

# 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>**

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

PARAMETER	CONDITIONS	UNITS
Minimum Input Voltage	I <sub>OUT</sub> = 0A to 25A	6V
Maximum Input Voltage	I <sub>OUT</sub> = 0A to 30A	24V
Output Voltage	V <sub>IN</sub> = 6V to 24V, MODE = FCC	24V ±2%
Default Operating Frequency	FREQ = GND	350kHz
Efficiency	V <sub>IN</sub> = 18V, V <sub>O</sub> = 24V, I <sub>O</sub> = 30A	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<sup>®</sup> 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.

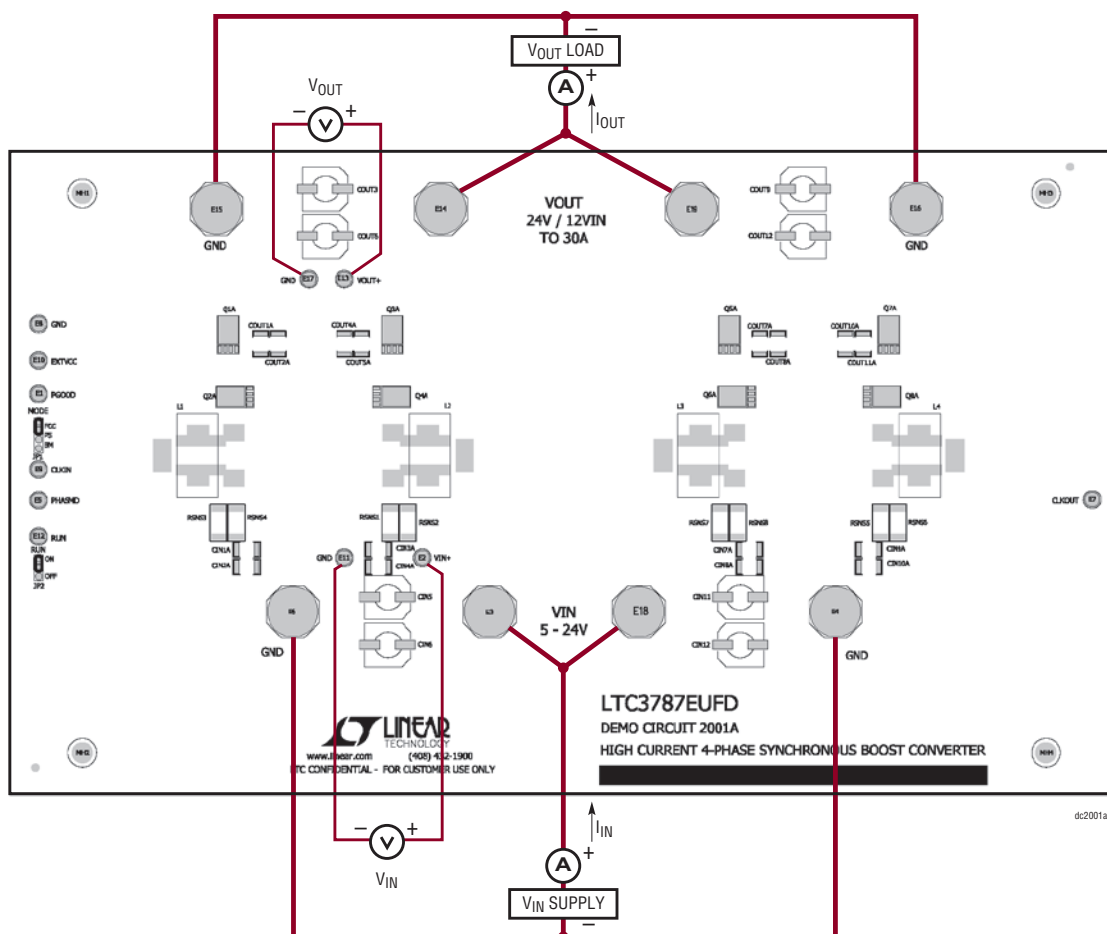


Figure 1. Proper Measurement Equipment Setup

**QUICK START PROCEDURE**

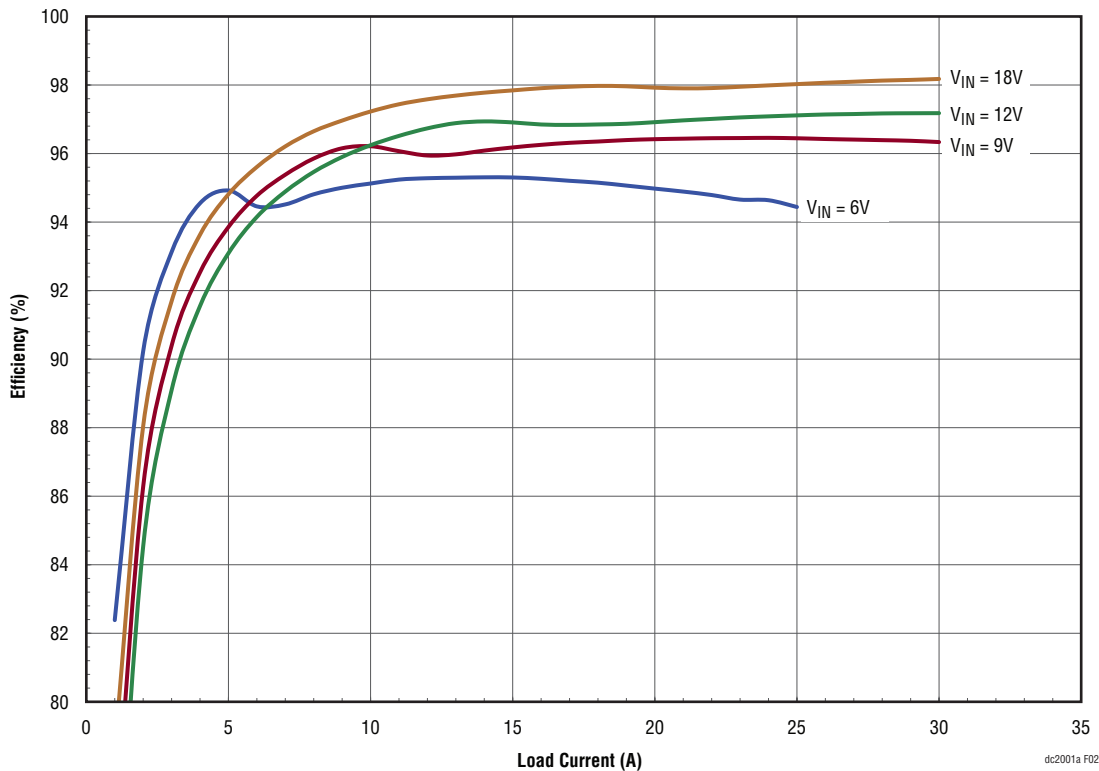


