP mode	TCLK-POST	60+128UI			ns
Detection time that the clock has stopped toggling	TCLK-MISS			60	ns
Time to drive LP-00 to prepare for HS clock transmission	TCLK-PREPAR E	38		95	ns
Minimum lead HS-0 drive period before starting Clock	TCLK-PREPAR E +TCLK-ZERO	300			ns
Time to enable Clock Lane receiver line termination measured from when Dn cross VIL,MAX	THS-TERM-EN			38	ns
Minimum time that the HS clock must be set prior to any associated date lane beginning the transmission from LP to HS mode	TCLK-PRE	8			UI
Time to drive HS differential state after last payload clock bit of a HS transmission burst	TCLK-TRAIL	60			ns

### 6.5 Reset Timing Characteristics





Reset Timing Characteristics VSP=5.8V, VSN=-5.6V, VDDI=1.7~1.9V					
Signal	Parameter	Symbol	Min.	Max.	Unit
RESX	Reset pulse duration	tRW	10(Note)		us
	Reset cancel	tRT		10(Note)	ms
				120(Note)	ms

**Note:**

-The reset cancel also includes required time for loading ID bytes, VCOM setting and other settings from EEPROM (or similar device) to registers.

This loading is done every time when there is HW reset cancel time (tRT) within 10 ms after a rising edge of RESX.

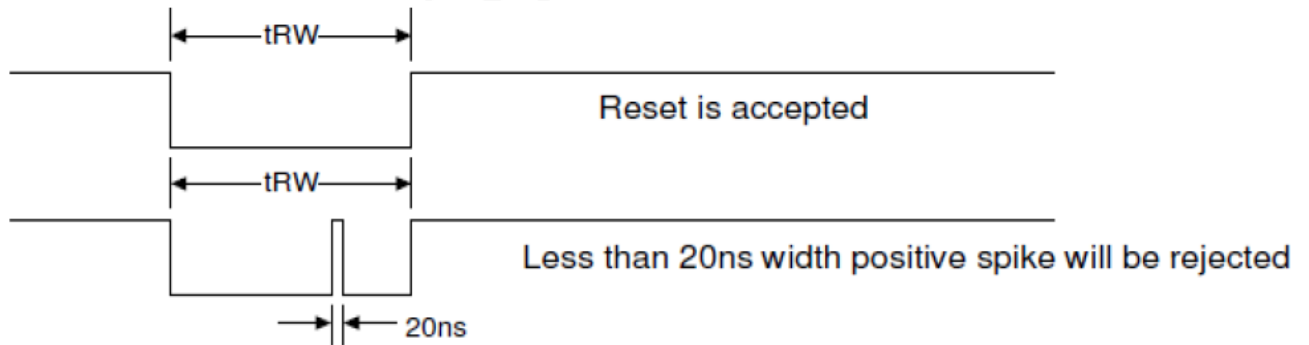
-Spike due to an electrostatic discharge on RESX line does not cause irregular system reset according to the table below:

RESX	Pulse Action
Shorter than 5us	Reset Rejected
Longer than 9us	Reset
Between 5us and 9us	Reset Starts



-During the Resetting period, the display will be blanked(The display is entering blanking sequence, which maximum time is 120 ms, when Reset starts at Sleep-Out status. The display remains the blank state in Sleep-In mode). Then return to Default condition for Hardware Reset.

-Spike Rejection also applies during a valid reset pulse as shown below:



-When Reset applied during Sleep-In Mode.

-When Reset applied during Sleep-Out Mode.

-It is necessary to wait 10ms after releasing RESX before sending commands. Also Sleep Out command cannot be sent for 120 ms.

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## 7. LCD Module Out-Going Quality Level

