# 适用于 MCU 应用的 CC3100MOD SimpleLink™ Wi-Fi CERTIFIED™ 网络处理器物联网模块解决方案

## 1 特性

- CC3100MOD 是一个由 CC3100R11MRGC 组成的 Wi-Fi® 模块， Wi-Fi 网络处理器 以及电源管理子系统。该完全集成模块包括所有必需的时钟、串行外设接口 (SPI) 闪存和无源器件。
- 模块化 FCC、IC、TELEC 和 CE 这些认证可帮助客户省力、省时、省钱
- Wi-Fi CERTIFIED™ 模块，支持 Wi-Fi Alliance 成员申请证书转让
- Wi-Fi 网络处理器子系统
  - 具有 Wi-Fi Internet-on-a chip™ 电路
  - 专用的 Arm® 微控制器 (MCU)

    可充分减轻外部 MCU 的 Wi-Fi 和互联网协议负载
  - ROM 中集成 Wi-Fi 驱动程序和多个互联网协议
  - 802.11 b/g/n 无线电、基带和媒体访问控制 (MAC)、Wi-Fi 驱动程序和请求
  - TCP/IP 堆栈
    - 业界通用 BSD 套接字应用编程接口 (API)
    - 8 个同步 TCP 或 UDP 套接字
    - 8 个套接字中的 2 个可以是 TLS 和 SSL 套接字
  - 强大的加密引擎，用于与针对 TLS 和 SSL 连接的 256 位 AES 加密的快速、安全 Wi-Fi 和互联网连接
  - 基站、AP 和 Wi-Fi Direct® 模式
  - WPA2 个人版和企业版安全性
  - 适用于自主和快速 Wi-Fi 连接的 SimpleLink™ 连接管理器
  - SmartConfig™ 技术、AP 模式和 WPS2，这些技术用于实现简单且灵活的 Wi-Fi 配置
  - TX 功率
    - 1 DSSS 时为 17dBm
    - 11 CCK 时为 17.25dBm
    - 54 OFDM 时为 13.5dBm
  - RX 灵敏度
    - 1 DSSS 时为 –94.7dBm
    - 11 CCK 时为 –87dBm
    - 54 OFDM 时为 –73dBm
  - 应用吞吐量
    - UDP：16Mbps
    - TCP：13Mbps
- 主机接口
  - 宽电源电压范围 ( 2.3V 至 3.6V )
  - 可通过 SPI 或 UART 接口与 8 位、16 位和 32 位 MCU 或 ASIC 连接
  - 主机驱动程序占用空间低：小于 6KB
  - 支持 RTOS 和无操作系统应用
- 电源管理子系统
  - 集成式直流/直流转换器支持宽电源电压范围：
    - 直接电池模式：2.3V 至 3.6V
  - 电压为 3.6V 时为低功耗
    - 实时时钟 (RTC) 休眠：7 µA
    - 待机：140 µA
    - RX 流量：54 OFDM 时为 54 mA
    - TX 流量：54 OFDM 时为 223 mA
- 模块上的 集成组件
  - 具有内部振荡器的 40.0MHz 晶体
  - 32.768kHz 晶体 (RTC)
  - 8Mbit SPI 串行闪存
  - 射频滤波器和无源器件
- 1.27mm 间距、63 引脚、20.5mm × 17.5mm LGA 封装，可实现轻松组装和低成本 PCB 设计
- 工作温度范围： –20°C 至 +70°C
- 模块支持 SimpleLink 开发人员生态系统

## 2 应用

用于物联网应用 (IoT)，例如：

- 云连接
- 互联网网关
- 家庭自动化
- 家用电器
- 门禁
- 安全系统
- 智能能源
- 工业控制
- 智能插座和仪表计量
- 无线音频
- IP 网络传感器节点
- 可穿戴设备

## 3 说明

向适用于物联网应用的低成本、低功耗 MCU 添加了 Wi-Fi®。CC3100MOD 是一款 FCC、IC、CE、 和 Wi-Fi CERTIFIED™ 模块，属于 SimpleLink™ Wi-Fi 系列，可极大地简化互联网连接的实施。CC3100MOD 集成了针对 Wi-Fi 和互联网的所有协议，极大程度降低了对主机 MCU 软件的要求。借助内置安全协议，CC3100MOD 解决方案可提供稳健且简单的安全体验。此外，CC3100MOD 是一个完整的平台解决方案，包括各种工具和软件、示例应用、用户和编程指南、参考设计以及 TI E2E™ 支持社区。CC3100MOD 采用 LGA 封装，易于布置所有必需组件，包括串行闪存、射频滤波器、晶体和全集成无源器件。

Wi-Fi 网络处理器子系统具有 Wi-Fi Internet-on-a chip™ 电路，并包含一个额外的专用 Arm® MCU，可减少主机 MCU 的。此子系统包含 802.11b/g/n 无线电、基带和具有强大加密引擎的 MAC，采用 256 位加密，可实现快速、安全的互联网连接。CC3100MOD 模块支持基站、接入点和 Wi-Fi Direct 模式。此模块支持 WPA2 个人和企业安全性以及 WPS 2.0。该子系统包含嵌入式 TCP/IP、TLS/SSL 堆栈、HTTP 服务器和多个互联网协议。

电源管理子系统包括支持宽电源电压范围的集成式直流/直流转换器。该子系统支持低功耗模式，例如 RTC 休眠，这需要大概 7μA 的电流。CC3100MOD 模块可通过 SPI 或 UART 接口连接至任何 8 位、16 位或 32 位 MCU。该器件驱动程序最大程度地减少了主机内存占用要求，TCP 客户端应用只需不到 7KB 的代码存储器和 700B 的 RAM。

**表 3-1. 模块信息**

| 器件型号(1) | 封装 | 封装尺寸 |
|---|---|---|
| CC3100MODR11MAMOB | MOB (63) | 20.5mm × 17.5mm |

