Anaren AIR for Wi-Fi
A43364 Wi-Fi Module Series

AIR
Anaren
Integrated
Radio
™
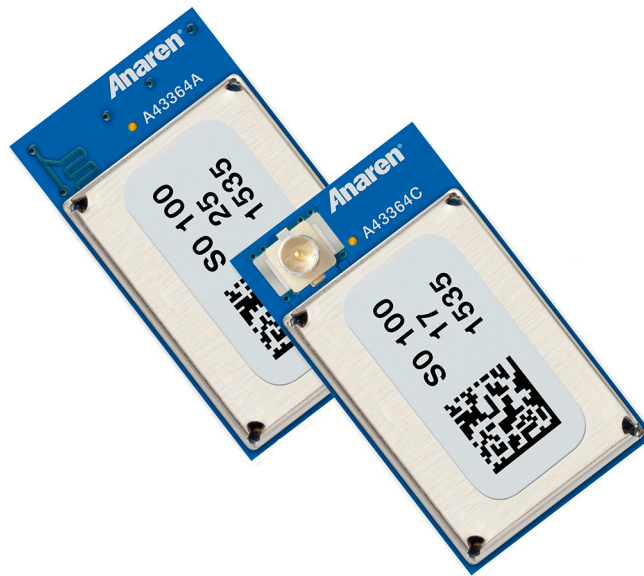
User's Manual

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Anaren AIR for Wi-Fi A43364x modules are based on the CYW43364 chipset from Cypress. They are surface-mounted 2.4GHz radio frequency (RF) transceivers incorporating Wi-Fi technology that conforms to the WLAN IEEE 802.11b/g/n. The CYW43364 chipset integrates an ARM® Cortex®-M3 processor and on-chip memory for complete WLAN subsystem functionality, minimizing the need to wake up the applications processor for standard WLAN functions. All control lines are provided at the module level for full control of the operation. Also incorporated in the modules are a STMicroelectronics STM32F412 ARM Cortex-M4-based microcontroller, two 26MHz crystals (one for the radio and the other for the microcontroller), the required RF matching and filtering for regulatory compliance, and filtering for noise reduction and sensitivity.

The module is available in two variations: A43364A and A43364C. The A43364A has an integral antenna, and the A43364C uses an external antenna through a U.FL connector. Each module measures 11mm x 19mm x 2.5mm, and are footprint compatible with each other.

The A43364x modules have received regulatory approvals for full modular devices in the United States (FCC), Canada (IC), and Europe (ETSI). The modular approval allows the end user to place either an A43364A or an A43364C with an approved antenna inside a finished product without having to perform costly regulatory testing for an intentional RF radiator. Section 2.3. Approved Usage has information on the requirements for the end user/integrator to fulfill in order to use the modules without intentional radiator regulatory testing.

1.1. A43364A

The A43364A module has an integral antenna, providing high efficiency and near-omni-directional radiation pattern. This approach offers the lowest system cost when the application allows collocation of the radio and antenna. See Figure 6 and Figure 7 for more information on antenna location and enclosure considerations.

1.2. A43364C

The A43364C module has a compact antenna connector that allows for locating the antenna away from the module due to form or function, or in order to exit a metal enclosure. See Table 1 for a list of approved antennas.

1.3. A43364x Features and Benefits

Features:
- Single-band 802.11b/g/n with complete Wi-Fi functionality
- Operating voltage: VDD = 3.0V to 4.8V (powers the radio core), VDDIO = 1.8V to 3.6V (powers MCU and radio I/O), VBAT = 1.65V to 3.6V (powers MCU's RTC, 32kHz oscillator, and backup registers)
- Operating temperature: -30°C to +85°C*
- CYW43364 chipset with integrated ARM Cortex-M3 processor and on-chip memory for complete WLAN subsystem functionality
- STM32F412 ARM Cortex-M4-based microcontroller with 1MB flash memory and 256KB SRAM
- Output power: FCC compliant up to +24.3dBm, ETSI compliant up to +19.9dBm
- 37 GPIO pins available
- Interfaces include: UART, SPI, I²S, I²C, USB, CAN, JTAG, ADC, PWM and GPIO
- Connection range up to 350 feet line of sight (may vary based on connected device)
- Support for secure OTA
- RoHS compliant
- Shielded package
- LGA footprint
- Small package size: 11mm x 19mm x 2.5mm
- Approximate weight: 0.8 grams

Module might have degraded performance below -10°C and above +55°C due to crystal and/or chipset specifications.

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Benefits:

- 100% RF tested in production for repeatable performance
- Minimal RF and protocol experience necessary
- Only requires a two-layer host PCB implementation
- FCC 15.247, IC RSS-210, and IC RSS-Gen certified
- Compliant with ETSI EN 300 328 V1.9.1
- No regulatory "intentional radiator" testing required, and simple certification labeling can be used for integrating the module into an end product (end product testing is still required)

1.4. Theory of Operation

The A43364x module operates in the global 2.4 GHz ISM/SRD frequency band. It can be used to implement a variety of networks, including point-to-point, point-to-multi-point, and peer-to-peer.

Figure 1 below shows the functionality of A43364x module. Both modules operate in a similar manner with the exception of the antenna—the A43364A communicates through a built-in antenna, and the A43364C communicates through an external antenna attached to a U.FL antenna port.
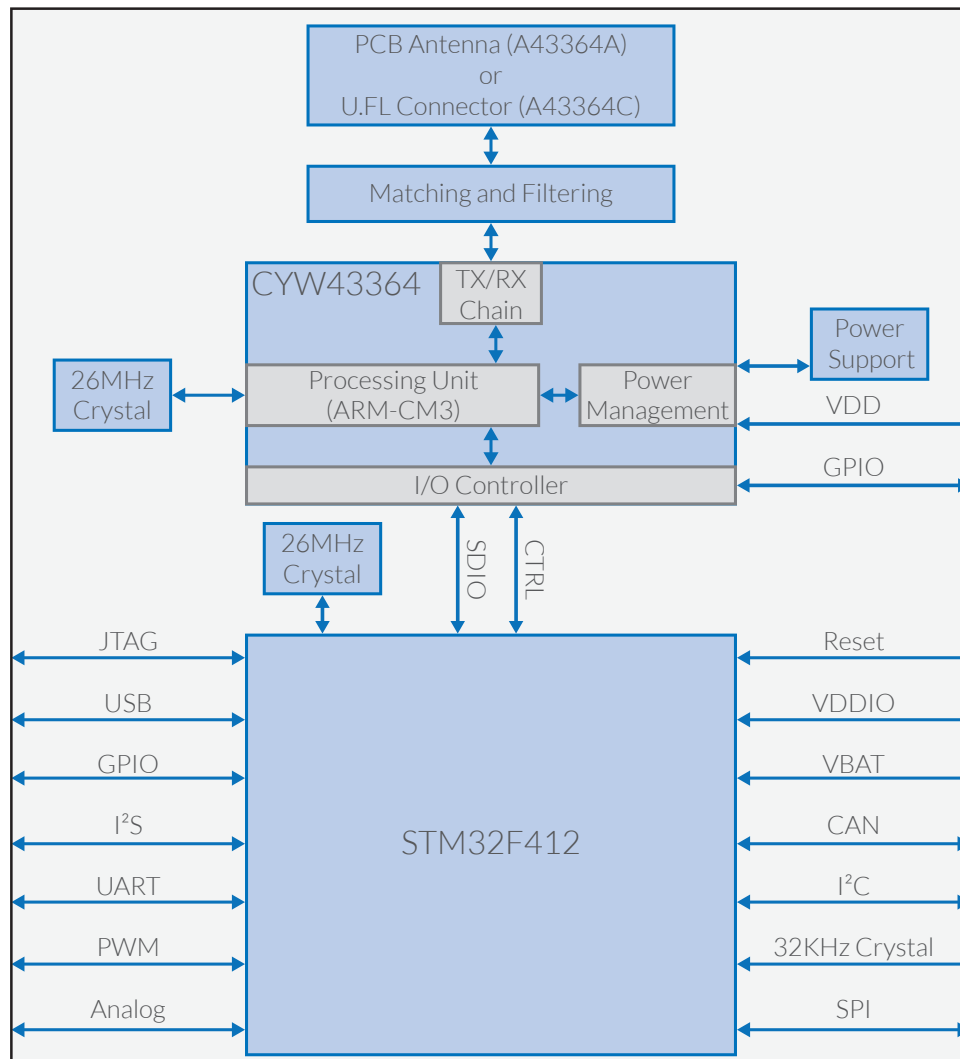

Figure 1: The functionality of the A43364x module, using an internal antenna or U.FL connector.

