

Bluetooth[®] Module

EYSMACAXX Series (RF+Baseband (Class 2))

Data Report

Part Number (EYSMACAXX) is modified for mass production.
Please ask for the detail from the local sales office.

In case you adopt this module and design some appliance, please
ask for the latest specifications from the local sales office.

We wish the customer to request the Specification Report when the
design for the mass production begins because the content of this
Data Report might change without a previous notice to the customer.

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EYSMACAXX SeriesTAIYO YUDEN Confidential
& Tentative**Document constituent list**

| Control name | Control No. | Document Page |
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| Absolute maximum ratings | HD-AM-A080180 | 1/1 |
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Rev. record

9-Dec.-2008> Ver.0.1 Draft

15-Jan.-2009> Ver.0.2

30-Jan.-2009> Ver.0.3

16-Jun.-2009> Ver.0.4

2-Mar.-2010> Ver.1.0

15-Feb.-2013> Ver.1.1

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| Control No. HD-AG-A080180 | (1/3) | Control name General Items |
|------------------------------|-------|-------------------------------|

Scope

This specification (“Specification”) applies to the hybrid IC “**EYSMACA**” for use **Bluetooth**[®] module (“Product”) manufacture by TAIYO YUDEN Co., Ltd. (“TAIYO YUDEN”)

1. Part Number: EYSMACAXX (UART/PCM I/F Support)

- Digit3: Customer Code ex) S: TAIYO YUDEN Standard
- Digit8: Hardware Code ex) X: TAIYO YUDEN Standard
- Digit9: Software Code ex) X: TAIYO YUDEN Standard

*** Part Number may be modified for mass production or other cases.**

Please see “m” for more information.

2. Function: Radio frequency transfer Module (power class 2). **Bluetooth**[®] standard Ver 2.1+EDR conformity

3. Application: Laptop PC, PC peripheral, Handy terminal

4. Structure: Hybrid IC loaded with silicon monolithic semiconductor

5. Outline: 39 pin leadless chip carrier

6. Marking: BD address, Lot and TAIYO YUDEN on shielding case.

7. Features:

- Bluetooth**[®] 2.1+EDR conformity
- Interface: UART/PCM
- Encryption
- Hold, Sniff and Park Mode
- Supported Link Type: ACL links (Piconet<7>), (e)SCO links (Piconet<3>)
- AFH
- EDR (Enhanced Data Rate)

8. Packing: Tray

Packaging method: Tray & aluminum moisture barrier bag

Packaging unit: 2860 pieces/tray

9. Terminal: 39 pin leadless chip carrier

10. Mount: SMD Type

11. Notes:

- a. Any question arising from this Specification shall be solved through mutual discussion by the parties hereof.
- b. This Product is not designed for radiation durable and should not be used under the circumstance of radiation.
- c. The operating conditions of this Product are as shown in this Specification. Please note that TAIYO YUDEN shall not be liable for a failure and/or abnormality which is caused by use under the conditions other than the operating conditions hereof.
- d. This Product mentioned in this Specification is manufactured for use in Laptop PC. Before using this Product in any special equipment (such as medical equipment, space equipment, air craft, disaster prevention equipment), where higher safety and reliability are duly required, the applicability and suitability of this Product must be fully evaluated by the customer at its sole risk to ensure correct and safety operation of those special equipments. Also, evaluation of the safety function of this Product even for use in general electronics equipment shall be thoroughly made and when necessary, a protective circuit shall be added in design stage, all at the customer’s sole risk.
- e. TAIYO YUDEN warrants only that this Product is in conformity with this Specification for one year after purchase and shall in no event give any other warranty.

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- f. The warranty period shall be one year.
- g. Communication between this Product and others might not be established nor maintained depending upon radio environment or operating conditions of this Product and other **Bluetooth**[®] products.
- h. This Product is designed for use in products which comply with **Bluetooth**[®] Specifications (Ver 2.1+EDR) (“Bluetooth Specifications”). TAIYO YUDEN disclaims and is not responsible for any liability concerning infringement by this Product under any intellectual property right owned by third party in case the customer uses this Product in any product which does not comply with Bluetooth Specifications (the “non-complying products”). Furthermore, TAIYO YUDEN warrants only that this Product complies with this Specification and does not grant any other warranty including warranty for application of the non-complying products.
- i. TAIYO YUDEN does not render updating or upgrading service for the firmware in the Module.
- j. In order to take tests for getting the certification of each country’s Radio Law with a device incorporating this module, it is necessary to make the software in Host to put the module into test condition. Please contact TAIYO YUDEN for farther details.
- k. Please evaluate adequately our module incorporated to your products before mass production.
- l. This Product operates in the unlicensed ISM band at 2.4GHz. In case this Product is used around the other wireless devices which operate in same frequency band of this Product, there is a possibility that interference occurs between this Product and such other devices. If such interference occurs, please stop the operation of other devices or relocate this Product before using this Product or do not use this Product around the other wireless devices.
- m. Part Number Modification Notice (**Bluetooth**[®] Modules)
Part numbers for sample modules or part numbers you see in this Specification are TAIYO YUDEN standard part numbers. In case of modification made to any modules, to meet requested specifics, the part number will carry a different part number, due to forfeit originality. Additionally, part numbers may be modified based on mass production stage, **Bluetooth**[®] logo Qualification stage, or other related stages. Please see the following examples for cases that User’s Code are modified:
- for specific firmware version (our standard item firmware will be upgraded occasionally)
 - for specific BD address (our standard item BD address is owned by TAIYO YUDEN)
 - for different baud rate (our standard is 115.2kbps and partly 1Mbps)
 - for specific PnP (Plug and Play) IDs (our standard item PnP IDs are owned by TAIYO YUDEN or chip manufacture)
 - for other related cases (specific or different setting, form, sizes, or display etc..)
- In case you have applied for **Bluetooth**[®] Qualification with our standard User’s Code without previous notice to TAIYO YUDEN, we shall not be responsible for any expense that will be required to change its name/number.
- n. Containment of hazardous substance in this Product
- *Pb (Lead) : Non use
- * This product conforms to RoHS Directive(2002/95/EC).
- p. In addition when this Product is used under environmental conditions such as over voltage which are not guaranteed, it may be destroyed in short mode. To ensure the security of customer’s product, please add an extra fuse or/and a protection circuit for over voltage.
- q. In some cases, TAIYO YUDEN may use replacements as component parts of Products. Such replacement shall apply only to component part of Products, which TAIYO YUDEN deems it possible to replace or substitute according to (i) Scope provided in this Specification (e.g. Official Standard (Type Approvals, Bluetooth LOGO etc.)) and (ii) Quality of Products. TAIYO YUDEN also ensures traceability of such replacement on production lot basis.

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| Control No. HD-AG-A080180 | (3/3) | Control name General Items |
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r. Do not alter Hardware and/or Software of this Product.

Please note that TAIYO YUDEN shall not be liable for any problem if it is caused by customer's alteration of Hardware or/and Software without Taiyo Yuden's prior approvals.

This module is still under development, thus specifications do not guarantee both the quality and reliability at the time of shipment. Since the specifications and mass production of the module are not confirmed either, the contents of the technical notes are subject to change without any prior notice.

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|------------------------------|-------|--|
| Control No. HD-AM-A080180 | (1/1) | Control name Absolute maximum ratings |
|------------------------------|-------|--|

Absolute maximum ratings

| Item | Symbol | Rating | | | | Remark |
|----------------|---------------------|--------|------|---------|------|---------------------------------------|
| | | Min. | Typ. | Max. | Unit | |
| Supply voltage | VDD_PIO, VDD_USB | -0.4 | | 3.7 | V | Ta=25 degrees C, GND reference |
| | VREG_IN | -0.4 | | 5.6 | V | |
| Input voltage | Vin | -0.3 | | VDD+0.3 | V | I/O terminals except USB interface |

Recommendation operating range

| Item | Symbol | Rating | | | | Remark |
|--|---------|--------|------|------|-----------|--------------------------|
| | | Min. | Typ. | Max. | Unit | |
| Supply voltage | VDD_PIO | 1.7 | 3.3 | 3.6 | V | |
| | VDD_USB | 1.7 | 3.3 | 3.6 | V | |
| | VREG_IN | 2.2 | - | 4.2 | V | |
| Supply voltage ripple and spike noise | VDD_rn | | | 30 | mVp-p | Note 1 |
| Operation temperature range | Topr | -20 | 25 | 75 | Degrees C | Humidity=40%RH Note 2 |
| Storage temperature range | Tstg | -30 | 25 | 85 | Degrees C | Humidity=40%RH Note 3 |

Notes:

- To fill the standard of "Supply voltage ripple and spike noise", the capacitor, which has the capacity of 2.2uF or more, should be put in the terminal VDD outside as a bypass capacitor.
- Operating temperature range is set to satisfy products electrical characteristics in the short term.
In terms of product life cycle when it is used in condition of varying from TYP standard in the long term, please refer to the reliability condition.
- Storage temperature range is the condition for transportation and storage in temporary.

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|------------------------------|-------|--|
| Control No. HD-AE-A080180 | (1/6) | Control name Electrical characteristics |
|------------------------------|-------|--|

Electrical characteristic**DC Specifications**

The Specification applies for Topr.= 25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min. | Typ. | Max. | Unit | Remark |
|-----|-------------------------|--|---------|---------|------|---------|------|---------------|
| 1 | Normal supply voltage 1 | | VDD_PIO | 1.7 | 3.3 | 3.6 | V | |
| 2 | Normal supply voltage 2 | | VDD_USB | 1.7 | 3.3 | 3.6 | V | |
| 3 | Normal supply voltage 3 | | VREG_IN | 2.2 | - | 4.2 | V | |
| 4 | Input Low Voltage 1 | /RESET, PIOX, PCM_IN, PCM_SYNC, PCM_CLK, UART_CTS, UART_RX | VIL1 | 0 | | 0.8 | V | |
| 5 | Input Low Voltage 2 | USB_DP, USB_DN | VIL2 | - | | 0.8 | V | |
| 6 | Input High Voltage 1 | /RESET, PIOX, PCM_IN, PCM_SYNC, PCM_CLK, UART_CTS, UART_RX | VIH1 | 0.7xVDD | | VDD+0.3 | V | |
| 7 | Input High Voltage 2 | USB_DP, USB_DN | VIH2 | 2.0 | | - | V | |
| 8 | Output Low Voltage 1 | PIOX, PCM_OUT, PCM_SYNC, PCM_CLK, UART_TX, UART_RTS | VOL1 | - | | 0.4 | V | IOL=4mA |
| 9 | Output Low Voltage 2 | USB_DP, USB_DN | VOL2 | - | | 0.3 | V | |
| 10 | Output High voltage 1 | PIOX, PCM_OUT, PCM_SYNC, PCM_CLK, UART_TX, UART_RTS | VOH1 | VDD-0.4 | | - | V | IOH=-4mA |
| 11 | Output High voltage 2 | USB_DP, USB_DN | VOH2 | 2.8 | | - | V | |
| 12 | Peak current | Continuous Rx | Icp1 | | 40 | 120 | mA | Notes 3, 4 |
| 13 | Average current1 | Sniff mode (Slave only) | Icca1 | | 6 | - | mA | Notes 1, 3, 4 |
| 14 | Average current2 | Standby mode | Icca2 | | 2 | - | mA | Notes 3, 4 |
| 15 | Average current3 | Send DM1packet (Master) | Icca3 | | 36 | - | mA | Notes 3, 4 |
| 16 | Average current4 | Receive DM1packet (Slave) | Icca4 | | 35 | - | mA | Notes 3, 4 |
| 17 | Average current5 | Hold mode (Slave only) | Icca5 | | 2 | - | mA | Notes 3, 4 |
| 18 | Average current6 | Park mode (Slave only) | Icca6 | | 3 | - | mA | Notes 2, 3, 4 |

Notes:

- Sniff mode parameter.
 - Max interval 0050h
 - Min interval 0010h
 - Attempt 0005h
 - Timeout 0005h
- Park mode parameter.
 - Max interval 0100h
 - Min interval 0010h
- The consumption current might fluctuate with the condition of radio communication, host performance and test circuit.
- The value may fluctuate several (mA) depending on Firmware version.

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| Control No. HD-AE-A080180 | (2/6) | Control name Electrical characteristics |
|------------------------------|-------|--|

AC Specifications (UART)

The Specification applies for Topr.= 25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min | Typ | Max | Unit | Remark |
|-----|--|-----------|--------|-----|----------|------|------|---------------|
| 1 | VDD_PIO, VDD_USB Rise Time from 0V to 3.0V | | t1 | 0 | | 2 | ms | |
| 2 | VREG_IN Rise Time from 0V to 3.0V | | t2 | 0 | | 2 | ms | |
| 3 | VDD_PIO, VDD_USB high to VREG_IN high | | t3 | 0 | | 2 | ms | |
| 4 | VREG_IN high to VDD_PIO, VDD_USB high | | t4 | 0 | | 2 | ms | |
| 5 | VREG_IN high to /RESET high | | t5 | 10 | | | ms | Notes 1, 2 |
| 6 | VDD_PIO, VDD_USB high to /RESET high | | t6 | 10 | | | ms | Notes 1, 2 |
| 7 | /RESET high to Module Ready | | t7 | | (1000) | 3000 | ms | Notes 3, 4, 5 |
| 8 | /RESET pulse width | | t8 | 6 | | | ms | |
| 9 | /RESET low to VDD_PIO, VDD_USB low | | t9 | 0 | | 2 | ms | |
| 10 | VDD_PIO, VDD_USB low to VREG_IN low | | t10 | 0 | | 2 | ms | |
| 11 | /RESET low to VRE_IN low | | t11 | 0 | | 2 | ms | |
| 12 | VREG_IN low to VDD_PIO, VDD_USB low | | t12 | 0 | | 2 | ms | |

