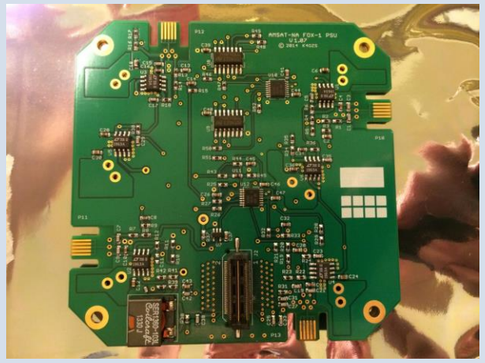
Fox-1 MPPT Trades

PSU V1.07



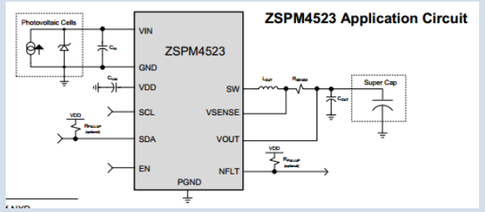
Pros

- Already built
- Simple, likely very reliable
- Available for engineering model testing
- Least schedule impact for PSU/MPPT team

Cons

- Uses LDO regulators which are inefficient
- Likely a large hit to power budget
- Likely reduced Fox-1 on-orbit operational capability
- Dumps excess voltage as heat

ZSMP4523 – IC Solution



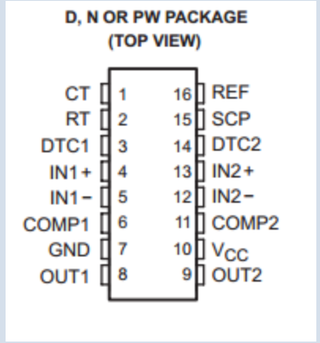
Pros

- Super small
- Extremely efficient (~95% at times)
- Quick to implement for Fox-1
- Evaluation board available < $50

Cons

- Designed for super-capacitors 2.7V output
- Unknown radiation tolerance
- Overall reliability unknown

TL1454 – Fox 2 Style



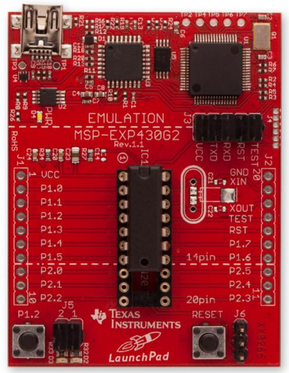
Pros

- PWM Controller works down to 3.6V
- Modeling Fox-2 MPPT architecture from Rochester Institute of Technology
- Could be fairly efficient (non-synchronous)
- Could be very efficient (synchronous) but harder to implement, more PCB area
- Stateless design (radiation friendly)
- MOSFET driver included in IC

Cons

- Likely requires a SEPIC converter which has larger PCB area
- May not fit six MPPTs on one board
- One PWM loop likely unused
- Not radiation tested
- Rated for 0C to 70C
- Is obsolete but offered by Mouser (low quantity)
- Potentially long MPPT design time

MSP430 – Smart MPPT



Pros

- Very small footprint compared to Fox-2 architecture.
- Allows most flexibility in MPPT design such as P&O method, maximum current
- FRAM devices offered (radiation tolerance)
- Long-term triplication possible
- Aerospace Industry uses MSP430s often

Cons

- Uses state which is risky for radiation
- Requires some extensive C firmware programming
- Overall system complexity increased
- Potentially long MPPT design time

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