(1) 如需更多信息，请参阅 节 13。

# 4 功能方框图

图 4-1 显示了 CC3100MOD 模块的功能方框图。

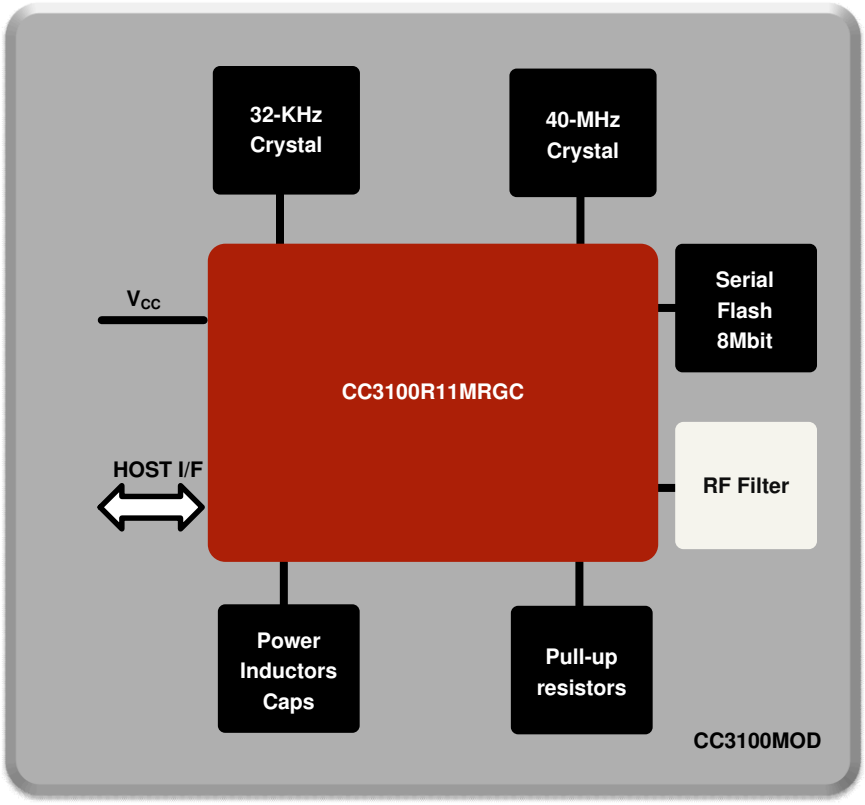



**图 4-1. CC3100MOD 功能方框图**

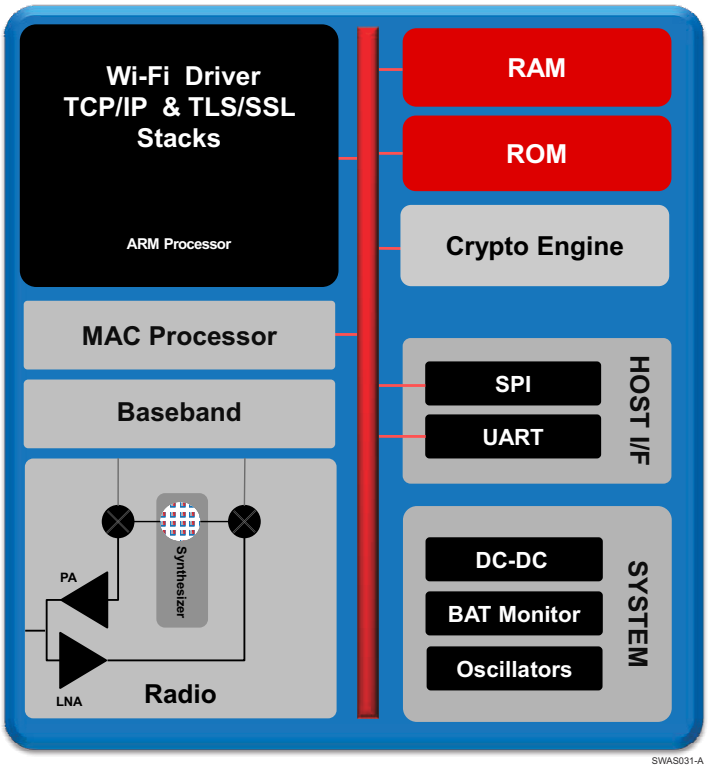



图 4-2. CC3100 硬件概览

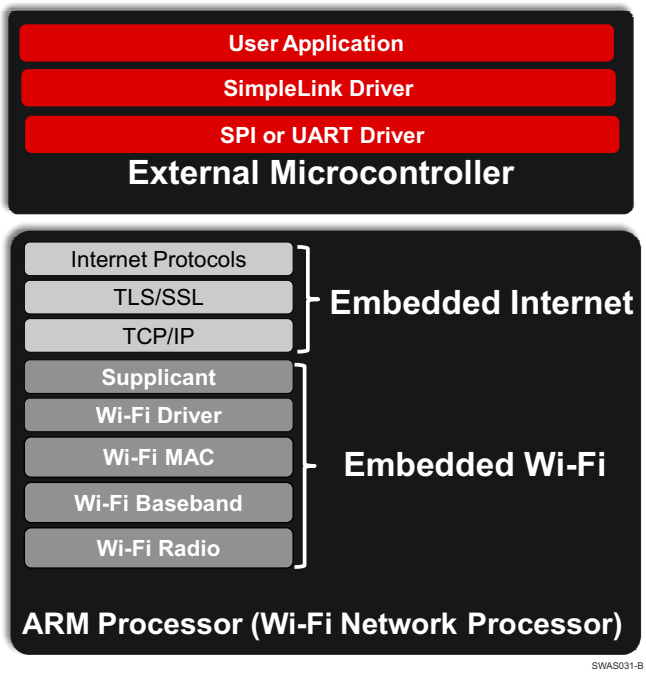



图 4-3. CC3100 软件概览

# 5 功能方框图

图 5-1 显示了 CC3100MOD 模块的功能方框图。

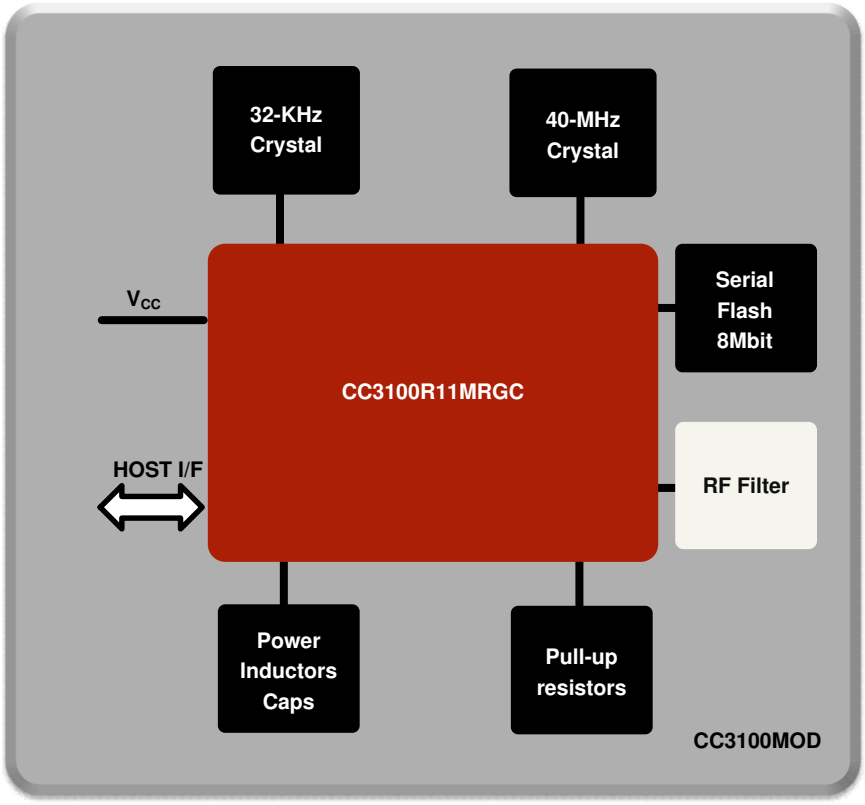



**图 5-1. CC3100MOD 功能方框图**

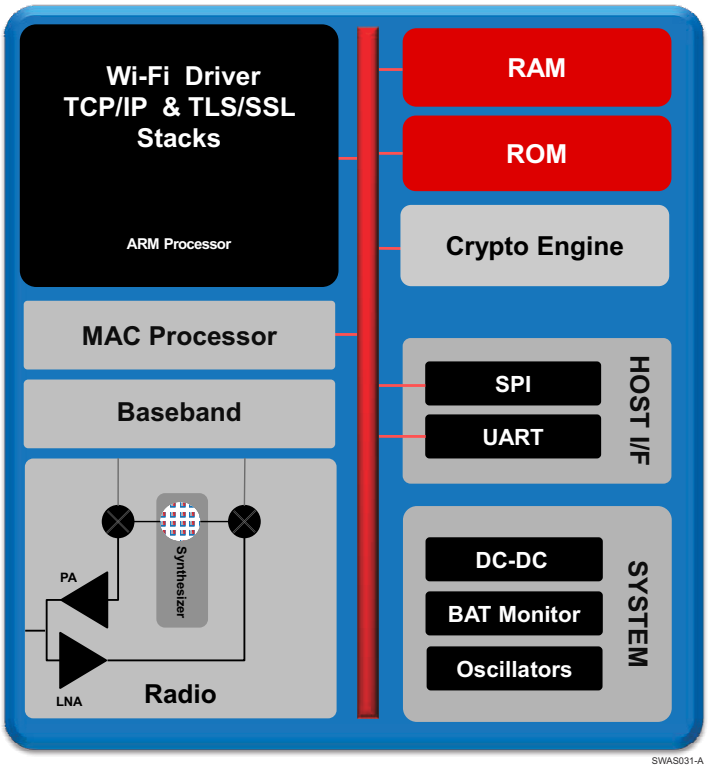



图 5-2. CC3100 硬件概览

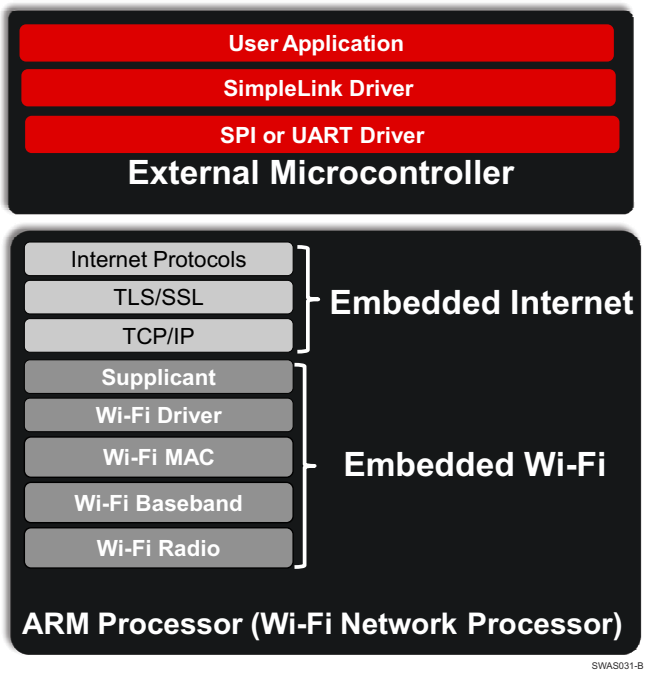



图 5-3. CC3100 软件概览

# Table of Contents



## 6 Revision History

注：以前版本的页码可能与当前版本的页码不同

| Changes from December 6, 2014 to September 22, 2020 (from Revision A () to Revision B ()) | Page |
|---|---|
| • 更新了整个文档中的表格、图和交叉参考的编号格式 | 1 |
| • 将 VBAT 或宽电压模式更新和更改为直接电池 | 1 |
| • 更新了特色 VBAT 范围，将其从“2.3V 至 3.63V”更改为“2.3V 至 3.6V” | 1 |
| • 将 TX 电流从 150mA (54 OFDM) 更改为 223 mA (54 OFDM) | 1 |
| • Changed MODULE PIN DESCRIPTION for PIN NO. 47 | 10 |
| • Changed from *Handling Ratings* table to *ESD Ratings* table | 12 |
| • Deleted Reset Requirements table | 13 |
| • Added graphs representing TX Power and IBAT vs TX Power Level Settings (1 DSSS, 6 OFDM, and 54 OFDM) | 13 |
| • Changed *Brownout and Blackout Conditions* section | 15 |
| • Added *Electrical Characteristics* | 16 |
| • Changed $V_{OH}$ in *Electrical Characteristics (3.3 V, 25°C)* | 16 |
| • Changed $V_{OL}$ in *Electrical Characteristics (3.3 V, 25°C)* | 16 |
| • Changed the Low-level sink current $V_{OH}$ value from: 0.4 to: 0.6 in 节 8.8 | 16 |
| • Deleted $V_{OH}$ and $V_{OL}$ from the pullup and pulldown current entries in 节 8.8 | 16 |
| • Changed 图 8-8 | 19 |
| • Changed minimum clock period to 50 ns, maximum clock low period to 25 ns, and maximum clock high period to 25 ns in *Host SPI Interface Timing Parameters* | 19 |
| • Changed minimum clock period to 50 ns, maximum clock low period to 25 ns, and maximum clock high period to 25 ns in *Host SPI Interface Timing Parameters* | 19 |
| • Added clock frequency at VBAT = 3.3 V and VBAT ≤ 2.1 V in *Host SPI Interface Timing Parameters* | 19 |

- Added description for nHIB pin in 表 8-3 ..... 20
- Changed HOST_SPI_CLK from 24 MHz to 20 MHz in 表 8-3 ..... 20
- Added 节 8.13, *Host UART* ..... 21
- Added 节 9.1, *Overview* ..... 23
- Changed 图 9-1 ..... 23
- Added 节 9.4, *Wi-Fi Network Processor Subsystem* ..... 24
- Added 表 9-1 ..... 24
- Changed in 节 9.5, *Power Management Architecture* ..... 25
- Added 节 9.6, *Low-Power Operating Modes* ..... 25
- Changed LPDS wakeup time from 10 ms to < 3 ms in 节 9.6.1, *Low-Power Deep Sleep* ..... 25
- Added Note 1 for 图 10-1 ..... 28
- Changed the new *Device and Documentation Support* section ..... 36
- Added NOTE to *Mechanical Drawing* ..... 38
- Updated reel quantities in 节 13.2 ..... 40
- Changed Package Qty value for CC3100MODR11MAMOBR in 节 13.2.1 ..... 0
- Changed SPQ value for CC3100MODR11MAMOBR throughout 节 13.2.2 ..... 41
- Changed Pin1 Quadrant values in 节 13.2.2 ..... 41

# 7 Terminal Configuration and Functions

## 7.1 CC3100MOD Pin Diagram

图 7-1 shows the pin diagram for the CC3100MOD device.

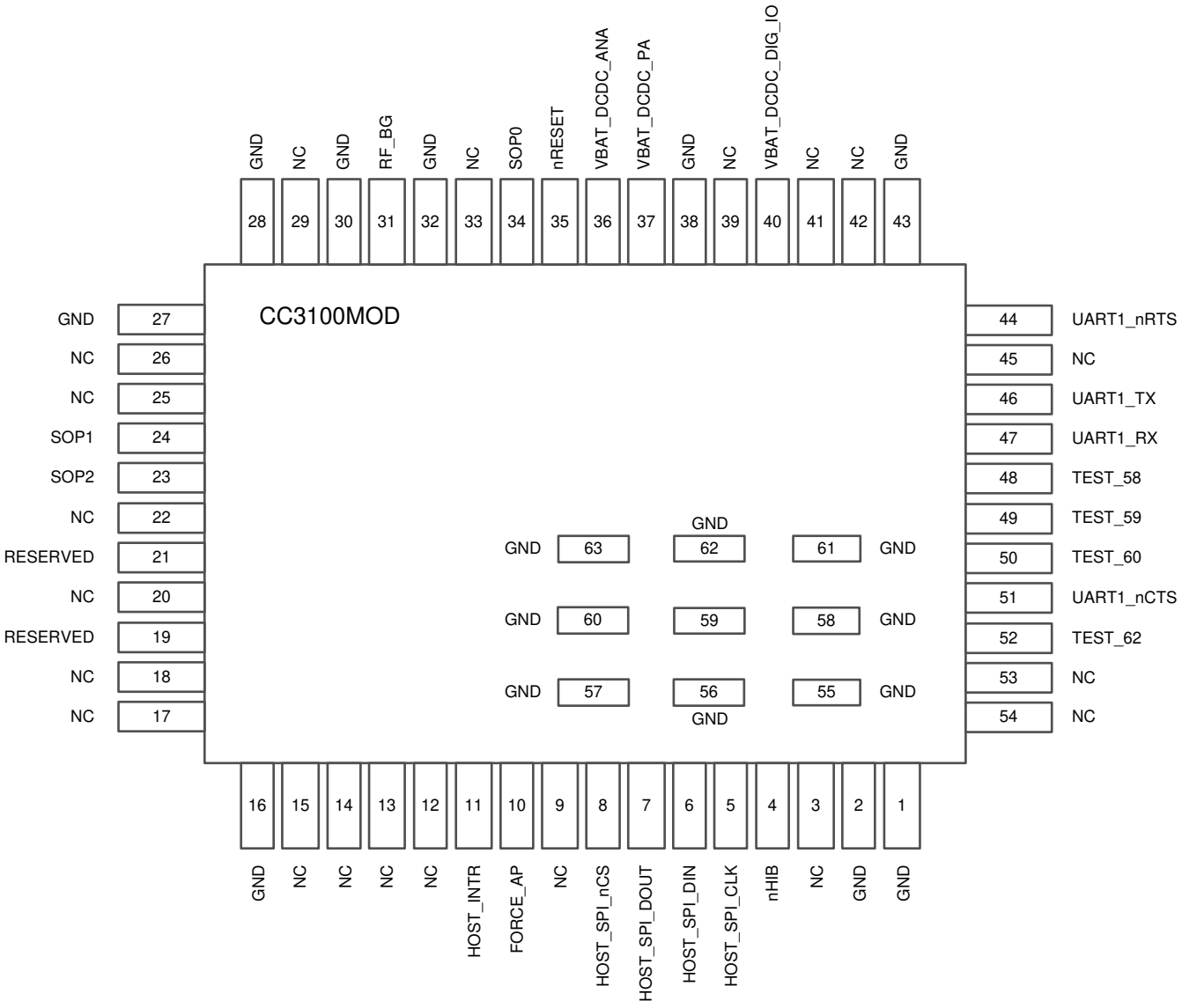



图 7-1 shows the approximate location of pins on the module. For the actual mechanical diagram, refer to 节 13.

**图 7-1. CC3100MOD Pin Diagram Bottom View**

## 7.2 Pin Attributes

表 7-1 lists the pin descriptions of the CC3100MOD module.

**备注**

If an external device drives a positive voltage to signal pads when the CC3100MOD is not powered, DC current is drawn from the other device. If the drive strength of the external device is adequate, an unintentional wakeup and boot of the CC3100MOD can occur. To prevent current draw, TI recommends one of the following:

- All devices interfaced to the CC3100MOD must be powered from the same power rail as the CC3100MOD.
- Use level-shifters between the CC3100MOD and any external devices fed from other independent rails.
- The nRESET pin of the CC3100MOD must be held low until the $V_{BAT}$ supply to the device is driven and stable. Leaving the nRESET pin unconnected ensures **this (_____)** automatically due to the internal RC circuit.

**表 7-1. Module Pin Attributes**

| PIN(1) | DEFAULT FUNCTION | TYPE | DESCRIPTION |
|---|---|---|---|
| 1 | GND | – | Ground |
| 2 | GND | – | Ground |
| 3 | NC | – | Reserved. Do not connect. |
| 4 | nHIB | I | Hibernate signal, active low. Refer to 图 8-7. |
| 5 | HOST_SPI_CLK | I | Host interface SPI clock |
| 6 | HOST_SPI_DIN | I | Host interface SPI data input |
| 7 | HOST_SPI_DOUT | O | Host interface SPI data output |
| 8 | HOST_SPI_nCS | I | Host interface SPI chip select (active low) |
| 9 | NC | – | Reserved. Do not connect. |
| 10 | NC | – | Reserved. Do not connect. |
| 11 | HOST_INTR | O | Interrupt output |
| 12 | NC | – | Reserved. Do not connect. |
| 13 | FLASH_SPI_MISO | I | Serial flash interface: SPI data in (active high) |
| 14 | FLASH_SPI_nCS_IN | O | Serial flash interface: SPI chip select (active low) |
| 15 | FLASH_SPI_CLK | O | Serial flash interface: SPI clock |
| 16 | GND | – | Ground |
| 17 | FLASH_SPI_MOSI | O | Serial flash interface: SPI data out |
| 18 | NC | – | Reserved. Do not connect. |
| 19 | RESERVED | – | Reserved. Do not connect. |
| 20 | NC | – | Unused. Do not connect. |
| 21 | RESERVED | – | Add 100-kΩ external pulldown resistor. Not adding this resistor can lead to higher current in LPDS mode. |
| 22 | | | |
| 23 | SOP2/TCXO_EN | – | Add 10-kΩ pulldown to ground. |
| 24 | SOP1 | – | Add 100k pulldown to ground. |
| 25 | NC | – | Reserved. Do not connect. |
| 26 | NC | – | Reserved. Do not connect. |
| 27, 28 | GND | – | Ground |
| 29 | NC | – | Do not connect. |

表 7-1. Module Pin Attributes (continued)

| PIN(1) | DEFAULT FUNCTION | TYPE | DESCRIPTION |
|---|---|---|---|
| 30 | GND | – | Ground. Reference for RF signal. |
| 31 | RF_BG | I/O | 2.4-GHz RF input/output |
| 32 | GND | – | Ground. Reference for RF signal. |
| 33 | NC | – | Reserved. Do not connect. |
| 34 | SOP0 | – | Add 100k pulldown to ground. |
| 35 | nRESET | I | Power on reset. Does not require external RC circuit. |
| 36 | VBAT_RESET | – | Power supply to internal pull-up resistor on nRESET pin (2.3 V to 3.6 V) |
| 37 | VBAT1 | – | Power supply for the module, can be connected to battery (2.3 V to 3.6 V). |
| 38 | GND | – | Ground |
| 39 | NC | – | To be left unconnected. Used for prototype samples only. |
| 40 | VBAT2 | – | Power supply for the module, can be connected to battery (2.3 V to 3.6 V). |
| 41, 42 | NC | – | Reserved. Do not connect. |
| 43 | GND | – | Ground |
| 44 | UART1_nRTS | O | UART request to send, connect to external test point. Used for on-module flash reprogramming. Add 100-kΩ pulldown to ground when using UART for host interface. |
| 45 | NC | – | Reserved. Do not connect. |
| 46 | UART1_TX | O | UART transmit, connect to external test point. Used for on-module flash reprogramming. |
| 47 | UART1_RX | I | UART receive, connect to external test point. Used for on-module flash reprogramming. TI recommends using a 100-kΩ pullup resistor to save a few tens of µA in hibernate state. |
| 48 | TEST_58 | O | Connect to external test point. |
| 49 | TEST_59 | I | Connect to external test point. |
| 50 | TEST_60 | O | Connect to external test point. |
| 51 | UART1_nCTS | I | UART clear to send, connect to external test point. Used for on-module flash reprogramming. |
| 52 | TEST_62 | O | Connect to external test point. |
| 53, 54 | NC | – | Reserved. Do not connect. |
| 55, 56, 57, 58, 59, 60, 61, 62, 63 | GND | – | Thermal Ground |

(1) Using a configuration file stored on flash, the vendor can optionally block any possibility of bringing up AP using the FORCE_AP pin.

# 8 Specifications

## 8.1 Absolute Maximum Ratings

These specifications indicate levels where permanent damage to the module can occur. Functional operation is not ensured under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the module (1) (2).

| | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{BAT}$ and VIO | Respect to GND | – 0.5 | 3.3 | 3.8 | V |
| Digital I/O | | – 0.5 | | $V_{BAT}$ + 0.5 | V |
| RF pin (Pin 31) | | – 0.5 | | 2.1 | V |
| Analog pins | | – 0.5 | | 2.1 | V |
| Operating temperature, $T_A$ | | – 40 | | 85 | °C |
| Storage temperature, $T_{stg}$ | | – 55 | | 125 | °C |
| Junction temperature, $T_j$ | | | | 104 | °C |

(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* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
(2) All voltage values are with respect to $V_{SS}$, unless otherwise noted.

## 8.2 ESD Ratings

| | | | | VALUE | UNIT |
|---|---|---|---|---|---|
| $V_{ESD}$ | Electrostatic discharge (ESD) performance | Human body model (HBM), per ANSI/ESDA/JEDEC JS001(1) | | ±1000 | V |
| | | Charged device model (CDM), per JESD22-C101(2) | All pins | ±250 | |

(1) JEDEC document JEP155 states that 500-V HBM allows safe manufacturing with a standard ESD control process.
(2) JEDEC document JEP157 states that 250-V CDM allows safe manufacturing with a standard ESD control process.

## 8.3 Power-On Hours (POH)

This information is provided solely for your convenience and does not extend or modify the warranty provided under TI's standard terms and conditions for TI semiconductor products.

| OPERATING CONDITION | JUNCTION TEMPERATURE ($T_j$) | POH |
|---|---|---|
| 20% active mode<br>80% sleep mode | $T_{Ambient}$ up to 85°C(2) | 17500(1) |

(1) The CC3100MOD device can be operated reliably for 10 years.
(2) The TX duty cycle (power amplifier ON time) is assumed to be 10% of the device POH. Of the remaining 90% of the time, the device can be in any other state.

## 8.4 Recommended Operating Conditions

Function operation is not ensured outside this limit, and operation outside this limit for extended periods can adversely affect long-term reliability of the module(1) (2).

| | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|
| $V_{BAT}$ and VIO | 2.3 | 3.3 | 3.6 | V |
| Operating temperature | – 20 | 25 | 70 | °C |
| Ambient thermal slew | – 20 | | 20 | °C/minute |

(1) Operating temperature is limited by crystal frequency variation.
(2) To ensure WLAN performance, the ripple on the power supply must be less than ±300 mV. The ripple should not cause the supply to fall below the brown-out voltage.

