EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

Features

- Voltage noise of only 0.83nV/√Hz
- Current noise of only 2.4pA/√Hz
- Low offset voltage ≤200µV
- 180MHz -3dB BW for A_V=10
- Low supply current - 10mA
- SOT23 package available
- ±2.5V to ±15V operation

Applications

- Ultrasound input amplifiers
- Wideband instrumentation
- Communication equipment
- AGC & PLL active filters
- Wideband sensors

Ordering Information

Part No	Package	Tape & Reel	Outline #
EL2125CW	5-Pin SOT23		MDP0038
EL2125CS	8-Pin SO		MDP0027
EL2125CN	8-Pin PDIP		MDP0031

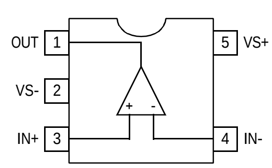
General Description

The EL2125C is an ultra-low noise, wideband amplifier that runs on half the supply current of competitive parts. It is intended for use in systems such as ultrasound imaging where a very small signal needs to be amplified by a large amount without adding significant noise. Its low power dissipation enables it to be packaged in the tiny SOT23 package, which further helps systems where many input channels create both space and power dissipation problems.

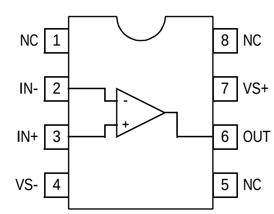
The EL2125C is stable for gains of 10 and greater and uses traditional voltage feedback. This allows the use of reactive elements in the feedback loop, a common requirement for many filter topologies. It operates from ±2.5V to ±15V supplies and is available in a 5-pin SOT23 package and 8-pin SO and 8-pin PDIP packages.

The EL2125C is fabricated in Elantec's proprietary complementary bipolar process, and is specified for operation from -45°C to +85°C.

Connection Diagrams



EL2125CW
(5-Pin SOT23)



EL2125CS
(8-Pin SO and 8-Pin PDIP)

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Absolute Maximum Ratings ($T_A = 25°C$)

V_S+ to V_S-	33V	Power Dissipation	See Curves
Continuous Output Current	40mA	Operating Temperature	-45°C to +85°C
Any Input	V_S- - 0.3V to V_S+ + 0.3V	Storage Temperature	-60°C to +150°C

Important Note:

All parameters having Min/Max specifications are guaranteed. Typ values are for information purposes only. Unless otherwise noted, all tests are at the specified temperature and are pulsed tests, therefore: $T_J = T_C = T_A$

Electrical Characteristics

$V_S = \pm5V$, $T_A = 25°C$, $R_F = 180\Omega$, $R_G = 20\Omega$, $R_L = 500\Omega$ unless otherwise specified.

Parameter	Description	Conditions	Min	Typ	Max	Unit
DC Performance						
V_{OS}	Input Offset Voltage (SO8 & PDIP8)			-0.2	2	mV
	Input Offset Voltage (SOT23-5)				3	mV
T_{CVOS}	Offset Voltage Temperature Coefficient			TBD		µV/°C
I_B	Input Bias Current		-30	-21		µA
I_{OS}	Input Bias Current Offset			0.2	1	µA
T_{CIB}	Input Bias Current Temperature Coefficient			TBD		nA/°C
C_{IN}	Input Capacitance			2.2		pF
A_{VOL}	Open Loop Gain		65	81		dB
PSRR	Power Supply Rejection Ratio [1]		75	96		dB
CMRR	Common Mode Rejection Ratio [2]		65	100		dB
CMIR	Common Mode Input Range					V
V_{OUT}	Output Voltage Swing	No load, $R_F = 1k\Omega$	3.5	3.8		V
V_{OUTL}	Output Voltage Swing	$R_L = 100\Omega$	2.8	3.1		V
I_{OUT}	Output Short Circuit Current [3]		80	100		mA
I_S	Supply Current			10.1	12	mA
AC Performance - $R_G = 20\Omega$, $C_L = 5pF$						
BW	-3dB Bandwidth			175		MHz
BW ±0.1dB	±0.1dB Bandwidth			34		MHz
BW ±1dB	±1dB Bandwidth			150		MHz
Peaking	Peaking			0.4		dB
SR	Slew Rate	$V_{OUT} = 2V_{PP}$, measured at 20% to 80%	TBD	190		V/µs
OS	Overshoot, 4Vpk-pk Output Square Wave	Positive	0.6			%
		Negative	2.7			%
T_S	Settling Time to 0.1% of ±1V Pulse			TBD		ns
V_N	Voltage Noise Spectral Density			0.83		nV/√Hz
I_N	Current Noise Spectral Density			2.4		pA/√Hz
HD2	2nd Harmonic Distortion [4]			TBD		dBc
HD3	3rd Harmonic Distortion [4]			TBD		dBc
THD	Total Harmonic Distortion [5]			TBD		dBc
IMD	Intermodulation Distortion [6]			TBD		%

