**IMPORTANT DIODE PARAMETERS**

1. **V­­­F** is the **forward voltage**. It refers to minimum voltage that diode needs to allow current flow
2. **VR** is **reverse breakdown voltage**. It shows the maximum reverse voltage that the diode can hold. This parameter mostly depends on the doping and semiconductor characteristics. There is also another term called non repetitive peak reverse voltage VRSM. It also refers to the maximum reverse voltage provided that it is not repetitive.
3. **trr** is the **reverse recovery time**. If a diode working in forward direction and suddenly changed to reverse direction it needs a time (trr) for becoming totally of. This is because free carriers inside the diode. (Electrons get back to n-side). In this time interval there exists a reverse current on diode.
4. **tfr**is the **forward recovery time.** It is time required for diode to turn on when a forward voltage is applied. Same logic with reverse recovery time.
5. **IF(AV)** is the **average forward current**(maximum forward current). It shows the maximum amount of forward current allowed by diode. It is a repetitive value, that is, this amount of current does not harm diode for indefinite period.
6. **Tj** is the **maximum operating junction temperature**. This parameter refers to maximum operating temperature that diode can work without any deformation. This parameter is also related to total power dissipation.
7. **IR** is the **reverse leakage current**. For an ideal diode, when a reverse voltage is applied to the diode it is not supposed to allow any current flow. However, for practical case there is a small amount of leakage current that flow through the diode when it is reverse biased. This current called reverse leakage current.
8. **IRM** is the **reverse recovery current**. As it is stated in reverse recovery time, if condition of a diode changes from forward to reverse, for a small-time interval there is a reverse current flow due to carriers. This current is called reverse recovery current.
9. **Vfr** is the **forward recovery voltage**. When a forward bias is applied to the diode before it gets in steady state, forward voltage is first increase and then becomes its forward voltage. Forward recovery time refers to maximum voltage reached during this interval.
10. **IFSM** is the **non-repetitive forward current.** Like IF, it also shows the maximum forward current of the diode. However, while there is no time limitation in IF(Diode can flow IF for indefinite time period), in IFSM there are time and magnitude limitation. That is diode can flow IFSM for limited time interval without any deformation. Also, this amount of current should not flow through the diode repetitively.

Most important parameters are,

* Forward Current
* Reverse Voltage
* Forward Voltage
* Recovery Time
* Maximum junction temperature

Part d)

1-Looking at the diodes that have current rating of 1A, we see that if large reverse breakdown voltage is required, selected diode will probably have a large forward voltage. Therefore, in conduction mode power dissipation becomes larger. If we choose diode that has larger reverse breakdown voltage than we need (overdesign), power consumption increases. However, choosing larger reverse breakdown voltage might be helpful. For example, in the circuit if there is a large amount of reverse voltage on diode for a short time interval, our circuit may not be affected.

For 1N4933GP-E3/54 and RGP10ME-E3/73 having 50V and 1000V reverse breakdown voltage, respectively. While 1N4933GP-E3/54 has a forward voltage of 1.2V, RGP10ME-E3/73 has 1.2V. In addition, if we need high switching frequency but not large reverse breakdown voltage, choosing 1N4933GP-E3/54 is a better option. It is because recovery time of RGP10ME-E3/73 more than twice of recovery time of 1N4933GP-E3/54.

2- Referring to the diodes having voltage rating of 50V (S1A-13-F and B550C-13-F)

The diode S1A-13-F has maximum forward current of 1A and B550C-13-F has 5A. Furthermore, while S1A-13-F has reverse current of 5uA, B550C-13-F has 500uA. In this case, assuming that the maximum forward current is the only criteria, and it should be around 800mA. Choosing B550C-13-F is overdesign. This is because S1A-13-F has enough for our design. Even if B550C-13-F satisfies the requirement it has more leakage current. Also, since it has larger maximum forward current, it may be more expensive. It can differ a lot if millions of circuits is going to be produced.