

430BOOST-TMP006 BoosterPack

User's Guide



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430BOOST-TMP006 BoosterPack

1 430BOOST-TMP006 BoosterPack Overview

1.1 Overview

The 430BOOST-TMP006 BoosterPack provides a quick and low-cost solution to evaluate and develop with the TMP006 contactless temperature sensor. To quickly get started, this BoosterPack comes with a pre-loaded firmware for MSP430G2553 device. The software ecosystem also provides fully commented source code for customers to get started with developing their application.. A GUI is also available for interaction with the BoosterPack. See [Figure 1](#) for an overview of the BoosterPack hardware.

LED On – Data Streaming Mode
 LED Off – Data Logging Mode

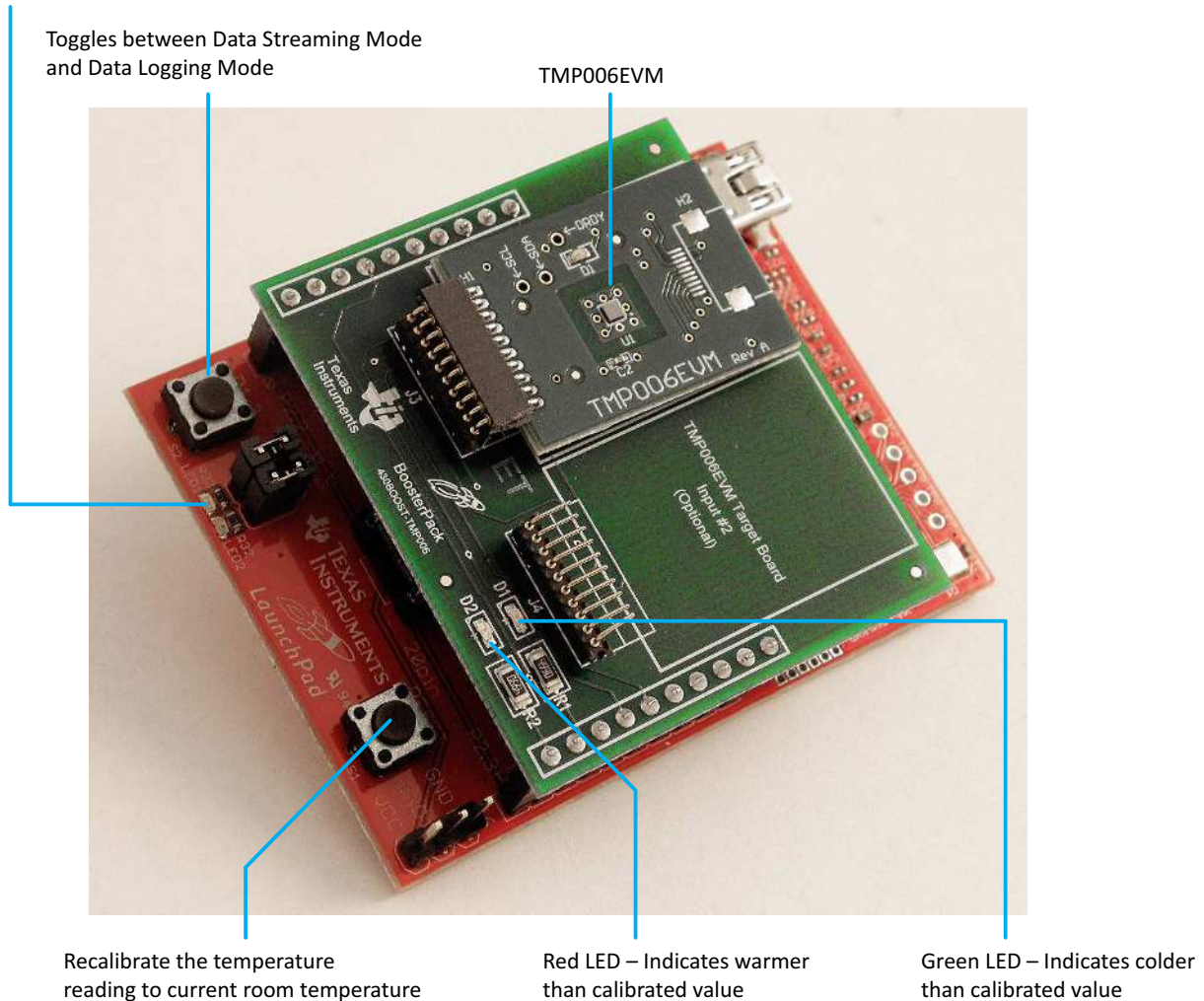


Figure 1. 430BOOST-TMP006 BoosterPack Overview

2 TMP006 Information

The TMP006 is a contactless temperature sensor that uses an infrared thermopile sensor to detect the temperature of a target object. The [TMP006 data sheet](#) contains all relevant electrical information (both analog and digital) pertaining to the device. The [TMP006 User's Guide](#) answers many common questions related to the operation of the TMP006, including critical application criteria, printed circuit board (PCB) layout guidelines, and the equations used to calculate target object temperature.

2.1 TMP006EVM

This BoosterPack is intended to demonstrate how an MSP430 and TMP006 can integrate into one system. To simplify this integration, the TMP006EVM is included as part of this BoosterPack kit. The TMP006EVM hardware is well documented in the [TMP006EVM User Guide](#); however, note that this BoosterPack contains different software.

3 Getting Started

3.1 Requirements

TMP006 BoosterPack requires LaunchPad rev1.4 and above. See www.ti.com/launchpadwiki for more information. TMP006 BoosterPack also requires a MSP430G2553 device, which is included. This device is pre-programmed with the user experience firmware (see [Section 5](#)).

3.2 Configuring LaunchPad

1. LaunchPad rev1.4 and below requires cross jumpering the UART lines. See *MSP-EXP430G2 LaunchPad Experimenter Board User's Guide* ([SLAU318](#)) for more information.
2. For LaunchPad rev1.5, switch to hardware UART through J3 jumpers (see [Figure 2](#)).



Figure 2. J3 Jumper

3. Remove P1.6 jumper for I2C operation (see [Figure 3](#)).

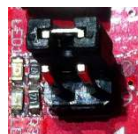


Figure 3. P1.6 Jumper

4. Do not touch the TMP006 sensor.
