NME80R4H GaN TRANSISTOR

Document Number: NME80R4H
Preliminary Datasheet V1.0

Gallium Nitride 28V 4W, RF Power Transistor

NME80R4H

Description

The NME80R4H is a 4W, unmatched GaN HEMT, designed for multiple applications with frequencies up to 8GHz, packaged by thermally enhanced tiny MME package.

There is no guarantee of performance when this part is used in applications designed outside of these frequencies.

- Typical narrow band performance (on Innogration fixture with device soldered)

V_{DD}=28V, I_{DQ}=20mA, CW,

Freq(MHz)	Pin(dBm)	Pout(dBm)	Pout(W)	IDS(A)	Gain(dB)	Eff(%)
6900	26.3	36.2	4.2	0.237	9.9	62.8
7000	25.8	36	4	0.226	10.2	62.9
7100	25.8	36	4	0.221	10.1	62.8
7200	26.5	35.7	3.8	0.223	9.2	60

- Typical broad band performance (on Innogration fixture with device soldered)

V_{DD}=28V, I_{DQ}=20mA, CW,

Freq (MHz)	P1dB (dBm)	P1dB (W)	P1dB Eff(%)	P1dB Gain(dB)	P3dB (dBm)	P3dB (W)	P3dB Eff(%)
6000	34.37	2.7	34.3	9.3	35.6	3.6	36.0
6100	34.2	2.6	35.7	8.84	35.4	3.5	37.1
6200	33.77	2.4	36.7	8.94	36.21	4.2	44.5
6300	35.42	3.5	49.0	9.24	37.34	5.4	58.1
6400	35.9	3.9	52.5	9.01	37.44	5.5	59.2
6500	35.91	3.9	49.3	8.52	37.33	5.4	54.4
6600	35.86	3.9	47.9	8.24	37.22	5.3	52.7
6700	35.81	3.8	45.6	7.93	37.13	5.2	50.8
6800	35.72	3.7	43.4	7.68	37.09	5.1	47.9
6900	35.8	3.8	41.9	7.44	37.03	5.1	45.6
7000	35.8	3.8	41.9	7.41	37.06	5.1	45.8
7100	35.85	3.9	43.6	7.58	37.03	5.0	47.0
7200	35.81	3.8	47.0	7.95	36.97	5.0	50.1
7300	36.03	4.0	52.4	8.34	37.03	5.0	54.7
7400	35.88	3.9	52.7	8.64	36.99	5.0	55.8
7500	35.81	3.8	52.3	8.45	36.84	4.8	54.1
7600	35.5	3.6	51.9	8.4	36.61	4.6	54.0
7700	35.32	3.4	51.9	8.22	36.5	4.5	55.8
7800	35.24	3.3	53.0	8.09	36.3	4.3	55.1
7900	34.44	2.8	49.4	8.11	35.71	3.7	52.4
8000	33.68	2.3	46.4	7.82	34.9	3.1	48.6

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Important Note: Proper Biasing Sequence for GaN HEMT Transistors

Turning the device ON

1. Set VGS to the pinch--off (VP) voltage, typically –5 V
2. Turn on VDS to nominal supply voltage (28V)
3. Increase VGS until IDS current is attained
4. Apply RF input power to desired level

Turning the device OFF

1. Turn RF power off
2. Reduce VGS down to VP, typically –5 V
3. Reduce VDS down to 0 V
4. Turn off VGS

Table 1. Maximum Ratings (Not simultaneous, TC = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	150	Vdc
Gate--Source Voltage	V_{GS}	-10,+2	Vdc
Operating Voltage	V_{DD}	40	Vdc
Maximum Forward Gate Current	Igmax	1	mA
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature(See note 1)	T_J	+225	°C
Total Device Power Dissipation (Derated above 25°C, see note 2)	Pdiss	12	W

1. **Continuous operation at maximum junction temperature will affect MTTF**
2. **Bias Conditions should also satisfy the following expression: Pdiss < (Tj – Tc) / RJC and Tc = Tcase**

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, T_J=200°C, DC Power Dissipation, FEA (See note 1)	$R_{\theta JC\text{-}DC}$	16	C/W

1. **$R_{\theta JC\text{-}DC}$ is tested at only DC condition, it is related to the highest thermal resistor value among all test conditions. It might be differently lower in different RF operation conditions like CW signal ,pulsed RF signal etc.**

Table 3. Electrical Characteristics (T_C = 25℃ unless otherwise noted)

DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=1mA	V_{DSS}		150		V
Gate Threshold Voltage	V_{DS} = 28V, I_D = 1mA	V_{GS}(th)	-4		-2	V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=20mA, Measured in Functional Test	$V_{GS(Q)}$	——	-2.46	——	V

Functional Tests (In Innogration broadband Test Fixture, 50 ohm system) : V_{DD} = 28 Vdc, I_{DQ} = 20 mA, f = 2000 MHz, CW

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain @Psat	Gp		20		dB
Drain Efficiency @Psat	Eff		70		%
Saturated Power	Psat		4		W
Input Return Loss	IRL		-7		dB
Mismatch stress at all phases(No device damage)	VSWR		10:1		Ψ

6.9-7.2GHz

Reference Circuit of Test Fixture Assembly Diagram

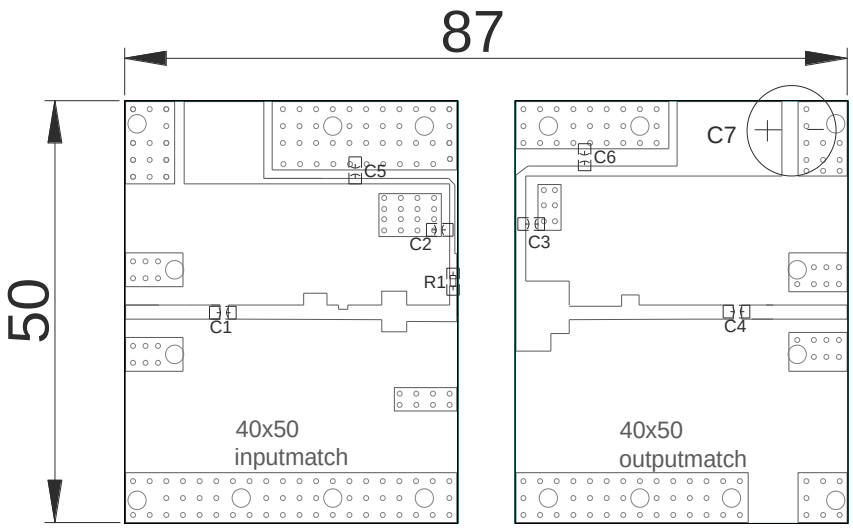
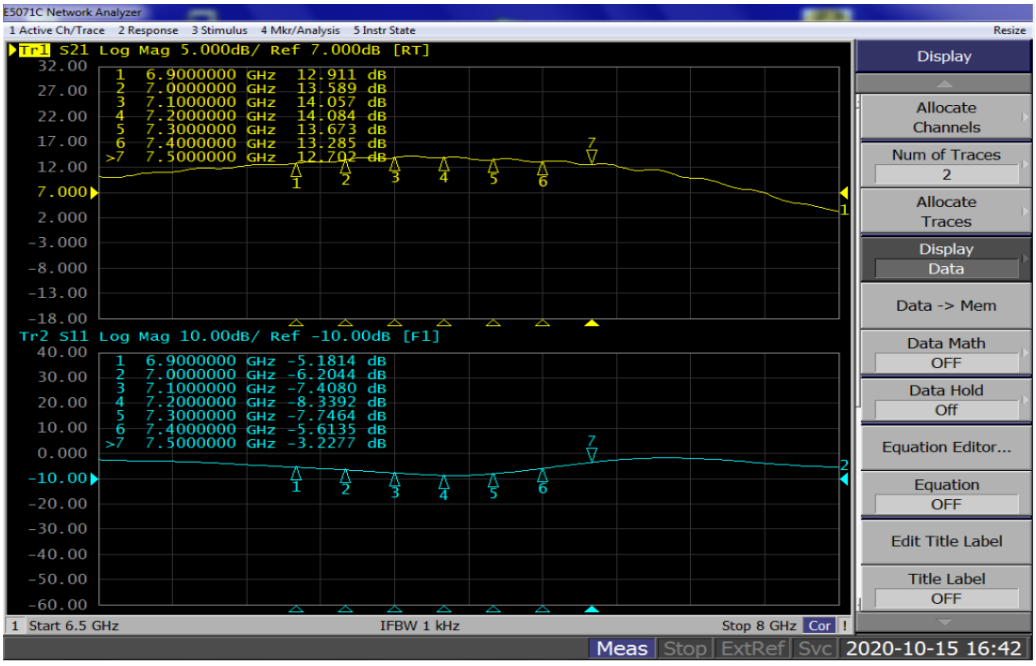


