

DAB band-III Amplifier Using the MCH4015



ON Semiconductor®

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Application Note

Overview

This application note explains about ON Semiconductor's MCH4015 which is used as a Low Noise Amplifier (LNA) for DAB (Digital Audio Broadcast).

The MCH4015 is a silicon bipolar transistor best suited for high-frequency applications which is assembled in the 4-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 band-III (170 MHz to 250 MHz), the product can provide 23dB gain and 1.06dB 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.

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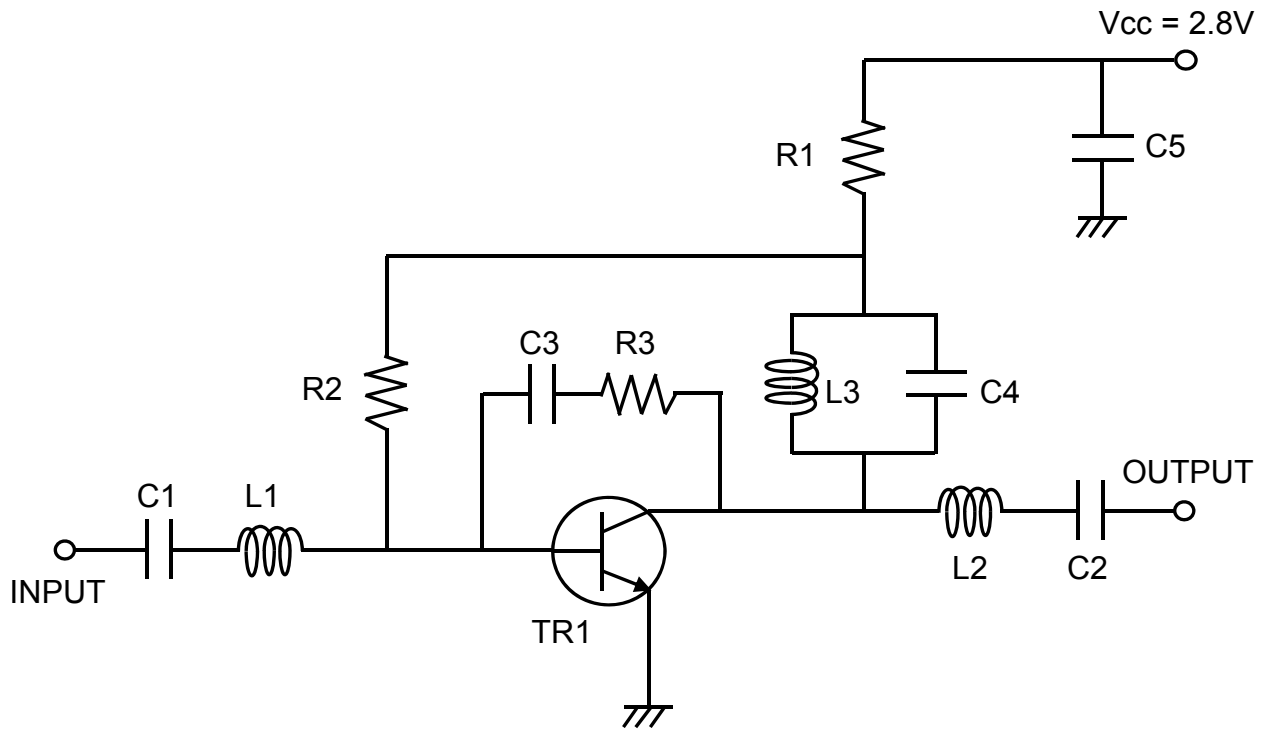
■ Summary of Data

