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High Temperature Quad Operational Amplifier HT1104

The High Temperature Quad Operational Amplifier, HT1104, is a versatile performer over an extremely wide temperature range. It is fabricated with Honeywell's dielectrically isolated high-temperature linear (HTMOS™) process, and is designed specifically for use in systems operating in severe high temperature environments.

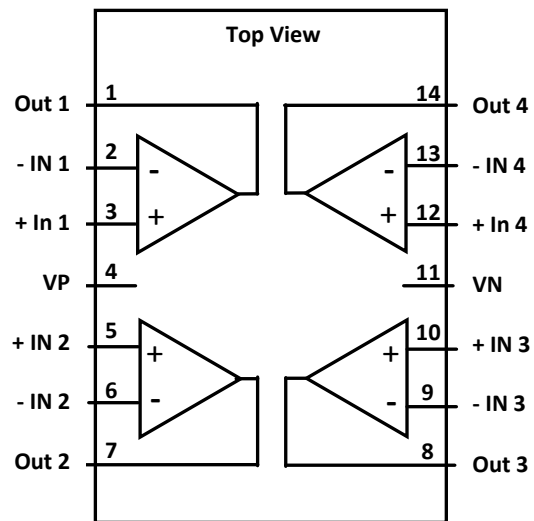


These amplifiers perform over the full -55°C to 225°C temperature range. All parts are burned in at 250°C. The HT1104 will operate with both single and split supplies. High temperature circuit applications such as transducer interfacing, amplification, active filtering, and signal buffering are all possible with the HT1104.

APPLICATIONS:

- Down-Hole Oil Well
- Turbine Engine Control
- Avionics
- Industrial Process Control
- Electric Power Conversion
- Heavy Duty Internal Combustion Engine

PINOUT DIAGRAM



FEATURES

- ▶ Specified Over -55°C to +225°C
- ▶ Single or Split Supply Operation
- ▶ Low Input Bias and Offset Parameters
- ▶ ESD Protection Circuitry
- ▶ Latch-up Free Design with Dielectric Isolation
- ▶ Hermetic 14-Lead Ceramic DIP package

ABSOLUTE MAXIMUM RATINGS (1)

| Symbol | Parameter | Rating | | Units |
|----------|---|----------|----------|-------|
| | | Min | Max | |
| VN to VP | Total Supply Voltage | | 13 | V |
| VPIN | Voltage on Any Pin (excluding power pins) | VN - 0.5 | VP + 0.5 | V |
| IOUT | DC or Average Output Current (each output) | -50 | +50 | mA |
| IOS | Output Short Circuit Current (1 second) | | 110 | mA |
| VHBM | ESD Input Protection Voltage (Human Body Model) | | 2000 | V |
| ΘJC | Thermal Resistance (Jct-to-Case) | | 10 | °C/W |
| TSTORE | Storage Temperature | -65 | 300 | °C |
| TSOLDER | Lead Temperature (soldering, 10 seconds) | | 355 | °C |
| TJ | Junction Temperature | | 315 | °C |

(1) Stresses in excess of those listed above may result in permanent damage. These are stress ratings only, and operation at these levels is not implied. Frequent or extended exposure to absolute maximum conditions may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Min | Max | Units |
|--------|---|----------|----------|-------|
| VP | Positive Supply Voltage (Single supply) | 5 | 10 | V |
| VN | Negative Supply Voltage (Single supply) | 0 | | V |
| VP | Positive Supply Voltage (Split supply) | | +5 | V |
| VN | Negative Supply Voltage (Split supply) | -5 | | V |
| IOUT | Continuous Output Current | -10 | +10 | mA |
| VPIN | Voltage on Any Pin (excluding power pins) | VN - 0.3 | VP + 0.3 | V |
| TC | Case Temperature | -55 | 225 | °C |

ELECTRICAL SPECIFICATIONS

Unless otherwise specified, specifications apply over the Recommended Operating Conditions.

VP = +5V, VN = -5V.

| Symbol | Parameter | Conditions | Limits | | Unit |
|---------|-----------------------------------|---|--------|------|------|
| | | | Min | Max | |
| Ip | Supply Current | | | 12.5 | mA |
| VO | Output Voltage Swing | R = 10kΩ, C = 20pF | -4.8 | +4.6 | V |
| ISOH | Output Short Circuit Current High | Open Loop, VP > VN, Vo = 0V, Absolute value | | 110 | mA |
| ISOL | Output Short Circuit Current Low | Open Loop, VN > VP, Vo = 0V, Absolute value | | 110 | mA |
| ISOURCE | Output Drive Current - source | Open Loop, VP > VN, Vo = 0V, absolute value | 10 | | mA |
| ISINK | Output Drive Current - sink | Open Loop, VN > VP, Vo = 0V, absolute value | 10 | | mA |
| IIO | Input Offset Current | -55°C to 25°C | -10 | 10 | nA |
| | | +225°C | -50 | 50 | nA |
| IB | Input Bias Current | -55°C to 25°C | -10 | 10 | nA |
| | | +225°C | -50 | 50 | nA |
| VIO | Input Offset Voltage | | -7 | 7 | mV |

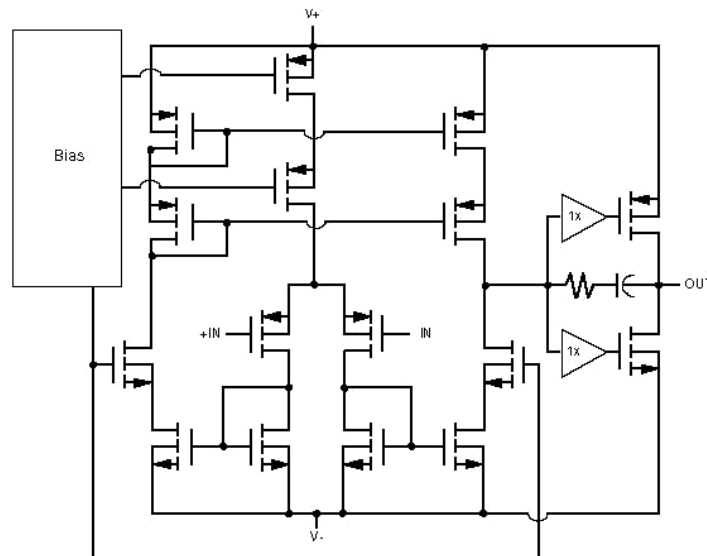
| Symbol | Parameter | Conditions | Limits | | Unit |
|------------------|---------------------------------|--------------------------|--------|--------|------|
| | | | Min | Max | |
| V _{CM} | Input Common Mode Voltage Range | 25°C to +225°C, -55°C | VN+0.2 | VP-2.2 | V |
| | | | VN+0.2 | VP-2.4 | V |
| A _{VOL} | DC Open Loop Gain | | 100 | | dB |
| CMRR | Common Mode Rejection Ratio | | 80 | | dB |
| PSRR | Power Supply Rejection Ratio | | 66 | | dB |

TYPICAL ELECTRICAL SPECIFICATIONS

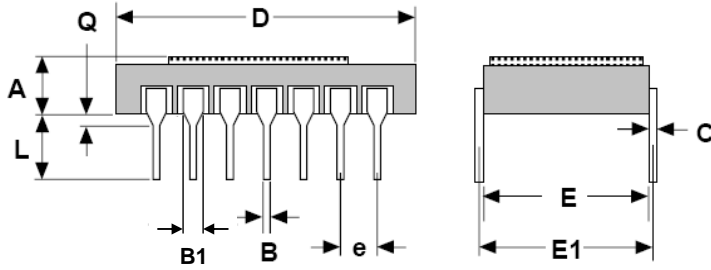
The following specifications are not tested on each device and are for reference only.

| Symbol | Parameter | Conditions | Typical | Units |
|-----------------|----------------------|--------------------------|---------|---------|
| V _{IO} | Input Offset Voltage | Drift with Temperature | 10 | μV/°C |
| N | Noise | f _o = 10 Hz | 200 | nv/√Hz |
| | | f _o = 1 kHz | 30 | nv/√Hz |
| | | f = 0.1 to 10 Hz | 8 | μV, p-p |
| SR | Slew Rate | R = 10kΩ, C = 20pF, 25°C | 1.4 | V/μsec |
| UGB | Unity Gain Bandwidth | R = 10kΩ, C = 20pF, 25°C | 1.4 | MHz |
| ∅M | Phase Margin | C = 20pF | 60 | degrees |
| AM | Gain Margin | C = 20pF | 8 | dB |

SIMPLIFIED SCHEMATIC (each amplifier)



PACKAGE DETAIL

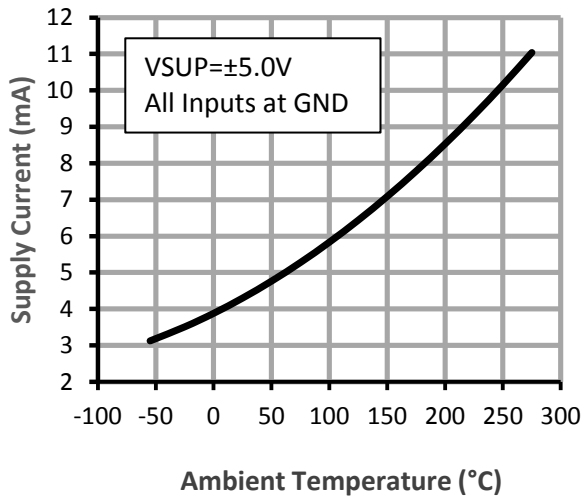


| | | | |
|----------|---------------|-----------|----------------|
| A | 0.150 (max) | E1 | 0.300 ± 0.010 |
| B | 0.018 ± 0.002 | B1 | 0.047 ± 0.002 |
| C | 0.010 ± 0.002 | e | 0.100 ± 0.005 |
| D | 0.700 ± 0.010 | L | 0.125 to 0.180 |
| E | 0.295 REF | Q | 0.035 ± 0.010 |

