

Some basic circuit design parameters for bipolar IC design

The basic circuit design parameters for a bipolar are as follows:

- | | | |
|-----|---|----------------------------------|
| 1.0 | $\beta = I_c/I_b$ | Dc current gain |
| 2.0 | $g_m = qI_c/mkT$ | Transconductance |
| 3.0 | $r_{b'e'} = \beta/g_m$ | base to emitter resistance |
| 4.0 | $r_{e'} = mkT/qI_e = \alpha_N mkT/qI_c$ | emitter resistance |
| 5.0 | $g_{ce} = \eta g_m$ | collector to emitter conductance |
| 6.0 | $\eta = (kT/q)(1/w)(dw/dV_{CB})$ | base width modulation factor |
| 7.0 | $g_{b'c'} = (\eta/\beta)g_m$ | Base to collector conductance |
| 8.0 | $C_b = 1/(r_{e'}*2\pi f_T)$ | Base diffusion capacitance |

I_c = Collector current
 I_b = Base current
 m = multiplier typically = 1
 k = Boltzman's constant
 w = base width

These expressions can be used for a basic hand crafted design and a circuit simulator can be used to fine tune it.

*Note: These parameters reflect the basic bipolar model.