AN11209

Set-Top Box LNAs BGU703X and BGU704X

Rev. 2 — 20 March 2017 Application note

Document information

Info	Content
Keywords	Set-Top Box, STB, LNA, BGU703X, BGU704X
Abstract	This document provides circuit, layout, BOM, and performance information of Set-Top Box LNA BGU703X and BGU704X

Revision history

Rev	Date	Description
1	20121005	Initial document
2	20170320	Add stability improvement circuit

Contact information

For more information, please visit: http://www.nxp.com

For sales office addresses, please send an email to: salesaddresses@nxp.com

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1. Introduction

In Set-Top Boxes (STBs) that use multiple or network-interfaced module (NIM) tuners, the RF signal usually needs to be distributed or split. Very often, a low noise amplifier (LNA) is used to compensate for signal loss when the signal is split with a balun core. In addition to that, due to its low noise, this LNA is used to improve the sensitivity of the tuner.

This STB LNA family of 5V and 3.3V wideband, low noise amplifiers is specifically designed for high linearity, low-noise performance for TV, DVR/PVR, set-top box tuner applications from 40 MHz to 1 GHz. They are used in discrete or Si CAN tuners, as well as on board tuners. Fig 1 shows the application diagram of an active splitter with passive loop-through. It shows that at the moment the power of the recording device (DVD-R, HDD-R, VCR, DVR) is on, the RF switch is open, so the RF signal travels via the recording device to the TV tuner. At the moment the power of the recording device is completely off, the RF switch closes and this ensures that the RF signal is looped through directly to the TV tuner. Built in NXPs own QUBiC4+ Si BiCMOS process these low noise amplifiers provide programmable gain (-2dB, 5dB and 10dB), have integrated biasing, 75 Ω matching (saving up to 15 external components compared to discrete solutions). These low noise amplifiers are very ESD robust (>2kV HBM and >1.5kV CDM) compared to GaAs solutions. Table 1 gives an overview of this STB LNA family.

In this document, the application diagram, board layout, bill of materials, and performance information are given.

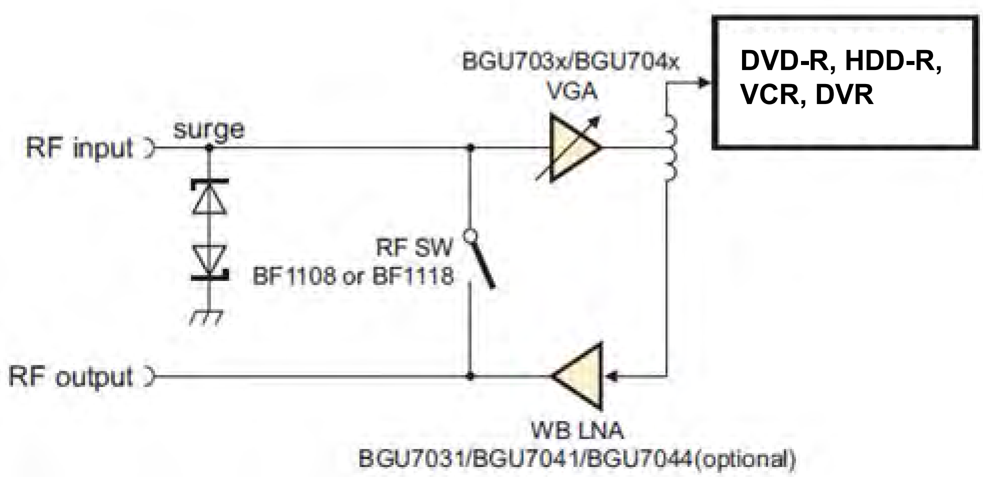

Fig 1. Application diagram of an active splitter with passive loop-through

Table 1. Overview product types

Type Number	Supply voltage [V]	Number of modes	Description
BGU7031	5.0	1	Fixed Gain 10dB
BGU7032	5.0	2	Gain 10dB

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Type Number	Supply voltage [V]	Number of modes	Description
			Bypass mode
BGU7033	5.0	3	Gain 10dB Gain 5dB Bypass mode
BGU7041	3.3	1	Fixed Gain 10dB
BGU7042	3.3	2	Gain 10dB Bypass mode
BGU7044	3.3	1	Fixed Gain 14dB
BGU7045	3.3	2	Gain 14dB Bypass mode

2. Application Circuit

A universal evaluation board is used to test the RF performance of the whole NXP STB LNA family BGU703X and BGU704X. For all the types, it needs the same input and output DC block capacitors, supply decoupling capacitors, and RF choke. The difference between the types is mainly the external resistor used to set an optimum biasing current, and depending on how many modes the type has, the resistor and decoupling capacitor are used for each control line (bypass and gain control). The resistor for the control line is used to protect the control pin of the STB LNA MMIC by limiting the current.

The circuit diagram of the universal evaluation board and the board itself are shown in Fig 2 and Fig 3 respectively. Table 2, Table 3, Table 4, Table 5, Table 6, Table 7, and Table 8 show the bills of materials for BGU7031, BGU7032, BGU7033, BGU7041, BGU7042, BGU7044, and BGU7045 respectively.

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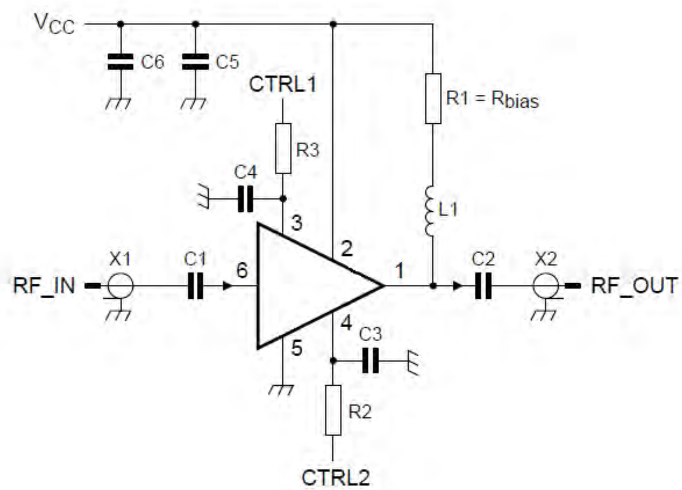
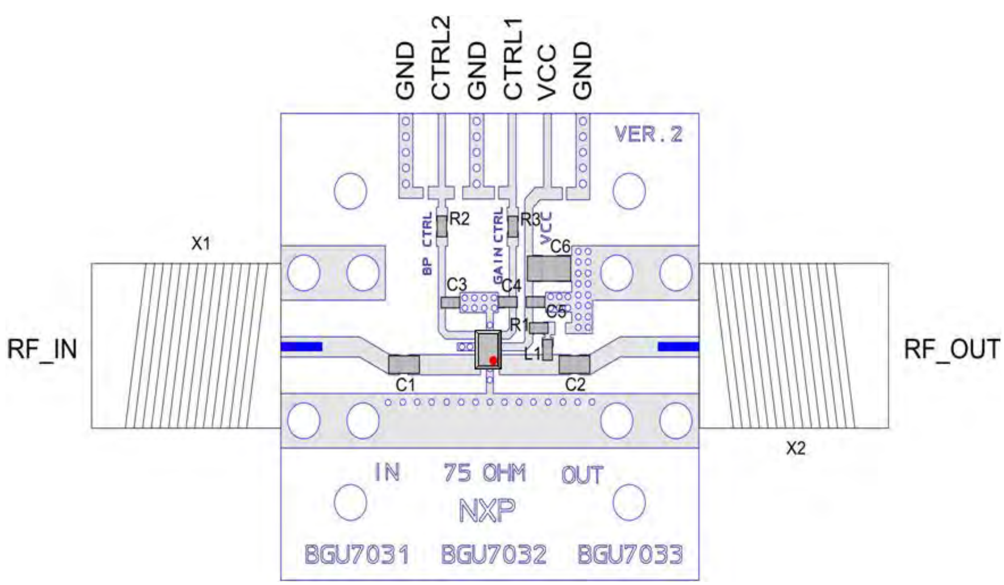


Fig 2. Circuit diagram of universal evaluation board for STB LNAs BGU703X and BGU704X



PCB material = FR4.

PCB thickness = 1.6 mm.

PCB size = 30 mm x 30 mm.

ε_r = 4.5; thickness of copper layer = 35 μm.

Fig 3. Universal evaluation board for STB LNAs BGU703X and BGU704X

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Table 2. Bill of materials BGU7031

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	NC		Not connected
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	43 Ω	R0603	Bias setting
R2	NC		Not connected
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

Table 3. Bill of materials BGU7032

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	10 nF	C0603	RF decoupling
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	43 Ω	R0603	Bias setting
R2	1.8 KΩ	R0603	Current limiting
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

Table 4. Bill of materials BGU7033

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	10 nF	C0603	RF decoupling
C4	10 nF	C0603	RF decoupling
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF

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Component	Value	Type	Remark
R1	43 Ω	R0603	Bias setting
R2	1.8 KΩ	R0603	Current limiting
R3	1.8 KΩ	R0603	Current limiting
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

Table 5. Bill of materials BGU7041

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	NC		Not connected
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	7.5 Ω	R0603	Bias setting
R2	NC		Not connected
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

Table 6. Bill of materials BGU7042

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	10 nF	C0603	RF decoupling
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	7.5 Ω	R0603	Bias setting
R2	1.8 KΩ	R0603	Current limiting
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

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Table 7. Bill of materials BGU7044

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	NC		Not connected
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	18 Ω	R0603	Bias setting
R2	NC		Not connected
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

Table 8. Bill of materials BGU7045

Component	Value	Type	Remark
C1	10 nF	C0805	DC blocking
C2	10 nF	C0805	DC blocking
C3	10 nF	C0603	RF decoupling
C4	NC		Not connected
C5	10 nF	C0603	RF decoupling
C6	10 μF	C1206	RF decoupling
L1	1.5 KΩ	L0603	RF Choke: Chip ferrite bead BLM18HE152SN1DF
R1	18 Ω	R0603	Bias setting
R2	1.8 KΩ	R0603	Current limiting
R3	NC		Not connected
X1	75 Ω	F-connector	input
X2	75 Ω	F-connector	output

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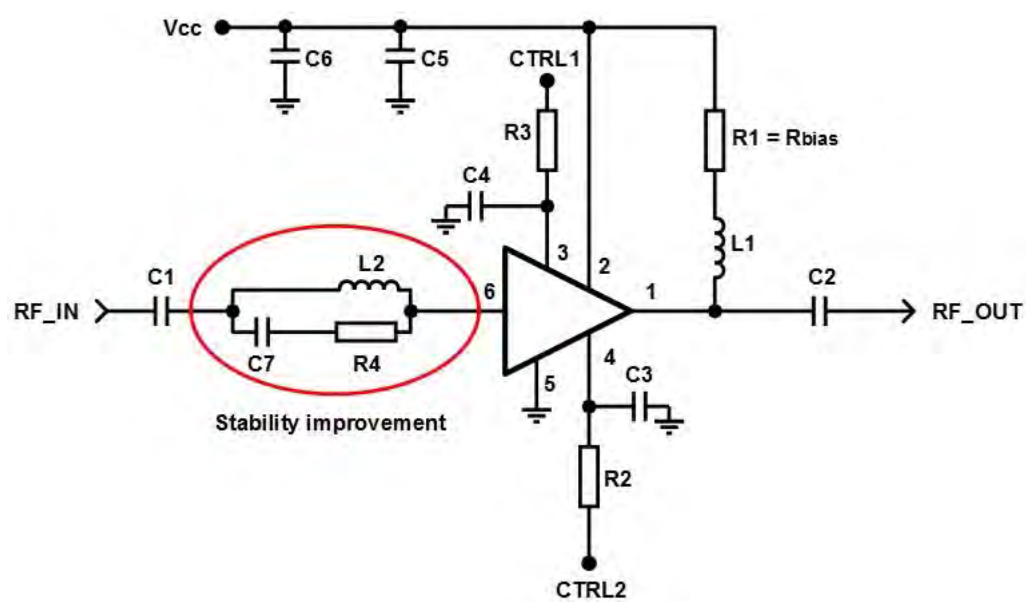
3. Stability

In some capacitive load cases at RF input the BGU70xx LNA’s tends to oscillate.
To avoid oscillation additional components (see Fig 4.) should be placed at RF input.



L2 = 2 nH
C7 = 1 pF
R4 = 47 ohm

Fig 4. Stability improvement on STB LNAs BGU703X and BGU704X

The stability improvement circuit has no influence on the RF-parameter!
Place the stability circuit closed to the LNA’s input, keep distance to GND and remove the GND layers below the L2, C7 and R4 up to LNA input to avoid capacitive load at LNA’s input.

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4. RF Performance for Different Bias Currents including Default Current

Because there are trade-offs between bias current, linearity, and NF, in this chapter the RF performance of all STB LNA types is given for different bias currents, including the default current. The bias current is controlled by the bias resistor and Table 9 shows an overview of the resistor values for different bias currents in gain mode of different types.

Table 9. Overview resistor values for different bias currents in gain mode of different types

Type	R_{bias} [Ω]			
	I_{CC}≈35mA	I_{CC}≈39mA	I_{CC}≈43mA	I_{CC}≈46mA
BGU7031/2/3	N/A	N/A	43 (default)	39
BGU7041/2	7.5 (default)	5.6	N/A	N/A
BGU7044/5	18 (default)	N/A	10	N/A

4.1 RF Test Setup

4.1.1 IM2, and IM3 measurement setup

For the IM2, and IM3 measurements in this report, the equipment list in Table 10 has been used and Fig 5 shows the test setup diagram.

Table 10. Equipment list for P1dB, IM2, and IM3 measurements

Instrument	Manufacturer	Type
(1x) 4- Port Vector Network Analyzer 10MHz – 24GHz	Rohde & Schwarz	ZVA24
(2x) Dual DC Power Supply	TTi	QL355TP
(1x) USB Powermeter	Rohde & Schwarz	NRP – Z21
(1x) Multimeter	Keithley	2000
(1x) Power Combiner	Agilent	11667B
(2x) Impedance Matching Transformer 75Ω/50Ω, N-connectors	Macom	TPX-75-4
3x Cables from ZVA	Rohde & Schwarz	Test cables PC2.9/PC3.5
1x Cable to input	Suhner	Sucoflex104E, appr.50cm
1x Cable from output	Suhner	Sucoflex104PE, appr.20cm
Additional connectors, cables and adapters as in drawing	Bomar, Suhner, Radiall	n.a.

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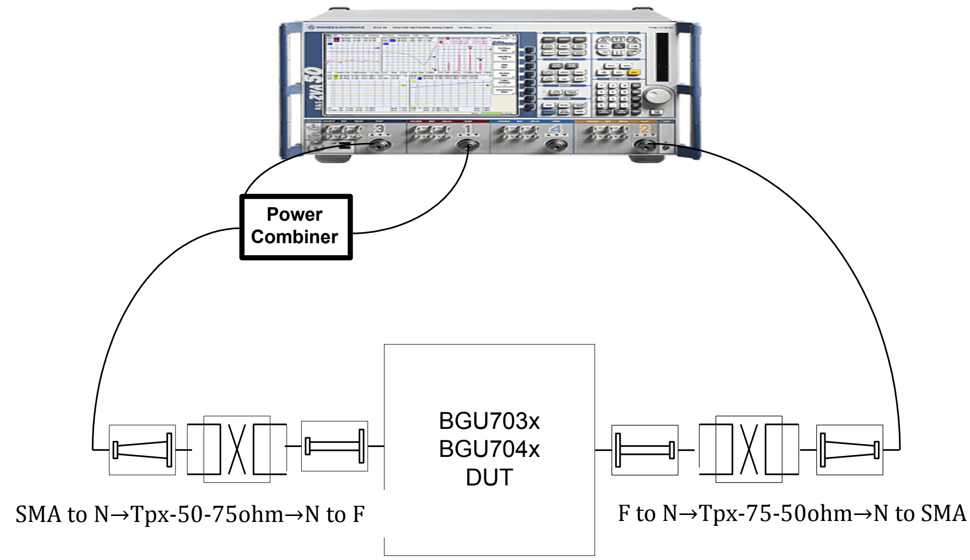

Fig 5. Test setup diagram for IM2, and IM3 measurements

4.1.2 NF measurement setup

For the NF measurement in this report, the equipment list in Table 11 has been used and Fig 6 shows the test setup diagram.

