

LM2636

6A Termination Supply Tracks 1/2 Core Voltage



Literature Number: SNVA564



6A TERMINATION SUPPLY TRACKS 1/2 CORE VOLTAGE

DESCRIPTION OF THE APPLICATION

Modern microprocessors require core voltages that are typically in the range of 2 - 3V. They also require "termination" voltages that should be 1/2 of the core voltage for best performance. The design problem is that the core voltage varies for different CPU's, and some designs even incorporate variable core voltage supplies which allow the system to adjust the core voltage on the fly to increase or decrease CPU operating speed as required in order to optimize power consumption.

Because of the variable nature of the core voltage, a termination voltage power supply design which can maintain an output of 1/2 V_{core} over a wide range of core voltages allows greater design flexibility, since the core voltage can be varied without upsetting the termination voltage set point.

This document describes a 6A power supply design which will generate a termination voltage which regulates to 1/2 V_{core} , intended for use in applications where the core voltage is between about 1.8V and 3.6V.

CIRCUIT DESCRIPTION (See schematic)

A LM2636 synchronous-rectifier controller switching at 300 kHz is used to build an efficient power converter which operates from a 5V input (details for designing with the LM2636 can be found on the data sheet).

Because the LM2636 is designed to operate at a fixed output voltage (as set by the control bits on pins 14 through 18), a different control scheme is used here so that the regulated output can track at 1/2 V_{core} .

The core voltage is divided by 1/2 through resistors R15 and R17, and this voltage is used as the reference by error amplifier U2-B. U2-B compares the "1/2 Vcore" reference to the Termination output voltage obtained through R16, and adjusts its output as required to lock the Termination voltage at 1/2 Vcore. In this way, the Termination output voltage is set by the core voltage signal.

U2-A is a unity-gain inverter to correct the phase of the feedback signal which is applied to the input of the LM2636's internal error amplifier. The gain of the internal amplifier is also set to unity by R6.

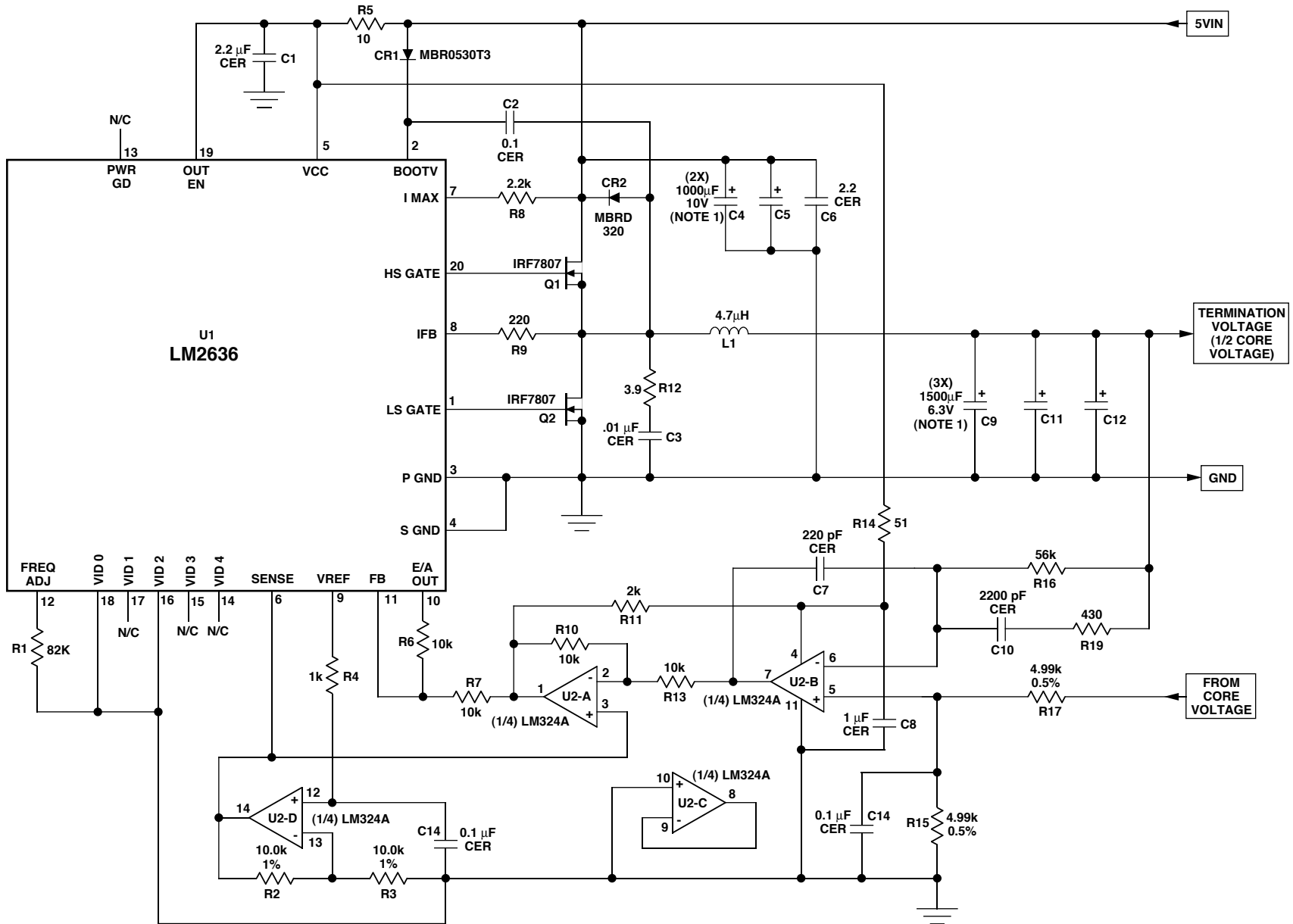
R11 is included to force a soft-start on turn on and eliminate overshoot. U2-D is used to amplify the 1.23V internal reference up to about 2.5V which sets the operating point for the error amplifier U2-B.

This 2.5V is also applied to the sense input of the LM2636, which normally would sense the regulated output voltage. Since the Termination output voltage must be variable (to track the core voltage), a fixed 2.5V is applied to the sense pin and the control pins at pins 16 and 18 are grounded which programs the internal DAC to an output of 2.5V.

In this way, the internal error detection circuitry of the LM2636 is prevented from shutting down the part due to an over or undervoltage condition, which would otherwise occur since the output is continuously adjustable.

Loop compensation is set by R16,R19, C7, and C10.

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NOTE 1. USE LOW ESR ALUMINUM ELECTROLYTIC CAPACITOR SUITABLE FOR 300K HZ SWITCHING APPLICATIONS.

NOTE 2. UNLESS OTHERWISE SHOWN, RESISTOR TOLERANCES ARE 5%.

NOTE 3. "CER" DESIGNATES A CERAMIC CAPACITOR, TEMP RANGE X7R OR X5R.

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