MIC39100/39101/39102 Evaluation Board

1A Low-Voltage Low-Dropout Regulator

General Description

This evaluation board can be used to evaluate several of Micrel's new, low voltage, high current, low-dropout linear voltage regulators. The MIC39100 is a three-terminal LDO offered in the SOT-223 surface mount, power package. The MIC39101 is a 1A LDO in a power SO-8 package that offers the added functionality of an enable pin and an error flag output. The MIC39102 is an adjustable version of the MIC39100 in a power SO-8 package and it also has the added functionality of an enable pin, allowing the user to disable the device and put it into a zero-current off mode state. The board has two layouts, one on the topside to accommodate the MIC39100 and one on the backside to accommodate the MIC39101/2. This one board can easily be used to evaluate any one of these parts.

Requirements

The evaluation board requires a power supply capable of supplying a minimum of 1A of output current. The maximum voltage of that power supply should be at least 5V. These parts are intended for 3.3V to 2.5V and 3.3V or 2.5V to 1.8V conversion. A high voltage power supply should not be needed. The MIC39100/1/2 has an input voltage range of 2.25V to 16V, therefore it is not limited to just 5V systems.

Circuit Description

The MIC39100/1/2 regulators are simple to implement, requiring only an output capacitor for proper operation. An input cap is required when the power supply is greater than 4" away from the device. All evaluation boards include an input capacitor within 1" of the device. This is the recommended maximum distance away from the device that a capacitor should be placed.

A minimum of 10µF of output capacitance is required for the MIC39100/1/2. Using large values of capacitance at the input and output will help to improve transient response. Table 1 shows the bill of materials for the different devices.

MIC39101/MIC39102

The MIC39101 circuit implements an error flag and an enable function. The enable function allows the user to put the device into a zero-current off state when the regulator is not required. The enable pin is an active-high pin and needs to be pulled high (≥2V) to enable the device and pulled low (≤ 0.8V) to disable the device. The error flag function is a voltage monitor that indicates when the output falls out of regulation for any reason. The error flag output is an open-collector output, which is active-low, and requires a pull-up resistor for proper operation. Boards assembled with the MIC39101 have a 47kΩ pull-up resistor from FLG to the input voltage.

The MIC39102 is an adjustable regulator that implements an enable pin that allows the user to disable the device. The enable pin is also active-high and requires that pin to be pulled high to turn-on the output and pulled low to disable the output. A jumper (JP1)is available to tie that pin to either the input or to ground. The output voltage of the MIC39102 is adjustable down to the band gap voltage of 1.24V. The board is set up with four set voltage options, A through D. A fifth option is available that can be custom set. The equation to set the output voltage is as follows:

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

$$V_{REF} = 1.24V$$

On the board as it stands, R1 is set to 10kΩ. Using the equation and knowing that R1 = 10kΩ, a custom voltage can be determined by solving for R2 and placing an 0805 or 1206 resistor in the slot prepared and labeled E.

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

$$R2 = \left(\frac{1.24V}{V_{OUT} - 1.24V}\right) \times 10k\Omega$$

Leaving all jumpers open sets the output voltage to the band gap voltage, 1.24V.

Minimum Load

All of the devices require a minimum load of 10mA. A resistor is included on the board to provide a minimum load of 10mA. The resistor value is different depending on the voltage option that the board has. The MIC39102 has a 140Ω resistor to maintain approximately 10mA at 1.4V output voltage. The 140Ω resistor can be changed to set a 10mA load depending upon the desired output voltage.

