

DC-8.0GHz, 12W, 28V, GaN RF Transistor

General Description

The GNNT8041D is a wideband pre-matched gallium nitride (GaN) high electron mobility transistor (HEMT), The device operates from DC to 8.0GHz with a 28V supply rail. Its typical saturated power is 12W@5.8GHz (P_{sat}). The P_{sat} gain is 11dB@5.8GHz above, and drain efficiency is 55% above.

Typical Application Data

- 0.7GHz-0.9GHz: $P_{sat} \geq 41.2\text{dBm}$
- 2.7GHz-3.2GHz: $P_{sat} \geq 41.6\text{dBm}$
- 3GHz-5GHz: $P_{sat} \geq 40.6\text{dBm}$
- 4.95GHz-5.9GHz: $P_{sat} \geq 41\text{dBm}$
- 5.7GHz-5.9GHz: $P_{sat} \geq 41\text{dBm}$
- 6GHz-6.6GHz: $P_{sat} \geq 41\text{dBm}$
- 6.6GHz-7.3GHz: $P_{sat} \geq 40.7\text{dBm}$

Features

- Operating Frequencies: DC-8.0GHz
- Output Power (P_{sat}): 12W@5.8GHz
- Power Gain: 11dB@5.8GHz
- $DE@P_{sat}$: 55%@5.8GHz
- 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})	30 mA (Typ)
Gate-Source Voltage(V_G)	-2.25 V (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: $T_A = 25^\circ\text{C}$, $V_D = 28\text{V}$, $I_{DQ} = 30\text{ mA}$, CW

Symbol	Parameter	Min	Typ	Max	Unit
G_{LIN}	Linear Gain	-	14	-	dB
P_{sat}	Output Power	-	12	-	W
DE_{sat}	Drain Efficiency	-	55	-	%
G_{sat}	Gain	-	11	-	dB

Thermal Characteristics

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

Test Data, 0.7GHz-0.9GHz (Test data at three temperature)

Test Condition: $T_A = 25\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 30\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
0.7	41.33	13.58	18	0.659	73.6
0.8	41.2	13.18	19.6	0.699	67.4
0.9	41.3	13.49	18	0.727	66.3

Test Condition: $T_A = -40\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 30\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
0.7	41.6	14.45	18.4	0.707	73.02
0.8	41.6	14.45	19.8	0.734	70.33
0.9	41.3	13.49	18.6	0.718	67.1

Test Condition: $T_A = 85\text{ }^{\circ}\text{C}$, $V_D = 28\text{ V}$, $I_{DQ} = 30\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
0.7	40.71	11.78	16.9	0.642	65.51
0.8	40.5	11.22	18.6	0.649	61.74
0.9	40.65	11.61	16.85	0.691	60.03

Test Data, 2.7GHz-3.2GHz EVB (Test data at three temperature)

Test Condition: TA = 25 °C, V_D =28 V, I_{DQ} = 30 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
2.7	42	15.85	13.2	0.906	62.48
2.8	41.7	14.79	13	0.858	61.57
2.9	41.8	15.14	12.8	0.936	57.75
3.0	41.7	14.79	13.2	0.893	59.15
3.1	41.66	14.66	12.8	0.893	58.61
3.2	41.68	14.72	12.7	0.873	60.23

Test Condition: TA = -40 °C, V_D =28 V, I_{DQ} = 30 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
2.7	42.3	16.98	13.2	0.930	65.22
2.8	42.05	16.03	13.7	0.905	63.27
2.9	42	15.85	13.67	0.951	59.52
3.0	41.9	15.49	14.3	0.924	59.86
3.1	41.76	15	13.6	0.904	59.25
3.2	41.85	15.31	13.4	0.900	60.76

Test Condition: TA = 85 °C, V_D =28 V, I_{DQ} = 30 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
2.7	41	12.59	11.65	0.807	55.71
2.8	40.8	12.02	12.1	0.801	53.61
2.9	40.55	11.35	11.93	0.813	49.86
3.0	40.6	11.48	12.37	0.809	50.69
3.1	40.5	11.22	12.6	0.778	51.51
3.2	40.5	11.22	12.56	0.779	51.44

