Avoid Electrical Overstress (EOS) Dual Supply Power Op Amp Apps

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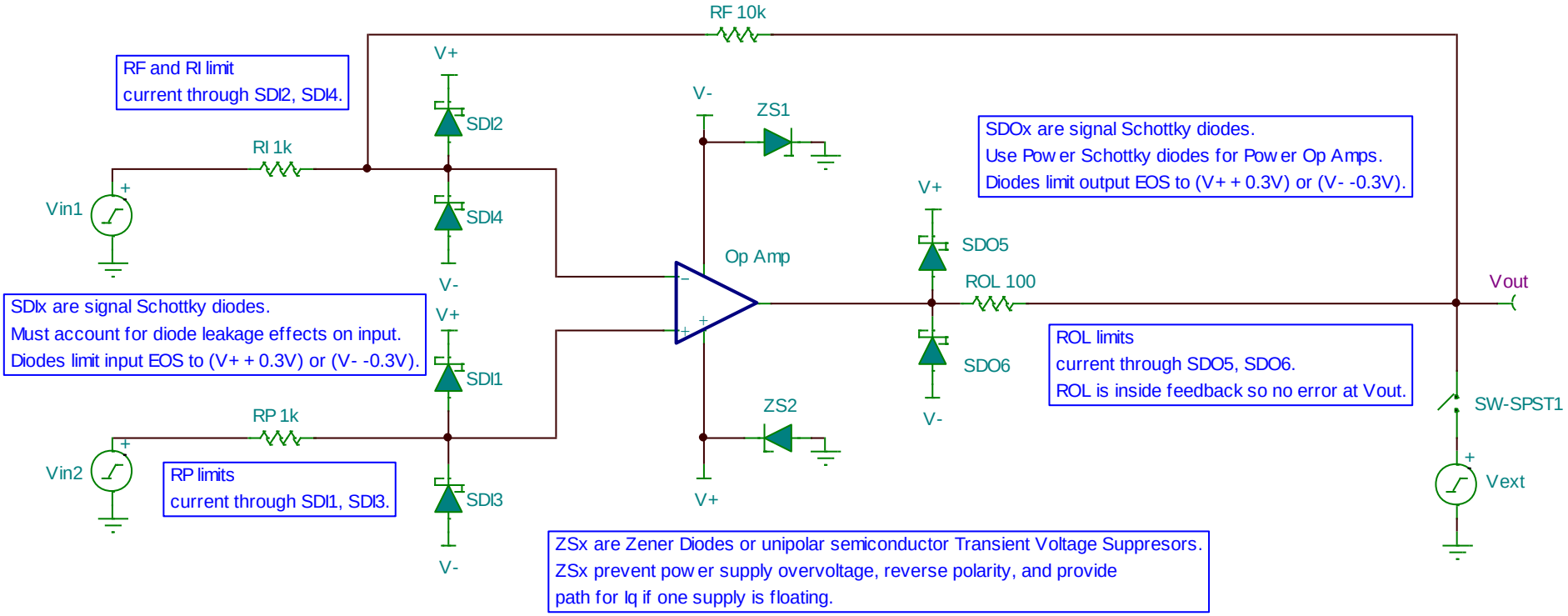
Complete External EOS Protection

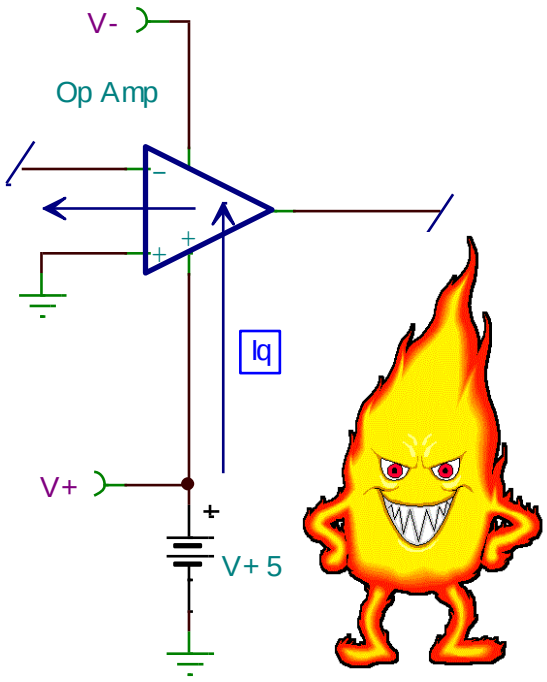
Complete EOS Protection using External Devices



EOS Iq Protection using Zeners or Unipolar Semiconductor Transient Voltage Suppressors

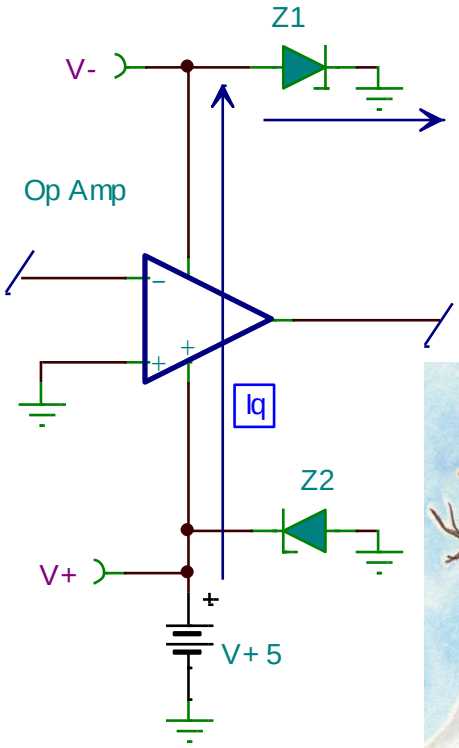
Iq with Open Supply

V- high impedance or effectively an open. Iq finds a path through reverse biased input stage junctions and out +input.



Iq without Supply Zeners

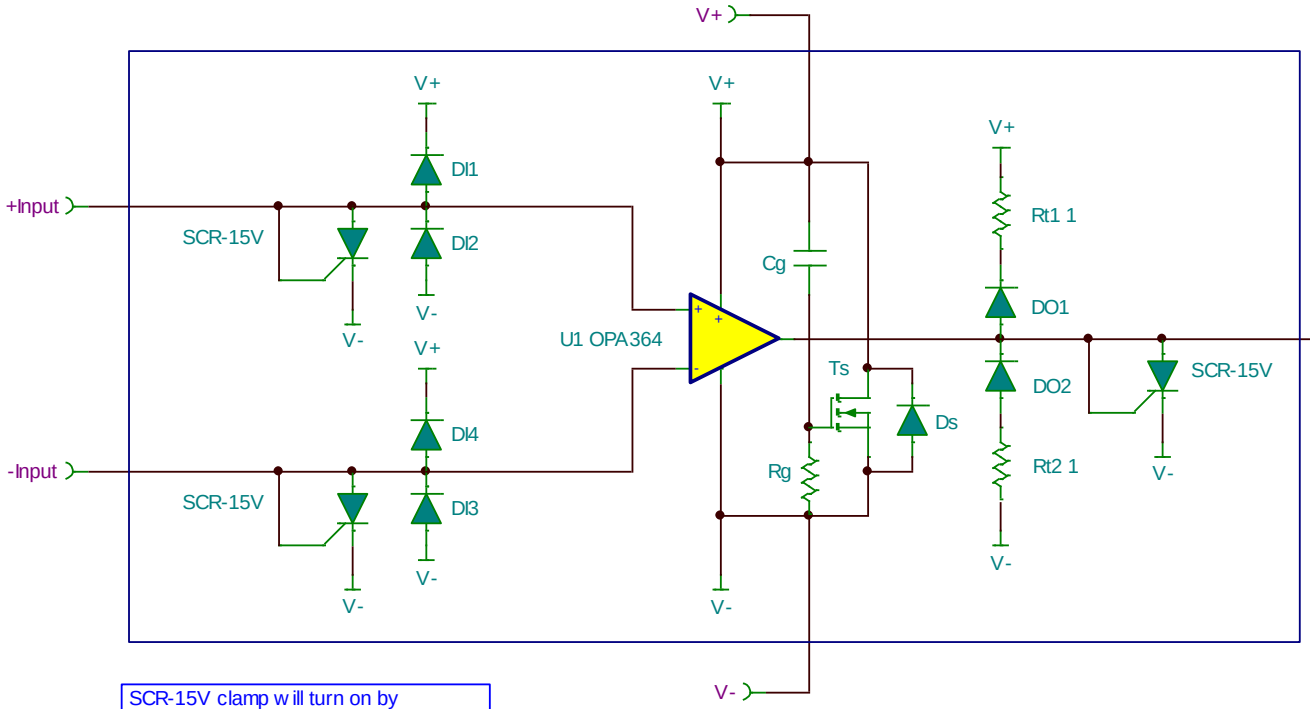
V- high impedance BUT Z1 is forward bias. V- now is +0.6V and Iq flows through Z1



Iq with Supply Zeners

OPA364 Internal ESD Structures

OPA364 Equivalent Schematic with ESD Cells



SCR-15V clamp will turn on by voltage > 15V and 100mA current drive.
If part is powered on output of OPA364 is shorted to V- and will drive high current through SCR-15V keeping it latched on until power is cycled.

DO, DO2 will clamp DC voltages on Out to V+ and V-.
Need to limit current to less than 50mA.
DO1 and DO2 willnot turn on as fast as SCR-15V for fast, high voltage transients.
Limit current into Out to prevent SCR-15V from turning on.

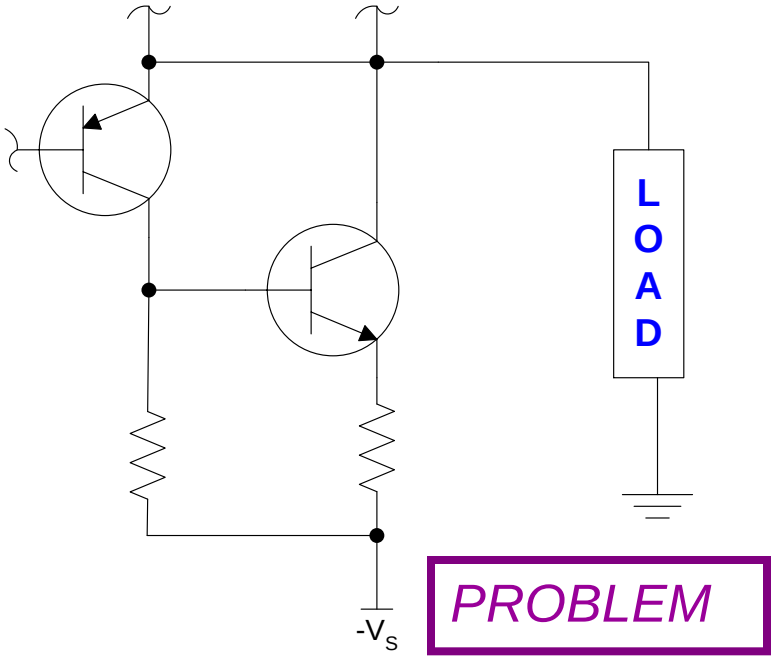
SCR-15V clamp will turn on by voltage > 15V and 100mA current drive.

Transient Supply Clamp.
Fast edge (10nS) will turn on Ts.
After short pulse goes away Ts will turn off.
Reverse polarity on supply will forward bias Ds!

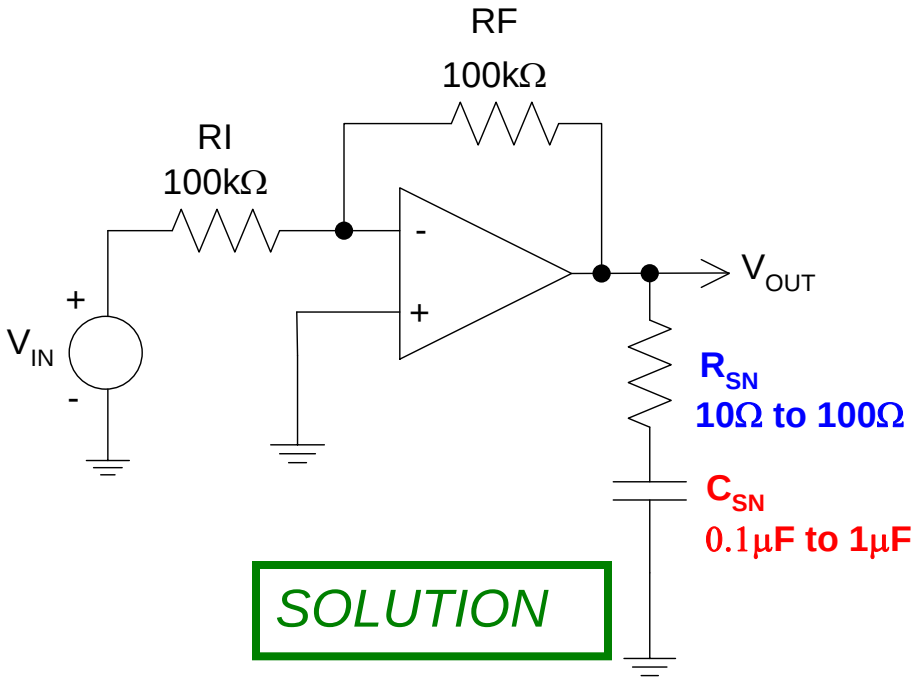
Dlx, Dl2 will clamp DC voltages on Out to V+ and V-.
Need to limit current to less than 50mA.
DO1 and DO2 willnot turn on as fast as SCR-15V for fast, high voltage transients.
Limit current into Out to prevent SCR-15V from turning on.

Power Op Amp Output Snubber

- ✓ fosc > fGBW
- ✓ oscillates unloaded? -- no
- ✓ oscillates with V_{IN}=0? -- no



PROBLEM



SOLUTION

Some Op Amps use composite output stages, usually on the negative output, that contain local feedback paths. Under reactive loads these output stages can oscillate.

The Output R-C Snubber Network lowers the high frequency gain of the output stage preventing unwanted oscillations under reactive loads.