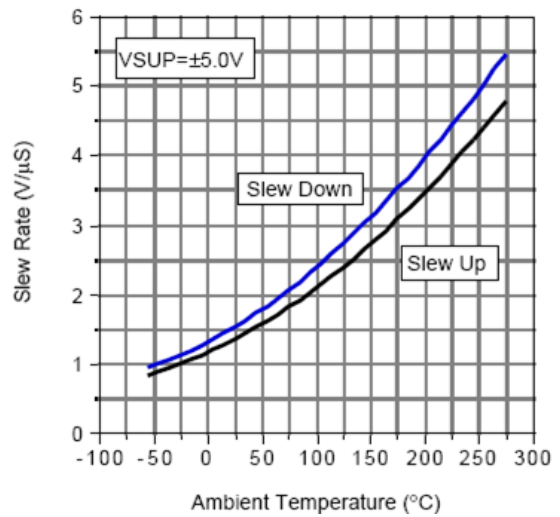
All dimensions in inches
Leads are Gold Plated Nickel

TYPICAL PERFORMANCE PLOTS

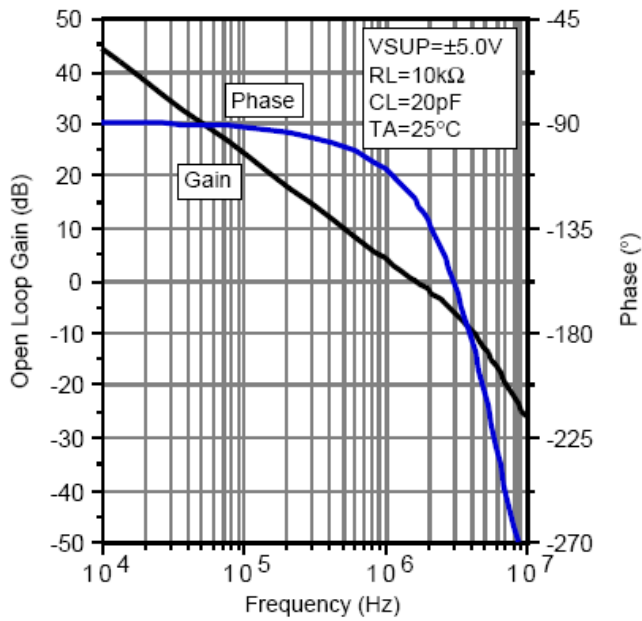
SUPPLY CURRENT vs. TEMPERATURE



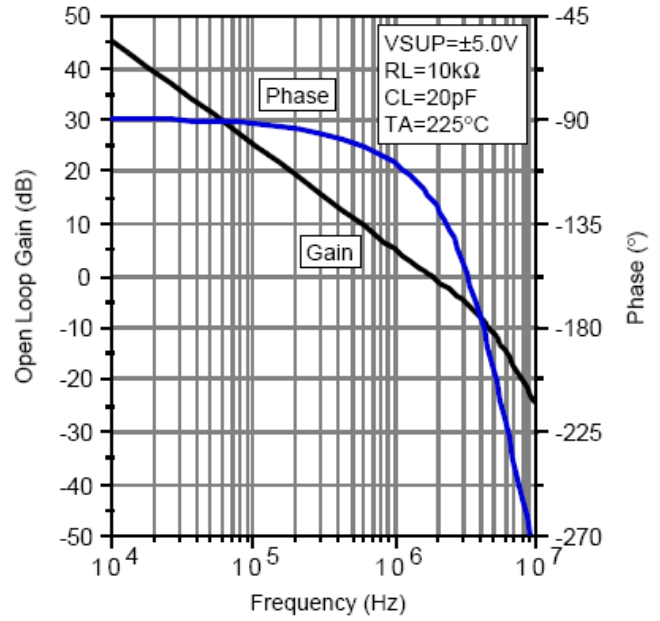
SLEW RATE vs. TEMPERATURE



