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Product	Model Name : 02517-00 Rev : 0 Size : 15.13"	Date Released : Nov. 09, 2011
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5 Wire Analog Resistive Touch Panel Specification
Manufacturer: Apex Material Technology Corp.

1.0 Mechanical Dimensions and Construction

1.1 General: Analog Resistive touch panel is laminated by ITO film to ITO glass.

1.2 Mechanical Performance:

1.2.1 Surface Hardness: 3H

1.2.2 ITO Glass Thickness: 2.80mm

1.2.3 Static force requires breaking the glass: >28kgf

1.2.4 Dynamic drop ball impact resistance: using 510g steel ball with 640mm height drop without breaking the glass.

1.2.5 Tail Type: FPC

1.2.5.1 Bending radius: R1.0mm

1.2.5.2 Bending endurance: 180deg for 10 times

1.2.5.3 Holding Force for Tail, Peeling upward 90deg with 500gw without impact to electric performance.

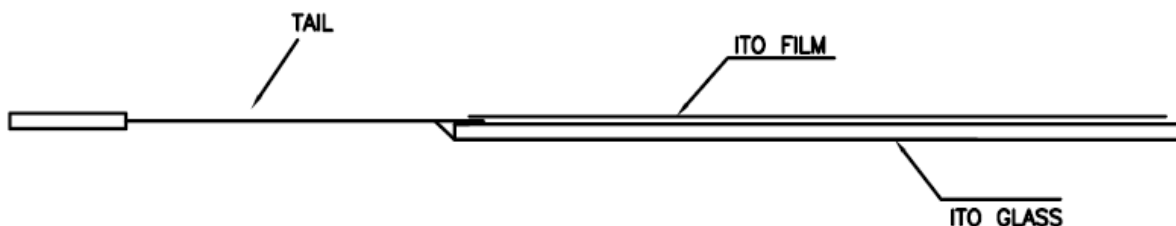
1.2.6 Surface Finish Type: Anti-glare

1.2.7 This model is with Anti-Newton Ring design.

1.3 Input Method and Activation Force

Input Method	Average Activation Force
R0.8mm Delrin stylus	Less than 1.00N
R8.0mm Silicone "finger"	Less than 1.00N

Touch panel side view:



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2.0 Typical Optical Characteristics

- 2.1 Visible Light Transmission: $81 \pm 3\%$
- 2.2 Haze: $9.5 \pm 4\%$

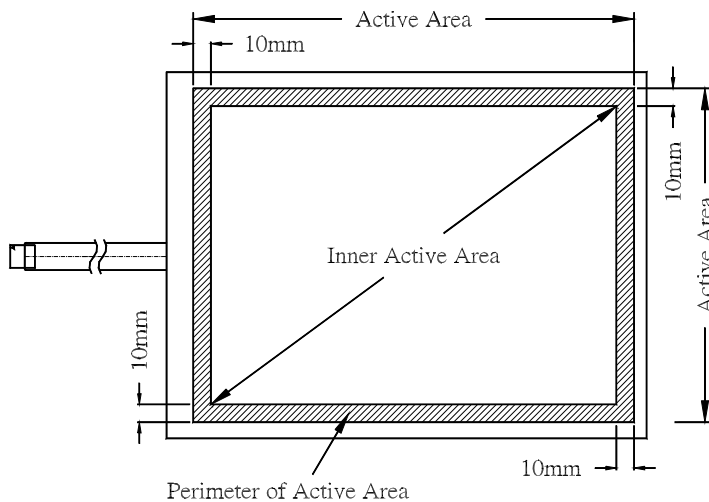
3.0 Electrical Specifications

- 3.1 Operating Voltage: 5.5V or less
- 3.2 Contact current: 70mA (maximum)
- 3.3 Circuit close resistance: 30~300Ω
- 3.4 Circuit open resistance: > 10MΩ at 25VDC
- 3.5 Contact bounce: < 10ms
- 3.6 Linearity Specifications:

The linearity specifications are based on PenMount touch panel controllers and drivers to define.

3.6.1 Inner Active Area: 10 mm inside of X and Y active area dimensions.

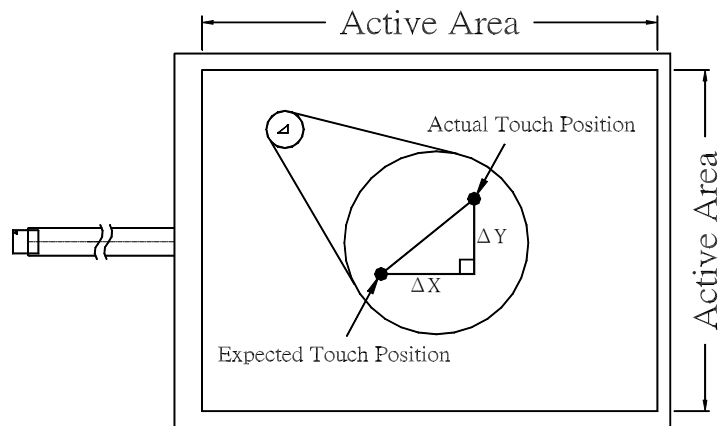
Perimeter of Active Area: The area 10 mm inside of X and Y active area dimensions.



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3.6.2 Calculate Linearity

$$\%Linearity = \frac{\sqrt{\Delta X^2 + \Delta Y^2}}{\text{Active Area Diagonal}} * 100$$



3.6.3 Linearity:

Inner Active Area: <1.0%

Perimeter of Active Area: <1.5%

3.7 Electrostatic Discharge Protection: (per EN 61000-4-2)

3.7.1 Air discharge: 15KV(maximum)

3.7.2 Contact discharge: 8KV(maximum)

3.8 Capacitance: 100nF (maximum)

3.9 Contact circuit resistance: < 2000ohms

4.0 Environmental Specifications

4.1 Operating Temperature: -20°C ~ +70°C

4.2 Storage Temperature: -40°C ~ +80°C

4.3 Humidity: limits to be at 90% RH at max 50°C

No dew condensation

4.4 Air pressure : 1080hPa ~ 660hPa



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5.0 Reliability Test

5.1 Exposure to high temperature

Touch panel is put into a test machine at the condition of 80°C for 504 hours. Then it is left at room temperature for 24 hours or more. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

5.2 Exposure to low temperature

Touch panel is put into a test machine at the condition of -40°C for 504 hours. Then it is left at room temperature for 24 hours or more. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

5.3 Exposure to constant temperature and humidity

Touch panel is put into a test machine at the condition of 60°C, 90%RH for 504 hours. Then it is left at room temperature for 24 hours or more. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

5.4 Thermal Shock

Touch panel is put into a test machine at the condition of -40°C for 30 minutes, and then 80°C for 30 minutes. The process is repeated by 50 cycles. Then it is left at room temperature for 24 hours or more. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

5.5 Vibration test

5.5.1 Vibration under Operation: Set frequency at 10~58Hz with 0.075mm amplitude and frequency at 58~500Hz with 1g amplitude; Test 10 cycles, test axis is +X, +Y, +Z

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axis; 1 octave / min.

5.5.2 Vibration under Storage: Set frequency at 5~9Hz with 3.5mm amplitude and frequency at 9~500Hz with 1g amplitude; Test 10 cycles, test axis is +X, +Y, +Z axis; 1 octave / min.

5.6 Shock test

5.6.1 Shock under Operation: The condition is set at 15g acceleration, half sine by 11ms shock. Test 3 cycles, test axis is +X, -X, +Y, -Y, +Z, -Z axis.

5.6.2 Shock under Storage: The condition is set at 25g acceleration, half sine by 6ms shock. Test 1000 cycles, test axis is +X, -X, +Y, -Y, +Z, -Z axis.

6.0 Durability test

6.1 Finger touches

6.1.1 Touch panel is hit 36 millions times with a silicone rubber of R8.0mm finger (see Fig.6-1), hitting rate is by 250g at 2 times per second. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

