Integrated Transceiver Modules for WLAN 802.11 b/g/n

FEATURES

- IEEE 802.11b,g,n,d,e,i compliant
- Typical WLAN Transmit Power:
  - 20.0dBm, 11 Mbps,CCK (b)
  - 14.5dBm, 54 Mbps,OFDM (g)
  - 12.5dBm, 65 Mbps,OFDM (n)
- Typical WLAN Sensitivity:
  - -89dBm, 8% PER, 11 Mbps
  - -76dBm, 10% PER, 54 Mbps
  - -73dBm, 10% PER, 65 Mbps
- Miniature footprint: 18 mm x 13 mm
- Low height profile: 1.9 mm
- U.FL connector for external antenna
- Terminal for PCB/Chip antenna feeds
- Integrated band-pass filter
- Compact design based on Texas Instruments WL1271L Transceiver
- Seamless integration with TI OMAP™ application processors
- SDIO Host data path interfaces
- Bluetooth Advanced Audio Interfaces
- Low power operation mode
- RoHS compliant

APPLICATIONS

- Security
- HVAC Control, Smart Energy
- Sensor Networks
- Medical

DESCRIPTION

The TiWi-BLE module is a high performance 2.4 GHz IEEE 802.11 b/g/n radio in a cost effective, pre-certified footprint.

The module realizes the necessary PHY/MAC layers to support WLAN applications in conjunction with a host processor over a SDIO interface.

ELECTRICAL SPECIFICATIONS

The majority of these characteristics are based on controlling and conditioning the tests using the TiWi-BLE control software application. Other control conditions may require these values to be re-characterized by the customer.

Absolute Maximum Ratings

Parameter	Min	Max	Unit
Power supply voltage (VBAT)[4][5]	-0.5	+5.5	V
Digital supply voltage (VIO)	-0.5	2.1	V
Voltage on any GPIO	-0.5	VIO + 0.5	V
Voltage on any Analog Pins[3]	-0.5	2.1	V
RF input power, antenna port		+10	dBm
Operating temperature[6]	-40	+85	ºC
Storage temperature	-55	+125	ºC

1. Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device and are not covered by the warranty. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. All parameters are measured as follows unless stated otherwise: VDD_IN=1.8V, VDDIO_1.8V=1.8V, VDD_LDO_CLASS1P5=3.6V
3. Analog pins: XTALP, XTALM, RFIOBT, DRPWRXBM, DRPWRXBP, DRPWTXB, and also FMRFINP, FMRFINM, FMRFINM, FMAUDLIN, FMAUDRIN, FMAUDLOUT, FMAUDROUT
4. The following signals are from the VBAT group, PMS_VBAT and VDD_LDO_CLASS1P5 (if BT class 1.5 direct VBAT is used).
5. Maximum allowed depends on accumulated time at that voltage; 4.8V for 7 years lifetime, 5.5V for 6 hours cumulative.
6. The device can be reliably operated for 5,000 active-WLAN cumulative hours at T_A of 85ºC.

Table 1 Absolute Maximum Ratings

Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
V_{BAT}	3.0	3.6	4.8	V
VIO	1.62	1.8	1.92	V
V_{IH}	0.65 x VIO	-	VIO	V
V_{IL}	0	-	0.35 x VIO	V
V_{OH} @ 4, 8 mA	VIO - 0.45	-	VIO	V
V_{OL} @ 4, 8 mA	0	-	0.45	V
Ambient temperature range	-40	25	85	ºC

Table 2 Recommended Operating Conditions

General Characteristics

Parameter	Min	Typ	Max	Unit
WLAN RF frequency range	2412		2472	MHz
WLAN RF data rate	1	802.11 b/g/n rates supported	65	Mbps

Table 3 General Characteristics

Power Consumption - WLAN

Parameter	Test Conditions	Min	Typ	Max	Unit
CCK (802.11b) TX Current	2437 MHz, V_{BAT} =3.6V, T_{amb}=+25°C Po=20dBm, 11 Mbps CCK L=1200 bytes, t_{delay} (idle)=4 μS	-	280	-	mA
OFDM (802.11g) TX Current	2437 MHz, V_{BAT} =3.6V, T_{amb}=+25°C Po=14.5 dBm, 54 Mbps OFDM L=1200 bytes, t_{delay} (idle)=4μS	-	185	-	mA
OFDM (802.11n) TX Current	2437 MHz, V_{BAT} =3.6V, T_{amb}=+25°C Po=12.5dBm, 65 Mbps OFDM L=1200 bytes, t_{delay} (idle)=4μS	-	165	-	mA
CCK (802.11b) RX Current		-	100	-	mA
OFDM (802.11g) RX Current		-	100	-	mA
OFDM (802.11n) RX Current		-	100	-	mA
Dynamic Mode [1]		-	<1.2	-	mA

[1] Total Current from V_{BAT} for reception of Beacons with DTIM=1 TBTT=100 mS, Beacon duration 1.6ms, 1 Mbps beacon reception in Listen Mode.

