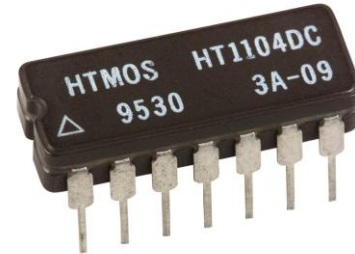


High Temperature Quad Operational Amplifier HT1104

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. All parts are burned in at 250°C.



These amplifiers provide guaranteed performance over the full -55 to 225°C temperature range. Typically, parts will operate up to +300°C for a year, with derated performance. The HT1104 will operate with both single and split supplies. High temperature 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

FEATURES

- | | |
|--|--|
| ▶ Specified Over -55 to +225°C | ▶ Input/Output Overload Protection |
| ▶ Single or Split Supply Operation | ▶ ESD Protection Circuitry |
| ▶ Common-Mode Input Voltage Range Includes Negative Rail | ▶ Latch-up Free Design with Dielectric Isolation |
| ▶ Low Input Bias and Offset Parameters | ▶ Hermetic 14-Lead Ceramic DIP |

ELECTRICAL CHARACTERISTICS

Symbol	Parameter	Conditions (1)	Typ	Min	Max	Units
V _{DD}	Supply Voltage (2)	-55 to +225°C		5.0	11	V
I _{DD}	Supply Current (total package)	-55 to +225°C	2 (25°C)		10 (225°C)	mA
V _O	Output Voltage Swing	V _s ±5V, R = 10kΩ, C = 20pF		-4.8	+4.6 (225°C)	V
I _O	Output Short Circuit Current	Sink/Source (3)	15			mA
V _{IO}	Input Offset Voltage	@ 25°C	2			mV
		-55 to +225°C			7	mV
		Drift with Temperature (4)	10		15	μV/°C
		Drift with Time (4)	100			μV/Year
N	Noise	f _o = 10 Hz (4)	200			nv/√Hz
		f _o = 1 kHz (4)	30			nv/√Hz
		f = 0 to 10 Hz (4)	8			μV, p-p
I _{IO}	Input Offset Current	@ 25°C	0.01			nA
		-55 to +225°C (5)	5		50	
I _{IB}	Input Bias Current	@ 25°C	0.01			nA
		-55 to +225°C (5)	10		50	
V _{CM}	Input Voltage Range	25° to +225°C, V _s = ±5V		-V _s	+V _s -2.2	V
		-55°C to 25°C		-V _s	+V _s -2.4	
A _{VOL}	Open Loop Gain	R = 10kΩ, C = 20pF	115	100		dB
CMRR	Common Mode Rejection Ratio		95	80		dB
PSRR	Power Supply Rejection Ratio	±V _s (6)	95	66		dB
SR	Slew Rate	R = 10kΩ, C = 20pF, 25°C (4)	1.4			V/μsec
UGB	Unity Gain Bandwidth	R = 10kΩ, C = 20pF, 25°C (4)	1.4			MHz
ØM	Phase Margin	C = 20pF (4)	60	50		°C
AM	Gain Margin	C = 20pF (4)		8		dB
ESD	ESD Protection	(4)		2000		V

(1) Unless otherwise noted, specifications apply for ±5V supply from -55 to 225°C.

(2) Recommended supplies are ±5V or 0-10V. Contact factory for low-voltage operation specifications.

(3) Rating for a single amplifier of the quad. For steady state biasing conditions, 10mA is the maximum recommended.

(4) These parameters are guaranteed by design and not tested on each device. Human body model, 1.5kΩ in series with 100pF.

(5) Guaranteed by characterization. Limit is below manufacturing tester resolution at 225°C.

(6) PSRR is calculated from data taken at V_{DD}-V_{SS}=10V±0.5V. PSRR typically >90dB at room temp,

