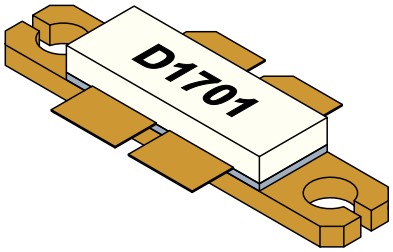
1. Description

- The D1701 is an 150W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1701 operates from DC to 6.5GHz with a 28V supply rail. It can deliver 150W CW power across the 5 to 6 GHz. The device is offered in an industry standard air cavity package.



D1701-PDS-F01

Figure 1. D1701 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}): 52.9dBm (195W)
- Linear Gain[1]: 13.8dB
- Typical DE @P_{SAT}[1]: 63.2%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 650F-B

[1] Measured in Raytron DEMO @6GHz

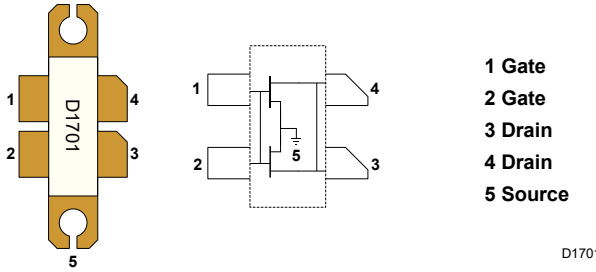
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	5.0GHz		5.5GHz		6.0GHz		Units
	Pulse	CW	Pulse	CW	Pulse	CW	
Linear Gain	12.6	12.2	13.0	12.3	13.8	12.9	dB
Drain Efficiency	59.0	52.6	62.3	56.1	63.2	52.2	%
Output Power	53.0	51.9	53.0	52.0	52.9	51.8	dBm
Output Power	200	155	200	158	195	151	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} = - 2.80V
- Pulse Test Condition: CW and pulse

5. Block Diagram



D1701-PDS-F02

Figure 2. D1701 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}	29.8	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}	-	-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)	0.74	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	0.95	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 100.0W
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} = 29.8mA)	$V_{DS(BR)}$	84	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	32.88	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 29.8mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 500mA)	$V_{GS(Q)}$	-	-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. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	33.7	-	pF
Output Capacitance	C_{DS}	-	22.0	-	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)

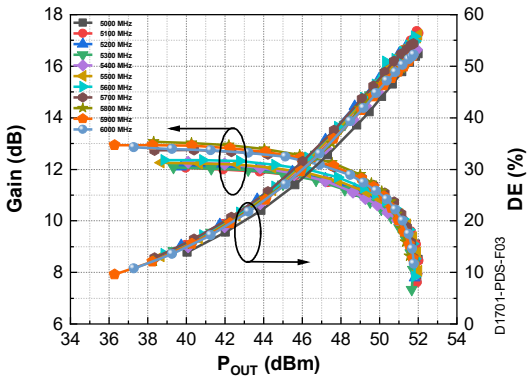


Figure 3. Wide-band Application Gain and DE vs. Output Power

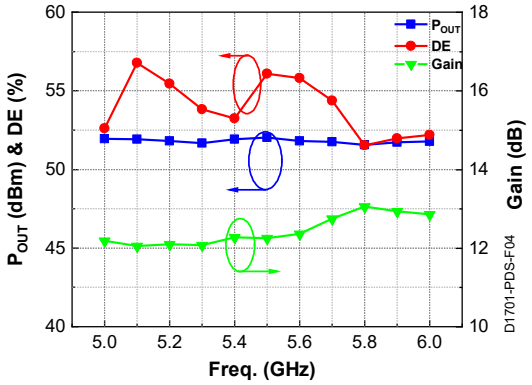


Figure 4. Wide-band Application P_{OUT}, Gain and DE vs. Freq.

Table 7. RF Characteristics

Freq. (GHz)	Linear Gain (dB)	Drain Efficiency (%)	Output Power (dBm)	Output Power (W)
5.0	12.2	52.6	51.9	155
5.1	12.1	56.8	51.9	155
5.2	12.1	55.5	51.8	151
5.3	12.1	53.8	51.7	148
5.4	12.3	53.2	51.9	155
5.5	12.3	56.1	52.0	158
5.6	12.4	55.8	51.8	151
5.7	12.8	54.4	51.8	151
5.8	13.1	51.5	51.6	145
5.9	12.9	52.0	51.7	148
6.0	12.9	52.2	51.8	151

• 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} = -2.80V

• Test Condition: CW

• The output power is 51.6dBm (145W) at 5-6GHz.

