

**SPECIFICATION  
FOR  
LCM+CTP Module**

MODULE No:	KD101HDFLA010-C016A
CUSTOMER:	

STARTEK	INITIAL	DATE
PREPARED BY		
CHECKED BY		
APPROVED BY		

CUSTOMER	INITIAL	DATE
APPROVED BY		



**Revision History**

Date	Rev. No.	Page	Summary
2018.08.29	V1.0	ALL	FIRST ISSUE
2018.10.08	V1.1	6	Add Weight

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## 1. Basic Specifications

### \* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorphous silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Panel, driver circuit, capacitance touch panel, back-light unit. The resolution of a 10.1" TFT-LCD contains 1280x800 pixels, and can display up to 16.7M colors.

### 1.1 TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	216.96(H)*135.6(V) (10.1 inch)	mm	
Driver element	TFT active matrix	-	
Display colors	16.7M	colors	
Number of pixels	1280(RGB)*800	dots	
Pixel arrangement	RGB vertical stripe	-	
Pixel pitch	0.1695(H)*0.1695(V)	mm	
Viewing angle	Free	o'clock	
Controller IC	TBD	-	
LCM Interface	LVDS Receiver 24 bit Interface	-	
Display mode	Transmissive /Normally Black	-	
Operating temperature	-30~+85	°C	
Storage temperature	-30~+85	°C	
Module bonding technology	Use Tape bonding between LCM and CTP	-	

### 1.2 CTP Features

General Information Items	Specification	Unit	Note
	Main Panel		
Resolution	1280(H)*800(V)	-	
Structure	G+G	-	
Controller IC	ILI2511	-	
Interface	USB+IIC	-	
Slave Adress	TBD	-	Note1
Touch mode	Multi Touch	-	-

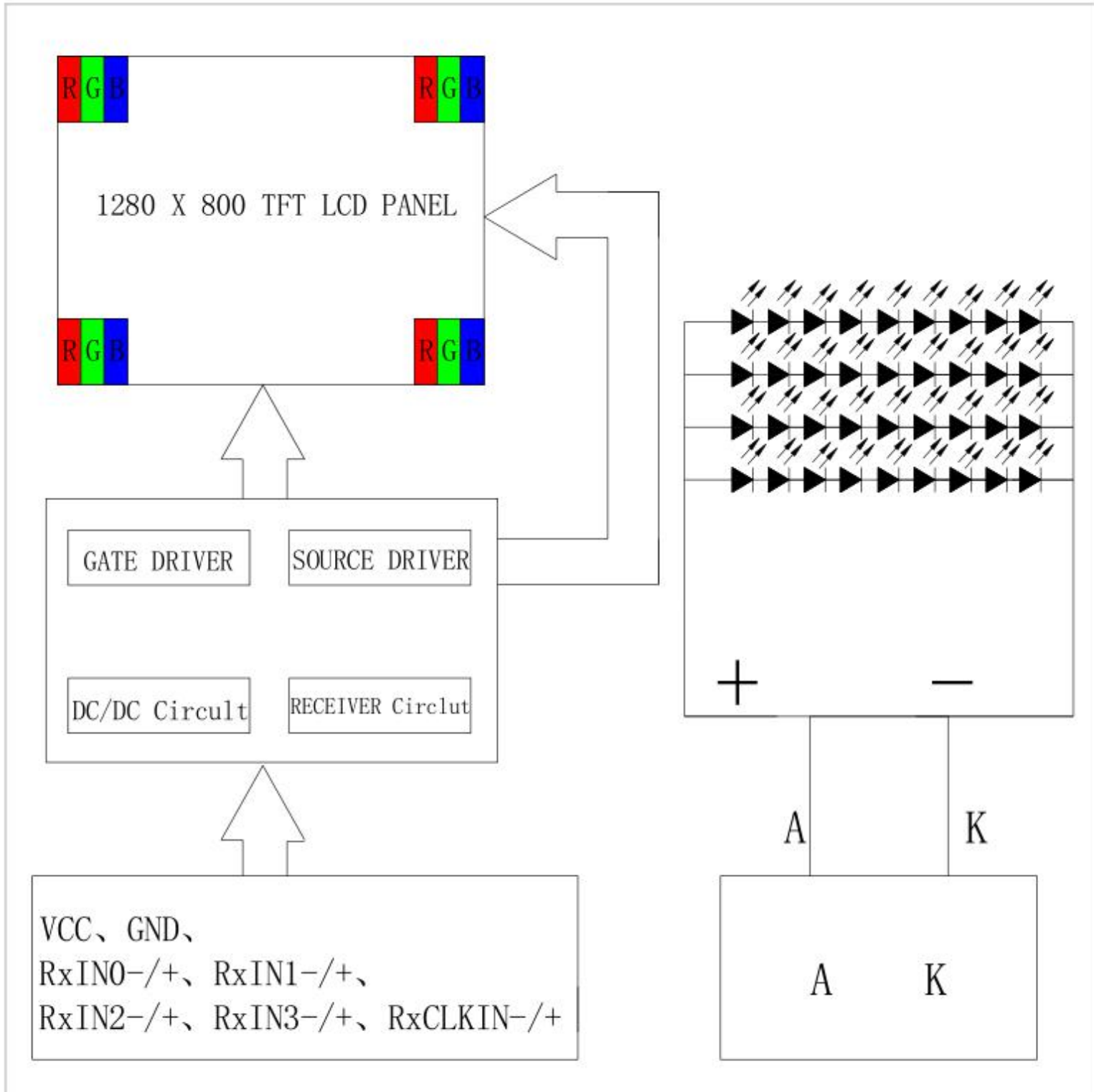
**Note1:** For specific configuration method, please refer to section 8.2

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**1.3 Mechanical Information**

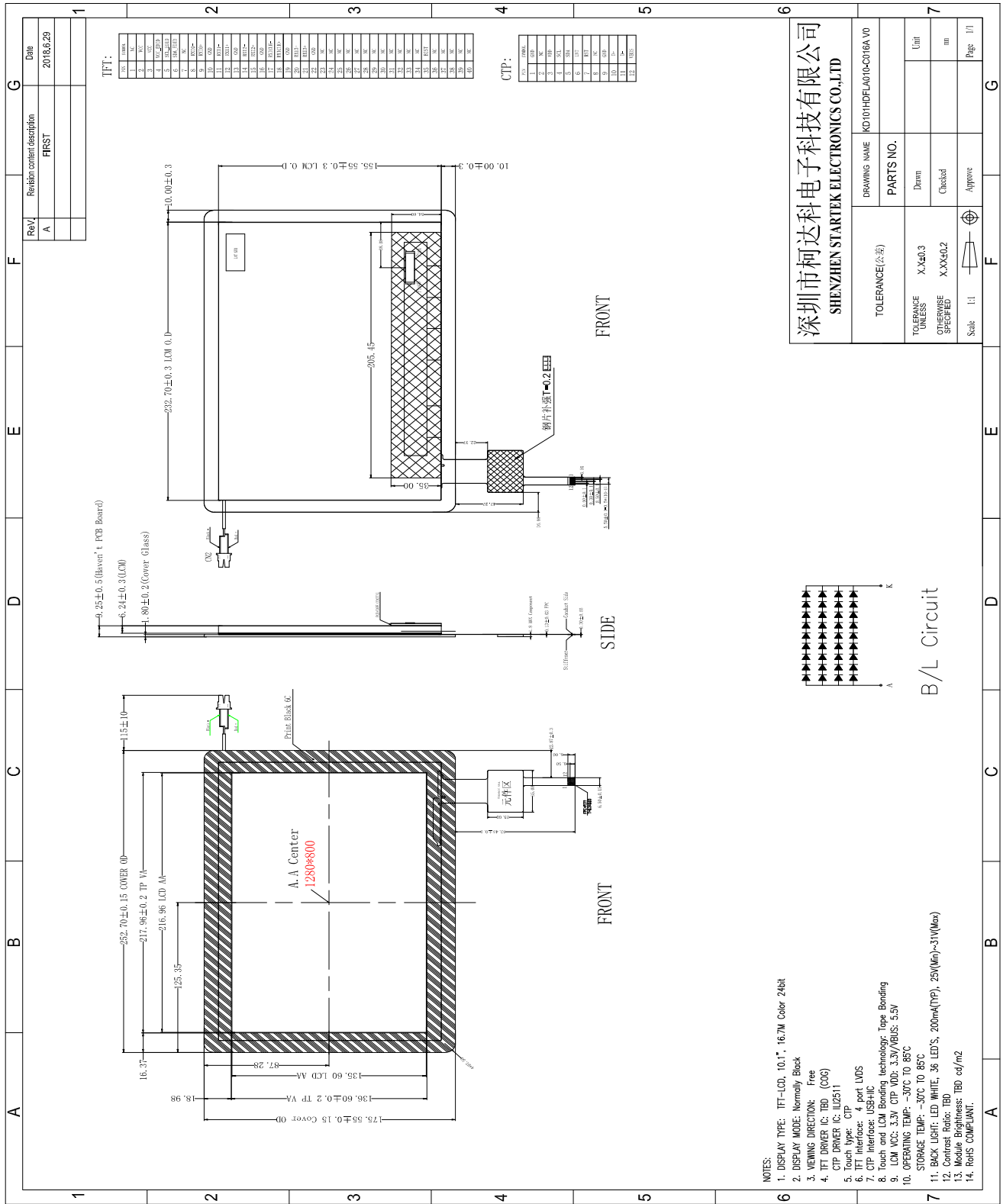
Item		Min.	Typ.	Max.	Unit	Note
Module size	Horizontal(H)	-	252.7	-	mm	
	Vertical(V)	-	175.55	-	mm	
	Depth(D)	-	9.25	-	mm	
Weight		-	538	-	g	

