Shenzhen Leadtek Electronics Co.,Ltd

PRODUCT SPECIFICATION

TFT-LCD MODULE

Module No： LTK088FHHCT01-V0

☑ Preliminary Specification

☐ Approval Specification

Designed by	Checked by	Approved by
jona	tom	lan

Final Approval by Customer

Approved by	Comment
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※The specification of “TBD” should refer to the measured value of sample . If there is difference between the design specification and measured value, we naturally shall negotiate and agree to solution with customer.

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Revision History

Date	Rev. No.	Page	Summary
2023.02.07	V0	ALL	FIRST ISSUE

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Contents

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1.Basic Specifications

* Description

This is a color active matrix TFT (Thin Film Transistor) LCD (liquid crystal display) that uses amorpho us silicon TFT as a switching device. This module is composed of a Transmissive type TFT-LCD Pan el, driver circuit, capacitance touch panel, back-light unit. The resolution of a 8.88'' TFT-LCD contains 480x1920 pixels, and can display up to 16.7M colors.

1.1 TFT Features

General Information Items	Specification	Unit	Note
	Main Panel		
Display area(AA)	54.72(H)*218.88(V)	mm	-
Driver element	TFT active matrix	-	-
Display colors	16.7M	colors	-
Number of pixels	480(RGB)*1920	dots	-
TFT Pixel arrangement	RGB vertical stripe	-	-
Pixel pitch	0.114(H)*0.114(V)	mm	-
Viewing angle	FREE	o'clock	-
TFT Controller IC	OTA7290	-	-
LCM Interface	4-lane MIPI	-	
Display mode	Transmissive/Normally Black	-	-
Operating temperature	-30～+85	℃	-
Storage temperature	-40～+90	℃	-
Module bonding technology	Use optical bonding between LCM and CTP	-	-

1.2 CTP Features

General Information Items	Specification	Unit	Note
	Main Panel		
Resolution	480(H)*1920(V)	-	
Structure	G+G	-	
Controller IC	FT7511	-	
Interface	I2C	-	
Slave Adress	0x38(7bit)/8bit:0x70(Write) 0x71(Read)	-	Note1
Touch mode	MULTI TOUCH	-	-
Logic level	3.3	V	

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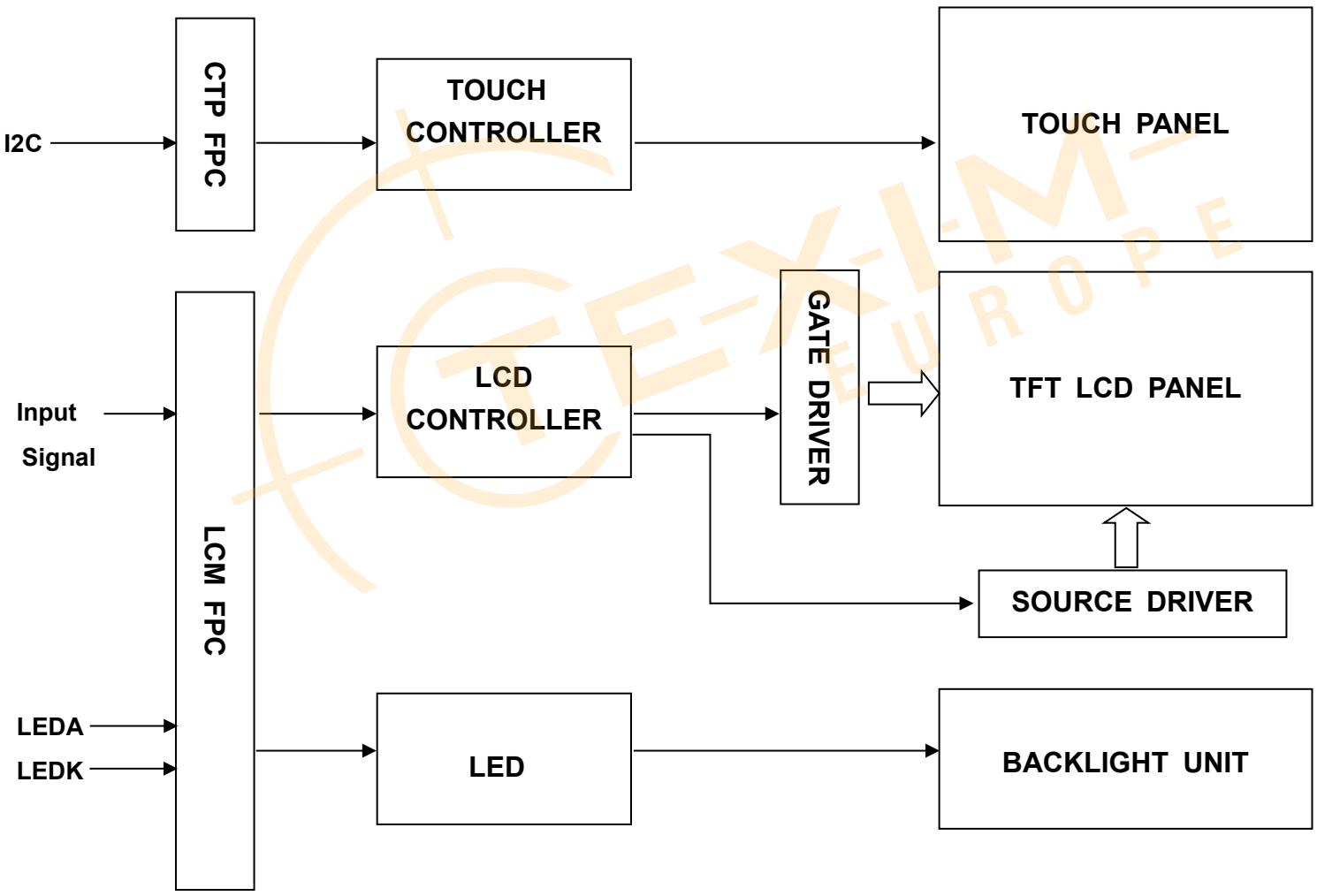
1.3 Mechanical Information

Item		Min.	Typ.	Max.	Unit	Note
FOG size	Horizontal(H)		76		mm	-
	Vertical(V)		243.1		mm	-
	Depth(D)		6.75		mm	-
Weight			175		g	-

