

## **AN-1843 LM2833X WSON Demo Board**

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### **1 Introduction**

The LM2833X WSONdemo board is designed to demonstrate the capabilities of the LM2833X 1.5MHz switching regulator in an WSON-10 package.

The demo board is configured to provide an output of 1.2V at up to 3A from an input voltage range of 3V to 5.5V. The board is thermally optimized with the small solution size of 1.2" X 1.1", shown in the demo board schematic in [Figure 1](#). The output voltage can be configured to a different value by changing the ratio between R1 and R2 according to the following equation:

$$R1 = R2 \times (VOUT / VFB - 1) \quad (1)$$

The feedback voltage VFB is regulated at 0.60V typically.

The board has C5 reserved for two purposes, given different application scenarios. First, at high VOUT applications, the control loop bandwidth is not as large as at low VOUT. Adding C5 at high VOUT can significantly improve the load step response by boosting the loop bandwidth without significantly compromising phase margin. Secondly, it also helps to minimize output voltage overshoot during sluggish startup, short circuit release, and recovery from thermal shutdown, since it creates a feed-forward path between VOUT and VFB, thus speeding up Gm-amplifier recovery. In practice, for a few kΩ of voltage divider bottom resistor R2, a 47nF ceramic capacitor is usually a good choice for C5. Note for applications where VOUT is close to VFB, since R1 is small, the effectiveness of adding C5 becomes decreasingly appreciable. Therefore, other measures need to be taken to achieve the desired performance. For example, to minimize output overshoot during slow startup at high VOUT, an alternative approach is to apply a separate signal at the EN terminal after VIN is fully established.

Another component which is not populated on the board is C4, which is reserved for applications where a large output capacitor is desired.

[Table 1](#) lists the bill of materials of this demo board. The measured performance characteristics and layout of this board are also included below.

### **2 Powering Up The Board**

Powering up the LM2833X WSON demo board is a single-step procedure, simply by applying a DC voltage of 3V to 5.5V to VIN and GND terminals. By default, VINC is connected to VIN through a low pass filter to remove any high frequency noise present at the input. EN is connected to VINC through a 100kΩ resistor. A separate logic signal at the EN terminal can be used, if startup and shutdown need to be controlled. A load can be connected between VOUT and GND terminals before or after the board is powered up. At VOUT of 1.2V, the internal soft-start circuit can bring up VOUT smoothly regardless of load or input voltage.

The LM2833X is designed to skip some pulses at very light loads to maintain output voltage regulation. Depending on load levels, the circuit may operate in either discontinuous or continuous conduction mode.

