

Applications Information

Power-up Sequencing for the A3940

Introduction

In order to avoid false faults due to the various protection features included in the Allegro® A3940, when powering-up the IC, consideration must be given to alternative power-up sequences.

The general sequence is:

1. Apply V_{BB} .
2. Turn-on the three A3940 power supplies (VREG5, VREG13, and VCP) via the RESET pin.
3. Wait for supplies to settle.
4. Charge the Bootstrap capacitors.
5. Begin PWM.

There are two alternative power-up scenarios to consider, described and illustrated on the following pages:

- Case A: the A3940 internal supplies are completely powered-down in Sleep mode, and
- Case B: the A3940 has been in Sleep mode for a short period of time, and the internal power supplies have not powered-down.

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Case A: Supplies Powered-Down

This case is illustrated in figure 1, and applies to a scenario where the A3940 internal supplies have completely powered-down in Sleep mode.

In this case, the following power-up sequence should be followed:

1. Ramp-up V_{BB} with the RESET pin LOW.

It is all right for the SR and MODE logic inputs to be in a “Don’t Care” state during this period.

2. Set the RESET pin HIGH (logic 1).

During this interval, VREG5 comes up quickly, but VCP

and VREG13 typically take 4 ms to power-up to final value.

If desired, the input logic can be set during this interval. The Bootstrap capacitors can be charged via the input logic Brake command (SR=MODE=1, and ENB=0).

3. As soon as the UVLO threshold for VREG13 is passed, the A3940 allows the low sides to turn on, which initiates the bootstrap charging. The Bootstrap capacitor charge time, t , is:

$$t = C_{BOOT} \times 11 \text{ V} / 140 \text{ mA} .$$

4. Enable PWM.

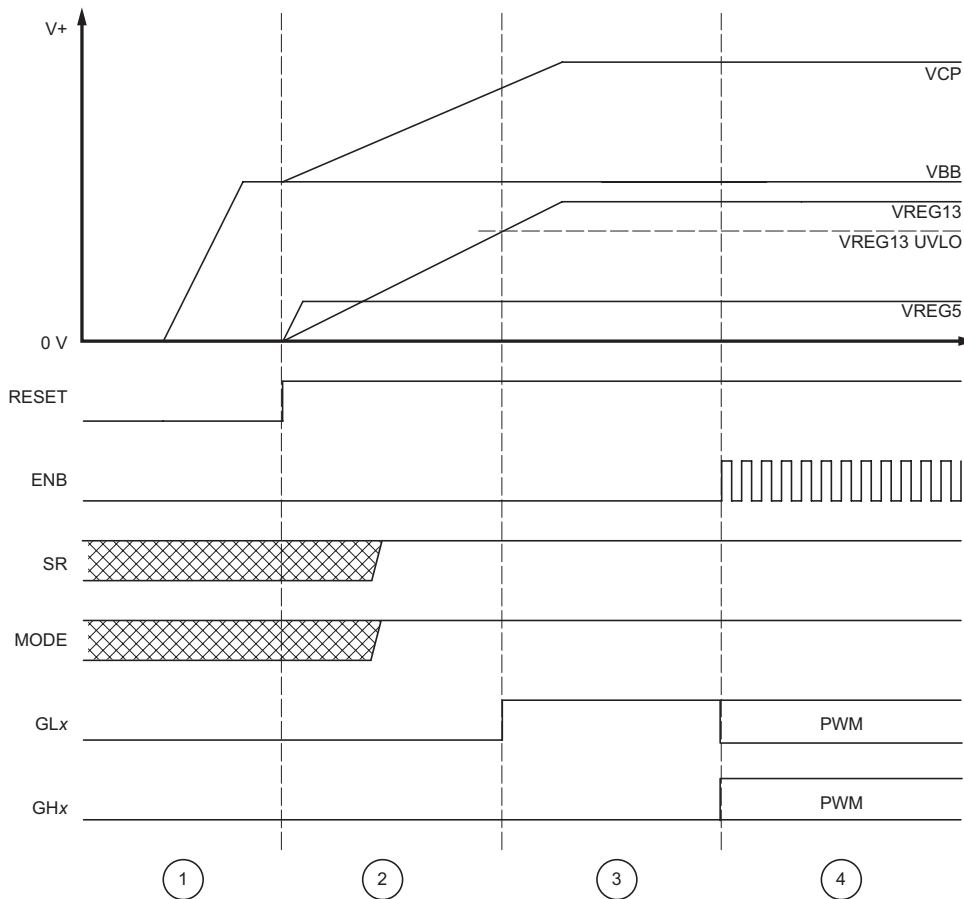


Figure 1. Power-up Sequence with Internal Supplies Completely Discharged

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Case B: Supplies Powered

This case is illustrated in figure 2, and applies to a scenario where the A3940 internal supplies have not completely powered-down in Sleep mode.