2. Block Diagram



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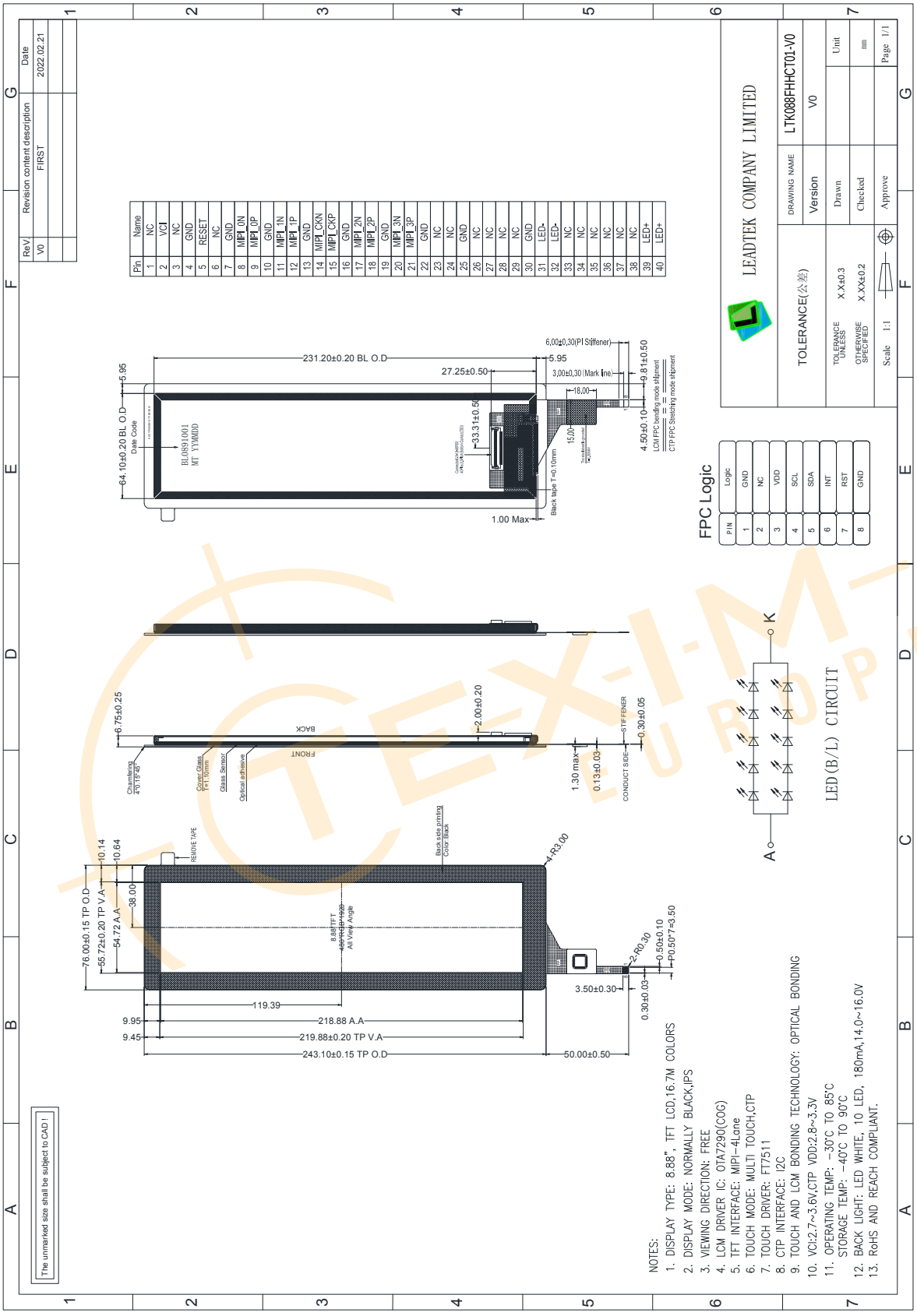
3. Outline dimension



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4. Input terminal Pin Assignment

4.1 TFT PIN Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	NC	No connected	--
2	VCI	Power supply for analog circuits.	P
3	NC	No connected	--
4	GND	Ground	P
5	RESET	Device reset signal.	I
6	NC	No connected	--
7	GND	Ground	P
8	MIPI_0N	MIPI Negative data signal (-)	I
9	MIPI_0P	MIPI Positive data signal (+)	I
10	GND	Ground	P
11	MIPI_1N	MIPI Negative data signal (-)	I
12	MIPI_1P	MIPI Positive data signal (+)	I
13	GND	Ground	P
14	MIPI_CKN	MIPI Negative clock signal (-)	I
15	MIPI_CKP	MIPI Positive clock signal (+)	I
16	GND	Ground	P
17	MIPI_2N	MIPI Negative data signal (-)	I
18	MIPI_2P	MIPI Positive data signal (+)	I
19	GND	Ground	P
20	MIPI_3N	MIPI Negative data signal (-)	I
21	MIPI_3P	MIPI Positive data signal (+)	I
22	GND	Ground	P
23	NC	No connected	--
24	NC	No connected	--
25	GND	Ground	P
26	NC	No connected	--
27	NC	No connected	--
28	NC	No connected	--
29	NC	No connected	--
30	GND	Ground	P
31	LED-	LED Cathode	P
32	LED-	LED Cathode	P
33	NC	No connected	--

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34	NC	No connected	--
35	NC	No connected	--
36	NC	No connected	--
37	NC	No connected	--
38	NC	No connected	--
39	LED+	LED anode	P
40	LED+	LED anode	P

4.2 CTP PIN Assignment

NO.	SYMBOL	DISCRIPTION	I/O
1	GND	Ground	P
2	NC	No Connection	--
3	VDD	Supply voltage	P
4	SCL	I2C clock input	I
5	SDA	I2C data input and output	I
6	INT	External interrupt to the host	I
7	RST	External Reset, Low is active	I
8	GND	Ground	P

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5. LCD Optical Characteristics

5.1 Optical specification

Item		Symbol	Condition	Min.	Typ.	Max.	Unit.	Note
Contrast Ratio		CR	Θ=0 Normal viewing angle	640	800	--		(1)(2)
Response time	Rising	$T_{R+}T_F$		--	40	--	msec	
	Falling							(1)(3)
Color Gamut		S(%)		43	48	--	%	
Color Filter Chromacicity	White	W_X		0.249	0.289	0.329		(1)(4) CF glass
		W_Y		0.275	0.315	0.355		
	Red	R_X		0.553	0.593	0.633		
		R_Y		0.311	0.351	0.391		
	Green	G_X		0.263	0.303	0.343		
		G_Y		0.495	0.535	0.575		
	Blue	B_X		0.108	0.148	0.188		
		B_Y		0.069	0.109	0.149		
Viewing angle	Hor.	ΘL	CR>10	--	80	--		(1)(4)
		ΘR		--	80	--		
	Ver.	ΘU		--	80	--		
		ΘD		--	80	--		
Option View Direction		Free						

*The data comes from the LCD specification.

Measuring Condition

Measuring surrounding : dark room

Ambient temperature : 25±2°C

15min. warm-up time.

Measuring Equipment

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

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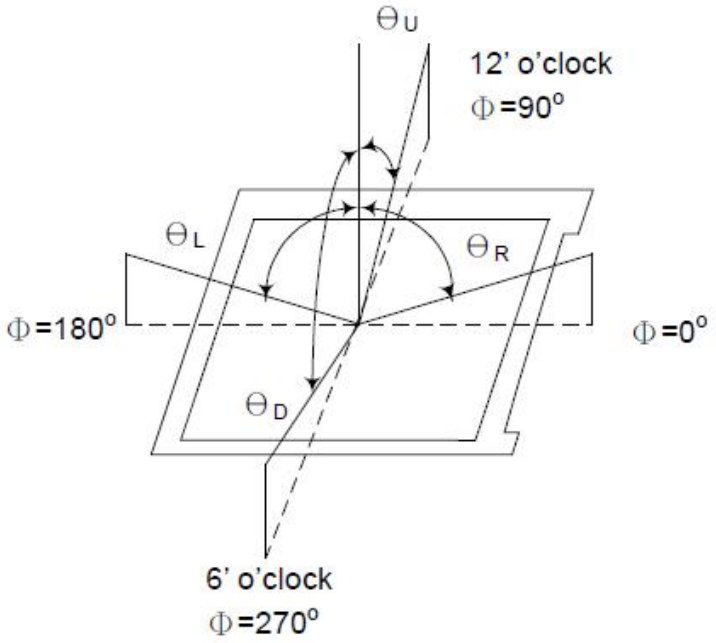
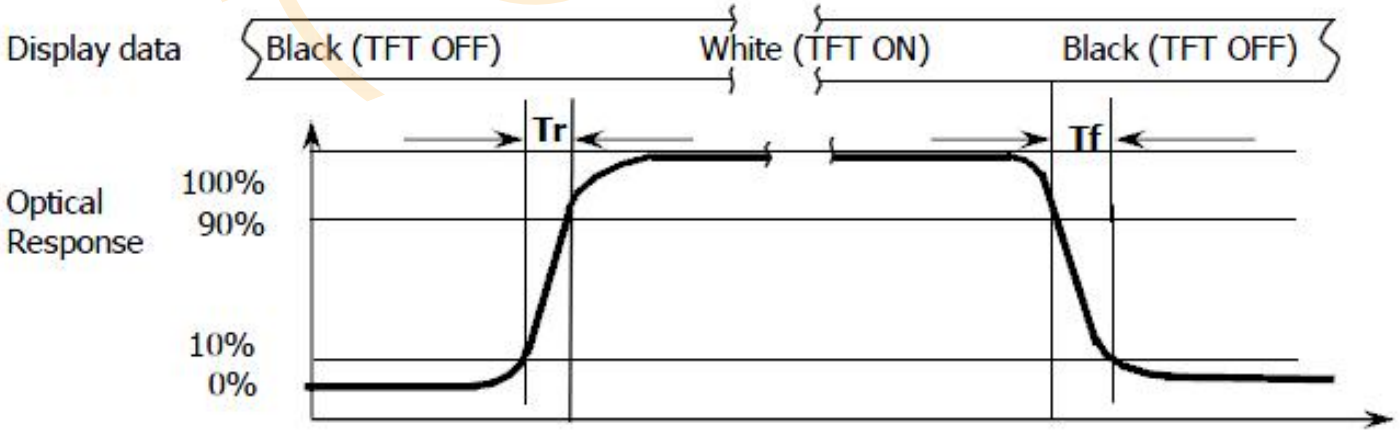
Note (1): Definition of Viewing Angle :



Note (2): Definition of Contrast Ratio(CR) :measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

Note (3): Response Time



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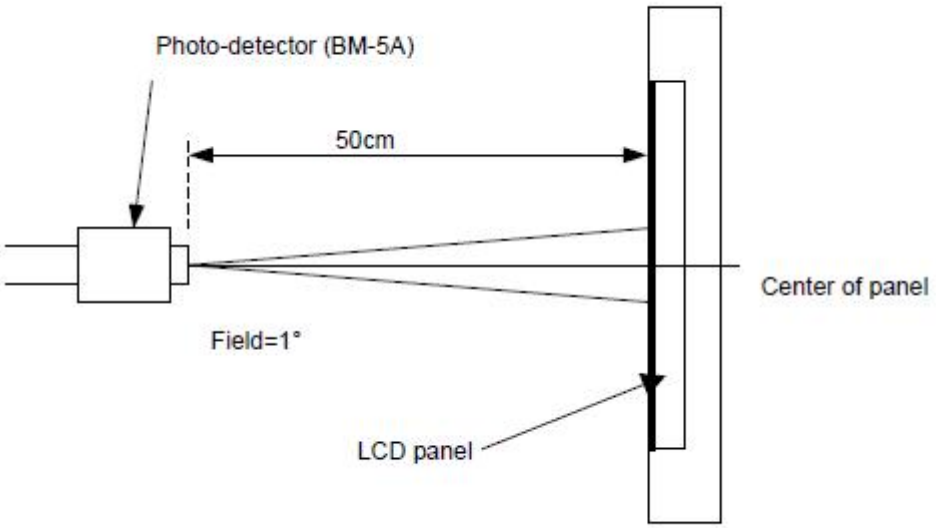
Note (4): Definition of optical measurement setup



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6. TFT Electrical Characteristics

6.1 Absolute Maximum Rating (Ta=25 VSS=0V)

Characteristics	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VCI	-0.5	4.0	V	Note1
Operating temperature	T_{OP}	-30	+85	℃	
Storage temperature	T_{ST}	-40	+90	℃	

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	VCI	2.7	3.3	3.6	V	--
Normal mode Current consumption	IDD	--	190	380	mA	--
Level input voltage	V_{IH}	0.7 VCI	--	VCI	V	--
	V_{IL}	GND	--	0.3 VCI	V	--
Level output voltage	V_{OH}	0.8* VCI	--	VCI	V	--
	V_{OL}	GND	--	0.2VCI	V	--

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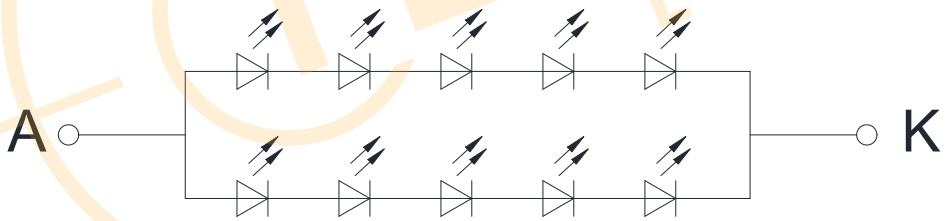
6.3 LED Backlight Characteristics

The back-light system is edge-lighting type with 10 chips White LED

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Forward Current	I_F	--	180	--	mA	
Forward Voltage	V_F	14	15	16	V	--
LCM Luminance IF=180mA	L_V	800	950	--	cd/m2	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: Ta=25±3 ℃, 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 Ta=25℃ and IL=180mA. The LED lifetime could be decreased if operating IL is larger than 180mA. The constant current driving method is suggested.



LED(B/L) CIRCUIT

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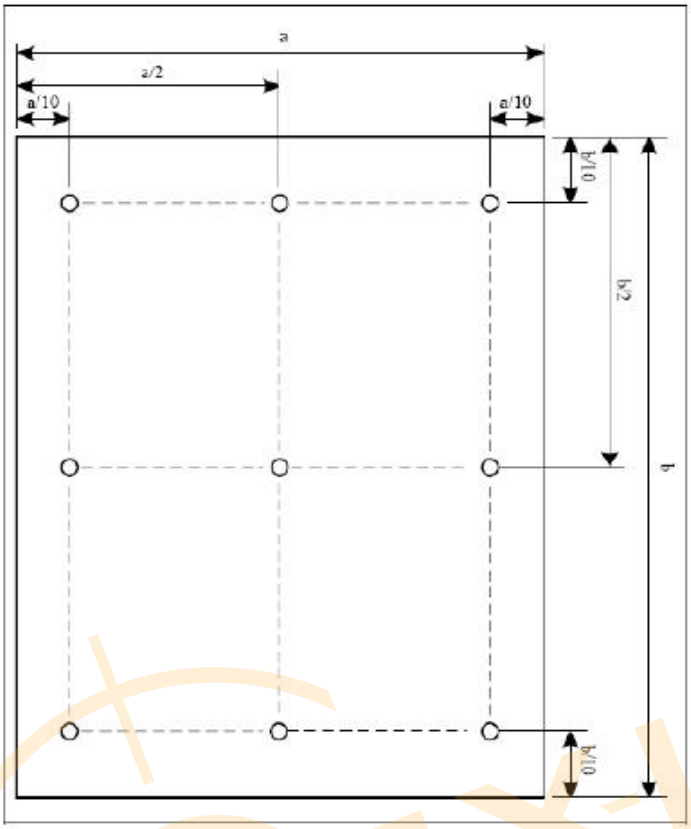
NOTE 3：Luminance Uniformity of these 9 points is defined as below:



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

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

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7. DC Characteristics

7.1 System characteristics

(VCC=1.5V, VDD=3.3V,AVDD=12V, VSS=VSSA=0V, TA=-20 to +85℃)

Parameter	Symbol	MIN.	Typ.	MAX.	UNIT	Conditions
VDD Input low voltage level	Vil1	0	-	0.3*VDD	V	For the VDD domain inputs.
VDD Input high voltage level	Vih1	0.7*VDD	-	VDD	V	For the VDD domain inputs.
VCC Input low voltage level	Vil2	0	-	0.2*VCC	V	For the VCC domain inputs.
VCC Input high voltage level	Vih2	0.8*VCC	-	VCC	V	For the VCC domain inputs.
I2C Low level input voltage	Vil3	1.65		VDD	V	For SDA/SCL inputs
I2C High level input voltage	Vih3	0		0.2	V	For SDA/SCL inputs
Input leakage current	Ii	-	-	+/- 1	μA	For the digital, I/O circuit (Not include the pull-up/down current)
Output high voltage level	Voh	0.8*VDD	-	-	V	For VDD domain outputs, Ioh = 400uA
Output low voltage level	Vol	-	-	0.2*VDD	V	For VDD domain outputs, Iol = 400uA
Differential input leakage Current	I_{DIFFI}	-10		+10	uA	For DxP, DxN, CLKP, CLKN (With steady state inputs)
Pull low/high resistor	Ri	100K	250K	500K	ohm	For the digital Input pin VDD=3.3, VCC=1.5
Output Voltage deviation	VOD1		±20	±35	mV	Vo = AGND+0.2V ~ AGND+1.5V Vo = HAVDD-0.2V ~ HAVDD-1.5V Vo = HAVDD+0.2V ~ HAVDD+1.5V Vo = AGND+0.2V ~ AGND+1.5V
Output Voltage deviation	VOD2		±15	±20	mV	Vo = AGND+1.5V ~ HAVDD-1.5V Vo = HAVDD+1.5V ~ AVDD-1.5V
Output Voltage Offset between Chips	VOC			±20		Vo = AGND+1.5V ~ HAVDD-1.5V Vo = HAVDD+1.5V ~ AVDD-1.5V
Input level of V1 ~ V7	Vref1	HAVDD+0.2	-	AVDD-0.2	V	Gamma positive voltage input
Input level of V8 ~ V14	Vref2	0.2	-	HAVDD-0.2	V	Gamma negative voltage input
Dynamic Range of Output	Vdr	0.2	-	AVDD-0.2	V	S0 ~ S1802
Sinking Current of Outputs	IOLy	80	-	-	μA	S0 ~ S1802
Driving Current of Outputs	IOHy	80	-	-	μA	S0 ~ S1802
Digital Operation current	Idd	-	TBD	-	mA	
Digital Stand-by current	Ist1	-	1.15	2.5	mA	
Analog Operation current	Idda	-	TBD	-	mA	
Analog Stand-by current	Ist2	-	3.5	6.9	mA	

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7.2 MIPI DC Characteristics

HS Receiver DC Specification

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Operation Voltage	VDD	1.5-10%	1.5	1.5+10%	mV	
Differential Input Voltage	|VID|	70	200	260	mV	
Common Mode Voltage	$V_{CMRX(DC)}$	70	-	330	mV	
Differential Input High Threshold Voltage	VTH	-	-	70	mV	
Differential Input Low Threshold Voltage	VTL	-70	-	-	mV	
Singled-ended input high voltage	V_{IHHS}	-	-	460	mV	
Singled-ended input low voltage	V_{ILHS}	-40	-	-	mV	
Singled-ended threshold for HS termination enable	$V_{TERM-EN}$	-	-	450	mV	
Differential input impedance	Z_{ID}	80	100	125	ohm	
Pin leakage current	I_{LEAK}	-10	-	10	uA	
Common-mode interference beyond 450MHz	$\Delta V_{CMRX(HF)}$	-	-	100	mV	
Common-mode interference 50MHz - 450MHz	$\Delta V_{CMRX(LF)}$	-50	-	50	mV	
Common-mode termination	C_{CM}	-	-	60	pF	
Embedded Termination	R_T	90	100	110	ohm	2bits RT_SEL[1: 0] for termination resistor selection 00 → 200ohm 10 , 01→ 150ohm 11 → 100ohm (default) 1bit ERMR_EN for termination resistor enable TERMR_EN=0, termr disable R=(OPEN) TERMR_EN=1, termr enable

Note:

(1) Excluding possible additional RF interference of 100mV peak sine wave beyond 450MHz.

(2) This table value includes a ground difference of 50mV between the transmitter and the receiver, the static common-mode level tolerance and variations below 450MHz.

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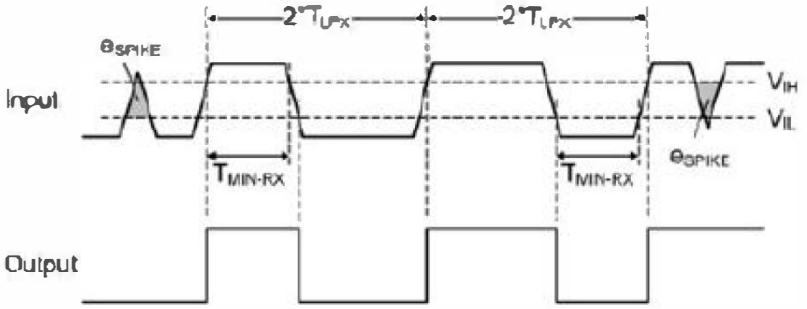
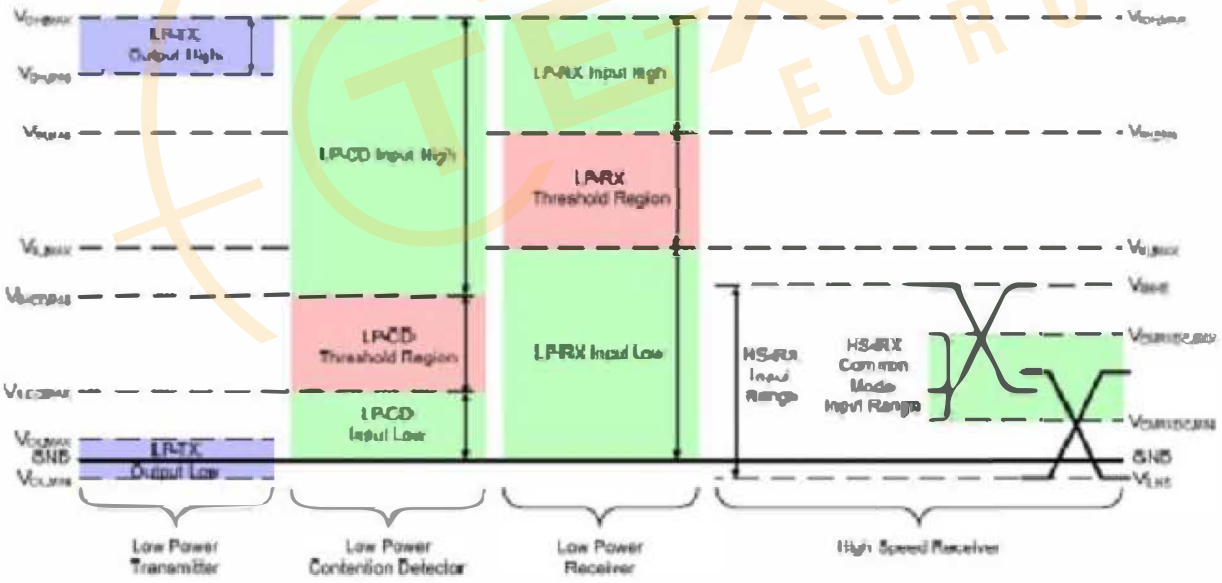
LP Receiver DC Specification

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 input voltage	V_{IH}	880	-	-	mV	
Logic 0 input voltage, not in ULP State	V_{IL}	-	-	550	mV	
Input hysteresis	V_{HYST}	25	-	-	mV	



Line Contention Detection

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Logic 1 contention threshold	V_{IHCD}	450	-	-	mV	
Logic 0 contention threshold	VILCD	-	-	200	mV	



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Input Characteristics

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Pin signal voltage range	V_{PIN}	-50		1350	mV	
Pin leakage current	I_{LEAK}	-10		10	uA	
Ground shift	V_{GNDSH}	-50		50	mV	
Transient pin voltage level	$V_{PIN(absmax)}$	-0.15		1.45	V	
Maximum transient time above $V_{PIN(max)}$ or below $V_{PIN(min)}$	$TV_{PIN(absmax)}$			20	ns	

Note:

(1) When the pad voltage is in the signal voltage range from VGNDSH, MIN to VOH + VGNDSH, MAX and the Lane Module is in LP receive mode.

(2) The voltage overshoot and undershoot beyond the VPIN is only allowed during a single 20ns window after any LP-0 to LP-1 transition or vice versa. For all other situations it must stay within the VPIN range.

(3) This value includes ground shift.

