

# User Manual

## DA16200 DA16600 Getting Started for AWS® IoT Core

### Abstract

*The DA16200/DA16600 is a highly integrated ultra-low power Wi-Fi system on chip (SoC) that allows users to develop a complete Wi-Fi solution on a single chip. This document is a DA16200/DA16600 getting started guide intended to help new or existing developers quickly get started using AWS® IoT Core using the DA16200/DA16600.*

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## DA16200/DA16600 Getting Started for AWS® IoT Core

### 1 Terms and Definitions

AP	Access Point
API	Application Programming Interface
AWS	Amazon Web Services
DPM	Dynamic Power Management
DTIM	Delivery Traffic Indication Map
IoT	Internet of Things
MCU	Micro-Controller Unit
OTA	Over The Air
SDK	Software Development Kit
TIM	Traffic Indication MAP

### 2 References

- [1] DA16200MOD, Datasheet, Renesas Electronics
- [2] DA16600MOD, Datasheet, Renesas Electronics
- [3] UM-WI-056, DA16200 DA16600, FreeRTOS Getting Started Guide, User Manual, Renesas Electronics
- [4] UM-WI-016, DA16200, Door Lock Application Using AWS IoT, User Manual, Renesas Electronics
- [5] UM-WI-017, DA16200, AWS IoT Server Setup, User Manual, Renesas Electronics

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### 3 Overview

The DA16200 Wi-Fi Development Kit provides a quick and easy method to start developing battery powered applications and products using ultra-low power Wi-Fi.

The ultra-low power DA16200 chipset is the world's lowest power Wi-Fi chip specifically designed to meet the requirements for power sensitive wireless applications.

The DA16600MOD-DEVKT provides a host board based on the DA16600 Wi-Fi + Bluetooth® Low Energy (LE) module supporting a USB connection to a PC for evaluation and development of low power Wi-Fi and Bluetooth® Low Energy applications.

#### 3.1 Benefits

- Ultra-low power Wi-Fi technology
- More than 1-year battery life for most applications
- Industry leading wireless range
- Fully integrated Wi-Fi system on chip (SoC)
- Comprehensive security capabilities
- Easy to use development tools means shorter time to market

#### 3.2 Features

- Highly integrated ultra-low power DA16200 Wi-Fi system module
- Best Radio Frequency performance
- SoC runs full networking OS and TCP/IP stack
- Built-in 4-channel auxiliary ADC for sensor interfaces
- Built-in hardware crypto engines for advanced security features
- Complete software stack
- eMMC/SD expanded memory

#### 3.3 Applications

DA16200MOD/DA16600MOD is a full offload SoC for IoT Applications, such as:

- Security systems
- Door locks
- Thermostats
- Garage door openers
- Blinds
- Lighting control
- Sprinkler systems
- Video camera security systems
- Smart appliances
- Video doorbell

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### 4 Hardware Description

#### 4.1 Datasheet

##### 4.1.1 DA16200MOD

The DA16200MOD is a fully integrated Wi-Fi® module with ultra-low power consumption, best RF performance and easy development environment. For more information, see DA16200MOD Datasheet Ref. [1].

##### 4.1.2 DA16600MOD

The DA16600 modules provide a convenient way to add both low power Wi-Fi and low power Bluetooth® Low Energy (LE) functionality to your device. For more information, see DA16600MOD Datasheet Ref. [2].

### 5 Setup Development Environment

To start Software Development Environment, follow the steps below:

- Install the ARM cross compiler
- Install and configure the e<sup>2</sup>studio
- Import the DA16200 SDK into the e<sup>2</sup>studio and build an application
- Download and test the application
- Use J-Link debugger to debug the application

For more information, see DA16200 DA16600 FreeRTOS Getting Started Guide, Ref. [3].

### 6 Setup Evaluation Board

To configure DA16200 EVK/DA16600 evaluation board, see DA16200 DA16600 FreeRTOS Getting Started Guide, Ref. [3].

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### 7 Setup AWS IoT

To configure AWS IoT server, follow the steps below:

- Set up AWS account and permissions
- Connect devices to AWS IoT
- Configure Amazon Cognito user pools and identity pools
- Setup with Amazon IAM
- Create S3 bucket

For more information, see DA16200 AWS IoT Server Setup, Ref. [5].

### 8 Build and Run Demos

To build AWS IoT reference sample, check the followings:

- Endpoint
- Thing Name
- Certificates

To run AWS IoT reference sample, the mobile app should be installed.

For more information, see DA16200 Door Lock Application for AWS IoT, Ref. [4].

### 9 Debugging

To start J-Link debugging, install J-Link and connect it to DA16200/DA16600. See the Debugging with J-Link Debug Probe section of DA16200 DA16600 FreeRTOS Getting Started Guide, Ref. [3].

The console log of the DA16200 is as follows:

```

Wakeup source is 0x4
[dpm_init_retmemory] DPM INIT CONFIGURATION (1)

*****
*           DA16200 SDK Information
* -----
*
* - CPU Type       : Cortex-M4 (120MHz)
* - OS Type        : FreeRTOS 10.4.3
* - Serial Flash   : 4 MB
* - SDK Version    : V3.2.3.0 AWS Doorlock Ref.
* - F/W Version    : FRTOS-GEN01-01-56c232799-004457
* - F/W Build Time : Jul 22 2022 12:00:50
* - Boot Index     : 0
*
*****

=> elapsed time: 0 ms, total time: 0 ms

System Mode : Station Only (0)
>>> Start DA16X Suppllicant ...
>>> DA16x Supp Ver2.7 - 2022_03
>>> Wi-Fi mode : b/g/n -> b/g (for DPM)
>>> MAC address (sta0) : d4:3d:39:10:9c:ac
>>> sta0 interface add OK
>>> Start STA mode...

```

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```
>>> Network Interface (wlan0) : UP
>>> Associated with 64:64:4a:a5:54:bc

Connection COMPLETE to 64:64:4a:a5:54:bc

-- DHCP Client WLAN0: SEL(6)

### User Call-back : Success to connect Wi-Fi ...
-- DHCP Client WLAN0: REQ(1)
-- DHCP Client WLAN0: CHK(8)
-- DHCP Client WLAN0: BOUND(10)
    Assigned addr   : 192.168.31.121
    netmask         : 255.255.255.0
    gateway         : 192.168.31.1
    DNS addr        : 192.168.31.1

    DHCP Server IP : 192.168.31.1
    Lease Time     : 12h 00m 00s
    Renewal Time   : 10h 00m 00s

=====

[ aws_shadow_dpm_auto_start]

AWS_IOT on Station Mode for "Renesas_DoorLockID_109Cac"

=====

sleepMode: 3, rtcTime: 0

=====

[ Set Sleep mode : 3 , RTC time : 0 ,useRTM : 1 ]

=====

[New Thread("DTawsMaT") Start for DEM APP]

=====

[dpmAppThreadCreate] DPM mode checked... (3)
"DIRawsMaT" got dpm data size (12)
"DERawsMaT" got dpm data size (308)
Boot mode

=====

[initDPMThread] =====

"awsMaT" already registered to port #443 for DPM process
=== app_chk_sleep_monitor_thread() started ===

sendDPMAppMSGQ...

=====

Wake mode [0x04] , type [0]
Wake up .... Boot
DNS Address [8.8.8.8] [208.67.222.222]
set_dns_addr() OK: "8.8.8.8"
set_dns_addr_2nd() OK: "208.67.222.222"

SNTP connection Try count = 15

>>> SNTP Server: pool.ntp.org (162.248.241.94)

>>> SNTP Time sync : 2022.09.29 - 00:32:32
```

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```

SNTP Sync: 2022.09.29 00:32:32 : checked
=====

[dpmAPPManager] statusFlag : 23
[dpmAPPManager] DM_NEED_INIT

DM_INIT

[app_is_needed_fleet_provisioning:686] thing name: "Renesas_DoorLockID_109Cac" in NVRAM
[INFO] [DoorLockDemo] [DPM_App_Main:2573] this is the provisioned device (thing ID: Renesas_DoorLockID_109Cac)
using certi from NVRAM
[INFO] [DoorLockDemo] [aws_dpm_app_init:2195] AWS_UPDATE_OTA_UNKNOWN
[INFO] [DoorLockDemo] [aws_dpm_app_init:2208] read AWS_NVRAM_CONFIG_OTA_STATE init status
[dpmAPPManager] DM_NEED_CONNECTION

DM_NEED_CONNECTION

[INFO] [DoorLockDemo] [aws_dpm_app_connect:2230] Establishing MQTT session with provisioned certificate...

recv timeout(=2000 ms) set OK (socket=0)

hostName = "alkzdt4nun8bnh-ats.iot.ap-northeast-2.amazonaws.com"
host IP = "3.34.227.134"

TCP connection OK to "alkzdt4nun8bnh-ats.iot.ap-northeast-2.amazonaws.com"

recv timeout(=120 ms) set OK (socket=0)

[INFO] [DoorLockDemo] [aws_dpm_app_connect:2280] Sucessfully established connection with provisioned
credentials.

[Make AWS-Thing-Name]
[NVRAM] AWS Thing name : [Renesas DoorLockID 109Cac] (len=25)
[NVRAM]
[Renesas_DoorLockID_109Cac/DeviceConnect] [Renesas_DoorLockID_109Cac/AppControl] [Renesas_DoorLockID_109Cac/Devic
eControl]

[INFO] [DoorLockDemo] [aws_dpm_app_subscription:1904] subscription info: total(default:4, tried:4), OK(4)
current RTM user Timer ID = 0
current RTM temperature(str): 0.000000
current RTM battery(str): 0.000000
current RTM doorOpen state: "false"
current RTM doorOpenMode : 0
current RTM FOTAFlag: 0
current RTM FOTA url : ""
[dpmAPPManager] DM_BOOT_WAKEUP

DM_WAKEUP_BOOT

[INFO] [DoorLockDemo] [connectionReadyInform:1594] publish (command response) OK - payload: "yes"
[closeControl]

=====

[INFO] [DoorLockDemo] [aws_dpm_app_door_work:1993] publish (shadow doorlock update) OK - payload:
{"state":{"reported":{"doorState":false,"openMethod":"app","doorStateChange":1,"doorOpenMode":0,"OTAupdate":0,
"OTAresult":"OTA_UNKNOWN"}}}
*****

last user Timer ID = 0
last doorOpenFlag state: "false"
last FOTA Stat: 0
last FOTA Url: ""

Sleep mode 3

DM_FINISH_DEVICE

recv timeout(=20 ms) set OK (socket=0)

[dpm_keepalive_timer_register] RTC interval (=1780 secs), mode (=0)

```



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```
>>> Start DPM Power-Down !!!
```

### 10 Troubleshooting

For questions or problems concerning the DA16200MOD-DEVKT/DA16600MOD-DEVKT, check the issues in the following forum:

- [Wi-Fi - Wireless Connectivity - Renesas Community](#)

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**DA16200/DA16600 Getting Started for AWS® IoT Core****Revision History**

Revision	Date	Description
1.3	Aug. 18, 2023	<ul style="list-style-type: none"><li>• Changed IDE to e2studio</li><li>• Editorial update</li></ul>
1.2	Dec. 01, 2022	Edited as direct link of documents
1.1	Nov. 04, 2022	Modify hyperlink of the documents
1.0	Oct. 13, 2022	Initial version.

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## DA16200/DA16600 Getting Started for AWS® IoT Core

### 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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## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

### Contact Information

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