1. Description

- The D1522 is a 50W (P_{SAT}) wideband matched GaN-HEMT device. The D1522 is matched to 50ohm on the input port and output port.
- The D1522 operates from 2.7 to 3.5GHz with a 28V supply rail. It is offered in a small hermetically sealed metal/ceramic flange package.

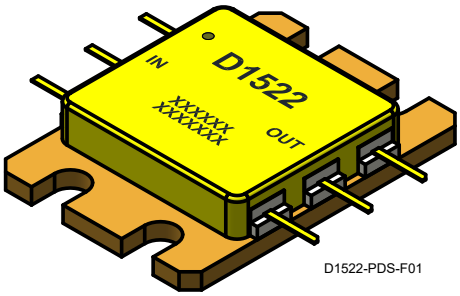


Figure 1. D1522 Package Outline

2. Applications

- Civilian Radar
- Land Mobile a Radio Communications
- Avionics and Test Instrumentation

3. Features[1]

- Operating Frequency: 2.7–3.5GHz
- Output Power (P_{SAT}): 47.0dBm (50W)
- Linear Gain: 16.0dB
- Typical DE @ P_{SAT}: 57.2%
- Operating Voltage: 28V
- Impedance Matched Z_{IN}/Z_{OUT}=50ohm
- Hermetically Sealed Package
- Package Type: 630F-B

[1] Measured in Raytron DEMO_A

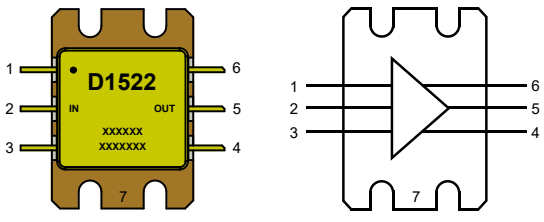
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.7GHz	2.9GHz	3.1GHz	3.3GHz	3.5GHz	Units
Linear Gain	16.1	17.4	17.3	16.7	16.7	dB
Drain Efficiency	57.2	73.4	72.0	62.3	57.6	%
Output Power	47.4	47.3	47.0	47.4	47.5	dBm
Output Power	55	54	50	55	56	W

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 180mA, V_{GS} = -2.98V
- Test Condition: CW

5. Block Diagram



1. **NC**
2. **RF_{IN}**
3. **Gate**
4. **Drain**
5. **RF_{OUT}**
6. **NC**
7. **Source**

D1522-PDS-F02

Figure 2. D1522 Block Diagram

Table of Contents

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6. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	84	V
Gate-Source Voltage	V_{GS}	-10 ~ +1	V
Operating Voltage	V_{DS}	10 ~ +32	V
Maximum Forward Gate Current	I_{GMax}	9.12	mA
Storage Temperature Range	T_{STG}	-65 ~ +150	°C
Operating Junction Temperature	T_J	250	°C

7. Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Operating Voltage, V_{DS}	-	28	-	V
Drain Bias Current, I_{DS}	-	180	-	mA
Gate-Source Voltage, V_{GS}	-	-2.98	-	V
Channel Temperature, T_{CH}	-	-	225	°C

Table 4. Thermal Resistance

Parameter	Symbol	Value	Unit
Thermal Resistance (Active Die Surface-to-Case)[1]	R_{thsc} (IR)	2.00	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	2.56	°C/W

[1] Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 45.0W

[2] Thermal Resistance at average power by Finite Element Analysis, Junction-to-Case, $T_{base\text{-}plate}$ = 85℃, $T_{junction}$ = 200℃

8. Electrical Characteristics (T_C = 25˚C)

Table 5. DC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage[1] (V_{GS} = -10V, I_{DS} = 9.12mA)	$V_{DS(BR)}$	84	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	10.49	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 9.12mA)	$V_{GS(TH)}$	-3.3	-2.8	-2.3	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 180mA)	$V_{GS(Q)}$	-	-2.98	-	V

[1] Measured on wafer prior to packaging

[2] Measured with packaged device

[3] Measured in Raytron DEMO

Table 6. RF Characteristics[1,2]

