# SBS 1.1-COMPLIANT GAS GAUGE ENABLED WITH IMPEDANCE TRACK™ TECHNOLOGY FOR USE WITH THE bq29330

## FEATURES

- **Next Generation Patented Impedance Track™ Technology accurately Measures Available Charge in Li-Ion and Li-Polymer Batteries**
- **Better than 1% Error Over Lifetime of the Battery**
- **Instant Accuracy – No Learning Cycle Required**
- **Supports the Smart Battery Specification SBS V1.1**
- **Powerful 8-Bit RISC CPU With Ultra-Low Power Modes**
- **Works With the TI bq29330 Analog Front-End (AFE) Protection IC to Provide Complete Pack Electronics Solution**
- **Full Array of Programmable Protection Features**
  - **Voltage, Current and Temperature**
- **Fully Integrated High Accurate Clock**
- **Flexible Configuration for 2 to 4 Series Li-Ion and Li-Polymer Cells**
- **Integrated Field Programmable FLASH Memory Eliminates the Need for External Configuration Memory**
- **Smart Battery Charger Control Feature**
- **Two 16-Bit Delta-Sigma Converter**
  - **Accurate Voltage and Temperature Measurements**
  - **Integrating Coloumb Counter for Charge Flow**
    - **Better Than 0.65 nVh of Resolution**
    - **Self-Calibrating**
- **Supports SHA-1 Authentication**
- **20-Pin TSSOP (PW)**

## APPLICATIONS

- **Notebook PCs**
- **Medical and Test Equipment**
- **Portable Instrumentation**

## DESCRIPTION

The bq20z70 SBS-compliant gas gauge IC, incorporating patented Impedance Track™ technology, is designed for battery-pack or in-system installation. The bq20z70 measures and maintains an accurate record of available charge in Li-ion or Li-polymer batteries using its integrated high-performance analog peripherals. The bq20z70 monitors capacity change, battery impedance, open-circuit voltage, and other critical parameters of the battery pack, and reports the information to the system host controller over a serial-communication bus. It is designed to work with the bq29330 analog front-end (AFE) protection IC to maximize functionality and safety, and minimize component count and cost in smart battery circuits.

The Impedance Track technology continuously analyzes the battery impedance, resulting in superior gas-gauging accuracy. This enables remaining capacity to be calculated with discharge rate, temperature, and cell aging all accounted for during each stage of every cycle.

### AVAILABLE OPTIONS

| $T_A$ | PACKAGE[1] | |
| --- | --- | --- |
| | **20-PIN TSSOP (PW) Tube** | **20-PIN TSSOP (PW) Tape and Reel** |
| −40°C to 85°C | bq20z70PW[2] | bq20z70PWR[3] |

