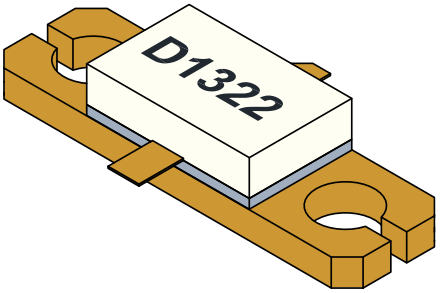
1. Description

- The D1322 is a 120W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The device operates from 2 to 3GHz with a 28V supply rail. The device is offered in an industry standard air cavity package.



D1322-PDS-F01

Figure 1. D1322 Package Outline

2. Applications

- Anti-Drone System
- Communication Shielding

3. Features[1]

- Operating Frequencies: 2-3GHz
- Output Power (P_{SAT}): 51.6dBm (145W)
- Linear Gain: 18.9dB
- Typical DE @P_{SAT}: 64.0%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 360F-A

[1] Measured in Raytron DEMO @2.6GHz

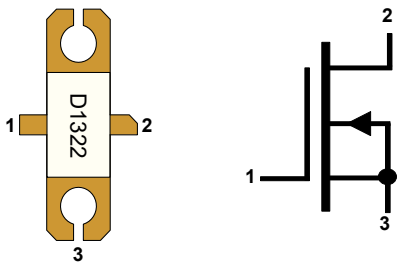
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.6GHz	Units
Linear Gain	18.9	dB
Drain Efficiency	64.0	%
Output Power	51.6	dBm
Output Power	145	W

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} =28V, I_{DS}=350mA, V_{GS} = -2.8V
- Test condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



1. Gate
2. Drain
3. Source

D1322-PDS-F02

Figure 2. D1322 Block Diagram

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6. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	120	V
Gate-Source Voltage	V_{GS}	-10 ~ +1	V
Operating Voltage	V_{DS}	0 ~ +40	V
Maximum Forward Gate Current	I_{GMax}	24.80	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
Drain-Source Voltage Range, V_{DS}	-	28	40	V
Drain Bias Current, I_{DS}	-	350	-	mA
Gate-Source Voltage, V_{GS}	-	-2.80	-	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)	1.04	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	1.35	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 76.0W

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} = 24.80mA)	$V_{DS(BR)}$	120	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	27.40	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 24.80mA)	$V_{GS(th)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 300mA)	$V_{GS(Q)}$	-	-2.80	-	V

1. Measured on wafer prior to packaging

2. Measured with packaged device

3. Typical Class AB performance in Raytron DEMO

Table 6. RF Characteristics @ DEMO [1,2]

Parameter	2.6GHz	Units
Linear Gain	18.9	dB
Drain Efficiency	64.0	%
Output Power	51.6	dBm
Output Power	145	W

1. Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 350mA, V_{GS} = -2.8V
2. Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	48.17	-	pF
Output Capacitance	C_{DS}	-	8.55	-	pF
Feedback Capacitance	C_{GD}	-	1.40	-	pF

