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## 3V to 80V, 7A, Current-Limiter with Surge, UV, Reverse Polarity, Loss of Ground Protection, and PMBus Interface

### General Description

The MAX17616AEVKIT# evaluation kit (EV kit) features the MAX17616A eFuse setup for 5V to 28V operation with a 2A auto-retry current limit. A 3.3V buck regulator provides a voltage for pull-ups and logic to run indicator LEDs on the board. The board provides a header to connect a DC1613A to a computer through USB and access to LTPowerPlay. LTPowerPlay provides a handy GUI for evaluating the PMBus capabilities. The board also includes an additional external N-channel FET for reverse conduction protection. **For easy PMBus evaluation, make sure to have the DC1613A in addition to this kit.** Visit [www.analog.com](http://www.analog.com) to order the DC1613A. For assistance with ordering a DC1613A, contact your local ADI sales representative.

### Features

- 3V to 80V Input Range
  - 3V to 75V if Reverse Protection FET Is Used
- 3% Accurate Current Monitoring
- Programmable Current-Limit Response
- Reverse Voltage/Current Protection
- Loss of GND Protection
- PMBus Feature Configuration
- PMBus Telemetry Reporting
  - Input Voltage
  - Output Voltage
  - Current
  - Temperature
- -40°C to +125°C Operation
- 23-Lead, 4.5mm x 5.75mm FC2QFN Package

Design files for this circuit board are available at [www.analog.com](http://www.analog.com).

[Ordering Information](#) appears at end of data sheet.

## Quick Start

## Configuration Diagram

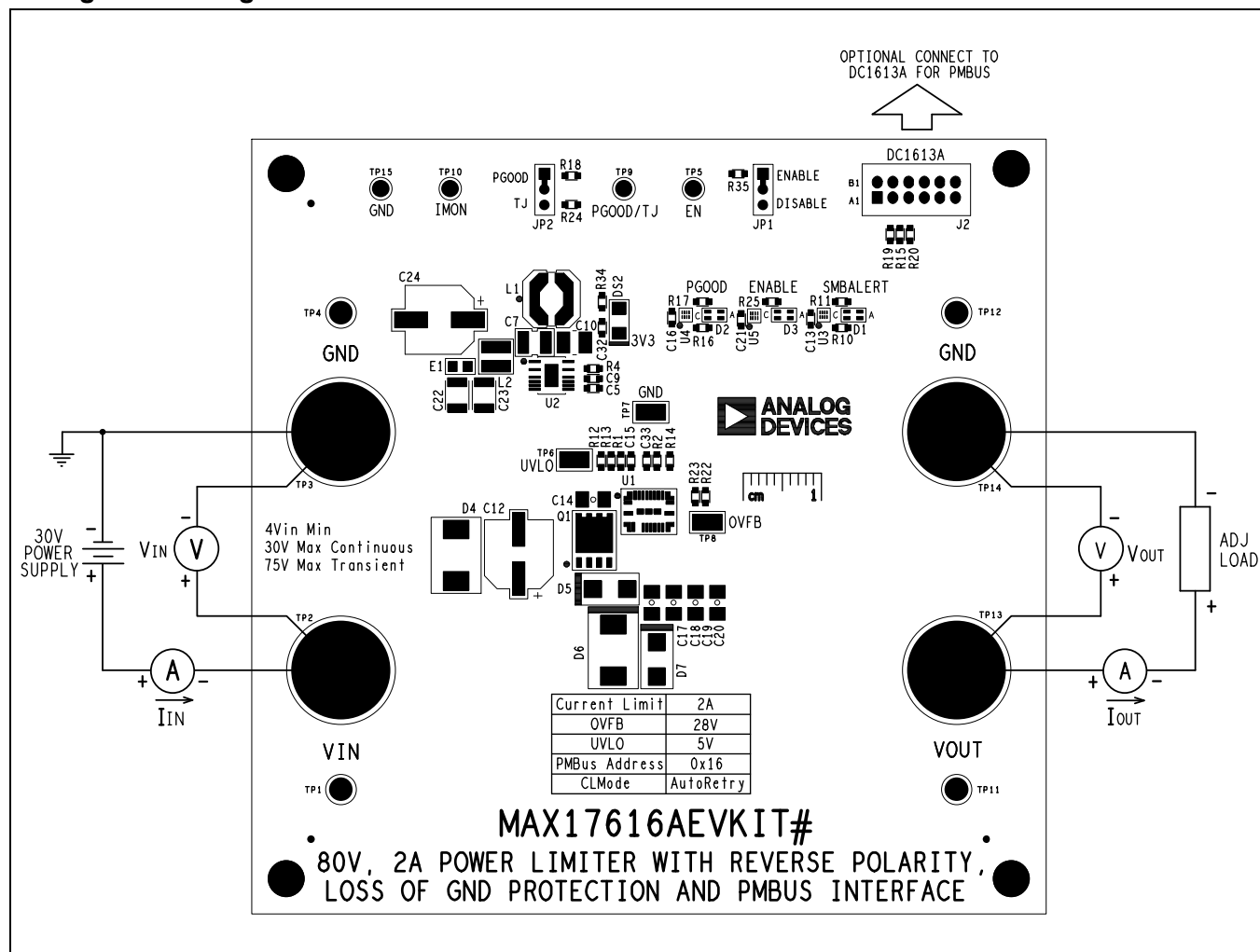


Figure 1. MAX17616AEVKIT# Board Connections

## Required Equipment

- 30V DC power supply with a 2A minimum capability
- Adjustable load (0 to 3A)
- Digital multimeters (DMMs)
- DC1613A and a computer

## Procedure

The EV kit is fully assembled and tested. For PMBus evaluation, use LTPowerPlay and DC1613A. See the [PMBus Evaluation](#) section for more details. LTPowerPlay is not required for the basic evaluation of the MAX17616A EV kit. Follow the steps below to verify board operation.

**Caution:** Do not turn on the power supply until all connections are completed.

1. Verify that all jumpers are in their default positions.
2. Set the DC power supply to 12V and connect it between  $V_{IN}$  and GND. Verify that PGOOD, ENABLE, and SMBALERT LEDs are all green.
3. Check OV surge protection by gradually increasing the DC power supply voltage and verify that  $V_{OUT}$  remains approximately 28V and SMBALERT LED turns red at approximately 28.0V<sub>IN</sub> and higher.
4. Gradually decrease the DC power supply voltage and verify that  $V_{OUT}$  returns to approximately  $V_{IN}$  at about 28.0V<sub>IN</sub> and lower.
5. Clear the SMBALERT. To clear the SMBALERT without using LTPowerPlay, use JP1 to disable MAX17616A, then reset JP1 back to enable. If using LTPowerPlay, use the “Clear Fault” command. Verify that SMBALERT LED turns green.
6. Set the DC power supply voltage to 12V and slowly increase the adjustable load current. At approximately 2A, verify that  $V_{OUT}$  drops significantly and both PGOOD and SMBALERT LEDs turn red.
7. Reduce the adjustable load current and verify that  $V_{OUT}$  returns close to  $V_{IN}$  and PGOOD LED turns green.
8. Clear the SMBALERT. Without LTPowerPlay, use JP1 to disable, then re-enable MAX17616A. With LTPowerPlay, click the “Clear Faults” command. Verify the SMBALERT LED turns green.

**PMBus Evaluation:** Use DC1613A, a computer, and LTPowerPlay software to evaluate PMBus capabilities. Follow the steps to install the LTPowerPlay software and make the required hardware connections. The LTPowerPlay software can be run without hardware attached. Note that after communication is established, the IC must still be configured correctly for the desired operation mode.

1. Visit [www.analog.com/en/ip/ltpower-play.html](http://www.analog.com/en/ip/ltpower-play.html) and follow the instructions on the webpage to download and install the latest version of the LTPowerPlay software.
2. Connect the computer to the MAX17616AEVKIT# using DC1613A. Use the DC1613A supplied USB cable to connect DC1613A to the computer's USB port. Use the DC1613A supplied ribbon cable to connect DC1613A to J2 on the MAX17616AEVKIT#.
3. Apply a minimum of 4V<sub>IN</sub> to the board. Open the LTPowerPlay software and select “Detect Chip”. Use LTPowerPlay to read registers, write to registers, and poll certain registers using PMBus (refer to the MAX17616A data sheet for further details).

