mmTron
Unleashing the mmWave Frontier

TMC254-D
21-29 Power Amplifier

Product Features

- RF frequency: 21 to 29 GHz
- Linear Gain: 24 dB
- P_{sat}: 8 W (10W with 28V bias)
- 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

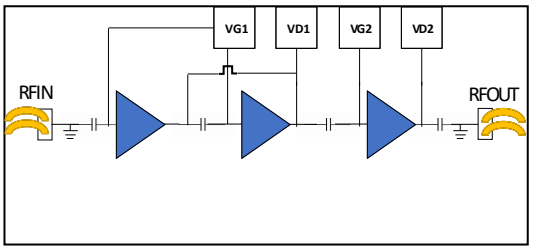
Applications

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

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 21 to 29 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 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 10W 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.

Functional Block Diagram



Ordering Information

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

* Contact mmTron for further information

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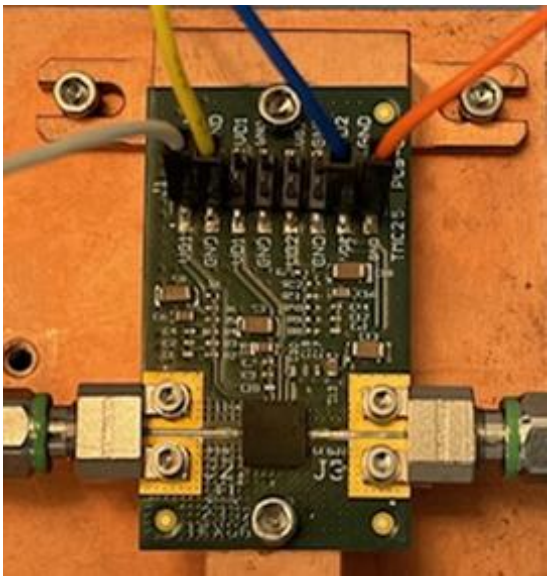
Typical Operating Conditions

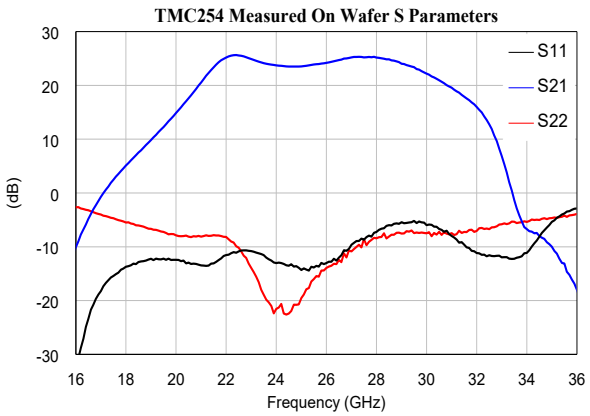
	Min	Typ	Max	
Frequency	21		29	GHz
Gain		24		dB
Return Loss		10		dB
P1dB		38		dBm
Psat at 18V		37		dBm
Psat at 23V		39		dBm
Psat at 28V		41		dBm
PAE @P1dB		30		%
OIP3		44		dBm
Bias Voltage	18	23	28	V
Bias Current		590		mA

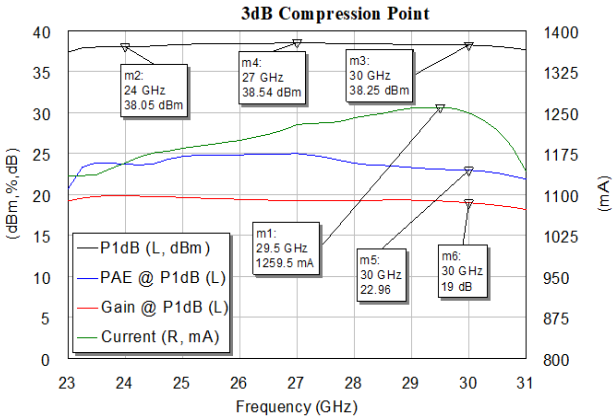
Electrical Performance : Ta = 25 °C, F = 27 GHz, Vdd=23V, Vgg=-3.8V.

