



DHSA-DS1 Preliminary Product Specification

Project Name: DHSA-DS1

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Revision: 0.2

Revision Date: 2018/08/24

Contact Information

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Revision History

REV	Author	Summary Changes	Date
0.1	Aaron Yen	Preliminary Release	2018/6/20
0.2	Aaron Yen	Operating Temp. Update	2018/8/24

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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.

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.

Contents

Contact Information	2
Revision History.....	2
Contents.....	4
1. Introduction	6
1.1. Features	6
1.2. Block Diagram	7
2. Electrical Specifications	8
2.1. Interface pin assignments.....	8
2.1.1. Pad Diagram.....	8
2.1.2. Pin Assignments.....	9
2.2. Absolute Maximum Ratings.....	10
2.3. Recommend Operating Conditions	10
2.4. Digital logic characteristics (3.3V I/O operation).....	10
3. RF Specifications	12
3.1. RF connections.....	12
3.1.1. WIFI RF performance at Antenna Connector at 25°C.....	12
5GHz.....	12
3.1.2. BT-Low Energy RF performance at Antenna Connector at 25C.....	12
	4.
4. Safety Recommendation.....	

1. Introduction

DHSA-DS1 is a wireless local area network (WLAN), Bluetooth (BT) Low Energy combo module to support 2.4G/5G IEEE 802.11a/ b/g/n WLAN standards, BLE 5.0. It enables seamless integration of WLAN/BT Low Energy technology with powerful embedded CPU.

1.1. Features

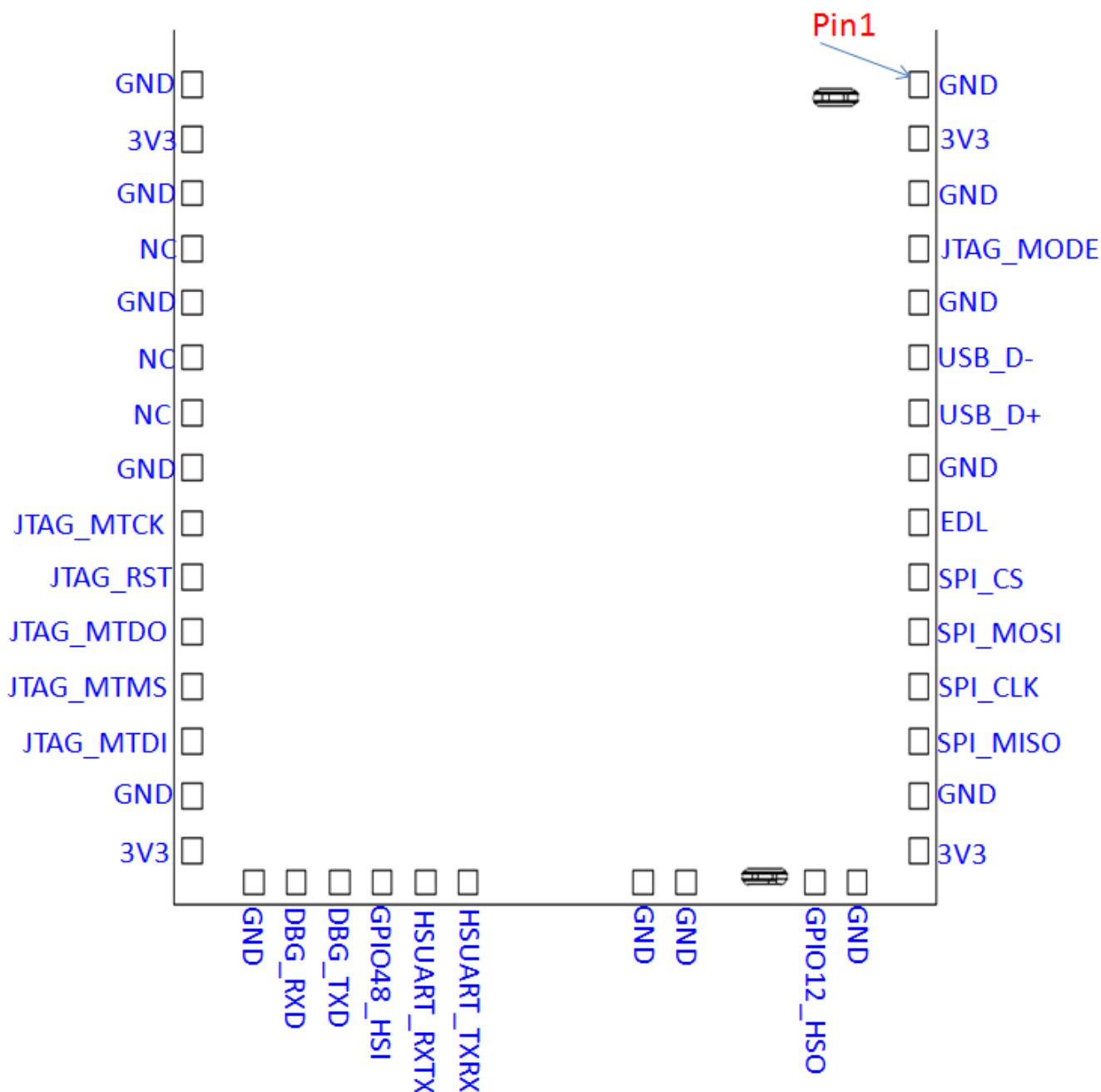
- 3 embedded Processors, ARM Cortex-M4F + ARM Cortex-M0 + XTENSA
- Wi-Fi Support IEEE 802.11a/b/g/n 2.4G/5G Band 1T1R
- Bluetooth Low Energy (BLE) compliant to the SIG v5 specification
- Single 3.3V supply
- 2 on-board antennas(WIFI and BLE) and 2 optional external antenna connectors
- Configurable memory retention for minimizing deep sleep power per application
- 26 GPIO to support the peripherals interfaces:
 - 6-pin JTAG signals
 - 2 of 2-wire UART interface
 - 1 of SPI master interface
 - 1 of USB2.0 interface for SW re-img or RF tools test
- Reserved External antenna connectors (DNI normally): U.FL.

