

CC350xE 2.4GHz SimpleLink™ Wi-Fi 6 and Bluetooth® Low Energy Wireless MCU

1 Features

Microcontroller

- Powerful 160MHz Arm® Cortex®-M33 processor with FPU, TrustZone®, and AI acceleration
- High-speed quad-SPI and octal-SPI for XiP flash with on-the-fly decryption
- Flexible configuration of low-latency TCM (up to 32KB) and cache (32KB or 64KB) for improved code execution performance
- Over 1MB embedded SRAM including 128KB TCM for Wi-Fi, BLE, networking, and application data
- Support for additional external PSRAM

Peripherals

- Up to 38 I/Os with flexible multiplexing options
- 8 x general-purpose timers and pulse-width modulation (PWM)
- 2 x universal asynchronous receiver-transmitter (UART)
- 2 x Serial Peripheral Interface (SPI)
- 2 x inter-integrated circuit (I²C)
- Inter-IC sound (I²S)
- Pulse density modulation (PDM)
- Secure digital and multimedia card (SD/MMC)
- Secure digital input output (SDIO) 2.0
- Controller area network (CAN) 2.0
- 8-channel, 12-bit analog-to-digital converter (ADC)

System Services

- Direct memory access (DMA)
- One-time-programmable memory (OTP)
- Real-time clock (RTC) and watchdog timer (WDT)

Radio

- Wi-Fi 6 (802.11ax)
 - Single-stream 20MHz channels with application throughput up to 20Mbps (UDP)
 - Compatible with IEEE 802.11 b/g/n/ax
 - Orthogonal frequency-division multiple access (OFDMA)
 - Target wake time (TWT)
 - Trigger frames
 - Basic service set (BSS) color
 - Integrated PA for complete WLAN system with up to 20dBm output power at 1 DSSS
 - Role support: STA, softAP with up to 4 stations, Wi-Fi direct, multi-role AP + STA

- Support for personal and enterprise Wi-Fi security: WPA and WPA2 PSK, WPA2 Enterprise, WPA3 personal or enterprise
- Wi-Fi TX Power:
 - 20dBm at 1 DSSS
 - 16dBm at 54 OFDM
- Wi-Fi RX Sensitivity:
 - –98.6dBm at 1 DSSS
 - –77.2dBm at 54 OFDM
- Bluetooth® low energy
 - Bluetooth Low Energy 5.4 certified stack
 - Supports long-range and high-speed PHYs (up to 2Mbps)

Security Features

- ARM TrustZone
- Hardware security module supporting all of the following:
 - ECC, RSA, AES, SHA2/3, MD5, CRC 16/32, and TRNG
 - Secure key storage
- Initial secure programming
- Secure boot
- Software IP and cloning protection
- Debug security through JTAG and debug port lock
- OTP with the ability to program root-of-trust public key
- Secure over-the-air (OTA) updates
- Anti-rollback protection

Clock Source

- 40.0MHz crystal or external clock
- Internal 32.768kHz low-frequency oscillator, external XTAL, or slow clock options

Power Management

- Support for 3.3V or 1.8V I/Os
- Supplies: VPA: 3.3V, VMAIN: 1.8V, VIO: 1.8/3.3V

Key Benefits

- Complete software development kit with open-source TCP/IP and TLS stacks
- Operating temperature: –40°C to +105°C
- Support for 3-wire PTA coexistence interface for use with external 2.4GHz radios (for example Thread or Zigbee®)
- Antenna selection capability

Package

- Easy to design with 56-pin, 7mm × 7mm quad flat no leaded (QFN) package



2 Applications

- Building Automation
 - Thermostat
 - HVAC motor control
 - Wireless security camera
 - Video Doorbell
 - Garage door system
- Appliances
 - Refrigerator and freezer
 - Oven
 - Washer and dryer
 - Residential water heater
 - Air conditioner indoor unit
 - Coffee machine
 - Vacuum robot
 - Robotic lawn mower
- Grid Infrastructure
 - Electricity meter
 - String Inverter
 - Micro Inverter
 - Battery energy storage systems
 - EV charging infrastructure
- Medical
 - Infusion pump
 - Electronic hospital bed and bed control
 - Multiparameter patient monitor
 - CPAP machine
 - Telehealth systems
 - Ultrasound scanner
 - Ultrasound smart probe
 - Electric toothbrush
- Retail automation and payment
- Connected peripherals and printers
- Factory automation and control
- Asset tracking

