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USER GUIDE 3917

The MAX6876 Power-Supply Tracker/Sequencer User Guide

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Abstract: This application note provides a step-by-step tutorial for configuring the MAX6876. The tutorial describes how to set thresholds, timing delays, current measurements, and sequencing/tracking order.

Overview of the MAX6876's Key Features

- Tracks and sequences up to four voltages
- Closed-loop tracking control with programmable slew rate
- Mixed tracking and sequencing
- I²C programmable
- Overcurrent sensing
- Separate power-good (PG) outputs

Introduction

The MAX6876 tracks and sequences up to four voltages using parameters programmed over I²C and stored in the internal EEPROM; these parameters include voltage thresholds, slew rates, timing delays, and the sequencing order. The parameters are set within the user-friendly MAX6876 Evaluation Kit software. The part may be programmed in-circuit using four wires: V_{CC}, SDA, SCL, and GND. In-circuit programming makes experimentation during prototyping very easy since no resistors or capacitors need to be replaced to change the thresholds or timing delays. In this circuit, power during normal operation comes from IN1 (the highest of the input voltages), and power during programming comes from V_{CC}. This configuration allows the main DC-DC power supplies on the board to remain off during programming.

Several passive components are required for operation. The ABP connection needs to be connected to a 1µF ceramic capacitor to filter the internal power supply. All of the status outputs are open drain and, accordingly, require pullup resistors. These resistors can be connected to any power-supply voltage under +6V. To filter noise on the IN_ connections, 0.1µF capacitors can be connected, but they are not absolutely necessary. **Figure 1** illustrates the basic connections and key features of the MAX6876.
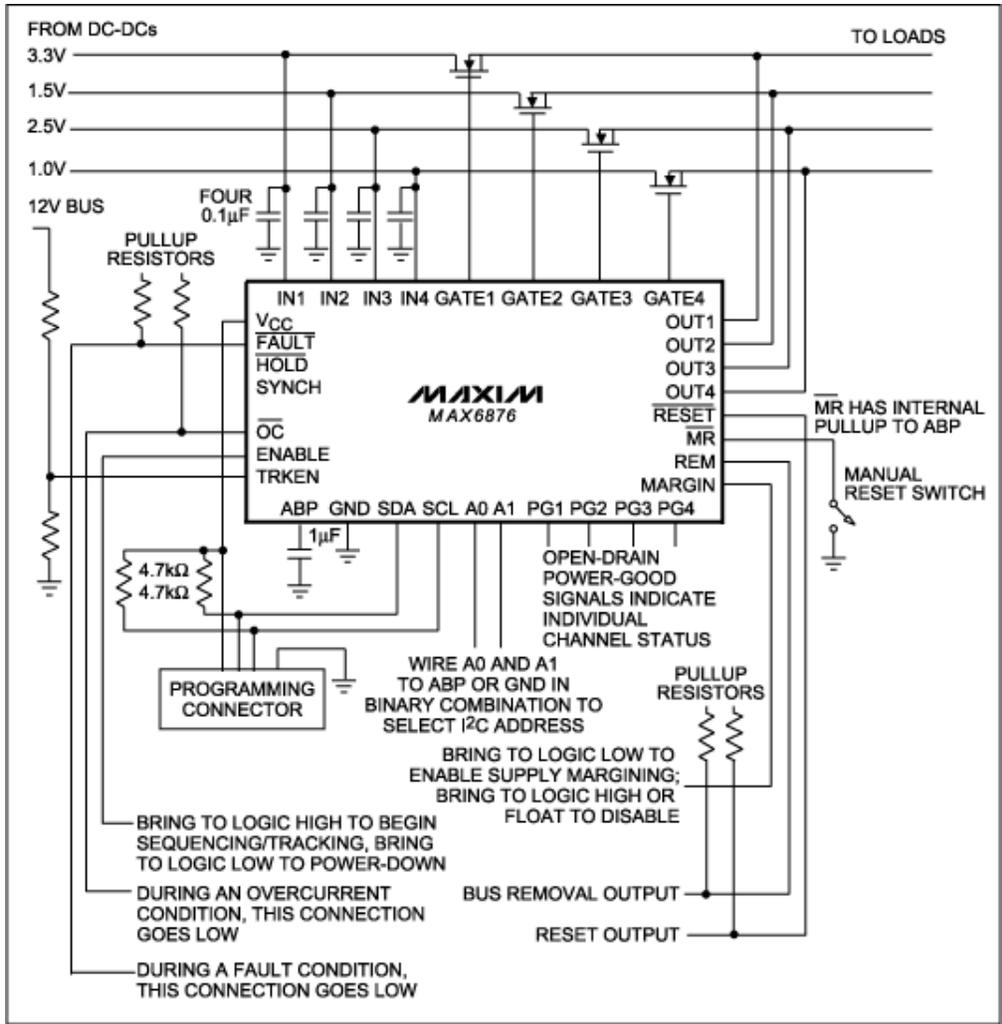
Figure 1. A diagram of the MAX6876's basic connections.