The description of the functional blocks shown in Figure 1 is given as follows:

• Antenna: The antenna couples energy between the air and the module. The integral antenna and the external monopole antenna—both centered at 2441.75 MHz—provide a near-omni-directional antenna pattern with high efficiency, such that the application will work in any direction. The end radiation pattern of the antenna depends on the ground plane, enclosure, and installation environment.

• Matching and Filtering: The matching provides the correct loading of the transmit amplifier to achieve the highest output power and the correct loading for the receive LNA to achieve the best sensitivity. Filtering removes spurious signals to comply with regulatory requirements, provides reduced susceptibility to power supply and digital noise, and filters out RF and high-frequency noise from the communication data and control link.

• TX/RX Chain: The TX/RX chain handles transmitting and receiving of the communication data based on the radio register settings. It involves the coordination of several blocks, including the modulator, demodulator, AGC control, frequency synthesizer, and frame control.

• Crystal: The crystal oscillator provides the necessary clock reference for the entire module operation. The A43364x modules use two 26 MHz crystals: one for the radio and one for the microcontroller.

• Power Management: Power management ensures a stable supply for the internal functions, as well as providing means for a low-power sleep mode.

Item	Part Number	Manufacturer	Type	Gain (dBi)
1	Integral part of A43364A	Anaren	Integral antenna	2
2	66089-2406	Anaren	Monopole whip, 6mm lead	3
3	66089-2430	Anaren	Monopole whip, 30mm lead	3

Table 1: Approved Antennas

1.5. Applications

• Home and building automation
• Lighting systems
• Wireless sensor networks
• Sports monitoring
• Health and wellness
• Cloud connectivity
• Access control
• Industrial control and monitoring

2. Approvals and Usage

A43364x modules meet many national regulations for worldwide Industrial Scientific and Medical (ISM) radio bands use. In particular, the modules have been certified to the following standards listed in this section.

2.1. Product Approvals

2.1.1. U.S.: Federal Communications Commission (FCC)

A43364x modules have been tested to comply with the FCC CFR47 Part 15 subpart C "Intentional Radiators" standard and Part 15 subpart B. The modules meet the requirements for modular transmitter approval as detailed in the FCC public notice DA 00-1407 released on June 26, 2000. The modular transmitter approval eliminates the need to re-perform costly intentional radiator testing when submitting an end product for certification.

(15.19a3) The A43364x modules comply 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.

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

2.1.1.1. FCC Labeling Requirements

The A43364x modules have been labeled with their own FCC identification number (ID), and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product 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: X7J-A16020401*
>
> *-or-*
>
> *Contains FCC ID: X7J-A16020401*
> *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.*

2.1.1.2. End User Manual

The end user manual should include the following 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 or more 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.*

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2.1.1.3. RF Exposure

All transmitters regulated by the FCC must comply with RF exposure requirements. *OET Bulletin 65: Evaluating Compliance with FCC Guidelines for Human Exposure to Radio Frequency Electromagnetic Fields* provides assistance in determining whether proposed or existing transmitting facilities, operations, or devices comply with limits for human exposure to RF fields adopted by the FCC. The bulletin offers guidelines and suggestions for evaluating compliance.

If appropriate, compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

The following statement must be included as a CAUTION statement in manuals and OEM products to alert users of FCC RF exposure compliance:

> *To satisfy FCC requirements the antenna used with this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except as permitted by FCC multi-transmitter procedures. The A43364 module is intended for use in mobile devices located at a distance greater than 20cm away from the body.*

2.1.2. Canada: Industry Canada (IC)

A43364x modules have been certified for use in Canada under IC Radio Standards Specification (RSS) RSS-210 and RSS-Gen.

From section 3.2 RSS-Gen, Issue 3, December 2010, *Modular Approval for Category I Equipment or Category II Equipment*:

> *Modular approval permits the installation of the same module in a host device or multiple host devices without the need to recertify the device. Equipment certification for a modular device may be sought for either Category I equipment or Category II equipment.*
>
> *Transmitters designed as modules for the installation in a host device may obtain equipment certification as a modular device provided that the applicable RSS is met and the following conditions in this section are met.*

In section 7.1.2 *Transmitter Antenna*, it has been mentioned that the user manuals for transmitters shall display the following notice in a visible location:

> *Notice: 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.*
>
> *Avis: Sous la réglementation d'Industrie Canada, ce transmetteur radio ne peut fonctionner qu'en utilisant seulement une antenne d'un type et d'un maximum (ou moins) de gain approuvé pour l'émetteur par Industrie Canada. Pour réduire des potentielles interférences radio pour les autres utilisateurs, le type d'antenne et son gain doivent être choisis de sorte que la puissance isotrope rayonnée équivalente (PIRE) ne dépasse pas ce qui est nécessaire pour une communication réussie.*

In section 7.1.2 *Transmitter Antenna*, it has been mentioned that the user manuals for transmitters equipped with detachable antennas shall also contain the following notice in a visible location:

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Notice: This radio transmitter (IC: 8975A-A16020401) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Avis: Cet émetteur radio (IC: 8975A-A16020401) a été approuvé par Industrie Canada pour fonctionner avec les types d'antennes énumérés ci-dessous avec le gain maximal admissible et l'impédance d'antenne requise pour chaque type d'antenne indiqué. Les types d'antennes ne figurant pas dans cette liste, ayant un gain supérieur au gain maximal indiqué pour ce type, sont strictement interdits pour l'utilisation avec cet appareil.

Item *Numéro d'article*	Part Number *Référence*	Manufacturer *Fabricant*	Type *Catégorie*	Gain (dBi) *Gain*
1	Integral part of A43364A *Partie intégrante de A43364A*	Anaren	Integral antenna *Antenne intégrée*	2
2	66089-2406	Anaren	Monopole whip, 6mm lead *Antenne monopôle, longueur 6mm*	3
3	66089-2430	Anaren	Monopole whip, 30mm lead Antenne monopôle, longueur 30mm	3

2.1.2.1. IC Labeling Requirements

From section 3.2.1 RSS-Gen, Issue 3, December 2010, *Labeling Requirements for the Host Device*:

The host device shall be properly labeled to identify the modules within the host device. The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning.

From section 5.2, RSS-Gen, Issue 3, December 2010, *Equipment Certification Numbers and Labels*:

Every unit of Category I radio apparatus certified for marketing and use in Canada shall bear a permanent label on which is indelibly displayed the model number and Industry Canada certification number of the equipment model (transmitter, receiver, or inseparable combination thereof). Each model shall be identified by a unique combination of a model number and a certification number, which are assigned as described below in this section.

