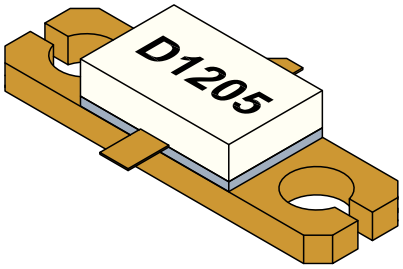
1. Description

- The D1205 is an 80W (P_{SAT}) wideband unmatched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1205 operates from DC to 6GHz with a 28V supply rail. The device is offered in an industry standard air cavity package.



D1205-PDS-F01

Figure 1. D1205 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}): 49.5dBm (89W)
- Linear Gain: 13.8dB
- Typical DE @ P_{SAT}: 71.0%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 360F-A

[1] Measured in Raytron DEMO @2.6GHz

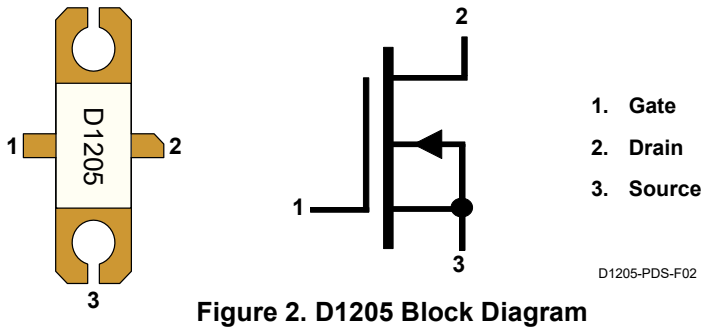
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.6GHz	Units
Linear Gain	13.8	dB
Drain Efficiency	71.0	%
Output Power	49.5	dBm

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.75V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



D1205-PDS-F02

Figure 2. D1205 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}	14.9	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}	-	200	-	mA
Gate-Source Voltage, V_{GS}	-	-2.75	-	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)	1.48	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	1.89	°C/W

[1] Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 50.0W

[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} = 14.9mA)	$V_{DS(BR)}$	120	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	16.44	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 14.9mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 200mA)	$V_{GS(Q)}$	-	-2.75	-	V

[1] Measured on wafer prior to packaging

[2] Measured with packaged device

[3] Measured in Raytron DEMO

Table 6. RF Characteristics

Parameter	2.6GHz	Units
Linear Gain	13.8	dB
Drain Efficiency	71.0	%
Output Power	49.5	dBm

- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%
- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.75V

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	11.65	-	pF
Output Capacitance	C_{DS}	-	5.26	-	pF
Feedback Capacitance	C_{GD}	-	0.8	-	pF