Figure 1. Test Circuit Component Layout (6900-7200MHz)

Table 4. Test Circuit Component Designations and Values

Component	Description	Remark
C1,C2,C3,C4	2.4pF	DLC75D
C5,C6	Ceramic multilayer capacitor, 10uF, 50V	10uF/50V
C7	470uF	470uF/63V
R1	Metal Film Resistor,12Ω	0603
PCB	0.762mm [0.030"] thick, εr=3.48, Rogers RO4350B, 1 oz. copper	

Figure 2. Network Analyzer S11/S21 output (Vds=28V,Vgs=-2.46V,Idq=20mA, Input Power =0dBm)



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6-8GHz

Reference Circuit of Test Fixture Assembly Diagram

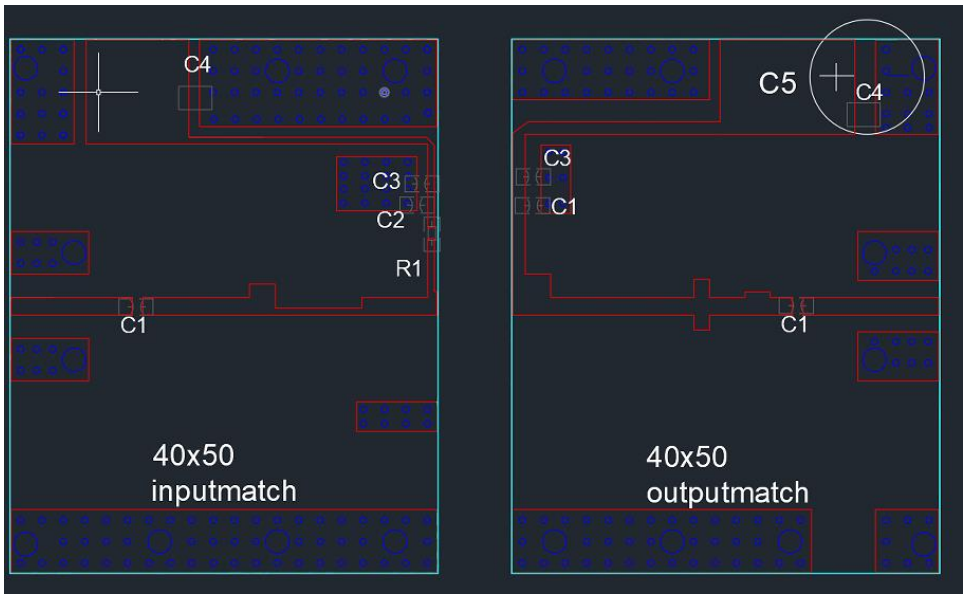
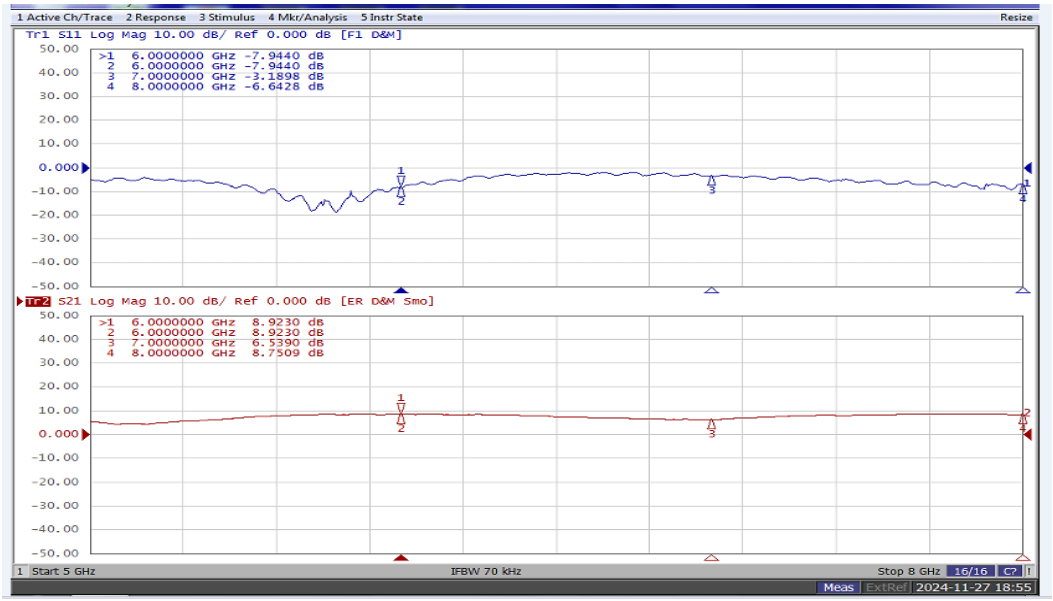


