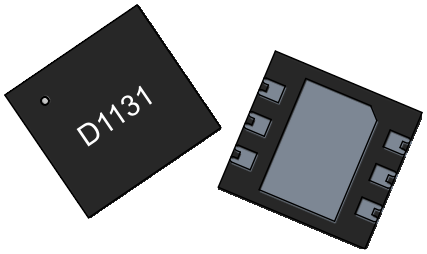
1. Description

- The D1131 is a 34W (P_{SAT}) wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1131 operates from DC to 3.0GHz with a 28V supply rail. It is assembled in a lead-free 7.0 x 6.5mm 6-lead DFN plastic package.



D1131-PDS-F01

Figure 1. D1131 Package Outline

2. Applications

- Test and Measurement
- Defense Communications
- Land Mobile Radio
- Wireless Infrastructure

3. Features[1]

- Operating Frequency: DC-3GHz
- Output Power (P_{SAT}): 45.3dBm(34W)
- Linear Gain: 19.2dB
- Typical DE @P_{SAT}: 76.8%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package: DFN 7.00 x 6.50 x 0.75mm

[1] Measured in Raytron DEMO @2.6GHz

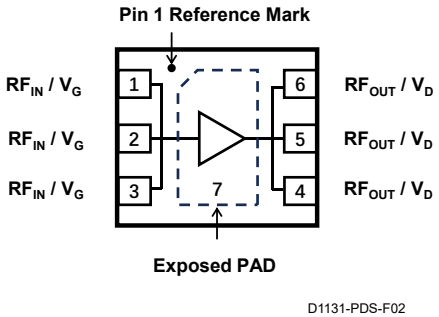
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.6GHz	Units
Linear Gain	19.2	dB
Drain Efficiency	76.8	%
Output Power	45.3	dBm
Output Power	34	W

- Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 150mA, V_{GS} = -3.0V
- Test condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



D1131-PDS-F02

Figure 2. D1131 Block Diagram

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6. Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Rating	Units
Drain-Source Voltage	V_{DSS}	84	V
Gate-Source Voltage	V_{GS}	-10 ~ +1	V
Operating Voltage	V_{DS}	10 ~ 32	V
Maximum Forward Gate Current	I_{GMax}	4.8	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}	-	28	32	V
Drain Bias Current, I_{DS}	-	150	-	mA
Gate-Source Voltage, V_{GS}	-	-3.0	-	V
Channel Temperature, T_{CH}	-	-	225	°C

8. Electrical Characteristics (T_C = 25˚C)

Table 4. DC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Drain-Source Breakdown Voltage[1] (V_{GS} = -10V, I_{DS} = 4.8mA)	$V_{DS(BR)}$	84	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	5.52	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 4.8mA)	$V_{GS(TH)}$	-3.3	-2.8	-2.3	V
Gate Quiescent Voltage (V_{DS} = 28V, I_{DS} = 150mA)	$V_{GS(Q)}$	-	-3.0	-	V

1. Measured on wafer prior to packaging
2. Measured with packaged device
3. Typical Class AB performance in Raytron DEMO

Table 5. RF Characteristics[1]

Test Method	Parameter	Symbol	Min.	Typ.	Max.	Units
DEMO[2] @2.6GHz	Linear Gain	G_{LIN}	-	19.2	-	dB
	Drain Efficiency	η_D	-	76.8	-	%
	Output Power	P_{SAT}	-	45.3	-	dBm

1. Test condition: Pulse, Pulse width = 100μs, Duty cycle = 10%
2. Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 150mA, V_{GS} = -3.0V

