Common-Mode Rejection Ratio

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Common-mode rejection ratio, (CMRR)is defined as the ratio of the differential voltage amplification to the common-mode voltage amplification,

$$CMMR = A_{DIF}/A_{COM}.$$

Ideally this ratio would be infinite with common mode voltages being totally rejected.

The common-mode input voltage affects the bias point of the input differential pair, which, in turn, changes the output voltage. The real mechanism at work is $\Delta V_{OS}/\Delta V_{COM}$.

In a Texas Instruments data sheet, CMRR = ΔVCOM/ΔVOS, which gives a positive number in dB. CMRR, as published in the data sheet, is a dc parameter. CMRR, when graphed vs. frequency, falls off as the frequency increases.

A common source of common-mode interference voltage is 50-Hz or 60-Hz ac noise. Care must be used to ensure that the CMRR of the op amp is not degraded by other circuit components. High values of resistance make the circuit vulnerable to common mode (and other) noise pick up. It is usually possible to scale resistors down and capacitors up to preserve circuit response.

Slew Rate at Unity Gain

Slew rate, SR, is the rate of change in the output voltage caused by a step input. Its units are V/μs or V/ms. Figure shows slew rate graphically. The primary factor controlling slew rate in most amps is an internal compensation capacitor CC, which is added to make the op amp unity gain stable.

The maximum rate of change is when either side of the differential pair is conducting 2IE. Essentially $SR = 2I_E/CC$. Remember, however, that not all op amps have compensation capacitors. In op amps without internal compensation capacitors, the slew rate is determined by internal op amp parasitic capacitances. Non compensated op amps have greater bandwidth and slew rate, but the designer must ensure the stability of the circuit by other means.

In op amps, power consumption is traded for noise and speed. In order to increase slew rate, the bias currents within the op amp are increased.

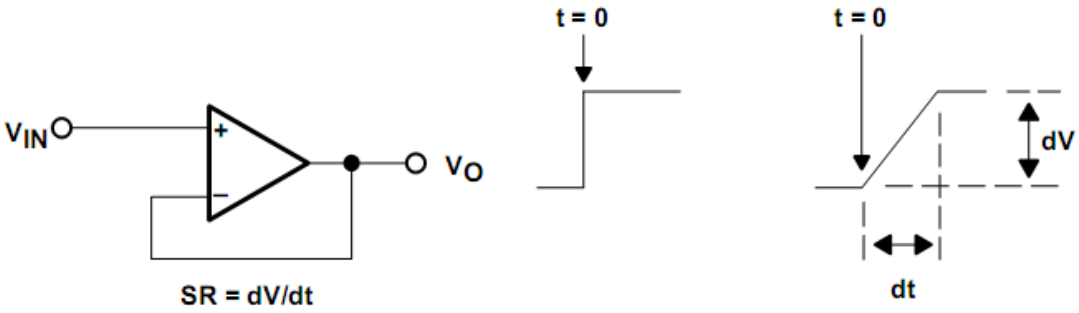

Figure 1.9