Comparing the NL2024xx22 to the RHx024QE34/HD34

January 15, 2024

Why are NL2024xx22 battery part numbers being updated to an RHx024xx34 part number?

The decision to update the part number was made for two reasons:

- Discontinuation of the Moli 2.2Ah cell used in the NL2024xx22 design, and
- Inspired Energy's transition of all our products using the BQ20Z655-R1 fuel gauge to the updated BQ40Z80 fuel gauge. The BQ20Z655-R1 is 13 years old and not recommended for new designs. Inspired Energy is transitioning to the newer BQ40Z80 fuel gauge in advance of the "655" part becoming obsolete and unavailable.

Are there any communication differences to be aware of?

The RHx024xx34 batteries uses the Texas Instruments BQ40Z80 fuel gauge. The software Battery management studio will be needed with the EVM2400 to communicate to this battery. The BQ Evaluation software will not work with this device for the extended features as they are slightly different and more advanced.

Are there firmware differences?

The firmware versions are different because of the different Ti chipsets. However, they are both fully SMBus 1.1 compatible and should not cause problems when obeying the SMBus protocol. If you are polling for specific message such as DeviceName(), DeviceChemistry(), etc. you should check with Inspired Energy prior to changing batteries to ensure compatibility.

The series cell stacks are read differently with the newer BQ40Z80 gauge. Please adjust your firmware to account for the new locations for the cell stacks.

Is the RH2024QE34 and RH3024QE34 available with IEC62133 and factory follow up service?

Yes. These batteries are registered and marked for IEC62133-2 (2017) compliance and carries the $_{c}$UL$_{US}$ mark for factory follow-up service to this standard. They are currently available for production and sale.

What else should a user be keenly aware of when considering an RHx024xx34 design as a drop-in replacement?

Battery-to-Host messaging remains the same per the SMBus 1.1 standard. Complications may be encountered if using the extended functions of the fuel gauge chipset. Review the application for use of extended functions and compare the two chipsets for potential problems addressing specific registers.

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What are the rating differences between an NL2024xx22* and RHx024xx34 design:

Rating differences may vary slightly depending on the specifications of the NL2024xx22 battery, but in general, here are the comparisons:

NL2024HD22	*Obsolete. Use RH2024HD34* 14.4V, 6.6Ah, 95Wh, <8A, 80W
NL2024ED22	*Alternate is RH3024HD34* 14.4V, 6.6Ah, 95Wh, <10A, 100W
NL2024QE22	*Obsolete. Use RH3024QE34* 14.4V, 6.6Ah, 95Wh, <10A, 100W +IEC62133 + cULus
NL2044HD22	*Obsolete. Use RH2044HD34* 14.4V, 6.6Ah, 95Wh, <8A, 80W
RH2024HD34	14.4V, 6.8Ah, 98Wh, <8A, 80W
RH2024QE34	14.4V, 6.8Ah, 98Wh, <8A, 80W IEC61233-2 + cULus
RH3024HD34	14.4V, 6.8Ah, 98Wh, <10A, 100W
RH3024QE34	14.4V, 6.8Ah_{TYP}, 98Wh_{TYP}, <10A, 100W IEC61233-2 + cULus

Batteries noted as such have IEC 62133-2 registration and are UL listed with quarterly factory follow-up audit service.

Additional agency registrations may also be obtained such as Korea KC, Japan PSE, India BIS, Taiwan BSMI, etc.; NRE's may apply and a custom part number is also an option.

How are the cell stack voltages accessed?

- With the old BQ20Z655-R1 gauge, TI extended function command was an SMBus word read to the following addresses: 0x3C,3D,3E, and 3F for the 4 series cell stacks.
- On the new gauge(bq40z80):
  - Write word 0x71 to manufacturer access() 0x00 command, then
  - Read the results as a block read on 0x23 as the very next command
- Cell stacks will be the first bytes returned as shown below in the snippet from the datasheet.

18.1.53 ManufacturerAccess() 0x0071 DAStatus1

This command returns the cell voltages, pack voltage, bat voltage, cell currents, cell powers, power, and average power on *ManufacturerBlockAccess()* or *ManufacturerData()*.

Status	Condition
Activate	0x0071 to *ManufacturerBlockAccess()* or *ManufacturerAccess()*

Action: Output 32 bytes of data on *ManufacturerBlockAccess()* or *ManufacturerData()* in the following format: aaAAbbBBccCCddDDeeEEffFFggGGhhHHiiIIjjJJkkKKllLLmmMMnnNNooOOppPP where:

Value	Description	Unit
AAaa	Cell Voltage 1	mV
BBbb	Cell Voltage 2	mV
CCcc	Cell Voltage 3	mV
DDdd	Cell Voltage 4	mV
EEee	BAT Voltage. Voltage at the BAT pin. This is different than *Voltage()*, which is the sum of all the cell voltages.	mV
FFff	PACK Voltage. Voltage at the PACK+ pin.	mV
GGgg	Cell Current 1. Simultaneous current measured during Cell Voltage 1 measurement	mA
HHhh	Cell Current 2. Simultaneous current measured during Cell Voltage 2 measurement	mA
IIii	Cell Current 3. Simultaneous current measured during Cell Voltage 3 measurement	mA
JJjj	Cell Current 4. Simultaneous current measured during Cell Voltage 4 measurement	mA
KKkk	Cell Power 1. Calculated using Cell Voltage1 and Cell Current 1 data	mA
LLll	Cell Power 2. Calculated using Cell Voltage2 and Cell Current 2 data	cW
MMmm	Cell Power 3. Calculated using Cell Voltage3 and Cell Current 3 data	cW
NNnn	Cell Power 4. Calculated using Cell Voltage4 and Cell Current 4 data	cW
OOoo	Power calculated by *Voltage()* × *Current()*	cW
PPpp	Average Power	cW