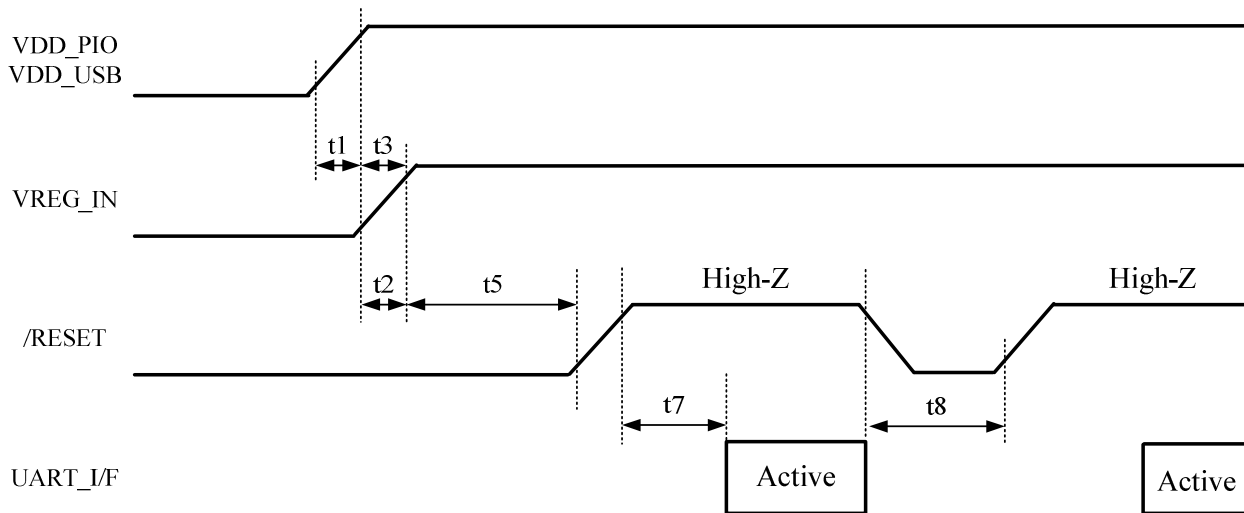
Notes:

- This module has an internal flash memory and a function to erase/sort unnecessary data if certain HCI commands are issued and consume more than a certain level of free space in the EEPROM. This operation occurs at every module initialization (power-on).
If supply voltage becomes non-defined states during initialization or writing in EEPROM, data in EEPROM might be destroyed. If the data in EEPROM is destroyed, module will not work correctly. Therefore please be sure to stabilize power source before /RESET release.
In addition please design module peripheral circuits to avoid temporary blackout of power source during operation. Please refer HD-AE-C080180 for HCI command which rewrites flash memory data.
- Input /RESET signal of 10ms and more in condition of VDD at over 3.0V.
- When the module is ready to accept the command, its module outputs the "04 0F 04 00 01 00 00" (Hex) to the UART TX Data Line. After that, please access to the module.
- The Typ. is a reference value. The value may change depending on the firmware version, conditions of use and types of flash memory.
- It may change due to the firmware version.

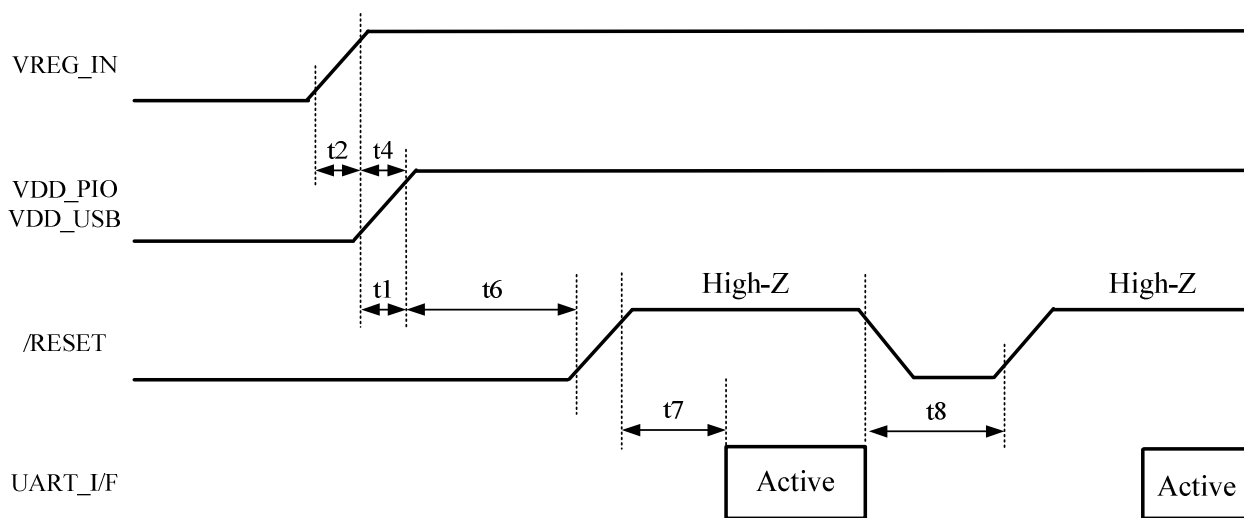
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|------------------------------|-------|--|
| Control No. HD-AE-A080180 | (3/6) | Control name Electrical characteristics |
|------------------------------|-------|--|



Timing Diagram for Power Up Sequence 1

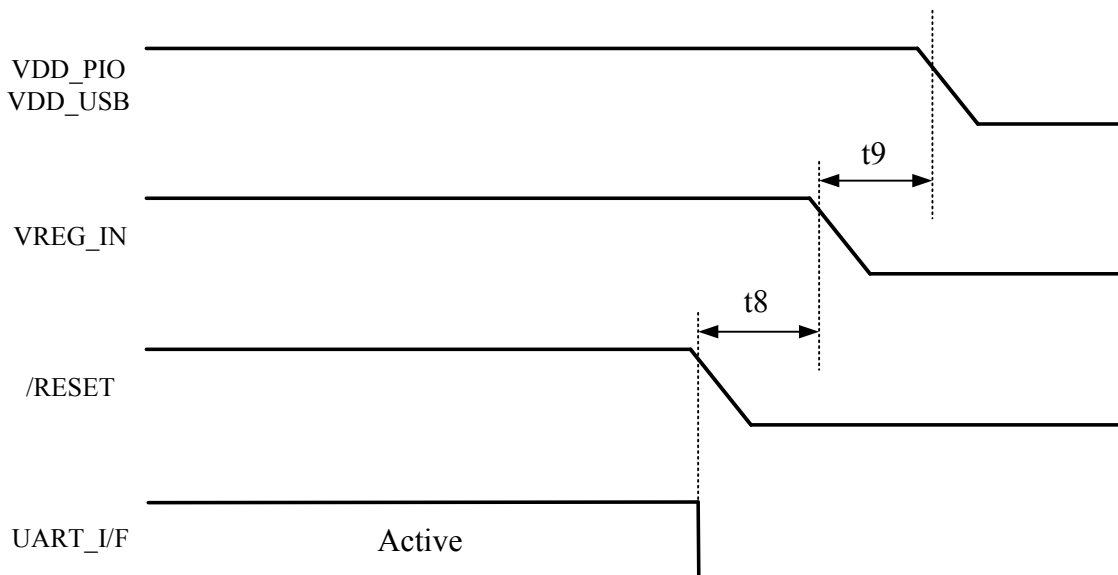


Timing Diagram for Power Up Sequence 2

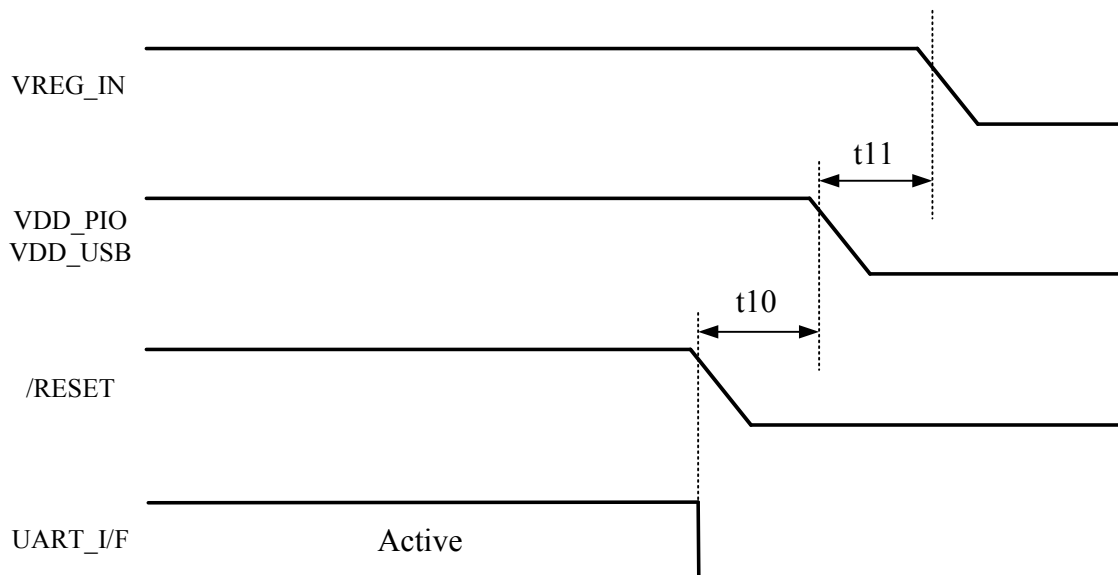
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| Control No. HD-AE-A080180 | (4/6) | Control name Electrical characteristics |
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Timing Diagram for Power Down Sequence 1



Timing Diagram for Power Down Sequence 2

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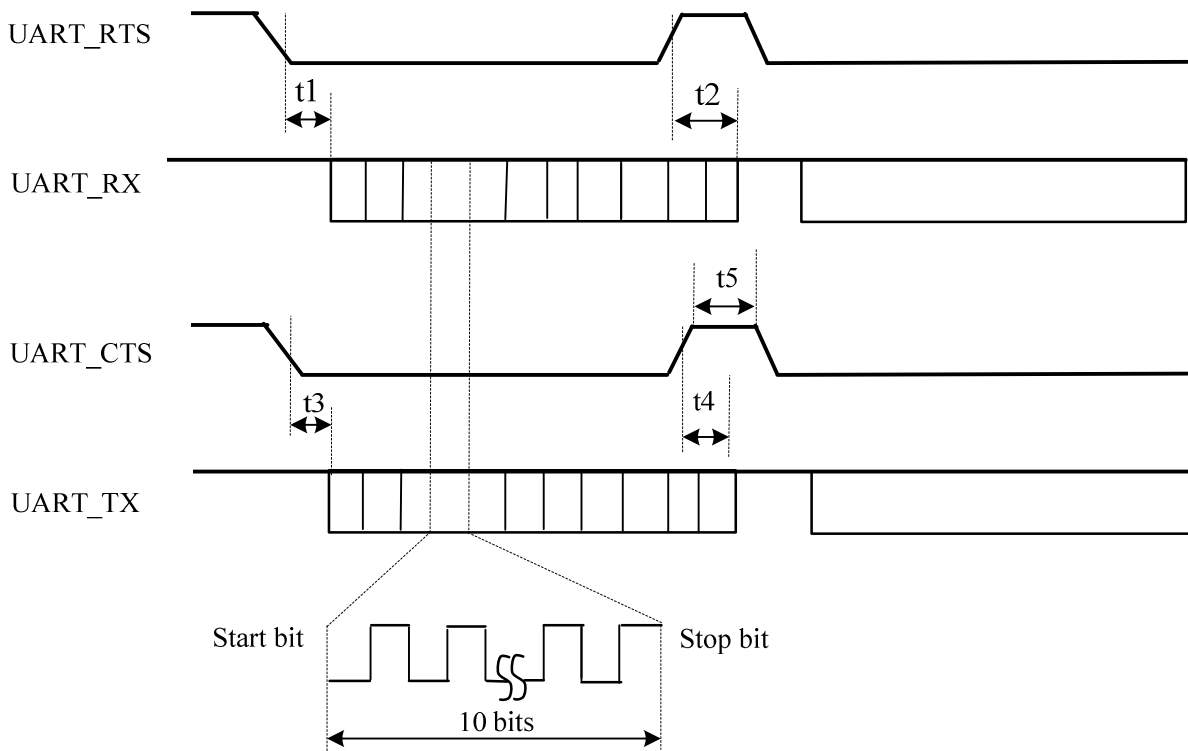
| | | |
|------------------------------|-------|--|
| Control No. HD-AE-A080180 | (5/6) | Control name Electrical characteristics |
|------------------------------|-------|--|

AC Specifications

UART Interface

The Specification applies for Topr.= 25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min | Typ | Max | Unit | Remark |
|-----|-------------------------|-----------|--------|-----|-----|-----|------|--------|
| 1 | RTS Low to RX Data On | | t1 | 0 | | | ms | |
| 2 | RTS High to RX Data Off | | t2 | | | 1 | byte | |
| 3 | CTS Low to TX Data On | | t3 | 0 | | | ms | |
| 4 | CTS High to TX Data Off | | t4 | | | 2 | byte | |
| 5 | CTS High Pulse Width | | t5 | 4 | | | bit | |



Timing Diagram for UART signals

<UART Parameters>

| Item | Parameter |
|--------------|---------------------|
| Baud Rate | 115.2kbps, see Note |
| Date Bits | 8bits |
| Stop Bits | 1bit |
| Parity | None |
| Flow Control | CTS/RTS |

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|------------------------------|-------|--|
| Control No. HD-AE-A080180 | (6/6) | Control name Electrical characteristics |
|------------------------------|-------|--|

PCM Interface

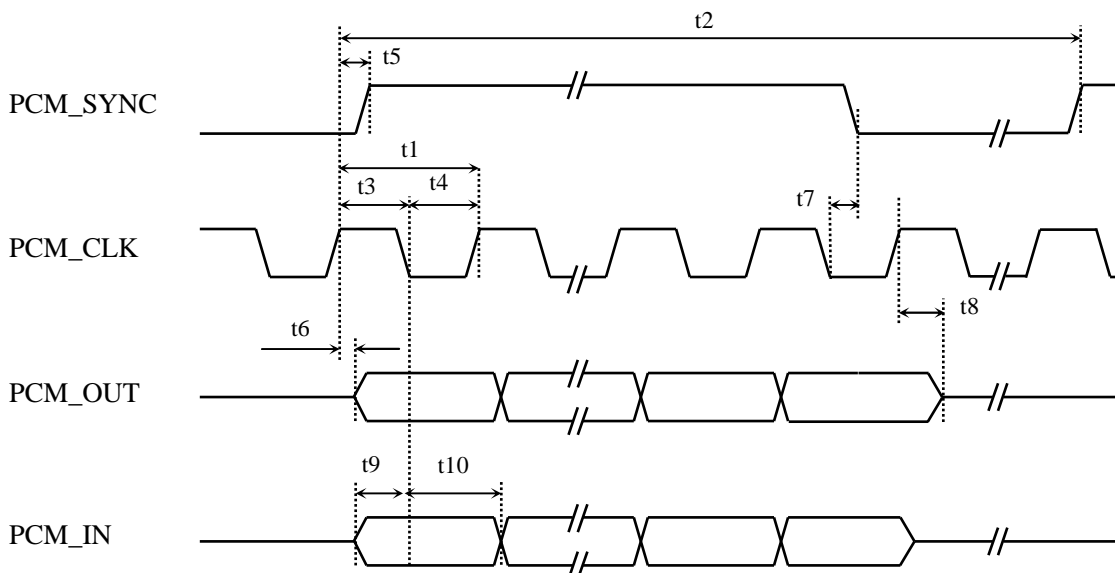
Support CODEC: MC145483 (MOTOROLA)

Please contact TAIYO YUDEN if you want to use the other CODEC.

