

SCE 0110 -
Elementos de Lógica Digital I

**Flip-Flops, Registradores e
Contadores**

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Circuitos combinacionais x sequenciais

- Circuitos combinacionais
 - São os circuitos que estudamos até a aula passada
 - A saída da função lógica depende somente das variáveis de entrada
- Circuitos sequenciais
 - A saída não depende somente das entradas atuais, mas também do comportamento passado do circuito
 - Esses circuitos possuem elementos (memórias) para armazenarem valores de sinais lógicos
 - O conteúdo dos elementos de armazenamento representam o **estado** do circuito

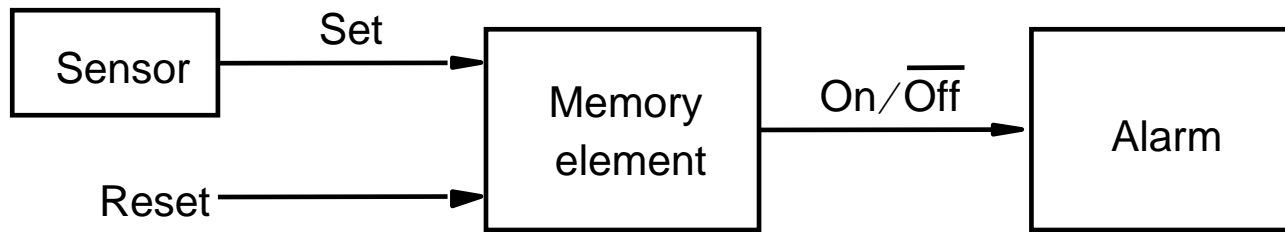


Figure 7.1. Control of an alarm system.

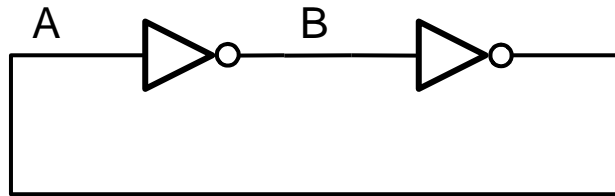


Figure 7.2. A simple memory element.