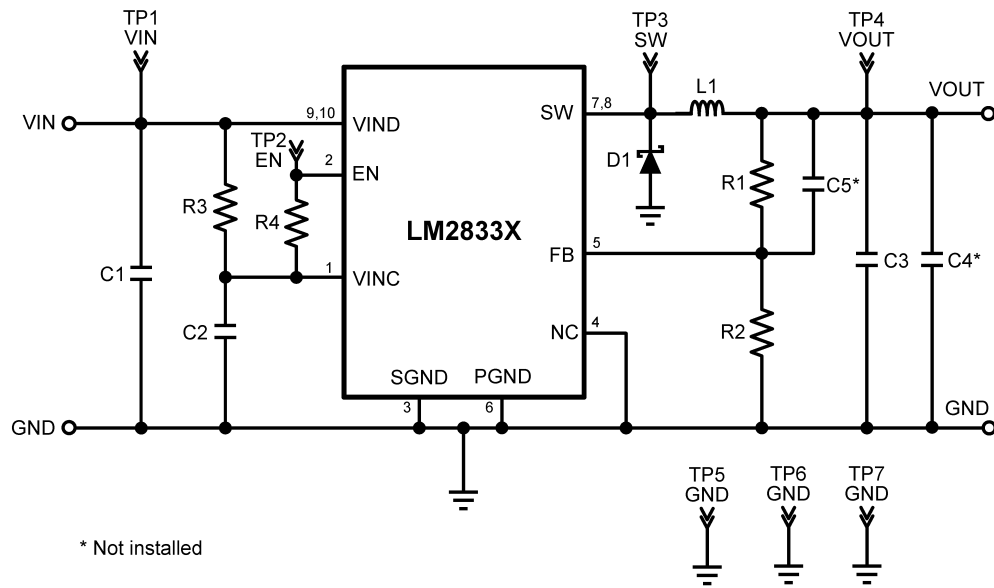
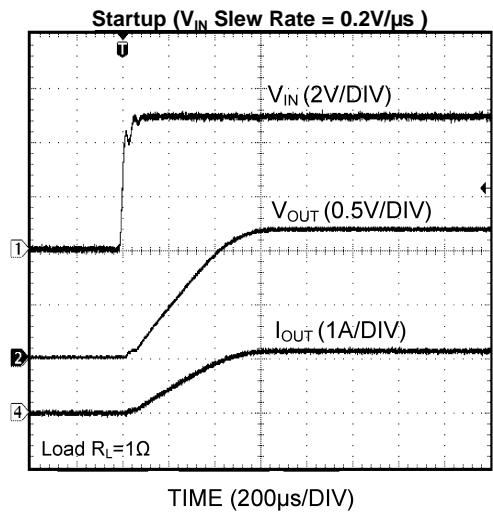
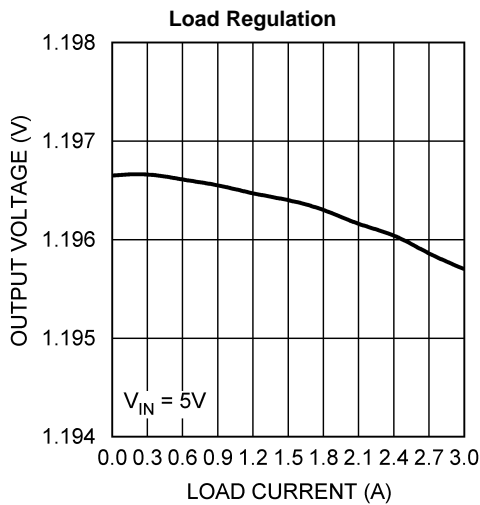
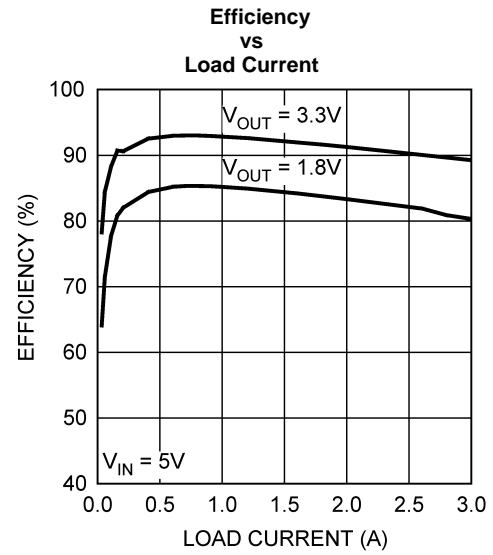
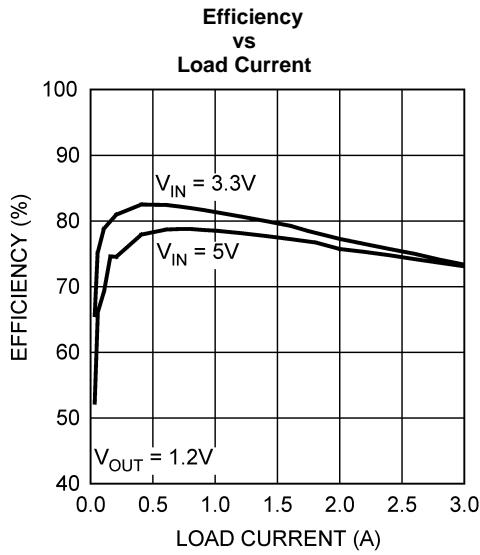
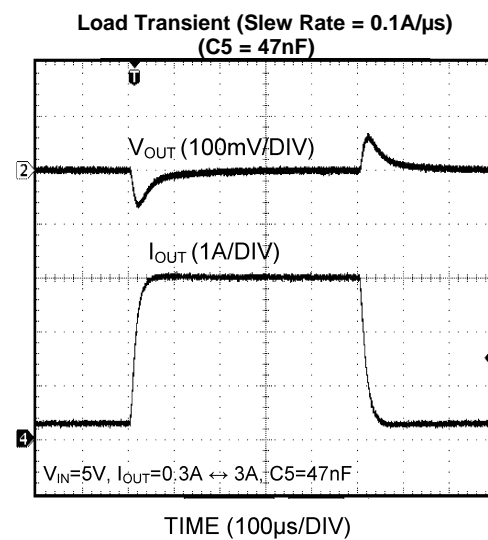
