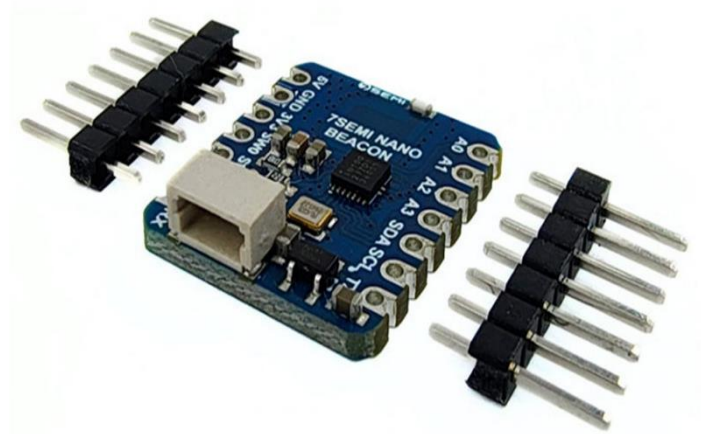


# 7SEMI

## IN100 Ultra-Low Power Bluetooth Beacon Manual

Version 1.0



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# 1.0 Features

- **Bluetooth Low Energy 5.3 Compliant**
  - Supports enhanced privacy modes.
- **Beacon Modes**
  - Proprietary and Bluetooth SIG-compliant.
  - iBeacon, Eddystone, and Altbeacon compliant (*iBeacon is a trademark of Apple Inc.; Eddystone is a trademark of Google Inc.*).
- **Ease of Use**
  - Configuration and usage require no software programming.
- **Memory**
  - 4Kb eFuse memory for advertising payload storage and manufacturer ID.
  - 4KB SRAM for dynamic payload storage.
- **Low Power Mode Advertising**
  - Supports continuous and event-triggered advertising.
- **RF Radio**
  - Operates in the 2.4GHz frequency band with a programmable TX output power of up to +4dBm.
  - Supports MedRadio band.
- **System Power Consumption**
  - Ultra-low power consumption, supporting multi-year operation on a small battery.
  - Sleep mode with power consumption < 650nA and 32kHz RC ON.
- **Peripheral Interfaces**
  - 1 UART and 1 I2C interface.
  - Pulse count interface for digital sensor input.
  - Built-in ultra-low leakage load switches (x2).
  - Sensor ADC (11-bit resolution), chip temperature measurement, VCC voltage measurement, and 4 customizable channels.

- **Clock Sources**
  - 26MHz XO crystal.
  - 32.768kHz RTC crystal (optional).
- **Security and Privacy**
  - AES-128 based authentication and encryption.
  - Resolvable private address for privacy protection.
  - Anti-cloning technology with time-varying beacon payloads.
- **Power Supply**
  - Integrated low leakage LDO.
  - Input voltage: 1.1V - 3.6V.
  - Supports single-cell 1.5V battery operation.
- **Operating Temperature**
  - Industrial range: -40°C to +85°C (extended version up to +125°C).
- **Packaging Options**
  - DFN8: 2.5mm x 2.5mm.
  - QFN18: 3.0mm x 3.0mm.
  - WLCSP10: 1.1mm x 2.0mm.

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## 2.0 Description

The **7Semi IN100 NanoBeacon Breakout Board** is a compact 2.4 GHz wireless, low-energy beacon solution engineered for easy integration and minimal power consumption. It's built around the IN100 NanoBeacon™ from InPlay™, a highly efficient wireless beacon that caters to a variety of IoT applications. This board is designed to eliminate the complexities of traditional wireless beacon configurations, offering a streamlined development experience without the need for extensive programming knowledge.

One of the standout features of the board is its use of the NanoBeacon Config Tool, a software-free setup that allows users to easily configure advertising settings and manage packet transmissions without delving into complicated coding. This user-friendly approach makes it ideal for developers looking to quickly prototype and deploy wireless solutions in areas such as asset tracking, smart home automation, and industrial monitoring.

Additionally, the IN100 NanoBeacon is known for its ultra-low power consumption, ensuring that your solutions can operate efficiently for extended periods, making it suitable for battery-powered and energy-sensitive applications. With its small form factor, ease of use, and powerful functionality, the 7Semi IN100 NanoBeacon Breakout Board is a versatile tool for wireless development projects.

