

LTC3787EUFD

4-Phase High Current Synchronous Step-Up Converter

DESCRIPTION

Demonstration circuit 2001A is a step-up DC/DC converter using two **LTC3787EUFD** dual-phase synchronous boost controllers in a parallel configuration for high current, high power 4-phase operation.

The DC2001A has an input supply voltage range from 6V to 24V. The converter provides an output voltage of 24V, with a very high efficiency output of 25A to 30A, as shown in Figure 2.

The **LTC3787** data sheet gives a complete description of the part, operation and application information, and must be read in conjunction with this demo manual for the DC2001A.

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

LT, LTC, LTM, Linear Technology, Burst Mode and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

PERFORMANCE SUMMARY

Specifications are at $T_A = 25^\circ\text{C}$

PARAMETER	CONDITIONS	UNITS
Minimum Input Voltage	$I_{OUT} = 0\text{A to } 25\text{A}$	6V
Maximum Input Voltage	$I_{OUT} = 0\text{A to } 30\text{A}$	24V
Output Voltage	$V_{IN} = 6\text{V to } 24\text{V}$, MODE = FCC	24V $\pm 2\%$
Default Operating Frequency	FREQ = GND	350kHz
Efficiency	$V_{IN} = 18\text{V}$, $V_O = 24\text{V}$, $I_O = 30\text{A}$	98.2%

QUICK START PROCEDURE

Demonstration circuit 2001A is easy to set up to evaluate the performance of the LTC3787. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below.

1. Set the jumper as follows:

JP1: FCC

JP2: ON

2. With all power off, connect the input power supply, load, and meters using heavy duty cables, as shown in Figure 1.

NOTE: Input supply must be capable of at least 65A at 12V, or 110A at 6V.

3. Preset the system load to 0A and the input supply to 12V, 2A current limit.

4. Turn on the supply and adjust the voltage to the desired value, up to 24V, while monitoring the output.

NOTE: Do not exceed 33V input.

5. Once the proper output voltage has been established, increase the current limit as necessary.
6. Turn on the load and adjust as necessary.

Optional

1. For pulse skip or Burst Mode® operation, set jumper JP1 to PS or BM.
2. To shut down switching, set jumper JP2 to OFF.
3. For power good indication, monitor PGOOD.
4. For external clock synchronization, connect the clock source to CLKIN and remove jumper JP1.

