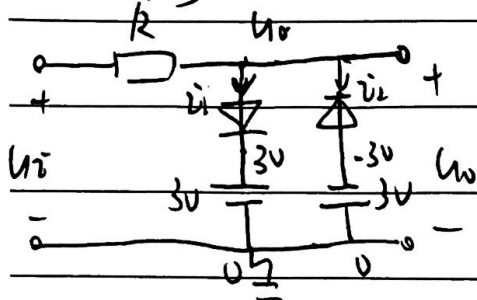


P53. 1.3



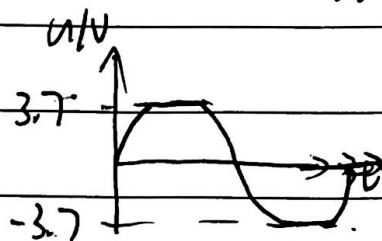
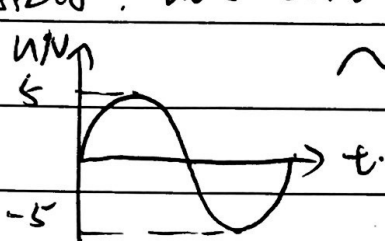
$$u_i = 5 \sin \omega t \quad U_D = 0.7$$

$$\frac{u_i - u_o}{R} = i_1 + i_2 \Rightarrow u_o = u_i - R(i_1 + i_2)$$

$i_1$  存在时,  $u_o \geq 3.7V$   $\therefore$   ~~$u_o \geq 3.7V$~~   $3.7V \leq u_o \leq 3.7V$  时

$i_2$  存在时,  $u_o \leq -3.7V$

$$u_o = u_i$$

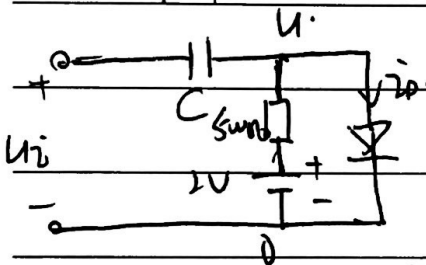


$$u_o = \int_{-\pi/2}^{\pi/2} 2 \sin t dt$$

$$\int_{-\pi/2}^{\pi/2} 2 \sin t dt = 4 \sin t \Big|_{-\pi/2}^{\pi/2}$$

$$4 \left( \frac{\pi}{2} - \left( -\frac{\pi}{2} \right) \right) = 4\pi$$

P54. 1.4



$$U_D = 0.7V \quad U_T = 26mV$$

$$u_i = 10 \cos \omega t$$

$$\frac{1}{2} u_i = 5 \cos \omega t$$

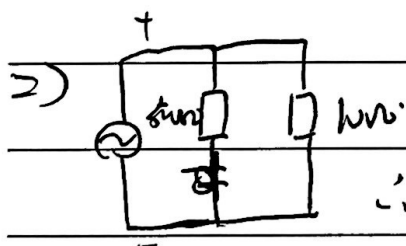
$$\frac{u_i - 2}{R} = -i_D \quad \text{在 } t=0 \text{ 到 } t=\pi \text{ 时 } u_i > 0, i_D > 0$$

$$\therefore u = 0.7 \Rightarrow i_D = 0$$

$$\frac{u-2}{R} = -i_D \quad u=0.7 \Rightarrow i_D = \frac{1.3}{50} A = 2.6mA$$

$$\therefore r_d = \frac{U_T}{i_D} = 100\Omega$$

$i_D'$  在  $0 \sim \frac{\pi}{2}$  上存在.

