



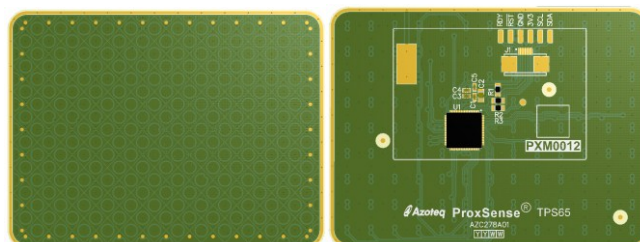
## ProxSense<sup>®</sup> Standard Trackpad Module Datasheet

Standard Capacitive Trackpads with XY Coordinate, Gesture Recognition & Patented Snap / Push Button Detection

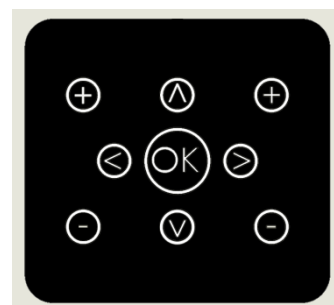
The ProxSense<sup>®</sup> series of standard capacitive trackpads offer best in class sensitivity, signal to noise ratio and power consumption. Automatic tuning for sense electrodes guarantees optimal operation over production and environmental change.

### Main Features

- Trackpad with on chip XY coordinate calculation
- 3584 x 2304 resolution
- 170Hz report rate
- Adjustable Sensitivity
- Proximity wake up from low power
- Automatic drift compensation
- 1 & 2 Finger Gesture Detection
  - Swipe
  - Tap
  - Pinch / Stretch
  - Gesture with Hold
- Fast I2C Interface
- Module Supplied With or Without Overlay & Snap
- Low Power, suitable for battery applications
- Supply voltage: 1.65V to 3.6V
- <40μA active sensing LP mode
- Direct Interface to BT audio IC



**RoHS2  
Compliant**



### Applications

- Micro Projectors
- Printers & White Goods
- Mechanical Push Button Replacement



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## Datasheet Revision History

Version	Description	Date
1.00	First Release	June 2015
1.01	Updated Ordering Information	September 2015



## 1 Hardware Description

All trackpad modules are constructed on RoHS2 and REACH compliant FR4 PCB material. The module PCBs are 1mm thick and have an OSP finish, with tinned pads for the user required solder points. The standard modules are not Halogen free.

**Table 1.1 Summary of Trackpad Offerings**

Module Name	Shape	Size	Touch IC	Resolution
<a href="#">TPS43</a>	Round	43mm x 40mm	IQS572	2048 x 1792
<a href="#">TPS65</a>	Round	65mmx 49mm	IQS550	3584 x 2304

**Table 1.2 Summary of Trackpad Overlay Offerings**

Module Name	Description	Stack-Up
Adhesive	3M Adhesive Supplied with Liner and Pull tab	<a href="#">A</a>
Mylar Overlay	1mm Mylar adhere to module with 3M double sided adhesive	<a href="#">B</a>
4mm Metal Dome for TPS43 only	Metal Dome sheet added on top of Isolation Film	<a href="#">C</a>
Printed Rubber Overlay for TPS43 only	1mm Black Overlay with Snap Keys	<a href="#">D</a>

### 1.2 PCB Specification

All 6 modules offered adhere to the following PCB specifications:

- Material: 2-layer, FR4 PCB (non-HF material)
- Conductor: 35µm Copper (1oz. Cu)
- Finish: OSP (tinned)
- Size: Module Specific
- PCB Final Thickness = 1.0mm +/- 10%
- Outline: Precision DIE-CUT Profile

