

FCC Class II Permissive Change Request Letter

Date: 11/14/2022

To FCC:

RE: FCC Permissive II Change Request for Company: Bang & Olufsen a/s FCC ID: TTUBSCORE

We are submitting an application for a class II permissive change to the FCC approval of the Company name: Bang & Olufsen a/s, product description: Audio Converter Box (FCC ID: TTUBSCORE, Original Grant Date: 08/09/2017). Here are the changes:

Power Management IC AXP152 (U108) changed to AXP313A plus 2 single-channel DC/DC converters (U102, U103).

previous revision Stream810H



AXP152 PMIC

new revision Stream810H3



smaller AXP313A PMIC with additional DC/DC converters (on top and bottom)

Ultra-low capacitance ESD protection diode is added at CON108 antenna socket to reduce risk of damage. The diode does not reduce transmit power significantly nor does it change the output spectrum.



See the appendix

Sincerely,

A handwritten signature in black ink, appearing to be 'MS' followed by a stylized flourish.

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Title : Product Compliance Lead

Company : BANG & OLUFSEN A/S

Stream810H change note 2022-03-17

Project	Stream810
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Date	2022-03-21
Revision	005
HW configuration	all
SW configuration	update for Stream810H3

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1. New module revision Stream810H3 (PMIC change)

1.1 Change Description

Power Management IC AXP152 (U108) changed to AXP313A plus 2 single-channel DC/DC converters (U102, U103)

1.2 Reason for Change

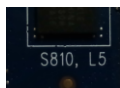
Safeguard future module availability (original PMIC expected not to be available in future)

1.3 Affected Versions

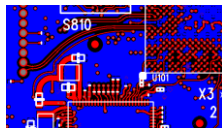
All (references to Stream810H in this document are also applicable to other Stream810 versions)

1.4 Identification of Modules

Silkscreen of previous Stream810 modules using AXP152:



Silkscreen of *production samples* of Stream810H3:



Layout and component placement changed as below

previous revision Stream810H



AXP152 PMIC

new revision Stream810H3



smaller AXP313A PMIC with additional DC/DC converters (on top and bottom)

1.5 Expected Application Impact

None expected since module HW specification remains unchanged (see also sections “Hardware Compatibility” and “Software Compatibility”) – however verification in actual application and processes recommended

1.6 Change Details

- AXP152 provided 4 supplies via DC/DCs and supply for WiFi chip via integrated LDO
- AXP313A provides 3 supplies via DC/DCs, 2 DC/DC converters are added for DDR3 RAM and WiFi chip

1.7 Hardware Compatibility of production samples

Old and new revision are identical in terms of

- external interfaces
- thermal properties, maximum ambient temperature
- footprint, dimensions, maximum component height
- power management functionality
- NB_IN pin functionality for power up/down, emergency shutdown, software recovery
- Wi-Fi and Bluetooth output power and sensitivity
- Spurious emissions
- WiFi/Bluetooth chip (unchanged)
- Supply voltage of WiFi/BT chip (unchanged)
- Internal voltage regulators of WiFi/Bluetooth chip (unchanged)

Power consumption of Stream810H3 is same or lower than for original Stream810, depending on use-case.

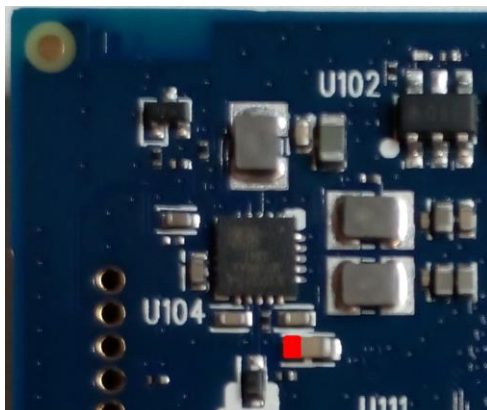
1.7.1 Technical Note on Current Injection via I/Os During Power Down

As stated in HW specification in pt. 5.2 pull-up resistors on module IO's shall be linked to '3V3_out' of the module (which does not provide power once module is off and thus no parasitic power supply via IO's occurs)

This remains valid for S810H3 and requires attention in case attached peripherals (e.g. HostMCU) remain powered while module is off. Like for the original S810H no current shall be injected into any module IO while the module is powered off.

