BGT60/70/80TR11

Frequently asked Questions about mmWave Transceivers

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Page	Subjects (major changes since last revision)

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1 BGT60/70/80TR11 mmWave Transceivers for Backhaul Applications

1.1 Features

- Fabricated with Infineons advanced Silicon-Germanium (SiGe) technology
- Housed in Infineon's **E**mbedded **W**afer **L**evel **B**all-Grid Array (eWLB) **P**ackage
- BGT60/70/80 can be programmed via SPI interface to work either in transmit (TX) or/and receive (RX) mode
- Zero IF – differential I/Q interface – direct conversion architecture
- Differential RF transmit output signaling
- Differential RF receive input signaling
- Differential intermediate frequency I/Q signaling
- Peak detector at VGA input at transmit path
- Peak detector at PA output at transmit path
- Built-in temperature sensor
- SPI interface
- ESD protected device
- BITE (**B**uilt-**I**n-**T**est **E**quipment) for self-test and calibration in production at Infineon to verify RF performance

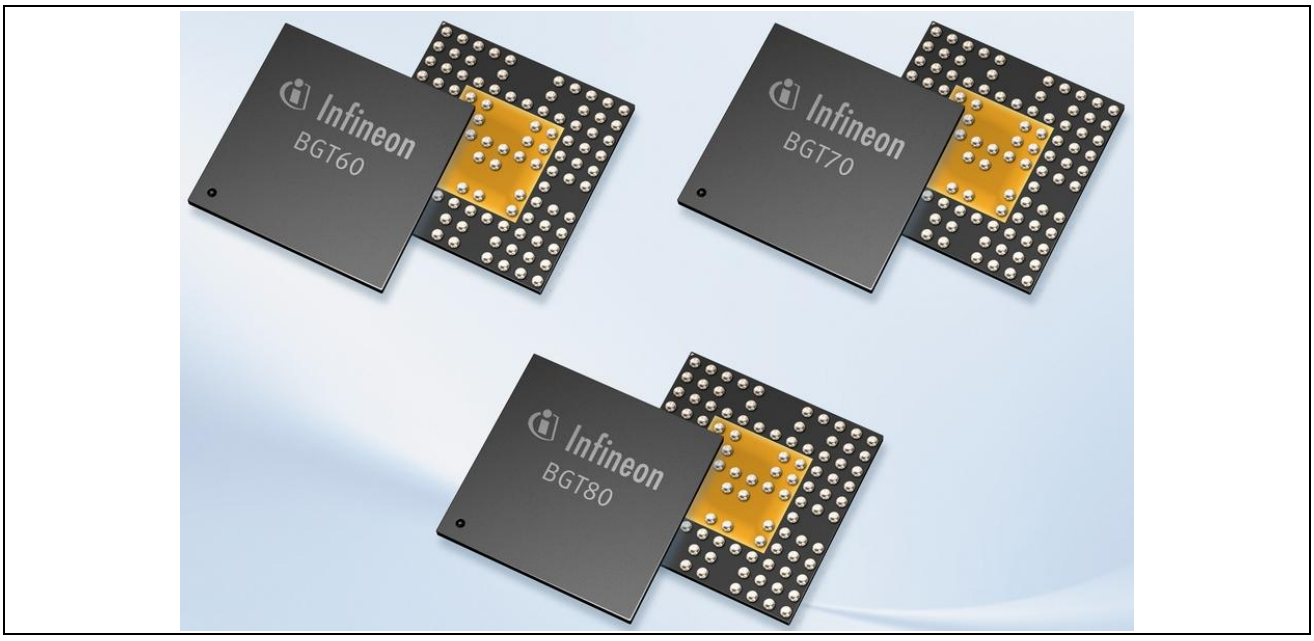

Figure 1 BGA60/70/80TR11 in eWLB package

2 Frequently asked Questions

Below are some of the questions and answers which provide basic information about the Infineon's mmWave Transceivers. For more detailed information please refer to datasheet.

Question - Does one chip cover 57-64GHz, 71-76GHz, 81-86GHz band?
Answer - No, BGT60 covers 57-64GHz, BGT70 covers 71-76GHz and BGT80 covers 81-86GHz band.

Question – What is the typical Power Consumption of BGT60/70/80 in TX mode and RX mode?
Answer – BGT60/70/80 consumes ~1.5 W in TX mode and ~1.1 W in RX mode.