Ta = 25 °C, Input Power = -40 dBm

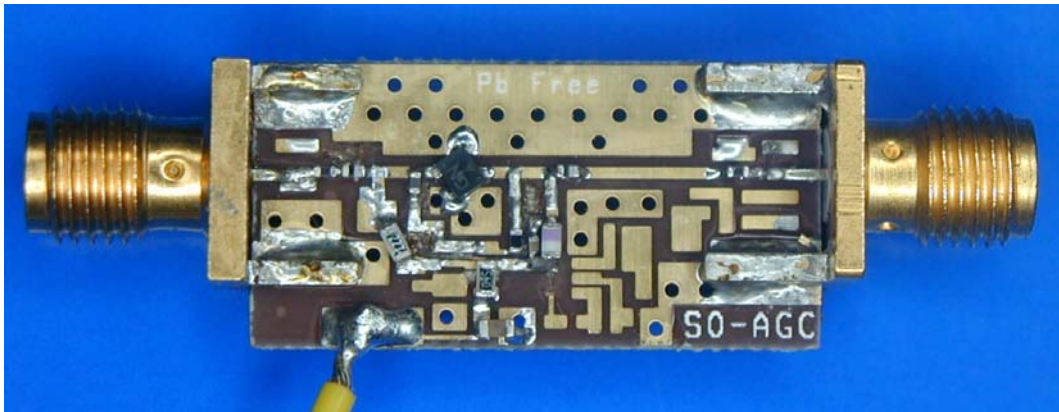
Parameter	Symbol	Condition	Result			Unit
DC Voltage	Vcc		2.6	2.8	3.0	V
DC Current	Icc		8.5	9.4	10.3	mA
Gain	Gp1	f = 170 MHz	22.8	23.2	23.6	dB
	Gp2	f = 210 MHz	22.6	23.0	23.3	dB
	Gp3	f = 250 MHz	22.0	22.4	22.7	dB
Noise Figure	NF1	f = 170 MHz	-	0.93	-	dB
	NF2	f = 210 MHz	-	1.06	-	dB
	NF3	f = 250 MHz	-	1.12	-	dB
Input Return Loss	RLin1	f = 170 MHz	10.9	11.4	11.6	dB
	RLin2	f = 210 MHz	11.4	11.7	11.7	dB
	RLin3	f = 250 MHz	11.0	11.2	11.1	dB
Output Return Loss	RLout1	f = 170 MHz	13.3	14.6	15.9	dB
	RLout2	f = 210 MHz	13.9	15.3	16.7	dB
	RLout3	f = 250 MHz	14.0	14.9	15.8	dB
Isolation	ISL1	f = 170 MHz	26.0	26.4	26.7	dB
	ISL2	f = 210 MHz	26.0	26.4	26.7	dB
	ISL3	f = 250 MHz	26.2	26.6	27.0	dB
Gain 1dB Compression Input Power	Pin1dB	f = 210 MHz	-	-20	-	dBm
Input 3rd Order Intercept Point	IIP3	f1 = 210 MHz f2 = 211 MHz Pin = -30 dBm	-	-7	-	dBm

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■Circuit Design



■Evaluation Board



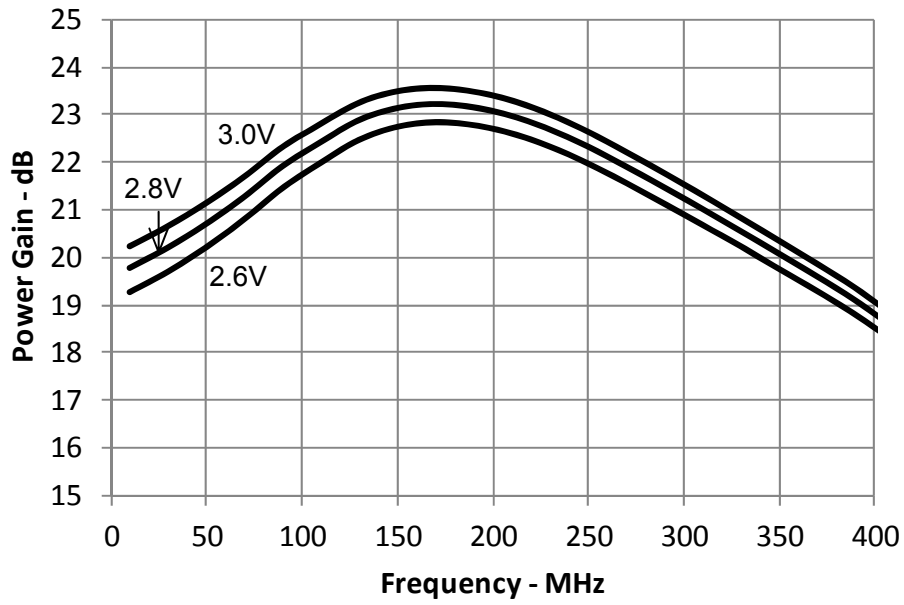
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■Bill of Materials

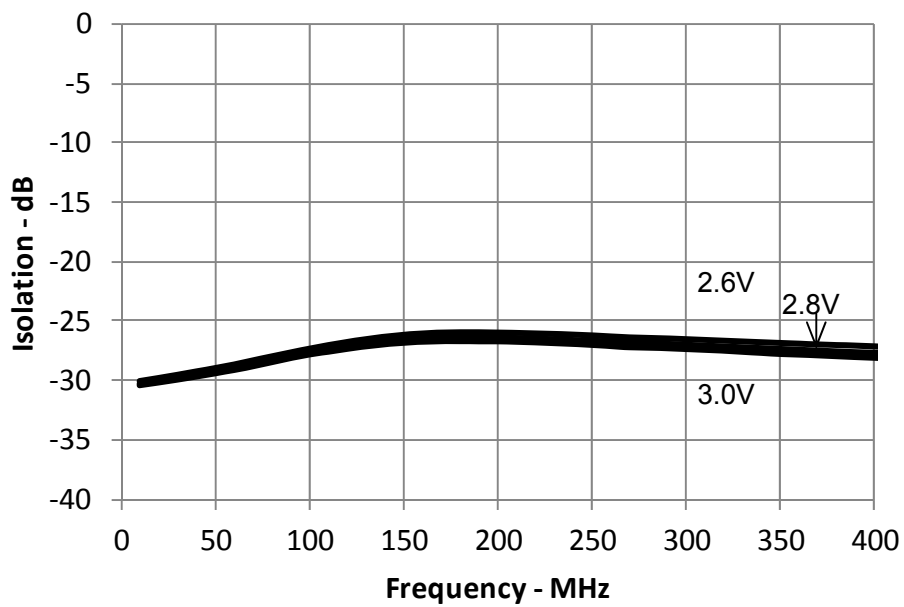
Item	Symbol	Value	Manufacturer	Size
Bip-Tr	TR1	MCH4015	ON Semiconductor	SC82
Capacitor	C1,C2,C3	1000 pF	TAIYOYUDEN	1005
	C4	7 pF	TAIYOYUDEN	1005
	C5	0.1 uF	TAIYOYUDEN	1608
Resistor	R1	56 Ω	Various	1608
	R2	22 k Ω	Various	1608
	R3	1.2 k Ω	Various	1005
Inductor	L1,L2	12 nH	TOKO LL1005-FHL12NJ	1005
	L3	120 nH	TOKO LL1608-FS121N	1608
Material	-	FR4	-	25.4x12.7mm

