

DC-8.0GHz, 7W, 28V, GaN RF Transistor

General Description

The GNNT6138D 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 7W@5.8GHz (P_{sat}). The P_{sat} gain is 11dB@5.8GHz above, and drain efficiency is 59% above.

Typical Application Data

- 5.7GHz-5.9GHz: $P_{sat} \geq 38.5\text{dBm}$
- 2.4GHz-2.6GHz: $P_{sat} \geq 39\text{dBm}$
- 100MHz-400MHz: $P_{sat} \geq 38.5\text{dBm}$
- 6425MHz-7125MHz: $P_{sat} \geq 37.7\text{dBm}$

Features

- Operating Frequencies: DC-8.0GHz
- Output Power (P_{sat}): 7W@5.8GHz
- Power Gain: 11dB@5.8GHz
- $DE@P_{sat}$: 59%@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})	20 mA (Typ)
Gate-Source Voltage(V_G)	-2.2 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}), $T_A = 25^\circ\text{C}$	33 dBm

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	-	14	-	dB
P_{sat}	Output Power	-	7	-	W
DE_{sat}	Drain Efficiency		59	-	%
G_{sat}	Gain	-	11	-	dB

Thermal Characteristics

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

Test Data, 5.7GHz-5.9GHz

Test Condition: TA = 25 °C, VD = 28 V, IDQ = 12 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
5.7	39.1	8.1	11.8	0.49	59.2
5.8	39	7.9	11.7	0.47	60.4
5.9	39	7.9	11.5	0.48	59.1

Test Data, 2.4GHz-2.6GHz (Test data at three temperature)

Test Condition: TA = 25 °C, VD = 28 V, IDQ = 12 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
2.4	39.50	8.9	16.7	0.47	67.7
2.5	39.45	8.8	17.1	0.45	69.9
2.6	39.17	8.3	17.1	0.43	68.9

Test Condition: TA = 85 °C, VD = 28 V, IDQ = 12 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
2.4	39.10	8.1	15.8	0.44	65.5
2.5	39.11	8.1	16.5	0.43	68.3
2.6	38.88	7.7	16.3	0.41	67.6

Test Condition: TA = -40 °C, VD = 28 V, IDQ = 12 mA, CW

Freq(GHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	ID(A)	DE(%)
2.4	39.70	9.3	17.6	0.48	69.9
2.5	39.72	9.4	18.2	0.46	73.4
2.6	39.43	8.8	18.5	0.43	72.8

Test Data, 0.1GHz-0.4GHz EVB

Test Condition: TA = 25 °C, V_D =28 V, I_{DQ} =12mA, CW

Freq(MHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
100	38.88	7.7	14.4	0.41	66.7
150	39.63	9.2	13.2	0.42	78.5
200	39.44	8.8	13.7	0.42	75.1
250	39.19	8.3	14.4	0.41	72.6
300	39.47	8.9	13.4	0.47	67.5
350	39.09	8.1	13.6	0.45	63.8
400	38.80	7.6	13.8	0.44	61.3

Test Data, 6425MHz-7125MHz EVB

Test Condition: TA = 25 °C, V_D =28 V, I_{DQ} =12mA, CW

Freq(MHz)	Psat(dBm)	Psat(W)	Power Gain(dB)	I _D (A)	DE(%)
6425	37.95	6.2	7.9	0.52	42.8
6525	38.02	6.3	7.8	0.52	43.5
6625	38.19	6.6	7.7	0.52	45.3
6725	38.10	6.5	7.8	0.52	44.7
6825	37.92	6.2	8.0	0.51	43.5
6925	37.80	6.0	7.5	0.49	44.1
7025	38.10	6.5	7.8	0.49	47.5
7125	37.78	6.0	7.1	0.46	46.8

