High Temperature Quad Operational Amplifier HT1104

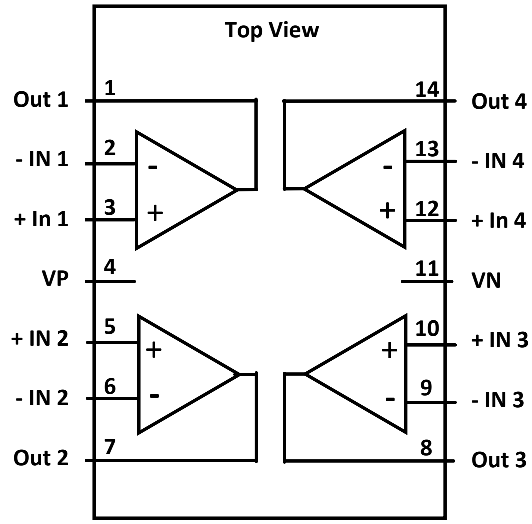
The High Temperature Quad Operational Amplifier, HT1104, is a versatile performer over an extremely wide temperature range. It is fabricated with Honeywell's dielectrically isolated high-temperature linear (HTMOS™) process, and is designed specifically for use in systems operating in severe high temperature 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 Min	Rating Max	Units
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 Min	Limits Max	Unit
I_P	Supply Current			12.5	mA
V_O	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
I_{IO}	Input Offset Current	-55°C to 25°C +225°C	-10 -50	10 50	nA nA
I_{IB}	Input Bias Current	-55°C to 25°C +225°C	-10 -50	10 50	nA nA
V_{IO}	Input Offset Voltage		-7	7	mV

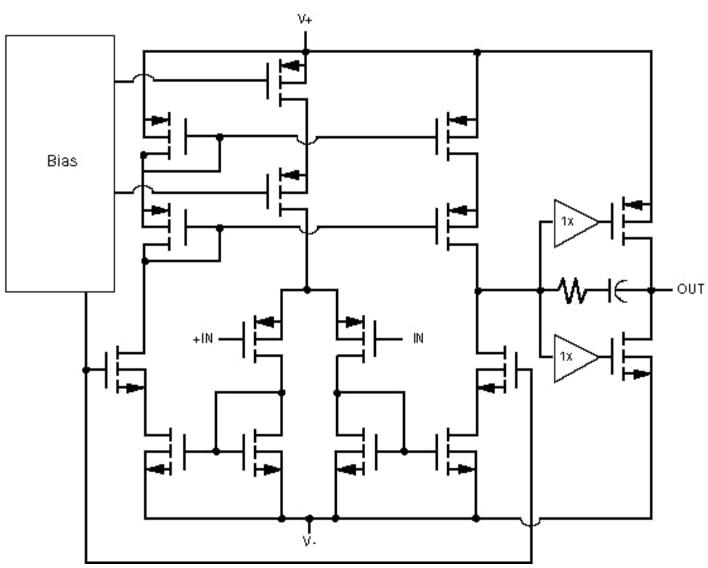
Symbol	Parameter	Conditions	Limits		Unit
			Min	Max	
V_{CM}	Input Common Mode Voltage Range	25°C to +225°C, -55°C	VN+0.2 VN+0.2	VP-2.2 VP-2.4	V V
A_{VOL}	DC Open Loop Gain		100		dB
CMRR	Common Mode Rejection Ratio		80		dB
PSRR	Power Supply Rejection Ratio		66		dB

TYPICAL ELECTRICAL SPECIFICATIONS

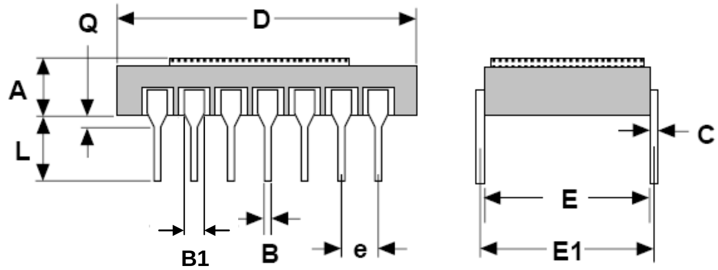
The following specifications are not tested on each device and are for reference only.

Symbol	Parameter	Conditions	Typical	Units
V_{IO}	Input Offset Voltage	Drift with Temperature	10	µV/°C
N	Noise	fo = 10 Hz fo = 1 kHz f = 0.1 to 10 Hz	200 30 8	nv/√Hz nv/√Hz 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
ØM	Phase Margin	C = 20pF	60	degrees
AM	Gain Margin	C = 20pF	8	dB

SIMPLIFIED SCHEMATIC (each amplifier)



PACKAGE DETAIL



A	0.150 (max)
B	0.018 ± 0.002
C	0.010 ± 0.002
D	0.700 ± 0.010
E	0.295 REF

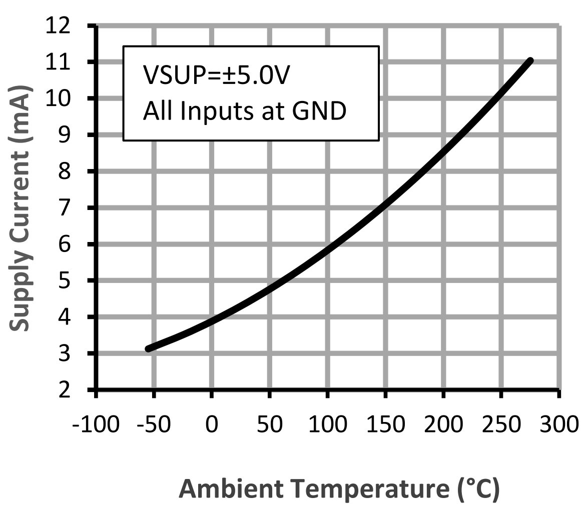
E1	0.300 ± 0.010
B1	0.047 ± 0.002
e	0.100 ± 0.005
L	0.125 to 0.180
Q	0.035 ± 0.010

All dimensions in inches

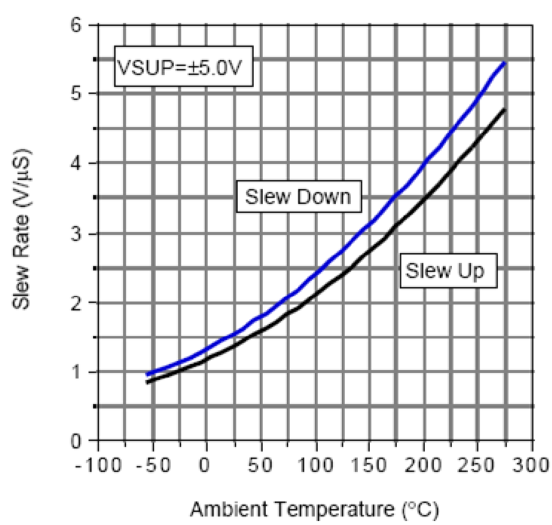
Leads are Gold Plated Nickel

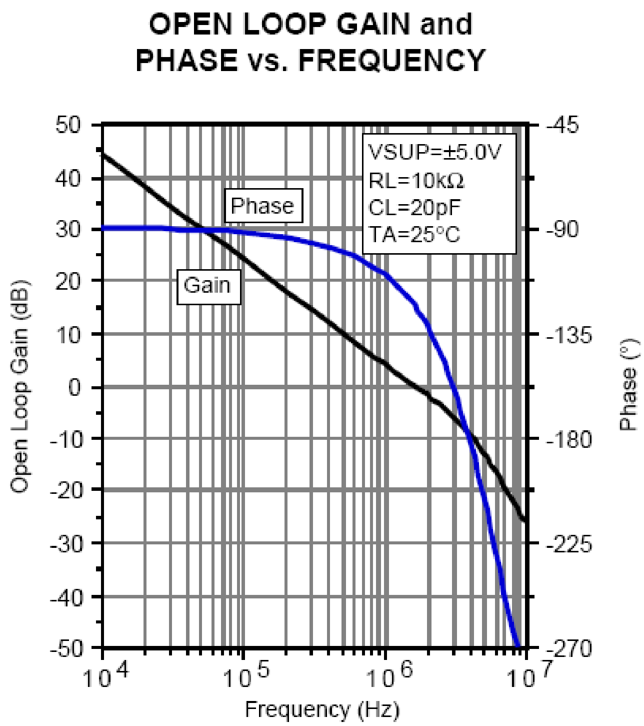
TYPICAL PERFORMANCE PLOTS

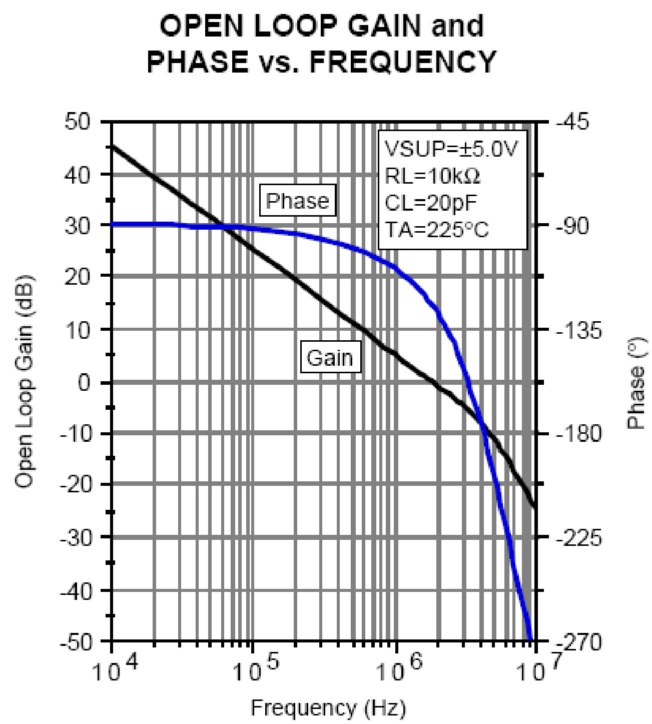
SUPPLY CURRENT vs. TEMPERATURE

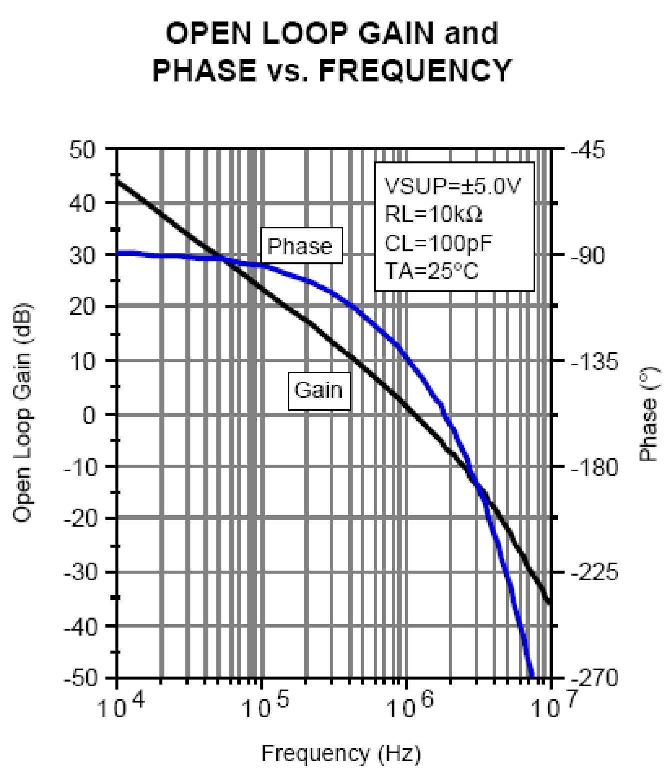


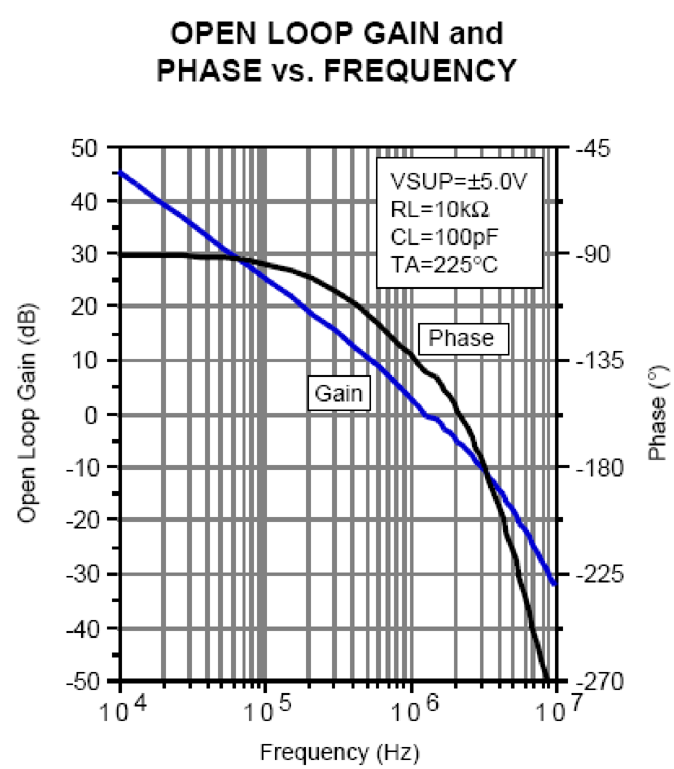
SLEW RATE vs. TEMPERATURE

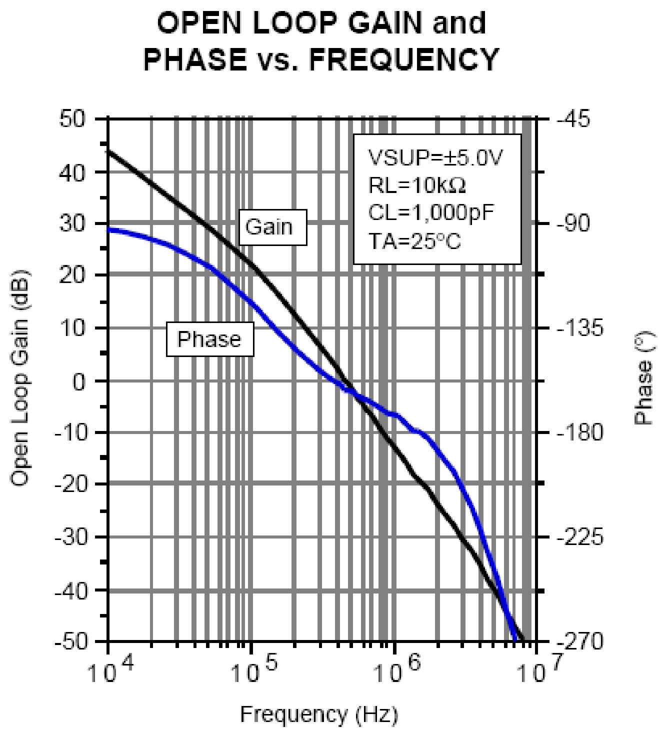


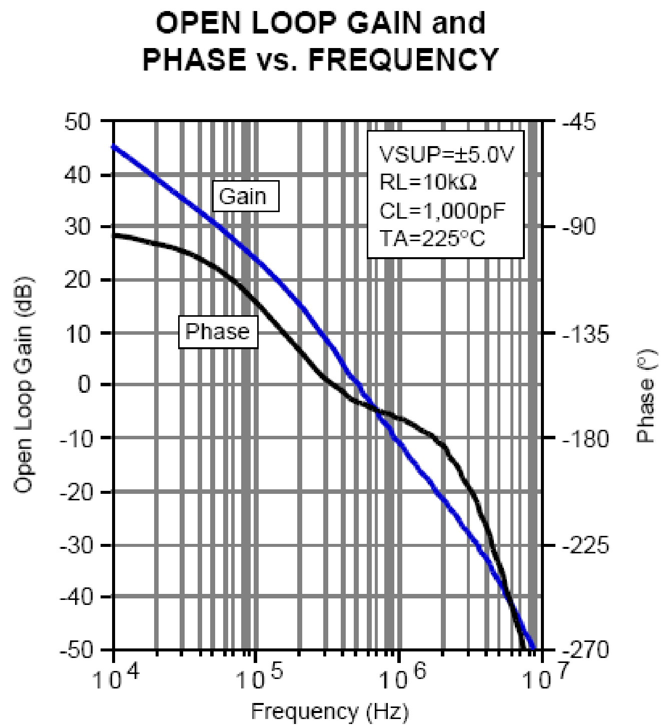

OPEN LOOP GAIN and
PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=20pF
TA=25°C
Phase
Gain
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)

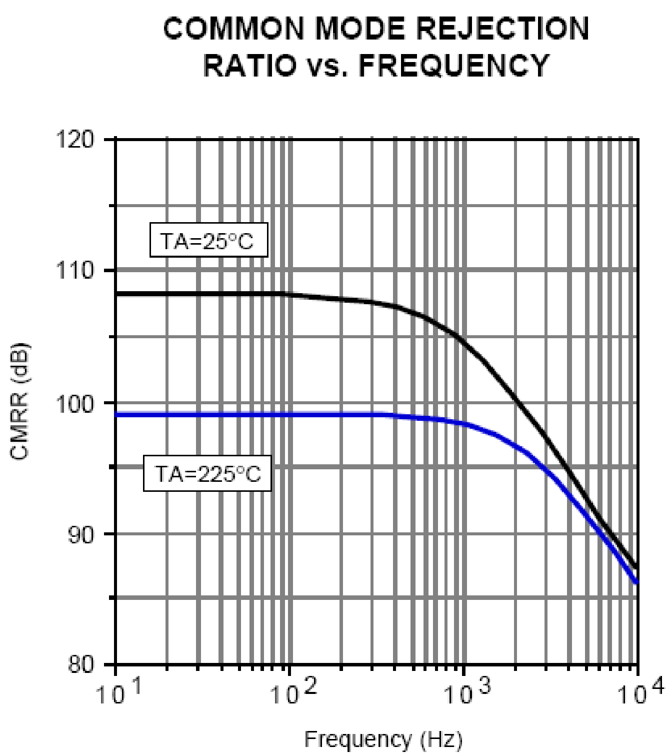

OPEN LOOP GAIN and
PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=20pF
TA=225°C
Phase
Gain
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)

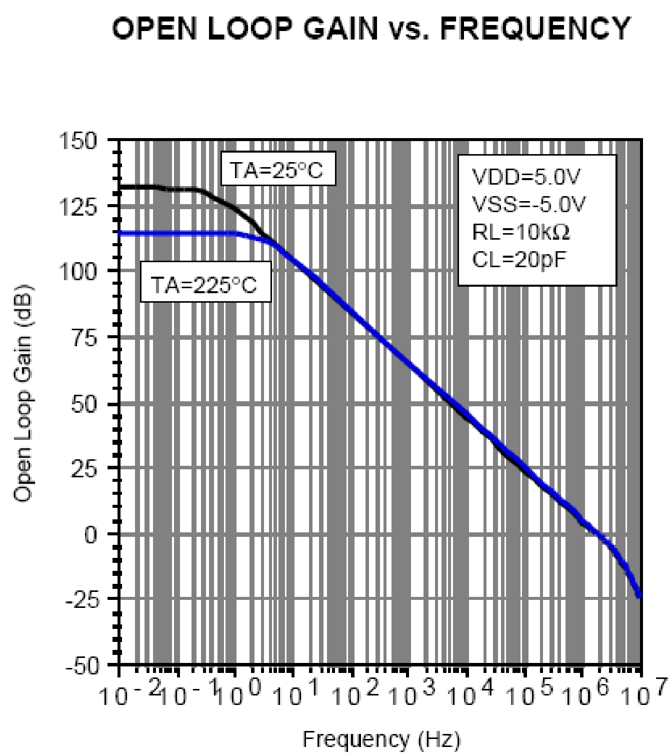

OPEN LOOP GAIN and
PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=100pF
TA=25°C
Phase
Gain
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)


OPEN LOOP GAIN and
PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=100pF
TA=225°C
Phase
Gain
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)

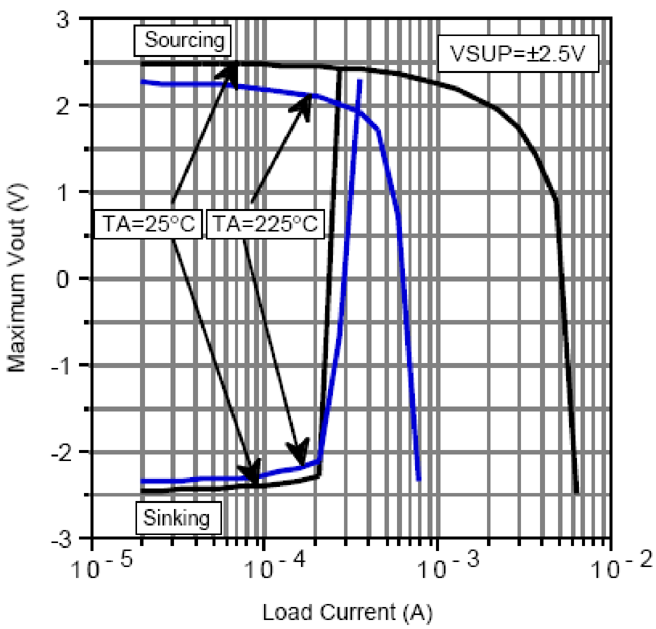

OPEN LOOP GAIN and PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=1,000pF
TA=25°C
Gain
Phase
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)


OPEN LOOP GAIN and PHASE vs. FREQUENCY
VSUP=±5.0V
RL=10kΩ
CL=1,000pF
TA=225°C
Gain
Phase
Open Loop Gain (dB)
Phase (°)
Frequency (Hz)

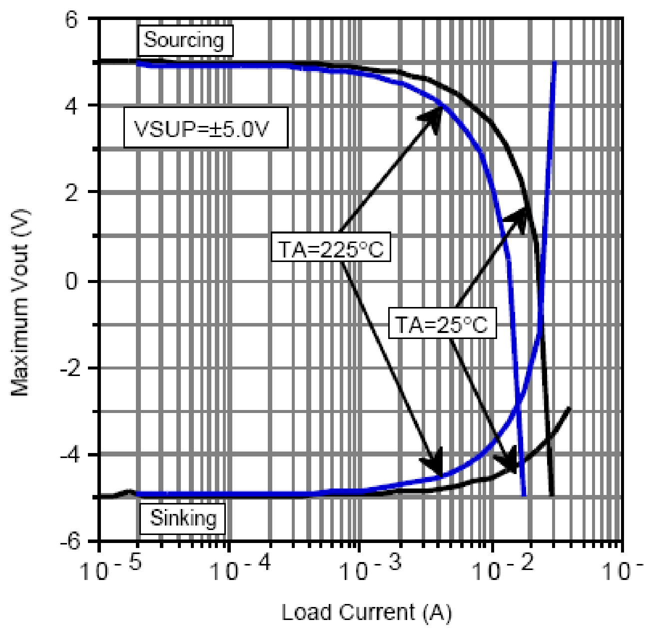

COMMON MODE REJECTION RATIO vs. FREQUENCY
TA=25°C
TA=225°C
CMRR (dB)
Frequency (Hz)


OPEN LOOP GAIN vs. FREQUENCY
TA=25°C
TA=225°C
VDD=5.0V
VSS=-5.0V
RL=10kΩ
CL=20pF
Open Loop Gain (dB)
Frequency (Hz)

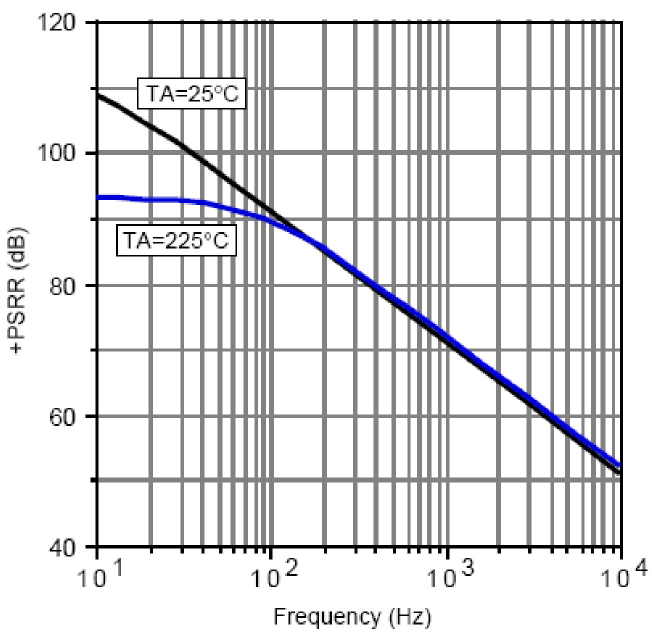
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



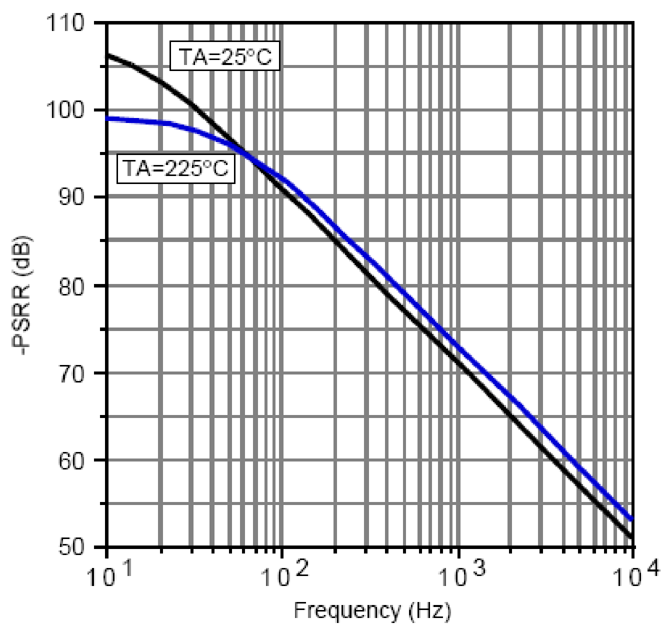
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



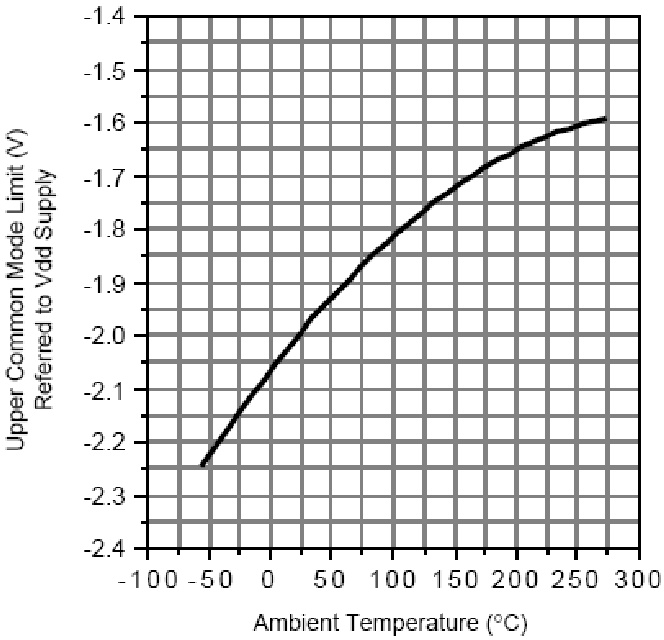
POSITIVE POWER SUPPLY REJECTION vs. FREQUENCY



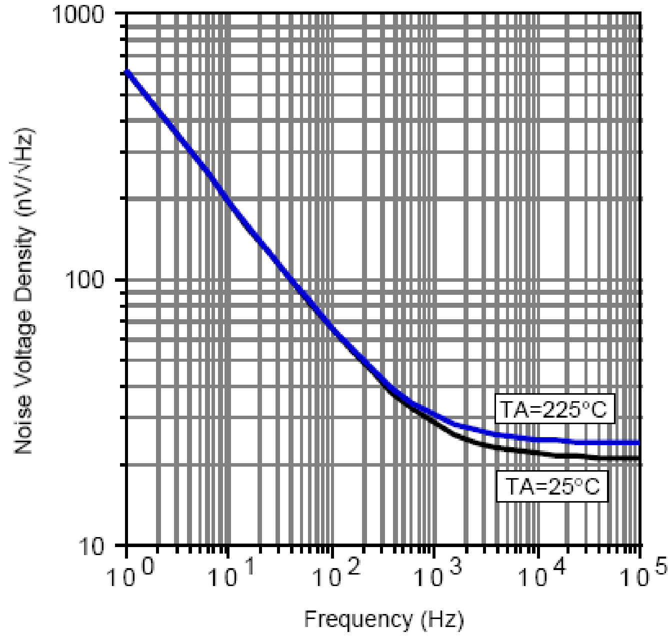
NEGATIVE POWER SUPPLY REJECTION vs. FREQUENCY



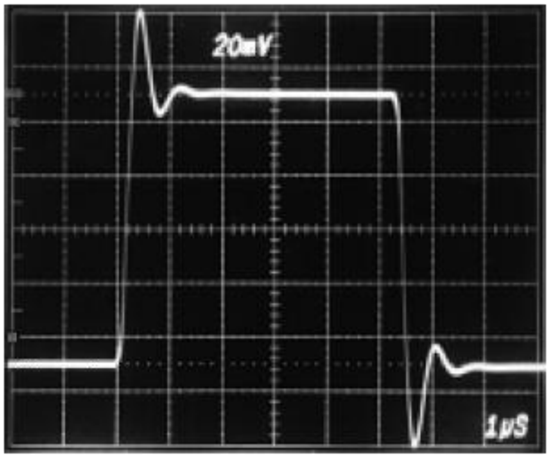
UPPER COMMON MODE LIMIT vs. TEMPERATURE



INPUT REFERRED NOISE VOLTAGE vs. FREQUENCY

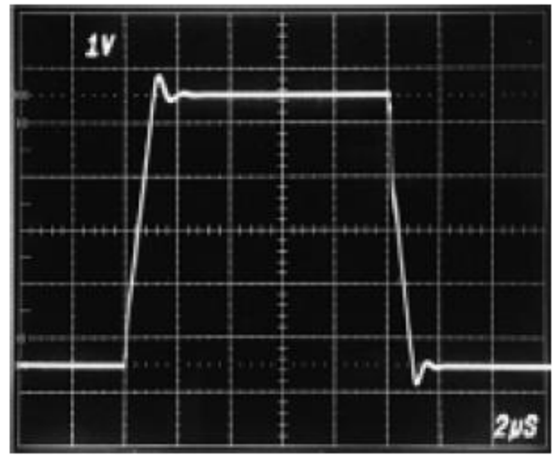


Small Signal Step Response



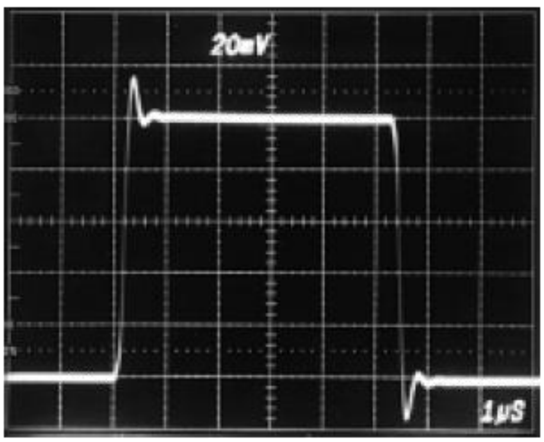
TA=225°C, CL=100pF

Large Signal Step Response



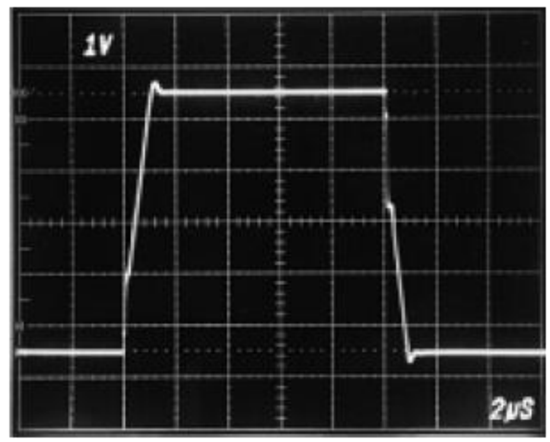
TA=225°C, CL=100pF

Small Signal Step Response



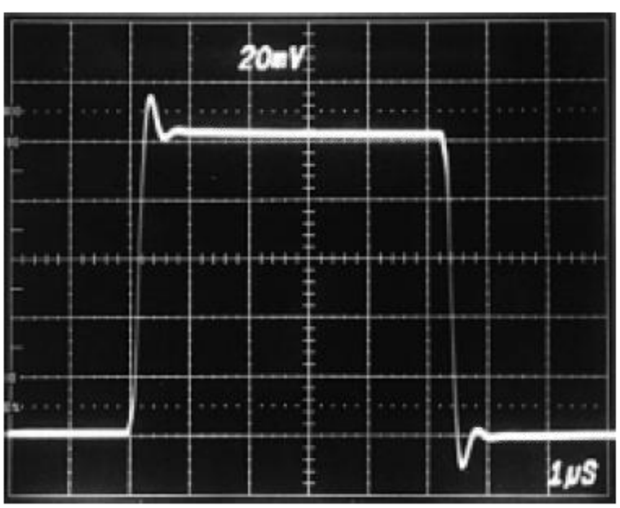
TA=225°C, CL=20pF

Large Signal Step Response



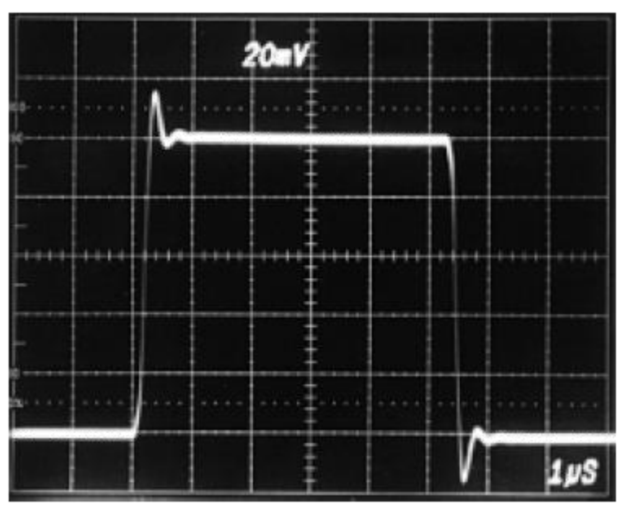
TA=225°C, CL=20pF

SMALL SIGNAL PULSE RESPONSE



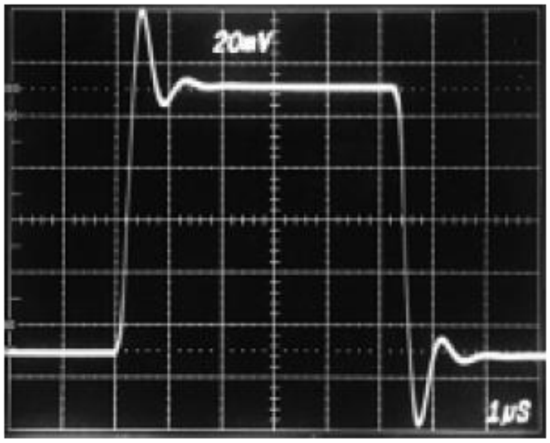
TA=25°C, CL=20pF, Av=+1

SMALL SIGNAL PULSE RESPONSE



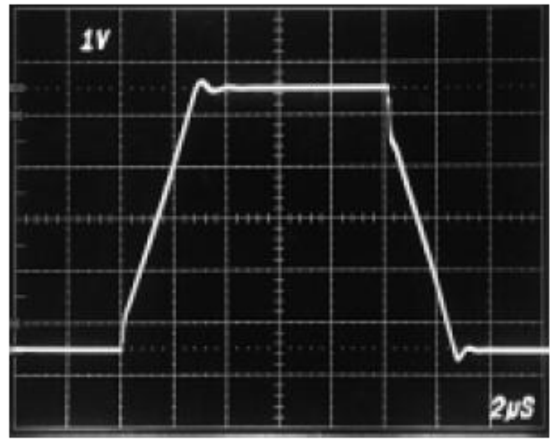
TA=225°C, CL=20pF, Av=+1

Small Signal Step Response



TA=25°C, CL=100pF

Large Signal Step Response



TA=25°C, CL=100pF

ORDERING INFORMATION

H T 1104 D C

SOURCE
H = Honeywell

PROCESS
T=Hi Temp SOI

PART NUMBER
1104 = Quad Op Amp

PACKAGE DESIGNATION
D = 14 Pin DIP

SCREEN LEVEL
C=Commercial

Find out more

For more information on Honeywell's High Temperature Electronics visit us online at www.hightempsolutions.com, or contact us at 1-800-323-8295. Customer Service Email: ps.customer.support@honeywell.com.

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