3 Description

The SimpleLink™ Wi-Fi system-on-chip CC35xx family is where affordability meets reliability, enabling engineers to connect more applications with confidence. CC35xx are single-chip Wi-Fi 6 and Bluetooth Low Energy 5.4 wireless microcontrollers (MCUs). The CC3500E and CC3501E are the first devices in this pin-to-pin compatible family.

- CC3500E: 2.4GHz Wi-Fi 6 wireless MCU
- CC3501E: 2.4GHz Wi-Fi 6 and Bluetooth Low Energy 5.4 wireless MCU

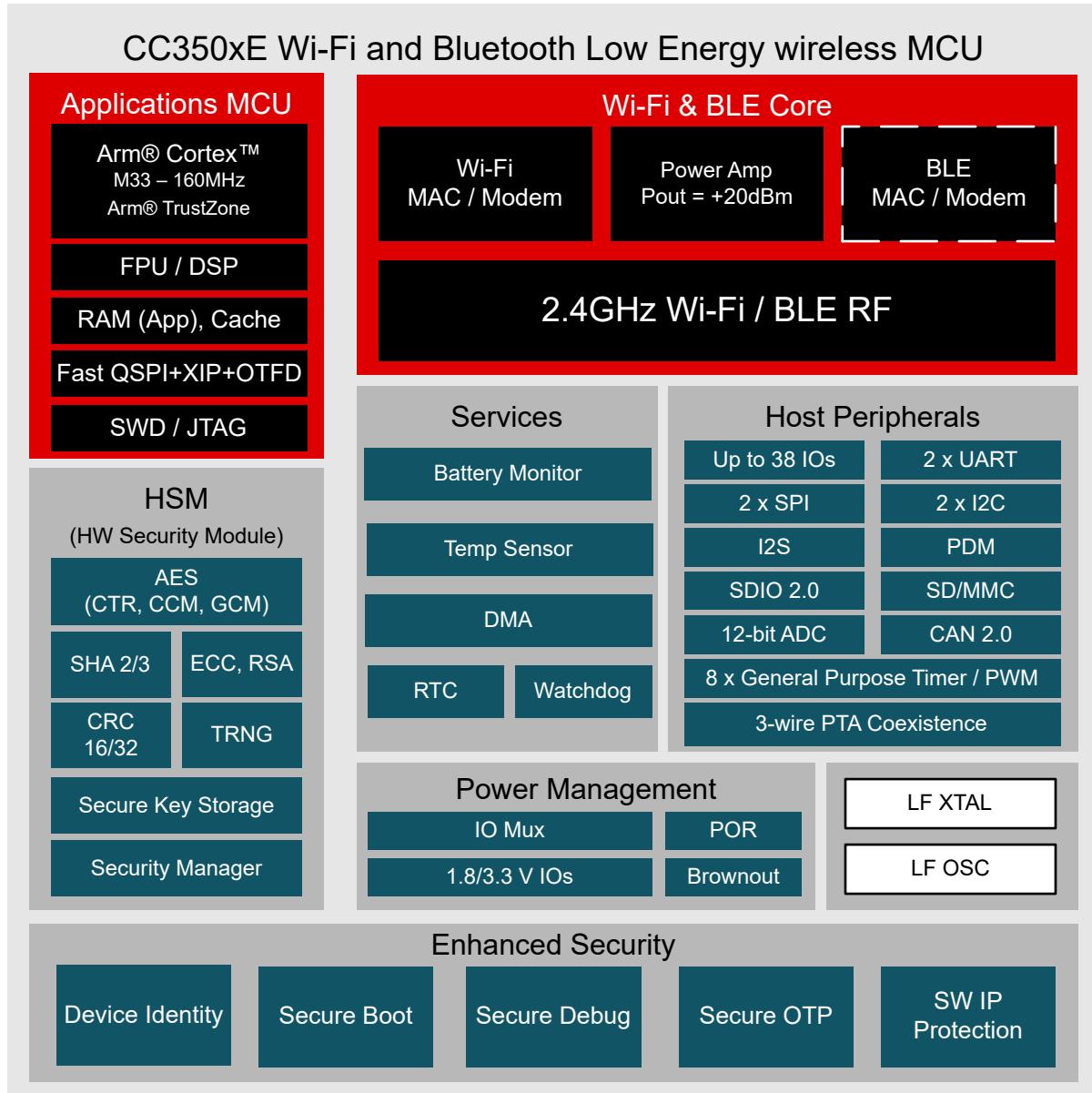
The CC350xE offers the latest standards from Wi-Fi and BLE while maintaining compatibility with Wi-Fi 4 (802.11 b/g/n) and Wi-Fi 5 (802.11 ac). These CC350xE are the 10th-generation connectivity combo chip from Texas Instruments. As such, the CC350xE is based on proven technology. These devices are an excellent choice in cost-sensitive embedded applications with RTOS software. CC350xE brings the efficiency of Wi-Fi 6 to embedded device applications for the Internet of Things (IoT), with a small PCB footprint and highly optimized bill of materials.

