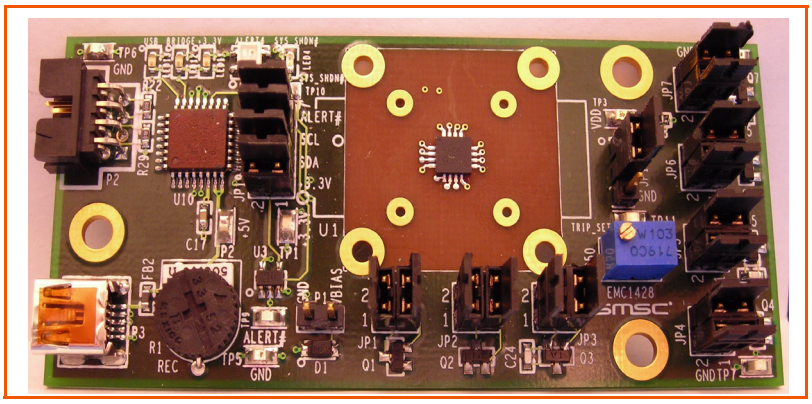
EMC1428 EVB User Manual



1 Overview

The EMC1428 device is a multi channel SMBus temperature sensor with $\overline{\text{SYS\_SHDN}}$ and $\overline{\text{ALERT}}$ outputs. Seven externally connected temperature diodes and one internal diode are available for temperature sensing. The system shutdown temperature is configurable as is the alert alarm levels.

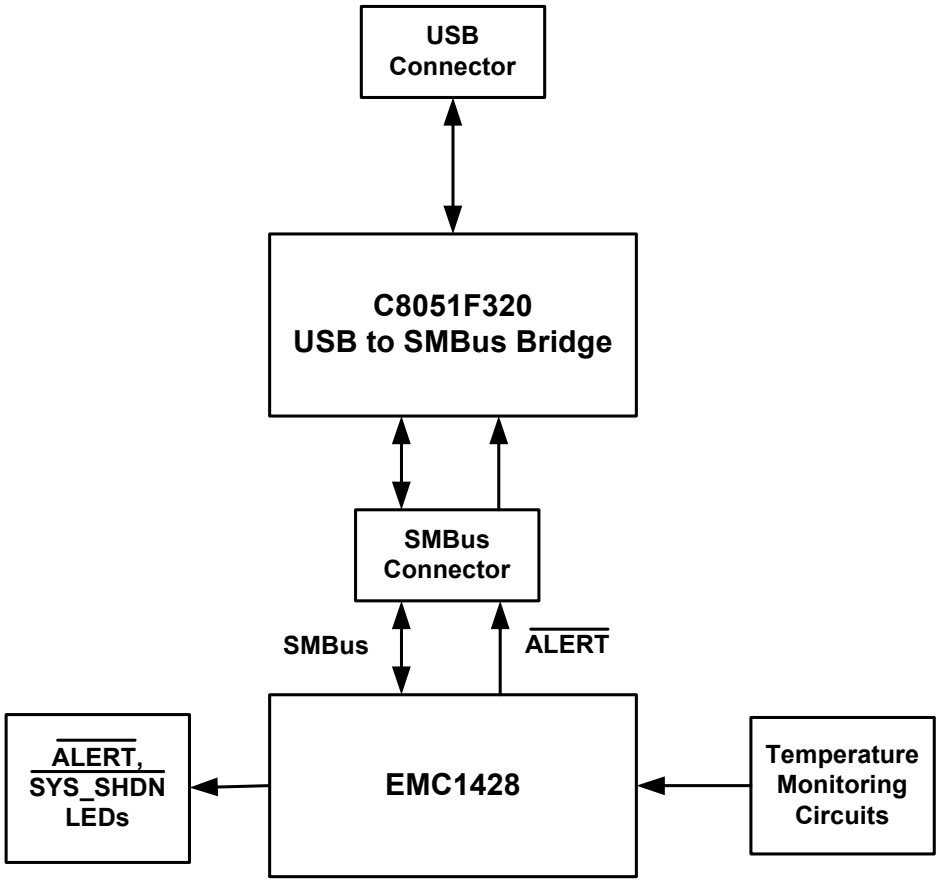
All of the functions of the EMC1428 can be tested and observed with the USB-based EVB-EMC1428. A block diagram of this EVB is shown in Figure 1.1.

