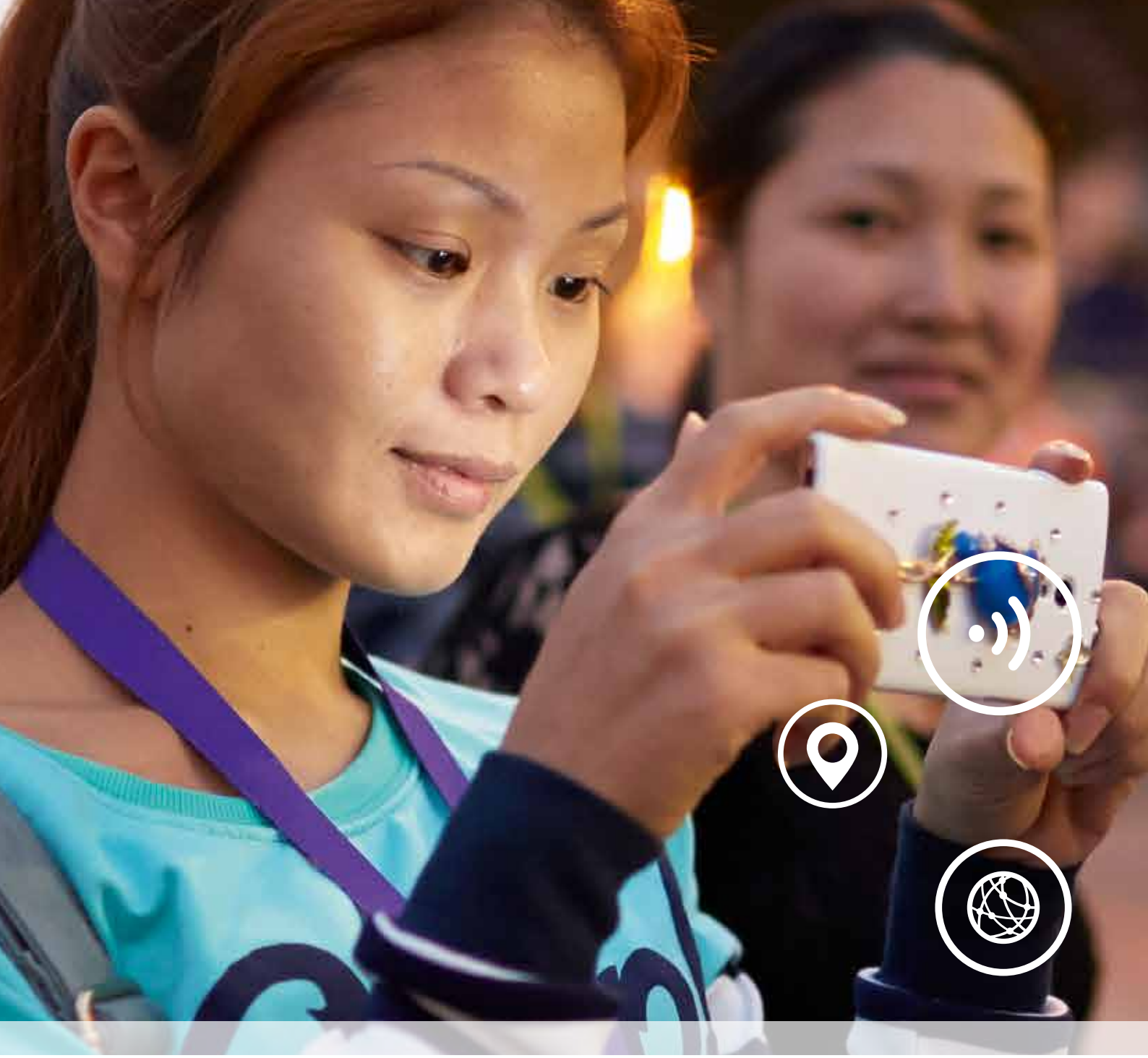


RF MANUAL 20TH EDITION

Application and design manual for Smart Antenna Solutions

May 2017

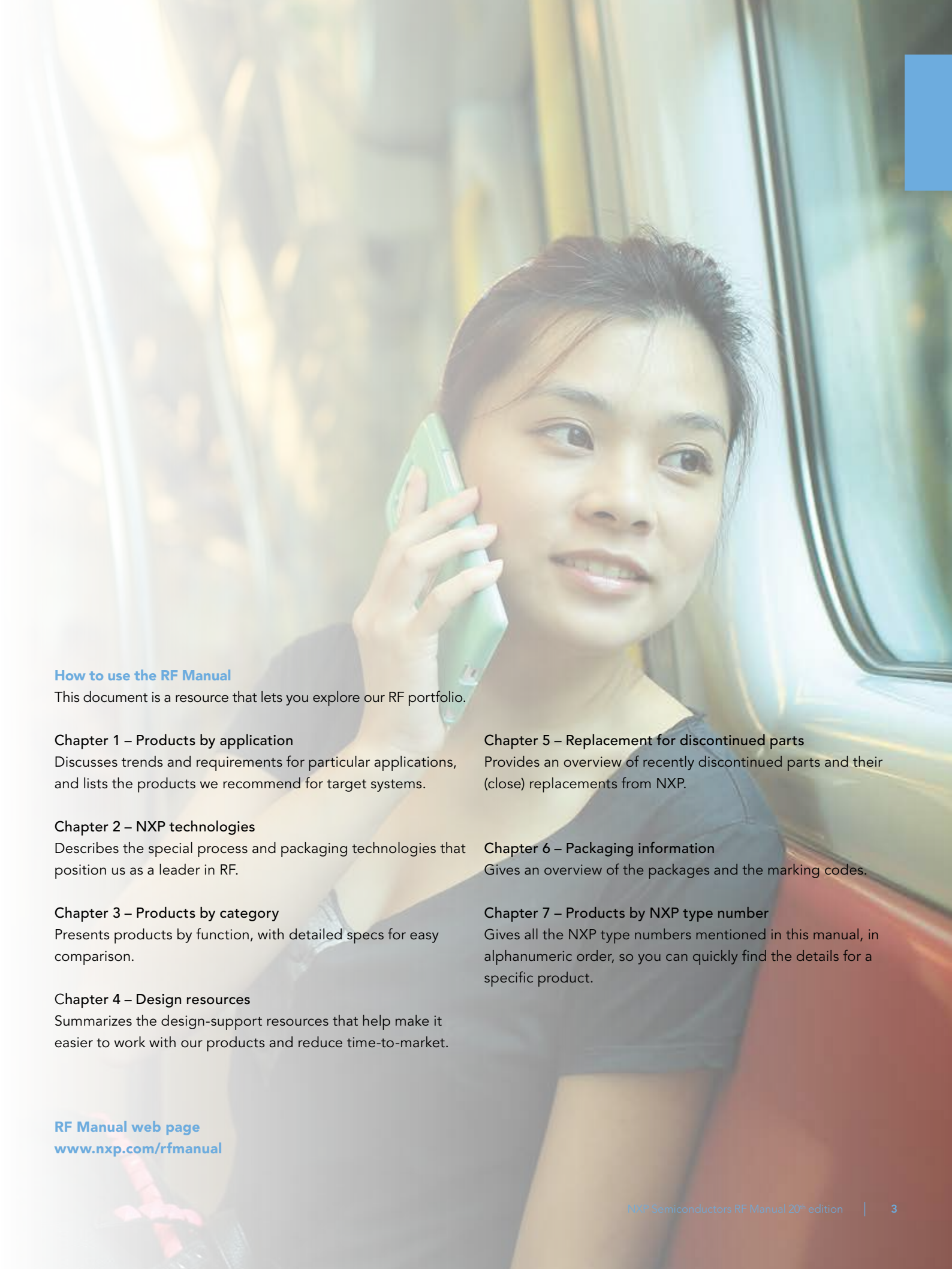
RF integration without compromise

At NXP, we are committed to ensuring you have the best mobile connection at all times.

With more than 3 Billion consumers online and over 50 Billion connected devices, the demand for always-on, always-connected devices continues to surge. With access to the internet by mobile device increasing by more than 200% every year, mobile device manufacturers and infrastructure network vendors now face unprecedented challenges to deliver the high performance voice and data services for all the downloading, streaming and cloud based services we have come to expect.

RF front-ends are becoming increasingly complex with the rapid deployment of LTE underway. More antennas are needed as well as support for an ever increasing number of cellular frequency bands. Just a few years ago only a handful of bands would need to be supported, whereas now 30+ bands are supported. To address all these RF challenges, while simultaneously achieving miniaturization and cost reduction, a new approach is needed.

The 20th edition of the RF Manual provides you with a comprehensive overview of our Smart Antenna Solutions with the highest level of integration without compromise; High performance, fully integrated combinations of multiple RF functions close to the antennas, delivering the highest, flawless performance, reliability, flexibility, quality or cost-of-ownership.



How to use the RF Manual

This document is a resource that lets you explore our RF portfolio.

Chapter 1 – Products by application
Discusses trends and requirements for particular applications, and lists the products we recommend for target systems.

Chapter 2 – NXP technologies
Describes the special process and packaging technologies that position us as a leader in RF.

Chapter 3 – Products by category
Presents products by function, with detailed specs for easy comparison.

Chapter 4 – Design resources
Summarizes the design-support resources that help make it easier to work with our products and reduce time-to-market.

Chapter 5 – Replacement for discontinued parts
Provides an overview of recently discontinued parts and their (close) replacements from NXP.

Chapter 6 – Packaging information
Gives an overview of the packages and the marking codes.

Chapter 7 – Products by NXP type number
Gives all the NXP type numbers mentioned in this manual, in alphanumeric order, so you can quickly find the details for a specific product.

RF Manual web page
www.nxp.com/rfmanual

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LEADING IN ADVANCED RF SOLUTIONS

We're **trusted** by the world's top businesses. That's why 9 out of the top 10 smartphone OEMs use NXP GPS LNAs.

In Focus: BL SAS new type naming convention

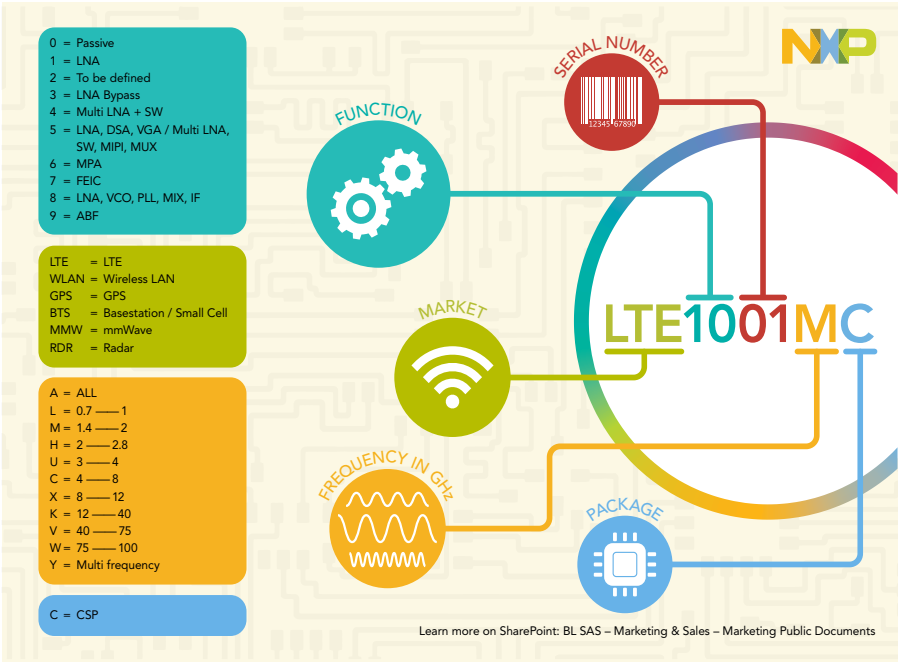
As one of the industry's leading technology company, NXP is constantly looking for ways to improve our products and our accessibility to those evaluating our products. One way that we've improved accessibility is by creating a new naming convention for the Smart Antenna Solutions portfolio. The parts you're already ordering will not change. However, new part numbers will follow a simple and consistent structure to make it easier for you to identify and order in the future.

1. The first set of letters in the new part numbers represent the market: LTE, WLAN, GPS, BTS for Basestation and small cell, MMW for millimeter Wave, and RDR for our line of Radar products.

2. The next two numerical digits identify the product's function, like LNA, MPA, etc, see picture.

3. The last two numerical digits are like a serial number used e.g. to indicate revision history.

4. As the frequency is one of the most important aspects in the smart antenna domain, the next alpha digit indicates frequency of the part, like H for 2 – 2.8 GHz, K for 12 - 40 GHz, etc, see below.



5. And lastly, if the part comes in a CSP package, it will be indicated by the letter C.

To get used to this new type naming methodology more quickly, we selected our 55 most important products and 'translated' them according the new naming convention. You will see them often be communicated next to each other (dual branding). We're confident this will not only be easier to understand but will make ordering simple.

New Name	Current Type	New Name	Current Type	New Name	Current Type
BTS1001H	BGU8053	GPS1102M	BGU7007	LTE3301HC	BGS8H5UK
BTS1001L	BGU8051	GPS1103M	BGU7004	LTE3301L	BGS8L5
BTS1001M	BGU8052	GPS1104M	BGU7008	LTE3301LC	BGS8L5UK
BTS3001H	BGU8063	GPS1201M	BGU8009	LTE3301U	BGS8U5
BTS3001L	BGU8061	GPS1202M	BGU8019	LTE4101YC	BGS613L5UK
BTS3001M	BGU8062	GPS1203M	BGU8019W/N2	LTE4102YC	BGS613H5UK
BTS5001H	BGU7075	GPS1301M	BGU8103	LTE4201YC	BGS8LL5UK
BTS5001M	BGU7073	GPS1401M	BGU8309	LTE4202YC	BGS8LH5UK
BTS5002M	BGU7078	LTE1001H	BGU8H1	LTE4203YC	BGS8HH5UK
BTS5101M	BGU8812	LTE1001L	BGU8L1	LTE5001HC	BGS829H6UK
BTS5201H	BGU8823	LTE1001M	BGU8M1	LTE5001LC	BGS829L6UK
BTS5201L	BGU8821	LTE1001MC	BGU8M1UK	LTE5001MC	BGS829M6UK
BTS5201M	BGU8822	LTE3001H	BGS8H2	LTE5101HC	BGS839H6UK
BTS6001A	BGA7210	LTE3001L	BGS8L2	WLAN3001C	BGS8358
BTS8001A	BGX7101HN/1	LTE3001M	BGS8M2	WLAN3001H	BGS8324
GPS1001M	BGU6005/N2	LTE3101MC	BGS8M4UK	WLAN3101C	BGS8458
GPS1002M	BGU6009/N2	LTE3201HC	BGS6H5UK	WLAN3101H	BGS8424
GPS1101M	BGU7005	LTE3301C	BGS8C5	WLAN7001C	BGF8458
		LTE3301H	BGS8H5	WLAN7002C	BGF8658

1. Products by application

NXP RF product catalog:
http://www.nxp.com/rf

1.1 New products

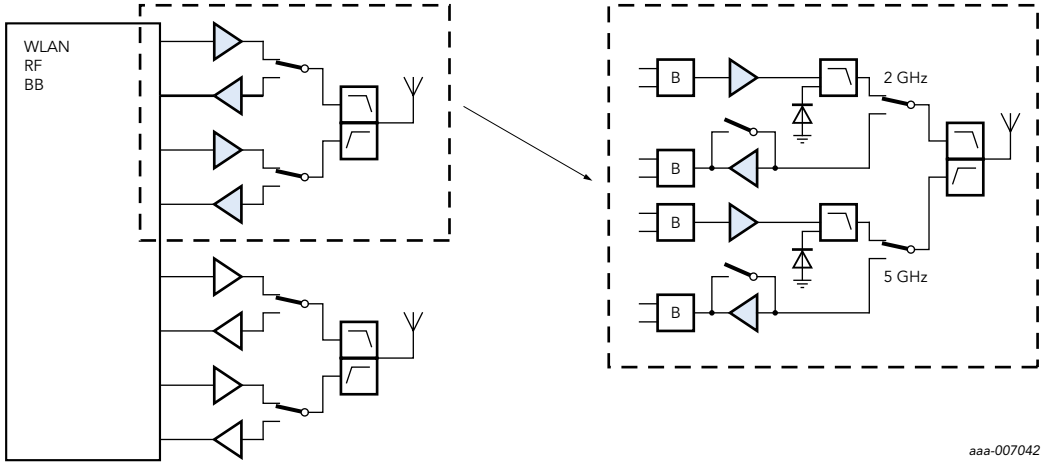
DEV = in DEVelopment
CQS = Customer Qualification Samples
RFS = Released For Supply

Type	New name	Application/description	Expected status June 2015	Planned release	Section
NEW: SiGe:C LNAs (for e.g. GPS)					
BGU8103	GPS1301M	GPS LNA, low current 1 mA	RFS	released	3.1.1
BGU8309	GPS1401M	GPS LNA, small package (0.8 x 0.8 mm2)	RFS	released	3.1.1
NEW: LNAs for LTE					
BGS8L5	LTE3301L	LTE LNA with bypass from 0.7 to 1 GHz, 0.7 dB NF, 15 dB gain	DEV	Q2-2017	3.1.1
BGS8M5	LTE3301H	LTE LNA with bypass from 1.5 to 2.7 GHz, 0.8 dB NF, 14 dB gain	DEV	Q2-2017	3.1.1
BGS8C5	LTE3301C	LTE LNA with bypass from 3.4 to 3.8 GHz, 1.0 dB NF, 16 dB gain	DEV	Q2-2017	3.1.1
BGS8U5	LTE3301U	LTE LNA with bypass from 5.1 to 5.95 GHz, 1.25 dB NF, 15 dB gain	DEV	Q2-2017	3.1.1
-	LTE3401L	LTE LNA with bypass from 0.7 to 1 GHz, 0.85 dB NF, 18 dB gain	DEV	Q2-2017	3.1.1
NEW: LNAs for WLAN					
BGS8324	WLAN3001H	2.4 GHz LNA for WLAN, 802.11b/g/n	RFS	released	3.1.1
BGS8358	WLAN3001C	5 GHz LNA for WLAN, 802.11a/n/ac	RFS	released	3.1.1
BGS8424	WLAN3101H	2.4 GHz LNA for WLAN, 802.11b/g/n, small package	RFS	released	3.1.1
BGS8458	WLAN3101C	5 GHz LNA for WLAN, 802.11a/n/ac, small package	RFS	released	3.1.1
BGF8458	WLAN7001C	5 GHz FEIC for WLAN, 802.11a/n/ac	DEV	Q2-2017	3.1.1
NEW: LNAs for wireless infrastructures					
BGU7078	BTS5101H	Variable gain high-linearity LNA 2.3-2.6 GHz, 1.1 dB NF	RFS	released	3.1.1
BGU8061	BTS3001L	High-linearity LNA with bypass 0.3-1.5 GHz, 1.1 dB NF	RFS	released	3.1.1
BGU8062	BTS3001M	High-linearity LNA with bypass 1.5-2.5 GHz, 1.3 dB NF	RFS	released	3.1.1
BGU8063	BTS3001H	High-linearity LNA with bypass 2.5-4.0 GHz, 1.6 dB NF	RFS	released	3.1.1
NEW: DOCSIS Cable Modem					
BGA3131	-	DOCSIS 3.1 upstream amplifier	RFS	released	3.1.3

1.2 Wireless connectivity mobile & wearable

1.2.1 WLAN for mobile & wearable application

Application diagram for WLAN

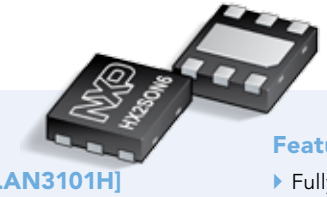


Recommended products

Function	Product	gain (dB)	NF (dB)	IIP3 (dB)	Package	Type	New name
2.4 GHz LNA + switch	MMIC	16 @ 8.3 mA	2.0	7	SOT1261	BGS8324	WLAN3001H
		15.5 @ 8.4 mA	2.0	6	SOT1261	BGS8424	WLAN3101H
5 GHz LNA + switch	MMIC	12.5 @ 9.5 mA	2.3	10	SOT1260	BGS8358	WLAN3001C
		13.5 @ 10.7 mA	2.4	9	SOT1234	BGS8458	WLAN3101C

Function	Product	gain (dB)	NF (dB)	Pout (dB)	Package	Type	New name
5 GHz FEIC	MMIC	14 @ 8 mA	2.3		SOT1436	BGF8458	WLAN7001C

For the complete product selection please see section 3.1.1



Product highlight:
WLAN LNAs plus switch BGS8424 [WLAN3101H] and BGS8458 [WLAN3101C]

These fully integrated LNAs plus switch are optimized for mobile IEEE 802.11b/g/n/ac WLAN applications in the 2.4 and 5 GHz bands. Manufactured in our high-performance QUBiC4 GEN8 technology, they combine best-in-class gain, noise figure, linearity for the LNA and an integrated RX/TX(/BT) switch with the process stability and ruggedness that SiGe technology is known for.

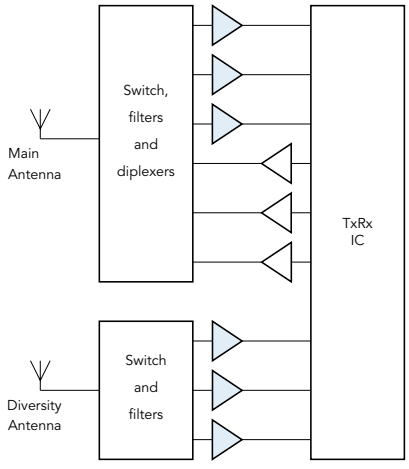
Features

- Fully integrated, high-performance LNA and switch (no external matching or DC blocking required)
- LNA Noise Figure (NF) of 2.0 dB (2.4 GHz) and 2.4 dB (5 GHz), with low current consumption of 8.4 resp. 10.7 mA
- Integrated TX-RX(-BT) switch with low losses (0.7 dB)
- Low bypass current of 8 resp. 4 µA
- Single-supply operation covering full Li-ion battery range from 2.7 to 5.25 V
- Small QFN-style package (1.5 x 1.5 x 0.3 resp. 1.2 x 1.4 x 0.3 mm, 0.4 mm pitch)

1.2.2 LTE LNA

While LTE/4G offers consumers much higher data rates (up to 300 Mbits/s) compared to UMTS/3G, LTE smartphones are more complex because they need more antennas, are used for multiple cellular and connectivity frequencies, and require additional switches and duplexers. BGS8x2 and BGU8x1 LTE LNAs increase the receive sensitivity of LTE main and diversity receivers by offering system-optimized gain, low noise figure, and high third-order linearity. As a result, LTE smartphone users enjoy higher and more consistent data rates. These features also mean RF designers have more options, as they can amplify the LTE signal close to the antenna and decrease line losses - something that is especially important for large tablet and combination phone/tablet ("phablet") form factors. The BGU8x1 and BGS8x2 LTE LNAs are available for Low (BGU8L1, BGS8L2), Mid (BGU8M1, BGS8M2) and High (BGU8H1, BGS8H2) cellular bands. The difference between the BGS8x2 and the BGU8x1 is that the BGS8x2 has a switch to bypass the LNA. This is beneficial when high RF signal levels are available at the input and there is no need for additional gain, because the LNA can be bypassed and switched off to lower the power consumption.

Application diagram of an LTE LNA in a mobile phone



Recommended products

Function	Product	Frequency (MHz)	Gain (dB)	NF (dB)	Package	Type	New name
LNA	MMIC	728 - 960	14	0.7	SOT1232	BGU8L1*	LTE1001L
		1805 - 2200	13	0.8		BGU8M1*	LTE1001M
		2300 - 2690	13	0.9		BGU8H1*	LTE1001H
LNA + bypass	MMIC	728 - 960	13	0.85		BGS8L2	LTE3001L
		1805 - 2200	14.4	0.85		BGS8M2*	LTE3001M
		2300 - 2690	12.5	1.0		BGS8H2*	LTE3001H
		703 - 960	13.6	0.7		BGS8L5*	LTE3301L
		1425-2690	13.1	0.75		BGS8H5*	LTE3301H
		3400 - 3800	15.5	1.0		BGS8U5	LTE3301U
		5150 - 5850	15	1.25		BGS8C5	LTE3301C
		703-960	18	0.85		-	LTE3401L

* also available in CSP package, contact NXP for detailed information on specifications

For the complete product selection please see section 3.1.1



Product highlight:
LTE LNAs with bypass BGS8x5 [LTE3301x]

The BGS8x5 delivers a full range of LTE LNAs covering the full LTE(-U) frequency range from 700 MHz up 6 GHz with products, each optimized for a sub-range of frequencies. The BGS8x5 can be applied in both primary and diversity path of LTE receivers to deliver better sensitivity under severe co-existence conditions (e.g. simultaneous cellular TX in FDD systems). The bypass switch allows to switch off the LNA under higher input signal conditions, thereby reducing the current consumption to less than 1 uA. The BGS8x2 requires only one external matching inductor.

Features

- Smallest 6-pin leadless package (1.1 mm x 0.7 mm x 0.37mm)
- Cover all bands with a Low (from 700 to 960 MHz), High (from 1425 to 2700 MHz), Ultra High (from 3400 to 3800 MHz) and C-band (from 5150 to 5850 MHz)
- Noise figure (NF) between 0.7 and 1.25 dB at a gain between 13 and 15.5 dB
- Current consumption of 4.5 mA in gain mode, < 1 uA in bypass mode
- High linearity (1 dB compression point and IIP3)
- Supply voltage from 1.5 to 3.1 V
- Require only one input matching inductor

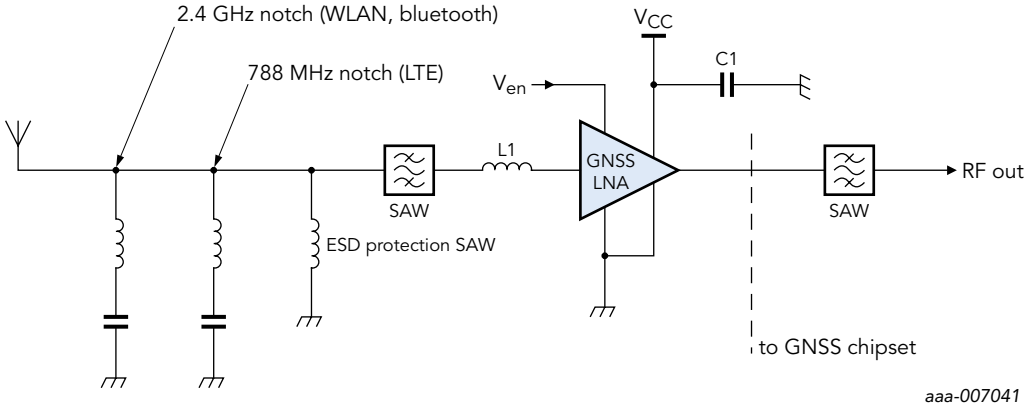
1.2.3 GPS for smartphones, tablets and wearables

BGU600x/700x/800x LNAs are designed to improve the linearity, noise figure, and reception of GPS signals, including GloNass and Compass, while offering the smallest footprint in the market. As the industry's first GPS LNAs to dynamically suppress strong cellular, Bluetooth, and WLAN transmit signals, the NXP BGU600x/700x/800x series offers the best reception for weak GPS signals, delivering an improvement of 10 dB or better IP3 under -40 to -20 dBm jamming conditions, while the noise figure remains below 1 dB. Requiring only one external component, the BGU600x/700x/800x LNAs save up to 70% in PCB size and 10% in component cost.

GPS is a standard feature in a wide range of consumer products, from smartphones, wearables, and tablets to digital still 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 smartphones and tablets, strong transmitters such as Bluetooth, WLAN, and cellular can drive the GPS LNA into compression. When the GPS LNA is in compression, it has lower gain, which causes poor GPS reception; it also generates inter-modulation products and harmonics from the transmitter signals, capable of overpowering weak signals and leading to loss of GPS reception.

The BGU600x/700x/800x 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/800x series requires only one input-matching inductor and an optional one supply decoupling capacitor to complete the design. This creates a very compact design and lowers the bill of materials.

Application diagram of a GNSS LNA with pre- and post-SAWs and notches, implemented as discretes, for 788 MHz (LTE) and 2.4 GHz (WLAN) suppression





Product highlight:
GPS LNA in diamond package BGU8309 [GPS1401M]

The BGU8309 [GPS1401M] has all the features of its predecessors put into smaller diamond shaped package. It features adaptive biasing to have optimal linearity versus current consumption performance in co-existence scenarios with radios in mobile phones. In nominal, non-jamming conditions it delivers 17dB gain at a noise figure of 0.7 dB. The BGU8309 requires only one external matching inductor.

