



KEYTEC, INC.

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Resistive Touch Screen Specifications

(4-wire, 5-wire and Matrix)

Revision: 090810

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1. Specification

1.1 Environment Conditions

Operating Temperature & Humidity	-20°C - +70°C, < 90 %RH
Storage Temperature & Humidity	-30°C - +80°C, < 90 %RH

1.2 Mechanical

Operation Force	10-80 g			
Operation Durability	Pen Hitting Durability		3,000,000 min.	
	Pen Sliding Durability		100,000 min.	
Optical	Transparency	>80%	Haze	<3%
Hardness	> 3 H			
Capacitance	< 5 nF			

1.3 Electrical

Max. Voltage	5V DC		
Max. Current	Top Layer	35mA	
	Bottom Layer	35mA	
Loop Resistance	Depending on the Active Area Size		
Insulation Impedance	>10MΩ (DC25V)		
Linearity	< 1.5%		
Chattering Time	< 15ms		

1.4 Structure and Dimensions

1.4.1. **Shape and Dimensions:** As specified in drawings.

1.4.2. **Structure, and Area Definition:**

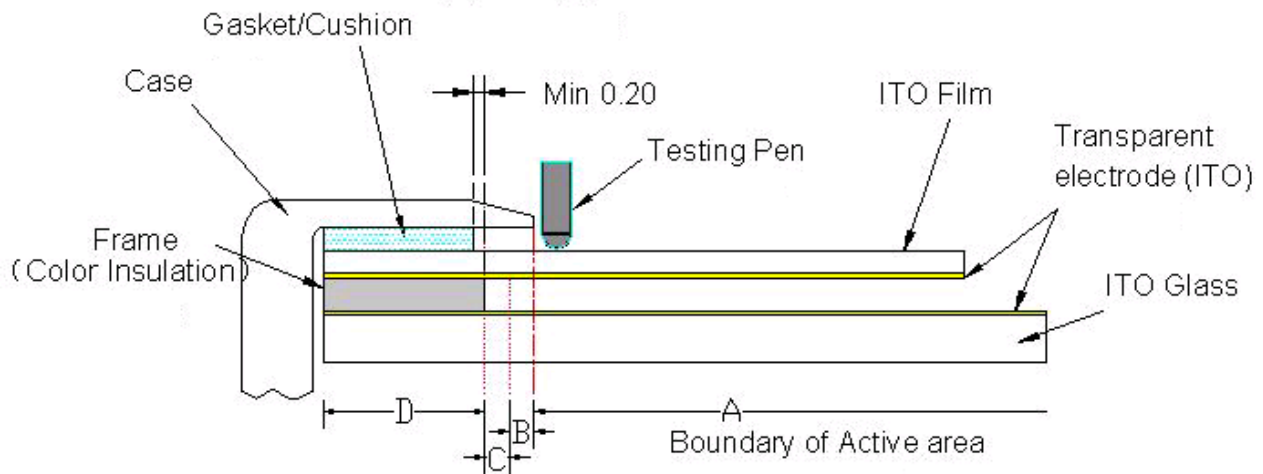


Figure 1.

Area-(A) : Active Area

Within this area, the touch screen can perform all the characteristics as specified in 1. without deviations.

Area-(B) : Sensitive Area

This area is defined as a 0.5-mm (finger touch) or 1.5-mm (pen slide) wide border around the boundary of the active area (Area A). Pressing in this area is not recommended as it will significantly degrade the touch screen's performance and durability. For example: the pen sliding durability can reduce from 100,000 strokes to 10,000 strokes. The operation force required to activate the touch screen is also increased by 100% in this area.

Area-(C) : Prohibited Area

This area is defined as a 0.5-mm (finger touch) or 1.5-mm (pen slide) wide border around the boundary of the sensitive area (Area B). Pressing in this area can instantly cause permanent damage to the touch screen, and such damage is not covered under warranty.

Area-(D) : Non-Active area (Frame)

This is the insulation area. Touch screen does not respond to the touch in this area.