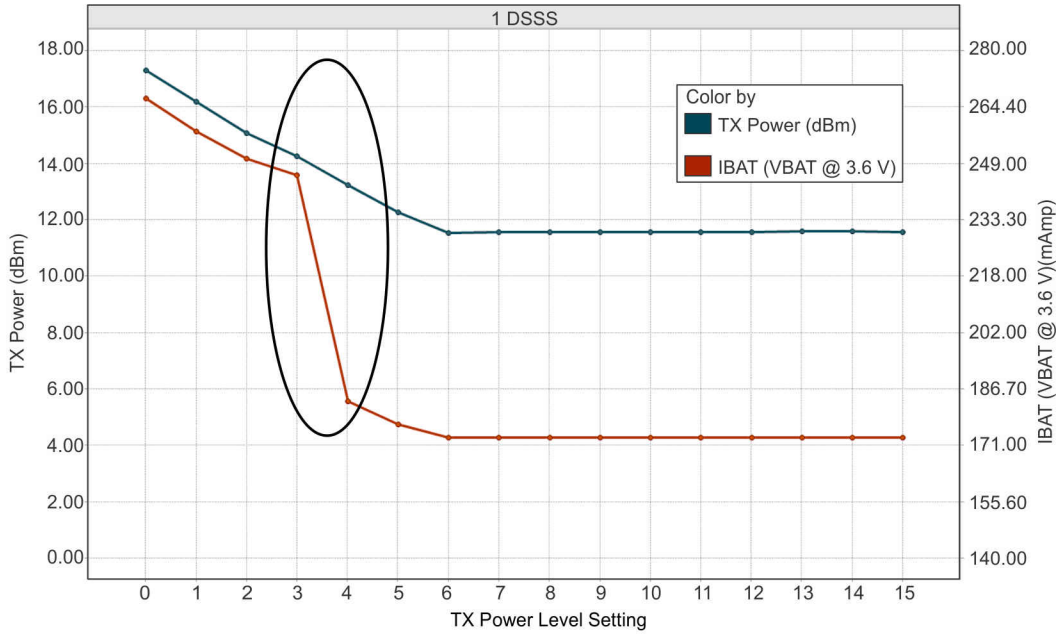
## 8.5 Power Consumption Summary

$T_A$ = 25°C, $V_{BAT}$ = 3.6 V

| PARAMETER | TEST CONDITIONS(1) (2) | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| TX | 1 DSSS | TX power level = 0 | | 272 | | mA |
| | | TX power level = 4 | | 188 | | |
| | 6 OFDM | TX power level = 0 | | 248 | | |
| | | TX power level = 4 | | 179 | | |
| | 54 OFDM | TX power level = 0 | | 223 | | |
| | | TX power level = 4 | | 160 | | |
| RX(3) | 1 DSSS | | | 53 | | mA |
| | 54 OFDM | | | 53 | | |
| Idle connected(4) | | | | 0.715 | | mA |
| LPDS | | | | 0.140 | | mA |
| Hibernate | | | | 7 | | µA |
| Peak calibration current(3) (5) | $V_{BAT}$ = 3.3 V | | | 450 | | mA |
| | $V_{BAT}$ = 2.3 V | | | 620 | | |

(1) TX power level = 0 implies maximum power (see 图 8-1, 图 8-2, and 图 8-3). TX power level = 4 implies output power backed off approximately 4 dB.
(2) The CC3100 system is a constant power-source system. The active current numbers scale inversely on the $V_{BAT}$ voltage supplied.
(3) The RX current is measured with a 1-Mbps throughput rate.
(4) DTIM = 1
(5) The complete calibration can take up to 17 mJ of energy from the battery over a time of 24 ms. In default mode, calibration is performed sparingly, typically when coming out of Hibernate and only if the temperature has changed by more than 20°C, or the time elapsed from prior calibration is greater than 24 hours.

## 8.6 TX Power and IBAT versus TX Power Level Settings




Note: The area enclosed in the circle represents a significant reduction in current during transition from TX power level 3 to 4. In the case of lower range requirements (13-dBm output power), TI recommends using TX power level 4 to reduce the current.

**图 8-1. TX Power and IBAT vs TX Power Level Settings (1 DSSS)**

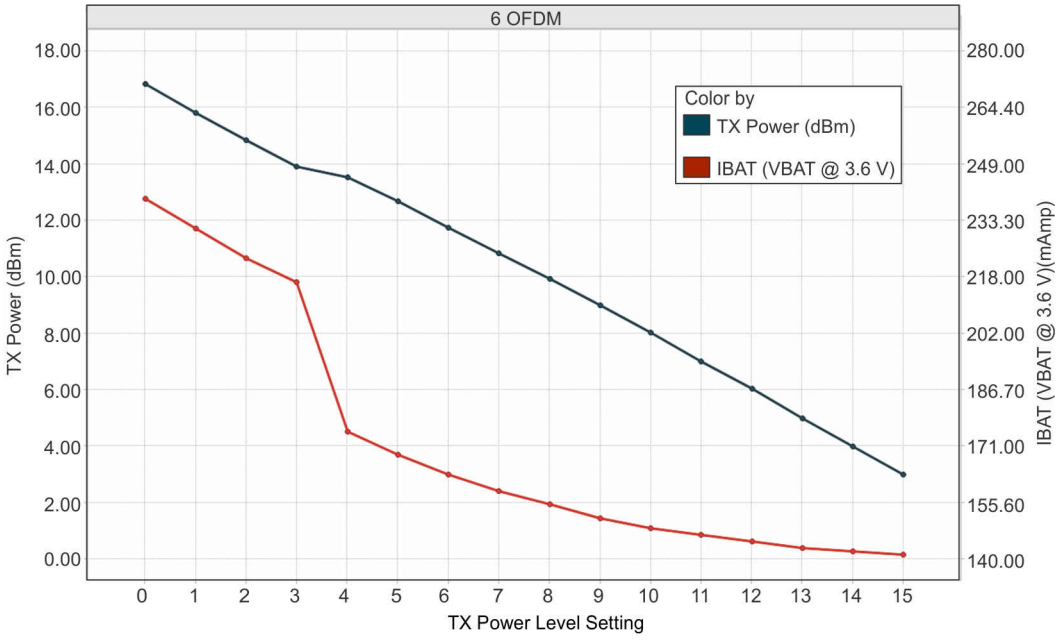



**图 8-2. TX Power and IBAT vs TX Power Level Settings (6 OFDM)**

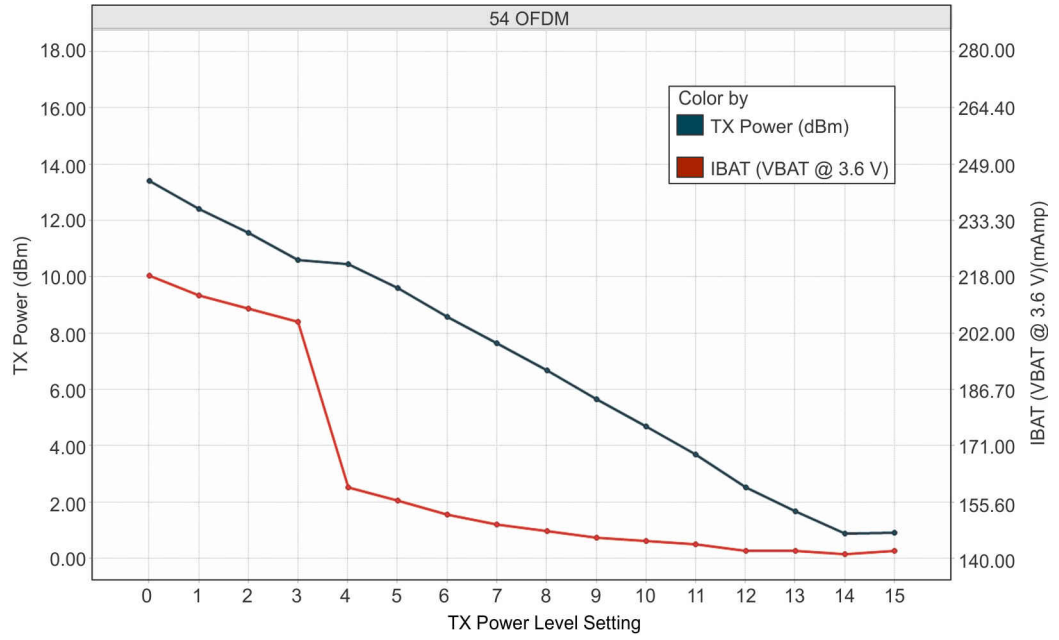



**图 8-3. TX Power and IBAT vs TX Power Level Settings (54 OFDM)**

## 8.7 Brownout and Blackout Conditions

The module enters a brownout condition when the input voltage dips below $V_{BROWNOUT}$ (see 图 8-4 and 图 8-5). This condition must be considered during design of the power supply routing, especially if operating from a battery. High-current operations, such as a TX packet or any external activity (not necessarily related directly to networking) can cause a drop in the supply voltage, potentially triggering a brownout condition. The resistance includes the internal resistance of the battery, contact resistance of the battery holder (four contacts for a 2× AA battery), and the wiring and PCB routing resistance.

**备注**

When the device is in the Hibernate state, brownout is not detected; only blackout is in effect during the Hibernate state.

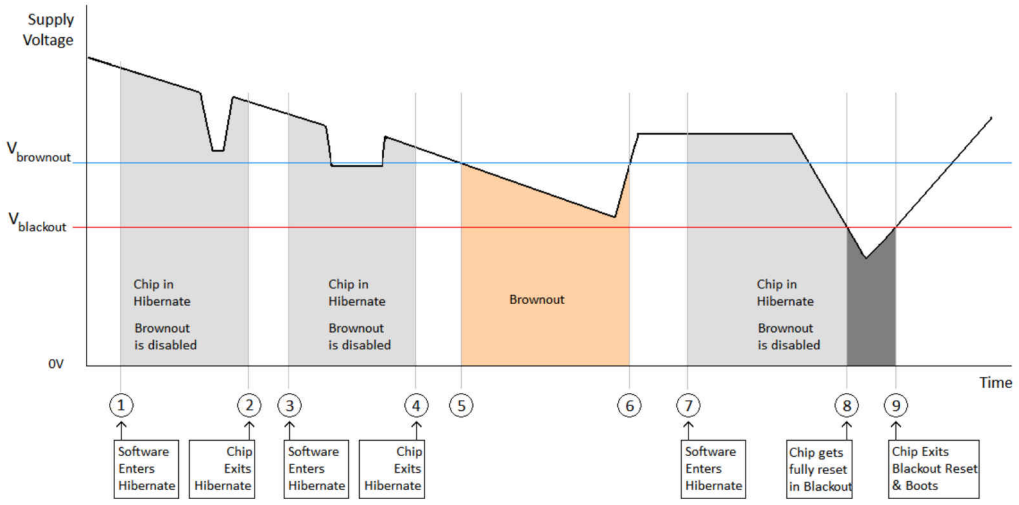



**图 8-4. Brownout and Blackout Levels (1 of 2)**

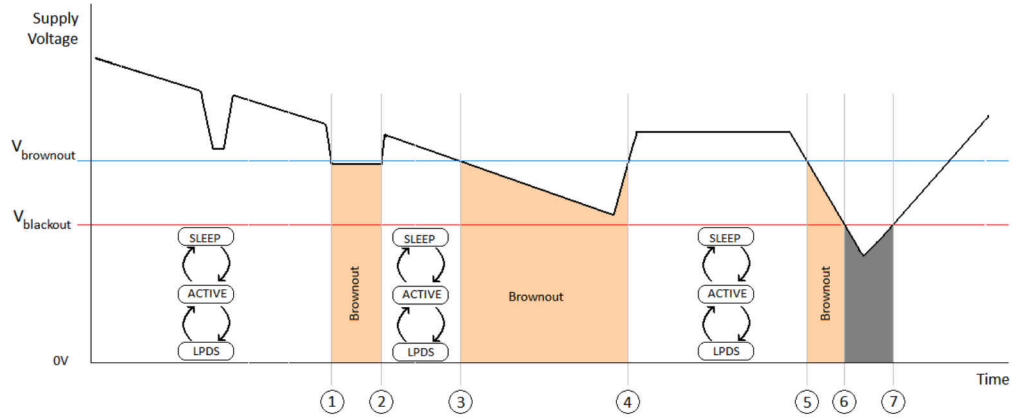



**图 8-5. Brownout and Blackout Levels (2 of 2)**

In the brownout condition, all sections of the CC3100MOD (including the 32-kHz RTC) shut down except for the Hibernate module, which remains on. The current in this state can reach approximately 400 µA. The blackout condition is equivalent to a hardware reset event in which all states within the module are lost. $V_{brownout}$ = 2.1 V and $V_{blackout}$ = 1.67 V

## 8.8 Electrical Characteristics (3.3 V, 25°C)

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

| PARAMETER | | TEST CONDITIONS | DRIVE SETTING STRENGTH | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|---|
| $C_{IN}$ | Pin capacitance | | | | 4 | | pF |
| $V_{IH}$ | High-level input voltage | | | 0.65 × VDD | | VDD + 0.5 V | V |
| $V_{IL}$ | Low-level input voltage | | | –0.5 | | 0.35 × VDD | V |
| $I_{IH}$ | High-level input current | | | | 5 | | nA |
| $I_{IL}$ | Low-level input current | | | | 5 | | nA |
| $V_{OH}$ | High-level output voltage ($V_{DD}$ = 3.0 V) | $V_{CC}$ = 3 V, $I_{OL}$ = 2 mA | 2 mA | 2.4 | | | V |
| $V_{OL}$ | Low-level output voltage ($V_{DD}$ = 3.0 V) | $V_{CC}$ = 3 V, $I_{OL}$ = 2 mA | 2 mA | | | 0.4 | V |
| $I_{OH}$ | High-level source current, $V_{OH}$ = 2.4 | | | 6 | | | mA |
| $I_{OL}$ | Low-level sink current, $V_{OH}$ = 0.6 | | | 6 | | | mA |
| **PIN INTERNAL PULLUP and PULLDOWN (25°C)** | | | | | | | |
| $I_{OH}$ | Pullup current, ($V_{DD}$ = 3.0 V) | | | 5 | | 10 | µA |
| $I_{OL}$ | Pulldown current, ($V_{DD}$ = 3.0 V) | | | 5 | | | µA |
| $V_{IL}$ | nRESET(1) | | | | 0.6 | | V |

(1) The nRESET pin must be held below 0.6 V for the module to register a reset.

## 8.9 WLAN RF Characteristics

### 8.9.1 WLAN Receiver Characteristics

$T_A$ = 25°C, $V_{BAT}$ = 2.3 to 3.6 V. Parameters measured at module pin on channel 7 (2442 MHz).

| PARAMETER | RATE | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Sensitivity (8% PER for 11b rates, 10% PER for 11g or 11n rates) (10% PER)(1) | 1 DSSS | | –94.7 | | dBm |
| | 2 DSSS | | –92.6 | | |
| | 11 CCK | | –87.0 | | |
| | 6 OFDM | | –89.0 | | |
| | 9 OFDM | | –88.0 | | |
| | 18 OFDM | | –85.0 | | |
| | 36 OFDM | | –79.5 | | |
| | 54 OFDM | | –73.0 | | |
| | MCS7 (Mixed Mode) | | –69.0 | | |
| Maximum input level (10% PER) | 802.11b | | –3.0 | | dBm |
| | 802.11g | | –9.0 | | |

(1) Sensitivity is 1-dB worse on channel 13 (2472 MHz).

### 8.9.2 WLAN Transmitter Characteristics

$T_A$ = 25°C, $V_{BAT}$ = 2.3 to 3.6 V. Parameters measured at module pin on channel 7 (2442 MHz)(1).

| PARAMETER | RATE | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| Max RMS Output Power measured at 1 dB from IEEE spectral mask or EVM | 1 DSSS | | 17 | | dBm |
| | 2 DSSS | | 17 | | |
| | 11 CCK | | 17.25 | | |
| | 6 OFDM | | 16.25 | | |
| | 9 OFDM | | 16.25 | | |
| | 18 OFDM | | 16 | | |
| | 36 OFDM | | 15 | | |
| | 54 OFDM | | 13.5 | | |
| | MCS7 (Mixed Mode) | | 12 | | |
| Transmit center frequency accuracy | | –20 | | 20 | ppm |

(1) Channel-to-channel variation is up to 2 dB. The edge channels (2412 MHz and 2462 MHz) have reduced TX power to meet FCC emission limits.

## 8.10 Reset Requirement

| PARAMETER | | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|
| $V_{IH}$ | Operation mode level | | 0.65 × $V_{BAT}$ | | V |
| $V_{IL}$ | Shutdown mode level(1) | 0 | 0.6 | | V |
| | Minimum time for nReset low for resetting the module | 5 | | | ms |
| $T_r$ and $T_f$ | Rise and fall times | | 20 | | µs |

(1) The nRESET pin must be held below 0.6 V for the module to register a reset.

