

LT8650S

Dual Channel 42V, 4A Synchronous Step-Down Silent Switcher with 6.2 μ A Quiescent Current

DESCRIPTION

Demonstration circuit 2407A is a dual channel 42V, 4A synchronous step-down Silent Switcher® with 6.2 μ 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® 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>

LT, LT, LTC, LTM, Linear Technology, the Linear logo, Silent Switcher, and Burst Mode are registered trademarks of Analog Devices, Inc. All other trademarks are the property of their respective owners.

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

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

TYPICAL PERFORMANCE CHARACTERISTICS

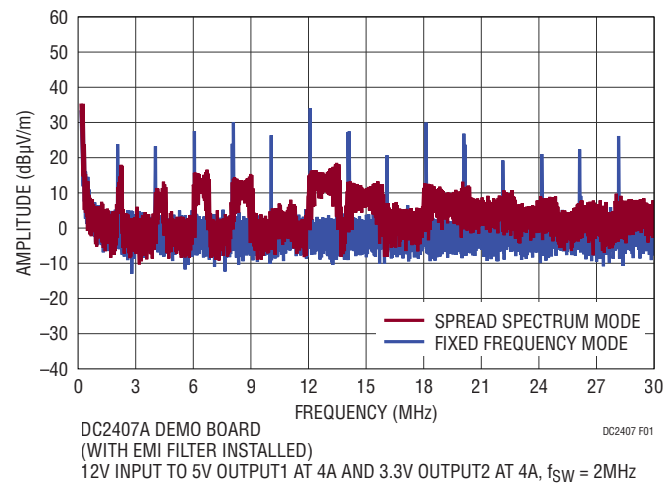


Figure 1. Conducted EMI Performance

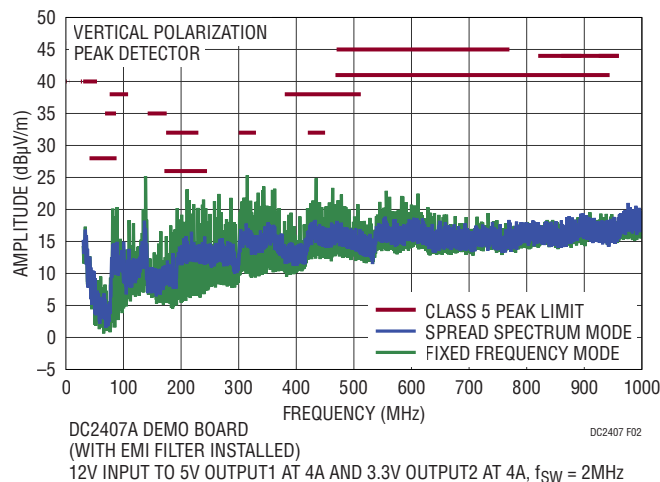


Figure 2: Radiated EMI Performance (CISPR 25 Radiated Emission Test with Class 5 Peak Limits)

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.

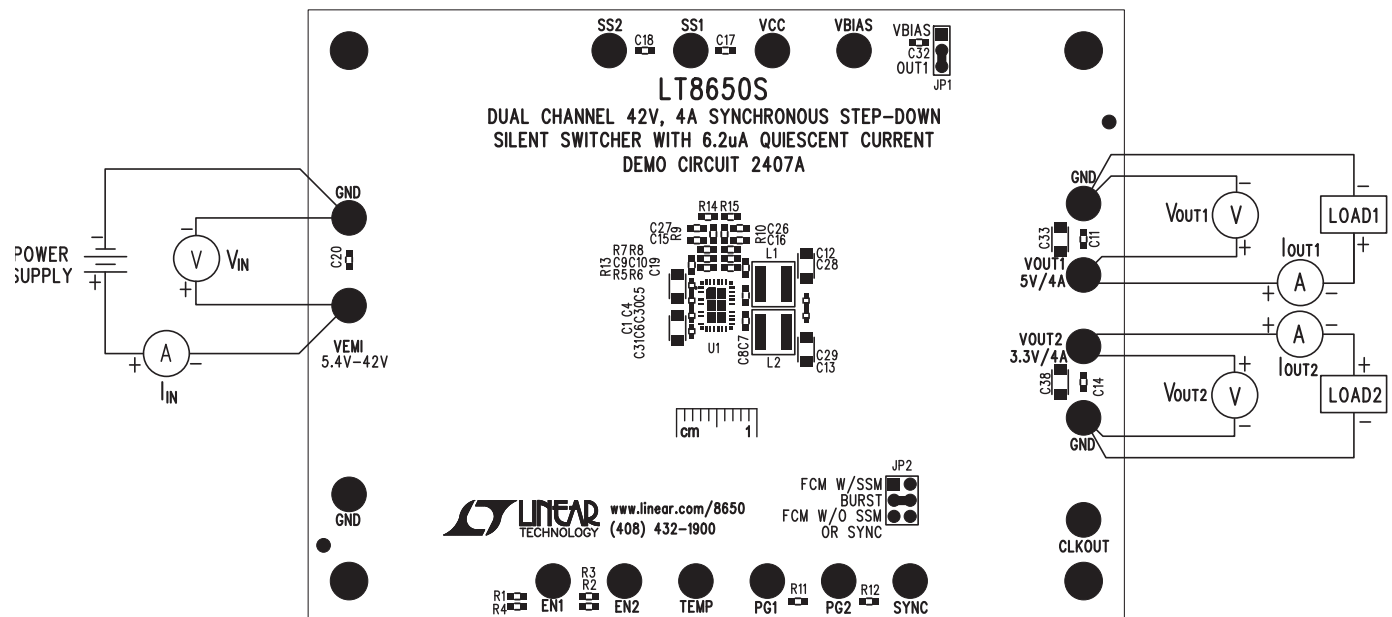


Figure 3. Proper Measurement Equipment Setup

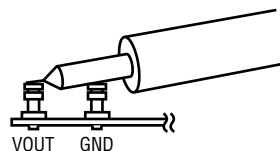


Figure 4. Measure Output Ripple

DEMO MANUAL

DC2407A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	2	C1, C4	CAP., 10 μ 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 μ F, X5R, 25V, 10%, 0603	MURATA, GRM188R61E475KE11D
4	4	C12, C13, C33, C38	CAP., 47 μ 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 μ F, X5R, 50V, 10%, 0603	MURATA, GRM188R61H105KAALD
7	2	C28, C29	CAP., 1 μ F, X7S, 10V, 10%, 0402	MURATA, GCM155C71A105KE38D
8	2	L1, L2	INDUCTOR, 1.0 μ 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 Ω , 1/10W, 0603	VISHAY, CRCW06030000Z0EA
15	1	U1	I.C. LT8650SEV, LGA	LINEAR TECH., LT8650SEV#PBF
Additional Demo Board Circuit Components				
1	1	C2	CAP., 22 μ 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 μ F, X7R, 50V, 10%, 1210	MURATA, GRM32ER71H106KA12L
5	4	C34-C37	CAP., 0.1 μ F, X7R, 50V, 10%, 0402	MURATA, GCM155R71H104KE02D
6	1	FB1	CHIP BEAD	Würth Elektronik, 74279226101
7	1	L3	INDUCTOR, 0.22 μ H	Würth Elektronik, 744373240022
8	0	R2, R4, R9, R10 (OPT)	RES., OPTION 0603	
Hardware for Demo Board Only				
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

DEMO MANUAL

DC2407A

DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

Please read the DEMO BOARD manual prior to handling the product. Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

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

Mailing Address:

Linear Technology
1630 McCarthy Blvd.
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation