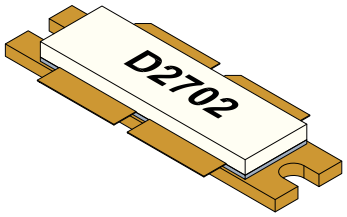
1. Description

- The D2702 is a 1000W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT).
- The D2702 operates from DC to 3GHz with a 48V supply rail. The device is offered in an industry standard air cavity package.



D2702-PDS-F01

Figure 1. D2702 Package Outline

2. Applications

- Military and Civilian Radar
- Land Mobile and Military Radio Communications
- Weather Radar
- Secondary Radar

3. Features

- Operating Frequency: DC–3GHz
- Output Power[1] (P_{SAT}): 60.5dBm (1122W)
- Linear Gain[1]: 20dB
- Typical DE[1] @P_{SAT}: 78%
- Operating Voltage: 48V
- Pulse Capable
- Package Type: 1230F-A

[1] Measured in Raytron DEMO @1.2GHz

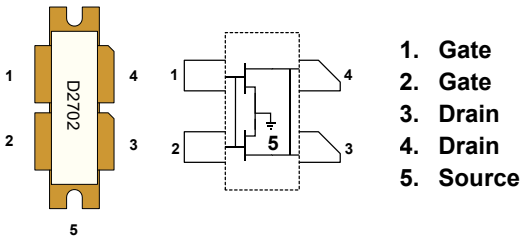
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	0.96GHz	1.1GHz	1.25GHz	Units
Linear Gain	17.8	18.8	17.8	dB
Drain Efficiency	62.2	77.7	71.8	%
Output Power	60.5	59.7	59.3	dBm
Output Power	1122	933	851	W

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 1000mA, V_{GS} = -3.2V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%

5. Block Diagram



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

D2702-PDS-F02

Figure 2. D2702 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}	176	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}	–	48	55	V
Drain Bias Current, I_{DS}	–	1000	–	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)	R_{thsc} (IR)	-	°C/W
Thermal Resistance (Junction-to-Case)	R_{thjc} (FEA)	0.28	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 280W

2. Thermal Resistance at average power by Finite Element Analysis, Junction-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 280W

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} = 176.0mA)	$V_{DS(BR)}$	150	-	-	V
Saturated Drain Current[1] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	183	-	A
Gate Threshold Voltage[2] (V_{DS} = 48V, I_{DS} = 176mA)	$V_{GS(TH)}$	-3.95	-3.32	-2.60	V
Gate Quiescent Voltage[2] (V_{DS} = 48V, I_{DS} = 1000mA)	$V_{GS(Q)}$	-	-3.20	-	V

1. Scaled from PCM data

2. Measured in Raytron DEMO

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

Parameter	0.96GHz	1.0GHz	1.05GHz	1.1GHz	1.15GHz	1.2GHz	1.25GHz	Units
Linear Gain	17.8	19.3	19.3	18.8	18.3	17.9	17.8	dB
Drain Efficiency	62.2	70.2	77.1	77.7	74.6	71.5	71.8	%
Output Power	60.5	60.4	60.2	59.7	59.4	59.4	59.3	dBm
Output Power	1122	1096	1047	933	871	871	851	W

1. Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 1000mA, V_{GS} = -3.2V
2. Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%

Table 7. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	229.15	-	pF
Output Capacitance	C_{DS}	-	62.94	-	pF
Feedback Capacitance	C_{GD}	-	8.28	-	pF

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

9. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_A: 0.96-1.25GHz)

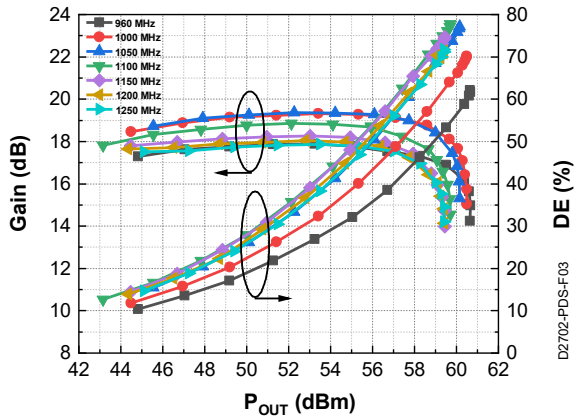


Figure 3. Wide-band Application Gain and DE vs. Output Power

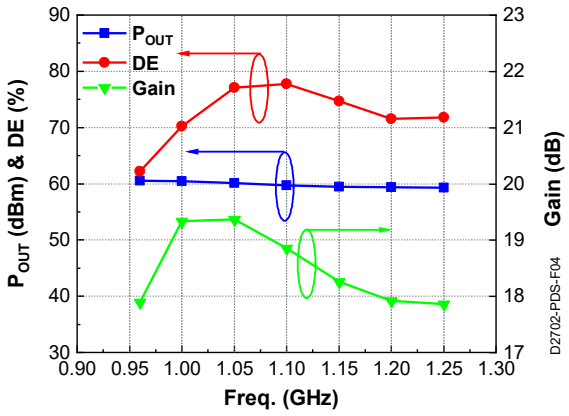


Figure 4. Wide-band Application P_{OUT}, Gain and DE vs. Freq.

- Typical Class AB performance in Raytron Wide-band Application DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 1000mA, V_{GS} = -3.2V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 5%
- The output power is 59.3dBm (851W) at 0.96-1.25GHz. It can be used in the avionics and L band radar application.

10. Package Outline

■ Pin Layout

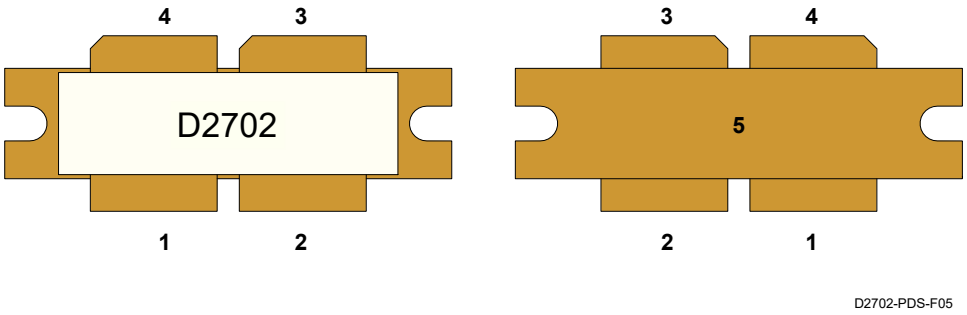


Figure 5. D2702 Pin Layout

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: 1230F-A)

