LM2698 Design Document

National Semiconductor
LM2698
July 2006

1.0 Design Specifications

Inputs	Outputs #1	Outputs #2
VinMin=36	Vout1=3.3	Vout2=1.8
VinMax=57	Iout1=2	Iout2=1

2.0 Design Description

The LM2698 is used to design a fully isolated forward converter power supply. The output inductor, L1, is augmented by a secondary winding to make a coupled-inductor (transformer) for creating a second low cost linear output. The linear output uses the LP2986 augmented with an additional pass transistor, Q2, to drive up to 1A of current. The LM2698 is a PWM regulator with internal low-side FET switch. The cascode FET stage, M1, provides a low cost means to protect the regulator IC from the high input voltage while providing very fast switching.

A forward converter architecture is mathematically analogous to a step-down, buck architecture with its Duty Cycle multiplied by the turns-ratio of the transformer, T1. The input voltage is effectively chopped by the switching action of the regulator's internal switch so that the AC signal can be passed through and reduced by the transformer. The AC voltage pulses at the voltage switch node connecting diode D5, flyback diode D4, and the LC filter, L1 & C6 & C12, act to create the correct output voltage as a function of the regulator switch duty cycle.

The LM3411 is a shunt regulator acting as feedback error amplifier plus reference while the opto-coupler provides dc isolation (between the primary and secondary sides supply) for the feedback path of the loop.

Notes: M1 in the schematic is displayed as Q2 in the layout. Q2 in the schematic is Q3 in the layout.

