

FIT2 Fitness Module

FEATURES

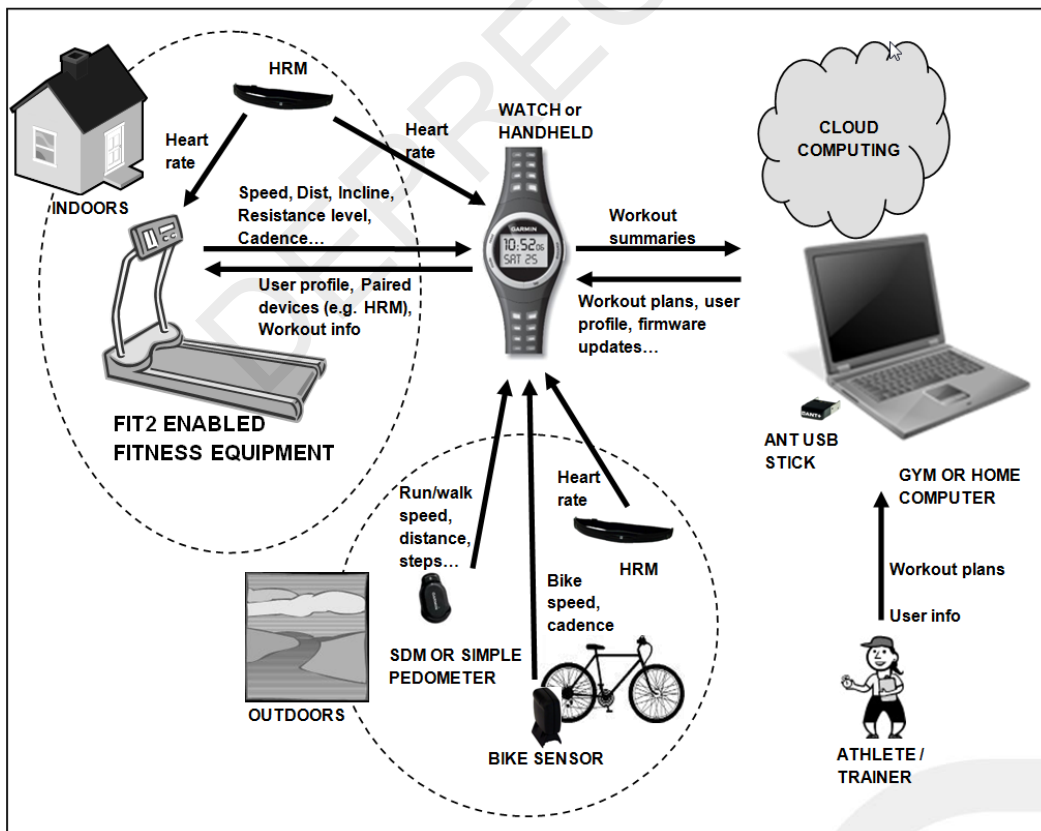
- 20mm x 20mm module with PCB F antenna
- Ultra low power operation
- Simple byte sync/async serial interface with fitness equipment console
- Standalone mode for retrofitting applications
- Proximity pairing
- Programmable output power up to +4 dBm
- Excellent receiver sensitivity -86 dBm
- Up to 3 public, managed and/or private network keys
- Up to 4 custom ANT channels for differentiating product features
- ANT channel combined message rate up to 200Hz (8byte data payload)
- Burst transfer rate up to 60Kbps (true data throughput)
- 2V to 3.6V supply voltage range
- -40°C to +85°C operating temperature
- Radio regulatory approval for major markets
- RoHS compliant



APPLICATIONS

Fitness Equipment Control Consoles

FIT2 Module Use Case and ANT+ data flow



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D00001578 Rev1.3

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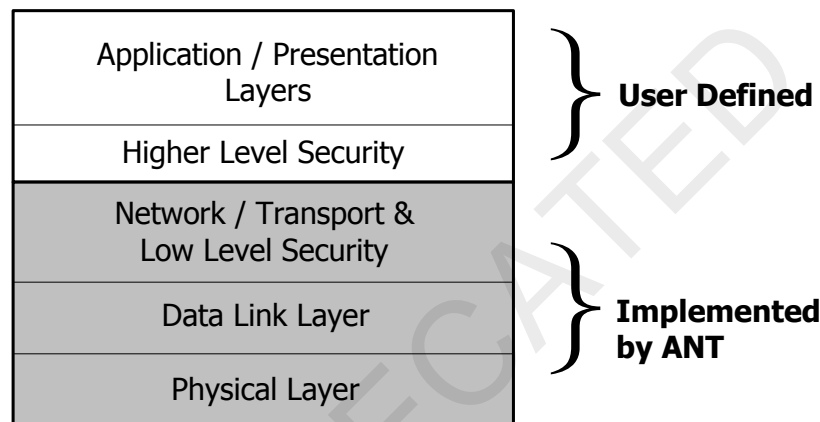
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ANT™ Overview

ANT™ is a practical wireless sensor network protocol running on 2.4 GHz ISM band. Designed for ultra low power, ease of use, efficiency and scalability, ANT easily handles peer-to-peer, star, tree and practical mesh topologies. ANT provides reliable data communications, flexible and adaptive network operation and cross-talk immunity. The protocol stack of ANT is extremely compact, requiring minimal microcontroller resources and considerably reducing system costs.

