TEXAS INSTRUMENTS

CC3100MOD SimpleLink™ Wi-Fi CERTIFIED™ ネットワーク・プロセッサ IoT (モノのインターネット) モジュール・ソリューション、MCU アプリケーション向け

1 特長

- CC3100MOD は、CC3100R11MRGC で構成される Wi-Fi ネットワーク・プロセッサとパワー・マネージメント・サブシステムを内蔵した Wi-Fi® モジュール。完全統合されたモジュールで、必要なクロック、シリアル・ペリフェラル・インターフェイス (SPI) フラッシュ、受動部品をすべて内蔵。
- モジュールの FCC、IC、TELEC、CE 認定によりユーザーの手間、時間、コストを削減
- Wi-Fi CERTIFIED™ モジュール、Wi-Fi Alliance メンバーに認定の転送要求が可能
- Wi-Fi ネットワーク・プロセッサ・サブシステム
  - Wi-Fi Internet-on-a-chip™ 回路を採用
  - 専用 Arm® マイコン (MCU)

    Wi-Fi およびインターネット・プロトコル処理を外付け MCU から完全にオフロード
  - Wi-Fi ドライバと複数のインターネット・プロトコルを ROM に内蔵
  - 802.11 b/g/n 無線、ベースバンド、メディア・アクセス制御 (MAC)、Wi-Fi ドライバ、サプリカント
  - TCP/IP スタック
    - 業界標準の BSD ソケット・アプリケーション・プログラミング・インターフェイス (API)
    - 8 つの TCP または UDP ソケットを同時に使用可能
    - 8 つのソケットのうち 2 つを TLS および SSL ソケットとして使用可能
  - 強力な暗号化エンジンによる高速で安全な Wi-Fi およびインターネット接続と 256 ビット AES 暗号化による TLS および SSL 接続
  - ステーション、AP、Wi-Fi Direct® の各モード
  - WPA2 パーソナルおよびエンタープライズ・セキュリティ
  - SimpleLink™ 接続マネージャによる自律的で高速な Wi-Fi 接続
  - SmartConfig™ テクノロジ、AP モード、WPS2 による簡単かつ柔軟な Wi-Fi プロビジョニング
  - TX 出力
    - 1DSSS で 17dBm
    - 11CCK で 17.25dBm
    - 54OFDM で 13.5dBm
  - RX 感度
    - 1DSSS で -94.7dBm
    - 11CCK で -87dBm
    - 54OFDM で -73dBm
  - アプリケーションのスループット
    - UDP：16Mbps
    - TCP：13Mbps
- ホスト・インターフェイス
  - 広い電源電圧範囲 (2.3〜3.6V)
  - SPI または UART インターフェイスを介して、8/16/32 ビット MCU または ASIC と接続
  - フットプリントが小さいホスト・ドライバ：6KB 未満
  - RTOS および OS なしアプリケーションに対応
- パワー・マネージメント・サブシステム
  - 電源電圧範囲の広い内蔵 DC/DC コンバータ：
    - バッテリ直接モード：2.3V〜3.6V
  - 3.6V で低消費電力
    - ハイバネーション (リアルタイム・クロック (RTC) を使用)：7μA
    - スタンバイ：140μA
    - RX トラフィック：54OFDM で 54mA
    - TX トラフィック：54OFDM で 223mA
- モジュールに内蔵のコンポーネント
  - 40.0MHz 水晶振動子と内部発振器
  - 32.768kHz 水晶振動子 (RTC)
  - 8Mbit の SPI シリアル・フラッシュ
  - RF フィルタおよび受動部品
- 1.27mm ピッチ、63 ピン、20.5mm × 17.5mm の LGA パッケージにより組み立てが簡単で、低コストの PCB を設計可能
- 動作温度範囲：-20℃〜+70℃
- SimpleLink 開発者エコシステムによるサポート

English Data Sheet: SWRS161

2 アプリケーション

次のような IoT (モノのインターネット) アプリケーション：

- クラウド接続
- インターネット・ゲートウェイ
- ホーム・オートメーション
- 家電製品
- アクセス制御
- セキュリティ・システム
- スマート・エネルギー
- 産業用制御
- スマート・プラグおよび計量
- ワイヤレス・オーディオ
- IP ネットワークのセンサ・ノード
- ウェアラブル

3 概要

Wi-Fi® を低コストかつ低消費電力の MCU に追加することで、IoT アプリケーションに対応できます。SimpleLink™ Wi-Fi ファミリの製品である CC3100MOD は、FCC、IC、CE、Wi-Fi CERTIFIED™ モジュールであり、インターネット接続性の実装を大幅に簡素化します。CC3100MOD には Wi-Fi およびインターネットのプロトコルがすべて内蔵されているため、ホスト MCU のソフトウェア要件を最小限に抑えることができます。セキュリティ・プロトコルを内蔵した CC3100MOD ソリューションは、堅牢でシンプルなセキュリティ環境を実現します。また、CC3100MOD は包括的なプラットフォーム・ソリューションであり、さまざまなツールとソフトウェア、サンプル・アプリケーション、ユーザー・ガイドとプログラミング・ガイド、リファレンス・デザイン、TI E2E™ コミュニティによるサポートも用意されています。CC3100MOD は LGA パッケージで供給され、すべての必要な部品 (例：シリアル・フラッシュ、RF フィルタ、水晶振動子、受動部品) を完全に統合しているため簡単にレイアウトできます。

Wi-Fi ネットワーク・プロセッサ・サブシステムは Wi-Fi Internet-on-a chip™ 回路を採用しており、ホスト MCU から引き受ける追加の専用 Arm® MCU を内蔵しています。このサブシステムには、802.11b/g/n 無線、ベースバンド、MAC が含まれ、強力な暗号化エンジンが搭載されているため、256 ビットの暗号化を使用して、高速で安全なインターネット接続が可能です。CC3100MOD モジュールは、ステーション、アクセス・ポイント、および Wi-Fi Direct モードをサポートしています。このモジュールは WPA2 パーソナルおよびエンタープライズ・セキュリティと WPS 2.0 もサポートしています。このサブシステムには、内蔵の TCP/IP、TLS/SSL スタック、HTTP サーバー、および複数のインターネット・プロトコルが含まれています。

パワー・マネージメント・サブシステムには、内蔵の DC/DC コンバータが含まれており、広範な電源電圧に対応できます。このサブシステムを使うと、RTC によるハイバネーションなどの低消費電力モードを実現できます。CC3100MOD モジュールは、SPI または UART インターフェイスを介して、8 ビット、16 ビット、または 32 ビットの任意の MCU に接続できます。デバイス・ドライバにより、TCP クライアント・アプリケーションにおけるホスト・メモリのフットプリント要件を、7KB 未満のコード・メモリ、700B の RAM と最小限に抑えることができます。

表 3-1. モジュール情報

部品番号 [(1)](#)	パッケージ	本体サイズ
CC3100MODR11MAMOB	MOB (63)	20.5mm × 17.5mm

(1) 詳細についてはセクション 13 を参照してください。

4 機能ブロック図

図 4-1 に、CC3100MOD モジュールの機能ブロック図を示します。

図 4-1. CC3100MOD の機能ブロック図
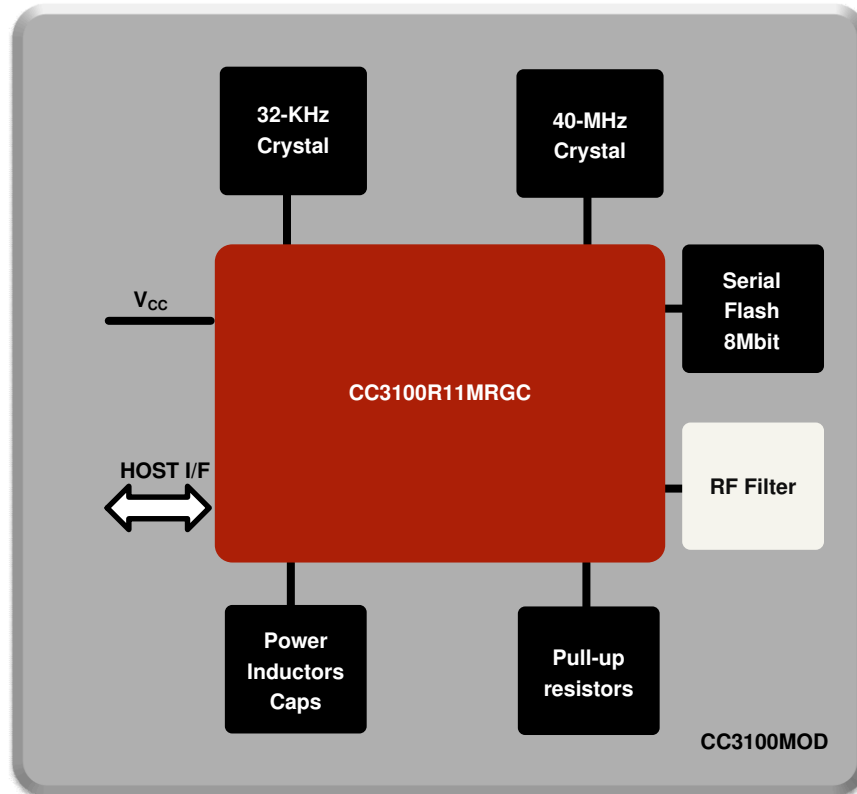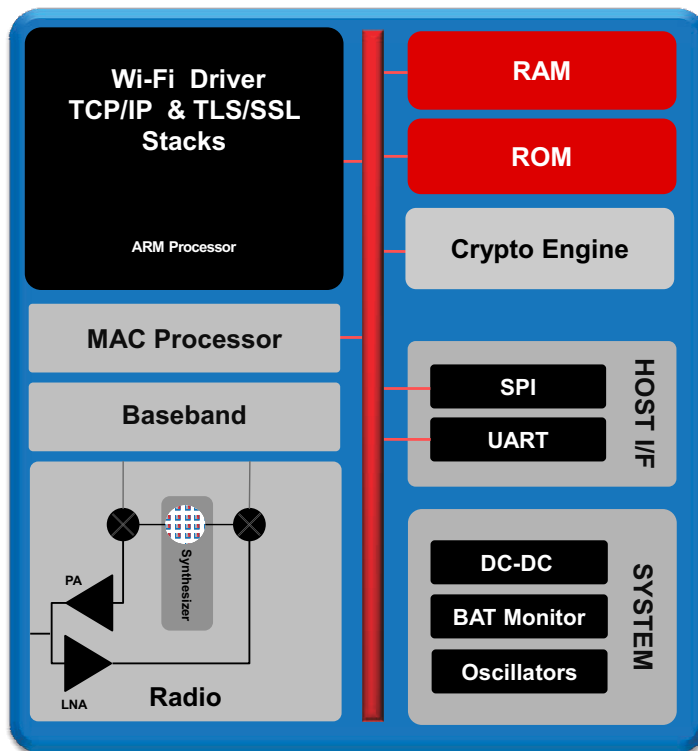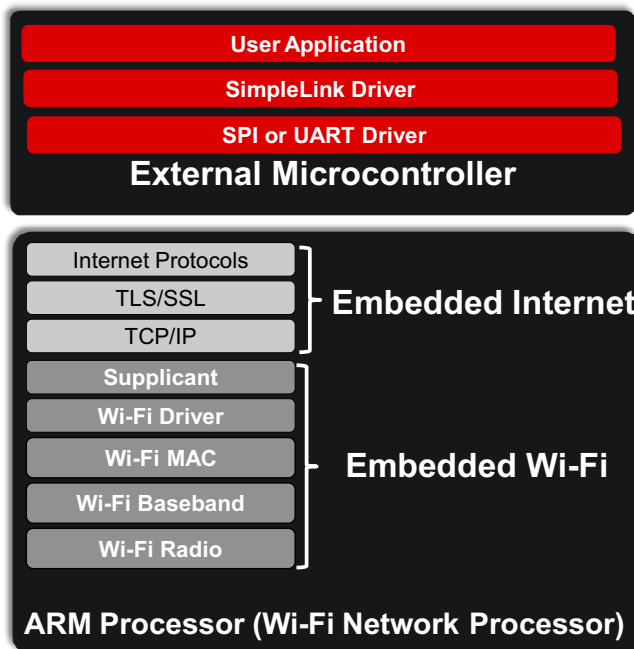
Product Folder Links: *CC3100MOD*

