

University of
Waterloo



UW ASIC Design Team
CMOSIC Team



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design ♦ team

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Overview

- Why are we here?
- What are we doing?
- Why are we doing it?
- How are we going to do it?
- When do we start?



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Why are we here?

- Why are we in Electrical / Computer Engineering?
 - Andrew: I love computers and building things.
 - Bob: It's one of the hardest programs in the country at the best university!
 - Chris: Get a great job and make \$100,000 starting salary!
 - Dave: My mom told me to!
 - Elaine: Pick up smart guys!



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Why are we here?

- Why should you be part of the UW ASIC Design Team?
 - Get the chance to build something you can't do by yourself at home
 - Challenge you to go beyond the classroom
 - Get the skills and experience you need to jump-start your career
 - You'll make your Mom proud
 - Meet people with similar interests and have fun



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Why are we here?

- Why should you be part of the CMOS IC Team?
 - Get a head-start on concepts that aren't really introduced until 4th year
 - Be part of a project that fabricates a physical device
 - Develop a strong understanding of how electronics work on a semiconductor level
 - Once in a lifetime opportunity to gain this experience before you graduate



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What are we doing?

Microelectronic
CIRCUITS
Sedra/Smith



FIFTH EDITION

- Building a full-custom ASIC (Application-Specific Integrated Circuit) of a SRAM (Static Random Access Memory)
- SRAM (pg. 1031 of Microelectronic Circuits by Sedra & Smith; pg. 657 of Digital Integrated Circuits)
- SRAM vs. DRAM (static latches vs. capacitors); both are volatile, but DRAM requires recharging
- Building a Gilbert Cell Mixer (monolithic, double-balanced, active mixer)

