LT3511: Monolithic High Voltage Isolated Flyback Converter

DESCRIPTION

Demonstration circuit 1517A is a monolithic high voltage isolated flyback converter featuring the LT3511. This demo circuit is designed for a 5V isolated output from an input voltage range of 36V to 75V. The maximum output current is up to 300mA. The circuit doesn't require an opto-isolator, due to the output voltage being sensed directly from the primary side transformer winding. A third winding off the transistor is used to bias the LT3511 for highest efficiency.

The flyback converter requires a minimum load to maintain good regulation. A Zener diode is placed between V_{OUT}^+ and V_{OUT}^- to clamp output voltage to ~7.5V if the minimum load requirement is not met. Depending on the input voltage and the output regulation requirement, a 15mA to 20mA minimum load is usually sufficient.

This demo circuit uses a diode-Zener clamp to limit the peak spike voltage due to transformer leakage inductance. A diode-Zener clamp is more efficient than a RCD clamp.

The LT3511 operates in boundary mode and also provides output voltage temperature compensation.

The LT3511 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide.

Design files for this circuit board are available at http://www.linear.com/demo

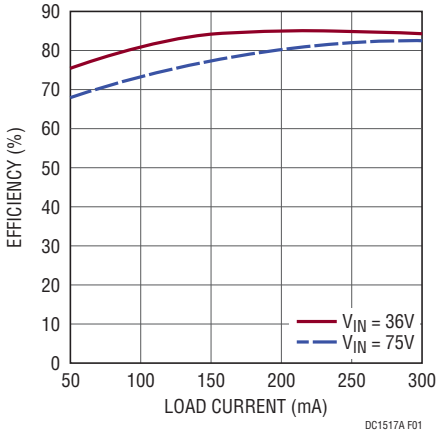


Figure 1. DC1517A Efficiency

PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	VALUE	UNITS
Minimum Input Supply Voltage		36	V
Maximum Input Supply Voltage		75	V
Output Voltage	I_{OUT} = 300mA	5	V
Output Voltage Tolerance	I_{OUT} = 300mA	±5	%
Switching Frequency	V_{IN} = 36V, I_{OUT} = 300mA	150	kHz
	V_{IN} = 75V, I_{OUT} = 300mA	220	kHz
Maximum Output Current		300	mA
Efficiency	V_{IN} = 36V, I_{OUT} = 300mA	84	%

QUICK START PROCEDURE

Demonstration circuit 1517A is easy to set up to evaluate the performance of the LT3511. Refer to Figure 2 for proper measurement equipment setup and to follow the procedure below:

Note: When measuring the input or output voltage ripple, care must be taken to avoid a long ground lead on the oscilloscope probe. Measure the input or output voltage ripple by touching the probe tip directly across the V_{IN} and GND or V_{OUT}^+ and V_{OUT}^- terminals.

Note: Make sure GND and V_{OUT}^- are not connected together accidently, such as by two oscilloscope probes.

1. With power off, connect the input power supply to V_{IN} and GND.
2. Connect a load of 300mA or less to V_{OUT}^+ and V_{OUT}^- terminals (not GND).
3. Turn on the power at the input.
4. Check for the proper output voltage (5V).

   Note: If there is no output, temporarily disconnect the load to make sure that the load is not set too high.
5. Once the proper output voltage is established, adjust the load and input within the operating ranges and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

