PmodTMP2™ Reference Manual

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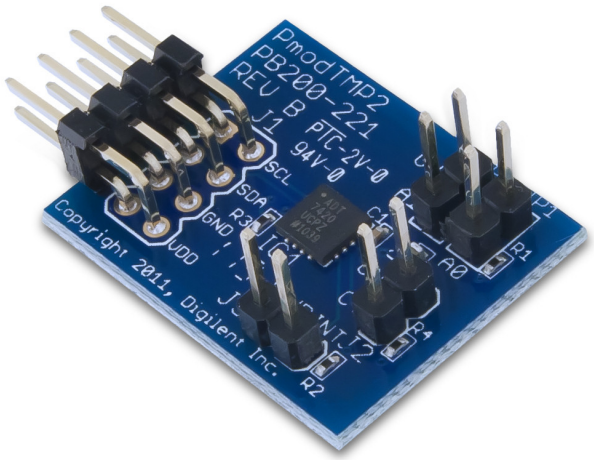
Overview

The PmodTMP2 is a temperature sensor and thermostat control board built around the Analog Devices ADT7420.

Features include:

- Up to 16-bit resolution
- Typical accuracy better than 0.25 °C
- I²C interface with 4 selectable addresses
- 240ms continuous conversion time
- Support for 3.3v and 5v interfaces
- No calibration required
- Programmable overtemperature/undertemperature control pins.



Functional Description

The PmodTMP2 uses an 8-pin connector that allows for communication via I²C, and provides pins to daisy-chain the PmodTMP2 to other I²C devices. The PmodTMP2 also provides two 2-pin headers for selecting the I²C address of the chip, and two 2-pin headers for controlling external devices based upon temperature thresholds defined by the user in software.

I²C Interface

The PmodTMP2's onboard ADT7420 chip acts as a slave device using the industry standard I²C communication scheme. To communicate with the PmodTMP2 device the I²C master device must specify a slave address (0x48-0x4B) and a flag indicating whether the communication is a read (1) or a write (0). This is followed by the actual data transfer. For the ADT7420, the data transfer should consist of the address of the desired device register followed by the data to be written to the specified register. To read from a register the master must write the desired register address to ADT7420, then send an I²C restart condition, and send a new read request to the ADT7420. If the master does not generate a restart condition prior to attempting the read, then the value written to the address register will be reset to 0x00.

As some registers stored 16-bit values as 8-bit register pairs, the ADT7420 will automatically increment the address register of the device when accessing certain registers such as the temperature registers and the threshold registers. This allows for the master to use a single read or write request to access both the low and high bytes of these registers. A complete listing of registers and their behavior can be found in the ADT7420 datasheet available on the Analog Devices web site.

Interface Connector Signal Description

Connector J1 – I2C Communications		
Pin	**Signal**	**Description**
1, 2	SCL	I2C Clock
3, 4	SDA	I2C Data
5, 6	GND	Power Supply Ground
7, 8	VCC	Power Supply (3.3V/5V)

The I²C interface standard uses two signal lines. These are I²C data and I²C clock. These signals map to the serial data (SDA) and serial clock (SCL) respectively on the ADT7420.

I²C Address Selection

Addresses		
JP2	**JP1**	**Address**
Open	Open	0x4B (0b1001011)
Open	Shorted	0x4A (0b1001010)
Shorted	Open	0x49 (0b1001001)
Shorted	Shorted	0x48 (0b1001000)

The PmodTMP2 I²C bus can be set to use one of four valid addresses. The top five bits of the address are fixed, and the two least significant bits are taken from the jumper states of JP2 and JP1. JP2 corresponds to bit one of the address while JP1 corresponds to bit zero. An open jumper corresponds to a one in the address while a shorted jumper corresponds to a zero. For example, when JP2 and JP1 are open the device uses the address 0x4B (0b1001011).

Open Drain Outputs

The PmodTMP2 provides two open drain output headers for controlling external devices based upon current temperature thresholds. If the temperature leaves a range defined by registers T_{LOW} (0x06:0x07) and T_{HIGH} (0x04:0x05) then the INT pin on J3 can be driven low or high based upon the configuration of the device. Similarly, the CT pin on J2 can be driven low or high if the temperature exceeds a critical threshold defined in T_{CRIT} (0x08:0x09). Both of these pins are pulled up by 10KOhm resistors when they are not driven by the device. For details on their electrical specifications and configuration of the INT and CT pins please refer to the ADT7420 datasheet.

Quickstart Operation

When the PmodTMP2 is powered up, the onboard ADT7420 is in a mode that can be used as a simple temperature sensor without any initial configuration. By default, the device address register points to the temperature MSB register, so a two byte read without specifying a register will read the value of the temperature register from the device. The first byte read back will be the most significant byte (MSB) of the temperature data, and the second will be the least significant byte (LSB) of the data. These two bytes form a two's complement 16-bit integer, if the result is shifted to the right three bits and multiplied by 0.0625 the resulting signed floating point value will be a temperature reading in degrees Celsius.

For information on reading and writing to the other registers of the device, as well as notes on the accuracy of the temperature measurements please refer to the ADT7420 datasheet.

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