Final Design Review

Operational Amplifier
Overview

• Introduction
  – Design selected
  – Basic functionality

• Specifications
  – Specifications to be met.

• Parasitic extraction
  – Corner Simulation with parasitics

• Conclusion
Introduction

Basic opamp requirements:-
   High gain, high bandwidth

Architecture selected:-
   Telescopic Amplifier with two cascode devices.
Opamp Design
Specifications Required

- Gain $\geq 80\text{db}$
- Bandwidth $\geq 250\text{Mhz}$
- Phase Margin (when $\beta=1/4$) = 70-75 degrees.
- Offset Value $\leq 10\text{mv}$
- Settling time $\leq 18\text{ns}$.

An op amp with parasitics needs to meet all the above requirements.
SS High Temp Full Supply

Bandwidth: - 295 Mhz
Gain: -88db
PM: - 72degrees.
SS High Temp Low Supply

Bandwidth: - 305Mhz
Gain: -79db
PM: -75degrees.
Parasitic extracted sim results:-
Temp : - 85 Supply=4.5V

<table>
<thead>
<tr>
<th></th>
<th>Gain</th>
<th>UGBW</th>
<th>Phase (at12d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Desired Values</td>
<td>&gt;80db</td>
<td>&gt;250Mhz</td>
<td>70°-75°</td>
</tr>
<tr>
<td>SS</td>
<td>79db</td>
<td>305Mhz</td>
<td>75</td>
</tr>
<tr>
<td>FF</td>
<td>80db</td>
<td>356Mhz</td>
<td>74</td>
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<tr>
<td>FS</td>
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<tr>
<td>SF</td>
<td>80db</td>
<td>305Mhz</td>
<td>73</td>
</tr>
<tr>
<td>TT</td>
<td>79db</td>
<td>290Mhz</td>
<td>74</td>
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</table>
Parasitic extracted sim results:-
Temp :- 27       Supply=5V

<table>
<thead>
<tr>
<th>Desired Values</th>
<th>Gain</th>
<th>UGBW</th>
<th>Phase (at12d)</th>
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<tbody>
<tr>
<td>SS</td>
<td>88db</td>
<td>338Mhz</td>
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<td>TT</td>
<td>87db</td>
<td>382Mhz</td>
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</table>
Conclusion

• The opamp meets all specification with the extracted parasitics.
• The bandwidth has improved due to shared regions (reduced capacitance).