

Design Note

UCC3585, Low Voltage Synchronous Buck Controller, Evaluation Board, Schematic, and List of Materials

By Brian Lynch

The UCC3585 is a voltage mode synchronous step down (BUCK) controller that provides the functionality required to obtain high efficiency, low cost, regulated power from a low input voltage rail. High efficiency is obtained through the use of synchronous rectification. The UCC3585 runs off a supply voltage as low as 2.5V. It incorporates an innovative tracking feature which allows the converter output to track the input voltage during power-up. This feature is essential for certain dual-rail microprocessors such as *PowerPC 603 and 604 and GTL bus voltage ICs*. The tracking feature is enhanced by a user configurable “track-and-hold” threshold that prevents overshoot of the output voltage during power-up.

The UCC3585 provides two outputs, one for directly driving a P-channel PWM switch and the

other for an N-channel synchronous regulator switch. These outputs are internally controlled to prevent cross conduction. The oscillator in UCC3585 is capable of high frequency operation to 700 kHz. The high frequency operation is facilitated by availability of a separate power ground pin. An error amplifier with a low reference voltage allows output voltages as low as 1.25V with 1% accuracy.

The UCC3585 also provides a versatile loss less programmable current limit that can be configured to provide pulse-by-pulse current limiting, timed shutdown after 7 consecutive faults or latch-off after fault detection. Additional features include under voltage lockout, a logic controlled enable and soft start function to control initial and post-fault power-up sequences.

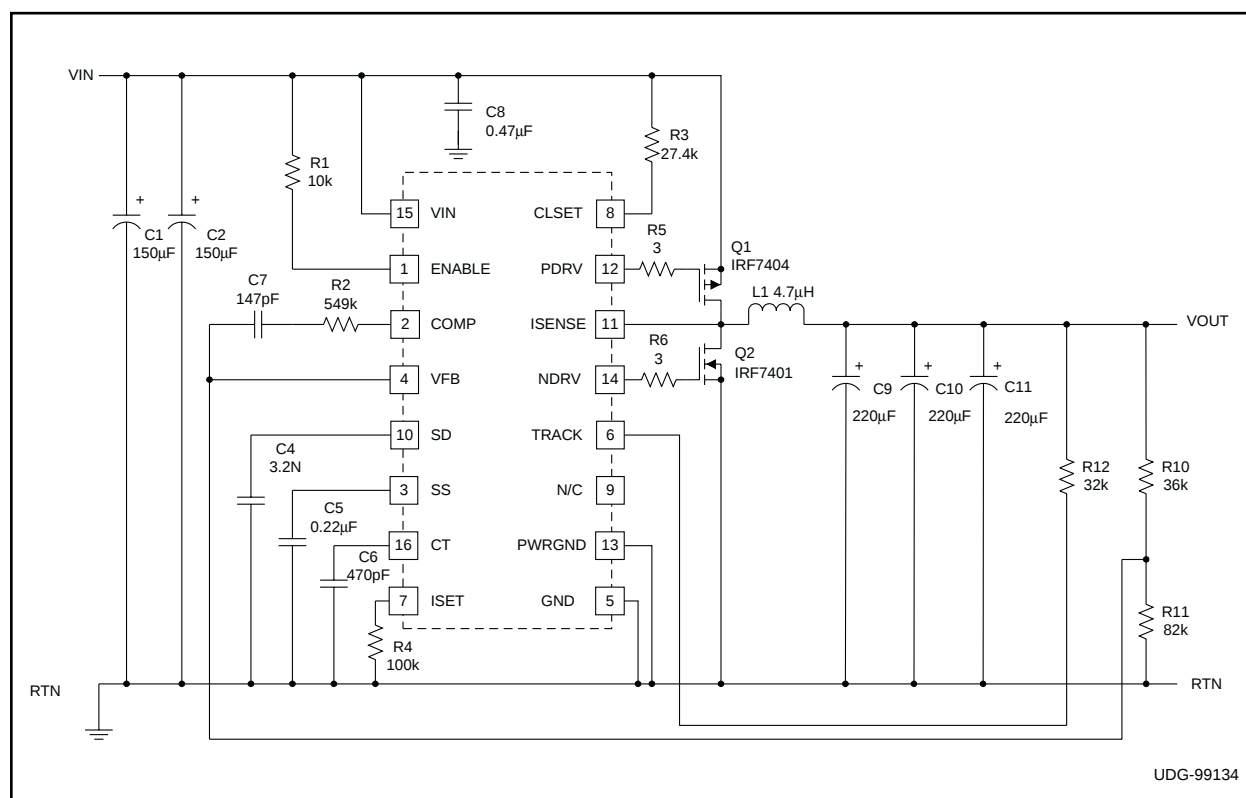


Figure 1. Block diagram.

The UCC3585 evaluation board is designed in a compact, all SMT form factor. Calculations for the design of the evaluation board, along with some helpful design tips may be found in the UCC3585 Data Sheet. Specifications for the evaluation board are shown in Table 1.

