

LM2757

Application Note 1731 LM2757 Evaluation Board



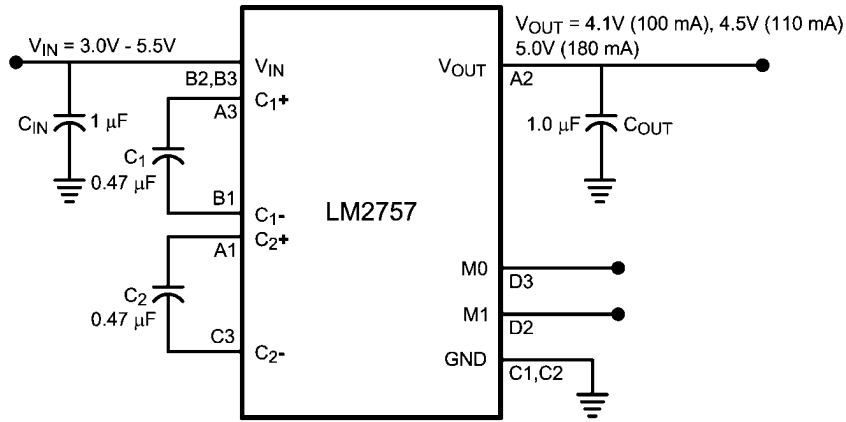
Literature Number: SNVA293

LM2757 Evaluation Board

National Semiconductor
Application Note 1731
Karl Schlosstein
February 19, 2008



Schematic



*Bump D1 is (NC) No Connect

30039801

General Description

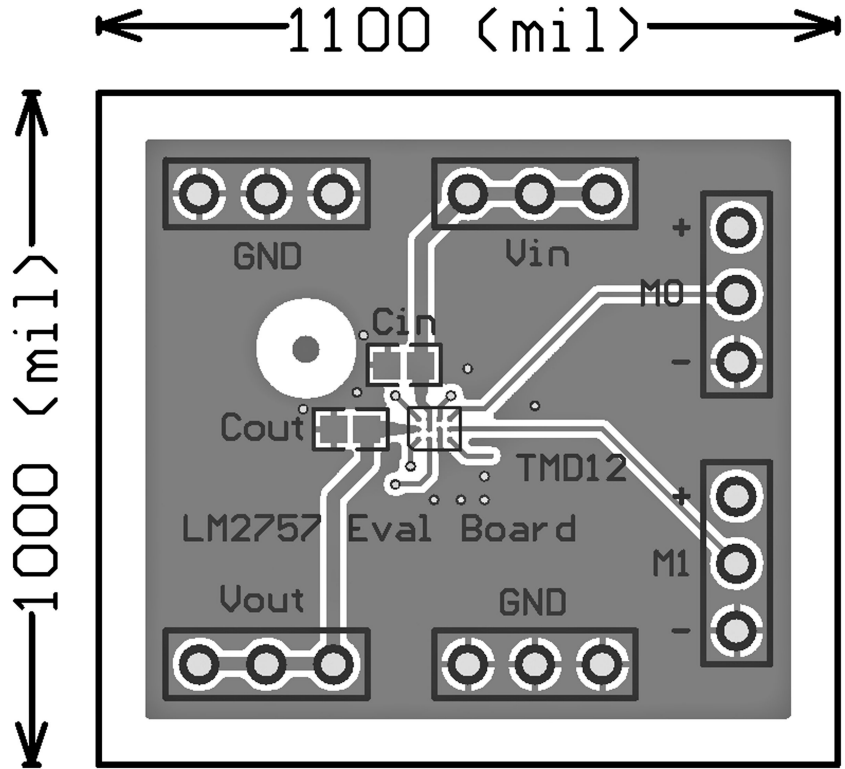
This evaluation board is for the testing and evaluation of the LM2757 IC. A voltage supply is the only input needed to op-

erate the device. To measure electrical quantities however, test or measuring equipment (multimeters, oscilloscopes, etc.) is needed.

Bill of Materials

Component Symbol	Value	Package [U.S. (Metric)]	Dimensions (mm)	Temperature Characteristic	Manufacturer	Part #
LM2757	--	μSMD-12 0.4mm Pitch	1.2 x 1.6 x 0.6	--	National	LM2757TM
C _{IN}	1.0μF, 10V	0603 (1608)	1.6 x 0.8 x 0.8	X5R	TDK	C1608X5R1A105K
C _{OUT}	1.0μF, 10V	0603 (1608)	1.6 x 0.8 x 0.8	X5R	TDK	C1608X5R1A105K
C ₁ , C ₂	0.47μF, 6.3V	0402 (1005)	1 x 0.5 x 0.6	X5R	TDK	C1005X5R0J474K

LM2757 Evaluation Board Layout



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FIGURE 1. Top Layer

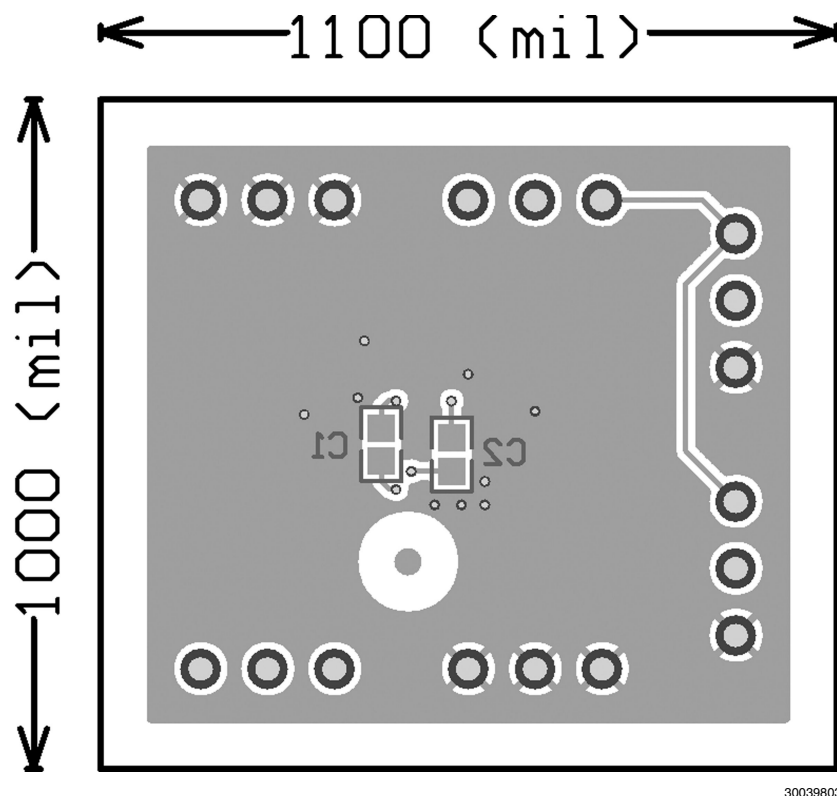


FIGURE 2. Bottom Layer (top view, unmirrored)

Board Operation

BASIC CONNECTIONS

To operate the LM2757 evaluation board, connect a supply voltage (2.7V-5.5V) to the board connector V_{in} , and the supply ground to GND. Device shutdown and voltage modes are enabled via the jumpers on the M0 and M1 headers, according to the table below:

M0	M1	MODE
0 (-)	0 (-)	Device Shutdown, Output High Impedance
0 (-)	1 (+)	5.0V
1 (+)	0 (-)	4.5V
1 (+)	1 (+)	4.1V

CIRCUIT DESCRIPTION

The core of the LM2757 is a two-phase charge pump controlled by an internally generated non-overlapping clock. The charge pump operates by using external flying capacitors C_1 , C_2 to transfer charge from the input to the output. At input voltages below 3.9V (typ.) for the 5V mode, the LM2757 operates in a 2x gain, with the input current being equal to 2x the load current. At input voltages above 3.9V (typ.) for the 5V mode, the part utilizes a gain of 3/2x, resulting in an input

current equal to 3/2 times the load current. For the 4.5V mode, the LM2757 operates in a 2x gain when the input voltage is below 3.35V (typ.) and transitions to a 3/2x gain when the input voltage is above 3.35V (typ.). For the 4.1V mode, the device utilizes the 3/2x gain for the entire input voltage range.

The two phases of the switched capacitor switching cycle will be referred to as "phase one" and "phase two". During phase one, one flying capacitor is charged by the input supply while the other flying capacitor is connected to the output and delivers charge to the load. After half of the switching cycle [$t = 1/(2 \times F_{SW})$], the LM2757 switches to phase two. In this configuration, the capacitor that supplied charge to the load in phase one is connected to the input to be recharged while the capacitor that had been charged in the previous phase is connected to the output to deliver charge. With this topology, output ripple is reduced by delivering charge to the output in every phase.

The LM2757 uses fixed frequency pre-regulation to regulate the output voltage. The input and output connections of the flying capacitors are made with internal MOS switches. Pre-regulation limits the gate drive of the MOS switch connected between the voltage input and the flying capacitors. Controlling the on resistance of this switch limits the amount of charge transferred into and out of each flying capacitor during the charge and discharge phases, and in turn helps to keep the output ripple very low.

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