## 2. Block Diagram



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### 3. Outline dimension



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## 4. Input terminal Pin Assignment

### 4.1 TFT PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	Not Connect	
2	VCC	Power Supply for LCM	P
3	VCC	Power Supply for LCM	P
4	VCC_EDID	VCC_EDID	P
5	SCL_EDID	SCL_EDID	I/O
6	SDA_EDID	SDA_EDID	I/O
7	NC	Not Connect	
8	RXI0-	Negative LVDS differential data 0 input	I
9	RXI0+	Positive LVDS differential data 0 input	I
10	GND	Ground	P
11	RXI1-	Negative LVDS differential data 1 input	I
12	RXI1+	Positive LVDS differential data 1 input	I
13	GND	Ground	P
14	RXI2-	Negative LVDS differential data 2 input	I
15	RXI2+	Positive LVDS differential data 2 input	I
16	GND	Ground	P
17	RXICLK-	Negative LVDS differential CLK input	I
18	RXICLK+	Positive LVDS differential CLK input	I
19	GND	Ground	P
20	RXI3-	Negative LVDS differential data 3 input	I
21	RXI3+	Positive LVDS differential data 3 input	I
22	GND	Ground	P
23	NC	Not Connect	
24	NC	Not Connect	
25	NC	Not Connect	
26	NC	Not Connect	
27	NC	Not Connect	
28	NC	Not Connect	
29	NC	Not Connect	
30	NC	Not Connect	

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31	NC	Not Connect	
32	NC	Not Connect	
33	NC	Not Connect	
34	NC	Not Connect	
35	BIST	BIST Pin	I
36	NC	Not Connect	
37	NC	Not Connect	
38	NC	Not Connect	
39	NC	Not Connect	
40	NC	Not Connect	

#### 4.2 CTP PIN Define

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground	P
2	NC	No Connection	NC
3	VDD	3.3V input power supply	P
4	SCL	I2C interface, clock input	I/O
5	SDA	I2C interface, data input	I/O
6	INT	Interrupt output	I/O
7	RST	External hardware reset input	I/O
8	NC	No Connection	NC
9	GND	Ground	P
10	D+	USB interface	I/O
11	D-	USB interface	I/O
12	VBUS	5V input power supply	P

## 5. LCD Optical Characteristics

### 5.1 Optical specification

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note	
Contrast Ratio	CR	$\Theta=0$ Normal viewing angle	600	800	--		Center	
Response time	Rising		$T_{R+T_F}$	--	25	50	msec	(1)
	Falling			--				(2)
								(4)
Color gamut	S(%)		--	80	--	%		
Color Filter Chromaticity	White	$W_X$	0.290	0.330	0.370		(1)	
		$W_Y$	0.335	0.375	0.415			
	Red	$R_X$	0.520	0.560	0.600			
		$R_Y$	0.313	0.353	0.393			
	Green	$G_X$	0.287	0.327	0.367			(2)
		$G_Y$	0.544	0.584	0.624			
	Blue	$B_X$	0.120	0.160	0.200			
		$B_Y$	0.150	0.190	0.230			
Viewing angle	Hor.	$\Theta_L$	75	85	--		(1)	
		$\Theta_R$	75	85	--		(2)	
	Ver.	$\Theta_U$	75	85	--		(3)	
		$\Theta_D$	75	85	--			
Option View Direction	Free							

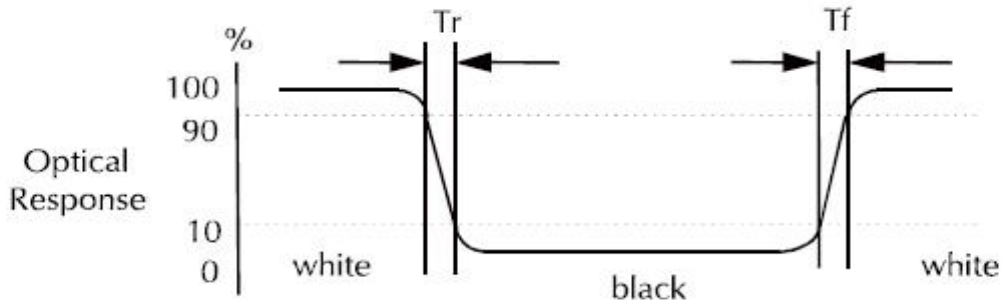
#### a. Test equipment setup

After stabilizing and leaving the panel alone shall be warmed up for the stable operation of LCM, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room. Optical specifications are measured by Topcon BM-7(fast) with a viewing angle of  $2^\circ$  at a distance of 50cm and normal direction.

#### b. Definition of response time: $T_r$ and $T_f$

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

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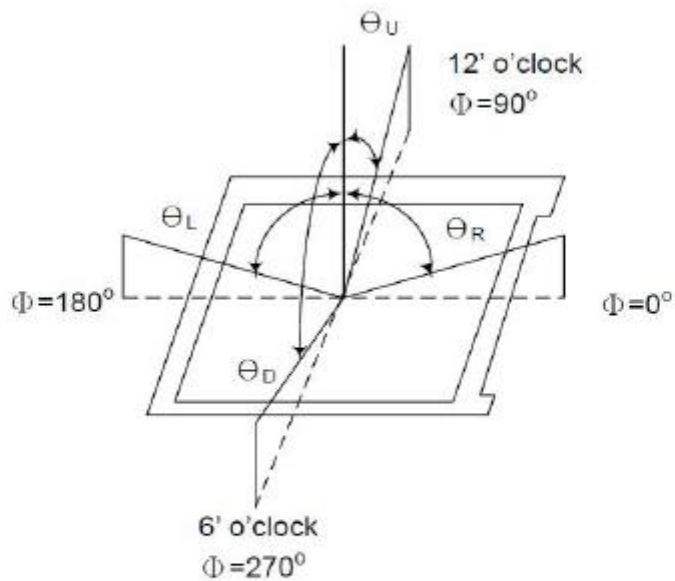


c. Definition of contrast ratio:

$$\text{Contrast Ratio (CR)} = \frac{\text{Brightness measured when LCD is at "white state"}}{\text{Brightness measured when LCD is at "black state"}}$$

d. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

e. View Angle



f. Definition of Luminance of White: Luminance of white at the center points

Light Source of Back-Light Unit	LED Type
---------------------------------	----------

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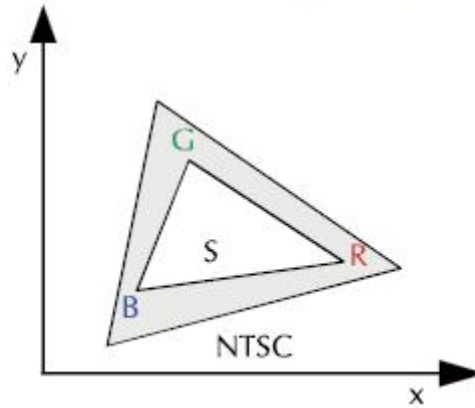
g. Definition of White Uniformity

$$\text{White Uniformity} = \frac{\text{Min. luminance of white among 9-points}}{\text{Max. luminance of white among 9-points}} \times 100\%$$

h. The definition of Color Gamut -Color Chromaticity CIE 1931

Color coordinate of white & red, green, blue at center point.

