TSL8329M

2.0-4.2 GHz GaAs plus GaN Dual channel

20-Watt Receiver Front End

Application Note: TSL8329M EVB C

Application Note

2000 MHz~4000 MHz

5.0 V 90 mA-HG mode

5.0 V 45 mA-LG mode

Rev-2.1

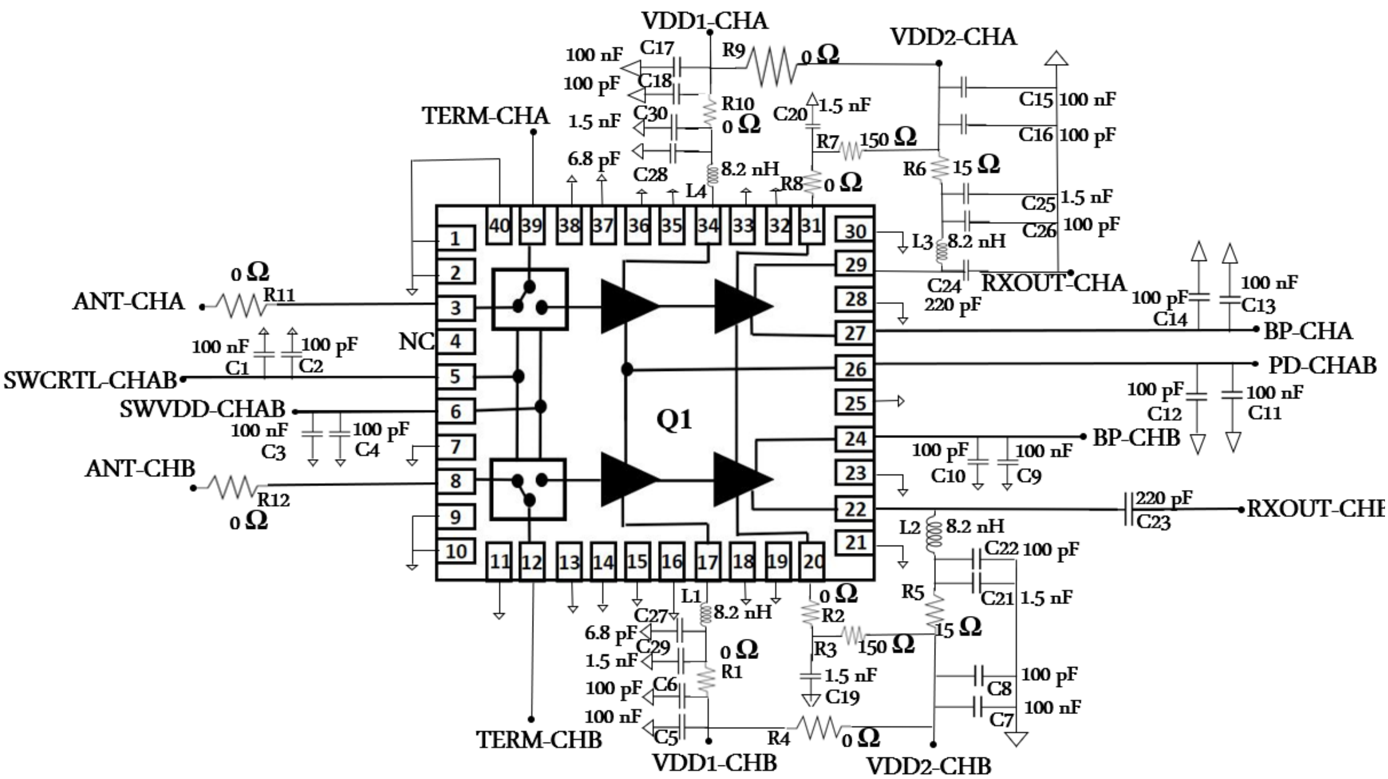
List of Contents

1. General Description

The TSL8329M is a dual-channel, integrated RF, front-end, multichip module designed for different applications. The device operates from 2.0 GHz to 4.2 GHz. The TSL8329M is configured in dual channels with a cascading, two-stage, LNA and a high GaN based SPDT switch. In high gain mode, the cascaded two-stage LNA and switch offer a low noise figure of 1 dB and a high gain of 32 dB at 3.6 GHz with an output third-order intercept point (OIP3) of 35 dBm (typical) at high gain mode. In low gain mode, one stage of the two-stage LNA is in bypass, providing 13 dB of gain at a lower current of 45 mA. In power-down mode, the LNAs are turned off and the device draws 5 mA. In transmit operation, when RF inputs are connected to a termination pin (TERM-CHA or TERM-CHB), the switch provides low insertion loss of 0.45 dB at 3.6 GHz and handles long-term evolution (LTE) average power (9 dB peak to average ratio (PAR)) of 43 dBm for full lifetime operation. The device comes in a RoHS compliant, compact, 6 mm × 6 mm, 40-Pin QFN.

TSL8329M-EVB-C is an evaluation board specially tuned for frequency range of 2000 MHz~4000 MHz applications. Its application in the areas of Wireless infrastructure, TDD massive multiple input & multiple output, active antenna systems, TDD-based communication systems etc.

