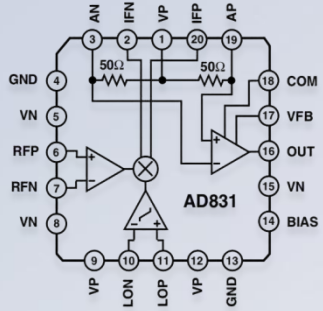
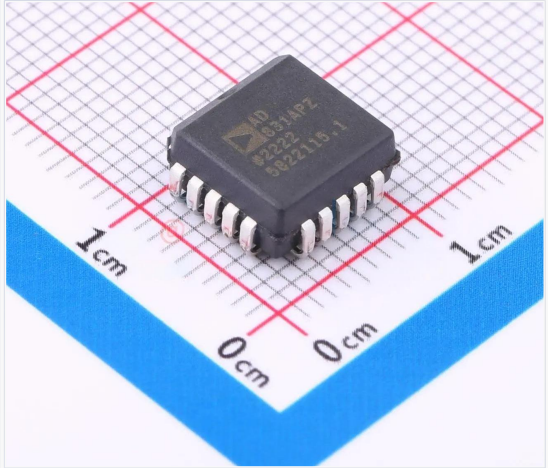
Chip Overview and Mixing Principle

Output contains $f_{RF} + f_{LO}$ and $|f_{RF} - f_{LO}|$ components

Chosen frequency:
RF = 120 MHz
LO = 130.7 MHz

FUNCTIONAL BLOCK DIAGRAM





Active Mixer IC for V/UHF applications

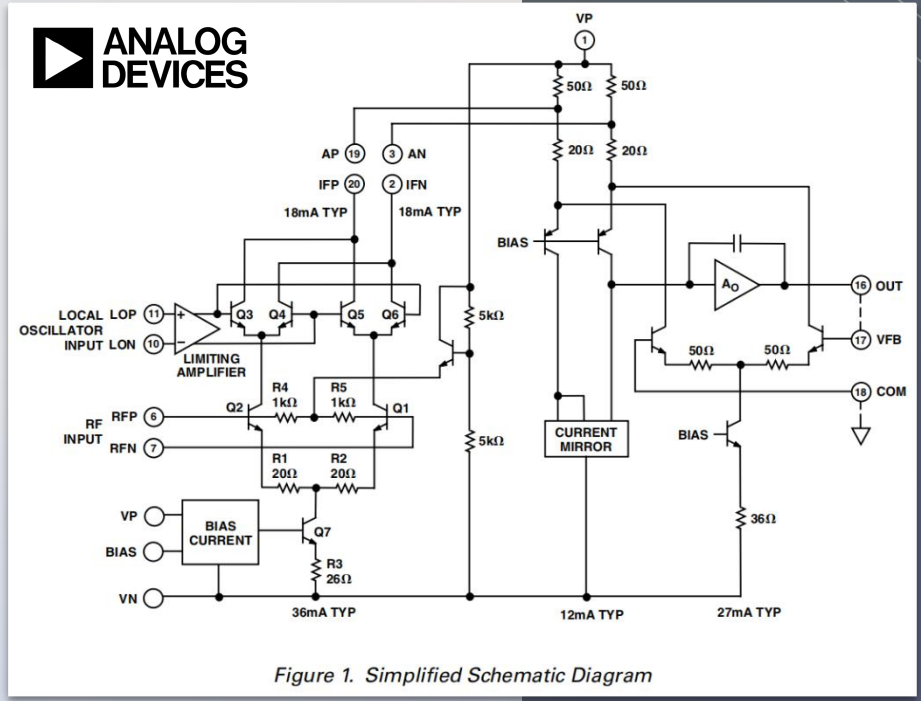
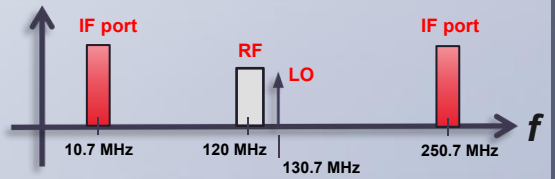


