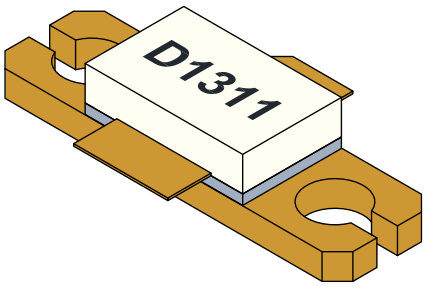
1. Description

- The D1311 is an 80W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1311 operates from DC to 6.5GHz with a 28V supply rail. It can deliver 70W CW power across the 4.8 to 6.2 GHz. The device is offered in an industry standard air cavity package.



D1311-PDS-F01

Figure 1. D1311 Package Outline

2. Applications

- Point-to-point Communication
- Broadband Wireless Access
- 5.8GHz ISM Applications

3. Features[1]

- Operating Frequency: DC–6.5GHz
- Output Power[1] (P_{SAT}): 49.9dBm (98W)
- Linear Gain[1]: 15.0dB
- Typical DE @P_{SAT}[1]: 63.2%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package Type: 360F-C

[1] Measured in Raytron DEMO @5.3GHz

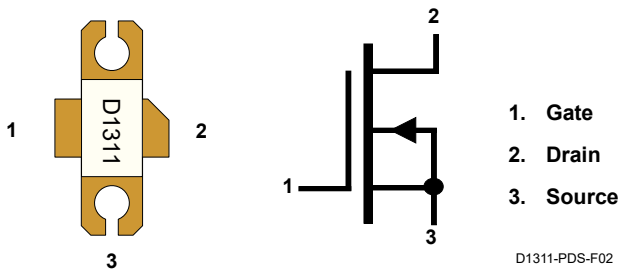
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	5.0GHz		5.5GHz		6.0GHz		Units
	Pulse	CW	Pulse	CW	Pulse	CW	
Linear Gain	14.3	13.6	14.6	13.6	13.9	12.9	dB
Drain Efficiency	66.8	57.9	60.5	53.7	58.1	51.2	%
Output Power	49.9	49.1	49.4	48.4	49.5	48.6	dBm
Output Power	98	81	87	69	89	72	W

- Typical Class AB performance in DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = - 2.80V
- Pulse Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



D1311-PDS-F02

Figure 2. D1311 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}	18.48	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	40	V
Drain Bias Current, I_{DS}	-	200	-	mA
Gate-Source Voltage, V_{GS}	-	-2.8	-	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)	1.31	°C/W
Thermal Resistance (Junction-to-Case)[2]	R_{thjc} (FEA)	1.61	°C/W

[1] Thermal Resistance at average power by infrared measurement, Active Die Surface-to-Case, $T_{base\text{-}plate}$ = 85℃, P_D = 64.0W

[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} = 18.5mA)	$V_{DS(BR)}$	120	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	20.41	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 18.5mA)	$V_{GS(th)}$	-3.30	-2.80	-2.60	V
Gate Quiescent Voltage[3] (V_{DS} = 28V, I_{DS} = 200mA)	$V_{GS(Q)}$	-	-2.80	-	V

[1] Measured on wafer prior to packaging

[2] Measured with packaged device

[3] Typical Class AB performance in Raytron DEMO

Table 6. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	26.60	-	pF
Output Capacitance	C_{DS}	-	21.61	-	pF
Feedback Capacitance	C_{GD}	-	1.22	-	pF

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

9. Wide-band Application Performance

■ Wide-band Application Performance (DEMO_A, 4.8-6.2GHz, Pulse)

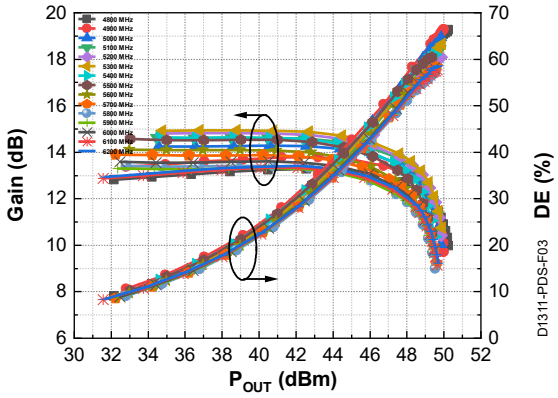


Figure 3. Wide-band Application Gain and DE vs. Output Power

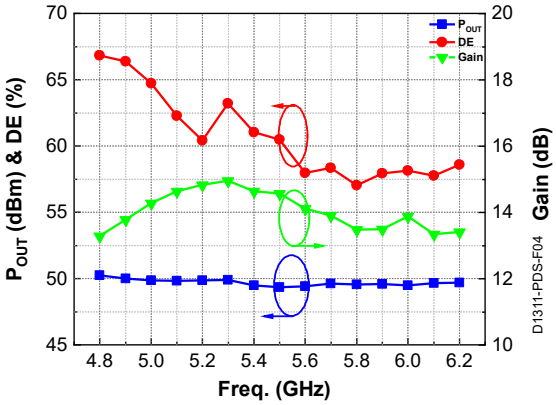


Figure 4. Wide-band Application P_{OUT}, Gain, and DE vs. Freq.

