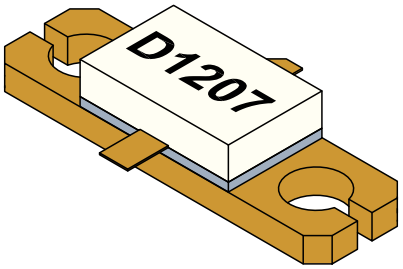
1. Description

- The D1207 is a 120W (P_{SAT}) wideband unmatched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1207 operates from DC to 6GHz with a 28V supply rail. The device is offered in an industry standard air cavity package.



D1207-PDS1-F01

Figure 1. D1207 Package Outline

2. Applications

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

3. Features[1]

- Operating Frequency: DC-6GHz
- Output Power (P_{SAT}): 51.7dBm (148W)
- Linear Gain: 12.3dB
- Typical DE @ P_{SAT}: 74.0%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 360F-A

[1] Measured in Raytron DEMO @2.6GHz

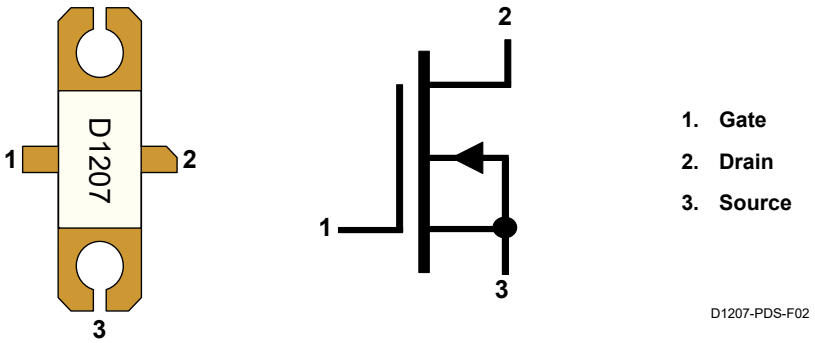
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.6GHz	Units
Linear Gain	12.3	dB
Drain Efficiency	74.0	%
Output Power	51.7	dBm

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 300mA, V_{GS} = -2.63V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



D1207-PDS-F02

Figure 2. D1207 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}	10 ~ +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}	-	300	-	mA
Gate-Source Voltage, V_{GS}	-	-2.63	-	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)	$V_{GS(TH)}$	-3.3	-2.8	-2.3	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 300mA)	$V_{GS(Q)}$	-	-2.63	-	V

[1] Measured on wafer prior to packaging

[2] Measured with packaged device

[3] Measured in Raytron DEMO

Table 6. RF Characteristics

Test Method	Parameter	Symbol	Min.	Typ.	Max.	Units
DEMO @2.6GHz	Linear Gain	G_{LIN}	-	12.3	-	dB
	Drain Efficiency	η_D	-	74.0	-	%
	Output Power	P_{SAT}	-	51.7	-	dBm

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 300mA, V_{GS} = -2.63V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	20.17	-	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

