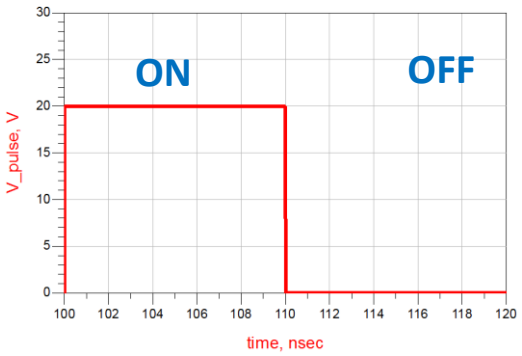
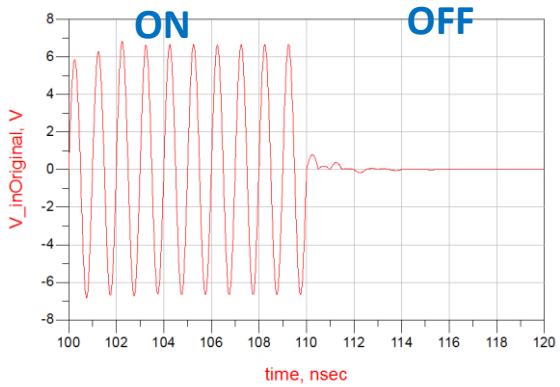
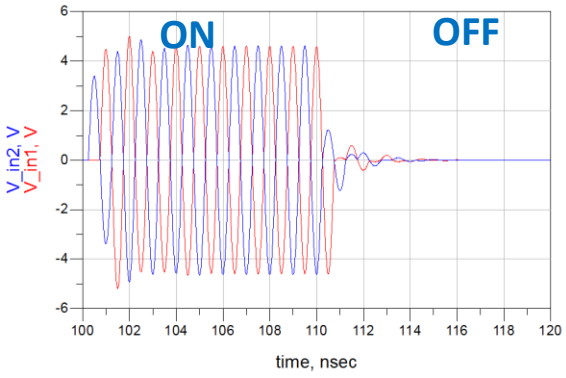
Pulse signal (Duty cycle: 50%)



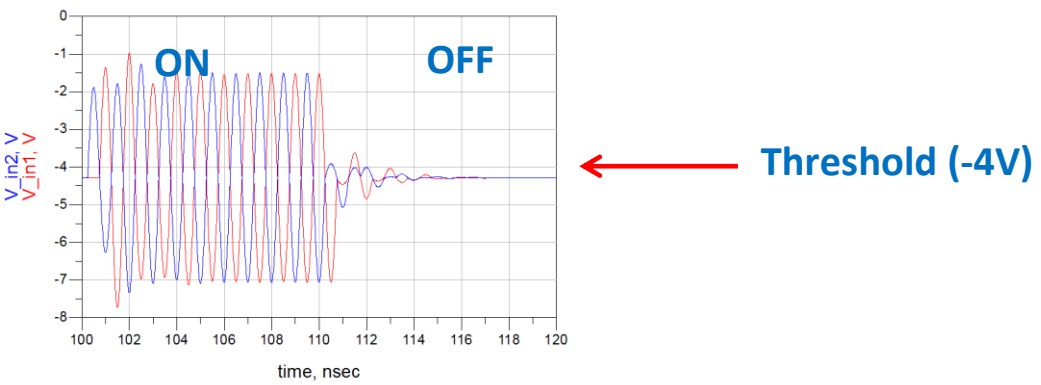
Modulated with sine carrier frequency (1GHz)

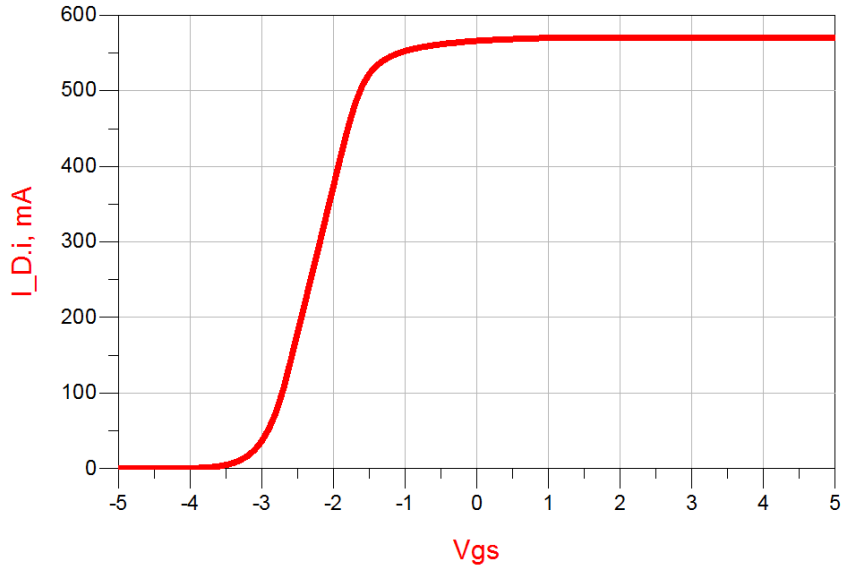


After passing through hybrid coupler, the signal splits into 2 complementary signals (180 degree phase difference). The Current Mode Class-D (CMCD) configuration requires two complementary signals to be applied at its transistors.



Before applied these signals at transistor gate, transistors are biased. I'm using HEMT as the switch transistor. It can only conduct drain current if the gate-source voltage >-4V as shown in the characteristic curve. That's the reason I bias the voltage for OFF-state below -4V, so no current will be conducted during this period.





So far, do you think I get this principle right in driving the transistor with modulated RF signal? What I don't really understand and still finding the answer is:

During the ON-state, the voltage is sine so it varies from max peak of -2.5V to min peak of -7V. How can the transistor keep turning ON, since the input voltage signal at gate can also drop below threshold (-4V)?

Or if I bias the input voltage to operate in saturation region, which is above 0 V, then the OFF-state will also operate in saturation region and eventually turns the transistor on, as shown in the figure below. What do you think? Am I missing something? Thanks a lot.