Table 4 WLAN Power Consumption

DC Characteristics – General Purpose I/O

Parameter	Test Conditions	Min	Typ	Max	Unit
VIO Current			-	16	mA
Logic input low, V_{IL}		0	-	0.35 x VIO	V
Logic input high, V_{IH}		0.65 x VIO	-	VIO	V
Logic output low, V_{OL} (Full Drive)	Iout = 8 mA	0	-	0.45	V
	Iout = 4 mA	0	-	0.45	V
Logic output low, V_{OL} (Reduced Drive)	Iout = 1 mA	0	-	0.112	V
	Iout = 0.09 mA	0	-	0.01	V
Logic output high, V_{OH} (Full Drive)	Iout = -8 mA	VIO - 0.45	-	VIO	V
	Iout = -4 mA	VIO - 0.45	-	VIO	V
Logic output high, V_{OH} (Reduced Drive)	Iout = -1 mA	VIO - 0.112	-	VIO	V
	Iout = -0.3 mA	VIO - 0.033	-	VIO	V

Table 5 DC Characteristics General Purpose I/O

WLAN RF Characteristics

WLAN Transmitter Characteristics (TA=25°C, VBAT=3.6 V)

Parameter	Test Conditions	Min	Typ	Max	Unit
11 Mbps CCK (802.11b) TX Output Power	11 Mbps CCK , 802.11(b) Mask Compliance, 35% EVM RMS power over TX packet	-	20	-	dBm
9 Mbps OFDM (802.11g) TX Output Power	9 Mbps OFDM , 802.11(g) Mask Compliance, -8 dB EVM RMS power over TX packet	-	19	-	dBm
54 Mbps OFDM (802.11g) TX Output Power	54 Mbps OFDM, 802.11(g) Mask Compliance, -25 dB EVM RMS power over TX packet	-	14.5	-	dBm
6.5 Mbps OFDM (802.11n) TX Output Power	6.5 Mbps OFDM, 802.11(n) Mask Compliance, -5 dB EVM RMS power over TX packet	-	19	-	dBm
65 Mbps OFDM (802.11n) TX Output Power	65 Mbps OFDM, 802.11(n) Mask Compliance, -28 dB EVM RMS power over TX packet	-	12.5	-	dBm

Table 6 WLAN Transmitter RF Characteristics

WLAN Receiver Characteristics
(TA=25°C, VBAT=3.6 V) [1]

Parameter	Test Conditions	Min	Typ	Max	Unit
1 Mbps CCK (802.11b) RX Sensitivity	8% PER	-	-97	-	dBm
11 Mbps CCK (802.11b) RX Sensitivity	8% PER	-	-89	-	dBm
9 Mbps OFDM (802.11g) RX Sensitivity	10% PER	-	-90	-	dBm
54 Mbps OFDM (802.11g) RX Sensitivity	10% PER	-	-76	-	dBm
6.5 Mbps OFDM (802.11n) RX Sensitivity	10% PER	-	-91	-	dBm
65 Mbps OFDM (802.11n) RX Sensitivity	10% PER	-	-73	--	dBm
11 Mbps CCK (802.11b) RX Overload Level	8% PER	-	-	-10	dBm
6 Mbps OFDM (802.11g) RX Overload Level	10% PER	-	-	-20	dBm
54 Mbps OFDM (802.11g) RX Overload Level.	10% PER	-	-	-20	dBm
65 Mbps OFDM (802.11n) RX Overload Level	10% PER	-	-	-20	dBm

[1] Up to 2 dB degradation at Channel 13 for 11g/n modes and up to 2 dB degradation at Channel 14 for 11b/g/n modes.

Table 7 WLAN Receiver RF Characteristics

WLAN POWER-UP SEQUENCE

The following sequence describes device power-up from shutdown. Only the WLAN Core is enabled; the Bluetooth and FM cores are disabled.