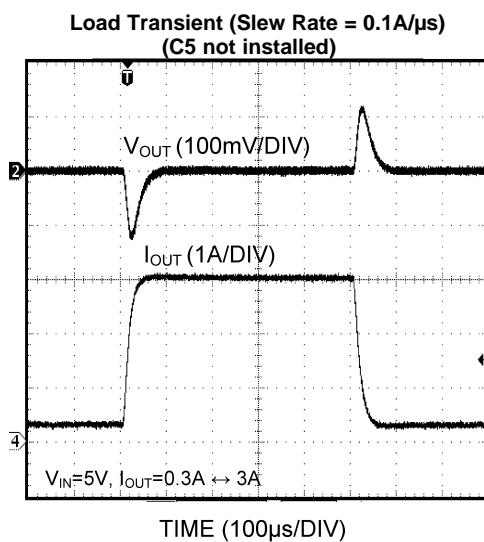
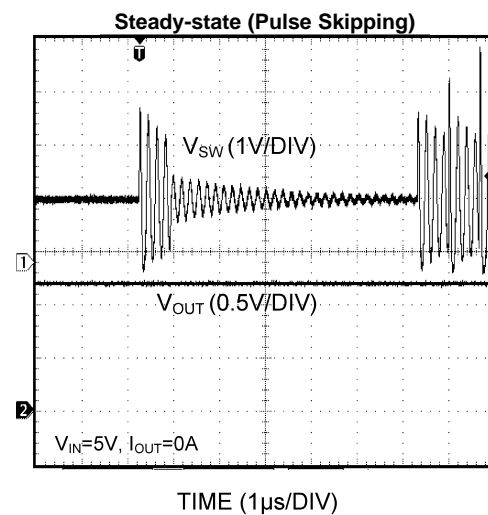
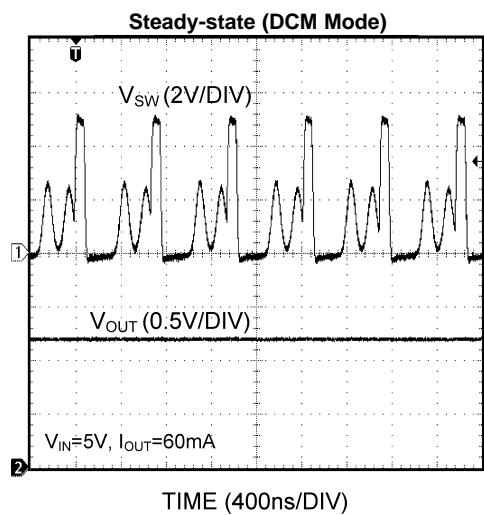
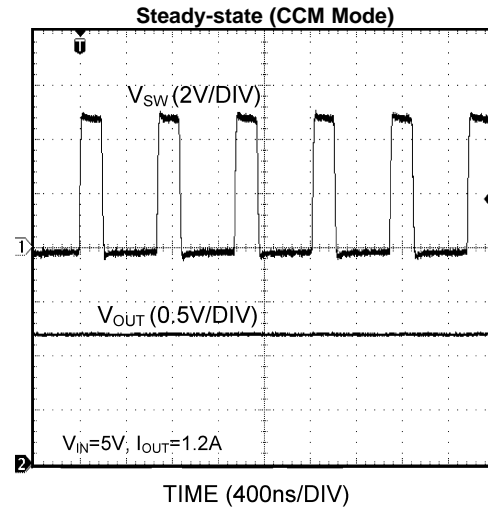
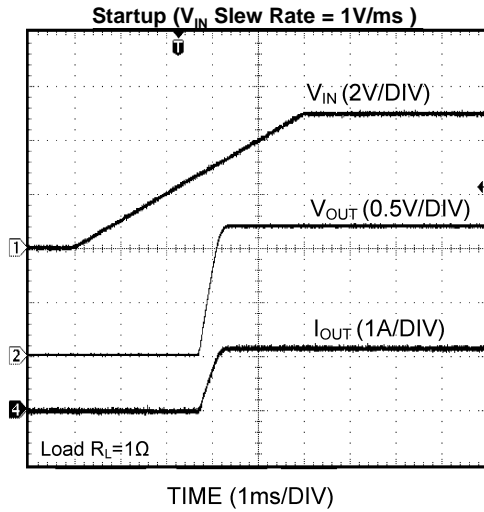
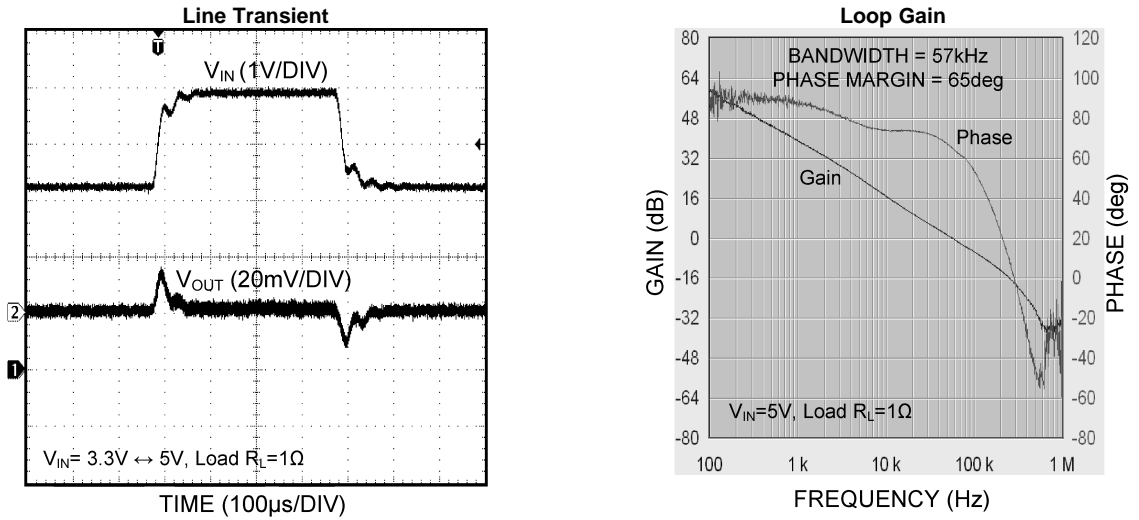