AC Specifications

The Specification applies for Topr.= 25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min | Typ | Max | Unit | Remark |
|-----|---|-----------|--------|-----|-----|-----|------|--------|
| 1 | PCM_CLK Frequency | | t1 | - | 256 | - | kHz | |
| 2 | PCM_SYNC Frequency | | t2 | - | 8 | - | kHz | |
| 3 | PCM_CLK High | | t3 | 980 | | | ns | |
| 4 | PCM_CLK Low | | t4 | 730 | | | ns | |
| 5 | Delay time from PCM_CLK High to PCM_SYNC High | | t5 | | | 20 | ns | |
| 6 | Delay time from PCM_CLK High to valid PCM_OUT | | t6 | | | 20 | ns | |
| 7 | Delay time from PCM_CLK Low to PCM_SYNC Low (Long Frame SYNC only) | | t7 | | | 20 | ns | |
| 8 | Delay time from PCM_CLK High to PCM_OUT invalid | | t8 | | | 20 | ns | |
| 9 | Setup time for PCMIN valid to PCM_CLK Low | | t9 | 30 | | | ns | |
| 10 | Hold time for PCM_CLK Low to PCM_IN valid | | t10 | 10 | | | ns | |



SPI Interface

This module does not support SPI Interface.

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| Control No. HD-AE-B080180 | (1/2) | Control name Electrical characteristics |
|------------------------------|-------|--|

RF Specifications at Basic Rate

The Specification applies for Ta=25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min | Typ | Max | Unit | Remark |
|-----|------------------------------|----------------------------------|--------|------|-----|--------|-------|------------------------|
| 1 | Frequency band | | FREQ | 2400 | | 2483.5 | MHz | |
| 2 | Tx power | | PO | -6 | 0 | +4 | dBm | |
| 3 | Modulation characteristics 1 | dF1: F0(11110000) | M1 | 140 | | 175 | kHz | |
| 4 | Modulation characteristics 2 | dF2: AA(10101010) | M4 | 115 | | | kHz | |
| 5 | Modulation characteristics 3 | dF2/dF1 | MC | 0.8 | | | | |
| 6 | In-band spurious emission 2 | 2MHz(M-N =2) | ISE1 | | | -20 | dBm | |
| 7 | In-band spurious emission 3 | 3MHz or greater (M-N >=3) | ISE2 | | | -40 | dBm | |
| 8 | Initial Carrier Frequency | | ICF | -75 | | +75 | kHz | |
| 9 | Frequency Drift 1 | DH1 | FD1 | -25 | | +25 | kHz | |
| 10 | Frequency Drift 2 | DH3,DH5 | FD2 | -40 | | +40 | kHz | |
| 11 | Drift rate | DH1,DH3,DH5 | DR | | | 400 | Hz/us | |
| 12 | C/I co-channel | | CIC | | | 11 | dB | -60dBm |
| 13 | C/I 1MHz | | CI1 | | | 0 | dB | -60dBm |
| 14 | C/I 2MHz | | CI2 | | | -30 | dB | -60dBm |
| 15 | C/I >= 3MHz | | CI3 | | | -40 | dB | -67dBm |
| 16 | C/I Image | | CI4 | | | -9 | dB | -3MHz offset -67dBm |
| 17 | C/I Image +/- 1MHz | | CI5 | | | -20 | dB | -67dBm |
| 18 | Out-of-Band Blocking 1 | 30MHz to 2000MHz f=2460MHz | OBB1 | | | -10 | dBm | BER<=0.1 % |
| 19 | Out-of-Band Blocking 2 | 2000 to 2399MHz f=2460MHz | OBB2 | | | -27 | dBm | BER<=0.1 % |
| 20 | Out-of-Band Blocking 3 | 2484 to 3000MHz f=2460MHz | OBB3 | | | -27 | dBm | BER<=0.1 % |
| 21 | Out-of-Band Blocking 4 | 3000MHz to 12.75GHz f=2460MHz | OBB4 | | | -10 | dBm | BER<=0.1 % |
| 22 | Maximum Input Level | | MAXP | -20 | | | dBm | BER<=0.1 % |
| 23 | 20dB Bandwidth | | B20 | | | 1 | MHz | |
| 24 | Sensitivity-single | DH1 | SEN1 | | | -70 | dBm | BER<=0.1 % |
| 25 | Sensitivity-multi | DH3,DH5 | SEN2 | | | -70 | dBm | BER<=0.1 % |

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| | | |
|------------------------------|-------|--|
| Control No. HD-AE-B080180 | (2/2) | Control name Electrical characteristics |
|------------------------------|-------|--|

RF Specifications at EDR

The Specification applies for Ta=25 degrees C, VDD_PIO=VDD_USB=VREG_IN=3.3V

| No. | Parameter | Condition | Symbol | Min | Typ | Max | Unit | Remark |
|-----|---------------------------------|------------------------------|-----------|-------------|-----|-------------|------|---------------------------|
| 1 | RMS DEVM 1 | Pai/4DQPSK | RDE1 | | | 0.20 | | |
| 2 | RMS DEVM 2 | 8DPSK | RDE2 | | | 0.13 | | |
| 3 | Peak DEVM 1 | Pai/4DQPSK | PDE1 | | | 0.35 | | |
| 4 | Peak DEVM 2 | 8DPSK | PDE2 | | | 0.25 | | |
| 5 | 99% DEVM 1 | Pai/4DQPSK | D991 | | | 0.30 | | |
| 6 | 99% DEVM 2 | 8DPSK | D992 | | | 0.20 | | |
| 7 | EDR In-band spurious emission 1 | M-N =1 | EISE1 | 26 | | | dB | |
| 8 | EDR In-band spurious emission 2 | M-N =2 | EISE2 | | | -20 | dBm | |
| 9 | EDR In-band spurious emission 3 | M-N =3 | EISE3 | | | -40 | dBm | |
| 10 | EDR Initial Carrier Frequency | | EICF | -75 | | +75 | kHz | |
| 11 | EDR Drift | | ED | -10 | | +10 | kHz | |
| 12 | Relative transmit power | PDPSK | RTP | PGFSK -4 | | PGFSK +1 | dB | |
| 13 | Actual Sensitivity Level | 2-DH5(3-DH5) 16000000bit | ESEN | | | -70 | dBm | BER= 10 ⁻⁴ |
| 14 | BER Floor Performance | 2-DH5(3-DH5) 160000000bit | FSEN | | | -60 | dBm | BER= 10 ⁻⁵ |
| 15 | C/I co-channel | 2-DH5 | 2CIC | | | 13 | dB | -60dBm |
| 16 | C/I 1MHz | 2-DH5 | 2CI1 | | | 0 | dB | -60dBm |
| 17 | C/I 2MHz | 2-DH5 | 2CI2 | | | -30 | dB | -60dBm |
| 18 | C/I >= 3MHz | 2-DH5 | 2CI3 | | | -40 | dB | -67dBm |
| 19 | C/I Image | 2-DH5 | 2CI4 | | | -7 | dB | -67dBm -3MHz offset |
| 20 | C/I Image +/- 1MHz | 2-DH5 | 2CI5 | | | -20 | dB | -67dBm |
| 21 | C/I co-channel | 3-DH5 | 3CIC | | | 21 | dB | -60dBm |
| 22 | C/I 1MHz | 3-DH5 | 3CI1 | | | 5 | dB | -60dBm |
| 23 | C/I 2MHz | 3-DH5 | 3CI2 | | | -25 | dB | -60dBm |
| 24 | C/I >= 3MHz | 3-DH5 | 3CI3 | | | -33 | dB | -67dBm |
| 25 | C/I Image | 3-DH5 | 3CI4 | | | 0 | dB | -67dBm -3MHz offset |
| 26 | C/I Image +/- 1MHz | 3-DH5 | 3CI5 | | | -13 | dB | -67dBm |
| 27 | Maximum Input Level | 2-DH5(3-DH5) | EMAX P | -20 | | | dBm | |

Note:

Bluetooth® standard Ver 2.1+EDR conformity

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|------------------------------|--------|--|
| Control No. HD-AE-C080180 | (1/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Supported HCI Commands / HCI Events

The **Bluetooth**® functions of this module is as written in the attached PICS. Depending on firmware version Upgrade, the **Bluetooth**® functions are subject to change without notice.

HCI COMMAND LIST

Firmware Version 23C (Build4839)

| Command Description | OpCode | Group (Hex) | Command (Hex) | Parameters | Returns | Status | Notes |
|---------------------|--------|-------------|---------------|------------|---------|--------|-------|
|---------------------|--------|-------------|---------------|------------|---------|--------|-------|

Device Setup

| | | | | | | | |
|-----------|--------|---|---|--|--------|-----|--|
| HCI_Reset | 0x0C03 | 3 | 3 | | States | Yes | |
|-----------|--------|---|---|--|--------|-----|--|

Controller Flow Control

| | | | | | | | |
|----------------------|--------|---|---|--|---------------------------------------|-----|--|
| HCI_Read_Buffer_Size | 0x1005 | 4 | 5 | | Status | Yes | |
| | | | | | HC ACL Data Packet Length | | |
| | | | | | HC Synchronous Data Packet Length | | |
| | | | | | HC Total Num ACL Data Packets | | |
| | | | | | HC Total Num Synchronous Data Packets | | |

Controller Information

| | | | | | | | |
|------------------------------------|--------|---|---|-------------|-----------------------|-----|--|
| HCI_Read_Local_Version_Information | 0x1001 | 4 | 1 | | Status | Yes | |
| | | | | | HCI Version | | |
| | | | | | HCI Revision | | |
| | | | | | LMP Version | | |
| | | | | | LMP Subversion | | |
| HCI_Read_Local_Supported_Commands | 0x1002 | 4 | 2 | | Status | Yes | |
| | | | | | Supported Commands | | |
| HCI_Read_Local_Supported_Features | 0x1003 | 4 | 3 | | Status | Yes | |
| | | | | | LMP Features | | |
| HCI_Read_Local_Extended_Features | 0x1004 | 4 | 4 | Page number | Status | Yes | |
| | | | | | Page number | | |
| | | | | | Maximum Page Number | | |
| | | | | | Extended LMP Features | | |
| HCI_Read_BD_ADDR | 0x1009 | 4 | 9 | | Status | Yes | |
| | | | | | BD ADDR | | |

Controller Configuration

| | | | | | | | |
|--------------------------------|--------|---|----|--------------------------------|-----------------|-----|--|
| HCI_Read_Local_Name | 0x0C14 | 3 | 14 | | States | Yes | |
| HCI_Write_Local_Name | 0x0C13 | 3 | 13 | Local Name | States | Yes | |
| HCI_Read_Class_of_Device | 0x0C23 | 3 | 23 | | States | Yes | |
| | | | | | Class of Device | | |
| HCI_Write_Class_of_Device | 0x0C24 | 3 | 24 | Class of Device | States | Yes | |
| HCI_Read_Number_Of_Support_IAC | 0x0C38 | 3 | 38 | | States | Yes | |
| | | | | | Num Support IAC | | |
| HCI_Read_Current_IAC_LAP | 0x0C39 | 3 | 39 | | States | Yes | |
| | | | | | Num Current IAC | | |
| | | | | | IAC LAP [I] | | |
| HCI_Write_Current_IAC_LAP | 0x0C3A | 3 | 3A | Num Current IAC IAC LAP [I] | States | Yes | |
| | | | | | IAC LAP [I] | | |
| HCI_Read_Scan_Enable | 0x0C19 | 3 | 19 | | States | Yes | |
| | | | | | Scan Enable | | |
| HCI_Write_Scan_Enable | 0x0C1A | 3 | 1A | Scan Enable | States | Yes | |

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| Control No. HD-AE-C080180 | (2/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Device Discover

| | | | | | | | |
|--|--------|---|----|---------------------------|---------------------------|-----|--|
| HCI_Inquiry | 0x0401 | 1 | 1 | LAP | | Yes | |
| | | | | Inquiry Length | | | |
| | | | | Num Responses | | | |
| HCI_Inquiry_Cancel | 0x0402 | 1 | 2 | | Status | Yes | |
| HCI_Periodic_Inquiry_Mode | 0x0403 | 1 | 3 | Max Period Length | Status | Yes | |
| | | | | Min Period Length | | | |
| | | | | LAP | | | |
| | | | | Inquiry Length | | | |
| HCI_Exit_Periodic_Inquiry_Mode | 0x0404 | 1 | 4 | | Status | Yes | |
| HCI_Read_Inquiry_Scan_Activity | 0x0C1D | 3 | 1D | | States | Yes | |
| | | | | | Inquiry Scan Interval | | |
| | | | | | Inquiry Scan Window | | |
| HCI_Write_Inquiry_Scan_Activity | 0x0C1E | 3 | 1E | Inquiry Scan Interval | States | Yes | |
| | | | | Inquiry Scan Window | | | |
| HCI_Read_Inquiry_Scan_Type | 0x0C42 | 3 | 42 | | Status | Yes | |
| HCI_Write_Inquiry_Scan_Type | 0x0C43 | 3 | 43 | Scan Type | Status | Yes | |
| HCI_Read_Inquiry_Mode | 0x0C44 | 3 | 44 | | Status | Yes | |
| HCI_Write_Inquiry_Mode | 0x0C45 | 3 | 45 | Inquiry Mode | Status | Yes | |
| HCI_Read_Inquiry_Response_Transmit_Power_Level | 0x0C58 | 3 | 58 | | Status | Yes | |
| | | | | | TX_Power | | |
| HCI_Write_Inquiry_Transmit_Power_Level | 0x0C59 | 3 | 59 | TX_Power | Status | Yes | |
| HCI_Read_Extended_Inquiry_Response | 0x0C51 | 3 | 51 | | Status | Yes | |
| | | | | | FEC_Required | | |
| | | | | | Extended_Inquiry_Response | | |
| HCI_Write_Extended_Inquiry_Response | 0x0C52 | 3 | 52 | FEC_Required | Status | Yes | |
| | | | | Extended_Inquiry_Response | | | |