English Data Sheet: SWRS161

SWAS031-A

図 4-2. CC3100 ハードウェアの概要

SWAS031-B

図 4-3. CC3100 ソフトウェアの概要

5 機能ブロック図

図 5-1 に、CC3100MOD モジュールの機能ブロック図を示します。

図 5-1. CC3100MOD の機能ブロック図

Product Folder Links: *CC3100MOD*

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図 5-2. CC3100 ハードウェアの概要

図 5-3. CC3100 ソフトウェアの概要

Product Folder Links: *CC3100MOD*

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6 Revision History

資料番号末尾の英字は改訂を表しています。その改訂履歴は英語版に準じています。

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7 Terminal Configuration and Functions

7.1 CC3100MOD Pin Diagram

図 7-1 shows the pin diagram for the CC3100MOD device.
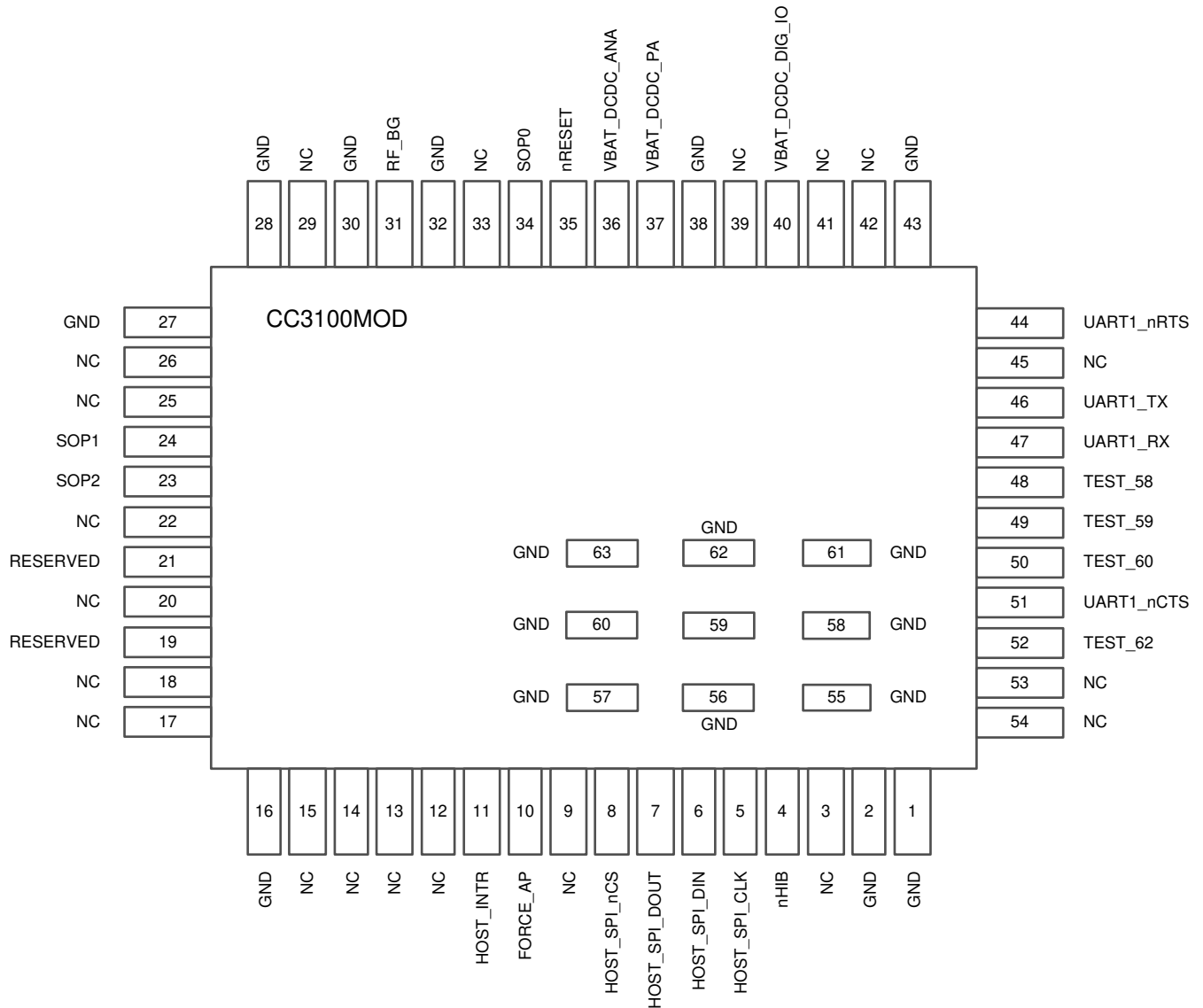
図 7-1 shows the approximate location of pins on the module. For the actual mechanical diagram, refer to セクション 13.

図 7-1. CC3100MOD Pin Diagram Bottom View

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7.2 Pin Attributes

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

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 図 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.

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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.

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English Data Sheet: SWRS161

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 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.

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

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 図 8-1, 図 8-2, and 図 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
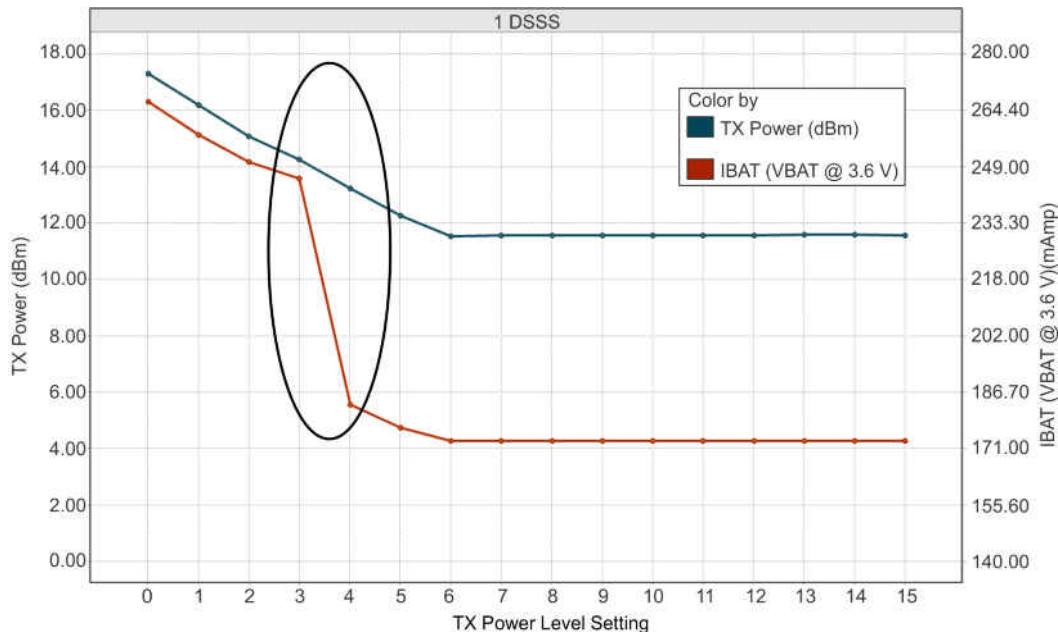
Note: The area enclosed in the circle represents a significant reduction in current during transition from TX power level 3 to 4. In the case of lower range requirements (13-dBm output power), TI recommends using TX power level 4 to reduce the current.

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

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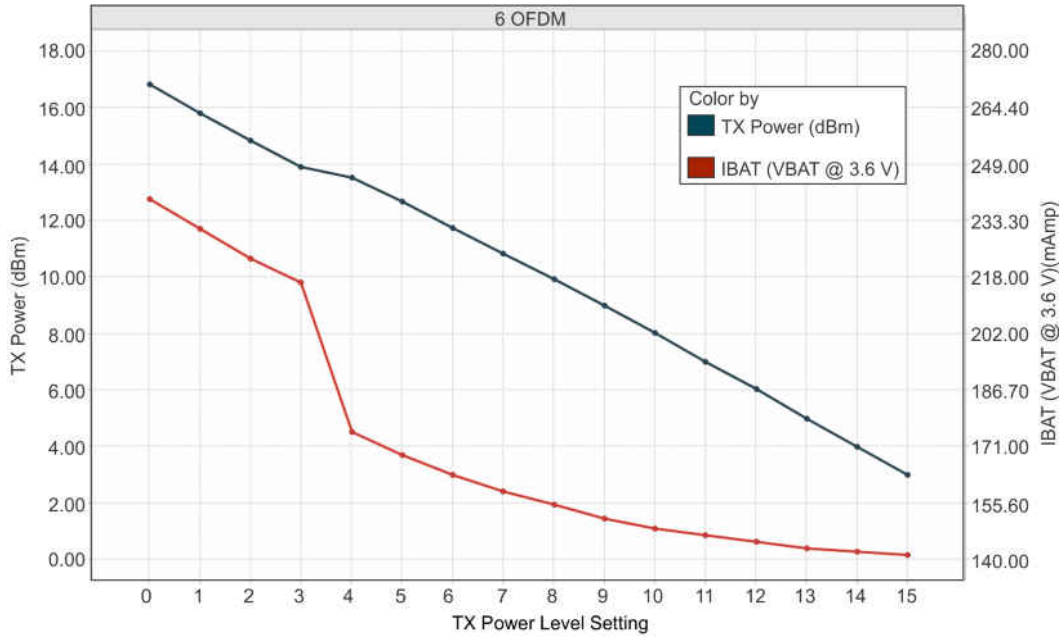
図 8-2. TX Power and IBAT vs TX Power Level Settings (6 OFDM)
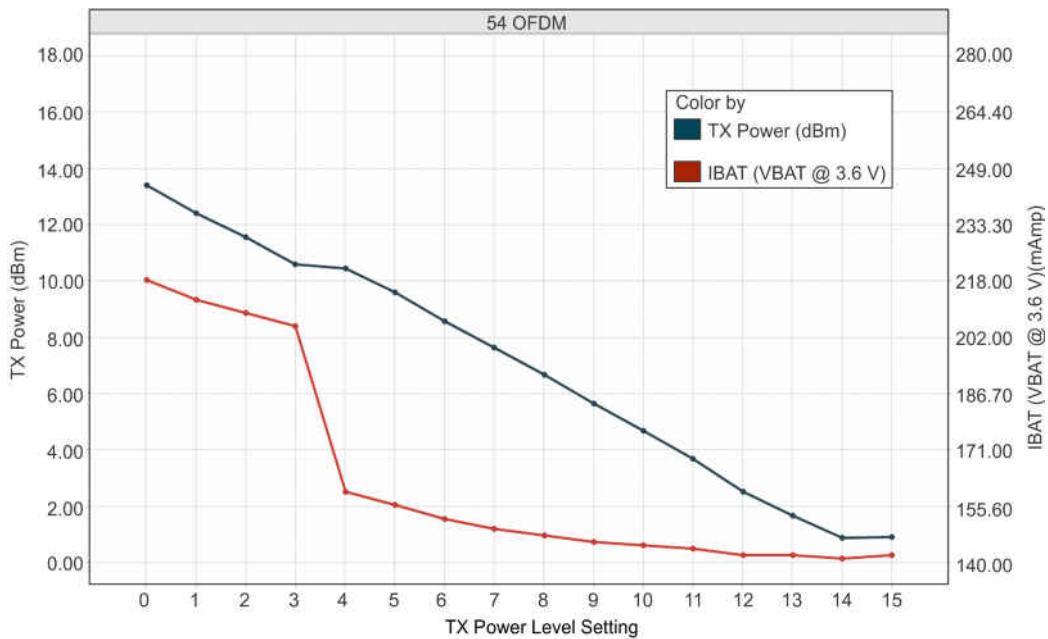
図 8-3. TX Power and IBAT vs TX Power Level Settings (54 OFDM)

8.7 Brownout and Blackout Conditions

The module enters a brownout condition when the input voltage dips below $V_{BROWNOUT}$ (see 図 8-4 and 図 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.

注

When the device is in the Hibernate state, brownout is not detected; only blackout is in effect during the Hibernate state.
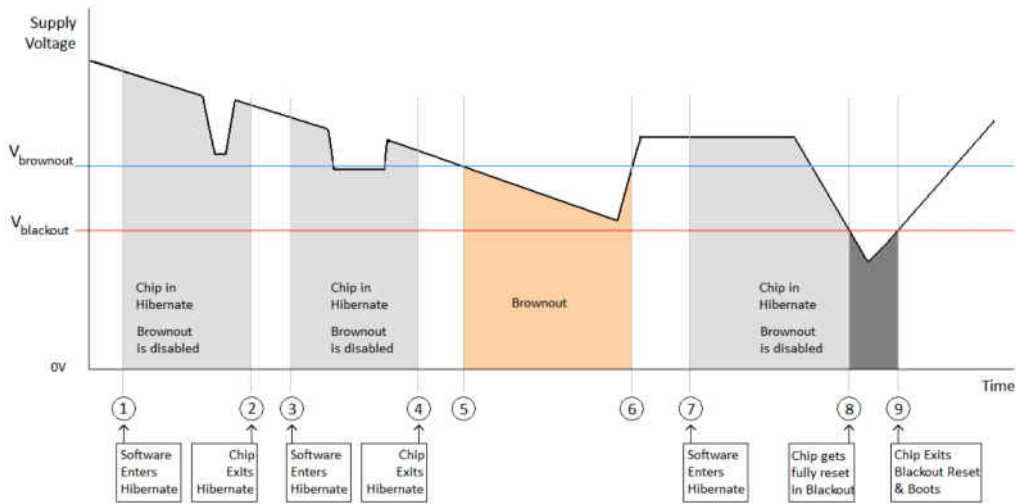
図 8-4. Brownout and Blackout Levels (1 of 2)
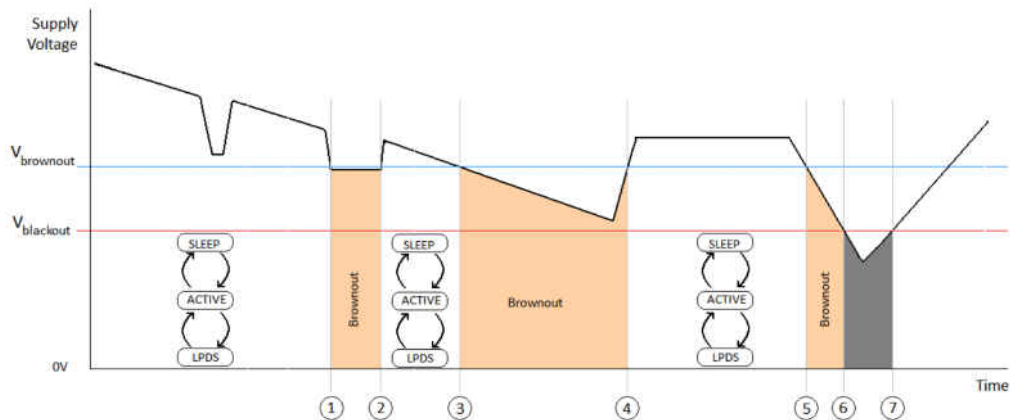
図 8-5. Brownout and Blackout Levels (2 of 2)

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

Product Folder Links: CC3100MOD

English Data Sheet: SWRS161

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			$0.65 \times VDD$		$VDD + 0.5$ V	V
V_{IL}	Low-level input voltage			−0.5		$0.35 \times VDD$	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).

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

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)
RΘ$_{JC}$	Junction-to-case	9.08	0.00
RΘ$_{JB}$	Junction-to-board	10.34	0.00
RΘ$_{JA}$	Junction-to-free air	11.60	0.00
RΘ$_{JMA}$	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

