SEMTECH

WIRELESS & SENSING PRODUCTS

SX1280/SX1281

Long Range, Low Power
2.4 GHz Transceiver

User Guide for the

SX1280 Development Kit

Table of Contents

List of Figures

1. Contents of delivery

The Development Kits for the SX1280 and SX1281 transceivers are delivered with the following contents:

- 2 SX1280 Development Kits
- 2 connection cables Mini-USB / USB

Before powering the kit, make sure to assemble the three parts shown in the image below

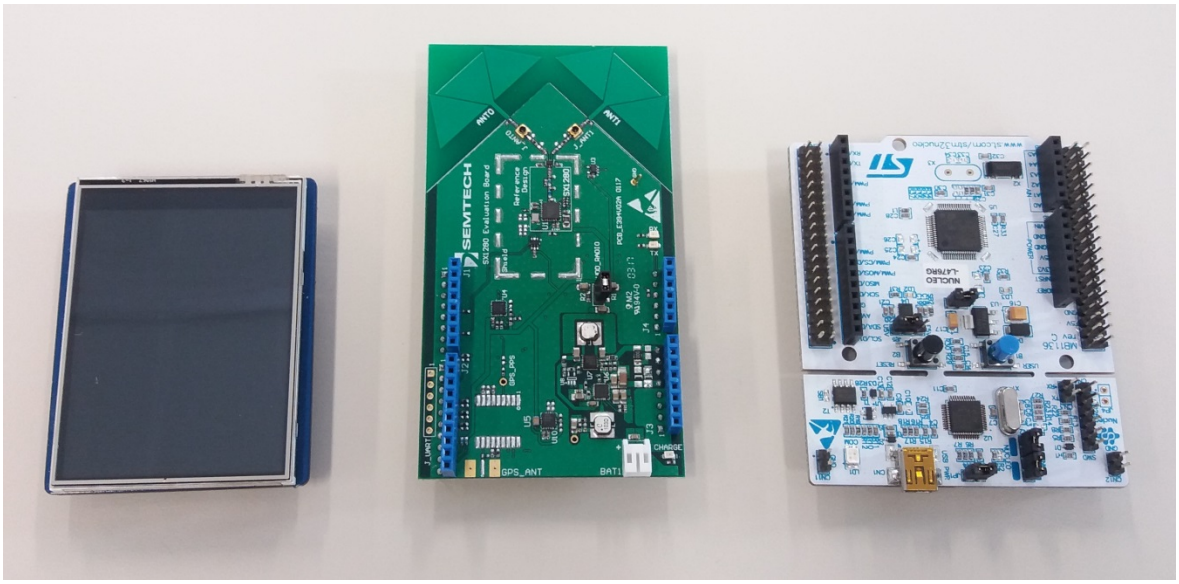

Figure 1: From left to right: screen, radio board and microcontroller MBED board

When you assemble the parts, make sure that they are correctly oriented, as shown below:

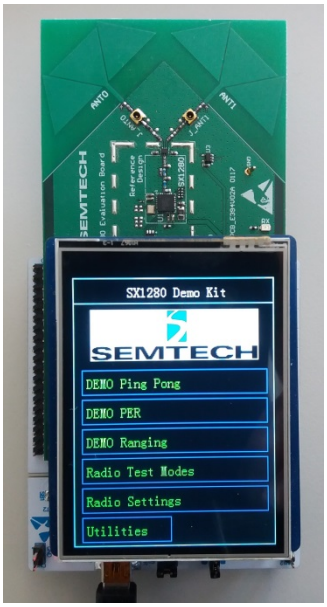

Figure 2: Screen, radio board and MBed board correctly assembled

2. First Use

2.1. Connect the SX1280 Development Kit

1. Plug the mini-USB / USB cable into the mini-USB socket of the SX1280 Development Kit
2. Plug the mini-USB / USB cable into the USB socket of your PC

The SX1280 Development Kit will power on and connect to your PC.

2.2. Welcome Display

The welcome screen with the top menu is visible upon power-on.

You can access the following test modes:

- **DEMO Ping Pong**

  This performs a bidirectional range test between a pair of radio units.

- **DEMO PER**
- This performs a unidirectional packet error rate test between user-defined Master and Slave units.

- **DEMO Ranging**

  This performs a ranging test between user-defined Master and Slave units.

