

## **AN–1302 LM2750-ADJ Evaluation Board**

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### **1 Part Description**

The LM2750-ADJ is a switched-capacitor doubler that produces a low-noise, well regulated output voltage. With a pair of external resistors, the output voltage can easily be set to a level between 3.8V and 5.2V. The LM2750 is provided in Texas Instruments 10-pin QFN, a package with excellent thermal properties that keeps the part from overheating under almost all rated operating conditions.

A perfect fit for space-constrained, battery-powered applications, the LM2750 requires only 3 external components: one input capacitor, one output capacitor, and one flying capacitor. Small, inexpensive ceramic capacitors are recommended for use. These capacitors, in conjunction with the 1.7MHz fixed switching frequency of the LM2750, yield low output voltage ripple, beneficial for systems requiring a low-noise supply.

Pre-regulation minimizes input current ripple, reducing input noise to negligible levels. A tightly controlled soft-start feature limits inrush currents during part activation. Shutdown completely disconnects the load from the input. Output current limiting and thermal shutdown circuitry protect both the LM2750 and connected devices in the event of output shorts or excessive current loads.

### **2 Board Usage**

#### **2.1 Input**

Connect the input and ground pins of the evaluation board to a power supply or battery with short, low-impedance, low-inductance wires or cables. The nominal input voltage range of the LM2750-ADJ is 2.7V to 5.6V, but at lower output voltages ( $V_{out} < 4.9V$ ) the input voltage should never be more than 0.7V below the output voltage.

#### **2.2 Output Voltage and Current**

The output voltage of the LM2750-ADJ can be programmed with a simple resistor divider (see resistors Rfb1 and Rfb2 on [Figure 1](#)). The values of the feedback resistors set the output voltage, as determined by the following equation:

$$V_{out} = 1.23V \times (1 + R_{fb1}/R_{fb2}) \quad (1)$$

In [Equation 1](#), the "1.23V" term is the nominal voltage of the feedback pin when the feedback loop is correctly established and the part is operating normally. The sum of the resistance of the two feedback resistors should be between 15k $\Omega$  and 20k $\Omega$ :

$$15k\Omega < (R_{fb1} + R_{fb2}) < 20k\Omega$$

If larger feedback resistors are desired, a 10pF capacitor should be placed in parallel with resistor R1.

The output voltage of the LM2750 is ensured to accurate to  $\pm 4\%$  when it is set to 5.0V and the part is operated within nominal operating ratings. Regulation is specified for load currents as high as 120mA. The LM2750 is capable of driving load currents up to and above 120mA. The LM2750 datasheet provides information on high load current usage, and datasheet curves illustrate the typical performance of the part with output currents as high as 175mA.

### 2.3 Shutdown

A jumper is present on the evaluation board to bring the LM2750 in and out of shutdown. When the jumper is in place, the  $\overline{SD}$  pin is connected to  $V_{IN}$ , and the part is operational.

Removing the jumper floats the  $\overline{SD}$  pin. A 200k $\Omega$  resistor connected internally between the  $\overline{SD}$  pin and GND pulls the voltage on the  $\overline{SD}$  pin low. This places the LM2750 in shutdown.

