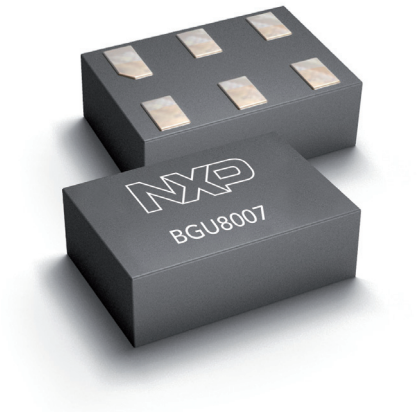


NXP SiGe:C GPS LNAs BGU700x/BGU8007

The best reception of GNSS signals with the smallest footprint

By dynamically suppressing strong cellular and WLAN transmit signals, an industry first, these LNAs offer the best reception of weak GPS signals. Linearity improves with a 10 dB better IP3 under -40 to -20 dBm jamming conditions, while NF remains below 1 dB. Requiring only two external components, they save up to 50% in PCB size and 10% in component cost, offering the smallest footprint in the market.

Key features

- Low noise figure: 0.75 dB
- System-optimized gain of 16.5 or 19 dB
- Adaptive biasing dynamically suppresses strong cellular and WLAN transmit signals, resulting in improved linearity of 10 dB better IP3 under -40 to -20 dBm jamming conditions and effective GPS output with jammer powers up to -15 dBm.
- AEC-Q100 qualified (BGU7004, BGU7008) for highest reliability in harsh conditions
- Only two external components required
- Small 6-pin leadless package: 1.45 x 1.0 x 0.5 mm

Key benefits

- Maintains optimal GPS signal reception for as long as possible
- Significant PCB size savings (50%)
- Lower component cost (10%)

Applications

- Smart phones, feature phones
- Tablets
- Personal Navigation Devices (PNDs)
- Digital Still Camera (DSCs)
- Digital Video Camera (DVCs)
- RF front-end modules (used in phones)
- Complete GPS chipset modules (used in DSCs)
- Automotive applications (BGU7004/8) : toll collection, emergency call

These SiGe:C low noise amplifiers (LNAs) improve the reception of GPS signals, including GloNass and Galileo. Available in extremely small 6-pin packages, they reduce footprint, lower cost, and enhance reception in systems that use an active or patch antenna.

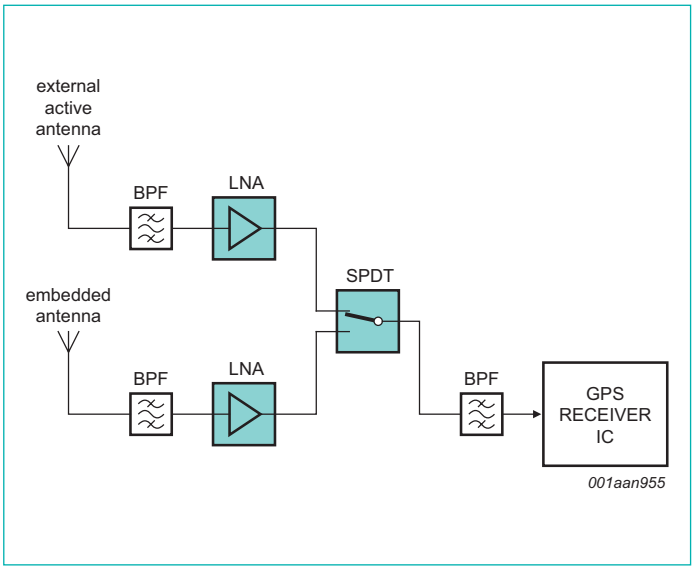
GPS has become a standard feature in a very wide range of consumer products, from personal navigation devices to digital video cameras, watches, electric cars, and more. GPS signal power levels are weak and below the noise floor at -155 dBm. In many of these products, especially smart phones, strong transmitters such as WLAN and cellular can drive the GPS LNA into compression. When the GPS LNA is in compression, it has lower gain which causes worse GPS reception. And when in

compression, the LNA generates intermodulation products and harmonics from the transmitter signals, which can overpower the weak GPS signals and lead to no GPS reception.

The NXP BGU700x/BGU8007 series use adaptive biasing to immediately detect any output power from jammers, and compensate by temporarily increasing the current. As a result, optimal GPS signal reception is maintained for as long as possible.