Table 3-1. Device Information

PART NUMBER	Wi-Fi 6 2.4GHz	Bluetooth Low Energy
CC3500E	✓	
CC3501E	✓	✓

4 Functional Block Diagram

The figure below shows a functional block diagram of the CC350xE.



ADVANCE INFORMATION

--- CC3501E only

Figure 4-1. CC350xE High-Level System Diagram

5 Pin Diagram

ADVANCE INFORMATION

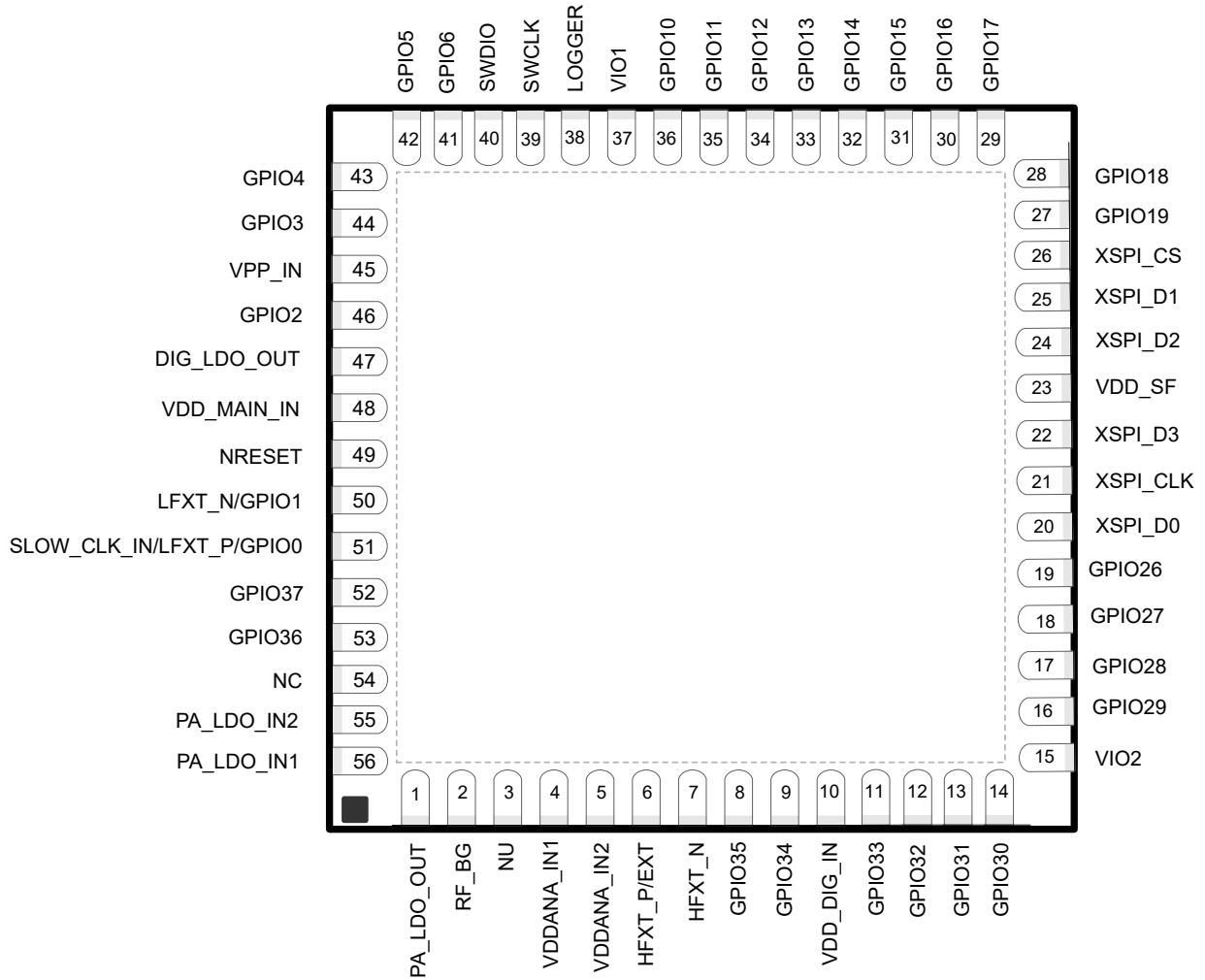


Figure 5-1. CC350xE Pin Diagram

6 Revision History

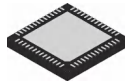
NOTE: Page numbers for previous revisions may differ from page numbers in the current version.

DATE	REVISION	NOTES
September 2024	*	Initial Release

7 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. For browser-based versions of this data sheet, refer to the left-hand navigation.