Table 11. Equipment list for NF measurement

Description	Manufacturer	Number
Noise Figure Analyzer 10MHz – 1600MHz	Agilent	8970A
Noise source 15dB / N(m) / 50Ω	Agilent	346B
DC Power-supply	TTi	QL564P
Multimeter	Agilent	34401A
Impedance adapters 5.7dB Loss Pad (N-f) 50Ω / (N-m) 75Ω	Agilent	11852B
Connector adapters (N-f) 75Ω / (F-m) 75Ω	Bomar	

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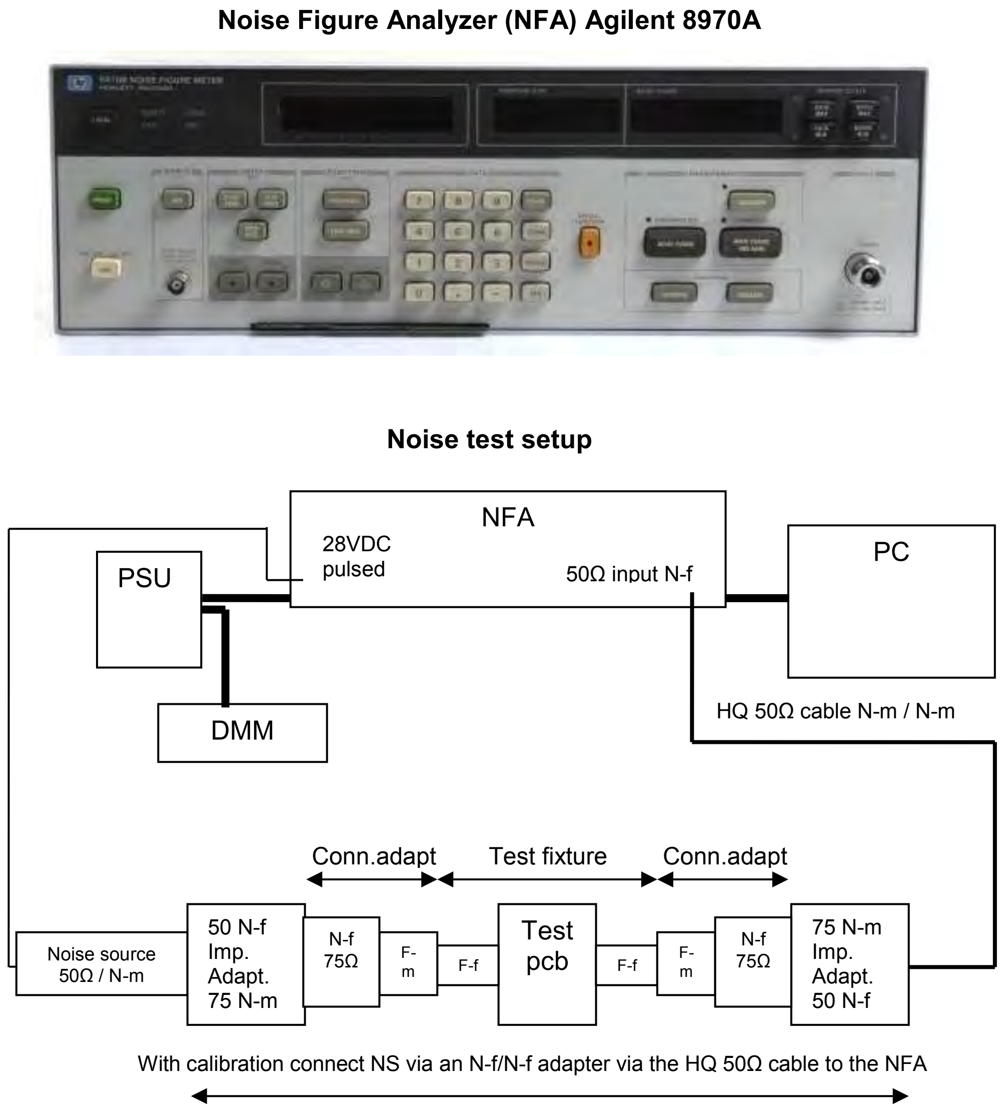

Fig 6. Test setup diagram for NF measurement

4.2 2nd Order Intermodulation (IM2)

For IM2 measurement ZVA S-par. system calibration is not needed since it is a pure and relative power amplitude measurement. Thus only manual Power calibration is required. For this measurement, two tones are used separated by 200MHz or 6MHz, depending on the specification. Via a broadband power combiner and 50Ω to 75Ω impedance transformers the two tones with equal amplitude are fed into the DUT. The measurement has been done with f_1=200MHz or f_1=97.25MHz, depending on the specification, and an input power sweep from -20dBm to 5dBm per tone is applied. The pre-defined losses of the 50Ω to 75Ω impedance transformers etc. are compensated afterwards using output data processing. With Power calibration the reference plane is the SMA connector at the

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50Ω input cable just before the SMA to N adapter that is connected to the input transformer. For IM2, only f_1+f_2 product has been measured.

The IM2 measurement results for different bias currents of BGU703X (5.0V devices) and BGU704X (3.3V devices) are given in chapter 4.2.1 with f_1=200MHz and tone spacing of 200MHz and chapter 4.2.2 with f_1=97.25MHz and tone spacing of 6MHz.

4.2.1 IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Table 12 shows an overview of IIP2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} =-15dBm per tone for BGU703x (5.0V devices) and BGU704x (3.3V devices) in different modes.

Table 12. Overview of IIP2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} =-15dBm per tone for BGU703x and BGU704x in different modes

IIP2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz, Pin=-15dBm per tone

IIP2		Type											
		BGU7031	BGU7032		BGU7033			BGU7041	BGU7042		BGU7044	BGU7045	
		10dB Gain	10dB Gain	Bypass	10dB Gain	5dB Gain	Bypass	10dB Gain	10dB Gain	Bypass	14dB Gain	14dB Gain	Bypass
bias current in gain mode [mA]	35	N/A	N/A	N/A	N/A	N/A	N/A	2.95E+01	2.98E+01	3.45E+01	2.73E+01	2.68E+01	3.40E+01
	39	N/A	N/A	N/A	N/A	N/A	N/A	3.59E+01	3.93E+01	3.27E+01	N/A	N/A	N/A
	43	3.47E+01	3.10E+01	3.35E+01	3.84E+01	3.42E+01	3.46E+01	N/A	N/A	N/A	2.93E+01	3.00E+01	3.47E+01
	46	3.35E+01	3.32E+01	3.41E+01	3.29E+01	3.23E+01	3.26E+01	N/A	N/A	N/A	N/A	N/A	N/A

4.2.1.1 BGU7031: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 7 to Fig 8 show 1st and 2nd order response of BGU7031 in 10dB gain mode with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.

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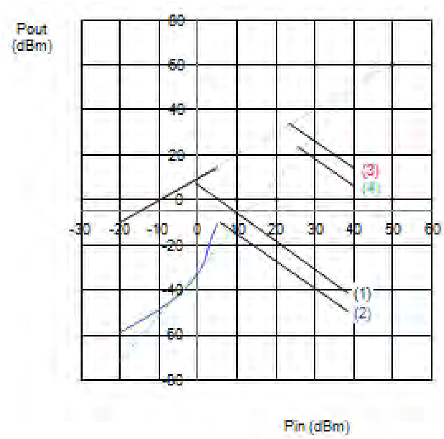


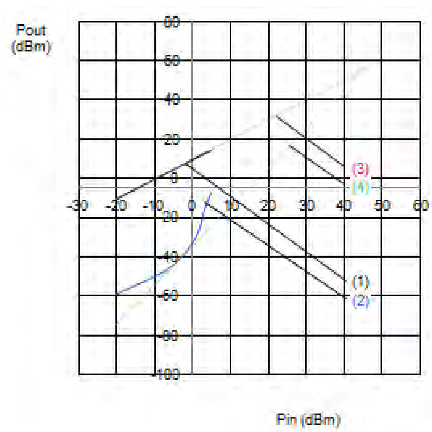
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 7. IM2 of BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 8. IM2 of BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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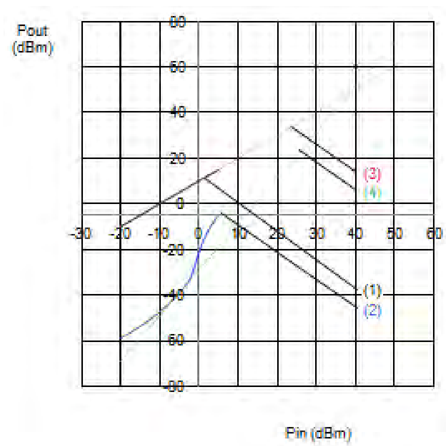
4.2.1.2 BGU7032: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 9 to Fig 12 show 1st and 2nd order response of BGU7032 in 10dB gain and bypass modes with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 9. IM2 of BGU7032 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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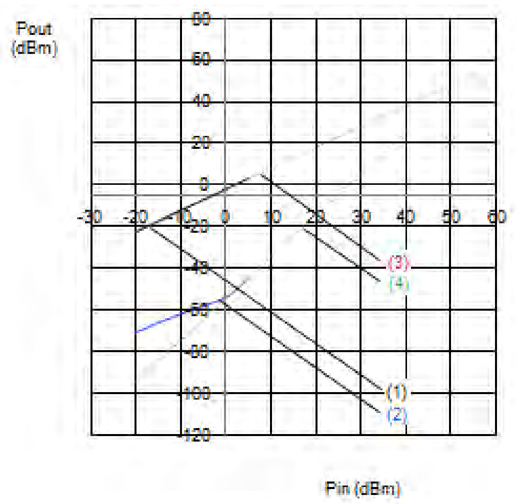

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 10. IM2 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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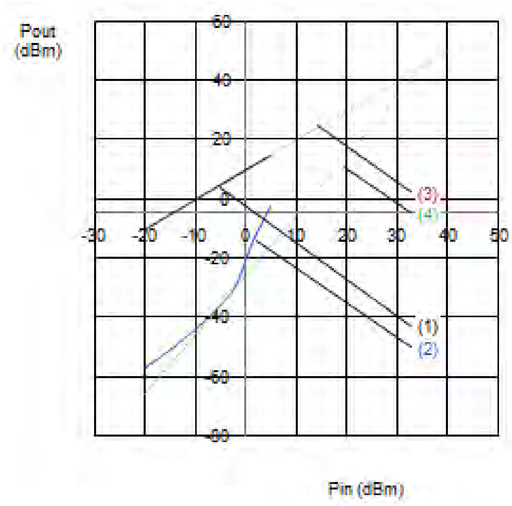


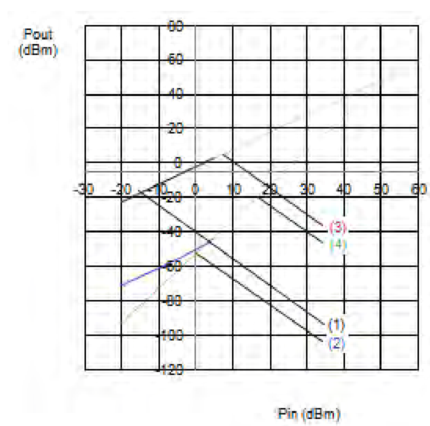
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 11. IM2 of BGU7032 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 12. IM2 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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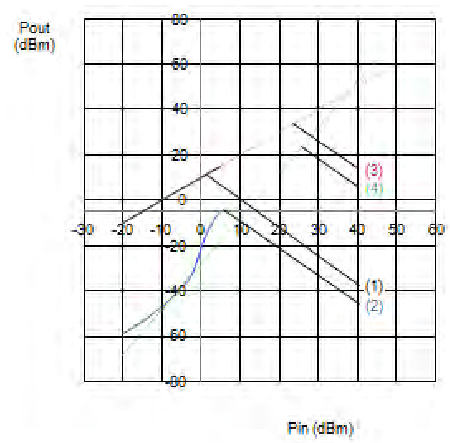
4.2.1.3 BGU7033: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 13 to Fig 18 show 1st and 2nd order response of BGU7033 in 10dB gain, 5dB gain, and bypass modes with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 13. IM2 of BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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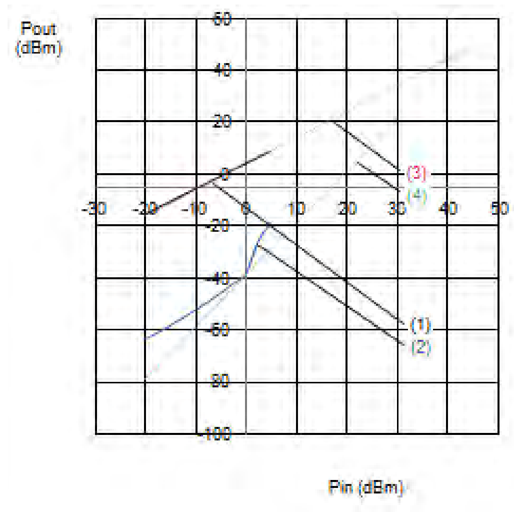

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 14. IM2 of BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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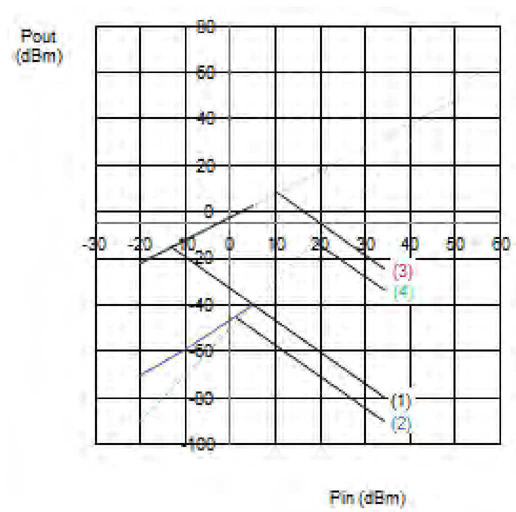

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 15. IM2 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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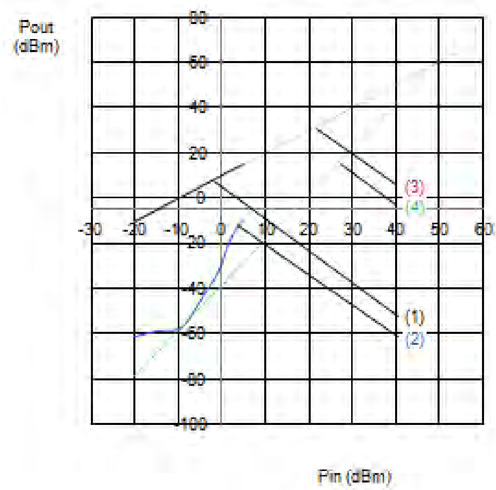

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 16. IM2 of BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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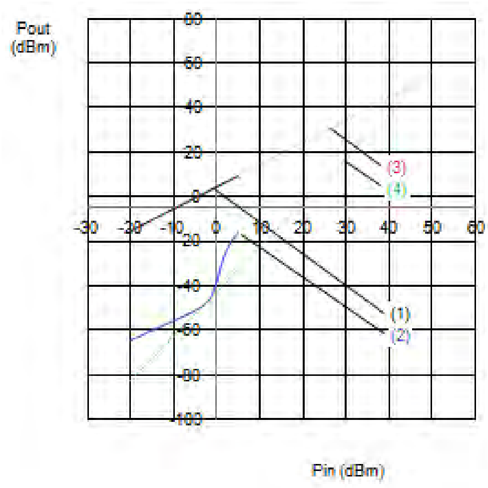


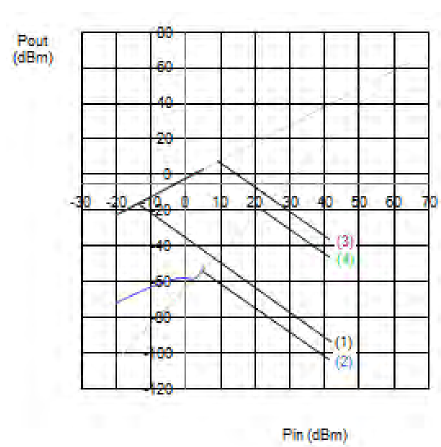
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 17. IM2 of BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 18. IM2 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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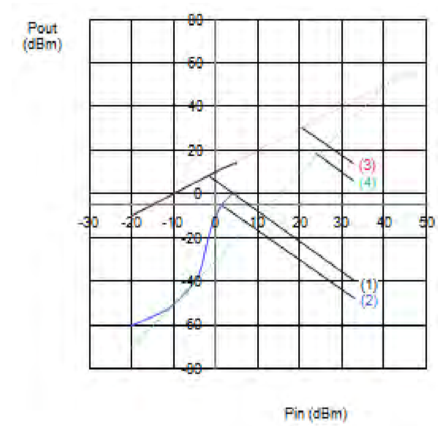
4.2.1.4 BGU7041: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 19 to Fig 20 show 1st and 2nd order response of BGU7041 in 10dB gain mode with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.



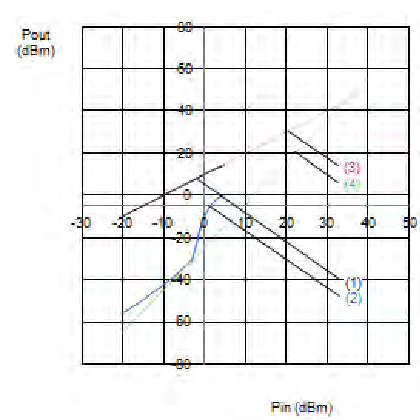
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 19. IM2 of BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 20. IM2 of BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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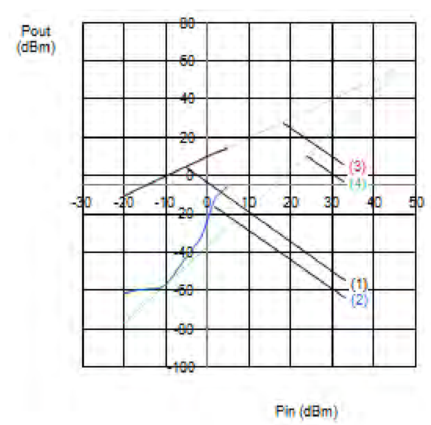
4.2.1.5 BGU7042: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 21 to Fig 24 show 1st and 2nd order response of BGU7042 in 10dB gain and bypass modes with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 21. IM2 of BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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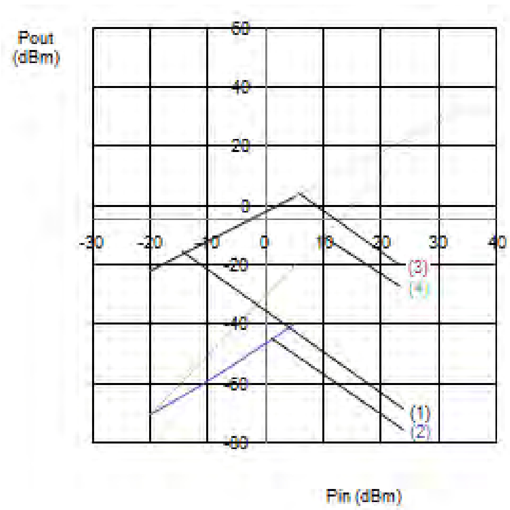

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 22. IM2 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=5.6Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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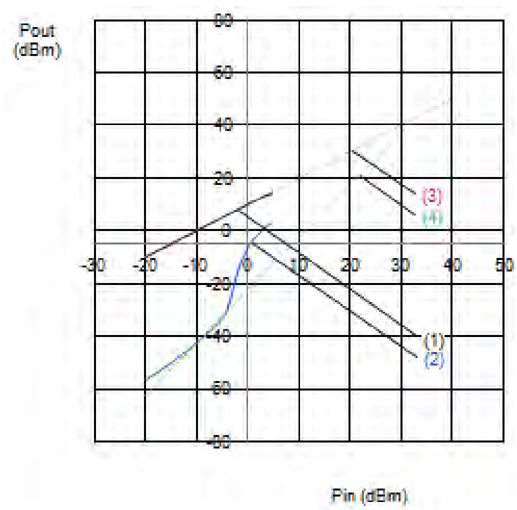
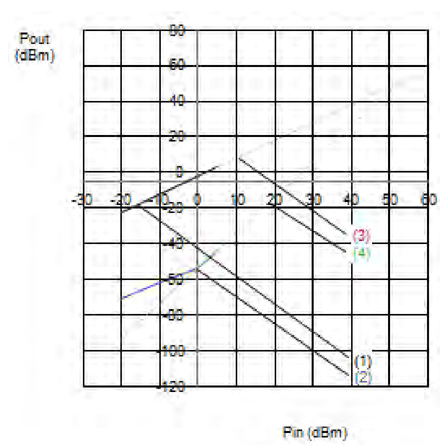


(1) 1st order
(2) 2nd order
(3) 1st order extrapolation
(4) 2nd order extrapolation

Fig 23. IM2 of BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order
(2) 2nd order
(3) 1st order extrapolation
(4) 2nd order extrapolation

Fig 24. IM2 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=7.5Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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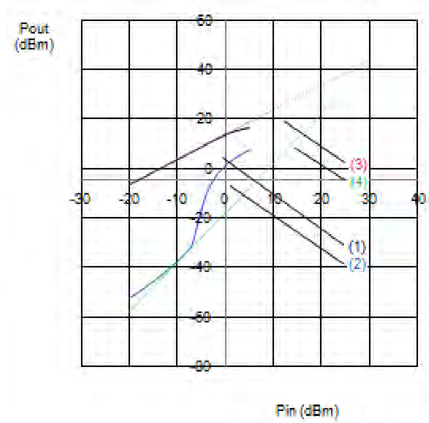
4.2.1.6 BGU7044: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 25 to Fig 26 show 1st and 2nd order response of BGU7044 in 14dB gain mode with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 25. IM2 of BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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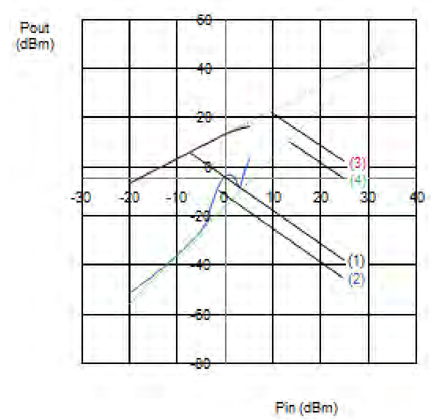

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 26. IM2 of BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

4.2.1.7 BGU7045: IM2 with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 27 to Fig 30 show 1st and 2nd order response of BGU7044 in 14dB gain and bypass modes with f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; and P_{in} per tone swept from -20dBm to 5dBm.

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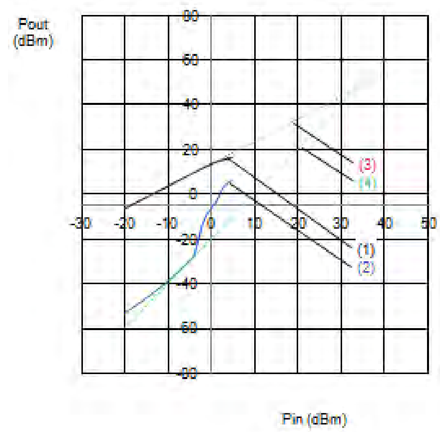


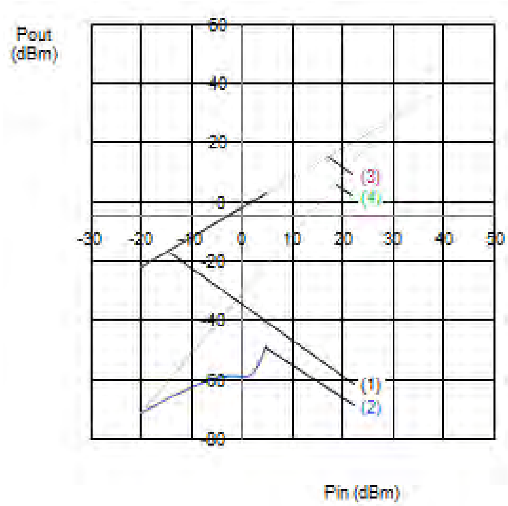
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 27. IM2 of BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 28. IM2 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=10Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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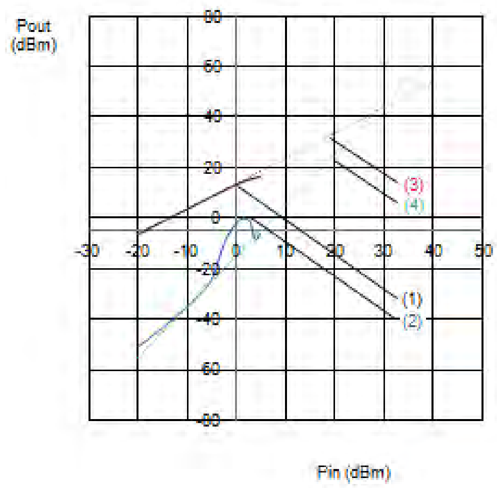


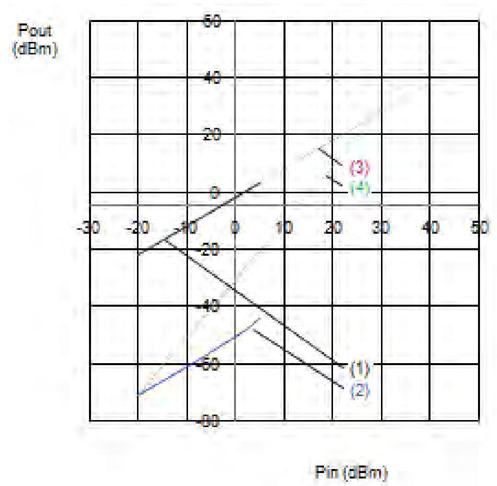
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 29. IM2 of BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 30. IM2 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=18Ω; f_1=200MHz, f_2=400MHz, f_{IM2}=600MHz; P_{in} per tone swept from -20dBm to 5dBm

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4.2.2 IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Table 13 shows an overview of IIP2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; and P_{in} =-20dBm per tone for BGU703x (5.0V devices) and BGU704x (3.3V devices) in different modes.

Table 13. Overview of IIP2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; and P_{in} = -20dBm per tone for BGU703x and BGU704x in different modes

IIP2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz, Pin=-20dBm per tone													
IIP2		Type											
		BGU7031	BGU7032		BGU7033			BGU7041	BGU7042		BGU7044	BGU7045	
		10dB Gain	10dB Gain	Bypass	10dB Gain	5dB Gain	Bypass	10dB Gain	10dB Gain	Bypass	14dB Gain	14dB Gain	Bypass
bias current in gain mode [mA]	35	N/A	N/A	N/A	N/A	N/A	N/A	3.48E+01	3.35E+01	4.47E+01	2.92E+01	2.91E+01	4.56E+01
	39	N/A	N/A	N/A	N/A	N/A	N/A	3.54E+01	3.43E+01	4.89E+01	N/A	N/A	N/A
	43	4.44E+01	3.53E+01	4.54E+01	3.51E+01	4.51E+01	4.86E+01	N/A	N/A	N/A	3.24E+01	3.24E+01	4.55E+01
	46	4.52E+01	3.58E+01	4.77E+01	3.65E+01	4.53E+01	4.83E+01	N/A	N/A	N/A	N/A	N/A	N/A

4.2.2.1 BGU7031: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 31 to Fig 32 show 1st and 2nd order response of BGU7031 in 10dB gain mode with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.

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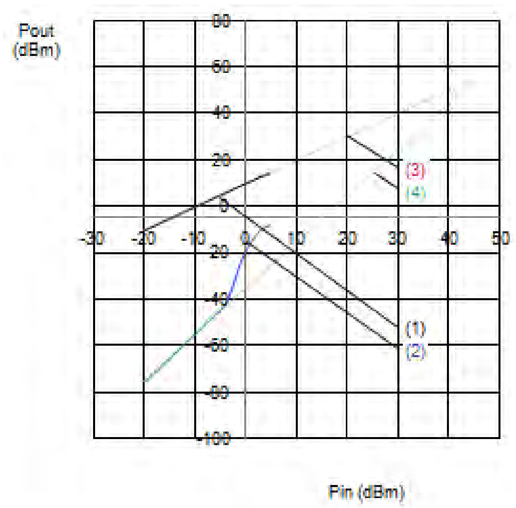


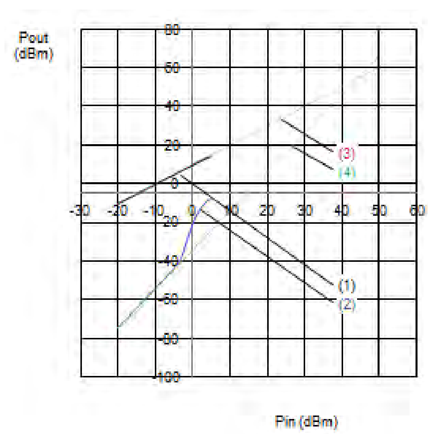
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 31. IM2 of BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 32. IM2 of BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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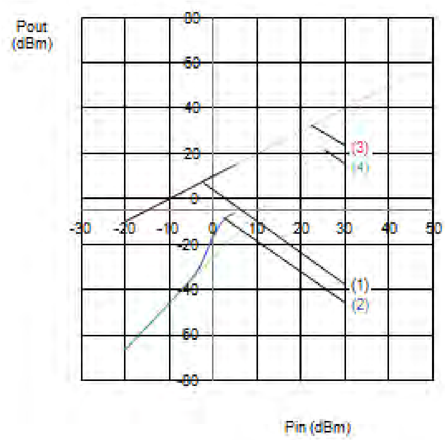
4.2.2.2 BGU7032: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 33 to Fig 36 show 1st and 2nd order response of BGU7032 in 10dB gain and bypass modes with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 33. IM2 of BGU7032 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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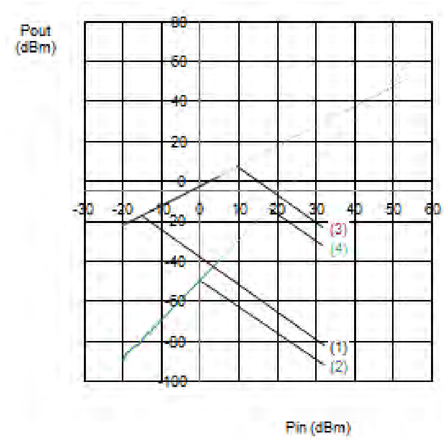


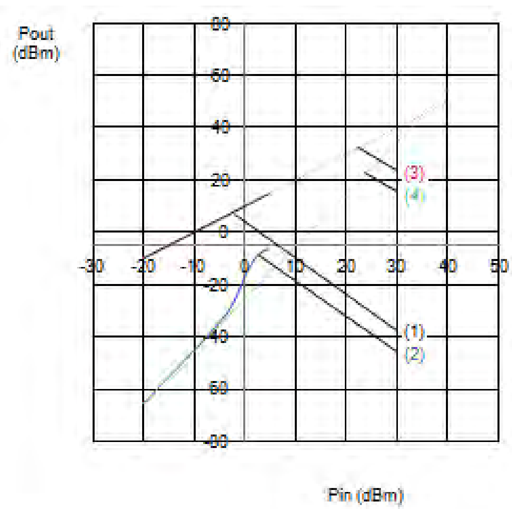
(1) 1^{st} order

(2) 2^{nd} order

(3) 1^{st} order extrapolation

(4) 2^{nd} order extrapolation

Fig 34. IM2 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1^{st} order

(2) 2^{nd} order

(3) 1^{st} order extrapolation

(4) 2^{nd} order extrapolation

Fig 35. IM2 of BGU7032 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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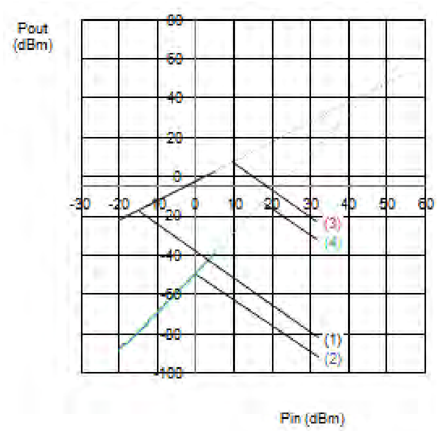

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 36. IM2 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

4.2.2.3 BGU7033: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 37 to Fig 42 show 1st and 2nd order response of BGU7033 in 10dB gain, 5dB gain, and bypass modes with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.