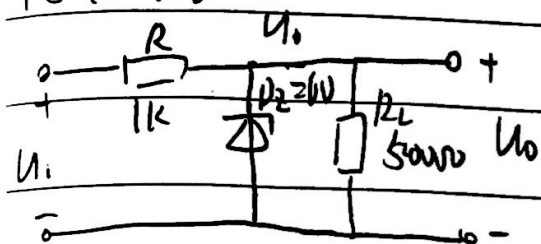


$$i_D' = \frac{10 \cos \omega t}{10} mA = \cos \omega t mA$$

$$\therefore i_{D_{avg}} = \int_0^{\pi/2} \cos \omega t dt = \frac{\sqrt{2}}{2} mA \quad \therefore \frac{\sqrt{2}}{2} mA$$

$$\therefore i_{D_{avg}} = 0.707 \frac{\sqrt{2}}{2} mA$$

P54. 1.6



$$U_Z = 6V, I_Z = 5mA, I_{ZM} = 15mA$$

$$4 = 5 + \frac{10}{R_L}$$

(1) ①  $U_1 = 6V$ ,  $\frac{U_1 - U_0}{R} = I_Z + \frac{U_0}{R_L}$

当  $I_Z \geq 5$  时  $U_0 = 6V$   $\therefore I_Z = -8mA$  矛盾  $\therefore I_Z = 0$ ,  $U_0 = \frac{10}{3}V$

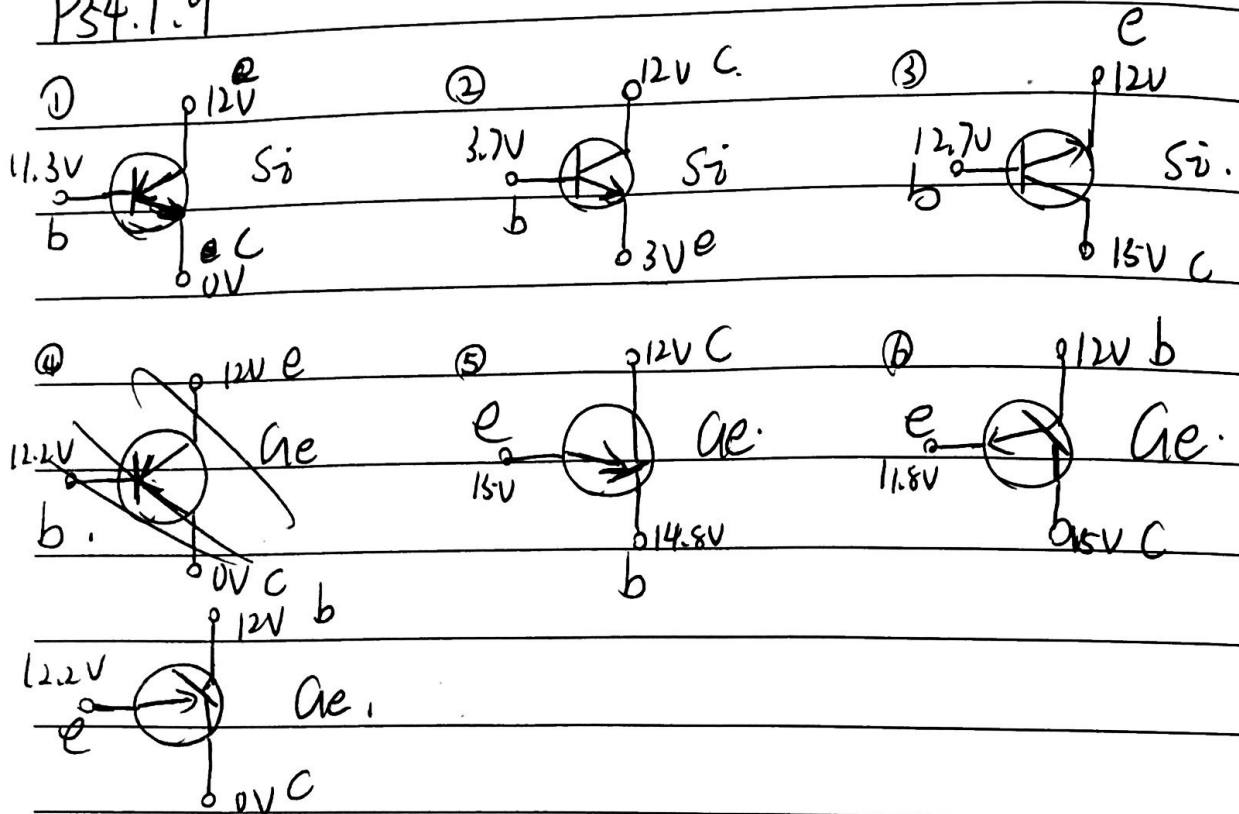
②  $U_1 = 15V$ , 当  $U_0 = 6V$  时,  $I_Z = -3mA$  矛盾  $\therefore I_Z = 0$ ,  $U_0 = 5V$

