

# 1.8V/10A Core Power Supply for CPUs, Microcontrollers, FPGAs, DDR2 Interfaces Using the MAX20710

MAXREFDES1233

## Design Verification Testing

### Introduction

The MAXREFDES1233 is a 1.8V/10A core power supply for CPUs, microcontrollers, FPGAs, or DDR2 interfaces. The expected input voltage is a regulated 12V, which is a common intermediary voltage for communication, networking, server, and storage equipment. The design has been tested and verified to meet the design requirements at room temperature (i.e.,  $T_A = 25^\circ\text{C}$ ) with a 12V input.

### Test Equipment Used

The following equipment was used for design verification:

- Chroma® Programmable DC Power Supply
- Digital Multimeter
- DC Electronic Load
- LeCroy® HDO4034A Oscilloscope

### Tests Conducted

The 6 tests that were conducted on the MAXREFDES1233 are listed below MAXREFDES1233 and the results for follow:

- 1) Startup (**Figure 1**)
- 2) Shutdown and Operation Current (**Table 1**)
- 3) Output Ripple (**Figure 2**)
- 4) Efficiency (**Figure 3**)
- 5) Load Regulation (**Figure 4**)
- 6) Transient Load (**Figure 5**)



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## Test Results

This design was assembled and tested to ensure the original design specifications were met. The test description and results are shown below.

### Startup

The startup waveforms for the MAXREFDES1233 are shown in Figure 1. The measurement was taken with no load on the output. The measured soft-start time is about 2.85ms, which is relatively close to the chosen design value of 3ms.

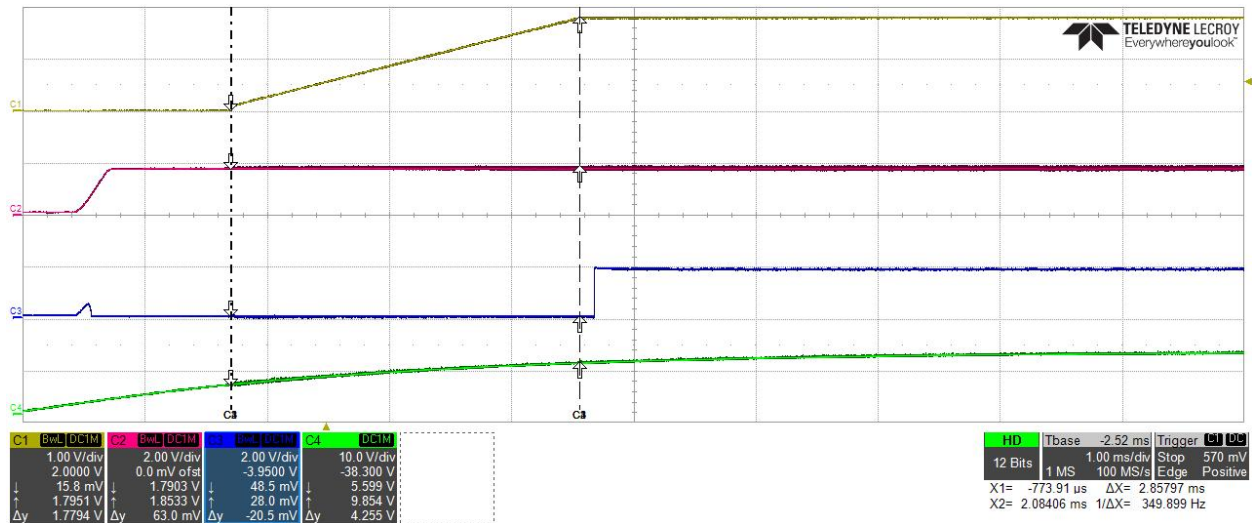


Figure 1. Startup waveforms showing  $V_{OUT}$  (C1), OE (C2), STAT (C3), and  $V_{IN}$  (C4).



## Shutdown and Operating Current

The shutdown and operating current are system parameters that might be critical depending on the application. These two parameters are measured at the 12V input and provided in Table 1. The values measured in Table 1 are of the entire MAXREDES1233 system.

**Table 1. Shutdown and Operating Current**

PARAMETER	SYMBOL	MIN	TYP (mA)	MAX
Operating Current	$I_{OP}$		44.2	
Shutdown Current	$I_{SHD}$		5.9	

The operating current is the input current required to maintain the output voltage. Most of the operating current is used to drive the synchronous switches.

The shutdown current is measured with the OE pin pulled to GND. This places the MAX20710 into a shutdown state where switching is not active, so the output voltage collapses to 0V.

## Output Ripple

The output voltage ripple is measured at the full 10A load and shown in Figure 2. The capture shows that the output voltage ripple at full load is about 17mV, which meets the design criteria.