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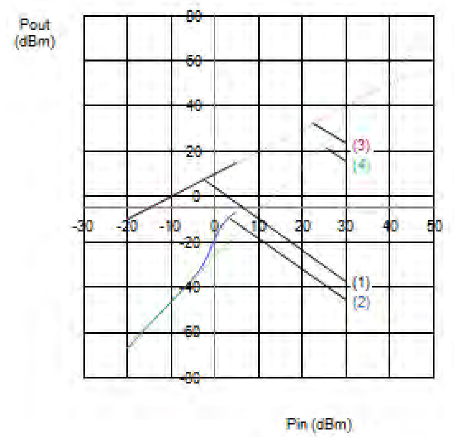


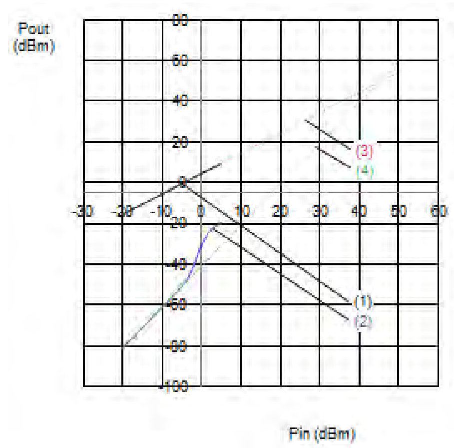
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 37. IM2 of BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 38. IM2 of BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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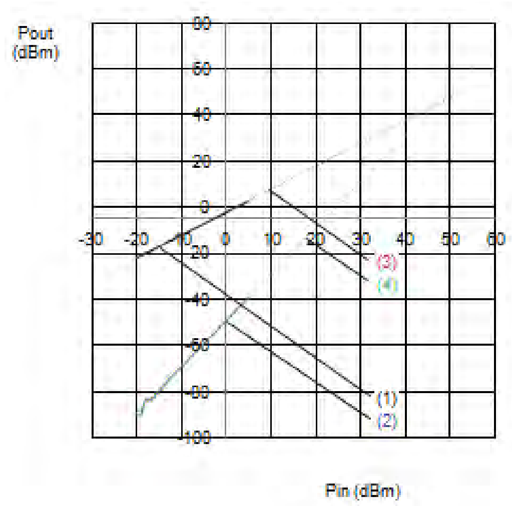

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 39. IM2 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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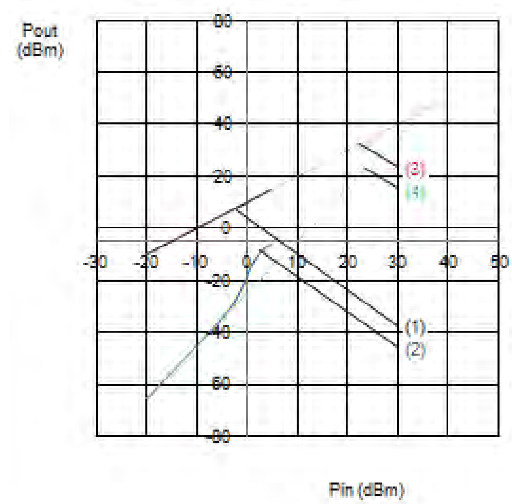

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 40. IM2 of BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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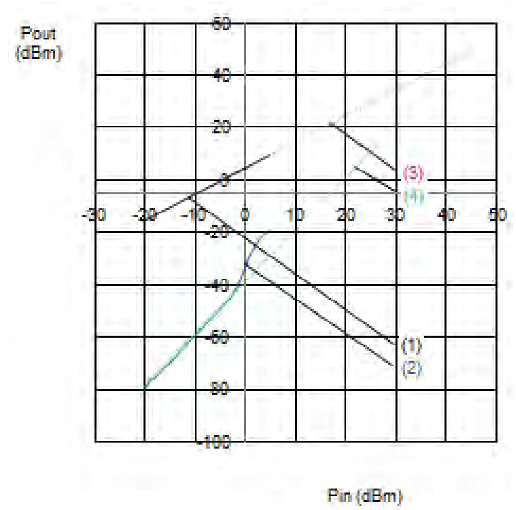


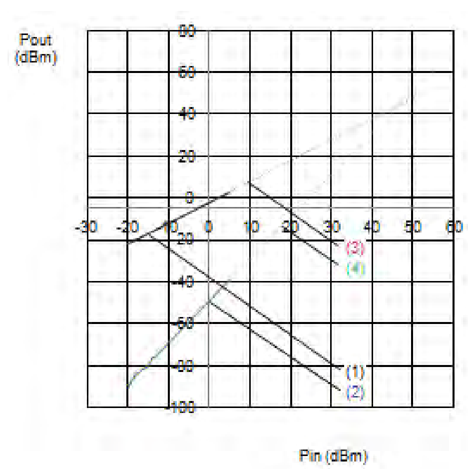
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 41. IM2 of BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 42. IM2 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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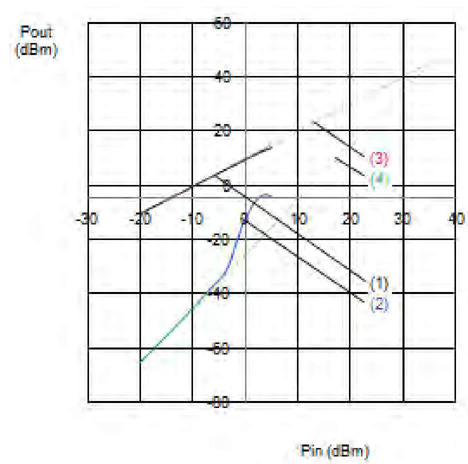
4.2.2.4 BGU7041: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 43 to Fig 44 show 1st and 2nd order response of BGU7041 in 10dB gain mode with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 43. IM2 of BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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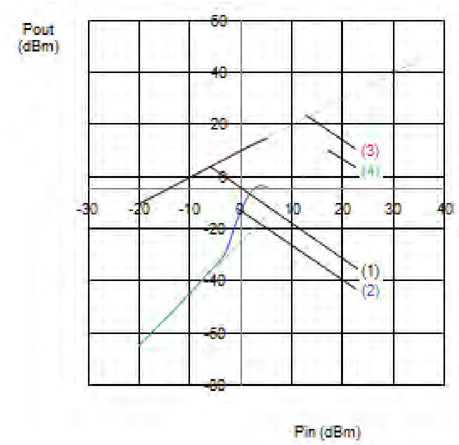

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 44. IM2 of BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

4.2.2.5 BGU7042: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 45 to Fig 48 show 1st and 2nd order response of BGU7042 in 10dB gain and bypass modes with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.

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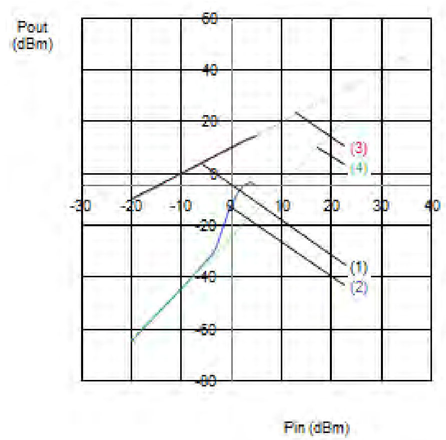


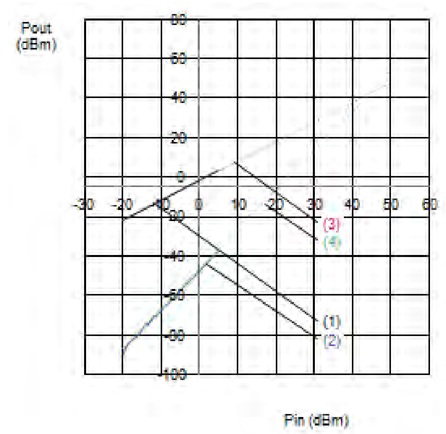
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 45. IM2 of BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 46. IM2 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=5.6Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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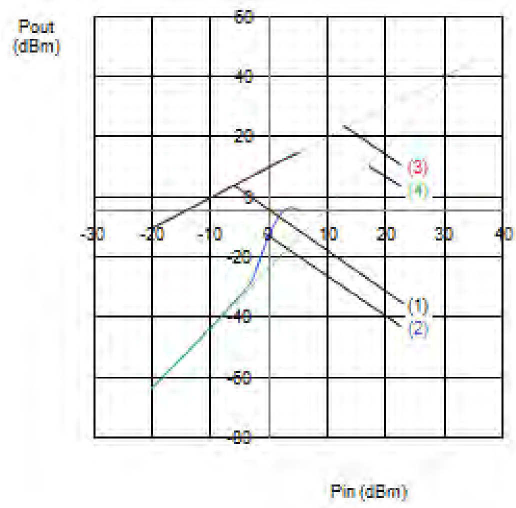


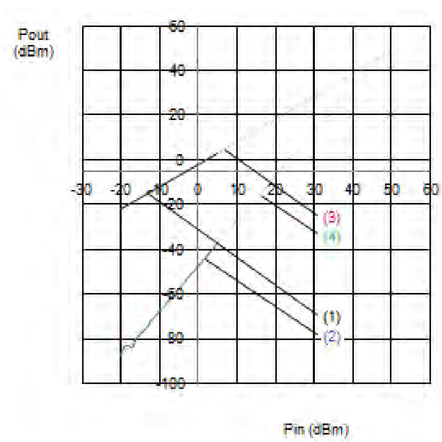
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 47. IM2 of BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 48. IM2 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=7.5Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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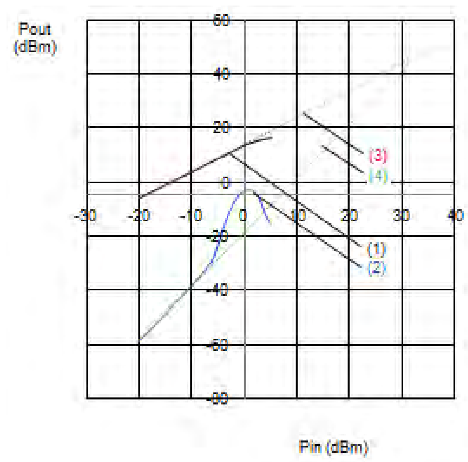
4.2.2.6 BGU7044: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 49 to Fig 50 show 1st and 2nd order response of BGU7044 in 14dB gain mode with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 49. IM2 of BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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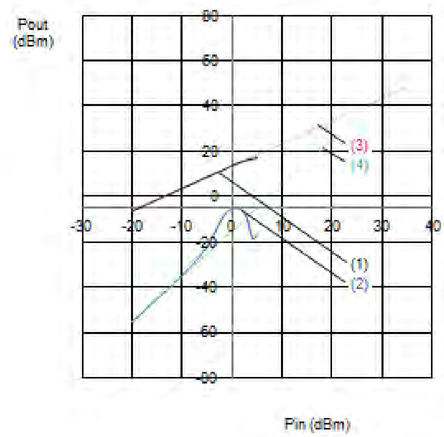

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 50. IM2 of BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

4.2.2.7 BGU7045: IM2 with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

Fig 51 to Fig 54 show 1st and 2nd order response of BGU7045 in 14dB gain and bypass modes with f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm.

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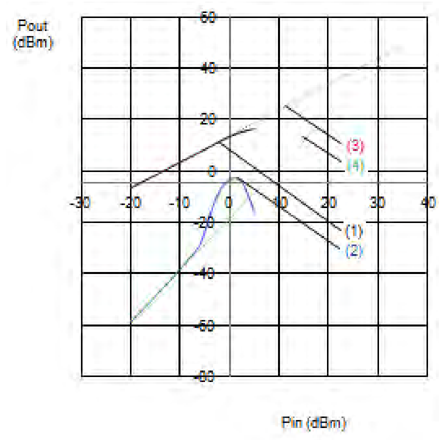


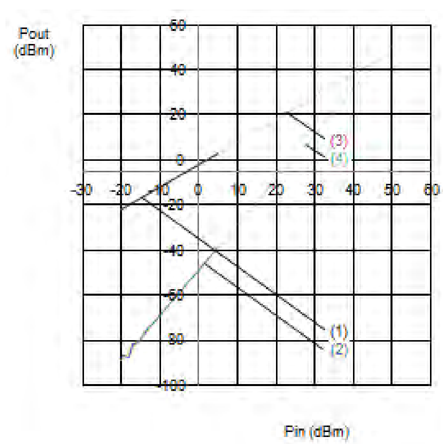
(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 51. IM2 of BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 52. IM2 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=10Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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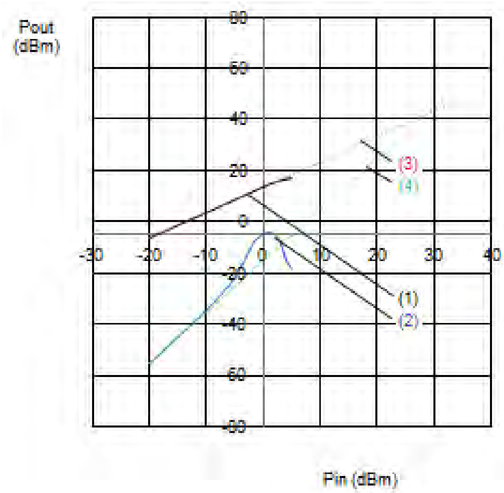

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 53. IM2 of BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

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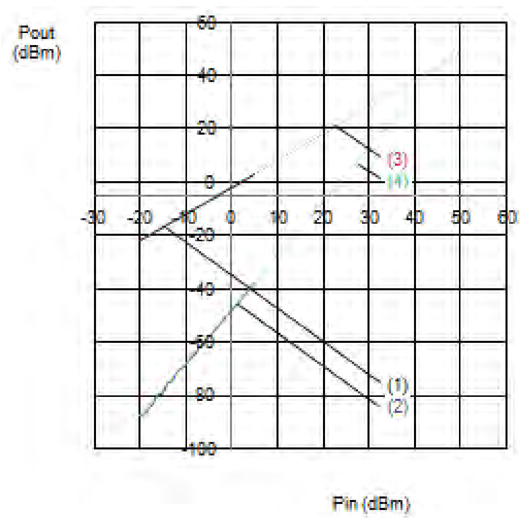

(1) 1st order

(2) 2nd order

(3) 1st order extrapolation

(4) 2nd order extrapolation

Fig 54. IM2 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=18Ω; f_1=97.25MHz, f_2=103.25MHz, f_{IM2}=200.50MHz; P_{in} per tone swept from -20dBm to 5dBm

4.3 3rd Order Intermodulation (IM3)

For IM3 measurement ZVA S-par. system calibration is not needed since it is a pure and relative power amplitude measurement. Thus only manual Power calibration is required. For this measurement, two tones are used separated by 1MHz or 10MHz, depending on the specification. Via a broadband power combiner and 50Ω to 75Ω impedance transformers the two tones with equal amplitude are fed into the DUT. The measurement has been done with f_1=1000MHz or f_1=900MHz, depending on the specification, and an input power sweep from -20dBm to 5dBm per tone is applied. The pre-defined losses of the 50Ω to 75Ω impedance transformers etc. are compensated afterwards using output data processing. With Power calibration the reference plane is the SMA connector at the 50Ω input cable just before the SMA to N adapter that is connected to the input transformer. Both IM3 products will be measured at the frequencies $2xf_1$-f_2 and $2xf_2$-f_1 Because both frequencies give similar results at these settings only frequency $2xf_2$-f_1 is used.

The IM3 measurement results for different bias currents of BGU703X (5.0V devices) and BGU704X (3.3V devices) are given in chapter 4.3.1 with f_1=1000MHz and tone spacing of 1MHz and chapter 4.3.2 with f_1=900MHz and tone spacing of 10MHz.

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4.3.1 IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Table 14 shows an overview of IIP3 with f_1=1000MHz, f_2=1001MHz, f_{IM3}=1002MHz; P_{in} = -10dBm per tone for BGU703x (5.0V devices) and BGU704x (3.3V devices) in different modes.

Table 14. Overview of IIP3 with f_1=1000MHz, f_2=1001MHz, f_{IM3}=1002MHz; P_{in} = -10dBm per tone for BGU703x and BGU704x in different modes

IIP3 with f_1=1000MHz, f_2=1001MHz, f_{IM3}=1002MHz, Pin=-10dBm per tone													
IIP3		Type											
		BGU7031	BGU7032		BGU7033			BGU7041	BGU7042		BGU7044	BGU7045	
		10dB Gain	10dB Gain	Bypass	10dB Gain	5dB Gain	Bypass	10dB Gain	10dB Gain	Bypass	14dB Gain	14dB Gain	Bypass
bias current in gain mode [mA]	35	N/A	N/A	N/A	N/A	N/A	N/A	2.03E+01	1.98E+01	3.06E+01	1.54E+01	1.55E+01	3.01E+01
	39	N/A	N/A	N/A	N/A	N/A	N/A	2.01E+01	2.01E+01	3.01E+01	N/A	N/A	N/A
	43	2.05E+01	2.08E+01	4.02E+01	2.14E+01	2.41E+01	3.05E+01	N/A	N/A	N/A	1.76E+01	1.76E+01	2.98E+01
	46	2.08E+01	2.08E+01	2.95E+01	2.13E+01	2.33E+01	3.70E+01	N/A	N/A	N/A	N/A	N/A	N/A

4.3.1.1 BGU7031: IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 55 to Fig 56 show 1st and 3rd order response of BGU7031 in 10dB gain mode with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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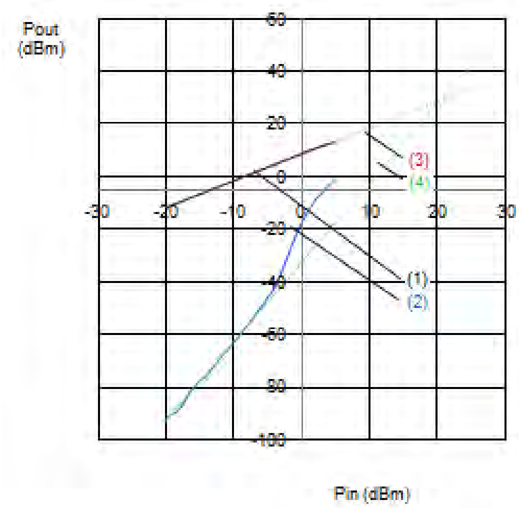


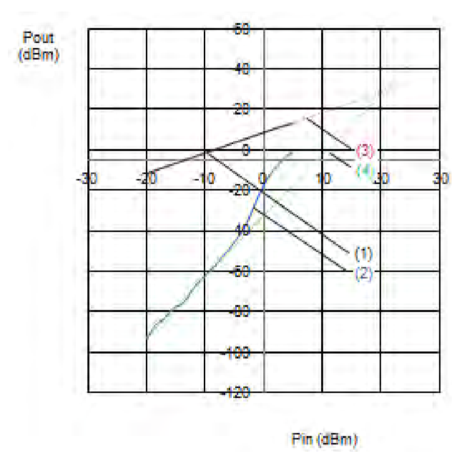
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 55. IM3 of BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 56. IM3 of BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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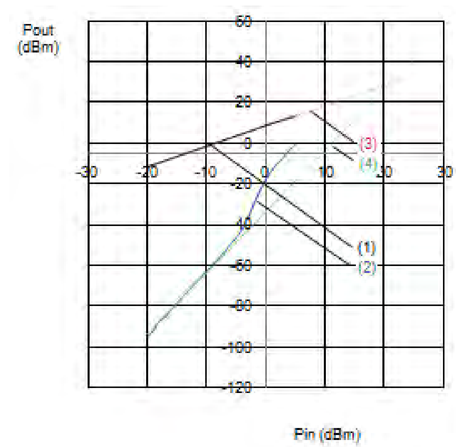
4.3.1.2 BGU7032: IM3 with f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 57 to Fig 60 show 1st and 3rd order response of BGU7032 in 10dB gain and bypass modes with f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 57. IM3 of BGU7032 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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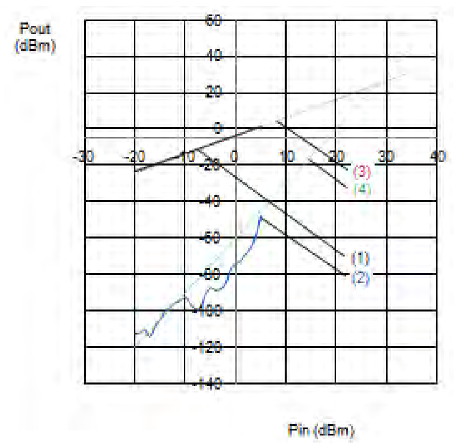


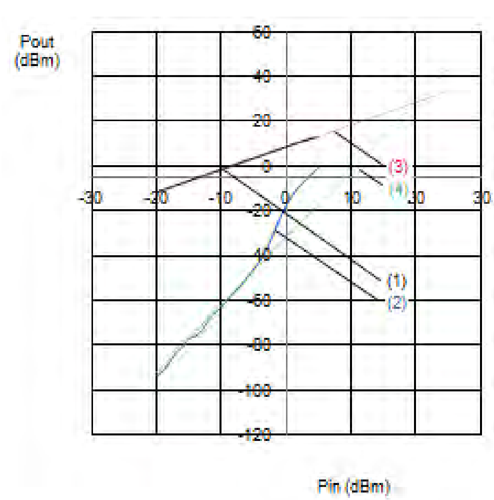
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 58. IM3 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 59. IM3 of BGU7032 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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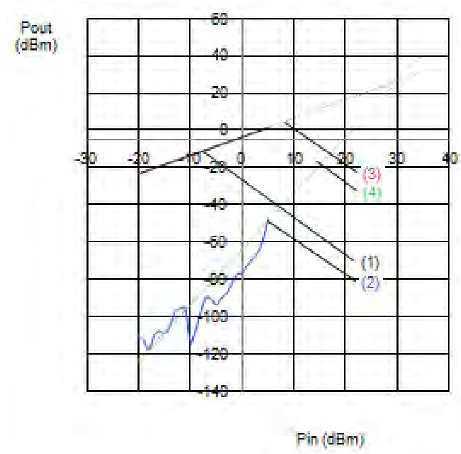

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 60. IM3 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.3.1.3 BGU7033: IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 61 to Fig 66 show 1st and 3rd order response of BGU7033 in 10dB gain, 5dB gain, and bypass modes with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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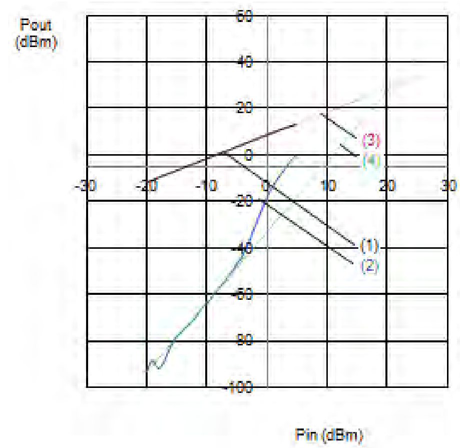


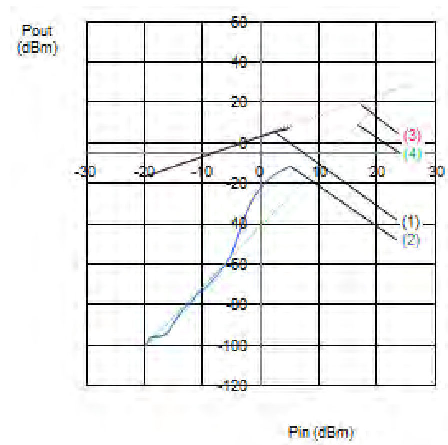
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 61. IM3 of BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 62. IM3 of BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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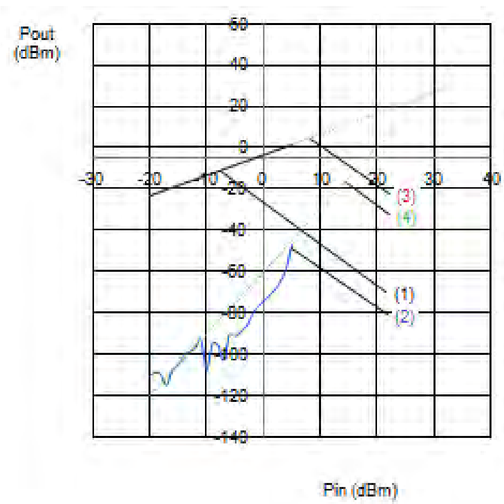

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 63. IM3 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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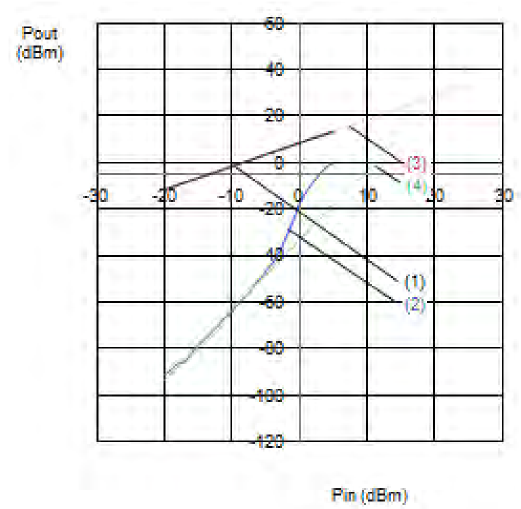

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 64. IM3 of BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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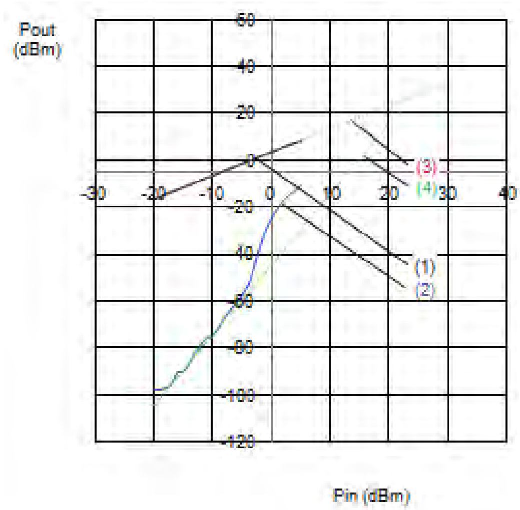


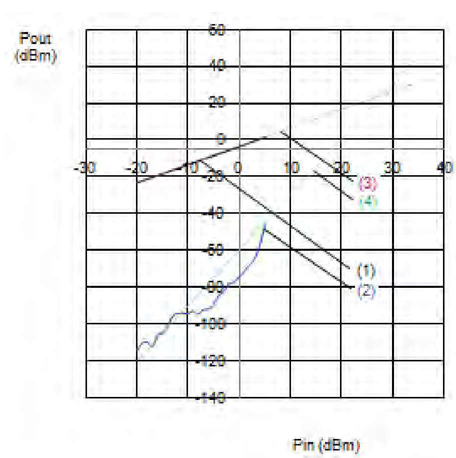
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 65. IM3 of BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 66. IM3 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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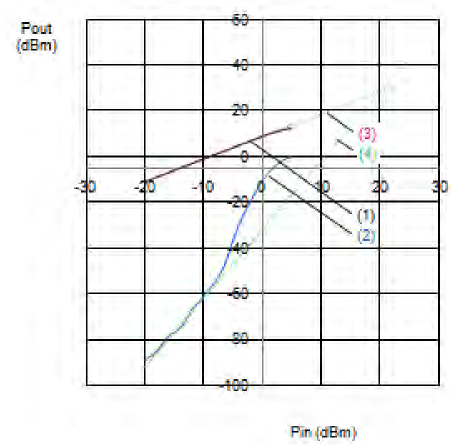
4.3.1.4 BGU7041: IM3 with f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 67 to Fig 68 show 1st and 3rd order response of BGU7041 in 10dB gain mode with f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 67. IM3 of BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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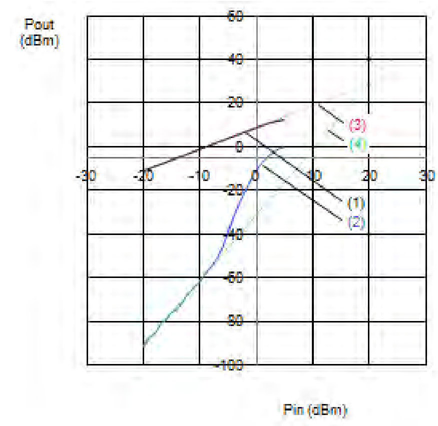

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 68. IM3 of BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.3.1.5 BGU7042: IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 69 to Fig 72 show 1st and 3rd order response of BGU7042 in 10dB gain and bypass modes with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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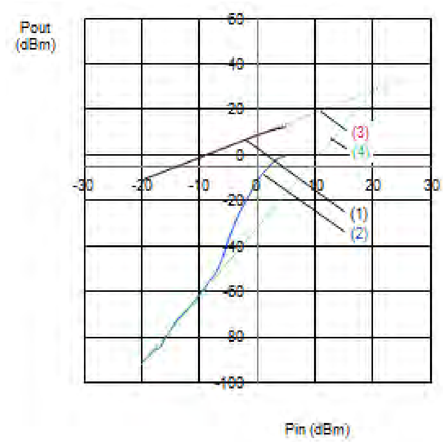


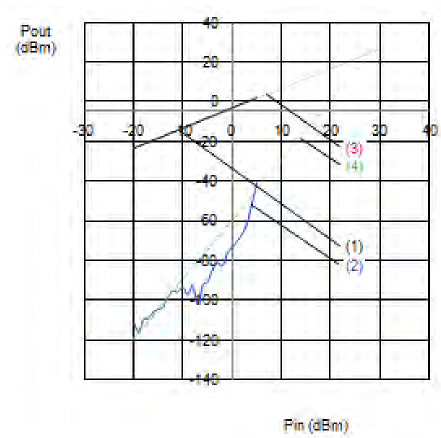
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 69. IM3 of BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=1000MHz, $f_2=f_1\pm$1MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 70. IM3 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=5.6Ω; f_1=1000MHz, $f_2=f_1\pm$1MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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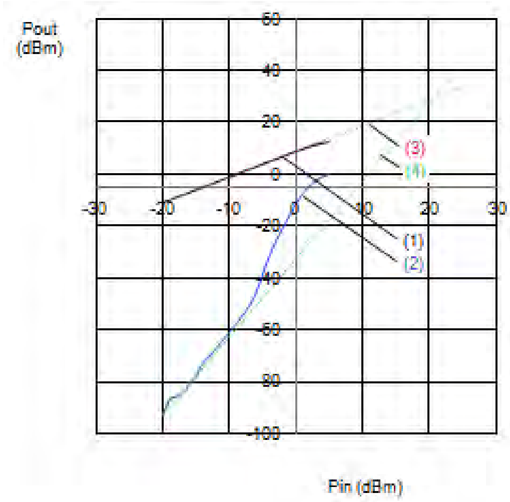


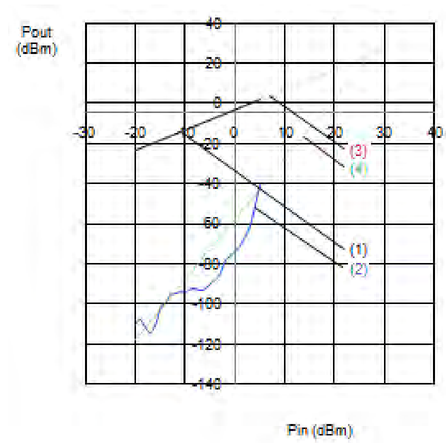
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 71. IM3 of BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 72. IM3 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=7.5Ω; f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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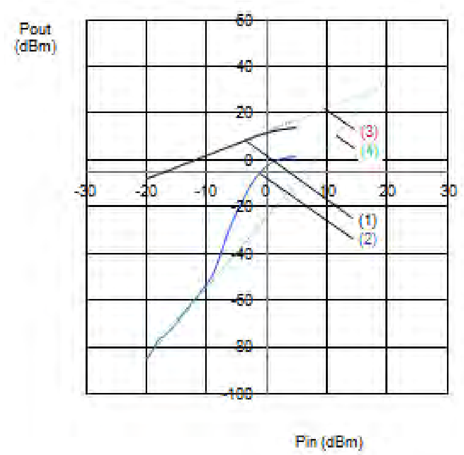
4.3.1.6 BGU7044: IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 73 to Fig 74 show 1st and 3rd order response of BGU7044 in 14dB gain mode with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 73. IM3 of BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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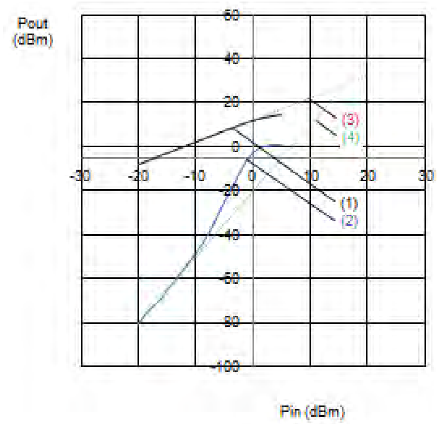

(1) 1st order
(2) 3rd order
(3) 1st order extrapolation
(4) 3rd order extrapolation

Fig 74. IM3 of BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.3.1.7 BGU7045: IM3 with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 75 to Fig 78 show 1st and 3rd order response of BGU7045 in 14dB gain and bypass mode with f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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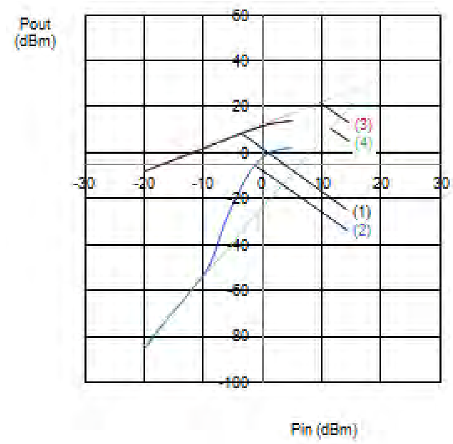


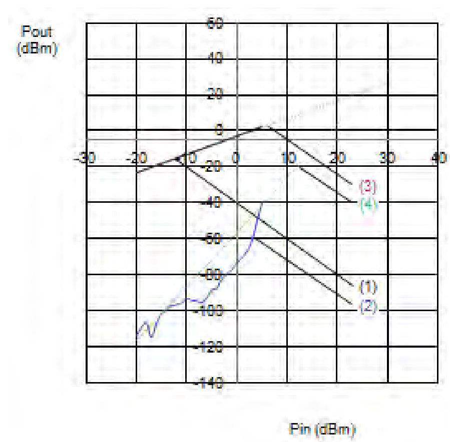
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 75. IM3 of BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 76. IM3 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=10Ω; f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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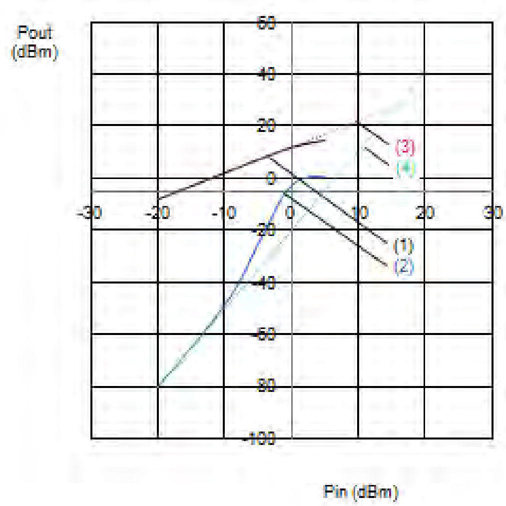

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 77. IM3 of BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=1000MHz, f_2=f_1±1MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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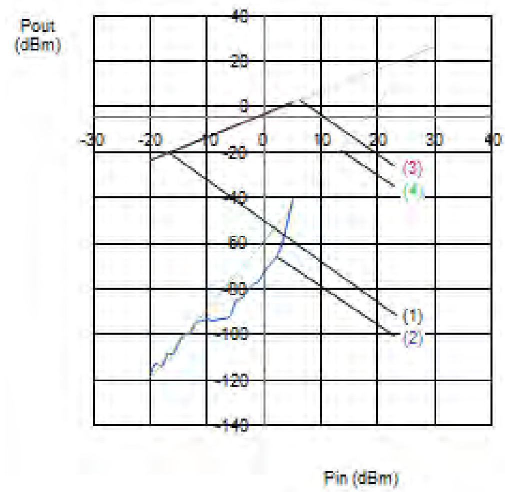

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 78. IM3 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=18Ω; f_1=1000MHz, $f_2=f_1\pm1$MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.3.2 IM3 with f_1=900MHz, f_2=910MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

Table 15 shows an overview of IIP3 with f_1=900MHz, f_2=910MHz, f_{IM3}=920MHz; P_{in} =-20dBm per tone for BGU703x (5.0V devices) and BGU704x (3.3V devices) in different modes.

