

DC-8.4GHz, 12W, 28V, GaN RF Transistor

General Description

The GNNT8141D is a wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT), The device operates from DC to 8.4GHz with a 28V supply rail. Its typical saturated power is 12W@8.1GHz (P_{sat}). The P_{sat} gain is 9.2dB@8.1GHz above, and drain efficiency is 45% above.

Typical Application Data

- 6.0GHz-7.3GHz: $P_{sat} \geq 40.9\text{dBm}$
- 7.2GHz-8.4GHz: $P_{sat} \geq 39.6\text{dBm}$
- 8.1GHz-8.4GHz: $P_{sat} \geq 40.8\text{dBm}$

Features

- Operating Frequencies: DC-8.4GHz
- Output Power (P_{sat}): 12W@8.1GHz
- Power Gain: 9.2dB@8.1GHz
- $DE@P_{sat}$: 47%@8.1GHz
- Operating Voltage: 28 V
- Support CW & Pulse mode

Recommended Operating Conditions

Parameter	Value
Drain-Source Voltage (V_D)	28 V (Typ)
Quiescent Current (I_{DQ})	20 mA (Typ)
Gate-Source Voltage(V_G)	-2.3V (Typ)

Note:

- 1.All the RF spec tested under recommended conditions.
- 2.Bias-up Procedure : Set V_G to the pinch-off (V_P) voltage, typically -5 V, then turn on V_D to nominal supply voltage (28V)
- 3.Bias-down Procedure : Turn off RF signal, then turn off V_D and wait 1 second to allow drain capacitor dissipation, turn off V_G .

Absolute Maximum Ratings

Note:

1. Operating outside the rated range may cause irreversible damage to the device.

Parameter	Range Value
Drain-Source Breakdown Voltage (BV_{DS})	120 V
Drain-Source Voltage Range, (V_D)	20 to 32 V
Gate-Source Voltage Range, (V_G)	-10 to +1 V
Operating Temperature Range	-40 to 125°C
Storage Temperature Range	-65 to 150°C
Maximum Input Power, CW (P_{in}), $T_A = 25^\circ \text{C}$	35dBm

RF Characteristics

Note:

1. Test condition: $T_A = 25^\circ \text{C}$, $V_D = 28\text{V}$, $I_{DQ} = 20 \text{mA}$, CW

Symbol	Parameter	Min	Typ	Max	Unit
G_{LIN}	Linear Gain	-	12	-	dB
P_{sat}	Output Power	-	12	-	W
DE_{sat}	Drain Efficiency	-	45	-	%
G_{sat}	Gain	-	9	-	dB

Thermal Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
$R_{\theta JC}$	Thermal Resistance	-	8.5	-	°C/W

Test Data, 8.1GHz-8.4GHz (Test data at three temperature)

Test Condition: $T_A = 25\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
8.10	41.00	12.59	9.10	0.97	46.35
8.20	40.90	12.30	9.70	0.95	46.25
8.30	40.90	12.30	9.60	0.95	46.06
8.40	40.60	11.48	9.10	0.93	44.23

Test Condition: $T_A = -40\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
8.10	41.60	14.45	10.90	1.05	49.16
8.20	41.45	13.96	10.90	1.03	48.42
8.30	41.40	13.80	10.20	1.04	47.40
8.40	41.00	12.59	9.50	0.98	45.88

Test Condition: $T_A = 85\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
8.10	39.80	9.55	7.10	0.87	39.20
8.20	39.70	9.33	7.90	0.86	38.76
8.30	39.80	9.55	8.00	0.86	39.66
8.40	39.60	9.12	7.90	0.83	39.24

Test Data, 7.2GHz-8.4GHz EVB (Test data at three temperature)

Test Condition: $T_A = 25\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
7.20	40.20	10.47	8.50	0.90	41.55
7.30	40.20	10.47	8.50	0.89	42.02
7.40	40.00	10.00	8.10	0.90	39.90
7.50	40.00	10.00	8.00	0.91	39.25
7.60	40.20	10.47	8.20	0.91	41.10
7.70	40.20	10.47	8.20	0.91	41.10
7.80	40.20	10.47	8.60	0.93	40.39
7.90	39.90	9.77	8.20	0.92	37.94
8.00	40.00	10.00	8.00	0.92	38.82
8.10	40.00	10.00	8.20	0.90	39.68
8.20	40.00	10.00	8.50	0.88	40.58
8.30	40.00	10.00	8.60	0.88	40.58
8.40	39.90	9.77	7.80	0.91	38.35

Test Condition: $T_A = -40\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
7.20	40.90	12.30	10.20	0.98	44.83
7.30	40.70	11.75	10.20	0.96	43.94
7.40	40.60	11.48	9.60	0.97	42.27
7.50	40.60	11.48	9.50	0.98	41.84
7.60	40.90	12.30	9.50	1.00	44.16
7.70	40.90	12.30	10.00	1.00	44.03
7.80	40.90	12.30	9.90	1.02	43.08
7.90	40.60	11.48	9.60	1.02	40.20
8.00	40.60	11.48	9.30	1.00	41.01
8.10	40.60	11.48	9.40	0.97	42.27
8.20	40.60	11.48	9.40	0.96	42.71
8.30	40.80	12.02	9.20	0.99	43.37
8.40	40.40	10.96	8.70	0.99	39.64

Test Condition: $T_A = 85\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 20\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
7.20	39.30	8.51	7.40	0.82	37.07
7.30	39.30	8.51	7.40	0.81	37.53
7.40	39.00	7.94	7.20	0.80	35.46
7.50	39.00	7.94	7.10	0.81	35.02
7.60	39.10	8.13	7.60	0.80	36.29
7.70	39.30	8.51	7.60	0.82	37.07
7.80	39.25	8.41	7.34	0.83	36.20
7.90	39.10	8.13	6.90	0.85	34.15
8.00	39.00	7.94	6.90	0.83	34.18
8.10	39.18	8.28	6.80	0.82	36.06
8.20	39.27	8.45	7.00	0.81	37.27
8.30	39.40	8.71	7.00	0.83	37.61
8.40	39.10	8.13	6.10	0.85	34.35

Test Data, 6.0GHz-7.3GHz EVB

Test Condition: TA = 25 °C, VD = 28V, IDQ = 20 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
6.00	41.00	12.59	7.60	0.97	46.35
6.10	41.10	12.88	8.30	0.99	46.71
6.20	41.20	13.18	8.60	0.96	49.04
6.30	41.10	12.88	8.20	0.94	48.95
6.40	40.90	12.30	8.00	0.98	44.83
6.50	41.00	12.59	7.80	0.97	46.35
6.60	41.30	13.49	8.50	0.96	50.18
6.70	41.10	12.88	8.80	0.96	47.93
6.80	40.90	12.30	8.10	0.97	45.30
6.90	41.00	12.59	8.10	0.96	46.84
7.00	41.30	13.49	9.40	0.95	50.71
7.10	41.00	12.59	9.00	0.92	49.14
7.20	40.90	12.30	8.30	0.91	48.28
7.30	40.90	12.30	8.30	0.91	48.28

ESD Protection Characteristics

Test Methodology	Class	Standard
Human Body Model	± 225V	JEDEC Standard JS-001-2017
Charge Device Model	± 1000V	JEDEC Standard JS-002-2018

Solderability

This package is lead-free/RoHS-compliant. The plating material on the leads is NiAu. It is compatible with both lead-free (maximum 260 °C reflow temperature) and tin-lead (maximum 245°C reflow temperature) soldering processes.

