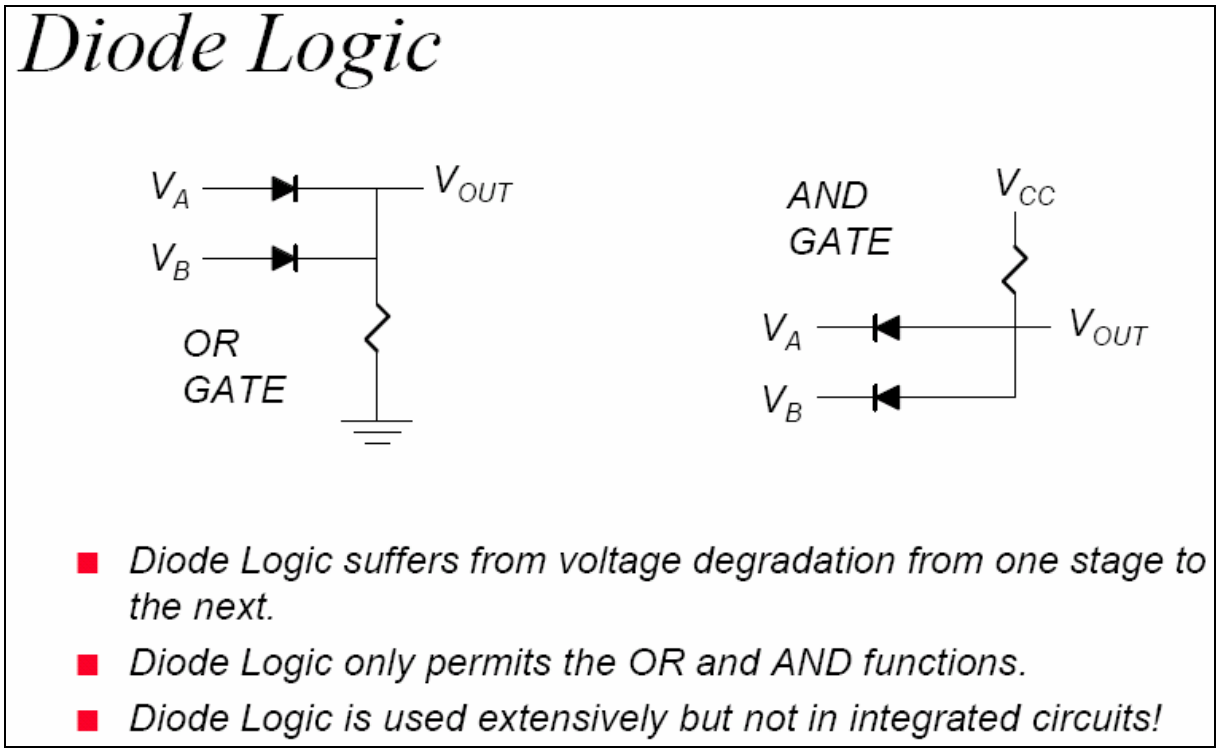
BAGIAN 3
DIODE LOGIC & DIODE-TRANSISTOR LOGIC

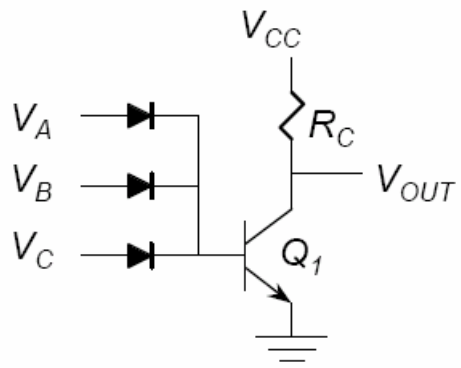
Representasi Logika :
Hidup/Mati; Benar/Salah; True/False; High/Low; 1/0; Atas/Bawah

Representasi Logika dalam rangkaian digital (TTL) :
High (3,5-5V)/Low (0 - 1V)

Operator Logika :
NOT : Keluaran merupakan kebalikan dari masukan
AND : Keluaran *high* jika seluruh masukan *high*
NAND : Keluaran *low* jika seluruh masukan *high*
OR : Keluaran *high* jika salah satu masukan *high*
NOR : Keluaran *low* jika salah satu masukan *high*
XOR : Keluaran *high* jika masukan berparitas *ganjil*
XNOR : Keluaran *high* jika masukan berparitas *genap*



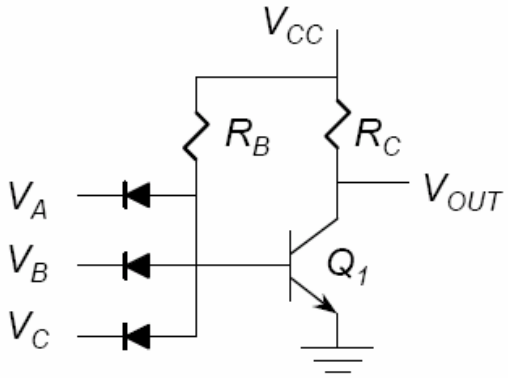
Diode-Transistor Logic (DTL)



