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LT3799-1

Offline Isolated Flyback LED Driver with PFC

DESCRIPTION

Demonstration circuit 1947A is an off-line isolated flyback LED driver featuring [LTC®3799-1](#). The demo board provides a single constant current output of 1A over an LED string voltage from 30V to 50V. It is optimized to operate over a wide AC input voltage range (90VAC to 277VAC, 47Hz to 63Hz). It provides a high power factor (>0.9) enabling a single design to be used worldwide. It is also designed to comply with the IEC 61000-3-2 Class C harmonics standard and the EN55015B conducted EMI standard.

The LT3799-1 controls an isolated flyback converter in boundary mode. Its novel current sensing scheme delivers a well-regulated output current to the secondary side without using an opto-coupler. Open- and shorted-LED protection ensures long term reliability.

The LT3799-1 is available in a low profile, thermally-enhanced 16-lead MSOP package.

The LT3799-1 data sheet gives a complete description of the device, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 1947A.

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

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PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Input Voltage Range	Line Frequency, 47Hz to 63Hz	90	230	277	VAC
Output Current I _{OUT}	V _{IN} = 120VAC, V _{LED} = 48V		1		A
Output Voltage		30	48	50	V
Open LED Voltage	(Note 1)	54			V

Note 1: For applications with low LED string voltage, FB pin divider resistor R4 and output clamp D9 can be adjusted to reduce the open voltage limit. See "Protection from Open LED and Shorted LED Faults" section in the data sheet for detail.

QUICK START PROCEDURE

IMPORTANT NOTE TO CUSTOMERS

HIGH VOLTAGES ARE PRESENTED ON THE DEMO CIRCUIT, AND CAN LEAD TO LETHAL INJURIES TO HUMAN BODY. ONLY QUALIFIED PERSONNEL SHOULD OPERATE IT. IT IS STRONGLY RECOMMENDED TO USE SAFETY GLASSES AND AN ISOLATION TRANSFORMER.

NOTE. IMPROPER COMPONENTS REPLACEMENT ON THE DEMO CIRCUIT CAN CAUSE PERFORMANCE DETERIORATIONS, CIRCUIT MALFUNCTION, PROPERTY DAMAGE, AND EVEN LIFE-THREATENING INJURIES. CONTACT LINEAR TECHNOLOGY APPLICATIONS ENGINEERS FOR PROPER COMPONENT REPLACEMENT.

Demonstration circuit 1947A is easy to set up to evaluate the performance of the LT3799-1.

for proper measurement equipment setup and follow the procedure below:

1. Connect a 1A LED string with forward voltage less than 50V, but greater than 30V, between LED+ and LED- terminals.
2. With power off, connect the input power supply to line (L) input and neutral (N) input.
3. Turn on the power at the input.

NOTE. Make sure that the input voltage does not exceed the maximum input voltage (277VAC).

4. Check for the proper output current.

Once the proper output currents are established, adjust the input voltage and/or the load and observe the output current regulation, efficiency, power factor and other parameters.

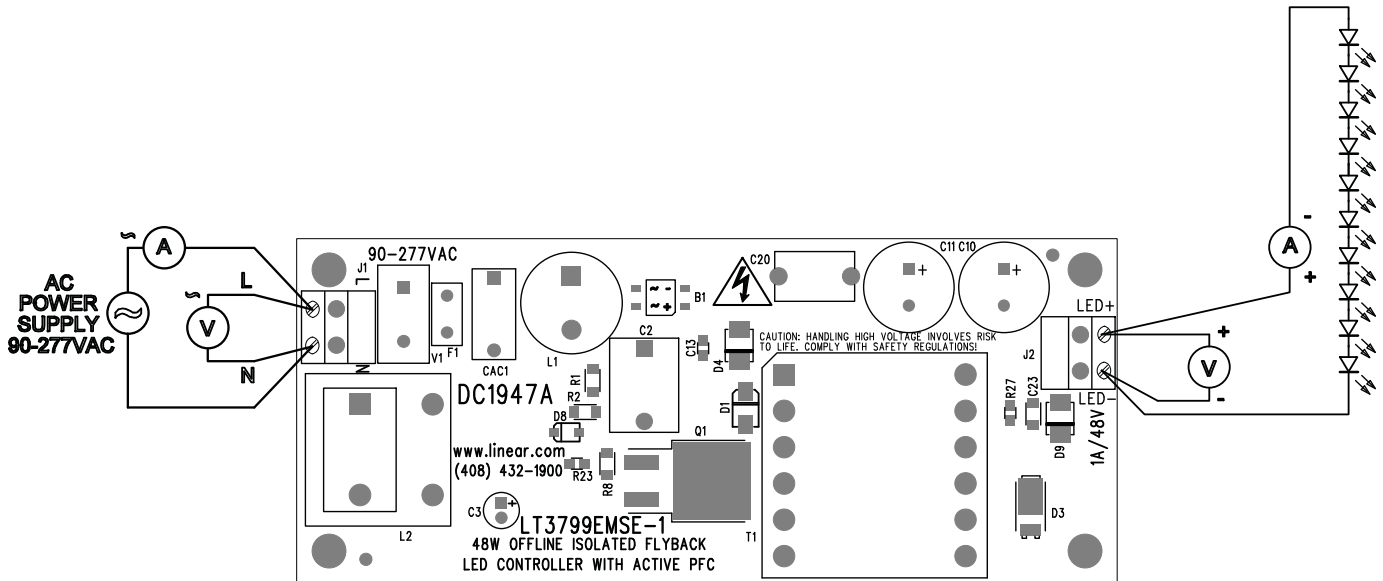


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

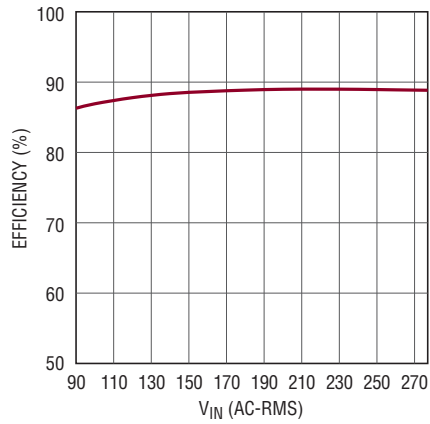


Figure 2. Efficiency vs Input Voltage

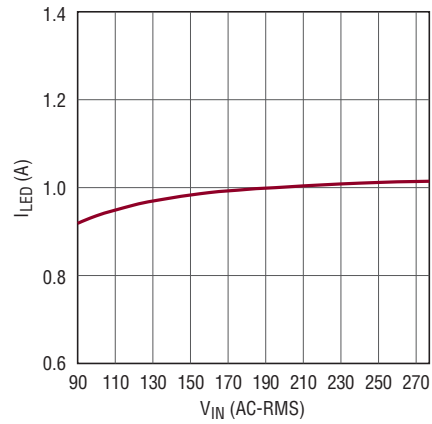


Figure 3. I_{OUT} vs Input Voltage

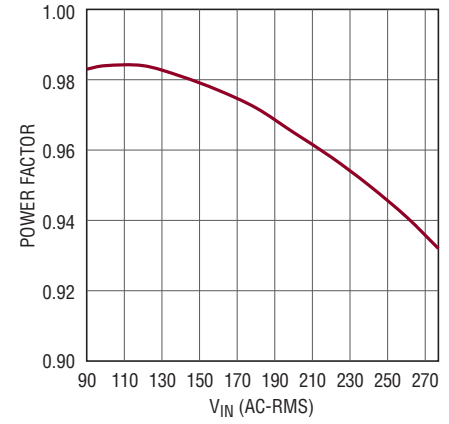


Figure 4. Power Factor vs Input Voltage

Input Line Voltage and Current

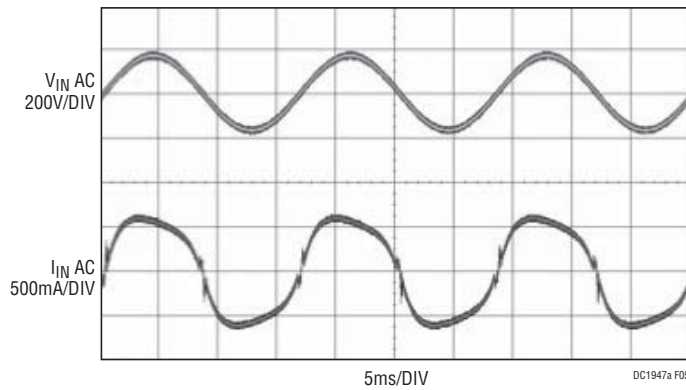


Figure 5. $V_{IN} = 120VAC$

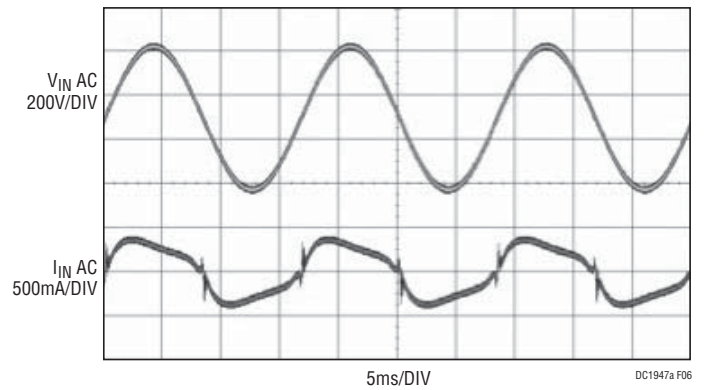


Figure 6. $V_{IN} = 230VAC$

Switch Node Voltage

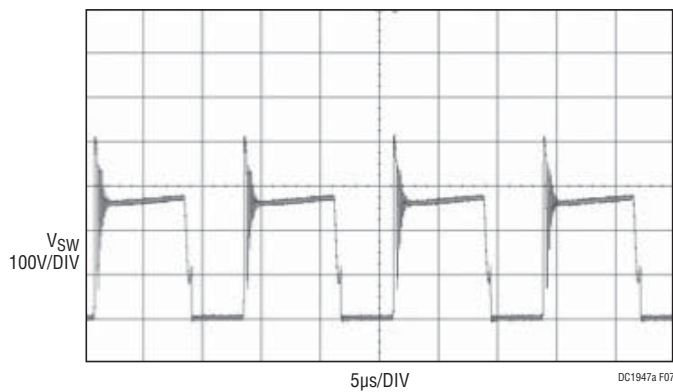


Figure 7. $V_{IN} = 120VAC$

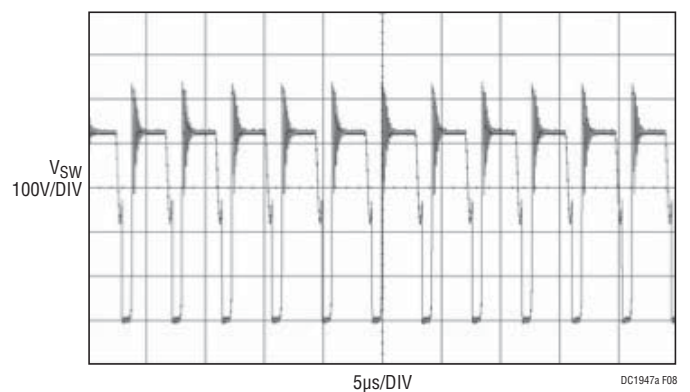


Figure 8. $V_{IN} = 230VAC$

QUICK START PROCEDURE

Output Voltage and Switch Node Voltage During Output Open

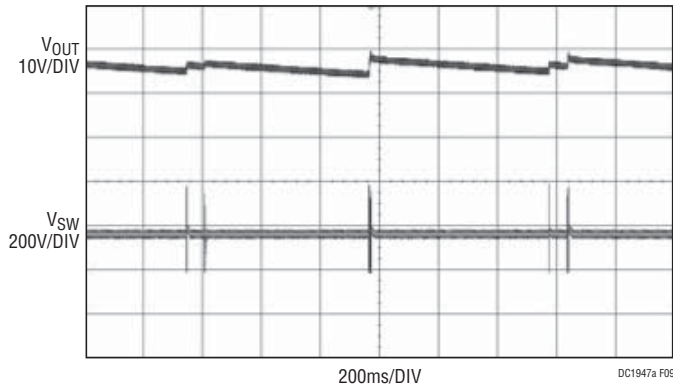


Figure 9. $V_{IN} = 120VAC$

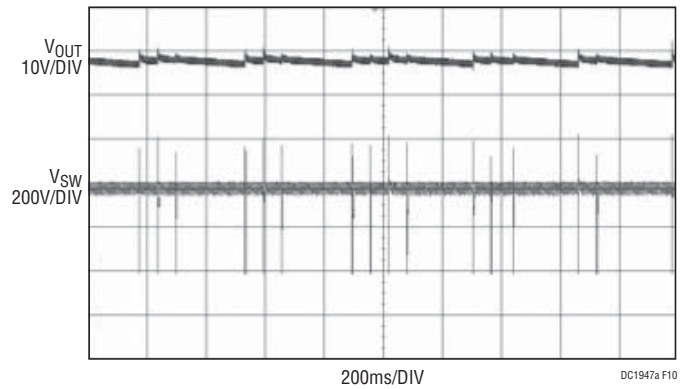


Figure 10. $V_{IN} = 230VAC$

Output Current and Switch Node Voltage During Output Short

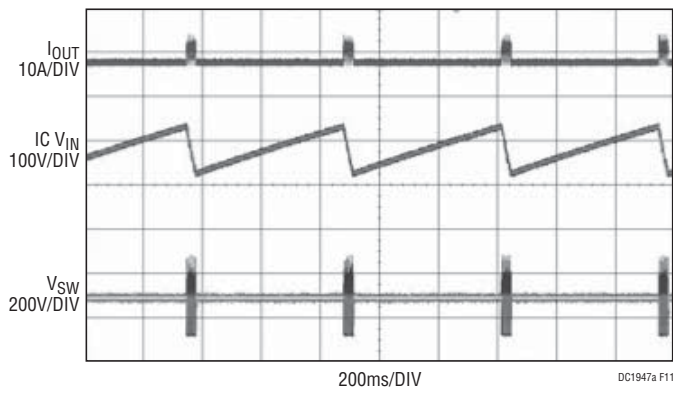


Figure 11. $V_{IN} = 120VAC$

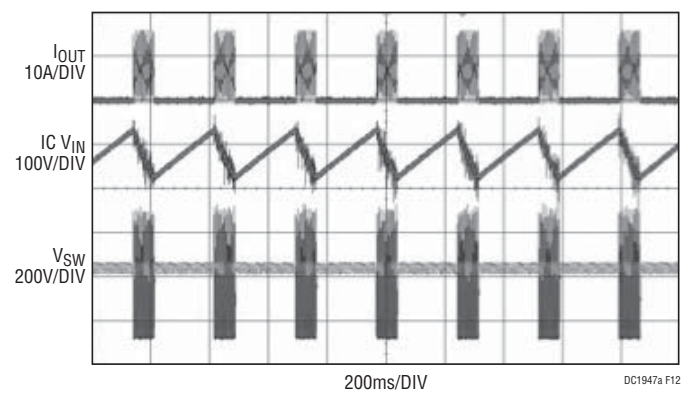


Figure 12. $V_{IN} = 230VAC$

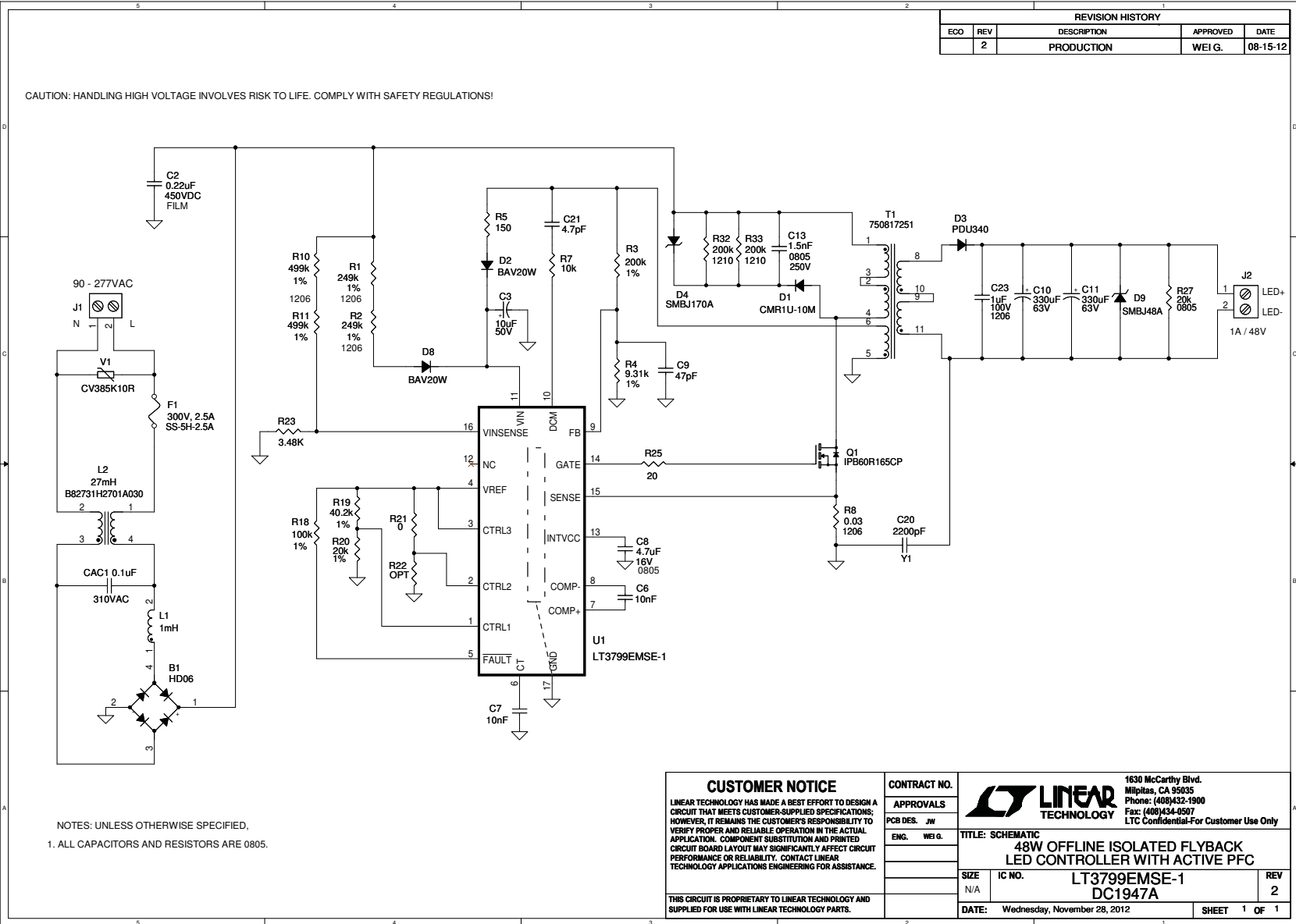
PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Required Circuit Components				
1	1	B1	RECTIFIER, BRIDGE 600V, 0.8A	DIODES INC., HD06-T
2	1	CAC1	CAP, 0.1 μ F, 310V, 20%	VISHAY, BFC233922104
3	1	C2	CAP, FILM, 0.22 μ F, 450V, 10%	RUBYCON, 450MPH224K
4	1	C3	CAP, 10 μ F, 20%, 50V, ALUM	RUBYCON, 50YXJ10M 5X11
5	2	C6, C7	CAP, X7R, 0.01 μ F, 50V, 10%, 0805	Murata, GRM216R71H103KA01D
6	1	C8	CAP, X5R, 4.7 μ F, 16V, 20%, 0805	AVX, 0805YD475MAT2A
7	1	C9	CAP, C0G, 47pF, 50V, 10%, 0805	AVX, 08055A470KAT
8	1	C10, C11	CAP, ELEC., 330 μ F, 63V, 20%	RUBYCON, 63ZL330MEF
9	1	C13	CAP, U2J, 1.5nF, 250V, 5%, 0805	Murata, GRM21A7U2E152JW31D