Color Gamut : NTSC(%) = ( RGB Triangle Area / NTSC Triangle Area ) x 100



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## 6. Electrical Characteristics

### 6.1 Absolute Maximum Rating

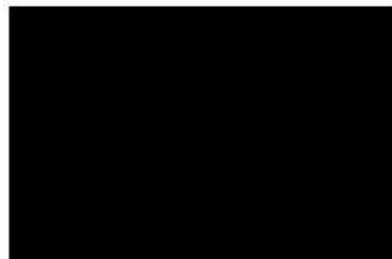
Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VCC	-0.3	4.0	V	Note1
Operating temperature	T <sub>OP</sub>	-30	+85	°C	
Storage temperature	T <sub>ST</sub>	-30	+85	°C	

NOTE1: If the absolute maximum rating of even is one of the above parameters is exceeded even momentarily, the quality of the product may be degraded. Absolute maximum ratings, therefore, specify the values exceeding which the product may be physically damaged. Be sure to use the product within the range of the absolute maximum ratings.

### 6.2 DC Electrical Characteristics

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Digital Supply Voltage	VCC	3.0	3.3	3.6	V	
Normal mode Current	ICC	--	270	300	mA	Note 1
Input Voltage for logic	V <sub>TH</sub>	-	-	+100	mA	
	V <sub>TL</sub>	-100	-	-	mA	

Note1: f<sub>v</sub> =60Hz , Ta=25°C , Display pattern : Black pattern



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### 6.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 36 chips LED

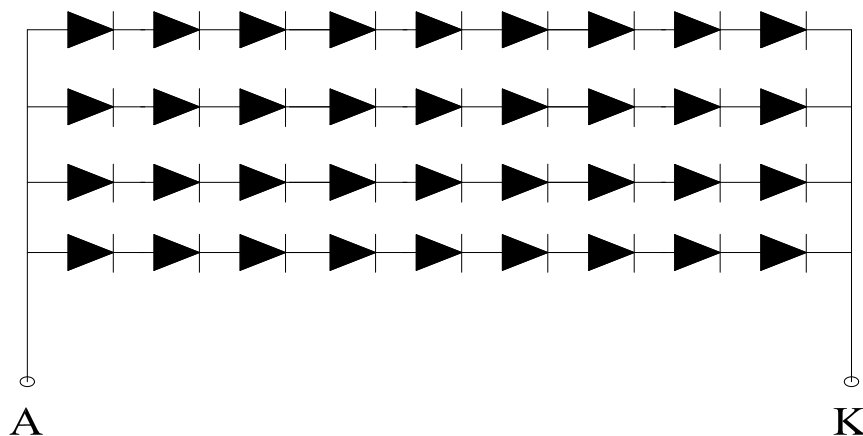
Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	$I_F$	--	200	--	mA	
Forward Voltage	$V_F$	25	25	31	V	
LCM Luminance	LV	900	1100	--	cd/m <sup>2</sup>	Note3
LED life time	Hr	50000	--	--	Hour	Note1,2
Uniformity	Avg	80	--	--	%	Note3

Note1: LED life time (Hr) can be defined as the time in which it continues to operate under the condition:

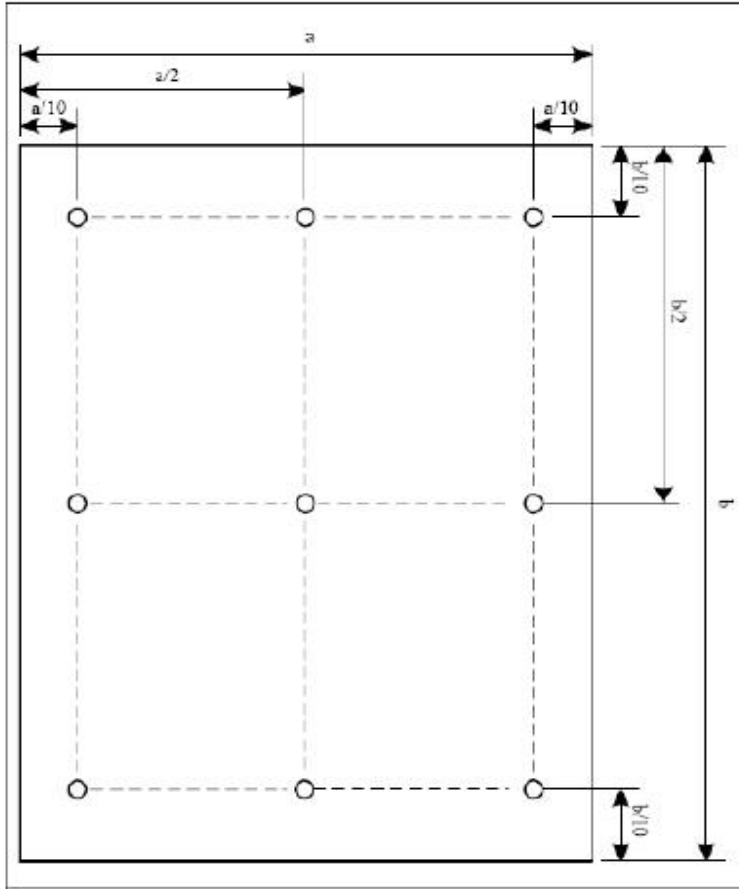
$T_a=25\pm 3\text{ }^\circ\text{C}$ , typical IL value indicated in the above table until the brightness becomes less than 50%.

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at

$T_a=25\text{ }^\circ\text{C}$  and  $I_L=200\text{mA}$ . The LED lifetime could be decreased if operating  $I_L$  is larger than 200mA. The constant current driving method is suggested.