Table 15. Overview of IIP3 with f_1=900MHz, f_2=910MHz, f_{IM3}=920MHz; P_{in} =-20dBm per tone for BGU703x and BGU704x in different modes

IIP3 with f_1=900MHz, f_2=910MHz, f_{IM3}=920MHz, Pin=-20dBm per tone												
IIP3	Type											
	BGU7031	BGU7032		BGU7033			BGU7041	BGU7042		BGU7044	BGU7045	
	10dB Gain	10dB Gain	Bypass	10dB Gain	5dB Gain	Bypass	10dB Gain	10dB Gain	Bypass	14dB Gain	14dB Gain	Bypass
bias current in gain mode [mA] 35	N/A	N/A	N/A	N/A	N/A	N/A	2.43E+01	2.49E+01	2.07E+01	1.97E+01	2.02E+01	2.22E+01
39	N/A	N/A	N/A	N/A	N/A	N/A	2.27E+01	2.52E+01	2.14E+01	N/A	N/A	N/A
43	2.57E+01	2.43E+01	2.29E+01	2.39E+01	2.43E+01	2.34E+01	N/A	N/A	N/A	2.25E+01	2.26E+01	2.27E+01
46	2.56E+01	2.49E+01	1.96E+01	2.47E+01	2.52E+01	1.95E+01	N/A	N/A	N/A	N/A	N/A	N/A

4.3.2.1 BGU7031: IM3 with f_1=900MHz, f_2=910MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 79 to Fig 80 show 1st and 3rd order response of BGU7031 in 10dB gain mode with f_1=900MHz, f_2=910MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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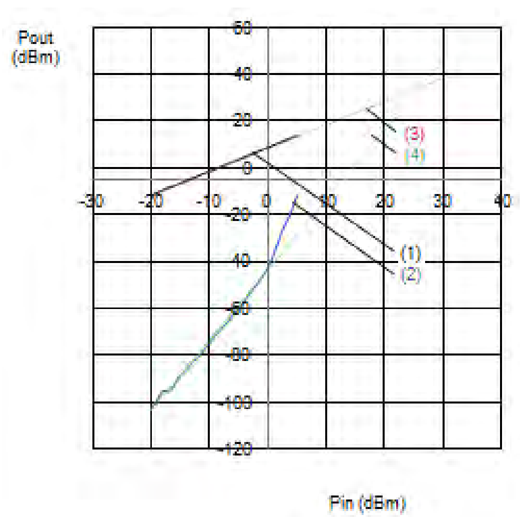


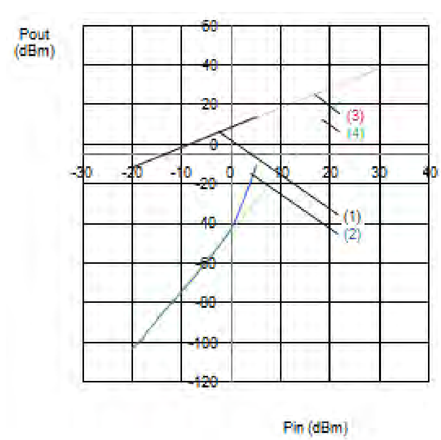
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 79. IM3 of BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 80. IM3 of BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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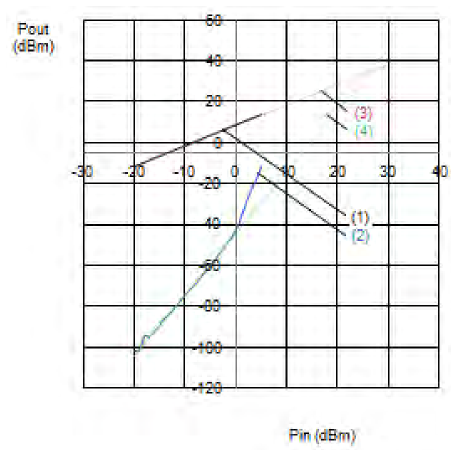
4.3.2.2 BGU7032: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 81 to Fig 84 show 1st and 3rd order response of BGU7032 in 10dB gain and bypass modes with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 81. IM3 of BGU7032 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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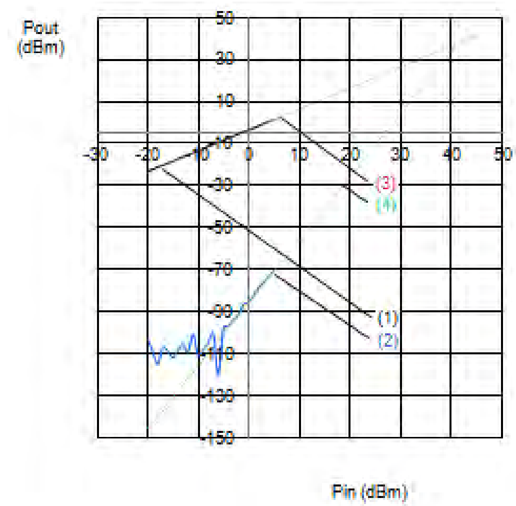

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 82. IM3 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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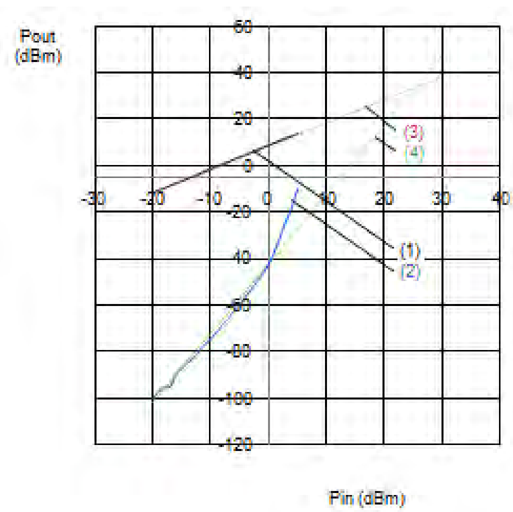


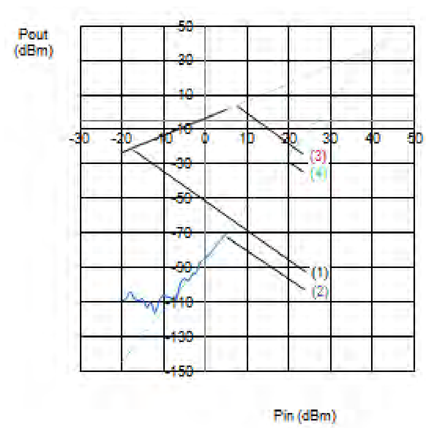
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 83. IM3 of BGU7032 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 84. IM3 of BGU7032 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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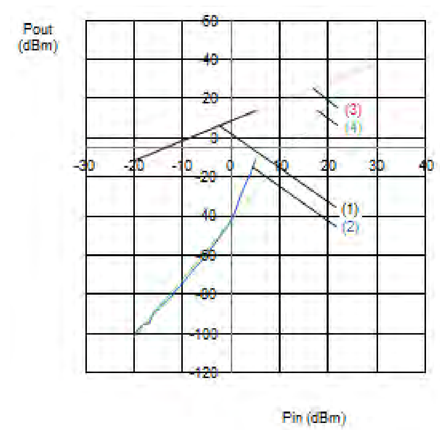
4.3.2.3 BGU7033: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 85 to Fig 90 show 1st and 3rd order response of BGU7033 in 10dB gain, 5dB gain, and bypass modes with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 85. IM3 of BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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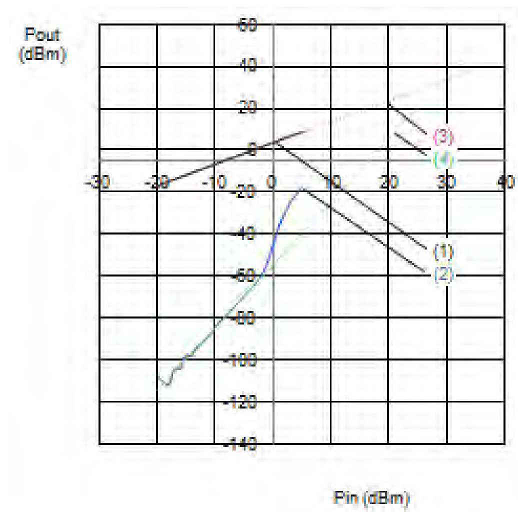

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 86. IM3 of BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω); f_1=900MHz, f_2=910MHz, $f_{IM3}=2xf_2-f_1$ (worst case); P_{in} per tone swept from -20dBm to 5dBm

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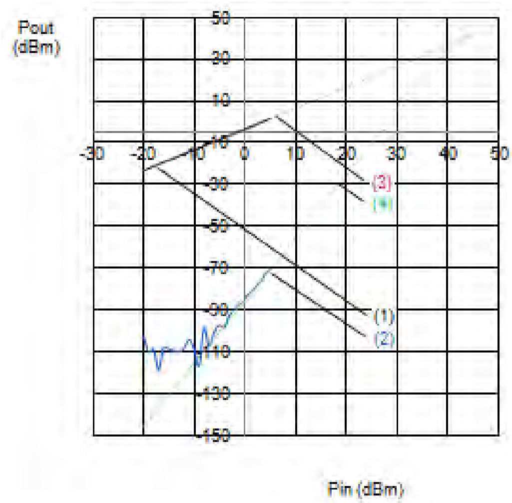

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 87. IM3 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=39Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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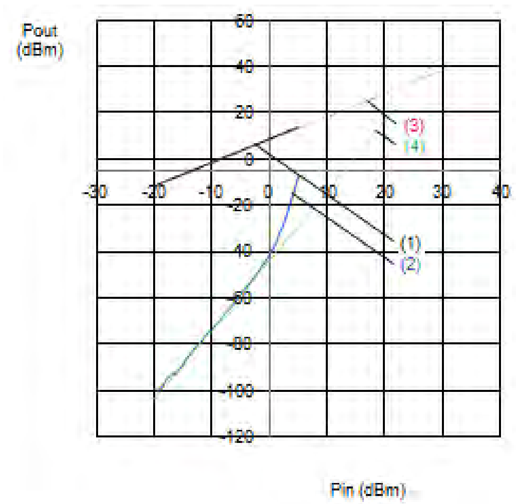

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 88. IM3 of BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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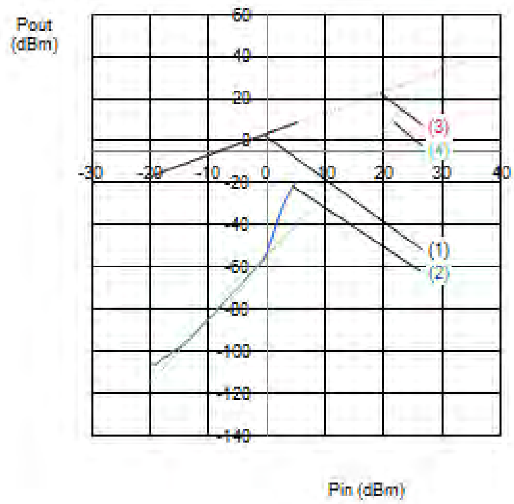


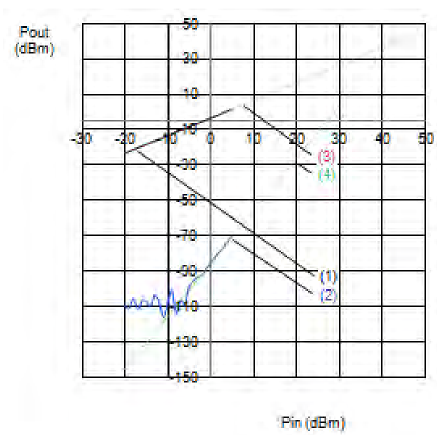
(1) 1[st] order

(2) 3[rd] order

(3) 1[st] order extrapolation

(4) 3[rd] order extrapolation

Fig 89. IM3 of BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1[st] order

(2) 3[rd] order

(3) 1[st] order extrapolation

(4) 3[rd] order extrapolation

Fig 90. IM3 of BGU7033 in Bypass mode with Icc=4mA; R_{bias}=43Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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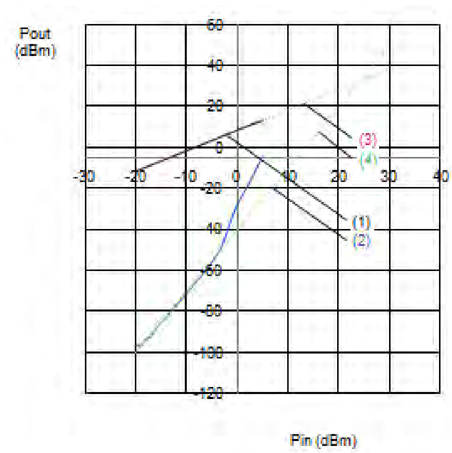
4.3.2.4 BGU7041: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 91 to Fig 92 show 1st and 3rd order response of BGU7041 in 10dB gain mode with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 91. IM3 of BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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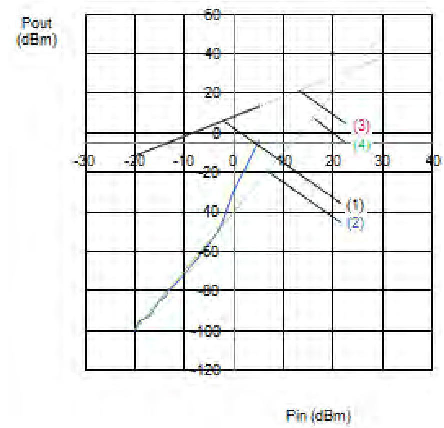

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 92. IM3 of BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.3.2.5 BGU7042: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 93 to Fig 96 show 1st and 3rd order response of BGU7042 in 10dB gain and bypass modes with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.