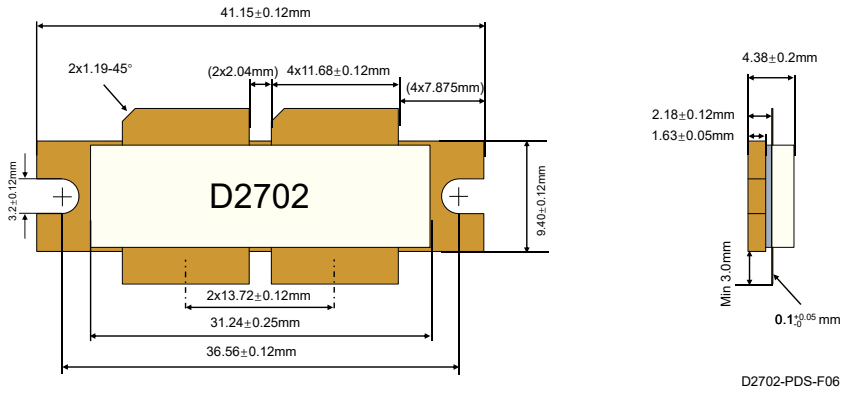


Figure 6. D2702 Mechanical Drawing

11. Application Circuit

■ Schematic

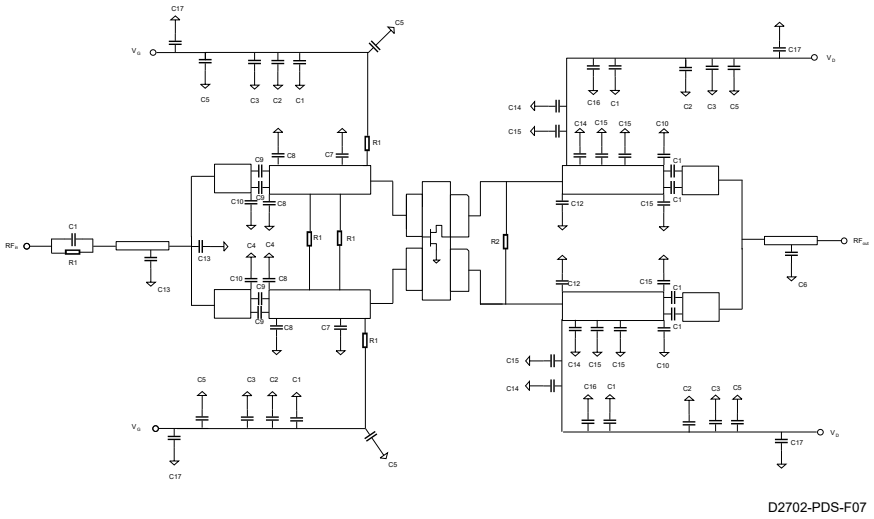


Figure 7. D2702 DEMO_A Application Circuit Schematic

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

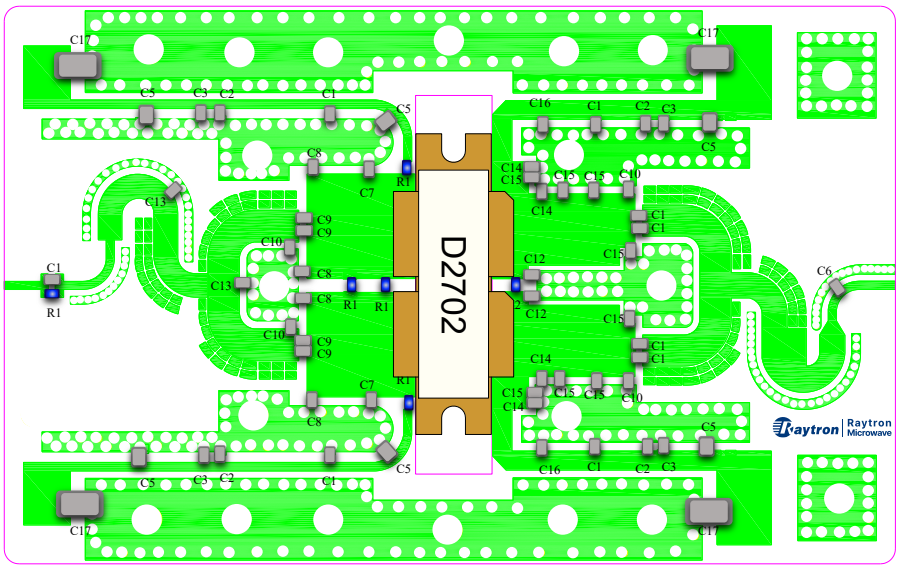


Figure 8. D2702 Application Circuit Layout
(DEMO_A Size: 12 x 7.5cm)

Table 10. Bill of Materials of DEMO_A

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	30.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E300GB12
C2	100.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C3	10.0nF	X7R 100V 0603 Capacitor	Murata	GCM188R72A103KA37D
C5	4.7uF	X7R 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C6	1pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R0BB12
C7	4.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E4R0CB12
C8	2.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R3BB12
C9	7.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E7R5CB12
C10	3.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E3R5BB12
C12	9.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E9R0CB12
C13	5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E5R0CB12
C14	7.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E7R0CB12
C15	3.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E3R0BB12
C16	62pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E620JB12
C17	470uF	100V,470uF	JWCO	N/A
R1	10Ω	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL
R2	2Ω	1/2W 1210 Resistor	Yageo	RC1210FR-072RL

12. DEMO Summary

Table 11. DEMO Summary

NO.	D2702 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 900W	48	0.96-1.25	17.8	59.3	851	62.2%	Pulse

13. Recommended Solder Temperature Profile

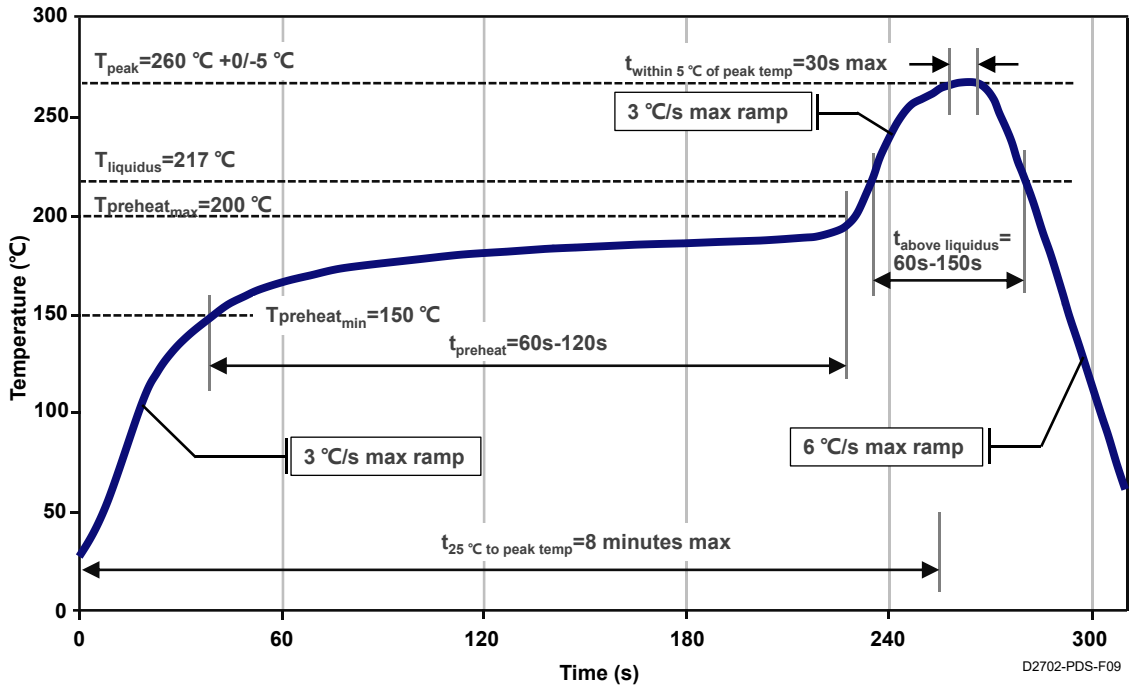


Figure 9. Recommended Solder Temperature Profile

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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