ANT provides carefree handling of the Physical, Network, and Transport OSI layers. In addition, it incorporates key low-level security features that form the foundation for user-defined, sophisticated, network-security implementations. ANT ensures adequate user control while considerably lightening the computational burden in providing a simple yet effective wireless networking solution.



ANT supports public, managed and private network architectures with 2^{32} uniquely addressable devices possible, ensuring that each device can be uniquely identified from each other in the same network.

ANT is proven with an installed base of over multimillion nodes in ultra low power sensor network applications in sport, fitness, home and industrial automation. The ANT solutions are available in chips, chipsets and modules to suit a wide variety of application needs.

The complete description of ANT message protocol is found in the document "ANT Message Protocol and Usage". The serial interface details are provided in the document "Interfacing with ANT General Purpose Chipsets and Modules". Both documents are available on www.thisisant.com.

ANT+ and ANT+ Alliance

ANT+ is the open application layer on the top of the ANT stack. It standardizes communications and facilitates interoperability between a wide array of personal sports, wellness and lifestyle monitoring devices. ANT+ defines device profiles that specify access, data formats, and channel parameters.

The ANT+ Alliance is comprised of companies who have adopted the ANT+ promise of interoperability. The Alliance ensures standardized communication through optimized brand value and partnerships with other top tier companies and products.

1. FIT2 Module for Fitness Equipment

The FIT2 module is an application specific and RF certified module for fitness equipment consoles. Integration with a FIT2 module enables a piece of fitness equipment to link to the growing ANT+ eco-system. Communication between fitness equipment, watch/phone, heart rate monitor and other sensors, a user's exercise data can be seamlessly displayed, stored, transferred and/or analyzed both indoors and outdoors, on a console, a computer, a phone, a tablet and/or in the Cloud (refer to the figure on page 1).

ANT technology is established and proven in fitness applications. ANT can manage more than 80 devices in proximity, at the normal 4Hz sport sensor message rate, without interference or cross-talk, which makes it ideally suited for crowded environments such as the cardio floor or the spin indoor cycling studio. ANT utilizes a proximity linking solution for quick, easy, and reliable pairing in crowded settings, and functions reliably with closely spaced equipment; with as little as 90cm between centers.

FIT2 represents the newest advancement of ANT technology in the fitness equipment industry. It is based on a proven ANT module platform and leverages the latest enhancements of ANT wireless technology to address both manufacturers' and consumers' needs. Key feature improvements in FIT2 include:

- Advanced ANT data burst allowing more reliable and 3 times faster data transfer
- 4 custom ANT channels available
- Up to 4dBm transmission power
- AES-128 encryption for ANT-FS data transfer

This document mainly covers the hardware aspects of the FIT2 module. For software development and application usage associated with FIT2 module, please refer to D00001229 ANT+ Fitness Module Application Note.

1.1 Using FIT2

There are several ways to use the FIT2 module to enable a piece of fitness equipment to communicate with ANT+ heart rate monitors, watches/handhelds and other sensors. In the normal use case, the FIT2 module is controlled by the fitness equipment through the common byte synchronous or asynchronous serial interface. Depending on its operational mode, the fitness equipment sets the state of the FIT2 module. The state machine diagram and control messages are found in the ANT+ Fitness Module Application Note.

While it is active, the FIT2 module will automatically search and pair with ANT+ heart rate monitors and watches/handhelds supporting the ANT+ fitness equipment profile when they are within proximity. Once paired, the fitness equipment will, via the FIT2 module, display the received heart rate and/or transfer exercise data to the watch/handheld using the ANT+ Fitness Equipment Profile until the exercise session is over. During the operation, the FIT2 module performs some ANT+ profile defined functions and serves as the RF medium connecting the fitness equipment and the paired ANT+ device(s). Full technical details are as available in the ANT+ Fitness Module Application Note and the ANT+ Fitness Equipment Device Profile.

The FIT2 module can also operate in standalone mode, which enables ANT+ heart rate monitor display in legacy fitness equipment. In this mode, the FIT2 module operates by itself, pairing with an ANT+ heart rate monitor or a watch/handheld in proximity, and transmitting the decoded heart rate through a digital pulse signal that the fitness equipment can use.

The FIT2 module supports up to four independent ANT channels that can be used by the fitness equipment. Manufacturers can use these four custom channels to offer further differentiating product features. The usage of these channels can include:

- Linking to more ANT+ sensors
- Communicating fitness equipment maintenance data

The table below summarizes the ANT channel allocation of the FIT2 module.

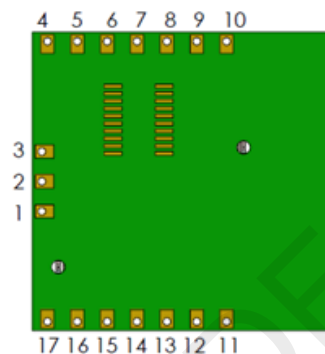
| Channel | Function | Defined By |
|---------------------|---|--------------------------------|
| Channel 0-1 and 8-9 | Available for ANT/ANT+ communication | Fitness equipment manufacturer |
| Channel 4 | Dedicated to FE and watch/handheld communication | FIT2 |
| Channel 5-7 | Dedicated to heart rate reception and watch/handheld to FE file sharing | FIT2 |

Important Notice: When serialized or unique ID is required to open ANT channels, please avoid using the FIT2 module serial number which is actually not serialized and does not provide the required uniqueness. The ANT message "Serial Number Set Channel ID (0x65)" (as described in section 9.5.2.16 of "ANT Message Protocol and Usage") must not be used.