2. TSL8329M-EVB-C Board Details



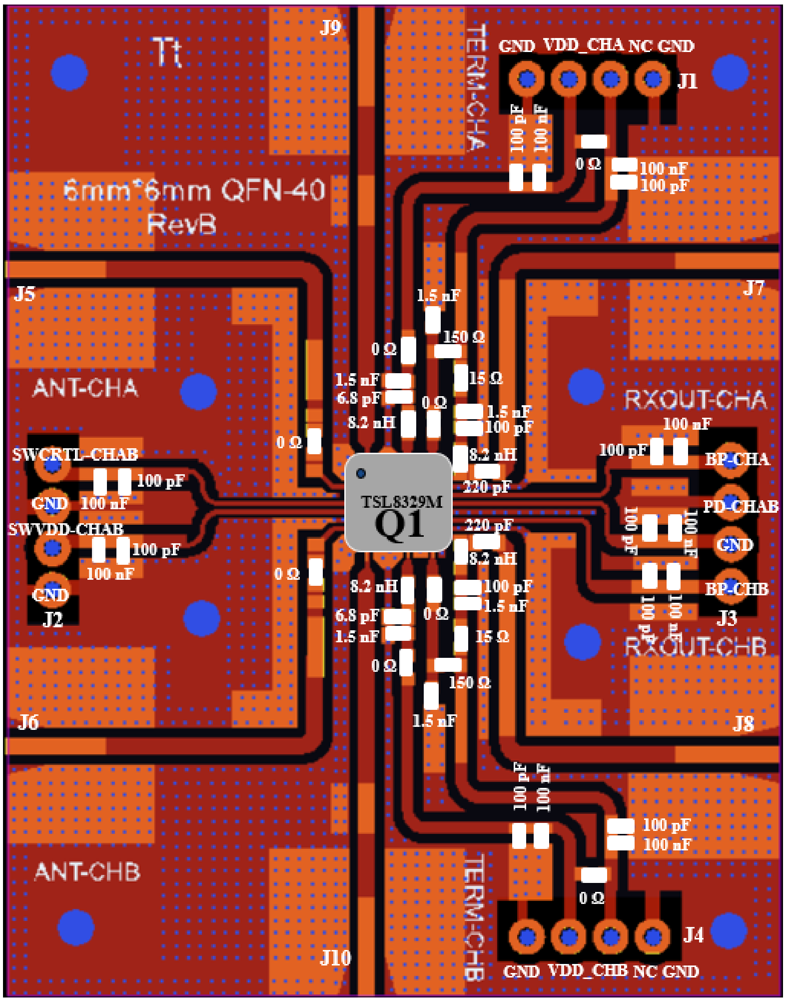


Figure 2.1 TSL8329M-EVB-C 2000 MHz ~ 4000 MHz schematic and EVB layout

3. TSL8329M-EVB-C Bill of Materials

Component ID	Value	Manufacturer	Recommended Part Number	Qty
R1, R2, R4, R8, R9, R10, R11, R12	0 Ω	Panasonic	ERJ-2GE0R00X	8
R3, R7	150 Ω	Panasonic	ERJ-2RHD1500X	2
R5, R6	15 Ω	Panasonic	ERJ-H2RD15R0X	2
L1, L2, L3, L4	8.2 nH	Coil craft	0402HP-8N2XGRW	4
C27, C28	6.8 pF	Murata	GJM1555C1H6R8BB01D	2
C19, C20, C21, C25, C29, C30	1.5 nF	Murata	04025C152JAT2A	6
C23, C24	220 pF	Murata	C0402C221K5GACAUTO	2
C2, C4, C6, C8, C10, C12, C14, C16, C18, C22, C26	100 pF	AVX	04025A101JAT4A	11
C1, C3, C5, C7, C9, C11, C13, C15, C17	100 nF	TDK	C1005X7R1H104K050BE	9
Q1	GaAs LNA+ GaN Switch	TagoreTech	TSL8328M	1
PCB	Rogers RO4350B, 20 mils, 1 oz copper			1

Table 3.1 TSL8329M-EVB-C BOM

4. TSL8329M-EVB-C Biasing Sequence

Turn ON Device	Turn OFF Device
1. Bias up SWVDD-CHAB= 5V test points. 2. Bias up the SWCTRL-CHAB test point. 3. Bias up the VDD-CHA test point. 4. Bias up the BP-CHA test points. 5. Bias up the PD-CHAB test point. 6. Apply an RF input signal	1. Turn RF power off. 2. Turn off BP and PD. 3. Turn off VDD-CHA. 4. Turn off SWCTRL-CHAB. 5. Turn off SWVDD-CHAB.

