ANALOG ELECTRONICS

LECTURE NO. 6

Switching Characteristics of Diode

- In the forward-bias state it was shown earlier that there are a large number of electrons from the *n-type material progressing* through the *p-type material and a large number of holes in the n-type.*

Switching Characteristics of Diode

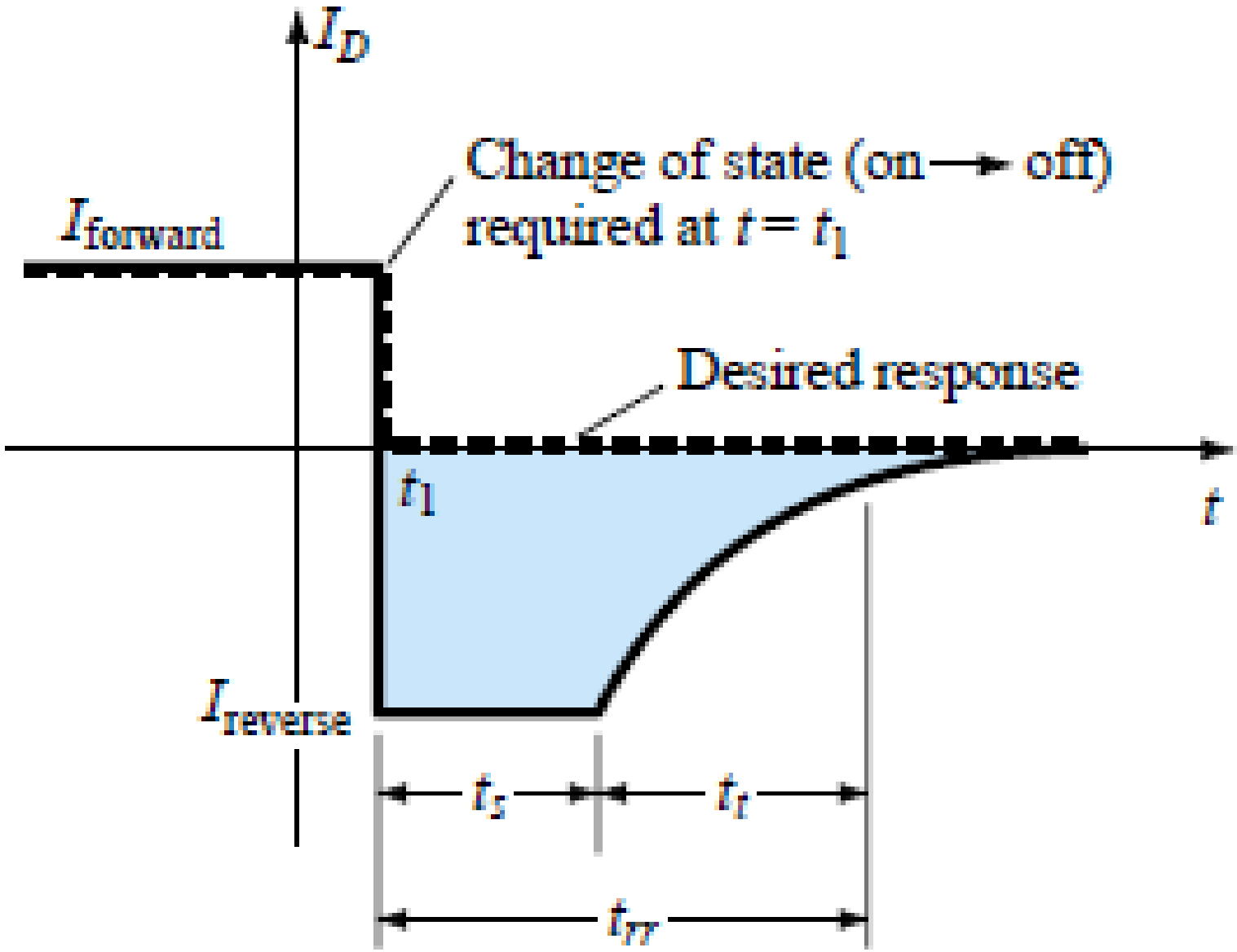
- The electrons in the *p-type and holes progressing through* the *n-type material establish a large number of minority carriers in each material*

Switching Characteristics of Diode

- If the applied voltage should be reversed to establish a reverse-bias situation, we would ideally like to see the diode change instantaneously from the conduction state to the non conduction state.

