



MIC2253 Evaluation Board

3.5A 1MHz High Efficiency Boost Regulator with OVP and Softstart

General Description

The MIC2253 is a high power density 1MHz PWM DC/DC boost regulator. The 3.5A minimum switch current limit combined with a 1MHz switching frequency allows the MIC2253 to use smaller inductors and deliver high power in a tiny solution size.

The 2.5V to 10V input voltage range of MIC2253 allows direct operation from 1 and 2 cell Li-ion as well as 3 to 4 cell NiCad, NiMH, Alkaline or lithium batteries. Maximum battery life is assured with a low 0.1µA shutdown current.

Requirements

The MIC2253 Evaluation board requires a single 10W bench power source adjustable from 2.5V to 10V. The load can either be active (electronic load) or passive (resistor) with the capability to dissipate 7W. It is ideal to have an oscilloscope available to view the circuit waveforms, but not essential. For the simplest test, two voltage meters are required to measure input and output voltage. For efficiency measurements, two voltage meters and two ammeters are required to prevent errors due to measurement inaccuracies.

Precautions

The evaluation board does not have input reverse polarity protection. Be cautious when connecting the input source to ensure correct polarity is observed.

Getting Started

- 1. Connect an external supply to the VIN (J1) terminal and GND (J4).** With the output of the power supply disabled, set its voltage to the desired input test voltage ($2.5V \leq V_{IN} \leq 10V$). An ammeter may be placed between the power supply and the VIN (J1) terminal of the evaluation board. Be sure to monitor the supply voltage at the VIN (J1) terminal, as the ammeter and/or power lead resistance can reduce the voltage supplied to the input.
- 2. Connect a load to the VOUT (J6) and GND pins (J7) terminals.** The load can be either passive (resistor) or active (electronic load). An ammeter may be placed between the load and output terminal. Be sure to monitor the output voltage at the VOUT (J6) terminal.
- 3. Enable/Disable the MIC2253 (J2).** The MIC2253 evaluation board has an Enable pull-down resistor-to-GND. By default the MIC2253 will be disabled and the output voltage will be approximately VIN. By placing a jumper at J5, the enable pin is tied directly to VIN and the output voltage will be enabled when the input supply of $\geq 2.5V$ is applied.
- 4. Over-Voltage Protection.** The MIC2253 evaluation board has a 0Ω resistor (R3) connecting the default 5.6V OVP protection circuit to the output. Please see the "Additional Information" section for instructions to externally adjust the OVP voltage.

Ordering Information

Part Number	Description
MIC2253-06YML EV	Evaluation Board with MIC2253-06YML 6V OVP Device

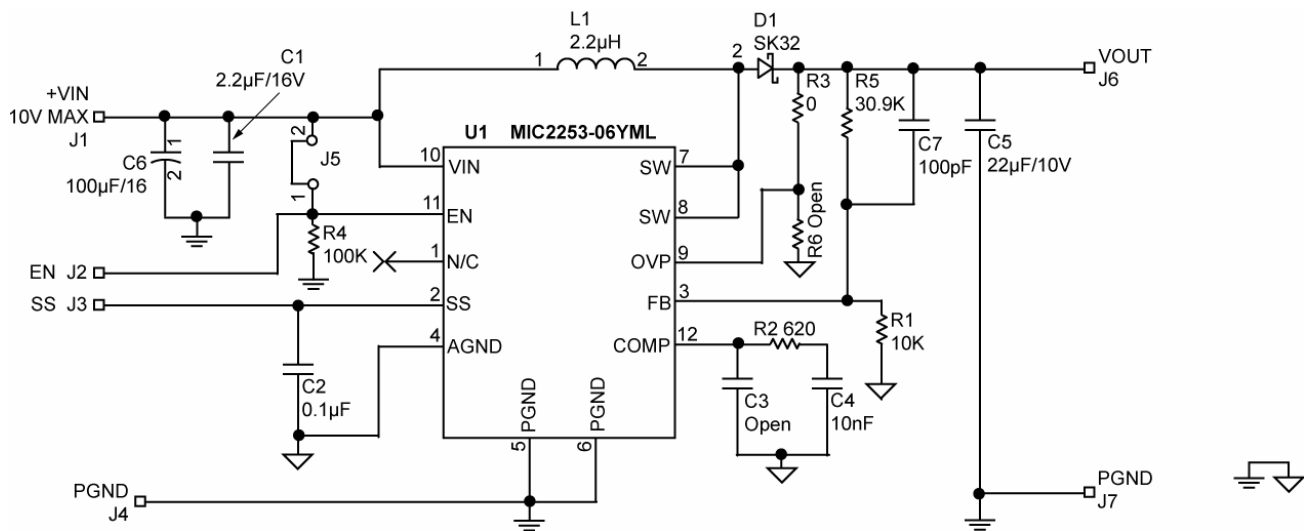
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Evaluation Board Schematic