ESD Protection Characteristics

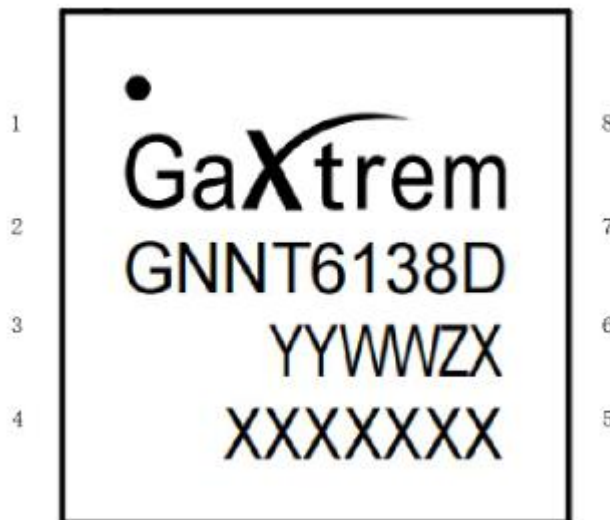
Test Methodology	Class	Standard
Human Body Model	±225V	JEDEC Standard JS-001-2017
Charge Device Model	±1000V	JEDEC Standard JS-002-2018

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.

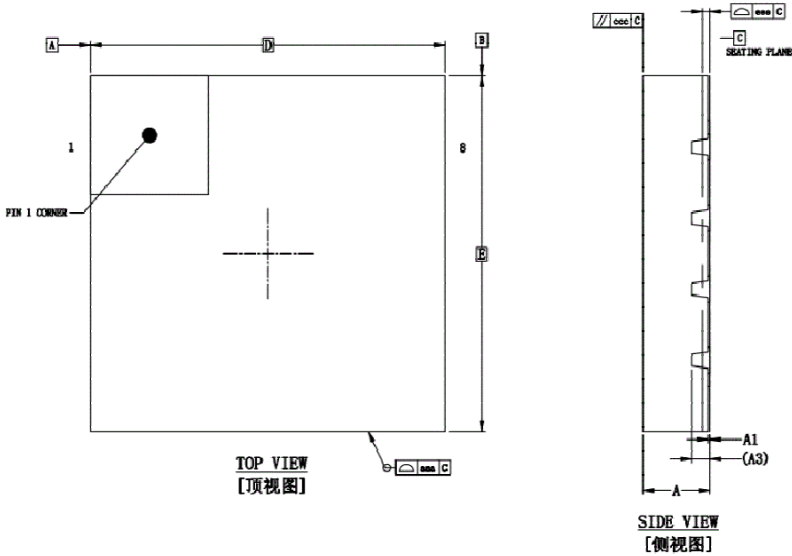
RoHs Compliance

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).

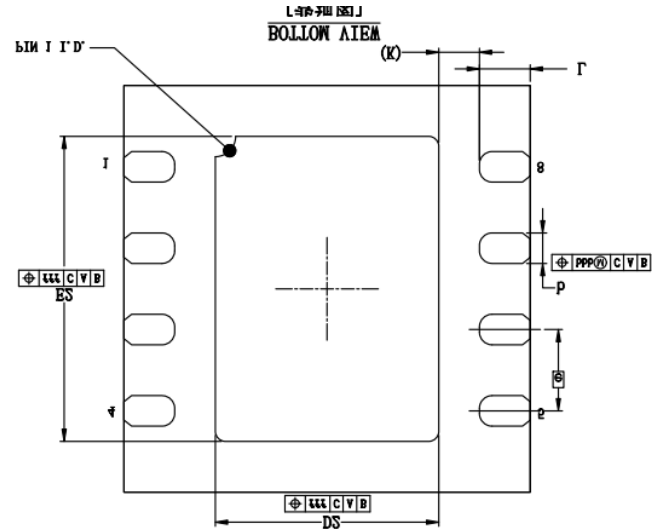
Pin Configuration



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	



		SYMBOL	MIN	NOM	MAX
TOTAL THICKNESS		A	0.70	0.75	0.80
STAND OFF		A1	0.00	0.02	0.05
L/F 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	D3	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	0.05		
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
2025/3/25	1.0	Preliminary Datasheet
2025/4/17	2.0	Update Test data of 6425-7125MHz