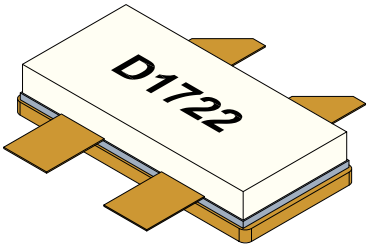
1. Description

- The D1722 is a 240W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT).
- The D1722 operates from DC to 3GHz with a 28V supply rail. The device is offered in an industry standard air cavity package.



D1722-PDS-F01

Figure 1. D1722 Package Outline

2. Applications

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

3. Features[1]

- Operating Frequency: DC–3GHz
- Output Power (P_{SAT}): 54.1dBm (257W)
- Linear Gain: 17.1dB
- Typical DE @ P_{SAT}: 62.7%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 780P-A

[1] Measured in Raytron DEMO @2.3GHz

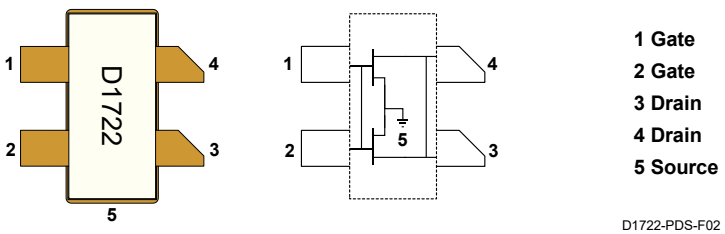
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.2GHz	2.3GHz	2.4GHz	Units
Linear Gain	16.4	17.1	17.0	dB
Drain Efficiency	58.3	62.7	64.8	%
Output Power	54.2	54.1	54.0	dBm
Output Power	263	257	251	W

- Typical Class AB performance in Raytron DEMO_A (2.2-2.4GHz) with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 600mA, V_{GS} = -2.65V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%

5. Block Diagram



D1722-PDS-F02

Figure 2. D1722 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}	49.6	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}	-	600	-	mA
Gate-Source Voltage, V_{GS}	-	-2.65	-	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)	0.52	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	0.68	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 152.0W
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} = 49.6mA)	$V_{DS(BR)}$	120	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	53.77	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 49.6mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 600mA)	$V_{GS(Q)}$	-	-2.65	-	V

1. Measured on wafer prior to packaging
2. Scaled from PCM data
3. Typical Class AB performance in Raytron DEMO

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

Parameter	2.3GHz	2.4GHz	2.5GHz	2.6GHz	2.7GHz	Units
Linear Gain	15.2	15.2	15.5	15.4	15.2	dB
Drain Efficiency	58.4	58.9	56.5	56.4	56.2	%
Output Power	53.2	52.9	53.4	53.1	52.8	dBm
Output Power	209	195	219	204	191	W

1. Typical Class AB performance in Raytron DEMO_B (2.3-2.7GHz) with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} =600mA, V_{GS} = -2.65V
2. Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	174.92	-	pF
Output Capacitance	C_{DS}	-	18.56	-	pF
Feedback Capacitance	C_{GD}	-	2.80	-	pF

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

9. Wide-band Application Performance

■ Wide-band Application Performance 1 (DEMO_A: 2.2-2.4GHz)

