

# BQ24800 SMBus 1- to 4-Cell Buck Battery Charge Controller With Peak Power, Hybrid Power Boost and Battery Only Boost Modes

## 1 Features

- Hybrid Power Boost Mode to power up system from adapter and battery together
  - Ultra-fast transient response of 150  $\mu$ s to enter Hybrid Power Boost Mode
- Battery Only Boost Mode to extend battery run time
- Peak power two-level input current limit to maximize the power from adapter and minimize battery discharge
- Charge 1- to 4-cell battery pack from 4.5- to 24-V adapter
- High accuracy power and current monitoring for CPU throttling
  - Comprehensive  $\overline{\text{PROCHOT}}$  profile
  - $\pm 2\%$  Current monitor accuracy
  - $\pm 5\%$  System Power Monitor Accuracy (PMON)
- Automatic NMOS power source selection from adapter or battery
  - ACFET Fast turn on in 100  $\mu$ s when exiting learn mode from battery removal
- Programmable input current, charge voltage, charge and discharge current limit
  - $\pm 0.4\%$  Charge voltage (16-mV/step)
  - $\pm 2\%$  Input current (64-mA/step)
  - $\pm 2\%$  Charge current (64-mA/step)
  - $\pm 2\%$  Discharge current (512-mA/step)
- High integration
  - Battery LEARN function
  - Battery present monitor
  - Boost Mode indicator
  - Loop compensation
  - BTST Diode
- Enhanced safety features for over-voltage protection, over-current protection, battery, inductor, and MOSFET short-circuit protection
- Switching frequency: 300 kHz, 400 kHz, 600 kHz, and 800 kHz
- Realtime system control on ILIM pin to limit charge and discharge current
- 0.65-mA Adapter standby quiescent current for Energy Star

## 2 Applications

- Notebook, ultrabook, detachable, and tablet PC
- Industrial and medical equipment
- System with battery backup
- Portable equipment

## 3 Description

The BQ24800 device is a high-efficiency, synchronous buck battery charger, offering low component count for space-constrained, multi-chemistry battery charging applications.

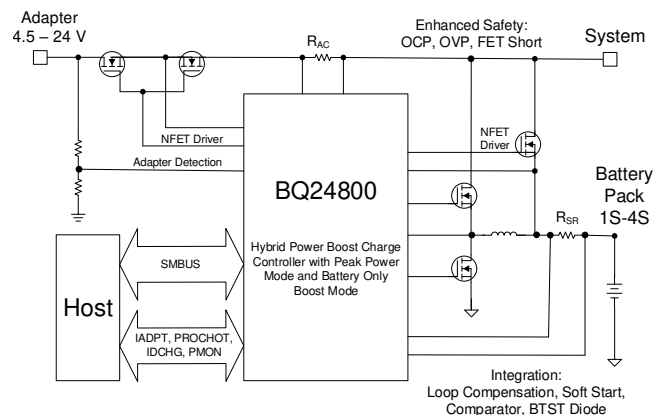
The BQ24800 device supports hybrid power boost mode. Hybrid power boost mode boosts the battery up to the system voltage in order to supplement the adapter when system power demand is temporarily higher than the adapter is able to provide. The ultra-fast transition from battery charging to battery discharging prevents adapter crash from overloading condition.

The BQ24800 device also supports battery only boost mode when no adapter is present. When the battery voltage is above the minimum system operation voltage, the battery is directly connected to the system supply rail through BATFET. Once the battery voltage goes below the minimum system operation voltage, BQ24800 will turn on the boost mode to regulate the system supply rail, extending the system run time.

### Device Information<sup>(1)</sup>

PART NUMBER	PACKAGE	BODY SIZE (NOM)
BQ24800	WQFN (28)	4.00 mm x 4.00 mm

(1) For all available packages, see the orderable addendum at the end of the data sheet.



#### 4 Description (continued)

The BQ24800 device uses two charge pumps to separately drive N-channel MOSFETs (ACFET, RBFET, and BATFET) for automatic system power source selection.

Through SMBus, a system power management microcontroller programs input current, charge current, discharge current, and charge voltage DACs with high regulation accuracies.

