A 10Gbps/channel On-Chip Signaling Circuit with an Impedance-Unmatched CML Driver in 90nm CMOS Technology

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Our work

- High-speed and long distance signal transmission in a 90nm technology
- 10Gbps/ch signaling on 3mm on-chip transmission-line
  - Maximum bandwidth: 12.5Gbps
- 30% Power reduction of driver by impedance-unmatched CML driver

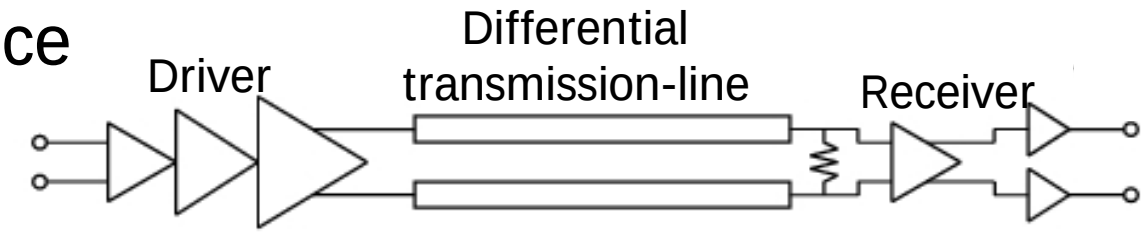
Solution of bottleneck

Bottleneck of on-chip signaling is Driver.

CML is a choice of driver

- Advantage:
  - High-speed operation
  - Higher noise tolerance
- Disadvantage:
  - Large power consumption

Targeted signaling system



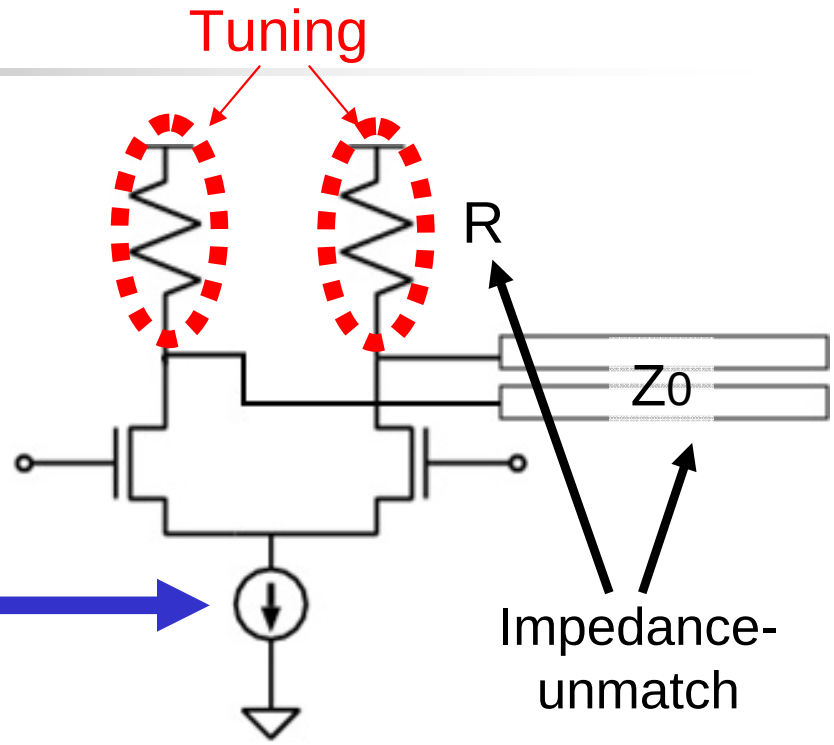
We challenged power reduction of driver.

