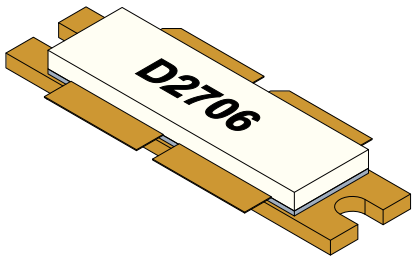
1. Description

- The D2706 is a 3000W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT).
- The D2706 operates from DC to 3GHz with a 48V supply rail. The device is offered in an industry standard air cavity package.



D2706-PDS-F01

Figure 1. D2706 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}): 64.8dBm (3027W)
- Linear Gain[1]: 14.4dB
- Typical DE[1] @P_{SAT}: 52.8%
- Operating Voltage: 48V
- Pulse Capable
- Package Type: 1230F-A

[1] Measured in Raytron DEMO @2.7GHz

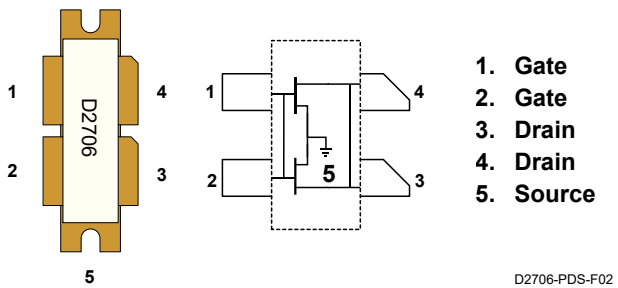
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.7GHz	3.0GHz	Units
Linear Gain	14.4	14.3	dB
Drain Efficiency	52.8	55.3	%
Output Power	64.8	64.2	dBm
Output Power	3027	2600	W

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 48V, I_{DS} = 350mA, V_{GS} = -3.0V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 2%

5. Block Diagram



D2706-PDS-F02

Figure 2. D2706 Block Diagram

Table of Contents

No.	Contents	Page
1	Description	1
2	Applications	1
3	Features	1
4	Brief Typical Performance	1
5	Block Diagram	1
6	Absolute Maximum Ratings	3
7	Recommended Operating Conditions	3
8	Electrical Characteristics	3
9	Wide-band Application Performance	4
10	Package Outline	5
11	Application Circuit	6
12	DEMO Summary	7
13	Recommended Solder Temperature Profile	8
14	Handling Precautions	8
15	Contact Information	9
16	Disclaimer	9

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 ~ +60	V
Maximum Forward Gate Current	I_{GMax}	320.0	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}	-	48.0	60.0	V
Drain Bias Current, I_{DS}	-	350	-	mA
Gate-Source Voltage, V_{GS}	-	-3.0	-	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)	TBD	°C/W

1. Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 400.0W

2. Thermal Resistance at average power by Finite Element Analysis, Junction-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 400.0W

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} = 320mA)	$V_{DS(BR)}$	150	-	-	V
Saturated Drain Current[1] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	346.90	-	A
Gate Threshold Voltage[2] (V_{DS} = 48V, I_{DS} = 320mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage[2] (V_{DS} = 48V, I_{DS} = 350mA)	$V_{GS(Q)}$	-	-3.00	-	V

1. Scaled from PCM data

2. Measured in Raytron DEMO

Table 6. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	503.99	-	pF
Output Capacitance	C_{DS}	-	109.20	-	pF
Feedback Capacitance	C_{GD}	-	18.48	-	pF

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

9. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_A: 2.7-3.0GHz)