Connection Setup

| | | | | | | | |
|-------------------------------|--------|---|----|---------------------------|--------------------|-----|--|
| HCI_Create_Connection | 0x0405 | 1 | 5 | BD ADDR | | Yes | |
| | | | | Packet Type | | | |
| | | | | Page Scan Repetition Mode | | | |
| | | | | Reserved | | | |
| | | | | Clock Offset | | | |
| | | | | Allow Role Switch | | | |
| HCI_Accept_Connection_Request | 0x0409 | 1 | 9 | BD ADDR | | Yes | |
| | | | | Role | | | |
| HCI_Reject_Connection_Request | 0x040A | 1 | A | BD ADDR | | Yes | |
| | | | | Reason | | | |
| HCI_Create_Connection_Cancel | 0x0408 | 1 | 8 | BD ADDR | Status | Yes | |
| | | | | | BD ADDR | | |
| HCI_Disconnect | 0x0406 | 1 | 6 | Connection Handle | | Yes | |
| | | | | Reason | | | |
| | | | | Packet Type | | | |
| HCI_Read_Page_Timeout | 0x0C17 | 3 | 17 | | States | Yes | |
| | | | | | Page Timeout | | |
| HCI_Write_Page_Timeout | 0x0C18 | 3 | 18 | Page Timeout | States | Yes | |
| HCI_Read_Page_Scan_Activity | 0x0C1B | 3 | 1B | | States | Yes | |
| | | | | | Page Scan Interval | | |
| | | | | | Page Scan Window | | |

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|------------------------------|--------|--|
| Control No. HD-AE-C080180 | (3/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

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|-------------------------------------|--------|---|----|--|-------------------------------|-----|--|
| HCI_Write_Page_Scan_Activity | 0x0C1C | 3 | 1C | Page Scan Interval Page Scan Window | States | Yes | |
| HCI_Read_Page_Scan_Type | 0x0C46 | 3 | 46 | | States | Yes | |
| HCI_Write_Page_Scan_Type | 0x0C47 | 3 | 47 | Page_Scan_Type | Page_Scan_Type | Yes | |
| HCI_Read_Connection_Accept_Timeout | 0x0C15 | 3 | 15 | | Status Conn_Accept_Timeout | Yes | |
| HCI_Write_Connection_Accept_Timeout | 0x0C16 | 3 | 16 | Conn_Accept_Timeout | Status | Yes | |

Remote Information

| | | | | | | | |
|-------------------------------------|--------|---|----|--|-------------------|-----|--|
| HCI_Remote_Name_Request | 0x0419 | 1 | 19 | BD_ADDR Page Scan Repetition Mode Page Scan Mode Clock Offset | | Yes | |
| HCI_Remote_Name_Request_Cancel | 0x041A | 1 | 1A | BD_ADDR | Status BD_ADDR | Yes | |
| HCI_Read_Remote_Supported_Features | 0x041B | 1 | 1B | Connection Handle | | Yes | |
| HCI_Read_Remote_Extended_Features | 0x041C | 1 | 1C | Connection Handle Page_Number | | Yes | |
| HCI_Read_Remote_Version_Information | 0x041D | 1 | 1D | Connection Handle | | Yes | |

Synchronous Connections

| | | | | | | | |
|--|--------|---|----|--|------------------------------------|-----|--|
| HCI_Setup_Synchronous_Connection | 0x0428 | 1 | 28 | Connection Handle Transmit Bandwidth Receive Bandwidth Max Latency Voice Setting Retransmission Effort Packet Type | | Yes | |
| HCI_Accept_Synchronous_Connection_Request | 0x0429 | 1 | 29 | BD_ADDR Transmit Bandwidth Receive Bandwidth Max Latency Content Format Retransmission Effort Packet Type | | Yes | |
| HCI_Reject_Synchronous_Connection_Request | 0x042A | 1 | 2A | BD_ADDR | | Yes | |
| HCI_Read_Voice_Setting | 0x0C25 | 3 | 25 | | States Voice Setting | Yes | |
| HCI_Write_Voice_Setting | 0x0C26 | 3 | 26 | Voice setting | States | Yes | |
| HCI_Write_Default_Erroneous_Data_Reporting | 0x0C5B | 3 | 5B | Erroneous_Data_Reporting | Status | No | |
| HCI_Read_Default_Erroneous_Data_Reporting | 0x0C5A | 3 | 5A | | Status Erroneous_Data_Reporting | No | |

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|------------------------------|--------|--|
| Control No. HD-AE-C080180 | (4/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Connection State

| | | | | | | | |
|--|--------|---|----|------------------------------|------------------------------|-----|--|
| HCI_Hold_Mode | 0x0801 | 2 | 1 | Connection Handle | | Yes | |
| | | | | Hold Mode Max Interval | | | |
| | | | | Hold Mode Min Interval | | | |
| HCI_Sniff_Mode | 0x0803 | 2 | 3 | Connection Handle | | Yes | |
| | | | | Sniff Max Interval | | | |
| | | | | Sniff Min Interval | | | |
| | | | | Sniff Attempt | | | |
| HCI_Sniff_Mode | 0x0803 | 2 | 3 | Sniff Timeout | | | |
| HCI_Exit_Sniff_Mode | 0x0804 | 2 | 4 | Connection Handle | | Yes | |
| HCI_Park_State | 0x0805 | 2 | 5 | Connection Handle | | Yes | |
| | | | | Beacon Max Interval | | | |
| | | | | Beacon Min Interval | | | |
| HCI_Exit_Park_State | 0x0806 | 2 | 6 | Connection Handle | | Yes | |
| HCI_Read_Link_Policy_Settings | 0x080C | 2 | C | Connection Handle | States | Yes | |
| | | | | | Connection Handle | | |
| | | | | | Link Policy Settings | | |
| HCI_Write_Link_Policy_Settings | 0x080D | 2 | D | Connection Handle | States | Yes | |
| | | | | Link Policy settings | Connection Handle | | |
| HCI_Read_Default_Link_Policy_Settings | 0x080E | 2 | E | | Status | Yes | |
| | | | | | Default Link Policy Settings | | |
| HCI_Write_Default_Link_Policy_Settings | 0x080F | 2 | F | Default Link Policy Settings | Status | Yes | |
| HCI_Read_Hold_Mode_Activity | 0x0C2B | 3 | 2B | | States | Yes | |
| | | | | | Hold Mode Activity | | |
| HCI_Write_Hold_Mode_Activity | 0x0C2C | 3 | 2C | Hold Mode Activity | States | Yes | |

Piconet Structure

| | | | | | | | |
|--------------------|--------|---|---|-------------------|-------------------|-----|--|
| HCI_Role_Discovery | 0x0809 | 2 | 9 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | Current Role | | |
| HCI_Switch_Role | 0x080B | 2 | B | BD ADDR | | Yes | |
| | | | | Role | | | |

Quality Service

| | | | | | | | | |
|----------------------------------|--------|---|----|-------------------|-------------------|-----|--|-------------------|
| HCI_Flow_Specification | 0x0810 | 2 | 10 | Connection Handle | | Yes | | |
| | | | | Flags | | | | |
| | | | | Flow direction | | | | |
| | | | | Service Type | | | | |
| | | | | Token Rate | | | | |
| | | | | Token Bucket Size | | | | |
| | | | | Peak Bandwidth | | | | |
| Access Latency | | | | | | | | |
| HCI_QoS_Setup | 0x0807 | 2 | 7 | Connection Handle | | Yes | | |
| | | | | Flags | | | | |
| | | | | Service Type | | | | |
| | | | | Token Rate | | | | |
| | | | | Peak Bandwidth | | | | |
| | | | | Latency | | | | |
| Delay Variation | | | | | | | | |
| HCI_Flush | 0x0C08 | 3 | 8 | Connection Handle | States | Yes | | |
| | | | | | Connection Handle | | | |
| HCI_Read_Automatic_Flush_Timeout | 0x0C27 | 3 | 27 | Connection Handle | States | Yes | | |
| | | | | | | | | Connection Handle |
| | | | | | | | | Flush Timeout |

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|------------------------------|--------|--|
| Control No. HD-AE-C080180 | (5/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

| | | | | | | | |
|--|--------|---|----|------------------------------|------------------------|-----|--|
| HCI_Write_Automatic_Flush_Timeout | 0x0C28 | 3 | 28 | Connection Handle | States | Yes | |
| | | | | Flash Timeout | Connection Handle | | |
| HCI_Read_Failed_Contact_Counter | 0x1401 | 5 | 1 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | Failed Contact Counter | | |
| HCI_Reset_Failed_Contact_Counter | 0x1402 | 5 | 2 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| HCI_Read_Num_Broadcast_Retransmission | 0x0C29 | 3 | 29 | | States | Yes | |
| HCI_Write_Num_Broadcast_Retransmission | 0x0C2A | 3 | 2A | Num Broadcast Retransmission | States | Yes | |
| HCI_Enhanced_Flush | 0x0C5F | 3 | 5F | Connection_Handle | | Yes | |
| | | | | Packet_Type | | | |
| | | | | Connection_Handle | | | |
| | | | | Maximum_Latency | | | |
| | | | | Minimum_Remote_Timeout | | | |
| | | | | Minimum_Local_Timeout | | | |

Physical Links

| | | | | | | | |
|---|--------|---|----|--------------------------------|--------------------------|-----|--|
| HCI_Read_Link_Supervision_Timeout | 0x0C36 | 3 | 36 | Connection Handle | States | Yes | |
| | | | | | Connection Handle | | |
| | | | | | Link Supervision Timeout | | |
| HCI_Write_Link_Supervision_Timeout | 0x0C37 | 3 | 37 | Connection Handle | States | Yes | |
| | | | | Link Supervision Timeout | Connection Handle | | |
| HCI_Read_AFH_Channel_Assessment_Mode | 0x0C48 | 3 | 48 | | Status | Yes | |
| HCI_Write_AFH_Channel_Assessment_Mode | 0x0C49 | 3 | 49 | AFH Channel Assessment Mode | Status | Yes | |
| HCI_Set_AFH_Host_Channel_Classification | 0x0C3F | 3 | 3F | AH Host Channel Classification | Status | Yes | |
| HCI_Change_Connection_Packet_Type | 0x040F | 1 | F | Connection Handle | | Yes | |
| | | | | Packet Type | | | |

Host Flow Control

| | | | | | | | |
|----------------------|--------|---|----|---------------------------------|--------|-----|--|
| HCI_Host_Buffer_Size | 0x0C33 | 3 | 33 | Host ACL Data Packet Length | States | Yes | |
| | | | | Host SCO Data Packet Length | | | |
| | | | | Host Total Num ACL Data Packets | | | |
| | | | | Host Total Num SCO Data Packets | | | |

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|------------------------------|--------|--|
| Control No. HD-AE-C080180 | (6/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

| | | | | | | | |
|---|--------|---|----|-----------------------------------|---------------------------------|-----|--|
| HCI_Set_Event_Mask | 0x0C01 | 3 | 1 | Event Mask | States | Yes | |
| HCI_Set_Event_Filter | 0x0C05 | 3 | 5 | Filter Type | States | Yes | |
| | | | | Filter Condition Type | | | |
| | | | | Condition | | | |
| HCI_Set_Controller_To_Host_Flow_Control | 0x0C31 | 3 | 31 | Flow Control Enable | States | Yes | |
| HCI_Host_Number_Of_Completed_Packets | 0x0C35 | 3 | 35 | Number of Handles | | Yes | |
| | | | | Connection handle [I] | | | |
| | | | | Host Num of Completed Packets [I] | | | |
| HCI_Read_Synchronous_Flow_Control_Enable | 0x0C2E | 3 | 2E | | States | Yes | |
| | | | | | Synchronous Flow Control Enable | | |
| HCI_Write_Synchronous_Flow_Control_Enable | 0x0C2F | 3 | 2F | Synchronous Flow Control Enable | States | Yes | |

Link Information

| | | | | | | | |
|-------------------------------|--------|---|----|-------------------|-------------------|-----|--|
| HCI_Read_LMP_Handle | 0x0420 | 1 | 20 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | LMP_Handle | | |
| | | | | | Reserved | | |
| HCI_Read_Transmit_Power_Level | 0x0C2D | 3 | 2D | Connection Handle | States | Yes | |
| | | | | Type | Connection Handle | | |
| | | | | | Power Level | | |
| HCI_Read_Link_Quality | 0x1403 | 5 | 3 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | Link Quality | | |
| HCI_Read_RSSI | 0x1405 | 5 | 5 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | RSSI | | |
| HCI_Read_Clock_Offset | 0x041F | 1 | 1F | Connection Handle | | Yes | |
| HCI_Read_Clock | 0x1407 | 5 | 7 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | Which Clock | Clock | | |
| | | | | | Accuracy | | |
| HCI_Read_AFH_Channel_Map | 0x1406 | 5 | 6 | Connection Handle | Status | Yes | |
| | | | | | Connection Handle | | |
| | | | | | AFH Mode | | |
| | | | | | AFH Channel Map | | |

Authentication and Encryption

| | | | | | | | |
|-------------------------------------|--------|---|----|-----------------------|-----------------------|-----|--|
| HCI_Read_Authentication_Enable | 0x0C1F | 3 | 1F | | States | Yes | |
| | | | | | Authentication Enable | | |
| HCI_Write_Authentication_Enable | 0x0C20 | 3 | 20 | Authentication Enable | States | Yes | |
| HCI_Read_Encryption_Mode | 0x0C21 | 3 | 21 | | States | Yes | |
| | | | | | Encryption Mode | | |
| HCI_Write_Encryption_Mode | 0x0C22 | 3 | 22 | Encryption Mode | States | Yes | |
| HCI_Link_Key_Request_Reply | 0x040B | 1 | B | BD ADDR | Status | Yes | |
| | | | | Link Key | BD ADDR | | |
| HCI_Link_Key_Request_Negative_Reply | 0x040C | 1 | C | BD ADDR | Status | Yes | |
| | | | | BD ADDR | | | |
| HCI_PIN_Code_Request_Reply | 0x040D | 1 | D | BD ADDR | Status | Yes | |
| | | | | PIN Code Length | | | |
| | | | | PIN Code | BD ADDR | | |
| HCI_PIN_Code_Request_Negative_Reply | 0x040E | 1 | E | BD ADDR | Status | Yes | |

