



UCC3961/UCC38C43 Reference Design (PR127A)

Reference Design

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Power Supply Control Products

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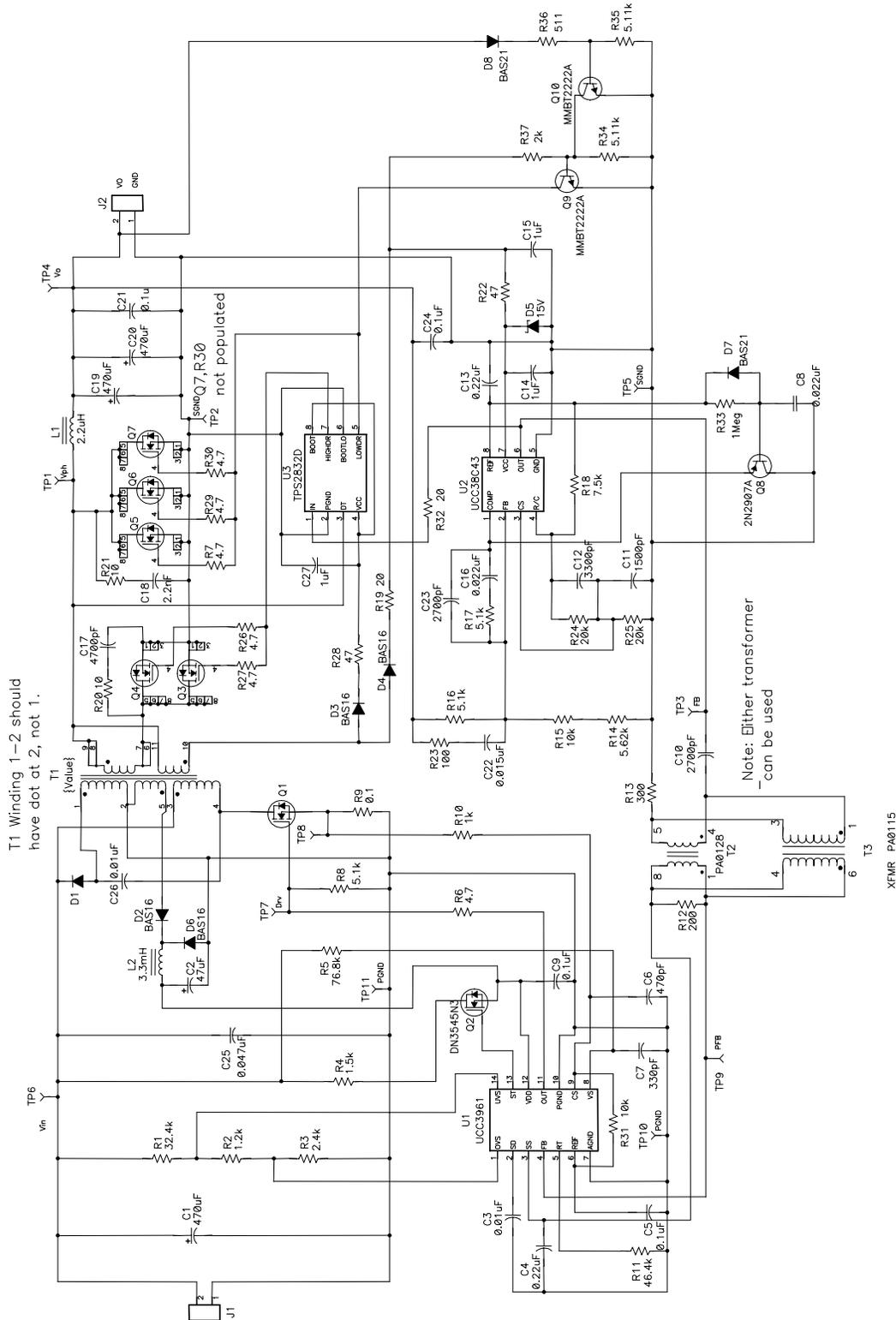
1 Introduction

The following reference design is a 50-W synchronous rectified forward converter using the UCC3961 *Advanced Primary Side Start Up Controller* for the primary side startup, driver and the UCC38C43 as the regulating controller that takes over after startup. The design controls a forward synchronous rectified topology which generates 15-A of current at 3.3 V. The module is designed to operate over a range of 42-V to 58-V and provides a 3.3-V_{DC} regulated output.