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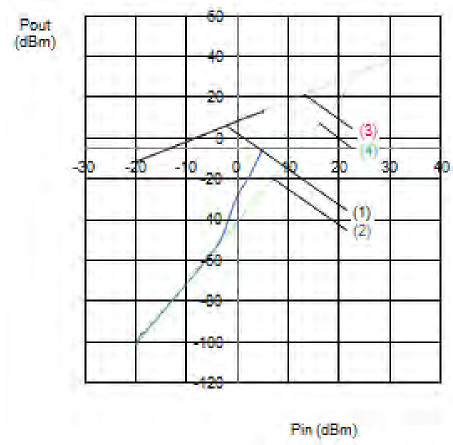


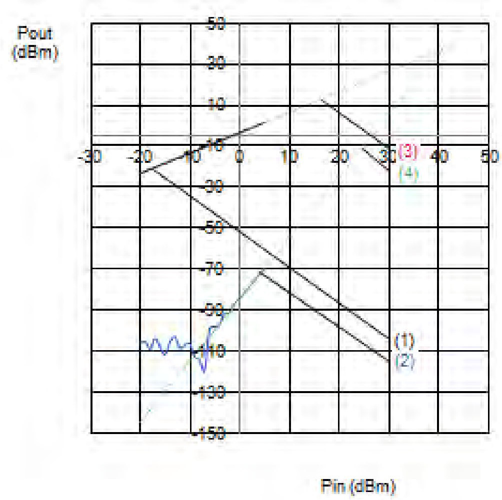
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 93. IM3 of BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 94. IM3 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=5.6Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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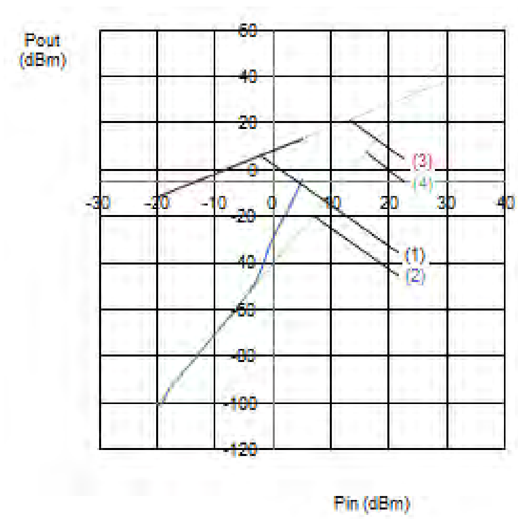


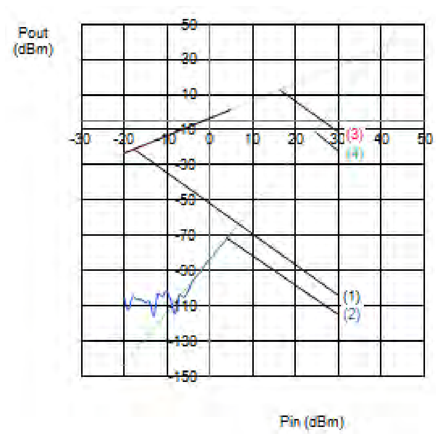
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 95. IM3 of BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 96. IM3 of BGU7042 in Bypass mode with Icc=3mA; R_{bias}=7.5Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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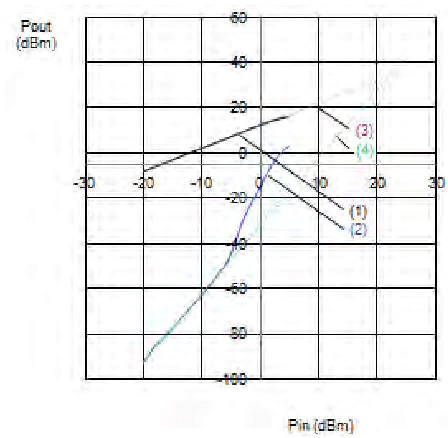
4.3.2.6 BGU7044: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 97 to Fig 98 show 1st and 3rd order response of BGU7044 in 14dB gain mode with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



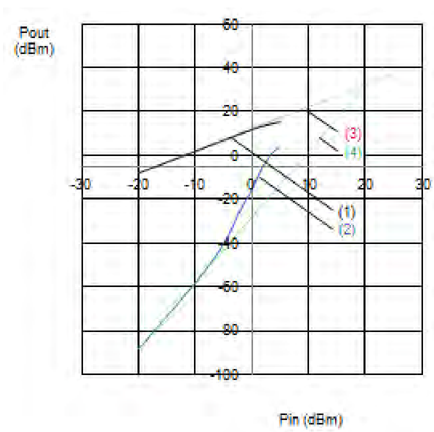
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 97. IM3 of BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 98. IM3 of BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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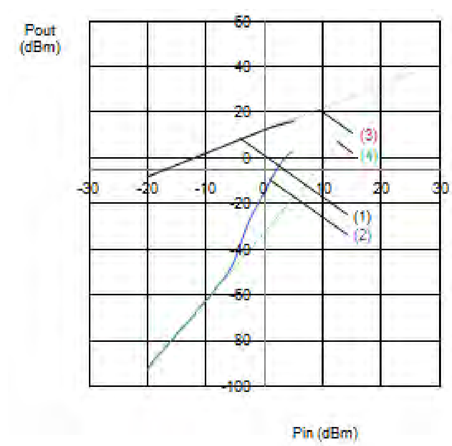
4.3.2.7 BGU7045: IM3 with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

Fig 99 to Fig 102 show 1st and 3rd order response of BGU7045 in 14dB gain and bypass modes with f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm.



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 99. IM3 of BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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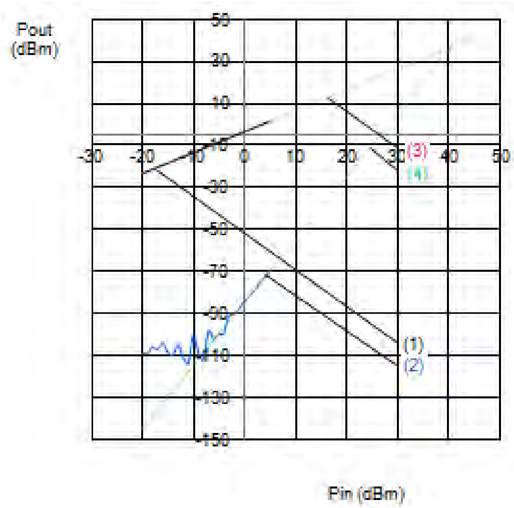


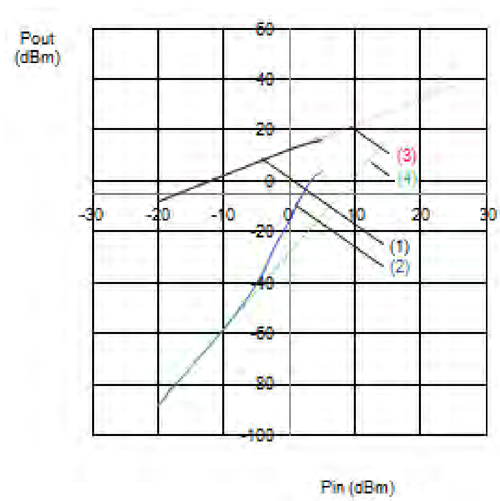
(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 100. IM3 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=10Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm



(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 101. IM3 of BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω); f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

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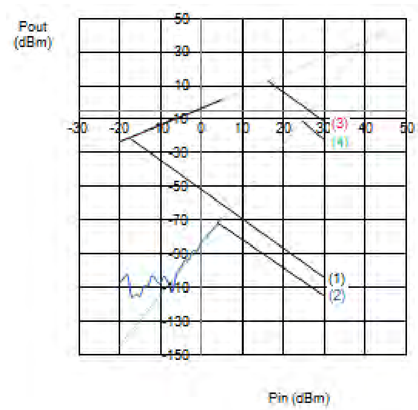

(1) 1st order

(2) 3rd order

(3) 1st order extrapolation

(4) 3rd order extrapolation

Fig 102. IM3 of BGU7045 in Bypass mode with Icc=3mA; R_{bias}=18Ω; f_1=900MHz, f_2=910MHz, f_{IM3}=2xf_2-f_1 (worst case); P_{in} per tone swept from -20dBm to 5dBm

4.4 CSO and CTB

Composite Second Order beat (CSO) and Composite Triple Beat (CTB) have been measured with 131 NTSC channels, and Vout=25dBmV for bypass mode and Vin=15dBmV for gain modes.

4.4.1 CSO and CTB in Bypass Mode of BGU703X and BGU704X

Fig 103 and Fig 104 show the CSO and CTB respectively of BGU7032, BGU7033, BGU7042 and BGU7045 in bypass mode.

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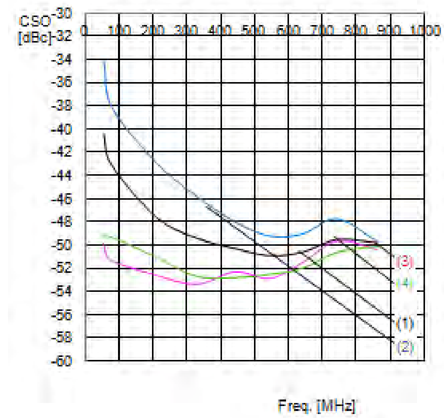


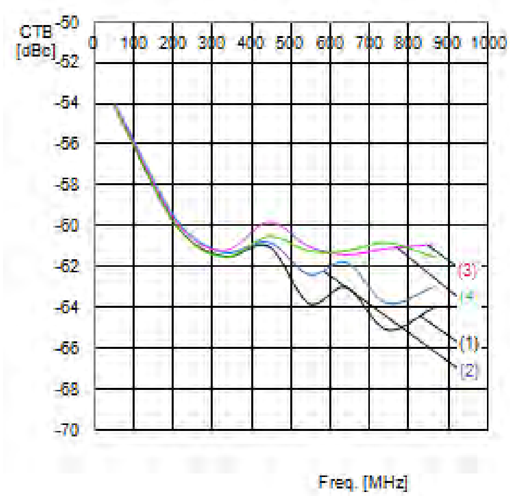
(1) BGU7032 in bypass mode with Icc=4mA

(2) BGU7033 in bypass mode with Icc=4mA

(3) BGU7042 in bypass mode with Icc=3mA

(4) BGU7045 in bypass mode with Icc=3mA

Fig 103. CSO of BGU703X and BGU704X in bypass mode



(1) BGU7032 in bypass mode with Icc=4mA

(2) BGU7033 in bypass mode with Icc=4mA

(3) BGU7042 in bypass mode with Icc=3mA

(4) BGU7045 in bypass mode with Icc=3mA

Fig 104. CTB of BGU703X and BGU704X in bypass mode

4.4.2 CSO in Gain Modes of BGU703X and BGU704X

Fig 105 to Fig 108 show the CSO of BGU7031, BGU7032, and BGU7033 in different gain modes and with different bias currents. Fig 109 to Fig 112 show the CSO of

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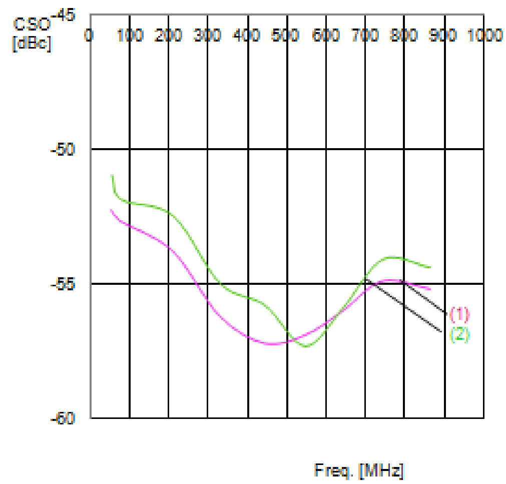
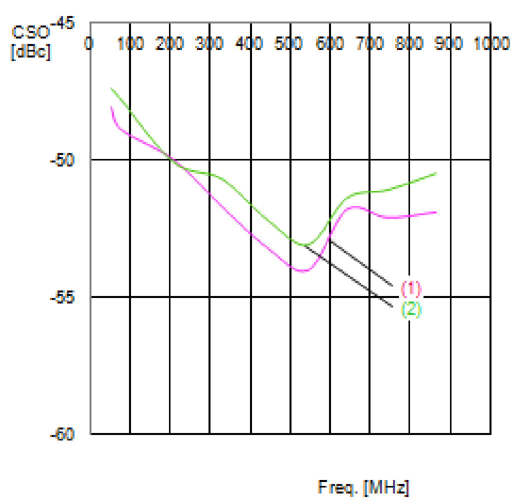
BGU7041, BGU7042, BGU7044, and BGU7045 in different gain modes and with different bias currents.



(1) BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 105. CSO of BGU7031 in 10dB gain mode and different bias currents



(1) BGU7032 in 10dB gain mode with Icc=46mA (Rbias=39Ω)

(2) BGU7032 in 10dB gain mode with Icc=43mA (Rbias=43Ω, default)

Fig 106. CSO of BGU7032 in 10dB gain mode and different bias currents

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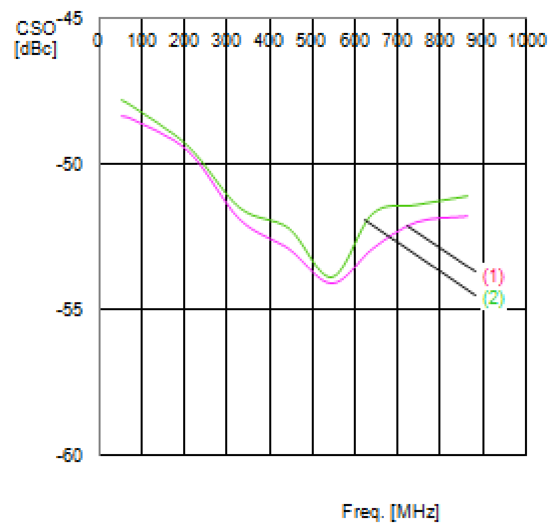
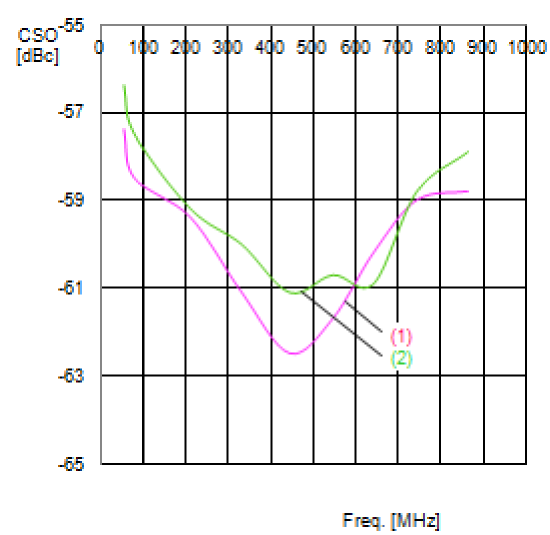


(1) BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 107. CSO of BGU7033 in 10dB gain mode and different bias currents



(1) BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 108. CSO of BGU7033 in 5dB gain mode and different bias currents

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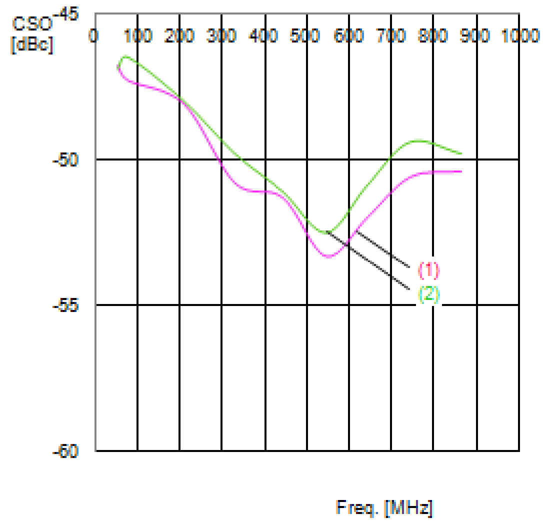
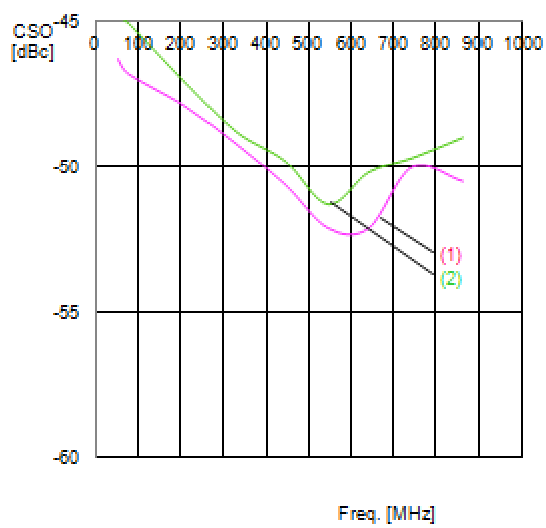


(1) BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

Fig 109. CSO of BGU7041 in 10dB gain mode and different bias currents



(1) BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

Fig 110. CSO of BGU7042 in 10dB gain mode and different bias currents

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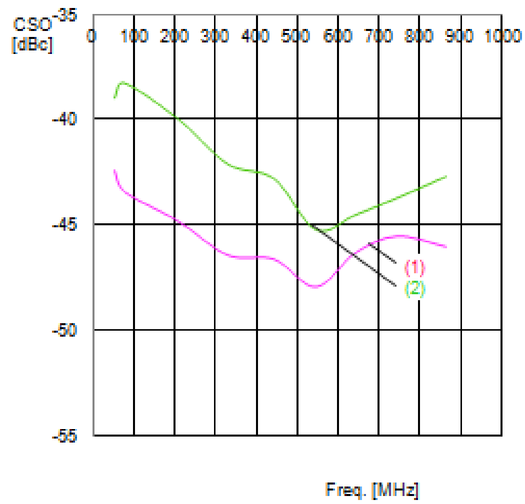
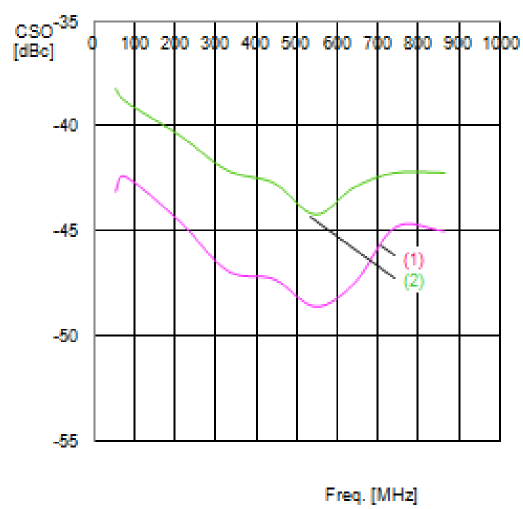


(1) BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 111. CSO of BGU7044 in 14dB gain mode and different bias currents



(1) BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 112. CSO of BGU7045 in 14dB gain mode and different bias currents

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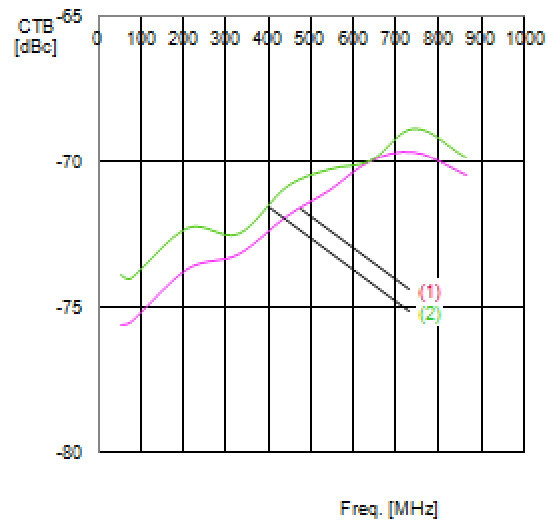
4.4.3 CTB in Gain Modes of BGU703X and BGU704X

Fig 113 to Fig 116 show the CTB of BGU7031, BGU7032, and BGU7033 in different gain modes and with different bias currents. Fig 117 to Fig 120 show the CTB of BGU7041, BGU7042, BGU7044, and BGU7045 in different gain modes and with different bias currents.



