

Die Size Estimate in 3 technologies: 0.18um, 0.35um, 0.6um CMOS
Small mixed signal design example: balanced analog and digital content
Estimated production volume: 1,000,000 units/year

| | 0.18um, 8" wafer 1P4M, HIRES poly | | | 0.35um, 8" wafer 1P4M, HIRES poly | | | 0.6um, 8" wafer 1P4M, HIRES poly | | | |
|--------------------------|--|---------------------|-----------------------|--------------------------------------|----------------------------|-----------------------|-------------------------------------|---------------------|----------------------------|---------------|
| | Description | Source | Area (um^2) | | Source | Area (um^2) | | Source | Area (um^2) | |
| Analog & OTP: | | | | | | | | | | |
| | Bias and BGR | int. IP | 95,400 | | int. IP | 114,480 | | int. IP | 137,376 | |
| | POR | int. IP | 16,200 | | int. IP | 19,440 | | int. IP | 23,328 | |
| | Lin reg & soft-start | custom | 70,000 | | custom | 84,000 | | custom | 100,800 | |
| | Xtal osc circuit | I/O lib | 20,000 | | I/O lib | 24,000 | | I/O lib | 28,800 | |
| | 10.4s+ timer | custom | 210,000 | | custom | 252,000 | | custom | 302,400 | |
| | temp sense blk | custom | 40,000 | | custom | 48,000 | | custom | 57,600 | |
| | 8b ADC | IP | 90,000 | | custom | 108,000 | | custom | 129,600 | |
| | 10b DAC | custom | 35,570 | | custom | 51,110 | | custom | 167,534 | |
| | PLL | IP | 132,000 | | IP | 158,400 | | IP | 190,080 | |
| | power amplifier | custom | 80,000 | | custom | 96,000 | | custom | 115,200 | |
| | DAC-based mixer | custom | 30,000 | | custom | 36,000 | | custom | 43,200 | |
| | OTP 32 x 1 | IP | 56,448 | | IP | 67,738 | | IP | 81,285 | |
| | | Analog area: | 875,618 | | Analog area: | 1,059,168 | | Analog area: | 1,377,204 | |
| Digital: | | | | | | | | | | |
| | logic gates density | 60,000 (gates/mm^2) | 100,000 | | 60,000 (gates/mm^2) | 25,000 | | 60,000 (gates/mm^2) | 7,500 | |
| | | Digital area: | 600,000 | | Digital area: | 2,400,000 | | Digital area: | 8,000,000 | |
| Pads: | std H (um) | std W (um) | | std H (um) | std W (um) | | std H (um) | std W (um) | | |
| | 257 | 60 | | 424 | 100 | | 430 | 110 | | |
| 1 | XTAL osc (1MHz) | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 2 | " | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 3 | VDD | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 4 | VBATT | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 5 | VSS | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 6 | RF+ | custom | 15,420 | | custom | 42,400 | | custom | 47,300 | |
| 7 | RF- | custom | 15,420 | | custom | 42,400 | | custom | 47,300 | |
| 8 | Program V | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 9 | EnableA | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 10 | EnableB | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 11 | test | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 12 | Vreg | I/O lib | 15,420 | | I/O lib | 42,400 | | I/O lib | 47,300 | |
| 12-24 | various | I/O lib | 185,040 | | I/O lib | 508,800 | | I/O lib | 567,600 | |
| | | Pad cell area: | 370,080 | | Pad cell area: | 1,017,600 | | Pad cell area: | 1,135,200 | |
| DIE SIZE TOTALS: | | | | | | | | | | |
| | analog | | 875,618 um^2 | | analog | 1,059,168 um^2 | | analog | 1,377,204 um^2 | |
| | digital | | 600,000 um^2 | | digital | 2,400,000 um^2 | | digital | 8,000,000 um^2 | |
| | pads | | 370,080 um^2 | | pads | 1,017,600 um^2 | | pads | 1,135,200 um^2 | |
| | | | 1,845,698 um^2 | | | 4,476,768 um^2 | | | 10,512,404 um^2 | |
| | routing/margin multiplier: | 1.3 | | | routing/margin multiplier: | 1.3 | | | routing/margin multiplier: | 1.3 |
| | | | 2,399,407 um^2 | | | 5,819,798 um^2 | | | 13,666,125 um^2 | |
| | Xdimension | 1.72 mm | | | Xdimension | 2.20 mm | | | Xdimension | 2.32 mm |
| | Ydimension | 1.40 mm | | | Ydimension | 2.65 mm | | | Ydimension | 5.89 mm |
| | yield (GDW) | 10,600 | | | yield (GDW) | 4,500 | | | yield (GDW) | 1,900 |
| | # wafers/year | 94 | | | # wafers/year | 222 | | | # wafers/year | 526 |
| | ** too few wafers/year for fab minimum requirement** | | | | BEST CHOICE | | | | | |
| | relative die cost: | - | | | relative die cost: | 0.56 | | | relative die cost: | 1.00 |
| | NRE costs ammortized over 2 year's production including engineering costs, masks, wafers, & test (per die): | | | | | \$0.20 | | | | \$0.19 |