LT3798
Isolated No Opto-Coupler Flyback Controller with PFC

DESCRIPTION

Demonstration circuit 1817A is an off-line isolated flyback converter featuring the LT®3798. The demo board provides a single constant-voltage output of 24V at 2A. It is optimized to operate over a wide AC input voltage range (90VAC to 265VAC, 47Hz to 63Hz). Output voltage accuracy stays within ±5% over the whole input voltage and load range. It provides a high power factor (>0.95) enabling the design to be used worldwide. It is also designed to comply with the IEC 61000-3-2 Class D harmonics standard and the EN55015B conducted EMI standard.

The LT3798 controls an isolated flyback converter in boundary mode, suitable for applications with voltage or current regulation. Its novel sensing scheme delivers a well regulated output voltage or current to the secondary side without the use of an opto-coupler.

The LT3798 is available in a low profile, thermally enhanced 16-lead MSOP package.

The LT3798 data sheet gives a complete description of the part, operation and application information. The data sheet must be read in conjunction with this quick start guide for demo circuit 1817A.

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

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PERFORMANCE SUMMARY (T_A = 25°C)

PARAMETER	CONDITIONS	MIN	TYP	MAX
Input Range	Line Frequency, 47Hz to 63Hz	90VAC	120VAC	265VAC
Output Voltage			24V	
Efficiency	90VAC to 265VAC, 2A I_{OUT}		87%	
Power Factor	24V/2A Output, 90VAC to 265VAC	0.95	0.98	0.99

QUICK START PROCEDURE

IMPORTANT NOTE TO CUSTOMERS:

HIGH VOLTAGES ARE PRESENT 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 1817A is easy to set up to evaluate the performance of the LT3798. Refer to Figure 1 for proper measurement equipment setup and follow this procedure:

1. Connect an adjustable load between + and – output 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 (265VAC).

4. Check for the proper output voltage.

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

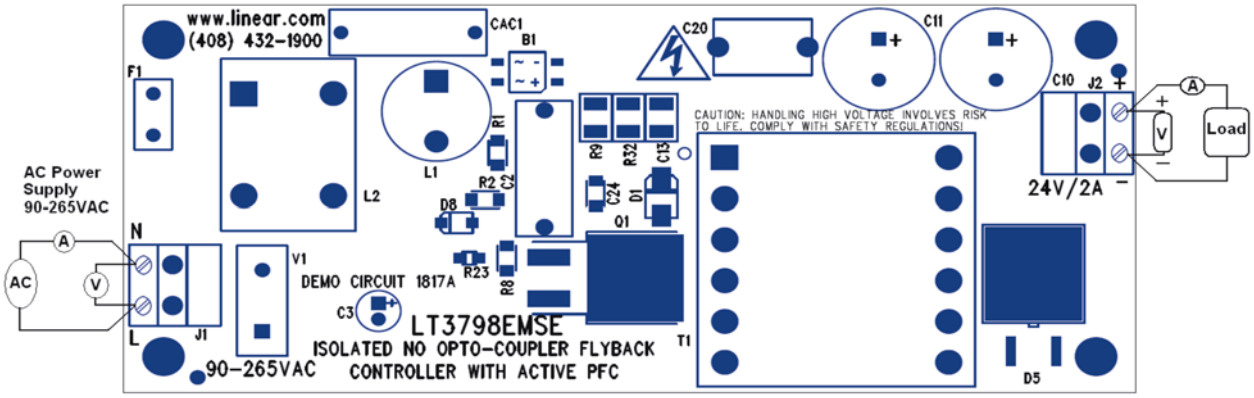


Figure 1. Proper Measurement Equipment Setup

QUICK START PROCEDURE

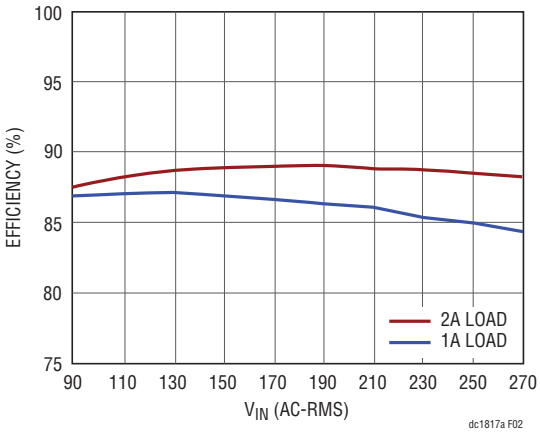


Figure 2. Efficiency vs Input Voltage

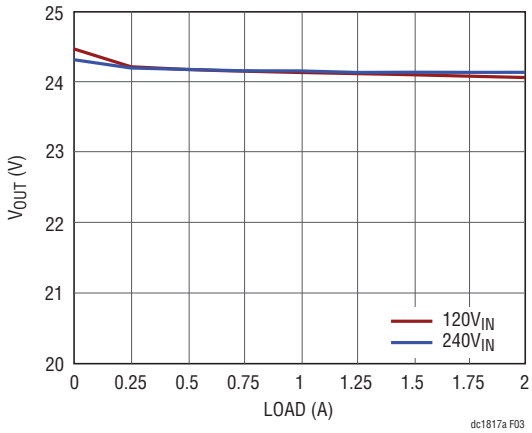


Figure 3. V_{OUT} vs Load Current

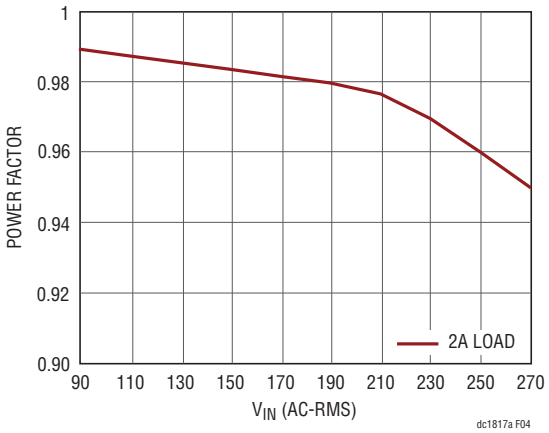


Figure 4. Power Factor vs Input Voltage

Input Line Voltage and Current

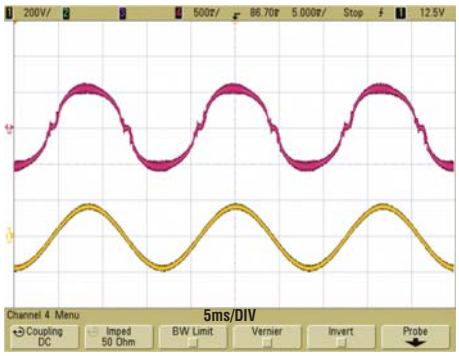


Figure 5. 120VAC (PF = 0.99)

$I_{IN(AC)}$ (1A/DIV)

$V_{IN(AC)}$ (200V/DIV)

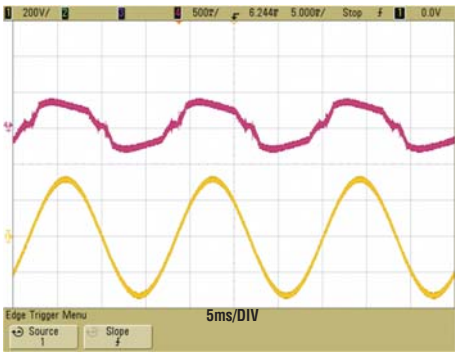


Figure 6. 230VAC (PF = 0.97)

QUICK START PROCEDURE

Switch Node Voltage



V_{SW}
(100V/DIV)

