



## NXP digital VGAs BGA7204 & BGA7210

# Digital wideband VGAs with high linearity & flexible current settings

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 up to 45%. The BGA7210 adds flexible current distribution across its two amplifiers, depending on the attenuation state, to save current.

### Key features

- ▶ Internally matched for 50  $\Omega$ 
  - 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
- ▶ High output third-order intercept,  $IP3_o$ 
  - BGA7204 = 38 dBm
  - BGA7210 = 39 dBm
- ▶ Attenuation range of 31.5 dB, 0.5 dB step size (6 bit)
- ▶ High output power,  $P_{L(1dB)}$ 
  - BGA7204 = 21 dBm
  - BGA7210 = 23 dBm
- ▶ Fast switching power-save mode (power down pin)
- ▶ Digitally controlled current setting from 120 to 195 mA with an optimum at 185mA (BGA7210 only)
- ▶ Simple control interfaces
  - BGA7204 SPI and parallel
  - BGA7210 SPI

- ▶ ESD protection on all pins (HBM 4 kV; CDM 2 kV)
- ▶ HVQFN32 (5 x 5 x 0.85 mm)

### Key benefits

- ▶ Wideband operation supports platforms with multiple frequency ranges
- ▶ Smart lead routing produces simpler design, decreases footprint by 25%
- ▶ Power-save mode can reduce current consumption in TDD systems up to 45%
- ▶ Flexible current setting (BGA7210) saves power
- ▶ Monolithic design enables high quality

### Applications

- ▶ GSM, W-CDMA, WiMAX, LTE basestations
- ▶ Wireless point-to-point and repeaters
- ▶ Cable modem termination systems
- ▶ Temperature-compensation circuits



The NXP BGA7204 and BGA7210 are monolithic digital variable gain amplifiers (VGAs) that operate over an extremely wide range with high linearity and high output power.

Designed for the transmit path of wireless architectures, these VGAs can be used to control the power level to the power amplifier. The up-converted signals are fed to the VGA, and thus help compensate for variations in cell load and the presence of aging infrastructure equipment.

The BGA7204 operates in the range between 0.4 and 2.75 GHz, while the BGA7210 operates between 0.7 and 3.8 GHz. By supporting more than 2 GHz of bandwidth, these devices can be used to populate several frequency bands.

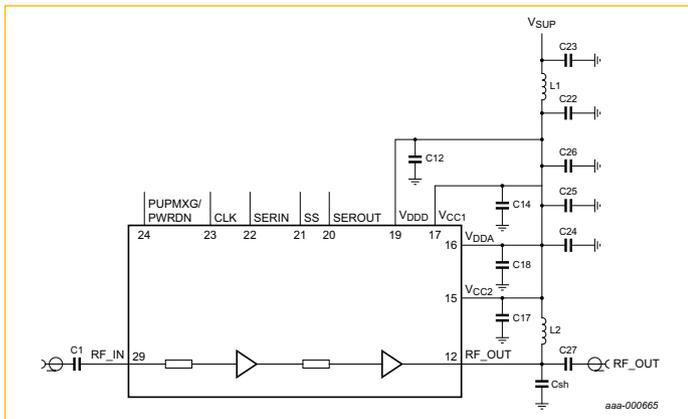
An integrated power-save mode makes it possible to reduce consumption even more, to just 15 mA during a receive slot. This can effectively reduce the current consumption in Time Division Duplexing (TDD) systems up to 45%.

The BGA7210 builds on the BGA7204 by adding flexible current setting across its two amplifiers, depending on the attenuation state. The serial peripheral interface is used to set the attenuation state, and, using a similar method, to set the current through the first and second amplifiers. The desired configuration is set by software and enables current savings of as much as 75 mA.

Higher output power, higher peak gain, and smaller attenuator step sizes enable engineers to use fewer components and provide greater control to maintain and optimize performance in the transmit chain.

Smart routing (with no connection crosses) reduces the number of board connections, simplifies design-in, and decreases the design footprint by 25%. The monolithic design increases reliability and ensures high quality.

### Schematic of BGA7210 evaluation board (OM7921)



### OM7921 – BGA7210 customer evaluation kit (also available OM7922 – BGA7204 CEK)



### Selection guide

Type number	Package	$f_{\text{range}}$ [min] (MHz)	$f_{\text{range}}$ [max] (MHz)	@ $V_{\text{CC}}$ (V)	@ $I_{\text{CC}}$ [typ] (mA)	$G_p$ @ minimum attenuation (dB)	Attenuation range (dB)	$IP3_o$ [typ] (dBm)	$P_{L(1dB)}$ [typ] (dBm)	NF [typ] (dB)
BGA7204	SOT617-3	400	700	5	115	18.5	31.5	38.0	21.0	7.0
		700	1450	5	115	18.5	31.5	37.5	21.0	6.5
		1450	2100	5	115	17.5	30.5	36.0	20.5	6.5
		2100	2750	5	115	16.5	30.0	34.0	20.0	7.0
BGA7210	SOT617-3	700	1400	5	185	30.0	31.5	39.0	21.0	6.5
		1400	1700	5	185	29.5	31.5	37.0	21.0	6.5
		1700	2200	5	185	29.0	31.5	35.0	21.0	6.5
		2200	2800	5	185	28.0	30.5	35.0	23.0	7.0
		3400	3800	5	185	26.0	29.5	27.0	19.0	8.0

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