5. Replace the existing LaunchPad device with the MSP430G2553 device inside the TMP006 BoosterPack. This device has been pre-loaded with the user experience firmware.
6. Insert BoosterPack on top of the LaunchPad.

3.3 Connecting Hardware

Install the LaunchPad drivers included in the firmware package, if needed (see [Section 4](#) for details on downloading the latest software).

Connect LaunchPad using a USB cable to a PC that is running Windows (see [Figure 4](#)). If prompted, allow Windows to install the software automatically.



Figure 4. Connect USB

4 Obtaining Software Packages

Download the latest software packages from www.ti.com/tmp006boosterpack.

Download the two software packages. One package contains the source code and binaries for MSP430G2553 firmware. The other is the GUI application created in LabView for interacting with the BoosterPack.

4.1 Re-Downloading or Modifying Firmware

This step is optional to get started if you have used the pre-loaded MSP430G2553 device inside the TMP006 BoosterPack. This step can be used to reload the firmware with a newer version or to a blank device. The quickest way to re-download firmware image is to run MSP430Flasher.bat inside the bin/firmware folder.

To modify the firmware, see [Section 5](#) regarding supported compilers.

4.2 Installing BoosterPack GUI

Extract the software zip software package with the filename 430boost_tmp006_gui_x_xx_xx_xx.zip. Execute the setup.exe inside gui_installer folder and follow the installation instructions.

4.3 Starting The Demo Application

1. Determine LaunchPad COM port through the Windows Device Manager.
2. Launch TMP006 BoosterPack GUI software.
3. Select COM Port and OK (see [Figure 5](#)).



Figure 5. Select COM port and Click OK

5 User Experience Application

This software package includes the project files to allow customers re-compile the code for user development. You could download free and unrestricted compilers and debuggers, including:

- Code Composer Studio™ version 5.2 (CCS)
- IAR Embedded Workbench™ v5.40.3

These project files are located inside 430boost_tmp006_x_xx_xx_xx.zip src folder with their respective compiler names as the folder.

This application uses hardware UART using the MSP430G2553 USCI module to communicate to the PC via the LaunchPad's backchannel UART. The software is capable of using timer-based UART, but the user would need to change the `HARDWARE_UART` definition inside the `uart.h` file, re-compile, and re-download the firmware.

There are two main user application modes in this user experience code. It operates together with the GUI application.

