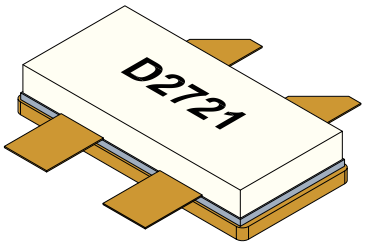
1. Description

- The D2721 is an 800W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D2721 operates from DC to 3GHz with a 48V supply rail. The device is offered in an industry standard air cavity package.



D2721-PDS-F01

Figure 1. D2721 Package Outline

2. Applications

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

3. Features

- Operating Frequency: DC–3GHz
- Output Power[1] (P_{SAT}): 59.1dBm (813W)
- Linear Gain[1]: 18.9dB
- Typical DE @ P_{SAT} [1]: 72.0%
- Operating Voltage: 48V
- CW and Pulse Capable
- Package Type: 780P-A

[1] Measured in Raytron DEMO @2.1GHz

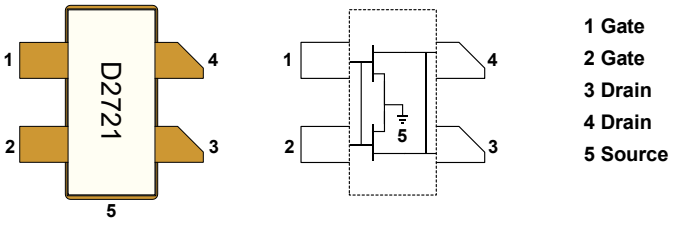
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	1.2GHz	2.1GHz	Units
Linear Gain	19.5	18.9	dB
Drain Efficiency	78.6	72.0	%
Output Power	59.2	59.1	dBm
Output Power	832	813	W

- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 50V, I_{DS} = 400mA, V_{GS} = -3.2V

5. Block Diagram



D2721-PDS-F02

Figure 2. D2721 Block Diagram

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6. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	150	V
Gate-Source Voltage	V_{GS}	-10 ~ +1	V
Operating Voltage	V_{DS}	10 ~ +55	V
Maximum Forward Gate Current	I_{GMax}	100.8	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}	-	50	55	V
Drain Bias Current, I_{DS}	-	400	-	mA
Gate-Source Voltage, V_{GS}	-	-3.2	-	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)	-	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	0.5	°C/W

[1] Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 280.0W

[2] Thermal Resistance at average power by Finite Element Analysis, Junction-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 280.0W

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} = 100.8mA)	$V_{DS(BR)}$	150	-	-	V
Saturated Drain Current[1] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	91.50	-	A
Gate Threshold Voltage[2] (V_{DS} = 50V, I_{DS} = 100.8mA)	$V_{GS(TH)}$	-3.95	-3.32	-2.60	V
Gate Quiescent Voltage[2] (V_{DS} = 50V, I_{DS} = 400.0mA)	$V_{GS(Q)}$	-	-3.20	-	V

[1] Scaled from PCM data

[2] Measured in Raytron DEMO

Table 6. RF Characteristics @ DEMO_E[1,2]

Parameter	0.7GHz	0.8GHz	0.9GHz	1.0GHz	1.1GHz	1.2GHz	1.25GHz	Units
Linear Gain	15.0	16.9	16.9	15.4	15.1	16.5	17.1	dB
Drain Efficiency	60.0	70.5	64.9	60.7	60.6	62.1	64.7	%
Output Power	57.7	57.6	56.6	56.5	56.7	56.8	56.6	dBm
Output Power	589	575	457	447	468	479	457	W

1. Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
2. Typical Class AB performance in Raytron DEMO_E with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 400mA, V_{GS} = -3.2V

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	163.36	-	pF
Output Capacitance	C_{DS}	-	38.62	-	pF
Feedback Capacitance	C_{GD}	-	4.80	-	pF

- Test Condition: V_{DS} = 50V, V_{GS} = -8V, f = 1MHz

9. Typical Performance

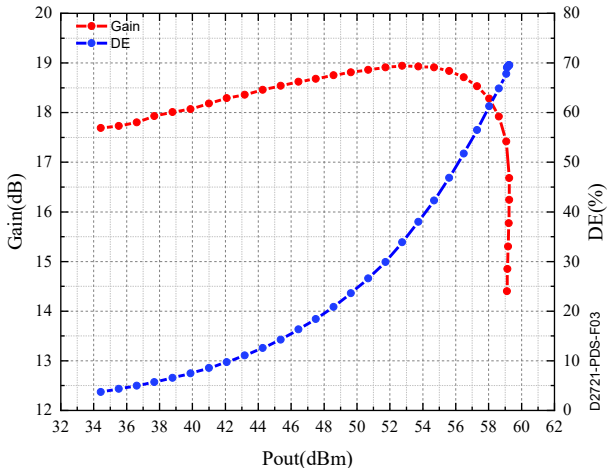


Figure 3. 1.2GHz Gain and DE @MXP vs. Output Power

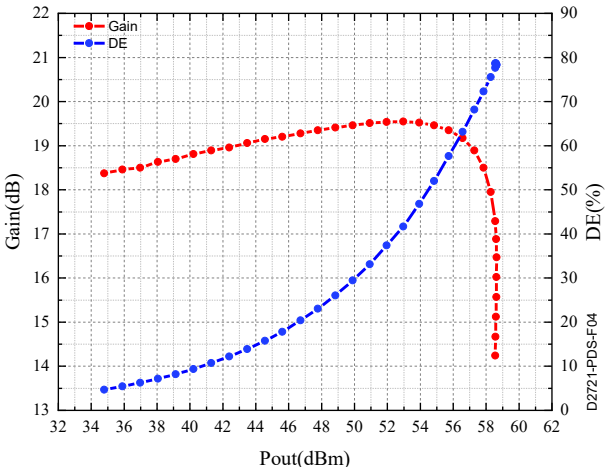


Figure 4. 1.2GHz Gain and DE @MXE vs. Output Power

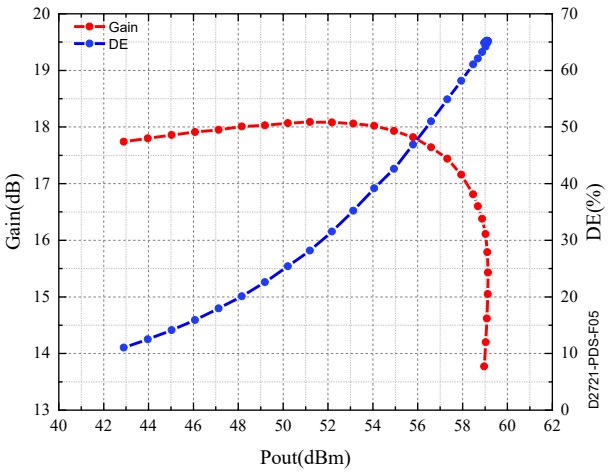


Figure 5. 2.1GHz Gain and DE @MXP vs. Output Power

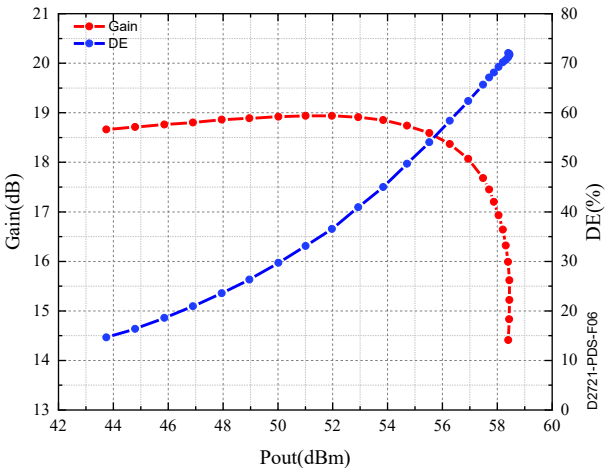


Figure 6. 2.1GHz Gain and DE @MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO with the device soldered onto the heatsink, test condition: V_{DS} = 50V, I_{DS}= 400mA, V_{GS} = -3.2V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%

