AN-1089 I2C Controlled Window Comparators

The Silego SLG46531V GreenPAK™ has an I2C communication interface for controlling its internal blocks configuration and some connections. It is highly flexible and easy to use. This example shows its use and configuration in the design of a dual window comparator.

Design overview

The design itself is a typical window comparator. 4 ACMPs are used to create 2 full window comparators inside the chip. The I2C interface is used to turn on ACMPs and change their V_{ref} values.

The basic window comparator consists of 2 ACMPs and a 2-bit LUT connected to their outputs. Both ACMPs IN+ are connected to one source, their IN- sources are different V_{ref} values. The LUT truth table is configured to produce a HIGH level when the input analog voltage is between ACMPs references and produce LOW in all other cases. All ACMPs could be dynamically turned on and off via their PWR UP nodes. In this design PWR Ups are connected via I2C virtual OUTs, so they can be controlled through I2C commands. IN- references of ACMP0-ACMP3 are configured as 100, 300, 600, 900 mV respectively. All IN+ inputs source from one pin. All output PINs are configured as Push Pull 1X (please refer to Fig. 1).

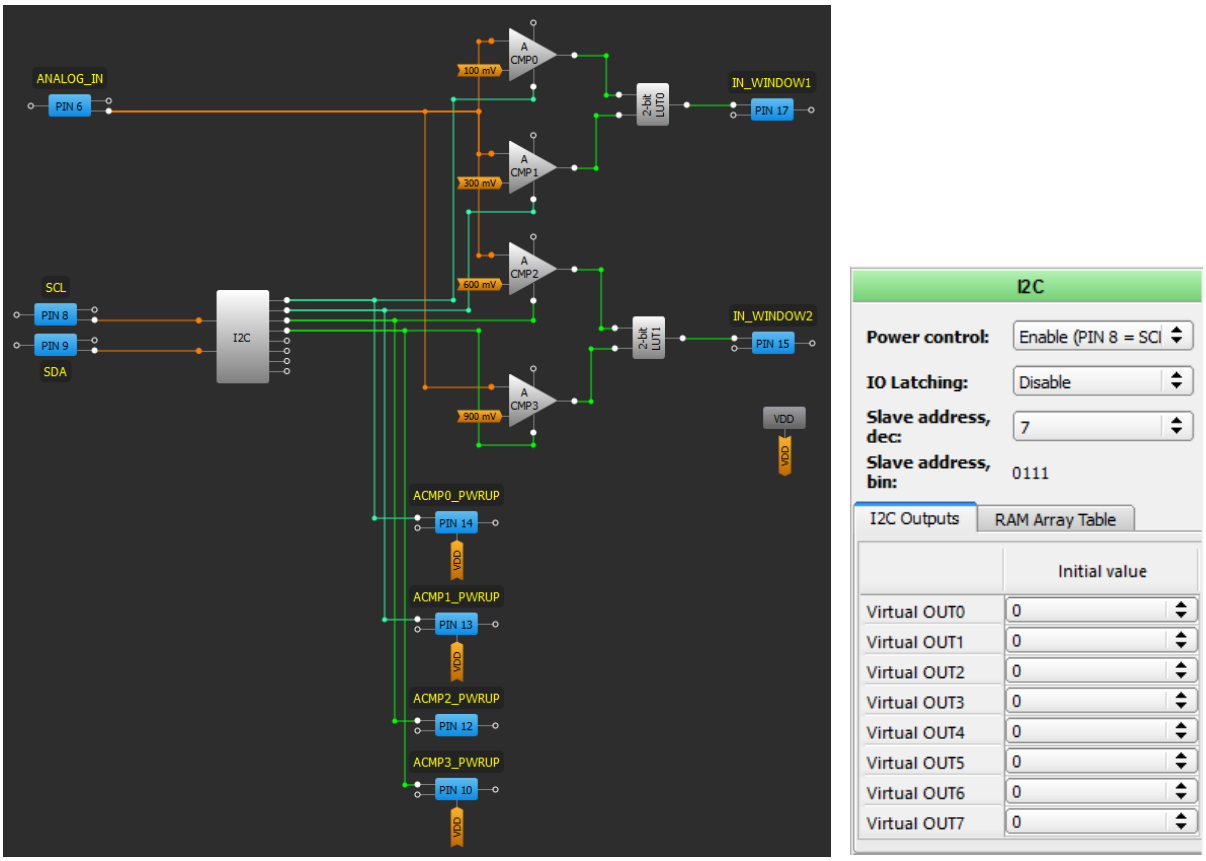

Figure 1. Dual window comparator design viewed in the GreenPAK Designer and I2C block configuration

I2C operation

ACMP V_{ref}s and PWR Ups are controlled via I2C protocol. It is a standard serial data transmission protocol. An example of correct chip and internal blocks addressing begins in Fig.2. Certain pin assignments in the SLG46531V are reserved by default: SCL (serial clock) input is assigned to PIN8, while and SDA (serial data) input is assigned to PIN9.