Since pressing in the areas of B and C can cause the micro cracking of ITO coating on the film and result in either permanent damage or shortening the life time of the product, it is strongly recommended the touch screen be installed with the following protections (as shown in Figure 1):

1. Add gasket (foam) material around the touch screen border. The width of the gasket should be slightly smaller than the width of insulation area (D).
2. The housing case or front bezel should extend to the edge of the active area (A), so the areas B and C are protected.

The gasket should be about 0.2 to 0.3 mm thick. If it is too thin, the edge of the housing case or front bezel may touch the active area and cause shorts. If it is too thick, it will affect the appearance of the product.

2. Testing Condition

2.1 Scope

The standard testing environment is at $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$, $65\%\text{RH} \pm 10\%\text{RH}$ and 860 hPa to 1060hPa.

2.2 Mechanical

2.2.1 Hitting Durability

Matrix & 4-wire Resistive Type: Hitting more than 3million times with 250g force and 2 times/sec frequency by $\phi 2\text{mm}$ 60° rubber testing pen. No failure after the testing cycle.

5-wire Resistive Type : Hitting more than 35 million times with 250g force and 2 times/sec frequency by $\phi 2\text{mm}$ 60° rubber testing pen. No failure after the testing cycle.

2.2.2 Pen Sliding Durability

(Note: The testing area is at least 3mm inside from the boundary of active area.)

4-wire Resistive Type : Sliding more than 100 thousand times with 250g force and 60mm/sec frequency in the same position(10-100mm) by $\phi 2\text{mm}$ soft-tip pen. No failure after the testing cycle.

5-wire Resistive Type: Sliding more than 1million times with 250g force and 60mm/sec frequency in the same place (10-100mm) by $\phi 2\text{mm}$ soft-tip pen. No failure after the testing cycle.

2.2.3 Operation Force 10-80 g ($\phi 2\text{mm}$ soft-tip pen) Operation force required by finger touch depends on the size of fingertip.

2.2.4 Impact Resistance

Testing condition

No glass break when 64g, $\phi 25.4\text{mm}$ steel ball is dropped vertically on the center of panel surface from a specified height. The height is set at 12-80cm depending on the thickness of the glass (0.7 – 3.0 mm).

2.2.5 Static Load Resistance

Testing condition

No glass break or crack after pressing the product vertically on the center of the panel surface with specified force by $\phi 15\text{mm}$ testing pen. The force is set at 8-20 kg/cm^2 depending on the thickness of the glass (0.7 – 3.0mm).

2.2.6 Tail Cable Pulling Test

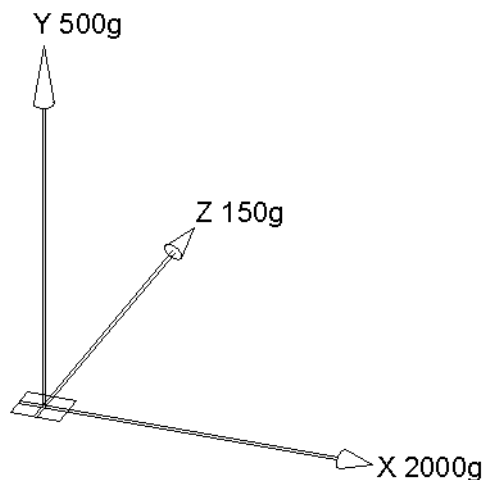


Figure 2

X direction: 2000g (pulling by 180°)

Y direction: 500g (pulling upward by 90°)

Z direction: 150g (pulling vertically with x and y direction)

No failure after pulling test.

2.2.7 Tail Cable Bending Test

Bend 3 times or more by radius of 1mm. No failure after bending test.

2.2.8 Vibration Resistance

In operating condition: Tested at 2 m/s^2 acceleration, 10 Hz to 55 Hz (1 min.) vibration for 30 min. in each direction of X, Y, Z. No failure after vibration test.

In storage condition: Tested at 20 m/s^2 acceleration, 10 Hz to 55 Hz (1 min.) vibration in each direction of X, Y, Z. No failure after vibration test.