DIGITAL
INTEGRATED CIRCUITS
A DESIGN PERSPECTIVE
SECOND EDITION

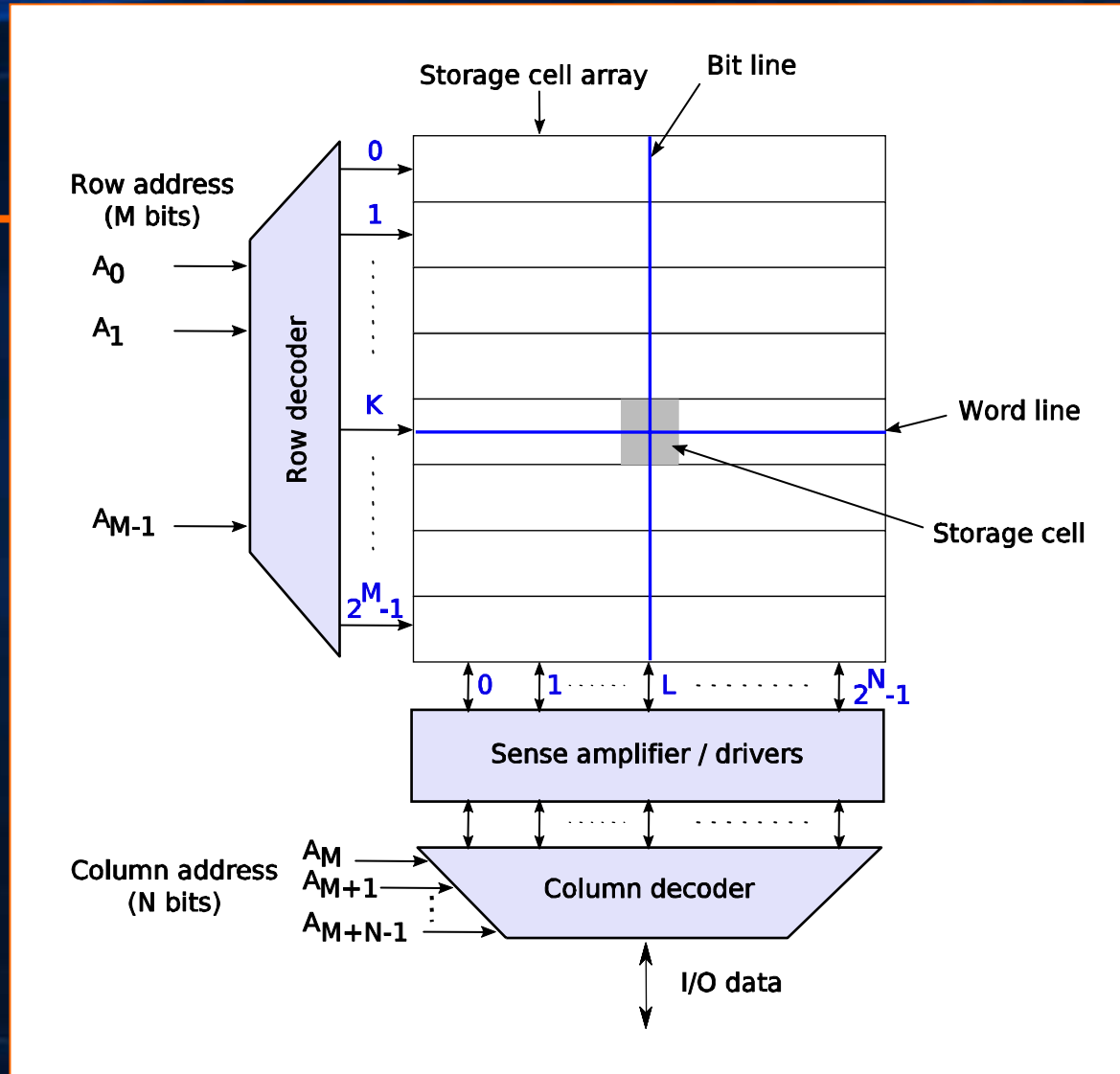


JAN M. RABAEY
ANANTHA CHANDRAKASAN
BORIVOJE NIKOLIC



Memory Chip

Figure 11.17 on page 1029
Microelectronic Circuits
Sedra & Smith

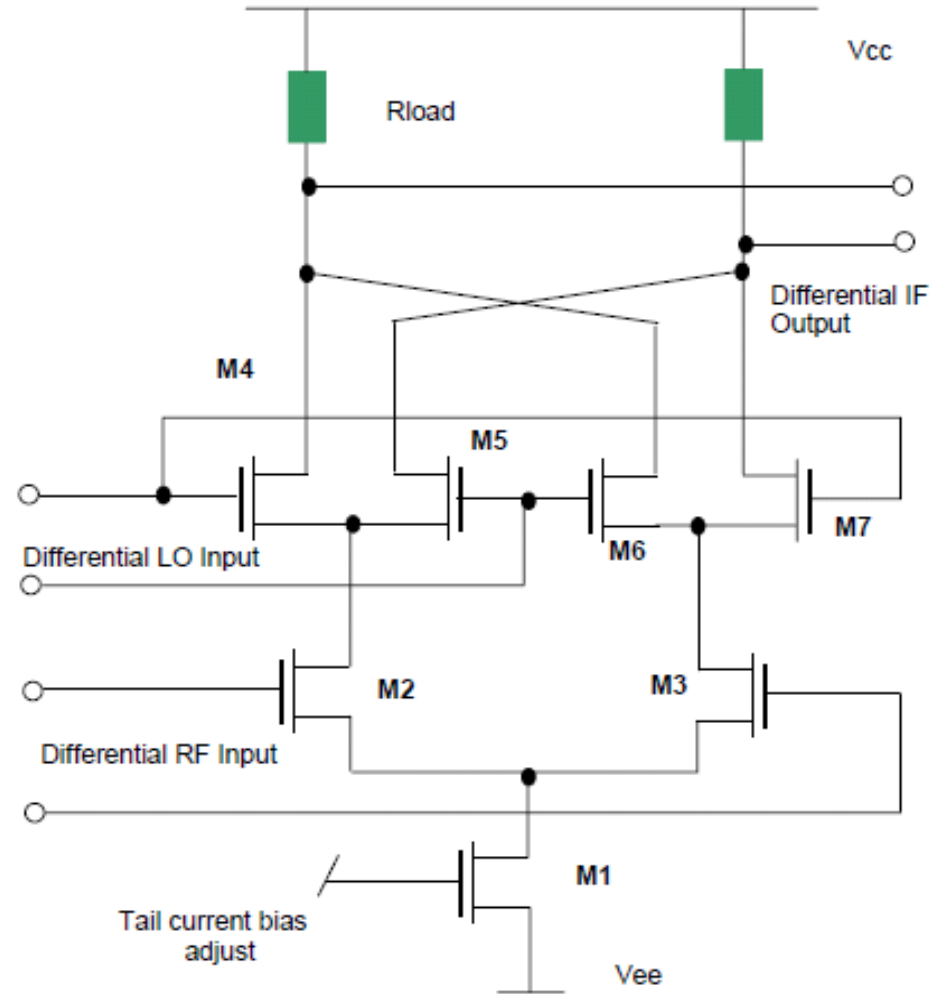




Gilbert Cell Mixer

Figure 3 Basic circuit of the Gilbert Cell Double balanced mixer (DBM)

from *Gilbert Cell Design Tutorial* by J P Silver





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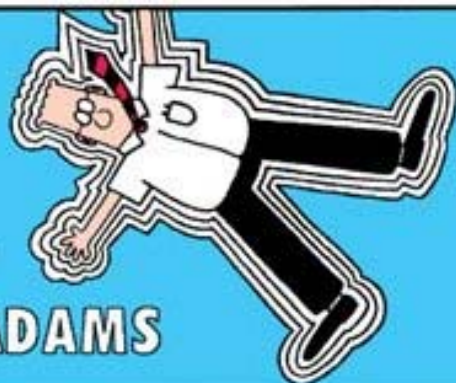


What is a full-custom ASIC?

- Define all the photo lithographic layers of the device
- Benefits
 - Reduced area
 - Improved performance
 - Ability to integrate analog components
- Disadvantages
 - Increased manufacturing and design time
 - Increased engineering costs
 - More complexity in the CAD system and higher skill requirement of the design team



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UM... I DON'T THINK IT'S VERY MUCH LIKE THAT.



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ANALOGY POLICE. COME WITH ME.



ARE YOU TAKING ME TO JAIL FOR MAKING A BAD ANALOGY?



THE ANALOGY POLICE DON'T USE A REAL JAIL. WE USE SOMETHING SIMILAR.



1-23-04

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SHE'S THE ONE BEING PUNISHED.



YOUR NECKTIE IS LIKE HITLER AT AN ICE RINK.





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Why are we doing it?

- Undergrads at UW have never done this before
- Set a new standard for undergrad students around the world
- To show the world what we are capable of
- Open new doors for our future by gaining the experience and skills as well as being part of a project that we can demonstrate



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How are we going to do it?

- Transistor layout for both projects is mostly complete
- Next step is to perform simulations to verify that the devices are operating properly
- Will likely have to re-iterate and improve upon our existing design
- Perform physical verification to check for effects of parasitic capacitance and other effects not covered by simulations



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When do we start?

- *Right away*
 1. Organize ourselves into groups
 2. Schedule tutorials for new members and design sessions to start the work right away
 3. Team leads assess
 4. Set team milestones as a team as first order of business



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