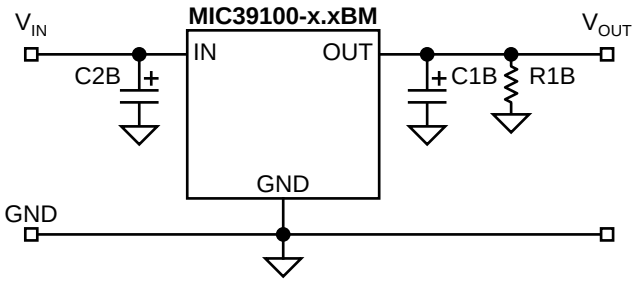

Figure 1. MIC39100, SOT-223 Regulator Schematic

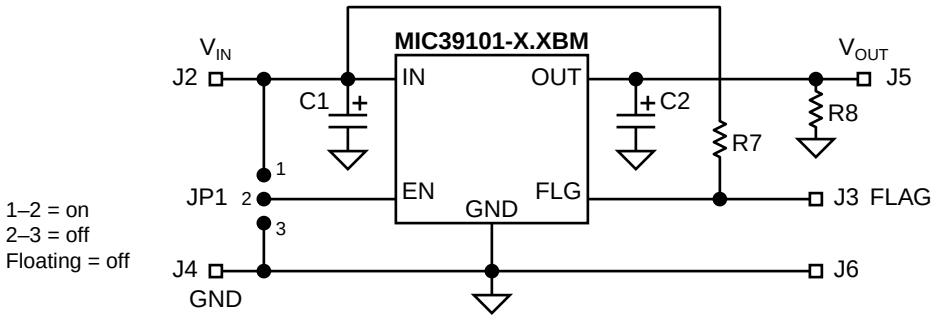

Figure 2. MIC39101, Power SOP-8 Regulator Schematic

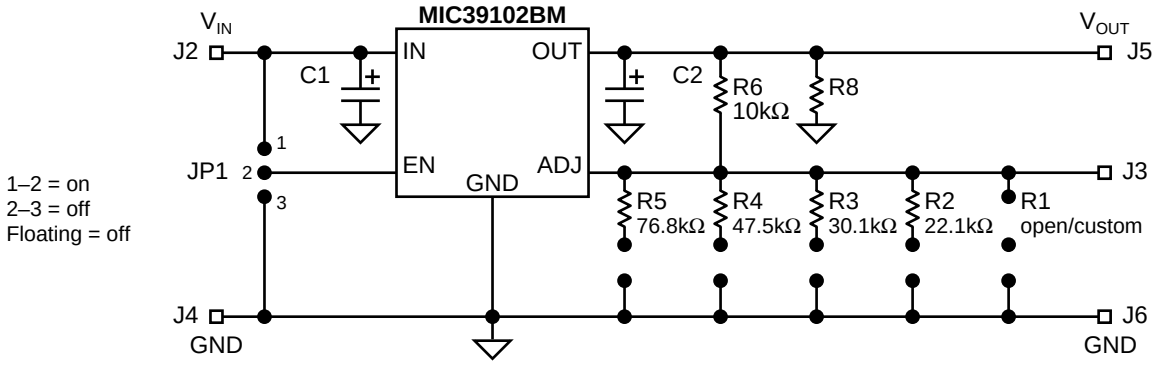

Figure 3. MIC39102, Adjustable Regulator Schematic

Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1B	TPSC106M025R0500	AVX	10µF, 25V, Tantalum	1
C2B	TPSC106M025R10500	AVX	10µF, 25V, Tantalum	1
R1B		AVX	240Ω (2.5V) or 180Ω (1.8V) 5% 1/8W	1
U1B	**MIC39100-x.xBS**	Micrel	LDO Regulator	1

C1	TPSC106M025R0500	AVX	10µF, 25V, Tantalum	1
C2	TPSC106M025R10500	AVX	10µF, 25V, Tantalum	1
R7			470Ω 5% 1/8W, size 0805	1
R8		AVX	240Ω (2.5V) or 180Ω (1.8V) 5% 1/8W	1
U1	**MIC39101-x.xBM**	Micrel	LDO Regulator	1

C1	TPSC106M025R0500	AVX	10µF, 25V, Tantalum	1
C2	TPSC106M025R0500	AVX	10µF, 25V, Tantalum	1
R1	Open			
R2			22.1k 1% 1/8W, size 0805	1
R3			30.1k 1% 1/8W, size 0805	1
R4			47.5k 1% 1/8W, size 0805	1
R5			76.8k 1% 1/8W, size 0805	1
R6			10k 1% 1/8W, size 0805	1
R7	Open			
R8			140Ω 1% 1/8W, size 0805	1
U1	**MIC39102BM**	Micrel	LDO Regulator	1

MICREL INC. 1849 FORTUNE DRIVE SAN JOSE, CA 95131 USA

TEL + 1 (408) 944-0800 FAX + 1 (408) 944-0970 WEB http://www.micrel.com