TA9310E

20W CW 0.5 – 4.0 GHz GaN Power Transistor

Application Note: TA9310E EVB J

Application Note

30 MHz~512 MHz

18 V 80 mA

18 V, 50 mA+30 mA each PA

Rev-2.1

List of Contents

1. General Description

The TA9310E is a broadband GaN power transistor capable of delivering 20 W CW from 500 MHz to 4.0 GHz frequency band. The transistor can be used at lower frequencies with reduced output power. The input and output can be matched for best power and efficiency for the desired band. The TA9310E is packaged in a compact, low-cost Dual Flat No lead (DFN) 5 x 6 x 0.75 mm, 8 leads plastic package. TA9310E-EVB-J is tuned from 30 MHz to 512 MHz as push-pull configurations using appropriate baluns.

2. TA9310E-EVB-J Board Details

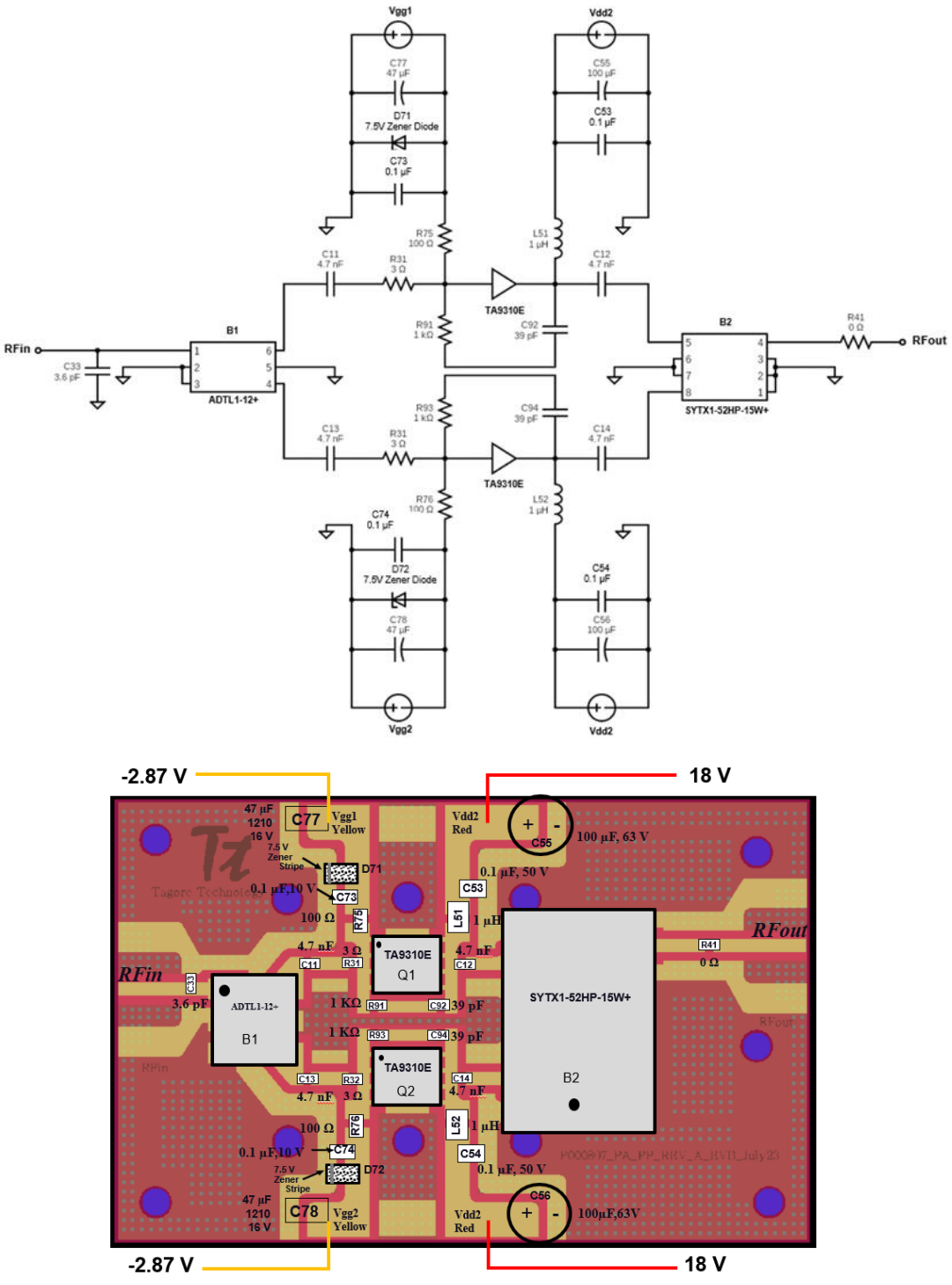

Figure 2.1 TA9310E-EVB-J 30 MHz ~ 512 MHz Schematic and EVB Layout

3. TA9310E-EVB-J Bill of Material

Component ID	Value	Manufacturer	Recommended Part Number
C11, C12	4.7 nF, 50 V	Murata	GRM1885C1H472JA01D
R31, R32	3 Ω	Vishay	RCS06033R00FKEA
C33	3.6 pF	AVX	600S3R6AT250XT
R41	0 Ω	Vishay	CRCW08050000Z0EAC
L51, L52	1 µH	Coil craft	PFL2512-102MEB
C53, C54	0.1 µF, 50 V	Murata	GRM31C5C1H104JA01L
C55, C56	100 µF,63 V	Nichicon	UPW1J101MPD1TD
D71, D72	7.5 V Zener	On Semiconductor	MMSZ5236BT1G
C73, C74	0.1 µF, 10 V	AVX	0603ZC104K4T2A
R75, R76	100 Ω	Vishay	CRCW0603100RFKEAHP
C77, C78	47 µF, 16 V	Murata	GRM32ER61C476ME15L