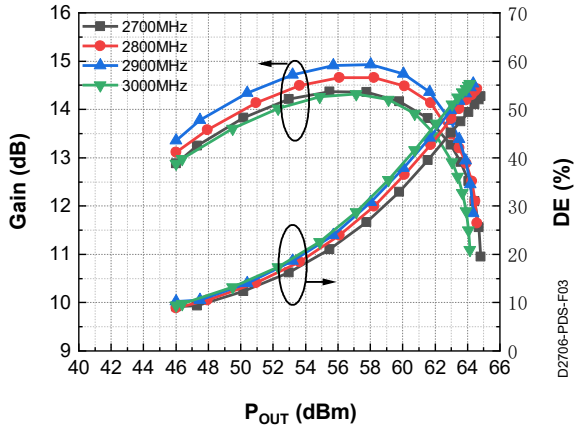


Figure 3. Wide-band Application Gain and DE vs. Output Power

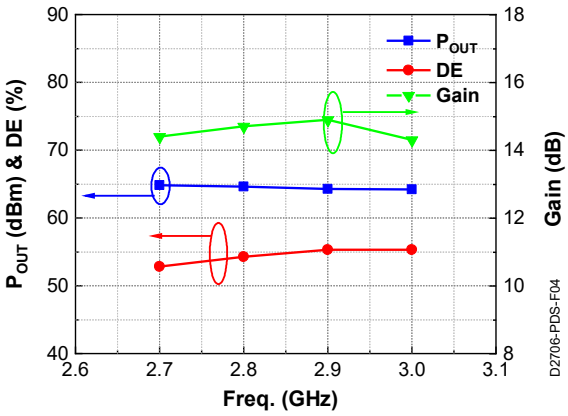


Figure 4. Wide-band Application P_{OUT}, Gain and DE vs. Freq.

Table 7. RF Characteristics

Parameter	2.7GHz	2.8GHz	2.9GHz	3.0GHz	Units
Linear Gain	14.4	14.7	14.9	14.3	dB
Drain Efficiency	52.8	54.3	55.3	55.3	%
Output Power	64.8	64.6	64.3	64.2	dBm
Output Power	3027	2877	2716	2600	W

• 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} = 350mA, V_{GS} = -3.0V

• Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 2%

• The output power is 64.2dBm (2600W) at 2.7-3.0GHz. It can be used in the avionics and S band radar application.

10. Package Outline

■ Pin Layout

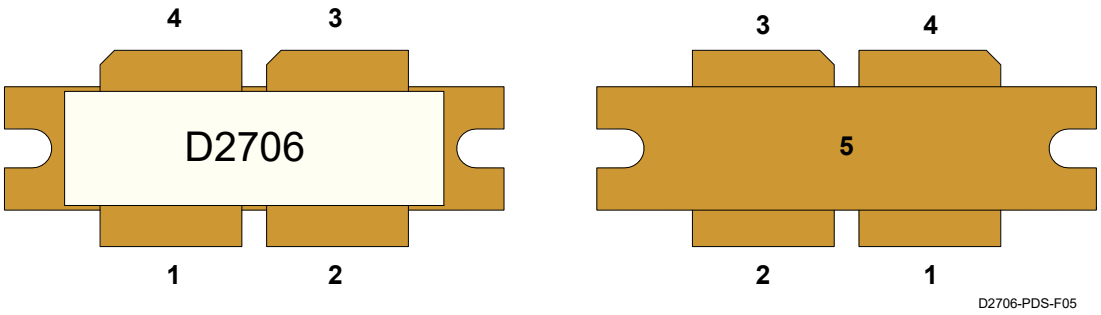


Figure 5. D2706 Pin Layout

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)

