Application Report
SNOA502A–October 2007–Revised April 2013

AN-1708 LMV841 Stability Considerations

ABSTRACT

This application note provides information regarding LMV841 stability.

Contents

List of Figures

1 Introduction

This application notes applies only for LMV841MG devices with date codes M0730 (units marked with single-digit date code "W") and earlier. For all other devices, please refer to the application notes contained in the *LMV841/LMV842/LMV844 CMOS Input, RRIO, Wide Supply Range Operational Amplifiers Data Sheet* (SNOSAT1). For more information, please contact your local TI™ sales representative.

2 Decoupling and Layout

For decoupling the supply lines it is suggested that 10 nF capacitors be placed as close as possible to the op amp.

For single supply, place a capacitor between V^+ and V^-. For dual supplies, place one capacitor between V^+ and the board ground, and the second capacitor between ground and V^-.

3 Capacitive Load

The LMV841 can be connected in the voltage-follower configuration; which is most-sensitive to capacitive loading.

The combination of a capacitive load placed on the output of an amplifier along with the amplifier's output impedance creates a phase lag, which reduces the phase margin of the amplifier. If the phase margin is significantly reduced, the response will be underdamped which causes peaking in the transfer and when there is too much peaking the op amp might start oscillating.

In order to drive heavier capacitive loads, an isolation resistor, R_{ISO}, should be used, as shown in Figure 1. By using this isolation resistor, the capacitive load is isolated from the amplifier's output, and hence, the pole caused by CL is no longer in the feedback loop. The larger the value of R_{ISO}, the more stable the output voltage will be. If values of R_{ISO} are sufficiently large, the feedback loop will be stable, independent of the value of C_L. However, larger values of R_{ISO} result in reduced output swing and reduced output current drive.

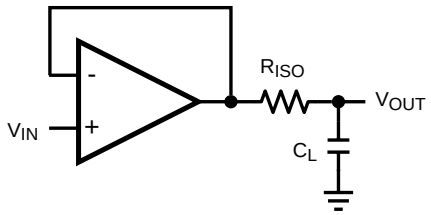
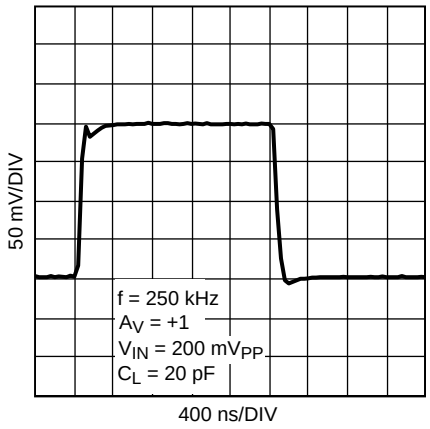


Figure 1. Isolating Capacitive Load

4 Reducing Overshoot

When the output of the op amp is at its lower swing limit (saturated near V^-), rapidly rising signals can cause some overshoot. This overshoot can be reduced by adding a resistor from the output to V^+. Even in extreme situations at high temperatures, a 10 kΩ resistor is sufficient to reduce the overshoot to negligible levels. The resistor at the output will however, reduce the maximum output swing, as would any resistive load at the output.



T_A = 25°C, V_S = 5V

Figure 2. Small Signal Step Response with Gain = 1

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