

ON Semiconductor

Is Now

onsemi™

To learn more about onsemi™, please visit our website at
www.onsemi.com

onsemi and **onsemi** and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi** product/patent coverage may be accessed at www.onsemi.com/site/pdf/Patent-Marking.pdf. **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner. Other names and brands may be claimed as the property of others.



Conversion Rates Explained for the ADT7461

by Mary Burke

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.

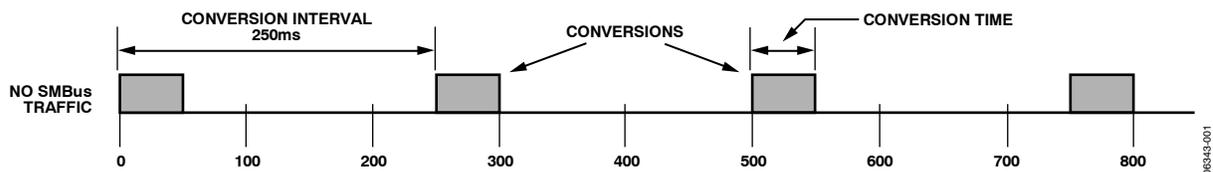


Figure 1.

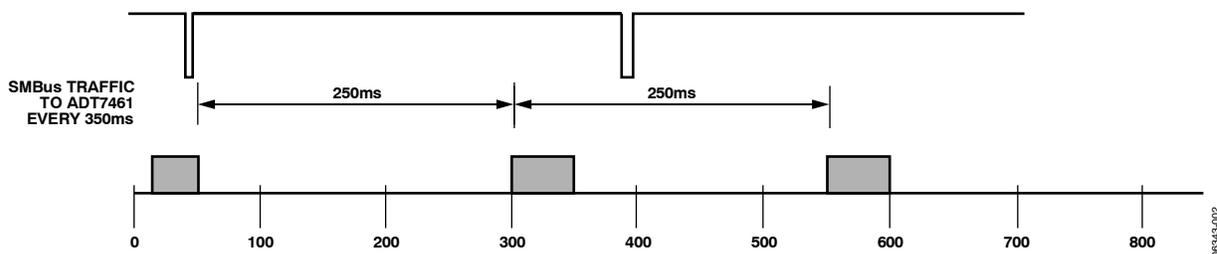


Figure 2.

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.

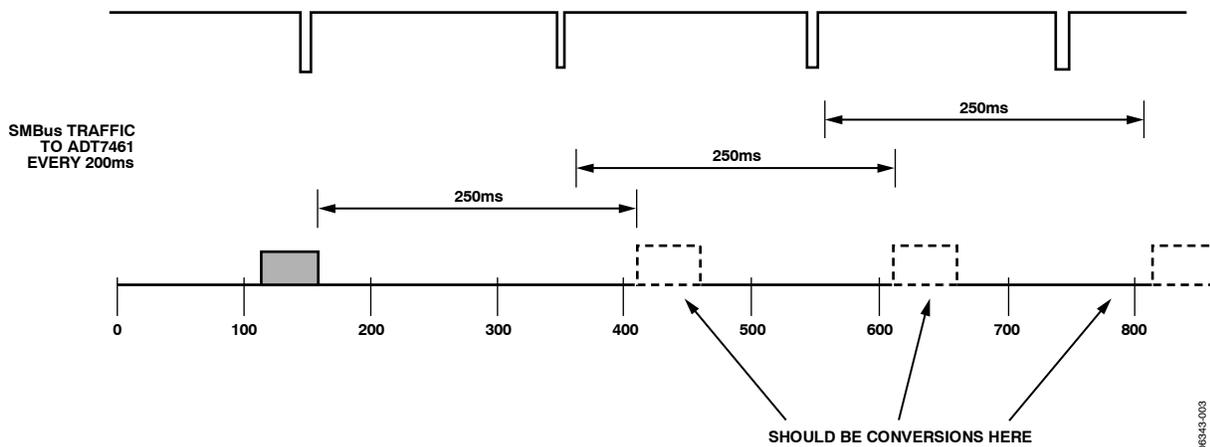


Figure 3.

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:
Literature Distribution Center for ON Semiconductor
P.O. Box 5163, Denver, Colorado 80217 USA
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada
Email: orderlit@onsemi.com

N. American Technical Support: 800-282-9855
Toll Free USA/Canada
Europe, Middle East and Africa Technical Support:
Phone: 421 33 790 2910
Japan Customer Focus Center
Phone: 81-3-5773-3850

ON Semiconductor Website: www.onsemi.com
Order Literature: <http://www.onsemi.com/orderlit>
For additional information, please contact your local Sales Representative