



R&T BiCMOS run2

Low Noise, Cryogenic Differential Amplifier

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DESCRIPTION

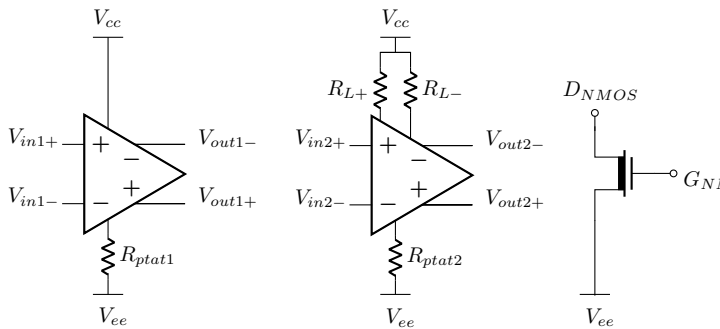
This ASIC, fabricated using IHP technology, integrates three distinct circuits designed for cryogenic operation (77 K). It features two low-noise differential amplifiers: a fully integrated version with on-chip resistors and a flexible version utilizing external resistors. Both amplifiers deliver an ultralow noise floor of $1 \text{ nV}/\sqrt{\text{Hz}}$ and are optimized for promising low flicker noise at cryogenic temperatures. The bandwidth is specified at 25 MHz for the on-chip variant and 50 MHz for the external resistor configuration. Additionally, a large-geometry

NMOS transistor ($W/L \approx 190,000$) is included for discrete characterization.

ABSOLUTE MAXIMUM RATINGS

Total Supply Voltage (V^+ to V^-)	5.15V
Input Current (Note 2)	$\pm 40 \text{ mA}$
Operating Junction Temperature Range (Note 5)	-40°C to 125°C

BLOCK DIAGRAM

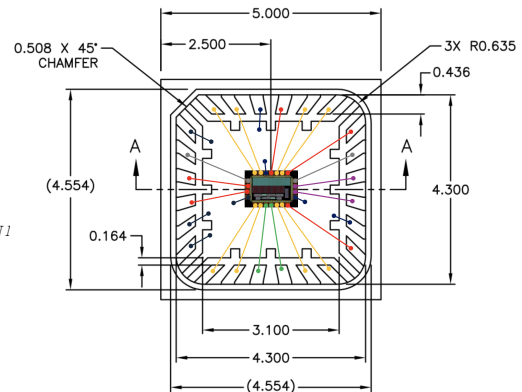


LNA 1

LNA 2

NMOS Block

PACKAGE



Bonding diagram with QFN24 package

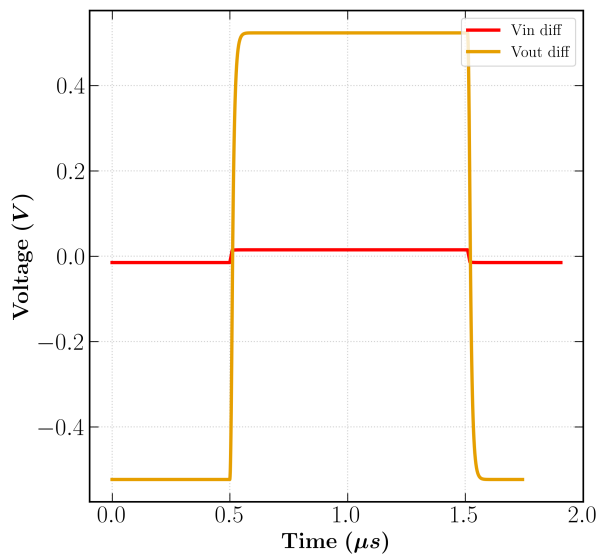
TABLE 1: ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	NOTES	$T_A = 27^\circ\text{C}$			SUB-GROUP	$-55^\circ\text{C} \leq T_A \leq 125^\circ\text{C}$			SUB-GROUP	UNITS
				MIN	TYP	MAX		MIN	TYP	MAX		
V_{OS}	Input Offset Voltage	$V_S = \pm 1.65 \text{ V}$ $V_{CM} = V^-$ to V^+			0.6	2	1			4	2,3	mV
					2.5	6	1			9	2,3	mV
I_B	Input Bias Current	$V_S = \pm 1.65 \text{ V}$ $V_{CM} = V^+$			8	18	1			20	2,3	μA
				-50	-23		1	-100			2,3	μA
	Input Noise Voltage	0.1 Hz to 10 Hz $V_{CM} = V^+$			8	18	1			20	2,3	μA
				-50	-23		1	-100			2,3	nV_{p-p}
SR	Slew Rate	$V_{in} \pm 1.25 \text{ mV}$ — LNA1		28	30	31	1	29	30	32	2,3	$\text{V}/\mu\text{s}$
		$V_{in} \pm 1.25 \text{ mV}$ — LNA2		39	36	42	1	38	39	40	2,3	$/\mu\text{s}$

