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# 434MHz LNA for RKE Using the 2SC5490A

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## Application Note

### Overview

This application note explains about ON Semiconductor's 2SC5490A which is used as a Low Noise Amplifier (LNA) for RKE (Remote Keyless Entry).

The 2SC5490A is a silicon bipolar transistor best suited for high-frequency applications which is assembled in the 3-pin surface mount package.

For information about the performance, please refer to the datasheet of this product.

Since the evaluation board is adjusted to achieve optimal performance in RKE (434 MHz), the product can provide 14.6dB gain and 1.45dB noise figure.

A standard material FR4 is used for the printed circuit board (PCB).

Please note that the losses of the PCB and the SMA connector are not excluded from the noise figure.

## 434MHz LNA for RKE Using the 2SC5490A

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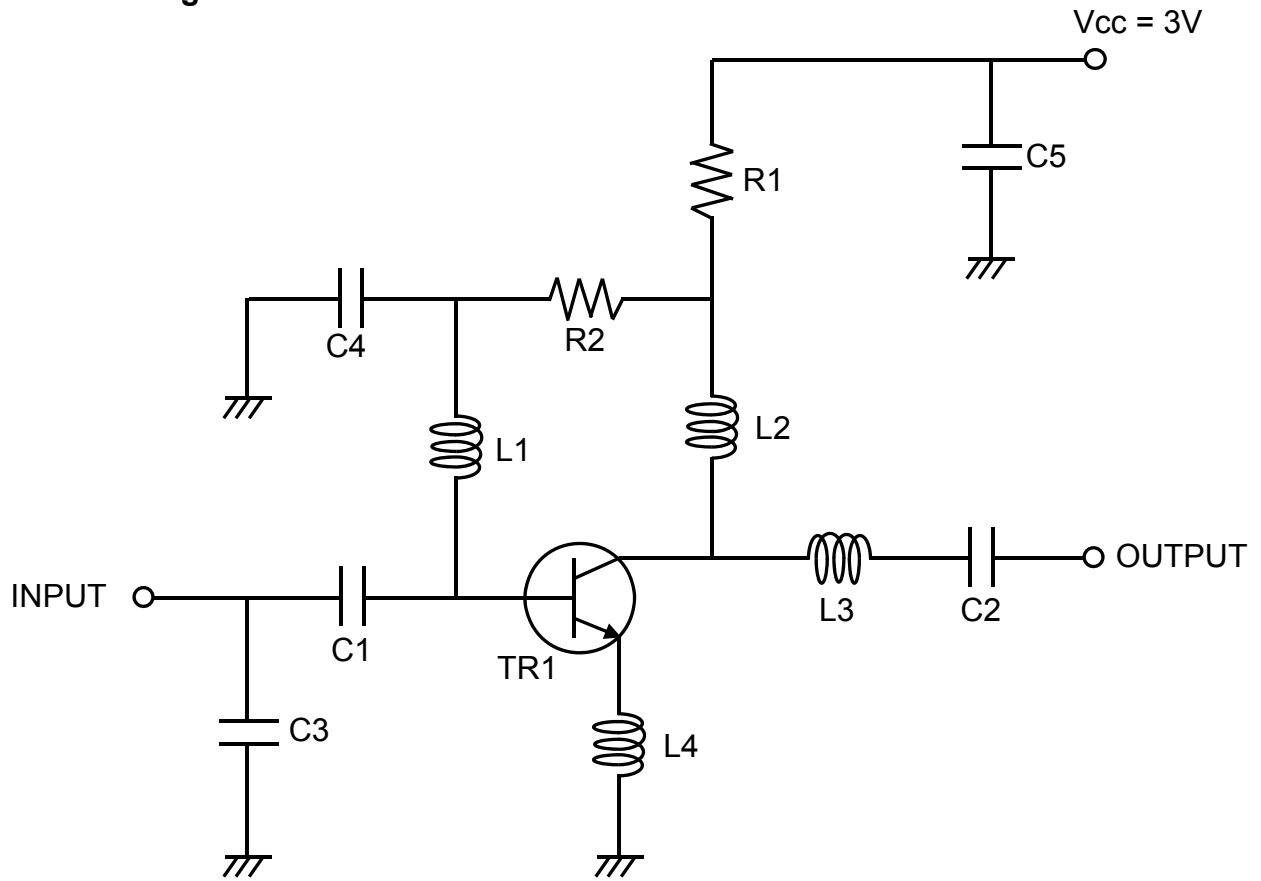
### ■ Summary of Data

