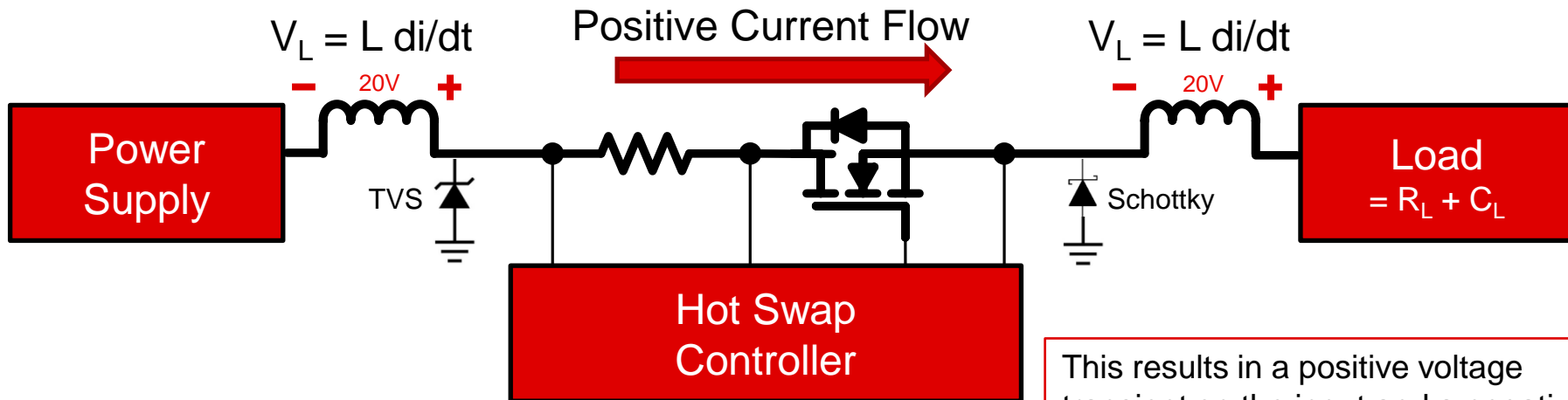


Schottky Diode for Transient Protection

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APP-PSIL-PS

Voltage transients during fast turn-off

Short Circuit / Severe Overcurrent – Simplified Schematic



For Short Circuit, di/dt may be: $(0A - 20A) / 10ns = -2 \times 10^9 A/s$

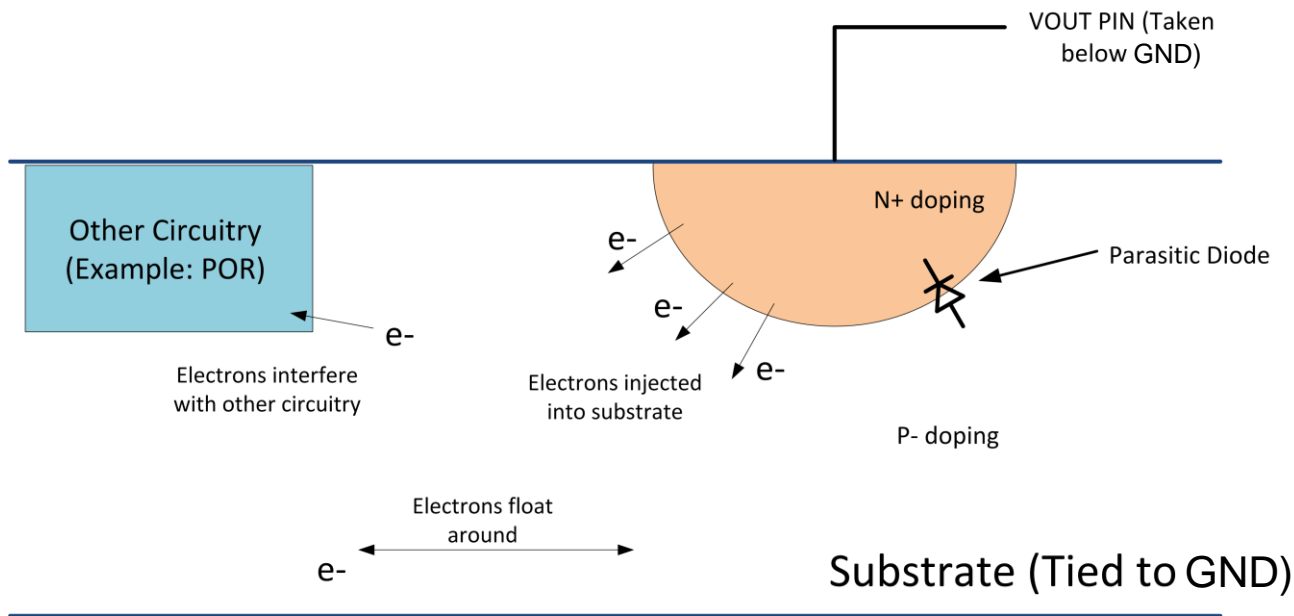
Trace inductance may be as low as 10nH.

$V_L = 10nH * -2 \times 10^9 A/s = -20V \rightarrow$ Both inductors will produce -20V.

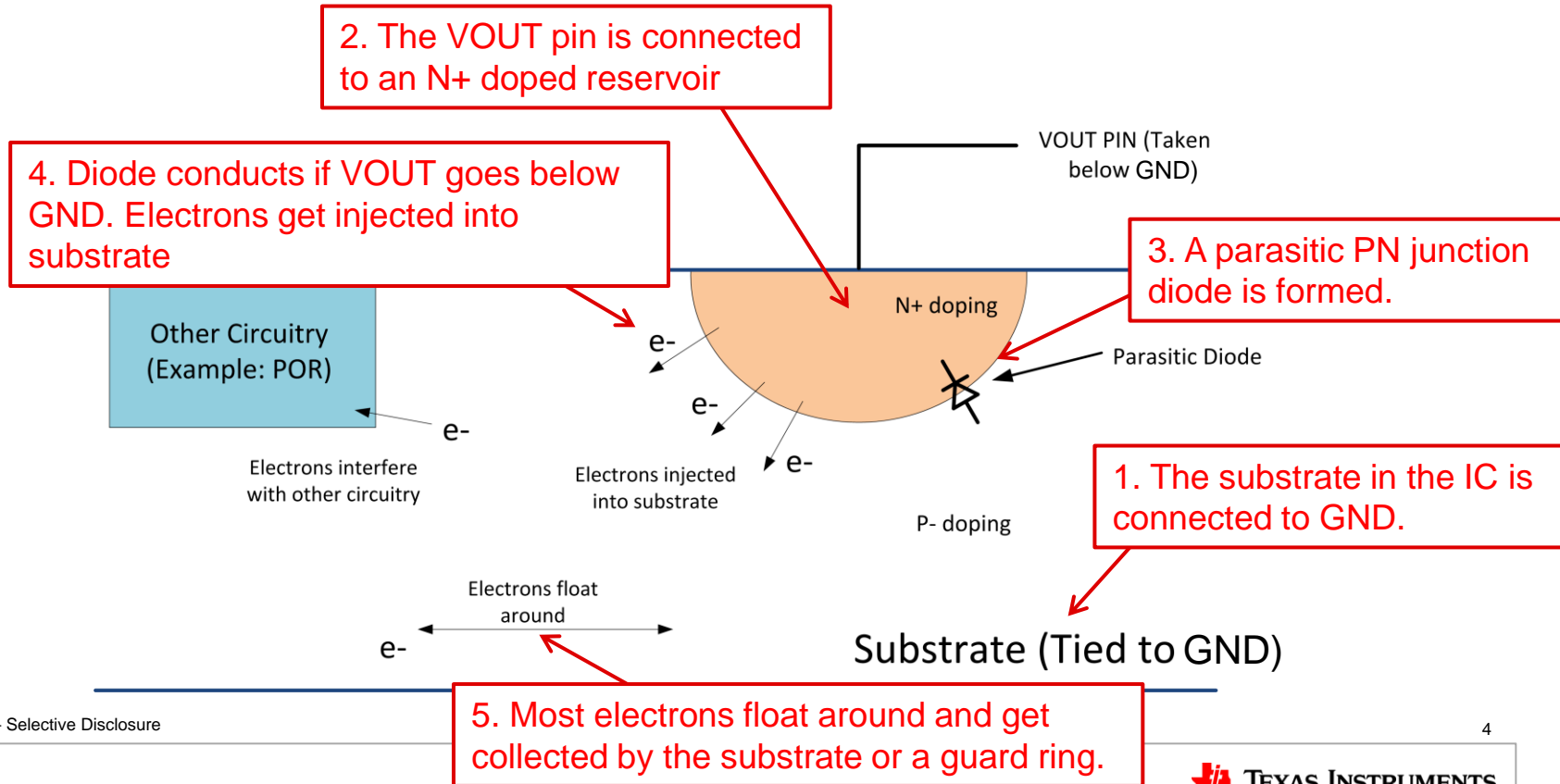
This results in a positive voltage transient on the input and a negative transient on the output.

A high power TVS on the input and Schottky on the output will clamp these voltages.

Internal to the IC



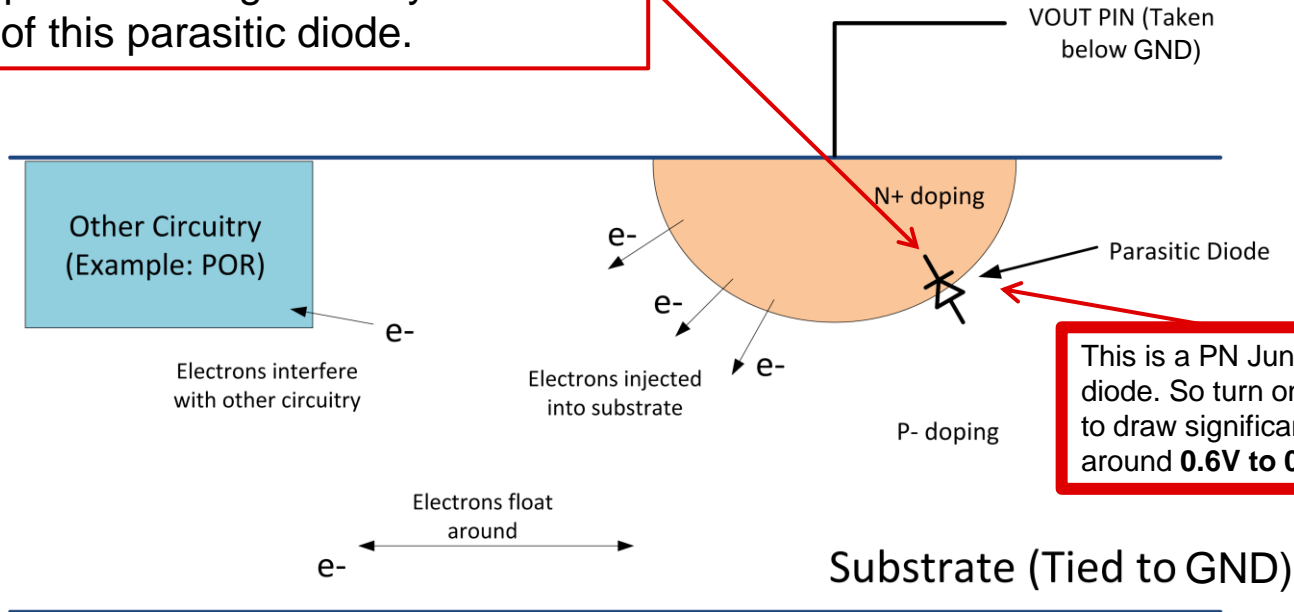
Internal to IC



Solutions - Overview

In order to avoid or minimize the number of electrons getting injected into the substrate, we need to prevent or significantly limit the conduction of this parasitic diode.

Reduce the peak negative voltage seen at the OUT pin.



This is a PN Junction based diode. So turn on forward voltage to draw significant current may be around **0.6V to 0.7V**

Solution – Output Schottky Diode

Adding a diode in parallel to the OUT pin will give an alternate path for current to flow during the negative transient. The key is to choose a component with a V_{forward} much lower than the internal PN diode. So **when selecting a device, try to see what the max current is during the short circuit and choose a diode with a V_f below 0.6V at that peak current.**

