TEXAS INSTRUMENTS

bq25570

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Ultra Low Power Harvester Power Management IC with Boost Charger, and Nano-Powered Buck Converter

Check for Samples: bq25570

FEATURES

- **Ultra Low Power DC/DC Boost Charger**
  - **Cold-start Voltage: V_{IN} ≥ 330 mV**
  - **Continuous Energy Harvesting From V_{IN} asLlow as 100 mV**
  - **Input Voltage Regulation Prevents Collapsing High Impedance Input Sources**
  - **Ship Mode with < 5 nA From Battery**
- **Energy Storage**
  - **Energy can be Stored to Re-chargeable Li-ion Batteries, Thin-film Batteries, Super-capacitors, or Conventional Capacitors**
- **Battery Charging and Protection**
  - **User Programmable Undervoltage and Overvoltage Levels**
- **Battery Good Output Flag**
  - **Programmable Threshold and Hysteresis**
  - **Warn Attached Microcontrollers of Pending Loss of Power**
  - **Can be Used to Enable or Disable System Loads**
- **Programmable Step Down Regulated Output (Buck)**
  - **High Efficiency up to 98%**
  - **Supports Peak Output Current up to 100 mA**
- **Programmable Maximum Power Point Tracking (MPPT)**
  - **Integrated Maximum Power Point Tracking for Optimal Energy Extraction From a Variety of Energy Harvesters**

APPLICATIONS

- **Energy Harvesting**
- **Solar Charger**
- **Thermal Electric Generator (TEG) Harvesting**
- **Wireless Sensor Networks (WSN)**
- **Low Power Wireless Monitoring**
- **Environmental Monitoring**
- **Bridge and Structural Health Monitoring (SHM)**
- **Smart Building Controls**
- **Portable and Wearable Health Devices**
- **Entertainment System Remote Controls**

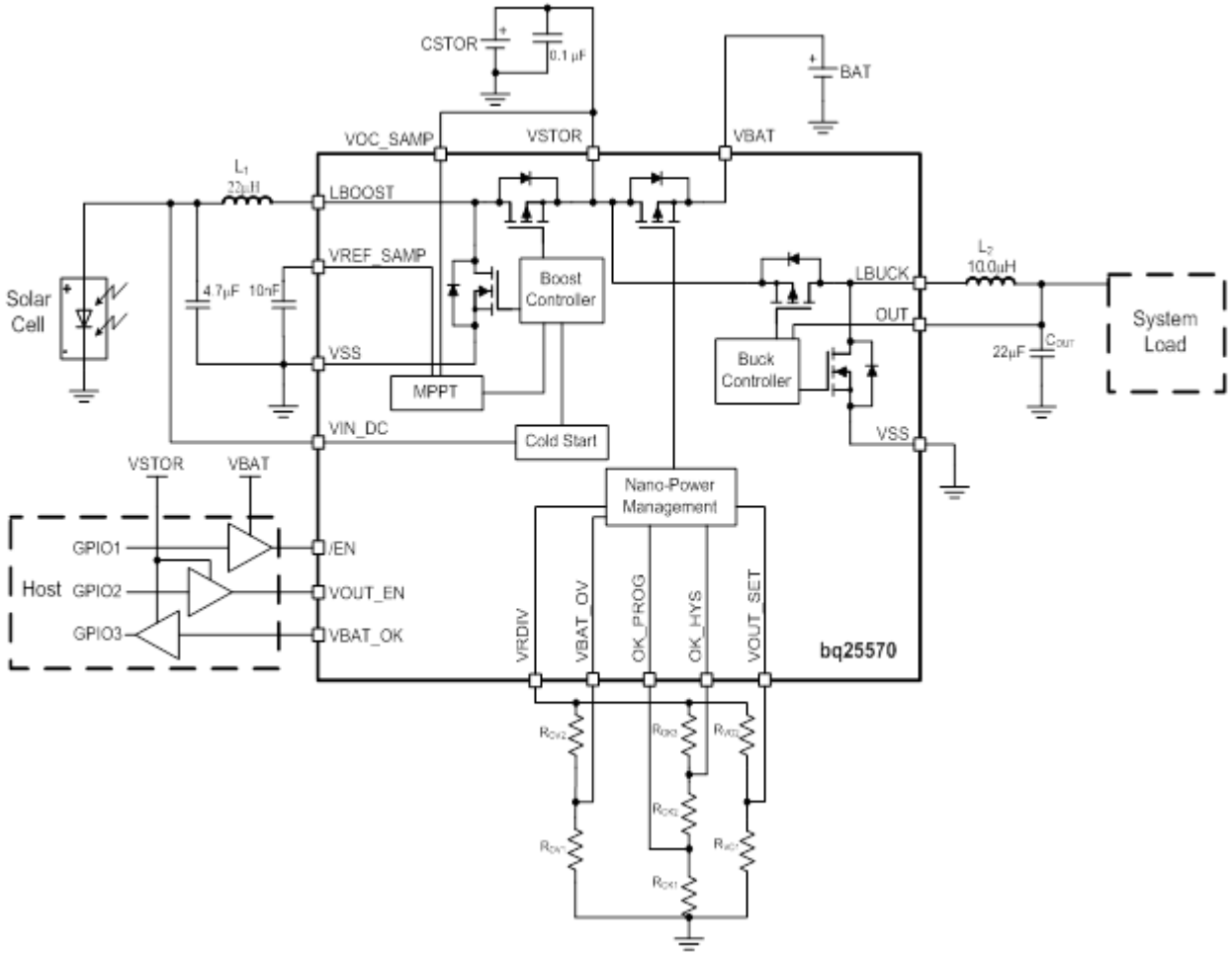
DESCRIPTION

The bq25570 is a highly integrated energy harvesting Nano-Power management solution that are well suited for meeting the special needs of ultra low power applications. The product is specifically designed to efficiently acquire and manage the microwatts (µW) to milliwatts (mW) of power generated from a variety of DC sources like photovoltaic (solar) or thermal electric generators. The bq25570 is the first device of its kind to implement a highly efficient boost converter/charger with a nano-powered buck converter targeted toward products and systems, such as wireless sensor networks (WSN) which have stringent power and operational demands. The design of the bq25570 starts with a DCDC boost converter/charger that requires only microwatts of power to begin operating. Once started, the boost converter/charger can effectively extract power from low voltage output harvesters such as thermoelectric generators (TEGs) or single or dual cell solar panels. The boost converter can be started with VIN as low as 330 mV, and once started, can continue to harvest energy down to VIN = 100 mV

In addition to the boost charging front end, bq25570 provides the system with an externally programmable regulated supply via the buck converter. The regulated output has been optimize to provide high efficiency across low output currents (< 10 µA) to high currents (100 mA).

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

TYPICAL APPLICATION SCHEMATICS



PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead/Ball Finish	MSL Peak Temp (3)	Op Temp (°C)	Top-Side Markings (4)	Samples
BQ25570RGRR	PREVIEW	VQFN	RGR	20	3000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR		BQ570	
BQ25570RGRT	PREVIEW	VQFN	RGR	20	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1 YEAR		BQ570	

