

**AW-CU427-E**  
**AW-CU427-P**

**IEEE 802.11 b/g/n MAC/baseband/radio  
and Bluetooth 4.2 IoT Module  
Internal Antenna**

**Datasheet**

**Rev. A**

**DF**

**(For Standard)**

## Features

### WiFi

- Single band 2.4 GHz 802.11 b/g/n
- SDIO v2.0, including DS and HS modes
- Security—WEP, WPA/WPA2 (personal), AES (HW), TKIP (HW), CKIP (SW), WMM/WMM-PS/WMM-SA
- Data Rate up to 72.2Mbps

### Bluetooth

- Supports extended Synchronous Connections (eSCO), for enhanced voice quality by allowing for retransmission of dropped packets
- Adaptive Frequency Hopping (AFH) for reducing radio frequency interference
- Maximum UART baud rates up to 4 Mbps
- Supports all Bluetooth 4.2 packet types
- Fully supports Bluetooth Core Specification version 4.2 + (Enhanced Data Rate) EDR features:
  - Adaptive Frequency Hopping (AFH)
  - Quality of Service (QoS)
  - Extended Synchronous Connections (eSCO) — Voice Connections
  - Fast Connect (interlaced page and inquiry scans)
  - Secure Simple Pairing (SSP)
  - Sniff Subrating (SSR)
  - Encryption Pause Resume (EPR)
  - Extended Inquiry Response (EIR)
  - Link Supervision Timeout (LST)
- Interface support – Host Controller Interface (HCI) using a high-speed UART interface and PCM for audio data

### MCU

- 150-MHz Arm Cortex-M4F CPU with single-cycle multiply (Floating Point and Memory Protection Unit)
- 100-MHz Cortex M0+ CPU
- 1 MB Application Flash with 32-KB EEPROM area and 32-KB Supervisory Flash
- 288 KB integrated SRAM
- OTP E-Fuse memory for validation and security
- Backup domain with 64 bytes of memory and Real-time Clock(RTC)
- 8 MHz Internal Main Oscillator (IMO) with 2% accuracy
- USB Full-Speed Dual-role Host and Device interface
- I2S Interface; up to 192 ksps Word Clock
- Two PDM channels for stereo digital microphones
- Execute-In-Place (XIP) from external Quad SPI Flash
- Supports 1, 2, 4, and Dual-Quad interfaces
- 12-bit 1 Msps SAR ADC with differential and single-ended modes
- Cypress CapSense Sigma Delta (CSD) provides best-in-class SNR, liquid tolerance, and proximity sensing
- Mutual Capacitance sensing (Cypress CSX) with dynamic usage of both Self and Mutual sensing
- Automatic hardware tuning (SmartSense™)
- Hardware acceleration for Symmetric and



Asymmetric cryptographic methods (AES, 3DES, RSA, and ECC) and Hash functions

(SHA-512, SHA-256)

- Up to 66 programmable IOs

AzureWave Confidential

## 1. Introduction

### 1.1.1 Product Overview

AzureWave presents AW-CU427 Wi-Fi & Bluetooth with Microcontroller solution which provides a highly cost-effective, flexible and easy to-use hardware/software platform to build a new generation of connected, smart devices. These smart-connected devices enable device to deliver a broad-range of services to consumers including energy-management, demand-response, home automation and remote access. This allows a user to manage comfort and convenience, also run diagnostics and receive alerts and notifications, in addition to managing and controlling the device. Developers can leverage the rich connectivity features of these new smart devices to create a new generation of innovative new applications and services.

The AW-CU427 offers the lowest RBOM. In addition, it integrates a power amplifier (PA) that meets the output power requirements of most handheld systems, a low-noise amplifier (LNA) for best-in-class receiver sensitivity, and an internal transmit/receive (iTR) RF switch, further reducing the overall solution cost and printed circuit board area. The AW-CU427 implements the world's most advanced Enhanced Collaborative Coexistence algorithms and hardware mechanisms, allowing for an extremely collaborative WLAN and Bluetooth coexistence. The Microcontroller is a combination of a dual-core microcontroller with low-power Flash technology and digital programmable logic, high-performance analog-to-digital and digital-to-analog conversion, low-power comparators, and standard communication and timing peripherals.

## 2 General

Features	Description
Product Description	IEEE 802.11 b/g/n Wireless LAN and Bluetooth IoT Module
Major Chipset	Cypress CYW43438, PSoC 62 (CY8C6247BZI-D54)
Host Interface	SPI/UART/SDIO/USB/I2C/I2S
Dimension	36.0mm(L) x 18mm(W) x 2.8mm(H)
Package	LGA Module
Antenna	Internal PCB antenna
Weight	16g