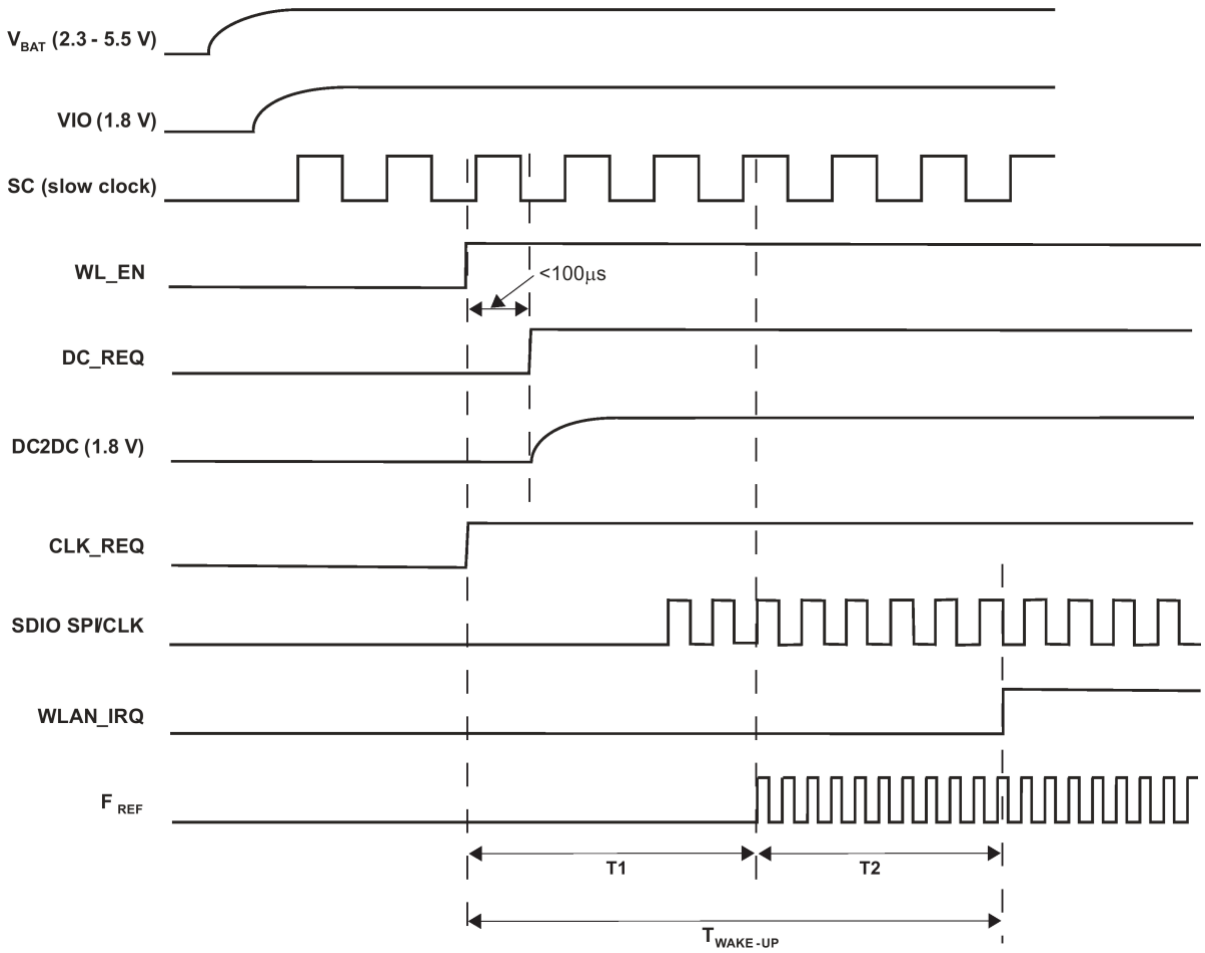


Figure 1 TiWi-BLE Power-up Sequence Requirements

1. No signals are allowed on the IO pins if no IO power is supplied, because the IOs are not 'failsafe'. Exceptions are CLK_REQ_OUT, SLOWCLK, XTALP, and AUD_xxx, which are failsafe and can tolerate external voltages with no VDDS and DC2DC".

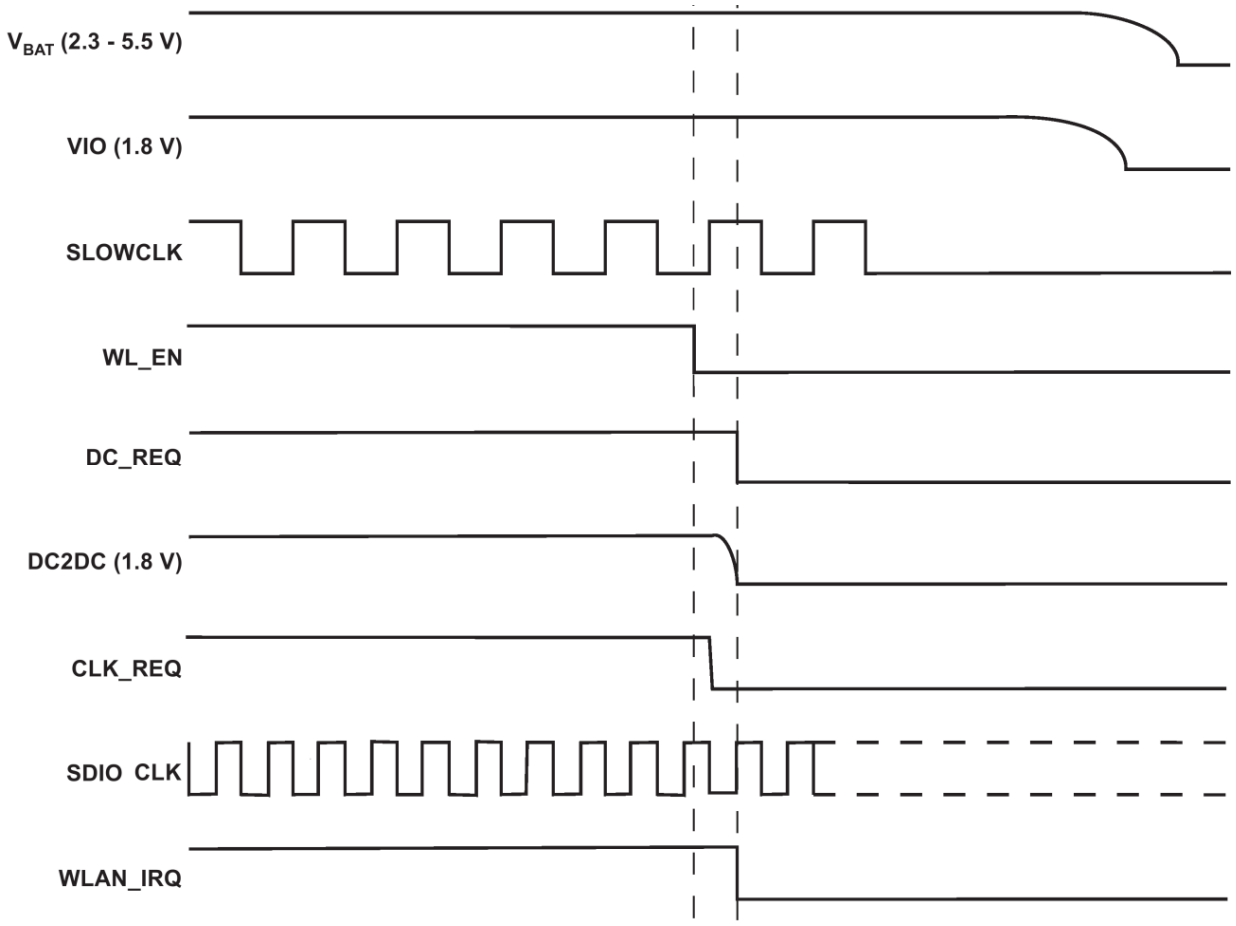
2. VBAT, VIO, and SLOWCLK must be available before WL_EN.

3. T_{wakeup} = T1 + T2

The duration of T1 is defined as the time from WL_EN=high until Fref is valid for the SoC. T1=~55ms

The duration of T2 depends on:
Operating system
– Host enumeration for the SDIO/WSPI
– PLL configuration
– Firmware download
– Releasing the core from reset
– Firmware initialization

WLAN POWER-DOWN SEQUENCE



Notes:
1. The DC2DC(1.8V) signal can be monitored on BT_FUNC2 Module Pin (#41)
2. DC_REQ and CLK_REQ are internal signals shown for reference only

Figure 2 TiWi-BLE Module Power-down Sequence Requirements

1. DC_REQ will go low only if WLAN is the only core working. Otherwise if another core is working (e.g BT) it will stay high.

2. CLK_REQ will go low only if WLAN is the only core working. Otherwise if another core is working and using the F_{REF} (e.g BT) it will stay high.

3. If WLAN is the only core that is operating, WL_EN must remain de-asserted for at least 64μsec before it is re-asserted.

IRQ OPERATION

1. The default state of the WLAN_IRQ prior to firmware initialization is 0.
2. During firmware initialization, the WLAN_IRQ is configured by the SDIO module; a WLAN_IRQ changes its state to 1.
3. A WLAN firmware interrupt is handled as follows:
    a. The WLAN firmware creates an Interrupt-to-Host, indicated by a 1-to-0 transition on the WLAN_IRQ line (host must be configured as active-low or falling-edge detect).
    b. After the host is available, depending on the interrupt priority and other host tasks, it masks the firmware interrupt. The WLAN_IRQ line returns to 1 (0-to-1 transition on the WLAN_IRQ line).
    c. The host reads the internal register status to determine the interrupt sources - the register is cleared after the read.
    d. The host processes in sequence all the interrupts read from this register
    e. The host unmasks the firmware interrupts.
4. The host is ready to receive another interrupt from the WLAN device.

SLOW (32 KHZ) CLOCK SOURCE REQUIREMENTS

The slow clock is always supplied from an external source. It is input on the SLOW_CLK pin, and can be a digital signal in the range of VIO only. For slow clock frequency and accuracy refer to Table 8. The external slow clock must be stable before the system exits from shut down mode.

Parameter [1]	Condition	Symbol	Min	Typ	Max	Unit
Input slow clock frequency				32768		Hz
Input slow clock accuracy	WLAN, BT				+/-250	ppm
Input transition time T_r/T_f – 10% to 90%		T_r/T_f			100	ns
Frequency input duty cycle			30	50	70	%
Input voltage limits	Square wave, DC coupled	VIH	0.65 x VDDS		VDDS	V_{peak}
VIL	0		0.35 x VDDS			
Input impedance			1			MW
Input capacitance					5	pF
Rise and fall time					100	ns
Phase noise	1 kHz			-125		dBc/Hz

[1] Slow clock is a fail safe input

Table 8 Slow Clock Source Requirements

SDIO INTERFACE TIMING

PARAMETER			MIN	MAX	UNIT
t_{CR}	Delay time, assign relative address or data transfer mode	Read-command CMD valid to card-response CMD valid	2	64	Clock cycles
t_{CC}	Delay time, CMD command valid to CMD command valid		58		Clock cycles
t_{RC}	Delay time, CMD response valid to CMD command valid		8		Clock cycles
t_{AC}	Access time, CMD command valid to SD3–SD0 read data valid		2		Clock cycles

Table 9 SDIO Interface Read (see Figure 3)

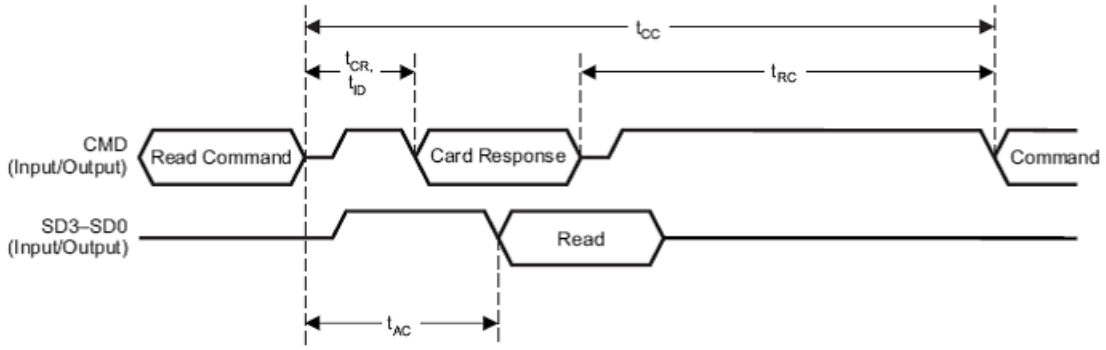
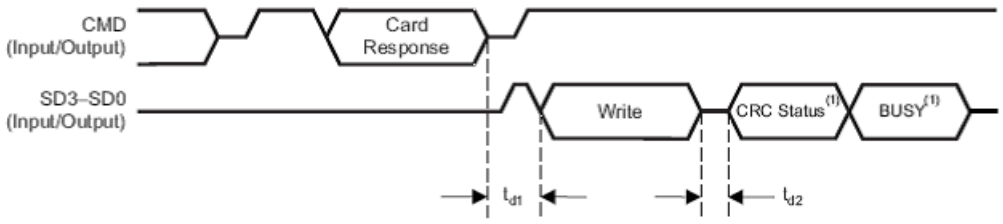


Figure 3 SDIO Single Block Read

PARAMETER		MIN	MAX	UNIT
t_{d1}	Delay time, CMD card response invalid to SD3–SD0 write data valid	2		Clock cycles
t_{d2}	Delay time, SD3–SD0 write data invalid end to CRC status valid	2	2	Clock cycles

Table 10 SDIO Interface Write (see Figure 4)



(1) CRC status and busy waveforms are only for data line 0. Data lines 1–3 are N/A. The busy waveform is optional, and may not be present.