## 8.11 Thermal Resistance Characteristics for MOB Package

| NAME | DESCRIPTION | °C/W | AIR FLOW (m/s) |
|---|---|---|---|
| $R\Theta_{JC}$ | Junction-to-case | 9.08 | 0.00 |
| $R\Theta_{JB}$ | Junction-to-board | 10.34 | 0.00 |
| $R\Theta_{JA}$ | Junction-to-free air | 11.60 | 0.00 |
| $R\Theta_{JMA}$ | Junction-to-moving air | 5.05 | <1.00 |
| $Psi_{JT}$ | Junction-to-package top | 9.08 | 0.00 |
| $Psi_{JB}$ | Junction-to-board | 10.19 | 0.00 |

## 8.12 Timing and Switching Characteristics

### 8.12.1 Wake-Up Sequence

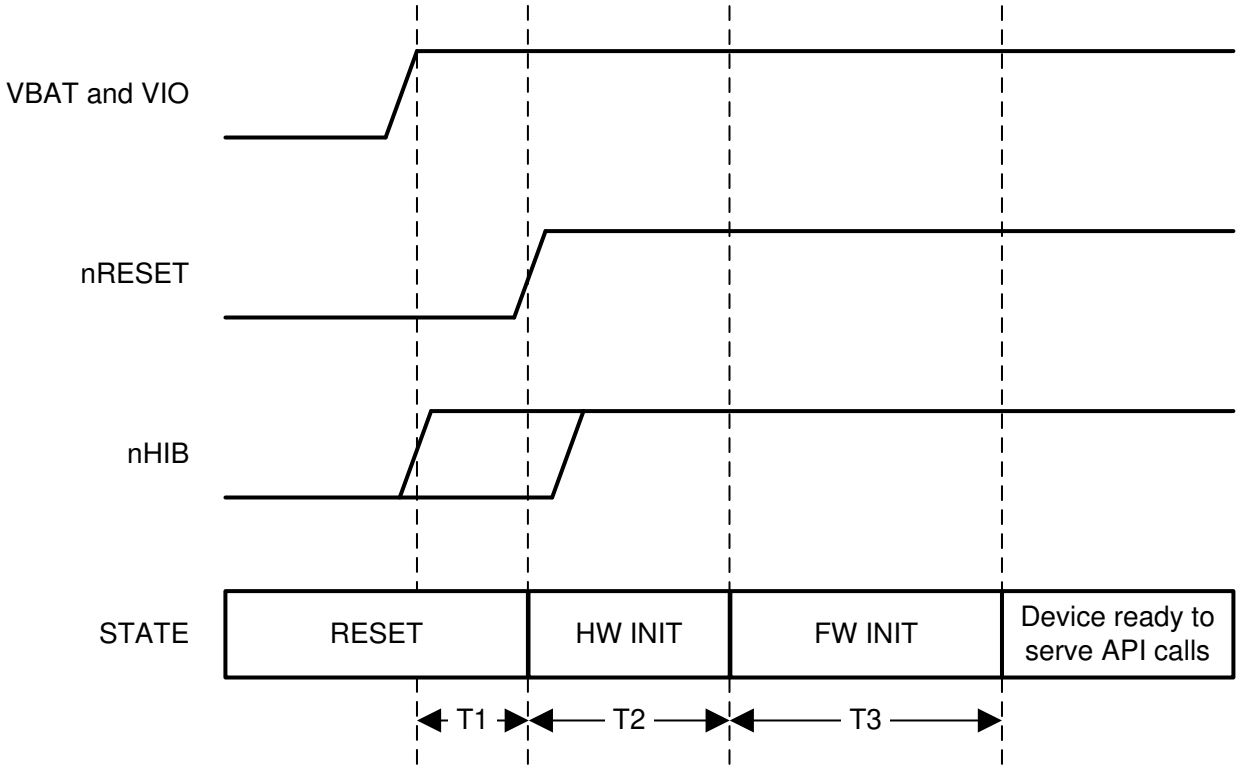



图 8-6. Wake-Up Sequence

表 8-1. First-Time Power-Up and Reset Removal Timing Requirements (32-kHz XTAL)

| ITEM | NAME | DESCRIPTION | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| T1 | Supply settling time | Depends on application board power supply, decap, and so on | | 3 | | ms |
| T2 | Hardware wake-up time | — | | 25 | | ms |
| T3 | Initialization time | 32-kHz XTAL settling + firmware initialization time + radio calibration | | 1.35 | | s |

### 8.12.2 Wake Up From Hibernate

图 8-7 shows the timing diagram for wake up from the hibernate state.

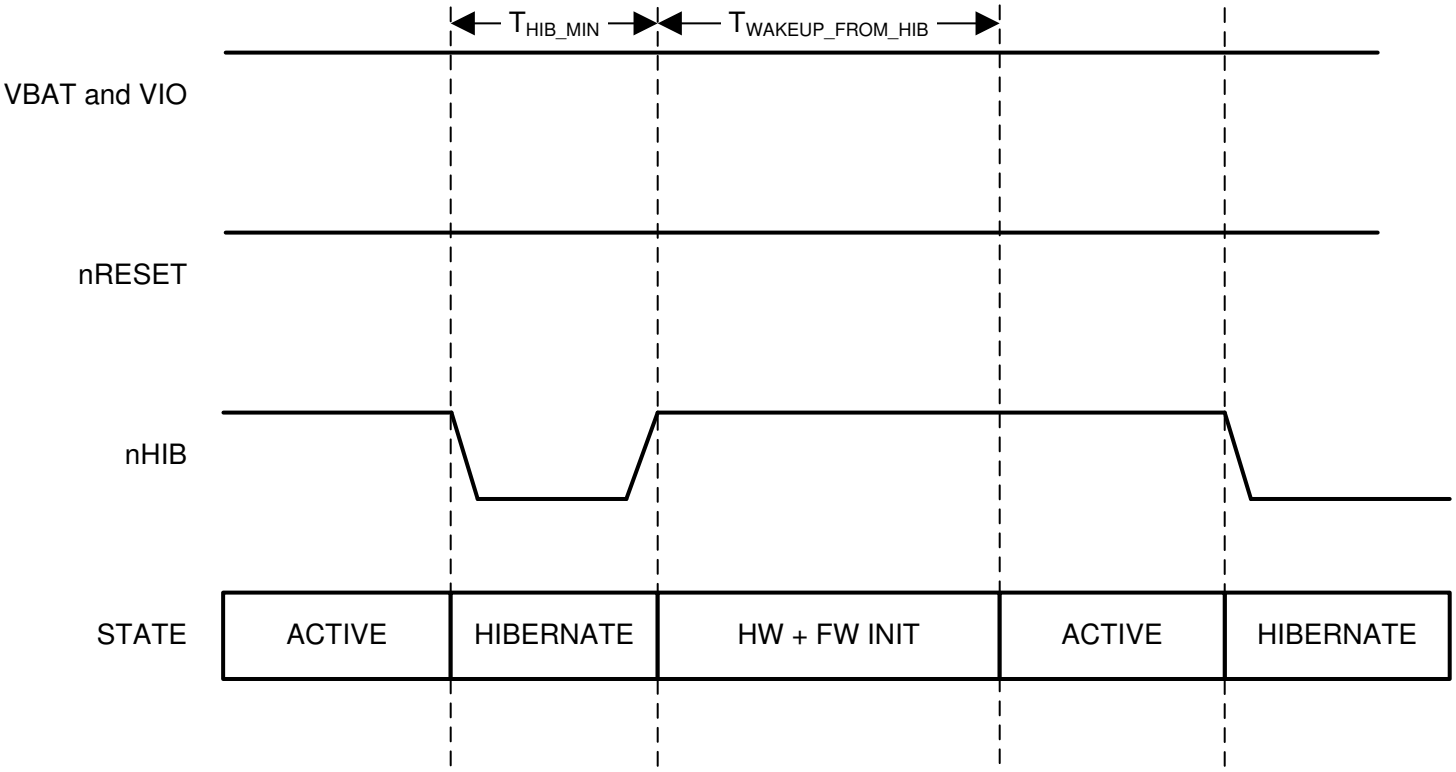



**图 8-7. nHIB Timing Diagram**

**备注**

The internal 32.768-kHz crystal oscillator is kept enabled by default when the chip goes to hibernate in response to nHIB being pulled low.

节 8.12.2.1 describes the timing requirements for nHIB.

#### *8.12.2.1 nHIB Timing Requirements*(1)

| ITEM | NAME | DESCRIPTION | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $T_{hib\_min}$ | Minimum hibernate time | Minimum LOW pulse width of nHIB | 10 | | | ms |
| $T_{wake\_from\_hib}$ | Hardware wake-up time plus firmware initialization time | See(2) | | 50 | | ms |

(1) Ensure that the nHIB low duration is not less than the specified width under all conditions, including power-ON, MCU hibernation, and so forth.
(2) If temperature changes by more than 20°C, initialization time from HIB can increase by 200 ms due to radio calibration.

### 8.12.3 Interfaces

This section describes the interfaces that are supported by the CC3100 module:

- Host SPI
- Host UART

#### *8.12.3.1 Host SPI Interface Timing*

图 8-8 shows the host SPI timing diagram.

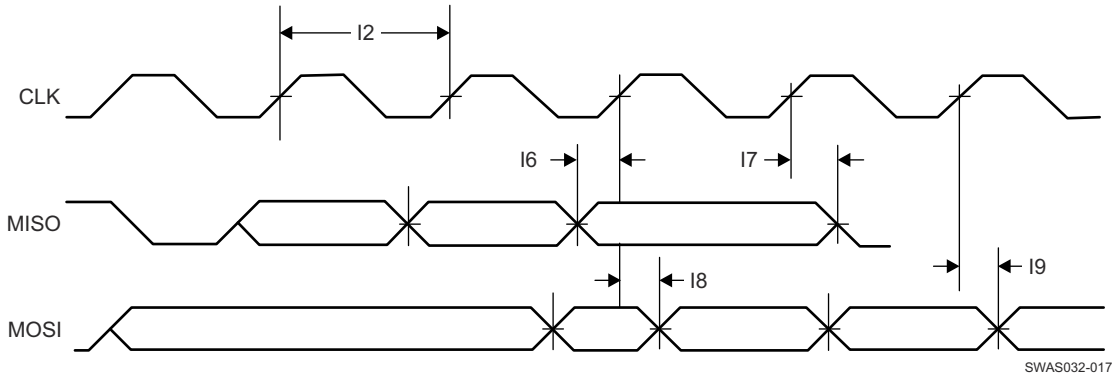



**图 8-8. Host SPI Timing**

**表 8-2. Host SPI Interface Timing Parameters**

| PARAMETER NUMBER | DESCRIPTION | | MIN | MAX | UNIT |
|---|---|---|---|---|---|
| I1 | F(1) | Clock frequency at $V_{BAT}$ = 3.3 V | | 20 | MHz |
| | | Clock frequency at $V_{BAT}$ ⩽ 2.1 V | | 12 | |
| I2 | $t_{clk}$ (1) (2) | Clock period | 50 | | ns |
| I5 | D(1) | Duty cycle | 45% | 55% | |
| I6 | $t_{IS}$ (1) | RX data setup time | 4 | | ns |
| I7 | $t_{IH}$ (1) | RX data hold time | 4 | | ns |
| I8 | $t_{OD}$ (1) | TX data output delay | | 20 | ns |
| I9 | $t_{OH}$ (1) | TX data hold time | | 24 | ns |

(1) The timing parameter has a maximum load of 20 pf at 3.3 V.
(2) Ensure that nCS (active-low signal) is asserted 10 ns before the clock is toggled. The nCS signal can be deasserted 10 ns after the clock edge.

### *8.12.3.2 SPI Host Interface*

The device interfaces to an external host using the SPI. The CC3100 device can interrupt the host using the HOST_INTR line to initiate the data transfer over the interface. The SPI host interface can work up to a speed of 20 MHz.

图 8-9 shows the SPI host interface.

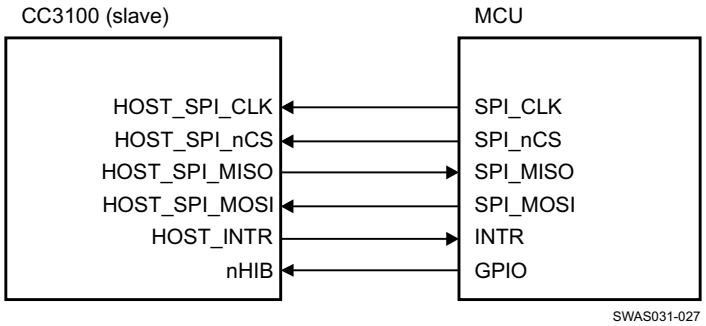



**图 8-9. SPI Host Interface**

表 8-3 lists the SPI host interface pins.

**表 8-3. SPI Host Interface**

| PIN NAME | DESCRIPTION |
|---|---|
| HOST_SPI_CLK | Clock (up to 20 MHz) from MCU host to CC3100 device |
| HOST_SPI_nCS | CS (active low) signal from MCU host to CC3100 device |

表 8-3. SPI Host Interface (continued)

| PIN NAME | DESCRIPTION |
|---|---|
| HOST_SPI_MOSI | Data from MCU host to CC3100 device |
| HOST_INTR | Interrupt from CC3100 device to MCU host |
| HOST_SPI_MISO | Data from CC3100 device to MCU host |
| nHIB | Active-low signal that commands the CC3100 device to enter hibernate mode (lowest power state) |

## 8.13 Host UART

The SimpleLink device requires the UART configuration described in 表 8-4.

表 8-4. SimpleLink™ UART Configuration

| PROPERTY | SUPPORTED CC3100 CONFIGURATION |
|---|---|
| Baud rate | 115200 bps, no auto-baud rate detection, can be changed by the host up to 3 Mbps using a special command |
| Data bits | 8 bits |
| Flow control | CTS/RTS |
| Parity | None |
| Stop bits | 1 |
| Bit order | Least significant bit (LSB) first |
| Host interrupt polarity | Active high |
| Host interrupt mode | Rising edge or level 1 |
| Endianness | Little-endian only(1) |

(1) The SimpleLink device does not support automatic detection of the host length while using the UART interface.

### 8.13.1 5-Wire UART Topology

图 8-10 shows the typical 5-wire UART topology comprised of four standard UART lines plus one IRQ line from the device to the host controller to allow efficient low power mode.

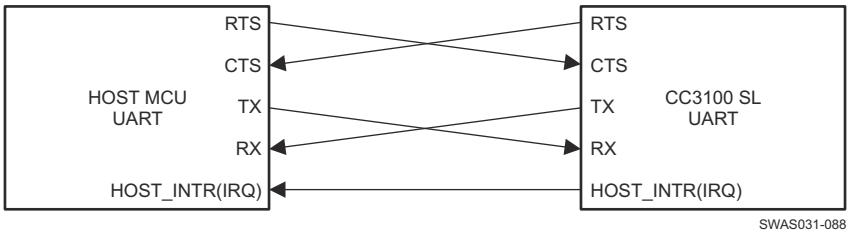



图 8-10. Typical 5-Wire UART Topology

图 8-10 shows the typical and recommended UART topology because it offers the maximum communication reliability and flexibility between the host and the SimpleLink device.

### 8.13.2 4-Wire UART Topology

The 4-wire UART topology eliminates the host IRQ line (see 图 8-11). Using this topology requires one of the following conditions to be met:

- Host is always awake or active.
- Host goes to sleep, but the UART module has receiver start-edge detection for automatic wake up and does not lose data.

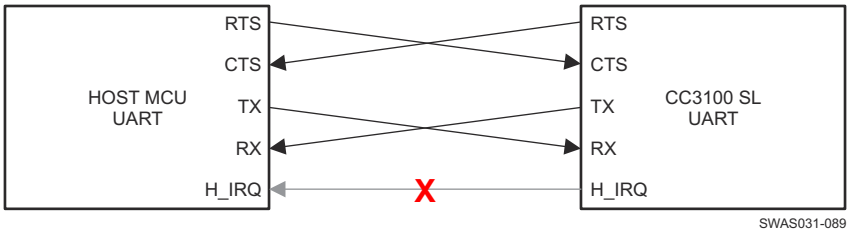



**图 8-11. 4-Wire UART Configuration**

### 8.13.3 3-Wire UART Topology

The 3-wire UART topology requires only the following lines (see 图 8-12).

- RX
- TX
- nCTS

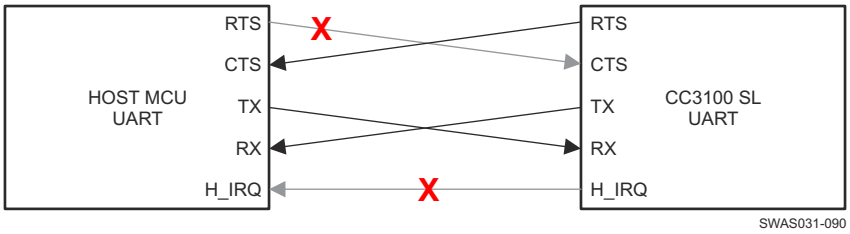



**图 8-12. 3-Wire UART Topology**

Using 3-wire topology requires one of the following conditions to be met:

- Host always stays awake or active.
- Host goes to sleep, but the UART module has receiver start-edge detection for auto wake up and does not lose data.
- Host can always receive any amount of data transmitted by the SimpleLink device because there is no flow control in this direction.

