

# TA9410E

25W CW 0.02 – 3.0 GHz GaN Power Transistor

Application Note: TA9410E EVB D

## Application Note

30MHz~800MHz

50V 100mA

Rev-1.1

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## 1. General Description

The TA9410E is a broadband GaN power transistor capable of delivering 25W CW from 20MHz to 3.0GHz frequency band. The input and output can be matched for best power and efficiency for the desired band. The TA9410E is packaged in a compact, low-cost Quad Flat No lead (QFN) 5x6x0.8mm, 8 leads plastic package.

TA9410E-EVB-D is an evaluation board specially tuned for frequency range of 30MHz~800MHz applications. Its high output power, power added efficiency performance makes it suitable for application of Private mobile radio handsets, public safety radios, Cellular infrastructure, Military radios etc.

## 2. TA9410E-EVB-D Board Details

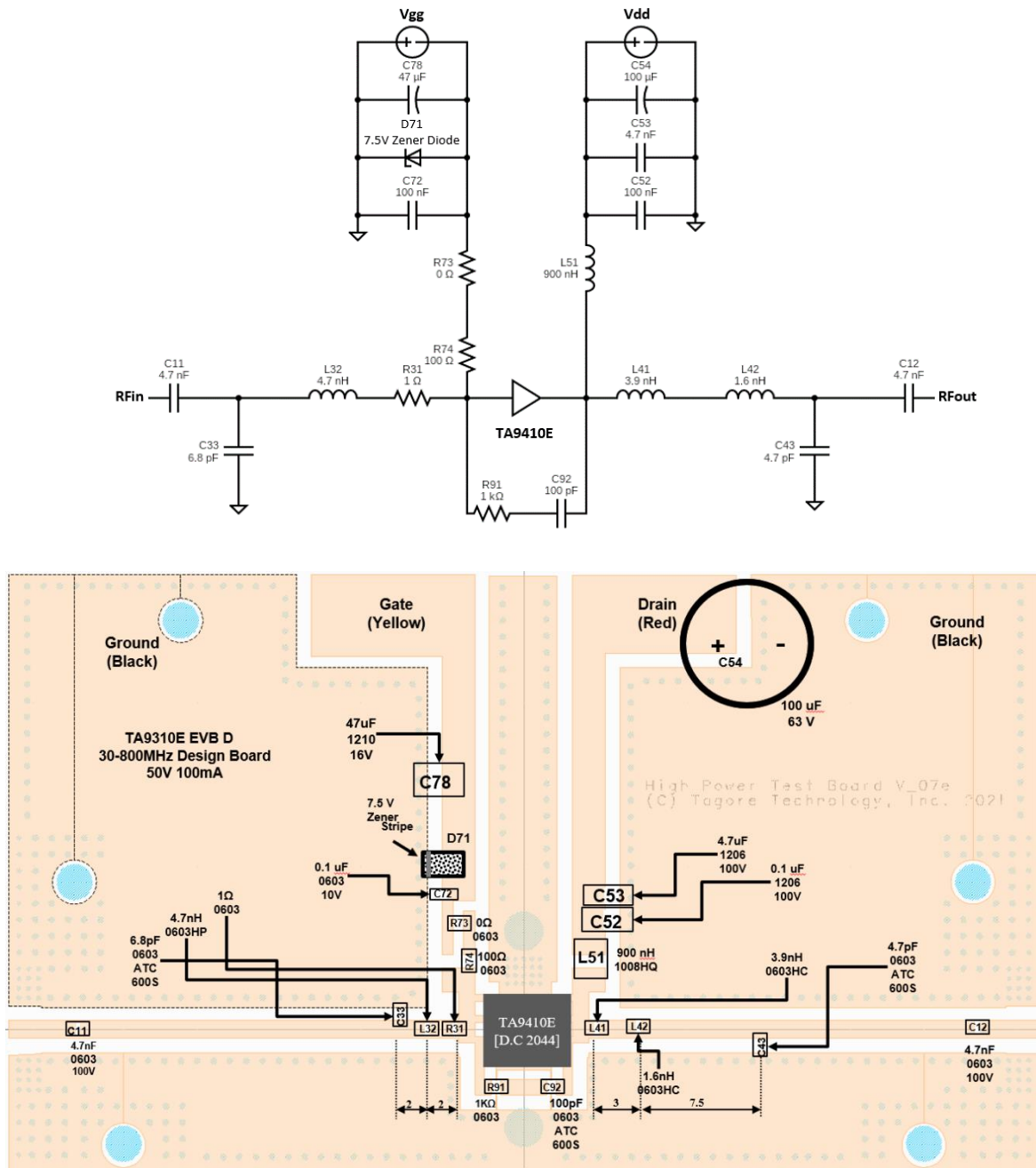


Figure 2.1 TA9410E-EVB-D 30MHz ~ 800MHz Schematic and EVB Layout

### 3. TA9410E-EVB-D Bill of Material

| Component ID | Value                                | Manufacturer      | Recommended Part Number |
|--------------|--------------------------------------|-------------------|-------------------------|
| C11, C12     | 4.7nF, 50V                           | Murata            | GRM1885C1H472JA01       |
| R31          | 1Ω, 0.5W                             | Panasonic         | ERJ-P06J1R0V            |
| L32          | 4.7nH                                | Coil craft        | 0603HC-4N7XJLW          |
| C33          | 6.8pF                                | AVX               | 600S6R8AT250XT          |
| L41          | 3.9nH                                | Coil craft        | 0603HC-3N9XJLW          |
| L42          | 1.6nH                                | Coil craft        | 0603HC-1N6XJLW          |
| C43          | 4.7pF                                | AVX               | 600S4R7BT250XT          |
| L51          | 900nH                                | Coil craft        | 1008AF-901XJLC          |
| C52          | 0.1μF, 50V                           | Murata            | GRM31C5C1H104JA01L      |
| C53          | 4.7μF                                | Murata            | GRM31CC72A475KE11K      |
| C54          | 100μF, 63V                           | Nichicon          | UPW1J101MPD1TD          |