1.2 Pinout

The FIT2 module has 17 pins along the module edge:

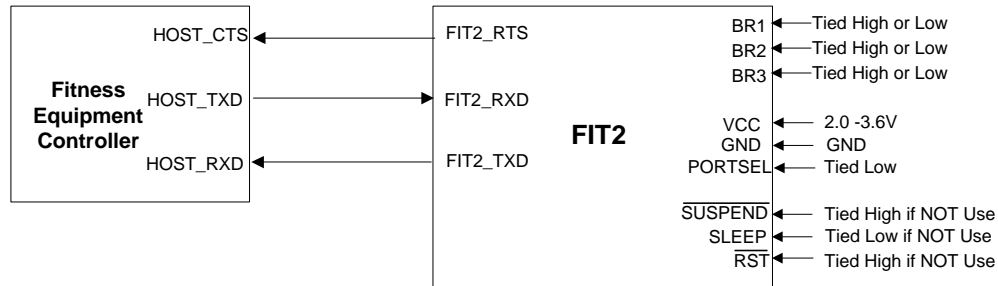
PINOUT (BOTTOM VIEW)



| Pin# | Pin Name | Description |
|------|-------------------|---|
| 1 | NC | No connection |
| 2 | RST | Reset the device |
| 3 | Vcc | Power supply source |
| 4 | GND | Power supply ground |
| 5 | NC | No connection |
| 6 | SUSPEND / SRDY | Async -> Suspend control Sync -> Serial port ready |
| 7 | SLEEP / MRDY | Async Sleep mode enable Async -> Sleep mode enable Sync -> Message ready indication |
| 8 | NC | No connection |
| 9 | PORTSEL | Async -> Tie to GND Sync -> Tie to Vcc |
| 10 | BR2 / SCLK | Async -> Baud rate selection Sync -> Clock output signal |
| 11 | TXD / SOUT | Async -> Transmit data signal Sync -> Data output |
| 12 | RXD / SIN | Async -> Receive data signal Sync -> Data input |
| 13 | BR1 / SFLOW | Async -> Baud rate selection Sync -> Tie to GND |
| 14 | BR3 | Async -> Baud rate selection Sync -> Tie to GND |
| 15 | HR_PULSE | HR Pulse output |
| 16 | NC | No connection |
| 17 | RTS / SEN | Async -> Request to send Sync -> Serial enable signal |

1.3 Asynchronous Serial Interconnect

The FIT2 module is able to connect with the fitness equipment console controller through the asynchronous serial interconnect. For implementation details and technical recommendations, refer to section 2 of the Interfacing with ANT General Purpose Chipsets and Modules document. The connection diagram of FIT2 is shown below.



Notes:

- Module RXD and TXD connect directly to hardware UART of microcontroller.
- The baud rate selection pins (BR1, BR2 and BR3) can be connected directly to the logic level of interest.
- RTS can be connected to an interrupt pin for flow control in some applications.

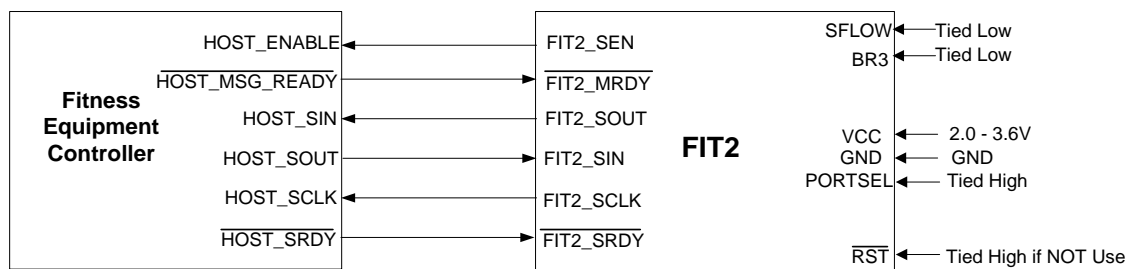
The baud rate of the asynchronous communication is controlled by the speed select signals BR1, BR2 and BR3. Please refer to the table below.

| BR3 | BR2 | BR1 | Baud Rate | ANT-FS | FIT2 Starting State |
|-----|-----|-----|-----------|--------|---------------------|
| 0 | 0 | 0 | 4800 | No | FIT2_OFF |
| 1 | 0 | 1 | 9600 | No | FIT2_OFF |
| 0 | 1 | 0 | 19200 | Yes | FIT2_OFF |
| 0 | 0 | 1 | 38400 | Yes | FIT2_OFF |
| 0 | 1 | 1 | 50000 | Yes | FIT2_OFF |
| 1 | 1 | 1 | 57600 | Yes | FIT2_OFF |
| 1 | 0 | 0 | 115200 | Yes | FIT2_OFF |
| 1 | 1 | 0 | Disabled | No | FE_READY |

When BR3=1, BR2=1 and BR1=0, the serial port is disabled and the FIT2 will start up in FE_READY state instead of FIT2_OFF. This pin selection is used in standalone mode where only the HR pulse feature is used. See section 1.5.