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■ Power Gain

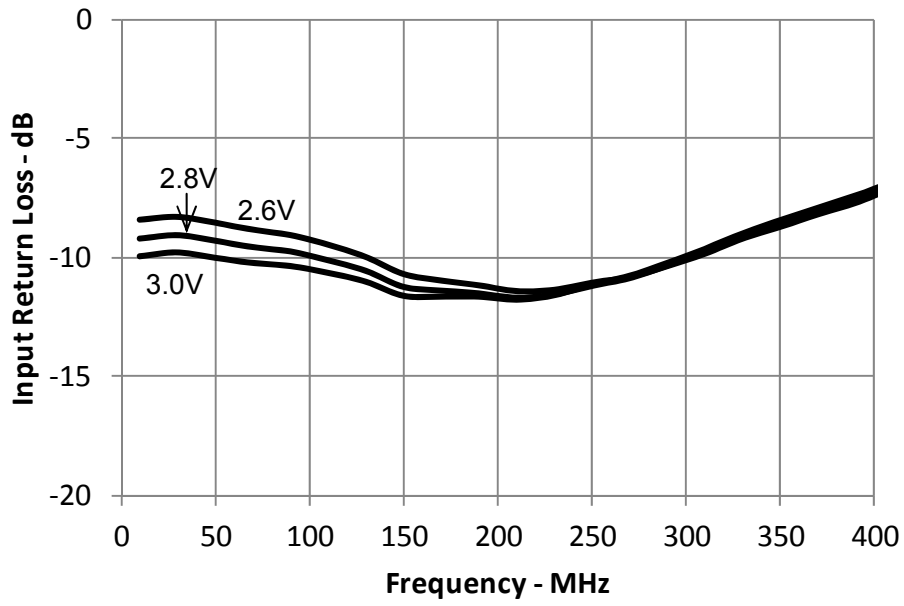


■ Isolation

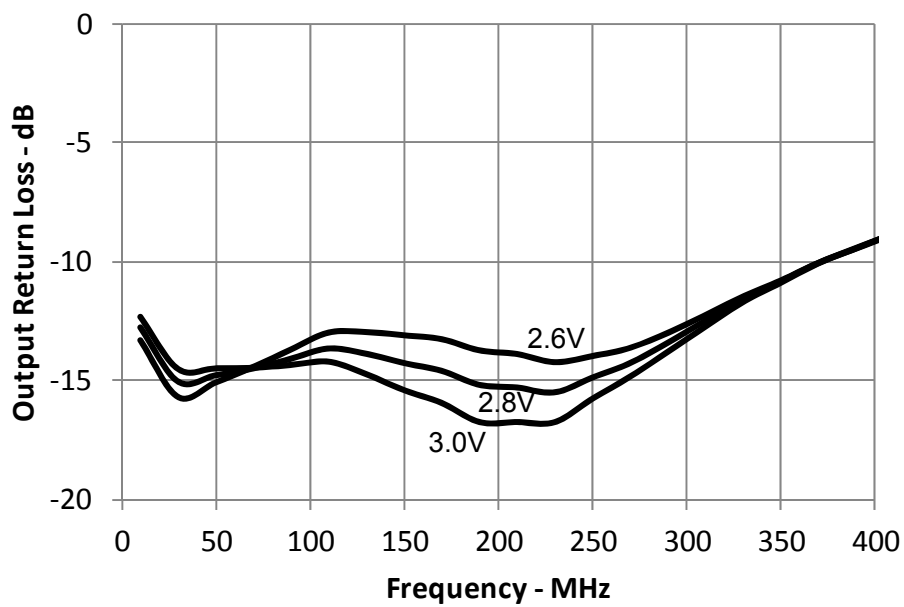


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■ Input Return Loss

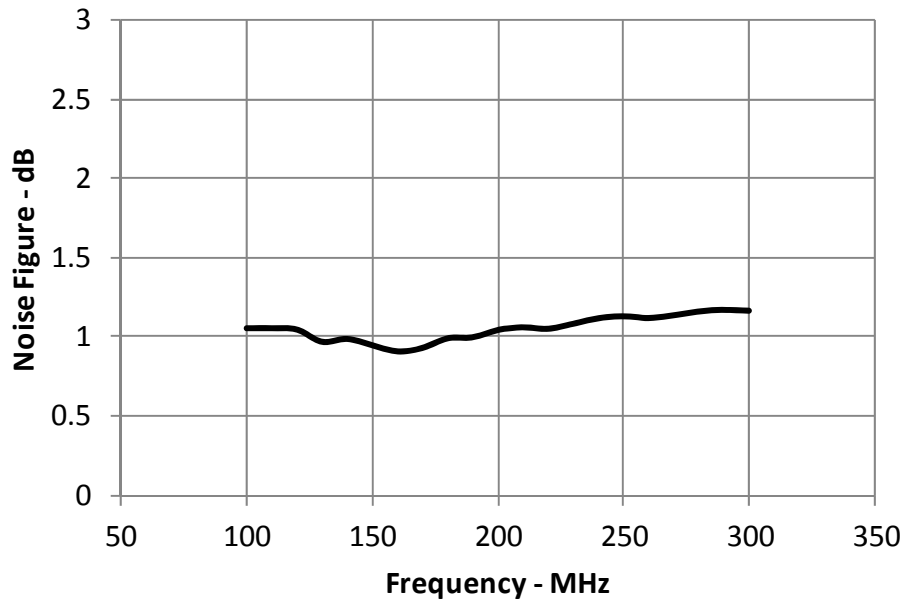


■ Output Return Loss