Figure 2. Efficiency Curves,  $f_{sw} = 350kHz$ , MODE = FCC

# DEMO MANUAL DC2001A

## PARTS LIST

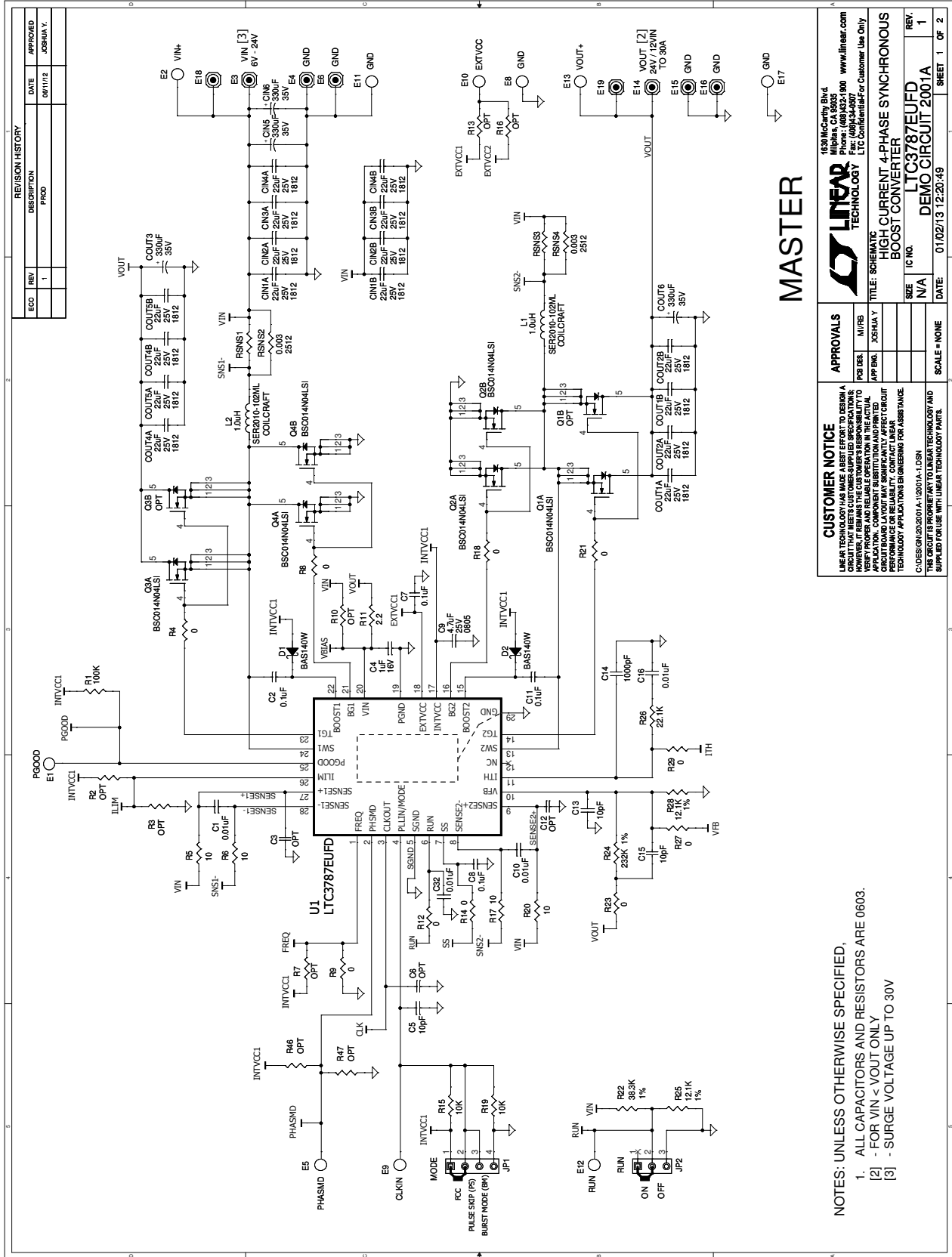
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	32	CIN1A-CIN4A, CIN1B-CIN4B, CIN7A-CIN10A, CIN7B-CIN10B, COUT1A-COUT2A, COUT1B-COUT2B, COUT4A-COUT5A, COUT4B-COUT5B, COUT7A-COUT8A, COUT7B-COUT8B, COUT10A-COUT11A, COUT10B-COUT11B	CAP, X7R, 22 $\mu$ F, 20%, 25V, 1812	TDK, C4532X7R1E226M
2	8	CIN5-CIN6, CIN11-CIN12, COUT3, COUT6, COUT9, COUT12	CAP, 330 $\mu$ F, 20%, 35V, ELECT	NIPPON CHEMI-CON, EMZA350ADA331MJA0G
3	8	C1, C10, C16-C17, C26, C31-C33	CAP, X7R, 0.01 $\mu$ F, 5%, 25V, 0603	AVX, 06033C103JAT2A
4	8	C2, C7-C8, C11, C19, C23-C24, C27	CAP, X7R, 0.1 $\mu$ F, 10%, 25V, 0603	TDK, C1608X7R1E104K
5	2	C4, C21	CAP, X7R, 1 $\mu$ 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 $\mu$ 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 $\mu$ 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 $\Omega$ , 5%, 1/10W, 0603	VISHAY, CRCW060310R0JNEA
14	2	R11, R35	RES, 2.2 $\Omega$ , 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 $\Omega$ , 5%, 1/10W, 0603	VISHAY, CRCW0603100RJNEA
21	8	RSNS1-RSNS8	RES, 0.003 $\Omega$ , 1%, 1W, 2512	PANASONIC, ERJM1WSF3M0U
22	2	U1, U2	IC, LTC3787EUFDF#PBF	LINEAR TECHNOLOGY, LTC3787EUFDF#PBF
<b>Additional Demo Board Circuit Components</b>				
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 $\Omega$ , JUMPER, 0603	VISHAY, CRCW06030000Z0EA
4	0	Q1B, Q3B, Q5B, Q7B	XSTR, MOSFET N-CHAN OPTIONAL	