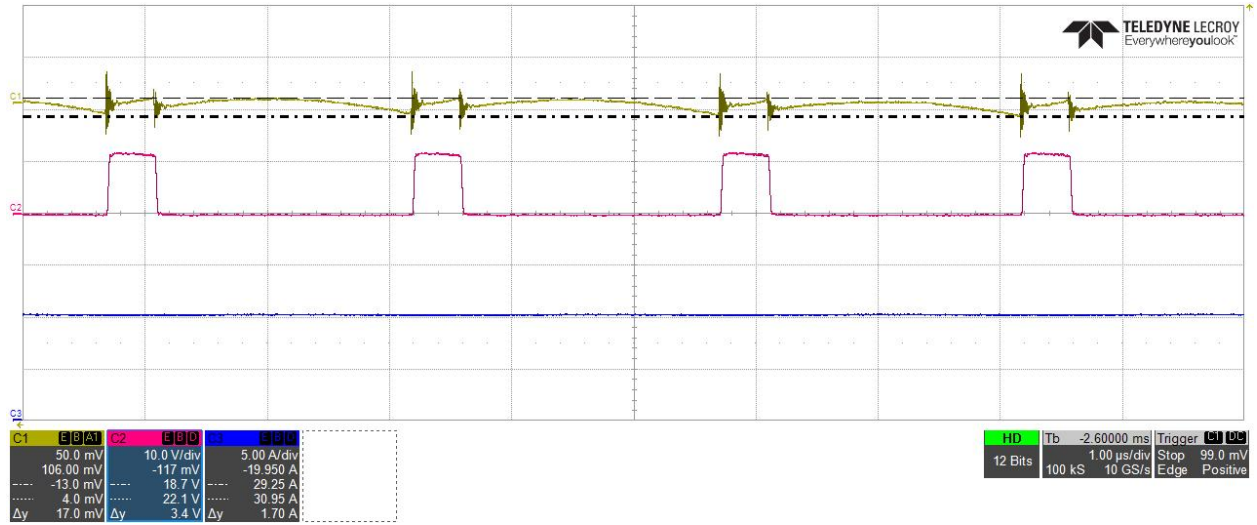


Figure 2. Output voltage ripple measurement showing  $V_{OUT}$  (C1),  $V_X$  (C2), and  $I_{OUT}$  (C3).

## Efficiency

The efficiency is measured for a 12V input and shown in Figure 3. The peak efficiency is about 92% at 7A load.

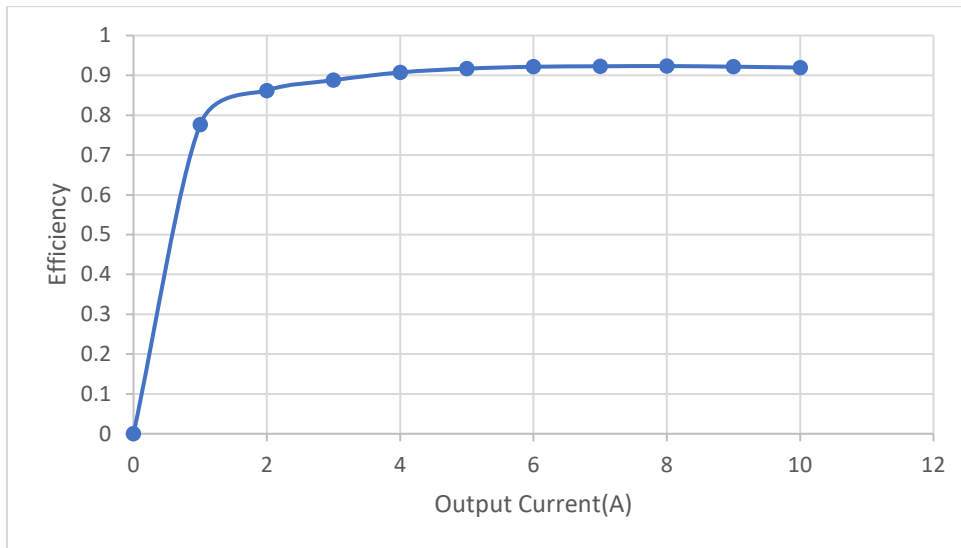


Figure 3. Efficiency versus output current.

### Load Regulation

The regulation accuracy across the full load range is shown in Figure 4 for a 12V input. The results show that the MAXRED1233 is within the target output voltage range across the expected load range.

