

BQ79606AA-Q1 Example Bring Up Procedure

ABSTRACT

The BQ79606AA-Q1 device provides simultaneous, high-accuracy channel measurements for three to six battery cells. With the inclusion of a daisy chain communication port, the BQ79606AA-Q1 device (stackable up to 51 devices) supports the large stack configurations found in battery packs for electrified automotive drive trains. This application report details the steps needed to wake up and initialize a stack of BQ79606AA-Q1 devices.

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Trademarks

1 Example Wakeup and Initialization Procedure

In this section, a generic *Wakeup and Initialization* procedure is described and can be used as a general reference. As an example, it is assumed that a BQ79606AA-Q1 is used as a communications bridge and 16 BQ79606AA-Q1 are used to monitor a stack of 96 cells in series. It is assumed that a baud rate of 1 MBaud is used for UART communications to the host. For an example diagram, see [Figure 1](#).

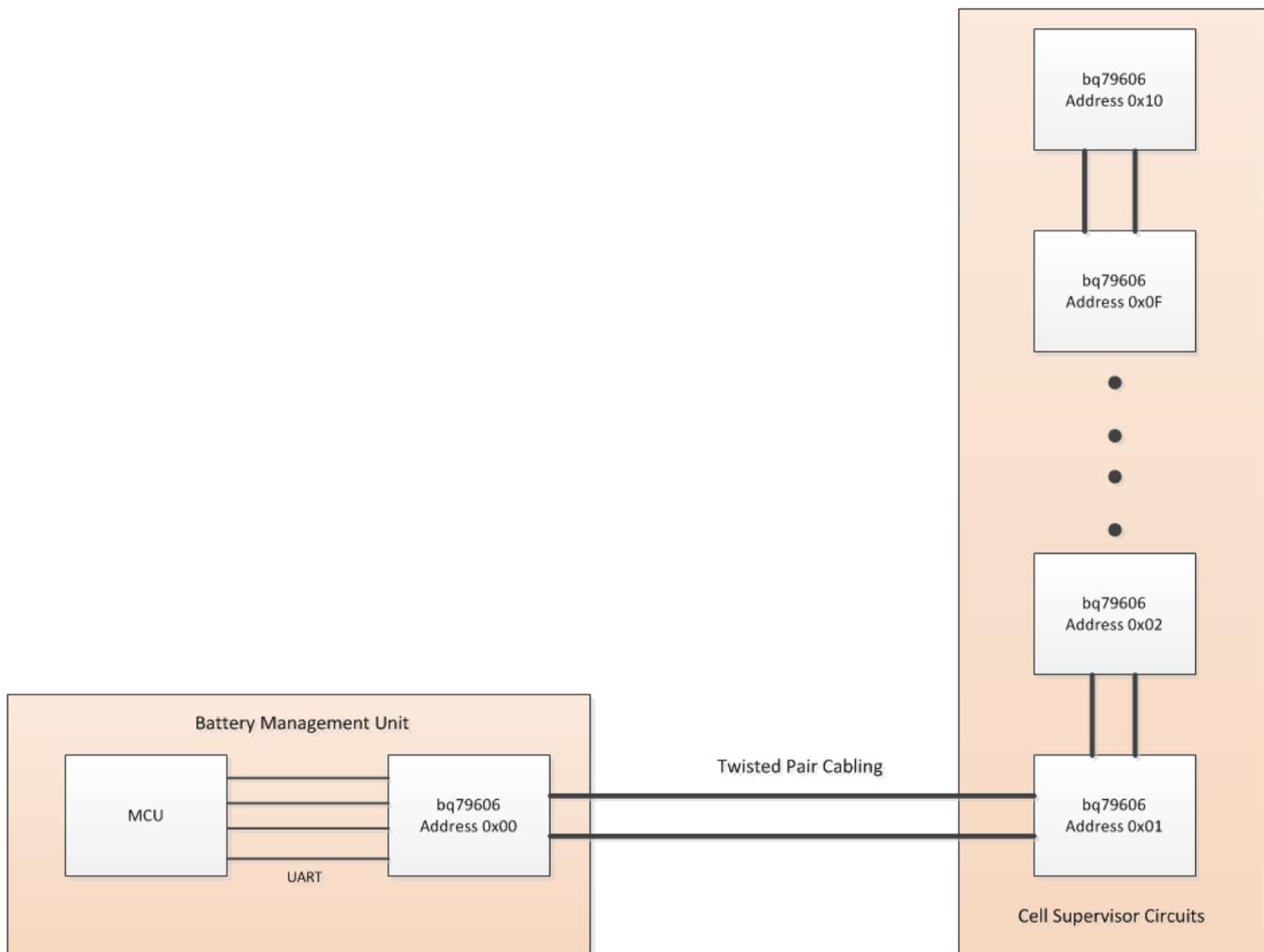


Figure 1. Basic System Diagram

There are three required major steps for bringing up a stack of BQ79606AA-Q1 devices, and an optional fourth step to save register settings to the one-time programmable (OTP) memory:

1. Wakeup
2. Auto-Addressing
3. Initial Register Configuration
4. Burning OTP

1.1 Wakeup Overview

After configuring all required peripherals on the host microcontroller unit (MCU), only one GPIO from the MCU is needed to wake all devices in the daisy chain stack. After applying power to all devices, and defaulting the MCU GPIO to a high state, only two steps are required to wake up the BQ79606AA-Q1 stack:

1. Drive the BQ79606AA-Q1 bridge device wake-up pin low for 300 μ s, then return the GPIO pin to a high state.
2. Wait for 12 ms per device in the stack to allow for wake-up tones to propagate along the daisy chain. For a total of 17 devices, a wait of 204 ms is sufficient to wake all devices.

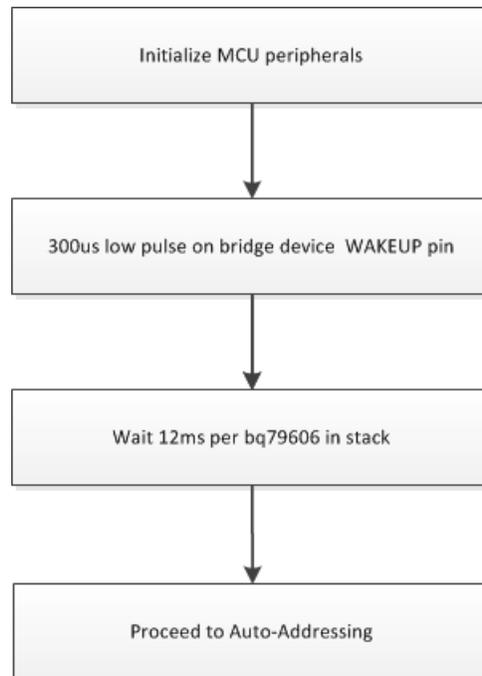
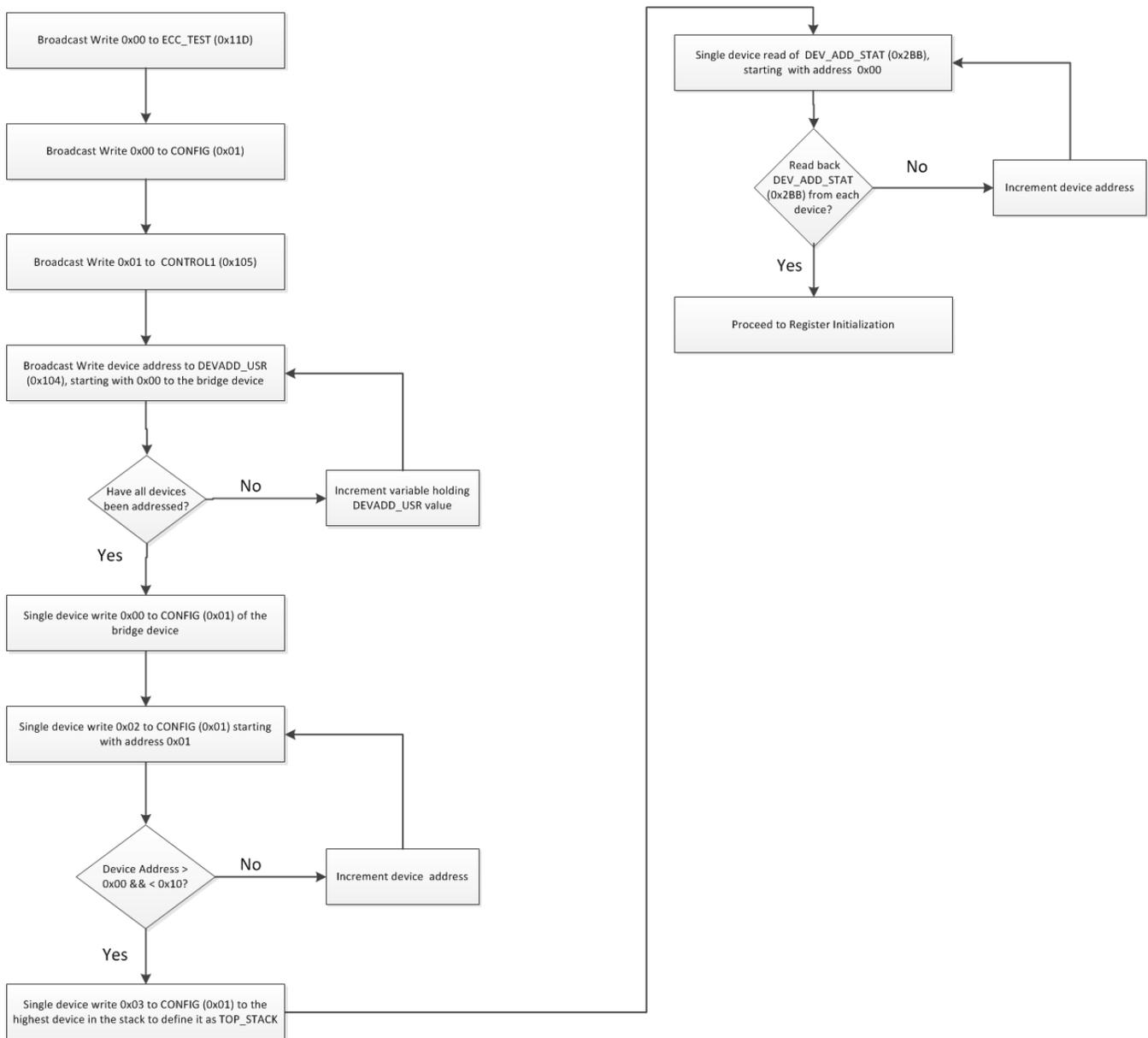