Switching Characteristics of Diode

- However, because of the large number of minority carriers in each material, the diode current will simply reverse as shown and stay at this measurable level for the period of time *ts (storage time) required for the minority* carriers to return to their majority-carrier state in the opposite material.

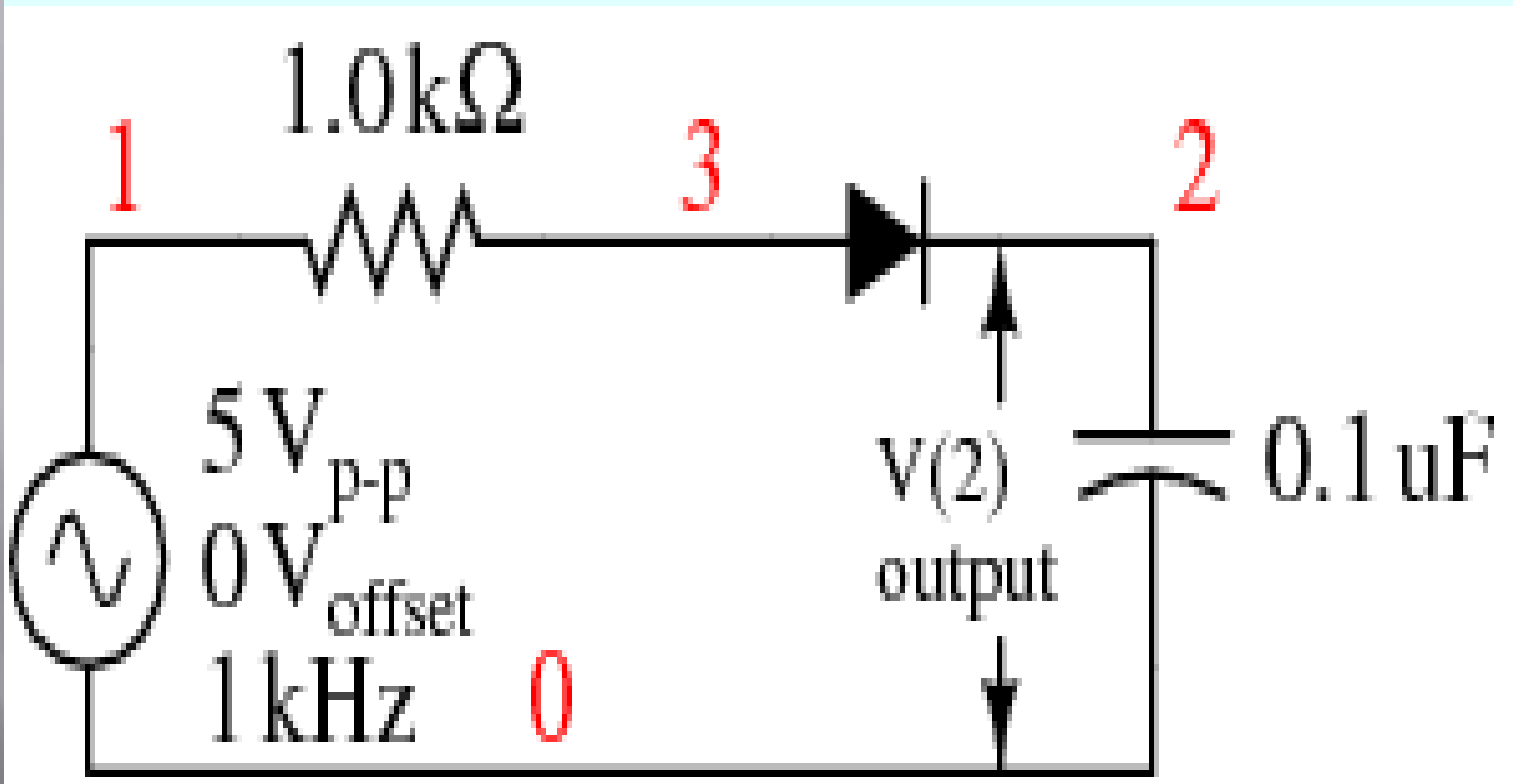

I_D
Change of state (on → off)
required at $t = t_1$
$I_{forward}$
Desired response
t_1
t
$I_{reverse}$
t_s
t_t
t_{rr}