Primitive Precursor to DTL

- *If any input goes high, the transistor saturates and V_{OUT} goes low.*
- *If all inputs are low, the transistor cuts off and V_{OUT} goes high.*
- *This is a NOR gate.*

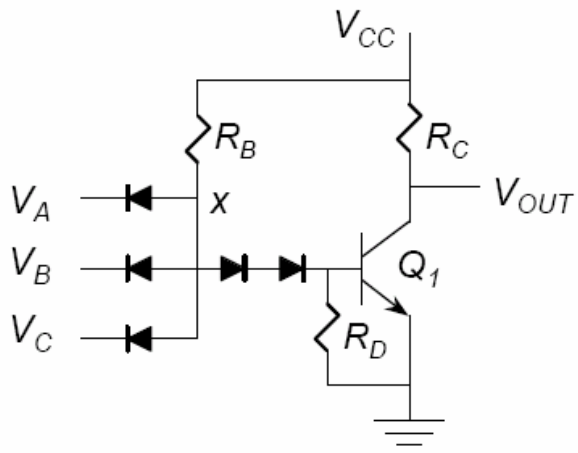
Diode-Transistor Logic (DTL)



Improved gate with reversed diodes.

- *If all inputs are high, the transistor saturates and V_{OUT} goes low.*
- *If any input goes low, the base current is diverted out through the input diode. The transistor cuts off and V_{OUT} goes high.*
- *This is a NAND gate.*

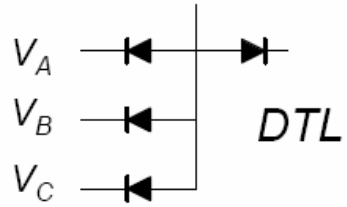
Diode-Transistor Logic (DTL)

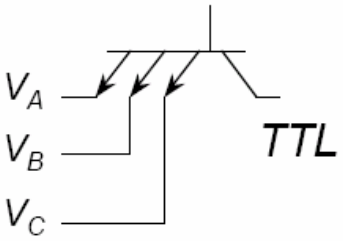


Basic DTL NAND gate.

- *If all inputs are high, V_x = 2.2V and the transistor is saturated.*
- *If any input goes low (0.2V), V_x=0.9V, and the transistor cuts off.*
- *The added resistor R_D provides a discharge path for stored base charge in the BJT, to provide a reasonable t_{PLH}.*

Why TTL?



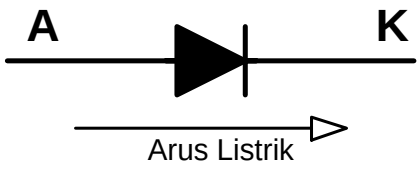


- *The DTL input uses a number of diodes which take up considerable chip area.*
- *In TTL, a single multi-emitter BJT replaces the input diodes, resulting in a more area-efficient design.*
- *DTL was ousted by faster TTL gates by 1974.*

RANGKAIAN LOGIKA DENGAN DIODA, TRANSISTOR, DAN RESISTOR

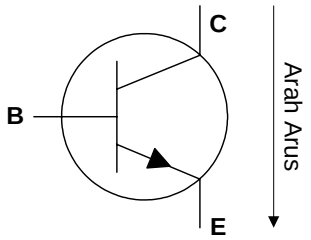
Karakteristik Dioda Ideal

- Terdiri atas Anoda (A) & Katoda (K)
- Dioda hanya dapat mengalirkan arus jika tegangan Anoda lebih besar dari tegangan Katoda.
- Arus hanya bisa mengalir pada satu arah, yaitu dari Anoda ke Katoda.

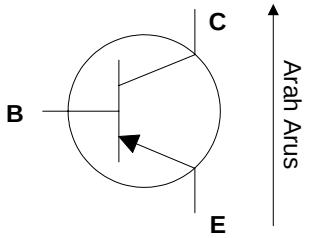


Karakteristik Transistor pada rangkaian logika

- Jika Basis mendapat arus, terjadi aliran arus dari Kolektor ke Emitor (pada transistor NPN) atau dari Emitor ke Kolektor (pada transistor PNP). Pada saat ini, transistor berada dalam keadaan *saturasi*.
- Jika Basis tidak mendapat arus, diasumsikan bahwa hubungan antara Kolektor dan Emitor terputus. Dalam keadaan ini, transistor berada dalam keadaan *cut off*.



