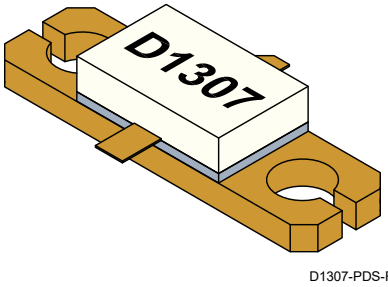
1. Description

- The D1307 is a 30W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1307 operates from 8 to 10GHz with a 28V supply rail. The device is offered in an industry standard air cavity package.



D1307-PDS-F01

Figure 1. D1307 Package Outline

2. Applications

- Weather Radar
- Marine Radar
- Broadband Amplifier
- Test Instrumentation

3. Features[1]

- Operating Frequency: 8–10GHz
- Output Power[1] (P_{SAT}): 45.4dBm (36W)
- Linear Gain[1]: 11.9dB
- Typical DE @ P_{SAT} [1]:48.0%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 360F-A

[1] Measured in Raytron DEMO @9.4GHz

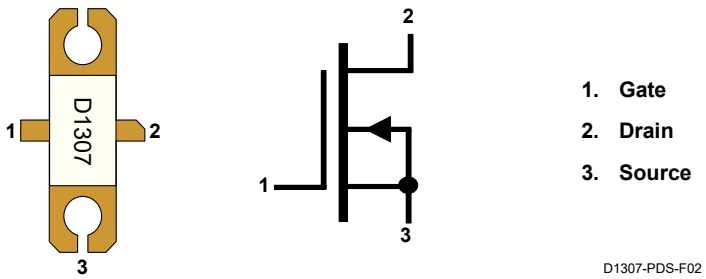
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	9.3GHz	9.4GHz	9.5GHz	Units
Linear Gain	11.6	11.9	11.4	dB
Drain Efficiency	51.7	48.0	47.8	%
Output Power	45.4	45.4	45.3	dBm
Output Power	34	34	34	W

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.60V
- Test Condition: CW

5. Block Diagram



D1307-PDS-F02

Figure 2. D1307 Block Diagram

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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}	6.72	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	32	V
Drain Bias Current, I_{DS}	-	200	-	mA
Gate-Source Voltage, V_{GS}	-	-2.60	-	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)	3.30	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	4.38	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 23.0W
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} = 6.72mA)	$V_{DS(BR)}$	84	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	7.73	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 6.72mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 200mA)	$V_{GS(Q)}$	-	-2.60	-	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 (CW)

Parameter	9.3GHz	9.4GHz	9.5GHz	Units
Linear Gain	11.6	11.9	11.4	dB
Power Gain	7.4	7.0	6.6	dB
Drain Efficiency	51.7	48.0	47.8	%
Output Power	45.4	45.4	45.3	dBm
Output Power	34	34	34	W

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.60V
- Test Condition: CW

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	9.96	-	pF
Output Capacitance	C_{DS}	-	5.72	-	pF
Feedback Capacitance	C_{GD}	-	0.53	-	pF

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

9. Wide-band Application Performance

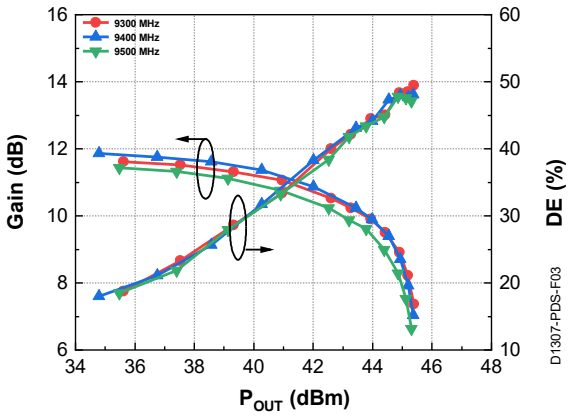


Figure 3. CW Gain and DE vs. Output Power

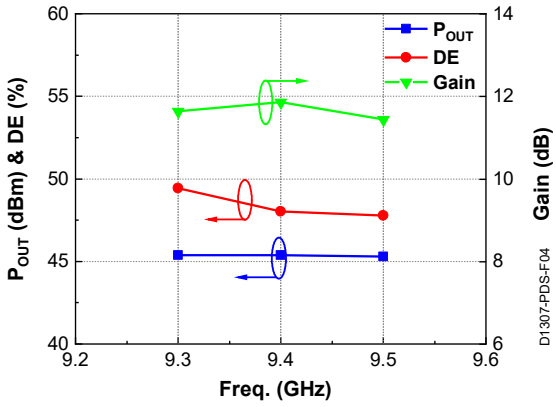


Figure 4. CW Gain and DE vs. Freq.