Figure 1. LM2833X WSON Demo Board Schematic

### 3 Typical Performance Characteristics







#### 4 Layout

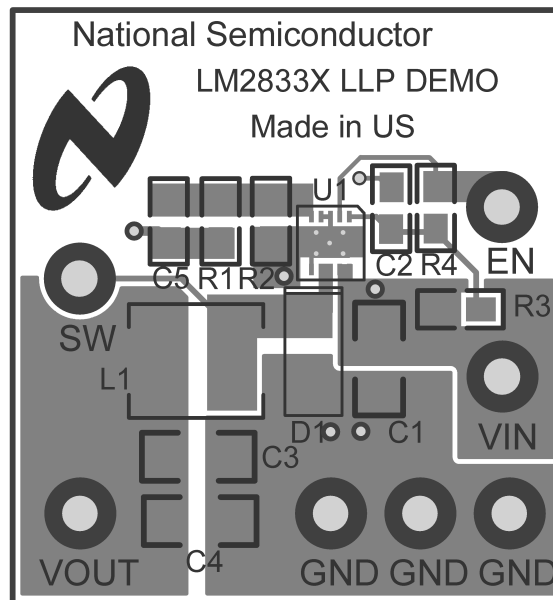
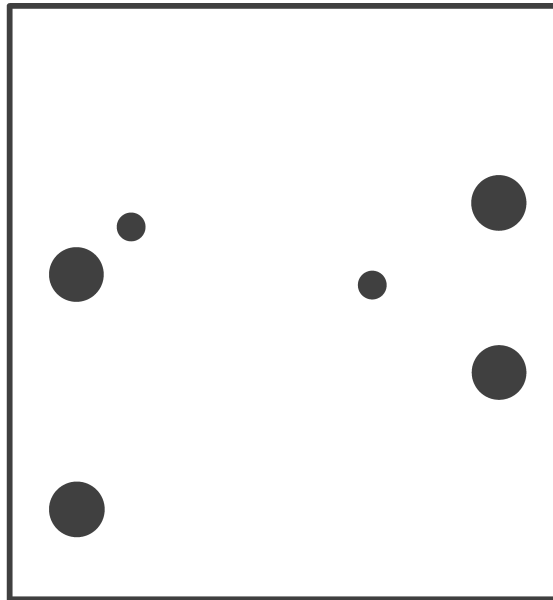
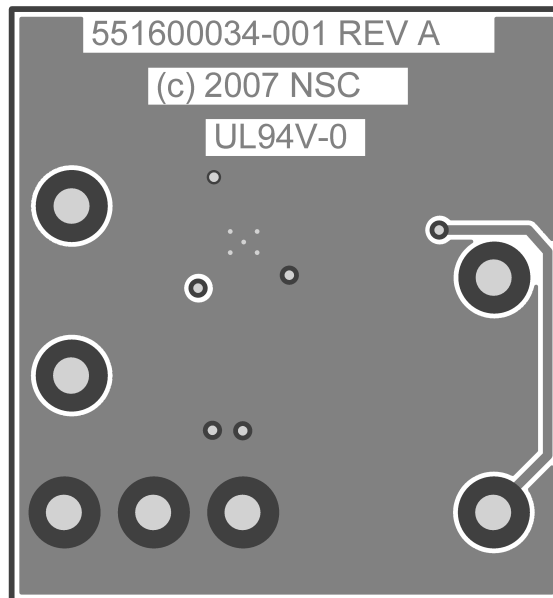