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

9. Typical Performance

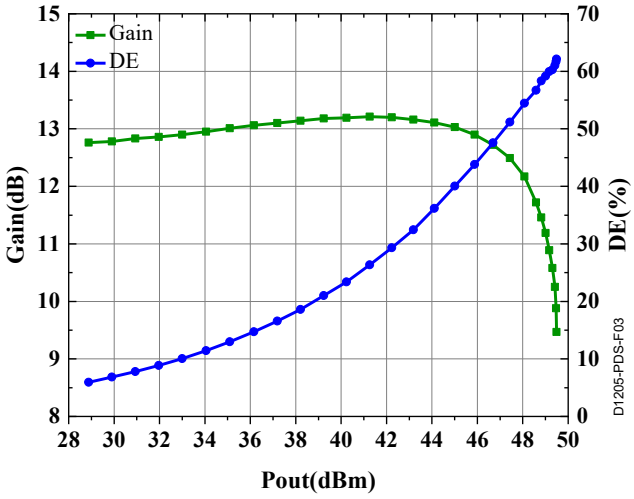


Figure 3. 2.6GHz Gain and DE @MXP vs. Output Power

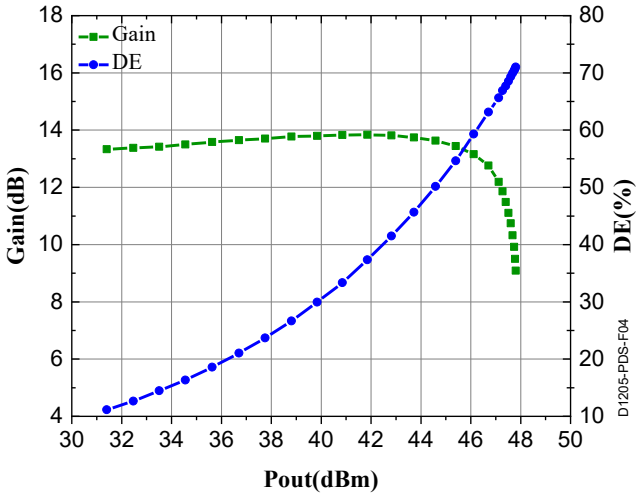


Figure 4. 2.6GHz Gain and DE @MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.75V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

10. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_D: 0.75-1.52GHz)

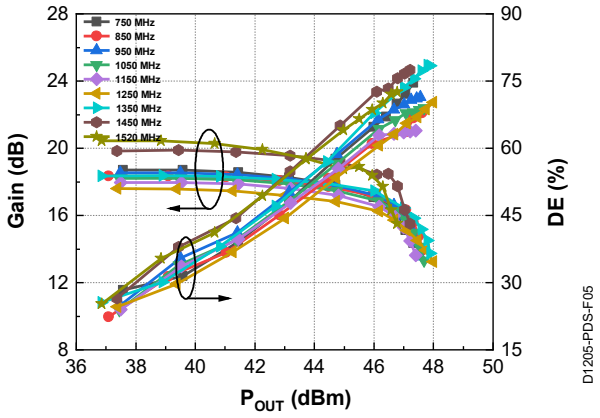


Figure 5. Wide-band Application Gain and DE vs. Output Power

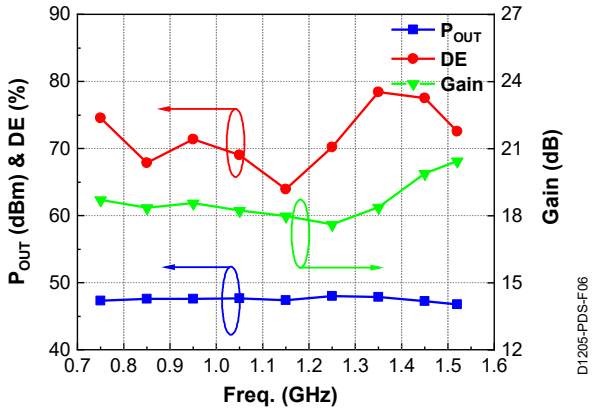


Figure 6. Wide-band Application Gain and DE vs. Freq.

Table 8. Wide-band RF Characteristics of DEMO_D

Freq. (GHz)	Linear Gain (dB)	Drain Efficiency (%)	Output Power (dBm)	Output Power (W)
0.75	18.7	74.5	47.3	54
0.85	18.4	67.8	47.6	58
0.95	18.6	71.4	47.6	58
1.05	18.2	69.0	47.7	59
1.15	18.0	64.0	47.4	55
1.25	17.6	70.2	48.0	63
1.35	18.4	78.4	47.9	62
1.45	19.9	77.5	47.2	52
1.52	20.5	72.5	46.8	48

- Typical Class AB performance in Raytron Wide-band Application DEMO_D with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.6V
- Test condition: Input CW
- The output power is 46.8dBm(48W) at 0.75-1.52GHz.