2.2.9 Package Drop Test

Drop the package with larger side facing the ground twice from 80-cm height – upside up and upside down. No damage to the product after dropping test.

2.3 Electrical

2.3.1 Loop Resistance

Matrix Type: Press on the both ends of circuit loop by multimeter's testing pen (5V) for the max loop resistance. (Note: The tested circuit loop should be the longest and the thinnest loop circuit)

Analog Type: Press on the end of circuit loop by multimeter's probe (5V). Test the loop resistance for each layer.

2.3.2 Insulation Impedance

Method one

Use the High Voltage Testing Machine. Press testing jig on the end of the tail. Make sure that the value of insulation impedance stays at more than $10 \text{ M}\Omega$. (The tester's screen will appear "pass".)

Method two

Press on the end of the tail by insulating meter's probe (25V). Test the insulation impedance of the product. Make sure that the insulation impedance stays at more than $10 \text{ M}\Omega$.

2.3.3 Linearity (For Analog Type only)

Use Linearity Testing Instrument. Make sure that the deviations should be less than 1.5%.

2.4 Appearance Inspection Criteria

2.4.1 Scope

The products are visually inspected under specified conditions to identify any cosmetic defects.

Inspection condition

The products are Inspected under a lighting source of 12-20 W cool white color of fluorescent light at a distance of 400-500mm from the product. A black-color board is placed under the product as a background. The inspector is looking at the product from 300-400-mm distance at 45-degree angle. Inspection time is about 10 sec for each piece.

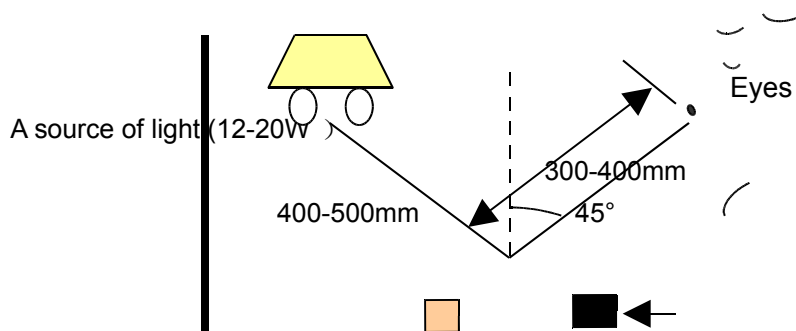


Figure 3

2.4.2 Dot-like Foreign Matter

(D=diameter; L=length; W=width; GT=glass thickness)

CRITERIA	JUDGMENT
$D < 0.1\text{mm}$	Ignore
$0.1\text{mm} \leq D \leq 0.15\text{mm}$	<p>If the object is at least 10mm in distance away from any other foreign object - ignored.</p> <p>If the object is within 10mm in distance from any other foreign object - maximum 2 objects are allowed.</p> <p>If there are more than 2 objects found within 10 mm – reject.</p>
$D > 0.15\text{mm}$	Reject

2.4.3 Linear Foreign Matter

CRITERIA	JUDGMENT
$W < 0.025\text{mm}$	Ignore
$0.025\text{mm} \leq W \leq 0.035\text{mm}$	<p>If $L \leq 2\text{mm}$ and the object is at least 10mm in distance away from any other foreign object - ignored.</p> <p>If $L \leq 2\text{mm}$ and the object is within 10mm in distance from any other foreign object - maximum 2 objects are allowed.</p> <p>If there are more than 2 objects found within 10 mm – reject.</p>
$0.035\text{mm} < W < 0.05\text{mm}$	<p>If $L < 1.5\text{mm}$, the object is at least 10mm in distance away from any other foreign object – ignored.</p> <p>If $L < 1.5\text{mm}$, the object is within 10mm in distance away from any other foreign object - maximum 2 objects are allowed.</p> <p>If there are more than 2 objects found within 10 mm – reject.</p>
$W > 0.05\text{ mm}$	Reject

2.4.4. Chip and Crack

Corner fragment – $X \leq 3.0$ mm, $Y \leq 3.0$ mm, $Z \leq GT$ – ignored, except when

1. fragment is on the tail cable area – reject.
2. fragment is on the circuit area – reject.

