

## 0.18 $\mu$ m process HV electrical guidelines

1 . As far as possible, for operating voltages higher than 5V, **Vg voltage must be applied before Vd voltage** in order to prevent maximum current injection, as shown on the following schematic Figure 3.1.

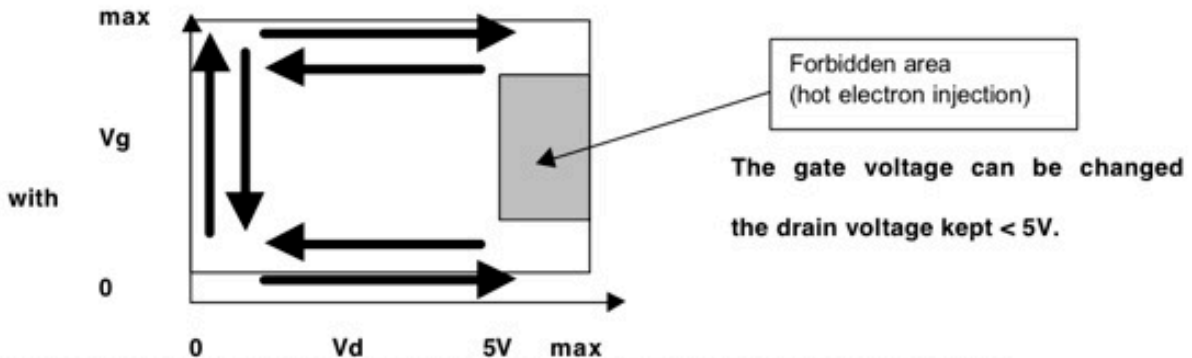


Figure 3.1 Schematic showing how to prevent maximum current injection area (@Vgs=Vds/2-0.5V).

Figure 3.2 is an example of the Vgs versus Vdsmax guideline curves. The right part of the curve, for Vds>Vdsmax is forbidden whereas the left part is allowed.

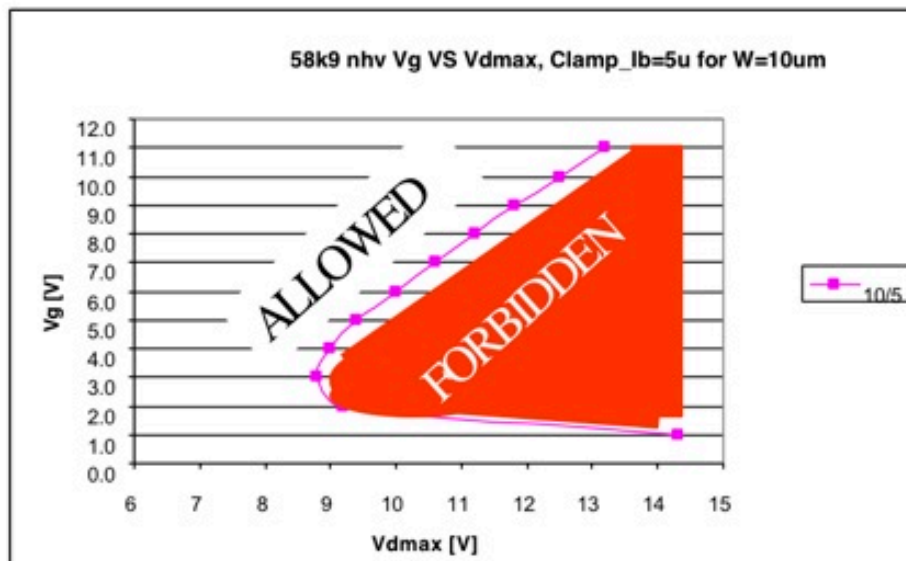


Figure 3.2 Vgs VS Vdsmax curve for a nhv 20/5 device. The right part is forbidden whereas the left part of the graph is allowed (weak impact ionization region).

The Vdsmax value corresponds to the maximum Vds value allowed. Else, impact ionization will degrade the device characteristics.

**The 20 years lifetime is defined as the stress time necessary to obtained 100mV of Vt.**

Details of the hot electron study are given in Annex. This study points out that a Vt shift of 100mV occurs when the device delivers a bulk current of 20uA during 20 years. HV guidelines Vgs versus Vdsmax curves have been made with a condition on bulk current of 10uA (instead of 20uA to be safe) for W=20um (2.5uA for W=5um).

It can be seen in the Figure 3.2 that Vdsmax value depends on Vgs value because the maximum impact ionization occurs @Vgs=Vds/2-0.5V (see annex for more details), that is why **Vg voltage must be applied before Vd voltage** in order to prevent maximum current injection.

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