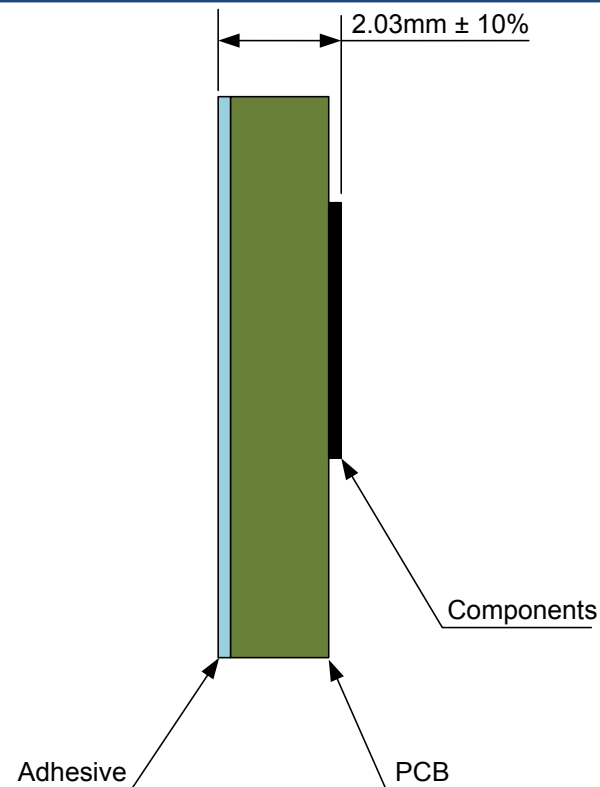
### 1.3 Adhesive Specification

All 6 modules offered are supplied with double sided adhesive applied on the trackpad for ease of integration. The adhesive is kept with the liner kept in place, with a pull tab for easy removal without tearing:

- Type: 3M 468 200MP
- Thickness = 0.13mm
- Liner = Polycoated Kraft Paper
- Liner w/ Pull-Tab (No glue on Pull-Tab)
- Adhesive sized to fit entire tracking area (module specific)

### 1.4 Stack-Up A Thickness

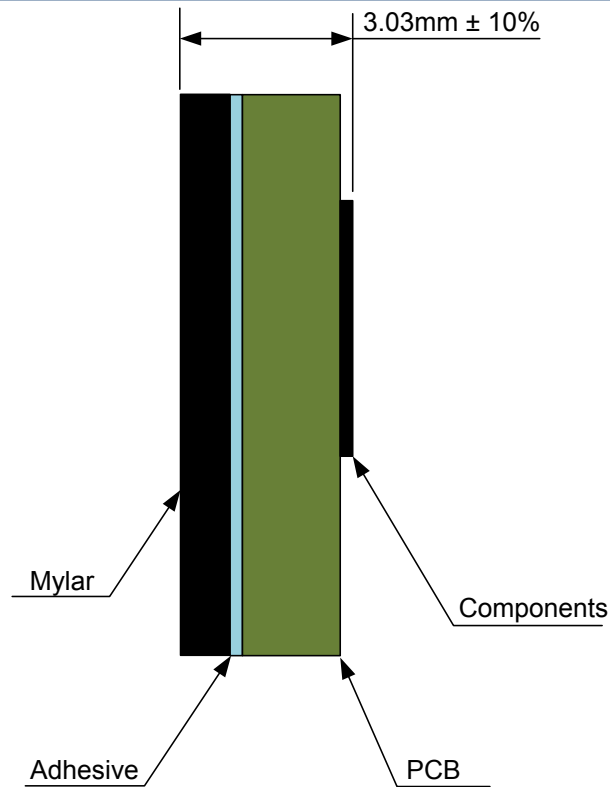
The total thickness given in Figure 1.2 does not include the protective liner on the adhesive, as this liner needs to be removed when the module is assembled into the application. The highest part (thickest part of the module) of the assembly is located at the 0603 capacitor – C2. Please refer to the module STEP file for a 3D drawing indicating component positions.



**Figure 1.1 Stack-Up (A) - Thickness. PCB + 3M Double Sided Adhesive.**

## 1.5 Stack-Up B Thickness

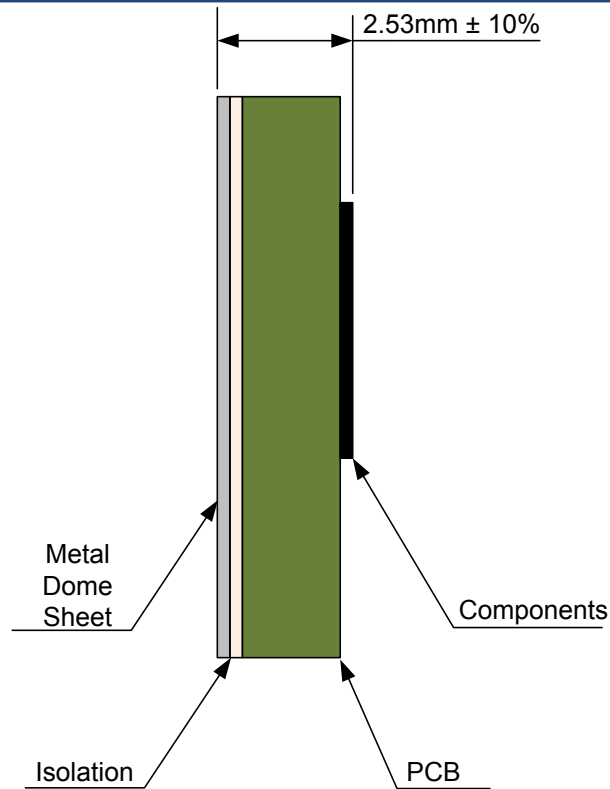
The total thickness given in Figure 1.2 includes the Mylar overlay, PCB and component heights. The highest part (thickest part of the module) of the assembly is located at the 0603 capacitor – C2. Please refer to the module STEP file for a 3D drawing indicating component positions.



**Figure 1.2 Maximum Module Thickness for Stack-Up B.  
PCB + 3M Double Sided Adhesive and Mylar Overlay.**

## 1.6 Stack-Up C Thickness

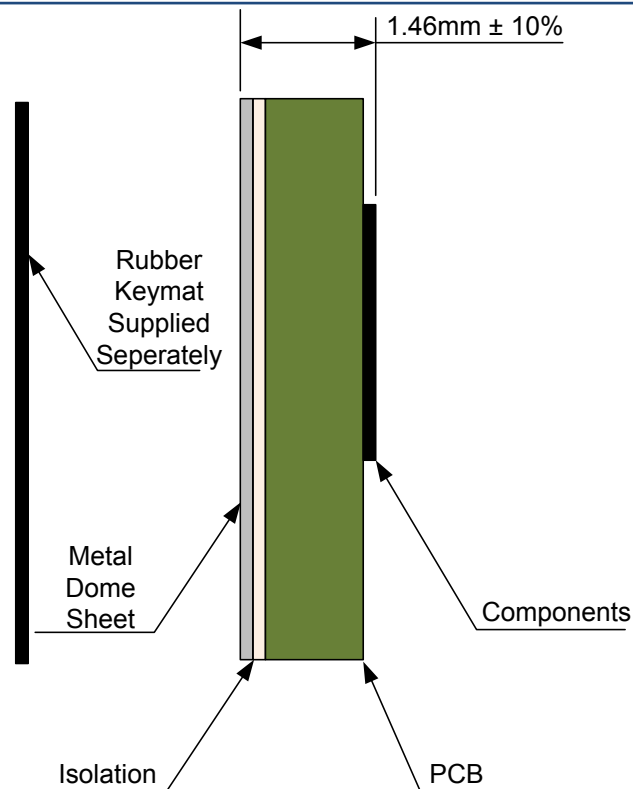
The total thickness given in Figure 1.3 indicates the height from the top of the metal domes, including PCB thickness and component heights. The highest part (thickest part of the module) of the assembly is located at the 0603 capacitor – C2.



**Figure 1.3 Maximum Module Thickness for Stack-Up C.**

## 1.7 Stack-Up D Thickness

The total thickness given in Figure 1.4 is the same as for stack-up C, with the addition of the printed rubber key mat which is supplied separately (not fixed to the PCB module). The rubber should be held in place by the application housing. The highest part (thickest part of the module) of the assembly is located at the 0603 capacitor – C2.



**Figure 1.4 Maximum Module Thickness.**

## 1.8 Compatible Overlay Thickness

TPS65 and TPS43 are designed to work optimally for 1mm overlays.

## 1.9 Finger Sizes

Because the modules are different physical sizes, but keep the same resolution, the trackpad pitch is different between the modules. Therefore a small variation in finger size is expected. The smallest and largest finger sizes allowed for valid gestures on each module are shown in Table 1.3 below.