The label shall be securely affixed to a permanently attached part of the device, in a location where it is visible or easily accessible to the user, and shall not be readily detachable. The label shall be sufficiently durable to remain fully legible and intact on the device in all normal conditions of use throughout the device's expected lifetime. These requirements may be met either by a separate label or nameplate permanently attached to the device or by permanently imprinting or impressing the label directly onto the device.

The label text 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 label information may be included in the user manual upon agreement with Industry Canada.

Section 5.2 continues:

> *The model number is assigned by the applicant and shall be unique to each model of radio apparatus under that applicant's responsibility. The model number shall be displayed on the label preceded by the text: "Model:", so it appears as follows:*
>
> *Model: model number assigned by applicant*

Label:

> *Contains/Contient IC: 8975A- A16020401*
>
> *Notice: 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.*
>
> *Avis: Cet appareil est conforme avec Industrie Canada RSS standard exempts de licence (s). Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne peut pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences qui peuvent causer un mauvais fonctionnement du dispositif.*

From section 7.1.4, RSS-Gen, Issue 3, December 2010, *Radio Apparatus Containing Digital Circuits (ICES-003)*:

> *Radio apparatus containing digital circuitry which can function separately from the operation of a transmitter or an associated transmitter, shall comply with ICES-003. In such cases, the labeling requirements of the applicable RSS apply, rather than the labelling requirements in ICES-003.*

For more information, visit the Industry Canada website at www.ic.gc.ca.

2.1.2.2. RF Exposure

All transmitters regulated by IC must comply with RF exposure limits as set forth in RSS-102, Issue 4, Section 4, *Exposure Limits*. Furthermore RSS-102, Issue 4, Section 2 *Certification Requirements* provides assistance in determining the specific requirements for compliance. If appropriate, compliance with exposure guidelines for mobile and unlicensed devices can be accomplished by the use of warning labels and by providing users with information concerning minimum separation distances from transmitting structures and proper installation of antennas.

The following statement must be included as a CAUTION statement in manuals and OEM products to alert users of IC RF exposure compliance:

> *Notice: To satisfy Industry Canada requirements the antenna used with this transmitter must not be co-located or operating in conjunction with any other antenna or transmitter except as permitted by Industry Canada's multi-transmitter procedures. The A43364 module is intended for use in mobile devices located at a distance greater than 20cm away from the body.*
>
> *Avis: Pour satisfaire aux exigences d'Industrie Canada l'antenne utilisée avec cet émetteur ne doit pas être colocalisée ni de fonctionner en conjonction avec une autre antenne ou un autre émetteur, sauf dans la mesure permise par les procédures multi-émetteurs de l'Industrie Canada. Le module A43336 est destiné pour être utilisé dans des appareils mobiles situés ă une distance supérieure 20cm éloigné du corps.*

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2.1.3. Europe: Conformité Européenne (CE)

A43364x modules have been certified for use in European countries covered by ETSI regulations. The following tests have been performed and the module has been found to be compliant to the requirements:
- Test standard ETSI EN 300 328 V1.9.1 (2015-02)
    - ✓ Maximum isotropic radiated power (normal and extreme conditions)
    - ✓ Maximum E.I.R.P. spectral density
    - ✓ Frequency range (normal and extreme conditions)
    - ✓ Transmitter spurious emissions
    - ✓ Receiver spurious emissions
    - ✓ Electro-static discharge and RF immunity (ETSI EN 301 489-17)
    - ✓ RF exposure (ETSI EN 62311:2008)
    - ✓ Safety (IEC 60950-1:2005 and EN 60950-1:2006)

A helpful document that can be a starting point in understanding the use of short range devices (SRD) in Europe is the *European Radio Communications Committee (ERC) Recommendation 70-03 E*, which is downloadable from the European Radio Communications Office (ERO) at www.ero.dk.

The end user is responsible for ensuring compliance with harmonized frequencies and labeling requirements for each country the end device is marketed and sold. For more information, see:
- Radio And Telecommunications Terminal Equipment (R&TTE): ec.europa.eu/enterprise/rtte/index_en.htm
- European Conference of Postal and Telecommunications Administrations (CEPT): www.cept.org/
- European Telecommunications Standards Institute (ETSI): www.etsi.org/
- European Radio Communications Office (ERO): www.ero.dk/

2.2. Potential Interference Sources

A43364x modules operate in the unlicensed ISM band, in which there are many other applications (e.g. WLAN, Classic Bluetooth, Bluetooth Low Energy, and microwave ovens). This can cause interference that may, in certain conditions, prohibit radio communication.

Some of the most common interferences are listed below.

2.2.1. WLAN

Wireless local area networks (WLAN) are divided into a number of overlapping channels. Figure 3 below shows the channels used by WLAN; for the U.S. and Canada, only channels 1-13 may be used. Predominantly, channels 1, 6, and 11 are used to achieve non-overlapping channels. The user is therefore encouraged to select unused WLAN channels in their respective environment.
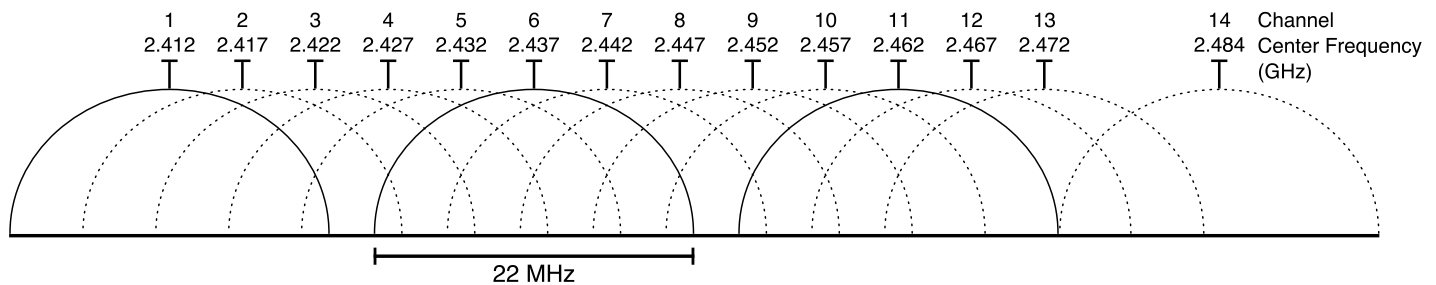

Figure 3: WLAN Channels

2.2.2. Classic Bluetooth®

Classic Bluetooth divides the 2.402-2.480 GHz band into 79 channels, each of which is 1 MHz wide. However, since Bluetooth changes channels rapidly (up to 1600 times a second), it is unlikely to cause continuous interference in a specific channel and can be overcome by implementing a simple acknowledge/retransmit functionality.

2.2.3. Microwave Ovens

A typical microwave oven uses a self-oscillating magnetron with a duty cycle below 50%, because the tube is completely off for half of every alternating current (AC) mains cycle (8.33 ms in 60 Hz countries and 10 ms in 50 Hz countries). The frequency of the microwave oven changes cyclically within each AC mains synchronized on period, and is generally not predictable.

The user is encouraged to have packet transmission durations less than half the AC mains period and implement an acknowledge/retransmit method.

2.2.4. Other Interference

Systems similar to the user's system may also exist within range and may also be a source of interference. Some typical applications to consider include the following:
• Alarm systems: These typically use low duty cycles and are therefore easy to avoid using acknowledge/ retransmit methods
• Car alarms (internal motion sensors)
• Video surveillance: These are operated on a fixed channel (determined during installation) and can be avoided by using clear channel assessment. It may be useful to change the channel used by the video surveillance equipment.