③  $U_1 = 35V$ , 当  $U_0 = 6V$  时,  $I_Z = 17mA \in [5, 25]$   $\therefore U_0 = 6V$

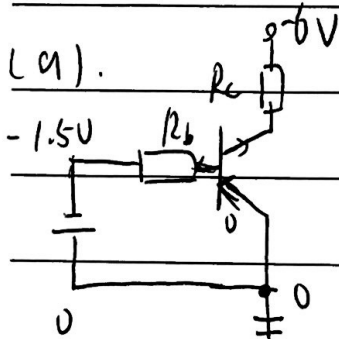
(2)  $\frac{U_1 - U_0}{R} = I_Z$ . 此时上-时刻  $U_0 = 6V$ ,  $I_Z$  跳变为  $29mA$ . 击穿.

$\therefore$  稳压管会击穿.

# P54.1.9



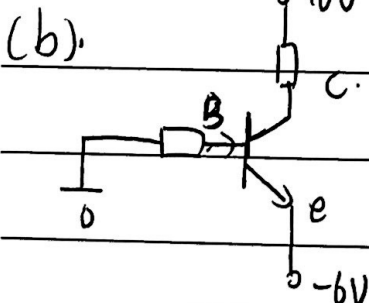
# P55.1.12



PNP型,  $|U_{BE}| > U_{on}$ ,  $U_{CE} < U_{BE}$  不符

∴ 有可能  $U_C + 6 = i_C R_c \Rightarrow U_C = i_C R_c - 6$

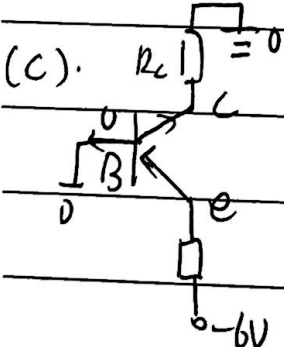
$U_B + 1.5 = i_B R_b \Rightarrow U_B = i_B R_b + 1.5$



