# A5G08H800W19N

### Airfast RF Power GaN Transistor

Rev. 2 — 30 May 2025

Product data sheet



### 1 General description

This 112 W asymmetrical Doherty RF power GaN transistor is designed for cellular base station applications requiring very wide instantaneous bandwidth capability covering the frequency range of 865 MHz to 960 MHz.

This part is characterized and performance is guaranteed for applications operating in the 865 MHz to 960 MHz band. There is no guarantee of performance when this part is used in applications designed outside of these frequencies.

### 2 Features and benefits

- · High terminal impedances for optimal broadband performance
- · Advanced high performance in-package Doherty
- Improved linearized error vector magnitude with next generation signal
- · Able to withstand extremely high output VSWR and broadband operating conditions
- Plastic package

# 3 Typical performance

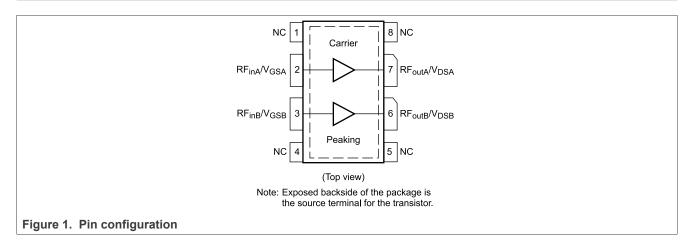
Table 1. 900 MHz — Typical Doherty single-carrier W-CDMA production test fixture performance  $V_{DD} = 50 \ Vdc$ ,  $I_{DQA} = 350 \ mA$ ,  $V_{GSB} = -5 \ Vdc$ ,  $P_{out} = 112 \ W \ Avg.$ , Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.<sup>[1]</sup>

Frequency	G <sub>ps</sub> (dB)	η <sub>D</sub> (%)	Output PAR (dB)	ACPR (dBc)
865 MHz	19.3	60.5	8.8	-28.0
913 MHz	19.5	59.9	8.6	-28.8
960 MHz	19.1	58.7	8.3	-30.5

[1] All data measured with device soldered to NXP production test fixture.



# 4 Pinning information



# 5 Ordering information

Table 2. Ordering information

Device	Tape and Reel Information	Package
A5G08H800W19NR3	R3 Suffix = 250 Units, 44 mm Tape Width, 13-inch Reel	OM-780-4S4S

# 6 Product marking



Table 3. Product marking trace code

Identifier	Description
AA	Assembly location
WL	Wafer lot indicator
YYWW	Date code
ZZ	Assembly lot

# 7 Limiting values

#### Table 4. Limiting values

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	125	Vdc
Gate-Source Voltage	V <sub>GS</sub>	-16, 0	Vdc
Operating Voltage	$V_{DD}$	55	Vdc
Maximum Forward Gate Current, I <sub>G (A+B)</sub> , @ T <sub>C</sub> = 25°C	I <sub>GMAX</sub>	95	mA
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Case Operating Temperature Range	T <sub>C</sub>	-55 to +150	°C
Maximum Channel Temperature	T <sub>CH</sub>	225	°C

# 8 Recommended operating conditions

#### Table 5. Recommended operating conditions

Characteristic	Symbol	Value	Unit
Operating Voltage	$V_{DD}$	50	Vdc

### 9 Thermal characteristics

#### Table 6. Thermal characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance by Infrared Measurement, Active Die Surface-to-Case Case Temperature 83°C, P <sub>D</sub> = 104 W	R <sub>0SC</sub> (IR)	0.37 <sup>[1]</sup>	°C/W
Thermal Resistance by Finite Element Analysis, Channel-to-Case Case Temperature 83°C, P <sub>D</sub> = 103.5 W	R <sub>0CHC</sub> (FEA)	0.6 <sup>[2]</sup>	°C/W

l] Refer to AN1955, Thermal Measurement Methodology of RF Power Amplifiers. Go to https://www.nxp.com/RF and search for AN1955.

# 10 ESD protection characteristics

### Table 7. ESD protection characteristics

Test Methodology	Class
Human Body Model (per JS-001-2017)	1A
Charge Device Model (per JS-002-2014)	C3

# 11 Moisture sensitivity level

#### Table 8. Moisture sensitivity level

Test Methodology	Rating	ng Package Peak Temperature		
Per JESD22-A113, IPC/JEDEC J-STD-020	3	245	°C	

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<sup>[2]</sup> R<sub>BCHC</sub> (FEA) must be used for purposes related to reliability and limitations on maximum channel temperature. MTTF may be estimated by the expression MTTF (hours) = 10<sup>[A+B/(T+273)]</sup>, where T is the channel temperature in degrees Celsius, A = –11.6 and B = 9129.

### 12 Electrical characteristics

#### 12.1 DC characteristics — off characteristics

Table 9. DC characteristics — off characteristics

 $(T_A = 25^{\circ}C \text{ unless otherwise noted})$ 

Characteristic	Symbol	Min	Тур	Max	Unit
Off characteristics <sup>[1]</sup>					
Off-State Drain Leakage	I <sub>D(BR)</sub>				mAdc
$(V_{DS} = 150 \text{ Vdc}, V_{GS} = -8 \text{ Vdc})$ Carrier		_	_	15.4	
$(V_{DS} = 150 \text{ Vdc}, V_{GS} = -8 \text{ Vdc})$ Peaking		_	_	26.4	

<sup>[1]</sup> Each side of device measured separately.

### 12.2 DC characteristics — on characteristics

Table 10. DC characteristics — on characteristics

 $(T_A = 25^{\circ}C \text{ unless otherwise noted})$ 

Characteristic	Symbol	Min	Тур	Max	Unit
On characteristics — Side A, Carrier					
Gate Threshold Voltage (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 35 mAdc)	V <sub>GS(th)</sub>	-4.6	-2.6	-1.9	Vdc
Gate Quiescent Voltage $(V_{DD} = 50 \text{ Vdc}, I_D = 350 \text{ mAdc}, Measured in Functional Test})$	V <sub>GSA(Q)</sub>	-3.1	-2.6	-2.1	Vdc
On characteristics — Side B, Peaking					
Gate Threshold Voltage (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 60 mAdc)	V <sub>GS(th)</sub>	-4.6	-2.6	-1.9	Vdc

#### 12.3 Functional tests

Table 11. Functional tests

(In NXP Doherty Production Test Fixture,  $T_A$  = 25°C unless otherwise noted, 50 ohm system)<sup>[1]</sup>  $V_{DD}$  = 50 Vdc,  $I_{DQA}$  = 350 mA,  $V_{GSB}$  = ( $V_t$  – 2.325) Vdc,  $P_{out}$  = 158 W Avg., f = 913 MHz, Single-Carrier W-CDMA, IQ Magnitude Clipping, Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset.

Characteristic	Symbol	Min	Тур	Max	Unit
Power Gain	G <sub>ps</sub>	17.1	18.2	19.7	dB
Drain Efficiency	$\eta_{D}$	54.5	59.7	_	%
Saturated Power (Pulsed CW, 5% Duty Cycle)	P <sub>sat</sub>	58.0	58.5	_	dBm
Adjacent Channel Power Ratio	ACPR	_	-30.2	-25.7	dBc

<sup>[1]</sup> Internally matched part.

### 12.4 Wideband ruggedness

#### Table 12. Wideband ruggedness

(In NXP Doherty Production Test Fixture,  $T_A$  = 25°C unless otherwise noted, 50 ohm system)  $I_{DQA}$  = 350 mA,  $V_{GSB}$  = -5 Vdc, f = 913 MHz, Additive White Gaussian Noise (AWGN) with 10 dB PAR.

Characteristic	Symbol	Min	Тур	Max	Unit
ISBW of 400 MHz at 55 Vdc, 159 W Avg. Modulated Output Power	No Device Degradation				
(3 dB Input Overdrive from 79 W Avg. Modulated Output Power)					

### 12.5 Typical performance

#### Table 13. Typical performance

(In NXP Doherty Production Test Fixture,  $T_A$  = 25°C unless otherwise noted, 50 ohm system)  $V_{DD}$  = 50 Vdc,  $I_{DQA}$  = 350 mA,  $V_{GSB}$  = -5 Vdc, 865–960 MHz Bandwidth.

