AN11852

BGU8062 bypass LNA delta gain

Rev. 1 — 14 June 2016 Application note

Document information

Info	Content
Keywords	BGU8062, Delta Gain,
Abstract	This application note describes the calculation and limits of the delta gain between LNA and By-pass mode. That can be used to set the AGC algorithms of a receiver system.
Contact information	For more information, please visit: http://www.nxp.com

Revision history

Rev	Date	Description
1	20160614	First publication

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1. Introduction

NXP semiconductors BGU8062 is a high performance integrated low noise amplifier with bypass function. The BGU8062 operates from 1500 MHz to 2700 MHz .The BGU8062 is ideal as 3rd stage amplifier in the Rx chain for wireless infrastructure application. Its bypass function enables higher dynamic range.

Full description of the device and its evaluation board is given in AN11688.

This application note gives the calculation and limits of the delta gain between the LNA- and by-pass mode of the BGU8062.
This delta gain can be used to set the systems AGC algorithm.

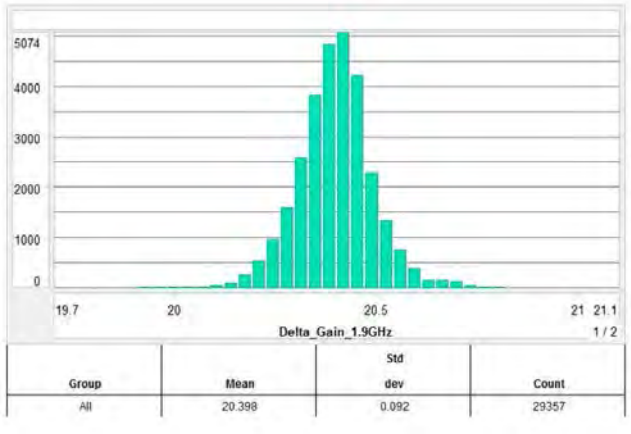
The BGU8062 performance information is available in the BGU8062 datasheet.

1.1 Calculation of the delta gain limits.

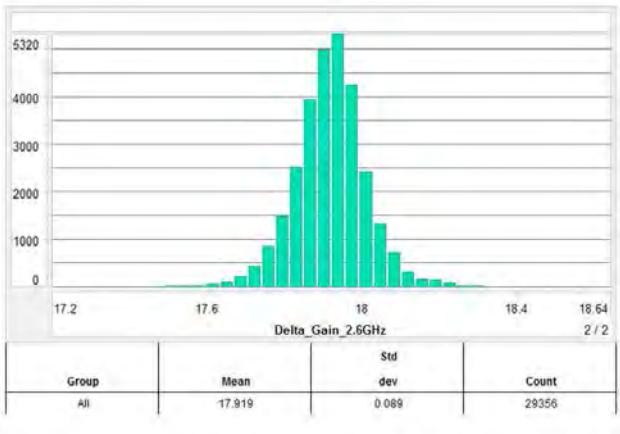
In order to come to the delta gain limits of the BGU8062 we did the following.
In final test LNA gain as well as Bypass loss is measured at 2 frequencies. 1.9GHz and 2.6 GHz. The distribution of the calculated delta gain at these 2 frequencies is taken as the process spread for delta gain. With ±6σ. See chapter 2. In addition to this we take the Gain variation over temperature for LNA and Bypass mode see chapter 3 to get to the limits for delta gain, see chapter 4

2. Distribution of the Delta Gain in final test.

The BGU8062 is final tested at the most important RF parameters at the primary frequencies of the RF band that are in the working frequency range of the BGU8062.
For the delta gain the Gain data in LNA mode and the Gain data of the by-pass mode are used. These parameters are being measured at 1900MHz and 2600MHz.
In the graphs below you can find the distribution of the calculated Delta gain.



a. Δ Gain at 1900MHz



b. Δ Gain @ 2600MHz

Fig 1. Distribution of delta gain measured in final test

For the Final test limits we use ±6σ to the mean value.