Figure 2. Wakeup Flowchart

1.1.1 Auto-Addressing Overview

Proper addressing of each BQ79606AA-Q1 in a stack is critical for proper operation of the devices. In addition to the summary of the following main points, all devices must be addressed sequentially up the stack, with a best practice of starting from address 0x00 for the bridge or base device.

- Dummy write 0x00 to the ECC_TEST register. This synchronizes the DLLs used for reclocking the daisy chain interface.
- Enter Auto-Addressing Mode with a broadcast write of 0x01 to the CONTROL1 register.
- Execute a broadcast write to DEVADD_USR with the lowest device address, 0x00. Repeat a broadcast write for every device address. Take care to ensure that all addresses are written sequentially.
- Write 0x00 to CONFIG of device address 0x00 — this sets it as the base device in the stack. This device ignores STACK reads and writes.
- Write 0x02 to CONFIG of all other devices in the stack. This sets them as stacked devices and enables them to respond to STACK reads and writes.
- Write 0x03 to CONFIG of the top-most device in the BQ79606AA-Q1 stack. This sets the device as the TOP_STACK, and it does not wait for the next highest devices response during a broadcast read command. **Please note that this step is critical for broadcast reads to work properly!**
- Read back all device addresses to ensure that addressing was executed properly.
- Update the CRCs of all devices (if initializing registers, it may be more desirable to wait until the end of the Register Initialization routine).


Figure 3. Auto-Addressing Flowchart

1.1.2 Register Initialization Overview

This section gives a general description of parameters that may be static in a design, and only need to be initialized once. This list of registers is not comprehensive, but offers a general guideline. **Care must be taken when disabling unused communication interfaces, as it is possible to disable needed interfaces and render the device unable to communicate until after a POR.**

In no particular order, the following flowchart summarizes registers that may only need configured after a POR or once before burning the One Time Programmable (OTP) memory.