Ta = 25 °C, Input Power = -40 dBm

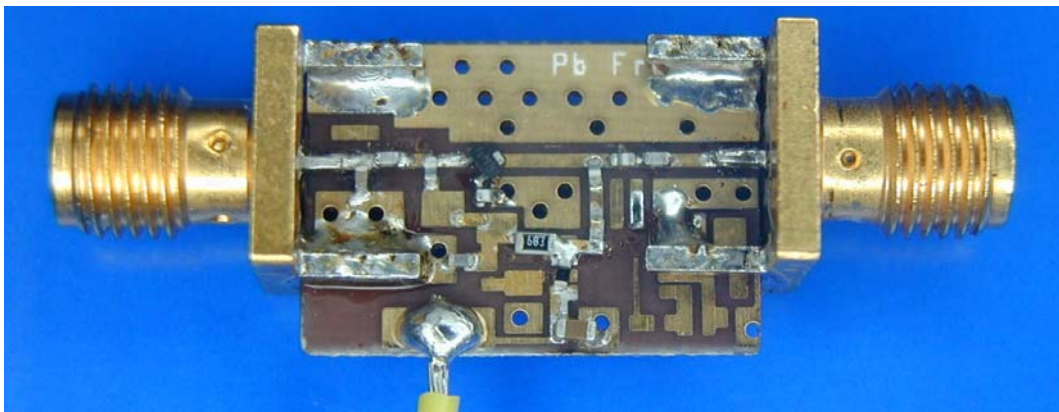
Parameter	Symbol	Condition	Result	Unit
DC Voltage	Vcc		3.0	V
DC Current	Icc		1.96	mA
Power Gain	Gp	f = 434 MHz	14.6	dB
Noise Figure	NF	f = 434 MHz	1.45	dB
Input Return Loss	RLin	f = 434 MHz	5.6	dB
Output Return Loss	RLout	f = 434 MHz	12.3	dB
Isolation	ISL	f = 434 MHz	19.5	dB
Gain 1dB Compression Input Power	Pin1dB	f = 434 MHz	-20	dBm
Input 3rd Order Intercept Point	IIP3	f1 = 433 MHz f2 = 434 MHz Pin = -35 dBm	-10	dBm

# 434MHz LNA for RKE Using the 2SC5490A

## ■Circuit Design



## ■Evaluation Board



## 434MHz LNA for RKE Using the 2SC5490A

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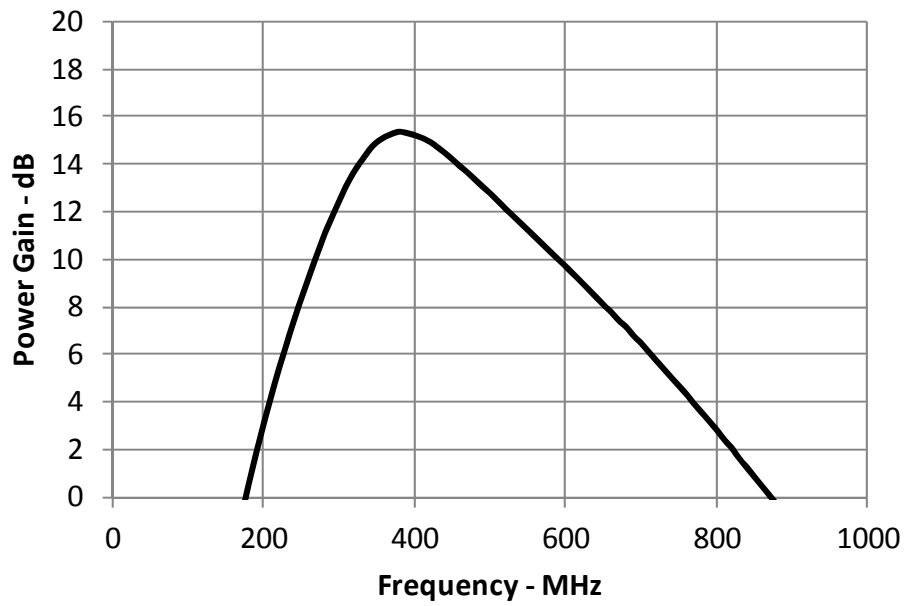
### ■Bill of Materials

Item	Symbol	Value	Manufacturer	Size
Bip-Tr	TR1	2SC5490A	ON Semiconductor	SC81
Capacitor	C1	10 pF	Murata GRM155	1005
	C2	6 pF	Murata GRM155	1005
	C3	4 pF	Murata GRM155	1005
	C4	150 pF	Murata GRM155	1005
	C5	0.1 uF	Various	1608
Resistor	R1	680 $\Omega$	Various	1005
	R2	68 k $\Omega$	Various	1608
Inductor	L1	22 nH	TDK MLG1005S	1005
	L2	10 nH	TDK MLG1005S	1005
	L3	39 nH	TDK MLG1005S	1005
	L4	2.2 nH	TDK MLG1005S	1005
Material	-	FR4	-	19 x 12 mm

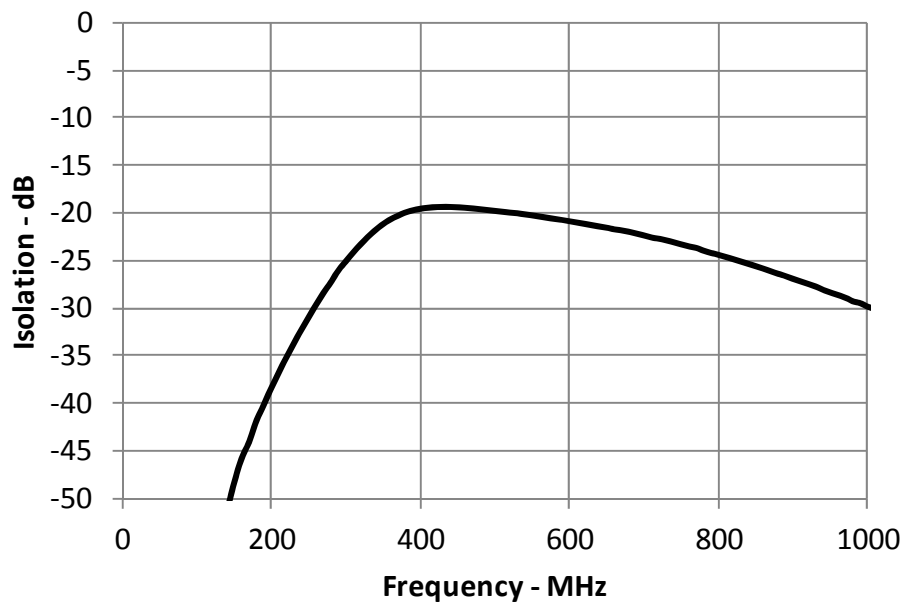
## 434MHz LNA for RKE Using the 2SC5490A