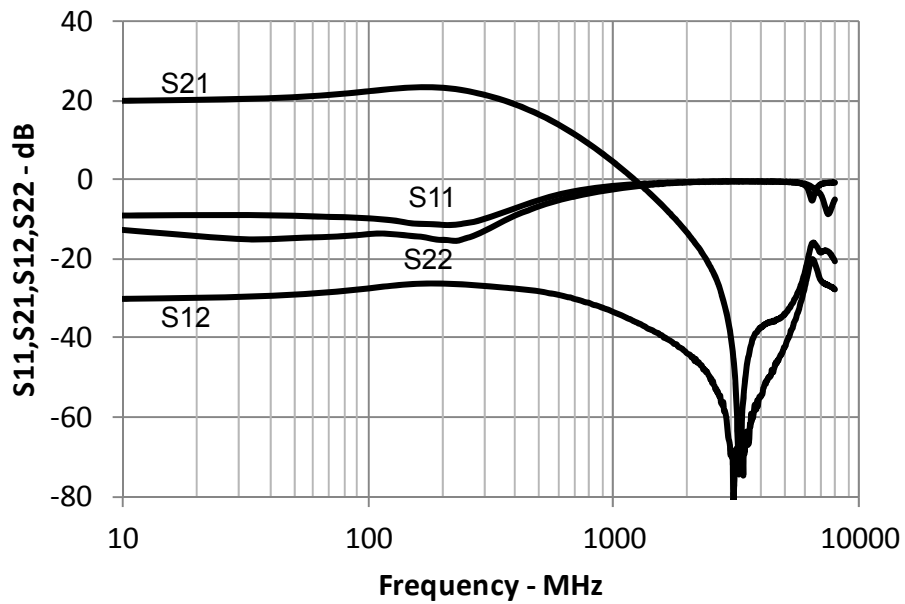


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■ Noise Figure

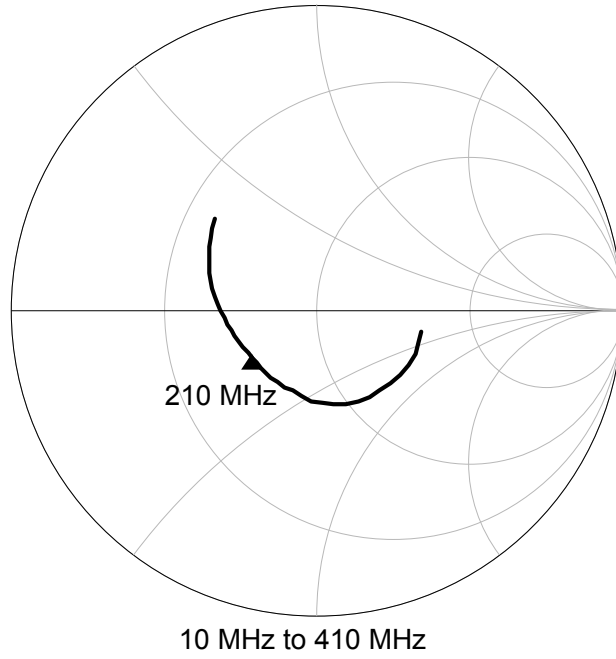


■ S11, S21, S12, S22 Wide Span

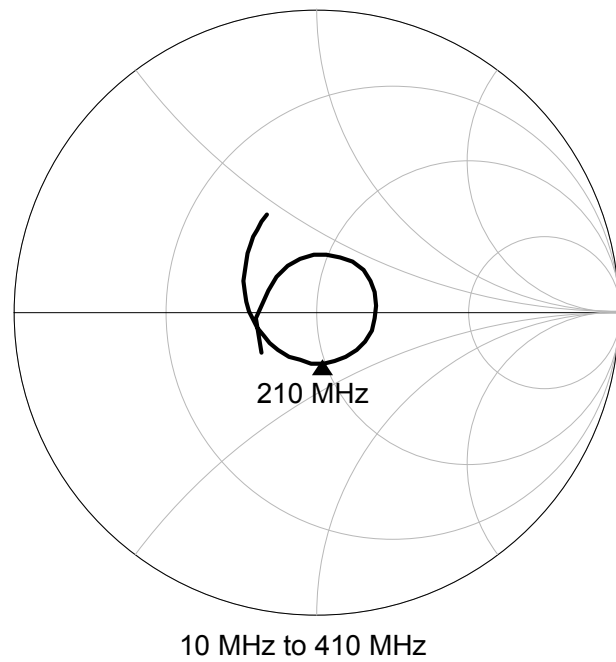


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■ Smith Chart Input Return Loss

