

# Application Note

## DA16200 DA16600 Bluetooth® LE Coexistence

AN-WI-002

### Abstract

*This document gives an application information about the DA16200 and DA16600 Bluetooth® LE Coexistence interface and configuration options.*

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## DA16200 DA16600 Bluetooth® LE Coexistence

### 1 Introduction

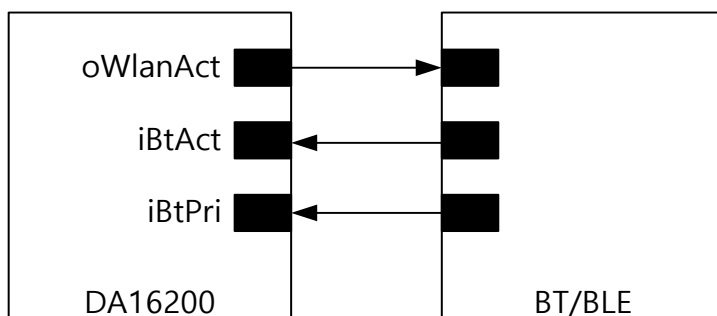
The DA16200 (DA16600) provides the ability to coordinate its 2.4 GHz RF activity with a companion Bluetooth® LE device through the Bluetooth® LE coexistence function. This function performs a handshake with a Bluetooth® LE device using either a 3-pin interface or a 1-pin interface.

### 2 Interface

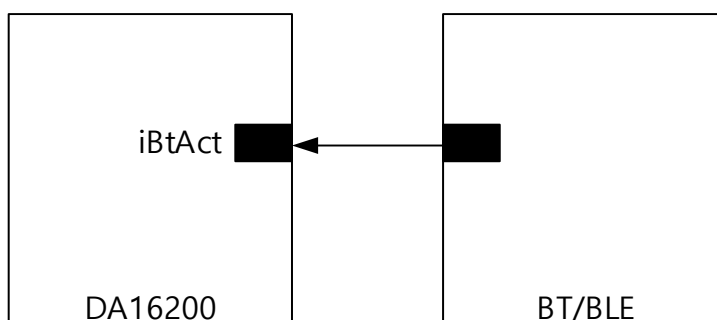
DA16200 (DA16600) pin multiplexing can be used to configure the following three pins as the Bluetooth® LE coexistence function:

- BT\_sig0 (oWlanAct)
  - Output indicating that WLAN is currently active
- BT\_sig1 (iBtAct)
  - Input indicating that BT/BLE is currently active
- BT\_sig2 (iBtPri)
  - Input (Optional) indicating that BT/BLE has higher priority

A variety of configuration settings are available for these pins including the polarity of signals, the priority of BT/WLAN (See [Table 3](#)), the usage status of the optional iBtPri function, and whether to switch oWlanAct to be active in the event of TX/RX/TRX. See [Figure 1](#) and [Figure 2](#).



**Figure 1: 3-Pin Bluetooth® LE Coexistence Interface**



**Figure 2: 1-Pin Bluetooth® LE Coexistence Interface**

### 3 Operation Scenario

The Bluetooth® LE coexistence feature can be enabled and disabled through a configuration register. The activation scenarios based on the status of each pin are as follows:

- BT\_sig0 (oWlanAct)
  - When asserted, external BT/BLE is expected to stop occupying RF
- BT\_sig1 (iBtAct)
  - When asserted, DA16200 (DA16600) stops occupying RF
- BT\_sig2 (iBtPri)
  - Optional, and thus may not be used
  - When used, DA16200 (DA16600) stops occupying RF when both iBtAct and iBtPri are active even if it has something to transmit at that moment

When both DA16200 (DA16600) and BT/BLE want to transmit a packet at the same time, there is a configuration in the DA16200 (DA16600) that determines who has priority at that moment.

When the priority of the DA16200 (DA16600) is set to be higher than BT/BLE, it ignores iBtAct signal and transmit its packet anyway.

When the priority of the DA16200 (DA16600) is set to be lower than BT/BLE, it delays transmission of its packet until BT/BLE de-asserts the iBtAct signal.

Priority can be set through an API which is described later in this document.

### 4 Pin Configuration

Table 1 shows the 3-pin configuration of Bluetooth® LE coexistence.

