

élantec
HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

Features

- Voltage noise of only 0.83nV/√Hz
- Current noise of only 2.4pA/√Hz
- Low offset voltage $\leq 200\mu\text{V}$
- 180MHz -3dB BW for $A_V=10$
- Low supply current - 10mA
- SOT23 package available
- $\pm 2.5\text{V}$ to $\pm 15\text{V}$ 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

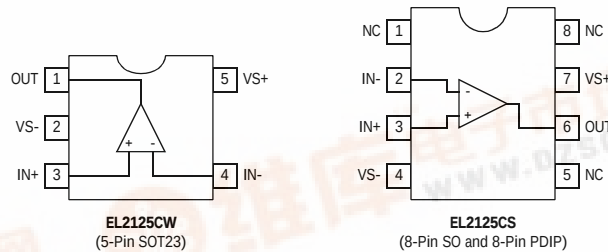
General Description

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 $\pm 2.5\text{V}$ to $\pm 15\text{V}$ 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 $+85^\circ\text{C}$.

Connection Diagrams



Note: All information contained in this data sheet has been carefully checked and is believed to be accurate as of the date of publication; however, this data sheet cannot be a "controlled document". Current revisions, if any, to these specifications are maintained at the factory and are available upon your request. We recommend checking the revision level before finalization of your design documentation.

© 2001 Elantec Semiconductor, Inc.

EL2125C - Preliminary

October 2, 2001



EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$)

V_{S+} to V_{S-}	33V	Power Dissipation	See Curves
Continuous Output Current	40mA	Operating Temperature	-45°C to +85°C
Any Input	$V_{S-} - 0.3\text{V}$ to $V_{S+} + 0.3\text{V}$	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

$V_S = \pm 5\text{V}$, $T_A = 25^\circ\text{C}$, $R_F = 180\Omega$, $R_G = 20\Omega$, $R_L = 500\Omega$ 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		$\mu\text{V}/^\circ\text{C}$
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		$\text{nA}/^\circ\text{C}$
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, $R_F = 1\text{k}\Omega$	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 - $R_G = 20\Omega$, $C_L = 5\text{pF}$						
BW	-3dB Bandwidth			175		MHz
BW $\pm 0.1\text{dB}$	$\pm 0.1\text{dB}$ Bandwidth			34		MHz
BW $\pm 1\text{dB}$	$\pm 1\text{dB}$ Bandwidth			150		MHz
Peaking	Peaking			0.4		dB
SR	Slew Rate	$V_{OUT} = 2V_{PP}$, measured at 20% to 80%	TBD	190		$\text{V}/\mu\text{s}$
OS	Overshoot, 4Vpk-pk Output Square Wave	Positive	0.6			%
		Negative	2.7			%
T_S	Settling Time to 0.1% of $\pm 1\text{V}$ Pulse			TBD		ns
V_N	Voltage Noise Spectral Density			0.83		$\text{nV}/\sqrt{\text{Hz}}$
I_N	Current Noise Spectral Density			2.4		$\text{pA}/\sqrt{\text{Hz}}$
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 $\pm 4\text{V}$ to $\pm 6\text{V}$
2. Measured by moving the inputs from $+3.5\text{V}$ to -4.4V
3. Pulse test only
4. Frequency = 10MHz, $V_{OUT} = 1\text{Vpk-pk}$, into 100Ω and 5pF load
5. Frequency = 20MHz, $V_{OUT} = -20\text{dBm}$ ($0.0274V_{RMS}$) into 500Ω and 15pF load
6. Two-tone IMD, frequencies = 5MHz and 6MHz at -20dBm output level, $R_{LOAD} = 500\Omega$ and 15pF

EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

EL2125C - Preliminary

Electrical Characteristics

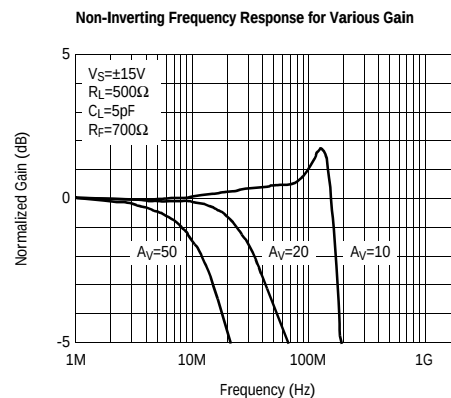
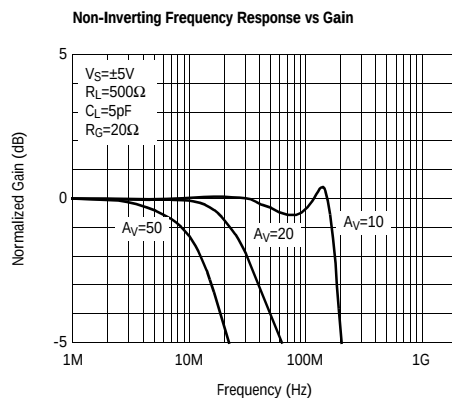
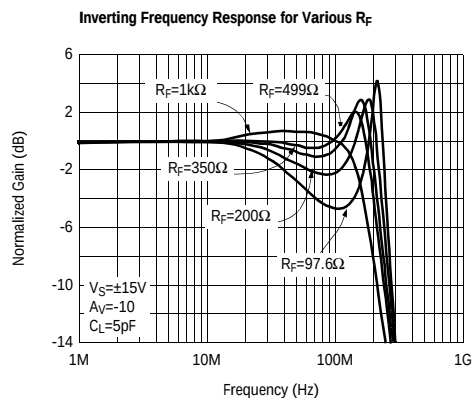
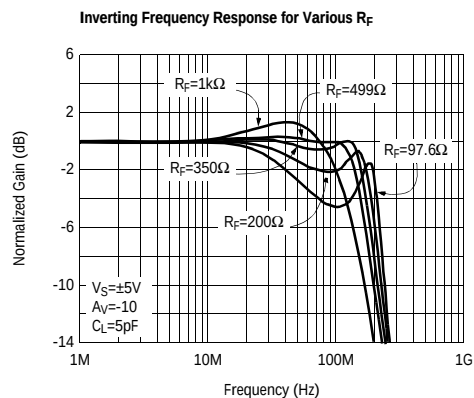
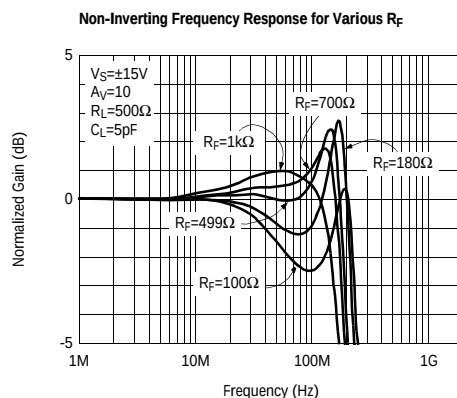
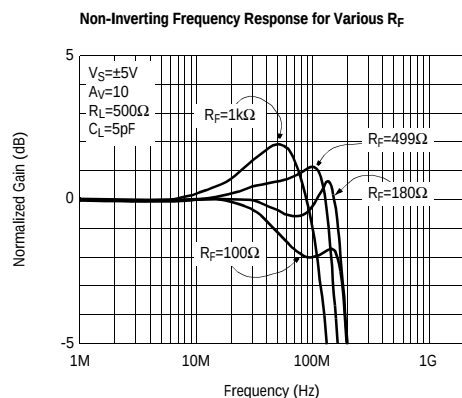
$V_S = \pm 15V$, $T_A = 25^\circ C$, $R_F = 180\Omega$, $R_G = 20\Omega$, $R_L = 500\Omega$ unless otherwise specified.

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		$\mu V/^\circ C$
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/ $^\circ C$
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 = 1k Ω		13.5		V
V _{OUTL}	Output Voltage Swing	Positive, R _F = 180 Ω , R _L = 500 Ω	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 $\pm 0.1dB$	$\pm 0.1dB$ Bandwidth			23		MHz
BW $\pm 1dB$	$\pm 1dB$ 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 $\pm 1V$ Pulse			TBD		ns
V _N	Voltage Noise Spectral Density			0.95		nV/ $\sqrt{Hz}$
I _N	Current Noise Spectral Density			2.1		pA/ $\sqrt{Hz}$
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 $\pm 13.5V$ to $\pm 16.5V$
2. Measured by moving the inputs from $+13.5V$ to $-14.4V$
3. Pulse test only
4. Frequency = 10MHz, V_{OUT} = 1Vpk-pk, into 100 Ω and 5pF load
5. Frequency = 20MHz, V_{OUT} = -20dBm (0.0274V_{RMS}) into 500 Ω and 15pF load
6. Two-tone IMD, frequencies = 5MHz and 6MHz at -20dBm output level, R_{LOAD} = 500 Ω and 15pF

EL2125C - Preliminary *Ultra-low Noise, Low Power, Wideband Amplifier*

Typical Performance Curves



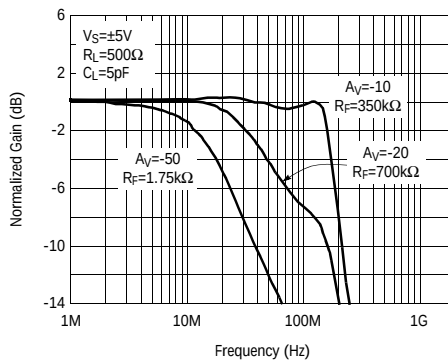
EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

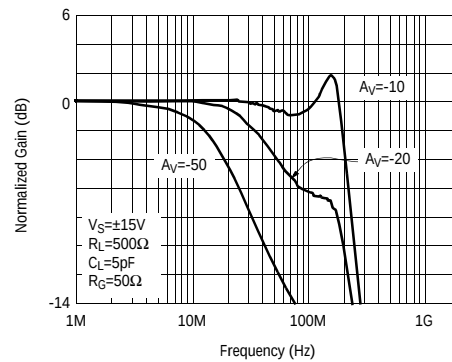
EL2125C - Preliminary

Typical Performance Curves

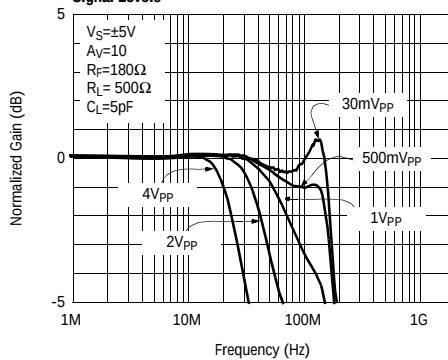
Inverting Frequency Response vs Gain



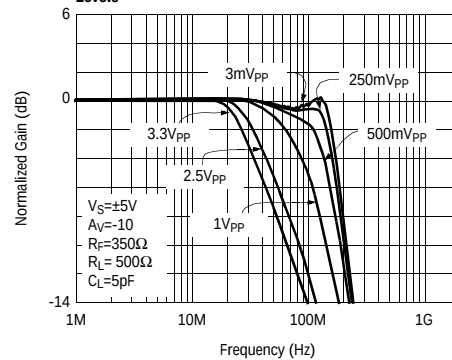
Inverting Frequency Response vs Gain



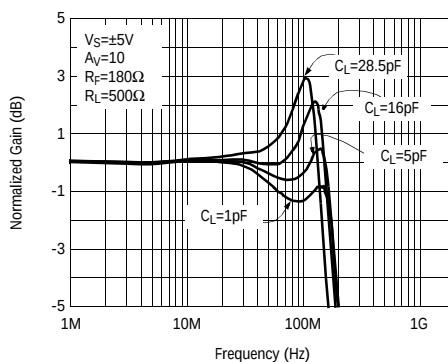
Non-Inverting Frequency Response for Various Output Signal Levels



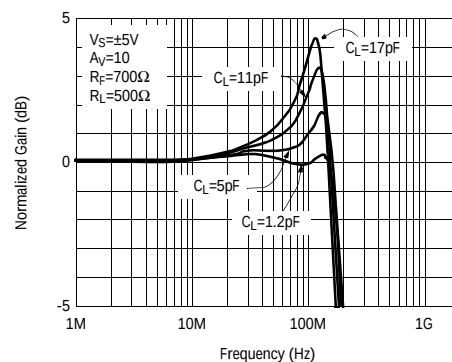
Inverting Frequency Response for Various Output Signal Levels



Non-Inverting Frequency Response for Various C_L

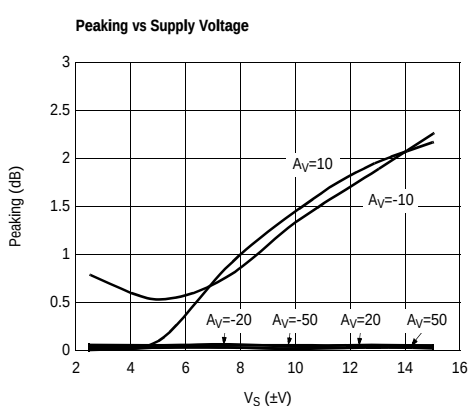
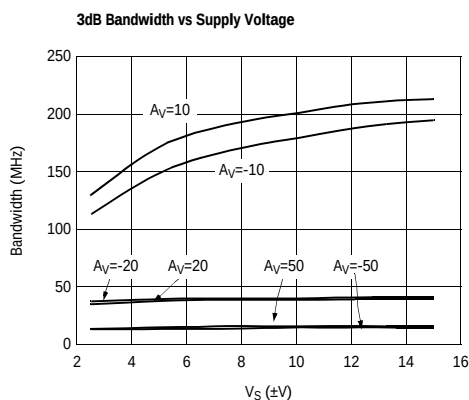
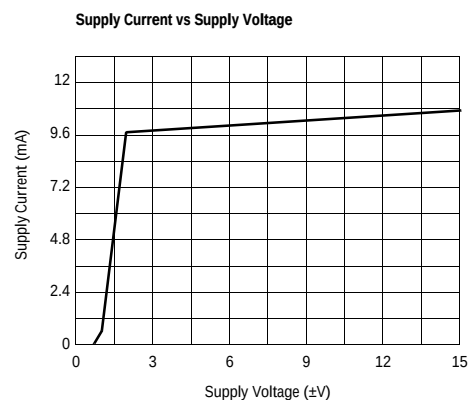
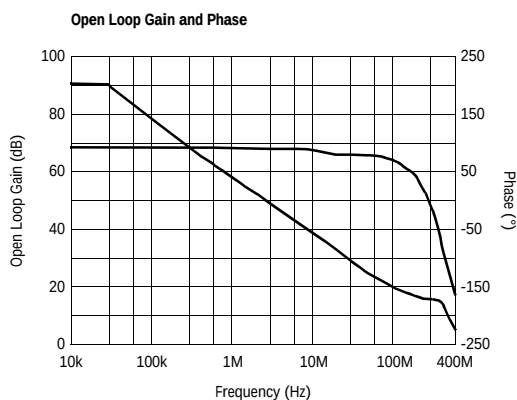
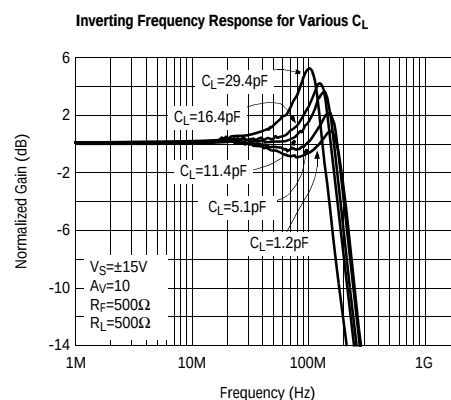
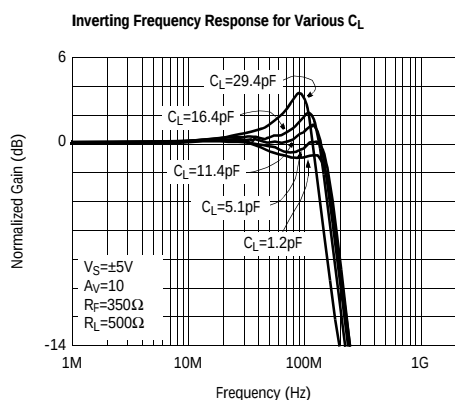