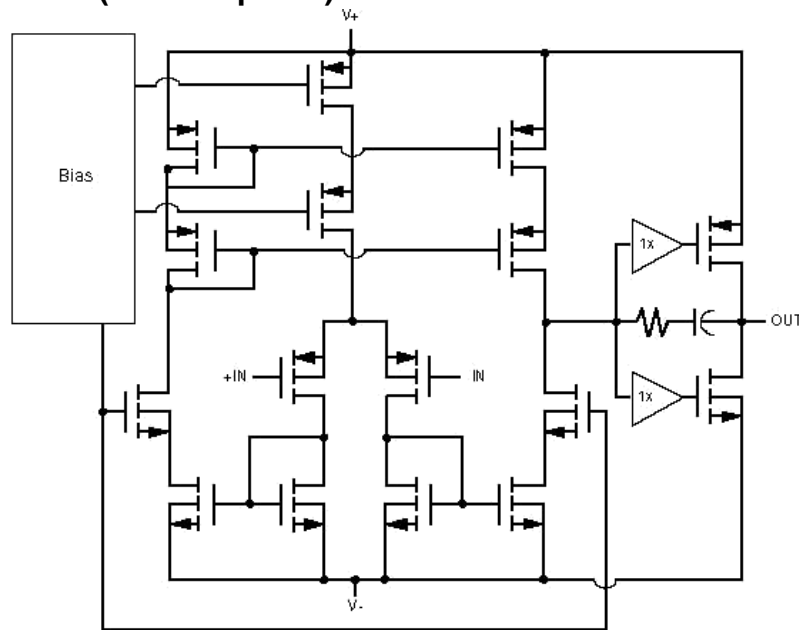
ABSOLUTE MAXIMUM RATINGS ⁽¹⁾

Total Supply Voltage (V ₊ to V ₋)13V
Input Voltage-0.5 to V _{DD} +0.5V
Output Short Circuit DurationContinuous
Input Current (each input)±5 mA
Output Current (each output)±50 mA
Storage Temperature-65Process
T = Hi Temp SOI	

(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.

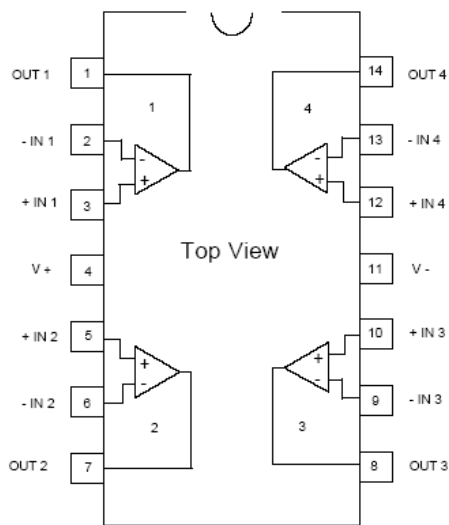
HT1104

SIMPLIFIED SCHEMATIC (each amplifier)

