

bq27220 Single-Cell CEDV Fuel Gauge

1 Features

- Single-Cell Li-Ion Battery Fuel Gauge
 - Resides in Pack or on System Board
 - Supports Embedded or Removable Batteries
 - Powers Directly from Battery with Integrated LDO
 - Supports a Low-Value (10-m Ω) External Sense Resistor
- Ultra-Low Power Consumption in NORMAL (50 μ A) and SLEEP (9 μ A) Modes
- Battery Fuel Gauging Based on Compensated End-of-Discharge Voltage (CEDV) Technology
 - Reports Remaining Capacity and State-of-Charge (SOC) with Smoothing Filter
 - Adjusts Automatically for Battery Aging, Self-Discharge, Temperature, and Rate Changes
 - Provides Battery State-of-Health (Aging) Estimation
- Microcontroller Peripheral Supports:
 - 400-kHz I²C™ Serial Interface
 - Configurable SOC Interrupt OR Battery Low Digital Output Warning
 - Internal Temperature Sensor OR Host-Reported Temperature OR External Thermistor

2 Applications

- Smartphones and Feature Phones
- Tablets
- Wearables
- Building Automation
- Portable Medical/Industrial Handsets
- Portable Audio
- Gaming

3 Description

The Texas Instruments bq27220 battery fuel gauge is a single-cell gauge that requires minimal user-configuration and system microcontroller firmware development, leading to quick system bring-up. The bq27220 device uses the Compensated End-of-Discharge Voltage (CEDV) algorithm for fuel gauging, and provides information such as remaining battery capacity (mAh), state-of-charge (%), runtime-to-empty (min), battery voltage (mV), temperature ($^{\circ}$ C), and state-of-health (%).

The bq27220 battery fuel gauge has ultra-low power consumption in NORMAL (50 μ A) and SLEEP (9 μ A) modes, leading to longer battery run time. Configurable interrupts help save system power and free up the host from continuous polling. Accurate temperature sensing is supported via an external thermistor.

Customers can use preloaded CEDV parameters in ROM or can generate custom chemistry parameters using TI's web-based tool, [GAUGEPARCAL](#). Custom-generated parameters can either be programmed in device RAM by the host on power up of the system or customers can program the parameters to an onboard One-Time Programmable (OTP) memory.

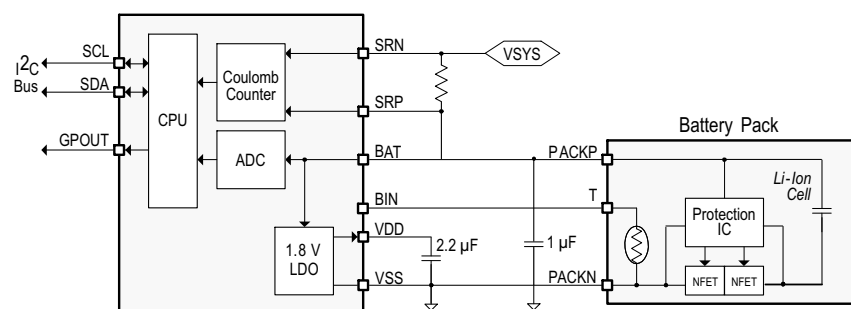
Battery fuel gauging with the bq27220 device requires connections only to PACK+ (P+) and PACK– (P–) for a removable battery pack or embedded battery circuit. The tiny, 9-ball, 1.62 mm \times 1.58 mm, 0.5-mm pitch NanoFree™ chip scale package (DSBGA) is ideal for space-constrained applications.

Device Information⁽¹⁾

PART NUMBER	PACKAGE	BODY SIZE (NOM)
bq27220	YZF (9)	1.62 mm \times 1.58 mm

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

Simplified Schematic (System-Side)



4 Device and Documentation Support

4.1 Documentation Support

4.1.1 Related Documentation

- *bq27220 Technical Reference Manual* ([SLUUBD4](#))
- *Quickstart Guide for bq27220* ([SLUUAP7](#))
- *Single Cell Gas Gauge Circuit Design* ([SLUA456](#))
- *Key Design Considerations for the bq27500 and bq27501* ([SLUA439](#))
- *ESD and RF Mitigation in Handheld Battery Electronics* ([SLUA460](#))

4.2 Community Resources

The following links connect to TI community resources. Linked contents are provided "AS IS" by the respective contributors. They do not constitute TI specifications and do not necessarily reflect TI's views; see TI's [Terms of Use](#).

TI E2E™ Online Community *TI's Engineer-to-Engineer (E2E) Community*. Created to foster collaboration among engineers. At e2e.ti.com, you can ask questions, share knowledge, explore ideas and help solve problems with fellow engineers.