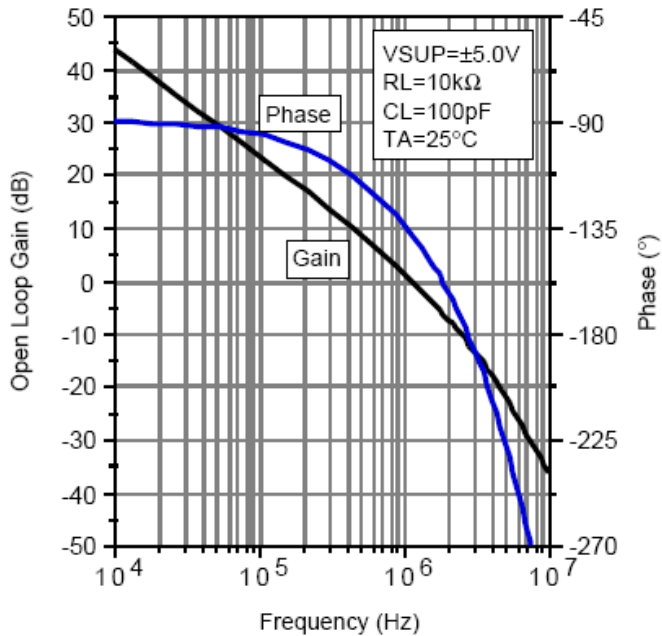
OPEN LOOP GAIN and PHASE vs. FREQUENCY



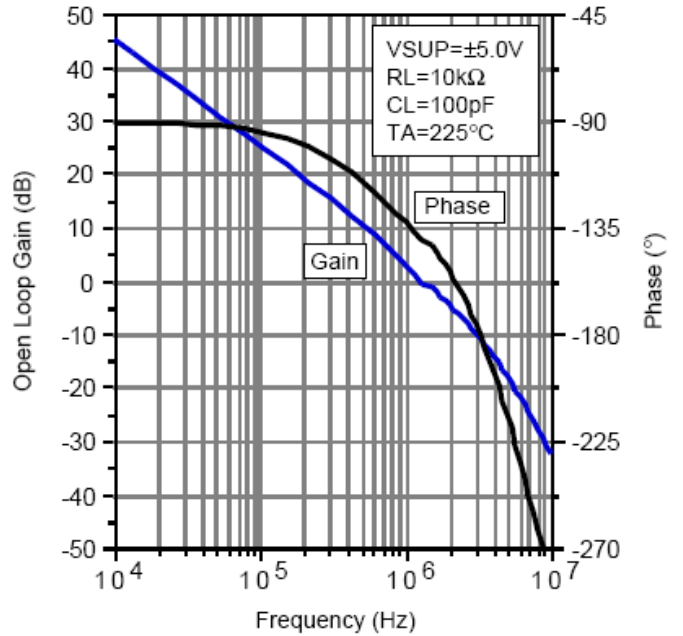
OPEN LOOP GAIN and PHASE vs. FREQUENCY



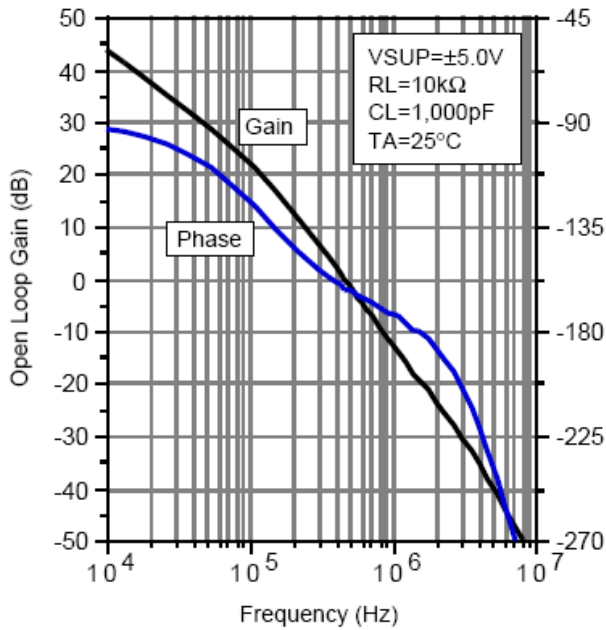
OPEN LOOP GAIN and PHASE vs. FREQUENCY



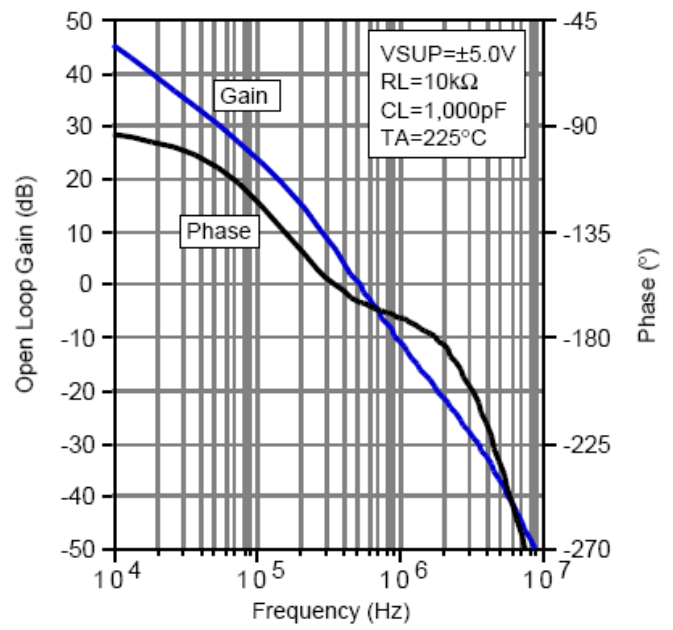