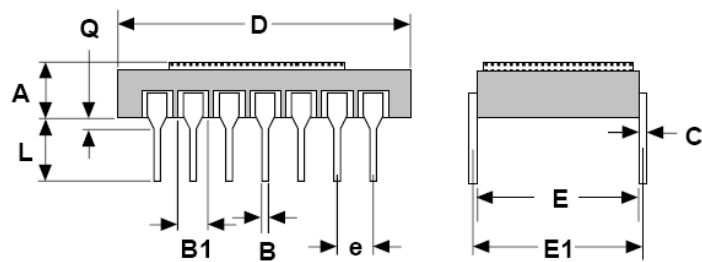


PACKAGE PINOUT

PACKAGE DETAIL



14-Lead Cerdip
 $\theta_{jc} = 7^{\circ}\text{C/W}$

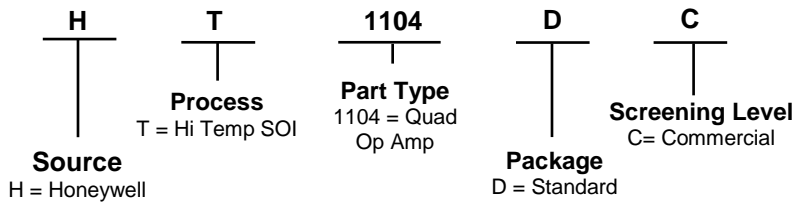


A	0.150 (max)
B	0.018 ± 0.002
C	0.010 ± 0.002
D	0.700 ± 0.010
E	0.295 REF

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

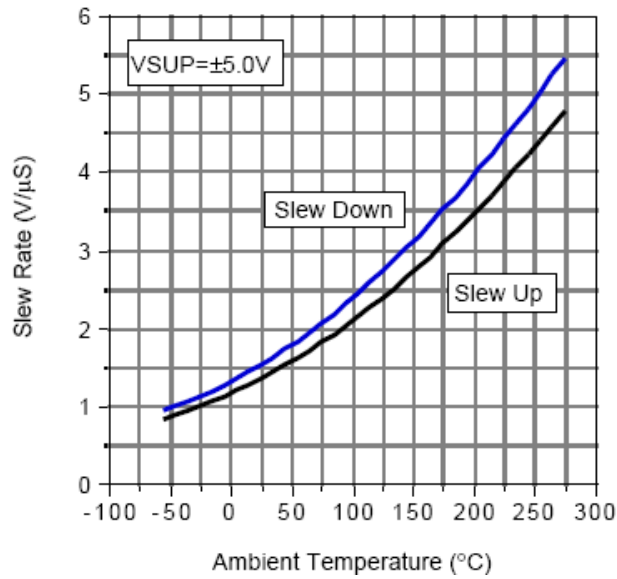
ORDERING INFORMATION



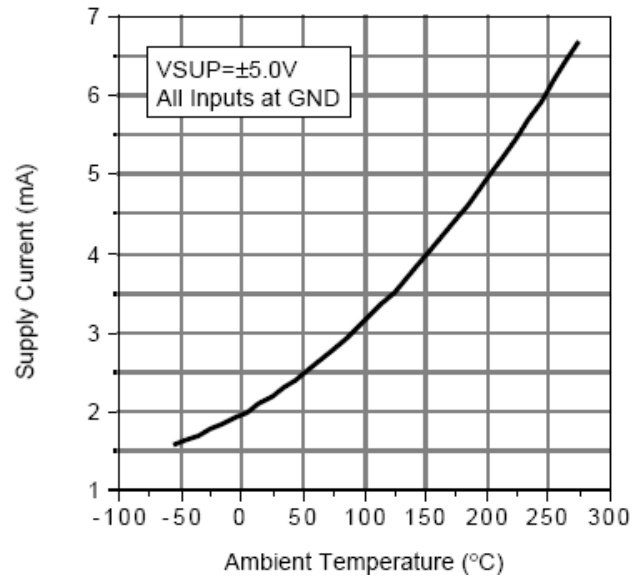
Find out more

For more information on Honeywell's High Temperature Electronics visit us online at www.honeywell.com/hightemp, or contact us at 800-323-8295 or 763-954-2474. Customer Service Email: ps.customer.support@honeywell.com.

