AN14739

MCX W72 Bluetooth Low Energy Power Consumption Analysis

Rev. 2.0 — 10 December 2025 Application note

Document information

Information	Content
Keywords	AN14739, MCX W72 MCUs, MCXW72-EVK board, Bluetooth Low Energy (BLE), power consumption analysis, low-power operation, MCX W72 Power Profile tool
Abstract	This document provides information about the power consumption of MCX W72 wireless MCUs. It describes how the hardware is designed and optimized for low-power operation. It also includes configuration steps to achieve the best low-power profile.

1 Introduction

This document provides the power consumption analysis of the MCX W72 (IIOT) wireless MCU using the MCXW72-EVK board. It describes how the device hardware is designed and optimized for low-power operation. It provides configuration steps to achieve the best low-power profile while maintaining the high performance of the system. It also describes the measurement setup and the procedures to measure the current consumption of MCX W72 chips.

Reducing the power consumption of wireless devices is a critical requirement for the automotive, industrial, and Internet of things (IoT) applications. As a result, the hardware has gradually improved and optimized from the power consumption perspective. New communication standards have been developed. Bluetooth Smart, also known as Bluetooth Low Energy, is part of these new standards that have been developed for long-term battery operation, typically years.

The MCX W72 is a radio wireless MCU that supports the Bluetooth Low Energy (LE) v6.x protocol.

1.1 Prerequisites

To perform the steps listed in this document, the reader must have good knowledge about the Bluetooth Smart protocol. Basic knowledge about the Arm MCU architecture and radio communication is also required.

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2 Bluetooth Smart power metrics

This section describes the steps to perform current-measurements on the MCXW72-EVK board, which includes the M10 module. The low-power (central and peripheral) reference design software is used to set the device to different modes for the current measurements. It is similar to using the temperature sensor in the Low-power mode.

The revision software used is the SDK 25.06 release.

The MCX W72 MCU comprises two CM33 cores:

- core0: main power domain.
- core1: Narrowband unit (NBU) or radio power domain.

The state (or mode) of these domains can be active, sleep, deep-sleep (DS), power-down (PD), or deep power-down (DPD). The steps involved are as follows:

- The CM33 is woken up (core0 wake-up power domain) and performs the system initialization and preprocessing.
- The transceiver (core1 NBU) is woken up and is ready to operate. If the software allows, the CM33 (core0) enters the “Inactive” mode.
- The transceiver performs one or more RX/TX sequences.
- The CM33 core1 processes the received or transmitted packets.
- The transceiver is put back to the Sleep mode.
- The CM33 core0 and core1 enter the low-power (Deep-sleep mode).

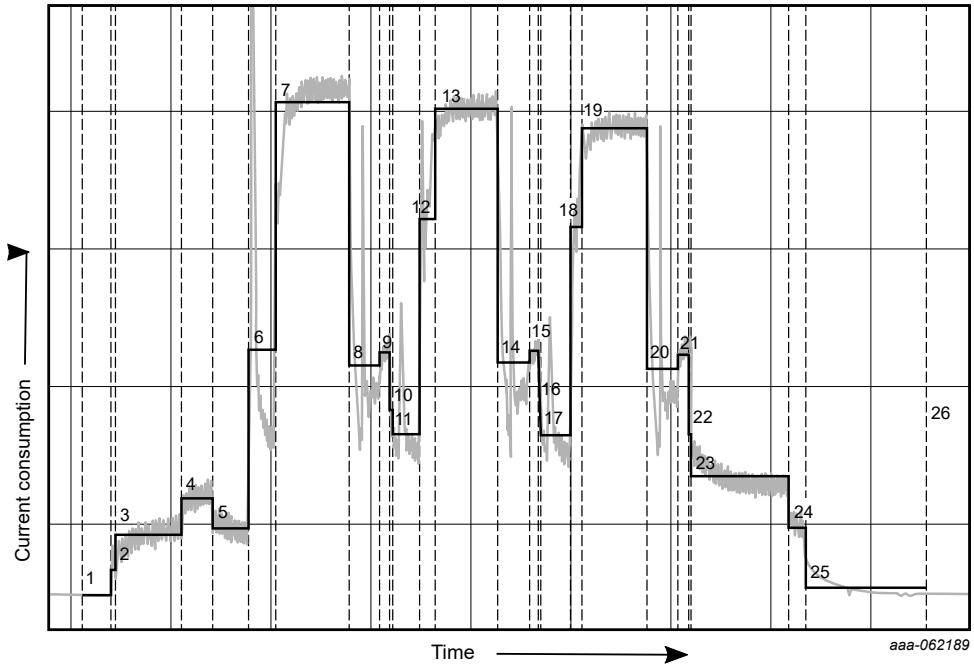

Figure 1. Typical operation cycle of a wireless low-power end device

Figure 1 shows how the current consumption varies over time for each operation cycle of the device.

At power up, the system performs the so-called power-on reset and then system initialization. After the initialization completes, the system enters the Low-power mode. Several Low-power modes are available for both the MCU and radio. Usually the software defines only the most suitable combinations of CM33 core0 and XCVR core1 Low-power modes (Deep-sleep mode for CM33 and NBU).

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Table 1 describes the timings from Figure 1 in sequence.

Table 1. Timings of a typical low-power device

Sequence number	Event - peripheral
1	SoC awakes from Low-power mode (DS, PD, or DPD)[1]
2	Power up
3	Preprocessing
4	MCU core1 (NBU) running
5	MCU WFI (Wait For Interrupt)
6	XCVR TX warm-up
7	XCVR active TX
8	TX to RX transition
9	XCVR active RX
10	XCVR RX warm-down
11	MCU WFI (CM33 STOP: RX to TX)
12	XCVR TX warm-up
13	XCVR active TX
14	TX to RX transition
15	XCVR active RX
16	XCVR RX (warm down)
17	CM33 STOP: RX to TX
18	XCVR TX (warm up)
19	XCVR active TX
20	TX to RX transition
21	XCVR active RX
22	XCVR RX warm-down
23	CM33 core1 (NBU) run: Postprocessing
24	SoC going to Deep-sleep mode
25	LP, SoC in Deep-sleep mode

[1] These are Deep-Sleep (DS), Power-down (PD), and Deep-Power Down (DPD) modes.

The time the transceiver takes to switch from RX to TX state is known as the *RX to TX turnaround time*. It is an important parameter of the transceiver.

Note: *When the radio is operational, the CM33 can also perform various tasks, such as serving interrupts or controlling various peripherals.*

The best metric to be applied is the current consumption over time, considering the average current of all the entities that are implied.

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2.1 Bluetooth LE

Bluetooth LE is suitable for low-power communication and a good candidate for the IoT deployments. The Bluetooth LE operates in the 2.4 GHz Industrial, scientific, and medical (ISM) band and uses the gaussian frequency shift keying (GFSK) modulation. The bandwidth bit period product is 0.5 and the modulation index is 0.5 (between 0.45 and 0.55).

Bluetooth LE transmits data using 40 channels over an 80 MHz bandwidth, from 2400 MHz to 2480 MHz with 2 MHz spacing. Each channel is spaced with 2 MHz. The data rate can be set to 1 bit/s, 2 Mbit/s, long range S2 (500 kbit/s), or S8 (125 kbit/s). These channels are numbered from 0 to 39. Three specific channels are dedicated for advertising packets (data exchange): channels 37, 38, and 39.

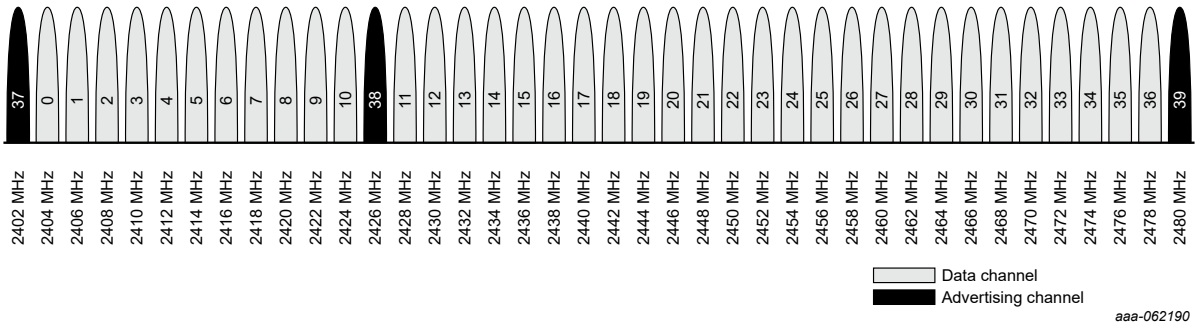

Figure 2. Bluetooth LE Radio Channels

The LE operation is achieved by using a low-duty cycle for transmission and/or reception of data, along with short advertising periods and data packets. An asynchronous and connection-less link-layer ensures low latency and fast transactions.

At the generic access profile (GAP) layer level, the roles of the Bluetooth LE devices are GAP central and GAP peripheral, as shown in Figure 3.

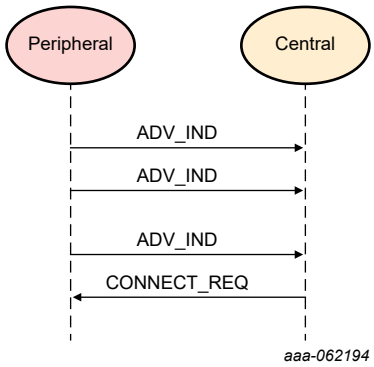

Figure 3. GAP peripheral and GAP central

The GAP peripheral starts to send the advertising data to the GAP central. If the GAP central wants to establish a connection with a GAP peripheral, it sends a connection request to the advertiser. Data exchange starts after the connection is established.

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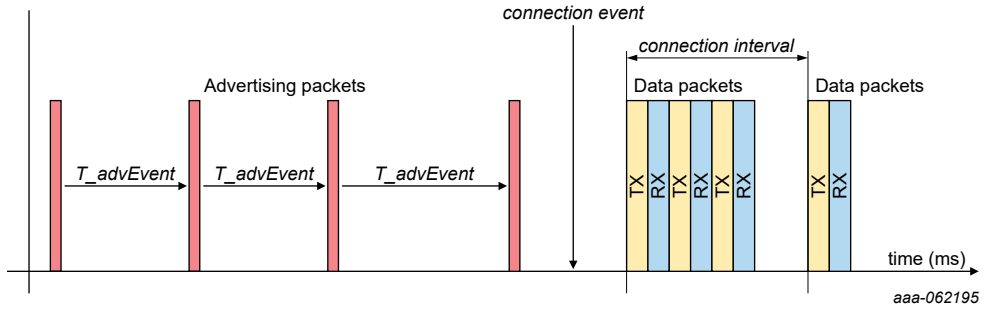

Figure 4. Bluetooth LE advertising and connection events

According to Bluetooth LE specifications, there are four types of advertising packets:

- ADV_IND: connectable undirected advertising
- ADV_DIRECT_IND: connectable directed advertising
- ADV_NONCONN_IND: non-connectable undirected advertising
- ADV_SCAN_IND: scannable undirected advertising (formerly known as ADV_DISCOVER_IND)

All the above advertising packet types use a TX followed with an RX sequence except for the non-connectable undirected advertising, as shown in Figure 5. After sending the advertising packet, the device waits for a scan request or a connect request from a peer device, if any.

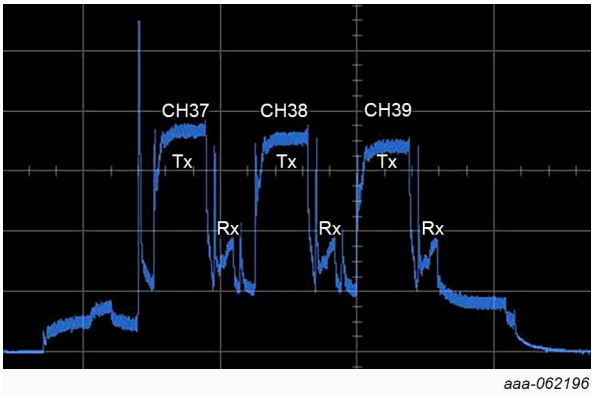

Figure 5. Current consumption versus time in the advertising phase for a Bluetooth LE peripheral device

Figure 5 shows the current variation with time when the system is in a typical advertising event. All three advertising channels are used. For each channel, a TX operation follows an RX operation.

Another feature of Bluetooth LE is that the advertising events have a random temporal component, according to Bluetooth LE specifications. For more details, see Figure 6.

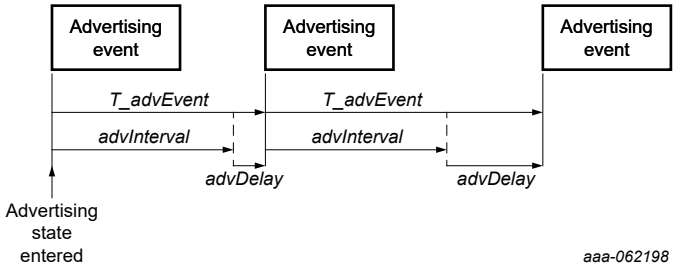

Figure 6. Advertising events occurring at unequal intervals

The timing of the Advertising events is provided by the formula:

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T_advEvent = advInterval + advDelay

Where:

- **advInterval**: Integer multiple of 0.625 ms with a range from 20 ms to 10.24 s
- **advDelay**: Pseudo-random value generated by the link-layer with a range from 0 ms to 10 ms

Therefore, a minimum advertising event interval is 20 ms and a maximum interval is 10.25 s.

Bluetooth LE is designed and implemented for ultra low-power battery-operated devices. The actual power consumption of a real Bluetooth LE device depends on the following:

- Bluetooth LE application profile
- Application duty cycle
- TX power
- Software management of low-power modes
- Board design and layout

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3 Low-power features

The MCX W72 MCU is an ultra-low power, highly integrated, single-chip device that enables the following:

- Bluetooth LE (1 Msps, 2 Msps, 500 ksps (LR S = 2), 125 ksps (LR S = 8)) ver 6.x
- Generic FSK (at 250 kbit/s, 500 kbit/s, 1000 kbit/s, and 2000 kbit/s) RF connectivity for portable, extremely low power embedded systems (MCX W72 IIoT)

The MCX W72 MCU supports up to 24 simultaneous Bluetooth LE connections as central, peripheral, or any combination. This MCU is designed for applications that focuses on bridging the embedded world to smartphones to:

- Enhance the human interface experience
- Share embedded data with the cloud
- Enable wireless firmware updates

The digital key leads the automotive applications. The smartphone can be used as an alternative to the key/smart FOB for unlocking and personalizing the driving experience. The digital key also provides selected and authorized access when a key is not needed (like car sharing).

The MCU integrates the Bluetooth LE 6.x compliant radio transceiver, operates in the 2.4-GHz ISM band, and supports the following features:

- Range of generic FSK
- Arm Cortex-M33+
- Arm Cortex-M33
- Up to 1 MB Flash
- Up to 256 kB static random access memory (SRAM)
- Bluetooth LE link layer (BTLL) hardware and peripherals optimized to meet the requirements of the target applications.

The RF section is optimized to require few external components, achieving the smallest RF footprint possible on a printed-circuit board. The NXP provides a certified Bluetooth LE stack to support the MCX W72 device.

Long battery life is achieved through the efficiency of code execution in the Cortex-M33 (Host)+, Cortex-M33 (NBU radio) cores, and multiple Low-power modes of the MCX W72. An integrated DC-DC converter enables a wide operating range from 1.8 V to 3.6 V in the Buck mode, and from 1.8 V to 3.6 V in the Bypass mode. The DC-DC in the Buck mode allows the MCX W72 to operate from a single coincell battery while reducing the peak RX and TX current consumption. The DC-DC in the Buck mode allows a single alkaline battery to be used throughout its entire useful voltage range of 1.8 V to 3.6 V. The integrated SYS_LDO regulator operates from 1.71 V to 3.6 V. The analog radio operates from 1.2 V to 3.6 V. The PA radio operates from 1.1 V to 2.4 V.

3.1 Hardware support for low-power operation

The MCX W72 SoC is designed and built with hardware features that allow the chip to operate in various low-power modes. The features are as follows:

- Multiple CM33 and NBU power modes, including low leakage with memory-retention modes
- BTLL deep-sleep mode support.
- Peripheral modules clock gating.
- Several peripheral doze modes.
- DC-DC converter.
- Transceiver sequence manager (TSM) ensures that the analog and digital transceiver blocks do not consume power when the RX/TX sequence is inactive.
- Dedicated power management controller (PMC).

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- Low-power peripherals (such as LPTMR, LPUART) can be configured as wake-up sources to exit a particular low-power state.

The software is responsible for configuring the hardware to achieve the best power scheme required by the applications. As described in the following sections, low-power chip modes are combinations of CM33 and LL/packet processor Deep-sleep modes. The clock gating of peripherals and general-purpose input/output (GPIO) state before entering a Low-power mode are in charge of the application developer. The connectivity software package provides callbacks that are called before entering a Low-power mode and after exiting a Low-power mode. The system enters a Low-power mode when it is idle and all software layers agree. The system exits a Low-power mode each time a synchronous or asynchronous event happens and requires to be processed.

3.1.1 CM33 core0 and CM33 core1 NBU power modes

The PMC module provides various power options to optimize and personalize the power consumption regarding the level of functionality that the application requests. Based on the Arm architecture, four power modes are defined:

- Sleep mode
- Deep-sleep mode (DSM)
- Power-down mode
- and Deep Power-down mode.

From the connectivity software perspective, only Deep-sleep modes are of interest. These modes are as follows:

- Deep-sleep 1 mode (all SRAM retention - 168 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)
- Deep-sleep 2 mode (SRAM retention - 32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)
- Power-down 1 mode (SRAM retention - 32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)
- Deep power-down 1 mode (SRAM retention - 8K RAM core0, no RAM NBU, no RAM DVP-V)
- Smart power switch 1 mode (SRAM retention - 8K RAM core0, no RAM NBU, no RAM DVP-V)

For more details on the power modes, refer to the *MCXW72 Reference Manual* (document MCXW72RM). See Section 7.

3.1.2 Link layer power modes

The BTLL has the following power modes available:

- IDLE
- RUN
- Deep-sleep mode (DSM)

Table 2. Low-power modes for Bluetooth LE applications

Deep-sleep mode (as defined in the connectivity framework)	Regulators	RAM retention (packet RAM and system RAM CM33)	Core main power domain	Core wake up power domain	Core RF power domain	Peripherals	NBU and EdgeLock	Clock
Deep-sleep 1	All regulators are in the Low-power mode	All RAM retained in BareMetal	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Deep-sleep (Disabled)	OSC32K enabled
Deep-sleep 2 (default)	All regulators in Low-power mode	32 kB of RAM retained All radio RAM retained	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Disabled	OSC32K enabled

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Table 2. Low-power modes for Bluetooth LE applications...*continued*

Deep-sleep mode (as defined in the connectivity framework)	Regulators	RAM retention (packet RAM and system RAM CM33)	Core main power domain	Core wake up power domain	Core RF power domain	Peripherals	NBU and EdgeLock	Clock
Power-down 1	All regulators in Low-power mode	32 kB of RAM retained, All radio RAM retained	Power-down	Power-down	Power-down	Disabled	Disabled	FRO32K enabled
Deep power-down 1	LDO_CORE and DC-DC off, LDO_SYS in low-power mode	8 kB of RAM retained, No radio RAM retained	Deep power-down	Deep power-down	Deep power-down	Disabled	Disabled	FRO32K enabled
Smart power switch DPD1	All regulators OFF	8 kB RAM retained, No radio RAM retained	Deep power-down	Deep power-down	Deep power-down	Disabled	Disabled	FRO16K enabled

Note: *The Bluetooth LE uses a common radio transceiver digital block (TSM). It is used to sequence the analog regulators and circuits for RX/TX operations on or off, so that these circuits only consume power during RX/TX.*

For more details, refer to the Connectivity Framework for the MCX W72.

3.1.3 XCVR power modes

Being a SoC, the MCX W72 transceiver is tightly coupled with the CM33 core0 and CM33/NBU core1. Therefore, the transceiver analog regulators are powered off whenever the CM33 enters a Low-power mode. Depending on the Low-power mode, the transceiver digital logic is power-gated or has its state retained.

3.1.4 DC-DC converter

The DC-DC module is a switch-mode power supply (SMPS) DC-DC converter that has the following two operational modes:

- Buck: Vin = 1.71 V to 3.6 V
- Bypass: Vin = 1.71 V to 3.6 V

The module is configurable through internal registers to operate in the Buck mode: Vdcdc_in for input and DCDC_LX for DC-DC output, with CM33 in the RUN mode and peripherals disabled.

For more information about the DC-DC converter, refer to the *MKW4xZ/3xZ/3xA/2xZ DC-DC Power Management* (document AN5025).

3.1.5 GPIO, analog pins, and clock gating

The clock-gating mechanism is implemented to reduce power dissipation. Whenever a peripheral is not used, it can be turned off using the SCGCx registers in the SIM module. Clock gating applies to each peripheral, including the GPIO module. Pruning the clock to a peripheral assures that the peripheral internal circuitry does not have switch states and power consumption, except for the leakage currents.

After reset, the clock gating bits are cleared. This implies that before using a peripheral, the corresponding clock gating bit must be set. Otherwise, any access to the peripheral registers causes a hardware fault. To turn off a peripheral clock (gate off), the peripheral must be turned off before the clock.

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The user application must control and set the state of GPIO ports before the device goes to sleep and after the device exits the low-power state. The Connectivity Software provides callback functions that are called before the device enters a low-power state and after it wakes up.

Related to the analog pins, the device has several analog blocks that have selectable reference voltages. The main blocks are 16-bit SAR ADC and CMP. The board design must consider the chip analog pins and use them appropriately.

The external analog inputs are typically shared with a digital I/O. To improve the performance in the presence of noise or when the source impedance is high, it is recommended to use capacitors on these inputs. The capacitors must be placed as close as possible to the chip analog pins.

For more details, see NXP reference designs and the *MCXW72 Reference Manual* (document MCXW72RM).

3.2 Software configuration for low-power operation

This section describes how to configure the software for low-power operation.

3.2.1 Bluetooth Smart Application configuration

The connectivity software package offers various Bluetooth LE demo projects. The **low-power project** is used to measure the current profile. This project is available at the following relative paths (SDK 25.06):

- **Peripheral**:

```
<installation_path><SDK revision>\boards\mcxw72evk\wireless_examples
\reference_design\bluetooth\lowpower_peripheral\bm\iar
```

- **Central**:

```
<installation_path><SDK revision>\boards\mcxw72evk\wireless_examples
\reference_design\bluetooth\lowpower_central\bm\iar
```

The `low power` folder in the reference design application folder is used to set the device for advertising and connect current measurements. It is based on the temperature sensor in the Low-power mode and included in the MCX W72 SDK. It requires some changes to allow the application to enter and leave the Low-power mode. The BareMetal or FreeRTOS versions of the application can be used.

For more information on how to set different Low-power modes, see the MCX W72 low-power connectivity design user guide. This document is located in the MCUXpresso SDK set of documents.

The next section describes different builds to set the MCXW72-EVK board into different states.

Low-power application:

- **Advertising and connection events**: (Default software setting @ +10 dBm)
  - MCU deep-sleep 2 mode (core0 RAM retained: 32 k), NBU Deep-sleep mode (RAM retained: 160 k), DSP-V (RAM retained: 96 k), RF output power = +10 dBm (default)
- **Deep-sleep 2 mode** (DSM2: 32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)

3.2.1.1 Preparing the software

This section describes how to prepare the software. To set all the different modes measured in this report, refer to the document *Low Power Reference User Guide* included in the SDK. Refer to the URL:

MCUXpresso SDK Documentation

This document is available in the SDK document package available for download via the MCUXpresso portal.

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3.2.1.1.1 Overview

This section provides an overview on how to prepare the software.

3.2.1.1.2 Deep-sleep modes available in the SDK

Table 3 shows the Deep-sleep low-power mode available by default in the SDK. The subblocks are defined as:

- Regulators
- RAM retention
- Core main power domain
- Core wake up power domain
- Core RF power domain
- Peripherals
- NBU and EdgeLock
- Clock

The state of the subblocks in this mode is also mentioned.

Table 3. Deep-sleep modes

Deep-sleep mode	Regulators	RAM retention	Core main power domain	Core wake up power domain	Core RF power domain	Peripherals	NBU and EdgeLock	Clock
Deep-sleep 2	All regulators in Low-power mode	All RAM retained (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Deep-sleep (disabled)	OSC32K enabled

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4 Power measurements and timing analysis

This section describes the power measurements and timing analysis.

4.1 Setting up test environment and device under test (DUT)

This section describes setting up the test environment, hardware tools and boards required, and all the necessary operations that must be done before the measurements.

All the measurements are performed using the CX3322A power analyzer and CX1101A current probe from Keysight (formerly Agilent Technology).

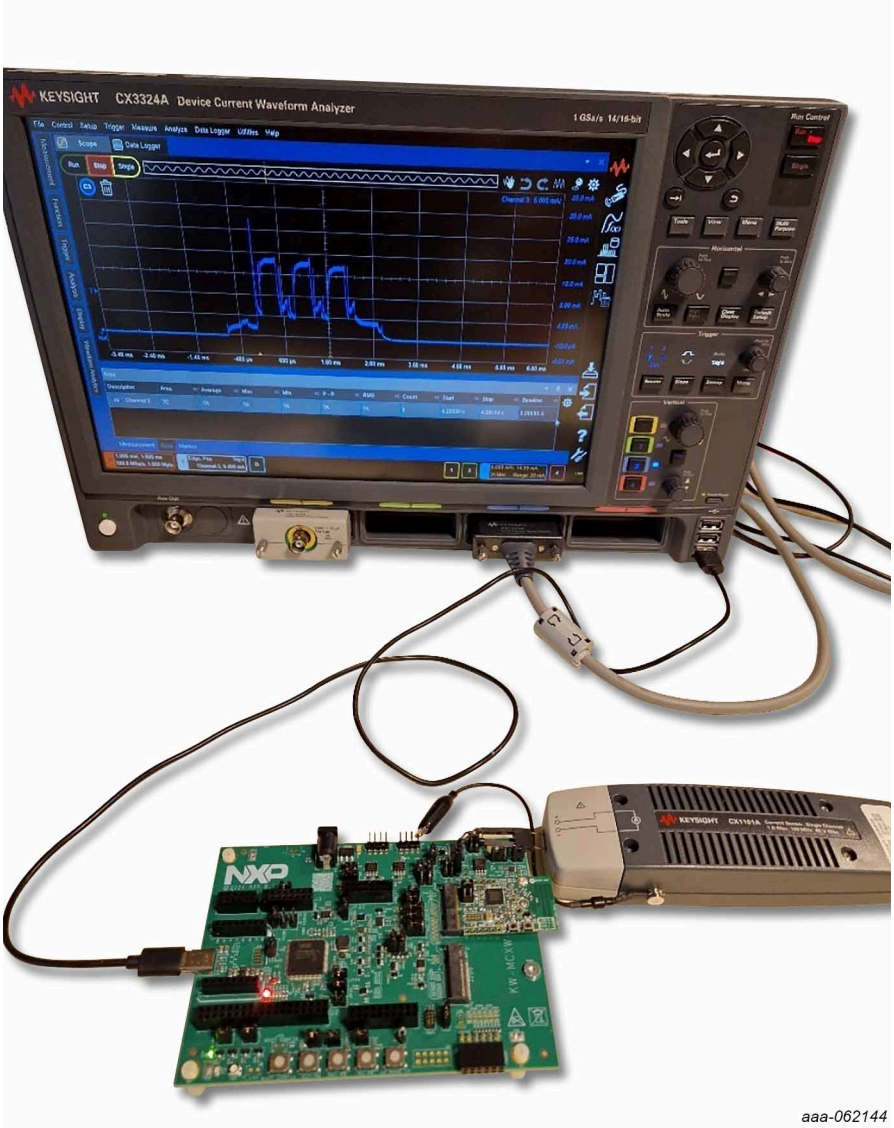

Figure 7. Keysight CX3322A power analyzer and CX1101A current probe

The USB power source supplies the KW-MCX-EVK-MB and M10 module (MCXW72-EVK) board while the power analyzer module 1 is used as an ampere meter. The power supply is set to provide 3.3 V DC. Two pairs of cables are required, one to supply the board (USB) and one for the current probe measurement. The

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connections between the power analyzer and the MCXW72-EVK board must be perfect to avoid unwanted spikes, power loss, or reset of the board.

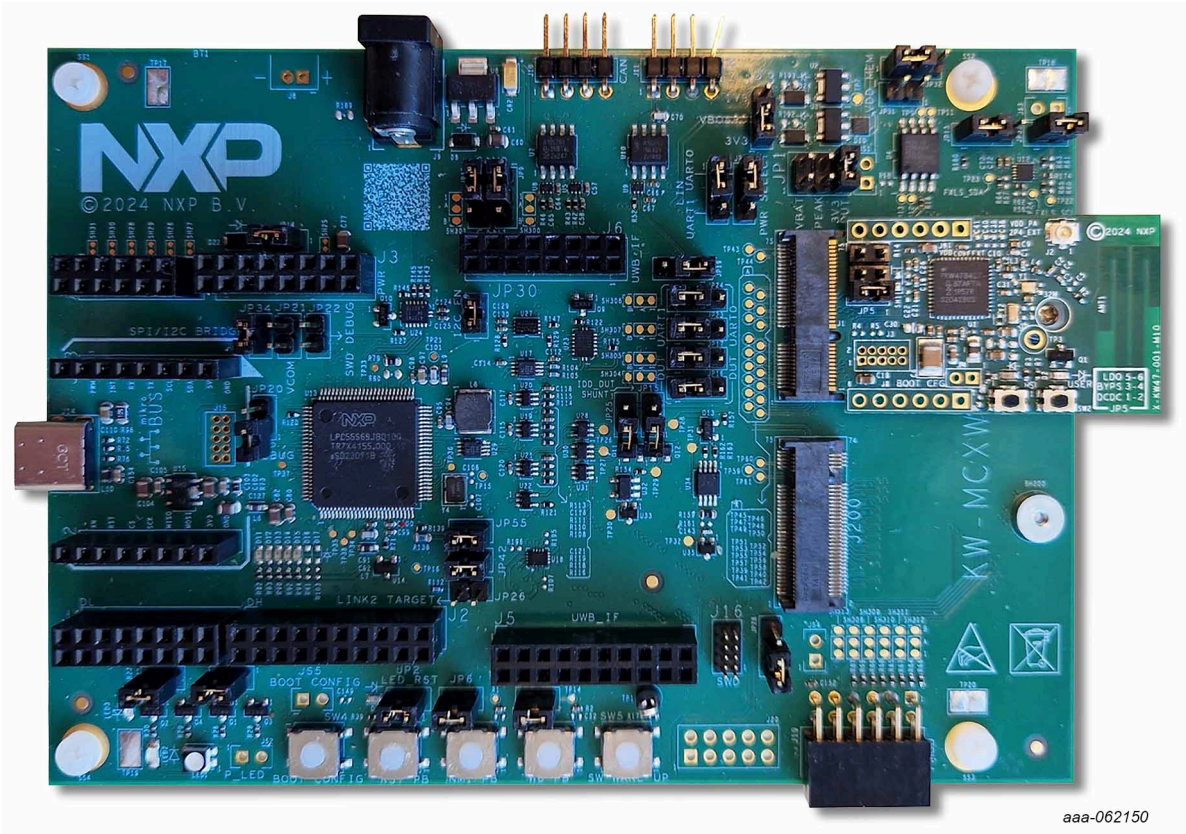

Figure 8. The KW-MCX-EVK-MB and M10 module (MCXW72-EVK) boards

The current measurements are performed in two setup modes using the KW-MCX-EVK-MB and M10 module (MCXW72-EVK) boards. The Bypass mode is shown in Figure 9 and the Buck mode is shown in Figure 10.

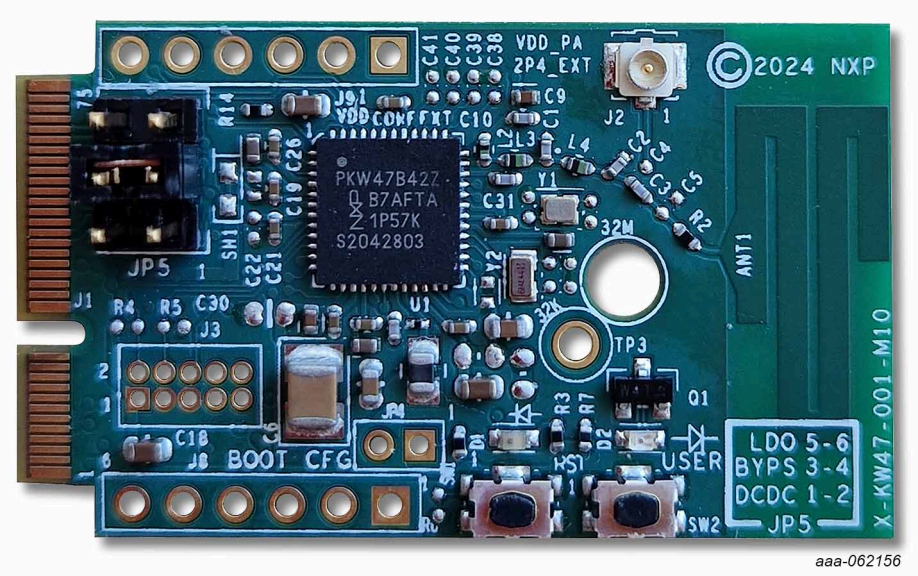

Figure 9. M10 module (in MCXW72-EVK board) in Bypass mode (JP5: pins 3 and 4 shorted)

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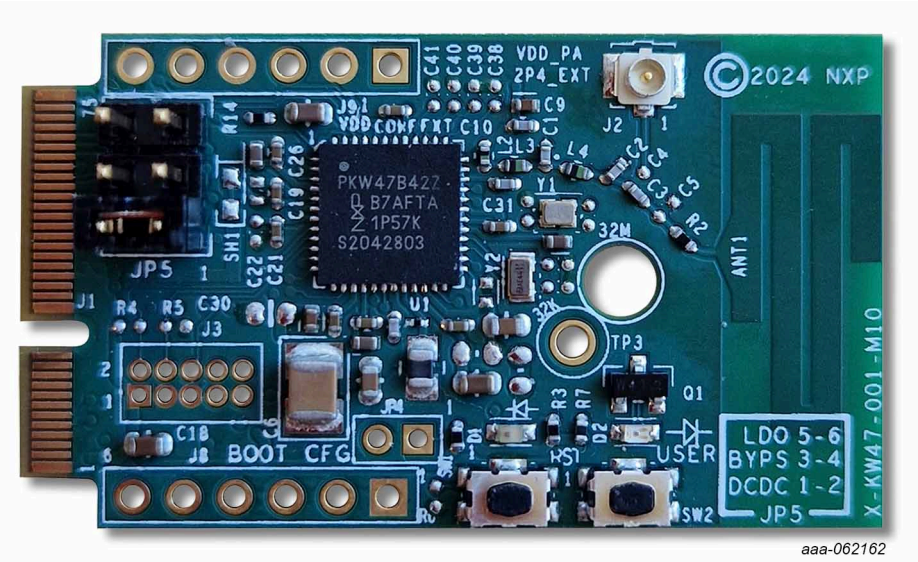

Figure 10. M10 module (MCX W72) in Buck mode (JP5: pins 5 and 6 shorted)

All the separate power rails are accessible on the following shunts in the M10 module, see Table 4:

Table 4. Header power consumption access points

Current signal names	Header number
Ireg	MB JP1: pins 5 and 6 shorted
Idd_LDO_CORE	M10 SH7
Idd_RF	M10 SH8
Idd_ANA	M10 SH6
Idd_dcdc/Idd_IO_D	M10 SH4
Idd_IO_ABC	M10 SH5
Idd_Switch	M10 SH1

Note: *Ireg = Idd_LDO_Core + Idd_RF + Idd_ANA + Idd_dcdc + Idd_IO_ABC + Idd_Switch*

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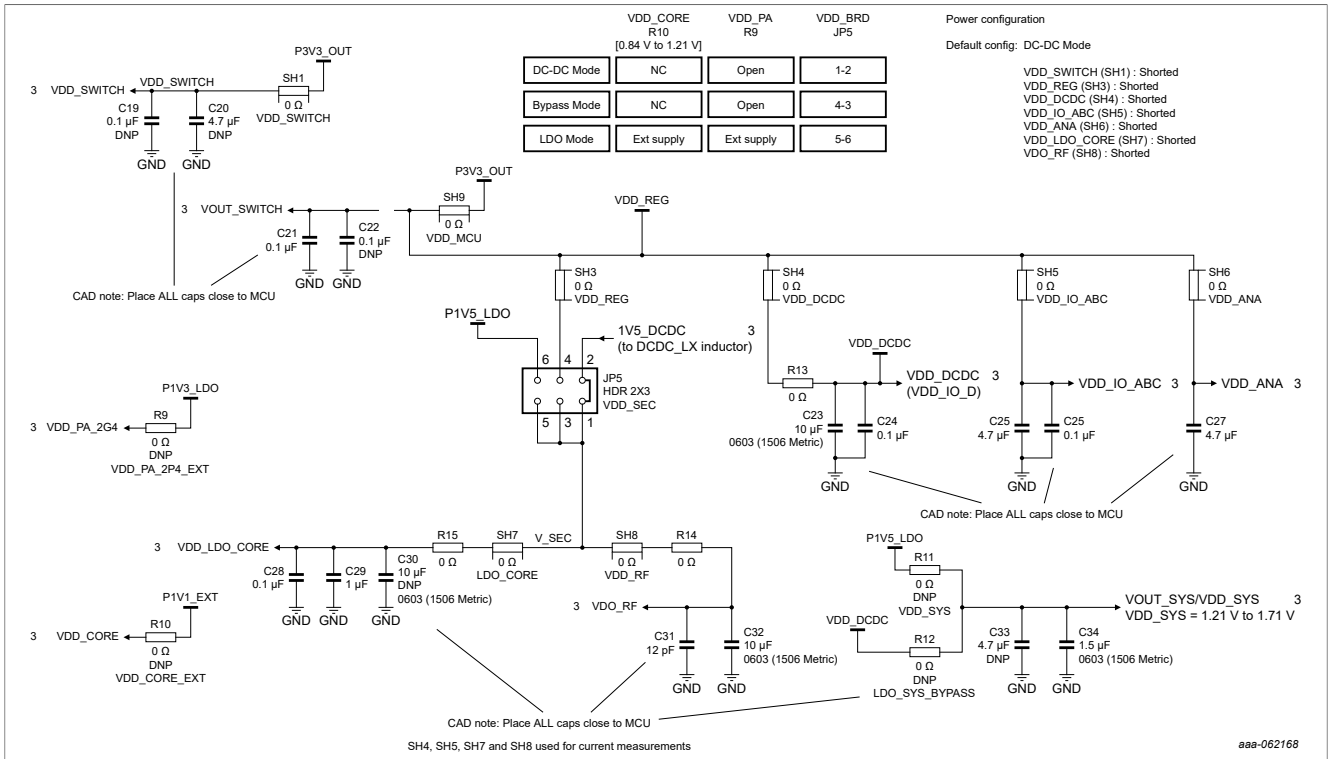

Figure 11. MCXW72-EVK board schematic and current shunt positions

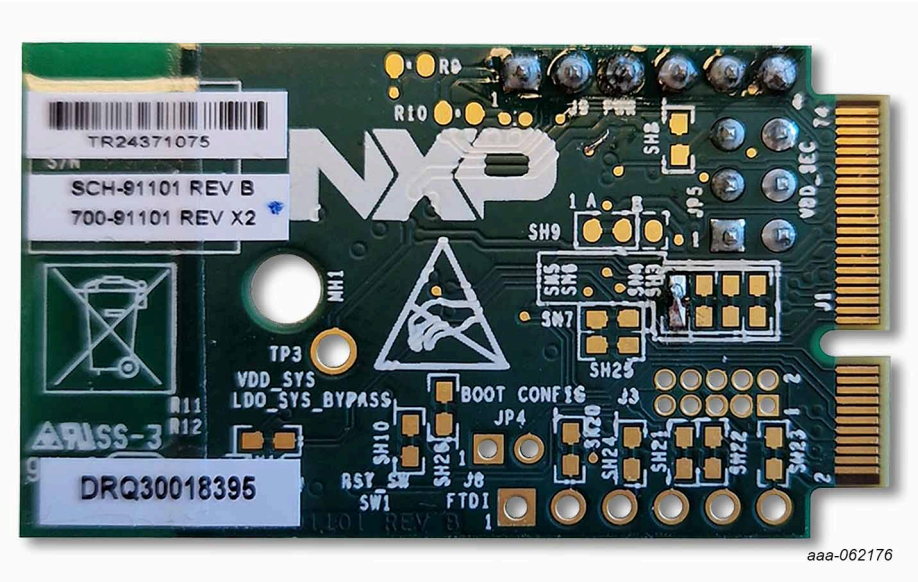

Figure 12. M10 module (MCX W72) shunt positions

4.1.1 Preparing the hardware

The KW-MCX-EVK-MB can manage different configurations of the MCX W72 power supply using JP5. The M10 module can be supplied by the LDO 3V3 or LDO 1V8 (Vboard) or by a CR2032 coincell battery (Vbat).

Three different configurations are available on the M10 module:

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1. JP1[1-2]: Coin battery on the motherboard to use the MCXW72-EVK without any cable for application demonstration.
2. JP1[3-4]: LDO (1V8 or 3V3 linked to JP5) power supply using USB cable with peak-current attenuation at each Bluetooth LE event, leaving the Low-power mode to start up. The purpose is to reduce the peak current to below 10 mA to save the battery lifetime. A 3.3 Ω serial resistor and a ferrite bead (BLM15HD182SN1) are placed to the Vbat wire. The MCX W72 integrates the DC-DC RAMP CNTRL to smooth the power up and reduce the peak current.
3. JP1[5-6]: LDO (1V8 or 3V3 linked to JP5) direct power supply using a USB cable.

This document provides the power consumption captures and measurements in the JP1: 5-6 position.

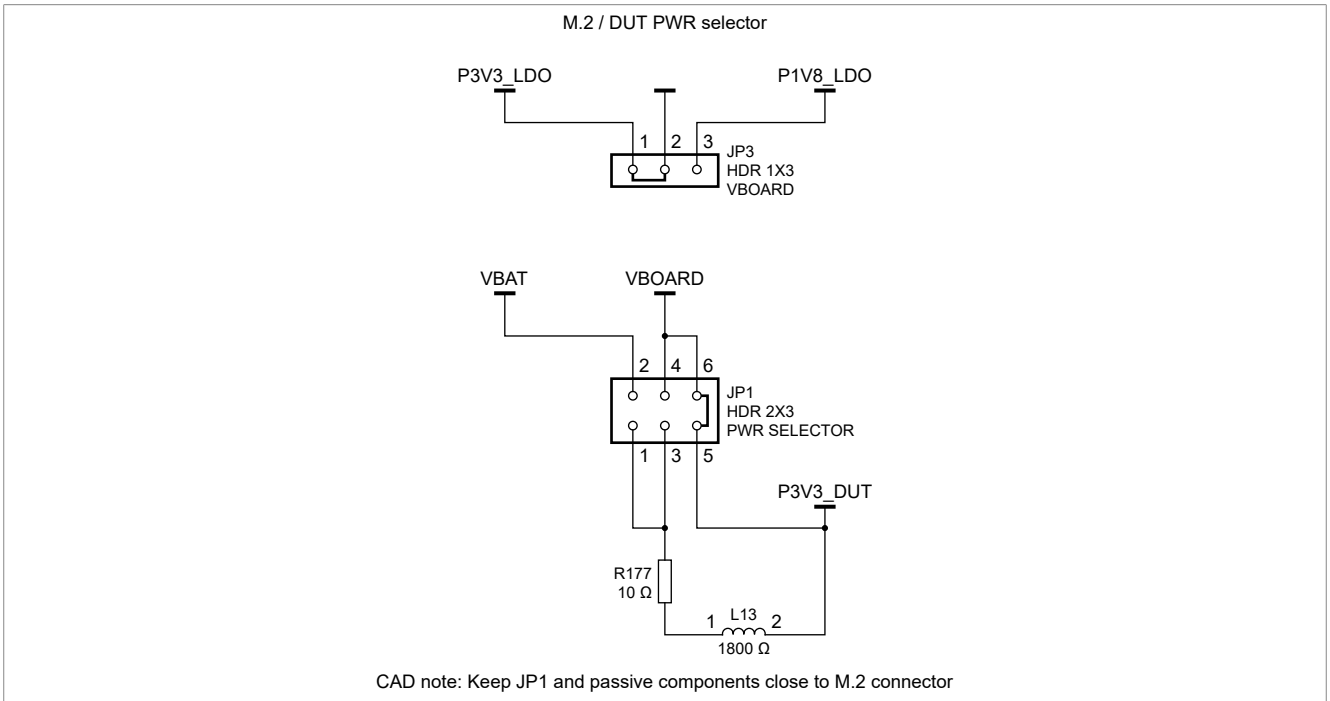

Figure 13. Serial resistors to limit the peak current

Figure 14 and Figure 15 show two waveforms captured at Ibat (JP1) during an advertising event with and without the serial components.

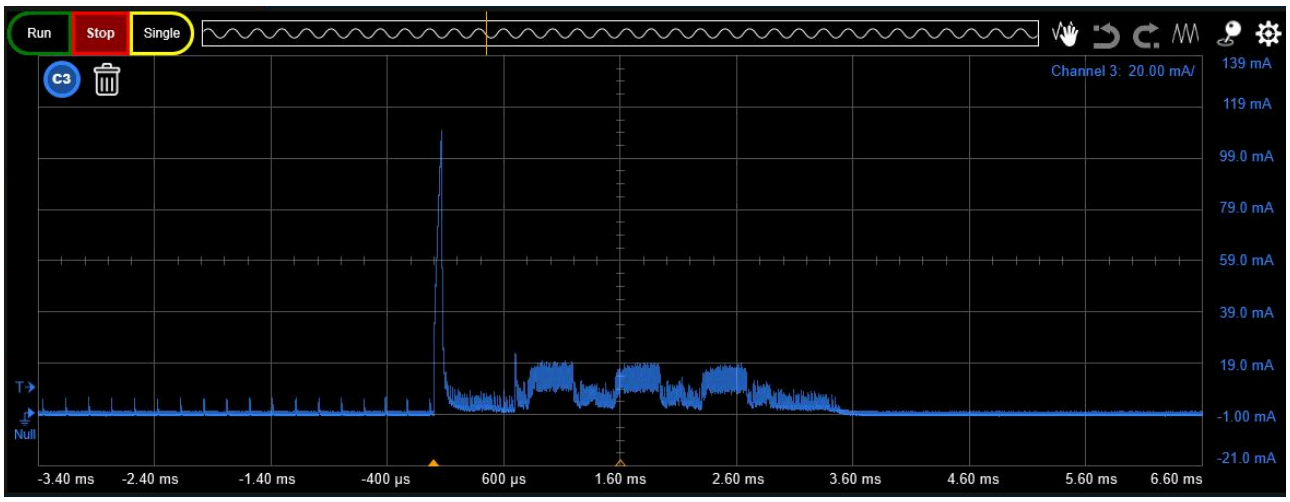

Figure 14. Ibat (blue curve) during advertising event with JP1: 5-6 (default HW configuration in this document)

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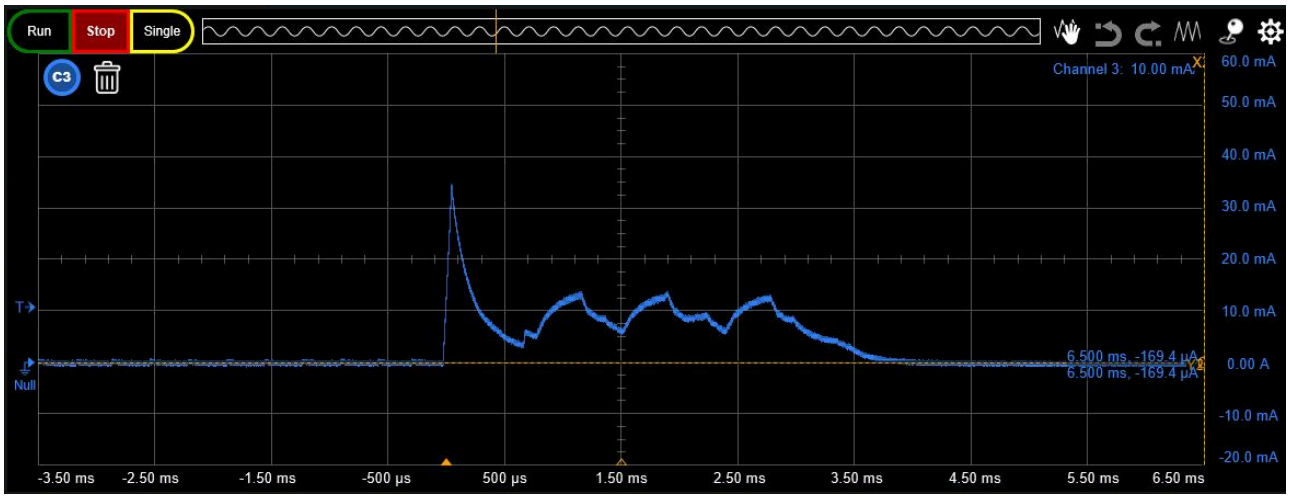

Figure 15. Ibat (blue curve) during advertising event with JP1: 3-4 (default HW configuration in this document)

Using the JP1: 3-4 position reduces the peak current from 100 mA to 35 mA in the Buck mode for a +10 dBm TX output.

4.1.1.1 DUT power supply hardware settings (jumper definition)

To set the M10 power supply module from the coin cell battery or USB cable through 1V8 or 3V3 LDOs, the jumpers JP1 and JP3 are available on the KW-MCX-EVK-MB motherboard.

Table 5. JP3 header supply configuration

Supply modes	Header JP3
LDO 3V3	1-2 (default)
LDO 1V8	3-4

Table 6. JP3 header supply configuration

Supply modes	Header JP1
VBAT	1-2
PEAK	3-4
P3V3 DUT	5-6 (default)

To measure the MCX W72 current consumption in a selected mode, jumper JP5 in the M10 module must be placed as in Figure 16.

- Jumper JP5 must be shunted at position 1-2 to allow the LDO 1V8 mode.
- Jumper JP5 must be shunted at position 3-4 to allow the Bypass mode.
- Jumper JP5 must be shunted at position 5-6 to allow the Buck mode (default configuration).

Header JP5 enables you to select the Buck, Bypass, or LDO 1V8 modes on the M10 module.

Table 7. JP5 header supply configuration

Supply modes	Header JP5
LDO 1V8	1-2
Bypass	3-4

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Table 7. JP5 header supply configuration*...continued*

Supply modes	Header JP5
Buck	5-6 (default)

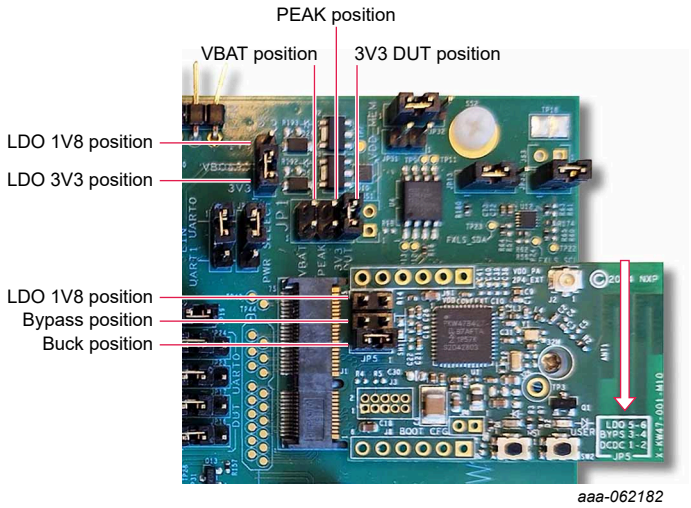

Figure 16. EVK JP5 header to select Buck, bypass, or LDO 1V8 modes

4.1.1.2 Jumper configuration by application use cases

Table 8 shows different configurations, depending on the application use cases.

Table 8. Jumper configuration by application use cases

Application use case	Supply modes	Jumper position
CR2032 coincell (no cable)	JP3: NA	JP3: NA
	JP1: VBAT (including peak reduction option)	JP1: 1-2
	JP5: Buck mode	JP5: 5-6
USB cable for lab evaluation with DC-DC enabled	JP3: LDO 3V3 (+10 dBm) or JP3: LDO 1V8 (<= +7 dBm)	JP3: 1-2 or JP3: 2-3
	JP1: 3V3 DUT	JP1: 5-6
	JP5: Buck mode	JP5: 5-6
USB cable for lab evaluation with DC-DC disabled	JP3: LDO 3V3	JP3: 1-2
	JP1: 3V3 DUT	JP1: 5-6
	JP5: Bypass mode	JP5: 5-6

4.1.2 DUT current-measurement example

This section describes the DUT current-measurement example.

4.1.2.1 Procedure using the USB cable power supply only

1. Remove the JP1 jumper from the KW-MCX-EVK-MB motherboard.

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2. Connect the current probe to JP1: 5-6 (default configuration) to measure the global power consumption (Ireg) of the MCX W72 DUT.
3. Supply the MCXW72-EVK board via the USB connector.

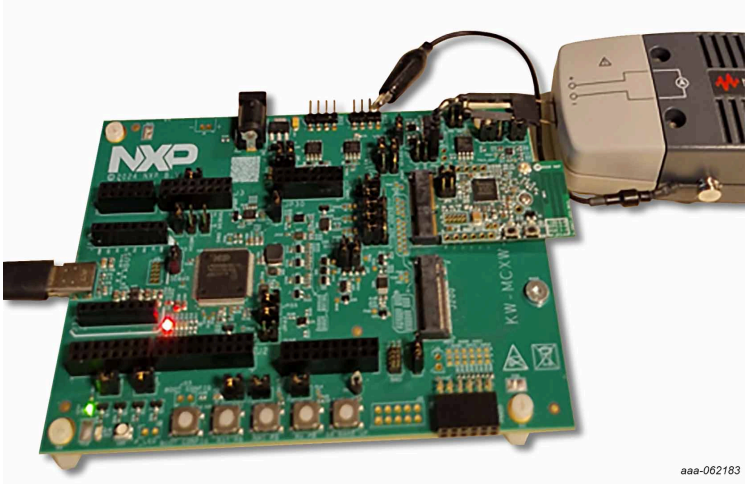

Figure 17. MCXW72-EVK board, current probe connected to JP1: pins 5 and 6 shorted, USB power supply

4.1.2.2 Procedure using an external power supply

1. Remove the JP1 jumper from the KW-MCX-EVK-MB motherboard.
2. Connect the current probe negative polarity to JP1-5 (default configuration) to measure the global power consumption (Ireg) of the MCX W72 DUT.
3. Connect the current probe positive polarity to an external power supply.
4. Set the external power supply to 1V8 to 3V6 voltage level.
5. Supply the MCXW72-EVK board via the USB connector.

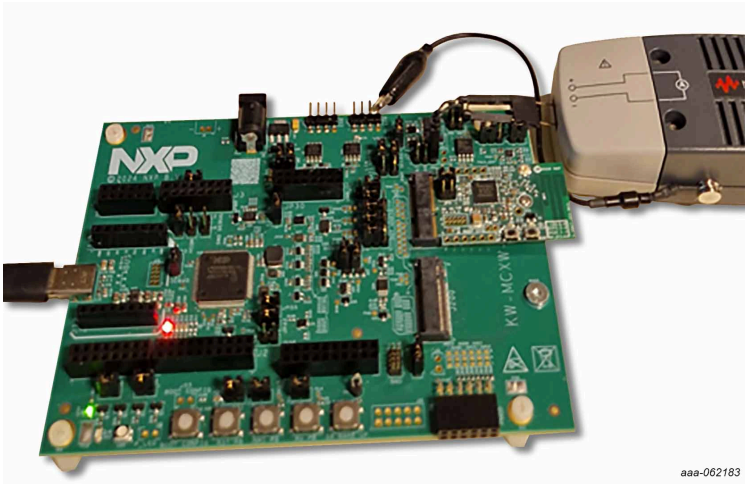

Figure 18. MCXW72-EVK board, current probe connected to JP1: 5, external power supply

4.2 Measuring the current consumption

This section guides you to set up the hardware and software to measure the current consumption using the MCXW72-EVK.

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4.2.1 Instructions

1. Choose the hardware Buck or Bypass mode selection, see Figure 13.
2. Connect the board to a PC and flash the LP_peripheral (Adv or Connect) or LP_master (scan) firmware, created in Section 3.2 to the DUT.
3. Set the output voltage of the external power source to 3.6 V.
   Note: *The voltage range must be from 1.8 V to 3.6 V.*
4. Connect TP18 (GND) to the power source. To avoid any damage to the board, disable the output of the power source.
5. Connect the Keysight CX3322A power analyzer and the CX1101A current probe to JP5-6 and to the power source. See Section 4.1.2.

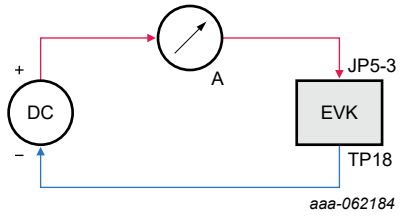

Figure 19. Connection block diagram

6. Apply the voltage to the board.

The current measurement is performed using the power analyzer built-in display and a USB flash memory stick to save the results.

4.2.2 Measurements and results

All the measurements within this section are made using the following:

- CM33 core0 in the Deep-sleep mode
- Flash in the doze mode
- RF output at **+10 dBm** (10 mW) and **+0 dBm** (1 mW) (see the `controller_interface.h` header file)
- Power supplies at 3.3 V (USB cable)
- The room temperature of 25 °C

The MCX W72 device comes from a typical process. All the phases from Figure 19 are analyzed and measured. In Section 4.7, all measurement results are presented in both the Buck and the Bypass modes with two RF output power levels (+0 dBm and +10 dBm).

A power profile tool is based on all those measurements. It is available on the NXP connectivity community webpage (KW35/38/KW45 and K32W1/MCX W71) Power Profile Tools (including Localization).

Note:

How to use the power analyzer is not a part of this document.

4.2.2.1 Overview

Using the steps in Section 3.2, a partial Bluetooth LE scenario (Low-power application) is captured and shown in Figure 20. The main events and phases are documented within the capture. All the plots that follow depict the current consumption (y-axis) versus time (x-axis).

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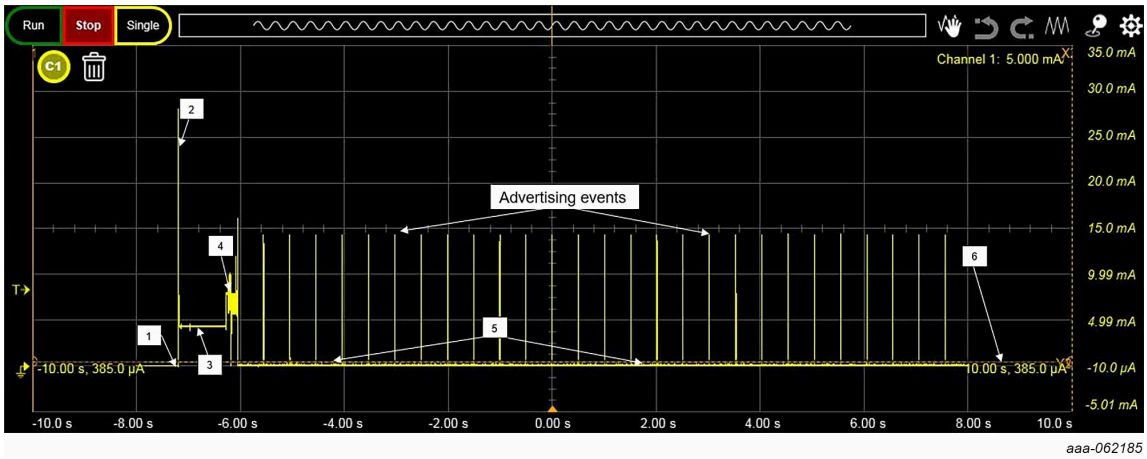

Figure 20. SoC current consumption sequence

Figure 20 shows the current consumption of the MCX W72 SoC during different operational phases, as listed in Table 9:

Table 9. Current consumption during different operational phases

Phase	Description
1	Power-on reset (POR), just after the SoC is connected to a power supply. The spike from Figure 20 is about **26 mA**. It happens due to the coupling capacitors and the SoC internal circuitry such as regulators, clock oscillators, MCU, radio digital, and radio analog.
2	The MCU is initialized among all the software: low-level drivers, framework, RTOS, Bluetooth LE stack, application.
3	The MCU is running.
4	The MCU leaves the Deep-sleep mode 1 and resumes its execution. The BTLL goes to the RUN state.
5	Between advertising events, the system enters the Deep-sleep mode 1.
6	After a disconnect, the SoC enters the Deep-sleep mode 1.

4.2.2.2 Deep-sleep modes

When the SoC is connected to the power supply, a power-up spike occurs due to the coupling of the board to the power supply. After the MCU POR, the following tasks occur:

- Software execution begins
- Clocks and peripherals are enabled and configured
- Connectivity framework is initialized
- RTOS tasks are initialized and started
- Bluetooth LE stack is up and running
- Bluetooth LE application is started

After all these tasks are completed, the system enters different Deep-sleep modes. The default Deep-sleep mode is the Deep-sleep mode 2 (sort the list from the lowest to the highest current consumption). See Section 3.1.2 for more details.

The initialization phase takes several milliseconds before the system enters the Deep-sleep mode, depending on the Deep-sleep mode chosen.

In different use cases, the device operates directly in Deep-sleep mode x.

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4.2.2.3 Power-On reset (POR)

The MCXW72-EVK board is set in the Buck mode configuration by default.

The binary file setting used is: Buck mode, Deep-sleep mode for both CM33 and CM3/NBU, 48 MHz clock mode, and automatic start advertising.

The cold start POR timing is 281 ms from the power up to the first TX advertising.

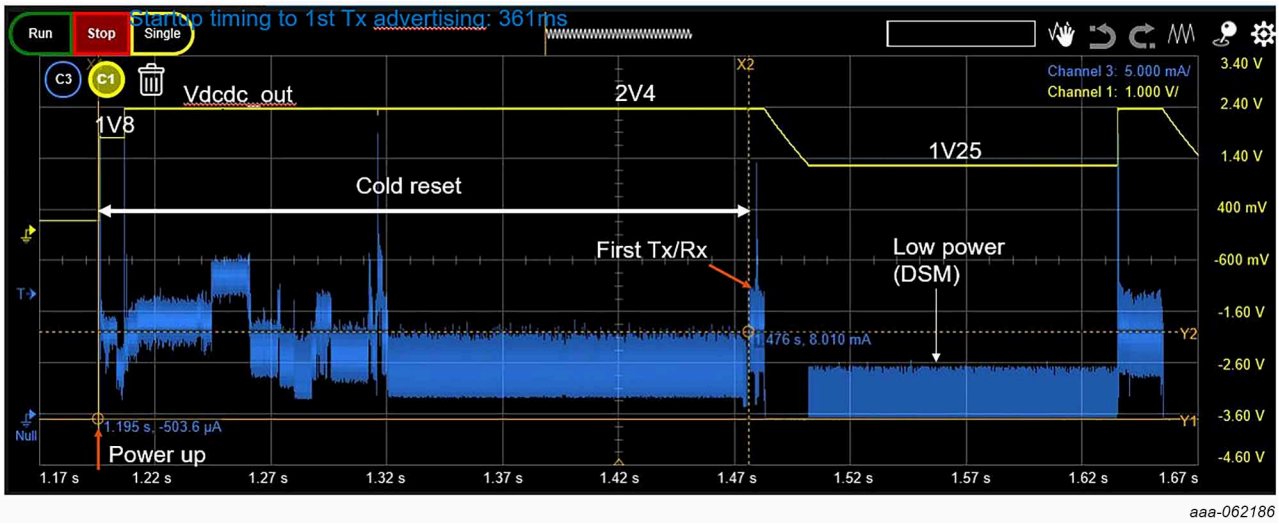

Figure 21. EVK SoC cold-start POR timing

Table 10. SoC POR timing

Type of wake-up	Timing (ms) (HW + SW initialization)
Cold-start POR	281 ms

Warm-start POR timings are 118 ms from the power up to the first TX advertising.

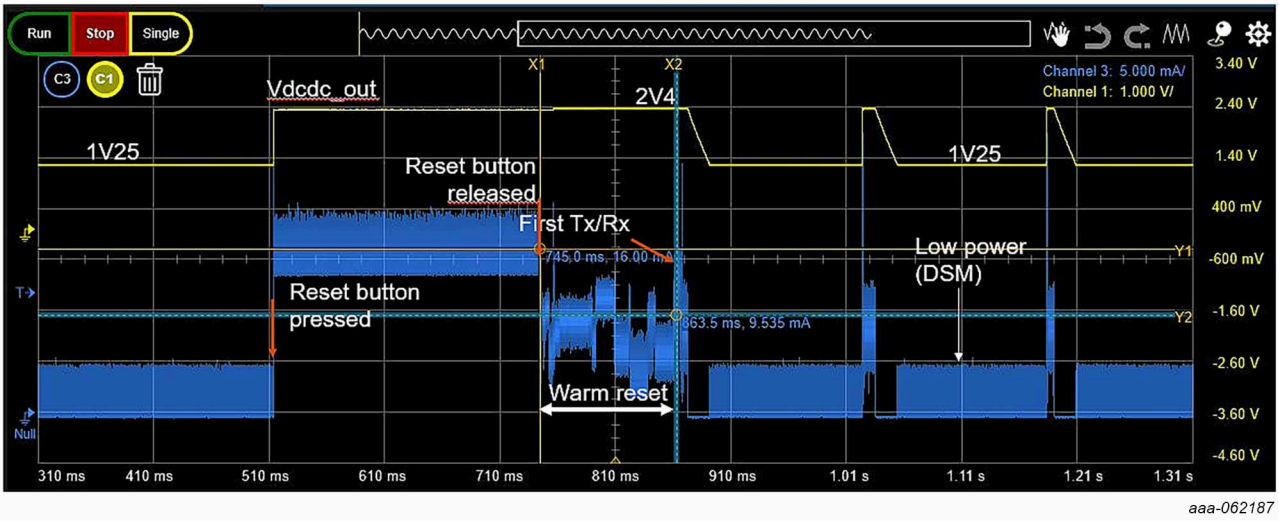

Figure 22. EVK SoC warm-start POR timing

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Table 11. SoC POR timing

Type of wake-up	Timing (ms) (HW + SW initialization)	Power consumption (mA) (HW + SW initialization)
First reset	281 ms	7.7 mA
Other reset	118 ms	6.9 mA

4.2.2.4 Low-power measurements

The following two subsections are dedicated to the Buck and Bypass DC-DC modes.

4.2.2.4.1 Bypass

The Deep-sleep mode is used. The MCXW72-EVK jumpers are in the bypass configuration. See Section 4.1.1.1 for more details.

The device enters the Advertising mode automatically after the power up. The device stops advertising and stays in the Low-power mode when the **SW2** button is pressed.

The binary-file settings used are: Bypass mode, `lp_kw47evk_bypass.srec`, and advertising period of 100 ms with the payload and connectable.

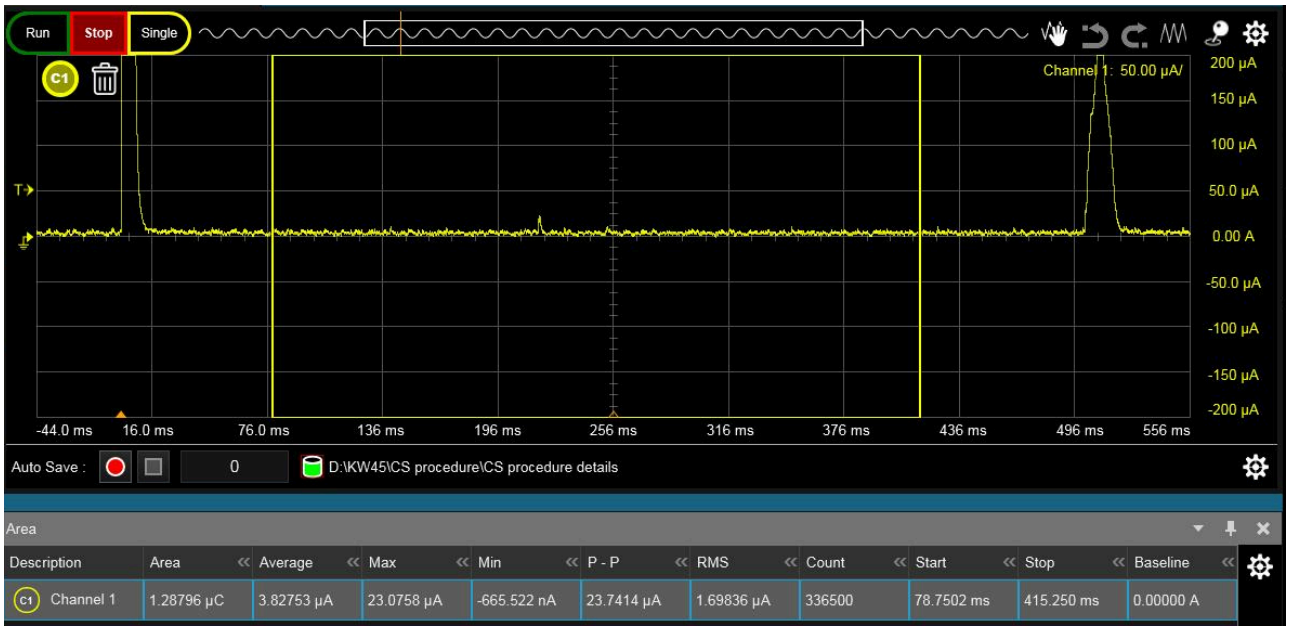

Figure 23. Deep-sleep mode - Bypass mode

Table 12. Deep-sleep mode 1 current consumption between events in Bypass mode

DCDC_IN = 3.3 V	Measured current		
-	**Avg**	**Max**	**Min**
-	3.82 µA	23 µA	1.29 µA

The low-power current consumption is measured at **3.82 µA @ 3.3 V** between the advertising events.

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4.2.2.4.2 Buck mode

The Deep-sleep mode is used. The MCXW72-EVK jumpers are in the buck configuration. See Section 4.1.1.1 for more details.

The device enters the Advertising mode automatically after the power up. The device stops advertising and stays in the Low-power mode when the **SW2** button is pressed.

The binary file setting used is: Buck mode: `lp_mcxw72_Buck.srec`, advertising period of 100 ms with the payload and connectable.

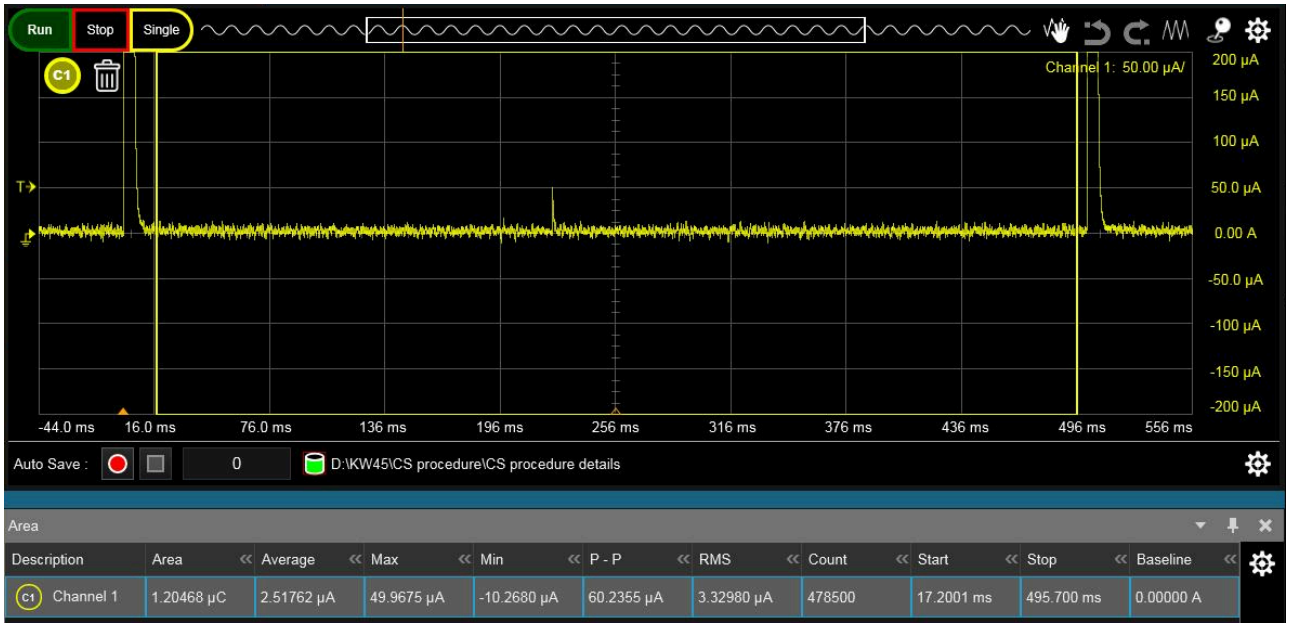

Figure 24. Deep-sleep mode - Buck mode

Table 13. Deep-sleep mode current consumption between events in Buck mode

DCDC_IN = 3.3 V	Measured current		
-	Avg	Max	Min
-	2.52 µA	50 µA	1.2 µA

The low-power current consumption is measured at **2.52 µA @ 3.3 V** between the advertising events.

4.2.2.4.3 Low-power summary

Table 14. Deep-sleep mode current consumption between events in Buck and Bypass modes

Deep-sleep mode	Regulators	RAM retention	Core0 main power domain	Core wake up power domain	Core1 RF power domain	Peripherals	DC-DC	Current consumption @ 3.3 V
Deep-sleep 2	All are in Low-power mode	RAM retained (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Buck	2.52 µA
Deep-sleep 2	All are in Low-power mode	RAM retained (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Bypass	3.82 µA

Note: *DC-DC peak information (Buck mode)*

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The DC-DC peaks occur every 360 ms. The nominal DC-DC peak is shown in Figure 25. The nominal DC-DC peak timing is around 500 µs for an advertising period of 500 ms.

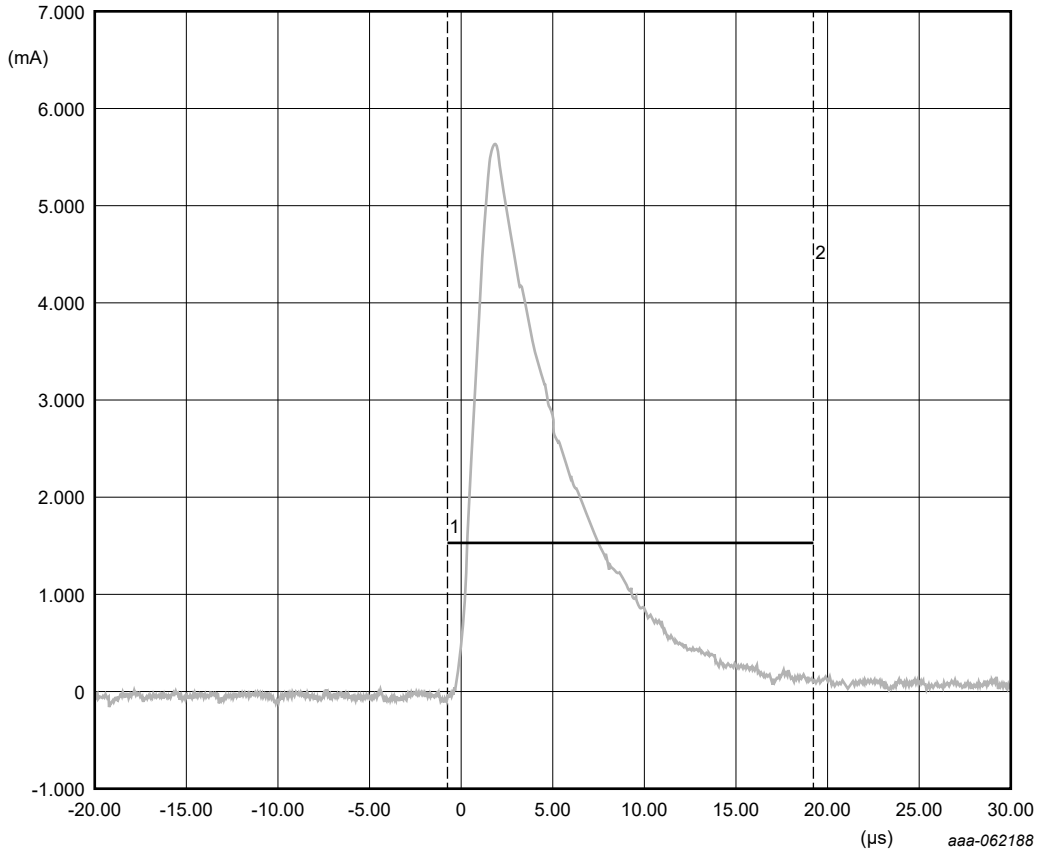

Figure 25. DC-DC peak consumption between advertising events - Buck mode

Table 15. DC-DC peak consumption between advertising events - Buck mode

Buck mode	Idd_REG (total consumption)		
State	**Time (ms)**	**Current (µA)**	**mA x ms**
DC-DC peak consumption	0.020 ms	1.53 mA	0.0306 mA-ms
-	-	Charge integral	8.52 pAh

4.2.2.5 Advertising mode

In an advertising event, the Bluetooth LE peripheral device broadcasts information to share or to connect to a Bluetooth LE central device, such as a smartphone. The device wakes up and broadcasts packets on three separate channels and listens on each of these channels for scan requests or connection requests.

The figures in the following sections capture the current consumption during different possible advertising events using the data rate of 1 Mbit/s.

The binary file settings used are:

- 48 MHz clock
- Advertising with 31 bytes
- TX payload
- 0 byte RX payload and connectable

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- RF output +10 dBm and +0 dBm
- Data rate at1 Mbit/s
- 32 k RAM core0 retained
- 160 k RAM NBU retained
- 96 k RAM DVP-V retained

Table 16. Advertising mode

DC-DC mode	Buck	Bypass
Supply	Vdd_DCDC = 3V3 Vdd_RF = 1.25 V Vdd_LDO_Core = 1.25 V	Vdd_RF = 3V3 Vdd_LDO_Core = 3V3
RF output power	+0 dBm and +10 dBm	
MCU clock mode	48 MHz	
RAM size	RAM retained: (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	
Data rate	1 Mbit/s	
Payload	TX: 31 bytes; RX: 0 bytes	
Connectable	Yes	
Flash:	Doze	
CM33:	Deep-sleep mode	
Setting:	Advertise from low-power DSM Peripheral to central	
Software:	LP_Peripheral (SDK 25.06)	

Buck mode:

- Wake up from the Low-power Deep-sleep 2 mode.

4.2.2.5.1 Buck, advertising, +0 dBm, no scan response

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. The **No scan response** option is set in the SDK apps.

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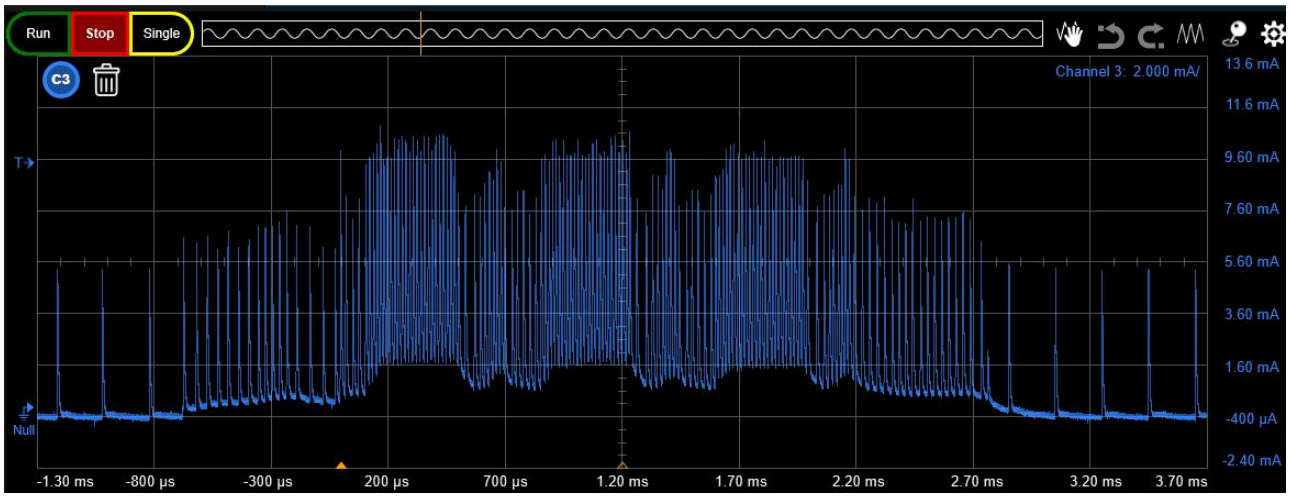

Figure 26. Advertising current profile, +0 dBm, no scan response, Buck mode

Table 17. Advertising power consumption, +0 dBm, connectable and scannable, Buck mode

CONNECTABLE & SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
ADVERTISING	Power up	0.155 ms	2.606 mA	0.404 mA-ms
	Preprocessing	0.175 ms	2.606 mA	0.456 mA-ms
	NBU running	0.150 ms	2.230 mA	0.335 mA-ms
	NBU WFI	0.200 ms	1.375 mA	0.275 mA-ms
	TX warm-up	0.080 ms	1.347 mA	0.108 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX to RX transition	0.150 ms	3.133 mA	0.470 mA-ms
	RX	0.080 ms	4.590 mA	0.367 mA-ms
	RX warm-down	0.020 ms	1.347 mA	0.027 mA-ms
	MCU WFI	0.160 ms	2.755 mA	0.441 mA-ms
	TX warm-up	0.080 ms	1.347 mA	0.108 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX to RX transition	0.150 ms	3.133 mA	0.470 mA-ms
	RX	0.080 ms	4.590 mA	0.367 mA-ms
	RX warm-down	0.020 ms	1.347 mA	0.027 mA-ms
	MCU WFI	0.160 ms	2.755 mA	0.441 mA-ms
	TX warm-up	0.080 ms	1.347 mA	0.108 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX to RX transition	0.150 ms	3.133 mA	0.470 mA-ms
	RX	0.080 ms	4.590 mA	0.367 mA-ms
	RX warm-down	0.020 ms	1.347 mA	0.027 mA-ms

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Table 17. Advertising power consumption, +0 dBm, connectable and scannable, Buck mode...*continued*

CONNECTABLE & SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
	ADV Post-process	0.500 ms	2.434 mA	1.217 mA-ms
	Active consumption	3.474 ms	Avg = 3.385 mA	11.758 mA-ms
	DSM duration	96.526 ms	0.004200 mA	0.405 mA-ms
	SUM	100.000 ms	Total	12.163 mA-ms
			Charge Integral	3.38 nAh
			Current (µA)	121.632 µA
			Power Consumption (mW)	0.401 mW

4.2.2.5.2 Buck, advertising, +0 dBm, one scan response

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. **One scan response** option is set in the SDK apps.

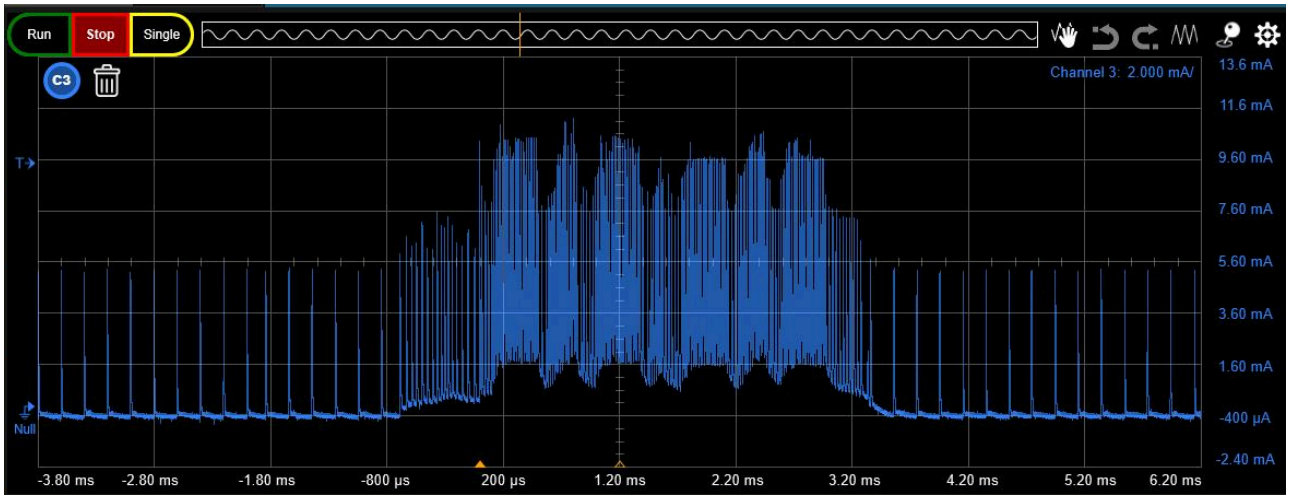

Figure 27. Advertising current profile, +0 dBm, one scan response, Buck mode

4.2.2.5.3 Buck, advertising, +0 dBm, two scan responses

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. The **two scan response** option is set in the SDK apps.

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Figure 28. Advertising current profile, +0 dBm, two scan responses, Buck mode

4.2.2.5.4 Buck, advertising +10 dBm, no scan response

The DCDC is in Buck mode. The Bluetooth LE event considered advertising. The radio TX output is set to +10 dBm. The **No scan response** option is set in the SDK apps.

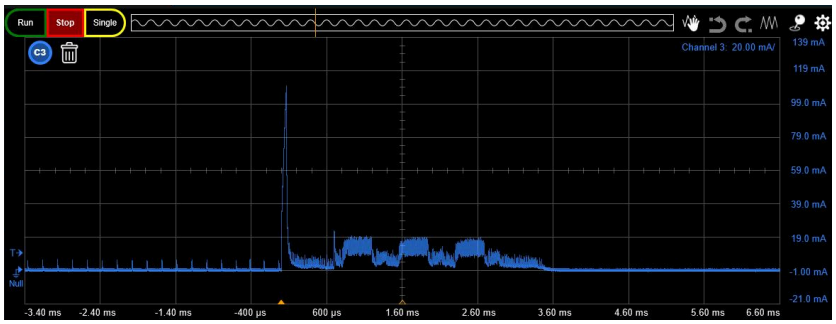

Figure 29. Advertising current profile, +10 dBm, no scan response, Buck mode

Table 18. Advertising power consumption, +10 dBm, connectable and scannable, Buck mode

	Advertising Interval	100.000 ms		
	State	Time (ms)	Current (mA)	mA x ms
CONNECTABLE & SCANABLE ADVERTISING				
ADVERTISING	Power up	0.155 ms	42.000 mA	6.510 mA-ms
	Preprocessing	0.175 ms	4.598 mA	0.805 mA-ms
	NBU running	0.150 ms	3.400 mA	0.510 mA-ms
	NBU WFI	0.200 ms	2.160 mA	0.432 mA-ms
	TX warm-up	0.080 ms	3.725 mA	0.298 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX to RX transition	0.150 ms	2.865 mA	0.430 mA-ms
	Rx	0.080 ms	7.435 mA	0.595 mA-ms
	RX warm-down	0.020 ms	3.725 mA	0.074 mA-ms

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Table 18. Advertising power consumption, +10 dBm, connectable and scannable, Buck mode*...continued*

	Advertising Interval	100.000 ms		
	State	Time (ms)	Current (mA)	mA x ms
CONNECTABLE & SCANABLE ADVERTISING				
	MCU WFI	0.160 ms	2.165 mA	0.346 mA-ms
	TX warm-up	0.080 ms	3.725 mA	0.298 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX to RX transition	0.150 ms	2.865 mA	0.430 mA-ms
	Rx	0.080 ms	7.435 mA	0.595 mA-ms
	RX warm-down	0.020 ms	3.725 mA	0.074 mA-ms
	MCU WFI	0.160 ms	2.165 mA	0.346 mA-ms
	TX warm-up	0.080 ms	3.725 mA	0.298 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX to RX transition	0.150 ms	2.865 mA	0.430 mA-ms
	Rx	0.080 ms	7.435 mA	0.595 mA-ms
	RX warm-down	0.020 ms	3.725 mA	0.074 mA-ms
	ADV Post-process	0.500 ms	3.744 mA	1.872 mA-ms
	Active Consumption	3.474 ms	Avg = 8.985 mA	31.213 mA-ms
	DSM duration	96.526 ms	0.004200 mA	0.405 mA-ms
	SUM	100.000 ms	Total	31.619 mA-ms
			Charge Integral	8.78 nAh
			Current (µA)	316.186 µA
			Power Consumption (mW)	1.043 mW

4.2.2.5.5 Buck, advertising +10 dBm, one scan response

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +10 dBm. The **one scan response** option is set in the SDK apps.

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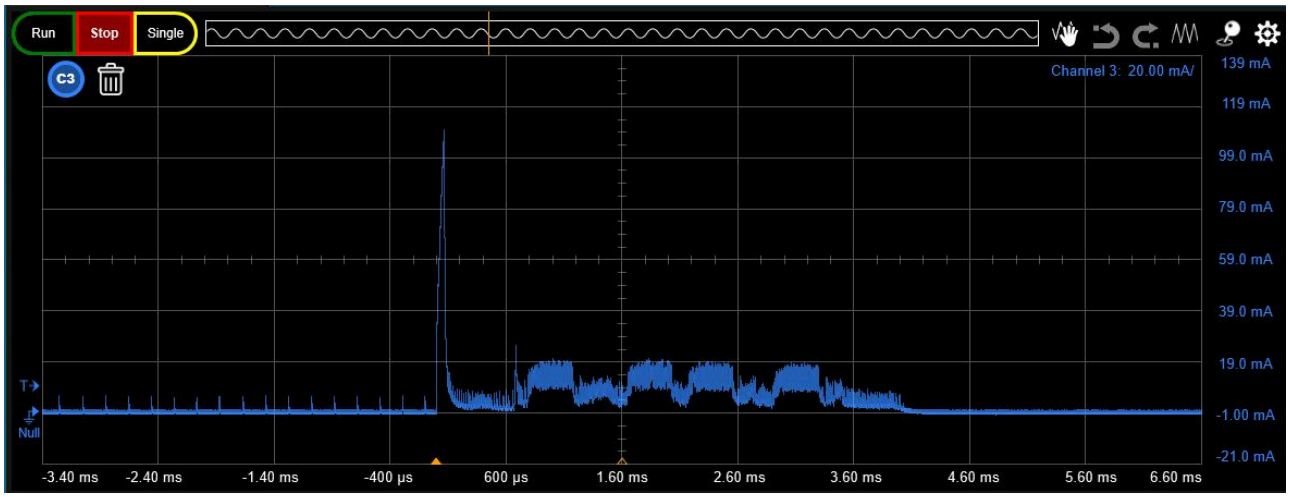

Figure 30. Advertising current profile, +10 dBm, one scan response, Buck mode

4.2.2.5.6 Buck, advertising +10 dBm, two scan responses

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +10 dBm. The **two scan response** option is set in the SDK apps.

