mmTron
Unleashing the mmWave Frontier

TMC168
24-30 GHz Low Noise Amplifier

Product Features

- RF frequency: 24 to 30 GHz
- Linear Gain: 23 dB
- Noise Figure: 2.8dB
- Psat: 14 dBm
- Bare Die: X=3.4, Y=1.16, Z=0.1 mm
- Package Size: 20-pin, X=5.0, Y=5.0 mm
- DC Power: 3 VDC, 40 mA

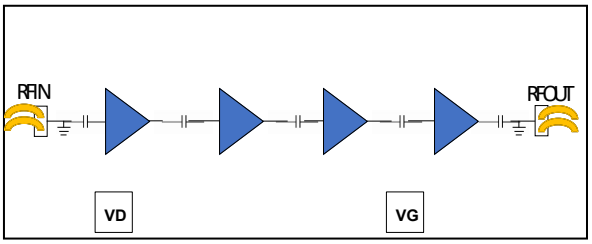
Applications

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

Product Description

The TMC168 GaAs Low Noise Amplifier is a high linearity device, available in bare die or in a 5x5 QFN package, designed for use in Radar, mmWave FWA, Radios, Military, EW and Space applications. The TMC168 is a 50Ω matched design providing less than 2.8dB of Noise Figure and greater than 12dBm of P1dB from 24 to 30 GHz and eliminates the need for RF port matching. TMC168 has on Chip ESD protection supporting 2kV HBM. 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 bare die version is available under TMC168-D, X=3.4 mm, Y=2.02 mm, Z=0.1mm.

