Bipolar analog output voltage

The op-amp and two resistors convert the difference $(I_{out} - \overline{I}_{out})$ into a voltage V_o.

$$V_o = (I_{out} - \overline{I}_{out}) R_f$$

I_{out} drives V_o positive while $\overline{I}_{out}$ drives it negative. If 'D' increases by one bit, I_{out} increases by one bit while $\overline{I}_{out}$ decreases by one bit. ∴ The difference $(I_{out} - \overline{I}_{out})$ increases by two bits. ∴ The bipolar output voltage span is twice that of unipolar case.

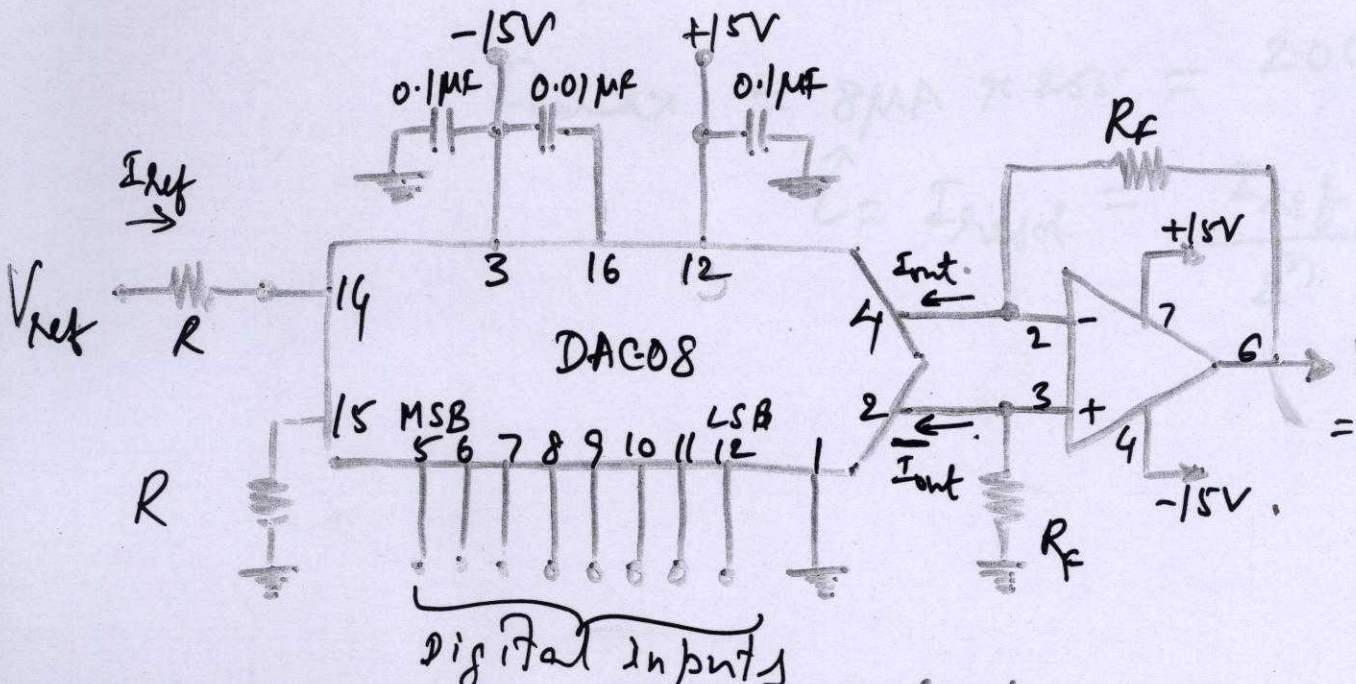

Fig. DAC-0808 connected for bipolar output voltage

$$V_o = (I_{out} - \overline{I}_{out}) R_f$$

$$= I_{Res}[D - (255 - D)] \times R_f = I_{Res} \cdot R_f (2D - 255)$$

8μA/bit
40mV/bit
with
V_{ref}
= 10.24
&
R = 5
= R_f

Bipolar conversion (DAC)

	Digital inputs								Analog outputs	
	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	I_{out} (mA)	V_o (V)
Negative full scale	0	0	0	0	0	0	0	0	0	−10.2
Negative zero	0	1	1	1	1	1	1	1	1.016	−0.04
Positive zero	1	0	0	0	0	0	0	0	1.024	0.04
Positive full scale	1	1	1	1	1	1	1	1	2.040	10.2

corresponding $\bar{I}_{out}$ (mA): 2.04
1.024
1.016
0.0

$I_{omax} = 8\mu A \times 255 = 2.04$ mA

$\zeta = I_{resol.} = \frac{I_{ref}}{2^7}$