2.3. Approved Usage

A43364x modules have been approved for use in the U.S., Canada, and Europe. The user is encouraged to use minimum power required to establish a link, thus minimizing interference.

Changes or modifications to the module and/or operation outside the limits are prohibited and could void the user's authority to operate the modules.

2.3.1. U.S. and Canada

Within the U.S. and Canada, A43364x modules have been approved for use as digitally-modulated transmitters, for which they conform to the bandwidth (a minimum of 500 kHz 6-dB bandwidth for U.S., a maximum bandwidth of 0.5% of the carrier frequency for Canada), power spectral density (max of 8 dBm / 3 kHz), total output power (max of 1 W including the antenna gain) and spurious radiation (harmonics and others including the restricted bands) requirements.

Table 2 shows approved frequencies of operations with the corresponding maximum output power values. These modules must be operated at or below the indicated power levels. Using the modules with higher power levels are prohibited, and will void the user's authority to operate the modules under current FCC/IC certification.

2. Approvals and Usage

A43364A with internal antenna (2dBi gain):

802.11b											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	8	7	0	0	0	0	3	13	16	22	26
Measured Output Power (dBm)	22.6	22.9	23.9	24.3	24.3	24.3	23.6	21.6	21.1	19.8	18.9
802.11g											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	7	1	0	0	0	0	2	8	17	23	29
Measured Output Power (dBm)	20.0	21.7	21.9	22.2	22.2	22.2	21.6	20.1	18.2	16.5	15.2
802.11n											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	8	2	0	0	0	0	3	9	17	23	30
Measured Output Power (dBm)	19.7	21.3	21.9	22.0	22.0	22.0	21.2	19.6	18.0	16.5	14.9

A43364C with external antenna (3dBi gain):

802.11b											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	14	12	4	4	1	0	2	5	6	14	16
Measured Output Power (dBm)	21.1	21.9	23.3	23.4	24.0	24.3	23.8	23.3	23.3	21.6	21.3
802.11g											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	11	5	1	0	0	0	0	1	7	11	20
Measured Output Power (dBm)	19.1	20.5	21.8	22.0	22.2	22.2	22.1	22.0	20.5	19.7	17.4
802.11n											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	14	6	3	0	0	0	0	2	6	14	22
Measured Output Power (dBm)	18.0	20.5	21.1	21.9	22.0	22.0	21.9	21.6	20.6	18.8	16.9

Table 2: Approved Power Levels for FCC/IC

Mode	Data Rate	Peak TX Current (mA)
802.11b	1 Mbps	560
	11 Mbps	555
802.11g	6 Mbps	420
	54 Mbps	370
802.11n	MCS0	415
	MCS7	415

Table 3: A43364 Module Peak TX Current Consumption

Please note that the specified current consumption numbers are for radio operation only and do not include other MCU peripherals.

2.3.2. Europe

For Europe, the maximum allowed output power is 20dBm with a spectral power density limit of 10dBm/MHz. A43364x modules comply with the power spectral density requirements at the power level shown in Table 4.

A43364A with internal antenna (2dBi gain):

802.11b											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	39	41	41	41	41	41	43	43	43	43	43
EIRP (dBm)	17.2	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0	17.0
802.11g											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	26	28	28	28	28	28	30	30	30	30	30
EIRP(dBm)	17.2	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1
802.11n											
	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11
Power Level Index (set in software)	26	28	28	28	28	28	30	30	30	30	30
EIRP (dBm)	17.1	17.0	17.0	17.0	17.0	17.0	16.9	16.9	16.9	16.9	16.9

Table 4: Approved Power Levels for ETSI

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A43364C with external antenna (3dBi gain):

802.11b										
	CH1	**CH2**	**CH3**	**CH4**	**CH5**	**CH6**	**CH7**	**CH8**	**CH9**	**CH10**	**CH11**
Power Level Index (set in software)	43	45	45	45	45	45	47	47	47	47	47
EIRP (dBm)	17.4	17.0	17.0	17.0	17.0	17.0	17.1	17.1	17.1	17.1	17.1
802.11g										
	CH1	**CH2**	**CH3**	**CH4**	**CH5**	**CH6**	**CH7**	**CH8**	**CH9**	**CH10**	**CH11**
Power Level Index (set in software)	30	32	32	32	32	32	34	34	34	34	34
EIRP(dBm)	17.2	17.1	17.1	17.1	17.1	17.1	17.0	17.0	17.0	17.0	17.0
802.11n										
	CH1	**CH2**	**CH3**	**CH4**	**CH5**	**CH6**	**CH7**	**CH8**	**CH9**	**CH10**	**CH11**
Power Level Index (set in software)	30	32	32	32	32	32	33	33	33	33	33
EIRP (dBm)	17.0	16.9	16.9	16.9	16.9	16.9	17.1	17.1	17.1	17.1	17.1

Table 4: Approved Power Levels for ETSI

3.1. Absolute Maximum Ratings

Under no circumstances shall the absolute maximum ratings given in Table 5 be violated. Stress exceeding one or more of the limiting values or exposure to maximum rating conditions for extended periods may cause permanent damage to the device. Functional operation of the device at these conditions is not implied.

	Caution! ESD sensitive device. Precaution should be used when handling the device in order to prevent permanent damage.		Caution! This assembly contains moisture sensitive devices and requires proper handling per IPC/JEDEC J-STD-033.

Parameter	Min	Max	Unit	Comments
Storage temperature	-40	+125	°C	
VDD supply voltage with respect to GND	-0.5	6.0	V	The maximum continuous voltage is 4.8V. Voltages as high as 5.0V for up to 250 seconds or as high as 6.0V for up to 10 seconds are allowed. Duration is cumulative over the lifetime of the device.
VDDIO supply voltage with respect to GND	-0.3	4.0	V	
VBAT supply voltage with respect to GND	-0.3	4.0	V	
V_{IN} with respect to GND (except GPIO_1, GPIO_2, GPIO_3, and GPIO4)	-0.3	4.0	V	
V_{IN} with respect to GND (GPIO_1, GPIO_2, GPIO_3, and GPIO_4)	-0.5	3.9	V	Undershoot/overshoot not to exceed 25% of the duty cycle at VIN + 0.5V.
ESD (HBM)	N/A	1250	V	Human body model contact discharge per JEDEC EID/JESD22-A114.
ESD (CDM)	N/A	300	V	Charged device model contact discharge per JEDEC EIA/JESD22-C101.

Table 5: Absolute Maximum Ratings

3.2. Operating Conditions

Parameter	Min	Max	Unit	Comments
Ambient temperature	-30	+85	°C	Specifications require derating below -10°C and above +55°C.
VDD supply voltage	3.0	4.8	V	Specifications require derating below 3.2V.
VDDIO supply voltage	1.8	3.6	V	
VBAT supply voltage	1.65	3.6	V	

Table 6: Operating Conditions

3.3. Digital I/O Characteristics

Parameter	Min	Max	Unit	Comments
V_{IL} (except GPIO_1, GPIO_2, GPIO_3, GPIO4)	-	TBD	V	
V_{IL} (GPIO_1, GPIO_2, GPIO_3, GPIO4)	-	0.35xVDDIO	V	VDDIO=1.8V
	-	0.8	V	VDDIO=3.3V
V_{IH} (except GPIO_1, GPIO_2, GPIO_3, GPIO4)	TBD	-	V	
V_{IH} (GPIO_1, GPIO_2, GPIO_3, GPIO4)	0.65xVDDIO	-	V	VDDIO=1.8V
	2.0	-	V	VDDIO=3.3V
V_{OL} (except GPIO_1, GPIO_2, GPIO_3, GPIO4)	-	TBD	V	
V_{OL} (GPIO_1, GPIO_2, GPIO_3, GPIO4)	-	0.45	V	VDDIO=1.8V I_{IO}=+2mA
	-	0.4		VDDIO=3.3V I_{IO}=+2mA
V_{OH} (except GPIO_1, GPIO_2, GPIO_3, GPIO4)	TBD	-	V	
V_{OH} (GPIO_1, GPIO_2, GPIO_3, GPIO4)	VDDIO-0.45	-	V	VDDIO=1.8V I_{IO}=+2mA
	VDDIO-0.4	-	V	VDDIO=3.3V I_{IO}=+2mA

Table 7: Digital I/O Characteristics

3.4. Pinout

The A43364A and A43364C modules share a common pinout and footprint, thus enabling the use of the same application PCB layout for both. Below the pinout is shown:

Where applicable:
- **NC = "No Connection"**
  Pin is not connected internally.
- **DNC = "Do Not Connect"**
  Pin reserved for internal use; ensure mating footprint pads are **isolated**.
- **GND = "Ground"**
  Connect the maximum number possible (minimum one for proper operation).
- **TGND = "Thermal Ground"**
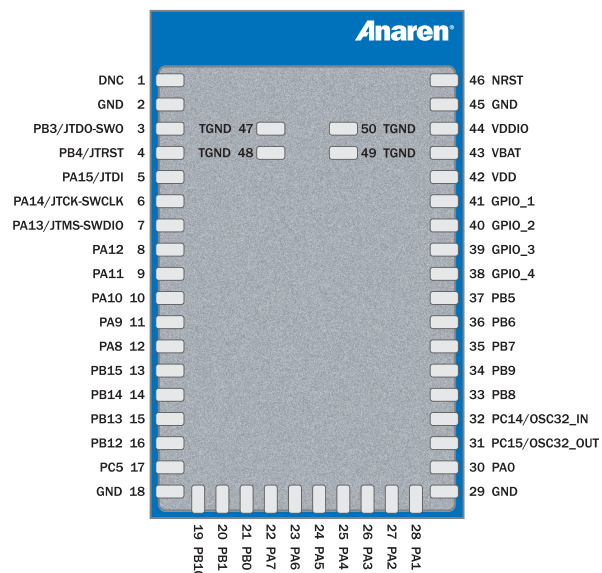 Connect to ground plane on PCB for optimal heat conduction out of the module.

Figure 4: A43364x Module Pinout (viewed from top side)

3.5. Pin Description

Pin	Name	Function									
		GPIO	UART	SPI	I²S	I²C	CAN	USB	ADC	Timer	Other
1	DNC										
2	GND										
3	PB3/JTDO-SWO	GPIO	USART1_RX	SPI1_SCK SPI3_SCK	I2S1_CK I2S3_CK	I2C2_SDA I2C4_SDA				TIM2_CH2	JTDO/TRACESWO
4	PB4/JTRST	GPIO		SPI1_MISO SPI3_MISO	I2S3ext_SD	I2C3_SDA				TIM3_CH1	JTRST
5	PA16/JTDI	GPIO	USART1_TX	SPI1_NSS SPI3_NSS	I2S1_WS I2S3_WS					TIM2_CH1 TIM2_ETR	JTDI
6	PA14/JTCK-SWCLK	GPIO									JTCK/SWCLK
7	PA13/JTMS-SWDIO	GPIO									JTMS/SWDIO
8	PA12	GPIO	USART1_RTS USART6_RX	SPI5_MISO			CAN1_TX	USB_FS_DP		TIM1_ETR	
9	PA11	GPIO	USART1_CTS USART6_TX	SPI4_MISO			CAN1_RX	USB_FS_DM		TIM1_CH4	
10	PA10	GPIO	USART1_RX	SPI5_MOSI	I2S5_SD			USB_FS_ID		TIM1_CH3	
11	PA9	GPIO	USART1_TX			I2C3_SMBA		USB_FS_VBUS		TIM1_CH2	
12	PA8	GPIO	USART1_CK			I2C3_SCL		USB_FS_SOF		TIM1_CH1	MCO_1
13	PB15	GPIO		SPI2_MOSI	I2S2_SD	I2C4_SCL				TIM1_CH3N TIM8_CH3N TIM12_CH2	RTC_50Hz
14	PB14	GPIO	USART3_RTS	SPI2_MISO	I2S2ext_SD	I2C4_SDA				TIM1_CH2N TIM8_CH2N TIM12_CH1	
15	PB13	GPIO	USART3_CTS	SPI2_SCK SPI4_SCK	I2S2_CK I2S4_CK	I2C4_SMBA	CAN2_TX			TIM1_CH1N	
16	PB12	GPIO	USART3_CK	SPI2_NSS SPI3_SCK SPI4_NSS	I2S2_WS I2S3_CK I2S4_WS	I2C2_SMBA	CAN2_RX			TIM1_BKIN	
17	PC5	GPIO	USART3_RX			I2C4_SMBA					
18	GND										
19	PB10	GPIO	USART3_TX	SPI2_SCK	I2S2_CK I2S3_MCK	I2C2_SCL I2C4_SCL				TIM2_CH3	
20	PB1	GPIO		SPI5_NSS	I2S5_WS				ADC1_9	TIM1_CH3N TIM3_CH4 TIM8_CH3N	
21	PB0	GPIO		SPI5_SCK	I2S5_CK				ADC1_8	TIM1_CH2N TIM3_CH3 TIM8_CH2N	
22	PA7	GPIO		SPI1_MOSI	I2S1_SD				ADC1_7	TIM1_CH1N TIM3_CH2 TIM8_CH1N TIM14_CH1	
23	PA6	GPIO		SPI1_MISO	I2S2_MCK				ADC1_6	TIM1_BKIN TIM3_CH1 TIM8_BKIN TIM13_CH1	
24	PA5	GPIO		SPI1_SCK	I2S1_CK				ADC1_5	TIM2_CH1 TIM2_ETR TIM8_CH1N	
25	PA4	GPIO	USART2_CK	SPI1_NSS SPI3_NSS	I2S1_WS I2S3_WS				ADC1_4		
26	PA3	GPIO	USART2_RX		I2S2_MCK				ADC1_3	TIM2_CH4 TIM5_CH4 TIM9_CH2	
27	PA2	GPIO	USART2_TX		I2S2_CKIN				ADC1_2	TIM2_CH3 TIM5_CH3 TIM9_CH1	
28	PA1	GPIO	USART2_RTS	SPI4_MOSI	I2S4_SD				ADC1_1	TIM2_CH2 TIM5_CH2	
29	GND										

Table 8: A43364x Pin Descriptions with References to Chip Pins

Pin	Name	Function									
		GPIO	UART	SPI	I²S	I²C	CAN	USB	ADC	Timer	Other
30	PA0	GPIO	USART2_CTS						ADC1_0	TIM2_CH1 TIM2_ETR TIM5_CH1 TIM8_ETR	WKUP1
31	PC15/OSC32_OUT	GPIO									OSC32_OUT
32	PC14/OSC32_IN	GPIO									OSC32_IN
33	PB8	GPIO		SPI5_MOSI	I2S5_SD	I2C1_SCL I2C3_SDA	CAN1_RX			TIM4_CH3 TIM10_CH1	
34	PB9	GPIO		SPI2_NSS	I2S2_WS	I2C1_SDA I2C2_SDA	CAN1_TX			TIM4_CH4 TIM11_CH1	
35	PB7	GPIO	USART1_RX			I2C1_SDA				TIM4_CH2	
36	PB6	GPIO	USART1_TX			I2C1_SCL	CAN2_TX			TIM4_CH1	
37	PB5	GPIO		SPI1_MOSI SPI3_MOSI	I2S1_SD I2S3_SD	I2C1_SMBA	CAN2_RX			TIM3_CH2	
38	GPIO_4										CYW43364 GPIO_4
39	GPIO_3										CYW43364 GPIO_3
40	GPIO_2										CYW43364 GPIO_2
41	GPIO_1										CYW43364 GPIO_1
42	VDD										
43	VBAT										
44	VDDIO										
45	GND										
46	NRST										MCU HW Reset
47	TGND										
48	TGND										
49	TGND										
50	TGND										

Table 8 (cont.): A43364x Pin Descriptions with References to Chip Pins

3.5.1. Internal Connections Between the Radio and the Microcontroller

Pin	Name	Function									
		GPIO	UART	SPI	I²S	I²C	CAN	USB	ADC	Timer	Other
	PC8										CYW43364 SDIO_D0
	PC9										CYW43364 SDIO_D1
	PC10										CYW43364 SDIO_D2
	PC11										CYW43364 SDIO_D3
	PC12										CYW43364 SDIO_CLK
	PD2										CYW43364 SDIO_CMD
	PC0										CYW43364 GPIO_0/WLAN_HOST_WAKE
	PC4										CYW43364 WL_REG_ON
	PC6										CYW43364 LPO_IN
	PH0/OSC_IN										26MHz XTAL
	PH1/OSC_OUT										26MHz XTAL

Table 9: A43364x Internal Characteristics

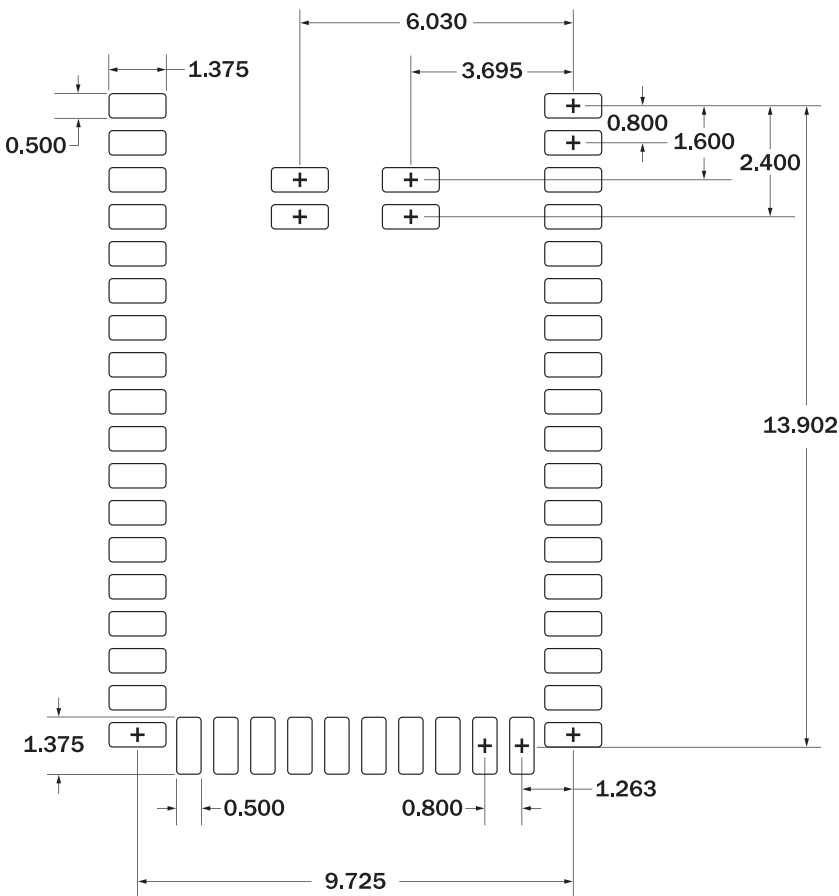## 3.6. Recommended Layout (dimensions in mm)

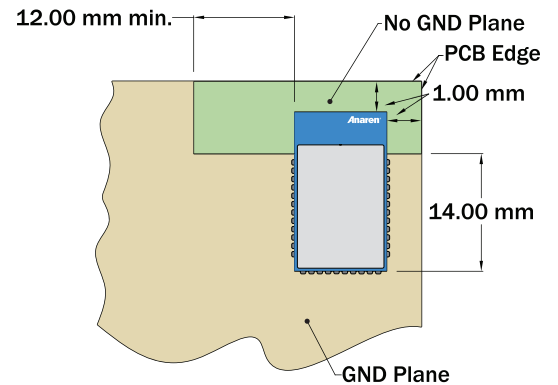Figure 5: Recommended PCB Footprint
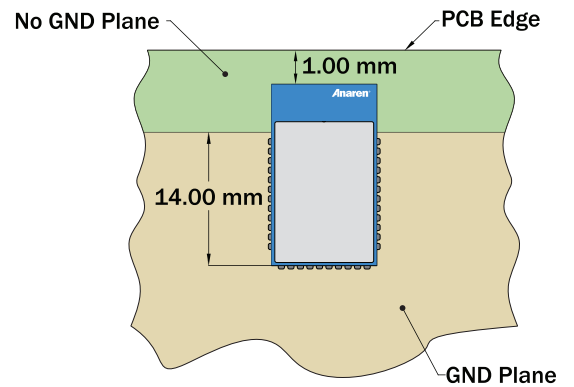

Figure 6: Mounting the Module in a Corner

Figure 7: Mounting the Module Along an Edge

NOTE: The "No GND" area is optional for A43364C modules. It may still be provided for compatibility with the internal antenna version (A43364A).

3.6.1. Module Usage Guidelines

The recommended PCB layout is shown in the figures above.
• If the design is using the on-module PCB antenna, the antenna's "No GND Plane" area labeled above needs to be kept clear of copper on all layers to ensure good RF performance.
• If the design is using an external antenna via the U.FL connector, it is okay to overlap the antenna area with copper. However, the design with an external antenna needs to meet appropriate regulatory requirements depending on the target geography, such as FCC, IC, MIC/TELEC, etc. Contact Anaren for additional information.

In addition to the above guidelines, note the following suggestions:
• Place external bypass capacitors as close as possible to the module pins.
• To achieve better communication quality, keep metallic objects away from the antenna (either the on-module chip antenna or an external antenna) as much as possible.