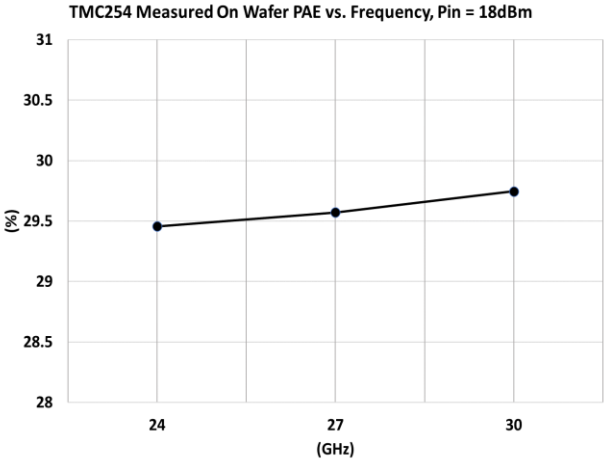
Evaluation Board TMC254-EVB

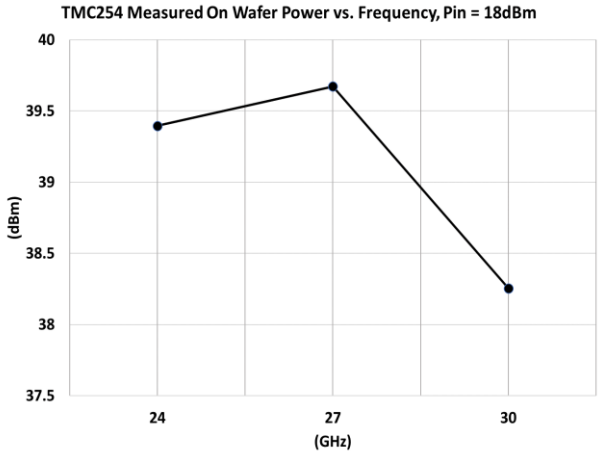


On-Wafer (TMC254D) Electrical