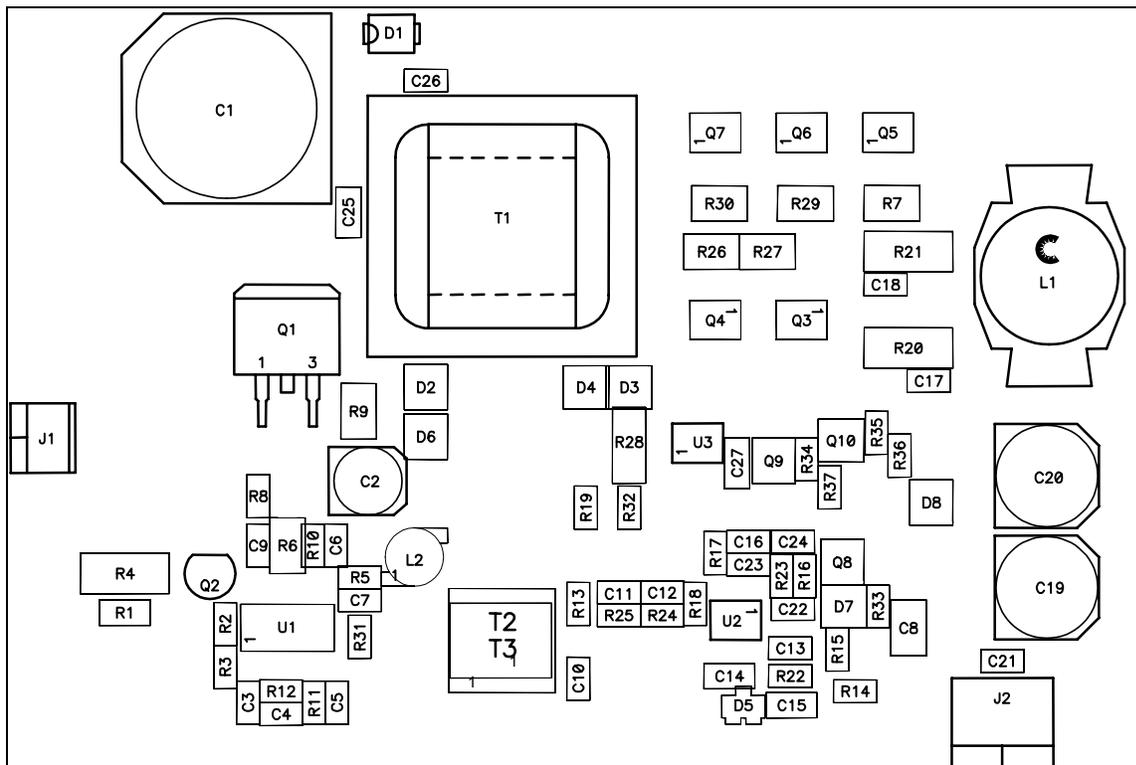
2 Caution

High-voltage levels are present on the evaluation module whenever it is energized. Proper precautions must be taken when working with this power module. Serious injury can occur if proper safety precautions are not followed.

3 Schematic



4 Reference Design Layout



5 Electrical Characteristics

	MIN	TYP	MAX	UNIT
V _{IN}	42	50	58	V
V _{OUT}	3.23	3.30	3.37	V
Output power	0	26	50	W
Turn-on overshoot			none	
Efficiency nominal V _{IN} and load		86%		
Efficiency nominal V _{IN(max)} load		86%		

6 Operation

The reference model described in this document operates from 42 V to 58 V on the input.

To start the converter voltage is applied to the inputs (J1, positive to pin 2 and negative to pin 1). Output voltage will appear at J2 (pin 1 positive, pin 2 negative). If the unit should be shut down and then power immediately reapplied the unit may not start. The voltage on the primary side must be discharged before a restart can be enabled. This is also true in the event of a momentary fault shutting the unit down. The primary side voltage must be applied in a monotonic manner during startup. If the voltage should dip during startup, the unit may latch off until the voltage is dropped and a restart is performed.

7 Reference Design Performance

The following figures show the reference designs performance.