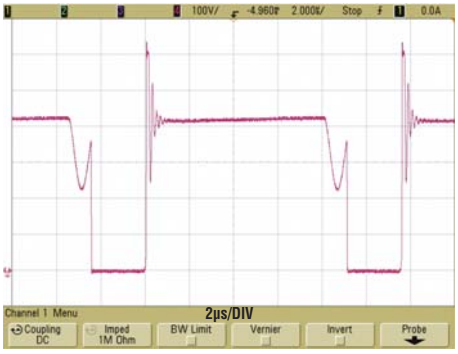
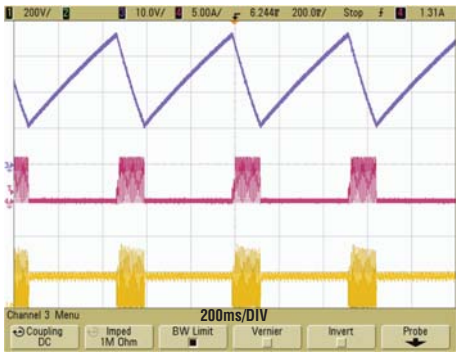


Figure 7. 120VAC (V_{SW} = 450V)

Figure 8. 230VAC (V_{SW} = 630V)

Output Current and Switch Node Voltage During Output Short



$I_{C(VIN)}$
(20V/DIV)

I_{OUT}
(5A/DIV)

V_{SW}
(200V/DIV)

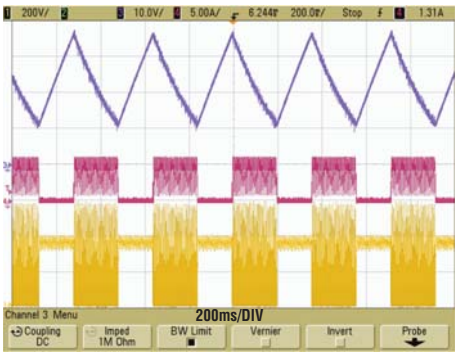
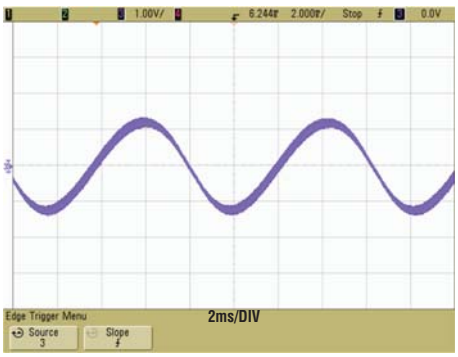


Figure 9. 120VAC

Figure 10. 230VAC



V_{OUT}
(1V/DIV)