Because there is no full flow control, the host cannot stop the SimpleLink device to send its data; thus, the following parameters must be carefully considered:

- Maximum baud rate
- RX character interrupt latency and low-level driver jitter buffer
- Time consumed by the user's application

# 9 Detailed Description

## 9.1 Overview

The CC3100MOD is a Wi-Fi Module that consists of the CC3100R11MRGC Wi-Fi network processor and power-management subsystems. This fully integrated Module includes all required clocks, SPI flash, and passives.

## 9.2 Module Features

### 9.2.1 WLAN

The WLAN features are as follows:

- 802.11 b/g/n integrated radio, modem, and MAC supporting WLAN communication as a BSS station with CCK and OFDM rates in the 2.4-GHz ISM band.
- Autocalibrated radio with a single-ended 50-Ω interface enables easy connection to the antenna without requiring expertise in radio circuit design.
- Advanced connection manager with multiple user-configurable profiles stored in an NVMEM allows automatic, fast connection to an access point without user or host intervention.
- Supports all common Wi-Fi security modes for personal and enterprise networks, with on-chip security accelerators.
- SmartConfig technology: A 1-step, 1-time process to connect a CC3100MOD-enabled device to the home wireless network, removing dependency on the I/O capabilities of the host MCU; thus, it is usable by deeply embedded applications.
- 802.11 transceiver mode transmits and receives proprietary data through a socket without adding MAC or PHY headers, and provides the option to select the working channel, rate, and transmitted power. The receiver mode works together with the filtering options.

### 9.2.2 Network Stack

The network stack features are as follows:

- Integrated IPv4, IPv6, and TCP/IP stack with BSD socket APIs for simple Internet connectivity with any MCU, microprocessor, or ASIC
- Support of 8 simultaneous TCP, UDP, or RAW sockets
- Built-in network protocols: ARP, ICMP, DHCP client, and DNS client for easy connection to the local network and the Internet
- Service discovery: Multicast DNS service discovery allows a client to advertise its service without a centralized server. After connecting to the access point, the CC3100MOD provides critical information, such as device name, IP, vendor, and port number.

### 9.2.3 Host Interface and Driver

- Interfaces over a 4-wire SPI with any MCU or a processor at a clock speed of 20 MHz
- Interfaces over UART with any MCU with a baud rate up to 3 Mbps. A low footprint driver is provided for TI MCUs and is easily ported to any processor or ASIC.
- Simple APIs enable easy integration with any single-threaded or multithreaded application.

### 9.2.4 System

- Works from one preregulated power supply or connects directly to a battery
- Ultra-low leakage when disabled (hibernate mode) with a current of less than 7 µA with the RTC running
- Integrated clock sources

## 9.3 Functional Block Diagram

图 9-1 shows the functional block diagram of the CC3100MOD SimpleLink Wi-Fi solution.

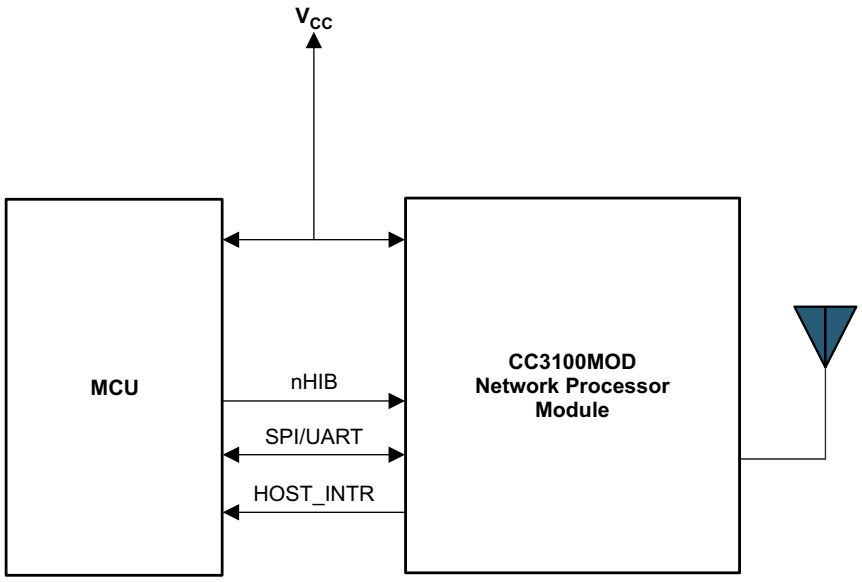



**图 9-1. Functional Block Diagram**

## 9.4 Wi-Fi Network Processor Subsystem

The Wi-Fi network processor subsystem includes a dedicated ARM MCU to completely offload the host MCU along with an 802.11 b/g/n radio, baseband, and MAC with a powerful crypto engine for a fast, secure WLAN and Internet connections with 256-bit encryption. The CC3100MOD supports station, AP, and Wi-Fi Direct modes. The module also supports WPA2 personal and enterprise security and WPS 2.0. The Wi-Fi network processor includes an embedded IPv4 TCP/IP stack.

表 9-1 summarizes the NWP features.

**表 9-1. Summary of Features Supported by the NWP Subsystem**

| ITEM | DOMAIN | CATEGORY | FEATURE | DETAILS |
|---|---|---|---|---|
| 1 | TCP/IP | Network Stack | IPv4 | Baseline IPv4 stack |
| 2 | TCP/IP | Network Stack | TCP/UDP | Base protocols |
| 3 | TCP/IP | Protocols | DHCP | Client and server mode |
| 4 | TCP/IP | Protocols | ARP | Support ARP protocol |
| 5 | TCP/IP | Protocols | DNS/mDNS | DNS Address resolution and local server |
| 6 | TCP/IP | Protocols | IGMP | Up to IGMPv3 for multicast management |
| 7 | TCP/IP | Applications | mDNS | Support multicast DNS for service publishing over IP |
| 8 | TCP/IP | Applications | mDNS-SD | Service discovery protocol over IP in local network |
| 9 | TCP/IP | Applications | Web Sever/HTTP Server | URL static and dynamic response with template |
| 10 | TCP/IP | Security | TLS/SSL | TLS v1.2 (client/server) / SSL v3.0 |
| 11 | TCP/IP | Security | TLS/SSL | For the supported Cipher Suite, go to SimpleLink Wi-Fi CC3100 SDK. |
| 12 | TCP/IP | Sockets | RAW Sockets | User-defined encapsulation at WLAN MAC/PHY or IP layers |
| 13 | WLAN | Connection | Policies | Allows management of connection and reconnection policy |
| 14 | WLAN | MAC | Promiscuous mode | Filter-based Promiscuous mode frame receiver |
| 15 | WLAN | Performance | Initialization time | From enable to first connection to open AP less than 50 ms |
| 16 | WLAN | Performance | Throughput | UDP = 16 Mbps |
| 17 | WLAN | Performance | Throughput | TCP = 13 Mbps |

表 9-1. Summary of Features Supported by the NWP Subsystem (continued)

| ITEM | DOMAIN | CATEGORY | FEATURE | DETAILS |
|---|---|---|---|---|
| 18 | WLAN | Provisioning | WPS2 | Enrollee using push button or PIN method. |
| 19 | WLAN | Provisioning | AP Config | AP mode for initial product configuration (with configurable Web page and beacon Info element) |
| 20 | WLAN | Provisioning | SmartConfig | Alternate method for initial product configuration |
| 21 | WLAN | Role | Station | 802.11bgn Station with legacy 802.11 power save |
| 22 | WLAN | Role | Soft AP | 802.11 bg single station with legacy 802.11 power save |
| 23 | WLAN | Role | P2P | P2P operation as GO |
| 24 | WLAN | Role | P2P | P2P operation as CLIENT |
| 25 | WLAN | Security | STA-Personal | WPA2 personal security |
| 26 | WLAN | Security | STA-Enterprise | WPA2 enterprise security |
| 27 | WLAN | Security | STA-Enterprise | EAP-TLS |
| 28 | WLAN | Security | STA-Enterprise | EAP-PEAPv0/TLS |
| 29 | WLAN | Security | STA-Enterprise | EAP-PEAPv1/TLS |
| 30 | WLAN | Security | STA-Enterprise | EAP-PEAPv0/MSCHAPv2 |
| 31 | WLAN | Security | STA-Enterprise | EAP-PEAPv1/MSCHAPv2 |
| 32 | WLAN | Security | STA-Enterprise | EAP-TTLS/EAP-TLS |
| 33 | WLAN | Security | STA-Enterprise | EAP-TTLS/MSCHAPv2 |
| 34 | WLAN | Security | AP-Personal | WPA2 personal security |

## 9.5 Power-Management Subsystem

The CC3100 power-management subsystem contains DC-DC converters to accommodate the differing voltage or current requirements of the system. The module can operate from an input voltage ranging from 2.3 V to 3.6 V and can be directly connected to 2× AA Alkaline batteries.

The CC3100MOD is a fully integrated module-based WLAN radio solution used on an embedded system with a wide-voltage supply range. The internal power management, including DC-DC converters and LDOs, generates all of the voltages required for the module to operate from a wide variety of input sources. For maximum flexibility, the module can operate in the modes described in the following sections.

### 9.5.1 $V_{BAT}$ Wide-Voltage Connection

In the wide-voltage battery connection, the module is powered directly by the battery. All other voltages required to operate the device are generated internally by the DC-DC converters. This scheme is the most common mode for the device because it supports wide-voltage operation from 2.3 to 3.6 V.

## 9.6 Low-Power Operating Modes

This section describes the low-power modes supported by the module to optimize battery life.

### 9.6.1 Low-Power Deep Sleep

The low-power deep-sleep (LPDS) mode is an energy-efficient and transparent sleep mode that is entered automatically during periods of inactivity based on internal power optimization algorithms. The module draws about 7 µA from the supply in this low-power mode. The module can wake up in less than 3 ms from the internal timer or from any incoming host command. Typical battery drain in this mode is 140 µA. During LPDS mode, the module retains the software state and certain configuration information. The operation is transparent to the external host; thus, no additional handshake is required to enter or exit this sleep mode.

### 9.6.2 Hibernate

The hibernate mode is the lowest power mode in which all of the digital logic is power-gated. Only a small section of the logic powered directly by the main input supply is retained. The real-time clock (RTC) is kept running and the module wakes up when the n_HIB line is asserted by the host driver. The wake-up time is longer than LPDS mode at about 50 ms.

**备注**

Wake-up time can be extended to 75 ms if a patch is loaded from the serial flash.

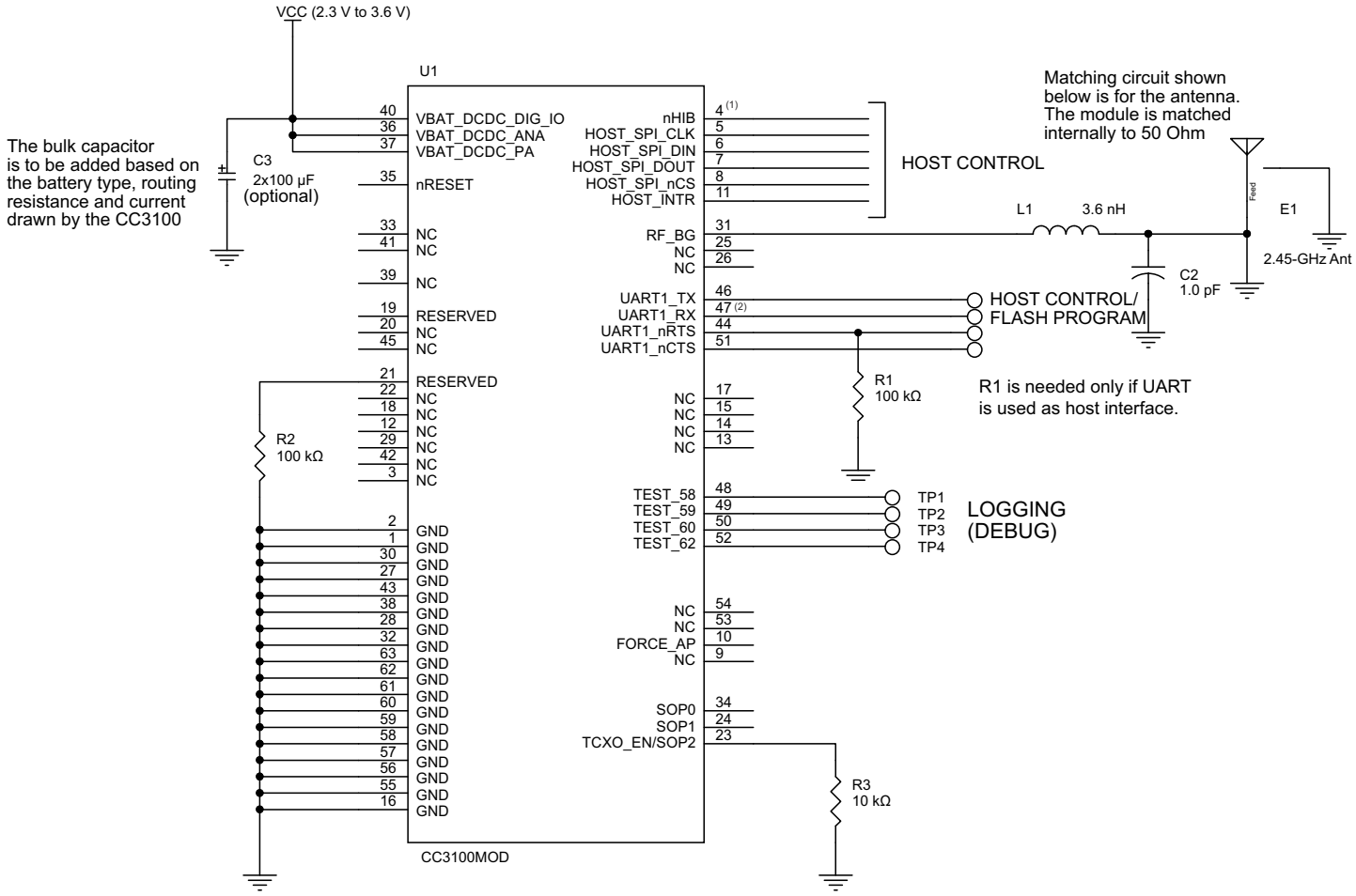
# 10 Applications, Implementation, and Layout

备注

Information in the following applications sections is not part of the TI component specification, and TI does not warrant its accuracy or completeness. TI’s customers are responsible for determining suitability of components for their purposes. Customers should validate and test their design implementation to confirm system functionality.

## 10.1 Reference Schematics

图 10-1 shows the reference schematic for the CC3100MOD module. The complete schematic can be downloaded from http://www.ti.com/lit/zip/swrc293.




A. If the GPIO from the MCU can float while the MCU enters low power, consider adding a pulldown resistor on the board to avoid floating.

B. TI recommends using a 100-kΩ pullup resistor to save a few tens of µA in hibernate state.

This is the reference schematic and not an actual board design. For the board files, refer to the CC3100MODBOOST in the CC3100MOD Tools Folder.

**图 10-1. CC3100MOD Module Reference Schematic**

## 10.2 Design Requirements

表 10-1 lists the bill of materials for a typical application using the CC3100 device.