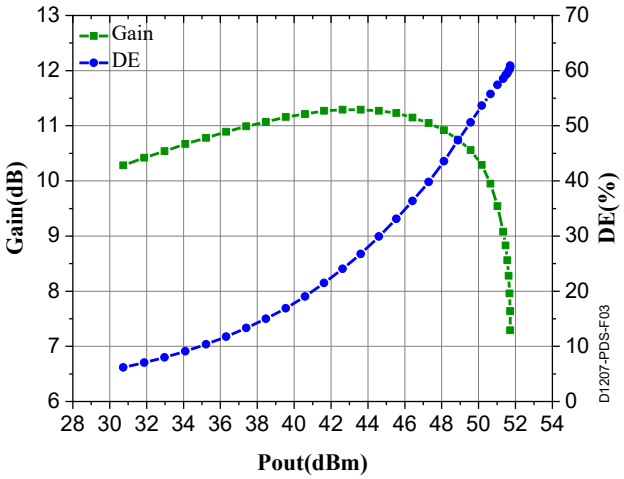


Figure 3. 2.6GHz Gain and DE @MXP vs. Output Power

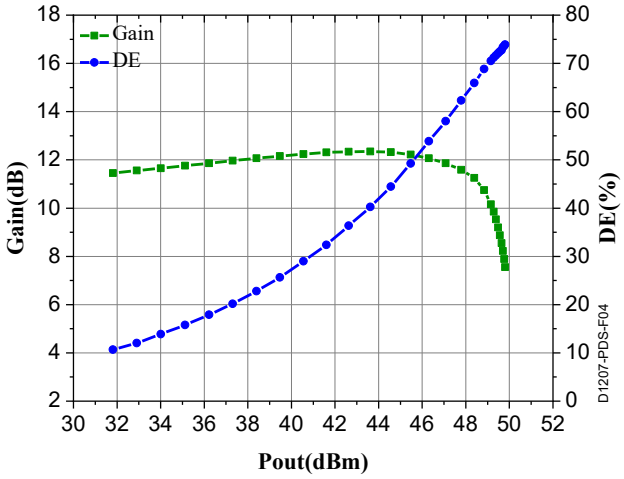


Figure 4. 2.6GHz Gain and DE @MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 300mA, V_{GS} = -2.63V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

10. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_B: 1.2-1.8GHz)

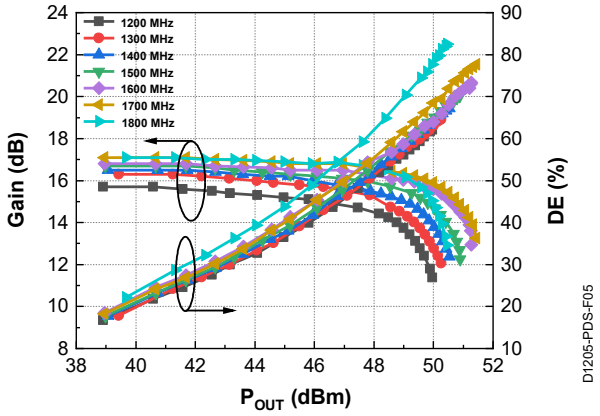


Figure 5. Wide-band Application Gain and DE vs. Output Power

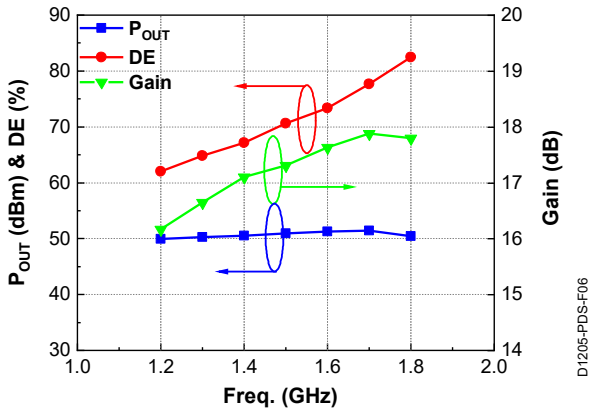


Figure 6. Wide-band Application Gain and DE vs. Freq.

Table 8. Wide-band RF Characteristics of DEMO_B

Parameter	1.2GHz	1.3GHz	1.4GHz	1.5GHz	1.6GHz	1.7GHz	1.8GHz	Units
Linear Gain	15.7	16.3	16.5	16.7	16.8	17.1	17.1	dB
Drain Efficiency	62.0	64.9	67.1	70.6	73.4	77.6	82.5	%
Output Power	50.0	50.3	50.5	50.9	51.2	51.4	50.4	dBm
Output Power	100	107	112	123	132	138	110	W

- Typical Class AB performance in Raytron Wide-band Application DEMO_B with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 300mA, V_{GS} = -2.7V
- Test Condition: Input CW
- The output power is 50.0dBm (100W) at 1.2-1.8GHz when V_{DS} = 28V. It can be used in the avionics and L band radar application.