To create a basic design with the MAX6876, use the following steps:

1. Download and install the MAX6876 Evaluation Kit software.

2. Connect a CMOD232 board (included in the Evaluation Kit) to the host computer using an RS232 cable (not a "null modem" type cable). Note that the MAX6876 Evaluation Kit software does not yet support the newer CMAXQUSB interface board.

3. Connect the CMOD232 board to either the MAX6876 Evaluation Kit or the application circuit board. The pinout of the CMOD232 connector P3 is as follows:
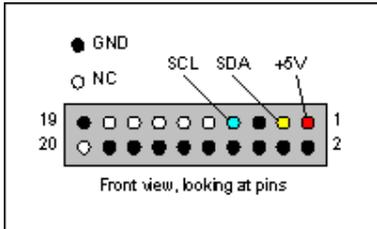
Figure 2. The pinout of the CMOD232 connector P3.

4. To connect to the CMOD232 and the MAX6876, launch the Evaluation Kit software, select System-

>Connect from the menu, and choose OK.

5. To enable a channel, click the checkbox in the upper left corner of each channel window; next, set the undervoltage and overvoltage thresholds by either clicking the voltage to the right of the window or dragging the waveform.
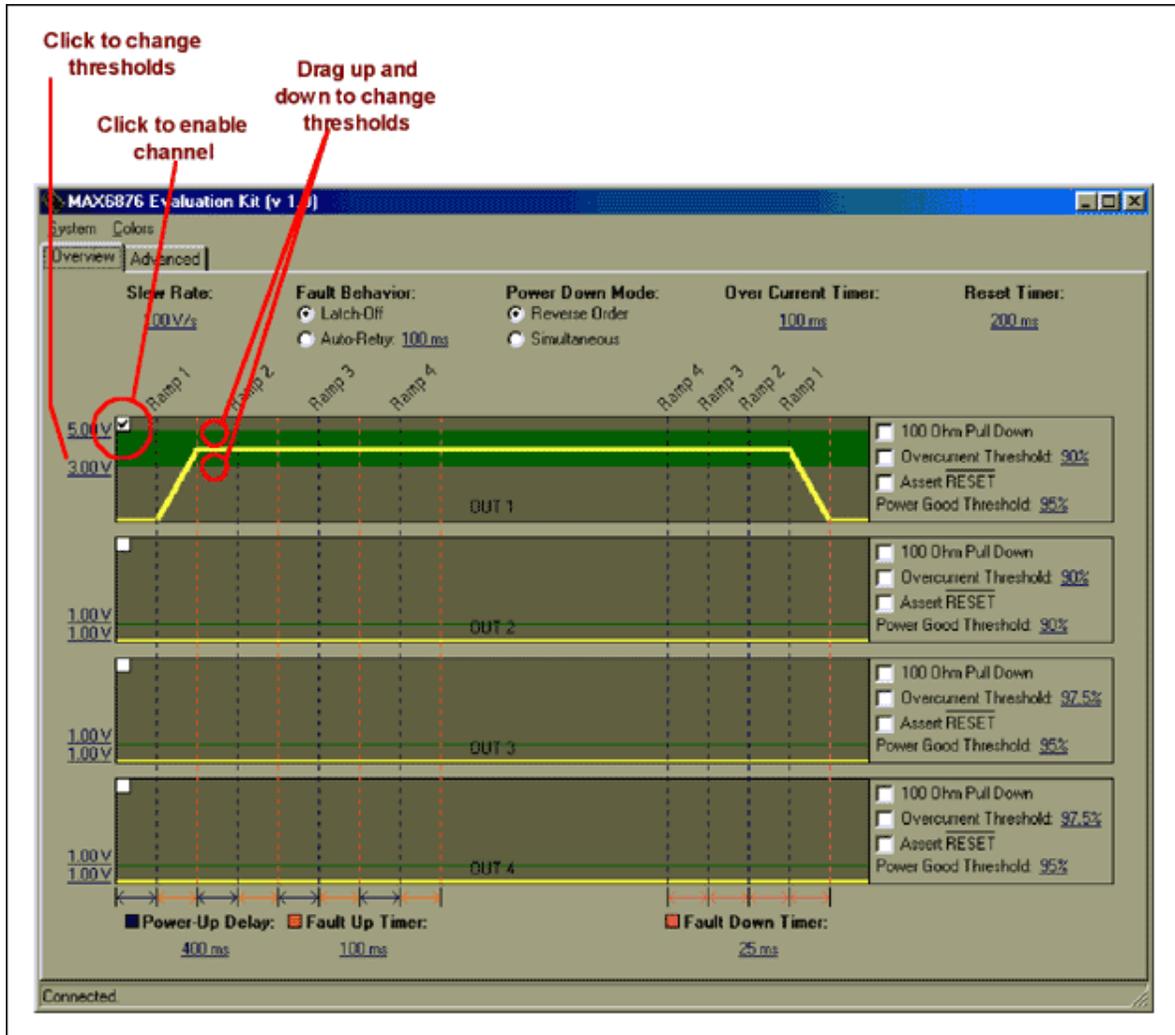
Figure 3. This screen capture illustrates how to enable a channel and set the thresholds of the MAX6876 with the Evaluation Kit software.

