



OSD DISPLAYS

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1. General Description

This display module consists of a 4.3 inch 480RGB x 272, TFT a-Si Active Matrix Color LCD that is electronically and mechanically integrated. The TFT display is capable of displaying 16.7M colors. Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes.

The product consists with a full x-y mutual capacitance touch panel with associated controller, true multi-touch function is supported. The touch panel is glass to glass structure with an optical bonded hardened glass lens. The complete LCD and touch sensor assembly shall be RoHS compliant.

2. General Parameters

2.1. TFT Display Parameter

Features	Details	Unit
Display Size(Diagonal)	4.3"	Inch
LCD type	α -Si TFT	
Display Mode	IPS/Transmissive /Normally black	
Resolution	480RGB x 272	
View Direction	free	
Grayscale Inversion Direction	-	
Module Outline	113.01 (H) x75.25 (V) x5.13 (T) (Note1)	mm
Active Area	95.04(H) x 53.83(V)	mm
LCD Glass Thickness	-	mm
Pixel Pitch	0.066 (H) x0.198 (V)	mm
Pixel Arrangement	Stripe	
Polarizer Surface Treatment	Normal	
Display Colors	16.7M	
Driver IC	SC7283	
Interface	24-bit RGB	

Note 1: Excluding hooks, posts, FPC/FPC tail etc.

2.2. Touch Panel Parameter

Features	Details	Note
Application Size(Diagonal)	4.3	Unit: Inch
Resolution	480 x 272	Origin (0,0) is on left-top
Operation Technology	Projected capacitive	--
Input Method	Bare or gloved finger	--
Number of Simultaneous Touches	5	Points
Gesture Support	No	--
Button Support	no	--
Touch Controller	MXT336U.	Microchip Product
Interface to Host	I2C	Maximum bus speed 400K Hz
I2C Address	0x4A	--
Optical Transmittance	>86%	--
Life of Touches	>10 million over lifetime	With correct input method
Connection Type	ZIF connector	--
Response Time/Speed	<15ms	--
Min. spacing between 2 touches	18	Unit: mm
Positional Accuracy	Center ± 1.0 /edge ± 2.0	Unit: mm
Minimum Touch Area	30	Unit: mm ²
Minimum Touch Pressure	0	Unit: N
Non-Linearity	Center ± 1.0 /edge ± 2.0	--
FG Weight	TBD	g
Config/Firmware Version	TBD	--

3. Absolute Maximum Ratings

3.1. TFT Display Parameter

Ta=25 \pm 2°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage	VDD	-0.3	+5.0	V
Storage temperature	T _{STG}	-30	+80	°C
Operating temperature	T _{OP}	-20	+70	°C

Note1: If Ta below 50°C, the maximum humidity is 90%RH, if Ta over 50°C, maximum humidity should be less than 60%RH.

3.2. Touch Panel Parameter

Ta=25 \pm 2°C

Item	Symbol	Min.	Max.	Unit
Supply Voltage Digital	VDD_TP	-0.3	+3.6	V
Operating temp		-20	+70	°C
Storage temp		-30	+80	°C

4. DC Characteristics

4.1. TFT Display DC Characteristics

Ta=25±2°C

Item		Symbol	Min.	Typ.	Max.	Unit
Supply Voltage (Note 1)		VDD	3.1	3.3	3.5	V
Logic Low input voltage		V _{IL}	VSS	-	0.3*VDD	V
Logic High input voltage		V _{IH}	0.7*VDD	-	VDD	V
Logic Low output voltage		V _{OL}	VSS	-	0.2*VDD	V
Logic High output voltage		V _{OH}	0.8*VDD	-	VDD	V
Current Consumption(Note 2)	Logic	I _{VDDI} +I _{VCI}	-	TBD	TBD	mA
	Analog					
Frame Frequency		f _{FR}	-	110	-	HZ

Note1: test condition is all on the still pattern and Ta is 25°C, VDD=3.3V (backlight current is not included). Value would be updated after samples build.

Note2: Excluding the LED current consumption , just LCD display part consumption.

4.2. TP Panel DC Characteristics

Ta=25±2°C

Parameter	Description	Min.	Typ.	Max.	Units	Notes
VDD_TP	Operating limits	-	3.3	-	V	±5%, Note1
IDD_TP	Active	-	TBD	-	mA	VDD
	Sleep	-	TBD	-	uA	VDD
Vil	Low input logic level	-0.3	-	0.3Vddio	V	Vddio=3.3V
Vih	High input logic level	0.7Vddio	-	Vddio+0.3	V	
Vol	Low output logic level	-	-	0.3Vddio	V	
Voh	High output logic level	0.7Vddio	-	-	V	

Note1: Noise should be less than 100μV RMS over the range 10 HZ to 1 MHZ

Ripple should be less than 50mV over the range 1 HZ to 1 MHZ

4.3. Backlight Characteristic

Ta=25±2°C

Item	Symbol	Condition	Min	Typ	Max	Unit
Forward Voltage	V_f	Ta=25 °C, IF=40mA	24.0	25.6	--	V
Forward Current	I_f	Ta=25 °C, V _F =25.6V	36	40	--	mA
Reverse Voltage	V _R	-	-	-	-	V
Reverse current	I_R		-	-	-	μA
Power dissipation	P_d	Ta=25 °C, I _F =40mA	-	1024	--	mW
Drive method	Constant current					
Life time	>=20,000 hrs					
LED Configuration	16 White LED ,8 in series ,2 in Parallel					

Note1: Test condition $I_f = 40\text{mA}$, Ta=25°C.

Note2 : The LED life time is defined as the module surface luminance decrease to the 50% of the original luminance when the ambient temperature is 25 °C and the operating current is 40mA. The LED life time would decrease if operating current is larger than 40mA.

5. Optical Characteristics

The optical specification is valid for optimized LCD drive voltage, room temperature and the recommended initialization setting unless otherwise stated under the respective section.

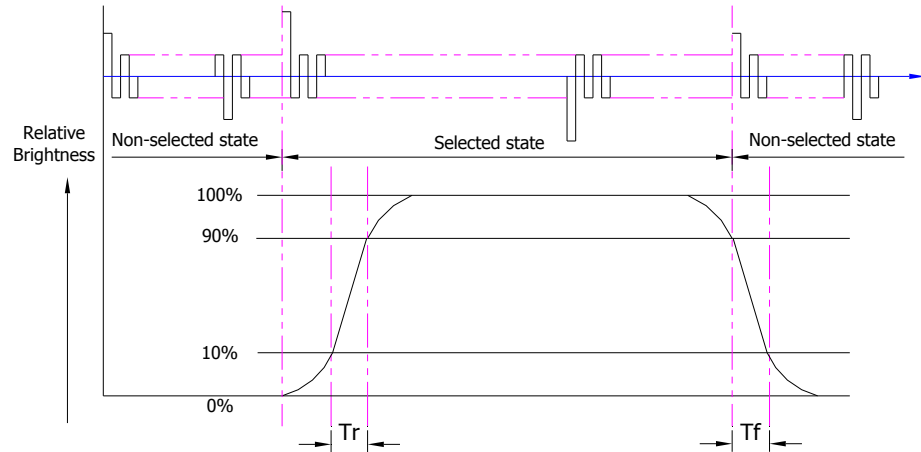
5.1. Optical Characteristics

Ta=25°C, VDD=3.3V, If=40mA

Backlight On (Transmissive Mode)	Item		Symbol	Condition	Specification			Unit
					Min.	Typ.	Max.	
	Surface Luminance (On TP Lens Surface, I_f =40mA) (See 5.6)		L_v	$\theta= 0^\circ$ Normal viewing angle	800	1000		cd/m ²
	Uniformity(CTP surface) (see 5.6)		Avg		75	80		%
	Contrast ratio(See 6.3)		CR		640	800		
	Response time (See 5.2)		T_{R+T_F}			25	40	ms
	Chromaticity Transmissive (See 5.5)	Red	X_R		0.5303	0.5703	0.6103	
			Y_R		0.2916	0.3316	0.3716	
		Green	X_G		0.2903	0.3450	0.3850	
			Y_G		0.6050	0.6478	0.6878	
		Blue	X_B		0.1078	0.1455	0.1855	
			Y_B		0.0455	0.0856	0.1256	
		White	X_W		0.2756	0.3125	0.3525	
			Y_W		0.3125	0.3531	0.3931	
	Viewing Angle (See 5.4)	Horizontal	θ_{x+}	Center CR≥10	70	80	-	Deg.
			θ_{x-}		70	80	-	
Vertical		θ_{Y+}	70		80	-		
		θ_{Y-}	70		80	-		
	NTSC Ratio(Gamut)				-	50	-	%

5.2. Definition of Response Time

5.2.1. Normally Black Type (Negative)

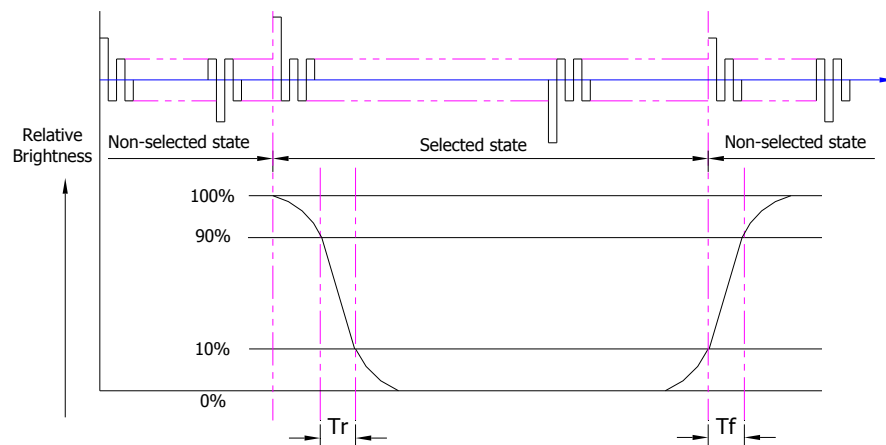


Tr is the time it takes to change from non-selected state with relative luminance 10% to selected state with relative luminance 90%;

