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LPC54608 Temperature logging on LCD using emWin's graphics library

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Technical note

Document information

Info	Content
Keywords	LPC54608, LCD, Temperature sensor, ADC, emWin's graphics library
Abstract	This technical note describes the example that logs temperature on LPC54608 LPCXpresso board LCD using the graphics library features of emWin.



Revision history

Rev	Date	Description
1.0	20170823	Initial version.

Contact information

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1. Introduction

The LPC5460x is a family of ARM Cortex-M4 based microcontrollers used in embedded applications. This technical note references the LPCXpresso development board for LPC5460x MCUs. For details of the board, see:

<http://www.nxp.com/products/microcontrollers-and-processors/arm-processors/lpc-cortex-m-mcus/lpc54000-series-cortex-m4-mcus/lpcxpresso-development-board-for-lpc5460x-mcus:OM13092>



Fig 1. LPC54608 LPCXpresso development board

This technical note describes how to log temperature using the on-chip temperature sensor and the graphics library of emWin.

2. Description

This example uses the LPC54608 12-bit ADC and temperature sensor to measure temperature. The formula to convert the ADC conversion output value to temperature is given. Temperature is calculated in the Celsius scale. The temperature readings are displayed on the LPC54608 LPCXpresso board LCD display as a graph using the graphics library of emWin. The temperature data is also printed to a PC terminal via the UART.

Every ADC conversion result value corresponds to a voltage level and the temperature value is calculated from this voltage level.

$$ADC\ Voltage\ (in\ V) = \frac{ADC\ conversion\ result\ (in\ decimal) \times V_{supply}}{4096}$$

where V_{supply} is the supply voltage (in Volts) to VREFP pin of LPC54608.

On the LPC54608 LPCXpresso board, the VREFP pin is connected to VDD pin by default. Therefore, in this example $V_{supply} = 3.3V$.

The formula to convert the temperature that is displayed on the LCD screen is:

$$Temperature\ (^{\circ}C) = \frac{(ADC\ Voltage \times 1000) - V_{LLS0}}{LLS\ Slope}$$

where V_{LLS0} is Linear Least Square (LLS) intercept at 0 °C.

From the LPC5460x datasheet, LLS at 0 °C is 584 mV and LLS Slope = -2.04 mV/°C.

These values are used in this example.

The example is available in three tool chains:

- MCUXpresso IDE v10.0
- Keil MDK v5.23
- IAR Workbench v8.11.2

The Keil and IAR examples are found in:

lpc54608_emwin_temp_sensor_keil_iar\boards\lpcxpresso54608\demo_apps\emwin_temp_sensor

The MCUXpresso example can be found in the zip file:

lpc54608_emwin_temp_sensor_mcux.zip

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