Microcontroller Interface

The microcontroller is accessible through an AXI slave interface that has 5 channels as shown in Figure 1. The microcontroller is going to give access to process, voltage and temperature measurements, through different routines.

These routines include reading the current measurement of group of sensors, enabling or disabling a continuous measuring mode where the microcontroller returns systematically the measurements of a group of sensors based on a predefined sampling interval. The interface supports commands that would return only the highest measured value within a specified group of sensors. The microcontroller interface would also allow to set a sampling interval for each one of the available measurements. The returned measurements represent values that are computed based on the average of an observation window, whose length can be defined through the interface. The interface would also provide different data formats for the different measurements. A high/low threshold can be defined for each one of the measurements, such that if it is violated the microcontroller would trigger an alarm through interrupt signals to the host processor. It supports other options as well, like sensor calibration and dynamically defining different sensor groups.

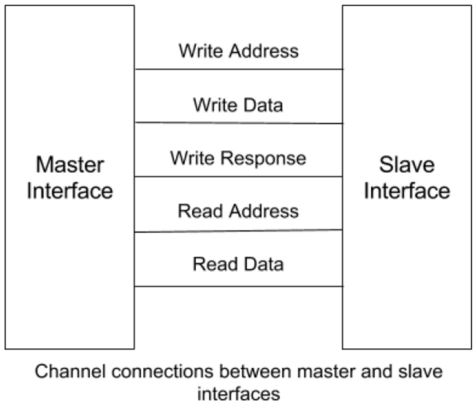

Figure 1: Data and Address channels of an AXI interface.

The data and address channels both consist of 32 bits as shown on Figure 2, where the two MSBs for the data channel specifies the measurement (temperature, voltage or delay). While the bits 28th to 24th specify which command is selected, and the 16 LSTs is for the data, the remaining bits are reserved for future use.

Figure 2: Data and Address bits

Temperature commands :

Command	Description
Read Temperature	Reads the temperature of the selected sensor or group of sensors
Enable/Disable continuous measuring mode	When it's enabled the temperature of the selected sensor or group of sensors are captured systematically based on the sampling intervals
Set sample interval for the temperature	Sets a sampling interval for the temperature sensors
Set an averaging window/resolution for the temperature sensors	Defines the number of the previous samples to average before returning the temperature values
Set temperature data format	Chooses a data format (among the available ones) for the temperature readings
Set T_HIGH threshold [ALARM]	Sets the temperature thresholds above which the risc-v would trigger an ALARM
Set T_LOW threshold [ALARM]	Sets the temperature thresholds below which the risc-v would trigger an ALARM
Set/read temperature sensor calibration	This command may be used to calibrate the temperature sensors when a highly precise temperature reference value is available
Read the highest temperature value	This command returns the highest temperature value of the selected group of sensors
Define the sensors group	Assigns the different sensors to different groups
Get the available sensors ID	Get the available sensors ID

Voltage commands :

Command	Description
Read Voltage	Reads the voltage of the selected sensor or group of sensors
Enable/Disable continuous measuring mode	When it's enabled the voltage of the selected sensor or group of sensors are captured systematically based on the sampling intervals
Set sample interval for the voltage	Sets a sampling interval for the voltage sensors
Set an averaging window/resolution for the voltage sensors	Defines the number of the previous samples to average before returning the voltage values
Set voltage data format	Chooses a data format (among the available ones) for the voltage readings
Set T_HIGH threshold [ALARM]	Sets the voltage thresholds above which the risc-v would trigger an ALARM
Set T_LOW threshold [ALARM]	Sets the voltage thresholds below which the risc-v would trigger an ALARM
Set/read voltage sensor calibration	This command may be used to calibrate the voltage sensors when a highly precise voltage reference value is available
Read the highest voltage value	This command returns the highest voltage value of the selected group of sensors
Define the sensors group	Assigns the different sensors to different groups
Get the available sensors ID	Get the available sensors ID

Delay commands :

Command	Description
Read the location of the CP	Read the location of the CP
Enable/Disable continuous measuring mode	When it's enabled the location CP of the is captured systematically based on the sampling intervals
Set sampling interval for the CP	Sets a sampling interval for the CPM
Set an averaging window/resolution	Defines the number of the previous samples to average before returning the values
Set data format	Chooses a data format (among the available ones) for the readings
Set T_HIGH threshold [ALARM]	Sets the thresholds above which the risc-v would trigger an ALARM
Set T_LOW threshold [ALARM]	Sets the thresholds below which the risc-v would trigger an ALARM
Set/read sensor calibration	This command may be used to calibrate the sensor
Define the sensors group	Assigns the different sensors to different groups
Get the available sensors ID	Get the available sensors ID