**Table 1. Jumper Connection Guide**

JUMPER	DEFAULT CONNECTION	FEATURE
JP1	ENABLE	Enable or Disable MAX17616A
JP2	PGOOD	Select between PGOOD and TJ

## Detailed Description of Hardware

The EV kit can be configured to evaluate user-defined input undervoltage lockout (UVLO) and surge protection thresholds using resistor-dividers. The output UV sensing setting can be configured using LTPowerPlay. The current-limit threshold is determined by an external resistor connected from the SET1 pin to GND. The current-limit default response is autoretry. Use LTPowerPlay to configure other current-limit responses. JP2 allows the user to select pin 20 between operating as PGOOD or monitoring the die temperature (TJ).

### Input Power Supply

The EV kit is powered by a 4V to 30V power supply connected between  $V_{IN}$  and GND. The EV Kit features a 77.4VC TVS at the input terminals, which limits the surge voltages and enhances protection.

### Power Supply for Logic Pins

A 3.3V buck regulator provides a 3.3V rail to connect SDA, SCL, and PG pins through pull-up resistors. The 3.3V rail also supplies power for logic chips to operate LED indicators.

### Enable

The MAX17616A internally pulls up to 1.5V when left floating. Use Jumper JP1 to connect the EN pin to either a pull-up resistor in the EN position or to GND in the DISABLE position.

**Table 2. EN (JP1) Settings**

JUMPER	SHUNT POSITION	SWITCH STATUS
JP1	ENABLE*	ON
	DISABLE	OFF

\*Default Position.

### PGOOD/TJ Pin 20

The MAX17616A pin 20 (PGOOD/TJ) can be configured to either operate as an open-drain power good indicator or monitor die temperature. The PGOOD position connects pin 20 through a 100k $\Omega$  resistor to the 3.3V rail. The TJ position connects pin 20 through a 10k $\Omega$  resistor to GND. Connecting pin 20 to GND with a 10k $\Omega$  to 20k $\Omega$  will monitor the internal die temperature. TJ provides 652mV at 25°C and 854mV at +125°C, with temperature slope of 2mV/°C. Refer to the MAX17616A data sheet for more details.

**Table 3. PGOOD/TJ (JP2) Settings**

JUMPER	SHUNT POSITION	SWITCH STATUS
JP2	PGOOD*	PGOOD indicator
	TJ	Die Temp

\*Default Position.

### Undervoltage Lockout Threshold (UVLO)

Input undervoltage lockout is set using a voltage divider (R12 and R13) connected to the UVLO pin. Output undervoltage sensing is set using the VOUT\_UV\_FAULT\_LIMIT command through PMBus. The EV kit is set for approximately 5V input UVLO, and the default VOUT\_UV\_FAULT\_LIMIT setting is 5V with a 10% rising threshold. Refer to the MAX17616A data sheet for more details.

### Overvoltage Surge Protection Threshold

The overvoltage surge protection threshold is set using a voltage divider (R21 and R22). The EV kit OV surge protection is set for approximately 28V. Refer to the MAX17616A data sheet for more details.

### Current-Limit Threshold

The EV kit connects SETI to GND through a 7.32kΩ resistor (R1). The EV kit is set for approximately 2A current limit. Use the equation below to calculate R<sub>SETI</sub> for a different current-limit threshold.

$$R_{SETI}(k\Omega) = \frac{14910}{I_{LIM}(mA)}$$

Where I<sub>LIM</sub> is the desired current limit in mA. Refer to the MAX17616A data sheet for more details.

### Current-Limit Type Select

The three modes of current limit are continuous, autoretry, and latch-off. Program the mode by using the SET\_CLMODE PMBus command. Autoretry is the default mode for the MAX17616A. Refer to the MAX17616A data sheet for more details.

### Detailed Description of Software

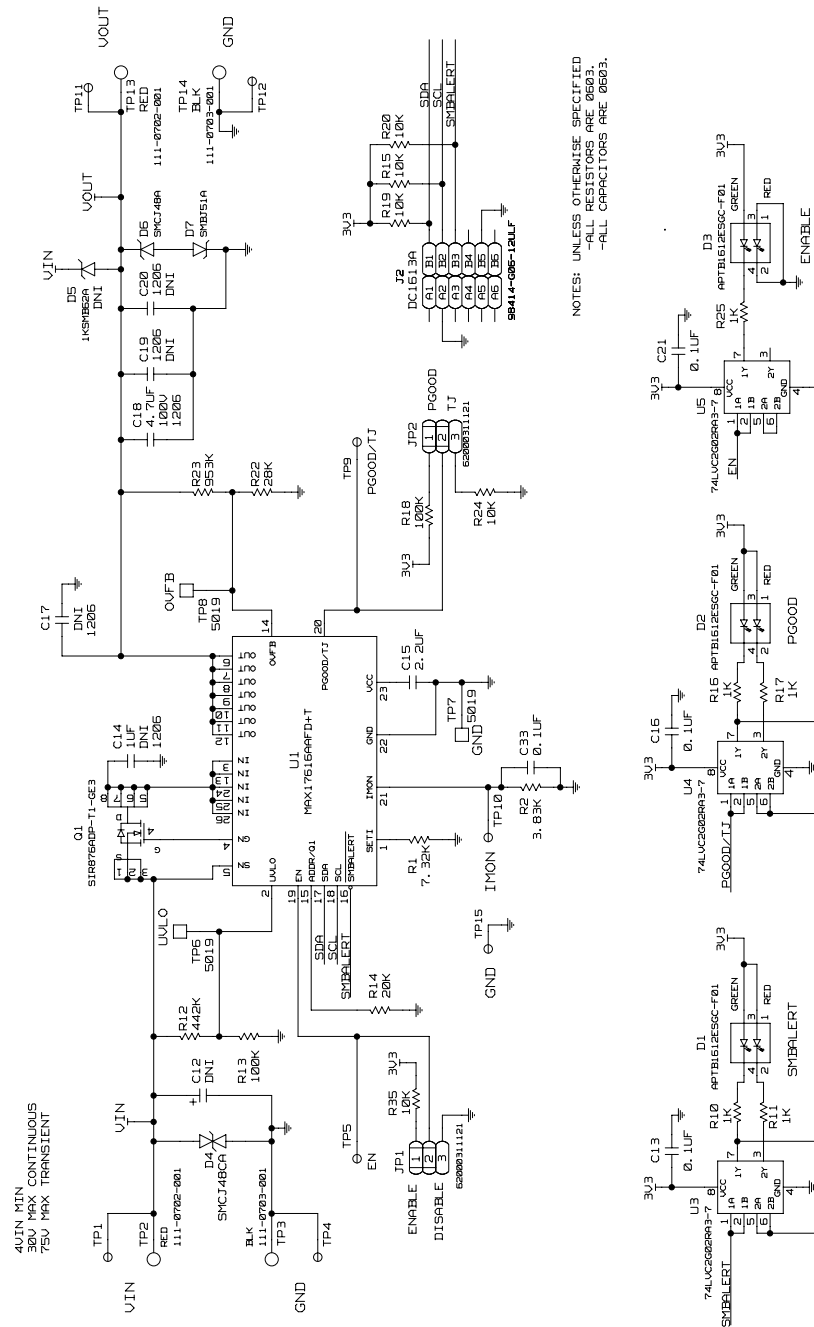
While observing safe ESD practices, carefully remove the MAX17616A EV kit board out of its packaging. Quickly inspect the board to ensure that no damage occurred during shipment. Jumpers/shunts were preinstalled prior to testing and packaging. Connect DC1613A to a computer with LTPowerPlay installed, and connect DC1613A to J2 on MAX17616AEVKIT#. Apply at least 4V across V<sub>IN</sub> and GND. Open LTPowerPlay and click "Detect Chip". LTPowerPlay provides a handy GUI experience to read registers, write to registers, and poll certain registers to display graphically. Refer to the MAX17616A data sheet to see all of the telemetry and configurations possible with the MAX17616A.

### Ordering Information

PART	TYPE
MAX17616AEVKIT#	EV Kit

#Denotes RoHS-compliance.

## MAX17616AEVKIT# Schematic



The schematic diagram illustrates a 3V3 buck converter using the LTC3639EMSE. The input is connected to VIN, which is filtered by a 330Ω resistor (E1) and a 2.2μH inductor (L2). The input filter is followed by a 2.2μF capacitor (C22) and a 2.2μF capacitor (C23). The input voltage is then regulated by the LTC3639EMSE, which is configured for a 3V3 output. The feedback network consists of a 220kΩ resistor (R4) and a 220pF capacitor (C9). The output is filtered by a 150μH inductor (L1) and a 22μF capacitor (C10). The output voltage is regulated to 3V3, as indicated by the 3V3 output label and the 3V3 output capacitor (C32). The feedback network is configured for a 3V3 output voltage.

## Revision History

REVISION NUMBER	REVISION DATE	DESCRIPTION	PAGES CHANGED
0	08/24	Initial release	—



### Notes

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