Note: 2 optional external antenna connectors are For future extension, only antenna(s) certified can be use with this module.

2. Electrical Specifications

2.1. Interface pin assignments

2.1.1. Pad Diagram



Pad diagram (Bottom View)

- There are Gnd Pads for thermal purpose on the bottom but not shown here, please refer detailed land pattern in [section 5.2](#).

2.1.2. Pin Assignments

Table 1. Pin Interface Family

Signal Name	Pad#	Description
GND	1	GND
3.3V	2	3.3V Input
GND	3	GND
JTAG_MODE	4	JTAG for debugging
GND	5	GND
USB_D-	6	USB data-
USB_D+	7	USB data+
GND	8	GND
EDL	9	Enable download mode
SPI_CS_N	10	SPI- chip select
SPI_MOSI	11	SPI data in from SOC
SPI_CLK	12	SPI - clock
SPI_MISO	13	SPI data out to SOC
GND	14	GND
3.3V	15	3.3V Input
GND	16	GND
HAND_SHAKE_OUT	17	Dyson specific hand-shake output
GND	18	GND
GND	19	GND
HSUART_TXRX	20	System TX to QCA4020 RXD
HSUART_RXTX	21	System RX to QCA4020 TXD
HAND_SHAKE_IN	22	Dyson specific hand_ hake output
DBG_TXD	23	Debug host RX to QCA4020 TXD
DBG_RXD	24	Debug host TX to QCA4020 RXD
GND	25	GND
3.3V	26	3.3V Input
GND	27	GND
JTAG_TDI	28	JTAG for debugging
JTAG_TMS	29	JTAG for debugging
JTAG_TDO	30	JTAG for debugging
JTAG_RST	31	JTAG for debugging
JTAG_TCK	32	JTAG for debugging
GND	33	GND
NC	34	Not connected
NC	35	Not connected
GND	36	GND
NC	37	Not connected
GND	38	GND
3.3V	39	3.3V Input
GND	40	GND

Signal Name	Pad#	Description
GND	41~65	GND for thermal dissipation

2.2. Absolute Maximum Ratings

Table 2. Power supply specifications

Signal	Description	Min.	Typ.	Max.	Unit
3.3V_IN	3.3V Power Supply Input	-0.3	3.3	4.0	V
Min V _{IH}	GPIO_ mapped to QCA4020 pins	-0.3	-	-	V
Max V _{IH}		-	-	3.6	V

2.3. Recommend Operating Conditions

Signal	Description	Min.	Typ.	Max.	Unit
3.3V_IN	3.3V Power Supply Input	3.14	3.3	3.46	V
Min V _{IH}	GPIO_ mapped to QCA4020 pins	-0.3	-	-	V
Max V _{IH}		-	-	3.6	V
T _A	Operating Temperature	-10	25	+60	°C

2.4. Digital logic characteristics (3.3V I/O operation)

Symbol	parameter	Min	Typ	Max	Unit
V _{IH}	High Level Input Voltage	1.8	-	3.6	V
V _{IL}	Low Level Input Voltage	-0.3	-	0.3	V
V _{OH}	High Level Output Voltage	2.2	-	3.3	V
V _{OL}	Low Level Output Voltage	0	-	0.4	V
I _{IH}	High Level Input Current	-	-	0.1	uA
I _{IL}	Low Level Input Current	-	-	0.1	uA
I _{OH}	High Level Output Current	-	-	20	mA
I _{OL}	Low Level Output Current	-	-	20	mA

C _{IN}	Input Capacitance	-	5	-	pF
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3. RF Specifications

3.1. RF connections

3.1.1. WIFI RF performance at Antenna Connector at 25°C

2.4GHz

Standard	Modulation	Index	TX Compliant Power	RX Sensitivity	Unit
802.11b	BPSK	1Mbps	17 +/-2	-93 +/-1	dBm
	QPSK	2Mbps	17 +/-2	-92 +/-1	dBm
	CCK	5.5Mbps	17 +/-2	-91 +/-1	dBm
	CCK	11Mbps	17 +/-2	-87 +/-1	dBm
802.11g	BPSK	6Mbps	18 +/-2	-91 +/-1	dBm
	64 QAM	54Mbps	16 +/-2	-75 +/-1	dBm
802.11n (HT20)	BPSK	MCS0	16 +/-2	-91 +/-1	dBm
	64 QAM	MCS7	15 +/-2	-72 +/-1	dBm

5GHz

Standard	Modulation	Index	TX Compliant Power	RX Sensitivity	Unit
802.11a	BPSK	6Mbps	14 +/-2	-89 +/-1	dBm
	64 QAM	54Mbps	8 +/-2	-72 +/-1	dBm
802.11n (HT20)	BPSK	MCS0	14 +/-2	-89 +/-1	dBm
	64 QAM	MCS7	6 +/-2	-69 +/-1	dBm

3.1.2. BT-Low Energy RF performance at Antenna Connector at 25°C

Test Item	Description	Typical	Unit
Maximum TX power	1Mbps	1.5 +/-2	dBm
TX Power under low TX	1Mbps	TBC	dBm
RX Sensitivity	1Mbps	-94 +/-1	dBm

The data shown in the table is a preliminary pre-test data at 25°C at RF In-line connector, subject to change after the measurement.

4. Safety Recommendation

Be sure the use of this product is allowed in the country and in the environment required. The use of this product may be dangerous and must be avoided in the following areas:

- Where it can interfere with other electronic devices in environments such as hospitals, airports, and aircraft
- Where there is a risk of explosion such as gasoline stations and oil refineries

It is the responsibility of the user to comply with the his or her country's regulations and the specific environmental regulations.

Do not disassemble the product; any mark of tampering will compromise the warranty's validity.

We recommend following the instructions of the hardware user guides for a correct wiring of the product. The product must be supplied with a stabilized voltage source, and the wiring must conform to the security and fire-prevention regulations.

This product must be handled with care; avoid any contact with the pins because electrostatic discharge may damage the product. Same caution must be taken regarding the SIM card; carefully check the instructions for its use. Do not insert or remove the SIM when the product is in power-saving mode.

The system integrator is responsible of the functioning of the final product; therefore, care must be taken for the external components of the module as well as for project or installation issues—there may be a risk of disturbing the GSM network or external devices or of having an impact on device security. If you have any doubts, please refer to the technical documentation and the relevant regulations in force.

Every module must be equipped with a proper antenna with specific characteristics. The antenna must be installed with care in order to avoid any interference with other electronic devices.

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- 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

WLAN				
Ant. No.	Ant. Net Gain (dBi)	Freq. range (GHz)	Ant. Type	Connector Type
1	2	2.4~2.4835	PCB	NA
	5	5.15~5.85		
Bluetooth				
Ant. No.	Ant. Net Gain (dBi)	Freq. range (GHz)	Ant. Type	Connector Type
1	2	2.4~2.4835	PCB	NA

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following: "Contains FCC ID: QVHDBWIFIBLE00". 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 cannot 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 cannot 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 shown 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

Industry Canada statement:

This device complies with ISSED'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' ISSED 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 ISSED 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 ISSED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé à plus de 20 cm entre le radiateur et votre corps.

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

1) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 1 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) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 1 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.

