



## User Guide

UG000453

# TMD2635

## TMD2635 EVM

Miniature Proximity Sensor Module

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# 1 Introduction

The TMD2635 evaluation kit comes with everything needed to evaluate the TMD2635 . The device features proximity detection using an IR VCSEL in a tiny and thin module.

## 1.1 Kit Content

**Figure 1:**  
Evaluation Kit Contents



No.	Item	Description
1	TMD2635 Daughter Card	PCB with TMD2635 sensor installed
2	EVM Controller Board	Used to communicate USB to I2C
3	USB Cable (A to Mini B)	Connects EVM controller to PC
4	Flash Drive	Includes application installer and documents

## 1.2 Ordering Information

Ordering Code	Description
TMD2635 EVM	TMD2635 Miniature Proximity Sensor Module

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## 2 Getting Started

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The software should be installed prior to connecting any hardware to the computer. Follow the instructions found in the Quick Start Guide (QSG). This loads the required driver for the USB interface and also the device's graphical user interface (GUI).

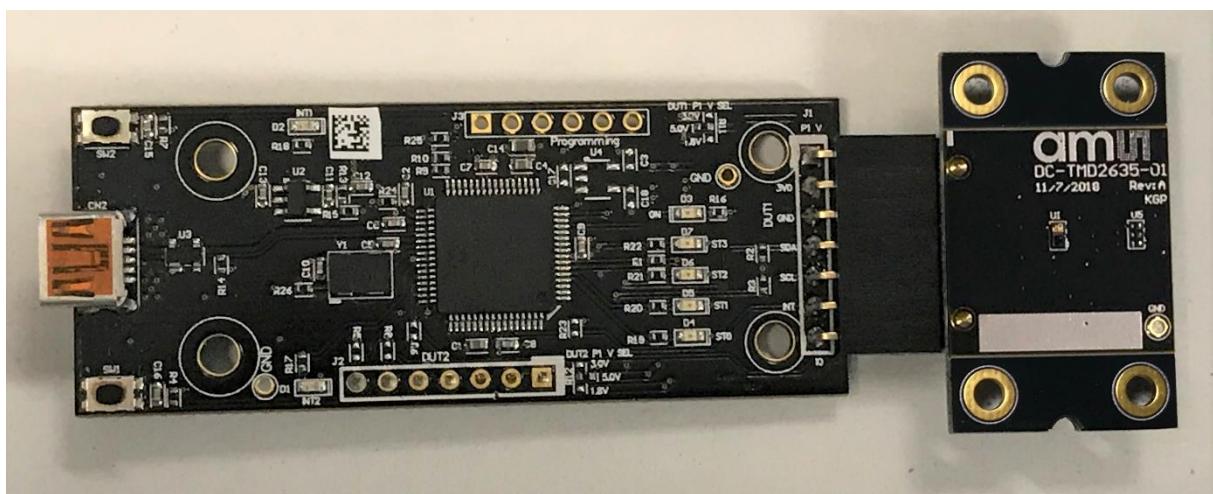
The balance of this document identifies and describes the controls available on the GUI. In combination with the TMD2635 datasheet, the QSG and application notes available on the **ams** website, there should be enough information to allow evaluation of the TMD2635 device.

## 3 Hardware Description

The hardware consists of the EVM Controller, the TMD2635 EVM daughter card, and a USB interface cable. The EVM controller board provides power and I2C communication to the daughter card through a seven pin connector. When the EVM controller is connected to the PC through USB, a green LED on the board flashes once on power up to indicate the system is getting power.

For schematics, layout and BOM information, please see the documents included with the install located in the TMD2635 EVM folder (All Programs -> ams -> TMD2635 EVM > Documents).

