

DC2229A-A: LTC3877
DC2229A-B: LTC3877/LTC3874
High Current Step-Down Converter

DESCRIPTION

Demonstration circuits 2229A-A and 2229A-B feature the [LTC[®]3877](#) in two high output current, high efficiency, VID programmed step-down converters with sub-m Ω DCR sensing. For both converters, the input voltage range is 6V to 14V and the switching frequency is 400kHz.

The DC2229A-A provides two outputs. V_{OUT1} is VID programmable from 0.6V to 1.23V and V_{OUT2} is set for 1.5V. Both rails have a maximum load current of 30A. The DC2229A-B assembly is a four phase converter providing a VID programmable output of 0.6V to 1.23V with a maximum load current of 120A. Phases 1 and 2 are controlled by the LTC3877 and phases 3 and 4 are controlled by the LTC3874 slave controller.

The demo board uses 0.25 μ H inductors with a DCR value of 0.325m Ω . The LTC3877 and LTC3874 employ a proprietary sub-m Ω DCR sensing architecture which enhances the signal to provide accurate control of the inductor current. The low DCR inductors, along with the use of low Q_g /low $R_{DS(ON)}$ discrete FETs and strong gate drivers provides high efficiency for high output current supplies. The full load efficiency is 90.3%, as seen on the 1.5V rail of the LTC3877 dual output converter (DC2229A-A assembly) with an input voltage of 12V.

Additional features of this demo board include:

- Remote sensing
- PLLIN and CLKOUT pins
- PGOOD, RUN and TK/SS pins
- Optional resistors to tie two or more phases together
- Optional footprints for BSG0811 dual channel MOSFETs
- Optional NTC network on the ITEMP pin of the LTC3877 for less current limit variation over temperature
- Dynamic load circuit

The demo board uses a high density, two-sided drop-in layout. The core components for each dual phase section consists of MOSFETs, inductors, ceramic C_{IN} , ceramic C_{OUT} on the top layer and the control circuit on the bottom, resides in a 1.3" x 1.3" area of the board.

The LTC3877 and LTC3874 data sheets provide a complete description of the IC operation and application information. These data sheets must be read in conjunction with the quick start guide.

Design files for this circuit board are available at <http://www.linear.com/demo/DC2229A>

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

PERFORMANCE SUMMARY

Table 1. DC2229A-A Performance Summary ($T_A = 25^\circ\text{C}$), No Airflow

PARAMETER	CONDITIONS	VALUES
Minimum Input Voltage		6V
Maximum Input Voltage		14V
Output Voltage V_{OUT1} , VID programmed	$I_{OUT1} = 0\text{A to }30\text{A}$, $V_{IN} = 6\text{V to }14\text{V}$ VID0–VID5 = L VID0, VID5 = L, VID1–VID4 = H VID0–VID5 = H	0.6V \pm 1% 0.9V \pm 1% 1.23V \pm 1%
Output Voltage V_{OUT2}	$I_{OUT2} = 0\text{A to }30\text{A}$, $V_{IN} = 6\text{V to }14\text{V}$	1.5V \pm 1.5%
V_{OUT1} Maximum Output Current, I_{OUT1}	$V_{IN} = 6\text{V to }14\text{V}$	30A
V_{OUT2} Maximum Output Current, I_{OUT2}	$V_{IN} = 6\text{V to }14\text{V}$	30A
Nominal Switching Frequency		400kHz
Efficiency	$V_{OUT1} = 1.2\text{V}$, $I_{OUT1} = 30\text{A}$, $V_{IN} = 12\text{V}$	89.1% typical
See Figures 3 to 5	$V_{OUT2} = 1.5\text{V}$, $I_{OUT2} = 30\text{A}$, $V_{IN} = 12\text{V}$	90.3% typical

Table 2. DC2229A-B Performance Summary ($T_A = 25^\circ\text{C}$), No Airflow

PARAMETER	CONDITIONS	VALUES
Minimum Input Voltage		6V
Maximum Input Voltage		14V
Output Voltage V_{OUT} , VID programmed	$I_{OUT1} = 0\text{A to }120\text{A}$, $V_{IN} = 6\text{V to }14\text{V}$ VID0–VID5 = L VID0, VID5 = L, VID1–VID4 = H VID0–VID5 = H	0.6V \pm 1% 0.9V \pm 1% 1.23V \pm 1%
V_{OUT} Maximum Output Current, I_{OUT}	$V_{IN} = 6\text{V to }14\text{V}$	120A
Nominal Switching Frequency		400kHz
Efficiency, See Figure 6	$V_{OUT} = 1.2\text{V}$, $I_{OUT1} = 120\text{A}$, $V_{IN} = 12\text{V}$	88.8% typical

QUICK START PROCEDURE

Demonstration circuits 2229A-A and 2229A-B are easy to set up to evaluate the performance of the LTC3877 and LTC3874. Please refer to Figure 1 (DC2229A-A assembly) and Figure 2 (DC2229A-B assembly) for the proper measurement equipment setup and follow the procedure below.

1) With power off, connect the input supply, load and meters as shown in Figure 1 or Figure 2. Preset the load to 0A and V_{IN} supply to be 0V. For both assemblies, place the jumpers in the following positions:

JP10	RUN	ON
JP8	MODE	FCM
JP7	VID_EN	H
JP1, JP6	VID0,VID5	L
JP2-JP5	VID1-VID4	H

2) Increase the input voltage to 12V.

3) Check the output voltage.

a) For the LTC3877 dual output converter (2229A-A assembly), V_{OUT1} should be $0.9V \pm 1\%$. V_{OUT2} should be $1.5V \pm 1.5\%$.

b) For the LTC3877/LTC3874 four phase converter (DC2229A-B assembly), V_{OUT1} should be $0.9V \pm 1\%$.

4) Next, apply full load and re-measure V_{OUT} .

a) For the LTC3877 dual output converter (DC2229A-A assembly), the full load current is 30A for V_{OUT1} and 30A for V_{OUT2} .

b) For the LTC3877/LTC3874 four phase converter (DC2229A-B assembly), the full load current is 120A.

5) Re-check regulation.

6) Adjust the input voltage and load current to the desired levels within their limits and observe the regulation, output ripple, load step response, efficiency and other parameters.

7) Adjust V_{OUT1} with VID0-VID5 at JP1-JP6. Refer to the data sheet for the VID programming table.

NOTE 1: To monitor the output voltage ripple, use the BNC connectors labeled V_{OUT1} and V_{OUT2} . V_{OUT1} is at J9 and V_{OUT2} is at J10.

NOTE 2: Do not connect load between the $VO1_SNS^+$ and $VO1_SNS^-$ turrets or between the $VO2_SNS^+$ and $VO2_SNS^-$ turrets. This could damage the converter. Only apply load across the stud connectors on the edge of the board which are located at J3 through J8.

Dynamic Load Circuit (Optional)

Demonstration circuit 2229A provides a simple load step circuit consisting of a MOSFET and sense resistor for V_{OUT1} and V_{OUT2} . To apply a load step, follow the steps below.

1) Pre-set the amplitude of a pulse generator to 0.0V and the duty cycle to 5% or less.

2) To monitor the load step current, connect a scope probe across the $I_{STEP}^{+/-}$ turrets for that rail.

3) Connect the output of the pulse generator to the PULSE GEN turret for the rail under test and connect the return to the adjacent GND turret.

4) With the converter running, slowly increase the amplitude of the pulse generator output to provide the desired load step pulse height. The scaling for the load step signal is 2mV/A.

5) For the four-phase LTC3877/LTC3874 converter (DC2229A-B assembly), either load step circuit can be used.

