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IQS550EV02 Datasheet

Trackpad demo module using IQS550-B000

1 Overview

The IQS550-B000 is a trackpad solution with on-chip gesture recognition, flexible device setup and leading sensitivity management and adjustment. The IQS550EV02 uses a 13x9 diamond sensor pattern to detect user proximity and touch. Finger position co-ordinates are then identified and gesture outputs are generated. With effective co-ordinate filtering, and advanced processing algorithms, the IQS550 provides reliable and stable outputs.

The IQS550EV02 is an assembled demo unit, which is ready to be evaluated using the Azoteq CT210/DS100 USB dongle and the IQS5xx-B000 PC GUI software. The trackpad has a Mylar overlay material, which provides a smooth tracking surface and outputs high performance finger coordinates.

The sensor reports these outputs via standard I²C protocol to the master and it is also fully configurable and programmable via this interface.

The IQS550EV02 is a standard IQS5xx-B000 product, and thus the IQS5xx-B000 product datasheet can be referenced for all relevant information:

http://www.azoteq.com/images/stories/pdf/iqs5xx-b000_trackpad_datasheet.pdf

The trackpad module used on the IQS550EV02 is the TPS65. This is one of numerous trackpad modules that Azoteq have developed, and are available to purchase for immediate design integration and mass production.

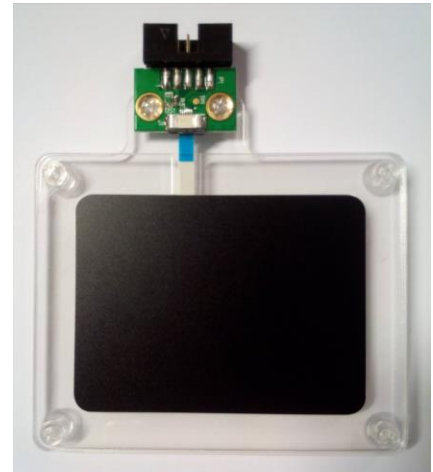


Figure 1.1 IQS550EV02 Trackpad Module

2 Device Configuration

The IQS550EV02 is programmed with the standard B000 trackpad firmware, with the setup parameters pre-configured for this PCB. Some of the important parameter configurations are shown in the table below.

Since this is just an example configuration, all normal IQS550-B000 setup flexibility exists, and the configuration can be modified as required by the user.

Table 2.1 IQS550EV02 Parameter / Setup Summary

Settings parameter	Value	Settings parameter	Value
Total Rx	9	Total Tx	13
Rx mapping	{0, 1, 2, 3, 4, 5, 6, 7, 8}	Tx mapping	{12, 11, 10, 9, 8, 7, 5, 1, 0, 2, 3, 4, 6}
ALP channel	Enabled	-	-
ALP Rxs	0x01 0xFF	ALP TxS	0x15 0x69



Prox threshold (TP)	30	Prox threshold (ALP)	6
Touch threshold – set	16	Touch threshold – clear	10
ATI Target (TP)	700	ATI Target (ALP)	450
ATI C (TP)	1	ATI C (ALP)	21
Active Mode report rate	13	Idle Touch report rate	50
Idle Mode report rate	75	LP1 report rate	80
LP2 report rate	160	-	-
Active Mode timeout	5	Idle Touch timeout	60
Idle Mode timeout	10	LP1 timeout	10
Total multi-touches	5	X & Y resolution	1024 x 768

To obtain the full device configuration simply connect the trackpad module to a CT210/DS100 and run it with the IQS5xx-B000 PC GUI software. At start up all GUI parameters are updated to match the on-chip values, and can therefore easily be read back in the GUI.

3 Connecting to PC

The module has a breakout PCB which converts the standard TPS65 flex connector to a 10-way CT210/DS100 compatible connector.

3.1 Hardware Connections

To connect the IQS550EV02 to the PC, simply connect the 10-way ribbon cable from the CT210/DS100 to the P1 connector on the trackpad module. The following table shows the connections required.