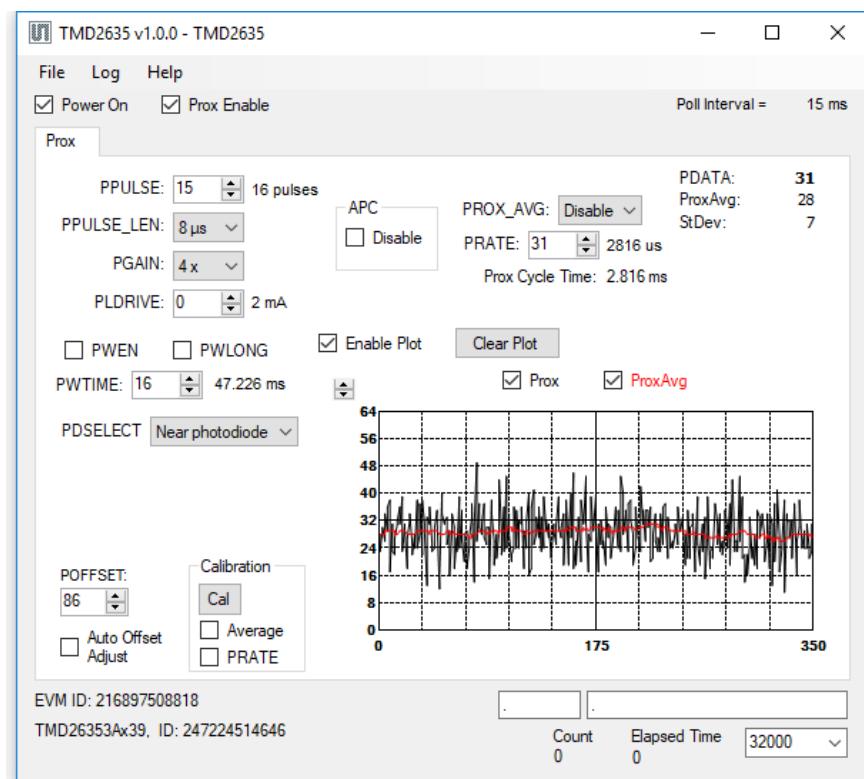
**Figure 2:**  
Evaluation Kit Hardware



## 4 Software Description

The main window (Figure 3) contains the system menus, system level controls, device information and logging status. The Prox tab contains settings for the proximity function. The application polls the proximity raw data continuously and calculates the prox average and standard deviation values.

**Figure 3:**  
Graphical User Interface (GUI) Main Window



### 4.1 Connect Software to Hardware

On startup, the software automatically connects to the hardware. On successful initialization, the software displays a main window, containing controls pertinent to the connected device. If the software detects an error, an error window appears. If “Device not found or is unsupported” appears, verify the correct daughterboard is properly connected to the EVM controller board. If “Cannot connect to EVM board” appears, verify the USB cable is connected. When the EVM controller board is connected to the USB, a green LED on the board flashes once on power up to indicate the USB cable is connected and providing power to the system.

If the EVM board is disconnected from the USB bus while the program is running it displays an error message and then terminates. Reconnect the EVM board and restart the program.

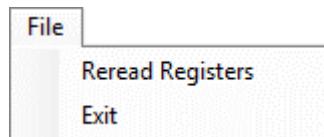
## 4.2 System Menus

At the top of the window there are pull-down menus labeled “File”, “Log”, and “Help”. The File menu provides basic application-level control. The Log menu is used to control the logging function, and the Help menu provides version and copyright information for the application.

### 4.2.1 File Menu

The File menu contains the following functions:

**Figure 4:**  
File Menu



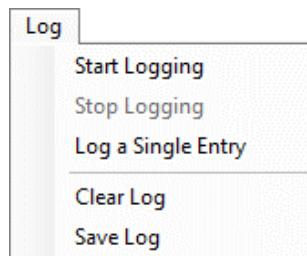
The **Reread Registers** function forces the program to re-read all of the control registers from the device and display them on the screen. This does not read the output data, because those registers are continually read while the program is running.

Click on the **Exit** command to close the main window and terminate the application. Any unsaved log data is cleared from memory. The application can also be closed by clicking the red “X” in the upper right hand corner.

### 4.2.2 Log Menu

The Log menu is used to control the logging function and to save the log data to a file. Log data is accumulated in memory until it is discarded or written to a data file.

**Figure 5:**  
Log Menu



Click **Start Logging** to start the logging function. Each time the program polls the output information from the device, it creates a new log entry showing the raw data values, the values of various control

registers, and the values entered by the user into the text fields near the bottom right corner of the window.

Click **Stop Logging** to stop the logging function. Once logging is stopped, the data can be written to a file, or the user can continue collecting additional data by clicking Start Logging again.

The **Log a Single Entry** command causes logging to start, collect one single entry, and immediately stop again. This function is not available when logging is already running.

Click **Clear Log** to discard any data that has already been collected. If there is data in memory, which has not been saved to disk, this function displays a prompt asking to verify it is OK to discard the data. If the log is running when this function is clicked, the log continues running after the existing data is discarded.

Click **Save Log** to save the collected log data to a csv file. This stops the logging function, if it is active, and displays a file dialog box to specify where to store the logged data. The default file name is described in the Log Status and Control Information section, but the file name may be changed if desired.

#### 4.2.3 Help Menu

The Help menu contains a single function: About.

**Figure 6:**  
Help Menu



The About function displays a dialog box (Figure 7) showing the version and copyright information for the application and library. Click the OK button to close this window and continue.

Figure 7:  
About Window



## 4.3 System Level Controls

Immediately below the top menu bar there are checkboxes used to control the system level functions of the TMD2635 device.

The **Power On** checkbox controls the PON function of the TMD2635. When this box is checked, the power is on and the device can operate. When this box is unchecked, the power is off and the device does not operate (The control registers can still be written, but the device does not function).

The **Prox Enable** checkbox controls the PEN function of the TMD2635. Proximity detection is enabled when this box is checked or disabled when unchecked.

## 4.4 Automatic Polling

The application automatically polls the TMD2635 raw Prox data if enabled. The Poll Interval displays the time between reads of the device.

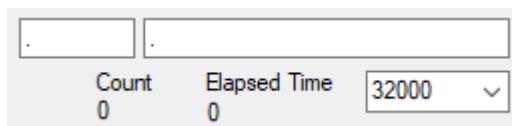
## 4.5 Device ID Information

The lower left corner of the window displays the ID number of the EVM Controller board, identifies the device being used and displays the ID of the device.

## 4.6 Log Status and Control Information

The lower right corner of the window contains status information and controls for the logging function:

**Figure 8:**  
Logging Status



This section contains text boxes that are stored in the log file data and used to build the file name for the log file. If the data in these fields are changed, the new values are stored with any new data logged. The default log file name is based on these values at the time the log file is written. If nothing is entered in these boxes they default to a period (“.”).

**Sample default file name:**

TMD2635\_1-2-3\_Log\_HH\_MM\_SS.csv

- From Application
- From User Input

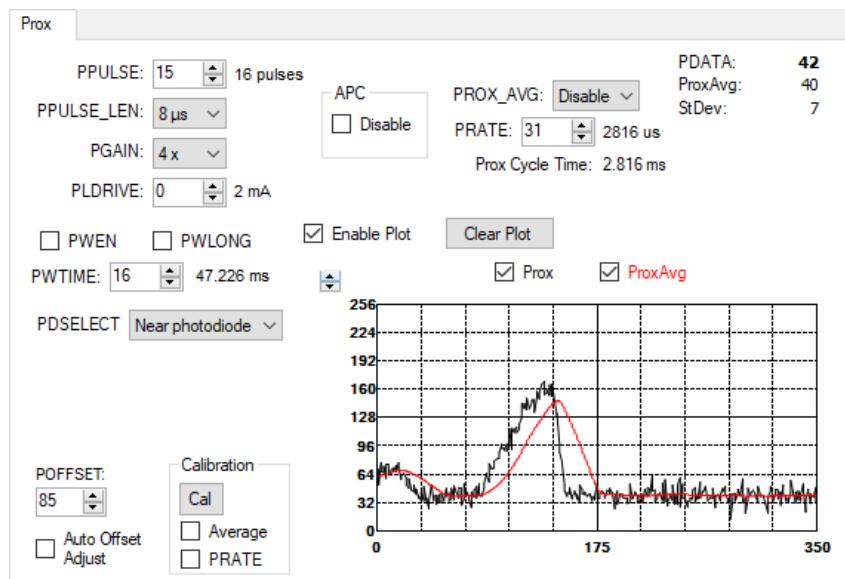
The **Count** value displayed is a count of the number of samples currently in the log buffer.

The **Elapsed Time** value indicates the elapsed time since data logging was started.

## 4.7 “Prox” Tab

The main portion of the screen contains a tab labeled Prox. The controls on this tab control the operation of the Proximity function of the TMD2635.

Figure 9:  
Prox Tab



#### 4.7.1 Prox Controls

The left side of the Prox tab contains controls to set various Prox settings.

The **PPULSE** controls the number of pulses used for each prox cycle. The number of pulses is the PPULSE value plus 1 and is displayed immediately to the right of the box.

The **PPULSE\_LEN** control sets the width of all IR VCSEL pulses within the proximity cycle. Longer pulses result in increased proximity range and typically result in less electrical noise generated in the analog front end. This drop-down box works in conjunction with the 16x checkbox to select the actual pulse length that is used. The values that can be chosen are 1 µs, 2 µs, 4 µs, 8 µs, 12 µs, 16 µs, 24 µs, and 32 µs.

The **PGAIN** control is a pulldown menu that lets you select the analog gain of the proximity IR sensor. The values that can be chosen are 1x, 2x, 4x and 8x.

The **PLDRIVE** control sets the drive strength of the IR VCSEL current. The values range 2 mA to 10 mA.

Checking the **PWEN** control enables the Prox Wait feature which inserts a wait time between each prox cycle. If this box is not checked, PWLONG and PWTIME have no effect.

The **PWLONG** checkbox, when checked, causes any prox wait time to be increased by 12x.

The **PWTIME** control controls the amount of wait time that is inserted between prox cycles when prox wait is enabled. The normal wait times range from 2.778 ms to nearly 712 ms. When PWLONG is

checked, the times range from 33.3 ms to over 8.5 seconds. The actual wait time selected is displayed immediately to the right of the box.