•

10. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_E: 0.7-1.25GHz)

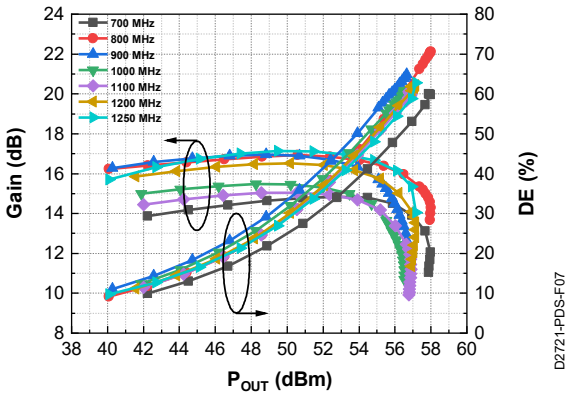


Figure 7. Wide-band Application Gain and DE vs. Output Power

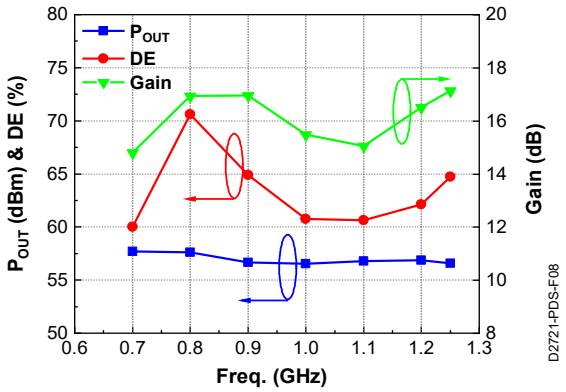


Figure 8. Wide-band Application P_{OUT}, Gain, and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_E (0.7-1.25GHz) with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 400mA, V_{GS} = -3.2V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
- The output power is 56.6dBm (457W) at 0.7-1.25GHz. It can be used in the avionics and radar application.

11. Package Outline

■ Pin Layout

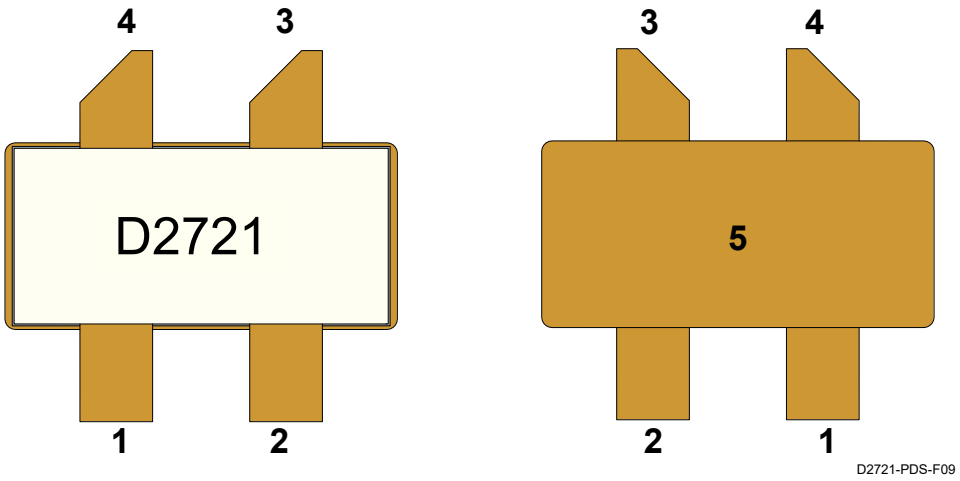


Figure 9. D2721 Pin Layout

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: 780P-A)