Figure 4 SDIO Single Block Write

SDIO CLOCK TIMING

Over Recommended Operating Conditions

Note: all timing parameters are indicated for the maximum Host-interface clock frequency.

PARAMETER			MIN	MAX	UNIT
f_{clock}	Clock frequency, CLK	$C_L \leq 30$ pF	0	26	MHz
DC	Low/high duty cycle	$C_L \leq 30$ pF	40	60	%
t_{TLH}	Rise time, CLK	$C_L \leq 30$ pF		4.3	ns
t_{THL}	Fall time, CLK	$C_L \leq 30$ pF		3.5	ns
t_{ISU}	Setup time, input valid before CLK ↑	$C_L \leq 30$ pF	4		ns
t_{IH}	Hold time, input valid after CLK ↑	$C_L \leq 30$ pF	5		ns
t_{ODLY}	Delay time, CLK↓ to output valid	$C_L \leq 30$ pF	2	12	ns

Table 11 SDIO Clock Timing

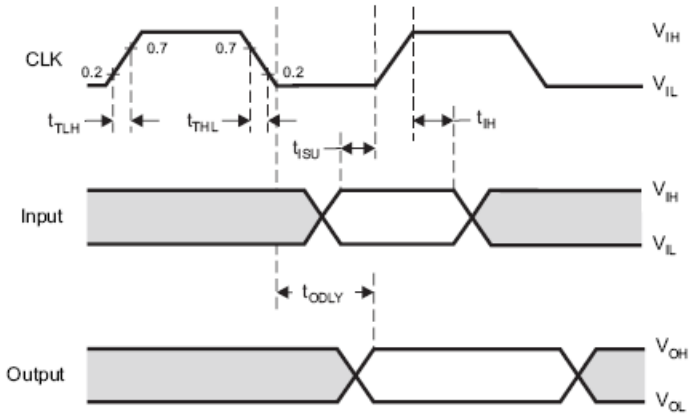
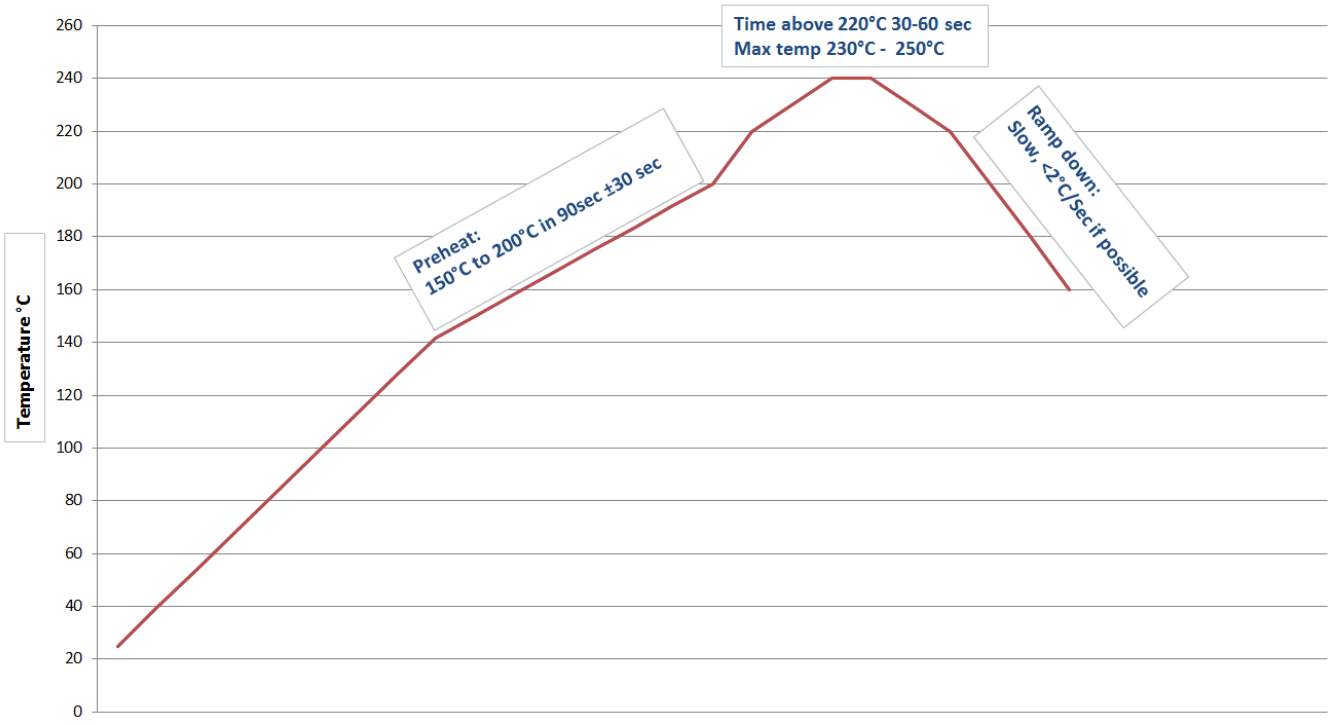


Figure 5 SDIO Clock Timing

SOLDERING RECOMMENDATIONS

Recommended Reflow Profile for Lead Free Solder



Note: The quality of solder joints on the castellations ('half vias') where they contact the host board should meet the appropriate IPC Specification. See IPC-A-610-D Acceptability of Electronic Assemblies, section 8.2.4 Castellated Terminations."

