

4 Proj choices:

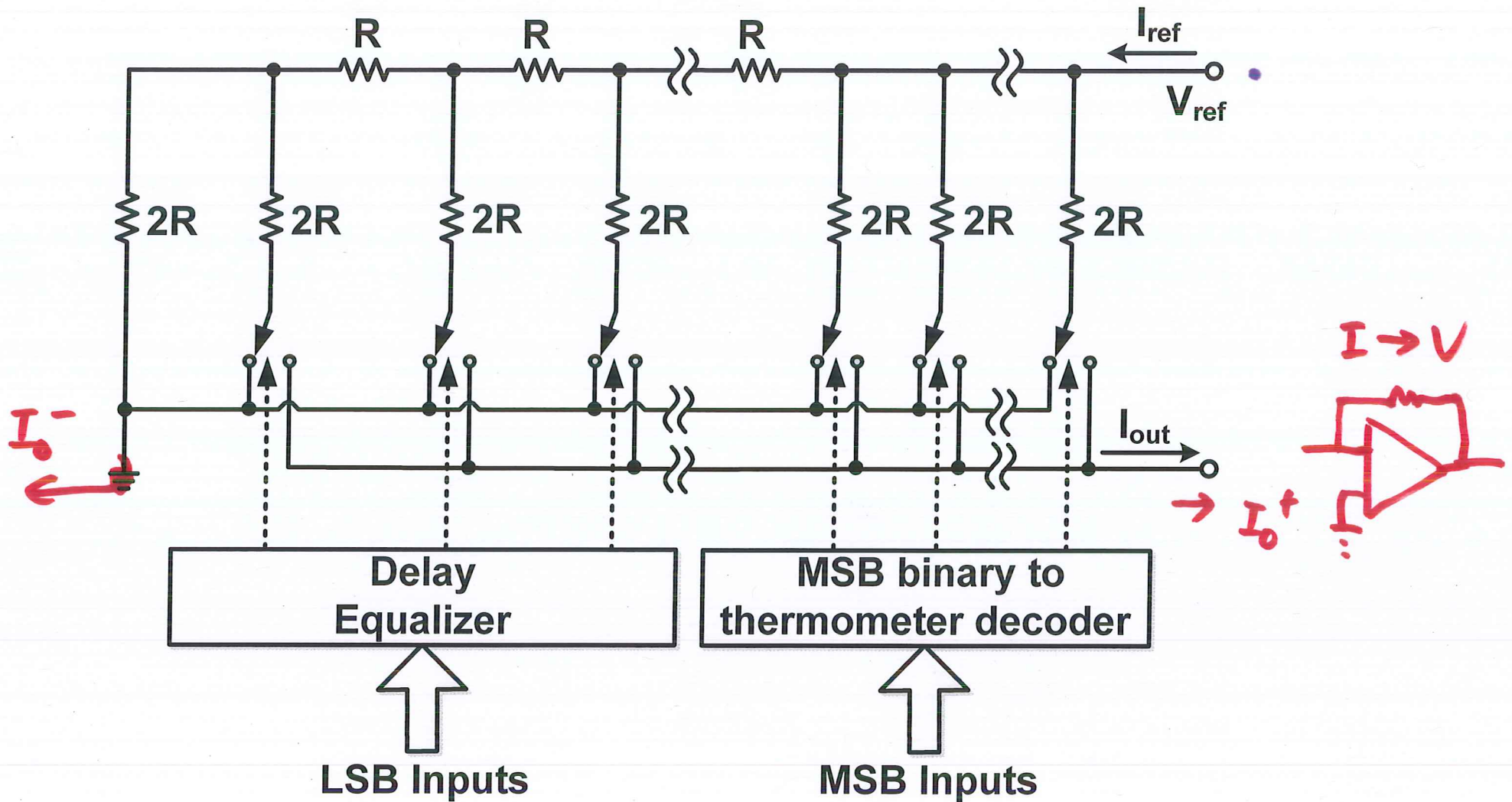
A. Buffer free interpolated String DAC (F)

B. Thermometer + R2R I-DAC (M)

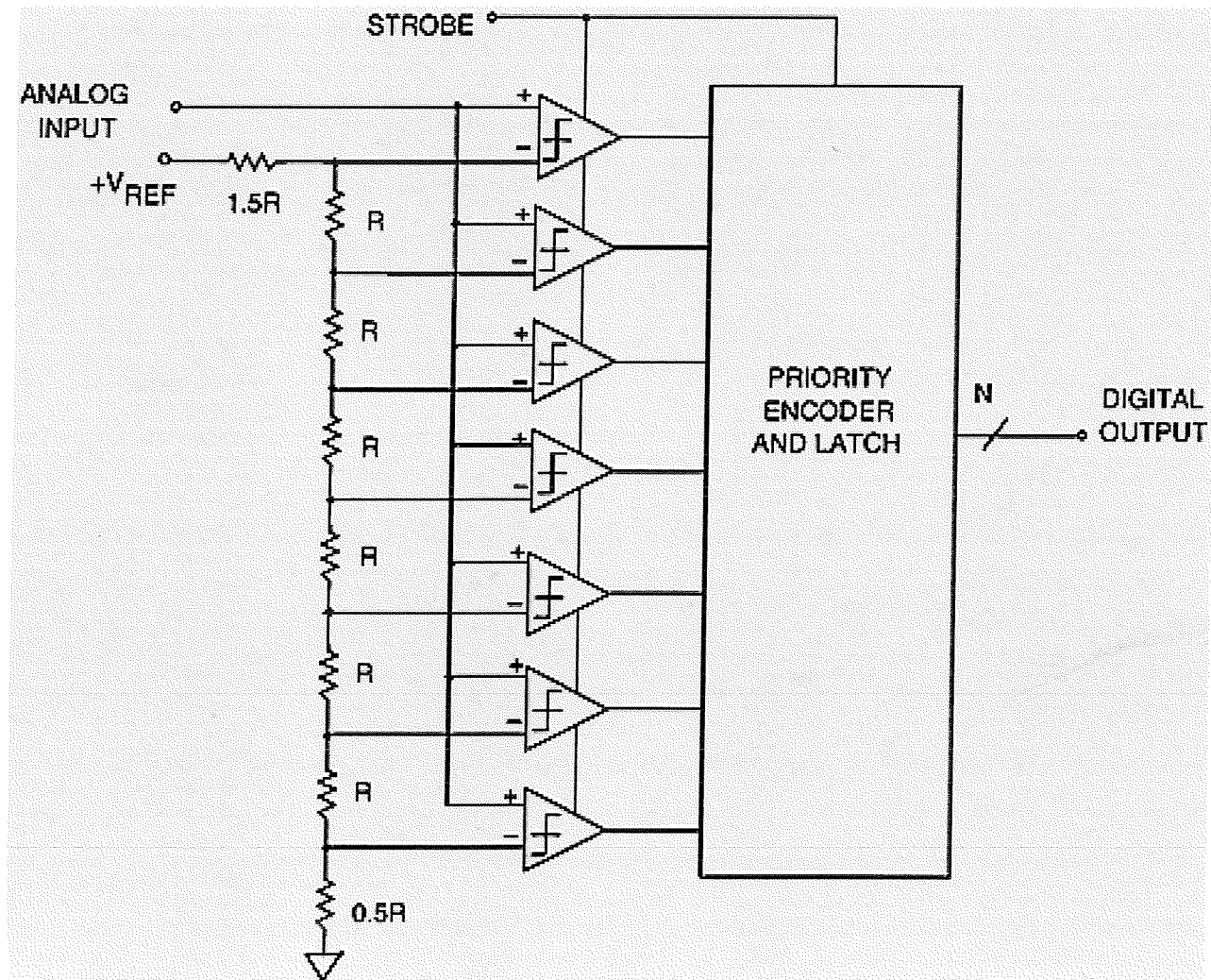
C. Flash ADC (W)

D. SAR ADC (F)

Can combine thermometer code and binary ladder:



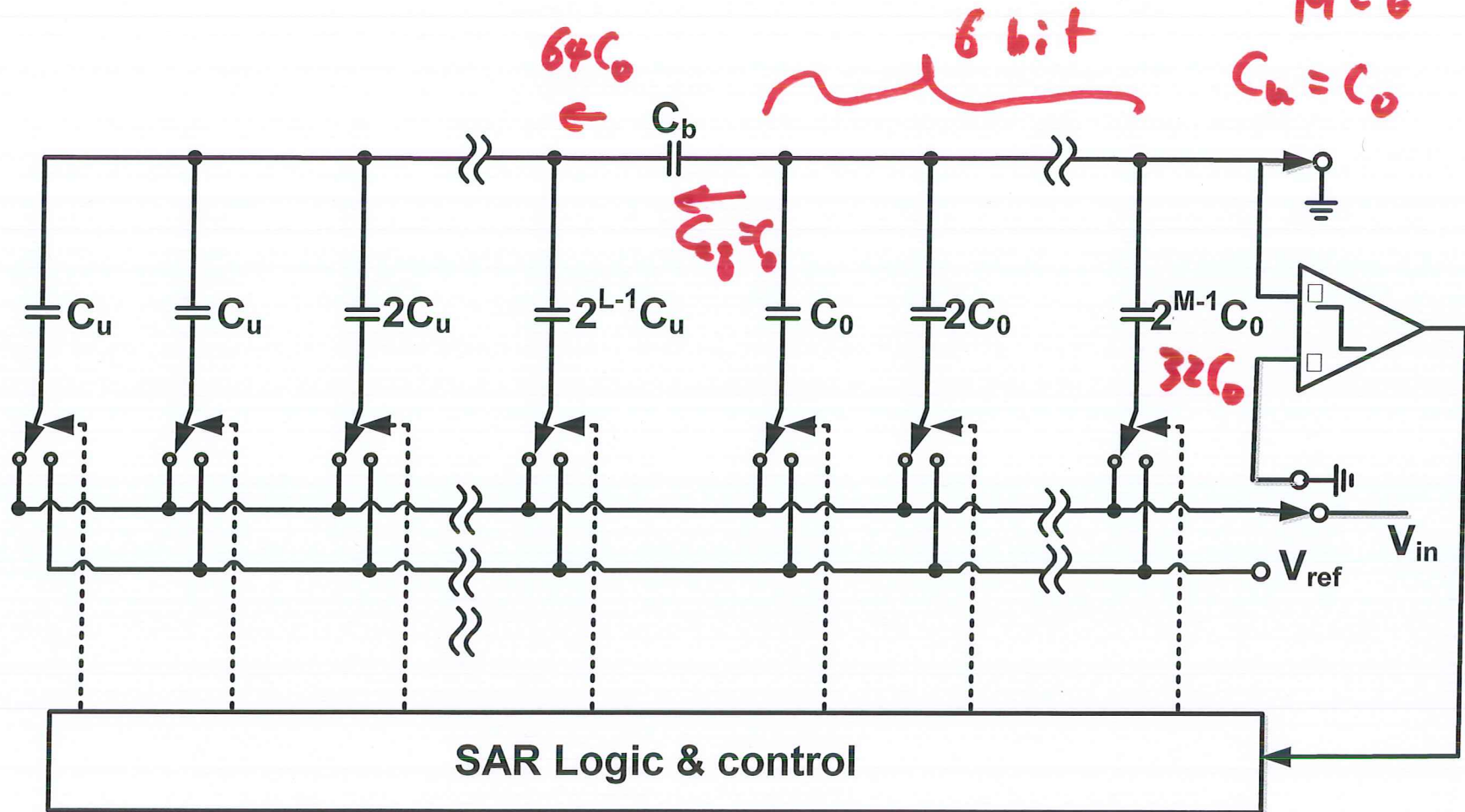
High Speed Flash ADC



C-DAC based SAR ADC

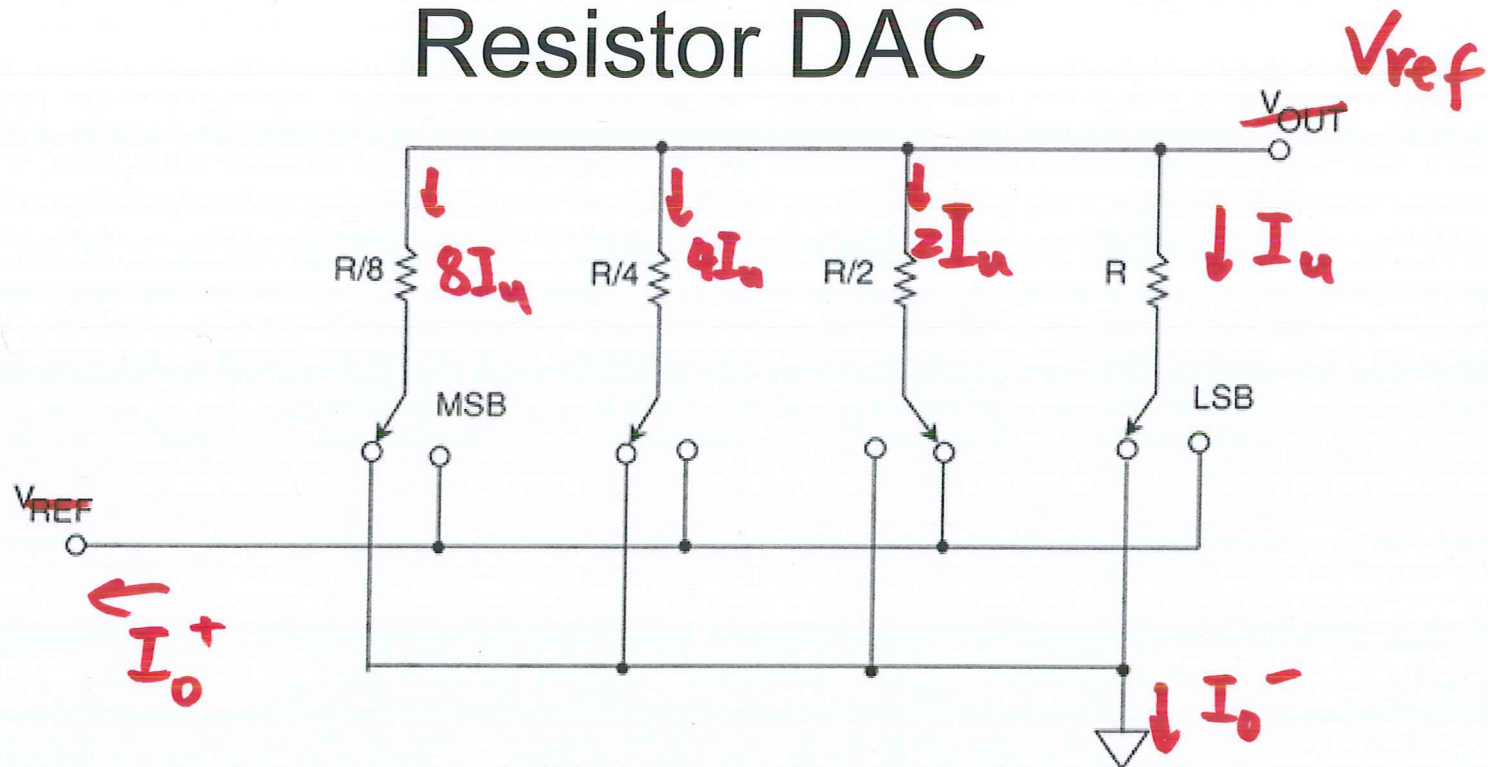
$L=6$
 $M=6$

$C_u = C_0$



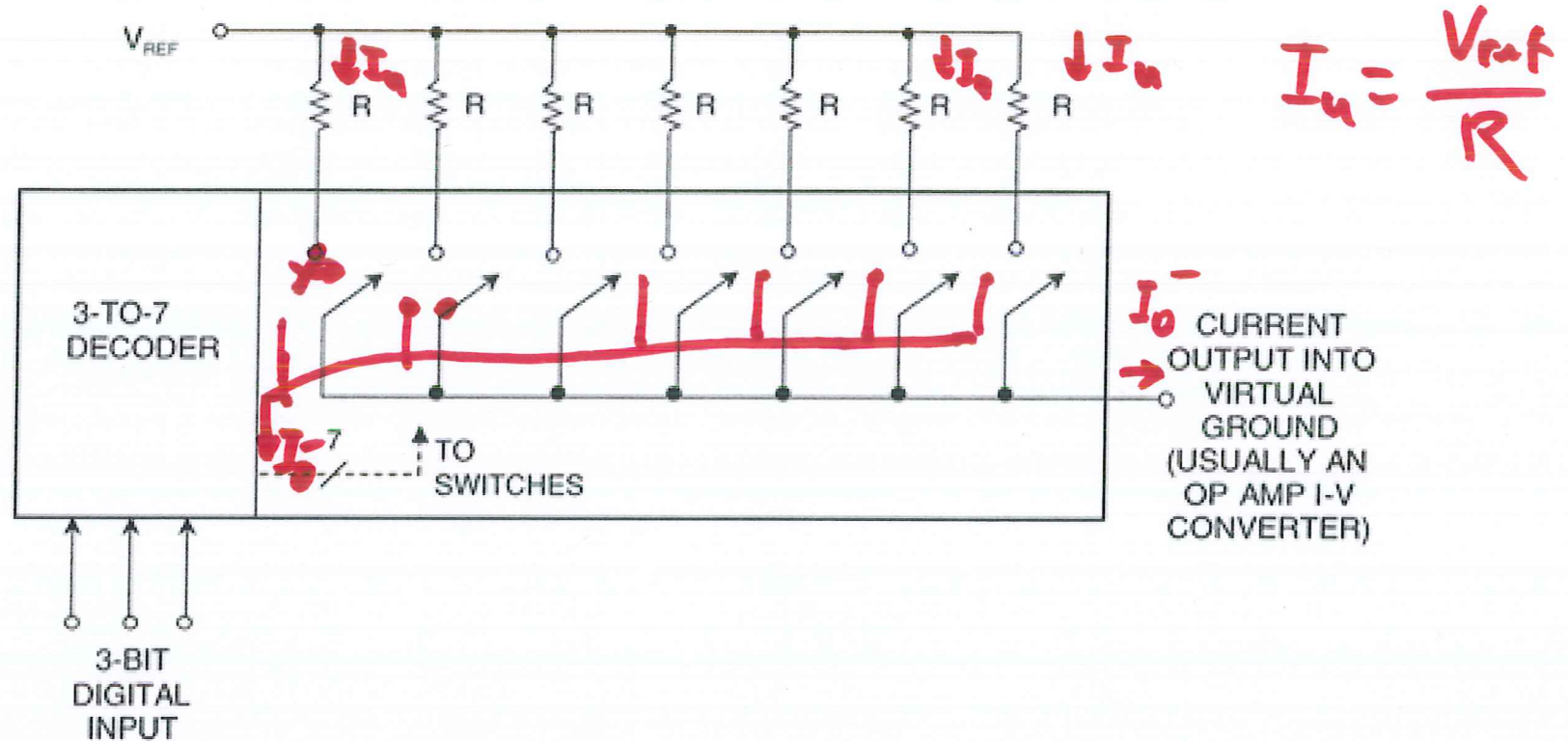
$$\frac{64C_0 \times C_b}{64C_0 + C_b} = C_0 \quad \text{Solve for } C_b$$

Voltage-Mode Binary-Weighted Resistor DAC



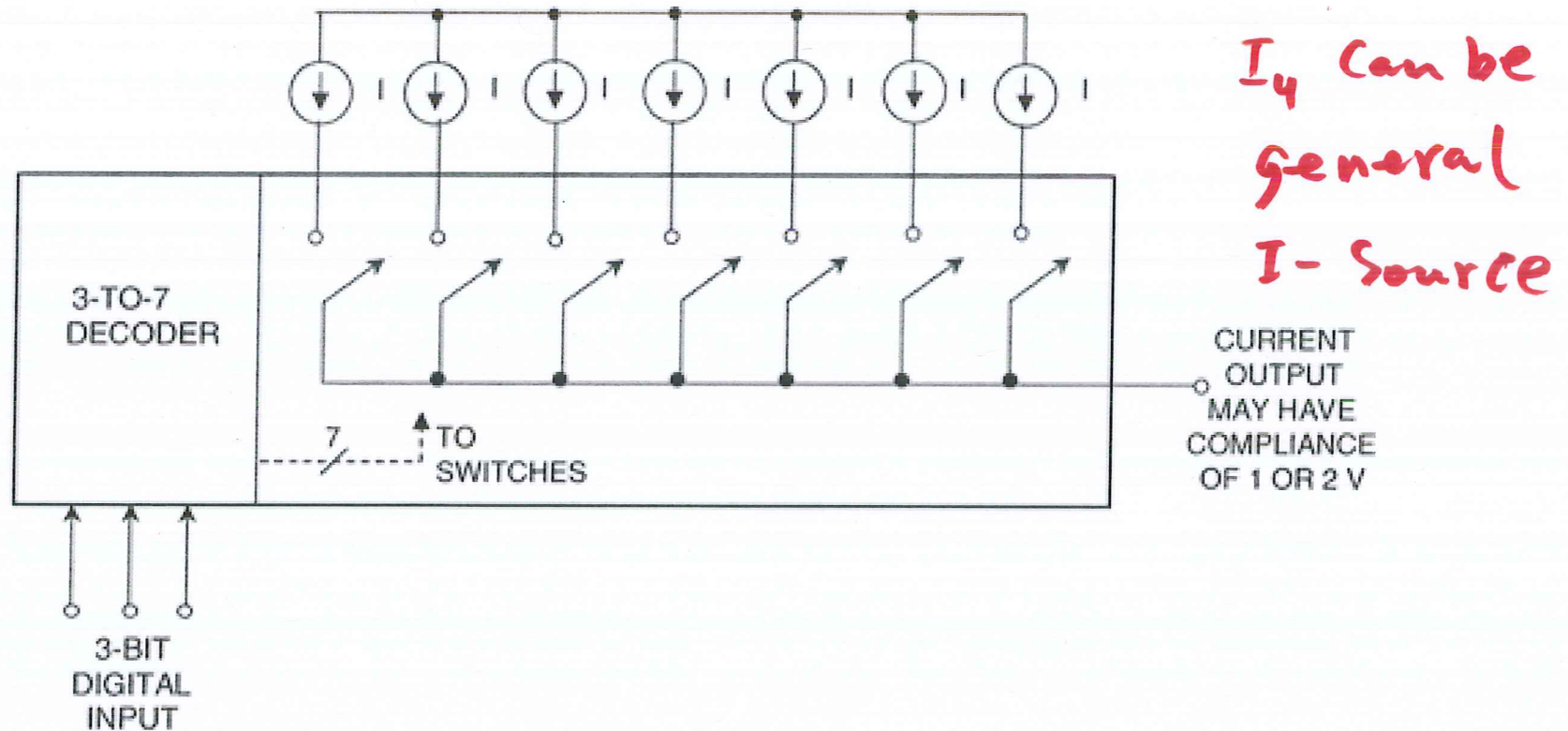
Adapted from: B. D. Smith, "Coding by Feedback Methods," Proceedings of the I. R. E., Vol. 41, August 1953, pp. 1053-1058

