GDDR4: Today's Ultimate Gaming Memory

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GDDR4 - The Development

- Goals
  - Speed
    - Gamers need the speed
  - Low power
    - Every watt saved in the memory can be spent on the GPU

- ATI lead the development within JEDEC
  - Joe Macri – Chair of the JEDEC GDDR4 Task Group and JC42.3 Dram Committee
  - ATI provided the critical IP that enabled the standard
  - Samsung and Hynix were the key Dram partners during development

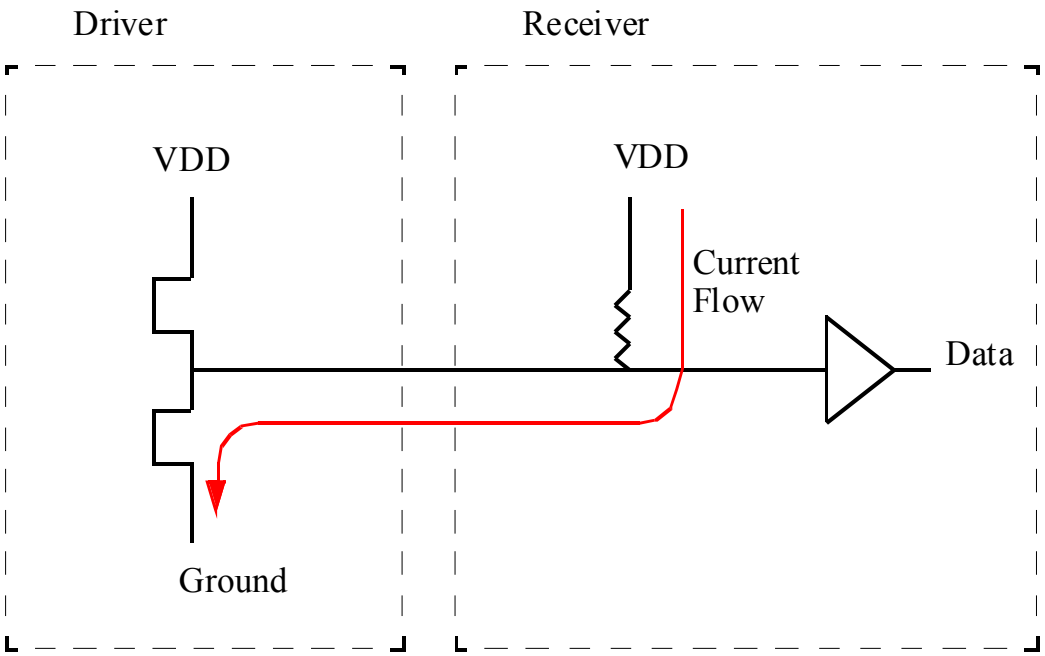
- Evolutionary from GDDR3
  - Ease backwards compatibility
  - Speeds development

Dram Core– Low Power by Design

- Density 512Mbit – 32Mbit X 32
- Lower VDD than GDDR3
  - Nominal voltage is 1.5v
    - 1.9v used for hi speed gaming and over clocking
  - ~30% power savings
- Fixed Data Burst Length of 8
  - Lowers core frequency by 2x VS GDDR3
  - Significantly reduces power
  - Allows higher clock frequency

DBI – Data Bus Inversion

- Lowers power consumption
- Increases speed by reducing VDD noise
- How does this work?
  - Only Logic 0's use power so eliminate them!



DBI – Data Bus Inversion

- Eliminating Logic 0's
  - If number of 0's is >4 then Invert Data and set DBI = 1
  - Receiver of data will flip it back via DBI Flag

  - Example 1

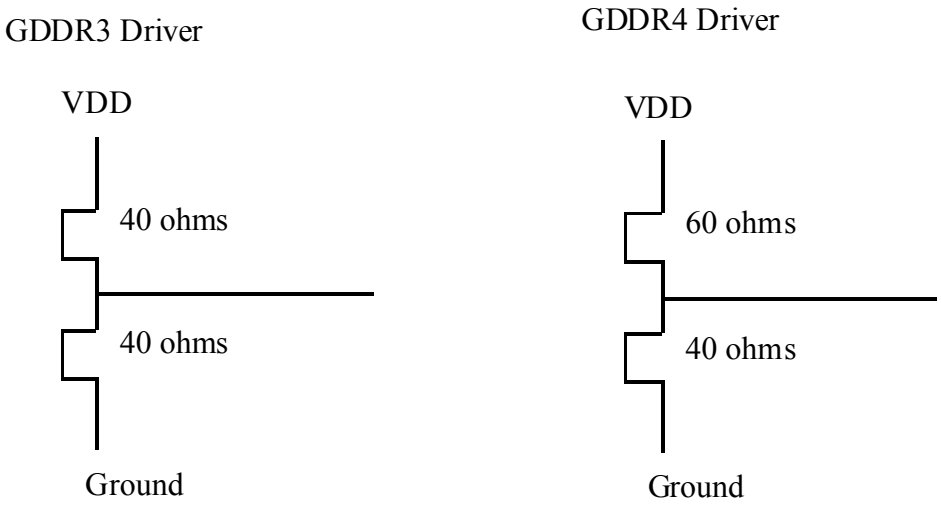
    Original Data = 00000000 ➔ Since # 0's >4 Invert
    Data on Bus = 11111111, DBI = 1
    When DBI = 1 ➔ Received data = 00000000