OPEN LOOP GAIN and PHASE vs. FREQUENCY



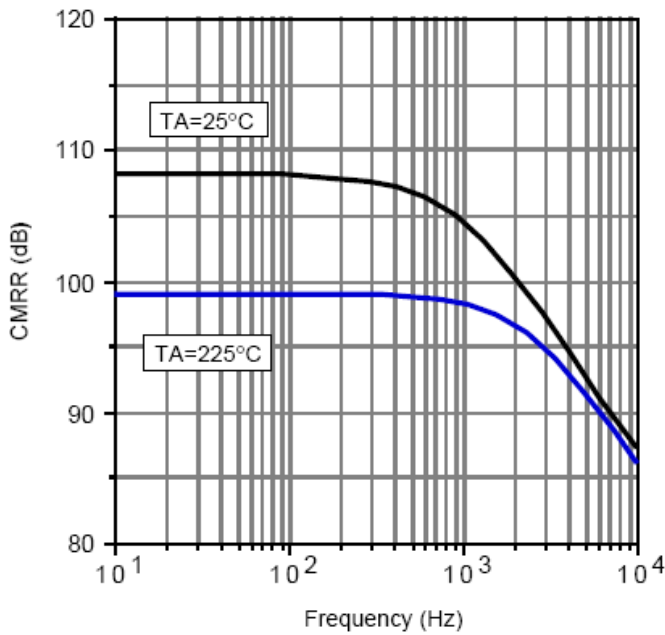
OPEN LOOP GAIN and PHASE vs. FREQUENCY



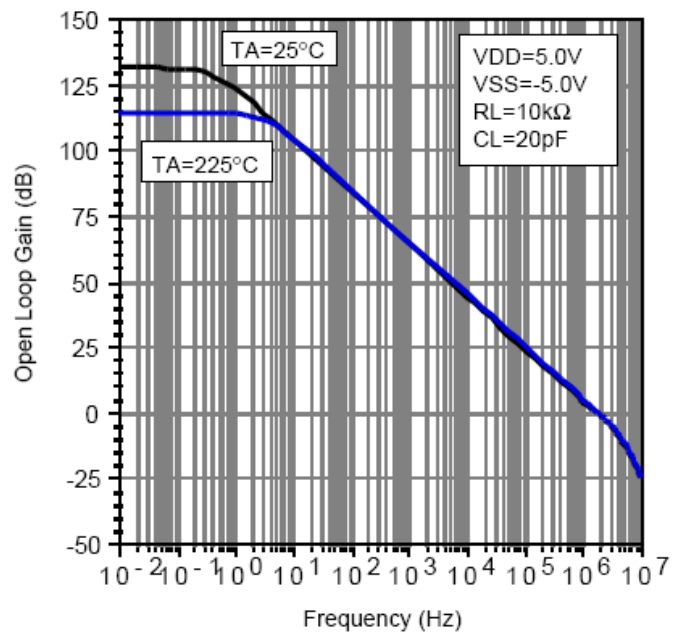
OPEN LOOP GAIN and PHASE vs. FREQUENCY



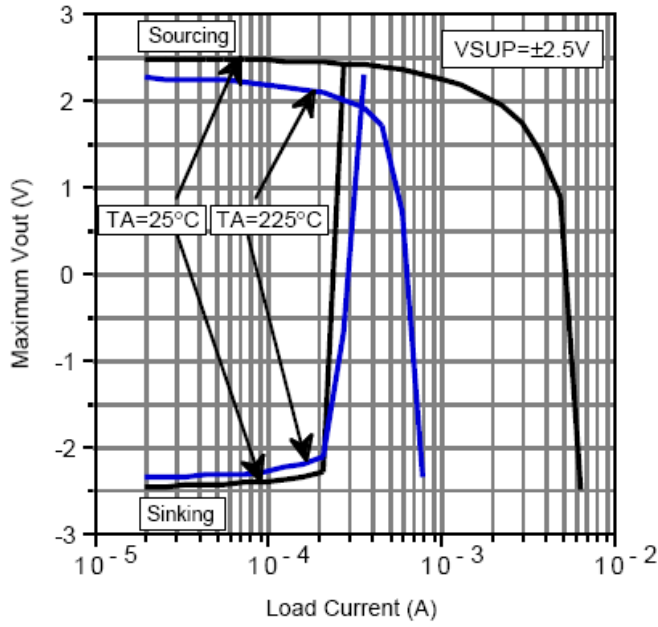
COMMON MODE REJECTION RATIO vs. FREQUENCY



