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Conversion Rates Explained for the ADT7461

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GENERAL DESCRIPTION

This application note is intended to explain conversion times and conversion intervals for the ADT7461 and to explain how SMBus activity affects temperature measurement updates.

Explanation of Terms

Conversion Time

The conversion time is specified in the ADT7461 data sheet. It is the duration of a complete temperature measurement, with both local and remote temperatures measured. The minimum and maximum specifications account for variation in the internal oscillator over supply voltage and temperature. The maximum conversion time is specified as 114.6 ms with averaging enabled and 12.56 ms with averaging disabled.

Conversion Interval

The conversion interval is set by the conversion rate register. Typical values for the conversion interval are provided in the ADT7461 data sheet.

Oscillator

The internal oscillator in the ADT7461 clocks the conversion time and the conversion interval.

Normal Operation Explained

During normal operation, the ADT7461 begins a temperature measurement at the start of each conversion interval. Figure 1 shows the sequence with the conversion rate set to 4 Hz (that is, the conversion interval is set to 250 ms; however, this is a typical figure only and the actual conversion interval varies from part to part).

What Happens if an SMBus Transaction Interrupts a Measurement?

If an SMBus transaction to the ADT7461 takes place during the conversion time, the ADT7461 aborts the current measurement and waits until the SMBus activity has completed. When the SMBus activity has completed, the ADT7461 resets the conversion interval. Once the conversion interval has elapsed, the ADT7461 starts a new measurement. This means that the user needs to allow enough quiet time on the SMBus for a complete conversion interval plus conversion time to elapse. Figure 2 shows the SMBus activity interrupting the measurement. However, in this example, there is sufficient quiet time on the SMBus to allow the conversion interval and conversion time to elapse. If the SMBus transaction takes place when a conversion is not taking place, the conversion interval is not reset.

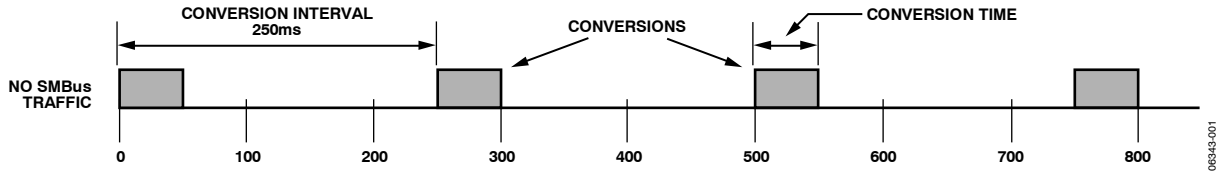

Figure 1.

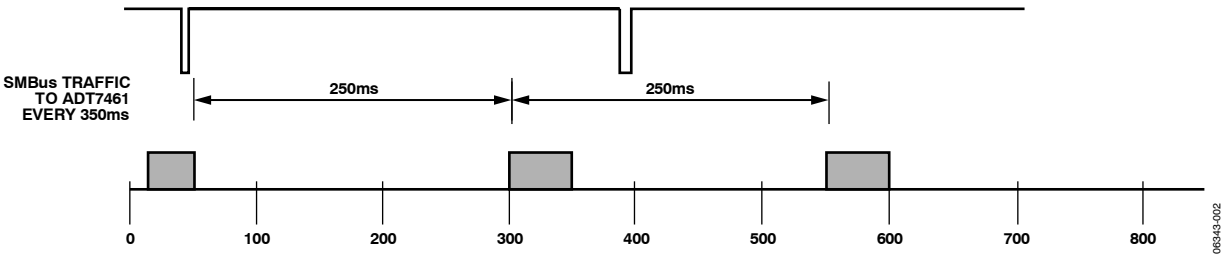

Figure 2.

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What Happens if the Quiet Time on the SMBus is not Long Enough?

If the quiet time is not long enough, the ADT7461 will not complete a measurement, as shown in Figure 3.

How Much Quiet Time does there have to be to Ensure Measurements are Completed?

For a conversion rate of 8 Hz, allow sufficient quiet time to ensure that a complete measurement is made. For example, the worst-case conversion interval at 8 Hz is 243 ms, and the worst-case conversion time with averaging enabled is 114.6 ms. To ensure that measurements are updated, allow at least 357.6 ms between SMBus transactions (this guarantees that measurements are completed regardless of variations in supply voltage and temperature. With averaging disabled, allow 243 ms plus 12.56 ms, which equals 255.56 ms.

One-Shot Mode

When a value is written to the one-shot register, a new measurement, and therefore a new conversion time, starts immediately. A new measurement result is available 114.6 ms after the write to the one-shot register if averaging is enabled, 12.56 ms later if averaging is disabled. One-shot mode can still be used when the ADT7461 is operating in round-robin mode or in standby mode.

A combination of round-robin mode and one-shot mode is the most comprehensive mode of operation. To generate a new measurement and minimize the quiet time necessary on the SMBus, the user can write to the one-shot register and read back the new measurement after 114.6 ms, or 12.56 ms if averaging is disabled. Because the ADT7461 is still operating in round-robin mode, measurements will be made regularly without intervention from the SMBus master (assuming sufficient quiet time on the SMBus, as described above). This offers fail-safe protection if the SMBus master locks up.

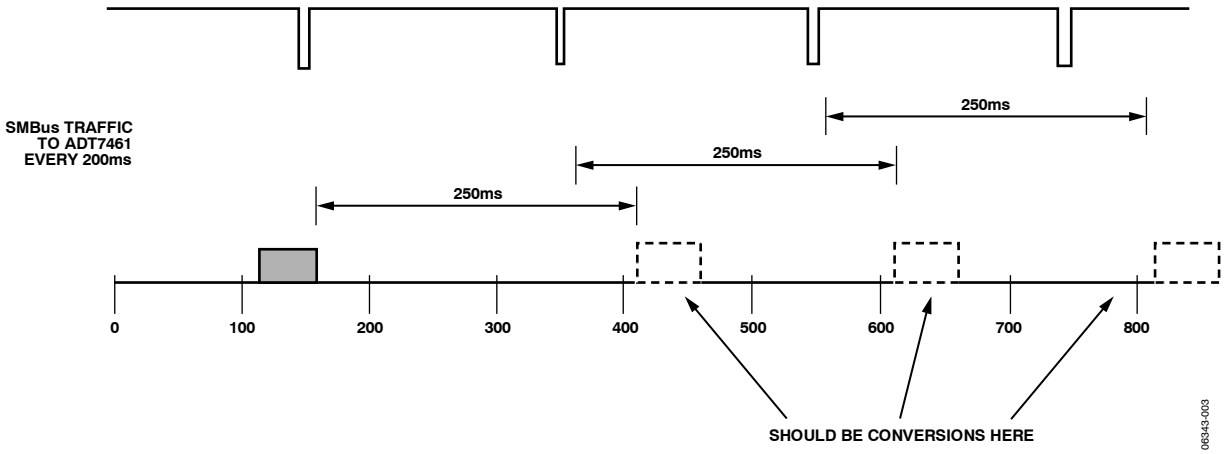

Figure 3.

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