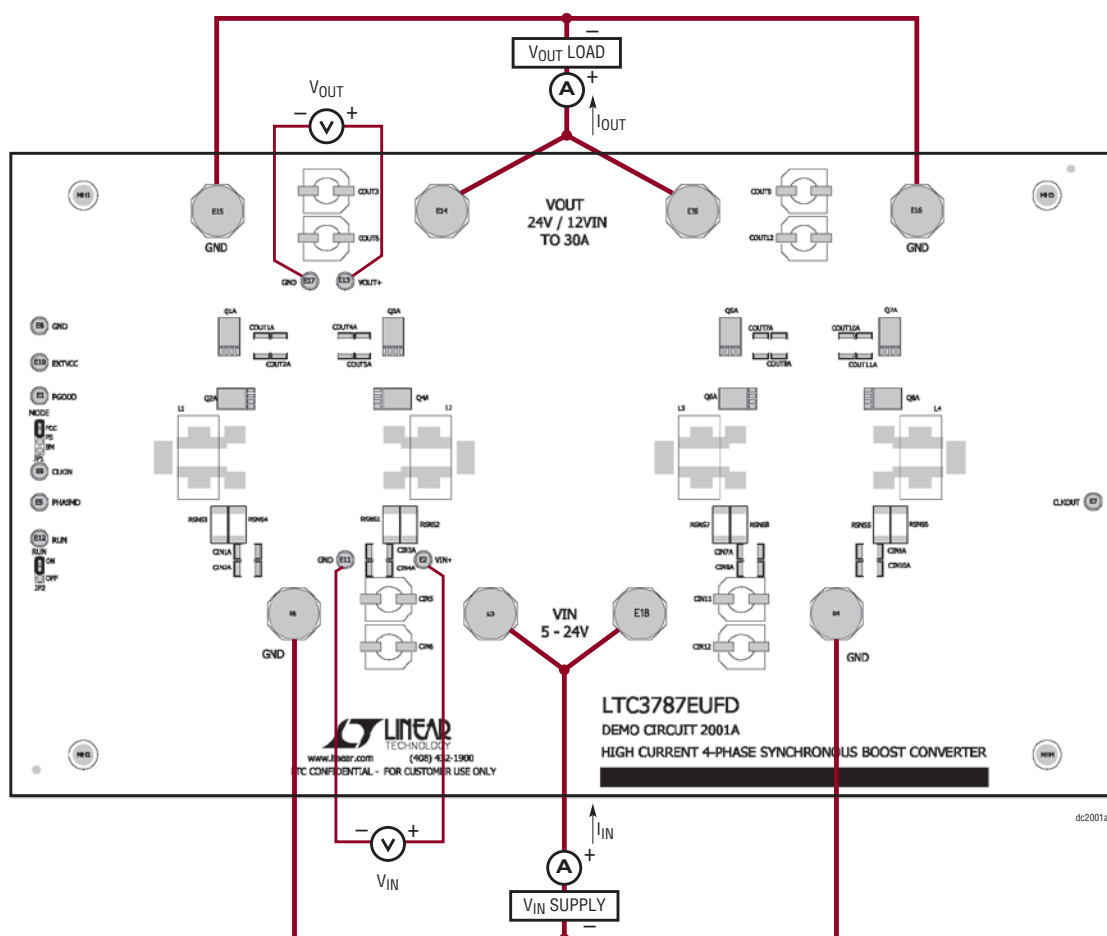


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

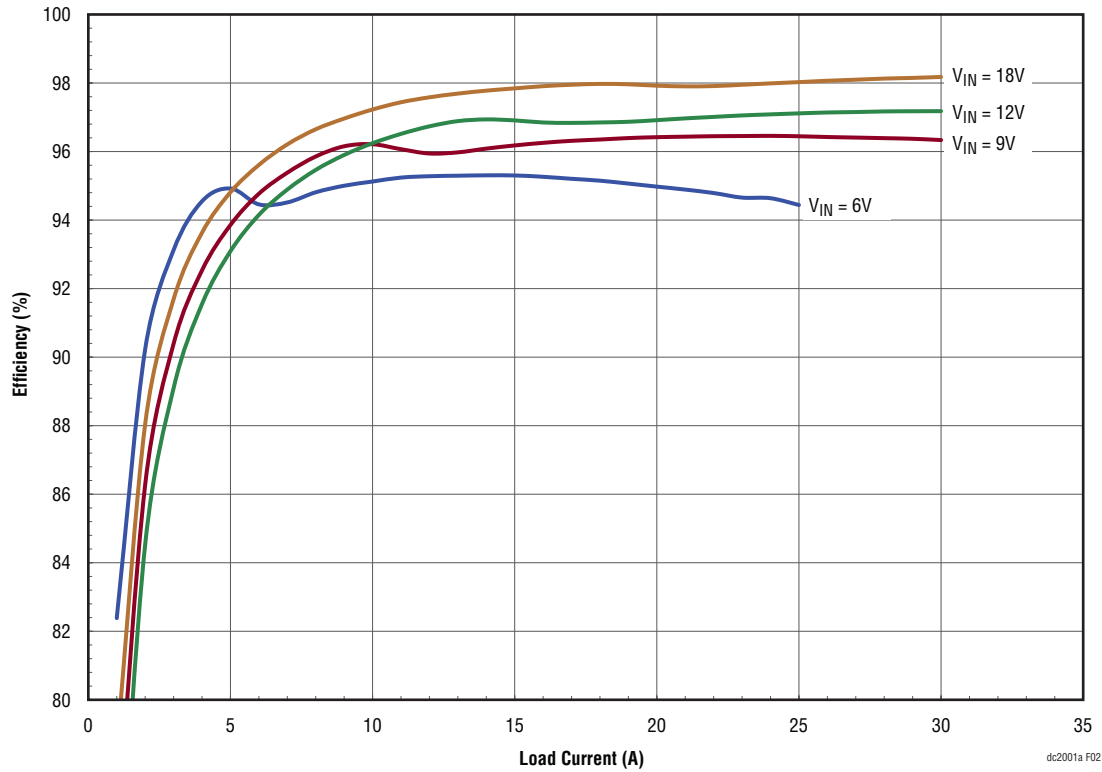


Figure 2. Efficiency Curves, $f_{sw} = 350\text{kHz}$, MODE = FCC

DEMO MANUAL DC2001A

PARTS LIST

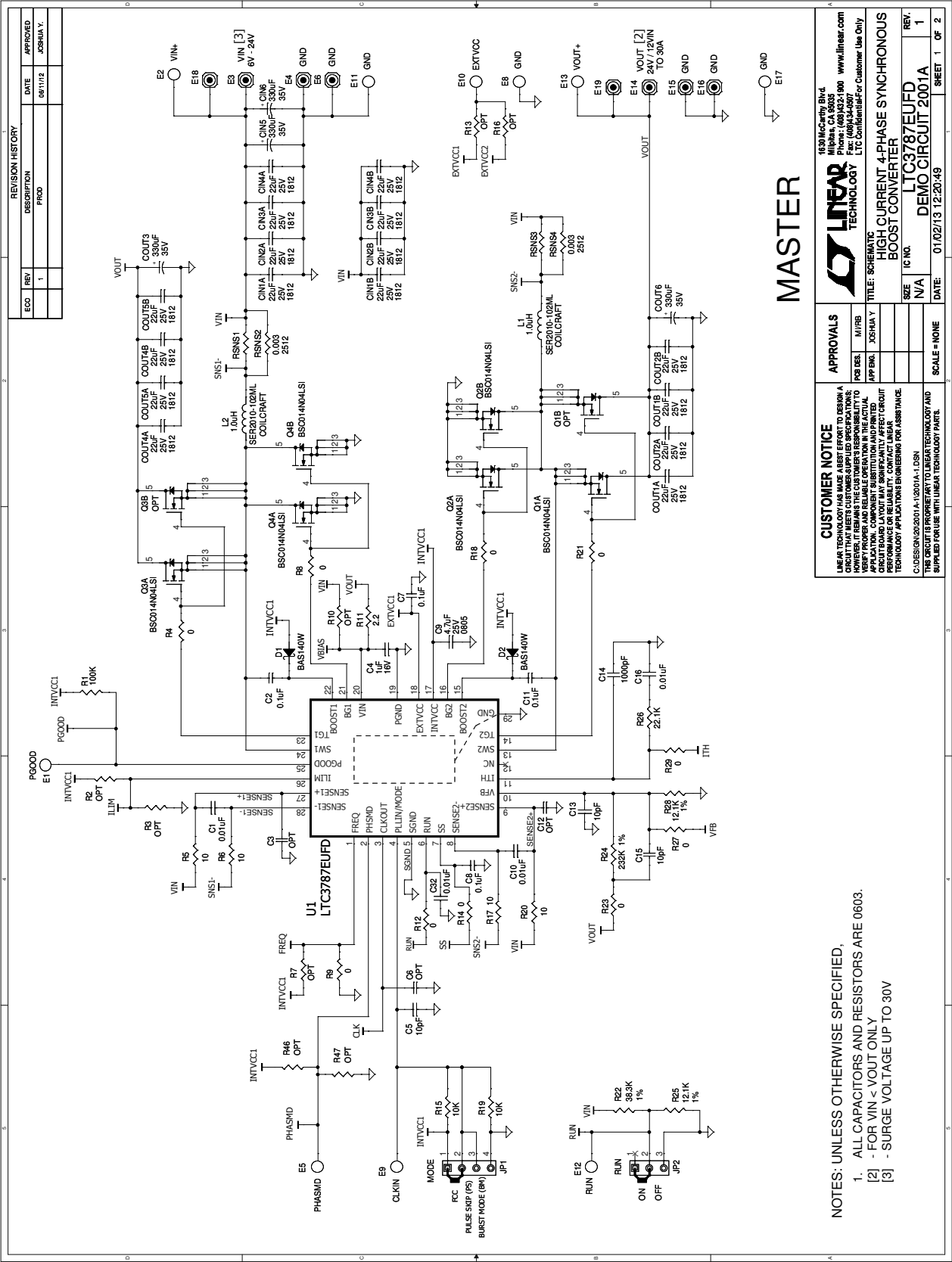
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	32	CIN1A-CIN4A, CIN1B-CIN4B, CIN7A-CIN10A, CIN7B-CIN10B, COUT1A-COUT2A, COUT1B-COUT2B, COUT4A-COUT5A, COUT4B-COUT5B, COUT7A-COUT8A, COUT7B-COUT8B, COUT10A-COUT11A, COUT10B-COUT11B	CAP, X7R, 22 μ F, 20%, 25V, 1812	TDK, C4532X7R1E226M
2	8	CIN5-CIN6, CIN11-CIN12, COUT3, COUT6, COUT9, COUT12	CAP, 330 μ F, 20%, 35V, ELECT	NIPPON CHEMI-CON, EMZA350ADA331MJA0G
3	8	C1, C10, C16-C17, C26, C31-C33	CAP, X7R, 0.01 μ F, 5%, 25V, 0603	AVX, 06033C103JAT2A