If unsure please double check via instructions below :

- mount Stream810H3 onto application board
- Supply Stream810H3 and request shutdown
- Measure voltage on highlighted SMD pad in shutdown mode



- Voltage should be below 1V (absolute maximum 2.0V); otherwise, the source of the current injection needs to be determined by checking all module I/O voltages and then rectified. Pulling up internal supply rails via I/Os may cause reliability problems both for original Stream810 and Stream810H3. On Stream810H3, a voltage above 2.0V on internal rail will also keep DC/DC converter for RAM supply enabled, increasing off-mode power consumption
- Note that a USB-UART converter attached to debug UART will inject current into the module I/Os. Disconnect such a converter from the PC while doing the measurement of current injection as well as any other connection which is not present in a finished product.

1.8 Software compatibility

Like the original Stream810H also the Stream810H3

- supports automatic revision detection and configuration by software
- is delivered with a minimal factory-default SW image and the product specific SW is to be loaded when integrating the module into a product

To support the new PMIC the product-specific SW needs to be updated accordingly
(however Interaction between Module and Application shall remain unaffected)

- Product SW supplied by StreamUnlimited will be compatible with both original Stream810H and new Stream810H3
- Product SW images not yet prepared for Stream810H3 must not be used with Stream810H3
- Stream810H3 will reject such SW images, the UART debug interface will show an error message as below

[ERROR] : SWUPDATE failed [0] ERROR : SW not compatible with hardware

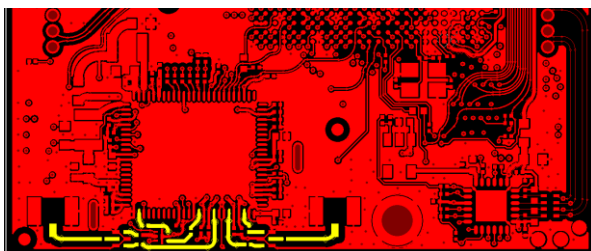
1.8.1 RF Emissions

StreamUnlimited tested conducted spectral emissions on both antenna ports for selected modulations in 2.4GHz and 5GHz band, the two module revisions are identical in terms of wanted and unwanted emissions on the antenna ports.

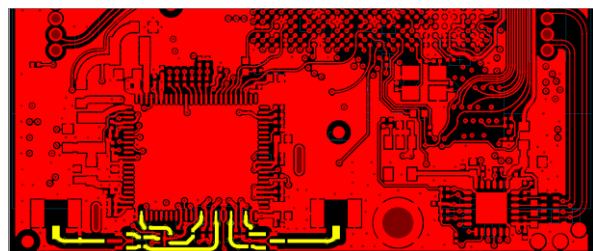
Also, spurious emissions were compared and are equal.

In-band spectral emissions of every module produced are verified using state-of-the-art Wi-Fi/Bluetooth test equipment, no change of average or spread of spectral parameters was observed during trial-run of Stream810H3

See below comparison of layout of RF section
original Stream810



Stream810H3



1.9 Impact on Modular Certifications

No change of

- Basic model name ('Stream810')
- FCC/IC IDs
- WiFi certificate number
- Bluetooth QDID

StreamUnlimited shared technical difference between Stream810H and Stream810H3 with certification partner TUV Austria. Conclusion:

- Criteria for FCC class 1 permissive change are met
- The term "minor change of circuitry for non-transmitter portions of the module" fits
- The CE/RED compliance test reports for Stream810H remain valid also for Stream810H3

Since spectral emission of the Stream810 module remains unchanged no difference on product level is expected – however a radiated emission test on product level is recommended to confirm.

StreamUnlimited suggests checking power consumption in low power standby (if applicable) and during network standby as well as checking the ripple on VIN supply of the module to confirm that the product still meets legal requirements, and that the power supply section of the product is not affected by the changes on the module. No issues are expected.

1.10 Note on certification for other countries

When replacing Stream810H with Stream810H3 in a product which was already certified for other regions than Europe/US/Canada, StreamUnlimited recommends to present the reports provided by StreamUnlimited to the certification partner and ask for confirmation that no additional testing or re-certification is needed on product level.

1.10.1 ROHS/REACH

New PMIC and additional DC/DC converters as well as changed inductor types are ROHS compliant, a test report of PMIC is available.

2. Improved ESD protection on Stream810H3

Change details

- Ultra-low capacitance ESD protection diode is added at CON108 antenna socket to reduce risk of damage



ESD discharge must still be avoided during module handling and connection of antennas. The diode does not reduce transmit power significantly nor does it change the output spectrum.

3. Update of recovery jig software for Stream810H3

StreamUnlimited provides a recovery jig to customers which allows recovery of modules in case they are bricked after programming the module with product-specific software (e.g. in case of power failure during programming).



To work with Stream810H3, this recovery jig needs to be updated