| D71          | 7.5 V Zener                          | On Semiconductor  | SZMMSZ5236BT 1G         |
| C72          | 0.1μF, 10V                           | AVX               | 0603ZC104K4T2A          |
| R75          | 100Ω                                 | Vishay            | CRCW060310R1FKEAHP      |
| R73          | 0Ω                                   | Vishay/Dale       | CRCW06030000Z0EAC       |
| R74          | 100 Ω                                | Vishay            | CRCW0603100RFKEB        |
| C78          | 47μF, 16V                            | Murata            | GRM32ER61C476ME15L      |
| R91          | 1KΩ                                  | Vishay/Dale       | CRCW06031K00FKEC        |
| C92          | 100 pF                               | AVX               | 600S101GT250XT          |
| Q1           | 25W GaN Transistor                   | Tagore Technology | TA9410E                 |
| PCB          | Rogers RO4350B, 20 mils, 1 oz copper |                   |                         |

**Table 3.1 TA9410E-EVB-D BOM**

### 4. TA9410E-EVB-D Biasing Sequence

| Turn ON Device   | Turn OFF Device  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Set <math>V_G</math> to -5V</li> <li>2. Set <math>V_D</math> to +50V</li> <li>3. Adjust <math>V_G</math> to reach required <math>I_{DQ}</math> current</li> <li>4. Apply RF power</li> </ol> | <ol style="list-style-type: none"> <li>1. Turn RF power off</li> <li>2. Turn off <math>V_D</math></li> <li>3. Turn off <math>V_G</math></li> </ol> |

**Table 4.1 TA9410E-EVB-D Bias and Sequencing**

## 5. TA9410E-EVB-D Board Measurement Summary

| Frequency (MHz) | S21 Gain(dB) | S11(dB) | S22(dB) | Psat(dBm) | PAE (%) @Psat |
|-----------------|--------------|---------|---------|-----------|---------------|
| 30              | 24.8         | -10.7   | -13.8   | 44.5      | 73            |
| 100             | 24.6         | -10.1   | -16.8   | 45.1      | 76            |
| 200             | 24.0         | -8.2    | -20.2   | 45.1      | 71            |
| 400             | 22.4         | -5.4    | -11.0   | 44.7      | 60            |
| 600             | 22.0         | -4.9    | -8.2    | 46.6      | 57            |
| 800             | 23.5         | -7.6    | -20.5   | 46.4      | 70            |

Table 5.1 TA9410E-EVB-D Electrical Characteristics Summary

## 6. TA9410E-EVB-D Test Results

All the tests are carried out at room temperature.

