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DEMO CIRCUIT 950A QUICK START GUIDE

LT3825 and LT3837 Non-opto Synchronous Fly-back Controller

DESCRIPTION

Demonstration circuit 950A is a 30W multi-output synchronous flyback converter in 1/8 brick format featuring the LT3825 and LT3837. Output voltage sensing is implemented without the use of opto-coupler, by sensing the voltage across a primary side auxiliary winding. A load compensation circuit is used to compensate for voltage drops caused by load currents.

DC950A-A has input voltage range 36V-72V and features the LT3825.

DC950A-B has input voltage range 9V-36V and features the LT3837.

Demonstration circuit 950A uses a transformer design with tapped secondary winding, to achieve higher efficiency and better cross regulation than is possible with a transformer that uses a separate winding for each output.

Design files for this circuit board are available. Call the LTC factory.

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PERFORMANCE SUMMARY Specifications are at TA = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V_{IN}	Input Supply Range	DC950A-A	36		72	V
		DC950A-B	9		36	V
V_{OUT}	Output Voltage	V_{OUT1}	4.85	5V	5.15	V
		V_{OUT2}	3.20	3.3V	3.40	V
		V_{OUT3}	2.42	2.5V	2.58	V
I_{OUT}	Output Current (Note: Total output power not to exceed 30W)	I_{OUT1} (5V output)	0	2	4	A
		I_{OUT2} (3.3V output)	0	3	4	A
		I_{OUT3} (2.5V output)	0	3	4	A
Efficiency	Efficiency	DC950A-A,V_{IN}=48V,I_{OUT1}=2A,I_{OUT1}=3A,I_{OUT3}=3A		90		%
		DC950A-B,V_{IN}=24V,I_{OUT1}=2A,I_{OUT1}=3A,I_{OUT3}=3A		89		%

EQUIPMENT

8 DMMs
1 DC Supply 0-72V 1A for DC950A-A test
1 DC Supply 0-36V 5A for DC950A-B test
3 Adjustable loads 0-3A

GETTING STARTED

Demonstration circuit 950A is easy to set up to evaluate the performance of the LT3825 and LT3837. Refer to Figure 1 for proper measurement equipment setup and follow the procedure below:

1. With power off, connect the input power supply to Vin and GND.
2. With no loads, adjust input voltage to be within the input voltage range (36V-72V for DC950A-A, 9V-36V for DC950A-B) and turn on the power at the input.
3. Check for the proper output voltages. Vout1 = 5V, Vout2 = 3.3V, Vout3 = 2.5V.
4. Adjust the loads and study the performance of the circuit. Note that the load current should not exceed 4A, and the total load on the three outputs should not exceed 30W continuous power.