1.1 Related Documents

The CD included with the evaluation board contains the following documents:

- Bill Of Materials
- Schematic
- Datasheets
- Chip Manager Application
- Chip Manager Register Definition File (EMC1428.xml)

Figure 1.1 EVB-EMC1428 Block Diagram



2 Getting Started

2.1 System Requirements

To use the EVB you will need:

- A PC running Windows 2000 or XP
- Display resolution 800x600 (or larger to view several windows simultaneously)
- An available USB port

2.2 Feature Summary

- The SMSC Chip Manager (ChipMan) application allows viewing and changing register values
- Graphing of any register
- Headers for connecting an external diode or CPU/GPU
- Resistance Error Correction verification
- Saving of settings of all registers allowing for quick loading at a later time
- USB communication to evaluation board
- An external SMBus master be easily connected

2.3 Installing the EVB

1. Install the Chip Manager application and device driver on a PC by running Setup.exe from the Chip Manager distribution CD. A revision history and install/un-install notes may be found in the readme.txt file on the disk.
2. Connect the supplied USB cable to an available USB port on the PC. Plug the “mini-B” end of the USB cable into EVB connector P3. The +3.3V and Bridge ACT LEDs should illuminate. After the EVB is connected to the PC the “Find New Hardware” wizard will pop up for USB driver installation. Follow the instructions in the readme.txt file to complete the installation process.
3. Start the EVB Software by selecting the Chip Manager application from the SMSC folder from the Programs Windows Start menu. The EVB will initialize and the Chip Manager Quick Help screen will appear as in Figure 2.1. The USBAct LED should be blinking when the Chip Manager is running. For more help with Chip Manager, select Help -> Contents for an html based help document as shown in Figure 2.2.

Note: The SMSC Chip Manager application allows viewing and changing register values for a variety of EVBs including the EMC1001, EMC1002, EMC1023, EMC1033 and the entire family of EMC14XX. The Chip Manager software only needs to be installed once to support all of these EVBs. The list of supported EVBs may be found in the pulldown menu under Options -> Select Device.

