

**Radiation Hardened Low Noise Quad Operational Amplifier**

The HS-5104ARH is a radiation hardened, monolithic quad operational amplifier that provides highly reliable performance in harsh radiation environments. Its excellent noise characteristics coupled with an unique array of dynamic specifications make this amplifier well-suited for a variety of satellite system applications. Dielectrically isolated, bipolar processing makes this device immune to Single Event Latch-Up.

The HS-5104ARH shows almost no change in offset voltage after exposure to 100kRAD(Si) gamma radiation, with only a minor increase in current. Complementing these specifications is a post radiation open loop gain in excess of 40K.

This quad operational amplifier is available in an industry standard pinout, allowing for immediate interchangeability with most other quad operational amplifiers.

**Specifications for Rad Hard QML devices are controlled by the Defense Supply Center in Columbus (DSCC). The SMD numbers listed here must be used when ordering.**

**Detailed Electrical Specifications for these devices are contained in SMD 5962-95690. A "hot-link" is provided on our homepage for downloading.**  
<http://www.intersil.com/spacedefense/space.htm>

**Features**

- Electrically Screened to SMD # 5962-95690
- QML Qualified per MIL-PRF-38535 Requirements
- Radiation Environment
  - Gamma Dose ( $\gamma$ ) .....  $1 \times 10^5$ RAD(Si)
- Low Noise
  - At 1kHz .....  $4.3nV/\sqrt{Hz}$  (Typ)
  - At 1kHz .....  $0.6pA/\sqrt{Hz}$  (Typ)
- Low Offset Voltage ..... 3.0mV (Max)
- High Slew Rate ..... 2.0V/ $\mu$ s (Typ)
- Gain Bandwidth Product ..... 8.0MHz (Typ)

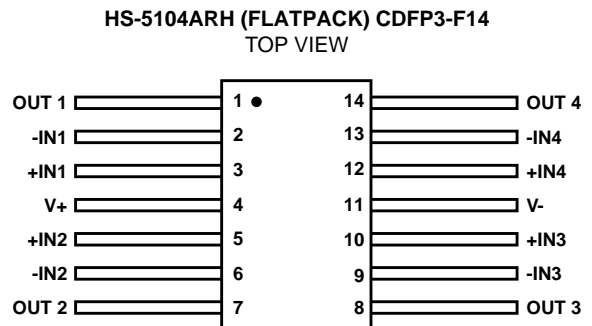
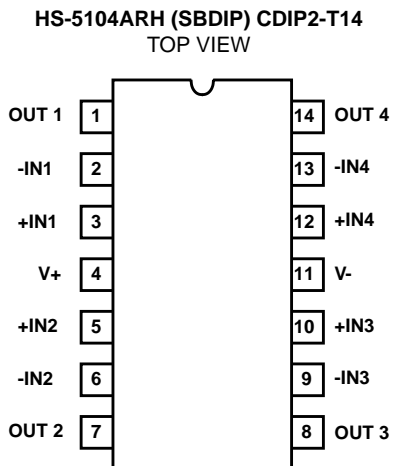
**Applications**

- High Q, Active Filters
- Voltage Regulators
- Integrators
- Signal Generators
- Voltage References
- Space Environments

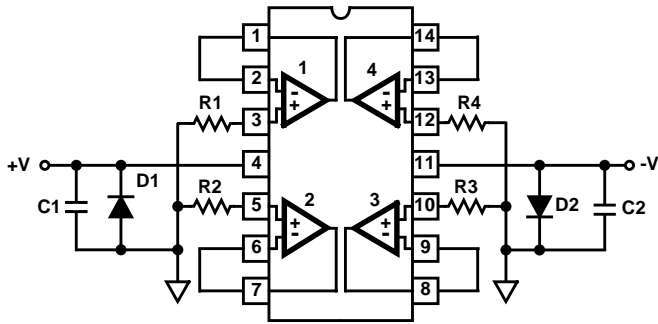
**Ordering Information**

ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)
5962R9569001V9A	HS0-5104ARH-Q	25
5962R9569001VCC	HS1-5104ARH-Q	-55 to 125
5962R9569001VXC	HS9-5104ARH-Q	-55 to 125
HS1-5104ARH/PROTO	HS1-5104ARH/PROTO	-55 to 125

**Pinouts**



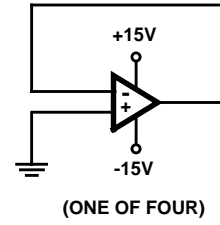
**Burn-In Circuit**



NOTES:

1. R1 = R2 = R3 = R4 = 1MW, 5%, 1/4W (Min)
2. C1 = C2 = 0.01 $\mu$ F/Socket (Min) or 0.1 $\mu$ F/Row (Min)
3. D1 = D2 = IN4002 or Equivalent/Board
4. |(V+) - (V-)| = 31V  $\pm$ 1V

**Irradiation Circuit**



(ONE OF FOUR)

NOTES:

5. +V = 15V
6. -V = -15V
7. Group E Sample Size = 4 Die Per Wafer

**Die Characteristics**

**DIE DIMENSIONS:**

95 mils x 99 mils x 19 mils ±1 mils  
(2420µm x 2530µm x 483µm ±25.4µm)

**INTERFACE MATERIALS:**

**Glassivation:**

Type: Nitride (Si3N4) over Silox (SiO2, 5% Phos.)  
Silox Thickness: 12kÅ ±2kÅ  
Nitride Thickness: 3.5kÅ ±1.5kÅ

**Top Metallization:**

Type: Al, 1% Cu  
Thickness: 16kÅ ±2kÅ

**Substrate:**

Bipolar Dielectric Isolation

**Backside Finish:**

Silicon

**ASSEMBLY RELATED INFORMATION:**

**Substrate Potential (Powered Up):**

Unbiased

**ADDITIONAL INFORMATION:**

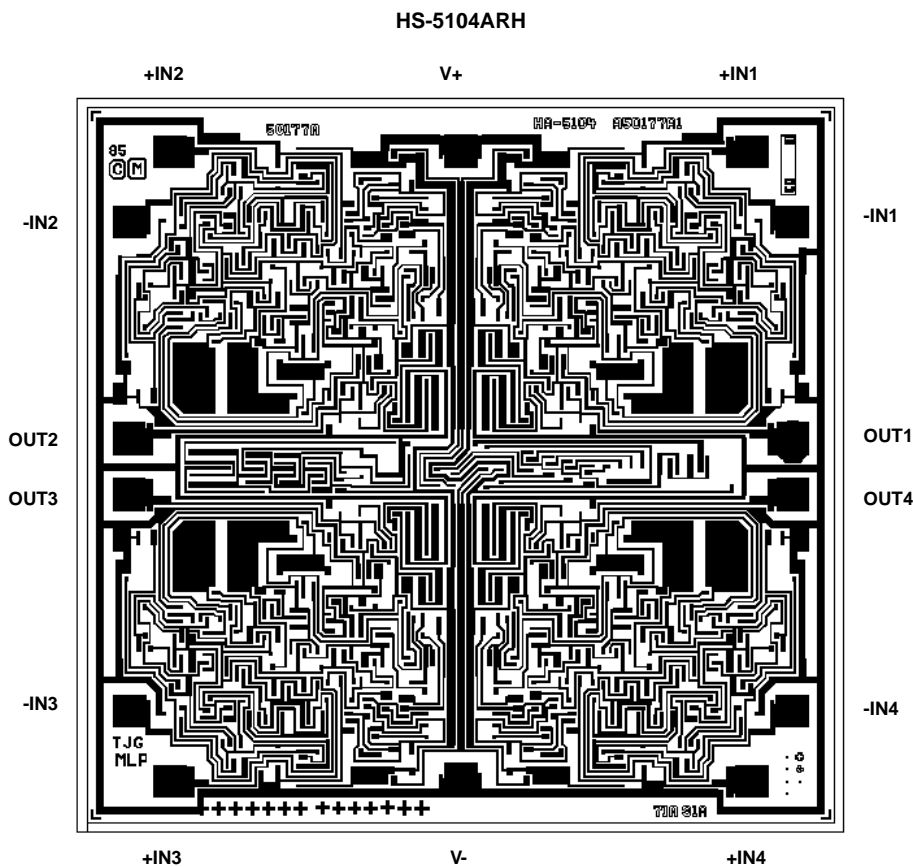
**Worst Case Current Density:**

<2.0 x 10<sup>5</sup> A/cm<sup>2</sup>

**Transistor Count:**

175

**Metallization Mask Layout**



All Intersil semiconductor products are manufactured, assembled and tested under **ISO9000** quality systems certification.

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