

電子電路設計模擬與實習

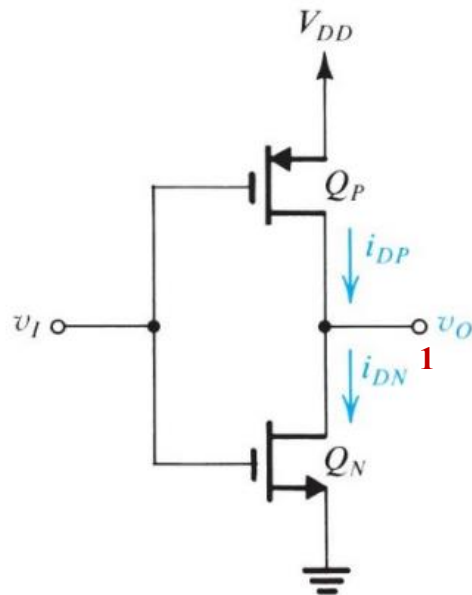
實驗名稱：CMOS 反向器電壓轉移特性 VTC

班級：電子二乙

組員：U0922113 郭晏寧

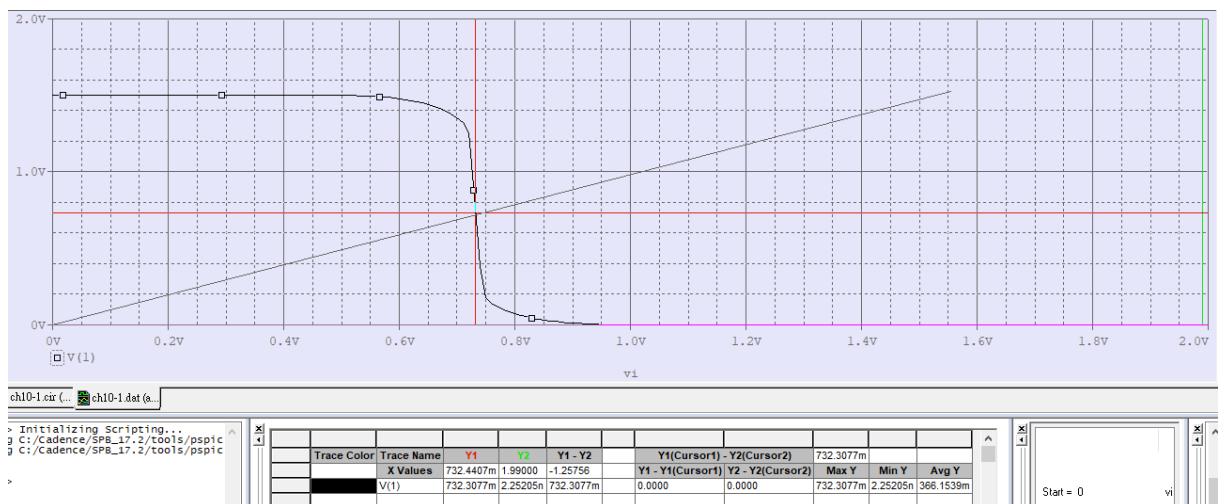
U0922107 張志斌

Lab 10-1. CMOS 反向器 VTC 曲線模擬及靜態參數萃取

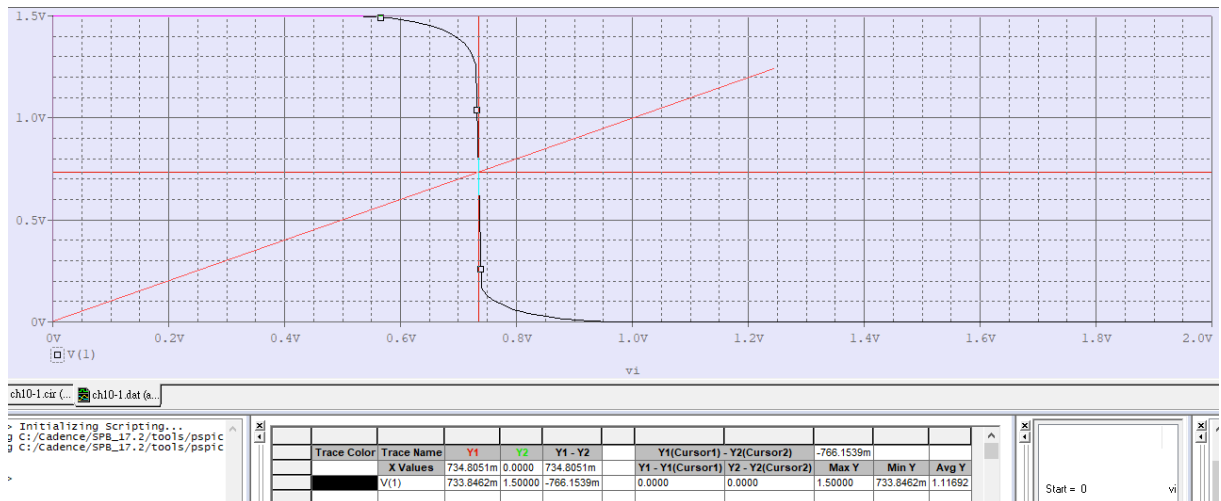


1. 模擬不同 λ (0.2、0.02、0.002) 下之 VTC 曲線。

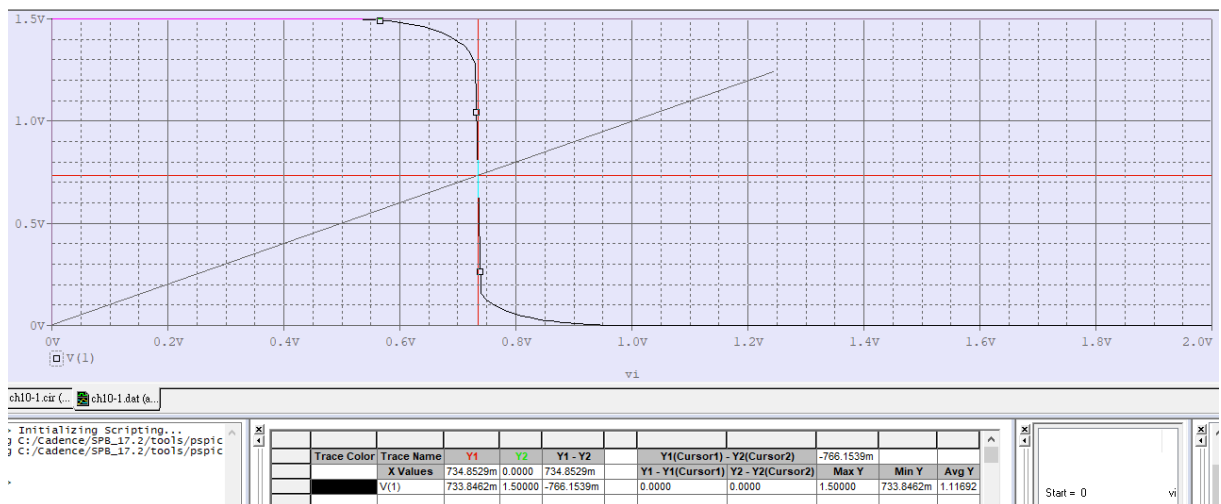
	λ		
	0.2	0.02	0.002
V_M	732.4407m	734.8051m	734.8529m
g	-46.1856	-11.1404	-8.00048



$$\lambda = 0.2$$



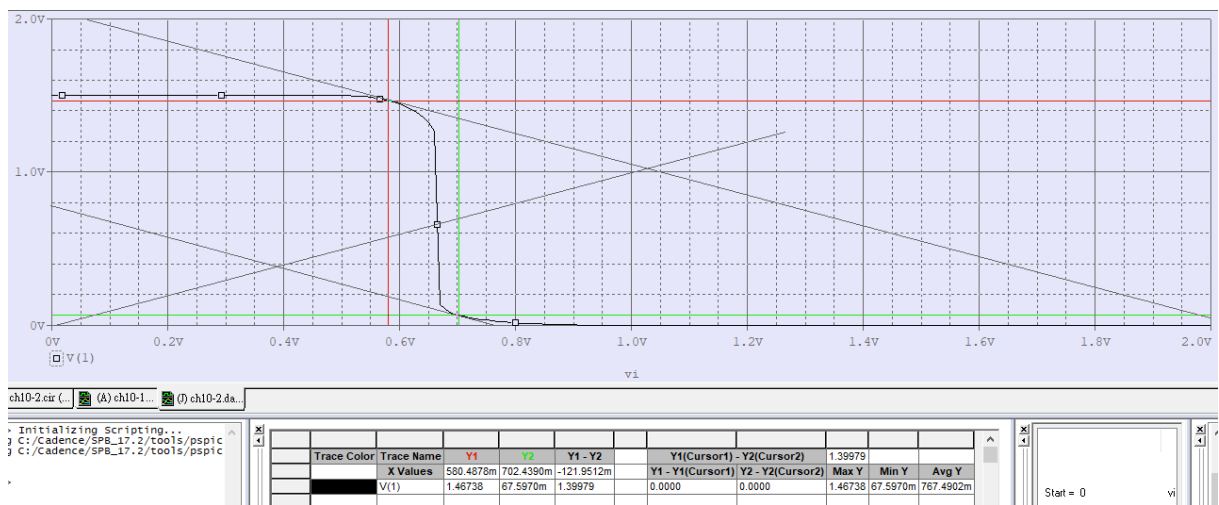
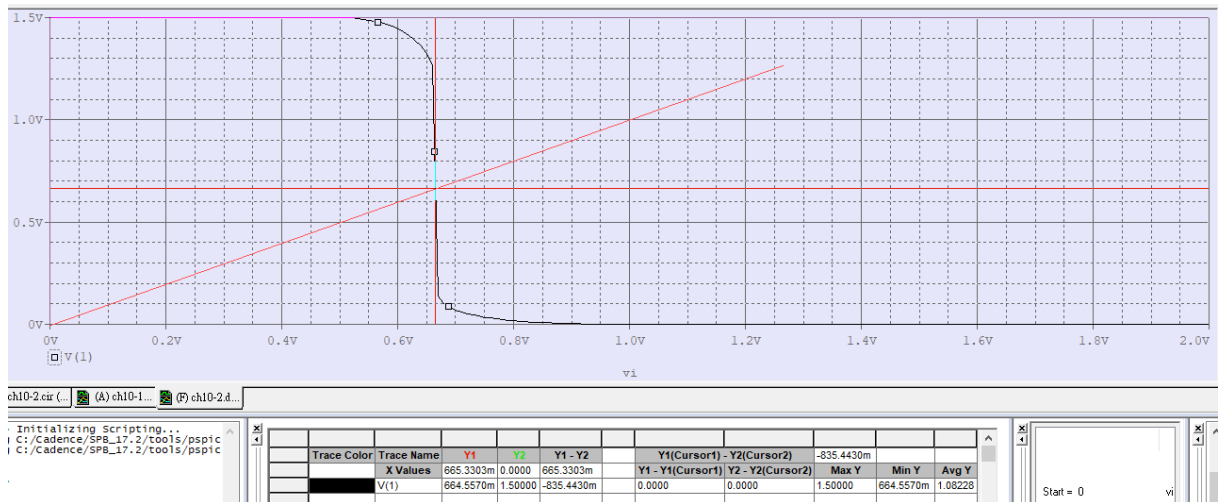
$$\lambda = 0.02$$