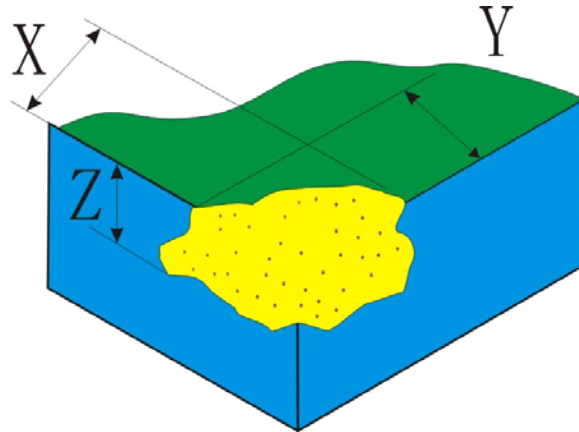


Figure 4

Side fragment – $X \leq 4.0$ mm, $Y \leq 2.0$ mm, $Z \leq GT$ – ignored, except when

1. fragment is on the tail cable area – reject.
2. fragment is on the circuit area – reject.

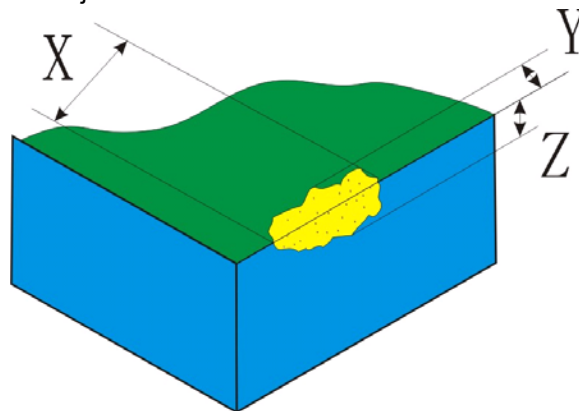


Figure 5

Progressive fragment – reject.

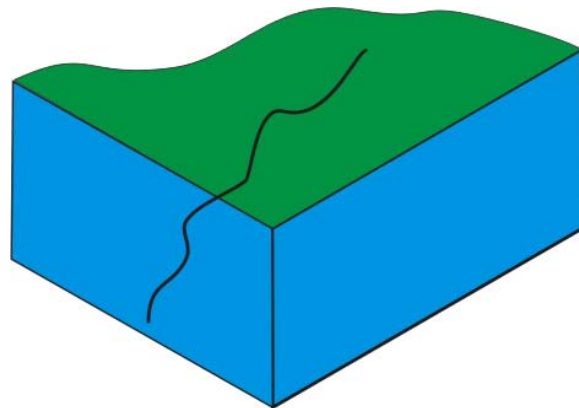


Figure 6

2.4.5 scratch

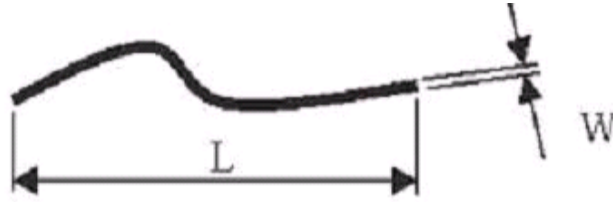


Figure 7

CRITERIA	JUDGMENT
$W < 0.03\text{mm}$	$L \leq 5\text{mm}$ – ignored
$0.03\text{mm} \leq W \leq 0.05\text{mm}$	<p>If $L \leq 5\text{mm}$ and the scratch is at least 10mm in distance away from any other scratch or foreign object – ignored.</p> <p>If $L \leq 5\text{mm}$ and the scratch is within 10mm in distance from any other scratch or foreign object – reject.</p> <p>$L > 5\text{mm}$ – reject.</p>
$W > 0.05\text{mm}$	Reject.