Features

- Smallest 5-pin leadless package (0.8 x 0.8 x 0.35 mm)
- Covers full GNSS L1 band, from 1559 to 1610 MHz
- Noise figure = 0.7 dB at a gain of 17 dB
- High 1 dB compression point of -9 dBm and out-of-band IP3i of 5 dBm
- Supply voltage 1.5 to 3.1 V, supply current 3.6 mA
- Power-down mode current consumption < 1 uA
- Integrated, temperature-stabilized bias for easy design

Recommended products

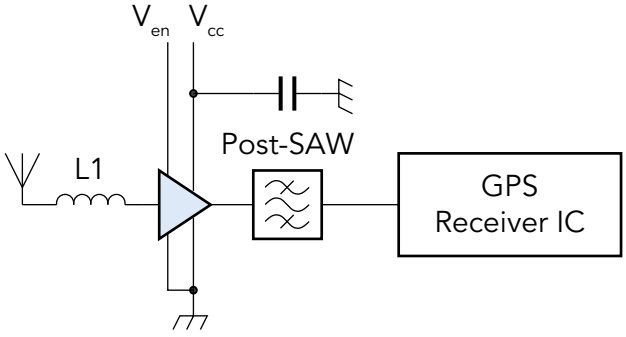
Function	Product	Icc (mA)	Gain (dB)	NF (dB)	Package	Type	New name
value LNA	MMIC	5.2	17.5	0.85	SOT886	BGU6005	GPS1001M
		5.1	17.0	0.9	SOT1230	BGU6009	GPS1002M
mid end LNA		4.5	16.5	0.85	SOT886	BGU7005	GPS1101M
		4.8	18.5	0.85	SOT886	BGU7007	GPS1102M
high end LNA		4.2	18.0	0.65	SOT1230	BGU8009*	GPS1201M
		4.6	18.5	0.55	SOT1232	BGU8019	GPS1202M
		4.0	17.0	0.7	SOT1226	BGU8309	GPS1401M
low current LNA		1.2	17.5	0.8	SOT1232	BGU8103*	GPS1301M
automotive qualified LNA		4.5	16.5	0.85	SOT886	BGU7004	GPS1103M
		4.8	18.5	0.85	SOT886	BGU7008	GPS1104M

* also available in CSP package, contact NXP for detailed information on specifications

For the complete product selection please see section 3.1.1

In wearable health and fitness applications like smart watches, low current is critical, but linearity requirements can be relaxed since the only relevant on-board jammers are Bluetooth and 2.4 GHz WLAN. For these low-current applications, NXP offers the BGU8010, which uses 3 mA of current and has a gain of 16 dB, the BGU8020, which uses 2 mA of current and has a gain of 16.5 dB, and the BGU8103, which uses 1.2 mA of current and has a gain of 17 dB.

Application diagram of wearable health and fitness device, showing the input-match inductor (L1) and a post-SAW



This application consists of the input match inductor L1 and a post SAW. Because no strong jammer signals are present, a pre-SAW is unnecessary.

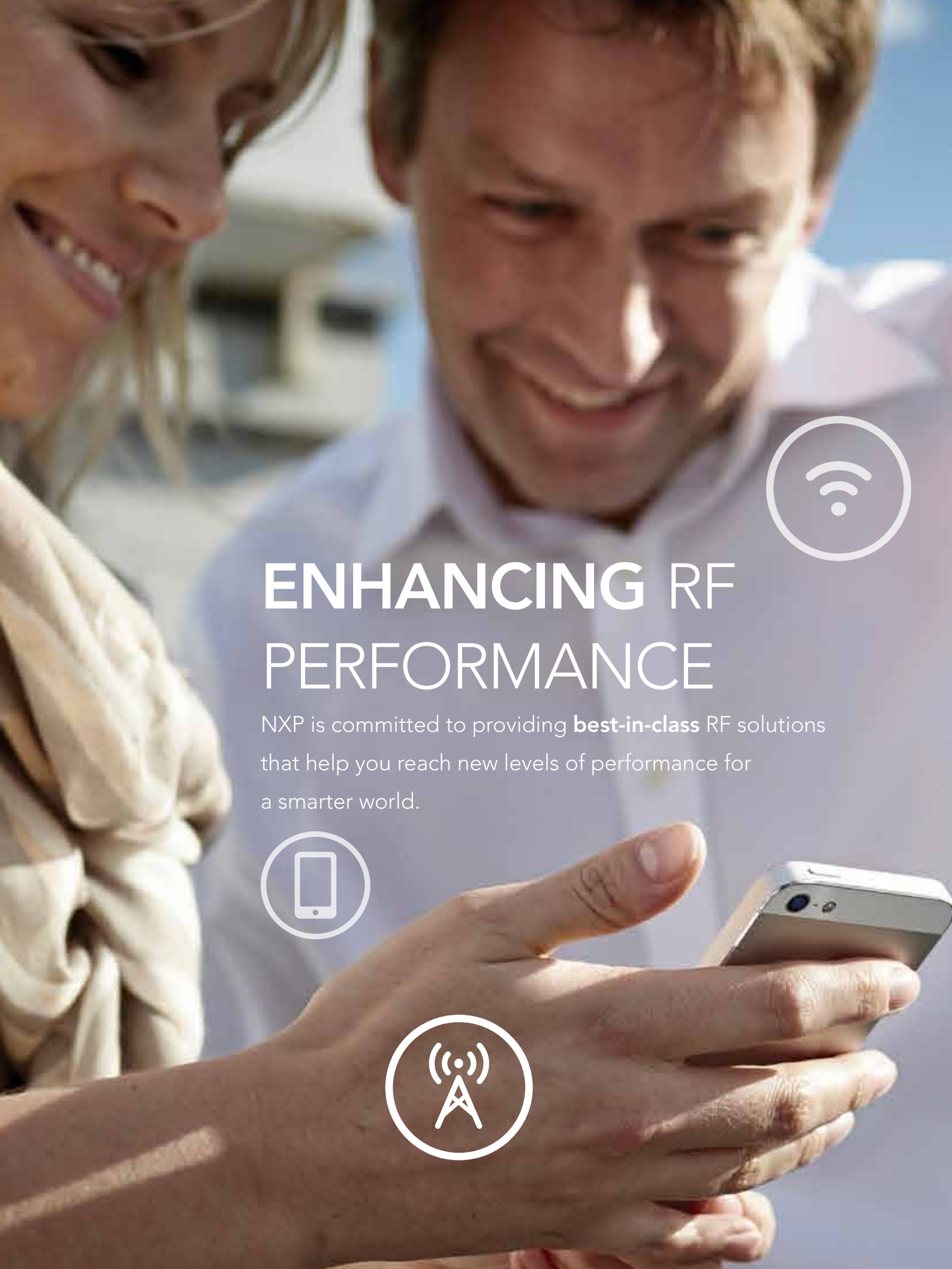


Product highlight: Low-current GPS LNA BGU8103 [GPS1301M]

Designed for extremely low power consumption, the BGU8103 delivers optimal performance even when exposed to jammers from coexisting cellular and connectivity transmitters.

Features

- Covers full GNSS L1 band, from 1559 to 1610 MHz
- Noise figure (NF) = 0.85 dB
- Gain 17.3 dB
- Input 1 dB compression point of -16 dBm
- Out-of-band IP3i of -8 dBm
- Supply voltage 1.5 to 3.1 V
- Optimized performance at low supply current of 1.2 mA
- Power-down mode current consumption < 1 µA



ENHANCING RF PERFORMANCE

NXP is committed to providing **best-in-class** RF solutions that help you reach new levels of performance for a smarter world.

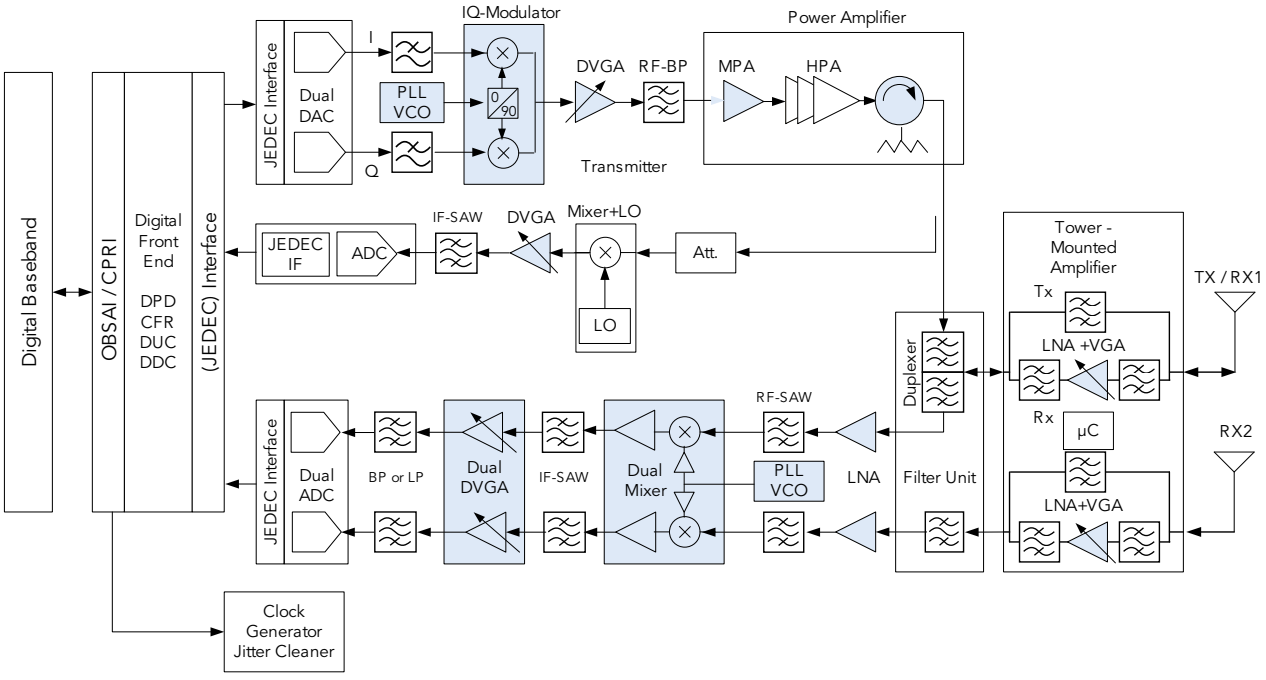
1.3 Wireless communication infrastructur

1.3.1 Base stations (all cellular standards and frequencies)

RF components for transmit line-ups and receive chains

As a global leader in RF technology and component design, NXP Semiconductors offers a complete portfolio of RF products, from low- to medium-power signal conditioning, that delivers advanced performance and helps simplify your design and the development process. Our solutions range from discretes and amplifiers (LNA, VGA, MPA) to mixers/oscillators.

Application diagram of base station showing Tx, Rx, and Tx feedback functions



Tx functions are in the upper region, Rx in the lower, and Tx feedback in the middle.

Product highlight: Base-station LNAs with ultra-low noise BGU805x [BTS1001x]



The BGU8051, BGU8052, and BGU8053 SiGe:C BiCMOS LNAs are designed to support high-performance communications systems from 300 up to 6000 MHz. Key enablers of maintaining sensitivity, even in adverse signal conditions, are high linearity (37 dB OIP3), ultra-low noise figures (e.g. 0.4 dB), and wideband S11<20 dB behavior. These ultra-low noise amplifiers enable 2G/3G/4G macro and micro base-station performance at unsurpassed value.

Features

- Three versions to cover low frequency (300 – 1500 MHz), mid frequency (1500 – 2500 MHz) and high frequency (2500 – 6000 MHz) ranges
- Very low Noise Figure 0.43 – 0.57 dB at a gain of 18 dB
- Very high linearity (1 dB compression point of 19dBm and IIP3 of 39 dBm) at 50 mA current consumption
- Supply voltage from 3.0 to 5.25 V
- Adjustable bias current through external resistor

Recommended products

Function	Product	Frequency	C_d (pF)	R_d (Ω)	$IP3_O$ (dBm)	Package	Type name	New name
attenuator	PIN diode	<3GHz	0.23	2	40dBm	SOT753	BAP64Q	-
			0.25	5.4	45dBm	SOT753	BAP70Q	-
			0.23	2	-	Various*	BAP64	-

Function	Product	Frequency range	NF (dB)	Gain (dB)	$IP3_O$ (dBm)	Package	Type name	New name
LNA	transistor	<6 GHz	0.65 @1.8 GHz	20.5 @1.8 GHz	34 @ 1.8 GHz	SOT343F	BFU690F	-
		<12 GHz	1.3 @ 12 GHz	12.5 @ 12 GHz	11 @ 12 GHz		BFU730F	-
		<12 GHz	0.5 @ 2.4 GHz	22 @ 2.4 GHz	32 @ 2.4 GHz		BFU760F	-
		<12 GHz	0.4 @ 1.8 GHz	19.5 @ 1.8 GHz	33 @ 1.8 GHz		BFU790F	-
	MMIC	0.3-1.5 GHz	0.43 @ 900 MHz	18.1	38.9	SOT1327	BGU8051	BTS1001L
		1.5-2.5 GHz	0.54 @ 1900 MHz	18.4	35.7		BGU8052	BTS1001M
		2-6 Ghz	0.57 @ 2500 MHz	18.4	36.0		BGU8053	BTS1001H
LNA + bypass	MMIC	0.3-1.5 GHz	1.1 @ 900 MHz	20.5	36.5	SOT650	BGU8061	BTS3001L
		1.5-2.5 GHz	1.3 @ 1500 MHz	18.5	36		BGU8062	BTS3001M
		2.7-4 GHz	1.6 @ 2500 MHz	19	34.5		BGU8063	BTS3001H

Function	Product	Frequency range	NF (dB)	Gain range (dB)	$IP3_i$ (dBm)	Package	Type name	New name
LNA + VGA	MMIC	0.699-0748 GHz	0.7 @ 700 MHz	0 - 35	0 @ 700 MHz	SOT1301	BGU7060	-
		0.770-0.915 GHz	0.75 @ 900 MHz		2 @ 900 MHz		BGU7061	-
		1.71-1.785 GHz	0.77 @1750 MHz		1 @ 1750 MHz		BGU7062N2	-
		1.92-1.98 GHz	0.9 @ 1950 MHz		0.9 @ 1950 MHz		BGU7063	-
		1.85-2.01 GHz	0.9 @ 1950 MHz		1 @ 1950 MHz		BGU7073	BTS5001M
		2.305-2.57 GHz	1.1 @ 2535 MHz		0.8 @ 2535 MHz		BGU7075	BTS5001H
		1.71-1.785 GHz	0.8 @ 1750 MHz		1.9 @ 1750 MHz		BGU7078	BTS5002M

Function	Product	Frequency range	Gain (dB)	$IP3_O$ (dBm)	Gain range (dB)	Package	Type name	New name
Single VGA	MMIC	0.7-3.8 GHz	30 dB	39dBm 0.7-1.4GHz	31.5 dB step 0.5dB	SOT167	BGA7210	BTS6001A
		0.4-2.75 GHz	18.5 dB	38dBm 0.4-0.7GHz	31.5 dB step 0.5dB		BGA7204	-
Dual IF VGA	MMIC	50-250 MHz	18.5 dB	43dBm @ 172MHz	24 dB step 1dB	SOT167	BGA7350	-
		50-500 MHz	22 dB	46 dBm @ 172MHz	28 dB step 1dB		BGA7351	-

Function	Product	Power (W)	$P_{L,1dB}$ (dBm)	Gain (dB)	$IP3_O$ (dBm)	Package	Type name	New name
MPA	MMIC	0.25	25.5 @ 2140 MHz	15	38.5	SOT89	BGA7024	-
		0.5	28 @ 2140 MHz	11	42.5		BGA7027	-
		0.25	25 @ 940 MHz	16	37.5	SOT908	BGA7124	-
		0.5	28 @ 2140 MHz	12	42		BGA7127	-
		1	30.5 @ 740 MHz	20	42.5		BGA7130	-

Function	Product	Frequency range	Conversion Gain	$P_{L,1dB}$ (dBm)	$IP3_i$ (dBm)	Package	Type	New name
Dual mixer	MMIC	0.7 - 0.95 GHz	8 @ 900MHz	13 dBm	26 dBm	SOT1092	BGX7220	-
		1.4 - 2.7 GHz	8 @ 2GHz	13 dBm	26 dBm		BGX7221	-

Function	Product	Frequency range	BW_{mod} (MHz)	$P_{L,1dB}$ (dBm)	Output power (dBm)	Package	Type name	New name
IQ modulator	MMIC	0.4-4 GHz	400	12	0	SOT616	BGX7100	-
		0.4-4 GHz	650	12	4		BGX7101	BTS8001A

For the complete product selection please see section 3.1.1, 3.1.2, 3.1.4 and 3.1.5



Product highlight:
Digital VGAs BGA7204 and BGA7210 [BTS6001A]

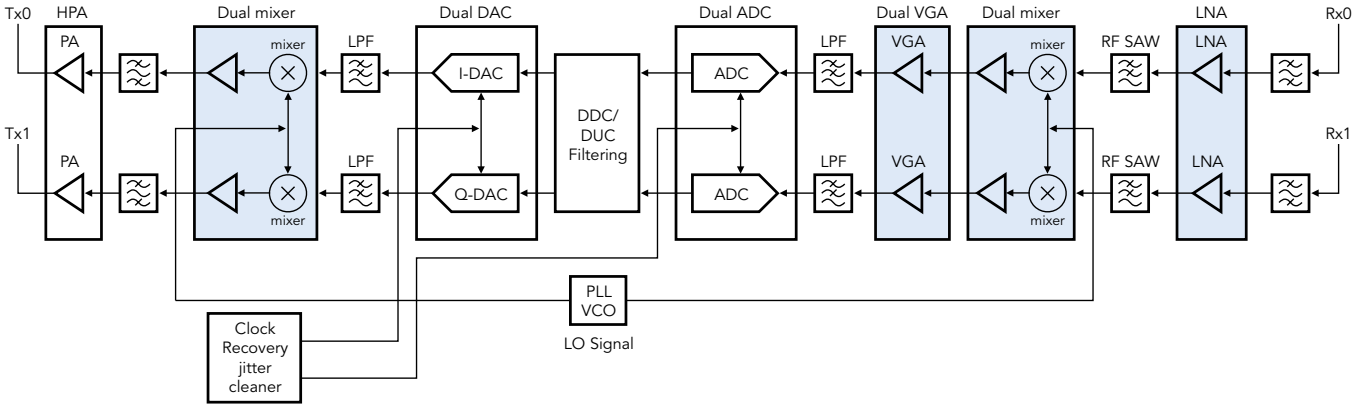
These 6-bit digital VGAs offer high linearity (35 dBm @ 2.2-2.8 GHz) and high output power (23 dBm @ 2.2-2.8 GHz) across a large bandwidth without external matching. Smart routing with no connection crosses simplifies design and decreases footprint by 25%. The unique power-save mode can effectively reduce the current consumption in TDD systems by up to 45%. The BGA7210 adds flexible current distribution across its two amplifiers, depending on the attenuation state, to save current.

Features

- Internally matched for 50 Ω
  - BGA7204 = 0.4 to 2.75 GHz
  - BGA7210 = 0.7 to 3.8 GHz
- High maximum power gain
  - BGA7204 = 18.5 dB
  - BGA7210 = 30 dB
- Attenuation range of 31.5 dB, 0.5 dB step size (6 bit)
- Fast-switching power-save mode (power-down pin)
- Simple control interfaces (SPI)
- ESD protection on all pins (HBM 4 kV; CDM 2 kV)

1.3.2 Repeater

Application diagram of the components used in a repeater system



Function	Product	Frequency range	NF (dB)	Gain (dB)	$IP3_O$ (dBm)	Package	Type name	New name
LNA	MMIC	0.3-1.5 GHz	0.43 @ 900 MHz	18.1	38.9	SOT1327	BGU8051	BTS1001L
		1.5-2.5 GHz	0.54 @ 1900 MHz	18.4	35.7	SOT1327	BGU8052	BTS1001M
		2-6 Ghz	0.57 @ 2500 MHz	18.4	36.0	SOT1327	BGU8053	BTS1001H
LNA+bypass	MMIC	0.3-1.5 GHz	1.1 @ 900 MHz	20.5	36.5	SOT650	BGU8061	BTS3001L
		1.5-2.5 GHz	1.3 @ 1500 MHz	18.5	36	SOT650	BGU8062	BTS3001M
		2.7-4 GHz	1.6 @ 2500 MHz	19	34.5	SOT650	BGU8063	BTS3001H

Function	Product	Frequency range	Conversion Gain (dB)	$P_{L,1dB}$ (dBm)	$IP3_I$ (dBm)	Package	Type name	New name
Dual mixer	MMIC	0.7 - 0.95 GHz	8 @ 900MHz	13 dBm	26 dBm	SOT1092	BGX7220	-
		1.4 - 2.7 GHz	8 @ 2GHz	13 dBm	26 dBm	SOT1092	BGX7221	-

Function	Product	Frequency range	NF (dB)	Gain range (dB)	$IP3_I$ (dBm)	Package	Type name	New name
LNA + VGA	MMIC	0.699-0748 GHz	0.7 @ 700 MHz	0 - 35	0 @ 700 MHz	SOT1301	BGU7060	-
		0.770-0.915 GHz	0.75 @ 900 MHz	0 - 35	2 @ 900 MHz		BGU7061	-
		1.71-1.785 GHz	0.77 @1750 MHz	0 - 35	1 @ 1750 MHz		BGU7062N2	-
		1.92-1.98 GHz	0.9 @ 1950 MHz	0 - 35	0.9 @ 1950 MHz		BGU7063	-
		1.85-2.01 GHz	0.9 @ 1950 MHz	0 - 35	1 @ 1950 MHz		BGU7073	BTS5001M
		2.305-2.57 GHz	1.1 @ 2535 MHz	0 - 35	0.8 @ 2535 MHz		BGU7075	BTS5001H
		1.71-1.785 GHz	0.8 @ 1750 MHz	0 - 35	1.9 @ 1750 MHz		BGU7078	BTS5002M

Function	Product	Frequency range	Gain (dB)	$IP3_O$ (dBm)	Gain range (dB)	Package	Type name	New name
Dual IF VGA	MMIC	50-250 MHz	18.5 dB	43dBm @ 172MHz	24 dB step 1dB	SOT167	BGA7350	-
		50-500 MHz	22 dB	46 dBm @ 172MHz	28 dB step 1dB		BGA7351	-

Function	Product	Power (W)	$P_{L,1dB}$ (dBm)	Gain (dB)	$IP3_O$ (dBm)	Package	Type name	New name
MPA	MMIC	0.25	25.5 @ 2140 MHz	15	38.5	SOT89	BGA7024	-
		0.5	28 @ 2140 MHz	11	42.5		BGA7027	-

For the complete product selection please see section 3.1.1, 3.1.2, 3.1.4 and 3.1.5



Product highlight:
MMIC dual down-mixer BGX7221

The BGX7221 combines a pair of high-performance, high-linearity down-mixers for use in receivers that have a common local oscillator used with, for example, main and diversity paths. The device covers frequency bands from 1700 to 2700 MHz with an extremely flat behavior.

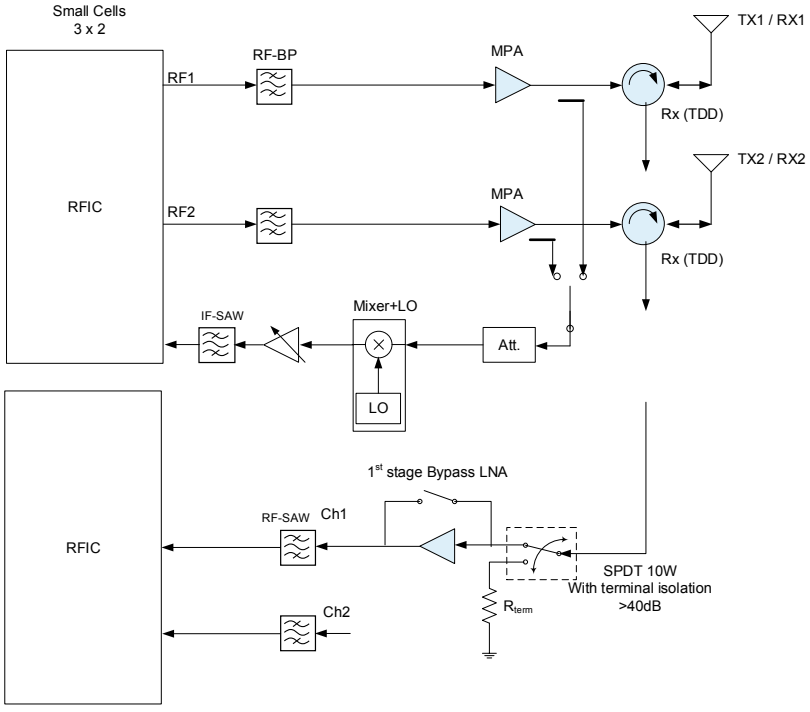
Features

- 8.5 dB conversion gain over all bands
- 13 dBm input, 1 dB compression point
- 25.5 dBm input third-order intercept point
- 10 dB (typ) small-signal noise figure
- Integrated active biasing
- Single +5 V supply operation
- Power-down per mixer with hardware control pins
- Low bias current in power-down mode
- Matched 50 Ω single-ended RF and LO input impedances
- ESD protection at all pins

1.3.3 Small cells

With the explosion of cellular data usage and the limited number of sites available for new macro base stations, operators have to find new ways of offering high data rates and excellent quality of service. One of the options is to complement the macro network with small cells, known as picocells (1 to 2 W average) and femtocells (0.25 to 0.5 W average). NXP offers and develops several types of solutions to the small-cell PAs designer, optimized for performance, integration, or cost.

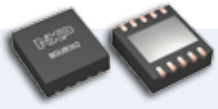
Application diagram of a typical small-cell line-up



Recommended product

Function	Product	Frequency range	NF (dB)	Gain (dB)	IP3$_o$ (dBm)	Package	Type name	New name
LNA	MMIC	0.3-1.5 GHz	0.43 @ 900 MHz	18.1	38.9	SOT1327	BGU8051	BTS1001L
		1.5-2.5 GHz	0.54 @ 1900 MHz	18.4	35.7		BGU8052	BTS1001M
		2-6 Ghz	0.57 @ 2500 MHz	18.4	36.0		BGU8053	BTS1001H
LNA+bypass	MMIC	0.3-1.5 GHz	1.1 @ 900 MHz	20.5	36.5	SOT650	BGU8061	BTS3001L
		1.5-2.5 GHz	1.3 @ 1500 MHz	18.5	36		BGU8062	BTS3001M
		2.7-4 GHz	1.6 @ 2500 MHz	19	34.5		BGU8063	BTS3001H

For the complete product selection please see section 3.1.1



Product highlight: Integrated low-noise, high-linearity amplifier with bypass BGU806x [BTS3001x]

Building on the success of the ultra-low noise BGU805x series, the BGU8062x is a series of SiGe:C BiCMOS LNAs with integrated bypass and fast shutdown. The BGU806x is a perfect 3rd stage gain block in the Rx chain in wireless infrastructure applications. The high-performance bypass function enables high dynamic range, while the fast shutdown function makes it well suited for TDD applications. The BGU806x is housed in a 10-pin package that measures 3 x 3 mm.

Features

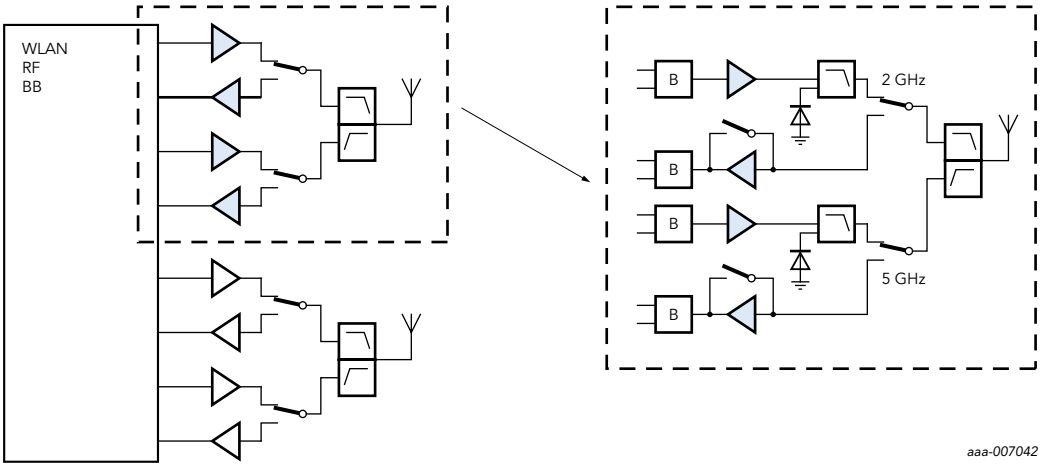
- Three versions to cover low frequency (700 – 1500 MHz), mid frequency (1500 – 2700 MHz) and high frequency (2500 – 4000 MHz) ranges
- Low Noise Figure ranging from 1.1 to 1.4 dB at a gain of 18.5 - 20.5 dB
- Very high linearity (1 dB compression point of ~20dBm and IIP3 of ~36 dBm) at 70-75 mA current consumption
- Performance optimized for a supply voltage of 5 V
- ESD protected on all pins
- 3 x 3 x 0.85 mm package with MSL = 1

1.4 Broadband communication infrastructure and TV

The increasing demand for bandwidth is very visible in broadband communication: fibers are moving closer to the home, and RF requirements are changing, due to the increased use of digital communication protocols. NXP offers a wide range of products which can be used in the network and in the home. For the network, we support fiber-optics with products for down- and upstream communication. For the home, we focus on down- and upstream communication for TVs, set-top boxes and access points-routers.