- Test Condition: V_{DS} = 28V, V_{GS} = -8V, f = 1MHz

9. Typical Performance

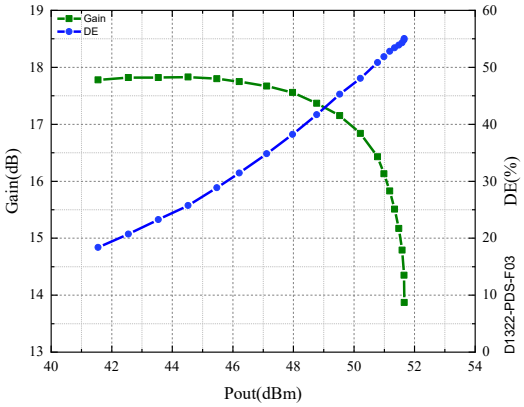


Figure 3. 2.6GHz Gain and DE@MXP vs. Output Power

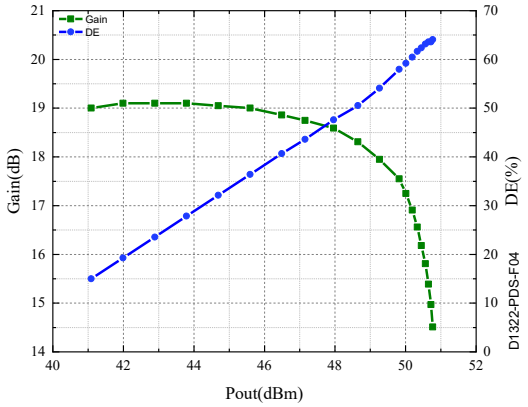


Figure 4. 2.6GHz Gain and DE@MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 350mA V_{GS} = -2.8V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

10. Wide-band Application Performance

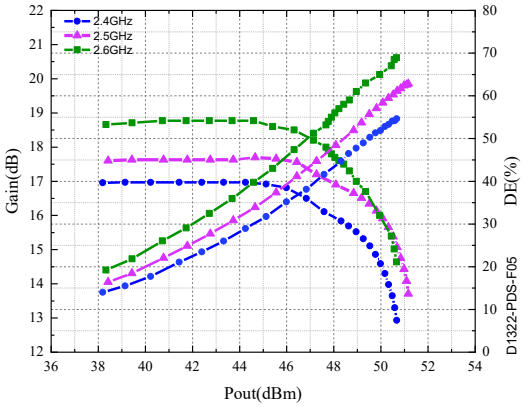


Figure 5. Gain and DE vs. Output Power

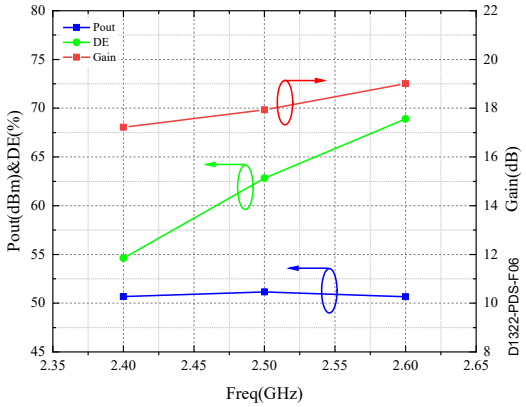


Figure 6. Gain and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_A (2.4-2.6GHz) with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 350mA, V_{GS} = -2.8V
- Test Condition: CW
- The output power reaches 50.7dBm (117W) at 2.4-2.6GHz.

Table 8. RF Characteristics @ DEMO_A [1,2]

Parameter	2.4GHz	2.5GHz	2.6GHz	Units
Linear Gain	17.2	17.9	19.0	dB
Drain Efficiency	54.6	62.8	68.9	%
Output Power	50.7	51.1	50.7	dBm
Output Power	117	129	117	W

1. Typical Class AB performance in Raytron DEMO_A (2.4-2.6GHz) with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 350mA, V_{GS} = -2.8V
2. Test condition: CW

11. Package Outline

■ Pin Layout

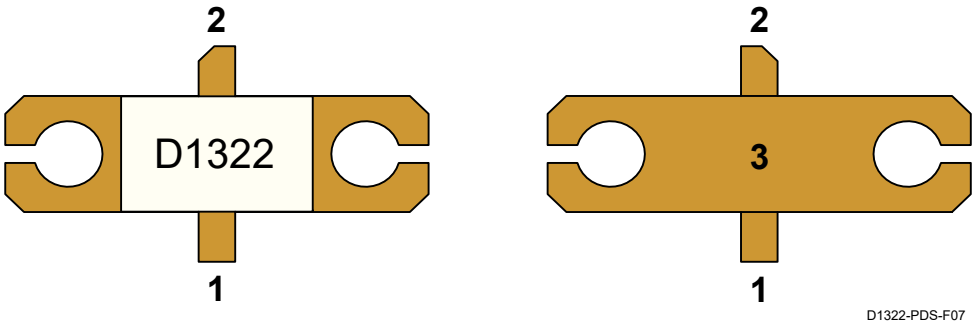


Figure 7. D1322 Pin Layout

Table 9. Pin Description

Pin	Symbol	Description
1	V_G / RF IN	Gate voltage / RF Input
2	V_D / RF OUT	Drain voltage / RF Output
3	Flange	Source to be Connected to Ground