Table 4.1 TSL8329M-EVB-C Bias and Sequencing

5. TSL8329M-EVB-C Board Measurement Summary

Parameter	Test Condition	Typical Values	Unit
Operational frequency Range		2.0-4.0 G	Hz
Gain	HG	37-29	dB
	LG	18-12	dB
Noise Figure (De-embedded)	HG	0.7-1.2	dB
	LG	0.7-1.2	dB
EVB Noise Figure	HG	1.1-1.6	dB
	LG	1.1-1.6	dB
Input Return Loss	HG	7.3-3.3	dB
	LG	4.2-7.3	dB
Output Return Loss	HG	4-17	dB
	LG	3-24	dBm
OP1dB	HG	18.5-20.5	dBm
	LG	7-12	dBm
OIP3 (With 1 MHz tone spacing)	0 dBm per tone,	31-35	dBm
	-2 dBm per tone,	17-21	dBm
Current, Id	HG	90	mA
	LG	45	
	PD	5	
Insertion Loss	Transmit operation at 3.0 GHz	0.45	dB
Channel to Channel Isolation Between RXOUT -CHA & RXOUT -CHB	At 3.0 GHz Receive operation	40	dB
Between TERM-CHA &TERM-CHB	Transmit operation	55	dB
SWITCH ISOLATION ANT-CHA to TERM-CHA and ANT-CHB to TERM-CHB	Transmit operation, PD-CHAB = 0 V	25	dB

Table 5.1 TSL8329M-EVB-C Electrical Characteristics Summary

6. TSL8329M-EVB-C Test Results

All the tests are carried out at room temperature.