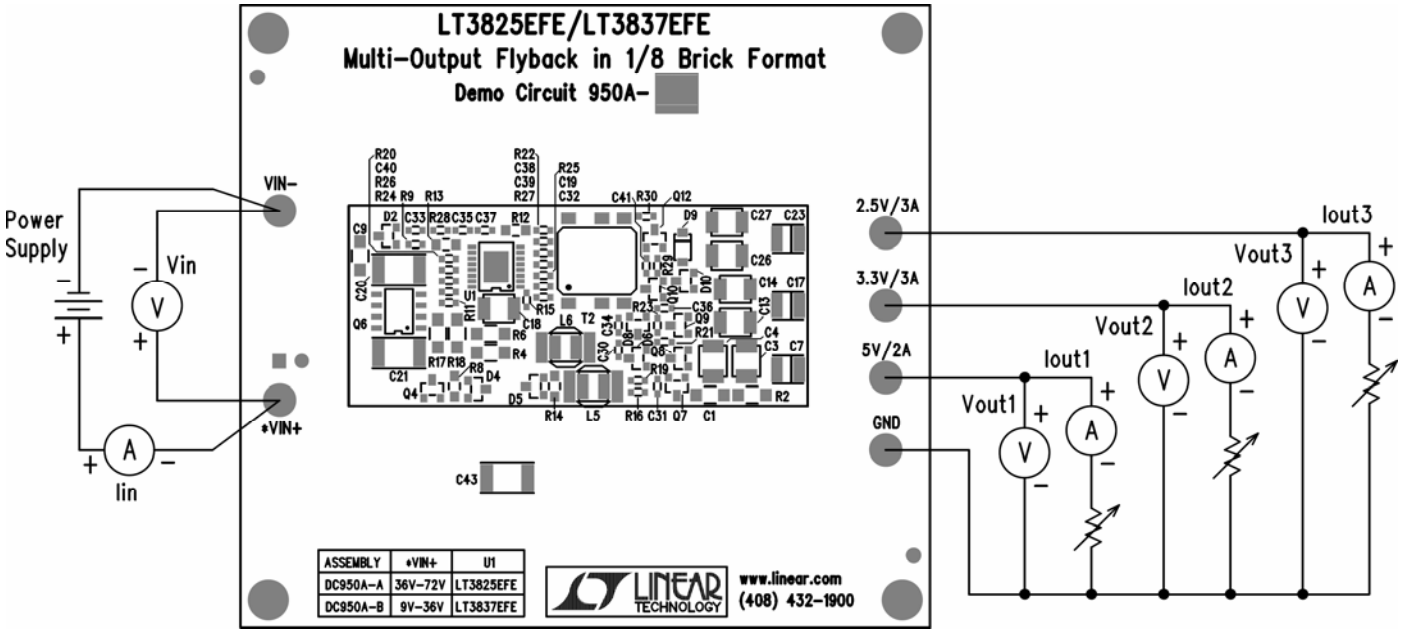
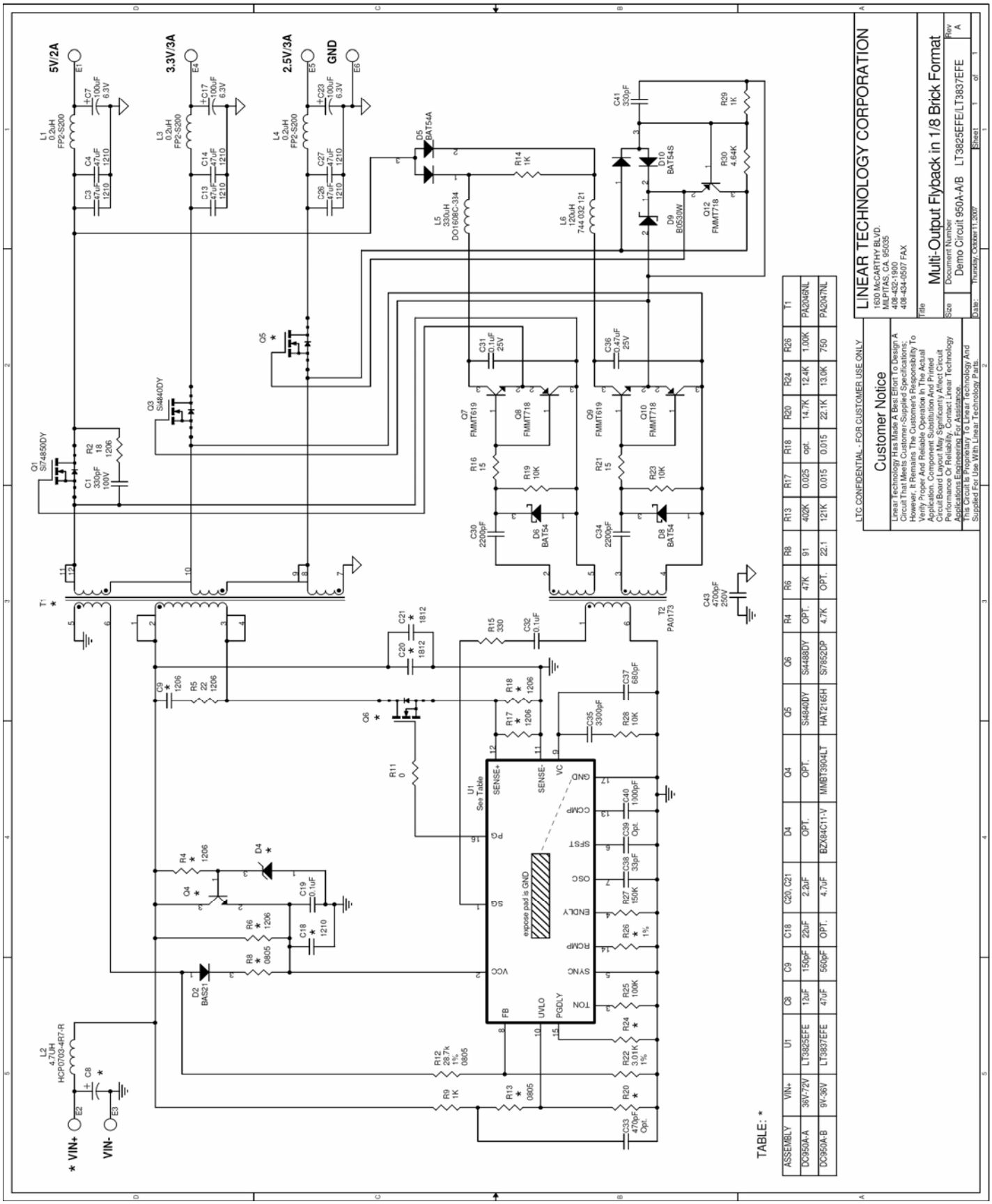


