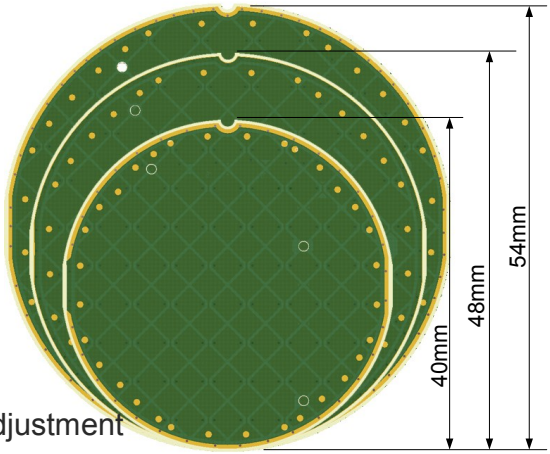
ProxSense® Standard Trackpad Module Datasheet

Standard Capacitive Trackpads with Gesture Recognition for Headphones & Audio Equipment with Direct Outputs for BT Connection

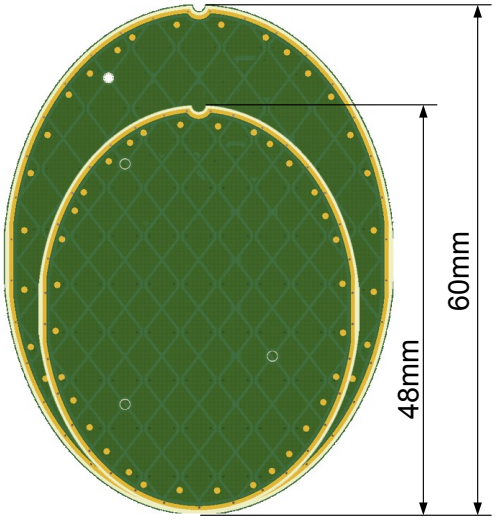
The ProxSense® series of standard capacitive trackpads offers best in class sensitivity, signal to noise ratio and power consumption. Automatic tuning for sense electrodes guarantees optimal operation over production and environmental change.



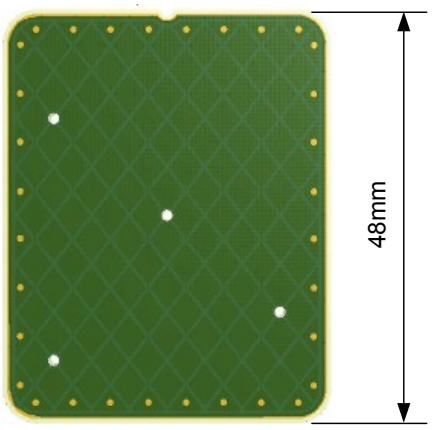
Main Features

- Trackpad with on chip XY coordinate calculation
- 1792 x 1792 resolution
- 170Hz scan rate for gesture recognition
- Adjustable Sensitivity
- Active high or low output
- Proximity wake up from low power
- Automatic drift compensation

- Commonly used Gestures mapped to I/O pins for Audio Adjustment
  - Swipe: Up
    Down
    Backwards
    Forwards
  - Swipe & Hold: Up
    Down
    Backwards
    Forwards
  - Tap
  - Tap & Hold



- Low Power, suitable for battery applications
- Supply voltage: 1.65V to 3.6V
- <40µA active sensing LP mode
- Direct Interface to BT audio IC



Applications

- Bluetooth Headphones
- Bluetooth Speakers
- Mechanical Push Button Replacement
- Portable Electronics
- Wearable Electronics

Contents

Datasheet Revision History

Version	Description	Date
1.00	Preliminary Draft	May 2015
1.01	First Release	June 2015
1.02	Updated ordering Information for Value Line	August 2015
1.03	Update Illustrations	Sept 2015

1 Hardware Description

All trackpad modules are available 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. The trackpad sensing is done with IQS572, connected to an 8x8 diamond grid for 1792 pixel resolution in the X and Y directions. The modules are supplied with 3M double sided adhesive tape. The modules do not include any connector to BT IC.

Table 1.1 Summary of Trackpad Offerings

Module Name	Shape	Size
TPR40	Round	Ø40mm
TPR48	Round	Ø48mm
TPR54	Round	Ø54mm
TPE60	Ellipse	60mm x 46mm
TPE48	Ellipse	48mm x 38mm
TPS48	Rectangle	48mm x 38mm

Two of the trackpad modules (TPR40 and TPR48) are also available in the **V**alue Line series. A comparison between the **P**erformance Line and **V**alue Line can be found in Table 1.2.

Table 1.2 Performance Line vs. Value Line.

	PCB	Sensor IC	Resolution	RoHS	REACH
Performance Line	FR4	IQS572	1792 x1792	Yes	Yes
Value Line	CEM-1	IQS525	1024 x 1024	Yes	No

1.2 PCB Specification

All 6 modules offered adhere to the following PCB specifications for the **P**erformance Line:

- 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

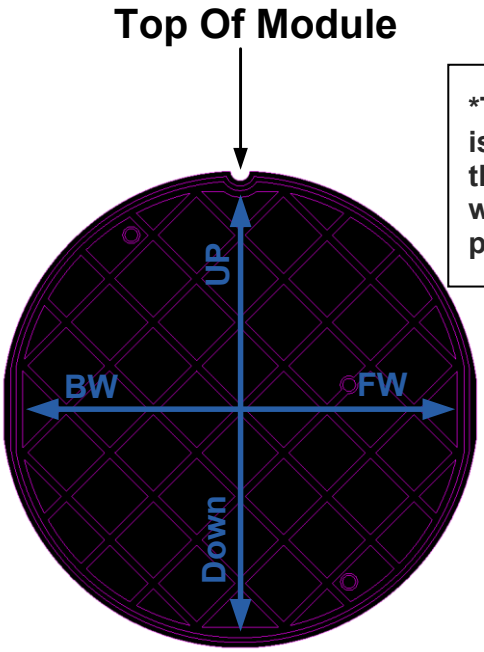
TPR40 and TPR48 are also offered in the **V**alue Line:

- Material: 2-layer, CEM-1* 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

*Please note that the Value Line module does not come with REACH certification.

