

**Radiation Hardened PRAM Four Channel Programmable Operational Amplifier**

HS-2400RH is a four-channel programmable amplifier providing a level of versatility unsurpassed by any other monolithic operational amplifier. Versatility is achieved by employing four input amplifier channels, any one (or none) of which may be electronically selected and connected to a single output stage through DTL/TTL compatible address inputs. The device formed by the output and the selected pair of inputs is an op amp which delivers excellent slew rate, gain bandwidth and power bandwidth performance. Other advantageous features for these dielectrically isolated amplifiers include high voltage gain and input impedance coupled with low input offset voltage and offset current. External compensation is not required on this device at closed loop gains greater than 10.

Each channel of the HS-2400RH can be controlled and operated with suitable feedback networks in any of the standard op amp configurations. This specialization makes these amplifiers excellent components for multiplexing signal selection and mathematical function designs. With 20V/μs slew rate, 20MHz gain bandwidth and low input bias currents make these devices ideal building blocks for signal generators, active filters and data acquisition designs. Programmability, coupled with 9mV maximum offset voltage and 50nA offset current, make these amplifiers outstanding components for signal conditioning circuits.

**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 5962-95684. A "hot-link" is provided on our homepage for downloading. <http://www.intersil.com/spacedefense/space.htm>

**Ordering Information**

ORDERING NUMBER	INTERNAL MKT. NUMBER	TEMP. RANGE (°C)
5962D9568401VEA	HS1-2400RH-Q	-55 to 125

**Features**

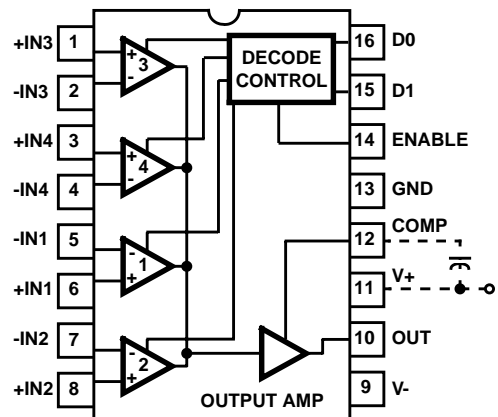
- Electrically Screened to SMD # 5962-95684
- QML Qualified per MIL-PRF-38535 Requirements
- Total GAMMA Dose . . . . .10k RAD(SI)
- Digital Programmability
- High Rate Slew
  - Uncompensated . . . . .20V/μs Min
  - Compensated . . . . .6V/μs Min
- Wide Gain Bandwidth
  - Uncompensated . . . . .20MHz Min
  - Compensated . . . . .4MHz Min
- High Gain . . . . .50kV/V Min
- Low Offset Current . . . . .50nA Max
- Single Capacitor Compensation for Unity Gain
- DTL/TTL Compatible Inputs