DEMO MANUAL DC2229A

QUICK START PROCEDURE

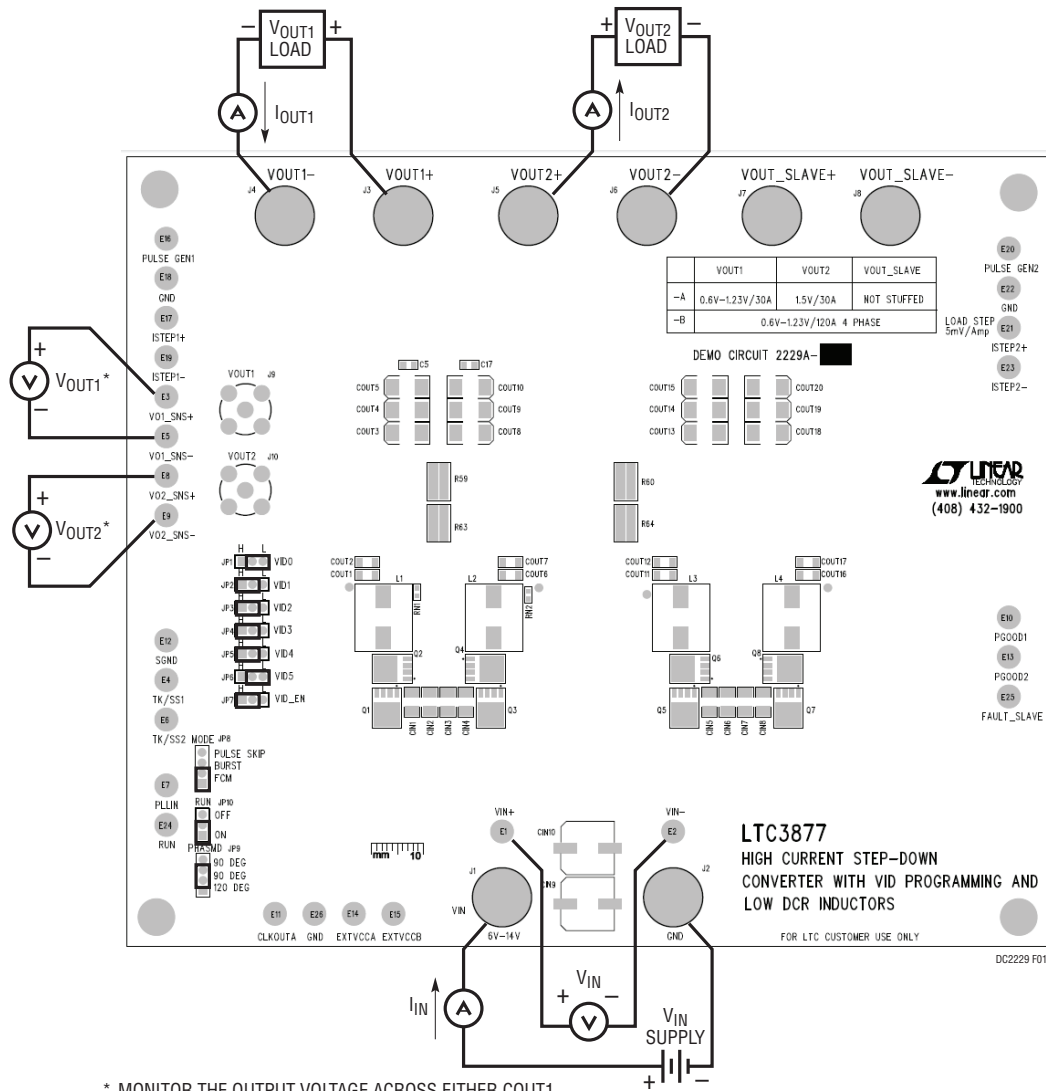


Figure 1. Proper Measurement Equipment Setup for the Dual Output LTC3877 Converter (DC2229A-A Assembly)

QUICK START PROCEDURE

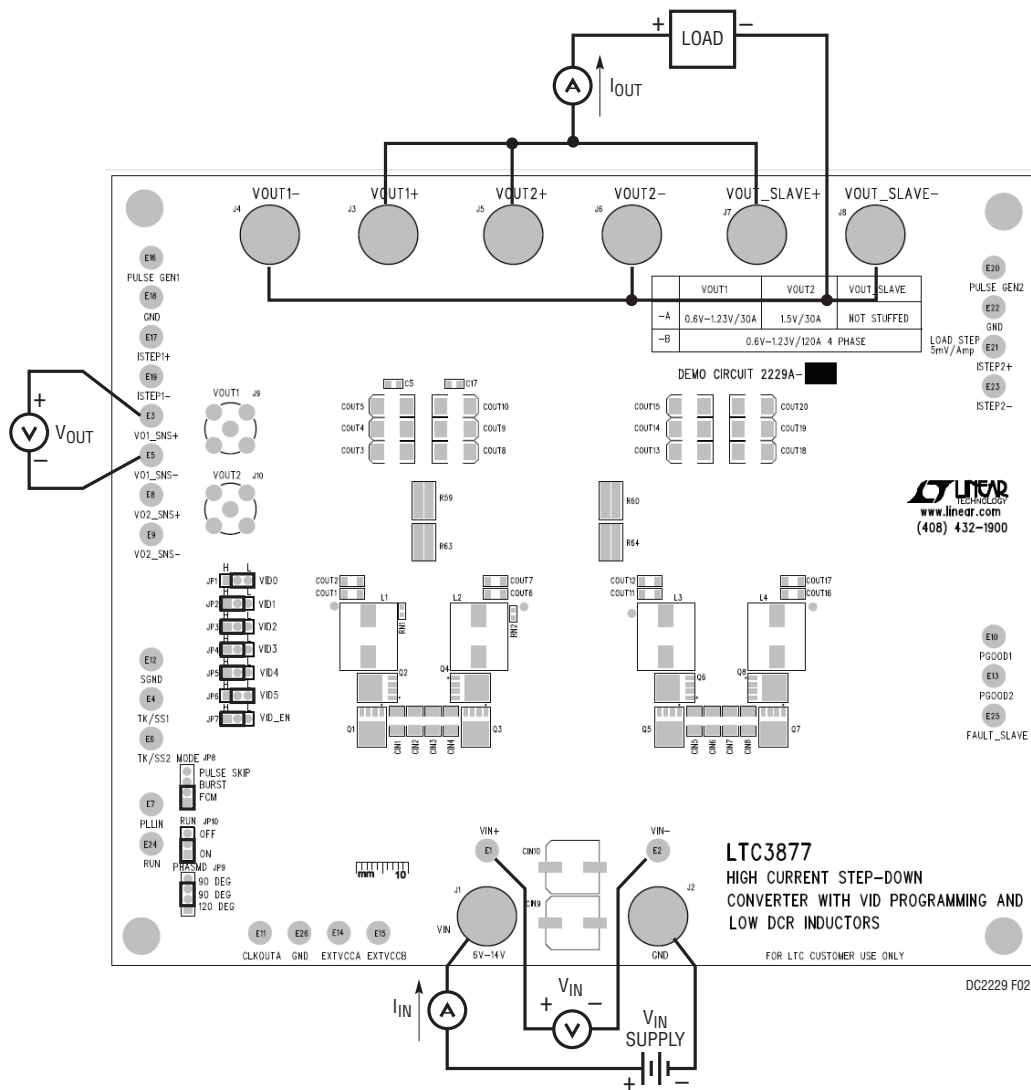


Figure 2. Proper Measurement Equipment Setup for the Four Phase LTC3877/LTC3874 Converter (DC2229A-B Assembly)

QUICK START PROCEDURE

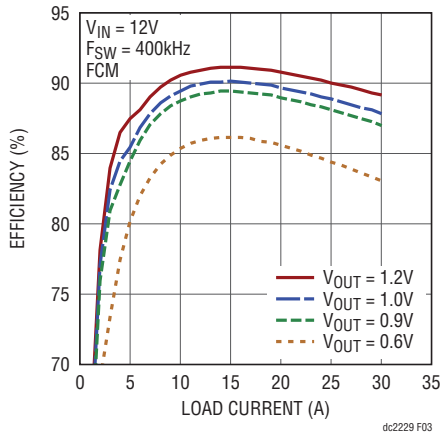


Figure 3. Efficiency Curves for V_{OUT1} of the LTC3877 Dual Output Converter (DC2229A-A Assembly) Across the Programmable VID Range. $V_{IN} = 12V$

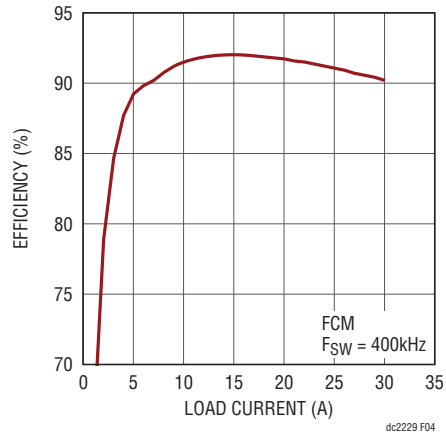


Figure 4. Efficiency Curves for the 1.5V Rail at V_{OUT2} on the LTC3877 Dual Output Converter (DC2229A-A Assembly) at $V_{IN} = 12V$

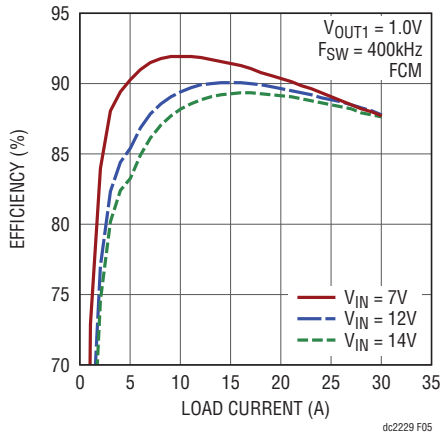


Figure 5. Efficiency Curves for V_{OUT1} of the LTC3877 Dual Output Converter (DC2229A-A Assembly) as the Input Voltage Is Varied. V_{OUT1} is set to 1.0V

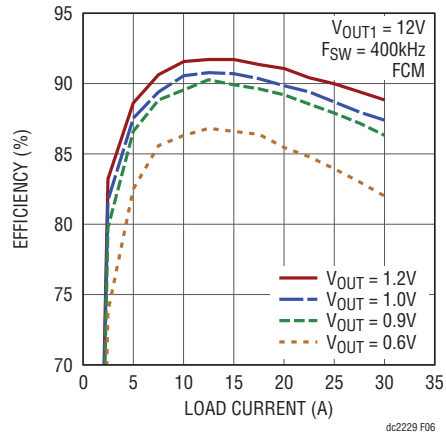


Figure 6. Efficiency Curves for V_{OUT1} of the Four Phase LTC3877/LTC3874 Converter (DC2229A-B Assembly) Across the VID Programming Range. $V_{IN} = 12V$

QUICK START PROCEDURE

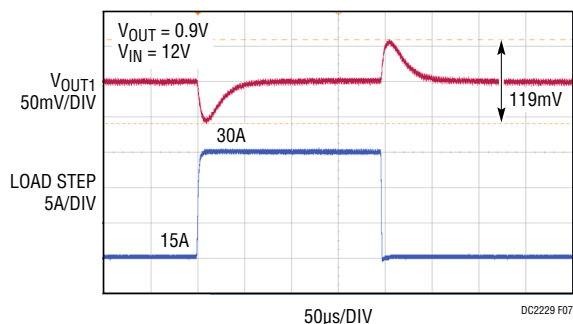


Figure 7. Load Step Response of V_{OUT1} on the Dual Output LTC3877 Converter (DC2229A-A Assembly)
 $V_{IDEN} = L, V_{ID0,5} = L, V_{ID1-4} = H$
 C_{OUT} : 3x Panasonic EEFSX0E331ER (330µF, 2.5V, 9mΩ) ||
2x Murata GRM31CR60G227ME11L (220µF, 4V, X5R, 1206)
 F_{SW} : 400kHz

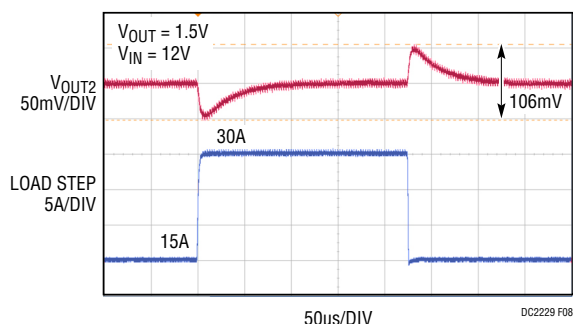


Figure 8. Load Step Response of V_{OUT2} on the Dual Output LTC3877 Converter (DC2229A-A Assembly)
 C_{OUT} : 3x Panasonic EEFSX0E331ER (330µF, 2.5V, 9mΩ) ||
2x Murata GRM31CR60G227ME11L (220µF, 4V, X5R, 1206)
 F_{SW} : 400kHz

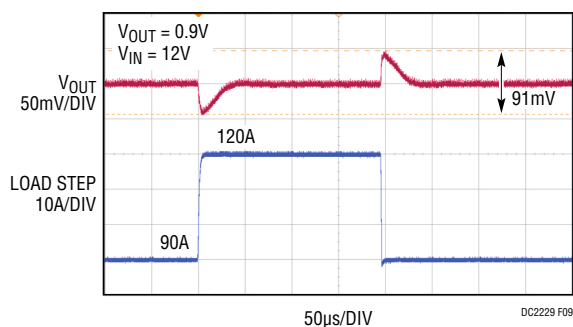


Figure 9. Load Step Response of the Four Phase LTC3877/LTC3874 Converter (DC2229A-B Assembly)
 $V_{IDEN} = L, V_{ID0,5} = L, V_{ID1-4} = H$
 C_{OUT} : 3x Panasonic EEFSX0E331ER (330µF, 2.5V, 9mΩ) ||
2x Murata GRM31CR60G227ME11L (220µF, 4V, X5R, 1206)
 F_{SW} : 400kHz

DEMO MANUAL DC2229A

PARTS LIST DC2155A-A

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC2229A-A Required Circuit Components				
1	6	C1, C4, C6, C8, C14, C15	CAP, 0.1 μ F, X7R, 16V, 10%, 0603	TDK, C1608X7R1C104K
2	1	C10	CAP, 3.3nF, X5R, 25V, 10%, 0603	TDK, C0603X5R1E332K
3	1	C11	CAP, 4.7 μ F, X5R, 16V, 10%, 0805	AVX, 0805YD475KAT2A
4	1	C12	CAP, 47pF, COG, 50V, 5%, 0603	AVX, 06035A470JAT2A
5	1	C13	CAP, 2.2nF, X7R, 25V, 10%, 0603	AVX, 06033C222KAT2A
6	4	C2, C3, C18, C19	CAP, 0.22 μ F, X7R, 16V, 10%, 0603	AVX, 0603YC224KAT2A
7	2	C5, C17	CAP, 10 μ F, X5R, 16V, 10%, 0805	AVX, 0805YD106KAT2A
8	1	C9	CAP, 100pF, COG, 50V, 5% 0603	AVX, 06035A101JAT2A
9	4	CIN1, CIN2, CIN3, CIN4	CAP, 22 μ F, X5R, 16V, 10%, 1210	MURATA, GRM32ER61C226KE20L
10	2	CIN9, CIN10	CAP, OS-CON, 180 μ F, 16V, 20%, SVP-F8	PANASONIC, 16SVP180MX
11	4	COU1, COU2, COU6, COU7	CAP, 220 μ F, X5R, 4V, 10%, 1206	MURATA, GRM31CR60G227ME11L
12	6	COU3-COU5, COU8-COU10	CAP, SPECIALTY POLYMER, 330 μ F, 2.5V, 7343	PANASONIC, EEF5X0E331ER
13	2	D1, D2	DIODE, SCHOTTKY, SOD-323	CENTRAL SEMI, CMDSH-3TR
14	2	L1, L2	INDUCTOR, 0.25 μ H	WURTH ELEKTRONIK, 744301025
15	2	Q1, Q3	MOSFET N-CH 25V 39A TDSO-8	INFINEON, BSC050NE2LS
16	2	Q2, Q4	MOSFET N-CH 25V 38A TDSO-8	INFINEON, BSC010NE2LSI
17	2	R12, R28	RES, 665 Ω , 1/10W, 1%, 0603	NIC, NRC06F6650TRF
18	1	R15	RES, 2.2 Ω , 1/10W, 1%, 0603	NIC, NRC06F2R20TRF
19	1	R16	RES, 20k, 1/10W, 1%, 0603	NIC, NRC06F2002TRF
20	5	R17, R37, R70, R72, R78	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
21	1	R18	RES, 4.75k, 1/10W, 1%, 0603	VISHAY, CRCW06034K75FKEA
22	1	R19	RES, 10.7k, 1/10W, 1%, 0603	VISHAY, CRCW060310K7FKEA
23	1	R21	RES, 15k, 1/10W, 1%, 0603	NIC, NRC06F1502TRF
24	1	R24	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
25	1	R27	RES, 88.7k, 1/10W, 1%, 0603	VISHAY, CRCW060388K7FKEA
26	1	R36	RES, 30.1k, 1/10W, 1%, 0603	VISHAY, CRCW060330K1FKEA
27	7	R4, R14, R20, R31, R74, R65, R82	RES, CHIP, 0 Ω , 0603	NIC, NRC06ZOTRF
28	1	R76	RES, 34.8k, 1/10W, 1%, 0603	VISHAY, CRCW060334K8FKEA
29	2	R8, R26	RES, 3.32k, 1/10W, 1%, 0603	NIC, NRC06F3321TRF
30	4	R9, R10, R33, R34	RES, 10 Ω , 1/10W, 1%, 0603	NIC, NRC06F10R0TRF
31	1	U1	IC, STEP-DOWN CONVERTER	LINEAR TECH, LTC3877EUK#PBF
Dynamic Load Circuits				
1	2	Q21, Q22	MOSFET N-CH 30V 80A D2PAK	VISHAY, SUM60N02-3M9P-E3
2	2	R70, R72	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
3	2	R71, R73	RES, 0.002 Ω , 1%, 1/2W, 2010	VISHAY, WSL20102L000FEA

