



HARRIS
SEMICONDUCTOR
PRODUCTS DIVISION
A DIVISION OF HARRIS CORPORATION

HA-2620-1

*High Temperature, Wide Band,
High Impedance Operational
Amplifier*

JUNE 1980

FEATURES

- CHARACTERIZED TO 250°C
- GUARANTEED FOR OPERATION AT 200°C
- WIDE BANDWIDTH
- HIGH INPUT IMPEDANCE
- LOW INPUT BIAS CURRENT
- LOW INPUT OFFSET CURRENT
- LOW INPUT OFFSET VOLTAGE
- HIGH GAIN

APPLICATIONS

- OIL WELL-LOGGING
- GEOTHERMAL WELL-LOGGING
- INDUSTRIAL PROCESS CONTROL
- ENGINE TESTING AND CONTROL

DESCRIPTION

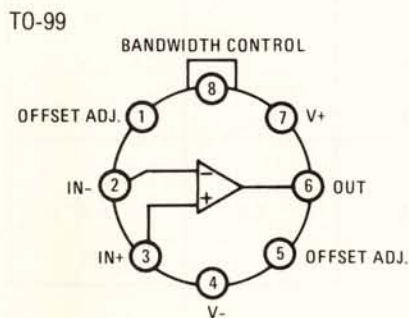
The HA-2620 is an uncompensated bipolar operational amplifier that features very high input impedance (500 M Ω) coupled with wideband AC performance. The high resistance of the input stage is complemented by low offset voltage (6mV) and low bias and offset currents (30nA) at 200°C to facilitate accurate signal processing. High gain bandwidth product, slew rate, and open loop gain allows the 2620 to perform high-gain amplification of fast wideband signals.

With the HA-2620-1 configuration Harris offers a device that has been characterized up to 250°C and life-tested at 200°C.

A final electrical test at 200°C is also included in the process flow.

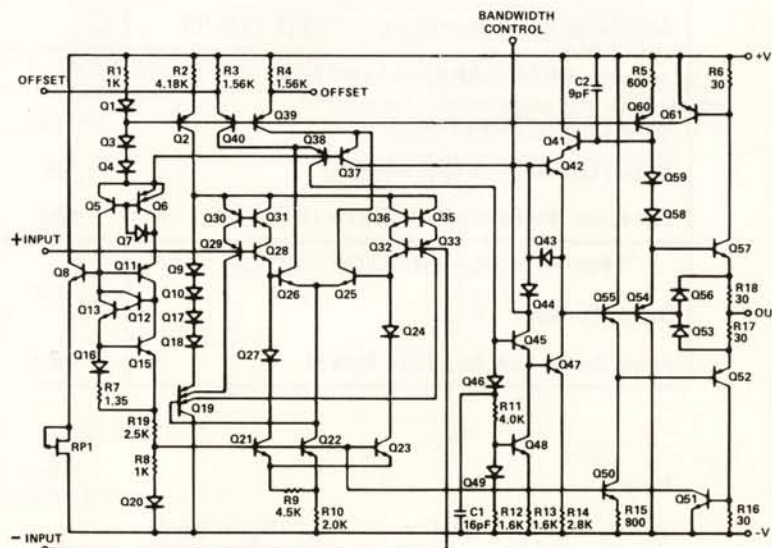
This amplifier is ideal for high temperature applications such as oil and geothermal well-logging, industrial process control, engine control, etc.

PINOUT



CASE CONNECTED TO V-

SCHEMATIC



SPECIFICATIONS

ABSOLUTE MAXIMUM RATINGS

| | |
|-------------------------------------|--|
| Voltage Between V+ and V- Terminals | 45.0V |
| Differential Input Voltage | $\pm 12.0V$ |
| Peak Output Current | Full Short Circuit Protection |
| Internal Power Dissipation | 145mW at 200°C |
| Operating Temperature Range | $0^{\circ}C \leq T_A \leq +200^{\circ}C$ |
| Storage Temperature Range | $-65^{\circ}C \leq T_A \leq +200^{\circ}C$ |
| Maximum Junction Temperature | 220°C |