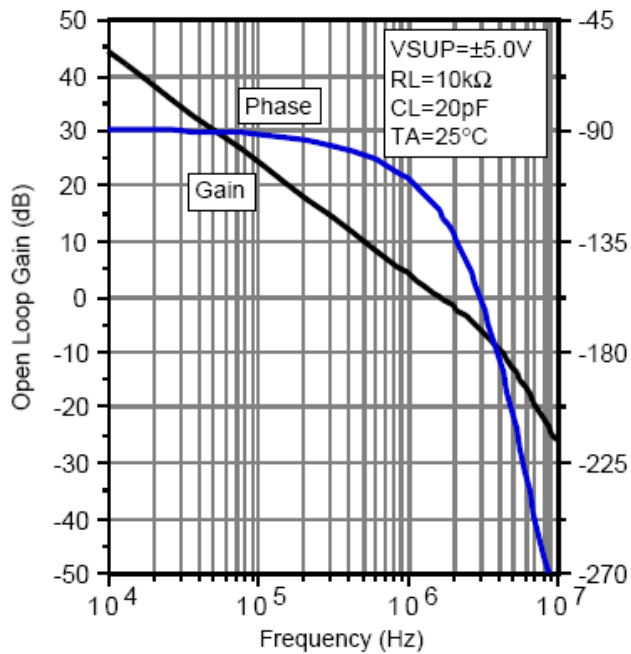
SLEW RATE vs. TEMPERATURE



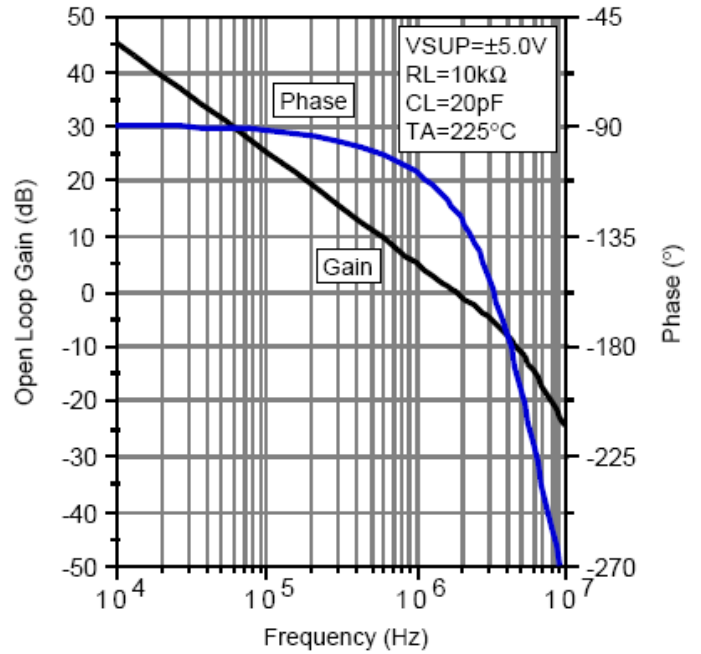
SUPPLY CURRENT vs. TEMPERATURE



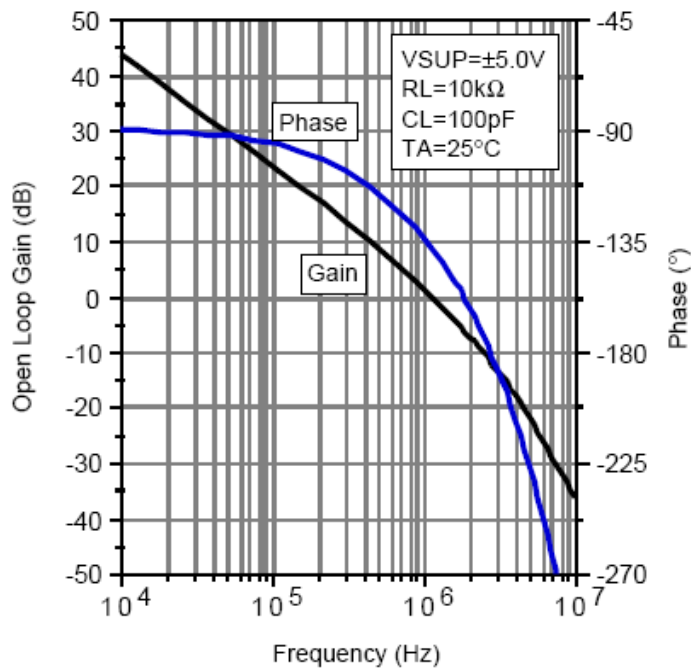
OPEN LOOP GAIN and PHASE vs. FREQUENCY



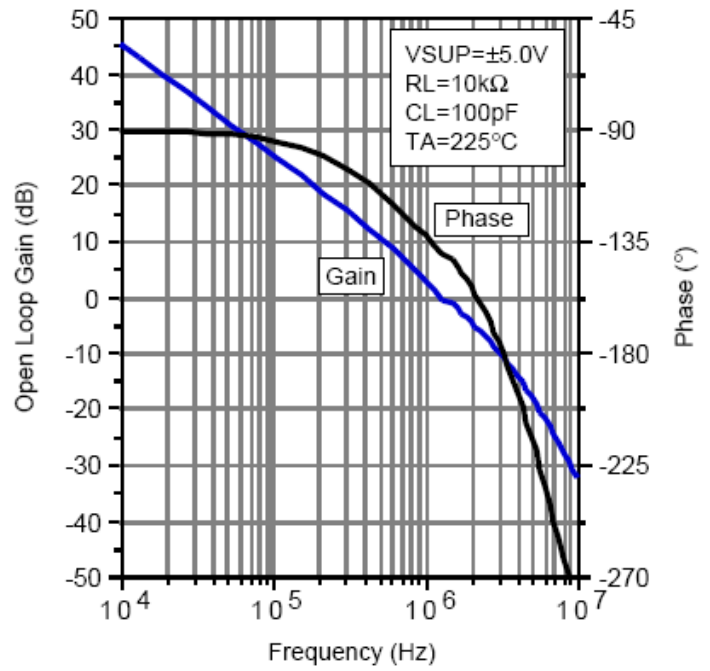
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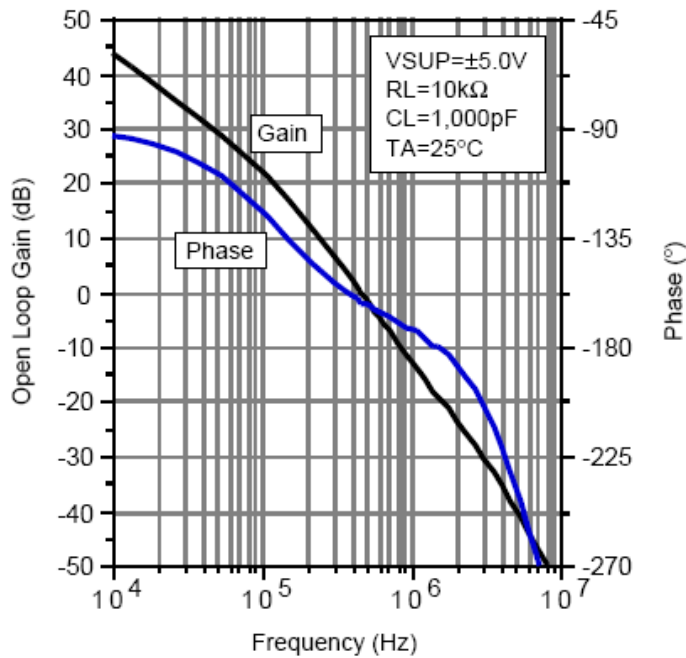
**OPEN LOOP GAIN and
PHASE vs. FREQUENCY**



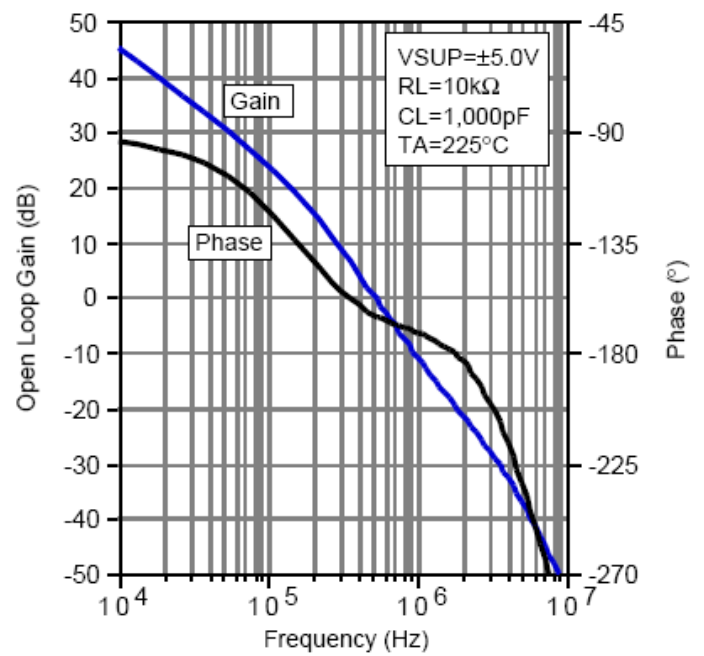
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PHASE vs. FREQUENCY**



