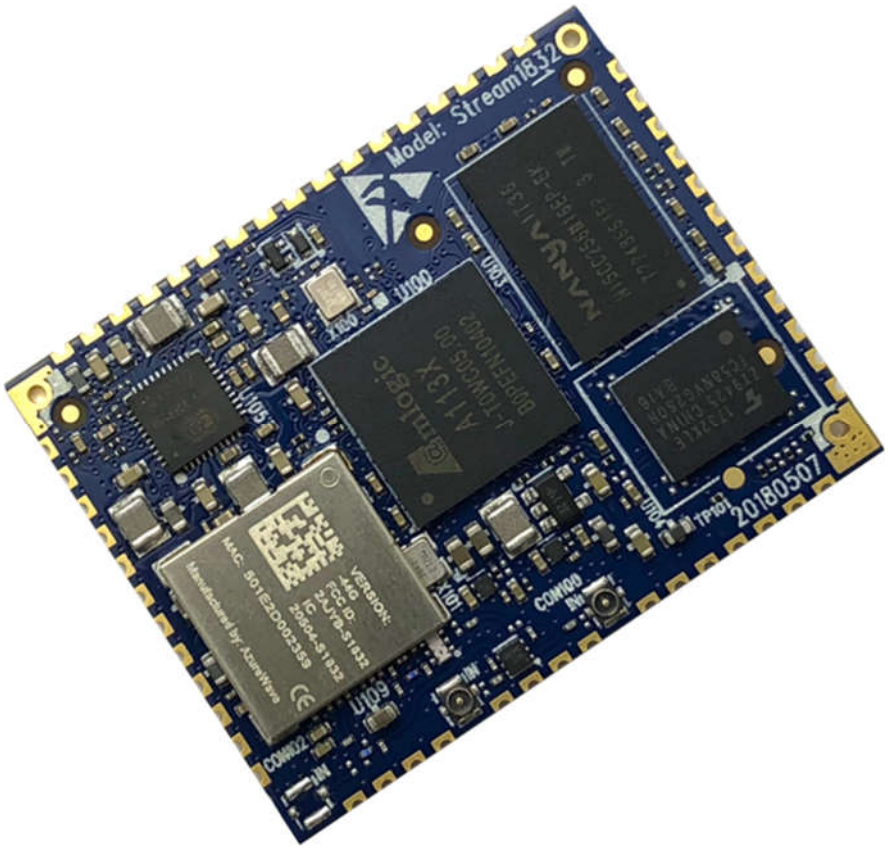
Instruction for FCC/IC compliant use

Stream1832
Network Audio Streaming Module



Version: 1.0

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Reviewer:

Date: November 22, 2018

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1. Table of Content

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2. Document History

No.	Primary Author(s)	Description of Version	Date Completed
0.1	T. Gruber	Initial version	2018-05-28
0.2	C. Apel	minor update	2018-10-04
1.0	C. Apel	update transmit power configuration	2018-11-22

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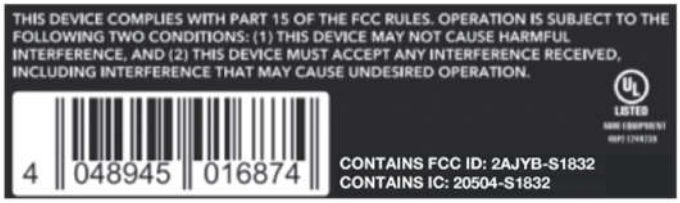
3. Module labelling

Module label already contains the necessary certification IDs. The printing must remain visible when the module is mounted. Should the module printing be covered e.g. by a heatsink, then an additional label must be applied which contains the same IDs.

4. Product labelling

Product label must contain following text:
“CONTAINS FCC ID: 2AJYB-S1832”
“CONTAINS IC: 20504-S1832”

See below example for reference



5. Instruction for use requirements

Instructions for use must contain warnings and customer information, see next two pages for detailed text

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Declaration of Conformity
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 product does not contain any user serviceable components. Any unauthorized product changes or modifications will invalidate warranty and all applicable regulatory certifications and approvals, including authority to operate this device.

Warning
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 or more 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.

Caution:
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
Operations in the 5.15 – 5.25GHz band are restricted to indoor usage only.

RF Exposure Requirements
To comply with FCC requirements, a minimum separation distance of 20cm (8 inches) is required between the equipment and the body of the user or nearby persons.

Canada:
This Class B digital apparatus complies with Canadian ICES-003 and RSS-247.
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.
The installer of this radio equipment must ensure that the product is located such that it does not emit RF field in excess of Health Canada limits for the general population: consult Safety Code 6, obtainable from Health Canada´s We site www.hc-sc.gc.ca/rpb.
As mentioned before, the installer cannot control the antenna orientation. However, they could place the complete product in a way that causes the problem mentioned above.
The device for operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.
Be advices that high-power radars are allocated as primary users (i.e. priority users) of the bands 5250-5350MHz and 5650-5850MHz and that these radars could cause interference and/or damage to LE-LAN devices.
Changes or modifications not expressly approved by the party responsible for compliance could

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void the user's authority to operate the equipment.