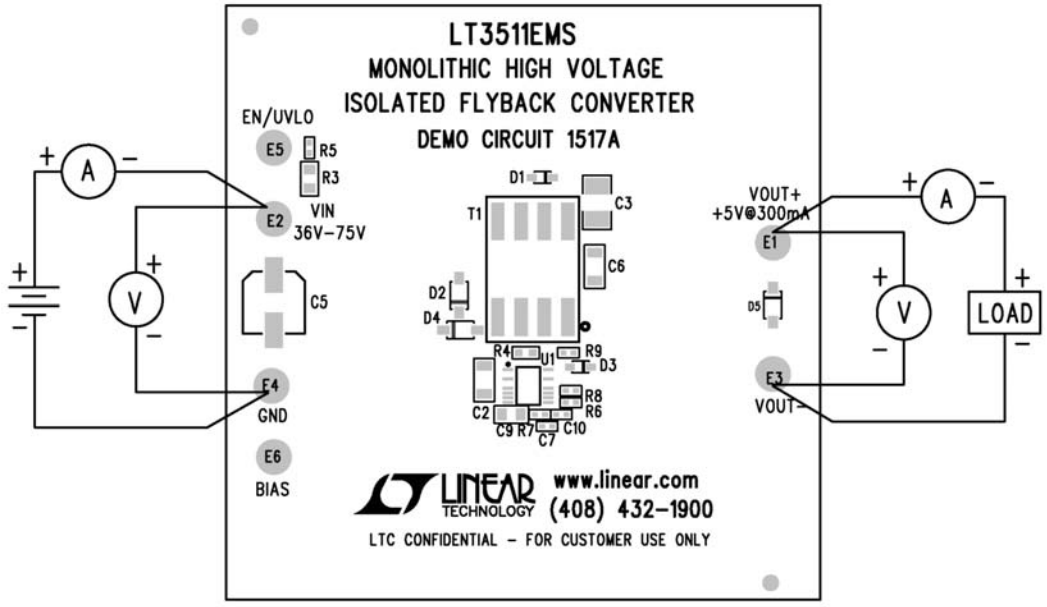


Figure 2. Proper Measurement Equipment Setup

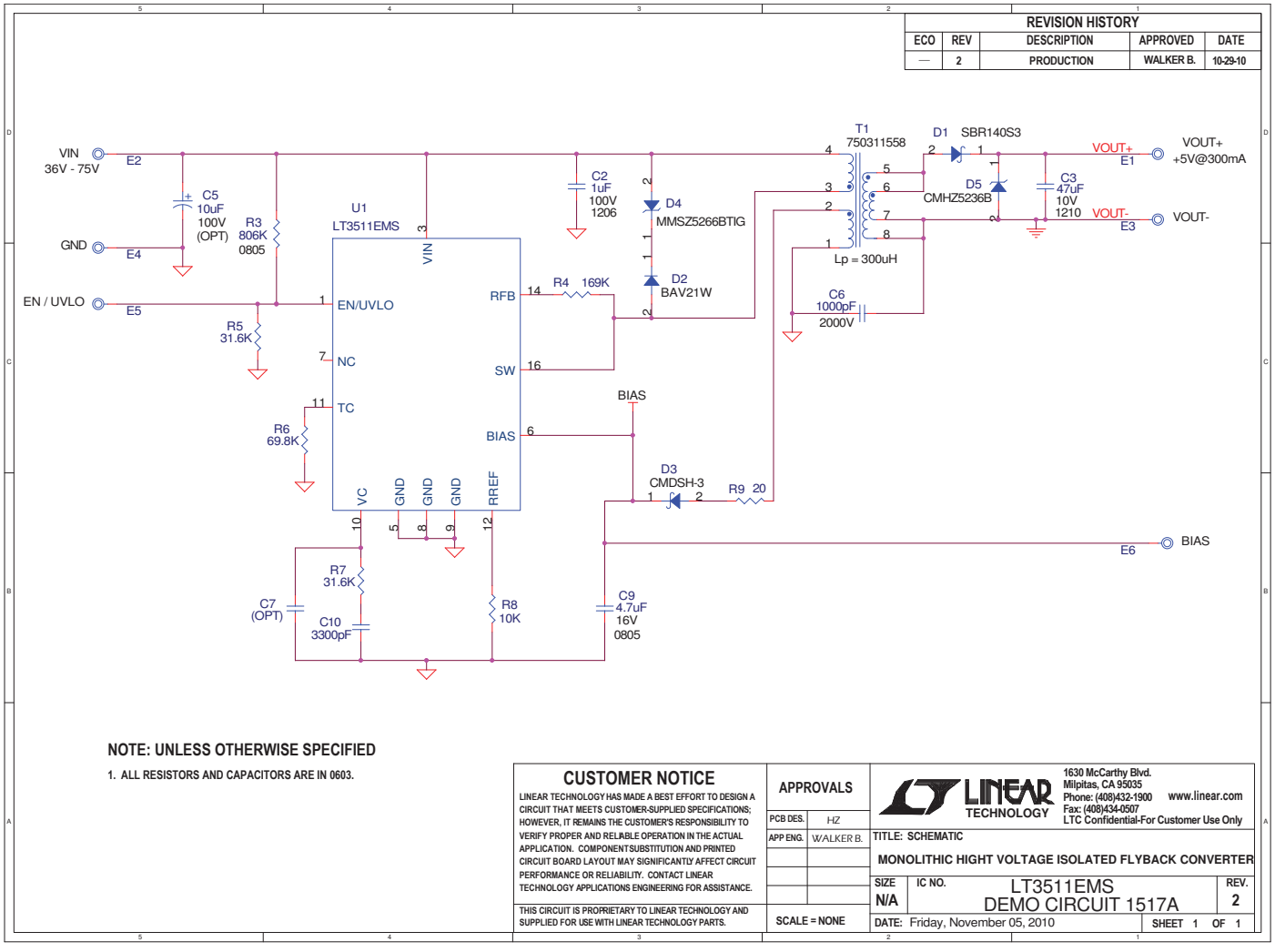
PARTS LIST

ITEM	QUANTITY	REFERENCE	DESCRIPTION	MANUFACTURERS PART NUMBER
Required Circuit Components				
1	1	C2	Capacitor, X7R, 1µF 100V, 10%, 1206	Murata, GRM31CR72A105KA01L
2	1	C3	Capacitor, X5R, 47µF 10V, 10%,1210	Murata, GRM32ER61A476KE20L
3	1	C5	Capacitor, Electrolytic, 10µF 100V	SUNCON, 100CE10BS
4	1	C9	Capacitor, X7R, 4.7µF 16V, 10%, 0805	Taiyo Yuden, EMK212137475KG
5	1	C10	Capacitor, X7R, 3300pF, 50V, 0402	AVX, 04025C332KAT2A
6	1	D1	Diode, Schottky, SOD-323	Diodes Inc. SBR140S3
7	1	D2	Diode, SOD-123	Diodes Inc. BAV21W-7-F
8	1	D4	Zener Diode, SOD-123	ON Semiconductor, MMSZ5266BT1G
9	1	D5	Zener Diode, SOD-123	Central Semiconductor, CMHZ5236B
10	1	R3	Resistor, Chip, 806k, 1%, 0805	Vishay, CRCW0805806KFKEA

PARTS LIST

ITEM	QUANTITY	REFERENCE	DESCRIPTION	MANUFACTURERS PART NUMBER
11	1	R4	Resistor, Chip, 169k, 1%, 0603	Vishay, CRCW0603169KFKEA
12	2	R5, R7	Resistor, Chip, 31.6k, 1%, 0402	Vishay, CRCW040231K6FKED
13	1	R6	Resistor, Chip, 69.8k, 1%, 0402	Vishay, CRCW040269K8FKED
14	1	R8	Resistor, Chip, 10k, 1%, 0402	NIC, NRC04F1002TRF
15	1	T1	Transformer	Würth, 750311558
16	1	U1	I.C., LT3511EMS, 16-Pin MSOP	Linear Technology, LT3511EMS
Additional Demo Board Circuit Components				
1	1	C6	Capacitor, X7R, 1000pF 2000V, 10%,1206	AVX 1206GC102KAT1A
2	0	C7 (Optional)	Capacitor, 0402	
3	1	D3	Diode, Schottky, SOD-323	Central Semiconductor, CMDSH-3 TR
4	1	R9	Resistor, Chip, 20, 1%, 0402	Vishay, CRCW040220R0FKED
Hardware, for Demo Board Only				
1	6	E1-E6	Testpoint, Turret, .095"	MILL-MAX, 2501-2-00-80-00-00-07-0

SCHEMATIC DIAGRAM



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