AD7142 Applications Using Sensor Buttons
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The AD7142 device interfaces with external capacitance sensors. These sensors can be arranged as buttons, scroll bars or wheels, or a combination thereof. This application note describes the host processor requirements to support sensor button interfaces.

AD7142 INTERRUPT CONFIGURATION OPTIONS

Interrupt Operating Modes
The AD7142 supports two interrupt operating modes.

- End-of-Conversion Interrupt Mode.
  By using the STAGE_COMPLETE_EN register, the INT output can be configured to assert at the end of a conversion stage. Typically, STAGE0_COMPLETE_EN is set equal to 1, so that the INT output asserts at the end of every STAGE0 conversion.

- Touch Interrupt Mode.
  The INT is asserted only when a user contacts a sensor.

Interrupt Configuration and Interrupt Status Registers

Table 1 lists and describes the interrupt configuration registers. The registers described in Table 2 are required to be read back by the host processor after each interrupt to determine which sensor button was contacted.

Note that the host processor must service the AD7142 interrupt by reading the necessary register to deassert the AD7142 interrupt output. Failing to service the interrupt results in the interrupt remaining low at all times.

Table 1. Interrupt Configuration Registers

Register Name	Address	Range	Description
STAGE_LOW_INT_EN	0x005	High/Low	STAGEx (x = 0 through 11) Low Interrupt Enable 0 = Interrupt Source Disabled
STAGE_HIGH_INT_EN	0x006	High/Low	STAGEx (x = 0 through 11) High Interrupt Enable 0 = Interrupt Source Disabled
STAGE_COMPLETE_EN	0x007	High/Low	STAGEx (x = 0 through 11) End-of-Conversion Interrupt Control 0 = Interrupt Source Disabled

Table 2. Interrupt Status Registers

Register Name	Address	Range	Description
STAGE_LOW_INT_EN	0x008	High/Low	STAGEx (x = 0 through 11) CDC Conversion Low Limit Result 1 = STAGEx Low Threshold Level Exceeded
STAGE_HIGH_INT_EN	0x009	High/Low	STAGEx (x = 0 through 11) CDC Conversion High Limit Result 1 = STAGEx High Threshold Level Exceeded
STAGE_COMPLETE_EN	0x00A	High/Low	STAGEx (x = 0 through 11) CDC Conversion Completion Status 1 = STAGEx Conversion Completed

INTERRUPT EXAMPLES

Two examples are provided to describe an end-of-conversion interrupt and a touch interrupt operation for two sensor buttons. For these two examples, Sensor Button A and Button B (see Figure 1) are connected to CDC STAGE0 and CDC STAGE1, respectively, to respond by the CDC output codes falling below the ambient level.

AD7142 CDC STAGE
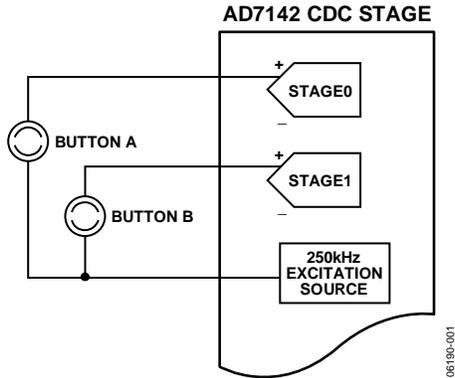
Figure 1. Two Button Configuration Example

Example 1: End-of-Conversion Interrupt Mode

Interrupt configuration register settings:

Address 0x005 = 0x0000 // STAGE*x*_LOW_INT_EN = 0 (*x* = 0 through 11)

Address 0x006 = 0x0000 // STAGE*x*_HIGH_INT_EN = 0 (*x* = 0 through 11)

Address 0x007 = 0x0001 // STAGE0_COMPLETE_EN = 1 (end-of-conversion interrupt mode configured to assert the INT output at the completion of each STAGE0 conversion)

The system host processor is required to read back the low limit interrupt status registers at Address 0x008 after each interrupt to check if a sensor button was contacted during the conversion sequence. For the timing diagram shown in Figure 2, the low limit interrupt status register located at Address 0x008 reports results as shown in Table 3.

