mmTron
Unleashing the mmWave Frontier

TMC212
36-42 GHz 9 W Linear Power Amplifier

Product Features

- RF frequency: 36 to 42 GHz
- Linear Gain: 23 dB
- Psat: 5 W (37 dBm) with 24V Bias
- Psat: 9 W (39.5 dBm) with 28V Bias
- Bare Die: X=3.5mm, Y=2.5mm, Z=0.1mm
- Package Size: 28-pin, X=6.0 mm, Y=6.0 mm, Z=1.2mm
- GaN HEMT Process
- DC Power: 18 to 28 VDC, ID1=175mA, ID2=225mA, IDT=400 mA

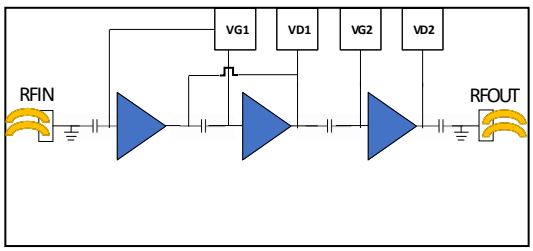
Applications

- Fixed Wireless Access
- SATCOM
- Military Radar, EW

Product Description

The TMC212 GaN HEMT Power amplifier is a three-stage High Linearity Single-ended power MMIC, packaged in a 6x6x1.2 mm3 air-cavity QFN, designed for use in fixed wireless access, SATCOM and Military Radar and EW applications. The bare die is available as TMC212-D, X=3.5mm, Y=2.5mm, Z=-0.1mm. The TMC212-D bare die is a 50Ω matched design which eliminates the need for RF port matching. To maximize performance, impedance matching structures are needed on the PCB for the TMC212-P6 packaged part. To ensure rugged and reliable operation and moisture protection, the TMC212 is designed for hi-volume ROHS SMT attach methods. TMC212 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
TMC212-D	Bare Die
TMC212-P6	Packaged (6x6 QFN)
TMC212-EVB	Evaluation Board
TMC212-T	Die on TAB
TMC212-EVM[1]	Evaluation Module

1- Contact mmTron for further information

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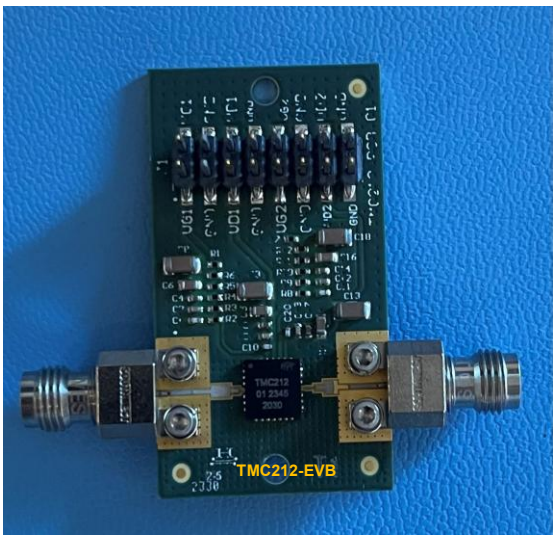
Typical Operating Conditions

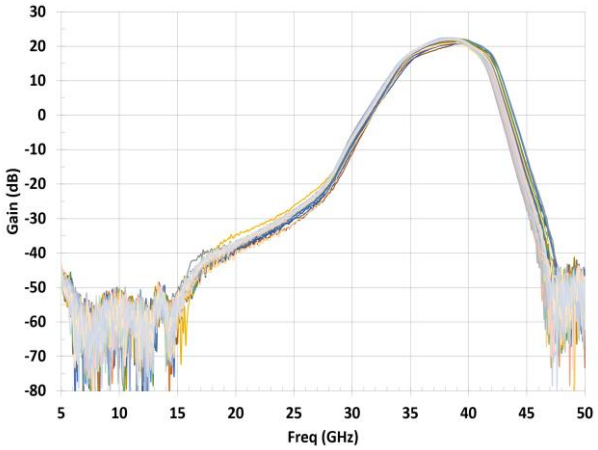
	Min	Typ	Max	
Frequency	36		42	GHz
Gain		23		dB
EVM@29 dBm		2		%
P1dB		38		dBm
Psat @28V/400mA		39.5		dBm
PAE		24		%
OIP3		43		dBm
Bias Voltage (VD)	18	24	28	V
Bias Current (ID1)	165	175	185	mA
Bias Current (ID2)	200	225	250	mA