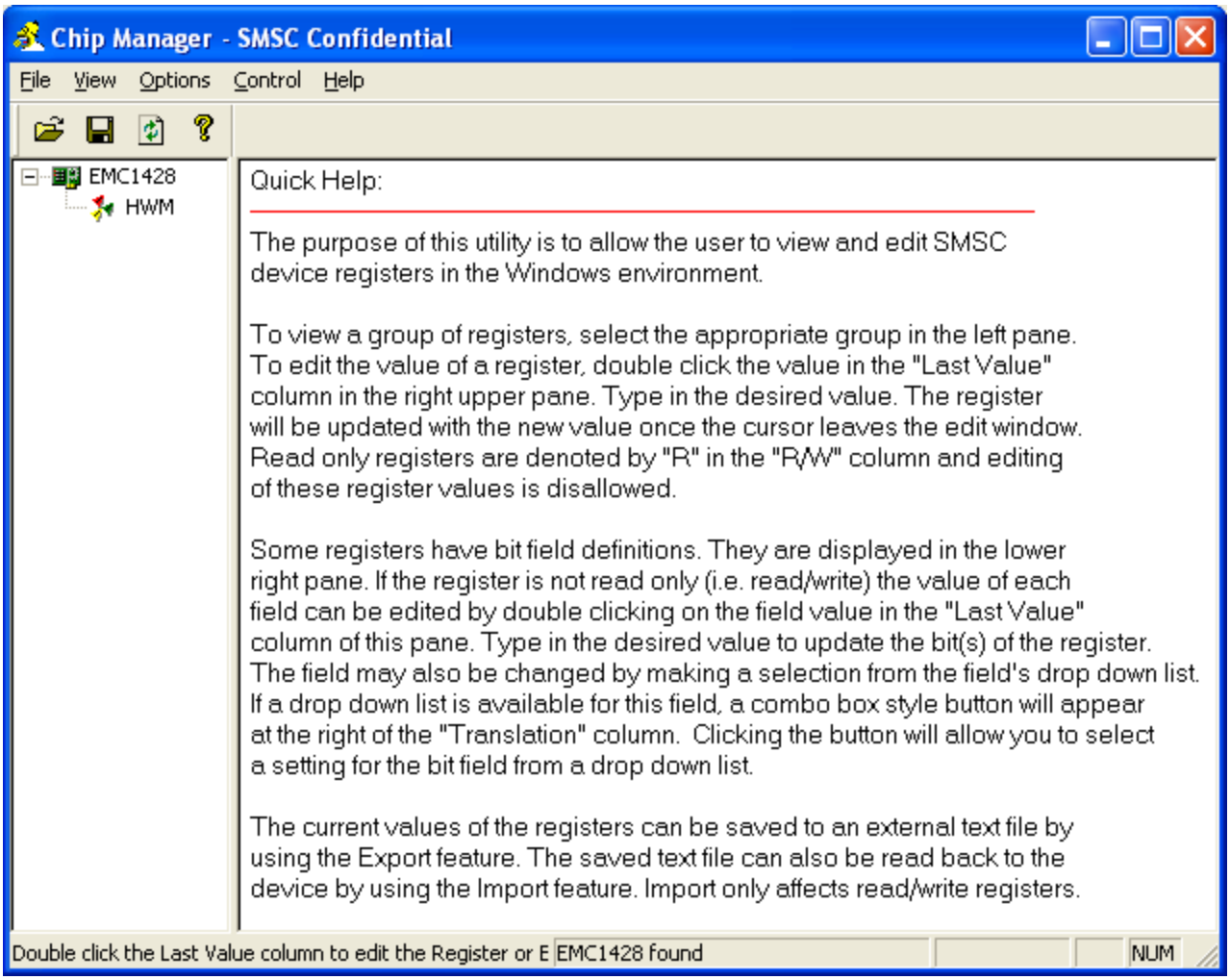


Figure 2.1 Chip Manager Quick Help Startup Screen

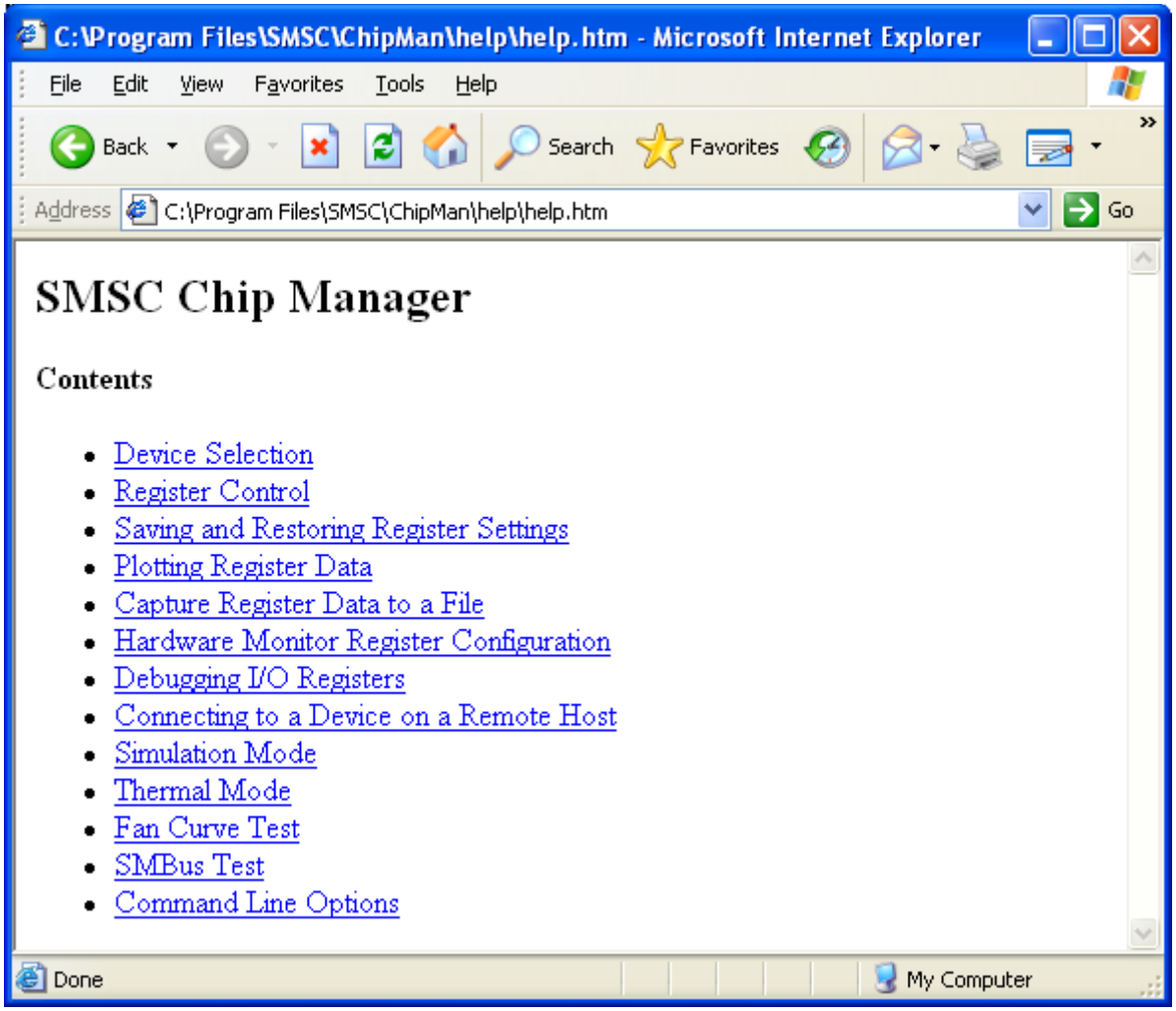


Figure 2.2 Chip Manager Help Screen

2.4 Board Layout

The EVB was designed for ease of use and user experimentation with easily accessible jumpers and access to the SMBus data lines. Figure 2.3 below shows the silk-screen for the EVB-EMC1428.