- Data Sampling Mode
- Data Logging Mode

5.1 Data Sampling Mode

This mode samples the object temperature and streams the data back to the PC via the MSP430 LaunchPad backchannel UART. The PC then displays the data on the GUI. The Object Temperature is the calculated temperature of the object. The Local Temperature is the temperature with transient correction filter applied.

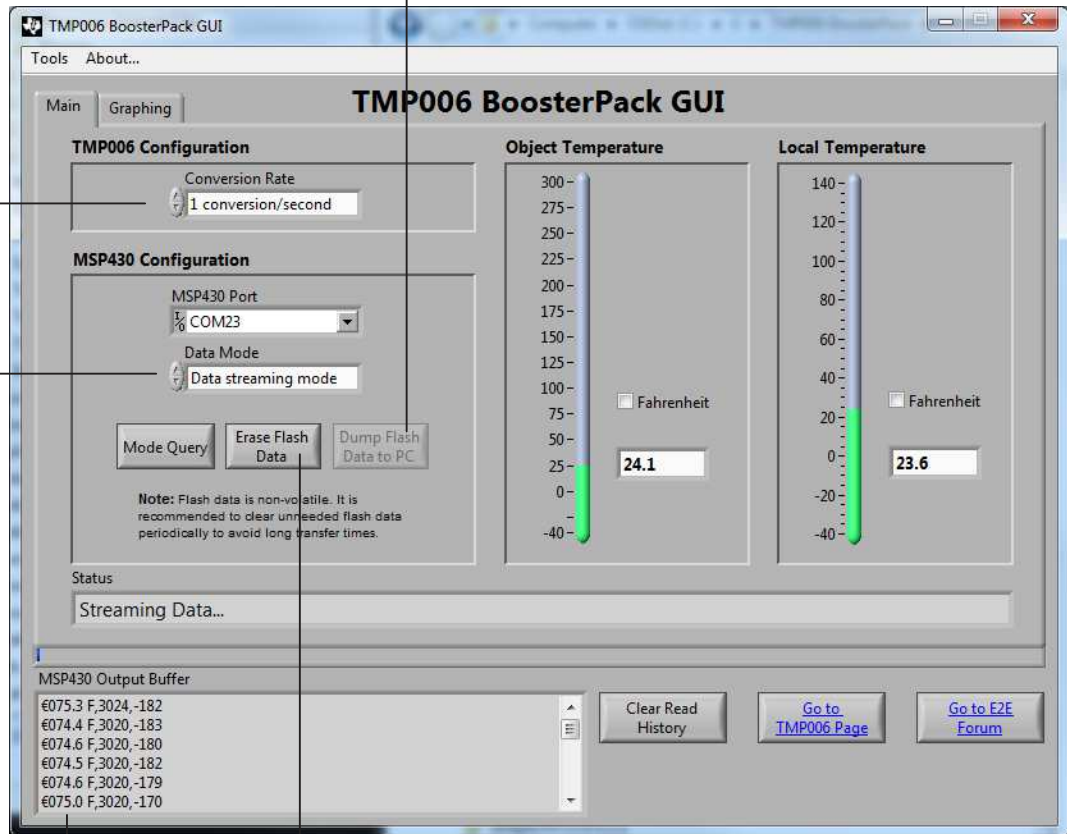
When this mode is operating, the LED1 (RED) on the LaunchPad is on.

The BoosterPack has green (D1) and red (D2) LEDs onboard. These LEDs light up depending on how cold or hot since it was last calibrated. The colder the temperature is from the calibrated value, the brighter the green LED would be. The hotter the temperature is from the calibrated value, the brighter the red led would be. To calibrate a new value, press the S1 button on the Launchpad.

Change the conversion rate on how often to sample the target temperature

Triggers a data dump from LaunchPad's memory buffer to the PC. Available only in Data Logging Mode.

Toggle between Data Stream and Data Logger Modes



Raw data output from MSP430

Clear the data logger memory from Flash

Figure 6. BoosterPack GUI in Data Streaming Mode

Figure 7 shows the graph plot of the data that were streamed back to the PC over time. To save the data into a CSV file (for example, for data analysis), click Tools > Save Streamed Temperature Data.