## 3 Evaluation Board Schematic

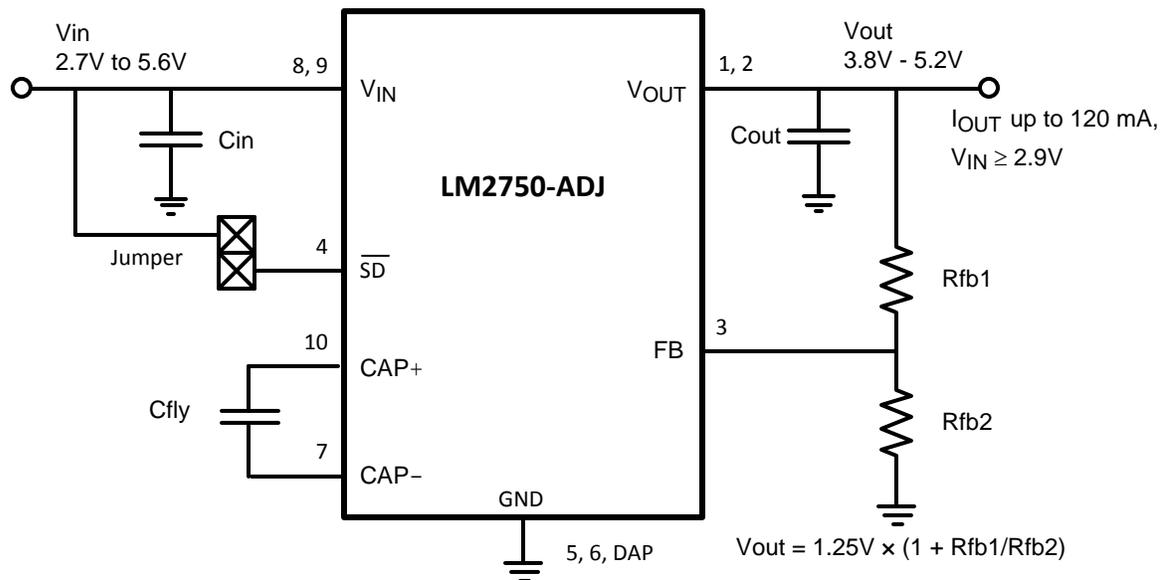


Figure 1. Evaluation Board Schematic

## 4 Components

### 4.1 Integrated Circuit

Part #	Package Mark I.D.	Package	Dimensions
LM2750-ADJ	S003B	WSO10 (NGY0010A)	3.0mm x 3.0mm x 0.8mm

### 4.2 Capacitors

Capacitor Symbol	Value	Case Size U.S. (Metric)	Height	Temperature Characteristic	Mfr.	Part #
Cin	2.2 $\mu$ F, 16V <sup>(1)</sup>	0805 (2012)	1.25mm	X5R	TDK	C2012X7R1C225K
Cfly	1.0 $\mu$ F, 10V <sup>(1)</sup>	0603 (1608)	0.8mm	X5R	TDK	C1608X5R1A105K
Cout	2.2 $\mu$ F, 16V <sup>(1)</sup>	0805 (2012)	1.25mm	X5R	TDK	C2012X7R1C225K

<sup>(1)</sup> To meet LM2750 minimum capacitance requirements, 10V is the minimum recommended voltage rating for all capacitors. This elevated rating recommendation accounts for capacitance degradation due to DC bias, a common property of ceramic capacitors. For more information on capacitors, refer to *LM2750 Low Noise Switched Capacitor Boost Regulator* (SNVS180).

### 4.3 Resistors

Evaluation Board nominally set to  $V_{OUT} = 4.5V$  with the following resistors:

Resistor Symbol	Value	Case Size U.S. (Metric)	Manufacturer	Part #
Rfb1	11.5k $\Omega$ , 1%	0603 (1608)	Vishay-Dale	CRCW06031152F
Rfb2	4.42k $\Omega$ , 1%	0603 (1608)	Vishay-Dale	CRCW06034421F

## 5 References

*LM2750 Low Noise Switched Capacitor Boost Regulator* ([SNVS180](#))

*AN-1187 Leadless Leadframe Package (LLP) Application Report* ([SNOA401](#))