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| Control No. HD-AE-C080180 | (7/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

| | | | | | | | |
|--|--------|---|----|---------------------|---------------------|-----|--|
| HCI_Authentication_Requested | 0x0411 | 1 | 11 | Connection Handle | | Yes | |
| HCI_Set_Connection_Encryption | 0x0413 | 1 | 13 | Connection Handle | | Yes | |
| | | | | Encryption Enable | | | |
| HCI_Change_Connection_Link_Key | 0x0415 | 1 | 15 | Connection Handle | | Yes | |
| HCI_Master_Link_Key | 0x0417 | 1 | 17 | Key Flag | | Yes | |
| HCI_Read_PIN_Type | 0x0C09 | 3 | 9 | | States | Yes | |
| | | | | | PIN Type | | |
| HCI_Write_PIN_Type | 0x0C0A | 3 | A | PIN Type | States | Yes | |
| HCI_Read_Stored_Link_Key | 0x0C0D | 3 | D | BD ADDR | States | Yes | |
| | | | | Read All Flag | Max Num Keys | | |
| | | | | | Num Keys Read | | |
| HCI_Write_Stored_Link_Key | 0x0C11 | 3 | 11 | Num Keys To Write | States | Yes | |
| | | | | BD ADDR [I] | Num Keys Written | | |
| | | | | Link Key [I] | | | |
| HCI_Delete_Stored_Link_Key | 0x0C12 | 3 | 12 | BD ADDR | States | Yes | |
| | | | | Delete All Flag | Num Keys Deleted | | |
| | | | | | Local Name | | |
| HCI_Create_New_Unit_Key | 0x0C0B | 3 | B | | States | Yes | |
| HCI_User_Confirmation_Request_Reply | 0x042C | 1 | 2C | BD ADDR | Status | Yes | |
| HCI_User_Confirmation_Request_Negative_Reply | 0x042D | 1 | 2D | BD ADDR | Status | Yes | |
| | | | | | BD ADDR | | |
| HCI_User_Passkey_Request_Reply | 0x042E | 1 | 2E | BD ADDR | Status | Yes | |
| | | | | Numeric_Value | BD ADDR | | |
| HCI_User_Passkey_Request_Negative_Reply | 0x042F | 1 | 2F | BD ADDR | Status | Yes | |
| | | | | | BD ADDR | | |
| HCI_Remote_OOB_Data_Request_Reply | 0x0430 | 1 | 30 | BD ADDR | Status | Yes | |
| | | | | C (Hash C) | BD ADDR | | |
| | | | | R (Randomizer R) | | | |
| HCI_Remote_OOB_Data_Request_Negative_Reply | 0x0433 | 1 | 33 | BD ADDR | Status | Yes | |
| HCI_Read_Local_OOB_Data | 0x0C57 | 3 | 57 | | Status | Yes | |
| | | | | | C (Hash C) | | |
| | | | | | R (Randomizer R) | | |
| HCI_Write_Simple_Pairing_mode | 0x0C56 | 3 | 56 | Simple_Pairing_Mode | Status | Yes | |
| HCI_Read_Simple_Pairing_mode | 0x0C55 | 3 | 55 | | Status | Yes | |
| | | | | | Simple_Pairing_Mode | | |
| HCI_Refresh_Encryption_Key | 0x0C53 | 3 | 53 | Connection_Handle | Status | Yes | |

Testing

| | | | | | | | |
|-------------------------------------|--------|---|---|---------------------------|---------------|-----|--|
| HCI_Read_Loopback_Mode | 0x1801 | 6 | 1 | | States | Yes | |
| | | | | | Loopback Mode | | |
| HCI_Write_Loopback_Mode | 0x1802 | 6 | 2 | Loopback Mode | Status | Yes | |
| HCI_Enable_Device_Under_Test_Mode | 0x1803 | 6 | 3 | | Status | Yes | |
| HCI_Write_Simple_Pairing_Debug_mode | 0x1804 | 6 | 4 | Simple_Pairing_Debug_Mode | Status | Yes | |

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| Control No. HD-AE-C080180 | (8/11) | Control name Electrical characteristics |
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HCI EVENT LIST

| Event Description | OpCode | Parameters | Status | Notes |
|--|--------|-------------------------------|--------|-------|
| Inquiry _Complete | 0x01 | Status | Yes | |
| Inquiry _Result | 0x02 | Num Responses | Yes | |
| | | BD ADDR [I] | | |
| | | Page Scan Repetition Mode [I] | | |
| | | Page Scan Period Mode [I] | | |
| | | Page Scan Mode [I] | | |
| | | Class of Device [I] | | |
| Connection _Complete | 0x03 | Status | Yes | |
| | | Connection Handle | | |
| | | BD ADDR | | |
| | | Link Type | | |
| | | Encryption Mode | | |
| Connection _Request | 0x04 | BD ADDR | Yes | |
| | | Class of Device | | |
| | | Link Type | | |
| Disconnection _Complete | 0x05 | Status | Yes | |
| | | Connection Handle | | |
| | | Reason | | |
| Authentication _Complete | 0x06 | Status | Yes | |
| | | Connection Handle | | |
| Remote _Name _Request _Complete | 0x07 | Status | Yes | |
| | | BD ADDR | | |
| | | Remote Name | | |
| Encryption _Change | 0x08 | Status | Yes | |
| | | Connection Handle | | |
| | | Encryption Enable | | |
| Change _Connection _Link _Key _Complete | 0x09 | Status | Yes | |
| | | Connection Handle | | |
| Master _Link _Key _Complete | 0x0A | Status | Yes | |
| | | Connection Handle | | |
| | | Key Flag | | |
| Read _Remote _Supported _Features _Complete | 0x0B | Status | Yes | |
| | | Connection Handle | | |
| | | LMP Features | | |
| Read _Remote _Version _Information _Complete | 0x0C | Status | Yes | |
| | | Connection Handle | | |
| | | LMP Version | | |
| | | Manufacture Name | | |
| QoS _Setup _Complete | 0x0D | LMP Subversion | Yes | |
| | | Status | | |
| | | Connection Handle | | |
| | | Flags | | |
| | | Service Type | | |
| | | Token Rate | | |
| | | Peak Bandwidth | | |
| Latency | | | | |
| Delay Variation | | | | |
| Command _Complete | 0x0E | Num HCI Command Packets | Yes | |
| | | Command Opcode | | |
| | | Return Parameters | | |

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| Control No. HD-AE-C080180 | (9/11) | Control name Electrical characteristics |
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| | | | | |
|--|------|-------------------------------|-----|--|
| Command_Status | 0x0F | Status | Yes | |
| | | Num HCI Command Packets | | |
| | | Command Opcode | | |
| Hardware_Error | 0x10 | Hardware Code | Yes | |
| Flush_Occurred | 0x11 | Connection Handle | Yes | |
| Role_Change | 0x12 | Status | Yes | |
| | | BD ADDR | | |
| | | New Role | | |
| Number_Of_Completed_Packets | 0x13 | Number of Handles | Yes | |
| | | Connection Handle [I] | | |
| | | HC Num HCI Data Packets [I] | | |
| Mode_Change | 0x14 | Status | Yes | |
| | | Connection Handle | | |
| | | Current Mode | | |
| | | Interval | | |
| Return_Link_Keys | 0x15 | Num Keys | Yes | |
| | | BD ADDR [I] | | |
| | | Link Key [I] | | |
| PIN_Code_Request | 0x16 | BD ADDR | Yes | |
| Link_Key_Request | 0x17 | BD ADDR | Yes | |
| Link_Key_Notification | 0x18 | BD ADDR | Yes | |
| | | Link Key | | |
| Loopback_Command | 0x19 | HCI Command Packet | Yes | |
| Data_Buffer_Overflow | 0x1A | Link Type | No | |
| Max_Slots_Change | 0x1B | Connection Handle | Yes | |
| | | LMP Max Slots | | |
| Read_Clock_Offset_Complete | 0x1C | Status | Yes | |
| | | Connection Handle | | |
| | | Clock Offset | | |
| Connection_Packet_Type_Change | 0x1D | Status | Yes | |
| | | Connection Handle | | |
| | | Packet Type | | |
| QoS_Violation | 0x1E | Connection Handle | No | |
| Page_Scan_Repetition_Mode_Change | 0x20 | BD ADDR | Yes | |
| | | Page Scan Repetition Mode | | |
| Flow_Specification_Complete | 0x21 | Status | Yes | |
| | | Connection Handle | | |
| | | Flags | | |
| | | Flow direction | | |
| | | Service Type | | |
| | | Token Rate | | |
| | | Token Bucket Size | | |
| | | Peak Bandwidth | | |
| Access Latency | | | | |
| Inquiry_Result_with_RSSI | 0x22 | Num Responses | Yes | |
| | | BD ADDR [I] | | |
| | | Page Scan Repetition Mode [I] | | |
| | | Page Scan Period Mode [I] | | |
| | | Page Scan Mode [I] | | |
| | | Class of Device [I] | | |
| | | Clock Offset [I] | | |
| RSSI [I] | | | | |
| Read_Remote_Extended_Features_Complete | 0x23 | Status | Yes | |
| | | Connection Handle | | |
| | | Page Number | | |
| | | Maximum page number | | |
| | | Extended LMP Features | | |

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|------------------------------|---------|--|
| Control No. HD-AE-C080180 | (10/11) | Control name Electrical characteristics |
|------------------------------|---------|--|

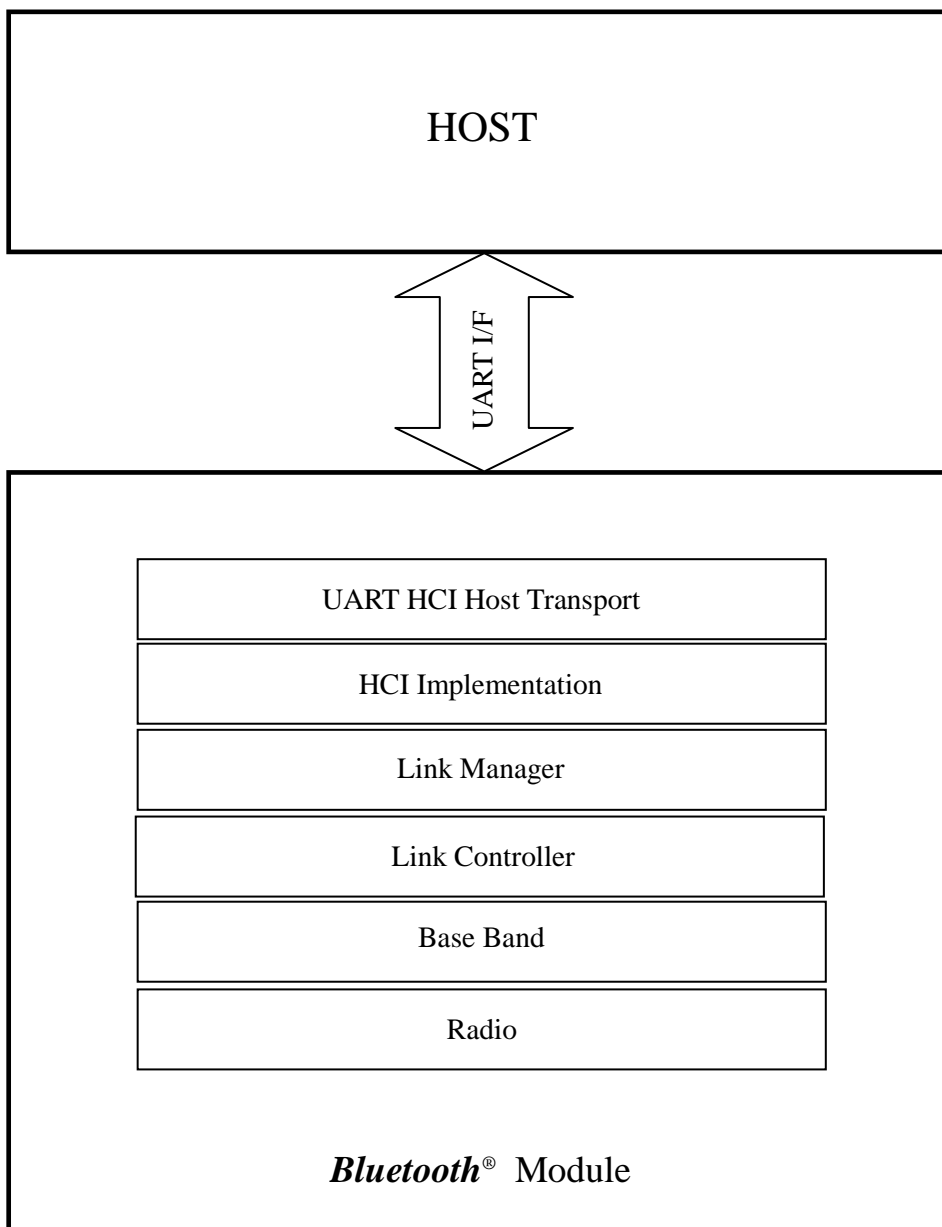
| | | | | |
|---|------|-----------------------------|-----|--|
| Synchronous_Connection_Complete | 0x2C | Status | Yes | |
| | | Connection_Handle | | |
| | | BD_ADDR | | |
| | | Link_Type | | |
| | | Transmission_Interval | | |
| | | Retransmission_Window | | |
| | | Rx_Packet_Length | | |
| | | Tx_Packet_Length | | |
| Synchronous_Connection_Changed | 0x2D | Status | Yes | |
| | | Connection_Handle | | |
| | | Transmission_Interval | | |
| | | Retransmission_Window | | |
| | | Rx_Packet_Length | | |
| | | Tx_Packet_Length | | |
| Sniff_Subrating | 0x2E | Status | Yes | |
| | | Connection_Handle | | |
| | | Maximum_Transmit_Latency | | |
| | | Maximum_Receive_Latency | | |
| | | Minimum_Remote_Timeout | | |
| Extended_Inquiry_Result | 0x2F | Num_Responses | Yes | |
| | | BD_ADDR | | |
| | | Page_Scan_Repetition_Mode | | |
| | | Reserved | | |
| | | Class_of_Device | | |
| | | Clock_Offset | | |
| | | RSSI | | |
| Extended_Inquiry_Response | | | | |
| Encryption_Key_Refresh_Complete | 0x30 | Status | Yes | |
| IO_Capability_Request | 0x31 | Connection_Handle | Yes | |
| IO_Capability_Response | 0x32 | BD_ADDR | Yes | |
| | | IO_Capability | | |
| | | OOB_Data_Present | | |
| | | Authentication_Requirements | | |
| User_Confirmation_Request | 0x33 | BD_ADDR | Yes | |
| User_Passkey_Request | 0x34 | Numeric_Value | Yes | |
| User_Passkey_Request | 0x34 | BD_ADDR | Yes | |
| Remote_OOB_Data_Request | 0x35 | BD_ADDR | Yes | |
| Simple_Pairing_Complete | 0x36 | Status | Yes | |
| | | BD_ADDR | | |
| Link_Supervision_Timeout_Changed | 0x38 | Connection_Handle | Yes | |
| | | Link_Supervision_Timeout | | |
| Enhanced_Flush_Complete | 0x39 | Connection_Handle | Yes | |
| User_Passkey_Notification | 0x3B | BD_ADDR | Yes | |
| | | Passkey | | |
| Keypress_Notification | 0x3C | BD_ADDR | Yes | |
| | | Notification_Type | | |
| Remote_Host_Supported_Features_Notification | 0x3D | BD_ADDR | Yes | |
| | | Host_Supported_Features | | |

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|------------------------------|---------|--|

Module Stack



Note:

The protocol stack in the module is compliant with the Specification of the *Bluetooth*® System V2.1+EDR

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PICS for Firmware Version 23C (Build4839)

The **Bluetooth**[®] functions of this module are as below. Depending on firmware version upgrade, the **Bluetooth**[®] functions are subject to change without notice.