10. Package Outline

■ Pin Layout

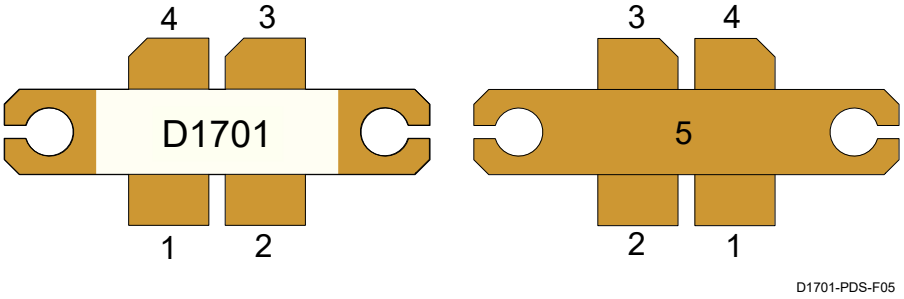


Figure 5. D1701 Pin Layout

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)

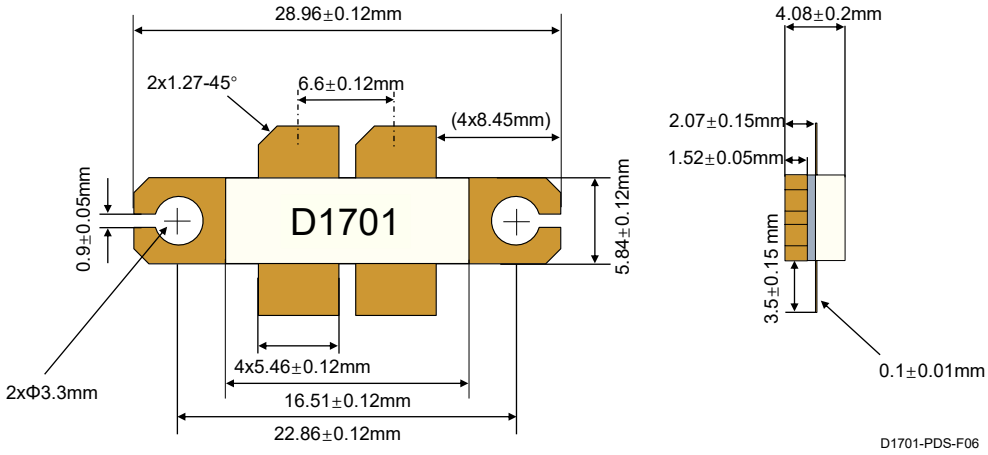


Figure 6. D1701 Mechanical Drawing

11. Application Circuit

■ Schematic

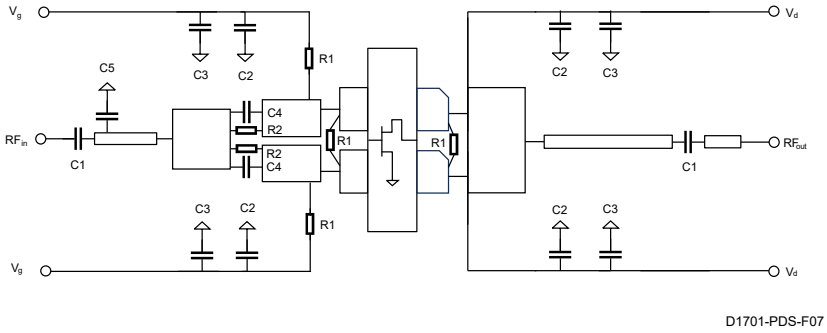


Figure 7. D1701 DEMO_A Application Circuit Schematic

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

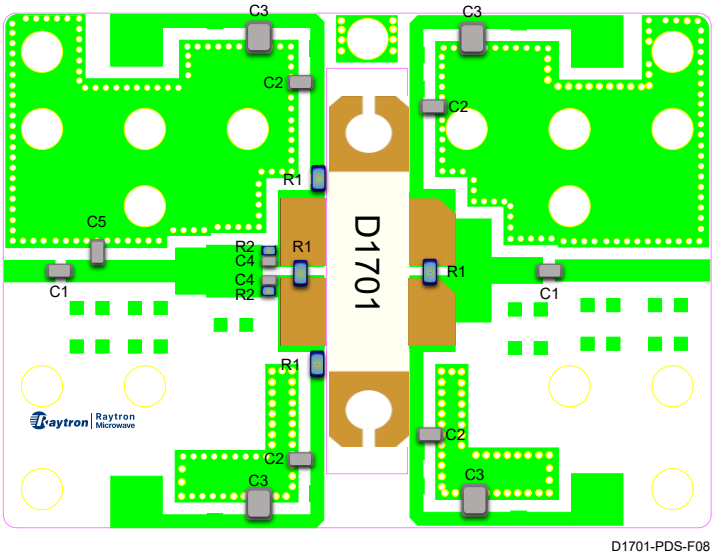


Figure 8. D1701 Application Circuit Layout
（DEMO_A Size: 5.5cm x 4.0cm）

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	30mil	N/A	Rogers	RO4350B
C1	1.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R5BB12D