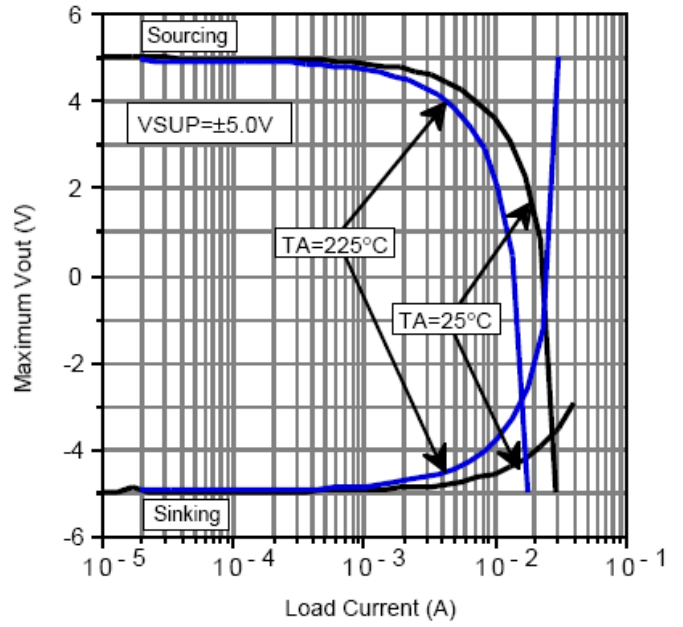
OPEN LOOP GAIN vs. FREQUENCY



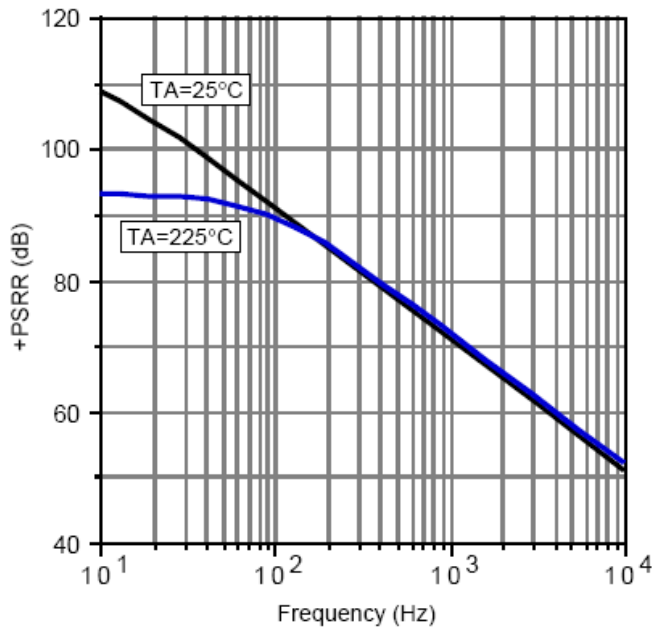
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



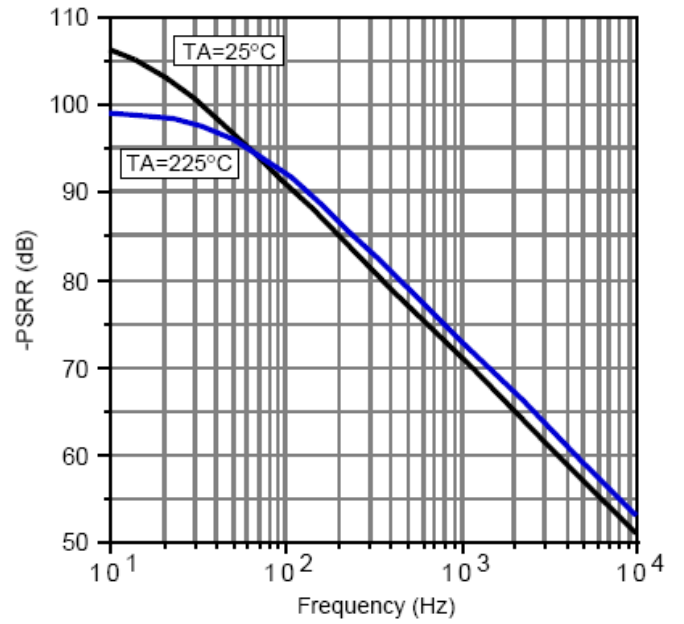
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



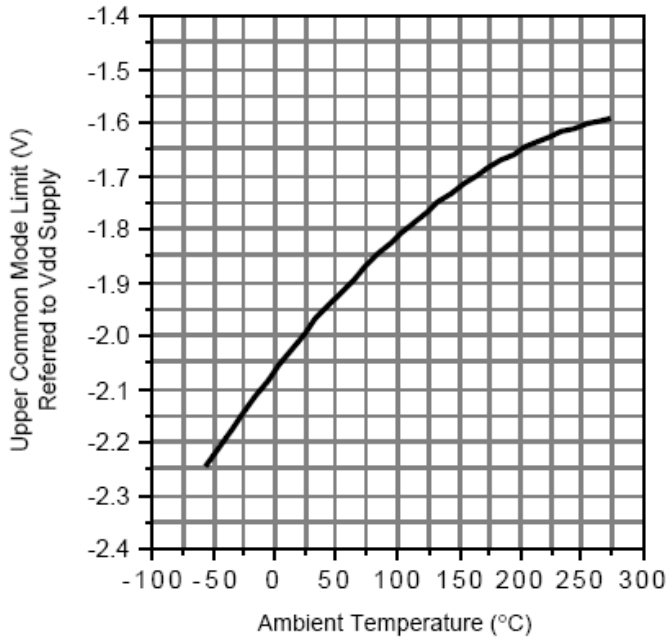
POSITIVE POWER SUPPLY REJECTION vs. FREQUENCY