4	8	C2, C7-C8, C11, C19, C23-C24, C27	CAP, X7R, 0.1 μ F, 10%, 25V, 0603	TDK, C1608X7R1E104K
5	2	C4, C21	CAP, X7R, 1 μ F, 10%, 16V, 0603	TAIYO YUDEN, EMK107BJ105KA-T
6	5	C5, C13, C15, C22, C29	CAP, NPO, 10pF, 5%, 25V, 0603	AVX, 06033A100JAT2A
7	2	C9, C25	CAP, X5R, 4.7 μ F, 20%, 25V, 0805	TAIYO YUDEN, TMK212BJ475MG-T
8	2	C14, C30	CAP, NPO, 1000pF, 5%, 25V, 0603	AVX, 06033A102JAT2A
9	4	D1-D4	DIODE, SCHOTTKY, 30V, SOD123	INFINEON, BAS140W
10	4	L1-L4	IND, 1.0 μ H	COILCRAFT, SER2010-102MLB
11	12	Q1A-Q8A, Q2B, Q4B, Q6B, Q8B	XSTR, MOSFET N-CHANNEL	INFINEON, BSC014N04LSI
12	1	R1	RES, 100k, 5%, 1/10W, 0603	VISHAY, CRCW0603100KJNEA
13	8	R5-R6, R17, R20, R31-R32, R39, R41	RES, 10 Ω , 5%, 1/10W, 0603	VISHAY, CRCW060310R0JNEA
14	2	R11, R35	RES, 2.2 Ω , 5%, 1/10W, 0603	VISHAY, CRCW06032R20JNEA
15	2	R15, R19	RES, 10k, 5%, 1/10W, 0603	VISHAY, CRCW060310K0JNEA