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

Note : Measuring machine: LCD-5100

5.2.2. Normally White Type (Positive)



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

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

Note : Measuring machine: LCD-5100 or EQUI

5.3. Definition of Contrast Ratio

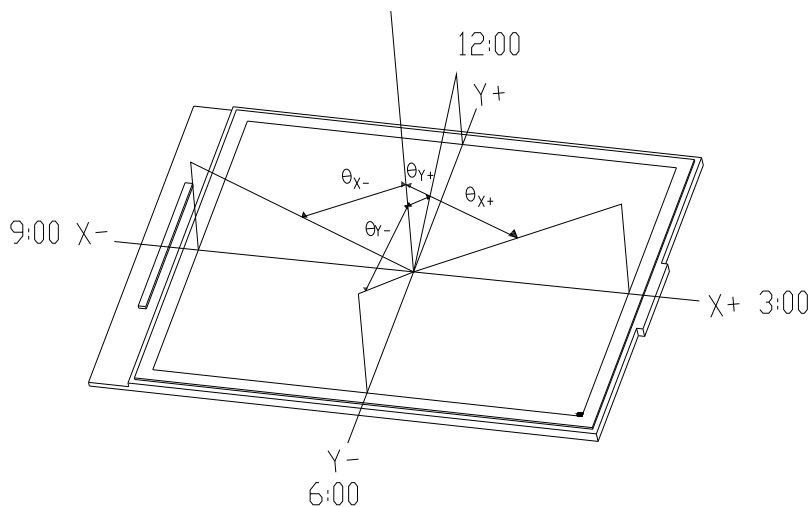
Contrast is measured perpendicular to display surface in reflective and transmissive mode.

The measurement condition is:

Measuring Equipment	Eldim or Equivalent
Measuring Point Diameter	5mm
Measuring Point Location	Active Area centre point
Test pattern	A: All Pixels white
	B: All Pixel black
Contrast setting	Maximum

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

5.4. Definition of Viewing Angles



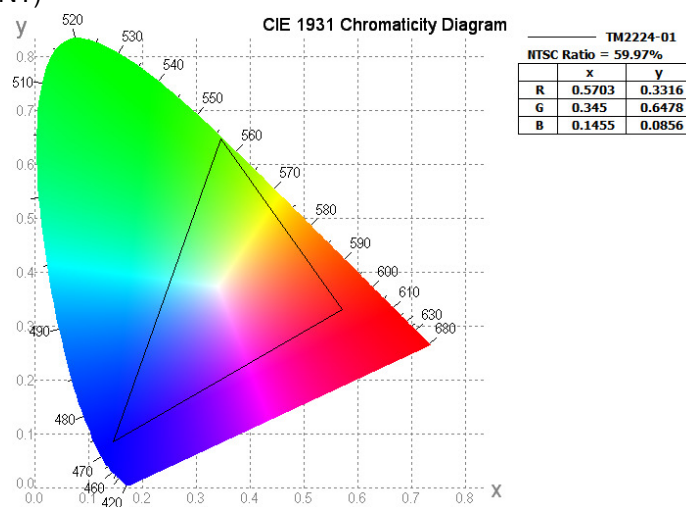
Measuring machine: LCD-5100 or EQUI

5.5. Definition of Color Appearance

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

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

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

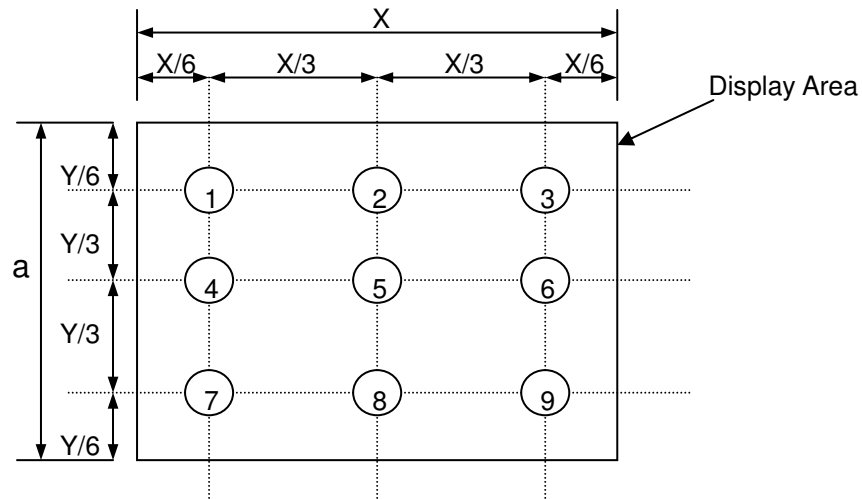


5.6. Definition of Surface Luminance, Uniformity and Transmittance

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

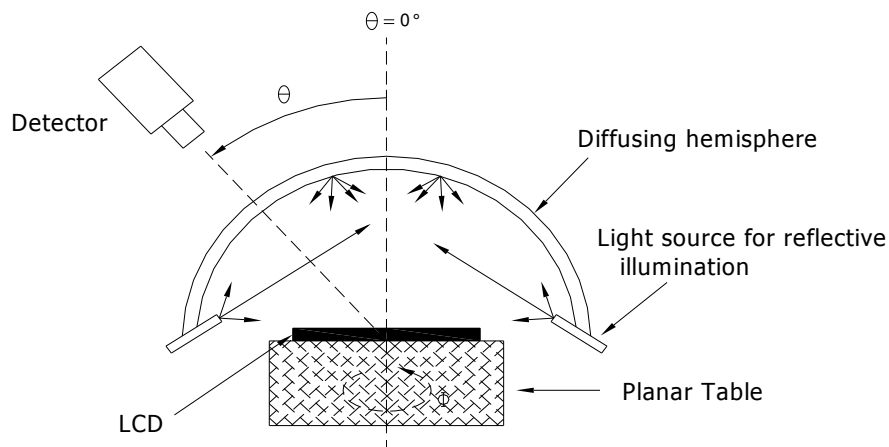
- 5.6.1. Surface Luminance: $L_V = \text{average } (L_{P1}:L_{P9})$.
- 5.6.2. Uniformity = $\text{Minimal } (L_{P1}:L_{P9}) / \text{Maximal } (L_{P1}:L_{P9}) * 100\%$.
- 5.6.3. Transmittance = $L_V \text{ on LCD} / L_V \text{ on Backlight} * 100\%$.

Note : Measuring machine: BM-7 OR EQUIVALENT



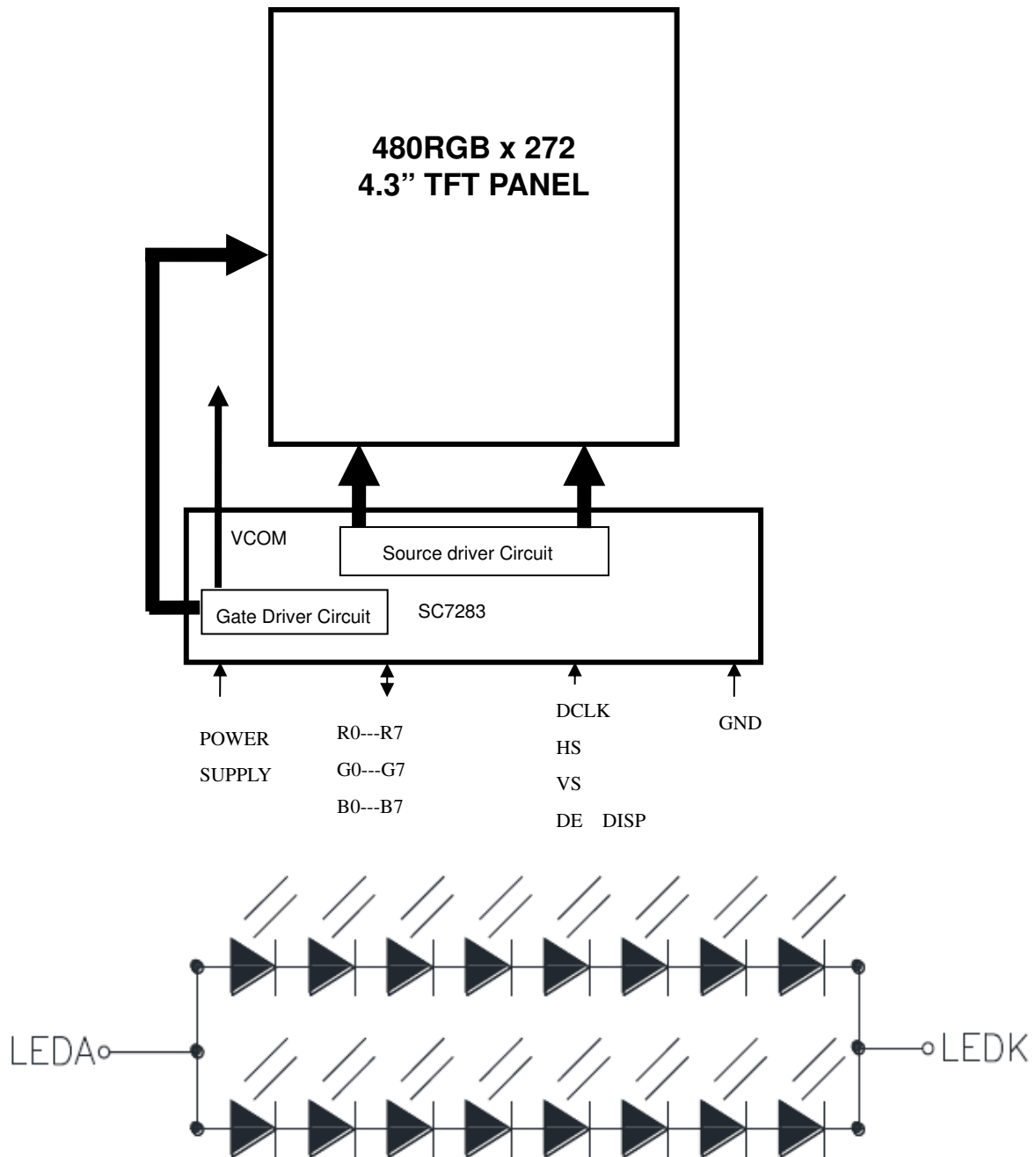
5.7. Definition of Reflectivity

To measure the reflectivity, the detector should be aligned to the normal direction of the LCD surface corresponding azimuthally angle $\theta=0^\circ$

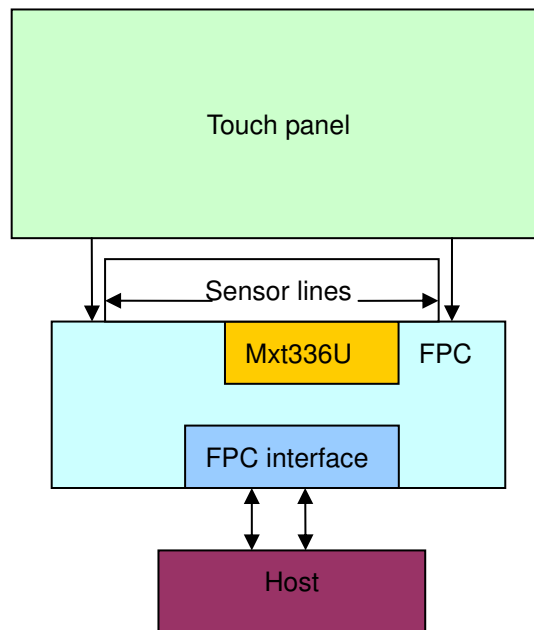


6. Block Diagram and Power Supply

6.1. Block Diagram and Power Supply for TFT Display



6.2. Block Diagram and Power Supply for Touch Panel



7. Interface Pins Definition

7.1. TFT Display Interface Pins Definition

Pin No.	Name	I/O	Function Description
1	LEDK	P	Power for LED backlight(Cathode)
2	LEDA	P	Power for LED backlight(Anode)
3	GND	P	Ground
4	VDD	P	Power for LCD
5-12	R0-R7	I	Red data
13-20	G0-G7	I	Green data
21-28	B0-B7	I	Blue data
29	GND	P	Ground
30	DCLK	I	Clock for input data
31	DISP	I	Display on/off
32	HSYNC	I	Horizontal sync input.
33	VSYNC	I	Vertical sync input
34	DE	I	Data enable
35	NC	/	No connect
36	GND	P	Ground
37	NC	/	No connect
38	NC	/	No connect
39	NC	/	No connect
40	NC	/	No connect

Note: I – Input ; O – Output ; P – Power/ground, C: Capacitor pin

1. For more information, refer to the datasheet of this driver IC.

7.2. Touch Panel Interface Pins Definition

Pin No.	Name	Type	Function Description
1	GND	P	Ground connection
2	VDD_TP	P	Power Supply
3	VDD_TP	P	Power Supply
4	INT_TP	OD	State change interrupt, INT line None pull-up resistor on CTP FPC, an external pull-up resistor is required, typical 4.7K to VDD.
5	SDA_TP	OD	Serial Interface Data, None pull-up resistor on CTP FPC, an external pull-up resistor is required, typical 4.7K to VDD.
6	SCL_TP	OD	Serial Interface clock None pull-up resistor on CTP FPC, an external pull-up resistor is required, typical 4.7K to VDD.
7	RST_TP	I	Reset low, Has internal 20K ohm to 60K ohm pull-high resistor in chip. Should connect to the hot system
8	GND	P	Ground connection

Note: P- Ground or Power, OD- open drain, I- Input, O – Output, NC- No Connection

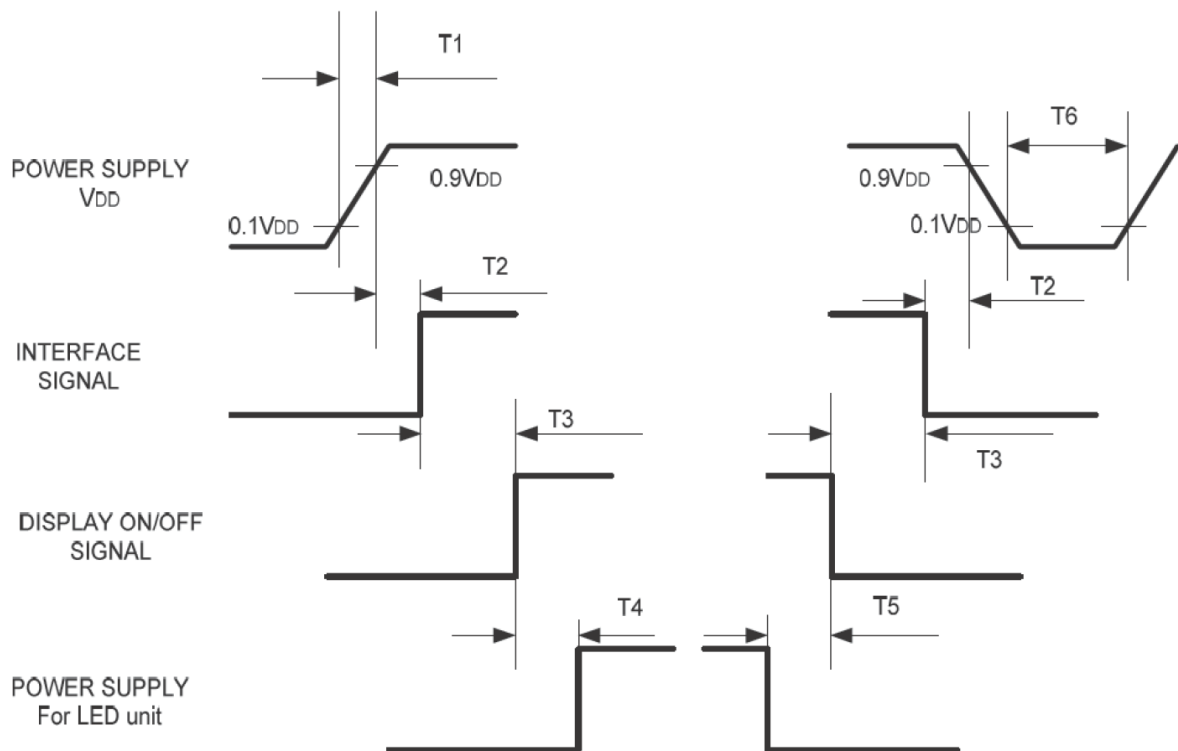
For more information, refer to the datasheet of this controller IC.

8. AC Characteristics

8.1. TFT Display Timing (Should modify according to controller IC)

8.1.1. Power Sequence

To prevent a latch-up or DC operation of the LCD module, the power on/off sequence should be as the diagram below.



Symbol	Specification	Symbol	Specification
T1	$0 \leq T1 \leq 10 \text{ msec}$	T4	$160 \text{ msec} \leq T4$
T2	$0 \leq T2 \leq 100 \text{ msec}$	T5	$160 \text{ msec} \leq T5$
T3	$0 \leq T3 \leq 200 \text{ msec}$	T6	$1 \text{ msec} \leq T6$

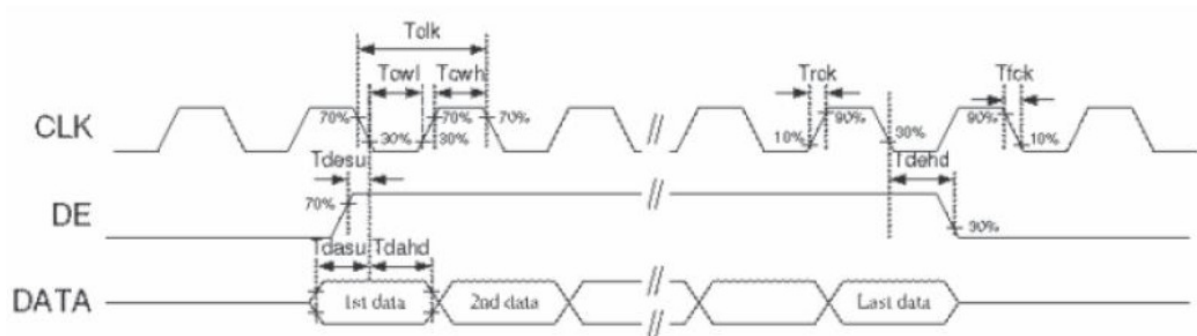
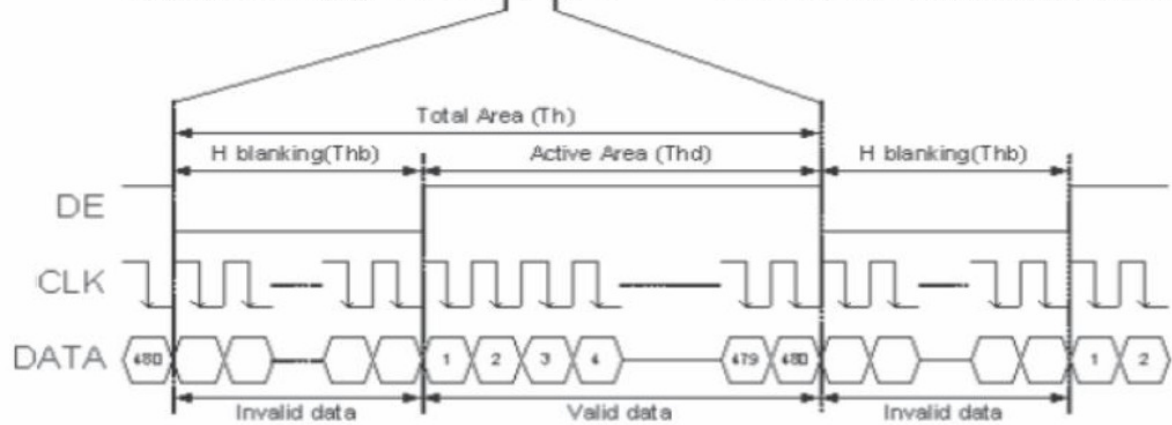
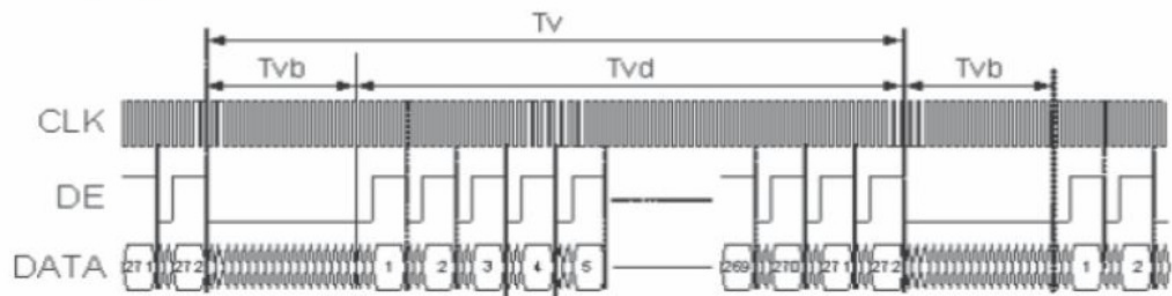
8.1.2. RGB Interface Timing