Design idea

Impedance matching at driver output is not mandatory for on-chip signaling

- Wire line is lossy
- Terminator eliminate the reflected wave

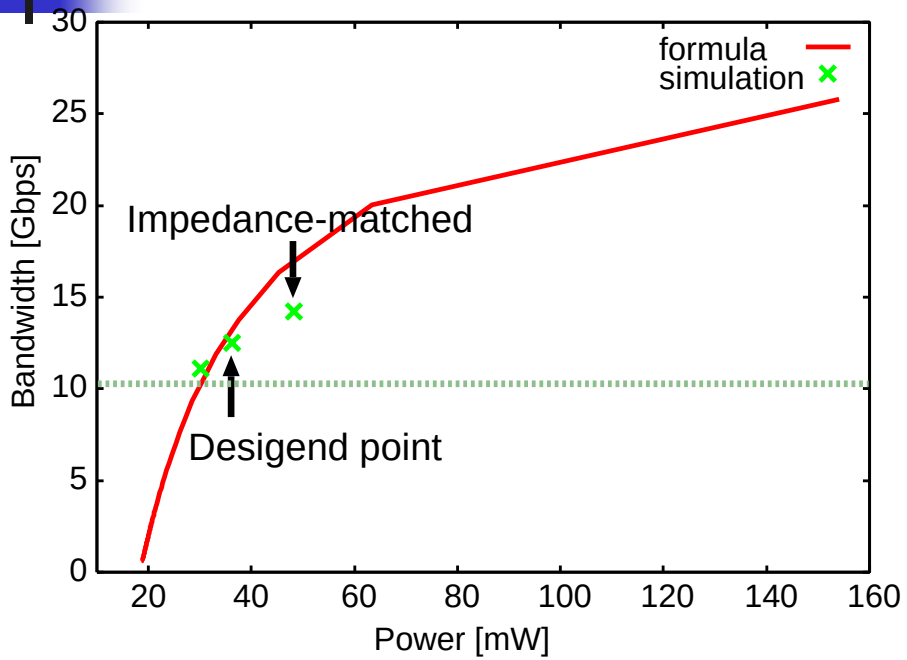
We can tune the tail current by changing the load resistance R.



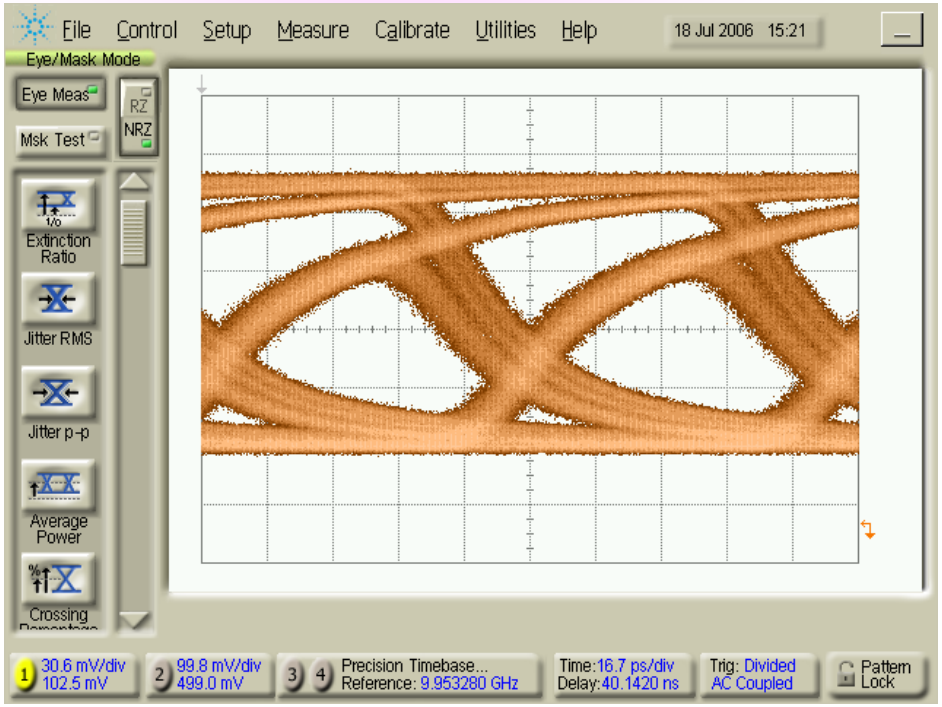
chip microphoto

Measurement results and Conclusion

Let's discuss at 1D-15



Trade-off curve between power and bandwidth of driver



Measured eye-diagram (12.5Gbps)

- The maximum signaling speed is 12.5Gbps.
- Power consumption reduced by 30%.

Thank you