R91, R93	1 KΩ,1.5 W	Vishay	RCP0603W1K00GE
C92, C94	39 pF	AVX	600S390JT250XT
Q1, Q2	20 W GaN Transistor	Tagore Tech	TA9310E
B1	Input Balun	Mini Circuits	ADTL1-12+
B2	Output Balun	Mini Circuits	SYTX1-52HP-15W+
PCB		Rogers RO4350B, 20 mils, 2 oz copper	

Table 3.1 TA9310E-EVB-J BOM

4. TA9310E-EVB-J Biasing Sequence

Turn ON Device	Turn OFF Device
Biasing of device *Terminate both ports with 50 Ω before biasing an EVB 1. Apply Vgg = -5 V on both devices 2. Apply Vdd = 18 V on both devices 3. Slowly adjust Vgg of device1 till you draw total current of 50 mA current. The Vgg of device1 should be around -2.85 V 4. Slowly adjust Vgg of device2 till you draw total current of 80 mA current. The Vgg of device2 should be around -2.87 V 5. Apply RF [Keep RF input power< 24 dBm]	1. Turn RF power off 2. Turn off V_D 3. Turn off V_G

Table 4.1 TA9310E-EVB-J Bias and Sequencing

5. TA9310E-EVB-J Board Measurement Summary

Frequency (MHz)	S21 Gain(dB)	S11(dB)	S22(dB)	H2dBc @40dBm	H3dBc @40dBm	OP1(dBm)	Psat (dBm)	PAE (%) @40dBm
30	22.0	-9.5	-11.0	41	12	38.6	41.2	58
100	21.6	-9.2	-10.3	39	13	40.7	42.0	55
200	20.8	-8.8	-8.8	34	14	39.5	41.5	52
300	20.0	-10.0	-8.2	36	20	40.7	41.8	50
400	19.4	-12.2	-9.3	43	23	40.3	42.0	48
512	18.1	-7.3	-13.5	42	22	39.5	41.0	52

Table 5.1 TA9310E-EVB-J 18 V, 80 mA [50 mA+30 mA] Electrical Characteristics Summary

6. TA9310E-EVB-J Test Results

All the tests are carried out at room temperature.