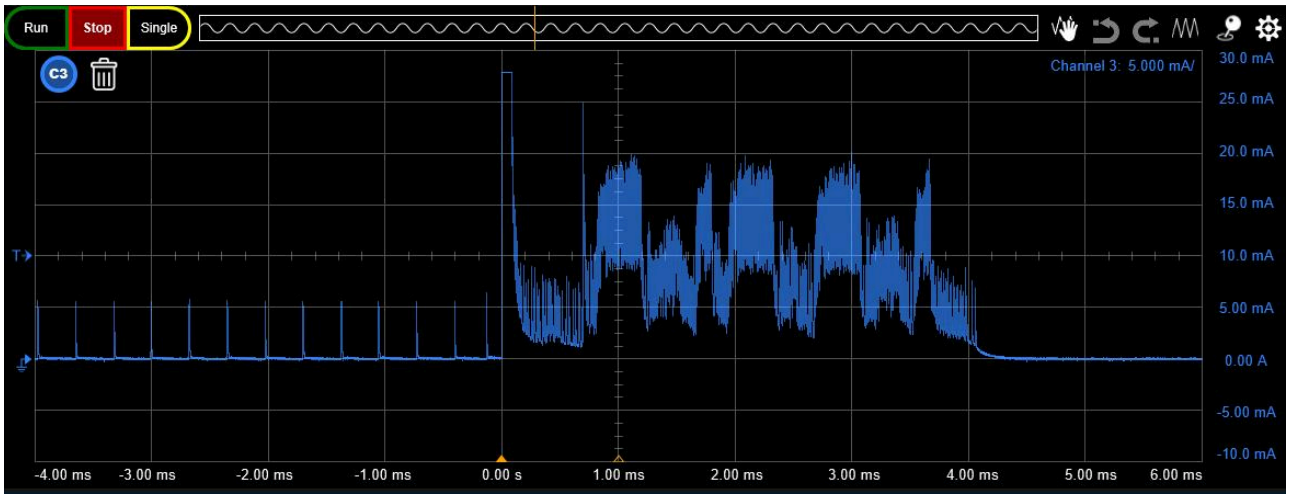

Figure 31. Advertising current profile, +10 dBm, two scan responses, Buck mode

4.2.2.5.7 Buck, advertising, +0 dBm, no connectable, no scannable

The DCDC is in Buck mode. The Bluetooth LE event considered is non-connectable advertising. The radio TX output is set to +0 dBm. The **no scan response** option is set in the SDK apps.

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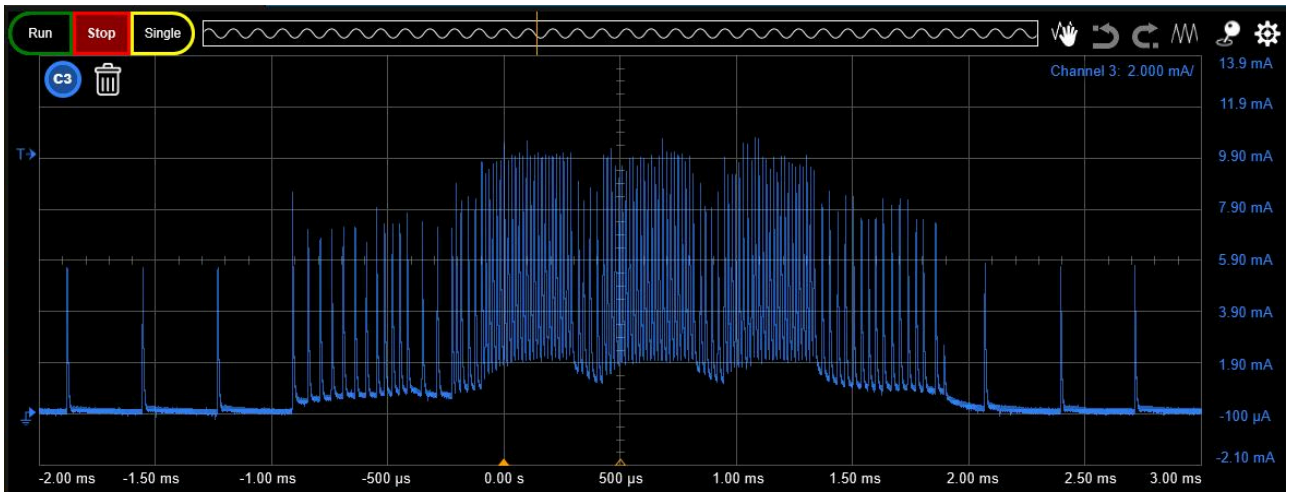

Figure 32. Advertising current profile, +0 dBm, no scannable, no connectable, Buck mode

Table 19. Advertising power consumption, +0 dBm, no scannable, no connectable, Buck mode

	Advertising Interval	100.000 ms		
	State	Time (ms)	Current (mA)	(mA) x (ms)
PERIPHERAL - NON CONNECTABLE ADVERTISING				
ADVERTISING	Power up	0.155 ms	2.606 mA	0.404 mA-ms
	Preprocessing	0.175 ms	2.606 mA	0.456 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	2.037 mA	0.163 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.598 mA	0.052 mA-ms
	ADV Post-process	0.500 ms	2.434 mA	1.217 mA-ms
	Active consumption	2.784 ms	Avg = 3.362 mA	9.360 mA-ms
	DSM duration	97.216	0.004200 mA	0.408 mA-ms
	SUM	100.000 ms	Total	9.768 mA-ms
			Charge Integral	2.71 nAh
			Current (mA)	0.0977 mA

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Table 19. Advertising power consumption, +0 dBm, no scannable, no connectable, Buck mode...*continued*

	Advertising Interval	100.000 ms		
	State	Time (ms)	Current (mA)	(mA) x (ms)
PERIPHERAL - NON CONNECTABLE ADVERTISING				
			Power Consumption (mW)	0.322 mW

4.2.2.5.8 Buck, advertising, +10 dBm, no connectable, no scannable

The DCDC is in Buck mode. The Bluetooth LE event considered is non-connectable advertising. The radio TX output is set to +10 dBm. The **no scan response** option is set in the SDK apps.

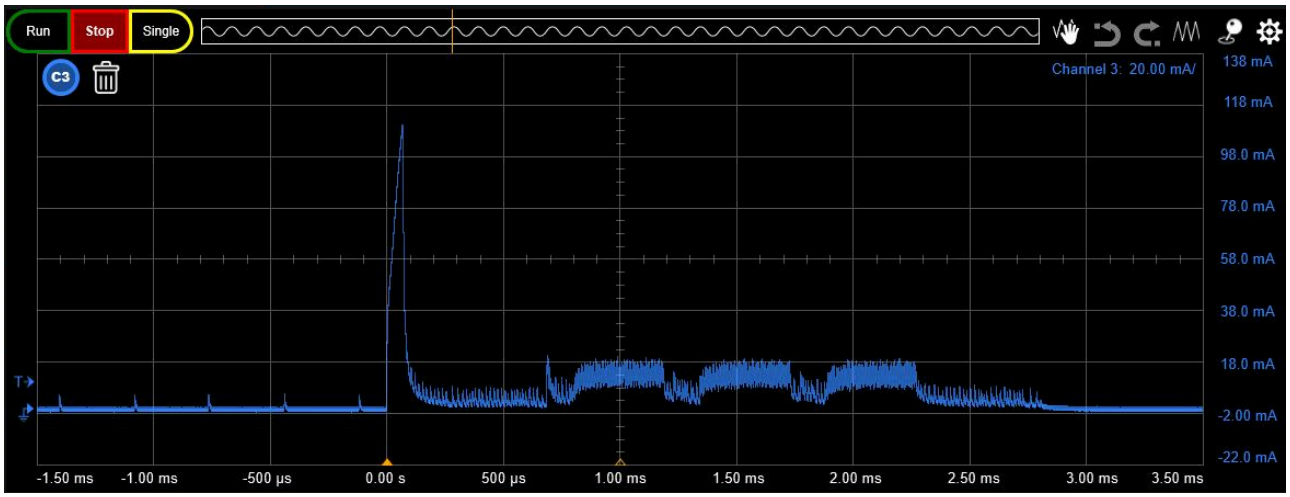

Figure 33. Advertising current profile, +10 dBm, no scannable, no connectable, Buck mode

Table 20. Advertising power consumption, +10 dBm, no scannable, no connectable, Buck mode

PERIPHERAL - NON CONNECTABLE ADVERTISING				
	Advertising Interval	100.000 ms		
	State	Time(ms)	Current(mA)	(mA) x (ms)
ADVERTISING	Power up	0.155 ms	20.500 mA	3.178 mA-ms
	Preprocessing	0.175 ms	4.598 mA	0.805 mA-ms
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	6.188 mA	0.495 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms

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Table 20. Advertising power consumption, +10 dBm, no scannable, no connectable, Buck mode...*continued*

PERIPHERAL - NON CONNECTABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**(mA) x (ms)**
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.736 mA	0.135 mA-ms
	ADV post-process	0.500 ms	3.744 mA	1.872 mA-ms
	Active consumption	2.784 ms	Avg = 9.317 mA	25.938 mA-ms
	DSM duration	97.216	0.004200 mA	0.408 mA-ms
	SUM	100.000 ms	Total	26.346 mA-ms
			Charge Integral	7.32 nAh
			Current (mA)	0.2635 mA
			Power Consumption (mW)	0.869 mW

Bypass mode:

- Wake up from the Low-power Deep-sleep mode

4.2.2.5.9 Bypass, advertising, +0 dBm, no scan response

The DCDC is in Buck mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. The **no scan response** option is set in the SDK apps.

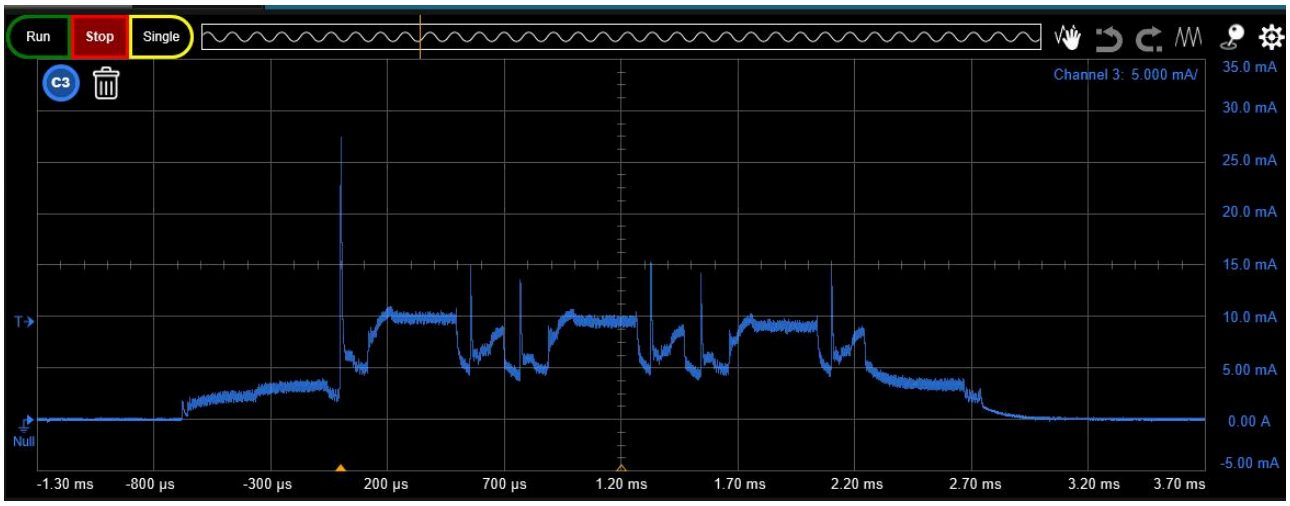

Figure 34. Advertising current profile, +0 dBm, no scan response, Bypass mode

Table 21. Advertising power consumption, +0 dBm, connectable and scannable, Bypass mode

CONNECTABLE and SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**(mA) x (ms)**
ADVERTISING	Power up	0.155 ms	2.245 mA	0.348 mA-ms

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Table 21. Advertising power consumption, +0 dBm, connectable and scannable, Bypass mode*...continued*

CONNECTABLE and SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**(mA) x (ms)**
	Preprocessing	0.175 ms	2.245 mA	0.393 mA-ms
	NBU running	0.150 ms	2.600 mA	0.390 mA-ms
	NBU WFI	0.200 ms	1.900 mA	0.380 mA-ms
	TX warm-down	0.080 ms	2.436 mA	0.195 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX to RX transition	0.150 ms	7.349 mA	1.102 mA-ms
	RX	0.080 ms	8.479 mA	0.678 mA-ms
	RX warm-down	0.020 ms	2.436 mA	0.049 mA-ms
	MCU WFI	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-down	0.080 ms	2.436 mA	0.195 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX to RX transition	0.150 ms	7.349 mA	1.102 mA-ms
	RX	0.080 ms	8.479 mA	0.678 mA-ms
	RX warm-down	0.020 ms	2.436 mA	0.049 mA-ms
	MCU WFI	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-down	0.080 ms	2.436 mA	0.195 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX to RX transition	0.150 ms	7.349 mA	1.102 mA-ms
	RX	0.080 ms	8.479 mA	0.678 mA-ms
	RX warm-down	0.020 ms	2.436 mA	0.049 mA-ms
	ADV post-process	0.500 ms	4.074 mA	2.037 mA-ms
	Active consumption	3.474 ms	Avg = 6.058 mA	21.047 mA-ms
	DSM duration	96.526 ms	0.005683 mA	0.549 mA-ms
	SUM	100.000 ms	Total	21.595 mA-ms
			Charge Integral	6.00 nAh
			Current (µA)	215.954 µA
		Power Consumption (mW)		0.713 mW

4.2.2.5.10 Bypass, advertising, +0 dBm, one scan response

The DCDC is in Bypass mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. The **one scan response** option is set in the SDK apps.

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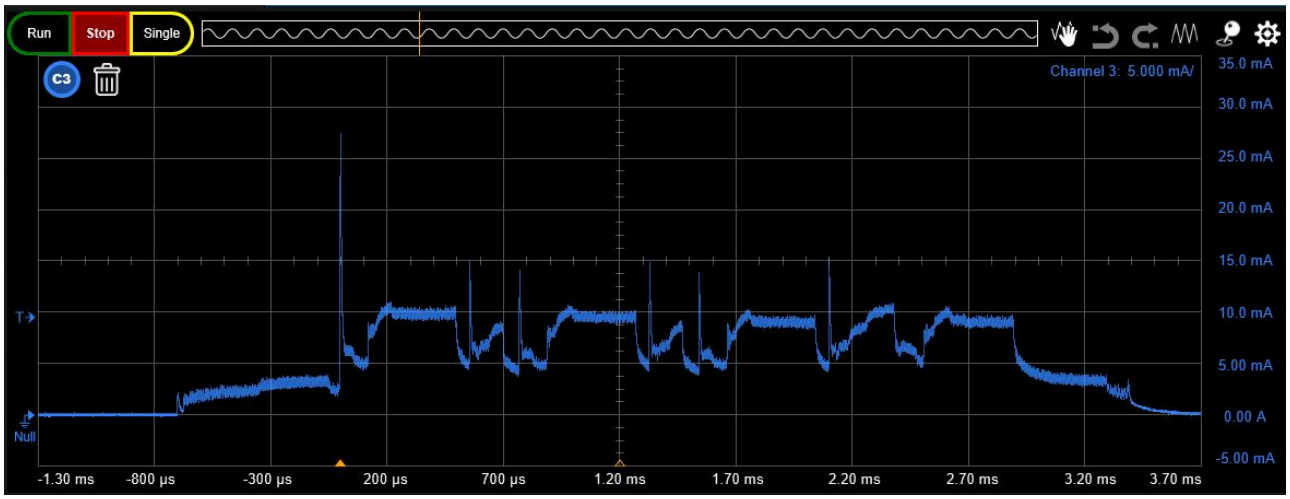

Figure 35. Advertising current profile, +0 dBm, one scan response, Bypass mode

4.2.2.5.11 Bypass, advertising, +0 dBm, two scan responses

The DCDC is in Bypass mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +0 dBm. The **two scan response** option is set in the SDK apps.

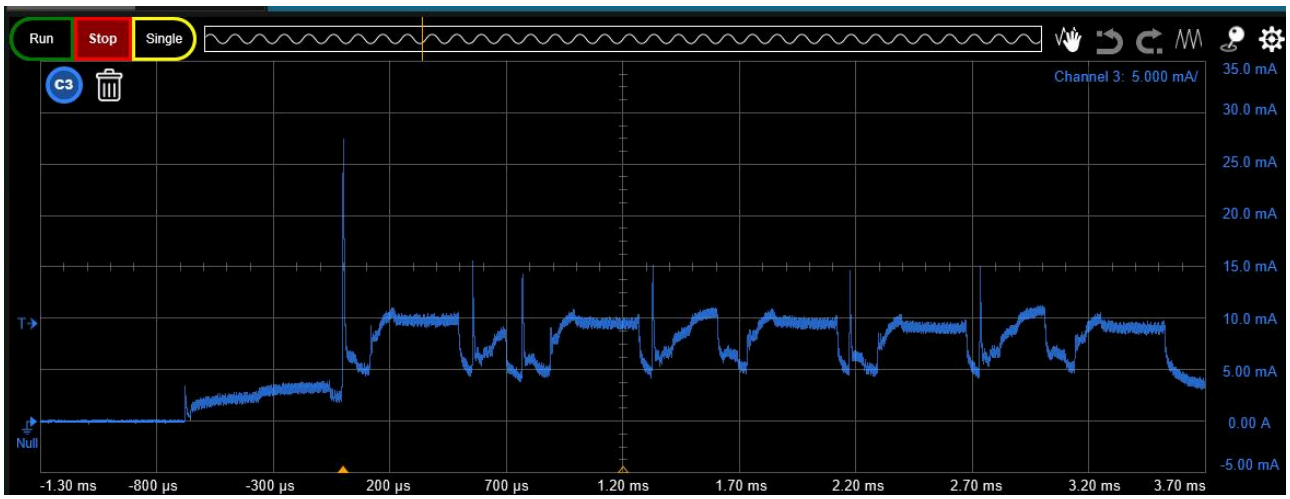

Figure 36. Advertising current profile, +0 dBm, two scan responses, Bypass mode

4.2.2.5.12 Bypass, advertising, +10 dBm, no scan response

The DCDC is in Bypass mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +10 dBm. The **no scan response** option is set in the SDK apps.

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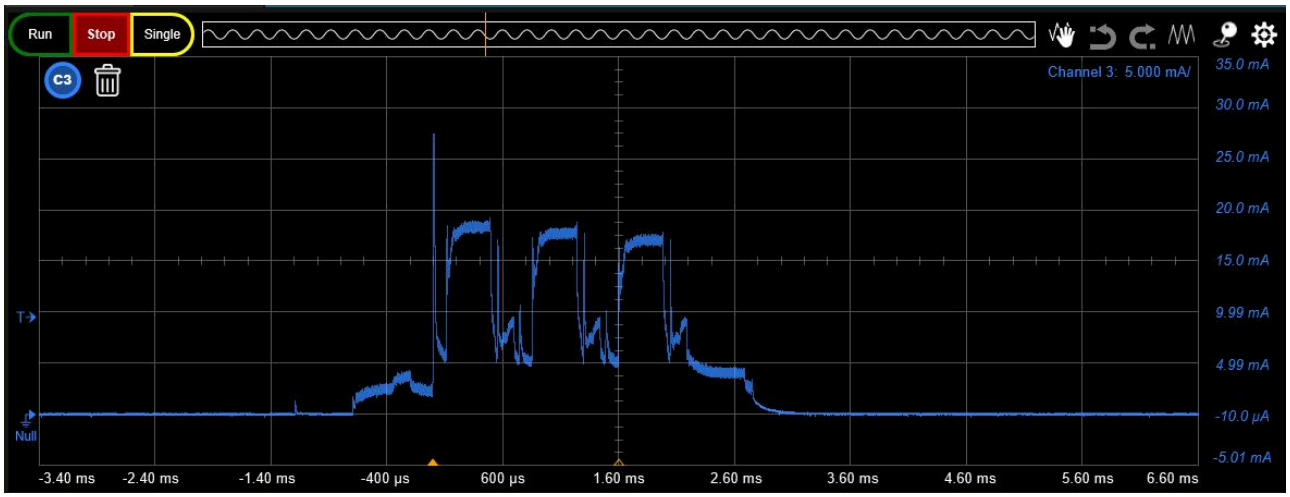

Figure 37. Advertising current profile, +10 dBm, no scan response, Bypass mode

Table 22. Advertising power consumption, +10 dBm, connectable and scannable, Bypass mode

CONNECTABLE & SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
ADVERTISING	Power up	0.155 ms	2.245 mA	0.348 mA-ms
	Preprocessing	0.175 ms	2.245 mA	0.393 mA-ms
	NBU running	0.150 ms	3.000 mA	0.450 mA-ms
	NBU WFI	0.200 ms	2.270 mA	0.454 mA-ms
	TX warm-up	0.080 ms	4.603 mA	0.368 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX to RX transition	0.150 ms	7.577 mA	1.137 mA-ms
	Rx	0.080 ms	8.707 mA	0.697 mA-ms
	RX warm-down	0.020 ms	4.603 mA	0.092 mA-ms
	MCU WFI	0.160 ms	5.692 mA	0.911 mA-ms
	TX warm-up	0.080 ms	4.603 mA	0.368 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX to RX transition	0.150 ms	7.577 mA	1.137 mA-ms
	Rx	0.080 ms	8.707 mA	0.697 mA-ms
	RX warm-down	0.020 ms	4.603 mA	0.092 mA-ms
	MCU WFI	0.160 ms	5.692 mA	0.911 mA-ms
	TX warm-up	0.080 ms	4.603 mA	0.368 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX to RX transition	0.150 ms	7.577 mA	1.137 mA-ms
	Rx	0.080 ms	8.707 mA	0.697 mA-ms
	RX warm-down	0.020 ms	4.603 mA	0.092 mA-ms

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Table 22. Advertising power consumption, +10 dBm, connectable and scannable, Bypass mode...*continued*

CONNECTABLE & SCANABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
	ADV Post-process	0.500 ms	5.904 mA	2.952 mA-ms
	Active Consumption	3.474 ms	Avg = 9.705 mA	33.714 mA-ms
	DSM duration	96.526 ms	0.005683 mA	0.549 mA-ms
	SUM	100.000 ms	Total	34.262 mA-ms
			Charge Integral	9.52 nAh
			Current (µA)	342.621 µA
		Power Consumption (mW)		1.131 mW

4.2.2.5.13 Bypass, advertising, +10 dBm, one scan response

The DCDC is in Bypass mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +10 dBm. One scan response option is set in the SDK apps.

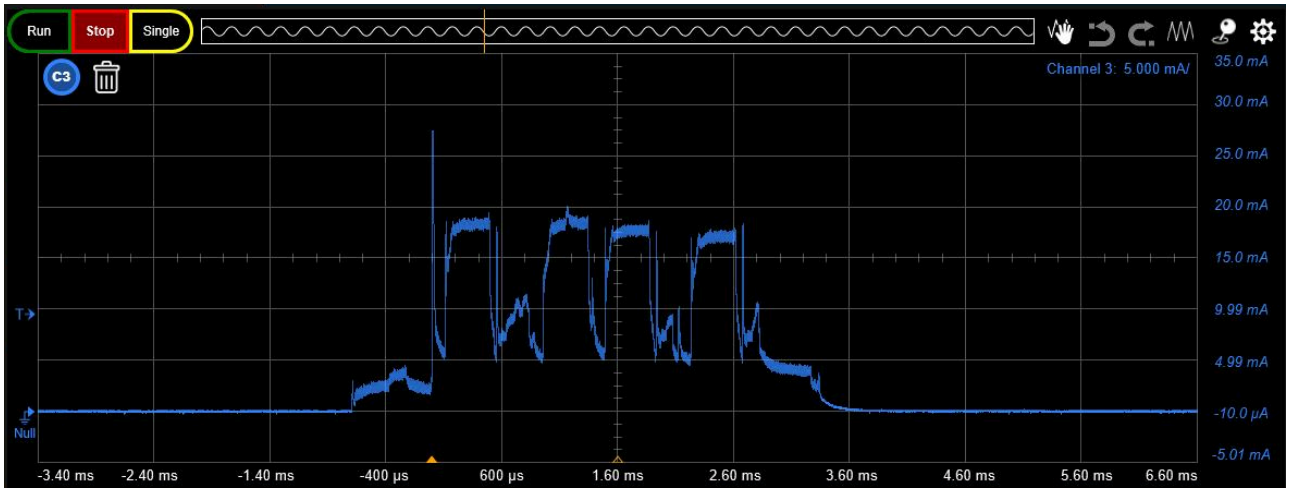

Figure 38. Advertising current profile, +10 dBm, no scan response, Bypass mode

4.2.2.5.14 Bypass, advertising, +10 dBm, two scan responses

The DCDC is in Bypass mode. The Bluetooth LE event considered is advertising. The radio TX output is set to +10 dBm. The **two scan response** option is set in the SDK apps.

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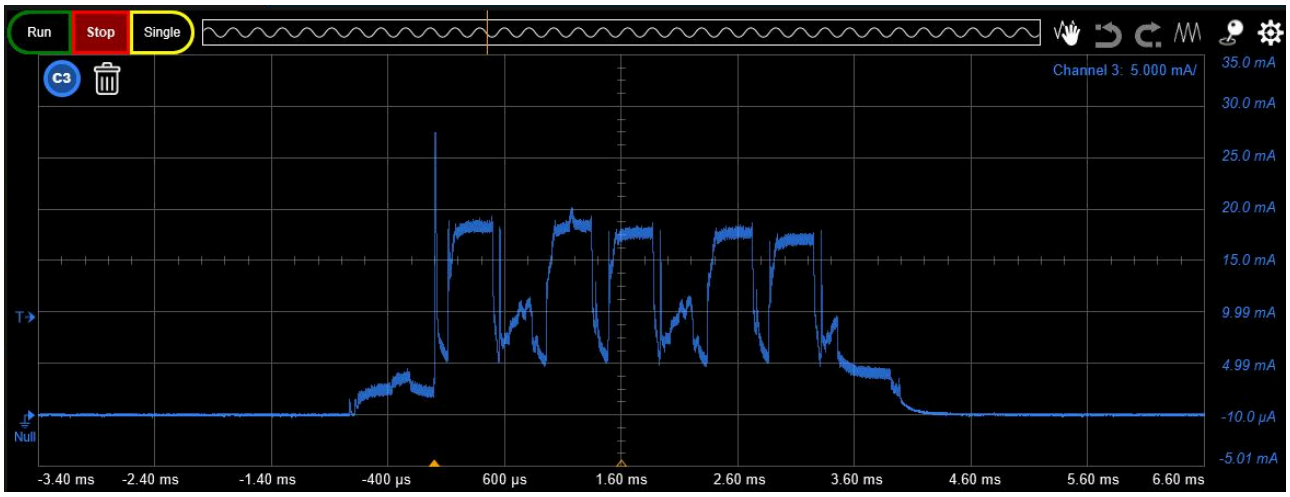

Figure 39. Advertising current profile, +10 dBm, two scan responses, Bypass mode

4.2.2.5.15 Bypass, advertising, +0 dBm, no connectable, no scannable

The DCDC is in Bypass mode. The Bluetooth LE event considered is non-connectable advertising. The radio TX output is set to +0 dBm. The **no scan response** option is set in the SDK apps.

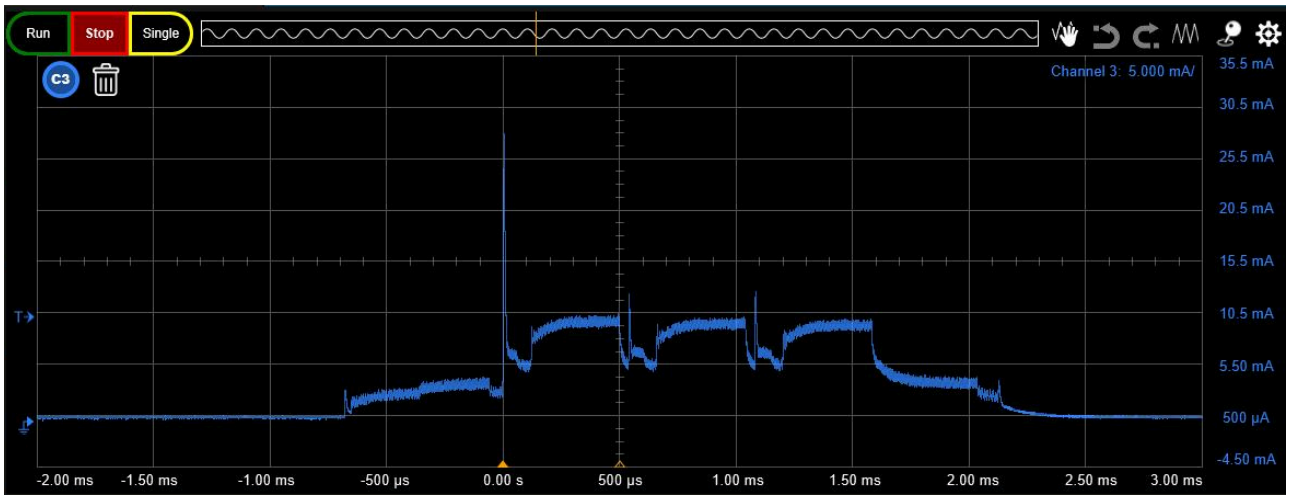

Figure 40. Advertising current profile, +0 dBm, no scannable, no connectable, Bypass mode

Table 23. Advertising power consumption, +0 dBm, no scannable, no connectable, Bypass mode

PERIPHERAL - NON CONNECTABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
ADVERTISING	Power up	0.155 ms	2.245 mA	0.348 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	2.656 mA	0.212 mA-ms

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Table 23. Advertising power consumption, +0 dBm, no scannable, no connectable, Bypass mode*...continued*

PERIPHERAL - NON CONNECTABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.871 mA	0.057 mA-ms
	ADV Post-process	0.500 ms	4.074 mA	2.037 mA-ms
	Active Consumption	2.784 ms	Avg = 5.895 mA	16.411 mA-ms
	DSM duration	97.216	0.005683 mA	0.552 mA-ms
	SUM	100.000 ms	Total	16.964 mA-ms
			Charge Integral	4.71 nAh
			Current (mA)	0.1696 mA
		Power Consumption (mW)		0.560 mW

4.2.2.5.16 Bypass, advertising, +10 dBm, no connectable, no scannable

The DCDC is in Bypass mode. The Bluetooth LE 'non-connectable advertising' event is considered. The radio TX output is set to +10 dBm. The **no scan response** option is set in the SDK apps.

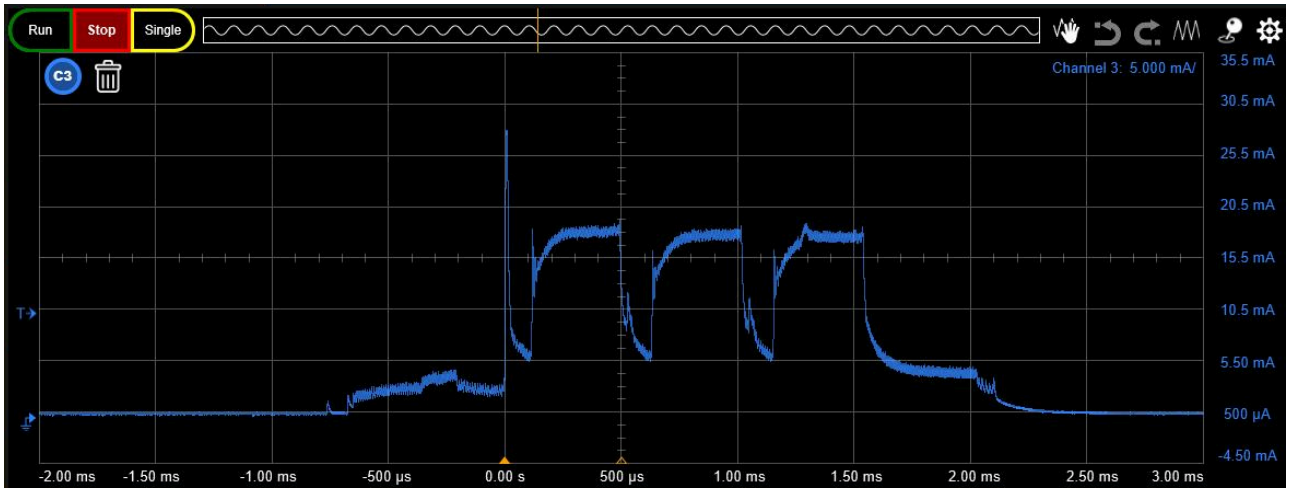

Figure 41. Advertising current profile, +10 dBm, no scannable, no connectable, Bypass mode

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Table 24. Advertising power consumption, +10 dBm, no scannable, no connectable, Bypass mode

PERIPHERAL - NON CONNECTABLE ADVERTISING				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
ADVERTISING	Power up	0.155 ms	20.500 mA	3.178 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	4.749 mA	0.380 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	5.330 mA	0.107 mA-ms
	ADV Post-process	0.500 ms	5.904 mA	2.952 mA-ms
	Active Consumption	2.784 ms	Avg = 11.080 mA	30.845 mA-ms
	DSM duration	97.216	0.005683 mA	0.552 mA-ms
	SUM	100.000 ms	Total	31.398 mA-ms
			Charge Integral	8.72 nAh
			Current (mA)	0.3140 mA
		Power Consumption (mW)		1.036 mW

Table 25. Global summary current consumption event versus main voltage

Advertising	1.71 V	1.8 V	2.1 V	2.4 V	2.7 V	3 V	3.3 V	3.6 V	Unit
Buck mode	6.39	6.4	6.39	6.39	6.14	5.31	5.27	5.32	nAh
Bypass mode	6.76	6.76	6.72	6.65	6.73	5.74	6.43	7.26	nAh

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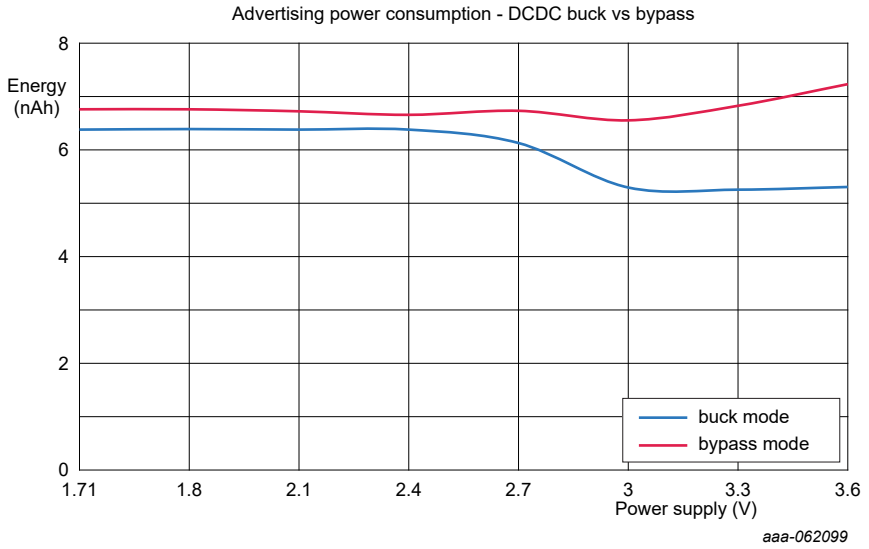

Figure 42. Global advertising event power consumption profile in Buck and Bypass mode, DSM vs main power supply

Table 26. Buck mode, summary current consumption event versus main voltage and temperature

Advertising, Buck	1.7 V	1.8 V	2.1 V	2.4 V	2.7 V	3.0 V	3.3 V	3.6 V	Unit
-40 °C	6.19	6.25	6.33	6.19	6.01	5.21	5.16	5.2	nAh
-20 °C	6.28	6.35	6.37	6.28	6.09	5.26	5.22	5.26	nAh
25 °C	6.39	6.4	6.39	6.39	6.14	5.31	5.27	5.32	nAh
65 °C	6.85	7.17	7.05	7.01	6.71	5.87	5.74	5.92	nAh
85 °C	7.9	8.15	7.93	8.02	7.48	6.5	6.38	6.22	nAh
105 °C	9.17	9.23	9.22	9.31	8.85	7.65	7.51	7.55	nAh
120 °C	10	10.3	10.52	10.6	10.22	8.8	8.64	8.88	nAh

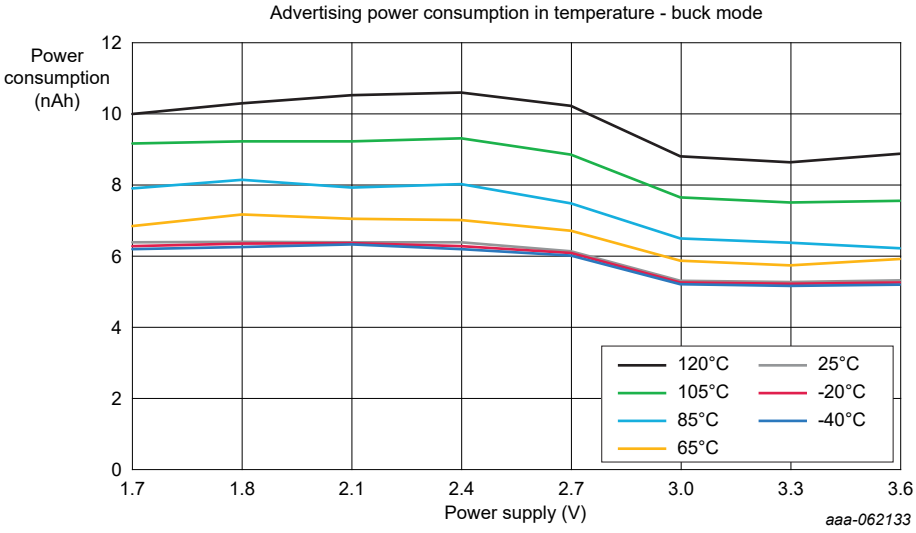

Figure 43. Global advertising event power consumption profile in Buck mode vs voltage and temperature, DSM2 vs main power supply

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Table 27. Bypass mode, summary current consumption event versus main voltage and temperature

Advertising, bypass	1.71 V	1.8 V	2.1 V	2.4 V	2.7 V	3.0 V	3.3 V	3.6 V	Unit
-40 °C	6.55	6.61	6.65	6.44	6.58	6.61	6.79	7.10	nAh
-20 °C	6.65	6.71	6.70	6.53	6.68	6.67	6.87	7.18	nAh
25 °C	6.76	6.76	6.72	6.65	6.73	6.74	6.93	7.26	nAh
65 °C	6.77	6.83	6.77	6.75	6.77	6.77	6.96	7.32	nAh
85 °C	6.88	6.92	6.85	6.83	6.85	6.85	7.04	7.34	nAh
105 °C	7.04	7.09	6.91	6.92	6.89	6.91	7.06	7.42	nAh
120 °C	7.19	7.21	6.96	7.01	6.95	6.98	7.11	7.47	nAh

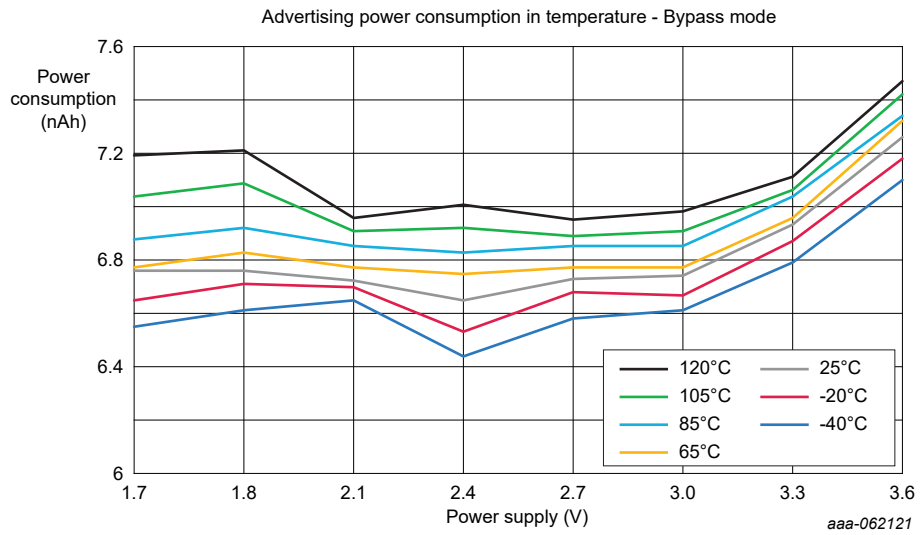

Figure 44. Global Advertising event power consumption profile in Bypass mode vs voltage and temperature, DSM vs main power supply

4.2.2.6 Connection mode

The NXP Android application is used to perform the connection.

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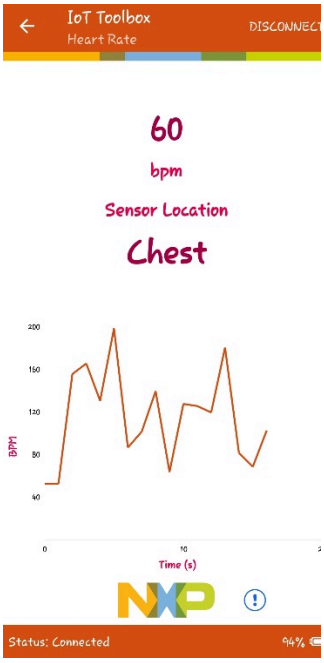

Figure 45. Current consumption - Connection events and DSM2 in between

Install the IoT Toolbox from the Google Play or Apple iTunes (IoT Toolbox version 5.1.8 or later) on the central side. In this case, a cell phone or a tablet with Bluetooth LE 6.x is available).

Use the Thermometer application. There is no need for a connecting device to measure advertising events. However, it is mandatory to measure connection events. To connect to the MCXW72-EVK board, the procedure is simple and straightforward:

- Open IoT Toolbox.
- Power up the MCXW72-EVK board. The advertising starts automatically.
- On the Android application, the FSL_Thermo is reported at the scan phase.
- Connect to the FSL_Thermo peripheral.
- Wait for the measurements.

The templates are shown in Figure 46.

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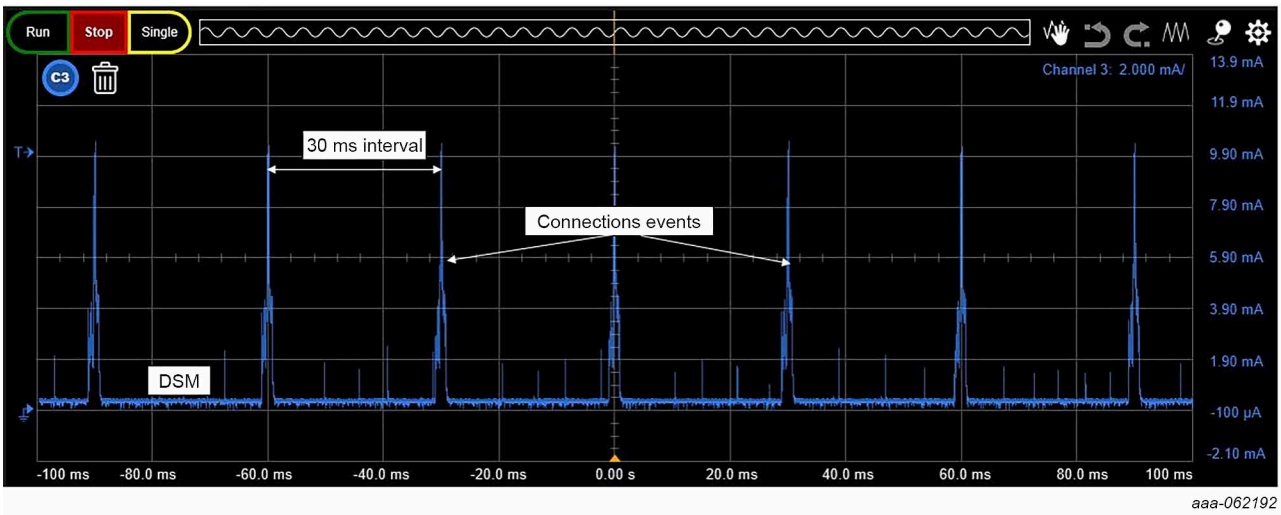

Figure 46. IoT Toolbox

Both use cases are used:

- The Low-power Deep-sleep mode is activated between the connection events.
- Figure 47 captures the current consumption during the connection event.

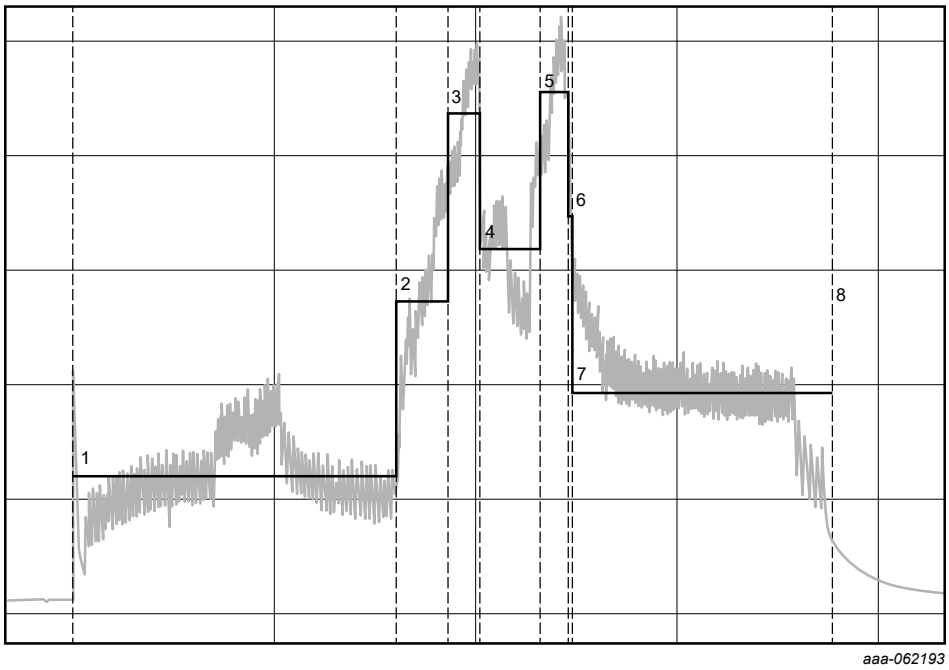

Figure 47. Current consumption - connection event period

Table 28. Events

Event
1. Preprocessing
2. TX warmup
3. Active RX
4. RX to TX transition

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Table 28. Events...*continued*

Event
5. Active TX
6. TX warmdown
7. Postprocessing

The binary file settings used are as follows:

- 48 MHz clock
- Connect with 0 byte TX payload
- 0 byte RX payload and connectable
- RF output of +10 dBm and +0 dBm
- Data rate at 1 Mbit/s
- 32 k RAM core0 retained
- 160 k RAM NBU retained
- 96 k RAM DVP-V retained

Table 29. Connection event

DC-DC mode	BUCK	BYPASS
Supply	Vdd_DCDC = 3V3 Vdd_RF = 1.25 V Vdd_LDO_Core = 1.25 V	Vdd_RF = 3V3 Vdd_LDO_Core = 3V3
RF output power	+0 dBm and +10 dBm	
MCU clock mode	48 MHz	
RAM size	RAM retained: (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	
Data rate	1 Mbit/s	
Payload	TX: 31 bytes; RX: 0 bytes	
Connectable	Yes	
Flash	Doze	
CM33	Deep-sleep mode	
Setting	Connect from low-power DSM peripheral to central	
Software	LP_Peripheral (SDK 25.06)	

Buck mode:

- Wake up from the Low-power Deep-sleep mode.

