

Distortion Level vs. Signal Level

Examination of (6), (12) and (15) shows that the relative distortion level is a function of the input signal level being applied to Fig. 1(a), (b) or (c), but that it is independent of the voltage gain being obtained. (The voltage gain can be adjusted by changing I and/or R .) Fig. 2 is a plot of total harmonic distortion vs. input signal amplitude for the single-transistor CE and the differential pair CE amplifiers at room temperature. As a point of reference, it could be noted that for the single transistor amplifier, about 5 mV of input signal results in a relative distortion level of 0.05 (5%), while for the differential pair the 5% distortion level occurs with an input signal of 39 mV.

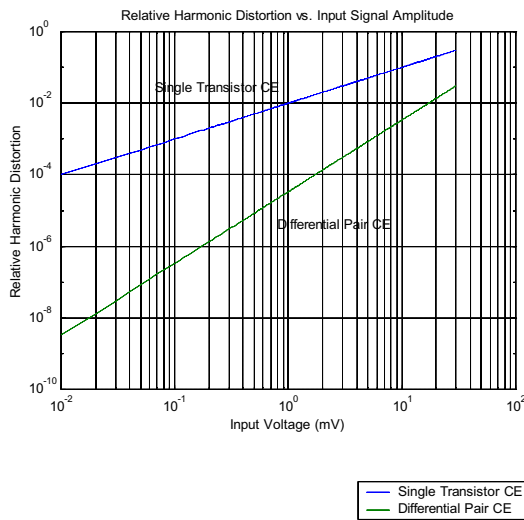


Fig. 2 Relative harmonic distortion vs. input voltage for the three CE amplifiers of Fig. 1. Graph applies at room temperature.

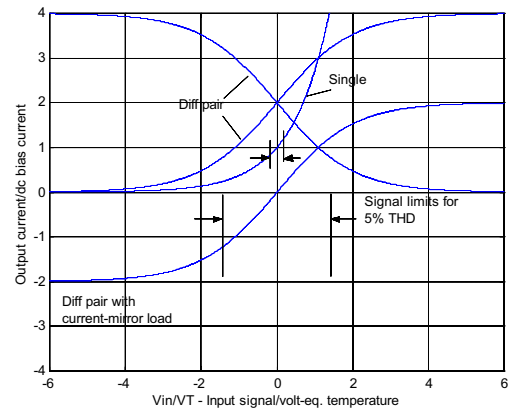


Fig. 3 Transfer curves for the three CE amplifiers of Fig. 1. Input signal normalized w.r.t. volt-equivalent of temperature. Output current normalized w.r.t. bias current.

Fig. 3 is a plot of the transfer functions of each of the three CE amplifiers of Fig. 1. The input voltage in each plot is normalized with respect to the volt-equivalent of temperature V_T . The output current for each plot is normalized with respect to the dc bias current used in that circuit. The dc bias current in each amplifier has been adjusted such that all three produce the same small-signal gain factor. The Q-point for each of the transfer curves is located at zero input voltage in the center of the figure. As a reference, the peak-to-peak input voltage which results in 5% THD is indicated for each transfer curve. For the single transistor circuit (the exponential transfer curve), this input level is about 40% of V_T , peak-to-peak. For the differential-pair (any of the hyperbolic tangent transfer curves), this input level is about 310% of V_T , peak-to-peak.