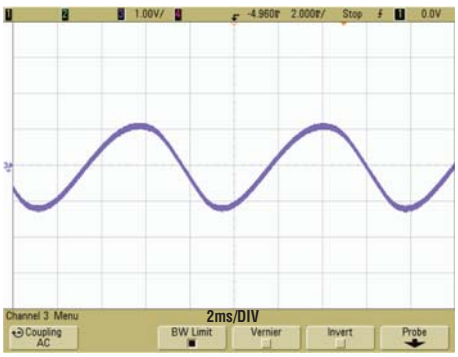


Figure 11. Output Ripple at 120VAC, 2A Load

Figure 12. Output Ripple at 230VAC, 2A Load

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, 0.1µF, 20%, 250V/275VAC, ECQ-UL	PANASONIC, ECQUAAF104M
3	1	C2	CAP, FILM, 0.22µF, 20%, 400V	PANASONIC, ECQE4224KF
4	1	C3	CAP, 10µF, 20%, 50V, ALUM	RUBYCON, 50YXJ10M 5X11
5	1	C6	CAP, 0805, 0.1µF, 10%, 50V, X7R	TDK, C2012X7R1H104K
6	1	C7	CAP, 0805, 2.2µF, 10%, 50V, X5R	TDK, C2012X5R1H225K
7	1	C8	CAP, 0805, 4.7µF, 20%, 16V, X5R	AVX, 0805YD475MAT2A
8	2	C10, C11	CAP, 1000µF, 20%, 35V, ELEC	NIPPON CHEMI-CON, ELXV350ETD102MK30S
9	1	C13	CAP, 2010, 2.2nF, 10%, 250V	MURATA, GRM32A7U2J222JW31D
10	1	C20	CAP, 2.2nF, 10%, Y5B, TYPE Y1	VISHAY, 440LD22-R
11	2	C12, C21	CAP, 0805, 22pF, ±0.25pF, 50V, NPO	AVX, 08055A220CAT2A
12	2	C23, C25	CAP, 1210, 10µF, 20%, 35V, X5R	MURATA, GRM32ER7YA106KA12L
13	1	C24	CAP, 1206, 47pF, 10%, 630V, NPO	AVX, 1206CA470KAT1A
14	1	D1	DIODE, FAST SWITCHING	CENTRAL SEMI, CMR1U-06M TR13
15	1	D2	DIODE, FAST SWITCHING	DIODES INC., BAV20W-7-F
16	1	D5	DIODE, SUPER BARRIER RECTIFIER, 20A	DIODES INC., SBR20A200CTB
17	1	D8	DIODE, FAST SWITCHING	DIODES INC., 1N4148W-7-F
18	1	F1	FUSE, 2.5A, FAST ACTING	COOPER BUSSMANN, SS-5F-3.15A
19	1	L2	CHOKE, D CODE, DOUBLE CHOKE	TDK/EPCOS, B82731H2701A030
20	1	L1	INDUCTOR, 1mH	TDK, TSL1315RA-102-JR78-PF
21	1	Q1	XSTR, MOSFET, N-CHANNEL, 650V	INFINEON, IPB60R165CP
22	2	R1, R2	RES, 1206, 100k, 1%, 1/4W	VISHAY, CRCW1206100KFKEA
23	1	R3	RES, 0805, 100k, 1%, 1/8W	VISHAY, CRCW0805100KFKEA
24	1	R4	RES, 0805, 5.49k, 1%, 1/8W	VISHAY, CRCW08055K49FKEA
25	1	R5	RES, 0805, 47Ω, 5%, 1/8W	VISHAY, CRCW080547R0JKEA
26	1	R25	RES, 0805, 20Ω, 1%, 1/8W	VISHAY, CRCW080520R0FKEA
27	1	R7	RES, 0805, 33k, 5%, 1/8W	VISHAY, CRCW080533K0JNEA
28	1	R8	RES, 0.03Ω, 1/4W 1%, 1206, SMD	VISHAY, WSL1206R0300FEA
29	1	R9	RES, 1210, 510Ω, 5%, 1/2W	VISHAY, CRCW1210510RJNEA
30	2	R10, R11	RES, 1206, 499k, 1%, 1/4W	VISHAY, CRCW1206499KFKEA
31	1	R18	RES, 0805, 10k, 1%, 1/8W	VISHAY, CRCW080510K0FKEA
32	1	R19	RES, 0805, 40.2k, 1%, 1/8W	VISHAY, CRCW080540K2FKEA
33	1	R20	RES, 0805, 31.6k, 1%, 1/8W	VISHAY, CRCW080531K6FKEA
34	2	R24, R37	RES, 0805, 0Ω, 5%, 1/8W	VISHAY, CRCW08050000Z0EA
35	2	R27, R28	RES, 1206, 510Ω, 5%, 1/4W	VISHAY CRCW1206510KJKEA
36	1	R32	RES, 1210 150k, 5%, 1/2W	NIC, NRC25J154TRF
37	1	R35	RES, 0805, 2.4M, 5%, 1/8W	VISHAY, CRCW08052M40JNEA
38	1	R36	RES, 0805, 301k, 1%, 1/8W	VISHAY, CRCW0805301KFKEA
39	1	R38	RES, 0805, 24.9k, 1%, 1/8W	VISHAY, CRCW080524K9FKEA

PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
40	1	T1	XFMR, FLYBACK	WÜRTH ELEKTRONIK, 750811248
41	1	U1	IC., ISOLATED FLYBACK, CONTROLLER	LINEAR TECHNOLOGY, LT3798EMSE#PBF
42	1	V1	VARISTOR, 320V, RMS, 13.5mm RADIAL	VISHAY, VDRS10P320BSE
Additional Circuit Components				
1	0	R23	RES, 0805, OPTION	OPTION
2	0	C9	CAP, 0805	OPTION
3	0	C14	CAP, 0805, OPTION	OPTION
Hardware/Components (For Demo Board Only)				
1	2	J1, J2	TERMINAL BLOCK, 2 POSITION	WEIDMULLER, 1715250000
2	4	MH1-MH4	STAND-OFF, NYLON, 0.25"	KEYSTONE, 8831 (SNAP-ON)

