

# DESIGN *FAQs*



## Frequently Asked Questions:

## CELL-PHONE HANDSET DESIGN

Louis E. Frenzel, Communications/Networking Editor

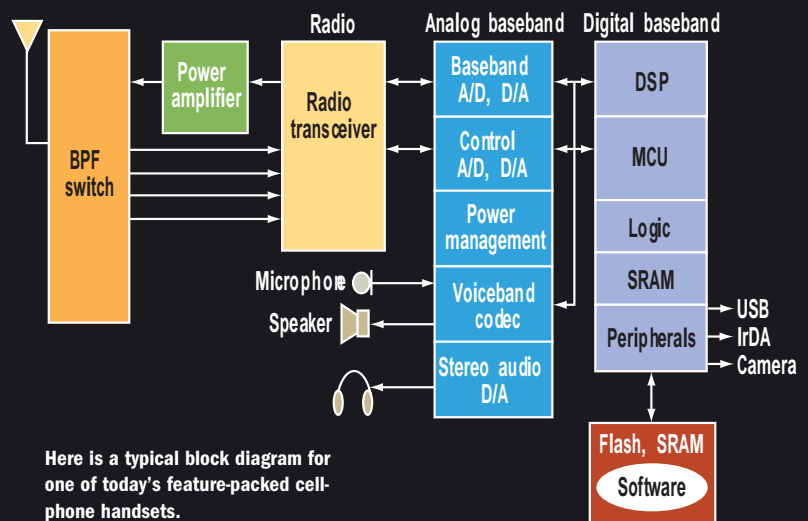
*Designing a cell-phone handset is a complex, multifaceted project with many issues that extend from the black art of RF design to efficient software development and virtually all other electronic specialties in between. Here are the basic design considerations. The questions below assume that the basic standard has already been selected (GSM, CDMA, and so forth).*

### What are the important considerations in selecting a radio transceiver (and power amplifier) for the design?

Any radio chip must have minimal spurious outputs so that it can easily pass the testing procedures imposed by regulatory bodies. The receiver should also have as much sensitivity as possible because this greatly extends the handset's useful range and minimizes dropouts. Both direct-conversion (zero IF) and low-IF designs work well. Multimode designs tend to favor direct conversion.

### What mixed-signal circuits are important in the design?

These include the analog-to-digital and digital-to-analog converters that link the RF transceiver and the baseband circuits, as well as other converters for AGC, RF power control, voice-band codecs, amplifiers, and battery monitoring and control. It is desirable to have all of these mixed-signal devices fully integrated.



### What should I look for in a baseband chip?

Baseband chips are pretty well defined by the standard and usually include a DSP for the voice encoding/compression-decompression, equalization, modulation, and demodulation and a control processor for the protocol stack and user interface. Power consumption is critical, but there's a need for high speed as well. Look for flexible interfaces so features like cameras and other peripherals can be added easily.

### Is it best to try to source all the chips from one supplier or mix and match?

There are obvious benefits to using a single supplier for all of

the chips. The interfaces, control software, and other parts will have been tested, making it easier to get the chips to work together, and if bugs arise it is clear who to call for support. Time-to-market improvements far outweigh any small cost savings, because market windows in the cell-phone business are very narrow.

### How much multimedia is included with the phone, and how do you plan to implement it?

More and more, phones include a variety of multimedia options, such as cameras, games, MP3 music players, and even TV tuners. Several vendors now offer multimedia or smart-phone processors

with a fast RISC processor and function-specific logic to make adding multimedia features easy.

### What is the most important hardware consideration outside of chip-set selection?

Layout of the pc board is critical, since noise from the high-speed baseband processor buses and interfaces (100 to 200 MHz and up) could interfere with the micro-volt-sensitivity receiver circuits. It's hard to get the layout right to minimize interference and meet all the performance and radiation specifications. The best approach is to use a chip set that comes with a solid reference design, preferably as open as possible so you can add or change what you want.

### How important is software?

The software is as important as the hardware. While most cell-phone chip sets come with standard software (both DSP and control), some further development is usually required to add the desired extra features.

### What should I look for in the software?

Be absolutely sure that the chip set comes with all the basic DSP and control software, such as the protocol stack, so that you can make a basic phone call. Also be certain that the software comes with a good development system that makes it fast and easy to add new features.

### What other factors should be considered?

As phones grow more complex with additional features, it is more important than ever to make them very easy to use. Be sure the user interface is as intuitive as possible, and minimize the number of button pushes. Screen layout is critical so that the needed information is displayed and understandable. Pay attention to the user interface when designing both the packaging and the software. Users won't use features that are hard to learn or access, and they won't buy that brand again if they have such a problem. Think about future sales.

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# PRODUCT Q&As

FROM THE COMPLETE TO THE DISCRETE, WE HAVE THE RIGHT SOLUTION FOR YOUR PORTABLE WIRELESS PLATFORM DESIGN.

## Nova Wireless Engine Reference Design

The Nova Wireless Engine from Analog Devices is a reference design that allows cell-phone manufacturers to quickly develop a family of GPRS feature-phones using the SoftFone and Othello product families. The Nova Wireless Engine supports a wide range of hardware and software capabilities from high-resolution cameras to high-quality stereo audio to streaming video; connectivity including USB, IrDA, and Bluetooth; and removable media such as Secure Digital and MMC memory cards.

For more, visit [www.analog.com/nova](http://www.analog.com/nova)



## Othello One TV Direct-Conversion Radio



The AD6539 Othello One TV is the latest entry in Analog Devices' Othello family of radio transceiver ICs for cellular handset applications. It reduces bill-of-materials cost by integrating the local-oscillator (LO) and transmit voltage-controlled oscillators on-chip. In addition, the AD6539 includes four independent low-noise amplifiers (LNAs) to enable true quad-band operation (850, 900, 1800, and 1900 MHz).

For more, visit [www.analog.com/othello радио](http://www.analog.com/othello радио)

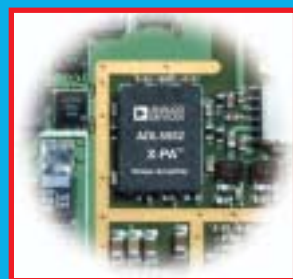
## SoftFone Baseband Processor

Our SoftFone family of baseband chipsets offer a wide range of proven wireless terminal products based on a flexible architecture. The SoftFone architecture is processor-independent and RAM-based for maximum flexibility. All Analog Devices' SoftFone processors include the optimum DSP and MCU cores for the target application, with the right tradeoff of power and performance. The ROM-less approach allows fast development times and addition of new features and services in the field.

For more, visit [www.analog.com/SoftFone](http://www.analog.com/SoftFone)



## X-PA Power Amplifier



The ADL5552 is a high-output-power, high-efficiency mobile handset power amplifier with integrated RF power control and measurement. In the GSM band, a high output power level of 35 dBm is achieved at an efficiency of 54%. In the DCS/PCS band, 50% efficiency is achieved at power levels of 33 dBm and 32 dBm, respectively. RF input and output impedances are matched to 50 ohms.

For more, visit [www.analog.com/XPA](http://www.analog.com/XPA)