Figure 1. Proper Measurement Equipment Setup


5V/2A
3.3V/3A
2.5V/3A
GND
* VIN+
VIN-
U1
See Table
expose pad is GND
T1
T2
PA0173
LINEAR TECHNOLOGY CORPORATION
1630 McCARTHY BLVD.
MILPITAS, CA. 95035
408-432-1900
408-434-0507 FAX
LTC CONFIDENTIAL - FOR CUSTOMER USE ONLY
Customer Notice
Linear Technology Has Made A Best Effort To Design A Circuit That Meets Customer-Provided Specifications. However, It Remains The Customer's Responsibility To Verify Proper And Reliable Operation In The Actual Application. Component Substitution And Printed Circuit Board Layout May Significantly Affect Circuit Performance Or Reliability. Contact Linear Technology Applications Engineering For Assistance.
This Circuit Is Proprietary To Linear Technology And Supplied For Use With Linear Technology Parts.
Title
Multi-Output Flyback in 1/8 Brick Format
Size
Document Number
Demo Circuit 950A-A/B LT3825EFE/LT3837EFE
Rev
A
Date: Thursday, October 11, 2007
Sheet 1 of 1
TABLE: *
ASSEMBLY | VIN+ | U1 | C8 | C9 | C18 | C20, C21 | D4 | Q4 | Q5 | Q6 | R4 | R6 | R8 | R13 | R17 | R18 | R20 | R24 | R26 | T1
DC950A-A | 36V-72V | LT3825EFE | 12uF | 150pF | 22uF | 2.2uF | OPT. | OPT. | SI4840DY | SI4488DY | OPT. | 47K | 91 | 402K | 0.025 | opt. | 14.7K | 12.4K | 1.00K | PA2046NL
DC950A-B | 9V-36V | LT3837EFE | 47uF | 560pF | OPT. | 4.7uF | BZX84C11-V | MMBT3904LT | HAT2165H | SI7852DP | 4.7K | OPT. | 22.1 | 121K | 0.015 | 0.015 | 22.1K | 13.0K | 750 | PA2047NL

