

# Space Radiation Dosimeter

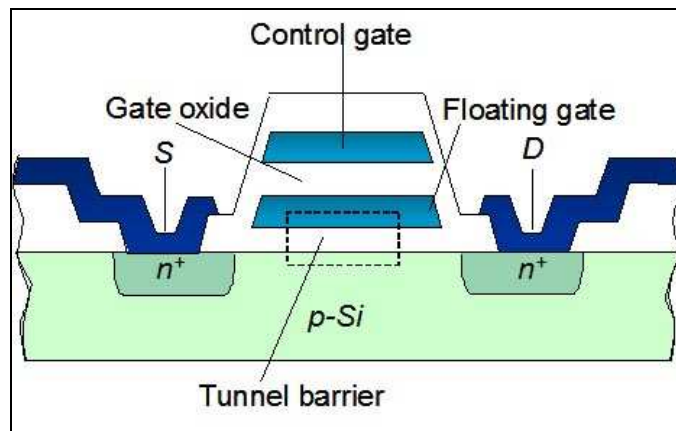
Space Micro's next generation space radiation dosimeter, the MicroRAD100™, represents the state-of-the-art solution for measuring and monitoring single event and total dose radiation effects in space.

The MicroRAD100™ is a low power, high performance space dosimeter solution that meets the challenges of space and satellite harsh environment platforms. Partnered with Clemson University, our patented UVEPROM detector technology is space-flight proven on the Naval Research Laboratory's Microelectronics and Photonics Test Bed (MPTB) mission. By utilizing Space Micro's patented radiation hardening technologies on commercial microelectronics that need space radiation mitigation, the MicroRAD100™ is able to provide industry superior performance in radiation monitoring and measurement along with ultra-low power utilization, all while avoiding highly custom and inherently high cost solutions.



Space Micro's MicroRAD100™ Dosimetry Card

## Theory of Operation:



Basic UVEPROM Dosimeter Cell

- Charge Stored on a Floating Gate
- Charged = "0" State
- Uncharged = "1" State
- Ionizing Radiation Decrease
- Charge on the Gate
- Sample UVEPROM: 1mm x 3mm die, 8M cells

## Space Micro Inc

### MicroRAD100™

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SPACE MICRO INC.

YOUR ACE IN SPACE

# Space Radiation Dosimeter

## Benefits:

### Lowest Power:

Measures incoming radiation while functionally "idle" (no power supplied), requires power only during readout.

### Lower Cost Potential:

The use of standard interfaces and COTS sensors minimizes non-recurring and special component costs.

### Maximum Flexibility:

Employs a standard Micro Read Only Memory interface; the architecture facilitates integration and scaling. The MicroRAD100™ can be reprogrammed in flight and has a digital readout.

## Space Radiation Detector Comparison

<i>Type</i>	<i>Measurement</i>	<i>Dynamic Range</i>	<i>Advantages</i>	<i>Disadvantages</i>
PIN Diode	TID, Dose Rate, particle sensor	Range $10^{14}$ #/cm <sup>2</sup> Sensitivity $10^9$ /cm <sup>2</sup> -nA	Detection of dose rate events, Fluence	Requires support hardware for dosimetry, Analog
RadFET <i>Thick Oxide</i>	TID	1 krad Sensitivity 1 rad	Small, Unpowered while sensing	Not in Human range, Analog
RadFET <i>Thin Oxide</i>	TID	10 Mrad Sensitivity 10s rad	Small, Unpowered while sensing	Not in Human range, Analog
OSL	TID	μrad- 10 krad	Wide range accurate, Proven	Passive, Destructive readout
Geiger	TID/Dose Rate	μrad- 500rad/hr	Wide range, Proven	Requires accumulation electronics
UVEPROM	TID	100 Mrad Sensitivity 1 rad	Permanent record (until erased), Digital, Large range, Unpowered while sensing, Easy readout	Not in Human range

## Applications:

- Space Industry
  - Federal or Commercial
  - Manned or Unmanned
  - LEO, GEO, or Interplanetary
- Nuclear Industry
  - Power Plants

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## Dosimetry Card Detailed Features:

- Radiation Measurement Sensitivity, TID  
1 Rad to 100 MRad (Si)
- Single Event Latchup (SEL) Immunity  
>70 LET (MeV\*cm<sup>2</sup>/mg)
- >100 kRad (Si) Total Dose Tolerance
- 2 Flash Devices for Characterization
- Programmable Readout (per  
minute/day/orbit/etc.)
- Built in Rad-Tolerant Digital Signal  
Processing (DSP)
- Temperature Sensor for Read  
Compensation
- Voltage Sensor for Read Compensation
- Power Supply Converts +28V Bus to  
cPCI Supplies
- RS 422 Serial Port for External  
Communications
- 64 Million Independent Radiation  
Sensors
- 100-500 Bin Granularity for Continuous  
Data
- Passive UVEPROM Sensors
- Permanent Physical Record
- Device Reprogrammable on Flight
- 32 kbit Instruction Cache, 16 kbit Data  
Cache, Each 32 Bits Wide
- Power:
  - "Read" Mode = 1 W
  - "Standby" Mode = 0 WRad Measurements Occur While  
Card is in "Standby" Mode
- Input Voltage = 5.0 V
- Compact PCI 3U Form Factor
  - 33 MHz PCI Internal and External  
(v 2.1) Bus
  - 400 kbps IIC Single Master
  - Synchronous Serial Interface
- Weight = 12 ounces
- Temperature Range
  - Operating: -15°C to +55°C
  - Storage: -40°C to +80°C
- Available with COTS or Mil Spec  
Components

Please contact Space Micro Inc for application specific configurations or further details.

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