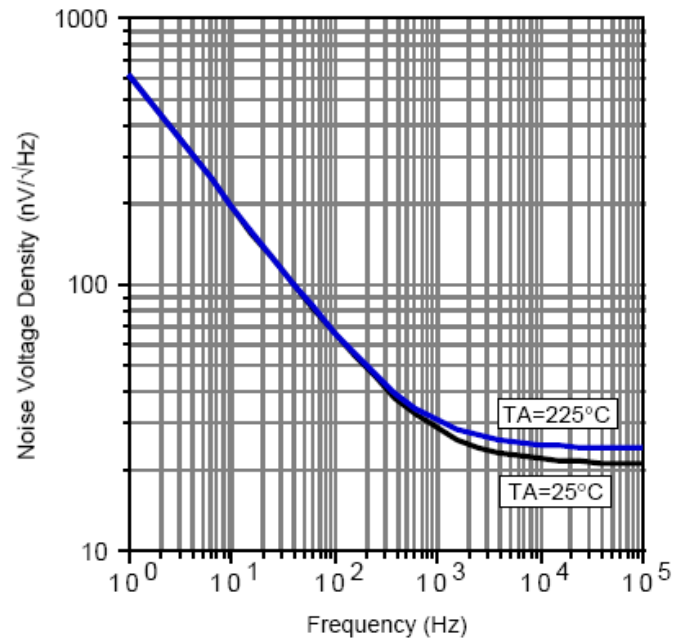
NEGATIVE POWER SUPPLY REJECTION vs. FREQUENCY



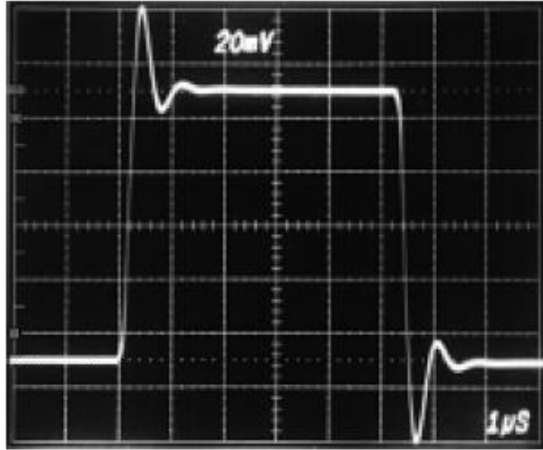
**UPPER COMMON MODE
LIMIT vs. TEMPERATURE**



