

2A Single Input I²C, Standalone Switch-Mode Li-Ion Battery Charger with Power-Path Management

Check for Samples: [bq24250](#), [bq24251](#), [bq24253](#)

FEATURES

- High-efficiency 3 MHz Switch-mode
- USB 2.0 and 3.0 Charging Compliant
 - Selectable Input Current Limit of 100 mA, 500 mA, or 900 mA
- BC1.2 Compliant D+, D- Detection with Dead Battery Provision Support
- I²C™ Programmability:
 - Battery Charge Voltage (VREG)
 - Battery Charge Current (ICHG)
 - Input Current Limit (ILIM)
 - Input Voltage Regulation (VDPM)
 - Input Overvoltage Protection (OVP)
 - Battery Termination Current (ITERM)
 - Charge Timer (TMR)
- Externally Programmable Defaults:
 - Battery Charge Current (ICHG)
 - Input Current Limit (ILIM)
 - Input Voltage Regulation (VDPM)
- Integrated 4.9 V, 50 mA LDO
- Hybrid SMPS Control Architecture
 - Optimized for Output Transient Response
- High Accuracy on Battery Voltage and Current Regulation
- Charge Time Optimizer: Fast CC to CV Handoff
- 20 V Maximum Input Voltage Rating
- 10.5 V Maximum Operating Input
- Low R_{DS(on)} Integrated Power FETs for up to 2 A Charging Rate
- Open Drain Status Outputs
- *AnyBoot* Robust Battery Detection Algorithm
- Li-ion, Li-Polymer, or LiFePO₄ Chemistries
- Miniature WCSP and QFN Package

APPLICATIONS

- Mobile Phones, Smart Phones
- MP3 Players
- Digital Still Cameras
- Portable Handheld Devices
- Multi-Media Players

DESCRIPTION

The bq2425x series are highly integrated single cell Li-Ion battery chargers and system power-path management devices targeted for space-limited, portable applications with high capacity batteries. The single cell charger has a single input that operates up to 10.5 V from either a USB port or AC wall adapter for a versatile solution. The power path management feature allows the bq2425x to power the system from a high efficiency constant frequency DC/DC converter while simultaneously and independently charging the battery. The charger monitors the battery current at all times and reduces the charge current when the system load requires current above the input current limit. This allows for proper charge termination and enables the system to run with a defective or absent battery pack. Additionally, this enables instant system turn-on even with a totally discharged battery or no battery. The power-path management architecture also permits the battery to supplement the system current requirements when the adapter cannot deliver the peak system currents. This enables the use of a smaller adapter. The battery is charged in four phases: trickle charge, pre-charge, constant current and constant voltage. In all charge phases, an internal control loop monitors the IC junction temperature and reduces the charge current if the internal temperature threshold is exceeded. The fully compliant BC1.2 D+, D- detection simplifies the system for compliance to the latest USB charging standard. All in a miniature WCSP or QFN package ⁽¹⁾

(1) Visit ti.com/batterymanagement for product details and design resources



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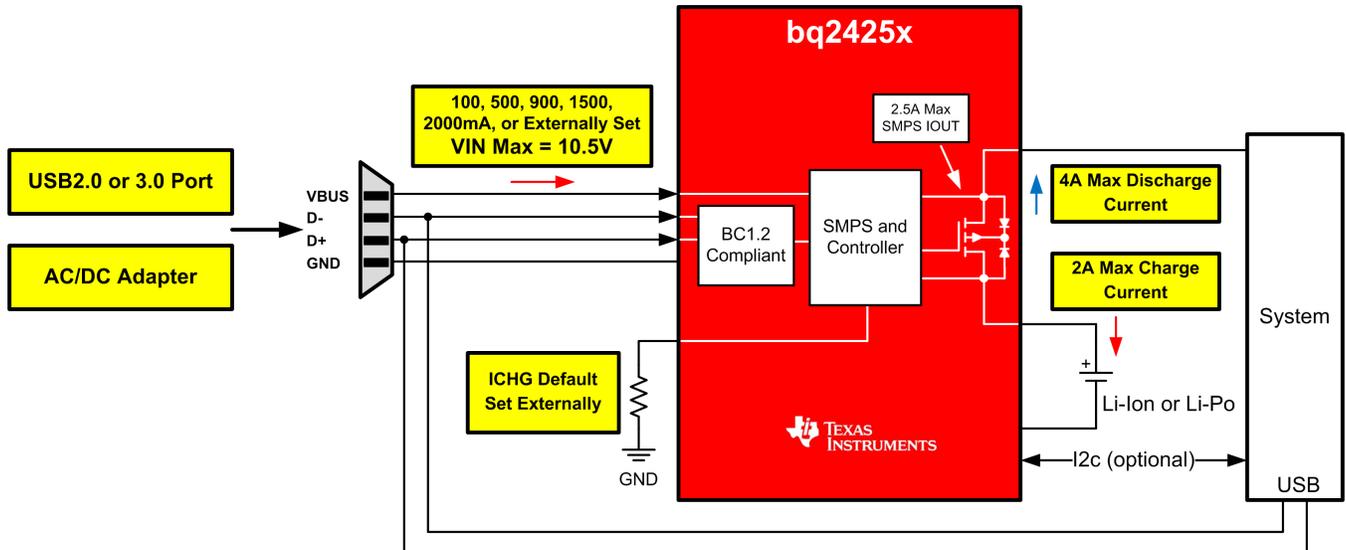
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These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