2.4.6 Fish Eye, Dent and Air Bubble

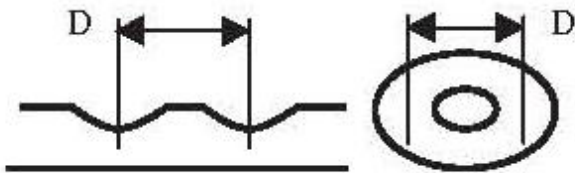


Figure 8

D(mm): average diameter = (Longest diameter + shortest diameter)/2

CRITERIA	JUDGMENT
$D \leq 0.2\text{mm}$	ignored
$0.2\text{mm} < D \leq 0.4\text{mm}$	Allow maximum 5
$0.4\text{mm} < D \leq 0.5\text{mm}$	Allow maximum 2
$W > 0.5\text{mm}$	Reject.

2.4.7 Newton's Ring:

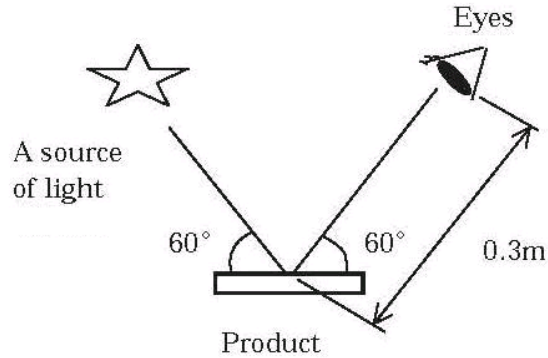


Figure 9

Visual inspection shall be done at a distance of 0.3 m between eyes and product with an angle of $60^\circ \pm 10^\circ$ to the surface of the product under a fluorescent light (40 W, natural color).

There are two types of Newton Rings

1. Regular type:

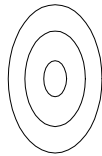


Figure 10

- A. When Newton ring' area is more than 1/3 of the touch screen's active area – reject.
- B. When Newton ring's area is less than 1/3 of the touch screen's active area, and it does not cause distortion on display's image – acceptable.
- C. When Newton Ring can cause distortion on display's image – reject.

2. Irregular type :

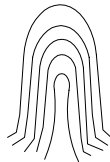


Figure 11

- A. When Newton ring' area is more than 1/2 of the touch screen's active area – reject.
- B. When Newton ring's area is less than 1/2 of the touch screen's active area, and it does not cause distortion on display's image – acceptable.
- C. When Newton Ring can cause distortion on display's image – reject.

3 Reliability Condition

3.1 Temperature condition

3.1.1 Temperature and Humidity resistance Test

After the sample is stored at 60°C, 90 %RH for 120 hours, it is stored at normal room temperature and humidity for 24 hours before testing. No failure in functional testing and no change in properties..

3.1.2 Heat Resistance

After the sample is stored at 70°C for 120 hours, it is stored at normal room temperature and humidity for 24 hours before testing. No failure in functional testing and no change in properties..

3.1.3 Cold Resistance

After the sample is stored at -20°C for 120 hours, it is stored at normal room temperature and humidity for 24 hours before testing. No failure in functional testing and no change in properties.

3.1.4 Thermal Shock

After the sample has completed 3 cycles at -20°C for 4 hours followed by 60°C for 4 hours (as shown in figure 12) , it is stored at normal room temperature and humidity for 24 hours before testing. No failure in functional testing and no change in properties.

