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

PERFORMANCE SUMMARY

Specifications are at T_A = 25°C

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

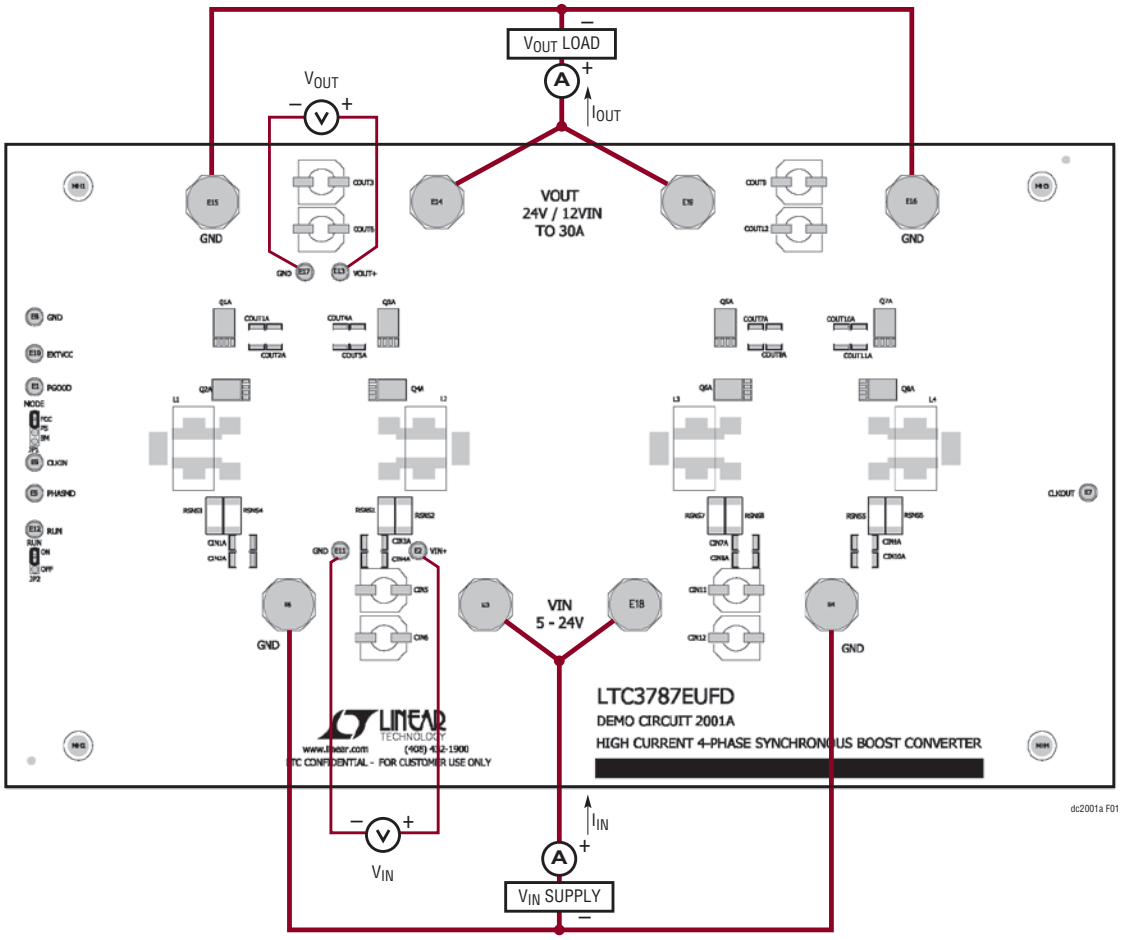


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

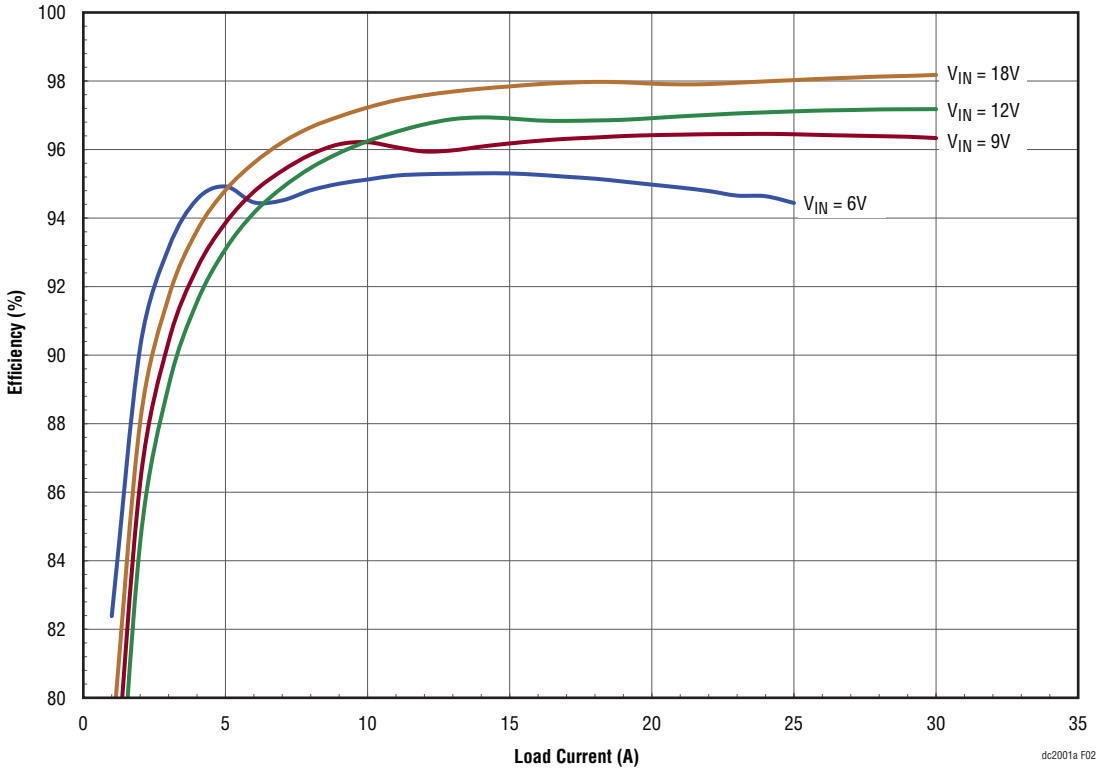


Figure 2. Efficiency Curves, f_{SW} = 350kHz, MODE = FCC

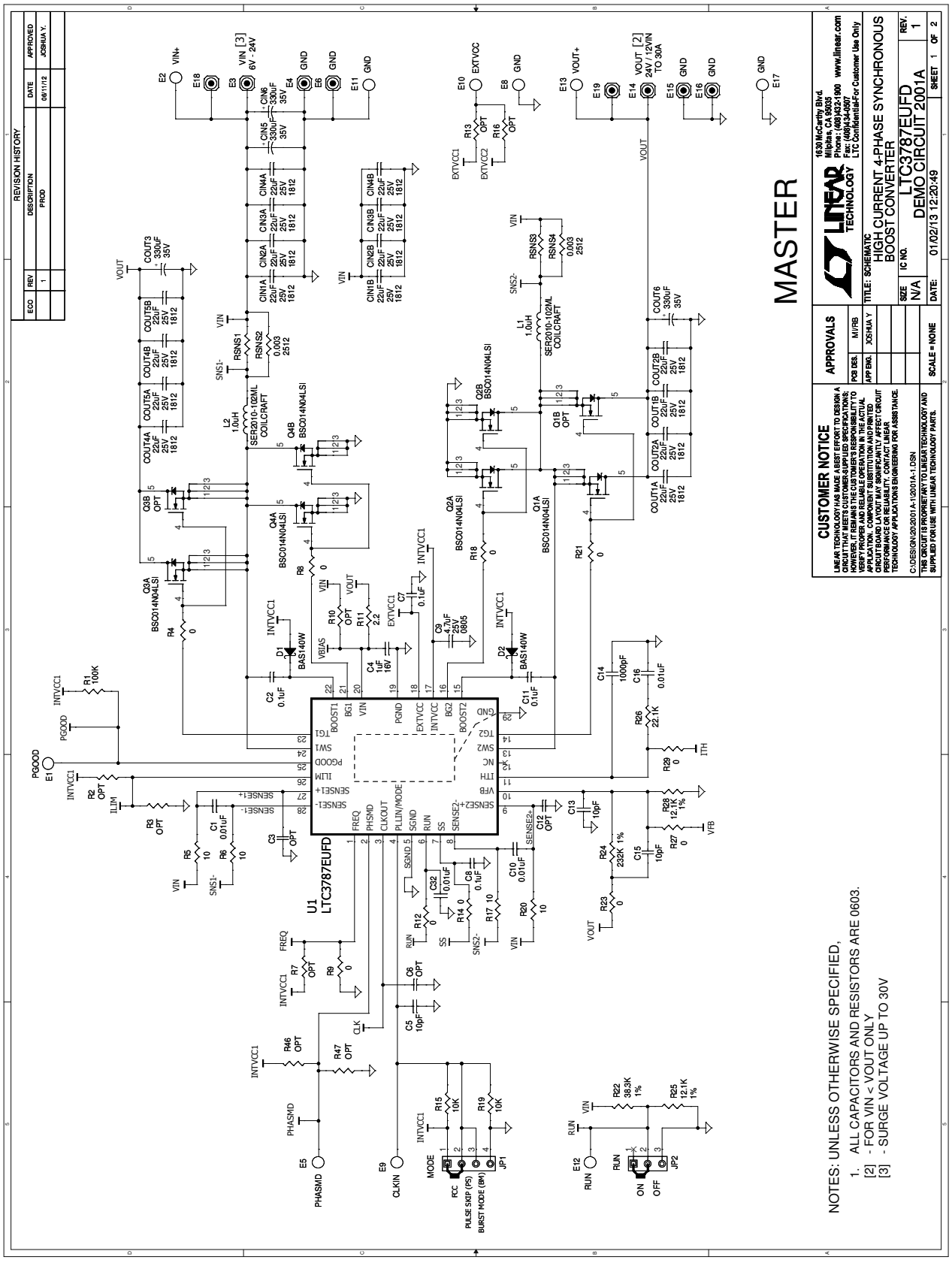
PARTS LIST

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, 22µF, 20%, 25V, 1812	TDK, C4532X7R1E226M
2	8	CIN5-CIN6, CIN11-CIN12, COUT3, COUT6, COUT9, COUT12	CAP, 330µF, 20%, 35V, ELECT	NIPPON CHEMI-CON, EMZA350ADA331MJA0G
3	8	C1, C10, C16-C17, C26, C31-C33	CAP, X7R, 0.01µF, 5%, 25V, 0603	AVX, 06033C103JAT2A
4	8	C2, C7-C8, C11, C19, C23-C24, C27	CAP, X7R, 0.1µF, 10%, 25V, 0603	TDK, C1608X7R1E104K
5	2	C4, C21	CAP, X7R, 1µF, 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, 4.7µF, 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, 1.0µH	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, 10Ω, 5%, 1/10W, 0603	VISHAY, CRCW060310R0JNEA
14	2	R11, R35	RES, 2.2Ω, 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, 100Ω, 5%, 1/10W, 0603	VISHAY, CRCW0603100RJNEA
21	8	RSNS1-RSNS8	RES, 0.003Ω, 1%, 1W, 2512	PANASONIC, ERJM1WSF3M0U
22	2	U1, U2	IC, LTC3787EUFD#PBF	LINEAR TECHNOLOGY, LTC3787EUFD#PBF
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, 0Ω, 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