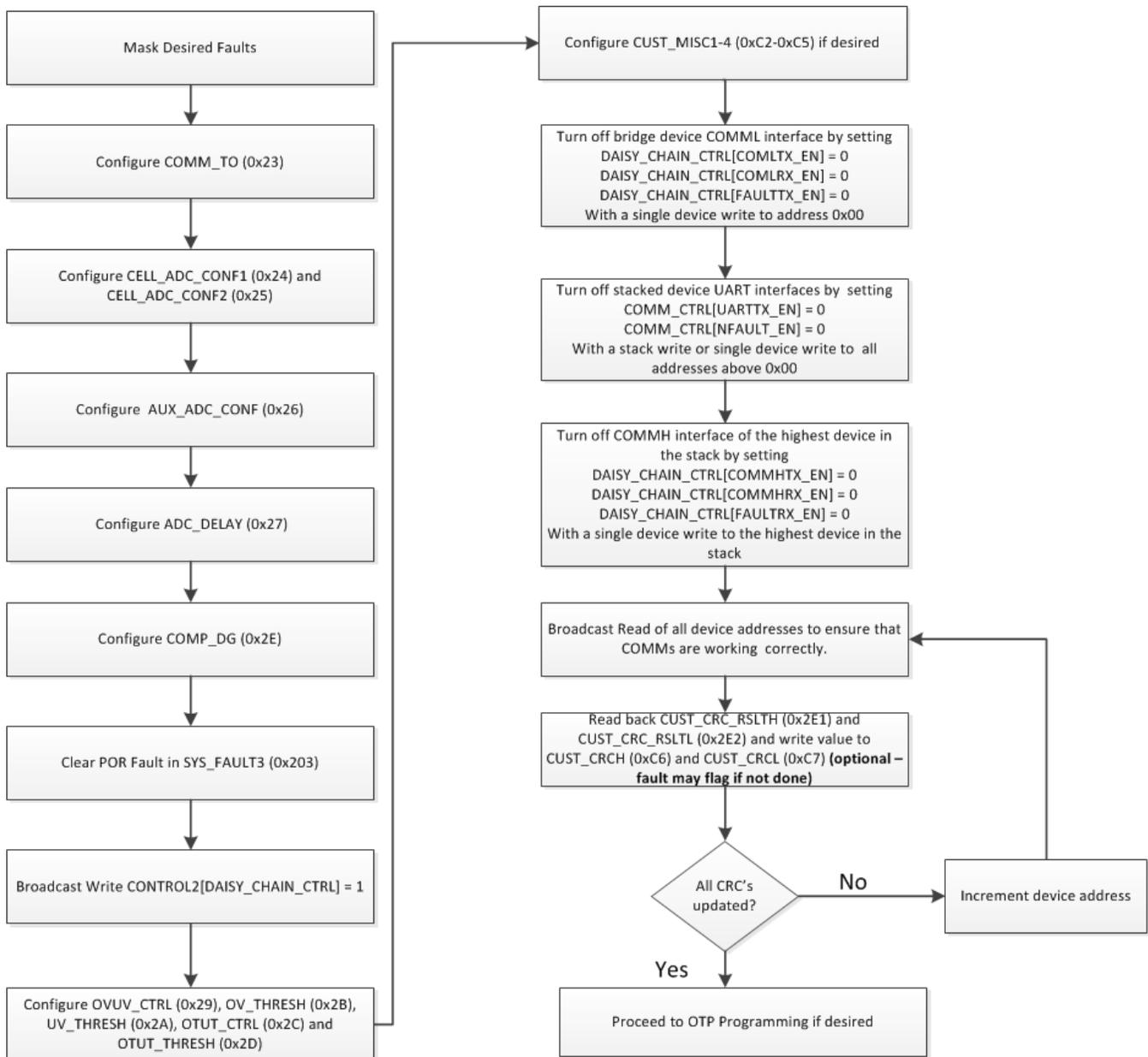


Figure 4. Generic Register Initialization Procedure

1.1.3 OTP Overview

During production, it may be desirable to program register values once and then burn values into non-volatile OTP memory. There are two pages of OTP programming, of which the BQ79606AA-Q1 loads the most recently set page into volatile memory upon a digital reset or full POR.