Characteristic	Symbol	Min	Тур	Max	Unit
Pulsed CW, 10% duty cycle					
Saturated Power <sup>[1]</sup>	P <sub>sat</sub>	_	912	_	W
AM/PM <sup>[1]</sup>	Ф		-20	_	۰
(Maximum value measured at saturated power across the 865–960 MHz bandwidth)					
Gain Variation @ Avg. Power over Temperature (-40°C to +85°C)	ΔG	_	0.007	_	dB/°C
Output Power Variation @ Saturated Power over Temperature (-40°C to +85°C)		_	0.003	_	dB/°C
Single-carrier W-CDMA, unclipped					
Gain Flatness in 95 MHz Bandwidth @ P <sub>out</sub> = 112 W Avg. <sup>[1]</sup>		_	0.4	_	dB
2-tone CW					
VBW Resonance Point <sup>[1]</sup> (IMD Third Order Intermodulation Inflection Point)	VBW <sub>res</sub>	_	110	_	MHz

<sup>[1]</sup> All data measured with device soldered to NXP production test fixture.

### Correct biasing sequence for GaN depletion mode transistors in a Doherty configuration

#### Bias ON the device

- 1. Set gate voltage  $V_{GSA}$  and  $V_{GSB}$  to -5 V.
- 2. Set drain voltage  $V_{DSA}$  and  $V_{DSB}$  to nominal supply voltage (+50 V).
- 3. Increase V<sub>GSA</sub> (carrier side) until I<sub>DQA</sub> current is attained.
- 4. Increase V<sub>GSB</sub> (peaking side) to target bias voltage.
- 5. Apply RF input power to desired level.

#### Bias OFF the device

- 1. Disable RF input power.
- 2. Adjust gate voltage  $V_{GSA}$  and  $V_{GSB}$  to -5 V.
- 3. Adjust drain voltage  $V_{DSA}$  and  $V_{DSB}$  to 0 V. Allow adequate time for drain voltage to reduce to 0 V from external drain capacitors.
- 4. Disable V<sub>GSA</sub> and V<sub>GSB</sub>.

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# 13 Component layout and parts list

### 13.1 Component layout

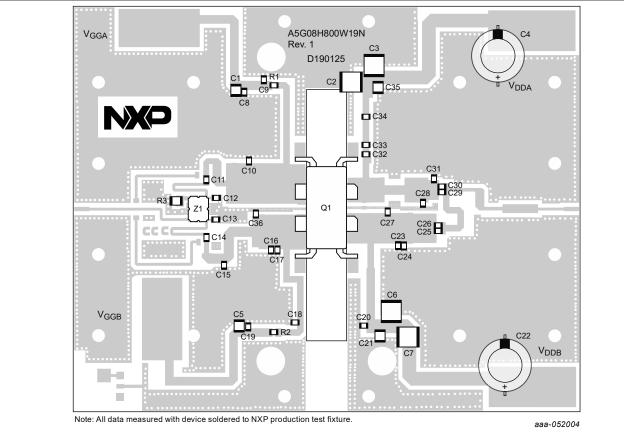


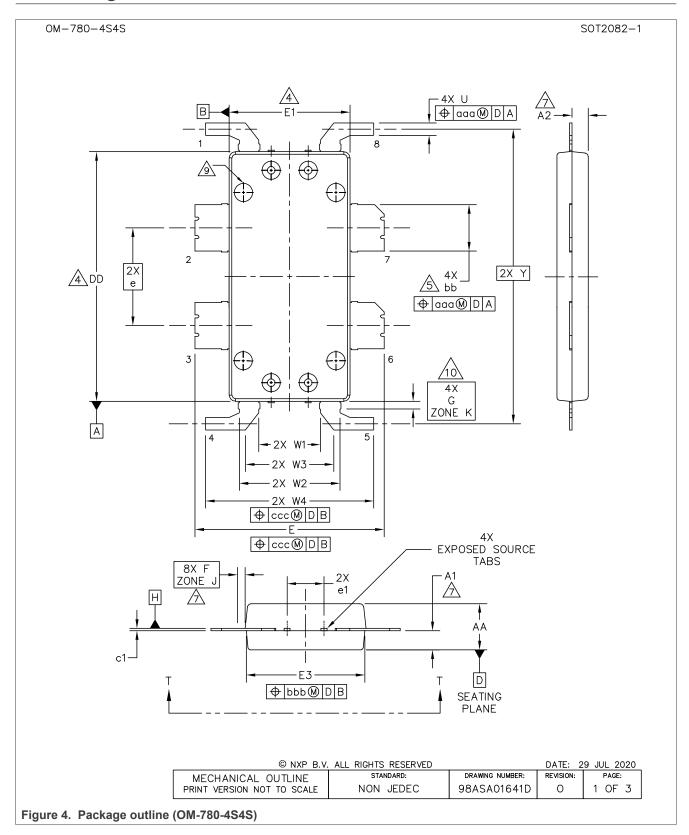
Figure 3. A5G08H800W19N production test circuit component layout