Summary ICS:**Table 21: Controller Core Specification**

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 5 | Core Spec Version 2.1 | M.1 | No |
| 6 | Core Spec Version 2.1 + EDR (Ver. 2.1 + EDR) | M.1 | Yes |

M.1: Mandatory to choose at least one version from Table 21.

Table 22: EDR Features

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | EDR for asynchronous transports (single slot) | C.1 | Yes |
| 2 | EDR for asynchronous transports (multi slot) | C.1 | Yes |
| 3 | EDR for asynchronous transports | C.1 | Yes |

C.1: For implementations supporting Ver. 2.1+EDR, the Supplier shall indicate support for one or more Enhanced Data Rate features (per specification Volume 0, Part B) in Table 22.

RF Capabilities (based on PICS proforma for Radio):**Table 1: RF Capabilities**

| Item | Capability | Status | Support |
|------|---------------------------------------|--------|---------|
| 1 | Power Class =1 | M.1 | No |
| 2 | Power Class =2 | M.1 | Yes |
| 3 | Power Class=3 | M.1 | No |
| 4 | Power Control | C.1 | Yes |
| 5 | 1-slot packets supported | M | Yes |
| 6 | 3-slot packets supported | O | Yes |
| 7 | 5-slot packets supported | O | Yes |
| 8 | 79 Channels | M | Yes |
| 9 | Support for GFSK modulation | M | Yes |
| 10 | Support for $\pi/4$ -DQPSK modulation | C.2 | Yes |
| 11 | Support for 8DPSK modulation | C.3 | Yes |

M.1: Must choose One and only One Power Class

C.1: Mandatory to support IF Power Class 1 is supported, ELSE Optional

C.2: Mandatory IF SUM (21/4) OR SUM (21/6) is claimed, Optional IF SUM (21/3) OR SUM (21/5) is claimed, Excluded otherwise.

C.3: Mandatory IF SUM (21/4) OR SUM (21/6) is claimed, Optional IF RF(1/8) AND (SUM (21/3) OR SUM (21/5)) are claimed

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|------------------------------|--------|--|
| Control No. HD-AE-D080180 | (2/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Baseband Capabilities (based on PICS proforma for Baseband)**Table 1: Physical Channel**

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Support frequency band and 79 RF channels | M | Yes |
| 2 | Adaptive Frequency Hopping Kernel | M | Yes |

Table 1a: Modulation schemes

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Basic Data Rate, 1 Mbps payload data rate | M | Yes |
| 2 | Enhanced Data Rate, 2 Mbps payload data rate | C.1 | Yes |
| 3 | Enhanced Data Rate, 3 Mbps payload data rate | C.2 | Yes |

C.1 Mandatory IF SUMMARY(21/6) is claimed, Optional IF SUMMARY(21/5) is claimed

C.2 Mandatory IF SUMMARY(21/6) is claimed, Optional IF BB(1a/2) AND SUMMARY(21/5) are claimed

Table 2: Link Types

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Support of ACL link | M | Yes |
| 2 | Support of SCO link | O | Yes |
| 3 | Support of eSCO link | O | Yes |
| 4 | Support of Enhanced Data Rate ACL links | C.1 | Yes |
| 5 | Support of Enhanced Data Rate eSCO links | C.2 | Yes |

C.1 Mandatory IF SUMMARY(22/1) OR SUMMARY(22/2) is claimed, Optional IF SUMMARY(21/5) OR SUMMARY(21/6) is claimed

C.2 Mandatory IF SUMMARY(22/3) is claimed, Optional IF SUMMARY(21/5) OR SUMMARY(21/6) is claimed

Table 3: SCO Link support

Prerequisite for Items (3/5-8):(2/3) (Support of eSCO link)

Prerequisite for Items (3/1-4):(2/2) (Support of SCO link)

| Item | Capability | Status | Support |
|------|-----------------------------------|--------|---------|
| 1 | SCO links to same Slave | C.1 | Yes |
| 2 | SCO links to different Slaves | O | Yes |
| 3 | SCO links from same Master | C.1 | Yes |
| 4 | SCO links from different Masters | O | No |
| 5 | eSCO links to same Slave | C.2 | Yes |
| 6 | eSCO links to different Slaves | O | Yes |
| 7 | eSCO links from same Master | C.2 | Yes |
| 8 | eSCO links from different Masters | O | No |

C.2: Mandatory to support at least One link (3/5 or 3/7)

C.1: Mandatory to support at least One link (3/1 3/3)

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|------------------------------|--------|--|
| Control No. HD-AE-D080180 | (3/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Table 4: Common packet types

| Item | Capability | Status | Support |
|------|-----------------------------|--------|---------|
| 1 | Support of ID packet type | M | Yes |
| 2 | Support of NULL packet type | M | Yes |
| 3 | Support of POLL packet type | M | Yes |
| 4 | Support of FHS packet type | M | Yes |
| 5 | Support of DM1 packet type | M | Yes |

Table 5: ACL packet types

| Item | Capability | Status | Support |
|------|-----------------------------|--------|---------|
| 1 | Support of DH1 packet type | M | Yes |
| 2 | Support of DM3 packet type | O | Yes |
| 3 | Support of DH3 packet type | O | Yes |
| 4 | Support of DM5 packet type | O | Yes |
| 5 | Support of DH5 packet type | O | Yes |
| 6 | Support of AUX1 packet type | O | Yes |

Table 5a: Enhanced Data Rate ACL Packet Types

Prerequisite: 2/4 (Support of Enhanced Data Rate ACL links)

| Item | Capability | Status | Support |
|------|---------------------------|--------|---------|
| 1 | Support 2-DH1 packet type | C.1 | Yes |
| 2 | Support 2-DH3 packet type | C.2 | Yes |
| 3 | Support 2-DH5 packet type | C.2 | Yes |
| 4 | Support 3-DH1 packet type | C.3 | Yes |
| 5 | Support 3-DH3 packet type | C.4 | Yes |
| 6 | Support 3-DH5 packet type | C.5 | Yes |

C.1 Mandatory IF SUMMARY(22/1) OR SUMMARY(22/2) is claimed, Optional IF BB(1a/2) is claimed

C.2 Mandatory IF SUMMARY(22/2) is claimed, Optional IF BB(1a/2) is claimed

C.3 Mandatory IF SUMMARY(22/1) OR SUMMARY(22/2) is claimed, Optional IF BB(1a/3) is claimed

C.4 Mandatory IF SUMMARY(22/2) is claimed, Optional IF BB(5a/2) AND BB(5a/4) are claimed

C.5 Mandatory IF SUMMARY(22/2) is claimed, Optional IF BB(5a/3) AND BB(5a/4) are claimed

Table 6: SCO and eSCO packet types

Prerequisite for Items (6/1-4):(2/2) (Support of SCO link)

Prerequisite for Items (6/5-7):(2/3) (Support of eSCO link)

| Item | Capability | Status | Support |
|------|----------------------------|--------|---------|
| 1 | Support of HV1 packet type | C.1 | Yes |
| 2 | Support of HV2 packet type | O | Yes |
| 3 | Support of HV3 packet type | O | Yes |
| 4 | Support of DV packet type | C.1 | Yes |
| 5 | Support of EV3 packet type | C.2 | Yes |
| 6 | Support of EV4 packet type | O | Yes |
| 7 | Support of EV5 packet type | O | Yes |

C.1 Mandatory IF only (2/2) SCO link is supported

C.2 Mandatory IF only (2/3) eSCO link is supported

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|------------------------------|--------|--|
| Control No. HD-AE-D080180 | (4/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Table 6a: Enhanced Data Rate eSCO packet types

Prerequisite: 2/5 (Support Enhanced Data Rate eSCO links)

| Item | Capability | Status | Support |
|------|----------------------------|--------|---------|
| 1 | Support 2 –EV3 packet type | C.1 | Yes |
| 2 | Support 2 –EV5 packet type | C.2 | Yes |
| 3 | Support 3 –EV3 packet type | C.3 | Yes |
| 4 | Support 3 –EV5 packet type | C.4 | Yes |

C.1 Mandatory IF SUMMARY(22/3) is claimed, Optional IF BB(1a/2) is claimed

C.2 Optional IF BB(1a/2) is claimed

C.3 Mandatory IF SUMMARY(22/3) is claimed Optional IF BB(1a/3) is claimed

C.4 Optional IF BB(1a/3) is claimed

Table 7: Page procedures

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Support paging | M | Yes |
| 2 | Support page scan | M | Yes |
| 3 | (Intentionally left blank) | | No |
| 4 | (Intentionally left blank) | | No |
| 5 | Supports Interlaced Scan during page scan | O | Yes |

Table 8: Paging schemes

| Item | Capability | Status | Support |
|------|------------------------------|--------|---------|
| 1 | Supports mandatory scan mode | M | Yes |

Table 9: Paging modes

| Item | Capability | Status | Support |
|------|-------------------------|--------|---------|
| 1 | Supports paging mode R0 | C.1 | Yes |
| 2 | Supports paging mode R1 | C.1 | Yes |
| 3 | Supports paging mode R2 | C.1 | Yes |

C.1: At least one of the paging scan modes must be supported.

Table 9b: Paging train repetition

| Item | Capability | Status | Support |
|------|-----------------------|--------|---------|
| 1 | Supports Npage >= 1 | O | Yes |
| 2 | Supports Npage >= 128 | O | Yes |
| 3 | Supports Npage >= 256 | M | Yes |

Note: The master should use Npage >= 256 unless it knows what SR mode the slave uses.

Table 10: Inquiry procedures

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Support inquiry | O | Yes |
| 2 | Inquiry scan with first FHS | O | Yes |
| 3 | (Intentionally left blank) | | No |
| 4 | (Intentionally left blank) | | No |
| 5 | Supports the dedicated inquiry access code | O | Yes |
| 6 | Supports Interlaced Scan during inquiry scan | O | Yes |
| 7 | Extended Inquiry Response | O | Yes |

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|------------------------------|--------|--|

Table 11: Piconet capabilities

| Item | Capability | Status | Support |
|------|---------------------------------|--------|---------|
| 1 | Broadcast messages | O | Yes |
| 2 | Point-to-multipoint connections | O | Yes |

Table 12: Scatternet capabilities

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Act as Master in one piconet and as Slave in another piconet | O | Yes |
| 2 | Act as Slave in more than one piconet | O | Yes |

Table 13: Synchronous Coding Schemes

Prerequisite: 2/2 (SCO link support)

| Item | Capability | Status | Support |
|------|------------------------------|--------|---------|
| 1 | A-law | O | Yes |
| 2 | u-law | O | Yes |
| 3 | CVSD | O | Yes |
| 4 | Transparent Synchronous Data | O | Yes |

Table 14: Erroneous Data Reporting

| Item | Capability | Status | Support |
|------|-----------------------------------|--------|---------|
| 1 | Erroneous Data Reporting for SCO | C.1 | Yes |
| 2 | Erroneous Data Reporting for eSCO | C.2 | Yes |

C.1: Optional IF ((SUM ICS: 21/5 OR SUM ICS: 21/6) AND HCI: 9/6) is supported, ELSE excluded.

C.2: Optional IF ((SUM ICS: 21/5 OR SUM ICS: 21/6) AND HCI: 9/7) is supported, ELSE excluded.

Table 15: This table is intentionally left blank: DO NOT USE

| Item | Capability | Status | Support |
|------|----------------------------|--------|---------|
| 1 | (Intentionally left blank) | | No |

Table 16: Non-flushable Packet Boundary Flag

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Support Non-flushable Packet Boundary Flag | C.1 | Yes |

C.1 MANDATORY IF ((SUM ICS: 21/5 OR SUM ICS 21/6) AND HCI: 12/10) is supported, ELSE OPTIONAL IF (SUM ICS: 21/5 OR SUM ICS: 21/6) is supported, ELSE excluded.

Table 17: Connection States

| Item | Capability | Status | Support |
|------|----------------------|--------|---------|
| 1 | Sniff Subrating Mode | C.1 | Yes |

C.1 MANDATORY IF ((SUM ICS: 21/5 OR SUM ICS 21/6) AND LMP: 2/8) is supported, ELSE OPTIONAL IF (SUM ICS: 21/5 OR SUM ICS: 21/6) is supported, ELSE excluded.