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8. AC Characteristics

8.1 System AC Characteristics

(VDD=3.3V, AVDD=12V, VSS=VSSA=0V, TA=-20 to +85℃)

Parameter	Symbol	MIN.	Typ.	MAX.	UNIT	Conditions
VDD Power On Slew rate	T	-	-	20	ms	From VSS to 90% VDD
RSTB pulse width	T	10	-	-	us	

8.2 MIPI AC Chrematistics

HS Receiver AC Timing Characteristics

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Bandwidth per lane	-	-	-	1000	Mbps	Bandwidth selected by register 'speedup' Speedup=0 → Max=550Mbps Speedup=1→ Max=1000Mbps
Operation frequency	-	-	-	500	MHz	
UI instantaneous	UI_{INST}	1	-	12.5	ns	1
Data to Clock Skew	Tskew	-0.15	-	0.15	UI_{INST}	
Inter-lane static skew	Tskew-lane	-	-	$UI_{INST}/50$	UI_{INST}	
Data to Clock Setup Time	T_{SETUP}	0.25	-	-	UI_{INST}	2
Data to Clock Hold Time	T_{HOLD}	0.25	-	-	UI_{INST}	
Common-mode interference beyond 450MHz	$\Delta V_{CMRX(HF)}$	-	-	100	mV	4
Common-mode interference 50MHz- 450MHz	$\Delta V_{CMRX(LF)}$	-50	-	50	mV	3,6
Common-mode termination	C_{CM}	-	-	60	pF	5

Note:

(1) Total silicon and package delay budget of 0.3*UINST

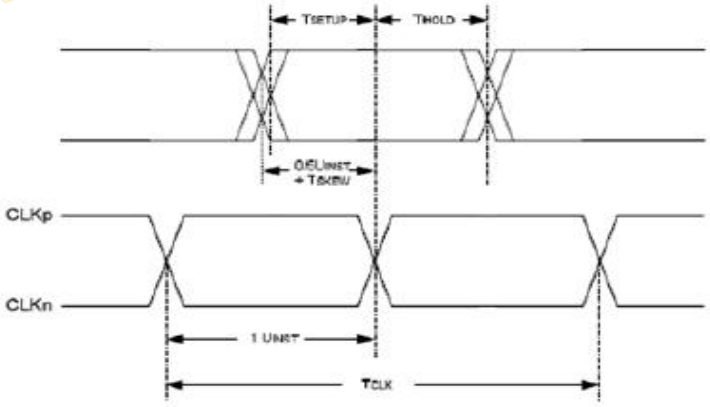
(2) Total setup and hold window for receiver of 0.3*UINST

(3) Excluding 'static' ground shift of 50mV

(4) =VCMRX (HF) is the peak amplitude of a sine wave superimposed on the receiver input

(5) For higher bit rates a 14pF capacitor will be needed to meet the common-mode return loss specification.

(6) Voltage difference compared to the DC average common-mode potential.



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LP Receiver AC Timing Characteristics

Parameter	Symbol	Rating			Unit	Note
		Min	Typ	Max		
Input pulse rejection	e_{SPIKE}	-	-	300	V·ps	1.2.3
Minimum pulse width response	T_{MIN-RX}	20	-	-	ns	
Peak interference amplitude	V_{INT}	-	-	200	mV	
Interference frequency	f_{INT}	450	-	-	MHz	
Logic 1 input voltage	V_{IH}	880	-	-	mV	
Logic 0 input voltage, not in ULP State	V_{IL}	-	-	550	mV	
Logic 0 input voltage, ULP State	$V_{IL-ULPS}$	-	-	300	mV	
Input Hysteresis	V_{HYST}	25	-	-	mV	
Logic 1 contention threshold	V_{IHCD}	450	-	-	mV	
Logic 0 contention threshold	V_{ILCD}	-	-	200	mV	

Note:

(1) Time-voltage integration of a spike above VIL when being in LP-0 state or below VIH when being in LP-1state.

(2) An impulse less than this will not change the receiver state.

(3) In addition to the required glitch rejection, implementers shall ensure rejection of known RF-interferers.

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9. Timing for DSI video mode

Parameter	Symbol	Min.	Typ.	Max.	Unit
DCLK frequency	FCLK	--	(71)	--	MHz
Horizontal display area	HDISP	--	480	--	Clock
Horizontal Sync. Width	hpw	5	10	50	Clock
Horizontal Sync. Back Porch	hbp	35	50	100	Clock
Horizontal Sync. Front Porch	hfp	35	50	200	Clock
Vertical display area	VDISP	--	1920	--	Line
Vertical Sync. Width	vs	10	20	50	Line
Vertical Sync. Back Porch	vbp	20	30	100	Line
Vertical Sync. Front Porch	vfp	20	30	200	Line
Frame-Rate	Fr	--	60	--	Hz

Note:

The best frame rate setting： 2 data lanes：50~60 Hz / 3 data lanes：50~70 Hz / 4 data lanes：50~70 Hz.

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10. CTP Specification

10.1 Electrical Characteristics

10.1.1 Absolute Maximum Rating

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	2.7	3.6	V	1
Operating temperature	T_{OP}	-30	+85	℃	-
Storage temperature	T_{ST}	-40	+90	℃	-

NOTES:

1. If used beyond the absolute maximum ratings, FT7511 may be permanently damaged. It is strongly recommended that the device be used within the electrical characteristics in normal operations. If exposed to the condition not within the electrical characteristics, it may affect the reliability of the device.
2. Make sure VDD3 (high) ≥VSSLF (low)

10.1.2 DC Electrical Characteristics (Ta=25℃)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Digital supply voltage	VDD		2.7	3.3	3.6	V	
Normal operation mode Current consumption	I_{opr}	VDD=3V Ta=25℃	-	11	-	mA	
Monitor mode Current consumption	I_{mon}		-	0.43	-	mA	
Sleep mode Current consumption	I_{slp}		-	42	-	uA	
Level input voltage	V_{IH}		0.7VDD	-	VDD	V	
	V_{IL}		-0.3	-	0.3VDD	V	
Level output voltage	V_{OH}	I_{OH}=3mA	0.7VDD	-	-	V	
	V_{OL}	I_{OH}=4.5mA	-	-	0.3VDD	V	

Notes: This sample data is intended for design guidance only. Values shown are typical for a 15Tx × 24Rx sensor configured at 80 Hz report rate.Actual current will depend on the particular sensor design and firmware options.

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10.1.3 AC Characteristics

AC Characteristics of Oscillators

Item	Symbol	Unit	Test Condition	Min.	Typ.	Max.	Note
OSC clock 1	fosc1	MHz	VDD3 = 2.8V; Ta=25℃	49	50	51	

AC Characteristics of TX & RX

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit	Note
TX acceptable clock	ftx		50	150	400	KHz	
TX output rise time	Ttxr		--	210	--	nS	
TX output fall time	Ttxf		--	210	--	nS	
RX input voltage	Trxi		1.2	--	1.6	V	

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10.2 I/O Ports Circuits

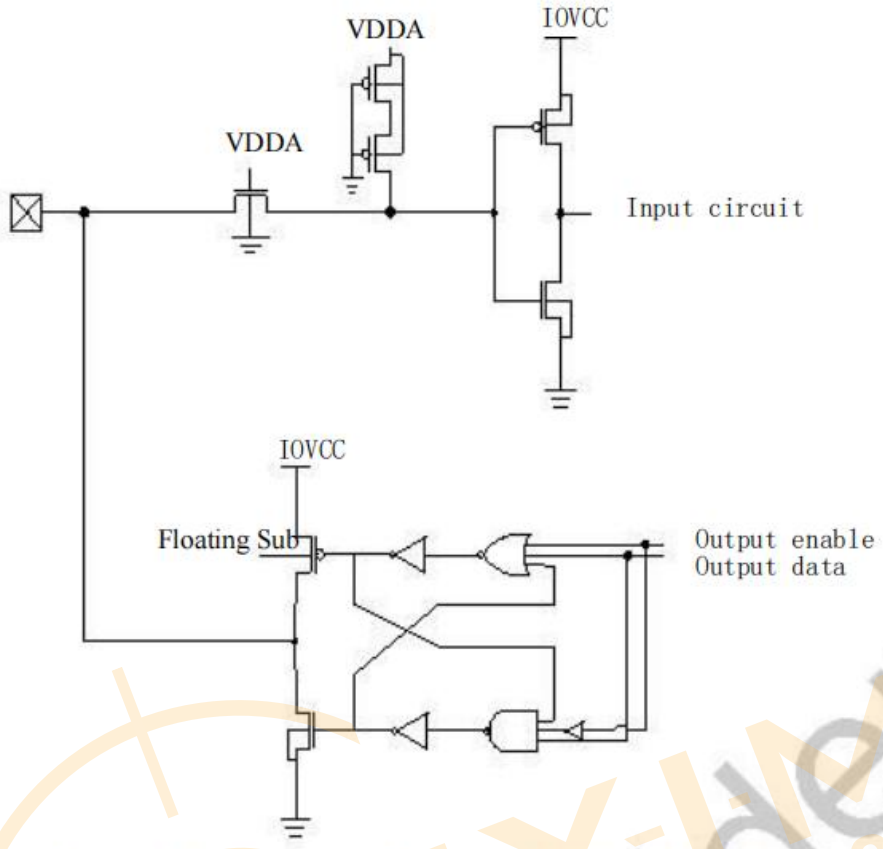

Figure 3-1 General Purpose*In/Out Port Circuit.*

The input/output property can be configured via firmware setting. The firmware can also control its output behavior as push-pull or as open-drain that SDA of I2C interface is required.