ADVANCE INFORMATION

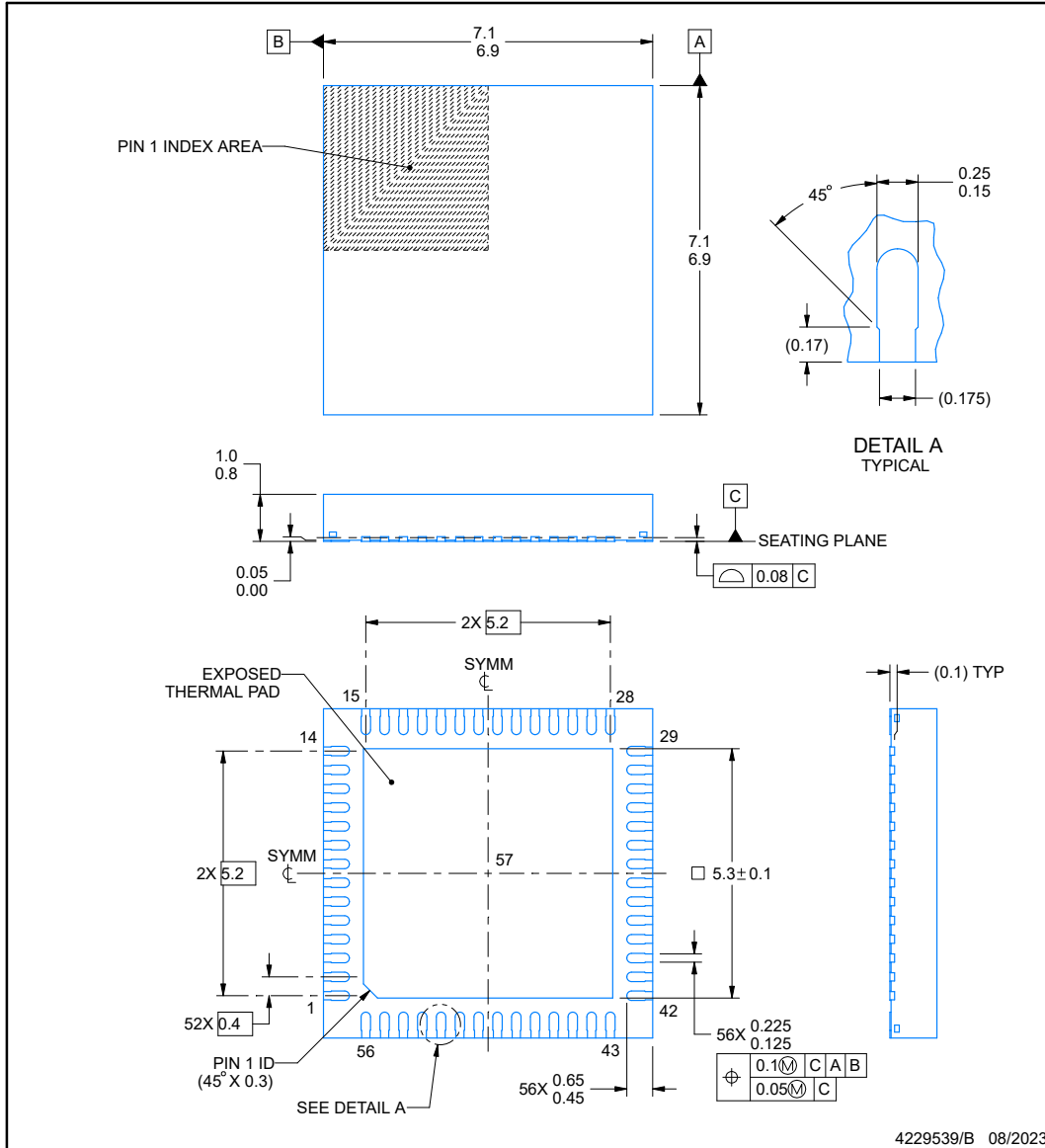


RSH0056G

PACKAGE OUTLINE

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES:

