CC1310 Simplelink™ Ultra-Low Power Sub-1 GHz Wireless MCU

1 Device Overview

1.1 Features

- Microcontroller
  - Powerful ARM® Cortex®-M3
  - EEMBC CoreMark Score: 142
  - Up to 48-MHz Clock Speed
  - 128KB of In-System Programmable Flash
  - 8-KB SRAM for Cache
  - Up to 20-KB of Ultra-Low Leakage SRAM
  - 2-Pin cJTAG and JTAG Debugging
  - Supports Over-the-Air Upgrade (OTA)
- Ultra-Low Power Sensor Controller
  - 16-Bit Architecture
  - 2KB of Ultra-Low Leakage SRAM for Code and Data
- Efficient Code Size Architecture, Placing Peripheral Drivers, RTOS, RF Drivers, and Bootloader in ROM
- RoHS-Compliant Packages
  - 4-mm × 4-mm RSM QFN32 (10 GPIOs)
  - 5-mm × 5-mm RHB QFN32 (15 GPIOs)
  - 7-mm × 7-mm RGZ QFN48 (30 GPIOs)
- Peripherals
  - All Digital Peripheral Pins Can Be Routed to Any GPIO
  - 4 General-Purpose Timer Modules (8 × 16 Bit or 4 × 32 Bit Timer, PWM Each)
  - 12-Bit ADC, 200-ksamples/s, 8-Channel Analog MUX
  - Continuous Comparator
  - Ultra-low Power Analog Comparator
  - Programmable Current Source
  - UART
  - 2 × SSI (SPI, µW, TI)
  - I^2C
  - I2S
  - Real-Time Clock (RTC)
  - AES-128 Security Module
  - True Random Number Generator (TRNG)
  - Support for Eight Capacitive Sensing Buttons
  - Integrated Temperature Sensor
- External System
  - World's Smallest Sub-1 GHz Wireless MCU: 4-mm x 4-mm
  - On-Chip Internal DC-DC Converter
  - Very Few External Components
  - Seamless Integration With the SimpleLink CC1190 Range Extender
  - Pin Compatible With the SimpleLink CC26xx
- Low Power
  - Wide Supply Voltage Range
    - Normal Operation: 1.8 V to 3.8 V
    - External Regulator Mode: 1.65 V to 1.95 V
  - Active-Mode RX: 5.5 mA
  - Active-Mode TX at +10 dBm: 12 mA, +14 dBm: 25 mA
  - Active-Mode MCU: 61 µA/MHz
  - Active-Mode MCU: 48.5 CoreMark/mA
  - Active-Mode Sensor Controller: 8.2 µA/MHz
  - Standby: 0.7 µA (RTC Running and RAM/CPU Retention)
  - Shutdown: 100 nA (Wakeup on External Events)
- RF Section
  - Excellent Receiver Sensitivity:
    - –121 dBm at 2.4 kbit/s
    - –111 dBm at 50 kbit/s
  - Very Good Selectivity and Blocking Performance
  - Data Rate up to 4 Mbit/s
  - Modulation Support: MSK, FSK, GFSK, OOK, ASK, 4GFSK, CPM (Shaped-8 FSK)
  - Highly Flexible RF Modem (Software-Defined Radio) to Also Cover Legacy and Proprietary Communication Protocols
  - Programmable Output Power up to +15 dBm With Shared RX and TX RF Pins (Regulated Power Supply)
  - Antenna Diversity
  - Coding Gain
  - Suitable for Systems Targeting Compliance With Worldwide Radio Frequency Regulations
    - ETSI EN 300 220, EN 303 131, EN 303 204 (Europe)
    - FCC CFR47 Part 15 (US)
    - ARIB STD-T108 (Japan)
- Tools and Development Environment
  - Full-Feature and Low-Cost Development Kits
  - Multiple Reference Designs for Different RF Configurations
  - Packet Sniffer PC Software
  - Sensor Controller Studio
  - SmartRF™ Studio
  - SmartRF Flash Programmer 2
  - IAR Embedded Workbench® for ARM
  - Code Composer Studio™