PARTS LIST DC2155A-A

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Additional Demo Board Circuit Components				
1	0	C25	CAP, 0805, OPTIONAL	
2	0	C7, C16, C20, C21, C22, C23, C24, C26, C27, C28, C29, C32, C34	CAP, 0603, OPTIONAL	
3	0	C33	CAP, 1206, OPTIONAL	
4		CIN11	CAP, OS-CON, SVP-F8	
5	0	CIN5-CIN8, CIN12-CIN19	CAP, 1210, OPTIONAL	
6	0	COU11, COU12, COU16, COU17	CAP, 1206, OPTIONAL	
7	0	COU13-COU15, COU18-COU20, COU21-COU44	POSCAP, 7343, OPTIONAL	
8		D3, D4	DIODE, SOD-323	
9	0	J7, J8	STUD, TESTPIN, OPTIONAL	PEM, KFH-032-10
10		L3, L4	INDUCTOR	WURTH ELEKTRONIK, 744301025
11	0	Q17-Q20	MOSFET, DUAL N-CHANNEL OPTIONAL	INFINEON, BSG0811ND
12		Q23	MOSFET, N-CHANNEL SOT-23 OPTIONAL	
13	0	Q5-Q16	MOSFET, N-CHANNEL, POWERPAK OPTIONAL	
14	2	R13, R22	RES, CHIP, 0 Ω , 0603	NIC, NRC06ZOTRF
15	1	R25	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
16	2	R35, R38	RES., 100k, 1/10W, 1%, 0603	NIC, NRC06F1003TRF
17	0	R1-R3, R5-R7, R11, R23, R29, R30, R32, R39-R58, R63, R64, R66-R68, R69, R75, R77, R80, R81, RN1, RN2	RES, 0603, OPTIONAL	
18	0	R79	RES, 0805, OPTIONAL	
19	0	R59, R60, R63, R64	RES, 1225, OPTIONAL	
20	0	U2	IC, STEP-DOWN CONTROLLER, SLAVE	LINEAR TECH., LTC3874IUFD#PBF
21	0	U3	IC, COMPARATOR	LINEAR TECH., LT6703IDC-3#PBF
Hardware: For Demo Board Only				
1	26	E1-E26	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2503-2-00-80-00-00-07-0
2	6	J1-J6	RING, LUG #10	KEYSTONE, 8205, #10
3	6	J1-J6	STUD, TEST PIN	PEM, KFH-032-10
4	6	J1-J6	WASHER, TIN PLATED BRASS	ANY #10
5	12	J1-J6 X (2)	NUT, BRASS 10-32	ANY #10-32
6	2	J9, J10	CONN, BNC 5PINS	CONNEX, 112404
7	8	JP1-JP7, JP10	HEADER, 3-PIN 0.079 SINGLE ROW	SULLINS, NRPNO31PAEN-RC
8	2	JP8, JP9	HEADER, 4-PIN, 2mm SINGLE ROW	SULLINS, NRPNO41PAEN-RC

DEMO MANUAL DC2229A

PARTS LIST DC2155A-B

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
DC2229A-B Required Circuit Components				
1	4	CIN1, CIN2, CIN3, CIN4	CAP, 22µF, X5R, 16V, 10%, 1210	MURATA., GRM32ER61C226KE20L
2	2	CIN9, CIN10	CAP, OS-CON, 180µF, 16V, 20%, SVP-F8	PANASONIC, 16SVP180MX
3	4	COU1, COU2, COU6, COU7	CAP, 220µF, X5R, 4V, 10%, 1206	MURATA., GRM31CR60G227ME11L
4	6	COU3–COU5, COU8–COU10	CAP, POSCAP, 330µF, 2.5V, 7343	PANASONIC, EEFSX0E331ER
5	5	C1, C4, C6, C8, C14	CAP, 0.1µF, X7R, 16V, 10%, 0603	TDK, C1608X7R1C104K
6	4	C2, C3, C18, C19	CAP, 0.22µF, X7R, 16V, 10%, 0603	AVX, 0603YC224KAT2A
7	2	C5, C17	CAP, 10µF, X5R, 16V, 10%, 0805	AVX, 0805YD106KAT2A
8	1	C9	CAP, 100pF, C0G, 50V, 5%, 0603	AVX, 06035A101JAT2A
9	1	C10	CAP, 3.3nF, X5R, 25V, 10%, 0603	TDK, C0603X5R1E332K
10	1	C11	CAP, 4.7µF, X5R, 16V, 10%, 0805	AVX, 0805YD475KAT2A
11	2	D1, D2	DIODE, SCHOTTKY, SOD-323	CENTRAL SEMI., CMDSH-3TR
12	2	L1, L2	INDUCTOR, 0.25µH	WURTH ELEKTRONIK, 744301025
13	2	Q1, Q3	MOSFET N-CH 25V 39A TDSO-N-8	INFINEON, BSC050NE2LS
14	2	Q2, Q4	MOSFET N-CH 25V 38A TDSO-N-8	INFINEON, BSC010NE2LSI
15	5	R4, R14, R20, R31, R74	RES, CHIP, 0Ω, 0603	NIC, NRC06ZOTRF
16	2	R8, R26	RES, 3.32k, 1/10W, 1%, 0603	NIC, NRC06F3321TRF
17	2	R9, R10	RES, 10Ω, 1/10W, 1%, 0603	NIC, NRC06F10R0TRF
18	2	R12, R28	RES, 665Ω, 1/10W, 1%, 0603	NIC, NRC06F6650TRF
19	1	R15	RES, 2.2Ω, 1/10W, 1%, 0603	NIC, NRC06F2R20TRF
20	1	R16	RES, 20k, 1/10W, 1%, 0603	NIC, NRC06F2002TRF
21	3	R17, R37, R78	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
22	1	R36	RES, 30.1k, 1/10W, 1%, 0603	VISHAY, CRCW060330K1FKEA
23	1	R27	RES, 88.7k, 1/10W, 1%, 0603	VISHAY, CRCW060388K7FKEA
24	1	U1	IC, LTC3877EUK#PBF, QFN 7mm x 7mm	LINEAR TECH., LTC3877EUK#PBF
25	4	CIN5–CIN8	CAP, 22µF, X5R, 16V, 10%, 1210	MURATA., GRM32ER61C226KE20L
26	1	C21	CAP, 47PF, C0G, 50V, 5%, 0603	MURATA., GRM1885C1H470JA01D
27	2	C23, C27	CAP, 0.22µF, X7R, 10V, 10%, 0603	AVX., 0603ZC224KAT2A
28	1	C25	CAP, 4.7µF, X5R, 16V, 10%, 0805	AVX, 0805YD475KAT2A
29	3	C22, C24, C28	CAP, 0.1µF, X7R, 16V, 10%, 0603	TDK, C0603X7R1C104K
30	6	COU13–COU15, COU18–COU20	CAP, POSCAP, 330µF, 2.5V, 7343	PANASONIC, EEFSX0E331ER
31	4	COU11, COU12, COU16, COU17	CAP, 220µF, X5R, 4V, 10% 1206	MURATA., GRM31CR60G227ME11
32	2	Q5, Q7	MOSFET N-CH 25V 39A TDSO-N-8	INFINEON, BSC050NE2LS
33	2	Q6, Q8	MOSFET N-CH 25V 38A TDSO-N-8	INFINEON, BSC010NE2LSI
34	1	Q23	MOSFET N-CH 60V 300MA SOT-23	VISHAY, 2N7002K-T1-E3
35	2	L3, L4	INDUCTOR, 0.25µH	WURTH ELEKTRONIK., 744301025
36	2	D3, D4	DIODE, SCHOTTKY, SOD-323	CENTRAL SEMI., CMDSH-3TR
37	14	R39, R44, R45, R47, R49, R54, R55, R56, R58, R61, R62, R66–R68	RES, CHIP, 0, 1%, 0603	NIC, NRC06ZOTRF
38	1	R18	RES, 4.02k, 1/10W, 1%, 0603	VISHAY, CRCW06034K02FKEA
39	1	R41	RES, 10k, 1/10W, 1%, 0603	VISHAY, CRCW060310K0FKEA
40	1	R82	RES, 4.22k, 1/10W, 1%, 0603	VISHAY, CRCW06034K22FKEA

dc2229af

PARTS LIST DC2155A-B

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
41	4	R59, R60, R63, R64	RES, 0, 1%, 1225	TEPRO, RN5326
42	1	R50	RES, 78.7k, 1/10W, 1%, 0603	NIC, NRC06F7872TRF
43	2	R43, R53	RES, 665Ω, 1/10W, 1%, 0603	NIC, NRC06F6650TRF
44	1	R46	RES, 2.2Ω, 1/10W, 1%, 0603	NIC, NRC06F2R20TRF
45	1	R76	RES, 30.1k, 1/10W, 1%, 0603	VISHAY, CRCW060330K1FKEA
46	1	U1	IC, STEP-DOWN CONVERTER	LINEAR TECH, LTC3877EUK#PBF
47	1	U2	IC, STEP-DOWN CONTROLLER, SLAVE	LINEAR TECH., LTC3874IUFD#PBF

