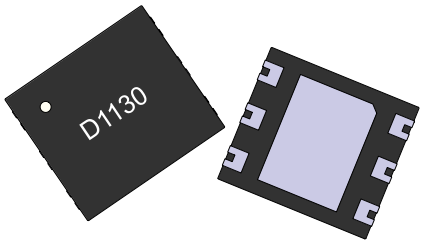
1. Description

- The D1130 is an 8W (P_{SAT}) wideband unmatched gallium nitride (GaN) high electron mobility transistor (HEMT) with first generation RF GaN technology from Raytron.
- The D1130 operates from DC to 8GHz with a 28V supply rail. It is assembled in a lead-free 4.5 x 4.0mm 6-lead DFN plastic package.



D1130-PDS-F01

Figure 1. D1130 Package Outline

2. Applications

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

3. Features[1]

- Operating Frequency: DC-8GHz
- Output Power (P_{SAT}): 39.3dBm (8.5W)
- Linear Gain: 23.2dB
- Typical DE @P_{SAT}: 71.5%
- Operating Voltage: 28V
- CW and Pulse Capable
- Package: DFN 4.50 x 4.00 x 0.75mm

[1] Measured in Raytron DEMO @2.6GHz

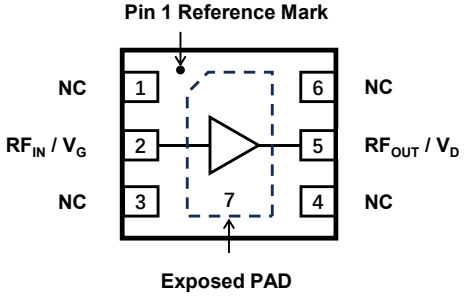
4. Brief Typical Performance

Table 1. Brief Typical Performance

Parameter	2.6GHz	Units
Linear Gain	23.2	dB
Drain Efficiency	71.5	%
Output Power	39.3	dBm
Output Power	8.5	W

- Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 100mA, V_{GS} = -2.3V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

5. Block Diagram



D1130-PDS-F02

Figure 2. D1130 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}	1.28	mA
Storage Temperature Range	T_{STG}	- 65 ~ +150	°C
Operating Junction Temperature	T_J	225	°C

7. Recommended Operating Conditions

Table 3. Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Units
Drain-Source Voltage Range, V_{DS}	-	28	48	V
Drain Bias Current, I_{DS}	-	100	-	mA
Gate-Source Voltage, V_{GS}	-	-2.3	-	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} = 1.28mA)	$V_{DS(BR)}$	150	-	-	V
Saturated Drain Current[2] (V_{DS} = 10V, V_{GS} = 1.0V)	I_{Max}	-	1.18	-	A
Gate Threshold Voltage[3] (V_{DS} = 28V, I_{DS} = 1.28mA)	$V_{GS(TH)}$	-3.30	-2.80	-2.30	V
Gate Quiescent Voltage (V_{DS} = 28V, I_{DS} = 100mA)	$V_{GS(Q)}$	-	-2.30	-	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}	-	23.2	-	dB
	Drain Efficiency	η_D	-	71.5	-	%
	Output Power	P_{SAT}	-	39.3	-	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} = 100mA, V_{GS} = -2.4V

Table 6. Dynamic Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Units
Input Capacitance	C_{GS}	-	1.77	-	pF
Output Capacitance	C_{DS}	-	0.81	-	pF
Feedback Capacitance	C_{GD}	-	0.08	-	pF