8.1.3. Parallel RGB interface Timing Characteristics

Parallel DE mode RGB input timing table

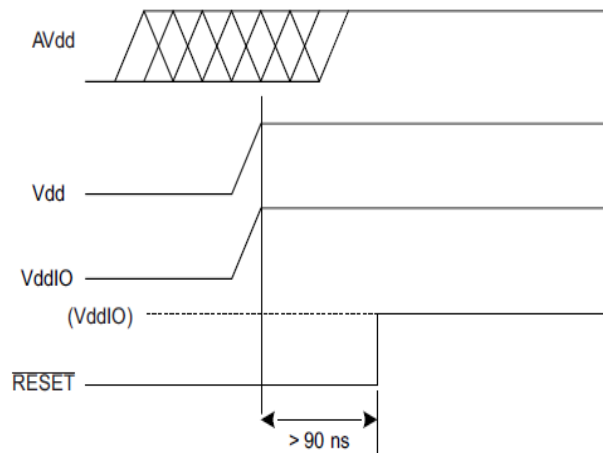
Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
CLK frequency	fclk	7	9	12	MHz
DEV period time	Tv	277	288	400	H
DEV display area	Tvd	272			H
DEV blanking	Tvb	5	16	128	H
DEH period time	Th	520	525	800	CLK
DEH display area	Thd	480			CLK
DEH blanking	Thb	40	45	320	CLK
CLK cycle time	Tclk	83	110	143	ns
Clock width of high level	Tcwh	40	50	60	%
Clock width of low level	Tcwl	40	50	60	%
Clock rising time	t _{rck}		-	9	ns
Clock falling time	t _{fck}		-	9	ns
Data Setup Time	t _{desu}	10	-	-	ns
Data Hold Time	t _{dahd}	10	-	-	ns
DE Setup Time	t _{desu}	10	-	-	ns
DE Hold Time	t _{dehd}	10	-	-	ns

Timing Diagram



8.2. Touch Panel Timing (Should modify according to controller IC)

8.2.1. Power Up / Reset Requirements



Note: When using external $\overline{\text{RESET}}$ at power-up, VddIO must not be enabled after Vdd

After power-up, the device takes 88 ms before it is ready to start communications.

Note: Any INT line activity before the power-on or reset period has expired should be ignored by the host. Operation of this signal cannot be guaranteed before the power-on/reset periods have expired.

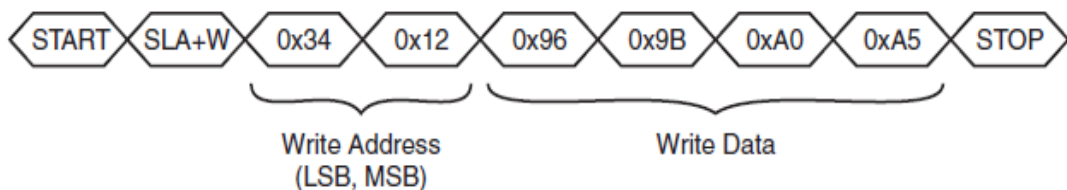
8.2.2. Interface Bus

The Touch Panel communicates with the host over an I2C bus.

Please refer to <http://www.i2c-bus.org> for more detail about the I2C bus.

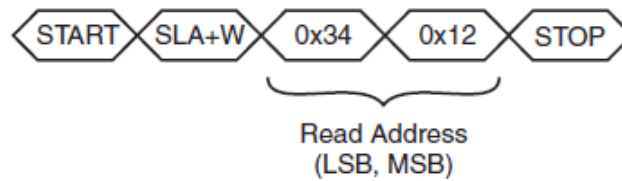
Please to <https://github.com/atmel-maxtouch/linux> for the Linux driver.

Example of a Four-byte Write Starting at Address 0x1234

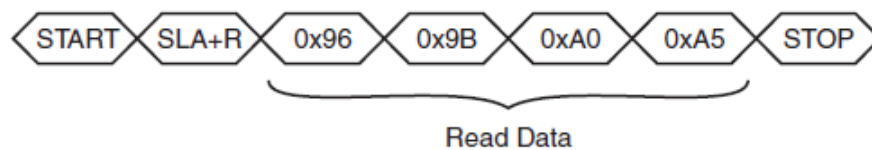


Example of a Four-byte Read Starting at Address 0x1234

Set Address Pointer



Read Data

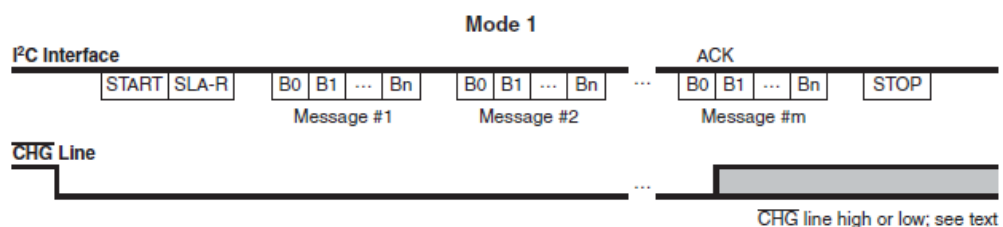
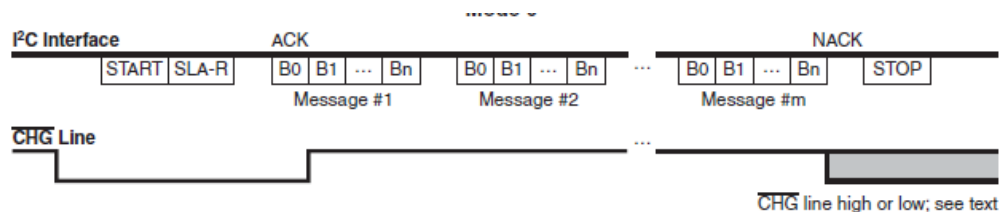


8.2.3. Touch event output

The INT line is an active-low, open-drain output that is used to alert the host that a new message is available in the Message Processor object. This provides the host with an interrupt-style interface with the potential for fast response times. It reduces the need for wasteful I2C-compatible communications.

The INT line remains low as long as there are messages to be read. The host should be configured so that the INT line is connected to an interrupt line that is level-triggered. The host should not use an edge-triggered interrupt as this means adding extra software precautions.

The INT line should be allowed to float during normal usage. This is particularly important after power-up or reset.



CHG Line = INT line

9. Recommended Setting and Initialization Flow for Reference

9.1. Touch Controller Setting

TBD

10. Quality Assurance

10.1.Purpose:

The purpose of this specification is to establish the cosmetic standards for inspection and measurement of a OSD TFT & Touch Panel & Cover Glass Sub-Assembly.

10.2. Scope

This specification applies to all TFT & Touch Panels & Cover Glass Sub-Assemblies built by OSD and should be used as the inspection guideline for quality control. The individual drawing specification will have priority if this document conflicts with the drawing.

10.3.Standard for Quality Test:

OSD performs the following tests to ensure the quality of product before shipment.

10.3.1. Sampling Plan:

ANSI / ASQC Z1.4-2008.

General inspection level II . Single sampling, normal inspection.

10.3.2. Sampling Criteria:

Visual inspection: AQL 1.0

Electrical functional: AQL 0.65

10.3.3. Reliability Test:

Detailed requirement refer to Reliability Test Specification.

10.4.Nonconforming Analysis & Disposition

10.4.1. Nonconforming analysis:

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

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

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

10.4.2. Disposition of nonconforming:

Non-conforming product over ppm level, OSD will offer corrective actions, not over PPM, OSD can offer FA if customer need. And the failures are confirmed to be OSD responsibility and within the shelf life of 1 year, they will be replaced.

10.5.Agreement Items

OSD and customer shall negotiate if the following situation occurs:

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

10.5.2. Additional requirement to be added in product specification.

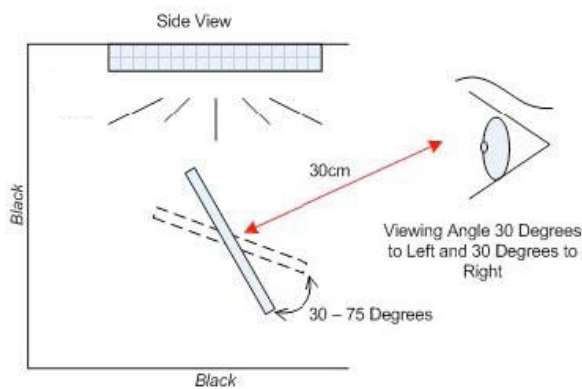
10.5.3. Any other special problem.