9. Typical Performance

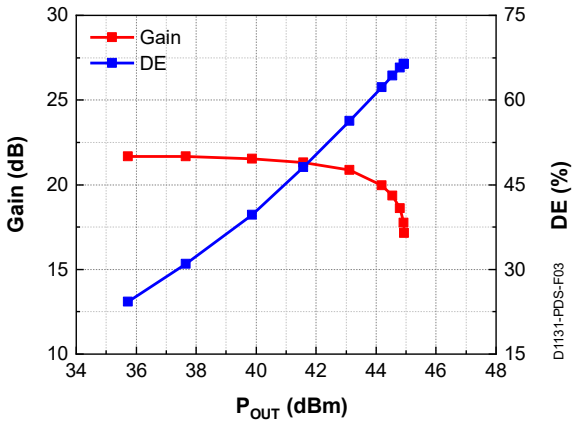


Figure 3. 1.2GHz Gain and DE @ MXP vs. Output Power

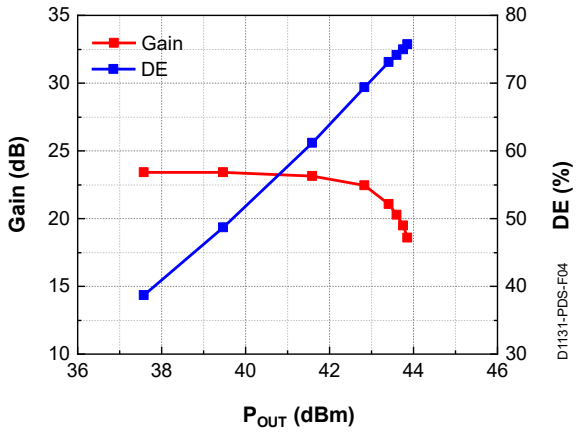


Figure 4. 1.2GHz Gain and DE @ MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 150mA
- Test condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

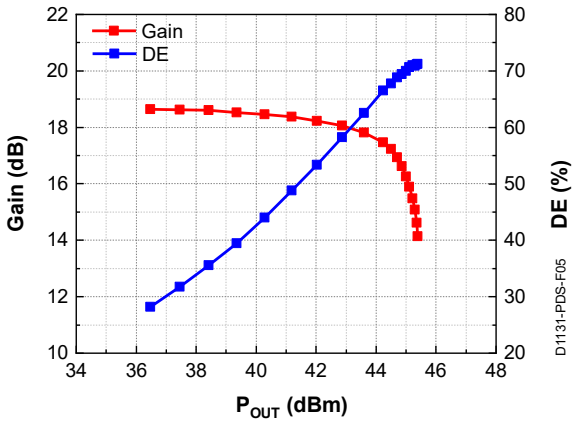


Figure 5. 2.6GHz Gain and DE @ MXP vs. Output Power

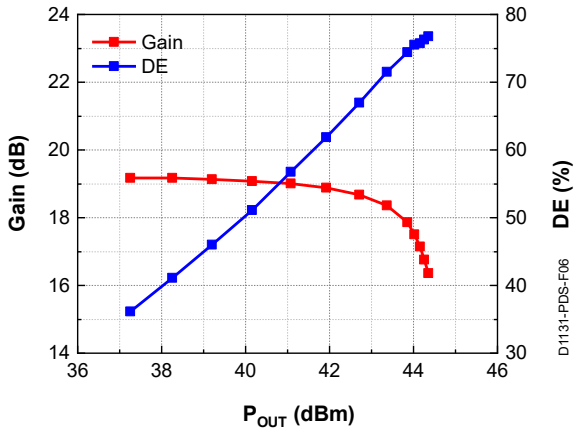


Figure 6. 2.6GHz Gain and DE @ MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 150mA, V_{GS} = -3.0V
- Test condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

10. Wide-band Application Performance (CW)

Table 6. RF Characteristics

Parameter	0.7GHz	0.73GHz	0.75GHz	Units
Linear Gain	19.8	19.9	20.5	dB
Power Gain	14.5	14.0	15.5	dB
Drain Efficiency	69.7	73.5	75.6	%
Output Power	45.0	45.2	45.1	dBm
Output Power	32	32	32	W

- Typical Class AB performance in Raytron DEMO_A, test condition: V_{DS} = 28V, I_{DS} = 150mA, V_{GS} = -3.0V
- Test condition: CW

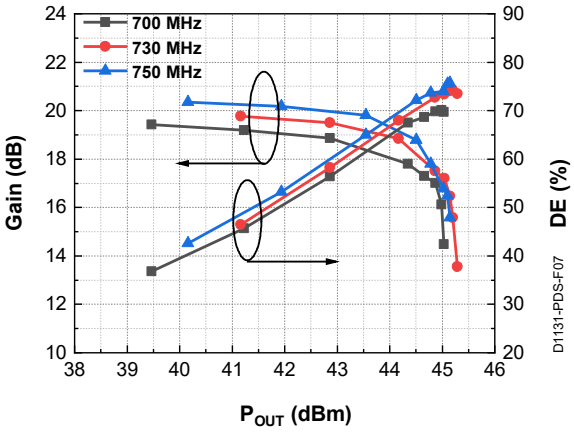


Figure 7. Gain and DE vs. Output Power (0.7GHz-0.75GHz)

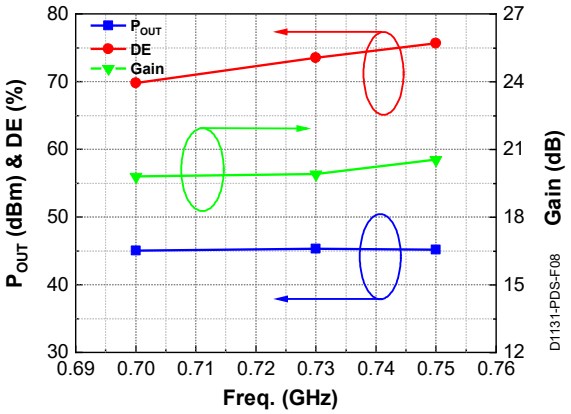


Figure 8. Gain and DE vs. Freq. (0.7GHz-0.75GHz)

- Typical Class AB performance in Raytron Wide-band Application DEMO_A, test condition: V_{DS} = 28V, I_{DS} = 150mA, V_{GS} = -3.0V
- Test Condition: CW
- The output power reaches 45.0dBm (32W) at 0.7-0.75GHz when V_{DS} = 28V.

