

Product Description

The TMC254-D GaN Power Amplifier is an ultra high linearity device, designed for use in mmWave 5G, Radios, Military, EW and Space applications.

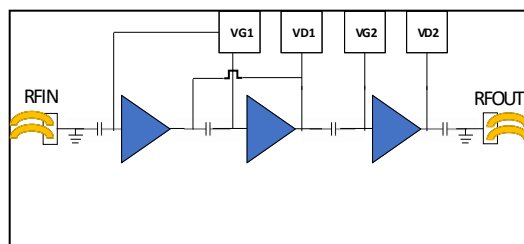
The TMC254-D provides 8 W of saturated power from 24 to 30 GHz with 30% PAE. The TMC254-D is matched to 50Ω, eliminating the need for RF port matching. Both bond pad and backside metallization are Au-based that is compatible with ribbon and wedge bonding and high conductivity epoxy and eutectic die attach methods.

The packaged version is available as TMC254 in a 5x5 overmold QFN as TMC254-P5 or upon request in a 6x6 Air-Cavity QFN as TMC254-P6. TMC254-D can be biased from 18V to 28V to adjust output power levels in the 5W to 12W range while maintaining excellent PAE and NPR. TMC254 normal operating temperature is -55 C to +105 C (with max of 130 C) allowing 1E6 hrs of MTBF.

Product Features

- RF frequency: 24 to 30 GHz
- Linear Gain: 24 dB
- P_{sat} : 8 W
- PAE: 30%
- Die Size: X=3.0 mm, Y=2.5 mm, Z=0.1mm
- Package Size: 5x5x0.9 mm
- DC Power: 23 VDC, 590 mA

Functional Block Diagram *



Applications

- mmWave 5G
- Point-to-Point Radios and VSATs
- Fiber Optics
- Military, EW and Space

Ordering Information

Part No.	Description
TMC254-D	Bare Die
TMC254-P5	Packaged (5x5 QFN)
TMC254-P6 *	Packaged (6x6 Air-Cavity QFN)

* Contact mmTron for further information



Table of Contents

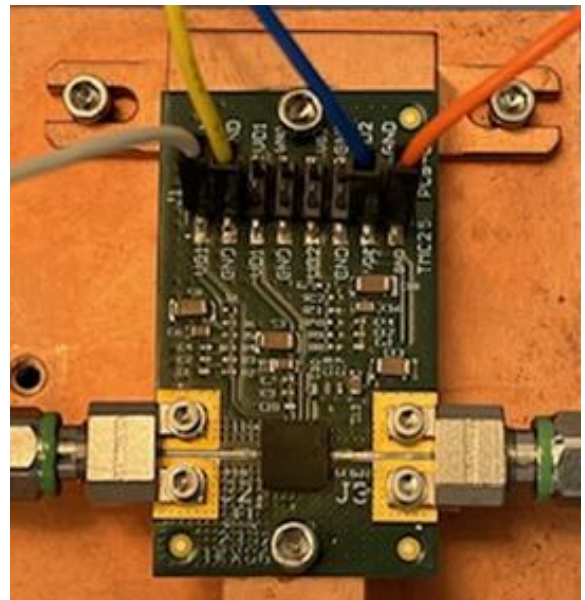
Product Description.....	1	1dB Compression Point, 23V, TMC254.....	4
Product Features.....	1	1dB Compression Point, 18V, TMC254.....	4
Functional Block Diagram.....	1	TMC254 Pad Layout and Description.....	5
Applications.....	1	TMC254 Power and Bypass Capacitors.....	5
Ordering Information.....	1	TMC254 packaged device, functional pinout.....	6
Typical Operating Conditions.....	2	TMC254 Assembly Drawing.....	6
Evaluation Board TMC254-EVB.....	2	Recommended Biasing.....	7
S-Parameters, On Wafer, TMC254D.....	3	Assembly Techniques.....	7
3 dB Compression Point, On Wafer, TMC254D.....	3	ESD Warning.....	7
PAE, Pout vs. Frequency, On Wafer, TMC254D.....	3	ROHS Compliance.....	7
PAE, Gain, Pout vs. Pin, TMC254D.....	4	Absolute Maximum Ratings.....	8
PAE, Gain, Pout vs. Pin, 25C/85C, TMC254D.....	4	Disclaimer.....	8

Typical Operating Conditions

	Min	Typ	Max	
Frequency	24		30	GHz
Gain		24		dB
Return Loss		10		dB
P1dB		38		dBm
Psat at 18V		37		dBm
Psat at 23V		39		dBm
Psat at 28V		41		dBm
PAE @P1dB		30		%
OIP3		44		dBm
Bias Voltage		23		V
Bias Current		590		mA

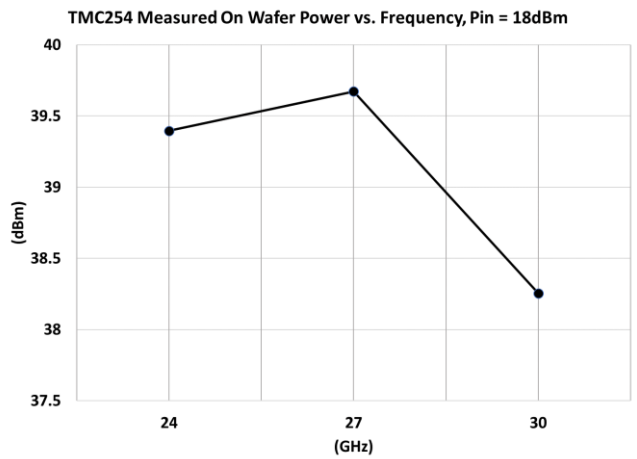
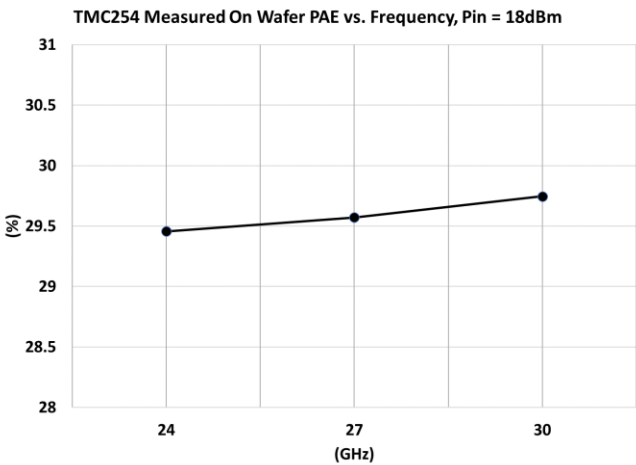
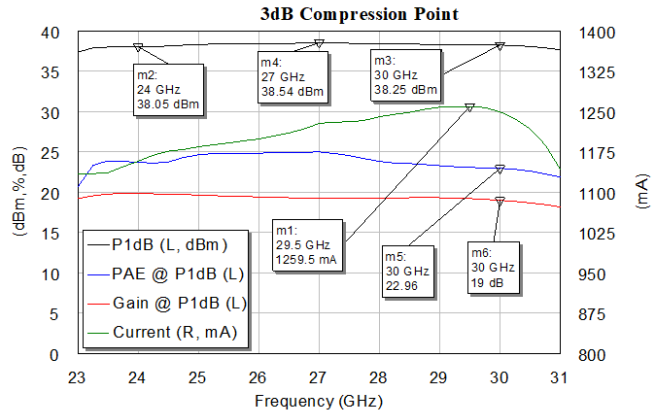
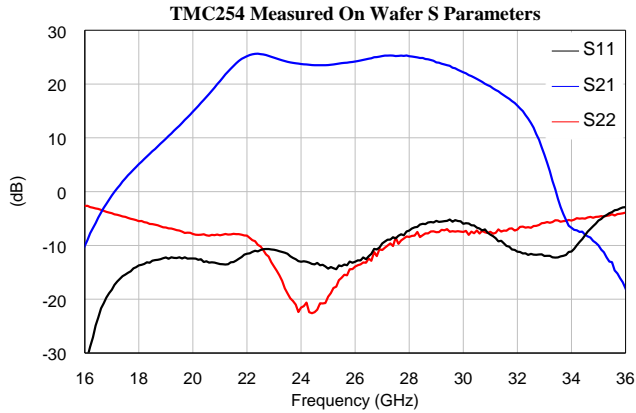
Electrical Performance : Ta = 25 °C, F = 27 GHz, Vdd=23V, Vgg=-3.8V.