## PARTS LIST

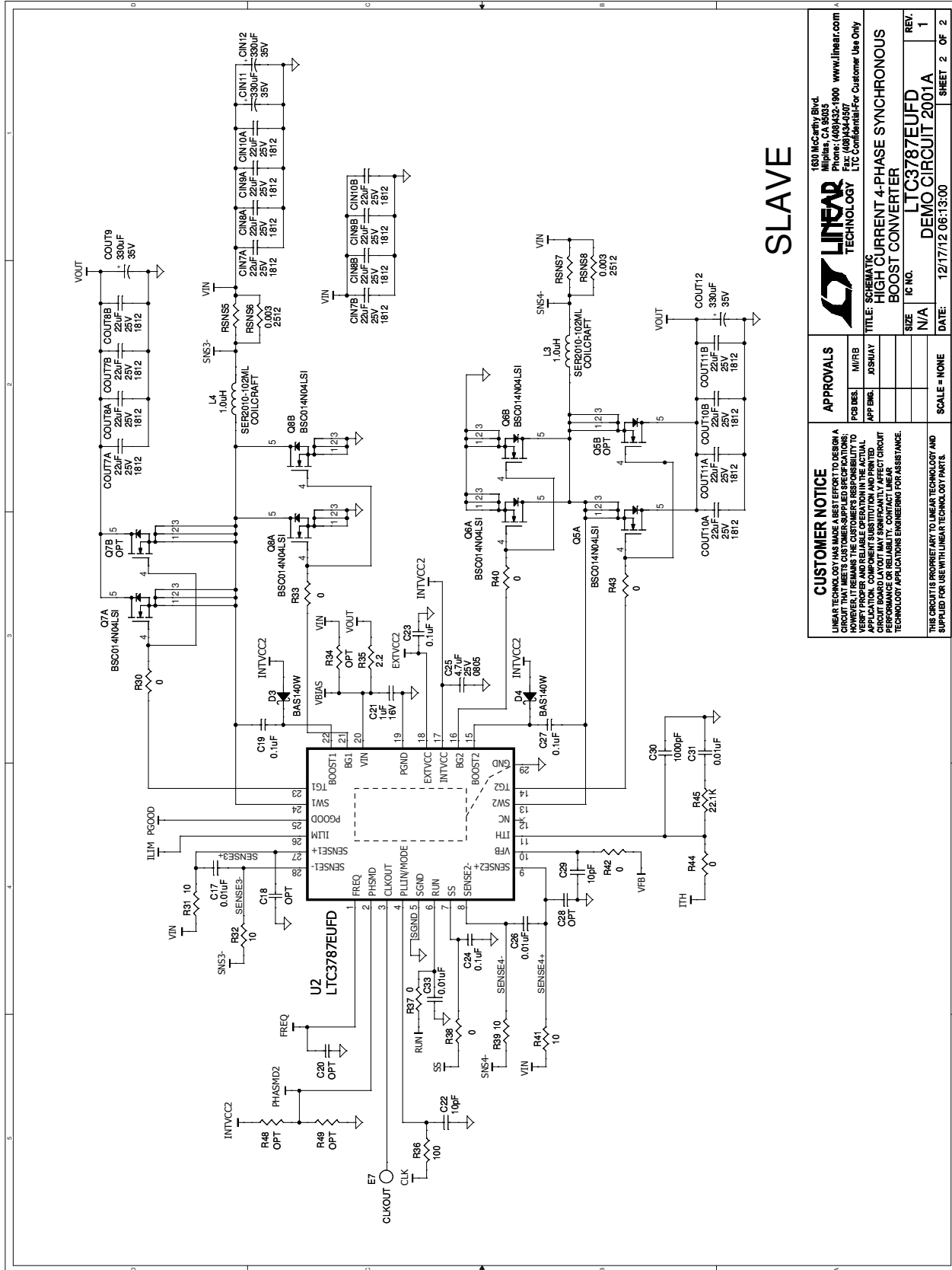
ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Hardware: For Demo Board Only</b>				
2	1	JP1	HEADER, 4-PIN, 2mm	SULLINS, NRPN041PAEN-RC
3	1	JP2	HEADER, 3-PIN, 2mm	SULLINS, NRPN031PAEN-RC
8	2	JP1, JP2	SHUNT	SAMTEC, 2SN-BK-G
1	11	E1-E2, E5, E7-E13, E17	TURRET	MILL-MAX, 2501-2-00-80-00-00-07-0
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 (x2)	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**



**SLAVE**

<p><b>CUSTOMER NOTICE</b>                  LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A CIRCUIT THAT MEETS CUSTOMER-APPLIED SPECIFICATIONS; HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THAT THE CIRCUIT MEETS ALL APPLICABLE ELECTRICAL AND MECHANICAL REQUIREMENTS. COMPONENT SUBSTITUTION AND PRINTED CIRCUIT BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE AND RELIABILITY. LINEAR TECHNOLOGY PROVIDES THIS SCHEMATIC FOR REFERENCE ONLY. LINEAR TECHNOLOGY PROVIDES ENGINEERING FOR ASSISTANCE.</p>		<p><b>APPROVALS</b></p> <table border="1"> <tr> <td>PCB DEL.</td> <td>M/FRB</td> </tr> <tr> <td>APP ENG.</td> <td>JOSHUAY</td> </tr> </table>		PCB DEL.	M/FRB	APP ENG.	JOSHUAY
PCB DEL.	M/FRB						
APP ENG.	JOSHUAY						
<p>180 MAC AVE, Bldg. 2                  MILWAUKEE, WI 53153                  PHONES: (414)332-1800 www.linear.com                  FAX: (414)332-4507                  LTC Confidential For Customer Use Only</p>		<p><b>TITLE:</b> SCHEMATIC  <b>DESCRIPTION:</b> HIGH CURRENT 4-PHASE SYNCHRONOUS BOOST CONVERTER</p>					
<p><b>SCALE:</b> NONE</p>		<p><b>REV.:</b> 1</p>					
<p><b>DATE:</b> 12/17/12 06:13:00</p>		<p><b>SHEET:</b> 2 OF 2</p>					



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