Freq.	Linear Gain (G_{LIN})	Drain Efficiency (η_D)	Out Power (P_{SAT})
2.7GHz	16.1dB	57.2%	47.4dBm (55W)
3.1GHz	17.3dB	72.0%	47.0dBm (50W)
3.5GHz	16.7dB	57.6%	47.5dBm (56W)

1. Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 180mA, V_{GS} = -2.98V
2. Test Condition: CW

9. Typical Performance

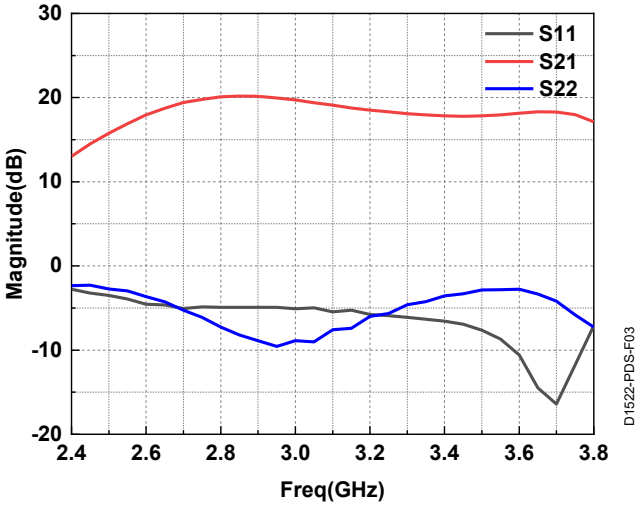


Figure 3. 2.7-3.5GHz S_{11}, S_{21} and S_{22} vs. Freq.

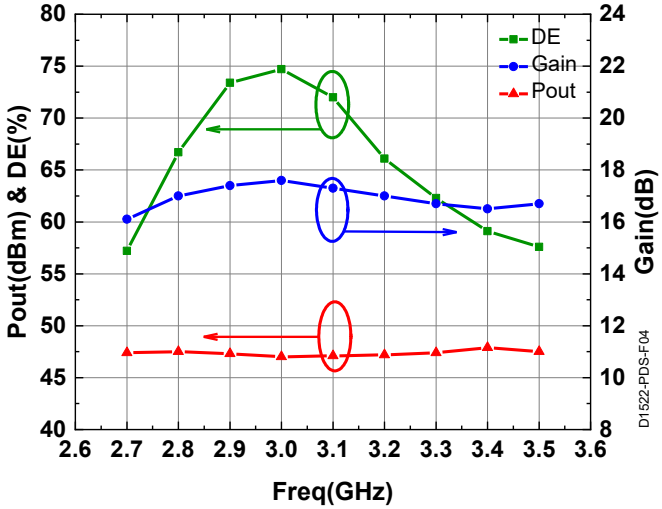


Figure 4. 2.7-3.5GHz Gain, DE, and Pout vs. Freq.