Block Diagram



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
BQ24250RGER	PREVIEW	VQFN	RGE	24	3000	TBD	Call TI	Call TI			
BQ24250RGET	PREVIEW	VQFN	RGE	24	250	TBD	Call TI	Call TI			
BQ24251YFFR	PREVIEW	DSBGA	YFF	30	3000	TBD	Call TI	Call TI			
BQ24251YFFT	PREVIEW	DSBGA	YFF	30	250	TBD	Call TI	Call TI			
BQ24253YFFR	PREVIEW	DSBGA	YFF	30	3000	TBD	Call TI	Call TI			
BQ24253YFFT	PREVIEW	DSBGA	YFF	30	250	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.

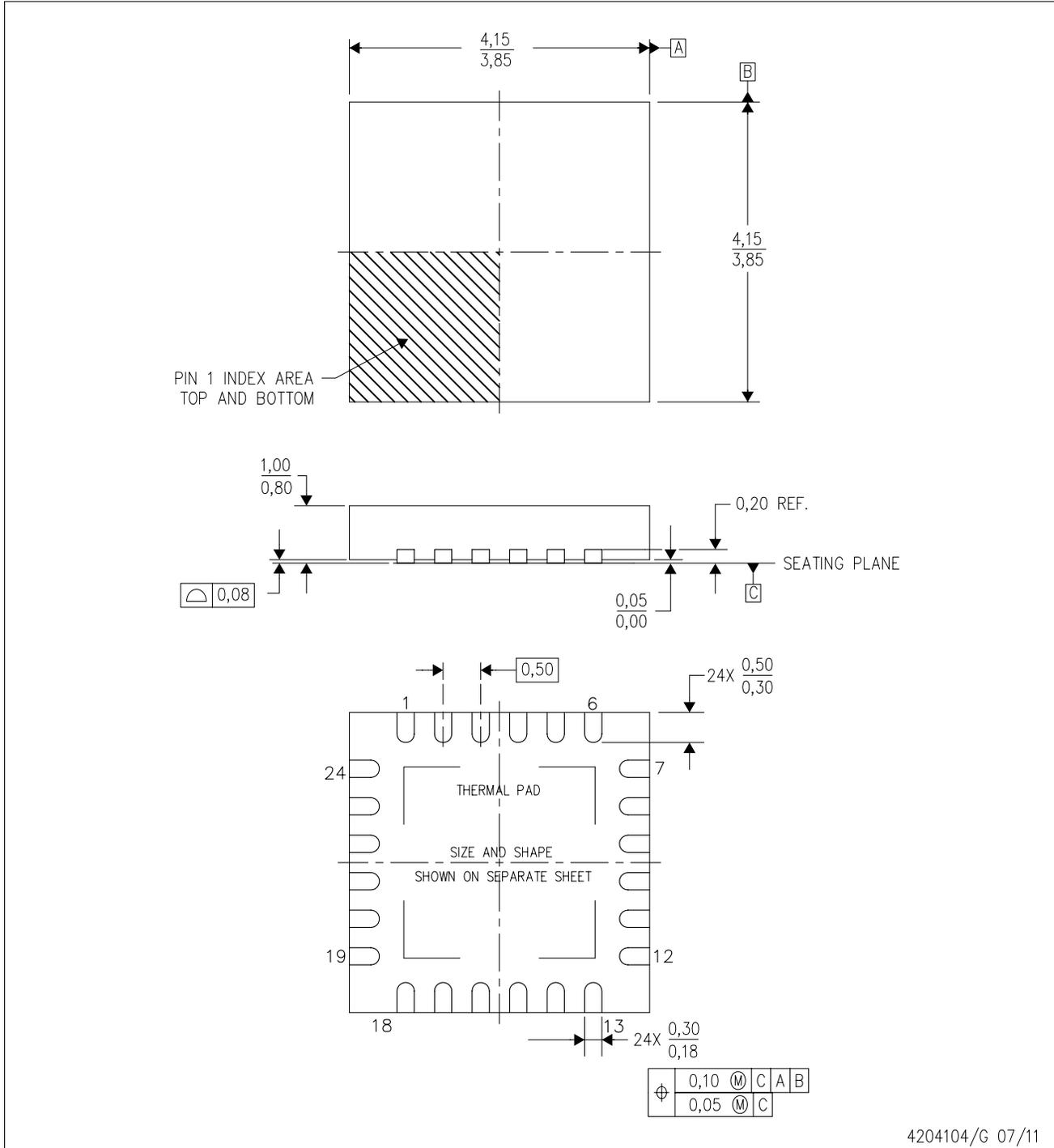
(4) Only one of markings shown within the brackets will appear on the physical device.