Evaluation Board TMC254-EVB





On-Wafer (TMC254D) Electrical Performance: Ta = 25°C, 24V/500 mA



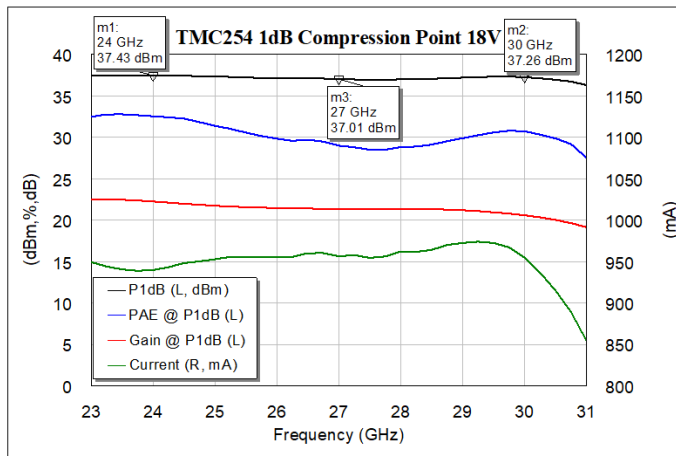
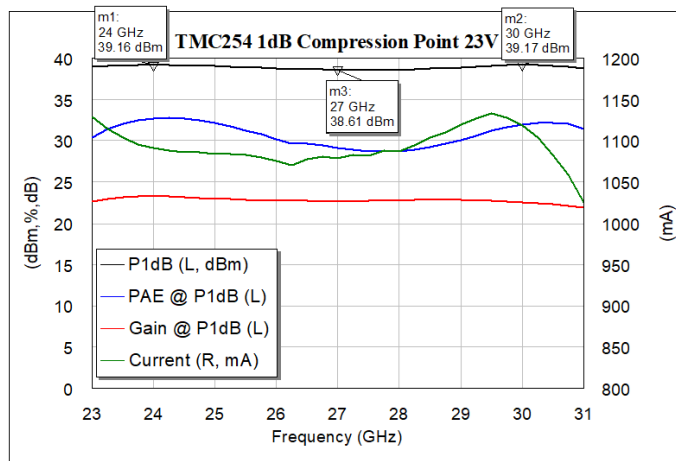
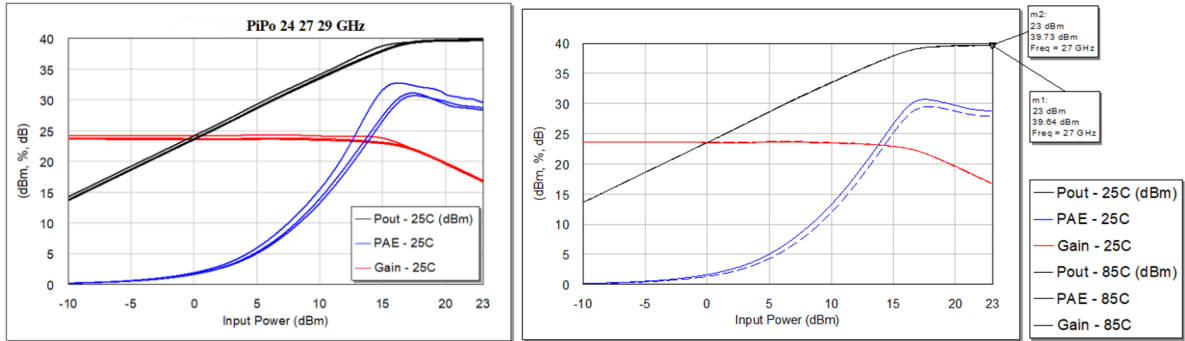