Table 3.1 Hardware connections to CT210/DS100

Function	CT210 / DS100 pin number	IQS550EV02 (on AZP581F01 break-out PCB) pin number
GND	Pin 1	Pin 1
VDDHI	Pin 3	Pin 3
SDA	Pin 7	Pin 7
SCL	Pin 9	Pin 9
RDY	Pin 10	Pin 10



3.2 Evaluation in GUI

The features of the IQS550-B000 product can be evaluated and visualised using the following PC GUI software:

http://www.azoteq.com/images/stories/software/azoteq_iqs5xxb000_setup.zip

This allows the designer to see the full power and information available from the IQS550 trackpad product. For more information on the GUI including the device setup procedure please see the following application note:

(please note the IQS550EV02 is already configured, this is just additional information)

<http://www.azoteq.com/images/stories/pdf/AZD087%20-%20IQS5xx-B000%20Setup%20and%20User%20Guide.pdf>

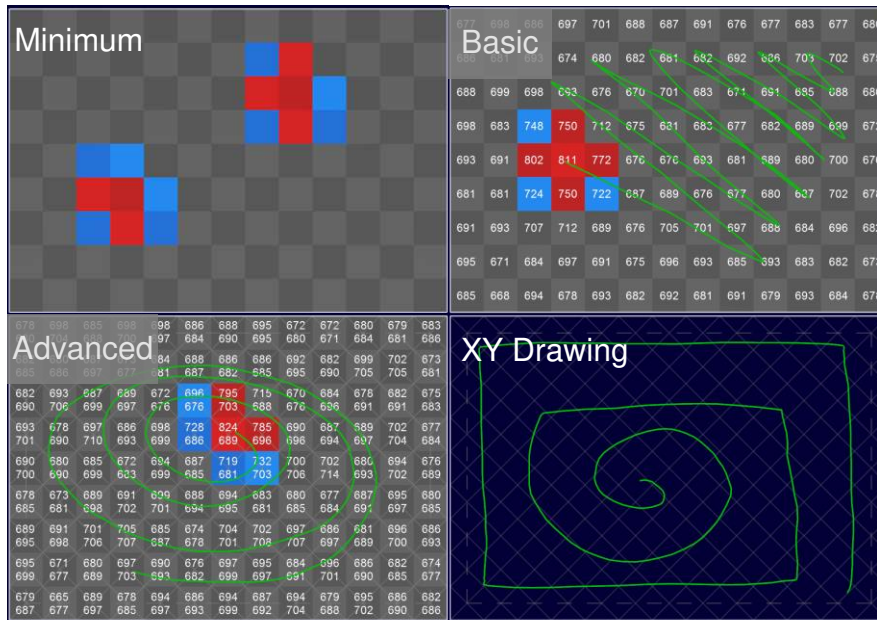


Figure 3.1 2D preset display examples

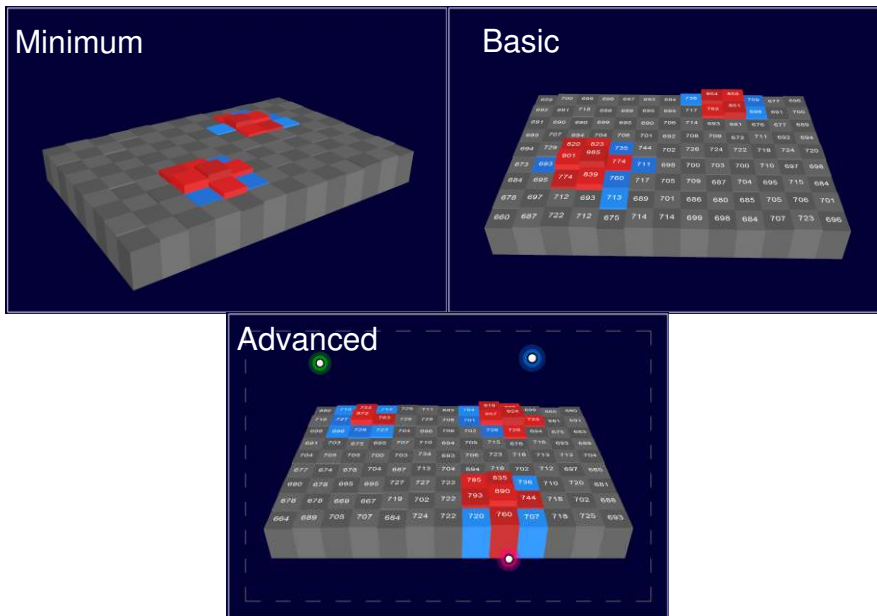


Figure 3.2 3D preset display examples



3.3 Programming

The IQS550EV02 is already programmed with suitable settings for the trackpad, and for general evaluation programming is not required.

The IQS5xx-B000 GUI enables a user to modify the configuration of a trackpad and to subsequently program the device with a hex file containing the newly updated settings.

This is explained further in the AZD087 application note.

4 Supporting Material

The IQS5xx-B000 product range has various supporting material available to assist with product integration and design.