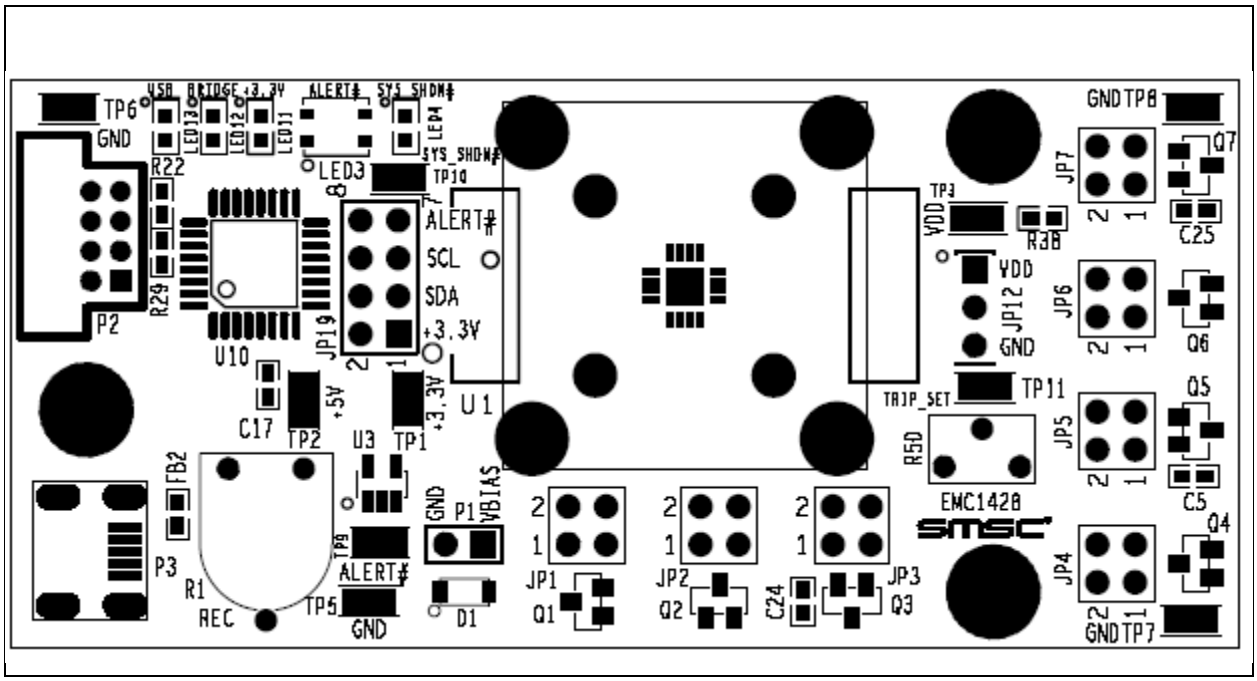


Figure 2.3 EVB-EMC1428 Board Outline and Silk-screen

3 Hardware Description

3.1 Introduction

The EVB-EMC1428 provides the means to demonstrate all of the EMC1428 features and to view and modify registers. LEDs indicate status information and test points are included to monitor system voltages with a user provided voltmeter or oscilloscope.

3.2 USB to SMBus Bridge

The USB to SMBus bridge is based on an 8051 micro controller with integrated USB and SMBus interfaces as well as internal flash and RAM. During EVB manufacture, firmware is loaded into the bridge that provides the interface between the USB and the SMBus. Power is sourced to the micro controller from the USB interface for device power and communication.

3.2.1 Direct SMBus Connect Option

It is also possible to connect an external SMBus master to the EVB-EMC1428. A few jumper settings are all that is required to drive the EMC1428 on the EVB:

- Simply remove the jumpers on JP19 and connect the SMBus master to the SCL, SDA and $\overline{\text{ALERT}}$ pins, as well as an external supply for +3.3V.
- The +3.3V can be supplied by the SMBus bridge by leaving the +3.3V jumper in place and retaining the USB connection.

3.3 Connecting to Remote Diodes

This EVB is populated with jumpers to connect to an external diode or CPU/GPU. If connecting to a CPU's thermal diode, it is necessary to provide a common ground. Also, it is usually necessary to bias the appropriate CPU Vcc plane above this common ground to avoid forward-biasing the ESD diodes with the temperature sensor signals. These connections have been provided on P1. Consult the CPU manufacturer's datasheet for guidance on interfacing to the thermal diode. Refer to the schematic EVB-EMC1428-SCH-7122-RevA.pdf for details on the EVB header connections.

3.4 Resistance Error Correction (REC)

External diode 1 on board the EVB-EMC1428 has a series resistance adjustment on the DN line. Checking the REC (Resistance Error Correction) feature is accomplished by turning the resistor wheel R1. With REC off, a significant temperature error will result. When the REC bit is set, the error will be corrected for.

3.5 Power Source

This EVB requires only one USB connection to power the entire board. The USB-SMBus bridge regulates the +5V USB power to +3.3V used by the EMC1428 and other EVB circuitry.

3.6 Test Points

Test points are provided for:

- Ground
- VDD supply pin
- +3.3V power
- +5V_USB power
- $\overline{\text{ALERT}}$ and $\overline{\text{SYS\_SHDN}}$ outputs

3.7 LED Indicators

LEDs indicate the status of the following signals (Table 3.1).