  - Example 2

    Original Data = 11111000 ➔ Since # 0's <4 Do not Invert
    Data on Bus = 11111000, DBI = 0
    When DBI = 0 ➔ Received data = 11111000

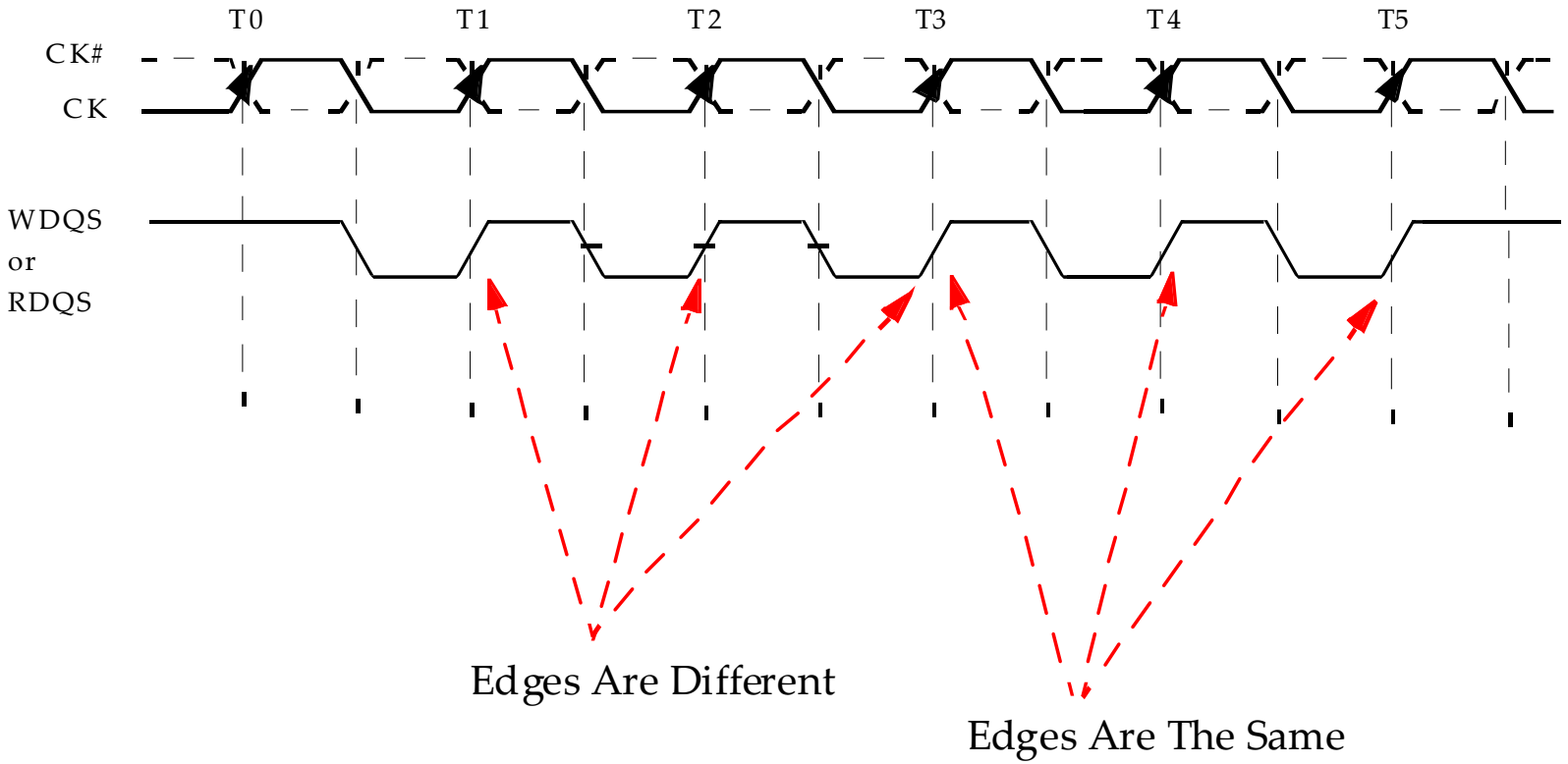
Smaller Transmitter

- GDDR4 has a lower input Capacitance than GDDR3
  - Lower Power
  - More Speed



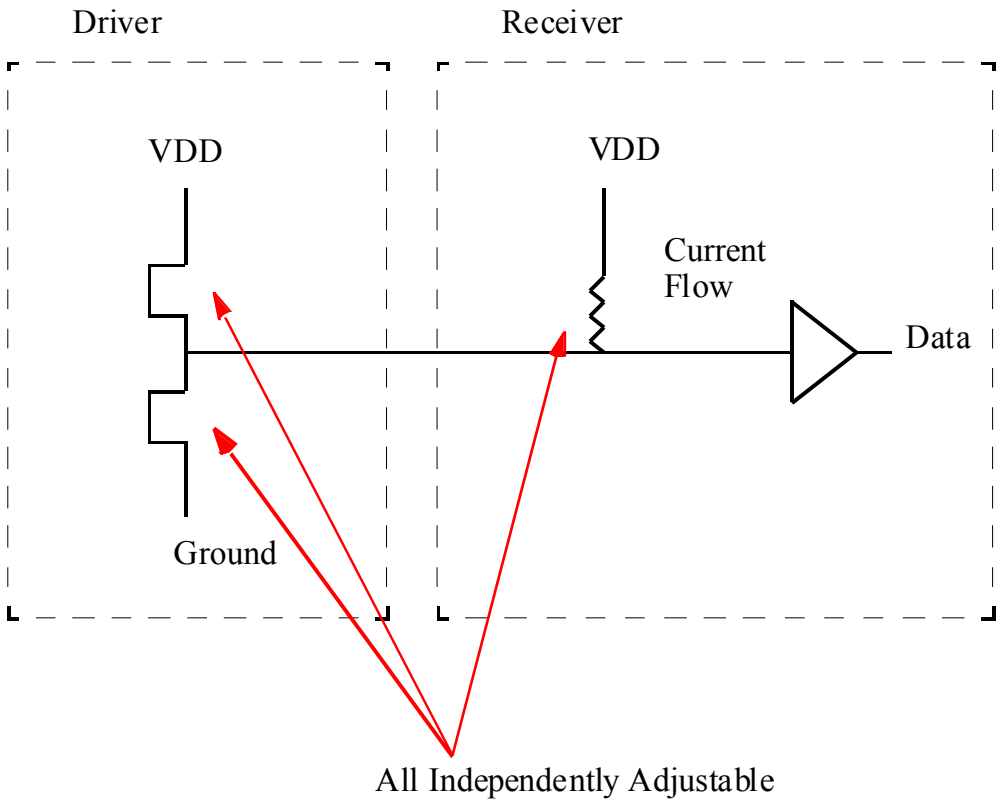
Multi-Cycle Preamble

- Reduce Jitter on Data Strobes