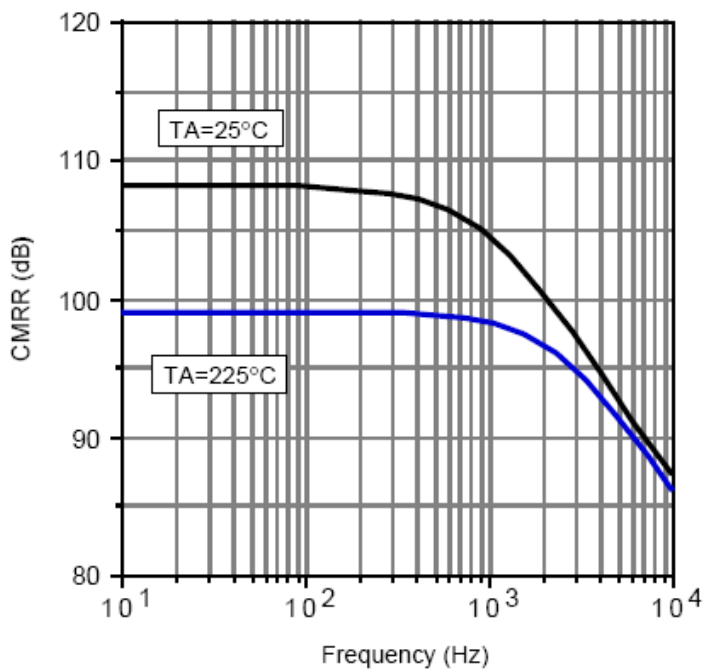
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PHASE vs. FREQUENCY**



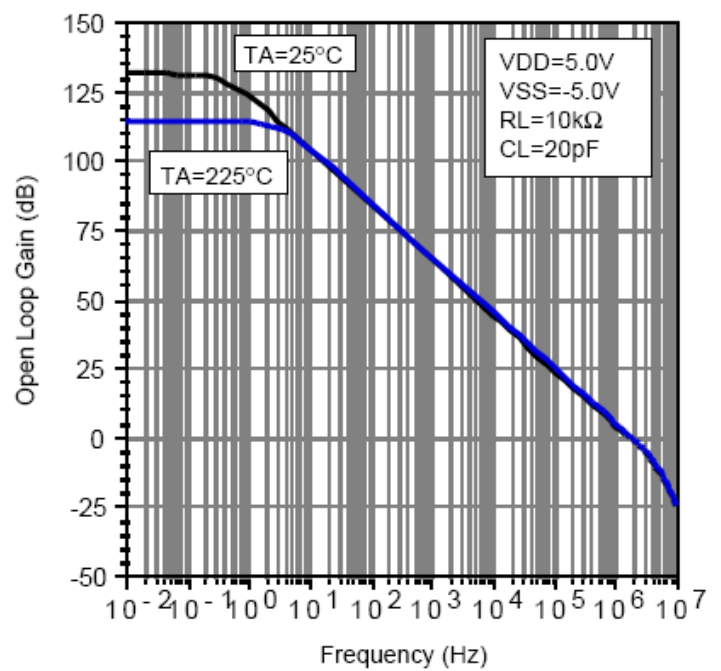
**OPEN LOOP GAIN and
PHASE vs. FREQUENCY**



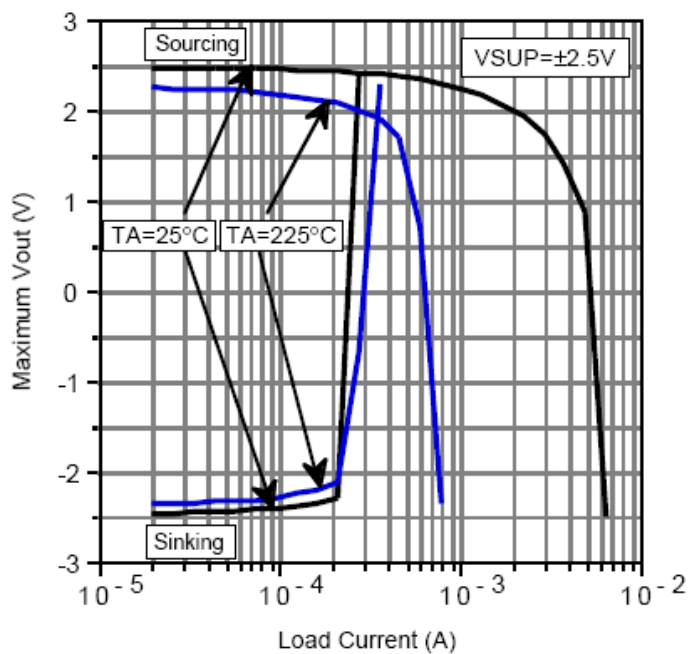
COMMON MODE REJECTION RATIO vs. FREQUENCY