Figure 1. Simplified Schematic Diagram

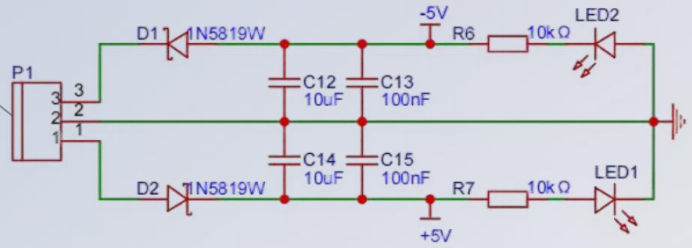
- RF / LO up to a few hundred MHz
- Differential IF output + on-chip IF amplifier
- RF input stage → switching mixer core
- LO limiting amplifier → square-like LO drive
- IF current outputs → on-chip voltage amplifier



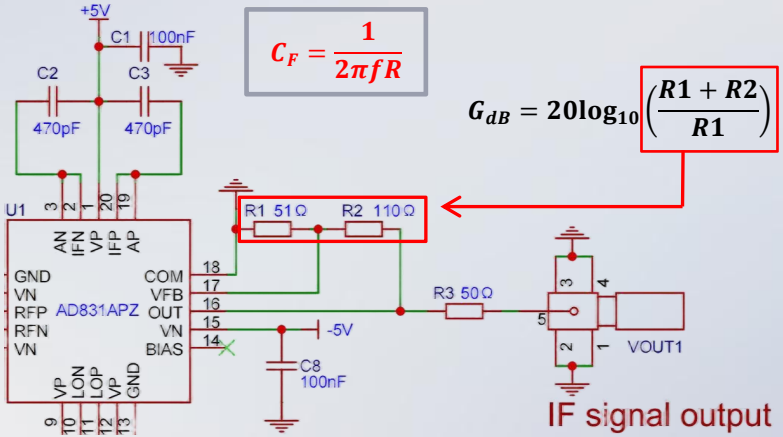
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Power Supply, RF/LO Input Network

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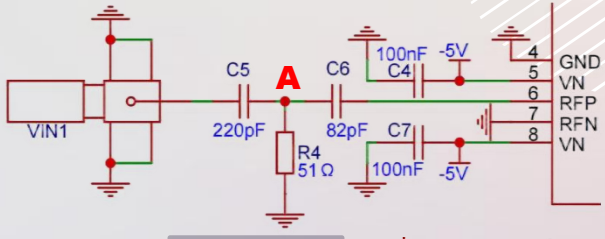
- Dual supply ±5 V from lab bench supplies
- Schottky Diode & LED for Protection & Indicating
- 10 μF for low-frequency ripple (10 kHz~5 MHz)
- 100 nF for high-frequency noise (1 MHz~100 MHz)



$$C_F = \frac{1}{2\pi f R}$$

$$G_{dB} = 20\log_{10}\left(\frac{R1 + R2}{R1}\right)$$

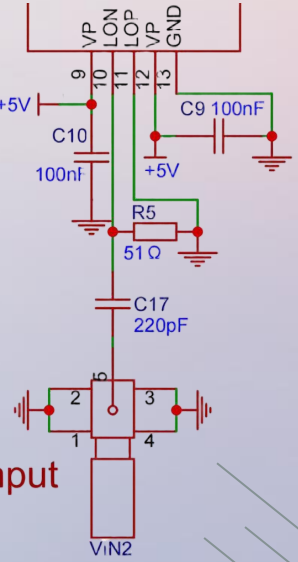
- Differential IF out puts with external 470 pF capacitor (C2 & C3) forms a low-pass
- +10 dB: convenient IF level for scope



$$f_c = \frac{1}{2\pi RC}$$

$$Z_C = \frac{1}{2\pi f C}$$

- C5 + 50 Ω source: high-pass
- R4: broadband ~50 Ω termination
- C6 + R4: second high-pass
- C17 + 50 Ω source: same as C5
- No extra 'C' on LO: keep a wider usable LO

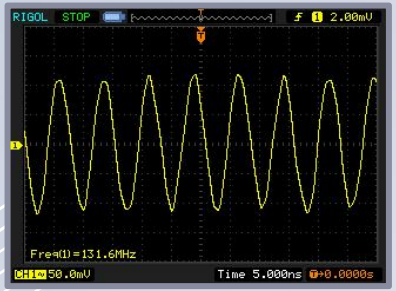


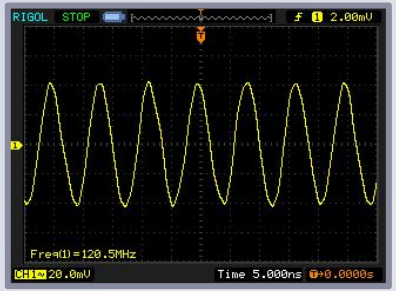
$$Loss_{dB} = 20\log_{10}\left(\frac{V_A}{V_S}\right) = 20\log_{10}\left(\frac{R_{load}}{R_s + R_{load}}\right)$$

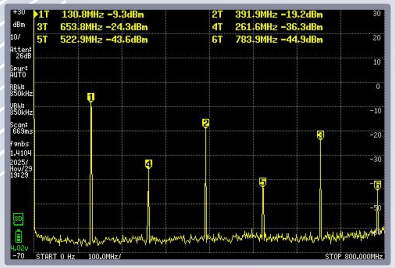
$$Extra\ Loss_{dB} = 20\log_{10}\left(\frac{V_{RFIN}}{V_A}\right) = 20\log_{10}\left(\frac{Z_{RFIN}}{Z_{C6} + Z_{RFIN}}\right)$$

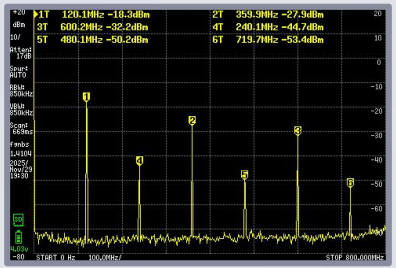
Measurement Results & PCB Layout

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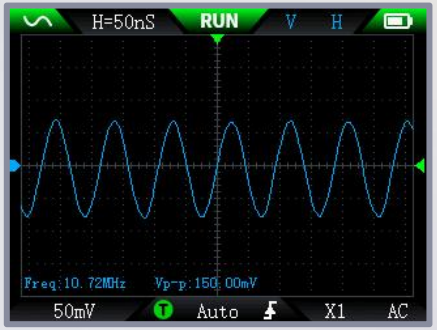




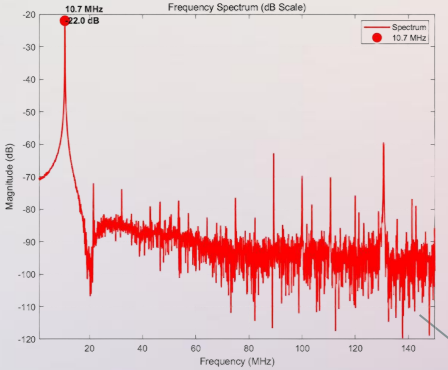


LO Input: T/F domain

RF Input: T/F domain

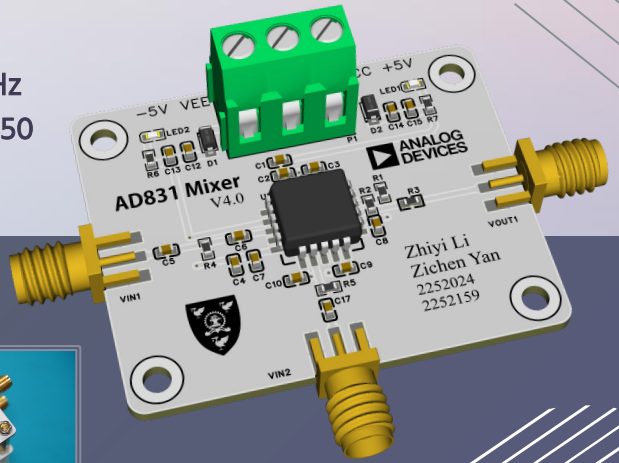


IF Output: T/F domain



Measurement results:

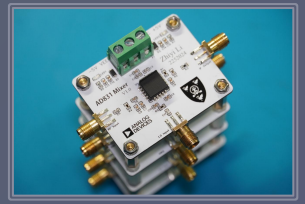
- Clear IF tone at ≈ 10.7 MHz
- Measured IF amplitude: 150 mVpp → −15.5 dBm
- When either RF or LO is turned off, the 10.7 MHz component disappears



Measurement setup:

- Dual supply: ±5 V from lab bench supplies
- LO: 130.7 MHz, −10 dBm (50 Ω source)
- RF: 120 MHz, ≈ −19 dBm (50 Ω source)
- IF measured at OUT: using 50 Ω oscilloscope



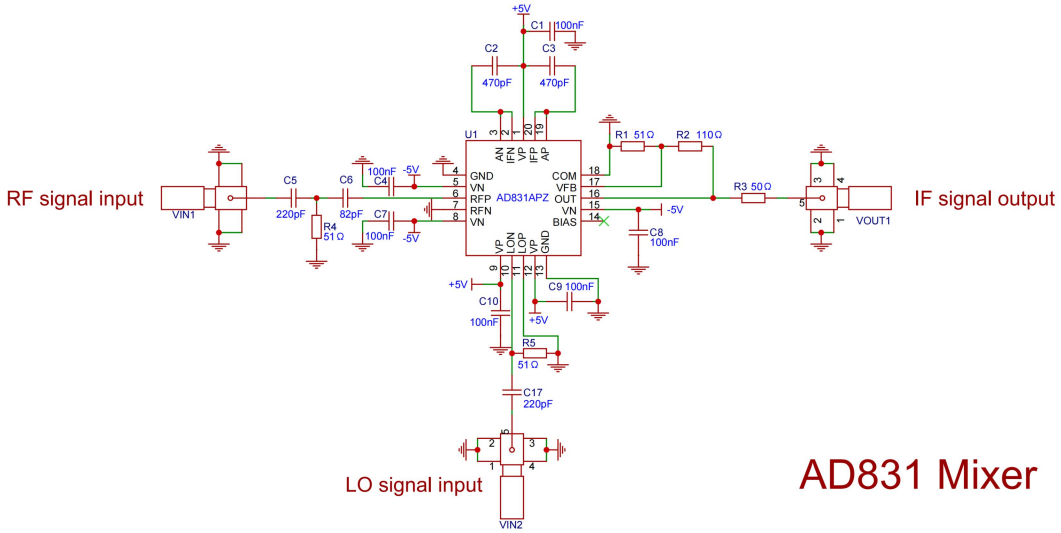


PCB version V1 to V4
Self-design / Self-soldering

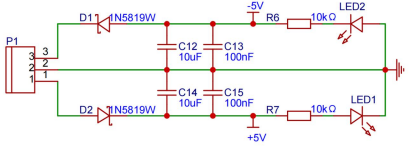
Appendix (additional information, not counted in pages)

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All capacitors shall use C0G type, feedback resistor (R1 and R2) tolerance 0.1%, other resistor tolerances 1%.



Power Input



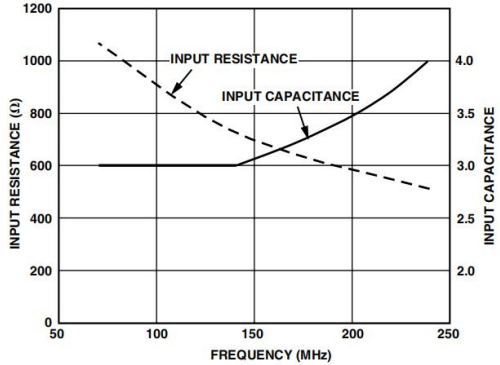
Mounting Hole



TITLE: A High-Performance AD831-Based Mixer		REV:
立创EDA	Company: XJTLU	Sheet: 1/1
	Date: Oct. 18th 2025	Drawn By: Zhiyi Li 2252024

PIN DESCRIPTION

Pin No.	Mnemonic	Description
1	VP	Positive Supply Input
2	IFN	Mixer Current Output
3	AN	Amplifier Negative Input
4	GND	Ground
5	VN	Negative Supply Input
6	RFP	RF Input
7	RFN	RF Input
8	VN	Negative Supply Input
9	VP	Positive Supply Input
10	LON	Local Oscillator Input
11	LOP	Local Oscillator Input
12	VP	Positive Supply Input
13	GND	Ground
14	BIAS	Bias Input
15	VN	Negative Supply Input
16	OUT	Amplifier Output
17	VFB	Amplifier Feedback Input
18	COM	Amplifier Output Common
19	AP	Amplifier Positive Input
20	IFP	Mixer Current Output



TPC 15. Input Impedance vs. Frequency, $Z_{IN} = R \| C$

Appendix (additional information, not counted in pages)

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No.	Quantity	Comment	Designator	Footprint	Value	Manufacturer Part	Manufacturer	Supplier Part	Supplier	LCSC Price	Sum price
1	8	100nF	C1, C4, C7, C8, C9, C10, C13, C15	C0603	100nF	CC0603KRX7R9BB104	YAGEO(国巨)	C14663	LCSC	0.0155	0.124
2	2	470pF	C2, C3	C0603	470pF	CC0603JRNP09BN471	YAGEO(国巨)	C106211	LCSC	0.0244	0.0488
3	2	220pF	C5, C17	C0603	220pF	CC0603JRNP09BN221	YAGEO(国巨)	C106210	LCSC	0.0259	0.0518
4	1	82pF	C6	C0603	82pF	0603CG820J500NT	FH(风华)	C1683	LCSC	0.0197	0.0197
5	2	10uF	C12, C14	C0603	10uF	GRM188R61E106KA73D	muRata(村田)	C344022	LCSC	0.1887	0.3774
6	2	1N5819W	D1, D2	SOD-123_L2.7-W1.6-LS3.7-RD		1N5819W	JSMSEMI(杰盛微)	C963381	LCSC	0.0478	0.0956
7	1	NCD0603R1	LED1	LED0603-RD_RED		NCD0603R1	国星光电	C84263	LCSC	0.0606	0.0606
8	1	XL-1608UBC-04	LED2	LED0603-RD_BLUE		XL-1608UBC-04	XINGLIGHT(成兴光)	C965807	LCSC	0.0227	0.0227
9	1	WJ500V-5.08-3P	P1	CONN-TH_3P-P5.00_WJ500V-5.08-3P		WJ500V-5.08-3P	KANGNEX(康奈克斯电气	C72334	LCSC	1.3033	1.3033
10	3	51Ω	R1, R4, R5	R0603	51Ω	0603WAF510JT5E	UNI-ROYAL(厚声)	C23197	LCSC	0.0071	0.0213
11	1	110Ω	R2	R0603	110Ω	PTFR0603B110RN9	RESI(开步睿思)	C2692732	LCSC	0.7417	0.7417
12	1	50Ω	R3	R0603	50Ω	RT0603BRE0750RL	YAGEO(国巨)	C849792	LCSC	0.1585	0.1585
13	2	10kΩ	R6, R7	R0603	10kΩ	RC0603JR-0710KL	YAGEO(国巨)	C99198	LCSC	0.0067	0.0134
14	4	M3铜柱	TP1, TP2, TP3, TP4	M3铜柱						0.42	1.68
15	1	AD831APZ	U1	PLCC-20_L9.0-W9.0-P1.27-LS10.0-T		AD831APZ	ADI(亚德诺)	C652692	Taobao	8.8	8.8
16	3	-	VIN1, VIN2, VOUT1	CONN-SMD_KH-SMA-KE8-G	-	KH-SMA-KE8-G	kinghelm(金航标)	C530661	LCSC	2.81	8.43
											21.9488