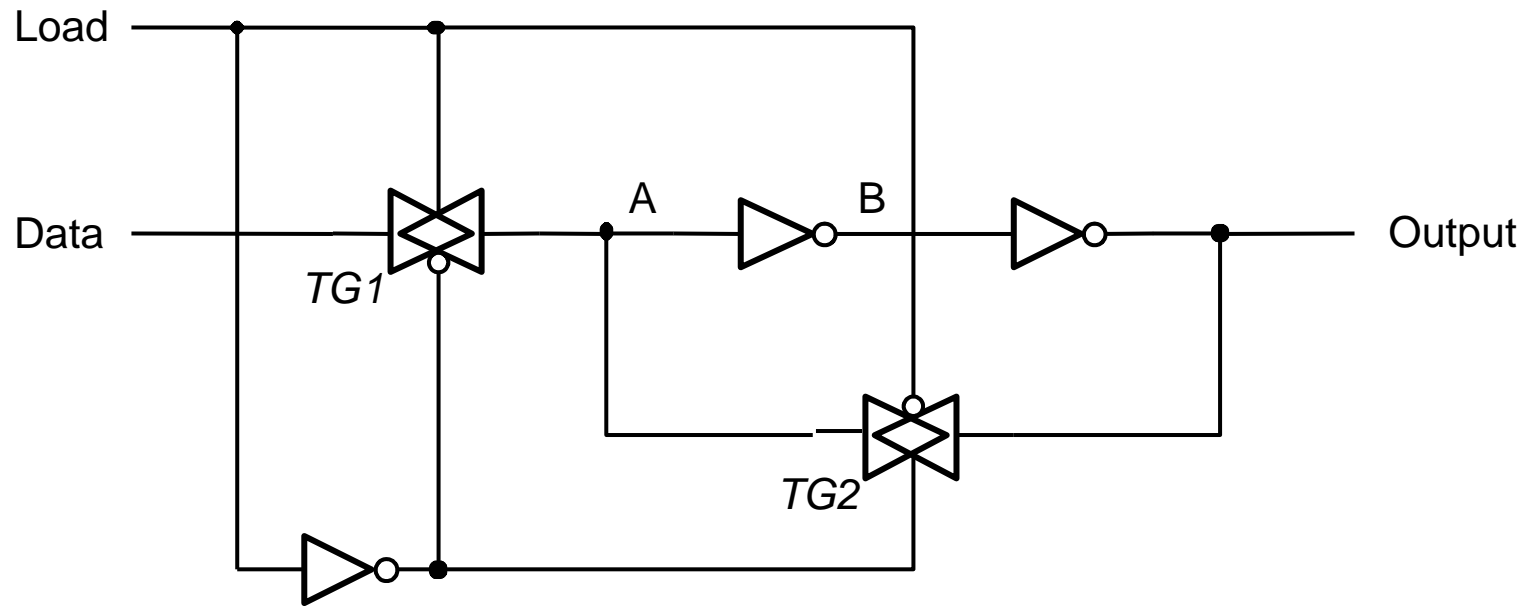


Figure 7.3. A controlled memory element.

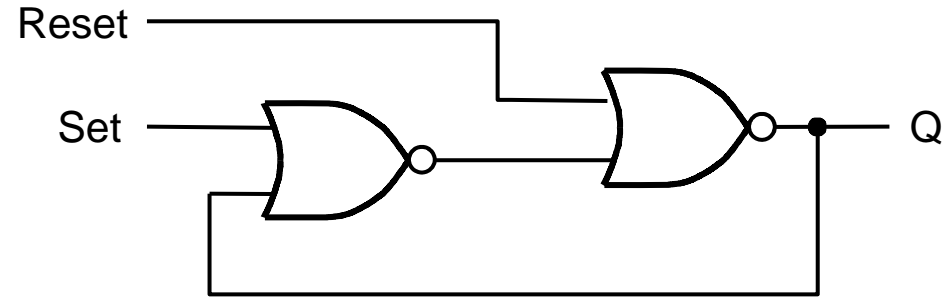
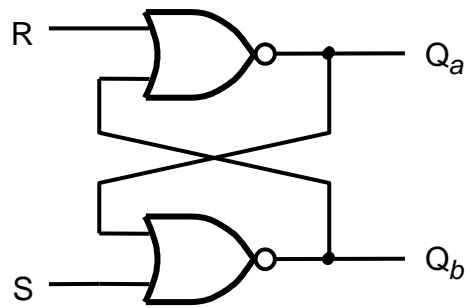


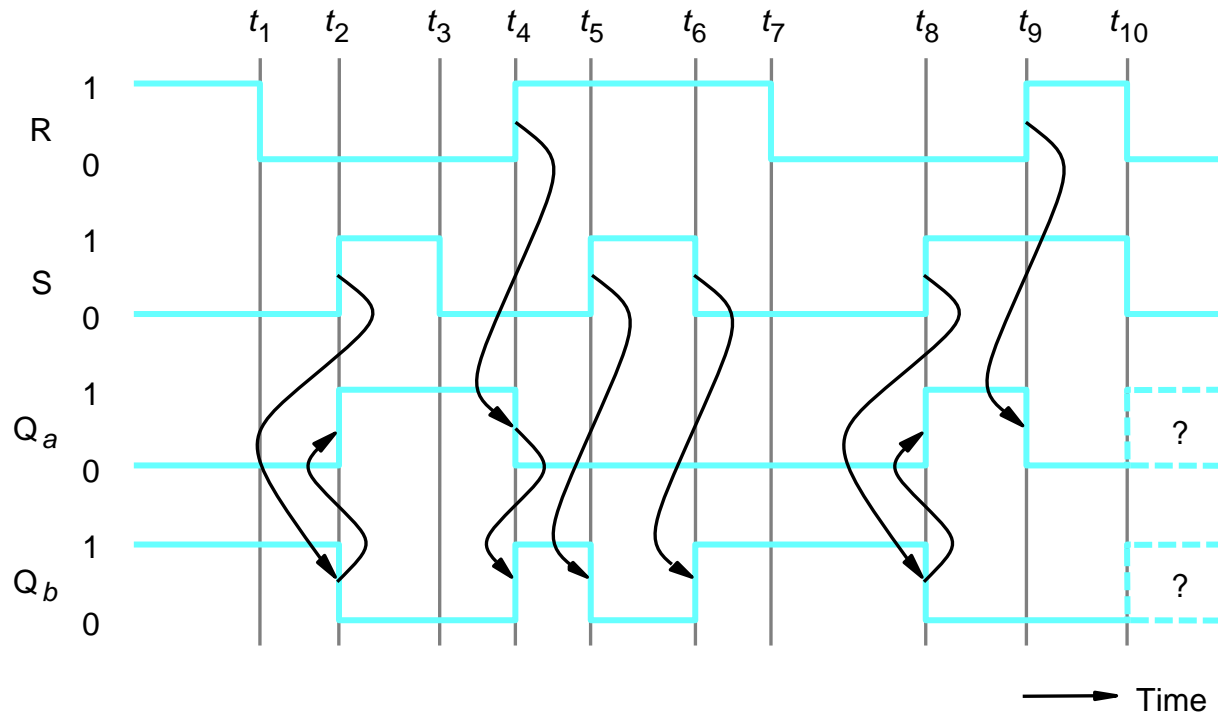
Figure 7.4. A memory element with NOR gates.



(a) Circuit

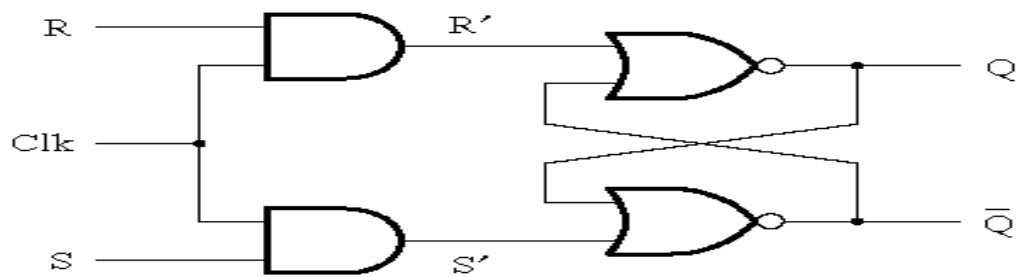
S	R	Q_a	Q_b
0	0	0/1	1/0 (no change)
0	1	0	1
1	0	1	0
1	1	0	0

(b) Truth table



(c) Timing diagram

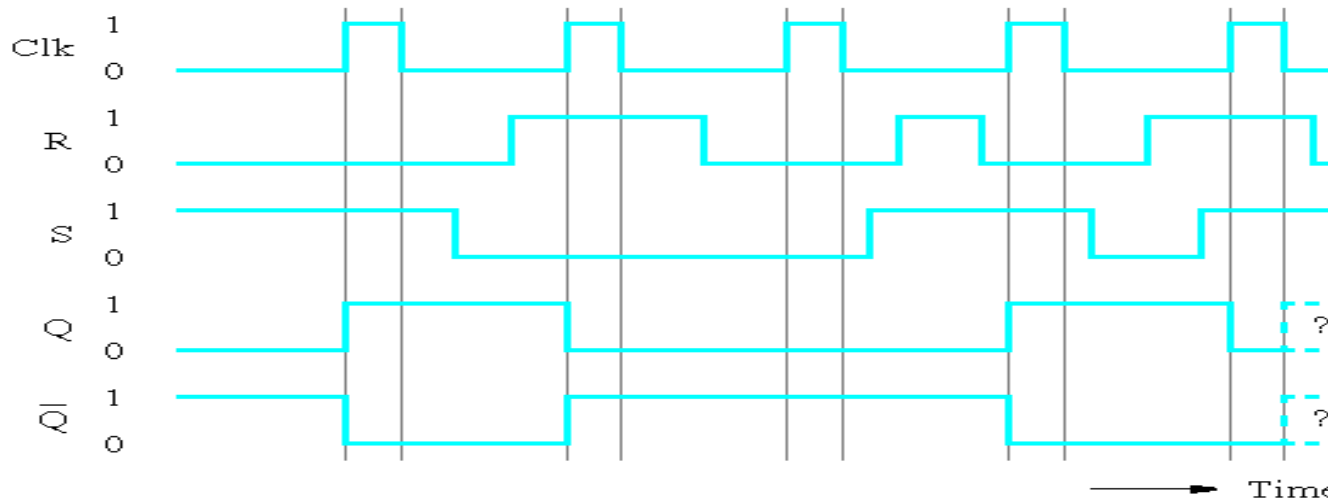
Figure 7.5. A latch built with NOR gates.



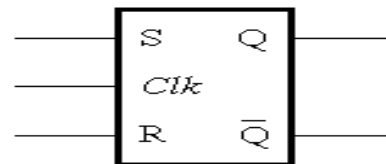
(a) Circuit

Clk	S	R	$Q(t+1)$
0	x	x	$Q(t)$ (no change)
1	0	0	$Q(t)$ (no change)
1	0	1	0
1	1	0	1
1	1	1	x

(b) Characteristic table



(c) Timing diagram



(d) Graphical symbol

Figure 7.6. Gated SR latch.