SENSING MULTIPLE JACKS USING ONE PIN

The new HD Audio CODECs implement a new sensing scheme that enables one pin to detect the presence of a plug in more than one jack.

Currently, one GPIO pin per jack is required to sense the presence of a plug. To fully implement Universal Jacks™ with headphone and microphone support on more than 2 jacks (as is supported on the STAC9758) extra GPIO pins are needed. One of the goals of the HD Audio program is to increase the number of audio I/O ports while remaining in a 48 pin package. This means that a jack detection strategy is needed that does not require additional GPIO pins.

Resistive Ladder

To achieve this goal, IDT uses the concept of a resistive ladder to detect multiple jacks. However, it is only possible to use this technique with jacks that have a special set of switched pins. This switch is isolated from the audio path. An example is shown below.

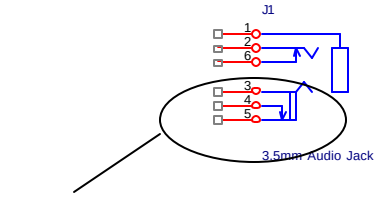

Figure 1

Each jack is connected to the codec through a resistor. Up to 3 jacks can be connected to the sense pin on the STAC9770, STAC9772 and STAC9778 products. A pull-up resistor connected to the analog supply biases the network. A schematic is shown in Figure 2.

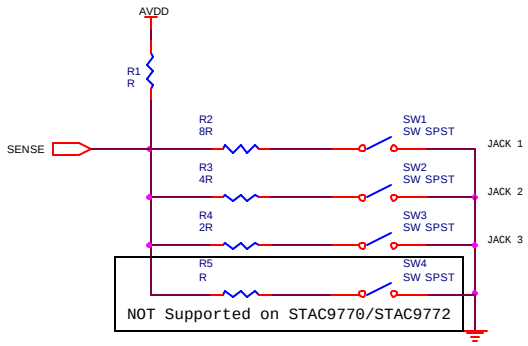

Figure 2

Identifying which switch (or switches) is closed is possible because the resistors have different values. The resistor values are based on a binary weighted scale so that the resistor on switch #1 is 2 times larger than the resistor on switch #2. The resistor on switch #2 is 2 times larger than the resistor on switch #3, and so on. The pull-up resistor is the same value as the smallest resistor defined. A typical set of values are shown in the table below.

Jack	Switch	Resistor	Value
1	#1	R2	40K
2	#2	R3	20K
3	#3	R4	10K
NA	#4	R5	5K

The Pull-Up resistor would then be 5K ohms.

All values may be implemented by using R-packs and wiring one or more resistors in series or parallel. All resistors must be precision resistors of 1% tolerance or better. See below for one possible implementation.

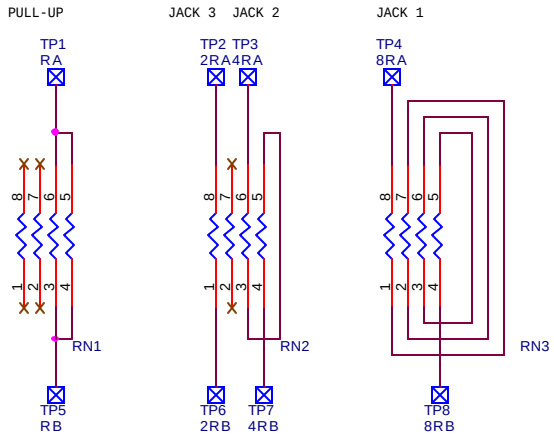

Figure 3

Conclusion

Using a single pin to sense multiple jacks is an exciting breakthrough that allows greater functionality from fewer pins. Products such as the STAC9772 can now provide all the GPIO functionality of a 48-pin device in a 32-pin package. Also, the STAC9770 can now implement more jacks with microphone bias support. In the future, the addition of more sense pins will allow even greater functionality.

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