11. Package Outline

■ Pin Layout

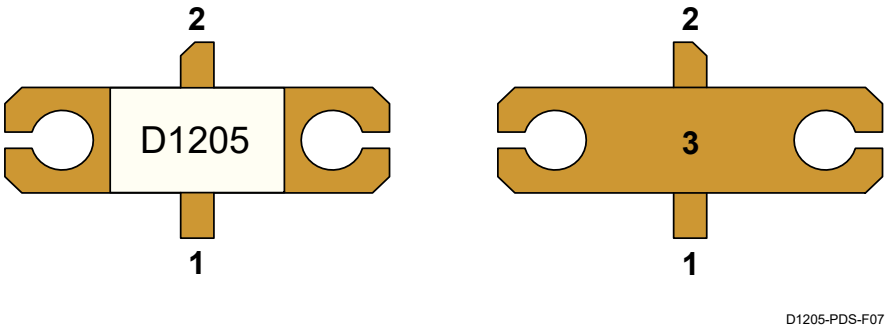


Figure 7. D1205 Pin Layout

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

D1205-PDS-F07

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

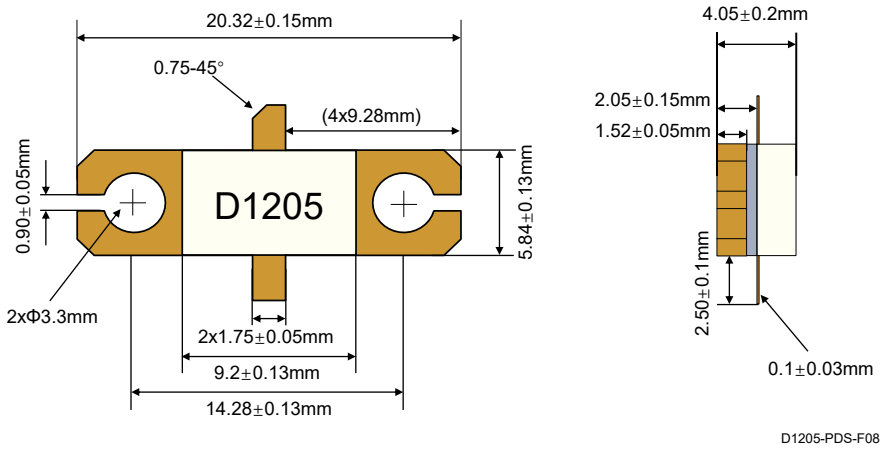


Figure 8. D1205 Mechanical Drawing

12. Application Circuit

■ Schematic

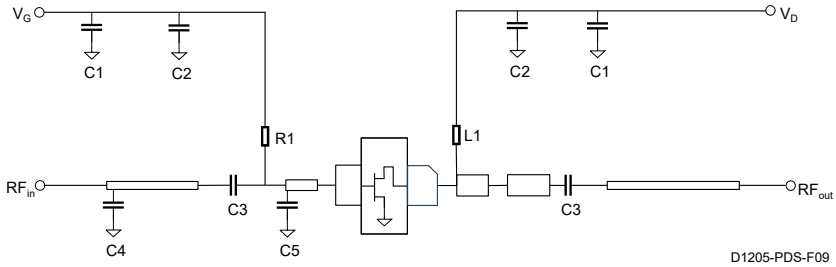


Figure 9. D1205 DEMO_D Application Circuit Schematic

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

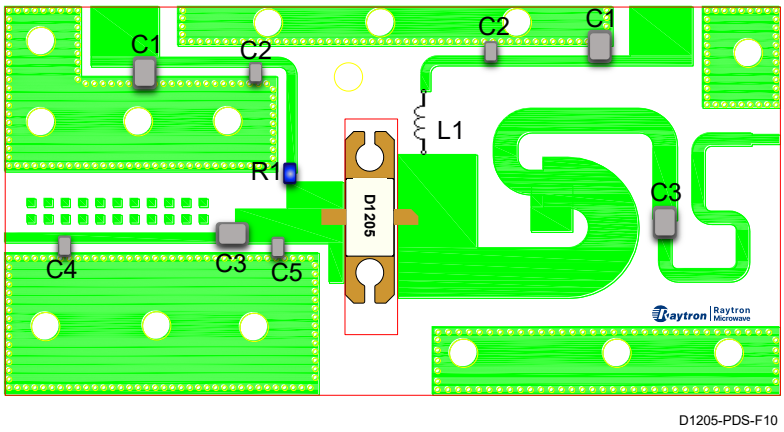


Figure 10. D1205 Application Circuit Layout
(DEMO_D Size: 9.0 x 4.5cm)