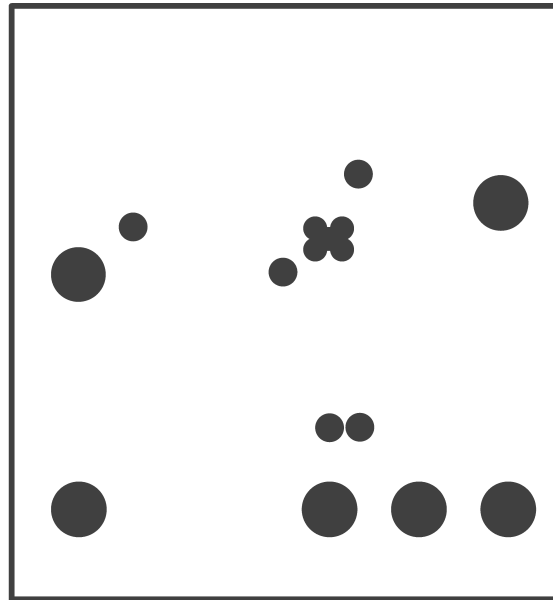
Figure 2. Top Layer and Top Overlay



**Figure 3. Internal Plane 1 (GND)**



**Figure 4. Bottom Layer**



**Figure 5. Internal Plane 2 (VIN)**

## 5 Bill of Materials

**Table 1. Bill of Materials**

| Part ID | Part Value                                  | Part Number        | Manufacturer      |
|---------|---|--------------------|-------------------|
| U1      | 1.5MHz 3.0A buck regulator, WSON-10         | LM2833             | Texas Instruments |
| L1      | 1.8 $\mu$ H, 3.6A, 5x5.2x2.2mm <sup>3</sup> | LTF5022T-1R8N3R6   | TDK               |
| C1      | 22 $\mu$ F, 6.3V, X5R, 1206                 | C3216X5R0J226MT    | TDK               |
| C2      | 0.22 $\mu$ F, 10V, X7R, 0805                | GRM216R71A224KC01D | Murata            |
| C3      | 47 $\mu$ F, 6.3V, X5R, 1206                 | JMK316BJ476ML-T    | Taiyo Yuden       |
| C4      | Open  |                    |                   |
| C5      | Open  |                    |                   |
| D1      | Schottky, 30V, 3A, 3-4E1A                   | CMS01              | Toshiba           |
| R1      | 2.00k $\Omega$ , 1%, 1/8W, 0805             | CRCW08052K00FKEA   | Vishay            |
| R2      | 2.00k $\Omega$ , 1%, 1/8W, 0805             | CRCW08052K00FKEA   | Vishay            |
| R3      | 10.0 $\Omega$ , 1%, 1/8W, 0805              | CRCW080510R0FKEA   | Vishay            |
| R4      | 100k $\Omega$ , 1%, 1/8W, 0805              | CRCW0805100KFKEA   | Vishay            |

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