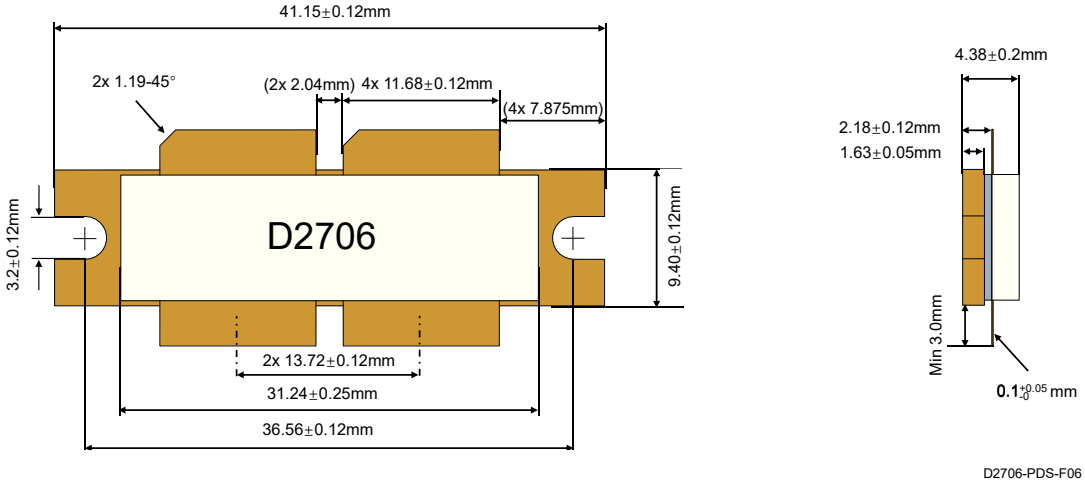


Figure 6. D2706 Mechanical Drawing

11. Application Circuit

■ Schematic

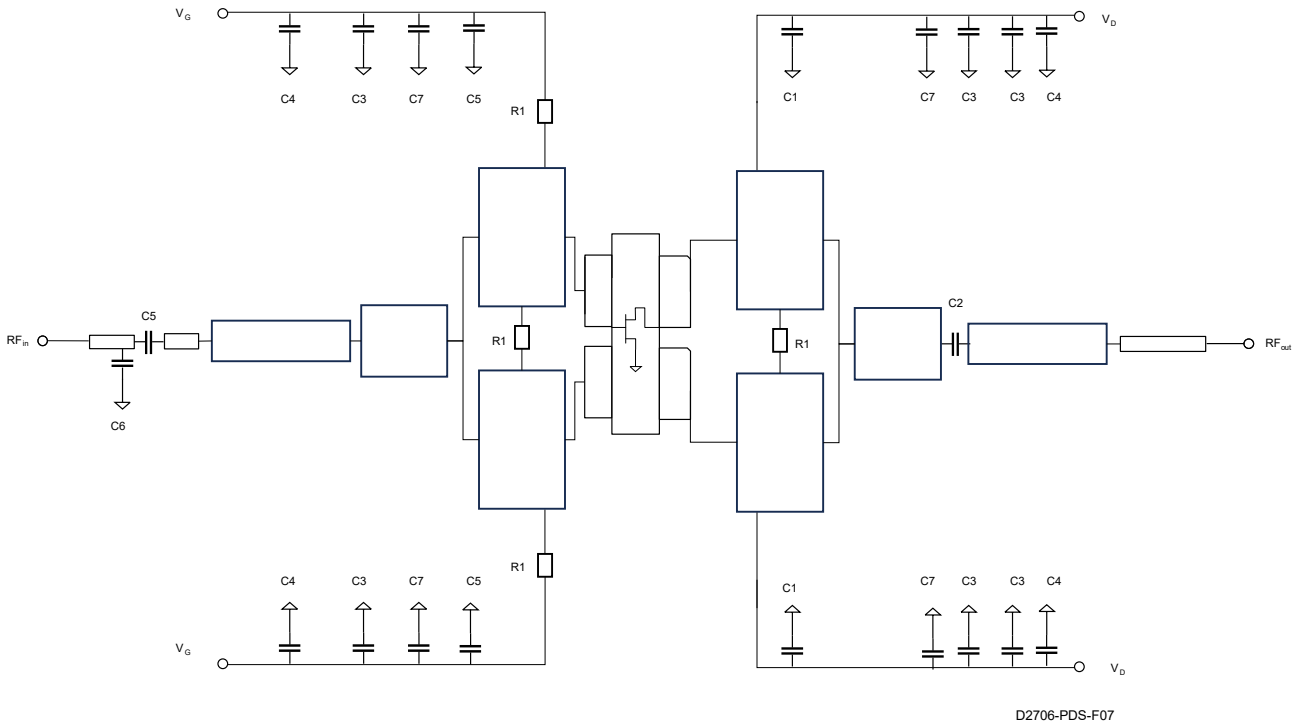


Figure 7. D2706 DEMO_A Application Circuit Schematic

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

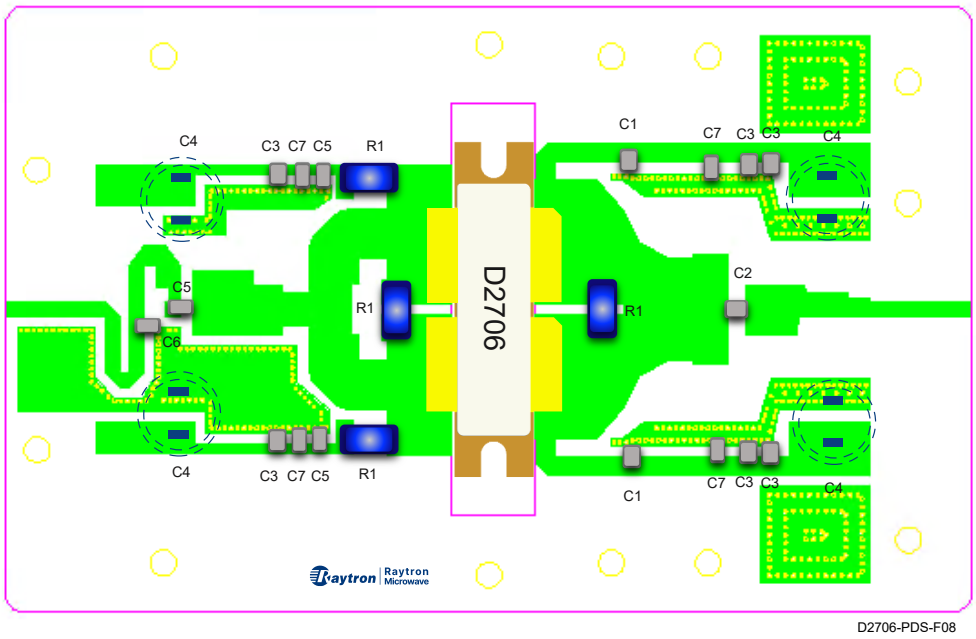


Figure 8. D2706 Application Circuit Layout
(DEMO_A Size: 12 x 7.5cm)

Table 10. Bill of Materials of DEMO_A

Component	Value	Description	Manufacturer	Part Number
PCB	30mil	Rogers4003C	Rogers	PCB
C1	10pF	1500V 10pF 1111 Capacitor	Chuangtian	SQ-1111C0G100J152NT
C2	8.2pF	1500V 8.2pF 1111 Capacitor	Chuangtian	SQ-1111C0G8R2C152NT
C3	10uF	X7R 100V 1206 Capacitor	Murata	GRM32EC72A106KE05L
