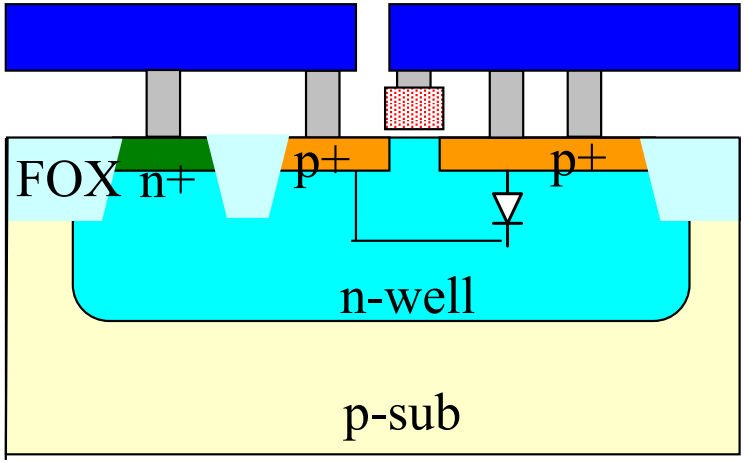
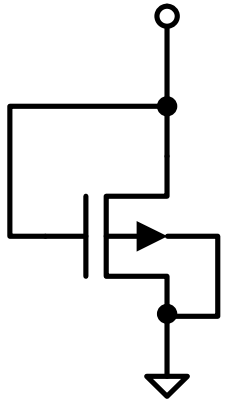
Lab. 09

CHARACTERIZATION OF VOLTAGE REFERENCES

1. Forward voltage drop and saturation current of pn diode

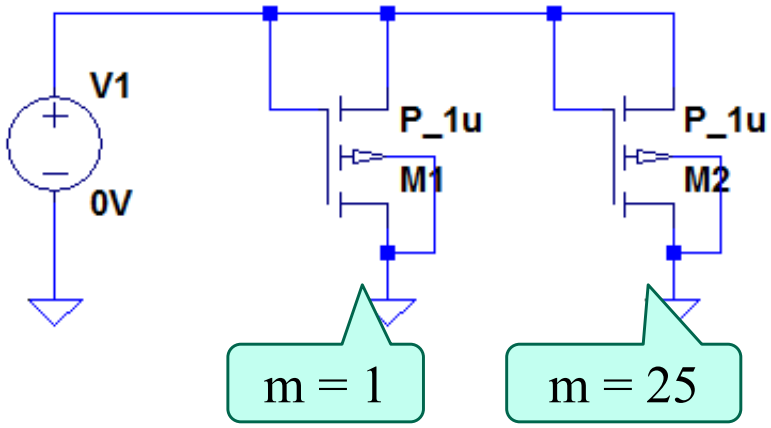
- Carry out the simulation to evaluate the forward voltage drop of the pn junction in p-ch MOSFET, which the areas of the pn junctions (source areas) are 10um-square and 50um-square, respectively.
- Evaluate the forward voltage at 2uA and the saturation current Is.

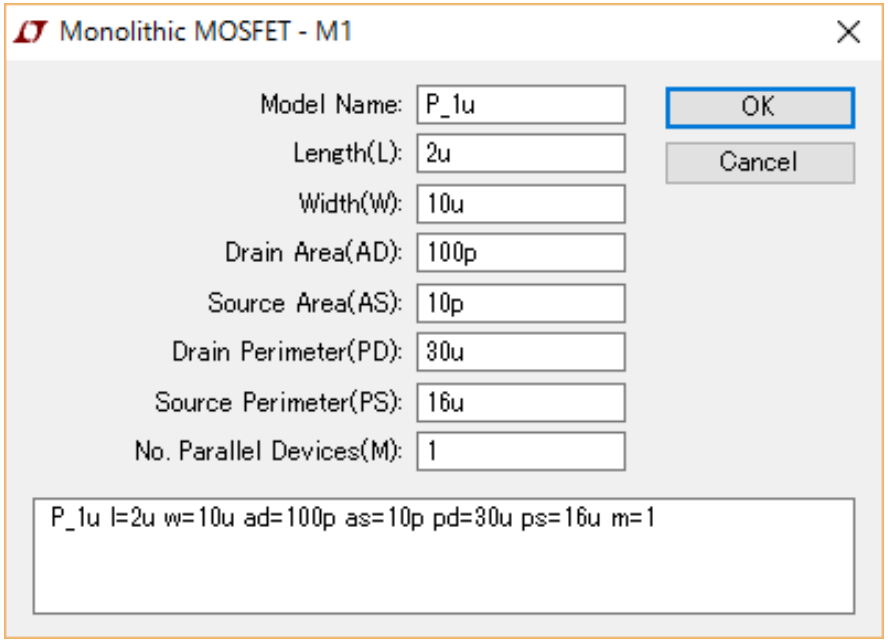




Schematic

```
.lib cmos.lib
.dc V1 0V 0.6V 1mV
// Measurement of Is
.meas dc Is1 find e**(ln(Is(M1))-d(ln(Is(M1)))/d(V1)*V1) when V1=0.2V
.meas dc Is2 find e**(ln(Is(M2))-d(ln(Is(M2)))/d(V1)*V1) when V1=0.2V
```

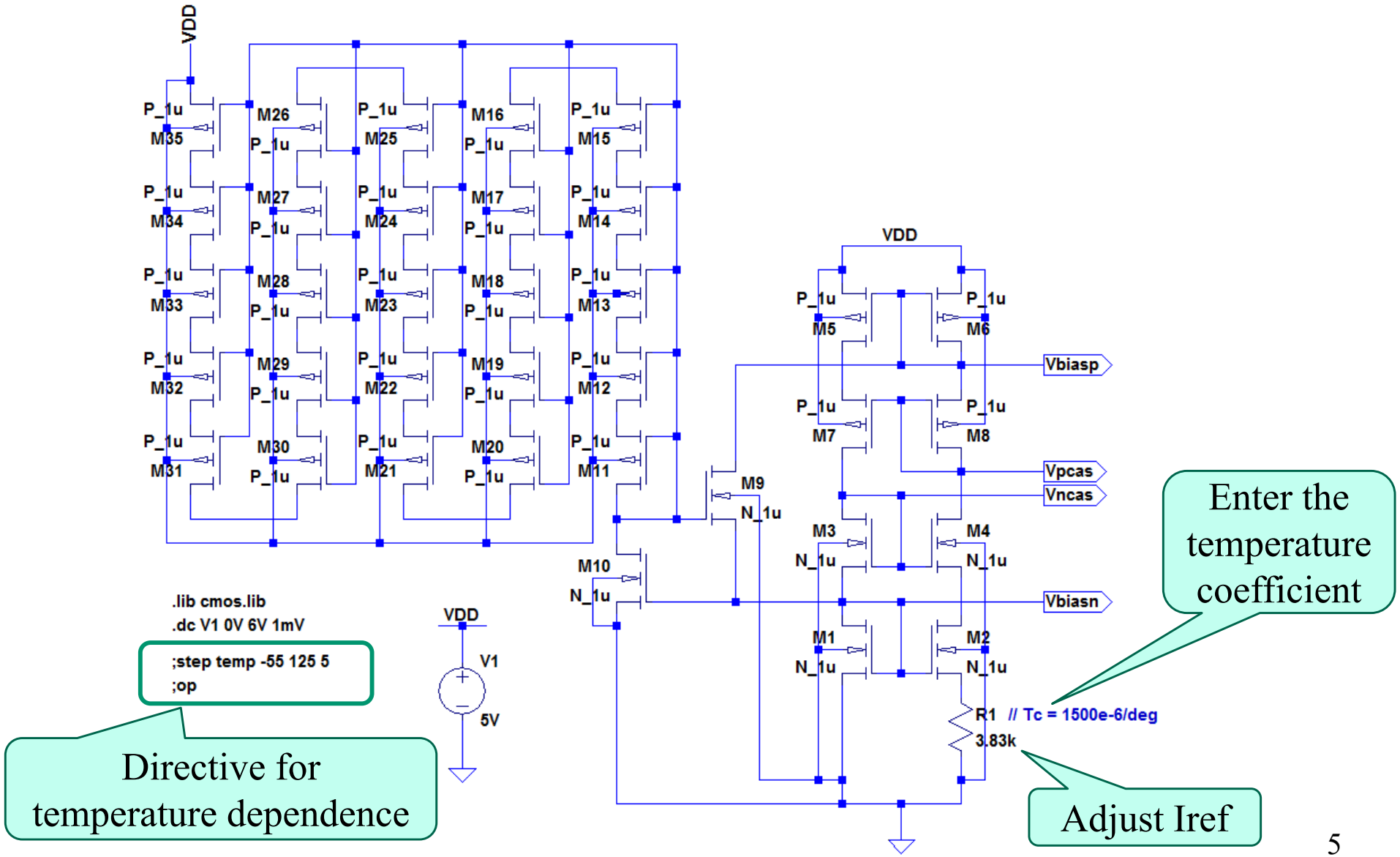




2. Stability of voltage references

- Carry out the simulation to evaluate the power supply voltage dependence from 0 to 6V and the temperature dependence from -55 to 125 degrees Celsius for the cascade BMR and cascade BGR, assuming the output current is 0A (Open the output node).