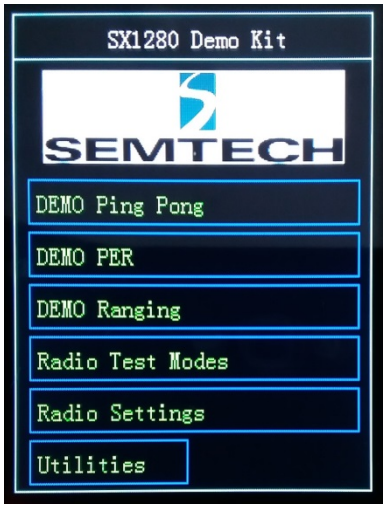

Figure 3: Welcome Display

Additionally, you can access the **Radio Test Modes**, which provide access to the basic operating modes of the radio.

The **Radio Settings** allow you to modify the communication and modem settings used in the demos.

The **Utilities** menu provides information about the peripherals and version of the installed firmware.

2.3. How to Navigate with the Touch Screen

In the kit the following conventions are adopted:

- Menus, functions and configuration of settings are indicated in Green
- Data that cannot be modified is indicated in White
- Result data from tests are indicated in Yellow

2.4. Check and Upload the Firmware File

Before using the SX1280 Development Kit, make sure to have the latest firmware:

- Go to the **Utilities** *section on page 14.*
- Check the **Firmware Version**.
- If it is not the latest version, download the firmware from the website *www.semtech.com* and save it to your PC.

The firmware can then be uploaded to the SX1280 Development Kit.

To upload the firmware file:

- Connect the SX1280 Development Kit as explained in *Section 2*
- Allow your computer to display the kit as an extra device
- Drag and drop the .bin file that has been provided to you or that you have downloaded from the Semtech website.
- The kit will initialize and eventually ask you to calibrate the screen, simply follow the on-screen instructions.

3. Ping Pong Demo

A Ping Pong Test is a bidirectional test between a pair of SX1280 kits. One needs to be configured as the Ping Pong Master and the other as the Ping Pong Slave. Communication is initiated by the Master whose packet is received by the Slave from which the PER may be calculated.

In response to this packet the Slave sends an acknowledgement, which also contains statistical information about the link calculated by the Slave. The Master, upon receiving this response, will then display both the PER for the Master to Slave and the Slave to Master packet exchanges.

Press on **Demo Ping Pong** from the Welcome Display to access this test.

You can change the radio settings from this menu:

➔ Press **SETTINGS** to adjust the same radio settings on the Master and the Slave units. See *Section 7* for more details on the radio settings.

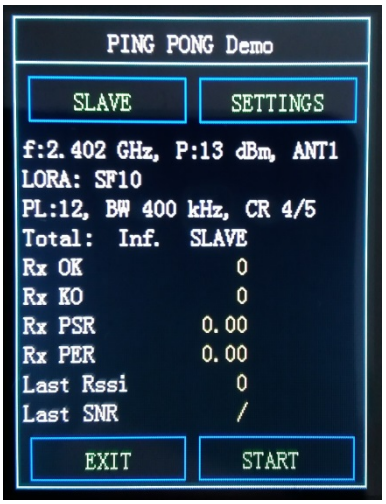

Figure 4. PING PONG Demo Slave Display

Before starting the test:

- Place the Slave unit into the desired position
- Place the Master unit into the desired position

➔ Press **SLAVE** to toggle a unit to **MASTER** and vice-versa

To start the Ping Pong test:

➔ Press **START** first on the Slave unit then on the Master Unit

- Both units will exchange data until you press **STOP** on either unit.
  The reception and transmission of data are indicated by LEDs on each unit.
- The result of the test is displayed on the screen of the Master unit:
  - Rx OK : number of packets completely received
  - Rx KO: number of packets not completely received
  - Rx PSR: Percentage Packet Success Rate for the last packet exchange
  - Rx PER: Percentage Packet Error Rate for the last packet exchange
  - Last RSSI: Received Signal Strength Indication [dBm]
  - Last SNR: Signal to Noise Ratio for the last packet exchange [dB]

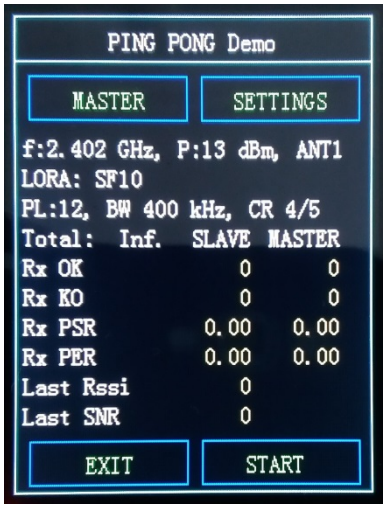

Figure 5: PING PONG Demo Master Display

4. PER Demo

A Packet Error Rate (PER) test is a unidirectional test where one kit is configured as a Master and the other as a Slave. In this case the Master will assume the role of transmitter and the Slave that of receiver. The aggregate PER of the packets received by the Slave, expressed as a percentage, is calculated and displayed on the receiver (Slave). Given this is a unidirectional test, the packet error rate is not displayed on the transmitter (Master).