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

9. Typical Performance

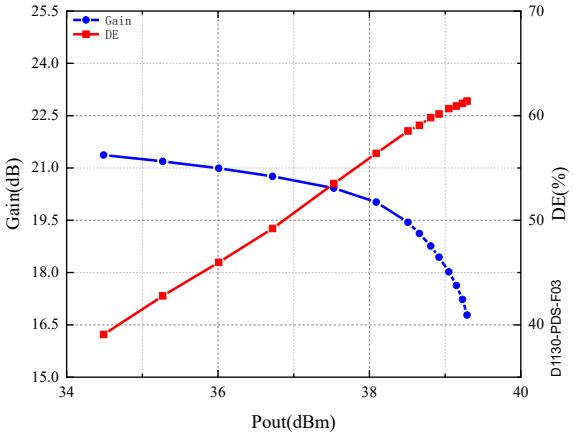


Figure 3. 2.6GHz Gain and DE @ MXP vs. Output Power

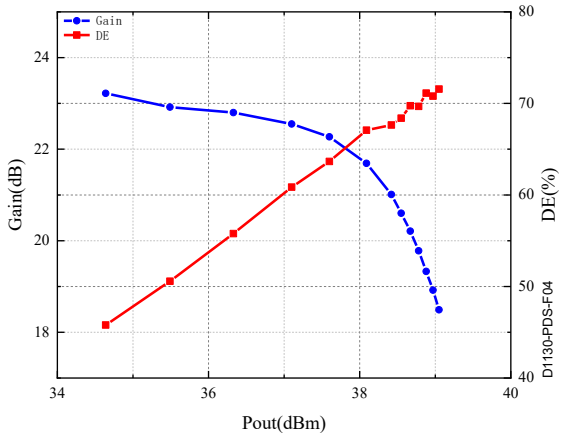


Figure 4. 2.6GHz Gain and DE @ MXE vs. Output Power

- Typical Class AB performance in Raytron DEMO, test condition: V_{DS} = 28V, I_{DS} = 100mA, V_{GS} = -2.4V
- Test Condition: Pulse, Pulse width = 100μs, Duty cycle = 10%

10. Wide-band Application Performance (CW)

Table 7. RF Characteristics (CW)

Parameter	5.7GHz	5.8GHz	5.9GHz	Units
Linear Gain	11.5	12.5	12.2	dB
Power Gain	8.1	9.0	9.1	dB
Drain Efficiency	55.2	58.2	56	%
Output Power	38.4	38.1	37.2	dBm
Output Power	7	6	5	W

- Typical Class AB performance in Raytron DEMO_A, test condition: V_{DS} = 28V, I_{DS} = 100mA, V_{GS} = -2.4V
- Test Condition: CW

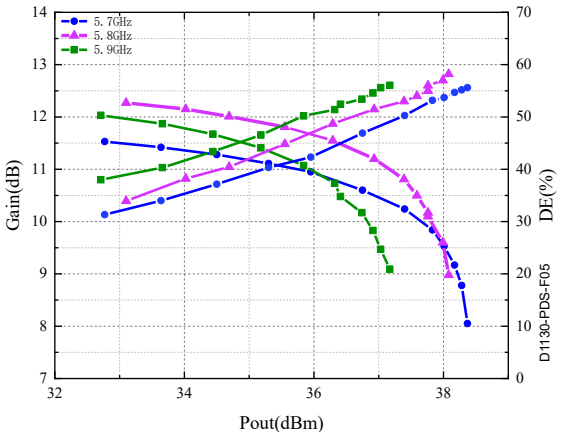


Figure 5. Gain and DE vs. Output Power (5.7GHz-5.9GHz)

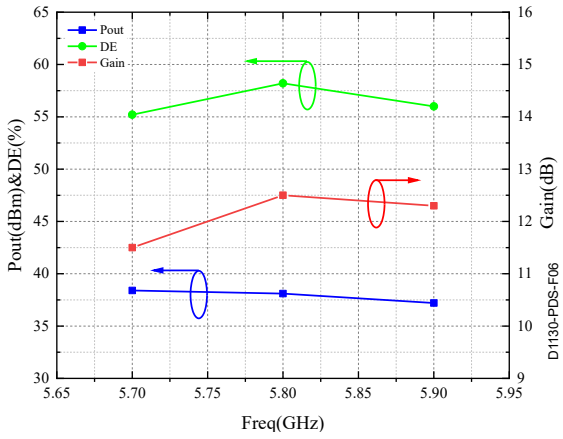


Figure 6. Gain and DE vs. Freq. (5.7GHz-5.9GHz)

- Typical Class AB performance in Raytron DEMO_A, test condition: V_{DS} = 28V, I_{DS} = 100mA, V_{GS} = -2.4V
- Test Condition: CW
- The output power reaches 37.2dBm(5W) at 5.7-5.9GHz when V_{DS} = 28V.

11. Package Outline

■ Pin Layout

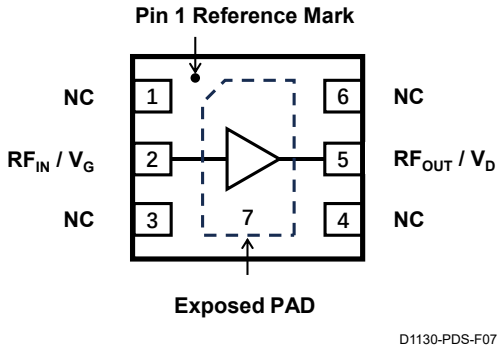


Figure 7. D1130 Pin Layout

Table 8. Pin Description

Pin	Symbol	Description
1/3/4/6	NC[1]	Not Connected
2	RF$_{IN}$ / V$_G$	RF Input / Gate Voltage
5	RF$_{OUT}$ / V$_D$	RF Output / Drain Voltage
7	Exposed PAD[2]	Ground / Source

[1] All no connection pins may be left floating or connected to the ground.