1. Measured by moving the supplies from ±4V to ±6V
2. Measured by moving the inputs from +3.5V to -4.4V
3. Pulse test only
4. Frequency = 10MHz, V_{OUT} = 1Vpk-pk, into 100Ω and 5pF load
5. Frequency = 20MHz, V_{OUT} = -20dBm ($0.0274V_{RMS}$) into 500Ω and 15pF load
6. Two-tone IMD, frequencies = 5MHz and 6MHz at -20dBm output level, R_{LOAD} = 500Ω and 15pF

Electrical Characteristics

V_S = ±15V, T_A = 25°C, R_F = 180Ω, R_G = 20Ω, R_L = 500Ω unless otherwise specified.

Parameter	Description	Conditions	Min	Typ	Max	Unit
DC Performance						
V_{OS}	Input Offset Voltage (SO8 & PDIP8)			-0.2	2	mV
	Input Offset Voltage (SOT23-5)				3	mV
T_{CVOS}	Offset Voltage Temperature Coefficient			TBD		µV/°C
I_B	Input Bias Current		-30	-21		µA
I_{OS}	Input Bias Current Offset			0.16	1	µA
T_{CIB}	Input Bias Current Temperature Coefficient			TBD		nA/°C
C_{IN}	Input Capacitance			2.2		pF
A_{VOL}	Open Loop Gain		75	86		dB
PSRR	Power Supply Rejection Ratio [1]		75	95		dB
CMRR	Common Mode Rejection Ratio [2]		75	100		dB
CMIR	Common Mode Input Range		TBD			V
V_{OUT}	Output Voltage Swing	No load, R_F = 1kΩ		13.5		V
V_{OUTL}	Output Voltage Swing	Positive, R_F = 180Ω, R_L = 500Ω	12.1			V
		Negative	-11.3			V
I_{OUT}	Output Short Circuit Current [3]		100	150		mA
I_S	Supply Current			10.8	12	mA
AC Performance - R_G = 20Ω, C_L = 5pF						
BW	-3dB Bandwidth			220		MHz
BW ±0.1dB	±0.1dB Bandwidth			23		MHz
BW ±1dB	±1dB Bandwidth			63		MHz
Peaking	Peaking			2.5		dB
SR	Slew Rate	V_{OUT} = 2V_{PP}, measured at 20% to 80%	TBD	225		V/µs
OS	Overshoot, 4Vpk-pk Output Square Wave			0.6		%
T_S	Settling Time to 0.1% of ±1V Pulse			TBD		ns
V_N	Voltage Noise Spectral Density			0.95		nV/√Hz
I_N	Current Noise Spectral Density			2.1		pA/√Hz
HD2	2nd Harmonic Distortion [4]			TBD		dBc
HD3	3rd Harmonic Distortion [4]			TBD		dBc
THD	Total Harmonic Distortion [5]			TBD		dBc
IMD	Intermodulation Distortion [6]			TBD		%

1. Measured by moving the supplies from ±13.5V to ±16.5V
2. Measured by moving the inputs from +13.5V to -14.4V
3. Pulse test only
4. Frequency = 10MHz, V_{OUT} = 1Vpk-pk, into 100Ω and 5pF load
5. Frequency = 20MHz, V_{OUT} = -20dBm (0.0274V_{RMS}) into 500Ω and 15pF load
6. Two-tone IMD, frequencies = 5MHz and 6MHz at -20dBm output level, R_{LOAD} = 500Ω and 15pF

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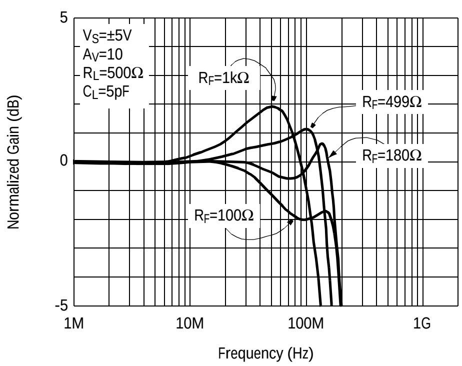
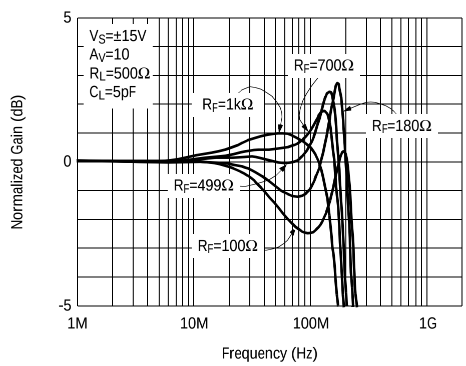
Typical Performance Curves

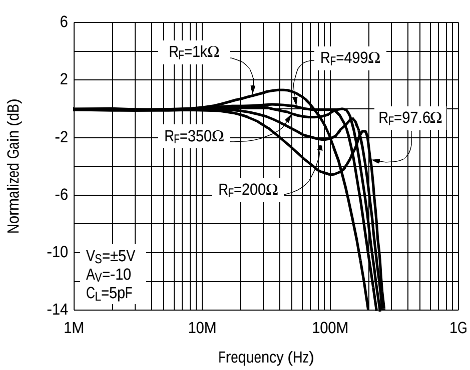
Non-Inverting Frequency Response for Various R_F



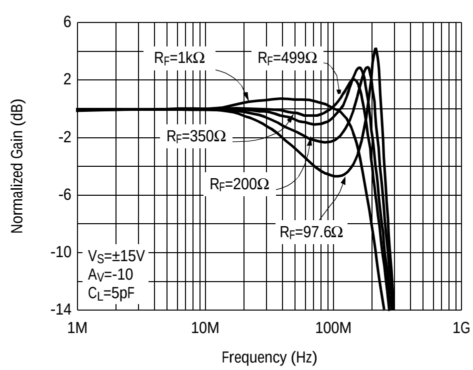
Non-Inverting Frequency Response for Various R_F



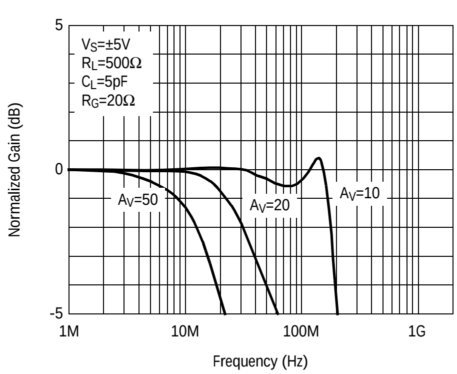
Inverting Frequency Response for Various R_F



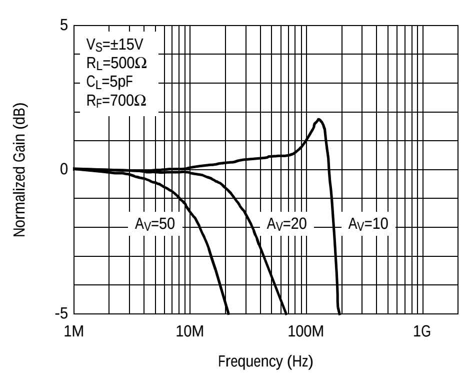
Inverting Frequency Response for Various R_F



Non-Inverting Frequency Response vs Gain

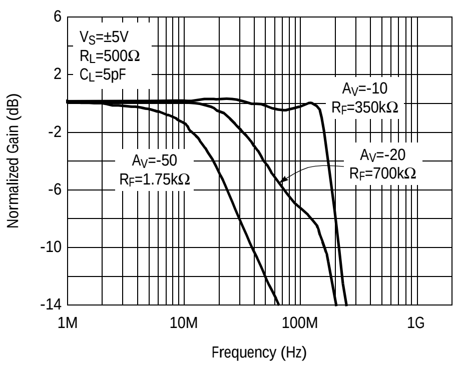


Non-Inverting Frequency Response for Various Gain

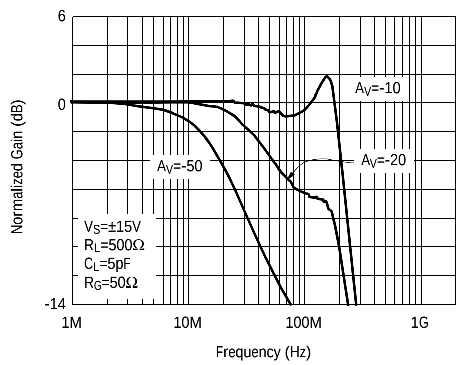


Typical Performance Curves

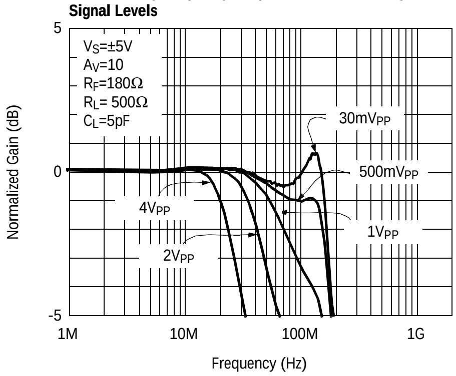
Inverting Frequency Response vs Gain



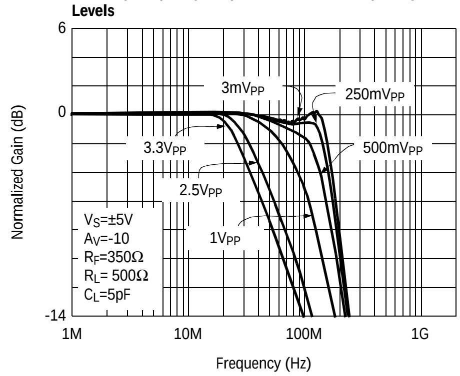
Inverting Frequency Response vs Gain



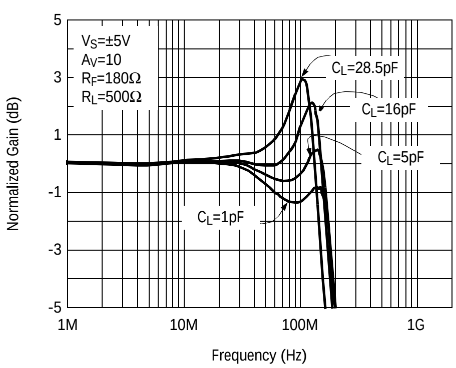
Non-Inverting Frequency Response for Various Output Signal Levels



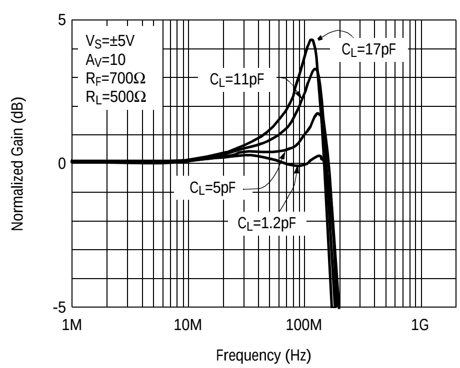
Inverting Frequency Response for Various Output Signal Levels



Non-Inverting Frequency Response for Various C_L



Non-Inverting Frequency Response for Various C_L



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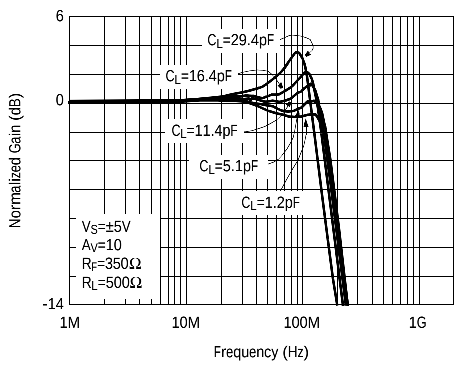
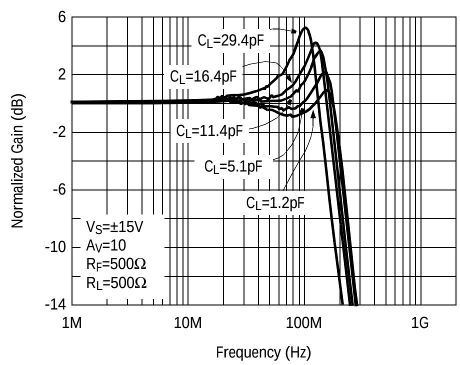
Typical Performance Curves

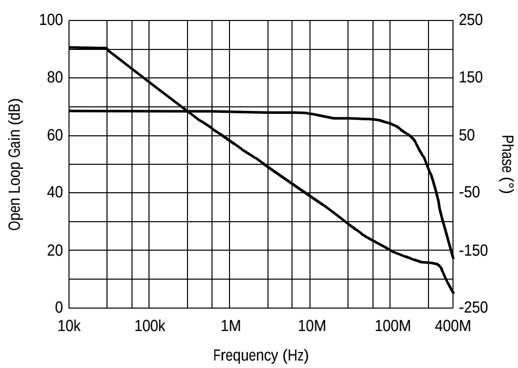
Inverting Frequency Response for Various C_L



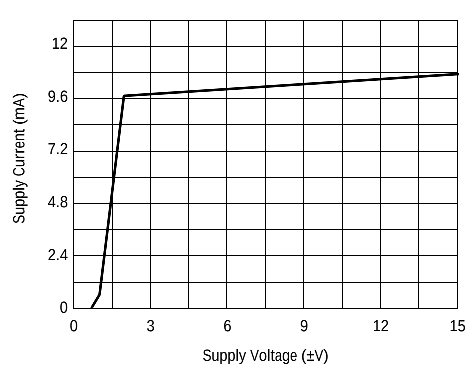
Inverting Frequency Response for Various C_L