3.0 Schematic

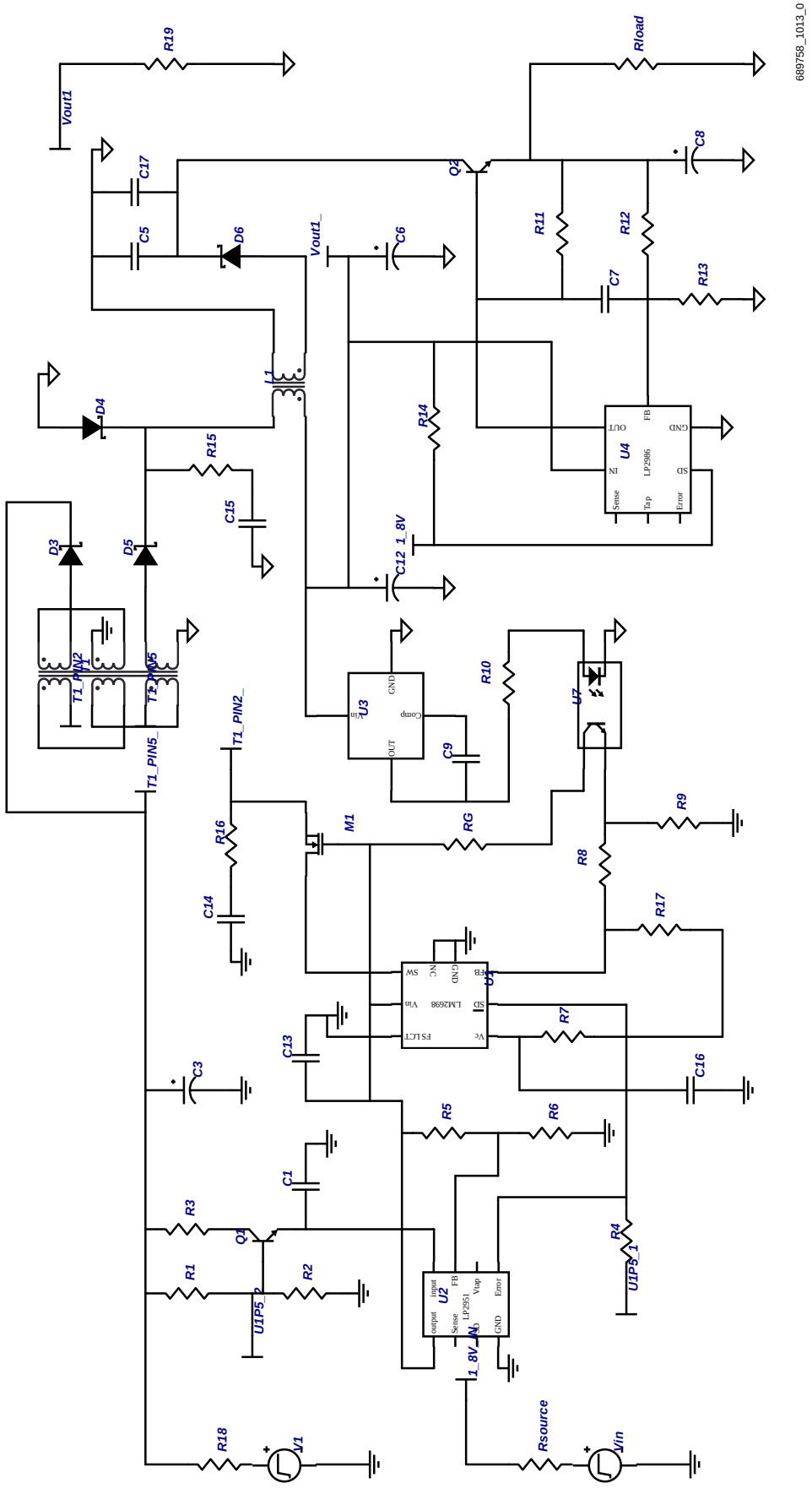

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FIGURE 1. Example Schematic Showing Connection for all Components.

4.0 Bill Of Materials

Part	Manufacturer	Part#	Attributes
C1	TDK	C2316X7R1E105K	1u F
C12	TDK	C3216X5R0J106M	10u F
C13	TDK	C3216X7R1E105K	1u F
C14	NOT USED	NOT USED	0 F
C15	Vishay	VJ1206A102KXAAT	1000p F
C16	Vishay	VJ1206A101KXAAT	100p F
C17	Vishay	594D107X9016D2T	100u F
C5	TDK	C3216X5R0J106M	10u F
C6	Vishay	594D337X96R3D2T	330u F
C7	Vishay	VJ1206A102KXAAT	1n F
C8	Vishay	594D107X9016D2T	100u F, 0.06 Ohms
C9	Vishay	VJ1206Y123KXXAT	12n F
D3	ONSEMI	MURS120	0.875 V
D4	ONSEMI	MBRS240	0.43 V
D5	ONSEMI	MBRS240	0.43 V
D6	ONSEMI	MBRS240	0.43 V
L1	Pulse	PO398	23.1u H, 0.0597 Ohms
M1	Fairchild	MMBTA42	
Q1	ONSEMI	FDS2670	
Q2	ONSEMI	MMJT9410	
R1	Vishay	CRCW12062002FRT6	20k Ohms
R10	Vishay	CRCW12061001FRT6	1k Ohms
R11	Vishay	CRCW12061000FRT6	100 Ohms
R12	Vishay	CRCW12064700FRT6	470 Ohms
R13	Vishay	CRCW12061001FRT6	1k Ohms
R14	Vishay	CRCW12061002FRT6	10k Ohms
R15	Vishay	CRCW12062R7JRT6	2.7 Ohms
R16	NOT USED	NOT USED	
R17	Vishay	CRCW12061003FRT6	100k Ohms
R2	Vishay	CRCW12061002FRT6	10k Ohms
R3	Vishay	CRCW12062001FRT6	2k Ohms
R4	Vishay	CRCW12061003FRT6	100k Ohms
R5	Vishay	CRCW12067502FRT6	75k Ohms
R6	Vishay	CRCW12061212FRT6	12.1k Ohms
R7	Vishay	CRCW12062003FRT6	200k Ohms
R8	Vishay	CRCW12063003FRT6	300k Ohms
R9	Vishay	CRCW12062001FRT6	2k Ohms
RG	Vishay	CRCW12063921FRT6	3.92k Ohms
T1	Coiltronics	VP2-1600	
U1	National Semiconductor	LM2698	
U2	National Semiconductor	LP2951	
U3	National Semiconductor	LM3411	
U4	National Semiconductor	LP2986	
U7	Vishay-Semiconductor	CNY-17F3	