6. Select the sequence for each channel by dragging the base of each ramp. Reverse sequencing can be turned-on using the Power Down Mode option buttons.
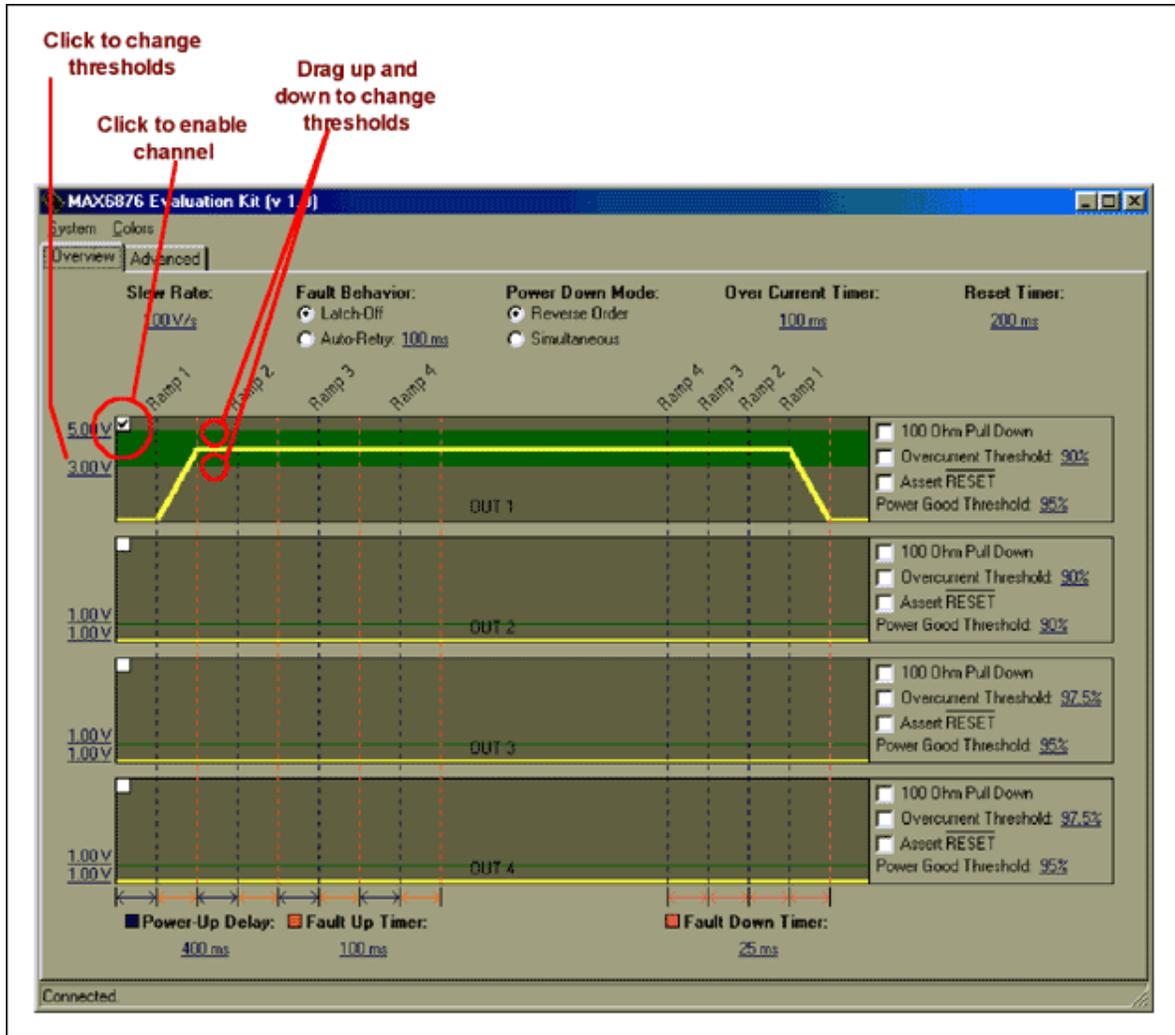
Figure 4. This screen capture illustrates how to configure the MAX6876 for mixed-mode tracking/sequencing.