The **PDSELECT** pulldown menu selects which photodiode(s) are connected to the prox ADC channel. You may select None, Far (the photodiode farthest from the VCSEL), Near (the photodiode nearest to the VCSEL), or Both.

The **APC Disable** checkbox disables the Automatic pulse control feature. In normal conditions, TMD2635 will dynamically reduce the number of pulses specified in the PPULSE control to keep the prox data from saturating. In high crosstalk situations this feature can be disabled, to force the specified number of pulses. When APC is disabled, the range of the prox output data is limited to a maximum of 1023.

The **PROX\_AVG** control allows a selected number of prox samples to be averaged together to produce a single PDATA value. You may disable this feature, or select 2, 4, 8, 16, 32, 64, or 128 samples to be averaged.

The **PRATE** control specifies the length of each prox cycle when PROX\_AVG is active. This is not a period of time inserted between cycles, like PWTIME, it is a start-to-start time. If PRATE is less than the amount of time specified by PPULSE and PPULSE\_LEN, PRATE will not have any effect. The amount of time selected can range from 88  $\mu$ s to approximately 22.5 ms and is displayed immediately to the right of the box.

The program calculates and displays the **Prox Cycle Time**. This is the number of prox samples averaged multiplied by the PRATE.

The **POFFSET** control shifts PDATA to remove crosstalk from the proximity data. The values range from -255 to 255.

The **Auto Offset Adjust** control, when checked, will decrease the proximity offset register when proximity ADC measurement is zero. When this box is checked, manual changing of the POFFSET control is disabled and The POFFSET value is read from the device on each update cycle.

The **Cal** button, in the Calibration box, triggers the sensor's proximity offset calibration sequence. This function automatically selects a POFFSET to remove crosstalk from PDATA.

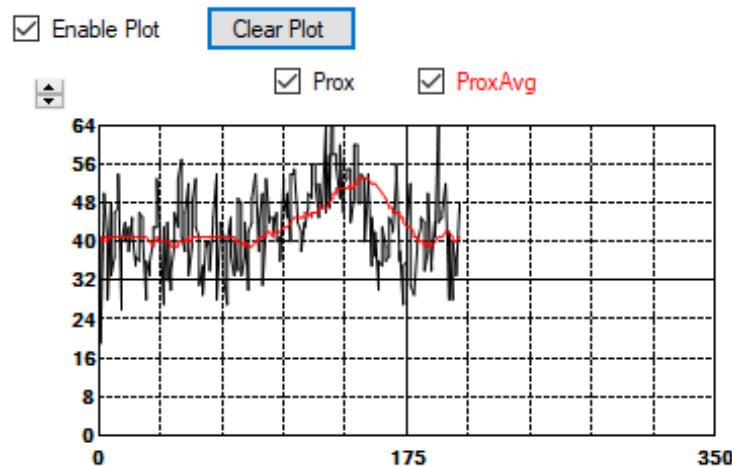
The **Average** checkbox, in the Calibration box, controls whether the calibration process should also average the number of samples specified by the PROX\_AVG control.

Checking the **PRATE** checkbox, in the Calibration box, causes the calibration prox cycles to be executed at the speed specified by the PRATE control described above.

#### 4.7.2 Prox Data Plot

The remaining portion of the Prox tab is used to display a running plot of the collected PDATA values and/or the calculated average of the most recent 32 PDATA values. The last 350 values are collected and plotted on the graph. As additional values are added, the old values will be deleted from the left side of the graph. To start the plotting function, check the Enable Plot checkbox.

Figure 10:  
Prox Plot Data



Check the **Prox** or **ProxAvg** boxes to select the value(s) to be displayed.

The scale of the Y-axis of the plot can be adjusted by clicking on the small up and down arrows at the top left corner of the plot. The scale can be set to any power of 2 from 16 to 16384.

Click the Clear Plot button to discard the current data and continue plotting the new data. Note if the Clear Plot button is clicked while the plot is disabled, the data is discarded, but the actual plot will not be updated until the plot function is re-enabled.

## 5 Resources

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For additional information regarding the TMD2635, please refer to the datasheet. For information regarding the installation of the TMD2635 EVM host application software please refer to the TMD2635 EVM Quick Start Guide.

Designer's Notebooks dealing with various aspects of optical measurement and optical measurement applications are available.

Additional Resources:

- TMD2635 Datasheet
- TMD2635 EVM Quick Start Guide (QSG)
- TMD2635 EVM User's Guide (this document)
- TMD2635 EVM Schematic Layout

## 6 Revision Information

Changes from previous version to current revision v1-00	Page
Initial Release	All

- Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
- Correction of typographical errors is not explicitly mentioned.

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