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| Control No. HD-AE-D080180 | (6/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Link Manager Capabilities (based on PICS proforma for Link Manager)**Table 1: Response Messages**

| Item | Capability | Status | Support |
|------|----------------|--------|---------|
| 1 | Accept message | M | Yes |
| 2 | Reject message | M | Yes |

Table 2: Supported Features

| Item | Capability | Status | Support |
|------|----------------------------------|--------|---------|
| 1 | 3-slot packets | O | Yes |
| 2 | 5-slot packets | O | Yes |
| 3 | Encryption | C.5 | Yes |
| 4 | Slot offset | O | Yes |
| 5 | Timing accuracy | O | Yes |
| 6 | Role switch (Master/Slave) | O | Yes |
| 7 | Hold mode | O | Yes |
| 8 | Sniff mode | O | Yes |
| 9 | Park mode | O | Yes |
| 10 | Power Control | C.1 | Yes |
| 11 | Channel quality driven data rate | O | Yes |
| 12 | SCO link | O | Yes |
| 13 | RSSI | O | Yes |
| 14 | Broadcast encryption | O | Yes |
| 15 | eSCO link | O | Yes |
| 16 | Adaptive frequency hopping | M | Yes |
| 17 | Enhanced Data Rate ACL | C.2 | Yes |
| 18 | Enhanced Data Rate eSCO | C.3 | Yes |
| 19 | Simple Pairing | C.4 | Yes |

C.1: Mandatory IF (RF:1/1) supported, ELSE Optional

C.2 Mandatory IF (SUMMARY:22/1) OR (SUMMARY:22/2) is claimed, Optional IF (SUMMARY:21/5) OR (SUMMARY:21/6) is claimed

C.3 Mandatory IF (SUMMARY:22/3) is claimed, Optional IF (SUMMARY:21/5) OR (SUMMARY:21/6) is claimed

C.4 Mandatory IF (SUMMARY 2-1/5 OR SUMMARY 2-1/6) is claimed, ELSE Excluded.

C.5 Optional IF (SUMMARY 2-1/1 OR SUMMARY 2-1/2 OR SUMMARY 2-1/3 OR SUMMARY 2-1/4) ELSE Mandatory

Table 3: Authentication

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Initiate authentication before connection completed | O | Yes |
| 2 | Initiate authentication after connection completed | O | Yes |
| 3 | Respond to authentication request | M | Yes |

Table 4: Pairing

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Initiate pairing before connection completed | O | Yes |
| 2 | Initiate pairing after connection completed | O | Yes |
| 3 | Respond to pairing request | M | Yes |
| 4 | Use fixed PIN and request responder to initiator switch | C.1 | Yes |
| 5 | Use variable PIN | C.1 | Yes |
| 6 | Accept initiator to responder switch | C.2 | Yes |

C.1: Mandatory to support at least One, (LMP:4/4) OR (LMP:4/5) OR both

C.2: Mandatory IF (LMP: 4/5) AND (LMP:4/1), OR (LMP: 4/5) AND (LMP:4/2)) is supported.

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| Control No. HD-AE-D080180 | (7/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Table 5: Link Keys

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Creation of link key - Unit Key | C.1 | Yes |
| 2 | Creation of link key - Combination Key | C.1 | Yes |
| 3 | Initiate change of link key | O | Yes |
| 4 | Accept change of link key | M | Yes |
| 5 | (Intentionally left blank) | | No |
| 6 | (Intentionally left blank) | | No |
| 7 | Accept pairing with Unit Key | O | Yes |

C.1: Mandatory to support at least One - either (LMP:5/1) OR (LMP:5/2).

Table 6: Encryption

Prerequisite: 2/3(Encryption supported)

| Item | Capability | Status | Support |
|------|-----------------------------|--------|---------|
| 1 | Initiate encryption | C.1 | Yes |
| 2 | Accept encryption requests | M.1 | Yes |
| 3 | (Intentionally left blank) | | No |
| 4 | (Intentionally left blank) | | No |
| 5 | Key size negotiation | M.1 | Yes |
| 6 | Start encryption, as master | M.1 | Yes |
| 7 | Accept start of encryption | M.1 | Yes |
| 8 | Stop encryption, as master | M.1 | Yes |
| 9 | Accept stop of encryption | M.1 | Yes |
| 10 | Encryption Pause/Resume | M.1 | Yes |

M.1: Mandatory IF (LMP:2/3) - (Encryption) is supported.

C.1: Mandatory IF (SUMMARY 2-1/5 OR SUMMARY 2-1/6) is claimed, ELSE Optional.

Table 7: Clock offset information

| Item | Capability | Status | Support |
|------|----------------------------------|--------|---------|
| 1 | Request clock offset information | O | Yes |
| 2 | Respond to clock offset requests | M | Yes |

Table 8: Slot offset information

Prerequisite: 2/4 (Slot offset)

| Item | Capability | Status | Support |
|------|------------------------------|--------|---------|
| 1 | Send slot offset information | C.1 | Yes |

C.1: Mandatory IF (LMP:13/1) - (Master/Slave switch) supported, ELSE Optional.

Table 9: Timing accuracy information

Prerequisite: 2/5 (Timing accuracy)

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Request timing accuracy information | O | Yes |
| 2 | Respond to timing accuracy information requests | M.1 | Yes |

M.1: Mandatory IF (LMP:2/5) - (Timing Accuracy) supported

Table 10: LM version information

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Request LM version information | O | Yes |
| 2 | Respond to LM version information requests | M | Yes |

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| Control No. HD-AE-D080180 | (8/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Table 11: Feature support

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Request supported features | C.1 | Yes |
| 2 | Respond to supported features requests | M | Yes |
| 3 | Request extended features mask | C.2 | Yes |
| 4 | Respond to extended features Request | C.2 | Yes |

C.1: Mandatory IF any of the Optional features in (LMP:2/1-3), (LMP:2/5), (LMP:2/7-12), (LMP:2/14-16), (LMP:26/1) is requested by the IUT, ELSE Optional.

C.2 Mandatory IF a feature requiring another features page is supported, ELSE Optional.

Table 12: Name information

| Item | Capability | Status | Support |
|------|--------------------------|--------|---------|
| 1 | Request name information | O | Yes |
| 2 | Respond to name requests | M | Yes |

Table 13: Role Switch

Prerequisite: 2/6(Role switch)

| Item | Capability | Status | Support |
|------|-------------------------------------|--------|---------|
| 1 | Request Master Slave switch | O | Yes |
| 2 | Accept Master Slave switch requests | M.1 | Yes |

M.1 Mandatory IF LMP:(2/6) - (Role Switch) supported

Table 14: Detach

| Item | Capability | Status | Support |
|------|-------------------|--------|---------|
| 1 | Detach connection | M | Yes |

Table 14a: Setting up and Removing Enhanced Data Rate ACL Connection

| Item | Capability | Status | Support |
|------|--------------------------|--------|---------|
| 1 | Enter Enhanced Data Rate | C.1 | Yes |
| 2 | Exit Enhanced Data Rate | C.1 | Yes |

C.1 Mandatory IF (LMP:2/17) supported, ELSE Excluded.

Table 14b: Setting up and Removing Enhanced Data Rate eSCO Connection

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Enter and exit eSCO using Enhanced Data Rate Packets | C.1 | Yes |

C.1 Mandatory IF (LMP:2/18) supported, ELSE Excluded.

Table 15: Hold mode

Prerequisite: 2/7 (Hold mode)

| Item | Capability | Status | Support |
|------|-------------------------------|--------|---------|
| 1 | Force hold mode | O | Yes |
| 2 | Request hold mode | C.1 | Yes |
| 3 | Respond to hold mode requests | M | Yes |
| 4 | Accept forced hold mode | M | Yes |

C.1: Mandatory IF (LMP:15/1) - (Force hold mode) is supported, ELSE Optional.

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|------------------------------|--------|--|
| Control No. HD-AE-D080180 | (9/11) | Control name Electrical characteristics |
|------------------------------|--------|--|

Table 16: Sniff mode

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | (Intentionally left blank) | | No |
| 2 | Request sniff mode | O | Yes |
| 3 | Respond to sniff mode requests (renegotiate or reject) | M.1 | Yes |
| 4 | (Intentionally left blank) | | No |
| 5 | Request un-sniff | C.1 | Yes |
| 6 | Accept un-sniff requests | M.1 | Yes |
| 7 | Sniff Subrating Mode | C2 | Yes |

C.1: Mandatory IF (LMP:16/2) - (Request sniff mode) is supported, ELSE Optional.

M.1: Mandatory IF (LMP:2/8) - (Sniff Mode) is supported.

C.2 Mandatory IF (SUMMARY 2-1/5 OR SUMMARY 2-1/6) is claimed, ELSE Excluded

Table 17: Park mode

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | (Intentionally left blank) | | No |
| 2 | Request park mode | O | Yes |
| 3 | Respond to park mode requests | M.1 | Yes |
| 4 | (Intentionally left blank) | | No |
| 5 | Set up broadcast scan window | O | Yes |
| 6 | Accept changes to the broadcast scan window | M.1 | Yes |
| 7 | Modify beacon parameters | O | Yes |
| 8 | Accept modification of beacon parameters | M.1 | Yes |
| 9 | Request Unpark using PM_ADDR | C.1 | Yes |
| 10 | Request Unpark using BD_ADDR | C.1 | Yes |
| 11 | Slave requested Unpark | O | Yes |
| 12 | Accept Unpark using PM_ADDR | M.1 | Yes |
| 13 | Accept Unpark using BD_ADDR | M.1 | Yes |

M.1: Mandatory IF (LMP:2/9) - (Park Mode) is supported

C.1: IF (LMP:17/3) - (Respond to park mode requests) is supported, THEN at least One of (LMP:17/9) - (Unpark using PM_ADDR) OR (LMP:17/10) - (Unpark using BD_ADDR) is Mandatory, ELSE Optional.

Table 18: Power Control

Prerequisite: 2/13 (RSSI)

Prerequisite: 2/10(Power control)

| Item | Capability | Status | Support |
|------|--------------------------------|--------|---------|
| 1 | Request to increase power | M.1 | Yes |
| 2 | Request to decrease power | M.1 | Yes |
| 3 | Respond when max power reached | M.2 | Yes |
| 4 | Respond when min power reached | M.2 | Yes |

M.1: Mandatory IF (LMP:2/13) - (RSSI) is supported

M.2: Mandatory IF (LMP:2/10) - (Power Control) is supported

Table 19: Link supervision timeout

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Set link supervision timeout value | O | Yes |
| 2 | Accept link supervision timeout setting | M | Yes |

Table 20: Quality of Service

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Channel quality driven change between DM and DH packet types | C.1 | Yes |
| 2 | Force/Request change of Quality of Service | M | Yes |
| 3 | Request change of Quality of Service | M | Yes |

C.1: Mandatory IF support of (LMP:2/11) is stated in the feature request, ELSE Optional.

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|------------------------------|---------|--|
| Control No. HD-AE-D080180 | (10/11) | Control name Electrical characteristics |
|------------------------------|---------|--|

Table 21: SCO Links

Prerequisite: 2/12 (SCO links)

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Initiate SCO links, as Master | O | Yes |
| 2 | Initiate SCO links, as Slave | O | Yes |
| 3 | Accept SCO links | O | Yes |
| 4 | Remove SCO links, as Master | C.1 | Yes |
| 5 | Remove SCO links, as Slave | C.2 | Yes |
| 6 | Negotiate SCO link parameters, as Master | C.3 | Yes |
| 7 | Negotiate SCO link parameters, as Slave | C.4 | Yes |

C.1: Mandatory IF (LMP:21/1) - (Initiating SCO links, as Master) is supported, ELSE Optional.

C.2: Mandatory IF (LMP:21/2) - (Initiating SCO links, as Slave) is supported, ELSE Optional.

C.3: Mandatory IF (LMP:21/1) - (Initiating SCO links, as Master) OR (LMP:21/3) - (Accept SCO links) is supported, ELSE Optional.

C.4: Mandatory IF (LMP:21/2) - (Initiating SCO links, as Slave) OR (LMP:21/3) - (Accept SCO links) is supported, ELSE Optional.

Table 22: Multi-Slot packages

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Accept maximum allowed number of slots to be used | C.1 | Yes |
| 2 | Request maximum number of slots to be used | C.1 | Yes |
| 3 | Accept request of maximum number of slots to be used | C.1 | Yes |

C.1: Mandatory IF (LMP:2/1) AND/OR (LMP:2/2) is supported in the feature request, ELSE Optional.

Table 23: Paging scheme

| Item | Capability | Status | Support |
|------|---------------------------------|--------|---------|
| 1 | Request page mode to use | O | Yes |
| 2 | Accept suggested page mode | O | Yes |
| 3 | Request page scan mode to use | O | Yes |
| 4 | Accept suggested page scan mode | O | Yes |

Table 24: Connection Establishment

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Create connection for higher layers | M | Yes |
| 2 | Respond to requests to establish connections for higher layers | M | Yes |
| 3 | Indicate that link set-up is completed | M | Yes |

Table 25: Test Mode

| Item | Capability | Status | Support |
|------|--|--------|---------|
| 1 | Activate test mode | O | Yes |
| 2 | Ability to reject activation of test mode if test mode is disabled | M | Yes |
| 3 | Control test mode | O | Yes |
| 4 | Ability to reject test mode control commands if test mode is disabled. | M | Yes |

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|------------------------------|---------|--|
| Control No. HD-AE-D080180 | (11/11) | Control name Electrical characteristics |
|------------------------------|---------|--|

Table 26: Adaptive Frequency Hopping

Prerequisite: 2/20(AFH)

| Item | Capability | Status | Support |
|------|---|--------|---------|
| 1 | Support of AFH switch as master | O | Yes |
| 2 | Support of AFH switch as slave | M | Yes |
| 3 | Support of Channel Classification reporting as master | C.1 | Yes |
| 4 | Support of Channel Classification reporting as slave | C.2 | Yes |
| 5 | Support channel classification from host | C.3 | Yes |
| 6 | Support of Channel Classification | O | Yes |

C.1: Optional IF (LMP:26/6) is supported, ELSE Excluded.

C.2: Mandatory IF (LMP:26/6) is supported, ELSE Excluded.

C.3: Mandatory IF (LMP:26/1) OR (LMP:26/4) is supported, ELSE Optional.