In this case, the following power-up sequence should be followed:

1. Place the A3940 in normal operation.
2. Pulse the RESET pin:

- a. Pulse the RESET pin LOW (logic 0).

This puts the A3940 into Sleep mode. The internal power supplies start to discharge.

- b. Initialize the input logic to Coast mode (SR=MODE=ENABLE=0).

- c. Set the RESET pin HIGH (logic 1).

- 3) Wait for supplies to settle.
- 4) Charge the Bootstrap capacitors via the input logic Brake command (SR=MODE=1, and ENB=0). The Bootstrap capacitor charge time, t , is:

$$t = C_{BOOT} \times 11 \text{ V} / 140 \text{ mA} .$$

- 5) Enable PWM.

Note: Fast (100 ns to 1000 ns) RESET pulses can be used to clear faults. In this case, as long as VREG5 is not discharged more than 500 mV, it is not required to go through the change in input logic before RESET goes high.

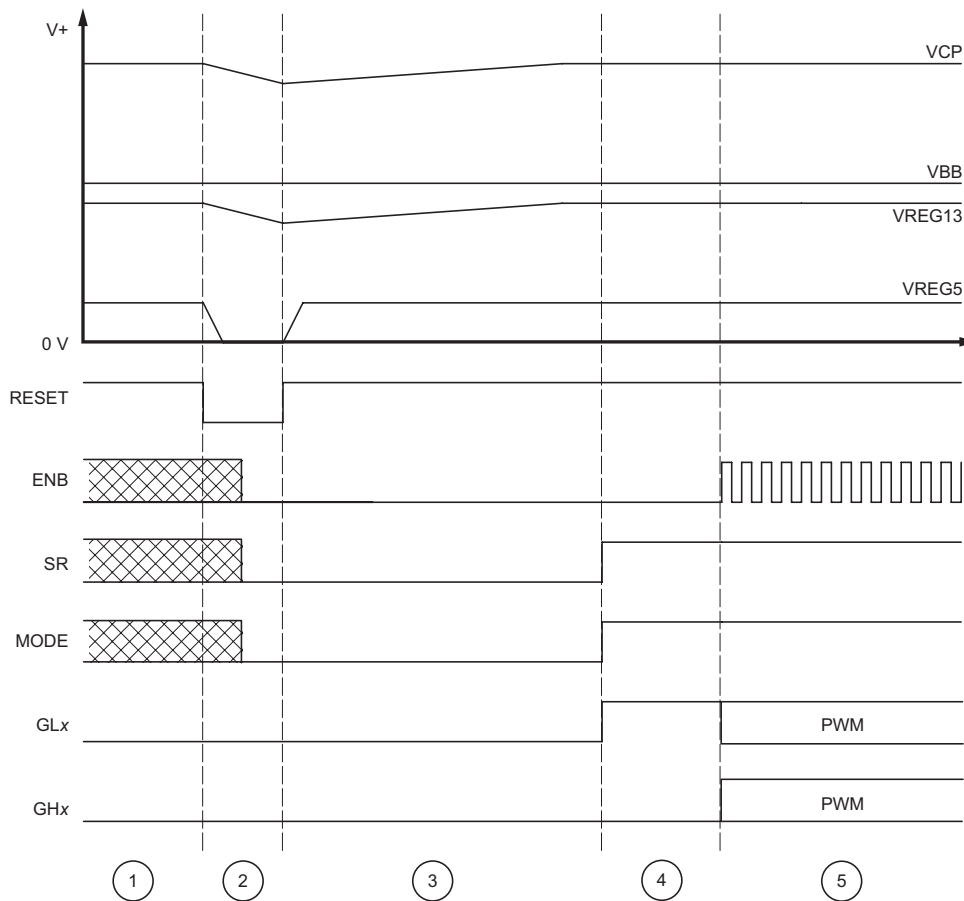


Figure 2. Power-up Sequence with Pulsed RESET. Internal supplies are not completely powered-down.

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