Cet appareil numérique de classe B est conforme aux normes NMB-003 et CNR-247 en vigueur au Canada.
Son fonctionnnement est soumis aux deux conditions suivantes : (1) Cet appareil ne doit pas créer d'interférences nuisibles. (2) Cet appareil doit tolérer toutes les interférences reçues, y compris les interférences pouvant entraîner un fonctionnement indésirable. L'installateur du présent matériel radio doit veiller à ce que le produit soit placé ou orienté de manière à n'émettre aucun champ radioélectrique supérieur aux limites fixées pour le grand public par le ministère fédéral Santé Canada ; consultez le Code de sécurité 6 sur le site Web de Santé Canada à l'adresse : www.hc-sc.gc.ca/rpb. Comme indiqué auparavant, l'installateur ne peut pas contrôler l'orientation de l'antenne. Il peut néanmoins placer le produit tout entier de manière à provoquer le problème décrit ci-dessus.

Les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux. Les utilisateurs de radars de haute puissance sont désignés utilisateurs principaux (c.-à-d., qu'ils ont la priorité) pour les bandes 5250-5350 MHz et 5650-5850 MHz et que ces radars pourraient causer du brouillage et/ou des dommages aux dispositifs LAN-EL.

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6. Antenna type and connections

Stream1832 provides two antenna ports via microwave coaxial connectors.
Antennas with 50 Ohm characteristic impedance must be connected to each microwave coaxial connector via coaxial RF cable. No external amplifier or tuning circuitry must be used.
Stream1832 was certified for FCC and IC compliance using following antennas:

Type of antenna:	**Molex 146153 (recommended)**	
Frequency band:	2400 – 2500 MHz	5150 – 5850 MHz
Return Loss:	< -10 dB	
Peak Gain (Max):	3.2 dBi 4.25 dBi	
Average Total Efficiency:	> 78%	> 79%
Impedance:	50 Ohm	
Cable Length *):	50mm, 100mm, 150mm, 200mm, 250mm, 300mm	
Type of antenna:	**Molex 204281**	
Frequency band:	2400 – 2500 MHz	5150 – 5850 MHz
Return Loss:	< -10 dB	
Peak Gain (Max):	2.2 dBi	3.5 dBi
Average Total Efficiency:	> 68%	> 70%
Impedance:	50 Ohm	
Cable Length *):	50mm, 100mm, 150mm, 200mm, 250mm, 300mm	
Type of antenna:	**2J-Antennas 2JMAS05c**	
Frequency band:	2400 – 2500 MHz	5100 – 5900 MHz
Antenna gain:	3 dBi	
VSWR:	< 1.5:1	
Impedance:	50 Ohm	
Cable Length:	150mm	

If using Stream1832 with antennas that exceed the gain of above antenna types, FCC and IC compliance must be re-evaluated and power settings adapted.

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7. Output Power configuration

To comply with Part 15 of the FCC Rules and Canadian ICES-003 and RSS-247, output power must be limited to following levels by permanent configuration setting. Below levels refer to firmware settings in dBm.

Frequency band	Channel width	modulation	dBm setting
2.4 GHz	20MHz	DSSS	17
2,4 GHz	20 MHz	OFDM	11
2,4 GHz	40 MHz	OFDM	12
5 GHz	20 MHz	OFDM	15
5 GHz	40 MHz	OFDM	12
5 GHz	80 MHz	OFDM	10

Bluetooth 4.2 output level setting: class 2 (4dBm)
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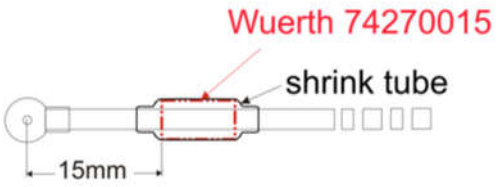
8. EMC application notes

Spurious emissions are highly dependant on the carrier board design. Legal compliance must be verified on product level.
Below recommendations should be taken into account to ensure legal compliance of the product application :

- Use a GND plane underneath the module.
- Use series resistors in all low speed interface lines, values need to be chosen depending on signal frequency and length of signal lines on application board.
- Use common mode signal filters in USB data lines, e.g. Wuerth 744232161.
- Do not use vias in high speed interface lines such as USB and Ethernet.
- Route high speed interface lines differentially and leave several mm gap to other signal lines when possible.
- Route following interfaces as short as possible, preferably on inner layers:
  - External RMII interface
  - I2S interfaces, especially clock lines
  - PDM interface, especially clock lines
- Make sure any interface which is not needed for your application is disabled in software.
- Since the WLAN antennas also radiate undesired disturbances the use of a Ferrite on the antenna cables is recommended, see below diagram for details:



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