**INPUT REFERRED NOISE
VOLTAGE vs. FREQUENCY**

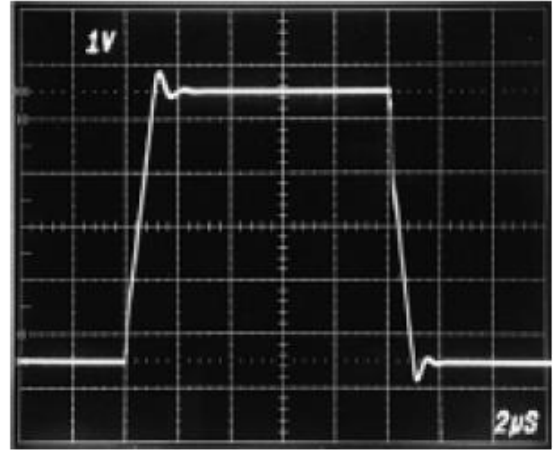


Small Signal Step Response

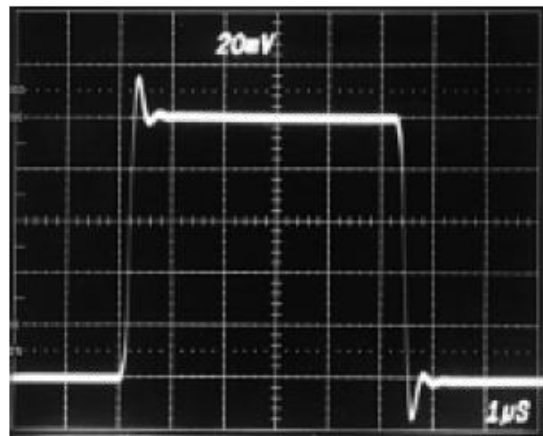


TA=225°C, CL=100pF
Small Signal Step Response

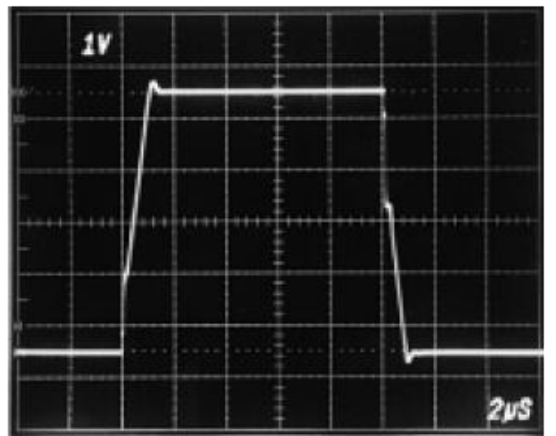
Large Signal Step Response



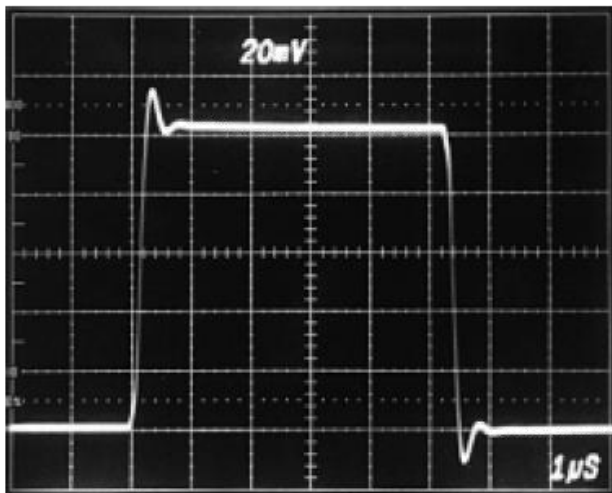
TA=225°C, CL=100pF
Large Signal Step Response



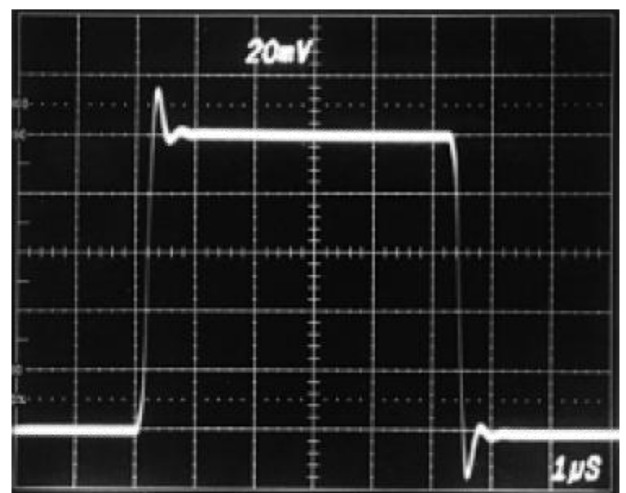
TA=225°C, CL=20pF
SMALL SIGNAL PULSE RESPONSE



TA=225°C, CL=20pF
SMALL SIGNAL PULSE RESPONSE

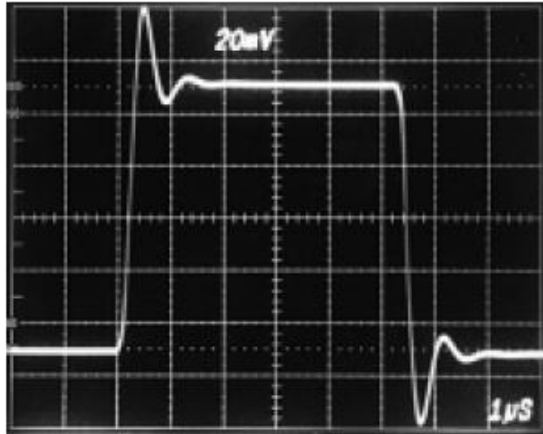


TA=25°C, CL=20pF, Av=+1



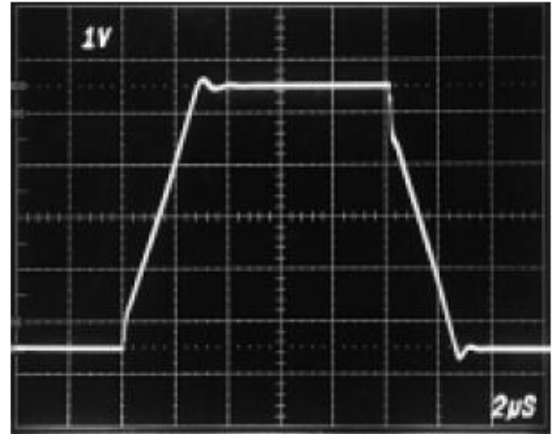
TA=225°C, CL=20pF, Av=+1

Small Signal Step Response



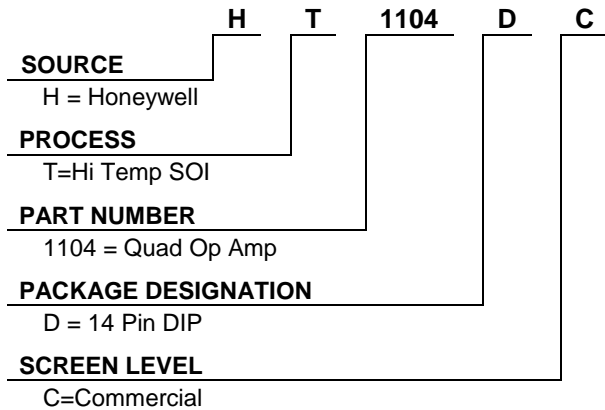
TA=25°C, CL=100pF

Large Signal Step Response



TA=25°C, CL=100pF

ORDERING INFORMATION



Find out more

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