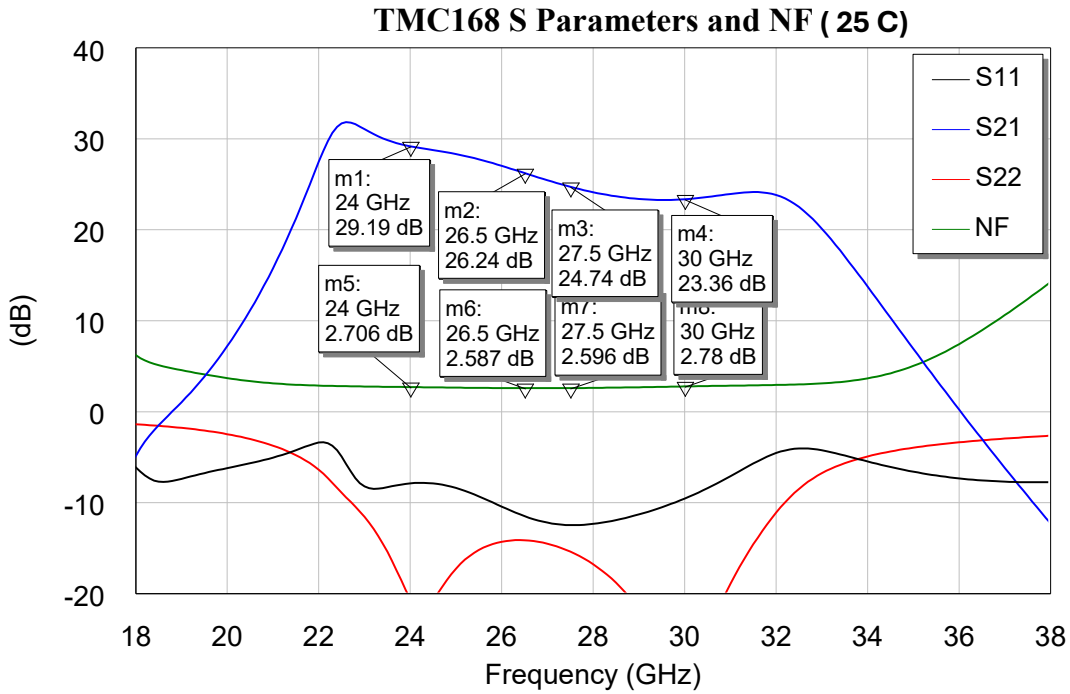
Functional Block Diagram

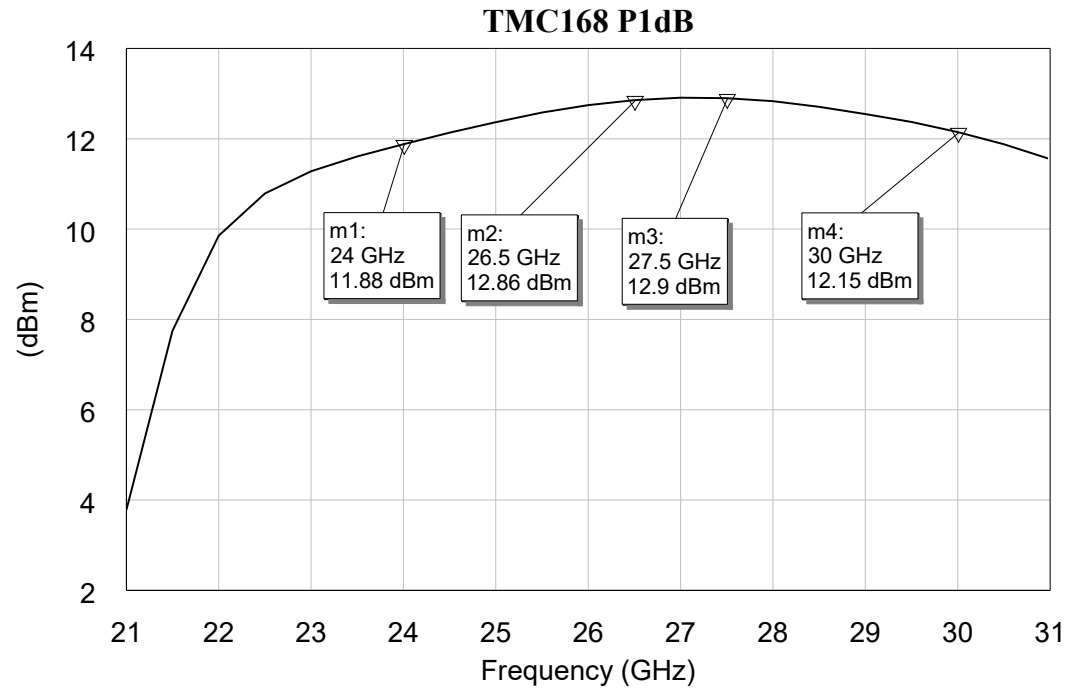


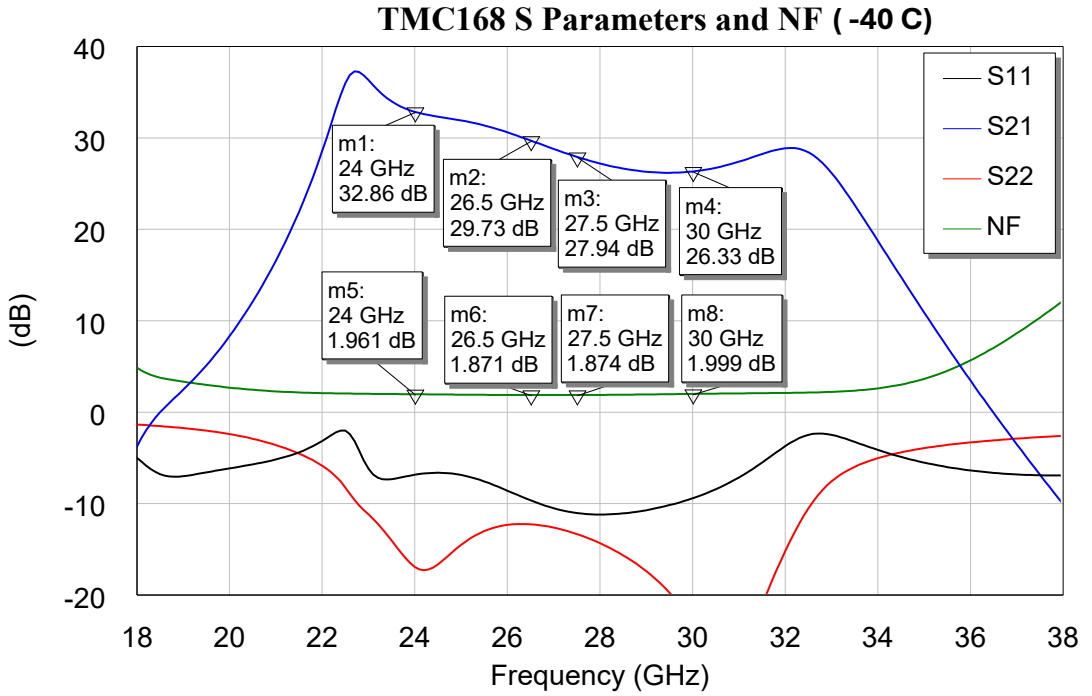