Thermometer current DACs



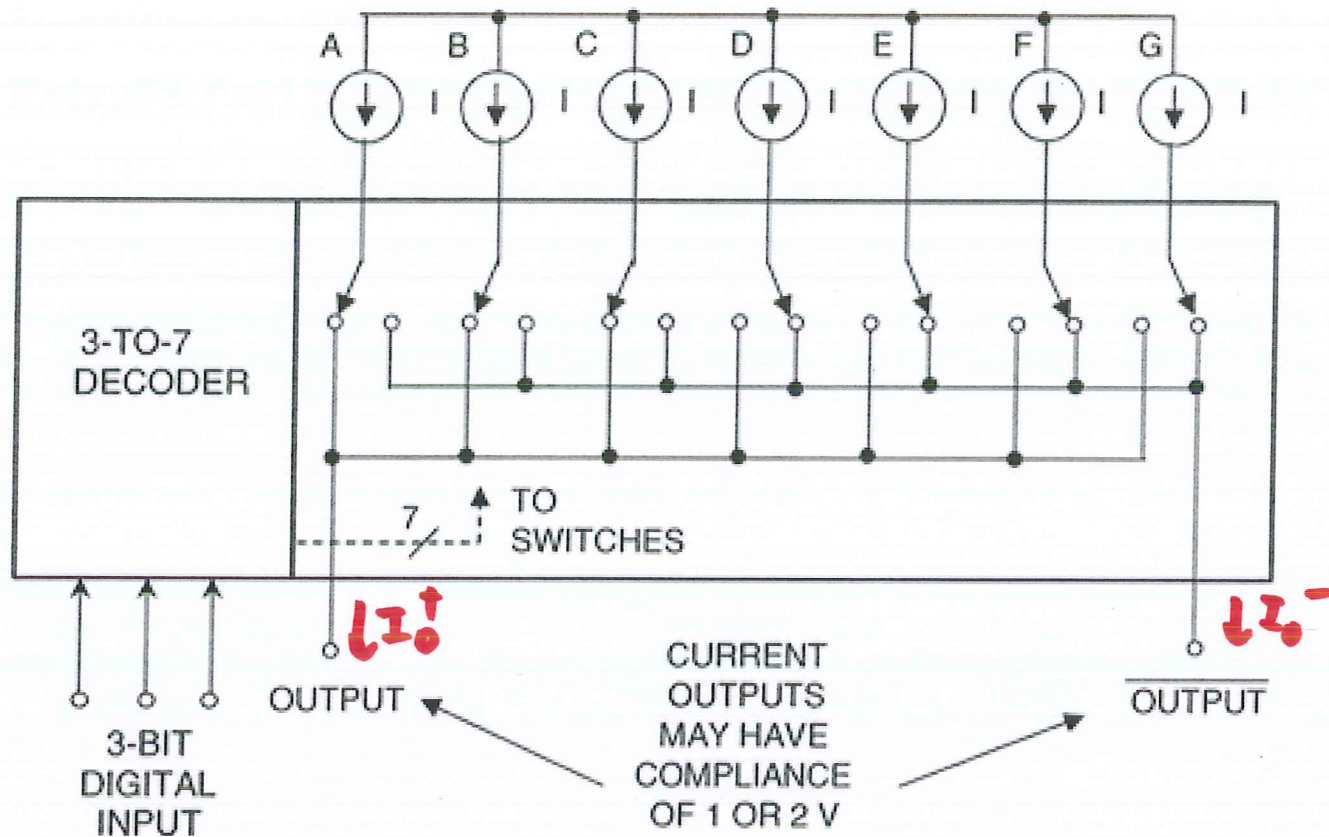
- Output node at virtual ground
- Each resistor contributes either 0 or V_{ref}/R
- If input digital code = k , k of the $2^N - 1$ switches will be turned on
- $I_{out} = kV_{ref}/R$
- Inherently monotonic

Use Matched Current Sources



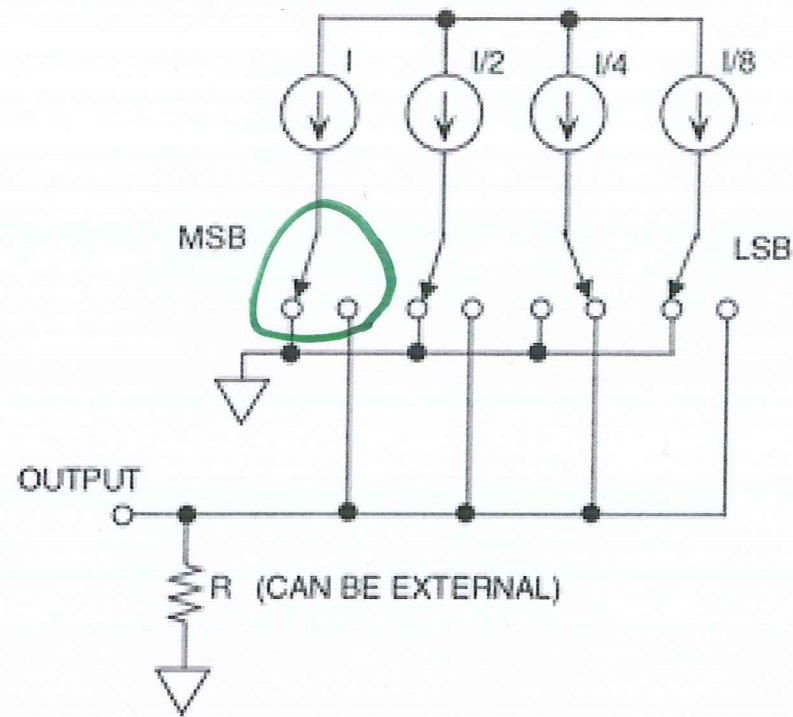
- Current mirrors to create identical current sources
- CMOS current sources are compact
- Cascode current mirrors to increase output impedance