### 6.1. S parameters

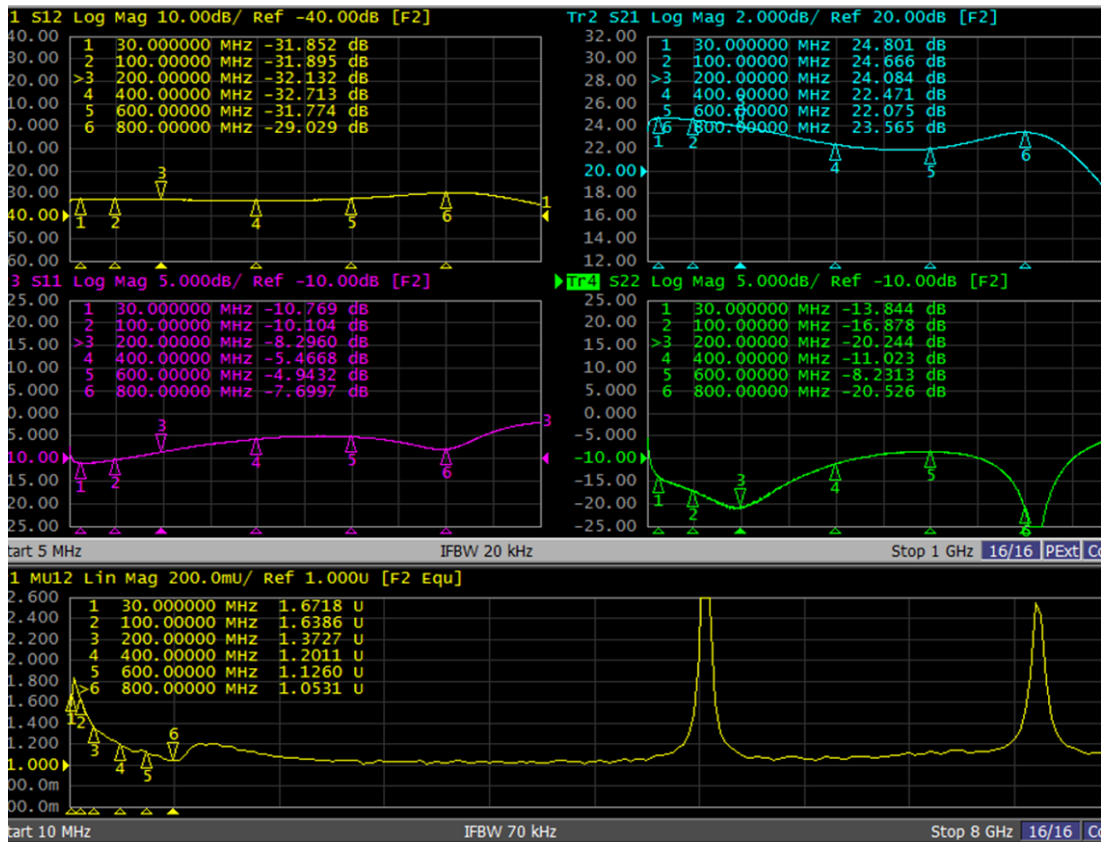
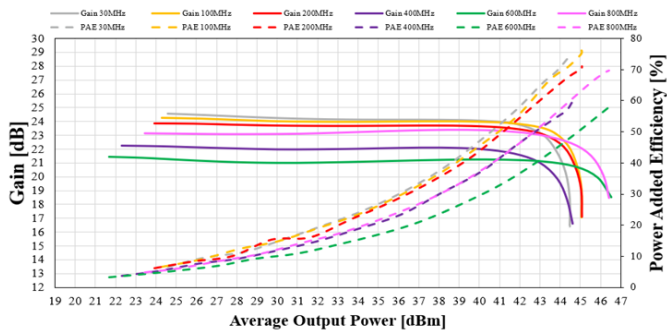
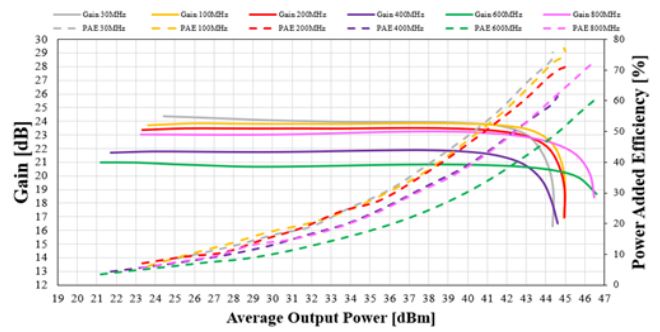