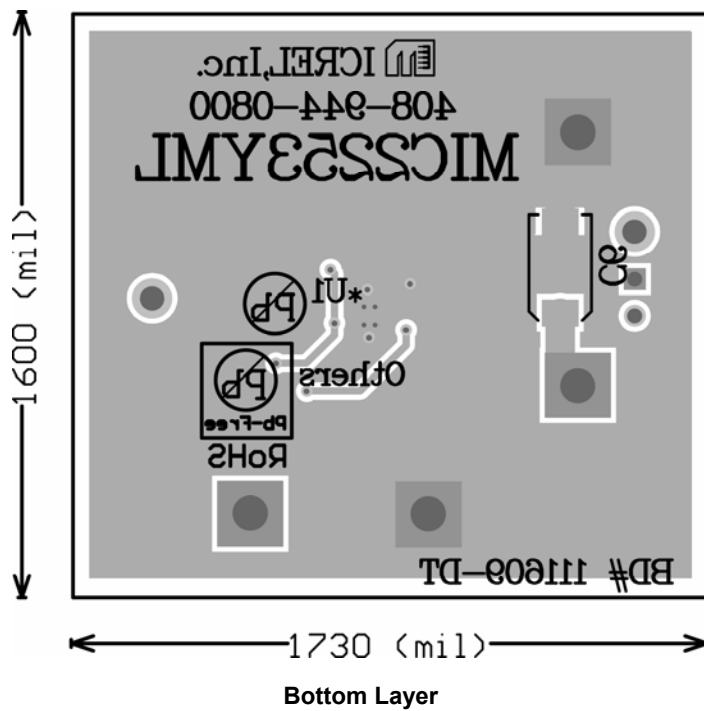
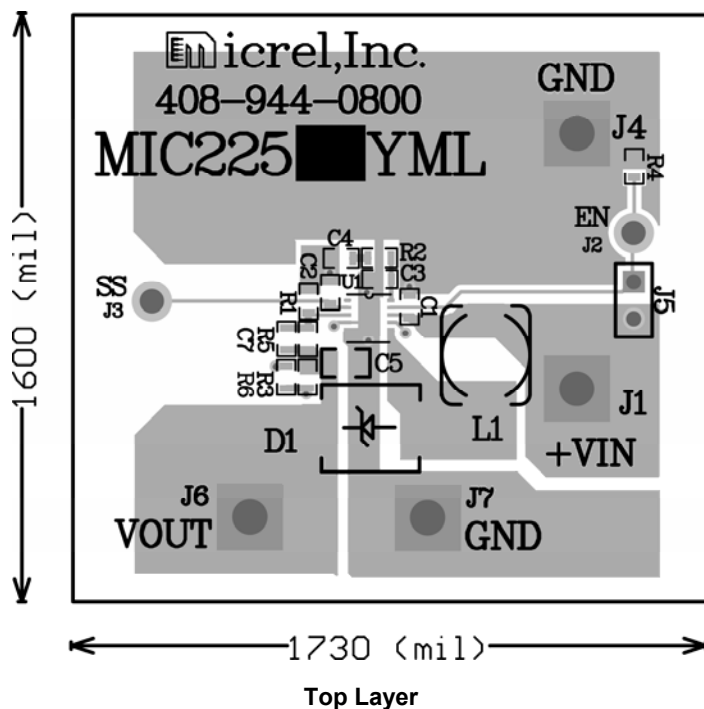
Bill of Materials