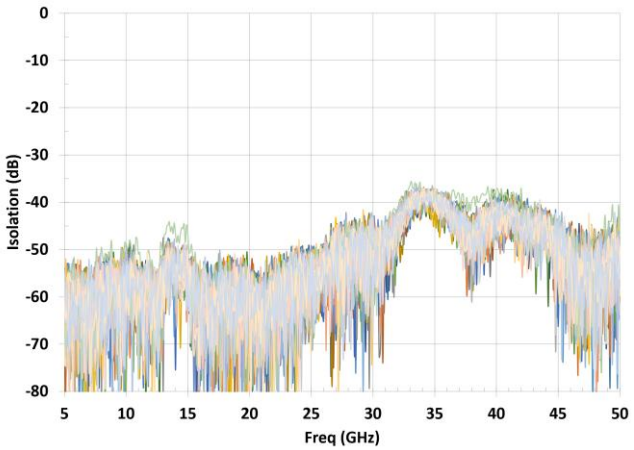
Electrical Performance : Ta = 25 °C, F = 38 GHz,
VD=24V/VG=-4.2V/ID=400mA.

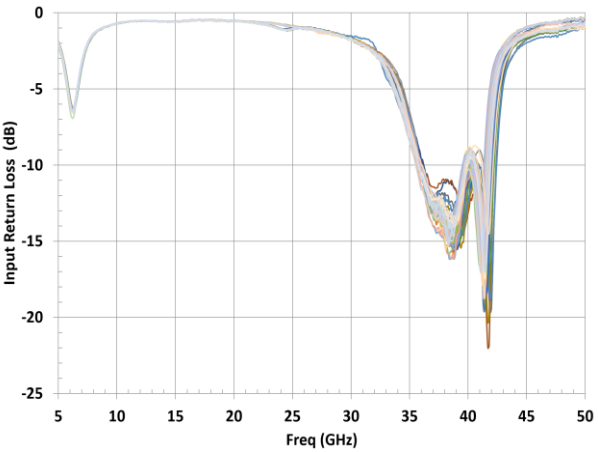
