A Swing-Enhanced Current-Reuse Class-C VCO with Dynamic Bias Control Circuits

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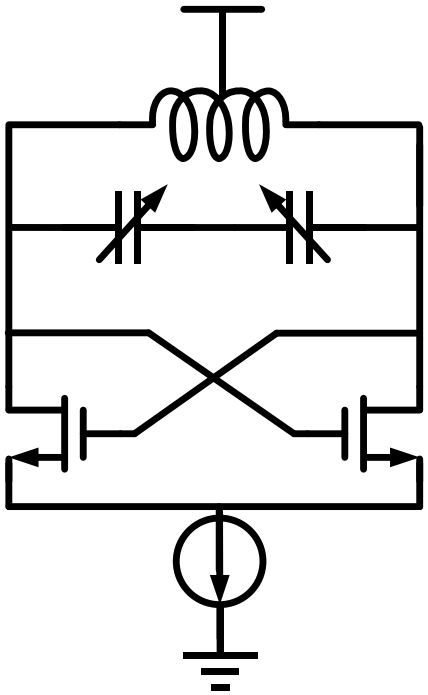
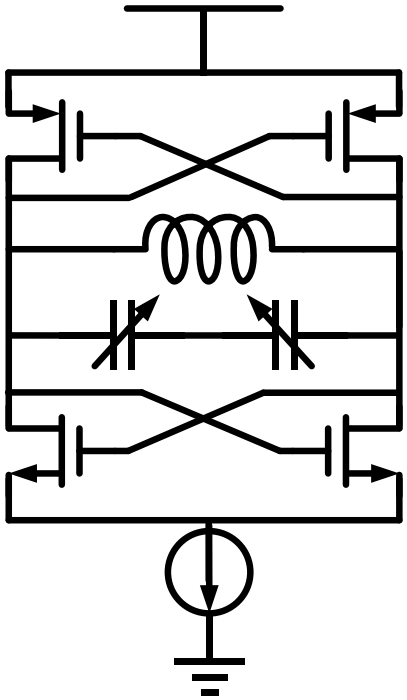
Conventional Class of LC-VCOs

NMOS LC-VCO



- Good phase noise performance at moderate power

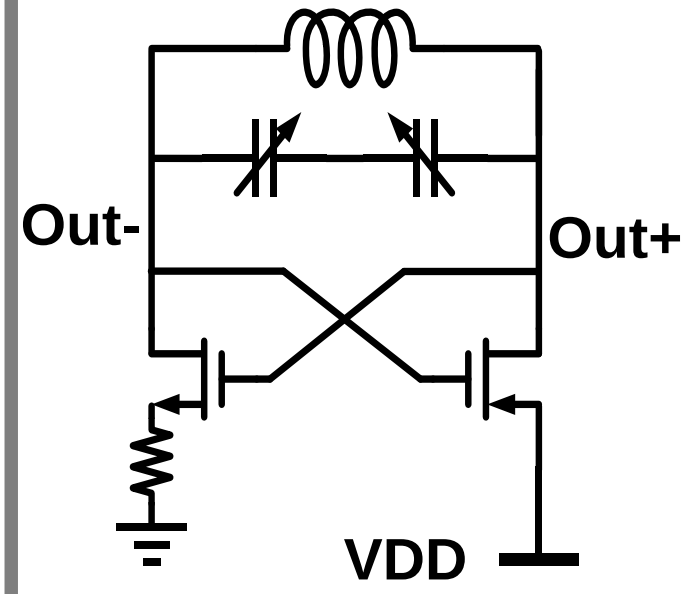
CMOS LC-VCO



- Better reliability
- 2x amplitude in current-limited regime (6dB FoM reduction)

Current-Reuse LC-VCO

[S.-J. Tun, *et al.*, ISSCC 2005]



- Conduct current half period
- Inherit same benefits of CMOS VCO

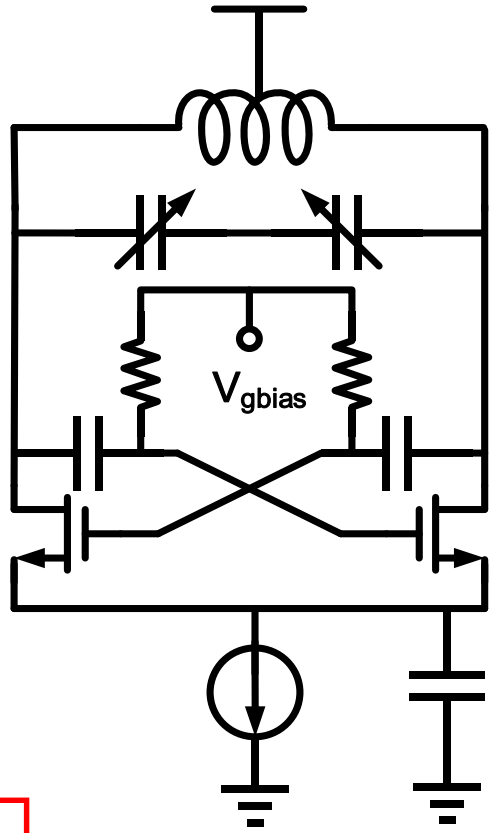
Class-C VCO

Class-C VCO

[A. Mazzanti, and P. Andreani, ISSCC 2008]