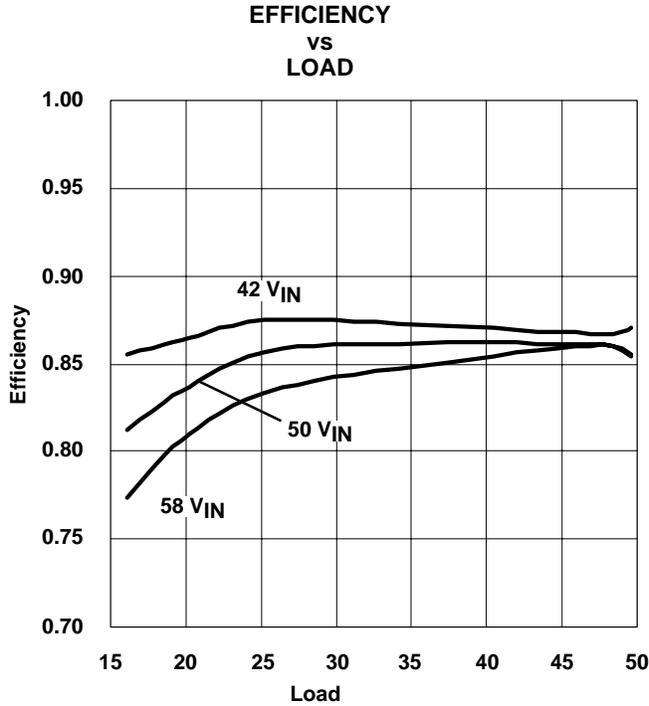


Figure 1

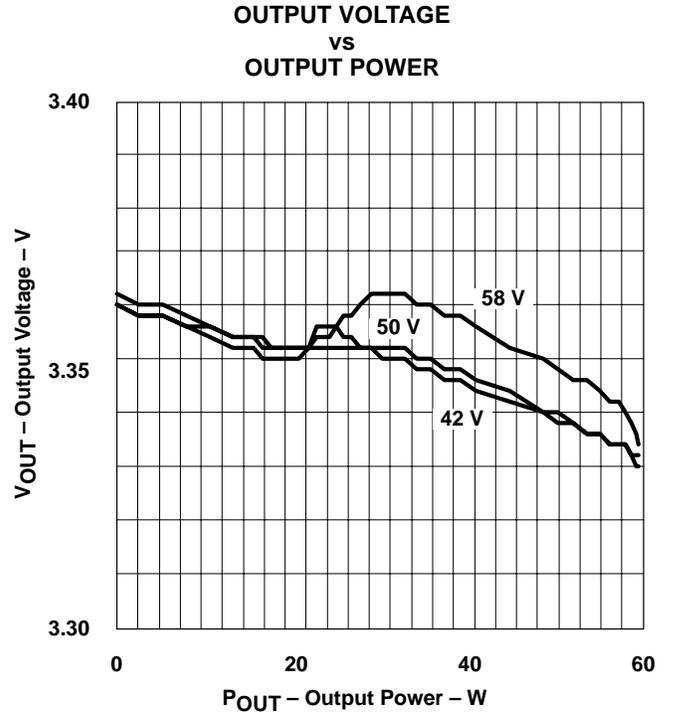


Figure 2

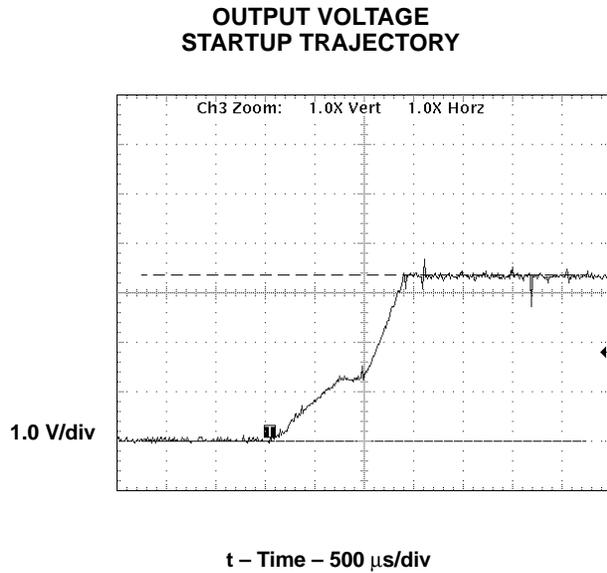


Figure 3

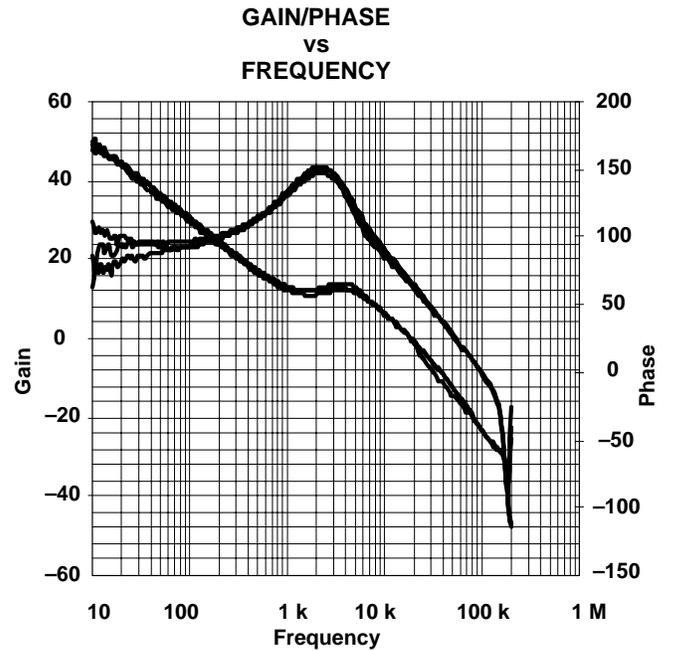


Figure 4

8 List Of Materials

Table 1 below lists the EVM components as configured corresponding to the schematic shown in Figure 1. Part types and manufacturers can be modified according to specific application requirements.

Table 1. List of Materials

REFERENCE	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER
B1	1	PCB	Any	
C1	1	Capacitor, AIEI, 470 μ F, 63 V, C_FC–K21	Panasonic	EEV–FC1J471N
C2	1	Capacitor, AIEI, 47 μ F, 25 V, CAP_ALUM_FC–D	Panasonic	ECE–V1EA470UP
C3	1	Capacitor, chip, 0.01 μ F, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H103K
C4, C13	2	Capacitor, chip, 0.22 μ F, 25 V, 10%, X7R, C0805	Panasonic	ECJ–2YB1E224K
C5, C9, C21, C24	4	Capacitor, chip, 0.1 μ F, 25 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1E104K
C6	1	Capacitor, chip, 470 pF, 100 V, 10%, X7R, C0805	Panasonic	ECJ–2VB2A471K
C7	1	Capacitor, chip, 330 pF, 100 V, 5%, X7R, C0805	Panasonic	ECJ–2VB2A331K
C14	1	Capacitor, chip, 2.2 μ F, 16 V, 10%, X5R, C1206	Panasonic	ECJ–3YB1C225K
C15, C27	2	Capacitor, chip, 1 μ F, 25 V, 10%, X7R, C1206	Panasonic	ECJ–3YB1E105K
C10, C23	2	Capacitor, chip, 2700 pF, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H272K
C11	1	Capacitor, chip, 1500 pF, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H152K