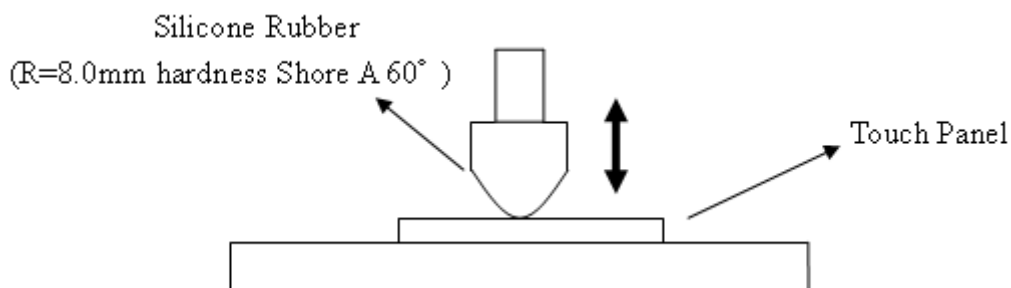


Fig. 6-1

6.1.2 Touch panel is hit 2 millions times with a silicone rubber of R8 finger, hitting rate is by 750g at 2 times per second. The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4

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- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

6.2 Stylus writing

Touch panel is drawn by R0.8mm Delrin stylus pen, at 250g forces, one inch by 200K times (see Fig.6-2). The measurement must satisfy the following:

- Circuit close resistance: as Sec. 3.3
- Circuit open resistance: as Sec. 3.4
- Contact bounce: as Sec. 3.5
- Linearity test: as Sec. 3.6

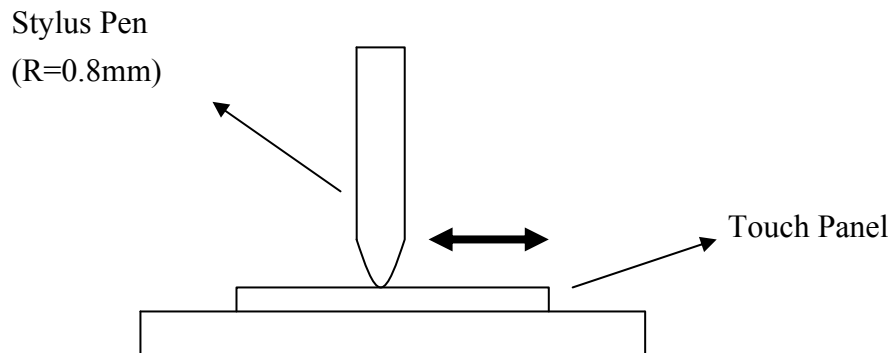


Fig. 6-2

7.0 Surface Chemical Resistance

Refer to AMT surface chemical resistance test method ASTD-001.

8.0 Integration Notes

8.1 Front Bezel

- 8.1.1 Recommend bezel opening close to the Active Area of Touch Panel.
- 8.1.2 The bezel must not touch the view area of the touch panel, utilize gasket to create a gap.

8.2 Front Gasket

- 8.2.1 Front gasket opening must be larger than the Adhesive Opening. This is to prevent the front gasket from accidental pressing on surface of touch panel active area when compressed.
- 8.2.2 Chose a elastic material for gasket e.g. PORON®
- 8.2.3 Not advisable using adhesive to bond the top surface of touch panel with the front bezel enclosure.



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9.0 Handling

- 9.1 Always store the touch panel in original packaging box under the recommended storage temperature and humidity range. The touch panel packaging is design to comply with 2A test rating based on ISTA series 2 Partial Simulation Performance Test Procedure.
- 9.2 Do not remove touch panel by the tail. When handle the product, we recommend to wear gloves and remove with care by rims of the glass.
- 9.3 When stacking the touch panels on top of each other, always use a buffer material between the touch panels. Do not touch the touch panel with sharp objects as this can cause scratch on the surface.
- 9.4 The touch panels are covered with protecting film to keep the surface of touch panel clean. Remove the protecting film before assembly. If the touch panel is store with protecting film attached for a period of time, the pressure sensitive adhesive of protecting film may stick to touch panel as stains.
- 9.5 For assembly precaution or other items not mentioned here, please refer to AMT's Integration Guide for system integration.

10.0 Optical Performance

- 10.1 Optical inspection method and optical defect standards refer to AMT document A001 updated version ; "Touch Panel Optical Quality Standard."
- 10.2 Outside to Viewing Area: any optical defects in this area need to be ignored if no touch panel function is affected.

11.0 Others

- 11.1 Always store the touch panel in its original shipping container under normal conditions (Temperature 20~25°C ; Humidity \leq 65%RH).
- 11.2 This Model is RoHS compliant.
- 11.3 UL Safety Certifications: The touch panels and PenMount controllers are UL recognized components as per report reference E331240.