Press on **Demo PER** from the Welcome Display to access this test.

You can change the radio settings from this menu:

➔ Press **SETTINGS** to adjust the same radio settings on the Master and the Slave units. See *Section 7* for more details on the radio settings.

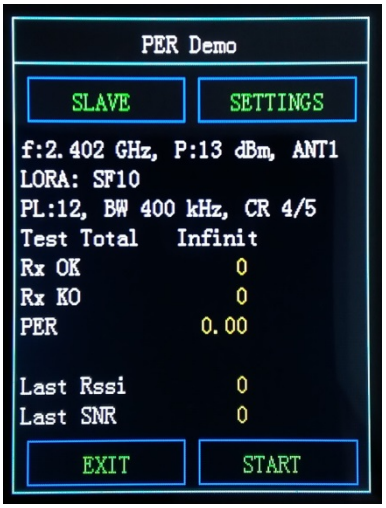

Figure 6: PER Demo Slave Display

Before starting the test:

- Place the Slave unit into the desired position
- Place the Master unit into the desired position

➔ Press **SLAVE** to toggle the unit to **MASTER** and vice-versa

To start the PER test:

➔ Press **START** first on the Slave unit then on the Master Unit

- Both units will exchange data until you press **STOP** on either unit.

  The reception and transmission of data are indicated by LEDs on each unit.
- The result of the Demo is displayed on the screen of the Slave unit:
  - Rx OK : number of packets completely received
  - Rx KO: number of packets not completely received
  - Rx PSR: Percentage Packet Success Rate for the last packet exchange
  - Rx PER: Percentage Packet Error Rate for the last packet exchange
  - Last RSSI: Received Signal Strength Indication [dBm]
  - Last SNR: Signal to Noise Ratio for the last packet exchange [dB]

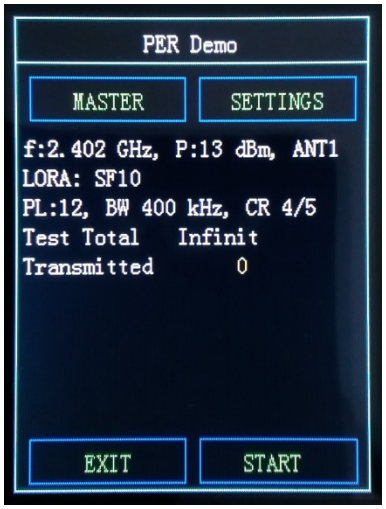

Figure 7: PER Demo Master Display

5. Ranging Demo

Press on **Demo Ranging** from the Welcome Display to access this test.

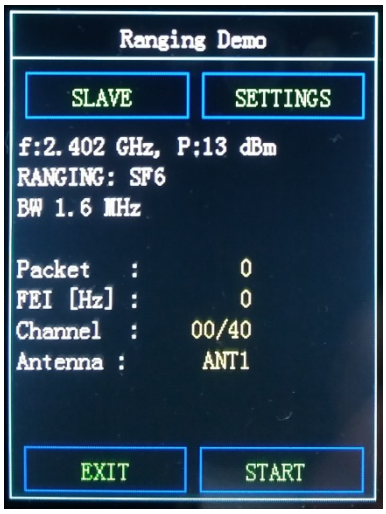

Figure 8: Ranging Demo Slave Display

You can change the radio settings from this menu:

➔ Press **SETTINGS** to adjust the same radio settings on the Master and the Slave units. See *Section 7* for more details on the radio settings.

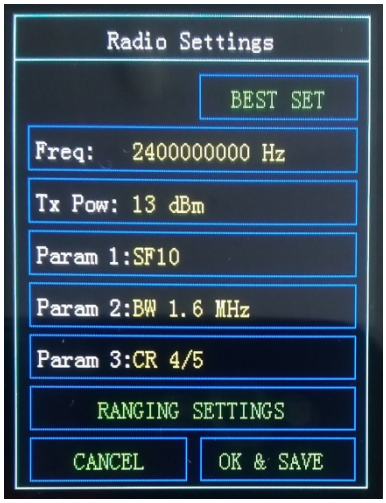

Figure 9: Radio Settings Display in Ranging Demo

From the **Radio Settings** menu you can change the ranging settings:

➔ Press **RANGING SETTINGS**

See *Section 7.4* for more details on the ranging settings.

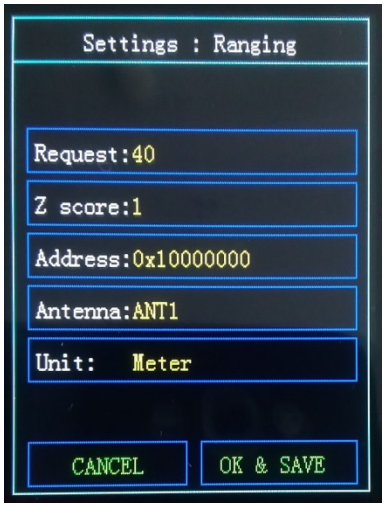

Figure 10: Ranging Demo Settings Display

Before starting the test:

- Place the Slave unit into the desired position
- Place the Master unit into the desired position

➔ Press **SLAVE** to toggle the unit to **MASTER** and vice-versa

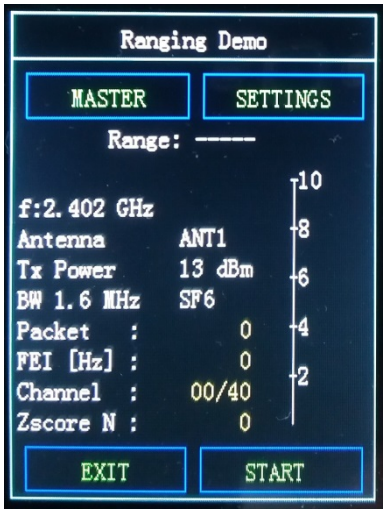

Figure 11: Ranging Demo Master Display before start

To start the Ranging test:

➔ Press **START** first on the Slave unit then on the Master Unit

➔ When testing in Ranging Demo, refresh the result and the graphical illustration by hitting the **REFRESH** button.

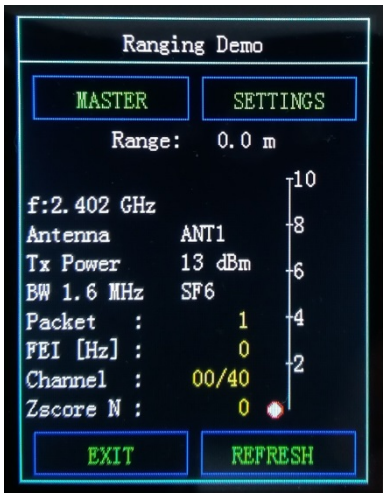

Figure 12: Ranging Demo Master Display during test

6. Radio Test Modes

The **Radio Test Modes** menu allows you to select certain preset test modes. These test modes allow the test of consumption of the radio in the respective modes, additionally that can be of use for testing the specification claims of the datasheet or various modem performances without the need to create custom firmware.

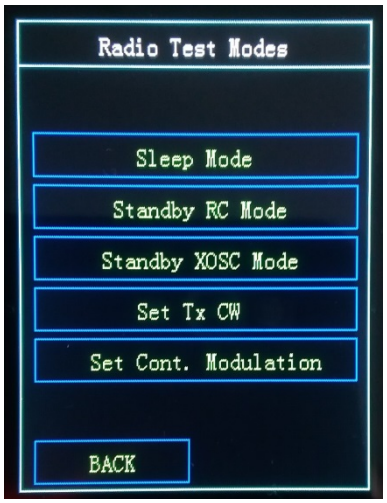

Figure 13: Radio Test Modes Display

7. Radio Settings

The radio settings available depend upon the modulation, denoted **Mod** in the sub-menu **Radio Settings**. For each modem you can modify the modulation and power parameters. The registered settings are proper to each modulation.

7.1. LORA Modulation

The radio settings available for **LORA** modulation are:

- The Frequency (**Freq**) as described in *Section 7.5*
- The Transmission Power (**Tx Pow**): in steps of 1 dBm between -18 dBm and +13 dBm
- **Param 1**: choose a Spreading Factor between SF5 and SF10
- **Param 2** : choose a BandWidth (**BW**) of either 400 kHz, 800 kHz or 1.6 MHz
- **Param 3**: The Coding Rate (**CR**) of the Forward Error Correction applied to the packet, of either CR 4/5, 4/6,4/7, 4/8 or CRLI 4/5, 4/6, 4/7
- **Payload**: size of the payload between 12 and 248 bytes

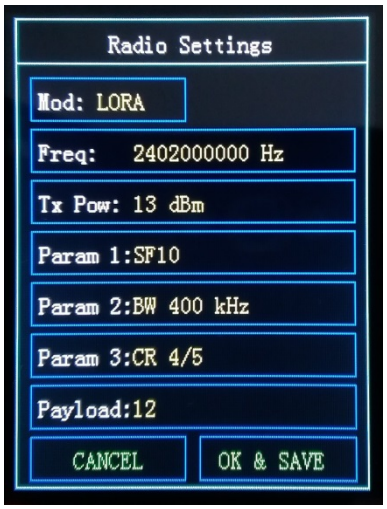

Figure 14: LORA Radio Settings Display

7.2. FLRC Modulation

The radio settings available for **FLRC** modulation are:

- The Frequency (**Freq**) as described in *Section 7.5*
- The Transmission Power (**Tx Power**): in steps of 1 dBm between -18 dBm and +13 dBm
- **Param 1**: choose a data rate and an associated bandwidth (**BW**)
- **Param 2** : The Coding Rate (**CR**) of the Forward Error Correction applied to the packet, of either 1, ½ or 3/4
- **Param 3**: Bandwidth-Time bit period product (**BT**) of either 1, 0.5 or OFF
- **Payload**: size of the payload between 12 and 120 bytes

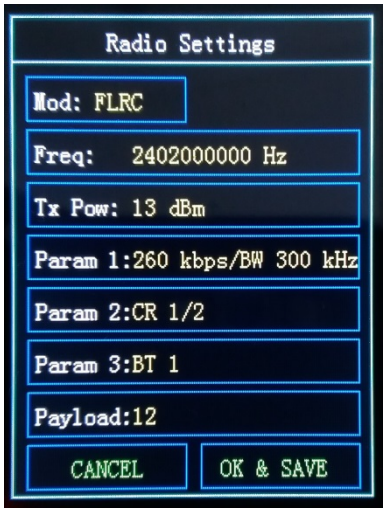

Figure 15: FLRC Radio Settings Display

7.3. GFSK Modulation

The radio settings available for **GFSK** modulation are:

- The Frequency (**Freq**) as described in *Section 7.5*
- The Transmission Power (**Tx Power**): in steps of 1 dBm between -18 dBm and +13 dBm
- **Param 1**: choose a data rate and an associated bandwidth (**BW**)
- **Param 2** : Modulation Index (**Mod. i**) between 0.35 and 4
- **Param 3**: Bandwidth-Time bit period product (**BT**) of either 1, 0.5 or OFF
- **Payload**: size of the payload between 12 and 248 bytes

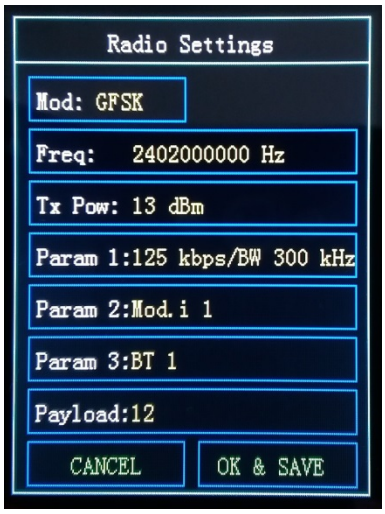

Figure 16: GFSK Radio Settings Display

7.4. Ranging Modem

The radio settings available for the **Ranging Modem** are:

- The Frequency (**Freq**) as described in *Section 7.5*
- The Transmission Power (**Tx Pow**): in steps of 1 dBm between -18 dBm and +13 dBm
- **Param 1**: choose a Spreading Factor between SF5 and SF10
- **Param 2** : choose a BandWidth (**BW**) of either 400 kHz, 800 kHz or 1.6 MHz
- **Param 3**: The Coding Rate (**CR**) of the Forward Error Correction applied to the packet, of either CR 4/5, 4/6,4/7, 4/8 or CRLI 4/5, 4/6, 4/7
- **Payload**: size of the payload between 12 and 248 bytes
- The button **BEST SET** selects the best settings for ranging