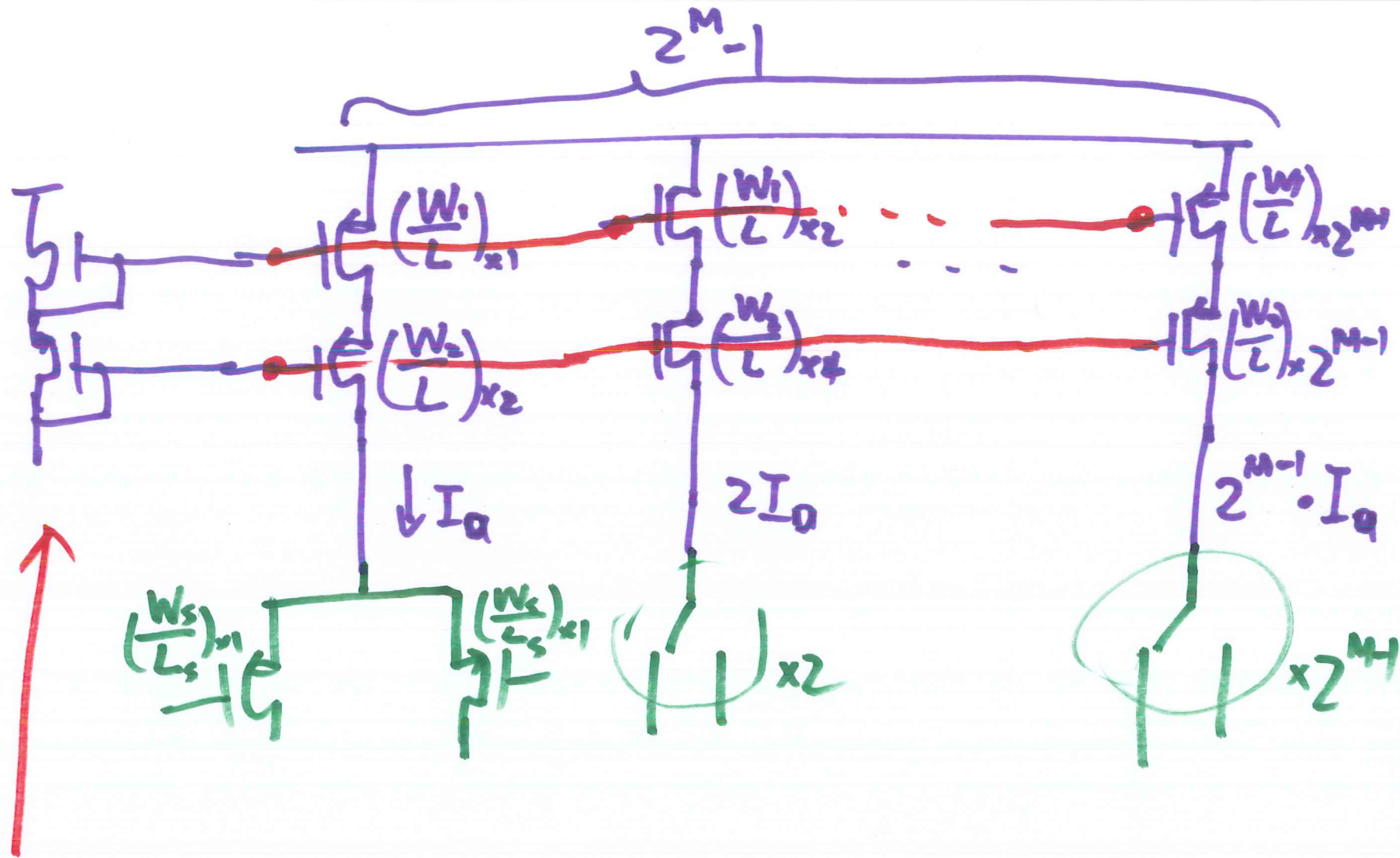
Use Complementary outputs



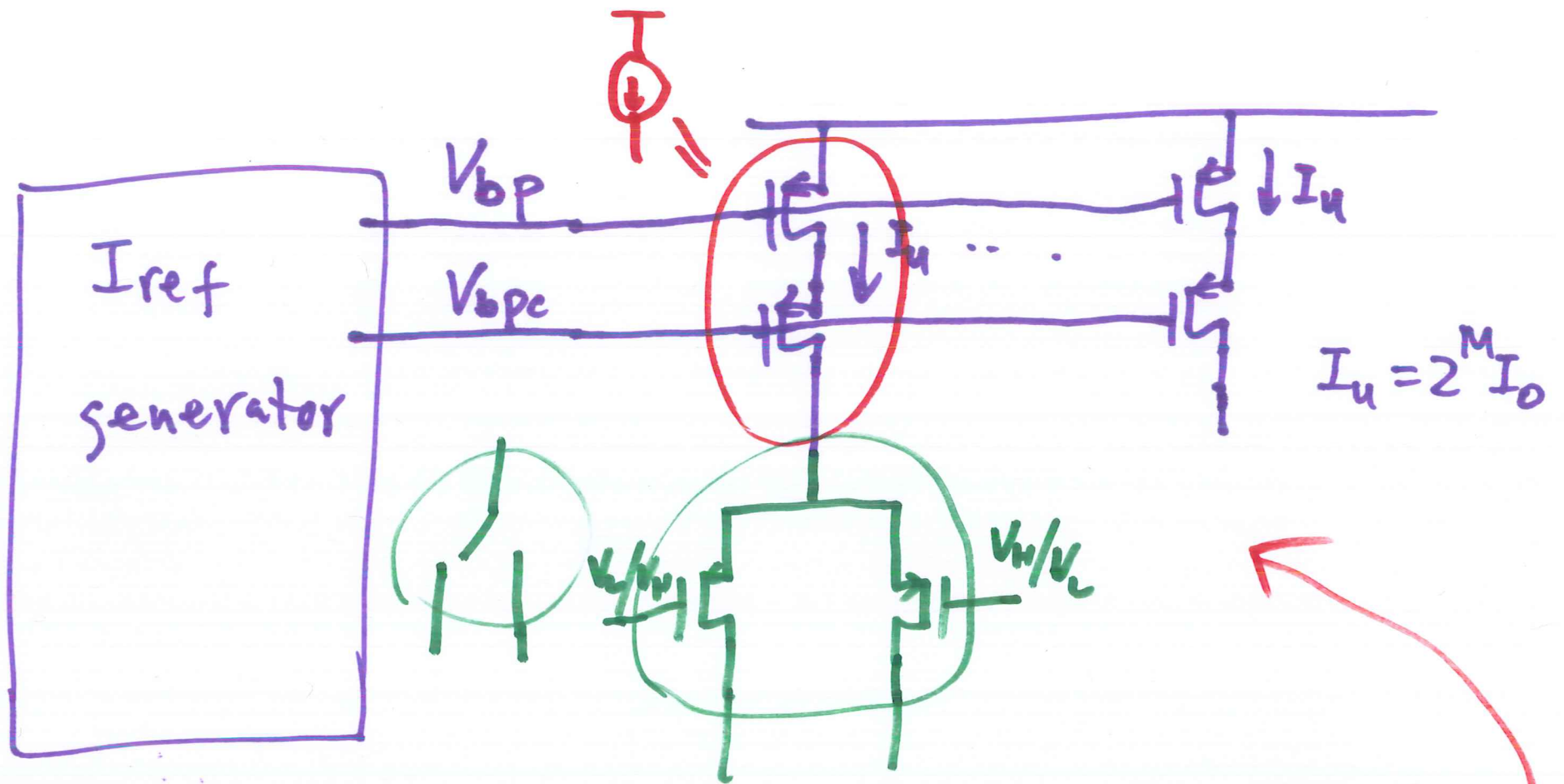
- Each current source and the two switches for a differential pair
- Differential pair input connects V_{inh} and v_{inl} that are enough to steer all tail current either to left or right side
- All tail currents in current mirror connection
- The on side diff pair transistor and tail current transistor in cascode
- Can cascode tail current source, to achieve double cascode R_{out}