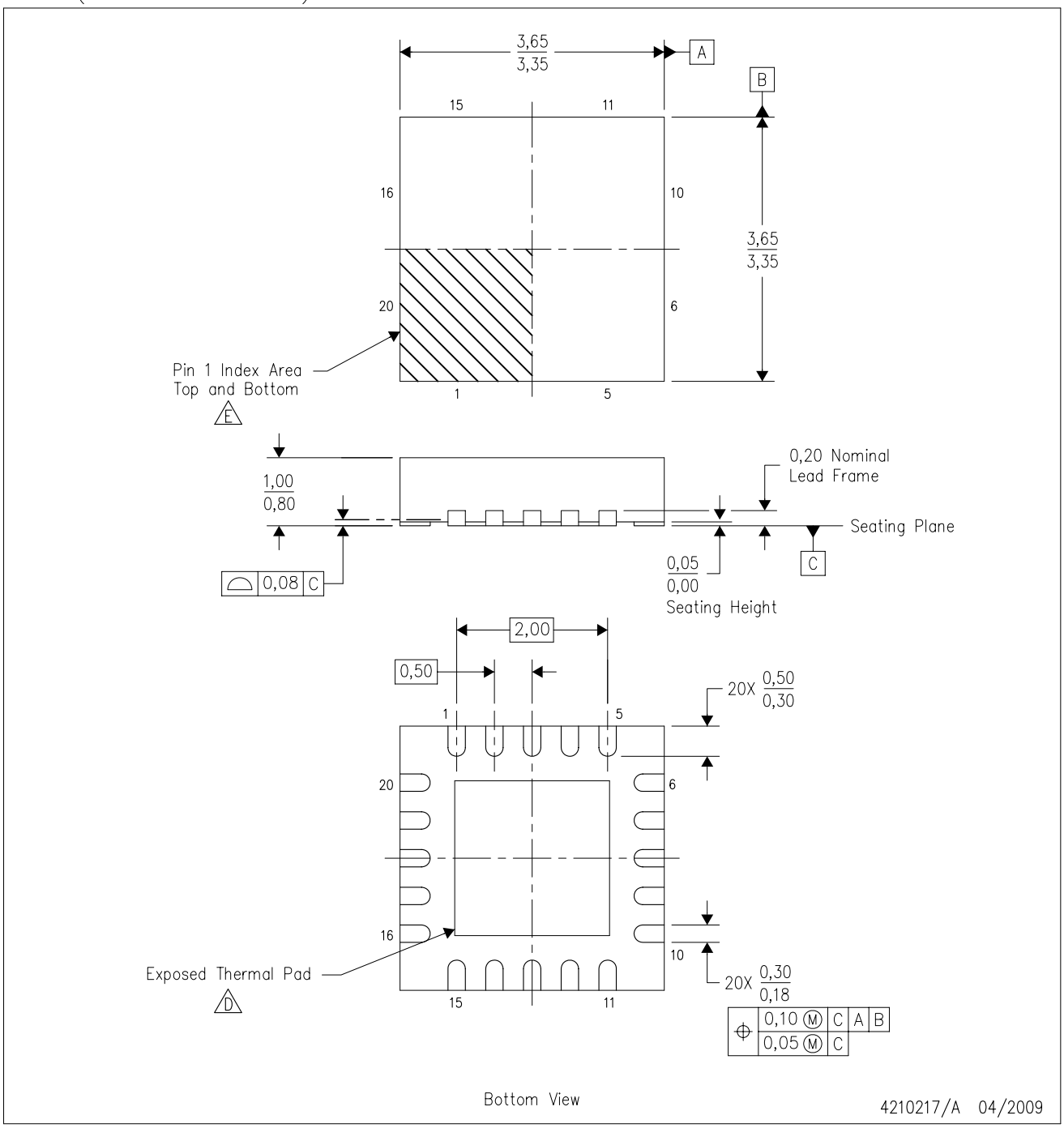
(1) The marketing status values are defined as follows:
ACTIVE: Product device recommended for new designs.
LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.
NRND: Not recommended for new designs. Device is in production to support existing customers, 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) Multiple Top-Side Markings will be inside parentheses. Only one Top-Side 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 Top-Side Marking for that device.

RGR (S–PVQFN–N20) 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. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
E. Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.

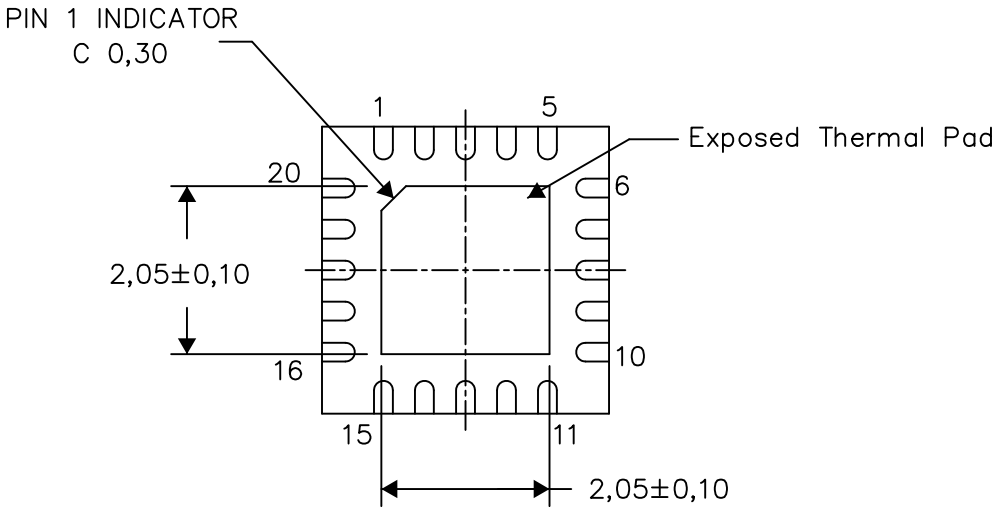
RGR (S–PVQFN–N20) PLASTIC QUAD FLATPACK NO–LEAD

THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No–Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at www.ti.com.

The exposed thermal pad dimensions for this package are shown in the following illustration.