11. Package Outline

■ Pin Layout

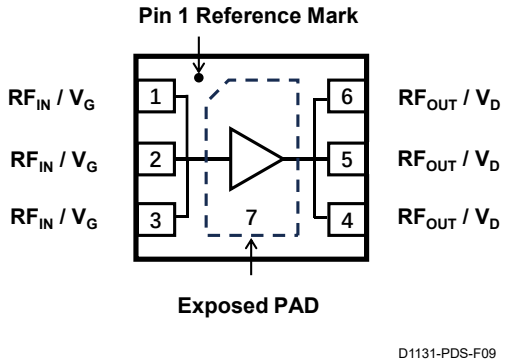


Figure 9. D1131 Pin Layout

Table 7. Pin Description

Pin	Symbol	Description
1/2/3	RF_{IN} / V_G	RF Input / Gate voltage
4/5/6	RF_{OUT} / V_D	RF Output / Drain voltage
7	Exposed PAD[1]	Ground / Source

[1]·The exposed pad centered on the package bottom must be connected to RF and DC ground. This path must also provide a low thermal resistance heat path.

■ Mechanical Drawing (Package Type: DFN 7.00 x 6.50 x 0.75mm)

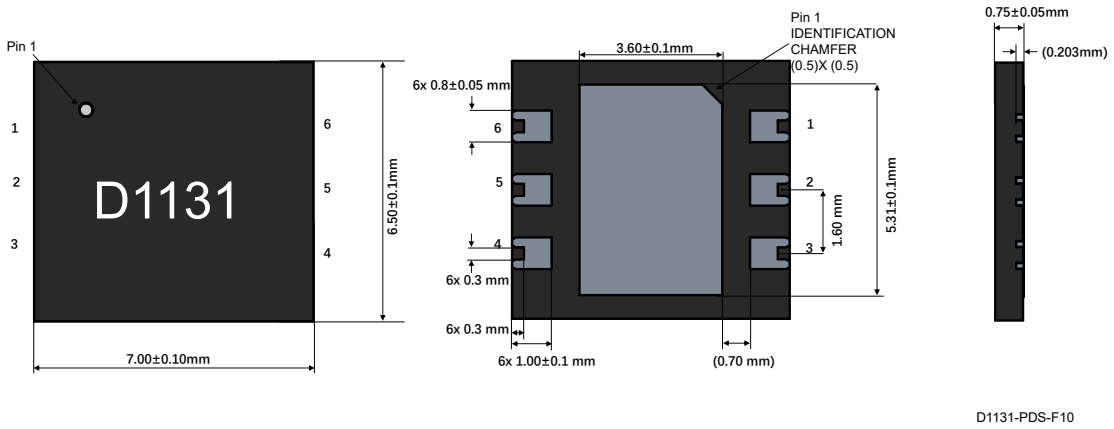


Figure 10. D1131 Mechanical Drawing

12. Application Circuit

■ Schematic

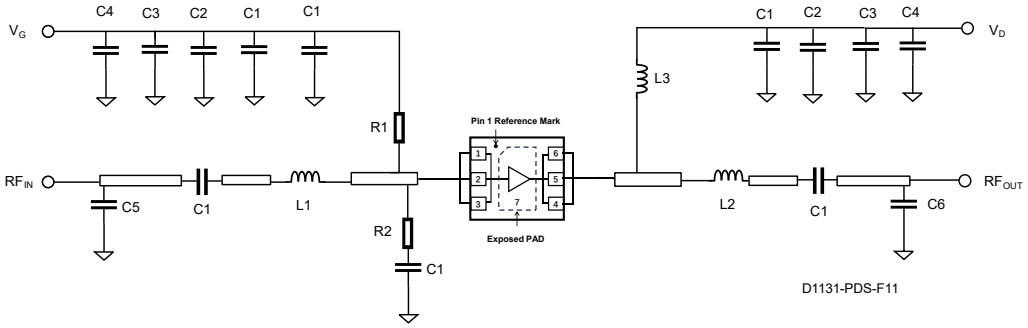


Figure 11. D1131 DEMO_A Application Circuit Schematic

Table 8. 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

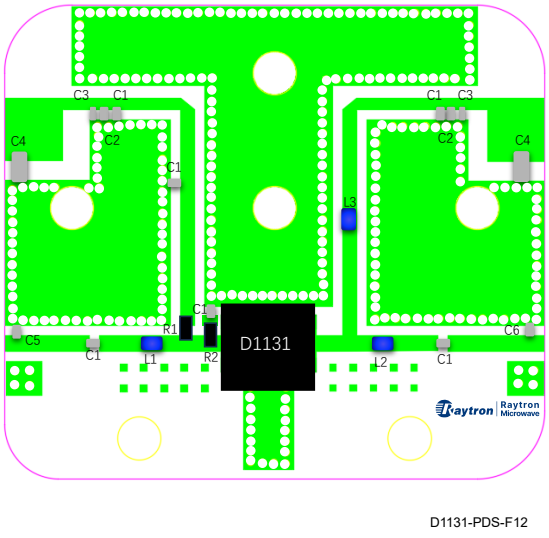


Figure 12. D1131 Application Circuit Layout (0.7GHz-0.75GHz)
（DEMO_A Size: 4.0 x 3.5cm）

Table 9. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	82pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E820JB12
C2	100pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E101JB12