Product Folder Links: CC3100MOD

English Data Sheet: SWRS161

8.12 Timing and Switching Characteristics

8.12.1 Wake-Up Sequence
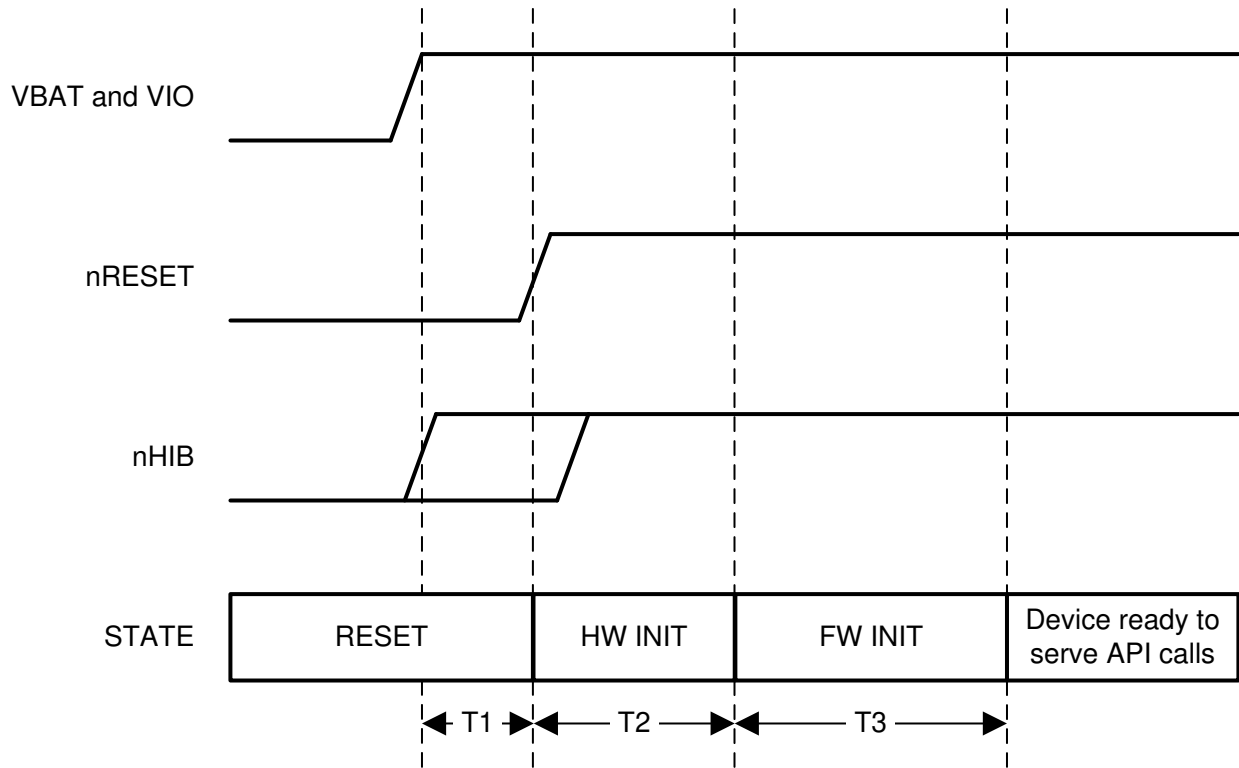
図 8-6. Wake-Up Sequence

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

図 8-7 shows the timing diagram for wake up from the hibernate state.
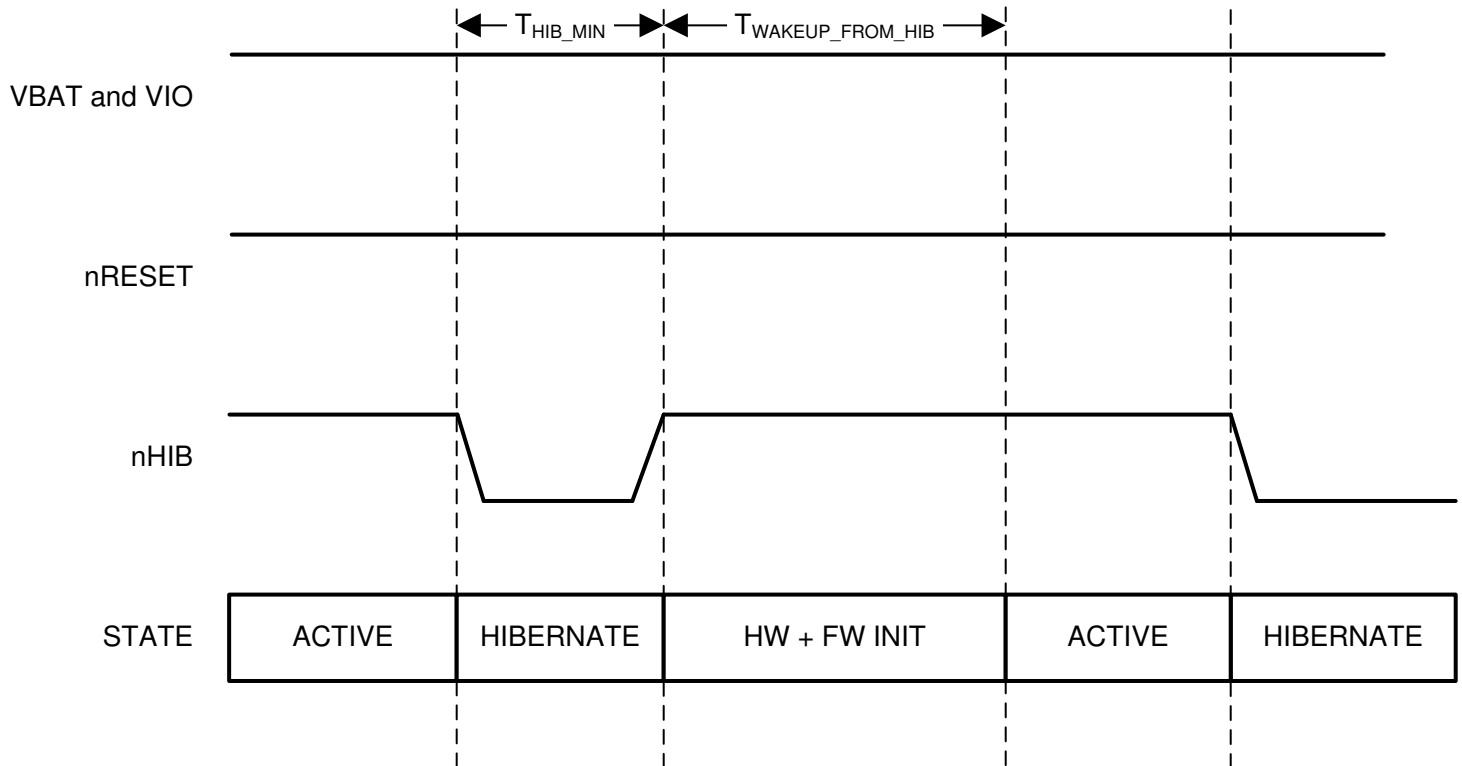
図 8-7. nHIB Timing Diagram

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.

セクション 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

図 8-8 shows the host SPI timing diagram.
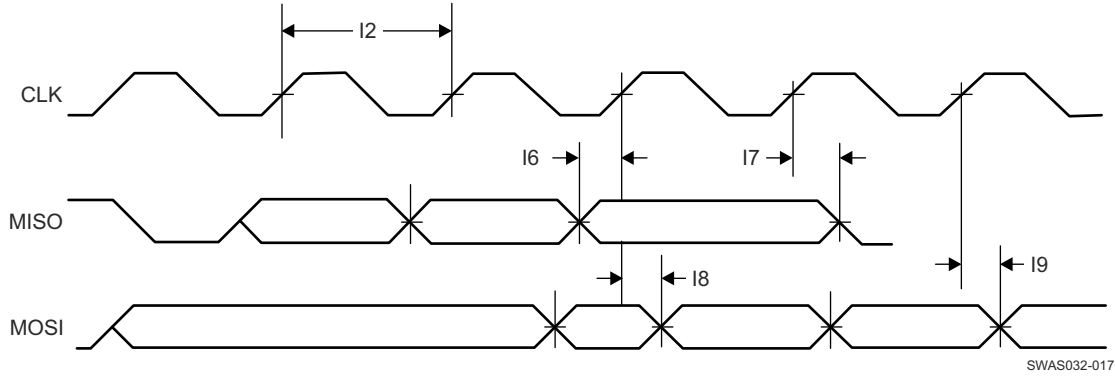
図 8-8. Host SPI Timing

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.

図 8-9 shows the SPI host interface.
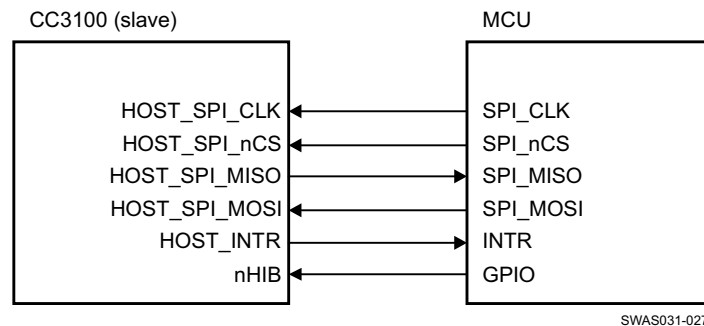
図 8-9. SPI Host Interface

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

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表 8-3. SPI Host Interface (continued)

PIN NAME	DESCRIPTION
HOST_SPI_nCS	CS (active low) signal from MCU host to CC3100 device
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

図 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.

SWAS031-088
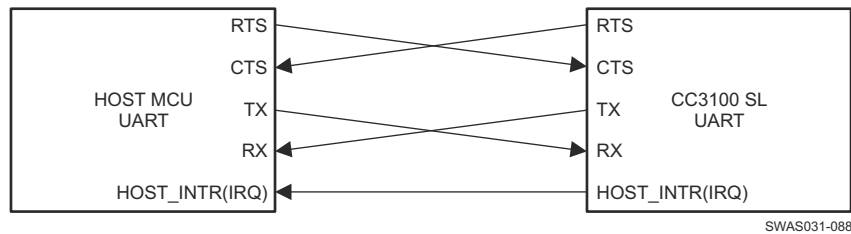
図 8-10. Typical 5-Wire UART Topology

図 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 図 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.

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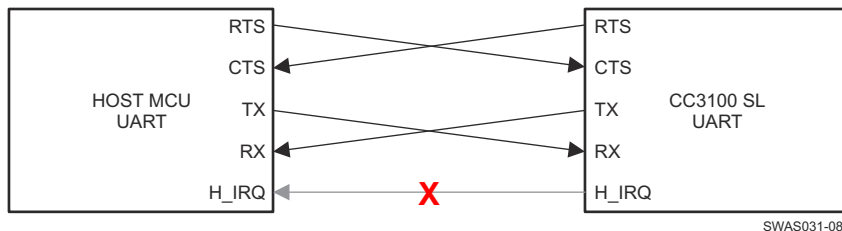
図 8-11. 4-Wire UART Configuration

8.13.3 3-Wire UART Topology

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

- RX
- TX
- nCTS
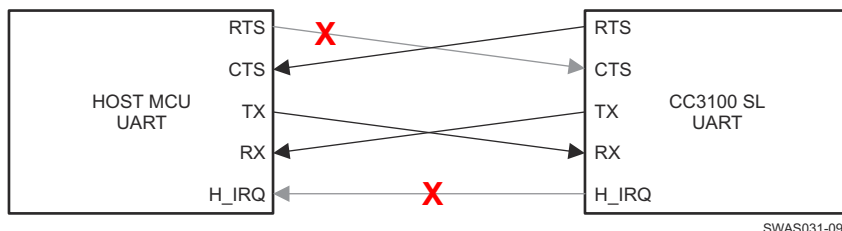
図 8-12. 3-Wire UART Topology

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

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

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

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

V_{CC}
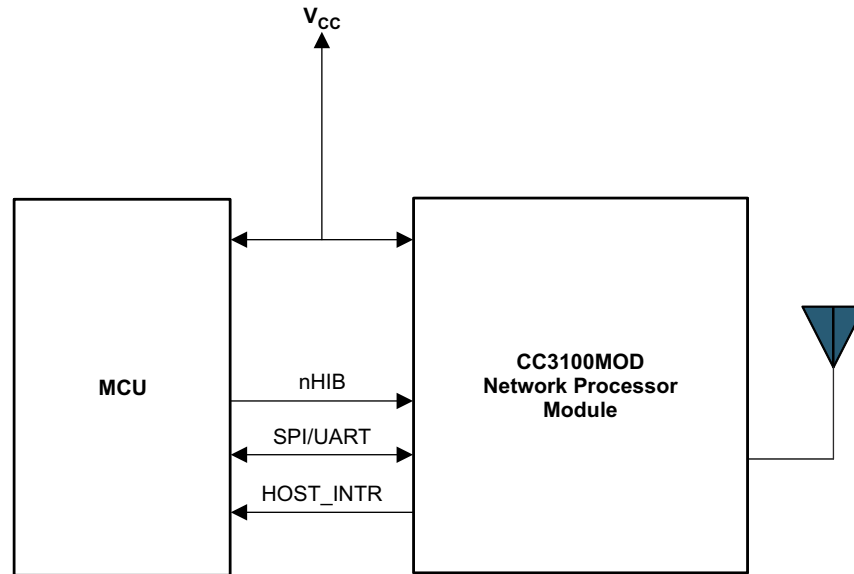
图 9-1. Functional Block Diagram

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

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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.

注

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

Product Folder Links: *CC3100MOD*

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10 Applications, Implementation, and Layout

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.

