19041010 方亮 自动化1班 数电第八章

题8.2 $V_O = -\frac{V_{REF}}{2^n}\cdot D_n = \frac{1}{2}(d_3\cdot 2^3 + d_2\cdot 2^2 + d_1\cdot 2^1 + d_0\cdot 2^0)$

得d_3, d_2, d_1, d_0分别为1时产生模拟电压值分别为4V, 2V, 1V, 0.5V

题8.4 $V_O = -\frac{V_{REF}}{2^n}\cdot D_n$

全0时 $V_O=0$, 全1时 $V_O = -\frac{2^{10}-1}{2^{10}}(-10V) = 9.99V$, 输出电压变化范围为 0~9.99V

若要使输出电压变化范围缩小一半, 可采取: ① V_{REF}减小为一半, 即改为-5V

② 反馈电阻使用外置电阻, 阻值为$\frac{R}{2}$

题8.5 $d_9d_8d_7d_6 = Q_3Q_2Q_1Q_0$ 依次为 0000, 0001, 0010, 0011, 0100, 0101, 0110, 0111, 1000, 1001, 1010, 1011, 1100, 1101, 1110, 1111

$d_5d_4d_3d_2d_1d_0 = 000000$

$V_O = -\frac{V_{REF}}{2^{10}}D_n$ 依次为 0; 0.625V; 1.25V; 1.875V; 2.5V; 3.125V; 3.75V; 4.375V; 5V; 5.625V; 6.25V; 6.875V; 7.5V; 8.125V; 8.75V; 9.375V;

题8.11 $V_O = -\frac{D_n}{2^n}\cdot V_I$ 故 $A_v = \frac{V_O}{V_I} = -\frac{D_n}{2^n} = -\frac{1}{2^{10}}(2^9\cdot d_9 + 2^8\cdot d_8 + \cdots + 2^0\cdot d_0)$

A_v取值范围为 $-0.999\sim 0$ $(-\frac{2^{10}-1}{2^{10}}\sim 0)$

题8.15 最大量化误差为 $\frac{1}{2^9-1}V_{REF}$ 即 $\frac{V_{REF}}{511}$

$\Delta V_{REF}\cdot\frac{509}{511} < \frac{V_{REF}}{511}$ 即 $\frac{\Delta V_{REF}}{V_{REF}} < \frac{1}{509}$ 即 $\left|\frac{\Delta V_{REF}}{V_{REF}}\right| < 0.2\%$

题8.16 $t = (n+2)CLK = (n+2)\cdot\frac{1}{f} = \frac{12}{1\times 10^6}S = 12\mu S$