



MIC3385 Evaluation Board

High Efficiency 8MHz Step-Down Converter with LOWQ[®] Mode

General Description

The Micrel MIC3385 is a high efficiency 8MHz PWM synchronous step-down switching regulator that features a LOWQ[®] LDO standby mode that draws only 20 μ A of quiescent current. The MIC3385 features an ultra-low noise, small size, and high efficiency solution for portable power applications.

In PWM mode, the MIC3385 operates at a constant frequency of 8MHz. 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 20 μ A 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 MIC3385 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 MIC3385 evaluation board requires an input power source that is able to deliver greater than 600mA 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 V_{IN} terminal may damage the device.

In addition, the maximum operating voltage of the MIC3385 evaluation board is 5.5V. Exceeding 6V on the input could damage the device.

Getting Started

1. **Connect an external supply to V_{IN} terminal.** Apply desired input voltage to the V_{IN} (J1) and ground (J2 and J6) 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_{IN} terminal to the evaluation board. Be sure to monitor the supply voltage 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} (J5) and ground terminals.** The load can be either passive (resistor) or active (electronic load). An ammeter can be placed between the load and the V_{OUT} terminal. Be sure to monitor the output voltage 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. **Disable the MIC3385.** Apply ground, or 0V, to the enable (EN) J4 terminal.

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Output Voltage

The output voltage on the MIC3385 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[®]

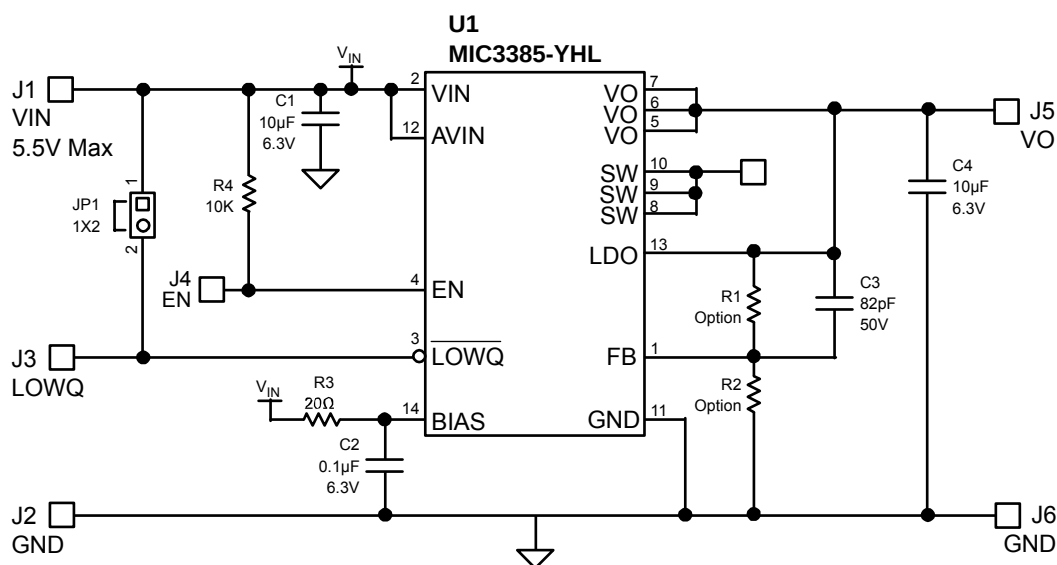
The MIC3385 is a 600mA PWM power device that utilizes a LOWQ[®] light load mode to maximize battery efficiency in light load conditions. This is achieved with a LOWQ[®] control pin that when pulled low, (Remove JP1), shuts down all the biasing and drive current for the PWM regulator, drawing only 20μA 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 MIC3385 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.

