



## MIC2205 Evaluation Board

### High Efficiency 2MHz Step-Down Converter with LOW™ Mode

#### General Description

The Micrel MIC2205 is a high efficiency 2MHz PWM synchronous step-down switching regulator that features a LOWQ™ LDO standby mode that draws only 18µA of quiescent current. The MIC2205 features an ultra-low noise, small size, and high efficiency solution for portable power applications.

In PWM mode, the MIC2205 operates at a constant frequency of 2MHz. Under light load conditions, such as in system sleep or standby modes, the PWM switching operation can be disabled to reduce switching losses. In this light load LOWQ™ mode, the LDO maintains the output voltage and draws only 18µA of quiescent current. The LDO mode of operation saves battery life while not introducing spurious noise and high ripple as experienced with pulse skipping or bursting mode regulators.

The MIC2205 operates from a 2.7V to 5.5V input and features internal power MOSFETs that can supply up to 600mA of output current in PWM mode. It can operate with a maximum duty cycle of 100% for use in low-dropout conditions.

#### Requirements

The MIC2205 evaluation board requires an input power source that is able to deliver greater than 1A at 2.7V. The output load can either be an active or passive source.

#### Precautions

The evaluation board does not have reverse polarity protection. Applying a negative voltage to the VIN terminal may damage the device.

In addition, the maximum operating voltage of the MIC2205 evaluation board is 5.5V. Exceeding 6V on the input could damage the device.

#### Getting Started

1. **Connect an external supply to V<sub>IN</sub> terminal.** Apply desired input voltage to the V<sub>IN</sub> and ground terminals of the evaluation board, paying careful attention to polarity and supply voltage ( $2.7V \leq V_{IN} \leq 5.5V$ ). An ammeter may be placed between the input supply and the V<sub>IN</sub> terminal to the evaluation board. Be sure to monitor the supply voltage at the V<sub>IN</sub> terminal. The ammeter and/or power lead resistance can reduce the voltage supplied to the input.
2. **Connect the load to the V<sub>OUT</sub> and ground terminals.** The load can be either passive (resistive) or active (electronic load). An ammeter can be placed between the load and the V<sub>OUT</sub> terminal. Ensure the output voltage is monitored at the V<sub>OUT</sub> 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 MIC2205.** Apply a 1.3V or greater voltage source to the enable pin.

LOWQ is a trademark of Micrel, Inc.

Micrel, Inc. • 2180 Fortune Drive • San Jose, CA 95131 • USA • tel + 1 (408) 944-0800 • fax 1 (408) 474-1000 • <http://www.micrel.com>

May 2006

M9999-051606  
(408) 955-1690

**Output Voltage**

The output voltage on the MIC2205 evaluation board is adjustable. The output voltage is controlled by the feedback resistors (R1 and R2) and can be calculated as follows:

$$V_{OUT} = 1.0V \times \left( \frac{R1}{R2} + 1 \right)$$

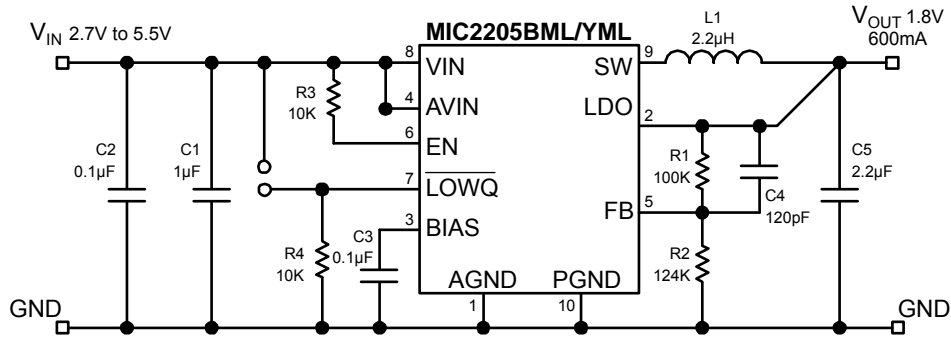
The evaluation board is initially adjusted to 1.8V, but can easily be modified by removing R2 and replacing it with the value that yields the desired output voltage. (Removing R2 sets the output to 1.0V).

$$R2 = \frac{100k\Omega}{\left( \frac{V_{OUT}}{1.0V} - 1 \right)}$$

**LOWQ™**

The MIC2205 is a 600mA PWM power device that utilizes a LOWQ™ light load mode to maximize battery efficiency in light load conditions. This is achieved with a LOWQ™ control pin that when pulled low, (Remove JP1), shuts down all the biasing and drive current for the PWM regulator, drawing only 18µA of operating current. This allows the output to be regulated through the LDO output that is capable of providing 60mA of output current. This method has the advantage of producing a clean, low current, ultra low noise output in LOWQ™ mode. During LOWQ™ mode, the SW node becomes high impedance, blocking current flow. Other methods of reducing quiescent current, such as pulse frequency modulation (PFM) or bursting techniques, create large amplitude, low frequency ripple voltages that can be detrimental to system operation.

When more than 60mA is required, the LOWQ pin can be forced high, (Connect JP1), causing the MIC2205 to enter PWM mode. In this case, the LDO output makes a "hand-off" to the PWM regulator virtually without any variation in output voltage. The LDO output then turns off allowing up to 600mA of current to be efficiently supplied through the PWM output to the load.



## Bill of Material

### MIC2205 Evaluation Board

Ref Des	Part Number	Description	Manufacturer
C1	06036D475MAT2A	4.7µF 6.3V X5R 0603 Ceramic Capacitor	TDK
	C1608X5R0J475M		Murata
C2	C1005X5R1C104K	0.1µF 16V X5R 0402 Ceramic Capacitor	TDK
	GRM155R61C104K		Murata
C3	C1005X5R1C104K	0.1µF 16V X5R 0402 Ceramic Capacitor	TDK
	GRM155R61C104K		Murata
C4	VJ0402A121KXJAT	120pF 16V X7R 0402 Ceramic Capacitor	Vishay
C5	06036D225MAT2A	2.2µF 6.3V X5R 0603 Ceramic Capacitor	AVX
	GRM188R60J225KE19D		Murata
	C1608X5R1A225K		TDK
L1	LQH32CN2R2M53	2.2µH 790mA Inductor	Murata
	VLF3010AT-2R2M1R0	2.2µH 100mA Inductor	TDK
	CBC2016T2R2M	2.2µH 750mA Inductor	Taiyo Yuden
R1	CRCW04021003FRT1	100kΩ 1% 0402 Resistor	Vishay
R2	CRCW04021243FRT1	124kΩ 1% 0402 Resistor	Vishay
R3	CRCW04021002FRT1	10kΩ 1% 0402 Resistor	Vishay
R4	CRCW04021002FRT1	10kΩ 1% 0402 Resistor	Vishay
U1	MIC2205BML/YML*	2MHz PWM Step-Down Converter/LDO	Micrel

**Notes:**

1. AVX: [www.avx.com](http://www.avx.com)
2. Murata: [www.murata.com](http://www.murata.com)
3. TDK: [www.tdk.com](http://www.tdk.com)
4. Vishay: [www.vishay.com](http://www.vishay.com)
5. Taiyo Yuden: [www.t-yuden.co](http://www.t-yuden.co)
6. Micrel, Inc.: [www.micrel.com](http://www.micrel.com)

\* Micrel IC = Pb-Free

### Printed Circuit Board Layouts

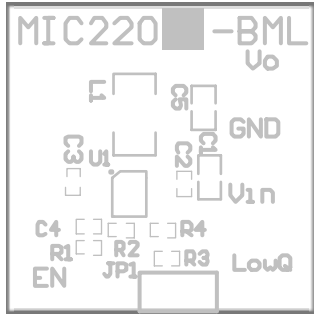


Figure 1a. Top Silkscreen

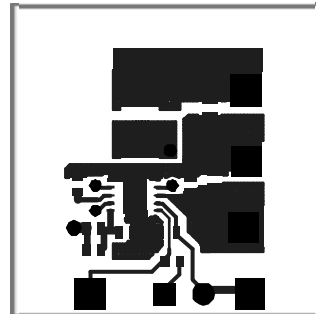


Figure 1b. Top Layer

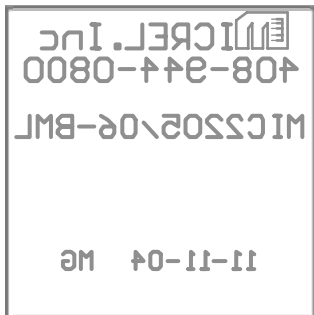


Figure 1c. Bottom Silkscreen

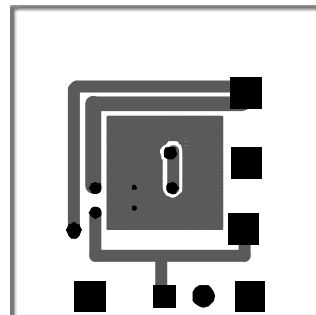


Figure 1d. Bottom Layer

---

**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.

© 2005 Micrel Incorporated

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».



## JONHON

«**JONHON**» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«**FORSTAR**» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели,  
кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А