Evaluation Board

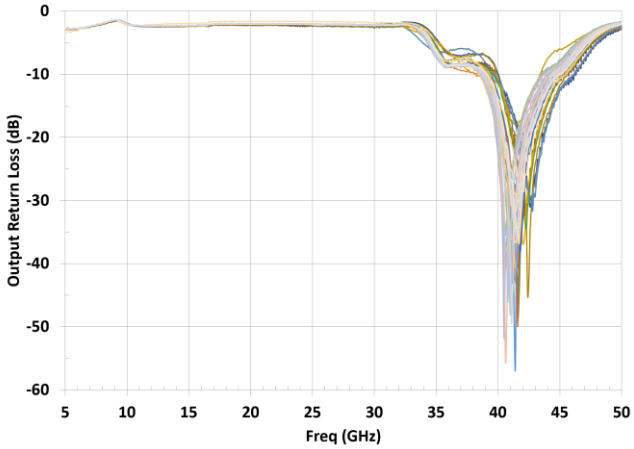


Electrical Performance: TMC212-D Ta = 25°C, 24V/400 mA

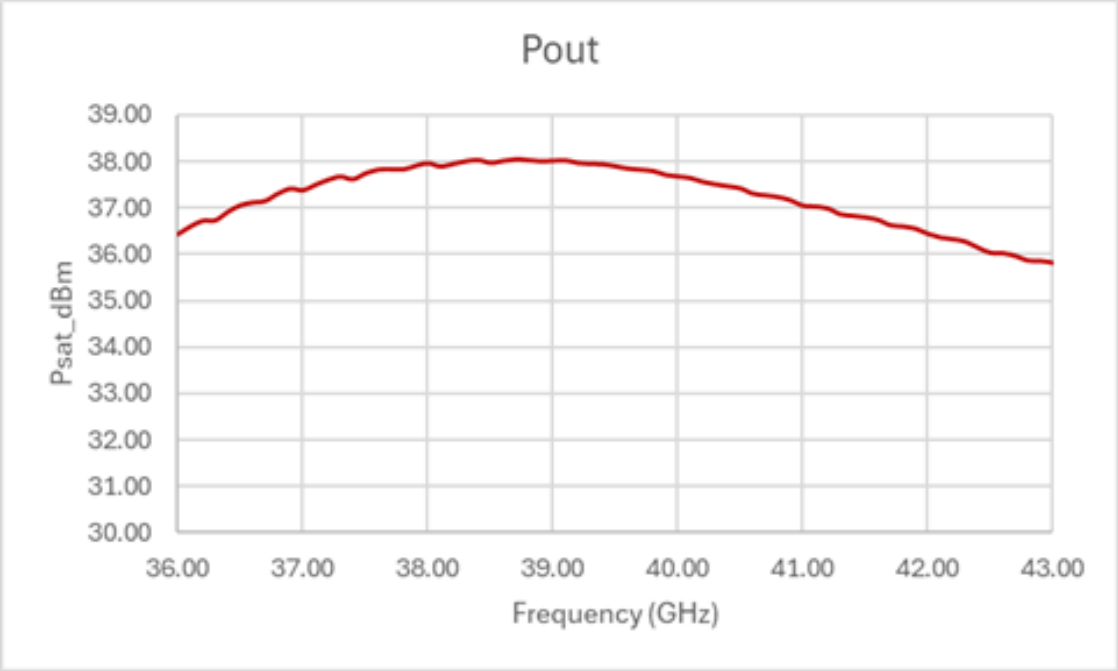


