

# **Parameters of an RF amplifier: A practical example**

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EE160: Principles of Communication Systems

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# A list of low-noise amplifiers (LNA)

Part#	RF Primary Function	Freq Response RF (min) (Hz)	Freq Response RF (max) (Hz)	Gain (typ) (dB)	OP1dB (typ) (dBm)	OIP3 (typ) (dBm)	NF (typ) (dB)	Device Match	V <sub>s</sub> (typ) (V)	I <sub>s</sub> (typ) (A)	Price (100-499) (\$ US)
HMC8325	LNA	71G	86G	21	13	22	3.6	Internal	3	50m	\$61.89 (HMC8325)
ADL7003	LNA	50G	95G	14	14	21	5.5	Internal	3	120m	\$215.62 (ADL7003CHIPS)
HMC7950	LNA, Low Phase Noise	2G	28G	15	16	26	2	-	5	64m	\$137.68 (HMC7950LS6)
HMC392ALC4	LNA	3.5G	8G	17	19	34.5	1.8	Internal	5	61m	\$51.55 (HMC392ALC4)
HMC392A-Die	LNA	3.5G	7G	17.2	19	32.5	1.7	Internal	5	59m	\$43.20 (HMC392A)
HMC717A	LNA	4.8G	6G	14.5	18	29.5	1.3	Internal	5	73m	\$6.70 (HMC717ALP3E)
HMC8410LP2FE	LNA	10M	10G	18	21	31.5	1.4	Internal	5	65m	\$29.86 (HMC8410LP2FE)
HMC8410-Die	LNA	10M	10G	18	20.5	31.5	1.4	Internal	5	65m	\$32.85 (HMC8410CHIPS)
HMC8402-Die	LNA, Wideband Distributed Amps	2G	30G	13.5	20	24	2.5	Internal	7	68m	\$114.67 (HMC8402)
HMC8401-Die	LNA, Wideband Distributed Amps	10M	28G	14.5	16.5	26	1.5	Internal	7.5	60m	\$110.05 (HMC8401)
HMC8400-Die	LNA, Wideband Distributed Amps	2G	30G	14	14.5	25	2	Internal	5	67m	\$102.61 (HMC8400)
ADL5726	LNA	21.2G	23.6G	24.7	-9.5	1	3.3	Internal	3.3	92.4m	\$11.89 (ADL5726ACPZN-R7)
ADL5725	LNA	17.7G	19.7G	27.8	-14	-1.5	2.4	Internal	3.3	108m	\$11.89 (ADL5725ACPZN-R7)
ADL5724	LNA	12.7G	15.4G	26.4	-11	2	2.1	Internal	3.3	109.7m	\$11.89 (ADL5724ACPZN-R7)

Source: <http://www.analog.com/en/products/amplifiers/rf-amplifiers/low-noise-amplifiers.html>

# Class exercise 1 (5 min)

- Which of the amplifiers shown in the previous table has best linear properties? Why?

# ADL7003 amplifier (50-95 GHz, GaAs)

## ADL7003

50 GHz to 95 GHz, GaAs,  
pHEMT, MMIC, Wideband Low  
Noise Amplifier



Data Sheet  
Rev. 0



Recommended  
for New Designs



Overview

Documentation

Tools & Simulations

Reference Materials

Design Resources

Discussions

Sample & Buy

## Overview

### Features and Benefits | Product Details

- Gain: 14 dB typical
- Noise figure: 5 dB typical
- Input return loss ( $S_{11}$ ): 15 dB typical
- Output return loss ( $S_{22}$ ): 20 dB typical
- Output power for 1 dB compression ( $P_{1dB}$ ): 14 dBm typical
- Saturated output power ( $P_{SAT}$ ): 18 dBm typical
- Output third-order intercept ( $IP_3$ ): 21 dBm typical
- Supply voltage: 3 V at 120 mA
- 50 Ω matched input/output
- Die size: 1.9 mm × 1.9 mm × 0.05 mm

### Product Categories

#### Amplifiers

- Low Noise Amplifiers

#### RF & Microwave

- Low Noise Amplifiers

### Markets & Technology

#### Communications

Source: <http://www.analog.com/en/products/adl7003.html#product-overview>

# Class exercise 2 (10 min)

- Sketch the input-output power characteristic of the ADL7003 amplifier

# Noise figure? Later in the course

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