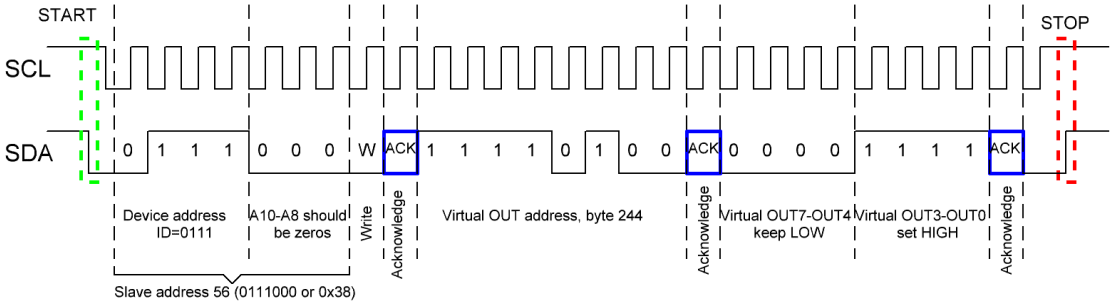

Figure 2. ACMPs powering up via I2C programming of Virtual OUTs. Timing Diagram

Typically, I2C slave device address consists of 7 bits. GreenPAK5 uses only the 4 MSB to control its device address, so 3 LSB (A10-A8) should be set to '000'. The device address ID is configured in the I2C block properties. In this case it is set to 0111, so the slave address is 56 (0111000 or 0x38). After the device address, the read-write bit follows. If it is LOW the data will be written to the GreenPAK, if it is HIGH the data will be read from the GreenPAK.

The address of Virtual OUTs is 244 (11110100). To switch a Virtual OUT HIGH, the corresponding bit should be sent into the GreenPAK.

During GreenPAK operation there is the possibility of changing some of the chip's blocks configurations. In this design, a reference voltage of ACMPs is changed by sending to respective ACMP address its configuration byte.

Fig. 3 shows the process of sequential configuration byte writing into the GreenPAK. After the device address and read/write bit, ACMP0 is addressed (byte 203 or 11001011). The configuration byte follows next. It consists of Low Bandwidth Filter option bit (MSB), two Gain option bits and 5 V_{ref} option bits (LSB). To have the next ACMP configured there is no need to send separate I2C code. The described code can be continued after ACK signal with 8 configuration bits.

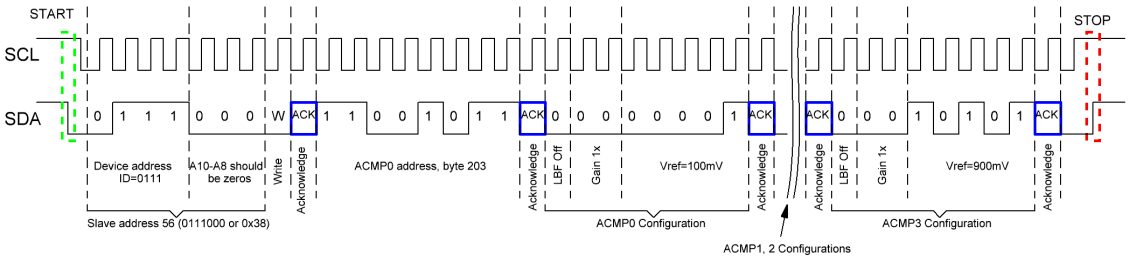

Figure 3. ACMPs V_{ref} programming via I2C. Timing Diagram

Conclusion

This example describes the implementation of dynamic control and reconfiguration using I2C in GreenPAK5. Dynamic access to these and other blocks within the GreenPAK CMIC afford the designer great flexibility.

About the Author

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Background: Roman Yankevych graduated from Lviv Polytechnic National University in 2009, studying at the Department of Radioelectronic Devices and Systems. He designs with Configurable Mixed Signal ICs (CMICs) and provides engineering support for their applications. Additionally, he has over 5yr experience with signal processing in radar and communication systems.

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Files

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