1.4.1 WLAN: access points and routers, fixed consumer electronics

Application diagram for WLAN



Recommended products

Function	Product	Gain @ 2.4GHz (dB)	Gain @ 5.5 GHz (dB)	NF (dB)	IIP3 (dBm)	Package	Type name
LNA	RF transistor	20	16	0.8 - 1.1	-5 - =10	SOT343F	BFU730F
		15	11	1 - 1.2	-1 - =15		BFU768F
		17	12	0.8 - 1.2	3 - +8	SOT883C	BFU730LX
		15	-	1	+6.5	SOT1189	BGU7224
	MMIC	-	13.5	1.6	+8		BGU7258

For the complete product selection please see section 3.1.1 and 3.2.1



Product highlight:
WLAN LNAs with bypass BGU7224 and BGU7258

These fully integrated LNAs enable IEEE 802.11b/g/n/ac WLANs and ISM applications in the 2.4 and 5 GHz bands. Manufactured in our high-performance QUBiC4x SiGe:C technology, they combine best-in-class gain, noise figure, linearity, and efficiency with the process stability and ruggedness that SiGe technology is known for.

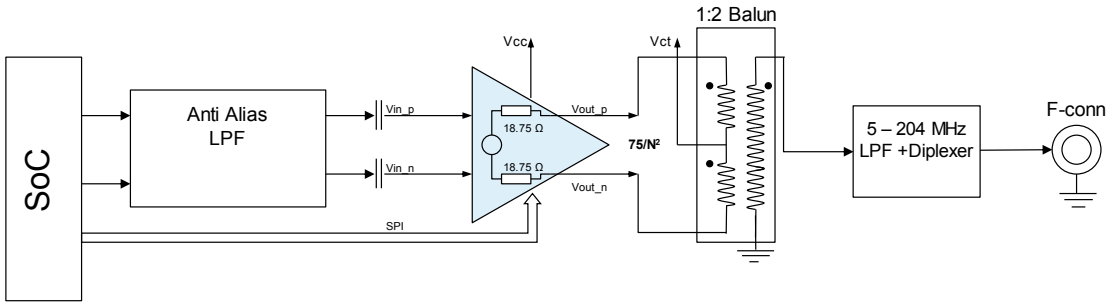
Features

- Fully integrated, high-performance LNA with built-in bypass (no external matching or DC blocking required)
- Noise figure (NF) of 1.0 dB (2.4 GHz) and 1.6 dB (5 GHz), with low current consumption of 13 mA
- Low bypass current of 2 µA
- Single-supply operation from 3.0 to 3.6 V
- Integrated, temperature-stabilized bias network
- High ESD protection of 2 kV HBM on all pins
- Ultrasmall QFN-style package (1.6 x 1.6 x 0.5 mm, 0.5 mm pitch), MSL 1 at 260 °C

1.4.2 Cable modem and set-top boxes based on DOCSIS 3.0 & 3.1

DOCSIS, the cable-modem standard from the CableLabs research consortium, supports IP traffic over digital cable-TV channels. For the upstream path NXP offers two solutions: the BGA3131 for the new DOCSIS 3.0 standard and the requirements set by their respective standards. The BGA3131 has a very low power consumption which eliminates the need for a costly external heatsink.

Application diagram of a DOCSIS cable modem with the BGA3031 upstream amplifier



Recommended products

Function	Product	Frequency range (MHz)	Gain (dB)	$P_{L,1dB}$ (dBmV)	Package	Type name
Upstream VGA for DOCSIS 3.0	MMIC	5 - 85	34	74	SOT662	BGA3031
Upstream VGA for DOCSIS 3.1	MMIC	5 - 205	37	78	SOT662	BGA3131

For the complete product selection please see section 3.1.3



Product highlight:
DOCSIS 3.1 upstream amplifier BGA3131 [BTS6031]

The BGA3131 MMIC is an upstream amplifier designed for the Data Over Cable Service Interface Specifications (DOCSIS 3.1) operating from 5 to 205 MHz. It meets the DOCSIS 3.1 specification at a best-in-class current consumption of 660 mA, eliminating the need for an expensive heatsink. The device provides can amplify DOCSIS 3.0 (QAM modulated signals) and DOCSIS 3.1 (OFDM modulated signals) up to an output level of 68 dBmV while meeting all the IMD, harmonics, ACLR and transient requirements.

Features

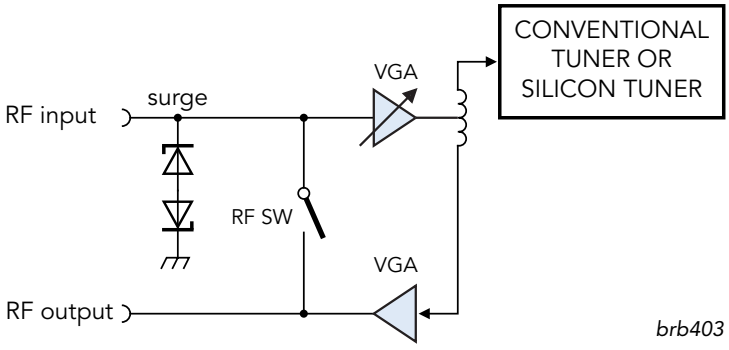
- 3-wire SPI control interface
- 58 dB gain control range, 1 dB steps with 0.4 dB gain step accuracy
- 5 MHz to 205 MHz frequency operating range
- Maximum voltage gain 37 dB, 6.5 dB noise figure
- Excellent linearity at 68 dBmV output power (IMD3 = 60 dBc, second & third harmonic level = 60 dBc, ACLR = 64 dBc)
- 5 V single supply operation
- ESD protection at all pins

1.4.3 Network Interface Module (NIM) for TV reception

Make a high-performance active splitter in a NIM tuner with the BGU703x/BGU704x

Today's TV tuners require complicated signal handling and benefit from flexibility in design. The front-end of a TV signal receiver is no longer just a tuned receiver, but has evolved into an RF network interface module (NIM) with tuned demodulators, active splitters, and remodulators. The active splitter requires an LNA with excellent linearity. NXP has two series of LNA/VGA MMICs (BGU703x/BGU704x), designed especially for high linearity (IP3O of 29 dBm) in low-noise applications such as an active splitter in a NIM tuner. The BGU703x family operates at a supply voltage of 5 V and is intended for use with conventional can tuners. The BGU704x family operates at 3.3 V and works seamlessly with Si tuner ICs, which also operate at 3.3 V.

Application diagram of an STB input stage with improved NF performance using the BGU703x and BGU704x



Recommended products

Function	Product	Supply voltage (V)	Gain (dB)	NF (dB)	Package	type name
VGA	MMIC	5	10	4.5	SOT363	BGU7031
			10	4.5	SOT363	BGU7032
			-2	2.5		
			10	4.5	SOT363	BGU7033
			5	6		
			-2	2.5		
		3.3	10	4	SOT363	BGU7041
			10	4	SOT363	BGU7042
			-2	2.5		
			14	2.8	SOT363	BGU7044
			14	2.8	SOT363	BGU7045
			-2	2.5		

For the complete product selection please see section 3.1.1



Product highlight: VGAs for TVs/STBs BGU703x and BGU704x

Designed for high linearity and low noise, these 3.3 and 5 V wideband VGAs support multi-tuner applications in TVs, DVR/PVRs, and STBs operating between 40 MHz and 1 GHz. A unique programmable gain with bypass mode compensates for tuner switch signal loss (important in multi-tuner systems), and improves overall system performance by 7 to 10 dB.

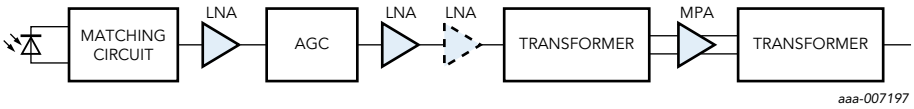
Features

- Flat gain between 40 MHz and 1 GHz
- Output power at 1 dB gain compression ($P_{L(1\ dB)}$) ranging from 9 to 14 dBm
- Noise figure as low as 2.8 dB
- High linearity with an OIP3 of 29 dBm
- 75 Ω input and output impedance
- Power-down during bypass mode
- ESD protection >2 kV HBM, >1.5 kV CDM on all pins

1.4.4 Optical mini- and midi-node line-up

We provide a complete system solution for optical mini- and midi-node line-ups, for use in systems that take the broadband TV signal from an optical network and amplify the signal onto a coaxial distribution network. Depending on the placement of the node, this might go straight into a home (FTTH), an apartment building (FTTB), or deeper in the network (FTTC).

Application diagram of an MMIC broadband amplifier for TV and distribution systems



NXP delivers all the components for optical mini- and midi-node line-ups, for FTTx applications:

- BGA301x input stages are LNAs that keep overall noise low
- BGA302x MPAs deliver high output power with excellent overall performance
- The BAP70Q PIN diode enables an adjustable-gain control circuit

Recommended products

Function	Product	V_R max (V)	IF max (mA)	r_D (Ω) @ IF=10 mA	Package	Type name
AGC	PIN diode	50	100	5.4	SOT753	BAP70Q

Function	Product	Frequency range (MHz)	Gain (dB)	NF (dB)	Package	Type name
LNA	MMIC	40 - 1006	12	3.1	SOT89	BGA3012
			15	2.5		BGA3015
			18	2.2		BGA3018

Function	Product	Frequency range (MHz)	Gain (dB)	IP3 (dBm)	IP2 (dBm)	P1dB (dBm)	Package	Type name
MPA	MMIC	40 - 1200	16	46	75	30	SOT786-2	BGA3021
			18					BGA3022
			20					BGA3023

For the complete product selection please see section 3.1.2 and 3.3.2



Product highlight:
MMIC wideband amplifiers with internal biasing BGA302x

These are MPAs, specifically designed as the output stage for high-linearity CATV optical mini- and midi-nodes. They operate over a frequency range of 40 to 1200 MHz, and are housed in a lead-free HSO8 package.

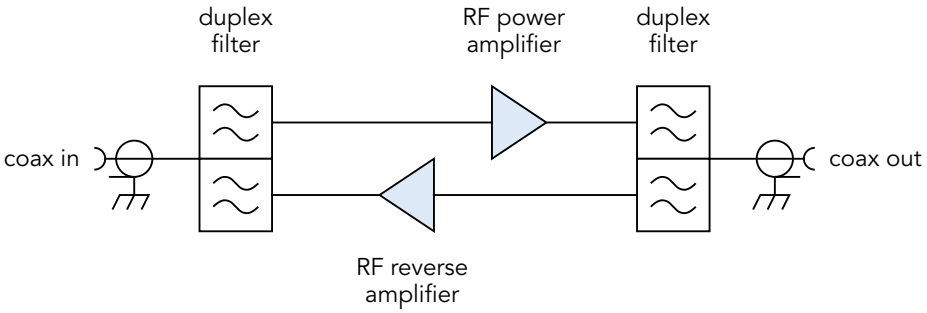
Features

- Internally biased
- Flat gain between 40 and 1200 MHz
- High linearity with an IP3o of 46 dBm and an IP2o of 75 dBm
- High gain output 1dB compression point of 30 dBm
- 75 Ω input and output impedance
- Icc (total) can be controlled between 175 and 350 mA

1.4.5 Broadband line extenders

Larger coaxial distribution networks often require longer distances and additional amplification. Our broadband solutions are ideally suited for use in bidirectional line extenders.

Application diagram of a bidirectional line extender



Recommended products

Function	Product	Frequency (MHz)	Gain (dB)	NF(dB)	Package	Type name
RF forward amplifier	Drop amplifier	1006	12	3.1	SOT89	BGA3012
			15	2.5	SOT89	BGA3015
			18	2.2	SOT89	BGA3018

Function	Product	Frequency range (MHz)	Gain (dB)	P1dB (dBm)	Package	Type name
RF reverse amplifier	Drop amplifier	5 - 300	12	22.5	SOT89	BGA3012
			15	23.5	SOT89	BGA3015
			18	24.5	SOT89	BGA3018

For the complete product selection please see section 3.1.2



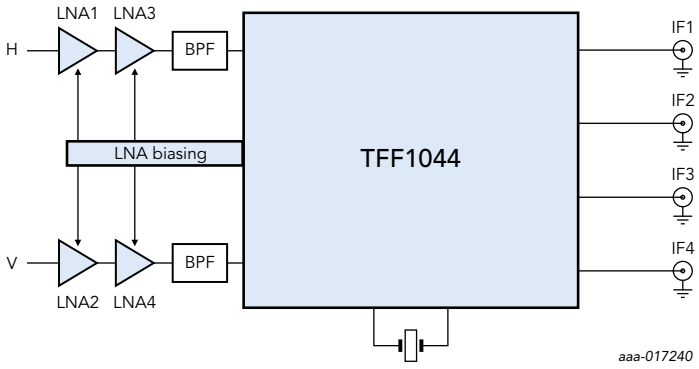
Product highlight:
Extreme-broadband amplifiers BGA301x

The BGA3012, BGA3015, and BGA3018 are extreme-broadband amplifiers that deliver 12, 15, and 18 dB of gain from 40 to 1006 MHz, while providing outstanding linearity performance. These amplifiers can also be used as a return path amplifier from 5 to 300 MHz, or in a combined TV and satellite system from 40 to 2600 MHz. At the low end of the frequency band, these amplifiers outperform competing GaAs devices in noise figure performance by 5 dB and in input power rating by more than 20 dB, while offering a superior ESD rating of 2 kV and a larger supply voltage operating range of 5 to 8 V. These amplifiers are very well suited for various broadband TV distribution system applications, such as FFTH, home gateways, and set-top boxes.

1.5 Satellite

1.5.1 Satellite outdoor unit, QUAD LNB with integrated mixer/oscillator/downconverter/ switch matrix

Application diagram of a QUAD LNB



Recommended products

Function	Product	Maximum gain (dB)	NF_{min} (dB)	$I_{cc, nom}$ (mA)	Package	Type name
1st stage LNA	RF transistor	14.2	0.65	6	SOT343F	BFU910F
2nd stage LNA	RF transistor	14	1.45	2	SOT343F	BFU710F
		12.5	1.3	5		BFU730F
		14.2	0.65	6		BFU910F

Function	Product	Gain (dB)	NF_{min} (dB)	$I_{cc, nom}$ (mA)	Package	Type name
Mixer/Oscillator/ downconverter	MMIC	30/33/36	8	145	HVLGA	TFF1044HN

For the complete product selection please see section 3.1.5 and 3.2.1



Product highlight:

World's first fully integrated Quad Ku-band to L-band downconverter IC TFF1044HN

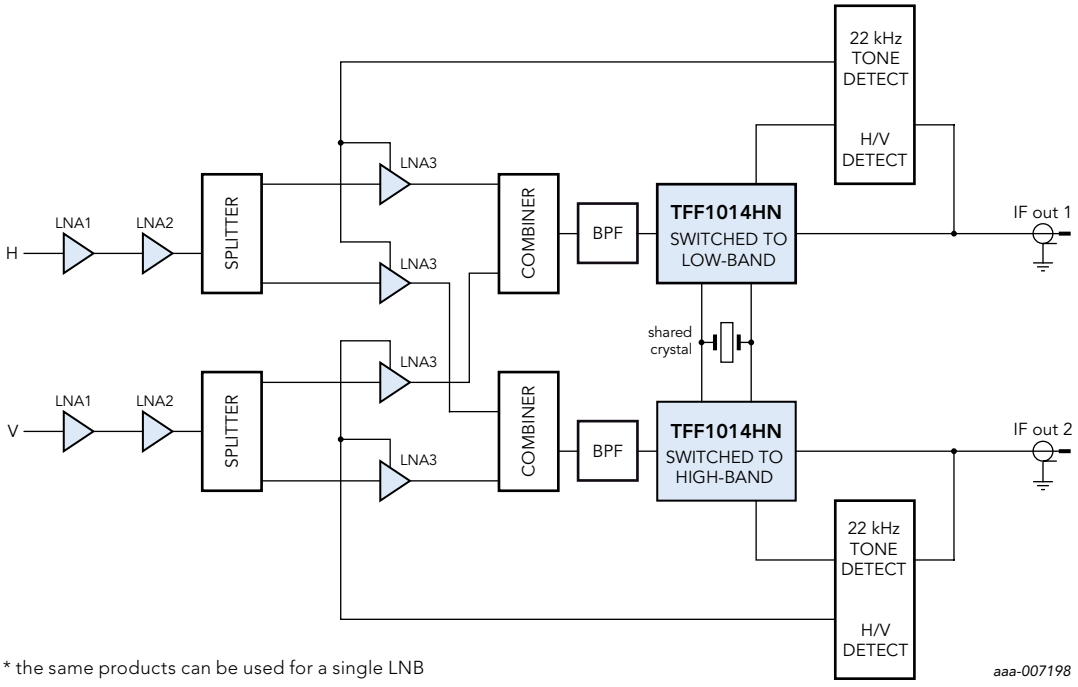
This universal Quad DVB-S/DVB-S2 compliant Ku-band downconverter enables significant size reduction for Quad or Quattro LNB's. It reduces total costs, since it enables alignment-free production, and significantly decreases manufacturing time, since it's fully tested.

Features

- Integrated voltage/tone detection, 4 x 4 matrix switch
- Low current consumption (Icc = 170 mA for 4 users active)
- Low Phase Noise (1.6 degrees RMS PJ typ)
- Selectable gain (30, 33, 36 dB)
- Small PCB footprint – HVLGA36 (5.0 x 5.0 x 0.72 mm) – low external component count

1.5.2 Satellite outdoor unit, twin LNB with integrated mixer/oscillator/downconverter

Application diagram of a twin LNB based on the TFF101x*



* the same products can be used for a single LNB

Recommended products

Function	Product	Package	Maximum gain (dB)	NF $_{min}$ [dB]	$I_{cc\ nom}$ [mA]	Type name
1st stage LNA	RF transistor	SOT343F	14,2	0,65	6	BFU910F
2nd and 3rd stage LNA	RF transistor	SOT343F	14	1,45	2	BFU710F
			12,5	1,3	5	BFU730F
			14,2	0,65	6	BFU910F

Function	Product	Package	Gain (dB)	NF $_{min}$ [dB]	$I_{cc\ nom}$ [mA]	Type name
Mixer/ Oscillator/ downconverter	RFIC	SOT763	30	9	52	TFF1012HN
			33	9	52	TFF1013HN
			36	7	52	TFF1014HN
			39	7	52	TFF1015HN
			42	7	52	TFF1017HN
			45	7	52	TFF1018HN

For the complete product selection please see section 3.1.5 and 3.2.1



Product highlight: Industry's lowest-power integrated Ku-band downconverters TFF101xHN

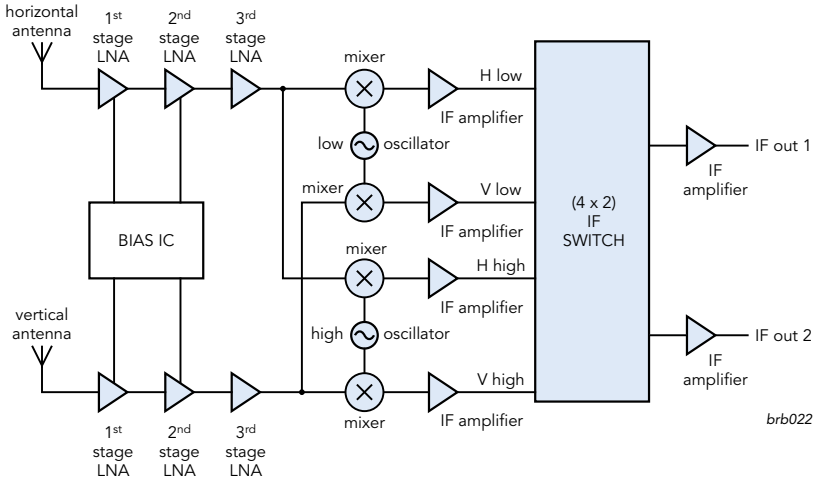
These Universal DVB-S compliant Ku-band downconverters consume about 50% less current (52 mA) than other integrated solutions. They are fully integrated (PLL synthesizer/mixer/IF gain block) and RF tested – which results in significantly decreased manufacturing time. Stability of the local oscillator is guaranteed, which improves overall system reliability over temperature and time, and eliminates the need for manual alignment in production.

Features

- Ultralow current consumption (I_{CC} = 52 mA)
- Low phase noise (1.5° RMS typ)
- Integration bandwidth from 10 kHz to 13 MHz
- Small PCB footprint
  - DHVQFN16 package (2.5 x 3.5 x 0.85 mm)
  - Only seven external components
  - No inductors necessary

1.5.3 Satellite outdoor unit, twin LNB with discrete components

Application diagram of a twin LNB with discrete components*



* the same products can be used for a single LNB

Recommended products

Function	Product	Gmax [dB]	NF min [dB]	I cc nom [mA]	Package	Type
1st stage LNA	RF transistor	14.2	0.65	6	SOT343F	BFU910F
2nd stage LNA	RF transistor	14	1.45	2	SOT343F	BFU710F
		12.5	1.3	5		BFU730F
		14.2	0.65	6		BFU910F

Function	Product	Gmax [dB]	NF min [dB]	I cc nom [mA]	Package	Type
Oscillator	RF transistor	12.5	1.2	30	SOT343F	BFU660F
		14	1.45	2		BFU710F
		12.5	1.3	5		BFU730F

Function	Product	Gmax [dB]	NF min [dB]	I cc nom [mA]	Package	Type
Mixer	RF transistor	14	1.45	2	SOT343F	BFU710F
		12.5	1.3	5		BFU730F

* Also available in ultrasmall leadless package SOD882D

For the complete product selection please see section 3.1.2, 3.2.1 and 3.3.2

Function	Product	V R max (V)	C d [pF]	R d [Ω] @10 mA	Package	Type
IF switch	PIN diode	175	0.23 @ 20 V	2	Various	BAP64*
		50	0.2 @ 20 V	1,5	Various	BAP51*
		50	0.2 @ 5 V	3	Various	BAP50*

Function	Product	Gain [dB]	P 1dB [dBm]	V cc/Icc [V/mA]	Package	Type
1st or output stage IF amplifier	IF gain block	20	-1	3.3 / 10.5	SOT363	BGA2800
		22.4	2	3.3 / 14.3		BGA2801
		26	1	3.3 / 12.5		BGA2802
		23	-6	3.0 / 5.8		BGA2803
		25	5	3.3 / 18.2		BGA2815
		31.3	5	3.3 / 22.2		BGA2816
		24.3	6	3.3 / 20		BGA2817
		29.8	6	3.3 / 19.9		BGA2818
		24	-1	5 / 9.1		BGA2850
		24.8	-3.5	5 / 7		BGA2851
		32.2	8	5 / 26.4		BGA2865
		23.9	4	5 / 17.4		BGA2866
		27.1	7	5 / 21.7		BGA2867
		31.7	10	5 / 24		BGA2869
	RF transistor	12.5		5.5 / 30	SOT343F	BFU660F



Product highlight:
NPN wideband SiGe RF transistor BFU910F

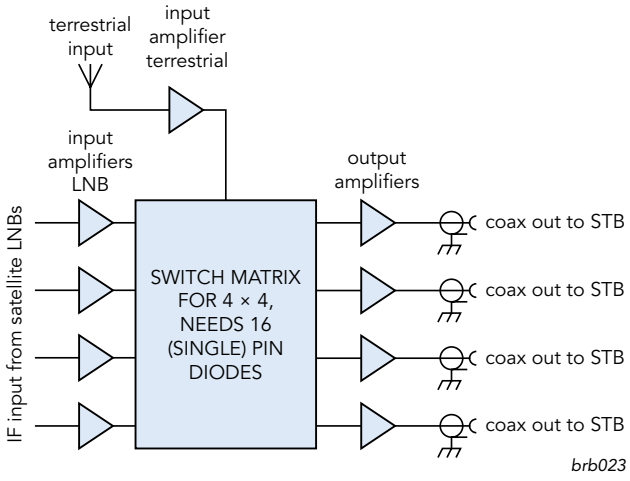
The BGU910F is a wideband RF transistor produced in the QUBIC GEN9 process for K-band applications (10 – 20 GHz). QUBiC GEN9 has been optimized towards extremely low noise figures in this frequency range. Typical applications are first, second or third stage amplifiers in satellite LNBs. The BFU910 can be used to replace GaAs devices giving the benefits of more robustness, single biasing and low current consumption in combination with an excellent RF performance.

Features

- Low noise, high gain microwave transistor with 90 GHz fT
- High maximum stable gain of 14.2 dB at 12 GHz
- Minimum noise figure (NF) of 0.65 dB at 12 GHz
- Current consumption 10 mA typical

1.5.4 Satellite multi-switch box - 4 x 4 (up to 16 x 16)/DiSEqC/SMATV

Application diagram of a satellite multi-switch box



Recommended products

Function	Product	Frequency range (MHz)	Gain (dB)	NF(dB)	Package	Type
Input amplifier terrestrial	MMIC	400-2700	22	2.9	SOT89	BGA7024
			23	4.6	SOT908	BGA7124
		40-1006	12	3.1	SOT89	BGA3012
			15	2.5		BGA3015
			18	2.2		BGA3018

Function	Product	Gain [dB]	P_{1dB} (dBm)	$V_{cc/Icc}$ (V/mA)	Package	Type
IF input amplifie	MMIC	23.9	4	5 / 17.4	SOT363	BGA2866
		27.1	7	5 / 21.7		BGA2867
		29.8	6	3.3 / 19.9		BGA2818

Function	Product	Gmax [dB]	NF_{min} [dB]	$I_{cc\ nom}$ [mA]	Package	Type
IF input amplifie	RF transistor	26	0.8	3	SOT343F	BFU630F
		24	0.65	30		BFU660F
		27	0.43	25		BFU725F/N1
		28	0.5	5		BFU730F

Function	Product	V_{r_max} [V]	C_d [pF]	Rd [Ohm]	Package	Type
Switch matrix	PIN diode	50	0.2	3	Various	BAP50*
		50	0.2	1.5		BAP51*
		175	0.23	0.7		BAP64*
		50	0.25	1.4		BAP70*
		60	0.25	0.85		BAP1321*

Function	Product	Gmax [dB]	NF_{min} [dB]	$I_{cc\ nom}$ [mA]	Package	Type
Switch matrix	RF transistor	27	0,43	25	SOT343F	BFU725F/N1
		28	0,5	5		BFU730F

Function	Product	Gain [dB]	P_{1dB} (dBm)	$V_{cc/Icc}$ (V/mA)	Package	Type
Output amplifier	MMIC	22	25.5	5/110	SOT89	BGA7024
		23	25	5/140	SOT908	BGA7124
		31.7	10	5 / 24	SOT363	BGA2869
		12	23	8/110		BGA3012
		15	24	8/110		BGA3015
		18	25	8/120		BGA3018

Function	Product	Gmax [dB]	NF_{min} [dB]	$I_{cc\ nom}$ [mA]	Package	Type
Output amplifier	RF transistor	26	0.8	3	SOT343F	BFU630F
		24	0.65	30		BFU660F
		27	0.43	25		BFU725F/N1
		28	0.5	5		BFU730F

* Also available in ultrasmall leadless package SOD882D

For the complete product selection please see section 3.1.2, 3.1.4, 3.2.1 and 3.3.2



Product highlight:
NPN wideband SiGe RF transistor BFU730F

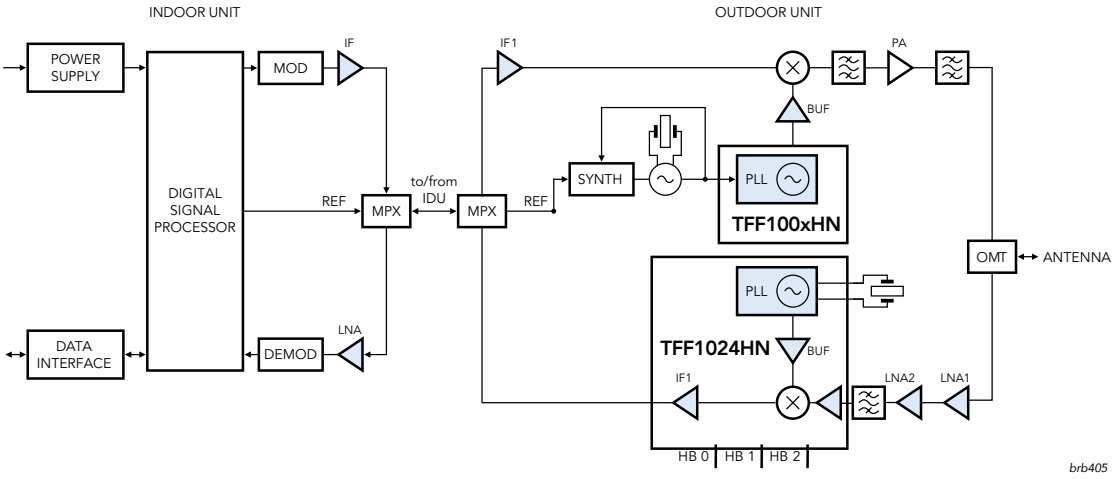
The BGU730F is part of the family of 6th (Si) and 7th (SiGe:C) generation RF transistors and can be used to perform nearly any RF function. These next-generation wideband transistors offer the best RF noise figure versus gain performance, drawing the lowest current. This performance allows for better signal reception at low power and enables RF receivers to operate more robustly in noisy environments.

Features

- Operates at 2.3 GHz
- High maximum power gain (Gp) of 17.6 dB
- Noise figure (NF) of 0.8 dB
- Input 1dB gain compression ($P_{i(1dB)}$) of -15 dBm
- Input third-order intercept point $IP3_I$ of +4.7 dBm

1.5.5 VSAT with integrated mixer/oscillator/downconverter

Application diagram of a VSAT using a flexible TFF1024HN downconverter

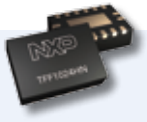


Recommended products

Function	Product	Gain (dB)	$P_{L,1dB}$ (dBm)	$V_{cc/Icc}$ (V/mA)	Package	Type name
IF amplifier	MMIC	20	-1	3.3 / 10.5	SOT363	BGA2800
		22.4	2	3.3 / 14.3		BGA2801
		26	1	3.3 / 12.5		BGA2802
		23	-6	3.0 / 5.8		BGA2803
		25	5	3.3 / 18.2		BGA2815
		31.3	5	3.3 / 22.2		BGA2816
		24.3	6	3.3 / 20		BGA2817
		29,8	6	3.3 / 19.9		BGA2818
		24	-1	5 / 9.1		BGA2850
		24.8	-3.5	5 / 7		BGA2851
		32.2	8	5 / 26.4		BGA2865
		23.9	4	5 / 17.4		BGA2866
		27.1	7	5 / 21.7		BGA2867
			10	5 / 24		BGA2869

Function	Product	Gmax [dB]	NF min [dB]	Icc nom [mA]	Package	Type
Mixer/oscillator/ downstreamconverter	MMIC	9.75, 10, 10.25, 10.55, 10.6, 10.75, 11.25, 11.3	34.3	56	SOT763	TFF1024HN

For the complete product selection please see section 3.1.2 and 3.1.5 and 3.2.1



Product highlight:
Downcoverter with PLL/VCO for VSAT TFF1024HN

This VSAT Ku-band downconverter consumes about 35% less current (60 mA) than other integrated solutions. It's fully integrated (PLL synthesizer/ mixer/IF gain block) and RF tested – which results in significantly decreased manufacturing time. Unlike dielectric resonance oscillators, which are mechanical components, the PLL-based TFF1024HN guarantees stable performance over lifetime and temperature, enabling high Service (QoS) for end-users. This downconverter operates at eight of the most-used Ku sub-bands using only one crystal.

Features

- Switched LO frequency
  - Eight selectable frequencies from 9.75 to 11.30 GHz
  - More LO frequencies obtainable with different Xtal values
- Ultralow current consumption (I_{CC} = 60 mA)
- Low phase noise (1.0° RMS typ)
  - 10 kHz to 13 MHz integration bandwidth
- Flat gain over frequency (< 2 dBpp)
- High linearity of > 16 dBm IP3o
- High P1dBo > 6 dBm

Function	Product	Maximum gain (dB)	NF_{min} (dB)	$I_{cc, nom}$ (mA)	Package	Type name
1st stage LNA	RF transistor	14.2	0.65	6	SOT343F	BFU910F
2nd stage LNA	RF transistor	14	1.45	2	SOT343F	BFU710F
		12.5	1.3	5		BFU730F
		14.2	0.65	6		BFU910F

Function	Product	LO frequency (GHz)	RMS Phase Jitter [degr]	I_{cc} (mA)	Package	Type name
PLL	MMIC	12.8 - 13.05	0.65	100	SOT616	TFF1003HN
		14.62 - 15.00	0.9	116		TFF1007HN
		9.03 - 9.22	0.7	100		TFF11092HN
		9.53 - 9.72	0.7	100		TFF11096HN
		9.92 - 10.13	0.7	100		TFF11101HN
		13.8 - 14.1	1	100		TFF11139HN
		14.5 - 14.8	1	100		TFF11145HN

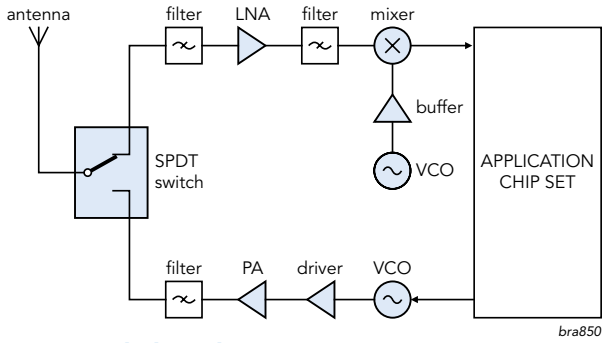
Function	Product	Maximum gain (dB)	NF_{min} (dB)	$I_{cc, nom}$ (mA)	Package	Type name
Oscillator / Buffer	transistor	17	1.7	2	SOT343F	BFU610F
		16	1.3	3		BFU630F
		12.5	1.2	30		BFU660F
		17	0.7	70		BFU690F
		14	1.45	2		BFU710F
		12.5	1.3	5		BFU730F
		13.5	0.75	25		BFU760F
		16.5	0.5	50		BFU790F

For the complete product selection please see section 3.1.2 and 3.1.5 and 3.2.1

1.6 Generic RF front-end for IOT

In a typical RF front-end, RF signals are received and transmitted anywhere in the range of DC to 20 GHz. All our wideband SiGe amplifiers can be used for high-speed, low-noise applications along this entire spectrum. Because our wideband transistors are so versatile, they are used in a broad range of functions and are an especially good choice for cost-sensitive applications that also need flexibility. In LNA applications, they support GPS, satellite radio, cordless phones, and WLAN. They also enable oscillators and drivers in consumer, ISM, and automotive applications. Many designers use varicap diodes principally as voltage-variable capacitors, with the diode function a secondary option, but these devices are ideally suited for use as VCOs in ISM-band applications.

Application diagram of a typical RF front-end interface



Recommended products

Function	Product	$V_{R\ max}$ (V)	IF_{max} (mA)	r_D (Ω) @ IF=10 mA	Package	Type name
SPDT switch	Bandswitch diode	35	100	0.5	SOD523	BA891
		35	100	0.5	SOD323	BA591
	RF diode	50 - 60	50 - 100	2.5	Various	BAP51*
		100-175	100	2	Various	BAP64*

Function	Product	Freq range(GHz)	NF (dB)	Gain (dB)	Package	Type name
LNA	transistor	< 2	0.7 @ 433 MHz	19.5 @ 433 MHz	SOT23	BFU520A
		< 2	0.8 @ 433 MHz	21 @ 433 MHz		BFU530A
		< 2	0.8 @ 433 MHz	21 @ 433 MHz	SOT143	BFU520
		< 2	0.9 @ 433 MHz	23 @ 433 MHz		BFU530
		< 2	0.8 @ 433 MHz	21 @ 433 MHz	SOT143X	BFU520X
		< 2	0.9 @ 433 MHz	23 @ 433 MHz		BFU530X
		< 2	0.8 @ 433 MHz	21 @ 433 MHz	SOT143XR	BFU520XR
		< 2	0.9 @ 433 MHz	23 @ 433 MHz		BFU530XR
		< 2	0.7 @ 433 MHz	20 @ 433 MHz	SOT323	BFU520W
		< 2	0.8 @ 433 MHz	21.5 @ 433 MHz		BFU530W
		< 2	0.7 @ 433 MHz	20 @ 433 MHz	SOT363	BFU520Y
		< 10	1.1 @ 2.4 GHz	16 @ 2.4 GHz	SOT343F	BFU610F
		< 10	0.85 @ 2.4GHz	19 @ 2.4 GHz		BFU630F
		< 6	0.7 @ 2.4 GHz	16 @ 2.4 GHz		BFU660F
		< 6	0.7 @ 2.4 GHz	11 @ 2.4 GHz		BFU690F
		< 18	1.45 @ 12 GHz	11.5 @ 12 GHz		BFU710F
		< 18	1.3 @ 12 GHz	10.5 @ 12 GHz		BFU730F
		< 10	0.75 @ 5.8 GHz	10.5 @ 5.8 GHz		BFU760F
		< 6	0.5 @ 2.4 GHz	10.5 @ 2.4 GHz		BFU790F
	MMIC	< 4	0.9 @ 1.5 GHz	8 - 21 @ 1.5 GHz	SOT1209	BGU6101
		< 4	0.9 @ 1.5 GHz	11 - 21 @ 1.5 GHz		BGU6102
		< 4	0.9 @ 1.5 GHz	13 - 19 @ 1.5 GHz		BGU6104

* Also available in ultrasmall leadless package SOD882D



Product highlight:
NPN wideband SiGe RF transistor BFU730F

The BGU730F is part of the family of 6th (Si) and 7th (SiGe:C) generation RF transistors and can be used to perform nearly any RF function. These wideband transistors offer the best RF noise figure versus gain performance, drawing the lowest current. This performance allows for better signal reception at low power and enables RF receivers to operate more robustly in noisy environments.

Features

- Operates at 2.3 GHz
- High maximum power gain (Gp) of 17.6 dB
- Noise figure (NF) of 0.8 dB
- Input 1 dB gain compression (Pi(1dB)) of -15 dBm
- Input third-order intercept point IP3I of +4.7 dBm

Recommended products

Function	Product	Freq range (GHz)	P_{L1dB} (dBm)	$IP3_o$ (dBm)	Package	Type name
Driver	transistor	< 2	9.5	19	SOT23	BFU530A
		< 2	13	23		BFU550A
		< 2	9	19	SOT143	BFU530
		< 2	13.5	23		BFU550
		< 2	9.5	19	SOT143X	BFU530X
		< 2	13	22.5		BFU550X
		< 2	9.5	19	SOT143XR	BFU530XR
		< 2	13	23		BFU550XR
		< 2	9.5	19	SOT323	BFU530W
		< 2	13	23		BFU550W
	MMIC	DC - 2.2	4	17	SOT363	BGA2866

Function	Product	Freq range (GHz)	PL_{1dB} (dBm)	$IP3_o$ (dBm)	Package	Type name
MPA	transistor	< 2	16	25.5	SOT89	BFU580Q
		< 2	23	32.5		BFU590Q
		< 2	15.5	25	SOT223	BFU580G
		< 2	22.5	32		BFU590G
	MMIC	< 2.7	25.5	38	SOT89	BGA7024
		< 2.7	29	43		BGA7027
		< 2.7	30	42	SOT908	BGA6130
		< 2.7	25	38.5		BGA7124
		< 2.7	28.5	42.5		BGA7127
		< 2.7	30.5	42.5		BGA7130

Function	Product	$R_{s\ max}$ (Ω)	C_{d1} (pf)	C_{d2} (pF)	Package	Type name
VCO	Varicap diodes	3	16 @ 1 V	4.8 @ 7.5 V	SOD523	BB181
		0,7	12.5 @ 0.5 V	0.9 @ 28 V	SOD323	BB156

Function	Product	fT (GHz)	Gmax (dB)	Icc max (mA)	Package	Type name
VCO	RF bipolar transistor	10	23	30	SOT23	BFU520A
		11	23	40		BFU530A
		10	23	30	SOT323	BFU520W
		11	24	40		BFU530W
		11	20	30	SOT143	BFU520
		11	21	40		BFU530
		11	20	30	SOT143X	BFU520X
		11	21	40		BFU530X
		11	20	30	SOT143XR	BFU520XR
		11	21	40		BFU530XR

For the complete product selection please see section 3.1.1 and 3.1.4, 3.2.1, 3.3.1, 3.3.2 and 3.3.3



Product highlight:
PNP wideband Si RF transistor BFU520x

Supporting broadband amplifiers up to 2 GHz, LNAs for ISM applications, and ISM-band oscillators, the BFU520X delivers high speed and low noise in a plastic, 4 inch, dual-emitter SOT143B package.

Features

- Low-noise, high-breakdown RF transistor
- AEC-Q101 qualified
- Minimum noise figure (NFmin) = 0.7 dB at 900 MHz
- Maximum stable gain of 20 dB at 900 MHz
- 11 GHz fT silicon technology

1.7 Automotive

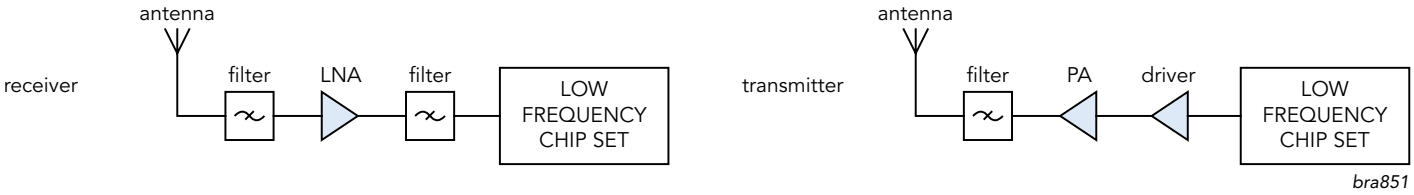
NXP is very active in the automotive market and is present in nearly every automotive application that uses RF. The examples in this section provide evidence that our portfolio covers all the key RF functions typically used in cars.

We recently expanded our portfolio by adding the BFU5x0 series, a new generation of best-in-class, AEC-Q101 qualified wideband transistors. Each BFU5x0 device has a different drain current and is available in up to six different packages, ranging from very small to ultrasmall. Overall, the series delivers ultra-low noise, very high breakdown voltage, and a maximum stable gain of 18 dB at 900 MHz.

1.7.1 Remote Keyless Entry (RKE), RF generic front-end with dedicated antenna for reception and transmission

With an RKE system, drivers can lock or unlock a vehicle by using a key fob equipped with a transmitter that sends data to a receiver in the vehicle. In the Tx chain, the driver and PA play major roles in ensuring a long range and accurate transmission. In the Rx chain, a discrete LNA is often used to ensure efficiency and security. We offer a wide selection of VCOs, drivers, and PAs that let the designer build the right configuration for their application.

Application diagram of a remote keyless entry system



bra851

Recommended products

Function	Product	Freq range (GHz)	NF (dB)	Gain (dB)	Package	Type name
LNA	transistor	< 2	0.7 @ 433 MHz	20 @ 433 MHz	SOT323	BFU520W
		< 2	0.8 @ 433 MHz	21.5 @ 433 MHz		BFU530W
	MMIC	< 4	0.9 @ 1.5 GHz	8 - 21 @ 1.5 GHz	SOT1209	BGU6101
		< 4	0.9 @ 1.5 GHz	11 - 21 @ 1.5 GHz		BGU6102
		< 4	0.9 @ 1.5 GHz	13 - 19 @ 1.5 GHz		BGU6104
		< 6	0.6 @ 1 GHz	20 @ 1 GHz	SOT886	BGU7003W

Function	Product	Freq range (GHz)	P_{L1dB} (dBm)	$IP3_o$ (dBm)	Package	Type name
Driver	MMIC	DC - 2.2	4	17	SOT363	BGA2866

Function	Product	Freq range (GHz)	P_{L1dB} (dBm)	$IP3_o$ (dBm)	Package	Type name
MPA	MMIC	< 2.7	30	42	SOT908	BGA6130
		< 2.7	25	38.5		BGA7124
		< 2.7	28.5	42.5		BGA7127
		< 2.7	30.5	42.5		BGA7130

For the complete product selection please see section 3.1.1 and 3.1.4 and 3.2.1



Product highlight: MMIC wideband amplifier BGU6101

The BGU6101 is an unmatched MMIC featuring an integrated bias-enable function and a wide supply voltage. It is part of a family of three products (BGU6101, BGU6102, BGU6104), and is optimized for 2 mA operation.

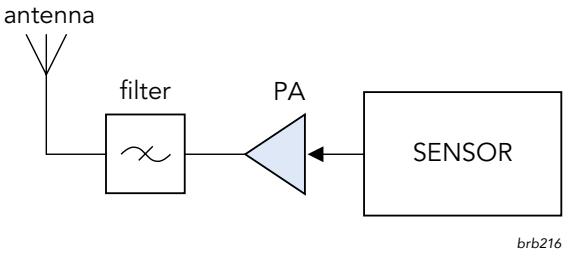
Features

- Applicable between 40 MHz and 6 GHz
- 13 dB gain and 0.8 dB NF at 450 MHz
- 50 Ω FM LNA: 15 dB gain and 1.4 dB NF at 100 MHz
- Integrated, temperature-stabilized bias for easy design
- Bias current configurable with external resistor
- Power-down mode current consumption < 1 µA
- ESD protection > 1 kV HBM on all pins

1.7.2 Tire-pressure monitoring system

Tire-pressure monitoring systems use a transmitter similar to that of an RKE system (see section 1.6.2). Range and accuracy are a must, so discrete drivers and/or PAs are mandatory. NXP offers a wide selection of VCOs, drivers, and PAs that support these requirements.

Application diagram of a tire-pressure monitoring system



Recommended products

Function	Product	Freq range (GHz)	P_{L1dB} (dBm)	$I_{cc\ max}$ (mA)	Package	Type name
MPA	transistor	< 2	7	30	SOT323	BFU520W
		< 2	10	40		BFU530W

For the complete product selection please see section 3.2.1



Product highlight:
NPN wideband silicon RF transistors BFU5xx

The BFU5xx transistor family is designed for applications up to 2 GHz such as communication, and automotive and industrial equipment. Due to the high gain at low supply current, these devices are also a good choice for battery-powered systems. All are available in multiple, small form-factor packages that ease design-in.

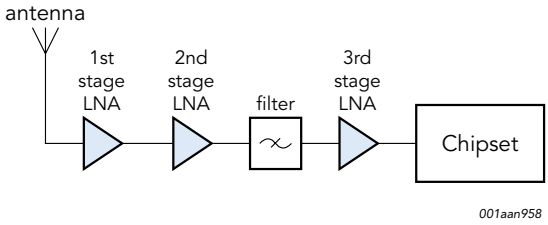
Features

- Low-noise, high-breakdown RF transistor
- AEC-Q101 qualified
- Minimum noise figure (NFmin) = 0.7 dB at 900 MHz
- Maximum stable gain of 18 dB at 900 MHz
- 11 GHz fT silicon technology

1.7.3 SDARS and HD radio

In a Satellite Digital Audio Radio Service (SDARS) system equipped with an active-antenna LNA, a BFU730F wideband transistor can drive the first stage in a three-stage SIRIUS LNA chain, while the BFU690F can drive the second and third stages.

Application diagram of an SDARS Active Antenna LNA - 2320-2332.5 (SIRIUS, 3 stages)



Recommended products

Function	Product	Freq range (GHz)	NF (dB)	Gain (dB)	Package	Type name
1st stage LNA	transistor	< 18	1.3 @ 12 GHz	10.5 @ 12 GHz	SOT343F	BFU730F

Function	Product	Freq range (GHz)	NF (dB)	Gain (dB)	Package	Type name
2nd stage LNA	transistor	< 6	0.7 @ 2.4 GHz	11 @ 2.4 GHz	SOT343F	BFU690F
	MMIC	DC - 2.2	3.2 @ 2.15 GHz	32 @ 2.15 GHz	SOT363	BGA2869
		DC - 2.2	3 @ 2.15 GHz	25 @ 2.15 GHz		BGA2851
		DC - 2.2	3.4 @ 2.15 GHz	23 @ 2.15 GHz		BGA2803

Function	Product	Freq range (GHz)	NF (dB)	Gain (dB)	Package	Type name
3rd stage LNA	transistor	< 6	0.7 @ 2.4 GHz	11 @ 2.4 GHz	SOT343F	BFU690F
		< 6	0.5 @ 2.4 GHz	10.5 @ 2.4 GHz		BFU790F

For the complete product selection please see section 3.1.1 and 3.2.1



Product highlight: IF gain blocks BGA28xx

These MMIC wideband amplifiers are equipped with internal matching circuitry and are housed in a 6-pin SOT363 plastic SMD package.

Features

- No output inductor necessary when used at the output stage
- Internally matched to 50 Ω
- Reverse isolation > 30 dB up to 2 GHz
- Good linearity with low second- and third-order products
- Unconditionally stable (K > 1)



INSPIRING RF SOLUTIONS

Our broad portfolio and **collaborative** approach help you advance your RF designs for a smarter world.

2. Technologies

2.1 Looking for a leader in SiGe:C? You just found us!

NXP's QUBIC BiCMOS SiGe:C technology enables future generations of RF products – including low-noise amplifiers, medium-power amplifiers, and local oscillator (LO) generators – to operate at higher performance levels, including higher frequency and higher integration. Use cases include increasing the performance of base stations, mobile phones, and other mobile platforms, along with equipment for communications infrastructure. The QUBIC process also helps speed satellite tracking and better connectivity with GPS signals for GPS systems, enhances satellite, WLAN, and microwave radio applications, strengthens performance in radar, and more.

Excellent RF signal quality and more functionality in one design

Silicon-germanium (SiGe) process technology-based QUBIC offers high RF performance at a competitive cost, while ensuring excellence in signal quality via robust, highly integrated functionalities and value-added solutions. This in-house process builds on mature processes that have been in mass production since 2002. The QUBIC process can integrate more functionality onto devices at a smaller footprint and with greater reliability and manufacturing efficiency, offering a clear competitive advantage to our customers.

More than an alternative

QUBIC delivers several benefits. It achieves RF performance comparable to GaAs for linearity, noise figure, and phase noise. It also provides higher robustness and reliable design (active ESD protection), and offers the option to integrate dense analog circuitry and digital control on the same mixed-signal IC. SiGe also offers lower DC power consumption. It allows wireless equipment manufacturers to add more functionality onto devices with less space, at a competitive cost, and with greater reliability and manufacturing efficiency. With QUBIC, customers can speed their migration from GaAs technology to silicon by enabling cutting-edge, low-noise performance and IP availability. QUBiC comes in five variants (Gen6 through Gen10), each with its own optimization for specific application areas.

QUBIC Gen6

The QUBIC Gen6 process features 0.25 µm CMOS with five metal layers for integration of dense digital logic-based smart functionality, and a rich set of active and passive devices for high-frequency mixed-signal designs, including thick top metal layers for high-quality inductors. The device set includes 35 GHz f_T implanted base Si double poly NPNs with 3.8 V breakdown voltage (BV_{CEO}) and low noise figure (NF < 1.1 dB @ 2 GHz), 5 GHz f_T VPNPs, a 28 GHz high-voltage NPN with 5.9 V breakdown voltage, differential and single-ended varicaps with Q-factor > 30, scalable inductors with Q-factor > 20, 800 MHz f_T lateral PNPs, 137, 220, and 12 to 2000 Ω/sq. poly and active resistors, a 270 Ω/sq. SiCr thin film resistor, a 5.7 fF/µm² oxide capacitor and a 5 fF/µm² MIM capacitor, one to six fF/µm² oxide capacitors, and various other devices, including isolated NMOS, and optional 3.3 V CMOS and RF-CMOS transistors. The QUBIC Gen6 process is ideal for applications up to 5 GHz.

QUBIC Gen7RF (QUBIC Gen7)

The QUBIC Gen7 process is a SiGe:C-based extension of the QUBIC process for high-frequency mixed-signal designs and offers a rich set of transistor devices, including a 110 GHz f_T NPN with 2.0 V breakdown voltage (BV_{CEO}) and very low noise figure (NF < 1.0 dB @ 10 GHz), a 60 GHz f_T NPN with 3.1 V BV_{CEO}, 0.25 µm CMOS, a variety of resistors, a 5.7 fF/µm² oxide capacitor, and a 5 fF/µm² MIM capacitor. QUBIC Gen7 is ideal for applications that typically operate at up to 30 GHz, such as wireless infrastructure, satellite communications, and point-to-point or wireless connectivity.

QUBIC Gen8RF (QUBIC Gen8)

The QUBIC GEN8 process further enhances the QUBIC Gen7 process. It offers 200 GHz f_T / 1.5 V BV_{CEO} NPNs and offers ultra-low noise figure (NF < 0.6 dB @ 10 GHz), 90 GHz f_T / 2.5 V BV_{CEO} NPN, 0.25 µm CMOS, several resistors, a 5.7 fF/µm² oxide capacitor and a 5 fF/µm² MIM capacitor. QUBIC Gen8 is ideal for applications operating at high frequencies (> 20 GHz), such as wireless infrastructure point-to-point, car radar, and aerospace, but also offers extremely low noise in the 1 - 2 GHz range. A recent process update provides high-power devices for use in applications that require high output power and high linearity. This Extended High Voltage device combines high breakdown capabilities with high speed. The BV_{CEO} is increased to 4 V and the BV_CBO equals 18 V. The f_T / f_{max} of this optional device is 50 / 160 GHz.

QUBIC Gen9RF

The latest release of the QUBIC family provides best-in-class noise figures at millimeter wave frequencies. The latest generation is optimized for NFmin, which is measured at 0.27 dB at 2 GHz, 0.35 dB at 5 GHz, and 0.49 dB at 10 GHz.

2.2 High-performance, small-size packaging

NXP's high-performance, small-size packaging, enabled by NXP's leadless package platform and WL-CSP technology

RF small-signal packaging is driven by two major trends which partly overlap

- Lower parasitics for better RF performance
- Smaller form factors for portable applications

To cope with these trends, NXP uses several approaches

- For non-space-restricted applications, the use of flat-pack packages instead of gull-wing versions reduces the parasitic impedance because of shorter lead length (e.g. SOT343F instead of SOT343). This results in better RF performance in the Ku and Ka bands (13 to 20 GHz).



SOT343



SOT343F



SOT1230



SOT1232

- For space-restricted applications, there are two ways to reduce the form factor and parasitics:
  - Leadless package platform
  - Wafer-Level Chip-Scale Package (WL-CSP) technology

The leadless package platform (>25 variants already released) is highly flexible with respect to package size, package height, and I/O pitch. For example, the 6-pin packages range in size from 1.45 x 1 x 0.5 mm with 0.5 mm pitch to 0.8 x 0.8 x 0.35 mm with 0.3 mm pitch.

Because of the compact size of the design, wire lengths and parasitic impedance are also restricted. The absence of leads further reduces the inductance.

Wafer-Level Chip-Scale Package technology is ideal for RF functions where the I/O pitch fits within the chip area. With smaller designs (and thus little effective chip area), it is more difficult to apply these on board due to smaller I/O pitches. Such small functions can now be flipped inside the SOT1232 package and still be mounted like a normal leadless package with 0.4 mm pitch. The absence of wires gives the lowest parasitic inductance available.



SOT886



SOT891



SOT1208



0.65 x 0.44 x 0.29 mm (including 0.09 mm balls)
5 I/Os @ 0.22 mm pitch



ENHANCING RF **PERFORMANCE**

NXP has a **proven** record in delivering the best RF performance.
That's why half of all satellite solutions use NXP components.
RF for a smarter world.

3. Products by function

3.1 RF ICs

Why choose NXP's RF MMIC amplifiers and mixers:

- Reduced RF component count
- Easy circuit design-in
- Reduced board size
- Short time-to-market
- Broad portfolio
- Volume delivery
- Short lead time



3.1.1 Low noise amplifiers

GPS LNAs for mobile, wearables and automotive

Type name	New name	Package	V_{cc} (V)		I_{cc} (mA)	Gain (dB)	NF (dB)	$P_{L,1dB}$ (dBm)		$IP3_i$ (dBm)	
			min	max	typ	typ	typ	V_{cc} = 1.8 V, typ	V_{cc} = 2.85 V, typ	V_{cc} = 1.8 V, typ	V_{cc} = 2.85 V, typ
BGU6005	GPS1001M	SOT1230	1.5	3.1	5,7	17.5	0.85#	-9	-6	3	6
BGU6009	GPS1002M	SOT1230	1.5	3.1	5,5	17.5	0.95#	-7	-4	5	7
BGU7004^	GPS1103M	SOT886	1.5	2.85	4.5	16.5 / 17.5*	0.9	-11	-8	9	12
BGU7005	GPS1101M	SOT886	1.5	2.85	4.5	16.5 / 17.5*	0.9	-11	-8	9	12
BGU7007	GPS1102M	SOT886	1.5	2.85	4.8	18.5 / 19.5*	0.9	-12	-11	4	5
BGU7008^	GPS1104M	SOT886	1.5	2.85	4.8	18.5 / 19.5*	0.9	-12	-11	4	5
BGU8004	-	WP-CSP	1.5	3.1	3.4	17 / 18*	0.6#	-10	-8	4	6
BGU8006	-	WL-CSP	1.5	3.1	4.1	17.5 / 19.0	0.6#	-10	-8	5	8
BGU8007	-	SOT886	1.5	2.2	4.6	19.0 / 20.5*	0.75#	-11	-	4	-
BGU8009	GPS1201M	SOT1230	1.5	3.1	4.4	17.6 / 20*	0.65	-10	-7	3	6
BGU8010	-	SOT1230	1.5	3.1	3.0	16.1 / 17*	0.70#	-12	-9	0	3
BGU8011	-	SOT1230	1.5	3.1	4.4	16.3 / 17.5*	0.65#	-8	-6	6	7
BGU8019	GPS1202M	SOT1232	1.5	3.1	4.4	18.5 / 20*	0.55#	-10	-7	2	6
BGU8103%	GPS1301M	SOT1232	1.5	3.1	1,2	17.6 / 19.1*	0.8#	-16	-13	-8	-7
BGU8309	GPS1301M	SOT1226-2	1.5	3.1	3.6	17/17	0.7#	-9	-9	5	5

^ AEC-Q101 qualified * with/without jammer # excluding board losses % also available in WL-CSP package with slightly deviating specification, detailed information available on request

General purpose LNAs

Type name	Package	VCC (V)	Icc (mA)	Gain (dB)					PL, 1dB (dBm)			NFmin (dB)					IP3o (dBm)					ESD protection HBM (kV)
				450 MHz	900 MHz	1800 MHz	2400 MHz	5800 MHz	450 MHz	900 MHz	2400 MHz	450 MHz	900 MHz	1800 MHz	2400 MHz	5800 MHz	450 MHz	900 MHz	1800 MHz	2400 MHz	5800 MHz	
BGA2012	SOT363	3	7.0			16.0								1.7					10.0			-
BGU7003	SOT891	2.5	5.0		20.0		15.2	11.4					0.6		0.8	1.5						1
BGU7003W	SOT886	2.5	5.0		20.0		15.2	11.4					0.6		0.8	1.5						1
BGU6101	SOT1209	3	1.5	13.0	12.0		13.0 (1)		-11.0	-11.5	-6.5 (1)	0.8	0.8		1.3 (1)		-2.5	-2.0		6.5 (1)	3	
BGU6102	SOT1209	3	3.0	18.5	16.5		14.0 (2)		-5.0	-5.5	0 (2)	0.7	0.8		1.2 (2)		5.5	6.0		11.5 (2)	3	
BGU6104	SOT1209	3	6.0	22.5	18.5		12.8 (3)		0.5	0.5	6.5 (3)	0.8	0.8		1.1 (3)		11.0	12.0		18.5 (3)	3	

(1) Icc = 3 mA (2) Icc = 6 mA (3) Icc = 12 mA

LTE LNAs mobile and wearables

Type name	New name	Package	V_{cc} (V)	$I_{cc, gain}$ (mA)	$I_{cc, bypass}$ (µA)	Frequency (MHz)	Gain (dB)	$Gain_{bypass}$ (dB)	NF (dB)	$IP3_i$ (dBm)	$P_{L, 1dB}$ (dBm)	t_{on} (µs)	t_{off} (µs)
			typ	typ	typ		typ	typ	typ	typ	typ	max	max
BGU8L1%	LTE1001L	SOT1232	2.8	4.6	-	740	14.5	-	0.7	1	-5	3	1
						882	14.5	-	0.7	2	-3		
						943	14.0	-	0.8	2	-3		
BGU8M1%	LTE1001M	SOT1232	2.8	5.0	-	1843	13.5	-	0.8	4	-2		
						1960	13.5	-	0.8	5	-2		
						2140	13.0	-	0.9	6	-2		
BGU8H1%	LTE1001H	SOT1232	2.8	5.0	-	2350	13.0	-	0.9	8	-1		
						2655	12.5	-	1.0	8	0		
BGS8L2%	LTE3001L	SOT1232	2.8	4.9	< 1	740	13,5	-1.6	0.84	1	-2	4	1
						882	13	-1.9	0.84	1.5	-1		
						943	12,5	-2	0.84	1.5	-0.5		
BGS8M2%	LTE3001M	SOT1232	2.8	5.4	< 1	1843	14.3	-2,3	0,8	2.5	-3.3	4	1
						1960	14.4	-2,1	0,8	3.5	-3.5		
						2140	13.7	-2,3	0,8	5	-2.5		
BGS8H2%	LTE3001H	SOT1232	2.8	5.4	< 1	2350	13	-2,3	1	4	-1.5		
						2655	11.2	-2,6	1	4	0		
BGS8L5%	LTE3301L	SOT1232	2.8	4.5	< 1	740	15.0	-1.5	0.7	1.0	-6.0	4	1
						882	13.5	-2.0	0.7	1.0	-5.0		
						943	13.0	-2.5	0.7	1.0	-6.0		
BGS8H5%	LTE3301H	SOT1232	2.8	4.5	< 1	1500	14.5	-2.5	0.7	-3.0	-8.5	4	1
						2140	13.0	-2.5	0.8	0.5	-6.0		
						2350	12.5	-2.5	0.8	1.0	-5.0		
						2655	11.5	-2.5	0.9	1.5	-4.5		
BGS8U5	LTE3301U	SOT1232	2.8	4.5	< 1	3400	16.0	-3.5	1.1	2.0	-11.0		
						3800	14.5	-3.5	1.0	2.0	-9.0		
BGS8C5	LTE3301C	SOT1232	2.8	4.6	< 1	5200	15.0	-4	1.25	0.0	-9.0		
						5800	15.0	-4	1.25	0.0	-10.0		
-	LTE3401L	SOT1232	2.8	4.5	< 1	740	18.0	-3	0.7	0.0	-1.0	4	1
						882	18.0	-3	0.7	0.0	-1.0		
						943	18.0	-3	0.7	0.0	-1.0		

% also available in WL-CSP package with slightly deviating specification, detailed information available on request

LNA (+ switches) for WLAN

Type name	New name	Package	V_{cc} (V)	$I_{cc, gain}$ (mA)	$I_{cc, bypass}$ (µA)	$I_{cc, TX/BT}$ (µA)	Frequency (MHz)	Gain (dB)	$Gain_{bypass}$ (dB)	NF (dB)	$NF_{TX/BT}$ (dB)	$IP3_i$ (dBm)	$P_{L, 1dB}$ (dBm)	$t_{on, off}$ (ns)
			typ	typ	typ			typ	typ	typ	typ	typ	typ	max
BGU7224	-	SOT1189	3.3	13	2	-	2400-2500	15	-5.5	1.0	-	5.5	-3	150
BGU7258	-	SOT1189	3.3	12	1	-	5100	14	-7	1.6	-	8	-4	150
							5900	13	-7	1.6	-	8	-4	150
BGS8324	WLAN3001H	SOT1261	3.3	8.3	8	200/8	2400-2500	16	-6	2.0	0.8/0.95	7	7	400
BGS8358	WLAN3001C	SOT1260	3.3	9.5	8	150/-	4900-5925	12.5	-8	2.3	0.75/-	10	-6	400
BGS8424	WLAN3002H	SOT1260	3.3	8.4	4	150/4	2400-2500	15.5	-6.5	2.0	0.7/0.95	6	-4.5	500
BGS8458	WLAN3002C	SOT1234	3.3	10.7	3.5	150/-	4900-5925	13.5	-7	2.4	0.7/-	9	0	500

FEIC for WLAN

type name	dual branding	Package	frequency (MHz)	V_{cc} (V)	RX gain mode				RX bypass mode		TX mode			
					I_{cc} (mA)	Gain (dB)	NF (dB)	$P_{L, 1dB}$ (dBm)	I_{cc} (mA)	Gain (dB)	I_{cc} @ 17 dBm (mA)	Gain (dB)	DEVM @ 17 dBm (%)	DEVM @ 19 dBm (%)
				typ	typ	typ			typ	typ	typ	typ	typ	typ
BGF8458	WLAN7001C	SOT1436	5150-5850	3.6	8	14	2.35	-3	5	-5.5	180	28	1.8	3.0

LNAs for wireless infrastructure

Type	New name	Package	V_{CC} (V)	I_{cc} (mA)	Frequency (MHz)		Gain (dB)	NF (dB)	$P_{L,1dB}$ (dBm)	$IP3_o$ (dBm)	$IP3_{o,bypass}$ (dBm)	RL_{in} (dB)	RL_{out} (dB)
			typ	typ	min	max	typ	typ	typ	typ	typ	typ	typ
BGU7060	-	SOT1301-1	5	200	700	800	3	22,4	12,7	31,8	-	-	-
							17	10,5	5,6	20,5	-	28,2	23,5
							18	6,11	-5,5	6,1	-	-	-
							35	0,84	-12,6	1	-	27,2	19
BGU7061	-	SOT1301-1	5	200	800	950	3	21,4	13,2	31,2	-	-	-
							17	11,2	5,6	21,4	-	23,7	19
							18	6,47	-4,8	6,3	-	-	-
							35	0,87	-12.5	2	-	31,5	18
BGU7062N2	-	SOT1301-1	5	215	1710	1785	3	22.1	10.9	30	-	-	-
							17	10.5	5.8	20.9	-	22	17.3
							18	5.95	-6.1	4.6	-	-	-
							35	0.94	-12.3	1	-	23.5	17.5
BGU7063	-	SOT1301-1	5	190	1920	1980	3	22	10,5	28		-	-
							17	11,3	6	20		25	18
				230	1920	1980	18	6.4	-6.4	5.4	-	-	-
							35	1.05	-12.5	0.9	-	31	15
BGU7073	BTS5001M	SOT1301-1	5	245	1850	2010	3	19,7	9,5	21,8	-	-	-
							17	9,7	5,7	18.3	-	31,6	15
							18	5,8	-6,3	5,5	-	-	-
							35	1,1	-11,6	1	-	28,5	19,5
BGU7075	BTS5001H	SOT1301-1	5	264	2500	2570	3	19,7	10,4	22	-	-	-
							17	10,4	5,5	17,9	-	28	15
							18	5,6	-5,7	4,3	-	-	-
							35	1,2	-12	0,8	-	22,5	21,4
BGU7078	BTS5002M	SOT1301-1	5	245	1710	1785	3	20.5	10.9	23	-	-	-
							17	10.1	6.3	19,3	-	33	12,8
							18	6.1	-5.7	5.5	-	-	-
							35	1	-11.3	1.5	-	25,7	15,6
BGU8051	BTS1001L	SOT1327-1	5	50	900	900	18	0.43	19.3	41	-	27	20
BGU8052	BTS1001M	SOT1327-1	5	47	1900	1900	18	0.52	19	39	-	27	12
BGU8053	BTS1001H	SOT1327-1	5	51	2500	2500	18	0.63	20	39	-	23	12
BGU8061	BTS3001L	SOT650-1			700	700	22,6	1,1	20,6	36,1	45,8	8,9	9,8
					900	900	20,9	1,1	20,7	36,8	45,3	10,9	11,6
					1500	1500	17,1	1,2	20,3	37,1	44,6	17,2	16,1
BGU8062	BTS3001M	SOT650-1			1500	1500	20,9	1,1	20,2	36	44,7	10,6	21,8
					1900	1900	18,5	1,2	20,2	35,6	43,5	12,6	34
					2700	2700	15,9	1,5	18,8	35	42,6	15,8	17,8
BGU8063	BTS3001M	SOT650-1	5	70	2500	2500	18,5	1,5	19,1	34,0	42,8	12,7	11,5
					3000	3000	16,6	1,4	18,9	33,6	42,5	11,6	9,6
					3500	3500	15,1	1,7	18,3	33,2	41,5	10,5	8,6

LNA for set-top boxes (75 Ω)

Type name	Package	Frequency range (MHz)	Mode	V_{CC} (V)	I_{cc} (mA)	Gain (dB)		$P_{L,1dB}$ (dBm)	$IP3_o$ (dBm)	FL (dB)	RL_{out} (dB)	RL_{in} (dB)
BGU7031	SOT363	40 - 1000	GP 10 dB	5	43	10	4.5	14	29	-0.2	12	18
BGU7032	SOT363	40 - 1000	GP 10 dB	5	43	10	4.5	14	29	-0.2	12	18
			Bypass	5	4	-2	2.5	-	29	-0.2	8	8
BGU7033	SOT363	40 - 1000	GP 10 dB	5	43	10	4.5	14	29	-0.2	12	18
			GP 5 dB	5	43	5	6	9	29	-0.2	12	17
			Bypass	5	4	-2	2.5	-	29	-0.2	8	8
BGU7041	SOT363	40 - 1000	GP 10 dB	3.3	38	10	4	12	29	-0.2	12	21
BGU7042	SOT363	40 - 1000	GP 10 dB	3.3	38	10	4	12	29	-0.2	12	21
			Bypass	3.3	3	-2	2.5	-	29	-0.2	10	10
BGU7044	SOT363	40 - 1000	GP 14 dB	3.3	34	14	2.8	13	29	-0.2	12	20
BGU7045	SOT363	40 - 1000	GP 14 dB	3.3	34	14	2.8	13	29	-0.2	12	20
			Bypass	3.3	3	-2	2.5	-	27	-0.2	10	9

3.1.2 Wideband amplifiers

General purpose wideband amplifiers 50 ohm

Type	Package	V_{CC} (V)	I_{cc} (mA)	Gain (dB)			$P_{L,1dB}$ (dBm)			NF (dB)			$IP3_o$ (dBm)		Z_{out} (W)	external inductor
		typ	typ	250 MHz	500 MHz	750 MHz	250 MHz	500 MHz	750 MHz	250 MHz	500 MHz	750 MHz	250 MHz	750 MHz		
BGA2870	SOT363	2.5	15.6	31.2	31.1	31	5	4	4	3.1	3.2	3.7	15	13	50	N
BGA2874	SOT363	2.5	16	31.1	31	30.6	5	4	4	3	3.1	3.4	19	17	50	N
BGA2800	SOT363	3	10.5	19.9	20.5	20.2			-2	3.7	3.6	3.7	11	8	50	N
BGA2803	SOT363	3	5.8	23.6	23.4	23	-6	-6	-8	3.7	3.6	3.4	5	2	50	N
BGA2801	SOT363	3	14.3	22.2	22.4	23	2	2	0	3.8	3.8	3.9	14	9	50	N
BGA2802	SOT363	3	12.5	25.6	25.8	25.5	3	1	-3	4.2	4.1	3.6	13	6	50	N
BGA2815	SOT363	3	18.2	25.8	25.3	25.2	8	5	1	3.7	3.8	3.7	17	10	50	N
BGA2817	SOT363	3	20	24.5	24.7	25.1	6	6	5	3.9	3.9	3.8	18	15	50	N
BGA2818	SOT363	3	19.9	30.1	29.8	30	7	6	4	3.5	3.3	3.3	18	14	50	N
BGA2851	SOT363	5	7	23.3	24.7	25.2	-3	-4	-5	4	3.2	3	8	5	50	N
BGA2866	SOT363	5	17.4	23.2	23.9	24.3	4	4	3	3.9	3.8	3.9	17	12	50	N
BGA2867	SOT363	5	21.7	26.4	27.2	27.2	6.8	6.5	4.9	3.7	3.8	3.7	18.8	14.1	50	N
BGA2869	SOT363	5	22	30.9	30.9	32.2	8.8	8.8	7.6	3.8	3.9	4	20	19	50	N
BGM1013	SOT363	5	27.5	35.3	35.6	32.1		13	8.1	4.6	4.6	4.9	22.7	18.6	75	Y

Extreme broadband amplifiers

Type	Package	Frequency range (MHz)	V_{CC} (V) typ	I_{cc} (mA) typ	Gain (dB)	NF (dB)	$P_{L,1dB}$ (dBm)	$IP3_o$ (dBm)	$IP2_o$ (dBm)
BGA3012	SOT89	40 - 1006	8	110	12	3.1	23	40	60
			5	70	12	2.9	18.0	36	54
		5 - 300	8	110	12	3.0	23.0	40	60
			5	70	12	2.9	17.0	40	55
BGA3015	SOT89	40 - 1006	8	110	15	2.5	24	40	60
			5	70	15	2.3	18.0	36	55
		5 - 300	8	110	15	2.3	24.0	40	60
			5	70	15	2.3	18.0	40	55
BGA3018	SOT89	40 - 1006	8	120	18	2.1	25	40	60
			5	75	18	2.2	18.0	36	54
		5 - 300	8	120	18	1.9	25.0	40	60
			5	75	18	1.9	20.0	36	54
BGA3021	SOT786-2	40 - 1200	8	350	16	5.5	29	47	85
			8	175	16	4.1	26	38	68
			5	165	16	4.1	23	38	69
BGA3022	SOT786-2	40 - 1200	8	350	18	5.1	30	47	85
			8	175	18	3.8	24	38	69
			5	165	18	3.8	24	38	71
BGA3023	SOT786-2	40 - 1200	8	350	20	5	30	46.5	85
			8	175	19	3.7	25	38	67
			5	165	19	3.7	23	38	68

3.1.3 variable gain and discrete step amplifiers

VGA's for wireless infratructure

Type name	Package	Type	V_{CC} (V)	I_{cc} (mA)	frequency range (MHz)		Gain @ minimum attenuation (dB)	Attenuation range (dB)	NF (dB)	$P_{L,\ 1dB}$ (dBmV)	$IP3_O$ (dBm)
			typ	typ	min	max			typ	typ	typ
BGA7204	SOT617-3	Single	5	115	400	700	18.5	31.5	7	21	38
			5	115	700	1450	18.5	31.5	6.5	21	37.5
			5	115	1450	2100	17.5	30.5	6.5	20.5	36
			5	115	2100	2750	16.5	30	7	20	34
BGA7210	SOT617-3	Single	5	185	700	1400	30	31.5	6.5	21	39
			5	185	1400	1700	29.5	31.5	6.5	21	37
			5	185	1700	2200	29	31.5	6.5	21	35
			5	185	2200	2800	28	30.5	7	23	35
			5	185	3400	3800	26	29.5	8	19	27
BGA7350	SOT617-1	Dual	5	245	50	250	18.5	24	6	17	43
BGA7351	SOT617-1	Dual	5	280	50	250	22	28	6	16.5	46

Upstream VGA for DOCSIS 3.0 & 3.1

Type name	DOCSIS standard	Package	V_{CC} (V)	I_{cc} (mA)	frequency range (MHz)		Gain @ minimum attenuation (dB)	Attenuation range (dB)	NF (dB)	$P_{L,\ 1dB}$ (dBmV)	IMD3 @ 64 dBmV (dBc)
			typ	typ	min	max			typ	typ	typ
BGA3031	3.0	SOT662	5	310	5	85	34	58	3.5	74	-70
BGA3131	3.1	SOT662	5	310	5	205	34	58	3.5	74	-70

2-stage variable-gain linear amplifier

Type	Package	VCC (V)	Icc (mA)	Frequency range (MHz)	@ 900 MHz				@ 1900 MHz				Limits		
					$Gain_{(1)}$ (dB)	$DG_{(2)}$ (dB)	$P_{L,\ 1dB}$ (dBm)	ACPR (dBc)	$Gain_{(1)}$ (dB)	DG(2) (dB)	$P_{L,\ 1dB}$ (dBm)	ACPR (dBc)	V_{CC} (V)	I_{cc} (mA)	P_{tot} (mW)
BGA2031/1	SOT363	3	51	800 - 2500	24	62	11	49	23	56	13	49	3.3	77	200

(1) Gain = GP, power gain (2) DG = gain control range

3.1.4 Power amplifiers

General purpose medium power amplifier

Type	Package	V_{CC} (V)	I_{cc} (mA)	Frequency range [MHz]	RF input frequency [MHz]	Gain (dB)	$P_{L,1dB}$ (dBm)	$IP3_o$ (dBm)	NF (dB)
		typ	typ	min		typ	typ	typ	typ
BGA6489	SOT89	5.1	78	100-3000	900	20.0	20.0	33.0	3.1
					1800	16.0	17.0	30.0	3.3
BGA6589	SOT89	4.8	81	100-3000	900	22.0	21.0	33.0	3
					1800	17.0	20.0	32.0	3.3
BGA7024	SOT89	5	110	400 - 2700	940	22.0	24.0	37.5	2.9
					1960	16.0	25.5	38.0	3.7
					2140	15.0	25.5	38.0	3.7
					2445	14.0	24.5	37.5	4.0
BGA7027	SOT89	5	165	400 - 2700	940	19.0	29.0	41.5	2.6
					1960	11.5	27.5	43.0	3.8
					2140	11.0	28.0	42.5	3.9
BGA7124	SOT908	5	140	400 - 2700	940	23.0	25.0	38.5	5.2
					1960	16.5	24.5	38.0	4.6
					2140	16.0	24.5	37.5	4.8
					2445	14.0	23.5	36.0	5.4
BGA7127	SOT908	5	180	400 - 2700	940	20.0	27.5	41.5	3.1
					1960	13.0	28.5	42.5	4.5
					2140	12.0	28.0	42.0	4.6
					2445	10.5	27.5	41.5	4.7
BGA7130	SOT908	5	450	400 - 2700	750	18.0	30.0	43.0	5.0
					2140	10.0	30.0	44.0	5.0
BGA6130	SOT908	3.6	70	400 - 2700	434	17.0	28.0	29.5	4.5
					915	14.0	29.0	30.0	4.0

FEIC for WLAN

type name	dual branding	Package	frequency (MHz)	V_{cc} (V)	RX gain mode				RX bypass mode		TX mode			
					I_{cc} (mA)	Gain (dB)	NF (dB)	$P_{L,1dB}$ (dBm)	I_{cc} (mA)	Gain (dB)	I_{cc} @ 17 dBm (mA)	Gain (dB)	DEVM @ 17 dBm (%)	DEVM @ 19 dBm (%)
				typ	typ	typ			typ	typ	typ	typ	typ	typ
BGF8458	WLAN7001C	SOT1436	5150-5850	3.6	8	14	2.35	-3	5	-5.5	180	28	1.8	3.0

3.1.5 Modulators, mixers, PLL and downconverters

Why choose NXP's low-noise LO generators:

- Lowest total cost of ownership
- Alignment-free concept
- Easy circuit design-in
- Improved LO stability

IQ modulators for wireless infrastructure

Type name	Package	V_{CC} (V)	f_{LO} (MHz)	I_{cc} (mA)	f_{LO} (MHz)	P_o (dBm)	BW_{mod} (MHz)	$N_{flr(o)}$ (dBm/Hz)*	$P_{L,1dB}$ (dBm)	$IP2_o$ (dBm)	$IP3_o$ (dBm)	SBS (dBm)	CF (dBm)
		typ	range	typ		typ	typ	typ	typ	typ	typ	typ	typ
BGX7100	SOT616-3	5	400 - 4000	165	750	-0.2	400	-159 / -158.5	11.5	71	29	55	-55
				165	910	-0.2	400	-159 / -158.5	11.5	72	29	49	-55
				173	1840	-0.2	400	-158.5 / -158	11.5	69	27	47	-50
				173	1960	-0.2	400	-158.5 / -158	11.5	72.5	27	49	-48
				178	2140	-0.2	400	-158.5 / -158	11.5	74	27	51	-45
				178	2650	-0.2	400	1	11.5	62	26	60	-45
				184	3650	-0.2	400	1	11.5	60	25	53	-43
BGX7101	SOT616-3	5	400 - 4000	172	750	4	650	-159 / -158.5	12	71	28	63	-51
				172	910	4	650	-159 / -158.5	12	75	28	49	-57
				180	1840	4	650	-158.5 / -158	12	71	27	55	-50
				180	1960	4	650	-158.5 / -158	12	72	27	57	-47
				178	2140	4	650	-158.5 / -158	12	75	27	63	-45
				182	2650	4	650	1	12	65	26	50	-45
				188	3650	4	650	1	12	65	25	57	-42

* Without modulation/with modulation

Dual mixers for wireless infrastructure

Type name	Package	V_{CC} (V)	I_{cc} (mA)	RF input frequency [MHz]		Local oscillator frequency (MHz)		Second-order spurious rejection 2RF-2LO (dBc)	NF_{SSB} single sided (dB)	$IP3_i$ (dBm)	G_{conv} (dB)
		typ	typ	min	max	min	max	max	typ	typ	typ
BGX7220	SOT1092-2	5	330	700	950	500	1150	-60	10	26	8
BGX7221	SOT1092-2	5	365	1400	2700	1500	2500	-60	10	25.5	8.5

Dual downconverter with PLL/VCO and switch matrix

Type name	Package	Input freq range (GHz)	V_{cc} (V)	I (mA)	G_{conv} (dB)	NF (dB)	$IP3_o$ (dBm)	LO Freq (GHz)	Integrated phase noise density (degrees RMS)
TFF1044HN	SOT1359-1	10.7 - 12.75	5	190	30-36	8	15	9.75 & 10.6	1.5

Downconverter with PLL/VCO for VSAT

Type name	Package	Input freq range (GHz)	V_{cc} (V)	I (mA)	G_{conv} (dB)	NF (dB)	$IP3_o$ (dBm)	LO Freq (GHz)	Integrated phase noise density (degrees RMS)
TFF1024HN	SOT763-1	10.7 - 12.75	5	54	30	7	16	9.75 / 11.3	1

Downconverter with PLL/VCO

Type name	Package	Input freq range (GHz)	V_{cc} (V)	I (mA)	G_{conv} (dB)	NF (dB)	$IP3_o$ (dBm)	LO Freq (GHz)	Integrated phase noise density (degrees RMS)
TFF1012HN	SOT763-1	10.7 - 12.75	5	56	30	8	17	9.75 / 10.6	1.5
TFF1013HN	SOT763-1	10.7 - 12.75	5	56	34	8	17	9.75 / 10.6	1.5
TFF1014HN	SOT763-1	10.7 - 12.75	5	52	36	7	13	9.75 / 10.6	1.5
TFF1015HN	SOT763-1	10.7 - 12.75	5	52	39	7	13	9.75 / 10.6	1.5
TFF1017HN	SOT763-1	10.7 - 12.75	5	52	42	7	13	9.75 / 10.6	1.5
TFF1018HN	SOT763-1	10.7 - 12.75	5	52	45	7	13	9.75 / 10.6	1.5

Low-noise LO generators for VSAT applications

Type name	Package	$f_{IN(REF)}$ (MHz)	V_{cc} (V)	I (mA)	PLL		output buffer		input
					phase noise @ N=64, @ 100 kHz (dBc/Hz)	f_{out}(RF) (GHz)	P_{out} (dBm)	RL_{out}(RF) (dB)	S_i (dBm)
			typ	typ	max		typ	max	min
TFF1003HN	SOT616	50 - 815	3.3	100	-92	12.8 - 13.05	-5	-10	-10
TFF1007HN	SOT616	230.46 - 234.38	3.3	100	-104	14.62 - 15	-3	-10	-10

Low-noise LO generators for general microwave applications

Type	Package	$f_{IN(REF)}$ (MHz)	V_{cc} (V)	I (mA)	PLL					output buffer		input	Frequency band
					phase noise @ N=64, @ 100 kHz (dBc/Hz)	phase noise @ N=64, @ 10 MHz (dBc/Hz)	f_{out}(RF) (GHz)			P_{out} (dBm)	RL_{out}(RF) (dB)	S_i (dBm)	
			typ	typ	max	max	Min	typ	Max	typ	max	Min	
TFF11088HN	SOT616	34 - 562	3.3	100	-95	-131	8.59	8.79	8.99	-5	-10	-10	X
TFF11092HN	SOT616	35 - 588	3.3	100	-95	-131	8.99	9.2	9.41	-5	-10	-10	X
TFF11096HN	SOT616	37 - 616	3.3	100	-95	-131	9.41	9.63	9.85	-5	-10	-10	X
TFF11101HN	SOT616	39 - 633	3.3	100	-95	-131	9.92	10.02	10.13	-3	-10	-10	X
TFF11132HN	SOT616	51 - 846	3.3	100	-95	-131	12.9	13.2	13.5	-5	-10	-10	Ku
TFF11139HN	SOT616	53 - 886	3.3	100	-95	-131	13.54	13.85	14.17	-5	-10	-10	Ka
TFF11142HN	SOT616	55 - 901	3.3	100	-95	-131	14.13	14.27	14.42	-4	-10	-10	X
TFF11145HN	SOT616	55 - 927	3.3	100	-95	-131	14.17	14.5	14.83	-5	-10	-10	Ka

3.2 RF bipolar transistors

3.2.1 Wideband transistors

RF wideband transistor selection guide on www.nxp.com/rftransistors
Easy-to-use parametric filters help you choose the right RF wideband transistor for your design.

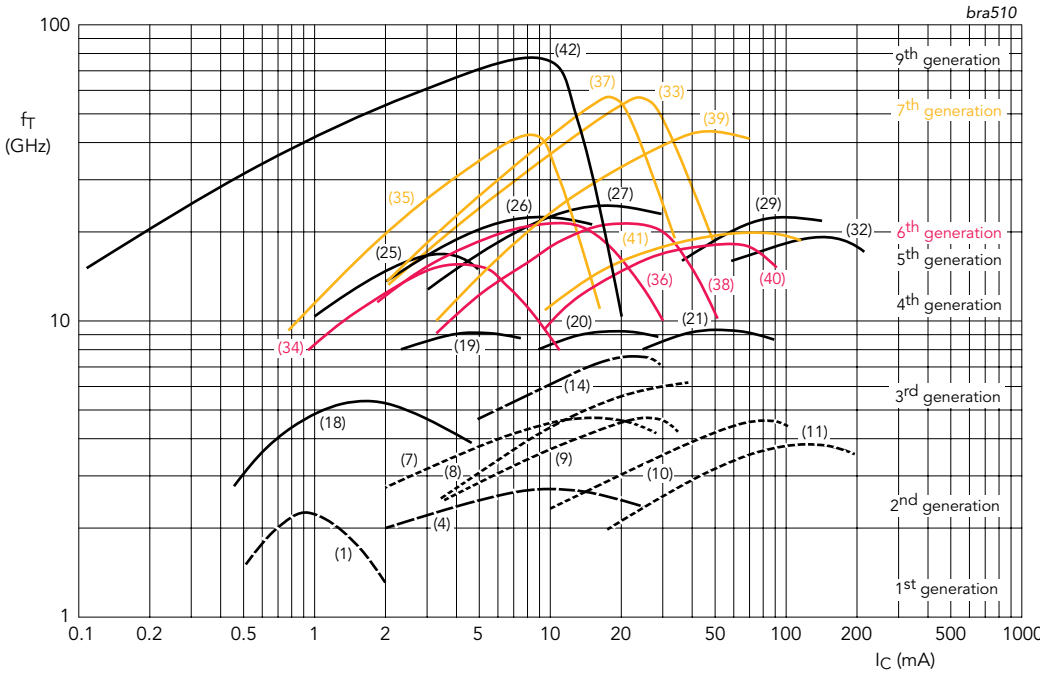
Why choose NXP's wideband transistors:

- Broad portfolio (1st - 7th generation)
- Short lead time
- Smallest packages
- Volume delivery

Wideband transistors

The f_T-I_C curve represents transition frequency (f_T) characteristics as a function of collector current (I_C) for the seven generations of RF wideband transistors. A group of transistors having the same I_C and similar f_T represents a curve. The curve number matches the products in the selection tables of this section (third column of each table), detailing their RF characteristics.