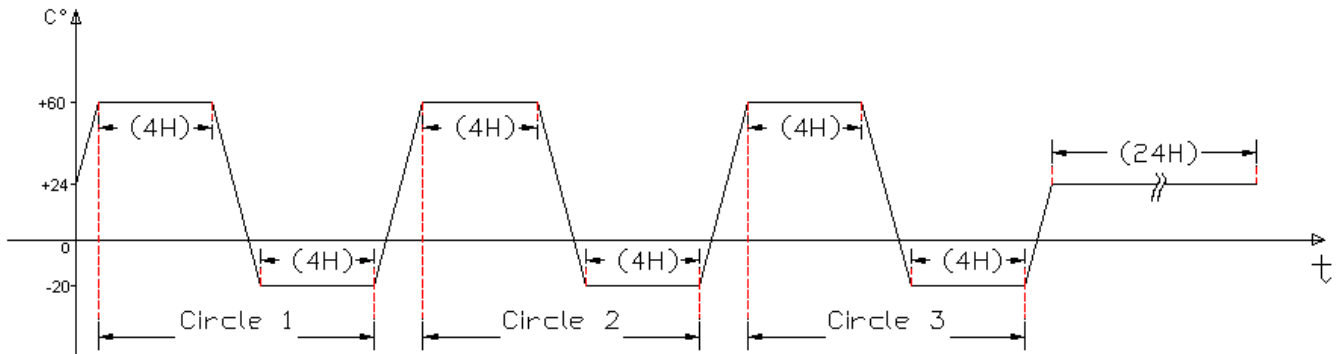


Figure 12

4 Precautions in use

In order to prevent misuse, damage and accident, please take the follow the precautions:

4.1 Storage

Store the products at the temperature and humidity within the range as defined in the specification. Do not store the products under direct sunlight or stresses.

4.2 Unloading

Handle the box with care. Do not drop the box. Always open the box from top.

4.3 Handling

Always wear clean finger cots, gloves when handling the touch screen panels. Only hold the portion outside the viewable area when handling the panel.

Do not handle the panel by holding the tail cable.

Do not put one panel on top of another without protective cushion in between.

Do not put any heavy, hard or sharp object on the panel.

4.4 Installing and Assembling

Do not apply excessive strain to the product.

Do not apply excessive stress to the tail cable.

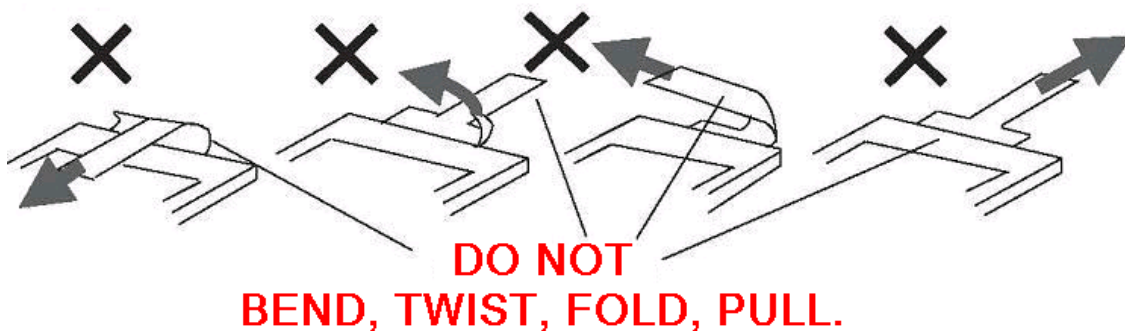


Figure 13

Do not adhere or mount any additional film or plate on the FPC tail cable as shown in below, because this may apply additional stress at elevated temperature which can weaken the bonding between the FPC and panel.

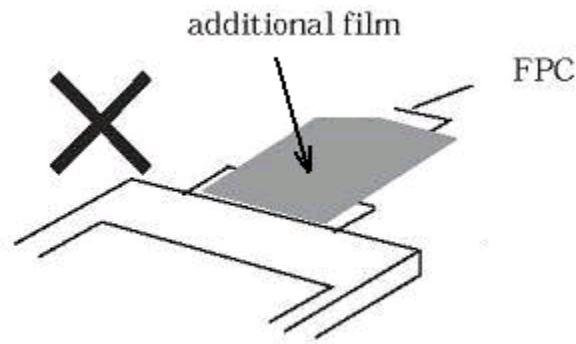


Figure 14

Do not apply any liquid to the edge of the panel.

Keep 0.2mm-0.5mm gap between touch panel and bezel when design the case in order to prevent the any force applied on the active area of the touch panel.