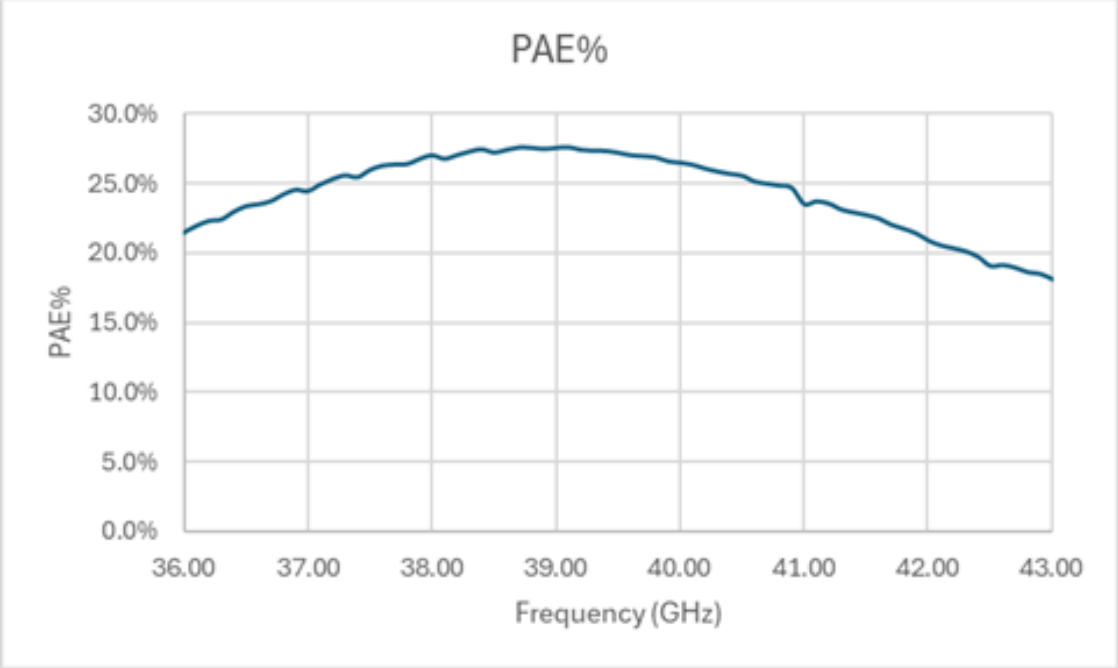




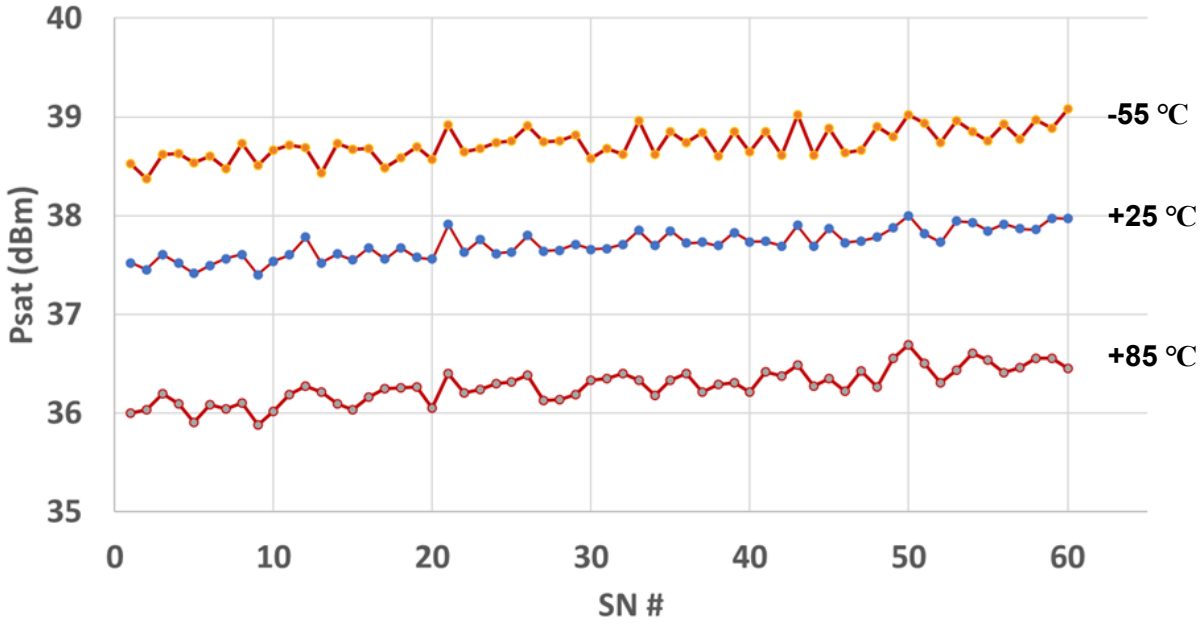


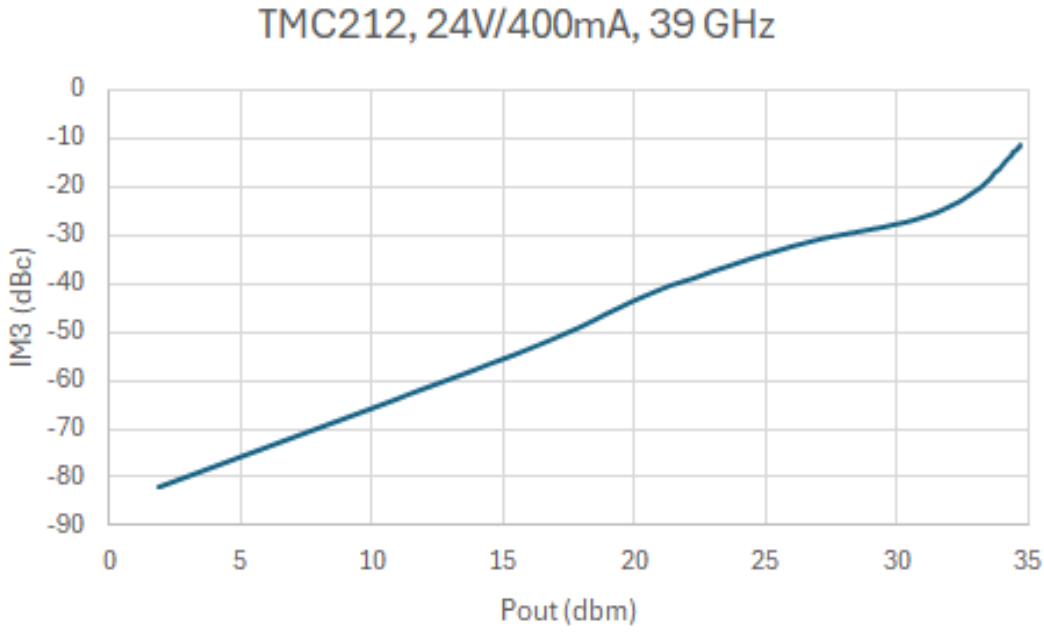
Electrical Performance: TMC212-D 24V/400 mA