Table 11. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Taizhou Wangling	F4MTM350
C1	4.7uF	X7S 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C2	51pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E510GB12
C3	47pF	1500V 1111 Capacitor	Chuangtian	SQ-1111C0G470J152NT
C4	2.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R3BB12
C5	6.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E6R5CB12
L1	N/A	7turns,D=5.1mm,d=1mm	N/A	N/A
R1	10Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL

13. DEMO Summary

Table 12. DEMO Summary

NO.	D1205 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 70W	28	1.3-1.8	18.6	48.4	69	74%	Pulse
2	DEMO_B, 60W	28	1.1-1.7	18.9	47.8	60	71%	Pulse
3	DEMO_C, 60W	28	1.43-1.52	14.9	48.2	66	69%	CW
4	DEMO_D, 50W	28	0.75-1.52	17.6	46.8	48	64%	CW
5	DEMO_E, 65W	28	2.4-2.6	12.9	48.3	68	66%	CW

14. Recommended Solder Temperature Profile

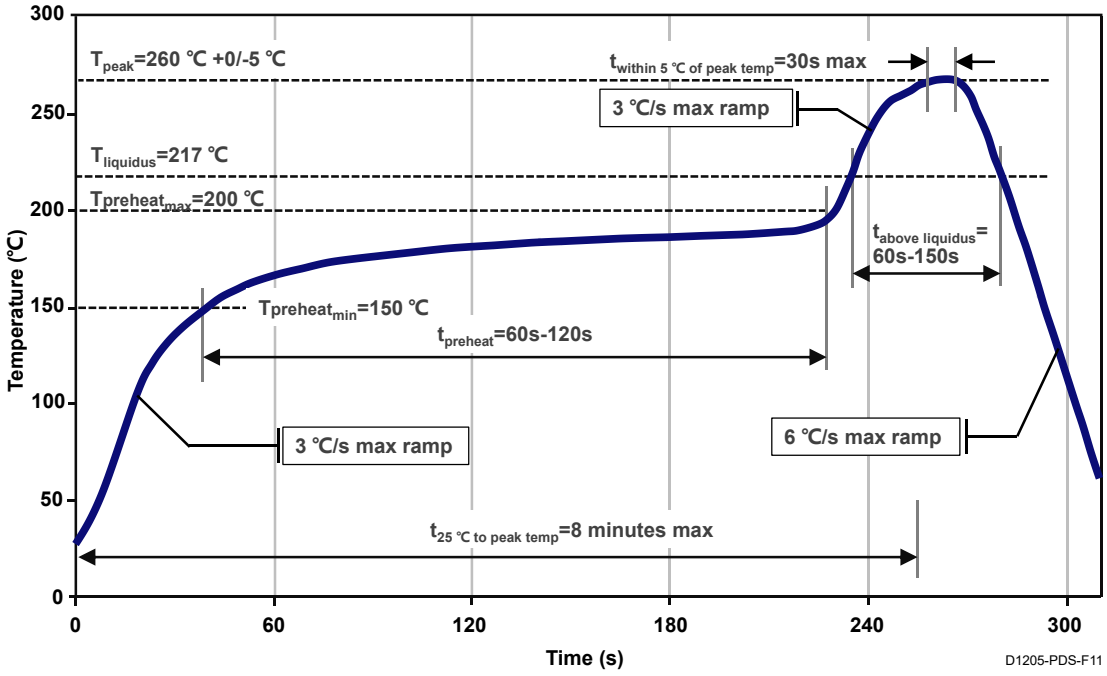


Figure 11. Recommended Solder Temperature Profile

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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