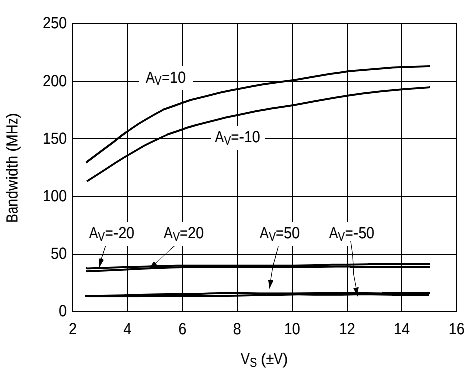
Open Loop Gain and Phase



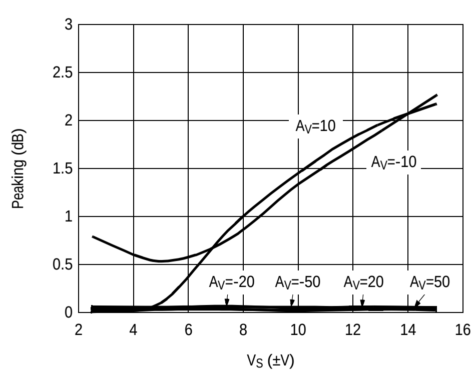
Supply Current vs Supply Voltage



3dB Bandwidth vs Supply Voltage

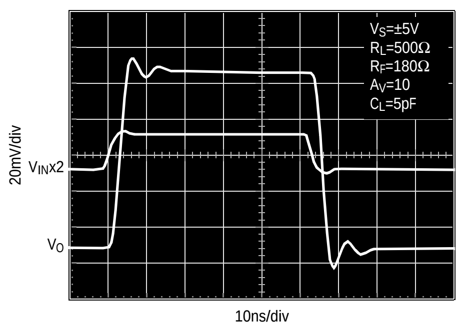


Peaking vs Supply Voltage

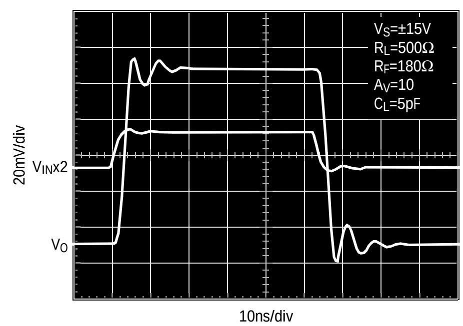


Typical Performance Curves

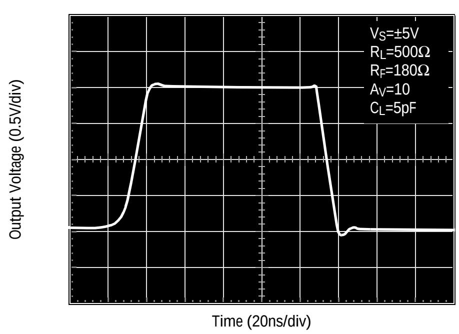
Small Signal Step Response



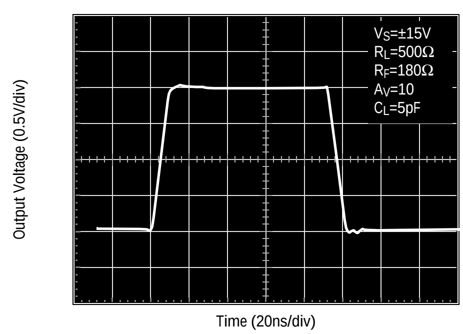
Small Signal Step Response



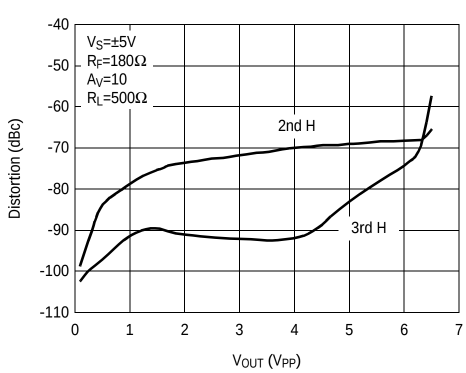
Large-Signal Step Response



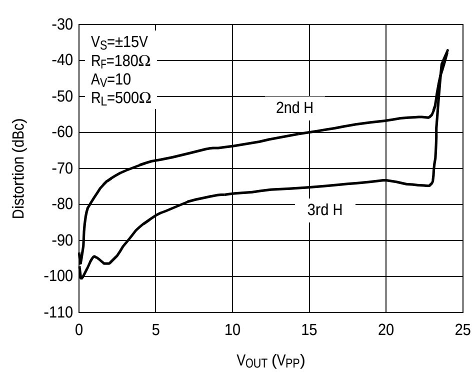
Large-Signal Step Response



1MHz Harmonic Distortion vs Output Swing

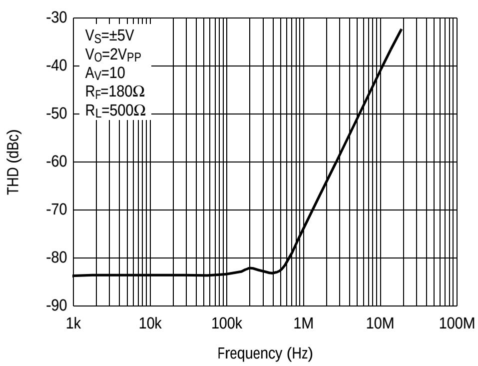