## 2.1 7Semi IN100 NanoBeacon Board

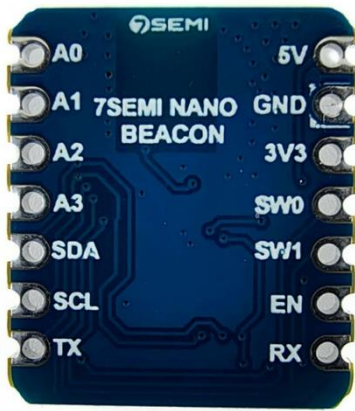


Figure 2.1.1 Bottom view

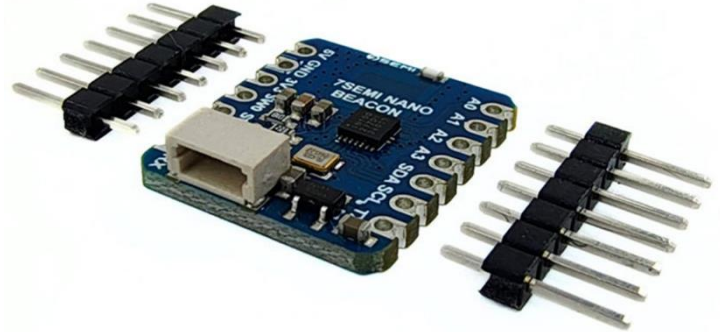


Figure 2.1.2 Side view

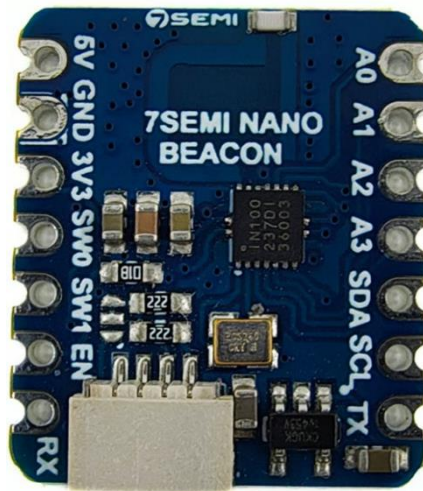


Figure 2.1.3 Top view

## 3.0 Pinouts

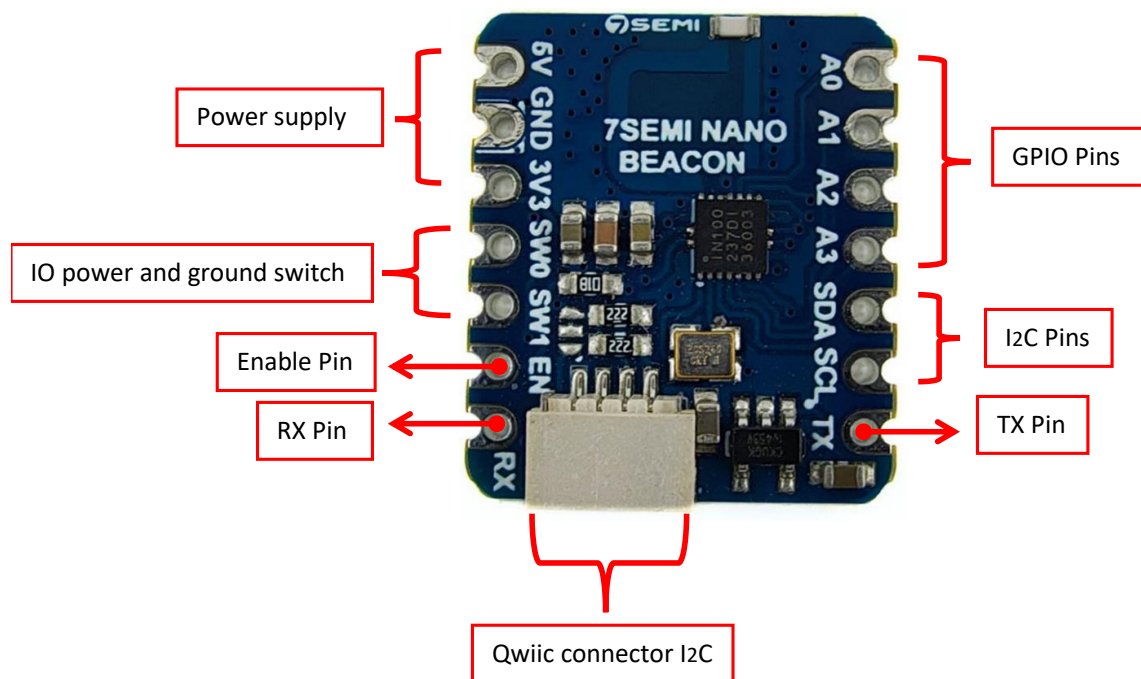


Figure 3.1 Pinouts



# 4.0 Example connection and program for 7Semi IN100 Bluetooth Beacon Board

## 4.1 NanoBeacon Config Tool

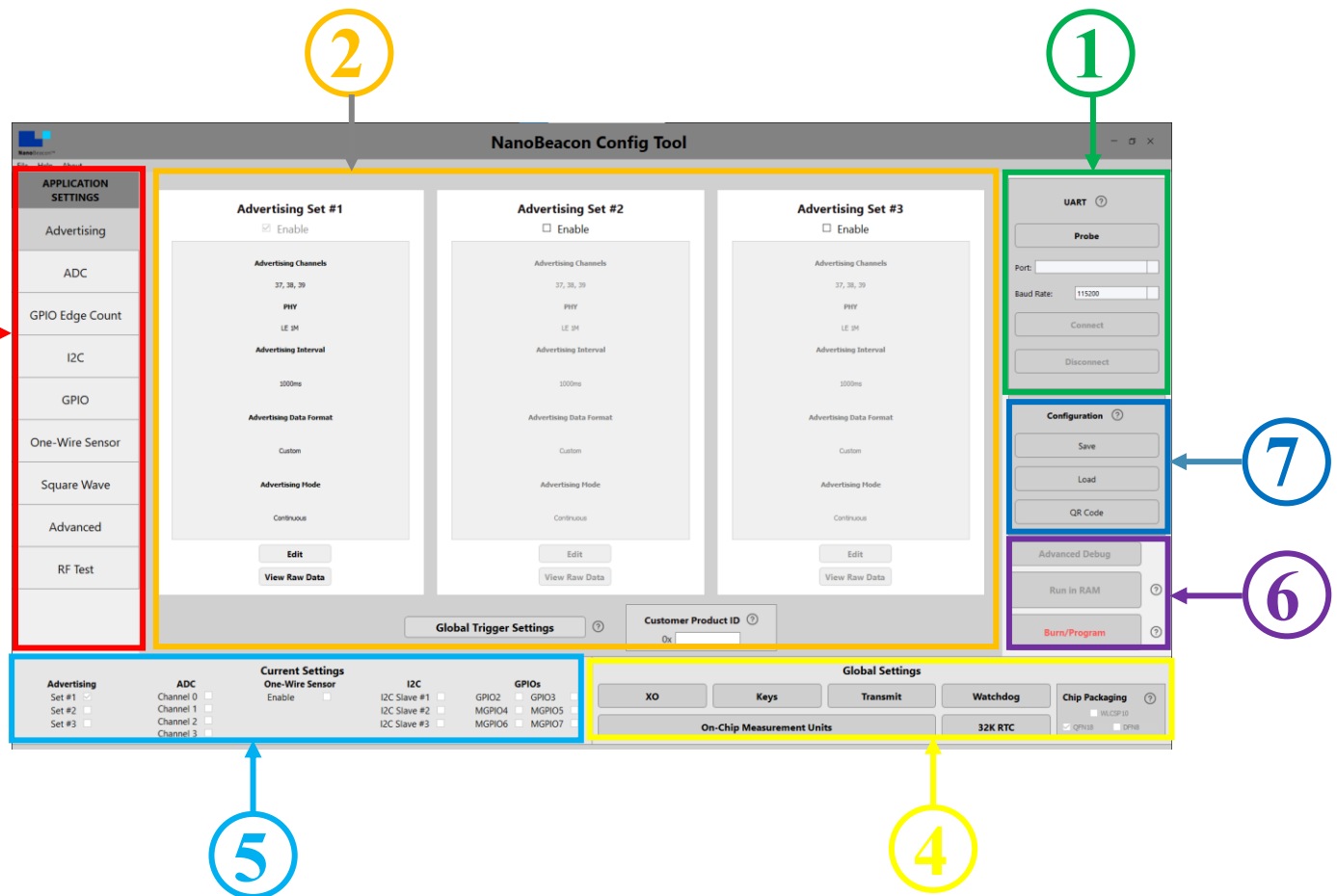


Figure 4.1.1 NanoBeacon Config Interface

The **InPlay NanoBeacon Config Tool** is a PC-based graphical user interface (GUI) designed to configure and test the IN100 NanoBeacon. It offers flexible configuration options for the IN100’s peripherals, advertising data payloads, and advertising parameters to match specific use case requirements.



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## Key Features of the NanoBeacon Config Tool:

### 1. UART Settings

- This section allows users to set the UART port and configure the baud rate for communication with the development kit. The default baud rate is 115200.

### 2. Advertising Settings

- This window provides options for configuring advertising data payloads, intervals, and advertising modes, such as continuous or triggered advertising, for up to three different advertising sets.

### 3. Application Settings

- This section contains configurable tabs for the IN100's features, including ADC, GPIO edge count, I2C, one-wire sensor, square wave, and more. It also includes an advanced mode for enabling special device behaviors beyond the standard configuration. The RF test tab makes it easy to run RF tests like BLE DTM mode and CW (continuous waveform/carrier) tests.

### 4. Global Settings

- This allows access to device settings that apply universally to all advertising sets.

### 5. Current Settings

- This overview displays the current configurations and settings selected for the device.

### 6. Configuration Options

- Users can save and load configuration files. The tool offers two ways to test configurations:
- **"Run in RAM" Mode:** This option allows users to test configurations temporarily in RAM before permanently committing them.
- **"Burn/Program" Mode:** This burns the configuration to the device's OTP (One-Time Programmable) memory. This step is irreversible and should only be performed after all testing is complete.

### 7. Advanced Debug

- This feature enables reading and writing to the device's registers, memory, and eFuse for debugging purposes only.

The Config Tool's user-friendly interface simplifies the setup process while offering advanced options for testing and finalizing configurations. Make sure to always reset the device before using "Run in RAM" mode and use the "Burn/Program" option only when you're confident with the settings.

**Note:** The Config Tool offers a testing "Run in RAM" mode for many settings but I2C is not available in the RAM testing mode. Users connecting I2C devices to the board should ensure their code works before clicking the "Burn/Program" button !.