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1.2 Applications

- 315-, 433-, 470-, 500-, 779-, 868-, 915-, and 920-MHz ISM and SRD Systems
- Low Power Wireless Systems with 50-kHz to 5-MHz Channel Spacing
- SmartGrid and Automatic Meter Reading
- Home and Building Automation
- Wireless Alarm and Security Systems
- Industrial Monitoring and Control
- Wireless Healthcare Applications
- Wireless Sensor Networks
- Active RFID
- IEEE 802.15.4g, IP-Enabled Smart Objects (6LoWPAN), wM-Bus, KNX Systems, and Proprietary Systems
- Energy Harvesting Applications
- ESL (Electronic Shelf Label)
- Long Range Sensor Applications
- Heat Cost Allocators

1.3 Description

The CC1310 device is the first part in a Sub-1 GHz family of cost-effective, ultra-low power wireless MCUs. The CC1310 device combines a flexible, very-low power RF transceiver with a powerful 48-MHz Cortex-M3 microcontroller in a platform supporting multiple physical layers and RF standards. A dedicated Cortex®-M0 MCU is handling low-level RF protocol commands that are stored in ROM or RAM, thus ensuring ultra-low power and flexibility. The low-power consumption of the CC1310 device does not come at the expense of RF performance; the CC1310 device has excellent sensitivity and robustness (selectivity and blocking) performance. The CC1310 device is a highly integrated solution offering a complete RF system solution, which includes an on-chip DC-DC converter into a true single-chip solution down to a 4-mm × 4-mm package.

Sensors can be handled in a very low power manner by a dedicated autonomous ultra-low power MCU that can be configured to handle analog and digital sensors; thus, the main MCU (Cortex-M3) sleeps for as long as possible. Software stack support for this device is as follows:

- wM-Bus
- SimpliciTI (Star Network)

Device Information

PART NUMBER	PACKAGE	BODY SIZE
CC1310F128RGZ	RGZ (QFN48)	7.00 mm × 7.00 mm
CC1310F128RHB	RHB (QFN32)	5.00 mm × 5.00 mm
CC1310F128RSM	RSM (QFN32)	4.00 mm × 4.00 mm
CC1310F64RGZ	RGZ (QFN48)	7.00 mm × 7.00 mm
CC1310F64RHB	RHB (QFN32)	5.00 mm × 5.00 mm
CC1310F64RSM	RSM (QFN32)	4.00 mm × 4.00 mm
CC1310F32RGZ	RGZ (QFN48)	7.00 mm × 7.00 mm
CC1310F32RHB	RHB (QFN32)	5.00 mm × 5.00 mm
CC1310F32RSM	RSM (QFN32)	4.00 mm × 4.00 mm

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1.4 Functional Block Diagram

Figure 1-1 shows a block diagram for the CC1310 device.