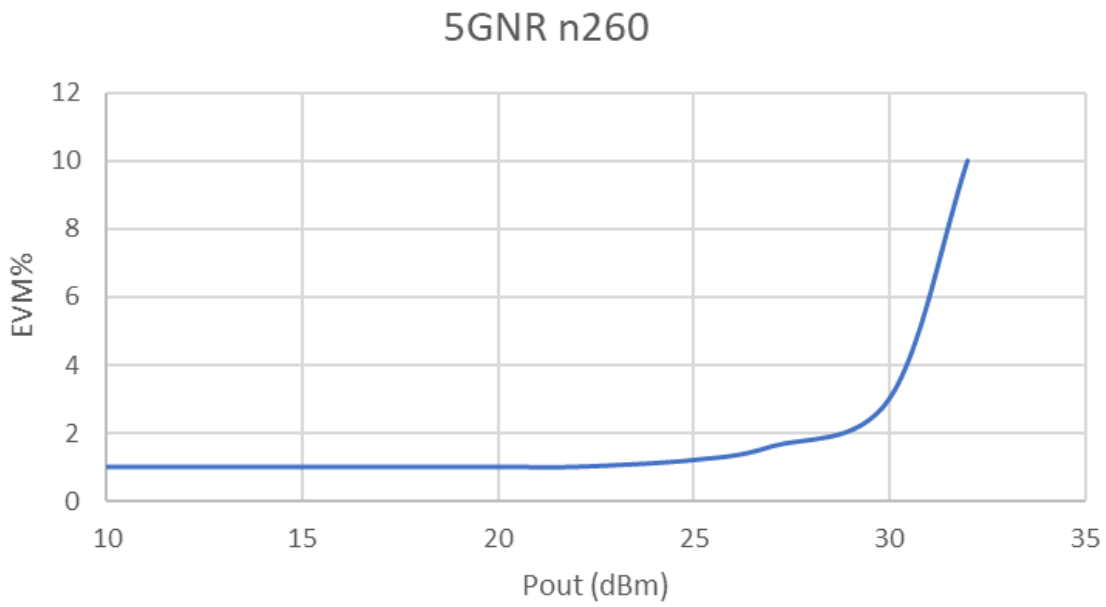


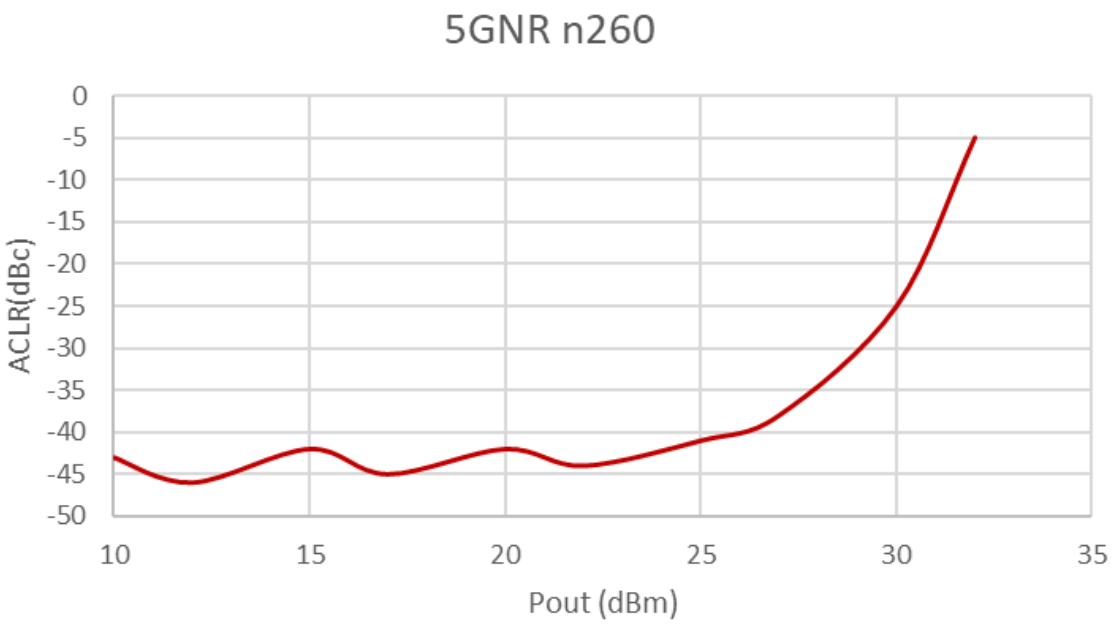
Electrical Performance: TMC212-D 24V/400 mA