3.7. Radio Module Details (dimensions in mm)
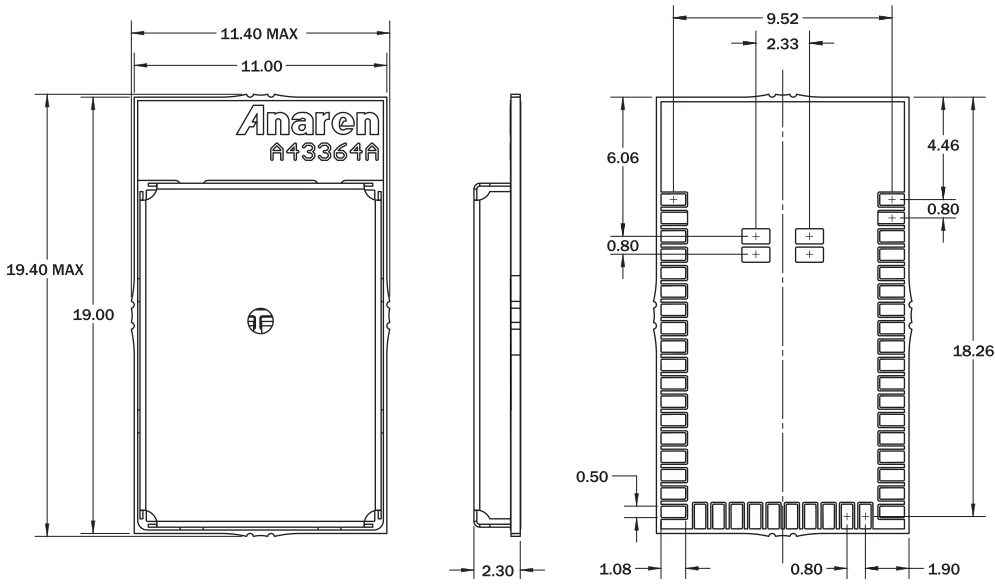
3.7.1. A43364A

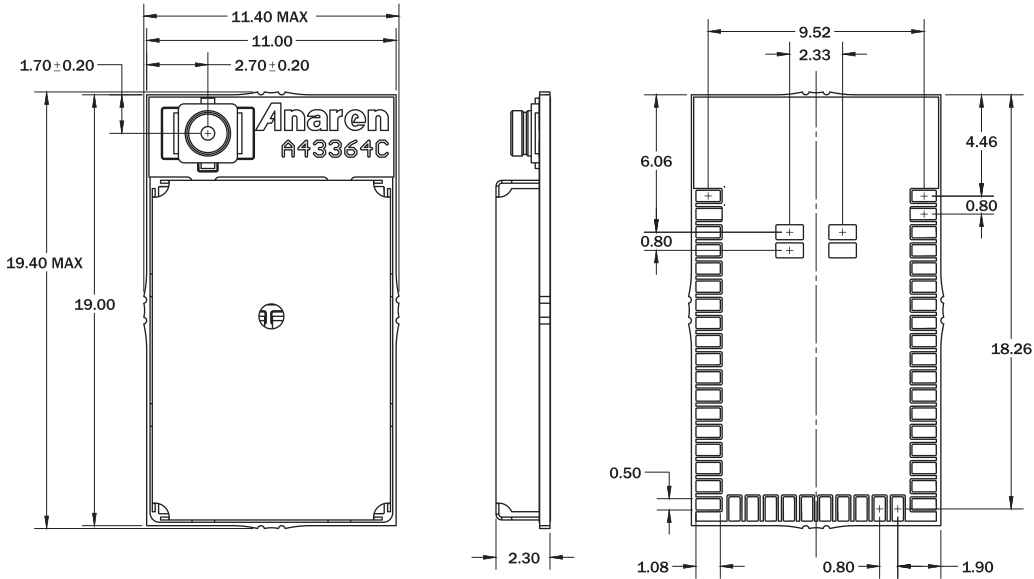Figure 8: A43364A Dimensions

3.7.2. A43364C

Figure 9: A43364C Dimensions

3.8. Packaging Details (dimensions in mm)

A43364x modules are available in either matrix tray or tape-and-reel packaging for high-volume assembly. Details of packaging are provided below.
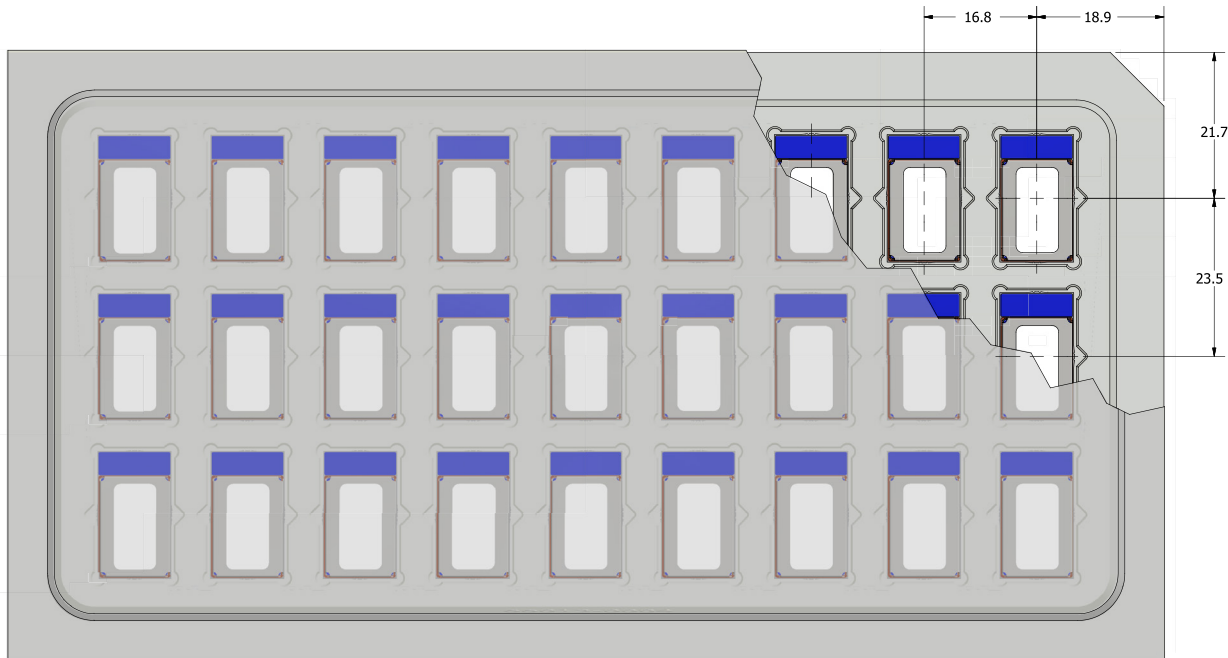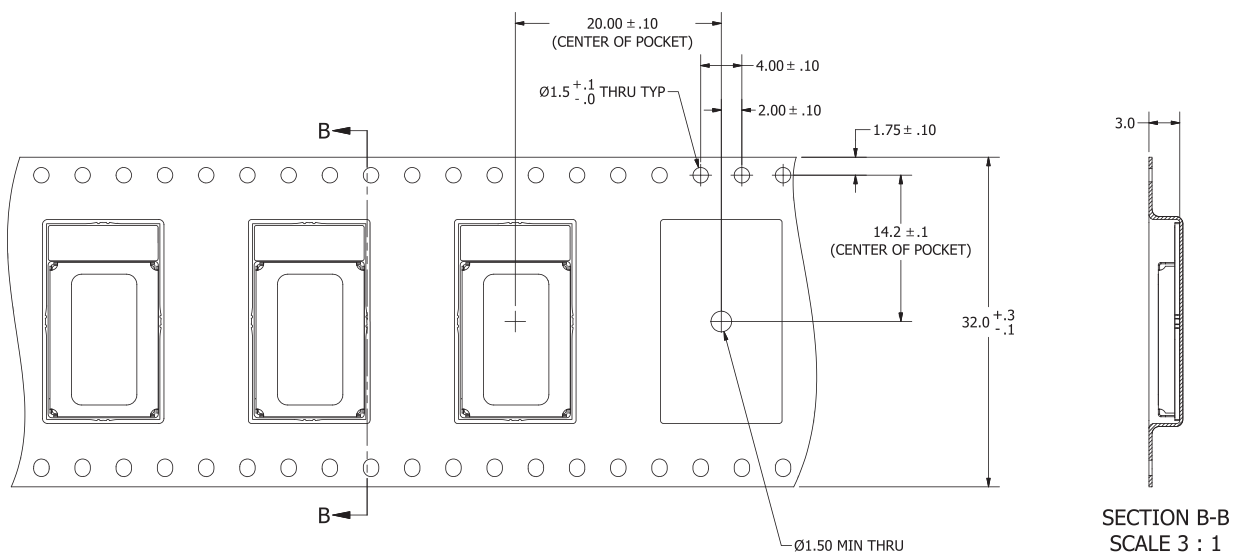
3.8.1. Matrix Tray Packaging

Figure 10: A43364AxxGM and A43364CxxGM Matrix Tray Packaging Detail (27/Tray)

3.8.2. Tape-Reel Packaging

DIRECTION OF PART FEED (LOADING)

Figure 11: A43364AGR and A43364CGR Tape-Reel Packaging Detail (500/Reel)

3.9. Soldering

A43364x modules may be mounted either manually (for prototyping), or automatically for production. A no-clean tin/silver/copper (SAC) solder is recommended, however, lead-based no-clean pastes may also be used.

