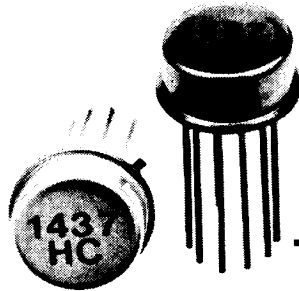




HyComp, Inc.



HC1437

Fast-Settling Operational Amplifier

FEATURES

- Clean settling
- Easy compensation
- True differential inputs
- ± 20 mA output
- FET inputs
- 350 MHz GBW product

DESCRIPTION

The HC1437 high-speed operational amplifier provides an exceptionally clean, fast-settling pulse response, with the notable absence of such undesirable phenomena as high-frequency ringing and long thermal tails. Its classic, straightforward design does not use speed-enhancing (but difficult-to-compensate) feedforward techniques — it is thus easy to compensate with a single external capacitor. The clean settling characteristics make the HC1437 ideally suited for such demanding applications as current-DAC output amplifiers and low-glitch, high-speed video processing.

The use of a single thin-film substrate—incorporating all ultra-stable nickel-chromium resistors—in the HC1437's construction ensures excellent tracking characteristics (over temperature and with life) for all circuit elements. A functional laser trim before package sealing gives the HC1437 its low (± 0.5 mV) initial-offset characteristic. The same high-reliability construction techniques are used for both industrial and military versions, assuring the user of complete confidence in using the HC1437 for the most rigorous applications.

APPLICATIONS

- IDAC outputs
- Pulse amplifiers
- Digital signal processing
- Video signal treatment
- Fast transients
- ADC buffers

Fast-settling amplifiers such as the HC1437 are needed, for example, for current-to-voltage conversions encountered with a variety of high-speed, current-output DACs. One example is the industry-standard, 50-nsec-settling, ECL-configured HC4000. An HC4000/HC1437 combination typically provides 155 nsec settling time to within a ± 1 LSB error band: an impressive figure for a 12-bit DAC. Moreover, the clean-settling HC1437 contributes no degradation to this DAC's exceptionally low-glitch output.

The FET input stage provides high input impedance ($10^9 \Omega$), wide ± 12 V common-mode range and low (200 pA) driver-circuit loading. Open-loop gain is a guaranteed 88 dB with the full ± 20 mA rated load. An enhanced-output version — Model HC1438, housed in a TO-8 package will provide a fully guaranteed ± 50 mA output.

The HC1437 is housed in a hermetically sealed 8-pin TO-78 package. The full MIL-temperature model (suffix: -883) receives complete MIL-STD-883B screening, including pre-seal visual inspection, acceleration, stabilization bake, gross- and fine-leak tests and 160 hours operating burn-in.

HC1437 FAST-SETTLING OPERATIONAL AMPLIFIER

ABSOLUTE MAXIMUM RATINGS (all models unless otherwise noted)

| | |
|-------------------------------------|-------------------|
| Supply Voltage | ± 20V |
| Differential Input Voltage | ± 20V |
| Operating Temperature | |
| HC1437 | 0°C to + 70°C |
| HC1437-883 | – 55°C to + 125°C |
| Storage Temperature | – 65°C to + 150°C |
| Lead Soldering Temperature (10 sec) | 300°C |

ORDERING INFORMATION

| | |
|---|------------|
| PART NUMBER | HC1437-883 |
| Model Selection | |
| Add "–883" for Screening to MIL-STD-883B, | |
| Method 5008 | |

EXAMPLES

0°C to + 70°C Operation: HC1437
 – 55°C to + 125°C Operation;
 MIL-STD-883B Screening: HC1437-883