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mmWave Frontier

TMC254-D 24-30 GHz Power Amplifier

TMC254 Electrical Performance: $T_a = 25/85^\circ\text{C}$, 23V



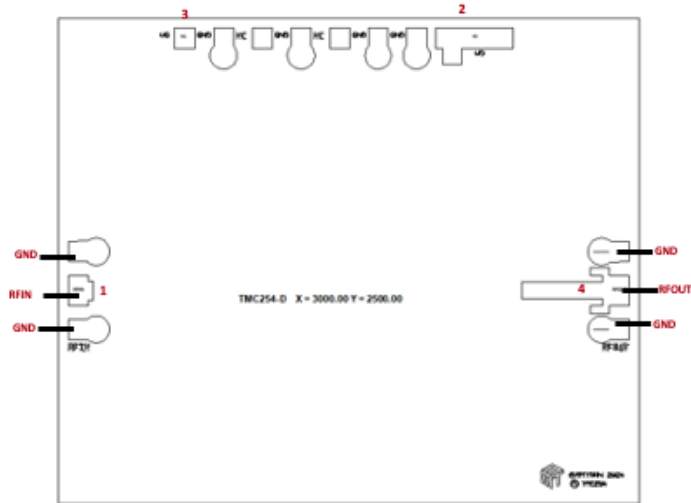


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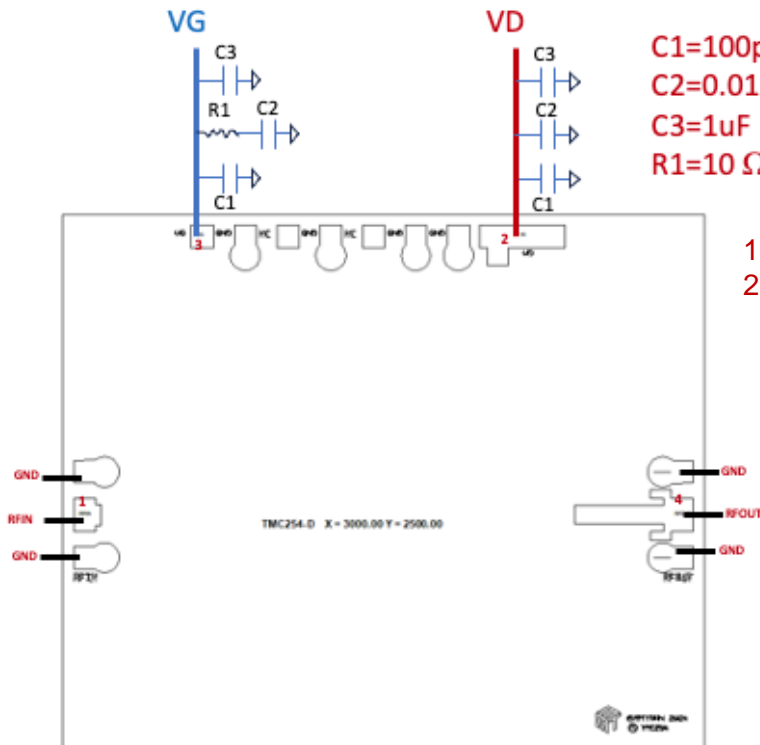
TMC254-D 24-30 GHz Power Amplifier