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10.1 Reference Schematics

図 10-1 shows the reference schematic for the CC3100MOD module. The complete schematic can be downloaded from http://www.ti.com/lit/zip/swrc293.
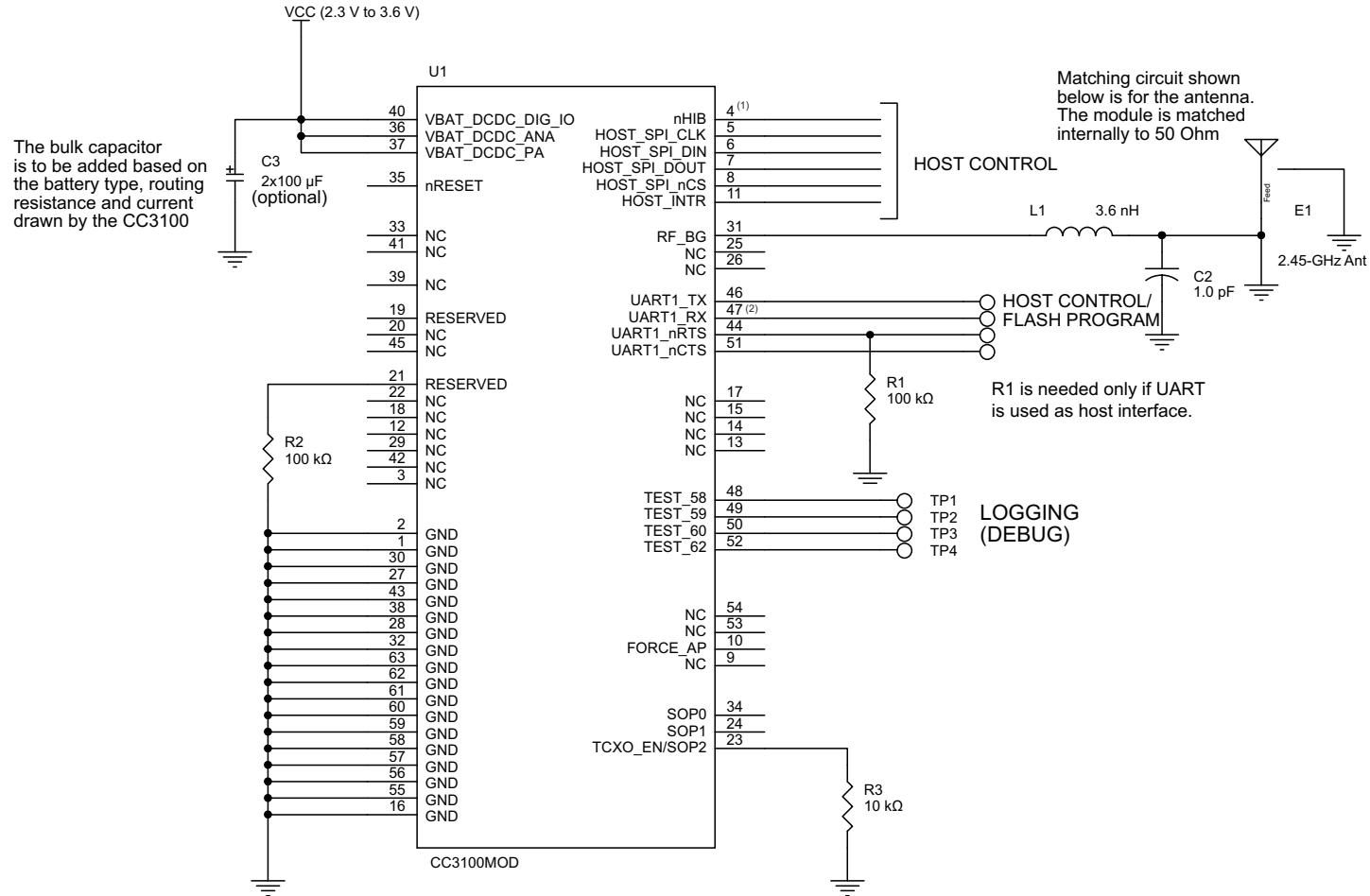
A. If the GPIO from the MCU can float while the MCU enters low power, consider adding a pulldown resistor on the board to avoid floating.

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.

図 10-1. CC3100MOD Module Reference Schematic

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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

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10.3 Layout Recommendations

10.3.1 RF Section (Placement and Routing)
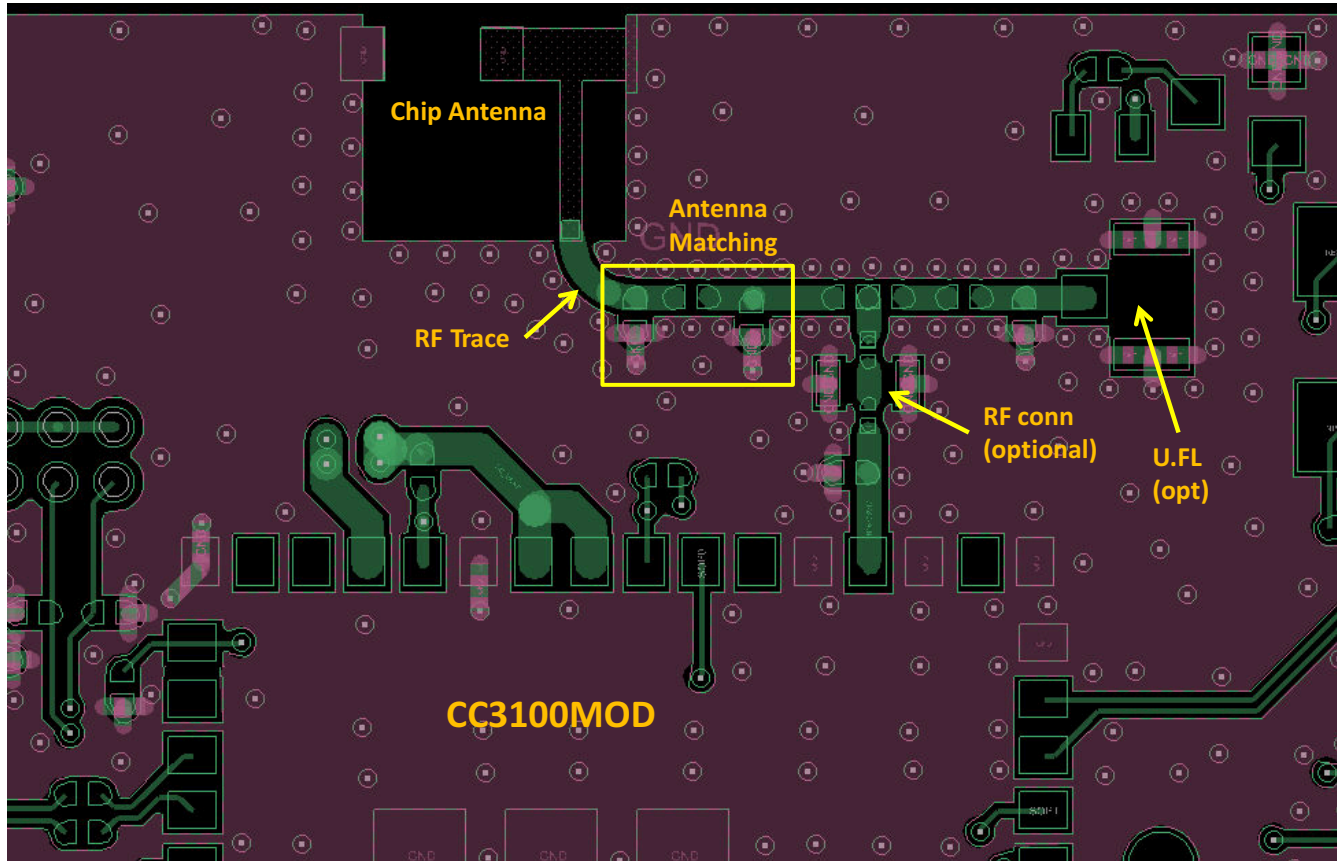
図 10-2. RF Section Layout

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.

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表 10-2. Antenna Guidelines (continued)
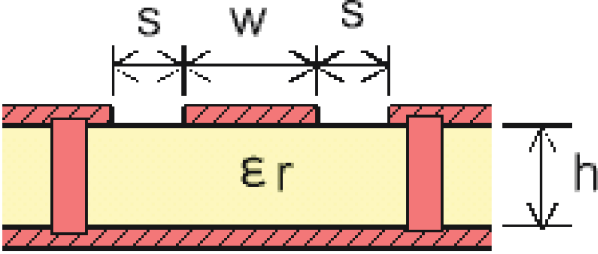
SR NO.	GUIDELINES
5	Ensure that the antenna impedance is 50 Ω because the device is rated to work only with a 50-Ω system.
6	In case of printed antenna, ensure that the simulation is performed with the solder mask in consideration.
7	Ensure that the antenna has a near omni-directional pattern.
8	The 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. 図 10-3 shows a cross section of the coplanar waveguide with the critical dimensions.
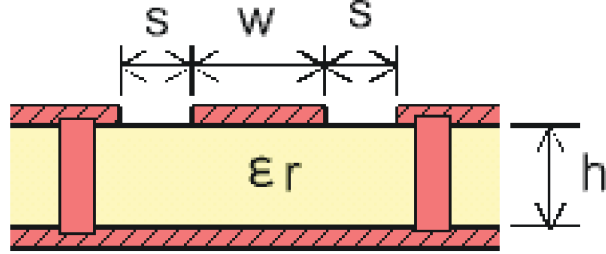
図 10-3. Coplanar Waveguide (Cross Section)

図 10-4 shows the top view of the coplanar waveguide with GND and via stitching.
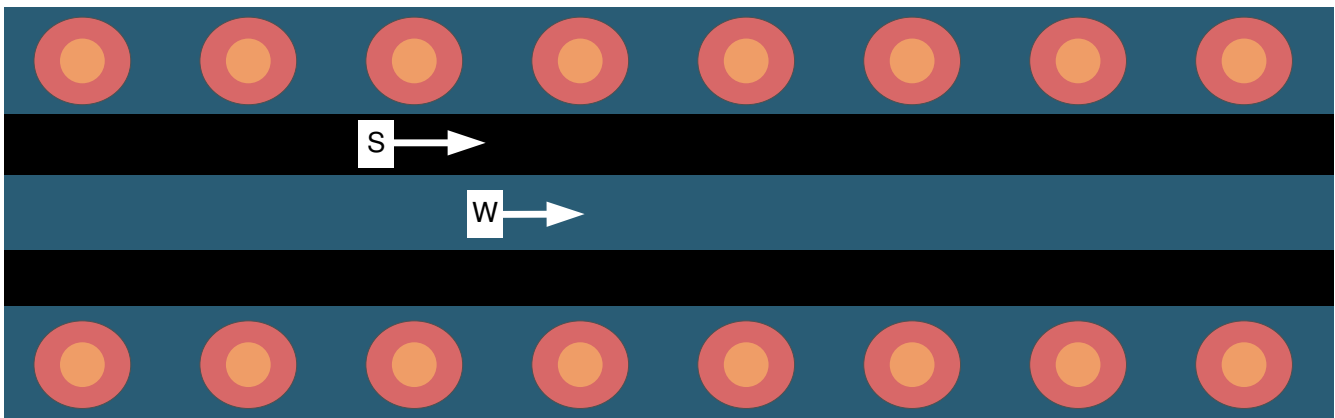
図 10-4. CPW With GND and Via Stitching (Top View)