Binary-Weighted Current Sources Switched into a Load

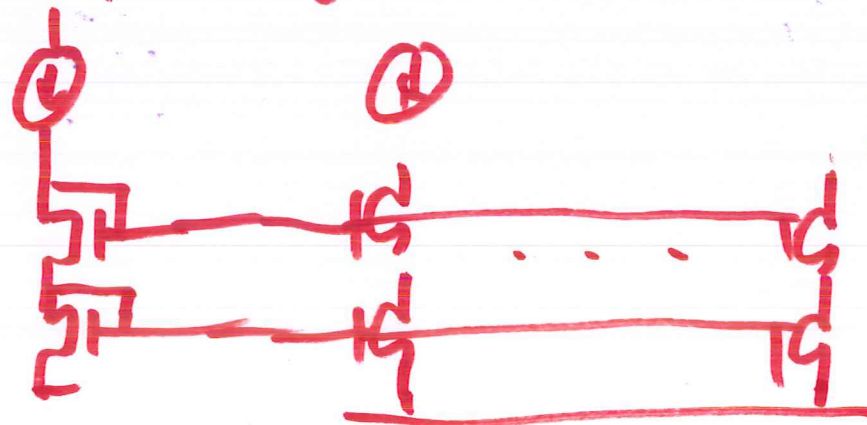




One primary can drive all 6 bit.