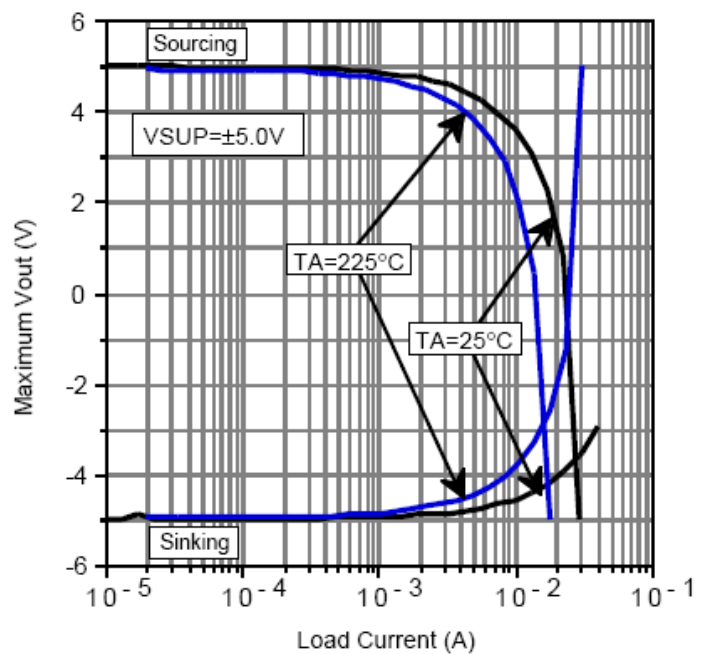
OPEN LOOP GAIN vs. FREQUENCY



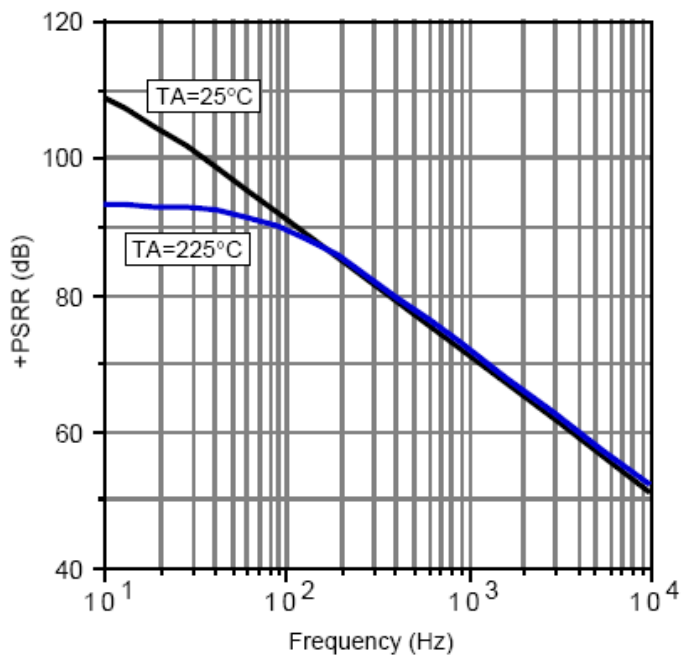
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