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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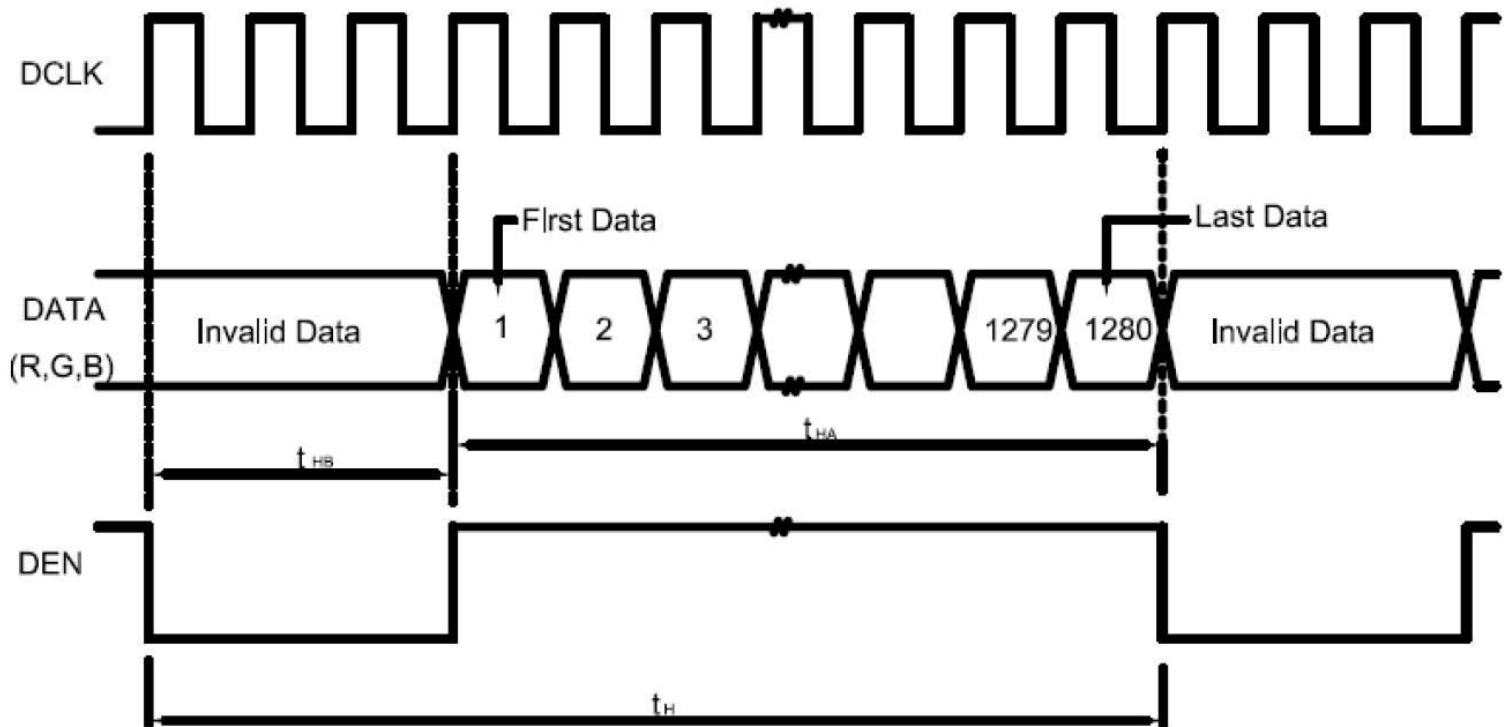
## 7. AC Characteristics

### 7.1 Timing Condition

Signal	Parameter	Symbol	Min.	Typ.	Max.	Unit.	Remark
DCLK	CLK Frequency	$t_{clk}$	68.9	71.1	73.4	MHz	
DE	Horizontal total Time	$t_H$	1410	1440	1470	$t_{CLK}$	
	Horizontal effective Time	$t_{HA}$	1280			$t_{CLK}$	
	Horizontal Blank Time	$t_{HB}$	90	160	190	$t_{CLK}$	
	Vertical total Time	$t_V$	815	823	1023	$t_H$	
	Vertical effective Time	$t_{VA}$	800			$t_H$	
	Vertical Blank Time	$t_{VB}$	15	23	33	$t_H$	

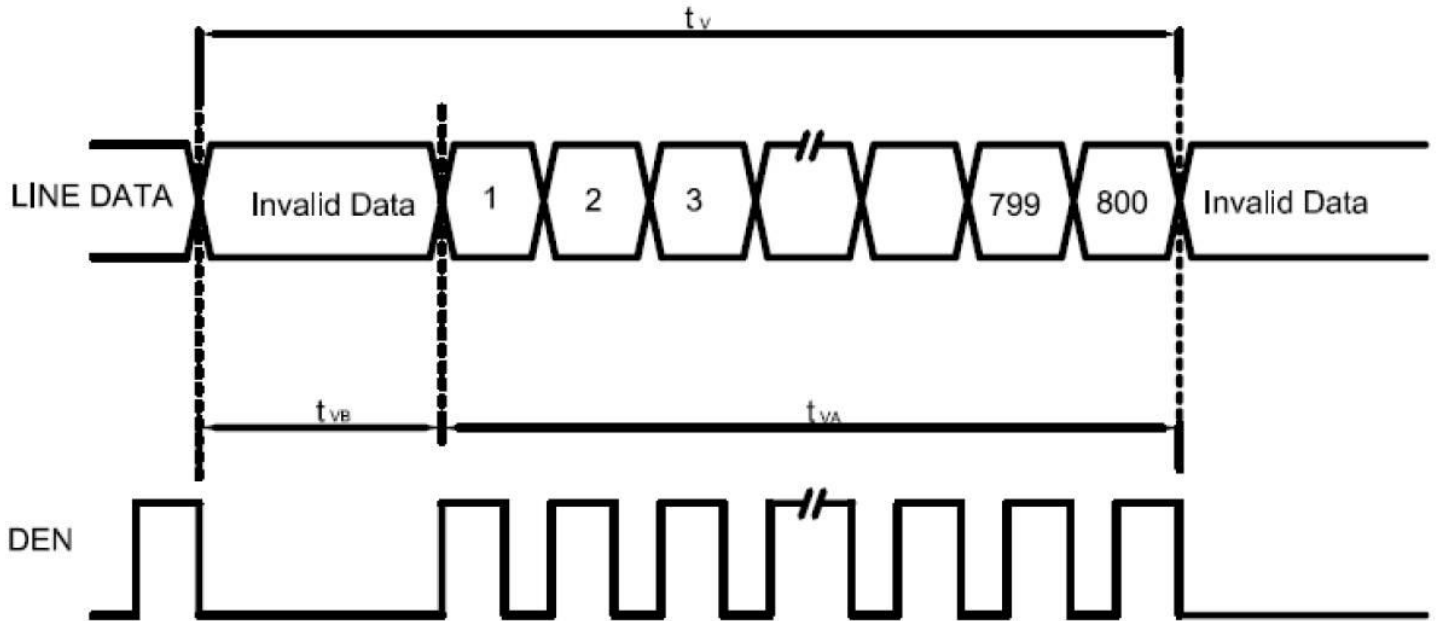
### 7.2 Timing Sequence(Timing Chart)

Horizontal Timing Sequence

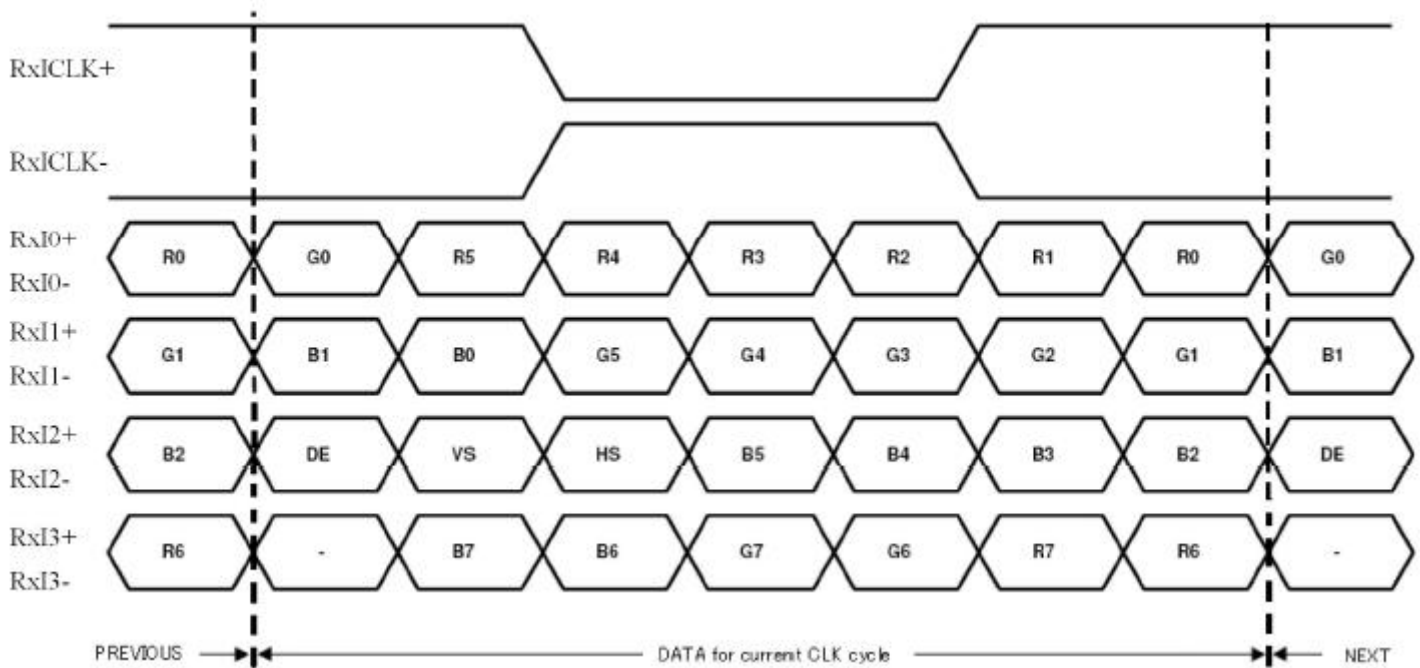


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Vertical Timing Sequence



LVDS Input Data Mapping(VESA)