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### ■ Power Gain



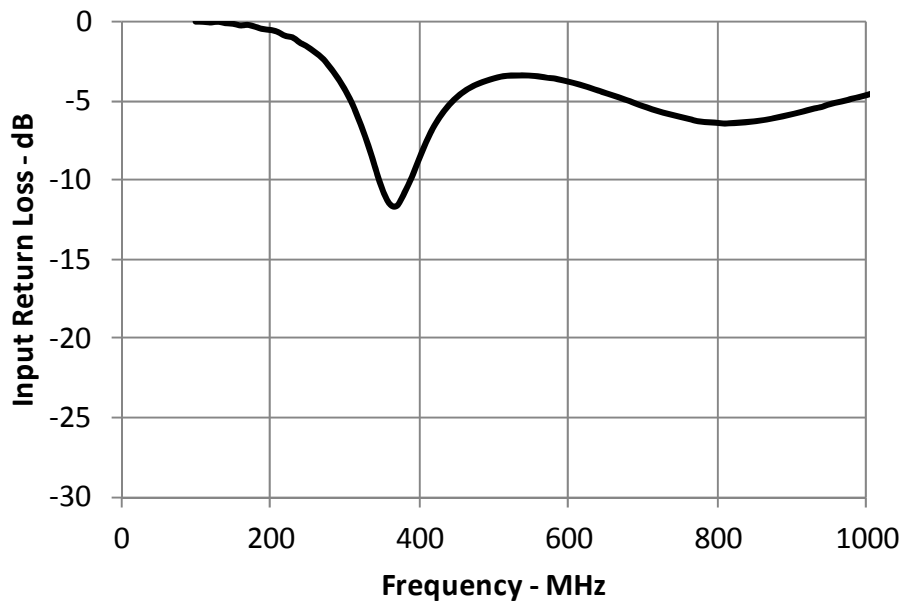
### ■ Isolation



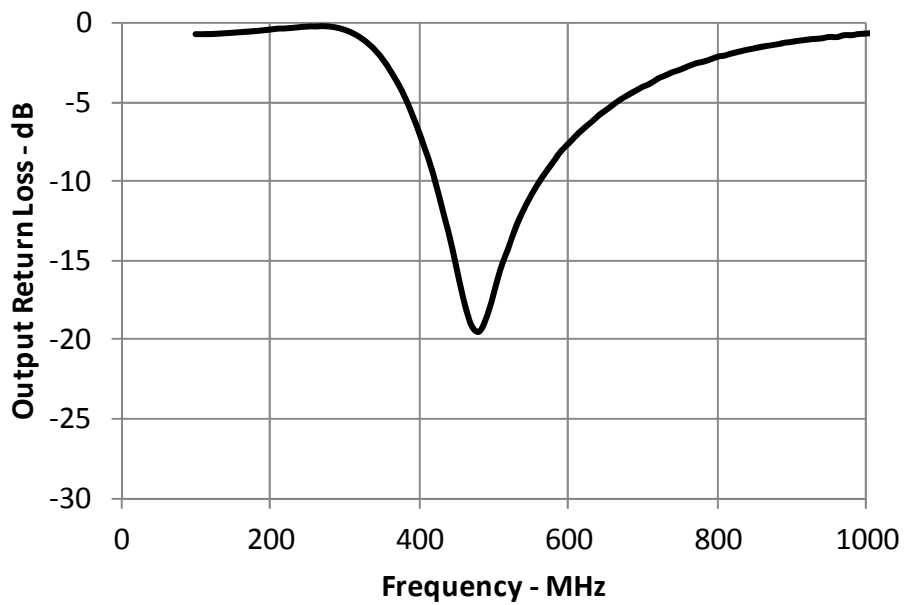
## 434MHz LNA for RKE Using the 2SC5490A

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### ■ Input Return Loss

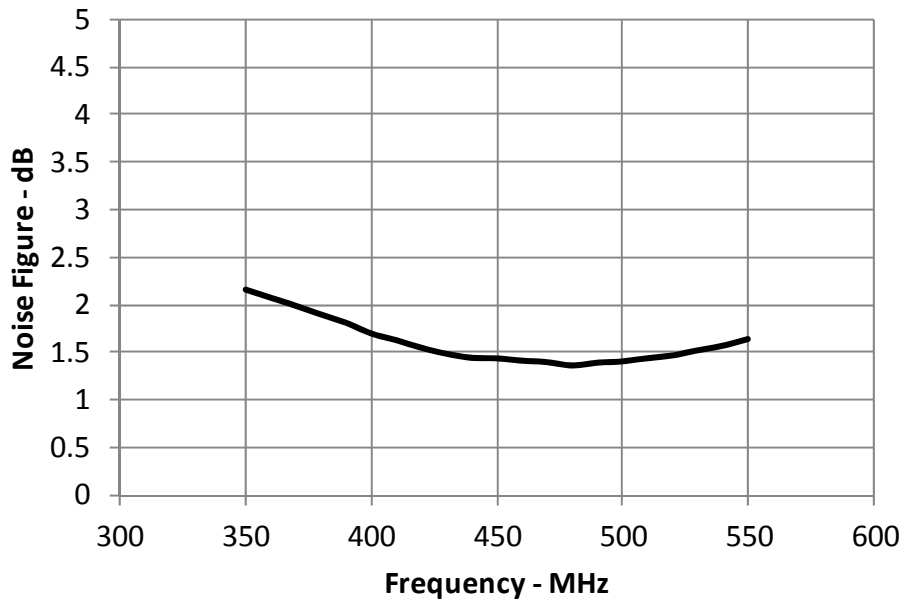


### ■ Output Return Loss

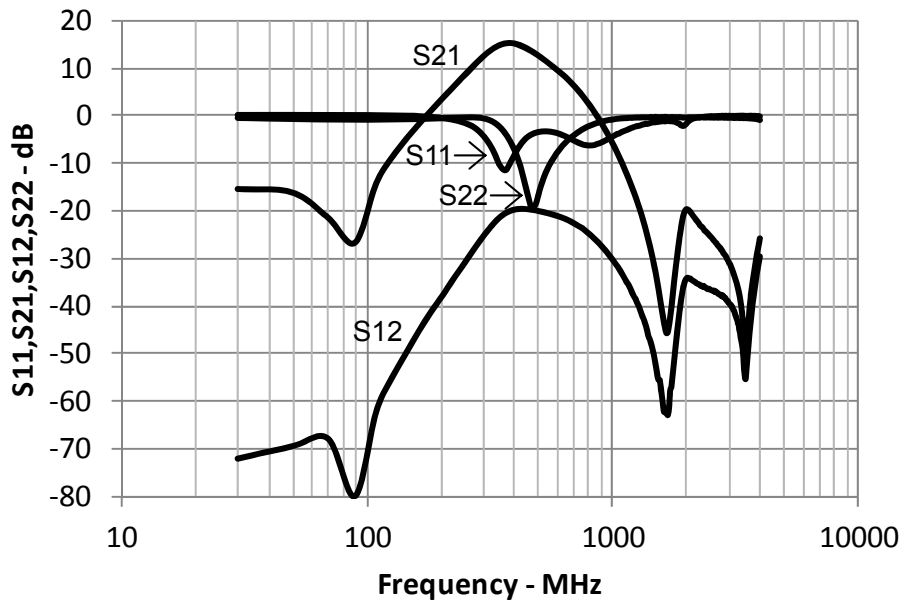


# 434MHz LNA for RKE Using the 2SC5490A

## ■ Noise Figure



## ■ S11, S21, S12, S22 Wide Span

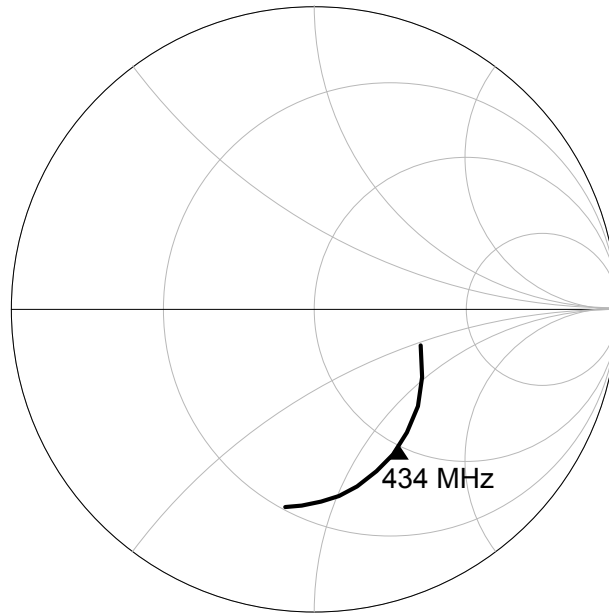




## 434MHz LNA for RKE Using the 2SC5490A

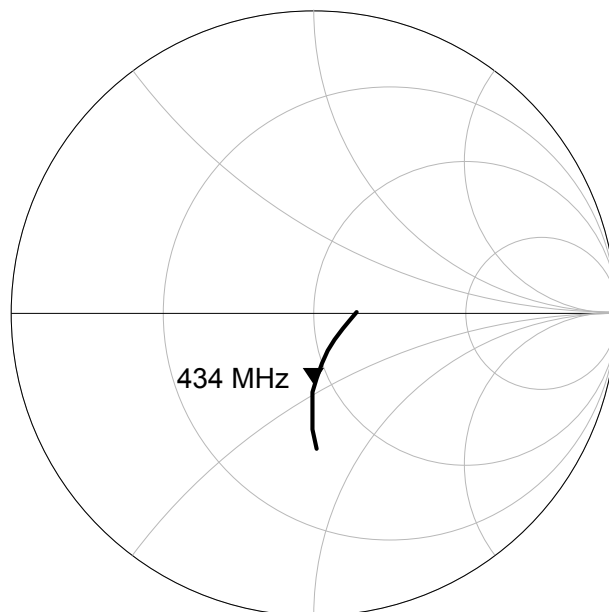
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### ■Smith Chart Input Return Loss



