

# Non-Opto Isolated Flyback Converter

## DESCRIPTION

Demonstration circuit 1557A is an Non-Opto Isolated Flyback Converter featuring LT3748EMS. It is designed for 12V output from a 30V to 75V DC input. The output current is up to 1A. The part senses the isolated output voltage directly from the primary side flyback waveform during the off time of the power switch. No third winding, opto-coupler or signal transformer is required for regulation. A minimum load of approximately 2% of maximum load is required on the output. Table 1 summarizes the performance of the demo board.

The demo circuit can be easily modified for applications of different input, and output voltages/currents. Some pre-designed EP10, EP13 transformers from vendors such as Wurth Electronics, Sumida, Pulse Engineering and Coilcraft can be assembled on the board.

The LT3748EMS is a high input voltage isolated flyback controller operating with input supply voltages from 5V to 100V. The LT3748EMS utilizes boundary mode operation

to provide a high efficiency, small size solution with improved load regulation of  $\pm 5\%$  over the full line, load and temperature ranges. The LT3748EMS is well suited for a wide variety of industrial, automotive, medical, telecom, data-com applications, where regulated isolated output is required.

The LT3748EMS datasheet gives a complete description of the part, operation and application information. The datasheet should be read in conjunction with this quick start guide for Demo Circuit 1557A.

**Design files for this circuit board are available. Call the LTC Factory.**

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**Table 1. Performance Summary of DC1557A ( $T_A = 25^{\circ}\text{C}$ )**

| PARAMETER             | CONDITION                   | VALUE           |
|-----------------------|-----------------------------|-----------------|
| Minimum Input Voltage |                             | 30V             |
| Maximum Input Voltage |                             | 75V             |
| Output Voltage, VOUT  | VIN=30V~75V<br>IOUT=20mA~1A | 12.0V $\pm 5\%$ |
| Output Current, IOUT  | VIN=30V~75V                 | 1.0A            |

## QUICK START PROCEDURE

Demo circuit 1557A is easy to set up to evaluate the performance of the LT3748EMS. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to VIN and GND.
2. Connect the load to the terminals VOUT+ and VOUT- on the board. Apply 20mA load to the output.

3. Turn on the power at the input. Increase VIN to 30V.

NOTE. Make sure that the input voltage does not exceed 75V.

4. Check for the proper output voltages. The output should be regulated at 12V ( $\pm 5\%$ ).

NOTE. If there is no output, temporarily disconnect the power supply. Make sure that the load is connected with correct polarity. If the output voltage is out of spec, make sure minimum load current is applied to the output, the load is not set too high, and the current of power supply is below current limit.

- Once the proper output voltage is established, adjust the input and load within the operating range and observe the output voltage regulation, ripple voltage, efficiency and other parameters.

NOTE. When measuring the input or output voltage ripples, 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 VIN and GND, or VOUT+ and VOUT- terminals. See Figure 2 for proper scope probe technique.