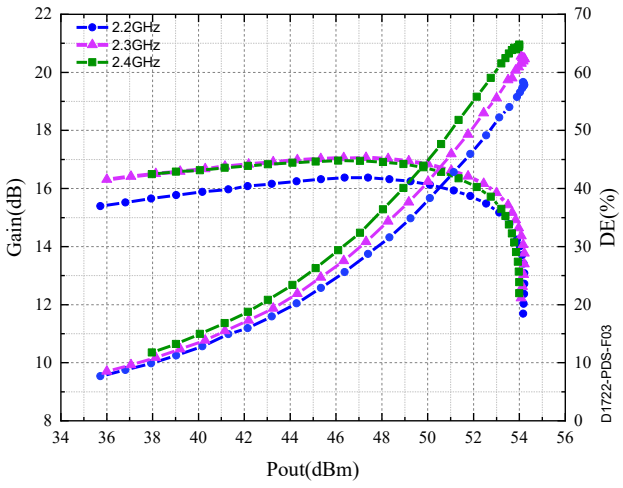


Figure 3. Wide-band Application Gain and DE vs. Output Power

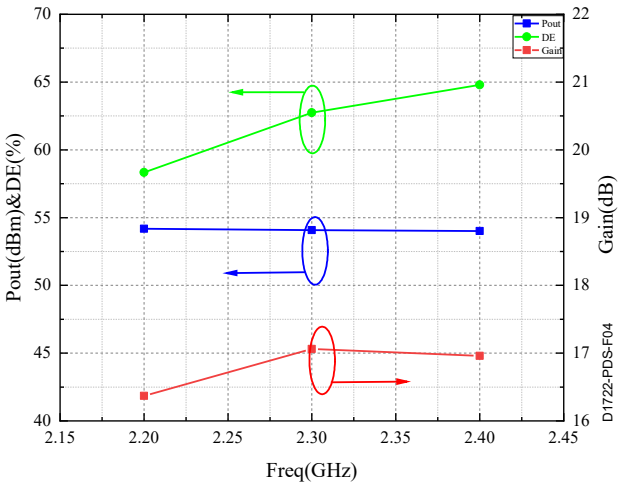


Figure 4. Wide-band Application Gain and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 600mA, V_{GS} = -2.65V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
- The output power is 54.0dBm (251W) at 2.2-2.4GHz, when V_{DS} = 28V.

■ Wide-band Application Performance 2 (DEMO_B: 2.3-2.7GHz)

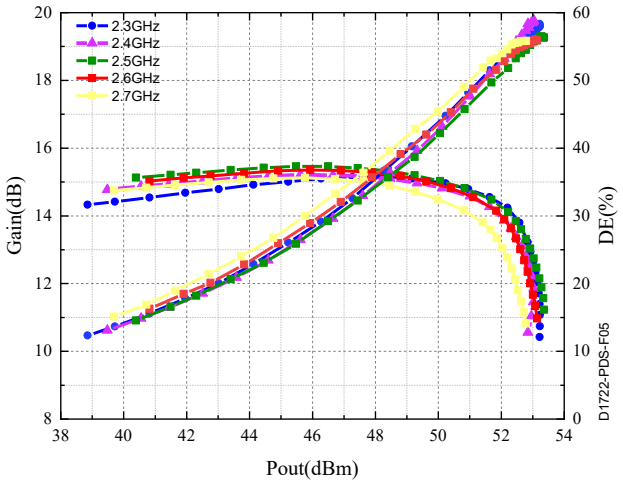


Figure 5. Wide-band Application Gain and DE vs. Output Power

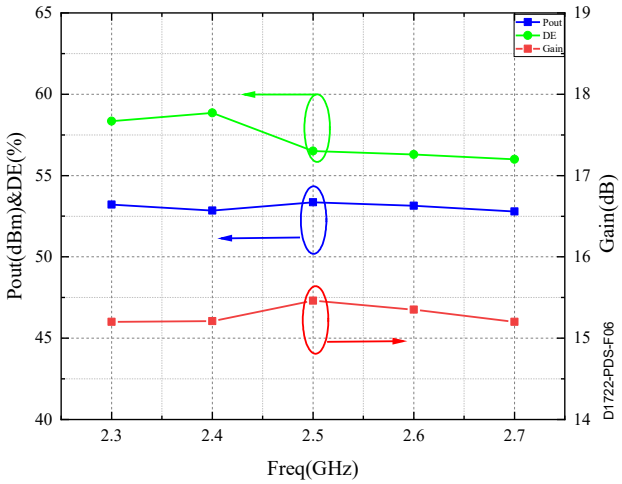


Figure 6. Wide-band Application Gain and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_B with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 600mA, V_{GS} = -2.65V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
- The output power is 52.8dBm (191W) at 2.3-2.7GHz, when V_{DS} = 28V.

10. Package Outline

■ Pin Layout

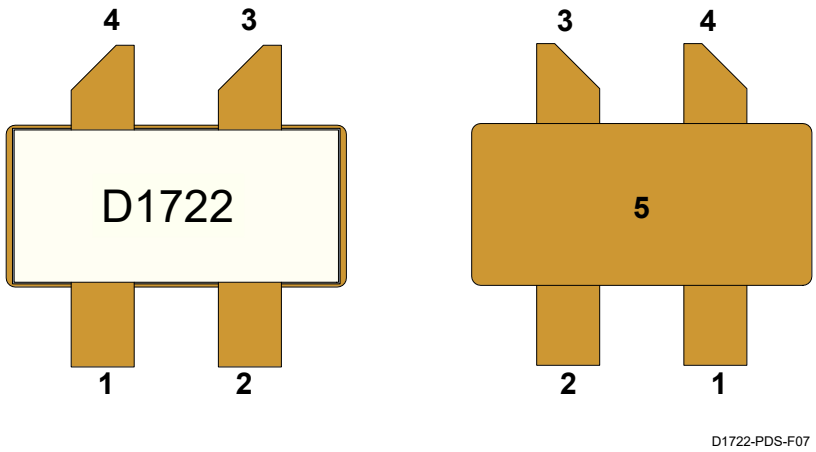


Figure 7. D1722 Pin Layout

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)