11. Package Outline

■ Pin Layout

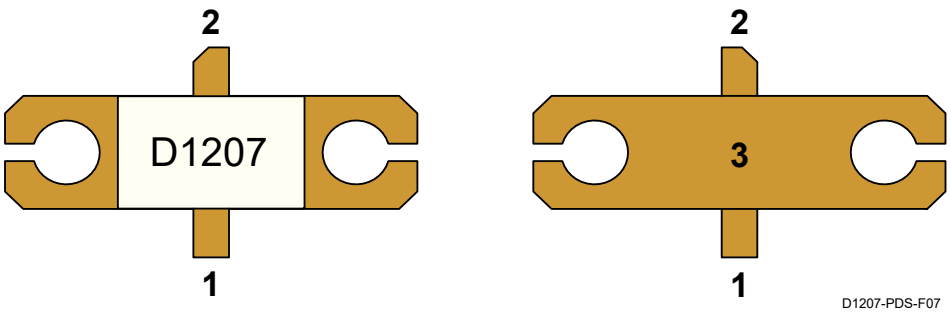


Figure 7. D1207 Pin Layout

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)

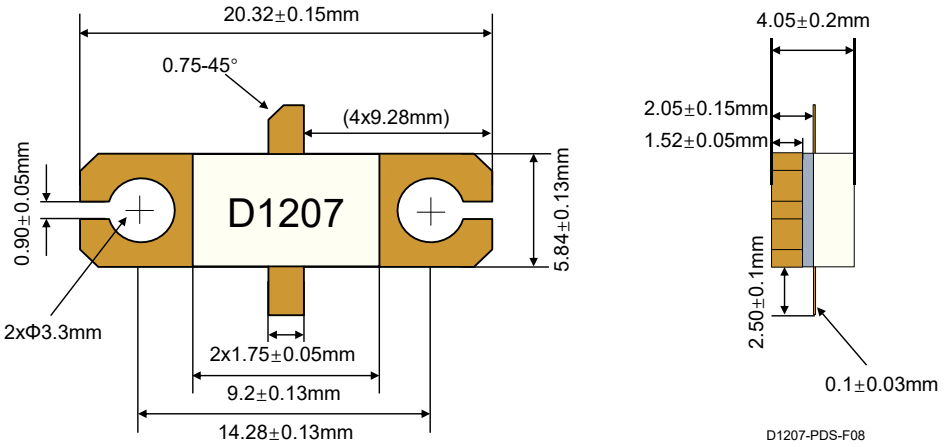


Figure 8. D1207 Mechanical Drawing

12. Application Circuit

■ Schematic

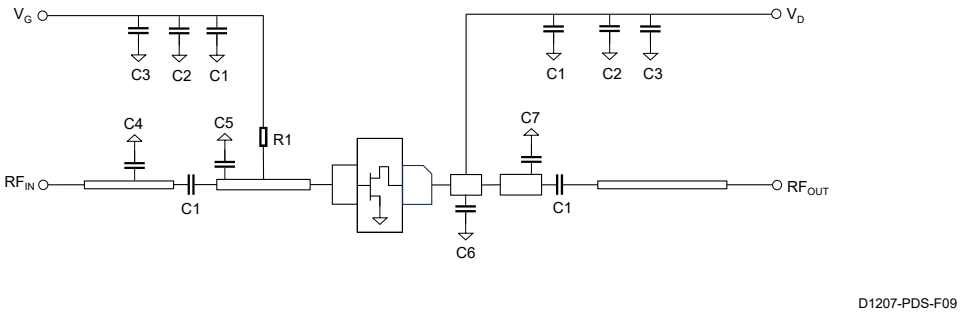
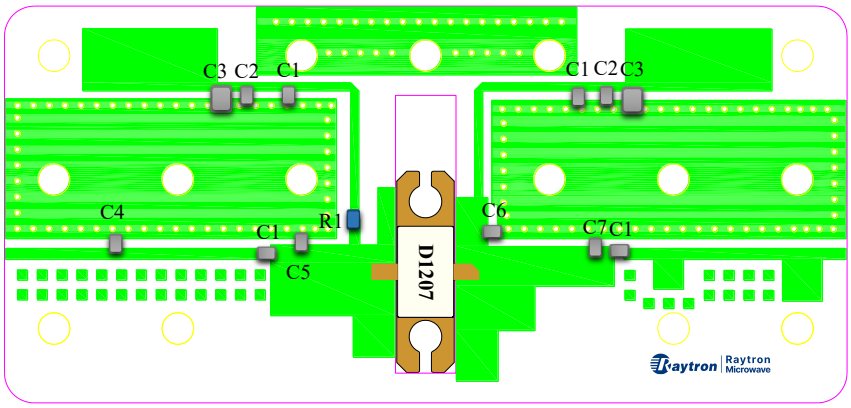