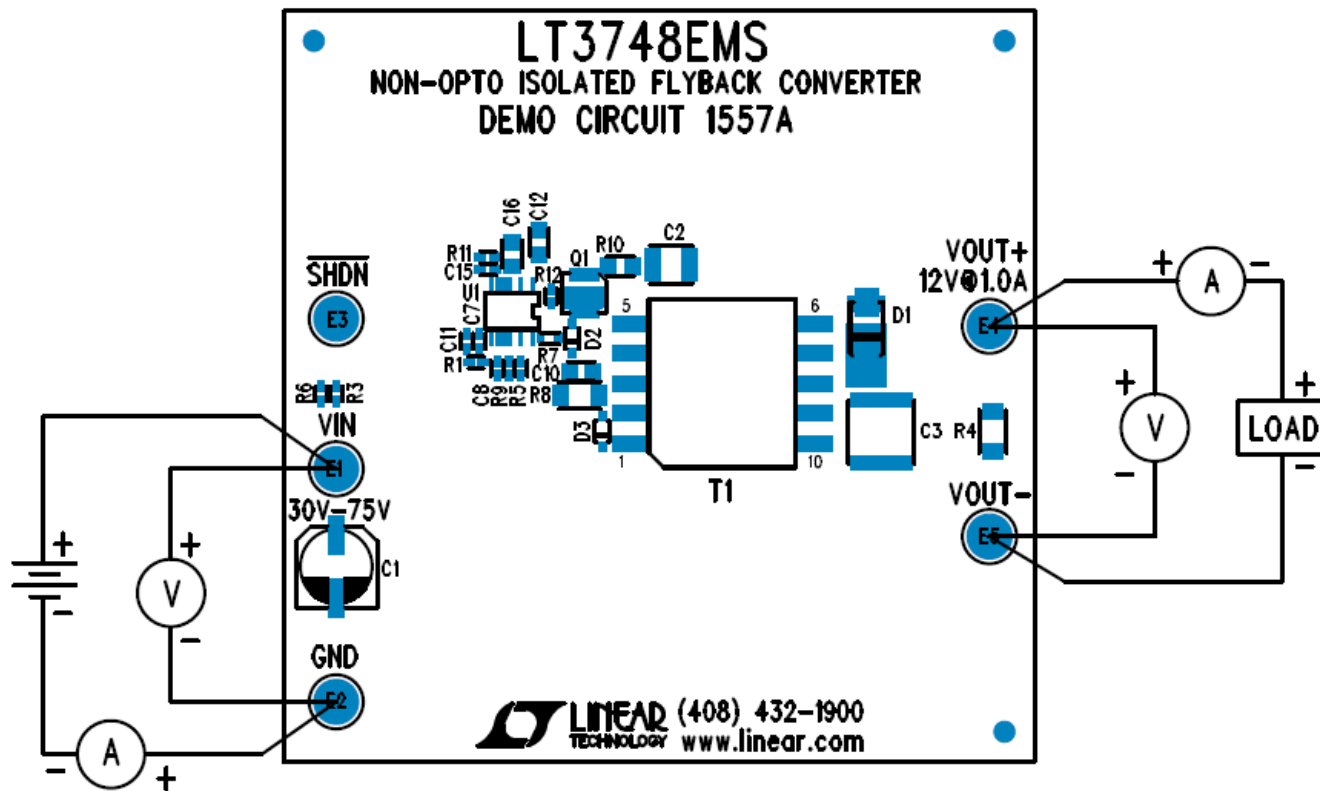


Figure 1. Proper Measurement Equipment Setup

