10 GHz PA

DESIGN DETAILS
PA Details

- TGA-2625-CP GaN MMIC from Triquint / Qorvo
- Milled Aluminum 2.7” x 1.7” x 0.75” housing
- Sequenced negative before positive bias circuit
- 12 W linear power output
- +28 V power supply
- Thermal design provides < 147°C channel temp.
PA Module Floor Plan
Packaged MMIC

TriQuint

TGA2625-CP
10 to 11 GHz, 17 W GaN Power Amplifier

Applications
- Radar
- Communications

Product Features
- Frequency Range: 10 – 11 GHz
- Pout: 42.5 dBm (at PIN = 15 dBm)
- PAE: > 40%
- Power Gain: 28 dB (at PIN = 15 dBm)
- Bias: VD = 28 V, Ido = 365 mA, VG = -2.6 V typical, pulsed (PW = 100 µs, DC = 10 %)
- Package Dimensions: 15.2 x 15.2 x 3.5 mm
- Package base is pure Cu offering superior thermal management

Functional Block Diagram
Power Transfer Curves – vs $I_{DQ}$

- $12 \, \text{W}$

**Graph Details:**
- $P_{OUT}$ vs $P_{IN}$
- Curves for $145 \, \text{mA}$ and $365 \, \text{mA}$
- CW, Freq = 10.5 GHz
Input Return Loss

Input Return Loss vs. Frequency vs. Temp.

S11 (dB)

-40 °C
25 °C
85 °C

Frequency (GHz)

V_D = 28 V, CW
NOTE: THIS IS SATURATED POWER
Drain Current

![Graph showing Drain Current vs. P_IN (dBm) for temperatures -40 °C, 25 °C, and 85 °C. The graph indicates that Drain Current increases with increasing P_IN and temperature.](image)
Gate Current

![Graph showing Gate Current with different temperatures (40 °C, 25 °C, 85 °C) and CW, Freq = 10.5 GHz.](image)

-40 °C
25 °C
85 °C

- P<sub>IN</sub> (dBm) vs. Gate Current (mA)
PAE

Power Added Efficiency (%) vs. $P_{IN} \ (\text{dBm})$

-40 °C, 25 °C, 85 °C

CW, Freq = 10.5 GHz
MMIC Package and Thermal Budget

$P_{OUT} = 12\, W$

$PAE = 40\%$

$P_{DISS} = 18\, W$

$P_{DC} = 30\, W$

(28V \times 1.1A)

5.4 \degree C/W

$\times 18\, W$

97 \degree C \Delta T

TOTAL $\theta = 5.4 \degree C/W$

147\degree C

CHANNEL TEMP

1.8 \degree C/W

50 \degree C

(122 \degree F)

MAX AMBIENT TEMPERATURE

0.25” Aluminum – housing floor

0.25” Aluminum – bracket

88\degree C

INTERFACE

86\degree C

82\degree C

82\degree C

0.2 \degree C/W

0.1 \degree C/W

3.3 \degree C/W
MTTF vs Temperature

Test Conditions: \( V_D = 40 \text{ V}; \) Failure Criteria = 10% reduction in \( I_{D_{\text{MAX}}} \)
PA Housing
Schematic Diagram

K5TRA

T. Apel
Bias Board Top Layer

2.250” x 0.725”
Bias Board Pads
Bias Board Bottom Layer
RF Input
Summary

• Conservative design – 12 W linear power output
• Milled Aluminum housing (2.7” x 1.7” x 0.75”)
• Thermal design provides < 150°C channel temp.
• Internal, sequenced bias circuit (on FR4)
• RF boards on Rogers 4003
• TGA-2625-CP GaN MMIC from Triquint / Qorvo
Questo è Tutto