

UCC3912/15 Programmable Hot Swap Power Manager – Performance Evaluation and Programming Information

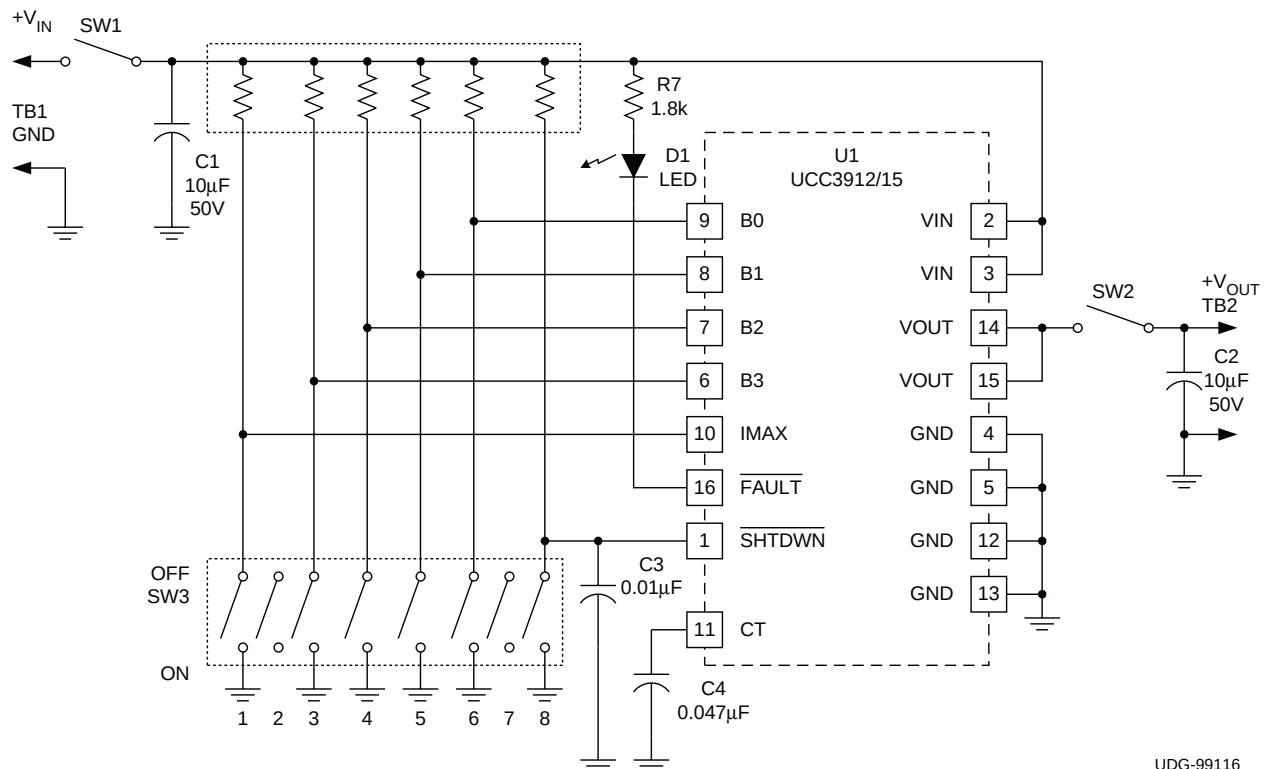
by Bill Andreyckak

The UCC3912/15 Evaluation Kit will enable designers to evaluate the performance of The UCC3912/15 Programmable Hot Swap Power Manager in a typical application circuit. This kit features a number of programming options which include: individual “Hot Swap” of input and output

connections, maximum current, Fault current level, and Shutdown. Each of these is programmed via switches located on the board. An LED indicates when the Current Fault Level comparator has been triggered and the device is in a low duty cycle mode.

Table 1. List of switches, connections and functions.

SWITCH	CONNECTION (Pin Number)	FUNCTION
SW1	VIN (2,3)	“Hot Swapping” of the input supply
SW2	VOUT (14,15)	“Hot Swapping” of the output supply
SW3-1	IMAX (10)	Sets maximum current level
SW3-3	B3 (6)	Current Limit DAC Bit#3 input
SW3-4	B2 (7)	Current Limit DAC Bit#2 input
SW3-5	B1 (8)	Current Limit DAC Bit#1 input
SW3-6	B0 (9)	Current Limit DAC Bit#0 input
SW3-8	Shutdown (1)	Shutdown input to disable IC



UDG-99116

Figure 1. UCC3912/15 Evaluation board schematic.

Programming the switches: Switch SW3 is a standard eight position DIP switch, but only six of these provide programming functions. The two switches located at positions 2 and 7 (SW3-2, SW3-7) are not used. Moving the switches toward the corresponding switch position number, or the “ON” direction GROUNDs the input and provides a digital “low”, or zero. A digital “high” input is provided when the switches are in the “OFF” position, or facing towards switches SW1 and SW2.

Timing functions : The UCC3912/15 Evaluation Kit incorporates a 0.047 microfarad timing capacitor to provide fault protection. Using the equations found in the device's datasheet, the actual timing intervals can be determined by:

$$FAULT = C_T \bullet 28 \bullet 103 = 1.3 \text{ milliseconds}$$

$$T_{SHUTDOWN} = C_T \bullet 106 = 47 \text{ milliseconds}$$

The exact duty cycle during a fault condition is :

$$Duty\ Cycle = \frac{FAULT}{T_{SHUTDOWN}} = \frac{1.3ms}{47ms} = 28\%(typical)$$

Maximum load capacitance : The maximum load capacitance can also be calculated using the equations found in the UCC3912/15 datasheet. Since a wide range of maximum load currents, output voltages and timing capacitors can be used, the maximum load capacitance value will vary with each application. Note that the Evaluation Kit uses a 10 μ F electrolytic capacitor on the output (VOUT) connection which must be taken into account to determine the maximum capacitive load.

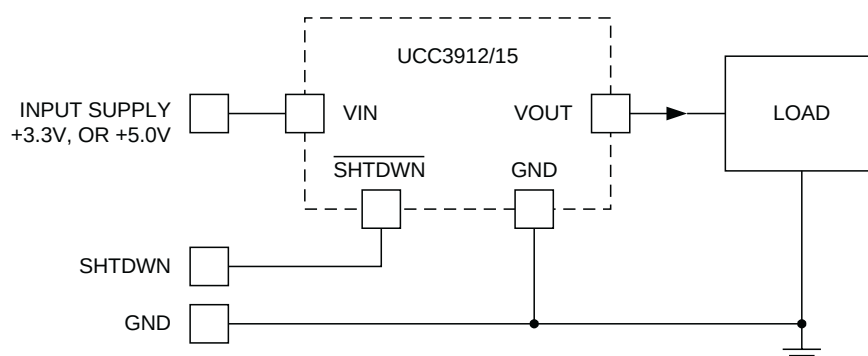
Supplying power : The Evaluation Kit has two terminal blocks for electrical connections to the input voltage supply and the output load. Terminal block TB1 is used for the input supply (V_{IN}) and TB2 is used to connect the kit to an appropriate load. Observe the correct polarity (+/-) of the connections as indicated on the printed circuit board, or damage could result.

Input voltage range: 3V minimum to 8V maximum for the UCC3912 and 7V minimum to 15V maximum for the UCC3915.

Output load: An adjustable electronic load can be used to draw varying amplitudes of current through the UCC3912/15 Evaluation Kit. This type of load is much easier to use than fixed value power resistors to determine the exact current limiting threshold. One example of an adjustable electronic load is shown in Unitrode Design Note #DN-52 which can sink over 5 amps of DC current and dissipate over 35 Watts of heat without a fan. This design is adequate for comprehensive testing of the UCC3912/15 Evaluation Kit.

