User guide

TSL2740 EVM

TSL2740 ALS and Proximity Sensor Evaluation Kit

Version 1.0

Contents

1 Introduction 3
1.1 Kit Contents 3
2 Getting Started 3
3 Hardware Description 3
4 Software Description 4
4.1 Connect Software to Hardware 4
4.2 System Menus 5
4.3 System Level Controls 6
4.4 Auto Polling 7
4.5 Device ID Information 7
4.6 Log Status and Control Information 7
4.7 “ALS” Tab 8
4.8 “Prox” Tab 10
5 Resources 12

1 Introduction

The TSL2740 evaluation kit comes with everything needed to evaluate the TSL2740 ALS and proximity sensor. The device features advanced digital Ambient Light Sensing (ALS) and proximity measurement.

1.1 Kit Contents

No.	Item	Description
1	TSL2740 Daughter Card	PCB with TSL2740 sensor and LED installed
2	EVM Controller Board V2.2	Used to communicate USB to I2C
3	USB Cable (A to Mini-B)	Connects EVM controller to PC
4	Flash Drive	Include application installer and documents

Figure 1. Evaluation Kit Contents

2 Getting Started

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).

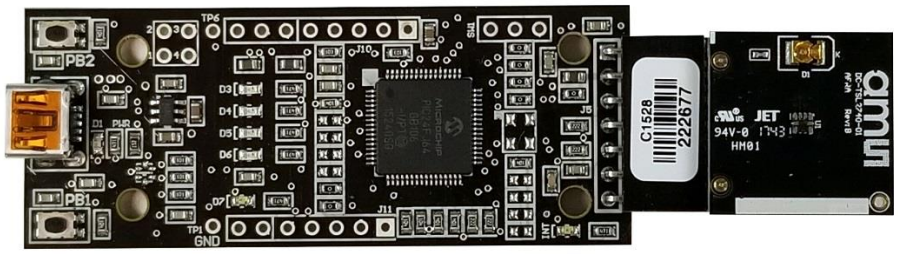
The balance of this document identifies and describes the controls available on the GUI. In combination with the TSL2740 datasheet, the QSG and application notes available on the ams website, www.ams.com, there should be enough information to allow evaluation of the TSL2740 device.

3 Hardware Description

The hardware consists of the EVM Controller, the TSL2740 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 TSL2740 EVM folder (All Programs -> ams -> TSL2740 EVM -> Documents).

