

# LT8650S

## Dual Channel 42V, 4A Synchronous Step-Down Silent Switcher with 6.2 $\mu$ A Quiescent Current

### DESCRIPTION

Demonstration circuit 2407A is a dual channel 42V, 4A synchronous step-down Silent Switcher<sup>®</sup> with 6.2 $\mu$ A quiescent current featuring the [LT8650S](#). The LT8650S is the second-generation Silent Switcher that minimizes EMI and reduces PCB layout sensitivity. The demonstration circuit has two outputs: 5V and 3.3V. Each output can source up to 4A continuous current at the same time. Figure 1 shows the conducted EMI measurements from 150kHz to 30MHz. Figure 2 shows the radiated EMI measurements from 30MHz to 1GHz. All measurements were tested per CISPR 25 specifications. The circuit passes the tests with wide margins.

The SYNC pin on the demo board is grounded by default for low ripple Burst Mode<sup>®</sup> operation. To synchronous to an external clock, move JP2 to FCM W/O SSM OR

SYNC position and apply the external clock to the SYNC turret. Moving JP2 to FCM W/SSM enables spread spectrum mode.

The demonstration circuit 2407A runs at 2MHz to minimize solution size. The efficiency is 92%. The IC temperature rise is less than 50°C when both channels run at full load, 4A each, at 2MHz.

The LT8650S 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 for demo circuit 2407A.

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2407A>**

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### PERFORMANCE SUMMARY Specifications are at T<sub>A</sub> = 25°C

| SYMBOL            | PARAMETER               | CONDITIONS  | MIN   | TYP | MAX   | UNITS |
|-------------------|-------------------------|---|-------|-----|-------|-------|
| V <sub>IN</sub>   | Input Supply Range      |   | 5.4   |     | 42    | V     |
| V <sub>OUT1</sub> | Output1 Voltage         |   | 4.8   | 5   | 5.2   | V     |
| I <sub>OUT1</sub> | Maximum Output1 Current |   | 4     |     |       | A     |
| V <sub>OUT2</sub> | Output2 Voltage         |   | 3.168 | 3.3 | 3.432 | V     |
| I <sub>OUT2</sub> | Maximum Output2 Current |   | 4     |     |       | A     |
| f <sub>SW</sub>   | Switching Frequency     |   | 1.85  | 2   | 2.15  | MHz   |
| EFE               | Efficiency at DC        | I <sub>OUT1</sub> = 4A, I <sub>OUT2</sub> = 4A, Input Voltage = 12V |       | 92  |       | %     |

### TYPICAL PERFORMANCE CHARACTERISTICS

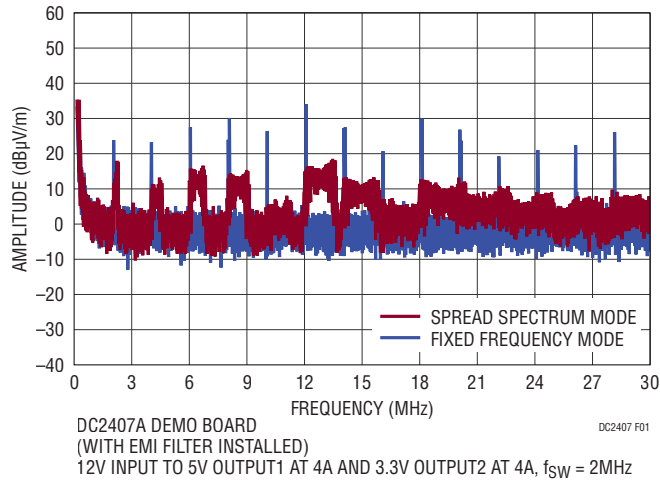


Figure 1. Conducted EMI Performance

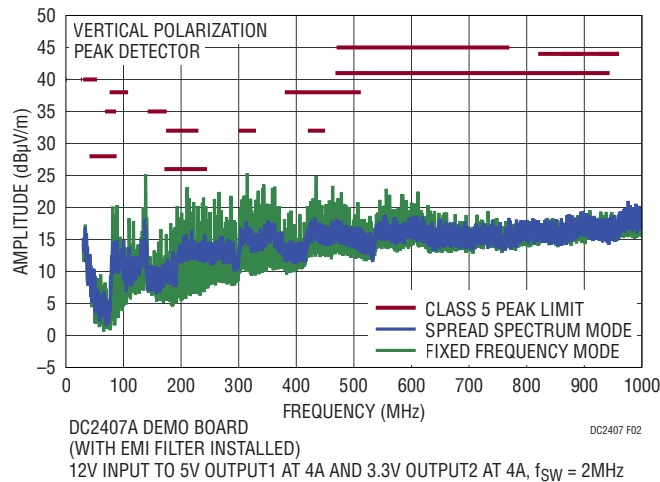


Figure 2: Radiated EMI Performance (CISPR 25 Radiated Emission Test with Class 5 Peak Limits)

## QUICK START PROCEDURE

Demonstration circuit 2407A is easy to set up to evaluate the performance of the LT8650S. Refer to Figure 3 and Figure 4 for proper measurement equipment setup and follow the procedure below.

1. With power off, connect the input power supply to VEMI and GND.

2. With power off, connect the loads to  $V_{OUT1}$  and GND and  $V_{OUT2}$  and GND.

3. Turn on the power at the input.

4. Carefully evaluate other design parameters as needed.

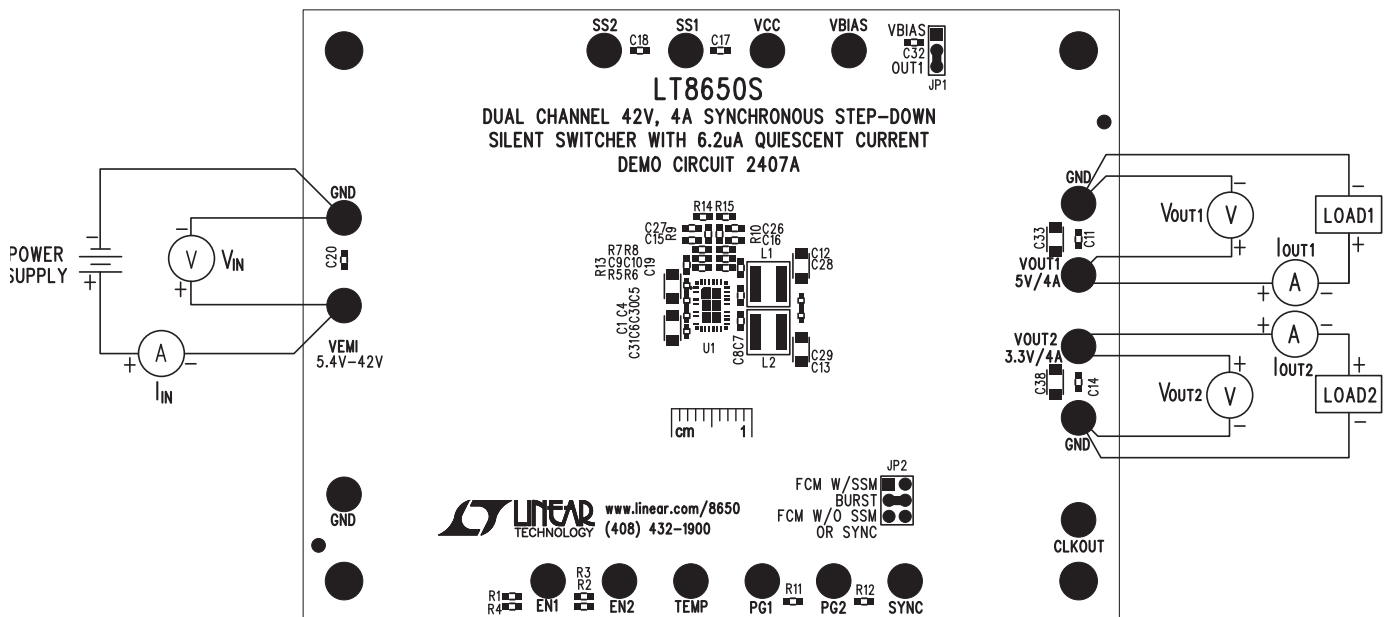


Figure 3. Proper Measurement Equipment Setup

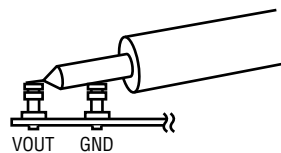


Figure 4. Measure Output Ripple

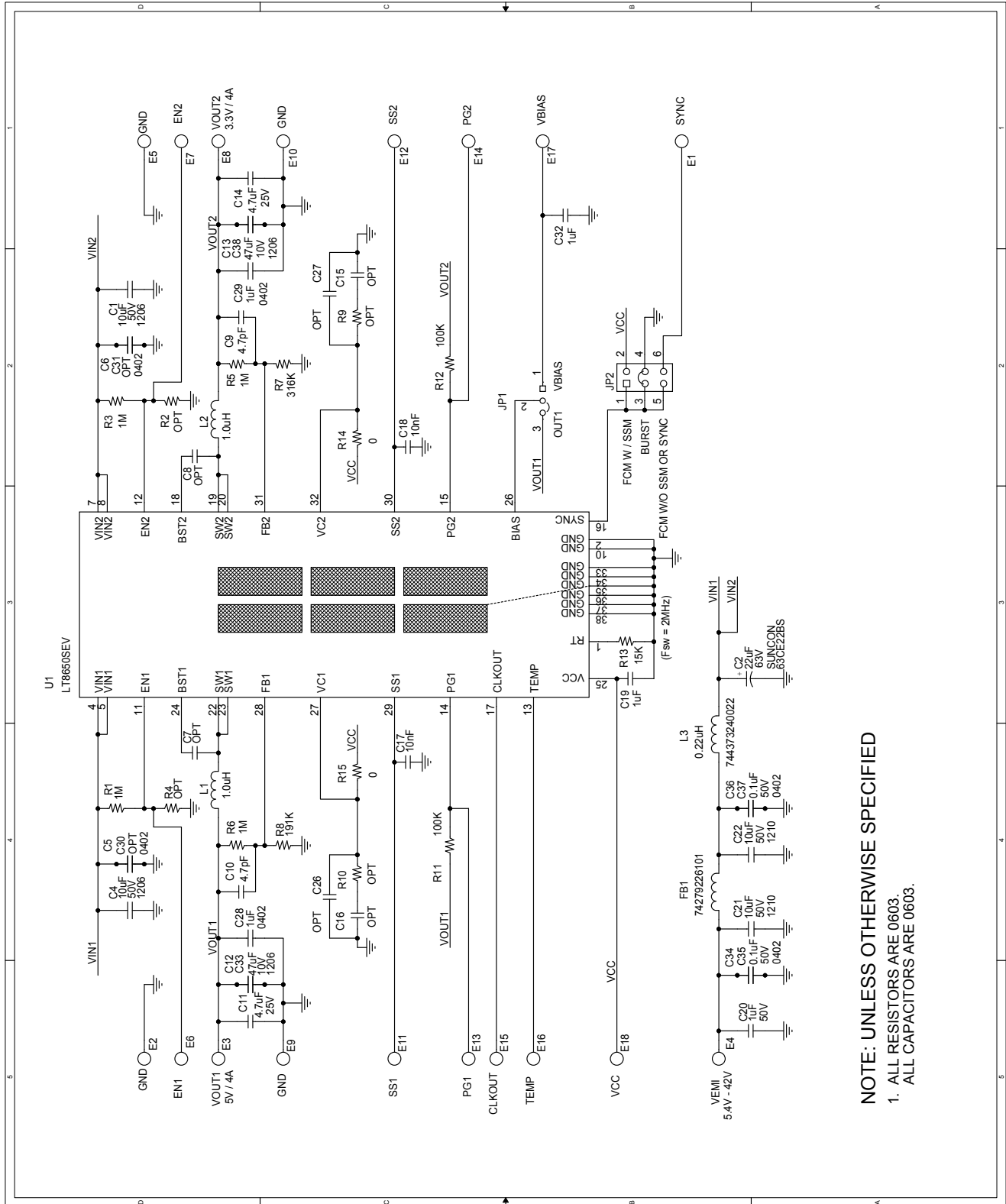
# DEMO MANUAL

## DC2407A

### PARTS LIST

| ITEM  | QTY | REFERENCE                        | PART DESCRIPTION                          | MANUFACTURER/PART NUMBER          |
|---|-----|----------------------------------|---|-----------------------------------|
| <b>Required Circuit Components</b>              |     |                                  |   |                                   |
| 1   | 2   | C1, C4                           | CAP., 10 $\mu$ F, X5R, 50V, 10%, 1206     | MURATA, GRM31CR61H106KA12L        |
| 2   | 2   | C9, C10                          | CAP., 4.7pF, C0G, 50V, $\pm$ 0.25pF, 0603 | MURATA, GRM1885C1H4R7CA01D        |
| 3   | 2   | C11, C14                         | CAP., 4.7 $\mu$ F, X5R, 25V, 10%, 0603    | MURATA, GRM188R61E475KE11D        |
| 4   | 4   | C12, C13, C33, C38               | CAP., 47 $\mu$ F, X6S, 10V, 10%, 1206     | MURATA, GRM31CC81A476ME44L        |
| 5   | 2   | C17, C18                         | CAP., 10nF, X7R, 25V, 10%, 0603           | MURATA, GRM188R71E103KA01D        |