**Applications**

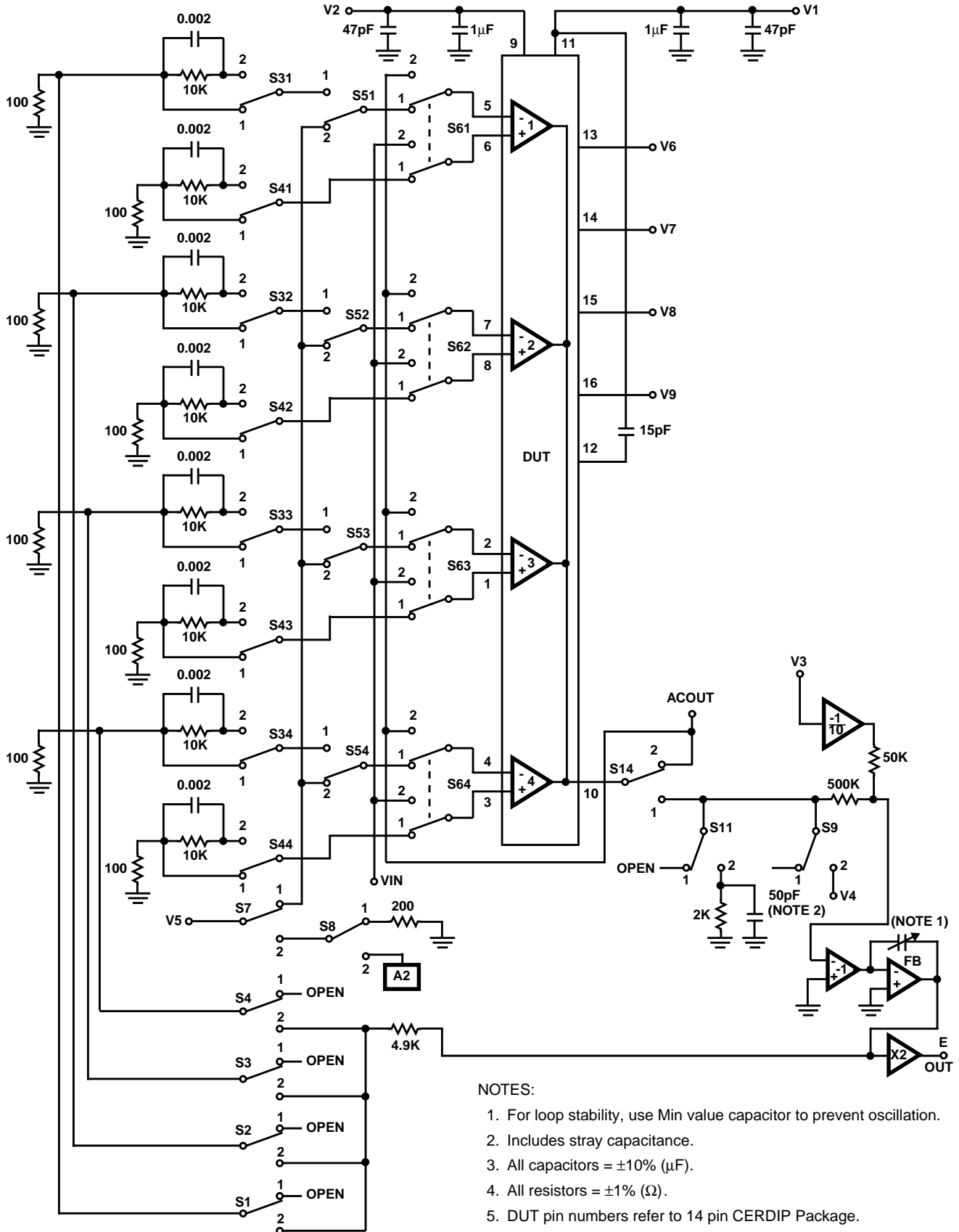
- Signal Selection/Multiplexing
- Operational Amplifier Gain Stage
- Oscillator Frequency
- Filter Characteristics
- Add-Subtract Functions
- Integrator Characteristics
- Comparator Levels

**Pinout**

16 LEAD CERAMIC DUAL-IN-LINE FRIT SEAL PACKAGE (CERDIP) MIL-STD-1835 GDIP-T16 TOP VIEW

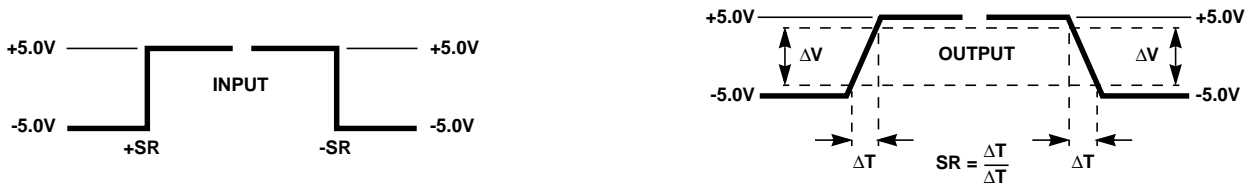


Test Circuit

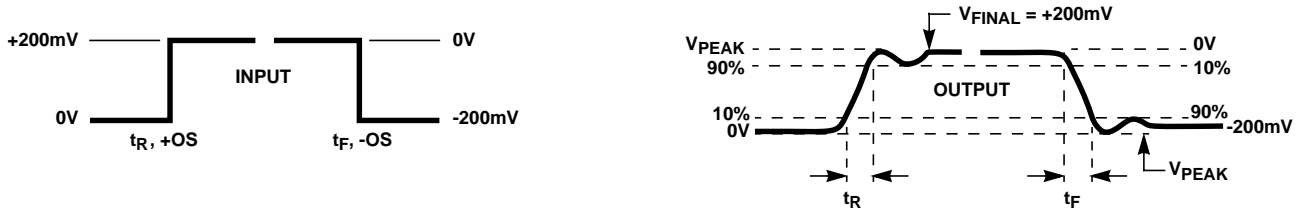


- NOTES:
1. For loop stability, use Min value capacitor to prevent oscillation.
  2. Includes stray capacitance.
  3. All capacitors =  $\pm 10\%$  ( $\mu F$ ).
  4. All resistors =  $\pm 1\%$  ( $\Omega$ ).
  5. DUT pin numbers refer to 14 pin Cerdip Package.