Table 7. RF Characteristics

Freq. (GHz)	Linear Gain (dB)	Drain Efficiency (%)	Output Power (dBm)	Output Power (W)
4.8	13.3	66.8	50.2	105
4.9	13.8	66.4	50.0	100
5.0	14.3	64.7	49.9	98
5.1	14.6	62.3	49.8	95
5.2	14.8	60.4	49.9	98
5.3	15.0	63.2	49.9	98
5.4	14.6	61.0	49.5	89
5.5	14.6	60.5	49.4	87
5.6	14.1	58.0	49.4	87
5.7	13.9	58.3	49.6	91
5.8	13.5	57.0	49.5	89
5.9	13.5	57.9	49.6	91
6.0	13.9	58.1	49.5	89
6.1	13.3	57.8	49.6	91
6.2	13.4	58.6	49.7	93

• Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.80V

• Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

• The output power is 49.4dBm (87W) at 4.8-6.2GHz.

■ Wide-band Application Performance (DEMO_A, 4.8-6.2GHz, CW)

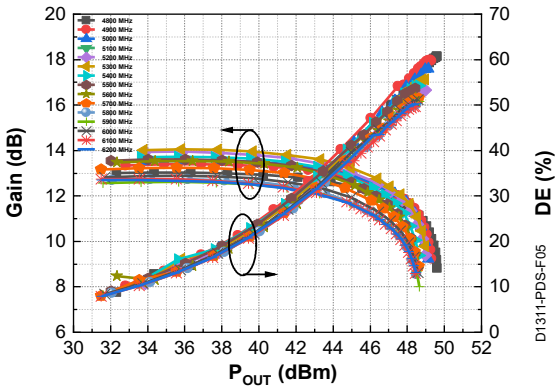


Figure 5. Wide-band Application Gain and DE vs. Output Power

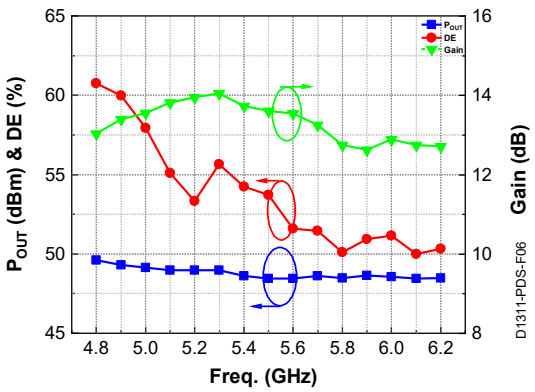


Figure 6. Wide-band Application P_{OUT}, Gain, and DE vs. Freq

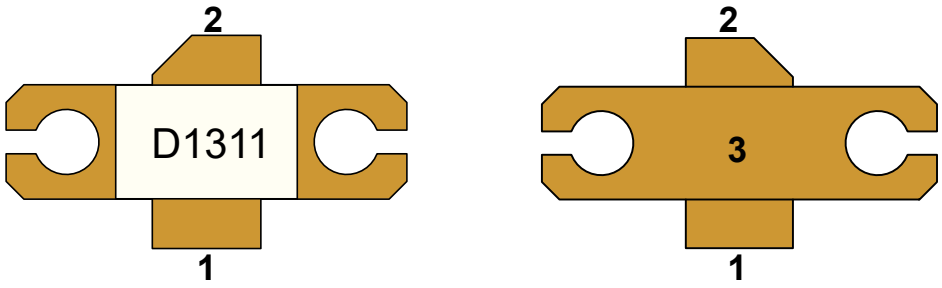
Table 8. RF Characteristics

Freq. (GHz)	Linear Gain (dB)	Drain Efficiency (%)	Output Power (dBm)	Output Power (W)
4.8	13.0	60.8	49.6	91
4.9	13.4	60.0	49.3	85
5.0	13.6	57.9	49.1	81
5.1	13.8	55.1	49.0	79
5.2	14.0	53.3	49.0	79
5.3	14.1	55.7	49.0	79
5.4	13.7	54.3	48.6	72
5.5	13.6	53.7	48.4	69
5.6	13.5	51.6	48.5	71
5.7	13.3	51.5	48.6	72
5.8	12.7	50.1	48.5	71
5.9	12.6	50.9	48.7	74
6.0	12.9	51.2	48.6	72
6.1	12.7	50.0	48.4	69
6.2	12.7	50.3	48.5	71