NanoBeacon download link : <https://inplay-tech.com/nanobeacon-config-tool>

## 4.2 Connection Explain of 7Semi IN100 with Computer Using 7Semi USB to TTL Board

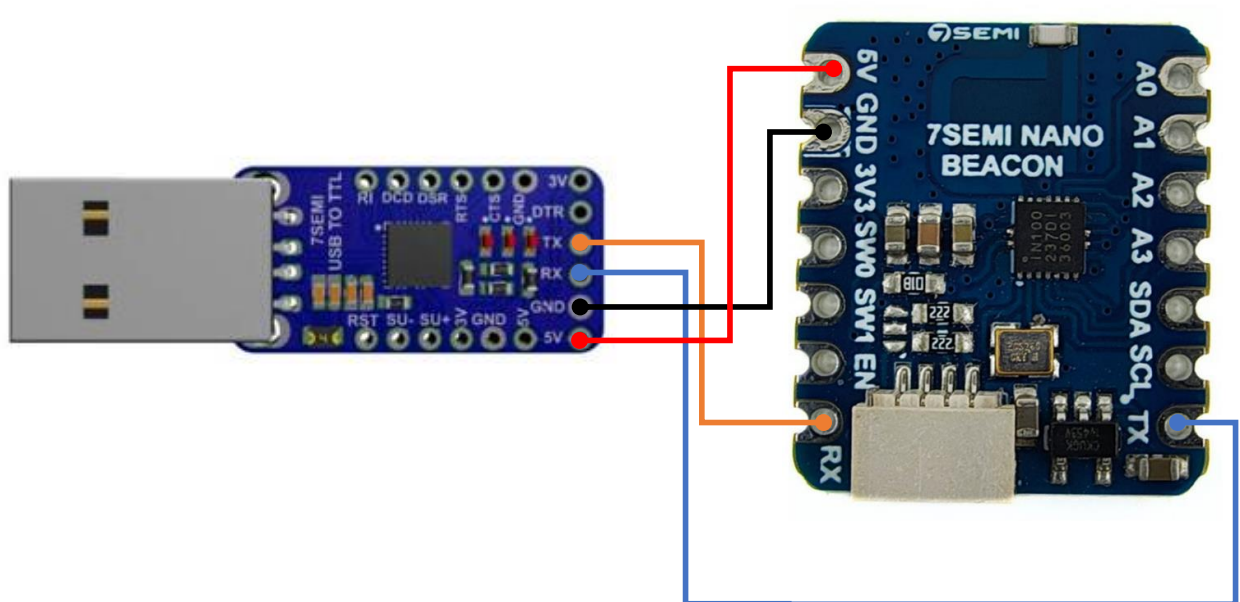


Figure 4.2.1 Circuit diagram

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To flash a program to the 7semi IN100 board using a USB-to-TTL converter, follow these steps for proper wiring and flashing:

**Required Components:**

- 7semi IN100 board
- USB-to-TTL converter
- Jumper wires
- Computer with the NanoBeacon Config Tool installed

**Steps to Flash the Program:**

**1. Circuit Connection:**

- **5V Power:** Connect the 5V pin of the IN100 to the 5V pin on the USB-to-TTL converter.
- **Ground (GND):** Connect the GND pin of the IN100 to the GND pin on the USB-to-TTL converter.
- **TX (Transmit) Pin:** Connect the **TX pin** of the IN100 to the **RX pin** on the USB-to-TTL converter (crossed connection).
- **RX (Receive) Pin:** Connect the **RX pin** of the IN100 to the **TX pin** on the USB-to-TTL converter (crossed connection).

Ensure all connections are made securely and correctly.

**2. Connect the USB-to-TTL Converter to the Computer**

- Plug the USB-to-TTL converter into a USB port on your computer.

**3. Install the USB-to-TTL Driver**

- If the USB-to-TTL converter requires a specific driver, make sure it is installed on your computer before proceeding.

#### 4. **Open the NanoBeacon Config Tool**

- Launch the **InPlay NanoBeacon Config Tool** on your computer. This will allow you to configure the settings and flash the program to the IN100 board.

#### 5. **Set Up Communication**

- In the Config Tool, go to the **UART Settings** section.
- Select the correct **COM port** for your USB-to-TTL converter.
- Set the baud rate to **115200** (the default for IN100).

#### 6. **Load and Configure the Program**

- Use the Config Tool to load the configuration or firmware you want to flash to the IN100 board.
- Ensure all configuration settings are correct and ready to upload.

#### 7. **Flashing the Program**

- You can first test the configuration using the **Run in RAM** option to ensure everything works as intended.
- Once confirmed, select the **Burn/Program** option to permanently flash the program to the IN100's OTP memory.

#### 8. **Verify the Flashing Process**

- After flashing, monitor the status in the Config Tool to confirm the program was uploaded successfully.

#### 9. **Disconnect**

- Once the flashing process is complete, you can safely disconnect the USB-to-TTL converter and test your IN100 device.

By following these steps, you can flash the program from your computer to the IN100 board using the USB-to-TTL converter, ensuring all connections and configurations are properly handled.

## Steps to Upload the Internal Temperature Example Program in the NanoBeacon Config Tool

### 1. Open the NanoBeacon Config Tool:

- Launch the **InPlay NanoBeacon Config Tool** on your computer. Make sure the tool is installed and ready to use.

### 2. Set UART Communication Settings:

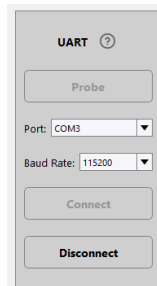


Figure 4.2.2 UART

- If you are working with a development kit, you may need to configure the **UART Settings** to select the correct COM port and set the baud rate to **115200** (the default for IN100). However, for configuration purposes, you can proceed without needing a live device connected at this stage.