**表 10-1. Bill of Materials**

| QUANTITY | PART REFERENCE | VALUE | MANUFACTURER | PART NUMBER | DESCRIPTION |
|---|---|---|---|---|---|
| 1 | U1 | CC3100MOD | Texas Instruments | CC3100MODR11MAMOB | SimpleLink Wi-Fi MCU Module |
| 1 | E1 | 2.45-GHz Ant | Taiyo Yuden | AH316M245001-T | ANT *Bluetooth* WLAN ZigBee® WIMAX |
| 1 | C2 | 1.0 pF | Murata Electronics North America | GJM1555C1H1R0BB01D | CAP CER 1 pF 50 V NP0 0402 |
| 1 | L1 | 3.6 nH | Murata Electronics North America | LQP15MN3N6B02D | INDUCTOR 3.6 nH 0.1 NH 0402 |

## 10.3 Layout Recommendations

### 10.3.1 RF Section (Placement and Routing)

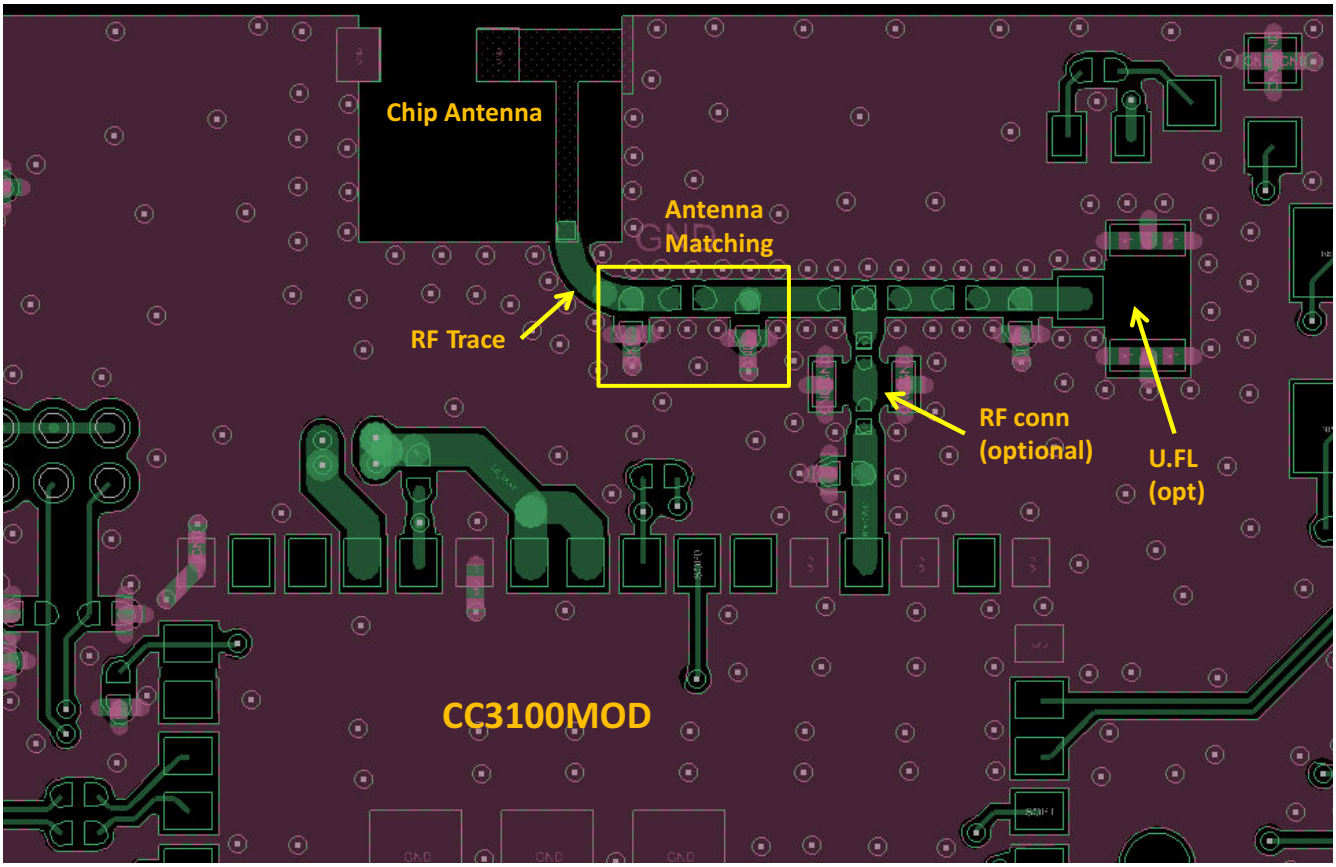



图 10-2. RF Section Layout

The RF section of this wireless device gets top priority in terms of layout. It is very important for the RF section to be laid out correctly to ensure optimum performance from the device. A poor layout can cause low-output power, EVM degradation, sensitivity degradation, and mask violations.

### 10.3.2 Antenna Placement and Routing

The antenna is the element used to convert the guided waves on the PCB traces to the free space electromagnetic radiation. The placement and layout of the antenna are the keys to increased range and data rates. 表 10-2 provides a summary of the recommended antennas to use with the CC3120MOD module.

表 10-2. Antenna Guidelines

| SR NO. | GUIDELINES |
|---|---|
| 1 | Place the antenna on an edge or corner of the PCB. |
| 2 | Ensure that no signals are routed across the antenna elements on all the layers of the PCB. |
| 3 | Most antennas, including the chip antenna used on the booster pack, require ground clearance on all the layers of the PCB. Ensure that the ground is cleared on inner layers as well. |
| 4 | Ensure that there is provision to place matching components for the antenna. These must be tuned for best return loss when the complete board is assembled. Any plastics or casing must also be mounted while tuning the antenna because this can impact the impedance. |

**表 10-2. Antenna Guidelines (continued)**

| SR NO. | GUIDELINES |
|---|---|
| 5 | Ensure that the antenna impedance is 50 Ω because the device is rated to work only with a 50-Ω system. |
| 6 | In case of printed antenna, ensure that the simulation is performed with the solder mask in consideration. |
| 7 | Ensure that the antenna has a near omni-directional pattern. |
| 8 | The feed point of the antenna is required to be grounded. This is only for the antenna type used on the CC3200MOD Launchpad. Refer to the specific antenna data sheets for the recommendations. |
| 9 | To use the FCC certification of the module, refer to CC31xx and CC32xx Radio Certifications wiki page on CC3200 Radio certification |

表 10-3 lists the recommended antennas to use with the CC3120MOD module.

**表 10-3. Recommended Components**

| CHOICE | PART NUMBER | MANUFACTURER | NOTES |
|---|---|---|---|
| 1 | AH316M245001-T | Taiyo Yuden | Can be placed at the edge of the PCB using the least amount of PCB area. |

### 10.3.3 Transmission Line Considerations

The RF signal from the device is routed to the antenna using a Coplanar Waveguide with ground (CPW-G) structure. CPW-G structure offers the maximum amount of isolation and the best possible shielding to the RF lines. In addition to the ground on the L1 layer, placing GND vias along the line also provides additional shielding. 图 10-3 shows a cross section of the coplanar waveguide with the critical dimensions.

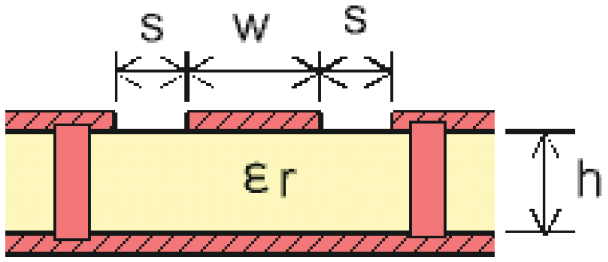



**图 10-3. Coplanar Waveguide (Cross Section)**

图 10-4 shows the top view of the coplanar waveguide with GND and via stitching.

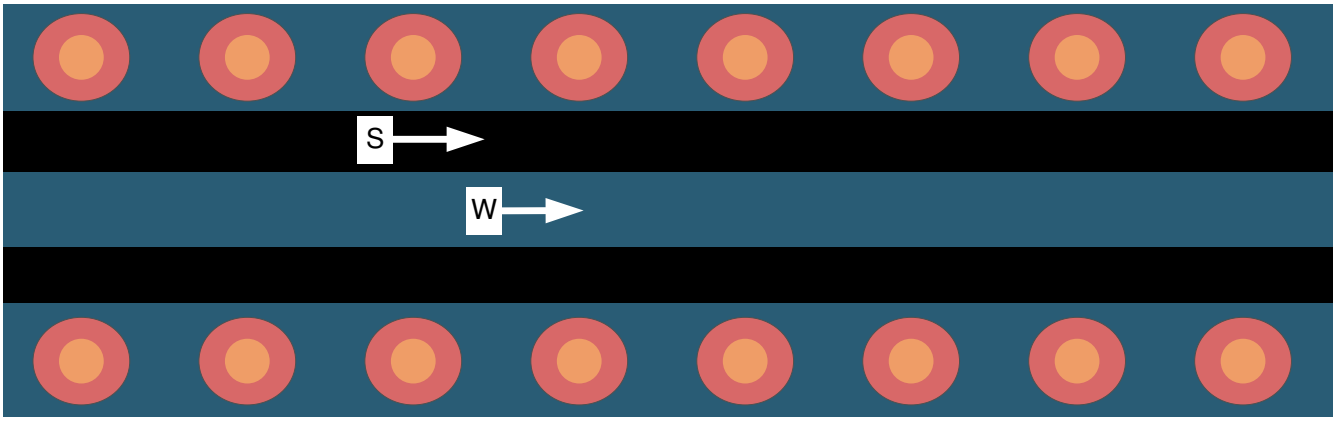



**图 10-4. CPW With GND and Via Stitching (Top View)**

The recommended values for the PCB are provided for 2-layer boards in 表 10-4 and 4-layer boards in 表 10-5.

**表 10-4. Recommended PCB Values for 2-Layer Board (L1 to L2 = 40 mils)**

| PARAMETER | VALUE | UNIT |
|---|---|---|
| W | 35 | mils |
| S | 6 | mils |
| H | 40 | mils |
| Er (FR-4 substrate) | 3.9 | |

**表 10-5. Recommended PCB Values for 4-Layer Board (L1 to L2 = 10 mils)**

| PARAMETER | VALUE | UNITS |
|---|---|---|
| W | 20 | mils |
| S | 18 | mils |
| H | 10 | mils |
| Er (FR-4 substrate) | 4 | |

# 11 Environmental Requirements and Specifications

## 11.1 Temperature

### 11.1.1 PCB Bending

The PCB bending specification will maintain planeness at a thickness of less than 0.1 mm.

## 11.2 Handling Environment

### 11.2.1 Terminals

The product is mounted with motherboard through land-grid array (LGA). To prevent poor soldering, do not touch the LGA portion by hand.

### 11.2.2 Falling

The mounted components will be damaged if the product falls or is dropped. Such damage may cause the product to malfunction.

## 11.3 Storage Condition

### 11.3.1 Moisture Barrier Bag Before Opened

A moisture barrier bag must be stored in a temperature of less than 30°C with humidity under 85% RH. The calculated shelf life for the dry-packed product will be 12 months from the date the bag is sealed.

### 11.3.2 Moisture Barrier Bag Open

Humidity indicator cards must be blue, < 30%.

## 11.4 Baking Conditions

Products require baking before mounting if:

- Humidity indicator cards read > 30%
- Temp < 30°C, humidity < 70% RH, over 96 hours

Baking condition: 90°C, 12 – 24 hours

Baking times: 1 time

## 11.5 Soldering and Reflow Condition

- Heating method: Conventional convection or IR convection
- Temperature measurement: Thermocouple d = 0.1 mm to 0.2 mm CA (K) or CC (T) at soldering portion or equivalent method
- Solder paste composition: Sn/3.0 Ag/0.5 Cu
- Allowable reflow soldering times: 2 times based on the reflow soldering profile (see 图 11-1)
- Temperature profile: Reflow soldering will be done according to the temperature profile (see 图 11-1)
- Peak temp: 245°C

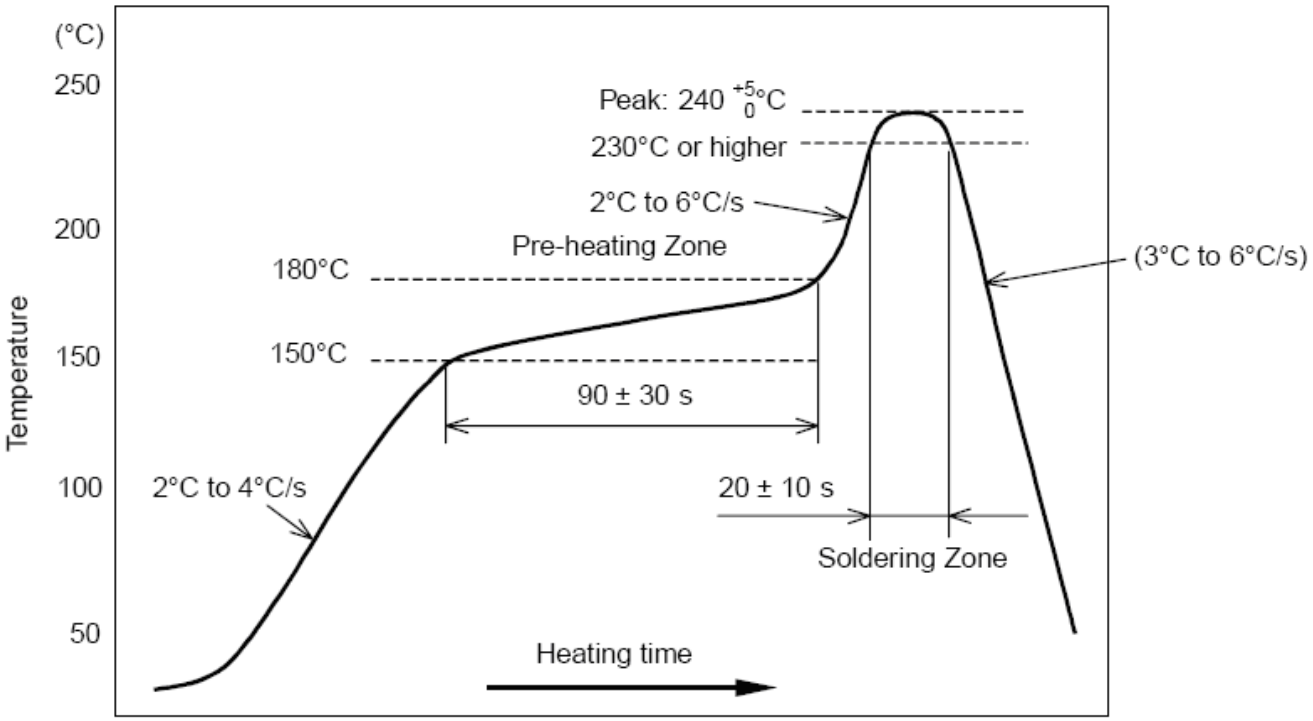



**图 11-1. Temperature Profile for Evaluation of Solder Heat Resistance of a Component (at Solder Joint)**

# 12 Device and Documentation Support

## 12.1 Device Support

### 12.1.1 Development Support

TI offers an extensive line of development tools, including tools to evaluate the performance of the processors, generate code, develop algorithm implementations, and fully integrate and debug software and hardware modules. The tool's support documentation is electronically available within the Code Composer Studio™ Integrated Development Environment (IDE).

The following products support development of the CC3100MOD applications:

**Software Development Tools:**

| | |
|---|---|
| **Code Composer Studio™ Integrated Development Environment (IDE)** | includes Editor C/C++/Assembly Code Generation and Debug plus additional development tools Scalable |
| **Real-Time Foundation Software ( DSP/BIOS ™)** | provides the basic run-time target software needed to support any CC3100MOD application. |

**Hardware Development Tools:**

**Extended Development System ( XDS™) Emulator**

For a complete listing of development-support tools for the CC3100MOD platform, visit the Texas Instruments website at www.ti.com. For information on pricing and availability, contact the nearest TI field sales office or authorized distributor.

#### *12.1.1.1 Firmware Updates*

TI updates features in the service pack for this module with no published schedule. Due to the ongoing changes, TI recommends that the user has the latest service pack in his or her module for production.

To stay informed, sign up for the SDK Alert Me button on the tools page or visit www.ti.com/tool/cc3100sdk.

### 12.1.2 Device Nomenclature

To designate the stages in the product development cycle, TI assigns prefixes to the part numbers of the CC3100MOD and support tools (see 图 12-1).

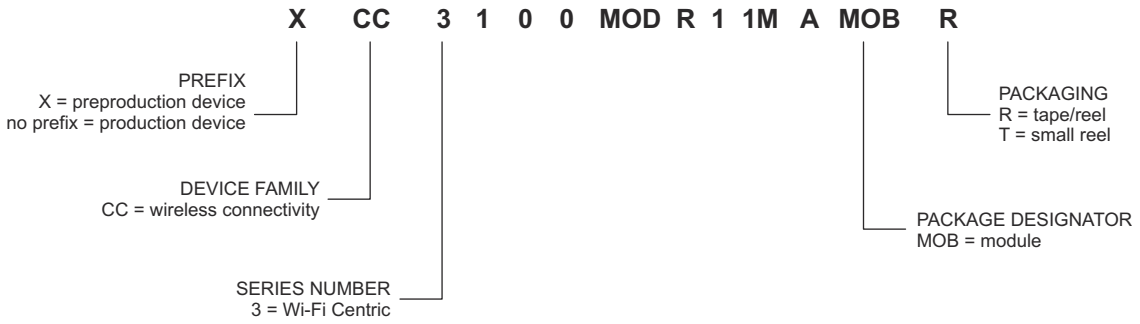



**图 12-1. CC3100**

For orderable part numbers of CC3100MOD modules in the MOB package types, see the Package Option Addendum of this document, the TI website (www.ti.com), or contact your TI sales representative.

## 12.2 Documentation Support

The following documents describe the CC3100MOD processor/MPU. Copies of these documents are available on the Internet at www.ti.com.

