

Small Satellite Constellations With the New Intersil Plastic ICs



ISL71026M	3.3V CAN Transceiver
ISL71444M	Rail-to-Rail Op Amp
ISL71218M	Rail-to-Rail Op Amp
ISL71001M	POL Regulator
ISL71010B50	5V Precision V.Ref.
ISL71010B25	2.5V Precision V.Ref.

Protec GmbH

Rosenheimer Landstraße 117
83229 Ottobrunn-Riemerling

eMail: sales@protec-semi.de
Web: <http://www.protec-semi.de>

Power Supply Sequencing in Spaceflight

In today's complex multi-rail power systems, power sequencing and fault monitoring are essential to boost the performance and the health of the design. Intensive processing of digital loads such as ASICs, FPGAs, DSPs, and microcontrollers require multiple rails to power their circuitry. These devices may demand very specific power-up and power-down sequencing of the rails in order to guarantee reliable operation and better efficiency.

Sequencing and monitoring all power supplies can be accomplished several ways. However, these implementations may not be suitable for spacecraft operating in the harsh deep space environment, or for satellites in Earth orbit, or may be more complex than with our new Sequencing ICs.



The ISL70321SEH and ISL73321SEH are radiation hardened and SEE mitigated power supply sequencers designed to drive Point-of-Load (POL) regulators or LDOs with enable pins. Up to four power supplies can be fully sequenced by a single device or multiple devices can be easily cascaded to sequence an unlimited number of power supplies for dense RF applications.

This power supply sequencer requires only two feedback resistors per power supply and a single resistor to set the rising and falling delay. The device features precision input comparators with an input threshold voltage of 600mV \pm 1.5% for the highest possible accuracy when monitoring the power supply voltages.

The ISL70321SEH and ISL73321SEH are offered in an 18 Ld 10mmx12mm CDFP package or die form and are fully specified across the military ambient temperature range of -55°C to +125°C. With minimal external component count, precision voltage monitoring, and SET mitigation, the ISL70321SEH and ISL73321SEH are the ideal choice to control many of today's highly dense power systems in high reliability applications.

The benefits of using an analog power sequencer are effortless design with minimal external components, and accurate fault monitoring to ensure reliable system operation.

In addition to sequencing, the ISL70321SEH has active monitoring of over half a dozen fault conditions to ensure reliable power system operation. These include:

- SEQUENCE ORDER FAULT - Out of sequence order
- BROWN OUT FAULT - Any VMx drops below its threshold when a sequence down is not happening
- PGOOD FAULT - VMx remains below its threshold after its ENx is released and the PGOOD timer duration has passed
- INPUT FAULT - Any VMx is high before its ENx is released
- INPUT FAULT - The UP input experiences a change in state before the first channel sequence operation is completed
- OUTPUT FAULT - DONE remains low after the DONE was released and the PGOOD timer duration has passed
- EXTERNALLY TRIGGERED FAULTS

For more complex multi-rail power systems, such as those in RF applications where the number of rails can easily exceed more than a dozen, the ISL70321SEH can easily be cascaded to sequence virtually an unlimited number of rails. Figure 6 highlights the necessary common connections to sequence 12 power supplies using three ISL70321SEH sequencers. Through the use of the UP, INIT and DONE pins, cascaded devices communicate to achieve power-up and reverse power-down sequencing of all the rails.