ELECTRICAL CHARACTERISTICS

$V_+ = +15V$ DC, $V_- = -15V$ DC

| HA-2620-1 Specifications at $T = +200^{\circ}C$ unless otherwise noted | | | | |
|--|------------|------------|-----|-------------------|
| PARAMETER | MIN | TYP | MAX | UNITS |
| INPUT CHARACTERISTICS | | | | |
| Offset Voltage | | 2 | 6 | mV |
| Offset Voltage Average Drift | | 5 | | $\mu V/^{\circ}C$ |
| Bias Current | | 10 | 35 | nA |
| Offset Current | | 5 | 35 | nA |
| Input Resistance ($T = +25^{\circ}C$) | 100 | 500 | | $m\Omega$ |
| Common Mode Range | ± 11.0 | | | V |
| TRANSFER CHARACTERISTICS | | | | |
| Large Signal Voltage Gain (Notes 1, 4) | 50K | | | V/V |
| Common Mode Rejection Ratio (Note 2) | 80 | 100 | | dB |
| Gain Bandwidth Product (Notes 1, 3, 6) ($T = +25^{\circ}C$) | | 100 | | MHz |
| OUTPUT CHARACTERISTICS | | | | |
| Output Voltage Swing (Note 1) | ± 10.0 | ± 12.0 | | V |
| Output Current (Note 4) ($T = +25^{\circ}C$) | ± 15 | ± 22 | | mA |
| Full Power Bandwidth (Note 4) ($T = +25^{\circ}C$) | 400 | 600 | | kHz |
| POWER SUPPLY CHARACTERISTICS | | | | |
| Supply Current | | 3.0 | 4.0 | mA |
| Power Supply Rejection Ratio (Note 5) | 80 | 90 | | dB |

Notes:

- $R_L = 2k$, $C_L = 50pF$
- $V_{cm} = \pm 10.0V$
- $V_O < 90mV$
- $V_O = \pm 10V$
- $V_S = \pm 9.0V$ to $\pm 15V$
- 40dB Gain

PERFORMANCE CURVES

$V_+ = 15V$ DC, $V_- = -15V$ DC, $T_A = +200^\circ\text{C}$ UNLESS OTHERWISE STATED