SCHEMATIC DIAGRAM

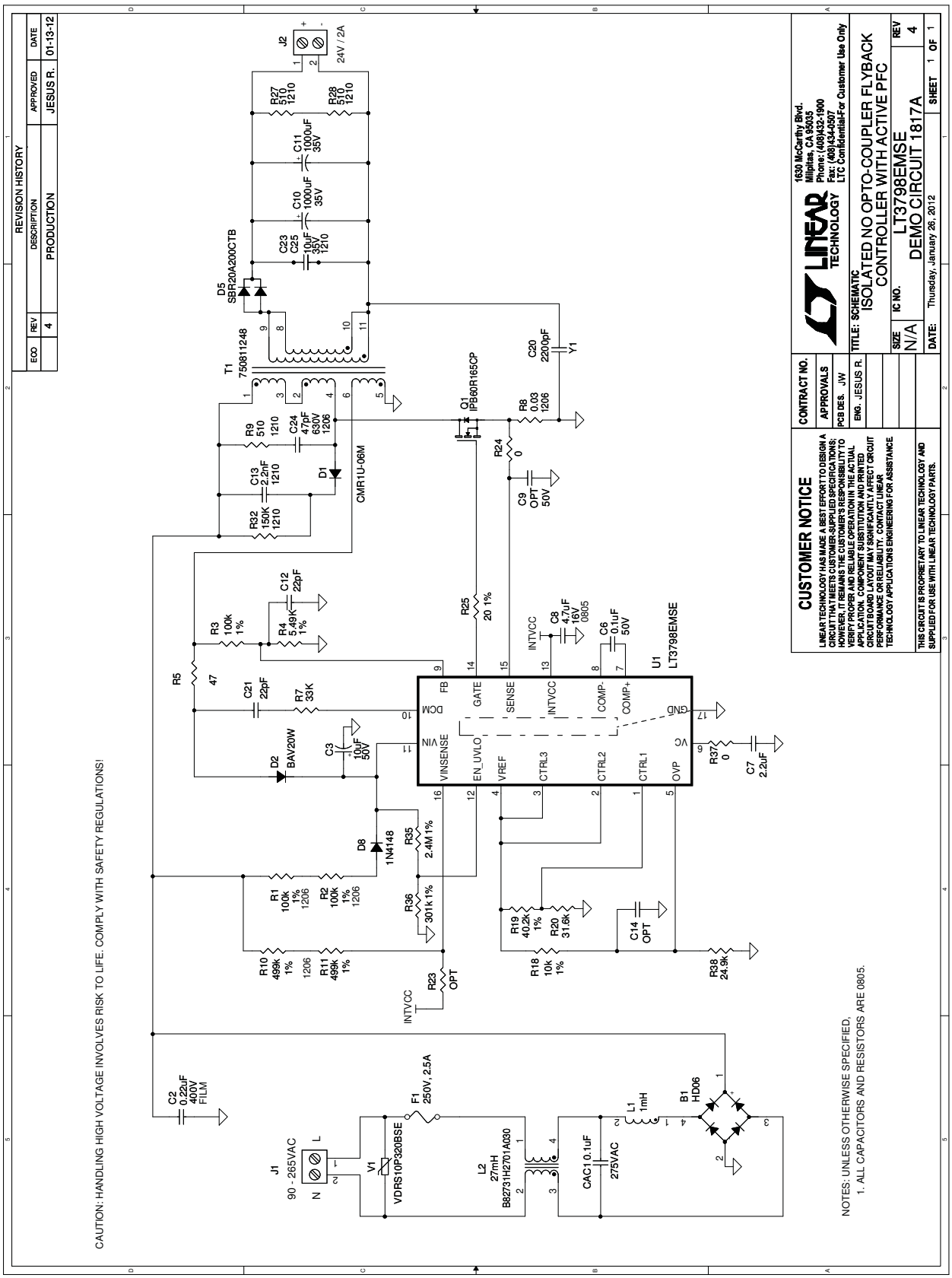


Figure 13. DC1817A Demo Circuit Schematic

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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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