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Display On/Off Sequence :

$$t1 \leq 10 \text{ ms}$$

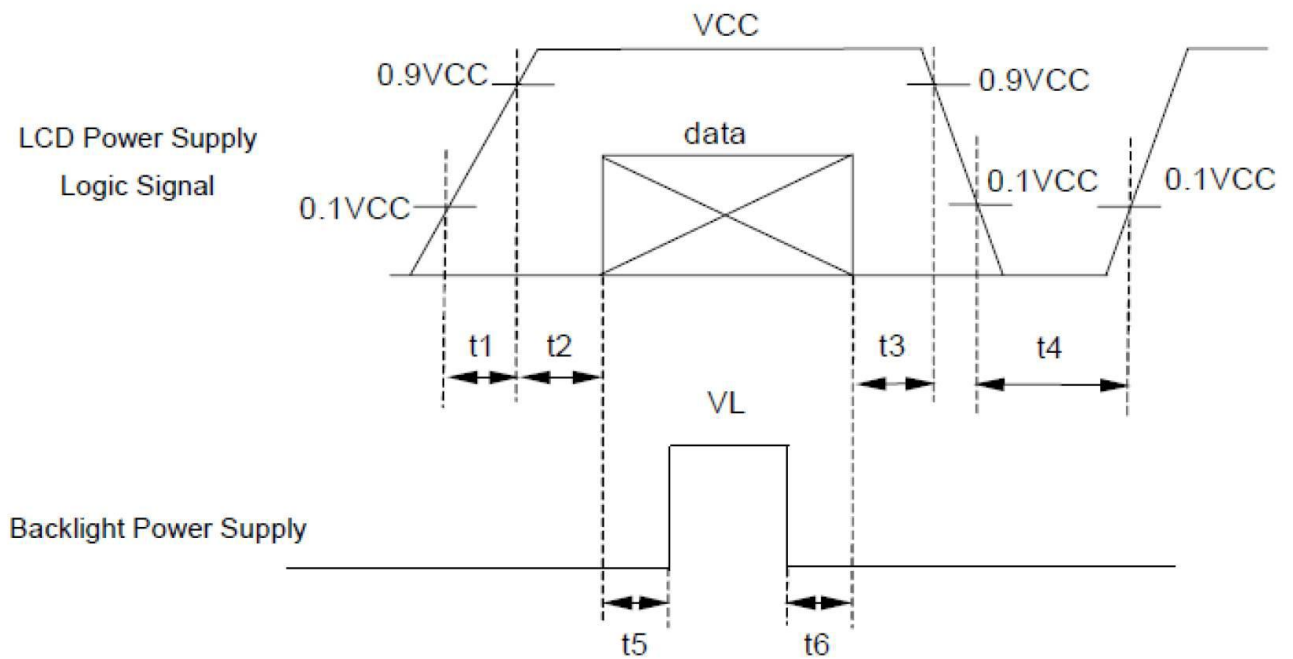
$$0 < t2 \leq 50 \text{ ms}$$

$$0 < t3 \leq 50 \text{ ms}$$

$$200 \text{ ms} \leq t4$$

$$200 \text{ ms} \leq t5$$

$$0 \leq t6$$



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### 7.3 Displayed Color and Input Data

	Color & Gray Scale	Data Signal																	
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Red	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(61)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(31)	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(1)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(0)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Green	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	Green(61)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(31)	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green(1)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(0)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Blue	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(31)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(1)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(0)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

0 : Low level voltage, 1 :High level voltage

Each basic color can be displayed in 64 gray scales from 6 bit data signals. With the combination of total 18 bit data signals, the 262,144-color display can be achieved on the screen.

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## 8. CTP Specification

### 8.1 Electrical Characteristics

#### 8.1.1 Absolute Maximum Rating

Parameter	Symbol	Min	Max	Unit
USB 5V input power supply voltage	$V_{DD5V}$	-0.3	6.0	V
$V_{DD3A}$ to GND	$V_{DD3A}$	-0.3	3.6	V
$V_{DD3D}$ to GND	$V_{DD3D}$	-0.3	3.6	V
$V_{DDIO}$ to GND	$V_{DDIO}$	-0.3	3.6	V
$V_{DD16}$ to GND	$V_{DD16}$	-0.3	1.65	V
$V_{GH}$ to GND	$V_{GH}$	-0.3	32	V
$V_{TX}$ to GND	$V_{TX}$	-0.3	32	V
ESD Susceptibility HBM (Human Body Mode)( <b>Note 1</b> )	HBM		4000	V
ESD Susceptibility MM (Machine Mode)	MM		400	V

**Note 1:** Devices are ESD sensitive. Handling precaution is recommended.

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### 8.1.2 Recommended Operating Conditions (Note 3)

Parameter	Symbol	Min	Max	Unit
USB 5V input power supply voltage	$V_{DD5V}$	4.4	5.5	V
$V_{DD3A}$ to GND	$V_{DD3A}$	3.0	3.6	V
$V_{DD3D}$ to GND	$V_{DD3D}$	3.0	3.6	V
$V_{DDIO}$ to GND	$V_{DDIO}$	1.8	3.6	V
$V_{GH}$ to GND	$V_{GH}$	-0.3	32	V
$V_{TX}$ to GND	$V_{TX}$	-0.3	32	V
Operating Ambient Temperature Range	$T_A$	-30	85	°C
Operating Junction Temperature Range	$T_J$	-30	85	°C
Storage Ambient Temperature Range	$T_{ST}$	-30	85	°C

**Note:** The device is not guaranteed to function outside its operating conditions.

### 8.1.3 DC Characteristics

#### Input Power Supply

( $V_{DD3A} = V_{DD3D} = 3.3V$ ,  $T_{opr} = 25^{\circ}C$ )

Item	Symbol	Min	Typ.	Max	Unit	Condition
USB 5V input power supply voltage	$V_{DD5V}$	4.4	5	5.5	V	@ USB
Digital input power supply voltage*	$V_{DD3D}$	3.0	3.3	3.6	V	
Analog input power supply voltage	$V_{DD3A}$	3.0	3.3	3.6	V	
I/O input power supply voltage*	$V_{DDIO}$	1.8		3.6	V	

\*If  $V_{DDIO}$  &  $V_{DD3D}$  is not supplied power, there is risk of I/O pin with current leakage

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**DC Characteristics**

 (VDD3A = VDD3D = 3.3V, T<sub>opr</sub> = 25°C)

Item	Symbol	Min	Typ.	Max	Unit	Condition
Operation current	I <sub>op</sub>		100		mA	Active Mode / 21.5"
Input Low Voltage	V <sub>IL1</sub>	0		0.3V <sub>DDIO</sub>	V	
Input High Voltage	V <sub>IH1</sub>	0.6V <sub>DDIO</sub>		V <sub>DDIO</sub> +0.5	V	
Hysteresis voltage	V <sub>HY</sub>		0.2V <sub>DDIO</sub>		V	
Input Low Voltage, XT_In	V <sub>IL2</sub>	0		0.6	V	V <sub>DDIO</sub> =3.3V
Input High Voltage, XT_In	V <sub>IH2</sub>	2.6		V <sub>DDIO</sub> +0.2	V	V <sub>DDIO</sub> =3.3V
Negative going threshold, /Reset	V <sub>ILS</sub>	0		0.2V <sub>DDIO</sub>	V	
Positive going threshold, /Reset	V <sub>IHS</sub>	0.6V <sub>DDIO</sub>		V <sub>DDIO</sub> +0.5	V	
Output High Voltage	V <sub>OH</sub>	0.7V <sub>DDIO</sub>			V	V <sub>DDIO</sub> =3.3V, I <sub>OH</sub> =8mA
Output Low Voltage	V <sub>OL</sub>			0.3V <sub>DDIO</sub>	V	V <sub>DDIO</sub> =3.3V, I <sub>OL</sub> =10mA