1.4 Byte Synchronous Serial Interconnect

The FIT2 module is able to connect with the fitness equipment console controller through the byte synchronous serial interconnect at 1MHz speed, and may be used with a hardware SPI port. For implementation details and



technical recommendations, refer to section 3 of the Interfacing with ANT General Purpose Chipsets and Modules document. The connection diagram of FIT2 is shown below.

Notes:

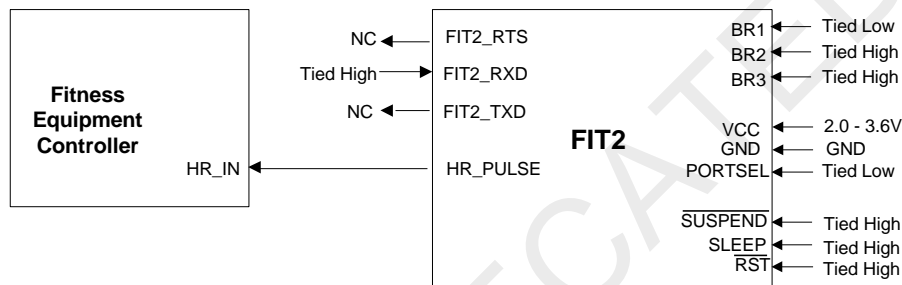
- Module SOUT, SIN, and SCLK connected directly to hardware USART of microcontroller.
- SEN needs to be on an interrupt capable I/O pin on the microcontroller.

1.5 Standalone Mode

The FIT2 module's standalone operation mode (BR3=1, BR2=1 and BR1=0) provides for a simple heart rate pulse output, which can be used to retrofit legacy fitness equipment with a capacity to receive from an ANT+ heart rate monitor. This mode does not use the serial port, and as such, only the heart rate function is enabled.

1.5.1 Interconnect

The standalone interface between ANT and the Fitness Equipment Controller is shown below.



1.5.2 Heart Rate Pulse

The HR_PULSE pin provides a single 793 μ s pulse event for every heart beat as shown below in the standalone mode. The period between edges is used to calculate the corresponding instantaneous heart rate (HR = 60/PERIOD beats per minute).



The heart rate pulse signal is intended for use in retrofit applications to legacy fitness equipment. This pin is only active in this mode.

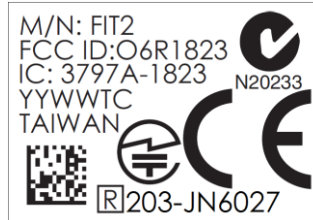
1.6 Ordering Information

FIT2 modules are shipped in two packages from Dynastream Innovations.

| ANT Part Number | Package |
|-----------------|---------------------------------|
| FIT2 - Reel | 800 modules taped on a 13" reel |
| FIT2 - Tray | 20 modules in a 4x5 tray |

1.7 Production Code

For technical support and customer service purposes, a production code of six characters is printed on the product sticker as illustrated below.



1.8 Reflow Guideline

The FIT2 module is rated at moisture sensitive level 3 (MSL=3). To handle and use these modules, please follow the IPC/JEDEC J-STD-033B.1 standard: Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices.

To reflow, it is recommended that the peak solder joint/pad temperatures do NOT exceed 240°C. If possible, pre-heat the assembly within the oven profile for ~30 seconds at ~150 °C. Follow the solder paste manufacturer's recommendations, especially regarding temperature ramp rate and the time above liquids.

DEPRECATED

2. Regulatory Approval

The FIT2 module has received regulatory approvals in the United States (FCC), Canada (IC) and Japan, and has been verified to conform to the appropriate regulations in Europe, Australia and New Zealand. Such European approvals allow the user to place the module inside a finished product and, in most cases, not require regulatory testing for an intentional radiator, provided no changes or modifications are made to the module circuitry. This does not preclude the possibility that some other form of authorization or testing may be required for the finished product. Changes or modifications could void the user's authority to operate the equipment. The end user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

2.1 United States

The FIT2 module 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.

The FIT2 module 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.

The FIT2 module does not contain any user-serviceable parts. Unauthorized repairs or modifications could result in permanent damage to the equipment, and void your warranty and your authority to operate this device under Part 15 regulations.

The FIT2 module is labelled with its own FCC ID, O6R1823 (note: First Character is the letter O, not the # 0.) If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID: O6R1823" or "Contains FCC ID: O6R1823". Any similar wording that expresses the same meaning may be used.

2.2 Industry Canada Compliance

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

(Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.)

To comply with Industry Canada regulations, it is required that product containing the FIT2 module display a label referring to the enclosed module. This exterior label can use wording similar to the following: "Contains IC: 3797A-1823"

This information shall be affixed in such a manner as not to be removable except by destruction or defacement. The size of the lettering shall be legible without the aid of magnification but is not required to be larger than 8-

point font size. If the device is too small to meet this condition, the information can be included in the user manual upon agreement with Industry Canada.

2.3 CE Declaration of Conformity

The FIT2 module is declared to be in conformance with the essential requirements and other relevant provisions of Directive 1999/5/EC and 2011/65/EU, as a low-powered unlicensed transmitter:

- EN 60950-1: Information technology equipment - Safety -- Part 1: General requirements
- EN 300 440-2: Electromagnetic compatibility and Radio spectrum Matters (ERM); Short range devices; Radio equipment to be used in the 1 GHz to 40 GHz frequency range; Part 2: Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive
- EN 61000-6-1: Electromagnetic compatibility (EMC) -- Part 6-1: Generic standards - Immunity for residential, commercial and light-industrial environments
- EN 301 489-1/-3: Electromagnetic compatibility and Radio spectrum Matters (ERM); Electromagnetic Compatibility (EMC); standard for radio equipment and services; Part 1: Common technical requirements; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 40 GHz

2.4 Australia & New Zealand

The FIT2 module has been tested and found to comply with AS/NZS 4268:2008, Radio equipment and systems – Short range devices. The ACMA/MED supplier code number is N20233

2.1 Japan

The FIT2 module has been granted type certificate (mark number R203-JN6027). Standard applied:

Notification No. 88 of MIC 2004, 2.4GHz band wide-band low-power data communication system (item 19 of Article 2 paragraph 1)

3. Electrical Specifications

3.1 Absolute Maximum Ratings ⁽¹⁾

| PARAMETER | TEST CONDITIONS | Min | Max | Unit |
|----------------------------|--|------|----------------|------|
| Supply voltage | All supply pins must have the same voltage | -0.3 | 3.9 | V |
| Voltage on any digital pin | | -0.3 | VDD+0.3, ≤ 3.9 | V |
| Input RF level | | | 10 | dBm |
| Storage temperature range | | -40 | 85 | °C |
| ESD | All pads, according to human-body model, JEDEC STD 22, method A114 | | 2 | kV |
| | According to charged-device model, JEDEC STD 22, method C101 | | 500 | V |

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions are not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

3.2 Recommended Operating Conditions

Over operating free-air temperature range (unless otherwise noted)

| PARAMETER | Min | Max | Unit |
|---|-----|-----|------|
| Operating ambient temperature range, T _A | -40 | +85 | °C |
| Operating supply voltage | 2.0 | 3.6 | V |

Note: No reverse polarity protection is provided.

3.3 ELECTRICAL CHARACTERISTICS

Measured with T_A = 25°C and V_{CC} = 3V

| PARAMETER | TEST CONDITIONS | Min | Typ | Max | Unit |
|--------------------------------|---|-----|------|-----|------|
| I – Current consumption | Peak RX current consumption | | 23.7 | | mA |
| | Peak TX current consumption, -6 dBm output power | | 25.9 | | mA |
| | Peak TX current consumption, 0 dBm output power | | 28.8 | | mA |
| | Peak TX current consumption, +4 dBm output power | | 34.3 | | mA |
| | Power-down current, 32 kHz oscillator active (Base) | | 1.0 | | μA |
| | Power-down current, 32 kHz oscillator disabled (Idle / Suspend) | | 0.5 | | μA |

3.4 RF Characteristics

Measured with $T_A = 25^\circ\text{C}$ and $V_{CC} = 3\text{V}$

| PARAMETER | TEST CONDITIONS | Min | Typ | Max | Unit |
|--|---------------------------------|------|-----|------|------|
| RF frequency range | Programmable in 1 MHz steps | 2400 | | 2495 | MHz |
| Data rate and modulation format | 1 Mbps, GFSK, 160 kHz deviation | | | | |

Receive Section

1 Mbps, GFSK, 160-kHz deviation. Measured $T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, and $f_C = 2440\text{ MHz}$, unless otherwise noted.

| PARAMETER | TEST CONDITIONS | Min | Typ | Max | Unit |
|---|---|------|-----|-----|------|
| Receiver sensitivity | 0.1% BER | | -86 | | dBm |
| Saturation | | | 10 | | dBm |
| Co-channel rejection | | | -9 | | dB |
| Adjacent-channel rejection | $\pm 2\text{ MHz}$ | | 23 | | dB |
| Alternate-channel rejection | $\pm 4\text{ MHz}$ | | 39 | | dB |
| Frequency error tolerance⁽¹⁾ | Including both initial tolerance and drift | -150 | | 150 | kHz |
| Symbol rate error tolerance⁽²⁾ | | -50 | | +50 | ppm |
| Spurious emission. Only largest spurious emission stated within each band. | Conducted measurement with a 50 Ω single-ended load. | | -70 | | dBm |

(1) Difference between center frequency of the received RF signal and local oscillator frequency.

(2) Difference between incoming symbol rate and the internally generated symbol rate

Transmit Section

Measured with $T_A = 25^\circ\text{C}$, $V_{CC} = 3\text{V}$, and $F_C = 2440\text{ MHz}$ unless otherwise noted.

| PARAMETER | TEST CONDITIONS | Min | Typ | Max | Unit |
|--|--|-----|-----|-----|------|
| Output power, maximum setting | Conducted measurement delivered to a single-ended 50 Ω load through a balun using maximum recommended output power setting. | | 4 | | dBm |
| Output power, minimum setting | Conducted measurement delivered to a single-ended 50 Ω load through a balun using minimum recommended output power setting. | | -21 | | dBm |
| Programmable output power range | Delivered to a single-ended 50 Ω load through a balun. | | 25 | | dB |

| PARAMETER | TEST CONDITIONS | Min | Typ | Max | Unit |
|--------------------------------------|---|-----|------|-----|------|
| Spurious emissions, conducted | Conducted measurement with a 50-Ω single-ended load. Complies with EN 300 328, EN 300 440 class 2, FCC CFR47, Part 15 and ARIB STD-T-66. ⁽¹⁾ | | -45 | | dBm |
| Average EIRP, Maximum setting | Radiated measurement with the module mated with ANTUIF ⁽¹⁾ board in an anechoic chamber at 2403 MHz. | | -3.5 | | dBm |