(1) BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 113. CTB of BGU7031 in 10dB gain mode and different bias currents

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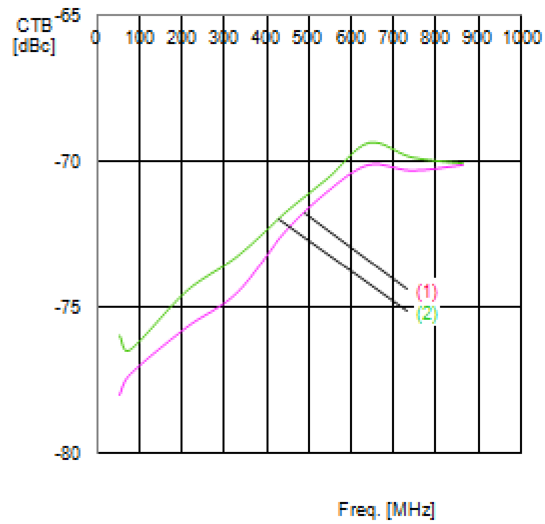
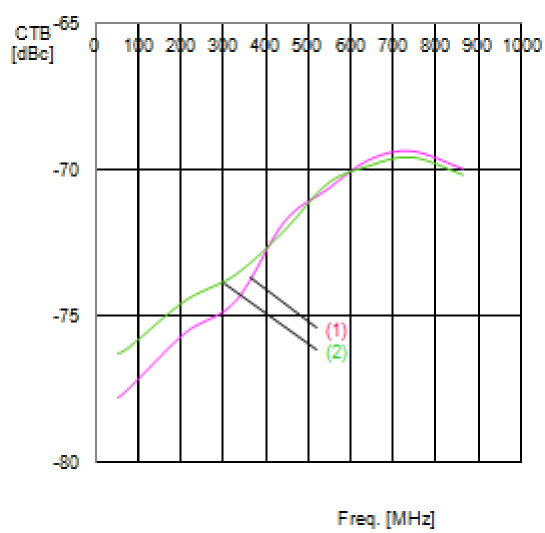


(1) BGU7032 in 10dB gain mode with Icc=46mA (Rbias=39Ω)

(2) BGU7032 in 10dB gain mode with Icc=43mA (Rbias=43Ω, default)

Fig 114. CTB of BGU7032 in 10dB gain mode and different bias currents



(1) BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 115. CTB of BGU7033 in 10dB gain mode and different bias currents

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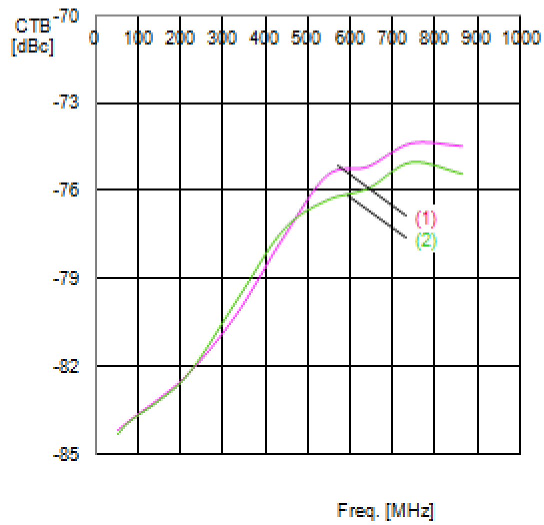
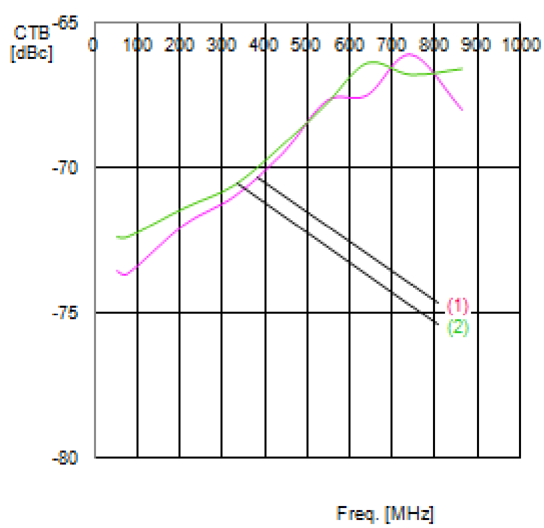


(1) BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 116. CTB of BGU7033 in 5dB gain mode and different bias currents



(1) BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

Fig 117. CTB of BGU7041 in 10dB gain mode and different bias currents

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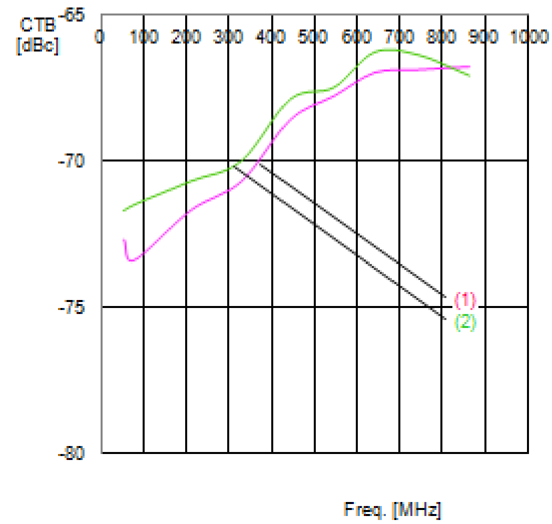
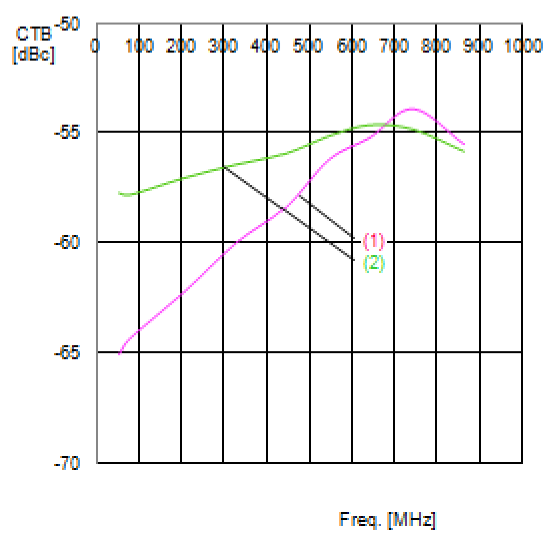


(1) BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

Fig 118. CTB of BGU7042 in 10dB gain mode and different bias currents



(1) BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 119. CTB of BGU7044 in 14dB gain mode and different bias currents

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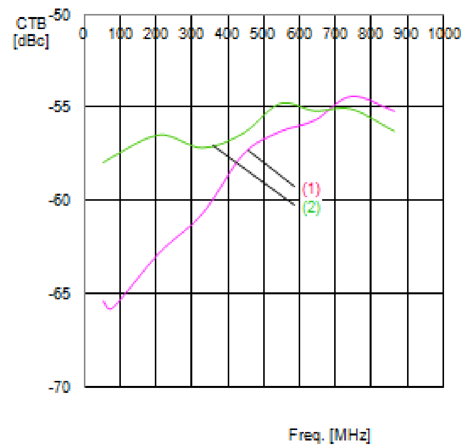

(1) BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 120. CTB of BGU7045 in 14dB gain mode and different bias currents

4.5 NF

The NF measurement results for different bias currents of BGU703X and BGU704X are given in chapter 4.5.1 and chapter 4.5.2 respectively.

4.5.1 NF of BGU703X

Fig 121, Fig 122, and Fig 123 show the NF of BGU7031, BGU7032, and BGU7033 respectively in different modes and with different bias currents.

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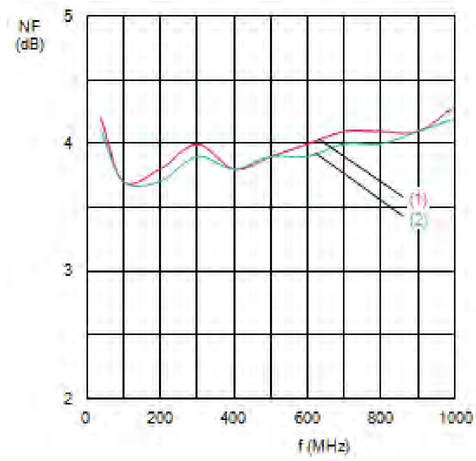
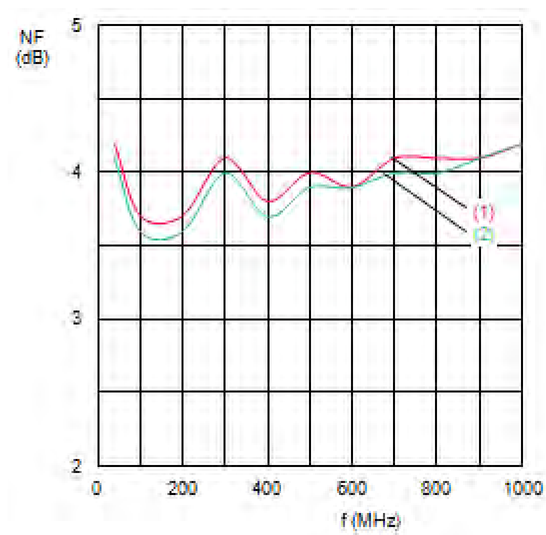


(1) BGU7031 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7031 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 121. NF of BGU7031 in 10dB gain mode and different bias currents



(1) BGU7032 in 10dB gain mode with Icc=46mA (Rbias=39Ω)

(2) BGU7032 in 10dB gain mode with Icc=43mA (Rbias=43Ω, default)

Fig 122. NF of BGU7032 in 10dB gain mode and different bias currents

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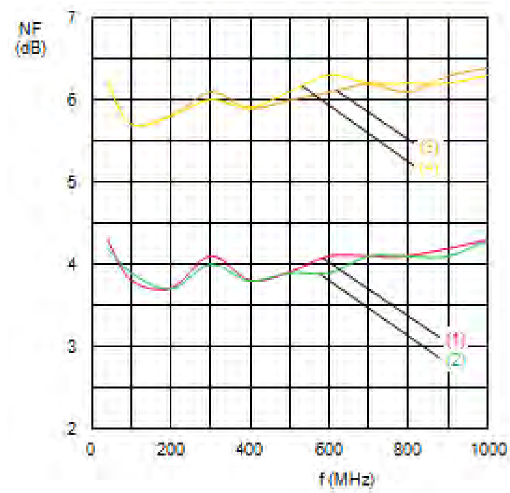


(1) BGU7033 in 10dB gain mode with Icc=46mA (R_{bias}=39Ω)

(2) BGU7033 in 10dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

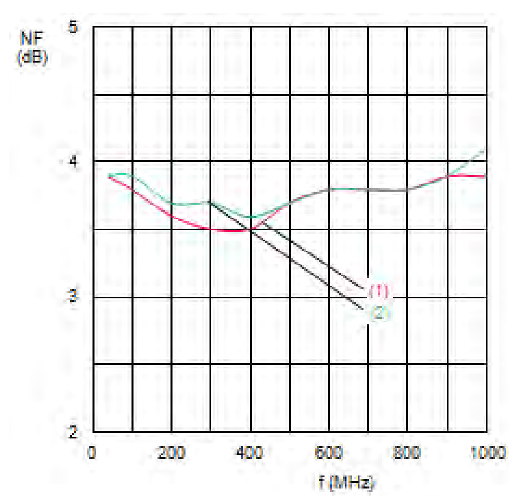
(3) BGU7033 in 5dB gain mode with Icc=46mA (R_{bias}=39Ω)

(4) BGU7033 in 5dB gain mode with Icc=43mA (R_{bias}=43Ω, default)

Fig 123. NF of BGU7033 in 10dB and 5dB gain mode and different bias currents

4.5.2 NF of BGU704X

Fig 124 to Fig 127 show the NF of BGU7041, BGU7042, BGU7044, and BGU7045 respectively in different modes and with different bias currents.



(1) BGU7041 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7041 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

Fig 124. NF of BGU7041 in 10dB gain mode and different bias currents

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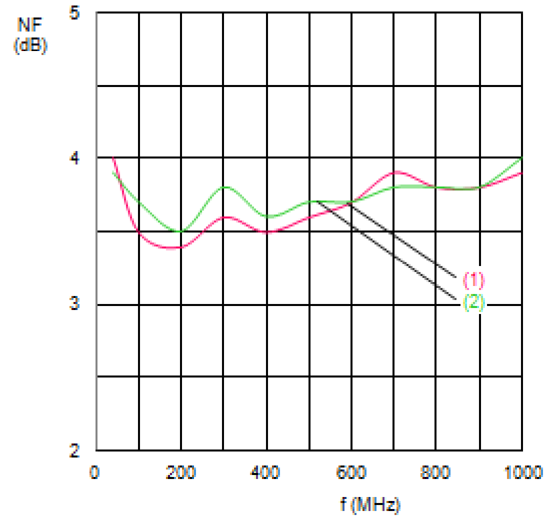
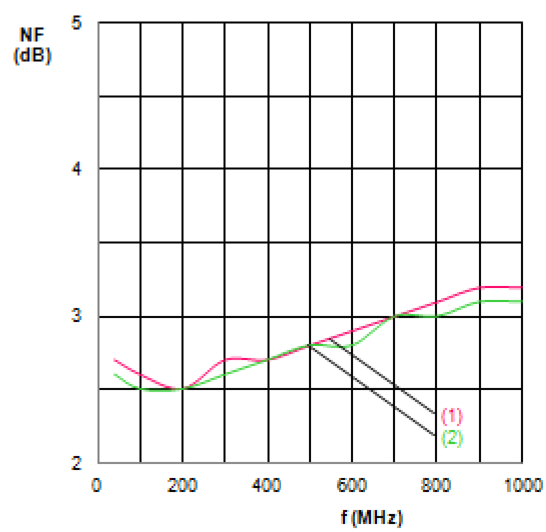


(1) BGU7042 in 10dB gain mode with Icc=39mA (R_{bias}=5.6Ω)

(2) BGU7042 in 10dB gain mode with Icc=35mA (R_{bias}=7.5Ω)

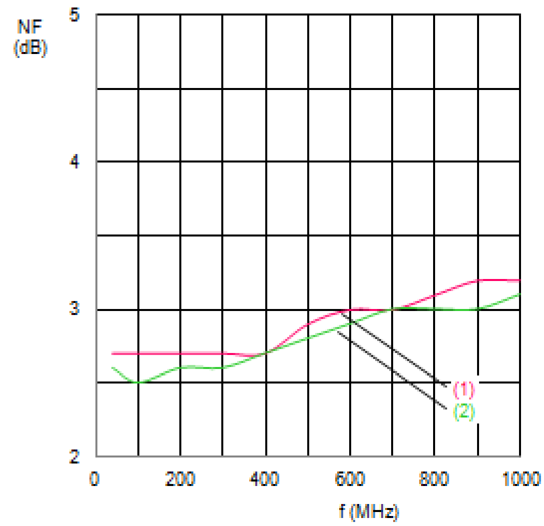
Fig 125. NF of BGU7042 in 10dB gain mode and different bias currents



(1) BGU7044 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7044 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 126. NF of BGU7044 in 14dB gain mode and different bias currents



(1) BGU7045 in 14dB gain mode with Icc=43mA (R_{bias}=10Ω)

(2) BGU7045 in 14dB gain mode with Icc=35mA (R_{bias}=18Ω)

Fig 127. NF of BGU7045 in 14dB gain mode and different bias currents

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