16	1	R22	RES, 38.3k, 1%, 1/10W, 0603	VISHAY, CRCW060338K3FKEA
17	1	R24	RES, 232k, 1%, 1/10W, 0603	VISHAY, CRCW0603232KFKEA
18	2	R25, R28	RES, 12.1k, 1%, 1/10W, 0603	VISHAY, CRCW060312K1FKEA
19	2	R26, R45	RES, 22.1k, 1%, 1/10W, 0603	VISHAY, CRCW060322K1FKEA
20	1	R36	RES, 100 Ω , 5%, 1/10W, 0603	VISHAY, CRCW0603100RJNEA
21	8	RSNS1-RSNS8	RES, 0.003 Ω , 1%, 1W, 2512	PANASONIC, ERJM1WSF3M0U
22	2	U1, U2	IC, LTC3787EUFDPBF	LINEAR TECHNOLOGY, LTC3787EUFDPBF
Additional Demo Board Circuit Components				
1	0	C3, C6, C12, C18, C20, C28	CAP, OPTIONAL, 0603	
2	0	R2, R3, R7, R10, R13, R16, R34, R46-R49	RES, OPTIONAL, 0603	
3	18	R4, R8-R9, R12, R14, R18, R21, R23, R27, R29-R30, R33, R37-R38, R40, R42-R44	RES, 0 Ω , JUMPER, 0603	VISHAY, CRCW06030000Z0EA
4	0	Q1B, Q3B, Q5B, Q7B	XSTR, MOSFET N-CHAN OPTIONAL	