(1) ANT USB Interface board is provided in the FIT2 development kit

3.5 Application Specific Power Usage

State Specific Average Current

The current consumption of the FIT2 depends on the FE state and the devices that are being tracked. The table below shows the power consumption specifications for each combination of FE state and device.

| FE_States | None | ANT+ HRM Only | ANT+ Watch Only | ANT+ HRM & Watch |
|-----------------------------|---------|---------------|-----------------|------------------|
| ASLEEP (OFF) | 0.5 μA | - | - | - |
| READY IN_USE (<30 sec) | 3865 μA | 3909 μA | 3998 μA | 4014 μA |
| IN_USE (>30sec) FINISHED | 0.5 μA | 45 μA | 224 μA | 270 μA |

The table does not include any current consumption values for the user configurable channels. The additional current consumption due to these channels should be calculated as below.

The table below lists the average current per message as a function of the serial interface and message type. The message types are:

All current values in μA. Measured with $T_A = 25^\circ\text{C}$ and $V_{CC} = 3\text{ V}$. Output power set at 0dBm

| Average Current Per Message | Transmit Broadcast ⁽¹⁾ | Receive Broadcast ⁽²⁾ | Transmit Acknowledged ⁽³⁾ | Receive Acknowledged ⁽⁴⁾ |
|-----------------------------|-----------------------------------|----------------------------------|--------------------------------------|-------------------------------------|
| ISync_Byte | 49 | 31 | 70 | 42 |
| ISync_57600 | 55 | 34 | 73 | 44 |
| ISync_50000 | 57 | 38 | 81 | 51 |
| ISync_38400 | 59 | 41 | 84 | 54 |
| ISync_19200 | 75 | 55 | 95 | 64 |
| ISync_9600 | 116 | 84 | 134 | 97 |
| ISync_4800 | 119 | 141 | 222 | 149 |

(1) Transmit Broadcast – Broadcast message transmitted over bi-directional master channel

- (2) Receive Broadcast – Broadcast message received by slave channel
- (3) Transmit Acknowledged – Acknowledged message transmitted over bi-directional master channel
- (4) Receive Acknowledged – Acknowledged message received by slave channel

While these current values include the contribution of the radio and the serial interface they do not include the base (idle) current. To calculate the average current consumption for a specific message rate please see the sample calculation below.

DEPRECATED

4. Mounting and Branding

An effective pairing process and good RF performance will lead to a good fitness equipment user experience. Therefore, the FIT2 module must be properly mounted on the carrier PCB and in relation to the fitness equipment console. Proper ANT+ branding is also required to provide visual assistance to fitness equipment users.

4.1 Mounting Recommendations

It is important to note the following recommendations when developing fitness equipment consoles using FIT2 modules.

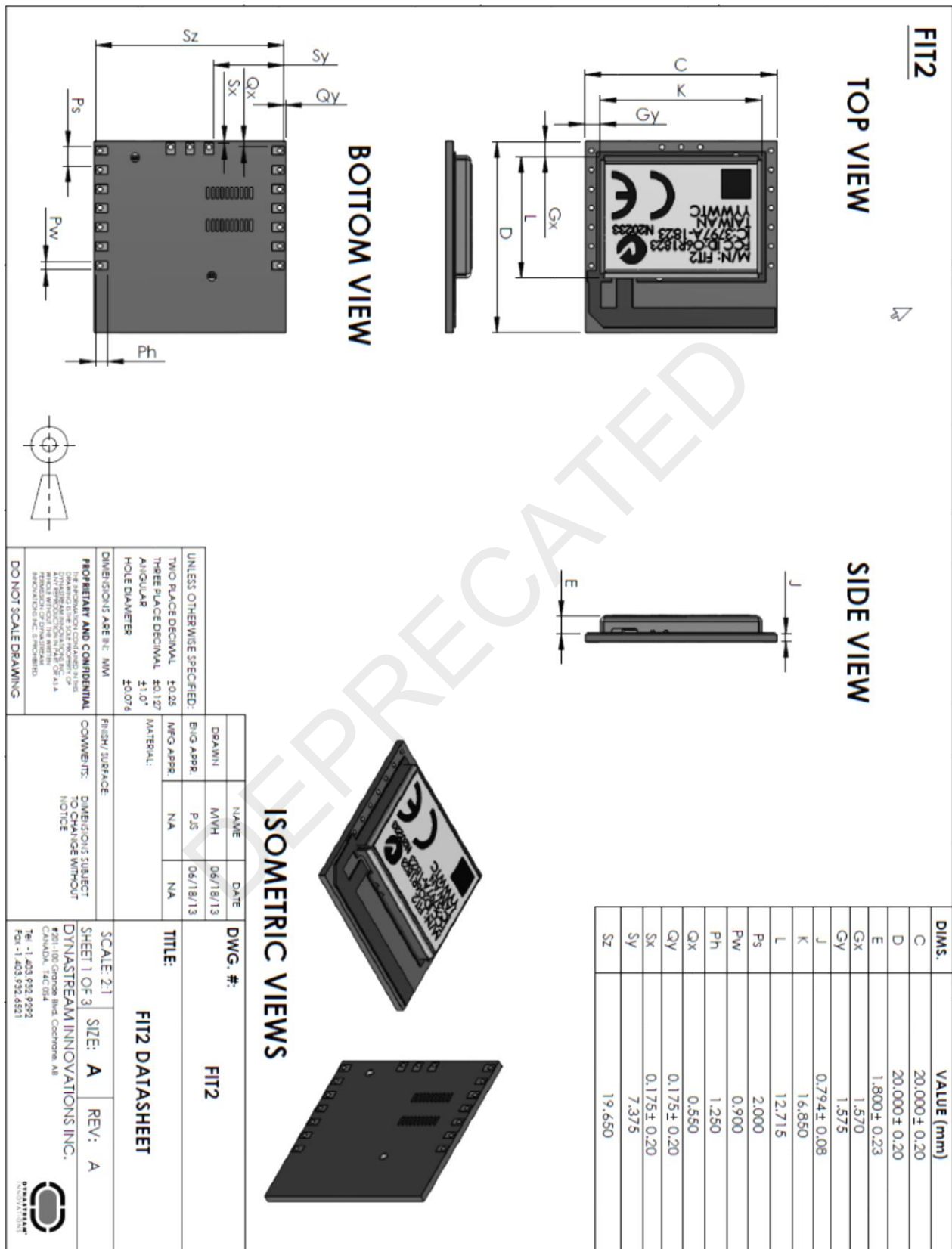
1. Do not place metallic objects in contact with the antenna and shield. Reduce the quantity and volume of metallic objects in the vicinity of the FIT2 module. Please refer to the Recommended Surface Mount Footprint drawing in section 5.
2. The use of non-metallic paint is required for all FIT2 enclosures. Using metallic paint will severely degrade RF performance, affecting pairing ability and module communication.
3. If possible, the module should be placed on, or close to, the front plastics of the fitness equipment console/enclosure, and be as close as possible to the user. The RF circuit provides much greater reliability if line of sight is available between the module and the user, with only the console/ enclosure plastics in between. It is important that the FIT2 is not located behind LCD or other electronics' PCBs within the console/ enclosure. In some applications, space does not allow for the module to adhere to this guideline. In these cases, the module may partially sit behind PCB material provided it is free of ferrous or nickel metals. However, this placement should be avoided if at all possible.
4. Module orientation is an important factor when mounting the FIT2. As there are many factors that affect the RF antenna's radiation patterns, the best results are achieved through testing the various orientation options on an individual design basis.
5. For large consoles (i.e. width > 45 cm), the FIT2 module should be located in the middle third of the console (ie. not situated close to the right or left side of the console). This helps ensure that the FIT2 will pair with the fitness equipment user, not a neighboring user or passer-by.
6. It is important that the FIT2 module is positioned away from electric noise sources such as fans, motors, generators, etc. LCD screens may also cause degradation to the RF signal. If possible, position the FIT2 away from LCD screens or, if this is not possible, maximize the distance from the LCD screen to the module.

4.2 ANT+ Branding

All fitness equipment using FIT2 modules must apply for ANT+ Product Certification to ensure proper ANT+ device profile implementation and proper use of ANT+ "LINK HERE" and/or ANT+ logos and trademarks as per the ANT+ Brand Guidelines. Visit <http://www.thisisant.com/developer/ant-plus/certification/> for the latest ANT+ Brand Guidelines and certification program details.

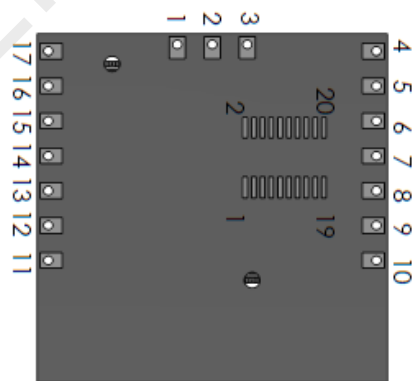
When choosing a mounting location for the FIT2 inside the console, particular attention should be paid to the proximity requirement for the ANT+ "LINK HERE" logo. This logo must be located on the console within 10-15cm of the internal mounting location of the FIT2. This is required because the ANT+ "LINK HERE" logo indicates to the user where to bring his/her device for proximity pairing.

5. Mechanical Drawings



**NOTES:**

1. AVOID PLACING METAL COMPONENTS NEAR THE PRINTED ANTENNA OF THE FIT2 MODULE. HAVING METAL OBJECTS/LARGE GROUND PLANES IN THIS AREA CAN REDUCE THE RF PERFORMANCE.
2. FIT2 MODULES COME IN A TAPE AND REEL PACKAGE FOR SMT.