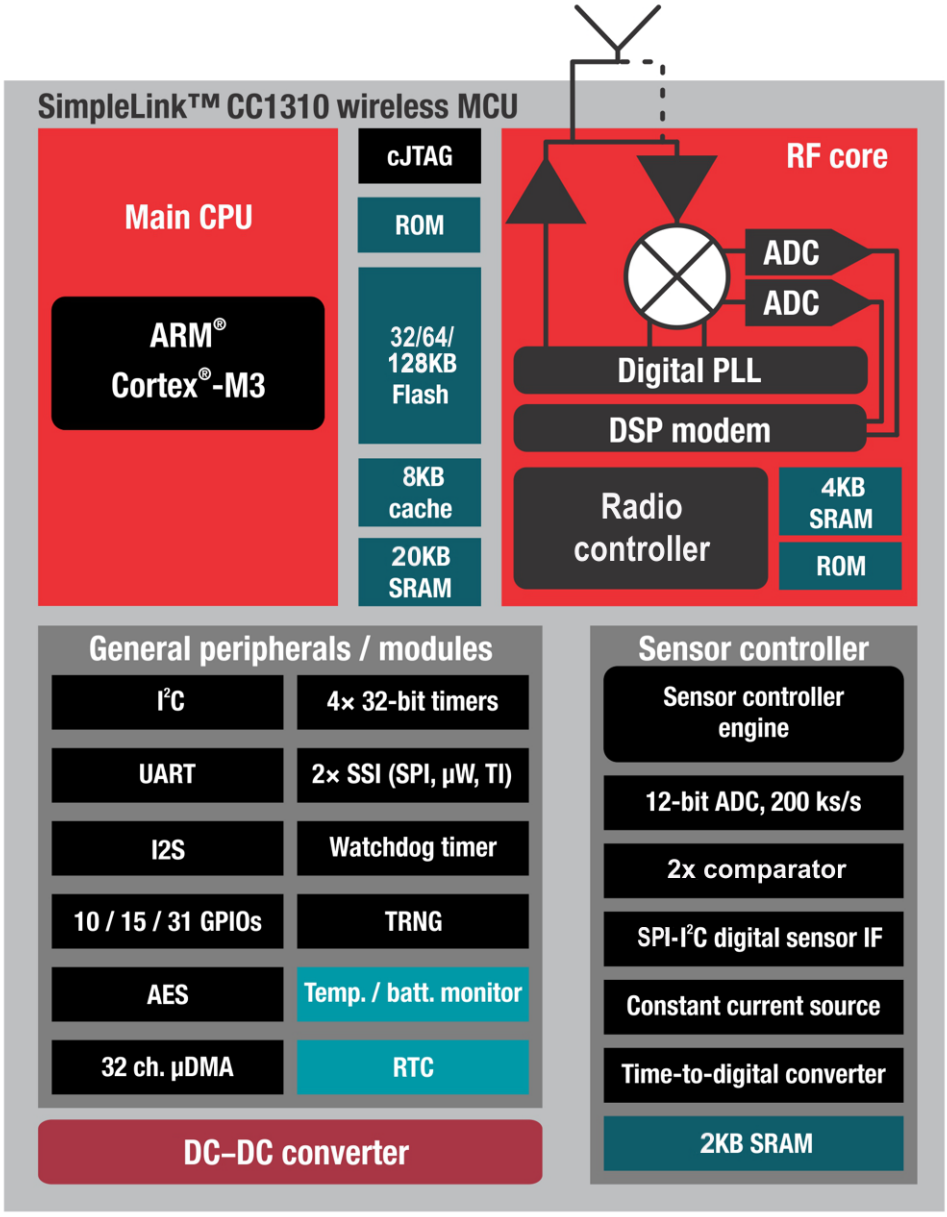

Figure 1-1. CC1310 Block Diagram

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Revision History

DATE	REVISION	NOTES
February 2015	1.0	Initial Release

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
CC1310F128RHBR	PREVIEW	VQFN	RHB	32	3000	TBD	Call TI	Call TI			
CC1310F128RSMR	PREVIEW	VQFN	RSM	32	3000	TBD	Call TI	Call TI			
CC1310F32RGZR	PREVIEW	VQFN	RGZ	48	2500	TBD	Call TI	Call TI			
CC1310F32RHBR	PREVIEW	VQFN	RHB	32	3000	TBD	Call TI	Call TI			
CC1310F32RSMR	PREVIEW	VQFN	RSM	32	3000	TBD	Call TI	Call TI			
CC1310F64RGZR	PREVIEW	VQFN	RGZ	48	2500	TBD	Call TI	Call TI			
CC1310F64RHBR	PREVIEW	VQFN	RHB	32	2500	TBD	Call TI	Call TI			
CC1310F64RSMR	PREVIEW	VQFN	RSM	32	3000	TBD	Call TI	Call TI			

(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) 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.
TBD: The Pb-Free/Green conversion plan has not been defined.
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 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/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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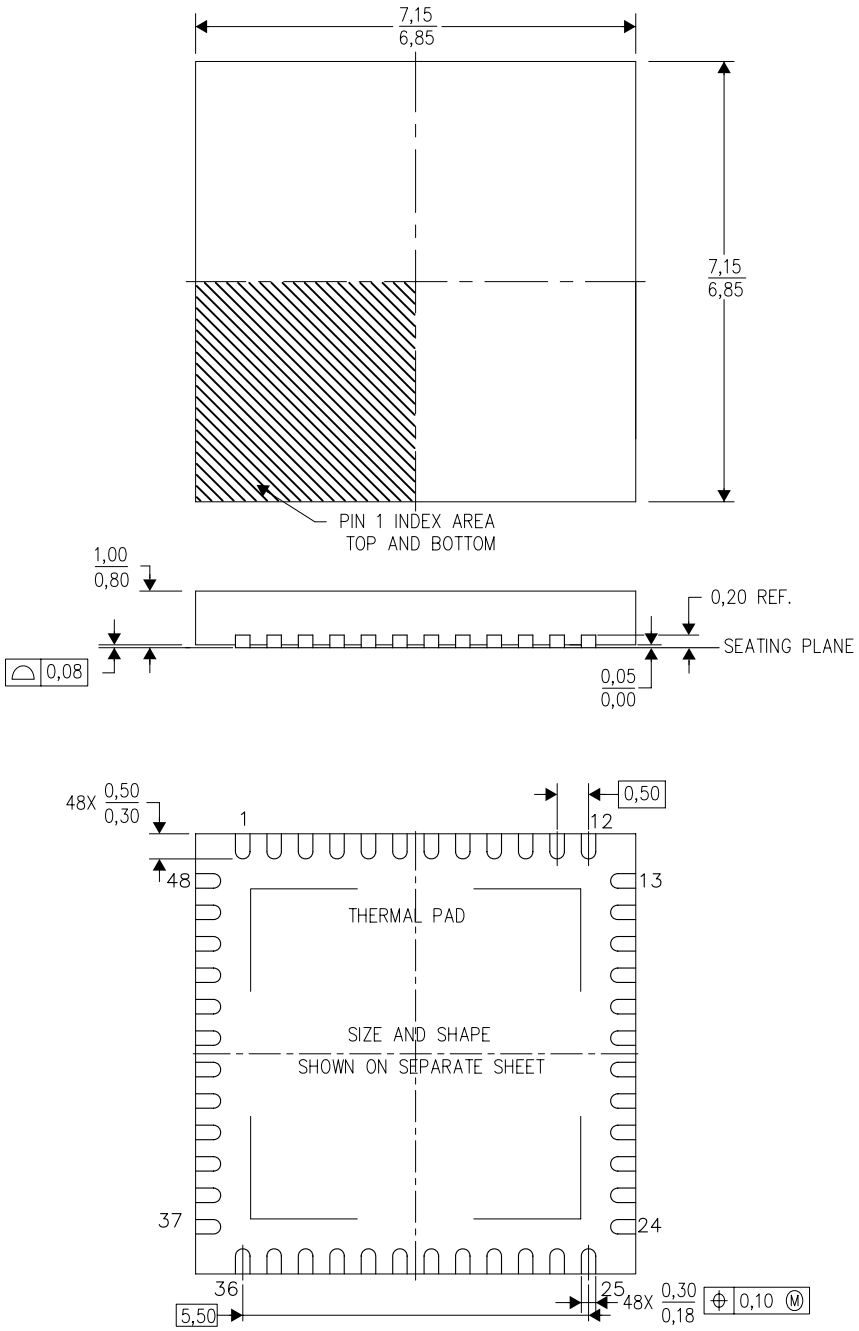
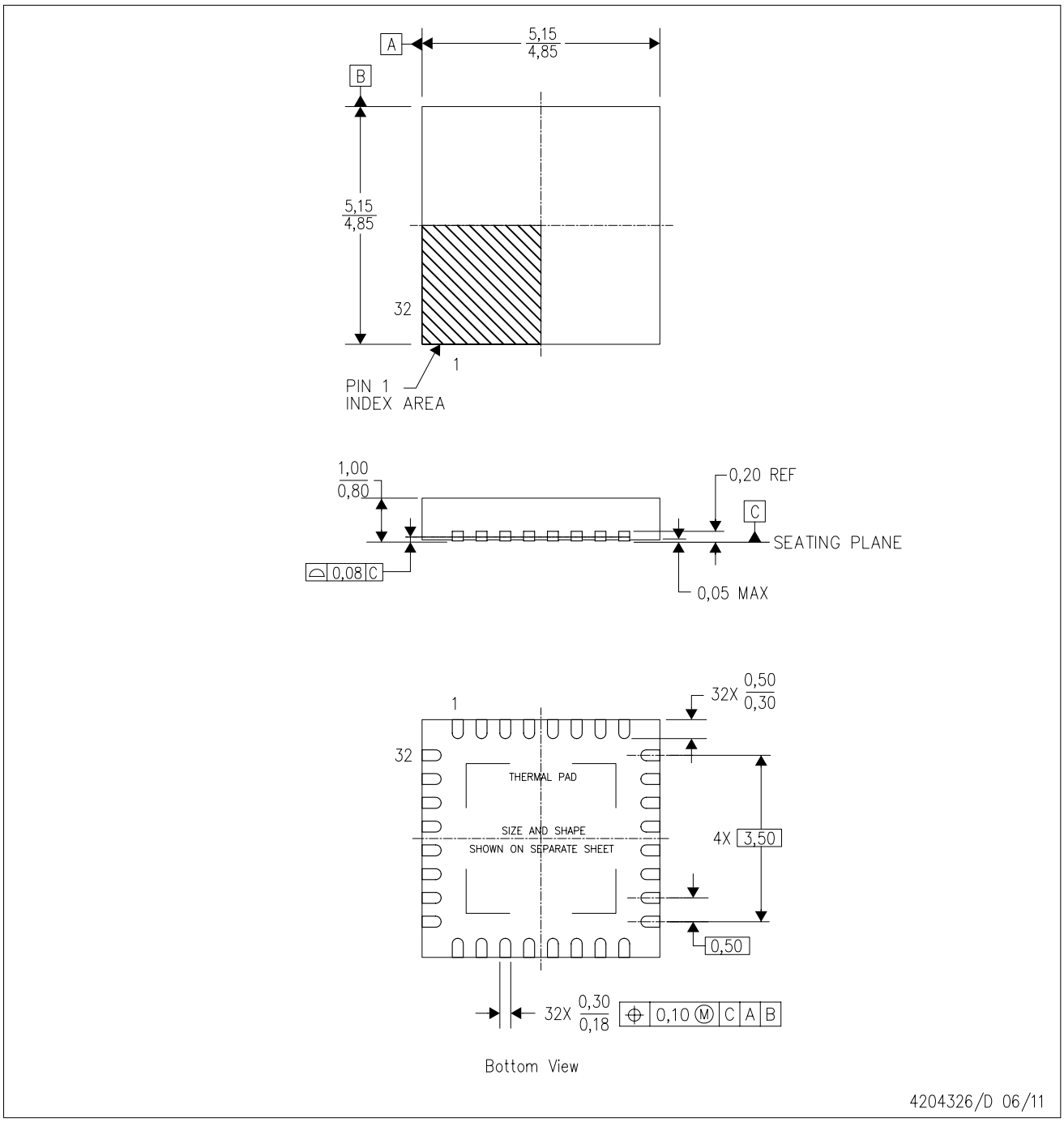
RGZ (S–PVQFN–N48) PLASTIC QUAD FLATPACK NO–LEAD