5.0 Layout

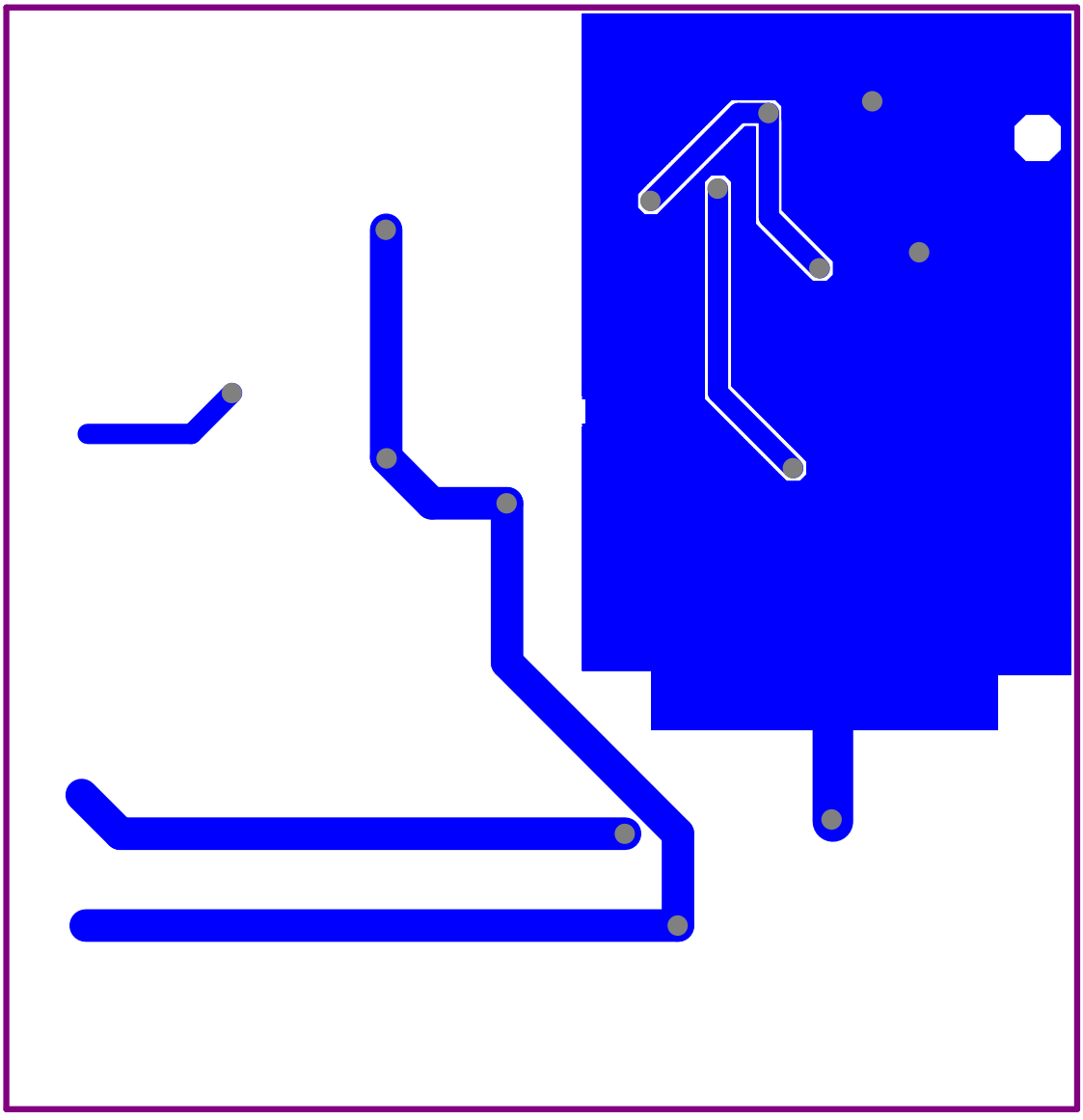

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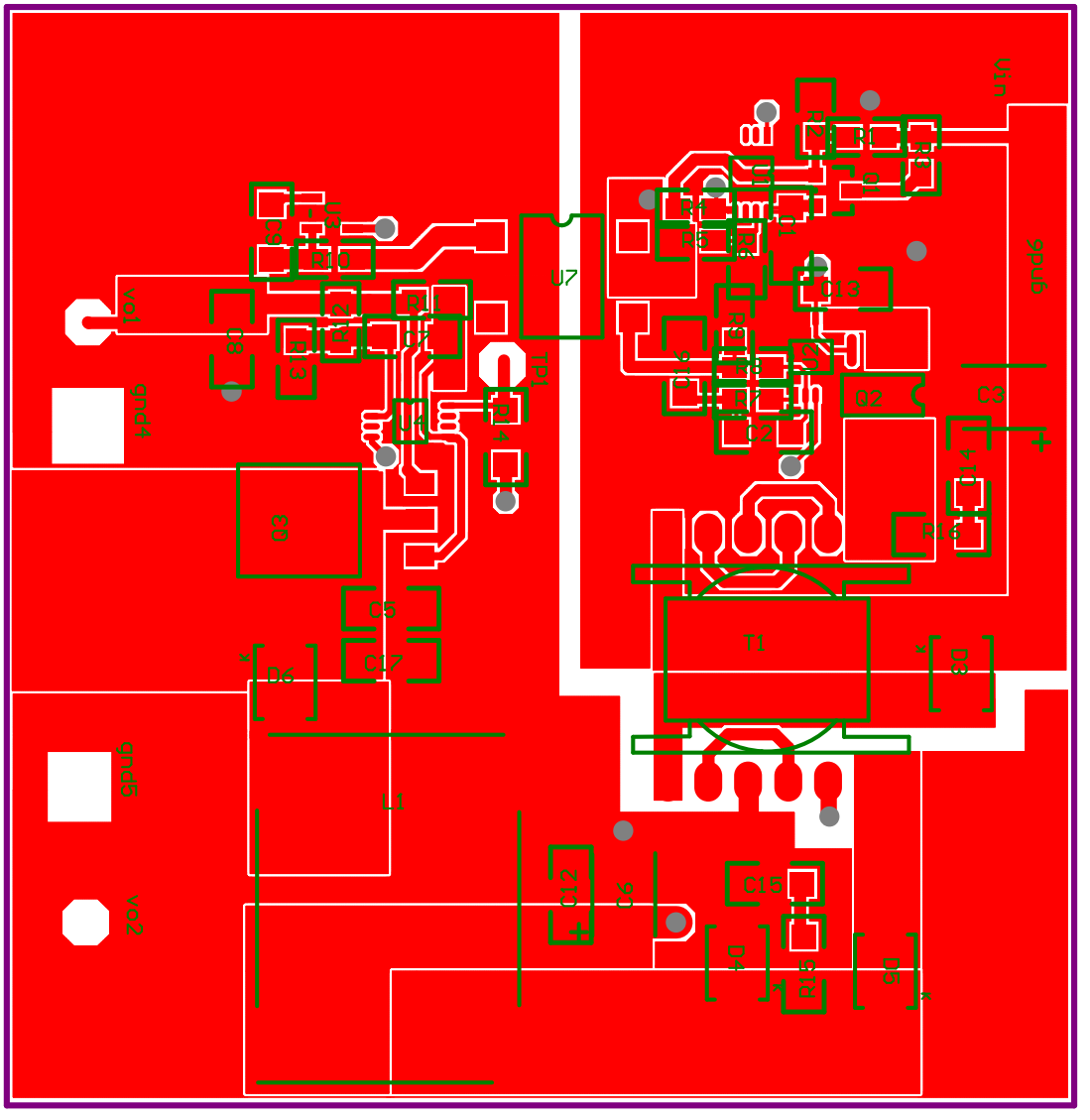
FIGURE 2. Board's Bottom View



PADC_NSC0086_lo_2

FIGURE 3. Board's Top View

Notes

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