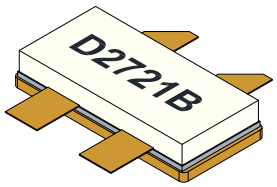
1. Description

- The D2721B 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 D2721B operates from DC to 3GHz with a 48V supply rail. It can deliver 200W CW power across 30-700MHz with a 32V supply rail. The device is offered in an industry standard air cavity package



D2721B-PDS-F01

Figure 1. D2721B Package Outline

2. Applications

- Military and Civilian Radar
- Land Mobile and Military Radio Communications
- Avionic and Test Instrumentation
- Balanced Amplifiers, Push-pull Amplifiers and Doherty Power Amplifiers

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] Typical Class AB performance in Raytron DEMO @2.1GHz

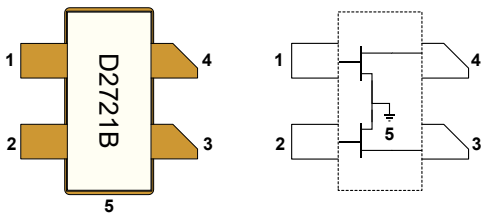
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	0.3GHz	0.5GHz	0.7GHz	Units
Linear Gain	21.5	20.5	21.1	dB
Drain Efficiency	66.0	63.2	69.4	%
Output Power	53.2	5.0	53.3	dBm

- Test Condition: Pulse, Pulse width = 200μs, Duty cycle = 20%
- Typical Class AB performance in Raytron DEMO_A (30-700MHz) with the device soldered onto the heatsink, test condition: V_{DS} = 32V, I_{DS} = 400mA, V_{GS} = -2.60V

5. Block Diagram



1. Gate
2. Gate
3. Drain
4. Drain
5. Source

D2721B-PDS-F02

Figure 2. D2721B 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}	-	32	55.0	V
Drain Bias Current, I_{DS}	-	400	-	mA
Gate-Source Voltage, V_{GS}	-	-2.6	-	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 = 140.0W

[2] Thermal Resistance at average power by Finite Element Analysis, Junction-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 140.0W

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}	-	104.8	-	A
Gate Threshold Voltage[2] (V_{DS} = 48V, I_{DS} = 100.8mA)	$V_{GS(TH)}$	-3.95	-3.32	-2.60	V
Gate Quiescent Voltage[2] (V_{DS} = 48V, I_{DS} = 400mA)	$V_{GS(Q)}$	-	-2.6	-	V

[1] Scaled from PCM data

[2] Measured in Raytron DEMO

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

Parameter	0.03GHz	0.15GHz	0.3GHz	0.4GHz	0.5GHz	0.6GHz	0.7GHz	Units
Linear Gain	20.6	21.7	21.5	20.0	20.5	21.1	21.1	dB
Drain Efficiency	60.0	70.7	66.0	62.1	63.2	67.4	69.4	%
Output Power	53.2	53.3	53.2	54.1	54.0	54.6	53.3	dBm
Output Power	209	214	209	257	251	288	214	W

1. Test Condition: Pulse, Pulse width = 200μs, Duty cycle = 20%
2. Typical Class AB performance in Raytron DEMO_A (30-700MHz) with the device soldered onto the heatsink, test condition: V_{DS} = 32V, I_{DS} = 400mA, V_{GS} = -2.60V

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	121.99	-	pF
Output Capacitance	C_{DS}	-	37.43	-	pF
Feedback Capacitance	C_{GD}	-	4.80	-	pF

- Test Condition: V_{DS} = 48V, V_{GS} = -8V, f = 1MHz

9. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_A: 30-700MHz)

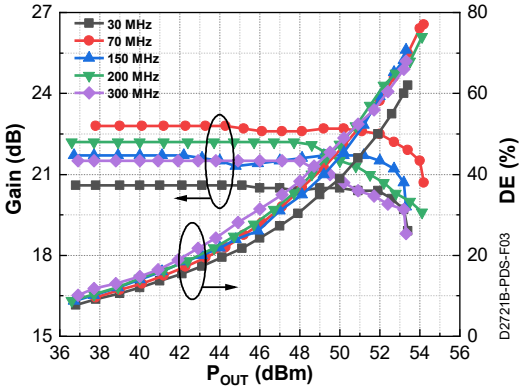


Figure 3. Wide-band Application Gain and DE vs. Output Power

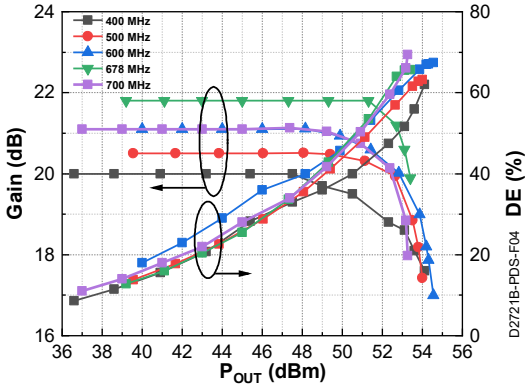


Figure 4. Wide-band Application Gain and DE vs. Output Power

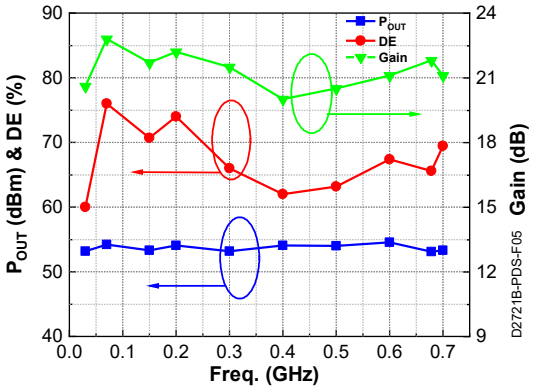


Figure 5. Gain, P_{OUT}, and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 32V, I_{DS} = 400mA, V_{GS} = -2.60V
- Test Condition: Pulse, Pulse width = 200μs, Duty cycle = 20%
- The output power is 53.2dBm (209W) at 30-700MHz. It can be used in the military radio station application.

10. Package Outline

■ Pin Layout

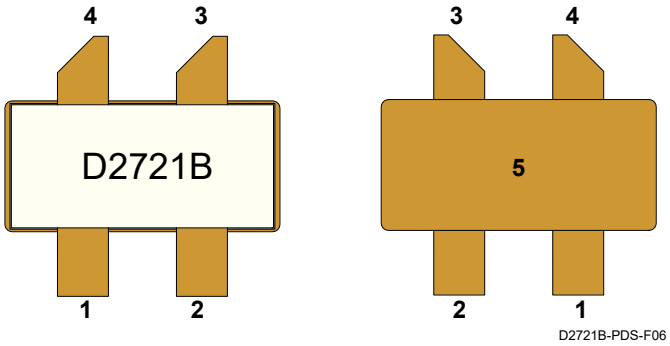


Figure 6. D2721B Pin Layout

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)

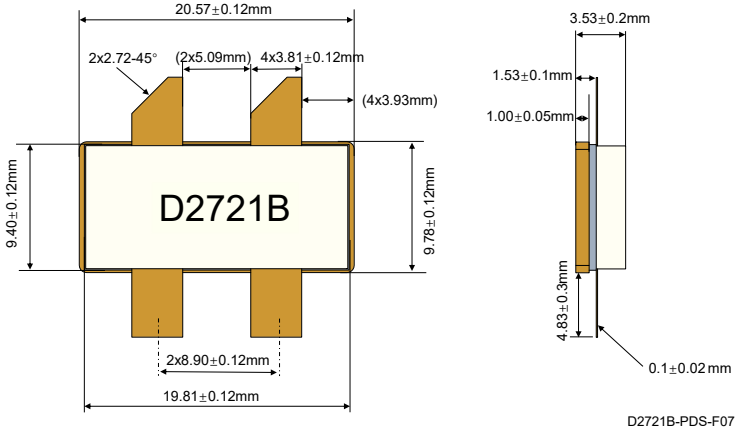


Figure 7. D2721B Mechanical Drawing

11. Application Circuit

■ Schematic

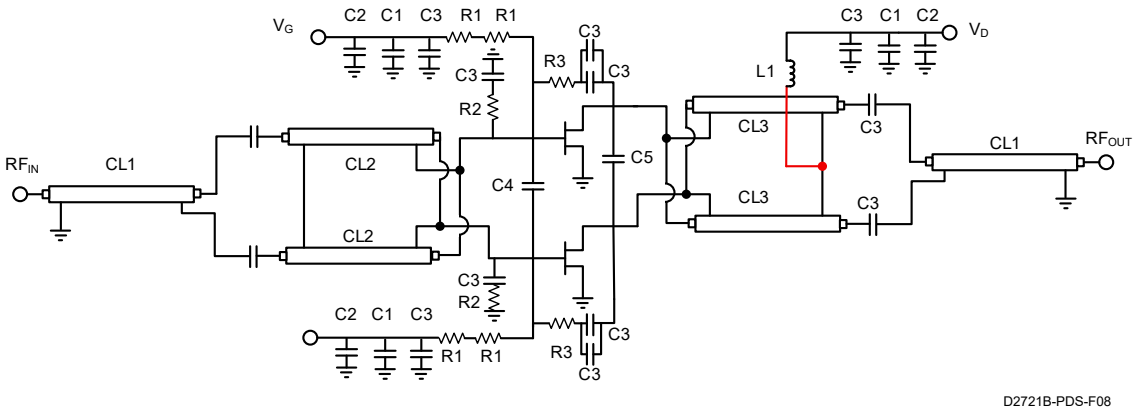


Figure 8. D2721B DEMO_A Application Circuit Schematic

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 (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

