Comparing the Ni2020ED29 to the new Ni3020HD29

March 23, 2023

Why is the Ni2020ED29 battery being replaced rather than just updated?

Our naming convention is changing to use Nx30yy to denote higher amperage capability. Thank the agencies for making it difficult to carry the same part number forward.

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

- Discontinuation of the LG 2.9Ah cell, 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 12 years old and not recommended for new designs. Inspired Energy is transitioning to the newer BQ40Z80 fuel gauge before the part becomes obsolete and unavailable.

Are there any communication differences to be aware of?

The Ni3020HD29 battery uses the Texas Instruments BQ40Z80. 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 Ni3020HD29 available with IEC62133 and factory follow up service?

The Ni3020QE29 is the same physical battery as the Ni3020HD29. It is registered and marked for IEC62133-2 (2017) compliance and carries the $_{C}$TUV$_{US}$ mark for factory follow-up service to this standard. It is currently available for production and sale.

What else should a user be keenly aware of when considering the NI3020HD29 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 differences between the Ni2020ED29 and NI3020HD29:

Difference	Ni2020ED29	NI3020HD29
Cell	LG	Moli P28A
CUV	2400mV	2500mV
COV	4300mV	4250mV
SOV	4500mV	4300mV
Pre-charge current <3000mV per cell	870mA charge rate	840 mA charge rate
Taper current for Full charge	290mA	150mA
UTD(under temp discharge threshold)	none	-30C
Over Current Discharge	8250mA	10500mA
Over charge capacity	8700mAh	8400mAh
Remaining capacity Alarm	870mAh	840mAh
Remaining energy Alarm	939mWh	907mWh
Cycle count threshold	7830mAh	7560mAh
Design Capacity	8700mAh	8400mAh
Design Energy	93960mWh	9072cWh
Device Name	Ni2020ED29	Ni3020HD29
Device Chemistry	LiON	LiON
Shutdown voltage	6900mV	7200mV
Termination Voltage (reports 0% SOC)	7500mV	8250mV
FET Thermistor to monitor 80C setting (OT2)	No	Yes
Cell Degradation.70% SOH. Reduced Charge rate	No	Yes
Time based Max error growth	No	Yes
Single ended learning cycle (rest period not required at end of charge or discharge to update max error)	No	Yes
Fuse	SFH-1212	SFJ-1215U
Secondary protection IC	BQ29412DCT	BQ294750DSG
Power Mosfet	FDS8813NZ	FDMS8018
Lithium Ion Cells	LGC INR18650	Moli-Cel INR18650 P28A
Fuel Gauge	BQ20z655-R1	BQ40Z80
Impedance	<145mΩ	<80mΩ

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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()*.

TEXAS INSTRUMENTS

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