Dynamic Load Circuits

1	2	Q21, Q22	MOSFET N-CH 30V 80A D2PAK	VISHAY, SUM60N02-3M9P-E3
2	2	R70, R72	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
3	2	R71, R73	RES, 0.002Ω, 1%, 1/2W, 2010	VISHAY, WSL20102L000FEA

Additional Demo Board Circuit Components

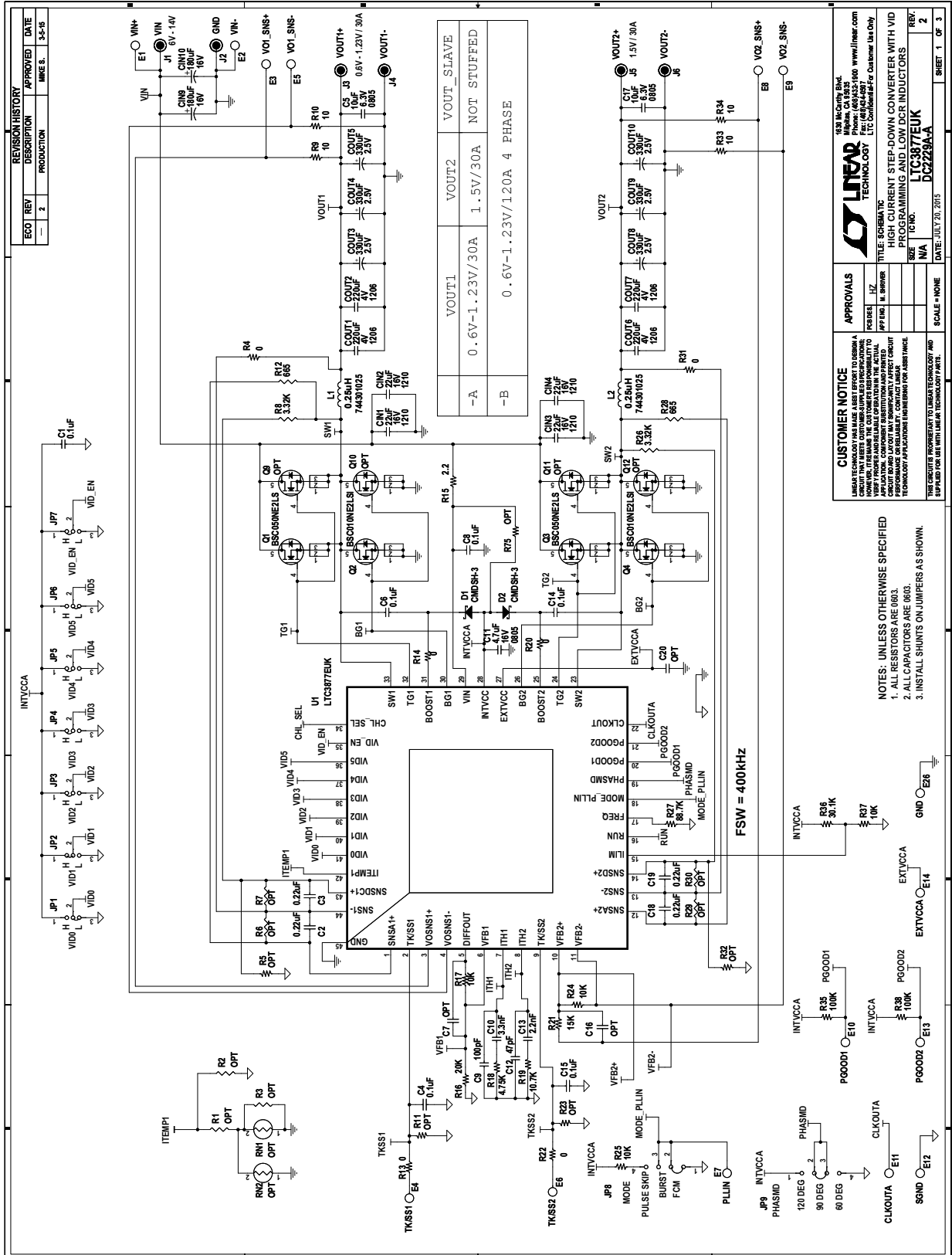
1	0	C12, C13, C15	CAP, OPTIONAL	
2	0	C20, C29, C32, C7, C16, C34	CAP, OPTIONAL	
3	1	C26	CAP, 47nF, X5R, 25V, 10%, 0603	AVX., 06033D473KAT2A
4	0	C33	CAP, 1206, OPTIONAL	
5	0	C7, C16, C34	CAP, 0603, OPTIONAL	
6	0	CIN11	CAP, OS-CON, SVP-F8	
7	0	CIN12-CIN19	CAP, 1210, OPTIONAL	
8	0	COUT21-COUT44	POSCAP, 7343, OPTIONAL	
9	0	Q17-Q20	MOSFET, DUAL N-CHANNEL OPTIONAL	INFINEON, BSG0811ND
10	0	Q9-Q16	MOSFET, N-CHANNEL, POWERPAK OPTIONAL	
11	2	R13, R22	RES, CHIP, 0Ω, 0603	NIC, NRC06ZOTRF
12	0	R1-R3, R5, R6, R7, R11, R19, R21, R23, R24, R29, R30, R32, R40, R42, R48, R51, R52, R57, R65, R69, R79, R80, R81, R75, R77, RN1, RN2	RES, OPTIONAL	
13	1	R25	RES, 10k, 1/10W, 1%, 0603	NIC, NRC06F1002TRF
14	2	R33, R34	RES, 10Ω, 1/10W, 1%, 0603	NIC, NRC06F10R0TRF
15	2	R35, R38	RES, 100k, 1/10W, 1%, 0603	NIC, NRC06F1003TRF
16	1	U3	IC, LT6703IDC-3#PBF	LINEAR TECH., LT6703IDC-3#PBF

Hardware: For Demo Board Only

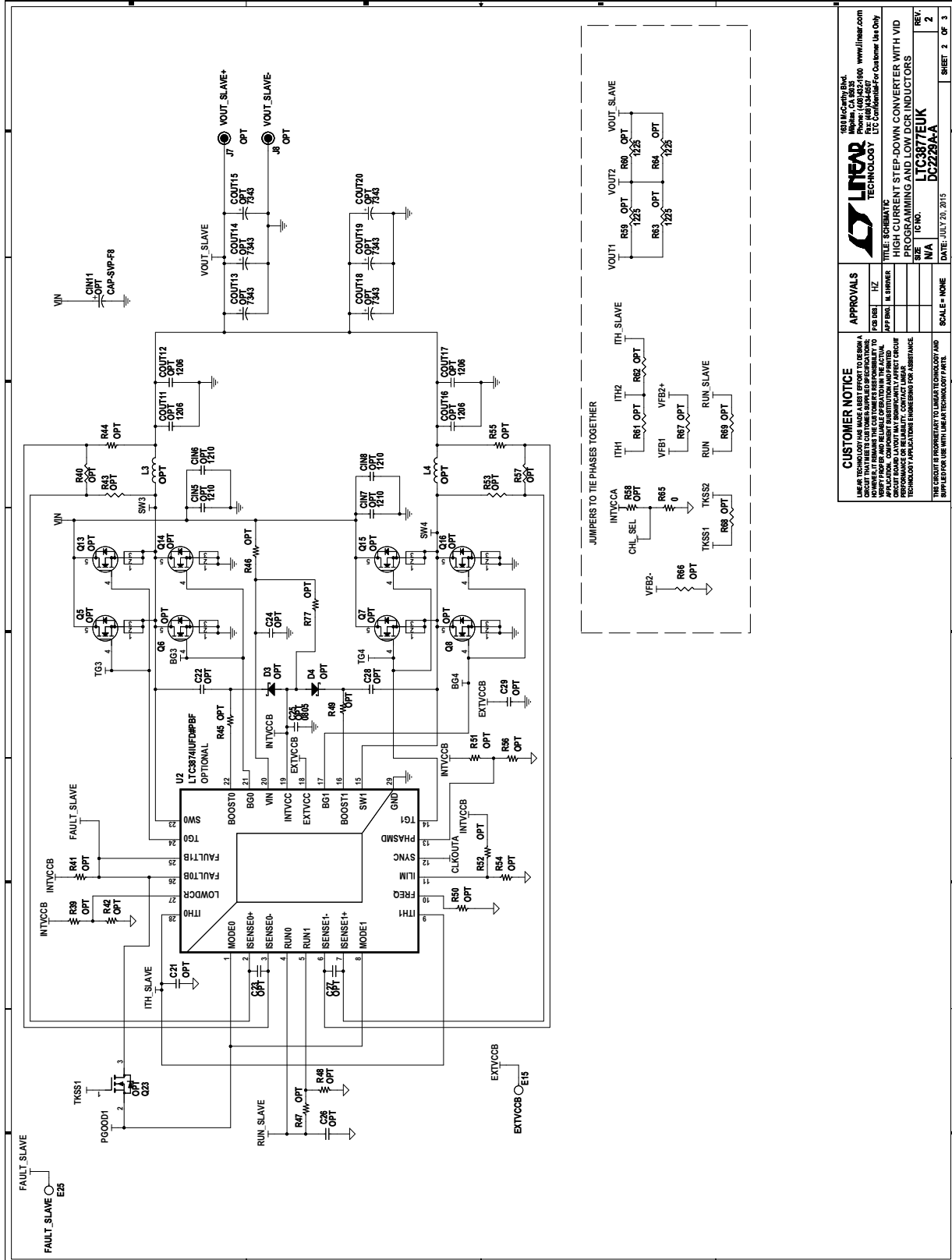
1	26	E1-E26	TESTPOINT, TURRET, 0.094"	MILL-MAX, 2503-2-00-80-00-00-07-0
2	6	J1-J8	RING, LUG #10	KEYSTONE, 8205, #10
3	6	J1-J8	STUD, TESTPIN	PEM, KFH-032-10
4	6	J1-J8	WASHER, TIN PLATED BRASS	ANY #10
5	12	J1-J8 X (2)	NUT, BRASS 10-32	ANY #10-32
6	2	J9, J10	CONN, BNC 5PINS	CONNEX, 112404
7	8	JP1-JP7, JP10	HEADER, 3-PIN 0.079 SINGLE ROW	SULLINS, NRPNO31PAEN-RC
8	2	JP8, JP9	HEADER, 4-PIN, 2mm SINGLE ROW	SULLINS, NRPNO41PAEN-RC