1.3 Module Orientation

All the modules have a cut in the PCB indicating the top of the module, which could also be used to align the module on the application overlay. This Notch can be seen in Figure 1.2



***Top Tip: Make sure the module is secured to the application with the double sided adhesive tape with no air gaps to do performance evaluation.**

Figure 1.1 Top Notch Illustrating Module Orientation.

1.4 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)

1.5 Total 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.

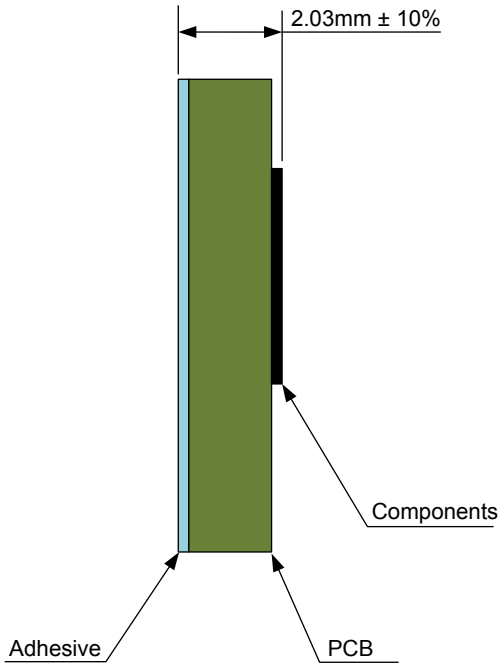


Figure 1.2 Maximum Module Thickness.

1.6 Compatible Overlay Thickness

The compatible overlay thicknesses are shown in Table 1.3 below. The modules have a solder link, S1, which can select one of two sensitivity settings tuned for different overlay thicknesses.

Table 1.3 Module Overlay Compatibility[1].

Solder link S1	Overlay Range
Open	1mm – 2mm
Closed	2mm – 3mm

For non-uniform overlays, the maximum curve in the overlay is limited to a 1mm height difference over the trackpad surface as shown in Figure 1.3.

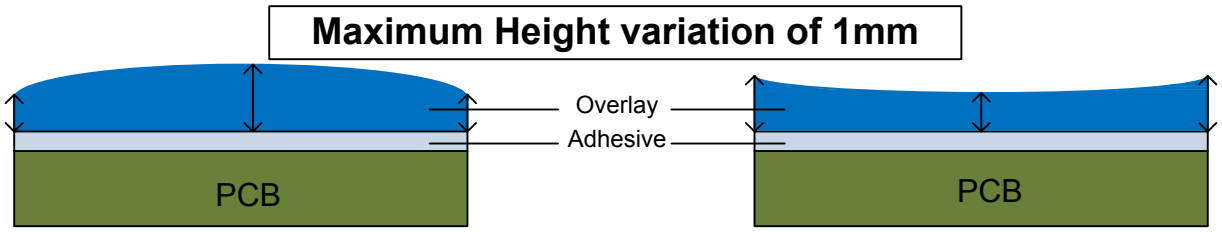


Figure 1.3 Maximum height variation in the overlay.

1.7 Output Level

The output level of the output pins can be changed from active high (default) to active low. This change is accomplished by connecting solder link S2 on the module during module integration into the application. The same output level is applicable on all 5 output pins.

[1] Note: Pilot Built 1 (PB1) modules only support the 1-2mm setting. Contact Azoteq for updated FW.

Table 1.4 Module Output Pin Level.

Solder link S2	Output Level
Open	Active High
Closed	Active Low

1.8 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 minimum finger size is expected. The smallest and largest finger sizes allowed for valid gestures on each module are shown in Table 1.5 below.

Table 1.5 Module Compatible Finger Sizes.

Module	Min Finger Diameter
TPR40	6.7 mm
TPR48	8.0 mm
TPR54	9.0 mm
TPE60	9.0 mm
TPE48	7.2 mm
TPS48	7.2 mm

2 TPR40

The TPR40 is a ø40mm round trackpad. A representation of the module can be found in Figure 2.1.

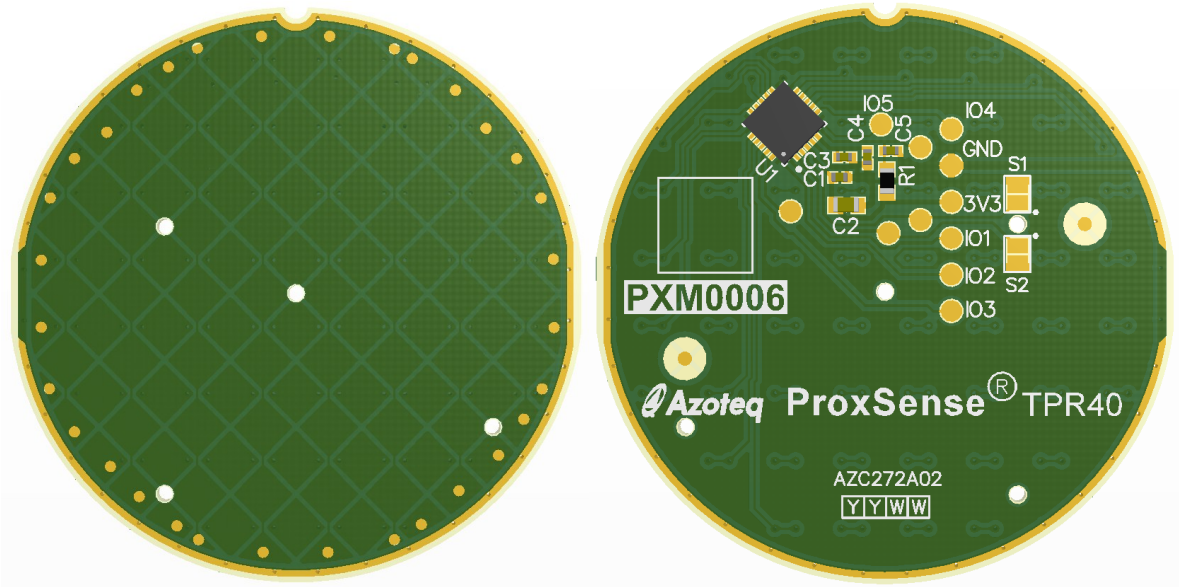


Figure 2.1 TPR40 – Module Representation.