| 6   | 3   | C19, C20, C32                    | CAP., 1 $\mu$ F, X5R, 50V, 10%, 0603      | MURATA, GRM188R61H105KAALD        |
| 7   | 2   | C28, C29                         | CAP., 1 $\mu$ F, X7S, 10V, 10%, 0402      | MURATA, GCM155C71A105KE38D        |
| 8   | 2   | L1, L2                           | INDUCTOR, 1.0 $\mu$ H, XFL5030            | COILCRAFT, XFL5030-102ME          |
| 9   | 4   | R1, R3, R5, R6                   | RES., 1M, 1/10W, 1%, 0603                 | VISHAY, CRCW06031M00FKEA          |
| 10  | 1   | R7                               | RES., 316k, 1/10W, 1%, 0603               | VISHAY, CRCW0603316KFKEA          |
| 11  | 1   | R8                               | RES., 191k, 1/10W, 1%, 0603               | VISHAY, CRCW0603191KFKEA          |
| 12  | 2   | R11, R12                         | RES., 100k, 1/10W, 1%, 0603               | VISHAY, CRCW0603100KFKEA          |
| 13  | 1   | R13                              | RES., 15k, 1/10W, 1%, 0603                | VISHAY, CRCW060315K0FKEA          |
| 14  | 2   | R14, R15                         | RES., 0 $\Omega$ , 1/10W, 0603            | VISHAY, CRCW06030000Z0EA          |
| 15  | 1   | U1                               | I.C. LT8650SEV, LGA                       | LINEAR TECH., LT8650SEV#PBF       |
| <b>Additional Demo Board Circuit Components</b> |     |                                  |   |                                   |
| 1   | 1   | C2                               | CAP., 22 $\mu$ F, ALUM, 63V               | SUN ELECT., 63CE22BS              |
| 2   | 0   | C5, C6, C30, C31 (OPT)           | CAP., OPTION, 0402                        |                                   |
| 3   | 0   | C7, C8, C15, C16, C26, C27 (OPT) | CAP., OPTION, 0603                        |                                   |
| 4   | 2   | C21, C22                         | CAP., 10 $\mu$ F, X7R, 50V, 10%, 1210     | MURATA, GRM32ER71H106KA12L        |
| 5   | 4   | C34-C37                          | CAP., 0.1 $\mu$ F, X7R, 50V, 10%, 0402    | MURATA, GCM155R71H104KE02D        |
| 6   | 1   | FB1                              | CHIP BEAD                                 | Würth Elektronik, 74279226101     |
| 7   | 1   | L3                               | INDUCTOR, 0.22 $\mu$ H                    | Würth Elektronik, 744373240022    |
| 8   | 0   | R2, R4, R9, R10 (OPT)            | RES, OPTION 0603                          |                                   |
| <b>Hardware for Demo Board Only</b>             |     |                                  |   |                                   |
| 1   | 18  | E1-E18                           | TESTPOINT, TURRET, 0.094" PBF             | MILL-MAX, 2501-2-00-80-00-00-07-0 |
| 2   | 1   | JP1                              | HEADER 3 PIN 0.079 SINGLE ROW             | Würth Elektronik, 62000311121     |
| 3   | 1   | JP2                              | HEADER 3 PIN 0.079 DOUBLE ROW             | Würth Elektronik, 62000621121     |
| 4   | 2   | xJP1, xJP2                       | SHUNT, 0.079" CENTER                      | Würth Elektronik, 60800213421     |
| 5   | 4   | (STAND-OFF)                      | STAND-OFF, NYLON 11.1mm                   | Würth Elektronik, 702934000       |

## SCHEMATIC DIAGRAM



**NOTE: UNLESS OTHERWISE SPECIFIED**  
1. ALL RESISTORS ARE 0603.  
ALL CAPACITORS ARE 0603.

# DEMO MANUAL

## DC2407A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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