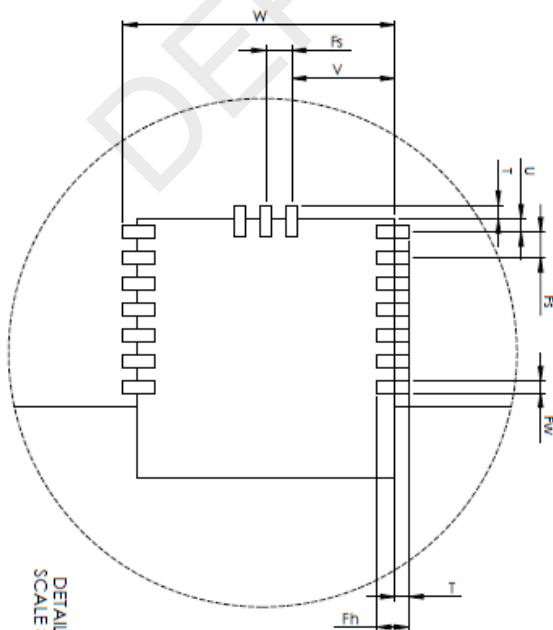
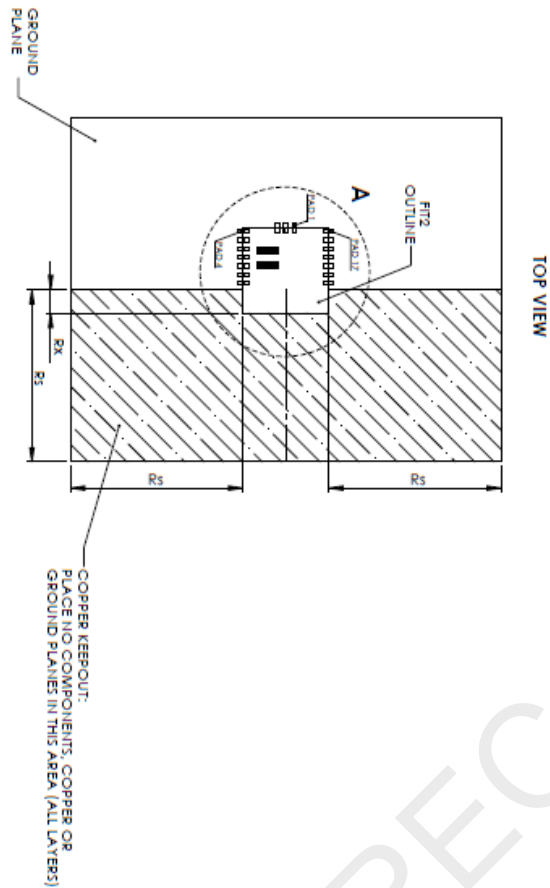
PINOUT (BOTTOM VIEW)

| | |
|-----------|------|
| DWG. #: | FIT2 |
| SCALE: | 1:1 |
| SHEET OF: | 3 |
| SIZE: | B |
| REV: | A |

RECOMMENDED SURFACE MOUNT FOOTPRINT FOR MATING FIT2

MATING PCB NOTES:

1. THE GROUND PLANE SHOULD BE EXTENDED TO THE FULL SIZE OF THE MATING PCB, WITH THE EXCEPTION OF THE COPPER KEEP-OUT.
2. IT IS BEST TO POSITION THE FITS SO THAT THE COPPER KEEP-OUT IS ON THE EDGE OR OVER HANGING THE EDGE OF THE MATING PCB. IF THE COPPER KEEP-OUT LATER IS COMPLETELY WITHIN THE BOUNDARIES OF THE PCB, THE GROUND PLANE SHOULD NOT FULLY SURROUND THE COPPER KEEP-OUT. IF THIS IS NOT POSSIBLE, THE COPPER KEEP-OUT SHOULD BE MADE MUCH LARGER TO PREVENT BT DEGRADATION.
3. WHEN DETERMINING THE REQUIRED FOOTPRINT FOR FEMALE HEADER (MOLEX P/N 55999 10208), USE THE SUGGESTED FOOTPRINT PROVIDED BY THE COMPONENT MANUFACTURER.



| UNITS | VALUE (mm) |
|-------|------------|
| R1 | 40.00 min |
| Rx | 5.50 |
| T | 1.07 |
| U | 1.00 |
| V | 8.00 |
| W | 21.07 |
| FW | 0.95 |
| FN | 2.50 |
| F5 | 2.00 |

| | | | | |
|-------|---|----|---|-----|
| REV | DWG. NO. | | | REV |
| B |  | | | |
| SCALE | 1:1 | 9T | 9 | 9 |

6. Technical Support

Users can seek ANT+ application support from Dynastream Innovations, www.thisisant.com.

6.1 ANT Forum

Users are encouraged to participate in the ANT forum moderated by the application engineering team of Dynastream Innovations for any engineering discussions. Joining the ANT forum is free and open at <http://www.thisisant.com/forum>.

6.2 Public Technical References

Documents:

1. Fitness Module Application Note
2. ANT+ Fitness Equipment Device Profile
3. ANT+ Heart Rate Monitor Device Profile
4. ANT Message Protocol and Usage
5. Integrated ANT-FS Interface Control Document
6. Interfacing with ANT General Purpose Chipsets and Modules
7. ANT+ Brand Guideline

Software:

1. ANT+ Fitness Equipment Demo
2. ANTWareII

The above documents are available at www.thisisant.com

6.3 ANT Developer's Zone

ANT development software tools, application notes, reference designs and other public resources are found in the ANT developer's zone at <http://www.thisisant.com/developer>.

To begin development with the ANT+ interoperability, please become an [ANT+ Adopter or ANT+ Alliance member](#) to obtain the access to the ANT+ documentation. ANT+ documents and design tools include the ANT+ Device Profiles, ANT-FS specification, ANT software (PC/Mac) libraries with source code, and embedded reference designs with source code.

6.4 ANT Social Media

ANT is on the following social media:

YouTube: <http://www.youtube.com/user/ANTAlliance>

Twitter: <http://twitter.com/ANTPlus>

Facebook: <https://www.facebook.com/pages/ANT/145243832297767>

LinkedIn: <http://www.linkedin.com/groups?gid=1379137>