CAUTION: A43364x modules are designed for no-clean fluxes only. DO NOT use water-based fluxes that require aqueous cleaning after solder. Spot cleaning with a flux remover and toothbrush may be performed with care.

3.9.1. Manual Mounting Procedure

The recommended soldering method is reflowing of a paste solder on a hot plate. This method works as long as the bottom of the board (where the module is to be mounted) is accessible, and there are no bottom-side components in the way.

An aluminum or copper block may be placed on the hot plate surface to transfer heat to a localized area on the board where the module is mounted. The following instructions demonstrate how to mount the module:
1. Set the hot plate to the reflow temperature the solder manufacturer recommends.
2. Apply solder paste to the pads on the board receiving the module.
3. Place the module carefully onto the dispensed solder.
4. Using tweezers or another holding device, carefully place the board holding module onto the hot plate surface (or metal block).
5. Apply heat until reflow occurs, per solder paste manufacturer's recommendations.
6. Carefully remove the board and place it on a heat-resistant surface to cool.
7. Check the assembly electrically to confirm there are no open or short circuits.

3.9.2. Automated Mounting

The A43364x module's recommended solder reflow profile is based on IPC/JEDEC J-STD-020.

Profile Feature	Sn-Pb Eutectic Assembly	Pb-free Assembly
Average ramp-up rate (Ts_{max} to Tp)	3°C/second max	3°C/second max
Preheat: • Temperature Min (Ts_{min}) • Temperature Max (Ts_{max}) • Time (Ts_{min} to Ts_{max})	• 100°C • 150°C • 60-120 seconds	• 150°C • 200°C • 60-180 seconds
Time maintained above: • Temperature (T_L) • Time (t_L)	• 183°C • 60-120 seconds	• 217°C • 60-150 seconds
Peak Temperature (Tp)	See Table 11	See Table 12
Time within 5°C of actual peak temperature (tp)[2]	10-30 seconds	20-40 seconds
Ramp-down rate	6°C/second max	6°C/second max
Time 23°C to peak temperature	6 minutes max	8 minutes max

Table 10: Classification Reflow Profiles

NOTE 1: All temperatures refer to the top side of the package, measured on the package body surface.
NOTE 2: Time within 5°C of actual peak temperature (tp) specified for the reflow profiles is a "supplier" minimum and a "user" maximum.

Figure 12: Classification Reflow Profile
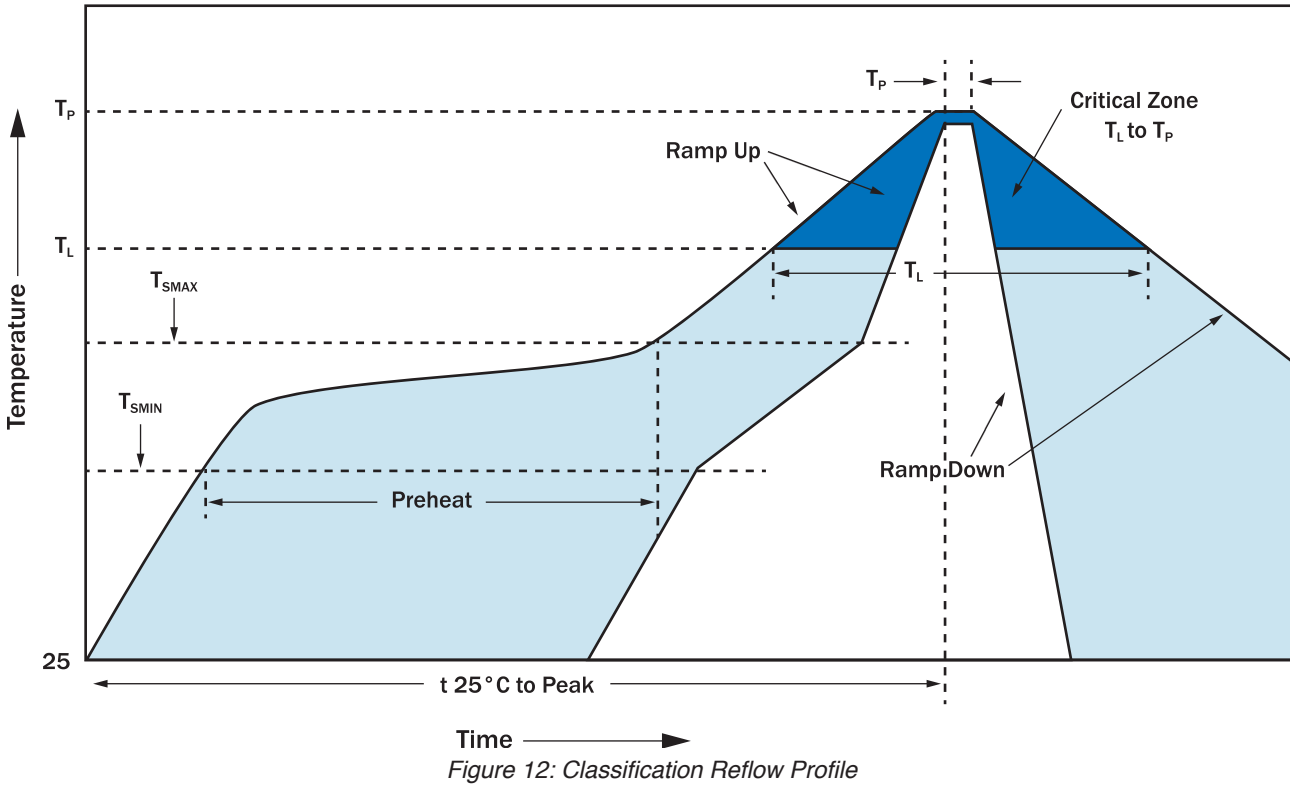
Package Thickness	Volume mm^3 <350	Volume mm^3 ≥350
<2.5mm	240+0/-5°C	225+0/-5°C
≥2.5mm	225+0/-5°C	225+0/-5°C

Table 11: SnPB Eutectic Process - Package Peak Reflow Temperatures

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<2.5mm	260°C*	260°C*	260°C*
1.6mm-2.5mm	260°C*	250°C*	245°C*
>2.5mm	250°C*	245°C*	245°C*
*Tolerance: The device manufacturer/supplier shall assure process compatibility up to an including the stated classification temperature at the rated MSL level.			

Table 12: Pb-free Process - Package Peak Reflow Temperatures

Date	Author	Change Note No./Notes
1/16/17	Chilbert	Submitted final manual

If you have additional questions, would like samples, or would like a quote, please contact the Anaren AIR team at AIR@anaren.com

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