



GPS front-end components for mobile and wireless application



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Infineon technologies offers complete range of RF front-end components for satellite-based global navigation systems

Satellite-based navigation systems, in particular GPS (global positioning system), are among the fastest growing businesses in the semiconductor industry. According to the market research company IMS Research, it is expected that approximately 200 million GPS units was sold in 2008. The most important market segments in 2008 are personal navigation devices (PNDs, 15% of the worldwide GPS market) and GPS-enabled mobile phones (79% of the worldwide GPS market).

Looking forward to 2011, the global GPS market is expected to grow with a compound annual growth rate (CAGR) of 38%. The underlying contributor to this growth is the GPS-enabled mobile phone market (CAGR = 31%) and the market for GPS-enabled digital cameras (CAGR = 207%).

INFINEON TECHNOLOGIES OFFERS A COMPLETE PRODUCT PORTFOLIO TO ALL CUSTOMERS DESIGNING HIGH-END FLEXIBLE RF FRONT-END SOLUTIONS FOR GPS THAT INCLUDES:

- **Low noise amplifiers (LNA):** consisting of a wide range of products including cost-effective, high-end RF transistors and MMICs (monolithic microwave integrated circuits)
- **Front-End Module (FEM):** LNAs and band-pass filters integrated into a single small package
- **Transient voltage suppression (TVS) diodes:** protecting GPS antenna highly reliably up to 20kV
- **RF Switches:** allow for diversity architectures

Infineon's latest GPS LNA BGA715L7 contributes to increased battery lifetime with a very low power consumption of only 5.9mW, approximately 20% lower than with alternative solutions which are available on the market. BGM781N11 including two band-pass filters and one LNA shows the most compact GPS FE module in the market with excellent jammer signal rejection.

Before you start to design your next generation RF front-end for GPS units, it will definitely be worth looking through the

The architecture and the performance data of the so-called RF front-end is the key contributor to fulfill strict requirements of the GPS system, because it consists of the whole line-up between the GPS antenna and the integrated GPS chipset. The main challenges for the growing GPS-enabled mobile phone market are to achieve high sensitivity and high immunity against interference of cellular signals driven by government regulations for safety and emergency reasons, for example, in the US and Japan. This means reception for GPS signals at very low power levels down to less than -160dBm in mobile phones has to be ensured indoors and even in underground parking lots. In addition, excellent ESD robustness characteristics and low power consumption for long battery usage duration are mandatory features for portable and mobile phones.

following brochure. After reviewing the brochure, you will find out how the level of receive sensitivity, the battery lifetime, the level of ESD protection, and the flexibility of your design can be tremendously boosted with Infineon's GPS products.

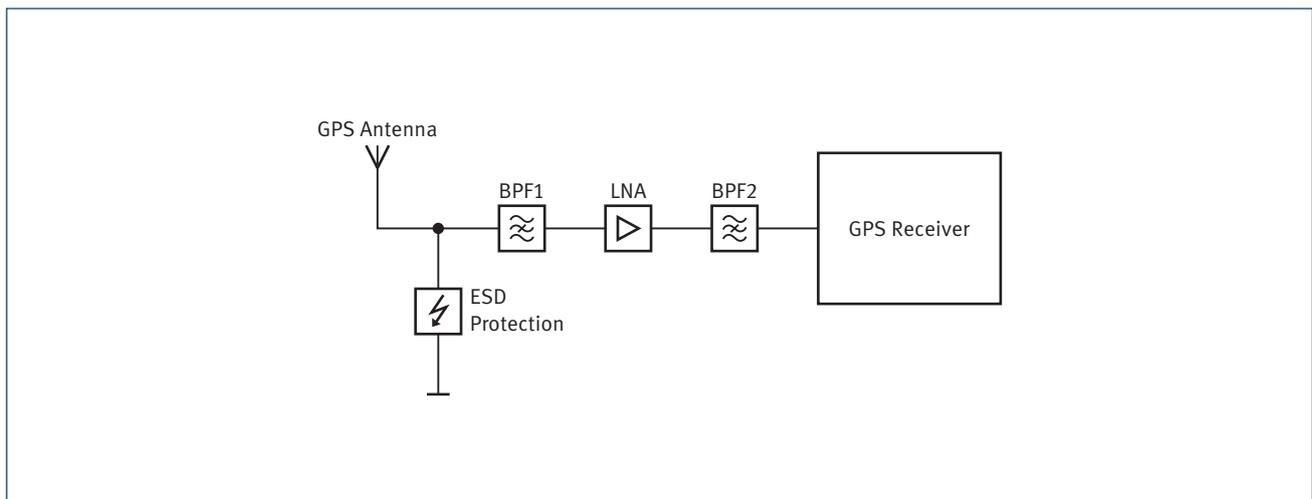
Please visit Infineon's RF & Protection Devices GPS Web page to explore our front-end solutions for your GPS-enabled products, at www.infineon.com/GPS. Ask your local sales representative for your own design kit for GPS.



Infineon's expertise in GPS front-end

Below is a general block diagram for GPS functionality in a device. From the antenna looking into GPS receiver, the ESD device protects the RF front-end against ESD hazards coming from ANT when it makes contact with the external environment. In modern wireless handheld systems, 8 kV contact discharge ESD protection according to the IEC61001-4-2 standard is a minimum requirement to protect the system. Infineon's low-capacitance TVS diodes provide excellent ESD protection levels that are widely used to protect the pre-filter

in GPS systems today. After the pre-filter, a good low noise amplifier (LNA) with high gain of 20dB and low noise figure of 0.6dB is mandatory to amplify the very weak GPS signals from satellites that arrive at the receiver's antenna with power levels of the order of -130 to -160dBm. From widely used LNAs, such as BGA615L7 and BFP640 to the newest LNAs BGA715L7 and BFP740F with the lowest noise figure of 0.6dB, Infineon provides customers the best LNA choices to realize outstanding GPS receiver designs.



Highly integrated GPS front-end solutions include pre-filter (BPF1), LNA and post-filter (BPF2) which enable customers to realize compact GPS function in mobile and portable devices. The pre-filter protects the LNA from being overdriven by jammer signals, e.g. cellular and WLAN transmit signals in the same device or from devices nearby, improving receiver blocking performance. The pre-filter's attenuation of the jammer signals also helps prevent undesired spurious signals from being generated in the LNA, some of which may fall directly on the desired GPS signal. The overall noise figure is dominated by the insertion loss of pre-filter and the noise figure of the LNA. The post-filter further reduces any jammer

signals that are present to provide additional protection to the receiver from saturation.

In summary, highly integrated GPS front-end solutions offer a well-optimized combination of low noise figure, high gain, high power handling capability and excellent desense characteristics to shorten the design cycle at the customer side along with using an extremely small PCB area for mobile and portable devices. Infineon enables customers to realize total front-end GPS solutions with components from a single supplier.

Highly integrated GPS low noise amplifiers and front-end modules

Infineon Technologies is a market leader in GPS LNAs and has good alignment with various reference designs for GPS applications in PND and cellular markets.

Infineon's GPS LNA product portfolio consists of a wide range of LNAs including MMICs, front-end modules (FEMs), and RF transistors. Using Infineon's leading SiGe:C bipolar transistors with integrated bias and matching, MMICs provide for easy usage, reduced external component count and short design

cycles to realize the GPS LNA function. The front-end module integrates LNA and filters in one single tiny package to provide solutions with smaller form factor and well-optimized performance in the GPS front-end for customers. Infineon's GPS LNA products have excellent features including low noise figure, high gain, high linearity, high levels of ESD protection and low current consumption to fulfill customers' needs to satisfy the increasing requirements of GPS systems.

CUSTOMER BENEFITS WITH INFINEON'S GPS LNAs:

- Best-in-class performance in key parameters
- Broad portfolio for both high-end and cost-effective solutions
- Leading high-volume supplier in RF transistors and MMICs
- Leading supplier in GPS
- Complete solution provider for GPS front-end
- Easy circuit & board design with excellent technical support

Please visit www.infineon.com/rfmmic to find more information about Infineon's MMICs for GPS and other applications.

PRODUCT LIST AND KEY PARAMETERS OF GPS MMICs AND FRONT-END MODULES

Product name	Gain (dB)	NF (dB)	IP _{-1dB} (dBm)	IIP ₃ (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
Front-end module									
BGM781N11	18.6	1.7	-15	-7	1.5...3.6	3.3	2	AN184	TSNP-11-2
MMICs									
BGA715L7	20	0.6	-15	-5	1.5...3.6	3.3	3	AN161	TSLP-7-1
BGA615L7	18	0.9	-13	-2	2.4...3.6	5.6	5	AN91, AN93	TSLP-7-1
BGA461	19	1.0	-14	-3	2.4...3.6	4.0	6	-	TSLP-7-4
BGA628L7	20.2	1.1	-23	-6.8	1.5...3.6	6.0	6	TR120	TSLP-7-8
BGA622	15	1.0	-17	-2	1.5...3.6	6.0	5	AN86	SOT343
BGA622L7	18	1.0	-20	-4	1.5...3.6	6.0	5	AN90	TSLP-7-1
BGA428	21	1.3	-19	-9	2.4...3.6	8.2	4	AN62	SOT363

Note:
 Gain: power gain measured of the application circuit in 50Ω system
 NF: noise figure
 IP_{-1dB}: input 1dB-compression point
 IIP₃: input 3rd-order intermodulation point
 #Ext: number of required external components used in the application circuit



Highly integrated GPS front-end module – BGM781N11

The highly integrated BGM781N11 is the world's smallest GPS front-end module. It includes the pre-filter, LNA and post-filter in one package with the measurements of $2.5 \times 2.5 \times 0.7 \text{mm}^3$. The BGM781N11 gives customers the smart solution to minimize their form factor while offering a first class combination of noise figure, gain, jammer signal desense, and ESD protection. The BGM781N11 is the perfect match to help customers realize their GPS functions in mobile phones, PNDs and active antenna applications.

The BGM781N11 contains the pre-filter that helps prevent the LNA from saturating because of the strong jammer signals coming

from collocated cellular transceivers. The high-gain SiGe LNA helps to reduce the system noise figure and enhance the sensitivity of the GPS system. And with the post-filter, the BGM781N11 offers a signal selectivity up to 90dBm for the purpose of reducing the jammer signals to ensure GPS reception in the worst conditions. Below is the application circuit of BGM681L11 with only two external components. Together with the ESD diode at input, the module has 8.0kV IEC ESD protection at the antenna port, customers can easily achieve their system ESD requirements (usually 8.0kV) without additional ESD protection devices.

KEY PARAMETERS OF BGM781N11 AT DC AND 1.575GHz

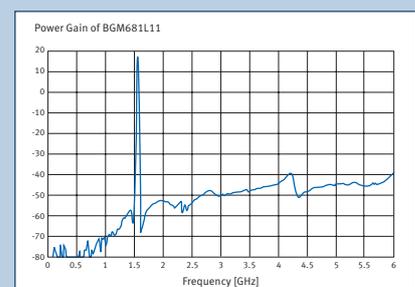
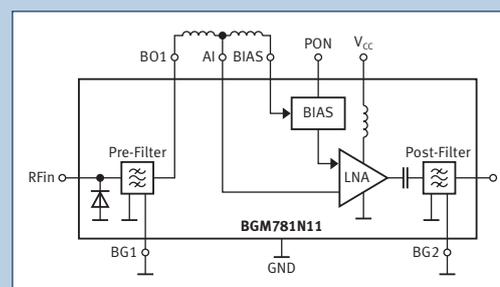
Product name	Gain (dB)	NF (dB)	IP_{-1dB} (dBm)	IIP_3 (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
BGM781N11	18.6	1.7	-15	-7	1.5...3.6	3.3	2	AN184	TSLP-11-2

KEY OUT-OF-BAND PARAMETERS OF BGM781N11

Product name	Jammer signal selectivity (dBc)			$IP_{-1dB}^{(1)}$ (dBm)	$IIP_3^{(2)}$ (dBm)
	900MHz	1,800MHz	2,400MHz		
BGM781N11	90	80	72	20	47

Notes:

- 1) measured with 900, 1,800 or 2,400MHz jammer signal
- 2) measured with two tones of 0dBm at $f_1 = 1,713 \text{MHz}$ and $f_2 = 1,851 \text{MHz}$.





Best-in-class LNA – BGA715L7

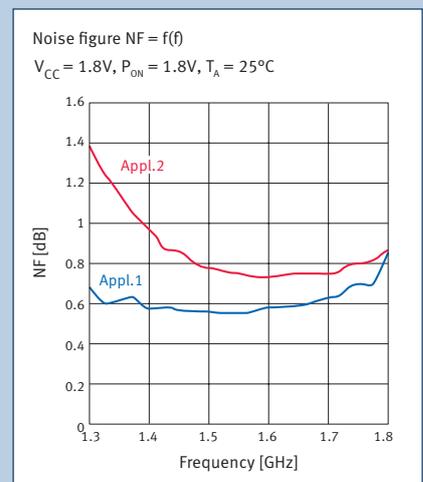
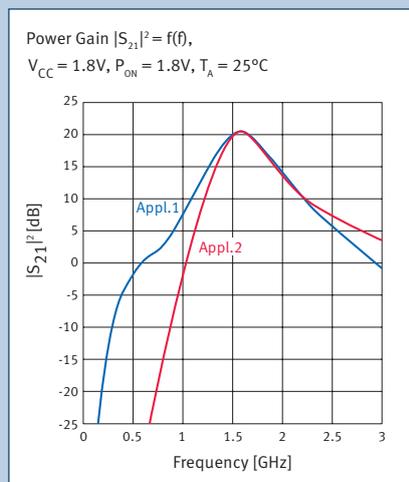
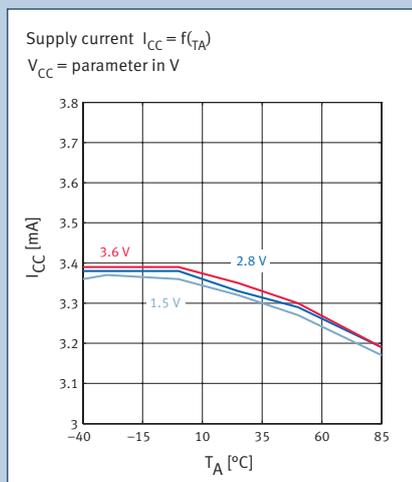
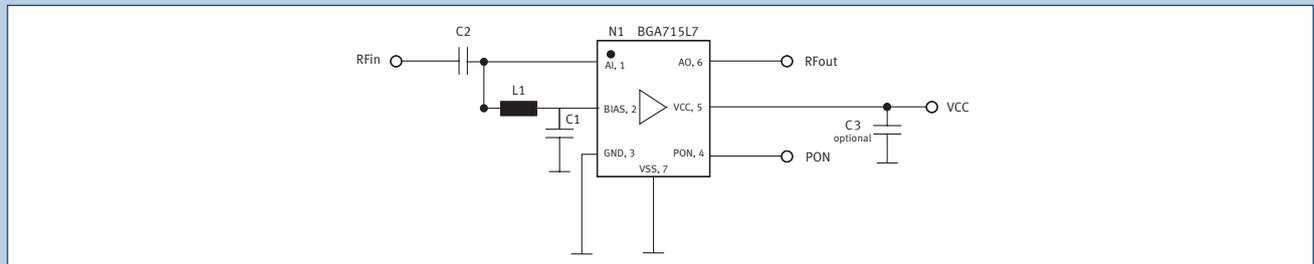
Customers remark that the brand new BGA715L7 is “the LOWEST low noise amplifier” on the market. The BGA715L7 sets a new milestone in the SiGe:C MMIC LNAs for GPS with its lowest noise figure of 0.6dB. The design of the BGA715L7 shows Infineon’s deep know-how in MMIC designs, utilizing our world class low noise SiGe:C bipolar technology.

The BGA715L7 builds on its successful predecessor, the BGA615L7, and uses the same package and pin definition to enable our customers to drop the BGA715L7 into their current

design with minor changes to the application circuit for better performance and lower power consumption. An improved biasing network makes the BGA715L7 work with a wide voltage supply range from 1.5 to 3.6V while maintaining a stable constant current consumption of 3.3mA over temperature. The output is 50Ω matched with an integrated DC blocking capacitor, and the BGA715L7 requires only four external components. Because of these features and with its 20dB of gain, the BGA715L7 makes the ideal solution for customers to reach the best-in-class performance in GPS.

KEY PARAMETERS OF BGA715L7 AT DC AND 1.575GHz

Product name	Gain (dB)	NF (dB)	IP _{-1dB} (dBm)	IIP ₃ (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
BGA715L7	20	0.6	-15	-5	1.5...3.6	3.3	3	AN161	TSLP-7-1





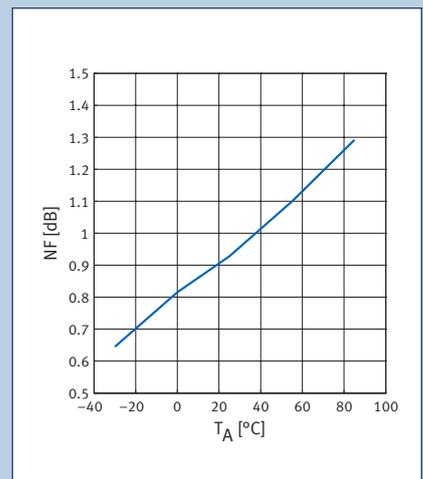
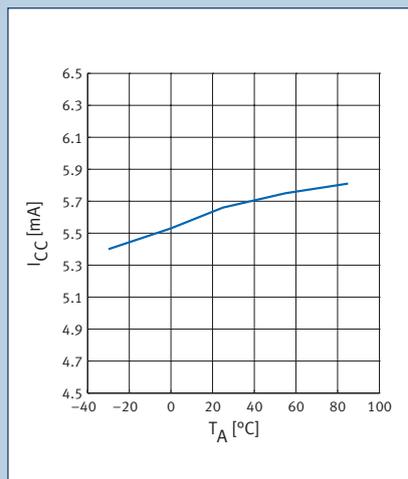
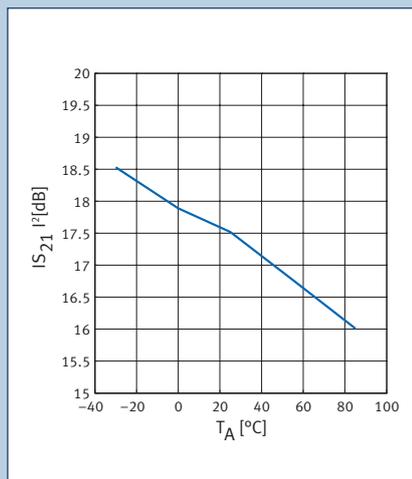
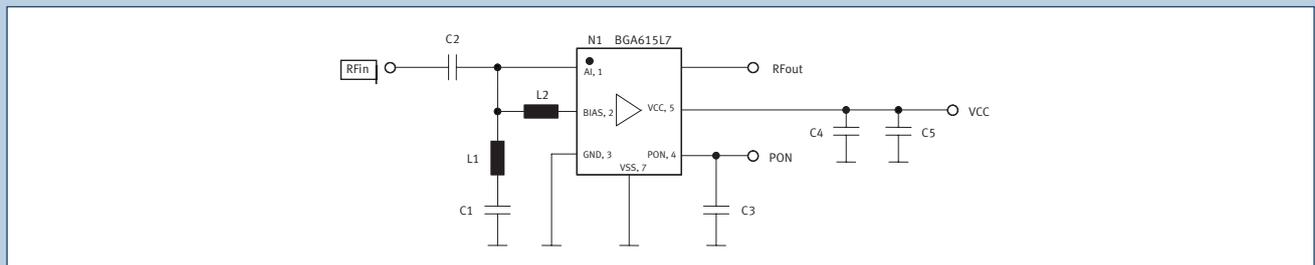
Best seller in the GPS world – BGA615L7

BGA615L7 has been the best-selling LNA in the GPS market for many years. This widely designed-in GPS LNA at our customers shows a well-defined balance among gain of 18dB, noise figure of 0.9dB and linearity performance so that it is the optimal choice for portable navigation devices, e.g. PNDs and PMPs (personal multimedia players) as well as for mobile

GPS applications. The BGA615L7 includes a cascade stage to boost the high gain and low noise figure. The active biasing circuit stabilizes its characteristics over voltage and temperature and enables on/off control. The output is 50Ω internally matched with integrated DC block which reduces the design effort and eases implementation into GPS receivers.