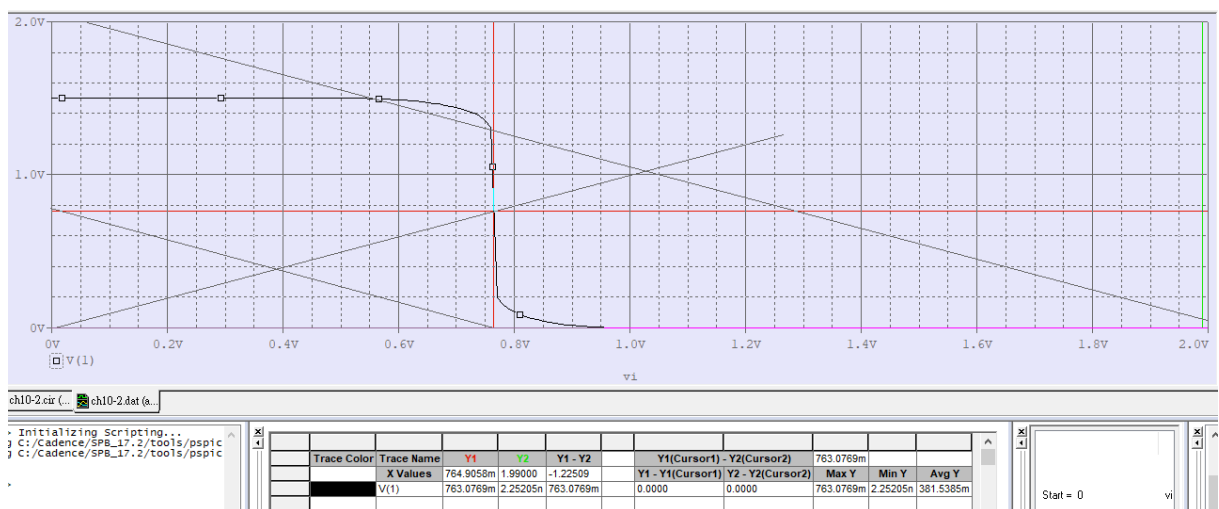
$$\lambda = 0.002$$

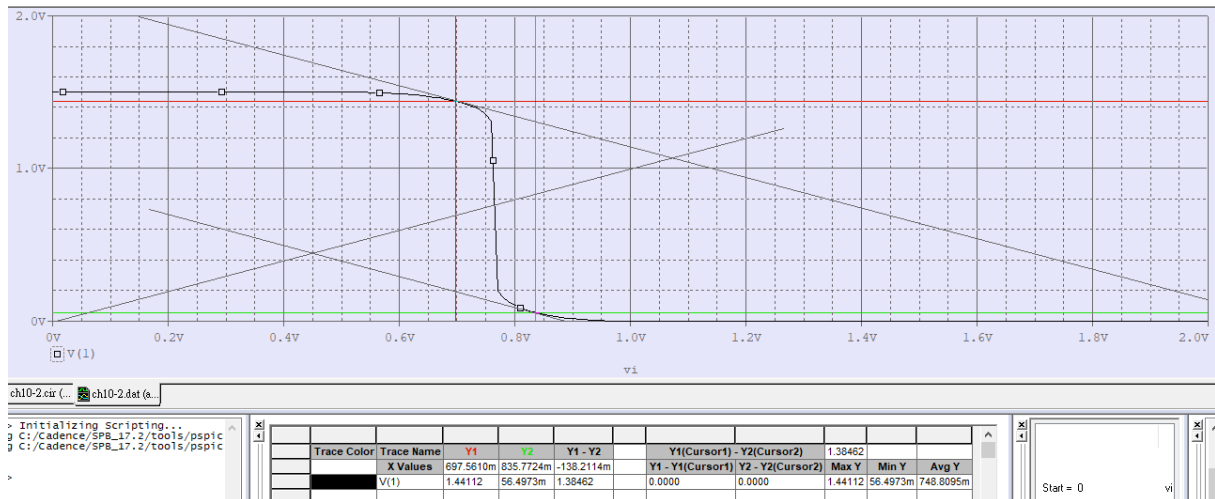
2. 模擬 PMOS、NMOS W/L 的尺寸比變動對反向器 VTC 曲線的影響。

靜態變數	PMOS-to-NMOS ration		
	1	5	11
V_M	665.3303m	764.9058m	814.6295m
g	-33.3033	-406.699	-14.613
V_{IL}	580.4878m	697.561m	773.9837m
V_{IH}	702.439m	835.7724m	881.3008m
V_{OL}	0	0	0
V_{OH}	1.5	1.5	1.5
NM_L	797.561m	664.2276m	618.6992m
NM_H	580.4878m	697.561m	773.9837m

