

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 (γ) 1×10^5 RAD(Si)
- Low Noise
 - At 1kHz $4.3\text{nV}/\sqrt{\text{Hz}}$ (Typ)
 - At 1kHz $0.6\text{pA}/\sqrt{\text{Hz}}$ (Typ)
- Low Offset Voltage 3.0mV (Max)
- High Slew Rate $2.0\text{V}/\mu\text{s}$ (Typ)
- Gain Bandwidth Product 8.0MHz (Typ)

Applications

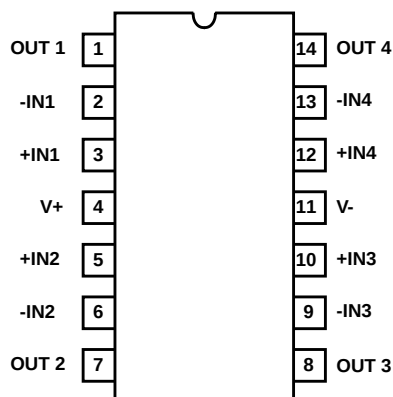
- High Q, Active Filters
- Voltage Regulators
- Integrators
- Signal Generators
- Voltage References
- Space Environments

Ordering Information

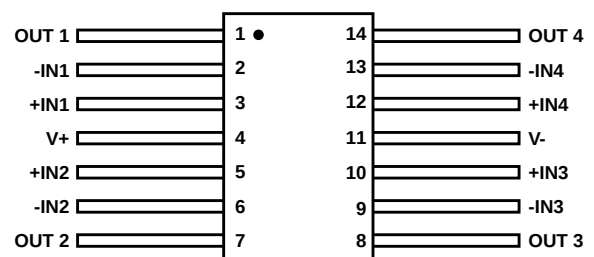
ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)
5962R9569001V9A	HS0-5104ARH-Q	25
5962R9569001VCC	HS1-5104ARH-Q	-55 to 125
5962R9569001VXC	HS9-5104ARH-Q	-55 to 125
HS1-5104ARH/PROTO	HS1-5104ARH/PROTO	-55 to 125

Pinouts

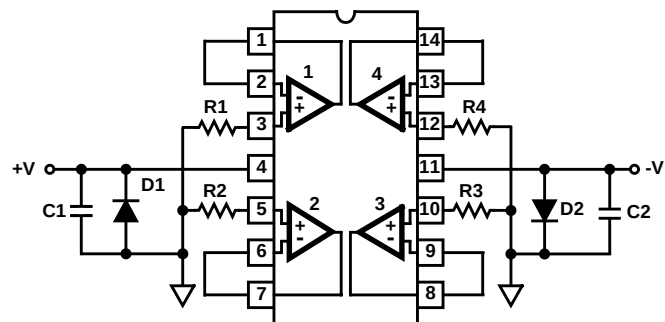
HS-5104ARH (SBDIP) CDIP2-T14
TOP VIEW



HS-5104ARH (FLATPACK) CDFP3-F14
TOP VIEW



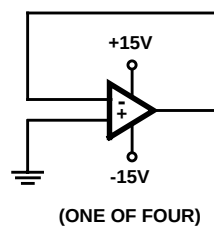
Burn-In Circuit



NOTES:

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

Irradiation Circuit



NOTES:

5. $+V = 15\text{V}$
6. $-V = -15\text{V}$
7. Group E Sample Size = 4 Die Per Wafer

Die Characteristics

DIE DIMENSIONS:

95 mils x 99 mils x 19 mils ± 1 mils
(2420 μ m x 2530 μ m x 483 μ m $\pm 25.4\mu$ m)

INTERFACE MATERIALS:

Glassivation:

Type: Nitride (Si₃N₄) over Silox (SiO₂, 5% Phos.)
Silox Thickness: 12k $\text{\AA}$ ± 2 k $\text{\AA}$
Nitride Thickness: 3.5k $\text{\AA}$ ± 1.5 k $\text{\AA}$

Top Metallization:

Type: Al, 1% Cu
Thickness: 16k $\text{\AA}$ ± 2 k $\text{\AA}$

Substrate:

Bipolar Dielectric Isolation

Backside Finish:

Silicon

ASSEMBLY RELATED INFORMATION:

Substrate Potential (Powered Up):

Unbiased

ADDITIONAL INFORMATION:

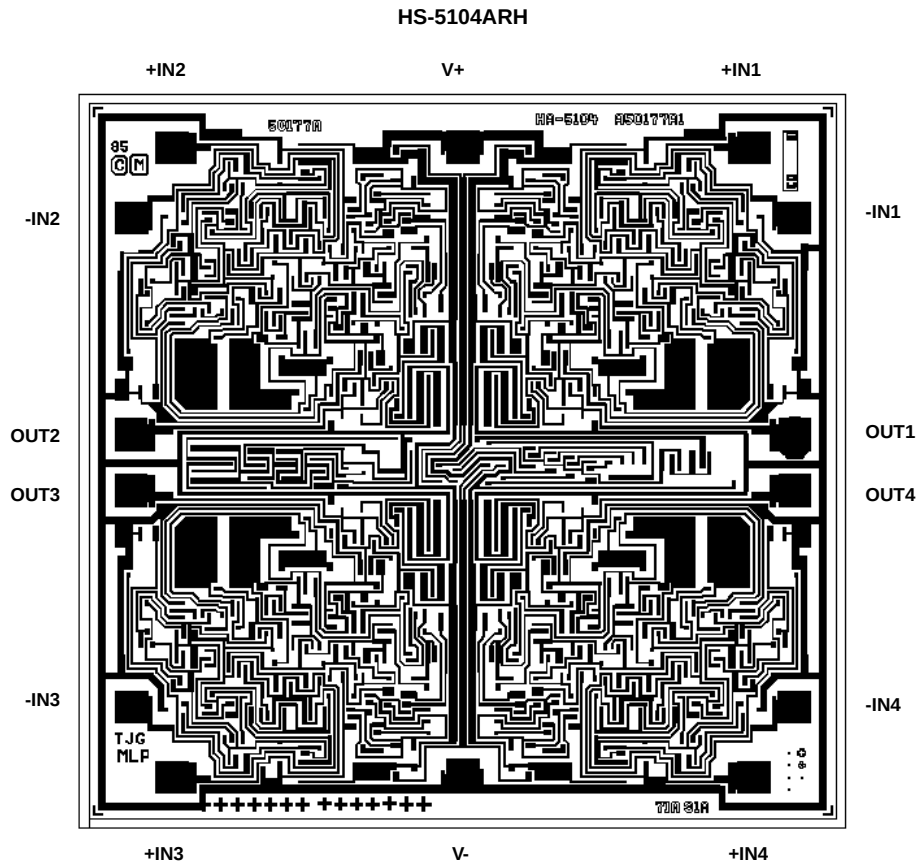
Worst Case Current Density:

$< 2.0 \times 10^5 \text{ A/cm}^2$

Transistor Count:

175

Metallization Mask Layout



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

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