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4.3 Trademarks

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4.4 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.

4.5 Glossary

[SLYZ022](#) — *TI Glossary*.

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

5 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/Ball Finish (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
BQ27220YZFR	PREVIEW	DSBGA	YZF	9	3000	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	BQ27220	
BQ27220YZFT	PREVIEW	DSBGA	YZF	9	250	Green (RoHS & no Sb/Br)	SNAGCU	Level-1-260C-UNLIM	-40 to 85	BQ27220	

(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.

OBSELETE: 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.

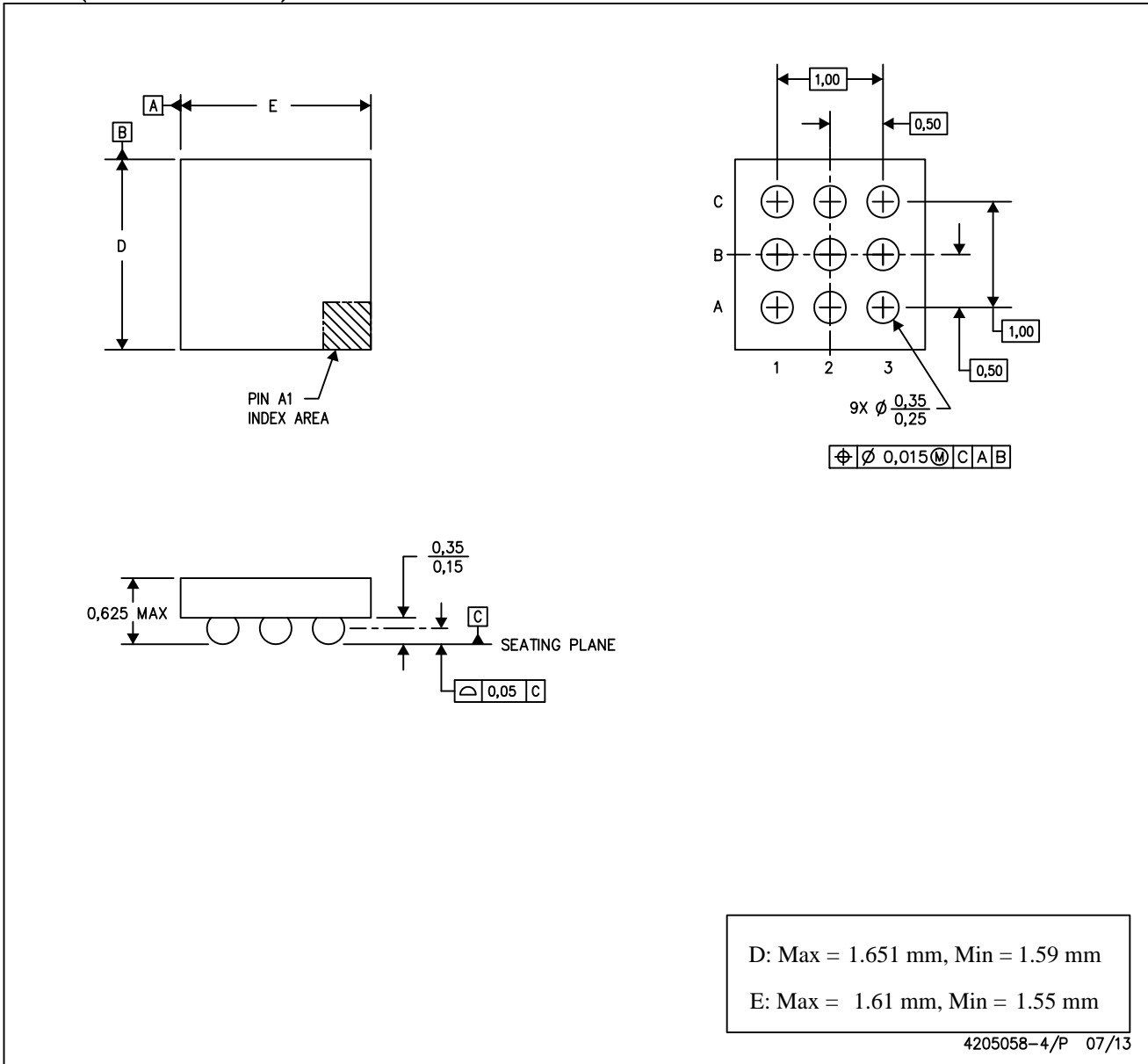
(6) Lead/Ball Finish - Orderable Devices may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead/Ball Finish values may wrap to two lines if the finish value exceeds the maximum column width.

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YZF (S-XBGA-N9)

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.

NanoFree is a trademark of Texas Instruments.

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