Wideband transistor line-ups by frequency



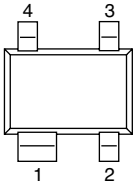


Figure 1

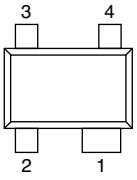


Figure 2

Pin	Description
	Type (Figure 1)
1	Collector
2	Base
3	Emitter
4	Emitter
	Type/X (Figure 1)
1	Collector
2	Emitter
3	Base
4	Emitter
	Type/XR (Figure 2)
1	Collector
2	Emitter
3	Base
4	Emitter

RF wideband transistor applications

Function	LNAs, mixers, frequency multipliers, buffers				High-linearity, high-output amplifiers and drives				Oscillators		
Frequency range	<2 GHz	<6 GHz	6-10 GHz	12-18 GHz	<2 GHz	<6 GHz	6-10 GHz	12-18 GHz	<6 GHz	6-10 GHz	12-18 GHz
Type/band	ISM433, ISM866	L,S,C	X ku low	Ku high, kz	ISM433, ISM866	L,S,C	X ku low	Ku high, kz	L,S,C	X ku low	Ku high, kz
BFU520*	•										
BFU530*	•										
BFU550*	•										
BFU580*					•						
BFU590*					•						
BFU610F		•	•								•
BFU630F		•	•			•			•		•
BFU660F		•				•			•	•	
BFU690F		•	•			•			•	•	
BFU725F/N1		•	•	•		•	•		•		•
BFU710F		•	•	•							•
BFU730F		•	•	•		•	•	•	•		•
BFU730LX		•	•	•		•	•	•	•		•
BFU760F		•	•			•	•		•		
BFU790F		•				•			•		
BFU768F		•	•			•	•		•		
BFU910F		•	•	•					•		

* Multiple package types available

Red = application note available on NXP.com

RF power transistors for portable equipement (VHF)

Type	Package	V_{CEO} (max) (V)	I_C (max) (mA)	P_{tot} (max) (mW)	Polarity	GUM (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)
BLT50	SOT223	10	500	2000	NPN	-	-	-	-
BLT81	SOT223	9.5	500	2000	NPN	-	-	-	-

RF wideband tranistors generation 1-4

Type	Generation	Curve	Package	f_T (typ) (GHz)	V_{CEO} (max) (V)	I_C (max) (mA)	P_{tot} (max) (mW)	Polarity	GUM (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	GUM (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)
BFT25	1	1	SOT23	2.3	5	6.5	30	NPN	18	500	1	1	12	800	1	1	3.8	500	1	1	-	-	-	-
BFG35	2	11	SOT223	4	18	150	1000	NPN	15	500	100	10	11	800	100	10	-	-	-	-	-	-	-	-
BFQ18A	2	11	SOT89	4	18	150	1000	NPN	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BFS25A	2	18	SOT323	5	5	6.5	32	NPN	-	-	-	-	13	1000	0.5	1	1.8	1000	1	1	-	-	-	-
BFT25A	2	18	SOT23	5	5	6.5	32	NPN	-	-	-	-	15	1000	0.5	1	1.8	1000	0.5	1	-	-	-	-
BFT92	2	7	SOT23	5	-15	-25	300	PNP	18	500	-14	-10	-	-	-	-	2.5	500	-5	-10	-	-	-	-
BFT92W	2	7	SOT323	4	-15	-35	300	PNP	17	500	-15	-10	11	1000	-15	-10	2.5	500	-5	-10	3	1000	-5	-10
BFT93	2	9	SOT23	5	-12	-35	300	PNP	16.5	500	-30	-5	2.4	500	-10	-5	-	-	-	-	-	-	-	-
BFT93W	2	9	SOT323	4	-12	-50	300	PNP	15.5	500	-30	-5	10	1000	-30	-5	2.4	500	-10	-5	3	1000	-10	-5
PBR941	4	20	SOT23	8	10	50	360	NPN	9.5	2000	15	6	-	-	-	-	1.4	1000	5	6	2	2000	5	6
PRF947	4	20	SOT323	8.5	10	50	250	NPN	10	2000	15	6	-	-	-	-	1.5	1000	5	6	2.1	2000	5	6

RF wideband transistors generations 5

Type	Package	f_T(typ)(GHz)	h_{FE}(typ)	V_{CEO} (max)(V)	V_{CES} (max)(V)	V_{EBO} (max)(V)	I_C (max)(mA)	P_{tot} (max)(mW)	$G_{p(max)}$(typ)(dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	$G_{p(max)}$(typ)(dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF_{min} (typ)(dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF_{min} (typ)(dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	$P_{L(1dB),\,50\Omega}$ (typ)(dBm)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	$IP3_{o,\,50\Omega}$ (typ)(dBm)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)
BFU520W	SOT323	10	95	12	24	2	30	450	23	433	5	8	19	900	5	8	0.7	433	5	8	0.8	900	5	8	7	900	10	8	17	900	10	8
BFU530W	SOT323	11	95	12	24	2	40	450	24	433	10	8	19	900	10	8	0.8	433	10	8	0.9	900	10	8	10	900	15	8	20	900	15	8
BFU550W	SOT323	11	95	12	24	2	50	450	24	433	15	8	18	900	15	8	0.9	433	15	8	0.9	900	15	8	14	900	25	8	23	900	25	8
BFU520A	SOT23	10	95	12	24	2	30	450	23	433	5	8	18	900	5	8	0.7	433	5	8	0.8	900	5	8	7	900	10	8	17	900	10	8
BFU530A	SOT23	11	95	12	24	2	40	450	23	433	10	8	18	900	10	8	0.8	433	10	8	0.9	900	10	8	10	900	15	8	20	900	15	8
BFU550A	SOT23	11	95	12	24	2	50	450	24	433	15	8	18	900	15	8	0.9	433	15	8	1.0	900	15	8	14	900	25	8	23	900	25	8
BFU520	SOT143	11	95	12	24	2	30	450	20	900	5	8	17	1800	5	8	0.8	900	5	8	0.9	1800	5	8	7	1800	10	8	17	1800	10	8
BFU530	SOT143	11	95	12	24	2	40	450	21	900	10	8	17	1800	10	8	0.9	900	10	8	1.0	1800	10	8	10	1800	15	8	19	1800	15	8
BFU550	SOT143	11	95	12	24	2	50	450	21	900	15	8	15	1800	15	8	1.0	900	15	8	1.1	1800	15	8	13	1800	25	8	23	1800	25	8
BFU520X	SOT143X	11	95	12	24	2	30	450	20	900	5	8	17	1800	5	8	0.8	900	5	8	0.9	1800	5	8	10	1800	10	8	20	1800	10	8
BFU530X	SOT143X	11	95	12	24	2	40	450	21	900	10	8	17	1800	10	8	0.9	900	10	8	1.0	1800	10	8	10	1800	15	8	20	1800	15	8
BFU550X	SOT143X	11	95	12	24	2	50	450	22	900	15	8	16	1800	15	8	1.0	900	15	8	1.1	1800	15	8	14	1800	25	8	23	1800	25	8
BFU520XR	SOT143XR	11	95	12	24	2	30	450	20	900	5	8	17	1800	5	8	0.8	900	5	8	0.9	1800	5	8	7	1800	10	8	17	1800	10	8
BFU530XR	SOT143XR	11	95	12	24	2	40	450	21	900	10	8	17	1800	10	8	0.9	900	10	8	1.0	1800	10	8	10	1800	15	8	19	1800	15	8
BFU550XR	SOT143XR	11	95	12	24	2	50	450	22	900	15	8	16	1800	15	8	1.0	900	15	8	1.1	1800	15	8	13	1800	25	8	23	1800	25	8
BFU580Q	SOT89	11	95	12	24	2	60	1000	20	433	20	8	14	900	20	8	1.0	433	20	8	1.1	900	20	8	15	900	30	8	25	900	30	8
BFU590Q	SOT90	8	95	12	24	2	200	2000	18	433	50	8	11	900	50	8	-	433	50	8	-	900	50	8	22	900	80	8	32	900	80	8
BFU580G	SOT223	11	95	12	24	2	60	1000	22	433	20	8	16	900	20	8	1.0	433	20	8	1.1	900	20	8	15	900	30	8	24	900	30	8
BFU590G	SOT223	9	95	12	24	2	200	2000	20	433	50	8	13	900	50	8	-	433	50	8	-	900	50	8	22	900	80	8	31	900	80	8
BFU520Y	SOT363	10	95	12	24	2	30	450	23	433	5	8	19	900	5	8	0.7	433	5	8	0.8	900	5	8	7	900	10	8	17	900	10	8

RF broadband generations 6 to 9

Type	Generation	Curve	Package	f_T (typ) (GHz)	V_{CEO} (max) (V)	I_C (max) (mA)	P_{tot} (max) (mW)	Polarity	GUM (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	NF (typ) (dB)	@ f = (MHz)	@ I_C = (mA)	@ V_{CE} = (V)	PL(1dB) (typ) (dBmW)	@ V_{CE} = (V)	@ f = (MHz)	@ I_C = (mA)	IP3 (typ) (dBm)	@ IC = (mA)	@ VCE = (V)
BFU610F	6	34	SOT343F	40	5	10	50	NPN	21	5800	8	2	0.75	2400	1	2	1.4	5800	1	2	-	-	-	-	14	8	5
BFU630F	6	36	SOT343F	40	5	30	130	NPN	28	2400	25	2	0.58	1500	5	2	0.73	2400	5	2	-	-	-	-	23	25	5
BFU660F	6	38	SOT343F	40	5	70	200	NPN	28.5	1500	60	2	0.6	1500	20	2	0.75	2400	20	2	-	-	-	-	30	60	5
BFU690F	6	40	SOT343F	40	5	100	300	NPN	25.6	1500	90	2	0.7	1500	50	2	0.9	2400	50	2	-	-	-	-	35	90	5
BFU710F	7	35	SOT343F	70	2.8	10	30	NPN	16.5	12000	8	2	0.9	5800	2	2	1.5	12000	2	2	-	-	-	-	14.5	8	2
BFU725F/N1	7	37	SOT343F	70	2.8	40	136	NPN	18	5800	25	2	0.47	2400	5	2	0.7	5800	5	2	8	2	5800	25	19	25	2
BFU730F	7	33	SOT343F	70	2.8	30	130	NPN	18.5	5800	25	2	0.56	2400	5	2	0.8	5800	5	2	-	-	-	-	20.5	25	2
BFU730LX	7	-	SOT883C	53	3.0	30	160	NPN	13.3	5800	25	2	0.55	2400	5	2	0.8	5800	5	2	-	-	-	-	26	12.4	2.3
BFU760F	7	39	SOT343F	70	2.8	70	220	NPN	25	2400	60	2	0.5	1500	20	2	0.6	2400	20	2	-	-	-	-	23	60	2
BFU790F	7	41	SOT343F	70	2.8	100	250	NPN	20.4	2400	90	2	0.56	1500	50	2	0.7	2400	50	2	-	-	-	-	24	90	2
BFU768F	7	39	SOT343F	70	2.8	70	220	NPN	13	5800	10.8	2.1	0.5	2400	10.8	2.1	0.7	5800	10.8	2.1	5	2.1	5800	10.8	19	10.8	2.1
BFU910F	9		SOT343F	90	2.0	15	300	NPN	15.5	10700	10	2	0.6	10700	6	2	0.65	12700	6	2	2	2	12000	10	12.5	10	2

3.3 RF diodes

3.3.1 Varicap diodes

Varicap selection guide on www.nxp.com/varicaps
Easy-to-use parametric filters help you choose the right varicap for your design.

Why choose NXP's varicap diodes:

- Reference designs for TV and radio tuning
- Direct matching process
- Small tolerances
- Short lead time
- Complete portfolio covering broad range of frequencies and packages (including leadless)
- Reliable volume supply

VCO and FM radio tuning varicap diodes

Type	Package	Number of diodes	Config	@ f = 1 MHz					r_s typ	r_s max	@ f =
				C_{d1} typ	@ V_R =	C_{d2} typ	@ V_R =	C_{d1}/C_{d2} typ			
				pF	V	pF	V		Ω	Ω	MHz
BB145B	SOD523	1	SG	6.8	1	2.75	4	2.5	-	0.6	470
BB156	SOD323	1	SG	16	1	4.8	7.5	2.5	0.4	0.7	470
BB201	SOT23	2	CC	95	1	27.6	7.5	3.4	0.25	0.5	100
BB202^	SOD523	1	SG	30.9	0.2	9.2	2.3	3.4	0.35	0.6	100
BB207*	SOT23	2	CC	81	1	27.6	7.5	2.9	0.2	0.4	100
BB208-02*	SOD523	1	SG	21.6	1	4.9	7.5	4.4	0.35	0.5	100
BB208-03*	SOD323	1	SG	21.6	1	4.9	7.5	4.4	0.35	0.5	100

* Includes special design for FM car radio (CREST-IC:TEF6860

^ Includes special design for mobile phone tuner ICs

Type of connection: CC = common cathode

SG = single

UHF varicap diodes

Type	Package	@ f = 1 MHz					r_s typ	r_s max	@ f =
		C_{d1} typ	@ V_R =	C_{d2} typ	@ V_R =	C_{d1}/C_{d2} typ			
		(pF)	(V)	(pF)	(V)		(Ω)	(Ω)	(MHz)
BB174	SOD523	19	1	2.1	28	9.0	0.6	0.75	470
BB135	SOD323	20	0.5	1.9	28	9.5	-	0.75	470

VHF varicap diodes

Type	Package	@ f = 1 MHz					r_s typ	r_s max	@ f =
		C_{d1} typ	@ V_R =	C_{d2} typ	@ V_R =	C_{d1}/C_{d2} typ			
		(pF)	(V)	(pF)	(V)		(Ω)	(Ω)	(MHz)
BB170	SOD323	39.3	1	2.6	28	15	-	0.9	100
BB171	SOD323	57.0	1	2.7	28	21	1	1.2	100
BB172	SOD323	38.5	1	2.6	28	15	0.65	0.8	100
BB173	SOD523	38.5	1	2.6	28	15	0.65	0.8	100
BB175	SOD523	57.0	1	2.7	28	21	1	1.2	100
BB131	SOD323	12.5	0.5	0.9	28	14	-	3	470
BB181	SOD523	12.5	0.5	0.9	28	14	-	3	470
BBY40	SOT23	29.0	3	5.1	25	6	-	0.7	200

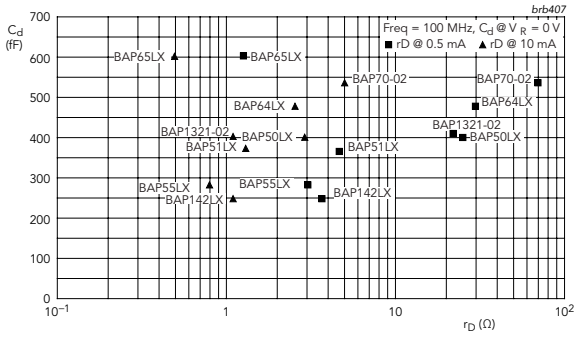
3.3.2 PIN diodes

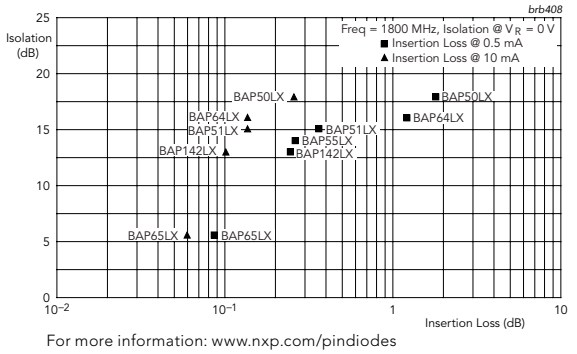
PIN diode selection guide on www.nxp.com/pindiodes
Easy-to-use parametric filters help you choose the right PIN diode for your design.

Why choose NXP's PIN diodes:

- Broad portfolio
- Unrivaled performance
- Short lead time
- Low series inductance
- Low insertion loss
- Low capacitance







For more information: www.nxp.com/pindiodes

PIN diodes: selection on isolation and insertion loss in SODD882D

Type	ISL (isolation)			IL (Insertion loss)											
	f = 900 MHz	f = 1800 MHz	f = 2450 MHz	f = 900 MHz				f = 1800 MHz				f = 2450 MHz			
	V_R = 0 V	V_R = 0 V	V_R = 0 V	I_F = 0.5 mA	I_F = 1 mA	I_F = 10 mA	I_F = 100 mA	I_F = 0.5 mA	I_F = 1 mA	I_F = 10 mA	I_F = 100 mA	I_F = 0.5 mA	I_F = 1 mA	I_F = 10 mA	I_F = 100 mA
BAP65LX	10	5.5	3.9	0.09	0.06	0.06	0.05	0.09	0.07	0.07	0.06	0.1	0.08	0.08	0.07
BAP55LX	19	14	12	0.24	0.17	0.08	0.05	0.25	0.18	0.09	0.07	0.26	0.19	0.1	0.08
BAP142LX	18	13	11	0.24	0.18	0.1	0.07	0.24	0.19	0.11	0.09	0.25	0.25	0.12	0.1
BAP51LX	19	15	13	0.36	0.25	0.12	0.9	0.36	0.26	0.14	0.1	0.38	0.27	0.15	0.12
BAP64LX	22	16	14	1.22	0.22	0.12	0.09	1.21	0.23	0.13	0.1	1.22	0.24	0.15	0.11
BAP50LX	20.3	17.9	16.5	1.82	1.07	0.25	-	1.8	1.06	0.26	-	1.81	1.08	0.27	-

SG = single
SR = series
CC = common cathode
CA = common anode

PIN diodes: typical Rd < 2 Ohm at 1 mA, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 20 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d typ (pF)	C_d max (pF)
BAP65LX	SOD882D	1	SG	30	100	-	-	0.94	-	0.49	0.9	0.61	0.48	0.85	0.37	-
BAP65-02	SOD523	1	SG	30	100	-	-	1	-	0.56	0.9	0.65	0.55	0.9	0.375	-
BAP65-03	SOD323	1	SG	30	100	-	-	1	-	0.56	0.9	0.65	0.55	0.9	0.375	-
BAP65-05	SOT23	2	CC	30	100	-	-	1	-	0.56	0.9	0.7	0.575	0.9	0.425	-
BAP65-05W	SOT323	2	CC	30	100	-	-	1	-	0.56	0.9	0.7	0.575	0.9	0.425	-

PIN diodes: typical Rd = 2.2-2.4 Ohm at 1 mA, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 20 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d typ (pF)	C_d max (pF)
BAP55LX	SOD882D	1	SG	50	100	3.3	4.5	2.2	3.3	0.8	1.2	0.28	0.23	-	0.18	0.28
BAP142LX	SOD882D	1	SG	50	100	3.3	5	2.4	3.6	1	1.8	0.25	0.22	-	0.16	0.26

PIN diodes: typical Rd = 3.2-3.6 Ohm at 1 mA, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 20 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d typ (pF)	C_d max (pF)
BAP51LX	SOD882D	1	SG	60	100	4.9	9	3.2	6.5	1.4	2.5	0.3	0.22	0.4	0.17	0.3
BAP51-02	SOD523	1	SG	60	50	5.5	9	3.6	6.5	1.5	2.5	0.4	0.3	0.55	0.2	0.35
BAP51-03	SOD323	1	SG	50	50	5.5	9	3.6	6.5	1.5	2.5	0.4	0.3	0.55	0.2	0.35
BAP51-04W	SOT323	2	SR	50	50	5.5	9	3.6	6.5	1.5	2.5	0.4	0.3	0.55	0.2	0.35
BAP51-05W	SOT323	2	CC	50	50	5.5	9	3.6	6.5	1.5	2.5	0.4	0.3	0.55	0.2	0.35
BAP51-06W	SOT323	2	CA	50	50	5.5	-	3.6	-	2	-	0.4	0.3	-	0.2	-

PIN diodes: typical Rd = 10 Ohm at 1 mA, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 20 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d typ (pF)	C_d max (pF)
BAP64Q	SOT753	4	SR	100	100	20	40	10	20	2	3,8	0.52	0.37	-	0.23	0.35
BAP64-02	SOD523	1	SG	175	100	20	40	10	20	2	3.8	0.48	0.35	-	0.23	0.35
BAP64-03	SOD323	1	SG	175	100	20	40	10	20	2	3.8	0.48	0.35	-	0.23	0.35
BAP64-04	SOT23	2	SR	175	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64-04W	SOT323	2	SR	100	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64-05	SOT23	2	CC	175	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64-05W	SOT323	2	CC	100	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64-06	SOT23	2	CA	175	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64-06W	SOT323	2	CA	100	100	20	40	10	20	2	3.8	0.52	0.37	-	0.23	0.35
BAP64LX^	SOD882D	1	SG	60	100	31	50	16	26	2.6	4.4	0.48	0.34	-	0.17*	0.3*

PIN diodes: typical Rd = 14-16 Ohm at 1 mA, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 5 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d typ (pF)	C_d max (pF)
BAP50-02	SOD523	1	SG	50	50	25	40	14	25	3	5	0.4	0.3	0.55	0.22	0.35
BAP50-03	SOD323	1	SG	50	50	25	40	14	25	3	5	0.4	0.3	0.55	0.2	0.35
BAP50-04	SOT23	2	SR	50	50	25	40	14	25	3	5	0.45	0.35	0.6	0.3	0.5
BAP50-04W	SOT323	2	SR	50	50	25	40	14	25	3	5	0.45	0.35	0.6	0.3	0.5
BAP50-05	SOT23	2	CC	50	50	25	40	14	25	3	5	0.45	0.3	0.5	0.35	0.6
BAP50-05W	SOT323	2	CC	50	50	25	40	14	25	3	5	0.45	0.35	0.6	0.3	0.5
BAP50LX	SOD882D	1	SG	50	50	26	40	14	25	3	5	0.4	0.28	0.55	0.19	0.35

PIN diodes: typical r_D @ 1 mA = 40, attenuator diodes

Type	Package	Number of diodes	Config	V_R max (V)	IF max (mA)	@ f = 100 MHz						@ f = 1 MHz				
						@ IF = 0.5 mA		@ IF = 1 mA		@ IF = 10 mA		@ V_R = 0 V	@ V_R = 1 V		@ V_R = 20 V	
						r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	r_D typ (Ω)	r_D max (Ω)	C_d typ (pF)	C_d typ (pF)	C_d max (pF)	C_d max (pF)	C_d typ (pF)
BAP70Q	SOT753	4	SR	50	100	77	100	40	50	5.4	7	0.6	0.43	-	0.25	0.3
BAP70-02	SOD523	1	SG	50	100	77	100	40	50	5.4	7	0.57	0.4	-	0.2	0.25
BAP70-03	SOD323	1	SG	50	100	77	100	40	50	5.4	7	0.57	0.4	-	0.2	0.25
BAP70-04W	SOT323	2	SR	50	100	77	100	40	50	5.4	7	0.6	0.43	-	0.25	0.3
BAP70-05	SOT23	2	CC	50	100	77	100	40	50	5.4	7	0.6	0.43	-	0.25	0.3
BAP70AM	SOT363	4	SR	50	100	77	100	40	50	5.4	7	0.57	0.4	-	0.2	0.25

^ attenuator / switching diode * @ VR = 20 V

3.3.3 Band-switch diodes

Band-switch diode selection guide on www.nxp.com/products/diodes
Easy-to-use parametric filters help you choose the right Band-switch diode for your design.

Why choose NXP's band-switch diodes:

- Reliable volume supplier
- Short lead time
- Low series inductance
- Low insertion loss
- Low capacitance
- High reverse isolation

Type	Package	V_R max (V)	IF max (mA)	r_D max (Ω)	@ IF = (mA)	@ f = (MHz)	C_d max (pF)	@ V_R = (V)	@ f = (MHz)
BA591	SOD323	35	100	0.7	3	100	0.9	3	1
BA891	SOD523	35	100	0.7	3	100	0.9	3	1
BAT18	SOT23	35	100	0.7	5	200	1	20	1

3.4 RF MOS transistors

3.4.1 JFETs

JFET selection guide on www.nxp.com/rffets
Easy-to-use parametric filters help you choose the right junction field-effect transistor for your design.

Why choose NXP's JFETs:

- Reliable volume supplier
- Short lead time
- Broad portfolio

N-channel field-effect transistors for switching

Type	Package	V_{DS}	I_G	Characteristics											
				I_{DSS}		V_{gsoff}		R_{DSON}	C_{rs}		t_{on}		t_{off}		
		(V)	(mA)	(mA)		(V)		(Ω)	(pF)		(ns)		(ns)		
		max	max	min	max	min	max	max	min	max	typ	max	typ	max	
PMBFJ108	SOT23	25	50	80	-	3	10	8	-	15	4	-	6	-	
PMBFJ109	SOT23	25	50	40	-	2	6	12	-	15	4	-	6	-	
PMBFJ110	SOT23	25	50	10	-	0.5	4	18	-	15	4	-	6		
PMBF4391	SOT23	40	50	50	150	4	10	30	-	3.5	-	15	-	20	
PMBF4393	SOT23	40	50	5	30	0.5	3	100	-	3.5	-	15	-	50	

P-channel field-effect transistor for switching

Type	Package	V_{DS}	I_G	Characteristics											
				I_{DSS}		V_{gsoff}		R_{DSON}	C_{rs}		t_{on}		t_{off}		
		(V)	(mA)	(mA)		(V)		(Ω)	(pF)		(ns)		(ns)		
		max	max	min	max	min	max	max	min	max	typ	max	typ	max	
PMBFJ177	SOT23	30	50	1.5	20	0.8	2.25	300			45	-	45	-	

N-channel field-effect transistors for general RF applications

Type	Package	V_{DS}	I_G	Characteristics							
				I_{DSS}		V_{gsoff}		|Yfs|		C_{rs}	
		(V)	(mA)	(mA)		(V)		(mS)		(pF)	
		max	max	min	max	min	max	min	max	min	max
DC, LF, and HF amplifiers											
BF545A	SOT23	30	10	2	6.5	0.4	7.5	3	6.5	0.8	-
BF545B	SOT23	30	10	6	15	0.4	7.5	3	6.5	0.8	-
BF545C	SOT23	30	10	12	25	0.4	7.5	3	6.5	0.8	-
BF556A	SOT23	30	10	3	7	0.5	7.5	4.5	-	0.8	-
Pre-amplifiers for AM tuners in car radios											
BF861A	SOT23	25	10	2	6.5	0.2	1.0	12	20	2.1	2.7
BF861B	SOT23	25	10	6	15	0.5	1.5	16	25	2.1	2.7
BF861C	SOT23	25	10	12	25	0.8	2	20	30	2.1	2.7
BF862	SOT23	20	10	10	25	0.3	2	35	-	typ. 1.9	
RF stages FM portables, car radios, main radios, and mixer stages											
BF510[1]	SOT23	20	10	0.7	3	0.8 (typ)		2.5		0.4	0.5
BF511[1]	SOT23	20	10	2.5	7	1.5 (typ)		4		0.4	0.5
BF512[1]	SOT23	20	10	6	12	2.2 (typ)		6		0.4	0.5
BF513[1]	SOT23	20	10	10	18	3 (typ)				0.4	0.5
Low-level general-purpose amplifiers											
BFR30	SOT23	25	5	4	10	< 5		1	4	1.5	-
BFR31	SOT23	25	5	1	5	< 2.5		1.5	4.5	1.5	-
General-purpose amplifiers											
BFT46	SOT23	25	5	0.2	1.5	< 1.2		> 1		1.5	-
AM input stages UHF/VHF amplifiers											
PMBFJ308	SOT23	25	50	12	60	1	6.5	>10		1.3	2.5
PMBFJ309	SOT23	25	50	12	30	1	4	>10		1.3	2.5

[1] Asymmetrical

3.4.2 MOSFETs

RF MOSFET selection guide on www.nxp.com/rffets
Easy-to-use parametric filters help you choose the right RF MOSFET for your design.

Why choose NXP's MOSFETs:

- Reference designs for TV tuning
- Short lead time
- Broad portfolio
- Smallest packages
- 2-in-1 FETs for tuner applications
- Reliable volume supply
- Highest performing MOSFETs for TV tuning



N-channel, single MOSFETs for switching

Type	Package	V_{DS}	Characteristics								
			I_D	I_{DSS}		$V_{GS(th)}$		R_{DSON}	$\|S_{21(on)}\|^2$	$\|S_{21(off)}\|^2$	MODE
		(V)	(mA)	(mA)		(V)		(Ω)	(dB)	(dB)	
		max	max	min	max	min	max	max	max	min	
Silicon RF switches											
BF1107	SOT23	3	10	-	100	-	7	20	2.5	30	Depl.
BF1108	SOT143B	3	10	-	100	-	7	20	3	30	Depl.
BF1108R	SOT143R	3	10	-	100	-	7	20	3	30	Depl.

N-channel, dual-gate MOSFETs

Type	Package	V_{DS}	I_D	Characteristics										
				I_{DSX}		$V_{GS(th)}$		|Yfs|		C_{is}	C_{os}	F @ 800 MHz	VHF	UHF
		(V)	(mA)	(mA)		(V)		(mS)		(pF)	(pF)	(dB)		
		max	max	min	max	min	max	min	max	typ	typ	typ		
With external bias														
BF992	SOT143	20	40	-	-	-	-1.3	20	-	4	2	1.2[1]	X	-
BF994S	SOT143	20	30	4	20	-	-2.5	15	-	2.5	1	1[1]	X	-
BF996S	SOT143	20	30	4	20	-	-2.5	15	-	2.3	0.8	1.8	-	X
Fully internal bias														
BF1105R	SOT343R	7	30	8	16	-	0.3	2	25	-2.2 [3]	1.2[2]	1.7	X	X

[1] @ 200 MHz
[2] COSS
[3] Cig



BUILDING ON DECADES OF RF **LEADERSHIP**

Our application **experts** work with you to solve any design challenge to help you realize a clear competitive advantage.

4. Design support

This chapter guides you through the available tools, documents, materials, and links that ease the design-in of our products.

4.1 Explore NXP's RF portfolio

Beyond this RF Manual, you can learn about NXP's broad RF portfolio through the NXP Technical Academy, various webinars, and the NXP channel on YouTube.

On NXP's YouTube channel, **www.youtube.com/user/nxpsemiconductors**, there are short videos that explain NXP's portfolio, application information, tips and tricks to optimize your system's performance, and more.

4.2 Product selection on NXP.com

Every RF product has its own webpage on the NXP website. Pages can be accessed in several ways: by product tree, by application area, or via cross-reference search. Or, simply type 'nxp <product>' in the Google search bar.

Product tree and parametric search

Our online product tree (www.nxp.com/products/rf) categorizes the product by function. The parametric search tool allows you to refine the selection based on performance requirements.

4.3 Product evaluation

NXP offers a broad range of support material for evaluating RF products and optimizing the performance of your application.

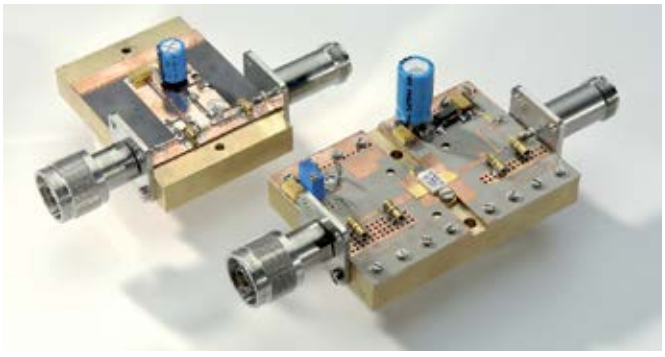
Datasheets and application notes

The first chapter of this RF Manual includes application diagrams, recommended type numbers, and product highlights. More in-depth application information is available in the product datasheets or in the Application Notes.

Simulation tools

To help you evaluate our products in your specific application, NXP offers various simulation tools, including small-signal touchstone S-parameters and parametric models that let you customize the biasing conditions. The parametric models are based on best-in-class Mextram models developed by Philips Research, a recognized leader in physics-based models. The parametric models fully support AC, DC, S-parameter, harmonic balance, and time-domain simulations. These models allow designers to assess the performance of complex systems at an early stage of the development process.

The models are available for Advanced Design System (ADS), Microwave Office (MWO), Genesys, and Ansoft Designer. Spice versions of the parametric models, which can be used with almost any commercial design tool, are also available.



Customer evaluation kits and samples

Several kits are available for product evaluation. Boards are provided with industry-standard RF connectors to facilitate measurements and design-in. The features and contents of each kit are described on the NXP website and are listed on the corresponding product page. On the Customer Evaluation Kits page you can also find support materials, such as the latest user manuals and software updates. You can order small quantities of all products to build and evaluate prototypes. To obtain a kit or order samples, please contact your local NXP representative or authorized distributor.



4.4 Additional design-in support

If you need additional design-in support, please contact your local NXP sales representative or authorized distributor. You can also submit a question using the web form on the NXP website.

4.5 Application notes

AN number	AN title	Application	product type name	new type name
automotive				
AN11024	SDARS active antenna 2nd stage LNA with BFU690, 2.33 GHz	automotive	BFU690	-
AN11066	SDARS active antenna 1st stage LNA with BFU730F, 2.33 GHz	automotive	BFU730F	-
broadband communication				
AN11209	Set-Top Box LNAs BGU703X and BGU704X	broadband communication	BGU703x, BGU704x	-
AN11220	BGA3012 - 1 GHz 12 dB gain wideband amplifier MMIC	broadband communication	BGA3012	-
AN11221	BGA3015 - 1 GHz 15 dB gain wideband amplifier MMIC	broadband communication	BGA3015	-
AN11222	BGA3018 - 1 GHz 18 dB gain wideband amplifier MMIC	broadband communication	BGA3018	-
AN11228	BGA301x Wideband Variable Gain Amplifier Application	broadband communication	BGA301x	-
AN11293	BGA3012 - 5 MHz to 300 MHz 12 dB reverse amplifier application	broadband communication	BGA3012	-
AN11294	BGA3015 - 5 MHz to 300 MHz 15 dB reverse amplifier application	broadband communication	BGA3015	-
AN11295	BGA3018 - 5 MHz to 300 MHz 18 dB reverse amplifier application	broadband communication	BGA3018	-
AN11296	BGA3018 - 40 MHz to 2600 MHz wideband amplifier application	broadband communication	BGA3018	-
AN11299	BGA301x - 40 MHz to 1006 MHz push-pull application	broadband communication	BGA301x	-
AN11541	Optical mini node…..	broadband communication		-
AN11545	BGA3023 - 1.2 GHz 20 dB gain CATV amplifier	broadband communication	BGA3023	-
AN11546	BGA3022 - 1.2 GHz 18 dB gain CATV amplifier	broadband communication	BGA3022	-
AN11547	BGA3021 - 1.2 GHz 16 dB gain CATV amplifier	broadband communication	BGA3021	-
AN11753	BGA3131 Thermal considerations	broadband communication	BGA3131	-
AN11817	BGA3131 DOCSIS 3.1 upstream amplifier	broadband communication	BGA3131	-
general purpose				
AN11152	Reducing the Spurs at RF_out caused by the biasing choke during fast switching on and off in TDD system	general purpose	-	-
UM10414	General Purpose Wideband Amp in SOT363 Demo Board	general purpose	-	-
UM10559	BFU6xx/BFU7xx Transistor Starter Kit Users Manual	general purpose	BFU6xx, BFU7xx	-
UM10772	User Manual BFU5xx series starter kits	general purpose	BFU5xx	-

Application notes (continued)

AN number	AN title	Application	product type name	new type name
general purpose LNA				
AN11006	Single stage 2.3_2.7GHz LNA with BFU730F	general purpose LNA	BFU730F	-
AN11072	BGU7003 400 MHz and 900 MHz application	general purpose LNA	BGU7003	-
AN11103	Externally-matched 900 MHz LNA using BGU7005	general purpose LNA	BGU7005	GPS1101M
AN11118	BFU725F/N1 1.5 GHz LNA evaluation board	general purpose LNA	BFU725F/N1	-
AN11148	BGU7003 1900MHz to 2100MHz LNA Application	general purpose LNA	BGU7003	-
AN11339	Maximum RF Input Power BFU730LX	general purpose LNA	BFU730LX	-
AN11377	BFU520A ISM 433 MHz LNA design	general purpose LNA	BFU520A	-
AN11378	BFU520A ISM 866 MHz LNA design	general purpose LNA	BFU520A	-
AN11379	BFU530A ISM 433 MHz LNA design	general purpose LNA	BFU530A	-
AN11380	BFU530A ISM 866 MHz LNA design	general purpose LNA	BFU530A	-
AN11381	BFU550A ISM 433 MHz LNA design	general purpose LNA	BFU550A	-
AN11382	BFU550A ISM 866 MHz LNA design	general purpose LNA	BFU550A	-
AN11421	BFU520W ISM 433 MHz LNA design	general purpose LNA	BFU520W	-
AN11422	BFU520W ISM 866 MHz LNA design	general purpose LNA	BFU520W	-
AN11423	BFU530W ISM 433 MHz LNA design	general purpose LNA	BFU530W	-
AN11424	BFU530W ISM 866 MHz LNA design	general purpose LNA	BFU530W	-
AN11425	BFU550W ISM 433 MHz LNA design	general purpose LNA	BFU550W	-
AN11426	BFU550W ISM 866 MHz LNA design	general purpose LNA	BFU550W	-
AN11427	BFU520 ISM 433 MHz LNA design	general purpose LNA	BFU520	-
AN11428	BFU520 ISM 866 MHz LNA design	general purpose LNA	BFU520	-
AN11429	BFU530 ISM 433 MHz LNA design	general purpose LNA	BFU530	-
AN11430	BFU530 ISM 866 MHz LNA design	general purpose LNA	BFU530	-
AN11431	BFU550 ISM 433 MHz LNA design	general purpose LNA	BFU550	-
AN11432	BFU550 ISM 866 MHz LNA design	general purpose LNA	BFU550	-
AN11433	BFU520X ISM 433 MHz LNA design	general purpose LNA	BFU520X	-
AN11434	BFU520X ISM 866 MHz LNA design	general purpose LNA	BFU520X	-
AN11435	BFU530X ISM 433 MHz LNA design	general purpose LNA	BFU530X	-
AN11436	BFU530X ISM 866 MHz LNA design	general purpose LNA	BFU530X	-
AN11437	BFU550X ISM 433 MHz LNA design	general purpose LNA	BFU550X	-
AN11438	BFU550X ISM 866 MHz LNA design	general purpose LNA	BFU550X	-
AN11439	BFU520XR ISM 433 MHz LNA design	general purpose LNA	BFU520XR	-
AN11440	BFU520XR ISM 866 MHz LNA design	general purpose LNA	BFU520XR	-
AN11441	BFU530XR ISM 433 MHz LNA design	general purpose LNA	BFU530XR	-

Application notes (continued)

AN number	AN title	Application	product type name	new type name
AN11442	BFU530XR ISM 866 MHz LNA design	general purpose LNA	BFU530XR	-
AN11443	BFU550XR ISM 433 MHz LNA design	general purpose LNA	BFU550XR	-
AN11444	BFU550XR ISM 866 MHz LNA design	general purpose LNA	BFU550XR	-
AN11481	2.62 ~ 2.69GHz LNA by using BGU7003	general purpose LNA	BGU7003	-
AN11499	Highly Linear FM LNA design with BFU580Q	general purpose LNA	BFU580Q	-
AN11500	Highly Linear FM LNA design with BFU580G	general purpose LNA	BFU580G	-
AN11787	Low-Cost External Remote Keyless Entry (RKE) Low Noise Amplifier for 315/433/868 MHz Automotive Applications using the BFU520W RF Transistor	general purpose LNA	BFU520W	-
AN11865	BGU6104 Low Noise Amplifier for ISM/LTE bands	general purpose LNA	BGU6104	-
AN11866	BGU6102 Low Noise Amplifier for ISM/LTE bands	general purpose LNA	BGU6102	-
AN11867	BGU6101 Low Noise Amplifier for ISM/LTE bands	general purpose LNA	BGU6101	-
UM10455	User manual for the BGU7003 100MHz LNA evaluation board	general purpose LNA	BGU7003	-
UM10483	BFU725F/N1 2.4 GHz to 6.0 GHz LNA demonstration board	general purpose LNA	BFU725F/N1	-
UM10517	User manual for the BGU7003 868MHz LNA evaluation board	general purpose LNA	BGU7003	-
general purpose MPA				
AN11190	Application Note for the BGA7130 EVB 865 - 880 MHz	general purpose MPA	BGA7130	-
AN11191	Application Note for the BGA7130 EVB 1930 - 1995 MHz	general purpose MPA	BGA7130	-
AN11501	BFU590G ISM 866 MHz PA design	general purpose MPA	BFU590G	-
AN11502	BFU590Q ISM 866 MHz PA design	general purpose MPA	BFU590Q	-
AN11503	BFU590G ISM 433 MHz PA design	general purpose MPA	BFU590G	-
AN11504	BFU590Q ISM 433 MHz PA design	general purpose MPA	BFU590Q	-
UM10565	User Manual for OM7828/BGA6130/Kit	general purpose MPA	BGA6130	-
UM10566	User Manual for OM7941/BGA7130LTE	general purpose MPA	BGA7130	-
UM10567	User Manual for OM7942/BGA7130WCDMA	general purpose MPA	BGA7130	-
GPS				
AN11086	BGU7003 LNA application for GPS L2 band	GPS	BGU7003	-
mobile FM				
AN11034	High Ohmic FM LNA for embedded Antenna in Portable applications with BGU7003W	mobile FM	BGU7003W	-
AN11035	50 Ohm FM LNA for embedded Antenna in Portable applications with BGU7003W	mobile FM	BGU7003W	-
AN11090	50 Ohm FM LNA for embedded Antenna in Portable applications with BGU6102	mobile FM	BGU6102	-
AN11091	High ohmic FM LNA for embedded Antenna in Portable applications with BGU6102	mobile FM	BGU6102	-
AN11734	Maximum RF Input Power BGU6101	mobile FM	BGU6101	-
AN11735	Maximum RF Input Power BGU6102	mobile FM	BGU6102	-
AN11736	Maximum RF Input Power BGU6104	mobile FM	BGU6104	-

Application notes (continued)

AN number	AN title	Application	product type name	new type name
mobile GPS				
AN11068	BGU8007/BGU7005 Matching Options for Improved LTE Jammer Immunity	mobile GPS	BGU7005/BGU8007	GPS1101M/-
AN11101	BGU7007 GPS front end evaluation board	mobile GPS	BGU7007	GPS1102M
AN11230	BGU8006 GNSS LNA evaluation board	mobile GPS	BGU8006	-
AN11284	BGU8006 GNSS front end evaluation board	mobile GPS	BGU8006	-
AN11288	BGU8009 GNSS LNA evaluation board	mobile GPS	BGU8009	GPS1201M
AN11317	BGU8009 GNSS front end evaluation board	mobile GPS	BGU8009	GPS1201M
AN11336	BGU8010 GNSS LNA evaluation board	mobile GPS	BGU8010	-
AN11337	BGU8011 GNSS LNA evaluation board	mobile GPS	BGU8011	-
AN11338	BGU8011 GNSS front end evaluation board	mobile GPS	BGU8011	-
AN11353	BGU8009/BGU7005 L2 and L5 Band LNA Application	mobile GPS	BGU7005/BGU8009	GPS1101M/GPS1201M
AN11357	BGU8009 Matching Options for 850 MHz / 2400 MHz Jammer Immunity	mobile GPS	BGU8009	GPS1201M
AN11368	BGU8019 GNSS LNA evaluation board	mobile GPS	BGU8019	GPS1202M
AN11369	BGU8004 GNSS LNA evaluation board	mobile GPS	BGU8004	-
AN11420	NXP GPS LNA - GPS LNA voltage supply via a coax cable coming from the GPS receiver	mobile GPS	-	-
AN11515	BGU6005/N2 GNSS LNA evaluation board	mobile GPS	BGU6005	GPS1001M
AN11525	BGU6009/N2 GNSS LNA evaluation board	mobile GPS	BGU6009	GPS1002M
AN11527	BGU8019 GNSS front end evaluation board	mobile GPS	BGU8019	GPS1202M
AN11573	BGU8103 GNSS LNA evaluation board	mobile GPS	BGU8103	GPS1301M
AN11678	BGU8103UK GNSS LNA evaluation board	mobile GPS	BGU8103	GPS1301M
AN11729	BGU8309 GNSS LNA evalution board	mobile GPS	BGU8309	GPS1401M
AN11872	BGU8309 GNSS LNA+B13 notch filter evaluation board	mobile GPS	BGU8309	GPS1401M
AN11912	BGU8103 [GPS1301M] GNSS L2-band LNA evaluation board	mobile GPS	BGU8103	GPS1301M
AN11913	BGU8019 [GPS1202M] tuned for GNSS L2-band evaluation	mobile GPS	BGU8019	GPS1202M
UM10339	User Manual for the BGU7003 GPS LNA demo boards v2.0	mobile GPS	BGU7003	-
UM10381	User manual for the BGU7005 GPS Front-end evaluation board	mobile GPS	BGU7005	GPS1101M
UM10453	2-Tone Test BGU7005 and BGU7007 GPS LNA	mobile GPS	BGU7005/BGU7007	GPS1101M/GPS1102M
UM10454	User manual for the BGU7003 2.4GHz LNA evaluation board	mobile GPS	BGU7003	-
UM10459	User manual for the BGU7007 GPS LNA evaluation board	mobile GPS	BGU7007	GPS1102M
UM10488	User manual for the BGU7008 GPS LNA evaluation board	mobile GPS	BGU7008	GPS1104M
UM10489	2-Tone Test BGU7004 and BGU7008 GPS LNA	mobile GPS	BGU7004/BGU7008	GPS1103M/GPS1104M
UM10490	User manual for the BGU7004 GPS Front end evaluation board	mobile GPS	BGU7004	GPS1103M
UM10491	User manual for the BGU7004 GPS LNA evaluation board	mobile GPS	BGU7004	GPS1103M
UM10497	User manual for the BGU8007 GPS LNA evaluation board	mobile GPS	BGU8007	-

Application notes (continued)

AN number	AN title	Application	product type name	new type name
mobile LTE				
AN11512	BGU8L1 LTE LNA evaluation board	mobile LTE	BGU8L1	LTE1001L
AN11513	BGU8M1 LTE LNA evaluation board	mobile LTE	BGU8M1	LTE1001M
AN11514	BGU8H1 LTE LNA evaluation board	mobile LTE	BGU8H1	LTE1001H
AN11594	BGU8H1UK LTE LNA evaluation board	mobile LTE	BGU8H1UK	LTE1001HC
AN11595	BGU8M1UK LTE LNA evaluation board	mobile LTE	BGU8M1UK	LTE1001MC
AN11654	BGS8L2 LTE LNA with bypass switch evaluation board	mobile LTE	BGS8L2	LTE3001L
AN11655	BGS8M2 LTE LNA with bypass switch evaluation board	mobile LTE	BGS8M2	LTE3001M
AN11656	BGS8H2 LTE LNA with bypass switch evaluation board	mobile LTE	BGS8H2	LTE3001H
AN11680	BGS8M2UK LTE LNA with bypass switch evaluation board	mobile LTE	BGS8M2UK	LTE3001MC
AN11681	BGS82H2UK LTE LNA with bypass switch evaluation board	mobile LTE	BGS8H2UK	LTE3001HC
AN11748	BGS8L4UK LTE LNA with bypass switch evaluation board	mobile LTE	BGS8L4UK	LTE3101LC
AN11749	BGS8M4UK LTE LNA with bypass switch evaluation board	mobile LTE	BGS8M4UK	LTE3101MC
AN11790	BGS8L5UK with bypass switch evaluation board	mobile LTE	BGS8L5UK	LTE3301LC
AN11791	BGS8H5UK with bypass switch evaluation board	mobile LTE	BGS8H5UK	LTE3301HC
mobile TV				
AN11097	CMMB LNA with BGU7003, 400 MHz to 800 MHz	mobile TV	BGU7003	-
satellite				
AN11010	Single stage Ku band LNA using BFU730F	satellite	BFU730F	-
AN11144	Universal Single LNB with TFF101x FIMOD IC	satellite	TFF101x	-
AN11516	TFF1024 EVB and application recommendations	satellite	TFF1024	-
AN11571	TFF1044 EVB Evaluation Results	satellite	TFF1044	-
AN11640	TFF1044 Quad DCV Application Recommendations	satellite	TFF1044	-
AN11674	A Ku band quad LNB reference design based on TFF1044HN	satellite	TFF1044	-
AN11698	BFU910F for Ku band Universal Single LNB applications	satellite	BFU910F	-
UM10484	Integrated clean-up-PLL, TFF1xxxx and buffer amplifier	satellite	TFF1xxxx	-
wireless infrastructure				
AN11135	Replacing HMC625 by NXP BGA7204	wireless infrastructure	BGA7204	-
AN11251	BGA7210 Operation Frequency Extension Down to 400 MHz	wireless infrastructure	BGA7210	BTS6001A
AN11152	BGA7210 Reducing the Spurs at RF_out caused by the biasing choke during fast switching on and off in TDD system	wireless infrastructure	BGA7210	BTS6001A
AN10998	BGX7221 evaluation board application note	wireless infrastructure	BGX7221	-
AN11014	BGX7100 evaluation board application note	wireless infrastructure	BGX7100	-
AN11132	BGX7220 evaluation board application note	wireless infrastructure	BGX7220	-

Application notes (continued)

AN number	AN title	Application	product type name	new type name
AN11171	BGU7063 evaluation board application note	wireless infrastructure	BGU7063	-
AN11189	BGX7101 evaluation board application note	wireless infrastructure	BGX7101	BTS8001A
AN11313	BGU7062N2 evaluation board application note	wireless infrastructure	BGU7062	-
AN11416	1900 MHz low noise, high linearity amplifier using BGU8052	wireless infrastructure	BGU8052	BTS1001M
AN11417	900 MHz low noise, high linearity amplifier using BGU8051	wireless infrastructure	BGU8051	BTS1001L
AN11418	2500 MHz low noise, high linearity amplifier using BGU8053	wireless infrastructure	BGU8053	BTS1001H
AN11556	BGU8051 900MHz LNA improved IRL	wireless infrastructure	BGU8051	BTS1001L
AN11557	BGU8052 1900MHz LNA improved IRL	wireless infrastructure	BGU8052	BTS1001M
AN11558	BGU8053 2500 MHz LNA improved IRL	wireless infrastructure	BGU8053	BTS1001H
AN11559	LNA for 450 MHz using BGU8051	wireless infrastructure	BGU8051	BTS1001L
AN11560	LNA for 3500 MHz using BGU8053	wireless infrastructure	BGU8053	BTS1001H
AN11638	BGU7060 Evaluation board application note	wireless infrastructure	BGU7060	-
AN11639	BGU7061 evaluation board application note	wireless infrastructure	BGU7061	-
AN11688	BGU8062 1500-2700 MHz High linear bypass LNA	wireless infrastructure	BGU8062	BTS3001M
AN11847	BGU8061 700-1500 MHz High Linear bypass LNA	wireless infrastructure	BGU8061	BTS3001L
AN11848	BGU8063 2500-4000 MHz High Linear bypass LNA	wireless infrastructure	BGU8063	BTS3001H
AN11852	BGU8062 bypass LNA delta gain	wireless infrastructure	BGU8062	BTS3001M
AN11902	BGU8052 [BTS1001M] applied at 1.3 GHz	wireless infrastructure	BGU8052	BTS1001M
WLAN				
AN11114	2.4-5.9GHz Broadband WiFi LNA With BFU730F	WLAN	BFU730F	-
AN11140	Low Noise Fast Turn ON/OFF 5-5.9GHz WiFi LNA with BFU730F	WLAN	BFU730F	-
AN11184	Low Noise Fast Turn ON/OFF 5-5.9 GHz WiFi LNA with BFU768F	WLAN	BFU768F	-
AN11223	Low Noise Fast Turn ON/OFF 2.4-2.5GHz WiFi LNA with BFU730LX	WLAN	BFU730LX	-
AN11224	Low Noise Fast Turn ON/OFF 5-5.9GHz WiFi LNA with BFU730LX	WLAN	BFU730LX	-
AN11283	High Linearity Low Noise 2.4-2.5GHz WiFi LNA with ON5096	WLAN	ON5096	-
AN11390	BGU7224 Low Noise Amplifier (256 QAM) 2.4 GHz WiFi LNA MMIC with Bypass	WLAN	BGU7224	-
AN11448	Low Noise Fast Turn ON-OFF 2.4-2.5GHz WiFi LNA with BFU730F	WLAN	BFU730F	-
AN11453	BGU7258 802.11 a/n/ac Low Noise Amplifier 5-6 GHz WiFi LNA MMIC with Bypass	WLAN	BGU7258	-
AN11454	Low Cost High Gain Fast Turn On/Off 5-5.9GHz WiFi LNA with BFU730F	WLAN	BFU730F	-

4.6 Simulation models

4.6.1 Simulation models for RF bipolar wideband transistors

		Attached to PIP / model page			Supported simulators			
Wideband transistors	Demo board	S-parameters	Spice model	Mextram model	S-parameters	Spice model	Mextram model	Device model
BFG35		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFG18A		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFS25A		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFT25		√			ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BFT25A		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFT92		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFT92W		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU520	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520Y	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU580G	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU580Q	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU590G	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU590Q	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU610F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU630F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU660F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU690F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU710F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU725F	√	√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU725F/N1	√	√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU730F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU730LX	√	√		√	ADS 2011	ADS 2011	ADS 2011	-

		Attached to PIP / model page			Supported simulators			
Wideband transistors	Demo board	S-parameters	Spice model	Mextram model	S-parameters	Spice model	Mextram model	Device model
BFU760F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU790F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU910F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFT92W		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFT93		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFT93W		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU520	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU520Y	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU530XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550A	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550W	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550X	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU550XR	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU580G	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU580Q	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU590G	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU590Q	√	√	√	√	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012, Microwave office	ADS 2011, ADS 2012	-
BFU610F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU630F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU660F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU690F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU710F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU725F	√	√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU725F/N1	√	√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BFU730F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU730LX	√	√		√	ADS 2011	ADS 2011	ADS 2011	-
BFU760F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-
BFU790F	√	√	√	√	ADS 2009, ADS 2011	ADS 2009, ADS 2011, Microwave Office	ADS 2009, ADS 2011, Microwave Office	-

4.6.2 Simulation models for RF MOSFET transistors

		Attached to PIP / model page			Supported simulators			
MOSFET	Demo board	S-parameters	Spice model	Mextram model	S-parameters	Spice model	Mextram model	Device model
PBR941		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
PRF947		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BF511		√			ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BF513		√			ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BF862		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BF862		√	√		ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BF904			√		-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BF908			√		-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-

4.6.3 Simulation models for RF MMIC amplifiers

		Attached to PIP / model page				Supported simulators			
MMIC	Demo board	S-parameters	Spice model	Mextram model	Device model	S-parameters	Spice model	Mextram model	Device model
BGA6589	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGA2800	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGA2801	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGA2815	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGA2866	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGA6130	√				√	-	-	-	ADS 2011
BGA3012	√	√			√	ADS 2011			ADS 2011
BGA3015	√	√			√	ADS 2011			ADS 2011
BGA3018	√	√			√	ADS 2011			ADS 2011
BGA7027	√	√				-	-	-	-
BGA7124	√	√				-	-	-	-
BGA7127	√	√				-	-	-	-
BGA7130	√				√	-	-	-	ADS 2011
BGM1013	√	√				ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-	-
BGU6102	√					-	-	-	-
BGU7031	√					-	-	-	-
BGU7032	√					-	-	-	-
BGU7033	√					-	-	-	-
BGU7041	√					-	-	-	-
BGU7042	√					-	-	-	-
BGU7044	√					-	-	-	-
BGU7045	√					-	-	-	-
BGU7050	√					-	-	-	-
BGU7051	√					-	-	-	-
BGU7052	√					-	-	-	-
BGU7053	√					-	-	-	-
BGU7061	√					-	-	-	-
BGU7062	√					-	-	-	-
BGU7063	√					-	-	-	-
BGU7064	√					-	-	-	-
BGU7003	√	√				-	-	-	-
BGU7003W	√					-	-	-	-
BGU7004	√	√				ADS 2011	-	-	-

Simulation models for RF MMIC amplifiers (continued)

		Attached to PIP / model page				Supported simulators			
MMIC	Demo board	S-parameters	Spice model	Mextram model	Device model	S-parameters	Spice model	Mextram model	Device model
BGU7005	√	√			√	ADS 2011	-	-	ADS 2011
BGU7007	√	√			√	ADS 2011	-	-	ADS 2011
BGU8006	√	√			√	ADS 2011	-	-	ADS 2011
BGU8007	√	√				ADS 2011	-	-	-
BGU8009	√	√			√	ADS 2011	-	-	ADS 2011
BGU7063	√					-	-	-	-
BGU7064	√					-	-	-	-
BGU7003	√	√				-	-	-	-
BGU7003W	√					-	-	-	-
BGU7004	√	√				ADS 2011	-	-	-
BGU7005	√	√			√	ADS 2011	-	-	ADS 2011
BGU7007	√	√			√	ADS 2011	-	-	ADS 2011
BGU8006	√	√			√	ADS 2011	-	-	ADS 2011
BGU8007	√	√				ADS 2011	-	-	-
BGU8009	√	√			√	ADS 2011	-	-	ADS 2011

4.6.4 Simulation models for RF varicap diodes

		Attached to PIP / model page				Supported simulators			
Varicap diode	Demo board	S-parameters	Spice model	Mextram model	Device model	S-parameters	Spice model	Mextram model	Device model
BB145B			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BB156			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BB201			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BB202			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BB207			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-
BB208-2			√			-	ADS 2009, ADS 2011, Microwave Office, Ansoft Designer	-	-