To operate, simply apply power to the input terminals and a load to the output terminals. The four

pin signal connector allows connection of an external capacitor for current limit functionality (Connect between SDOWN and GND), or to remotely ENABLE/DISABLE the DC/DC converter.

For complete details about the operation of the Low Voltage Synchronous Buck Controller, please refer to the UCC3585 Data Sheet.

Table 1. Electrical characteristics.

PARAMETER	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Power Input Power Supplied to V_{IN}					
Voltage	Normal Operating Voltage	2.5		5.5	V
Required current	At $V_{OUT} = 1.8$, $I_{OUT} = 3A$		3.5		A
Power Output					
Output Voltage			1.8		V
Voltage Tolerance				1	%
Load Current		0		3	A
Short Circuit Current	At 3.3V Input		3.5		A

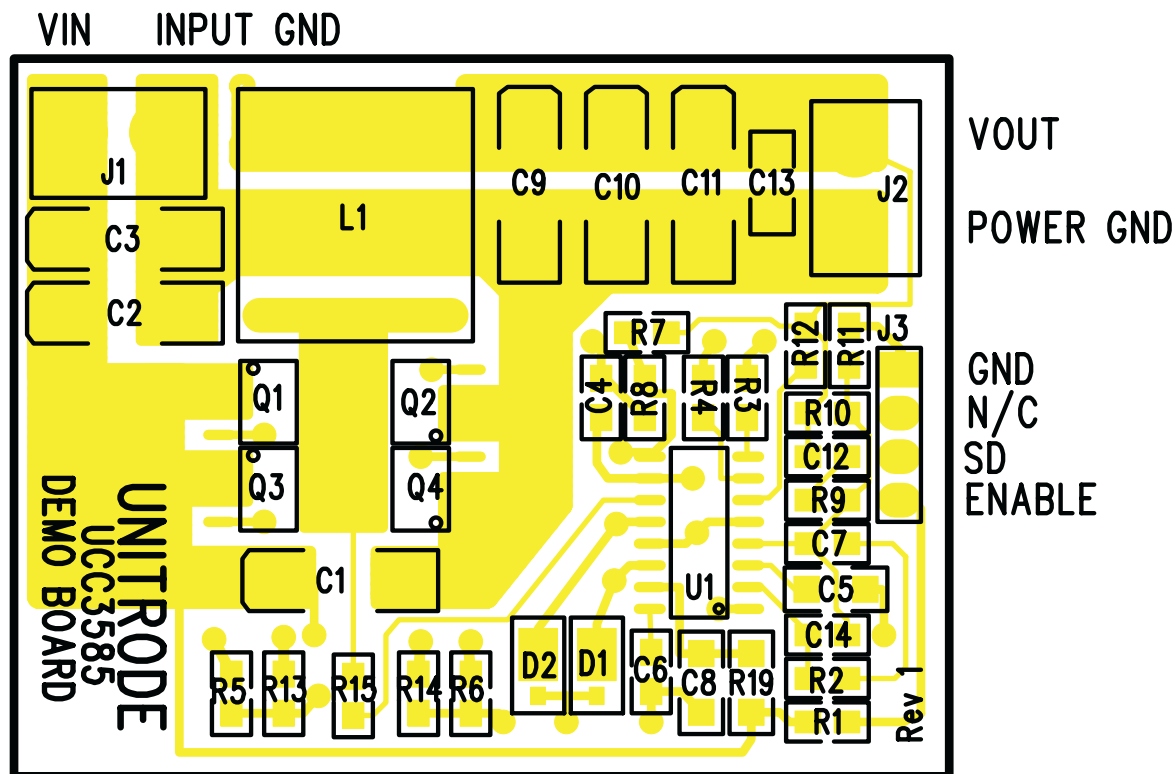


Figure 2. UCC3585 evaluation board layout.

Table II. UCC3585 evaluation board list of materials.

Designator	Description	Part Value	Manufacturer	Part Number
C1,C2,C3	Tantalum Capacitor	150 μ F, 10V	Sprague	594D157X0010D2T
C4	Ceramic Capacitor	0.047 μ F		
C5	Ceramic Capacitor	0.01 μ F		
C6	Ceramic Capacitor	470pF		
C7	Ceramic Capacitor	470pF		
C8,C13	Ceramic Capacitor	0.47 μ F		
C9,C10,C11	Tantalum Capacitor	220 μ F, 6.3V	Sprague	594D227X06R3D2T
C14	Ceramic Capacitor	10pF		
R1	Resistor, Film	10k		
R2	Resistor, Film	180k		
R3	Resistor, Film	27.4k, 1%		
R4	Resistor, Film	100k, 1%		
R5,R6	Resistor, Film	3.0 Ω		
R8				
R10	Resistor, Film	36k, 1%		
R11	Resistor, Film	82k, 1%		
R15	Resistor, Film	32k		
R19	Resistor, Film	10		
J1,J2	Connectors			
Q1	P-channel MOSFET		Int'l Rectifier	IRF7404
Q2	N-channel MOSFET		Int'l Rectifier	IRF7401
L1	3.8 μ H Inductor		Pulse Engineering	
	PC Board			
	4 pin connector			

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.