NPN型  ~~$U_{CE} = 12V$~~   $U$

$U_{CE} > U_{BE}$ ,  $U_{BE} > U_{on}$  不符, 不行

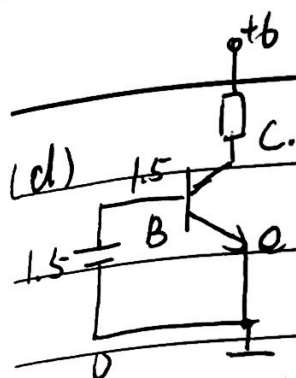
$U_B = 0 - i_B R_b < 0$



PNP型,  $U_C < U_B$ ,  $U_{CE} < U_{BE}$

∴ ~~不行~~  $U_C = 0 + i_C R_c > 0$ ,  $U_B = 0$

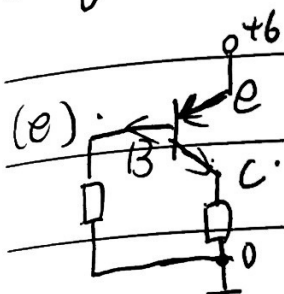
∴ 不行



$U_B = 1.5V$   $U_e = 0V$  NPN型

$U_{BE} = 1.5V > U_{on}$   ~~$U_{CE} > U_{BE}$~~  ~~PP~~

~~PN结~~ ~~极~~ ~~损坏~~



PNP型  $U_e = 6V$

$i_{B}R_b = U_B > 0$   $i_{C}R_c = U_C > 0$

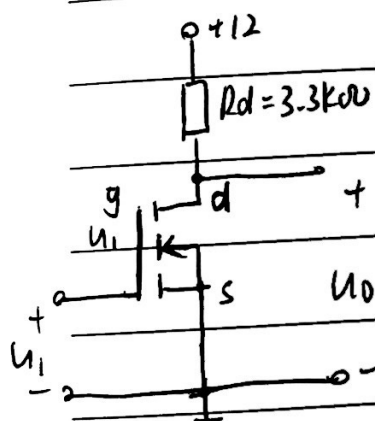
$\therefore$  可能

附:

原料, 设备制造, 芯片设计, 晶圆制造, 封装测试

中国: 晶圆代工, 封装测试, 原材料供应, 销售市场

P55, 1.14



$U_1 = 4, 8, 12V$  时. 工作区域.

$U_{gs} = U_1$

①  $U_1 = 4V$  时. 截止.

②  $U_1 = 8V$  时. 若在 ~~截止~~ 恒流区,  $i \approx 0.6mA$

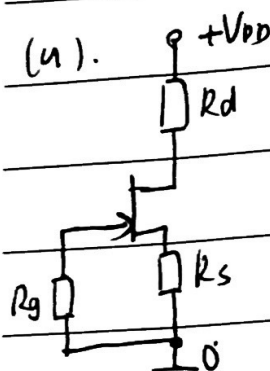
$U_d = 12 - 3.3 \times 0.6 > U_1$   $\therefore$  是在恒流区.

③  $U_1 = 12V$  时. 若恒流区,  $i \approx 4mA$ .

$U_d = 12 - 3.3 \times 4 < 0$   $\therefore$  在可变电阻区.

P55. 1.15

(a).

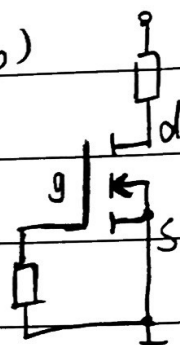


N沟道结型. ~~增强型~~

恒流区条件:  $U_{DS} > U_{GS} - U_{GS(th)}$ ,  $U_{GS} < 0$ .

∴ 有可能.

(b)

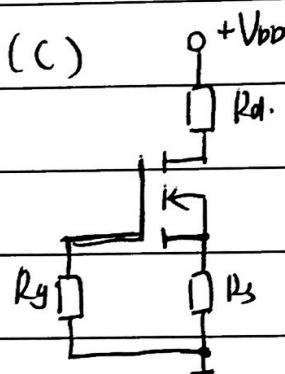


N沟道增强型.

恒流区条件  $U_{GS} > U_{GS(th)}$ ,  $U_{DS} > U_{GS} - U_{GS(th)}$

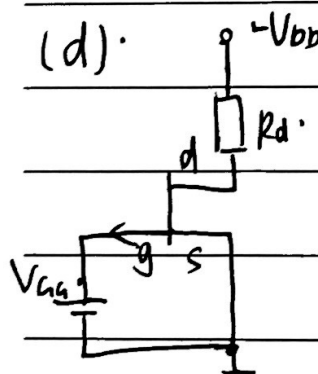
$U_{GS} \approx 0$  ∴ 不可能

(c)



$U_{GS} < 0$  ∴ 不可能

(d).



P沟道结型.

恒流区条件:  $U_{DS} < U_{GS} - U_{GS(off)}$ ,  $U_{GS} > 0$ .

$U_{GS} > 0$ . ∴ 可能.