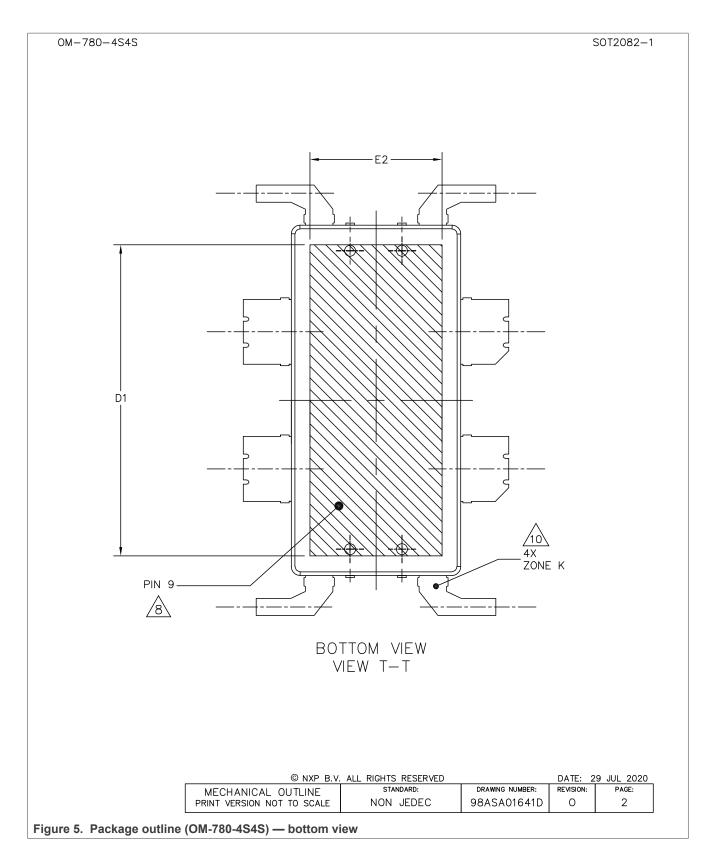
# 13.2 Component designations and values

Table 14. A5G08H800W19N production test circuit component designations and values

Part	Description	Part Number	Manufacturer
C1, C5	10 μF Chip Capacitor	GRM32EC72A106KE05L	Murata
C2, C6	4.7 μF Chip Capacitor	C453X752A475M	TDK
C3, C7	10 μF Chip Capacitor	C5750X7S2106M	TDK
C4, C22	220 μF, 100 V Electrolytic Chip Capacitor	EEV-FK2A221M	Panasonic
C8, C9, C11, C14, C18, C19, C20, C25, C26	100 pF Chip Capacitor	800R101KT500XT	ATC
C10, C23	2.0 pF Chip Capacitor	600F2R0BT250XT	ATC
C12, C13, C15	1.2 pF Chip Capacitor	600F1R2BT250XT	ATC
C16	1.0 pF Chip Capacitor	600F1R0BT250XT	ATC
C17	2.2 pF Chip Capacitor	600F2R2BT250XT	ATC
C21, C35	1 μF Chip Capacitor	GRM32CR72A105KA35L	Murata
C24	5.1 pF Chip Capacitor	600F5R1BT250XT	ATC
C27	1.6 pF Chip Capacitor	600F1R6BT250XT	ATC
C28	3.3 pF Chip Capacitor	600F3R3BT250XT	Murata
C29, C30	20 pF Chip Capacitor	600F200JT250XT	ATC
C31	3.9 pF Chip Capacitor	600F3R9BT250XT	ATC
C32, C33, C34	68 pF Chip Capacitor	600F680JT250XT	ATC
C36	0.5 pF Chip Capacitor	600F0R5BT250XT	ATC
R1, R2	8.25 Ω, 1/4 W Chip Resistor	CRCW12068R25FKEA	Vishay
R3	50 Ω, 30 W Termination Resistor	RFP-375375N6Z50-2	Anaren
Q1	RF Power GaN Transistor	A5G08H800W19N	NXP
Z1	800–1000 MHz, 90°, 2 dB Asymmetric Coupler	CMX09Q02	RN2 Technologies
PCB	Rogers RO4360G2, 0.020", ε <sub>r</sub> = 6.15	D190125	MTL