400 MHz to 500 MHz

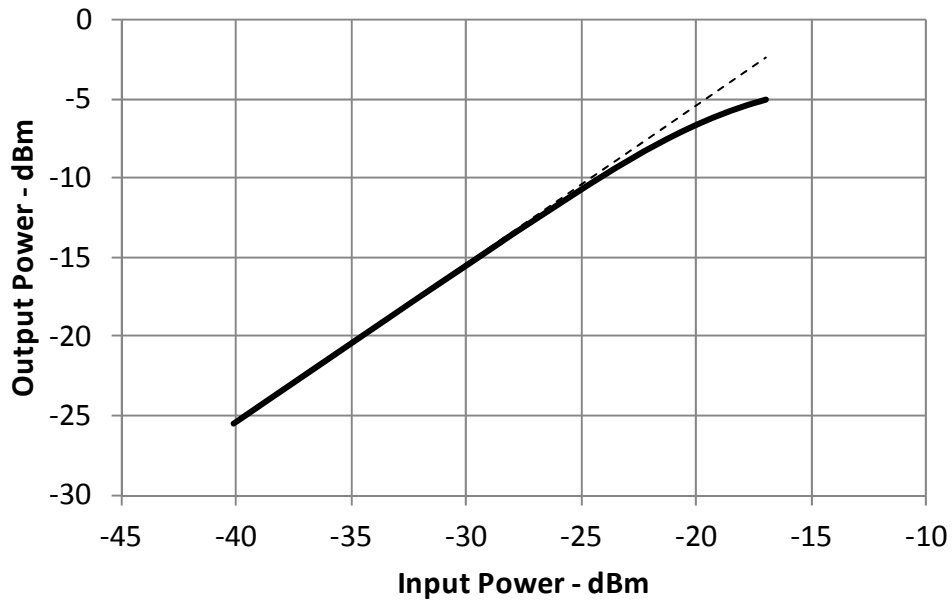
### ■Smith Chart Output Return Loss



400 MHz to 500 MHz

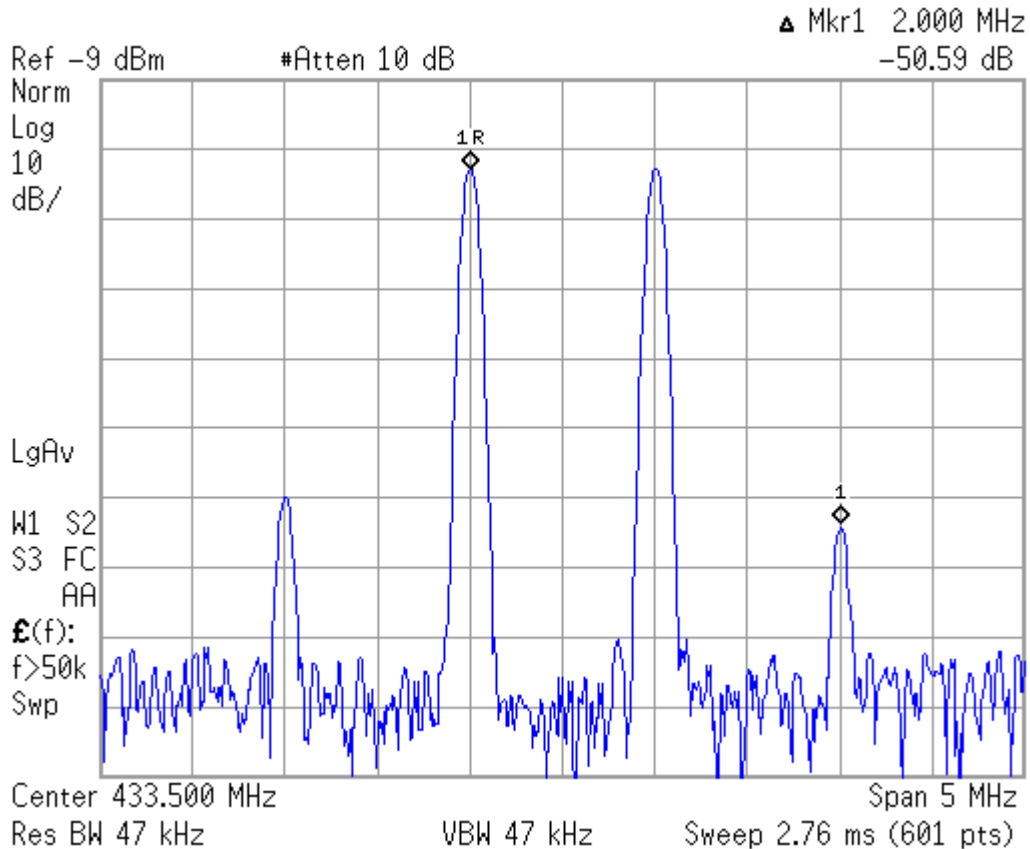
# 434MHz LNA for RKE Using the 2SC5490A

## ■ Gain 1dB Compression Point



## ■ Input 3rd Order Intercept Point

f1 = 433 MHz, f2 = 434 MHz, Pin = -35 dBm



## 434MHz LNA for RKE Using the 2SC5490A

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