7. Consult **Table 1** and select the appropriate options for each channel.

Table 1. Channel-Control Options.

Option Name	Function
100 Ohm Pull Down	Activates a 100Ω pulldown resistor on the channel's OUT connection during shutdown only.
Overcurrent Threshold	Activates overcurrent monitoring on the channel. This compares the IN_ voltage to the OUT_ voltage. When OUT_ falls below a percentage of IN_, Overcurrent Threshold asserts the OC output (bringing it low).
Assert RESET	Activates this channel's control over the RESET line. If this channel falls below its power-good threshold, RESET asserts low.
Power Good Threshold	When the channel's OUT voltage is within this percentage of the IN voltage, the corresponding PG pin asserts (goes high impedance).

8. To set the slew rate, click the Slew Rate selection on the upper left portion of the screen.
9. Set the power-up delay by clicking Power-Up Delay in the lower left portion of the screen. The power-up delay is the amount of time it takes for a channel to track up after another channel goes into power-good mode.
10. Set the Fault Up Timer and the Fault Down Timer. These are the maximum allowable times for a channel output to ramp from zero volts to the channel input voltage, or from the channel input voltage to zero volts. Be very careful when setting the fault timers: it is possible to generate an unnecessary fault by using slow slew rates and fast fault timers. The time for a single voltage to track up from zero volts can be calculated with the following formula:

$$t_{TRACK}(s) = V_{IN} \times \frac{PGThresh(\%)}{100} \times \frac{1}{SlewRate(V/s)} \qquad \text{Eq.1}$$