6.1. S parameters

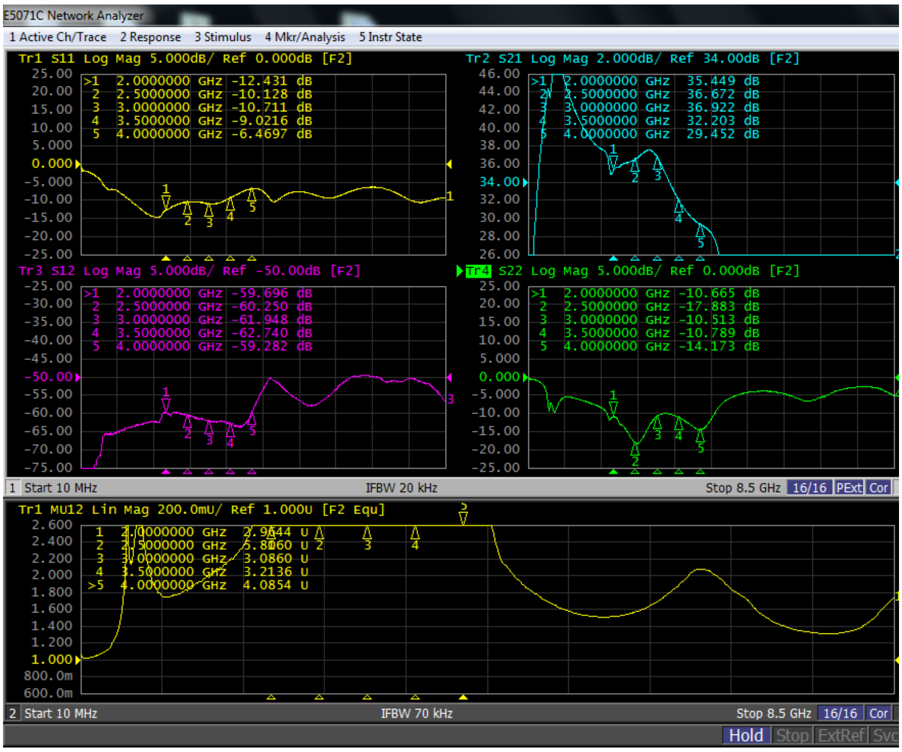


Figure 6.1.1. S parameters of HG mode of TSL8329M-EVB-C

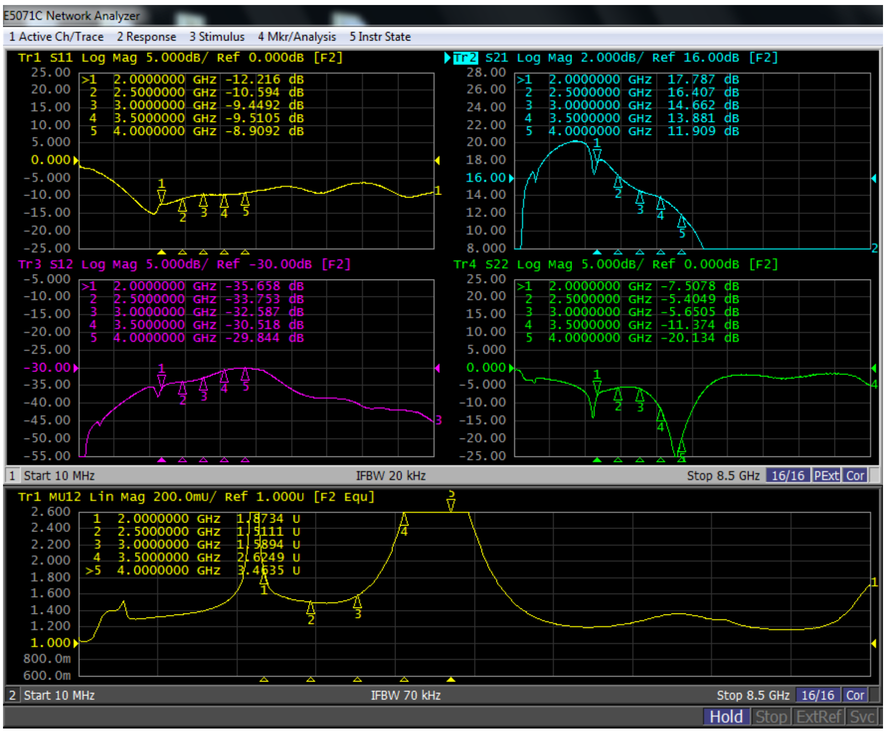


Figure 6.1.2 S parameters of LG mode of TSL8329M-EVB-C

6.2. De-embedded Noise Figure

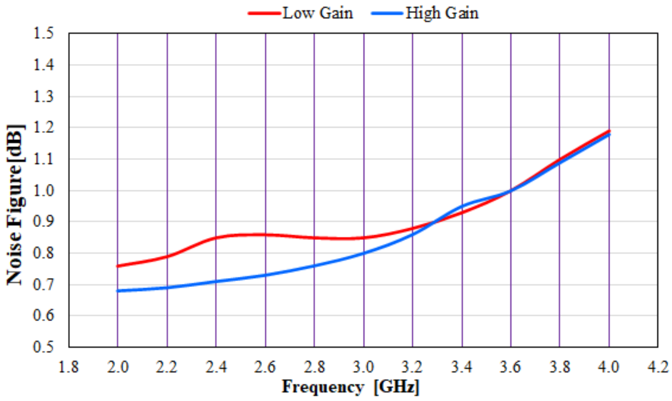