PARTS LIST

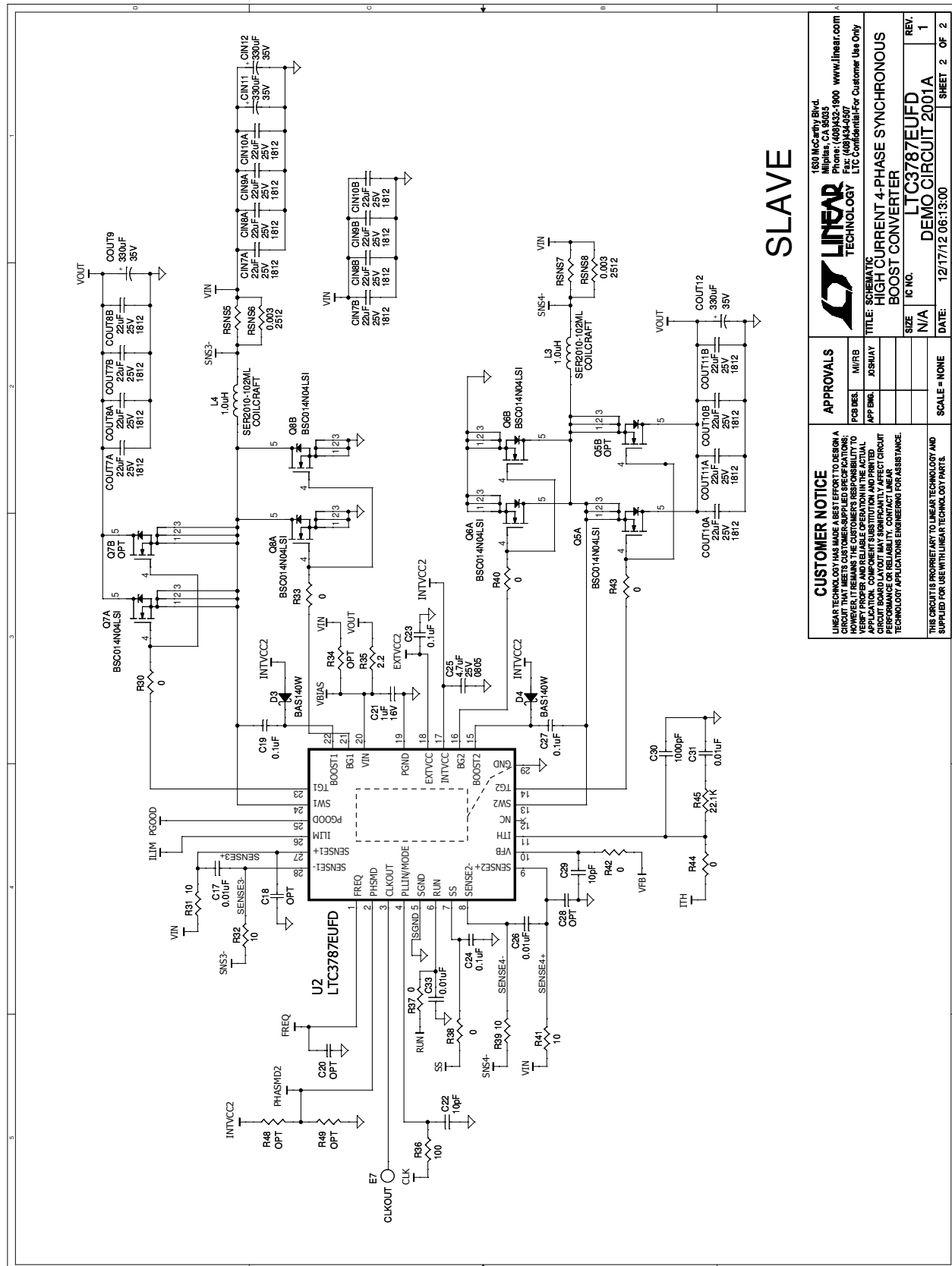
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Hardware: For Demo Board Only				
2	1	JP1	HEADER, 4-PIN, 2mm	SULLINS, NRPN041PAEN-RC
3	1	JP2	HEADER, 3-PIN, 2mm	SULLINS, NRPN031PAEN-RC
8	2	JP1, JP2	SHUNT	SAMTEC, 2SN-BK-G
1	11	E1-E2, E5, E7-E13, E17	TURRET	MILL-MAX, 2501-2-00-80-00-00-07-0
4	8	E3-E4, E6, E14-E16, E18-E19	STUD, TEST PIN	PEM, KFH-032-10
6	8	E3-E4, E6, E14-E16, E18-E19	LUG RING, #10	KEYSTONE, 8205
7	8	E3-E4, E6, E14-E16, E18-E19	WASHER, #10 TIN PLATED BRASS	ANY #10 EXT BZ TN
5	16	E3-E4, E6, E14-E16, E18-E19 (×2)	NUT, BRASS 10-32	ANY #10-32
9	4	MH1, MH2, MH3, MH4	STANDOFF, SNAP-ON	KEYSTONE, 8834

DEMO MANUAL DC2001A

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



dc2001af

DEMO MANUAL DC2001A

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

dc2001af