Wireless Module 802.11ac/a/b/g/n
WYSBHV G & WBSBHVGXG
Overview

March 25th, 2016 Version 1.0
WYSBHVGXG: IEEE 802.11ac 1x1 Module (11ac+Bluetooth®4.2)

Features
- SMD type module.
- IEEE802.11ac/a/b/g/n 1x1 conformity. Data rates up to MCS9(433.3Mbps)
- BT4.2(supports Bluetooth Low Energy). Class2 supports.
- Low standby current (with low power operation)
- Transmit data rate : 11/5.5/2/1 Mbps(11b), 54/48/36/24/18/12/9/6 Mbps(11a/g), 150~6.5 Mbps (11n, MCS7~0, HT20/80), 433.3 ~ 7.22 Mbps (11ac MCS9~0, HT80 )
- Channel Number : 1 to 13 channel (11bgn), W52/W53/W56/W58(11ac/11an), 79 channel (BT), 40 channel (BLE)
- Interface : SDIO3.0, PCM
- Built-in Diplexer, 2G-PA, 5G-PA, 5G-LNA, OTP, X’tal, DC/DC Power
- Security: TKIP, WEP, AES, CCMP, CMAC, WAPI, WPA/WPA2(64bit/128bit)
- Outline: 12.6 x 8.9 x 1.9(Max) mm
- Package: Metal case package
- RoHS Conformity

General Electrical Specification

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>11b / g / n (HT20/HT40)</td>
<td>2412</td>
<td>2472</td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11a / ac (HT80)</td>
<td>5180</td>
<td>5825</td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BT / BLE</td>
<td>2402</td>
<td>2480</td>
<td>MHz</td>
<td></td>
</tr>
<tr>
<td>Operation Voltage</td>
<td>VDD33</td>
<td>3.0</td>
<td>3.3</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>VIO</td>
<td>1.8/ 3.3</td>
<td></td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>TX Output Power</td>
<td>11b/11g/11n-2G(20TH/40TH)</td>
<td>10 / 10 / 10</td>
<td>12 / 12 / 12</td>
<td>14 / 14 / 14</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>11a/11n-5G20TH/40TH/11ac</td>
<td>10 / 10 / 8 / 6</td>
<td>12 / 12 / 10 / 8</td>
<td>14 / 14 / 12 / 10</td>
<td>dBm</td>
</tr>
<tr>
<td></td>
<td>BT</td>
<td>-6</td>
<td>0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>RX Sensitivity</td>
<td>11b/11g/11n-2G(20TH/40TH)</td>
<td>-87/-73/-69/-66</td>
<td>-76 / -65 / -64/-61</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>11a/11n-5G(20TH/40TH)/11ac</td>
<td>-71/-68/-65/-57</td>
<td>-65 / -64/-61/-51</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>BT / BLE</td>
<td>-86/-86</td>
<td>-70 / -70</td>
<td>dBm</td>
<td></td>
</tr>
<tr>
<td>TX Power Consumption</td>
<td>Burst Mode 11b (Duty=46.8%)</td>
<td>488</td>
<td></td>
<td></td>
<td>mW</td>
</tr>
<tr>
<td>RX Power Consumption</td>
<td>Mode 11ac 5G</td>
<td>358</td>
<td></td>
<td></td>
<td>mW</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>Sleep Mode</td>
<td>1.8</td>
<td></td>
<td></td>
<td>mW</td>
</tr>
<tr>
<td>General Operation Temperature Range</td>
<td>-30 / 25 / 85</td>
<td></td>
<td></td>
<td>degC</td>
<td></td>
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</tbody>
</table>

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WBSBHVGXG: Wireless LAN Module Evaluation Kit

To Evaluate WLAN Module WYSBHVGXG
You Will Need WBSBHVGXG

WBSBHVGXG is the evaluation kit for WLAN Module WYSBHVGXG. This kit has everything you need to evaluate the performance of this module.

WBSBHVGXG Kit includes:

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WBSBHVGXG</td>
<td>Evaluation Board for WLAN module WYSBHVGXG with SDIO interface</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Red &amp; Blue Cable</td>
<td>Power Supply Cable</td>
<td>1</td>
</tr>
</tbody>
</table>
Supplemental Product Information

**WLAN Module Operating Environment**

- PC with Linux Fedora18 with software development option and SDIO interface

**Attention:** *PC with SDIO is required. Although SDIO and SD Memory Card have the same slot shape, they are not compatible. WLAN Module and Evaluation Board will not work if they are connected to SD memory card slot.*

**What will be provided if the Evaluation Board is purchased**

- Lab-tool User Guide: RF Control Tool Guide
- Lab-tool: RF Control Tool
- WLAN Device Driver Software for Linux PC, Fedora18