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RGE (S-PVQFN-N24)

PLASTIC QUAD FLATPACK NO-LEAD

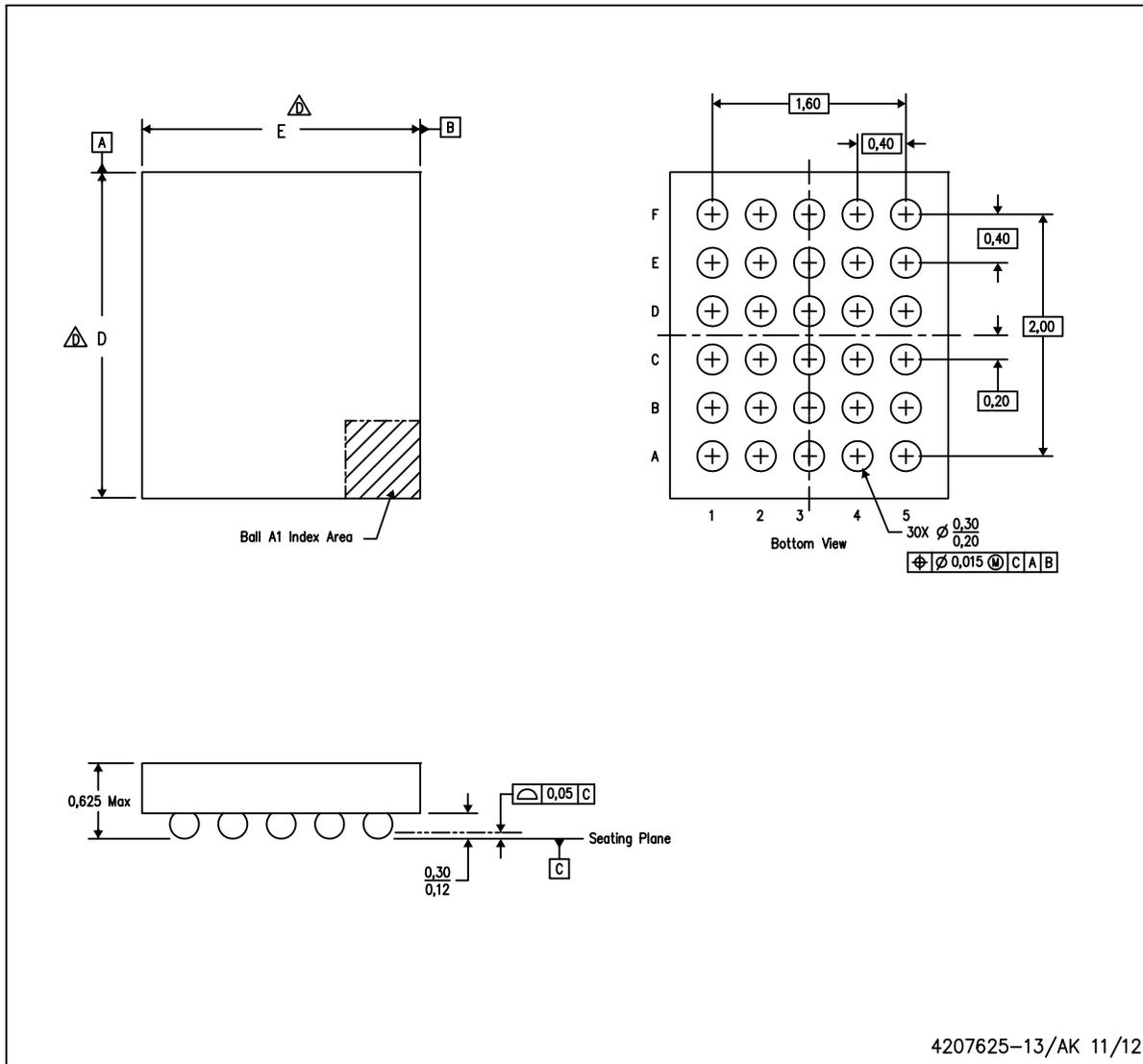


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- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
 - This drawing is subject to change without notice.
 - Quad Flatpack, No-Leads (QFN) package configuration.
 - The package thermal pad must be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

YFF (R-XBGA-N30)

DIE-SIZE BALL GRID ARRAY



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. NanoFree™ package configuration.
- $\triangle D$ The package size (Dimension D and E) of a particular device is specified in the device Product Data Sheet version of this drawing, in case it cannot be found in the product data sheet please contact a local TI representative.
- E. Reference Product Data Sheet for array population.
6 x 5 matrix pattern is shown for illustration only.
- F. This package contains Pb-free balls.

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