  - More Speed



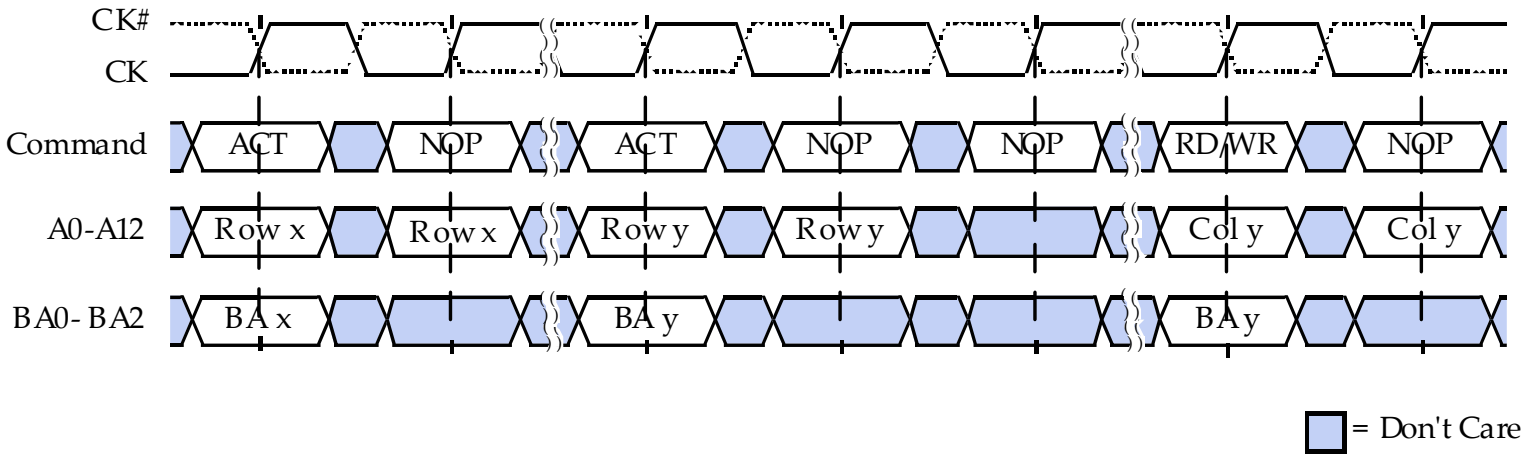
Fully adjustable Driver and Terminator

- Every Dram Manufacturer is a bit different
  - Adjustability allows optimizing for speed

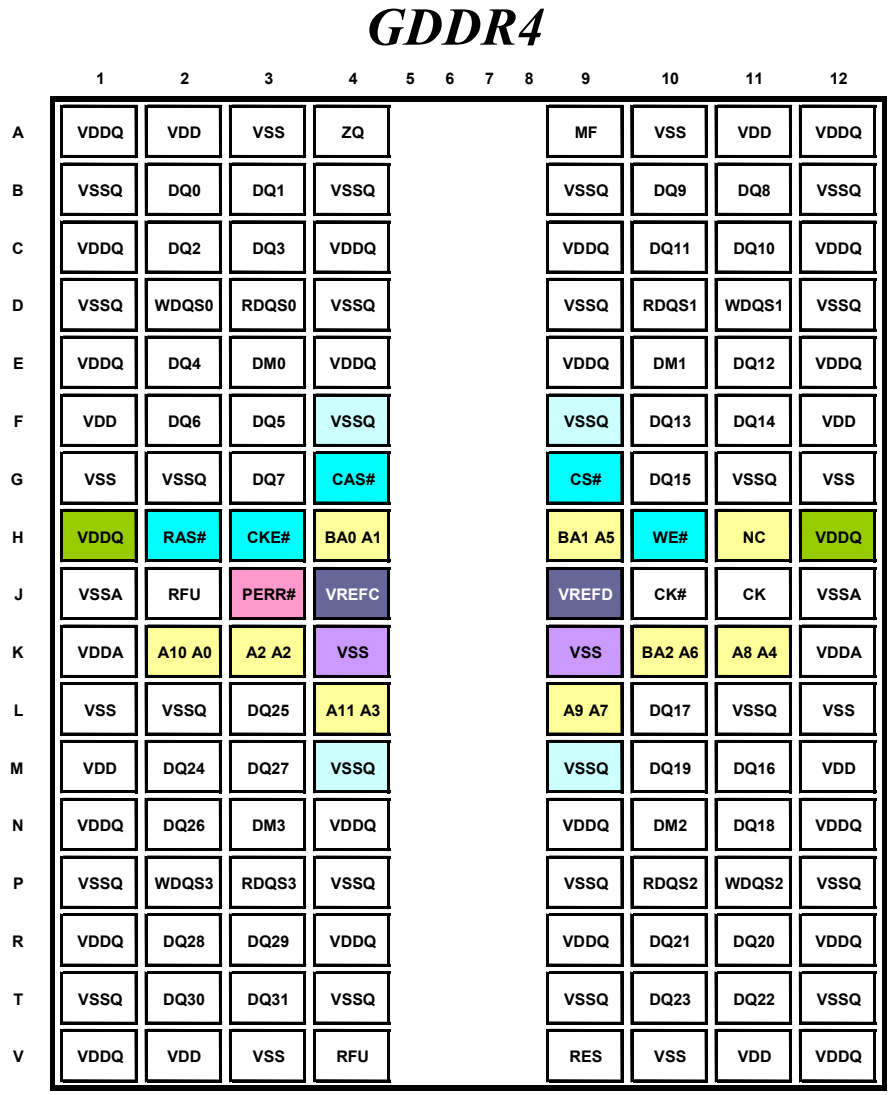


Double Pumped Address Bus

- GDDR4 uses ½ the pins for address than GDDR3
  - Slight reduction in Power
- Frees pins up to be used for Power and Ground
  - Increases Speed
- Address are sent on two consecutive cycles



GDDR4 - 136ball BGA



GDDR4 The Ultimate Gamers Memory

- Improved Over Clocking
  - Lower power at all frequency VS GDDR3
  - Improved signaling technology allows higher speeds
- Higher Frequencies enhances gaming experience
  - Smoothes Frame Rates

X1950 combined with GDDR4 is the Gamers Choice bar None!!!