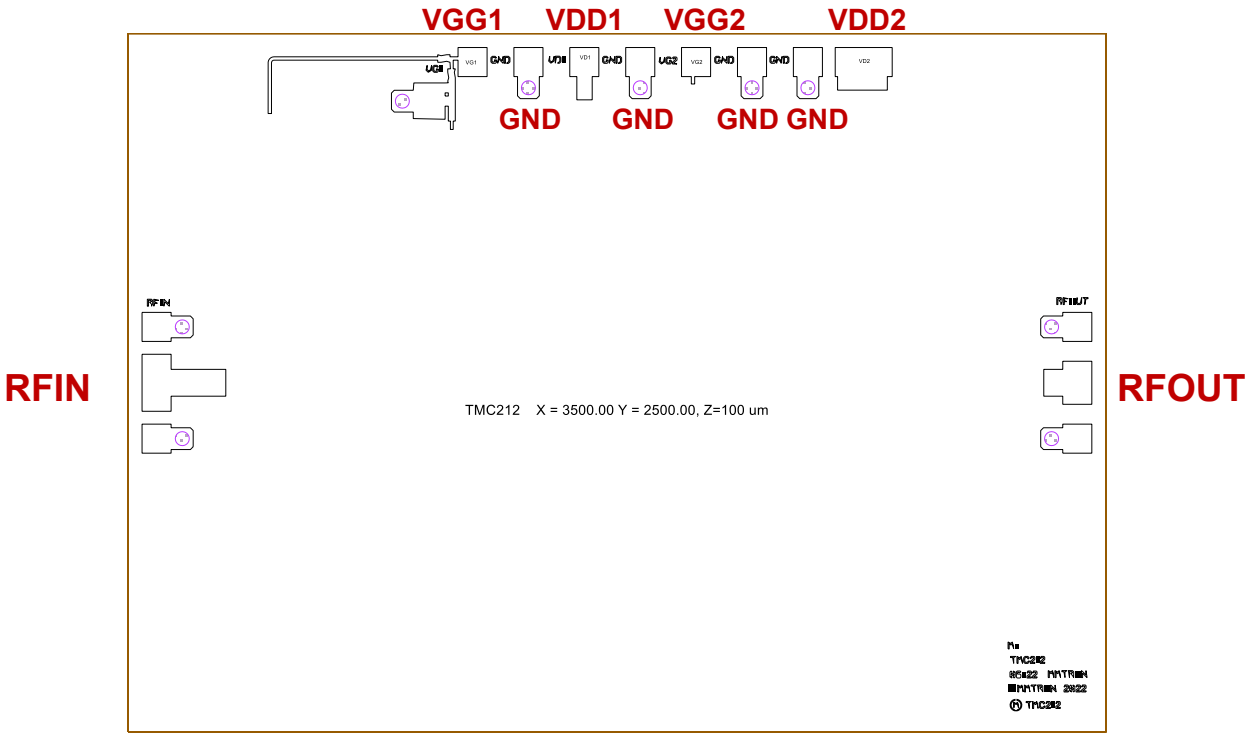




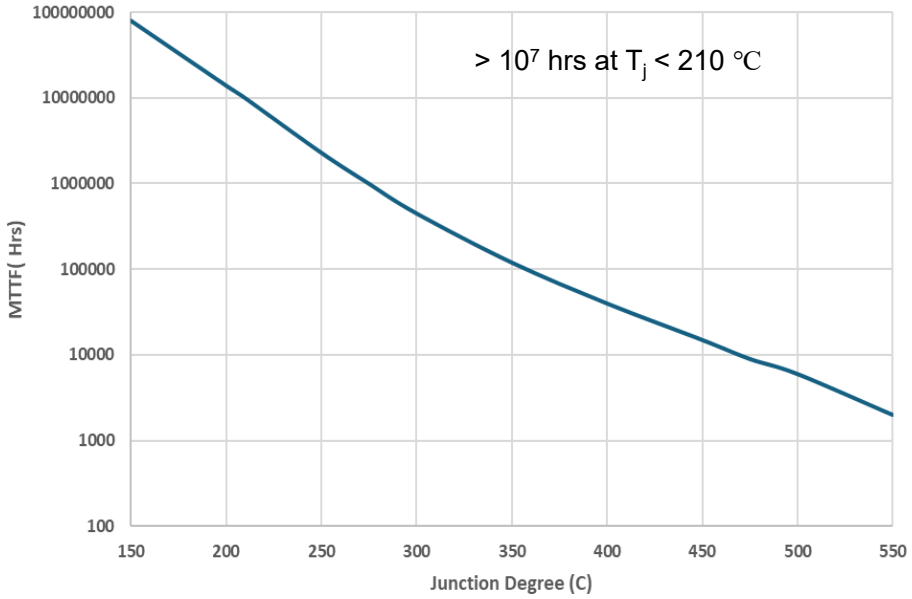
Electrical Performance: TMC212-D Ta = 25°C, 24V/400 mA