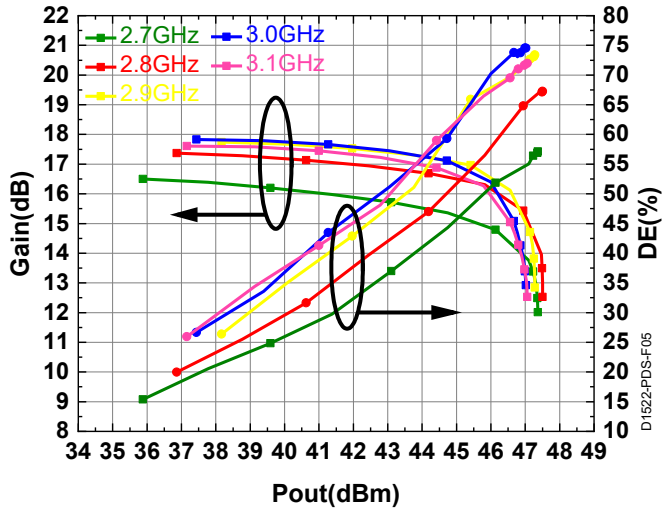


Figure 5. 2.7-3.1GHz Gain and DE vs. P_{OUT}

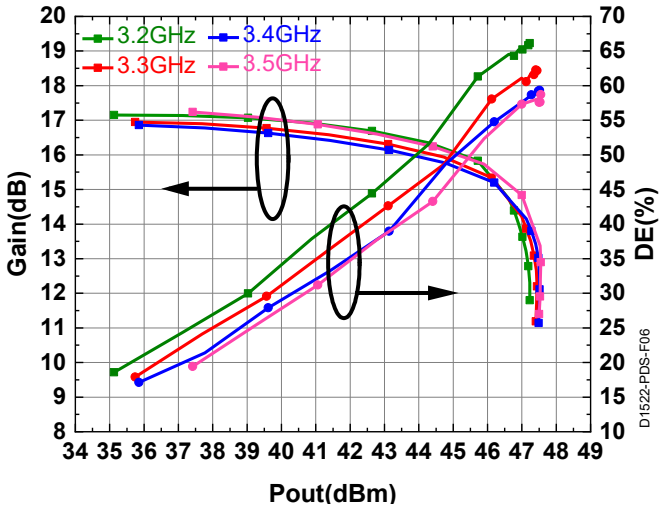


Figure 6. 3.2-3.5GHz Gain and DE vs. P_{OUT}

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 180mA, V_{GS} = -2.98V
- Test Condition: CW

Table 7. RF Characteristics @ DEMO_A[1,2,3], 2.7-3.5GHz, CW, 28V

Freq.	Linear Gain (G_{LIN})	Drain Efficiency (η_D)	Out Power (P_{SAT})
2.7GHz	16.1dB	57.2%	47.4dBm (55W)
2.8GHz	17.0dB	66.7%	47.5dBm (56W)
2.9GHz	17.4dB	73.4%	47.3dBm (54W)
3.0GHz	17.6dB	74.7%	47.0dBm (50W)
3.1GHz	17.3dB	72.0%	47.1dBm (51W)
3.2GHz	17.0dB	66.1%	47.2dBm (52W)
3.3GHz	16.7dB	62.3%	47.4dBm (55W)
3.4GHz	16.5dB	59.1%	47.9dBm (62W)
3.5GHz	16.7dB	57.6%	47.5dBm (56W)

1. Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 180mA, V_{GS} = -2.98V
2. Test Condition: CW
3. The output power reaches 47.0dBm (50W) at 2.7-3.5GHz when V_{DS}=28V.

10. Package Outline

■ Pin Layout

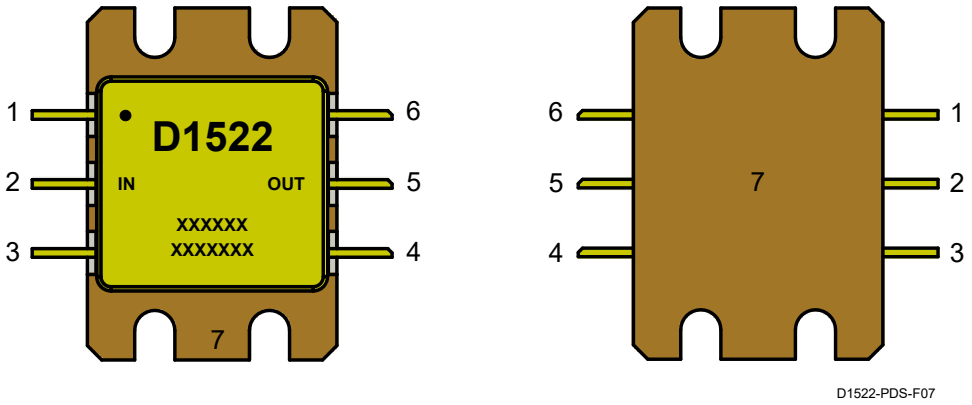


Figure 7. D1522 Pin Layout

Table 8. Pin Description

Pin	Symbol	Description
1	NC	Not Connected
2	RF_{IN}	RF Input
3	V_G	Gate Voltage
4	V_D	Drain Voltage
5	RF_{OUT}	RF Output
6	NC	Not Connected
7	Flange	Source to be Connected to Ground

■ Mechanical Drawing (Package Type: 630F-B)

