Application Note 50

MIC2145 Low Power POE Flyback Converter

By Steven Chenetz

General Description

The MIC2145 skip mode controller is used to implement a flyback converter that is intended for use in non-isolated, low power, POE applications. The circuit has a nominal 48V input and supports the POE voltage range of 36V to 57V. The output voltage is 2.5V at 350mA.

The maximum voltage rating of the MIC2145 is 16V. To get around the low voltage rating, transistor Q2, with a 100V rating, is connected in series with the switch pin of the MIC2145 to form a cascode configuration. Diode D6, clamps the voltage at the source of Q2 to Vdd (6V). The base of Q2 is always at Vdd potential. Q2 conducts when the MIC2145 switch pin goes low and turns off when the switch pin goes high.

Components R3, D3, and Q1 comprise an emitter follower voltage that regulates the MIC2145 supply voltage at 6V. The flyback transformer is a standard off-the-shelf magnetic, configured at a 5:1 turns ratio. L2 and C8 form an input filter to attenuate ripple voltage on the input. L1 and C7 attenuate r ipple on the output voltage.

Optional Components C1 and R5 may be used to snub out high frequency ringing caused by the parasitics in the secondary section. C6 may be added, if necessary, to eliminate noise at the feedback pin.

The output voltage is set by the R1, R2 resistor divider and is calculated using the formula:

$$Vout = 1.08 \times \left(1 + \frac{R1}{R2}\right)$$

- The schematic is shown in Figure 1:

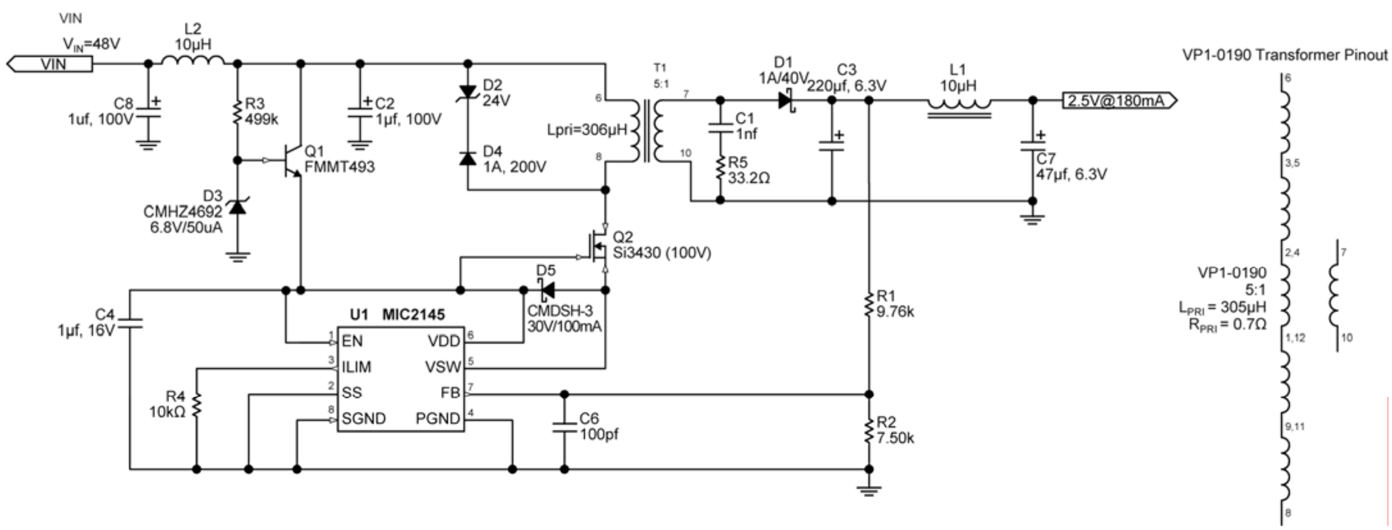


Figure 1

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
U1	**MIC2145BMM**	**Micrel**	**Switching Regulator**	**1**
D1	1N5819	Diodes Inc	1A 40V schottky	1
D2	SMAJ24A	Diodes Inc	Transient Voltage Suppressor 24V	1
D3	CMHZ4692-M11	Central Semiconductor	6.8V, 50uA zener diode	1
D4	CMR1U-02M-M11	Central Semiconductor	1A, 200V ultrafast rectifier	1
D5	CMDSH-3-M11	Central Semiconductor	100mA, 30V schottky	1
Q1	FMMT493	Zetex	100V NPN	1
Q2	SI3430DV	Vishay-Siliconix	100V N-Channel MOSFET	1
T1	VP1-0190	Cooper ET	transformer	1
L1, L2	CDRH4D28-100	Sumida	Inductor, 10uh	2
C1	GRM31BR32J102CKY01L	MuRata	1nF, 630V, X7R size 1206	0
C2, C8	GRM32ER72A105KA01L	MuRata	1uF, 100V, X7R, size 1210	2
C3	TPSD227M006R0050	AVX	220uf, 6.3V, tant	1
C4	GRM21BR71E105KA99L.	MuRata	1uF, 25V, X7R size 0805	1
C6	VJ0805A101KXAAB	Vishay	100pf, 50V, X7R	0
C7	TPSB476M006R0250	AVX	47uf, 6.3V, tantalum	1
R1	CRCW08059761FRT1	Vishay dale	9.76k, 1%	1
R2	CRCW08057501FRT1	Vishay dale	7.5k, 1%	1
R3	CRCW08054993FRT1	Vishay dale	499k, 1%	1
R4	CRCW08051002FRT1	Vishay dale	10k ohms, 1%	1
R5	CRCW120633R2FRT1	Vishay dale	33.2 ohms, 1%	0

Notes:

1. Central Semi Tel: 631-435-1110
2. Cooper ET Tel: 561-752-5000
3. Sumida Tel: 408-321-9660
4. Murata Tel: 800-831-9172
5. Vishay Tel: 206-452-5664
6. Micrel Semiconductor Tel: 408-944-0800

The efficiency for 4.5Vin and 12Vin is shown in Figure 2.

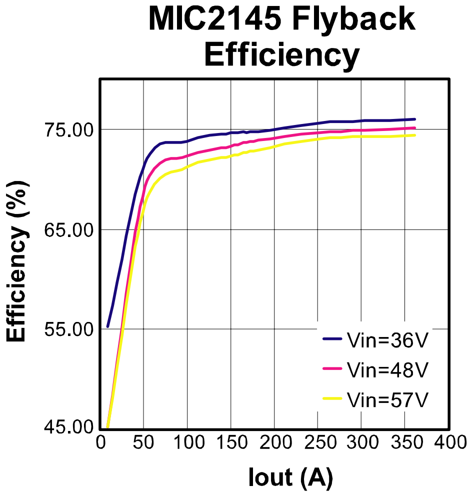
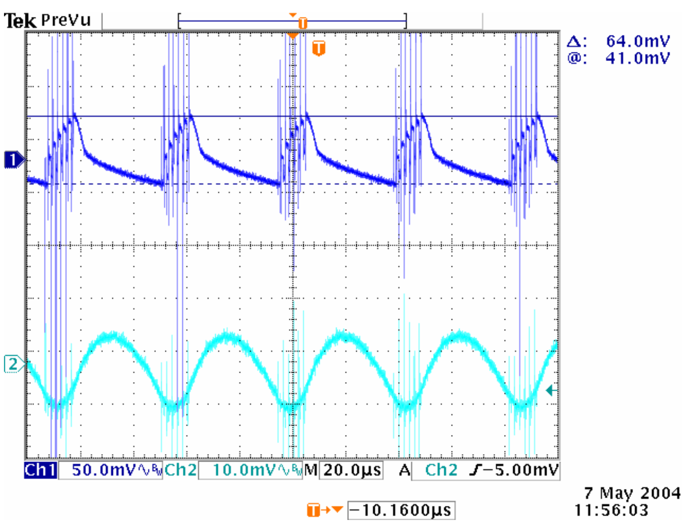


Figure 2

Output noise and ripple, before and after the 2nd stage LC filter is shown in Figure 3.



Output Voltage Ripple & Noise before and After the 2nd stage LC filter

V_{IN}=48V

V_O=2.5V

I_O=180mA

Timebase=20µs/div

Top Trace is before the LC filter
Scale: 50mV/div
Bottom Trace is after the LC filter
Scale: 10mV/div

Figure 3

MICREL, INC. 2180 FORTUNE DRIVE SAN JOSE, CA 95131 USA
TEL +1 (408) 944-0800 FAX +1 (408) 474-1000 WEB http:/www.micrel.com