**Table 1: 3-Pin Bluetooth® LE Coexistence Pin Configuration**

Signals	Description	I/O	DA16200 GPIO Num	Pin Number			
				DA16200	DA16200MOD	DA16600MOD	
						DA16200	DA14531
oWlanAct	Wi-Fi active signal	O	GPIOA8	30	25	35	48 (P0_5)
iBtAct	BT active signal	I	GPIOA9	29	24	34	3 (P0_6)
iBtPri	BT priority	I	GPIOA10	28	23	33	47 (P0_7)

When GPIOA8 and GPIOA9 are assigned as either an SDIO or SPI interface, only the GPIOA10 pin should be used for Bluetooth® LE Coexistence. In this case, the GPIOA10 pin must be connected to the iBtAct pin of the BT/BLE chipset to coordinate the use of the RF signal between the DA16200 (DA16600) and BT/BLE chipsets. Table 2 show 1-pin configuration of Bluetooth® LE coexistence.

**Table 2: 1-Pin Bluetooth® LE Coexistence Pin Configuration**

Signals	Description	I/O	DA16200 GPIO Num	Pin Number			
				DA16200	DA16200MOD	DA16600MOD	
						DA16200	DA14531
iBtAct	BT active signal	I	GPIOA10	28	23	33	3 (P0_6)

## 5 Pin Multiplex

Pin multiplexing for the Bluetooth® LE coexistence feature can be configured by modifying the `initialize_bt_coex(void)` function in the file “`rf_meas_api.c`” file as follows:

```
// pin mux setup for Bluetooth® LE coexistence
#ifdef __SUPPORT_BTCOEX_1PIN__
    _dal6x_io_pinmux(PIN_EMUX, EMUX_BT);
#endif
    _dal6x_io_pinmux(PIN_FMUX, FMUX_GPIOBT);
```

## 6 SDK Feature Definition

The Bluetooth® LE coexistence feature can be enabled in the DA16200 (DA16600) SDK by defining the following literals in the customer specific version of the “`config_generic_sdk.h`” file:

- 3-Pin Bluetooth® LE Coexistence
 

```
#define __SUPPORT_BTCOEX__           // BT Coexistences
```
- 1-Pin Bluetooth® LE Coexistence
 

```
#define __SUPPORT_BTCOEX__           // BT Coexistences
#define __SUPPORT_BTCOEX_1PIN__     // BT Coexistences with 1 pin
```
- Polarity Configuration
 

```
#define BTCOEX_POLARITY_HIGH 0
#define BTCOEX_POLARITY_LOW  1
```

### NOTE

When 1-pin Bluetooth® LE Coexistence support is defined in “`config_generic_sdk.h`”, the GPIOA10 pin should be connected to the iBtAct pin of the BT/BLE chipset.

## 7 Application Programming Interface

**Table 3: Bluetooth® LE Coexistence API Elements**

<code>void rf_meas_btcoex(uint8_t enable, uint8_t priority, uint8_t gpio);</code>	
enable	0 or 1 (1: enable)
priority	priority: 0,1,2 0: BT > WLAN (BT priority is higher than WLAN) 1: BT = WLAN (BT and WLAN priorities are equal) 2: BT < WLAN (WLAN priority is higher than BT)
gpio	Pin mux setup for test Used for test purposes. Should be '0'
Return	void

Example code for the Bluetooth® LE coexistence API when using 3 pins:

```
rf_meas_btcoex(1, 0, 0); // 1: BT coexistence is enabled, 0: BLE win in conflict
rf_meas_btcoex(1, 2, 0); // 1: BT coexistence is enabled, 2: WLAN win in conflict
```

Example code for the Bluetooth® LE coexistence API when using 1 pin:

```
rf_meas_btcoex(1, 0, 0); // 1: BT coexistence is enabled, 0: BLE win in conflict
```

## Revision History

Revision	Date	Description
1.8	25-Mar-2022	Update logo, disclaimer, copyright.
1.7	27-Jan-2022	Added <a href="#">Table 2</a> . Updated <a href="#">Table 1</a> and <a href="#">Table 3</a> .
1.6	21-Dec-2021	TW editorial and rebranded template Section 6 and Section 7 updated
1.5	25-Nov-2021	Title updated
1.4	30-Jun-2021	Added the description for BT Coexistence using 1-pin interface.
1.3	09-Apr-2020	Document number changed to AN-WI-002 from AN-B-080, minor edits
1.2	06-Jan-2020	Section 6: add sample code and configuration Finalized document
1.1	28-Nov-2019	Editorial review
1.0	14-Aug-2019	Preliminary DRAFT Release

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**DA16200 DA16600 Bluetooth® LE Coexistence****Status Definitions**

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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