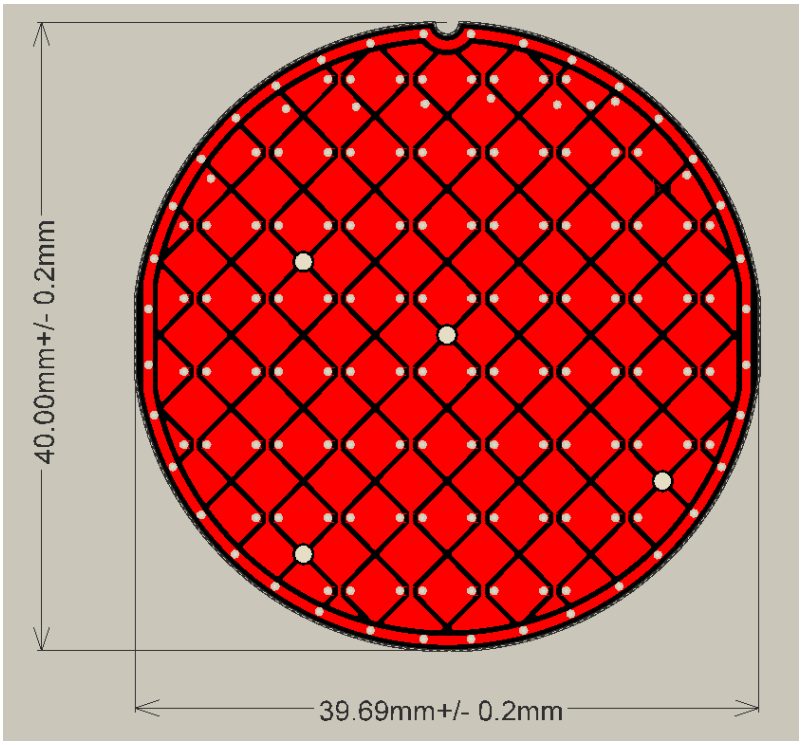


Figure 2.2 TPR40 PCB Dimensions.

3 TPR48

The TPR48 is an ø48mm round trackpad. A representation of the module can be found in Figure 3.1.

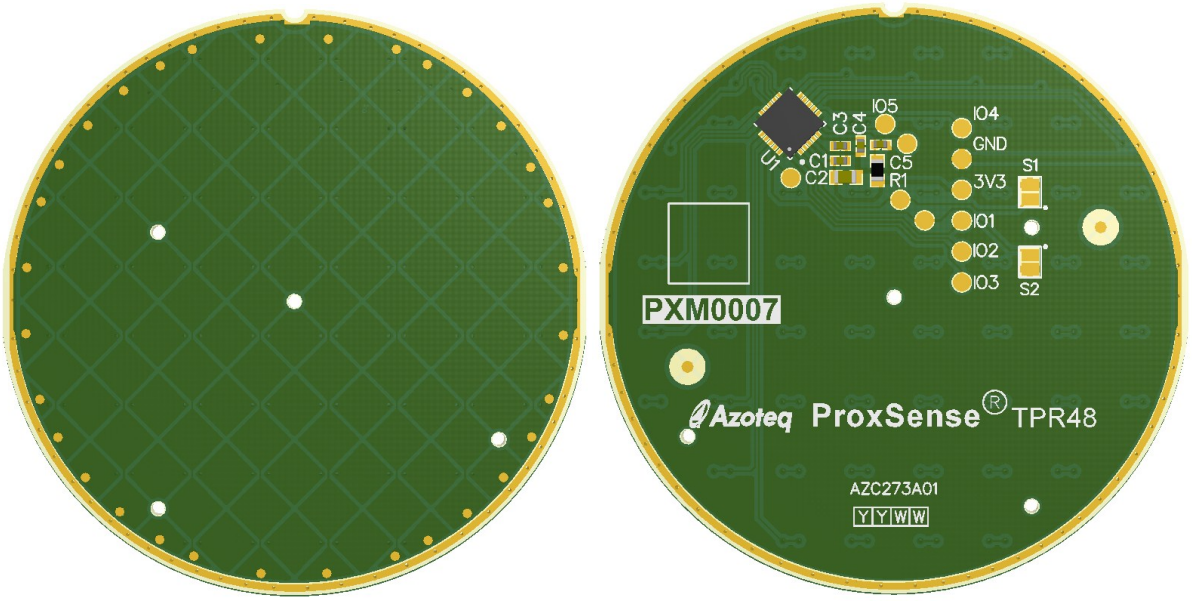


Figure 3.1 TPR48 – Module Representation.

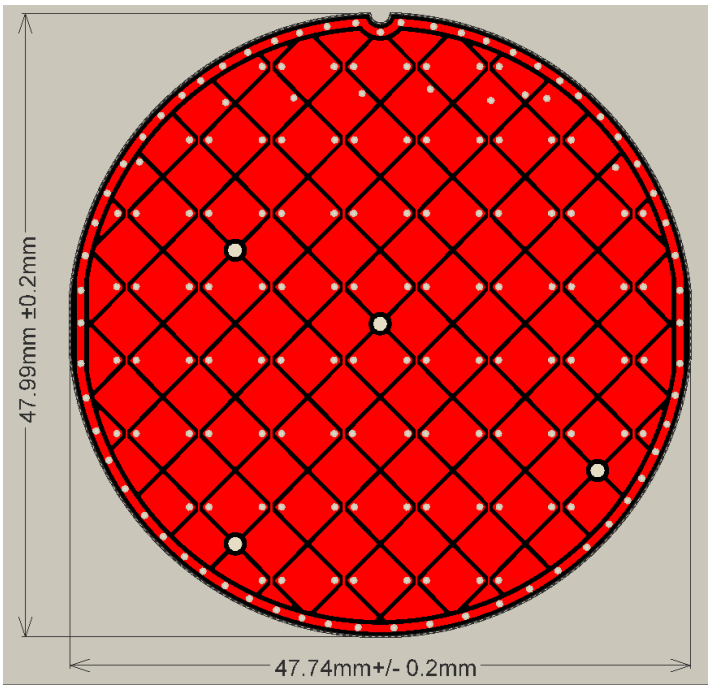


Figure 3.2 TPR48 PCB Dimensions.