Each device in the BGU700x/BGU8007 series requires only one input matching inductor and one supply decoupling capacitor to complete the design. This creates a very compact design and lowers the bill of materials. Designers can save up to 50% in PCB size and 10% in component cost. For example the BGU7005 is in a 1.45 x 1 mm package with application area at only 4.53 mm^2. This is 50% smaller than a comparable solution with a 9.06 mm^2 application area.

Application diagram



Smallest footprint

Type	Package	Package size	MMIC *					SMD's Appl.	SMD size		SMD's area	Appl. area
			X	Y	Pins	Pitch	Area		X	Y		
		mm	mm	mm	#	mm	mm^2	#	mm	mm	mm^2	mm^2
BGU7005/7	SOT886	1.45 x 1	1.7	1.25	6	0.5	2.13	2	1.5	0.8	2.4	4.53
Competitor	Wafer level package	1.26 x 0.86	1.5	1.1	6	0.4	1.65	6	1.5	0.8	7.2	8.85
Competitor	Wafer level package	0.86 x 0.86	1.1	1.1	4	0.4	1.21	4	1.5	0.8	4.8	6.01
Competitor	Thin small leadless package	2 x 1.3	2.25	1.55	6	0.5	3.49	4	1.5	0.8	4.8	8.29
Competitor	Thin small leadless package	1.4 x 1.26	1.65	1.5	6	0.48	2.48	4	1.5	0.8	4.8	7.28
Competitor	Thin small outline non-leaded	1.5 x 1.5	1.75	1.75	6	0.5	3.06	5	1.5	0.8	6	9.06

* Incl. keep out area on pcb (common used assembly rule)

Selection guide

Type	Package	@ 1.575 GHz																												
		Supply voltage		Supply current			Insertion power gain			Noise figure	Input power at 1 dB gain compression										Input third-order intercept point f_1 = 1713 MHz, f_2 = 1851 MHz										
		V_{cc}		I_{cc}			$\lvert s_{21}\rvert^2$			NF	$P_{L(1dB)}$										IP3$_i$										
		(V)		(mA)			(dB)			(dB)	(dBm)										(dBm)										
		Min	Max	Min	Typ	Max	Min	Typ	Max	Typ	V_{cc} = 1.5 V, Min	V_{cc} = 1.5 V, Typ	V_{cc} = 1.8 V, Min	V_{cc} = 1.8 V, Typ	V_{cc} = 2.2 V, Min	V_{cc} = 2.2 V, Typ	V_{cc} = 2.5 V, I_{cc} = 5 mA	V_{cc} = 2.85 V, Min	V_{cc} = 2.85 V, Typ	V_{cc} = 1.5 V, Min	V_{cc} = 1.5 V, Typ	V_{cc} = 1.8 V, Min	V_{cc} = 1.8 V, Typ	V_{cc} = 2.2 V, Min	V_{cc} = 2.2 V, Typ	V_{cc} = 2.5 V, I_{cc} = 5 mA	V_{cc} = 2.85 V, Min	V_{cc} = 2.85 V, Typ
BGU7003	SOT891	2.2	2.85	3	-	15	16	18.3	20	0.8	-	-	-	-	-	-	-20	-	-	-	-	-	-	-	-	0	-	-
BGU7004^	SOT886	1.5	2.85	-	4.5	-	-	16.5*	-	0.9	-	-	-14	-11	-	-	-	-11	-8	-	-	5	9	-	-	-	5	12
BGU7005	SOT886	1.5	2.85	-	4.5	-	-	16.5*	-	0.9	-	-	-14	-11	-	-	-	-11	-8	-	-	5	9	-	-	-	5	12
BGU7007	SOT886	1.5	2.85	-	4.8	-	-	18.5**	-	0.9	-	-	-15	-12	-	-	-	-14	-11	-	-	1	4	-	-	-	2	5
BGU7008^	SOT886	1.5	2.85	-	4.8	-	-	18.5**	-	0.9	-	-	-15	-12	-	-	-	-14	-11	-	-	1	4	-	-	-	2	5
BGU8007	SOT886	1.5	2.2	-	4.6	-	-	19.0***	-	0.75#	-15	-12	-	-	-13	-10	-	-	-	1	4	-	-	2	5	-	-	-

* = 16.5 dB without jammer / 17.5 dB with jammer
** = 18.5 dB without jammer / 19.5 dB with jammer
*** = 19.0 dB without jammer / 20.5 dB with jammer

^ = AEC-Q101 qualified (some limitations apply)
# = Evaluation board losses excluded

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