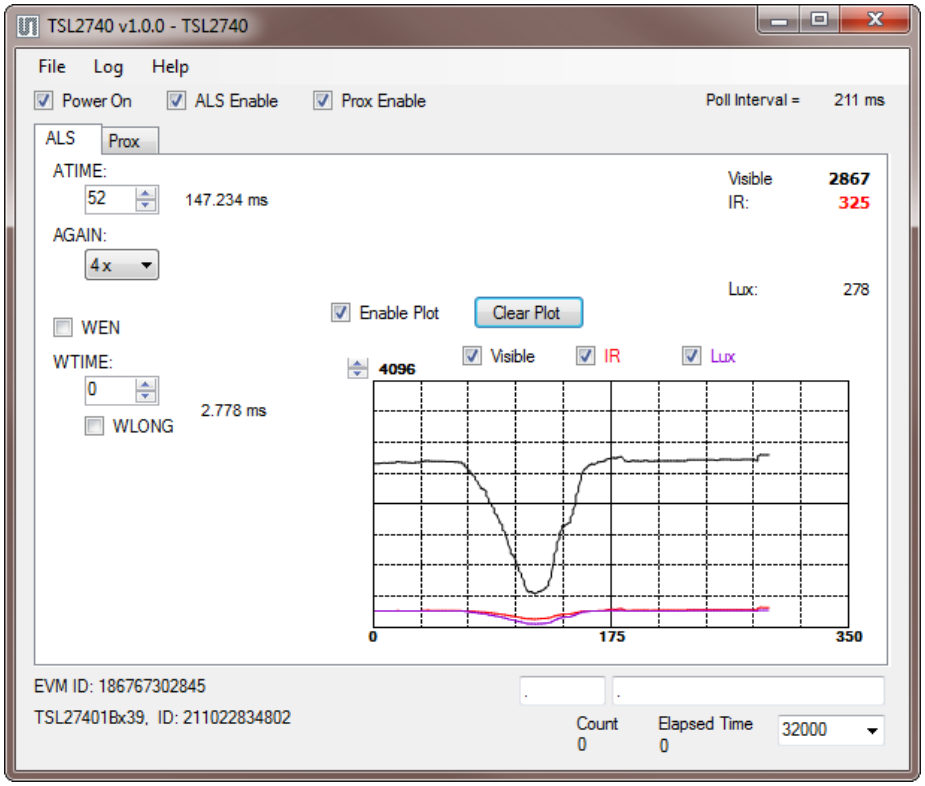
Figure 2. Evaluation Kit Hardware



4 Software Description

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

Figure 3. Software 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.

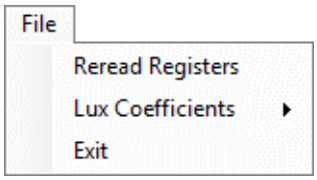
4.2 System Menus

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.

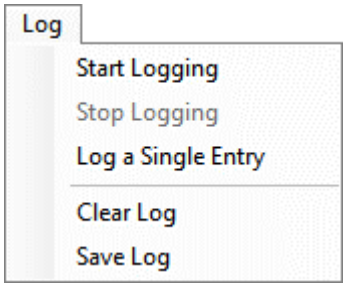
The **Lux Coefficients** menu allows the user to Display, Load or Save the lux coefficients used to calculate lux. See *ALS Lux Coefficients* section for more details.

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 close 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.

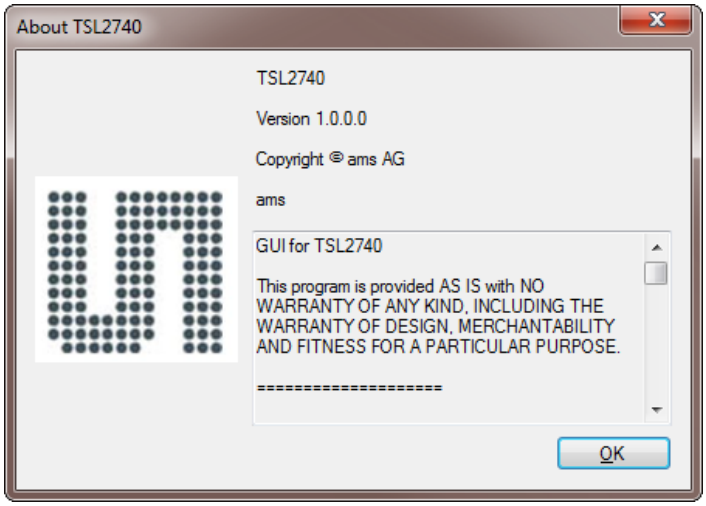
4.2.3 Help Menu

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 Widow



4.3 System Level Controls

Immediately below the top menu bar there are checkboxes used to control the system level functions of the TSL2740 device.

The **Power-On** checkbox controls the PON function of the TSL2740. 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 **ALS Enable** checkbox controls the AEN function of the TSL2740. When this box is checked, the device collects and report ALS data as programmed. When this box is unchecked, the ALS functions do not operate.

The **Prox Enable** checkbox controls the PEN function of the TSL2740. Proximity detection is enabled when this box is checked or disabled when unchecked.

4.4 Auto Polling

The application automatically polls the TSL2740 raw data of ALS and Prox if enabled. The **Poll Interval** displays the time between reads of the device.

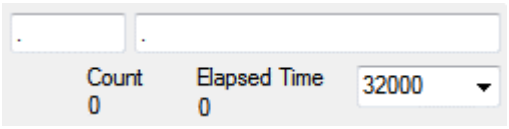
4.5 Device ID Information

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:

`TSL2740_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.

