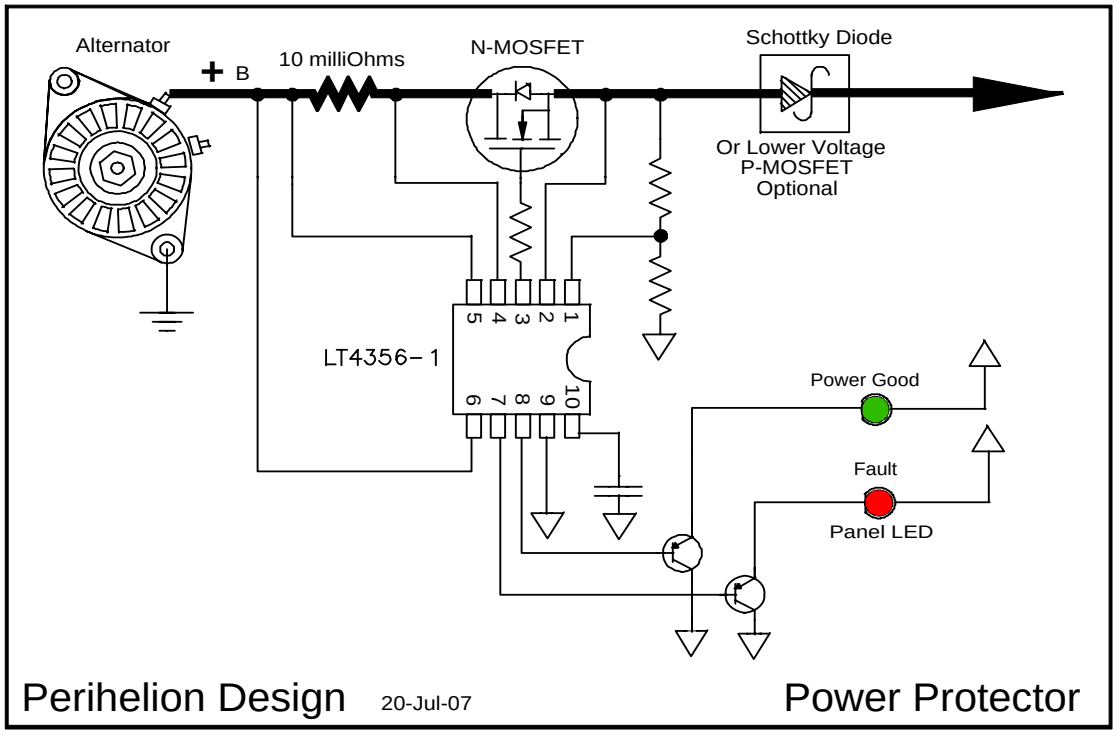
I talk to many builders who are particularly concerned about frying their expensive avionics and glass panels. These parts are typically 1/3 of the airplane cost.

Wiring a small aircraft involves installing systems to safeguard the buses against failure of the alternator. Either an internally regulated alternator or its more adaptable brother with an external regulator still has the potential problem of a runaway condition, as well as a short circuit of the main battery to alternator B-lead, and frequent load dump OV conditions.

A solution is herein proposed—

Linear Technology has introduced a clever device, the LT4356-1 Overvoltage Protection Regulator and Inrush Limiter to address all these worries. Not only that…they list "Automotive/Avionic Surge Protection" is one of its chief applications.

The LTC approach takes the high voltage from a load dump or failed alternator and REGULATES it while the situation is being tamed. The IC package is 3mm X 4mm and drives a big N-MOSFET that does the heavy work of regulating the voltage.



So what happens? Normally the alternator current is carried by the N-MOSFET. Assume the current is 50A, and the Rds(on) is 0.012 ohms. The dissipation would be only 30W. This is easy to handle with a reasonable heat sink.

Assume the alternator and/or the regulator goes cuckoo. This could happen if the alternator field winding shorts to the B-lead output or the sense lead in the regulator opens, or other untoward goings-on. The alternator output goes into an upward voltage spiral. This voltage is not unlimited, especially if there is a load on it, but could be 80 VDC.

Now the LT4356-1 REGULATES the output via a big N-MOSFET on a heat sink. The aircraft buses never sees more than 14.5 Volts (or whatever is desired). This is true for the short time (500 mS) load dumps, and it will regulate a runaway alternator for a time determined by whatever the N-MOSFET and heat sink can dissipate.

The LT4356-1 has a timer circuit to protect the N-MOSFET. If the time expires and the stress continues, the fault warning signals an impending power-down and the N-MOSFET shuts off the B-line.

Additionally, some models of the LT4356-1 have a spare amplifier/comparator that can be used for any purpose (not shown here). It operates from 4 to 80 VDC, and withstands –30V and up to 100V. A series low voltage P-MOSFET or a Schottky diode can be added to protect against a shorted alternator that would draw reverse current. The device has built-in protection again high current shorts of the B-Line to the battery.

The drawing shows a basic form. A few additional parts are necessary. However, consider the parts that WOULDN’T be necessary:

The B-Line contactor,
The OV monitor,
The load dump preventer,
The B-Line fuse,
The alternator switch.

No crow bar or linear over voltage switch.

I don’t have current plans to market this but will build one for myself.

Discussion is invited.