**Attention:** *There is a possibility that export control could limit customer’s access WLAN Device Driver and the API Specification depending on the customer's country or application.*

**Attention:** *WYSBHVGXG (not WBSBHVGXG) provided by web distributor is not bundled any above documents and software. To get them, you need to purchase WBSBHVGXG (Evaluation Board).*

**Anyone can access other documents at the following site:**

- English: [http://www.yuden.co.jp/ut/product/category/module/WYSBHVGXG.html](http://www.yuden.co.jp/ut/product/category/module/WYSBHVGXG.html)
- Japanese: [http://www.yuden.co.jp/jp/product/category/module/WYSBHVGXG.html](http://www.yuden.co.jp/jp/product/category/module/WYSBHVGXG.html)
Example of hardware configuration for WBSBHVGXG

DC5.0V Power Supply

WBSBHVGXG

SDIO

Fedora 18

*Ethernet

*Windows 7

*To use LABTOOL, PC with Windows7 is also required. Each PCs are connected via Ethernet cable.
Software Structure

Sample Application
- uaputl , mlanutl (Configuration tools)

WLAN Device driver
- Data path:
  Communicate data such as TCP or UDP
- 11bg config/11ac config/11n config:
  Configure the such as CH/Rate/band/mode
- Supplicant config:
  Configure the generated key by supplicant of middleware
- Infra/Adhoc config:
  Configure the Infra or Adhoc mode
- uAP/WFD config:
  Configure the uAP or WFD mode

Bluetooth Device driver
- Bluetooth driver

Firmware
- Data TX/RX:
  Transmit and receive data on the air, such as TCP or UDP
- 11b/g/a/n function:
  Execute the function of such as CH/Rate/Band/Mode
- E-supplicant function:
  Generate the key of WPA/WPA2
- Infra/Adhoc function:
  Execute the function of Infra or Adhoc mode
- uAP/WFD function:
  Execute the function of uAP or WFD mode
- Bluetooth 4.2

*WFD : Wi-Fi Direct , E-supplicant : Embedded supplicant
Software Feature Set

**General**
- 1 Spatial stream (1x1)
- 802.11b Data rates of 1, 2, 5.5 and 11 Mbps
- 802.11a/g Data rates 6 - 48, and 54 Mbps
- 802.11n Data rates up to 300 Mbps (MCS0 to 15)
- 802.11ac Data rates up to 433 Mbps (MCS0 to 9)
- 802.11d International roaming
- 802.11e QoS block ack
- 802.11h Transmit power control, DFS
- 802.11i WPA / WPA2 and 802.11X
- Infrastructure and Ad-hoc mode
- Security WEP 64 and 128-bit, TKIP and AES CCMP for WPA / WPA2
- WMM Support, WMM PS (UAPSD)
- IEEE Power Save, Auto Deep Sleep / Host Sleep
- Embedded Supplicant
- Support for TX and RX of AMPDU and AMSDU-4k packets
- Support for Only TX of AMSDU-8k packets
- Background Scan, Vendor specific IE

**Access point**
- Multi-BSS support (2 BSS)
- Association support up to 8 stations
- Automatic channel selection (ACS)

**Simultaneous AP-STA Operation**
- AP-STA functionality
- Independent security configurations on different interfaces
- Enhanced power save
  (AP-STA simultaneous power save)

**Wi-Fi Direct/P2P**
- Autonomous Group Owner mode (GO)
- P2P Client mode
- P2P Client association with WLAN AP
- P2P Client power save
- P2P Client WMM PS (UAPSD)
- GO WMM PS / IEEE PS for associated P2P clients
- 8 client support, Provision discovery

**Bluetooth**
- BT 4.2, BT class 2
- Adaptive frequency hopping (AFH)
- Wake on BT
- Coexistence with Wi-Fi
## Driver Package

<table>
<thead>
<tr>
<th>Driver package (Platform)</th>
<th>Software</th>
<th>CPU / OS Type</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Object package for PC</td>
<td>Device driver</td>
<td>CPU: x86 (PC) OS: Fedora 18 (Linux 3.6.10)</td>
<td>Driver object&lt;br&gt;- Linux configuration tools&lt;br&gt;- Linux WLAN and BT driver, Firmware&lt;br&gt;Document&lt;br&gt;- Install guide&lt;br&gt;- Demonstration guide</td>
</tr>
<tr>
<td>RF control tool (Lab-tool)</td>
<td></td>
<td>CPU: x86 (PC) OS: Windows and Linux</td>
<td>Driver object&lt;br&gt;- Windows Lab-tool&lt;br&gt;- Linux bridge tool, Linux driver, Firmware&lt;br&gt;Document&lt;br&gt;- User guide</td>
</tr>
</tbody>
</table>