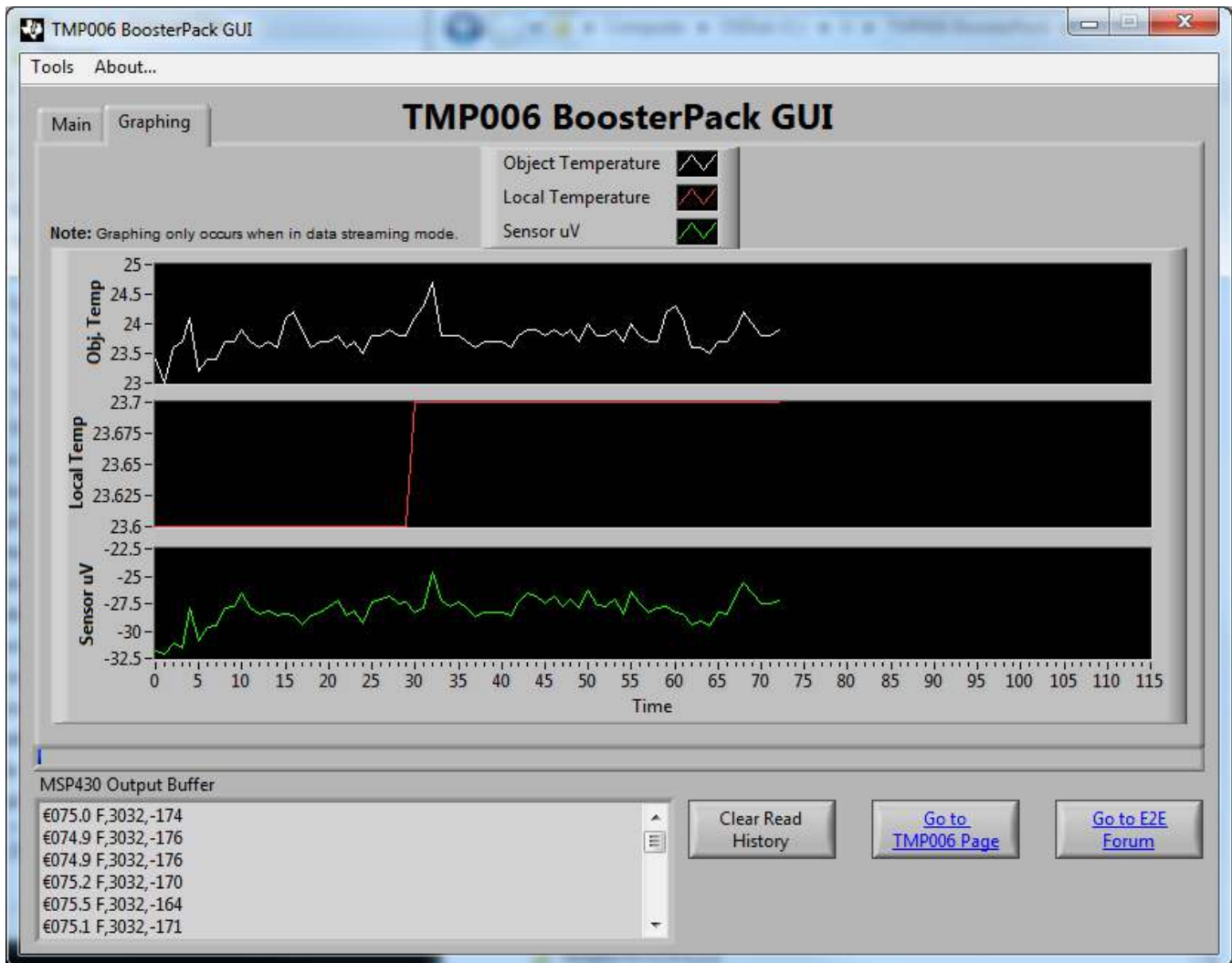


Figure 7. Temperature Values Plotted on Graphs

5.2 Data Logging Mode

In this mode, temperature can be sampled without connection to a PC. An external power source like a battery pack, not included, must be used. To start data logging mode, press the S2 button. This button is required if the BoosterPack is used in an untethered mode from the PC. Ensure that LED1 is no longer ON, which indicates that the firmware is no longer in Data Logging Mode.

To operate the following user configurations, the BoosterPack must be connected to a PC. Select the data logging mode in the GUI or press the S2 button to switch the mode if the BoosterPack is in data sampling mode. Clear the data logging buffer in flash memory by pressing Erase Flash Data on the GUI. To send the data to the PC for data analysis, click Dump Flash Data to PC in the GUI. All of the logged temperature from the flash memory is read. This data can then be used for data analysis; for example, using an Excel® spreadsheet.