Table 1. Final test limits for Δ Gain with 6 sigma

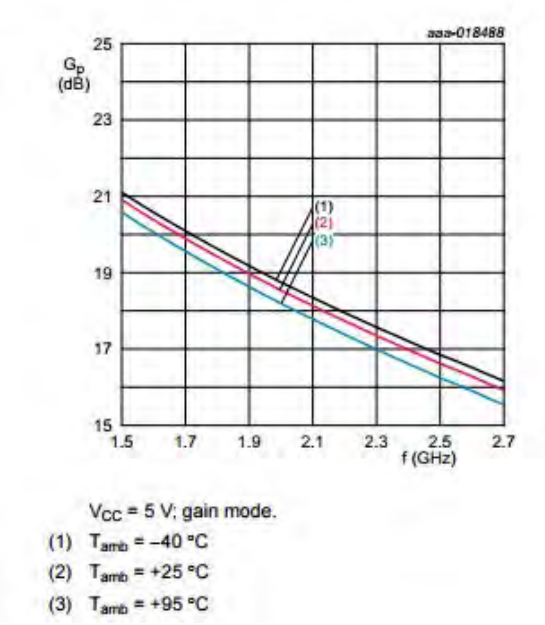
Measured at Vcc=5V, T=25ºC

Frequency	Mean	LSL	USL	STDEV
1900MHz	20.4	19.8	21.0	0.1
2600MHz	17.9	17.3	18.5	0.1

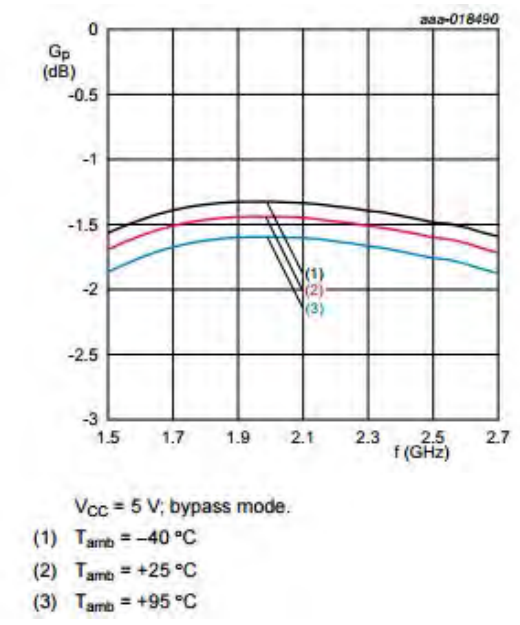
3. Gain and Bypass Loss variation over temperature.

During the release of the BGU8062 the device has been characterized over temperature. At -40ºC, 25º and 95ºC. The typical variation over temperature can be found in the product datasheet.

Gain and Bypass variation over temperature is shown in Fig 2.



c. LNA Gain over temperature



d. Bypass loss over temperature

Fig 2. Typical LNA and By-pass gain variation over temperature.

Subtracting the By-pass gain (loss) from the LNA gain results in the Δ Gain variation over temperature. See Fig 3

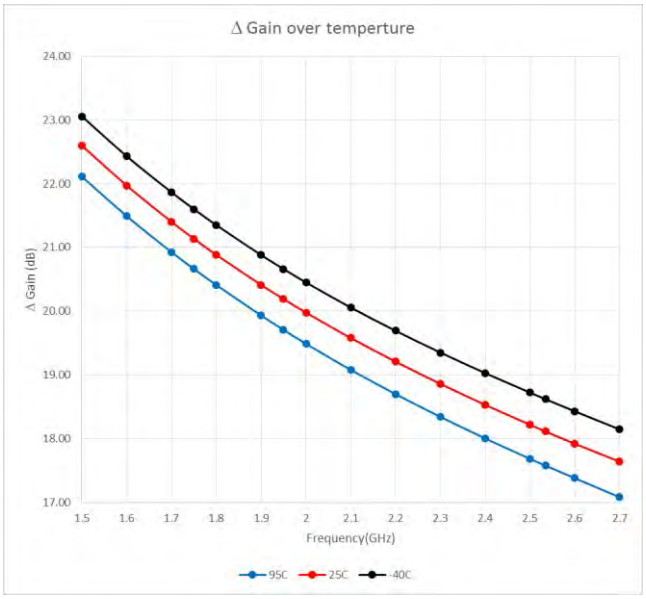


Fig 3. Δ Gain vs Frequency over temperature. Typical values.