Figure 6 Reflow Profile

Repeating Reflow Soldering

Only a single reflow soldering process is encouraged for host boards.

CLEANING

In general, cleaning the populated modules is strongly discouraged. Residuals under the module cannot be easily removed with any cleaning process.

- Cleaning with water can lead to capillary effects where water is absorbed into the gap between the host board and the module. The combination of soldering flux residuals and encapsulated water could lead to short circuits between neighboring pads. Water could also damage any stickers or labels.
- Cleaning with alcohol or a similar organic solvent will likely flood soldering flux residuals into the RF shield, which is not accessible for post-washing inspection. The solvent could also damage any stickers or labels.
- Ultrasonic cleaning could damage the module permanently.

OPTICAL INSPECTION

After soldering the Module to the host board, consider optical inspection to check the following:

- Proper alignment and centering of the module over the pads.
- Proper solder joints on all pads.
- Excessive solder or contacts to neighboring pads, or vias.

REWORK

The module can be unsoldered from the host board if the Moisture Sensitivity Level (MSL) requirements are met as described in this datasheet.

Never attempt a rework on the module itself, e.g. replacing individual components. Such actions will terminate warranty coverage.

HANDLING AND STORAGE

Handling

The modules contain a highly sensitive electronic circuitry. Handling without proper ESD protection may destroy or damage the module permanently. ESD protection may destroy or damage the module permanently.

Moisture Sensitivity Level (MSL)

Per J-STD-020, devices rated as MSL 4 and not stored in a sealed bag with desiccant pack should be baked prior to use.

After opening packaging, devices that will be subjected to reflow must be mounted within 72 hours of factory conditions (<30°C and 60% RH) or stored at <10% RH.

Bake devices for 48 hours at 125°C.

Storage

Please use this product within 6 months after receipt. Any product used after 6 months of receipt needs to have solderability confirmed before use.

The product shall be stored without opening the packing under the ambient temperature from 5 to 35deg.C and humidity from 20 to 70%RH. (Packing materials, in particular, may be deformed at the temperatures above this range.)

Do not store in salty air or in an environment with a high concentration of corrosive gas, such as Cl2, H2S, NH3, SO2, or NOX.

Do not store in direct sunlight.

The product should not be subject to excessive mechanical shock.

AGENCY CERTIFICATIONS

FCC ID: H5P-TIWIBLE

IC: 6050A-TIWIBLE

Model: TiWi-BLE

AGENCY STATEMENTS

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC CAUTION: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

To comply with FCC and Industry Canada RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 35 mm from all persons and must not be operating in conjunction with any other antenna or transmitter.
If the module is used in a multi-transmitter or simultaneous transmission host then the module must be evaluated and approved to one of the host platform exposure conditions. (Mobile exposure, Portable exposure or Mixed Mobile and Portable exposure).

Industry Canada Statements

This Device complies with Industry Canada License-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.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This device has been designed to operate with the antenna(s) listed below, and having a maximum gain of 2.15 dBi. Antennas not included in this list or having a gain greater than 2.15 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

List of all Antennas Acceptable for use with the Transmitter

1) Mitsubishi materials AM03DP-ST01 with a peak gain of 2.15dBi (0 dBd)
2) HOKO Electronics 1029-C17586 with a peak gain of 1.9dBi
3) LSR 2.4GHz dipole antenna with a peak gain of 2.0dBi
4) Ethertronics Prestta 1000423 2.4GHz antenna with a peak gain of -0.6dBi (at 2.4GHz)
5) LSR 2.4GHz waterproof Dipole Antenna, part 001-0010, with a peak gain of 2.0dBi.

Cet appareil est conforme avec Industrie Canada, exempts de licence standard RSS (s). Son fonctionnement est soumis aux deux conditions suivantes: 1) ce dispositif ne peut pas causer d'interférences, et 2) ce dispositif doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement de l'appareil.

En vertu des règlements d'Industrie Canada, cet émetteur de radio ne peut fonctionner en utilisant une antenne d'un type et maximale (ou moins) Gain approuvé pour l'émetteur par Industrie Canada. Pour réduire les interférences radio potentielles pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis afin que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire pour une communication réussie.

Cet appareil a été conçu pour fonctionner avec l'antenne mentionnés ci-dessous et avoir un maximum de gain de 2,15 dBi. Antennes non inclus dans cette liste ou avoir un gain supérieur à 2,15 dBi sont strictement interdits pour une utilisation avec cet appareil. L'impédance d'antenne requis est de 50 ohms.

Liste des antennes autant Acceptable pour une utilisation avec l'émetteur

1) Mitsubishi matériaux AM03DP-ST01 avec un gain de pic de 2.15dBi (0 dBd)
2) HOKO HOKO Electronics 1029-C17586 avec un pic de 1.9dBi
3) LSR 2.4GHz 2.4 GHz antenne dipôle avec un gain maximum de 2.0dBi
4) Ethertronics Prestta 1000423 2,4 GHz antenne avec un gain maximum de - 0.6dBi (à 2, 4GHz)
5) LSR 2.4 GHz antenne dipôle imperméable à l'eau , partie 001-0010, avec un gain maximum de 2.0dBi.

OEM RESPONSIBILITIES TO COMPLY WITH FCC AND INDUSTRY CANADA REGULATIONS

The TiWi-BLE Module has been certified for integration into products only by OEM integrators under the following condition:

To comply with FCC and Industry Canada RF exposure limits for general population / uncontrolled exposure, the antenna(s) used for this transmitter must be installed to provide a separation distance of at least 35mm from all persons and operating in conjunction with any other antenna or transmitter.

