Applications

- Stabilization
  - Satellite Communication Antennas
  - Optical Line-of-Sight Systems
  - Missile Seekers

- Controls
  - Aircraft & Missile Flight Control
  - Attitude Control
  - Yaw Dampers

- Guidance
  - Missile Mid-Course Guidance
  - Inertial/GPS Navigation Systems

- Instrumentation
  - Rocket Boosters
  - Simulation & Training Aids

Description

The BEI GyroChip™ Model QRS11 is a “MEMS” technology, solid-state “gyro on a chip.” This DC input/high-level DC output device is fully self contained, extremely small and lightweight. No external support electronics are required. Since the inertial sensing element is comprised of just one micromachined piece of crystalline quartz (no moving parts), it has a virtually “unlimited” life. The Model QRS11 is a mature product in high volume production. It is fully qualified and used on numerous advanced aircraft, missile, and space systems.

Features

- High-Performance Inertial Sensor
- Internal Electronics
- Compact, Rugged Package
- DC Input/High Level DC Output
- Long Operating Life
- Wide Bandwidth
- Over 100,000 Hours MTBF
- Fast Start-Up

Operation

The BEI GyroChip™ Model QRS11 utilizes a one piece, micromachined, vibrating quartz tuning fork sensing element. Applying the Coriolis effect, a rotational motion about the sensor’s input axis produces a DC voltage output proportional to the rate of rotation. Use of piezoelectric quartz material simplifies the active element resulting in exceptional stability over temperature and product life.
NOTES:
1. QRS1 IS SUPPLIED WITH TWO MOUNTING RINGS, MOUNTING SCREWS & MATING TEST CONNECTOR.
2. ANGULAR RATE APPLIED AS SHOWN WILL PRODUCE A POSITIVE OUTPUT (NOT MARKED ON UNIT).
3. UNIT OF MEASURE IS IN INCHES/\[\text{MM}\].
4. A DC VOLTAGE INPUT (\(\pm 4\ 0\ \text{Vdc}\) MAX.) APPLIED TO THE SELF-TEST WILL RESULT IN A CORRESPONDING PROPORTIONAL DC OUTPUT VOLTAGE.
5. TTL COMPATIBLE BIT OUTPUT SIGNAL OF \(\pm 2.4\ \text{Vdc}\) (REFERENCED TO POWER GROUND) INDICATING A PROPERLY FUNCTIONING UNIT.

### SUMMARY SPECIFICATIONS

**PARAMETER** | **QRS11-XXXXX-100** | **QRS11-XXXXX-101**
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**Part Number** | QRS11-XXXXX-100** | QRS11-XXXXX-101**
**Power Requirements** | Standard | High
**Input Voltage** | \(\pm\) 5 Vdc \(\pm 5\%\) regulation | \(\pm 2.5\ \text{Vdc}\)
**Input Current** | \(\leq 80\text{mA}\) (each supply) | \(\leq 80\text{mA}\) (each supply)
**Input Power Noise Limits** | \(< 10\ \text{mVrms}\) wideband, except at 8.7 \(\pm 0.5\ \text{KHz}\), \(< 1\ \text{mVrms}\) | \(< 10\ \text{mVrms}\) wideband, except at 8.7 \(\pm 0.5\ \text{KHz}\), \(< 1\ \text{mVrms}\)
**Performance** | Standard Ranges | High Ranges
**Scale Factor Calibration (at 22˚C)** | \(\leq 0.03\%/\text{˚C}\) | \(\leq 0.05\%/\text{˚C}\)
**Scale Factor over Temperature (Dev. from 22˚C)** | \(< 0.004\%/\text{˚C}\) | \(< 0.010\%/\text{˚C}\)
**Bias Calibration (at 22˚C)** | \(\leq 2.0’/\text{˚c}\)* | \(\leq 0.5’/\text{˚c}\)*
**Bias Variation over Temperature (Dev. from 22˚C)** | \(\leq 0.002’/\text{˚c/g}\) | \(\leq 0.005’/\text{˚c/g}\)
**Short Term Bias Stability (100 sec at const. temp)** | \(< 0.02’/\text{sec}\) | \(< 0.02’/\text{sec}\)
**Long Term Bias Stability (1 year)** | \(< 0.2’/\text{sec}\) | \(< 0.2’/\text{sec}\)
**G Sensitivity** | \(< 0.02’/\text{sec/g}\) | \(< 0.02’/\text{sec/g}\)
**Start-Up Time** | \(< 1\ \text{sec}\) | \(< 1\ \text{sec}\)
**Bandwidth (-90˚)** | \(> 60\ \text{Hz}\) | \(> 60\ \text{Hz}\)
**Non-Linearity** | \(\leq 0.05’\%\) of F.R. | \(\leq 0.05’\%\) of F.R.
**Threshold/Resolution** | \(\leq 0.004’/\text{sec}\)* | \(\leq 0.010’/\sqrt{\text{Hz}}\)*
**Output Noise (DC to 100Hz)** | \(< 0.010’/\text{sec/\sqrt{Hz}}\) | \(< 0.010’/\text{sec/\sqrt{Hz}}\)
**Operating Life** | 10 years, typical | 10 years, typical

**Environments**

- **Operating Temperature** | \(-40˚C\) to \(+80˚C\) | \(-55˚C\) to \(+100˚C\)
- **Storage Temperature** | \(-55˚C\) to \(+100˚C\) | \(-55˚C\) to \(+100˚C\)
- **Vibration Operating** | 8 \(g\text{rms}\) 20 Hz to 2 KHz random (Consult factory for other vibration level requirements) | 8 \(g\text{rms}\) 20 Hz to 2 KHz random, 5 minutes/axis
- **Shock** | 200 g, any axis | 200 g, any axis
- **Weight** | \(< 60\ \text{grams}\) | \(< 60\ \text{grams}\)

**AVAILABLE OPTIONS**

- Special Ranges
- Low Noise
- Extended Bandwidth
- Flying Leads

*Values indicated for \(\pm 100’/\text{sec}\) range. **“XXXX” designates \(\pm\) range.

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