SPECIFICATIONS (25°C, ± 15V supplies, 500Ω load unless otherwise noted)

| MODEL | HC1437 | | | HC1437-883 | | | UNITS |
|------------------------------------|--------|-----------------|------|------------|-----------------|-------|---------|
| | MIN | TYP | MAX | MIN | TYP | MAX | |
| Input Characteristics | | | | | | | |
| Common Mode for Rated Specs | | ± 12 | | ± 10 | ± 12 | | Volts |
| Common Mode Rejection Ratio | | 78 | | 60 | 78 | | dB |
| Power Supply Rejection Ratio | | 76 | | | 76 | | dB |
| Differential Input Resistance | | 10 ⁶ | | | 10 ⁶ | | MΩ |
| Differential Input Capacitance | | 3 | | | 3 | | pF |
| Bias Current | | ± 200 | | | ± 200 | | pA |
| Bias Current Drift | | (1) | | | (1) | | pA |
| Offset Current | | ± 20 | | | ± 20 | | pA |
| Offset Voltage (untrimmed) | | ± 0.5 | | | ± 0.5 | ± 1 | mV |
| Offset Voltage Drift (unloaded) | | ± 15 | | | ± 15 | ± 50 | μV/°C |
| Output Characteristics | | | | | | | |
| Peak Voltage | | ± 12 | | ± 10 | ± 12 | | Volts |
| Peak Current (2) | | ± 24 | | ± 20 | ± 24 | | mA |
| Voltage Gain (10 Hz) | | 95 | | 88 | 95 | | dB |
| Impedance (open-loop) | | 90 | | | 90 | | Ω |
| Short Circuit Current | | 50 | | | 50 | | mA |
| Noise (referred to input) | | | | | | | |
| 0.1 Hz to 100 Hz | | 4 | | | 4 | | μV p-p |
| | | 0.5 | | | 0.5 | | μV RMS |
| 100 Hz to 10kHz | | 5 | | | 5 | | μV p-p |
| | | 1 | | | 1 | | μV RMS |
| 10 kHz to 1MHz | | 50 | | | 50 | | μV p-p |
| | | 6 | | | 6 | | μV RMS |
| Dynamic Characteristics | | | | | | | |
| Gain-Bandwidth Product (3) | | 350 | | | 350 | | MHz |
| Unity-Gain Bandwidth | | 40 | | | 40 | | MHz |
| Full-Power Bandwidth | | | | | | | |
| (0 pF compensation) | | 6 | | | 6 | | MHz |
| (15 pF compensation) | | 3.1 | | | 3.1 | | MHz |
| Settling Time (10V step) (4) | | | | | | | |
| to ± 1% error band | | 85 | | | 85 | | nsec |
| to ± 0.1% error band | | 110 | | | 110 | 140 | nsec |
| to ± 0.025% error band | | 150 | | | 150 | | nsec |
| Rise Time (15 pF compensation) | | 9 | | | 9 | | nsec |
| Slew Rate | | | | | | | |
| (0 pF compensation) | | 400 | | | 400 | | V/μsec |
| (15 pF compensation) | | 225 | | | 225 | | V/μsec |
| Power Supplies | | | | | | | |
| Nominal Voltage | | ± 15 | | | ± 15 | | Volts |
| Supply Range | ± 12 | | ± 20 | ± 12 | | ± 20 | Volts |
| Quiescent Current | | ± 12 | | | ± 12 | ± 15 | mA |
| Temperature Characteristics | | | | | | | |
| Operating Temperature | 0 | | + 70 | – 55 | | + 125 | °C |
| Thermal Resistance | | | | | | | |
| junction-to-ambient | | 150 | | | 150 | | °C/watt |
| junction-to-case | | 70 | | | 70 | | °C/watt |

SPECIFICATION NOTES:

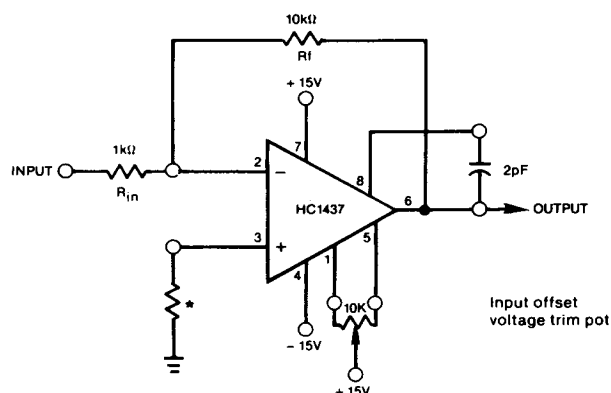
1. Doubles for every 10°C increase.
2. Indefinitely protected against short circuits (current limited to 50mA) with heat sink applied. 10-second max short circuit allowed with no heat sink. Heat sink recommended-Wakefield Eng. models 205-CB and 204-CB.

