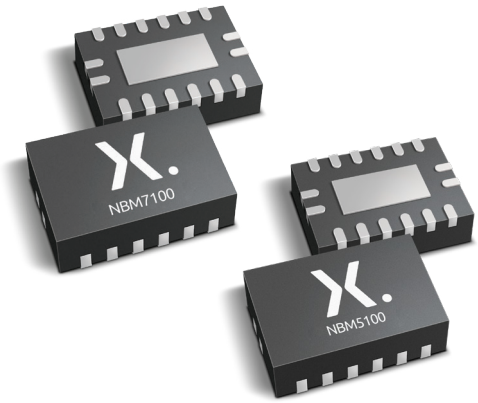
Coin cell battery life booster with adaptive power optimization

Improves lithium coin cell performance and battery life

NBM5100A/B, NBM7100A/B

Lithium primary coin cell batteries (e.g. CR2032) are small, low-leakage, energy dense sources routinely used to supply low power wireless IoT sensor electronics utilizing interfaces like Bluetooth, Zigbee, NB-IoT and other wireless protocols. IoT sensors are often size/space constrained and are frequently placed in hard to access locations making battery replacement difficult.



While more energy dense (Wh/kg) versus other primary battery chemistries (e.g. alkaline), it is difficult to extract more than a few 10s of mW from a coin cell before its capacity starts to degrade. During a transmission cycle, a typical IoT sensor requires 100s of mW and is expected to last for thousands of transmission cycles before its battery reaches end of life.

Nexperia's coin cell battery life boosters are designed to overcome the challenges of lithium primary batteries operating under burst load conditions as found in IoT sensors thereby extending the useful lifetime between replacement by typically 4-10 times. The NBM devices are suitable for use with $LiMnO_2$ (coin) and Li-$SOCL_2$ (lithium thionyl chloride) type batteries up to 3.6 V.

Overview

The NBM5100A/B, NBM7100A/B devices are integrated power management circuits containing 2 stages of high efficiency DC/DC conversion and an intelligent learning algorithm. The devices overcome voltage drop and battery life limitations associated with extracting high pulse currents from lithium primary batteries such as 3.6 V lithium thionyl chloride (Li-$SOCl_2$) or 3 V lithium manganese dioxide ($LiMnO_2$) batteries.

The first stage DC/DC conversion transfers energy from the lithium battery at a low constant current to a capacitive storage element. Once charged, a second DC/DC conversion cycle utilizes this stored energy to supply a regulated voltage output capable of high pulse current loads. The battery is never directly subjected to large pulse currents, resulting in a longer, predictable battery lifetime.

NBM5100B and NBM7100B include a SPI serial port interface. NBM5100A and NBM7100A are offered with I^2C serial interface as well as an autonomous mode which minimizes communication requirements on the I^2C bus. This is useful for applications where no 'smart microcontrollers" are present.

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EFFICIENCY WINS.

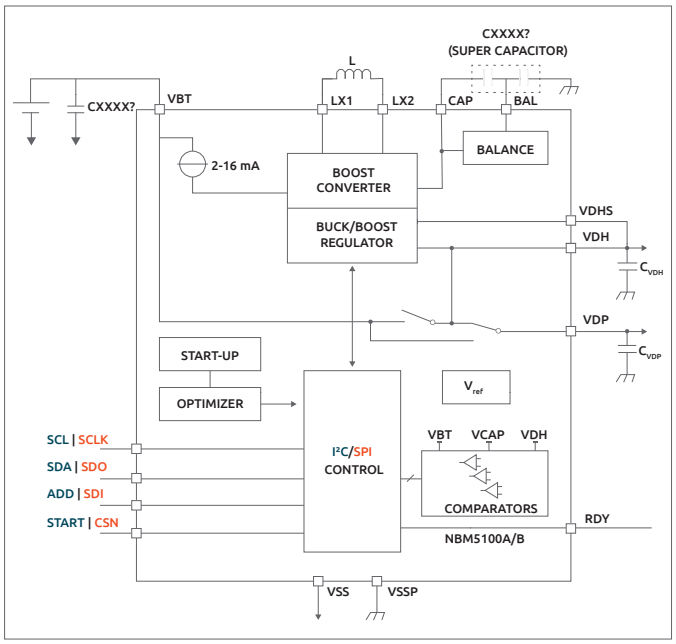
Applications

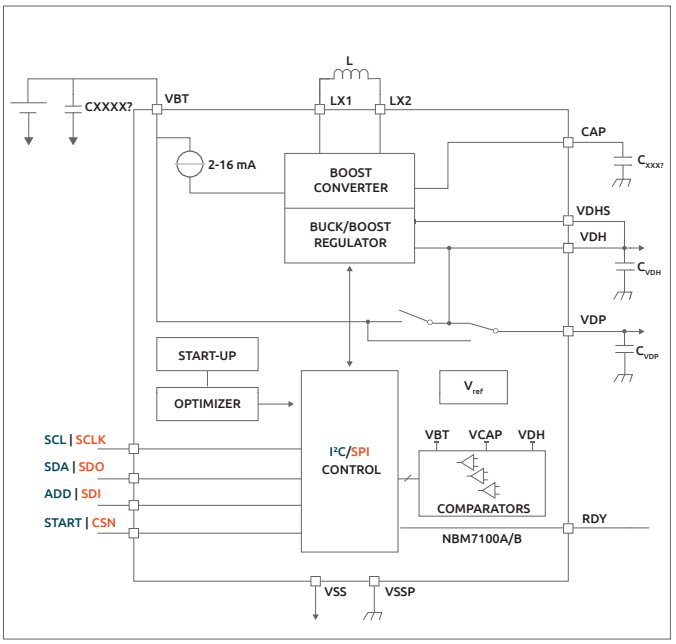
- **Battery powered wireless microcontroller applications:** Bluetooth®, LoRaWAN®, Sigfox™, LTE-M, NB-IoT, Zigbee
- **Industrial:** temperature, occupancy, e-metering, electronic shelf label, asset tracking, irrigation monitoring
- **Consumer/wearable:** location tags, heart rate monitor, blood glucose meter

Features and benefits

- Programmable constant battery load current: 2 to 16 mA
- Protection against battery voltage dips (Brown-out)
- Pulse load output current: ≤ 200 mA
- Regulated programmable output voltage VDH: 1.8 V to 3.6 V
- Ultra-low standby current: < 50 nA
- Typical conversion efficiency of > 90% with adaptive optimization
- 63 adaptive load optimization settings
- Integrated fuel gauge
- Small 16 pin lead-free package (SOT763-1/DHVQFN16; 2.5 mm × 3.5 mm × 0.85 mm)
- Specified from -40 °C to +85 °C

Block diagrams





Product Family

Device part Number	Bus Interface	Autonomous Start Mode	Storage Cap Charge Balance Function	Max Storage Cap Voltage	Max Load Current
NBM7100A	I²C	Supported	Not Supported	11 V	200 mA
NBM5100A	I²C	Supported	Supported	5.5 V	150 mA
Nbm7100B	SPI	Not Supported	Not Supported	11 V	200 mA
NBM5100B	SPI	Not supported	Supported	5.5 V	150 mA

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