Test Waveforms

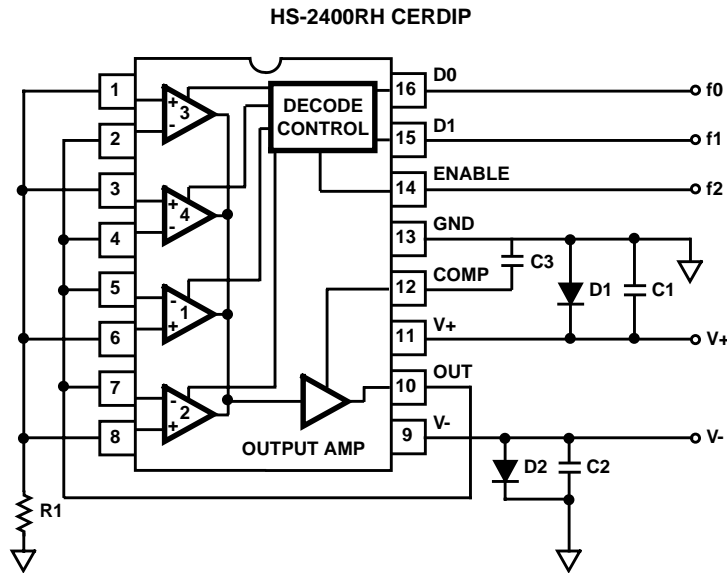


SLEW RATE WAVEFORMS



OVERSHOOT, RISE AND FALL TIME WAVEFORMS

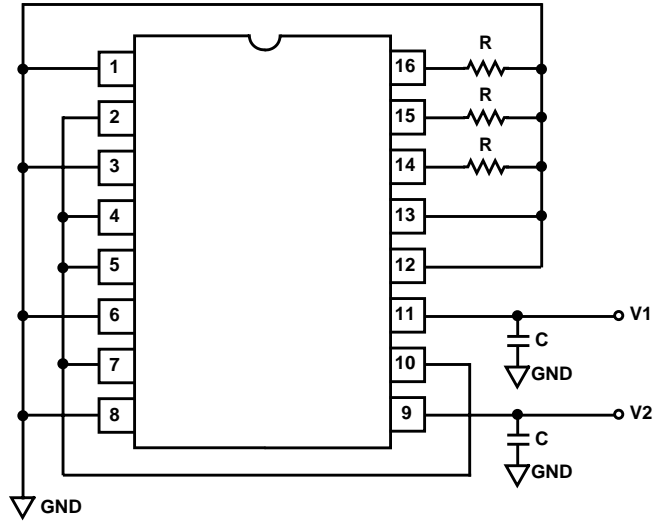
Burn-In Circuit



NOTES:

6. R1 = 100kΩ/Socket, 5%, 1/4W (Min).
7. C1 = C2 = 0.01μF/Socket (Min) or 0.1μF/Row (Min).
8. C3 = 0.001μF/Socket, 10%.
9. D1 = D2 = 1N4002 or equivalent (per board).
10. |(V+) - (V-)| = 30V.
11. Duty Cycle 50% for: f0 = 100kHz, f1 = 50kHz, f2 = 25kHz.