10.6.Standard viewing conditions:

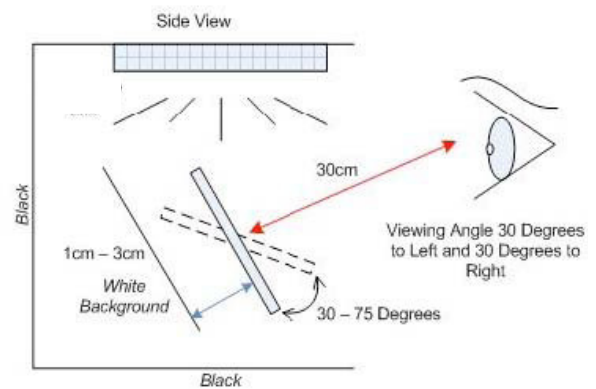
For the purpose of cosmetic inspection, all OSD touch panels are to be clean, dry and viewed under the following conditions:

- 10.6.1. Lighting: Daylight or cool white fluorescent lighting approximately from 70 to 140 foot-candles (approximately equal to 750 to 1500 Lux). Lighting should be diffused so that shadow is not a factor.
- 10.6.2. Distance: 12 inches (approximately equal to 30~40 cm) from the eyes.
- 10.6.3. Inspection Time: 10 seconds per surface for a touch panel and/or cover glass assembly.
- 10.6.4. Inspector qualification: Inspection must be made by an individual with 20/20 or corrected to 20/20 vision with color discrimination capability.
- 10.6.5. Parts shall not be manipulated to reflect a single light source in order to accentuate surface flaws. Parts shall be viewed without directly reflecting a light source.
- 10.6.6. Please refer below photos for the inspection environment.

Black Booth or Black Background



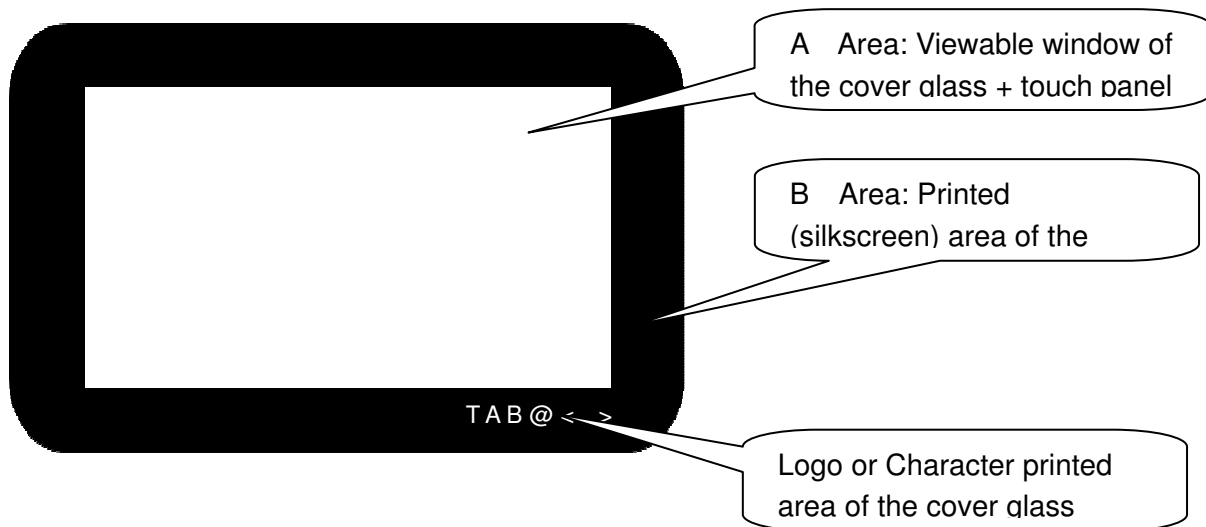
White Background



10.7. Cosmetic Specifications and Acceptance Criteria Guidelines

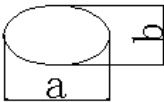
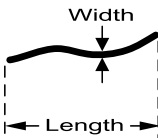
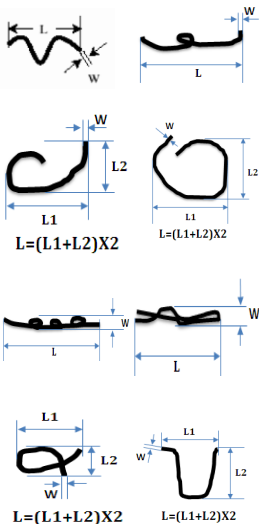
- 10.7.1. Defects must be found at Incoming Quality Control (IQC), prior to non-OSD cover glass (faceplate) or TFT display bonding, or before final manufacturing assembly.
- 10.7.2. Bubbles or contamination outside the viewing area are acceptable. These anomalies do not impact functionality, performance or long term reliability.
- 10.7.3. Bubbles between TFT/cover glass/sensor and protective film are acceptable. These anomalies do not impact functionality, performance or long term reliability.
- 10.7.4. If a surface blemish or defect can be wiped off easily, removed by cleaning or blown away using a compressed air gun, the touch panel is acceptable.
- 10.7.5. Blemishes or defects on the touch panel back side that are not visible from the front are acceptable. These anomalies do not impact performance, functionality or long term reliability.
- 10.7.6. Glass chips that do not impact functionality, performance or long term reliability and only observed from the back side are acceptable.
- 10.7.7. Glass cracks or fractures are not acceptable. This is a defect.
- 10.7.8. The FPC/PCBA refer to the IPC-A-610 (class 2) or IPC-6013.


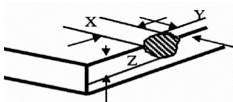

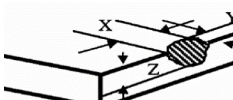

10.8. Product surface area definition

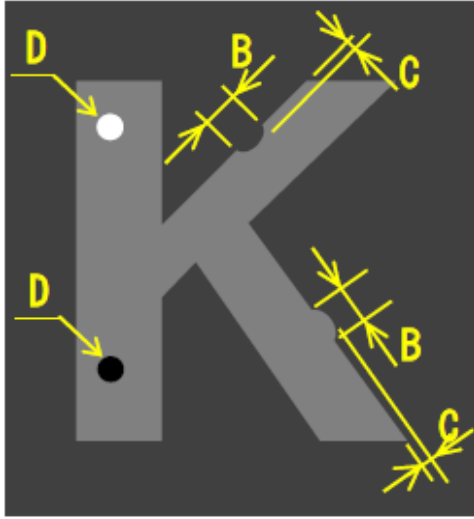
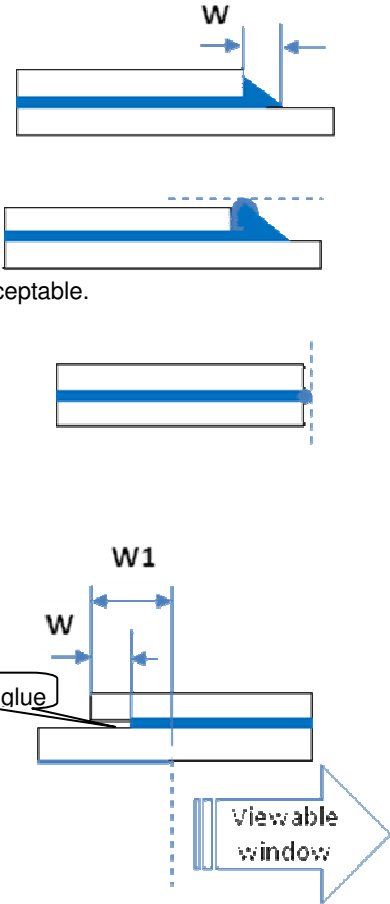



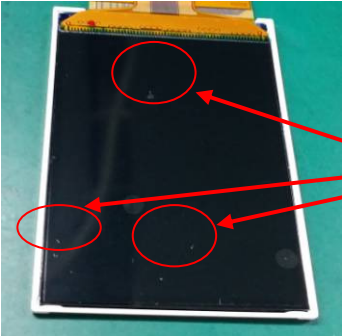

10.9. Inspection items and acceptance criteria

Visual defect

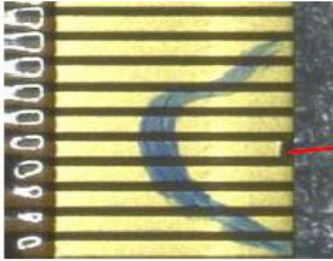
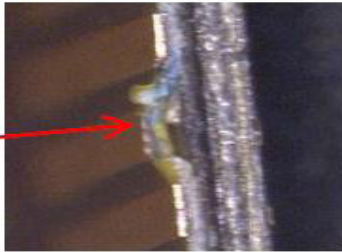
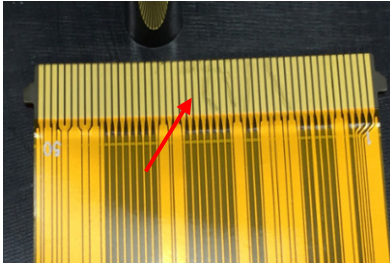
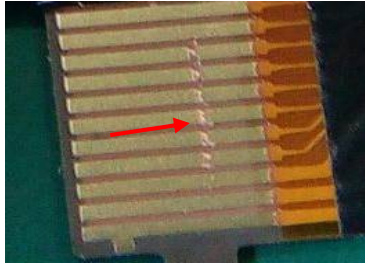
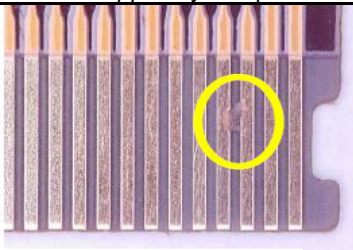
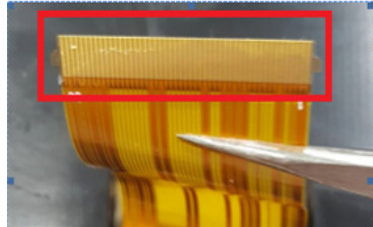
Item #	Inspection Item	Acceptance Criteria				
01	<div>Circular defect (Include contamination, black or white dots/spots, pin hole, bubble etc.)</div> <div></div> <div>Φ=(a+b) / 2</div>	1.9.1.1 A area circular defect:				
		Diameter Φ (mm)		Accept. qty. within A area	Minimum distance between blemishes	
		Dots or Spots	Φ ≤ 0.1	Ignored	/	
			0.1 < Φ ≤ 0.2	3	3 mm	
			0.2 < Φ ≤ 0.3	2	3 mm	
			Φ > 0.3	0	/	
		1.9.1.2 B area circular defect:				
		Diameter Φ (mm)		Accept. qty. within B area	Minimum distance between blemishes	
		Dots or Spots	Φ ≤ 0.1	Ignored	/	
			0.1 < Φ ≤ 0.3	4	3 mm	
Φ > 0.3	0		/			
02	<div>Linear fibers, scratches, etc.</div> <div></div> <div><div>Length ----L</div><div>Width ----W</div></div> <div></div>	Linear defects:				
		Length (mm)	Width (mm)	Accept. Quantity within A area	Accept. Quantity within B area	Minimum distance between blemishes
		Ignored	W ≤ 0.03 mm	Ignored		/
		L ≤ 5 mm	0.03 < W ≤ 0.05	4	3	3 mm
		L ≤ 5 mm	0.05 < W ≤ 0.10	3	2	3 mm
		L > 5 mm	W > 0.10	0	0	/
		Remarks:				
		a) Bubbles or contamination outside viewing area is acceptable.				
		b) It is acceptable if any above defects can be wiped off, or blown away by using a compressed air gun.				
		c) It is acceptable if any above blemish or defects only can be seen from the rear view (the blemish or defects can't be seen from the front view).				

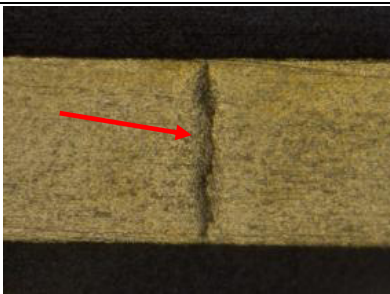


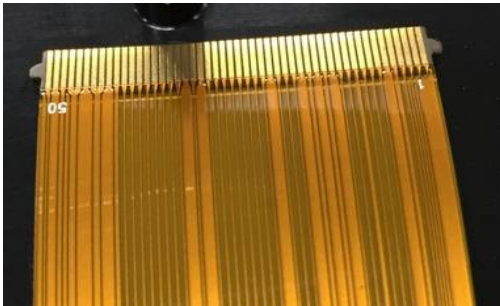
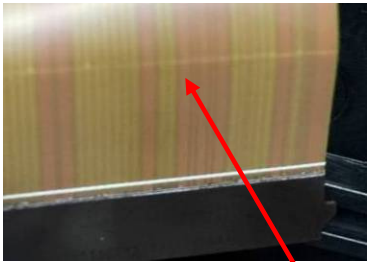
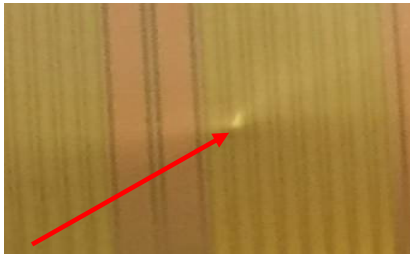
Item #	Inspection Item	Acceptance Criteria																																																
03	Polarizer bubble	<table><tr><th>Diameter Φ (mm)</th><th>Accept. qty. within A area</th><th>Minimum istance between blemishes</th></tr><tr><td>$\varphi \leq 0.2$</td><td>Ignored</td><td>/</td></tr><tr><td>$0.2 < \varphi \leq 0.5$</td><td>4</td><td>3mm</td></tr><tr><td>$0.5 < \varphi$</td><td>0</td><td>/</td></tr></table>	Diameter Φ (mm)	Accept. qty. within A area	Minimum istance between blemishes	$\varphi \leq 0.2$	Ignored	/	$0.2 < \varphi \leq 0.5$	4	3mm	$0.5 < \varphi$	0	/																																				
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$0.2 < \varphi \leq 0.5$	4	3mm																																																
$0.5 < \varphi$	0	/																																																
04	Dent	<table><tr><th>Diameter Φ (mm)</th><th>Accept. qty. within A area</th><th>Minimum distance between blemishes</th></tr><tr><td>$\varphi \leq 0.2$</td><td>Ignored</td><td>/</td></tr><tr><td>$0.2 < \varphi \leq 0.5$</td><td>4</td><td>3mm</td></tr><tr><td>$0.5 < \varphi$</td><td>0</td><td>/</td></tr></table>	Diameter Φ (mm)	Accept. qty. within A area	Minimum distance between blemishes	$\varphi \leq 0.2$	Ignored	/	$0.2 < \varphi \leq 0.5$	4	3mm	$0.5 < \varphi$	0	/																																				
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$0.2 < \varphi \leq 0.5$	4	3mm																																																
$0.5 < \varphi$	0	/																																																
05	Glass chips on the edge	<p>a) Chipping on the cover glass (faceplate):</p> <p>Surface of the Cover Glass: Very small chips on the surface, if any, will be regarded as dot blemishes and evaluated using the dot (circular) defect criteria.</p> <p>Edge of Cover Glass: Below are the criteria for faceplate chipping:</p> <div></div> <table><tr><th colspan="2">Chip on any other area – Front View</th><th colspan="2">Chip on corner – Front View</th></tr><tr><td>X and Y</td><td>Z</td><td>X and Y</td><td>Z</td></tr><tr><td>Ok $\leq 0.5\text{mm}$</td><td>Ok $\leq 1/2t$</td><td>Ok $\leq 0.5\text{mm}$</td><td>Ok $\leq t$</td></tr></table> <table><tr><th colspan="3">Chip on any other area – Rear View</th><th colspan="3">Chip on corner – Rear View</th></tr><tr><td>X</td><td>Y</td><td>Z</td><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Ok $\leq 1.5\text{mm}$</td><td>Ok $\leq 1.0\text{mm}$</td><td>Ok $\leq 1/2t$</td><td>Ok $\leq 1.0\text{mm}$</td><td>Ok $\leq 1.0\text{mm}$</td><td>Ok $\leq t$</td></tr></table> <p>b) Chipping on the Touch Sensor (Touch sensor glass) or TFT display:</p> <div></div> <table><tr><th colspan="3">Chip on edge</th><th colspan="3">Chip on corner</th></tr><tr><td>X</td><td>Y</td><td>Z</td><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Ok $\leq 4\text{mm}$</td><td>Ok $\leq 2\text{mm}$</td><td>Ok $\leq t$</td><td>Ok $\leq 4\text{mm}$</td><td>Ok $\leq 3\text{mm}$</td><td>Ok $\leq t$</td></tr></table> <p>Remarks: a. The variable t = thickness of glass.</p> <p>b. The touch panel top glass is bonded to the cover glass (faceplate). OSD will ensure that if there are glass chips, they are not visible from the front. Glass cracks or fractures are not acceptable.</p> <p>c. Edge chipping cannot be close to the ITO trace/PAD. Chipping if present will not impact function, performance or reliability.</p>	Chip on any other area – Front View		Chip on corner – Front View		X and Y	Z	X and Y	Z	Ok $\leq 0.5\text{mm}$	Ok $\leq 1/2t$	Ok $\leq 0.5\text{mm}$	Ok $\leq t$	Chip on any other area – Rear View			Chip on corner – Rear View			X	Y	Z	X	Y	Z	Ok $\leq 1.5\text{mm}$	Ok $\leq 1.0\text{mm}$	Ok $\leq 1/2t$	Ok $\leq 1.0\text{mm}$	Ok $\leq 1.0\text{mm}$	Ok $\leq t$	Chip on edge			Chip on corner			X	Y	Z	X	Y	Z	Ok $\leq 4\text{mm}$	Ok $\leq 2\text{mm}$	Ok $\leq t$	Ok $\leq 4\text{mm}$	Ok $\leq 3\text{mm}$	Ok $\leq t$
Chip on any other area – Front View		Chip on corner – Front View																																																
X and Y	Z	X and Y	Z																																															
Ok $\leq 0.5\text{mm}$	Ok $\leq 1/2t$	Ok $\leq 0.5\text{mm}$	Ok $\leq t$																																															
Chip on any other area – Rear View			Chip on corner – Rear View																																															
X	Y	Z	X	Y	Z																																													
Ok $\leq 1.5\text{mm}$	Ok $\leq 1.0\text{mm}$	Ok $\leq 1/2t$	Ok $\leq 1.0\text{mm}$	Ok $\leq 1.0\text{mm}$	Ok $\leq t$																																													
Chip on edge			Chip on corner																																															
X	Y	Z	X	Y	Z																																													
Ok $\leq 4\text{mm}$	Ok $\leq 2\text{mm}$	Ok $\leq t$	Ok $\leq 4\text{mm}$	Ok $\leq 3\text{mm}$	Ok $\leq t$																																													
06	Glass Crack	<p>Glass cracks or fractures are not acceptable.</p> 																																																

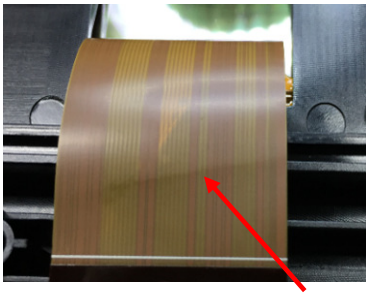

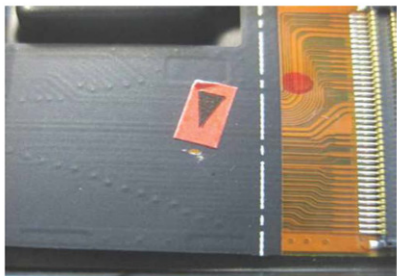

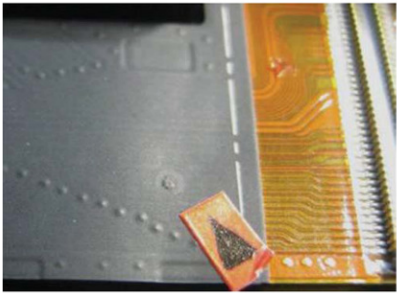
	Inspection Item	Acceptance Criteria
07	Logo print defects	<p>The logo print must be in focus and readable.</p>  <ul style="list-style-type: none"> a) Character : Slight or chip $B \leq 1/3$ of Line width $C \leq 1/3$ of Line width 1pc on 1 character is accepted b) Character: Thick or blur $B \leq 1/3$ of Line width $C \leq 1/3$ of Line width 1pc on 1 character is accepted c) Pin hole or Splash $D \leq 0.1\text{mm}$--- Ignored $0.1 < D \leq 0.3\text{mm}$---1pc on 1 character is accepted
08	Glue Defect	<ul style="list-style-type: none"> a) Exceed glue: <ul style="list-style-type: none"> 1) Width of exceed glue----W $W \leq 2\text{ mm}$ 2) The thickness of the exceed glue higher than smaller glass is unacceptable. 3) The exceed glue can't overstep to the edge of the glass. b) Missing glue: <ul style="list-style-type: none"> Width of missing glue----W Width of frame----W1 $W \leq 1/2 W1$ <p>Remarks: The large air bubble should be looked as missing glue and can't extend to viewable window.</p> 

