**Programmable Frequency Divider**

The frequency divider is an important part of the frequency-synthesizer. With a programmable divider, the synthesizer’s output frequency can be programmed using control digits. The programmable frequency divider can have a wide range of divide ratio. The divide ratio can be set between $2^{\text{min}}$ to $(2^{\text{max}}-1)$, where the designer can specify the min and max value. The control digits (P0, P1, … , Pn) for selecting the divide ratio are given off-chip using serial in parallel out circuits. The block diagram of the programmable divider is given in Figure 2(a). Each basic block is a divide by 2 or 3 divider. The whole circuits are composed of several blocks. The programmable divider has been simulated across various process corners, and temperature between –30°C and 70°C. Simulation results demonstrate the circuit can operate up to 5 GHz. Figure 2(b) shows the input and output signals of different blocks.

The ring VCO can generate 0~2GHz frequency with 1.8V Power supply. The divide-by-256 frequency divider can follow the ring VCO output in the entire frequency range. The programmable frequency divider works well as designed. Its dividing ration can change from 64~95. And it can also follow the entire frequency range of the ring VCO. Some testing figures are pasted below.
Figure---channel 1, programmable divider with dividing ratio of 64

Figure---channel 1, programmable divider with dividing ratio of 80
Figure---channel 1, programmable divider with dividing ratio of 95