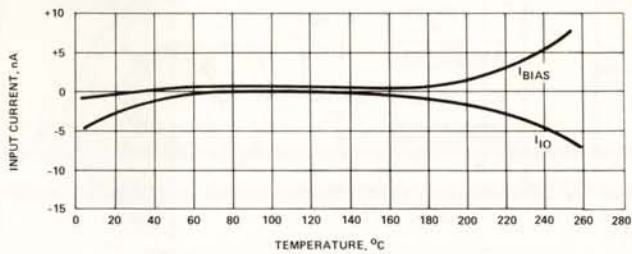


FIGURE 1. BIAS AND OFFSET CURRENT VERSUS TEMPERATURE

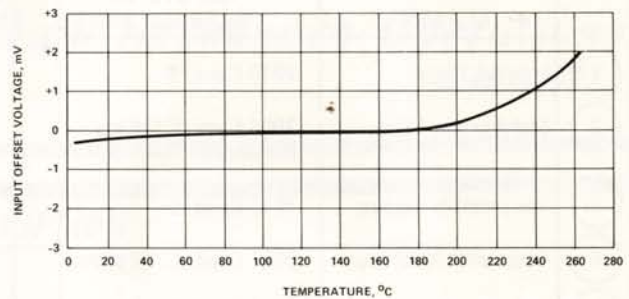


FIGURE 2. INPUT OFFSET VOLTAGE VERSUS TEMPERATURE

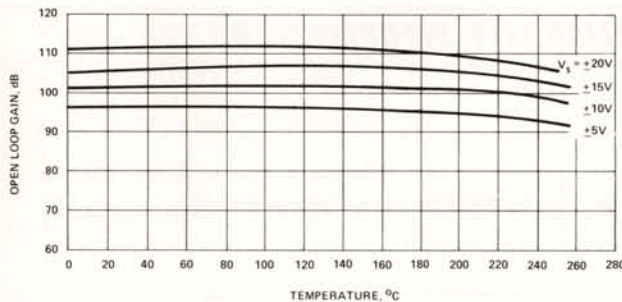


FIGURE 3. OPEN LOOP GAIN VERSUS TEMPERATURE

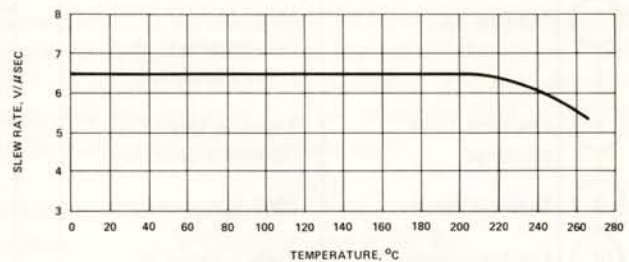


FIGURE 4. SLEW RATE VERSUS TEMPERATURE

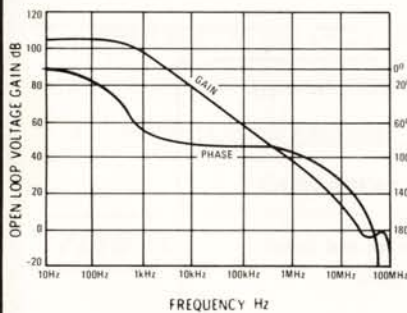


FIGURE 5. OPEN LOOP FREQUENCY AND PHASE RESPONSE

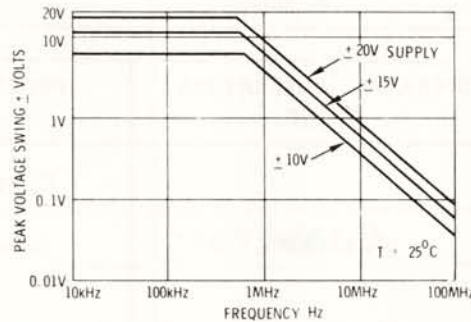
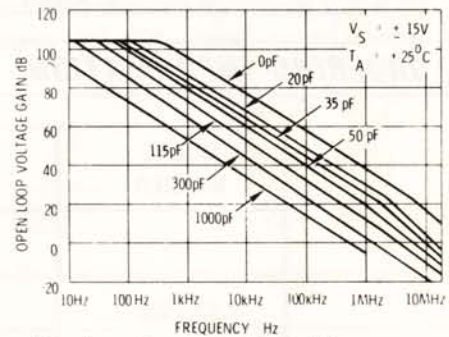


FIGURE 6. OUTPUT VOLTAGE SWING VERSUS FREQUENCY



Note: External Compensation is Required For Closed Loop Gain ≤ 5 . If External Compensation is Used, Also Connect 100 pF Capacitor From Output to Ground.