DC950A-A BILL OF MATERIAL

Item	Qty	Reference	Part Description	Manufacture / Part #
REQUIRED CIRCUIT COMPONENTS[1]				
1	1	C38	Capacitor, NP0, 33pF, 50V, 0603	AVX, 06035A330KAT2
2	1	C41	Capacitor, NPO, 330PF, 50V, 0603	AVX, 06035A331KAT
3	1	C1	Capacitor, NPO 330PF 100V 1206	AVX, 12061A331KAT
4	2	C34,C30	Capacitor, X7R, 2200pF, 50V, 0603	AVX, 06035C222JAT
5	3	C19,C31,C32	Capacitor, X5R, 0.1uF, 25V, 0603	AVX, 06033D104KAT2A
6	1	C40	Capacitor, X7R, 1000pF, 50V, 0603	AVX, 06035C102KAT2A
7	1	C36	Capacitor, X5R, 0.47uF, 16V, 0603	AVX, 0603YD474M
8	6	C3,C4,C13,C14,C26,C27	Capacitor, X5R, 47uF, 6.3V, 1210	TDK, 3225X5R0J476M
9	0	C33,C39	Capacitor, 0603	OPT
10	1	C35	Capacitor, X7R, 3300PF, 50V, 0603	KEMET, C0603C332J5RAC
11	1	C37	Capacitor, NPO, 680PF, 50V, 0603	AVX, 06035A681JAT
12	1	C9	Capacitor, NPO, 150pF, 200V, 1206	AVX, 12062A151KAT2A
13	1	C18	Capacitor, X7R, 22uF, 16V, 1210	TDK, C3225RX7R1C226M
14	2	C20,C21	Capacitor, X7R, 2.2uF, 100V, 1812	TDK, C4532X7R2A225M
15	1	D2	BAS21	Diodes, Inc.,BAS21-7-F
16	2	D8,D6	BAT54	Diodes, Inc.,BAT54-7-F
17	1	D5	BAT54A	Diodes, Inc.,BAT54A-7
18	1	D10	BAT54S	Diodes, Inc.,BAT54S-7-F
19	1	D9	B0530W	Diodes, Inc.,B0530W-7-F
20	0	D4	Zenerdiode, 12V, 5%, SOT23	OPT
21	1	L5	Inductor, 330uH	Coilcraft, DO1608C-334MLB
22	1	L6	Inductor, 120uH	Wurth Elektronik, 744 032 121
23	1	Q1	MOSFET, n-ch, SO8	Vishay, Si4850EY-T1-E3
24	1	Q3	MOSFET, n-ch, SO8	Vishay, Si4840DY-T1-E3
25	2	Q7,Q9	Transistor, npn, SOT23	Zetex, FMMT619TA
26	3	Q8,Q10,Q12	Transistor, pnp, SOT23	Zetex, FMMT718TA
27	0	Q4	Transistor, npn, SOT23	OPT
28	1	Q5	MOSFET, n-ch, SO8	Vishay, Si4840DY-T1-E3
29	1	Q6	MOSFET, n-ch, SO8	Vishay, Si4488DY-T1-E3
30	1	R11	Resistor, 0 OHMS 0603	VISHAY, CRCW06030000Z0EA
31	1	R2	Resistor, 18 OHMS 1206	VISHAY, CRCW120618R0JNEA
32	2	R21,R16	Resistor, 15 OHMS 0603	VISHAY, CRCW060315R0FKEA
33	1	R15	Resistor, 330 OHMS 0603	VISHAY, CRCW0603330RFKEA
34	2	R9,R29	Resistor, 1.00k, 0603	VISHAY, CRCW06031K0FKED
35	1	R14	Resistor, 1.00k, 0805	VISHAY, CRCW08051K0FKED
36	1	R22	Resistor, 3.01K, 0603	VISHAY, CRCW06033011FRT6
37	1	R30	Resistor, 4.64K, 0603	VISHAY, CRCW06034K64FKED
38	3	R19,R23,R28	Resistor, 10.0K, 0603	VISHAY, CRCW060310K0FKED
39	1	R12	Resistor, 28.7K, 0805	VISHAY, CRCW080528K7FKED
40	1	R25	Resistor, 100K, 0603	VISHAY, CRCW0603100KJNEA
41	1	R27	Resistor, 150K, 0603	VISHAY, CRCW0603150KJNEA
42	1	R5	Resistor, 22 OHM, 1206	VISHAY, CRCW120622ROJNEA
43	1	R17	Resistor, 0.025 OHM 1% 1206	IRC, LRF1206LF-01-R025-F
44	1	R26	Resistor, 1.00K, 0603	VISHAY, CRCW06031K00FKEA
45	1	R6	Resistor, 47K, 1206	VISHAY, CRCW120647K0JNEA
46	1	R13	Resistor, 402K, 0805	VISHAY, CRCW0805402KFKEA
47	0	R4,R18	Resistor, 1206	OPT
48	1	R8	Resistor, 91 OHMS 0805	VISHAY, CRCW080591R0FKEA
49	1	R20	Resistor, 14.7K, 0603	VISHAY, CRCW060314K7FKEA
50	1	R24	Resistor, 12.4K, 0603	VISHAY, CRCW060312K4FKEA