(1) For the most current package and ordering information, see the Package Option Addendum at the end of this document, or see the TI website at www.ti.com.
(2) A single tube quantity is 50 units.
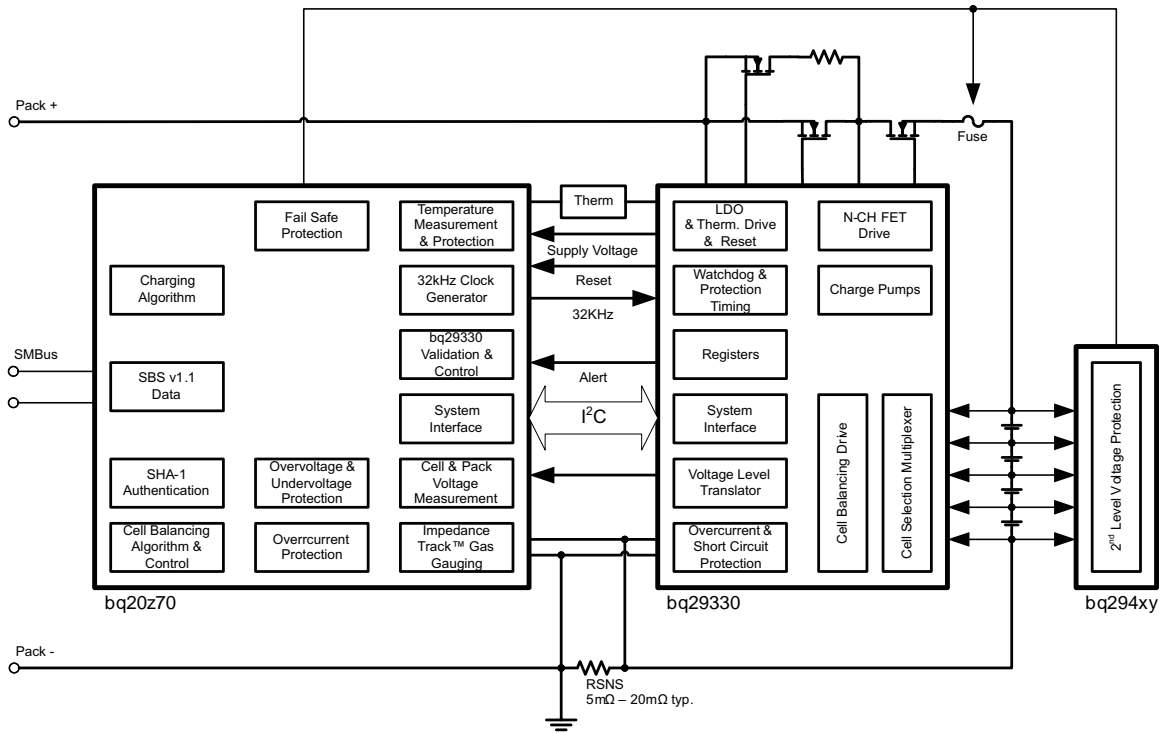(3) A single reel quantity is 2000 units

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# bq20z70

## TSSOP (PW)
## (TOP VIEW)

| | | |
|---|---|---|
| XALERT | 1 | 20 | VCELL- |
| TS2 | 2 | 19 | VCELL+ |
| TS1 | 3 | 18 | VCC |
| CLKOUT | 4 | 17 | VSS |
| PRES | 5 | 16 | MRST |
| PFIN | 6 | 15 | SRN |
| SAFE | 7 | 14 | SRP |
| SMBD | 8 | 13 | VSS |
| NC | 9 | 12 | SCLK |
| SMBC | 10 | 11 | SDATA |

**ELECTRICAL CHARACTERISTICS**

| | | | |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

# bq20z70

$V_{CC}$ = 2.4 V to 2.6 V, $T_A$ = −40°C to 85°C (unless otherwise noted)

| PARAMETER | | TEST CONDITIONS | MIN | TYP | MAX | UNIT |
|---|---|---|---|---|---|---|
| $f_{SMB}$ | SMBus operating frequency | Slave mode, SMBC 50% duty cycle | 10 | | 100 | kHz |
| $f_{MAS}$ | SMBus master clock frequency | Master mode, no clock low slave extend | | 51.2 | | |
| $t_{BUF}$ | Bus free time between start and stop | | 4.7 | | | |
| $t_{HD:STA}$ | Hold time after (repeated) start | | 4 | | | |
| $t_{SU:STA}$ | Repeated start setup time | | 4.7 | | | s |
| $t_{SU:STO}$ | Stop setup time | | 4 | | | |
| $t_{HD:DAT}$ | Data hold time | Receive mode | 0 | | | |
| | | Transmit mode | 300 | | | ns |
| $t_{SU:DAT}$ | Data setup time | | 250 | | | |
| $t_{TIMEOUT}$ | Error signal/detect | See [1] | 25 | | 35 | ms |
| $t_{LOW}$ | Clock low period | | 4.7 | | | |
| $t_{HIGH}$ | Clock high period | See [2] | 4 | | 50 | s |
| $t_{LOW:SEXT}$ | Cumulative clock low slave extend time | See [3] | | | 25 | |
| $t_{LOW:MEXT}$ | Cumulative clock low master extend time | See [4] | | | 10 | ms |
| $t_F$ | Clock/data fall time | ($V_{ILMAX}$ − 0.15 V) to ($V_{IHMIN}$ + 0.15 V) | | | 300 | |
| $t_R$ | Clock/data rise time | 0.9 VCC to (VILMAX − 0.15 V) | | | 1000 | ns |