3. Measured at 10MHz; no compensation.
4. Consult factory for settling-time test circuit.

HC1437 FAST-SETTLING OPERATIONAL AMPLIFIER

Inverting Gain of-10-Amplifier

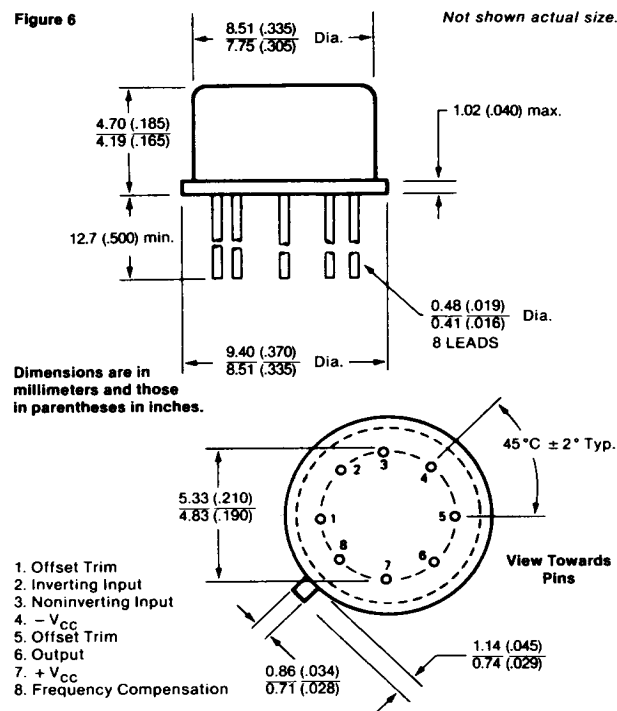
Figure 5



* For minimum offset drift, match to total parallel resistance seen by pin 2.

Mechanical Outline: TO-78 (similar to TO-99)

Figure 6



HyComp, Inc. reserves the right to make improvements and/or changes in the specifications to their products at any time, and cannot assume responsibility for circuits shown, or represent that they are free from patent infringement.

100% Screening According to MIL-STD-883, Method 5008, Class B

| Test | Methods and Conditions | Purpose |
|------------------------|--|--|
| * Internal Visual | Method 2017 | Removes visually defective units and reduces failures due to materials, construction, and workmanship. |
| * Stabilization Bake | Method 1008, Condition C 24 hours at 150°C | Stabilizes circuit components prior to conducting further screening and testing. |
| Temperature Cycling | Method 1010, Condition C 10 cycles from -65°C +0°C to +150°C +3°C -5°C -0°C | Removes potential failures due to poor workmanship. |
| Constant Acceleration | Method 2001, Condition A Y, Axis, 5,000 g | Removes potential failures due to poor workmanship. |
| * Seal, Fine and Gross | Method 1014, Fine Leak condition A, Bomb time 2 hours at 60 psi; Leak Rate < 2×10^{-7} cc/sec; Gross Leak, Condition C, no bubbles | Ensures hermeticity. |
| Burn In | Method 1015, Condition B, 160 hours at 125°C | Removes devices subject to infant mortality. |
| * Electrical Test | Per Data Sheet (page 2) | Ensures electrical performance. |
| * External Visual | Method 2009 | Removes visually defective units and reduces failures due to materials, construction, and workmanship. |

*Standard tests for all HC1437 units.