Transistor NPN

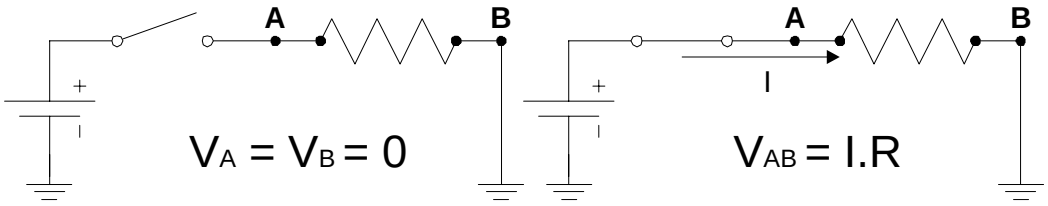


Transistor PNP

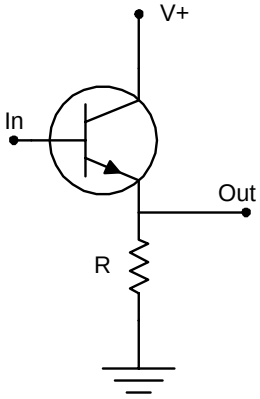
Karakteristik Resistor (Hambatan)

- Jika Resistor tidak dialiri arus, maka tegangan kedua ujungnya sama.

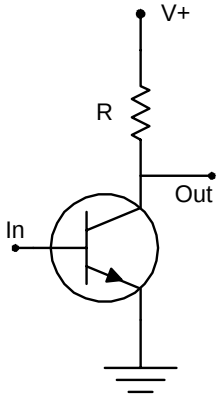
- Jika Resistor dialiri arus, maka beda tegangan antara kedua ujungnya adalah I.R, dimana I adalah besarnya arus dan R adalah nilai hambatan.



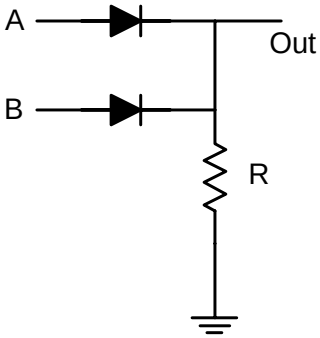
Rangkaian Logika :



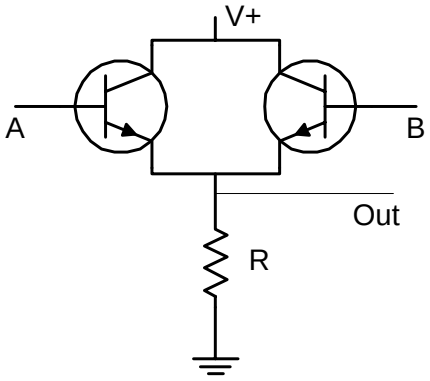
Buffer (RTL)



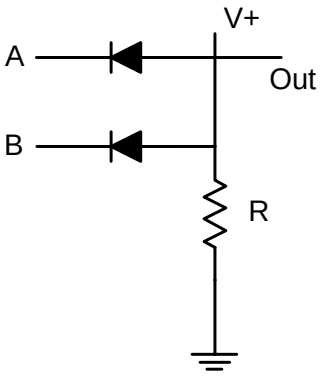
Inverter (RTL)



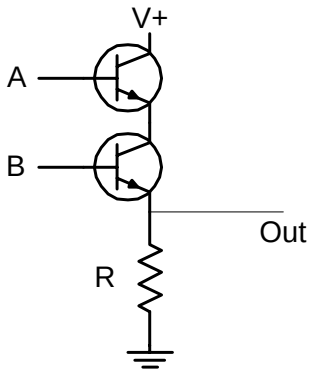
OR (RDL)



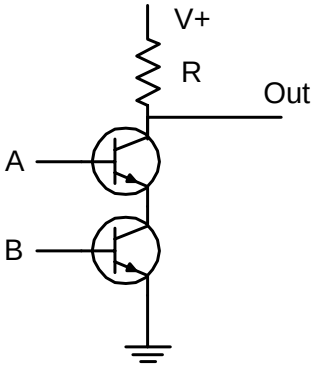
OR (RTL)



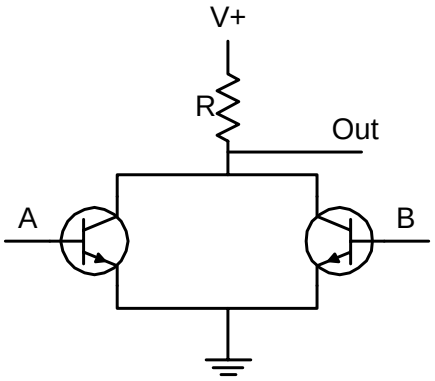
AND (RDL)



AND (RTL)



NAND (RDL)



NOR (RTL)