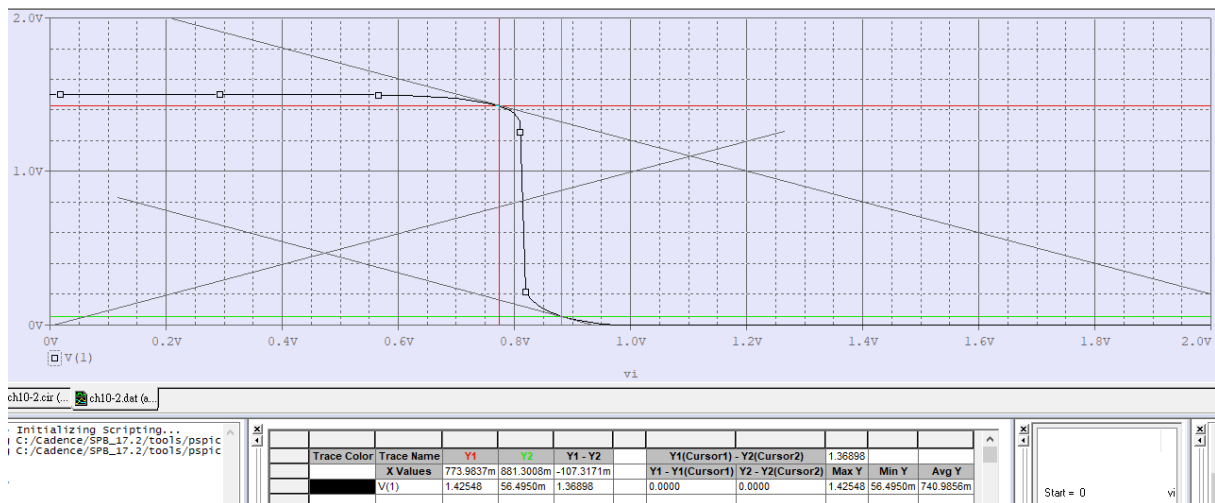
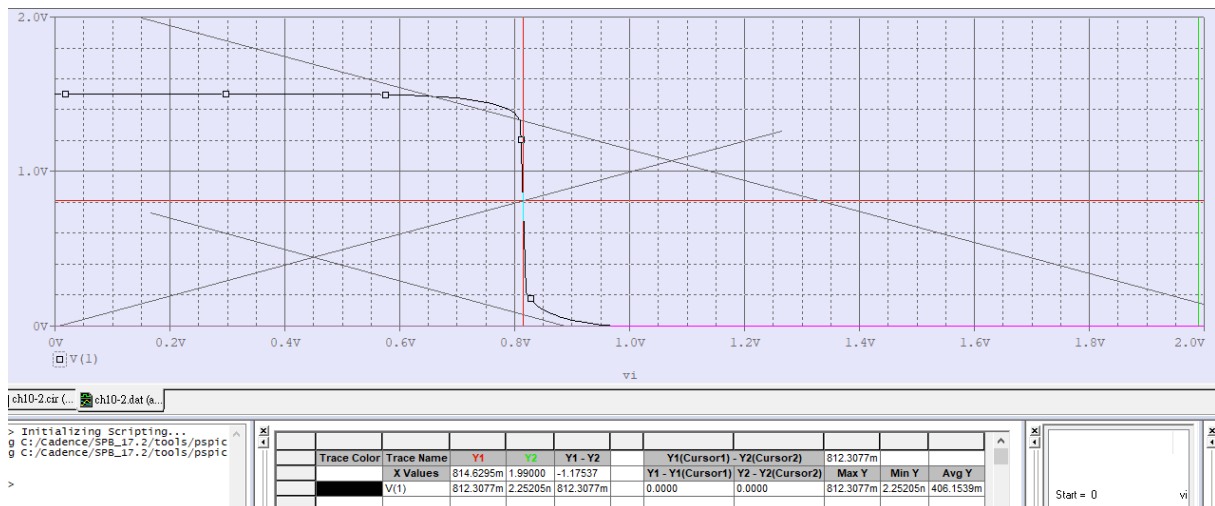