KEY PARAMETERS OF BGA615L7 AT DC AND 1.575GHz

Product name	Gain (dB)	NF (dB)	IP _{-1dB} (dBm)	IIP ₃ (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
BGA615L7	18	0.9	-13	-2	2.4...3.6	5.6	5	AN91 AN93	TSLP-7-1



Excellent performance/price ratio – BGA461

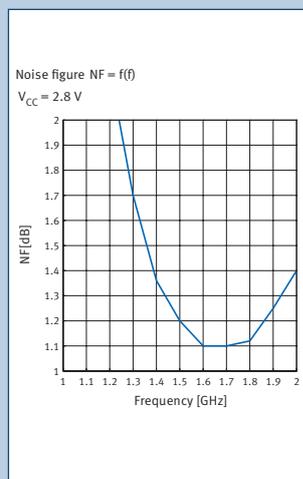
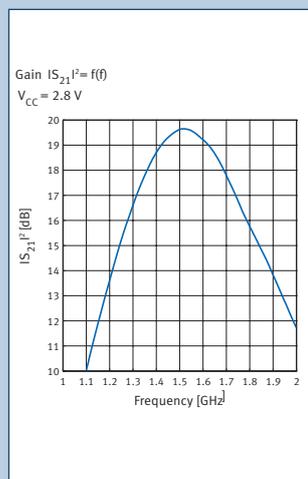
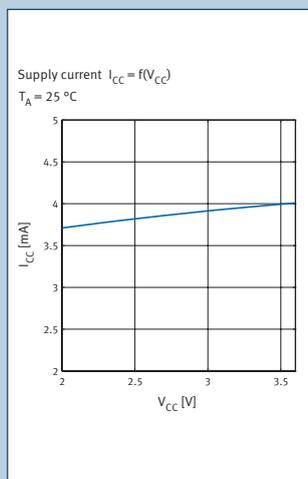
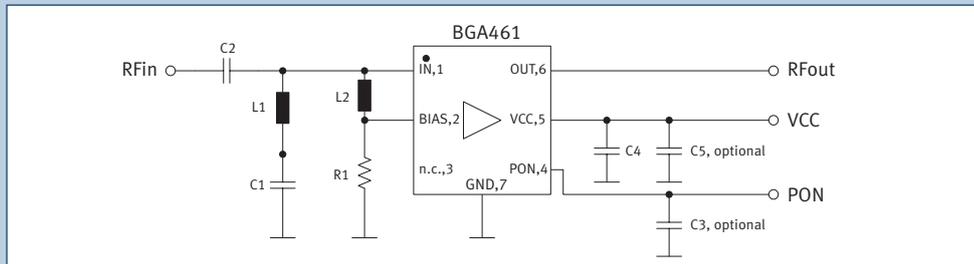
The BGA461 is one of the most attractive GPS LNAs in the Infineon GPS portfolio since it offers the best overall performance/price ratio. It offers a high gain of 20dB and low noise figure of 1.0dB with only 4mA.

The BGA461 is based on our successful BGA615L7 LNA, and it uses the same pin definition as BGA615L7. The package differs by having bigger pads giving it a pin pitch of 500µm making it easy-to-handle for custom-

ers that want to reduce risk in their assembly lines. The BGA461 features an external biasing resistor enabling customers to tune the current in the range of 3 to 6mA to have the best combination of the power consumption and linearity for their applications. The output is 50Ω matched with an integrated DC block and the input is easily matched with three external components.

KEY PARAMETERS OF BGA461 AT DC AND 1.575GHz

Product name	Gain (dB)	NF (dB)	IP _{-1dB} (dBm)	IIP ₃ (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
BGA461L7	19	1.0	-14	-3	2.4...3.6	4.0	6	-	TSLP-7-4





SiGe:C high-performance RF transistors for GPS low noise amplifiers

The Infineon silicon-germanium-carbon (SiGe:C) RF bipolar transistors in standard SOT, flat-lead TSFP and leadless ultra-miniature TSLP packages are excellent choices for LNA in all kinds of GPS systems such as those found in Active Antennas, mobile phone/handheld devices or car navigation units.

RF transistors offer an excellent trade-off

between the highest design flexibility, best attainable RF performance and lowest cost. Infineon Technologies provides many ready-to-use application notes and associated application boards for GPS which take into account the market requirements of modern GPS LNA designs and leading GPS chipset providers.