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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	

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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

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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 図 11-1)
- Temperature profile: Reflow soldering will be done according to the temperature profile (see 図 11-1)
- Peak temp: 245°C
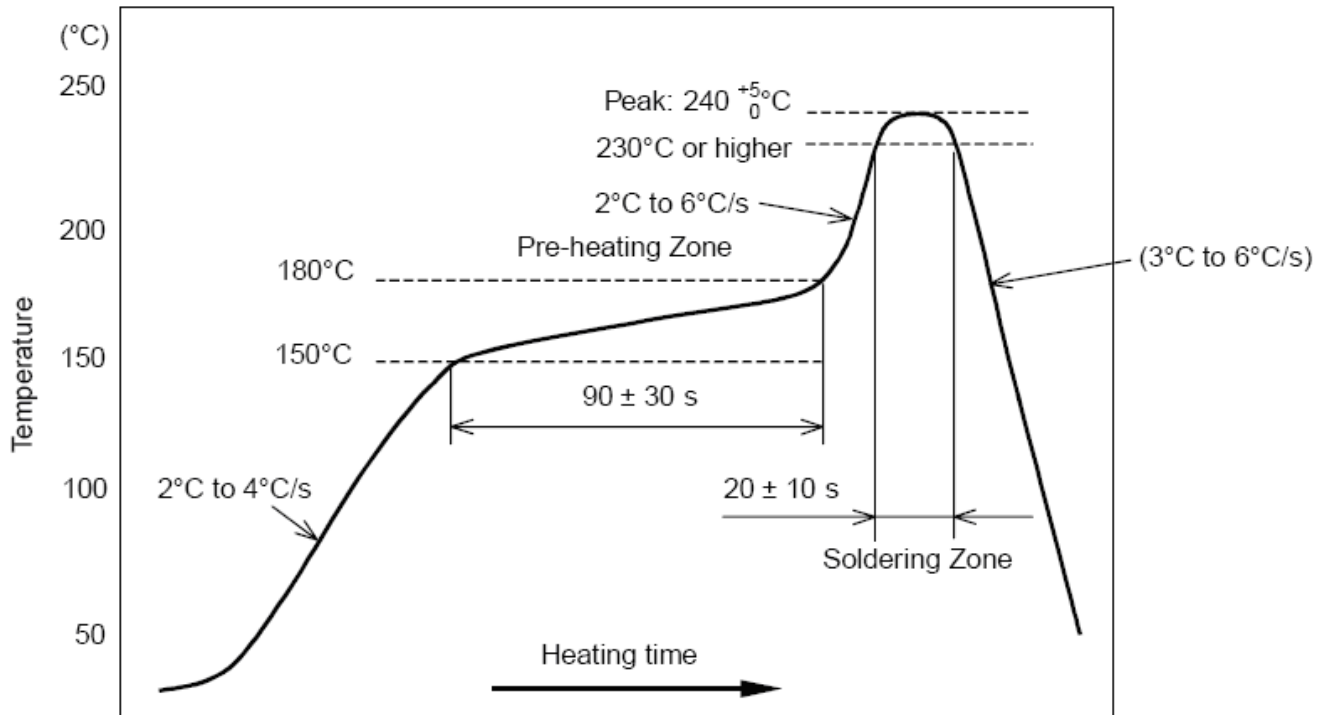
図 11-1. Temperature Profile for Evaluation of Solder Heat Resistance of a Component (at Solder Joint)

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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 図 12-1).
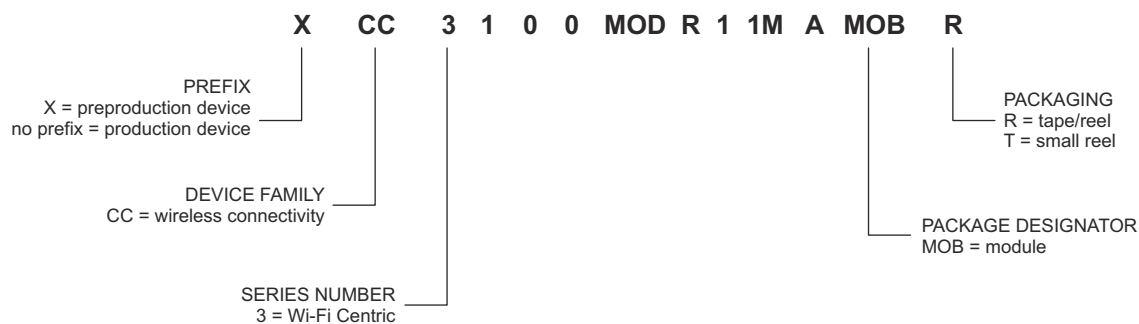
図 12-1. CC3100

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

Product Folder Links: *CC3100MOD*

English Data Sheet: SWRS161

12.3 Trademarks

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12.4 静電気放電に関する注意事項

この IC は、ESD によって破損する可能性があります。テキサス・インスツルメンツは、IC を取り扱う際には常に適切な注意を払うことを推奨します。正しい ESD 対策をとらないと、デバイスを破損するおそれがあります。

ESD による破損は、わずかな性能低下からデバイスの完全な故障まで多岐にわたります。精密な IC の場合、パラメータがわずかに変化するだけで公表されている仕様から外れる可能性があるため、破損が発生しやすくなっています。

12.5 用語集

TI 用語集　　　この用語集には、用語や略語の一覧および定義が記載されています。

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

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

図 13-1 shows the CC3100MOD module.
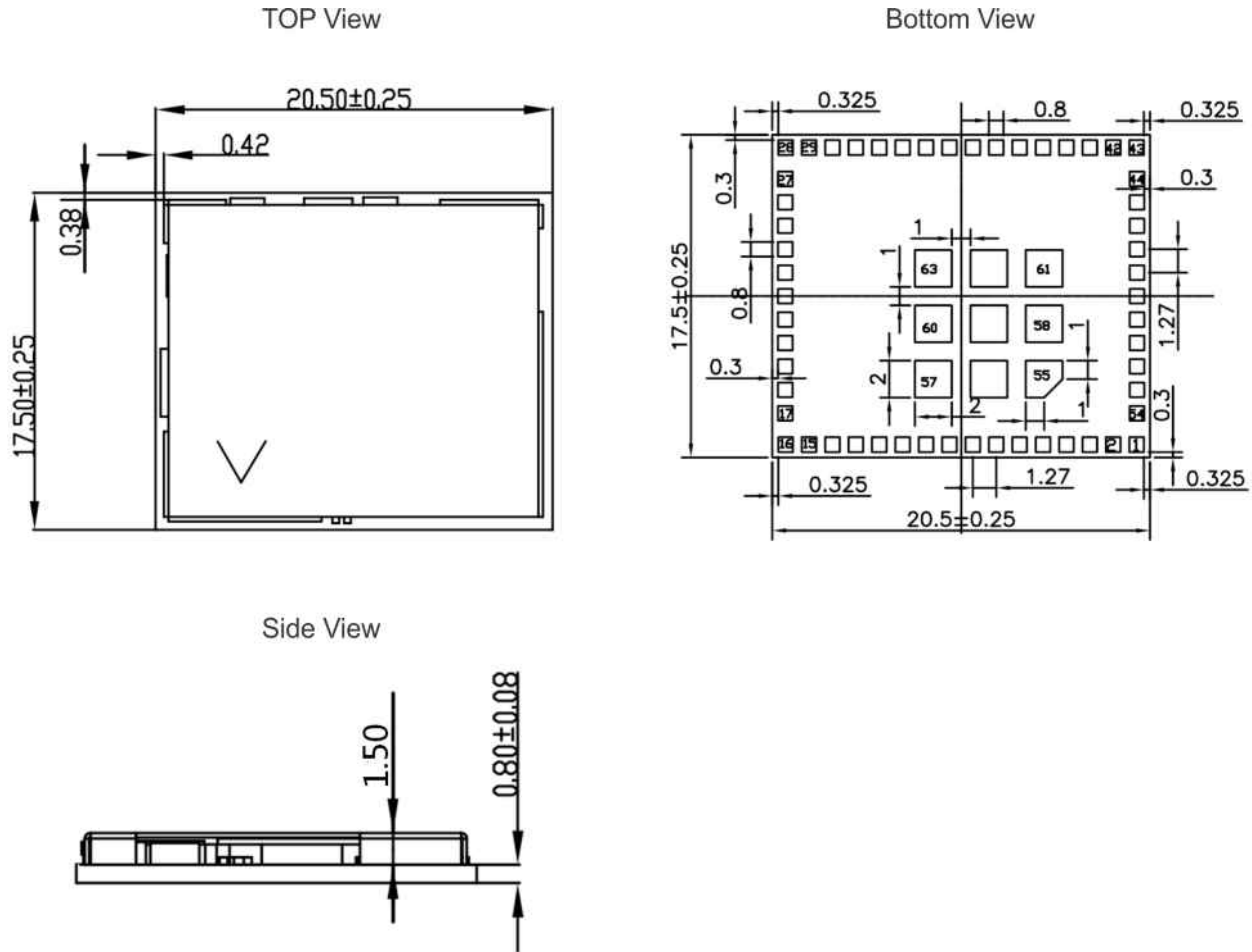
図 **13-1. Mechanical Drawing**

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

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

図 13-2. Land Pattern Drawing

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.