### 3. Access the Example Programs:

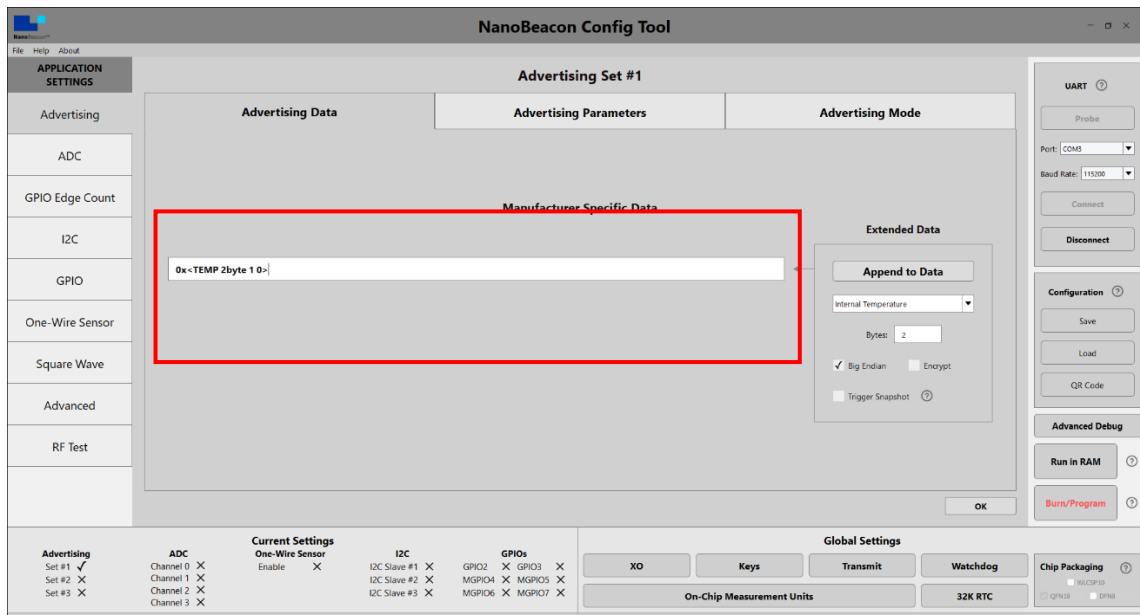


Figure 4.2.3 Manufacturer Specific data

- Navigate to the **Application Settings** tab in the NanoBeacon Config Tool.
- Look for a pre-configured **internal temperature example program** from the available examples in the tool. This example will typically configure the IN100's internal temperature sensor to read and advertise the temperature data.



#### 4. Configure the Advertising Settings:

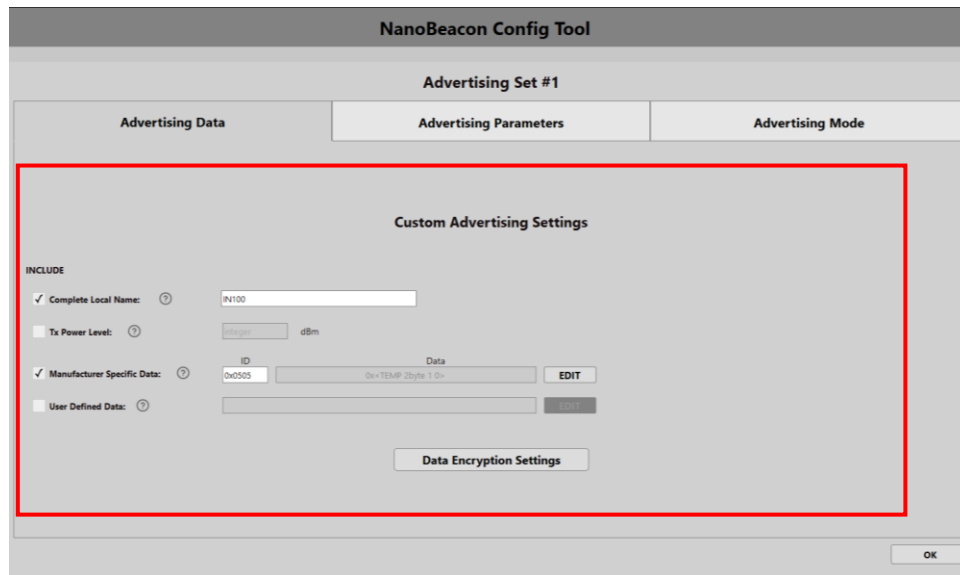


Figure 4.2.4 Custom Advertising Settings

- Go to the **Advertising Settings** tab to configure the **advertising data payload**.
  - Set the payload to include the internal temperature data.
  - Adjust the **advertising interval** and **advertising mode** (e.g., continuous or triggered) based on your requirements.

