

Minimizing Adapter Inrush Current Using BQ24810's Battery Only Boost Mode



Christian Moyer

Introduction

When an adapter is hot-plugged into a system where the system voltage is lower than the adapter voltage, the large voltage difference can result in significant inrush current as the bulk capacitors rapidly charge and the system transitions to adapter power. Applications that require large system capacitance can experience very high inrush currents. This current surge can cause unwanted behavior, including input voltage droop, adapter overcurrent protection events, increased stress on external components, and potential system resets.

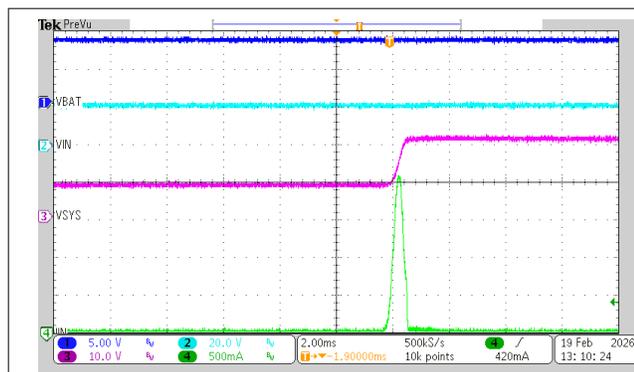
To mitigate this inrush current, the host controller can enable battery-only boost mode on the BQ24810 to temporarily boost the system voltage prior to adapter insertion. Increasing this voltage minimizes the potential difference between the adapter and the system rail, reducing the current required to pull the system rail up and thereby minimizing the peak inrush current.

Register Configuration To Enable Battery Only Boost:

- Disable Low Power Mode REG0x12[15] = 0.
- Configure the Charge Voltage register REG0x15.
- Set the Minimum System Voltage to the maximum value REG0x3E[13:8]=111111
- Set the Battery Boost System Regulation Voltage to the maximum value REG0x38[5] = 1.
- Enable Battery Only Boost Mode REG0x38[6] = 1.
- Set AC Plug Exit Deglitch Time to minimum value REG0x36[6:5] = 11.

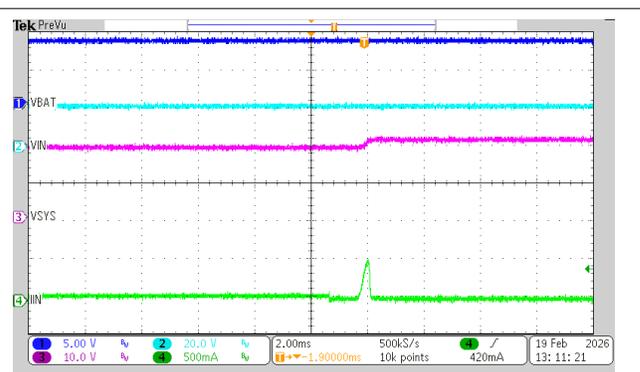
Test Results

The following test results demonstrate the typical adapter inrush current when battery boost mode is disabled vs. enabled, at different battery voltages.



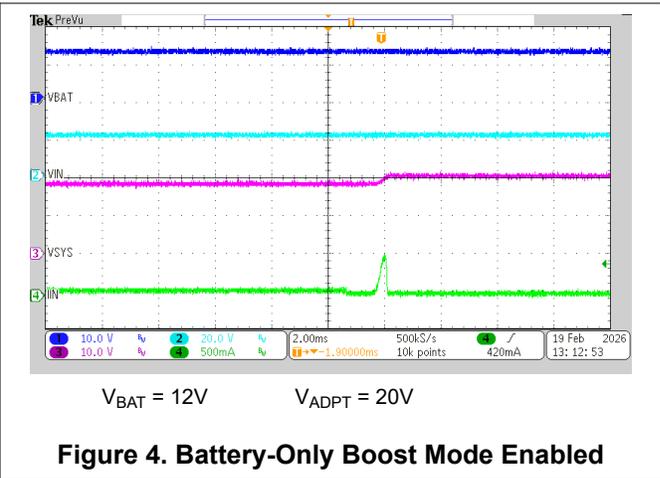
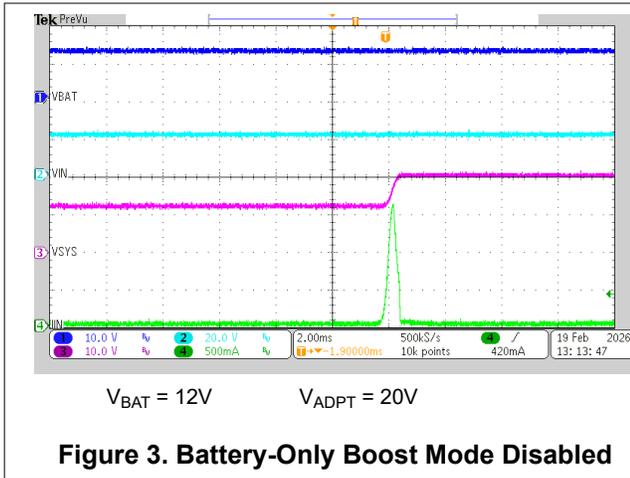
$V_{BAT} = 8V$ $V_{ADPT} = 20V$

Figure 1. Battery-Only Boost Mode Disabled



$V_{BAT} = 8V$ $V_{ADPT} = 20V$

Figure 2. Battery-Only Boost Mode Enabled



Conclusion

Enabling the BQ24810 battery-only boost feature prior to adapter insertion can significantly reduce inrush current by raising the system voltage and minimizing the voltage difference between the adapter and system rail. The test results above demonstrate the magnitude of the inrush current typically seen during adapter insertion and how enabling battery-only boost mode effectively mitigates this spike. This approach helps prevent input voltage droop, avoids triggering adapter over-current protection, and reduces stress on system components during hot-plug events, thereby improving overall system robustness.

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