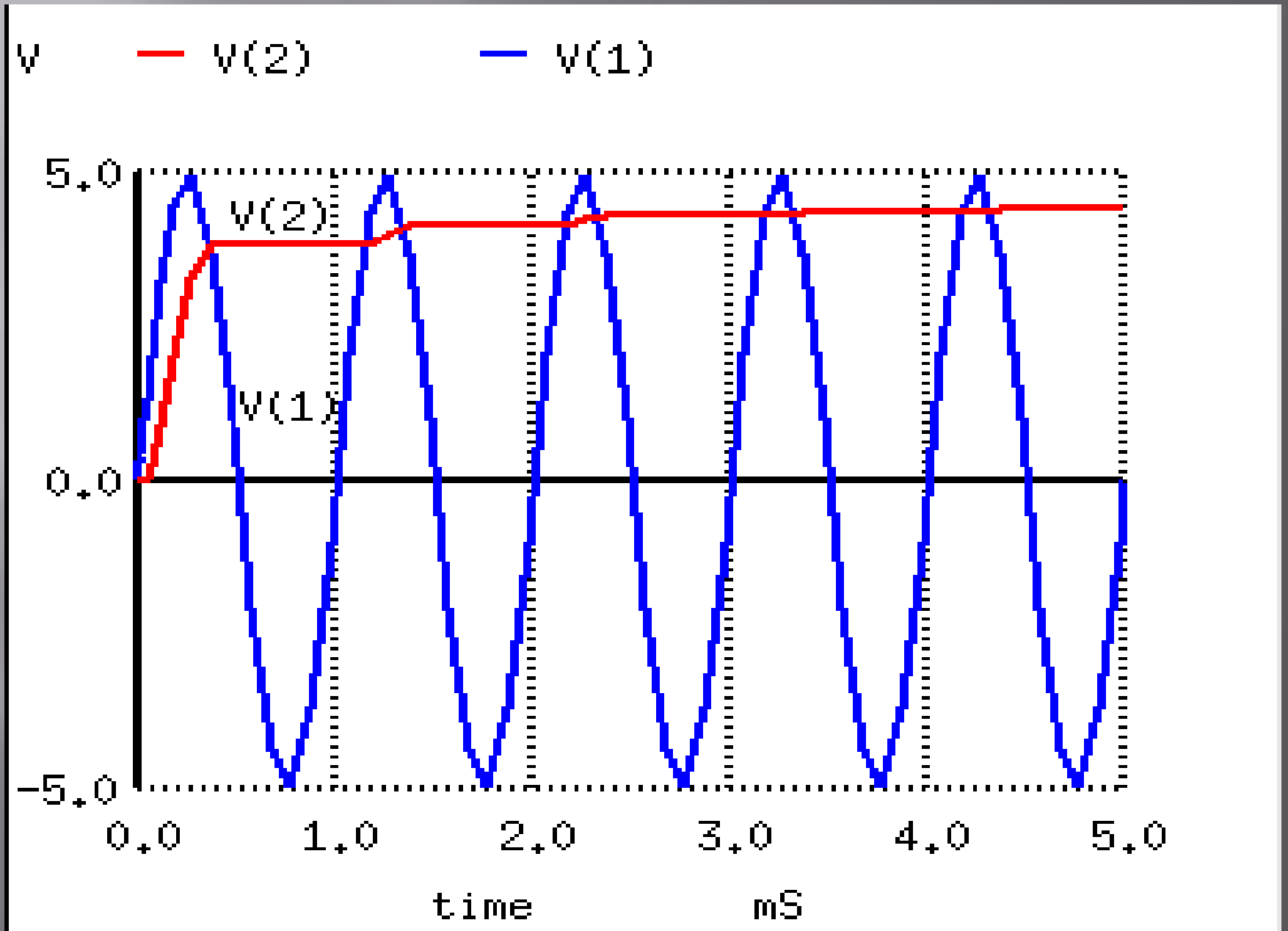
Peak to Peak Detector

- A *peak detector* is a series connection of a diode and a capacitor outputting a DC voltage equal to the peak value of the applied AC signal.

Peak to Peak Detector

- An AC voltage applied to the peak detector, charges the capacitor to the peak of the input.
- The diode conducts positive “half cycles,” charging the capacitor to the waveform peak.
- When the input waveform falls below the DC “peak” stored on the capacitor, the diode is reverse biased, blocking current flow from capacitor back to the source.
- Thus, the capacitor retains the peak value even as the waveform drops tozero


1.0kΩ
1
3
2
5 V p-p
0 V offset
1 kHz
0
V(2)
output
0.1 uF


V
V(2)
V(1)
5.0
0.0
-5.0
V(2)
V(1)
0.0
1.0
2.0
3.0
4.0
5.0
time
mS