INFINEON TECHNOLOGIES LOOKED CAREFULLY INTO FACTORS LIKE:

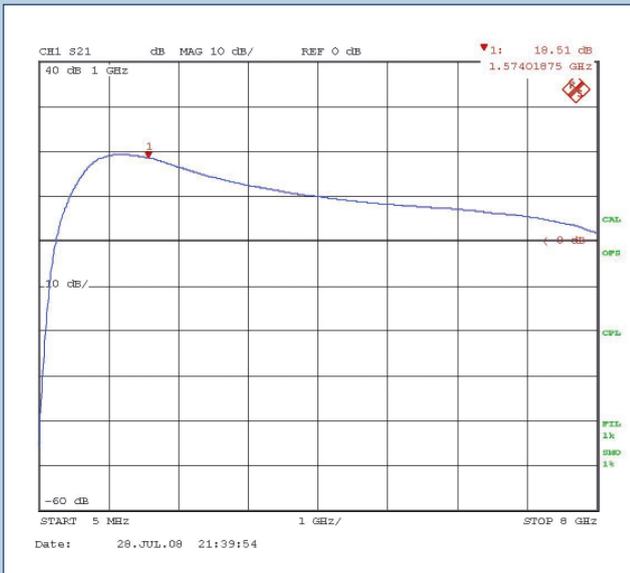
- Number of external passive components needed
- Linearity vs. current consumption
- 1.8V, 3V supply voltage flexibility – only external resistor value change is required

Click on www.infineon.com/rf.appnotes to find more information about Infineon RF transistors for GPS and other wireless applications.

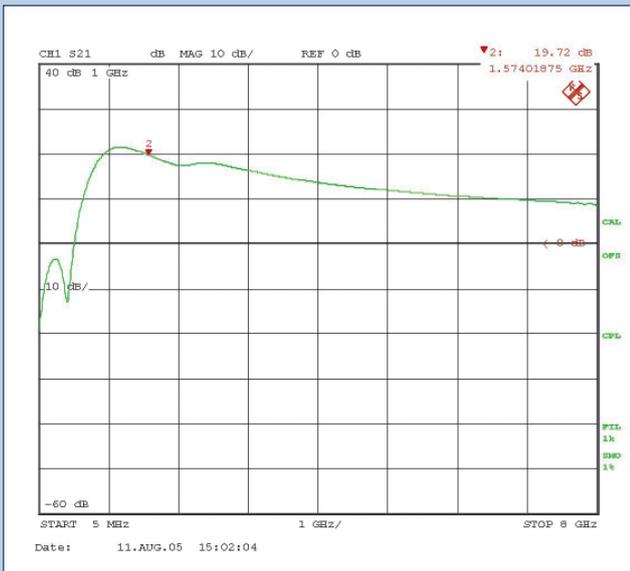
PRODUCT LIST AND KEY PARAMETERS OF GPS RF TRANSISTORS

Product name	Gain (dB)	NF (dB)	IP _{-1dB} (dBm)	IIP ₃ (dBm)	Supply (V)	Current (mA)	# ext.	Application note	Package
BFP640 BFP640F	17.2	0.8	-16	-5.9	1.8 or 3	6.7	8	–	SOT343 TSFP-4
BFP640 BFP640F	18.5	0.9	-12.7	+6.1	1.8 or 3	8.6	10	AN121	SOT343 TSFP-4
BFP740 BFP740F	20	0.7	-20	-2	1.8 or 3	8	10	AN117	SOT343 TSFP-4
BFR740L3RH	19.5	0.7	-19.5	-1.5	1.8 or 3	8	10	–	TSLP-3-9
BFP720 BFP720F	21.5	0.8	-21	-11	1.8 or 3	6.0	9	–	SOT343 TSFP-4
BFP420	14.2	1.3	-16	4	2.75	5.0	9	AN155	SOT343

Note:
Data taken at 25°C, f = 1,575MHz, Data for device on PC board, reference planes @ SMA connectors, e.g. PCB loss is NOT subtracted for noise figure, power gain numbers. Results are at 1.8 V, 3 V on request or in application notes.



The picture left is the gain curve of BFP640F high linearity GPS LNA. LNA has 18.5dB gain, 0.9dB noise figure, and input third-order Intercept of +6dBm drawing 8mA from either 1.8 or 3.0V. 10 external components are used. Amplifier is unconditionally stable, e.g. $k > 1$, $B_1 > 0$. For more information please see application note AN121.



The picture left is the gain curve of BFP740F high Linearity GPS LNA. LNA has 20dB gain, 0.7dB noise figure, drawing 9mA from a 1.8 volt supply. 1.8 or 3.0V operation is possible with a single resistor value change. 10 external elements are used. Amplifier is unconditionally stable, e.g. $k > 1$, $B_1 > 0$. For more information please see application note AN117.



Best-in-class RF ESD protection devices for antenna

For any antenna exposed to the outside world, ESD is a continuous threat to device reliability. For that reason it is mandatory for the circuit elements placed right after the antenna to be protected against ESD threats. Today, many front-end technologies have built-in ESD protection which was conceived to safeguard the semiconductor chip from ESD events during manufacturing. However, overall ESD robustness at system level can only be achieved via the use of an external protection device.