### 7.1 VISUAL & FUNCTION INSPECTION STANDARD

#### 7.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

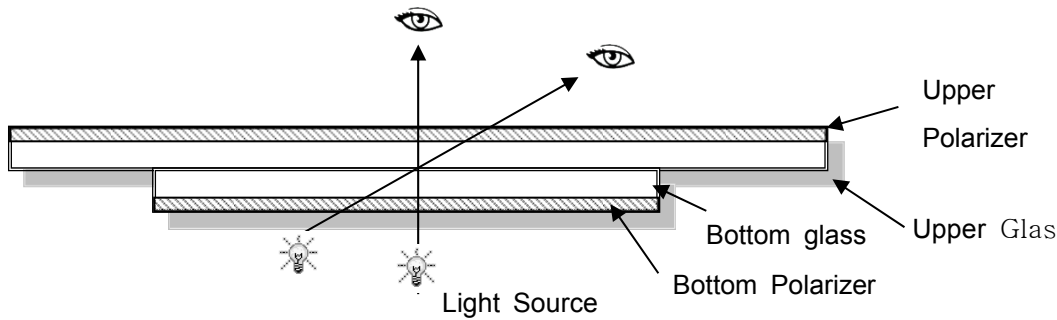
Temperature : 25±5°C

Humidity : 65%±10%RH

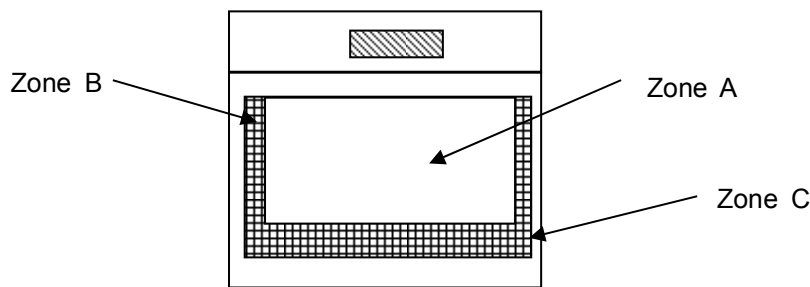
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



#### 7.1.2 Definition



Zone A : Effective Viewing Area(Character or Digit can be seen)

Zone B : Viewing Area except Zone A

Zone C : Outside (Zone A+Zone B) which can not be seen after assembly by customer .)

Zone D : IC Bonding Area

Note:

As a general rule ,visual defects in Zone C can be ignored when it doesn't effect product function or appearance after assembly by customer

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### 7.1.3 Sampling Plan

According to GB/T 2828.1-2003 ; , normal inspection, Class II

AQL:

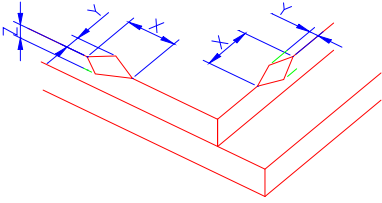
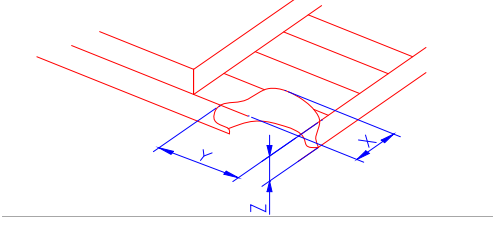
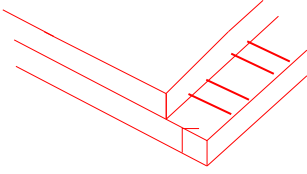
Major defect	Minor defect
0.65	1.5

LCD: Liquid Crystal Display , TP: Touch Panel , LCM: Liquid Crystal Module

No	Items to be inspected	Criteria	Classification of defects
1	Functional defects	1) No display, Open or miss line 2) Display abnormally, Short 3) Backlight no lighting, abnormal lighting. 4) TP no function	Major
2	Missing	Missing component	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot Line defect	Light dot, Dim spot, Polarizer Bubble ; Polarizer accidented spot.	
6	Soldering appearance	Good soldering , Peeling off is not allowed.	
7	LCD/Polarizer/TP	Black/White spot/line, scratch, crack, etc.	



7.1.4 Criteria (Visual)

Number	Items	Criteria(mm)						
1.0 LCD Crack/Broken NOTE: X: Length Y: Width Z: Height L: Length of IT O, T: Height of LCD	(1) The edge of LCD broken	 <table border="1" data-bbox="756 667 1455 815"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>&lt;Inner border line of the seal</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	<Inner border line of the seal	≤T
	X	Y	Z					
	≤3.0mm	<Inner border line of the seal	≤T					
(2)LCD corner broken	 <table border="1" data-bbox="817 1122 1394 1220"> <thead> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> </thead> <tbody> <tr> <td>≤3.0mm</td> <td>≤L</td> <td>≤T</td> </tr> </tbody> </table>	X	Y	Z	≤3.0mm	≤L	≤T	
X	Y	Z						
≤3.0mm	≤L	≤T						
(3) LCD crack	 <p style="text-align: center;">Crack Not allowed</p>							