09	Protective Film	<p>a) Protective film misalignment $\leq 2\text{mm}$ from edge should be acceptable.</p> <p>b) Protective film bubbles are acceptable.</p>  <p>Protective film bubbles ---Accept</p> <p>c) Protective film contamination: No impact the part surface under the protective film should be acceptable.</p>  <p>Protective film contamination ---Accept</p> <p>d) Protective film surface scratch: No hurt the part under the protective film should be acceptable.</p>  <p>Protective film surface scratch ---Accept</p> <p>e) Protective film broken to expose the part under the protective film, not allowed.</p>
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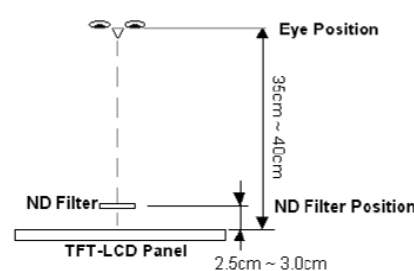
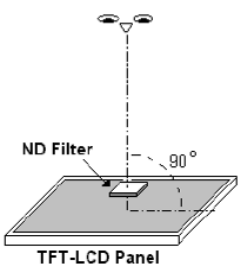
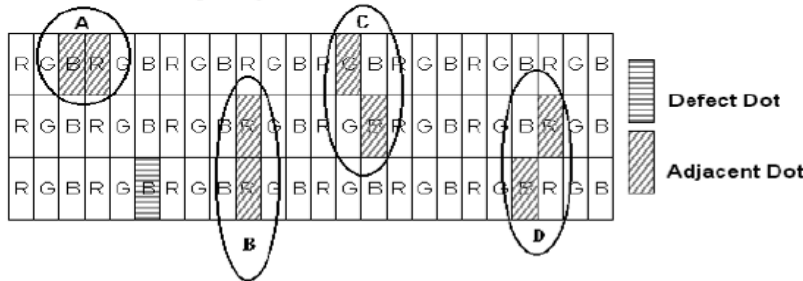
10). FPC Cosmetic Inspection Criteria:

1)	The tip of the terminal missing	  <p>Terminal missing and perk ---Not allowed</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Chip remain on the PIN</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>Debris on the remaining PIN</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>Terminal missing and perk</td><td>Not Allowed</td><td>Visual</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Chip remain on the PIN	Not Allowed	Visual	Debris on the remaining PIN	Not Allowed	Visual	Terminal missing and perk	Not Allowed	Visual
Item	Accept Qty	Remark												
Chip remain on the PIN	Not Allowed	Visual												
Debris on the remaining PIN	Not Allowed	Visual												
Terminal missing and perk	Not Allowed	Visual												
2)	Scratch on golden finger	  <p>Not copper exposed---Accept Copper exposed---Not allowed</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Scratches on the golden fingers but no copper layer exposed</td><td>Ignore</td><td>Check by 10 time Microscope</td></tr> <tr> <td>Damage the golden layer to make the copper layer exposed</td><td>Not allowed</td><td>Check by 10 time Microscope</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Scratches on the golden fingers but no copper layer exposed	Ignore	Check by 10 time Microscope	Damage the golden layer to make the copper layer exposed	Not allowed	Check by 10 time Microscope			
Item	Accept Qty	Remark												
Scratches on the golden fingers but no copper layer exposed	Ignore	Check by 10 time Microscope												
Damage the golden layer to make the copper layer exposed	Not allowed	Check by 10 time Microscope												
3)	Contamination or glue remained on the golden finger	  <p>Nonconductive particles remained---OK Glue remained on golden fingers--- Not Allowed</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Conductive contamination exist in PINs</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>No Moving nonconductive foreigner contamination between two pins</td><td>Ignore</td><td>Visual</td></tr> <tr> <td>Glue remained on the golden finger</td><td>Not Allowed</td><td>Visual</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Conductive contamination exist in PINs	Not Allowed	Visual	No Moving nonconductive foreigner contamination between two pins	Ignore	Visual	Glue remained on the golden finger	Not Allowed	Visual
Item	Accept Qty	Remark												
Conductive contamination exist in PINs	Not Allowed	Visual												
No Moving nonconductive foreigner contamination between two pins	Ignore	Visual												
Glue remained on the golden finger	Not Allowed	Visual												

4)	Circuit Crack	 <p>Circuit crack---Not Allowed</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Circuit crack</td><td>Not Allowed</td><td>Check by CCD or Microscope</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Circuit crack	Not Allowed	Check by CCD or Microscope
Item	Accept Qty	Remark						
Circuit crack	Not Allowed	Check by CCD or Microscope						
5)	Golden finger discoloration	<div>  <p>Golden finger no discoloration ---OK</p> </div> <div>  <p>Golden finger turns black ---NG</p> </div> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Golden finger discoloration</td><td>Copper exposure, turns black (as upper photo) is not allowed.</td><td>Check by 10 time Microscope</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Golden finger discoloration	Copper exposure, turns black (as upper photo) is not allowed.	Check by 10 time Microscope
Item	Accept Qty	Remark						
Golden finger discoloration	Copper exposure, turns black (as upper photo) is not allowed.	Check by 10 time Microscope						
6)	Scratches on FPC coverlayer	 <p>No copper layer exposed---Accepted</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Scratches on the coverlayer but no copper layer exposed</td><td>Ignore</td><td>Check by 10 time Microscope</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Scratches on the coverlayer but no copper layer exposed	Ignore	Check by 10 time Microscope
Item	Accept Qty	Remark						
Scratches on the coverlayer but no copper layer exposed	Ignore	Check by 10 time Microscope						
7)	FPC Crease	<p>Photos for dead fold:</p> <div>  </div> <div>  </div> <p>Coverlayer turns white--- Not Allowed</p>						

		<p>Photos for not dead fold:</p>   <p>Crease existed, but coverlayer not turns white---Accept</p> <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Dead fold</td><td>Not Allowed</td><td>FPC coverlayer will turns white for the dead fold parts, to check by 10 time microscope if need.</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Dead fold	Not Allowed	FPC coverlayer will turns white for the dead fold parts, to check by 10 time microscope if need.									
Item	Accept Qty	Remark															
Dead fold	Not Allowed	FPC coverlayer will turns white for the dead fold parts, to check by 10 time microscope if need.															
8)	EMI shielding Film (From IPC-A-600H 4.1.13)	<div>    </div> <p>图4113a</p> <p>图4113b</p> <p>图4113c</p> <p>Acceptable - Class 1,2,3 (可接受条件 - 1.2,3级)</p> <ul style="list-style-type: none"> • Voids, scratches or foreign material do not exceed 5 locations per side; • Voids, scratches or foreign material do not expose metal underneath the silver film (exposed coverlay underneath is acceptable); • Voids are less than 3.0 x 3.0 mm [0.118 x 0.118 in] in size; • The width of scratches does not exceed 1.5 mm [0.060 in], and their length does not exceed 50% of the length of the flexible printed board; • Touch up by black oil pen (see Figure 4113c); • 每面的空洞、划痕或外来夹杂物不超过5处； • 空洞、划痕或外来夹杂物未暴露银膜下的金属（暴露覆盖层可接受）。 • 空洞尺寸小于3.0x3.0mm[0.118x0.118in]； • 划痕宽度未超过1.5mm[0.060in]，且长度未超过挠性印制板长度的50%； • 用黑色油性笔进行修补（见图4113c）。 <table border="1"> <thead> <tr> <th>Item</th><th>Accept Qty</th><th>Remark</th></tr> </thead> <tbody> <tr> <td>Exceed 5 locations per side</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>Exposed metal underneath(Cu layer)</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>The diameter of voids exceeds 3.0mm.</td><td>Not Allowed</td><td>Visual</td></tr> <tr> <td>The width of scratches exceeds 1.5mm, or length exceeds 50% of the length of FPC.</td><td>Not Allowed</td><td>Visual</td></tr> </tbody> </table>	Item	Accept Qty	Remark	Exceed 5 locations per side	Not Allowed	Visual	Exposed metal underneath(Cu layer)	Not Allowed	Visual	The diameter of voids exceeds 3.0mm.	Not Allowed	Visual	The width of scratches exceeds 1.5mm, or length exceeds 50% of the length of FPC.	Not Allowed	Visual
Item	Accept Qty	Remark															
Exceed 5 locations per side	Not Allowed	Visual															
Exposed metal underneath(Cu layer)	Not Allowed	Visual															
The diameter of voids exceeds 3.0mm.	Not Allowed	Visual															
The width of scratches exceeds 1.5mm, or length exceeds 50% of the length of FPC.	Not Allowed	Visual															
9)	Other Failures	To sign the golden sample if need															

Electrical defect

Item #	Inspection Item	Acceptance Criteria														
01	Dot(Pixel Defect)	<table><tr><th>Defected item</th><th>Active area</th></tr><tr><td>Bright Dot</td><td>$N \leq 2$</td></tr><tr><td>Dark Dot</td><td>$N \leq 3$</td></tr><tr><td>Total Dot</td><td>$N \leq 4$</td></tr><tr><td>Two Adjacent Dot</td><td>$N \leq 1$</td></tr><tr><td>There or More Adjacent Dot</td><td>Not Allowed</td></tr><tr><td>Line Defect</td><td>Not Allowed</td></tr></table>	Defected item	Active area	Bright Dot	$N \leq 2$	Dark Dot	$N \leq 3$	Total Dot	$N \leq 4$	Two Adjacent Dot	$N \leq 1$	There or More Adjacent Dot	Not Allowed	Line Defect	Not Allowed
		Defected item	Active area													
		Bright Dot	$N \leq 2$													
		Dark Dot	$N \leq 3$													
		Total Dot	$N \leq 4$													
		Two Adjacent Dot	$N \leq 1$													
		There or More Adjacent Dot	Not Allowed													
		Line Defect	Not Allowed													
		Remark:														
		a. One pixel consists of 3 sub-pixels, including R,G and B dot(Sub-pixel=Dot)														
b. The defective area of the dot is larger than 50% of one sub-pixel area as one defect; less than 50% of one sub-pixel area will be not made as one failure.																
c. Bright dot is defined through 5% transmission ND filter as following:																
<div></div>																
d. Judge defect dot and adjacent dot as following. Allow below (as A, B, C and D status) adjacent defect dots, including bright and dark adjacent dot. And they will be counted as 2 defect dots in total quantity.																
<div></div>																
Defects on the Black Matrix, out of Display area, are not considered as a defect or counted.																
02	Electrical Defect	<p>The below defects must be rejected.</p> <ol style="list-style-type: none">1) Missing vertical / horizontal segment,2) Abnormal Display.3) No function or no display.4) Current exceeds product specifications.5) LCD viewing angle defect.														