**Irradiation Circuit**

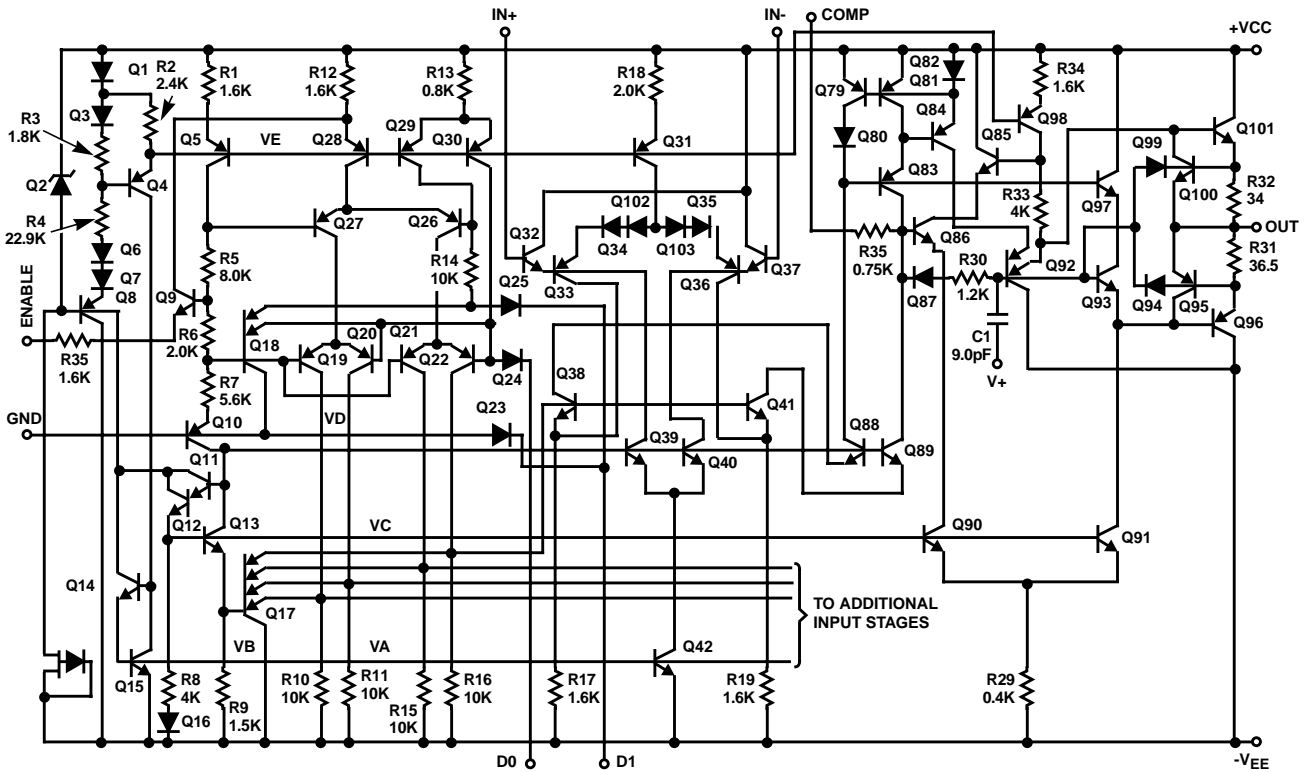


NOTES:

- 12. V1 = +15V.
- 13. V2 = -15V.

- 14. R = 1 Meg  $\Omega$ .
- 15. C = 0.1 $\mu$ F.

**Schematic Diagram**



NOTE:

- 16. Diagram Includes: One Input Stage, Decode Control, Bias Network, and Output Stage.

**Die Characteristics**

**DIE DIMENSIONS:**

88 mils x 67 mils x 19 mils ±1 mils  
 2240µm x 1710µm x 483µm ±25.4µm

**INTERFACE MATERIALS:**

**Top Metallization:**

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

**Glassivation:**

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

**Substrate: Potential (Powered Up)**

Unbiased

**ADDITIONAL INFORMATION:**

**Worst Case Current Density:**

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

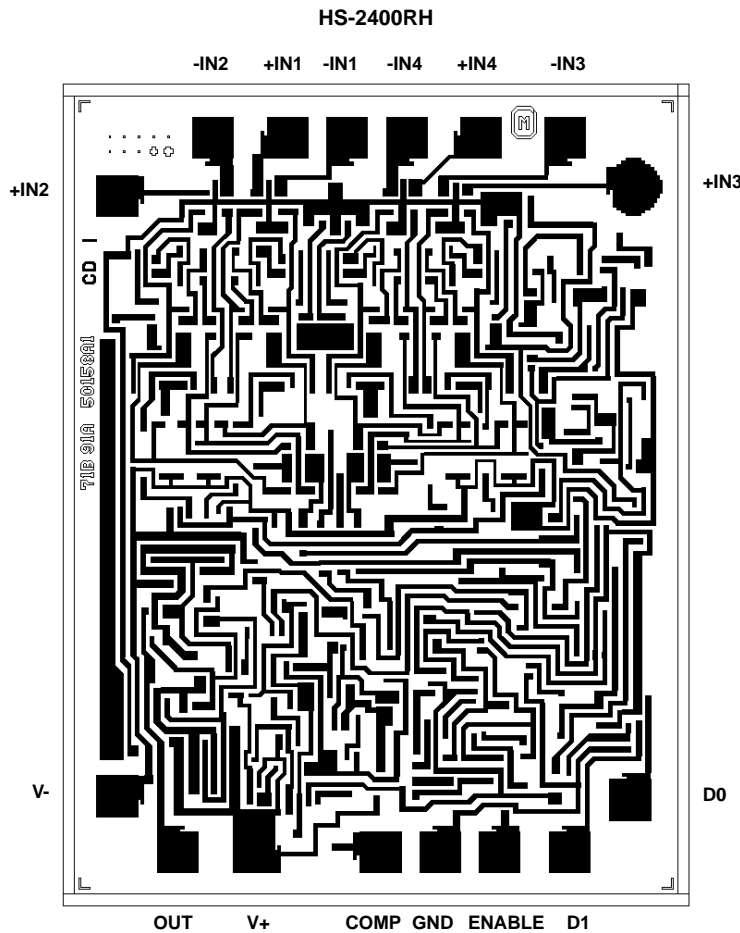
**Transistor Count:**

251

**Process:**

Bipolar Dielectric Isolation

**Metallization Mask Layout**



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

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