Product Folder Links: CC3100MOD

English Data Sheet: SWRS161

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

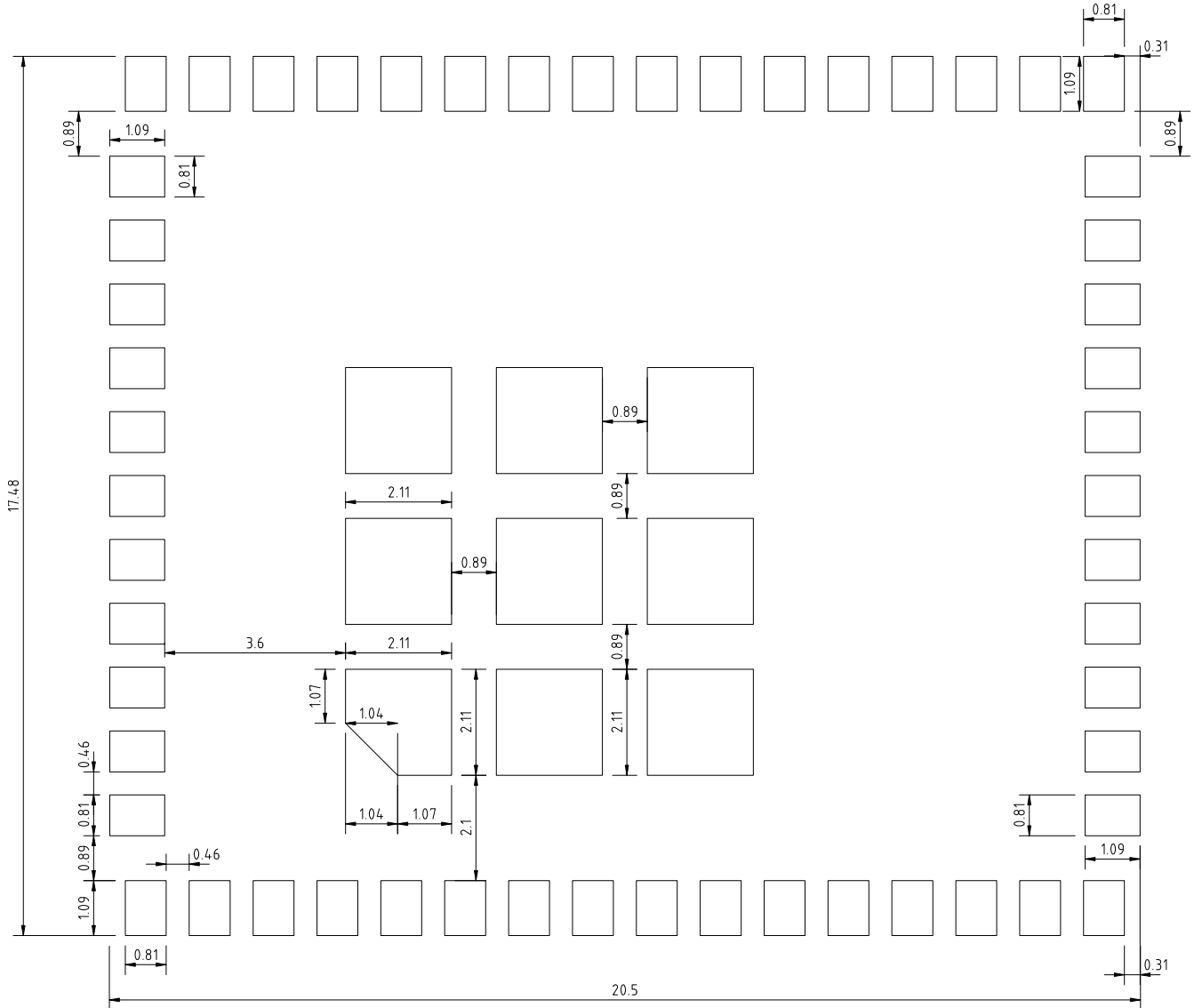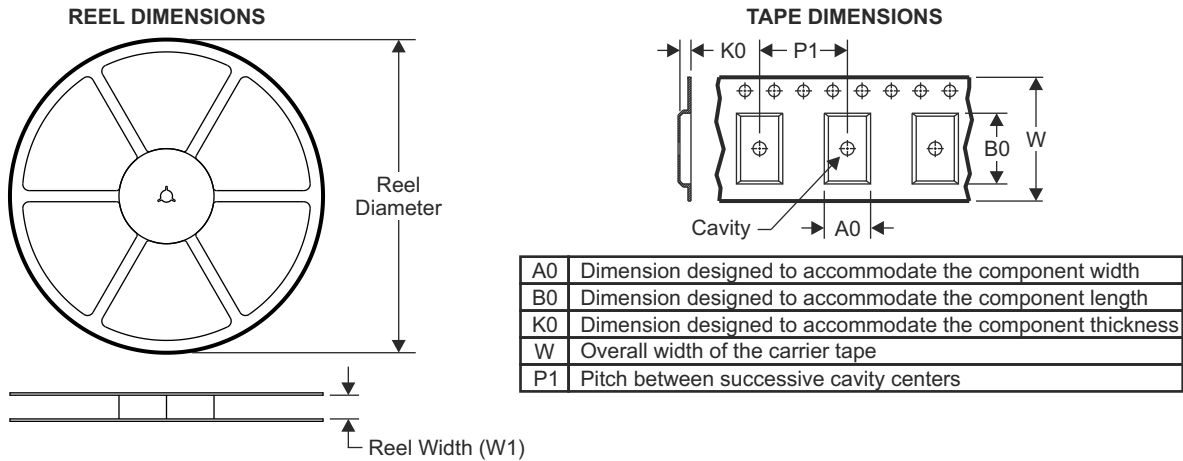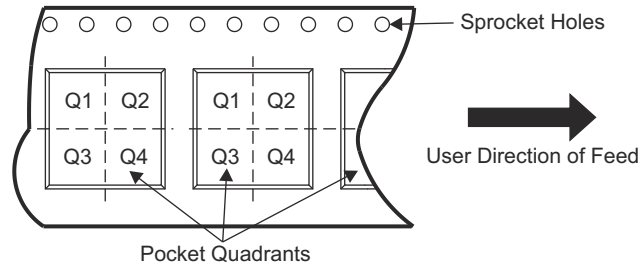| Orderable Device	Status [1]	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL, Peak Temp [3]	Op Temp (°C)	Device Marking [4] [5]
CC3100MODR11MAMOBR	ACTIVE	MOB	63	750	RoHS Exempt	Ni Au	3, 250°C	–20 to 70	CC3100MODR11MAMOB
CC3100MODR11MAMOBT	ACTIVE	MOB	63	250	RoHS Exempt	Ni Au	3, 250°C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

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In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

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

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

TAPE AND REEL BOX DIMENSIONS
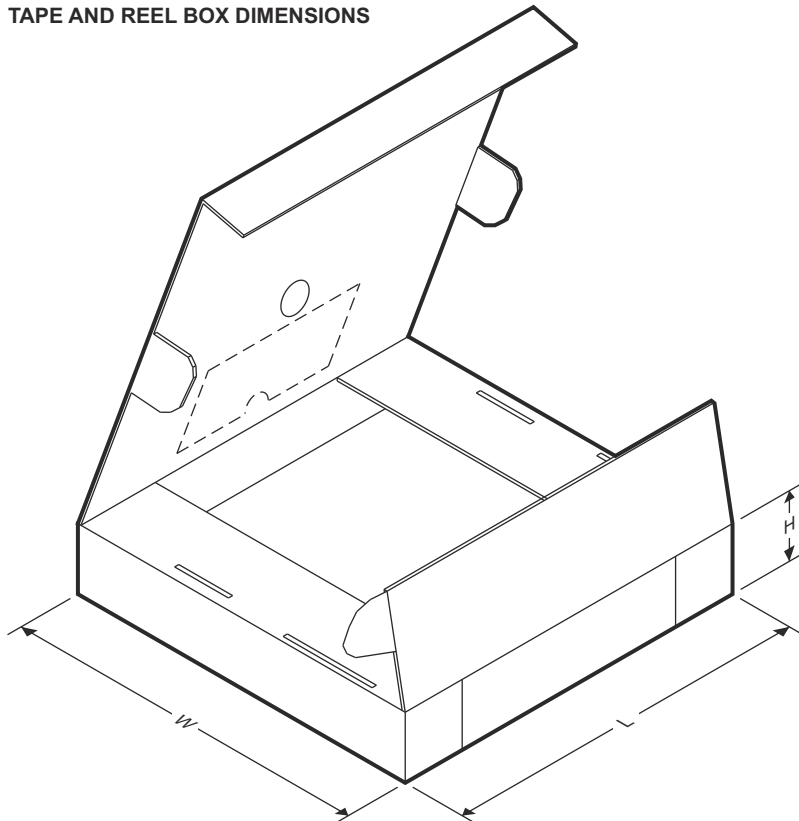
Device	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
CC3100MODR11MAMOBR	MOB	63	750	354.0	354.0	55.0
CC3100MODR11MAMOBT	MOB	63	250	354.0	354.0	55.0

Product Folder Links: *CC3100MOD*

English Data Sheet: *SWRS161*

PACKAGE OPTION ADDENDUM

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.

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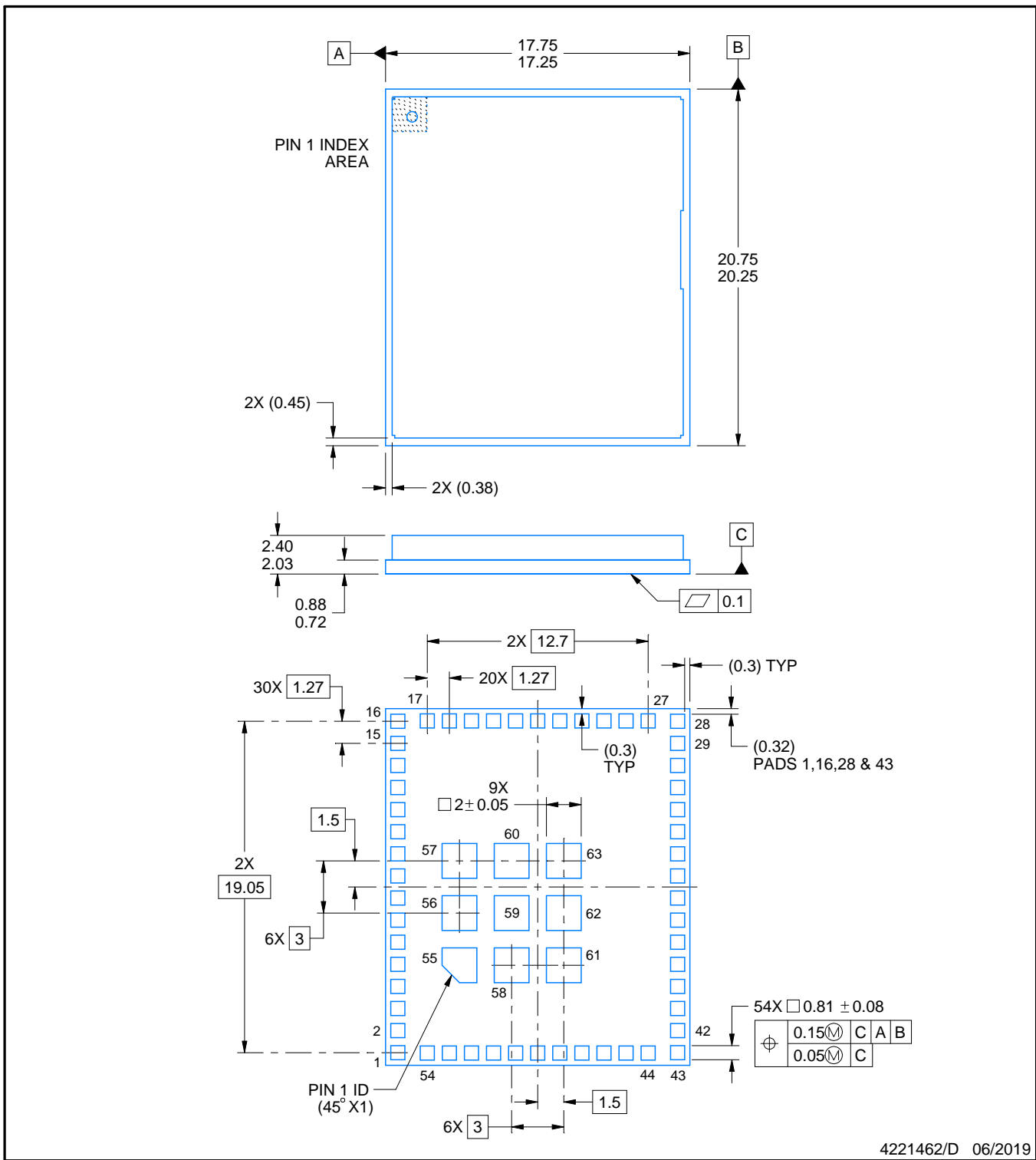
A | 17.75 / 17.25 | B