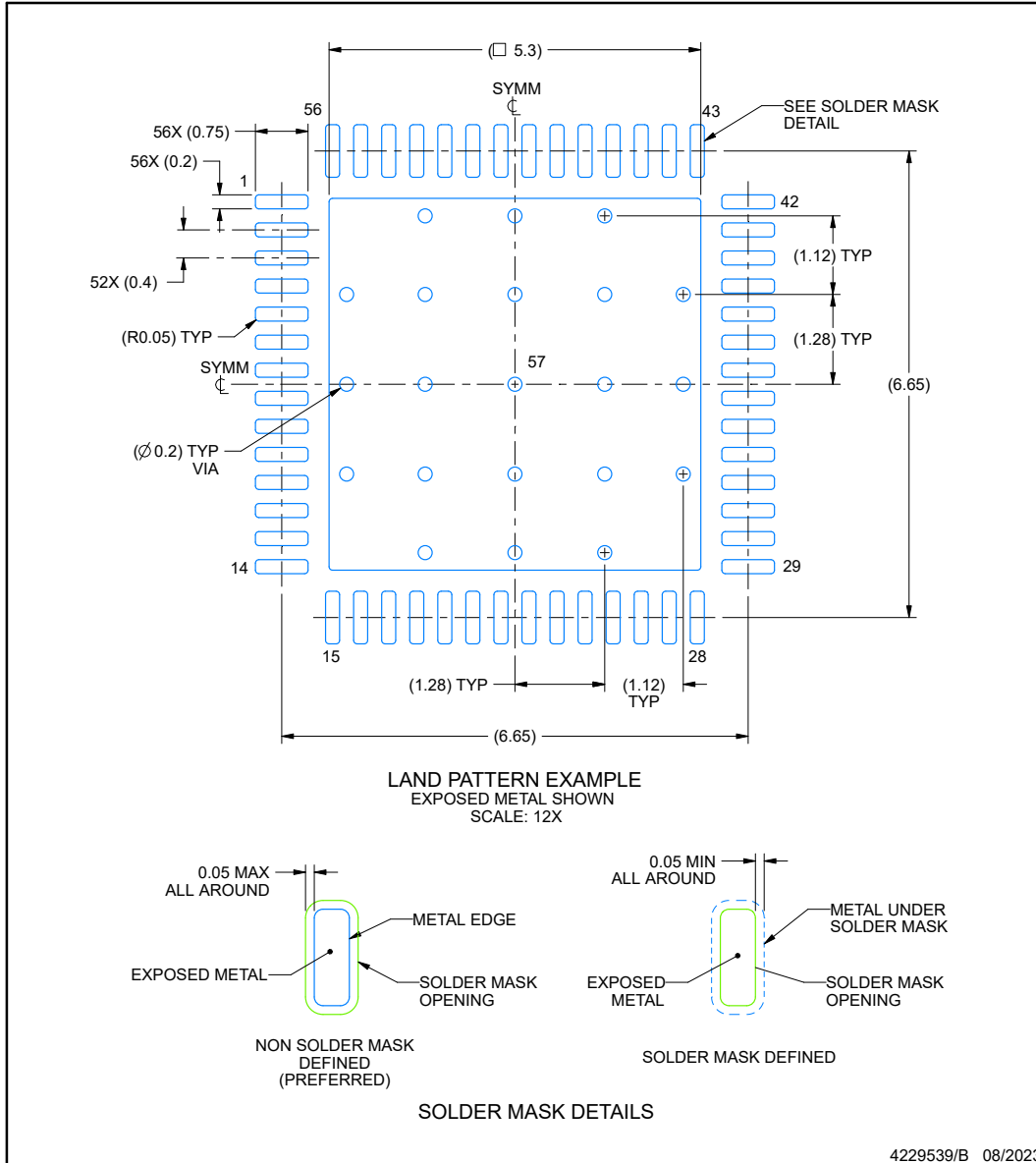
1. All linear dimensions are in millimeters. Any dimensions in parenthesis are for reference only. Dimensioning and tolerancing per ASME Y14.5M.
2. This drawing is subject to change without notice.
3. The package thermal pad must be soldered to the printed circuit board for thermal and mechanical performance.