The BQ24800 device monitors adapter current (IADP), battery discharge current (IDCHG), and system power (PMON) for host to throttle back CPU speed or reduce system power when needed.

The BQ24800 device charges 1-, 2-, 3-, or 4-series Li+ cells.

## 5 Device and Documentation Support

### 5.1 Device Support

#### 5.1.1 Third-Party Products Disclaimer

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### 5.2 Documentation Support

#### 5.2.1 Related Documentation

For related documentation see the following: [BQ24800 EVM User's Guide](#)

### 5.3 Receiving Notification of Documentation Updates

To receive notification of documentation updates, navigate to the device product folder on ti.com. In the upper right corner, click on *Alert me* to register and receive a weekly digest of any product information that has changed. For change details, review the revision history included in any revised document.

### 5.4 Support Resources

TI E2E™ [support forums](#) are an engineer's go-to source for fast, verified answers and design help — straight from the experts. Search existing answers or ask your own question to get the quick design help you need.

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### 5.5 Trademarks

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### 5.6 Electrostatic Discharge Caution



This integrated circuit can be damaged by ESD. Texas Instruments recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage.

ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications.

### 5.7 Glossary



[SLYZ022](#) — *TI Glossary*.

This glossary lists and explains terms, acronyms, and definitions.

## 6 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.

**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
BQ24800RUYR	ACTIVE	WQFN	RUY	28	3000	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	BQ 24800	
BQ24800RUYT	ACTIVE	WQFN	RUY	28	250	RoHS & Green	NIPDAU	Level-2-260C-1 YEAR	-40 to 85	BQ 24800	

(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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**TAPE AND REEL INFORMATION**

**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**

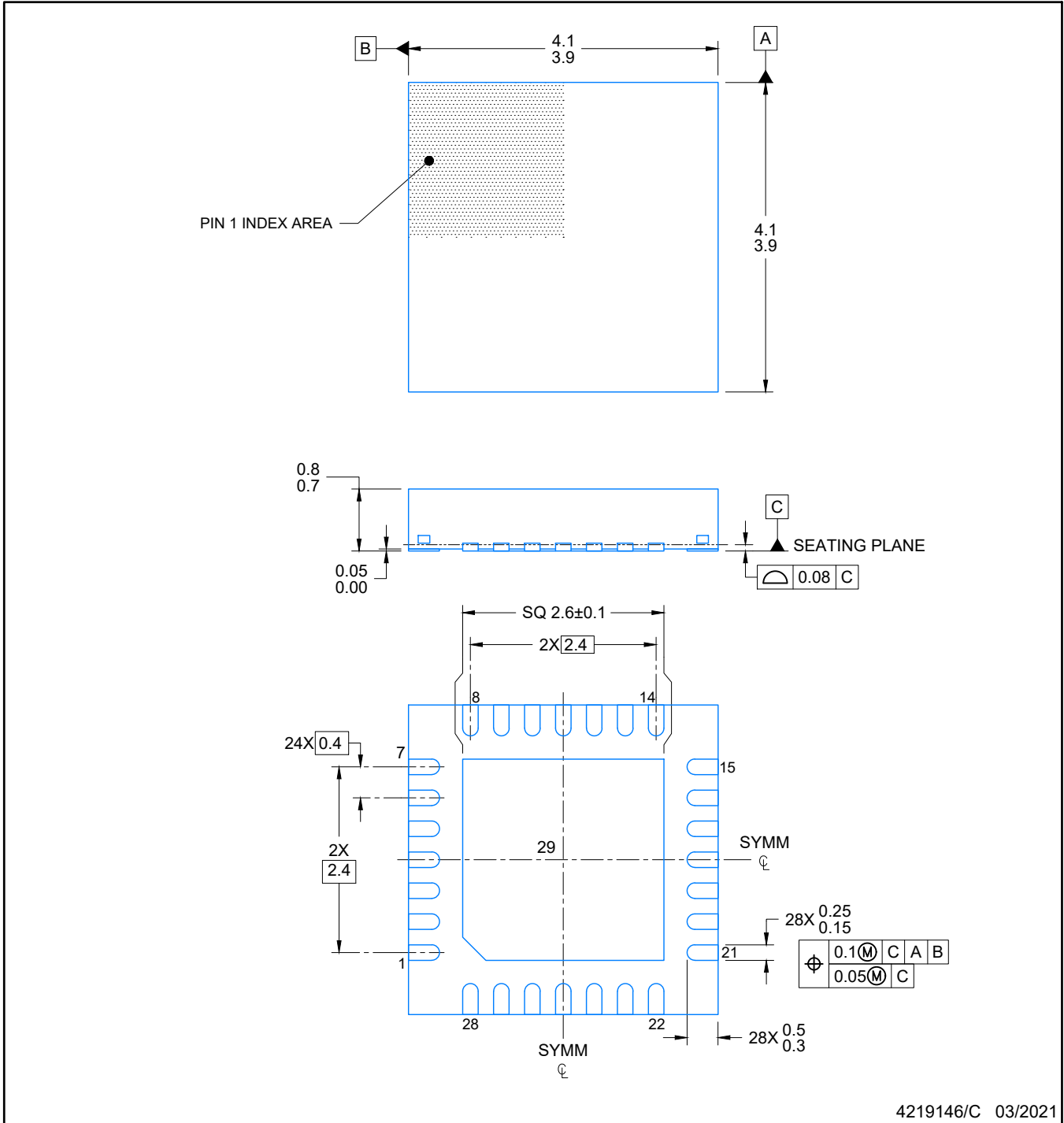

\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
BQ24800RUYR	WQFN	RUY	28	3000	330.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2
BQ24800RUYT	WQFN	RUY	28	250	180.0	12.4	4.25	4.25	1.15	8.0	12.0	Q2

**TAPE AND REEL BOX DIMENSIONS**


\*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
BQ24800RUYR	WQFN	RUY	28	3000	367.0	367.0	35.0
BQ24800RUYT	WQFN	RUY	28	250	210.0	185.0	35.0