Test Data, 3GHz-5GHz EVB

Test Condition: $T_A = 25\text{ }^{\circ}\text{C}$, $V_D = 28\text{V}$, $I_{DQ} = 30\text{ mA}$, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I_D (A)	DE(%)
3	41.3	13.49	8.3	1.07	45.03
3.1	41.8	15.14	9	1.07	50.52
3.2	41.5	14.13	8.2	1.06	47.59
3.3	41.4	13.8	8.3	1.1	44.82
3.4	41.2	13.18	8.2	1.09	43.19
3.5	40.7	11.75	8.2	1.05	39.96
3.6	40.9	12.3	8.3	1.06	41.45
3.7	40.6	11.48	8.1	1.08	37.97
3.8	40.9	12.3	8.4	1.1	39.94
3.9	41.3	13.49	9.1	1.08	44.61
4	41.16	13.06	8.6	1.1	42.41
4.1	41.2	13.18	8.9	1.08	43.59
4.2	41.8	15.14	9.7	1.12	48.26
4.3	42	15.85	9.6	1.08	52.41
4.4	42	15.85	9.15	1.1	51.46
4.5	42.2	16.6	9.5	1.06	55.92
4.6	42.2	16.6	9.3	0.98	60.48
4.7	41.76	15	9.1	0.93	57.59
4.8	42	15.85	8.8	1.05	53.91
4.9	41.8	15.14	8.6	0.95	56.9
5	41.3	13.49	8.3	0.91	52.94

Test Data, 4.95GHz-5.9GHz EVB

Test Condition: TA = 25 °C, VD =28 V, IDQ =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
4.95	41.3	13.49	8.5	1	48.18
5	41.4	13.8	8.4	1.03	47.86
5.1	41.5	14.13	8.6	1	50.45
5.2	41.6	14.45	9.3	0.98	52.68
5.3	41.4	13.8	8.4	1	49.3
5.4	41.6	14.45	8.9	1.01	51.11
5.5	41.5	14.13	9	0.93	54.24
5.6	41.5	14.13	8.9	0.94	53.67
5.7	41.18	13.12	8.34	0.9	52.07
5.8	41.2	13.18	8.4	0.85	55.39
5.9	41	12.59	8.3	0.78	57.64

Test Data, 5.7GHz-5.9GHz EVB (Test data at three temperature)

Test Condition: TA = 25 °C, VD =28 V, IDQ =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
5.7	41.4	13.8	11.3	0.879	56.09
5.8	41.35	13.65	11.5	0.885	55.07
5.9	41	12.59	11.3	0.798	56.34

Test Condition: TA =-40 °C, VD =28 V, IDQ =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
5.7	41.6	14.45	11.6	0.908	56.85
5.8	41.6	14.45	11.9	0.908	56.85
5.9	41.1	12.88	12.3	0.779	59.06

Test Condition: TA = 85 °C, V_D =28 V, I_{DQ} =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
5.7	40.2	10.47	10.3	0.756	49.47
5.8	40.4	10.96	10.7	0.785	49.89
5.9	40.1	10.23	10.8	0.690	52.97

Test Data, 6GHz-6.6GHz EVB

Test Condition: TA = 25 °C, V_D =28 V, I_{DQ} =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
6	41.8	15.14	7.1	1.05	51.48
6.1	41.9	15.49	7.7	1.04	53.19
6.2	41.97	15.74	7.77	1	56.21
6.3	41.5	14.13	7.8	0.92	54.83
6.4	41.3	13.49	7.8	0.94	51.25
6.5	41.33	13.58	7.3	0.95	51.06
6.6	41	12.59	7.7	0.89	50.52