5. Replacement for discontinued parts

NXP end-of-life listings
www.nxp.com/products/eol/

5.1 Cross-references: NXP discontinued types versus NXP replacement types

In alphabetical order by discontinued type

NXP discontinued type	Product family NXP	close replacement
BB148	varicap diodes	BB170
BB152	varicap diodes	BB171
BB153	varicap diodes	BB172
BB173LX	varicap diodes	BB173
BB174LX	varicap diodes	BB174
BB178	varicap diodes	BB173
BB178/L	varicap diodes	BB173
BB178LX	varicap diodes	BB173
BB181LX	varicap diodes	BB181
BB182	varicap diodes	BB175
BB182/L	varicap diodes	BB175
BF1118	N-channel FET	no NXP replacement
BF1118R	N-channel FET	no NXP replacement
BF1118W	N-channel FET	no NXP replacement
BF1118WR	N-channel FET	no NXP replacement
BF904	N-channel FET	no NXP replacement
BF908	N-channel FET	no NXP replacement
BF908R	N-channel FET	no NXP replacement
BF908WR	N-channel FET	no NXP replacement
BF991	N-channel FET	no NXP replacement
BFG135	wideband transistor	BFU590G
BFG198	wideband transistor	BFU580G, BFU590G
BFG21W	power transistor	no NXP replacement
BFG31	PNP transistor	no NXP replacement
BFG410W	wideband transistor	BFU610F
BFG425W	wideband transistor	BFU630F
BFG480W	power transistor	no NXP replacement
BFG505	wideband transistor	BFU520
BFG505/X	wideband transistor	BFU520X
BFG520	wideband transistor	BFU550
BFG520/X	wideband transistor	BFU550X
BFG520/XR	wideband transistor	BFU550XR
BFG520W	wideband transistor	no NXP replacement, only with different package
BFG520W/X	wideband transistor	no NXP replacement, only with different package
BFG540	wideband transistor	BFU550
BFG540/X	wideband transistor	BFU550X
BFG540/XR	wideband transistor	BFU550XR
BFG540W	wideband transistor	no NXP replacement, only with different package
BFG540W/X	wideband transistor	no NXP replacement, only with different package
BFG540W/XR	wideband transistor	no NXP replacement, only with different package
BFG541	wideband transistor	BFU590G
BFG590/X	wideband transistor	no NXP replacement
BFG591	wideband transistor	BFU590G
BFG67	wideband transistor	BFU550
BFG67/X	wideband transistor	BFU550
BFG93A	wideband transistor	BFU530A
BFG97	wideband transistor	BFU580G, BFU590G
BFM505	wideband transistor	BFU520Y
BFM520	wideband transistor	BFU520Y
BFQ149	PNP transistor	no NXP replacement
BFQ19	wideband transistor	BFU5980Q
BFQ540	wideband transistor	BFU580Q, BFU590Q
BFQ591	wideband transistor	BFU590Q
BFQ67	wideband transistor	BFU530A
BFQ67W	wideband transistor	BFU530W
BFR106	wideband transistor	BFU550A
BFR505	wideband transistor	BFU520A
BFR520	wideband transistor	BFU550A
BFR520T	wideband transistor	no NXP replacement, only with different package
BFR540	wideband transistor	BFU550A
BFR92A	wideband transistor	BFU530A
BFR92AW	wideband transistor	BFU520W
BFR93A	wideband transistor	BFU530A
BFR93AW	wideband transistor	BFU530W
BFR94A	wideband transistor	BFU520A
BFS17	wideband transistor	BFU520A
BFS17A	wideband transistor	BFU520A
BFS17W	wideband transistor	BFU550W
BFS505	wideband transistor	BFU520W
BFS520	wideband transistor	BFU550W
BFS540	wideband transistor	BFU550W
BGA2001	wideband amplifier	depending application
BGA2002	wideband amplifier	depending application
BGA2011	wideband amplifier	depending application
BGA2031	wideband amplifier	depending application
BGA2711	wideband amplifier	depending application
BGA2714	wideband amplifier	BGA2803
BGA2716	wideband amplifier	BGA2866
BGA2748	wideband amplifier	BGA2803
BGA2771	wideband amplifier	depending application
BGA6289	power amplifier	BGA7024
BGM1014	wideband amplifier	BGA2869
BLT70	power transistor	no NXP replacement
BLT80	power transistor	no NXP replacement
BSR56	N-channel FET	no NXP replacement
BSR58	N-channel FET	no NXP replacement
ON4832	wideband transistor	BFU550X
ON5023	wideband transistor	BFU520A
PBR951	wideband transistor	BFU550A
PMBF4392	N-channel FET	no NXP replacement
PMBFJ111	N-channel FET	no NXP replacement
PMBFJ112	N-channel FET	no NXP replacement
PMBFJ113	N-channel FET	no NXP replacement
PMBFJ174	P-channel FET	no NXP replacement
PMBFJ175	P-channel FET	no NXP replacement
PMBFJ176	P-channel FET	no NXP replacement
PRF949	wideband transistor	BFU550W
PRF957	wideband transistor	BFU550W

6. Packing and packaging information

6.1 Packing quantities per package with relevant ordering codes

Package	Package dimentions (L x W x H, mm)	Packing quantity	Product 12NC ending	Packing method
SOD323	2.1x1.25x0.9	3000	115	PM T+R 3K 115 SOD323 1.25X1.7
		10000	135	PM T+R 10K 135 SOD323 1.25X1.7
SOD523	1.6x0.83x0.63	3000	115	PM T+R 3K 115 SOD523 0.83X1.6
		10000	135	PM T+R 10K 135 SOD523 0.83X1.6
		20000	335	PM T+R 20K 335 SOD523 0.83X1.6
SOD882	1x0.6x0.37	10000	315	PM T+R 10K 315 SOD882D 0.6X1CC
SOT1092	6x6x0.82	4000	518	PM T+R 330X16 HVQFN 6X6 DP
SOT1189	1.6x1.6x0.5	4000	115	PM T+R 180X8 XSON 1.6X1.6
SOT1209	2x1.3x0.35	5000	147	PM T+R 5K 147 XSON 1.3x2.00
SOT1226	0.8x0.8x0.33	10000	147	TR 10K 147 Q2 SOT1226C
SOT1230	1.1x0.9x0.47	5000	115	PM T+R 5K 115 SOT1230 0.9X1.1
SOT1232	1.1x0.7x0.37	5000	115	PM T+R 5K 115 SOT1232 1.1X0.7
SOT1234	1.4x1.2x0.32	5000	147	TR 5K 147 Q2 SOT1234-1
SOT1260	1.5x1.5x0.33	5000	147	TR 5K 147 Q2 SOT1260-1
SOT1261	2x2x0.3	5000	147	TR 5K 147 Q2 SOT1261-1
SOT1301	8x8x1.3	2000	518	TR 330X16 8.40x8.40 518 Q1
SOT1327	2x2x0.75	2000	115	PM T+R 180X8 HWSON 2.0X2.0
SOT1359	5x5x0.72	6000	518	TR 330X12 HVQFN 5X5 DP 518
SOT143	2.9x1.25x0.9	3000	215	PM T+R 3K 215 SOT143 1.25X2.9
		10000	235	PM T+R 10K 235 SOT143 1.25X2.9
SOT1431	5x5x0.72	6000	518	TR 6K 518 Q1 SOT1431-1 DP
SOT1436	1.7x2x0.33	15000	128	TR 15K 128 Q2 SOT1436-1
		5000	147	TR 5K 147 Q2 SOT1436-1
SOT223	6.5x3.5x1.6	1000	115	PM T+R 1K 115 SOT223 3.5X6.66
		4000	135	PM T+R 4K 135 SOT223 3.5X6.66
SOT23	2.9x1.3x1.1	3000	215	PM T+R 3K 215 SOT23 1.3X2.9
		10000	235	PM T+R 10K 235 SOT23 1.3X2.9
SOT323	2.1x1.25x0.9	3000	115	PM T+R 3K 115 SOT323 1.25X2.1
		10000	135	PM T+R 10K 135 SOT323 1.25X2.1
SOT343	2.1x1.25x0.9	3000	115	PM T+R 3K 115 SOT343 1.25X2.1
		10000	135	PM T+R 10K 135 SOT343 1.25X2.1
SOT363	2.1x1.25x0.9	3000	115	PM T+R 3K 115 SOT363 1.25X2
		10000	135	PM T+R 10K 135 SOT363 1.25X2
SOT416	1.6x0.8x0.75	3000	115	PM T+R 3K 115 SOT416 0.8X1.6
SOT616	4x4x.085	1500	115	PM T+R 180X12 HVQFN 4X4
		6000	118	PM T+R 330X12 HVQFN 4X4
		490	111	PM 1 TRAY JEDEC HVQFN (S4)
		6000	518	PM T+R 330X12 HVQFN 4X4 DP
		2450	557	PM 5 TRAY JEDEC HVQFN (S4) DP
SOT617	5x5x0.85	1500	115	PM T+R 180X12 HVQFN 5X5
SOT618	6x6x0.9	4000	518	PM T+R 330X16 HVQFN 6X6 DP
SOT619	7x7x0.85	2000	518	PM T+R 330X16 HVQFN 7X7 DP
SOT650	35x35x2.67	6000	118	PM T+R 330X12 HVSON 3X3
SOT662	5x5x0.85	6000	118	PM T+R 330X12 HVQFN 5X5
		1000	115	PM REEL 180X12 HVQFN (S5)
SOT753	2.75x1x0.95	3000	125	PM T+R 3K 125 SOT753 1X2.75
SOT763	3.5x2.5x0.85	6000	135	PM T+R 330X12 DHVQFN 2.5X3.5
		3000	115	PM T+R 180X12 DHVQFN 2.5X3.5
SOT786	4.9x3.9x1.5	2500	518	PM T+R 330X12 HSO 3.9X4.9 DP
SOT883	1x0.6x0.34	10000	225	PM T+R 10K 225 SOT883C 0.6X1CC
SOT886	1.45x1x0.5	5000	125	PM T+R 5K 125 SOT886 1.45X1 CC
SOT89	4.5x2.5x1.6	1000	115	PM T+R 1K 115 SOT89 2.5X4.5
		4000	135	PM T+R 4K 135 SOT89 2.5X4.5
SOT891	1x1x0.5	5000	132	PM REEL 5K 132 SOT891 CC HMB
SOT908	3x3x0.85	6000	118	PM T+R 330X12 HVSON 3X3

PM: packing method, T+R: tape and reel, TR: tray, DP: dry pack

6.2 Marking codes

In general, device marking includes the part number, some manufacturing information, and the NXP logo. If packages are too small for the full-length part number, a shorter, coded part number (called the "marking code") is used instead. To save space, the marking code uses a % symbol in place of the manufacturing-site code. The full-length part number is always printed on the packing label on the box or bulk-pack in which the devices are supplied.

t = made in Malaysia
W = made in China

Marking code	Type	Package
A1	BA591	SOD323
7	BA891	SOD523
1001 0010	BAP142LX	SOD882
K4	BAP50-02	SOD523
A8	BAP50-03	SOD323
4L%	BAP50-04	SOT23
6W%	BAP50-04W	SOT323
1C%	BAP50-05	SOT23
W4%	BAP50-05W	SOT323
1001 0011	BAP50LX	SOD882
K1	BAP51-02	SOD523
A5	BAP51-03	SOD323
W6%	BAP51-04W	SOT323
%1W	BAP51-05W	SOT323
W7%	BAP51-06W	SOT323
1001 0011	BAP51LX	SOD882
1111 1101	BAP55LX	SOD882
S	BAP64-02	SOD523
A3	BAP64-03	SOD323
4K%	BAP64-04	SOT23
4W%	BAP64-04W	SOT323
5K%	BAP64-05	SOT23
5W%	BAP64-05W	SOT323
6K%	BAP64-06	SOT23
V4%	BAP64-06W	SOT323
1111 1111	BAP64LX	SOD882
A1	BAP64Q	SOT753
K6	BAP65-02	SOD523
D3	BAP65-03	SOD323
7K%	BAP65-05	SOT23
V6%	BAP65-05W	SOT323
1001 0110	BAP65LX	SOD882
K8	BAP70-02	SOD523
A9	BAP70-03	SOD323
1N%	BAP70-04W	SOT323
8K%	BAP70-05	SOT23
N9%	BAP70AM	SOT363
A2	BAP70Q	SOT753
10%	BAT18	SOT23
P1	BB131	SOD323
P5	BB135	SOD323
Z	BB145B	SOD523
PF	BB156	SOD323
4H	BB170	SOD323
4J	BB171	SOD323
4K	BB172	SOD323
CE	BB173	SOD523
CF	BB174	SOD523
CH	BB175	SOD523
N	BB181	SOD523
SC%	BB201	SOT23
L2	BB202	SOD523
%13	BB207	SOT23
A1	BB208-02	SOD523
A2	BB208-03	SOD323
S2%	BBY40	SOT23
S6%	BF510	SOT23
S7%	BF511	SOT23
S8%	BF512	SOT23
S9%	BF513	SOT23
20%	BF545A	SOT23
21%	BF545B	SOT23
22%	BF545C	SOT23
24%	BF556A	SOT23
28%	BF861A	SOT23
29%	BF861B	SOT23
30%	BF861C	SOT23
2A%	BF862	SOT23
BFG35	BFG35	SOT223
FF	BFQ18A	SOT89
M1%	BFR30	SOT23
M2%	BFR31	SOT23
N6%	BFS25A	SOT323
V1%	BFT25	SOT23
34%	BFT25A	SOT23
M3%	BFT46	SOT23
W1%	BFT92	SOT23
W1%	BFT92W	SOT323
X1%	BFT93	SOT23
X1%	BFT93W	SOT323
%TA	BFU520	SOT143
HZ%	BFU520A	SOT23
ZA%	BFU520W	SOT323
%TE	BFU520X	SOT143
%TJ	BFU520XR	SOT143
WB%	BFU520Y	SOT363
%TB	BFU530	SOT143
HY%	BFU530A	SOT23
ZB%	BFU530W	SOT323
%TF	BFU530X	SOT143
%TK	BFU530XR	SOT143
%TC	BFU550	SOT143
HW%	BFU550A	SOT23
ZC%	BFU550W	SOT323
%TG	BFU550X	SOT143
%TL	BFU550XR	SOT143
BFU580G	BFU580G	SOT223
S58	BFU580Q	SOT89
BFU590G	BFU590G	SOT223
S59	BFU590Q	SOT89
D1%	BFU610F	SOT343
D2%	BFU630F	SOT343
D3%	BFU660F	SOT343
ZA%	BFU668F	SOT343
D4%	BFU690F	SOT343
D5%	BFU710F	SOT343
B7%	BFU725F/N1	SOT343
D6%	BFU730F	SOT343
ZD	BFU730LX	SOT883
D7%	BFU760F	SOT343
ZB%	BFU768F	SOT343
D8%	BFU790F	SOT343
F1%	BFU910F	SOT343
A6%	BGA2012	SOT363
%E7	BGA2800	SOT363
%E8	BGA2801	SOT363
MA%	BGA2802	SOT363
MB%	BGA2803	SOT363
%E9	BGA2815	SOT363
LS%	BGA2817	SOT363
TA%	BGA2818	SOT363
MC%	BGA2851	SOT363
%ED	BGA2866	SOT363
LP%	BGA2867	SOT363
MD%	BGA2869	SOT363
YC%	BGA2870	SOT363
LR%	BGA2874	SOT363
%6W	BGA3012	SOT89
%6X	BGA3015	SOT89
%6Y	BGA3018	SOT89
BGA3021	BGA3021	SOT786
BGA3022	BGA3022	SOT786
BGA3023	BGA3023	SOT786
3031	BGA3031	SOT662
3131	BGA3131	SOT662
6130	BGA6130	SOT908
%4A	BGA6489	SOT89
%5A	BGA6589	SOT89

Marking code	Type	Package
%6K	BGA7024	SOT89
%6L	BGA7027	SOT89
7124	BGA7124	SOT908
7127	BGA7127	SOT908
7130	BGA7130	SOT908
7204	BGA7204	SOT617
7210	BGA7210	SOT617
7350	BGA7350	SOT617
7351	BGA7351	SOT617
458	BGF8458	SOT1436
C4%	BGM1013	SOT363
24	BGS8324	SOT1261
58	BGS8358	SOT1260
24	BGS8424	SOT1260
58	BGS8458	SOT1234
U	BGS8C5	SOT1232
P	BGS8H2	SOT1232
R	BGS8H5	SOT1232
J	BGS8L2	SOT1232
S	BGS8L5	SOT1232
N	BGS8M2	SOT1232
T	BGS8U5	SOT1232
D1	BGU6005/N2	SOT886
W	BGU6009/N2	SOT1230
1A	BGU6101	SOT1209
1B	BGU6102	SOT1209
1C	BGU6104	SOT1209
B3	BGU7003	SOT891
UW	BGU7003W	SOT886
UY	BGU7004	SOT886
AC	BGU7005	SOT886
D1	BGU7005/Z/N2	SOT886
B6	BGU7007	SOT886
B7	BGU7008	SOT886
SC%	BGU7031	SOT363
SD%	BGU7032	SOT363
SE%	BGU7033	SOT363
%VA	BGU7041	SOT363
%VB	BGU7042	SOT363

Marking code	Type	Package
LJ%	BGU7044	SOT363
LK%	BGU7045	SOT363
BGU7060	BGU7060	SOT1301
BGU7061	BGU7061	SOT1301
BGU7062N2	BGU7062N2	SOT1301
BGU7063	BGU7063	SOT1301
BGU7073	BGU7073	SOT1301
BGU7075	BGU7075	SOT1301
BGU7078	BGU7078	SOT1301
224	BGU7224	SOT1189
258	BGU7258	SOT1189
UZ	BGU8007	SOT886
A	BGU8009	SOT1230
B	BGU8010	SOT1230
C	BGU8011	SOT1230
A	BGU8019	SOT1232
G	BGU8019W/N2	SOT1230
B	BGU8020	SOT1232
51	BGU8051	SOT1327
52	BGU8052	SOT1327
53	BGU8053	SOT1327
8061	BGU8061	SOT650
8062	BGU8062	SOT650
8063	BGU8063	SOT650
G	BGU8103	SOT1232
A	BGU8309	SOT1226
u8821	BGU8821	SOT1431
u8822	BGU8822	SOT1431
u8823	BGU8823	SOT1431
F	BGU8H1	SOT1232
D	BGU8L1	SOT1232
E	BGU8M1	SOT1232
7100	BGX7100HN/1	SOT616
7101	BGX7101HN/1	SOT616
BGX7220	BGX7220HN/1	SOT1092
BGX7221	BGX7221HN/1	SOT1092
BLT50	BLT50	SOT223
BLT81	BLT81	SOT223
B5%	BSR12	SOT23

Marking code	Type	Package
M5%	BSR57	SOT23
BTS5101M	BTS5101M	SOT1301
ON5046	ON5046	SOT223
%7N	ON5087	SOT343
%6N	ON5088	SOT343
%8N	ON5089	SOT343
ZE%	ON5096	SOT343
IT12P	ON7800	SOT662
8077	ON8077	SOT1359
V0%	PBR941	SOT23
LB%	PBR941B	SOT23
%6J	PMBF4391	SOT23
%6g	PMBF4393	SOT23
38%	PMBFJ108	SOT23
39%	PMBFJ109	SOT23
40%	PMBFJ110	SOT23
%6Y	PMBFJ177	SOT23
48%	PMBFJ308	SOT23
49%	PMBFJ309	SOT23
V0%	PRF947	SOT323
1003	TFF1003HN/N1	SOT616
1007	TFF1007HN/N1	SOT616
T1012	TFF1012HN/N1	SOT763
T1013	TFF1013HN/N1	SOT763
T1014	TFF1014HN/N1	SOT763
T1015	TFF1015HN/N1	SOT763
T1017	TFF1017HN/N1	SOT763
T1018	TFF1018HN/N1	SOT763
T1024	TFF1024HN/N1	SOT763
T1025	TFF1025HN/N1	SOT763
T1044	TFF1044HN/N1	SOT1359
T086	TFF11086HN/N1	SOT616
T092	TFF11092HN/N1	SOT616
T096	TFF11096HN/N1	SOT616
T101	TFF11101HN/N1	SOT616
T139	TFF11139HN/N1	SOT616
T142	TFF11142HN/N1	SOT616
T145	TFF11145HN/N1	SOT616

7. Product index

Type	New name	Chapter
BA591	-	3.3.3
BA891	-	3.3.3
BAP142LX	-	3.3.2
BAP50-02	-	3.3.2
BAP50-03	-	3.3.2
BAP50-04	-	3.3.2
BAP50-04W	-	3.3.2
BAP50-05	-	3.3.2
BAP50-05W	-	3.3.2
BAP50LX	-	3.3.2
BAP51-02	-	3.3.2
BAP51-03	-	3.3.2
BAP51-04W	-	3.3.2
BAP51-05W	-	3.3.2
BAP51-06W	-	3.3.2
BAP51LX	-	3.3.2
BAP55LX	-	3.3.2
BAP64-02	-	3.3.2
BAP64-03	-	3.3.2
BAP64-04	-	3.3.2
BAP64-04W	-	3.3.2
BAP64-05	-	3.3.2
BAP64-05W	-	3.3.2
BAP64-06	-	3.3.2
BAP64-06W	-	3.3.2
BAP64LX	-	3.3.2
BAP64Q	-	3.3.2
BAP65-02	-	3.3.2
BAP65-03	-	3.3.2
BAP65-05	-	3.3.2
BAP65-05W	-	3.3.2
BAP65LX	-	3.3.2
BAP70-02	-	3.3.2
BAP70-03	-	3.3.2
BAP70-04W	-	3.3.2
BAP70-05	-	3.3.2
BAP70AM	-	3.3.2
BAP70Q	-	3.3.2
BAT18	-	3.3.3
BB131	-	3.3.1
BB135	-	3.3.1
BB145B	-	3.3.1
BB156	-	3.3.1
BB170	-	3.3.1
BB171	-	3.3.1
BB172	-	3.3.1
BB173	-	3.3.1
BB174	-	3.3.1
BB175	-	3.3.1
BB181	-	3.3.1
BB201	-	3.3.1
BB202	-	3.3.1
BB207	-	3.3.1
BB208-02	-	3.3.1
BB208-03	-	3.3.1
BBY40	-	3.3.1
BF1105R	-	3.4.2
BF1107	-	3.4.2
BF1108	-	3.4.2
BF1108R	-	3.4.2
BF510	-	3.4.2
BF511	-	3.4.2
BF512	-	3.4.2
BF513	-	3.4.2
BF545A	-	3.4.2
BF545B	-	3.4.2
BF545C	-	3.4.2
BF556A	-	3.4.2
BF861A	-	3.4.2
BF861B	-	3.4.2
BF861C	-	3.4.2
BF862	-	3.4.2
BF992	-	3.4.2
BF994S	-	3.4.2
BF996S	-	3.4.2
BFG35	-	3.2.1
BFQ18A	-	3.2.1
BFR30	-	3.4.2
BFR31	-	3.4.2
BFS25A	-	3.2.1
BFT25	-	3.2.1
BFT46	-	3.4.2
BFT92	-	3.2.1
BFT92W	-	3.2.1
BFT93	-	3.2.1
BFT93W	-	3.2.1
BFU520	-	3.2.1
BFU520A	-	3.2.1
BFU520W	-	3.2.1
BFU520X	-	3.2.1
BFU520XR	-	3.2.1
BFU520Y	-	3.2.1
BFU530	-	3.2.1
BFU530A	-	3.2.1
BFU530W	-	3.2.1
BFU530X	-	3.2.1
BFU530XR	-	3.2.1
BFU550	-	3.2.1
BFU550A	-	3.2.1
BFU550W	-	3.2.1
BFU550X	-	3.2.1
BFU550XR	-	3.2.1
BFU580G	-	3.2.1
BFU580Q	-	3.2.1
BFU590G	-	3.2.1
BFU590Q	-	3.2.1
BFU610F	-	3.2.1
BFU630F	-	3.2.1
BFU660F	-	3.2.1
BFU690F	-	3.2.1
BFU710F	-	3.2.1
BFU725F/N1	-	3.2.1
BFU730F	-	3.2.1
BFU730LX	-	3.2.1
BFU760F	-	3.2.1
BFU768F	-	3.2.1
BFU790F	-	3.2.1
BFU910F	-	3.2.1
BGA2012	-	3.1.1
BGA2031/1	-	3.1.3
BGA2800	-	3.1.2
BGA2801	-	3.1.2
BGA2802	-	3.1.2
BGA2803	-	3.1.2
BGA2815	-	3.1.2
BGA2817	-	3.1.2
BGA2818	-	3.1.2
BGA2851	-	3.1.2
BGA2866	-	3.1.2
BGA2867	-	3.1.2
BGA2869	-	3.1.2
BGA2870	-	3.1.2

Type	New name	Chapter
BGA2874	-	3.1.2
BGA3012	-	3.1.2
BGA3015	-	3.1.2
BGA3018	-	3.1.2
BGA3021	-	3.1.2
BGA3022	-	3.1.2
BGA3023	-	3.1.2
BGA3031	-	3.1.3
BGA3131	-	3.1.3
BGA6130	-	3.1.4
BGA6489	-	3.1.4
BGA6589	-	3.1.4
BGA7024	-	3.1.4
BGA7027	-	3.1.4
BGA7124	-	3.1.4
BGA7127	-	3.1.4
BGA7130	-	3.1.4
BGA7204	-	3.1.3
BGA7210	BTS6001A	3.1.3
BGA7350	-	3.1.3
BGA7351	-	3.1.3
BGF8458	WLAN7001C	3.1.1
BGM1013	-	3.1.2
BGS8324	WLAN3001H	3.1.1
BGS8358	WLAN3001C	3.1.1
BGS8424	WLAN3101H	3.1.1
BGS8458	WLAN3101C	3.1.1
BGS8L2	LTE3001L	3.1.1
BGS8M2	LTE3001M	3.1.1
BGS8H2	LTE3001H	3.1.1
BGS8L5	LTE3301L	3.1.1
BGS8H5	LTE3301H	3.1.1
BGS8C5	LTE3301C	3.1.1
BGS8U5	LTE3301U	3.1.1
-	LTE3401L	3.1.1
BGU6005	GPS1001M	3.1.1
BGU6009	GPS1002M	3.1.1
BGU6101	-	3.1.1

Type	New name	Chapter
BGU6102	-	3.1.1
BGU6104	-	3.1.1
BGU7003	-	3.1.1
BGU7003W	-	3.1.1
BGU7004	GPS1103M	3.1.1
BGU7005	GPS1101M	3.1.1
BGU7007	GPS1102M	3.1.1
BGU7008	GPS1104M	3.1.1
BGU7031	-	3.1.1
BGU7032	-	3.1.1
BGU7033	-	3.1.1
BGU7041	-	3.1.1
BGU7042	-	3.1.1
BGU7044	-	3.1.1
BGU7045	-	3.1.1
BGU7060	-	3.1.1
BGU7061	-	3.1.1
BGU7062N2	-	3.1.1
BGU7063	-	3.1.1
BGU7073	BTS5001M	3.1.1
BGU7075	BTS5001H	3.1.1
BGU7078	BTS5002M	3.1.1
BGU7224	-	3.1.1
BGU7258	-	3.1.1
BGU8004	-	3.1.1
BGU8006	-	3.1.1
BGU8007	-	3.1.1
BGU8009	GPS1201M	3.1.1
BGU8010	-	3.1.1
BGU8011	-	3.1.1
BGU8019	GPS1202M	3.1.1
BGU8103	GPS1301M	3.1.1
BGU8309	GPS1401M	3.1.1
BGU8051	BTS1001L	3.1.1
BGU8052	BTS1001M	3.1.1
BGU8053	BTS1001H	3.1.1
BGU8061	BTS3001L	3.1.1
BGU8062	BTS3001M	3.1.1

Type	New name	Chapter
BGU8063	BTS3001H	3.1.1
BGU8L1	LTE1001L	3.1.1
BGU8M1	LTE1001M	3.1.1
BGU8H1	LTE1001H	3.1.1
BGX7100	-	3.1.5
BGX7101	BTS8001A	3.1.5
BGX7220	-	3.1.5
BGX7221	-	3.1.5
BLT50	-	3.2.1
BLT81	-	3.2.1
PBR941	-	3.2.1
PMBF4391	-	3.4.2
PMBF4393	-	3.4.2
PMBFJ108	-	3.4.2
PMBFJ109	-	3.4.2
PMBFJ110	-	3.4.2
PMBFJ177	-	3.4.2
PMBFJ308	-	3.4.2
PMBFJ309	-	3.4.2
PRF947	-	3.2.1
TFF1003HN	-	3.1.5
TFF1007HN	-	3.1.5
TFF1012HN	-	3.1.5
TFF1013HN	-	3.1.5
TFF1014HN	-	3.1.5
TFF1015HN	-	3.1.5
TFF1017HN	-	3.1.5
TFF1018HN	-	3.1.5
TFF1024HN	-	3.1.5
TFF1044HN	-	3.1.5
TFF11088HN	-	3.1.5
TFF11092HN	-	3.1.5
TFF11096HN	-	3.1.5
TFF11101HN	-	3.1.5
TFF11132HN	-	3.1.5
TFF11139HN	-	3.1.5
TFF11142HN	-	3.1.5
TFF11145HN	-	3.1.5



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