Intersil Space Products

New Products for the Space Market

• Long history and presence in space market
• Broad offering of DLA compliant products

MEWS26
Tsukuba, Japan

Josh Broline
Marketing Manager, High Reliability Products Group
Intersil Today

• **Leading provider of innovative power management and precision analog solutions**
  – Extensive IP portfolio developed over decades of innovation

• **Headquartered in Silicon Valley**
  – 18 Global Locations & 7 Design Centers
  – ~1,100 Employees

• **Strong financial position**
  – Debt free balance sheet
  – Consistent R&D investment

2012 Revenue of $608M

- Industrial & Infrastructure 60%
- Personal Computing 20%
- Consumer 20%
Radiation hardened space overview

- ~300 Space qualified radiation hardened products available
- Consistent manufacturing in Intersil’s MIL-PRF-38535 (QML) qualified facility located in Palm Bay, Florida
- All parts are fully compliant to QML Class V (space level) requirements
- All products are on individual DLA SMD drawings
- High dose rate radiation tested and guaranteed to Method 1019 using in-house Gammacell 220™
- ELDRS characterization and production ELDRS wafer by wafer testing using in-house low dose rate irradiator
- SEE characterizations are performed at Texas A&M and completed reports can be found at www.Intersil.com
Intersil’s hardened product coverage

Precision Signal Processing

- Op Amps
  - High Speed
  - Precision
  - Rail-to-Rail
  - Low Power
- D/A Converter
- Voltage References
- Comparators
- uP/Peripherals
- Memory (PROM)
- Switch/MUX
  - 16CH MUX (1840)
  - Dual/Quad Switches
- Transistor Arrays

Logic
- CD/HTS/HCTS/HCS/ACTS

- Interface
  - RS-422
  - Receivers/Drivers

Power Management

- POL Voltage Regulators
- PWM Controllers
- Supervisory ICs
- MOSFET Drivers
- Linear Regulators
- Low Dropout Regulators
- Source Drivers

Served Today - Active Investment

Future Products

Serving

Not Serving

Broad coverage of analog and power management applications
Features:
- Wide supply range: 2.7V to 40V
- Enhanced SET performance
- Rail-to-rail input and output performance
- Unity gain stable
- Industry standard pinout

Radiation hardness:
- SEL/SEB $\text{LET}_{TH} (V_S = \pm 18V)$: 86.4 MeV.cm$^2$/mg
- SET $\text{LET}_{TH} (<5\mu\text{sec})$: 86.4 MeV.cm$^2$/mg
- TID acceptance tested on a wafer by wafer basis
- High Dose Rate: 300krad(Si)
- Low Dose Rate: 50krad(Si)
- Low dose rate characterization to 150krad(Si)

<table>
<thead>
<tr>
<th>Input offset voltage: 300µV maximum (CMV = 0V)</th>
<th>Bias current: 17nA maximum</th>
<th>Supply current: 2.4mA maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input offset voltage TC (typ.): 0.5µV/C</td>
<td>Slew rate: 60V/µsec</td>
<td>Gain – bandwidth product (typ.): 19MHz</td>
</tr>
</tbody>
</table>
ISL70444SEH SET performance at high LET

No SET pulses in excess of 4µs at 86 MeV.cm²/mg.
ISL70444SEH total dose performance

ISL70444SEH input offset voltage

All 4 channels, as a function of total dose irradiation at low dose rate for biased and unbiased cases and at high dose rate for the biased case.

The dose rate was 0.01 rad(Si)/s for low dose rate irradiation and 69.7 rad(Si)/s for high dose rate irradiation.

The high dose rate test was followed by a high temp anneal.

The specification limits are -400µV to +400µV.

Highly stable offset voltage at low and high dose rate
ISL71590SEH temperature transducer

Features:
- Linear output current, -55°C to +125°C
- Superior temperature accuracy over radiation
- No external components
- High HBM ESD rating at >3kV

Radiation hardness:
- SEL/SEB LET$_{TH}$ (VS = 33V) 86.4 MeV·cm$^2$/mg
- TID acceptance tested, wafer by wafer basis
- High dose rate 100krad(Si)
- Low dose rate 50krad(Si)
- Product characterization up to 150krad(Si)

<table>
<thead>
<tr>
<th>Linear output current, scale factor: 1uA/K</th>
<th>Absolute Accuracy: +/-1.7°C</th>
<th>Operating voltage range: 4.0V to 33V</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post low dose rate maximum error: -1°C (50krad)</td>
<td>Maximum error change over 1000h life test: +/-0.3°C</td>
<td>Long term drift (typical): -0.05°C</td>
</tr>
</tbody>
</table>

SMD # 5962-13215

2 lead flatpack & die
ISL71590SEH total dose response

ISL71590 temperature error vs. high and low dose rate irradiation

Greatly improved high and low dose rate hardness
Predictable in-beam performance at high LET

ISL71590SEH SEB voltage for each of the four samples tested.

The LET was 86MeV.cm²/mg and the samples were irradiated at 125°C.

Based on this data, the derated in-beam supply voltage is specified at 31V.
ISL71090SEH precision voltage reference family

Features:
- Best In class **voltage accuracy**
- Best In class **output noise**
- Superior temperature coefficient
- 1.25V and 2.5V (released), 5V, 7.5V

Radiation Tolerance
- SEL/SEB LET_{TH} (36V) 86.4 MeV·cm²/mg
- SET LET_{TH} (+/-5%) 86.4 MeV·cm²/mg
- TID acceptance tested, **wafer by wafer basis**
- High dose rate 100krad(Si)
- Low dose rate 50krad(Si)
- Product characterization up to 150krad(Si)

<table>
<thead>
<tr>
<th>Accuracy over temperature: +/-0.15%</th>
<th>Output noise (typ.): 1 – 2uV_{P-P}</th>
<th>Maximum temperature coefficient: 10ppm/C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy over Radiation: +/-0.15%</td>
<td>Maximum line regulation: 18ppm/V</td>
<td>Supply voltage range: 4.0V to 30V</td>
</tr>
</tbody>
</table>

2.5V Accuracy vs. Temperature

SMD # 5962-13211
8ld Flatpack & Die
ISL71090SEH total dose performance

The SMD post-irradiation spec limits are 2.495V to 2.505V.

Stable reference voltage over low and high dose rate
**ISL75052SEH 12Vin 1.5A Adjustable LDO**

**Features:**
- Voltage range: 4.0 to **13.2V**
- Low dropout performance
- High output **voltage accuracy**
- Superior SET performance

**Radiation Hardness:**
- SEL/SEB LET\(_{TH}\) (14.7V) 86.4 MeV·cm\(^2\)/mg
- SET LET\(_{TH}\) (±/-5%) 86.4 MeV·cm\(^2\)/mg
- TID acceptance tested, **wafer by wafer basis**
- High dose rate 100krad(Si)
- Low dose rate 50krad(Si)
- Product characterization up to 150krad(Si)

**TABLE:**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum dropout voltage</td>
<td>400mV</td>
</tr>
<tr>
<td>Maximum PSRR</td>
<td>55dB (1kHz)</td>
</tr>
<tr>
<td>Output voltage range</td>
<td>0.6 to 12.7V</td>
</tr>
<tr>
<td>Output Voltage Accuracy</td>
<td>+/-2%</td>
</tr>
<tr>
<td>Maximum shutdown current</td>
<td>120uA</td>
</tr>
<tr>
<td>Programmable current limit</td>
<td></td>
</tr>
</tbody>
</table>

**FIGURE 2. DROPOUT vs I\(_{OUT}\)**

**SMD # 5962-13220**

16ld Flatpack & Die
ISL75052SEH SET total dose performance

ISL75052SEH output voltage accuracy, 4.0V in, 2.5V out, no load, as a function of low and high dose rate for the biased and unbiased cases.

The post-irradiation spec limits are 2.45V to 2.55V or +/-2%.

Stable output voltage over low and high dose rate
Customer Support

- **Contact our local Sales Manager: Sakai-san**
  - For all inquiries: Q&A, PCNs, product procurement and alerts
  - ksakai@intersil.com

- **Customer facility visits are welcome**
  - Facility tour available upon request

- **Full collateral available on Intersil’s website**
  - Datasheets, SMDs, Spice/iSim Models, TID/SEE Reports, eval brds, etc
Ideas to leave you with.....

• For 50+ years, Intersil has been serving the radiation hardened marketplace

• Extensive amount of flight history

• Significant investment in new products

• Proven expertise in “latest technology” for power management and precision signal processing applications
ISL70002SEH 5V 12A sync buck POL regulator

Features:
- Current share/multi-phase capability
- 12A (single regulator)
- 19A (two regulators in parallel)
- Integrated high/low side power MOSFETs
- Internally compensated

Radiation hardness:
- SEL/SEB LET_{TH} (6.2V) 86.4 MeV·cm²/mg
- SET LET_{TH} (<1% output change) 86.4 MeV·cm²/mg
- TID acceptance tested, wafer by wafer basis
- High dose rate 100krad(Si)
- Low dose rate 50krad(Si)
- Product characterization up to 150krad(Si)

Voltage reference accuracy: +/-1%
On-chip upper/lower MOSFET Rds_{on} (typ.): 20.0/15.0 mohms
Maximum shutdown current: 4mA

Input voltage range: 3.0V to 5.5V
External frequency synchronization range: 400kHz to 1.2MHz
>90%E efficiency
Complete Intersil solution for powering a Xilinx FPGA

5V ± 10%

12A Switching Regulator
(19A multiphase solution)

3A LDO Regulator

1.0V Core Voltage

2.5V Auxiliary Voltage

1.2V - 3.3V I/O Voltage

6A Switching Regulator

Released to Production
SMD # 5962R1220201

ISL70002SEH

VIN
EN
M/S
SYNC
LXX
PGOOD

Released to Production
SMD # 5962R1121202

ISL75051SEH

VIN
EN
BYP
VOUT
PGOOD

Released to Production
SMD # 5962R0922502

ISL70001SEH

VIN
EN
M/S
SYNC
PGOOD

Designed for predictable SET performance