When applied to high-frequency circuits, the parasitic capacitance of the protection device must be kept at a minimum in order to not interfere with the signal performance. In addition, designers should choose devices providing appropriate clamping voltage for the application. Infineon TVS diodes overcome the ESD problem in RF antennas by providing outstanding clamping performance and ultralow capacitance in a very small form factor. For detailed information and data sheets please see www.infineon.com/rfantennaprotection.

FEATURES AND BENEFITS

- Multi-strike ESD absorption capability exceeding IEC 61000-4-2 standard level 4
- Ultralow capacitance down to 0.2pF to minimize “loading” of RF circuitry
- Optimized devices with very low noise figure/loss contribution
- Dedicated packages for space-constrained applications

KEY PARAMETERS OF TVS DIODES FOR RF ANTENNA APPLICATIONS

Product name	V_{RWM} [V]	ESD ¹⁾ [kV]	I_{pp} ³⁾ [A]	V_{cl} ⁴⁾ [V]	Loss ⁵⁾ [dB]	Return loss ⁵⁾ [dB]	Noise figure ⁵⁾ [dB]	C_t ⁶⁾ [pF]	Application note	Package
ESD0P2RF-02LS	5.3	20	3	16	0.12	23	0.10	0.2 (1GHz)	AN167	TSSLP-2
ESD0P2RF-02LRH	5.3	20	3	16	0.13	23	0.11	0.2 (1GHz)	AN167	TSLP-2
ESD5V3U1U-02LS	5.3	20	3	12	0.22	19	0.16	0.4	-	TSSLP-2
ESD5V3U1U-02LRH	5.3	20	3	12	0.23	19	0.17	0.4	-	TSLP-2
ESD1P0RFS	70	20	10	12	/			1.0	AN103	SOT363
ESD1P0RFW	70	20	10	12	/			1.0	AN103	SOT323
ESD0P8RFL	50	20	10	12	0.44	11	0.08	0.8 (1GHz)	AN163	TSLP-4
ESD0P4RFL	50	15	5	6	0.17	18	0.06	0.4 (1GHz)	AN163	TSLP-4

Notes:

- 1) Electrostatic discharge as per IEC61000-4-2, contact discharge
- 2) Electro-fast transient according to IEC61000-4-4 (5/50ns)
- 3) Maximum peak pulse current according to IEC61000-4-5 (8/20μs)
- 4) Clamping Voltage at I_{pp_max}
- 5) $T_s = 25^\circ\text{C}$, $V_g = 0\text{V}$, $f = 2\text{GHz}$, $Z_s = Z_l = 50\Omega$
- 6) Typical capacitance at 1MHz (unless specified), 0V

TVS diodes for ESD protection of high-speed digital interfaces

The ESD5V3- and ESD3V3-diode series are specially designed for the protection of ultra-high-speed interfaces with data rates up to 8GBd and beyond. The main feature of these products is their ultralow capacitance values down to 0.4pF. This combined with improved package features makes these devices ideal to fulfill stringent signal quality requirements at high-speed data transmission rates.

The bidirectional ESD8V0 diode series is designed for use in a wide voltage range from -8V to +14V. The key feature of this series is its low leakage current of less than 1nA, an important factor for battery-powered devices.

For detailed information and data sheets please see www.infineon.com/highspeed-interfaces.

FEATURES AND BENEFITS

- Superior ESD/transient absorption capability beyond market standards
- Ultralow capacitance to minimize signal attenuation/distortion at high frequencies
- Very low clamping voltages to protect ESD-sensitive IC/ASICs
- Ultrasmall form factor and thinnest package designs
- Leakage current of less than 1nA for long battery lifetime in portable devices
- Optimized flow-through array designs for easy trace routing

KEY PARAMETERS OF TVS DIODES FOR HIGH-SPEED DIGITAL INTERFACES

Product name	V_{RWM} [V]	ESD ¹⁾ [kV]	$I_{pp,max}$ ²⁾ [A]	V_C ⁴⁾ [V]	V_{FC} ⁴⁾ [V]	I_R ⁵⁾ [nA]	C_t ⁶⁾ [pF]	Application note	Package
ESD8V0L1B-02LRH	-8/14	25	2.5	26	20	<1	8.5	AN100	TSLP-2-17
ESD8V0L2B-03L	-8/14	15	1	26	20	<1	4	AN100	TSLP-3-1
ESD8V0R1B-02LRH	-8/14	14	1	23	17	<1	4	AN140	TSLP-2-17
ESD8V0R1B-02LS	-8/14	14	1	23	17	<1	4	AN140	TSSLP-2-1
ESD5V3U1U-02LS	5.3	20	3	12	4	<10	0.4	AN140	TSSLP-2-1
ESD5V3U1U-02LRH	5.3	20	3	12	4	<10	0.4	AN140	TSLP-2-7
ESD3V3U1U-02LS	3.3	20	3	12	4	<1	0.4	AN140	TSSLP-2-1
ESD3V3U1U-02LRH	3.3	20	3	12	4	<1	0.4	AN140	TSLP-2-7
ESD5V3U2U-03LRH	5.3	20	3	12	4	<1	0.4	–	TSLP-3-7
ESD5V3U2U-03F	5.3	20	3	12	4	<1	0.4	–	TSFP-3
ESD5V3U4RRS	5.3	15	3	12	4	<10	0.4	–	SOT363
ESD5V3U4U-HDMI	5.3	20	3	12	4	<1	0.4	–	TSLP-9