■ Mechanical Drawing (Package Type: 360F-A)

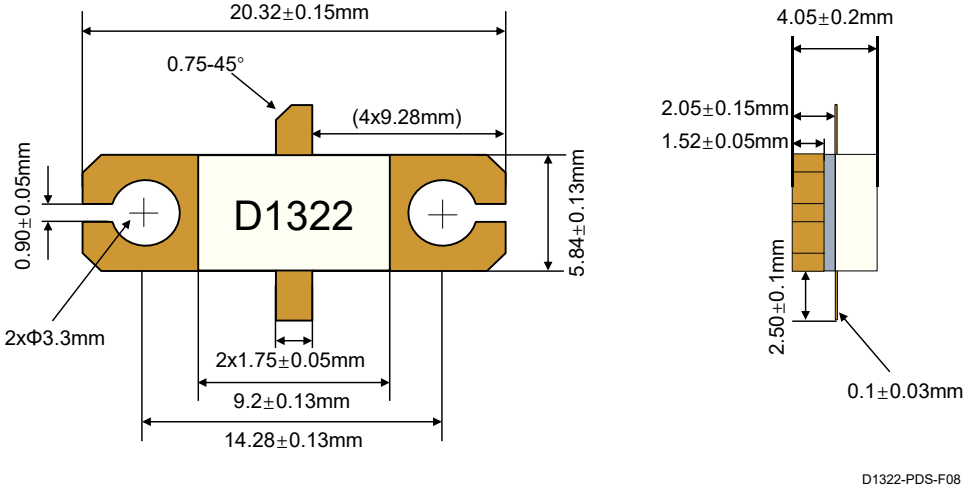


Figure 8. D1322 Mechanical Drawing

12. Application Circuit

■ Schematic

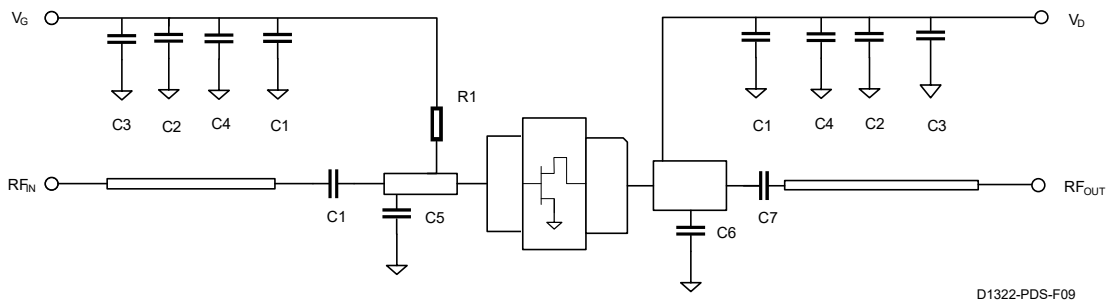


Figure 9. D1322 DEMO_A Application Circuit Schematic (2.4-2.6GHz)

Table 10. 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

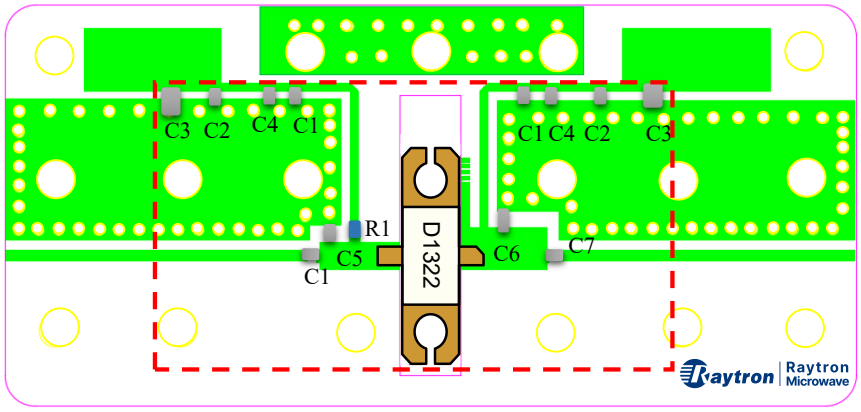


Figure 10. D1322 Application Circuit Layout (2.4-2.6GHz)
(DEMO_A Size: 5.1cm x 2.9cm)

Table 11. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	9pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E9R0CB12D
C2	1000pF	C0G 250V 0603 Capacitor	Murata	GCM1885C2A102JA16D
C3	1.0uF	X7R 100V 1210 Capacitor	Murata	GRM32ER72A105KA01K
C4	100.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12D
C5	1.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R5BB12D
C6	0.9pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER90WB12D
C7	1.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R5BB12D
R1	10Ω	1/8W 0805 Resistor	Yageo	AT0805BRD0710RL

13. DEMO Summary

Table 12. DEMO Summary

NO.	D1322 DEMO Name	V_{DS} (V)	Freq. (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 110W	28	2.4-2.6	17.2	50.7	117	55%	CW
2	DEMO_B, 90W	28	2-2.5	16.3	49.6	91	50%	CW

14. Recommended Solder Temperature Profile

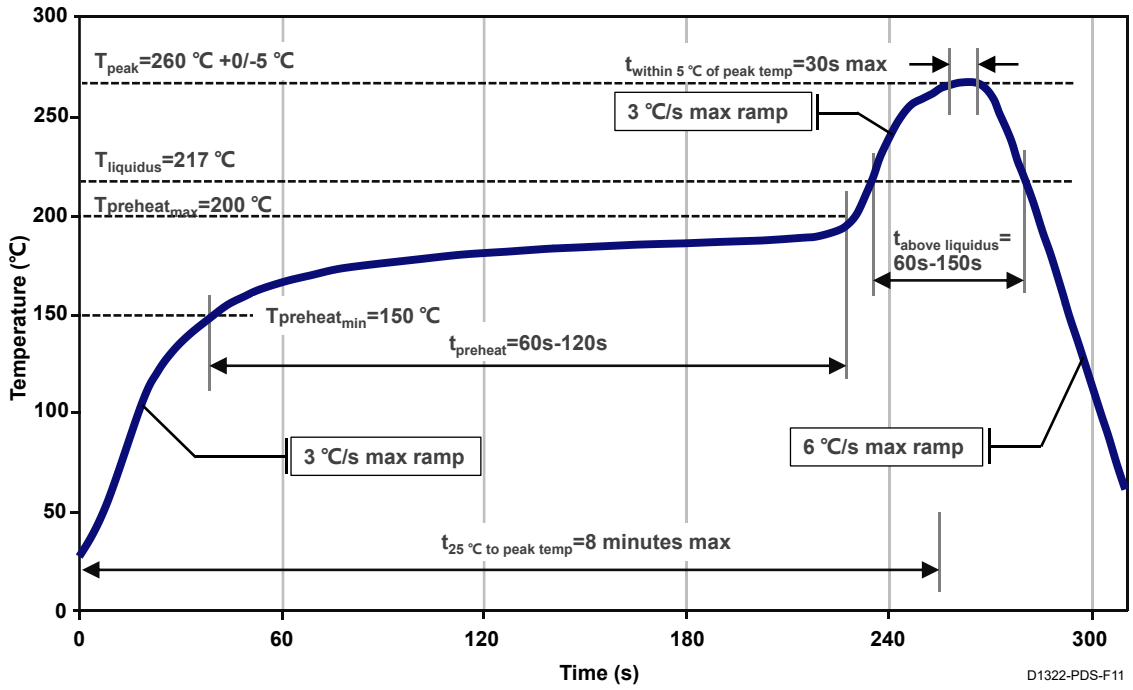


Figure 11. Recommended Solder Temperature Profile

15. 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.



16. 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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