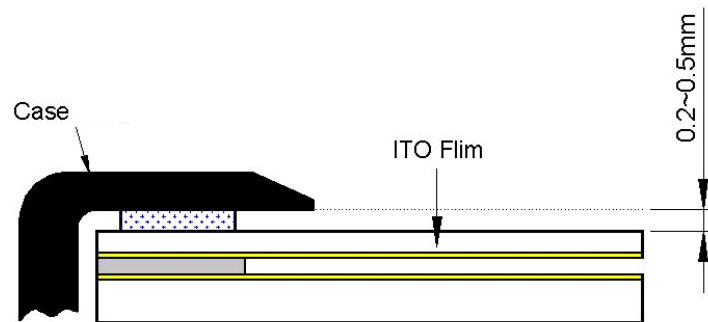


Figure 15

We recommend that bezel's opening edge cover the boundary of the active area by at least 0.5 mm (for finger touch) to 1.5 mm (for pen touch) when design the case in order to prevent the pressure applied at sensitive area which may cause serious damage to the transparent ITO electrode.

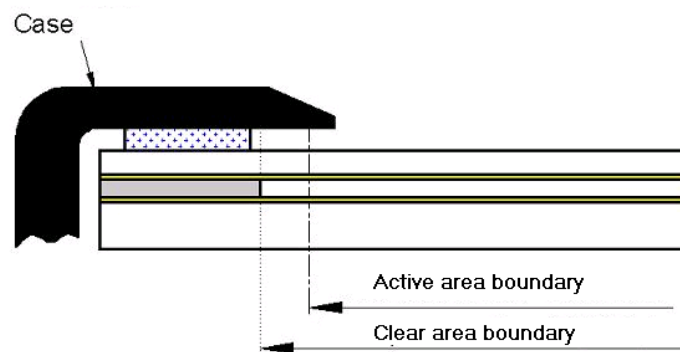


Figure 16

As described in 1.4.2., pressing in the “sensitive” area can cause micro cracking of ITO coating on the film and result in either permanent damage or shortening the life time of the product, it is strongly recommended the touch screen be installed with the following protections (as shown in Figure 17):

1. Add gasket (foam) material around the touch screen border. The width of the gasket should be slightly smaller than the width of insulation area.

2. The housing case or front bezel should extend to the edge of the active area, so the “sensitive” area is protected.

The gasket should be about 0.2 to 0.3 mm thick. If it is too thin, the edge of the housing case or front bezel may touch the active area and cause shorts. If it is too thick, it will affect the appearance of the product.

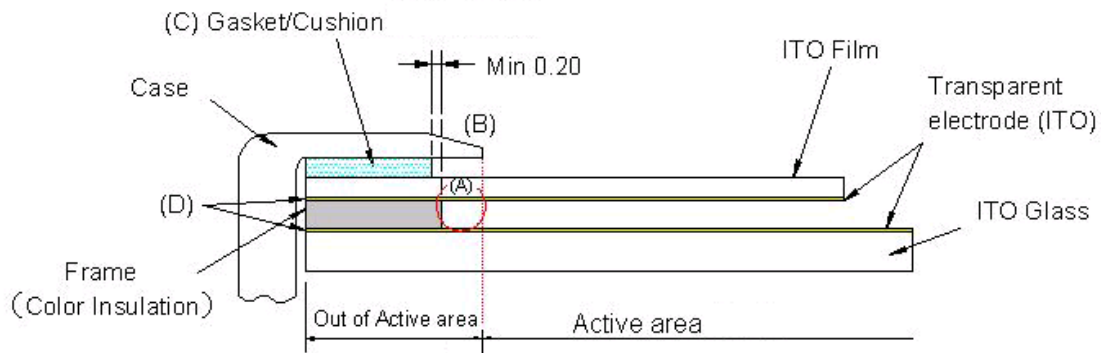


Figure 17

Do not apply excessive stress on touch screen by over tightening the case. This may cause the wavy surface and malfunctions.