SWRU368 CC3100/CC3200 SimpleLink™ Wi-Fi® Internet-on-a Chip User's Guide

## 12.3 Trademarks

Wi-Fi CERTIFIED™ is a trademark of Wi-Fi Alliance.
Internet-on-a chip™, E2E™, XDS™ are trademarks of Texas Instruments.
SimpleLink™ and SmartConfig™ are trademarks of TI.
Code Composer Studio™ is a trademark of Texas Instruments.
Wi-Fi® and Wi-Fi Direct® are registered trademarks of Wi-Fi Alliance.
Arm® is a registered trademark of Arm Limited.
ZigBee® is a registered trademark of ZigBee Alliance.
所有商标均为其各自所有者的财产。

## 12.4 静电放电警告

静电放电 (ESD) 会损坏这个集成电路。德州仪器 (TI) 建议通过适当的预防措施处理所有集成电路。如果不遵守正确的处理和安装程序，可能会损坏集成电路。

ESD 的损坏小至导致微小的性能降级，大至整个器件故障。精密的集成电路可能更容易受到损坏，这是因为非常细微的参数更改都可能会导致器件与其发布的规格不相符。

## 12.5 术语表

TI 术语表　　本术语表列出并解释了术语、首字母缩略词和定义。

# 13 Mechanical, Packaging, and Orderable Information

The following pages include mechanical packaging and orderable information. This information is the most current data available for the designated devices. This data is subject to change without notice and revision of this document.

## 13.1 Mechanical Drawing

图 13-1 shows the CC3100MOD module.

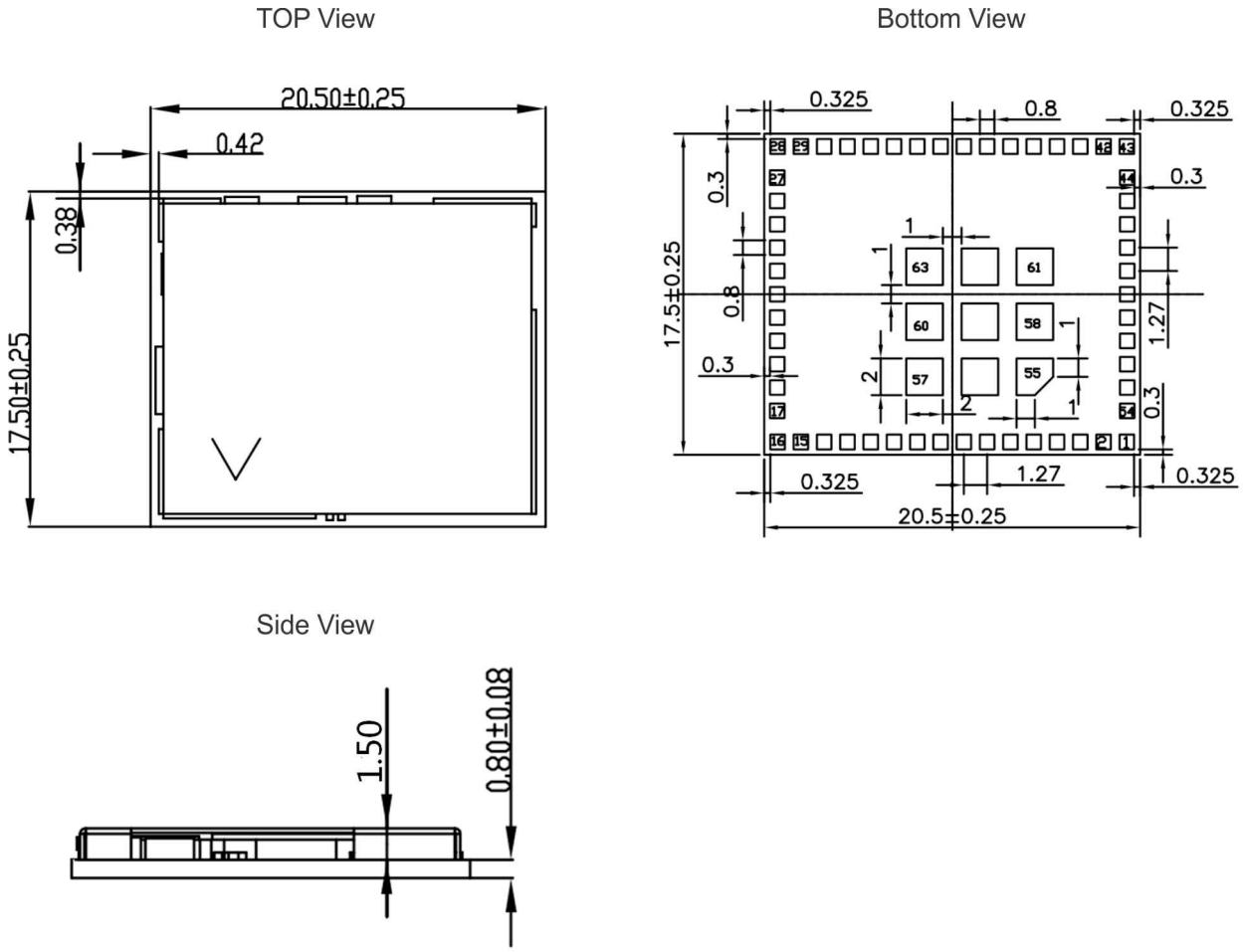



**图 13-1. Mechanical Drawing**

备注

1. The total height of the module is 2.33 mm.
2. The weight of the module is 0.00175 kg ±3%.

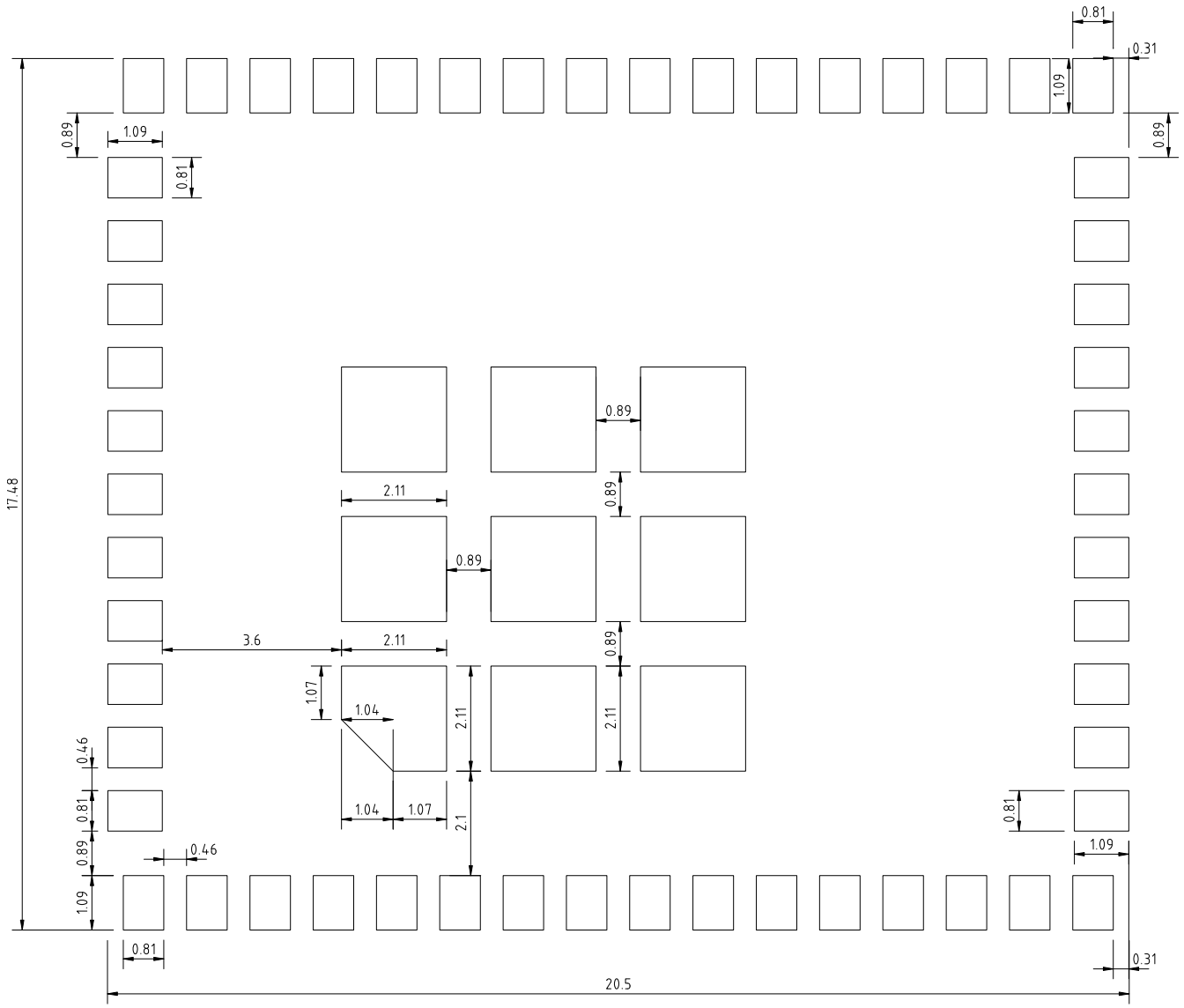



**图 13-2. Land Pattern Drawing**

**备注**

1. All dimensions are in mm.
2. Solder mask should be the same or 5% larger than the dimension of the pad
3. Solder paste must be the same as the pin for all peripheral pads. For ground pins, make the solder paste 20% smaller than the pad.

## 13.2 Package Option

We offer two reel size options for flexibility: a 750-unit reel and a 250-unit reel.

### 13.2.1 Packaging Information

| Orderable Device | Status (1) | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead/Ball Finish | MSL, Peak Temp (3) | Op Temp (°C) | Device Marking(4) (5) |
|---|---|---|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | ACTIVE | MOB | 63 | 750 | RoHS Exempt | Ni Au | 3, 250°C | –20 to 70 | CC3100MODR11MAMOB |
| CC3100MODR11MAMOBT | ACTIVE | MOB | 63 | 250 | RoHS Exempt | Ni Au | 3, 250°C | –20 to 70 | CC3100MODR11MAMOB |

(1) The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PRE_PROD** Unannounced device, not in production, not available for mass market, nor on the web, samples not available.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.
**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.
**Green (RoHS & no Sb/Br)**: TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

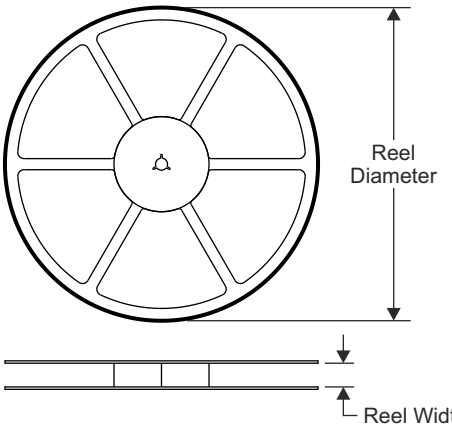
(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device

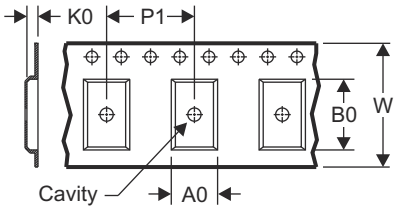
(5) Multiple Device markings will be inside parentheses. Only on Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

### 13.2.2 Tape and Reel Information

**REEL DIMENSIONS**

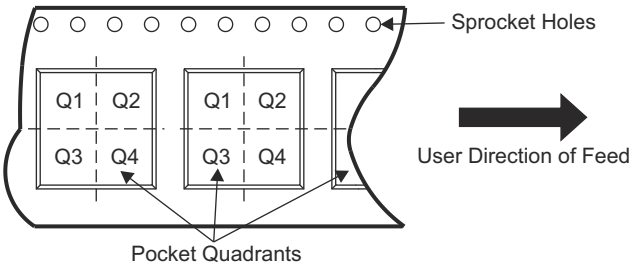



**TAPE DIMENSIONS**



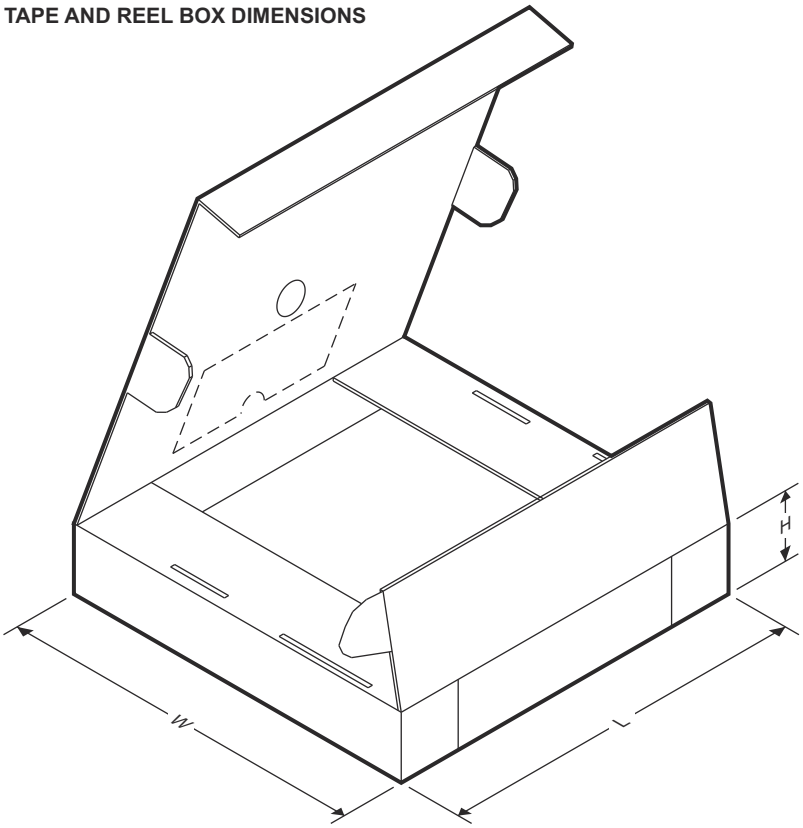

| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




| Device | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | MOB | 63 | 750 | 330.0±2.0 | 44.0 | 17.85±0.10 | 20.85±0.10 | 2.50±0.10 | 24.00±0.10 | 44.00±0.30 | Q1 |
| CC3100MODR11MAMOBT | MOB | 63 | 250 | 330.0±2.0 | 44.0 | 17.85±0.10 | 20.85±0.10 | 2.50±0.10 | 24.00±0.10 | 44.00±0.30 | Q1 |

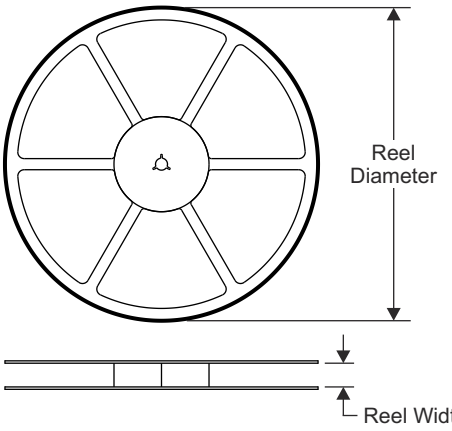
**TAPE AND REEL BOX DIMENSIONS**



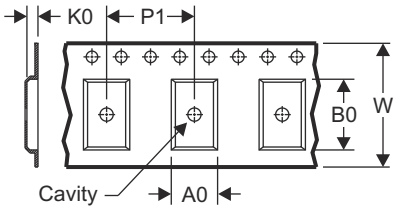

| Device | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | MOB | 63 | 750 | 354.0 | 354.0 | 55.0 |
| CC3100MODR11MAMOBT | MOB | 63 | 250 | 354.0 | 354.0 | 55.0 |