M.1: Mandatory IF (LMP:2/20) - (AFH) supported

Table 27: This Table is intentionally left blank

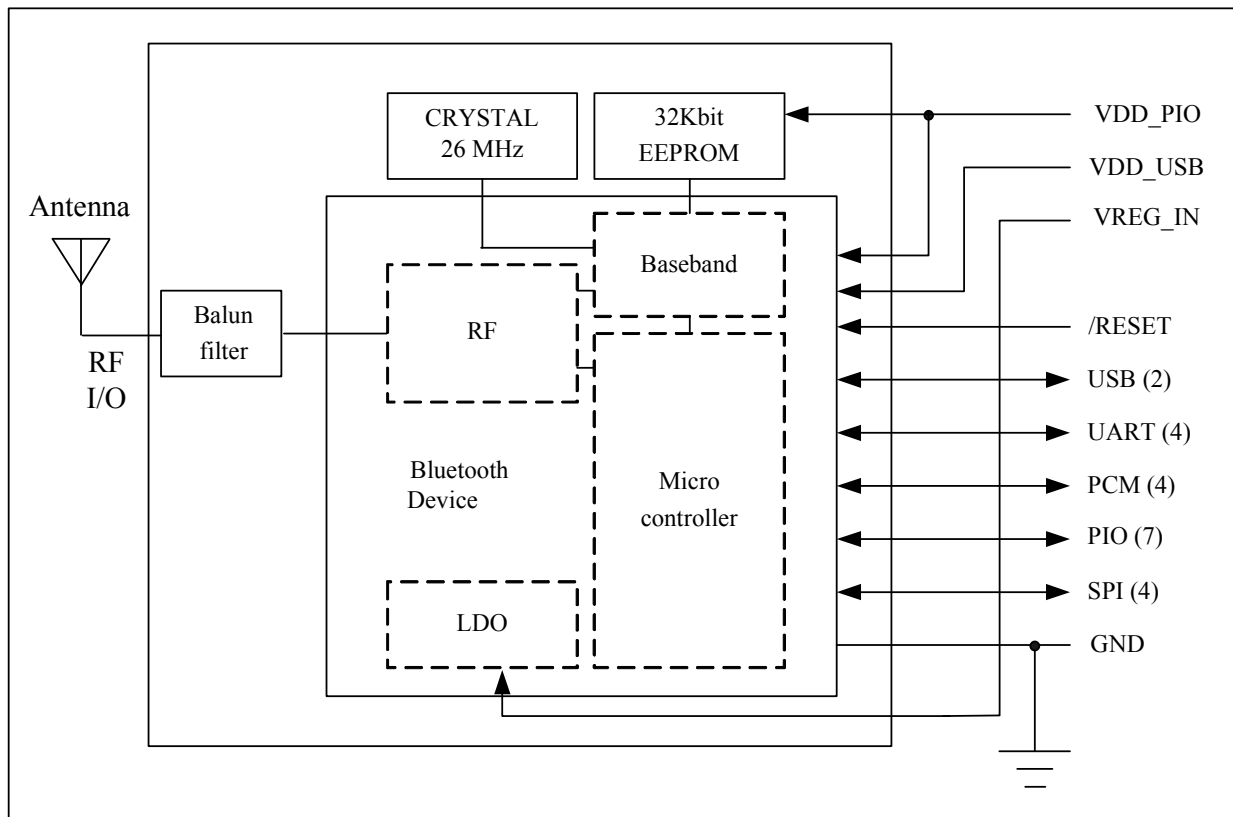
| Item | Capability | Status | Support |
|------|-----------------------------------|--------|---------|
| 1 | This line is intentionally blank. | O | No |
| 2 | This line is intentionally blank. | O | No |
| 3 | N/A | O | No |
| 4 | N/A | O | No |

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| | | |
|------------------------------|-------|-----------------------------------|
| Control No. HD-MC-A080180 | (1/1) | Control name Circuit Schematic |
|------------------------------|-------|-----------------------------------|

Block Diagram



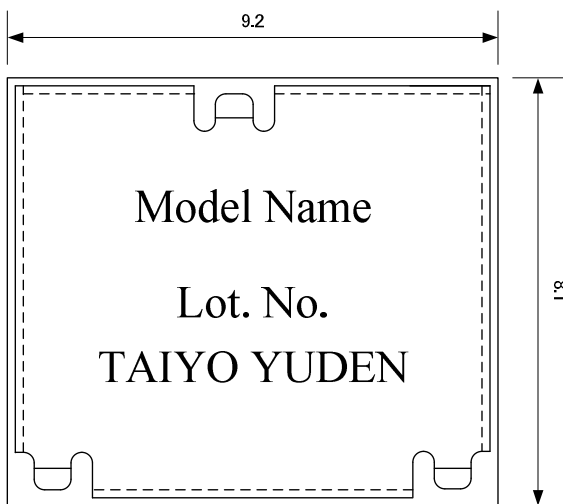
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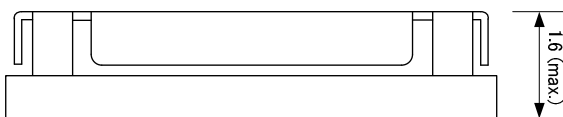
| | | |
|------------------------------|-------|------------------------------------|
| Control No. HD-AD-A080180 | (1/1) | Control name Outline/Appearance |
|------------------------------|-------|------------------------------------|

Unit: mm, Tolerances unless otherwise specified: +/-0.2mm

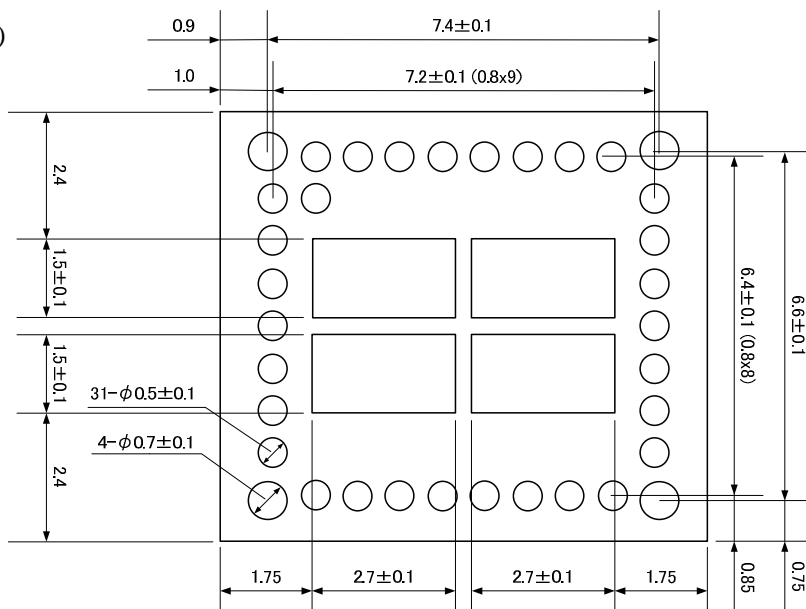
(TOP VIEW)



(SIDE VIEW)



(BOTTOM VIEW)



TOP VIEW

Note:

Outline/Appearance data is PRELIMINARY, not guaranteed and subject to change without notice.

Please contact Taiyo Yuden for the details of module mountings.

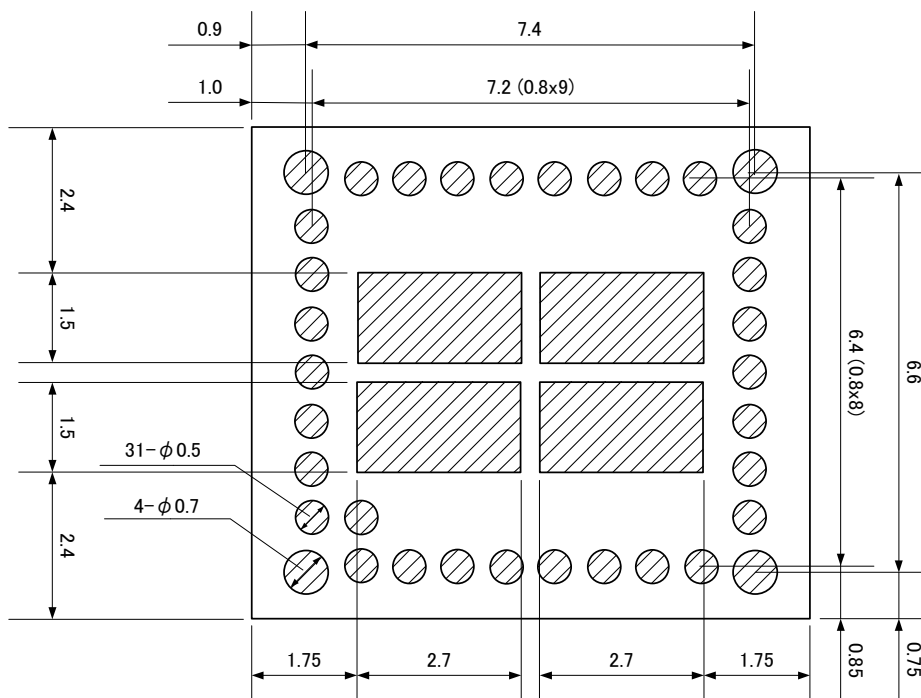
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| | | |
|------------------------------|-------|------------------------------------|
| Control No. HD-AD-B080180 | (1/1) | Control name Outline/Appearance |
|------------------------------|-------|------------------------------------|

LAND PATERNE EXAMPLE

Unit: mm



Caution

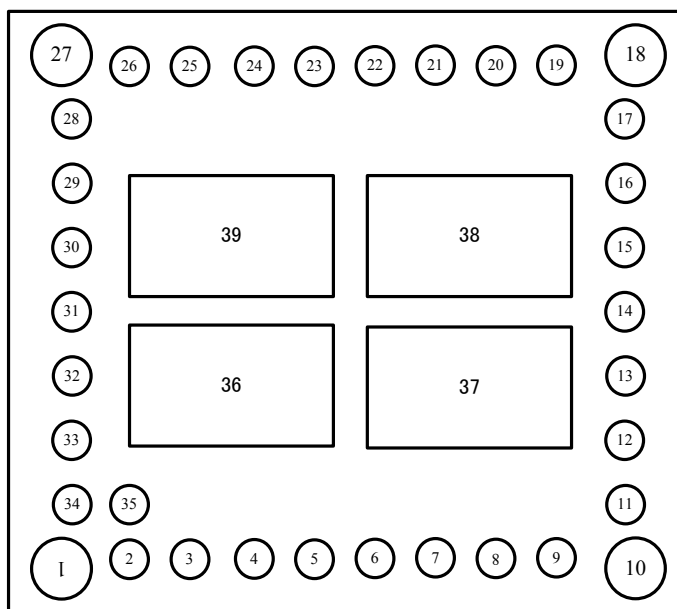
Do not wire on mother board except ground pattern where reverse side of module to be placed.

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| | | |
|------------------------------|-------|----------------------------|
| Control No. HD-BA-A080180 | (1/2) | Control name Pin Layout |
|------------------------------|-------|----------------------------|

Pin Descriptions



TOP VIEW

| Terminal No. | Terminal name | Type | Input/Output | Description | Block | Remark |
|--------------|---------------|-------|--------------|---|--------|--------|
| 33 | VDD_PIO | Power | Input | DC3.3V Power supply for PIO | Power | |
| 32 | VDD_USB | Power | Input | DC3.3V Power supply for UART ports and USB ports | | |
| 34 | VREG_IN | Power | Input | Internal Regulator input | | |
| 2 | /RESET | CMOS | Input | Active low RESET signal with internal weak pull-up | /RESET | |
| 26 | USB_DP | CMOS | Input/Output | This signal should be connected to ground | USB | |
| 25 | USB_DN | CMOS | Input/Output | This signal should be connected to ground | | |
| 29 | UART_TX | CMOS | Output | TX data to host | UART | |
| 31 | UART_RX | CMOS | Input | RX data from host (with weak internal pull-down) | | |
| 28 | UART_RTS | CMOS | Output | UART request to send active low(flow control signal to host, tristatable with internal pull-up) | | |
| 30 | UART_CTS | CMOS | Input | UART clear to send active low (flow control signal from host, with weak internal pull-down) | | |
| 22 | PCM_SYNC | CMOS | Input/Output | Synchronous data SYNC (with weak internal pull-down) | PCM | |
| 20 | PCM_OUT | CMOS | Output | Synchronous data (tristatable with internal weak pull-down) | | |
| 21 | PCM_IN | CMOS | Input | Synchronous data (with internal weak pull-down) | | |
| 23 | PCM_CLK | CMOS | Input/Output | Synchronous data clock (with weak internal pull-down) | | |

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| | | |
|------------------------------|-------|----------------------------|
| Control No. HD-BA-A080180 | (2/2) | Control name Pin Layout |
|------------------------------|-------|----------------------------|

| Terminal No. | Terminal name | Type | Input/Output | Description | Block | Remark |
|--------------|---------------------------------|-------|--------------|---|-------|--------|
| 3 | PIO0 | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. | PIO | |
| 9 | PIO1 | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. | | |
| 11 | PIO7 | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. | | |
| 16 | PIO5/ BT_ACTIVE | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. (BT_Active output for Co-existence signaling.) | | |
| 17 | PIO6 | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. | | |
| 19 | PIO4/ BT_PRIORITY /CH_CLK | CMOS | Output | BT_Priority/CH_CLK output for Co-existence signaling. | | |
| 8 | PIO9 | CMOS | Input/Output | Reserved, Keep on set side terminal open. Bi-directional with programmable strength internal pull-up/down. | | |
| 13 | SPI_CSB | CMOS | Input | Do not Connection | SPI | |
| 15 | SPI_MISO | CMOS | Output | Do not Connection | | |
| 12 | SPI_CLK | CMOS | Input | Do not Connection | | |
| 14 | SPI_MOSI | CMOS | Input | Do not Connection | | |
| 5 | RF_IN_OUT | RF | Input/Output | 50 ohm antenna connection | RF | |
| 1 | GND | Power | - | Ground | Power | |
| 4 | GND | Power | - | Ground | | |
| 6 | GND | Power | - | Ground | | |
| 7 | GND | Power | - | Ground | | |
| 10 | GND | Power | - | Ground | | |
| 18 | GND | Power | - | Ground | | |
| 24 | GND | Power | - | Ground | | |
| 27 | GND | Power | - | Ground | | |
| 35 | GND | Power | - | Ground | | |
| 36 | GND | Power | - | Ground | | |
| 37 | GND | Power | - | Ground | | |
| 38 | GND | Power | - | Ground | | |
| 39 | GND | Power | - | Ground | | |

Notes:

1. Weak pull-ups can be thought of 1M Ohm connections to VDD, but are more accurately modeled as a -1uA current source.
2. Pin 32, 33 and 34 is used for power supply of BT module. To fill the standard of "Supply voltage ripple and spike noise", the capacitor, which has the capacity of 2.2uF or more, should be put in the terminal VDD outside as a bypass capacitor.

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| | |
|----------------------|--------------------------------|
| Control No. (1/1) | Control name Reflow Profile |
|----------------------|--------------------------------|

Recommended Reflow Profile