For the primary frequencies this results in the values in Table 2

Table 2. Delta gain variation over temperature for the primary frequencies

Measured at Vcc=5V from -40ºC to 95ºC

Frequency	-40ºC	25ºC	95ºC	Unit
1750MHz	20.7	21.1	21.6	dB
1950MHz	19.7	20.2	20.7	dB
2535MHz	17.6	18.1	18.6	dB

4. Guaranteed Delta gain window.

Combining the temperature behavior of the Delta gain with the distribution of the delta gain measured at final test at 1900MHz and 2600MHz and the ±6σ we come to the following gain window over frequency and temperature.

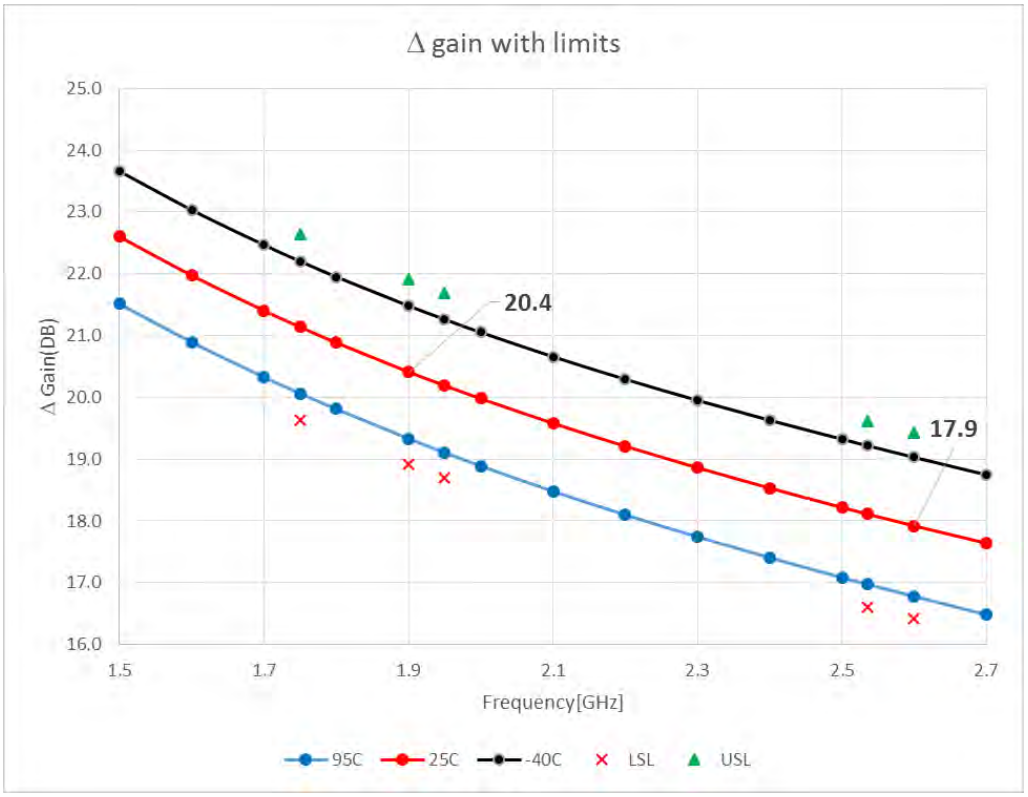


Fig 4. Δ Gain window versus frequency and temperature

When combining the Distribution in final test Table 1 with the temperature behavior Table 2, we can agree the following delta gain behavior over process and temperature. See Table 3 Here an additional 0.4 dB guard band has been implemented.

Table 3. Δ gain limits

Valid at Vcc=5V from -40ºC to 95ºC.

Frequency	Min	Typ	max	Unit	Comment
1750MHz	19.6	21.1	22.6	dB	
1900MHz	**18.9**	**20.4**	**21.9**	**dB**	**Measured in FT**
1950MHz	18.7	20.2	21.7	dB	
2535MHz	16.6	18.1	19.6	dB	
2600MHz	**16.4**	**17.9**	**19.4**	**dB**	**Measured in FT**

5. Abbreviations

Table 4. Abbreviations

Acronym	Description
AC	Alternating Current
DC	Direct Current
ESD	Electro Static Discharge
MMIC	Monolithic Microwave Integrated Circuit
PCB	Printed Circuit Board
RF	Radio Frequency
SMD	Surface Mounted Device

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7. List of figures

8. List of tables

9. Contents

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