Table 3.1 LED Status Indicators

LED	SIGNAL	OFF	GREEN	RED
LED3	$\overline{\text{ALERT}}$	+3.3V power OFF	No $\overline{\text{ALERT}}$	$\overline{\text{ALERT}}$
LED4	$\overline{\text{SYS\_SHDN}}$	+3.3V power OFF	NA	$\overline{\text{SYS\_SHDN}}$
LED11	+3.3V	+3.3V power OFF	+3.3V power ON	NA
LED12	Bridge Activity	NO Activity on USB/SMBus Bridge	Activity on USB/SMBus Bridge	NA
LED13	USB Activity	NO Activity on USB port	Activity on USB port	NA

3.8 Jumper Settings

This EVB has many jumper configurations to evaluate the many features of the EMC1428.

This EVB also allows for an off-board diode to be tested (see Table 3.2). This is done by removing both jumpers of the channel of interest. Then connect Pin 1 to the ‘remote+’ terminal of the remote diode and Pin 3 to the ‘remote-‘ terminal of the remote diode. Make sure a common ground exists between the remote diode (GPU, etc.) and the EVB-EMC1428. Also ensure that the remote diode is properly biased according to the diode manufacture.

Table 3.2 Remote Diode Configurations

JUMPER	CONFIGURATION	PIN 1	PIN 2	PIN 3	PIN 4
JP1	On-board diode (Q1)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open
JP2	On-board diode (Q2)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open
JP3	On-board diode (Q3)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open
JP4	On-board diode (Q4)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open
JP5	On-board diode (Q5)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open
JP6	On-board diode (Q6)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open

Table 3.2 Remote Diode Configurations

JUMPER	CONFIGURATION	PIN 1	PIN 2	PIN 3	PIN 4
JP7	On-board diode (Q7)	short / DP		short / DN	
	Off-board diode (CPU, GPU, etc.)	remote + / DP	open	remote - / DN	open

A unique feature of the EMC1428 devices is the ability to select the Hardware System shutdown temperature based on the resistor attached to the TRIP_SET pin and the tri-state setting of the SHDN_SEL pin. The EVB allows the user to quickly evaluate each of the many temperature values by adjusting R50. JP12 can be moved to 3 different states which define the powerup state of beta compensation and REC. Please see the data sheet for detailed operation of these features.

.

Table 3.3 SHDN_SEL Configuration

SHDN_SEL	JP12 CONNECTION	DESCRIPTION
VDD	1-2	Transistor Mode (Beta Comp enabled, REC enabled)
GND	2-3	Diode Mode (Beta Comp disabled, REC enabled)
OPEN	OPEN	Simple Mode (Beta Comp disabled, REC disabled)

3.9 Default Jumper Settings

Table 3.4 Default Jumper Settings

JUMPER	NAME	CONNECTION	DESCRIPTION
JP1	External diode 1 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP2	External diode 2 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP3	External diode 3 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP4	External diode 4 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP5	External diode 5 off-board connection	1 - 2 3 - 4	DP connection DN connection

JUMPER	NAME	CONNECTION	DESCRIPTION
JP6	External diode 6 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP7	External diode 7 off-board connection	1 - 2 3 - 4	DP connection DN connection
JP12	SHDN_SEL	1 2 3 (open)	Diode mode
JP19	USB to SMBus	1 - 2 3 - 4 5 - 6 7 - 8	+3.3V SDA - SMBus SCL - SMBus $\overline{\text{ALERT}}$
P1	Bias connections for remote CPU transistor	1 2 (open)	Vbias ~ 0.7V GND
P2	Flash Prog Header	NA	Used in manufacturing

Note: dashed line indicates jumper position

3.10 Other Sensor Features

Other features such as Ideality Factor Configuration, Conversion Rate, and Digital Filtering can be controlled with EMC1428 registers. See the datasheet register description for details.

4 Software Description

4.1 Chip Manager Overview

The Chip Manager (ChipMan) application initially displays the main Help screen, where detailed description of the application's features may be found. The Help screens can be displayed at any time by selecting Help from the menubar. Chip Manager enables the user to display temperature readings, set temperature limits and read/write configuration register values.