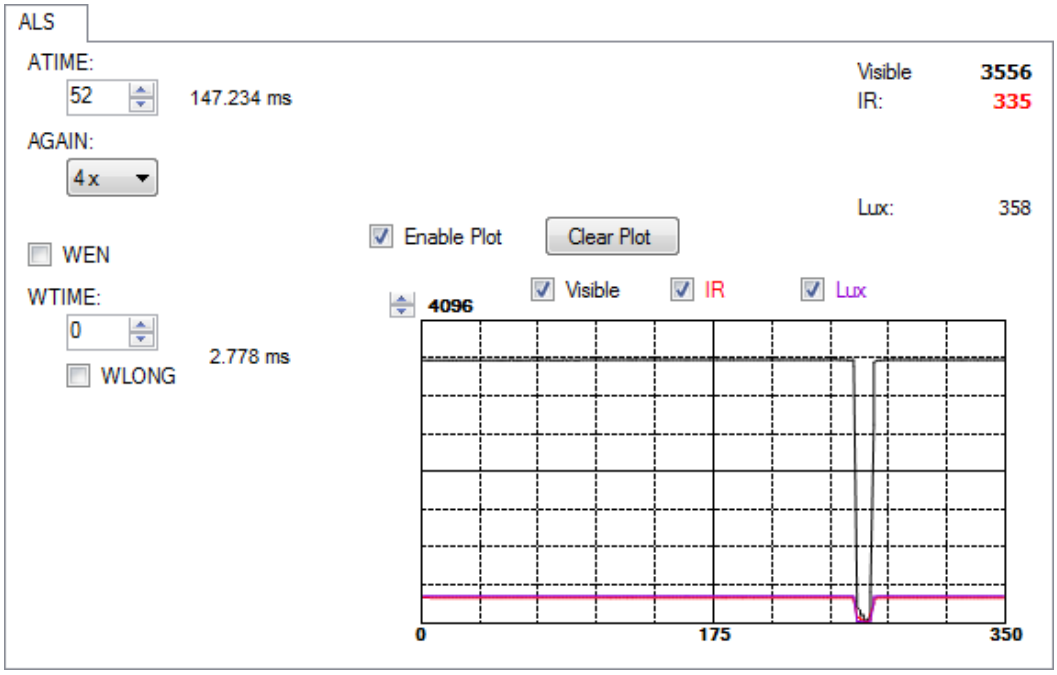
The **Elapsed Time** value indicates the elapsed time since data logging was started.

The final field in this section controls the number of log samples to collect and then automatically stop and save the log data. Once the count of the log entries reaches the amount shown in this field, the program stops logging and pops up a window asking for a file name to save the collected data. After saving the collected data the log is cleared and the count is set back to zero.

4.7 "ALS" Tab

The main portion of the screen contains a tab labeled ALS. The controls in this tab are divided into 3 sections, each performing a separate function.

Figure 9. ALS Tab



4.7.1 ALS Controls

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

The **ATIME** control sets the time of the ALS integration. ATIME can be adjusted in 2.778ms steps. The values range from ATIME = 0 (2.778ms) to ATIME = 255 (711.168ms).

The **AGAIN** control is a pulldown menu which sets the analog gain of the ALS sensor. The values available are 1x, 4x, 16x, and 64x.

The **WEN** checkbox controls the ALS Wait feature. When this box is checked, the values for WTIME and WLONG are used to determine the time between ALS cycles. When this box is unchecked, there is no wait period between ALS cycles and the values of WTIME and WLONG are ignored.

The **WTIME** control sets the time to wait between ALS cycles. WTIME can be adjusted in 2.778ms steps. The values range from WTIME = 0 (2.778ms) to WTIME = 255 (711.168ms).

The **WLONG** checkbox controls sets the WTIME factor. When this box is checked, the wait time between ALS cycles is extended by a factor of 12x.