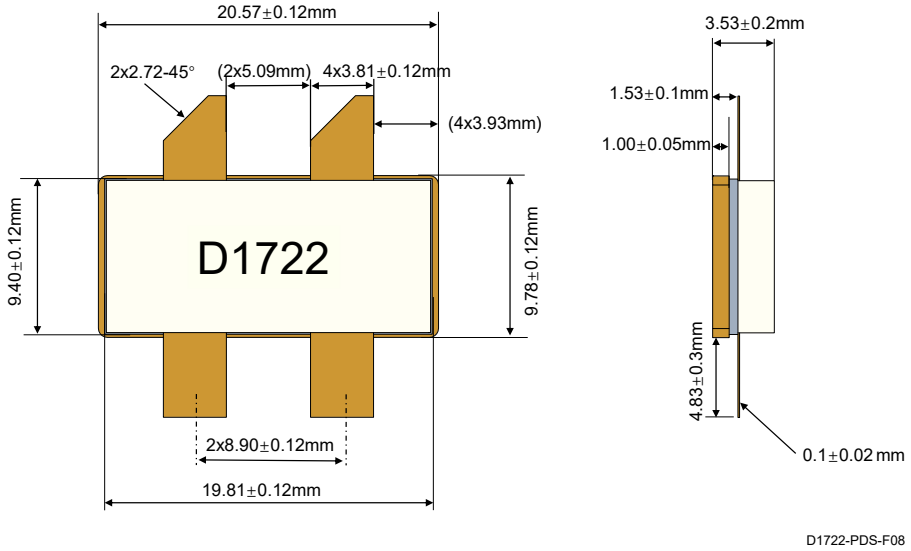


Figure 8. D1722 Mechanical Drawing

11. Application Circuit

■ Schematic

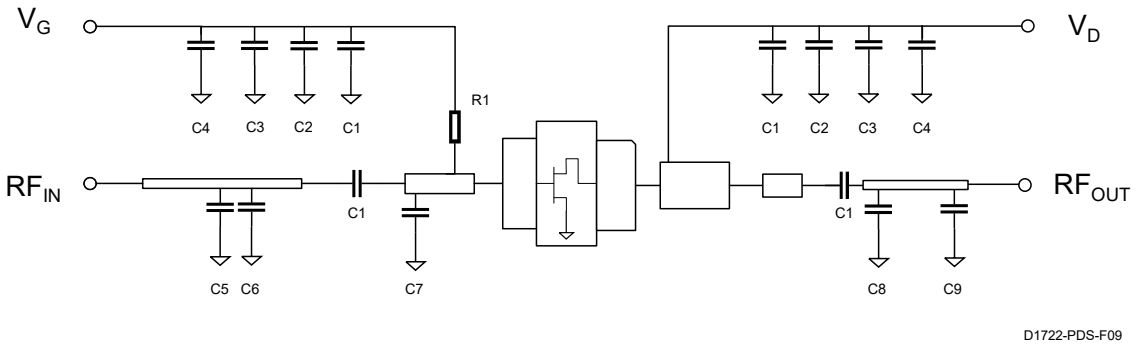


Figure 9. D1722 Application Circuit Schematic
(DEMO_B 2.3-2.7GHz)

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

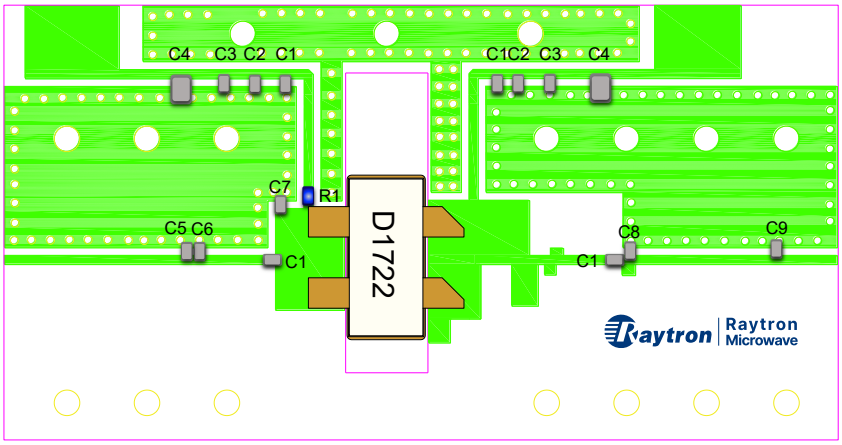


Figure 10. D1722 Application Circuit Layout (2.3-2.7GHz)
(DEMO_B Size: 10.5cm x 5.5cm)