Non-Inverting Frequency Response for Various C_L



EL2125C - Preliminary *Ultra-low Noise, Low Power, Wideband Amplifier*

Typical Performance Curves



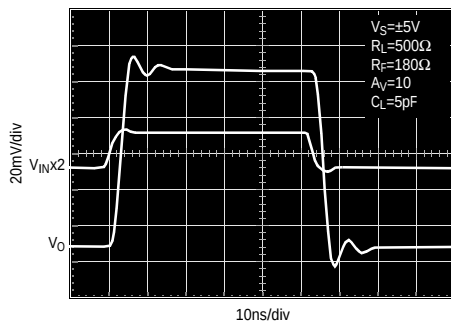
EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

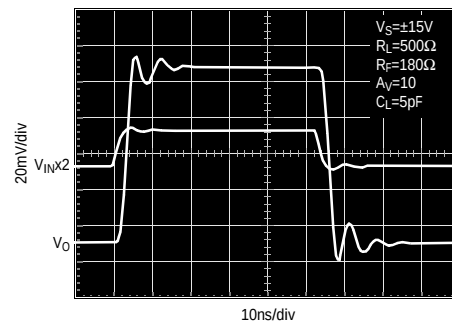
EL2125C - Preliminary

Typical Performance Curves

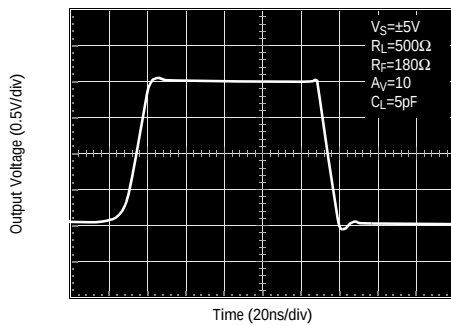
Small Signal Step Response



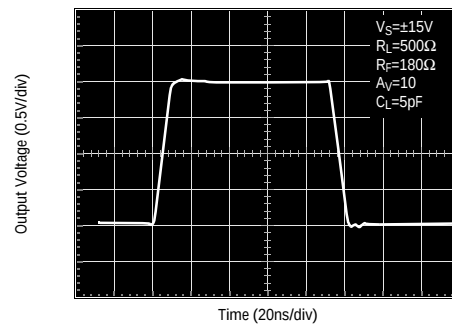
Small Signal Step Response



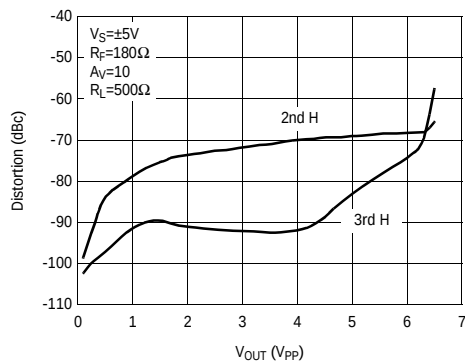
Large-Signal Step Response



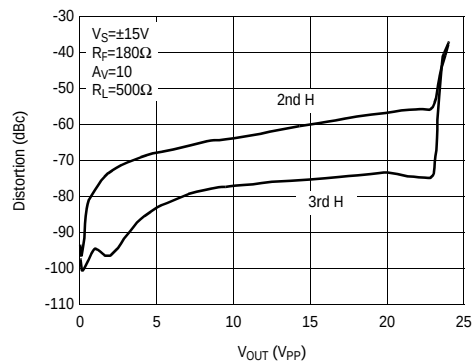
Large-Signal Step Response



1MHz Harmonic Distortion vs Output Swing



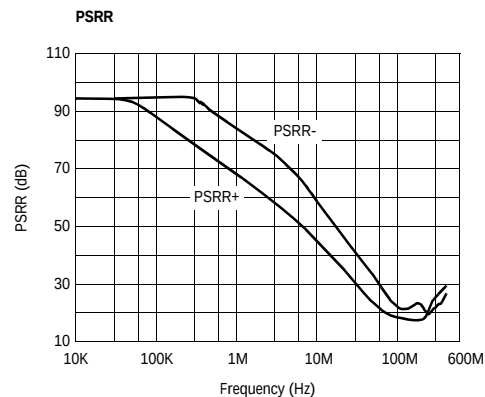
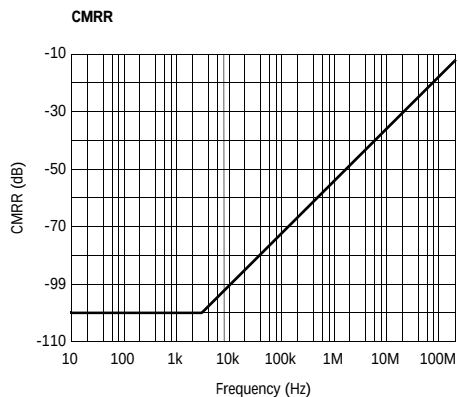
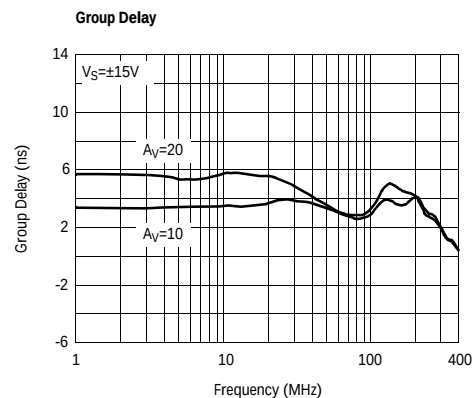
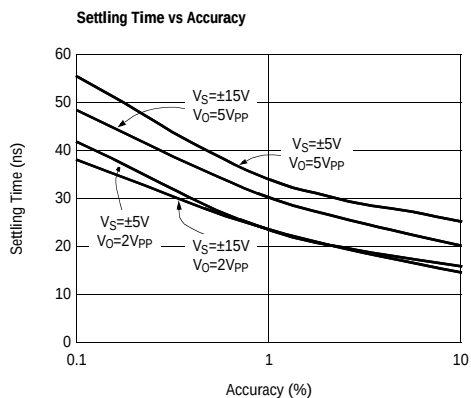
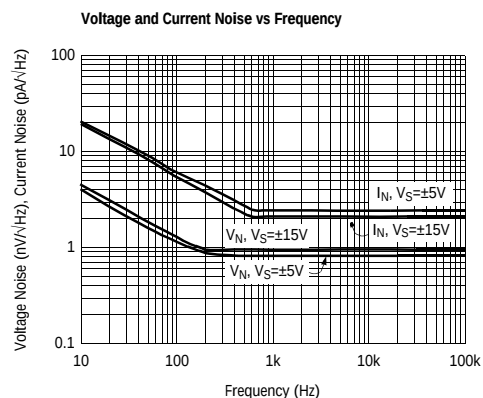
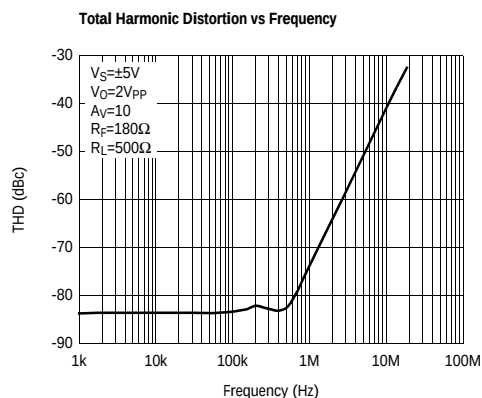
1MHz Harmonic Distortion vs Output Swing



EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

Typical Performance Curves

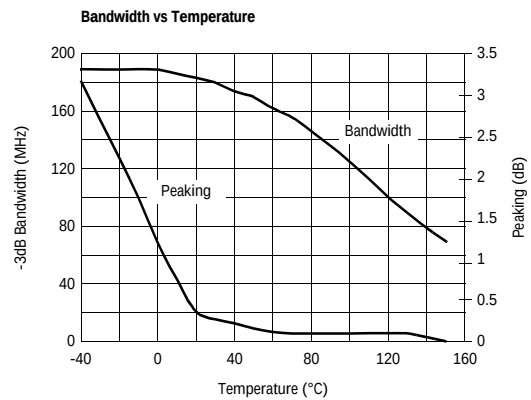
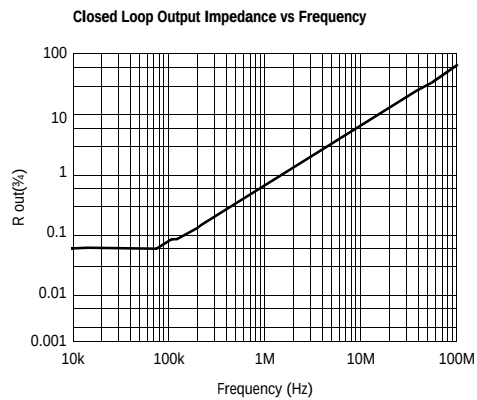


EL2125C - Preliminary

Ultra-low Noise, Low Power, Wideband Amplifier

EL2125C - Preliminary

Typical Performance Curves



EL2125C - Preliminary*Ultra-low Noise, Low Power, Wideband Amplifier***General Disclaimer**

Specifications contained in this data sheet are in effect as of the publication date shown. Elantec, Inc. reserves the right to make changes in the circuitry or specifications contained herein at any time without notice. Elantec, Inc. assumes no responsibility for the use of any circuits described herein and makes no representations that they are free from patent infringement.

élan**tec**

HIGH PERFORMANCE ANALOG INTEGRATED CIRCUITS

Elantec Semiconductor, Inc.

675 Trade Zone Blvd.

Milpitas, CA 95035

Telephone: (408) 945-1323

(888) ELANTEC

Fax: (408) 945-9305

European Office: +44-118-977-6020

Japan Technical Center: +81-45-682-5820

WARNING - Life Support Policy

Elantec, Inc. products are not authorized for and should not be used within Life Support Systems without the specific written consent of Elantec, Inc. Life Support systems are equipment intended to support or sustain life and whose failure to perform when properly used in accordance with instructions provided can be reasonably expected to result in significant personal injury or death. Users contemplating application of Elantec, Inc. Products in Life Support Systems are requested to contact Elantec, Inc. factory headquarters to establish suitable terms & conditions for these applications. Elantec, Inc.'s warranty is limited to replacement of defective components and does not cover injury to persons or property or other consequential damages.