### 13.2.2 Tape and Reel Information

**REEL DIMENSIONS**

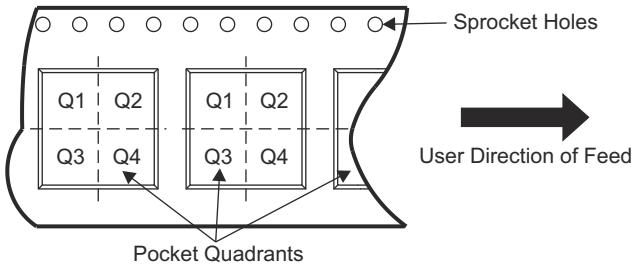



**TAPE DIMENSIONS**



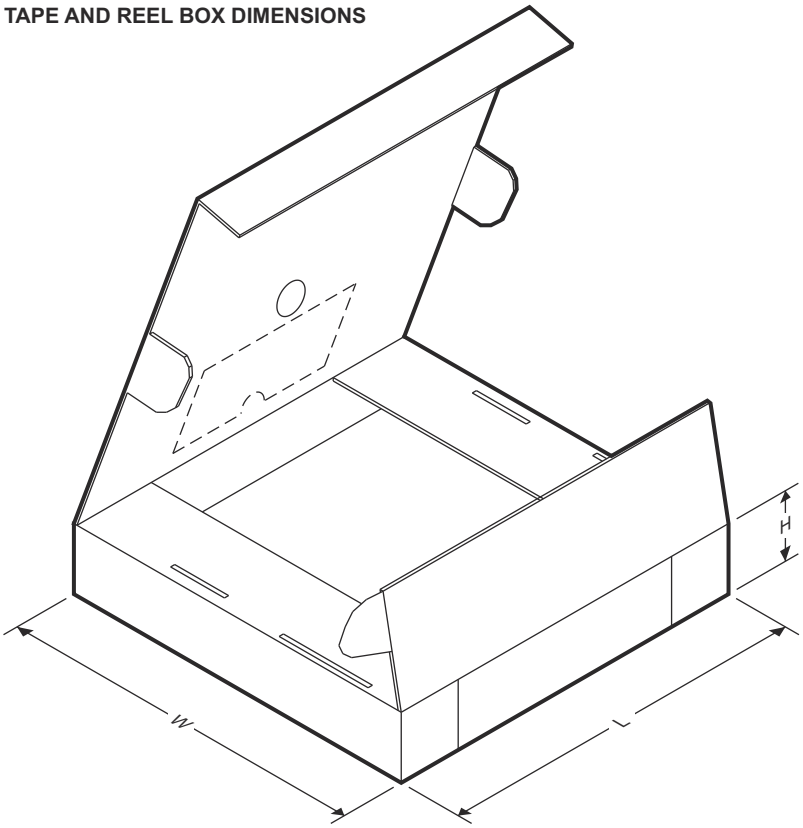

| | |
|---|---|
| A0 | Dimension designed to accommodate the component width |
| B0 | Dimension designed to accommodate the component length |
| K0 | Dimension designed to accommodate the component thickness |
| W | Overall width of the carrier tape |
| P1 | Pitch between successive cavity centers |

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**




| Device | Package Drawing | Pins | SPQ | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | MOB | 63 | 750 | 330.0±2.0 | 44.0 | 17.85±0.10 | 20.85±0.10 | 2.50±0.10 | 24.00±0.10 | 44.00±0.30 | Q1 |
| CC3100MODR11MAMOBT | MOB | 63 | 250 | 330.0±2.0 | 44.0 | 17.85±0.10 | 20.85±0.10 | 2.50±0.10 | 24.00±0.10 | 44.00±0.30 | Q1 |

**TAPE AND REEL BOX DIMENSIONS**




| Device | Package Drawing | Pins | SPQ | Length (mm) | Width (mm) | Height (mm) |
|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | MOB | 63 | 750 | 354.0 | 354.0 | 55.0 |
| CC3100MODR11MAMOBT | MOB | 63 | 250 | 354.0 | 354.0 | 55.0 |

## PACKAGING INFORMATION

| Orderable Device | Status (1) | Package Type | Package Drawing | Pins | Package Qty | Eco Plan (2) | Lead finish/ Ball material (6) | MSL Peak Temp (3) | Op Temp (°C) | Device Marking (4/5) | Samples |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CC3100MODR11MAMOBR | ACTIVE | QFM | MOB | 63 | 750 | RoHS (In Work) & Green (In Work) | NIAU | Level-3-260C-168 HR | -20 to 70 | (CC3100MODR11MAMOB, CC3100MODR1M2AMOB) (Z64-CC31000MODR1, Z64-CC3100MODR1) (2015DJ3068(M), 451L-CC3100MODR1) (3.3V, 400MA, 3.3V, 400MA) (001-A08147, 451L-CC3100MODR1) MO-VVSS | Samples |
| CC3100MODR11MAMOBT | ACTIVE | QFM | MOB | 63 | 250 | RoHS & Green | NIAU | Level-3-260C-168 HR | -20 to 70 | (CC3100MODR11MAMOB, CC3100MODR1M2AMOB) (Z64-CC31000MODR1, Z64-CC3100MODR1) (2015DJ3068(M), 451L-CC3100MODR1) (3.3V, 400MA, 3.3V, 400MA) (001-A08147, 451L-CC3100MODR1) MO-VVSS | Samples |

(1) The marketing status values are defined as follows:
**ACTIVE:** Product device recommended for new designs.
**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.
**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.
**OBSOLETE:** TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".
**RoHS Exempt:** TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.
**Green:** TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

(3) MSL, Peak Temp. - The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

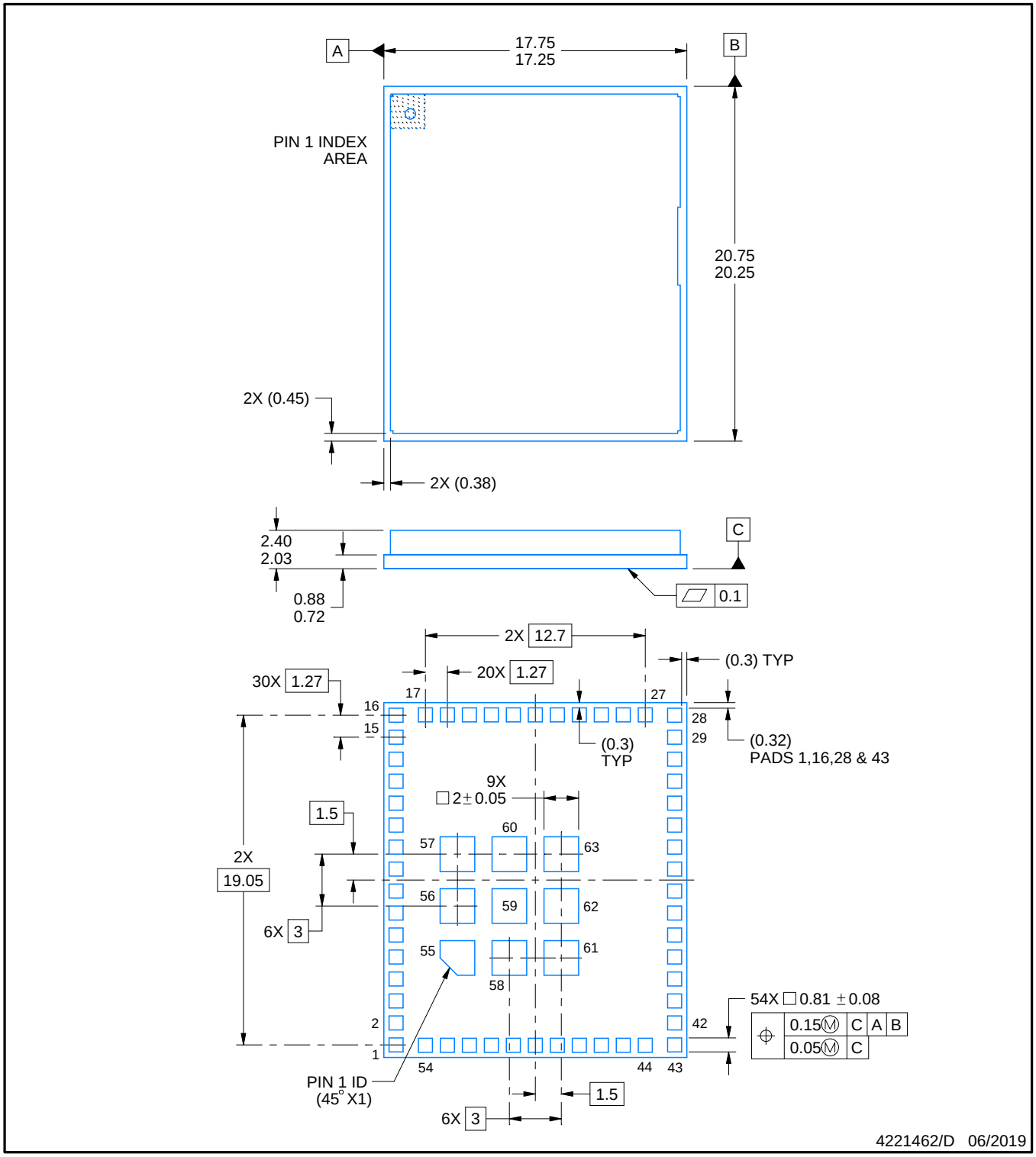
(6) Lead finish/Ball material - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

# PACKAGE OUTLINE

## MOB0063A

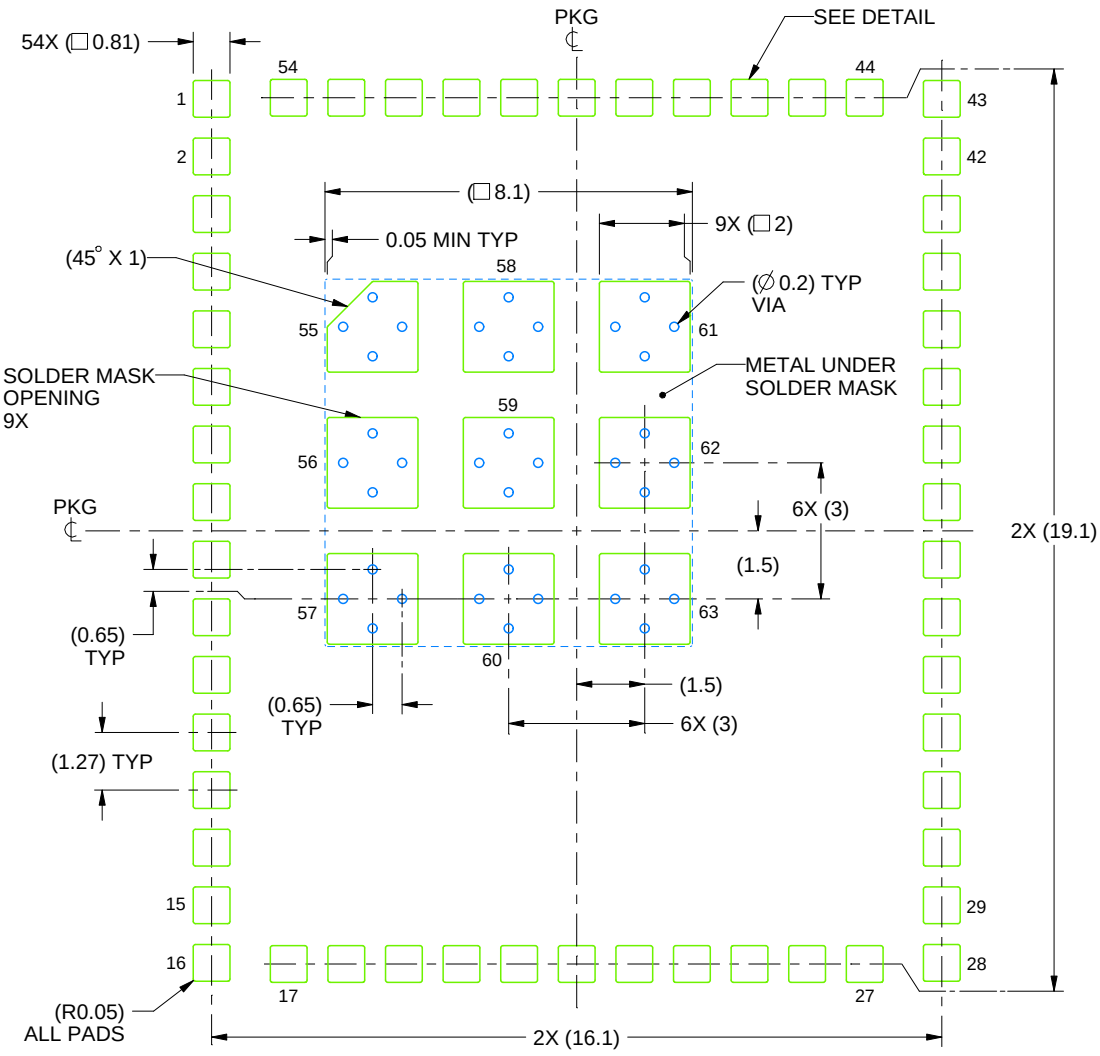
## QFM - 2.4 mm max height

QUAD FLAT MODULE

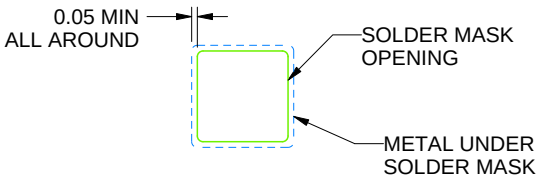



NOTES:

1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.




LAND PATTERN EXAMPLE
SOLDER MASK DEFINED
SCALE:6X

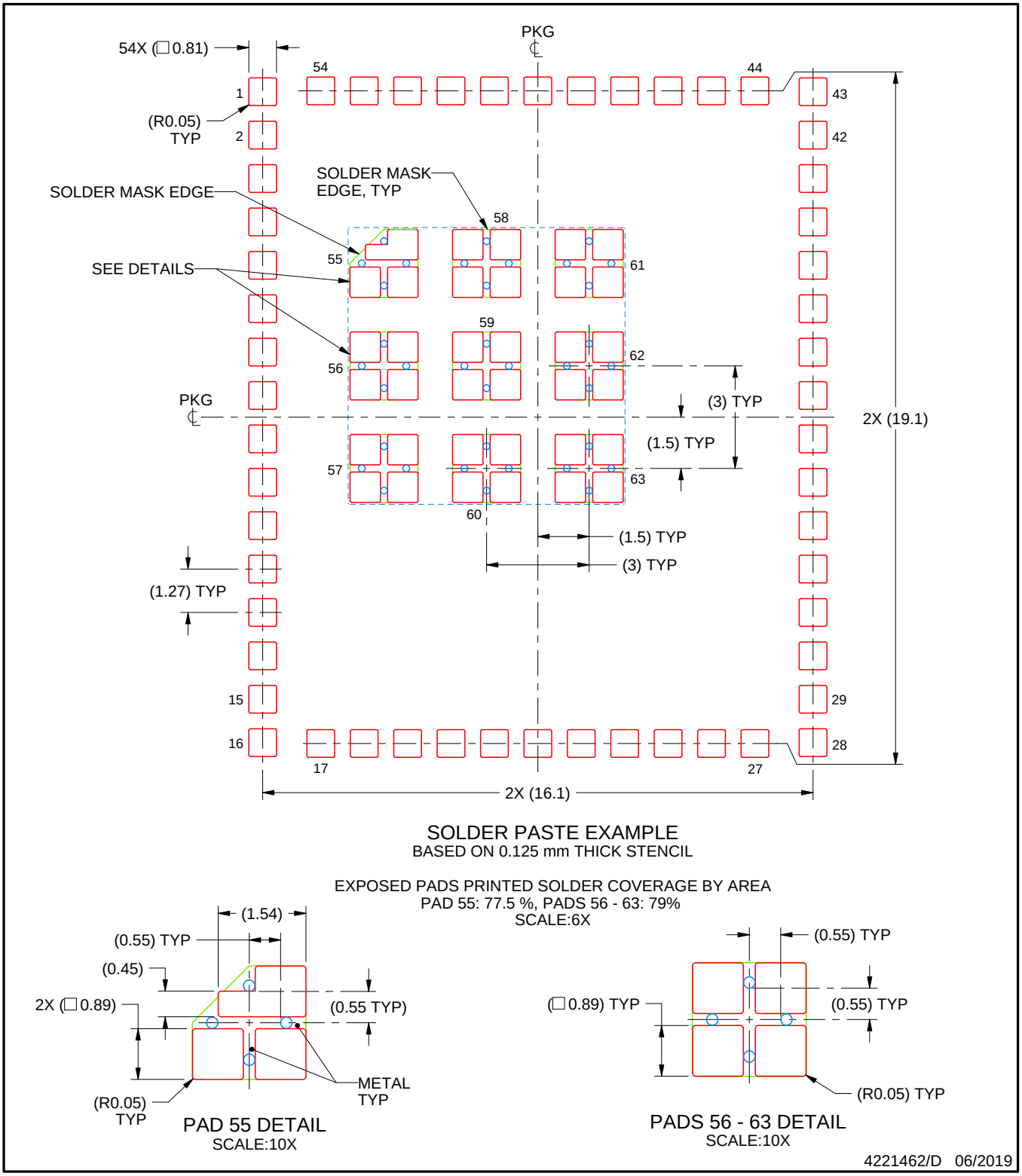



SIGNAL PADS DETAIL

4221462/D 06/2019

NOTES: (continued)

3. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/slua271).




NOTES: (continued)

4. Laser cutting apertures with trapezoidal walls and rounded corners may offer better paste release. IPC-7525 may have alternate design recommendations.

# 重要声明和免责声明

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