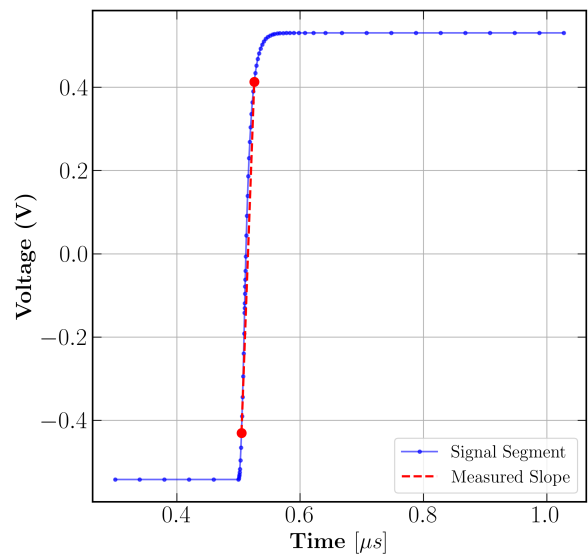
TYPICAL PERFORMANCE CHARACTERISTICS

Slew Rate Measurement

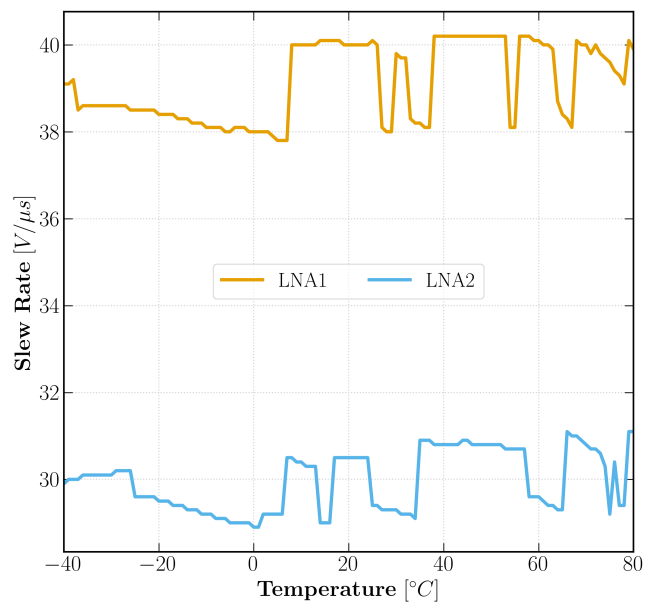
Example of signal response @27° C



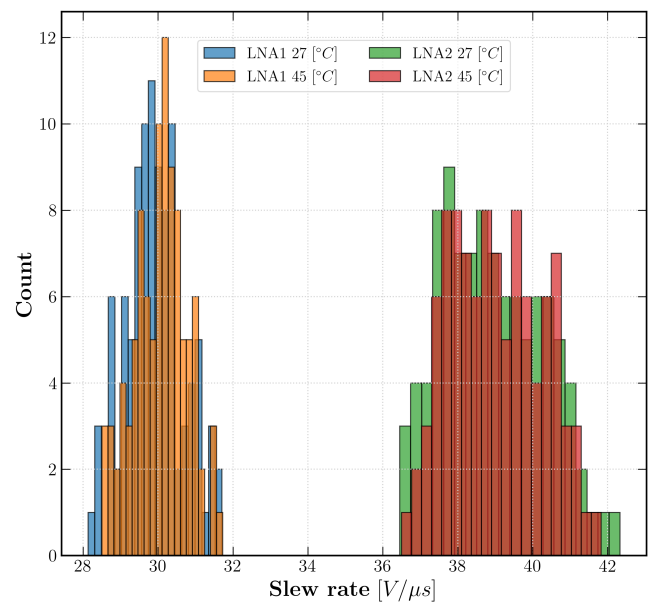
Slew Rate Calculate (10% – 90%) Example



Slew Rate vs Temperature



Histogram of Slew Rate



Common-mode Rejection Ratio (CMRR)