10	1	C20	CAP, 2.2nF, 10%, TYPE "Y1"	VISHAY, 440LD22-R
11	1	C21	CAP, C0G, 4.7pF, 50V, 0805	AVX, 08055A4R7BAQ2A
12	1	C23	CAP, X7R, 1 μ F, 100V, 10%, 1206	AVX 12061C105KAT2A
13	1	D1	DIODE, ULTRA FAST RECTIFIER	CENTRAL SEMI.CMR1U-10M
14	2	D2, D8	DIODE, FAST SWITCHING	DIODES INC., BAV20W-7-F
15	1	D3	DIODE, 3A Ultra-Fast REC., Power-DI-5	DIODES INC., PDU340-13
16	1	D4	DIODE, TVS, 600W, 170V, SMB	DIODES INC., SMBJ170A-13-F
17	1	D9	DIODE, TVS, 600W, 48V, SMB	DIODES INC. SMBJ48A-13-F
18	1	F1	FUSE, 2.5A	BUSSMAN, SS-5H-2.5A
19	1	L1	INDUCTOR, 1mH,	TDK, TSL1315RA-102JR78-PF
20	1	L2	CHOKE, D Code Double Choke	EPCOS, B82731H2701A030
21	1	Q1	XSTR, MOSFET, N-CHANNEL 650V	INFINEON, IPB60R165CP
22	2	R1, R2	RES, CHIP, 249k, 1%, 1/4W, 1206	VISHAY, CRCW0805249KFKEA
23	1	R3	RES, CHIP, 200k, 1%, 1/8W, 0805	VISHAY, CRCW0805200KFKEA
24	1	R4	RES, CHIP, 9.31k, 1%, 1/8W, 0805	VISHAY, CRCW08059K31FKEA