DEMO MANUAL DC2229A

SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



CUSTOMER NOTICE
 LDC TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC THAT IS ACCURATE AND COMPLETE. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THE SCHEMATIC IS CORRECT FOR THEIR APPLICATION. COMPONENT SUBSTITUTION AND PARTS LISTING ARE NOT GUARANTEED. CONTACT LDC TECHNOLOGY FOR APPLICATIONS ENGINEERING FOR ASSISTANCE.

APPROVALS

DESIGNER	DATE
APP. ENG.	DATE
APP. MGR.	DATE
TEST. ENGR.	DATE
SCALE	SCALE
SCALE	SCALE

SCALE = NONE

DATE = JULY 20, 2015

REVISIONS

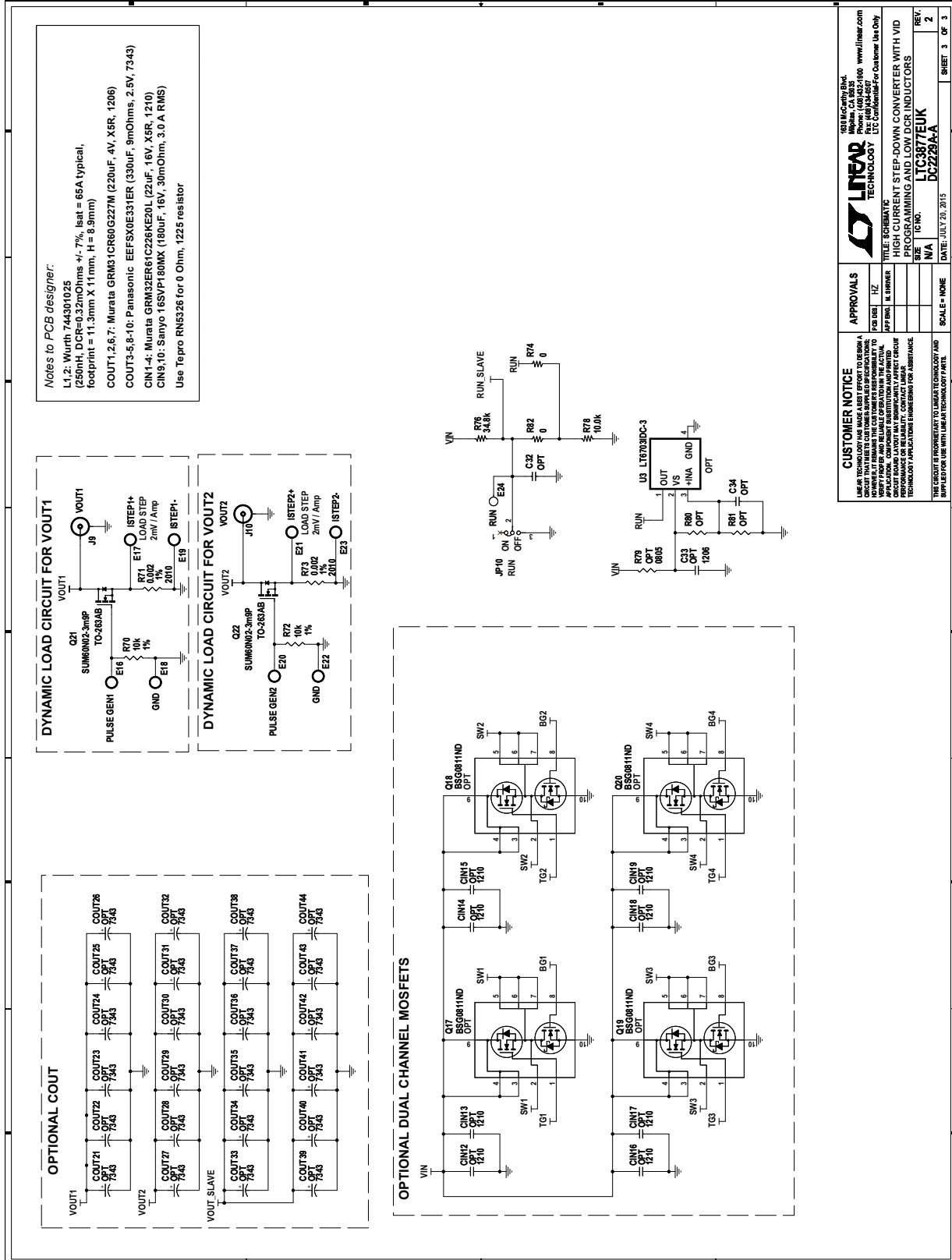
REV.	DESCRIPTION
1	INITIAL RELEASE
2	REVISION

8110 MAC-001 Rev. 1
LINEAR TECHNOLOGY
 9600 Shaker Blvd., Fremont, CA 94538
 Phone: (415) 521-1000 www.linear.com
 © 2015 Linear Technology Corporation. All rights reserved. LDC Confidential for Customer Use Only.