4.7.2 ALS Lux Coefficients

The TSL2740 ALS supplies information that is used to calculate Lux (unit of illumination). The Lux equation for the TSL2740 uses a combination of data from the sensor and various coefficients to calculate the Lux value. The software is pre-configured with coefficients for an open-air configuration. When the sensor is placed behind glass, different coefficients should be loaded into the software to update the Lux equation. The coefficients can be loaded or saved to an XML file using the File menu. To ensure the proper XML format first save the current coefficients using **File** >

Lux Coefficients > **Save**. Once the file is saved located the XML file created and edit with a text editor such as notepad to change the coefficients. Then go to **File** > **Lux Coefficients** > **Load** and select the XML file that was updated.

The software can also automatically load new coefficients upon starting the GUI. To do this save the XML file as **TSL2740_luxeq.xml** in the system documents directory (**%USERPROFILE%\Documents**, also known as **My Documents**). Then restart the GUI and see a dialog appear with the new coefficients displayed.

If you are experiencing trouble loading new coefficients, this may indicate a problem with the file format. The XML file must contain all the required Lux equation elements to be loaded. The format of the file follows the standard XML format and is as follows:

```
<?xml version="1.0" encoding="utf-8"?>
<!-- Device:TSL2740 Saved:12/11/2017 4:12:30 PM -->
<luxeq>
  <eq_values>
    <coef name="DGF" value="58.514" />
    <coef name="CoefB" value="0.202" />
    <coef name="CoefC" value="0.893" />
    <coef name="CoefD" value="0.147" />
  </eq_values>
</luxeq>
```

4.7.3 ALS Output Data

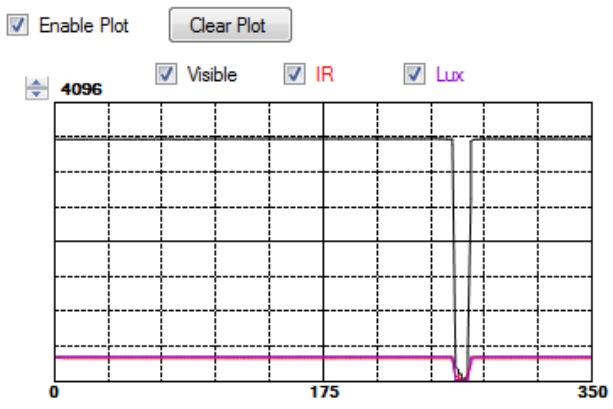
The top right corner of the ALS tab displays the output data. This data is continuously read. The polling interval is shown above the tab.

- **Visible** displays the data counts for the Visible channel
- **IR** displays the data counts for the IR channel
- **Lux** displays the calculated lux based upon the channel counts and lux coefficients

4.7.4 ALS Data Plot

The remaining portion of the ALS tab is used to display a running plot of the collected ALS values and calculated Lux. 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 and select the **Visible**, **IR**, or **Lux** checkbox.

Figure 10. ALS Data Plot



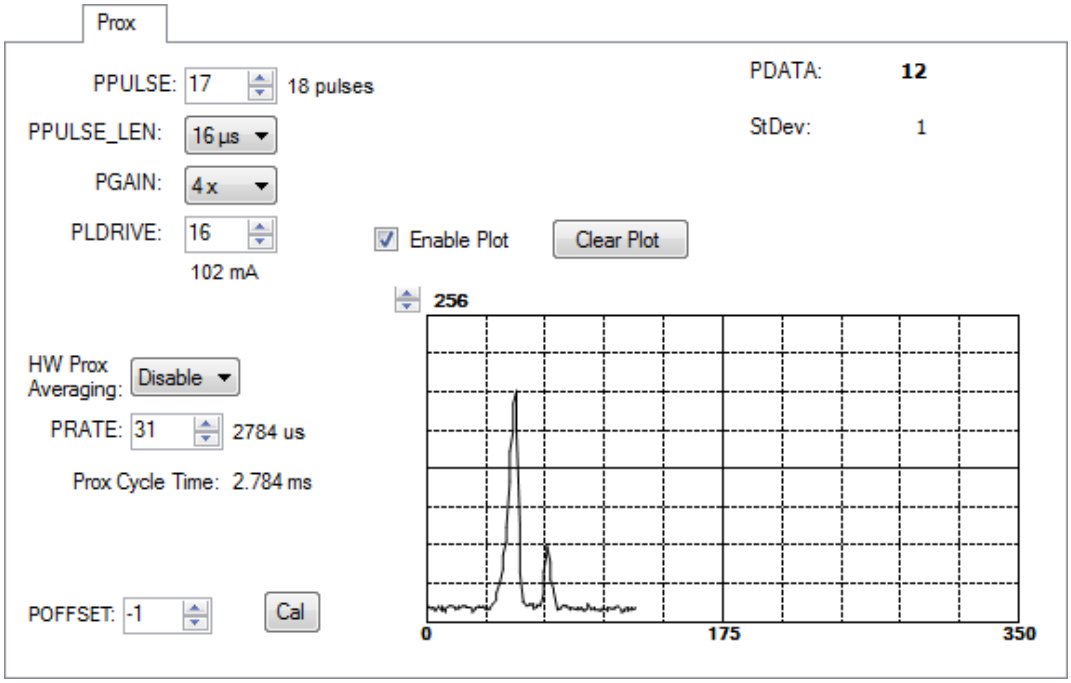
The scale of the Y-axis of the plot can be adjusted by clicking on the small up and down arrows at the top left corner of the plot. The scale can be set to any power of 2 from 64 through 65536.