SCHEMATIC DIAGRAM



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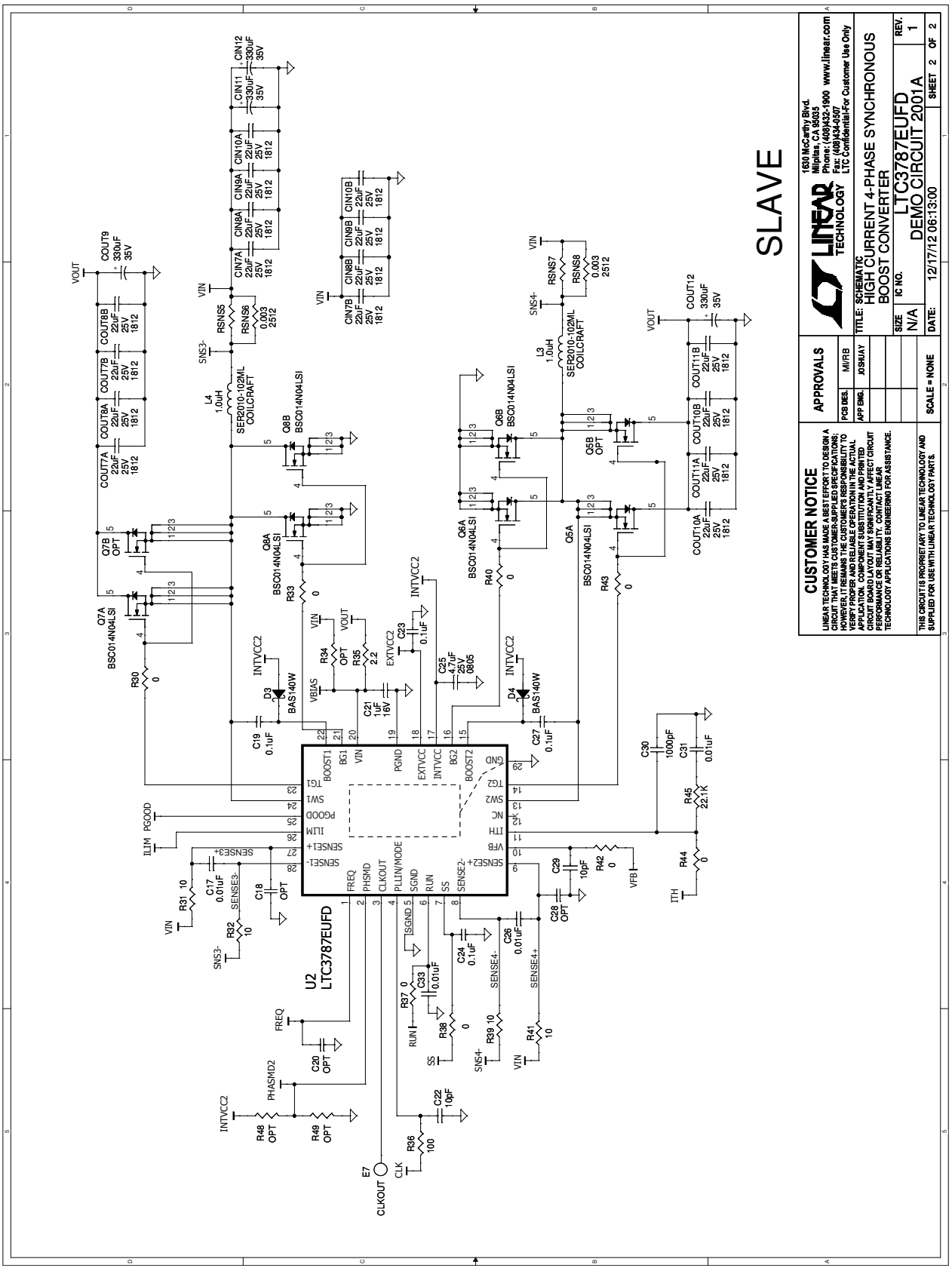

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