1MHz Harmonic Distortion vs Output Swing

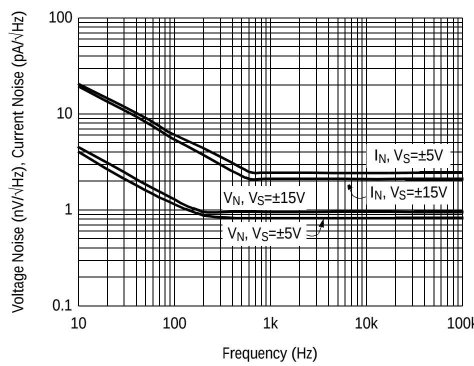


Typical Performance Curves

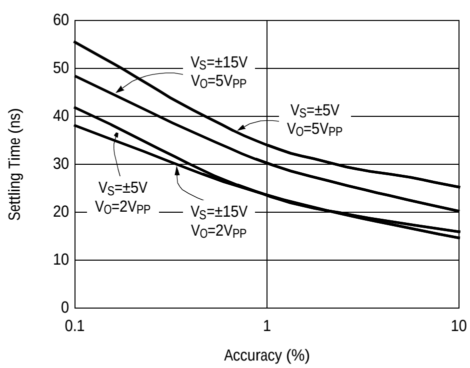
Total Harmonic Distortion vs Frequency



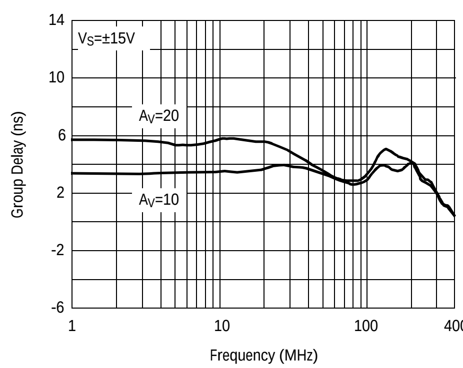
Voltage and Current Noise vs Frequency



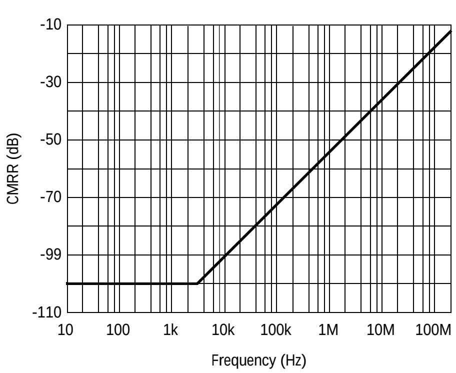
Settling Time vs Accuracy



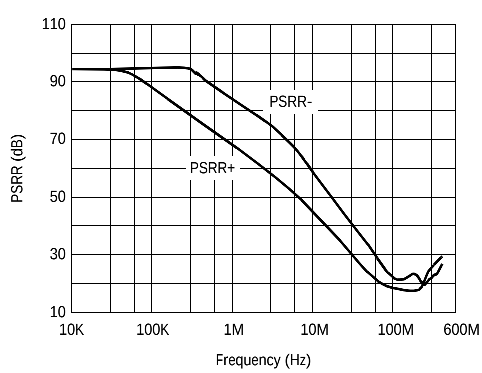
Group Delay



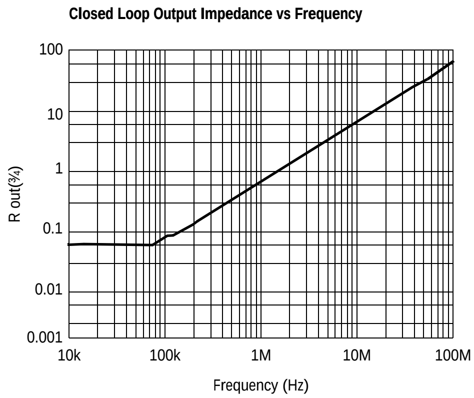
CMRR

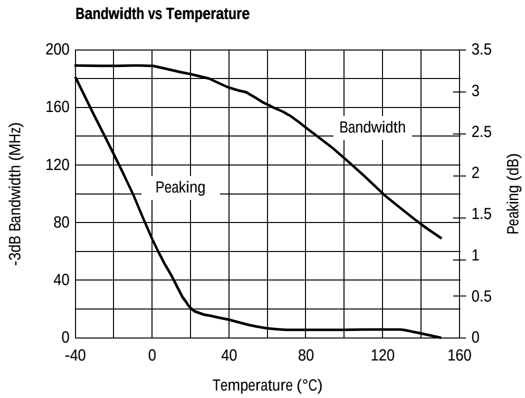


PSRR



Typical Performance Curves





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HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

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