PIN 1 INDEX AREA

20.75 / 20.25

2X (0.45)

2X (0.38)

2.40 / 2.03

0.88 / 0.72

C

0.1

2X 12.7

30X 1.27

20X 1.27

(0.3) TYP

17

27

28
29

(0.3) TYP

(0.32) PADS 1,16,28 & 43

16
15

9X □ 2 ± 0.05

1.5

57   60   63

2X 19.05

56   59   62

6X 3

55   61

58

2
1

42

54X □ 0.81 ± 0.08

⊕ | 0.15 Ⓜ | C | A | B
  | 0.05 Ⓜ | C

54   44   43

PIN 1 ID (45° X1)
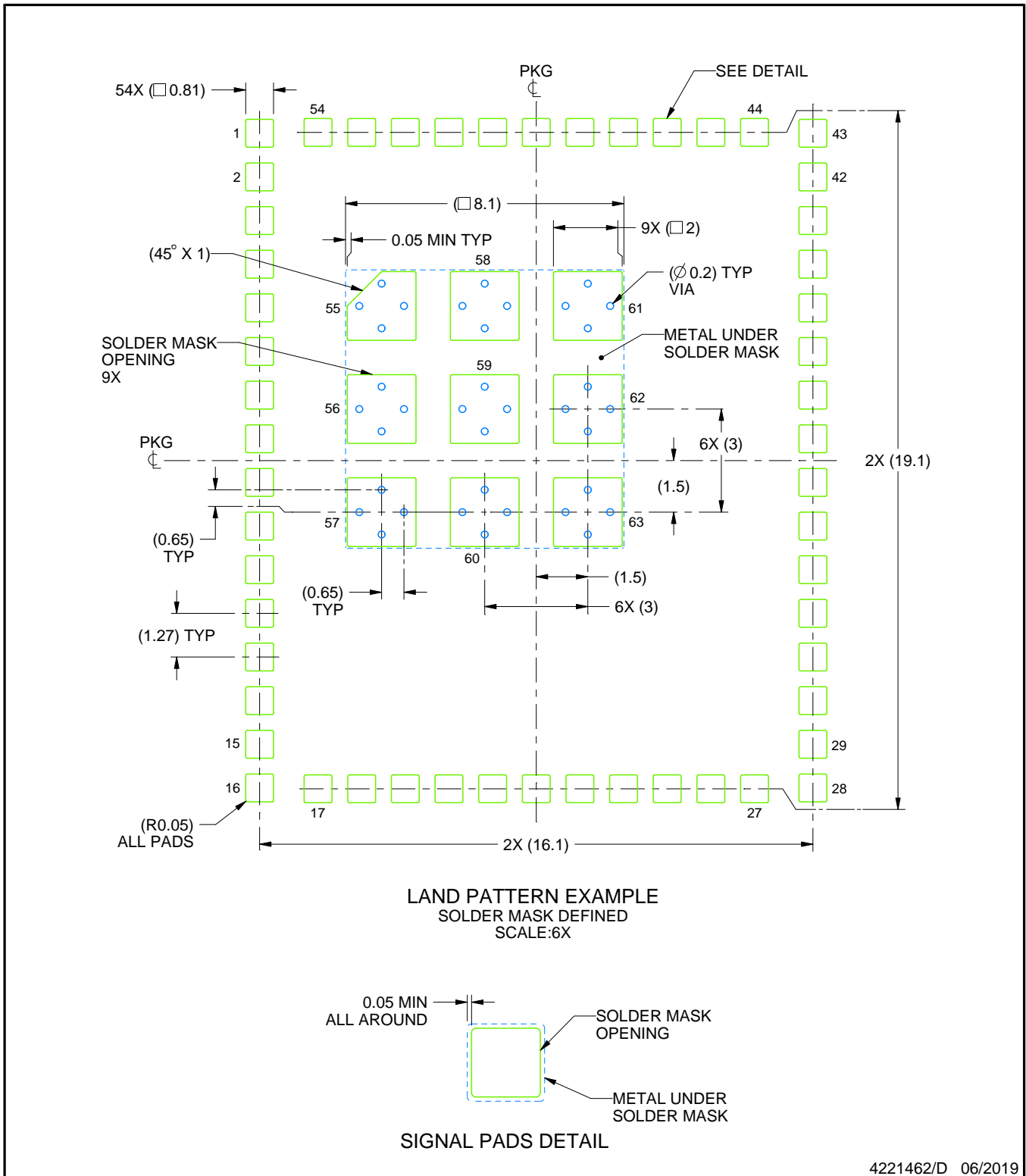
6X 3   1.5

4221462/D   06/2019

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.

54X (□ 0.81)

PKG ₵

SEE DETAIL

54

44

43

1

2

(□ 8.1)

9X (□ 2)

0.05 MIN TYP

(45° X 1)

58

(⌀ 0.2) TYP VIA

55

61

METAL UNDER SOLDER MASK

SOLDER MASK OPENING 9X

59

56

62

PKG ₵

6X (3)

2X (19.1)

(1.5)

(0.65) TYP

57

63

(0.65) TYP

60

(1.27) TYP

(1.5)

6X (3)

15

29

16

28

17

27

(R0.05) ALL PADS

2X (16.1)

LAND PATTERN EXAMPLE
SOLDER MASK DEFINED
SCALE:6X

0.05 MIN ALL AROUND

SOLDER MASK OPENING

METAL UNDER SOLDER MASK

SIGNAL PADS DETAIL
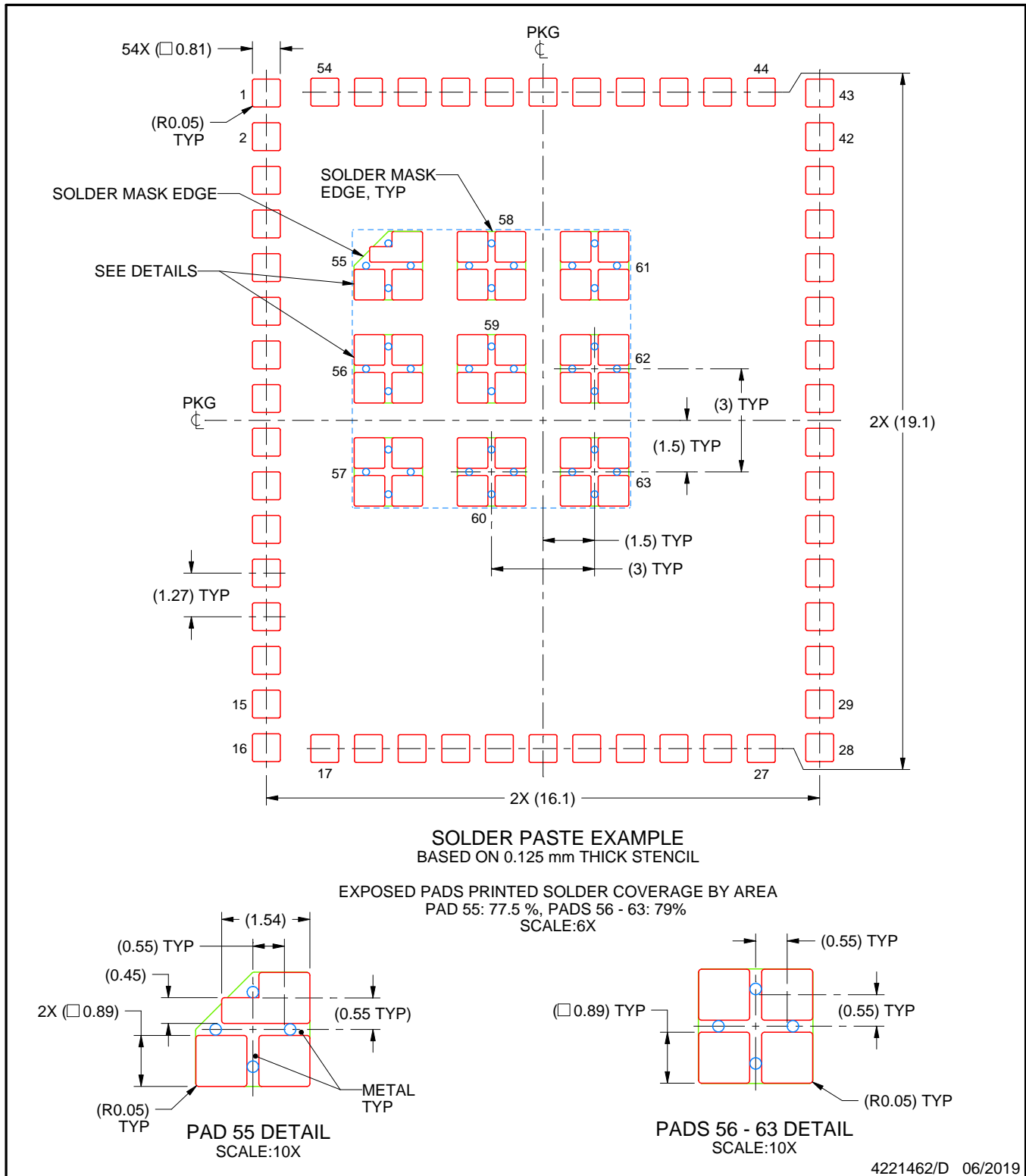
4221462/D   06/2019

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).

SOLDER PASTE EXAMPLE
BASED ON 0.125 mm THICK STENCIL

EXPOSED PADS PRINTED SOLDER COVERAGE BY AREA
PAD 55: 77.5 %, PADS 56 - 63: 79%
SCALE:6X

PAD 55 DETAIL
SCALE:10X

PADS 56 - 63 DETAIL
SCALE:10X

4221462/D 06/2019

NOTES: (continued)

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

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