Question – What is the typical Saturated Output Power of BGT60/70/80?
Answer – The typical saturated output Power of BGT60 is 14dBm, BGT70 is 14dBm and BGT80 is 10dBm.

Question - Are all the transceivers single ended or differential?
Answer - All the transceivers have differential interface i.e. RF Input/Output are differential as well as the IF input/output.

Question – How much are the board losses on the EVB from device landing pad to Waveguide transition?
Answer – The transition losses on board from device landing pad to Waveguide interface are ~2dB.

Question – Does one require different power supply for the individual blocks inside the chip?
Answer – All the mmWave transceivers require just one power supply of 3.3V. In addition to global Vcc, there are separate supplies for VCO and integrated Temperature sensor. We recommend using separate path for VCO supply. The other two supplies can be connected together.

Question - Is there an integrated PLL in the chip?
Answer - No, there is no integrated PLL in the chip. The chip has an internal divider (Divide by 32 with respect to TX output Frequency for BGT60 and Divide by 64 with respect to TX output Frequency for BGT70 and BGT80). The divider gives low frequency in the range of 1.1 to 2GHz at its output which can be used to drive any off-the-shelf available PLL.

Question - Are the IF input/output DC coupled?
Answer - No it's not allowed to have DC coupling at IF input. For IF output it's recommended to have DC coupling in order to avoid DC offset from the direct conversion receiver, saturating the subsequent stages.

Question - What modulation schemes are intended to be supported with BGT60/70/80 transceivers?
Answer - The excellent phase noise of the VCO allows one to scale upto QAM64 in 250MHz channel BW.

Question - What is the typical Phase Noise of BGT70/80 at 100kHz offset from the carrier?
Answer - The typical phase noise is better than -80dBc/Hz at 100kHz offset from carrier over the whole frequency band.

Question - What maximum IF input level can one apply at the IF TX input?
Answer - The IF level at TX input will depend on the modulation scheme one intends to use. For example, in case of QPSK one can drive the transmitter near to its P1dB level but in QAM-64 one needs to have certain back-off in order to be in linear region.

Question - What considerations should I take into account when I design my own board?
Answer - The TX “OUT” and RX “IN” are covering the frequency range of 57-86GHz (considering all chips), it is highly recommended to design the differential to waveguide transition in proper way to minimize any board losses occurring at these frequencies. The line lengths on the carrier board should be kept to minimum. The chip dissipates ~1.5W in TX mode. Proper care should be taken to design the layer stack-up and the heat sink in order to carry away the dissipated power.

Question - How is the chip controlled, i.e. how can one vary the TX output Power, make LO leakage calibration etc.?
Answer - The chip has a SPI interface through which the internal DACs can be used to controlled the gain of the VGA as well as the LO leakage calibration. The basic software is provided with the EVB which allows the user to read the power detector, temperature sensor and also make automatic LO leakage calibration at TX port. The selection between TX or RX mode can also be done via this GUI.

Question - Are the mmWave transceivers tested in production before shipment to customers?
Answer - Yes, all of the chips shipped to customers are tested during production.

Question - Are the chips limited in operation mode i.e. can they be used for FDD and/or TDD?
Answer - The chips can be used in TDD as well as FDD mode. In TDD Mode one requires two chips for the link. In case of FDD one requires four chips for the link.

Question - What is the IF RX impedance?
Answer - The RX IF has emitter follower at its output which has low impedance. The optimal load it can drive is 400 Ohm differential. So in case of lab measurements it should be taken care of not to drive directly Spectrum Analyzer with 50 Ohm impedance. Rather an impedance conversion stage eg. an Opamp can be used to make measurements.

Question – Is there a way to control the receiver chain gain?
Answer – The mmWave transceivers does not have internal VGA in the RX chain. To vary the gain one needs off-chip VGA. For recommendations please contact us.

Question – Are mmWave Transceivers ESD protected?

Answer – The whole IC is up to ±1kV ESD protected according to Human-Body-Model (HBM).

Question – Does one require underfill in the production process when one mounts BGT60&70/80TR11 devices on board?

Answer – Infineon has vast expertise in handling eWLB package. It is not recommened to use any kind of underfill with BGT60/70/80TR11 devices.

3 Author

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