Application Report
SLVA366–October 2009

3.6 V to 5.5-V Input, LDO Reference Design

PMP - DC/DC Low-Power Converters

ABSTRACT

This design was created to help those desiring to design-in a Stellaris® ARM® Cortex™-M3 MCU into a system using an input voltage in the range of 3.6V to 5.5V and is interested in using a easy-to-use low-dropout linear regulator (LDO) for a simple design, but is not as concerned about maintaining the highest efficiency or longest battery life.

1 Features

- 3.6-V to 5.5-V input voltage range
- Fixed 3.3-V output eliminates need for external voltage-setting resistors
- The TPS78233 is capable of driving up to 150mA
- The TPS78233 is stable with a 1-µF output capacitor
- Low quiescent current (1 µA)
- Low dropout voltage (175 mV @ 85°C)
- SOT23-5 package

2 Introduction

This reference design is for the Stellaris® ARM® Cortex™-M3 MCU devices and accounts for voltage and current, requirements given below. The Stellaris® devices only require a single 3.3V input, so no sequencing is required. The operating input voltage for this reference design is 3.6V to 5.5V. This design is optimized for ease-of-use, small design/low part count and quick design time.

3 Requirements

The power requirements for each Stellaris® ARM® Cortex™-M3 MCU family are listed below.

For more information and other reference designs, please visit www.ti.com/processorpower .

Table 1. Stellaris® ARM® Cortex™-M3 MCU Family Power Requirements

DEVICE FAMILY	PIN NAME	VOLTAGE (V)	I_{MAX} (mA)	TOLERANCE	SEQUENCING ORDER	TIMING DELAY	COMMENTS
LM3S100 series LM3S300 series LM3S600 series LM3S800 series LM3S1000 series LM3S2000 series LM3S3000 series LM3S5000 series	VDD	3.3	170	±10%	—	—	Internal regulator supplies power to device core
LM3S6000 series LM3S8000 series	VDD	3.3	225	±10%	—	—	Internal regulator supplies power to device core
LM3S9000 series	VDD	3.3	150	±10%	—	—	Internal regulator supplies power to device core
LM3S2B93, LM3S2B2793, LM3S5B91, LM3S5791	VDD	3.3	100	±10%	—	—	Internal regulator supplies power to device core
Note: The "Imax" currents listed are worst case expected values.							

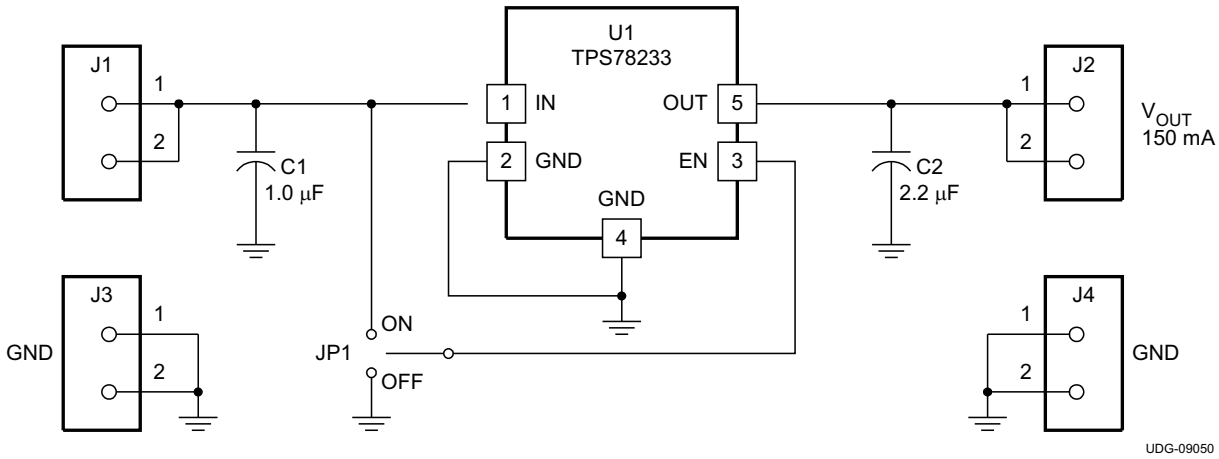

Figure 1. PMP4772 Reference Design Schematic

4 List of Materials

Table 2. PMP4772 List of Materials

REF DES	QTY	VALUE	DESCRIPTION	SIZE	PART NUMBER	MFR
C1	1	1.0 µF	Capacitor, Ceramic, 10 V, X7R, 10%	0603	Std	Std
C2	1	2.2 µF	Capacitor, Ceramic, 6.3 V, X5R	0603	Std	Std
J1, J2, J3, J4	4		Header, 2-pin, 100 mil spacing, (36-pin strip)	0.100 x 2	PTC36SAAN	Sullins
JP1	1		Header, 3-pin, 100mil spacing, (36-pin strip)	0.1" x 3	PTC36SAAN	Sullins
L1	1	10 µH	Inductor, SMT, 10 µH, 1 A, 128 mΩ	0.185x0.185	CDRH4D28-100	Sumida
U1	1		IC, Switching Buck Converter, 1.8 V, 300 mA	SOT23-5	TPS62203DBV	Texas Instruments
R1	1	0	Resistor, Chip, 0 Ω, 1/16-W, yy%	0603	Std	Std

5 Test Results

The input and output startup waveforms are shown in Figure 3 through Figure 5. The 3.6-V output ripple voltage is shown in Figure 7. Figure 6 shows the 3.6-V transient response.

5.1 Test Results

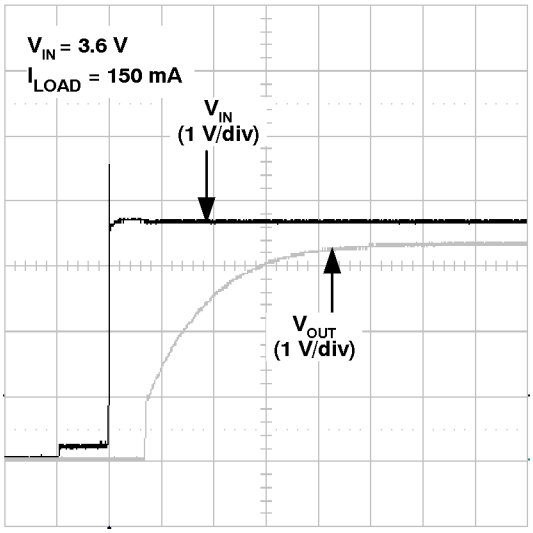

Figure 2. 3.6-V Startup Waveform (Loaded)

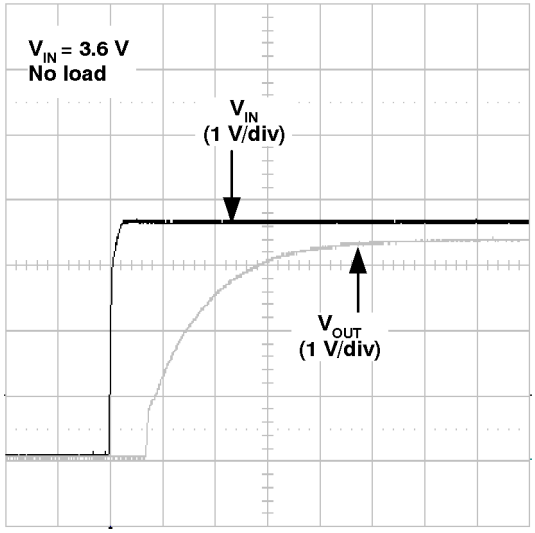

Figure 3. 3.6-V Startup Waveform (No Load)

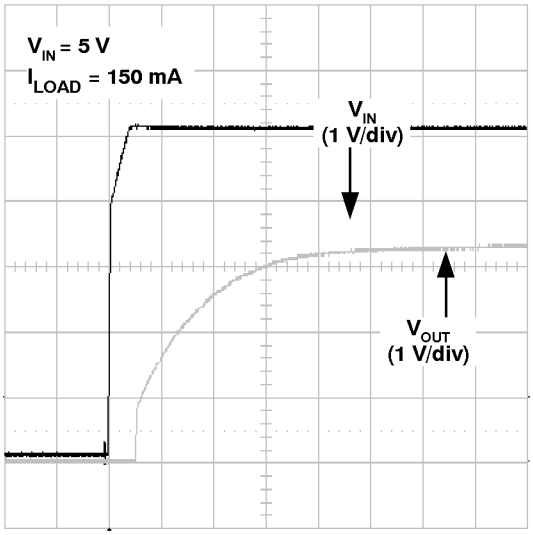

Figure 4. 5-V Startup Waveform (Loaded)

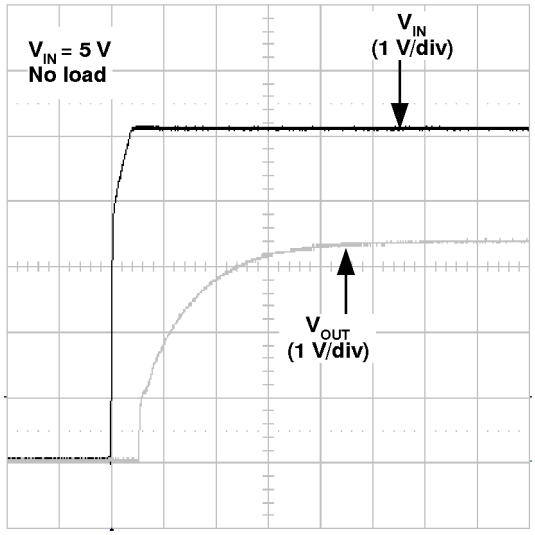

Figure 5. 5-V Startup Waveform (No Load)

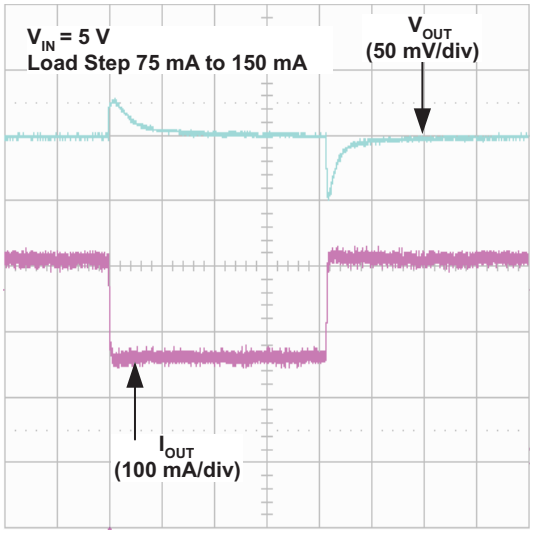

Figure 6. Transient Waveform

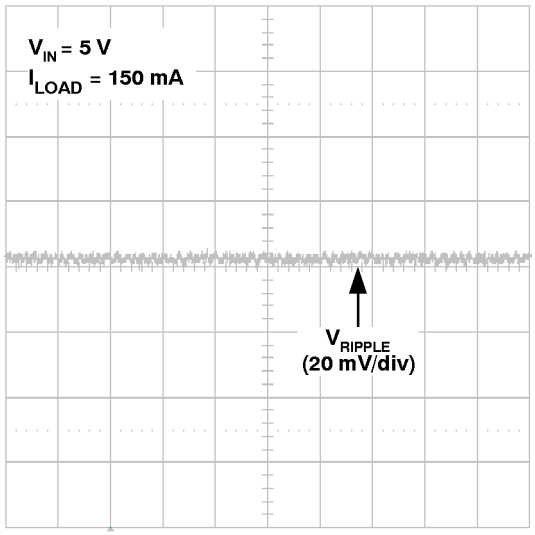

Figure 7. Output Ripple Voltage

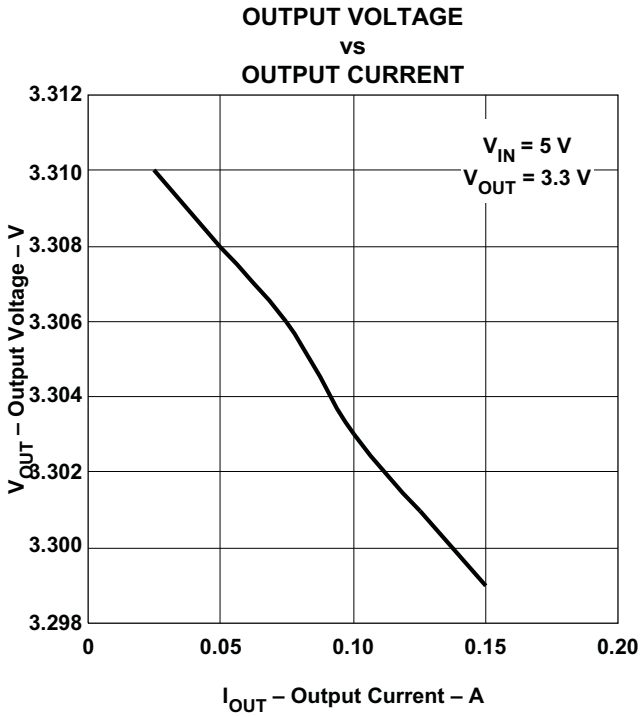

Figure 8.