Comparing the bq29312A to the bq29312

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ABSTRACT

The bq29312A analog front end (AFE) IC contains a minor change to the existing bq29312 AFE that improves overall system-level ESD performance. The specifications of the bq29312 and bq29312A are identical.

System-Level ESD Improvement

Internal Regulator Change

The bq29312 contains an internal regulator that provides a controlled power supply to the rest of the device. This power supply is used to hold the RAM data valid, to power the state machine, and to provide voltage reference. A power-on-reset (POR) circuit controls the power supply. If this supply is disturbed, it could cause the bq29312 to reset.

Internal Reset Circuit Power Supply

The bq29312 has an internal reset circuit that drives the I^2C circuit (see Figure 1). One of the bq29312A integrated circuit (IC) design goals was to reduce the overall current consumption of the IC. The bq29312A reset circuit power supply current was reduced compared to the bq29312 although the circuit remained the same.

Analysis of the bq29312 indicated that the extra low current change caused an increase in board-level ESD susceptibility. As a result, the reset circuit's power supply current of the bq29312A was increased, although this change did not change the data sheet specification of supply current.
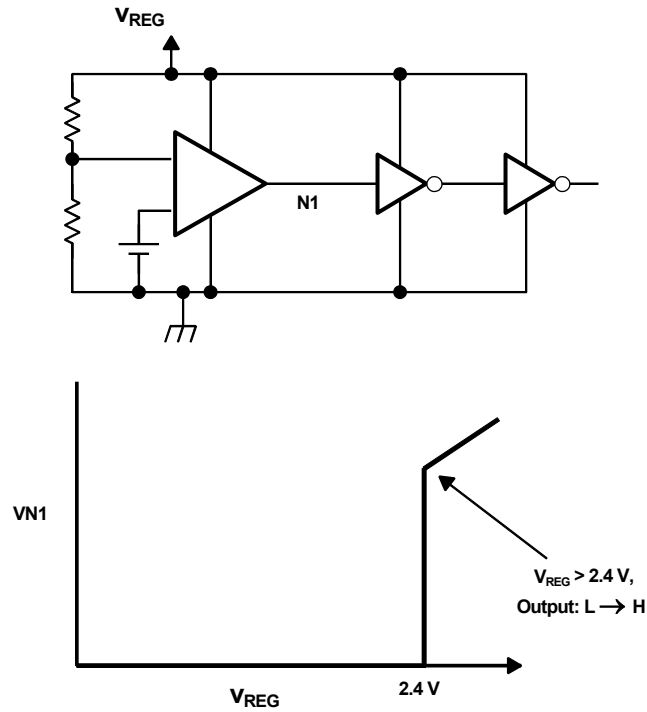
Figure 1. I²C Reset Circuitry and Voltage Thresholds

Reset to I²C Line Change

During an ESD event, it was observed that the connection of the reset output and I²C block was being affected. As a result, the signal line was separated from the reset circuit to the internal I²C circuit and a filter was added in front of I²C block to absorb any noise (see Figure 2).
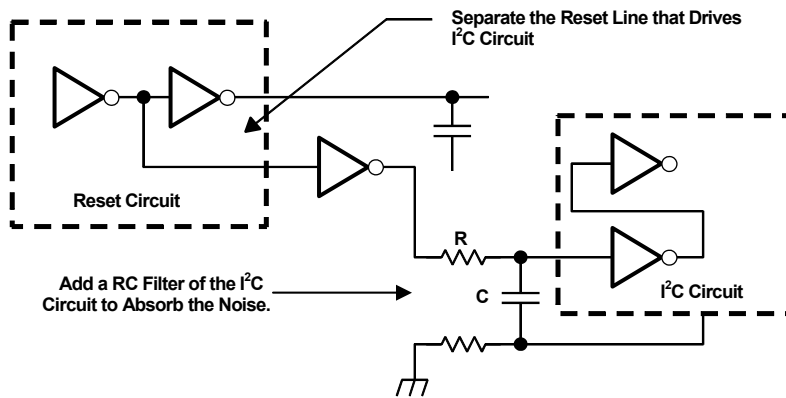

Figure 2. Internal Reset Circuit

Layout Recommendations

Texas Instruments recommends connecting the capacitor on REG (pin 22) to the bq29312A as closely as possible as this affects the stability of the regulator output, which is in turn connected to the internal regulator circuit. TI also recommends that the BAT input does not have traces where pulsed current or high-frequency signals could be present (including transients) placed close to it, although this is a more general PCB layout principle in analog designs.

The change made in the bq29312A routes the ground connection of this internal regulator to a node less sensitive to transients, thus providing a more stable power supply under extreme transient conditions. In addition to this improvement, Figure 3 illustrates another layout recommendation.
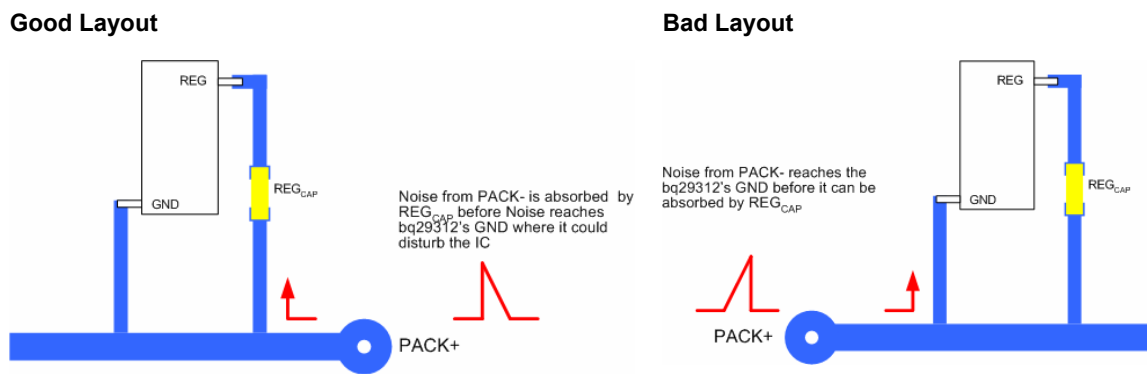

Figure 3. Layout Example

Summary

Both the bq29312 and bq29312A AFE ICs provide an excellent solution for good ESD levels, but the bq29312A is less sensitive to the PCB layout items previously noted.

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