Figure 9. D1207 DEMO_B Application Circuit Schematic

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



D1207-PDS-F10

Figure 10. D1207 Application Circuit Layout
(DEMO_B Size: 7.1cm x 3.0cm)

Table 11. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	20pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E200GB12
C2	1000pF	C0G 250V 0805 Capacitor	Murata	GCM1885C2A102JA16D
C3	1.0uF	X7R 100V 1210 Capacitor	Murata	GRM32ER72A105KA01
C4	1.2pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R2BB12
C5	2.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R5BB12
C6	2.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R5BB12
C7	0.2pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER20WB12
R1	10Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL

13. DEMO Summary

Table 12. DEMO Summary

NO.	D1207 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 95W	28	2.2-2.5	12.8	49.8	96	52%	CW
2	DEMO_B, 100W	28	1.2-1.8	15.7	50.0	100	62%	CW
3	DEMO_C, 80W	28	2-2.7	12.6	48.9	78	49%	CW

14. Recommended Solder Temperature Profile

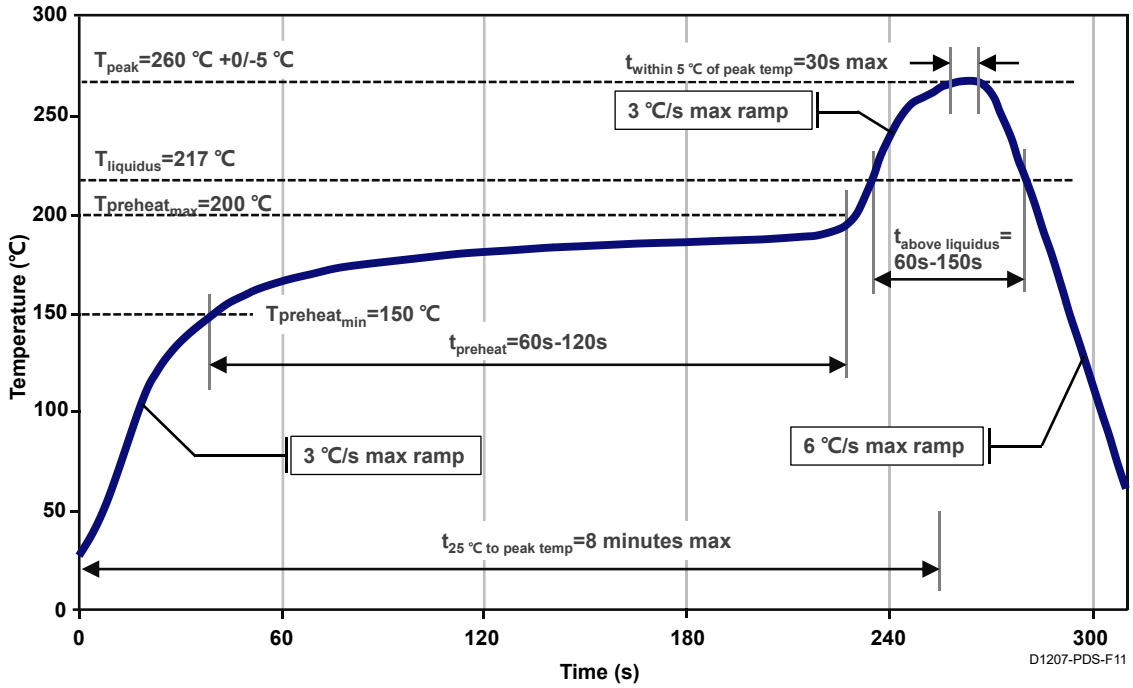


Figure 11. Recommended Solder Temperature Profile

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

17. Disclaimer

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