Output current range: 0A to 4A, 0W to 32W (approximate)

“Hot swap” testing should be performed using power resistors and/or capacitors to draw the specific load current and characteristics required. These should be placed across the Evaluation Kit output connections and testing performed by switching SW2 on and off while monitoring the load current and voltage. DO NOT USE AN ELECTRONIC LOAD unless it has been characterized for this “hot swap” application. Many electronic loads will attempt to draw very high current with a rapid application of input voltage and could falsely cause tripping of the UCC3912/15 Fault circuitry.



UDG-99117

Figure 2. UCC3912/15 Used as a Low Current Standby (<5 μ A) Power Switch

Other Applications: While primarily intended for “hot swap” data communications power supply applications, the UCC3912/15 also lends itself to any low voltage circuit breaker or protection application below 4A. Some of these include battery powered tools and equipment, PCMCIA card power switching and many 3.0V, 3.3V and 5.0V power supplies.

Note on UCC3915 Operation: The UCC3915 FAULT output (pin 16) has an **absolute maximum** rating of 8V. For input voltages $\geq 8V$, resistor R7 should be isolated from V_{IN} and connected to a voltage source $< 8V$.

Summary: The features of the UCC3912/15 Programmable Hot Swap Power Manager offer design flexibility and programmable maximum current protection for a wide variety of power applications including: data communications, computer, battery powered and portable equipment, PCMCIA card power, industrial controls and many low voltage power supplies.

