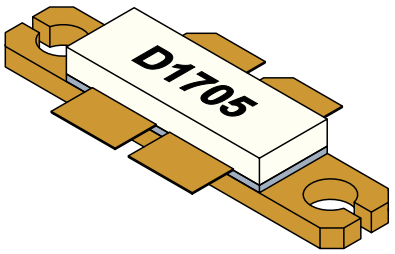
1. Description

- The D1705 is an 120W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1705 operates from DC to 6.5GHz with a 28V supply rail. It can deliver 100W CW power across the 5 to 6 GHz. The device is offered in an industry standard air cavity package.



D1705-PDS-F01

Figure 1. D1705 Package Outline

2. Applications

- Point-to-point Communication
- Broadband Wireless Access
- 5.8GHz ISM Applications

3. Features[1]

- Operating Frequency: DC–6.5GHz
- Output Power[1] (P_{SAT}): 51.3dBm (135W)
- Linear Gain[1]: 13.7dB
- Typical DE @P_{SAT}[1]: 59.9%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 650F-B

[1] Measured in Raytron DEMO @6GHz

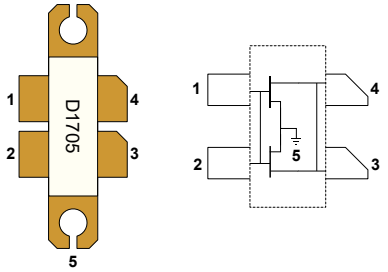
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	5.0GHz		5.5GHz		6.0GHz		Units
	Pulse	CW	Pulse	CW	Pulse	CW	
Linear Gain	10.2	10.0	12.9	12.7	11.7	11.5	dB
Drain Efficiency	55.9	51.3	53.7	47.7	63.2	59.0	%
Output Power	50.6	50.0	51.2	50.1	50.8	50.1	dBm
Output Power	115	100	132	102	120	102	W

- Typical Class AB performance in DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 500mA, V_{GS} = - 3.04V
- Pulse Test Condition: CW and pulse

5. Block Diagram



D1705-PDS-F02

Figure 2. D1705 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}	18.24	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}	-	500	-	mA
Gate-Source Voltage, V_{GS}	-	-3.04	-	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)	1.00	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	1.28	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 90.0W
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} = 18.24mA)	$V_{DS(BR)}$	84	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	20.98	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 18.24mA)	$V_{GS(th)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 500mA)	$V_{GS(Q)}$	-	-3.04	-	V

1. Measured on wafer prior to packaging
2. Measured with packaged device
3. Typical Class AB performance in Raytron DEMO

Table 6. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	40.1	-	pF
Output Capacitance	C_{DS}	-	21.7	-	pF
Feedback Capacitance	C_{GD}	-	1.6	-	pF

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

9. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_A: 5-6GHz)

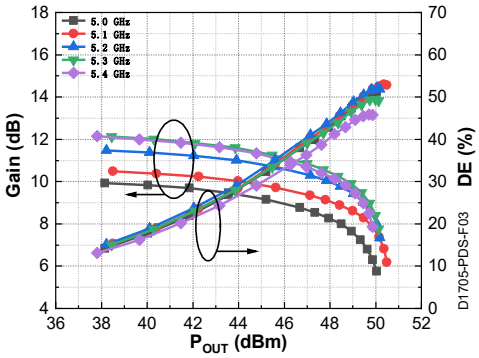


Figure 3. Wide-band Application Gain and DE vs. Output Power

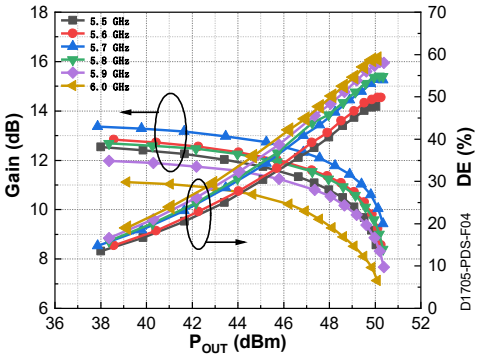


Figure 4. Wide-band Application Gain and DE vs. Output Power

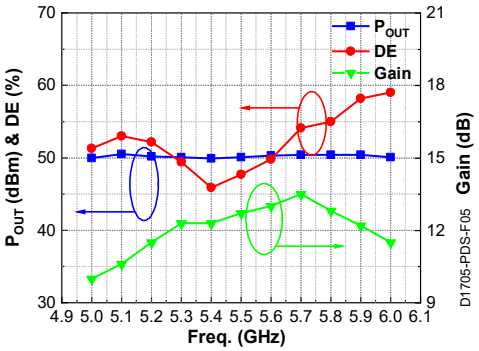


Figure 5. Wide-band Application P_{OUT}, Gain and DE vs. Freq.