C2	2.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R0BB12D
C3	1.0uF	X7S 100V 1506 Capacitor	Murata	GRM32ER72A105KA01L
C4	2.4pF	C0G 250V 0603 Capacitor	Murata	GQM1875C2E2R4CB12D
C5	0.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER30WB12D
R1	10Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL
R2	5.1Ω	1/10W 0603 Resistor	Yageo	RC0603FR-075R1L

12. DEMO Summary

Table 11. DEMO Summary

NO.	D1701 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 150W	28	5-6	12.0	51.6	145	51.5%	CW

13. Recommended Solder Temperature Profile

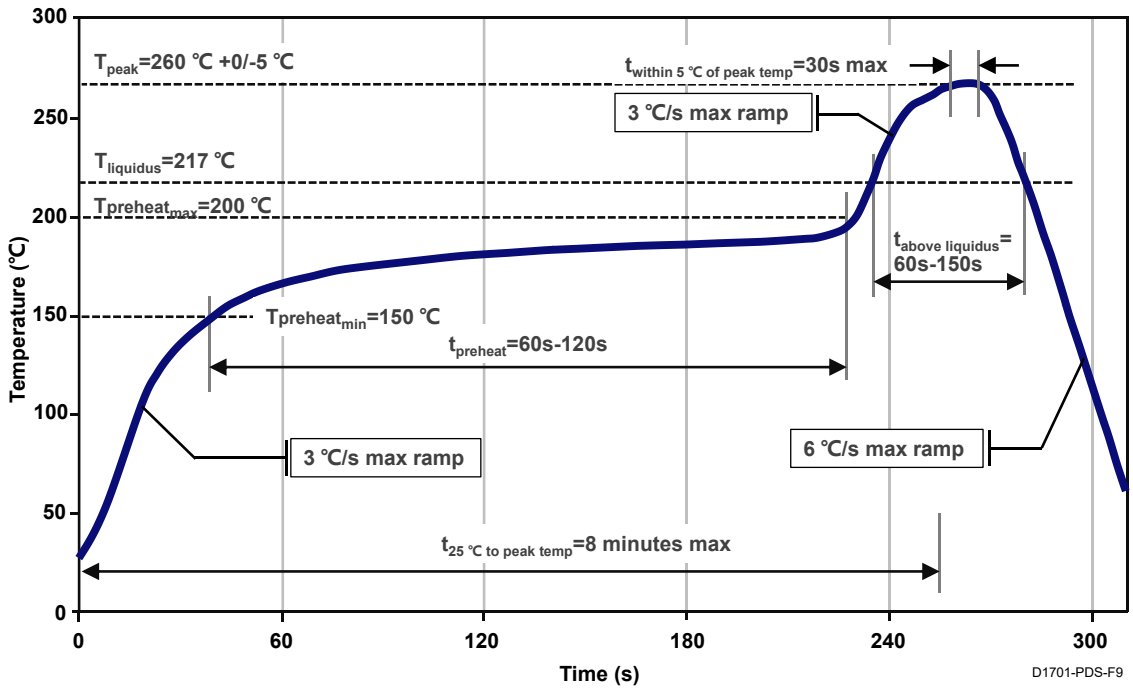


Figure 9. Recommended Solder Temperature Profile

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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