**USB DC Characteristics**

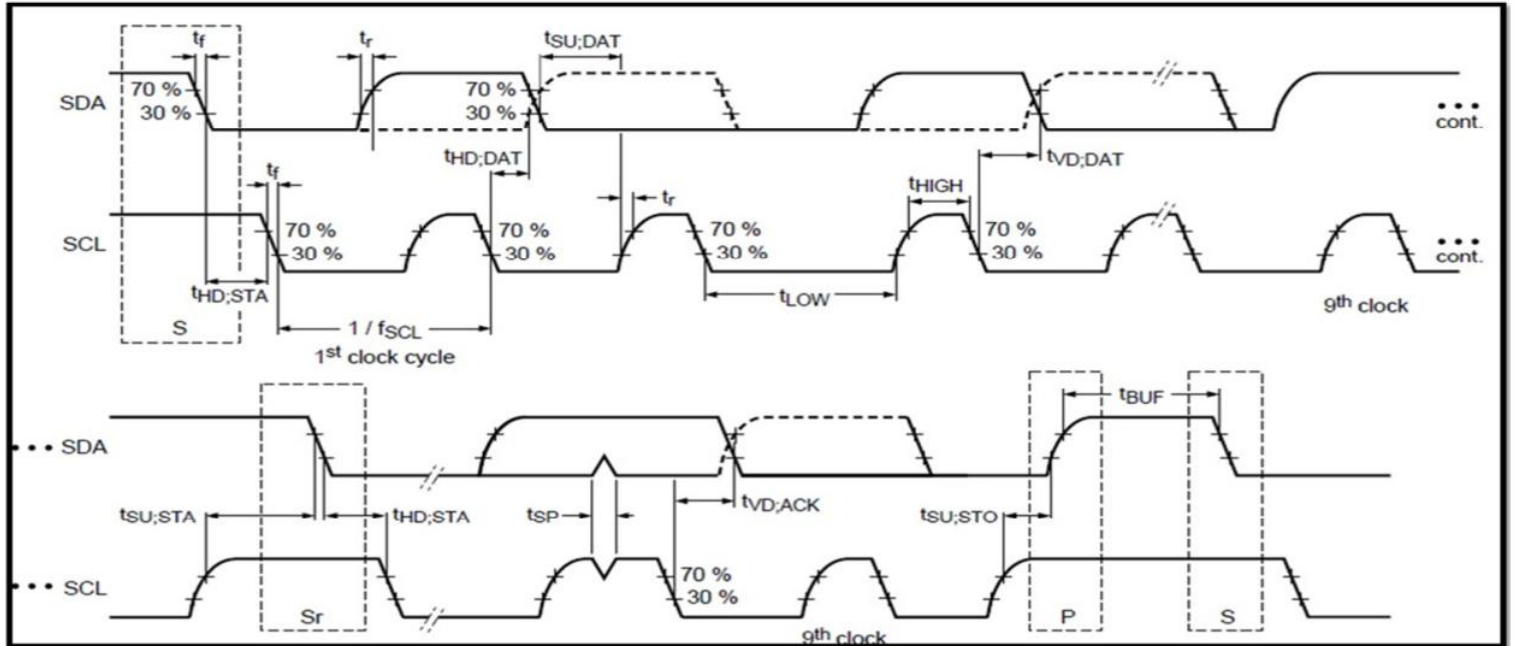
Item	Symbol	Min	Typ.	Max	Unit	Condition
Input Low	$V_{IL}$			0.8	V	
Input High (driven)	$V_{IH}$	2.0			V	
Differential input sensitivity	$V_{DI}$	0.2			V	(D+) – (D-)
Differential common-mode range	$V_{CM}$	0.8		2.5	V	Includes $V_{DI}$ range
Single-ended receiver threshold	$V_{SE}$	0.8		2.0	V	
Receiver hysteresis	$V_{RH}$		200		mV	
Output low (driven)	$V_{OL}$	0		0.3	V	
Output high (driven)	$V_{OH}$	2.8		3.6	V	
Output signal cross voltage	$V_{CRS}$	1.3		2.0	V	
Pull-up resistor	$R_{PU}$	1.425		1.575	k $\Omega$	
Pull-down resistor	$R_{PD}$	14.25		15.75	k $\Omega$	
Termination Voltage for upstream port pull up (RPU)	$V_{TRM}$	3.0		3.6	V	

**Crystal Characteristics**

Item	Symbol	Min	Typ.	Max	Unit	Condition
Input clock frequency	$f_{XIN}$		12		MHz	External crystal



### 8.1.4 I2C AC Characteristics



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**Table I2C AC Characteristics**

Parameter	Symbol	Standard-mode		Fast-mode		Unit
		Min	Max	Min	Max	
SCL clock frequency	$f_{SCL}$	0	100	0	400	kHz
Hold time START condition	$t_{HD;STA}$	4.0	-	0.6	-	us
LOW period of the SCL clock	$t_{Low}$	4.7	-	1.3	-	us
HIGH period of the SCL clock	$t_{High}$	4.0	-	0.6	-	us
Set-up time for a repeated START condition	$t_{SU;STA}$	4.7	-	0.6	-	us
Data hold time	$t_{HD;DAT}$	300	-	300	-	ns
Data set-up time	$t_{SU;DAT}$	250	-	100	-	ns
Rise time of both SDA and SCL signals (30% to 70%)	$t_r$	-	1000	20	300	ns
Fall time of both SDA and SCL signals (70% to 30%)	$t_f$	-	300	20	300	ns
Set-up time for STOP condition	$t_{SU;STO}$	4.0	-	0.6	-	us
Bus free time between a STOP and START condition	$t_{BUF}$	4.7	-	1.3	-	us
Capacitive load for each bus line	$C_b$	-	400	-	400	pF
Noise margin at the LOW level for each connected device	$V_{nL}$	$0.1V_{DD}$	-	$0.1V_{DD}$	-	V
Noise margin at the HIGH level for each connected device	$V_{nH}$	$0.2V_{DD}$	-	$0.2V_{DD}$	-	V

### 8.1.5 USB Timing

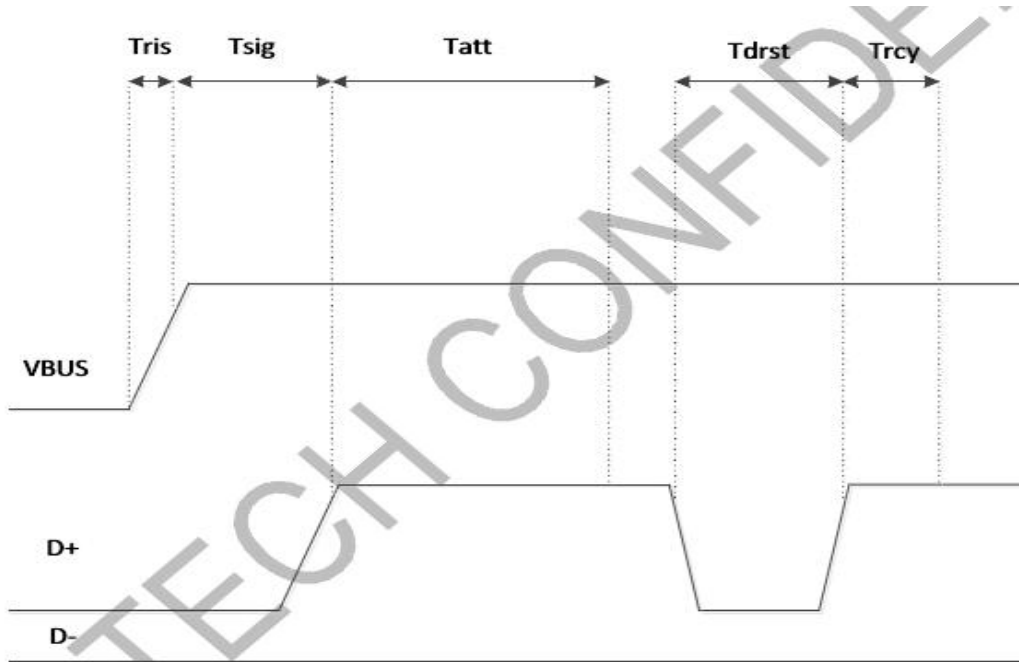


Figure 3-11 Power on / down Sequence

Table 3-7 USB Power on/Reset Sequence Parameters

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tsig	Time required for the device internal power rail to stabilize and for D+ or D- to reach VIH (min)	100	--	ms
Tatt	Time ensures that the electrical and mechanical connection is stable before software attempts to reset the attached device	100	--	ms
Tdrst	Time hubs drive reset to a device	10	--	ms
Trcy	The USB System Software guarantees a minimum of 10 ms for reset recovery	10	--	ms

USB is configured in device mode, and a Full speed USB function is supported. The USB function controller is as follows.