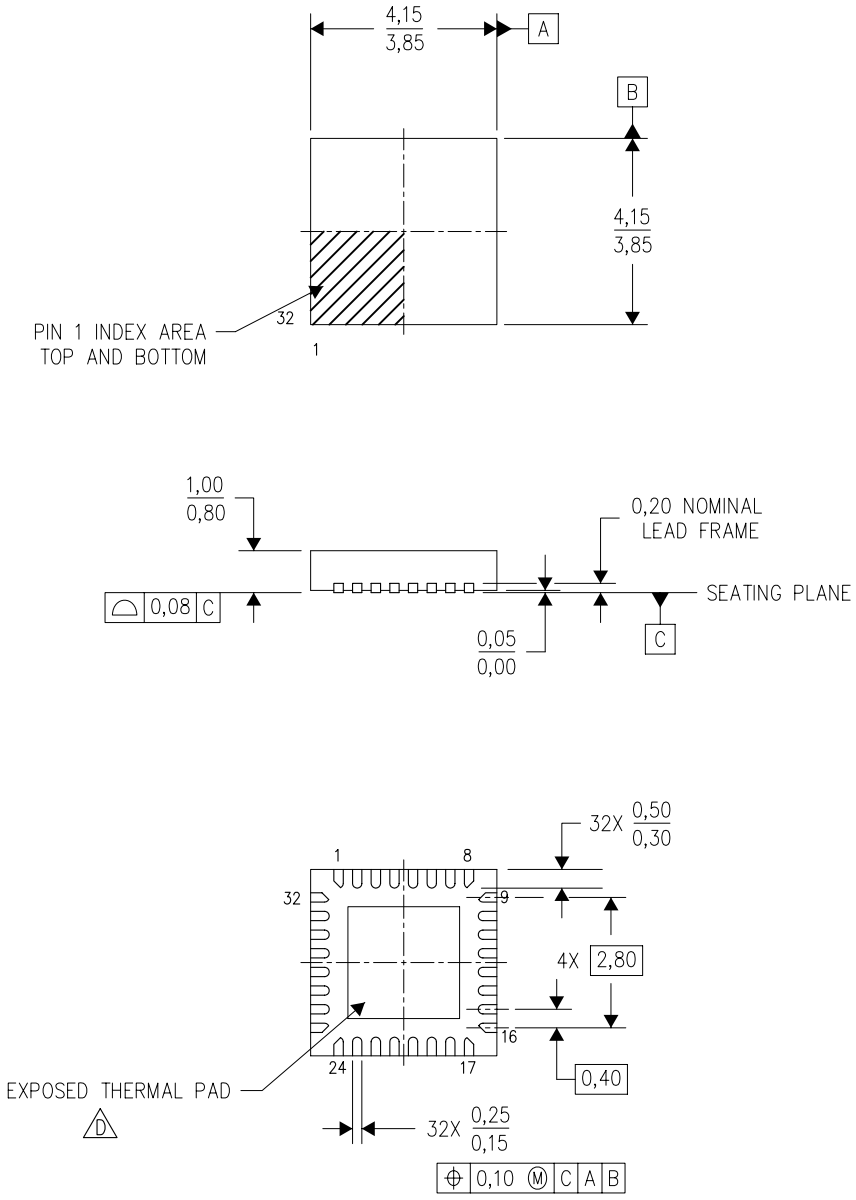
NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. Quad Flatpack, No–leads (QFN) package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Falls within JEDEC MO–220.

RHB (S–PVQFN–N32) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) Package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance.
E. See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
F. Falls within JEDEC MO–220.

RSM (S–PVQFN–N32) PLASTIC QUAD FLATPACK NO–LEAD



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NOTES:
A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M–1994.
B. This drawing is subject to change without notice.
C. QFN (Quad Flatpack No–Lead) Package configuration.
D. The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.

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