(1) The bq20z70 times out when any clock low exceeds $t_{TIMEOUT}$.
(2) $t_{HIGH:MAX}$. is minimum bus idle time. SMBC = 1 for t > 50 s causes reset of any transaction involving the bq20z70 that is in progress.
(3) $t_{LOW:SEXT}$ is the cumulative time a slave device is allowed to extend the clock cycles in one message from initial start to the stop.
(4) $t_{LOW:MEXT}$ is the cumulative time a master device is allowed to extend the clock cycles in one message from initial start to the stop.

## SMBus TIMING DIAGRAM
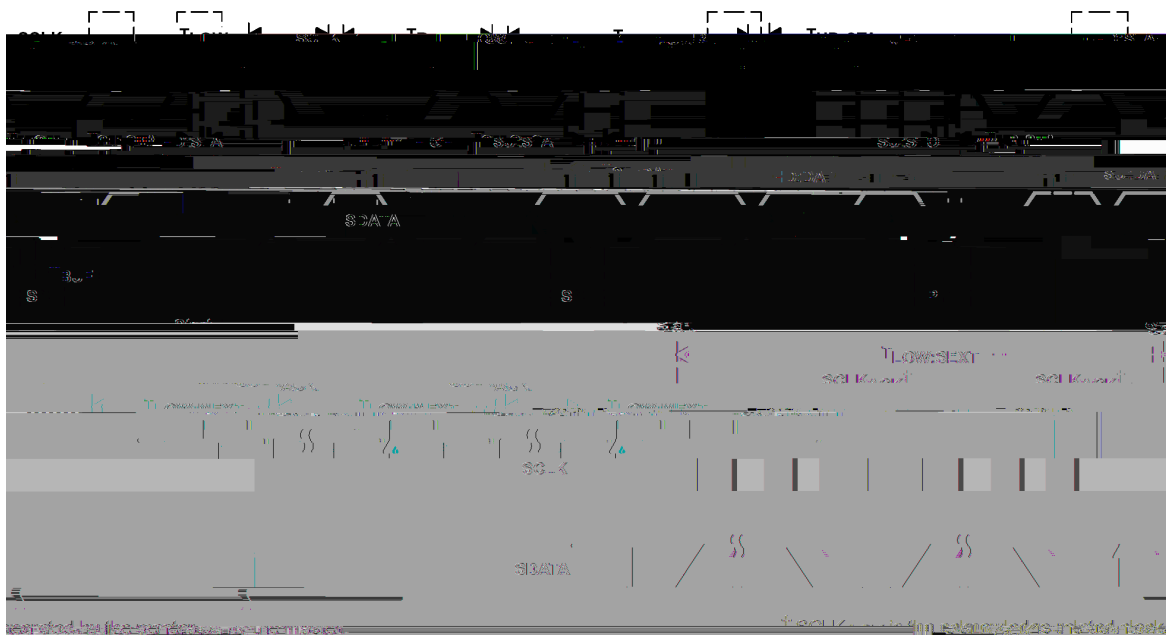
## FEATURE SET

**Primary (1st Level) Safety Features**

**Secondary (2nd Level) Safety Features**

**Charge Control Features**

**Gas Gauging**

**Authentication**

# FEATURE SET (continued)

## Power Modes

The bq20z70 supports 3 different power modes to reduce power consumption:

- In Normal Mode, the bq20z70 performs measurements, calculations, protection decisions and data updates in 1 second intervals. Between these intervals, the bq20z70 is in a reduced power stage.
- In Sleep Mode, the bq20z70 performs measurements, calculations, protection decisions and data