If the module is used in a multi-transmitter or simultaneous transmission host then the module must be evaluated and approved to one of the host platform exposure conditions. (Mobile exposure, Portable exposure or Mixed Mobile and Portable exposure).

However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed (for example, digital device emissions, PC peripheral requirements, etc.).

IMPORTANT NOTE: In the event that these conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC and Industry Canada authorizations are no longer considered valid and the FCC ID and IC Certification Number cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC and Industry Canada authorization.

Le module de TiWi-BLE a été certifié pour l'intégration dans des produits uniquement par des intégrateurs OEM dans les conditions suivante:

Pour se conformer aux limites d'exposition aux RF de la FCC et d'Industrie Canada pour la population générale / exposition non contrôlée, l'antenne (s) utilisé pour cet émetteur doit être installé pour fournir une distance de séparation d'au moins 35mm de toutes les personnes et opérant en conjonction avec une autre antenne ou émetteur.

Si le module est utilisé dans un environnement multi-émetteur ou hôte de la transmission simultanée alors le module doit être évaluée et a approuvé l'une quelconque des conditions d'exposition de la plate-forme d'accueil. (Exposition mobile, l'exposition portable ou l'exposition mobile et portable mixte).

Toutefois, l'intégrateur OEM est toujours responsable de tester leur produit final pour toutes les exigences de conformité supplémentaires requis avec ce module installé (par exemple, les émissions appareil numérique, les exigences de périphériques PC, etc.)

NOTE IMPORTANTE: Dans le cas où ces conditions ne peuvent être satisfaites (pour certaines configurations ou de co-implantation avec un autre émetteur), puis la FCC et Industrie autorisations Canada ne sont plus considérés comme valides et l'ID de la FCC et IC numéro de certification ne peut pas être utilisé sur la produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'un distincte de la FCC et Industrie Canada l'autorisation.

OEM LABELING REQUIREMENTS FOR END-PRODUCT

The TiWi-BLE module is labeled with its own FCC ID and IC Certification Number. The FCC ID and IC certification numbers are not visible when the module is installed inside another device, as such the end device into which the module is installed must display a label referring to the enclosed module. The final end product must be labeled in a visible area with the following:

“**Contains Transmitter Module FCC ID: H5P-TIWIBLE”**

“**Contains Transmitter Module IC: 6050A-TIWIBLE”**

or

“**Contains FCC ID: H5P-TIWIBLE”**

“**Contains IC: 6050A-TIWIBLE”**

The OEM of the TiWi-BLE Module must only use the approved antenna(s) listed above, which have been certified with this module.

Le module de TiWi-BLE est étiqueté avec son propre ID de la FCC et IC numéro de certification. L'ID de la FCC et IC numéros de certification ne sont pas visibles lorsque le module est installé à l'intérieur d'un autre appareil, comme par exemple le terminal dans lequel le module est installé doit afficher une etiquette faisant référence au module ci-joint. Le produit final doit être étiqueté dans un endroit visible par le suivant:

“Contient Module émetteur FCC ID: H5P-TIWIBLE"
“Contient Module émetteur IC: 6050A-TIWIBLE"

ou

“Contient FCC ID: H5P-TIWIBLE"
“Contient IC: 6050A-TIWIBLE”

L’OEM du module TiWi-BLE ne doit utiliser l'antenne approuvée (s) ci-dessus, qui ont été certifiés avec ce module.

OEM END PRODUCT USER MANUAL STATEMENTS

The OEM integrator should not provide information to the end user regarding how to install or remove this RF module or change RF related parameters in the user manual of the end product.

The user manual for the end product must include the following information in a prominent location:

This device is granted for configurations in which the antennas used for this transmitter must be installed to provide a separation distance of at least 35mm from all person and not be co-located with any other transmitters except in accordance with FCC and Industry Canada multi-transmitter product procedures.

Other user manual statements may apply.

L'intégrateur OEM ne devrait pas fournir des informations à l'utilisateur final en ce qui concerne la façon d'installer ou de retirer ce module RF ou modifier les paramètres RF connexes dans le manuel utilisateur du produit final.

Le manuel d'utilisation pour le produit final doit comporter les informations suivantes dans unendroit bien en vue:

Ce dispositif est accordée pour les configurations dans lesquelles les antennes utilisées pour cet émetteur doit être installé pour fournir une distance de séparation d'au moins 35mm de toute personne et ne pas être co-localisés avec d'autres émetteurs sauf en conformité avec la FCC et d'Industrie Canada produit de l'émetteur multiples procédures.

Autres déclarations manuel de l'utilisateur peuvent s'appliquer.