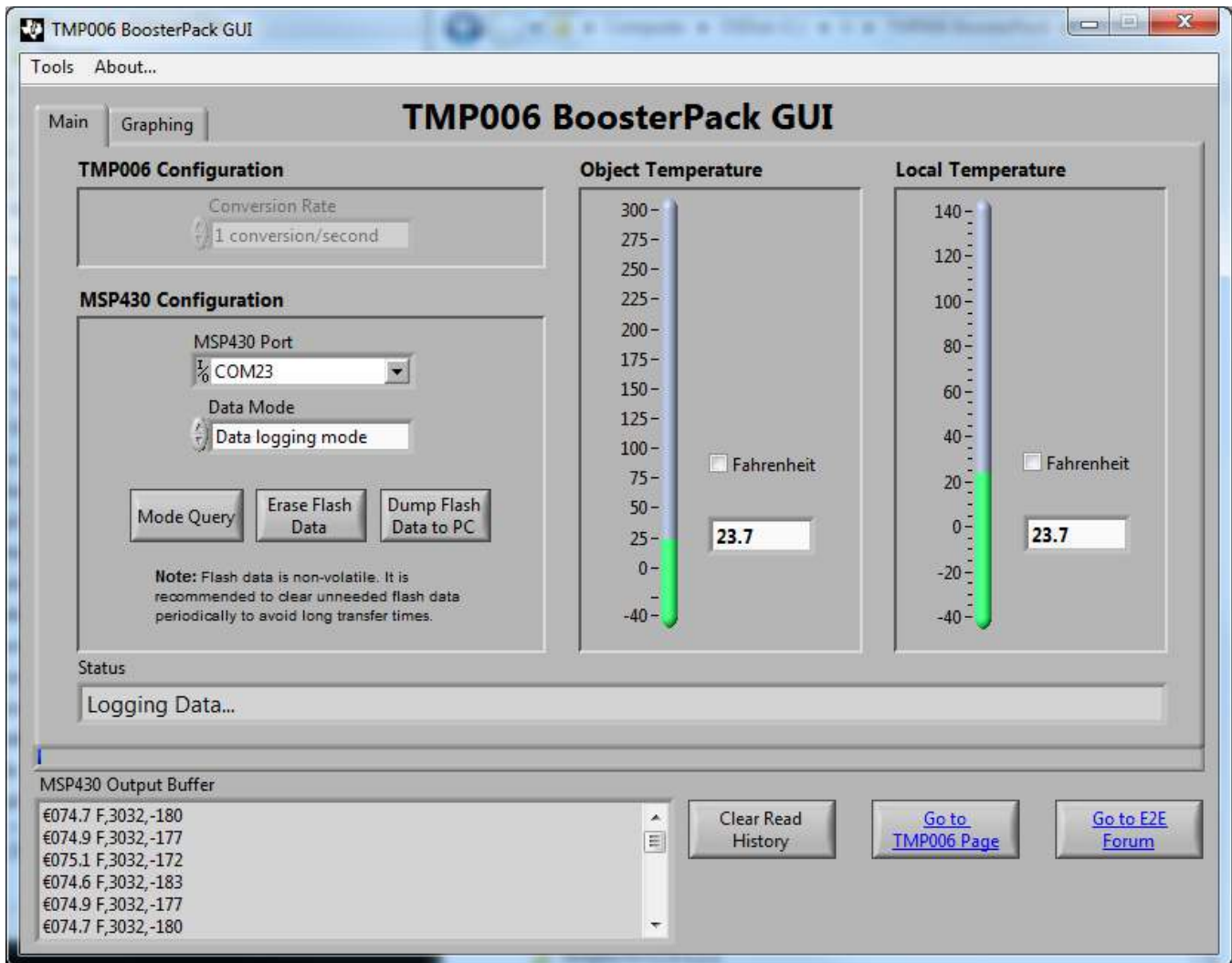


Figure 8. BoosterPack GUI in Data Logging Mode

6 API Guide

This source code allows the user to leverage it for their application development when coupled with an MSP430 device and TMP006. The TMP006 API source code is fully documented in the doc folder. See the Doxygen output under doc folder for detailed information on all available API functions.

