AN-2284 LM34926 Isolated Evaluation Board

1 Introduction

An isolated bias supply is implemented in this evaluation board with LM34926 Constant-On-Time regulator. LM34926 regulator integrates both the high and low side power switches essential for creating isolated buck converter.

Board Specifications:

- Input Range: 20V to 100V
- Primary Output Voltage: 10V
- Secondary (Isolated) Output Voltage: 9.5V
- Maximum Load Current (Primary + Secondary): 250mA
- Maximum Power Output: 2.5W
- Nominal Switching Frequency: 750kHz
- Efficiency (FIN = 36V, IOUT2 = 250mA): 77 percent
- Board size: 2 inch x 2 inch

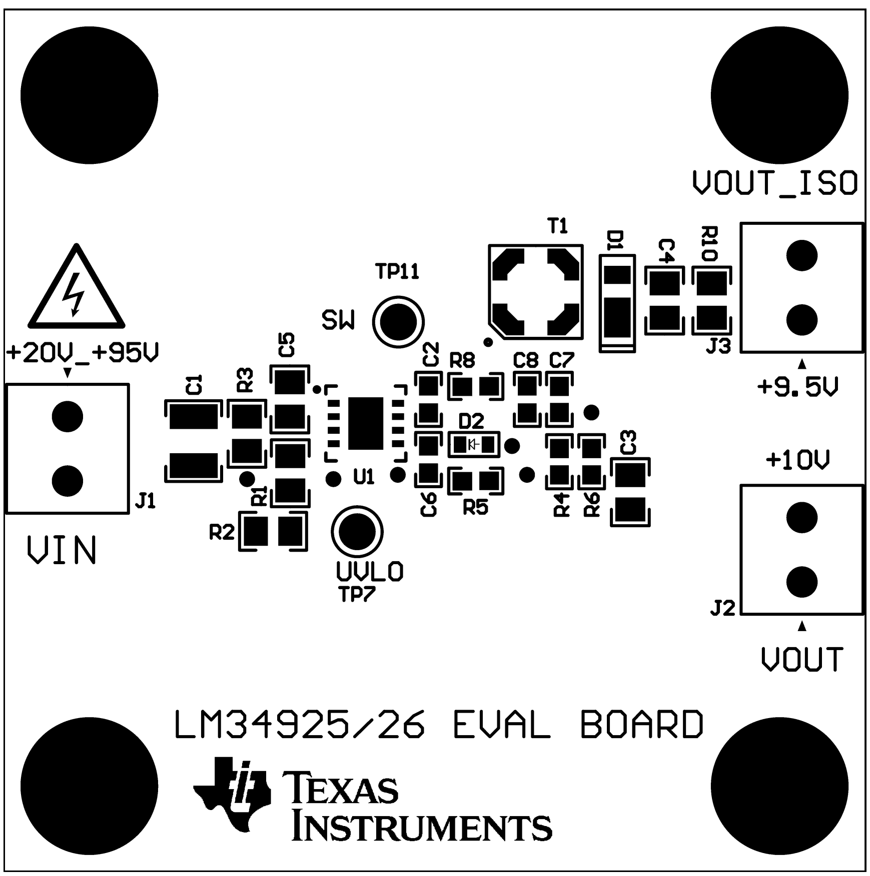

Figure 1. LM34926 Evaluation Board (Top View)

2 UVLO Threshold and Hysteresis

The UVLO resistors are selected using the following two equations:

$$V_{IN(HYS)} = I_{HYS} R_1 \tag{1}$$

and

$$V_{IN\ (UVLO,rising)} = 1.225V \times \left(\frac{R_1}{R_2} + 1\right) \tag{2}$$

On this evaluation board R1 = 127kΩ and R2 = 8.25kΩ, resulting in UVLO rising threshold at VIN = 20.5V and a hysteresis of 2.54V.

2.1 Board Connection and Start-up

The input connections are made using TP1 (VIN) and TP2 (GND) terminals. The primary output appears at TP3 (VOUT1) and TP4 (GND). The secondary (isolated) output is available across TP5 (VOUT2) and TP6 (IGND). The input voltage should be gradually increased above UVLO set point of 20.5V. Both the outputs (VOUT1 and VOUT2) should be close to 10V at this point. This board is designed to function with input voltage range of 20V to 100V. The minimum VIN threshold can be changed by changing the UVLO resistors R1, R2. VIN should not exceed 100V.