Figure 6.1.1. S parameters of TA9410E-EVB-D

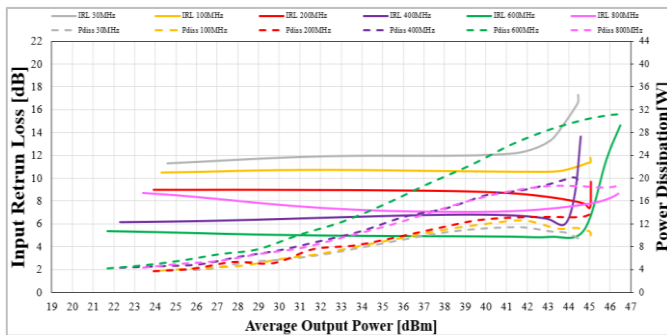
## 6.2. Large Signal Test Results



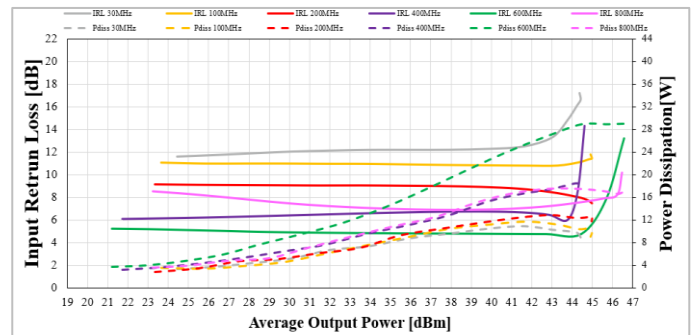
**Figure 6.2.1. Gain Vs Pout of TA9410E-EVB-D with 1% Pulsed Setup**



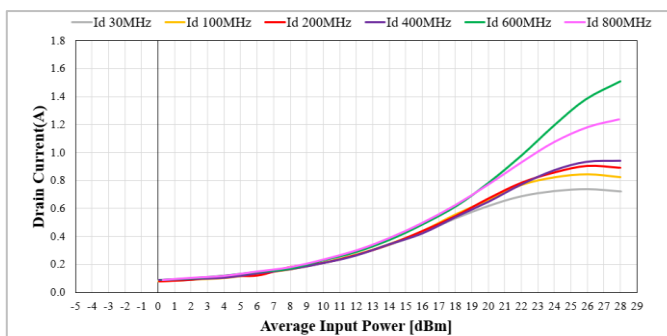
**Figure 6.2.2. Gain Vs Pout of TA9410E-EVB-D with 20% Pulsed**



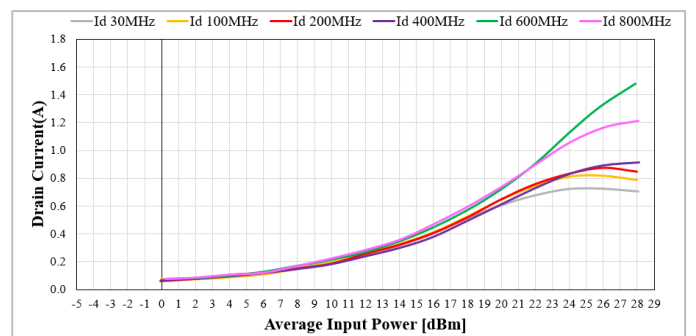
**Figure 6.2.3. IRL and Pdiss Vs Pout of TA9410E-EVB-D with 1% Pulsed Setup**



**Figure 6.2.4. IRL and Pdiss Vs Pout of TA9410E-EVB-D with 20% Pulsed Setup**

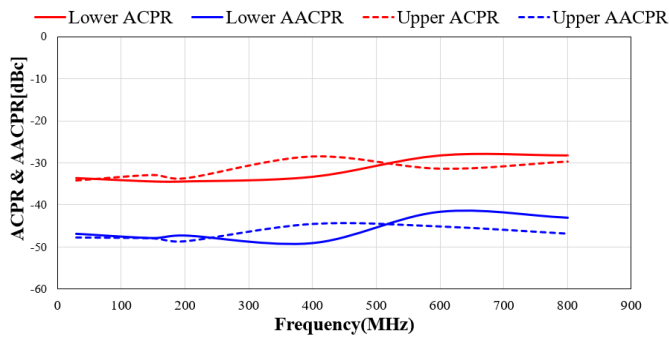


**Figure 6.2.5. Drain Current Vs Pin of TA9410E-EVB-D with 1% Pulsed Setup**



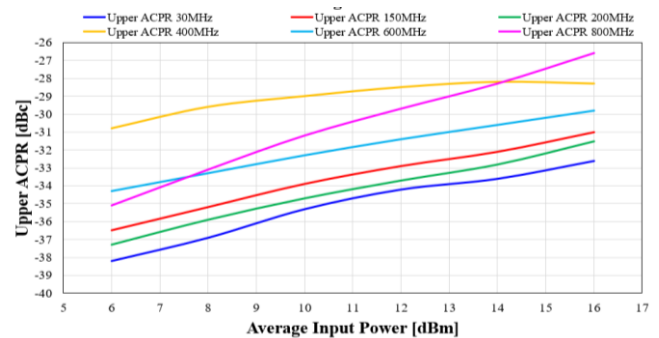
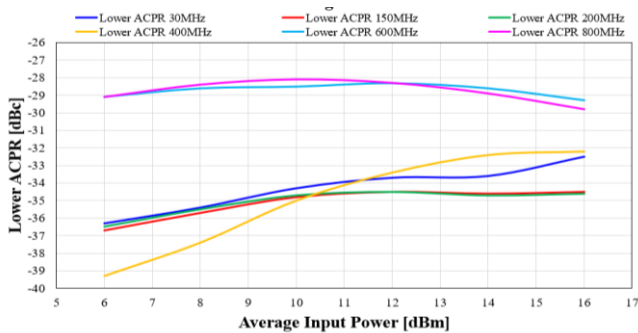
**Figure 6.2.6. Drain Current Vs Pin of TA9410E-EVB-D with 20% Pulsed Setup**

### 6.3. ACPR & AACPR Results



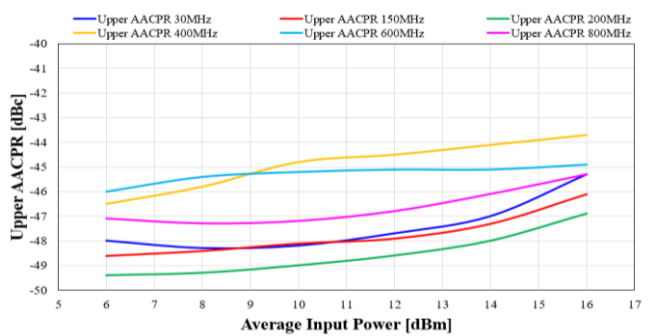
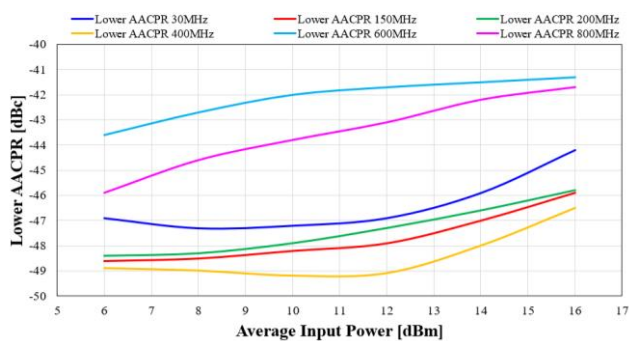
| Pin                     | Frequency (MHz) | AACPR (-) | ACPR (-) | PoutAvg | ACPR (+) | AACPR (+) |
|-------------------------|-----------------|-----------|----------|---------|----------|-----------|
| 12dBm<br>[50V<br>100mA] | 30              | -46.9     | -33.7    | 34.9    | -34.2    | -47.7     |
|                         | 150             | -47.9     | -34.5    | 34.9    | -32.9    | -47.9     |
|                         | 200             | -47.3     | -34.5    | 35.1    | -33.7    | -48.6     |
|                         | 400             | -49.1     | -33.4    | 32.4    | -28.5    | -44.5     |
|                         | 600             | -41.7     | -28.3    | 33.5    | -31.4    | -45.1     |
|                         | 800             | -43.1     | -28.3    | 34.9    | -29.7    | -46.8     |

**Figure 6.2.7. ACPR & AACPR Measurements: 8dB PAPR 16QAM 5MHz/4.515Intergrated BW/Uplink[50V 100mA Pin:12dBm]**



**Figure 6.2.8. Lower ACPR Measurements: 8dB PAPR 16QAM 5MHz/4.515Intergrated BW/Uplink**

**Figure 6.2.9. Upper ACPR Measurements: 8dB PAPR 16QAM 5MHz/4.515Intergrated BW/Uplink**



**Figure 6.2.10. Lower AACPR Measurements: 8dB PAPR 16QAM 5MHz/4.515Intergrated BW/Uplink**

**Figure 6.2.11. Upper AACPR Measurements: 8dB PAPR 16QAM 5MHz/4.515Intergrated BW/Uplink**

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601 W Campus Dr. Ste C1

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