Performance: Ta = 25°C, 24V/500 mA

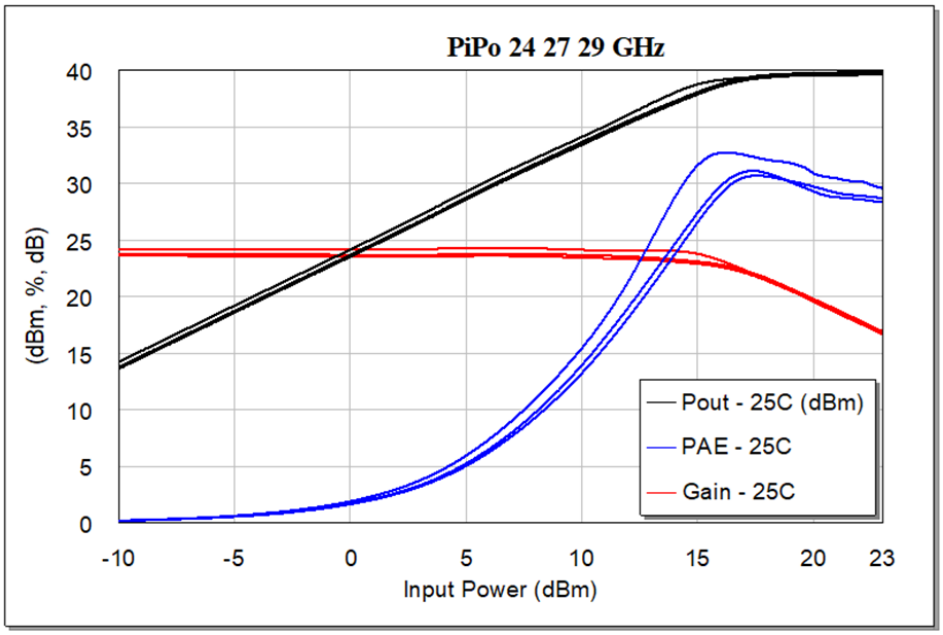


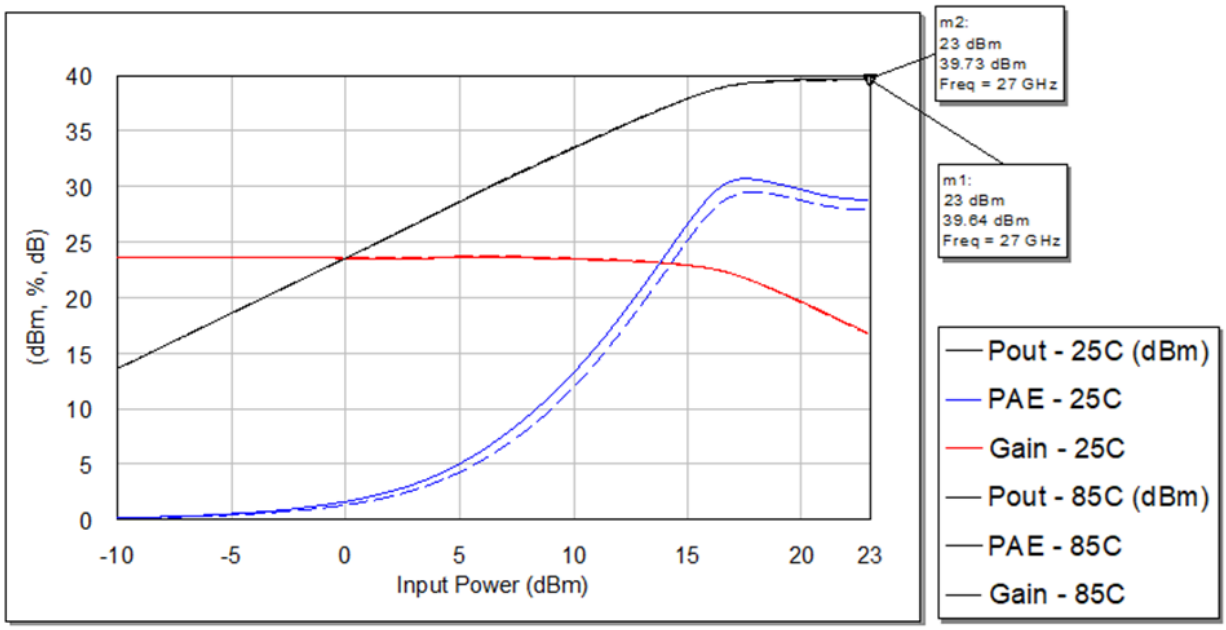




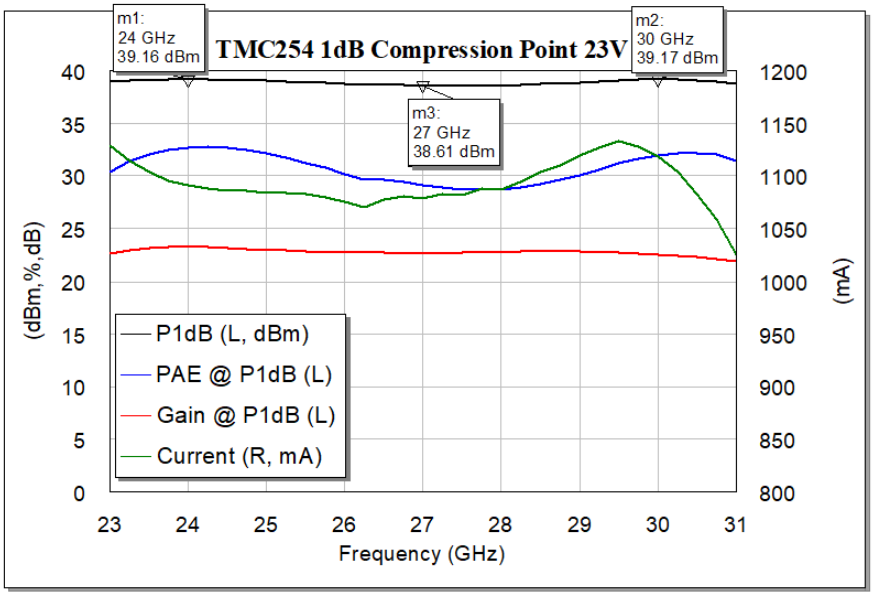


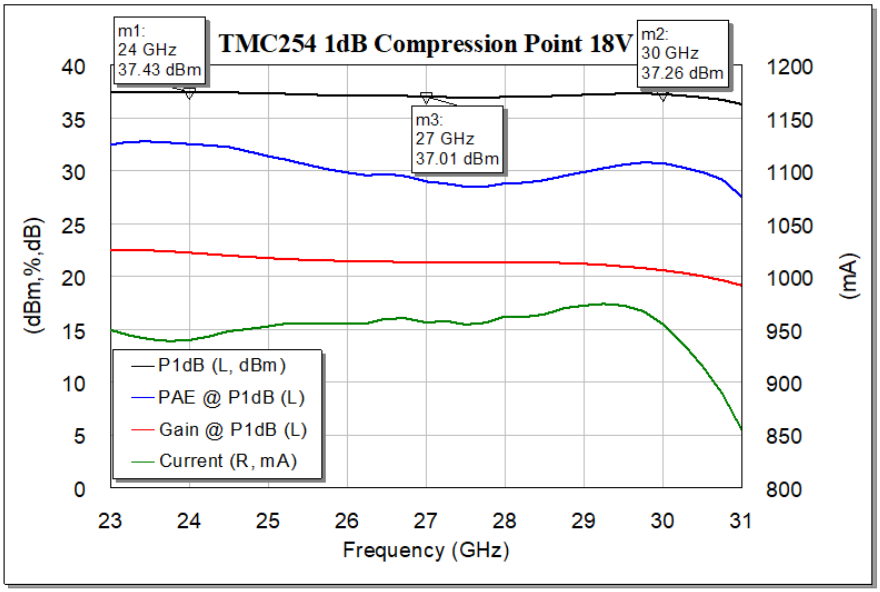
TMC254 Electrical Performance: Ta = 25/85°C, 23V



