Zener Regulator

Electrical Engineering

Sizing the series resistor for a shunt regulator, worst case at both extremes.

The resistor must satisfy the two opposite corners at once.

1. **Fix the zener voltage**
   Choose V_Z at the output you need and note its test current I_ZT.

2. **Take the tight corner**
   Lowest input voltage with the highest load current is the binding case.

3. **Size the series resistor**
   R = (V_in min − V_Z)/(I_load max + I_Z min); keep I_Z min near 5 mA.

4. **Check the other corner**
   Highest input with no load at all: the zener then carries every milliamp.

5. **Check dissipation**
   P_Z = V_Z I_Z max and P_R = (V_in − V_Z)²/R. Derate both parts.

A shunt regulator draws its full current whether the load needs it or not. Past about 100 mW, use a series regulator.