EXAMPLE BOARD LAYOUT

RSH0056G

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

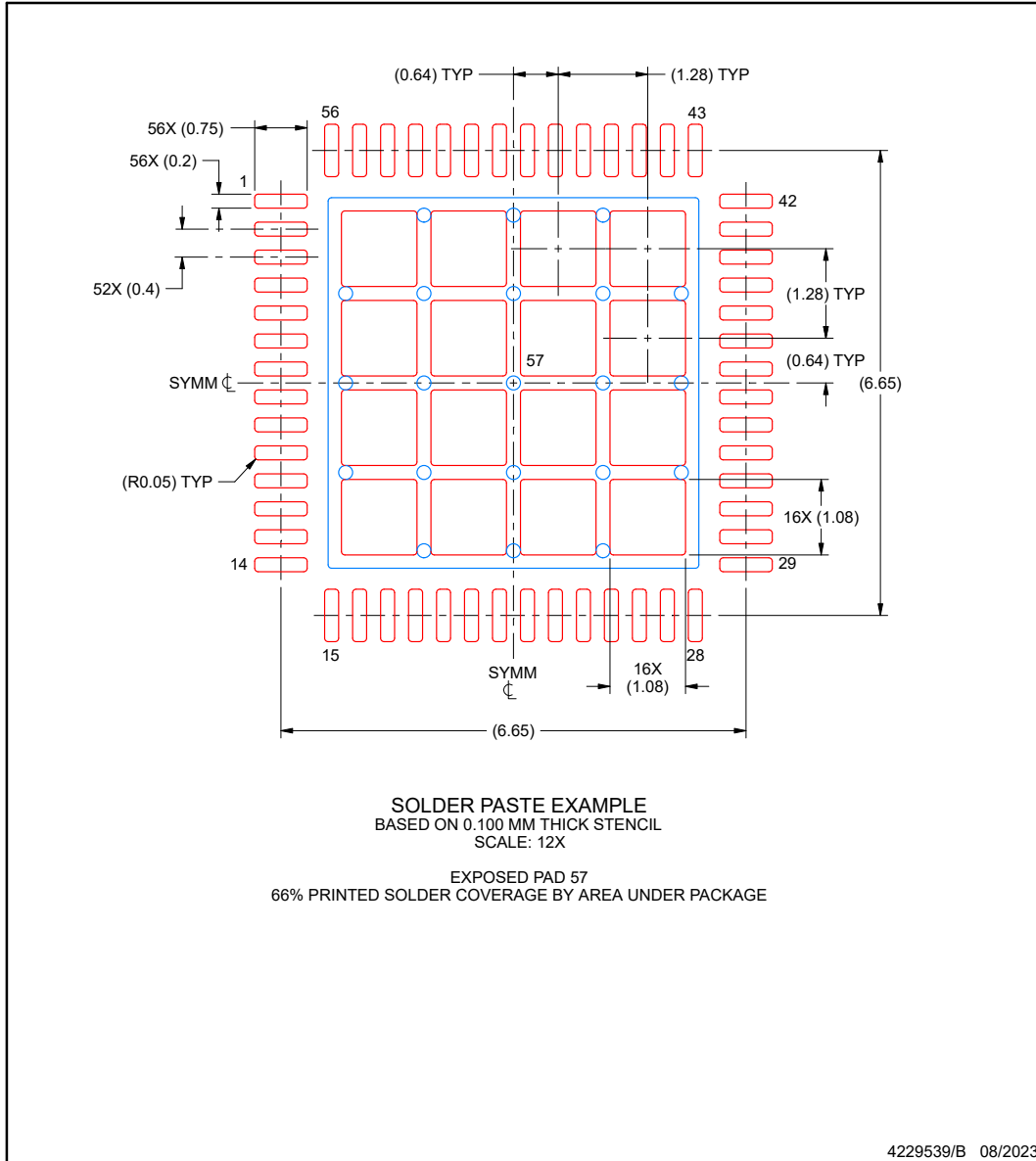
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 (www.ti.com/lit/sl原因271).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

EXAMPLE STENCIL DESIGN

RSH0056G

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



NOTES: (continued)

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

ADVANCE INFORMATION

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
XCC3501ENJARSHR	ACTIVE	VQFN	RSH	56	2500	TBD	Call TI	Call TI	-40 to 105		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.

Important Information and Disclaimer: The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

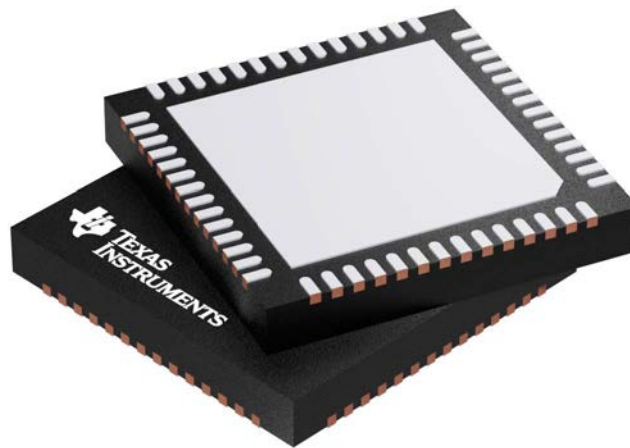
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

RSH 56

GENERIC PACKAGE VIEW

VQFN - 1 mm max height

PLASTIC QUAD FLATPACK - NO LEAD



Images above are just a representation of the package family, actual package may vary.
Refer to the product data sheet for package details.

4207513/D

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2024, Texas Instruments Incorporated