Test Data, 6.6GHz-7.3GHz EVB

Test Condition: TA = 25 °C, V_D =28 V, I_{DQ} =30mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
6.6	40.93	12.39	6.9	0.97	45.61
6.7	40.9	12.3	7.03	0.99	44.38
6.8	40.8	12.02	7.1	1.02	42.1
6.9	40.94	12.42	7	1.02	43.38
7	41.2	13.18	7	1	47.08
7.1	41.07	12.79	7.1	1	45.69
7.2	40.7	11.75	6.9	0.95	44.17
7.3	40.85	12.16	7	0.96	45.25

ESD Protection Characteristics

Test Methodology	Class	Standard
Human Body Model	$\pm 225V$	JEDEC Standard JS-001-2017
Charge Device Model	$\pm 1000V$	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

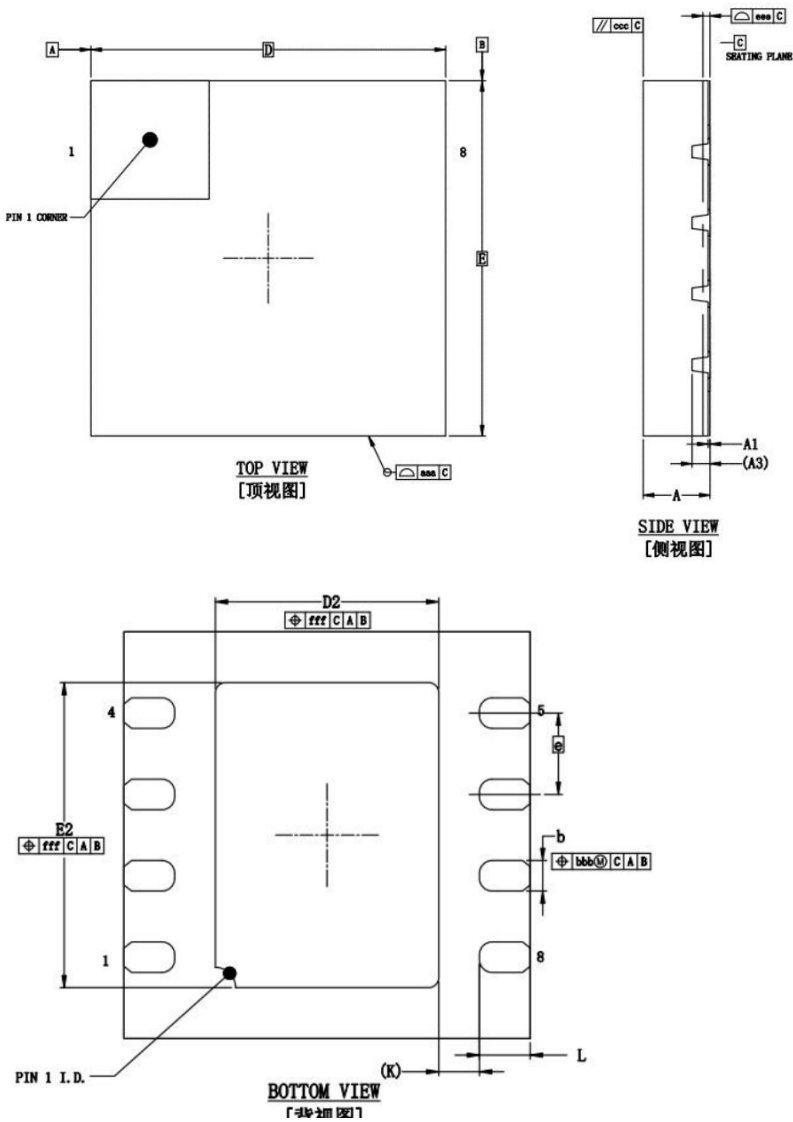
This part is compliant with 2015/863/ and EU 2011/65/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

Pin Configuration



PIN	Symbol	Description
2,3	V_G / RF IN	Gate voltage / RF Input to be matched to 50 ohms;
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
2024/8/20	1.0	Preliminary Datasheet
2024/9/15	2.0	Update Test Data