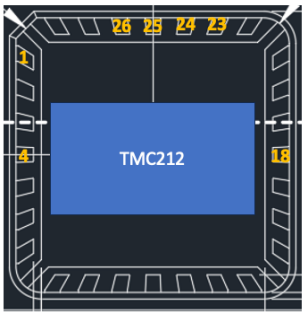



VGG1
VDD1
VGG2
VDD2
GND
GND
GND
GND
RFIN
RFOUT
TMC212 X = 3500.00 Y = 2500.00, Z=100 um

MTTF vs. Junction Temperature



TMC212-P6 Packaged Device, Functional Pinout



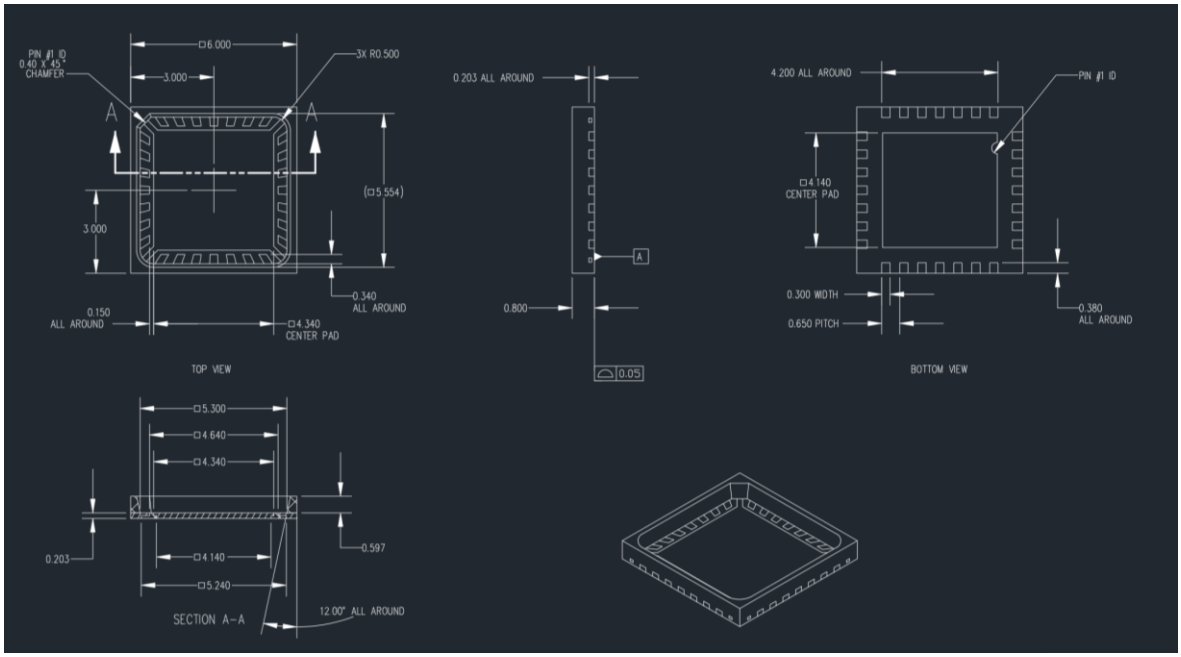


Pin#	Function
3	GND
4	RF Input
5	GND
17	GND
18	RF Output
19	GND

Pin#	Function
23	VD2
24	VG2
25	VD1
26	VG1

NOTE: All other pins are GND.

TMC212-P6 Packaged Device, Assembly Drawing



Recommended Biasing

The TMC212 is operated with two positive supplies VD1 and VD2 and two negative supply voltages VG1 and VG2.

The positive voltages VD1 and VD2 can be connected together or biased separately. The negative voltages VG1 and VG2 can be connected together or biased separately.

The positive supply must be connected to VD pads 23 and 25 on one side of the package. The negative bias should be connected to VG pads 24 and 26 on one side of the package.

The VG1=VG2 is biased to -6V first, then VDD is gradually biased to +18V to +28V, and finally, VG1=VG2 is adjusted to around -5V for ID1=175mA and ID2=225mA DC current.

Reverse the sequence during power down, i.e. bring the VG1=VG2 to -6V, lower VD1=VD2 to 0V, and then VG1=VG2 to 0.

Assembly Techniques

The TMC212 is fabricated using a GaN-based semiconductor material structure and is to be packaged in an 6x6 air-cavity QFN. The package is back-metalized and can be mounted with standard PCB assembly techniques. The mounting surface should be clean and flat.

Absolute Maximum Ratings

Parameter	Value / Range
Drain Voltage (VD)	+30 V
Gate Voltage (VG)	-7 to 0 V
Drain Current (ID1)	430 mA
Drain Current (ID2)	530 mA
Gate Current (IG1+IG2), T_j =180 °C	20 mA
Power Dissipation, 85°C	16 W
Input Power, CW, 50 Ω	22 dBm
Mounting Temperature, 30 sec.	260 °C
Storage Temperature	-55 to +150 °C

NOTE: Operation of TMC212 outside the parameter ranges given above can cause irreversible damage.



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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