The magnetics in this design is optimized for solution size, and therefore limits the output power. **The total load at the output should not exceed 250mA, otherwise the coupled inductor will saturate/overheat, which can destroy both the coupled inductor and the regulator IC U1**. If a sustained over-current situation is to be tolerated, a coupled inductor with higher saturation and rms ratings should be used.

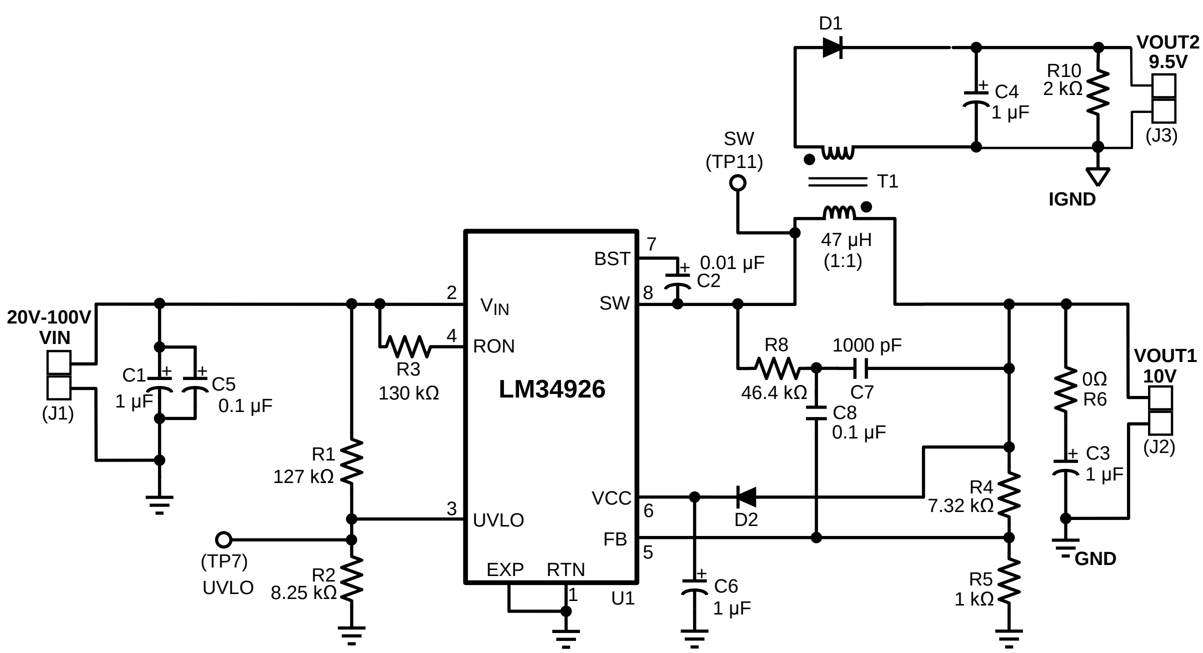

Figure 2. Complete Evaluation Board Schematic

3 Bill of Materials

Table 1. Bill of Materials

Item	Description	Mfg., Part Number	Package	Value
U1	Sync Switching Regulator	Texas Instruments, LM34926	WSON-8	100V, 300mA
T1	Coupled Inductor, 1500 VDC	Coilcraft, LPD5030V-473ME	5mm x 5mm	47uH, 0.47A
	Alternate Part	Wurth, 750312750	8.26mm x 6.60mm	22uH, 0.76A
D1	Schottky Diode	Diodes Inc., DFLS1100-7	Pwr–DI123	100V, 1A
D2	Schottky Diode	Diodes Inc., SDM10U45-7	SOD–523	40V, 100mA
C1	Ceramic Capacitor	MuRata, GRM32CR72A105KA35L	1210	1uF, 100V, X7R
C2	Ceramic Capacitor	TDK, C1608X7R1C103K	0603	0.01uF, 16V, X7R