Item	Part Number	Manufacturer	Description	Qty.
C1	C1608X5R1C225K	TDK ⁽¹⁾	Capacitor, 2.2 μ F, 16V, X5R, 0603 size	1
	GRM188R61C225KE15	Murata ⁽²⁾	Capacitor, 2.2 μ F, 16V, X5R, 0603 size	
	CL10A225K08NNN	Samsung ⁽³⁾	Capacitor, 2.2 μ F, 16V, X5R, 0603 size	
C2	C1608X7R1H104K/10	TDK	Capacitor, 0.1 μ F, 16V, X7R, 0603 size	1
	GRM188R71H104KA93	Murata	Capacitor, 0.1 μ F, 16V, X7R, 0603 size	
	CL10B104KB8NNN	Samsung	Capacitor, 0.1 μ F, 16V, X7R, 0603 size	
C4	C1608X5R1H103K	TDK	Capacitor, 10nF, 50V, X5R, 0603 size	1
	CL10B103KB8NNN	Samsung	Capacitor, 10nF, 50V, X5R, 0603 size	
	06035C103KA12A	AVX	Capacitor, 10nF, 50V, X5R, 0603 size	
C5	CL21A226MPCLRNC	Samsung	Capacitor, 22 μ F, 10V, X5R, 0805 size	1
	LMK212BJ226MG-T	Taiyo Yuden ⁽⁴⁾	Capacitor, 22 μ F, 10V, X5R, 0805 size	
C6	TPSD107K016R150	AVX	Capacitor, 100 μ F, 16V, D case size	1
C7	C1608C0G1H101J	TDK	Capacitor, 100pF, 50V, C0G, 0603 size	1
	GRM1885C1H101JA01	Murata	Capacitor, 100pF, 50V, C0G, 0603 size	
	CL10C101JB8NNN	Samsung	Capacitor, 100pF, 50V, C0G, 0603 size	
	06035A101AT2A	AVX ⁽⁵⁾	Capacitor, 100pF, 50V, C0G, 0603 size	
D1	CMSH3-40M	Central ⁽⁶⁾	Schottky Diode, 3A, 40V	1
	SK32	MCC ⁽⁷⁾	Schottky Diode, 3A, 20V	
	SK34	MCC	Schottky Diode, 3A, 40V	
L1	LTF5022T-2R2N3R2	TDK	Inductor, 2.2 μ H, 3.4A, 5.2 x 5.0 x 2.2mm	1
	RLF7030T-2R2M	TDK	Inductor, 2.2 μ H, 5.4A, 6.8 x 7.3 x 3.2mm ⁽¹¹⁾	
	MOS6020-222ML	Coilcraft ⁽⁸⁾	Inductor, 2.2 μ H, 3.56A, 6.0 x 7.1 x 2.4mm ⁽¹¹⁾	
R1	CRCW06031002FRTI	Vishay ⁽⁹⁾	Resistor, 10k Ω , 1%, 1/16W, 0603 size	1
R2	CRCW06036200FRTI	Vishay	Resistor, 620 Ω , 1%, 1/16W, 0603 size	1
R3	CRCW06030000FKEA	Vishay	Resistor, 0 Ω , 1%, 1/16W, 0603 size	1
R4	CRCW06031003FRTI	Vishay	Resistor, 100k Ω , 1%, 1/16W, 0603 size	1
R5	CRCW06033092FRTI	Vishay	Resistor, 30.9k Ω , 1%, 1/16W, 0603 size	1
U1	MIC2253-06YML	Micrel, Inc. ⁽¹⁰⁾	1MHz High Power and High Efficiency Boost Regulator	1

Notes:

1. TDK: www.tdk.com
2. Murata: www.murata.com
3. Samsung: www.sem.samsung.com
4. Taiyo Yuden: www.t-yuden.com
5. AVX: www.avx.com
6. Central: www.centalsemi.com
7. MCC: www.mccsemi.com
8. Coilcraft: www.coilcraft.com
9. Vishay: www.vishay.com
10. Micrel, Inc.: www.micrel.com
11. For higher current applications, it is recommended to use the larger inductor specified.

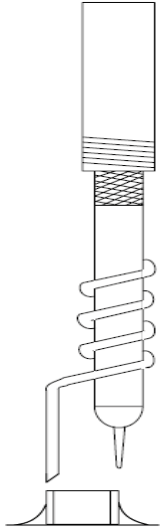
PCB Layout Recommendations



Additional Information

Ripple Measurements

To properly measure voltage ripple on either the input or output of any regulator with a switching regulator near by, a proper ring in tip measurement is required. Standard oscilloscope probes come with a grounding clip, or a long wire with an alligator clip. Unfortunately, for high frequency measurements, this ground clip can pick up high frequency noise and erroneously inject it into the measured output ripple.



The MIC2253 evaluation boards accommodate a home made ring in tip measurement by probing across input and output capacitors. This requires the removing of the oscilloscope probe sheath and ground clip from a standard oscilloscope probe and wrapping a non-shielded bus wire around the oscilloscope probe (as shown on the left). If there does not happen to be any non-shielded bus wire immediately available, the leads from axial resistors will work. By maintaining the shortest possible ground lengths on the oscilloscope probe, true ripple measurements can be obtained.

Over-Voltage Protection (OVP)

The MIC2253 provides a fixed 5.6V overvoltage protection. The overvoltage functionality will clamp the output voltage to a safe level (5.6V) in the event that a fault condition causes the output voltage to increase beyond control or the OVP pin exceeds 5.6V. To ensure the highest level of protection, the MIC2253 OVP pin will shut the switch off when an overvoltage condition is detected and regulates to the OVP set point. The OVP set point should be set below the rating of the output capacitor to ensure protection. Two external resistors can be used to change the OVP from the range of 5.7V to 30V. Be careful not to exceed the 30V rating of the switch. The OVP feature may be disabled by grounding the OVP pin.

The OVP pin is connected internally to a reference voltage via a voltage divider circuit. For a 5.6V OVP setting, connect the OVP pin directly to the output voltage with a 0Ω resistor at R3. To increase the OVP voltage above 5.6V, replace the R3 and R6 resistor values on the evaluation board with the calculated values using the following equation:

$$V_{OVP} = 1.245 \times \frac{67k \times (R3 + R6)}{(15k \times R6)}$$

V _{OVP} (V)	R3 (kΩ)	R6 (kΩ)
8.0	13.0	30.1
10	23.7	30.1
12	34.8	30.1
15	51.1	30.1
18	66.5	30.1
20	78.7	30.1
25	105	30.1
30	130	30.1

Table 1. OVP Example Resistor Values

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