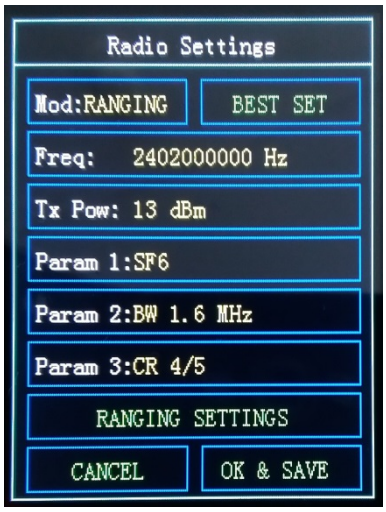

Figure 17: Ranging Modem Radio Settings Display

From this menu you can also access the **Ranging Settings** as in *Section 5.*

7.5. Frequency Setting

In this menu you can set the frequency for each modulation:

- Select the frequency **Step** that you wish to tune: from 1 Hz to 10 MHz
- With **-** and **+** change the value of the step of your tuned frequency
- The resulting frequency in displayed in **Freq**
- Additionally you can select one of the three **Preset** frequencies by simply pressing the desired frequency value.

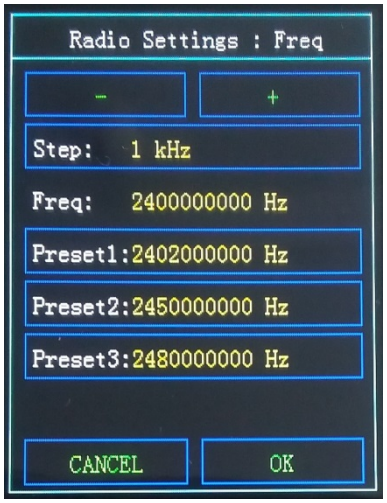

Figure 18: Frequency Setting Display

8. Utilities

In this menu you can reset the SX1280 Development Kit to its factory settings:

➔ Press on **Fact. Reset**

The **Utilities** section is also useful to check:

- the **Firmware Version**
- the **GPS** satellites that the unit sees and the resulting position in **Pos.**
  If no satellite can be seen, the unit will display **Satellites searching**
- the **Proximity** sensor output – each antenna has an independent capacitive proximity sensor that allows the detection of proximate objects – here we see the raw sensor output.

You can modify:

- the Power Amplifier mode (**PA Mode**): either DCDC or LDO
- the **Packets** limit: Infinite, 100, 200, 500 or 1000
- the **Antenna** in use: either ANT1 or ANT2

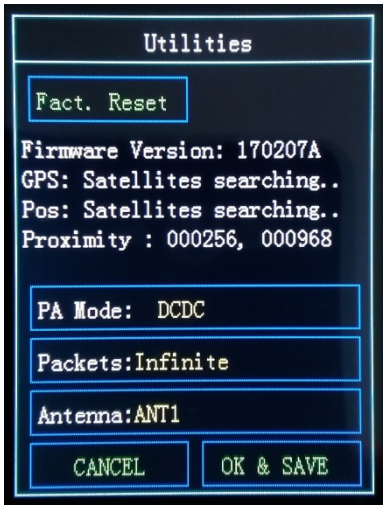

Figure 19: Utilities Display

Important Notice

Information relating to this product and the application or design described herein is believed to be reliable, however such information is provided as a guide only and Semtech assumes no liability for any errors in this document, or for the application or design described herein. Semtech reserves the right to make changes to the product or this document at any time without notice. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Semtech warrants performance of its products to the specifications applicable at the time of sale, and all sales are made in accordance with Semtech's standard terms and conditions of sale.

SEMTECH PRODUCTS ARE NOT DESIGNED, INTENDED, AUTHORIZED OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT APPLICATIONS, DEVICES OR SYSTEMS, OR IN NUCLEAR APPLICATIONS IN WHICH THE FAILURE COULD BE REASONABLY EXPECTED TO RESULT IN PERSONAL INJURY, LOSS OF LIFE OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. INCLUSION OF SEMTECH PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE UNDERTAKEN SOLELY AT THE CUSTOMER'S OWN RISK. Should a customer purchase or use Semtech products for any such unauthorized application, the customer shall indemnify and hold Semtech and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs damages and attorney fees which could arise.

Contact Information

Semtech Corporation
Wireless & Sensing Products
200 Flynn Road, Camarillo, CA 93012
E-mail: sales@semtech.com
Phone: (805) 498-2111, Fax: (805) 498-3804
www.semtech.com

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Semtech:
SX1280DVK1ZHP