Table 3. Results of the Low Limit Interrupt Status Register

	Sequence 1	Sequence 2
Address 0x008	0000000000000001 [1]	0000000000000010

[1] As shown in Figure 1, Sensor Button A is connected to STAGE0 and Sensor Button B is connected to STAGE1.
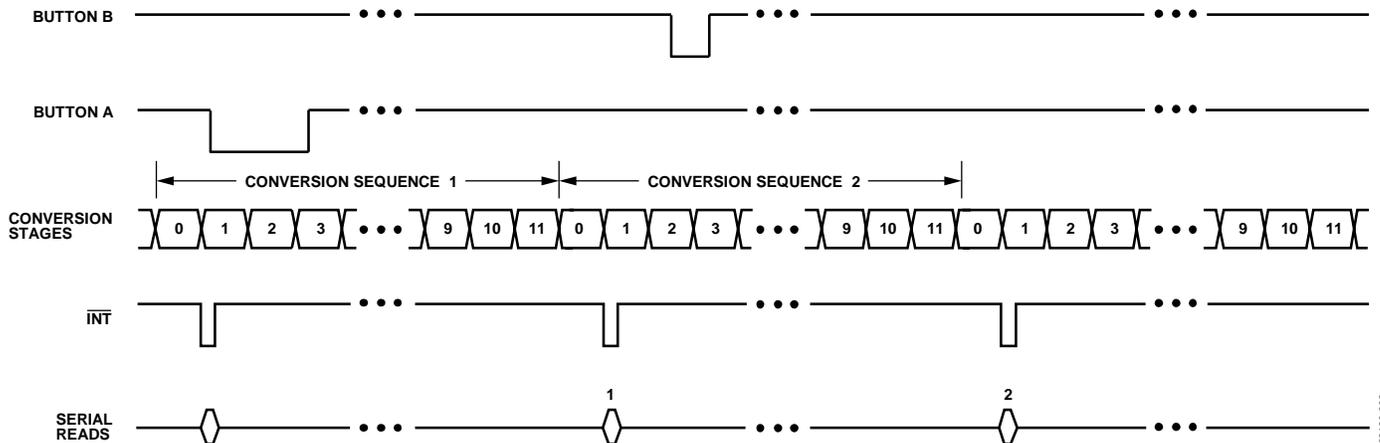
Figure 2. Timing Diagram for End-of-Conversion Interrupt Mode

Example 2: Touch Interrupt Mode

Interrupt configuration register settings:

Address 0x005 = 0x0003 // STAGE0_LOW_INT_EN = 1 and STAGE1_LOW_INT_EN = 1

Address 0x006 = 0x0000 // STAGEx_HIGH_INT_EN = 0 (x = 0 through 11)

Address 0x007 = 0x0000 // STAGEx_COMPLETE_EN = 0 (x = 0 through 11)

As shown in Figure 3, two interrupts assert each time the user contacts a sensor. The first interrupt indicates the user has made contact, while the second interrupt indicates the user has lifted off (seized contact with) the sensor. The host processor is required to read back the low limit interrupt status register located at Address 0x008 for each interrupt.

The low limit interrupt status register located at Address 0x008 reports results as shown in Table 4. Note that Xs indicate "Don't Care".

Table 4. Results of the Low Limit Interrupt Status Register

Serial Reads	Address 0x008[1]
1	0000000000000001
2	XXXXXXXXXXXXXXX
3	0000000000000001
4	XXXXXXXXXXXXXXX

[1] As shown in Figure 1, Sensor Button A is connected to STAGE0 and Sensor Button B is connected to STAGE1.
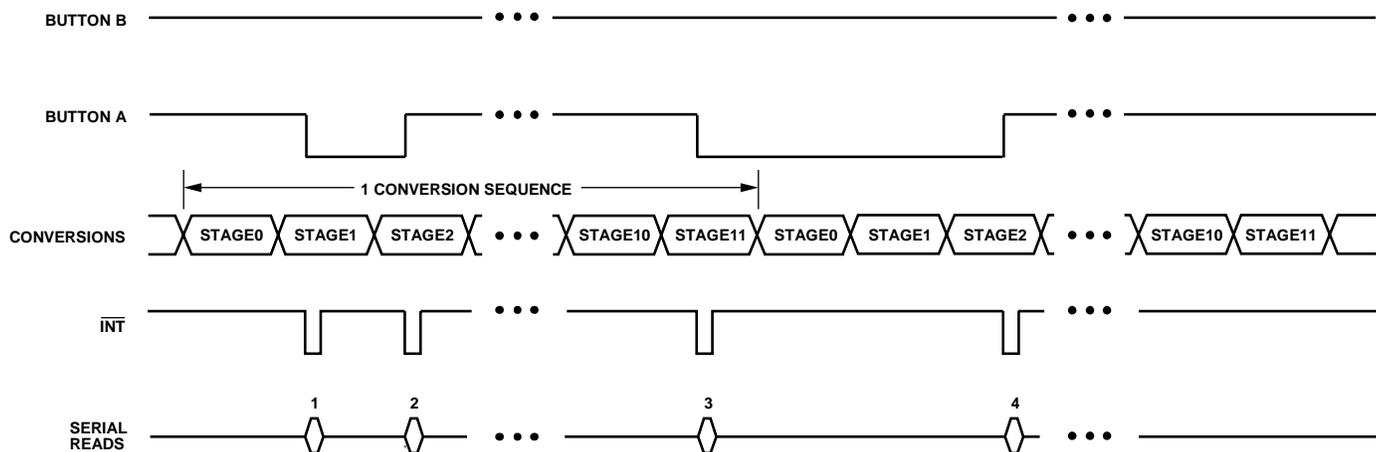
Figure 3. Timing Diagram for Touch-Only Interrupt Operating Mode

NOTES

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