PMOS-to-NMOS ratio = 1





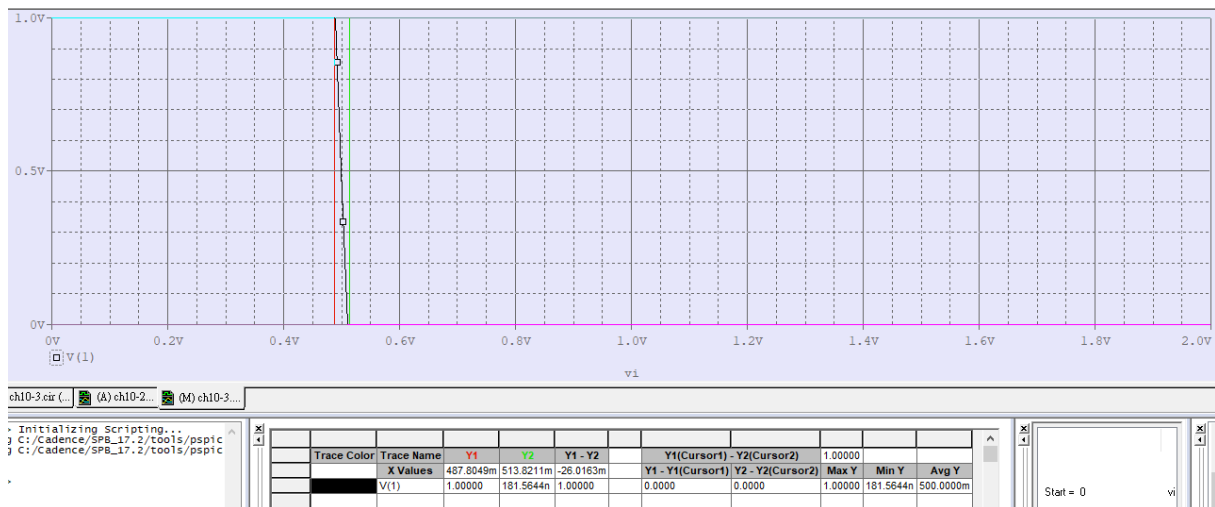
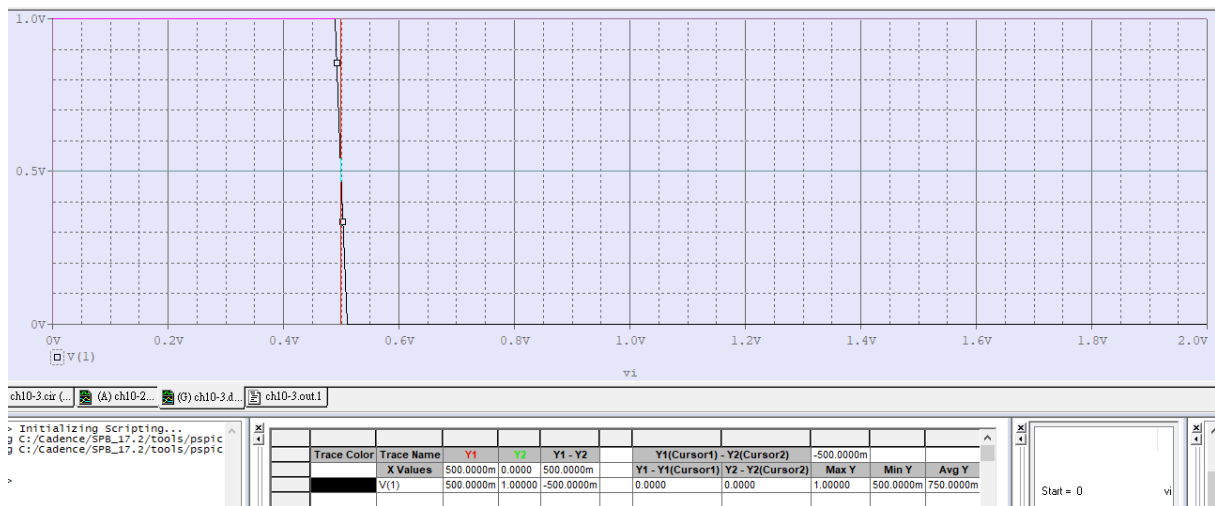
PMOS-to-NMOS ratio = 5