2.0	Spot defect	<p><math>\Phi=(X+Y)/2</math></p>	① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)			
	Zone		Acceptable Qty			
	Size (mm)		A	B	C	
	$\Phi \leq 0.10$		Ignore		Ignore	
	$0.10 < \Phi \leq 0.25$		3( distance $\geq 10\text{mm}$ )			
	$0.25 < \Phi \leq 0.3$		2			
	$\Phi > 0.35$		0			
	② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)					
	Zone		Acceptable Qty			
	Size (mm)		A	B	C	
$\Phi \leq 0.1$	Ignore		Ignore			
$0.10 < \Phi \leq 0.25$	3( distance $\geq 10\text{mm}$ )					
$0.25 < \Phi \leq 0.3$	2					
$\Phi > 0.35$	0					
③ Polarizer accidented spot						
Zone	Acceptable Qty					
Size (mm)	A	B	C			
$\Phi \leq 0.2$	Ignore		Ignore			
$0.3 < \Phi \leq 0.5$	2( distance $\geq 10\text{mm}$ )					
$\Phi > 0.5$	0					
④ Pixel bad points (light dot, Dim dot, color dot)						
Zone	Acceptable Qty					
Size (mm)	A	B	C			
$\Phi \leq 0.1$	Ignore		Ignore			
$0.15 < \Phi \leq 0.25$	2( distance $\geq 10\text{mm}$ )					
$\Phi > 0.3$	0					
⑤ Polarizer Bubble						
Zone	Acceptable Qty					
Size (mm)	A	B	C			
$\Phi \leq 0.2$	Ignore		Ignore			
$0.3 < \Phi \leq 0.4$	3(distance $\geq 10\text{mm}$ )					
$0.5 < \Phi \leq 0.6$	2					
$0.6 < \Phi$	0					

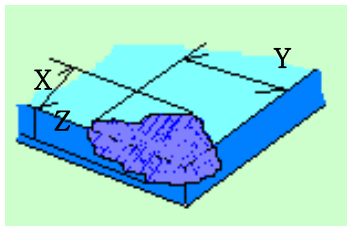
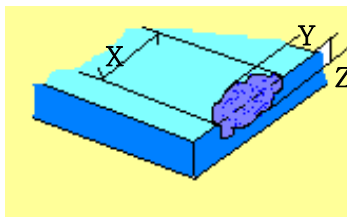


3.0	Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)	<table border="1"> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Length(m)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td><math>\Phi \leq 0.05</math></td> <td>Ignore</td> <td colspan="2">Ignore</td> <td rowspan="3">Ignore</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.06</math></td> <td><math>L \leq 4.0</math></td> <td colspan="2"><math>N \leq 3</math></td> </tr> <tr> <td><math>0.07 &lt; W \leq 0.08</math></td> <td><math>L \leq 3.0</math></td> <td colspan="2"><math>N \leq 2</math></td> </tr> <tr> <td><math>0.08 &lt; W</math></td> <td colspan="4">Define as spot defect</td> </tr> </table>	Width(mm)	Length(m)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		Ignore	$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$		$0.07 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$		$0.08 < W$	Define as spot defect			
		Width(mm)			Length(m)	Acceptable Qty																						
			A	B		C																						
		$\Phi \leq 0.05$	Ignore	Ignore		Ignore																						
		$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$																								
$0.07 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$																										
$0.08 < W$	Define as spot defect																											
4.0	Electronic Components SMT	Not allow missing parts, solderless connection, cold solder joint, mismatch, The positive and negative polarity opposite																										
5.0	Display color & Brightness	<p>1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples.</p> <p>2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.</p>																										
6.0	LCD Mura	By 5% ND filter invisible.																										

7.0	CTP Related	CTP Cover sensor accidented black/white spot	<table border="1"> <tr> <th rowspan="2">Size <math>\Phi</math>(mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td><math>\Phi \leq 0.1</math></td> <td colspan="2">Ignore</td> <td rowspan="4">Ignore</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.2</math></td> <td colspan="2">3 (distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.20 &lt; \Phi \leq 0.25</math></td> <td colspan="2">2</td> </tr> <tr> <td><math>\Phi &gt; 0.3</math></td> <td colspan="2">0</td> </tr> </table>	Size $\Phi$ (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.1$	Ignore		Ignore	$0.1 < \Phi \leq 0.2$	3 (distance $\geq 10$ mm)		$0.20 < \Phi \leq 0.25$	2		$\Phi > 0.3$	0					
			Size $\Phi$ (mm)		Acceptable Qty																						
				A	B	C																					
			$\Phi \leq 0.1$	Ignore		Ignore																					
			$0.1 < \Phi \leq 0.2$	3 (distance $\geq 10$ mm)																							
		$0.20 < \Phi \leq 0.25$	2																								
		$\Phi > 0.3$	0																								
		CTP Cover scratch	<table border="1"> <tr> <th rowspan="2">Width(mm)</th> <th rowspan="2">Ignore (mm)</th> <th colspan="3">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> <th>C</th> </tr> <tr> <td><math>\Phi \leq 0.05</math></td> <td>Ignore</td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.06</math></td> <td><math>L \leq 4.0</math></td> <td colspan="2"><math>N \leq 3</math></td> </tr> <tr> <td><math>0.07 &lt; W \leq 0.08</math></td> <td><math>L \leq 3.0</math></td> <td colspan="2"><math>N \leq 2</math></td> </tr> <tr> <td><math>0.08 &lt; W</math></td> <td colspan="3">Define as spot defect</td> </tr> </table>	Width(mm)	Ignore (mm)	Acceptable Qty			A	B	C	$\Phi \leq 0.05$	Ignore	Ignore		$0.05 < W \leq 0.06$	$L \leq 4.0$	$N \leq 3$		$0.07 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$		$0.08 < W$	Define as spot defect		
			Width(mm)			Ignore (mm)	Acceptable Qty																				
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$0.05 < W \leq 0.06$	$L \leq 4.0$		$N \leq 3$																								
$0.07 < W \leq 0.08$	$L \leq 3.0$	$N \leq 2$																									
$0.08 < W$	Define as spot defect																										





CTP Cover Pinhole/ Lack of ink	<table border="1"> <tr> <th rowspan="2">Zone Size (mm)</th> <th colspan="2">Acceptable Qty</th> </tr> <tr> <th colspan="2">C</th> </tr> <tr> <td><math>\Phi \leq 0.1</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.1 &lt; \Phi \leq 0.2</math></td> <td colspan="2">3(distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.25 &lt; \Phi \leq 0.3</math></td> <td colspan="2">2</td> </tr> <tr> <td><math>\Phi &gt; 0.35</math></td> <td colspan="2">0</td> </tr> </table>		Zone Size (mm)	Acceptable Qty		C		$\Phi \leq 0.1$	Ignore		$0.1 < \Phi \leq 0.2$	3(distance $\geq 10$ mm)		$0.25 < \Phi \leq 0.3$	2		$\Phi > 0.35$	0	
	Zone Size (mm)	Acceptable Qty																	
		C																	
	$\Phi \leq 0.1$	Ignore																	
$0.1 < \Phi \leq 0.2$	3(distance $\geq 10$ mm)																		
$0.25 < \Phi \leq 0.3$	2																		
$\Phi > 0.35$	0																		
CTP Bonding bubble/ accidented spot	<table border="1"> <tr> <th rowspan="2">Size <math>\Phi</math>(mm)</th> <th colspan="2">Acceptable Qty</th> </tr> <tr> <th>A</th> <th>B</th> </tr> <tr> <td><math>\Phi \leq 0.1</math></td> <td colspan="2">Ignore</td> </tr> <tr> <td><math>0.15 &lt; \Phi \leq 0.2</math></td> <td colspan="2">3(distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.25</math></td> <td colspan="2">2</td> </tr> <tr> <td><math>\Phi &gt; 0.25</math></td> <td colspan="2">0</td> </tr> </table>		Size $\Phi$ (mm)	Acceptable Qty		A	B	$\Phi \leq 0.1$	Ignore		$0.15 < \Phi \leq 0.2$	3(distance $\geq 10$ mm)		$0.2 < \Phi \leq 0.25$	2		$\Phi > 0.25$	0	
	Size $\Phi$ (mm)	Acceptable Qty																	
		A	B																
	$\Phi \leq 0.1$	Ignore																	
	$0.15 < \Phi \leq 0.2$	3(distance $\geq 10$ mm)																	
$0.2 < \Phi \leq 0.25$	2																		
$\Phi > 0.25$	0																		
Assembly deflection	beyond the edge of backlight $\leq 0.2$ mm																		
TP cover broken X : length Y : width Z : height	<table border="1"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td><math>X \leq 0.5</math>mm</td> <td><math>Y \leq 0.5</math>mm</td> <td><math>Z &lt; \text{cover thickness}</math></td> </tr> </table>	X	Y	Z	$X \leq 0.5$ mm	$Y \leq 0.5$ mm	$Z < \text{cover thickness}$												
	X	Y	Z																
$X \leq 0.5$ mm	$Y \leq 0.5$ mm	$Z < \text{cover thickness}$																	
<table border="1"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td><math>X \leq 0.3</math>mm</td> <td><math>Y \leq 0.3</math>mm</td> <td><math>Z &lt; \text{LCD thickness}</math></td> </tr> </table>	X	Y	Z	$X \leq 0.3$ mm	$Y \leq 0.3$ mm	$Z < \text{LCD thickness}$													
X	Y	Z																	
$X \leq 0.3$ mm	$Y \leq 0.3$ mm	$Z < \text{LCD thickness}$																	
TP cover broken X : length Y : width Z : height	<table border="1"> <tr> <th>X</th> <th>Y</th> <th>Z</th> </tr> <tr> <td><math>X \leq 0.3</math>mm</td> <td><math>Y \leq 0.3</math>mm</td> <td><math>Z &lt; \text{LCD thickness}</math></td> </tr> </table>	X	Y	Z	$X \leq 0.3$ mm	$Y \leq 0.3$ mm	$Z < \text{LCD thickness}$												
X	Y	Z																	
$X \leq 0.3$ mm	$Y \leq 0.3$ mm	$Z < \text{LCD thickness}$																	