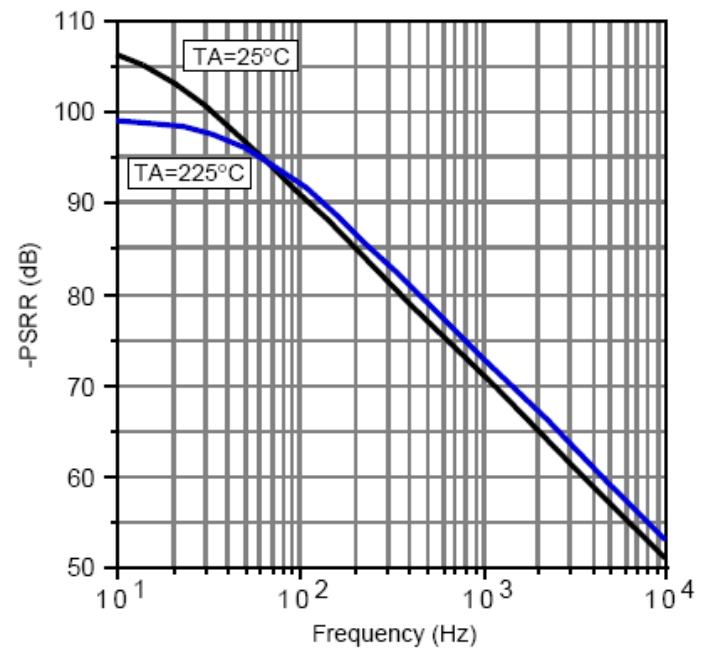
MAXIMUM OUTPUT SWING vs. LOAD CURRENT



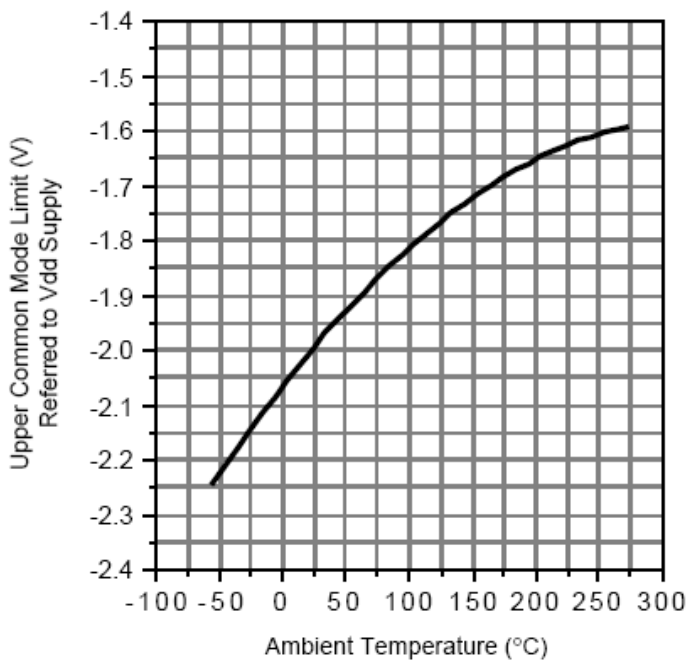
**POSITIVE POWER SUPPLY
REJECTION vs. FREQUENCY**



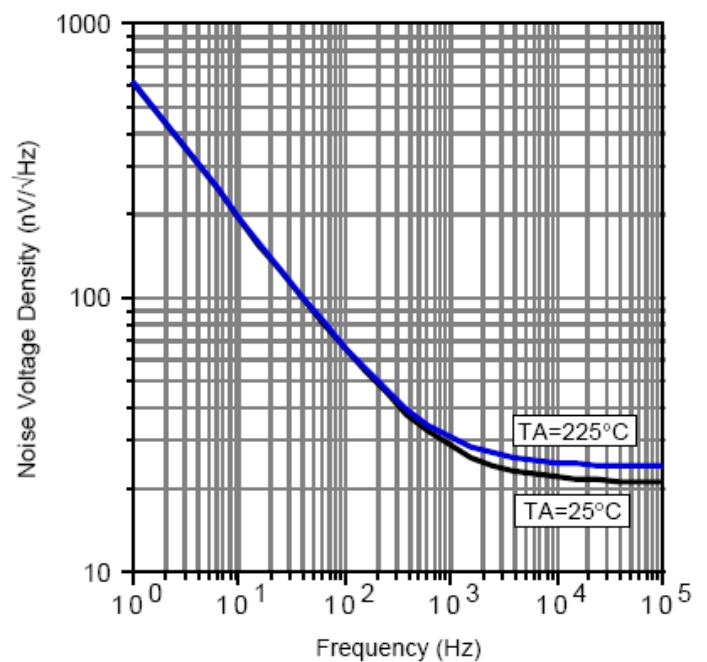
**NEGATIVE POWER SUPPLY
REJECTION vs. FREQUENCY**



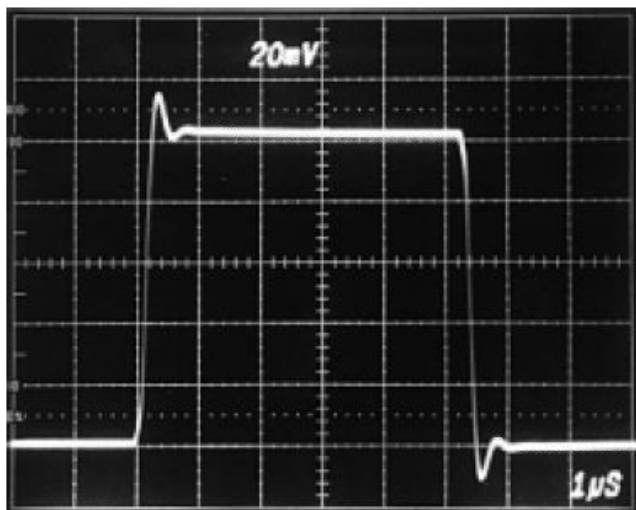
**UPPER COMMON MODE
LIMIT vs. TEMPERATURE**