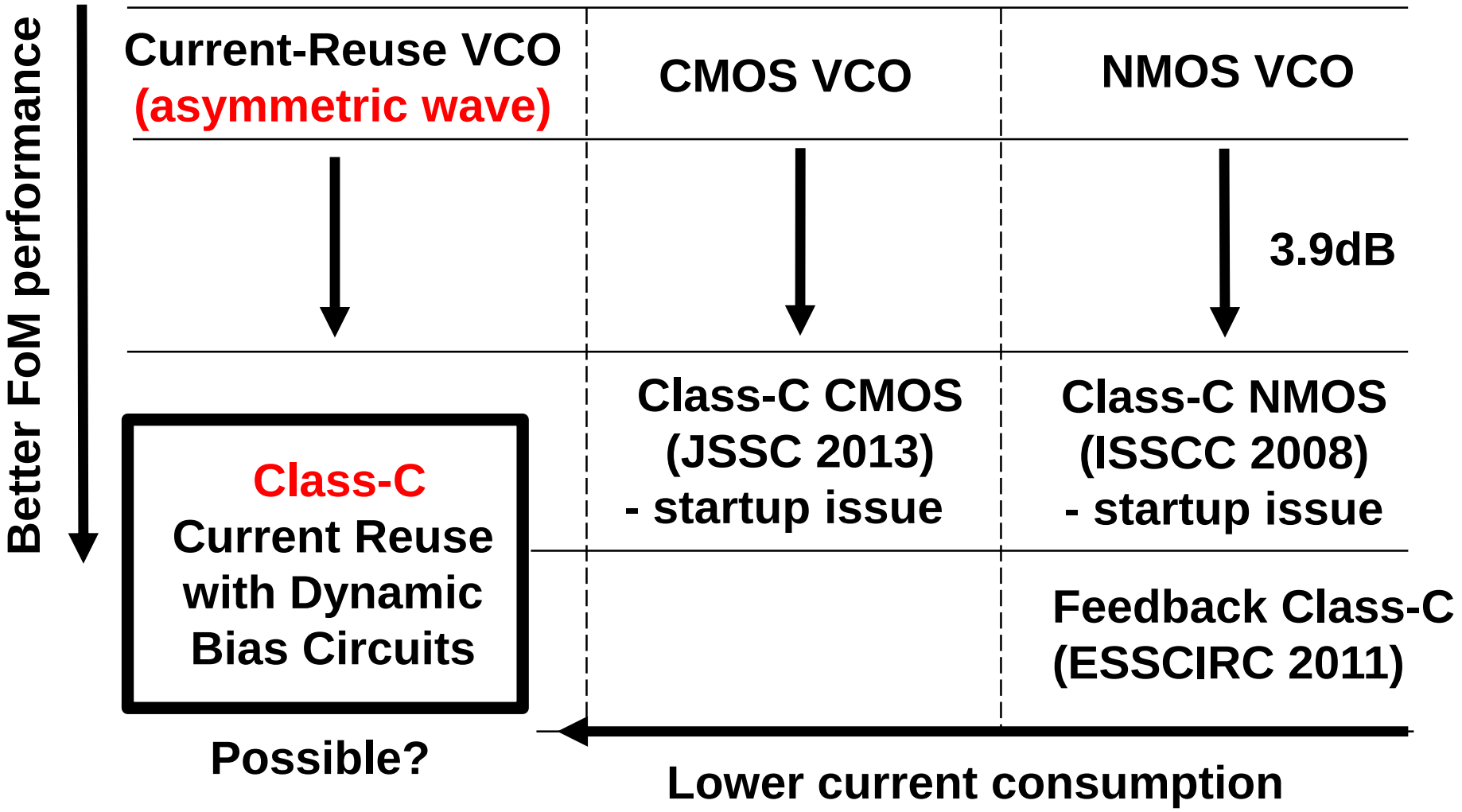
- Biasing NMOS cross-coupled MOSFETs in class-C operation