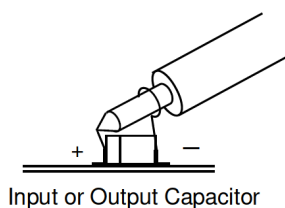
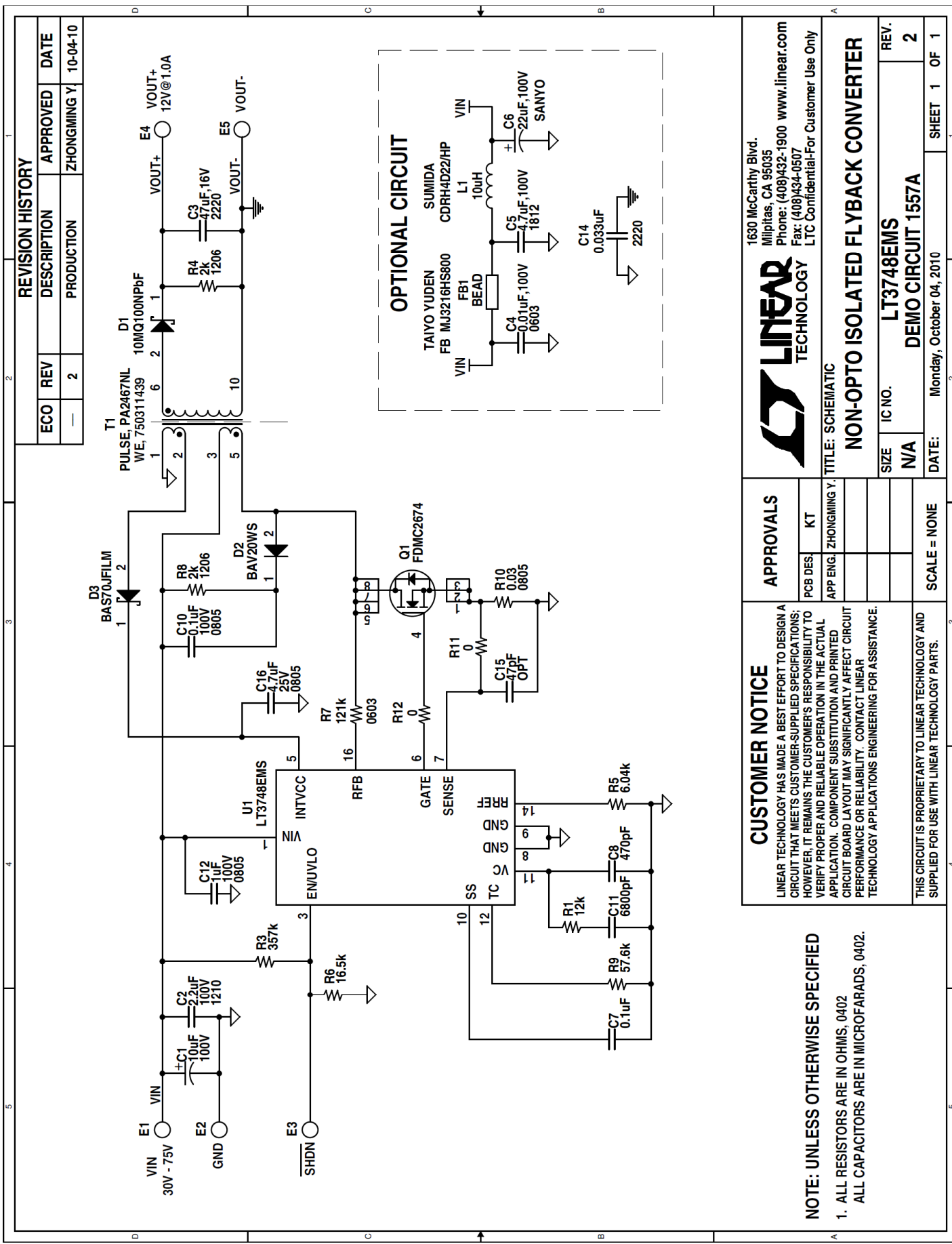