[2] 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 4.50 x 4.00 x 0.75mm)

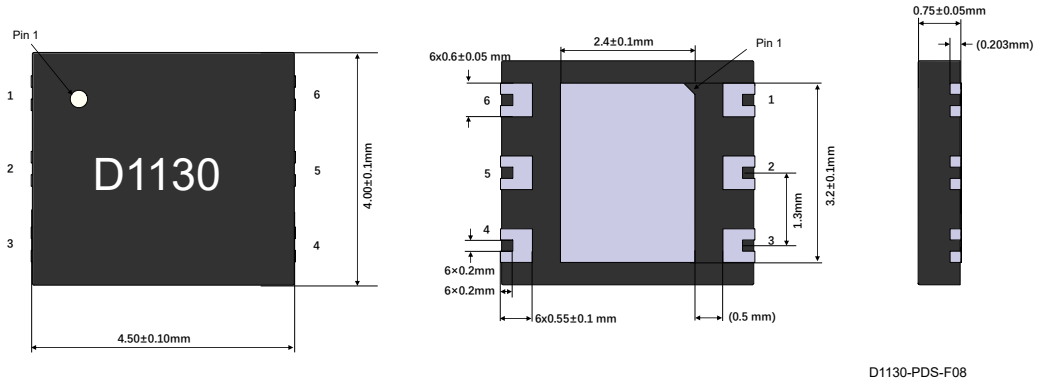


Figure 8. D1130 Mechanical Drawing

12. Application Circuit

■ Schematic

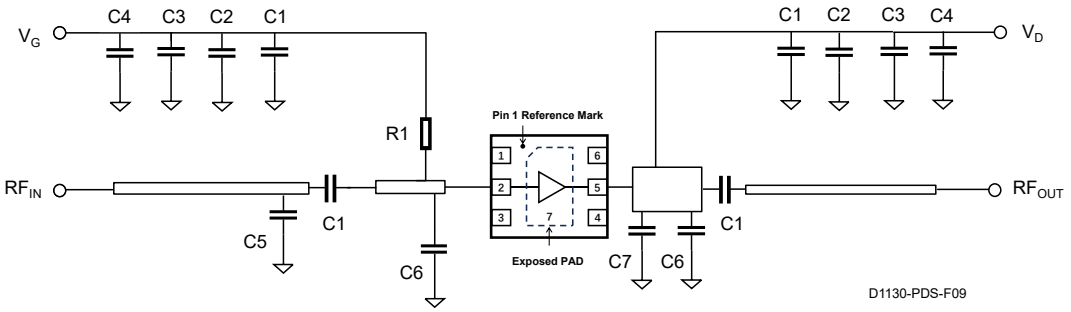


Figure 9. D1130 DEMO_A Application Circuit Schematic

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 (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

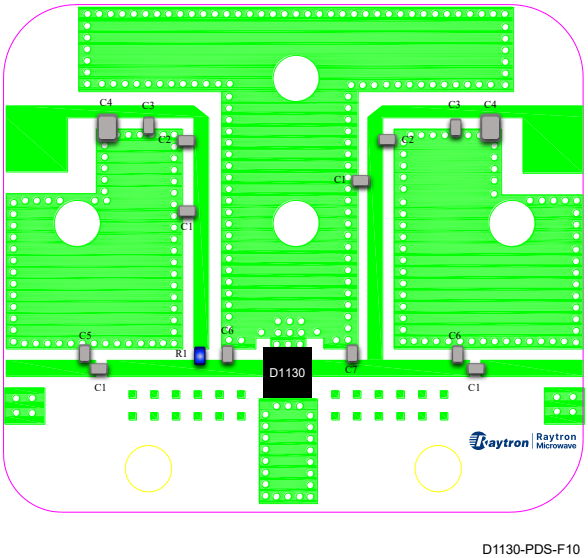


Figure 10. D1130 Application Circuit Layout (5.7-5.9GHz)
（DEMO_A Size: 4.0 x 3.5cm）