6.1. S parameters

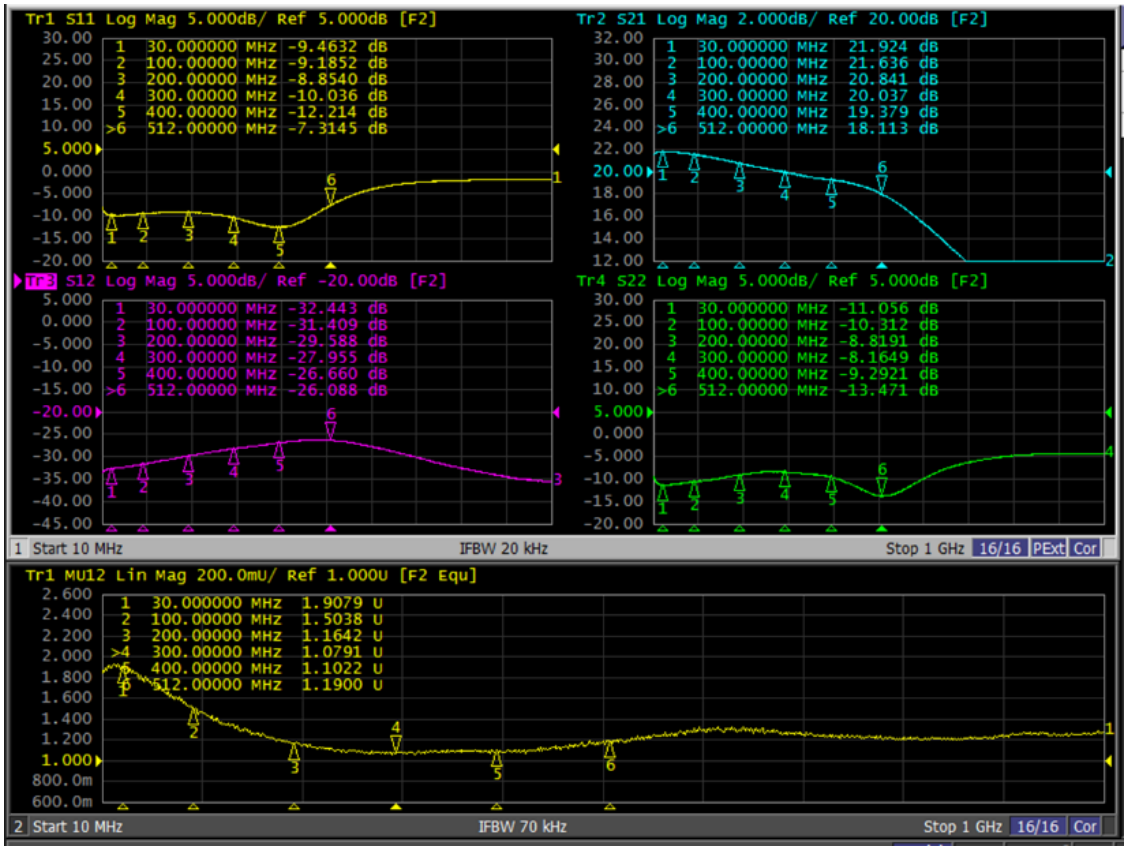

Figure 6.1.1. S parameters of TA9310E-EVB-J 18 V, 80 mA [50 mA+30 mA]