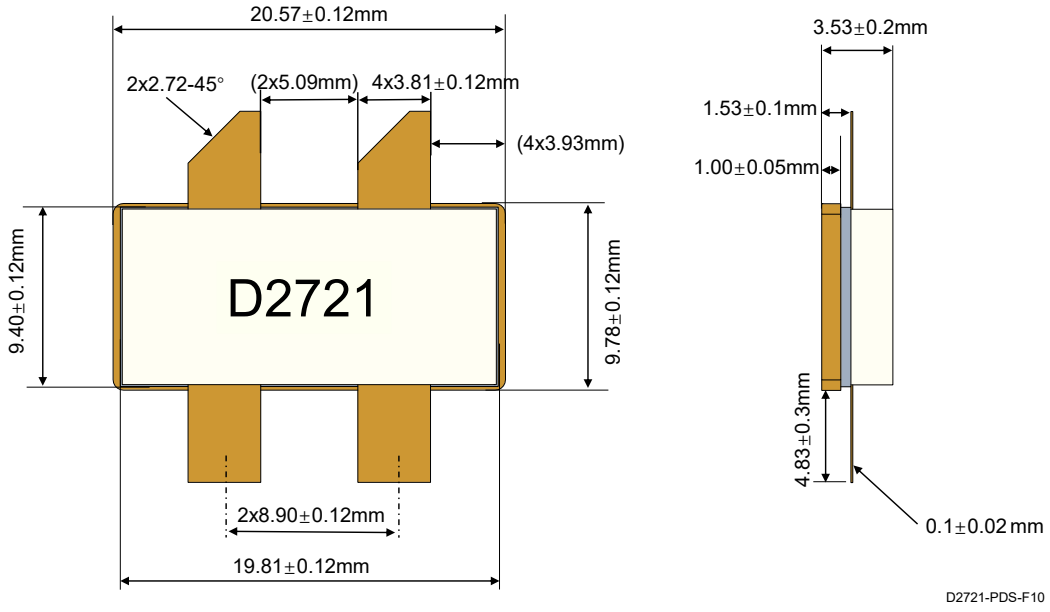
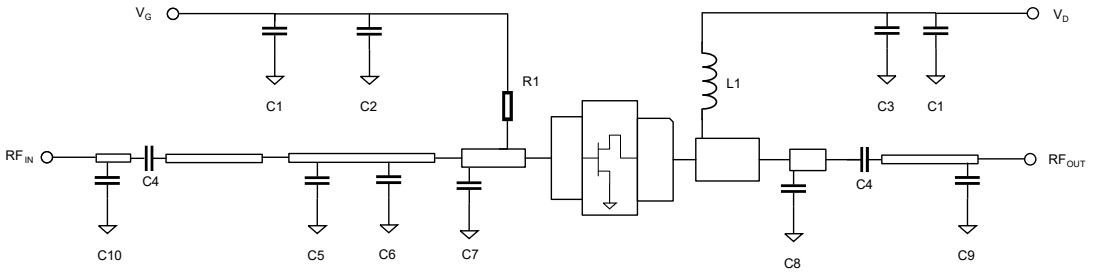


Figure 10. D2721 Mechanical Drawing

12. Application Circuit

■ Schematic



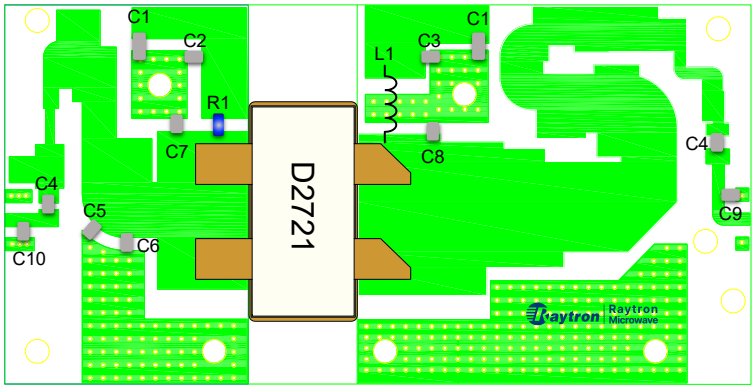
D2721-PDS-F11

Figure 11. D2721 DEMO_E 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 (48V)	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



D2721-PDS-F12

Figure 12. D2721 Application Circuit Layout
(DEMO_E Size: 7.0 x 3.5cm)

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	Rogers4350B
C1	4.7uF	X7R 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C2	100.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C3	51.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E510JB12
C4	25.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E250GB12
C5	5.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E5R0CB12
C6	2.7pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R7BB12
C7	9.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E9R0CB12
C8	12.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E120FB12
C9	0.7pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER70WB12
C10	3.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E3R5BB12
L1	N/A	7turn, D=5mm, d=1.5mm	N/A	N/A
R1	10Ω	1/8W 0805	Yageo	RC0805FR-0710RL

13. DEMO Summary

Table 11. DEMO Summary

NO.	D2721 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 200W	28	0.50-0.80	18.2	53.1	204	54.4%	Pulse
2	DEMO_B, 250W	28	1.35-1.45	14.2	54.1	257	60.6%	Pulse
3	DEMO_C, 270W	28	2.00-2.10	15.9	54.4	270	51.7%	Pulse
4	DEMO_D, 250W	28	1.40-1.60	13.8	53.0	251	53.0%	Pulse
5	DEMO_E, 450W	48	0.70-1.25	15.0	56.5	447	60.0%	Pulse
6	DEMO_F, 570W	48	0.57-0.68	23.4	60.5	575	60.5%	Pulse

14. Recommended Solder Temperature Profile

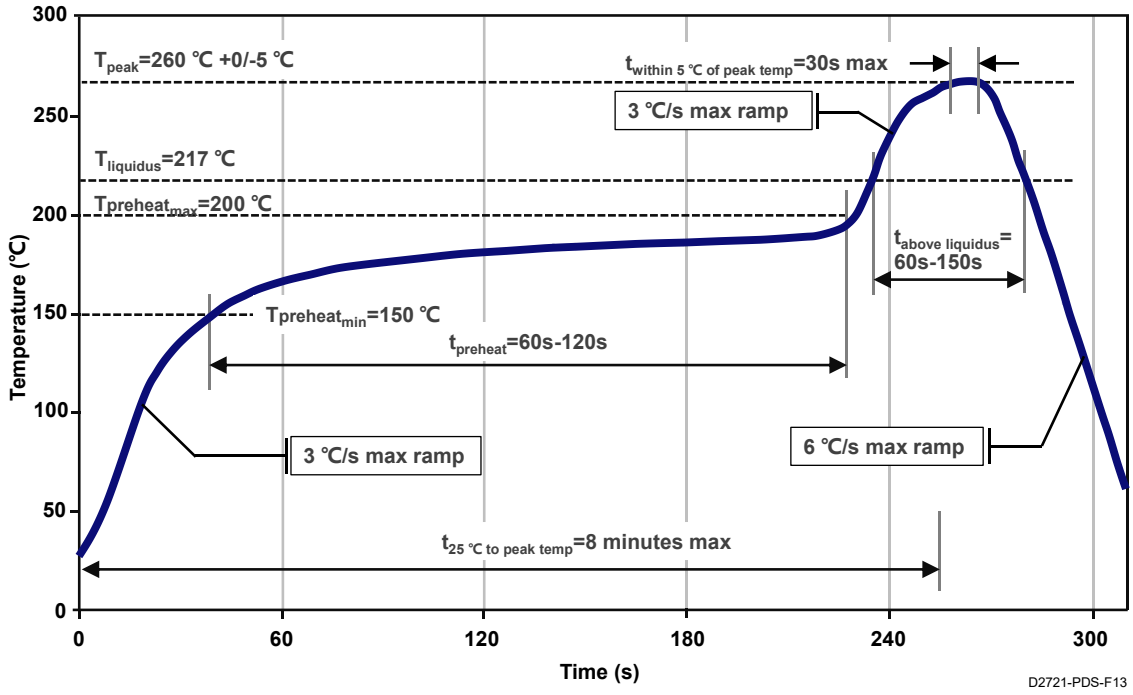


Figure 13. Recommended Solder Temperature Profile

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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