Notes:

- 1) Electrostatic discharge as per IEC61000-4-2, contact discharge
 2) Peak pulse current according to IEC61000-4-5 (8/20µs)
 3) Clamping voltage or forward clamping voltage at $I_{pp,max}$

- 4) Leakage current at V_{RWM} (maximum reverse working voltage)
 5) Typical capacitance at 1MHz, 0V



Low insertion loss CMOS switch for external antenna connection – BGS12A

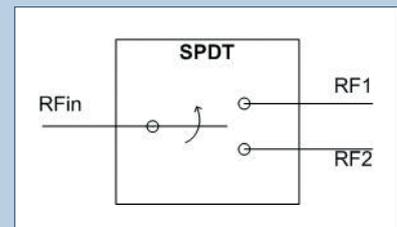
The BGS12A is a general-purpose single-pole, double-throw (SPDT) RF CMOS switch. With its insertion loss of only 0.4dB at 1.5GHz it is ideally suited for GPS applications.

Manufactured using a unique variant of an industry-standard RF-CMOS technology, this switch does not require external DC-blocking capacitors, and the control logic

is fully integrated onto one single die. The BGS12A has the same level of performance in terms of insertion loss, isolation and harmonic generation in comparison with other switches manufactured in GaAs technology, while requiring less printed circuit board area and having a better cost position. All interfaces are protected against ESD to at least 1.0kV HBM (human body model).

CUSTOMER ADVANTAGES WITH INFINEON'S BGS12A:

- Cost and space savings via a reduction in external components
- Improved yield due to fewer ESD failures during production
- CMOS-compatible control voltage down to 1.4V
- Single control line
- Relaxed filtering requirements due to low harmonic levels

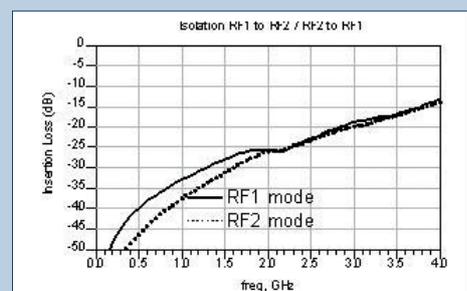
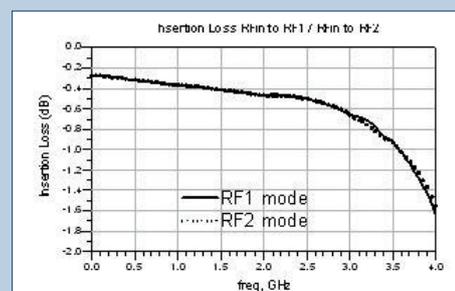


For detailed information and data sheets please see www.infineon.com/rfswitches.

PRODUCT LIST WITH KEY PARAMETERS@1.575GHz

Product name	Insertion loss [dB]	Isolation [dB]	Return loss [dB]	Supply [V]	Package
BGS12A	0.4 ¹⁾	30	15	2.4...2.8	FWLP-6
BGS12AL7-6	0.4	27	23	2.4...2.8	TSLP-7-6
BGS12AL7-4	0.4	27	23	2.4...2.8	TSLP-7-4

1) with external matching

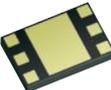
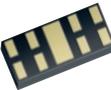


Package Information

HOW TO READ THE TABLES

Package (JEITA)	
Scale 1:1	SAMPLE (Scale)
Pins	
Dimensions [mm]	

LEADLESS PACKAGES

TSSLP-2-1		TSLP-2-7	
			
2	5:1	2	5:1
0.62 x 0.32 x 0.31mm ³		1.0 x 0.6 x 0.39mm ³	
TSLP-3-1		TSLP-3-7	
			
3	5:1	3	5:1
1.0 x 0.6 x 0.4mm ³		1.0 x 0.6 x 0.39mm ³	
TSLP-3-9		TSLP-7-1	
			
3	5:1	7	5:1
1.0 x 0.6 x 0.31mm ³		2.0 x 1.3 x 0.4mm ³	
TSLP-7-4		TSLP-7-6	
			
7	5:1	7	5:1
2.3 x 1.5 x 0.4mm ³		1.4 x 1.26 x 0.39mm ³	
TSLP-9-1		TSNP-11-2	
			
9	5:1	13	3:1
2.3 x 1.0 x 0.31mm ³		2.5 x 2.5 x 0.73mm ³	

TSFPx / SOTx PACKAGES

SOT323		SOT343	
			
3	2:1	4	2:1
2.0 x 2.1 x 0.9mm ³		2.0 x 2.1 x 0.9mm ³	
TSFP-4		SOT363	
			
4	2:1	6	2:1
1.4 x 1.2 x 0.55mm ³		2.0 x 2.1 x 0.9mm ³	

For detailed information please refer to our data-sheets or www.infineon.com/packages.

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