There is an example project for the I²C master code required to communicate with the IQS5xx-B000 slave device. It is designed for the Arduino Uno, and the full example project and description document can be found here:

http://www.azoteq.com/images/stories/software/iqs550_arduino_example_code.zip

The IQS5xx-B000 parameters are obtained using the PC GUI, and once the desired performance is achieved the custom HEX file is exported from the GUI and is available for programming onto the device during production testing. The IQS5xx device has an I²C bootloader through which the programming is achieved. A full example project (also for an Arduino Uno) with documentation for the programming is available here:

<http://www.azoteq.com/images/stories/software/IQS5xx%20Bootloader%20Example%20v1.1.zip>

A design guide is available which provides details for some of the basic concepts and design considerations needed when embarking on a custom design:

http://www.azoteq.com/images/stories/pdf/azd068-trackpad_design_guide.pdf

The PCB layout and sensor design is critical to the performance of the trackpad, and obtaining a configuration that will be operational across product and IC variation for the expected temperature ranges is an intricate process.

Azoteq has the expertise to handle these issues without the time investment needed by the customer. Azoteq have a manufacturing facility with the expertise and equipment to build and test high quality high volume trackpad modules. It is strongly recommended that the trackpad design is handled by Azoteq, who deliver a complete module solution.

5 Electrical Characteristics

For all general electrical characteristics, please refer to the IQS5xx-B000 datasheet.

5.1 Current Consumption

With the parameters configured for the specific module, some expected current consumption values can be provided.

Please note these are bench measured values, and can vary depending on numerous factors. For example in Active mode (during a user touch), the current varies according to the size of the touch due to change in the amount of processing required. The following are simply to provide an estimate of what can be expected.



Table 5.1 Total Current Consumption

User Interaction	Mode	I ² C bytes read	Report Rate	Current	Unit
1 standard 8mm finger	Active Mode	25 bytes	13ms	2.7	mA
2 standard 8mm fingers	Active Mode	25 bytes	13ms	3.10	mA
None	Idle Mode	None	75ms	340	uA
None	LP1	None	80ms	47	uA
None	LP2	None	160ms	26	uA
None	Suspend	None	n/a	<1	uA

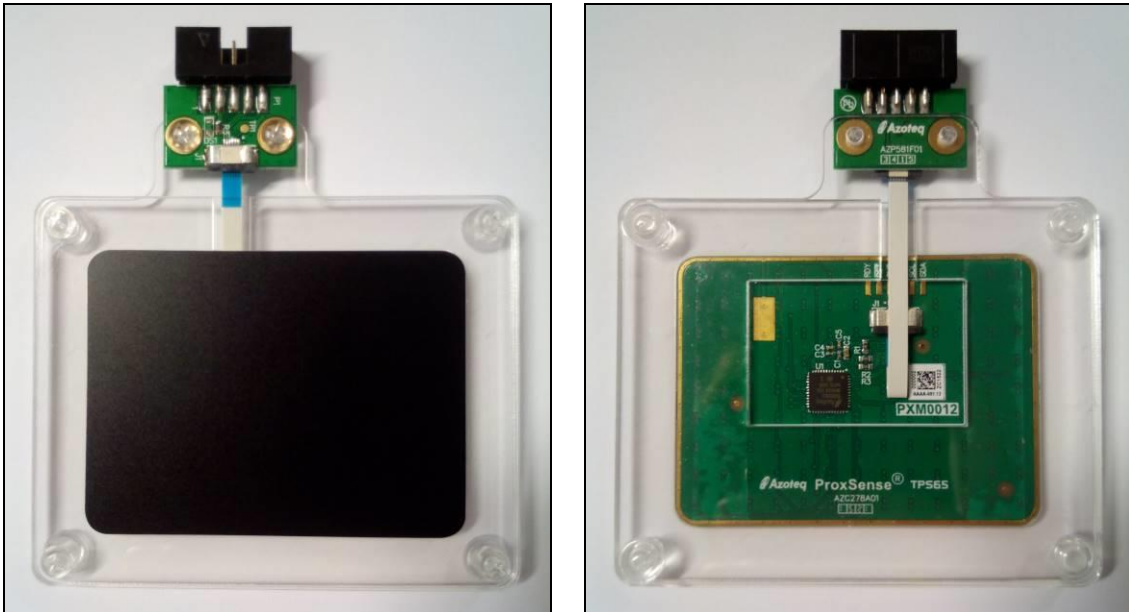


Figure 5.1 Front and back view of IQS550EV02 trackpad module



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The following patents relate to the device or usage of the device: US 6,249,089; US 6,952,084; US 6,984,900; US 7,084,526; US 7,084,531; US 8,395,395; US 8,531,120; US 8,659,306; US 8,823,273; US 9,209,803; US 9,360,510; EP 2,351,220; EP 2,559,164; EP 2,656,189; HK 1,156,120; HK 1,157,080; SA 2001/2151; SA 2006/05363; SA 2014/01541; SA 2015/023634

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