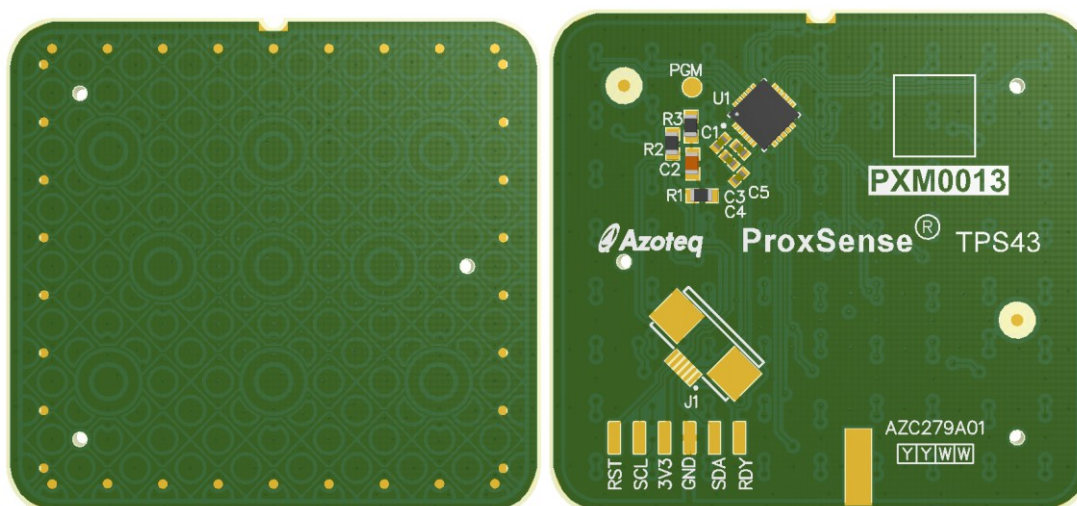
**Table 1.3 Module Compatible Finger Sizes.**

Module	Min Finger	Min Finger Separation
TPS43	6.5 mm	12 mm
TPS65	7.0 mm	12.9 mm

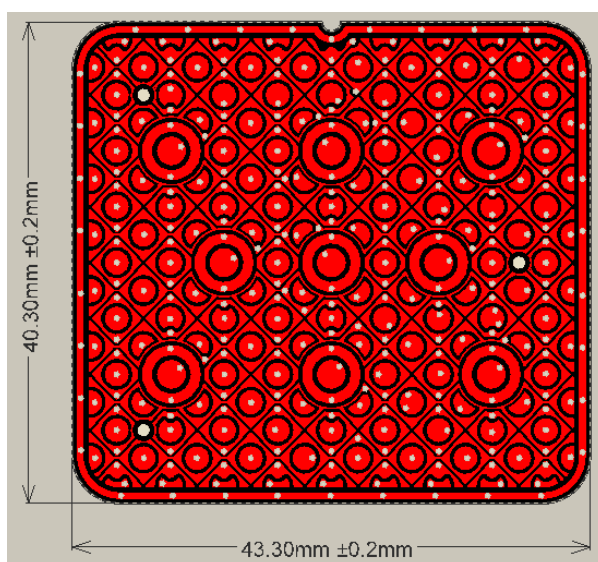


## 2 TPS43

The TPS43 is a 43mm x 40mm rectangular trackpad with rounded corners. A representation of the module can be found in Figure 2.1.



**Figure 2.1**    **TPS43 – Module Representation.**



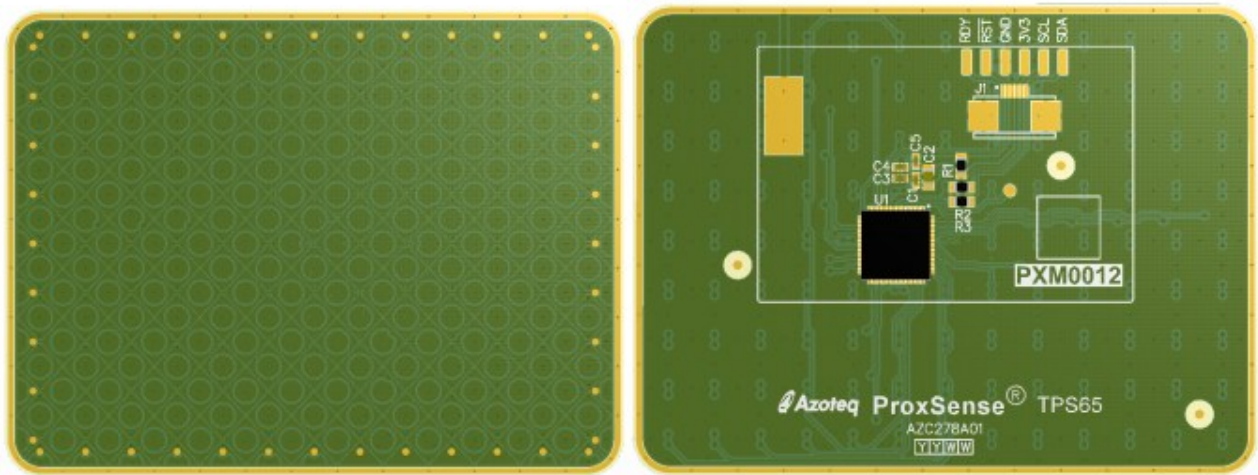
**Figure 2.2**    **TPS43 PCB Dimensions.**



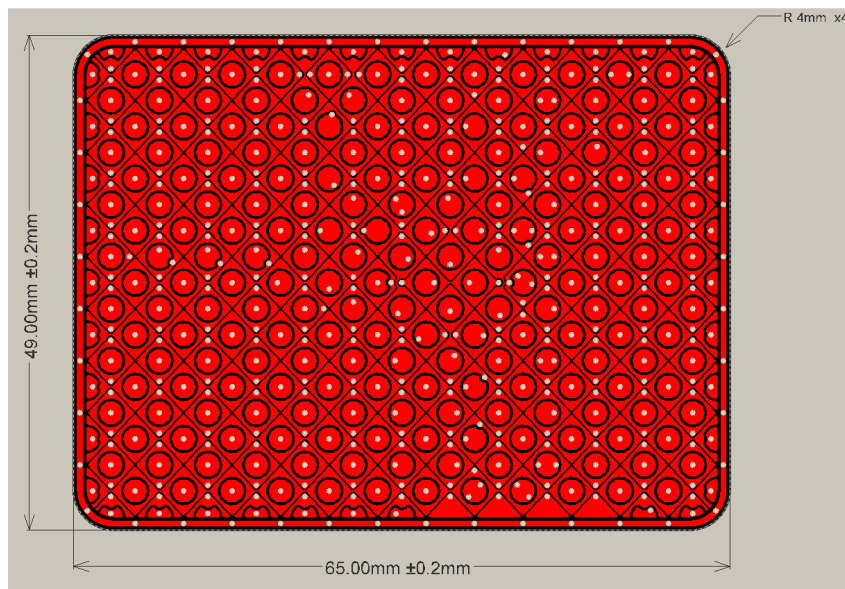


### 3 TPS65

The TPS65 is a 65mm x 49mm rectangular trackpad with rounded corners. A representation of the module can be found in Figure 3.1.



**Figure 3.1**    **TPS48 – Module Representation.**



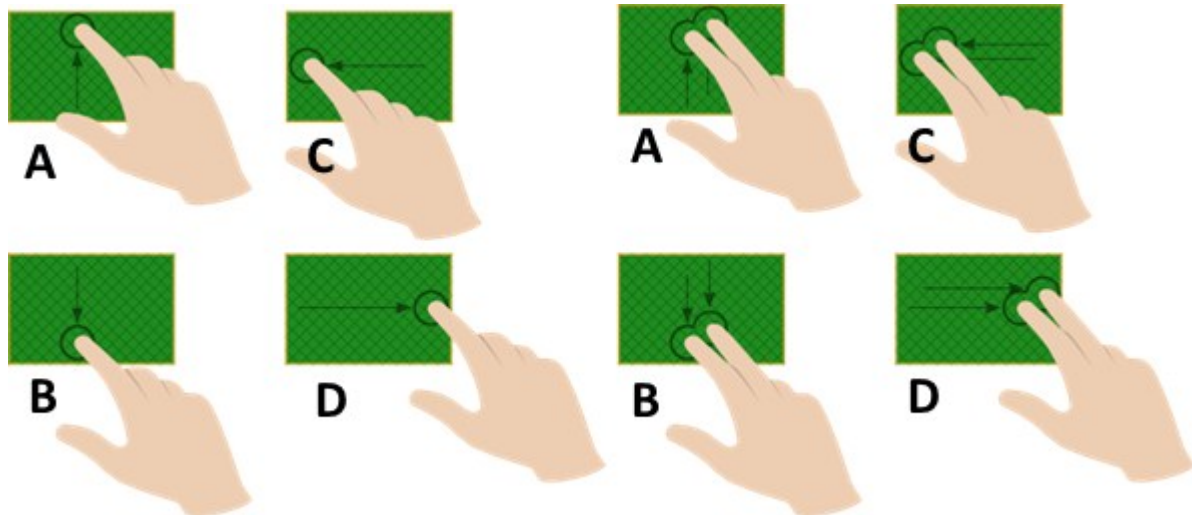
**Figure 3.2**    **TPS48 PCB Dimensions.**

## 4 Gestures and Implementation

The TPS65 and TPS43 output filtered XY coordinate for up to 2 fingers, making it ideal to be used for mouse pointer applications. It also supports gesture recognition, as shown below.

### 4.1 Swipe Gestures

There are four swipe gestures that can be detected by the trackpad modules, with either 1 or 2 fingers, as shown in Figure 4.1 below.



**Figure 4.1 Illustrations of the 4 swipe gestures that can be detected by the trackpad modules.**

Each time any of the swipe gestures are performed correctly, the corresponding bit in the memory map will be set.

#### 4.1.2 Swipe Upward (A)

A single finger / two finger action as shown in Figure 4.1 part A, placed anywhere on the trackpad surface, and moved more than XXmm from the bottom to the top within XXms and then lifted off the trackpad will generate a swipe gesture. The swipe gesture is limited to finger movement  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage.

#### 4.1.3 Swipe Downward (B)

A single finger / two finger action as shown in Figure 4.1 part B, placed anywhere on the trackpad surface, and moved more than XXmm from the top to the bottom within XXms and then lifted off the trackpad will generate a swipe gesture. The swipe gesture is limited to finger movement  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage.

#### 4.1.4 Swipe Backward (C)

A single finger / two finger action as shown in Figure 4.1 part C, placed anywhere on the trackpad surface, and moved more than XXmm from right to left within XXms and then lifted off the trackpad will generate a swipe gesture. The swipe gesture is limited to finger movement  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage.

#### 4.1.5 Swipe Forward (D)

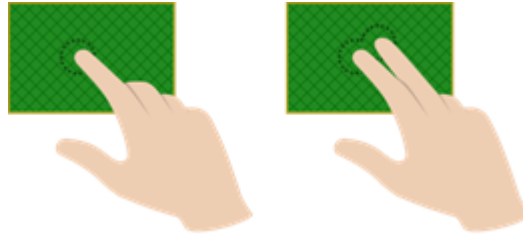
A single finger / two finger action as shown in Figure 4.1 part D, placed anywhere on the trackpad surface, and moved more than XXmm from left to right within XXms and then lifted off



the trackpad will generate a swipe gesture. The swipe gesture is limited to finger movement  $< \pm 45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage.

## 4.2 Tap Gesture

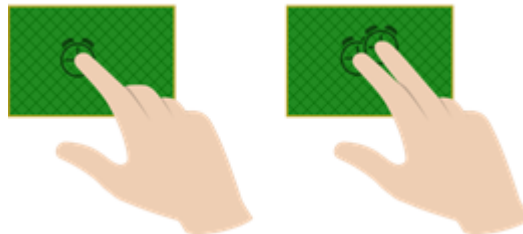
The trackpad modules can recognize a tap gesture, from a single finger or two fingers, at any point on the trackpad surface. A valid tap gesture is recognized if a touch is made and release within XXms.



**Figure 4.2** Illustration of Tap Gesture.

## 4.3 Tap and Hold Gesture

The trackpad modules can recognize a tap & hold gesture, from a single finger or two fingers, at any point on the trackpad surface. A valid tap & hold gesture is recognized if a touch is made and the finger does not release the touch for more than XXms.

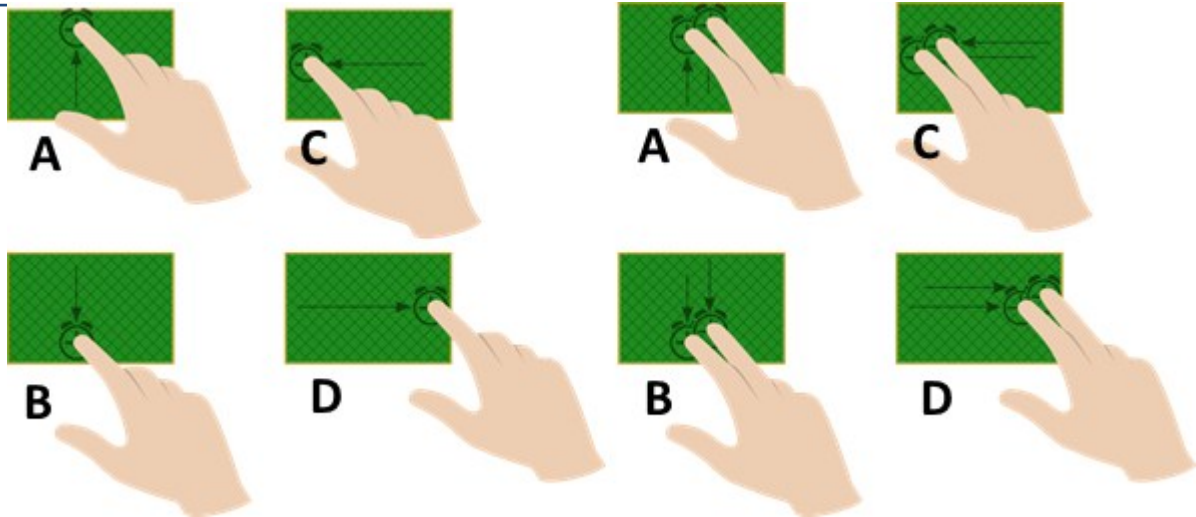


**Figure 4.3** Illustration of Tap & Hold Gesture.

When a valid tap & hold is detected, the modules will set the corresponding bit in the memory map.

## 4.4 Swipe and Hold Gestures

There are four swipe & hold gestures that can be detected by the trackpad modules, with either 1 or 2 fingers, as shown in Figure 4.4 below.



**Figure 4.4 Illustrations of the 4 swipe & hold gestures that can be detected by the trackpad modules.**

#### **4.4.1 Swipe Upward & Hold (A)**

A single finger / two finger action as shown in Figure 4.4 part A, place anywhere on the trackpad surface, and moved more than XXmm from the bottom to the top within XXms and then kept stationary on the trackpad will generate a swipe gesture. The swipe gesture is limited to  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage. The output pulses will stop once the finger is lifted off the trackpad.

#### **4.4.2 Swipe Downward & Hold (B)**

A single finger / two finger action as shown in Figure 4.4 part B, place anywhere on the trackpad surface, and moved more than XXmm from the top to the bottom within XXms and then kept stationary on the trackpad will generate a swipe gesture. The swipe gesture is limited to  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage. The output pulses will stop once the finger is lifted off the trackpad.

#### **4.4.3 Swipe Backward & Hold (C)**

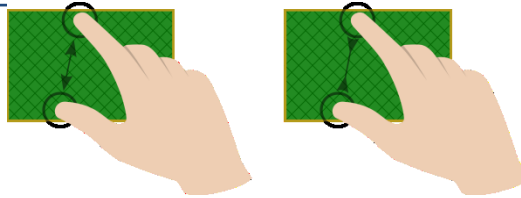
A single finger / two finger action as shown in Figure 4.4 part C, place anywhere on the trackpad surface, and moved more than XXmm from right to left within and then kept stationary on the trackpad will generate a swipe gesture. The swipe gesture is limited to  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage. The output pulses will stop once the finger is lifted off the trackpad.

#### **4.4.4 Swipe Forward & Hold (D)**

A single finger / two finger action as shown in Figure 4.4 part D, place anywhere on the trackpad surface, and moved more than XXmm from left to right within XXms and then kept stationary on the trackpad will generate a swipe gesture. The swipe gesture is limited to  $< +45$  degrees from the vertical, and dependent on the finger not lifting off the trackpad during the finger movement stage. The output pulses will stop once the finger is lifted off the trackpad.

### **4.5 Pinch & Stretch**

A pinch gesture is reported when two touches move closer to each other, and conversely a stretch gesture is reported when they move apart as shown in Figure 4.5.



**Figure 4.5** Illustration of Pinch and Stretch Gesture.

## **5 Communication Interface**

Under Construction.



## 6 Specifications

### 6.1 Absolute Maximum Specifications

The following absolute maximum parameters are specified for the device:

*Exceeding these maximum specifications may cause damage to the device.*

- Operating temperature -40°C to 85°C
- Supply Voltage (VDDHI – GND) 3.6V
- Minimum power-on slope 100V/s
- ESD protection ±2kV (Human body model)

### 6.2 Application Level Tests

According to the module design, with proper application system design implementation a 16kV IEC air discharge and 1Vp-p Conducted Immunity level should be possible to achieve.