Figure 3. Test Circuit Component Layout (6000-8000MHz)

Table 5. Test Circuit Component Designations and Values

Component	Value	Quantity
C1	1.2pF	3
C2	0.7pF	1
R1	10 ohm	1
C3	1uF	2
C4	10uF	2
C5	470uF	1

Figure 4. Network Analyzer S11/S21 output (Vds=28V,Vgs=-2.46V,Idq=20mA, Input Power =0dBm)



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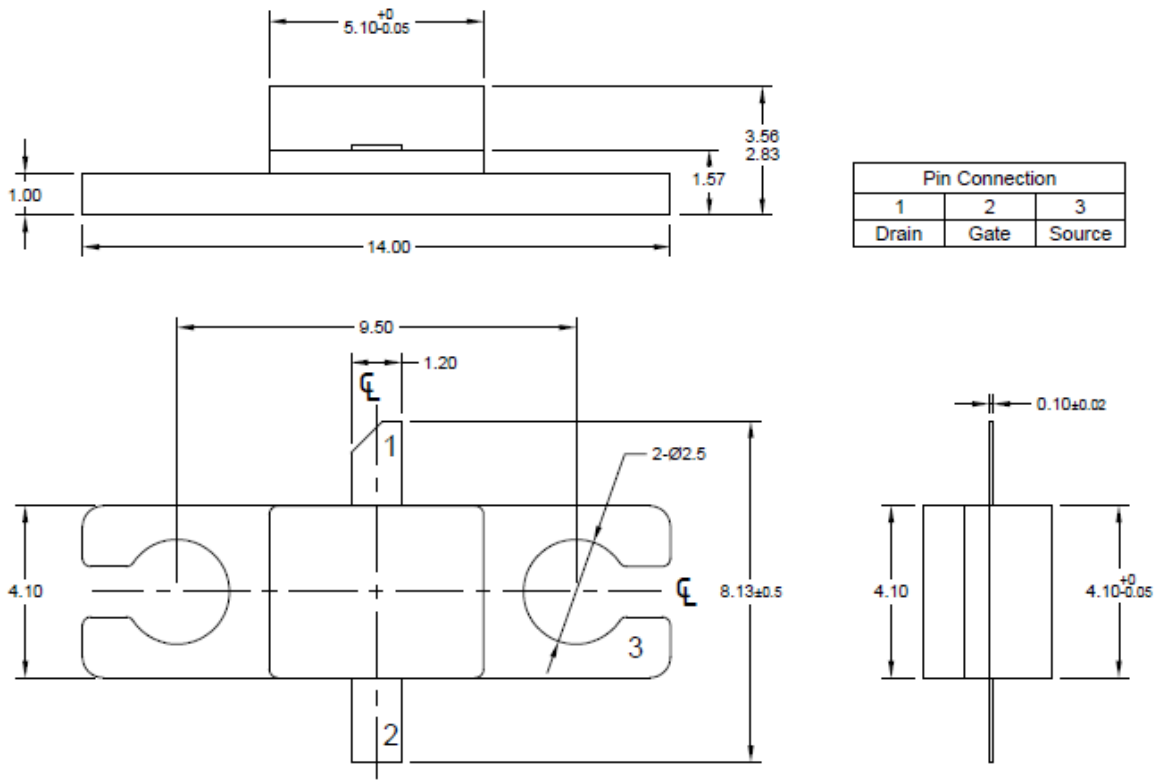
Package Outline

Flanged ceramic package; 2 leads



Pin Connection		
1	2	3
Drain	Gate	Source

Unit: mm
Tolerances(unless specified): x.x ±0.25
x.xx ±0.13

OUTLINE VERSION	REFERENCE			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
PKG-MME					10/10/2016

Figure 1. Package Outline PKG-MME

Revision history

Table 4. Document revision history

Date	Revision	Datasheet Status
2024/02/21	V1.0	Preliminary Datasheet Creation
2024/12/4	V1.1	Add 6-8GHz application data

Application data based on YHG-20-27/ZXY-24-38

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