AZD089 – Smart Touch Remote Control Reference Design

Reference design for low-cost trackpad and button remote controller using IQS525

1 Introduction

The necessity for remote controls to include advanced features, such as mouse cursor tracking, gesture recognition and touch control is growing, as smart devices integrated into our everyday lifestyle.

The aim of this document is to provide an example of how the IQS525 can be used to create a low-cost remote controller with high-end features and touch performance. This design is purely for reference, illustrating a single-chip solution with minimum external components.

Figure 1 The popularity of touch enabled remotes are rapidly increasing

The IQS525 has numerous advantages, to be a logical choice for a touch-enabled remote control design:

- Single chip solution
- Low cost (minimal components)
- High performance trackpad
- Sensitive touch detection (allows extended range of overlay possibilities)
- Innovative snap feature (integrated into trackpad for real-estate reduction)
- Heads-up interaction (due to touch and snap sensing on a single key)
- On-chip gesture recognition
- Low power consumption (while still actively sensing)

2 Resources

2.1 Total Available Resources

The IQS525 provides numerous possibilities, depending on the design requirements. The following resources are available to be utilised for a custom design project.

Table 1 IQS525 Total Available Resources

Item	Quantity	Description
Tx sensors	2	The IQS525 has 2 'pure' Tx sensing channels. These can also be used as GPIOs if need be.
Rx sensors	8	The IQS525 has 8 Rx channels, but these can also be configured to operate as Txs (but not as GPIOs)
GPIOs	13	13 dedicated GPIOs, with internal on-chip pull-up resistors

Using these available resources, you have the following total amount of features available for your design possibilities:

- Traditional keys/buttons (press only):
  - 42 (matrix) or
  - 13 (direct)
- Trackpad:
  - up to 45mm x 45mm (5x5 configuration) or
  - 54mm x 36mm (6x4 configuration)
- Snap keys (integrated with trackpad or can be used without a trackpad):
  - 25 – these give touch and snap outputs, and use

The traditional keys and snap keys use metal domes, carbon coated overlays or similar for the detection method, as seen in standard remote controls today.

The snap keys add innovative touch feedback available to the user before key actuation, for heads-up implementations. This allows for locating and illustrating the user finger location graphically on a display.

Figure 2 Heads-up using touch-snap output keys

2.2 Resources Selected for Reference Design

For this reference design, the following configuration was used, purely as an example. The resources available can be modified to suit the specific design.

Table 2 Reference Design Configuration

Item	Description
5x5 trackpad	The 10 Rx/Tx sensors are used to provide a 5x5 sized trackpad. This sensor can supply cursor control and gestures to the application.
Snap keys integrated on trackpad	5 snap keys are integrated in the trackpad area. They serve as 4 direction keys and an enter/OK button.
GPIOs	8 dedicated GPIOs, with internal on-chip pull-up resistors are sensed directly to provide 8 traditional remote control keys

3 Design

3.1 System overview

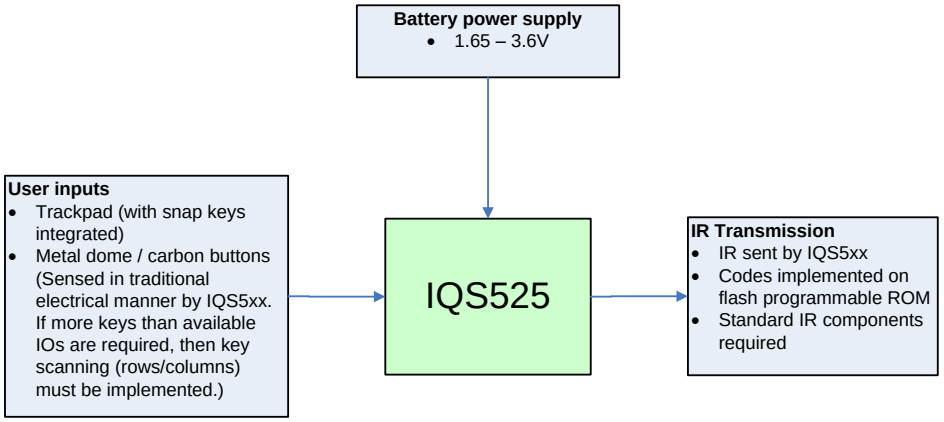

Figure 3 System overview

3.2 Mechanical

With the resources for the reference design as described in Section 2.2, an example design is shown in the mechanical drawings below.

0 depicts the 8 buttons, and also the 5x5 trackpad area.

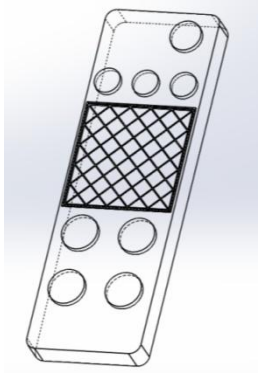

Figure 4 Example Mechanical Design

There are 5 additional mechanical snap keys integrated into the trackpad, as shown in 0 below.

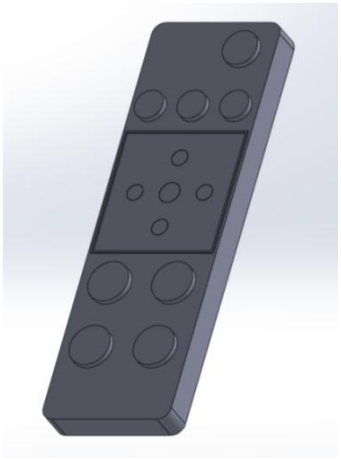

Figure 5 Trackpad with Integrated Snap Keys

3.3 Typical Circuit Diagram

The IQS525 requires minimal external components to perform the required functions for a remote controller.

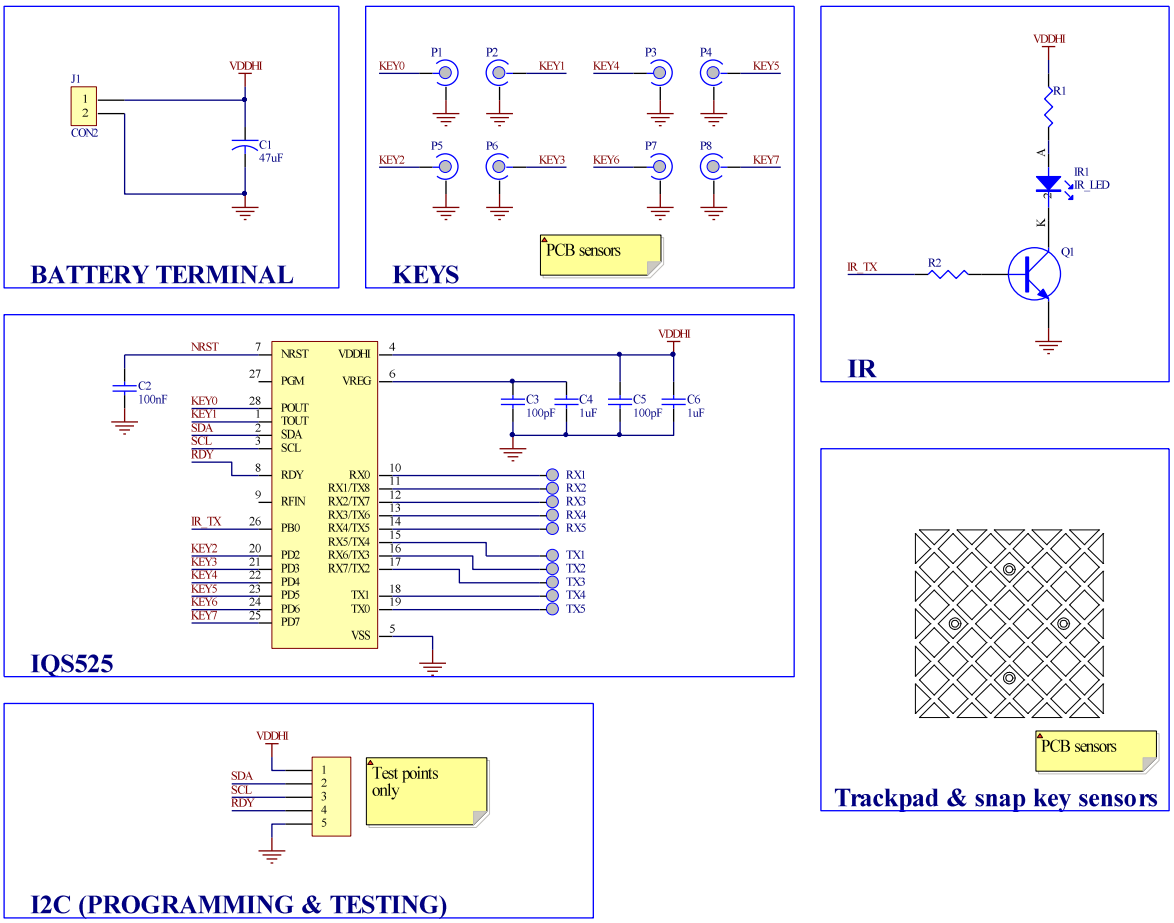

Figure 6 Reference design schematic

4 Bill of Materials

4.1 PCB Components

The PCB is responsible for the trackpad/button sensing, and the transmission of the key codes via infra-red (IR) LED. The components required are shown below:

Table 3 PCB Components

Part	Quantity	Description
IQS525	1	IQS525 MCU performing all sensing and processing required
PCB	1	Double sided PCB containing the trackpad and keys/buttons, implemented with copper sensor patterns.
47uF cap	1	47uF electrolytic capacitor
IR LED	1	Infra-red transmitting LED for remote transmission
1uF cap	2	1uF decoupling chip capacitor
100pF cap	2	100pF decoupling chip capacitor
100nF cap	1	100nF chip capacitor
NPN transistor	1	Transistor for IR control
Resistor	2	Transistor biasing and current control chip resistors in IR circuitry

4.2 Mechanical Components

The mechanical components depend on many design choices. As an overview the basic components for most scenarios would be the plastic remote control body/housing, the battery terminal connectors, the key and trackpad overlay structure (such as silicon keys), and the metal dome sticker layer. Then also the PCB assembly described in the previous section.

5 Summary

This document shows how easily a low-cost yet high-end remote control can be designed with the IQS525. The flash capabilities of the device, together with dedicated support from the Azoteq engineering team to integrate the customer IR protocol into the IQS525, make this a highly attractive smart remote control solution. The IQS5xx-B000 trackpad controller solution firmware is a perfect platform to development from, reducing time-to-market, and using tried and tested Azoteq sensing algorithms.

The IQS525 provides numerous possibilities, with even more options available when looking at the larger IQS572 and IQS550 devices.

Contact Azoteq for further information, visit www.Azoteq.com.

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