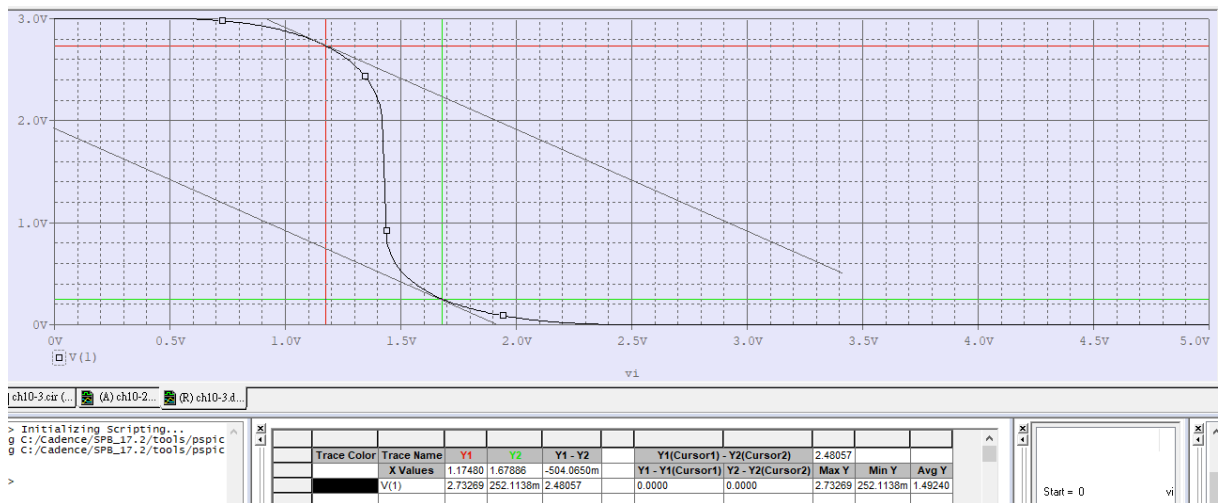
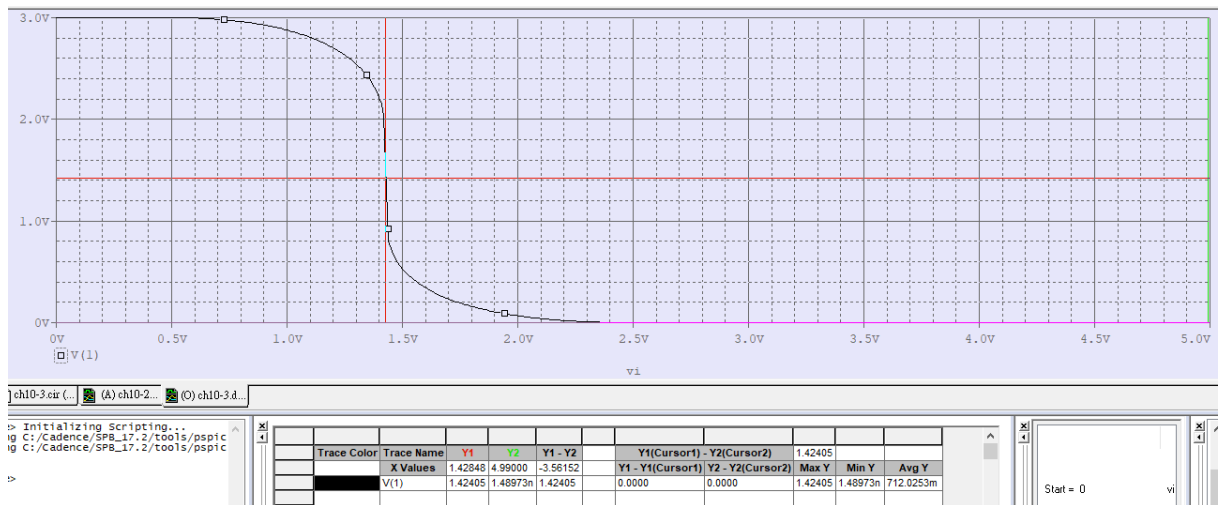
PMOS-to-NMOS ratio = 11