### 6.3 Power Consumption

**Table 6.1 Trackpad Module General Operating Conditions**

DESCRIPTION	MIN	TYP	MAX	UNIT
Supply voltage	1.65	3.3V	3.6	V
Tracking Mode Current	-	TBD		mA
Low Power Current	-	TBD	TBD	μA

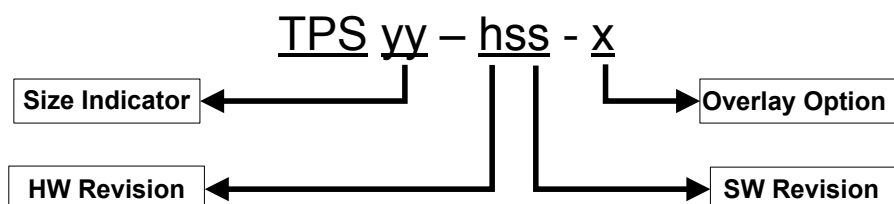
**Table 6.2 Start-up and shut-down slope Characteristics**

DESCRIPTION	Conditions	PARAMETER	MIN	MAX	UNIT
Power On Reset	V <sub>DDHI</sub> Slope ≥ 100V/s @25°C	V <sub>POR</sub>	1.44	1.65	V
Power Down Reset	V <sub>DDHI</sub> Slope ≥ 100V/s @25°C	V <sub>PDR</sub>	1.30	1.60	V



## 7 Ordering Information

Order quantities will be subject to MOQ of 5k pcs. Contact the official distributor for sample quantities. A list of the distributors can be found under the “Distributors” section of [www.azoteq.com](http://www.azoteq.com).



<b>Trackpad Module</b>	TPS	=	Trackpad
<b>Size Indicator (yy)</b>	43	=	43mm
	65	=	65mm
<b>Hardware Revision (h)</b>	1	=	Standard Module With Hot Bar Connection
	2	=	Standard Module with Ziff Connector
<b>Software Revision (ss)</b>	01	=	Standard Gestures
<b>Overlay Options (x)</b>	A	=	No overlay, Adhesive only
	B	=	1mm Black Mylar
	C	=	Metal Dome Layer (4mm Domes)
	D	=	Metal Dome Layer with Rubber Mat
<b>Overlay options C and D are only available for TPS43</b>			

Note: For non-standard versions please contact Azoteq direct.





## Appendix A. Contact Information

	USA	Asia	South Africa
<b>Physical Address</b>	6507 Jester Blvd Bldg 5, suite 510G Austin TX 78750 USA	Rm2125, Glittery City Shennan Rd Futian District Shenzhen, 518033 China	109 Main Street Paarl 7646 South Africa
<b>Postal Address</b>	6507 Jester Blvd Bldg 5, suite 510G Austin TX 78750 USA	Rm2125, Glittery City Shennan Rd Futian District Shenzhen, 518033 China	PO Box 3534 Paarl 7620 South Africa
<b>Tel</b>	+1 512 538 1995	+86 755 8303 5294 ext 808	+27 21 863 0033
<b>Fax</b>	+1 512 672 8442		+27 21 863 1512
<b>Email</b>	kobusm@azoteq.com	linayu@azoteq.com.cn	info@azoteq.com

Please visit [www.azoteq.com](http://www.azoteq.com) for a list of distributors and worldwide representation.

The following patents relate to the device or usage of the device: US 6,249,089 B1; US 6,621,225 B2; US 6,650,066 B2; US 6,952,084 B2; US 6,984,900 B1; US 7,084,526 B2; US 7,084,531 B2; US 7,265,494 B2; US 7,291,940 B2; US 7,329,970 B2; US 7,336,037 B2; US 7,443,101 B2; US 7,466,040 B2 ; US 7,498,749 B2; US 7,528,508 B2; US 7,755,219 B2; US 7,772,781 B2; US 7,781,980 B2; US 7,915,765 B2; US 7,994,726 B2; US 8,035,623 B2; US RE43,606 E; US 8,288,952 B2; US 8,395,395 B2; US 8,531,120 B2; US 8,659,306 B2; US 8,823,273 B2 B2; EP 1 120 018 B2; EP 1 206 168 B1; EP 1 308 913 B1; EP 1 530 178 A1; EP 2 351 220 B1; EP 2 559 164 B1; CN 1330853; CN 1783573; AUS 761094; HK 104 1401

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