6.1 Summary of API Functions

The following API functions are available for code development:

```
void tmp006_init (unsigned char drdyPinEn, unsigned int conversionTime)
void tmp006_wakeup (void)
void tmp006_disable (void)
unsigned char tmp006_ready (void)
struct TempReading tmp006_getTemp (void)
long double tmp006_calculateTemp (long double *tDie, long double *vObj)
int tmp006_read (unsigned char writeByte)
void tmp006_write (unsigned char pointer, unsigned int writeByte)
```

7 References

1. *MSP-EXP430G2 LaunchPad Experimenter Board User's Guide* ([SLAU318](#))

8 Schematics

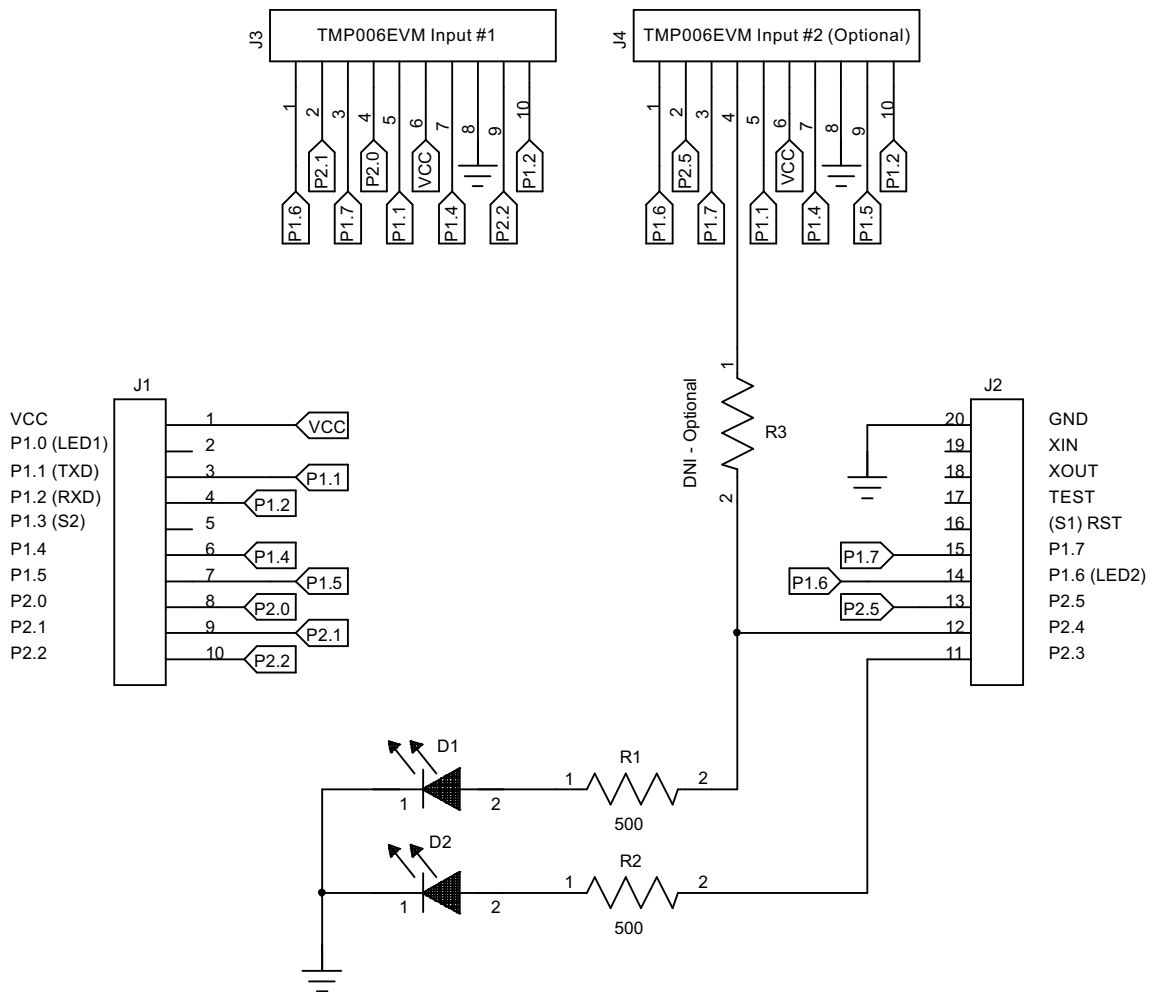


Figure 9. 430BOOST-TMP006 Schematic

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- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
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