MECHANICAL DATA

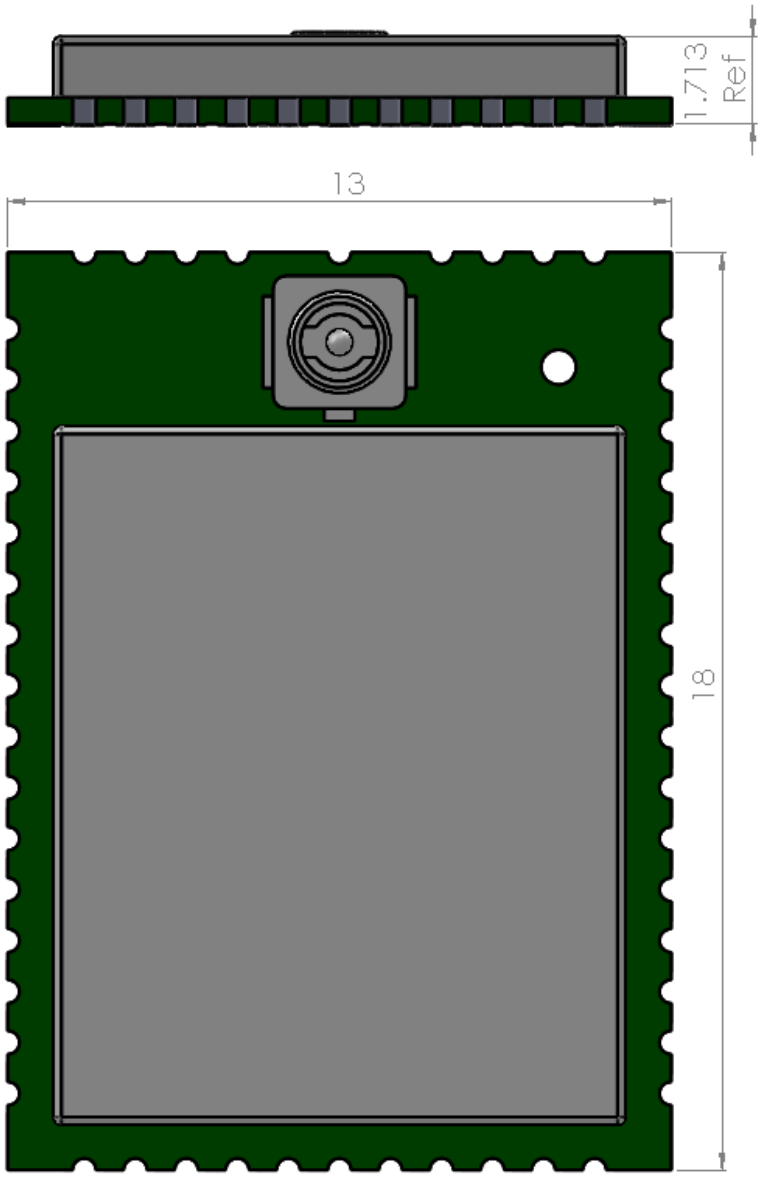
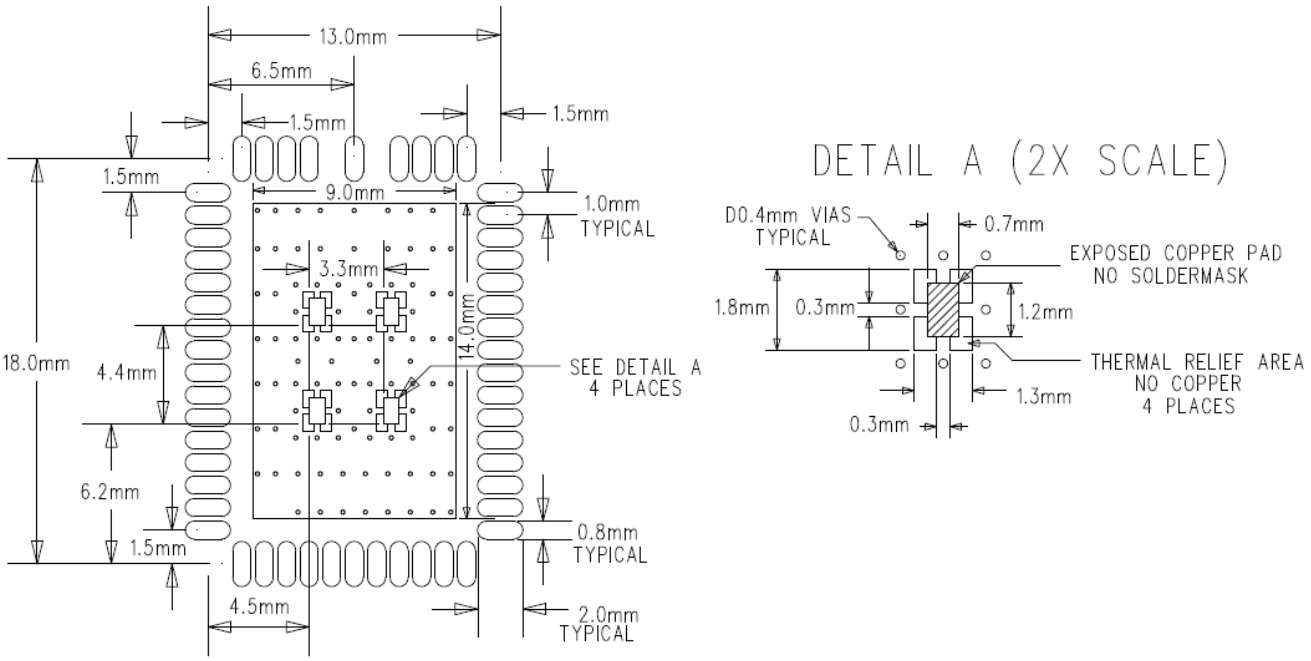


Figure 7 Module Mechanical Dimensions (Maximum Module Height = 1.9 mm)



LAYOUT NOTES:

1 – MINIMUM 4–LAYER PCB WITH SECOND LAYER GROUND PLANE

2 – FOUR GROUND PADS BENEATH MODULE TO BE THERMALLY TIED TO
TOP LAYER GROUND POUR (SEE DETAIL A).
CONNECT TOP SIDE POUR TO LAYER 2 GROUND PLANE USING AMPLE VIAS.

3 – AVOID LONG ROUTES ON TOP LAYER BENEATH MODULE. VIA FANOUT BENEATH MODULE IS ACCEPTABLE,

Figure 8 TiWi-BLE Recommended PCB Footprint (Top View)