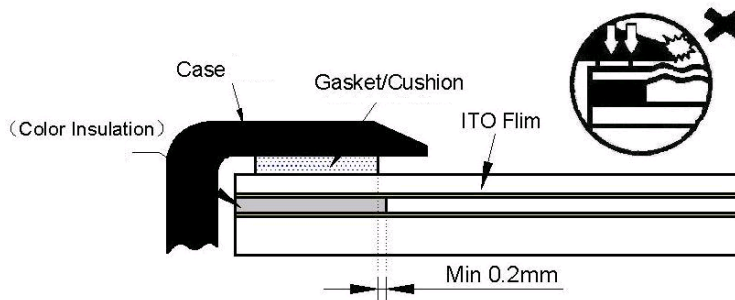


Figure 18

Do not use pen to press along the edges of touch screen.

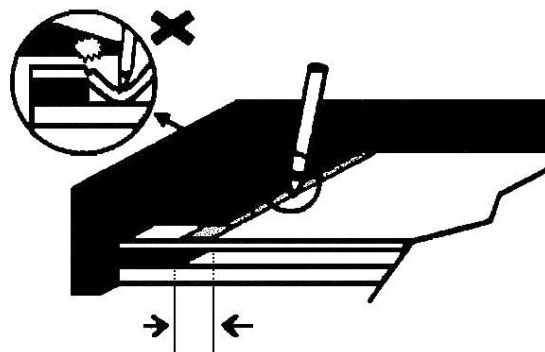


Figure 19

Do not contact the edges of touch screen with conductive material.

It is recommended to keep 0.2-0.3 mm clearance between the case and touch screen edge.

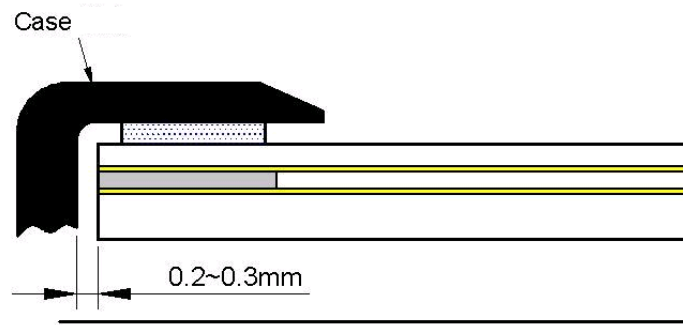


Figure 20

In order to avoid damage to FPC tail, it is necessary to keep minimum 2.0 mm between the case and tail exit area.

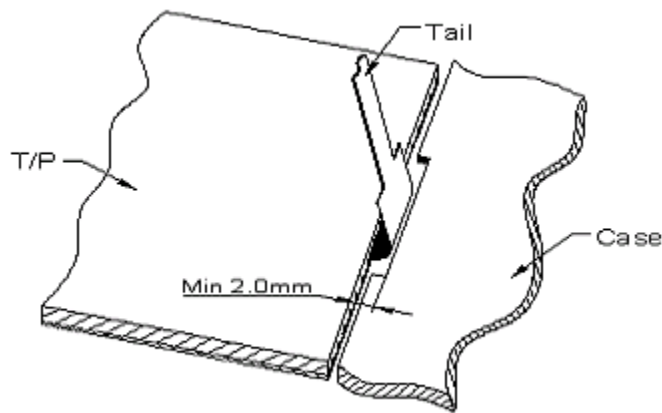


Figure 21

The edges of the case should never get in touch of the touch screen surface

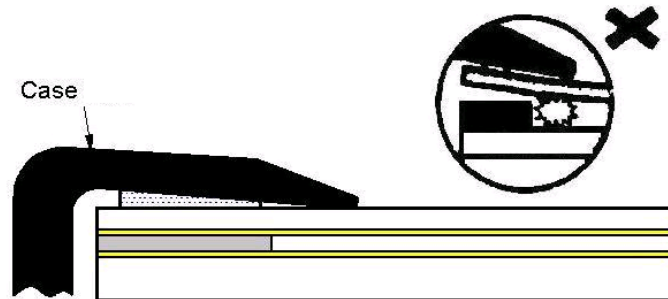


Figure 22

Do not spray any liquid directly to the screen. Clean the screen with soft cloth or paper towel dampened with cleaning solution, such as Windex, alcohol. Do not use strong and aggressive chemicals to clean the touch screen. Do not apply any liquid on the edges of the touch screen.