TITLE: SCHEMATIC
PROGRAMMING AND LOW dCR INDUCTORS
LTC3877EUK
DC2229A-A

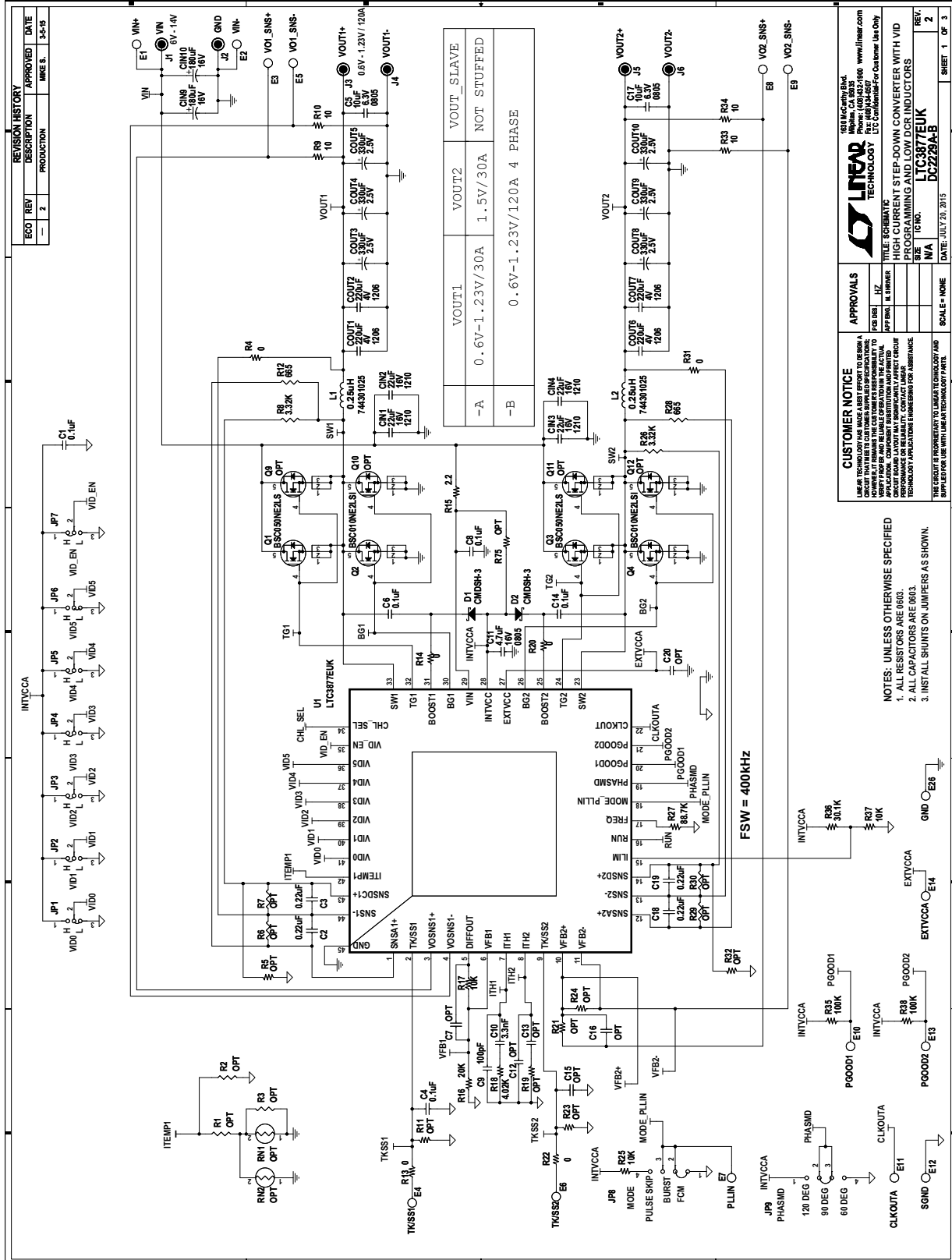
SHEET 2 OF 3

SCHEMATIC DIAGRAM



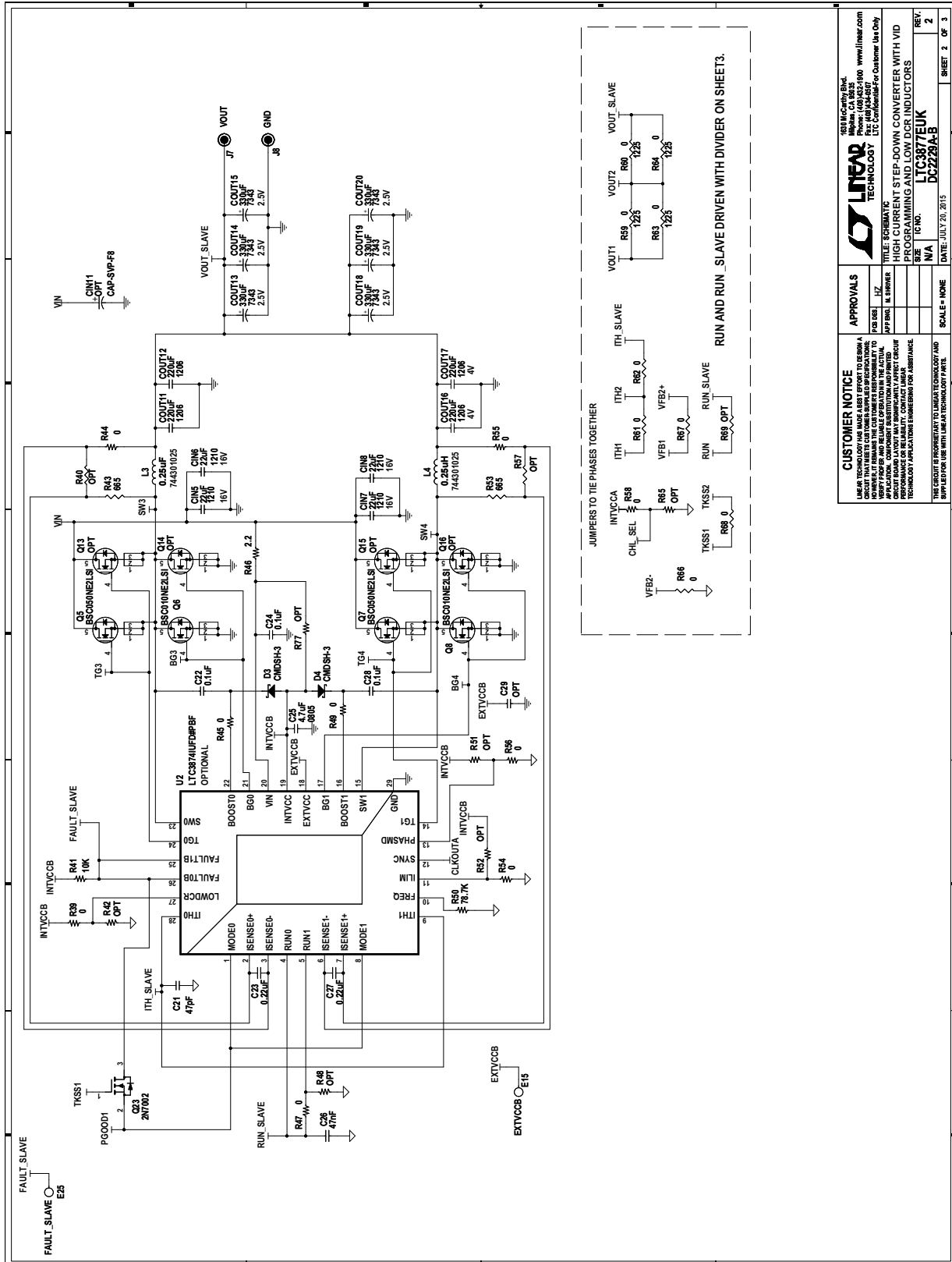
		681 MACOM Drive Milpitas, CA 95035 Phone: (408) 252-1000 www.linear.com Fax: (408) 252-1001 LTC Confidential - For Customer Use Only	
		DC2229A-A	
CUSTOMER NOTICE LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN AND MANUFACTURE THIS PRODUCT TO MEET THE CUSTOMER'S REQUIREMENTS. LINEAR TECHNOLOGY DOES NOT WARRANT THE PERFORMANCE OF THIS PRODUCT IN ANY APPLICATION. CUSTOMER'S APPLICATIONS ARE THE SOLE RESPONSIBILITY OF THE CUSTOMER. CONTACT LINEAR TECHNOLOGY FOR APPLICATIONS ENGINEERING SUPPORT.		SCALE: NONE SHEET: 3 OF 3	
APPROVALS		TITLE: SCHEMATIC PROGRAMMING AND LOW DCR INDUCTORS HIGH CURRENT STEP-DOWN CONVERTER WITH VID DATE: JULY 20, 2015	
PCB DRG.	HZ	APP BRN.	M. BRNKR
DATE:	N/A	REV:	2

SCHEMATIC DIAGRAM



DEMO MANUAL DC2229A

SCHEMATIC DIAGRAM



APPROVALS	
DESIGNER	_____
APP. ENG.	_____
TEST ENG.	_____
PROG. MGR.	_____
QA	_____
DATE	JULY 20, 2015
SCALE	NONE
SHEET	2 OF 3

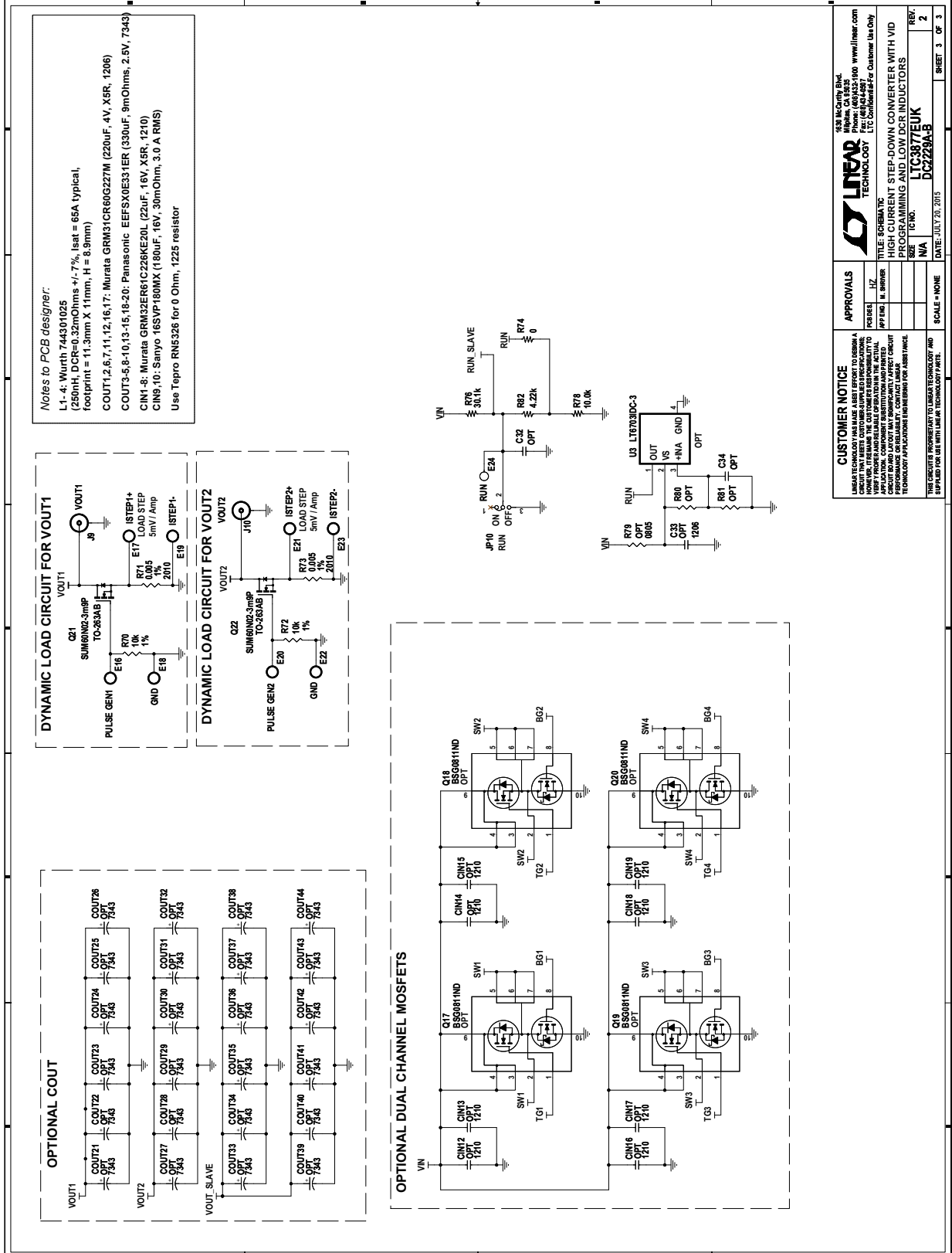
CUSTOMER NOTICE
 LINEAR TECHNOLOGY HAS MADE A BEST EFFORT TO DESIGN A SCHEMATIC THAT IS COMPLETELY ACCURATE. HOWEVER, IT REMAINS THE CUSTOMER'S RESPONSIBILITY TO VERIFY THE OPERATION OF THE CIRCUIT. LINEAR TECHNOLOGY ASSUMES NO LIABILITY FOR ANY DAMAGE OR LOSS OF DATA OR INFORMATION RESULTING FROM THE USE OF THIS SCHEMATIC. CONTACT LINEAR TECHNOLOGY FOR APPLICATIONS ENGINEERING FOR ASSISTANCE.

LINEAR TECHNOLOGY
 951 MacArthur Blvd.
 Milpitas, CA 95035
 Phone: (408) 252-1000 www.linear.com
 Fax: (408) 252-1001
 © 2015 Linear Technology Corporation. All rights reserved.

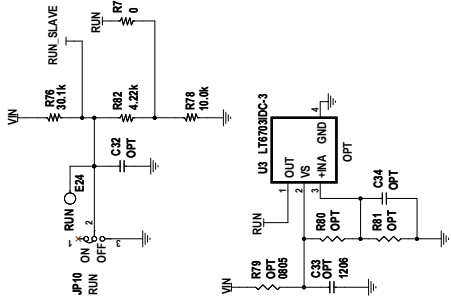
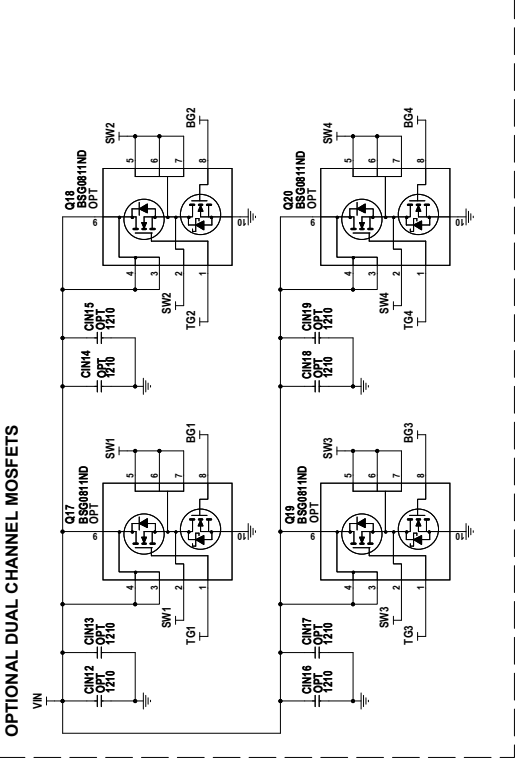
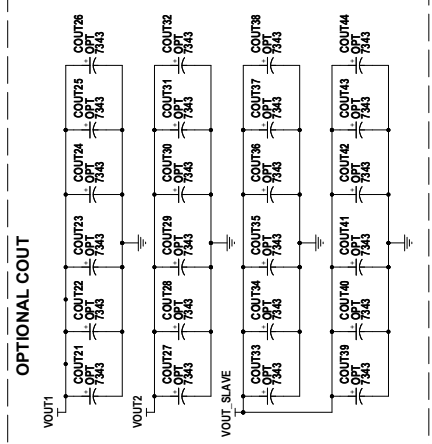
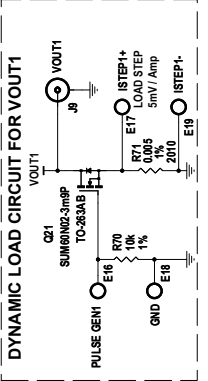
TITLE: SCHEMATIC
PROGRAMMING AND LOW DCR INDUCTORS
LTC3871EUK
DC2229A-B

REV: 2

SCHEMATIC DIAGRAM



Notes to PCB designer:
 L1-4: Wurth 744301025 (250mH, DCR=0.32mOhms +/- 7%, Isat = 65A typical, footprint = 11.3mm X 11mm, H = 6.9mm)
 COUT1,2,6,7,11,12,16,17: Murata GRM31CR60G227M (220µF, 4V, X5R, 1206)
 COUT3-5,8-10,13-15,18-20: Panasonic EEF5X0E331ER (330µF, 9mOhms, 2.5V, 7343)
 CIN1-8: Murata GRM32ER61C226KE20L (22µF, 16V, X5R, 1210)
 CIN9,10: Sanyo 165VP160MX (180µF, 16V, 30mOhm, 3.0 A RMS)
 Use Teptro RNS326 for 0 Ohm, 1225 resistor



CUSTOMER NOTICE
 LINEAR TECHNOLOGY MAKES A BEST EFFORT TO DESIGN A PRODUCT THAT MEETS THE CUSTOMER'S REQUIREMENTS TO THE MAXIMUM EXTENT POSSIBLE. THE CUSTOMER'S RESPONSIBILITY TO LINEAR TECHNOLOGY IS TO PROVIDE ACCURATE INFORMATION AND REQUIREMENTS. LINEAR TECHNOLOGY ASSUMES NO LIABILITY FOR APPLICATIONS, COMPONENT SUBSTITUTIONS, OR CIRCuits. CREDIT AND BOARD LAYOUT MAY SIGNIFICANTLY AFFECT CIRCUIT PERFORMANCE. CUSTOMER APPLICATIONS ENGINEERING FOR ASSISTANCE.

APPROVALS

DESIGNER	DATE
APPROVED	DATE

SCALE - NONE

DATE - JULY 20, 2015

IC NO. LTC3877EUK

REV. 2

SHEET 3 OF 3

LINEAR TECHNOLOGY
 100 N. Lincoln Ave.
 Milpitas, CA 95035
 Phone: (408) 328-1900 www.linear.com
 FAX: (408) 328-1901
 LITC02229A Rev. 1.0
 TITLE: SCHEMATIC
 HIGH CURRENT STEP-DOWN CONVERTER WITH VID
 PROGRAMMING AND LOW DCR INDUCTORS

DEMO MANUAL DC2229A

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