FIGURE 7. OPEN-LOOP FREQUENCY RESPONSE FOR VARIOUS VALUES OF CAPACITORS FROM BANDWIDTH CONTROL PIN TO GROUND

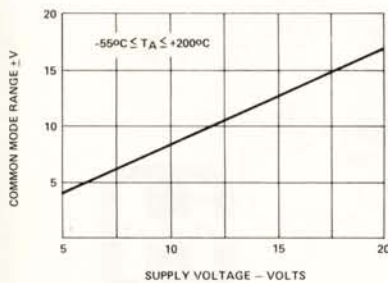


FIGURE 8. COMMON MODE VOLTAGE RANGE AS A FUNCTION OF SUPPLY VOLTAGE

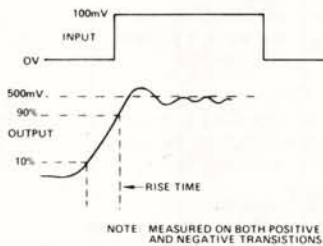


FIGURE 9. TRANSIENT RESPONSE

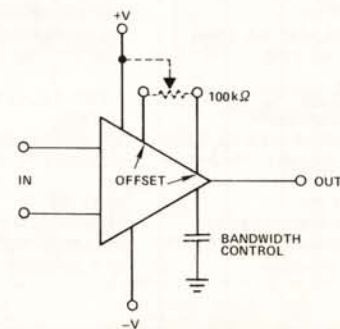


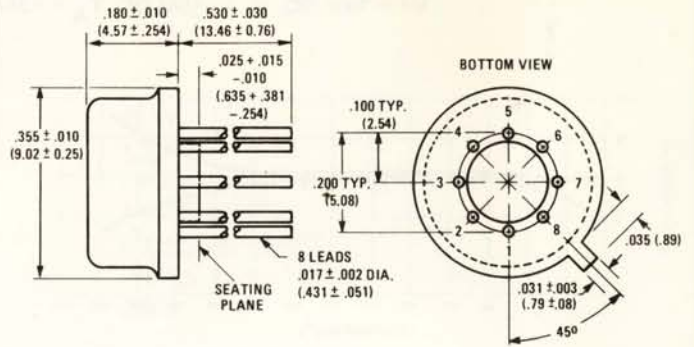
FIGURE 10. SUGGESTED OFFSET ZERO ADJUST HOOKUP

DASH 1 PRODUCT FLOW

PACKAGE

HARRIS SEMICONDUCTOR DASH 1 PRODUCT FLOW 100% SCREENING PROCEDURE

| | SCREEN | MIL-STD-883 METHOD/COND |
|----|--------------------------|---|
| 1 | Internal Visual | 2010 Cond. B |
| 2 | Stabilization Bake | 1008 Cond. C (24 hrs. minimum) |
| 3 | Temperature Cycling | 1010 Cond. C |
| 4 | Constant Acceleration | 2001 Cond. E; Y1 plane |
| 5 | Seal: A Fine B Gross | 1014 Cond. A or B 1014 Cond. C |
| 6 | Initial Electrical | Harris Specifications |
| 7 | Burn-In Test | 1015, 160 hrs. @ 125°C (or equivalent) (Burn-In circuits enclosed) |
| 8 | Electrical 100% go-no-go | Tested at Worst Case Operating Conditions |
| 9 | External Visual | 2009 Sample Inspection |
| 10 | Lot Acceptance | Table I, Group A Elect. Tests |
| 11 | Final Electrical | Harris Specifications @ +200°C |



1. All dimensions in inches; millimeters are shown in parentheses.
2. All dimensions $\pm .010$ (± 0.25 mm) unless otherwise shown.

RELIABILITY INFORMATION

Life test data for HA2620-1 is available in Reliability Bulletin 137

ORDERING INFORMATION

| MODEL NUMBER | OPERATING TEMPERATURE RANGE | PRODUCT DESCRIPTION |
|--------------|-----------------------------|--|
| HA2-2620-1 | 0°C to +200°C | HI-Rel Integrated Circuit Characterized and tested at 200°C |

SALES OFFICES

1503 SO. COAST DRIVE
SUITE 320
COSTA MESA, CA. 92626
(714) 540-2176

SUITE 115
2020 WEST McNAB ROAD
FT. LAUDERDALE, FL. 33309
(305) 971-3200

SUITE 273
555 BROAD HOLLOW ROAD
MELVILLE, N.Y. 11747
(516) 249-4500

17120 DALLAS PARKWAY
DALLAS, TX. 75248
(214) 934-4237

SUITE 300
625 ELLIS STREET
MOUNTAIN VIEW, CA. 94043
(415) 964-6443

415 WEST GOLF ROAD
SUITE 19
ARLINGTON HEIGHTS, IL. 60005
(312) 437-4712

SUITE 206
5250 FAR HILLS AVE.
KETTERING, OH. 45429
(513) 433-5770

33919 NINTH AVE. SOUTH
FEDERAL WAY, WA. 98003
(206) 838-4878

SUITE 227
21243 VENTURA BLVD.
WOODLAND HILLS, CA. 91364
(213) 992-0686

SUITE 301
177 WORCESTER STREET
WELLESLEY HILLS, MA. 02181
(617) 237-5430

SUITE 325
650 E. SWEDES FORD ROAD
WAYNE, PA. 19087
(215) 687-6680



HARRIS
SEMICONDUCTOR
PRODUCTS DIVISION
A DIVISION OF HARRIS CORPORATION

NOTICE: Harris Semiconductor's products are sold by description only. Harris Semiconductor reserves the right to make changes in circuit design and/or specifications at any time without notice. Accordingly, the reader is cautioned to verify that data sheets are current before placing orders.