4.2 Temperature/Register History Graph

To open a Temperature or Register History Graph window, select the register or registers to plot in the Chip Manager application. then select Options -> Plot Register Data from the menubar. Once the graph appears, select Control -> Start to begin plotting data. The history plot continuously updates the register data reported by the EMC1428. Figure 4.1below is a typical Temperature History with the external diode of the EMC1428 starting at room temp and then being heated by simply placing a finger on Q1.

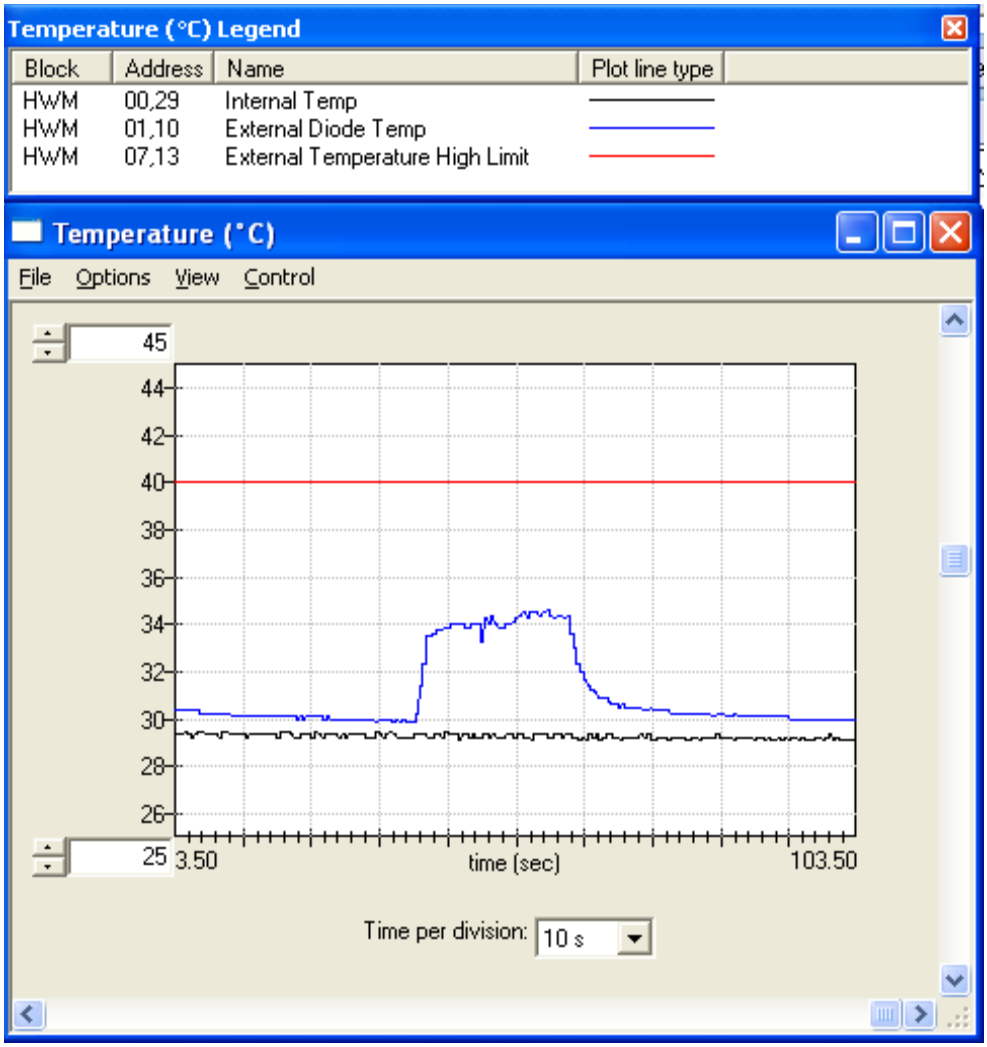


Figure 4.1 EMC1428 Temperature History Graph