C4	470uF	100V,470uF	JWCO	N/A
C5	9.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E9R0CB12
C6	0.7pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER70WB12
C7	1nF	C0G 250V 0805 Capacitor	Murata	GRM21A5C2E102JWA1D
R1	5.1Ω	1W 2512 Resistor	Yageo	RC2512JK-075R1L

12. DEMO Summary

Table 11. DEMO Summary

NO.	D2706 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 2600W	48	2.7-3.0	14.3	64.2	2600	52.8%	Pulse

13. Recommended Solder Temperature Profile

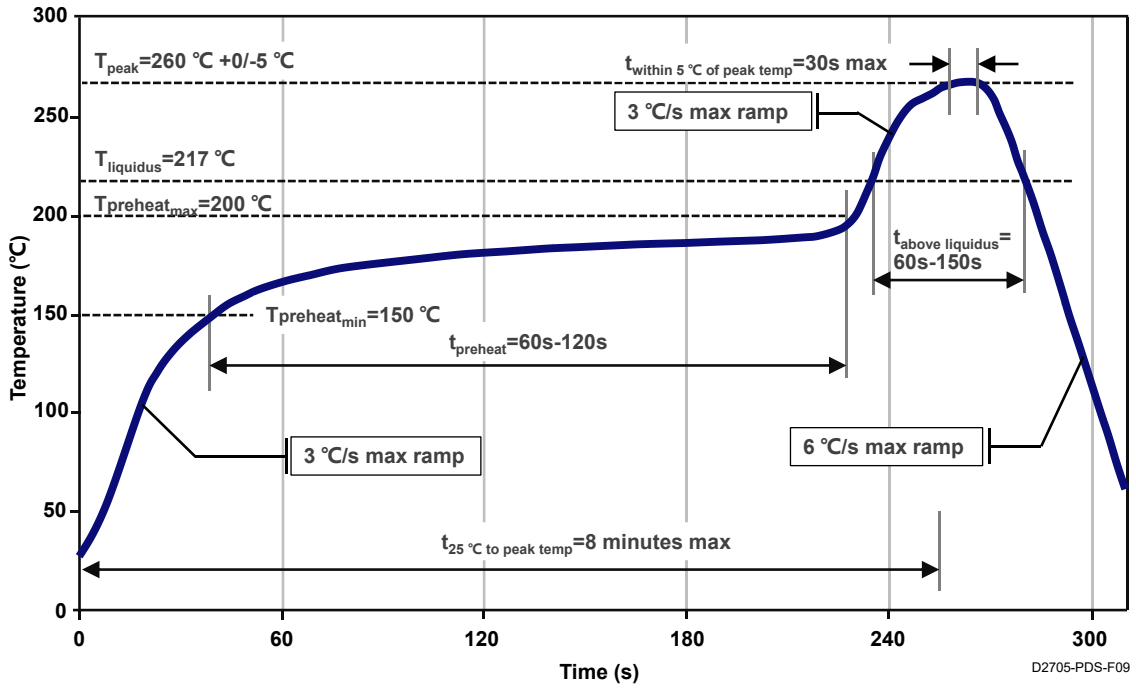


Figure 9. Recommended Solder Temperature Profile

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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