Bypass mode:

- Wake up from Low-power Deep-sleep mode.

The mobile phone is the central that defines the data rate during the connection. Three data rates are considered: 1 Mbit/s, 2 Mbit/s, and 500 kbit/s (LR S = 2).

Note: *In the* `app_preinclude.h` *file, enable the* `gAppExtAdvEnable` *parameter to get the LR connection.*

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If enabled, the OPT Host lib is required. This implies that it must be set to the `lib_ble_5-2_OPT_host_cm33_iar.a` library in the linker setting:

```
#define gAppExtAdvEnable_d 1
```

4.2.2.6.1 Test environment: connect 1 Mbit/s

The Bluetooth LE event considered is connection. The data rate is set to 1 Mbit/s.

4.2.2.6.1.1 Buck, connection +0 dBm, 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +0 dBm. The data rate is set to 1 Mbit/s.

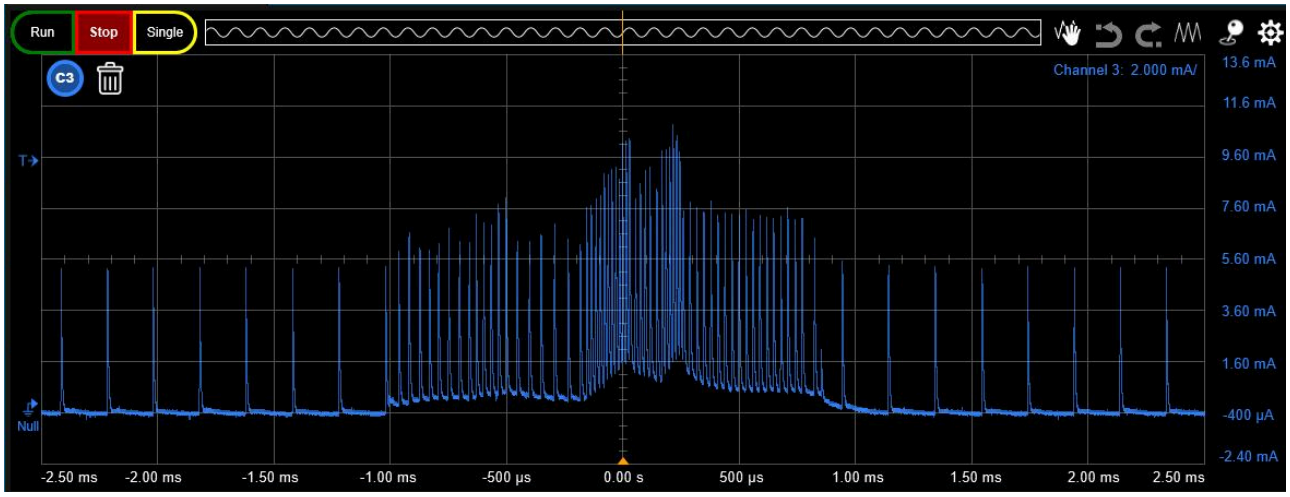

Figure 48. Connection current profile, +0 dBm, Buck mode, 1 Mbit/s

Table 30. Connection power consumption, +0 dBm, Buck mode, 1 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
CONNECTION	Power up	0.025 ms	27.300 mA	0.683 mA-ms
	CONN pre-processing	0.375 ms	2.793 mA	1.047 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	2.500 mA	0.500 mA-ms
	RX warm-up	0.080 ms	1.418 mA	0.113 mA-ms
	Rx	0.080 ms	4.590 mA	0.367 mA-ms
	RX to TX transition	0.150 ms	4.475 mA	0.671 mA-ms
	TX (+0 dBm)	0.080 ms	5.360 mA	0.429 mA-ms
	TX warm-down	0.020 ms	0.950 mA	0.019 mA-ms
	CONN Post-process	0.360 ms	4.137 mA	1.489 mA-ms
	Active Consumption	1.520 ms	Avg = 3.993 mA	6.069 mA-ms

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Table 30. Connection power consumption, +0 dBm, Buck mode, 1 Mbit/s*...continued*

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
	DSM duration	28.480	0.004200 mA	0.120 mA-ms
	SUM	30.000 ms	Total	6.189 mA-ms
			Charge Integral	1.72 nAh
			Current (mA)	0.2063 mA
			Power Consumption (mW)	0.681 mW

4.2.2.6.1.2 Buck, connection +10 dBm, 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +10 dBm. The data rate is set to 1 Mbit/s.

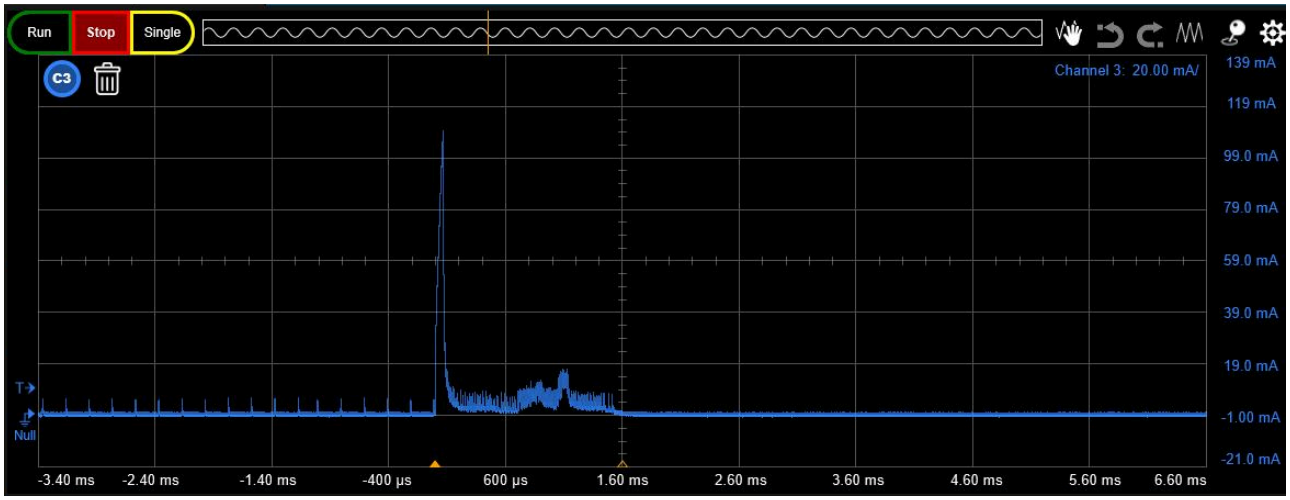

Figure 49. Connection current profile, +10 dBm, Buck mode, 1 Mbit/s

Table 31. Connection power consumption, +10 dBm, Buck mode, 1 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
CONNECTION	Power up	0.025 ms	28.400 mA	0.710 mA-ms
	CONN pre-processing	0.375 ms	3.447 mA	1.293 mA-ms
	CONN MCU running	0.150 ms	3.400 mA	0.510 mA-ms
	MCU-WFI	0.200 ms	2.520 mA	0.504 mA-ms
	RX warm-up	0.080 ms	1.991 mA	0.159 mA-ms
	Rx	0.080 ms	7.435 mA	0.595 mA-ms
	RX to TX transition	0.150 ms	5.190 mA	0.778 mA-ms
	TX (+10 dBm)	0.080 ms	16.465 mA	1.317 mA-ms

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Table 31. Connection power consumption, +10 dBm, Buck mode, 1 Mbit/s*...continued*

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
	TX warm-down	0.020 ms	2.096 mA	0.042 mA-ms
	CONN Post-process	0.360 ms	4.493 mA	1.617 mA-ms
	Active Consumption	1.520 ms	Avg = 4.951 mA	7.526 mA-ms
	DSM duration	28.480	0.004200 mA	0.120 mA-ms
	SUM	30.000 ms	Total	7.645 mA-ms
			Charge Integral	2.12 nAh
			Current (mA)	0.2548 mA
			Power Consumption (mW)	0.841 mW

4.2.2.6.1.3 Bypass, connection +0 dBm, 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +0 dBm. The data rate is set to 1 Mbit/s.

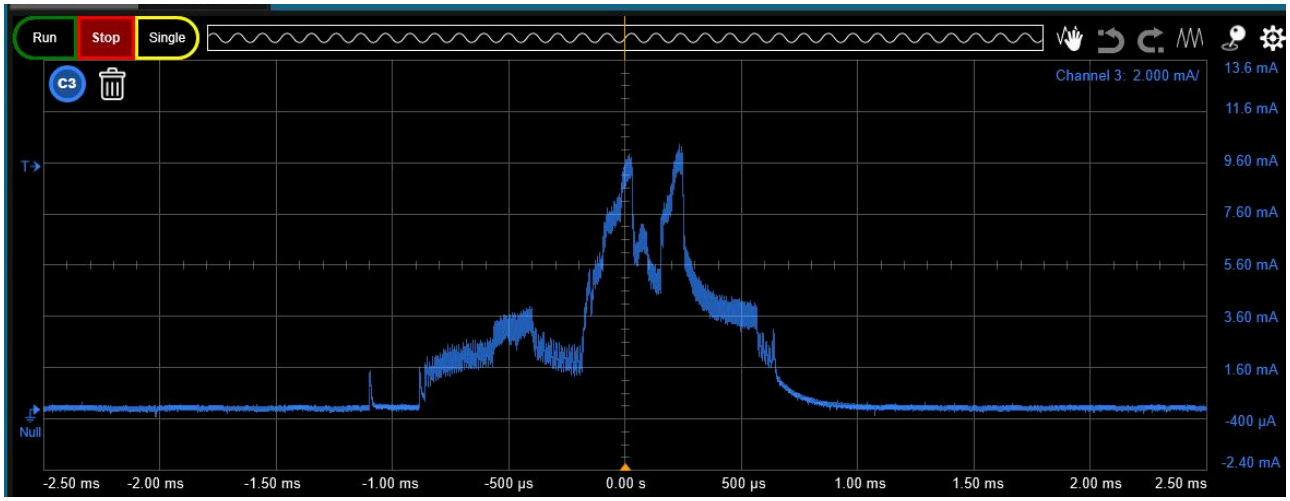

Figure 50. Connection current profile, +0 dBm, Bypass mode, 1 Mbit/s

Table 32. Connection power consumption, +0 dBm, Bypass mode, 1 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
CONNECTION	Power up	0.025 ms	3.168 mA	0.079 mA-ms
	CONN pre-processing	0.375 ms	3.168 mA	1.188 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.148 mA	0.092 mA-ms

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Table 32. Connection power consumption, +0 dBm, Bypass mode, 1 Mbit/s*...continued*

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
	Rx	0.080 ms	8.479 mA	0.678 mA-ms
	RX to TX transition	0.150 ms	6.549 mA	0.982 mA-ms
	TX (+0 dBm)	0.080 ms	10.279 mA	0.822 mA-ms
	TX warm-down	0.020 ms	0.728 mA	0.015 mA-ms
	CONN Post-process	0.360 ms	4.288 mA	1.544 mA-ms
	Active Consumption	1.520 ms	Avg = 4.441 mA	6.750 mA-ms
	DSM duration	28.480	0.005683 mA	0.162 mA-ms
	SUM	30.000 ms	Total	6.912 mA-ms
			Charge Integral	1.92 nAh
			Current (mA)	0.2304 mA
		Power Consumption (mW)		0.760 mW

4.2.2.6.1.4 Bypass, connection +10 dBm, 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +10 dBm. The data rate is set to 1 Mbit/s.

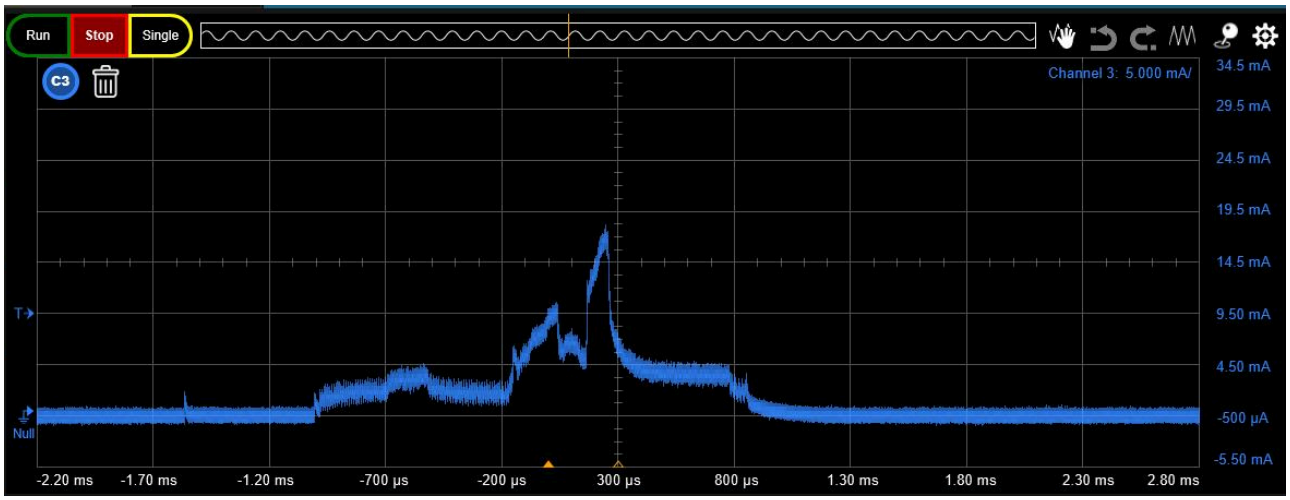

Figure 51. Connection current profile, +10 dBm, Bypass mode, 1 Mbit/s

Table 33. Connection power consumption, +10 dBm, Bypass mode, 1 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
CONNECTION	Power up	0.025 ms	4.561 mA	0.114 mA-ms
	CONN pre-processing	0.375 ms	4.561 mA	1.710 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms

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Table 33. Connection power consumption, +10 dBm, Bypass mode, 1 Mbit/s*...continued*

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x ms**
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.171 mA	0.094 mA-ms
	Rx	0.080 ms	8.707 mA	0.697 mA-ms
	RX to TX transition	0.150 ms	6.777 mA	1.017 mA-ms
	TX (+10 dBm)	0.080 ms	20.747 mA	1.660 mA-ms
	TX warm-down	0.020 ms	1.348 mA	0.027 mA-ms
	CONN Post-process	0.360 ms	6.215 mA	2.237 mA-ms
	Active Consumption	1.520 ms	Avg = 5.859 mA	8.905 mA-ms
	DSM duration	28.480	0.005683 mA	0.162 mA-ms
	SUM	30.000 ms	Total	9.067 mA-ms
			Charge Integral	2.52 nAh
			Current (mA)	0.3022 mA
		Power Consumption (mW)		0.997 mW

4.2.2.6.2 Test environment: connect 2 Mbit/s

The Bluetooth LE event considered is connection. The data rate is set to 2 Mbit/s.

4.2.2.6.2.1 Buck, connection +0 dBm, 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +0 dBm. The data rate is set to 2 Mbit/s.

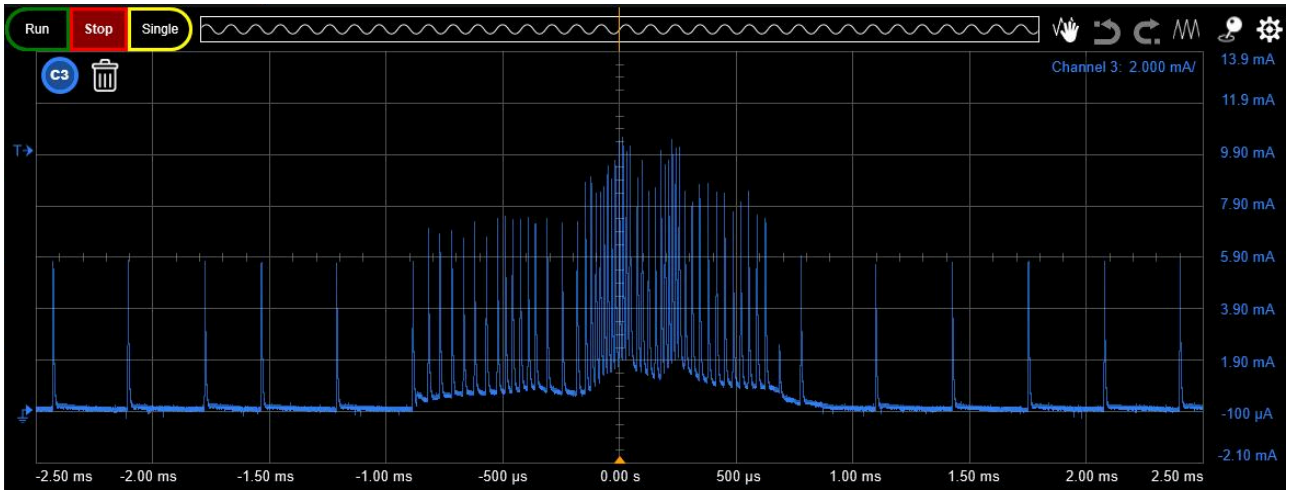

Figure 52. Connection current profile, +0 dBm, Buck mode, 2 Mbit/s

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Table 34. Connection power consumption, +0 dBm, Buck mode, 2 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	30.000 ms		
	State	Time(ms)	Current(mA)	mA x mS
CONNECTION	Power up	0.025 ms	27.300 mA	0.683 mA-ms
	CONN pre-processing	0.375 ms	2.206 mA	0.827 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	2.500 mA	0.500 mA-ms
	RX warm-up	0.080 ms	1.418 mA	0.113 mA-ms
	Rx	0.044 ms	4.590 mA	0.202 mA-ms
	RX to TX transition	0.150 ms	4.475 mA	0.671 mA-ms
	TX (+0 dBm)	0.044 ms	5.360 mA	0.236 mA-ms
	TX warm-down	0.020 ms	0.950 mA	0.019 mA-ms
	CONN Post-process	0.360 ms	4.137 mA	1.489 mA-ms
	Active Consumption	1.448 ms	Avg = 3.792 mA	5.491 mA-ms
	DSM duration	28.552	0.004200 mA	0.120 mA-ms
	SUM	30.000 ms	Total	5.611 mA-ms
			Charge Integral	1.56 nAh
			Current (mA)	0.1870 mA
			Power Consumption (mW)	0.617 mW

4.2.2.6.2.2 Buck, connection +10 dBm, 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +10 dBm. The data rate is set to 2 Mbit/s.

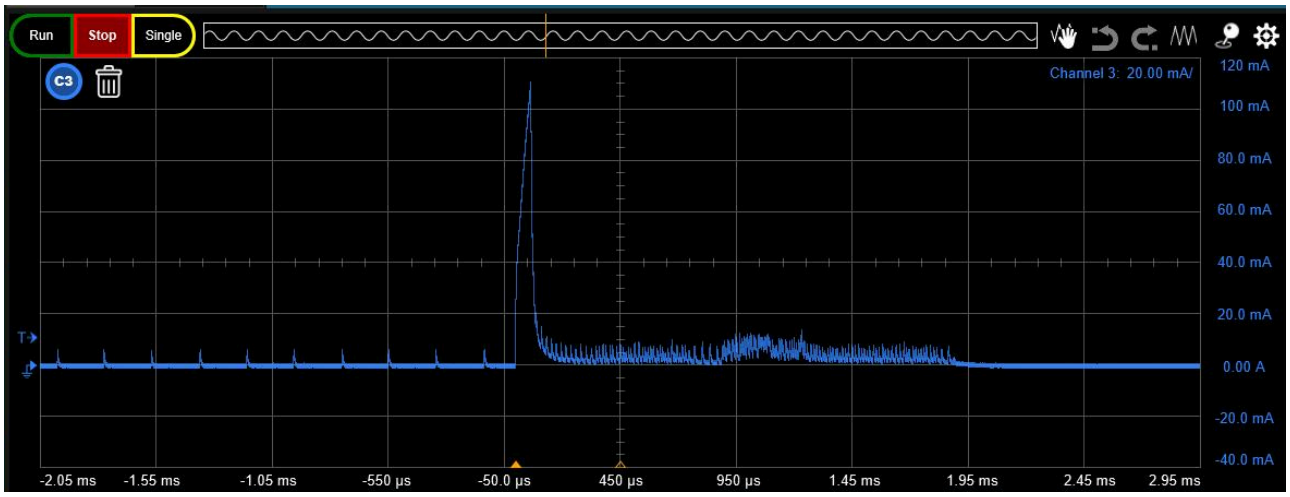

Figure 53. Connection current profile, +10 dBm, Buck mode, 2 Mbit/s

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Table 35. Connection power consumption, +10 dBm, Buck mode, 2 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	30.000 ms		
	State	Time(ms)	Current(mA)	mA x mS
CONNECTION	Power up	0.025 ms	28.400 mA	0.710 mA-ms
	CONN pre-processing	0.375 ms	3.940 mA	1.478 mA-ms
	CONN MCU running	0.150 ms	3.400 mA	0.510 mA-ms
	MCU-WFI	0.200 ms	2.520 mA	0.504 mA-ms
	RX warm-up	0.080 ms	1.991 mA	0.159 mA-ms
	Rx	0.044 ms	7.435 mA	0.327 mA-ms
	RX to TX transition	0.150 ms	5.190 mA	0.778 mA-ms
	TX (+10 dBm)	0.044 ms	16.465 mA	0.724 mA-ms
	TX warm-down	0.020 ms	2.096 mA	0.042 mA-ms
	CONN Post-process	0.360 ms	4.493 mA	1.617 mA-ms
	Active Consumption	1.448 ms	Avg = 4.731 mA	6.850 mA-ms
	DSM duration	28.552	0.004200 mA	0.120 mA-ms
	SUM	30.000 ms	Total	6.970 mA-ms
			Charge Integral	1.94 nAh
			Current (mA)	0.2323 mA
			Power Consumption (mW)	0.767 mW

4.2.2.6.2.3 Bypass, connection +0 dBm, 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +0 dBm. The data rate is set to 2 Mbit/s.

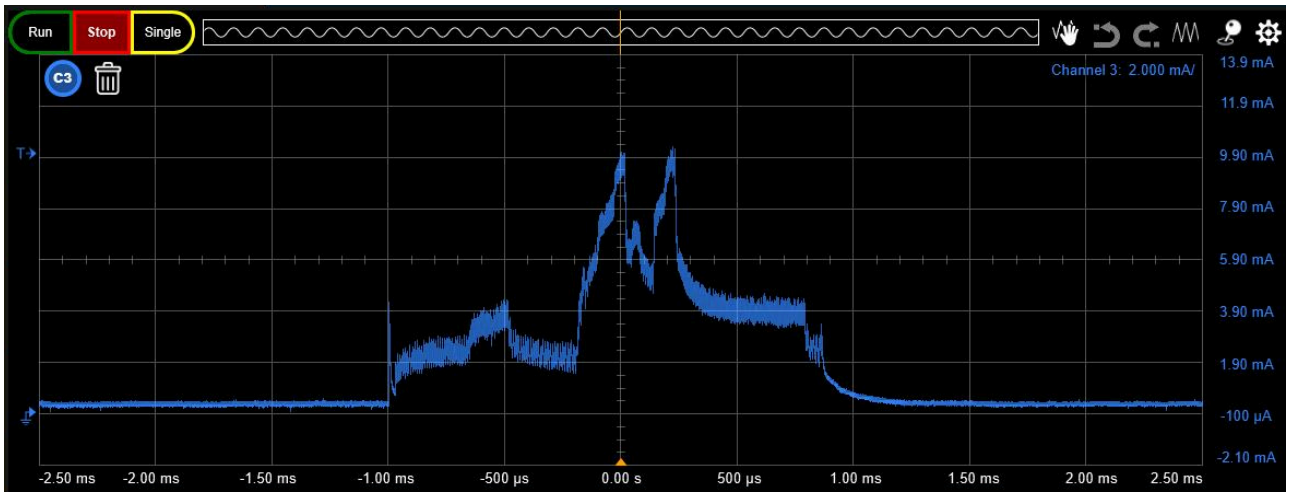

Figure 54. Connection current profile, +0 dBm, bypass mode, 2 Mbit/s

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Table 36. Connection power consumption, +0 dBm, Bypass mode, 2 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	30.000 ms		
	State	Time(ms)	Current(mA)	mA x mS
CONNECTION	Power up	0.025 ms	3.453 mA	0.086 mA-ms
	CONN pre-processing	0.375 ms	3.453 mA	1.295 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.148 mA	0.092 mA-ms
	Rx	0.044 ms	8.479 mA	0.373 mA-ms
	RX to TX transition	0.150 ms	6.549 mA	0.982 mA-ms
	TX (+0 dBm)	0.044 ms	10.279 mA	0.452 mA-ms
	TX warm-down	0.020 ms	0.728 mA	0.015 mA-ms
	CONN Post-process	0.360 ms	4.288 mA	1.544 mA-ms
	Active Consumption	1.448 ms	Avg = 4.274 mA	6.189 mA-ms
	DSM duration	28.552	0.005683 mA	0.162 mA-ms
	SUM	30.000 ms	Total	6.352 mA-ms
			Charge Integral	1.76 nAh
			Current (mA)	0.2117 mA
		Power Consumption (mW)		0.699 mW

4.2.2.6.2.4 Bypass, connection +10 dBm, 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is Connection. The radio TX output power is set to +10 dBm. The data rate is set to 2 Mbit/s.

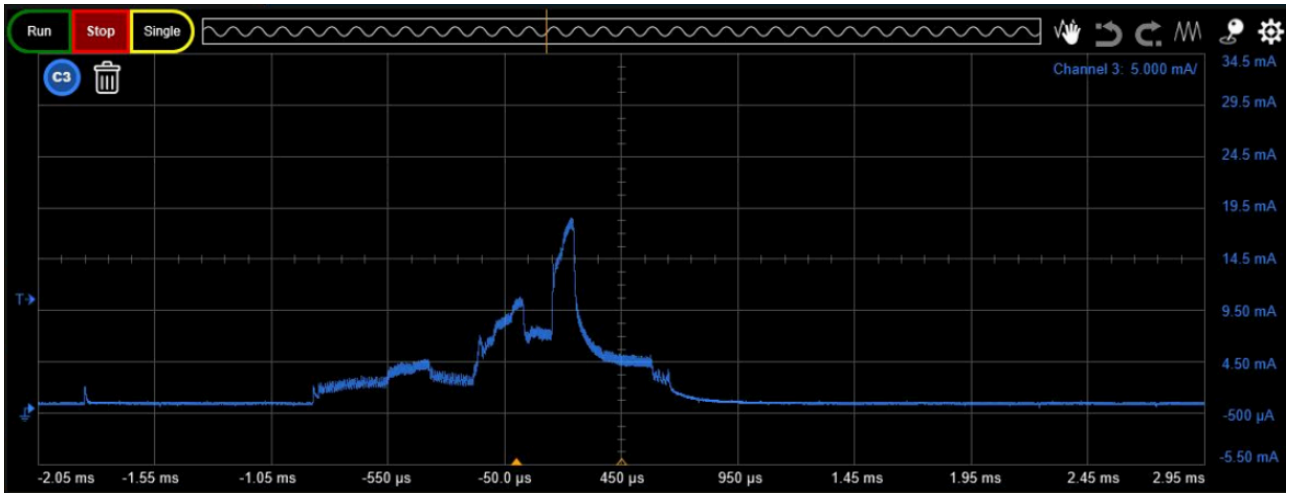

Figure 55. Connection current profile, +10 dBm, Bypass mode, 2 Mbit/s

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Table 37. Connection power consumption, +10 dBm, Bypass mode, 2 Mbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	5.313 mA	0.133 mA-ms
	CONN pre-processing	0.375 ms	5.313 mA	1.992 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.171 mA	0.094 mA-ms
	RX	0.044 ms	8.707 mA	0.383 mA-ms
	RX to TX transition	0.150 ms	6.777 mA	1.017 mA-ms
	TX (+10 dBm)	0.044 ms	20.747 mA	0.913 mA-ms
	TX warm-down	0.020 ms	1.348 mA	0.027 mA-ms
	CONN Post-process	0.360 ms	6.215 mA	2.237 mA-ms
	Active Consumption	1.448 ms	Avg = 5.626 mA	8.146 mA-ms
	DSM duration	28.552	0.005683 mA	0.162 mA-ms
	SUM	30.000 ms	Total	8.308 mA-ms
			Charge Integral	2.31 nAh
			Current (mA)	0.2769 mA
		Power Consumption (mW)		0.914 mW

4.2.2.6.3 Test environment: connect 500 kbit/s (coded LR S2)

The Bluetooth LE event considered is connection. The data rate is set to 500 kbit/s (coded LR S = 2).

4.2.2.6.3.1 Buck, connection +0 dBm, 500 kbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is connection. The radio TX output power is set to +0 dBm. The data rate is set to 500 kbit/s (coded LR S = 2).

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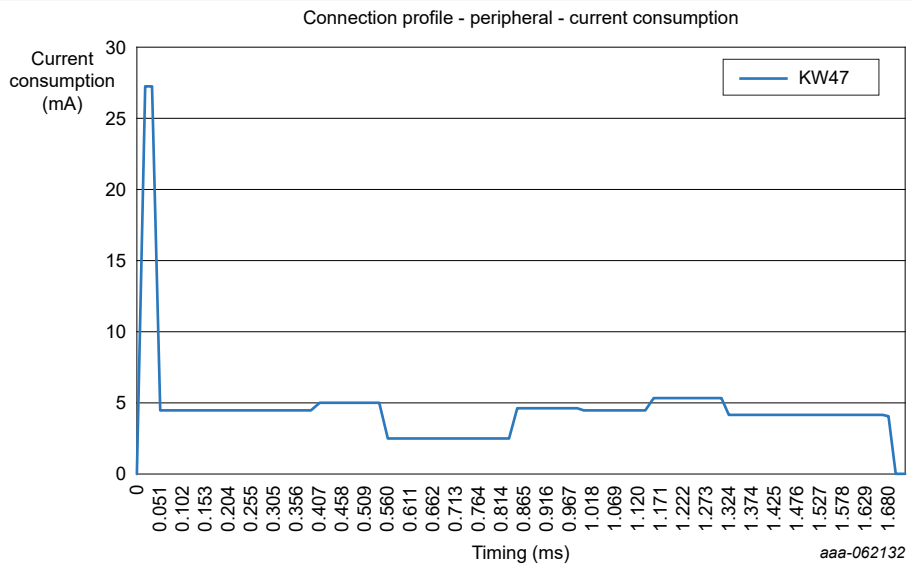

Figure 56. Connection current profile, +0 dBm, Buck mode, 500 kbit/s

Table 38. Connection power consumption, +0 dBm, Buck mode, 500 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	27.300 mA	0.683 mA-ms
	CONN pre-processing	0.375 ms	4.463 mA	1.674 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	2.500 mA	0.500 mA-ms
	RX warm-up	0.080 ms	1.418 mA	0.113 mA-ms
	RX	0.160 ms	4.590 mA	0.734 mA-ms
	RX to TX transition	0.150 ms	4.475 mA	0.671 mA-ms
	TX (+0 dBm)	0.160 ms	5.360 mA	0.858 mA-ms
	TX warm-down	0.020 ms	0.950 mA	0.019 mA-ms
	CONN Post-process	0.360 ms	4.137 mA	1.489 mA-ms
	Active Consumption	1.680 ms	Avg = 4.459 mA	7.491 mA-ms
	DSM duration	28.320	0.004200 mA	0.119 mA-ms
	SUM	30.000 ms	Total	7.610 mA-ms
			Charge Integral	2.11 nAh
			Current (mA)	0.2537 mA
			Power Consumption (mW)	0.837 mW

4.2.2.6.3.2 Buck, connection +10 dBm, 500 kbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is connection. The radio TX output power is set to +10 dBm. The data rate is set to 500 kbit/s (coded LR S = 2).

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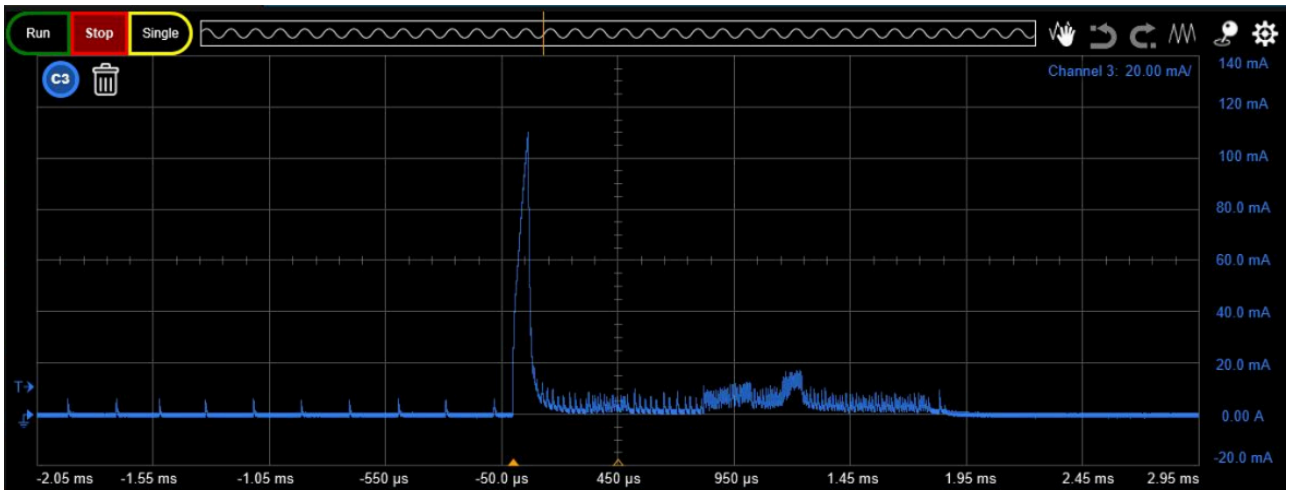

Figure 57. Connection current profile, +10 dBm, Buck mode, 500 kbit/s

Table 39. Connection power consumption, +10 dBm, Buck mode, 500 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	28.400 mA	0.710 mA-ms
	CONN pre-processing	0.375 ms	5.579 mA	2.092 mA-ms
	CONN MCU running	0.150 ms	3.400 mA	0.510 mA-ms
	MCU-WFI	0.200 ms	2.520 mA	0.504 mA-ms
	RX warm-up	0.080 ms	1.991 mA	0.159 mA-ms
	Rx	0.160 ms	7.435 mA	1.190 mA-ms
	RX to TX transition	0.150 ms	5.190 mA	0.778 mA-ms
	TX (+10 dBm)	0.160 ms	16.465 mA	2.634 mA-ms
	TX warm-down	0.020 ms	2.096 mA	0.042 mA-ms
	CONN Post-process	0.360 ms	4.493 mA	1.617 mA-ms
	Active Consumption	1.680 ms	Avg = 6.093 mA	10.237 mA-ms
	DSM duration	28.320	0.004200 mA	0.119 mA-ms
	SUM	30.000 ms	Total	10.356 mA-ms
			Charge Integral	2.88 nAh
			Current (mA)	0.3452 mA
			Power Consumption (mW)	1.139 mW

4.2.2.6.3.3 Bypass, connection +0 dBm, 500 kbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is connection. The radio Tx output power is set to +0 dBm. The data rate is set to 500 kbit/s (coded LR S = 2).

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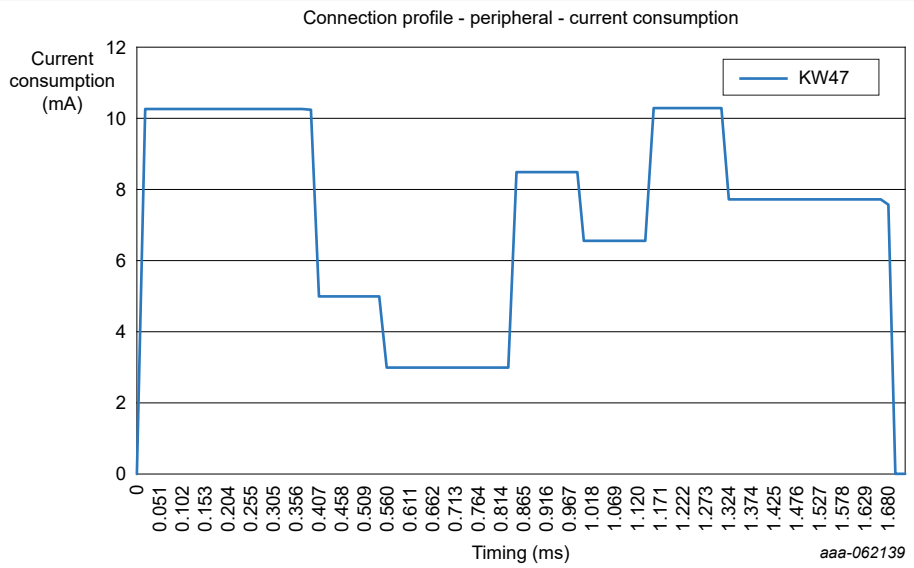

Figure 58. Connection current profile, +0 dBm, bypass mode, 500 kbit/s

Table 40. Connection power consumption, +0 dBm, Bypass mode, 500 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	10.241 mA	0.256 mA-ms
	CONN pre-processing	0.375 ms	10.241 mA	3.841 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.148 mA	0.092 mA-ms
	Rx	0.160 ms	8.479 mA	1.357 mA-ms
	RX to TX transition	0.150 ms	6.549 mA	0.982 mA-ms
	TX (+0 dBm)	0.160 ms	10.279 mA	1.645 mA-ms
	TX warm-down	0.020 ms	0.900 mA	0.018 mA-ms
	CONN Post-process	0.360 ms	7.719 mA	2.779 mA-ms
	Active Consumption	1.680 ms	Avg = 7.333 mA	12.319 mA-ms
	DSM duration	28.320	0.005683 mA	0.161 mA-ms
	SUM	30.000 ms	Total	12.480 mA-ms
			Charge Integral	3.47 nAh
			Current (mA)	0.4160 mA
		Power Consumption (mW)		1.373 mW

4.2.2.6.3.4 Bypass, connection +10 dBm, 500 kbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is connection. The radio TX output power is set to +10 dBm. The data rate is set to 500 kbit/s (coded LR S = 2).

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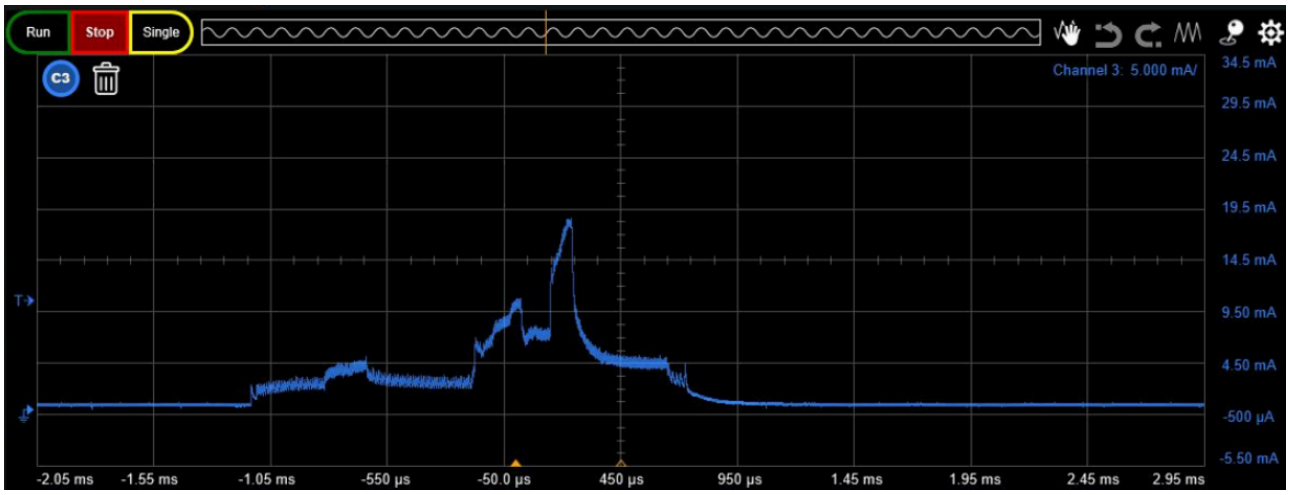

Figure 59. Connection current profile, +10 dBm, Bypass mode, 500 kbit/s

Table 41. Connection power consumption, +10 dBm, Bypass mode, 500 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	10.241 mA	0.256 mA-ms
	CONN pre-processing	0.375 ms	10.241 mA	3.841 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.171 mA	0.094 mA-ms
	Rx	0.160 ms	8.707 mA	1.393 mA-ms
	RX to TX transition	0.150 ms	6.777 mA	1.017 mA-ms
	TX (+10 dBm)	0.160 ms	20.747 mA	3.319 mA-ms
	TX warm-down	0.020 ms	1.597 mA	0.032 mA-ms
	CONN Post-process	0.360 ms	11.187 mA	4.027 mA-ms
	Active Consumption	1.680 ms	Avg = 9.124 mA	15.329 mA-ms
	DSM duration	28.320	0.005683 mA	0.161 mA-ms
	SUM	30.000 ms	Total	15.490 mA-ms
			Charge Integral	4.30 nAh
			Current (mA)	0.5163 mA
		Power Consumption (mW)		1.704 mW

4.2.2.6.4 Test environment: connect 125 kbit/s

The Bluetooth LE event considered is connection. The data rate is set to 125 kbit/s.

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4.2.2.6.4.1 Buck, connection +0 dBm, 125 kbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is connection. The radio Tx output power is set to +0 dBm. The data rate is set to 125 kbit/s.

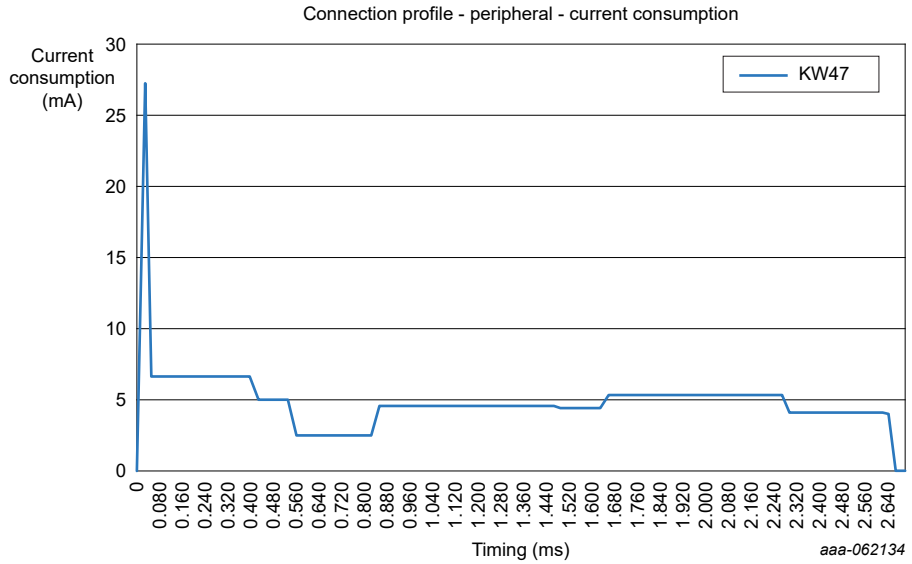

Figure 60. Connection current profile, +0 dBm, Buck mode, 125 kbit/s

Table 42. Connection power consumption, +0 dBm, Buck mode, 125 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	3.731 mA	0.093 mA-ms
	CONN pre-processing	0.375 ms	3.731 mA	1.399 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.148 mA	0.092 mA-ms
	Rx	0.640 ms	8.479 mA	5.427 mA-ms
	RX to TX transition	0.150 ms	6.549 mA	0.982 mA-ms
	TX (+0 dBm)	0.640 ms	10.279 mA	6.579 mA-ms
	TX warm-down	0.020 ms	0.900 mA	0.018 mA-ms
	CONN Post-process	0.360 ms	7.719 mA	2.779 mA-ms
	Active Consumption	2.640 ms	Avg = 7.090 mA	18.719 mA-ms
	DSM duration	27.360	0.004200 mA	0.115 mA-ms
	SUM	30.000 ms	Total	18.834 mA-ms
			Charge Integral	5.23 nAh
			Current (mA)	0.6278 mA
			Power Consumption (mW)	2.072 mW

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4.2.2.6.4.2 Buck, connection +10 dBm, 125 kbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is connection. The radio Tx output power is set to +10 dBm. The data rate is set to 125 kbit/s.

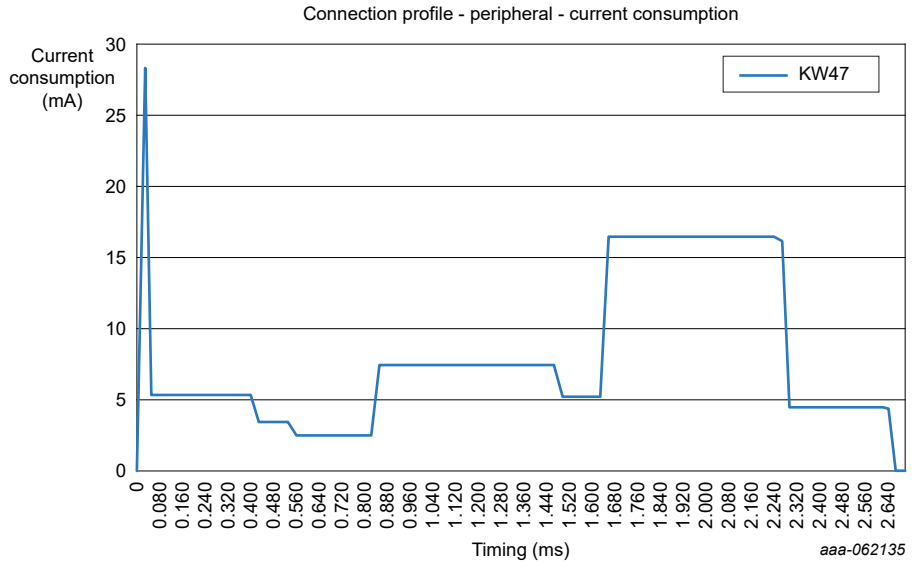

Figure 61. Connection current profile, +10 dBm, Buck mode, 125 kbit/s

Table 43. Connection power consumption, +10 dBm, Buck mode, 125 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	28.400 mA	0.710 mA-ms
	CONN pre-processing	0.375 ms	5.352 mA	2.007 mA-ms
	CONN MCU running	0.150 ms	3.400 mA	0.510 mA-ms
	MCU-WFI	0.200 ms	2.520 mA	0.504 mA-ms
	RX warm-up	0.080 ms	1.991 mA	0.159 mA-ms
	Rx	0.640 ms	7.435 mA	4.758 mA-ms
	RX to TX transition	0.150 ms	5.190 mA	0.778 mA-ms
	TX (+10 dBm)	0.640 ms	16.465 mA	10.537 mA-ms
	TX warm-down	0.020 ms	2.096 mA	0.042 mA-ms
	CONN Post-process	0.360 ms	4.493 mA	1.617 mA-ms
	Active Consumption	2.640 ms	Avg = 8.191 mA	21.623 mA-ms
	DSM duration	27.360	0.004200 mA	0.115 mA-ms
	SUM	30.000 ms	Total	21.738 mA-ms
			Charge Integral	6.04 nAh
			Current (mA)	0.7246 mA
			Power Consumption (mW)	2.391 mW

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4.2.2.6.4.3 Bypass, connection +0 dBm, 125 kbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is connection. The radio Tx output power is set to +0 dBm. The data rate is set to 125 kbit/s.

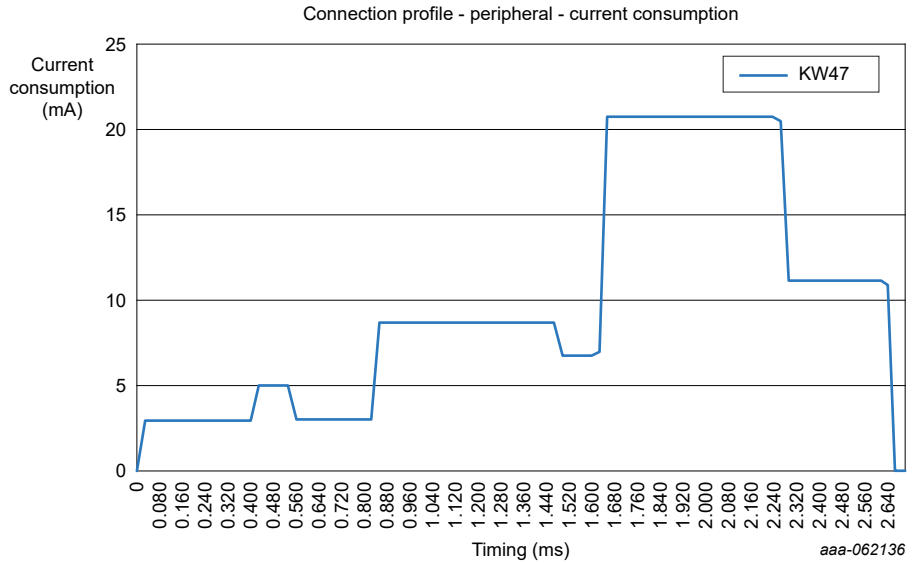

Figure 62. Connection current profile, +0 dBm, Bypass mode, 125 kbit/s

Table 44. Connection power consumption, +0 dBm, Bypass mode, 125 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	3.731 mA	0.093 mA-ms
	CONN pre-processing	0.375 ms	3.731 mA	1.399 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.148 mA	0.092 mA-ms
	Rx	0.640 ms	8.479 mA	5.427 mA-ms
	RX to TX transition	0.150 ms	6.549 mA	0.982 mA-ms
	TX (+0 dBm)	0.640 ms	10.279 mA	6.579 mA-ms
	TX warm-down	0.020 ms	0.900 mA	0.018 mA-ms
	CONN Post-process	0.360 ms	7.719 mA	2.779 mA-ms
	Active Consumption	2.640 ms	Avg = 7.090 mA	18.719 mA-ms
	DSM duration	27.360	0.005683 mA	0.155 mA-ms
	SUM	30.000 ms	Total	18.874 mA-ms
			Charge Integral	5.24 nAh
			Current (mA)	0.6291 mA
		Power Consumption (mW)		2.076 mW

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4.2.2.6.4.4 Bypass, connection +10 dBm, 125 kbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is connection. The radio Tx output power is set to +10 dBm. The data rate is set to 125 kbit/s.

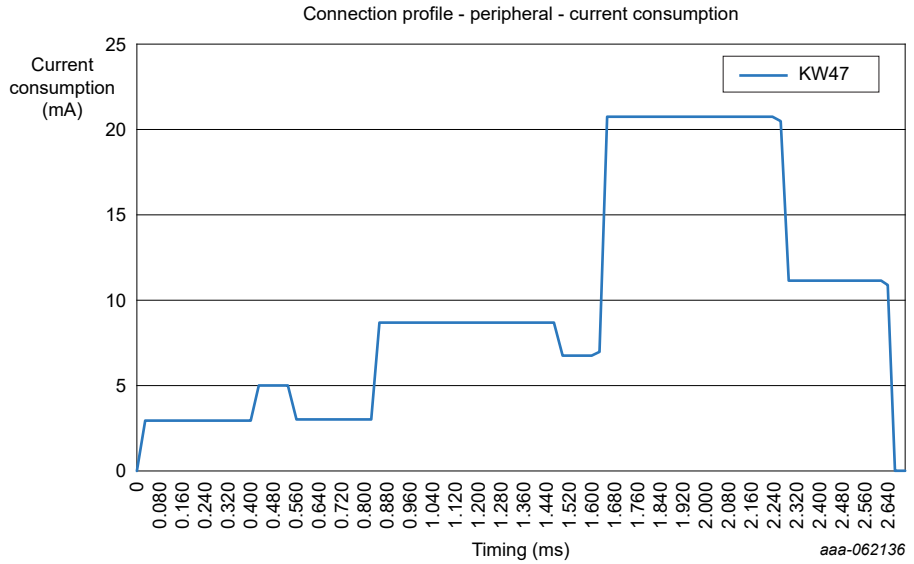

Figure 63. Connection current profile, +10 dBm, Bypass mode, 125 kbit/s

Table 45. Connection power consumption, +10 dBm, Bypass mode, 125 kbit/s

CONNECTION (1 packet exchange)				
	Connection Interval	**30.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
CONNECTION	Power up	0.025 ms	2.985 mA	0.075 mA-ms
	CONN pre-processing	0.375 ms	2.985 mA	1.119 mA-ms
	CONN MCU running	0.150 ms	5.000 mA	0.750 mA-ms
	MCU-WFI	0.200 ms	3.000 mA	0.600 mA-ms
	RX warm-up	0.080 ms	1.171 mA	0.094 mA-ms
	Rx	0.640 ms	8.707 mA	5.572 mA-ms
	RX to TX transition	0.150 ms	6.777 mA	1.017 mA-ms
	TX (+10 dBm)	0.640 ms	20.747 mA	13.278 mA-ms
	TX warm-down	0.020 ms	1.597 mA	0.032 mA-ms
	CONN Post-process	0.360 ms	11.187 mA	4.027 mA-ms
	Active Consumption	2.640 ms	Avg = 10.062 mA	26.564 mA-ms
	DSM duration	27.360	0.005683 mA	0.155 mA-ms
	SUM	30.000 ms	Total	26.719 mA-ms
			Charge Integral	7.42 nAh
			Current (mA)	0.8906 mA
		Power Consumption (mW)		2.939 mW

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4.2.2.6.5 Summary

This section provides the Connect mode summary.

Table 46. Connect current consumption (MCU DSM, flash doze)

48 MHz clock using 32 kHz crystal	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
	DSM2	DSM2
	T = 25 °C	
CONN preprocessing 1 Mbit/s	-	-
CONN preprocessing 2 Mbit/s	-	-
CONN preprocessing 500 kbit/s	-	-
CONN preprocessing 125 kbit/s	-	-

Table 47. Connect timing (MCU DSM2, flash doze)

Radio/profile timing parameters (ms)	Buck mode (3 V)	Bypass mode (3 V)
48 MHz clock using 32 kHz crystal	DSM2	DSM2
	T = 25 °C	
Conn preprocessing time 1 Mbit/s	0.750 ms	0.750 ms
Conn postprocessing time 1 Mbit/s	0.360 ms	0.360 ms
Conn preprocessing time 2 Mbit/s	0.750 ms	0.750 ms
Conn postprocessing time 2 Mbit/s	0.360 ms	0.360 ms
Conn preprocessing time 500 kbit/s	0.750 ms	0.750 ms
Conn postprocessing time 500 kbit/s	0.360 ms	0.360 ms
Conn preprocessing time 125 kbit/s	0.750 ms	0.750 ms
Conn postprocessing time 125 kbit/s	0.360 ms	0.360 ms

Table 48. Connect current consumption event

Connect	DC-DC mode	DSM2 Vdcdc_in = 3 V		
1 Mbit/s	Buck	1.536 ms	4.361 mA	1.861 nAh
	Bypass	1.536 ms	5.598 mA	2.389 nAh
2 Mbit/s	Buck	1.456 ms	3.383 mA	1.368 nAh
	Bypass	1.456 ms	4.071 mA	1.646 nAh
LR S2, 500 kbit/s	Buck	1.712 ms	4.626 mA	2.200 nAh
	Bypass	1.712 ms	7.716 mA	3.670 nAh
LR S8, 125 kbit/s	Buck	2.768 ms	5.495 mA	4.225 nAh
	Bypass	2.768 ms	10.310 mA	7.928 nAh

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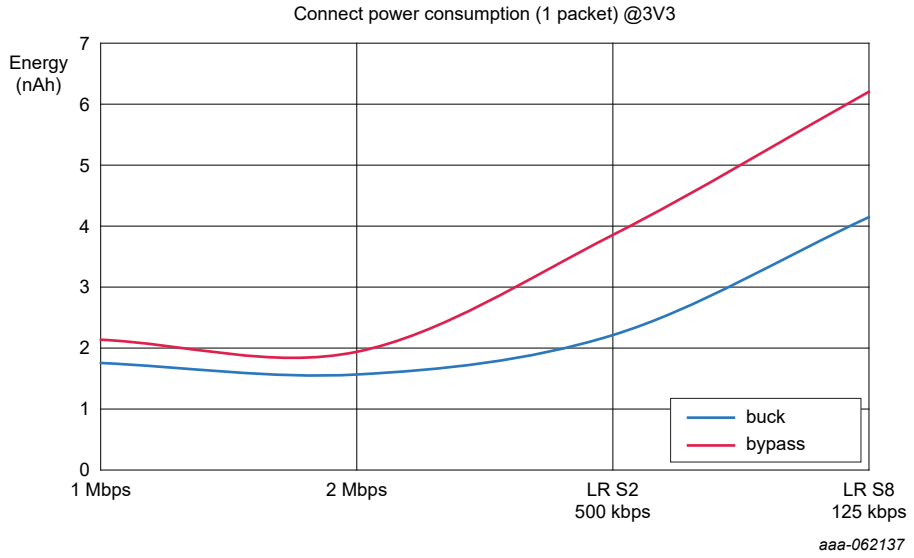

Figure 64. Connect profile vs data rate and DC-DC modes, DSM (MCU DSM2, flash doze)

4.2.2.7 Scan mode

Using the steps provided in Section 3.2, a partial Bluetooth LE scenario (Temperature Collector application) is captured and shown in Figure 65. The main events and phases are documented within the capture. All the plots that follow depict the current.

Both use cases are used:

- The DSM mode is activated between the scan events.

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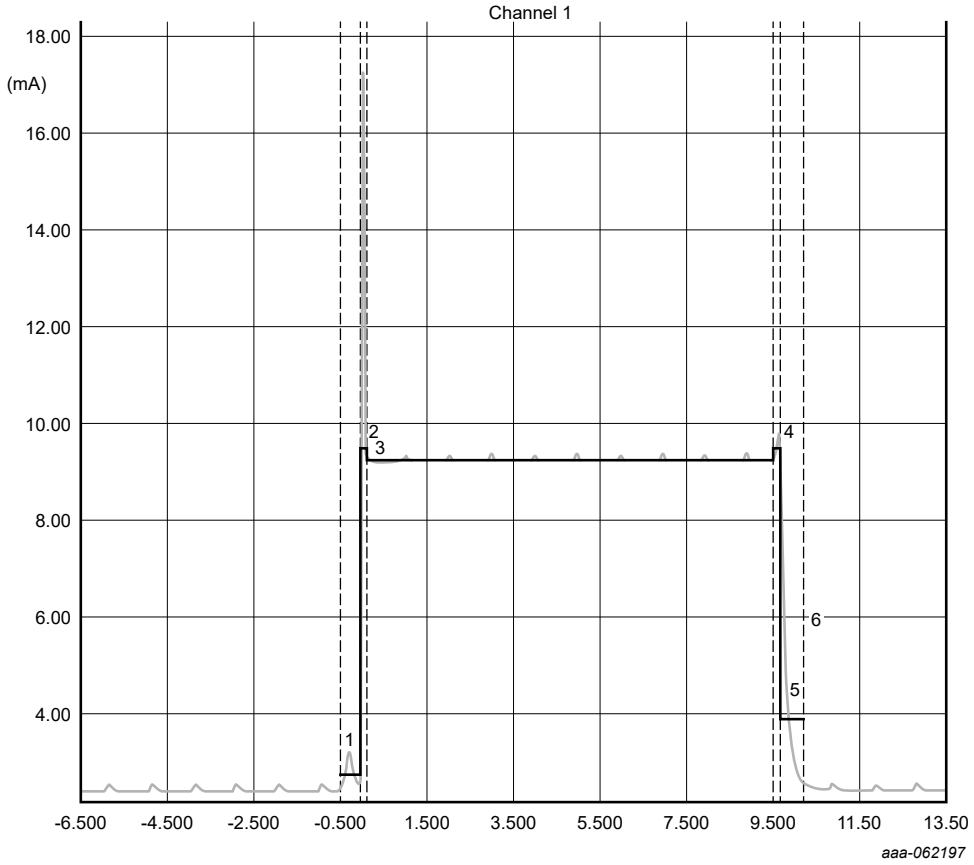

Figure 65. Current consumption - Scan event period

Table 49. Scan events

Event
1. Preprocessing
2. RX warmup
3. Active RX
4. RX warmdown
5. Postprocessing

The figures in the following sections capture the current consumption during the scan event.

The binary file settings used are as follows:

- 48 MHz clock
- Scan
- Vdd_RF at 1.25 V (equivalent to +0 dBm) and 2.4 V (equivalent to +10 dBm)
- Data rate at 1 Mbit/s
- 32 k RAM core0 retained
- 160 k RAM NBU retained
- 96 k RAM DVP-V retained

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Table 50. Scan event

DC-DC mode	Buck	Bypass
Supply	Vdd_DCDC = 3V3 Vdd_RF = 1.25 V Vdd_LDO_Core = 1.25 V	Vdd_RF = 3V3 Vdd_LDO_Core = 3V3
Vdcdc_out voltage (RF output power)	1.25 V (+0 dBm) and 2.4 V (+10 dBm)	
MCU clock mode	48 MHz	
RAM size	RAM retained: (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	
Data rate	1 Mbit/s	
Payload	N/A	
Connectable	Yes	
Flash:	Doze	
CM33:	Deep-sleep mode	
Setting:	Scan from low-power DSM Central	
Software:	LP_Central (SDK 25.06)	

Buck mode:

- Wake up from the Low-power Deep-sleep mode.

4.2.2.7.1 Buck, scan, DCDC_output = 1V25

The DCDC is in Buck mode. The Bluetooth LE event considered is Scan. The DCDC voltage output is set to 1.25 V.

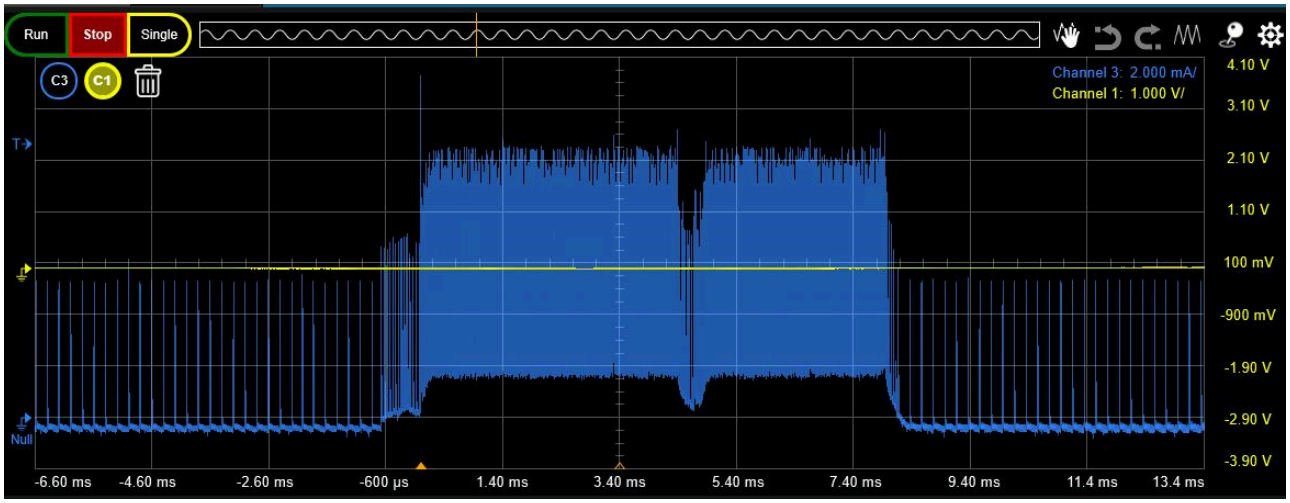

Figure 66. Scan current profile, DCDC_out = 1.25 V (+0 dBm), Buck mode

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Table 51. Scan power consumption, DCDC_out = 1.25 V (+0 dBm), Buck mode

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
SCAN	Scan pre-processing	0.670 ms	1.690 mA	1.132 mA-ms
	RX warm-up	0.080 ms	3.405 mA	0.272 mA-ms
	Rx Scan	50.000 ms	5.120 mA	256.000 mA-ms
	RX warm-down	0.020 ms	3.608 mA	0.072 mA-ms
	Scan Post-process	0.300 ms	2.095 mA	0.629 mA-ms
	Active Consumption	51.070 ms	Avg = 5.054 mA	258.105 mA-ms
	DSM duration	48.93	0.004200 mA	0.206 mA-ms
	SUM	100.000 ms	Total	258.311 mA-ms
			Charge Integral	71.75 nAh
			Current (mA)	2.5831 mA
			Power Consumption (mW)	8.524 mW

4.2.2.7.2 Buck, scan, DCDC_output = 2V4

The DCDC is in Buck mode. The Bluetooth LE event considered is Scan. The DCDC voltage output is set to 2.4 V.

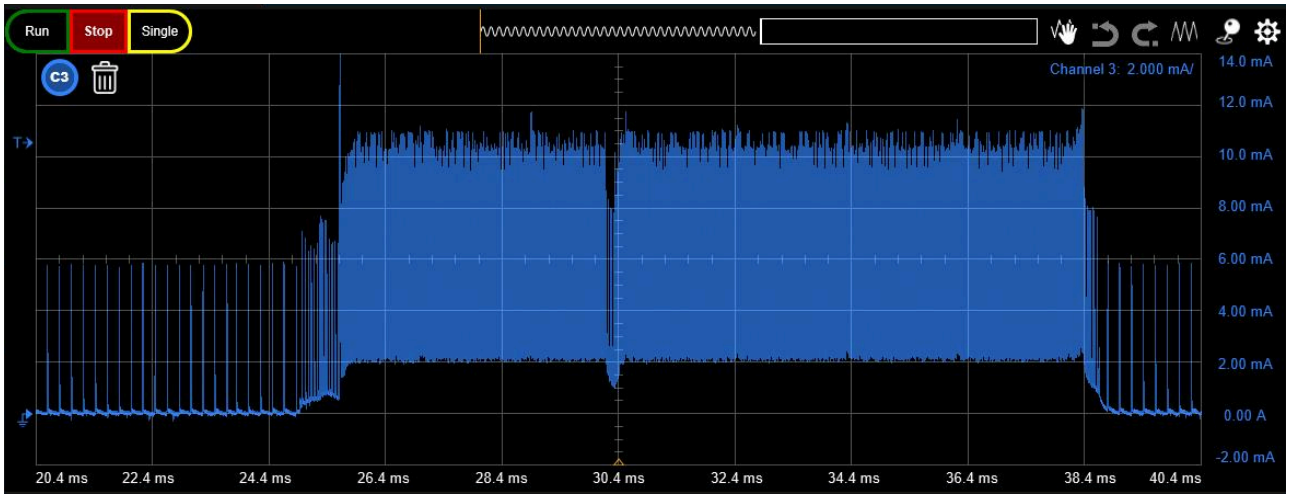

Figure 67. Scan current profile, DCDC_out = 2.4 V (+10 dBm), Buck mode

Table 52. Scan power consumption, DCDC_out = 2.4 V (+10 dBm), Buck mode

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
SCAN	Scan pre-processing	0.670 ms	8.664 mA	5.805 mA-ms
	RX warm-up	0.080 ms	8.777 mA	0.702 mA-ms

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Table 52. Scan power consumption, DCDC_out = 2.4 V (+10 dBm), Buck mode...*continued*

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx Scan	50.000 ms	8.890 mA	444.500 mA-ms
	RX warm-down	0.020 ms	5.787 mA	0.116 mA-ms
	Scan Post-process	0.300 ms	2.685 mA	0.805 mA-ms
	Active Consumption	51.070 ms	Avg = 8.849 mA	451.928 mA-ms
	DSM duration	48.93	0.004200 mA	0.206 mA-ms
	SUM	100.000 ms	Total	452.134 mA-ms
			Charge Integral	125.59 nAh
			Current (mA)	4.5213 mA
			Power Consumption (mW)	14.920 mW

Bypass mode:

- Wake up from the Low-power Deep-sleep mode.

4.2.2.7.3 Bypass, scan, DCDC_output = 1V25

The DCDC is in Bypass mode. The Bluetooth LE event considered is Scan. The DCDC voltage output is set to 1.25 V.

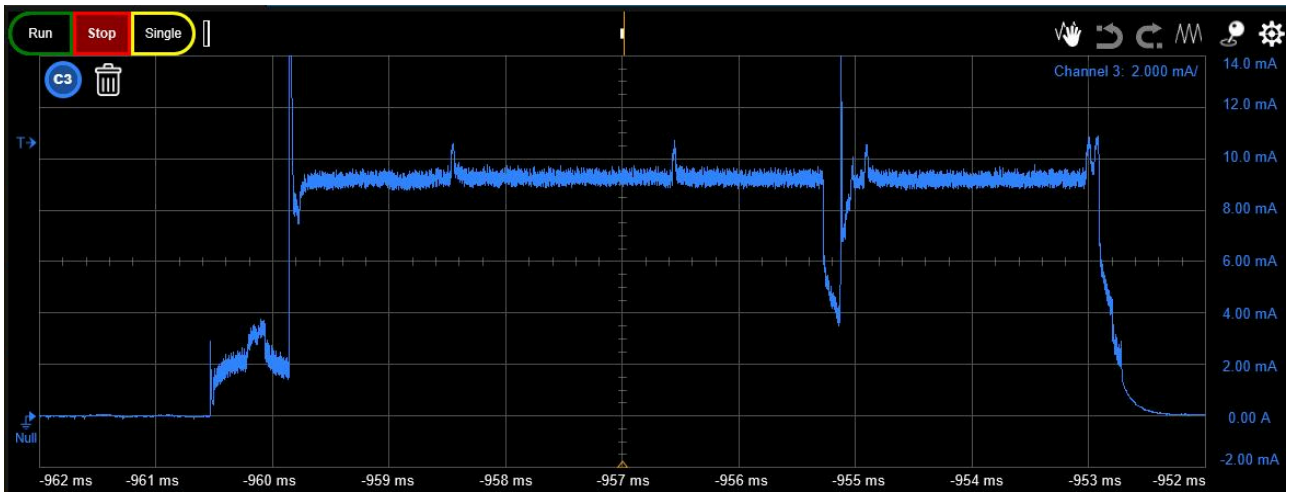

Figure 68. Scan current profile, DCDC_out = 1.25 V, Bypass mode

Table 53. Scan power consumption, DCDC_out = 1.25 V (+0 dBm), Bypass mode

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
SCAN	Scan pre-processing	0.670 ms	0.736 mA	0.493 mA-ms
	RX warm-up	0.080 ms	5.193 mA	0.415 mA-ms

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Table 53. Scan power consumption, DCDC_out = 1.25 V (+0 dBm), Bypass mode*...continued*

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx Scan	50.000 ms	9.650 mA	482.500 mA-ms
	RX warm-down	0.020 ms	6.047 mA	0.121 mA-ms
	Scan Post-process	0.300 ms	2.444 mA	0.733 mA-ms
	Active Consumption	51.070 ms	Avg = 9.482 mA	484.263 mA-ms
	DSM duration	48.93	0.005683 mA	0.278 mA-ms
	SUM	100.000 ms	Total	484.541 mA-ms
			Charge Integral	134.59 nAh
			Current (mA)	4.8454 mA
		Power Consumption (mW)		15.990 mW

4.2.2.7.4 Bypass, scan, DCDC_output = 2V4

The DCDC is in Bypass mode. The Bluetooth LE event considered is Scan. The DCDC voltage output is set to 2.4 V.

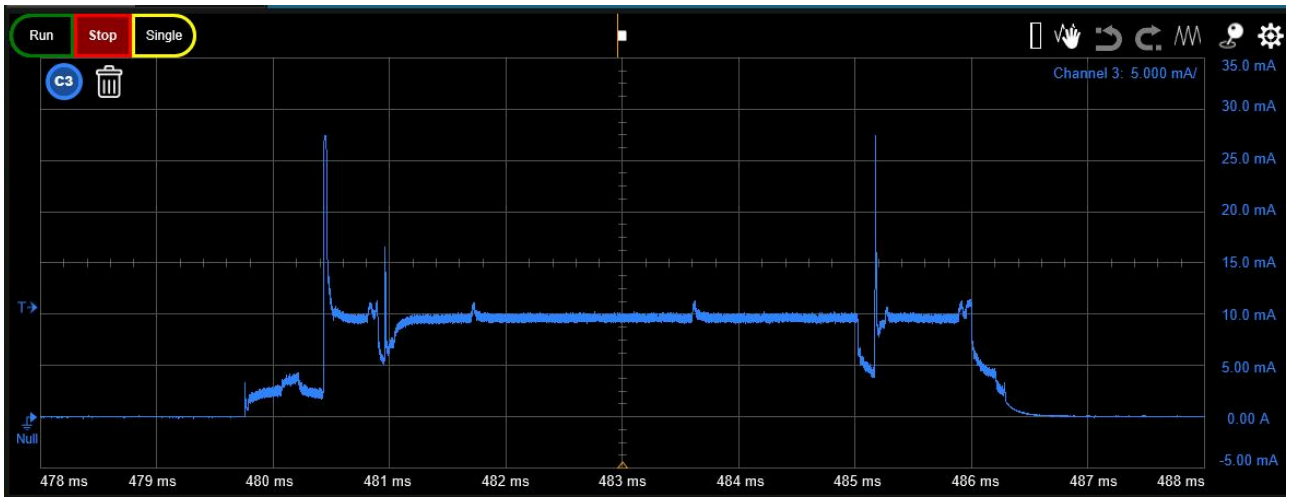

Figure 69. Scan current profile, DCDC_out = 2.4 V, Bypass mode

Table 54. Scan current profile, DCDC_out = 2.4 V, Bypass mode

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
SCAN	Scan pre-processing	0.670 ms	0.898 mA	0.602 mA-ms
	RX warm-up	0.080 ms	5.479 mA	0.438 mA-ms
	Rx Scan	50.000 ms	10.060 mA	503.000 mA-ms
	RX warm-down	0.020 ms	6.801 mA	0.136 mA-ms
	Scan Post-process	0.300 ms	3.543 mA	1.063 mA-ms

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Table 54. Scan current profile, DCDC_out = 2.4 V, Bypass mode*...continued*

SCANNING				
	Scanning Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Active Consumption	51.070 ms	Avg = 9.893 mA	505.239 mA-ms
	DSM duration	48.93	0.005683 mA	0.278 mA-ms
	SUM	100.000 ms	Total	505.517 mA-ms
			Charge Integral	140.42 nAh
			Current (mA)	5.0552 mA
		Power Consumption (mW)		16.682 mW

4.2.2.7.5 Summary

This section provides the scan current consumption summary.

Table 55. Scan current timing (MCU DSM2, flash doze)

Radio/profile timing parameters (ms)	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
	DSM	
48 MHz using 32 kHz crystal	**T = 25 °C**	
SCAN preprocessing time	1.900 ms	1.900 ms
SCAN postprocessing time	0.150 ms	0.150 ms

Table 56. Scan current consumption event

-	DC-DC mode	DSM Vdcdc_in = 3V3		
Scan	Buck	6.150 ms	5.672 mA	10.08 nAh
	Bypass	6.150 ms	21.829 mA	22.01 nAh

4.3 Advertising extension

The Bluetooth 5.x transmits the advert packets in the data channels. Although the specification prefers to label them as “secondary advert channels”:

- Increases advertising data length
- Allows advertising on data channels
- Enables long-range connection establishment
- Enables chaining and periodic advertising

In this case, the new primary advert points to an auxiliary packet, which specifies a “connectionless” train of packets that hops at a known cadence.

The cadence information and the access address code are provided by that auxiliary packet.

The figures in the following section capture the current consumption during the:

- Advertising events at 1 Mbit/s, 2 Mbit/s, and coded.

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- Advertising extension event using the data rate at 1 Mbit/s, 2 Mbit/s, and coded. The bypass mode graphs are provided as an example.

The binary file settings used are as follows:

- 48 MHz clock
- Advertising extension with protocol data unit (PDU) 8 bytes for channels 37, 38, and 39
- Advertising extension with PDU Y bytes (31-byte payload) and connectable
- RF output of +0 dBm and +10 dBm

Buck mode:

- Wake up from the Low-power Deep-sleep mode.

Bypass mode:

- Wake up from the Low-power Deep-sleep mode.

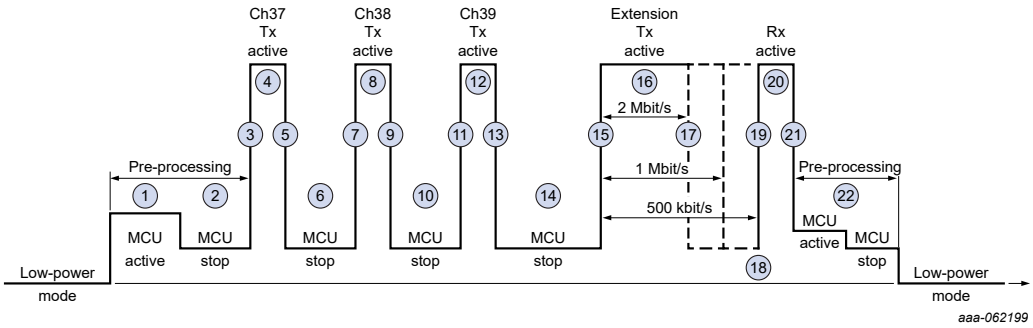

Figure 70. Current consumption - advertising event period

Table 57. Advertising extension event

Sequence number	Event type
1	Preprocessing/MCU active
2	Preprocessing/MCU stop
3	TX warm-up
4	TX active
5	TX warm-down
6	MCU stop
7	TX warm-up
8	TX active
9	TX warm-down
10	MCU stop
11	TX warm-up
12	TX active
13	TX warm-down
14	MCU stop
15	TX warm-up
16	TX active
17	TX warm-down

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Table 57. Advertising extension event*...continued*

Sequence number	Event type
18	TX to RX
19	RX warm-up
20	RX active
21	RX warm-down
22	Postprocessing

Table 58. Advertising extension

DC-DC mode	Buck mode	Bypass mode
Supply	Vdd_DCDC = 3V3 Vdd_RF = 1.25 V Vdd_LDO_Core = 1.25 V	Vdd_RF = 3V3 Vdd_LDO_Core = 3V3
RF output power	+0 dBm and +10 dBm	
MCU clock mode	48 MHz	
RAM size	RAM retained: (32 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	
Data rate	1 Mbit/s 1 Ms/s	
Payload	• For channel 37, channel 38, and channel 39: PDU size 31 bytes (31-byte payload) • For secondary channels: PDU size 2, payload size TX 31 bytes, RX 0 bytes	
Connectable	Yes	
Flash	Doze	
MCU	DSM	
Setting	Advertise from low-power DSM peripheral to central	
Software	Low Power (SDK 25.06)	

4.3.1 Buck, extended advertising, +0 dBm, 1 Mbit/s, 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 1 Mbit/s for the extension.

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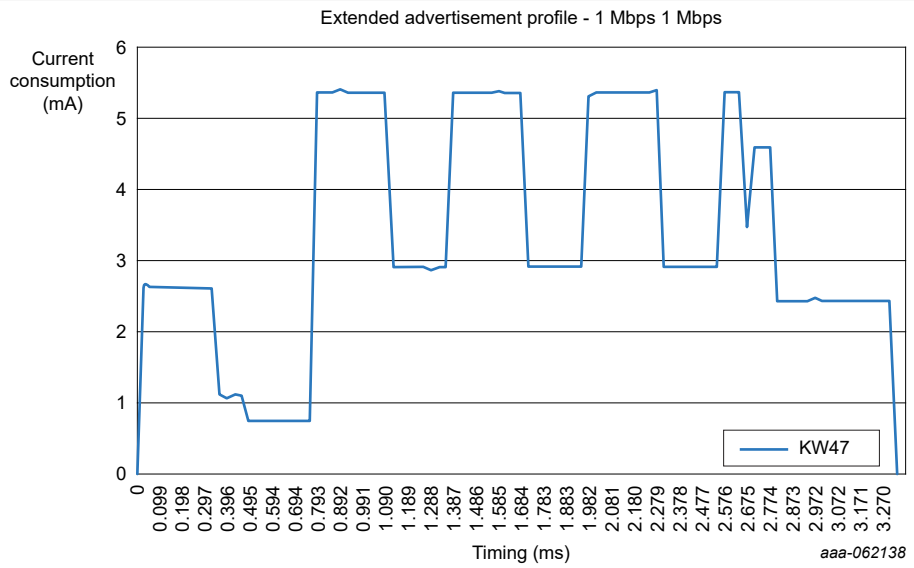

Figure 71. Extended advertising current profile, +0 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s

Table 59. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	2.606 mA	0.404 mA-ms
	Preprocessing	0.175 ms	2.606 mA	0.456 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	2.655 mA	0.212 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.096 ms	5.360 mA	0.515 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms

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Table 59. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s...*continued*

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.080 ms	4.590 mA	0.367 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	0.500 ms	2.434 mA	1.217 mA-ms
	Active Consumption	3.270 ms	Avg = 3.459 mA	11.309 mA-ms
	DSM duration	96.730 ms	0.004200 mA	0.406 mA-ms
	SUM	100.000 ms	Total	11.716 mA-ms
			Charge Integral	3.25 nAh
			Current (mA)	0.1172 mA
			Power Consumption (mW)	0.387 mW

4.3.2 Buck, extended advertising, +10 dBm, 1 Mbit/s, 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 1 Mbit/s for the extension.

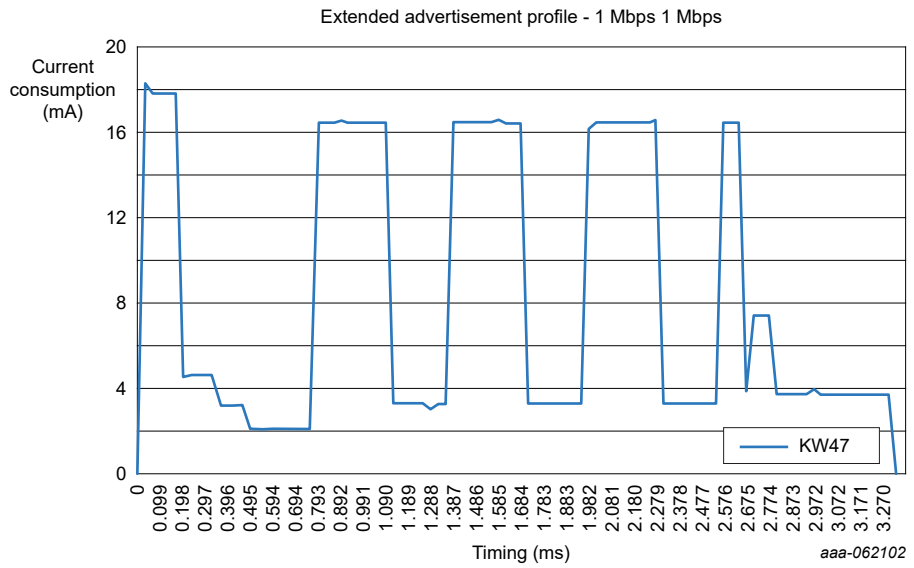

Figure 72. Extended advertising current profile, +10 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s

Table 60. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	4.598 mA	0.805 mA-ms

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Table 60. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, 1 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.096 ms	16.465 mA	1.581 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms
	Rx - Aux channel	0.080 ms	7.435 mA	0.595 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	0.500 ms	3.744 mA	1.872 mA-ms
	Active Consumption	3.270 ms	Avg = 9.083 mA	29.702 mA-ms
	DSM duration	96.730 ms	0.004200 mA	0.406 mA-ms
	SUM	100.000 ms	Total	30.108 mA-ms
			Charge Integral	8.36 nAh
			Current (mA)	0.3011 mA
			Power Consumption (mW)	0.994 mW

4.3.3 Bypass, extended advertising, +0 dBm, 1 Mbit/s, 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 1 Mbit/s for the extension.

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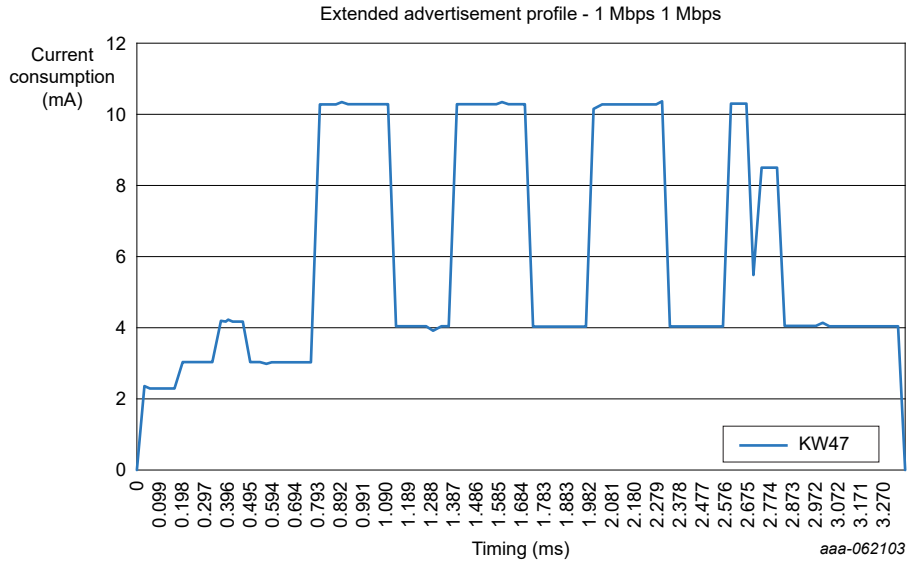

Figure 73. Extended advertising current profile, +0 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s

Table 61. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	1.227 mA	0.190 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	2.301 mA	0.184 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.096 ms	10.279 mA	0.987 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms

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Table 61. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.080 ms	8.479 mA	0.678 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	0.500 ms	4.074 mA	2.037 mA-ms
	Active Consumption	3.270 ms	Avg = 5.948 mA	19.449 mA-ms
	DSM duration	96.730 ms	0.005683 mA	0.550 mA-ms
	SUM	100.000 ms	Total	19.998 mA-ms
			Charge Integral	5.56 nAh
			Current (mA)	0.2000 mA
		Power Consumption (mW)		0.660 mW

4.3.4 Bypass, extended advertising, +10 dBm, 1 Mbit/s, 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 1 Mbit/s for the extension.

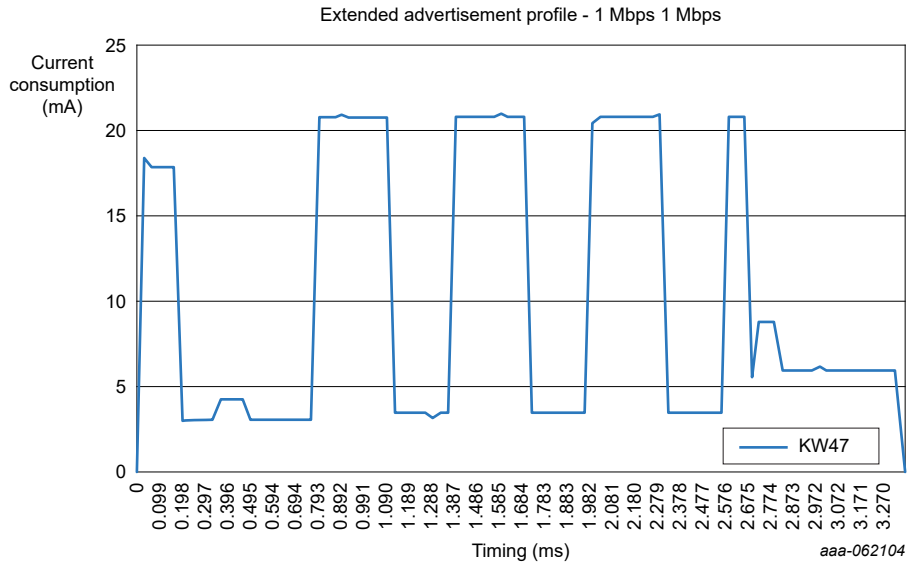

Figure 74. Extended advertising current profile, +10 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s

Table 62. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
Extended Advertising	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 62. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, 1 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time (ms)**	**Current (mA)**	**mA x ms**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.096 ms	20.747 mA	1.992 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms
	RX - Aux channel	0.080 ms	8.707 mA	0.697 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	0.500 ms	5.904 mA	2.952 mA-ms
	Active Consumption	3.270 ms	Avg = 10.765 mA	35.202 mA-ms
	DSM duration	96.730 ms	0.005683 mA	0.550 mA-ms
	SUM	100.000 ms	Total	35.752 mA-ms
			Charge Integral	9.93 nAh
			Current (mA)	0.3575 mA
		Power Consumption (mW)		1.180 mW

4.3.5 Buck, extended advertising, +0 dBm, 1 Mbit/s, 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 2 Mbit/s for the extension.

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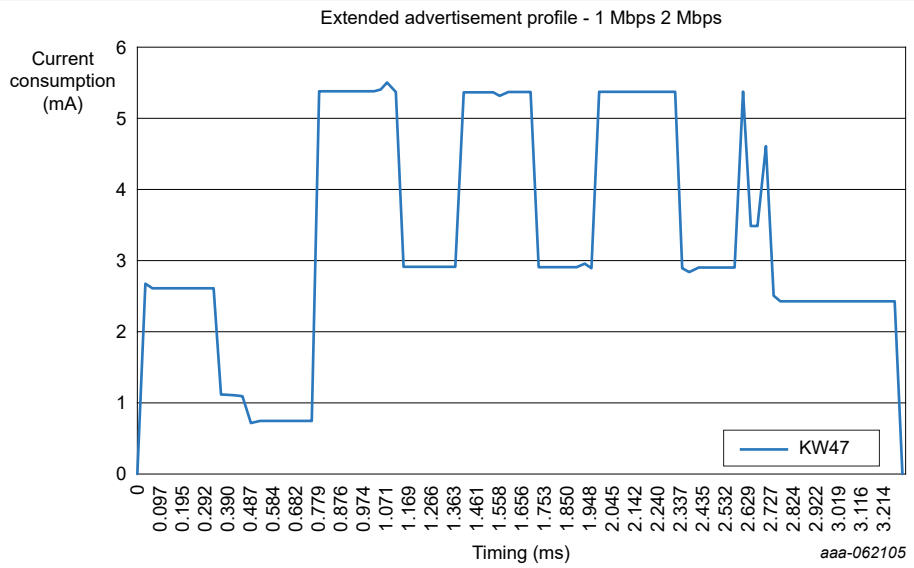

Figure 75. Extended advertising current profile, +0 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s

Table 63. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	2.606 mA	0.404 mA-ms
	Preprocessing	0.175 ms	2.606 mA	0.456 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	2.655 mA	0.212 mA-ms
	TX (+0 dBm)	0.336 ms	5.360 mA	1.801 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.336 ms	5.360 mA	1.801 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.336 ms	5.360 mA	1.801 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.052 ms	5.360 mA	0.279 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms

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Table 63. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s...*continued*

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.044 ms	4.590 mA	0.202 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	0.500 ms	2.434 mA	1.217 mA-ms
	Active Consumption	3.214 ms	Avg = 3.434 mA	11.037 mA-ms
	DSM duration	96.786 ms	0.004200 mA	0.407 mA-ms
	SUM	100.000 ms	Total	11.443 mA-ms
			Charge Integral	3.18 nAh
			Current (mA)	0.1144 mA
			Power Consumption (mW)	0.378 mW

4.3.6 Buck, extended advertising, +10 dBm, 1 Mbit/s, 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 2 Mbit/s for the extension.

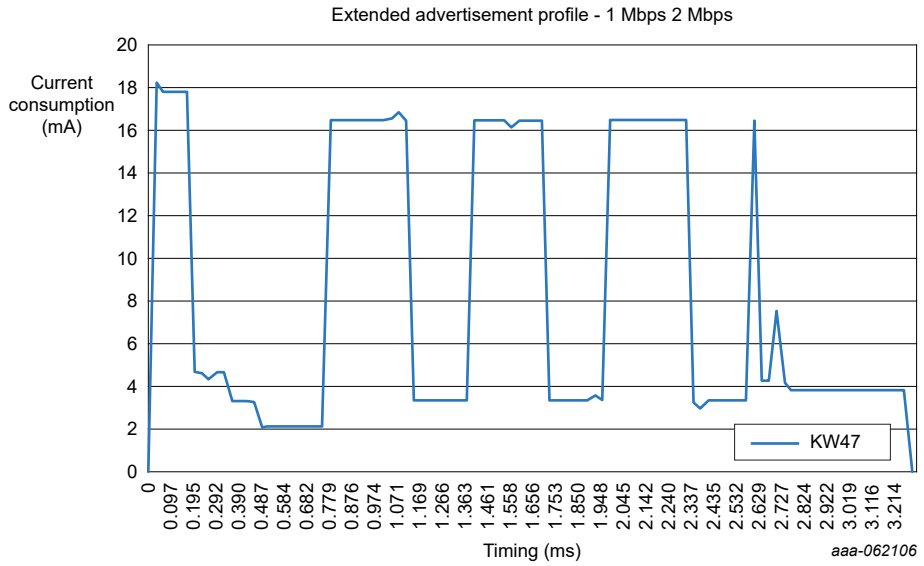

Figure 76. Extended advertising current profile, +10 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s

Table 64. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	4.598 mA	0.805 mA-ms

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Table 64. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, 2 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.336 ms	16.465 mA	5.532 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.336 ms	16.465 mA	5.532 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.336 ms	16.465 mA	5.532 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.052 ms	16.465 mA	0.856 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms
	Rx - Aux channel	0.044 ms	7.435 mA	0.327 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	0.500 ms	3.744 mA	1.872 mA-ms
	Active Consumption	3.214 ms	Avg = 9.056 mA	29.105 mA-ms
	DSM duration	96.786 ms	0.004200 mA	0.407 mA-ms
	SUM	100.000 ms	Total	29.512 mA-ms
			Charge Integral	8.20 nAh
			Current (mA)	0.2951 mA
			Power Consumption (mW)	0.974 mW

4.3.7 Bypass, extended advertising, +0 dBm, 1 Mbit/s, 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 2 Mbit/s for the extension.

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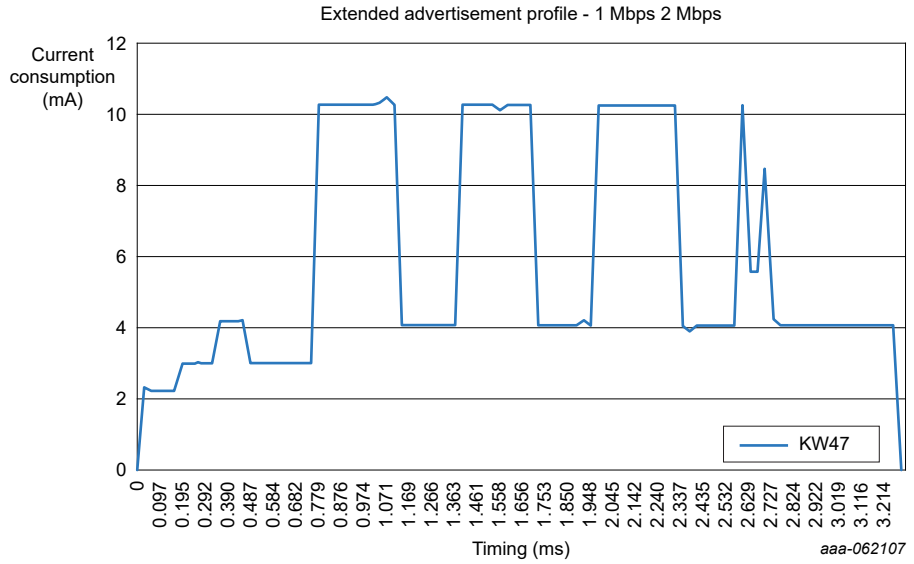

Figure 77. Extended Advertising current profile, +0 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s

Table 65. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	2.245 mA	0.348 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	2.505 mA	0.200 mA-ms
	TX (+0 dBm)	0.336 ms	10.279 mA	3.454 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.336 ms	10.279 mA	3.454 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.336 ms	10.279 mA	3.454 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.052 ms	10.279 mA	0.535 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms

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Table 65. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.044 ms	8.479 mA	0.373 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	0.500 ms	4.074 mA	2.037 mA-ms
	Active Consumption	3.214 ms	Avg = 5.946 mA	19.112 mA-ms
	DSM duration	96.786 ms	0.005683 mA	0.550 mA-ms
	SUM	100.000 ms	Total	19.662 mA-ms
			Charge Integral	5.46 nAh
			Current (mA)	0.1966 mA
		Power Consumption (mW)		0.649 mW

4.3.8 Bypass, extended advertising, +10 dBm, 1 Mbit/s, 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and 2 Mbit/s for the extension.

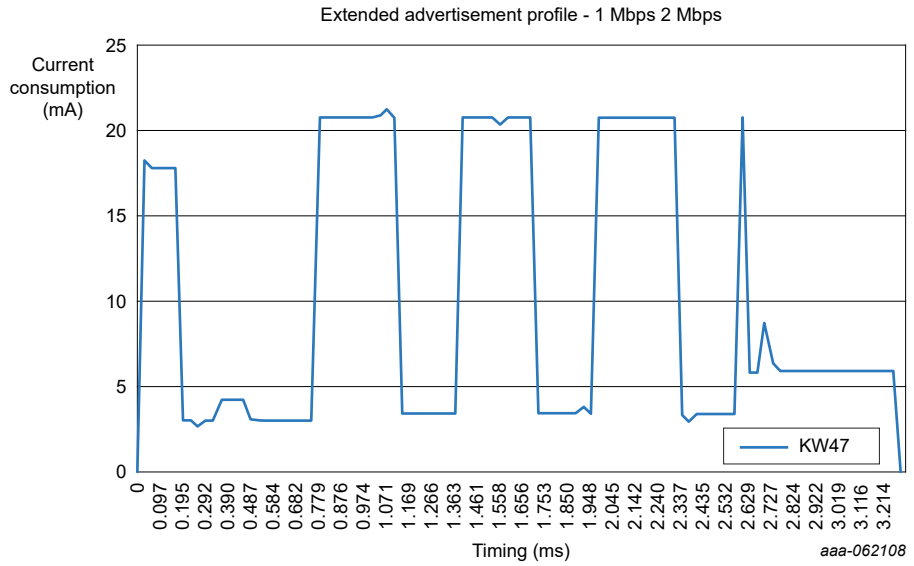

Figure 78. Extended advertising current profile, +10 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s

Table 66. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 66. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, 2 Mbit/s*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.336 ms	20.747 mA	6.971 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.336 ms	20.747 mA	6.971 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.336 ms	20.747 mA	6.971 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.052 ms	20.747 mA	1.079 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms
	Rx - Aux channel	0.044 ms	8.707 mA	0.383 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	0.500 ms	5.904 mA	2.952 mA-ms
	Active Consumption	3.214 ms	Avg = 10.726 mA	34.474 mA-ms
	DSM duration	96.786 ms	0.005683 mA	0.550 mA-ms
	SUM	100.000 ms	Total	35.024 mA-ms
			Charge Integral	9.73 nAh
			Current (mA)	0.3502 mA
		Power Consumption (mW)		1.156 mW

4.3.9 Buck, extended advertising, +0 dBm, 1 Mbit/s, coded (S2)

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and coded (S2) for the extension.

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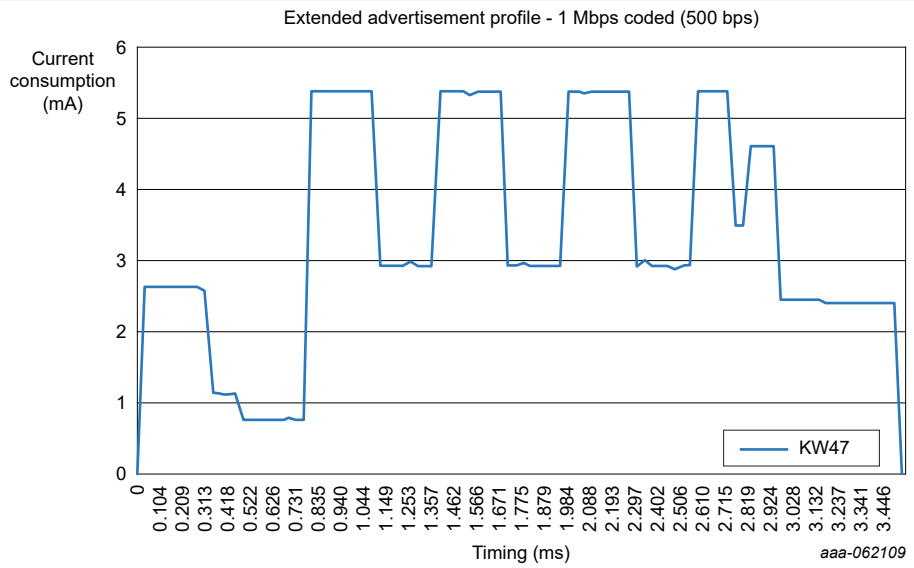

Figure 79. Extended advertising current profile, +0 dBm, Buck mode, 1 Mbit/s, coded (S2)

Table 67. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, coded (S2)

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	2.606 mA	0.404 mA-ms
	Preprocessing	0.175 ms	2.606 mA	0.456 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	2.655 mA	0.212 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.328 ms	5.360 mA	1.758 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.192 ms	5.360 mA	1.029 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms

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Table 67. Extended advertising power consumption, +0 dBm, Buck mode, 1 Mbit/s, coded (S2)*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.160 ms	4.590 mA	0.734 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	0.500 ms	2.434 mA	1.217 mA-ms
	Active Consumption	3.446 ms	Avg = 3.538 mA	12.191 mA-ms
	DSM duration	96.554 ms	0.004200 mA	0.406 mA-ms
	SUM	100.000 ms	Total	12.597 mA-ms
			Charge Integral	3.50 nAh
			Current (mA)	0.1260 mA
			Power Consumption (mW)	0.416 mW

4.3.10 Buck, extended advertising, +10 dBm, 1 Mbit/s, coded (S2)

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and coded (S2) for the extension.

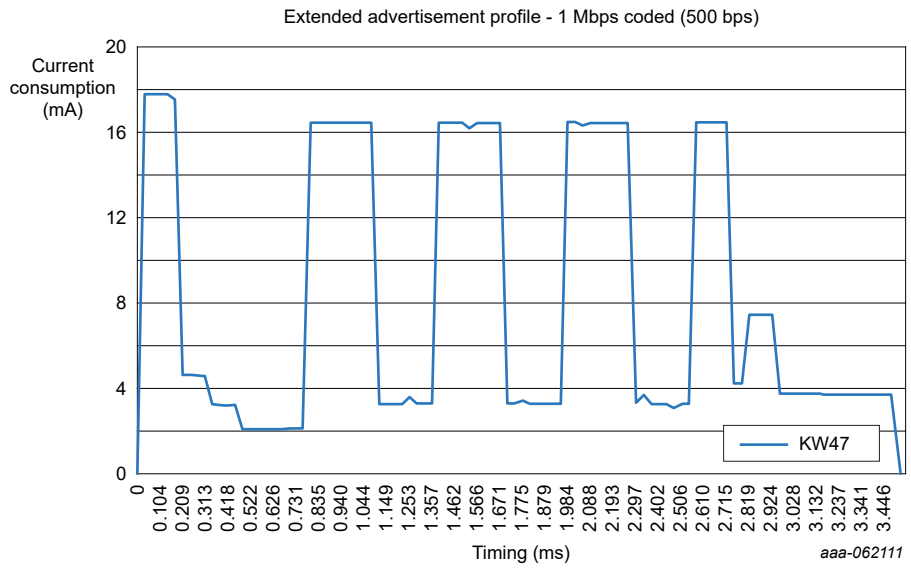

Figure 80. Extended advertising current profile, +10 dBm, Buck mode, 1 Mbit/s, coded (S2)

Table 68. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, coded (S2)

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	4.598 mA	0.805 mA-ms

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Table 68. Extended advertising power consumption, +10 dBm, Buck mode, 1 Mbit/s, coded (S2)*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.328 ms	16.465 mA	5.400 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.192 ms	16.465 mA	3.161 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms
	Rx - Aux channel	0.160 ms	7.435 mA	1.190 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	0.500 ms	3.744 mA	1.872 mA-ms
	Active Consumption	3.446 ms	Avg = 9.251 mA	31.878 mA-ms
	DSM duration	96.554 ms	0.004200 mA	0.406 mA-ms
	SUM	100.000 ms	Total	32.283 mA-ms
			Charge Integral	8.97 nAh
			Current (mA)	0.3228 mA
			Power Consumption (mW)	1.065 mW

4.3.11 Bypass, extended advertising, +0 dBm, 1 Mbit/s, coded (S2)

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to 1 Mbit/s for the standard advertising and coded (S2) for the extension.

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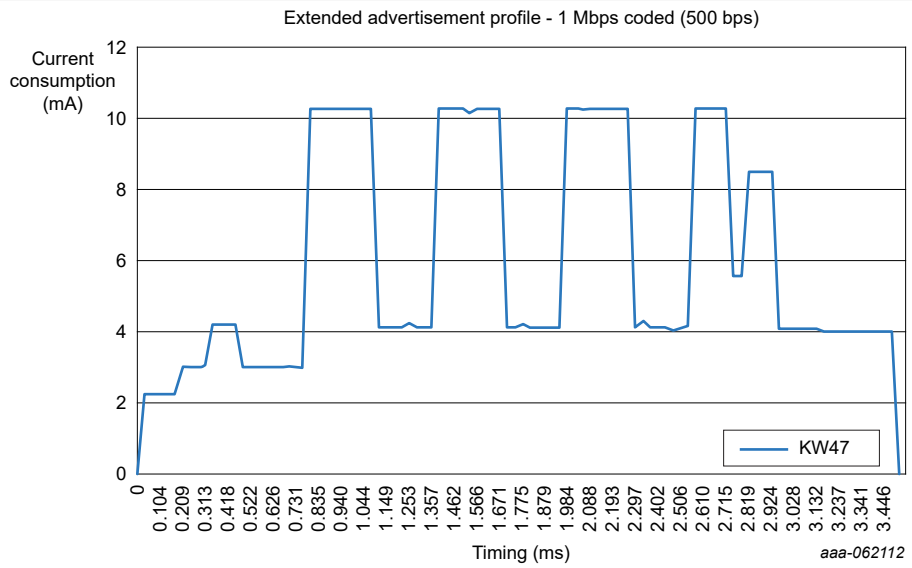

Figure 81. Extended advertising current profile, +0 dBm, Bypass mode, 1 Mbit/s, coded (S2)

Table 69. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, coded (S2)

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	2.245 mA	0.348 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	2.505 mA	0.200 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.328 ms	10.279 mA	3.372 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.192 ms	10.279 mA	1.974 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms

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Table 69. Extended advertising power consumption, +0 dBm, Bypass mode, 1 Mbit/s, coded (S2)*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.160 ms	8.479 mA	1.357 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	0.500 ms	4.074 mA	2.037 mA-ms
	Active Consumption	3.446 ms	Avg = 6.178 mA	21.288 mA-ms
	DSM duration	96.554 ms	0.005683 mA	0.549 mA-ms
	SUM	100.000 ms	Total	21.837 mA-ms
			Charge Integral	6.07 nAh
			Current (mA)	0.2184 mA
		Power Consumption (mW)		0.721 mW

4.3.12 Bypass, extended advertising, +10 dBm, 1 Mbit/s, coded (S2)

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to 1 Mbit/s for the standard advertising and coded (S2) for the extension.

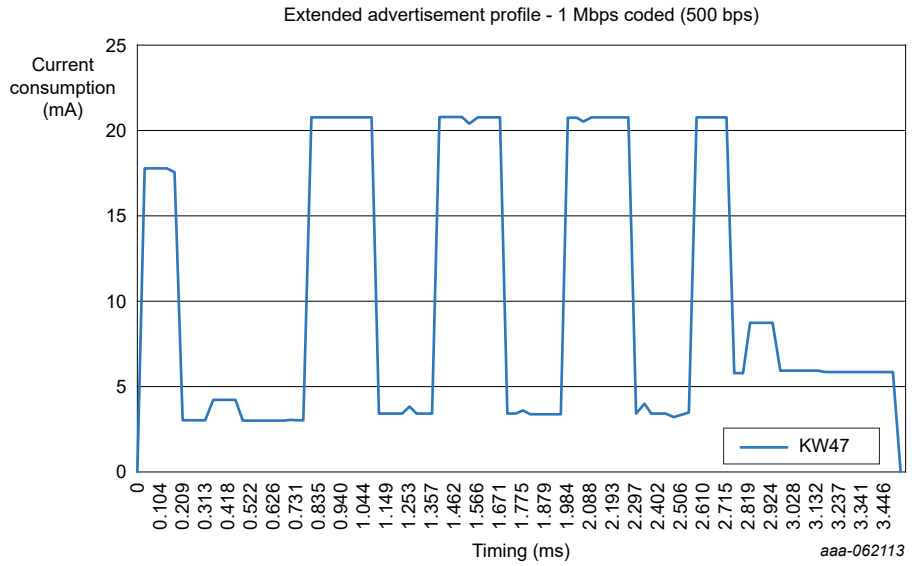

Figure 82. Extended advertising current profile, +10 dBm, Bypass mode, 1 Mbit/s, coded (S2)

Table 70. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, coded (S2)

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING long range	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.175 ms	3.000 mA	0.525 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 70. Extended advertising power consumption, +10 dBm, Bypass mode, 1 Mbit/s, coded (S2)*...continued*

Long Range ADVERTISEMENT 1 Mbit/s - Coded (S2)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.328 ms	20.747 mA	6.805 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.192 ms	20.747 mA	3.983 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms
	Rx - Aux channel	0.160 ms	8.707 mA	1.393 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	0.500 ms	5.904 mA	2.952 mA-ms
	Active Consumption	3.446 ms	Avg = 10.995 mA	37.890 mA-ms
	DSM duration	96.554 ms	0.005683 mA	0.549 mA-ms
	SUM	100.000 ms	Total	38.439 mA-ms
			Charge Integral	10.68 nAh
			Current (mA)	0.3844 mA
		Power Consumption (mW)		1.268 mW

4.3.13 Test environment: advertising extension coded 1 Mbit/s

The Bluetooth LE event considered is extended advertising. The data rates are set to coded (S2) for the standard advertising, and 1 Mbit/s for the extension.

4.3.13.1 Buck, advertising extension, +0 dBm, coded (S2), 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for the standard advertising, and 1 Mbit/s for the extension.

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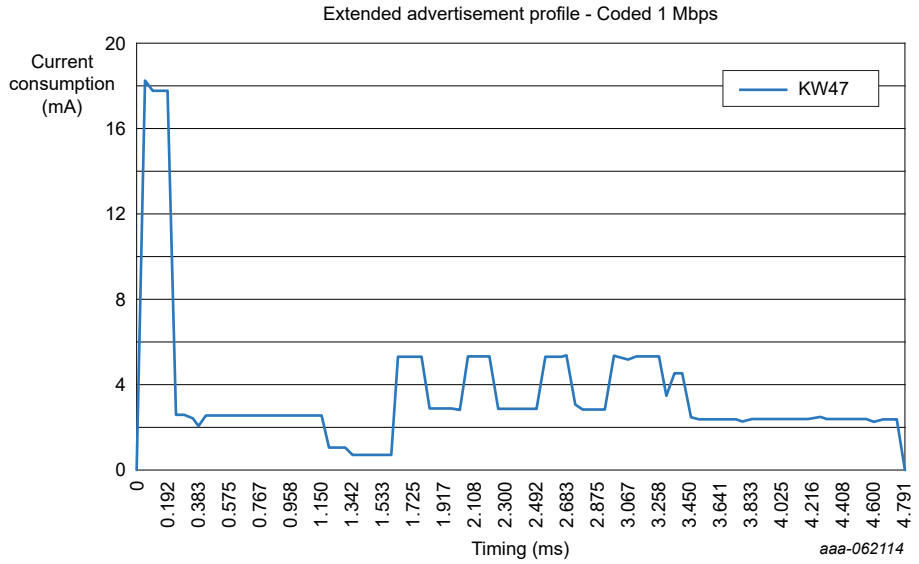

Figure 83. Extended advertising current profile, +0 dBm, Buck mode, coded (S2), 1 Mbit/s

Table 71. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2), 1 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	2.606 mA	2.593 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	7.720 mA	0.618 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.328 ms	5.360 mA	1.758 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms

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Table 71. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2), 1 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.080 ms	4.590 mA	0.367 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	1.330 ms	2.434 mA	3.237 mA-ms
	Active Consumption	4.744 ms	Avg = 3.643 mA	17.283 mA-ms
	DSM duration	95.256	0.004200 mA	0.400 mA-ms
	SUM	100.000 ms	Total	17.683 mA-ms
			Charge Integral	4.91 nAh
			Current (mA)	0.1768 mA
			Power Consumption (mW)	0.584 mW

4.3.13.2 Buck, advertising extension, +10 dBm, coded (S2), 1 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for the standard advertising, and 1 Mbit/s for the extension.

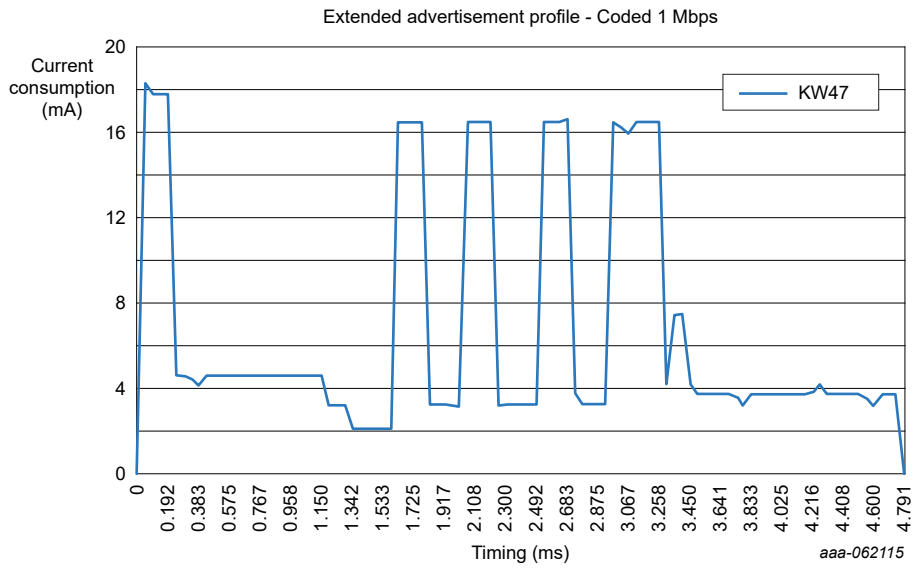

Figure 84. Extended advertising current profile, +10 dBm, Buck mode, coded (S2), 1 Mbit/s

Table 72. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2), 1 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	4.598 mA	4.575 mA-ms

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Table 72. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2), 1 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.328 ms	16.465 mA	5.400 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms
	Rx - Aux channel	0.080 ms	7.435 mA	0.595 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	1.330 ms	3.744 mA	4.980 mA-ms
	Active Consumption	4.744 ms	Avg = 7.100 mA	33.683 mA-ms
	DSM duration	95.256	0.004200 mA	0.400 mA-ms
	SUM	100.000 ms	Total	34.083 mA-ms
			Charge Integral	9.47 nAh
			Current (mA)	0.3408 mA
			Power Consumption (mW)	1.125 mW

4.3.13.3 Bypass, advertising extension, +0 dBm, coded (S2), 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for the standard advertising, and 1 Mbit/s for the extension.

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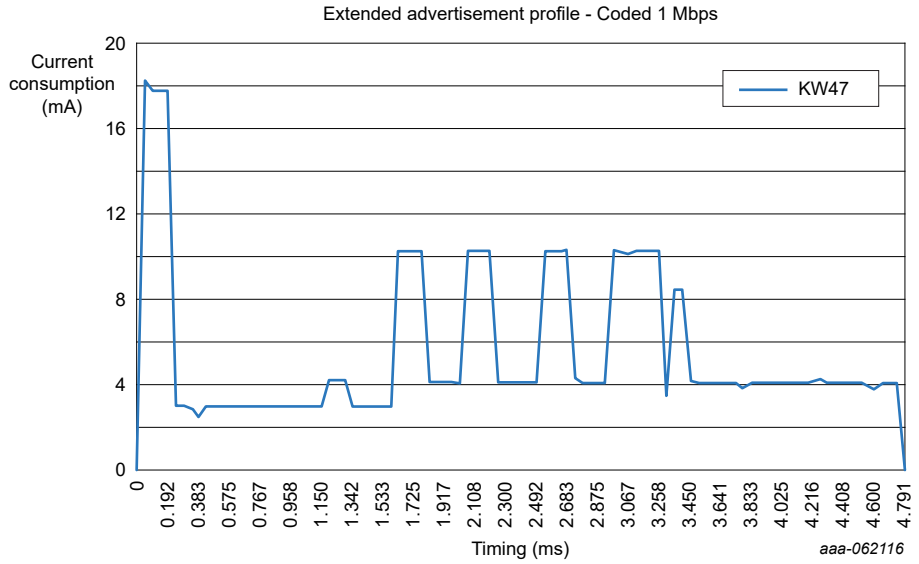

Figure 85. Extended advertising current profile, +0 dBm, Bypass mode, coded (S2), 1 Mbit/s

Table 73. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2), 1 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	5.616 mA	0.449 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.328 ms	10.279 mA	3.372 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms

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Table 73. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2), 1 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.080 ms	8.479 mA	0.678 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	1.330 ms	4.074 mA	5.418 mA-ms
	Active Consumption	4.744 ms	Avg = 5.547 mA	26.315 mA-ms
	DSM duration	95.256 ms	0.005683 mA	0.541 mA-ms
	SUM	100.000 ms	Total	26.856 mA-ms
			Charge Integral	7.46 nAh
			Current (mA)	0.2686 mA
		Power Consumption (mW)		0.886 mW

4.3.13.4 Bypass, advertising extension, +10 dBm, coded (S2), 1 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for the standard advertising, and 1 Mbit/s for the extension.

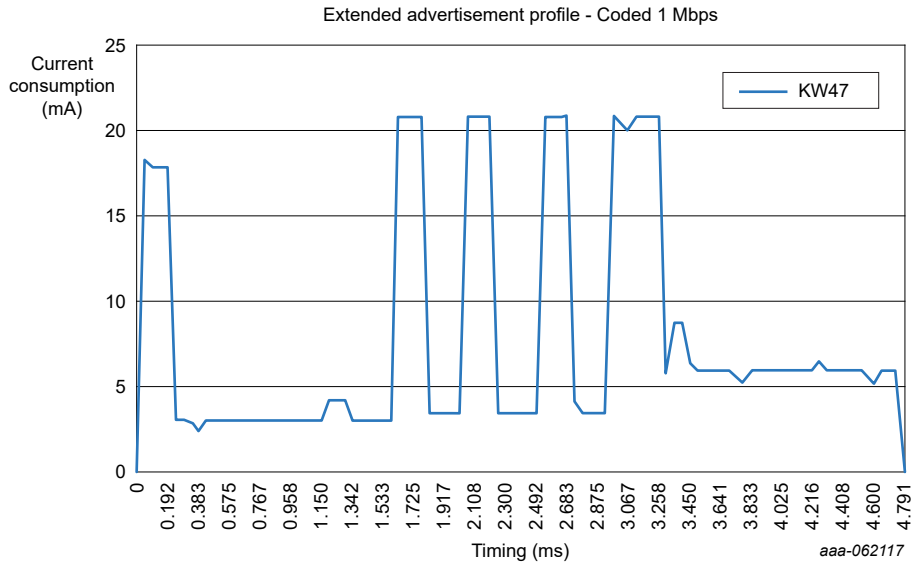

Figure 86. Extended advertising current profile, +10 dBm, Bypass mode, coded (S2), 1 Mbit/s

Table 74. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2), 1 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 74. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2), 1 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 1 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.328 ms	20.747 mA	6.805 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms
	Rx - Aux channel	0.080 ms	8.707 mA	0.697 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	1.330 ms	5.904 mA	7.853 mA-ms
	Active Consumption	4.744 ms	Avg = 8.202 mA	38.911 mA-ms
	DSM duration	95.256 ms	0.005683 mA	0.541 mA-ms
	SUM	100.000 ms	Total	39.453 mA-ms
			Charge Integral	10.96 nAh
			Current (mA)	0.3945 mA
		Power Consumption (mW)		1.302 mW

4.3.14 Test environment: advertising extension, coded, 2 Mbit/s

The Bluetooth LE event considered is extended advertising. The data rates are set to coded (S2) for the standard advertising, and 2 Mbit/s for the extension.

4.3.14.1 Buck, advertising extension, +0 dBm, coded (S2), 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for the standard advertising, and 2 Mbit/s for the extension.

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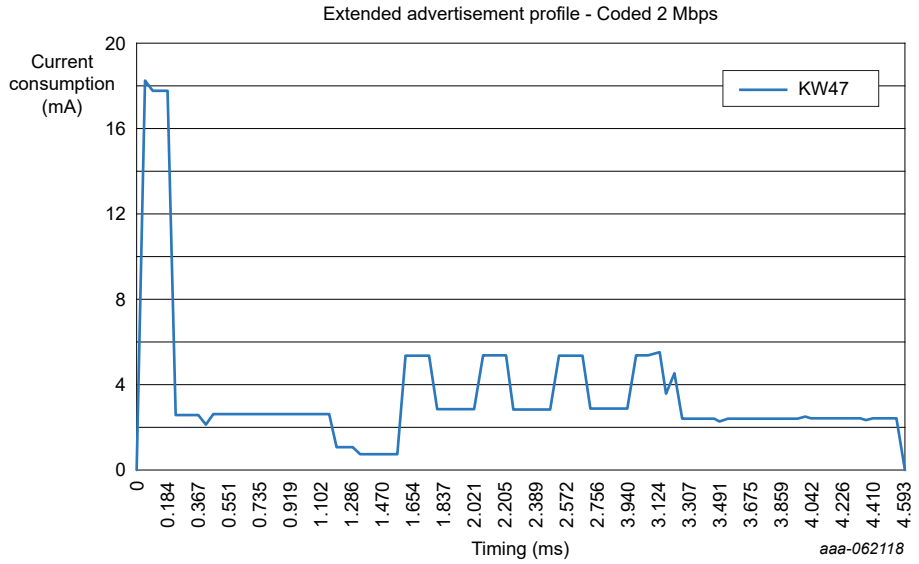

Figure 87. Extended advertising current profile, +0 dBm, Buck mode, coded (S2), 2 Mbit/s

Table 75. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2), 2 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	2.606 mA	2.593 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	7.720 mA	0.618 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.168 ms	5.360 mA	0.901 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms

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Table 75. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2), 2 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.044 ms	4.590 mA	0.202 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	1.330 ms	2.434 mA	3.237 mA-ms
	Active Consumption	4.548 ms	Avg = 3.575 mA	16.260 mA-ms
	DSM duration	95.452	0.004200 mA	0.401 mA-ms
	SUM	100.000 ms	Total	16.661 mA-ms
			Charge Integral	4.63 nAh
			Current (mA)	0.1666 mA
			Power Consumption (mW)	0.550 mW

4.3.14.2 Buck, advertising extension, +10 dBm, coded (S2), 2 Mbit/s

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for the standard advertising, and 2 Mbit/s for the extension.

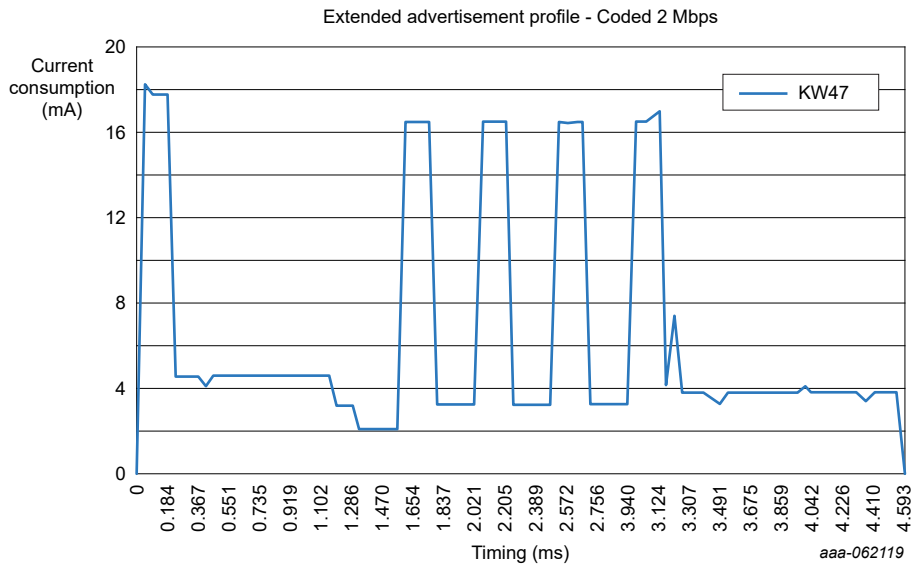

Figure 88. Extended advertising current profile, +10 dBm, Buck mode, coded (S2), 2 Mbit/s

Table 76. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2), 2 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	4.598 mA	4.575 mA-ms

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Table 76. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2), 2 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.168 ms	16.465 mA	2.766 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms
	Rx - Aux channel	0.044 ms	7.435 mA	0.327 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	1.330 ms	3.744 mA	4.980 mA-ms
	Active Consumption	4.548 ms	Avg = 6.768 mA	30.781 mA-ms
	DSM duration	95.452	0.004200 mA	0.401 mA-ms
	SUM	100.000 ms	Total	31.182 mA-ms
			Charge Integral	8.66 nAh
			Current (mA)	0.3118 mA
			Power Consumption (mW)	1.029 mW

4.3.14.3 Bypass, advertising extension, +0 dBm, coded (S2), 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for the standard advertising, and 2 Mbit/s for the extension.

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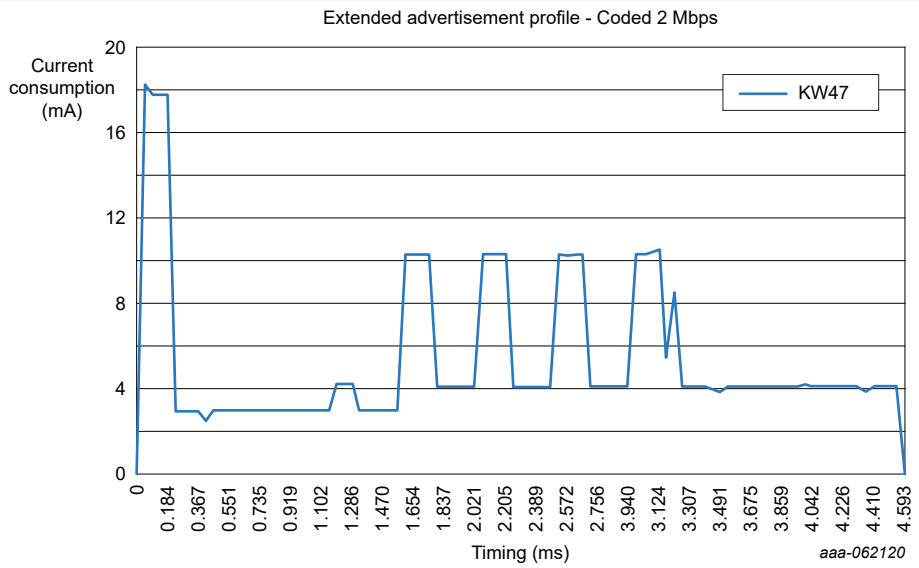

Figure 89. Extended advertising current profile, +0 dBm, Bypass mode, coded (S2), 2 Mbit/s

Table 77. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2), 2 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	5.616 mA	0.449 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.168 ms	10.279 mA	1.727 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms

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Table 77. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2), 2 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.044 ms	8.479 mA	0.373 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	1.330 ms	4.074 mA	5.418 mA-ms
	Active Consumption	4.548 ms	Avg = 5.357 mA	24.365 mA-ms
	DSM duration	95.452 ms	0.005683 mA	0.542 mA-ms
	SUM	100.000 ms	Total	24.907 mA-ms
			Charge Integral	6.92 nAh
			Current (mA)	0.2491 mA
		Power Consumption (mW)		0.822 mW

4.3.14.4 Bypass, advertising extension, +10 dBm, coded (S2), 2 Mbit/s

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for the standard advertising, and 2 Mbit/s for the extension.

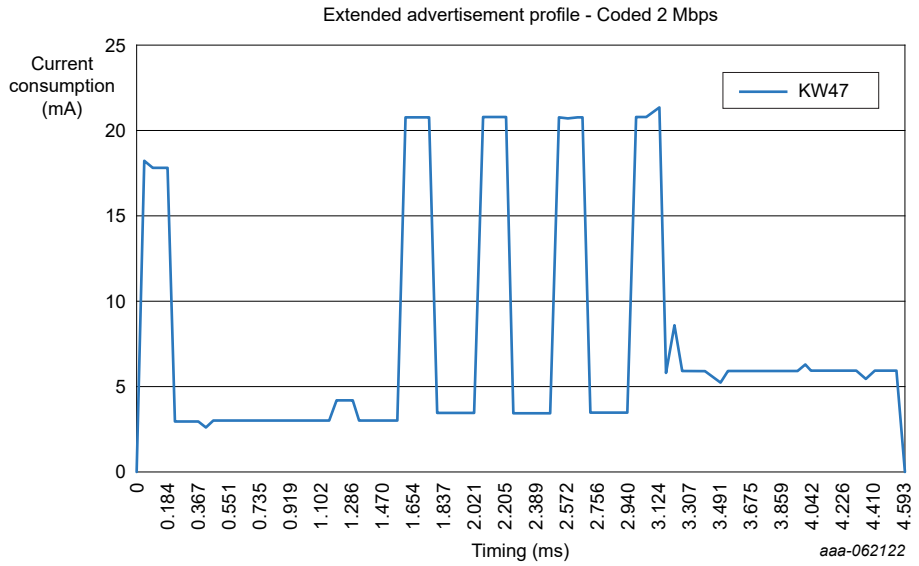

Figure 90. Extended advertising current profile, +10 dBm, Bypass mode, coded (S2), 2 Mbit/s

Table 78. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2), 2 Mbit/s

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
EXTENDED ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 78. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2), 2 Mbit/s*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - 2 Mbit/s				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.168 ms	20.747 mA	3.485 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms
	Rx - Aux channel	0.044 ms	8.707 mA	0.383 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	1.330 ms	5.904 mA	7.853 mA-ms
	Active Consumption	4.548 ms	Avg = 7.757 mA	35.278 mA-ms
	DSM duration	95.452 ms	0.005683 mA	0.542 mA-ms
	SUM	100.000 ms	Total	35.821 mA-ms
			Charge Integral	9.95 nAh
			Current (mA)	0.3582 mA
		Power Consumption (mW)		1.182 mW

4.3.15 Test environment: advertising extension, coded

The Bluetooth LE event considered is extended advertising. The data rates are set to coded (S2) for both the standard advertising and extension.

Table 79. Test environment: advertising extension, coded

DC-DC mode	Buck mode	Bypass mode
Supply	Vdd_DCDC = 3V3 Vdd_RF = 1.25 V Vdd_LDO_Core = 1.25 V	Vdd_RF = 3V3 Vdd_LDO_Core = 3V3

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Table 79. Test environment: advertising extension, coded*...continued*

DC-DC mode	Buck mode	Bypass mode
RF output power	+0 dBm	
MCU clock mode	48 MHz	
RAM size	128 k	
Data rate	Coded coded	
Payload	For CH37, 38, and 39: PDU size 6 bytes (payload 31 bytes), For secondary CH: PDU size 2 bytes, payload size TX: 31 bytes; RX: 2 bytes	
Connectable	Yes	
Flash:	Doze	
MCU:	DSM2	
Setting:	Advertise from low-power DSM2 Peripheral to central	
Software:	Low power (SDK 25.06)	

4.3.15.1 Buck, advertising extension, +0 dBm, coded (S2)

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for both the standard advertising and extension.

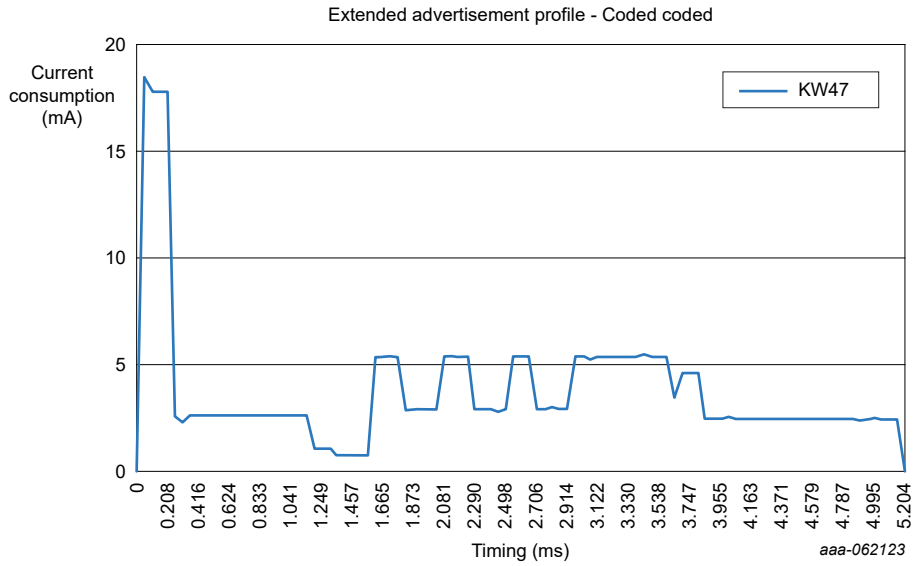

Figure 91. Extended advertising current profile, +0 dBm, Buck mode, coded (S2)

Table 80. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2)

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
Extended ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	2.606 mA	2.593 mA-ms
	MCU running	0.150 ms	1.100 mA	0.165 mA-ms

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Table 80. Extended advertising power consumption, +0 dBm, Buck mode, coded (S2)*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	0.750 mA	0.150 mA-ms
	TX warm-up	0.080 ms	7.720 mA	0.618 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	2.754 mA	0.220 mA-ms
	TX (+0 dBm)	0.192 ms	5.360 mA	1.029 mA-ms
	TX warm-down	0.020 ms	2.754 mA	0.055 mA-ms
	MCU-STOP	0.160 ms	2.900 mA	0.464 mA-ms
	TX warm-up	0.080 ms	4.130 mA	0.330 mA-ms
	TX (+0 dBm) - Aux channel	0.656 ms	5.360 mA	3.516 mA-ms
	TX to RX transition	0.050 ms	3.475 mA	0.174 mA-ms
	Rx - Aux channel	0.160 ms	4.590 mA	0.734 mA-ms
	RX warm-down	0.020 ms	2.341 mA	0.047 mA-ms
	ADV Post-process	1.330 ms	2.434 mA	3.237 mA-ms
	Active Consumption	5.152 ms	Avg = 3.767 mA	19.408 mA-ms
	DSM duration	94.848	0.004200 mA	0.398 mA-ms
	SUM	100.000 ms	Total	19.807 mA-ms
			Charge Integral	5.50 nAh
			Current (mA)	0.1981 mA
			Power Consumption (mW)	0.654 mW

4.3.15.2 Buck, advertising extension, +10 dBm, coded (S2)

The DCDC is in Buck mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for both the standard advertising and extension

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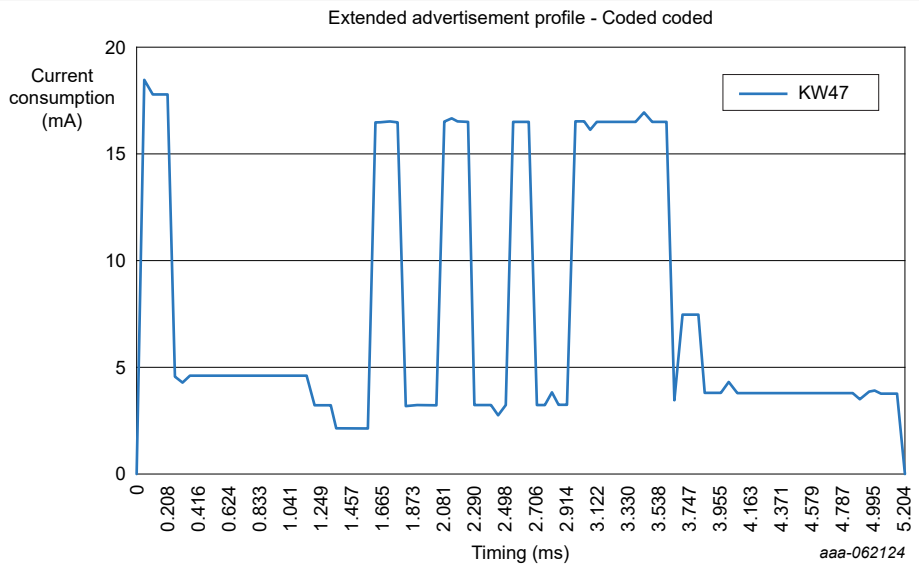

Figure 92. Extended advertising current profile, +10 dBm, Buck mode, coded (S2)

Table 81. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2)

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
Extended ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	4.598 mA	4.575 mA-ms
	MCU running	0.150 ms	3.200 mA	0.480 mA-ms
	MCU WFI	0.200 ms	2.100 mA	0.420 mA-ms
	TX warm-up	0.080 ms	11.422 mA	0.914 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	6.570 mA	0.526 mA-ms
	TX (+10 dBm)	0.192 ms	16.465 mA	3.161 mA-ms
	TX warm-down	0.020 ms	6.570 mA	0.131 mA-ms
	MCU-STOP	0.160 ms	3.247 mA	0.519 mA-ms
	TX warm-up	0.080 ms	9.856 mA	0.788 mA-ms
	TX (+10 dBm) - Aux channel	0.656 ms	16.465 mA	10.801 mA-ms
	TX to RX transition	0.050 ms	4.190 mA	0.209 mA-ms

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Table 81. Extended advertising power consumption, +10 dBm, Buck mode, coded (S2)*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.160 ms	7.435 mA	1.190 mA-ms
	RX warm-down	0.020 ms	3.726 mA	0.075 mA-ms
	ADV Post-process	1.330 ms	3.744 mA	4.980 mA-ms
	Active Consumption	5.152 ms	Avg = 7.701 mA	39.678 mA-ms
	DSM duration	94.848	0.004200 mA	0.398 mA-ms
	SUM	100.000 ms	Total	40.076 mA-ms
			Charge Integral	11.13 nAh
			Current (mA)	0.4008 mA
			Power Consumption (mW)	1.323 mW

4.3.15.3 Bypass, advertising extension, +0 dBm, coded (S2)

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +0 dBm. The data rates are set to coded (S2) for both the standard advertising and extension.

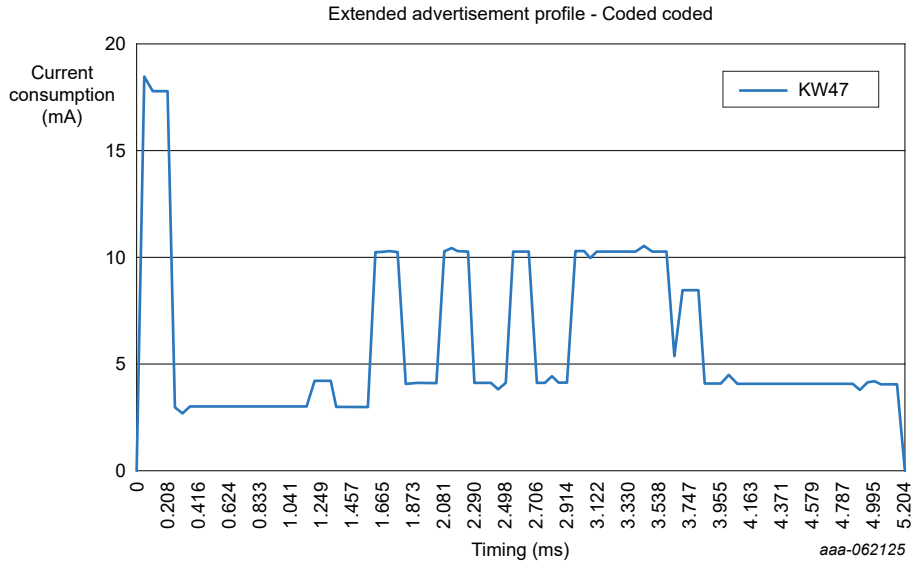

Figure 93. Extended advertising current profile, +0 dBm, Bypass mode, coded (S2)

Table 82. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2)

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
Extended ADVERTISE MENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms

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Table 82. Extended advertising power consumption, +0 dBm, Bypass mode, coded (S2)*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	5.616 mA	0.449 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	2.875 mA	0.230 mA-ms
	TX (+0 dBm)	0.192 ms	10.279 mA	1.974 mA-ms
	TX warm-down	0.020 ms	2.875 mA	0.058 mA-ms
	MCU-STOP	0.160 ms	4.098 mA	0.656 mA-ms
	TX warm-up	0.080 ms	7.189 mA	0.575 mA-ms
	TX (+0 dBm) - Aux channel	0.656 ms	10.279 mA	6.743 mA-ms
	TX to RX transition	0.050 ms	5.549 mA	0.277 mA-ms
	Rx - Aux channel	0.160 ms	8.479 mA	1.357 mA-ms
	RX warm-down	0.020 ms	2.511 mA	0.050 mA-ms
	ADV Post-process	1.330 ms	4.074 mA	5.418 mA-ms
	Active Consumption	5.152 ms	Avg = 5.894 mA	30.365 mA-ms
	DSM duration	94.848 ms	0.005683 mA	0.539 mA-ms
	SUM	100.000 ms	Total	30.904 mA-ms
			Charge Integral	8.58 nAh
			Current (mA)	0.3090 mA
		Power Consumption (mW)		1.020 mW

4.3.15.4 Bypass, advertising extension, +10 dBm, coded (S2)

The DCDC is in Bypass mode. The Bluetooth LE event considered is extended advertising. The radio TX output power is set to +10 dBm. The data rates are set to coded (S2) for both the standard advertising and extension

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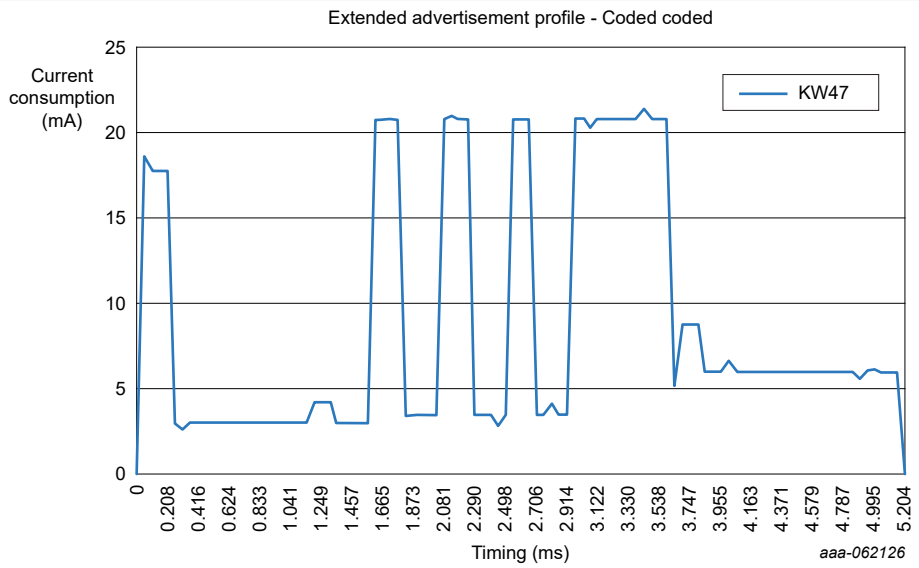

Figure 94. Extended advertising current profile, +10 dBm, Bypass mode, coded (S2)

Table 83. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2)

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
Extended ADVERTISEMENT	Power up	0.155 ms	17.800 mA	2.759 mA-ms
	Preprocessing	0.995 ms	3.000 mA	2.985 mA-ms
	MCU running	0.150 ms	4.200 mA	0.630 mA-ms
	MCU WFI	0.200 ms	3.000 mA	0.600 mA-ms
	TX warm-up	0.080 ms	7.709 mA	0.617 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	4.832 mA	0.387 mA-ms
	TX (+10 dBm)	0.192 ms	20.747 mA	3.983 mA-ms
	TX warm-down	0.020 ms	4.832 mA	0.097 mA-ms
	MCU-STOP	0.160 ms	3.415 mA	0.546 mA-ms
	TX warm-up	0.080 ms	12.081 mA	0.966 mA-ms
	TX (+10 dBm) - Aux channel	0.656 ms	20.747 mA	13.610 mA-ms
	TX to RX transition	0.050 ms	5.777 mA	0.289 mA-ms

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Table 83. Extended advertising power consumption, +10 dBm, Bypass mode, coded (S2)*...continued*

EXTENDED ADVERTISEMENT CODED (500 kbit/s) - CODED (500 kbit/s)				
	Advertising Interval	**100.000 ms**		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
	Rx - Aux channel	0.160 ms	8.707 mA	1.393 mA-ms
	RX warm-down	0.020 ms	2.922 mA	0.058 mA-ms
	ADV Post-process	1.330 ms	5.904 mA	7.853 mA-ms
	Active Consumption	5.152 ms	Avg = 9.009 mA	46.413 mA-ms
	DSM duration	94.848 ms	0.005683 mA	0.539 mA-ms
	SUM	100.000 ms	Total	46.952 mA-ms
			Charge Integral	13.04 nAh
			Current (mA)	0.4695 mA
		Power Consumption (mW)		1.549 mW

4.3.15.5 Summary table

This section provides the advertising extension summary.

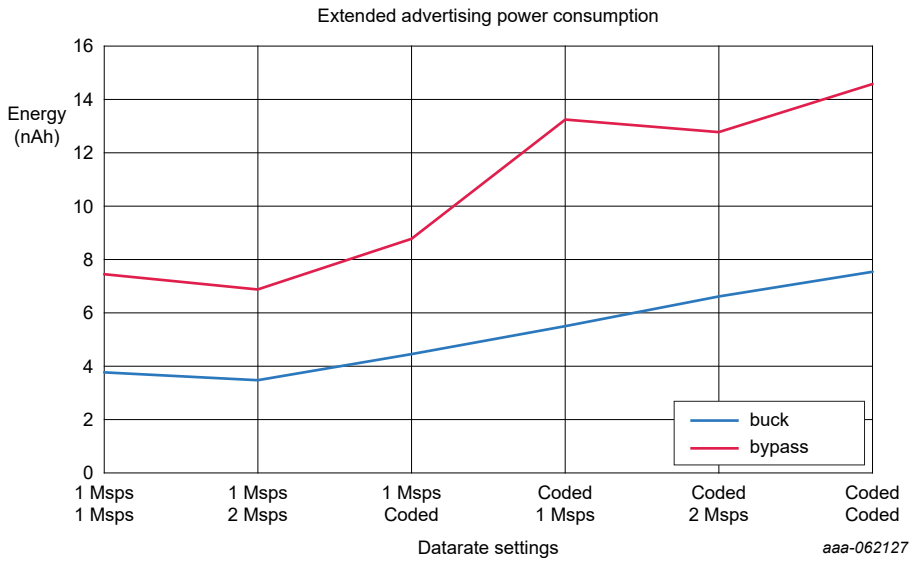

Figure 95. Advertising extension power consumption versus data rate modes

Table 84. Advertising extension summary table

-	-	Idd_REG (total consumption)			
Advertising extension	**DC-DC mode**	**Time (ms)**	**Current (mA)**	**mA x mS**	**Charge integral**
1 Msps 1 Msps	Buck mode	3.502 ms	3.872 mA	13.560 mA-ms	3.77 nAh
	Bypass mode	3.502 ms	7.652 mA	3.767 mA-ms	7.44 nAh
1 Msps 2 Msps	Buck mode	3.330 ms	3.761 mA	12.524 mA-ms	3.48 nAh
	Bypass mode	3.330 ms	7.442 mA	24.781 mA-ms	6.88 nAh

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Table 84. Advertising extension summary table*...continued*

-	-	Idd_REG (total consumption)			
Advertising extension	**DC-DC mode**	**Time (ms)**	**Current (mA)**	**mA x mS**	**Charge integral**
1 Msps coded	Buck mode	3.910 ms	4.096 mA	16.015 mA-ms	4.45 nAh
	Bypass mode	3.910 ms	8.076 mA	31.578 mA-ms	8.77 nAh
Coded 1 Msps	Buck mode	4.566 ms	4.339 mA	19.812 mA-ms	5.50 nAh
	Bypass mode	6.136 ms	7.773 mA	47.695 mA-ms	13.25 nAh
Coded 2 Msps	Buck mode	5.988 ms	3.976 mA	23.808 mA-ms	6.61 nAh
	Bypass mode	5.988 ms	7.676 mA	45.965 mA-ms	12.77 nAh
Coded coded	Buck mode	6.544 ms	4.151 mA	27.164 mA-ms	7.55 nAh
	Bypass mode	6.544 ms	8.019 mA	52.477 mA-ms	14.58 nAh

4.3.15.6 Summary data

This section provides the advertising extension consumption summary.

Table 85. Advertising extension consumption summary

Advertising extension	DC-DC mode	Vdd_Reg (V) power supply (ambient, 25 °C)							
		1.7 V	**1.8 V**	**2.1 V**	**2.4 V**	**2.7 V**	**3.0 V**	**3.3 V**	**3.6 V**
1 Mbit/s 1 Mbit/s	Buck	10.54 nAh	10.16 nAh	5.14 nAh	4.36 nAh	4.13 nAh	3.77 nAh	3.49 nAh	2.21 nAh
	Bypass	5.46 nAh	5.54 nAh	5.90 nAh	6.45 nAh	6.96 nAh	7.44 nAh	7.83 nAh	8.02 nAh
1 Mbit/s 2 Mbit/s	Buck	10.38 nAh	10.05 nAh	5.12 nAh	4.30 nAh	3.95 nAh	3.48 nAh	3.33 nAh	2.29 nAh
	Bypass	4.99 nAh	5.06 nAh	5.36 nAh	5.83 nAh	6.34 nAh	6.88 nAh	7.32 nAh	7.79 nAh
1 Mbit/s coded	Buck	12.44 nAh	11.99 nAh	6.07 nAh	5.15 nAh	4.87 nAh	4.45 nAh	4.12 nAh	2.61 nAh
	Bypass	6.44 nAh	6.52 nAh	6.95 nAh	7.60 nAh	8.20 nAh	8.77 nAh	9.22 nAh	9.45 nAh
Coded 1 Mbit/s	Buck	15.40 nAh	14.84 nAh	7.51 nAh	6.37 nAh	6.03 nAh	5.50 nAh	5.09 nAh	3.23 nAh
	Bypass	9.72 nAh	9.85 nAh	10.49 nAh	11.48 nAh	12.38 nAh	13.25 nAh	13.93 nAh	14.27 nAh
Coded 2 Mbit/s	Buck	18.50 nAh	17.83 nAh	9.02 nAh	7.65 nAh	7.25 nAh	6.61 nAh	6.12 nAh	3.88 nAh
	Bypass	9.37 nAh	9.49 nAh	10.11 nAh	11.07 nAh	11.93 nAh	12.77 nAh	13.42 nAh	13.75 nAh
Coded coded	Buck	21.10 nAh	20.34 nAh	10.29 nAh	8.73 nAh	8.26 nAh	7.55 nAh	6.98 nAh	4.42 nAh
	Bypass	10.69 nAh	10.84 nAh	11.55 nAh	12.64 nAh	13.62 nAh	14.58 nAh	15.32 nAh	15.70 nAh

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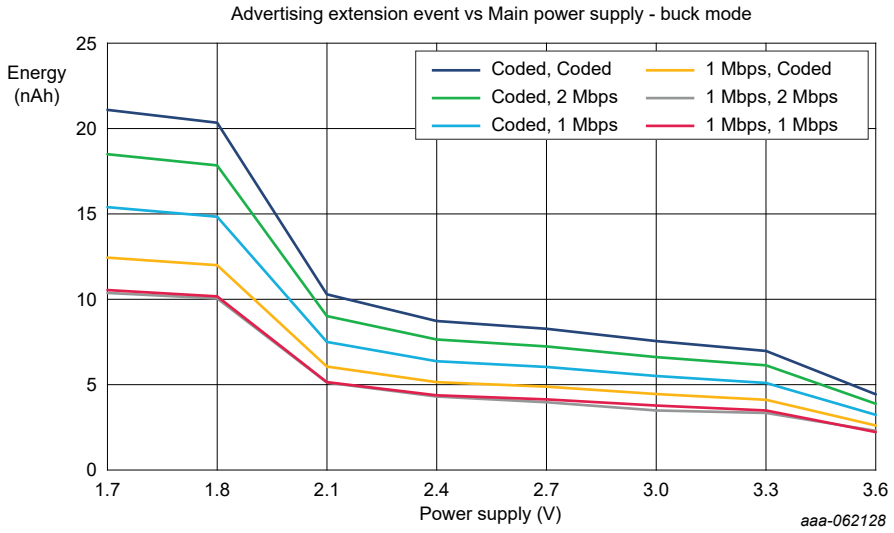

Figure 96. Advertising extension consumption event, Buck mode

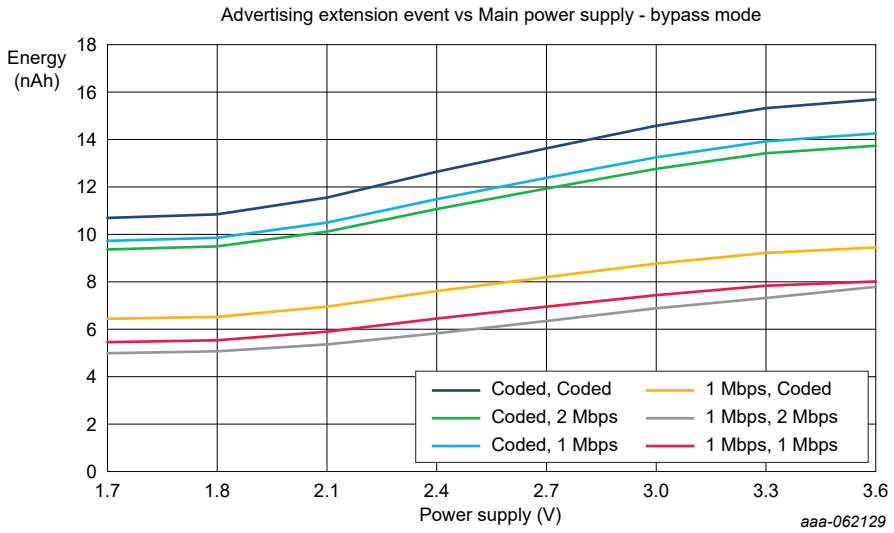

Figure 97. Advertising extension consumption event, Bypass mode

4.4 Scan extension

Using the steps provided in Section 3.2, a partial Bluetooth LE scenario (Low-power application) is captured, see Figure 98. The main events and phases are documented within the capture. All the plots that follow depict the current.

Both use cases are used:

- The DSM mode is activated between the scan events.

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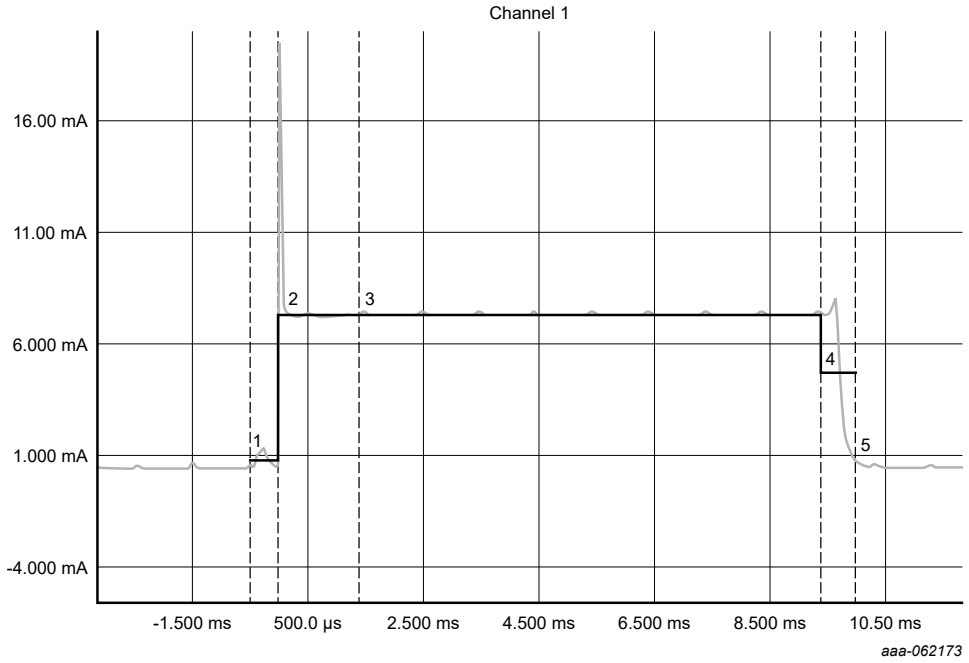

Figure 98. Current consumption - SCAN extension event period

Table 86. SCAN extension events

Event
1. Preprocessing
2. RX warmup
3. Active RX
4. RX warmdown
5. Postprocessing

The figures in the following sections capture the current consumption during the scan extension event using the data rate of 1 Mbit/s and coded (S2, 500 kbit/s). The Buck and Bypass mode graphs are provided as an example.

The binary file settings used are as follows: 48 MHz clock, scan extension, and connectable.

Buck mode:

- Wake up from the Low-power Deep-sleep mode.

Bypass mode:

- Wake up from the Low-power Deep-sleep mode.

Table 87. Scan extension

DC-DC mode	Buck mode	Bypass mode
Supply	**Vdd_DCDC = 3V3** **Vdd_RF = 1.25 V** **Vdd_LDO_Core = 1.25 V**	**Vdd_RF = 3V3 Vdd_LDO_Core = 3V3**
RF output power	N/A	
MCU clock mode	48 MHz	

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Table 87. Scan extension*...continued*

DC-DC mode	Buck mode	Bypass mode
Supply	**Vdd_DCDC = 3V3** **Vdd_RF = 1.25 V** **Vdd_LDO_Core = 1.25 V**	**Vdd_RF = 3V3 Vdd_LDO_Core = 3V3**
RAM size	128 k	
Data rate	1 Msps 1 Mbit/s	
Payload	Empty	
Connectable	Yes	
Flash:	Doze	
MCU:	DSM2	
Setting:	Advertise from low-power DSM Peripheral to central	
Software:	Low Power (SDK 25.06)	

4.4.1 Test environment: scan extension 1 Mbit/s

The **extended scan** Bluetooth LE event is considered. The data rate is set to 1 Mbit/s.

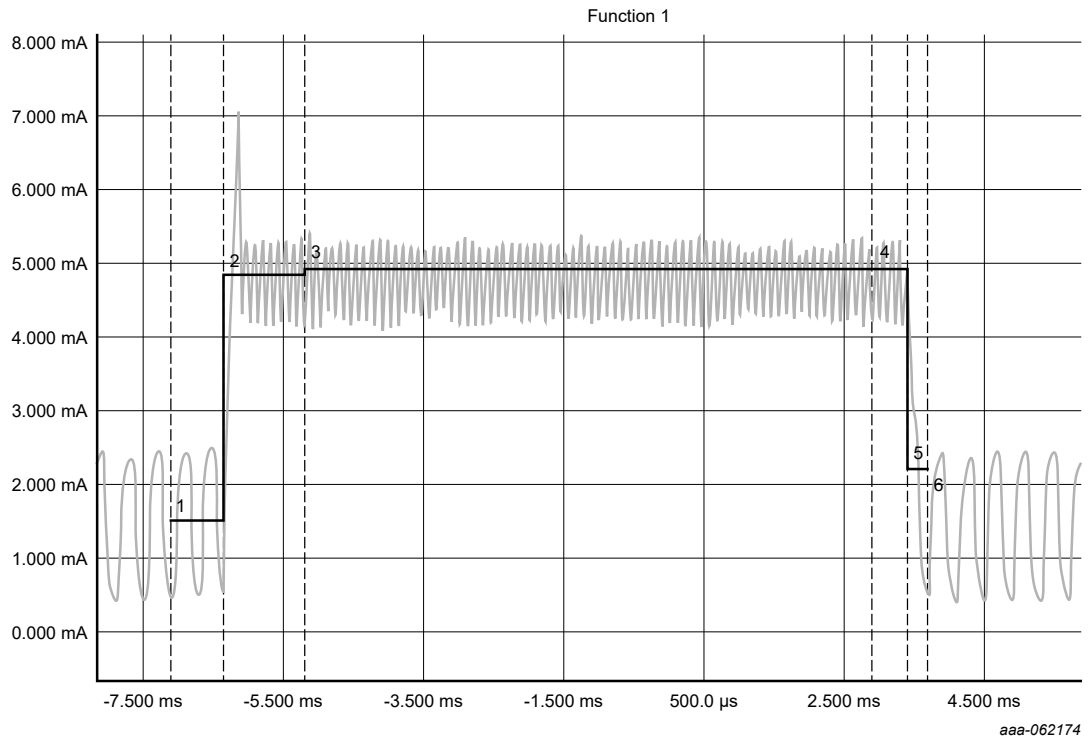

Figure 99. Scan extension current profile event after DSM mode, Buck mode, 1 Mbit/s

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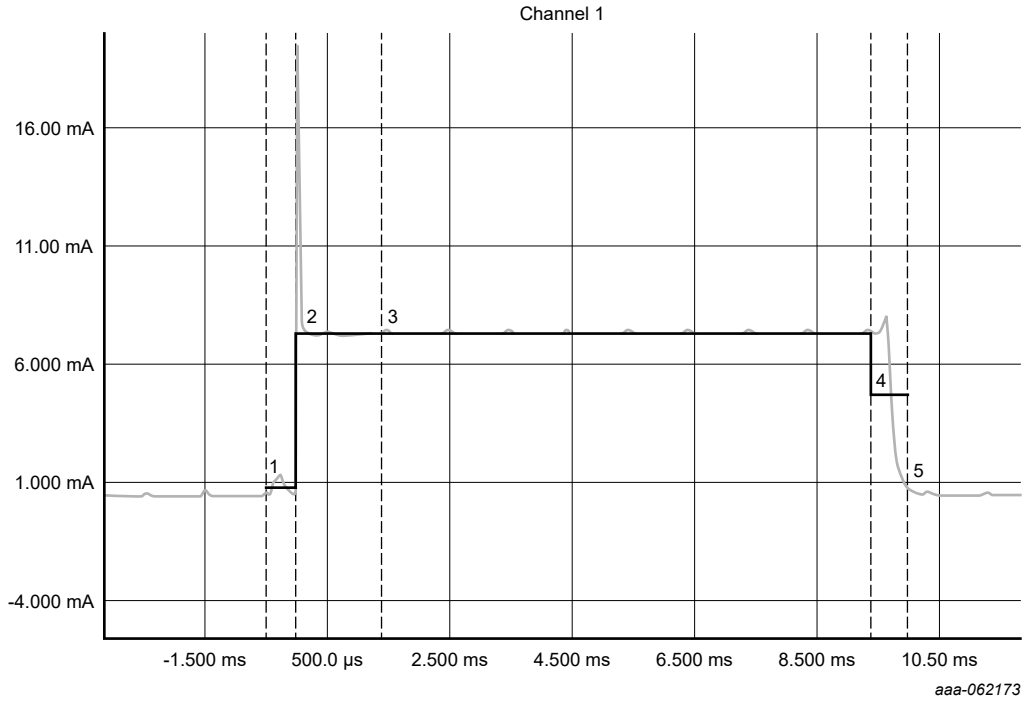

Figure 100. Scan extension current profile event after DSM mode, Bypass mode, 1 Mbit/s

4.4.2 Test environment: scan extension, 1 Mbit/s, coded

The '**extended scan**' Bluetooth LE event is considered. The data rates are set to 1 Mbit/s for the standard advertising and coded for the extension.

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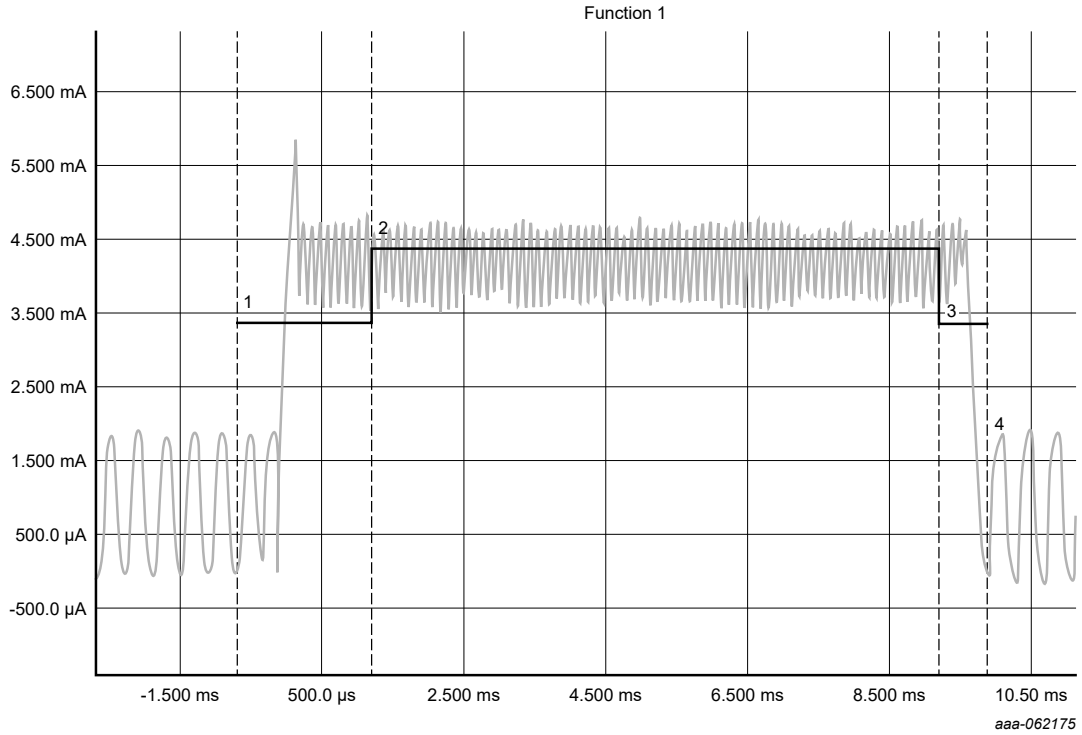

Figure 101. Scan extension current profile event after the DSM mode, Buck mode, 1 Mbit/s, coded

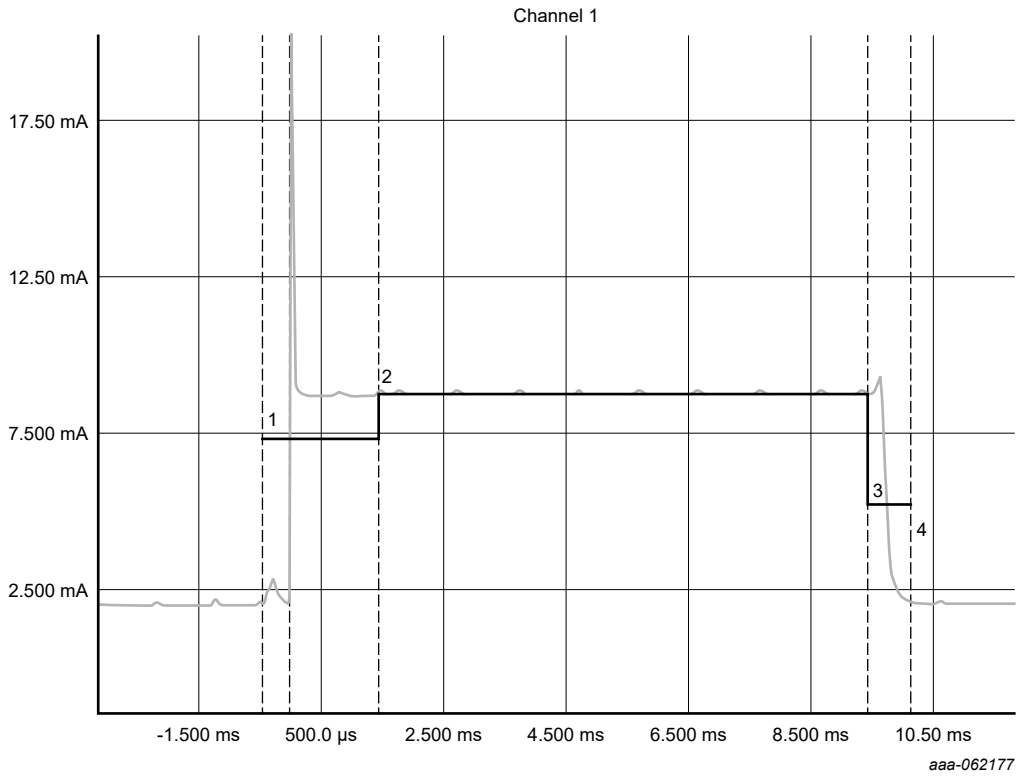

Figure 102. Scan extension current profile event after DSM mode, Bypass mode, 1 Mbit/s coded

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4.4.3 Timing data

Table 88. Scanning extension timing

-		Timing (ms)			
		Buck		Bypass	
		DSM2		DSM2	
		1M 1M	1M coded	1M 1M	1M coded
1	Preprocessing	1.550 ms	2.000 ms	1.550 ms	2.000 ms
2	RX warmup	0.160 ms	0.160 ms	0.160 ms	0.160 ms
3	RX active	4.000 ms	4.000 ms	4.000 ms	4.000 ms
4	RX warmdown	0.200 ms	0.200 ms	0.200 ms	0.200 ms
5	Postprocessing	0.700 ms	0.850 ms	0.700 ms	0.850 ms
6	Total	6.610 ms	7.210 ms	6.610 ms	7.210 ms

Table 89. Scanning extension consumption

-		Consumption (mA)			
		Buck		Bypass	
		DSM2		DSM2	
		1 M 1 M	1 M coded	1 M 1 M	1 M coded
1	Preprocessing	2.660 mA	2.690 mA	2.170 mA	3.364 mA
2	RX warmup	9.260 mA	9.800 mA	13.930 mA	2.229 mA
3	RX active	4.860 mA	4.860 mA	9.700 mA	9.700 mA
4	RX warmdown	8.900 mA	6.270 mA	8.130 mA	1.626 mA
5	Postprocessing	3.530 mA	1.947 mA	2.700 mA	1.890 mA
6	Total	5.842 mA	5.113 mA	7.326 mA	7.326 mA

4.4.4 Summary data

This section provides the scan extension consumption summary.

Table 90. Scanning extension consumption summary

Scan	DC-DC mode	1.7 V	1.8 V	2.1 V	2.4 V	2.7 V	3.0 V	3.3 V	3.6 V
Scan 1 Mbit/s	Buck	7.15 nAh	7.14 nAh	7.05 nAh	7.22 nAh	6.91 nAh	6.20 nAh	5.70 nAh	5.32 nAh
	Bypass	12.11 nAh	12.07 nAh	11.97 nAh	12.26 nAh	11.96 nAh	11.59 nAh	11.54 nAh	11.53 nAh
Scan ext. 1 Mbit/s	Buck	9.34 nAh	9.38 nAh	9.32 nAh	9.45 nAh	9.08 nAh	8.14 nAh	7.49 nAh	7.00 nAh
	Bypass	13.91 nAh	13.86 nAh	13.74 nAh	14.08 nAh	13.73 nAh	13.31 nAh	13.29 nAh	13.26 nAh
Scan ext. coded 500 kbit/s	Buck	9.37 nAh	9.40 nAh	9.29 nAh	9.48 nAh	9.09 nAh	8.14 nAh	7.56 nAh	7.05 nAh
	Bypass	14.00 nAh	13.95 nAh	13.88 nAh	14.17 nAh	13.85 nAh	13.55 nAh	13.47 nAh	13.48 nAh

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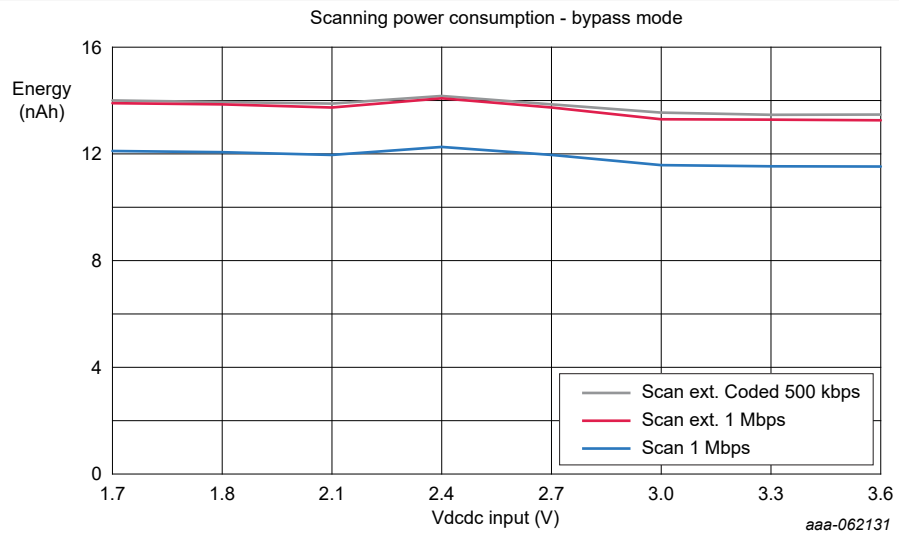

Figure 103. Scanning extension consumption event, Bypass mode

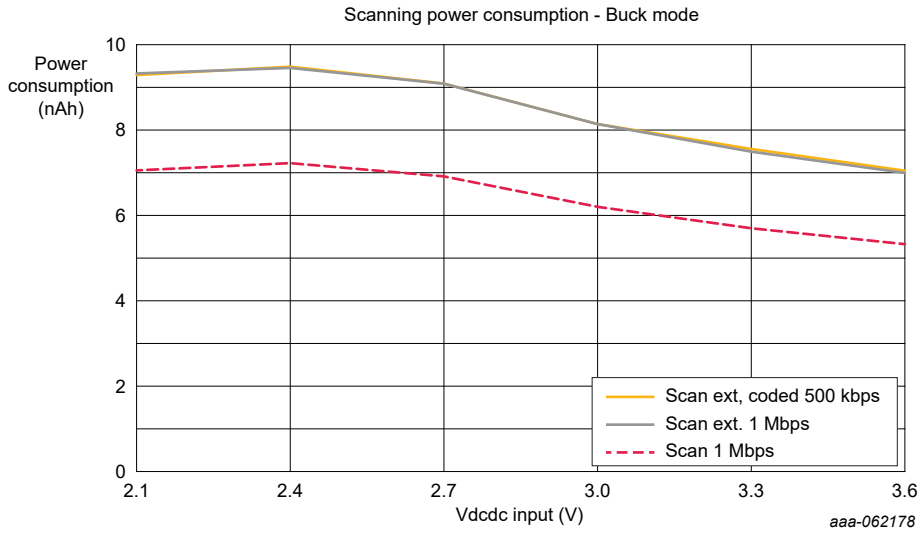

Figure 104. Scanning extension consumption event, Buck mode

4.5 Channel selection algorithm (CSA) #1 and #2

The CSA #1 is the legacy method that only supports channel selection for connection events. The CSA #1 consists of two stages:

- Calculation of the unmapped channel index
- Mapping this index to a data channel index from the set of used channels

The CSA #2 supports channel selection for both connection events and periodic advertising packets. At the start of an event, which can be a connection event or a periodic advertising packet, the algorithm described here generates an event channel index. This event channel index can be a data channel index or a secondary advertising channel index, as appropriate. Some of the CSA #2 claims are as follows:

- CSA #2 is a more complex and harder to track algorithm for obtaining the channel index for the next event.
- It is more effective at avoiding interference and multipath fading effects than CSA #1, especially in high-throughput use cases.

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4.6 High-duty-cycle advertising

High-duty-cycle advertising enables a faster connection setup.

No specific power-consumption measurement is done for this mode.

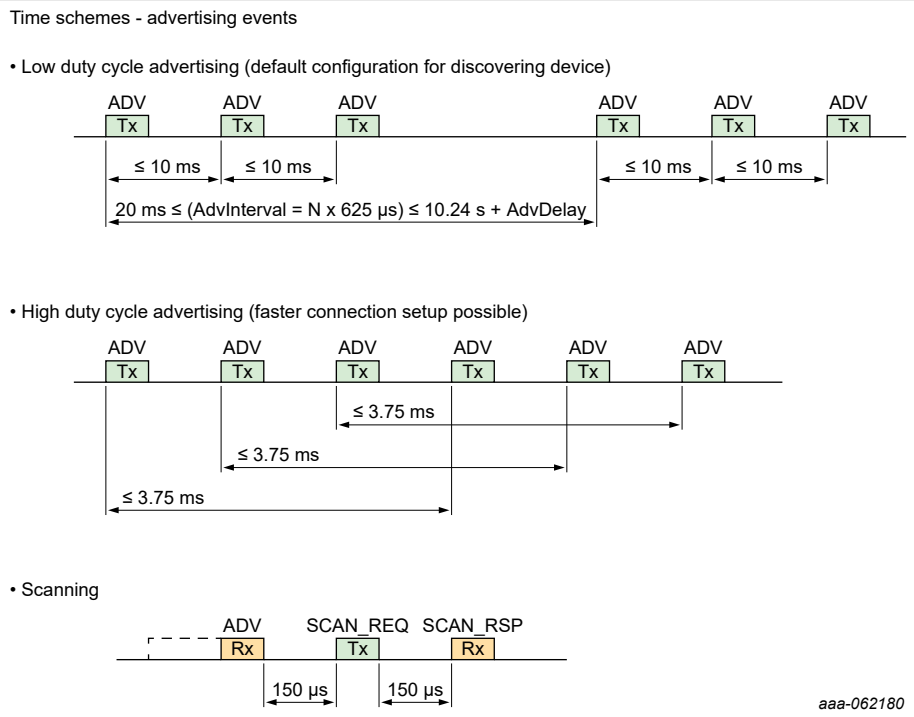

Figure 105. Low and high-duty-cycle advertising

4.7 Reports

Table 91 and Table 92 provide the power consumption at 3V3 in the Buck and Bypass modes at ambient temperature (+25 °C).

Table 91. SoC measurements summary (ambient temperature, 3V3)

Deep-sleep mode	Regul.	RAM retention	Core main power domain	Core wake up power domain	Core RF power domain	Peripheral	DC-DC	Current consumption @ 3.3 V
Deep-sleep	All are in the Low-power mode	All RAM retained (168 k RAM core0, 160 k RAM NBU, 96 k RAM DVP-V)	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Buck	2.52 µA
Deep-sleep	All are in the Low-power mode	All RAM retained (168 k RAM	Deep-sleep	Deep-sleep	Deep-sleep	Disabled	Bypass	3.82 µA

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Table 91. SoC measurements summary (ambient temperature, 3V3)*...continued*

Deep-sleep mode	Regul.	RAM retention	Core main power domain	Core wake up power domain	Core RF power domain	Peripheral	DC-DC	Current consumption @ 3.3 V
		core0, 160 k RAM NBU, 96 k RAM DVP-V)						

*Active mode: Buck mode (Vdcdc_in = 3 V), 48 MHz clock, CM33 in Deep-sleep mode

Condition of measurement: Vdcdc_in = 3 V, 25 °C (ambient)

Table 92. Wakeup timing summary

Type of wake-up	Timing (ms) (HW + SW initialization)	Power consumption (mA) (HW + SW initialization)
First reset	281 ms	7.7 mA
Other reset	118 ms	6.9 mA

4.7.1 Power consumption summary tables

This section provides the power consumption summary tables.

Table 93. Event power consumption summary

1 event, Vdcdc_in = 3V3, 25 °C	Mode	DSM (ms)	DSM (mA)	DSM (nAh)
Advertising	Buck	3.474 ms	3.490 mA	3.37 nAh
	Bypass	3.474 ms	7.543 mA	7.28 nAh
MCU	Buck	0.160 ms	3.018 mA	0.13 nAh
	Bypass	0.160 ms	7.263 mA	0.32 nAh
Connect-1 Mbit/s	Buck	1.520 ms	4.161 mA	1.76 nAh
	Bypass	1.520 ms	5.067 mA	2.14 nAh
Connect-2 Mbit/s	Buck	1.448 ms	3.898 mA	1.57 nAh
	Bypass	1.448 ms	4.825 mA	1.94 nAh
Connect-500 kbit/s	Buck	1.680 ms	4.746 mA	2.21 nAh
	Bypass	1.680 ms	8.270 mA	3.86 nAh
Connect-125 kbit/s	Buck	2.640 ms	5.659 mA	4.15 nAh
	Bypass	2.640 ms	8.468 mA	6.21 nAh
Scan	Buck	5.070 ms	3.056 mA	6.20 nAh
	Bypass	5.070 ms	8.227 mA	11.59 nAh

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Table 94. Advertising power consumption summary

48 MHz clock using 32 MHz crystal	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
	DSM2	DSM2
	T = 25 °C	
Advertising consumption on 1 event @ +0 dBm	3.474 ms	3.474 ms
	3.490 mA	7.543 mA
	3.368 nAh	7.279 nAh
Advertising consumption details @ +0 dBm		
TX active (+0 dBm) - MCU stop	3.627 mA	8.216 mA
RX active - MCU STOP	4.840 mA	7.580 mA
TX warmup - MCU STOP	3.536 mA	4.500 mA
TX warmdown - MCU STOP	3.536 mA	4.500 mA
RX warmup - MCU STOP	3.536 mA	4.500 mA
RX warmdown - MCU STOP	3.536 mA	4.500 mA
TX to RX transition - MCU STOP (advertising event)	3.536 mA	5.500 mA

Table 95. Pre/postprocessing, MCU consumption summary

48 MHz FEE mode using 32 MHz crystal	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
	DSM2	
	T = 25 °C	
ADV preprocessing	1.370 mA	3.000 mA
CONN preprocessing - 1 Mbit/s	4.161 mA	5.067 mA
CONN preprocessing - 2 Mbit/s	3.898 mA	4.825 mA
CONN preprocessing - LRS2	4.746 mA	8.270 mA
CONN preprocessing - LRS8	5.659 mA	8.468 mA
Radio postprocessing	2.146 mA	4.990 mA
MCU STOP	3.018 mA	7.263 mA

Table 96. MCU power consumption summary

MCU DSM consumption	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
	DSM2	
	T = 25 °C	
Timing period (ms)	0.160 ms	0.160 ms
Consumption (mA)	3.018 mA	7.263 mA
MCU DSM2 consumption (nAh)	0.134 nAh	0.323 nAh

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4.7.2 Timings summary table

Table 97. Advertising and connection timing summary

Radio/profile timing parameters (ms)	Buck mode consumption (3V3)	Bypass mode consumption (3V3)
48 MHz clock using 32 MHz crystal	DSM2	DSM2
	T = 25 °C	
ADV preprocessing time - 1 Mbit/s	0.200 ms	0.200 ms
ADV postprocessing time - 1 Mbit/s	0.500 ms	0.500 ms
Conn preprocessing time - 1 Mbit/s	0.200 ms	0.200 ms
Conn postprocessing time - 1 Mbit/s	0.360 ms	0.360 ms
Conn preprocessing time - 2 Mbit/s	0.200 ms	0.200 ms
Conn postprocessing time - 2 Mbit/s	0.360 ms	0.360 ms
Conn preprocessing time - 500 kbit/s	0.200 ms	0.200 ms
Conn postprocessing time - 500 kbit/s	0.360 ms	0.360 ms
Conn preprocessing time - 125 kbit/s	0.200 ms	0.200 ms
Conn postprocessing time - 125 kbit/s	0.360 ms	0.360 ms
SCAN preprocessing time - 125 kbit/s	0.670 ms	0.670 ms
SCAN postprocessing time - 125 kbit/s	0.300 ms	0.300 ms

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5 MCX W72 Power Profile tool

This section describes the MCX W72 Power Profile tool.

