UNITRODE

Design Note

UCC3588 5-Bit Programmable Output BiCMOS Power Supply Controller, Evaluation Board, Schematic and List of Materials

By Brian Lynch

The UCC3588 voltage mode synchronous step down (buck) controller provides the functionality required for high efficiency, low cost, regulated power for microprocessors. A 5-bit DAC provides output voltage adjustment from 1.3 to 3.5 volts. High efficiency is obtained through the use of synchronous rectification, and tight transient response is obtained through of high speed window comparators which bypass the voltage loop in the event the output voltage exceeds its tolerance during fast load current changes.

The UCC3588 Demo board is designed in the form of a standard VRM form factor. Calculations for the design of the Demo Board, along with some helpful design tips may be found in the UCC3588 Data Sheet. A 40 pin connector provides all input and output connectivity. Specifications for the Demo Board are shown in Table 1.
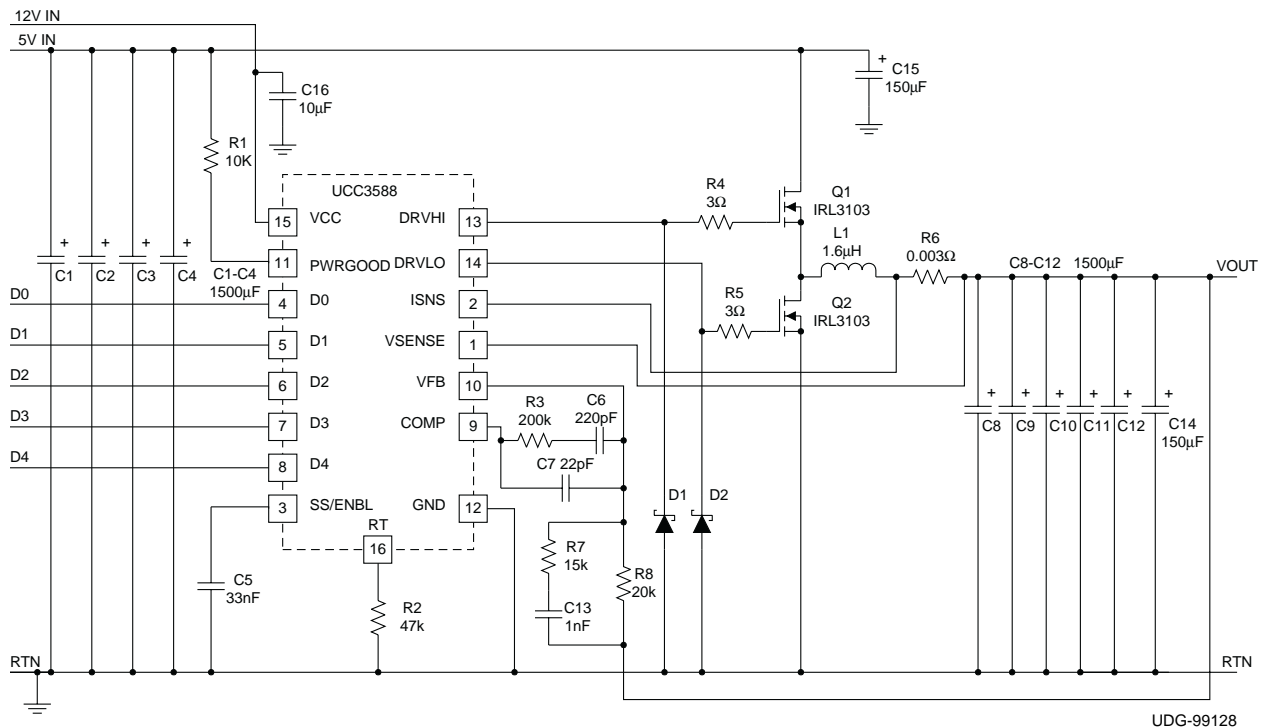

Figure 1. UCC3588 evaluation board schematic.

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Table 1. Electrical characteristics.

PARAMETER		MIN	TYP	MAX	UNITS
Power Input Supplied to "5 VIN"					
Voltage	Normal Operating Voltage	4.5		5.5	Volts
Required current	At V_{OUT} = 3.3, I_{OUT} = 12 Amps		10		Amps
Bias Power Supplied to "12 VIN"					
Voltage	Normal Operating Voltage	11		13	Volts
Required Current				100	mA
Power Output					
DAC Programmable Voltage Range	50mV Steps	1.3		1.75	Volts
	100mV Steps	1.8		3.5	Volts
Voltage Tolerance	Any Output Voltage			1	%
Load Current	Any Output Voltage	0		12	Amps
Short Circuit Current			20		Amps

Operating Guidelines

Refer to the module pin connection diagram to the right.