- Typical Class AB performance in Raytron DEMO_A Wide-band Application with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.60V
- Test Condition: CW
- The output power is 45.3dBm (34W) at 9.3-9.5GHz.

10. Package Outline

■ Pin Layout

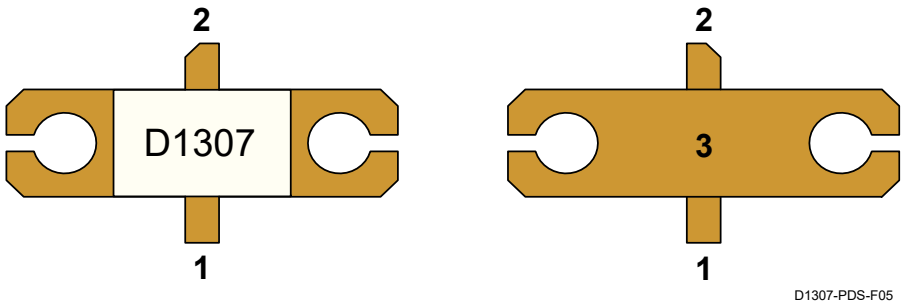


Figure 5. D1307 Pin Layout

Table 8. 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)

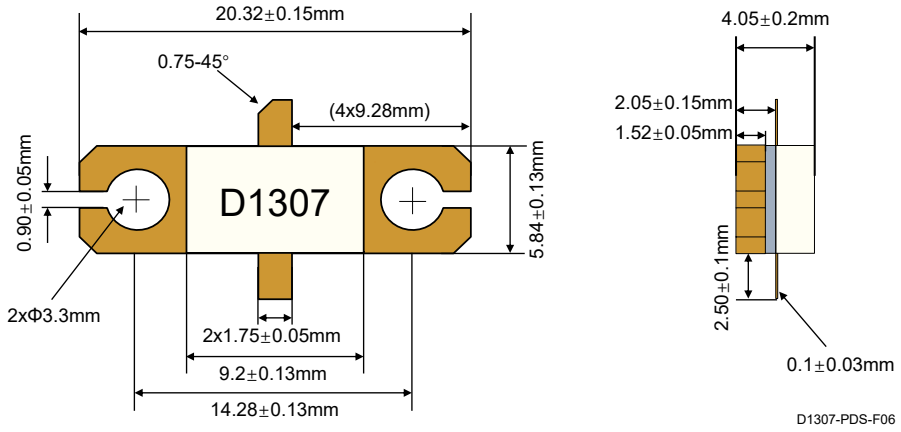


Figure 6. D1307 Mechanical Drawing

11. Application Circuit

■ Schematic

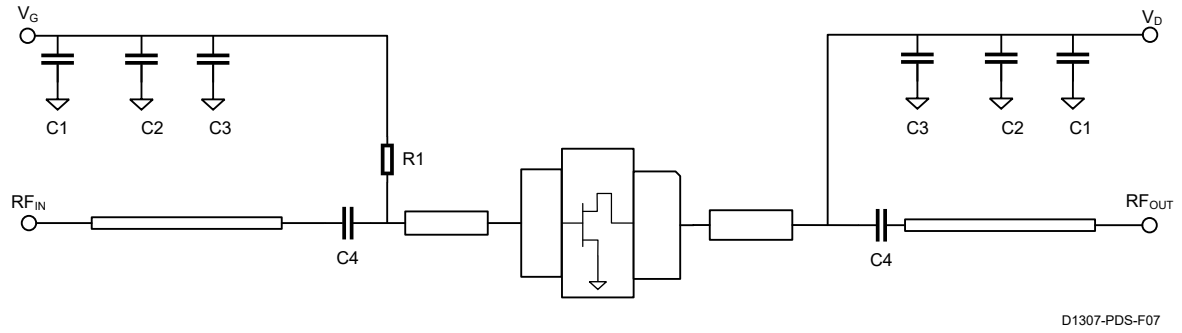


Figure 7. D1307 DEMO_A Application Circuit Schematic

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

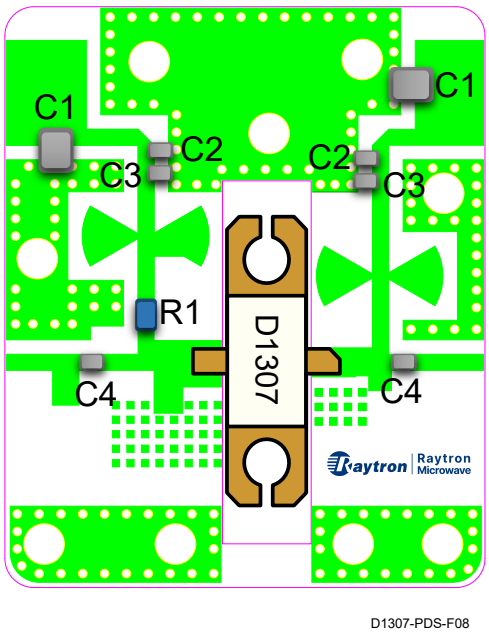


Figure 8. D1307 Application Circuit Layout
(DEMO_A Size: 3.3cm x 4.0cm)