		6) No Backlight. 7) Dark Backlight. 8) Touch Panel no function.
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10.10. Identification/marketing criteria:

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

10.11. Packing:

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

Modules inside package box should have compliant mark.

All direct package materials shall offer ESD protection.

11. Reliability Specification

Item	Condition	Cycle Time	Quantity	Remark
High Temp. Operation Test	+70 °C	96hrs	8pcs	
Low Temp. Operation Test	-20 °C	96hrs	8pcs	
High Temperature and High Humidity(operation)	Ta=+50 °C, 90%RH	96 hrs	8pcs	
Thermal Shock Test	-30°C (30min) → +80 °C (30min)	10cycles	5pcs	
Laminative load test (for packaging)	First place the sample carton on a plane, then load the standard weight object on the top of the sample carton, finally observe the status of the sample carton	24 hrs	One inner carton	Refer to OSD WI Document, WI-Q4 L-0196
Packing Drop test (for packaging)	1 drop on a corner, 1 drop on three arris, 1 drop on six sides	1time	One inner carton	
ESD(On Final Product)	150pF,330Ω,±4KV contact test 150pF,330Ω,±8KV air	10times	5pcs	*4

- Note:**
- For humidity test, DI water should be used.
Inspection Standard: Inspect after 1-2hrs storage at room temperature, the sample shall be free from the following defects:
 - Air bubble in the LCD
 - Seal Leakage
 - Non-display
 - Missing Segment
 - Glass Crack
 - IDD is greater than twice initial value.
 - Others as per QA Inspection Criteria
 - No defect is allowed after testing.
 - ESD should be applied to LCD glass panel, not other areas (such as on IC and so on)
IDD should be within twice initial value.
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.
 - For the item in end product, the test should be implemented by customer.

12. Precautions and Warranty

12.1. Safety

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

12.2. Handling

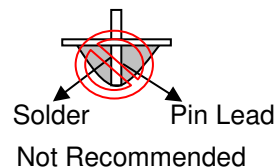
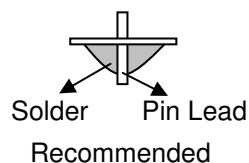
- 12.2.1. Reverse and use within ratings in order to keep performance and prevent damage.
- 12.2.2. Do not wipe the polarizer or LENS with dry cloth, as it might cause scratch. If the surface of the LCD needs to be cleaned, wipe it swiftly with cotton or other soft cloth soaked with petroleum IPA, do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

12.3. Storage

- 12.3.1. Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 10 °C and 30 °C, and keep the relative humidity between 40%RH and 70%RH.
- 12.3.2. Store them in a sealed polyethylene bag. If properly sealed, there is no need for the desiccant
- 12.3.3. Store them with no touch on surface by the anything else. It is recommended to store them as they have been contained in the inner container at the time of delivery from us.

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

- 12.4.1. Pins of LCD and Backlight
 - 12.4.1.1. Solder tip can touch and press on the tip of Pin LEAD during the soldering
 - 12.4.1.2. Recommended Soldering Conditions
 - Solder Type: Sn96.3~94-Ag3.3~4.3-Cu0.4~1.1
 - Maximum Solder Temperature: 370 °C
 - Maximum Solder Time: 3s at the maximum temperature
 - Recommended Soldering Temp: 350±20 °C
 - Typical Soldering Time: ≤3s
 - 12.4.1.3. Solder Wetting



12.4.2. Pins of EL

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

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

12.4.2.3. Recommended Soldering Conditions

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

Recommended Solder Temperature: 270~290 °C

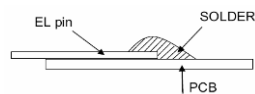
Typical Soldering Time: ≤2s

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

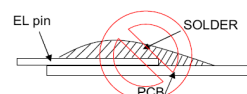
12.4.2.4. No horizontal press on the EL leads during soldering.

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

12.4.2.6. Solder Wetting

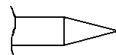


Recommended

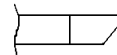


Not Recommended

12.4.2.7. The type of the solder iron:

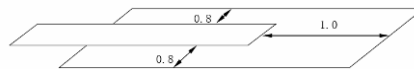


Recommended



Not Recommended

12.4.2.8. Solder Pad



12.5.Operation

- 12.5.1. Do not drive LCD with DC voltage
- 12.5.2. Response time will increase below lower temperature
- 12.5.3. Display may change color with different temperature
- 12.5.4. Mechanical disturbance during operation, such as pressing on the display area, may cause the segments to appear “fractured”.

12.6.Static Electricity

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

12.7.Limited Warranty

12.7.1. Unless agreed between OSD and the customer, OSD will replace or repair any of its LCD modules which are found to be functionally defective when inspected in accordance with OSD LCD acceptance for a period of one year from date of production. Cosmetic/ Visual defects must be returned to OSD within 90 days of shipment. Confirmation of such date shall be based on data code on product. The warranty liability of OSD limited to repair and/or replace on the terms set forth above. OSD will not be responsible for any subsequent or consequential events.

12.8.Scrap

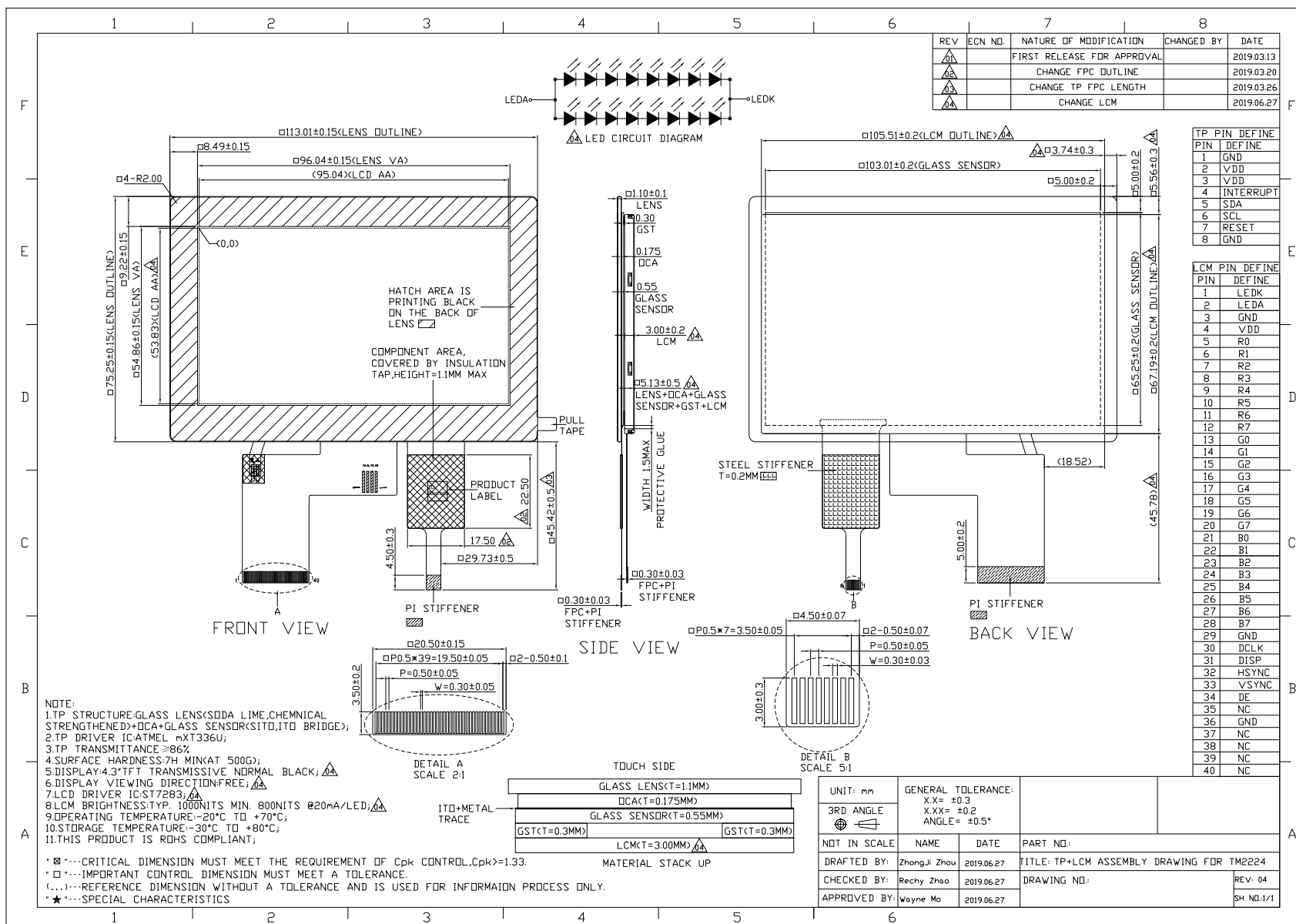
For environment consideration, in case you scrape this product, follow a disposal standard of industrial waste that is legally valid in the community, country or territory where you reside, or consult a professional consultant for handling. Don't attempt to disassemble the product, or throw it away with other wasted material.

13. Packaging

TBD



14. Outline Drawing



Reference

Item	Description	Revision
MXT336U	Capacitive full resolution touch screen controllers	CX
SC7283	TFT driver IC	CX