Table 10. Bill of Materials

Component	Value	Description	Manufacturer	Part Number
PCB	20mil	N/A	Rogers	RO4350B
C1	1.9pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2E1R9BB12
C2	100.0pF	X7R 100V 0805 Capacitor	Murata	GQM2195C2E101JB12
C3	10000.0pF	X7R 100V 0603 Capacitor	Murata	GCM188R72A103KA37D
C4	4.7uF	X7S 250V 1206Capacitor	Murata	GRM31CC72A475KE11L
C5	0.5pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER50WB12
C6	0.2pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER20WB12
C7	0.6pF	C0G 250V 0805 Capacitor	Murata	GQM2195C2ER60WB12
R1	10.0Ω	1/10W 0603 Resistor	Yageo	AC0603FR-0710RL

13. DEMO Summary

Table 11. DEMO Summary

No.	D1130 DEMO Name	V_{DS} (V)	Freq (GHz)	Linear Gain(dB)	P_{SAT} (dBm)	P_{SAT} (W)	Drain Efficiency(%)	Pulse or CW
1	DEMO_A, 5W	28	5.7-5.9	11.5	37.2	5	55%	CW
2	DEMO_B, 7W	28	3.5-3.8	20.1	38.7	7	54%	CW
3	DEMO_C, 5W	28	5.7-6.4	10.7	37.0	5	42%	CW
4	DEMO_D, 5W	20	2.8-3.1	22.5	37.4	5	56%	CW
5	DEMO_E, 6W	28	1.2-1.4	20.8	37.6	6	63%	CW
6	DEMO_F, 6W	28	2.8-3.2	19.8	38	6	58%	CW
7	DEMO_G, 8W	28	1-1.4	20.6	38.8	8	60%	CW
8	DEMO_H, 7W	28	3.2-3.6	18.3	38.3	7	57%	CW
9	DEMO_I, 5W	28	4.9-5.9	11.9	37.4	5	48%	CW
10	DEMO_J, 7W	28	4.6-5	15.1	38.5	7	54%	CW
11	DEMO_K, 6W	28	2.1-2.6	19.5	37.7	6	54%	CW

14. Recommended Solder Temperature Profile

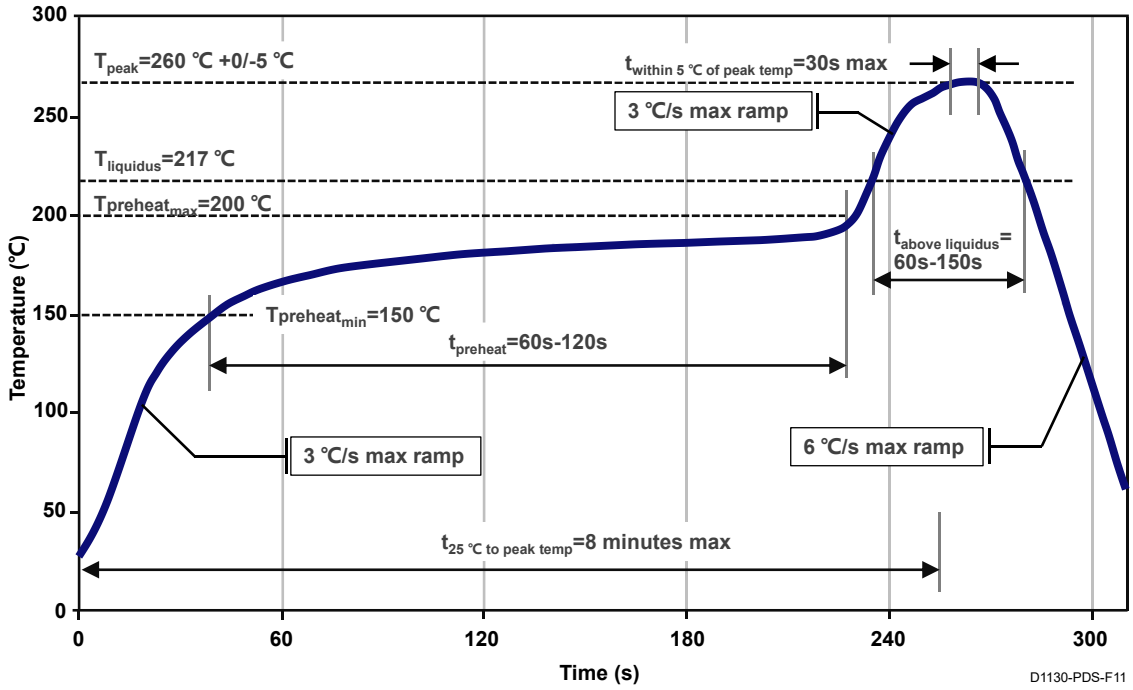


Figure 11. Recommended Solder Temperature Profile

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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