Figure 6.2.1 De-embedded NF of HG and LG mode of TSL8329M-EVB-C

6.3. Large Signal Test Results

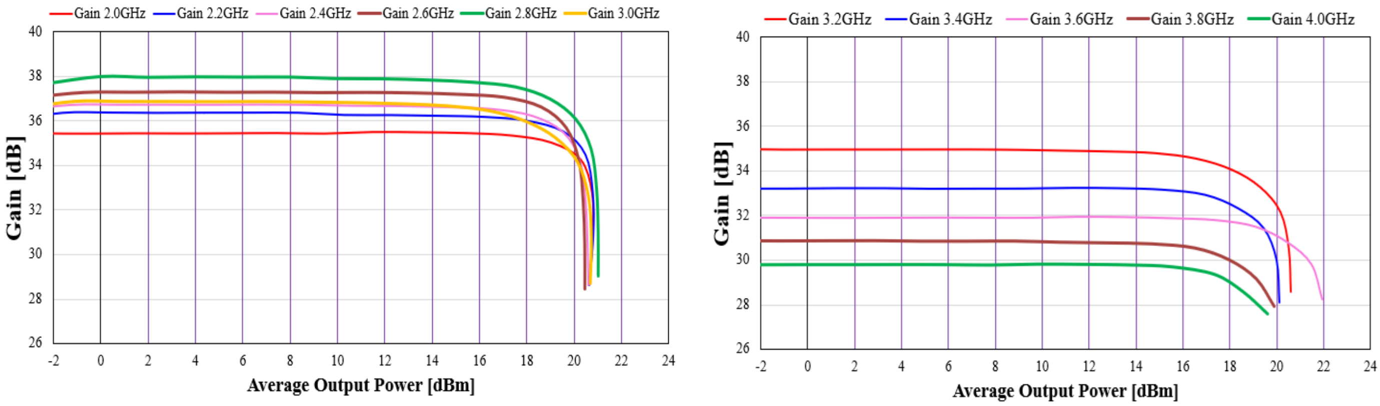


Figure 6.3.1. Gain Vs Pout of HG mode of TSL8329M-EVB-C

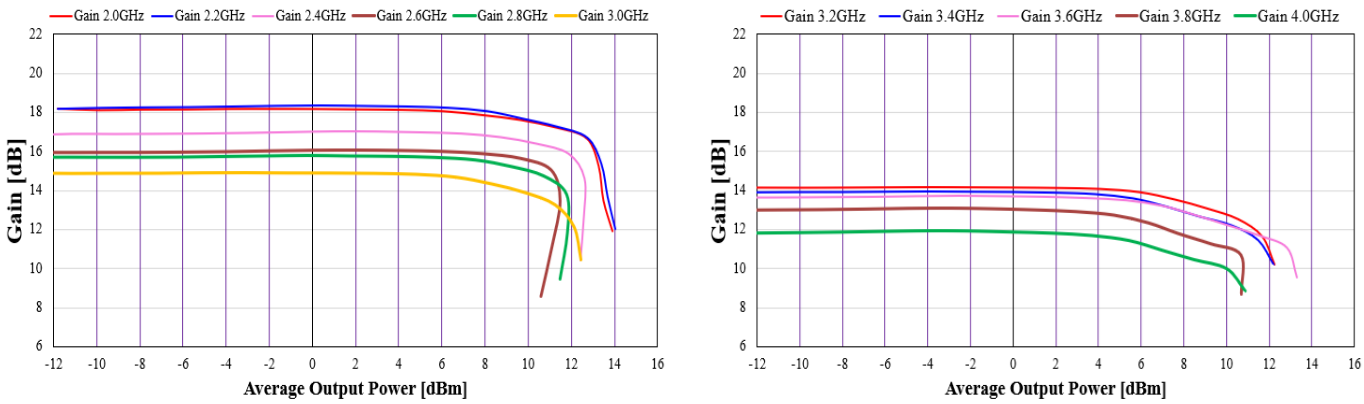


Figure 6.3.2. Gain Vs Pout of HG mode of TSL8329M-EVB-C