**INPUT REFERRED NOISE
VOLTAGE vs. FREQUENCY**

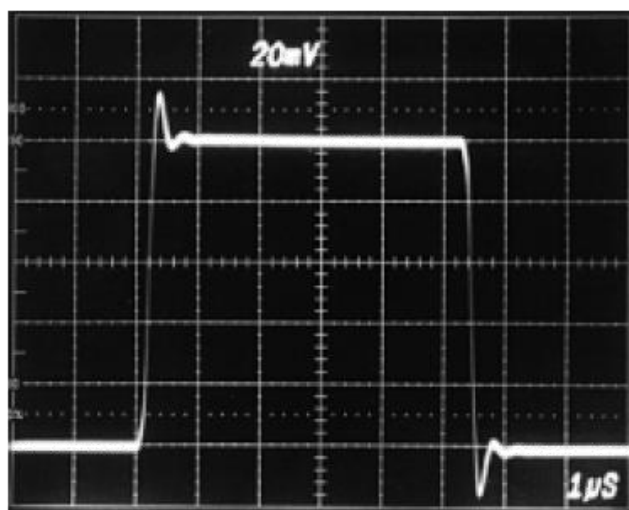


SMALL SIGNAL PULSE RESPONSE



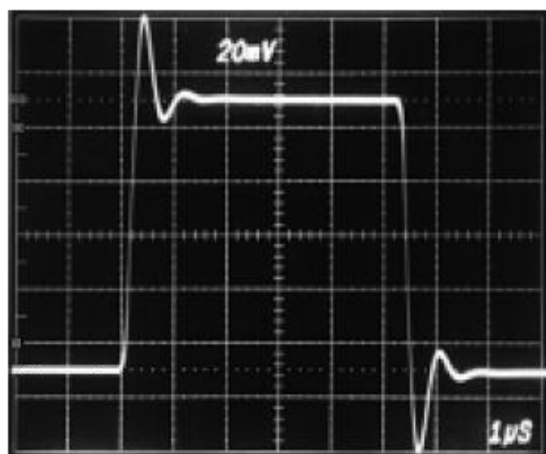
TA=25°C, CL=20pF, Av=+1

SMALL SIGNAL PULSE RESPONSE



TA=225°C, CL=20pF, Av=+1

Small Signal Step Response



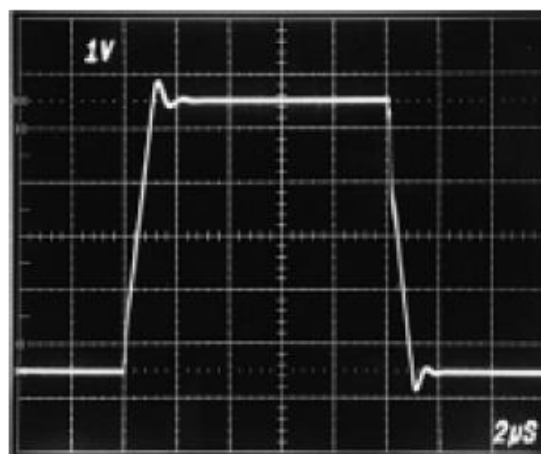
TA=225°C, CL=100pF

Small Signal Step Response



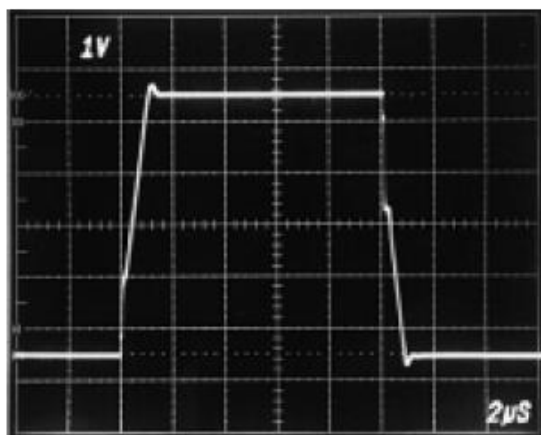
TA=225°C, CL=20pF

Large Signal Step Response



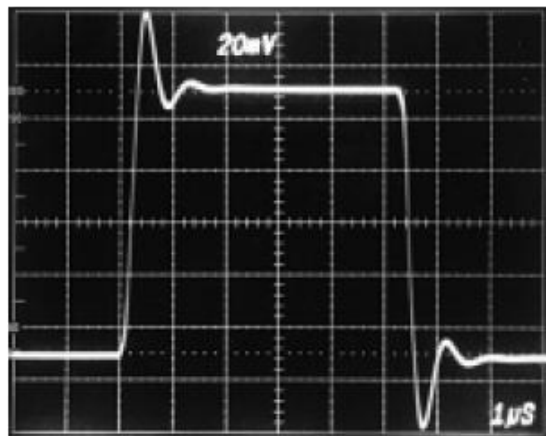
TA=225°C, CL=100pF

Large Signal Step Response



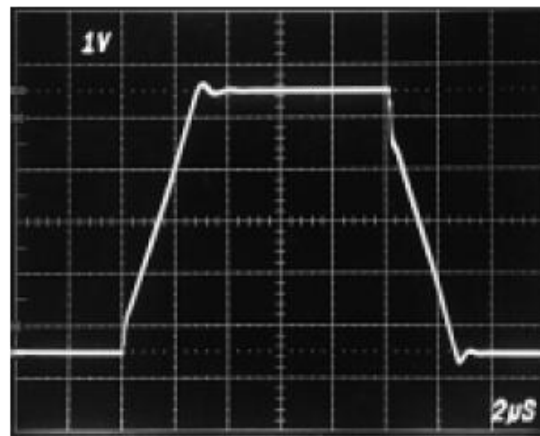
TA=225°C, CL=20pF

Small Signal Step Response



TA=25°C, CL=100pF

Large Signal Step Response



TA=25°C, CL=100pF

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