6.2. Large Signal Test Results for device 1 : 18 V, 50 mA and device 2: 18 V, 30 mA

Caution: Please use input RF power below 24dBm to prevent damage to the balun

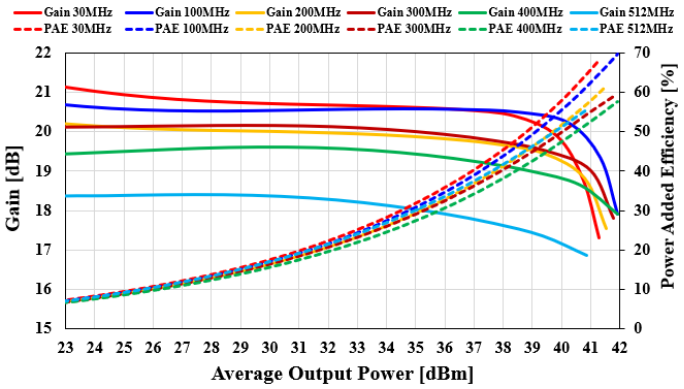

Figure 6.2.1. Gain and PAE vs P_{OUT} of TA9310E-EVB-J

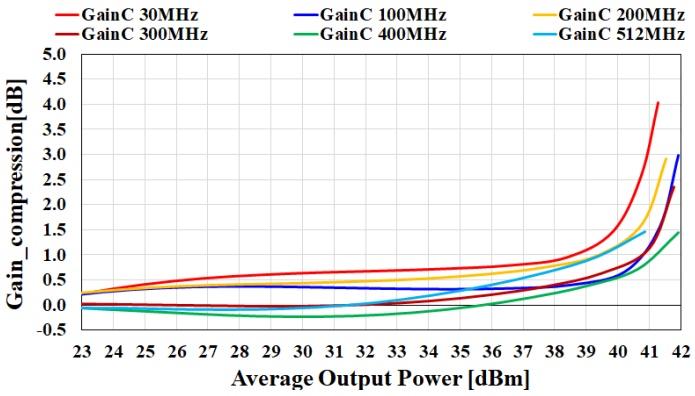

Figure 6.2.2. Gain compression vs P_{OUT} of TA9310E-EVB-J

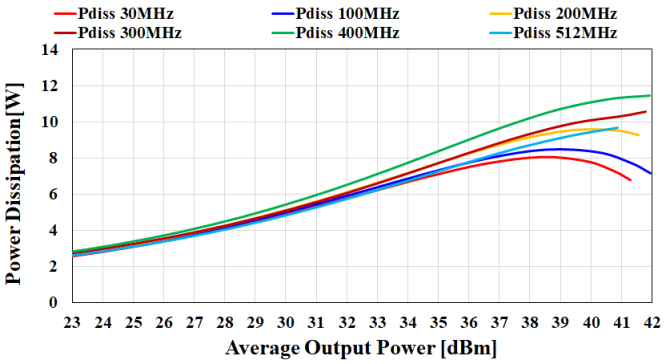

Figure 6.2.3. Pdiss vs P_{OUT} of TA9310E-EVB-J

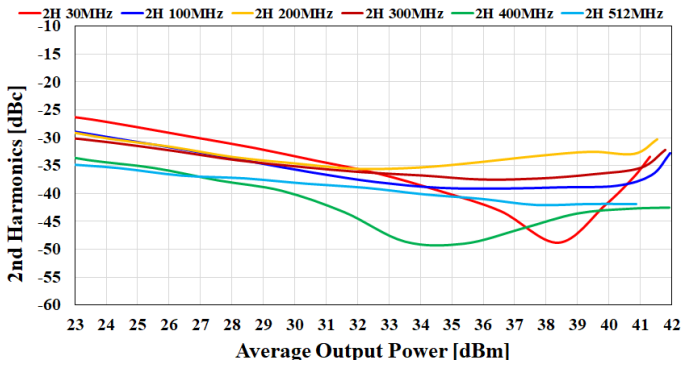

Figure 6.2.4. H2dBc vs P_{OUT} of TA9310E-EVB-J

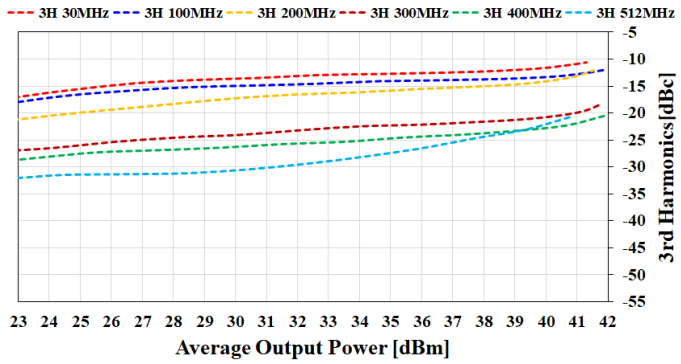

Figure 6.2.5. H3dBc vs P_{OUT} of TA9310E-EVB-J

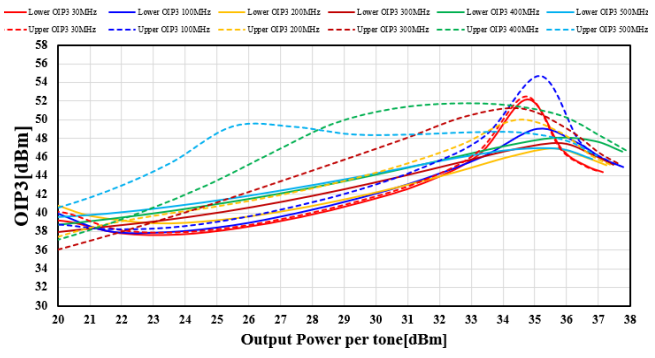

Figure 6.3.6. OIP3dBm of TA9310E-EVB-J 1 MHz tone spacing

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