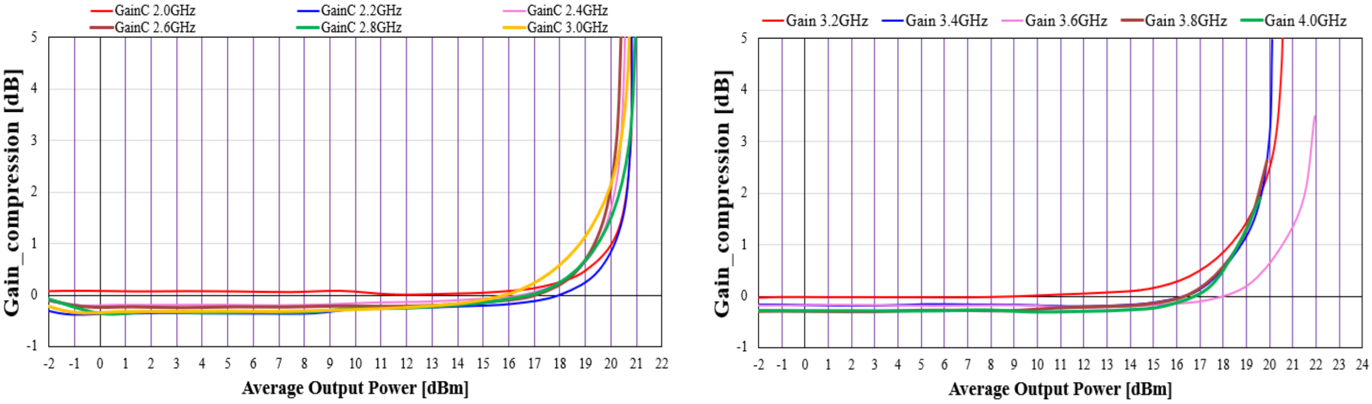


Figure 6.3.3. Gain compression Pout of HG mode of TSL8329M-EVB-C

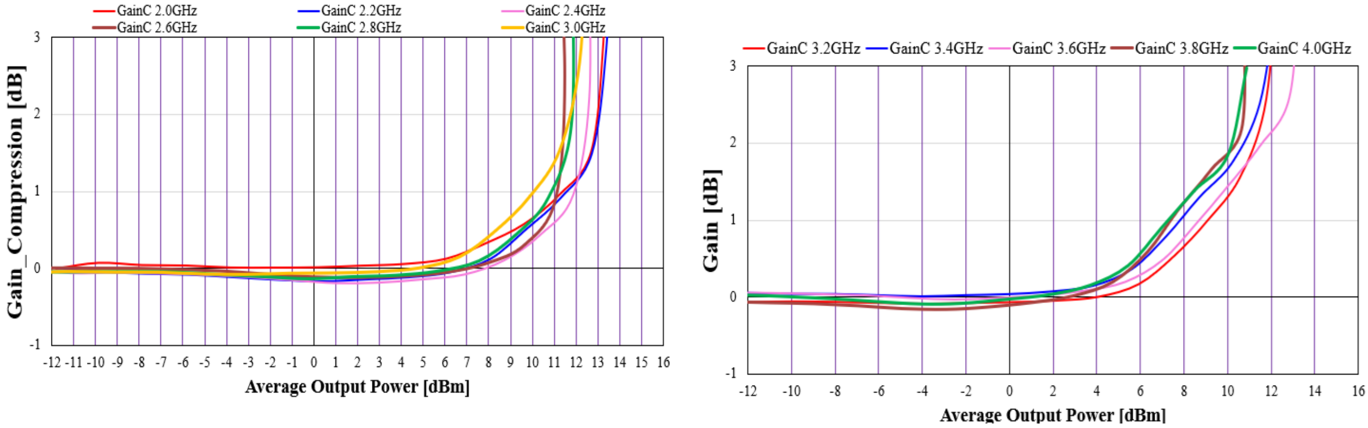


Figure 6.3.4. Gain compression Pout of HG mode of TSL8329M-EVB-C

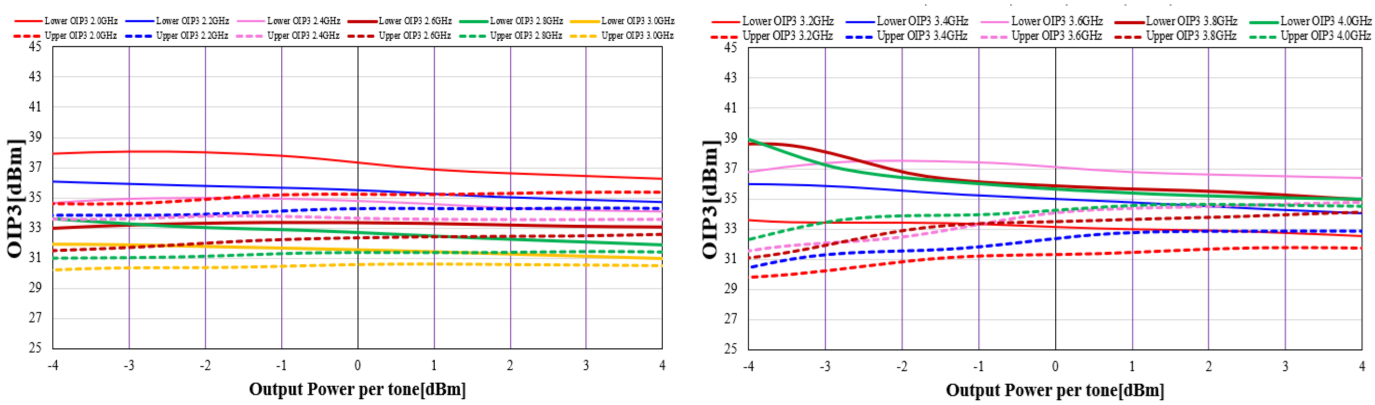


Figure 6.3.5. OIP3 Vs Pout per tone of HG mode of TSL8329M-EVB-C