USB 2.01-compliant composite device , full speed (12Mbps) ;

Require external crystal (12MHz) ;

Support USB LPM L1;

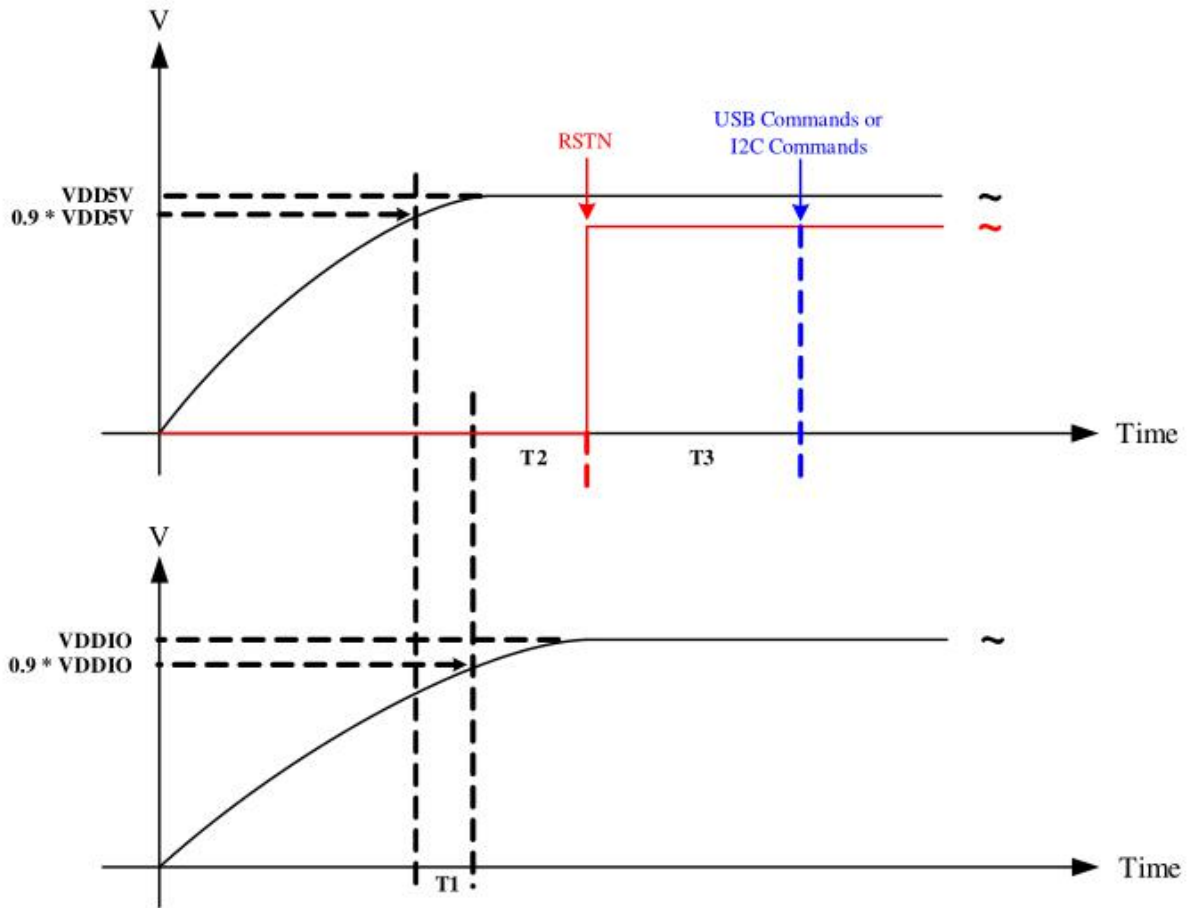
integrated transceiver;

Support USB-HID protocol for Win8.

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## 8.2 Power Sequence

### 8.2.1 Power-on Sequence



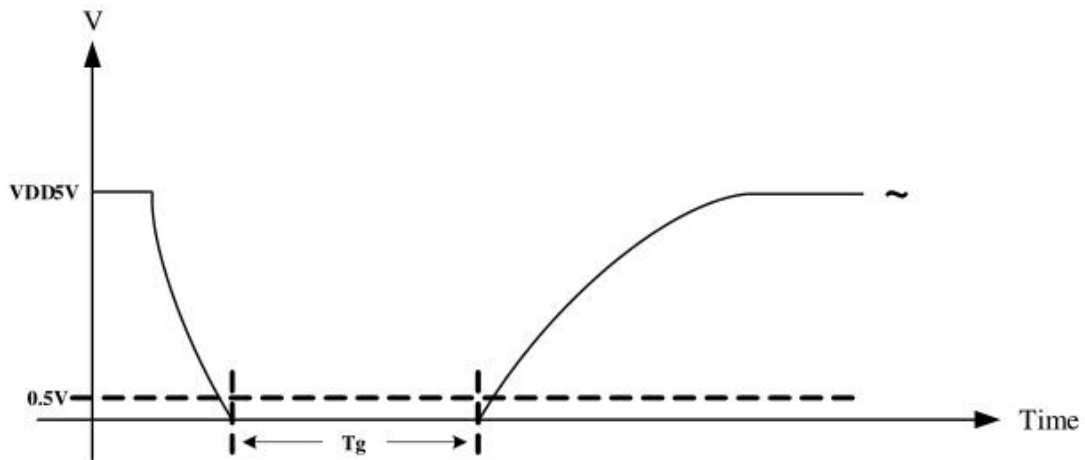
1. T1: the time difference between  $0.9 \cdot VDD5V$  and  $0.9 \cdot VDDIO$ . T1 must be  $\geq 0$  sec.
2. T2: the time difference between  $0.9 \cdot VDDIO$  and RSTN. T2 must be  $\geq 200$  us.
3. T3: the time difference between RSTN and Commands.

T3 in case of USB must be  $\geq 20$  ms.

T3 in case of I2C must be  $\geq 300$  ms.

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### 8.2.2 Power-off to Power-on Sequence



Tg : the time difference between power-off and power-on. Tg must be > 10us.

**Note.** During the power off time, the VDD5V must be lower than 0.5V that make sure the touch controller have been correctly reset.