For example, with a V_{IN} of 3.3V, a Power Good Threshold of 95%, and a Slew Rate of 100V/s, the time required to ramp-up/-down is 31.35ms. Therefore, the Fault Up Timer and Fault Down Timer must be set to at least 50ms—the 25ms option would cause FAULT to be asserted. If more than one channel is ramping-up/-down at the same time, the two voltages will track; it is, therefore, possible for the ramp-up/-down time period to be longer than the theoretical calculation.
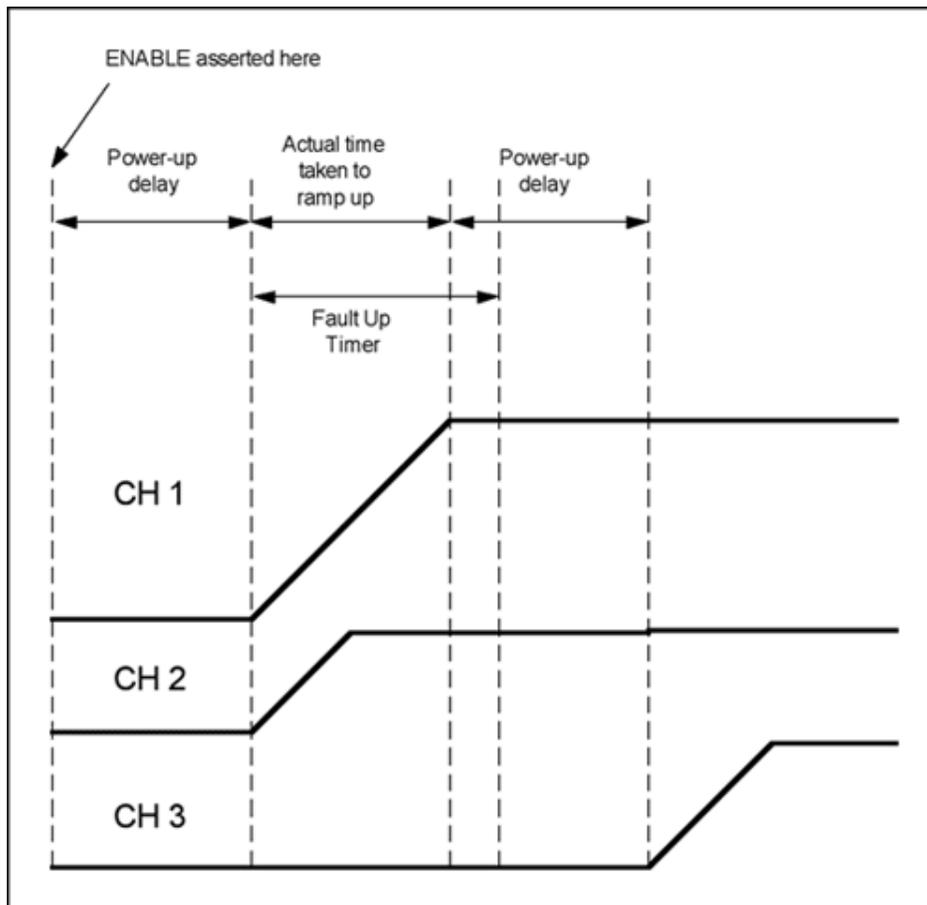
Figure 5. Power-Up and Fault Timings for the MAX6876.

11. Set the Fault Behavior option. In Latch-Off mode, the device shuts off after a fault and waits for ENABLE to be toggled before trying again. In Auto-Retry mode, the device tries again at the specified interval.
12. The Over Current Timer setting determines how long an overcurrent condition must be present in order to assert the OC output. Set the Over Current timer to a value that will not cause glitches to prematurely

assert the OC output.

13. The Reset Timer setting determines the RESET pulse width. Set the Reset Timer to a value that is guaranteed to reset the microprocessor connected to the pin.

14. Once all parameters are set, write them to the MAX6876 EEPROM by selecting System→Commit Configuration to EEPROM.

15. The configuration can be saved to a file by selecting System→Save Configuration. All of the registers are written to this configuration file.

Multiple MAX6876 devices can be connected together for more than 4 channels, but this multiple-device configuration only operates in tracking mode, in which all channels ramp-up at once. See the datasheet for more information and an application circuit for connecting multiple MAX6876 devices.

Related Parts		
MAX6876	EEPROM-Programmable, Quad, Power-Supply Tracker/Sequencer Circuit	Free Samples

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