4 TPR54

The TPR54 is an ø54mm round trackpad. A representation of the module can be found in Figure 4.1.

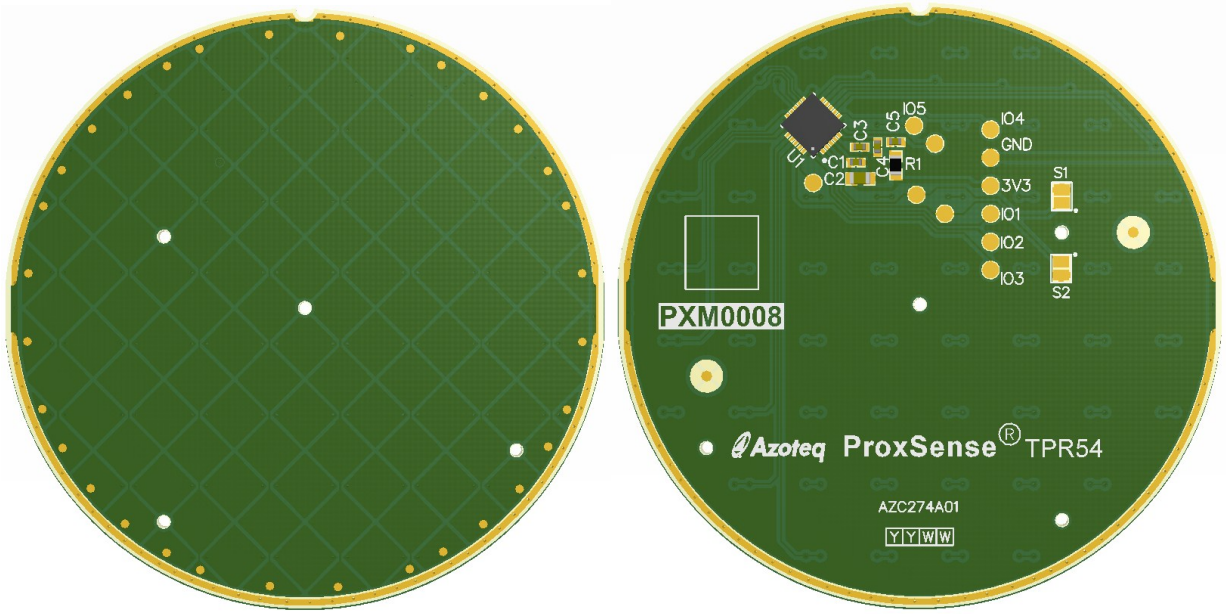


Figure 4.1 TPR54 – Module Representation.

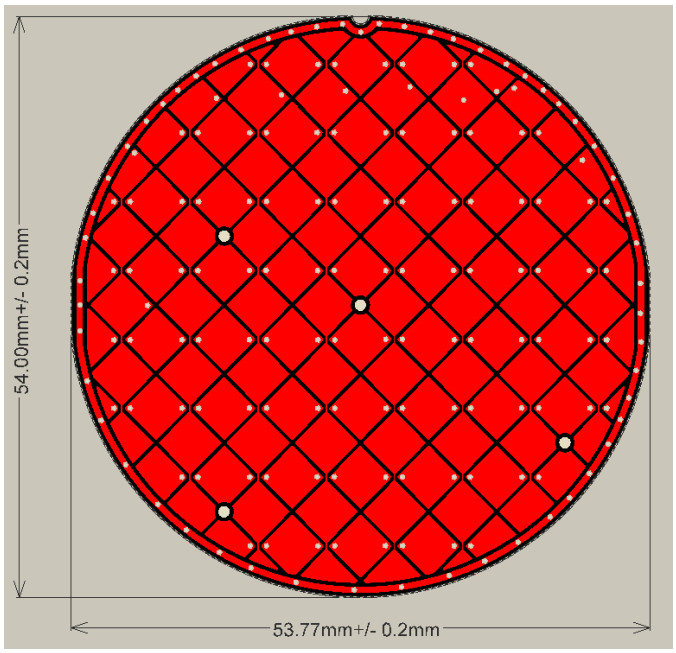


Figure 4.2 TPR54 PCB Dimensions.

5 TPE60

The TPE60 is a 60mm x 46mm ellipsoid shaped trackpad. A representation of the module can be found in Figure 5.1.

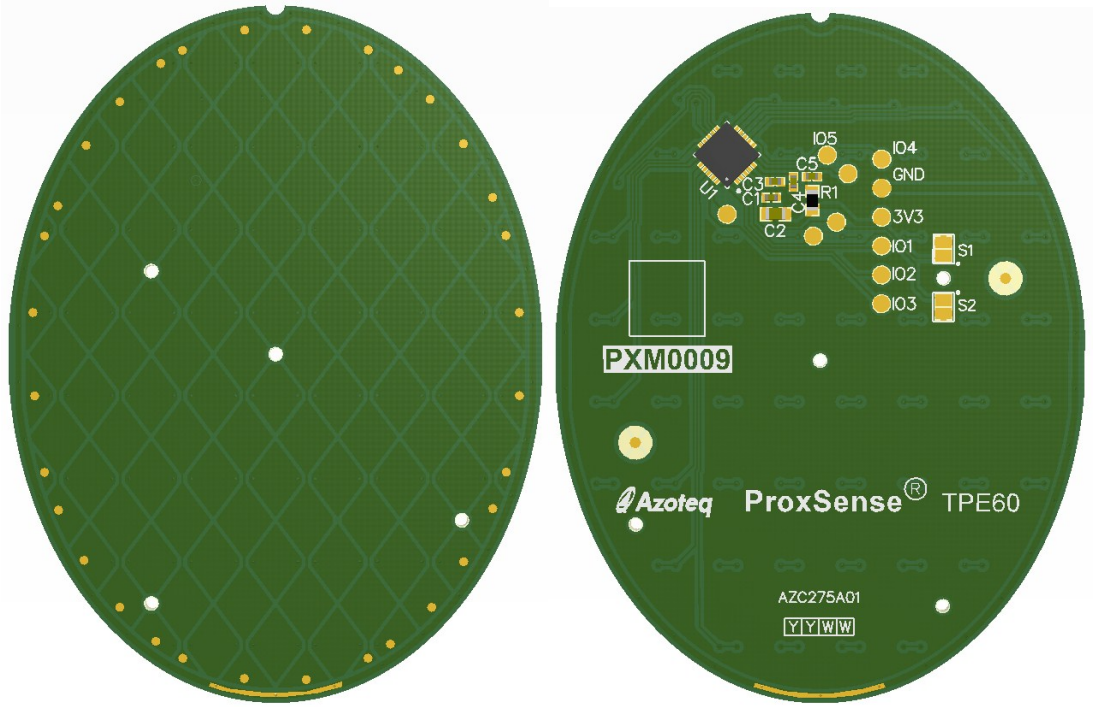


Figure 5.1 TPE60 – Module Representation.

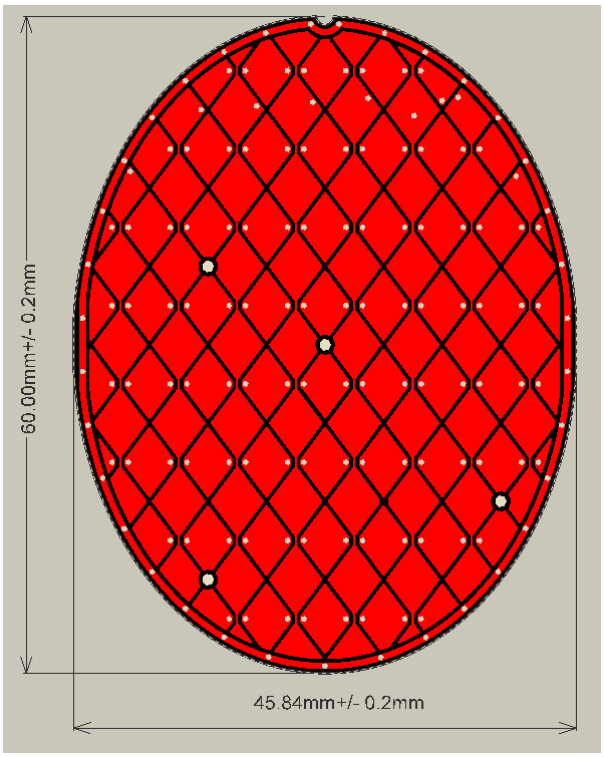


Figure 5.2 TPE60 PCB Dimensions.

6 TPE48

The TPE48 is a 48mm x 38mm ellipsoid shaped trackpad. A representation of the module can be found in Figure 6.1.

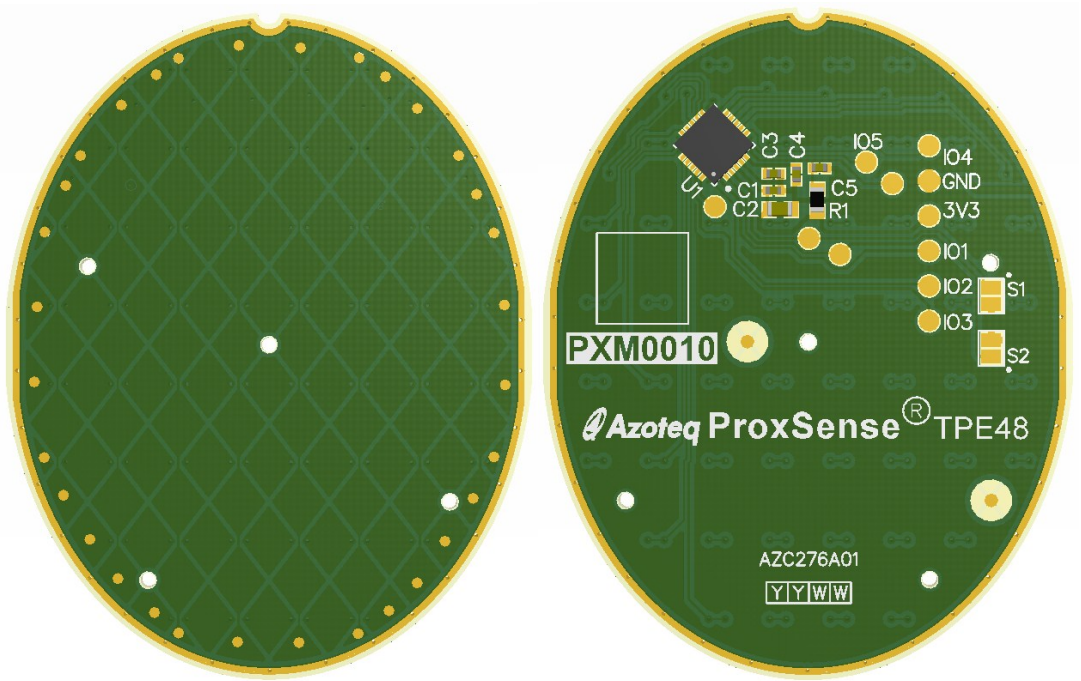


Figure 6.1 TPE48 – Module Representation.

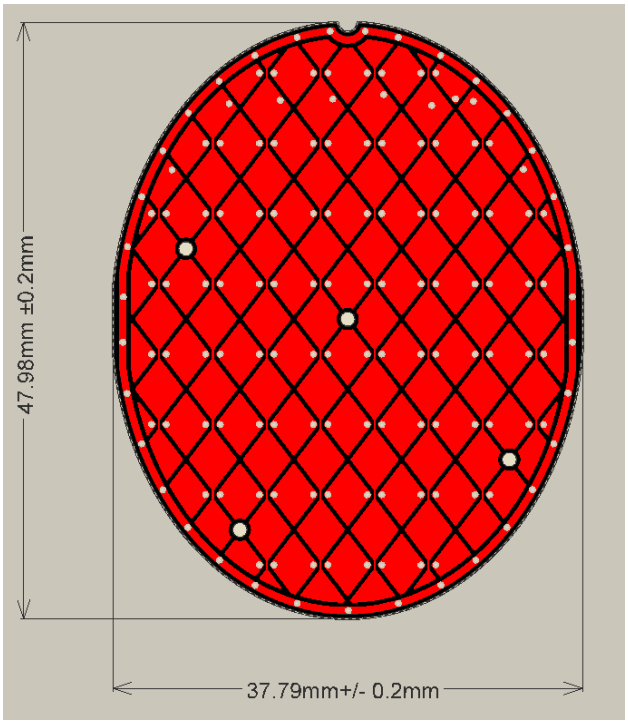


Figure 6.2 TPE48 PCB Dimensions.

7 TPS48

The TPS48 is a 48mm x 38mm rectangular trackpad with rounded corners. A representation of the module can be found in Figure 7.1.

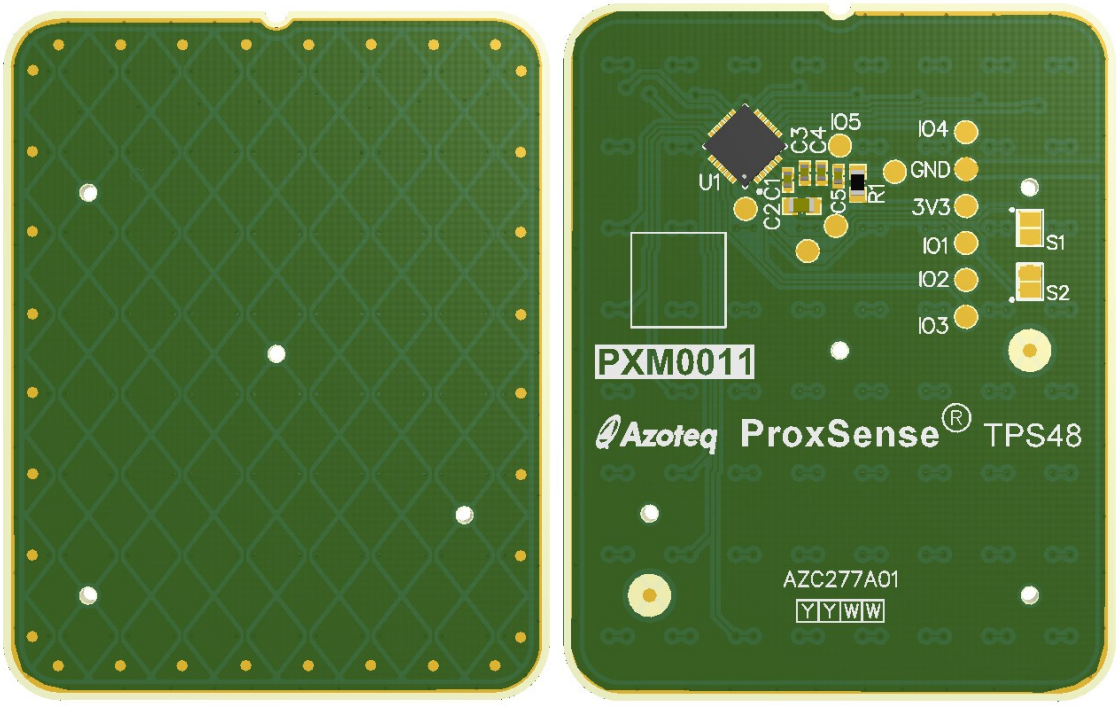


Figure 7.1 TPS48 – Module Representation.

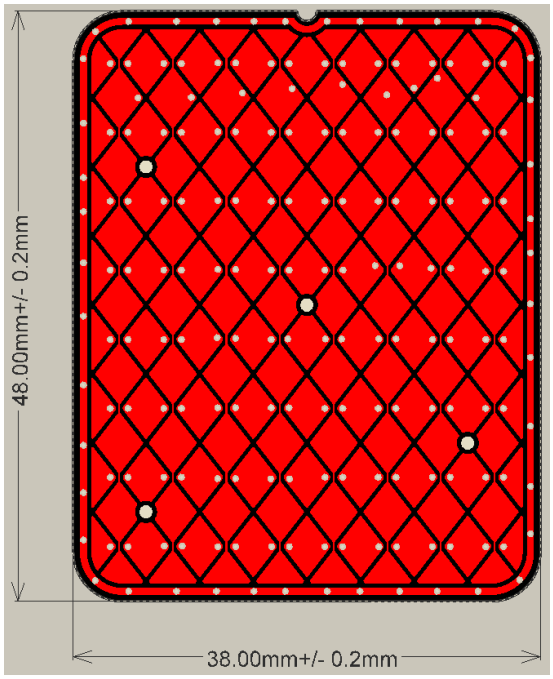


Figure 7.2 TPS48 PCB Dimensions.

8 Gesture Implementation

8.1 Swipe Gestures

There are four swipe gestures that can be detected by the trackpad modules, as shown in Figure 8.1 below.

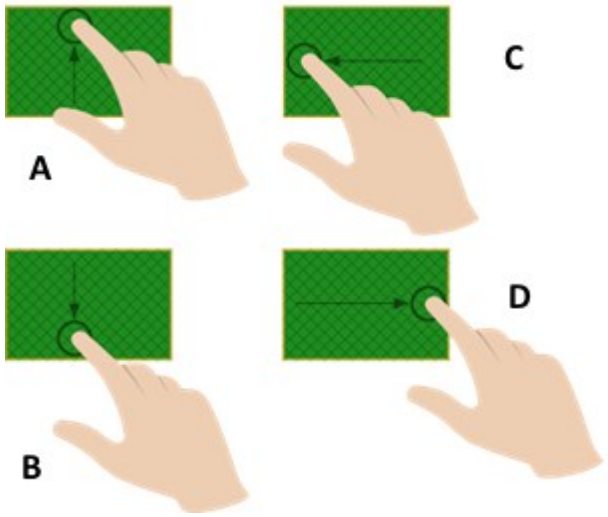


Figure 8.1 Illustrations off the 4 swipe gestures that can be detected by the trackpad modules.

Each time any of the swipe gestures are performed correctly (correct finger action within a 18ms to 1 second window), the corresponding I/O pin of the trackpad will output a single 200ms pulse to the Bluetooth IC. The user has the option to select a high (default) or low (by adding a solder link on the module) pulse. The high level as indicated on the figure below will correspond to the input voltage supplied to the trackpad module.

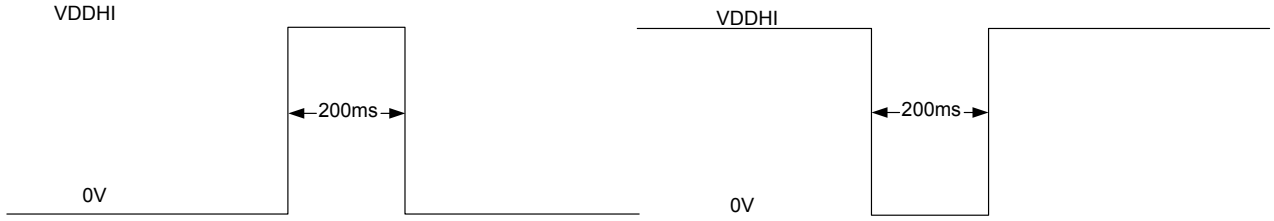


Figure 8.2 High output pulse shown on the left; Low output pulse shown on the right.

8.1.1 Swipe Upward (A)

A single finger action as shown in Figure 8.1 part A, place anywhere on the trackpad surface, and moved more than 14mm from the bottom to the top within 1s and then lifted off the trackpad will generate a 200ms pulse on I/O_1. 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.

8.1.2 Swipe Downward (B)

A single finger action as shown in Figure 8.1 part B, place anywhere on the trackpad surface, and moved more than 14mm from the top to the bottom within 1s and then lifted off the trackpad will generate a 200ms pulse on I/O_3. 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.

8.1.3 Swipe Backward (C)

A single finger action as shown in Figure 8.1 part C, place anywhere on the trackpad surface, and moved more than 14mm from right to left within 1s and then lifted off the trackpad will generate a 200ms pulse on I/O_4. The swipe gesture is limited to finger movement < +-45 degrees from the horizontal, and dependent on the finger not lifting off the trackpad during the finger movement stage.

8.1.4 Swipe Forward (D)

A single finger action as shown in Figure 8.1 part D, placed anywhere on the trackpad surface, and moved more than 14mm from left to right within 1s and then lifted off the trackpad will generate a 200ms pulse on I/O_5. The swipe gesture is limited to finger movement < +-45 degrees from the horizontal, and dependent on the finger not lifting off the trackpad during the finger movement stage.

8.2 Tap Gesture

The trackpad modules can recognize a tap gesture, from a single finger, at any point on the trackpad surface. A valid tap gesture is recognized if a touch is made by moving less than 4mm on the overlay surface and release within 600ms but not faster than 18ms. When a valid tap is detected, the modules will output a 200ms pulse on I/O_2 as shown in Figure 8.2.

Figure 8.3 Tap Gesture.

8.3 Tap and Hold Gesture

The trackpad modules can recognize a tap & hold gesture, from a single finger, 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 600ms without moving more than 4mm on the trackpad overlay surface.

Figure 8.4 Tap& Hold Gesture.

When a valid tap & hold is detected, the modules will output a continuous pulse (continuous high level of the output, or low if solder link is made) on I/O_2 until the finger is lifted off the trackpad.

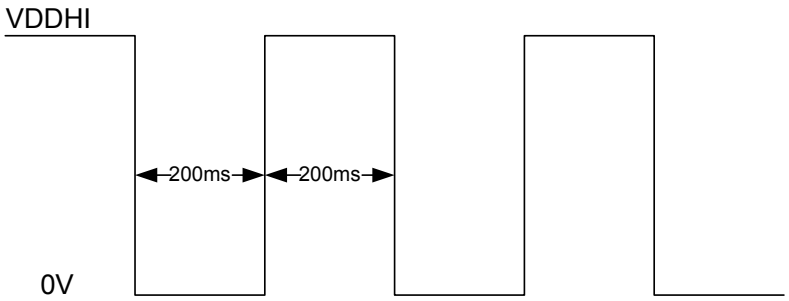


Figure 8.5 Continuous output of 200ms pulses for swipe and hold gesture.

8.4 Swipe and Hold Gestures

There are four swipe & hold gestures that can be detected by the trackpad modules, as shown in Figure 8.6 below.

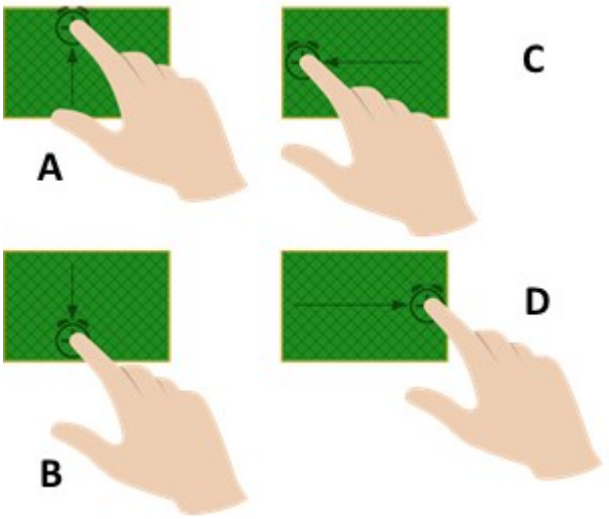


Figure 8.6 Illustrations off the 4 swipe & hold gestures that can be detected by the trackpad modules.

Each time any of the swipe & hold gestures are performed correctly, the corresponding I/O pin of the trackpad will continuously output 200ms pulses to the Bluetooth IC. The user has the option to select a high (default) or low (by adding a solder link on the module) pulse. The high level as indicated on the figure below will correspond to the input voltage supplied to the trackpad module.

8.4.2 Swipe Upward & Hold (A)

A single finger action as shown in Figure 8.6 part A, placed anywhere on the trackpad surface, and moved more than 14mm from the bottom to the top within 1s and then kept stationary on the trackpad for 600ms or more will generate continuous 200ms pulses on I/O_1. 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.

8.4.3 Swipe Downward & Hold (B)

A single finger action as shown in Figure 8.6 part B, placed anywhere on the trackpad surface, and moved more than 14mm from the top to the bottom within 1s and then kept stationary on the trackpad for 600ms or more will generate continuous 200ms pulses on I/O_3. 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.

8.4.4 Swipe Backward & Hold (C)

A single finger action as shown in Figure 8.6 part C, placed anywhere on the trackpad surface, and moved more than 14mm from right to left within and then kept stationary on the trackpad for 600ms or more will generate continuous 200ms pulses on I/O_4. 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.

8.4.5 Swipe Forward & Hold (D)

A single finger action as shown in Figure 8.6 part D, place anywhere on the trackpad surface, and moved more than 14mm from left to right within 1s and then kept stationary on the trackpad for 600ms or more will generate continuous 200ms pulses on I/O_5. 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.

8.5 Gesture I/O Mapping

The pin mapping for the modules for gesture output is shown in below.

Table 8.1 Module Gesture Output Pin Mapping.

Gesture	Output Pin	Output Type	Typical Feature
Swipe Upward	I/O_1	Single Pulse	Volume Increase
Swipe Upward & Hold	I/O_1	Multiple Pulses	Continuous Volume Increase
Swipe Downward	I/O_3	Single Pulse	Volume Decrease
Swipe Downward & Hold	I/O_3	Multiple Pulses	Continuous Volume Decrease
Swipe Forward	I/O_5	Single Pulse	Skip / Next Track
Swipe Forward & Hold	I/O_5	Multiple Pulses	Fast Forward
Swipe Backward	I/O_4	Single Pulse	Skip / Previous Track
Swipe Backward & Hold	I/O_4	Multiple Pulses	Reverse/Rewind
Tap	I/O_2	Single Pulse	Play/Pause (Call Answer)
Tap & Hold	I/O_2	Continuous Pulse	Start/STOP

9 Specifications

9.1 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)

9.2 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.

9.3 Power Consumption

Table 9.1 Trackpad Module General Operating Conditions

DESCRIPTION	MIN	TYP	MAX	UNIT
Supply voltage	1.65	3.3V	3.6	V
Tracking Mode Current	-	4		mA
Low Power Current	-	35	TBD	µA

9.4 Output Pin Voltage

Table 9.2 Output Pin Characteristics

Symbol	Parameter Conditions	Conditions	Min.	Max.	Unit
V_{OL} (1)	Output low level voltage for an I/O pin	I_{IO} = +2mA, V_{DDHI} = 1.8V	-	0.45	V
		I_{IO} = +2mA, V_{DDHI} = 3.0V	-	0.45	
V_{OH} (2)	Output high level voltage for an I/O pin	I_{IO} = -1mA, V_{DDHI} = 1.8V	V_{DDHI} -0.45	-	
		I_{IO} = -1mA, V_{DDHI} = 3.0V	V_{DDHI} -0.45	-	

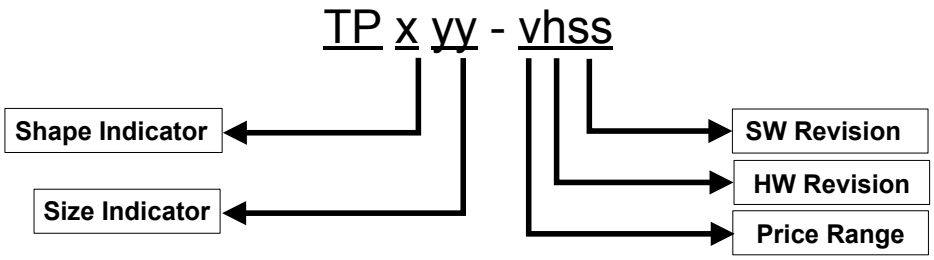
Table 9.3 Start-up and shut-down slope Characteristics

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

10 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.

10.1 Stand Alone Track Pads



Trackpad Module	TP	=	Trackpad
Shape Indicator (x)	R	=	Round
	E	=	Ellipsoid
	S	=	Square/Rectangular
Size Indicator (yy)	40	=	40mm
	48	=	48mm
	54	=	54mm
	60	=	60mm
Price Range (v)	V	=	Value Line (low cost)
	P	=	Performance Line (high performance)
Hardware Revision (h)	1	=	Standard BT Headphone Module
Software Revision (ss)	01	=	Standard Gestures

Example: **TPR40-P101** – is a round 40mm trackpad from the high performance line, 1st revision HW and SW

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

Appendix A. Contact Information

	USA	Asia	South Africa
Physical Address	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
Postal Address	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
Tel	+1 512 538 1995	+86 755 8303 5294 ext 808	+27 21 863 0033
Fax	+1 512 672 8442		+27 21 863 1512
Email	kobusm@azoteq.com	linayu@azoteq.com.cn	info@azoteq.com

Please visit www.azoteq.com for a list of distributors and worldwide representation.

Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

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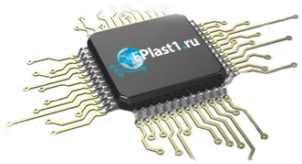
- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



Как с нами связаться

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