C12	1	Capacitor, chip, 3300 pF, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H332K
C8, C16	2	Capacitor, chip, 0.022 μ F, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H223K
C17	1	Capacitor, chip, 4700 pF, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H472K
C18	1	Capacitor, chip, 2200 pF, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H222K
C19, C20	2	Capacitor, OsCon, 470 μ F, 6.3 V, CAP_RV10	Sanyo	6SV470M
C22	1	Capacitor, chip, 0.015 μ F, 50 V, 10%, X7R, C0805	Panasonic	ECJ–2VB1H153K
C25	1	Capacitor, chip, 47000 pF, 100 V, 10%, X7R, C1206	Panasonic	ECJ–3YB2A473K
C26	1	Capacitor, chip, 0.01 μ F, 100 V, 10%, X7R, C0805	Panasonic	ECJ–2VB2A103K
D1	1	Diode, 2 A, 200 V, 403A	Digikey(DI)	ES2DDICT–ND
D2, D3, D4, D6, D7, D8	6	Diode, sw, 50 V, 150 mA, SOT–23	Digikey(ZX)	BAR74ZXCT–ND
D5	1	Diode, Zener, 15 V, 350 mW, SOT–23	Digikey	BZX84C15DICT–ND
J1	1	Connector, screw term, 6 A, TB_2x3.5MM	Altech	AK550/2wp
J2	1	Connector, screw term, 15 A, TB_2x5.1MM	Altech	AK500/2wp
L1	1	Inductor, 2.2 μ H, 24 A _{DC} , IND_UP4B	Coiltronics	HC2–2R2
L2	1	Inductor, 3200 μ H, 50 mA	Toko	875FU–332M
Q1	1	MOSFET, 200 V, 0.18 Ω , SMD–220	International Rectifier	IRF640NS
Q2	1	MOSFET, N–channel depl, 450V, 20ohms, TO–92	Supertex Inc.	DN3545N3
Q3, Q4, Q5, Q6	4	MOSFET, N–channel, SO–8	International Rectifier	IRF7463
Q7		Not populated		
Q8	1	Bipolar PNP, 60 V, 0.6 A, SOT–23	Zetex	FMMT2907ACT–ND
Q9, Q10	2	Bipolar NPN, 60 V, 0.2 A, SOT–23	Zetex	FMMT3904CT–ND