C3, C4	Ceramic Capacitor	TDK, C2012X7R1E105K	0805	1uF, 25V, X7R
C5	Ceramic Capacitor	Kemet, C0805C104K1RACTU	0805	0.1uF, 100V, X7R
C6	Ceramic Capacitor	TDK, C1608X7R1C105K	0603	1uF, 16V, X7R
C7	Ceramic Capacitor	Murata, GRM188R71E102KA01D	0603	1000pF,25V, X7R
C8	Ceramic Capacitor	AVX, 0603YC104KAT2A	0603	0.1uF, 16V, X7R
R1	Resistor	Vishay/Dale, CRCW0805127KFKEA	0805	127kΩ, 1%
R2	Resistor	Vishay/Dale, CRCW08058K25FKEA	0805	8.25kΩ, 1%
R3	Resistor	Vishay/Dale, CRCW0805130KFKEA	0805	130kΩ, 1%
R4	Resistor	Panasonic, ERJ-3EKF7321V	0603	7.32kΩ, 1%
R5	Resistor	Panasonic, ERJ-3EKF1001V	0603	1.0kΩ,1%
R6	Resistor	Yageo, RC0603JR-070RL	0603	0Ω
R8	Resistor	Panasonic, ERJ-3EKF4642V	0603	46.4kΩ, 1%
R10	Resistor	Panasonic, ERJ-6GEYJ202V	0805	2kΩ, 5%

4 Performance Curves

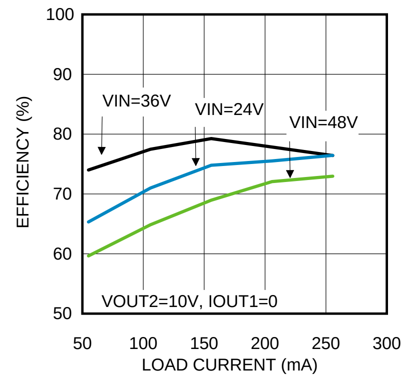

Figure 3. Efficiency at 750kHz, VOUT1=10V

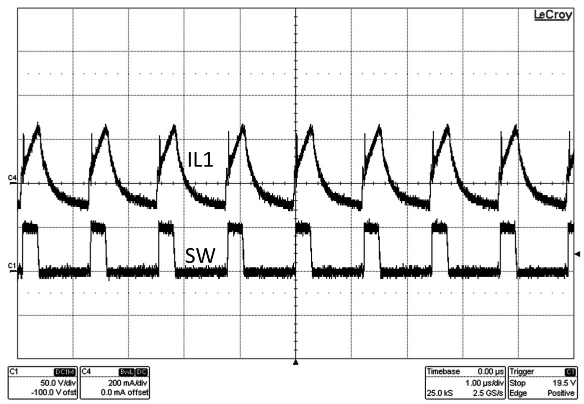

Figure 4. Steady State Waveform (VIN=48V, IOUT1=0mA, IOUT2= 100mA)

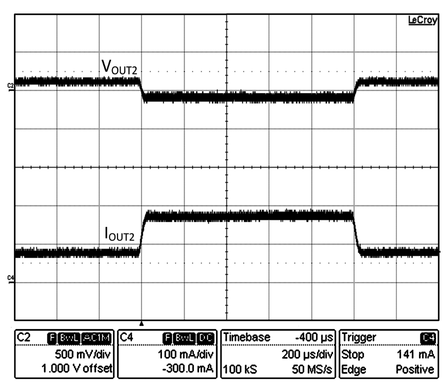

Figure 5. Step Load Response (VIN=48V, IOUT1=0, Step Load on IOUT2=80mA-180mA)

5 PC Board Layout

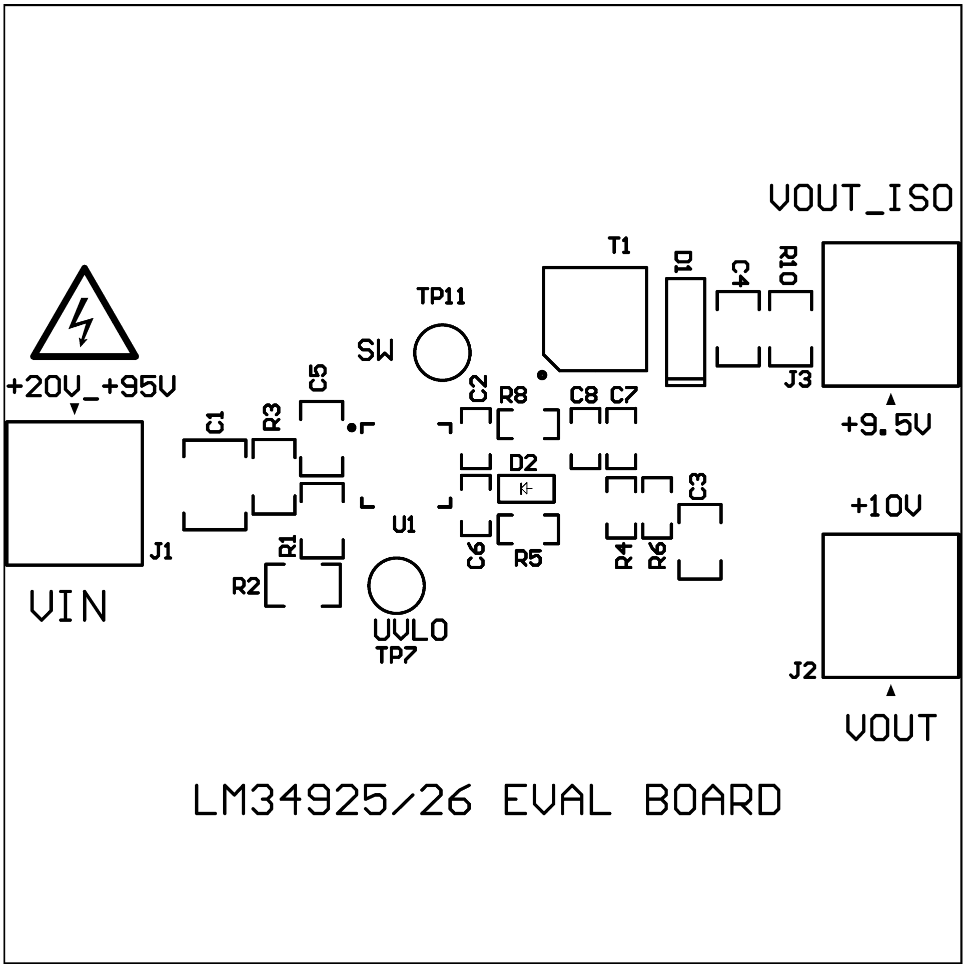

Figure 6. Board Silkscreen

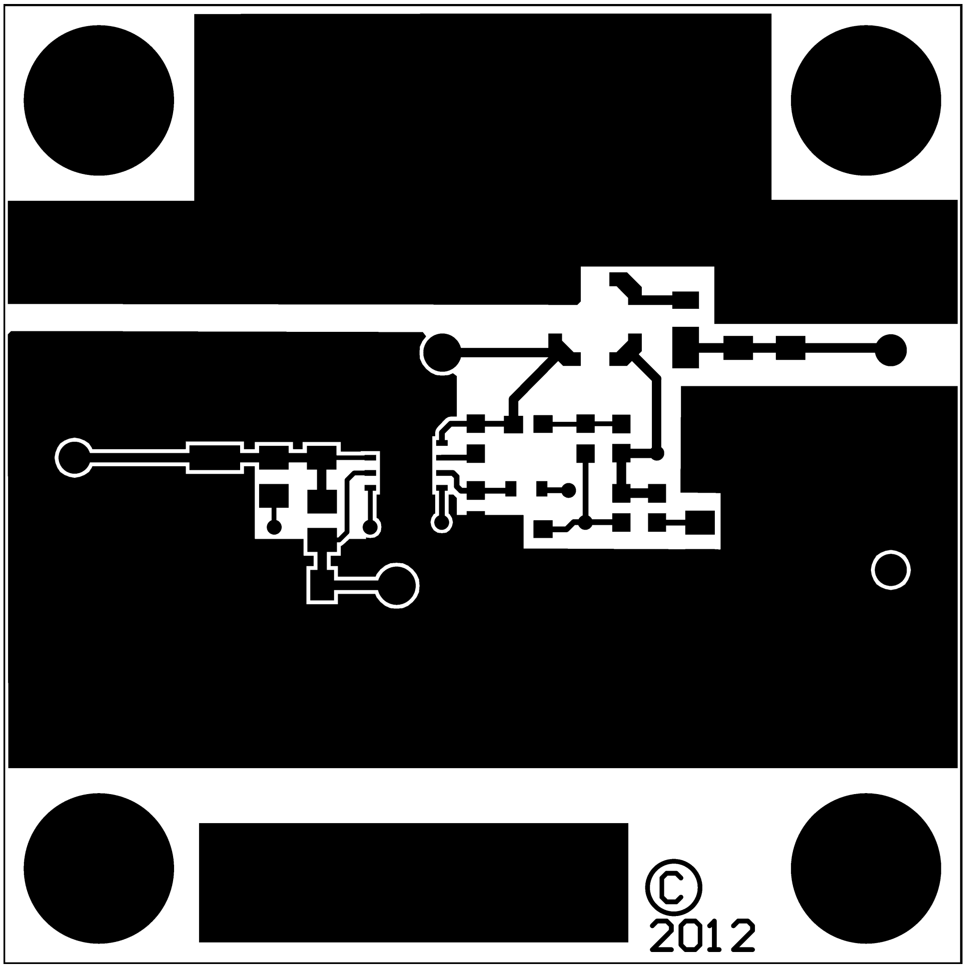