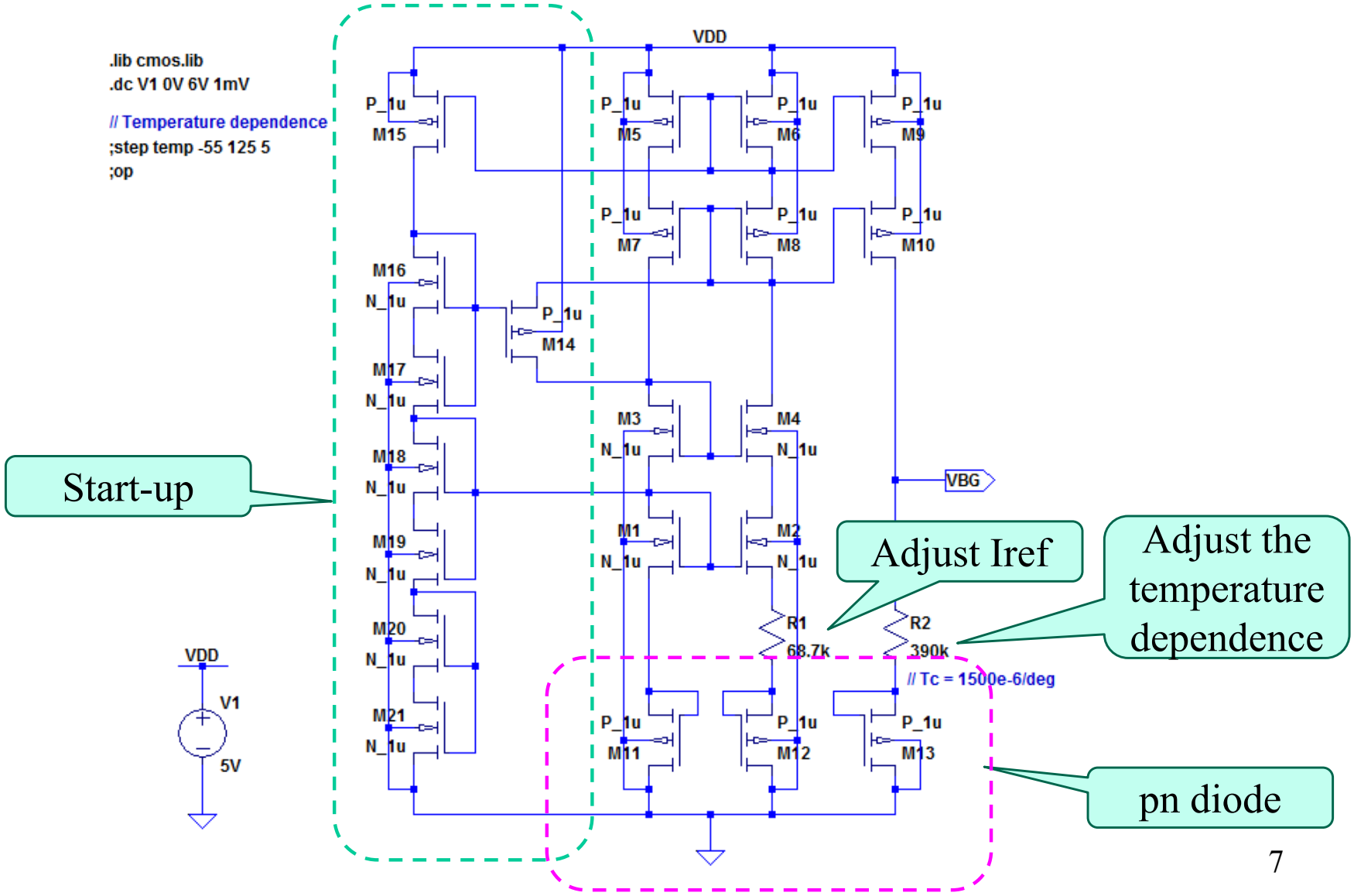
Schematic of cascade BMR



Parameters of cascade BMR

MOSFET	L(m)	W(m)	M	AD, AS(m^2)	PD, PS(m)	W/L
M1, M3, M4, M10	2u	20u	1	60p	26u	10
M2	2u	20u	4	60p	26u	40
M5-M8	2u	20u	3	60p	26p	30
M9	1u	10u	1	30p	16u	10
M11-M35	2u	5u	1	15p	11u	1/10

Schematic of cascade BGR



Parameters of cascade BGR

MOSFET	L(m)	W(m)	M	AD, AS(m^2)	PD, PS(m)	W/L
M1-M4, M16-M21	5u	5u	1	15p	11u	1
M5-M10, M15	5u	5u	3	15p	11u	3
M11,M13	2u	10u	25	100p, 30p	30p, 16p	50um^2
M12	2u	10u	200	100p, 30p	30p, 16p	8*50um^2
M14	1u	5u	1	15p	11u	5