### WLAN

Features	Description
WLAN Standard	IEEE 802.11b/g/n, Wi-Fi compliant

WLAN VID/PID	n/a																																			
WLAN SVID/SPID	n/a																																			
Frequency Range	WLAN: 2.4 GHz Band																																			
Modulation	DSSS DBPSK(1Mbps), DQPSK(2Mbps), CCK(11/5.5Mbps) OFDM BPSK(9/6Mbps), QPSK(18/12Mbps), DBPSK(1Mbps), DQPSK(2Mbps), CCK(11/5.5Mbps), 16-QAM(36/24Mbps), 64-QAM (72.2/54/48Mbps)																																			
Number of Channels	802.11b: USA, Canada and Taiwan – 1 ~ 11 Most European Countries – 1 ~ 13 Japan – 1 ~ 13 802.11g: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13 802.11n: USA and Canada – 1 ~ 11 Most European Countries – 1 ~ 13																																			
Output Power (Board Level Limit)*	2.4G <table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11b (11Mbps) @EVM&lt;35%</td> <td>17</td> <td>19</td> <td>21</td> <td>dBm</td> </tr> <tr> <td>11g (54Mbps) @EVM ≤ -25 dB</td> <td>16</td> <td>18</td> <td>20</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7) @EVM ≤ -27 dB</td> <td>15.5</td> <td>17.5</td> <td>19.5</td> <td>dBm</td> </tr> </tbody> </table>		Min	Typ	Max	Unit	11b (11Mbps) @EVM<35%	17	19	21	dBm	11g (54Mbps) @EVM ≤ -25 dB	16	18	20	dBm	11n (HT20 MCS7) @EVM ≤ -27 dB	15.5	17.5	19.5	dBm															
	Min	Typ	Max	Unit																																
11b (11Mbps) @EVM<35%	17	19	21	dBm																																
11g (54Mbps) @EVM ≤ -25 dB	16	18	20	dBm																																
11n (HT20 MCS7) @EVM ≤ -27 dB	15.5	17.5	19.5	dBm																																
Receiver Sensitivity	2.4G <table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>11b (1Mbps)</td> <td></td> <td>-97</td> <td>-93</td> <td>dBm</td> </tr> <tr> <td>11g (6Mbps)</td> <td></td> <td>-91</td> <td>-87</td> <td>dBm</td> </tr> <tr> <td>11b (11Mbps)</td> <td></td> <td>-89</td> <td>-85</td> <td>dBm</td> </tr> <tr> <td>11g (54Mbps)</td> <td></td> <td>-76</td> <td>-72</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS0)</td> <td></td> <td>-91</td> <td>-87</td> <td>dBm</td> </tr> <tr> <td>11n (HT20 MCS7)</td> <td></td> <td>-73</td> <td>-69</td> <td>dBm</td> </tr> </tbody> </table>		Min	Typ	Max	Unit	11b (1Mbps)		-97	-93	dBm	11g (6Mbps)		-91	-87	dBm	11b (11Mbps)		-89	-85	dBm	11g (54Mbps)		-76	-72	dBm	11n (HT20 MCS0)		-91	-87	dBm	11n (HT20 MCS7)		-73	-69	dBm
	Min	Typ	Max	Unit																																
11b (1Mbps)		-97	-93	dBm																																
11g (6Mbps)		-91	-87	dBm																																
11b (11Mbps)		-89	-85	dBm																																
11g (54Mbps)		-76	-72	dBm																																
11n (HT20 MCS0)		-91	-87	dBm																																
11n (HT20 MCS7)		-73	-69	dBm																																
Data Rate	802.11b: 1, 2, 5.5, 11Mbps 802.11g: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n: MCS0~7 HT20																																			
Security	<ul style="list-style-type: none"> <li>◆ WPA™- and WPA2™- (Personal) support for powerful encryption and authentication</li> <li>◆ AES and TKIP acceleration hardware for faster data encryption and 802.11i compatibility</li> <li>◆ Cisco® Compatible Extension- (CCX, CCX 2.0, CCX 3.0, CCX 4.0, CCX5.0) certified</li> <li>◆ Wi-Fi Protected Setup (WPS)</li> <li>◆ WEP</li> <li>◆ WMM / WMM-SA</li> <li>◆ CKIP(Software)</li> </ul>																																			

## Bluetooth

Features	Description																				
Bluetooth Standard	Bluetooth 2.1+Enhanced Data Rate (EDR) / BT4.2																				
Bluetooth VID/PID	n/a																				
Frequency Range	2400~2483.5MHz																				
Modulation	GFSK (1Mbps), $\pi/4$ DQPSK (2Mbps) and 8DPSK (3Mbps)																				
Output Power	Basic Rate : 8dBm +/- 2dBm (Max Settings) BLE:8dBm+/-2dBm(Max Settings)																				
Receiver Sensitivity	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Typ</th> <th>Max</th> <th>Unit</th> </tr> </thead> <tbody> <tr> <td>DH5</td> <td></td> <td>-91</td> <td>-82</td> <td>dBm</td> </tr> <tr> <td>2DH5</td> <td></td> <td>-93</td> <td>-84</td> <td>dBm</td> </tr> <tr> <td>3DH5</td> <td></td> <td>-87</td> <td>-78</td> <td>dBm</td> </tr> </tbody> </table>		Min	Typ	Max	Unit	DH5		-91	-82	dBm	2DH5		-93	-84	dBm	3DH5		-87	-78	dBm
		Min	Typ	Max	Unit																
	DH5		-91	-82	dBm																
	2DH5		-93	-84	dBm																
3DH5		-87	-78	dBm																	

## Operating Conditions

Features	Description
Operating Conditions	
Voltage	WIFI/BT VBAT:3.2V~4.8V (3.6V Typical) VDD for MCU(except for USB):1.7V~3.6V
Operating Temperature	-30~70°C (Functionality is guaranteed.)
Operating Humidity	less than 85% R.H.
Storage Temperature	-40~85°C
Storage Humidity	less than 60% R.H.
ESD Protection	
Human Body Model	±1KV
Charged Device Model	±300V

### **Federal Communication Commission Interference Statement**

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

**Radiation Exposure Statement:**

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

**This module is intended for OEM integrators only. Per FCC KDB 996369 D03 OEM Manual v01 guidance, the following conditions must be strictly followed when using this certified module:**

**KDB 996369 D03 OEM Manual v01 rule sections:**

**2.2 List of applicable FCC rules**

This module has been tested for compliance to FCC Part 15

**2.3 Summarize the specific operational use conditions**

The module is tested for standalone mobile RF exposure use condition. Any other usage conditions such as co-location with other transmitter(s) or being used in a portable condition will need a separate reassessment through a class II permissive change application or new certification.

**2.4 Limited module procedures**

Not applicable.

**2.5 Trace antenna designs**

Not applicable.

**2.6 RF exposure considerations**

This equipment complies with FCC mobile radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 20cm between the radiator & your body. If the module is installed in a portable host, a separate SAR evaluation is required to confirm compliance with relevant FCC portable RF exposure rules.

**2.7 Antennas**

The following antennas have been certified for use with this module; antennas of the same type with equal or lower gain may also be used with this module. The antenna must be installed such that 20 cm can be maintained between the antenna and users.

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain(dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
1	0	mag layers	MSA-4008-25GC1-A1	2.98	2.4~2.4835GHz	PIFA	i-pex(MHF)	150
2	0	AzureWave	AW-CU427	3.12	2.4~2.4835GHz	PIFA	None	-

**2.8 Label and compliance information**

The final end product must be labeled in a visible area with the following: “Contains FCC ID: TLZ-CU427”. The grantee’s FCC ID can be used only when all FCC compliance requirements are met.

**2.9 Information on test modes and additional testing requirements**

This transmitter is tested in a standalone mobile RF exposure condition and any co-located or simultaneous transmission with other transmitter(s) or portable use will require a separate class II permissive change re-evaluation or new certification.

**2.10 Additional testing, Part 15 Subpart B disclaimer**

This transmitter module is tested as a subsystem and its certification does not cover the FCC Part 15 Subpart B (unintentional radiator) rule requirement applicable to the final host. The final host will still need to be reassessed for compliance to this portion of rule requirements if applicable.

As long as all conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance



requirements required with this module installed.

**IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

#### **Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

#### **OEM/Host manufacturer responsibilities**

OEM/Host manufacturers are ultimately responsible for the compliance of the Host and Module. The final product must be reassessed against all the essential requirements of the FCC rule such as FCC Part 15 Subpart B before it can be placed on the US market. This includes reassessing the transmitter module for compliance with the Radio and EMF essential requirements of the FCC rules. This module must not be incorporated into any other device or system without retesting for compliance as multi-radio and combined equipment.

#### **Industry Canada statement:**

This device complies with ISED's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Le présent appareil est conforme aux CNR d'ISED applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) le dispositif ne doit pas produire de brouillage préjudiciable, et (2) ce dispositif doit accepter tout brouillage reçu, y compris un brouillage susceptible de provoquer un fonctionnement indésirable.

#### **Radiation Exposure Statement:**



This equipment complies with ISED radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with greater than 20cm between the radiator & your body.

**Déclaration d'exposition aux radiations:**

Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

AzureWave Confidential

**This device is intended only for OEM integrators under the following conditions: (For module device use)**

The antenna must be installed and operated with greater than 20cm between the antenna and users,  
2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as **2** conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

**Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif module)**

1) L'antenne doit être installé et exploité avec plus de 20 cm entre l'antenne et les utilisateurs,

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les **2** conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

**IMPORTANT NOTE:**

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

**NOTE IMPORTANTE:**

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

### **End Product Labeling**

This transmitter module is authorized only for use in device where the antenna may be installed and operated with greater than 20cm between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 6100A-CU427".

### **Plaque signalétique du produit final**

Ce module émetteur est autorisé uniquement pour une utilisation dans un appareil où l'antenne peut être installée et utilisée à plus de 20 cm entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 6100A-CU427".

### **Manual Information To the End User**

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

### **Manuel d'information à l'utilisateur final**

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateur du produit final qui intègre ce module.

Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.