To operate the UCC3588 Demo Board, the output voltage must first be programmed through the DAC. To program a "0", tie the appropriate pin to "GND". To program a "1", leave the pin floating. NOTE: The DAC pins should ONLY be programmed from an open collector/drain source. Internal circuitry provides the necessary pull up. Refer to the UCC3588 Data Sheet for DAC programming codes.

Next, apply 12V and 5V power to the module. The IC operates from the 12V supply while power to the load is converted from the 5V supply. Lastly, apply the load.

For more complete information, pin descriptions and specifications for the UCC3855 5-Bit Programmable Output BiCMOS Power Supply Controller, please refer to the UCC3588 data sheet or contact your Unitrode Field Applications Engineer at (603) 424-2410.

Table 2. Model pin connection diagram.

PIN	ROW A	ROW B
1	5 VIN	5 VIN
2	5 VIN	5 VIN
3	5 VIN	5 VIN
4	12 VIN	12 VIN
5	12 VIN	VOUT
6	No Connect	ENABLE
7	VID 0	VID 1
8	VID 2	VID 3
9	VID 4	PWRGD
10	VOUT	GND
11	GND	VOUT
12	VOUT	GND
13	GND	VOUT
14	VOUT	GND
15	GND	VOUT
16	VOUT	GND
17	GND	VOUT
18	VOUT	GND
19	GND	VOUT
20	VOUT	GND

Table III. List Of Materials

Reference Designator	Qty	Description	Manufacturer	Part Number
C1,C2,C3,C4	4	1500µF, 6.3v, Aluminum Electrolytic Capacitor	Sanyo	MV-GX
C8,C9,C10, C11,C12	5	1500µF, 6.3v, Aluminum Electrolytic Capacitor	Sanyo	MV-GX
C5	1	33nF, 25V, Z5U, Ceramic Capacitor		
C6	1	220pF, 25V, X7R, Ceramic Capacitor		
C7	1	22pF, 25V, X7R, Ceramic Capacitor		
C16	1	10µF, 16V, Tantalum Capacitor		
C14,C15	2	150µF, 6V, Tantalum Capacitor		
C13	1	1000pF, 25v, X7R, Ceramic Capacitor		
L1	1	T51-52C with 5 turns #16 AWG	Micrometals	
Q1, Q2	2	N-Channel MOSFET	International Rectifier	IRL3103
R1	1	10k, 5%, 0.1w Resistor		
R2	1	47.0k, 1%, 0.1w Resistor		
R3	1	200k, 5%, 0.1w Resistor		
R4, R5	2	3.3Ω, 5%, 0.25w Resistor		
R7	1	15k, 5%, 0.1W Resistor		
R8	1	20k, 5%, 0.1W Resistor		
U1	1	UCC3588 PWM Controller		
D1,D2	2			FMKA140
J1	1	40 Pin Connector	AMP	532956-7
R6	1	3mΩ Sense Resistor (part of PCB Etch)		
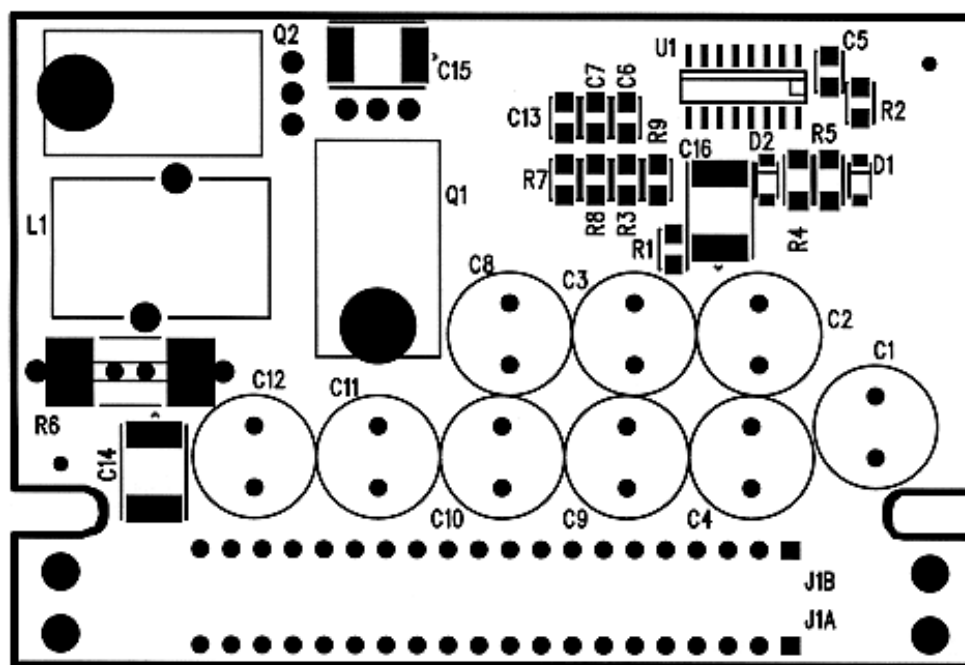
Figure 1. UCC3588 evaluation board layout.

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