The MCX W72 Power Profile tool is available on the link: MCX W72 Bluetooth LE power profiling tool.

This tool can be used to determine the power consumption for a specific configuration and the associated battery life time. For this purpose, the users must fill a few fields related to the Bluetooth LE standard.

The following subsections provide detailed information about the Dashboard section and an overview of the other sections available in the tool.

5.1 Dashboard overview

The selected sheet is the "**Dashboard**" view as shown in Figure 106.

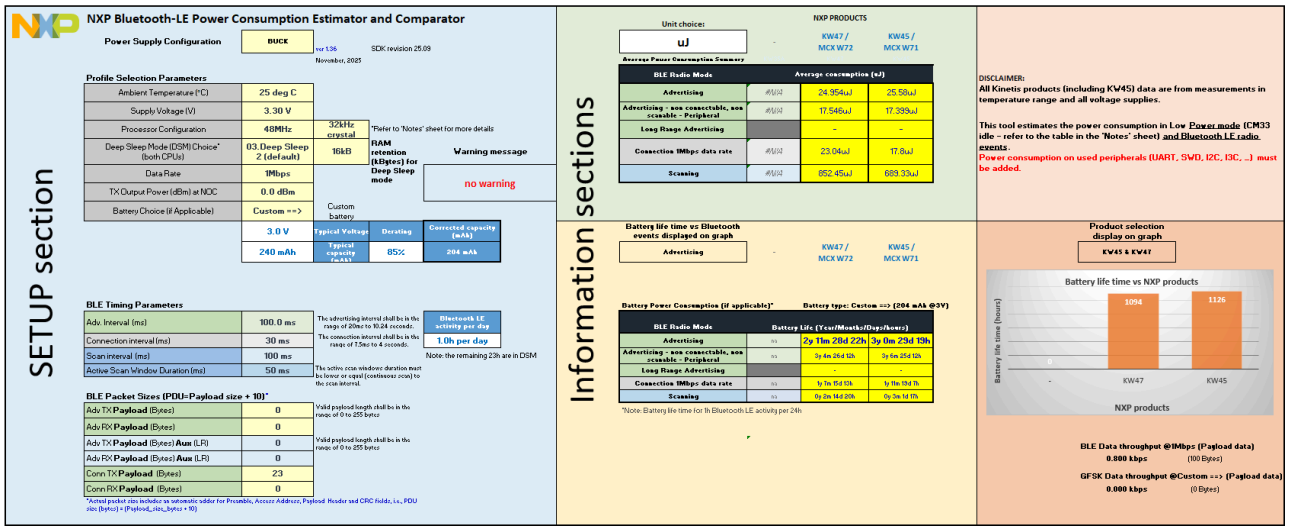

Figure 106. The MCX W72 Power Profile tool overview

5.2 Sheet overview

The "**Dashboard**" sheet is the main board that users must fill to get the power consumption and battery life time information.

Additional information is available in the other sheets as displayed in Figure 107.

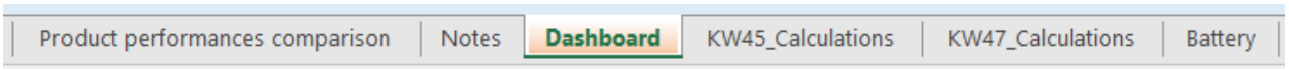

Figure 107. MCX W72 Power Profile tool overview

The available sheets are as follows:

- Product performances comparison
- Notes
- Dashboard
- KW45_Calculations
- MCXW72_Calculations
- Battery

These sheets are described in the following subsections.

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5.2.1 Product performance comparison

The **Product performance comparison** sheet compares the performance details of MCX W72 and KW45 devices.

The sheet extract is displayed in Figure 108.

		KW47	KW45
internal DCDC			
Buck		X	X
Bypass		X	X
Crystal			
26 MHz		X	X
32 MHz		X	X
MCU Core0 clock configuration			
12 MHz			
16 MHz			
20.97 MHz		X	X
32 MHz		X	X
48 MHz		X	X
96 MHz		X	X
150 MHz		X	

Figure 108. Product performance comparison sheet

5.2.2 Notes

This sheet compares the different low-power consumption details of the MCX W72 and KW45.

The sheet extract is displayed in Figure 109.

Notes

1. The Power Profile Calculator is build to provide the power consumption of your application. It's a mix between real measurements in voltage and temperature. The process is not taken into account which may create some variation. In general, the power consumption results could be affected by +/-10% from the measurements.

2. MCU is configured to be in STOP mode during all radio events, and Flash is on doze mode.

3. Cells with gray background indicate calculations that are not applicable given a configuration

3. DISCLAIMER: This excel workbook is provided as an estimation tool for NXP customers and is based on power profile measurements done on a set of randomly selected parts. A specific part may exhibit deviation from the nominal measurements used on this tool

4. Low Power Deep Sleep Modes (DSM) available

KW45

Deep Sleep mode (As defined in Connectivity framework)	Regulators	RAM retention (packet RAM and System RAM CM33)	Core Main Power domain	Core Wake up power domain	Core RF power domain	Peripherals	NBU and EdgeLock	Clock	Typical use case	Modes managed in the Power Profile Calculator Tool	Name on the roll bar menu	Power consumption from SDK* (baremetal)	Power consumption from SDK* (FreeRtos)
Deep Sleep 1	all regulators in Low Power mode	All RAM retained in bare metal	Deep Sleep	Deep Sleep	Deep Sleep	Disabled	Deep Sleep (Disabled)	OSC32K enabled	Deep Sleep 1 mode current - All regulators in low-power mode, all RAM retained, all peripherals, NBU, and EdgeLock disabled, OSC32K enabled	Yes	**02.Deep Sleep 1**	3.6 uA	4.2 uA
Deep Sleep 2 (default)	all regulators in Low Power mode	16KB of RAM retained All radio RAM retained	Deep Sleep	Deep Sleep	Deep Sleep	Disabled	Disabled	OSC32K enabled	Deep Sleep 2 mode current - All regulators in low power, 16 KB of RAM retained, all radio RAM retained, all peripherals, NBU, and Edge Lock disabled, OSC32K enabled	Yes	**03.Deep Sleep 2 (Default)**	2.1 uA	2.8 uA
Power Down 1	all regulators in Low Power mode	16KB of RAM retained, All radio RAM retained	Power down	Power down	Power down	Disabled	Disabled	FRO32K enabled	Power Down 1 mode current - All regulators in low power, 16 KB of RAM retained, all radio RAM retained, all peripherals, NBU, and Edge Lock disabled, FRO32K enabled	Yes	**06.Power Down 1**	1.7 uA	2.3 uA
Deep Power Down 1	LDO_CORE and DCDC off, LDO_SYS in low power	8KB of RAM retained, No radio RAM retained	Deep Power Down	Deep Power Down	Deep Power Down	Disabled	Disabled	FRO32K enabled	Deep Power Down 1 mode current - LDO_CORE and DCDC off, LDO_SYS in low power, no RAM retained, no radio RAM retained, all peripherals, NBU, and EdgeLock disabled, FRO32K	Yes	**10.Deep Power Down 1**	0.83 uA	0.98 uA
Smart power switch DPD1	All regulators OFF	8KB RAM retained, No radio RAM retained	Deep Power Down	Deep Power Down	Deep Power Down	Disabled	Disabled	FRO16K enabled	Smart Power Switch Deep Power Down 2 mode current - All regulators off, 8 KB RAM retained, no radio RAM retained, all peripherals, NBU, and EdgeLock disabled, FRO16K	Yes	**12.Smart power switch DPD1**	430 nA	450 nA

*Note: All regulator enabled. 3.0 V supply upstream from DCDC. DCDC output for CORE_LDO and VDD_RF. DCDC output is: 1.25V for VDD_CORE = 1.0 V (active BLE event and LP mode). SYS_LDO input = 3.3 V, output = 1.8 V. For more information, please refer to the datasheet.

Figure 109. Notes sheet

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5.2.3 Setup section dashboard view

This section contains the different Bluetooth LE parameters that can be set. The **SETUP section** is divided into three areas:

- Profile selection
- Bluetooth LE timing
- Bluetooth LE packet sizes

The available parameters to set are in the yellow area.

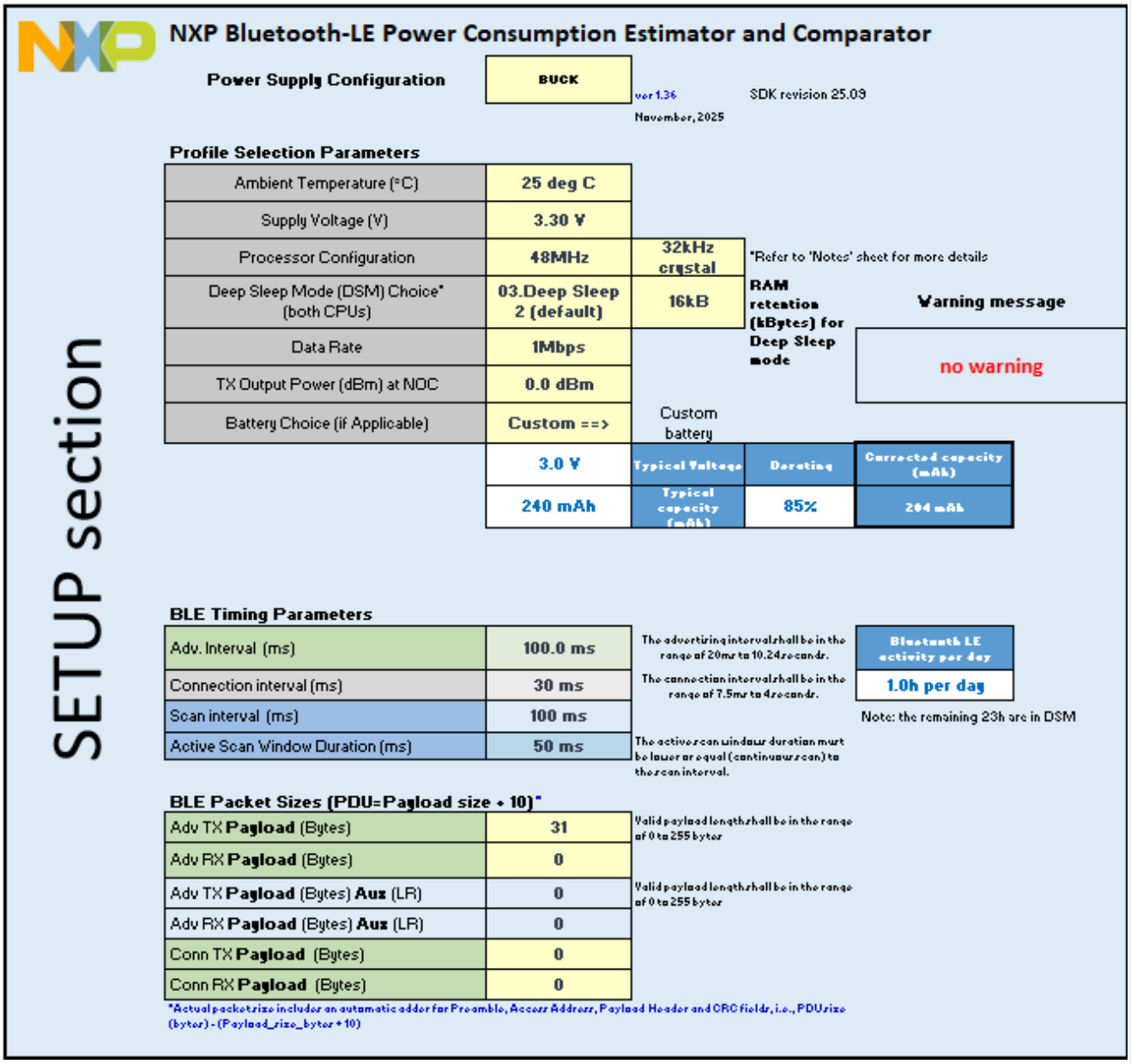

Figure 110. Dashboard sheet - 'SETUP' section

If the choice is not acceptable, the “Warning message” area provides information. For example, set it to +10 dBm with a supply voltage of 2.1 V.

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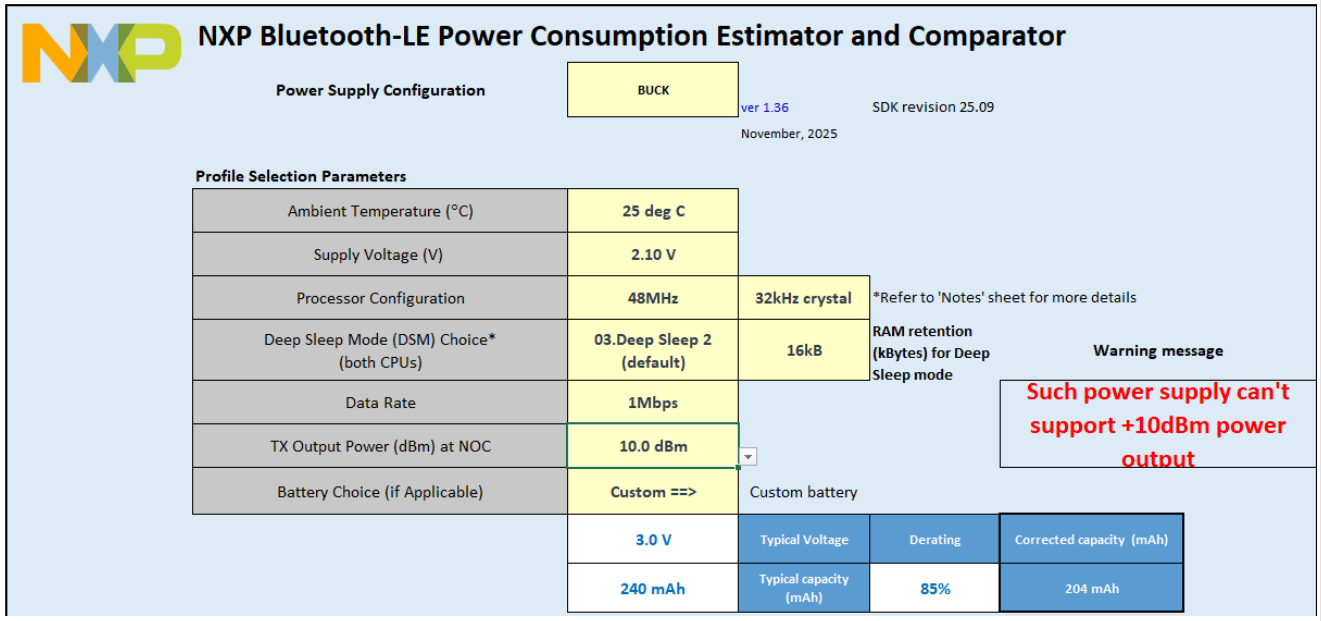

Figure 111. Setup section - warning message

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5.2.3.1 Profile selection

This subsection describes the generally available parameters to set:

- Power supply configuration: Buck or Bypass
- Ambient temperature: -40/-20/25/65/85/105/120 °C
- Supply voltage: 3.6/3.3/3.0/2.7/2.4/2.1/1.8/1.71 V
- Processor (MCU core0) configuration: 20.97/32/48/96 MHz
- Deep-sleep mode choice (low-power configuration): deep-sleep 1/deep-sleep 2 (default into the SDK)/power-down 1/deep power-down 1/smart power switch
  - More information is available in the Section 5.2.2.
- Data rate (Bluetooth LE): 1 Mbit/s/2 Mbit/s/500 kbit/s (LR S2) /125 kbit/s (LR S8)
- Battery choice: Custom/CR2032/…
  - Custom choice to set the voltage (V), typical capacity (mAh), and derating of the battery (%)
  - For other choices, the applied default values are in the “Battery” sheet

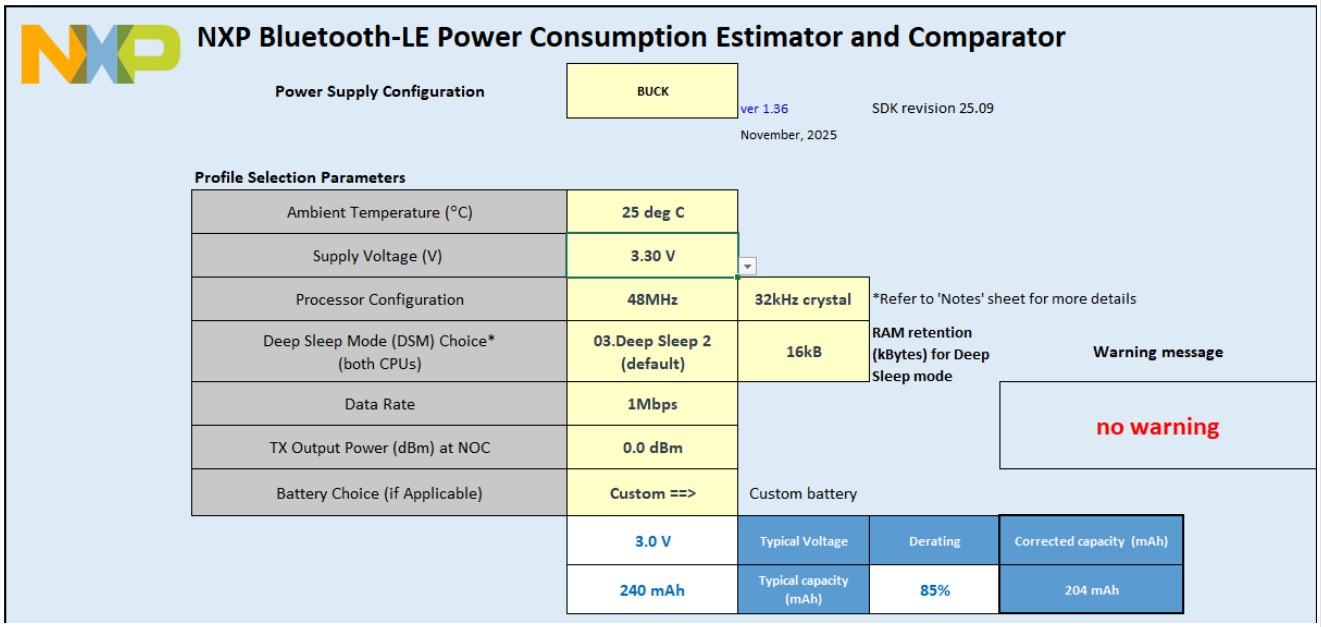

Figure 112. Setup section - profile selection

This parameter sets the Bluetooth LE activity number of hours per day. The remaining unused hours are set to low-power, defined in the Deep-sleep mode choice cell.

Figure 113 shows the Bluetooth LE activity of 3 h per day and 21 h of no activity (low-power mode).

The total battery life time section provides the information linked to this setting.

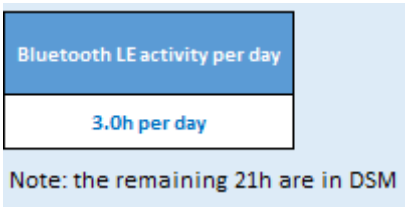

Figure 113. Setup section - Bluetooth LE activity per day

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5.2.3.2 Bluetooth LE timings

This subsection describes the different Bluetooth LE timings for the following:

- Advertising and connection interval events
- Scan interval and scan windows events

The advertising interval ranges from 20 ms to 10.24 s.

The connection interval ranges from 7.5 ms to 4 s.

The scan interval must be higher than (% duty cycle) or equal to (100 % duty cycle) the active-scan window duration.

For example, the scan interval set to 100 ms and the active scan window duration set to 50 ms provide a 50 % duty cycle scan.

BLE Timing Parameters

Adv. Interval (ms)	100.0 ms	The advertising interval shall be in the range of 20ms to 10.24 seconds.
Connection interval (ms)	0 ms	The connection interval shall be in the range of 7.5ms to 4 seconds.
Scan interval (ms)	100 ms	
Active Scan Window Duration (ms)	50 ms	The active scan windows duration must be lower or equal (continuous scan) to the scan interval.

Figure 114. Setup section - Bluetooth LE timings

5.2.3.3 Bluetooth LE packet sizes

This subsection describes the different Bluetooth LE TX and RX payloads for advertising and connection in standard and long-range events.

For more information regarding the packet format and its content, see the Section 5.2.2.

Fill the value for the payload number only. The tool adds the bytes for the preamble, access address, link layer header, and CRC: 10 bytes for 1 Mbit/s and LR and 11 bytes for 2 Mbit/s. The MIC option is not considered.

BLE Packet Sizes (PDU=Payload size + 10)*

Adv TX **Payload** (Bytes)	31	Valid payload length shall be in the range of 0 to 255 bytes
Adv RX **Payload** (Bytes)	0	
Adv TX **Payload** (Bytes) **Aux** (LR)	0	Valid payload length shall be in the range of 0 to 255 bytes
Adv RX **Payload** (Bytes) **Aux** (LR)	0	
Conn TX **Payload** (Bytes)	0	
Conn RX **Payload** (Bytes)	0	

*Actual packet size includes an automatic adder for Preamble, Access Address, Payload Header and CRC fields, i.e., PDU size (bytes) = (Payload_size_bytes + 10)

Figure 115. Setup section - Bluetooth LE packet sizes

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5.2.4 Overview of Information sections

The Information section is split into four areas to display the following subsections:

- Light-green area: power consumption/energy
- Light-yellow area: battery life time
- Light-red area: disclaimer
- Red area: battery life time graph

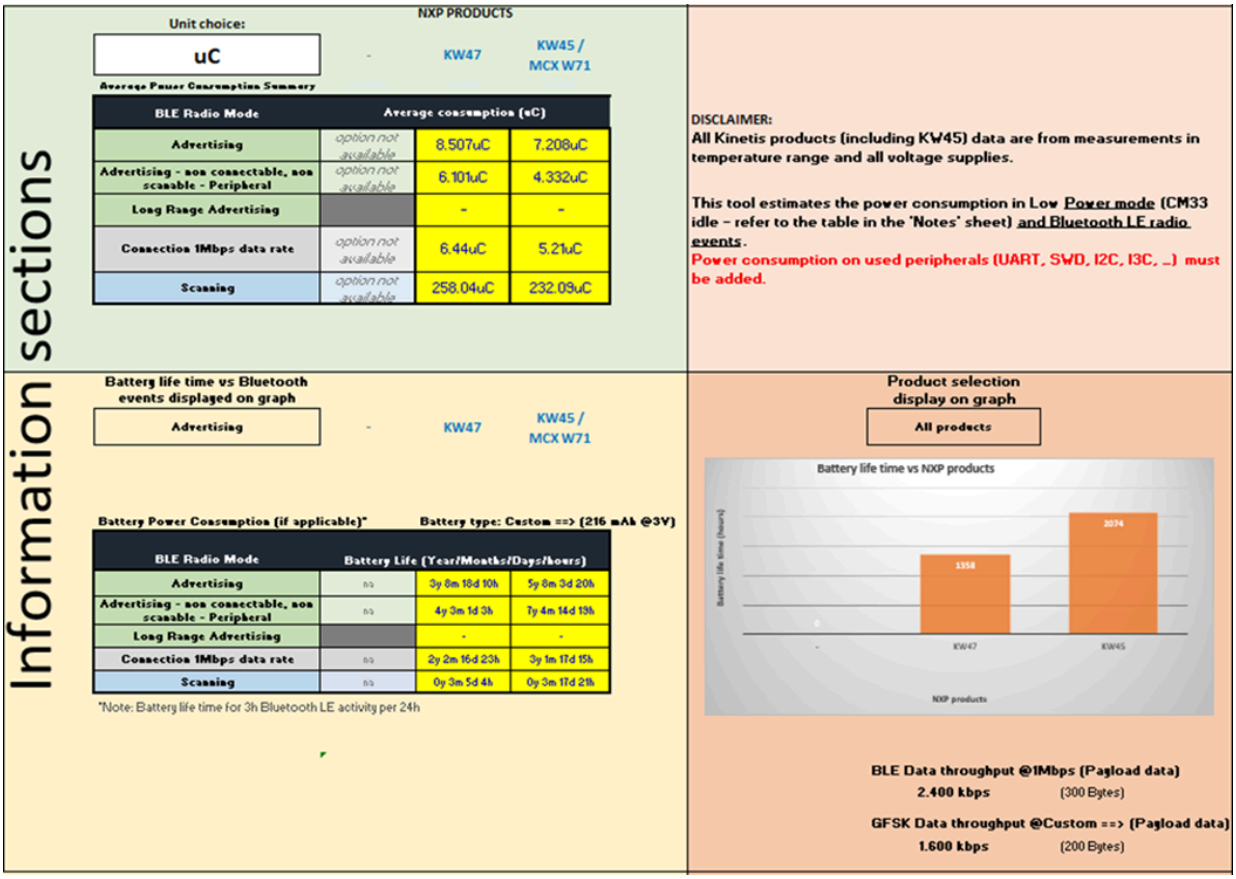

Figure 116. Dashboard sheet - information sections

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5.2.4.1 Light-green area: power consumption/energy

This subsection provides the average power consumption (µA or µW) or energy (nAh, µC, or µJ) linked to the unit choice. Five Bluetooth LE events are considered:

- Legacy advertising
- Advertising non-connectable and non-scannable
- Long-range advertising (LR S2 [500 kbit/s] or LR S8 [125 kbit/s])
- Connection with a different data rate: 1 Mbit/s, 2 Mbit/s, 500 kbit/s, 125 kbit/s
- Scanning

5.2.4.2 Light-yellow area: battery life time

This subsection provides the battery life time linked to the type of battery selected (custom 216 mAh @ 3 V in this example). Five Bluetooth LE events are considered independently:

- Legacy advertising
- Advertising non-connectable and non-scannable
- Long-range advertising (LR S2 [500 kbit/s] or LR S8 [125 kbit/s])
- Connection with a different data rate: 1 Mbit/s, 2 Mbit/s, 500 kbit/s, 125 kbit/s
- Scanning

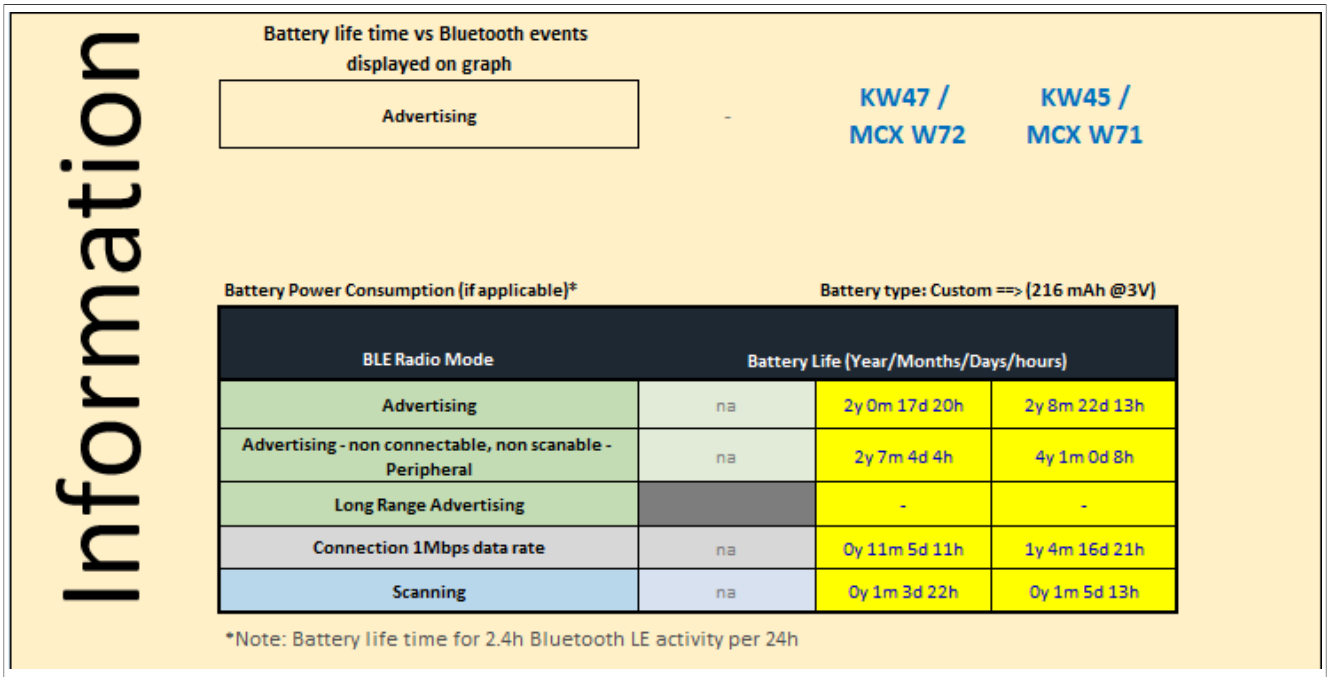

Figure 117. Subarea section - battery lifetime

5.2.4.3 Red area: battery life time graph

This subsection compares the KW45 and/or MCX W72 battery life time (in days). The battery life time is linked to the selection performed in the previous yellow windows (“Battery lifetime vs Bluetooth LE events displayed on graph”). Figure 118 shows the battery life time, considering the advertising events. The Bluetooth LE and GFSK throughput information is also provided.

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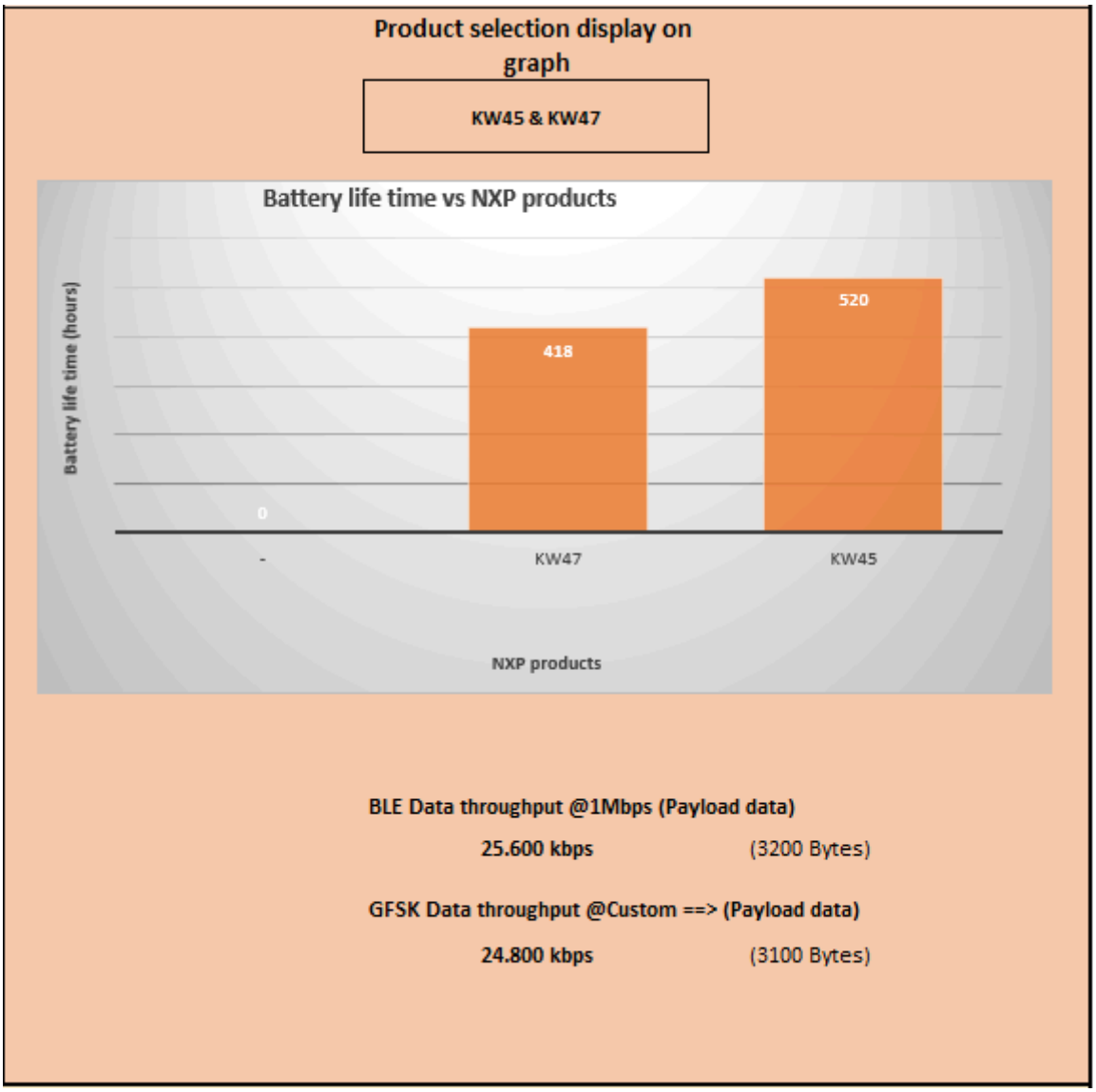

Figure 118. Subarea section - battery lifetime graph

5.2.4.4 Light-red area: disclaimer

This subsection provides the disclaimer linked to all products in this tool: KW45 and MCX W72.

The Power Profile tool is based on the Bluetooth LE measurement data performed at the voltage from 1.71 V to 3.6 V, and temperature from -40 °C to 120 °C. Only the radio MCU core1 (NBU) is active. The MCU core0 is in the Low-power mode selected (Deep-sleep, Power-down, Deep power-down, or Power-switch modes). Peripherals are not activated. Figure 119 shows a sample of this section.

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DISCLAIMER:
All Kinetis products (including KW45) data are from measurements in temperature range and all voltage supplies.

This tool estimates the power consumption in Low Power mode (CM33 idle - refer to the table in the 'Notes' sheet) and Bluetooth LE radio events.
Power consumption on used peripherals (UART, SWD, I2C, I3C, ...) must be added.

Figure 119. Subarea section - disclaimer

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5.2.5 Graph sections dashboard view

This subsection provides all the graphs linked to the Bluetooth LE events. There are two types of graphs per event: current consumption over time and cumulative energy over time. It concerns the following:

- Legacy advertising
- Advertising non-connectable and non-scannable
- Long-range advertising (LR S2 [500 kbit/s] or LR S8 [125 kbit/s])
- Peripheral and central connection
- Scanning
- Extended advertising 1 Mbit/s xMbit/s [1 Mbit/s, 2 Mbit/s, 500 kB/s] profile
- Extended advertising coded xMbit/s [1 Mbit/s, 2 Mbit/s, 500 kB/s] profile

Figure 120 shows the Area section graph.

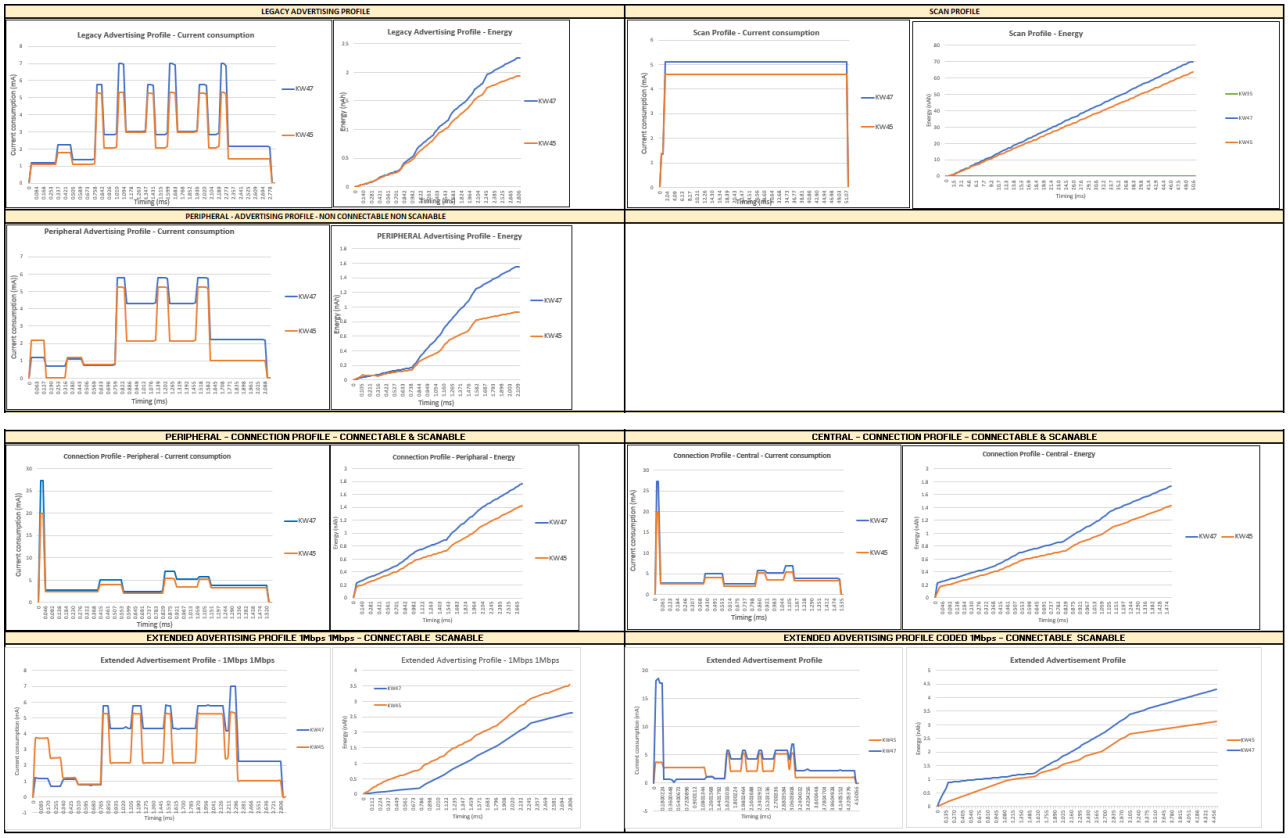

Figure 120. Area section - graph displays

5.2.6 MCX W72 calculations view

The **MCX W72 calculations sheet** provides the power consumption of the device as per the sub events listed below:

- Radio RX and TX
- Rise/fall
- MCU core0 idle/stop/wait for interrupt (WFI)
- NBU idle/run
- TX to RX transition

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- Preprocessing
- Postprocessing
- Power up
- Low power in different modes

Figure 121 shows a sample of the MCX W72 calculation sheet that describes the calculation of each Bluetooth LE power consumption event in detail. Total timings (ms), charge integral (nAh), current (µA), and power consumption (mW) are provided.

Power Supply Configuration	BUCK
Profile Selection Parameters	
Ambient Temperature (°C)	25 deg C
DCDC Supply Voltage (V)	3.3 V
Processor Configuration	48MHz
Deep Sleep Mode (DSM) Choice	03.Deep Sleep 2 (default)
Data rate	1Mbps
TX Output Power (dBm) at NOC	0.0 dBm
Connection data rate	1Mbps

Average Radio Power Consumption@3.3V	Current (mA)
Reference Radio Supply Voltage (V)	3.30 V
TX Active (0dBm)	3.627 mA
TX Active (2dBm)	5.287 mA
TX Active (3.5dBm)	5.898 mA
TX Active (4dBm)	7.068 mA
TX Active (5dBm)	6.276 mA
TX Active (7dBm)	8.184 mA
TX Active (10dBm)	14.694 mA
RX Active	4.836 mA
Scanning	5.120 mA
TX Warm-up	1.431 mA
TX Warm-down	3.365 mA
RX warm-up	0.000 mA
Rx warm-down	1.431 mA
Tx to Rx trasition	3.025 mA
Rx to Tx trasition	3.025 mA
Reference MCU Supply Voltage (V)	3.30 V
ADV pre-processing	0.698 mA
Extended ADV 1M pre-processing	6.349 mA
Extended ADV 2M pre-processing	7.880 mA
Extended ADV Coded 500k pre-processing	5.579 mA
CONN pre-processing-1Mbps	2.793 mA
CONN pre-processing-2Mbps	4.413 mA
CONN pre-processing-500kbps	4.463 mA
CONN pre-processing-125kbps	6.690 mA
Radio Post-processing	2.246 mA
MCU STOP	2.156 mA
Sleep 1	0.07044 mA

CONNECTABLE & SCANABLE ADVERTISING				
	Advertising Interval	100.000 ms		
	State	**Time(ms)**	**Current(mA)**	**mA x mS**
ADVERTISING	Power up	0.155 ms	1.187 mA	0.184 mA-ms
	Pre-processing	0.175 ms	1.187 mA	0.208 mA-ms
	MCU running	0.150 ms	2.230 mA	0.335 mA-ms
	MCU WFI	0.200 ms	1.370 mA	0.274 mA-ms
	TX Warm-up	0.080 ms	1.431 mA	0.114 mA-ms
	Tx (+0dBm)	0.096 ms	5.783 mA	0.555 mA-ms
	Tx to Rx transition	0.150 ms	2.860 mA	0.429 mA-ms
	Rx	0.080 ms	6.992 mA	0.559 mA-ms
	Rx Warm-down	0.020 ms	1.431 mA	0.029 mA-ms
	MCU WFI	0.160 ms	3.018 mA	0.483 mA-ms
	TX Warm-up	0.080 ms	1.431 mA	0.114 mA-ms
	Tx (+0dBm)	0.096 ms	5.783 mA	0.555 mA-ms
	Tx to Rx transition	0.150 ms	2.860 mA	0.429 mA-ms
	Rx	0.080 ms	6.992 mA	0.559 mA-ms
	Rx Warm-down	0.020 ms	1.431 mA	0.029 mA-ms
	MCU WFI	0.160 ms	3.018 mA	0.483 mA-ms
	TX Warm-up	0.080 ms	1.431 mA	0.114 mA-ms
	Tx (+0dBm)	0.096 ms	5.783 mA	0.555 mA-ms
	Tx to Rx transition	0.150 ms	2.860 mA	0.429 mA-ms
	Rx	0.080 ms	6.992 mA	0.559 mA-ms
	Rx Warm-down	0.020 ms	1.431 mA	0.029 mA-ms
	ADV Post-process	0.500 ms	2.146 mA	1.073 mA-ms
	Active Consumption	2.778 ms	Avg= 2.915 mA	**8.099 mA-ms**
	DSM duration	97.222 ms	0.004200 mA	0.408 mA-ms
	SUM	**100.000 ms**	**Total**	**8.507 mA-ms**
			Charge Integral	**2.36 nAh**
			Current (uA)	85.071 uA
			Power Consumption (mW)	0.281 mW
			Avg= 2.915 mA	**2.25 nAh**

Advertising Power Consumption Breakdown		
State Summary	**Consumption (%)**	
MCU only	27.19%	2.268 mA
Warmup & Transitions	20.17%	2.288 mA
TX	19.58%	5.783 mA
RX	19.72%	6.992 mA
DSM	4.80%	0.004 mA
	Total (avrg)	85.071 uA

Figure 121. MCX W72 calculation sheet extract

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5.2.7 Battery view

The sheet provides all the battery capabilities per coincell battery types. One open source is named “custom”. The end users can fill the typical capacity (mAh) and derating (%) of their own battery. See Figure 122.

Battery Choice	Battery Type	Manufacturer	Nominal Votage(V)	Typical capacity (mAh)	Typical Voltage	Typical Load (kohms)	Serial Stack size	Energy (mWh)
1	A76 (x2)	Energizer	1.5	150	1.25	7.5	2	375
2	A76Z (x2)	Energizer	1.5	118	1.25	6.8	2	295
3	CR2025	Energizer	3	163	2.8	15	1	456.4
4	CR2032	Energizer	3	240	2.8	15	1	672
5	Custom ==>	na	3	240	3	na	1	720
6	E91 (x2)	Energizer	1.5	2800	1.25	0.043	2	7000
7	E92 (x2)	Energizer	1.5	1200	1.25	0.024	2	3000
8	E96 (x2)	Energizer	1.5	650	1.25	0.075	2	1625
9	NCR18500	Panasonic	3.6	2000	3.6	0.00950	1	7200
10	UR18650ZTA	Panasonic	3.7	3000	3.7	0.00255	1	11100
(x2) implies that two batteries are stacked in series								

Figure 122. Battery sheet

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6 Acronyms

Table 98 lists the acronyms used in this document.

Table 98. Acronym and abbreviations

Term	Description
ADC	Analog-to-digital converter
Bluetooth LE	Bluetooth Low Energy or Bluetooth Smart
BTLL	Bluetooth LE link layer
CSA	Channel selection algorithm
DC	Direct current
DSM	Deep-sleep mode
DUT	Device under test
EVK	Evaluation kit
GAP	Generic access profile
GFSK or GenFSK	Gaussian frequency shift keying
GPIO	General-purpose input/output
IoT	Internet of things
ISM	Industrial, scientific, and medical bands
LE	Low energy
LPTMR	Low-power timer
LPUART	Low-power UART
MCU	Microcontroller unit
PC	Personal computer
PDU	Protocol data unit
PMC	Power management controller
RX	Reception
SAR	Successive approximation register
SCGC	System clock gating control register
SDK	Software development kit
SIM	System integration module
SMPS	Switch mode power supply
SRAM	Static random access memory
TSM	Transceiver sequence manager
TX	Transmission
UART	Universal asynchronous receiver transmitter
USB	Universal serial bus
WFI	Wait for interrupt
XCVR	Transceiver

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7 References

Table 99 lists the references used to supplement this document.

Table 99. Related documentation/resources

Document	Link/how to access
MKW4xZ/3xZ/3xA/2xZ DC-DC Power Management (document AN5025)	AN5025
MCXW72x Reference Manual (document MCXW72xRM)	https://www.nxp.com/products/MCX-W72#documentation
Low Power Reference User Guide	Low power reference user guide in MCUXpresso SDK Documentation
Wireless Connectivity Framework Reference Manual	Wireless Connectivity Framework
MCX W72 Power Profile Tool	Power Profile Tool Link

For any access related support, contact your local NXP Field Application Engineer (FAE) or sales representative.

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8 Revision history

Table 100. Revision history

Document ID	Release date	Description
AN14739 v.2.0	10 December 2025	First public release
AN14739 v.1.0	6 October 2025	Initial NDA release

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