- Typical Class AB performance in Raytron DEMO_A with the device soldered onto the heatsink, test condition: V_{DS} = 28V, I_{DS} = 200mA, V_{GS} = -2.80V
- Test Condition: CW
- The output power is 48.4dBm (69W) at 4.8-6.2GHz.

10. Package Outline

■ Pin Layout



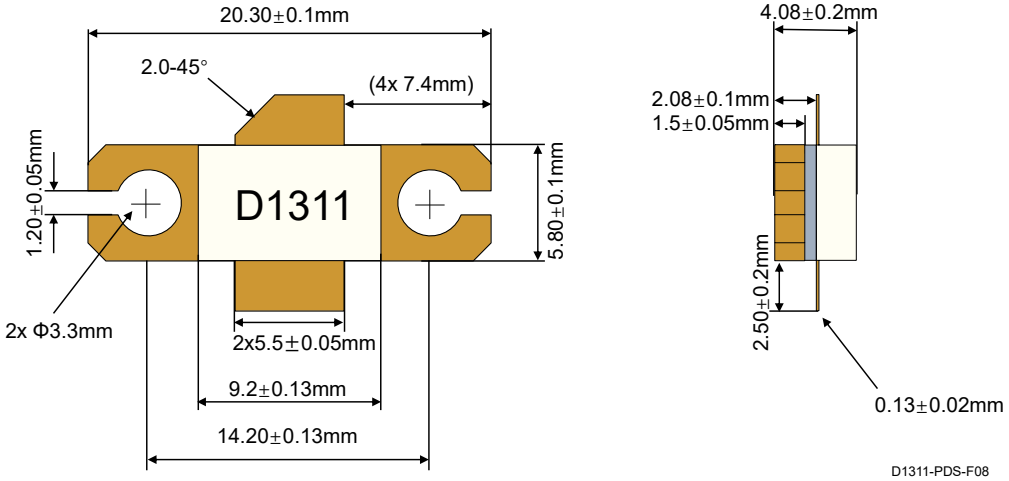
D1311-PDS-F07

Figure 7. D1311 Pin Layout

Table 9. Pin Description

Pin	Symbol	Description
1	V_G / RF IN	Gate voltage / RF Input
2	V_D / RF OUT	Drain voltage / RF Output
3	Flange	Source to be Connected to Ground

■ Mechanical Drawing (Package Type: 360F-C)