TMC254D Pad Layout and Functional Description



Pad#	Function
1	RF Input
2	VDD Bias
3	VGG Bias
4	RF Output

TMC254D Power Supply and Bypass Capacitor Values



C1=100pF
C2=0.01uF
C3=1uF
R1=10 Ω

- 1) Place C1 very close to the chip
- 2) Use GSG connection for RF ports

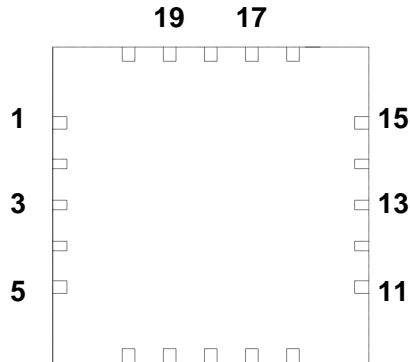


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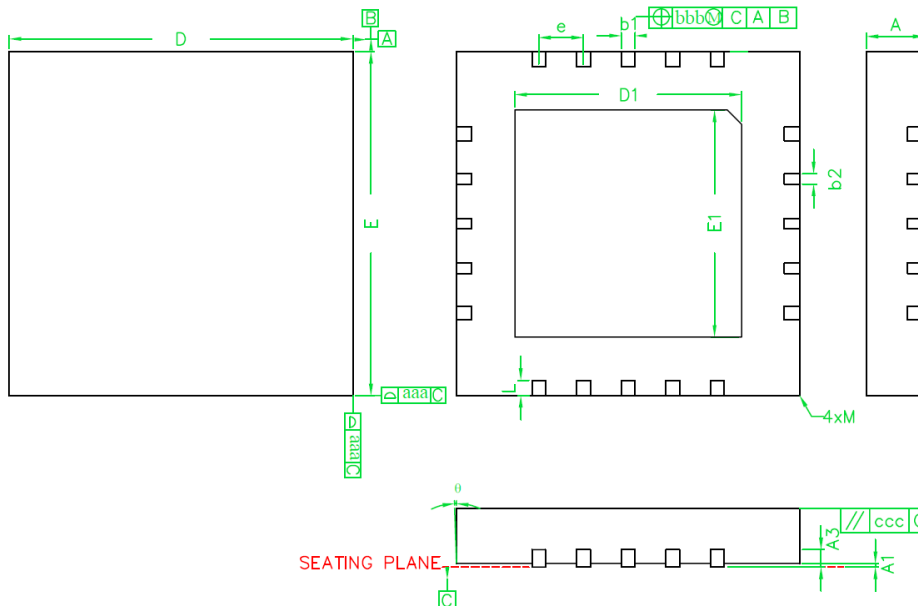
TMC254-D 24-30 GHz Power Amplifier

TMC254-P5 Packaged Device, Functional Pinout



Pad#	Function
13	RF Output
17	VDD Bias
19	VGG Bias
3	RF Input
2,4,12,14	GND

TMC254-P5 Overmold QFN Packaged Device, Assembly Drawing (all units in mm)



SYMBOLS	DIMENSIONS IN MILLIMETERS		
	MIN	NOM	MAX
A	0.80	0.90	1.00
A1	0	0.02	0.05
A3	---	0.25REF.	---
b1	0.15	0.20	0.25
b2	0.10	0.15	0.20
D	4.90	5.00	5.10
D1	---	3.30BSC	---
E	4.90	5.00	5.10
E1	---	3.30BSC	---
e	---	0.65BSC	---
L	0.18	0.23	0.28
θ	0	---	12°
aaa	---	0.25	---
bbb	---	0.10	---
ccc	---	0.10	---
M	---	---	0.05

1. DXF and detailed assembly drawings are available on request.

Recommended Biasing

The TMC254 is operated with one positive supply VD and one negative supply voltage VG.

The positive supply must be connected to VD pad 2 on the die (and pin 23 on the package). The negative bias should be connected to VG pad 3 on the die (and pin 26 on the package).

The VG is biased to -6V first, then VD is gradually biased to desired value in +18 to +28V range, and finally, VG is adjusted to around -4V for ID=590mA DC current.

Reverse the sequence during power down, i.e. bring the VG to -6V, lower VD to 0V, and then VG to 0.

Assembly Techniques

The TMC254 is fabricated using a GaN-based semiconductor material structure and is to be attached using AuSn Eutectic or High Thermal Conductivity Silver epoxy. The mounting surface should be clean and flat.

ESD Warning

III-V MMICs are ESD-sensitive. Preventative ESD measures must be employed in all aspects of storage, handling, and assembly. MMIC ESD precautions, handling considerations, and die-attach and bonding methods are critical factors in successful III-V MMIC performance and reliability.

RoHS Compliance

This part is RoHS compliant, meeting the requirements of the EU Restriction of Hazardous Substances Directive 2002/95/EC, commonly known as RoHS. Six substances are regulated: lead, mercury, cadmium, chromium VI (hexavalent chromium), polybrominated biphenyls (PBB), and polybrominated biphenyl ethers (PBDE). RoHS compliance requires that any residual concentration of these substances is below the Directive's maximum concentration values (MCV): cadmium 100ppm by weight and all others 1000ppm by weight.