Ordering Information

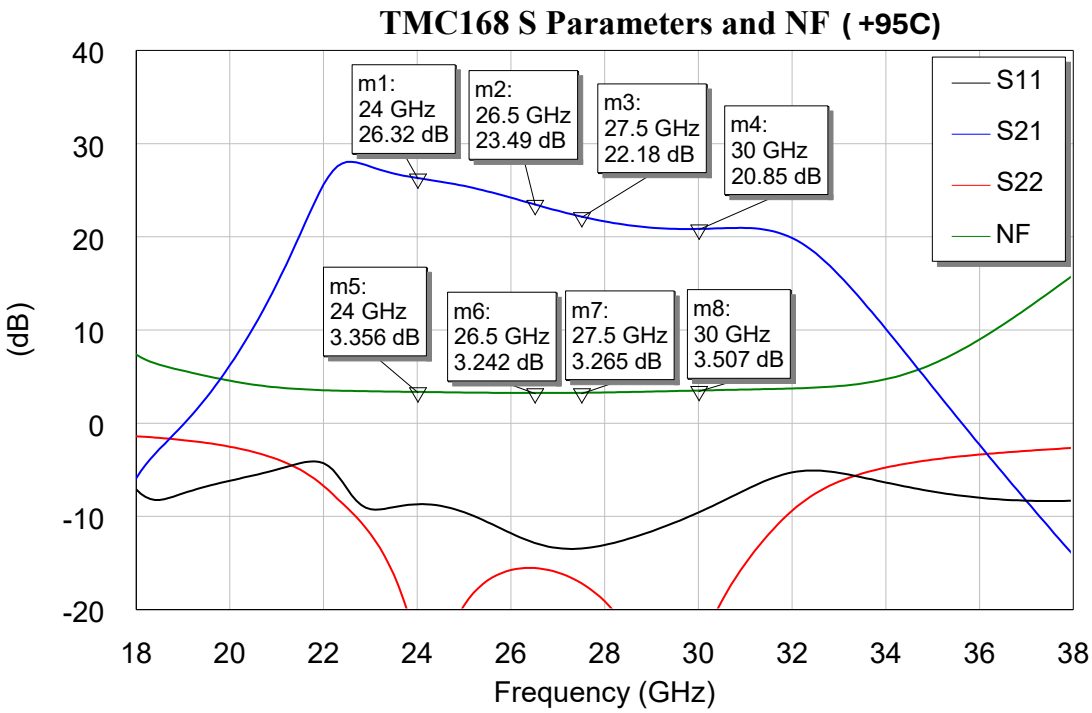
Part No.	Description
TMC168-D	Bare Die
TMC168-P5	Packaged Device

