

Slew rate

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10:22 PM

Definition

$$\left. \frac{dv_o}{dt} \right|_{\max}$$

It is the max rate of change of voltage at the output of the operational amplifier.

$$\text{typically: } 0.1 \text{ V}/\mu\text{s} \leq \text{SR} \leq 10 \text{ V}/\mu\text{s}$$

let: $v_o = V_m \sin \omega t$
(max change of rate occurs at zero crossings)

$$\left. \frac{dv_o}{dt} \right|_{\max} = V_m \omega \cos \omega t / \max = V_m \omega = \text{maximum rate of change} = \text{slew rate}$$

for no signal distortion

$$V_m \omega \leq \text{SR} \quad \text{or}$$

$$V_m \leq \frac{\text{SR}}{\omega}$$

$$\begin{aligned} V_m &\leq \frac{\text{SR}}{2\pi f} \Rightarrow \\ f &\leq \frac{\text{SR}}{2\pi V_m} \end{aligned}$$

let $f_m = \text{full-power bandwidth}$, i.e. the highest frequency at which a full-scale signal can be developed. (op-amp data sheet)

If $V_{FS} = \text{the amplitude of the full-scale output signal} \Rightarrow$

$$f_m \leq \frac{\text{SR}}{2\pi V_{FS}}$$

theoretical output
dis for no output limiter
by slew rate.

$$f_M \leq \frac{SR}{2\pi V_{FS}}$$

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