Figure 7. Board Top Layer

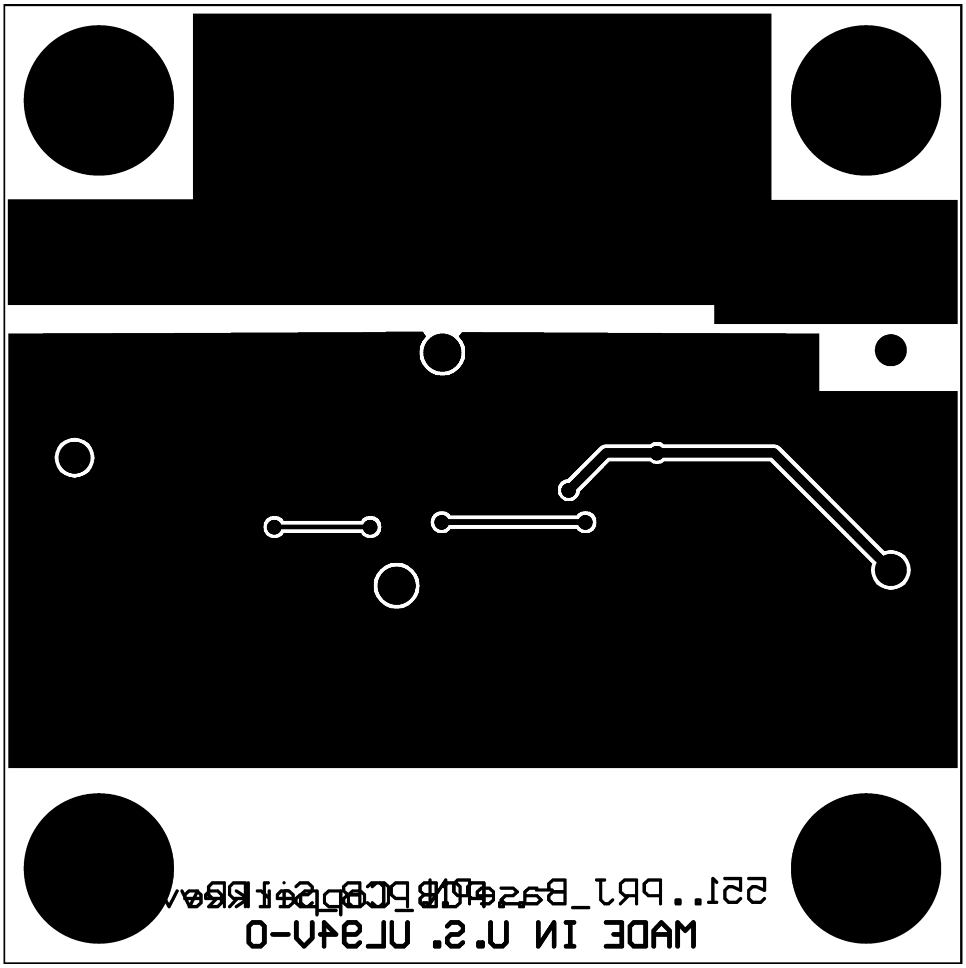

Figure 8. Board Bottom Layer

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