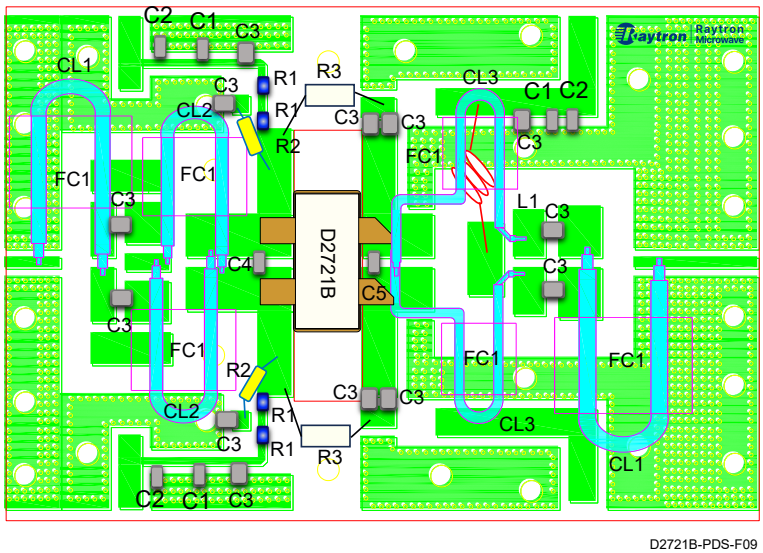


Figure 9. D2721B DEMO_A Application Circuit Layout
(DEMO_A Size: 11.0cm x 7.5cm)

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	30mil	N/A	Rogers	RO4350B
C1	0.1uF	C0G 100V 1206 Capacitor	Murata	GRM3195C2A104JA01D
C2	4.7uF	X7S 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C3	150pF	1111 150pF 1500V Capacitor	Chuangtian	SQ-1111C0G151J102NT
C4	24pF	1111 24pF 1500V Capacitor	Chuangtian	SQ-1111C0G240J152NT
C5	12pF	1111 12pF 1500V Capacitor	Chuangtian	SQ-1111C0G120J152NT
L1	60nH	3 turns，R=0.6mm	N/A	N/A
R1	6.2Ω	1/8W 0805 Resistor	Yageo	RC0805FR-076R2L
R2	140Ω	1/4W ±1% 6 x 2mm	N/A	N/A
R3	200Ω	20W 5 x 2.5mm	Qingda	RFG200-20-W8
CL1	40mm	50Ohm Coaxial	N/A	SFF-50-1.5
CL2	40mm	17Ohm Coaxial	N/A	SFF-17-1.5
CL3	55mm	17Ohm Coaxial	N/A	SFF-17-1.5
FC1	190Ω	Ferrite Core	FAIR-RITE	2861000202

12. DEMO Summary

Table 11. DEMO Summary

NO.	D2721B 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	32	0.03-0.7	20.0	53.1	204	60%	Pulse
2	DEMO_B, 150W	28	0.02-0.53	22.4	52.1	162	57%	CW

13. Recommended Solder Temperature Profile

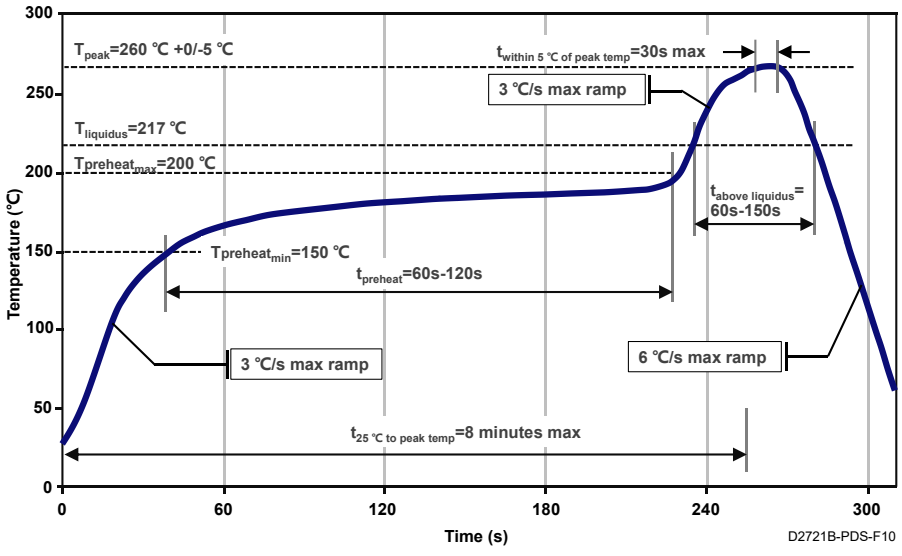


Figure 10. Recommended Solder Temperature Profile

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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