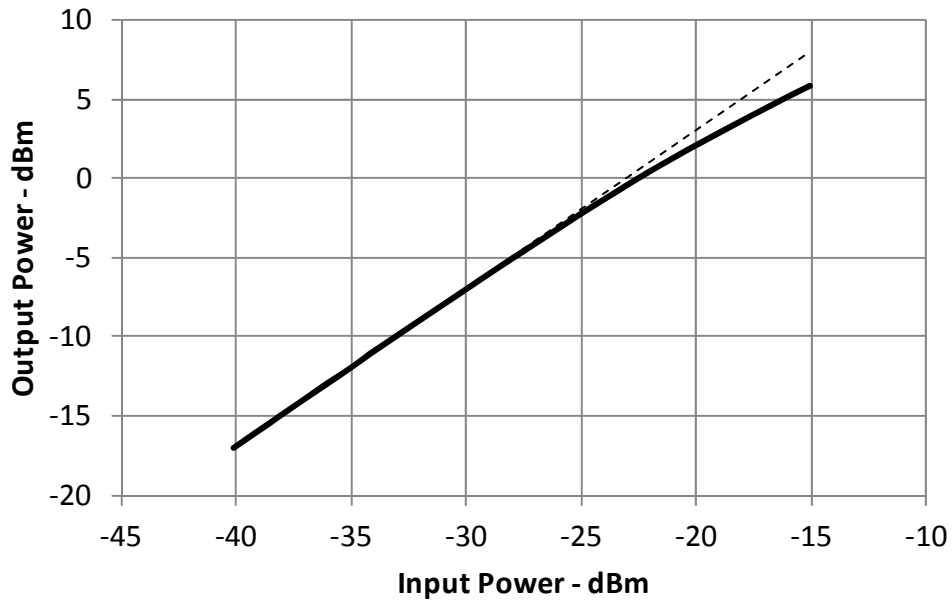


■ Smith Chart Output Return Loss



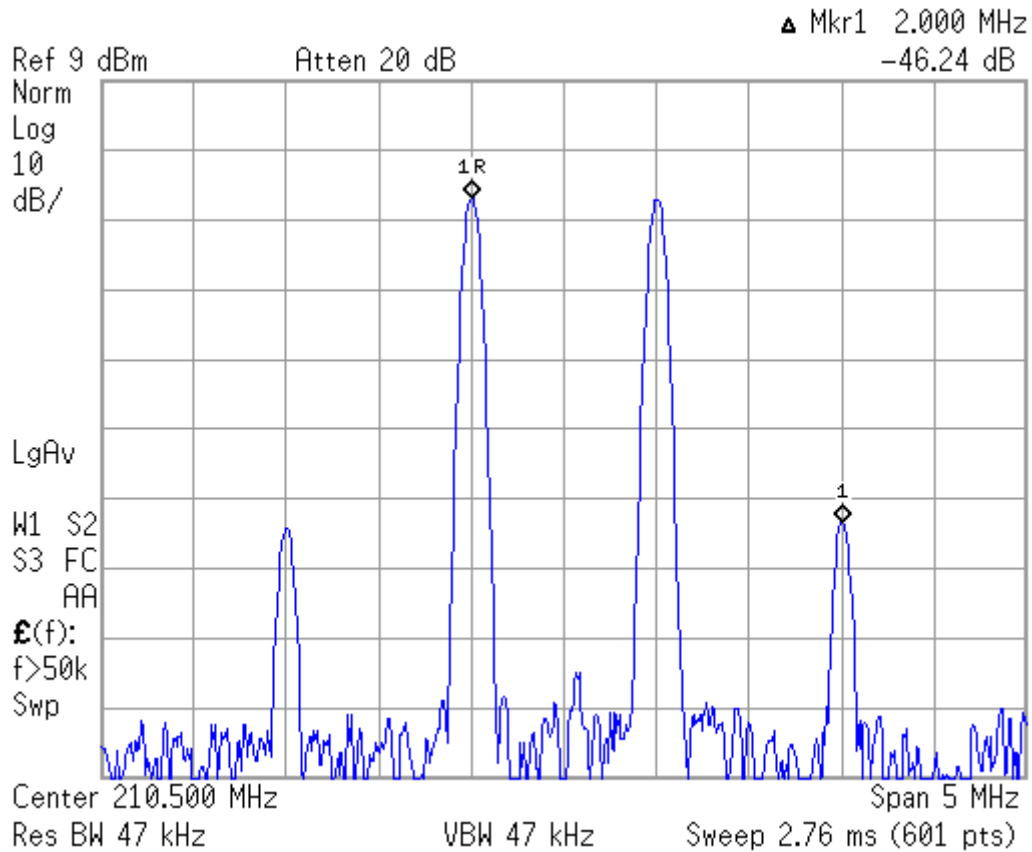
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■ Gain 1dB Compression Point



■ Input 3rd Order Intercept Point

f1 = 210 MHz, f2 = 211 MHz, Pin = -30 dBm



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