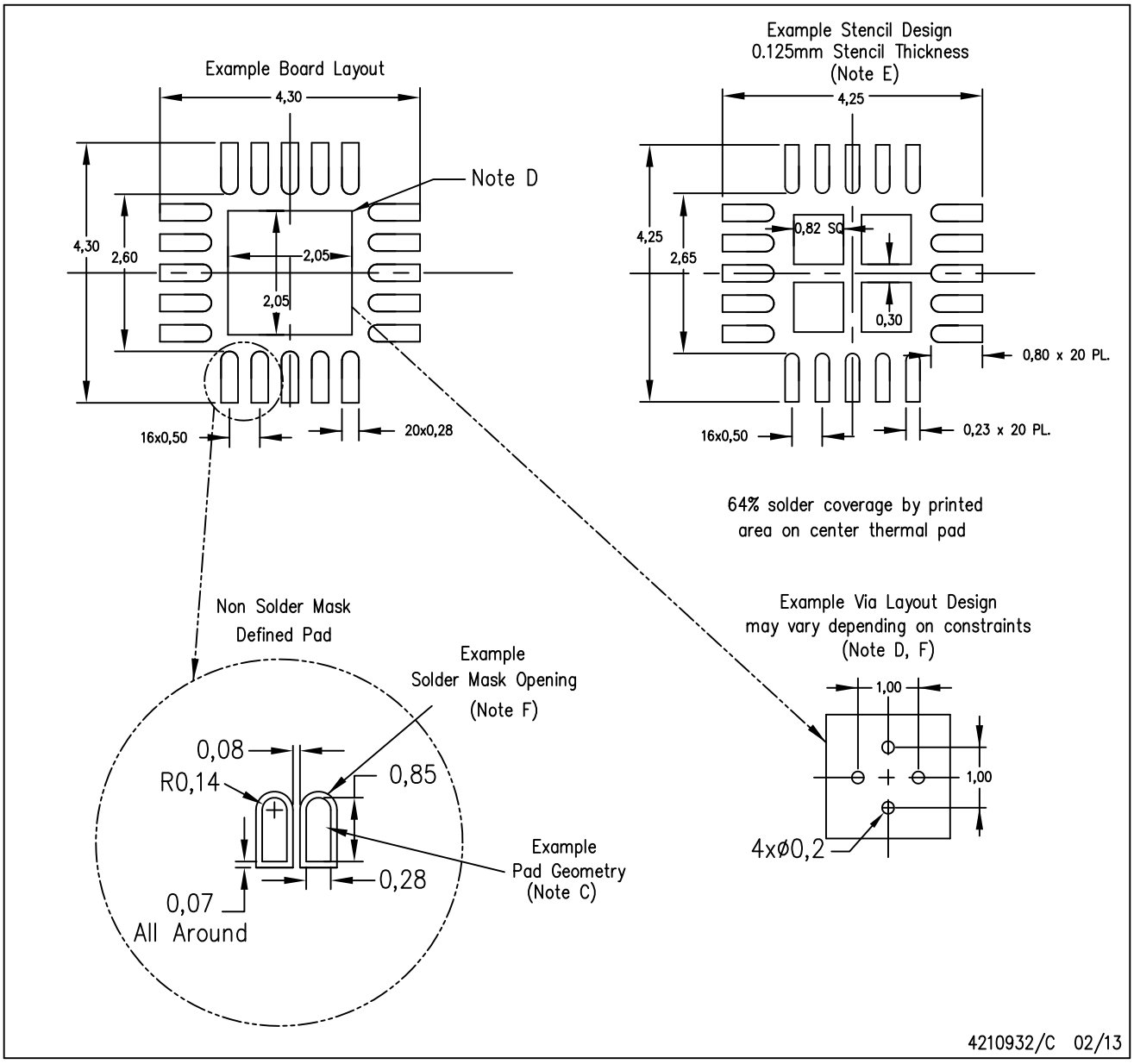
Bottom View

Exposed Thermal Pad Dimensions

4210218/D 02/13

NOTE: All linear dimensions are in millimeters

RGR (S–PVQFN–N20) PLASTIC QUAD FLATPACK NO–LEAD



NOTES:
A. All linear dimensions are in millimeters.
B. This drawing is subject to change without notice.
C. Publication IPC–7351 is recommended for alternate designs.
D. This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat–Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at www.ti.com <http://www.ti.com>.
Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC 7525 for stencil design considerations. Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.

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