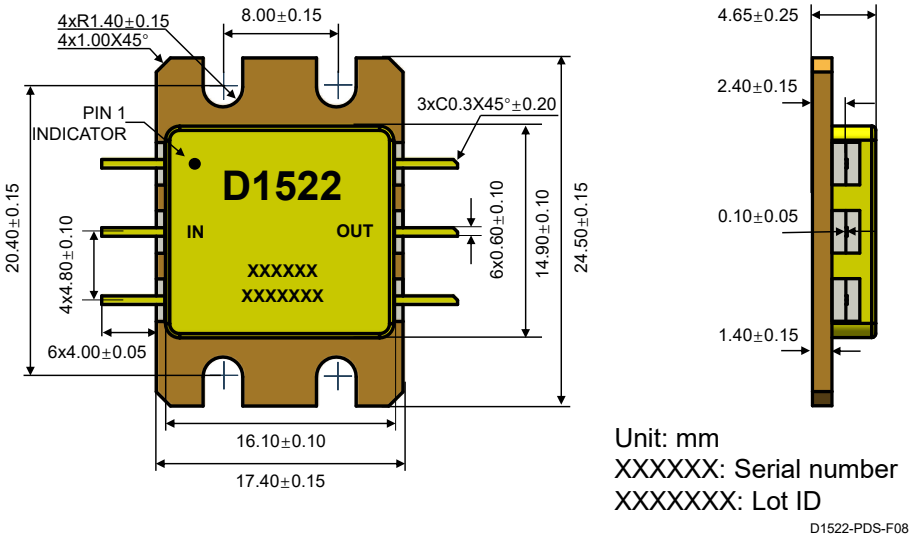


Figure 8. D1522 Mechanical Drawing

11. Application Circuit

■ Schematic

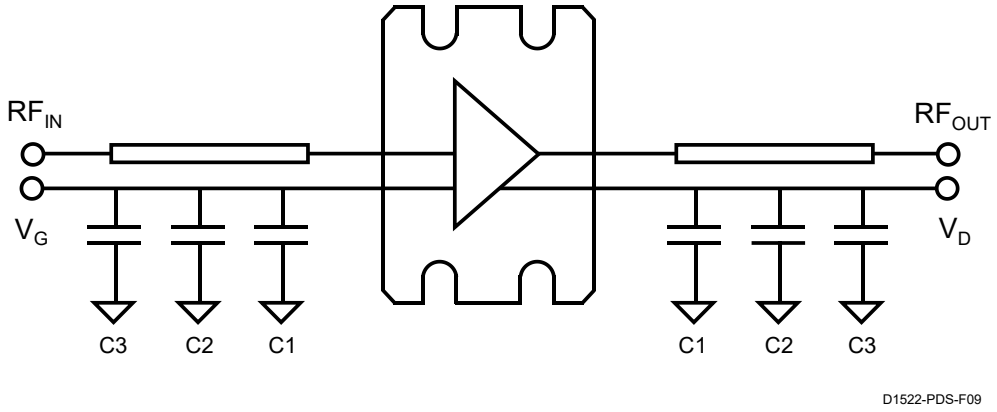


Figure 9. D1522 DEMO_A Application Circuit Schematic

Table 9. Bias Procedure

Bias-up Procedure	Bias-down Procedure
1) Set V_{GS} to the pinch-off voltage, typically -6V	1) Turn off RF signal
2) Turn on V_{DS} to nominal supply voltage (28V)	2) Turn off V_{DS}
3) Slowly adjust V_{GS} until I_{DS} current is attained	3) Wait two seconds to allow drain capacitor to discharge
4) Apply RF input power to desired level	4) Turn off V_{GS}

■ Layout

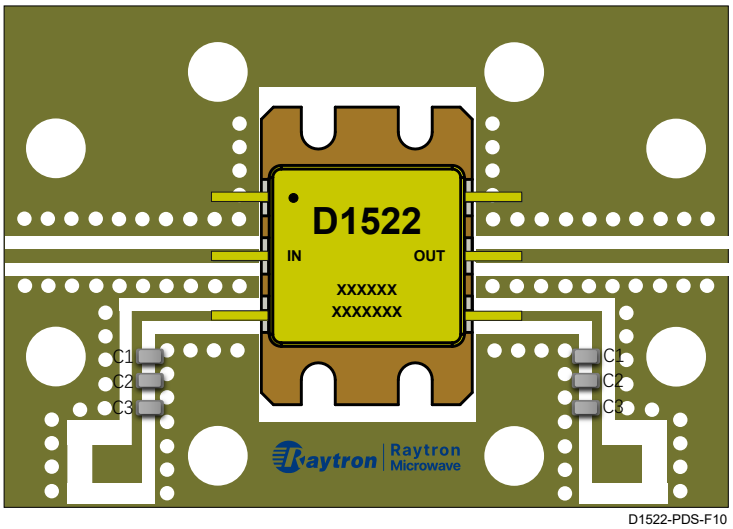


Figure 10. D1522 Application Circuit Layout
（DEMO_A Size: 5.8cm x 4.0cm）

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	100.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C2	10.0nF	X7R 100V 0603 Capacitor	Murata	GCM188R72A103KA37D
C3	1.0uF	X7R 100V 1210 Capacitor	Murata	GRM32ER72A105KA01L

12. DEMO Summary

Table 11. DEMO Summary

NO.	D1522 DEMO Name	V_{DS} (V)	Freq. (GHz)	Linear Gain (dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency (%)	Pulse or CW
1	DEMO_A, 50W	28	2.7-3.5	16.1	47	50	57.2	CW

13. Recommended Solder Temperature Profile

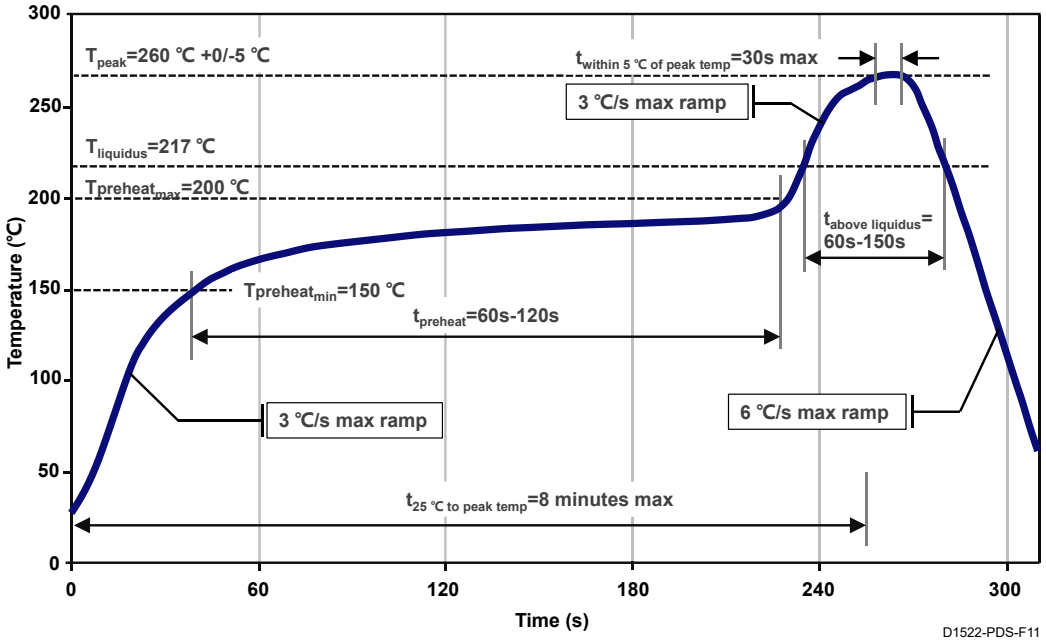


Figure 11. Recommended Solder Temperature Profile

14. Handling Precautions

- **ESD Caution**

  ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore proper ESD precautions should be taken to avoid performance degradation or loss of functionality.



15. Contact Information

For the latest specifications, additional product information, technical support and sales support, please contact:

- **Email:** RF.support@raytrontek.com
- **Web:** www.raytrontek.com

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