Table 7. RF Characteristics

Freq. (GHz)	Linear Gain (dB)	Drain Efficiency (%)	Output Power (dBm)	Output Power (W)
5.0	10.0	51.3	50.0	100
5.1	10.6	53.0	50.5	112
5.2	11.5	52.2	50.2	105
5.3	12.3	49.4	50.1	102
5.4	12.3	45.9	49.9	98
5.5	12.7	47.7	50.1	102
5.6	13.0	49.8	50.3	107
5.7	13.5	54.1	50.4	110

5.8	12.8	55.0	50.4	110
5.9	12.2	58.2	50.4	110
6.0	11.5	59.0	50.1	102

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 500mA, V_{GS} = -3.04V
- Test Condition: CW
- The output power is 49.9dBm (98W) at 5-6GHz.

10. Package Outline

■ Pin Layout

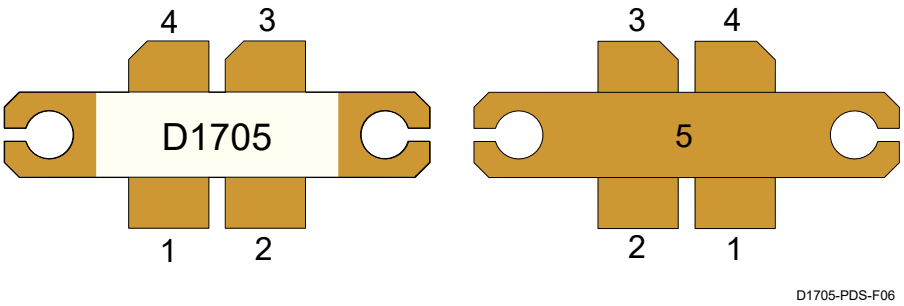


Figure 6. D1705 Pin Layout

Table 8. Pin Description

Pin	Symbol	Description
1/2	V_G / RF_{IN}	Gate voltage / RF Input
3/4	V_D / RF_{OUT}	Drain voltage / RF Output
5	Flange	Source to be Connected to Ground

■ Mechanical Drawing (Package Type: 650F-B)

