MIC4720YMME Evaluation Board

2A Buck Regulator

General Description

The Micrel MIC4720 is a high efficiency PWM buck (step-down) regulator that provides up to 2A of output current. The MIC4720 operates at 2MHz and has proprietary internal compensation that allows a closed loop bandwidth of over 200kHz. The low on-resistance internal P-Channel MOSFET of the MIC4720 allows efficiencies up to 94%, reduces external component count and eliminates the need for an expensive external current sense resistor. The MIC4720 operates from a 2.7V to 5.5V input and its output is adjustable down to 1V. The devices can operate with a maximum duty cycle of 100% for use in low-dropout applications.

Requirements

The MIC4720 evaluation board requires an input power source that is able to deliver greater than 2.7V at over 2A. The output load can either be an active or passive load.

Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the V_{IN} terminal may damage the device. In addition, the maximum operating voltage of the MIC4720 evaluation board is 5.5V. Exceeding 6V on the input could damage the device. **For short circuit testing, an additional input capacitor over 22µF is required** when using the demo board. This is preferably an electrolytic, but may be tantalum or ceramic. The inductance of long test leads connecting the supply voltage to the demo board can be over 1µH.

During a short circuit condition, the high peak currents through the test leads may cause the input voltage to spike high and exceed the absolute maximum rating of 6V, possibly damaging the device.

Getting Started

1. **Connect an external supply to V_{IN} terminal**. Apply desired input voltage to the V_{IN} and ground terminals of the evaluation board, paying careful attention to polarity and supply voltage ($2.7V<V_{IN}<5.5V$). An ammeter may be placed between the input supply and the V_{IN} terminal to the evaluation board. Ensure the supply voltage is monitored at the V_{IN} terminal. The ammeter and/or power lead resistance can reduce the voltage supplied to the input.

2. **Connect the load to the V_{OUT} and ground terminals**. The load can be either passive (resistive) or active (as in an electronic load). An ammeter can be placed between the load and the V_{OUT} terminal. Ensure the output voltage is monitored at the V_{OUT} terminal. The default output voltage is set to 1.8V. This can be adjusted by changing the feedback resistors. See “Output Voltage.”

3. **Enable the MIC4720**. The enable pin is connected to a pull up resistor. The MIC4720 turns on when V_{IN} exceeds the UVLO threshold at the V_{IN} pin. The MIC4720 may be turned off by shorting the pin to ground or bringing the enable pin below the enable threshold. An external connection on the board provides easy access to the enable pin.

Output Voltage

The output voltage on the MIC4720 evaluation board is adjustable. The output voltage is controlled by the feedback resistors (R1 and R2) and can be calculated as follows:

$$V_{OUT} = V_{REF} \times \left(1 + \frac{R1}{R2}\right)$$

Where V_{REF} = 1V.

The evaluation board is preset at 1.8V, but can easily be modified by removing R2 and replacing it with the value that yields the desired output voltage. (Removing R2 sets the output to 1V).

$$R2 = \frac{R1 \times V_{REF}}{V_{OUT} - V_{REF}}$$

For V_{REF} = 1V, this reduces to:

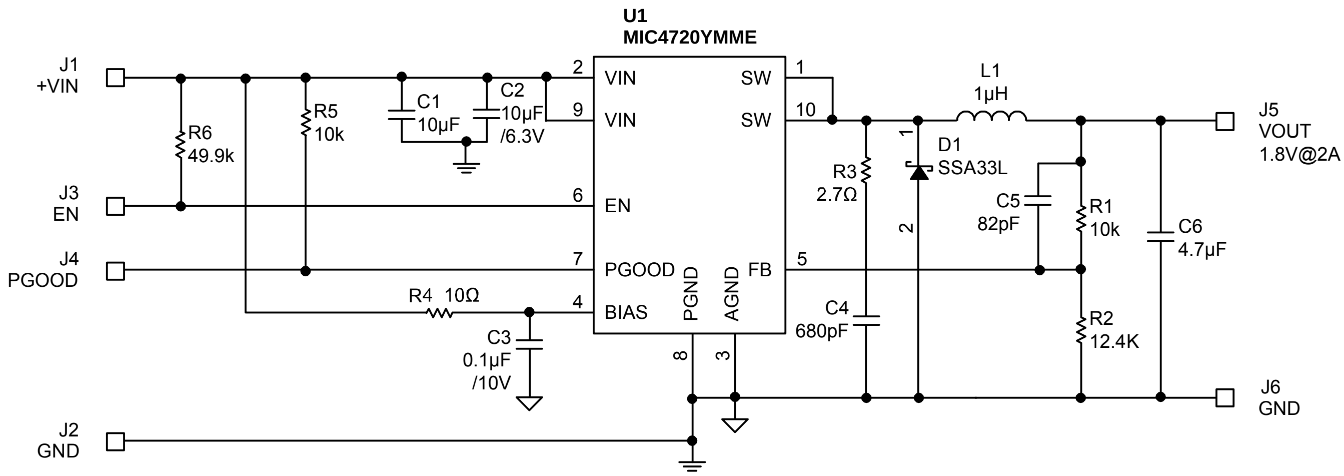
$$R2 = \frac{R1}{V_{OUT} - 1}$$

Power OK

The POK pin is pulled up to V_{IN} through a pull-up resistor and is asserted low when V_{OUT} is within the regulation band. An external connection on the board provides easy access to the POK pin.

Ordering Information

Part Number	Description	Package
MIC4720YMME	IC	10-Pin MSOP EPAD
MIC4720YMME EV	Evaluation Board	10-Pin MSOP EPAD



Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1, C2	C1608 X5R0J106K	TDK[1]	10µF Ceramic Capacitor X5R 6.3V	2
	GRM188R61A106K	Murata[2]	10µF Ceramic Capacitor X5R 10V	
	08056D106MAT	AVX[3]	10µF Ceramic Capacitor X5R 6.3V	
	JMK107BJ106MA-T	Taiyo Yuden[4]	10µF Ceramic Capacitor X5R 6.3V	
C3	VJ0402Y104KXQCW1BC	Vishay[5]	0.1µF Ceramic Capacitor X7R 10V	1
	C1005X7R1A104K	TDK[1]	0.1µF Ceramic Capacitor X7R 10V	
	0402ZD104MAT	AVX[3]	0.1µF Ceramic Capacitor X5R 10V	
C4	VJ0402A681KXXCW1BC	Vishay[5]	680pF Ceramic Capacitor NPO 10V	1
	C1005COG1A681J	TDK[1]	680pF Ceramic Capacitor 10V	
C5	VJ0402A82KXXCW1BC	Vishay[5]	82pF Ceramic Capacitor NPO 10V	1
	C1005COG1A820J	TDK[1]	82pF Ceramic Capacitor 10V	
C6	C1608X5R0J475K	TDK[1]	4.7µF Ceramic Capacitor X5R 6V	1
	06036D475MAT	AVX[3]		
	JMK107BJ475MA-T	Taiyo Yuden[4]		
	GRM188R60J475KE19D	Murata[2]		
D1	SSA33L	Vishay[5]	3A Schottky 30V	1
	MBRM330-13	Diodes, Inc.[6]		
L1	LTF5022T-1R2N4R2	TDK[1]	1.2µH Inductor 4.3A ±30%	1
	IHLP2525AHER1R0M01	Vishay[5]	1µH Inductor 7A	
R1, R5	CRCW04021002FKEYE3	Vishay Dale[5]	10k 1% 0402 1/16W	2
R2	CRCW04021242FKEYE3	Vishay Dale[5]	12.4k 1% 0402 1/16W	1
R3	CRCW04022R70FKEYE3		2.7Ω 1% 0402 1/16W	1
R4	CRCW040210R0FKEYE3		10Ω 1% 0402 Resistor	1
R6	CRCW04024992FKEYE3		49.9k 1% 0402 Resistor	1
U1	**MIC4720YMME**	**Micrel, Inc.[7]**	**2MHz 2A Buck Regulator**	**1**

Notes:

1. TDK: www.tdk.com
2. Murata: www.murata.com
3. AVX: www.avx.com
4. Taiyo Yuden: www.t-yuden.com
5. Vishay: www.vishay.com
6. Diodes, Inc.: www.diodes.com
7. **Micrel, Inc.: www.micrel.com**

Printed Circuit Board Layouts

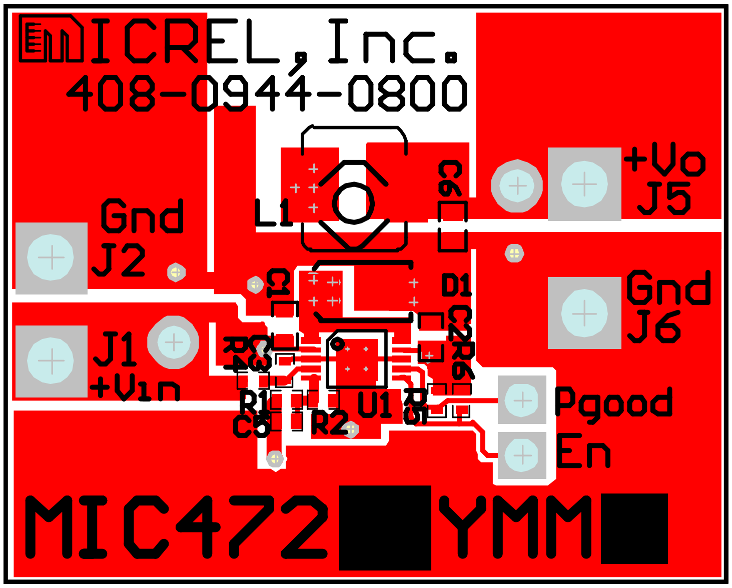


Figure 1a. Top Layer

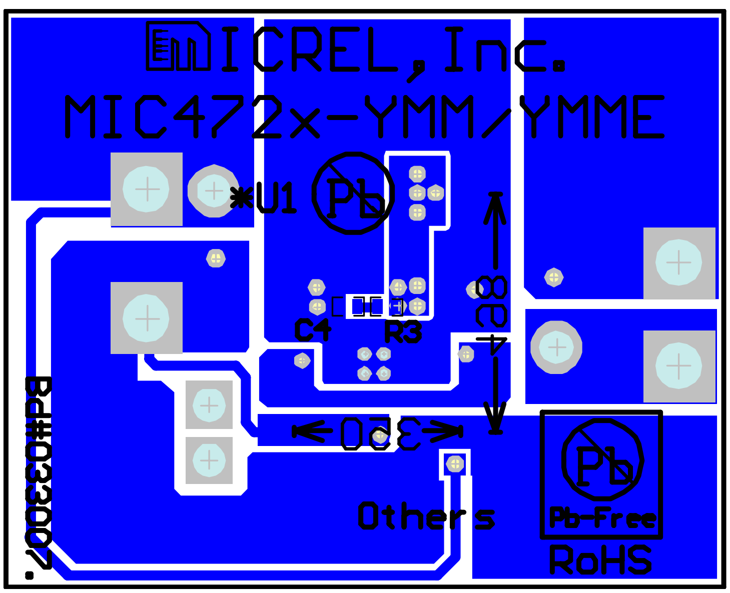


Figure 1b. Bottom Layer

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

This information furnished by Micrel in this data sheet is believed to be accurate and reliable. However no responsibility is assumed by Micrel for its use. Micrel reserves the right to change circuitry and specifications at any time without notification to the customer.
Micrel Products are not designed or authorized for use as components in life support appliances, devices or systems where malfunction of a product can reasonably be expected to result in personal injury. Life support devices or systems are devices or systems that (a) are intended for surgical implant into the body or (b) support or sustain life, and whose failure to perform can be reasonably expected to result in a significant injury to the user. A Purchaser's use or sale of Micrel Products for use in life support appliances, devices or systems is a Purchaser's own risk and Purchaser agrees to fully indemnify Micrel for any damages resulting from such use or sale.

© 2007 Micrel Incorporated