## CONFIGURATION

**Oscillator Function**

**System Present Operation**

## BATTERY PARAMETER MEASUREMENTS

**Charge and Discharge Counting**

**Voltage**

**Current**

**Auto Calibration**

**Temperature**

# COMMUNICATIONS

**SMBus On and Off State**

## SBS Commands

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
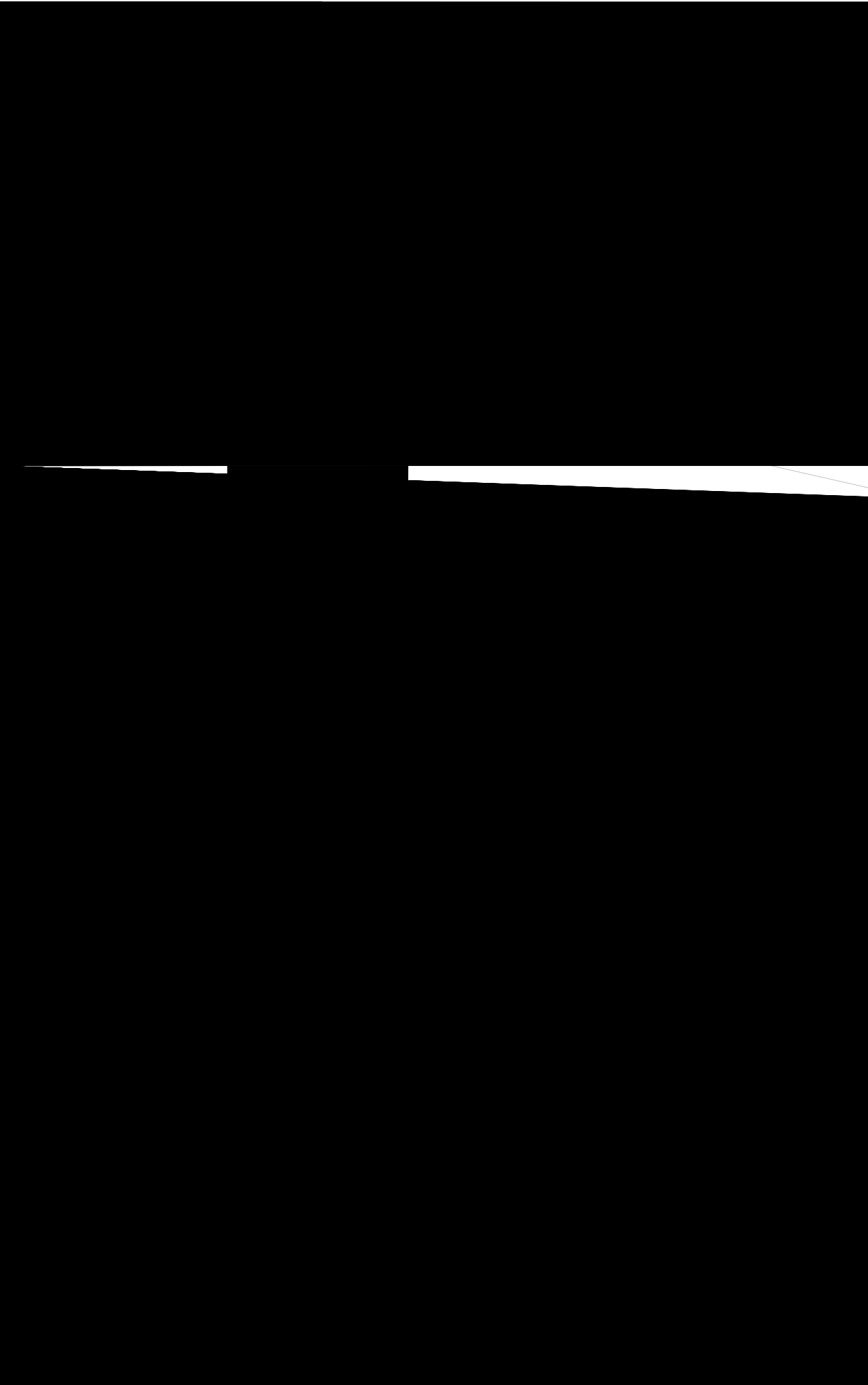
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