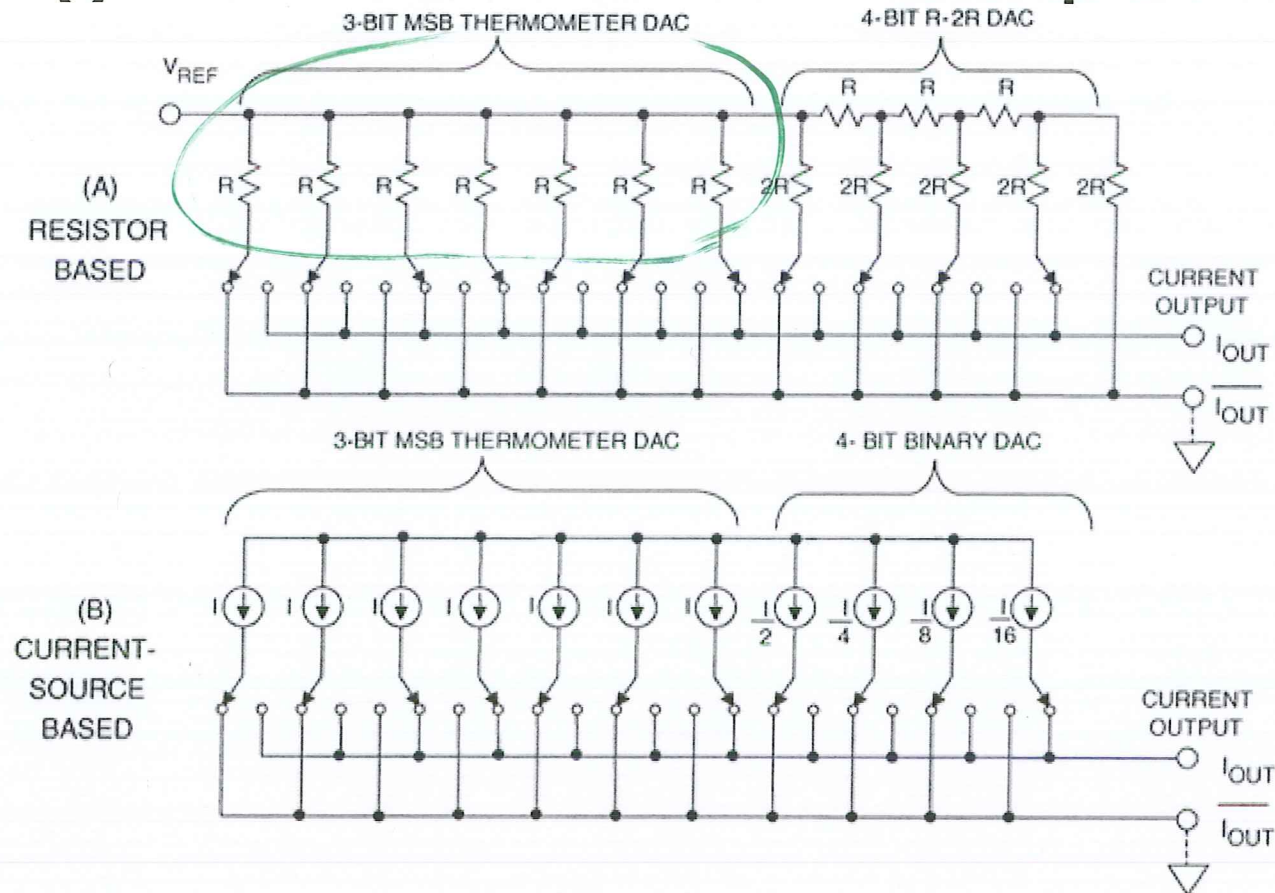
One primary



each one, they drive 8 of

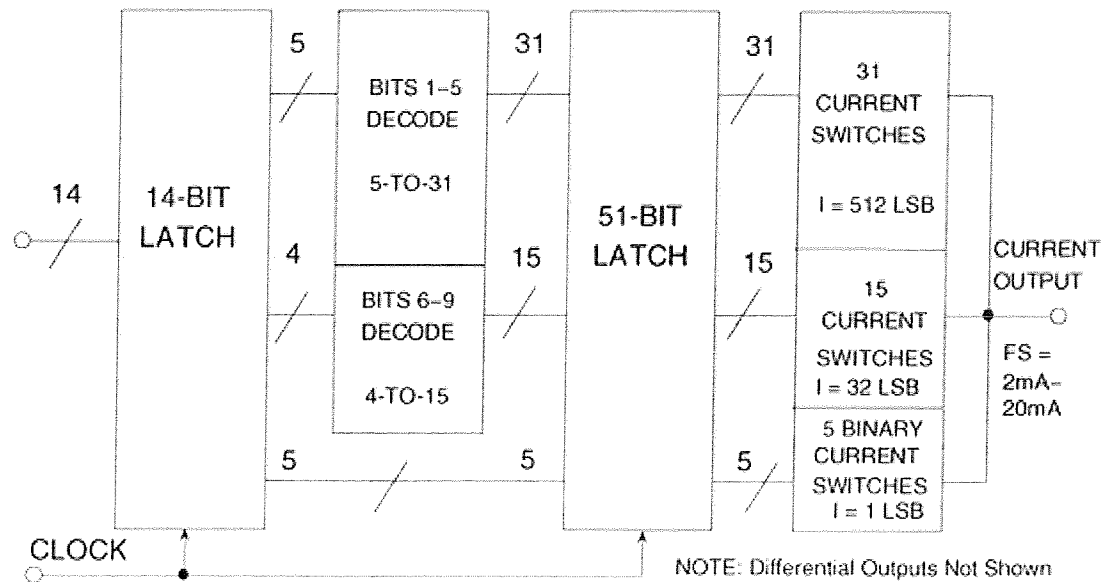
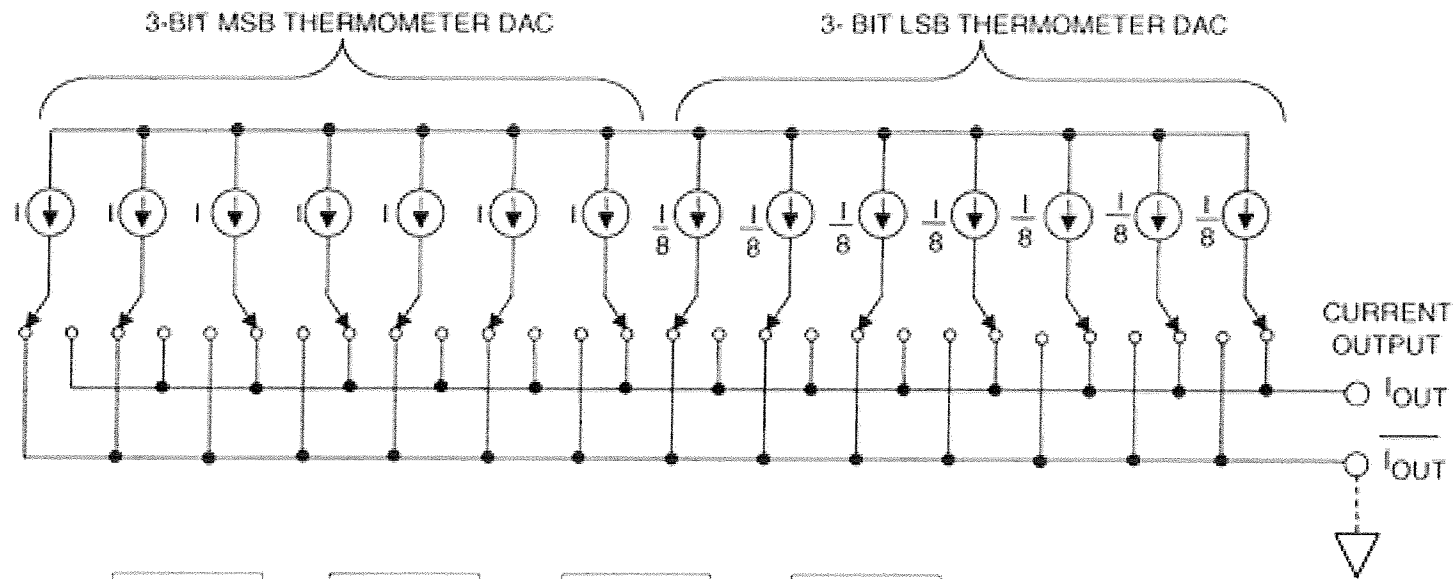
8 secondary

Segmented Current-Output DACs



- Instead of turning on and off current, use current steering;
- Current steering is much faster, suited for high speed
- Use differential pair as steering switch
- Use just enough diff voltage to steer the current completely

Thermometer + thermometer segmentation



Example use

Can combine thermometer code and binary ladder:

