Application Report
SLUAA14–February 2020

BQ27Z561-R1 to BQ27Z561-R2 Change List

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ABSTRACT

The BQ27Z561-R2 firmware enables several feature additions and performance improvements to the BQ27Z561-R1 device, and this document describes the BQ27Z561-R2 additions and features. The *BQ27Z561-R1 Impedance Track™ Battery Gas Gauge Solution for 1-Series Cell Li-Ion Battery Packs Data Sheet* (SLUSDH5), the latest ordering information, and the *BQ27Z561-R2 Technical Reference Manual* (SLUUC54) are available on TI.com.

1 Trademarks

Impedance Track™ is the trademark of Texas Instruments.

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2 Introduction

The Texas Instruments BQ27Z561-R2 Impedance Track™ gas gauge solution is a highly integrated, accurate 1-series cell gas gauge with a flash programmable custom reduced instruction-set CPU (RISC) and SHA-256 authentication for li-ion and li- polymer battery packs. The 1-series cell capability includes parallel cells for increased capacity.

3 Change Details

Table 1. BQ27Z561-R1 to BQ27Z561-R2 Change Descriptions

Change Description	BQ27Z561	BQ27Z561-R1	BQ27Z561-R2	Comments
LiFePO4 chemistry support	Not present	New feature	Present	The LFP_RELAX feature supports slower relaxation at the end of charge. There is a change of OCVFR functionality when LiFePO4 is selected to clear after 48 hours or when cell voltage falls below ***FlatVoltMin***. This new feature enables the option to use DOD data at a valid charge termination (VCT) and after relaxation is detected.
ManufacturerInfoB() support	Not present	New feature	Present	An additional block read of scratch pad data flash that can be 4 to 32 bytes long
Time-based lifetime features	Not present	New feature	Present	New time-based lifetime features that include total run time and time spent at different temperature ranges
Fast OCV update option	Not present	New feature	Present	When enabled, voltage data is used after a fixed time for OCV calculation rather than waiting for a dV/dt of 2 µs, which is the normal method.
Battery Trip Point (BTP) feature	Not present	New feature	Present	Either the BTP feature or the INT feature can be selected to use with INT, which is also enabled with additional options.
Ability for charging thresholds to be manipulated by *RelativeStateOfCharge()* (RSOC)	Not present	New feature	Present	Reported charging parameters can be optionally changed based on a level of *RSOC()* rather than voltage.
Improved state-of-health (SOH) algorithm	Present, but with a less-enhanced algorithm	Enhanced feature	Present	The state-of-health (SOH) algorithm now uses the following: ● ***Min Delta Voltage***, rather than ***Delta Voltage***, to calculate EDV ● The JEITA ***Rec Temp Charging:Voltage***, rather than the present voltage at charge termination ● The new data flash ***SOH Temp A*** and ***SOH Temp K***, which are generated and used in simulations along with ***SOH Load Rate*** ● The current used at EOC during simulation is ***Taper Current***, rather than the measured current.
Enhanced *ChargingCurrent()* and *ChargingVoltage()* reporting options	Present, but with less-enhanced options	Enhanced feature	Present	*ChargingCurrent()* and *ChargingVoltage()* can have separate values for the JEITA ranges of STL and STH, and can be enabled with SLEEPCHG to report non-zero values when charging and when the device is in SLEEP mode.

Table 1. BQ27Z561-R1 to BQ27Z561-R2 Change Descriptions (continued)

Change Description	BQ27Z561	BQ27Z561-R1	BQ27Z561-R2	Comments
Static *ChargeVoltage()*	Not present	Not present	New feature	A configuration option to select between *ChargingVoltage()* or a static parameter, ***Charge Term Voltage***, to determine if cell voltage is within range for charge termination.
ChargeVoltage() override	Not present	Not present	New feature	A MAC to overwrite the charging voltages in data flash, which determines *ChargingVoltage()* based on temperature. This MAC is available in SEALED mode.
ChargeVoltage() compensation for system resistance	Not present	Not present	New feature	While charging, increase *ChargeVoltage()* to compensate for the voltage drop across the system resistance such that the voltage at the cell equals the originally desired charging voltage.
SOC-based lifetimes features	Not present	Not present	Enhanced feature	An SOC-based lifetime feature that includes total runtime spent at different states of charge and temperature
QMax update based on discharge (DSG) cycles	Not present	Not present	New feature	Adjust QMax down based on cycle count since last QMax update
Active flat zone detection	Not present	Not present	New feature	Indication bit to inform the system if relaxing in current location would result in a valid DOD update
QMax Day MAC	Not present	Not present	New feature	Command to return elapsed time in days when QMax was last updated
QMax Cycle Count	Not present	Not present	New feature	Command to return cycle count at the last update to QMax
ChargeVoltage() degrade	Not present	Not present	New feature	Method to reduce *ChargeVoltage()* based on SOH, cycle count, total run time, time at high temp, or time at high temp and high SOC.
Cell Swelling	Not present	Not present	New feature	Temporary *ChargeVoltage()* reduction if cell temperature and SOC are high
Hold 1% until termination voltage	Not present	Not present	New feature	This new feature prevents early report of SOC = 0 by hold SOC at 1% until termination voltage has been reached.
TURBO Mode 3.0	Not present	Not present	New feature	The BQ27Z561-R2 TURBO Mode 3.0 helps the system to adjust the power level by providing information about maximum power, depending on the battery state-of-charge, temperature, and present battery impedance, and provides improved prediction of allowed high load pulses.
HIBERNATE mode	Not present	Not present	New feature	This is the lowest power mode for the device. In this mode, all measurement and clocking circuits are turned off; thus, the mode should only be entered when no charging or discharging of the battery is expected (for instance, when the pack is out of the system). This mode is exited upon two valid communication events.
ManufacturerInfoC() support	Not present	Not present	New feature	An additional block read of scratch pad data flash that can be 4 to 32 bytes long

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