Ordering Information

Part Number	Description
MIC3385 EV	Evaluation board with the MIC3385-YHL device



Bill of Materials

Ref Des	Part Number	Description	Manufacturer
C1, C4	C1608X5R0J106K	10µF 6.3V X5R 0603 Ceramic Capacitor	TDK ⁽¹⁾
	06036D106MAT2A		AVX ⁽²⁾
	GRM188R60J106M	10µF 6.3V X7R 0603 Ceramic Capacitor	MuRata ⁽³⁾
C2	C1005X5R0J104M	0.1µF 6.3V X5R 0402 Ceramic Capacitor	TDK ⁽¹⁾
	04026D104MAT2A		AVX ⁽²⁾
	GRM155R60J104K	0.1µF 6.3V X7R 0402 Ceramic Capacitor	MuRata ⁽³⁾
C3	VJ0402A820KXQCW1BC	82pF X7R 0402 Ceramic Capacitor	Vishay ⁽⁴⁾
	C1005COG1H820J	82pF COG 0402 Ceramic Capacitor	TDK ⁽¹⁾
R1	CRCW04021003F	100kΩ 1% 0402 Resistor (Optional)	Vishay ⁽⁴⁾
R2	CRCW04021243F	124kΩ 1% 0402 Resistor (Optional)	Vishay ⁽⁴⁾
R3	CRCW040220R0F	20Ω 1% 0402 Resistor	Vishay ⁽⁴⁾
R4, R5	CRCW04021002F	10kΩ 1% 0402 Resistor	Vishay ⁽⁴⁾
U1	MIC3385YHL	8MHz PWM Step-Down Converter/LDO	Micrel, Inc. ⁽⁵⁾

Notes:

1. TDK: www.tdk.com
2. AVX: www.avx.com
3. Murata: www.murata.com
4. Vishay: www.vishay.com
5. Micrel, Inc.: www.micrel.com

Printed Circuit Board Layouts

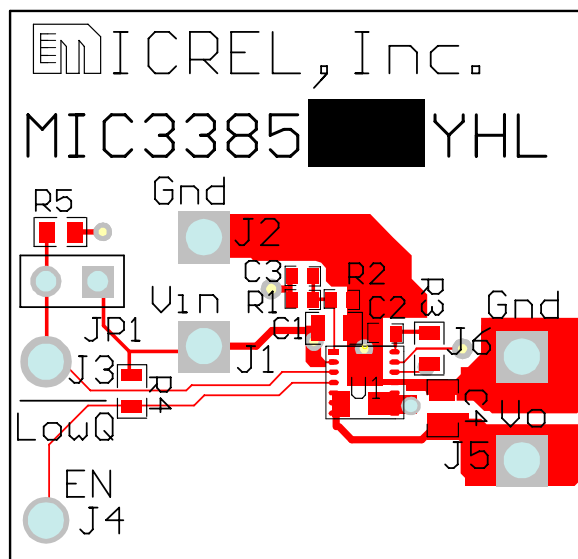


Figure 1a. Top Layer

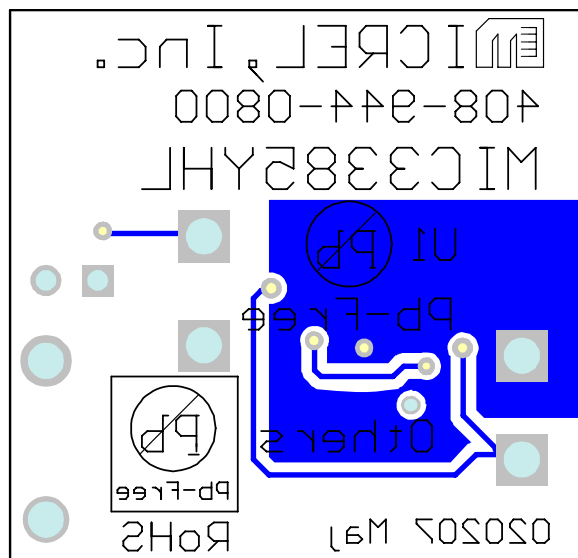


Figure 1b. Bottom Layer

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