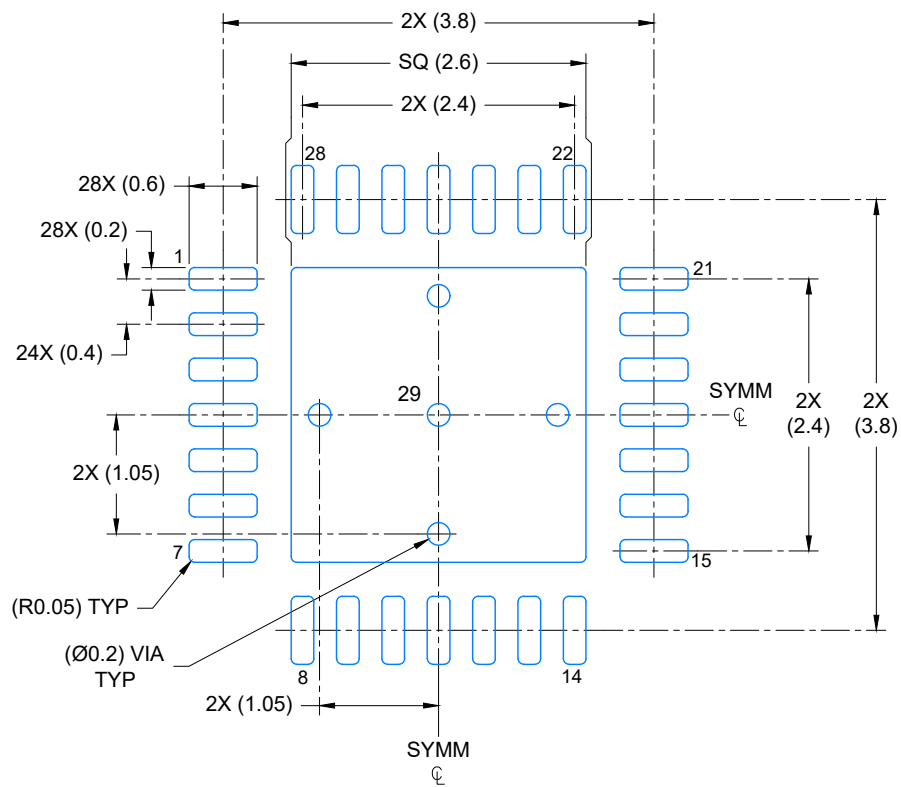


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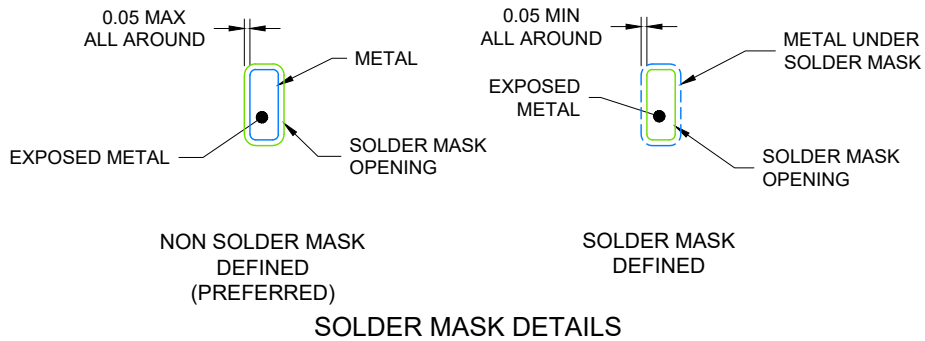
NOTES:

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 optimal thermal and mechanical performance.





LAND PATTERN EXAMPLE  
EXPOSED METAL SHOWN  
SCALE: 15X



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NOTES: (continued)

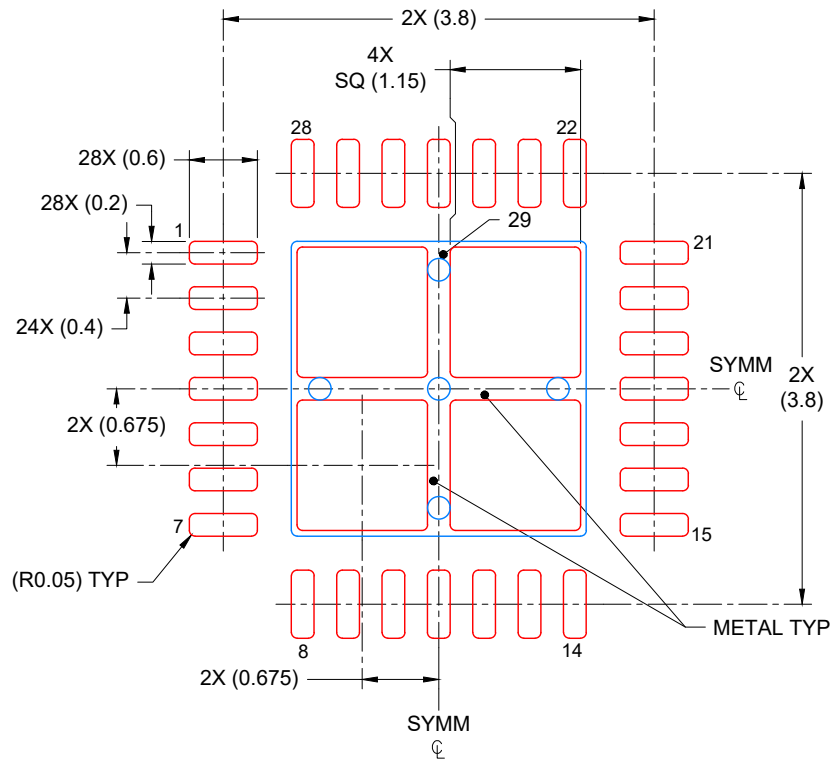
4. This package is designed to be soldered to a thermal pad on the board. For more information, see Texas Instruments literature number SLUA271 ([www.ti.com/lit/slua271](http://www.ti.com/lit/slua271)).
5. Vias are optional depending on application, refer to device data sheet. If any vias are implemented, refer to their locations shown on this view. It is recommended that vias under paste be filled, plugged or tented.

# EXAMPLE STENCIL DESIGN

RUY0028A

WQFN - 0.8 mm max height

PLASTIC QUAD FLATPACK-NO LEAD



SOLDER PASTE EXAMPLE  
BASED ON 0.125 mm THICK STENCIL

EXPOSED PAD  
78% PRINTED COVERAGE BY AREA  
SCALE: 15X

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NOTES: (continued)

6. 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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