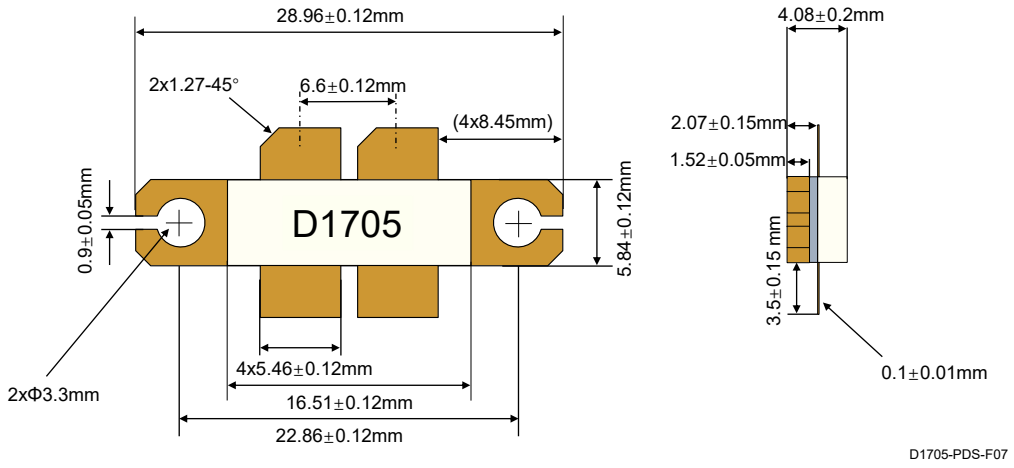


Figure 7. D1705 Mechanical Drawing

11. Application Circuit

■ Schematic

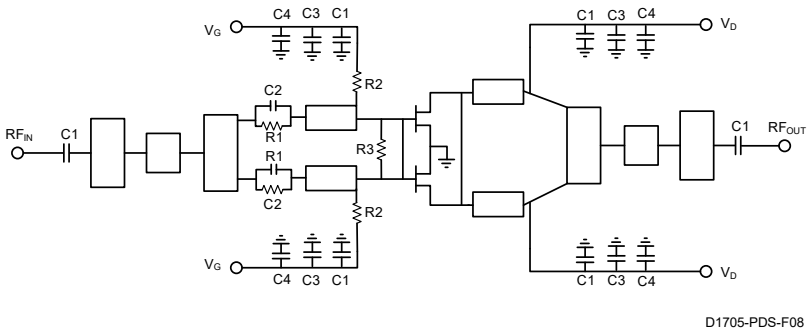


Figure 8. D1705 DEMO_A Application Circuit Schematic

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

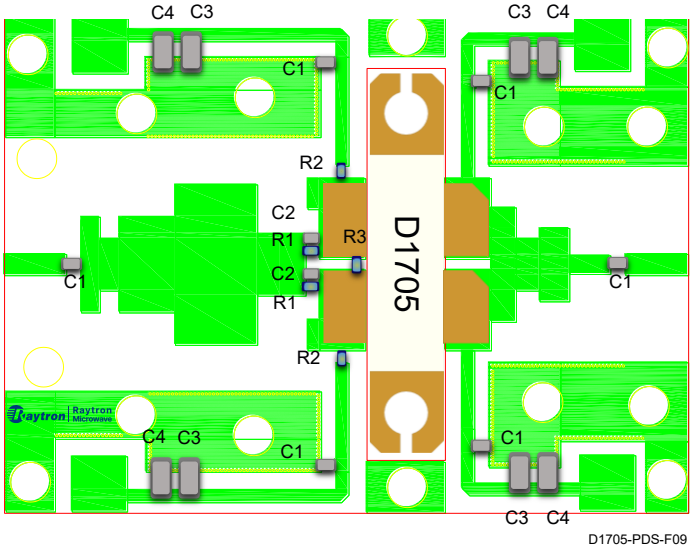


Figure 9. D1705 Application Circuit Layout
（DEMO_A Size: 5.5cm x 4.0cm）

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	30mil	N/A	Rogers	RO4350B
C1	2.7pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R7BB12D
C2	1.2pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R2BB12D
C3	0.1uF	C0G 100V 1206 Capacitor	Murata	GRM3195C2A104JA01D
C4	4.7uF	X7S 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
R1	40Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0740RL
R2	10Ω	1/10W 0603 Resistor	Yageo	RC0603FR-0710RL
R3	10Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL

12. DEMO Summary

Table 11. DEMO Summary

NO.	D1705 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 100W	28	5-6	10.0	49.9	98	45.8%	CW

13. Recommended Solder Temperature Profile

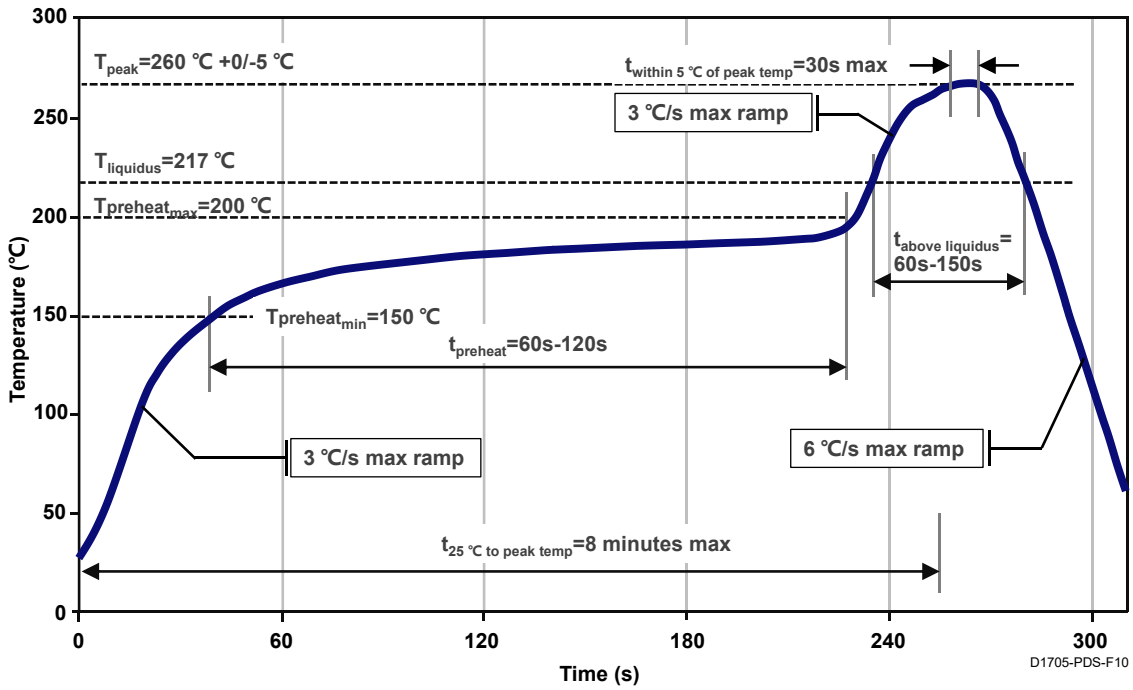


Figure 10. Recommended Solder Temperature Profile

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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