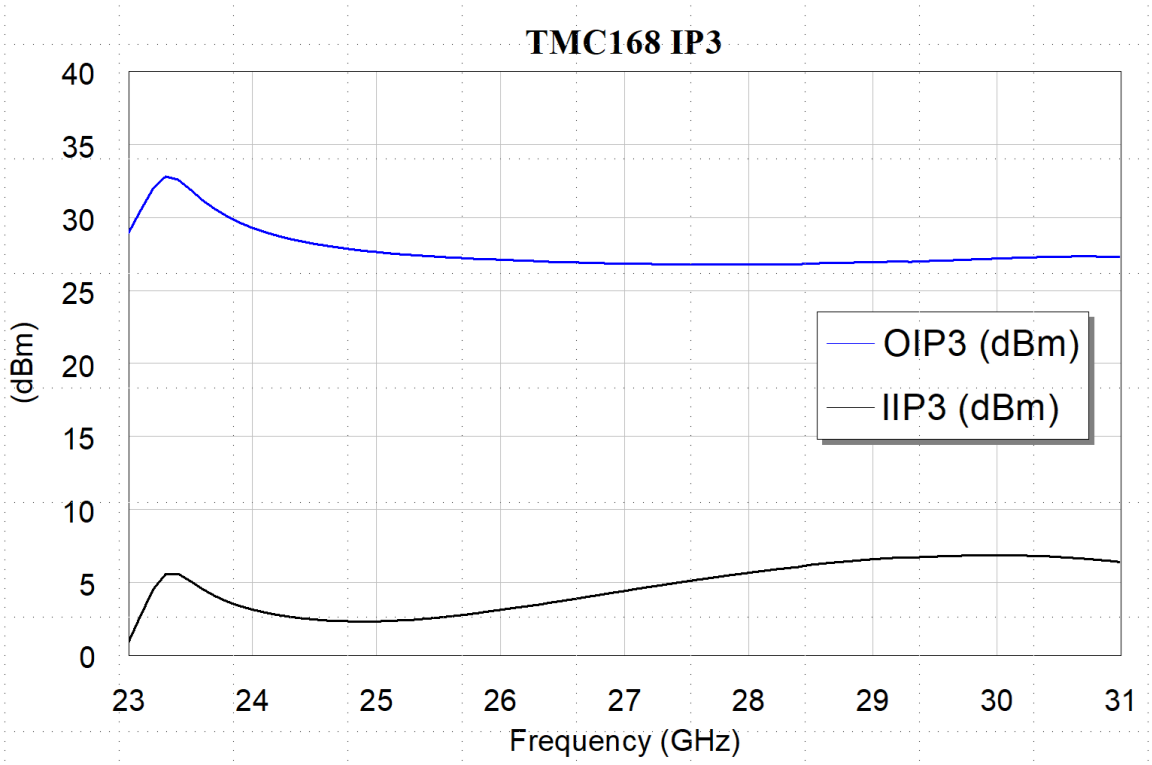
Parameter	Units	Range 1	Range 2
Frequency	GHz	24 - 30	26.5 – 27.5
Gain	dB	> 23.3	> 24.7
Noise Figure	dB	< 2.8	< 2.6
IIP3	dBm	> 2.3	> 3.5
P1dB	dBm	> 11.9	> 12.9
Input Return Loss	dB	> 7	> 11
Output Return Loss	dB	> 14	> 14
Video Bandwidth	MHz	> 500	
Power Consumption	mW	120	
Bias Point	V,mA	3V, 40mA	


TMC168 S Parameters and NF (25 C)
S11
S21
S22
NF
m1:
24 GHz
29.19 dB
m2:
26.5 GHz
26.24 dB
m3:
27.5 GHz
24.74 dB
m4:
30 GHz
23.36 dB
m5:
24 GHz
2.706 dB
m6:
26.5 GHz
2.587 dB
m7:
27.5 GHz
2.596 dB
30 GHz
2.78 dB
(dB)
40
30
20
10
0
-10
-20
18
20
22
24
26
28
30
32
34
36
38
Frequency (GHz)


TMC168 P1dB
m1:
24 GHz
11.88 dBm
m2:
26.5 GHz
12.86 dBm
m3:
27.5 GHz
12.9 dBm
m4:
30 GHz
12.15 dBm
(dBm)
14
12
10
8
6
4
2
21
22
23
24
25
26
27
28
29
30
31
Frequency (GHz)


TMC168 S Parameters and NF (-40 C)
S11
S21
S22
NF
m1: 24 GHz 32.86 dB
m2: 26.5 GHz 29.73 dB
m3: 27.5 GHz 27.94 dB
m4: 30 GHz 26.33 dB
m5: 24 GHz 1.961 dB
m6: 26.5 GHz 1.871 dB
m7: 27.5 GHz 1.874 dB
m8: 30 GHz 1.999 dB
(dB)
Frequency (GHz)