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	4.7uF	X7S 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C2	1000pF	C0G 250V 0603 Capacitor	Murata	GCM1885C2A102JA16D
C3	100pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C4	1pF	C0G 250V 0603 Capacitor	Murata	GQM2195C2E1R0BB12
R1	10.0Ω	1/10W 0603 Resistor	Yageo	RC0603FR-0710RL

12. DEMO Summary

Table 10. DEMO Summary

NO.	D1307 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 30W	28	9.3-9.5	11.4	45.3	34	47.8%	CW
2	DEMO_B, 25W	28	8.3-8.5	10.2	44.0	25	42.5%	CW

13. Recommended Solder Temperature Profile

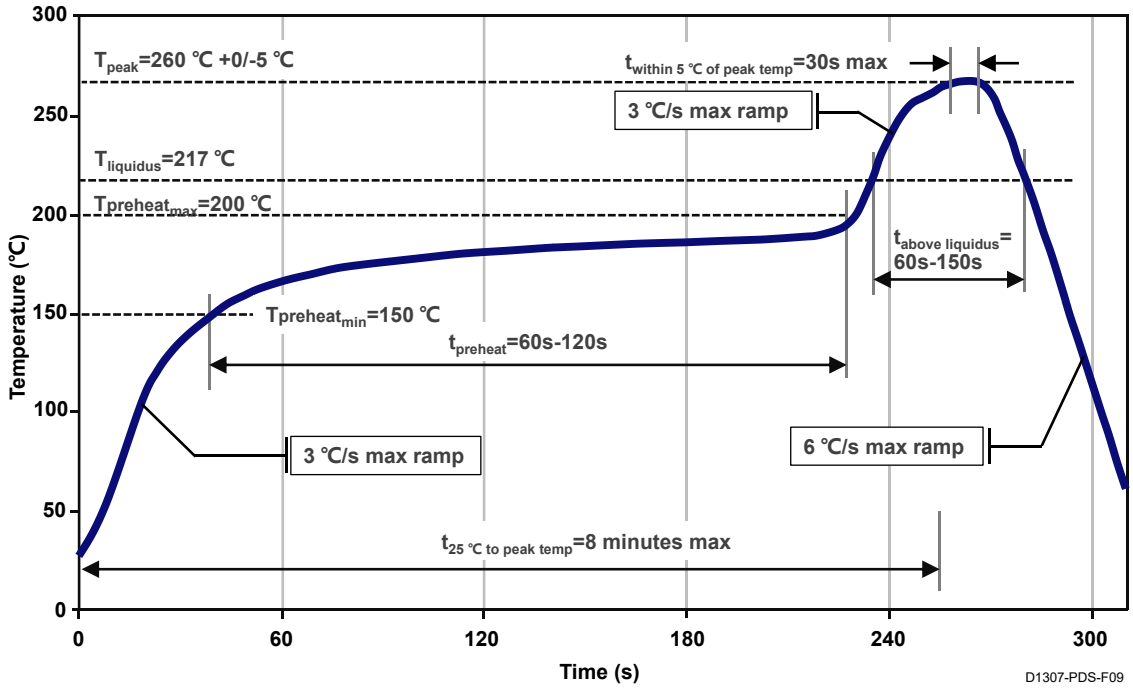


Figure 9. Recommended Solder Temperature Profile

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

16. Disclaimer

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