RoHs Compliance

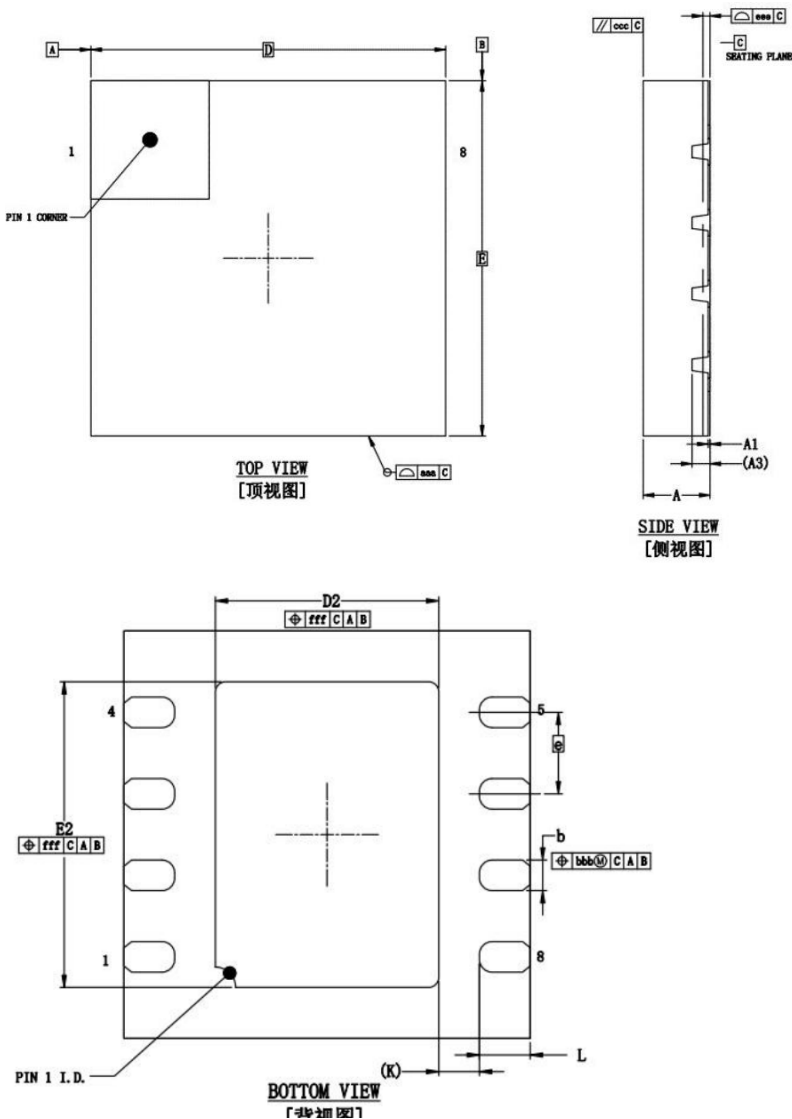
This part is compliant with 2015/863/ and EU 2011/65/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

Pin Configuration



PIN	Symbol	Description
6,7	V_D / RF OUT	Drain voltage / RF Output to be matched to 50 ohms;
Other	NC	PIN1,4 can connect Gate , PIN5,8 can connect Drain

Package Dimensions



		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.70	0.75	0.80
STAND OFF		A1	0.00	0.02	0.05
L/P THICKNESS		A3	0.203 REF		
LEAD WIDTH		b	0.25	0.3	0.35
BODY SIZE	X	D	4 BSC		
	Y	E	4 BSC		
LEAD PITCH		e	0.8 BSC		
EP SIZE	X	D2	2.10	2.2	2.30
	Y	E2	2.90	3	3.10
LEAD LENGTH		L	0.40	0.5	0.60
LEAD TIP TO EP EDGE		K	0.4 REF		
PACKAGE EDGE TOLERANCE		aaa	0.1		
MOLD FLATNESS		ccc	0.1		
COPLANARITY		eee	0.08		
LEAD OFFSET		bbb	0.1		
EXPOSED PAD OFFSET		fff	0.1		

Note:

1. All dimensions are in millimeters.
2. All dimension tolerances are +/- 0.10 or +/- 0.20 mm.

Revision History

Data	Revision	Datasheet Status
2025/08/20	1.0	Preliminary Datasheet
2025/08/22	2.0	Update Test Data