D1311-PDS-F08

Figure 8. D1311 Mechanical Drawing

11. Application Circuit

■ Schematic

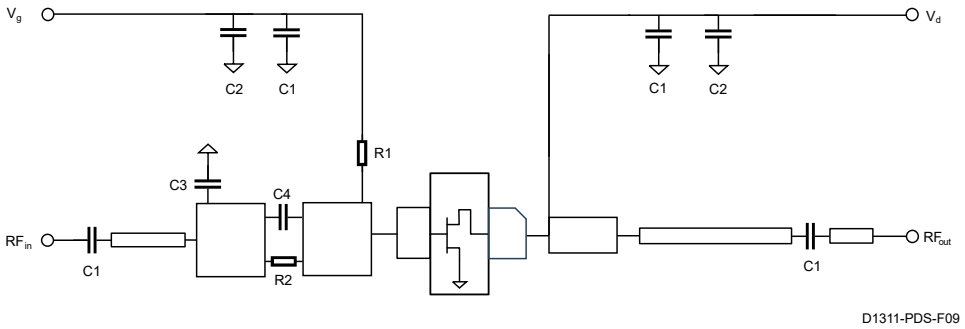


Figure 9. D1311 DEMO_A Application Circuit Schematic

Table 10. 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

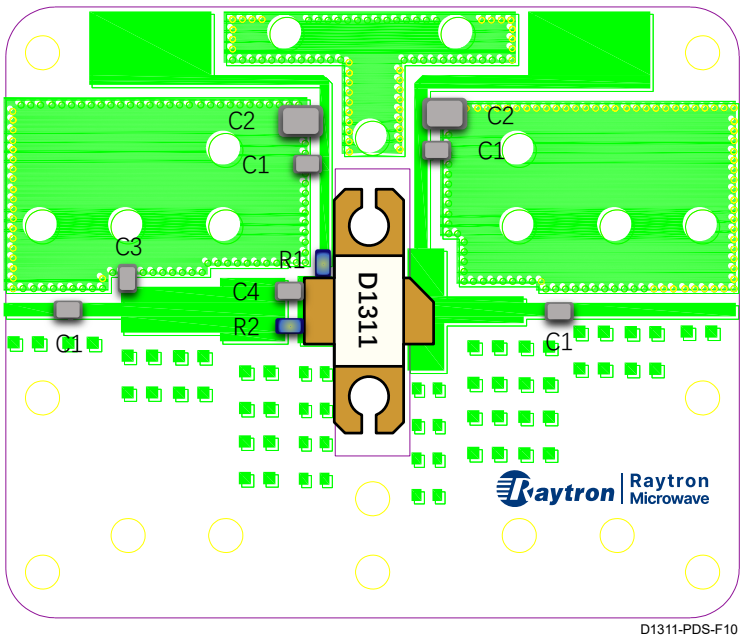


Figure 10. D1311 Application Circuit Layout
（DEMO_A Size: 6.0cm x 5.0cm）

Table 11. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	2.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E2R0BB12D
C2	1.0uF	X7R 100V 1210 Capacitor	Murata	GRM32ER72A105KA01
C3	0.3pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER30WB12D
C4	3.0pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E3R0BB12D
R1	10.0ohms	1/8W 0805 Resistor	Yageo	RC0805FR-0710RL
R2	5.1ohms	1/8W 0805 Resistor	Yageo	RC0805FR-075R1L

12. DEMO Summary

Table 12. DEMO Summary

NO.	D1311 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency	Pulse or CW
1	DEMO_A, 70W	28	4.8-6.2	12.5	48.4	69	50.0%	CW

13. Recommended Solder Temperature Profile

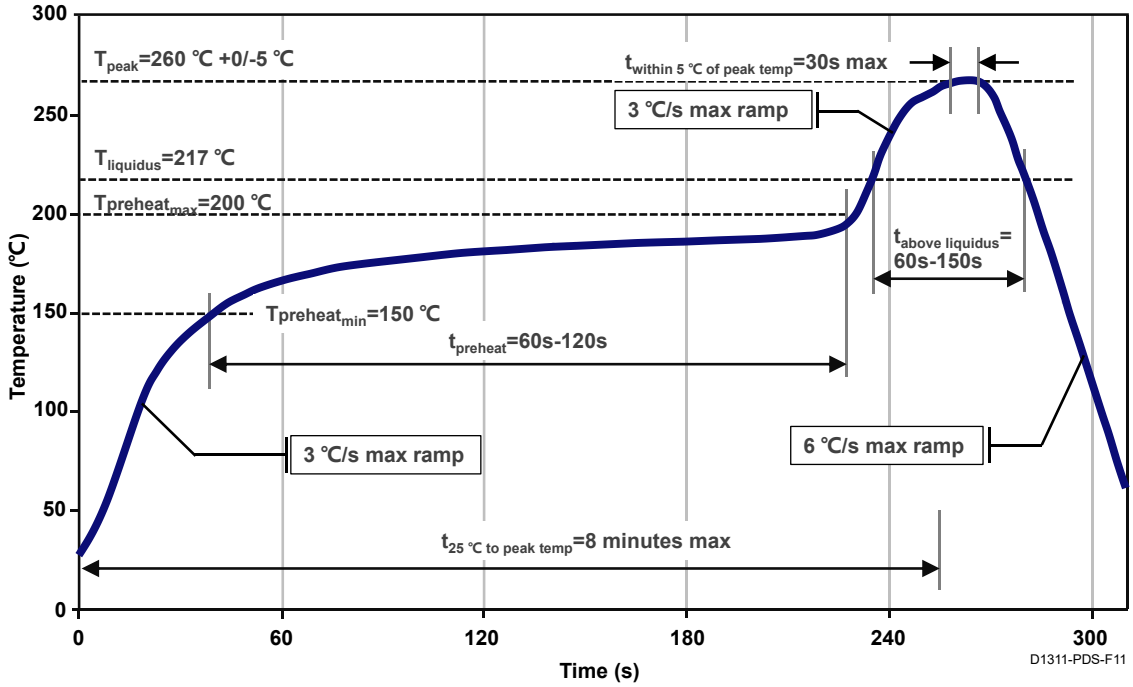


Figure 11. Recommended Solder Temperature Profile

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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