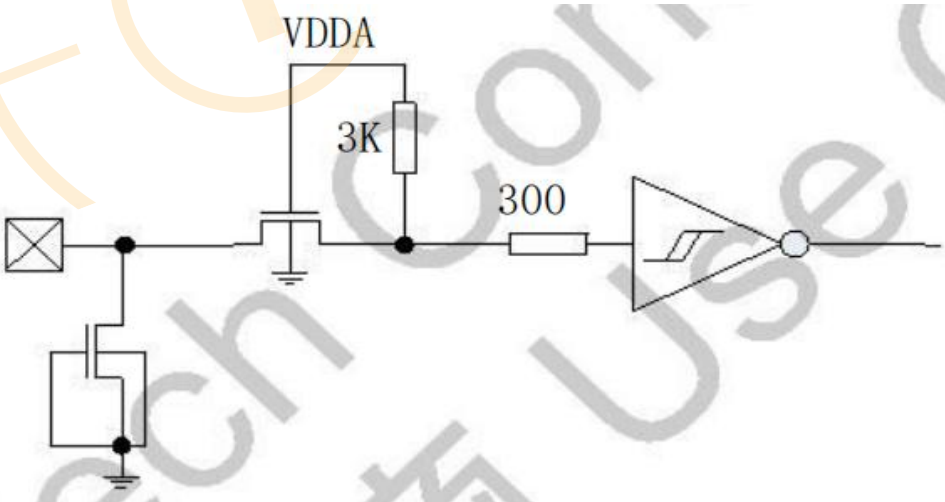

Figure 3-2 Reset Input Port Circuits

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10.3 POWER ON/Reset/Wake Sequence

Reset should be pulled down to be low before powering on and powering down. I2C shouldn't be used by other devices during Reset time after VDD powering on (Trtp). INT signal will be sent to the host after initializing all parameters and then start to report points to the host. If Power is down, the voltage of supply must be below 0.3V and Tpdt is more than 1ms.

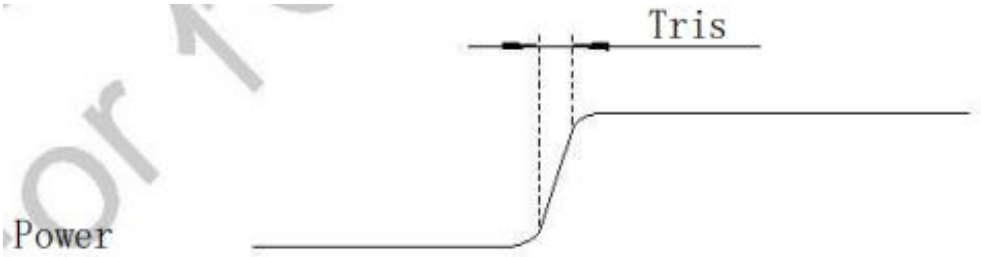

Figure 3-3 Power on time

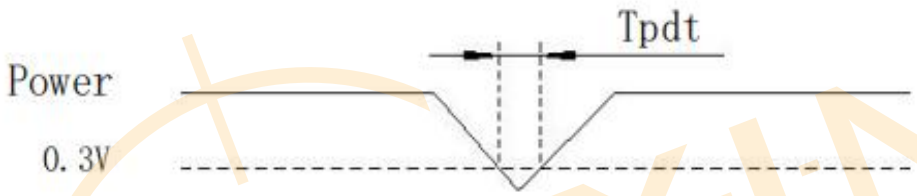

Figure 3-4 Power Cycle requirement

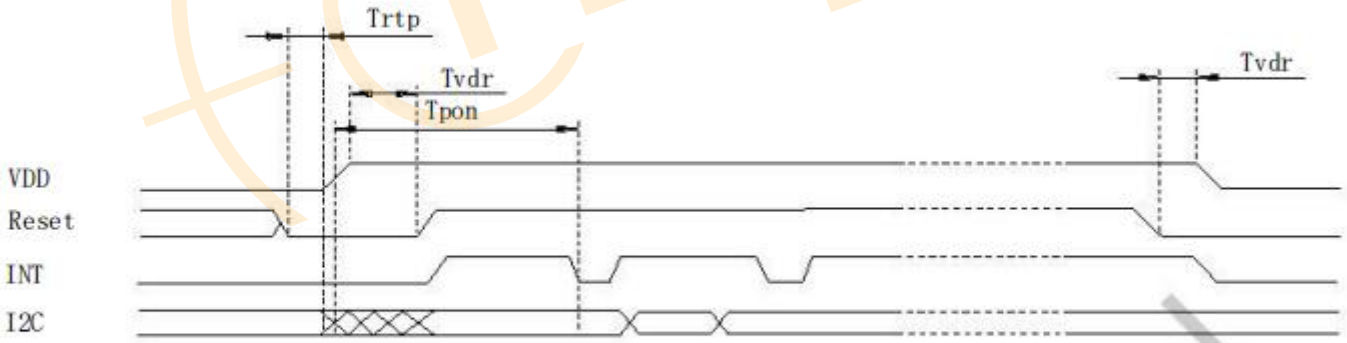

Figure 3-5 Power on Sequence

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Reset time must be enough to guarantee reliable reset, the time of starting to report point after resetting approach to the time of starting to report point after powering on.

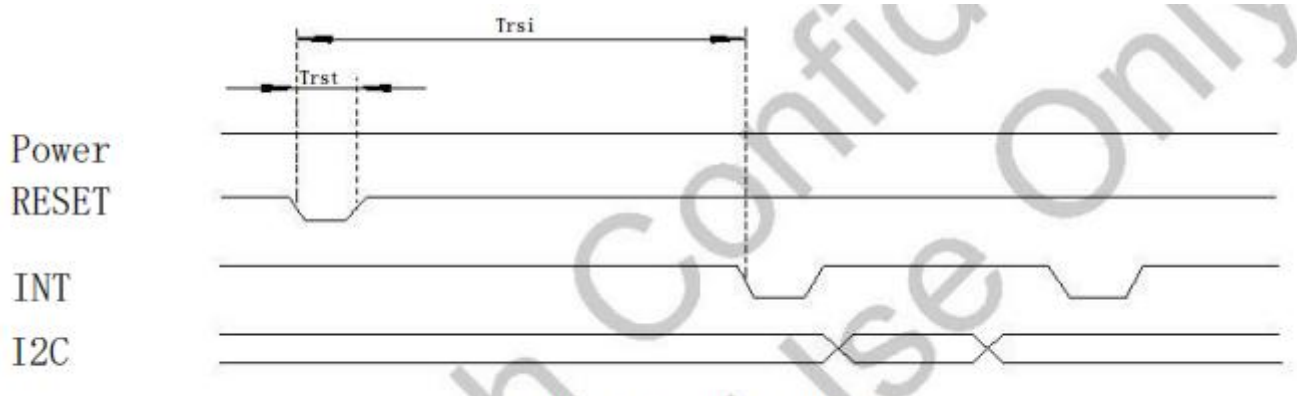

Figure 3-6 Reset Sequence

Table 3-5Power on/Reset Sequence Parameters

Parameter	Description	Min	Max	Units
Tris	Rise time from 0.1VDD to 0.9VDD	--	5	ms
Tpdt	Time of the voltage of supply being below 0.3V	5	--	ms
Trtp	Time of resetting to be low before powering on	100	--	μs
Tpon	Time of starting to report point after powering on	--	200	ms
Tvdr	Reset time after VDD powering on	1	--	ms
Trsi	Time of starting to report point after resetting	--	200	ms
Trst	Reset time	1	--	ms

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10.4 I2C Timing

FT7511 supports the I2C interfaces, which can be used by a host processor or other devices.

The I2C is always configured in the Slave mode. The data transfer format is shown in Figure 2-4.

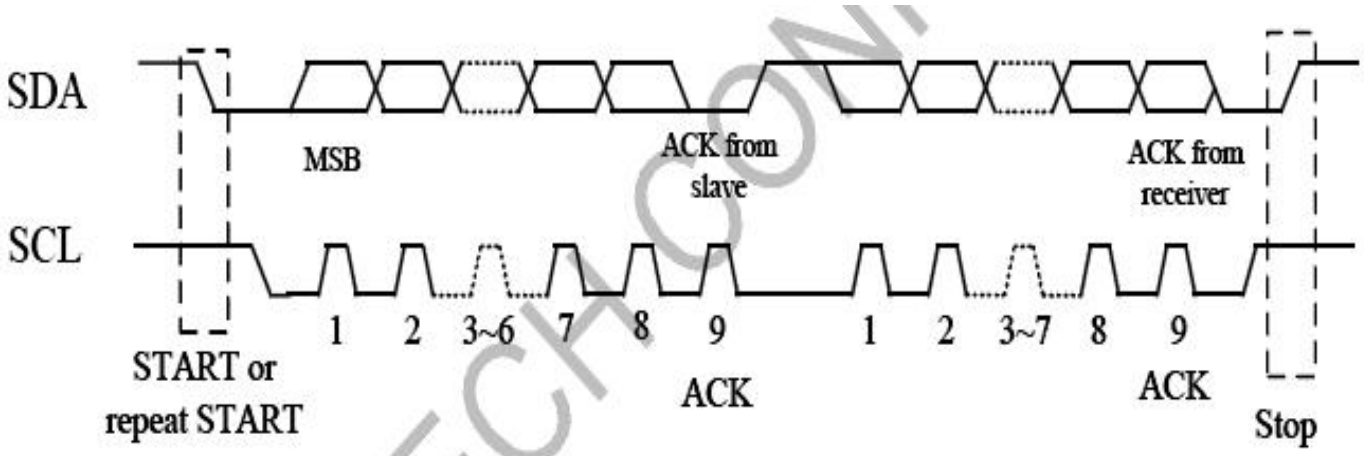

Figure 2-4 I2C Serial Data Transfer Format

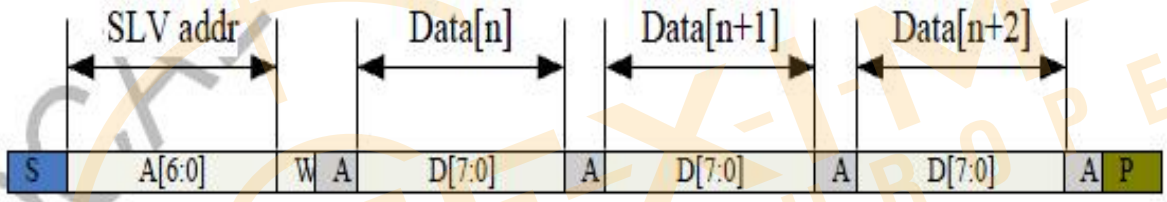

Figure 2-5 I2C master write, slave read

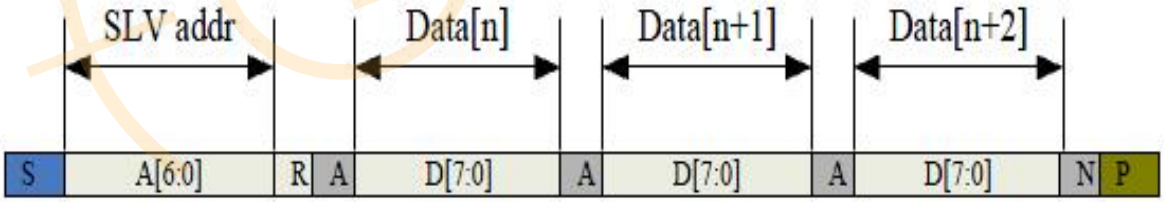

Figure 2-6 I2C master read, slave write

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Table 2-1 lists the meanings of the mnemonics used in the above figures.

Table 2-1 Mnemonics Description

Mnemonics	Description
S	I2C Start or I2C Restart
A[6:0]	Slave address
R/ W	READ/WRITE bit, '1' for read, '0'for write
A(N)	ACK(NACK) bit
P	STOP: the indication of the end of a packet (if this bit is missing, S will indicate the end of the current packet and the beginning of the next packet)

I2C Interface Timing Characteristics is shown in Table 2-2.

Table 2-2 I2C Timing Characteristics

Parameter	Min	Max	Unit
SCL frequency	0	400	KHz
Bus free time between a STOP and START condition	1.3		us
Hold time (repeated) START condition	0.6		us
Data setup time	100		ns
Setup time for a repeated START condition	0.6		us
Setup time for STOP condition	0.6		us
Rise time of both SDA and SCL signals	20	300	ns
Fall time of both SDA and SCL signals	20x (VDD/5.5V)	300	ns

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11. LCD Module Out-Going Quality Level

11.1 VISUAL & FUNCTION INSPECTION STANDARD

11.1.1 Inspection conditions

Inspection performed under the following conditions is recommended.

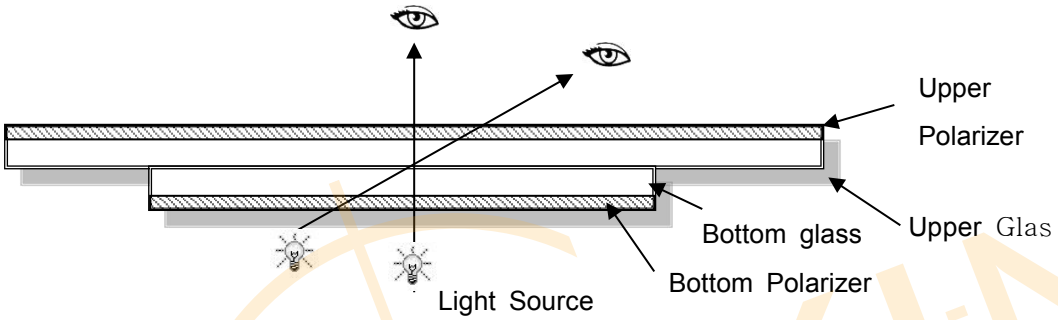
Temperature : 25±5℃

Humidity : 65%±10%RH

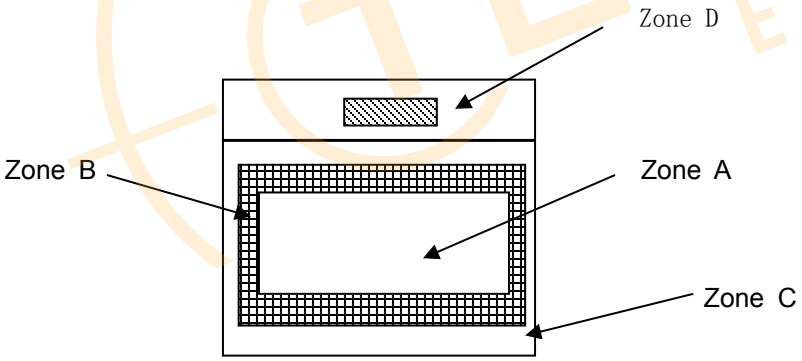
Viewing Angle : Normal viewing Angle.

Illumination: Single fluorescent lamp (300 to 700Lux)

Viewing distance:30-50cm



11.1.2 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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11.1.3 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 , LCM: Liquid Crystal Module, CTP: Capacitive Touch Panel

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. etc	Major
2	Missing	Missing components and etc	
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed,deformation and etc	
4	Color tone	Color unevenness, refer to limited sample	Minor
5	Spot/Line defect	Light dot,Dim spot,(Note1) Polarizer Air Bubble, Polarizer accidented spot and etc	
6	Soldering appearance	Good soldering , Peeling off is not allowed and etc	
7	LCD/Polarizer/CTP	Black/White spot/line, scratch, crack, etc.	