Figure 2. Proper Scope Probe Placement for Measuring Input or Output Ripple



Linear Technology Corporation  
LT3748EMS

Bill of Materials  
Demo Bd. #1557A

| Item                                             | Qty | Reference      | Part Description                          | Manufacturer / Part #                |
|--------------------------------------------------|-----|----------------|-------------------------------------------|--------------------------------------|
| <b>REQUIRED CIRCUIT COMPONENTS:</b>              |     |                |                                           |                                      |
| 1                                                | 1   | C1             | CAP., ELECTROLYTIC, 10uF 100V, 6.3x8      | NIC, NACEW100M100V6.3X8TR13F         |
| 2                                                | 1   | C2             | CAP., X7R, 2.2uF 100V, 1210               | TDK, C3225X7R2A225M                  |
| 3                                                | 1   | C3             | CAP., X7R, 47uF 16V, 2220                 | TDK, C5750X7R1C476M                  |
| 4                                                | 1   | C7             | CAP., X7R, 0.1uF 16V, 0402                | TDK, C1005X7R1C104K                  |
| 5                                                | 1   | C8             | CAP., C0G, 470pF 50V, 0402                | TDK, C1005C0G1H471M                  |
| 6                                                | 1   | C10            | CAP., X7R, .1uF 100V, 0805                | TDK, C2012X7R2A104K                  |
| 7                                                | 1   | C11            | CAP., X7R, 6800pF 25V, 0402               | TDK, C1005X7R1E682K                  |
| 8                                                | 1   | C12            | CAP., X7S, 1uF 100V, 0805                 | TDK, C2012X7S2A105K                  |
| 9                                                | 1   | C13            | CAP., C0G, 10pF 50V, 0402                 | TDK, C1005C0G1H100M                  |
| 10                                               | 1   | C16            | CAP., X5R, 4.7uF, 25V, 0805               | TDK, 2012X5R1E475K                   |
| 11                                               | 1   | D1             | SCHOTTKY BARRIER RECTIFIER 2.1A,SMA-DIODE | VISHAY, VS-10MQ100NPbF               |
| 12                                               | 1   | D2             | SCHOTTKY MINI, SOD323                     | DIODES/ZETEX., BAV20WS-7-F           |
| 13                                               | 1   | D3             | DE, SCHOTTKY MINI, SOD323                 | DIODES/ZETEX., 1N5711WS-7-F          |
| 14                                               | 1   | Q1             | MOSFET N-CH, POWER33                      | FAIRCHILD SEMI., FDMC2674            |
| 15                                               | 1   | R1             | RES., CHIP, 12KΩ, 0402                    | VISHAY, CRCW040212K0FKED             |
| 16                                               | 1   | R3             | RES., CHIP, 357KΩ, 0402                   | NIC, NRC04F3573TRF                   |
| 17                                               | 2   | R4,R8          | RES., CHIP, 2KΩ, 1206                     | VISHAY, CRCW12062K00FKEA             |
| 18                                               | 1   | R5             | RES., CHIP, 6.04KΩ, 0402                  | NIC, NRC04F6041TRF                   |
| 19                                               | 1   | R6             | RES., CHIP, 16.5KΩ, 0402                  | VISHAY, CRCW040216K5FKED             |
| 20                                               | 1   | R7             | RES., CHIP, 121KΩ, 0603                   | VISHAY, CRCW0603121KFKED             |
| 21                                               | 1   | R9             | RES., CHIP, 57.6KΩ, 0402                  | VISHAY, CRCW040257K6FKED             |
| 22                                               | 1   | R10            | RES., SENSE, 0.03, 0805                   | VISHAY, WSL0805R0300FEA              |
| 23                                               | 2   | R11,R12        | RES., CHIP, 0Ω, 0402                      | VISHAY, CRCW04020000Z0ED             |
| 24                                               | 1   | T1             | XFMR, FLYBACK, TRANS-PULSE-EP13           | PULSE, PA2467NL, or WURTH, 750311439 |
| 25                                               | 1   | U1             | IC., LT3748EMS, MSE16(12)                 | LINEAR TECH., LT3748EMS              |
| <b>ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS:</b> |     |                |                                           |                                      |
| 1                                                | 0   | C4 (OPT)       | CAP., X7R, 0.01uF 50V, 0603               | TDK, C1608X7R1H103K                  |
| 2                                                | 0   | C5 (OPT)       | CAP., X7R, 4.7uF 100V, 1210               | TDK, C4532X7S2A475M                  |
| 3                                                | 0   | C6 (OPT)       | CAP., 22uF 100V                           | OPT                                  |
| 4                                                | 0   | C14 (OPT)      | CAP., 0.033uF, 2220                       | OPT                                  |
| 5                                                | 0   | C15 (OPT)      | CAP., NPO, 47pF 50V, 0402                 | OPT                                  |
| 6                                                | 0   | FB1 (OPT)      | BEAD, 1206                                | TAIYO YUDEN, FB MJ3216HS800          |
| 7                                                | 0   | L1 (OPT)       | IND, PWR, 10UH, L-CDRH4D22/HP             | SUMIDA, CDRH4D22HPNP-100MC           |
| 8                                                | 0   | R2 (OPT)       | RES., CHIP, 0603                          | OPT                                  |
| <b>HARDWARE-FOR DEMO BOARD ONLY:</b>             |     |                |                                           |                                      |
| 1                                                | 5   | E1,E2,E3,E4,E5 | TP, TURRET, 0.094"                        | MILL-MAX, 2501-2-00-80-00-00-07-0    |



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