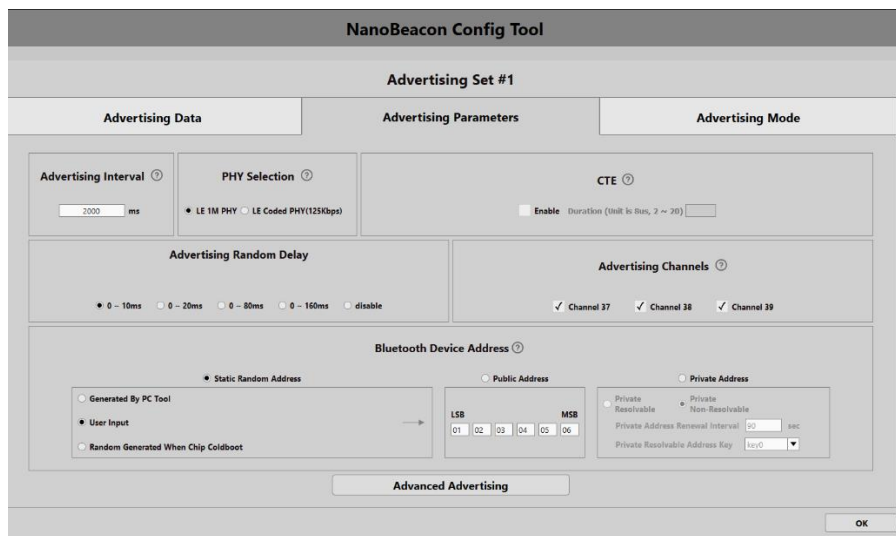


Figure 4.2.5 Advertising parameters

- The advertising data payload can be set up to send the internal temperature at regular intervals, allowing you to observe it via a BLE scanner or the InPlay Scanner App.

### 5. Test in "Run in RAM" Mode:

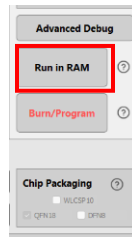


Figure 4.2.6 Run in Ram

- Once the internal temperature program is loaded, use the "**Run in RAM**" option to simulate the settings in the tool without committing any changes permanently.
- This allows you to verify that the configuration and internal temperature readings are working as expected in a test environment. Note that the settings are temporary when using this mode, and any changes will not be written to the device's permanent memory.

### 6. Save the Configuration File:

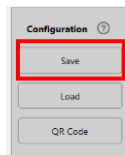


Figure 4.2.7 Configuration

- In the **Configuration** section, you can save your current configuration (including the internal temperature example) to a file.
- This configuration file can later be loaded and applied to an IN100 device without needing to reconfigure everything from scratch.

### 7. Burn/Program to Device:

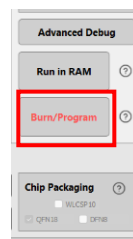


Figure 4.2.8 Burn/Program

- After confirming that the internal temperature example works as intended, go back to the **Configuration** section.
- Choose the "**Burn/Program**" option to permanently store the program on the device once you are ready for deployment. This will upload the configuration file to the device's OTP memory, making the settings permanent.
- **Note : Users connecting I2C devices to the board should ensure their code works before clicking the "Burn/Program" button !.**

## 8. Review Settings:

- Before finalizing, use the **Current Settings** tab to double-check the device settings and ensure all configurations (advertising data, internal temperature, etc.) are set as desired.

By following these steps, you can configure and test the **internal temperature example program** within the NanoBeacon Config Tool in a purely software environment. This allows you to set up and verify the program before burning it to the IN100.

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## 5.0 Contact Information



*7Semi is a leading provider of wide range of efficient and accessible hardware products and related technical solutions to an extensive range of industries like IoT, Automation, Education and Learning, Robotics and more*

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***We're happy to answer questions.***

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