Note1: a) Light dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

b) Dim dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

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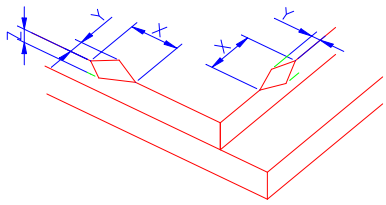
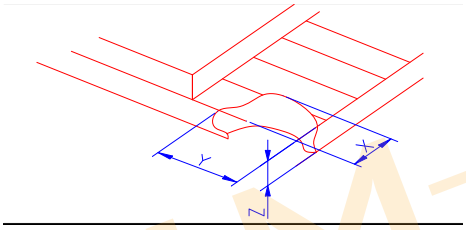
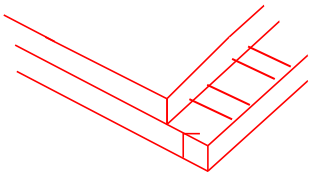
11.1.4 Criteria (Visual)

<table>
<tr><th>Number</th><th>Items</th><th>Criteria(mm)</th></tr>
<tr><td rowspan="3">1.0 LCD Crack/Broken
NOTE:
X: Length
Y: Width
Z: Height
L: Length of ITO,
T: Height of LCD</td><td>(1) The edge of LCD broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td><Inner border line of the seal</td><td>≤T</td></tr></table></td></tr>
<tr><td>(2)LCD corner broken</td><td> 
<table><tr><th>X</th><th>Y</th><th>Z</th></tr><tr><td>≤3.0mm</td><td>≤L</td><td>≤T</td></tr></table></td></tr>
<tr><td>(3) LCD crack</td><td> 
Crack
Not allowed</td></tr>
</table>

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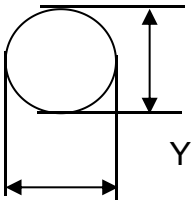
2.0 Spot defect



Φ=(X+Y)/2

① light dot（ black/white spot ， pinhole, stain，etc.）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧10mm)		
0.25<Φ≤0.4	2(distance≧10mm)		
Φ>0.4	0		

② Dim spot（light leakage、dent、dark spot，etc）

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.15	Ignore	Ignore	
0.15<Φ≤0.25	3(distance≧10mm)		
0.25<Φ≤0.4	2(distance≧10mm)		
Φ>0.4	0		

③ Polarizer accidented spot

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.5	2(distance≧10mm)		
Φ>0.5	0		

④Polarizer Bubble

Zone / Size (mm)	Acceptable Qty		
	A	B	C
Φ≤0.2	Ignore		Ignore
0.2<Φ≤0.4	2(distance≧10mm)		
Φ>0.4	0		

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3.0	LCD Pixel defect	Pixel bad points

Item	Zone A	Acceptable Qt
Bright dot	Random	N≤2
	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Dark dot	Random	N≤3
	2 dots adjacent	N≤0
	3 dots adjacent	N≤0
Distance	1. Minimum Distance Between Bright dots. 2. Minimum Distance Between dark dots 3. Minimum Distance Between dark and bright dot.	5mm
Total bright and dark dot		N≤4

Note:

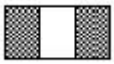
A) Bright dot：Dots appear bright and unchanged in size in which LCD panel is displaying under black pattern.

B) Dark dot: Dots appear dark and unchanged in size in which LCD panel is displaying under pure red, green, blue picture.

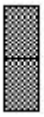
C) 2 dot adjacent = 1 pair = 2 dots

Picture:

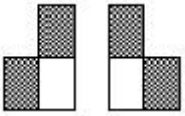
2 dot adjacent



2 dot adjacent



2 dot adjacent (vertical)



2 dot adjacent (slant)

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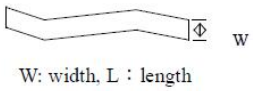
<table>
<tr>
<td>4.0</td>
<td>Line defect (LCD /Polarizer backlight black/white line, scratch, stain)
 

W: width, L：length
N：Count</td>
<td>
<table>
<tr><td rowspan="2">Width(mm)</td><td rowspan="2">Length(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.05</td><td>Ignore</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.05<W≤0.06</td><td>L≤5.0</td><td colspan="2">N≤3</td></tr>
<tr><td>0.06<W≤0.08</td><td>L≤4.0</td><td colspan="2">N≤2</td></tr>
<tr><td>W>0.08</td><td colspan="4">Define as spot defect</td></tr>
</table>
</td>
</tr>
<tr>
<td>5.0</td>
<td>Electronic Components SMT.</td>
<td>Not allow missing parts，solderless connection，cold solder joint，mis match，The positive and negative polarity opposite</td>
</tr>
<tr>
<td>6.0</td>
<td>Display color& Brightness.</td>
<td>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.</td>
</tr>
<tr>
<td>7.0</td>
<td>LCD Mura/Waving/ Hot spot</td>
<td>Not visible through 5% ND filter in 50% gray or judge by limit sample if necessary.</td>
</tr>
</table>

<table>
<tr>
<td>8.0</td>
<td>CTP Related</td>
<td>CTP Cover sensor accidented black/white spot</td>
<td>
<table>
<tr><td rowspan="2">Size Φ(mm)</td><td colspan="3">Acceptable Qty</td></tr>
<tr><td>A</td><td>B</td><td>C</td></tr>
<tr><td>Φ≤0.15</td><td colspan="2">Ignore</td><td rowspan="3">Ignore</td></tr>
<tr><td>0.15<Φ≤0.25</td><td colspan="2">4（distance≧10mm）</td></tr>
<tr><td>0.25<Φ≤0.35</td><td colspan="2">3（distance≧10mm）</td></tr>
<tr><td>Φ>0.35</td><td colspan="2">0</td><td></td></tr>
</table>
</td>
</tr>
</table>

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CTP Cover scratch

Width(mm)	Ignore (mm)	Acceptable Qty		
		A	B	C
Φ≤0.05	Ignore	Ignore		
0.05<W≤0.06	L≤4.0	N≤3		
0.06<W≤0.08	L≤3.0	N≤2		
0.08<W	Define as spot defect			

CTP Cover Pinhole/ Lack of ink

Zone / Size (mm)	Acceptable Qty
	C
Φ≤0.2	Ignore
0.2<Φ≤0.3	4(distance≧10mm)
0.3<Φ≤0.4	2(distance≧10mm)
Φ>0.4	0

CTP Bonding bubble/ accidented spot

Size Φ(mm)	Acceptable Qty	
	A	B
Φ≤0.1	Ignore	
0.1<Φ≤0.2	3(distance≧10mm)	
0.2<Φ≤0.3	2(distance≧10mm)	
Φ>0.3	0	

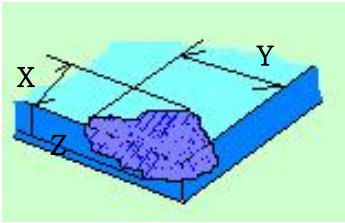
Assembly deflection

beyond the edge of backlight ≤0.2mm

CTP cover broken
X：length
Y：width
Z：height

X	Y	Z
X≤0.5mm	Y≤0.5mm	Z<cover thickness

* Circuitry broken is not allowed.



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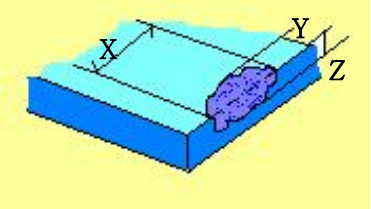
		CTP cover broken X：length Y：width Z：height	X: X≤0.3mm; Y: Y≤0.3mm; Z: Z<cover thickness * Circuitry broken is not allowed.	

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	CTP no function	Not allowed

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12. Reliability Test Result

Item	Condition	Inspection after test
High Temperature Operating	85℃,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℃, 96HR	
High Temperature Storage	90℃, 96HR	
Low Temperature Storage	-40℃, 96HR	
High Temperature & High Humidity Operating	+60℃, 90% RH ,96 hours.	
Thermal Shock (Non-operation)	-10℃,30 min ↔ +60℃,30 min, Change time:5min 20CYC.	
ESD test	C=150pF, R=330,5points/panel Air:±8KV, 5times; Contact:±6KV, 5 times; (Environment: 15℃~35℃, 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,80㎝(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.

6. The color fading mura of polarizing filter should not care.

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13. Cautions and Handling Precautions

13.1 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

13.2 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 ℃ 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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14. Packing

----TBD----------

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Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time.

All operating parameters, including typical parameters, must be validated for each customer application by the customer’s technical experts.

Please contact us if you have any questions about the contents of the datasheet.

This may not be the latest version of the datasheet. Please check with us if a later version is available.

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