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	8.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E8R0CB12
C2	100.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C3	10000.0pF	X7R 100V 0603 Capacitor	Murata	GCM188R72A103KA37D
C4	1.0uF	X7R 100V 1210 Capacitor	Murata	GRM32ER72A105KA01
C5	0.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER30WB12
C6	0.4pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER40WB12
C7	0.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER50WB12
C8	0.8pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER80WB12
C9	0.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER30WB12
R1	10Ω	1/8W 0805	Yageo	RC0805FR-0710RL

12. DEMO Summary

Table 11. DEMO Summary

NO.	D1722 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 250W	28	2.2-2.4	16.4	54.0	251	58%	Pulse
2	DEMO_B, 190W	28	2.3-2.7	15.2	52.8	191	56.2%	Pulse
3	DEMO_C, 160W	28	2.5-3.0	13.7	52.2	166	48%	Pulse
4	DEMO_D, 180W	28	1.3-1.95	16	52.6	182	61%	CW
5	DEMO_E, 100W	28	0.7-2.7	10.6	49.8	96	40%	CW
6	DEMO_F, 200W	28	1.1-1.7	17.1	53.0	200	65%	Pulse
7	DEMO_G, 140W	28	2.2-2.9	12.6	51.0	126	46%	CW
8	DEMO_H, 200W	28	0.9-0.92	21.3	53.2	208	62%	CW
9	DEMO_I, 200W	28	2.4-2.5	15.7	53.0	200	66%	CW

13. Recommended Solder Temperature Profile

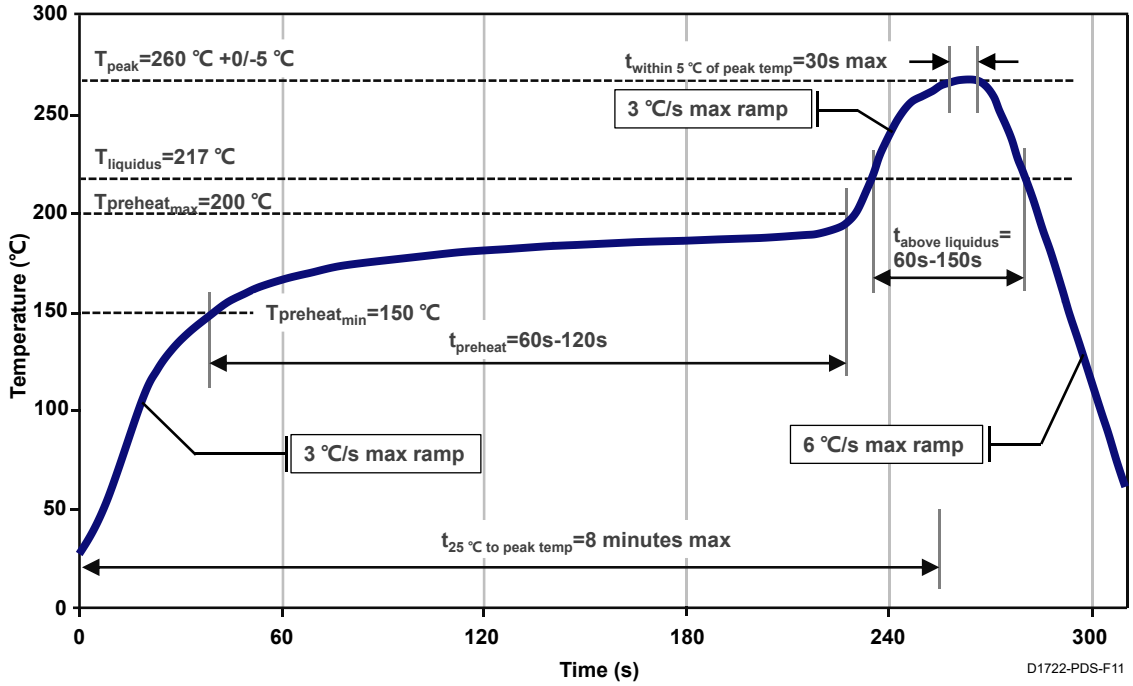


Figure 11. Recommended Solder Temperature Profile

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

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