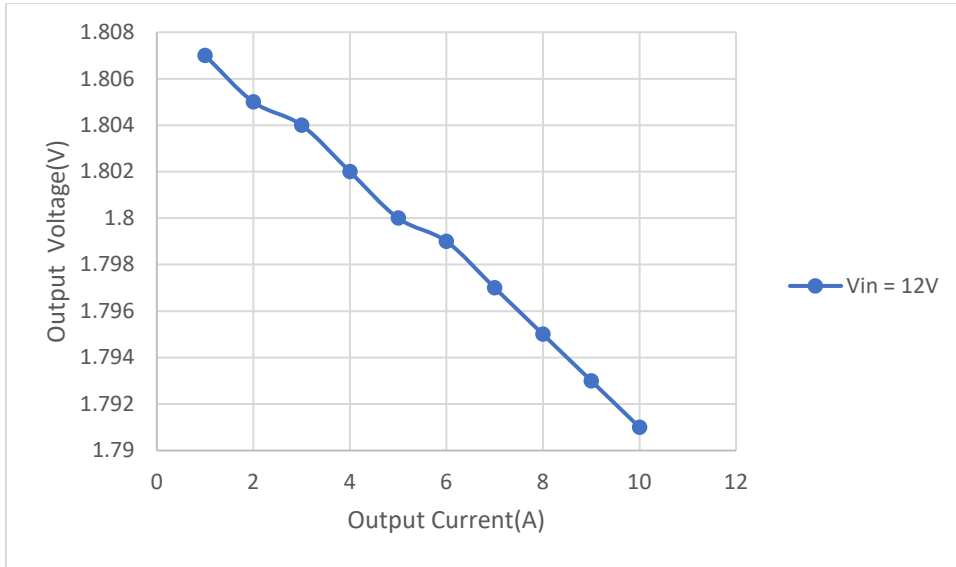


Figure 4. Output voltage versus output current.

## Transient Load

The overshoot and undershoot for a 5A transient load are shown in Figure 5. The output current is stepped from 5A to 10A with a slew rate of about 5A/ $\mu$ s. Both the undershoot and overshoot are under the maximum specification of 90mV.

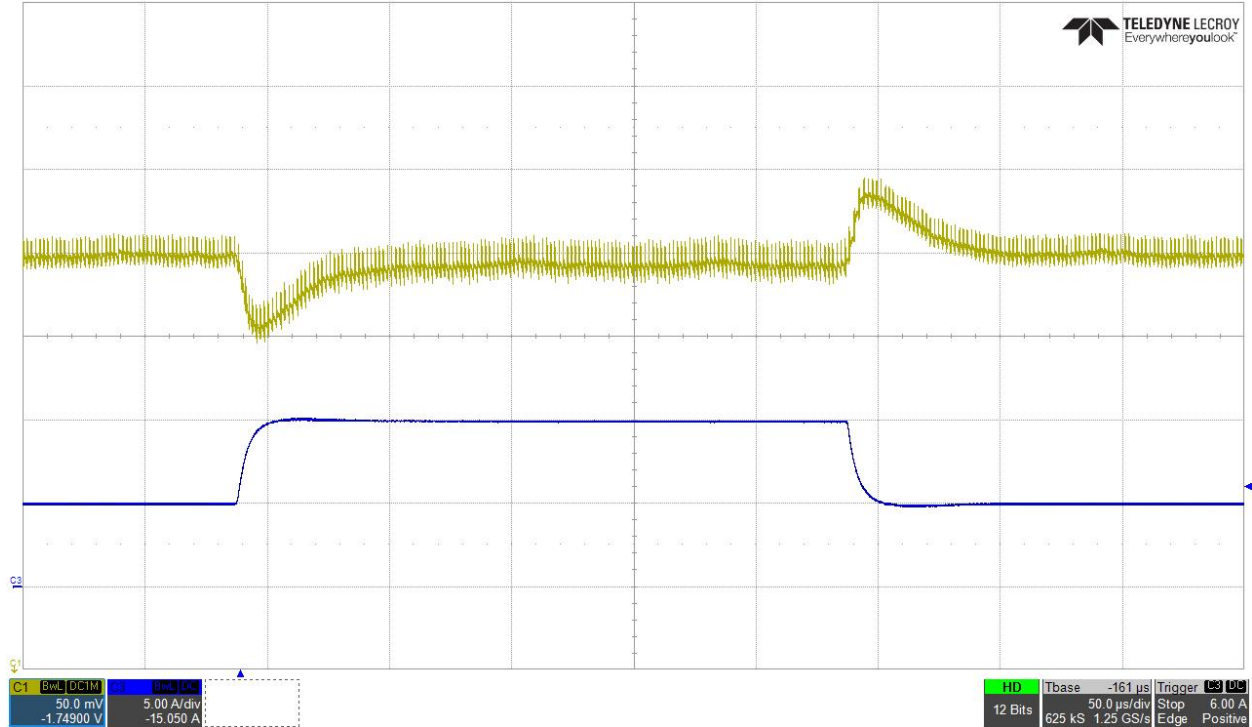


Figure 5. Load transient response showing  $V_{OUT}$  (C1) and  $I_{OUT}$  (C2).

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