Criteria ( functional items)

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Number	Items	Criteria (mm)
1	No display	Not allowed
2	Missing segment	Not allowed
3	Short	Not allowed
4	Backlight no lighting	Not allowed
5	TP no function	Not allowed



## 8. Reliability Test Results

Item	Condition	Inspection after test
High Temperature Operating	70°C,96H	Inspection after 2~4hours storage at room temperature, the sample shall be free from defects: 1.Air bubble in the LCD; 2.Non-display; 3.Missing segments/line; 4.Glass crack; 5.Current IDD is twice higher than initial value.
Low Temperature Operating	-20°C, 96HR	
High Temperature Storage	80°C, 96HR	
Low Temperature Storage	-30°C, 96HR	
High Temperature & High Humidity Operating	+60°C, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-30°C,30 min ↔ 80°C,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15°C~35°C, 30%~60%).	
Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X.Y.Z. (6 hours for total) (Package condition).	
Box Drop Test	1 Corner 3 Edges 6 faces,80cm(MEDIUM BOX)	

Remark:

- 1.The test samples should be applied to only one test item.
- 2.Sample size 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 judged as a good part.
- 5.Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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## 9. Cautions and Handling Precautions

### 9.1 Handling and Operating the Module

- (1) When the module is assembled, it should be attached to the system firmly.  
Do not warp or twist the module during assembly work.
- (2) Protect the module from physical shock or any force. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (3) Note that polarizer is very fragile and could be easily damaged. Do not press or scratch the surface.
- (4) Do not allow drops of water or chemicals to remain on the display surface.  
If you have the droplets for a long time, staining and discoloration may occur.
- (5) If the surface of the polarizer is dirty, clean it using some absorbent cotton or soft cloth.
- (6) The desirable cleaners are water, IPA (Isopropyl Alcohol) or Hexane.  
Do not use ketene type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (7) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs, or clothes, it must be washed away thoroughly with soap.
- (8) Protect the module from static; it may cause damage to the CMOS ICs.
- (9) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (10) Do not disassemble the module.
- (11) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (12) Pins of I/F connector shall not be touched directly with bare hands.
- (13) Do not connect, disconnect the module in the "Power ON" condition.
- (14) Power supply should always be turned on/off by the item 6.1 Power On Sequence & 6.2 Power Off Sequence

### 9.2 Storage and Transportation.

- (1) Do not leave the panel in high temperature, and high humidity for a long time.  
It is highly recommended to store the module with temperature from 0 to 35 °C and relative humidity of less than 70%
- (2) Do not store the TFT-LCD module in direct sunlight.
- (3) The module shall be stored in a dark place. When storing the modules for a long time, be sure to adopt effective measures for protecting the modules from strong ultraviolet radiation, sunlight, or fluorescent light.
- (4) It is recommended that the modules should be stored under a condition where no condensation is allowed. Formation of dewdrops may cause an abnormal operation or a failure of the module.  
In particular, the greatest possible care should be taken to prevent any module from being operated where condensation has occurred inside.
- (5) This panel has its circuitry FPC on the bottom side and should be handled carefully in order not to be stressed.

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## 10. Packing

---TBD-----

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