# 14 Package information





OM-780-4S4S SOT2082-1

- 1. CONTROLLING DIMENSION: INCH
- 2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
- 3. DATUM PLANE H IS LOCATED AT TOP OF LEAD AND IS COINCIDENT WITH THE LEAD WHERE THE LEAD EXITS THE PLASTIC BODY AT THE TOP OF THE PARTING LINE.



/4. DIMENSIONS DD AND E1 DO NOT INCLUDE MOLD PROTRUSION. ALLOWABLE PROTRUSION IS .006 INCH (0.15 MM) PER SIDE. DIMENSIONS DD AND E1 DO INCLUDE MOLD MISMATCH AND ARE DETERMINED AT DATUM PLANE H.



/5.\ DIMENSION 66 DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE .005 INCH (0.13 MM) TOTAL IN EXCESS OF THE 66 DIMENSION AT MAXIMUM MATERIAL CONDITION.

6. DATUMS A AND B TO BE DETERMINED AT DATUM PLANE H.



7. DIMENSIONS A1 AND A2 APPLIES WITHIN ZONE J ONLY. A1 APPLIES TO PINS 2, 3, 6 AND 7. A2 APPLIES TO PINS 1, 4, 5 AND 8.



A. HATCHING REPRESENTS THE EXPOSED AREA OF THE HEAT SLUG. THE DIMENSIONS D1 AND E2 REPRESENT THE VALUES BETWEEN THE TWO OPPOSITE POINTS ALONG THE EDGES OF EXPOSED AREA OF HEAT SLUG.



9. DIMPLED HOLE REPRESENTS INPUT SIDE.

ZONE K REPRESENTS NON—SOLDERABLE REGION WHERE MOLD FLASH AND RESIN BLEED ARE PERMITTED ON BOTH SIDES OF THE LEADS.

	IN	CH	MILLIN	<b>METER</b>		INCH		MILLIMETER	
DIM	MIN	MAX	MIN	MAX	DIM	MIN	MAX	MIN	MAX
AA	.148	.152	3.76	3.86	W2	.321	.331	8.15	8.41
A1	.059	.065	1.50	1.65	W3	.281	.291	7.14	7.39
A2	.056	.068	1.42	1.73	W4	.538	.554	13.67	14.07
DD	.808	.812	20.52	20.62	U	.037	.043	0.94	1.09
D1	.720		18.29		Y	.956 BSC		24.28 BSC	
E	.610	.618	15.49	15.70	bb	.147	.153	3.73	3.89
E1	.390	.394	9.91	10.01	c1	.007	.011	0.18	0.28
E2	.306		7.77		е	.317 BSC		8.05 BSC	
E3	.383	.387	9.73	9.83	e1	.116	.124	2.95	3.15
F	.025	BSC	0.64	BSC	aaa	.004		0.10	
G	.030	BSC	0.76	BSC	bbb	.006		0.15	
W1	.195	.205	4.95	5.21	ccc	.010 0.25		25	

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Figure 6. Package outline (OM-780-4S4S) — notes, dimensions

### 15 Product documentation, software and tools

Refer to the following resources to aid your design process.

#### **Application notes**

- AN1907: Solder Reflow Attach Method for High Power RF Devices in Plastic Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

#### **Software**

• .s2p File

### **Development tools**

· Printed Circuit Boards

# 16 Revision history

The following table summarizes revisions to this document.

Table 15. Revision history

Document ID	Release date	Description
A5G08H800W19N v.2	_	<ul><li>Fig. 2, Product marking: updated, p. 2</li><li>Table 3, Product marking trace code: updated, p. 2</li></ul>
A5G08H800W19N v.1	21 December 2023	Table 8, Moisture Sensitivity Level: package peak temperature updated to reflect actual test data, p. 3
A5G08H800W19N v.0	17 August 2023	Initial release of data sheet

### Legal information

#### Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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