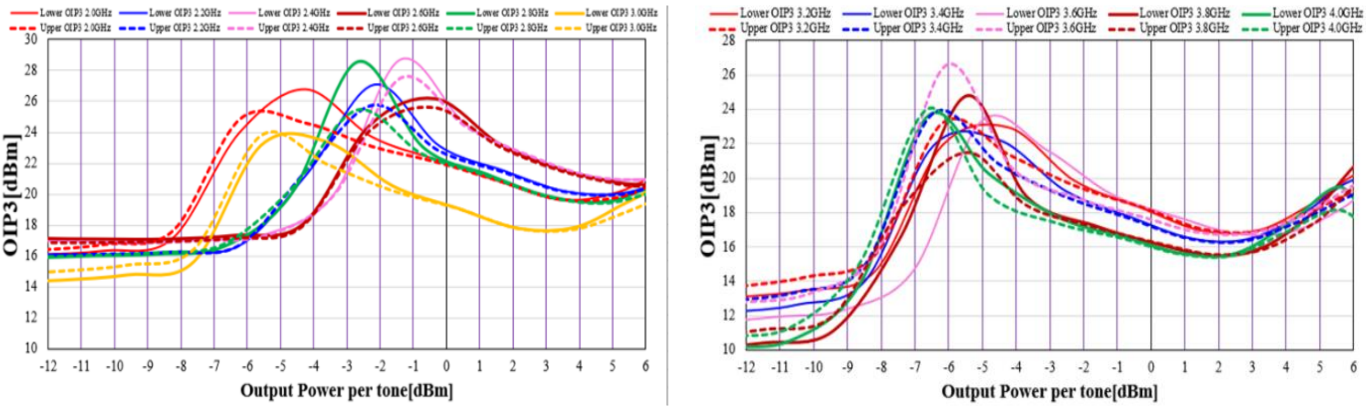


Figure 6.3.6. OIP3 Vs Pout per tone of HG mode of TSL8329M-EVB-C

Edition Revision 2.1 - 2024-07-30

Published by

TagoreTech Inc.

601 W Campus Dr. Ste C1

Arlington Heights, IL 60004, USA

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