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.

4.8 "Prox" Tab

The main portion of the screen contains a tab labeled Prox. The controls in this tab are divided into 3 sections, each performing a separate function.

Figure 11. Prox Tab



4.8.1 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 the IR LED 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.

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 external IR LED current. The LED current value is (PLDRIVE +1) * 6mA but the actual current through LED is factory trimmed to normalize IR intensity. The values range from PLDRIVE = 0 (6mA) to PLDRIVE = 31 (192mA).

The **HW Prox Averaging** control is a pulldown menu that defines the number of ADC samples collected and averaged during a cycle. The values range from 0 (Disabled) to 7 (128 samples) where each value is the exponent of 2 (2^{value}).

The **PRATE** controls sets the duration of a single prox sample. The time is equal to (PRATE +1) * 87us, with a range from PRATE = 0 (87us) to PRATE = 255 (22.272ms). If HW Prox Averaging is set then the total prox cycle time is multiplied by the number of samples to average.

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

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

4.8.2 Prox Output Data

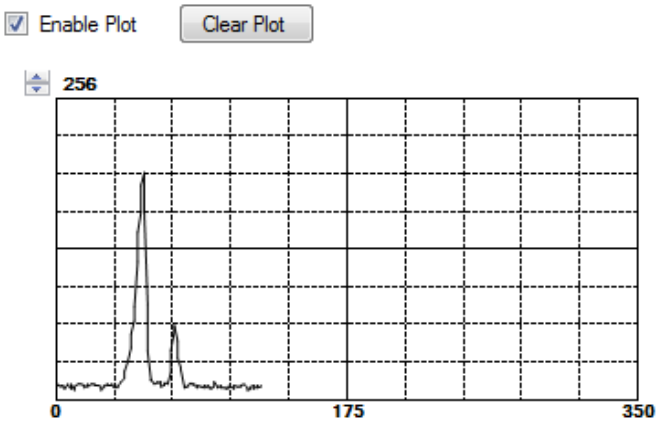
The top right corner of the Prox tab displays the output data. This data is continuously read. The polling interval is shown above the tab.

- **PDATA** displays the Proximity ADC channel data counts
- **StDev** displays the calculated prox standard deviation based on the last 32 PDATA samples

4.8.3 Prox Data Plot

The remaining portion of the Prox tab is used to display a running plot of the collected 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 12. Prox Data Plot



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 256.

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

For additional information regarding the TSL2740, please refer to the datasheet. For information regarding the installation of the TSL2740 EVM host application software please refer to the TSL2740 EVM Quick Start Guide.

Designer's Notebooks dealing with various aspects of optical measurement and optical measurement applications are available. All content is available on the ams website www.ams.com.

Addition Resources:

- TSL2740 Datasheet
- TSL2740 EVM Quick Start Guide (QSG)
- TSL2740 EVM User's Guide (this document)
- TSL2740 EVM Schematic and Layout

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А