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## 9. LCD Module Out-Going Quality Level

### 9.1 VISUAL & FUNCTION INSPECTION STANDARD

#### 9.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

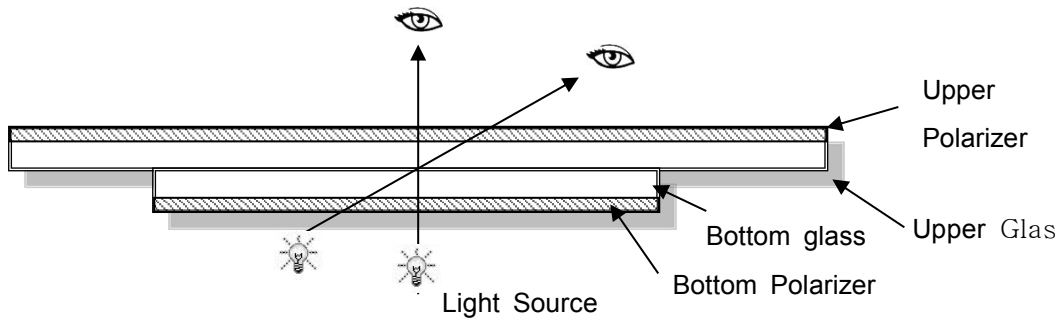
Temperature :  $25\pm 5^{\circ}\text{C}$

Humidity :  $65\%\pm 10\%\text{RH}$

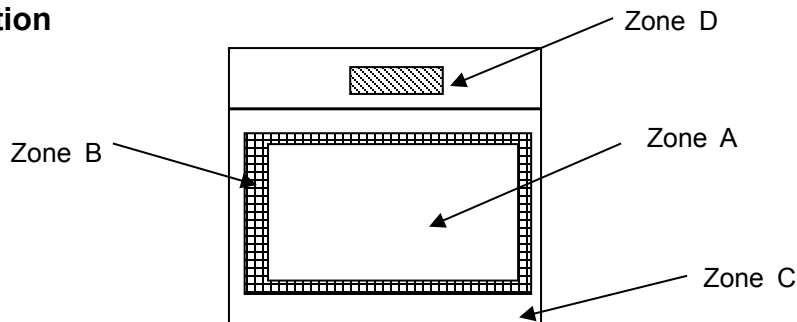
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



#### 9.1.2 Definition



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

Zone B : Viewing Area except Zone A

Zone C Cover (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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### 9.1.3 Sampling Plan

According to GB/T 2828-2003 ; , normal inspection, Class II

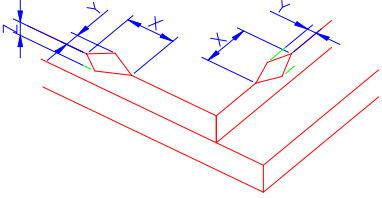
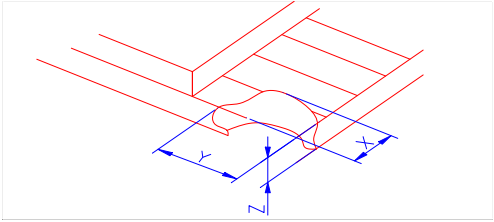
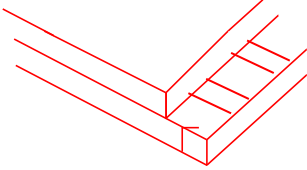
AQL:

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.	

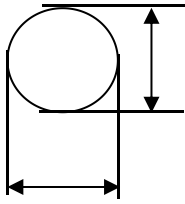
### 9.1.4 Criteria (Visual)

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 1453 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="815 1122 1394 1223"> <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



X

$$\Phi = (X+Y)/2$$

① light dot (LCD/TP/Polarizer black/white spot , light dot, pinhole, dent, stain)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.10$	Ignore		
$0.10 < \Phi \leq 0.25$	4( distance $\geq 10\text{mm}$ )		
$0.25 < \Phi \leq 0.35$	3		
$\Phi > 0.4$	0		

② Dim spot (LCD/TP/Polarizer dim dot, light leakage, dark spot)

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.1$	Ignore		
$0.10 < \Phi \leq 0.25$	4( distance $\geq 10\text{mm}$ )		
$0.25 < \Phi \leq 0.35$	3		
$\Phi > 0.4$	0		

③ Polarizer accidented spot

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.3 < \Phi \leq 0.5$	3( distance $\geq 10\text{mm}$ )		
$\Phi > 0.5$	1		

④ Pixel bad points (light dot, Dim dot, color dot)

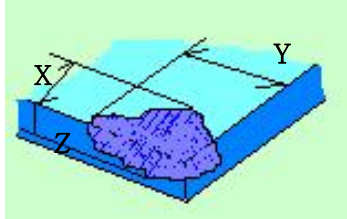
Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.15$	Ignore		
$0.2 < \Phi \leq 0.3$	2( distance $\geq 10\text{mm}$ )		
$\Phi > 0.4$	1		

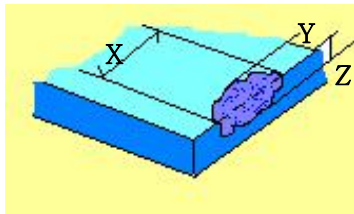
⑤ Polarizer Bubble

Zone Size (mm)	Acceptable Qty		
	A	B	C
$\Phi \leq 0.2$	Ignore		
$0.3 < \Phi \leq 0.4$	4(distance $\geq 10$ )		
$0.4 < \Phi \leq 0.5$	3		

3.0	Line defect (LCD/TP /Polarizer backlight black/white line, scratch, stain)	Width(mm)	Length(m)	Acceptable Qty		
		$\Phi \leq 0.05$	Ignore	A	B	C
		$0.05 < W \leq 0.06$	$L \leq 4.0$	Ignore		
		$0.07 < W \leq 0.08$	$L \leq 3.0$	N $\leq$ 3		
		$0.08 < W$	N $\leq$ 2			
		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	1. Color: Measuring the color coordinates, The measurement standard according to the datasheet or samples. 2. Brightness: Measuring the brightness of White screen, The measurement standard according to the datasheet or Samples.				
6.0	LCD Mura	By 5% ND filter invisible.				

7.0	CTP Related	CTP Cover sensor identified black/white spot	Size $\Phi$ (mm)	Acceptable Qty		
			$\Phi \leq 0.1$	A	B	C
			$0.15 < \Phi \leq 0.25$	Ignore		
			$0.25 < \Phi \leq 0.35$	4 (distance $\geq$ 10mm)		
			$\Phi > 0.4$	3		
			1			
			Ignore			

		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="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="3"><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="3"><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)	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																								
				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																														
CTP Cover Pinhole/ Lack of ink	<table border="1"> <tr> <th rowspan="2">Zone Size (mm)</th> <th>Acceptable Qty</th> </tr> <tr> <th>C</th> </tr> <tr> <td><math>\Phi \leq 0.2</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.2 &lt; \Phi \leq 0.3</math></td> <td>4(distance <math>\geq 10</math>mm)</td> </tr> <tr> <td><math>0.3 &lt; \Phi \leq 0.4</math></td> <td>3</td> </tr> <tr> <td><math>\Phi &gt; 0.4</math></td> <td>0</td> </tr> </table>	Zone Size (mm)	Acceptable Qty	C	$\Phi \leq 0.2$	Ignore	$0.2 < \Phi \leq 0.3$	4(distance $\geq 10$ mm)	$0.3 < \Phi \leq 0.4$	3	$\Phi > 0.4$	0																			
Zone Size (mm)	Acceptable Qty																														
	C																														
$\Phi \leq 0.2$	Ignore																														
$0.2 < \Phi \leq 0.3$	4(distance $\geq 10$ mm)																														
$0.3 < \Phi \leq 0.4$	3																														
$\Phi > 0.4$	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> <td>X</td> <td>Y</td> <td>Z</td> </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> <p>* Circuitry broken is not allowed.</p>	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	$Z < \text{cover thickness}$																													
																															

		TP cover broken X : length Y : width Z : height	X	Y	Z	
			$X \leq 0.3\text{mm}$	$Y \leq 0.3\text{mm}$	Z < LCD thickness	
* Circuitry broken is not allowed.						

Criteria ( functional items)

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

## 10. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85°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	-30°C, 96HR	
High Temperature Storage	85°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 ↔ 85°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:

- The test samples should be applied to only one test item.
- Sample size for each test item is 5~10pcs.
- For Damp Proof Test, Pure water(Resistance > 10MΩ) should be used.
- 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.
- Failure Judgment Criterion: Basic Specification, Electrical Characteristic, Mechanical Characteristic, Optical Characteristic.

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## 11. Cautions and Handling Precautions

### 11.1 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

### 11.2 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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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	

## 12. Packing

-----TBD-----

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	常备库存 Stock For Sale	长期供货 Long Time supply	支持少量 NO MOQ	品种齐全 In Full Range