25	1	R5	RES, CHIP, 150, 1%, 1/8W, 0805	VISHAY, CRCW0805150RFKEA
26	1	R7	RES, CHIP, 10k, 1%, 1/8W, 0805	VISHAY, CRCW080510KFKEA
27	1	R8	RES, CHIP, 0.03, 1/4W, 1%, 1206	VISHAY, WSL1206R0300FEA
28	2	R10, R11	RES, CHIP, 499k, 1%, 1/4W, 1206	VISHAY, CRCW1206499KFKEA
29	1	R18	RES, CHIP, 100k, 1%, 1/8W, 0805	VISHAY, CRCW0805100KFKEA
30	1	R19	RES, CHIP, 40.2k, 1%, 1/8W, 0805	VISHAY, CRCW080540K2FKEA
31	2	R20, R27	RES, CHIP, 20k, 1%, 1/8W, 0805	VISHAY, CRCW080520KFKEA
32	1	R21	RES, CHIP, 0, 1/8W, 0805	VISHAY, CRCW08050000Z0EA
33	1	R23	RES, CHIP, 3.48k, 1%, 1/8W, 0805	VISHAY, CRCW08053K48FKEA
34	1	R25	RES, CHIP, 20, 5%, 1/8W, 0805	VISHAY, CRCW080520R0JKEA
35	2	R32, R33	RES, CHIP, 200k, 1%, 1/2W, 1210	VISHAY, CRCW1210200KFKEA
36	1	T1	XFMR, FLYBACK	WÜRTH ELECTONIK, 750817251
37	1	U1	IC., Isolated Flyback Controller	LINEAR TECH. LT3799EMSE-1#PBF
38	1	V1	VARISTOR, 385V	Stackpole Electronic, Inc. CV385K10R

DEMO MANUAL DC1947A

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
Additional Demo Board Circuit Components				
1	0	R22(OPT)	RES, CHIP, 0805	
Hardware—For Demo Board Only				
1	2	J1, J2	TERMINAL BLOCK, 2 POSITION	WEIDMULLER, 1715250000
2	4	MH1 to MH4	STAND-OFF, NYLON,0.25"	KEYSTONE, 8831(SNAP ON)



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CONTRACT NO.
 APPROVALS
 PCB DES. JW
 ENG. WEI G.

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TITLE: SCHEMATIC
48W OFFLINE ISOLATED FLYBACK LED CONTROLLER WITH ACTIVE PFC

SIZE N/A IC NO. **LT3799EMSE-1** REV 2
DC1947A

DATE: Wednesday, November 28, 2012 SHEET 1 OF 1

THIS CIRCUIT IS PROPRIETARY TO LINEAR TECHNOLOGY AND SUPPLIED FOR USE WITH LINEAR TECHNOLOGY PARTS.

DEMO MANUAL DC1947A

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This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

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