3. 模擬電源電壓 V_{DD} 變動對反向器 VTC 曲線的影響。

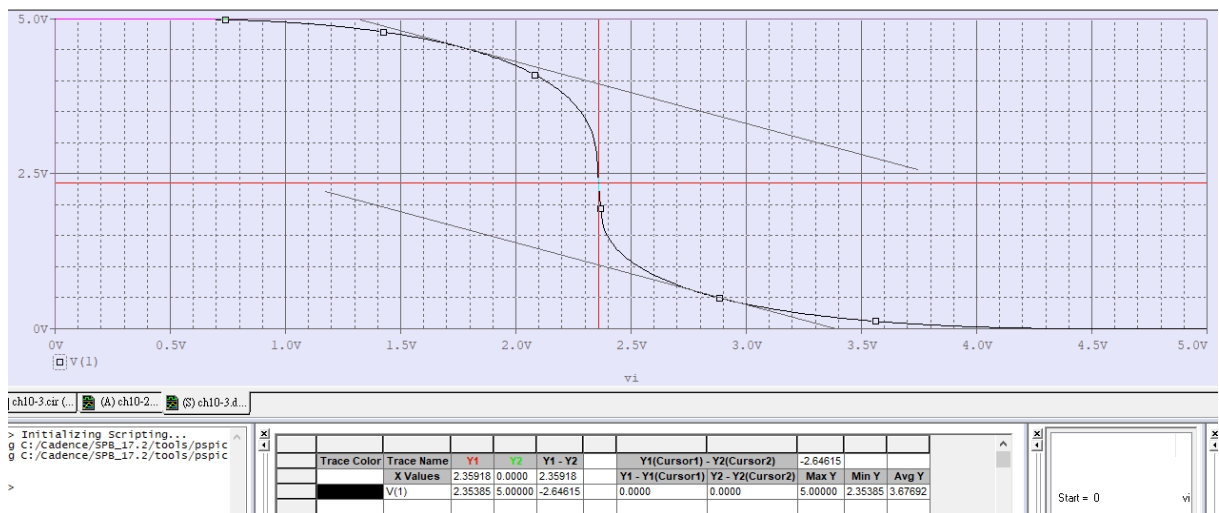
靜態變數	V_{DD}		
	1	3	5
V_M	0.5	1.42848	2.35918
g	0	-103.479	-52.6367
V_{IL}	487.8049m	1.17480	1.83058
V_{IH}	513.8211m	1.67886	2.85950
V_{OL}	0	0	0
V_{OH}	1	3	5
NM_L	486.1789m	1.32114	2.14050
NM_H	487.8049m	1.17480	1.83058

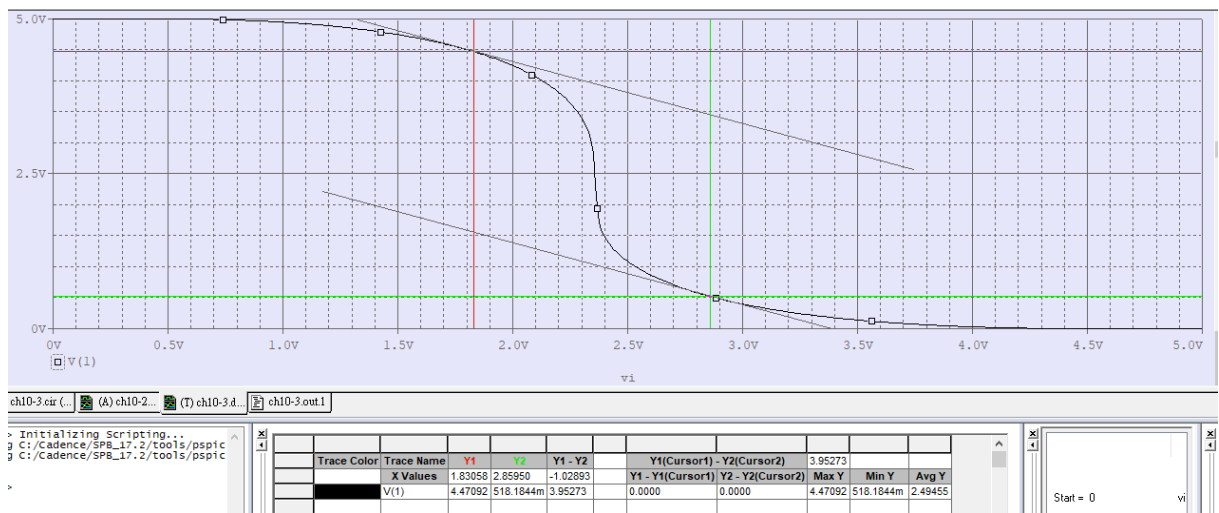


$$V_{DD} = 1$$



$$V_{DD} = 3$$





$$V_{DD} = 5$$