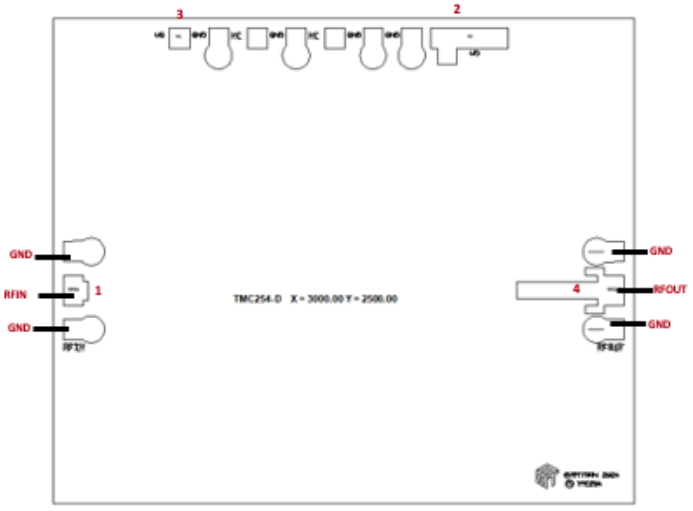


TMC254 Electrical Performance: Ta = 25/85°C, 23V



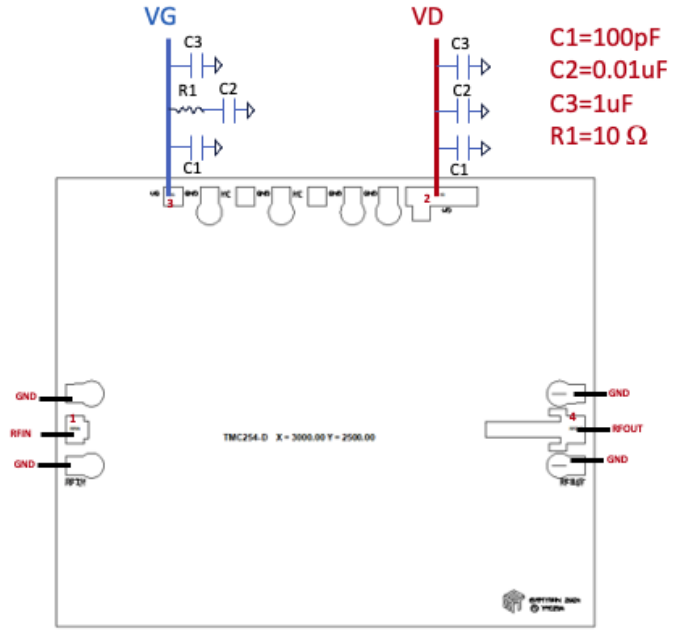


TMC254-D Pad Layout and Functional Description



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

TMC254-D Power Supply and Bypass Capacitor Values



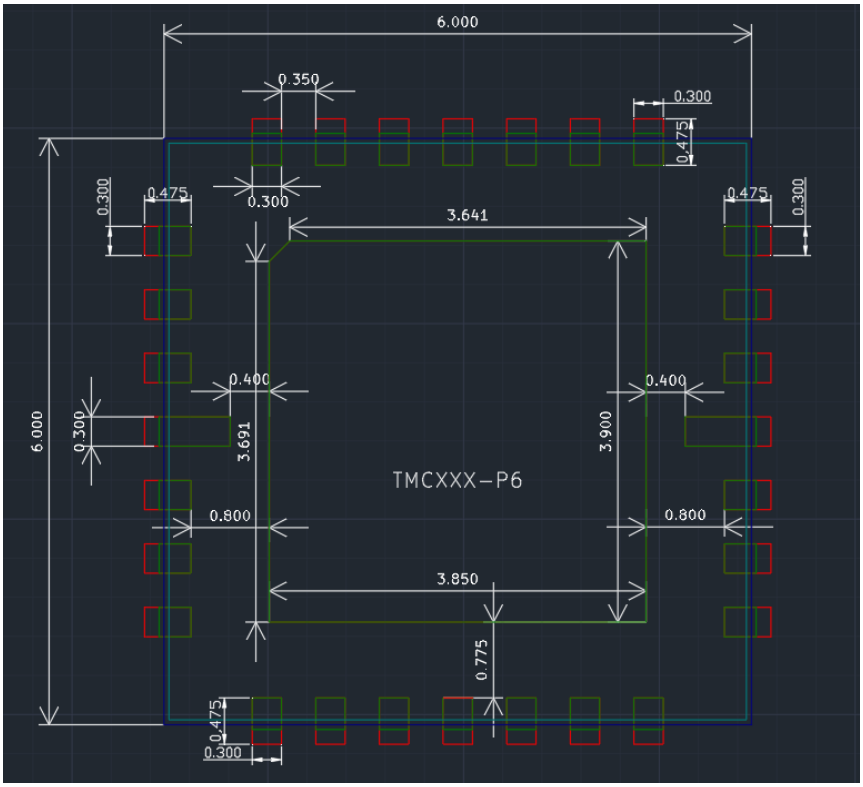
1) Place C1 very close to the chip
2) Use GSG connection for RF ports

TMC254-P6 Packaged Device, Functional Pinout

Lead frame drawing



Pad#	Function
18	RF Output
23	VDD Bias
26	VGG Bias
4	RF Input
3,5,17,19	GND



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 -4.5V 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.



Electrostatic Discharge Caution

This integrated circuit can be damaged by ESD. mmTron Inc. recommends that all integrated circuits be handled with appropriate precautions. Failure to observe proper handling and installation procedures can cause damage. ESD damage can range from subtle performance degradation to complete device failure. Precision integrated circuits may be more susceptible to damage because very small parametric changes could cause the device not to meet its published specifications. 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 Compliant

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.

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