The flowchart in Figure 4 summarizes the steps required to store current register values into the non-volatile memory.

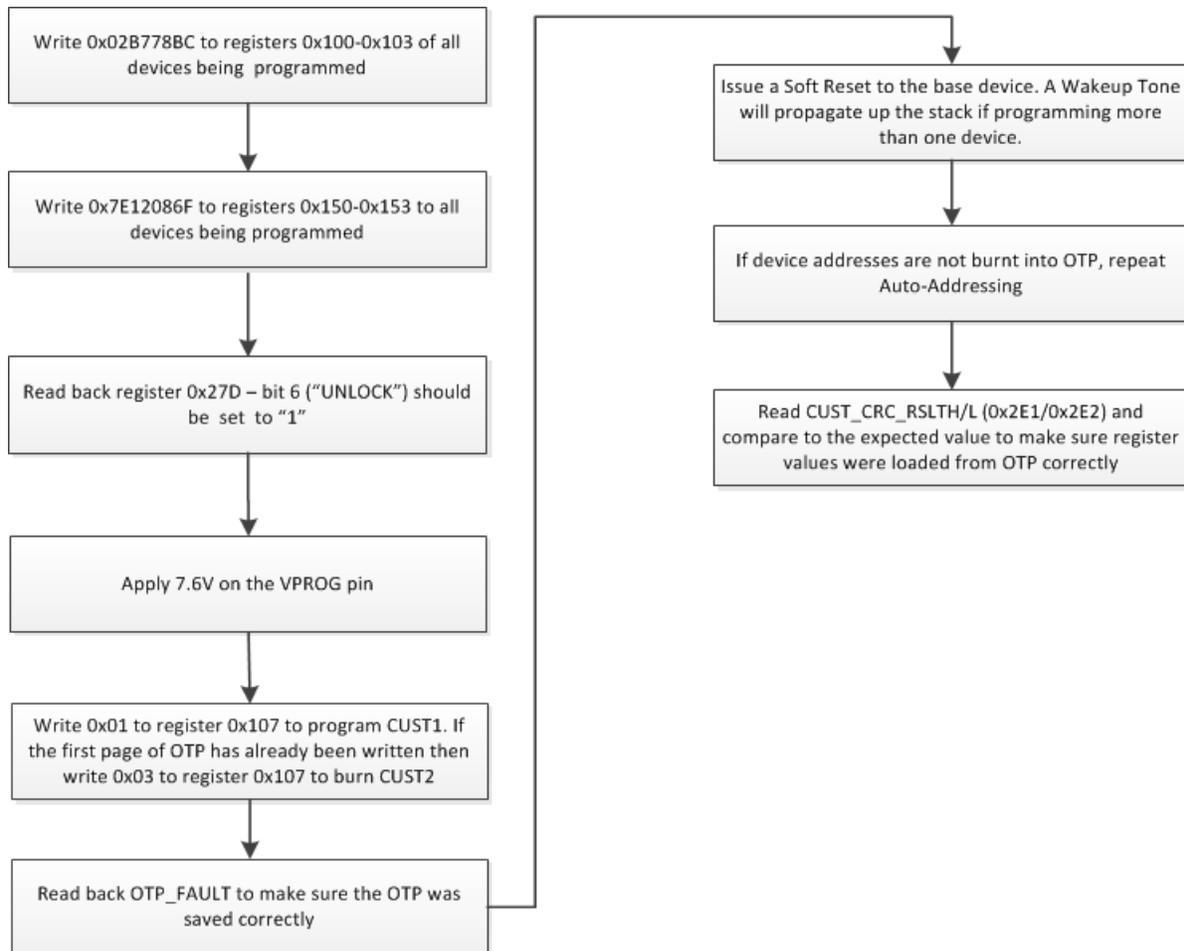


Figure 5. OTP Programming Flowchart

2 References

1. Texas Instruments, [BQ79606AA-Q1 SafeTI™ Precision Monitor with Integrated Hardware Protector for Multi-Cell Lithium-Ion and Lithium Phosphate Battery Packs Automotive Applications Data Sheet](#)

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