6 Board Layers

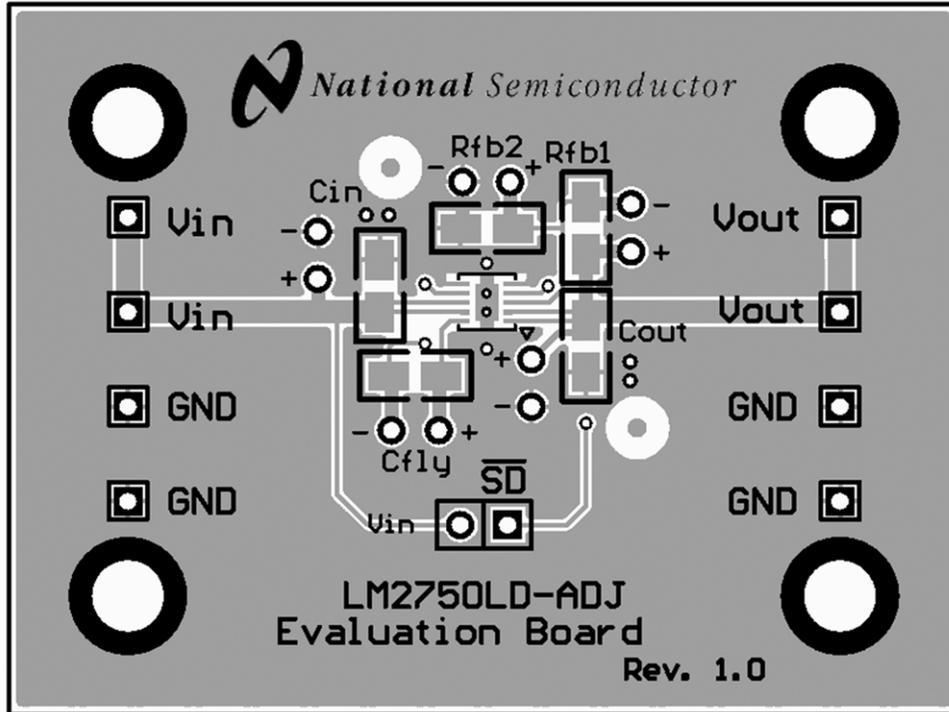


Figure 2. Top Layer, Top View

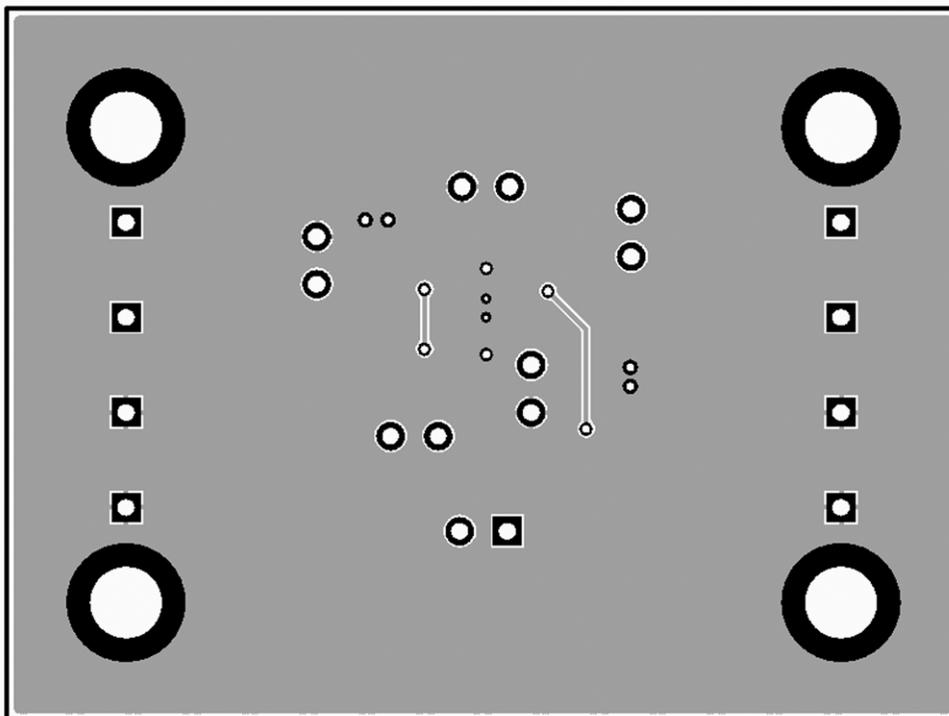


Figure 3. Bottom Layer, Top View (unmirrored)

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