51	1	T2	Gatedrive transformer	Pulse Engineering, PA0173
52	1	T1	EFD20 Flyback transformer	Pulse Engineering, PA2046NL
53	1	U1	LT3825EFE#PBF	Linear Technology, LT3825EFE#PBF
ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS[2]				
1	1	C8	Capacitor, electrolytic, 12UF, 100V	Sanyo, 100ME12AX+TS
2	3	C7,C17,C23	Capacitor, TANT, 100uF, 6.3V, 3528	Kemet, T520B107M006ASE070
3	1	C43	Capacitor, X7R, 4700pF 250V, 1812	MURATA, GA343DR7GD472KW01L
4	3	L1,L3,L4	Inductor, 0.2uH	Cooper, FP2-S200
5	1	L2	Inductor, 4.7uH	Cooper, HCP0703-4R7-R
HARDWARE-FOR DEMO BOARD ONLY:				
1	4	(STAND-OFF),	STAND-OFF, NYLON 0.50"	KEYSTONE, 8833(SNAP ON)
2	6	E1-E6	Turret, 0.094"	Mill-Max, 2501-200-80-00-00-07-0
	Notes:			
	1. Required Circuit Components are those parts that are required to implement the circuit function			
	2. Additional Demo Board Circuit Components are those parts that provide added functionality for the demo board but are not required in the actual circuit.			

DC950A-B BILL OF MATERIAL

Item	*Qty*	*Reference*	*Part Description*	*Manufacture / Part #*
REQUIRED CIRCUIT COMPONENTS[1]				
1	1	C38	Capacitor, NP0, 33pF, 50V, 0603	AVX, 06035A330KAT2
2	1	C41	Capacitor, NPO, 330PF, 50V, 0603	AVX, 06035A331KAT
3	1	C1	Capacitor, NPO 330PF 100V 1206	AVX, 12061A331KAT
4	2	C34,C30	Capacitor, X7R, 2200pF, 50V, 0603	AVX, 06035C222JAT
5	3	C19,C31,C32	Capacitor, X5R, 0.1uF, 25V, 0603	AVX, 06033D104KAT2A
6	1	C40	Capacitor, X7R, 1000pF, 50V, 0603	AVX, 06035C102KAT2A
7	1	C36	Capacitor, X5R, 0.47uF, 16V, 0603	AVX, 0603YD474M
8	6	C3,C4,C13,C14,C26,C27	Capacitor, X5R, 47uF, 6.3V, 1210	TDK, 3225X5R0J476M
9	0	C33,C39	Capacitor, 0603	OPT
10	1	C35	Capacitor, X7R, 3300PF, 50V, 0603	KEMET, C0603C332J5RAC
11	1	C37	Capacitor, NPO, 680PF, 50V, 0603	AVX, 06035A681JAT
12	1	C9	Capacitor, NPO, 560pF, 100V, 1206	AVX, 12061A561KAT2A
13	0	C18	Capacitor, 1210	OPT
14	2	C20,C21	Capacitor, X7R, 4.7uF, 50V, 1812	TDK,C4532X7R1H475MT
15	1	D2	BAS21	Diodes, Inc.,BAS21-7-F
16	2	D8,D6	BAT54	Diodes, Inc.,BAT54-7-F
17	1	D5	BAT54A	Diodes, Inc.,BAT54A-7
18	1	D10	BAT54S	Diodes, Inc.,BAT54S-7-F
19	1	D9	B0530W	Diodes, Inc.,B0530W-7-F
20	1	D4	Zenerdiode, 11V, 5%, SOT23	Vishay, BZX84C11-V
21	1	L5	Inductor, 330uH	Coilcraft, DO1608C-334MLB
22	1	L6	Inductor, 120uH	Wurth Elektronik, 744 032 121
23	1	Q1	MOSFET, n-ch, SO8	Vishay, Si4850EY-T1-E3
24	1	Q3	MOSFET, n-ch, SO8	Vishay, Si4840DY-T1-E3
25	2	Q7,Q9	Transistor, npn, SOT23	Zetex, FMMT619TA
26	3	Q8,Q10,Q12	Transistor, pnp, SOT23	Zetex, FMMT718TA

27	1	Q4	Transistor, npn, SOT23	MMBT3904LT
28	1	Q5	MOSFET, n-ch, SO8	Renesas, HAT2165H
29	1	Q6	MOSFET, n-ch, SO8	Vishay, Si7852DP-T1-E3
30	1	R11	Resistor, 0 OHMS 0603	VISHAY, CRCW06030000Z0EA
31	1	R2	Resistor, 18 OHMS 1206	VISHAY, CRCW120618R0JNEA
32	2	R21,R16	Resistor, 15 OHMS 0603	VISHAY, CRCW060315R0FKEA
33	1	R15	Resistor, 330 OHMS 0603	VISHAY, CRCW0603330RFKEA
34	2	R9,R29	Resistor, 1.00k, 0603	VISHAY, CRCW06031K0FKED
35	1	R14	Resistor, 1.00k, 0805	VISHAY, CRCW08051K0FKED
36	1	R22	Resistor, 3.01K, 0603	VISHAY, CRCW06033011FRT6
37	1	R30	Resistor, 4.64K, 0603	VISHAY, CRCW06034K64FKED
38	3	R19,R23,R28	Resistor, 10.0K, 0603	VISHAY, CRCW060310K0FKED
39	1	R12	Resistor, 28.7K, 0805	VISHAY, CRCW080528K7FKED
40	1	R25	Resistor, 100K, 0603	VISHAY, CRCW0603100KJNEA
41	1	R27	Resistor, 150K, 0603	VISHAY, CRCW0603150KJNEA
42	1	R5	Resistor, 22 OHM, 1206	VISHAY, CRCW120622ROJNEA
43	2	R17,R18	Resistor, 0.015 OHM 1% 1206	IRC, LRF1206-01-R015-F
44	1	R26	Resistor, 750 OHMS, 0603	VISHAY, CRCW0603750RFKEA
45	1	R4	Resistor, 4.7k, 1206	VISHAY, CRCW12064K70FKEA
46	1	R13	Resistor, 121K, 0805	VISHAY, CRCW0805121KFKEA
47	0	R6	Resistor, 1206	OPT
48	1	R8	Resistor, 22.1 OHMS 0805	VISHAY, CRCW080522R1FKEA
49	1	R20	Resistor, 22.1K, 0603	VISHAY, CRCW060322K1FKEA
50	1	R24	Resistor, 13.0K, 0603	VISHAY, CRCW060313K0FKEA
51	1	T2	Gatedrive transformer	Pulse Engineering, PA0173
52	1	T1	EFD20 Flyback transformer	Pulse Engineering, PA2047NL
53	1	U1	LT3837EFE#PBF	Linear Technology, LT3837EFE#PBF
ADDITIONAL DEMO BOARD CIRCUIT COMPONENTS[2]				
1	1	C8	Capacitor, electrolytic, 47UF, 50V	Sanyo, 50ME47AX+TS
2	3	C7,C17,C23	Capacitor, TANT, 100uF, 6.3V, 3528	Kemet, T520B107M006ASE070
3	1	C43	Capacitor, X7R, 4700pF 250V, 1812	MURATA, GA343DR7GD472KW01L
4	3	L1,L3,L4	Inductor, 0.2uH	Cooper, FP2-S200
5	1	L2	Inductor, 4.7uH	Cooper, HCP0703-4R7-R
HARDWARE-FOR DEMO BOARD ONLY:				
1	4	(STAND-OFF),	STAND-OFF, NYLON 0.50"	KEYSTONE, 8833(SNAP ON)
2	6	E1-E6	Turret, 0.094"	Mill-Max, 2501-200-80-00-00-07-0
	Notes:			
	1. Required Circuit Components are those parts that are required to implement the circuit function			
	2. Additional Demo Board Circuit Components are those parts that provide added functionality for the demo board but are not required in the actual circuit.			