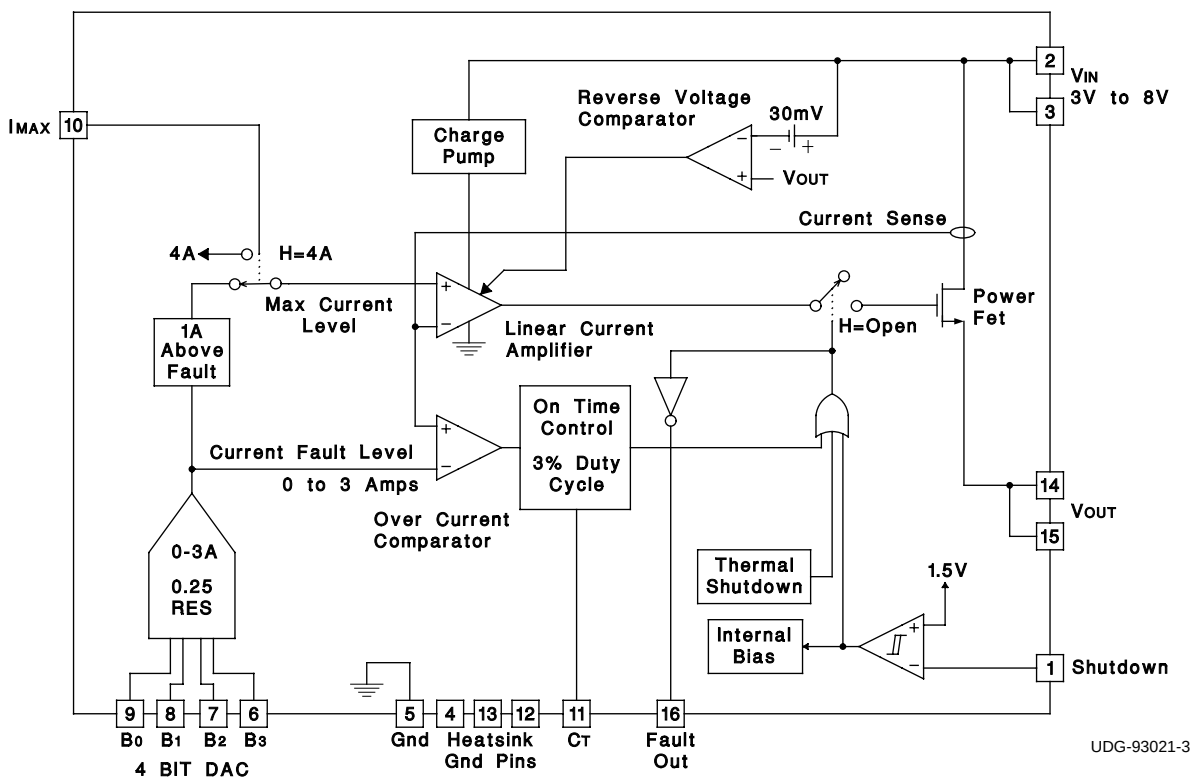


Figure 3. UCC3912 block diagram.

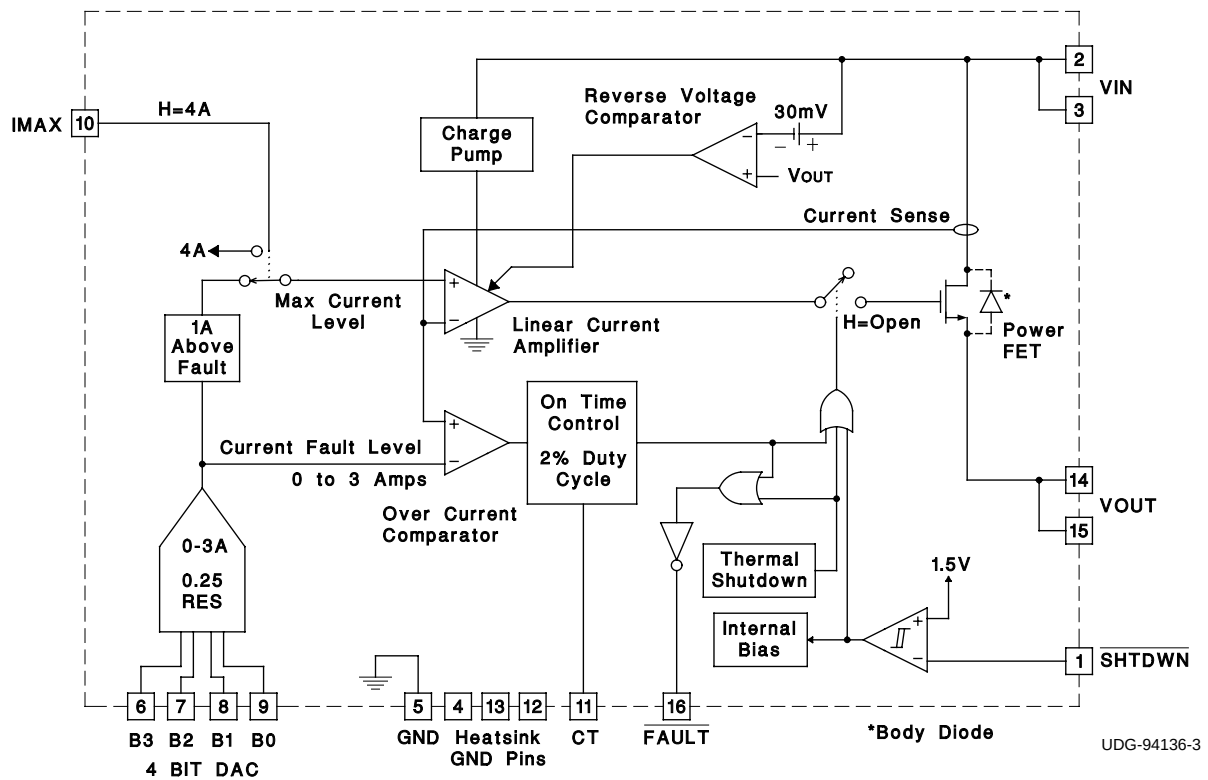


Figure 4. UCC3915 block diagram.

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.