- More efficient MOS current generation

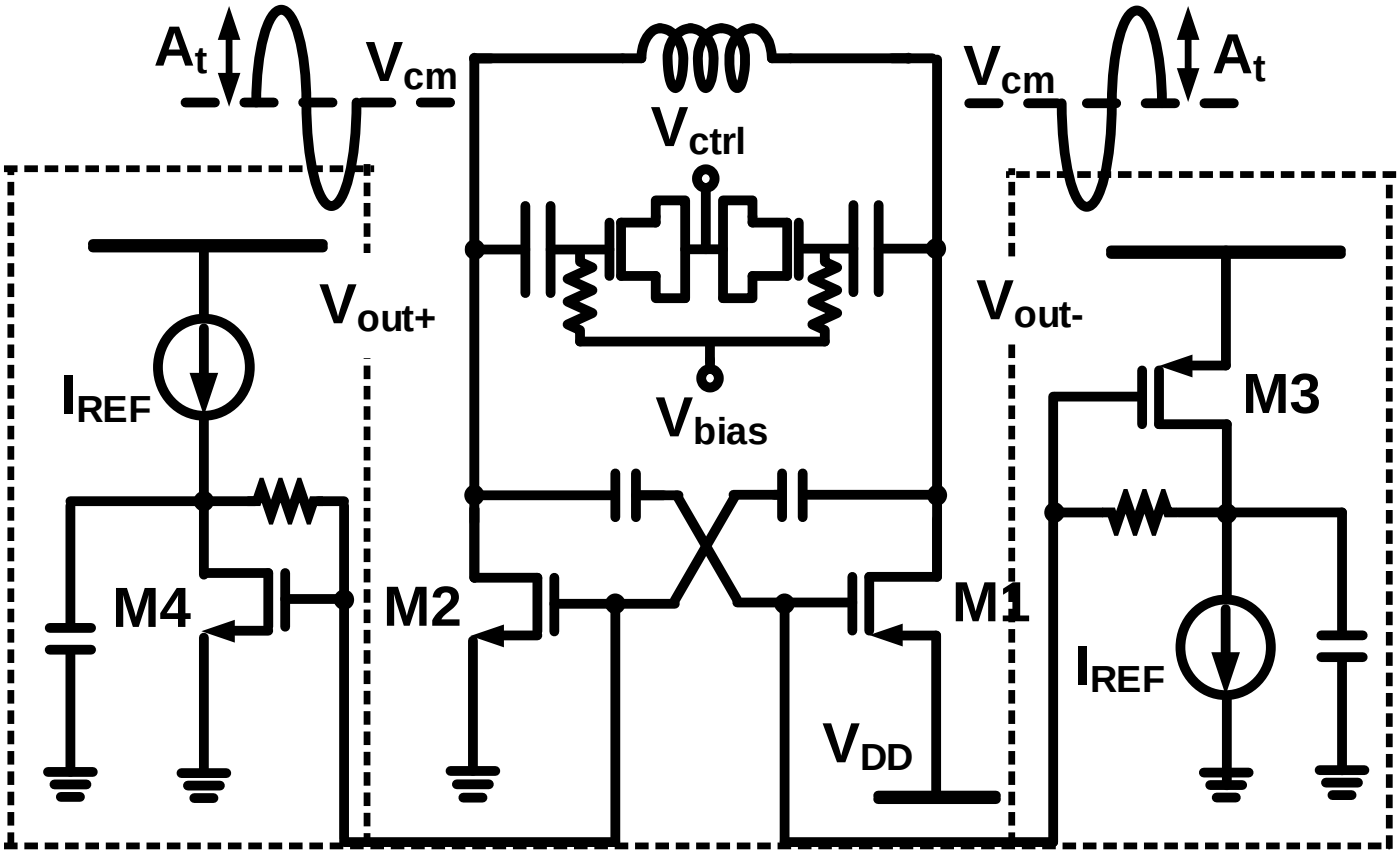


With same power budget, phase noise achieves a significant improvement (3.9dB reduction in FoM)

LC-VCO Topologies



Proposed Current-Reuse Class-C VCO



- **Dynamic** Bias Control Circuits for Class-C operation
  - Reliable startup & enhance oscillation swing

Performance Comparison

	Topology	Freq./Offset Freq. [GHz/MHz]	Phase Noise [dBc/Hz]	Power [mW]	FoM [dBc/Hz]
ISSCC'13	Class-D	3.3/5	-144	6	-190
ISSCC'10	CMOS	3/1	-114	0.7	-187
ISSCC'12	CMOS	6.8/2	-123	9	-185
ISSCC'05	Current-Reuse	2.0/1	-123	1	-189
Proposed	Class-C Current-Reuse	4.6/1	-119	2.4	-189

- The proposed work achieves low phase noise as well as low power consumption