C3	1000pF	C0G 100V 0603 Capacitor	Murata	GCM1885C2A102JA16D
C4	4.7uF	X7S 100V 1206 Capacitor	Murata	GRM31CC72A475KE11L
C5	9pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E9R0CB12
C6	5.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E5R5BB12
L1	4.3nH	2.2A 0603 Inductor	Murata	LQW18AN4N3C80D
L2	3.9nH	2.2A 0603 Inductor	Murata	LQW18AN3N9C80D
L3	0.9uH	1008AF-901X	JEC	1008AF-901X
R1	10Ω	1/8W 0805 Resistor	Yageo	AT0805BRD0710RL
R2	47Ω	1/8W 0805 Resistor	Yageo	AT0805BRD0747RL

13. DEMO Summary

Table 10. DEMO Summary

No.	D1131 DEMO Name	V_{DS} (V)	Freq (MHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency (%)	Pulse or CW
1	DEMO_A, 30W	28	700-750	19.8	45	30	69%	CW
2	DEMO_B, 20W	28	40-50	24	43.6	23	67%	CW

14. Recommended Solder Temperature Profile

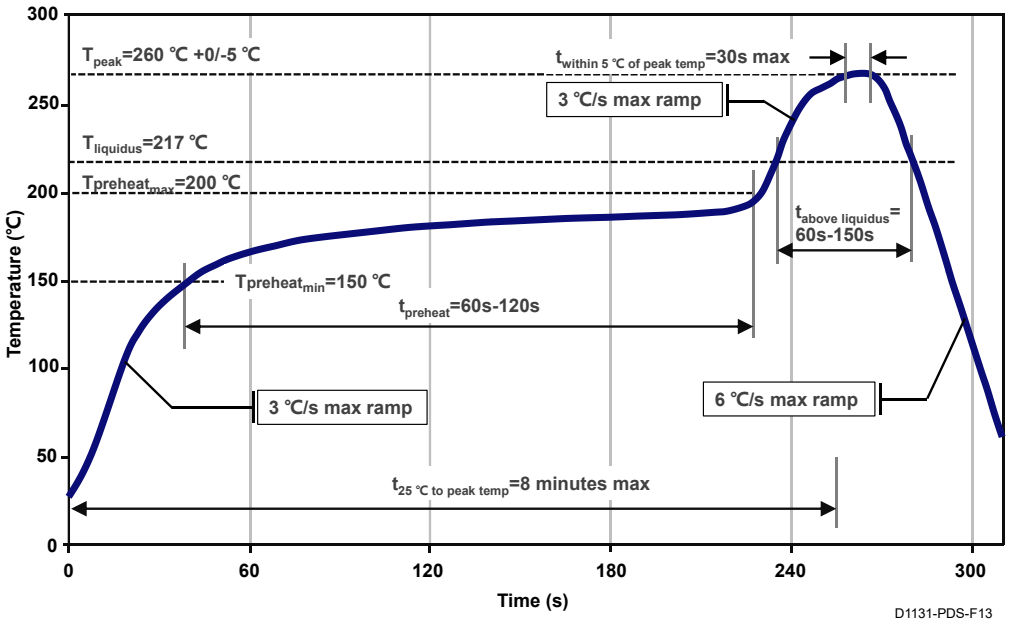


Figure 13. Recommended Solder Temperature Profile

15. 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.



16. 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

17. Disclaimer

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