

Dual 2A Buck Regulator

General Description

The Micrel MIC4742 is a high efficiency dual PWM buck (step-down) regulator that provides up to 2A of output current for each channel. The MIC4742 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 MIC4742 allows efficiencies up to 92%, reduces external component count and eliminates the need for an expensive external current sense resistor. The MIC4742 operates from a 2.9V to 5.5V input and its output is adjustable down to 0.6V. The devices can operate with a maximum duty cycle of 100% for use in low-dropout applications.

Requirements

The MIC4742 evaluation board requires an input power source that is able to deliver greater than 2.9V at over 4A. 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 MIC4742 evaluation board is 5.5V. Exceeding 6V on the input could damage the device.

Getting Started

- 1. Connect an external supply to VIN terminal. Apply desired input voltage to the V_{IN} and ground terminals of the evaluation board, paying careful attention to polarity and supply voltage ($2.9V < V_{IN} < 5.5V$). 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_{OUT1}/V_{OUT2} 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_{OUT1}/V_{OUT2} terminal. Ensure the output voltage is monitored at the V_{OUT1}/V_{OUT2} terminal. The default V_{OUT1} is set to 1.8V and the default V_{OUT2} is set to 1.2V. This can be adjusted by changing the feedback resistors. See "Output Voltage."

3. Enable the MIC4742. The enable pins are connected to pull up resistors. Both outputs of the MIC4742 turn on when V_{IN} exceeds the UVLO threshold at the V_{IN} pin. Each output of the MIC4742 may be turned off by shorting the enable 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 voltages on the MIC4742 evaluation board are adjustable. The output voltage is controlled by the feedback resistors (R11 and R12 for V_{OUT1} , R21 and R22 for V_{OUT2}) and can be calculated as follows:

$$V_{OUT1} = V_{REF} \times (1 + \frac{R11}{R12})$$
$$V_{OUT2} = V_{REF} \times (1 + \frac{R21}{R22})$$

Where $V_{REF} = 0.6V$.

The evaluation board is preset at 1.8V for V_{OUT1} and 1.2V for V_{OUT2} , but can easily be modified by removing R12 or R22 and replacing them with the value that yields the desired output voltage.

$$R12 = \frac{R11 \times V_{REF}}{V_{OUT} - V_{REF}}$$
$$R22 = \frac{R21 \times V_{REF}}{V_{OUT} - V_{REF}}$$

For $V_{REF} = 0.6V$, this reduces to:

$$R12 = \frac{R11 \times 0.6V}{V_{OUT} - 0.6V}$$

$$R22 = \frac{R21 \times 0.6V}{V_{OUT} - 0.6V}$$

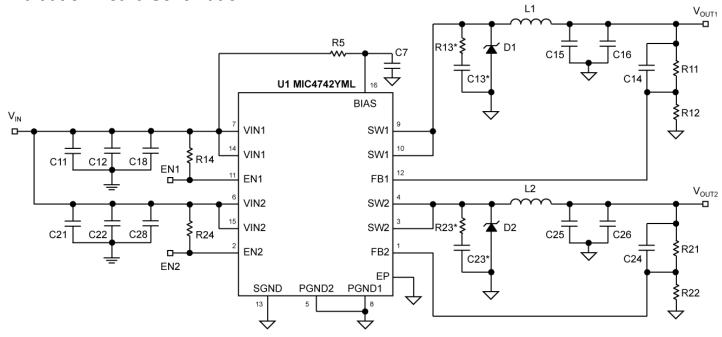
Ordering Information

Part Number	Description	Package
MIC4742YML	IC	16-Pin EPAD-MLF [®]
MIC4742YML EV	Evaluation Board	16-Pin EPAD-MLF [®]

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MLF is a registered trademark of Amkor Technology, Inc.

Evaluation Board Schematic



Bill of Materials

Item	Part Number	Manufacturer	Description	Qty
C11,C12	GRM188R60J106M	Murata ⁽¹⁾		
C21,C22	C1608X5R0J106M	TDK ⁽²⁾	10μF Ceramic Capacitor, X5R, Size 0603, 6.3V	
	06036D106KMAT2A	AVX ⁽³⁾		
C13*,C23*	VJ0603A681KXXCW	Vishay ⁽⁴⁾	680pF Ceramic Capacitor, NPO, Size 0603, 6.3V	2
C14,C24	VJ0603A820KXXCW	Vishay ⁽⁴⁾	82pF Ceramic Capacitor, NPO Size 0603, 10V	2
C15,C25	GRM188R60J475K	Murata ⁽¹⁾		
	C1608 X5R0J475M	TDK ⁽²⁾	4.7μF Ceramic Capacitor, X5R, Size 0603, 6.3V	2
	0603D475MAT	AVX ⁽³⁾		
C16,C26,C7	VJ0603Y104KXXAT	Vishay ⁽⁴⁾	0.1µF Ceramic Capacitor, X7R, Size 0603, 25V	5
C18,C28		-		
D1,D2	SS2P3L	Vishay ⁽⁴⁾		
	SSA23L	Vishay ⁽⁴⁾	2A Schottky 30V	2
	B230A	Diodes ⁽⁵⁾		
L1,L2	IHLP2525AH-01 1R0	Vishay ⁽⁴⁾	1µH Inductor 17.5mΩ 6.86mm(L) x 6.47mm(W) x 1.8mm(H)	
	RLF7030-1R0 N	TDK ⁽²⁾	1µH Inductor 8.8mΩ 7.3mm(L) x 6.8mm(W) x 3.2mm(H)	2
	HCP0703-1R0	COOPER ⁽⁶⁾	1µH Inductor 10mΩ 7.3mm(L) x 7.0mm(W) x 3.0mm(H)	
R11,R12	CRCW060310K0FKXX	Vishay ⁽⁴⁾	10kΩ, 1%, Size 0603 Resistor	2
R12,R22	CRCW06033K16FKXX		3.16kΩ, 1%, Size 0603 Resistor For 2.5V _{OUT}	
	CRCW06034K99FKXX		4.99kΩ, 1%, Size 0603 Resistor For 1.8 V _{OUT}	
	CRCW06036K65FKXX	Vishay ⁽⁴⁾	6.65k Ω , 1%, Size 0603 Resistor For 1.5 V _{OUT}	2
	CRCW060310K0FKXX		10kΩ, 1%, Size 0603 Resistor For 1.2 V _{OUT}	
	CRCW060315K0FKXX		15kΩ, 1%, Size 0603 Resistor For 1.0 V _{OUT}	

Bill of Materials (continued)

Item	Part Number	Manufacturer	Description	Qty
R13*, R23*	CRCW06032R70FKXX	Vishay ⁽⁴⁾	2.7Ω, 1%, Size 0603 Resistor	2
R14, R24	CRCW060349K9FKXX	Vishay ⁽⁴⁾	49.9kΩ, 1%, Size 0603 Resistor	2
R5	CRCW060310R0FKXX	Vishay ⁽⁴⁾	10Ω, 1%, Size 0603 Resistor	1
U1	MIC4742YML	Micrel, Inc. ⁽⁷⁾	Dual 2A 2MHz Integrated Switch Buck Regulator	1

Notes:

1. Murata: www.murata.com

2. TDK: www.tdk.com

3. AVX: www.avx.com

4. Vishay: www.vishay.com

5. Cooper: www.cooperbussmann.com

6. Diode: www.diodes.com

7. Micrel, Inc: <u>www.micrel.com</u>

* only for ultra-low noise applications.

Printed Circuit Board Layouts

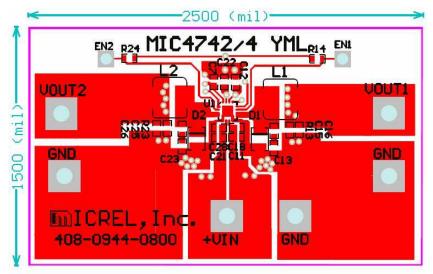


Figure 1a. Top Layer

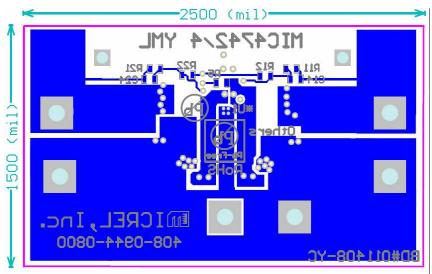
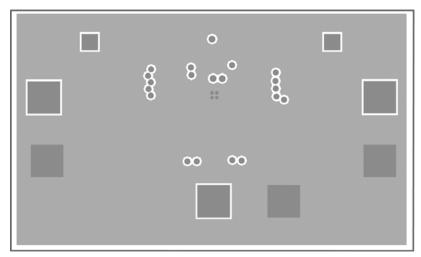


Figure 1b. Bottom Layer





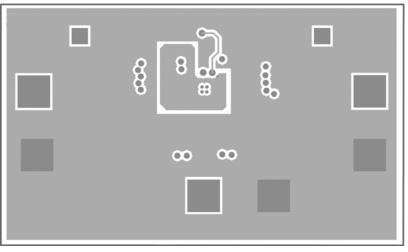


Figure 1d. Mid-Layer 2

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