TMC168 S Parameters and NF (+95C)
S11
S21
S22
NF
m1: 24 GHz 26.32 dB
m2: 26.5 GHz 23.49 dB
m3: 27.5 GHz 22.18 dB
m4: 30 GHz 20.85 dB
m5: 24 GHz 3.356 dB
m6: 26.5 GHz 3.242 dB
m7: 27.5 GHz 3.265 dB
m8: 30 GHz 3.507 dB
(dB)
Frequency (GHz)


TMC168 IP3
40
35
30
25
20
15
10
5
0
(dBm)
23
24
25
26
27
28
29
30
31
Frequency (GHz)
OIP3 (dBm)
IIP3 (dBm)

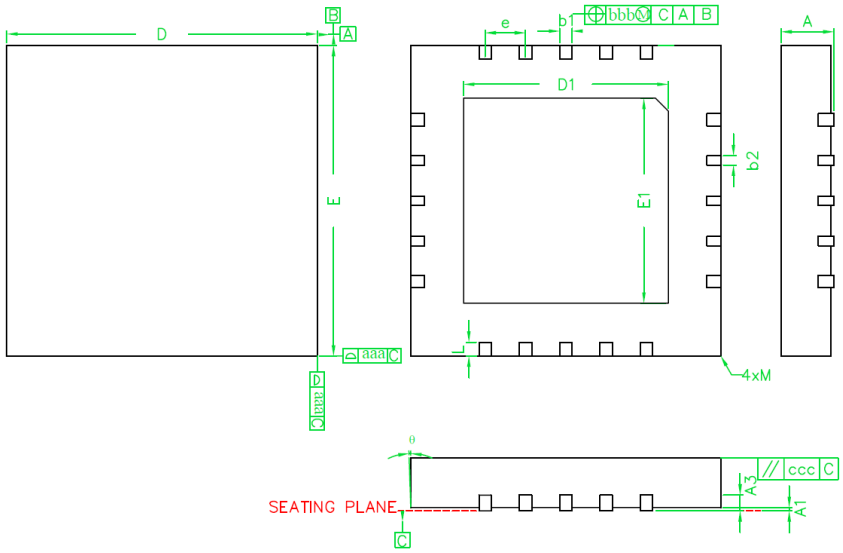
Recommended Biasing

The TMC168 is operated with one positive supply VD and one negative supply VG.

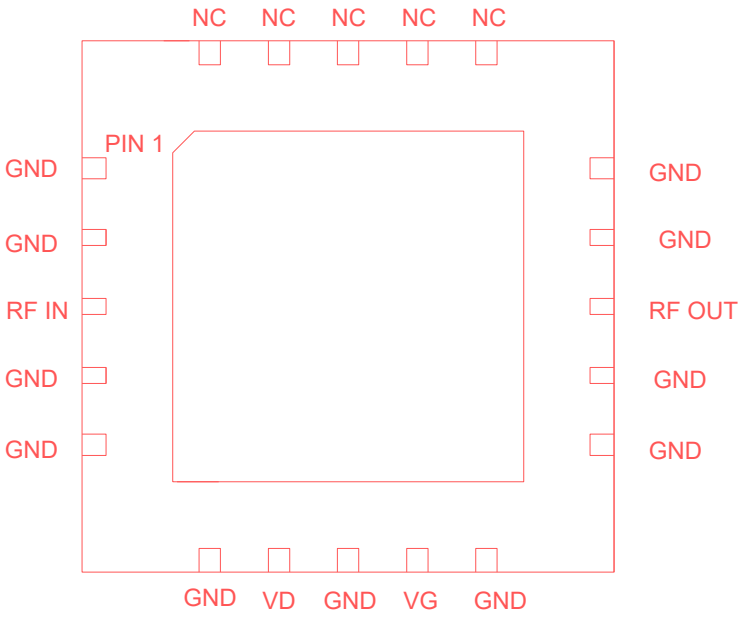
Assembly Techniques

The TMC168 is fabricated using a GaAs-based semiconductor material structure and may be used packaged in a standard overmold or an air-cavity QFN or used as a die.

Package Drawing, 5x5, 20-pin, 0.65mm pitch



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



DXF file is available upon request



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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