REFERENCE	QTY	DESCRIPTION	MANUFACTURER	PART NUMBER
R1	1	Resistor, chip, 32.4 k Ω , 0.125 W, 1%, R1206		
R2	1	Resistor, chip, 1.2 k Ω , 0.1 W, 1%, R0805		
R3	1	Resistor, chip, 2.4 k Ω , 0.1 W, 1%, R0805		
R4	1	Resistor, chip, 1.5 k Ω , 1 W, 5%, R2512		
R5	1	Resistor, chip, 76.8 k Ω , 0.1 W, 1%, R0805		
R6, R7, R26, R27, R29	5	Resistor, chip, 4.7 Ω , 0.25 W, 5%, R1210		
R8, R16, R17, R34, R35	5	Resistor, chip, 5.1 k Ω , 0.1 W, 5%, R0805		
R9	1	Resistor, chip, 0.1 Ω , 0.25 W, 5%, R1210		
R10	1	Resistor, chip, 1 k Ω , 0.1 W, 5%, R0805		
R11	1	Resistor, chip, 46.4 k Ω , 0.1 W, 1%, R0805		
R12	1	Resistor, chip, 200 Ω , 0.1 W, 5%, R0805		
R13	1	Resistor, chip, 300 Ω , 0.1 W, 5%, R0805		
R14	1	Resistor, chip, 5.62 k Ω , 0.1 W, 1%, R0805		
R15, R31	2	Resistor, chip, 10 k Ω , 0.1 W, 5%, R0805		
R18	1	Resistor, chip, 7.50 k Ω , 0.1 W, 1%, R0805		
R19, R32	2	Resistor, chip, 20 Ω , 0.1 W, 5%, R0805		
R20, R21	2	Resistor, chip, 10 Ω , 1 W, 5%, R2512		
R22	1	Resistor, chip, 47 Ω , 0.1 W, 5%, R0805		
R23	1	Resistor, chip, 100 Ω , 0.1 W, 5%, R0805		
R24, R25	2	Resistor, chip, 20 k Ω , 0.1 W, 5%, R0805		
R28	1	Resistor, chip, 47 Ω , 0.5 W, 5%, R2010		
R30		not populated,		
R33	1	Resistor, chip, 1 M, 0.1 W, 5%, R0805		
R36	1	Resistor, chip, 511 Ω , 0.1 W, 5%, R0805		
R37	1	Resistor, chip, 2 k Ω , 0.1 W, 5%, R0805		
T1	1	Transformer, power, 5 windings, XFMR_EPC25	Century Mag.	2444
T2 (See Note)	1	Transformer, pulse, 2 windings	Pulse Eng	PA0128
T3 (See Note)	1	Transformer, pulse, 2 windings	Pulse Eng	PA-0115
TP1-TP11	11	Testpoints, TP_FARNELL_1MM	Keystone	5012
U1	1	IC, primary startup, SO14	TI	UCC3961D
U2	1	IC, BiCMOS PWM controller, SO8	TI	UCC38C43D
U3	1	IC, MOSFET driver, SO8	TI	TPS2832D

NOTE: Use either T2 or T3

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