Introduction

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| **Parameter** | **Specification** |
| Operating temperature | 25 °C |
| VDD / VSS | ±2.5 V |
| Rout half circuit | 10 kΩ |
| Cout half-circuit | 500 fF |
| Cin half-circuit | 100 fF |
| Common mode output voltage | ±0.5 V |
| Power dissipation | ≤2 mW |
| Small-signal transresistance gain | ≥40 kΩ |
| Freq resp characteristics | 1 domant pole |
| -3 dB bandwidth | ≥75 MHz |
| Figure of Merit FOM | ≥(40 x 75)/2 = 1,500 kΩ MHz/mW |
| **Additional Design Parameters** | **Specification** |
| L current mirror | ≥ 2 um |
| Vov,min | 150 mV |
| Size increments | 0.2 um |
| Max current mirror ratio | 20 |

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| **Schematic** | **SS model** |
| Common Gate (simple) |  |
| Common Source (simple) |  |
| Common Drain (simple) |  |

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| **stage** | **A0** | **gain** | **units** |
| CG | A1 | i2/i1 = RL1 | V/A |
| CS | A2 | Vov2L/Vov2 | V/V |
| CD | A3 | gm3 (1/gm3’||(Rout+2ro3) | V/V |

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|  | **R** | **R** |  |
| R1 | Rin1 | 1/gm1 | (Vov1/2ID1) |
| R2 | Rout1 | 2ro1||RU||RD | 20/ID1||RU||RD |
| Rin2 | inf | Inf |
| R3 | Rout2 | 2ro2||(1/gm2L) | 2ro2||(VovL2/2ID2) |
| Rin3 | Inf | inf |
| R4 | Rout3 | 2ro3||(1/gm3) | 20/ID2||RU||RD |
| C1 | Cin1 | Cin + Cgs1 + Csb1 |  |
| C2 | Cout1 | Cgd1 + Cdb1 |  |
| Cin2 | Cgb2 + Cgs2 + Cgb2 + (1+A)Cgd2 |  |
| C3 | Cout2 | (1+1/A) Cgd2+ Cdb2 |  |
| Cin3 | Cgd3 + (1+A)Cgs3 |  |
| C4 | Cout3 | (1+1/A)Cgs3 + Csb3 |  |

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| Knobs |  |  |  |
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|  | **R** | **R** |  |
| R1 | Rin1 | 1/gm1 | (Vov1/2ID1) |
| R2 | Rout1 | 2ro1||RU||RD | 20/ID1||RU||RD |
| Rin2 | inf | Inf |
| R3 | Rout2 | 2ro2||(1/gm2L) | 2ro2||(VovL2/2ID2) |
| Rin3 | Inf | inf |
| R4 | Rout3 | 2ro3||(1/gm3) | 20/ID2||RU||RD |
| C1 | Cin1 | Cin + Cgs1 + Csb1 |  |
| C2 | Cout1 | Cgd1 + Cdb1 |  |
| Cin2 | Cgb2 + Cgs2 + Cgb2 + (1+A)Cgd2 |  |
| C3 | Cout2 | (1+1/A) Cgd2+ Cdb2 |  |
| Cin3 | Cgd3 + (1+A)Cgs3 |  |
| C4 | Cout3 | (1+1/A)Cgs3 + Csb3 |  |

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| **A** | **equation** | **pole location** | **gain** | **Other form** |
| vin/iin | R1 / (1+sR1C1) | P2 = -1/R1C1 | 1/gm1 | Vov1/(2 ID1) |
| v1/vin | gm1 R2 / (1+sR2C2) | P2 = -1/R2C2 | gm1 R2 | (2 R2 ID2)/Vov2 |
| v2/v1 | -gm2 R3 / (1+sR3C3) | P3 = -1/R3C3 | gm2 R3 | (VovL2 / Vov2) |
| vo/v2 | gm3 R4 /  (1+gm3 R4+sR4C4) | P4 = -(1+gm3 R4)/R4C4 | gm3 R4/  (1+gm3 R4) | (2 ID3R4) / (Vov3 + 2 ID3R4) |

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| **Input variables** | |
| Vov1 |  |
| Vov1 |  |
| Vov1 |  |
| Id\_1 |  |
| Id\_2 |  |
| Id\_3 |  |
| A2 = (VovL2 / Vov2) |  |
| R = RU||RD |  |

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| **Pole Locations** | |
| P1 |  |
| Vov1 |  |
| Vov1 |  |
| Id\_1 |  |
| Id\_2 |  |
| Id\_3 |  |
| A2 = (VovL2 / Vov2) |  |
| R = RU||RD |  |

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| **HSpice .op outputs** | |
| cgs | Cgs |
| cgd | Cgd |
| cgtot | Cgd + Cgd + Cgb |
| cdtot | Cgd + Cdb |
| cstot | Cgs + Csb |
| cbtot | Cgb + Csb +Cdb |

Common Drain: