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Rev. 0, 03/2020

RoHS

RF Power GaN Transistor

A3G26H200W17S

2496–2690 MHz, 34 W Avg., 48 V AIRFAST RF POWER GaN TRANSISTOR

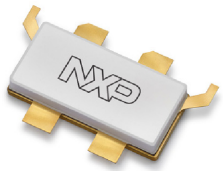
This 34 W asymmetrical Doherty RF power GaN transistor is designed for cellular base station applications requiring very wide instantaneous bandwidth capability covering the frequency range of 2496 to 2690 MHz.

This part is characterized and performance is guaranteed for applications operating in the 2496 to 2690 MHz band. There is no guarantee of performance when this part is used in applications designed outside of these frequencies.

2600 MHz

- Typical Doherty Single-Carrier W-CDMA Performance: V_{DD} = 48 Vdc, I_{DQA} = 120 mA, V_{GSB} = –5.3 Vdc, P_{out} = 34 W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
2496 MHz	14.7	54.2	8.1	–29.3
2590 MHz	14.8	55.5	7.9	–30.9
2690 MHz	14.2	54.0	7.8	–34.1



NI-780S-4S2S

Features

- High terminal impedances for optimal broadband performance
- Advanced high performance in-package Doherty
- Able to withstand extremely high output VSWR and broadband operating conditions

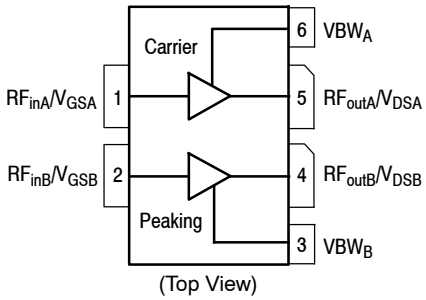


Figure 1. Pin Connections

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Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	125	Vdc
Gate-Source Voltage	V_{GS}	–8, 0	Vdc
Operating Voltage	V_{DD}	0 to +55	Vdc
Maximum Forward Gate Current, $I_{G\ (A+B)}$, @ T_C = 25°C	I_{GMAX}	29	mA
Storage Temperature Range	T_{stg}	–65 to +150	°C
Case Operating Temperature Range	T_C	–55 to +150	°C
Operating Active Die Surface Temperature Range	T_J	–55 to +225	°C
Maximum Channel Temperature (1)	T_{CH}	275	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance by Infrared Measurement, Active Die Surface-to-Case Case Temperature 77°C, P_D = 31.8 W	$R_{\theta JC}$ (IR)	1.2 (2)	°C/W
Thermal Resistance by Finite Element Analysis, Channel-to-Case Case Temperature 90°C, P_D = 31.8 W	$R_{\theta CHC}$ (FEA)	1.75 (3)	°C/W

Table 3. ESD Protection Characteristics

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

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Off Characteristics (4)						
Drain-Source Breakdown Voltage		$V_{(BR)DSS}$		—	—	Vdc
(V_{GS} = –8 Vdc, I_D = 16.2 mAdc)	Carrier		150			
(V_{GS} = –8 Vdc, I_D = 29.7 mAdc)	Peaking		150			
On Characteristics — Side A, Carrier						
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 10 mAdc)		$V_{GS(th)}$	–3.5	–3	–2.5	Vdc
Gate Quiescent Voltage (V_{DD} = 48 Vdc, I_{DA} = 120 mAdc, Measured in Functional Test)		$V_{GSA(Q)}$	–3.2	–2.7	–2.2	Vdc
Gate-Source Leakage Current (V_{DS} = 150 Vdc, V_{GS} = –8 Vdc)		I_{GSS}	–5.0	—	—	mAdc
On Characteristics — Side B, Peaking						
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 18.9 mAdc)		$V_{GS(th)}$	–4.0	–3	–2.5	Vdc
Gate-Source Leakage Current (V_{DS} = 150 Vdc, V_{GS} = –8 Vdc)		I_{GSS}	–4.75	—	—	mAdc

1. Reliability tests were conducted at 225°C. Operations with T_{CH} at 275°C will reduce median time to failure.
2. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.nxp.com/RF and search for AN1955.
3. $R_{\theta CHC}$ (FEA) must be used for purposes related to reliability and limitations on maximum channel temperature. MTTF may be estimated by the expression MTTF (hours) = $10^{[A + B/(T + 273)]}$, where T is the channel temperature in degrees Celsius, A = –11.1 and B = 8366.
4. Each side of device measured separately.

(continued)

Table 4. Electrical Characteristics (T_A = 25°C unless otherwise noted) **(continued)**

Characteristic	Symbol	Min	Typ	Max	Unit
Functional Tests (1) (In NXP Doherty Production Test Fixture, 50 ohm system) V_{DD} = 48 Vdc, I_{DQA} = 120 mA, V_{GSB} = –5.3 Vdc, P_{out} = 34 W Avg., f = 2690 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. **[See note on correct biasing sequence.]**					
Power Gain	G_{ps}	13.0	14.2	16.0	dB
Drain Efficiency	η_D	46.0	54.0	—	%
P_{out} @ 3 dB Compression Point, CW	P3dB	51.9	52.5	—	dBm
Adjacent Channel Power Ratio	ACPR	—	–34.1	–27.0	dBc
Wideband Ruggedness (In NXP Doherty Production Test Fixture, 50 ohm system) I_{DQA} = 120 mA, V_{GSB} = –5.3 Vdc, f = 2590 MHz, Additive White Gaussian Noise (AWGN) with 10 dB PAR					
ISBW of 400 MHz at 55 Vdc, 120 W Avg. Modulated Output Power (7 dB Input Overdrive from 34 W Avg. Modulated Output Power)	No Device Degradation				
Typical Performance (In NXP Doherty Production Test Fixture, 50 ohm system) V_{DD} = 48 Vdc, I_{DQA} = 120 mA, V_{GSB} = –5.3 Vdc, 2496–2690 MHz Bandwidth					
P_{out} @ 3 dB Compression Point (2)	P3dB	—	178	—	W
AM/PM (Maximum value measured at the P3dB compression point across the 2496–2690 MHz bandwidth)	Φ	—	–26	—	°
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	240	—	MHz
Gain Flatness in 194 MHz Bandwidth @ P_{out} = 34 W Avg.	G_F	—	0.7	—	dB
Gain Variation over Temperature (–40°C to +85°C)	ΔG	—	0.015	—	dB/°C
Output Power Variation over Temperature (–40°C to +85°C)	ΔP1dB	—	0.001	—	dB/°C

Table 5. Ordering Information

Device	Tape and Reel Information	Package
A3G26H200W17SR3	R3 Suffix = 250 Units, 44 mm Tape Width, 13-inch Reel	NI-780S-4S2S

1. Part internally matched both on input and output.
2. P3dB = P_{avg} + 7.0 dB where P_{avg} is the average output power measured using an unclipped W-CDMA single-carrier input signal where output PAR is compressed to 7.0 dB @ 0.01% probability on CCDF.

NOTE: Correct Biasing Sequence for GaN Depletion Mode Transistors

Turning the device ON

1. Set V_{GS} to –5 V
2. Turn on V_{DS} to nominal supply voltage (48 V)
3. Increase V_{GS} until I_{DS} current is attained
4. Apply RF input power to desired level

Turning the device OFF

1. Turn RF power off
2. Reduce V_{GS} down to –5 V
3. Reduce V_{DS} down to 0 V (Adequate time must be allowed for V_{DS} to reduce to 0 V to prevent severe damage to device.)
4. Turn off V_{GS}

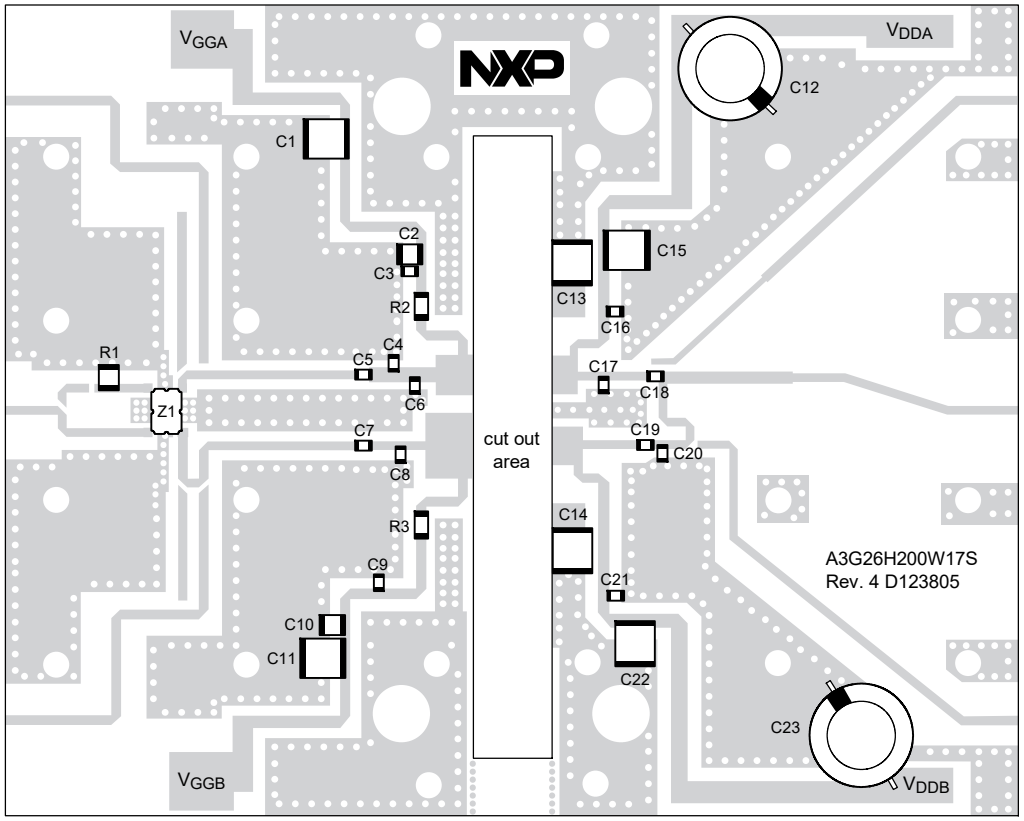
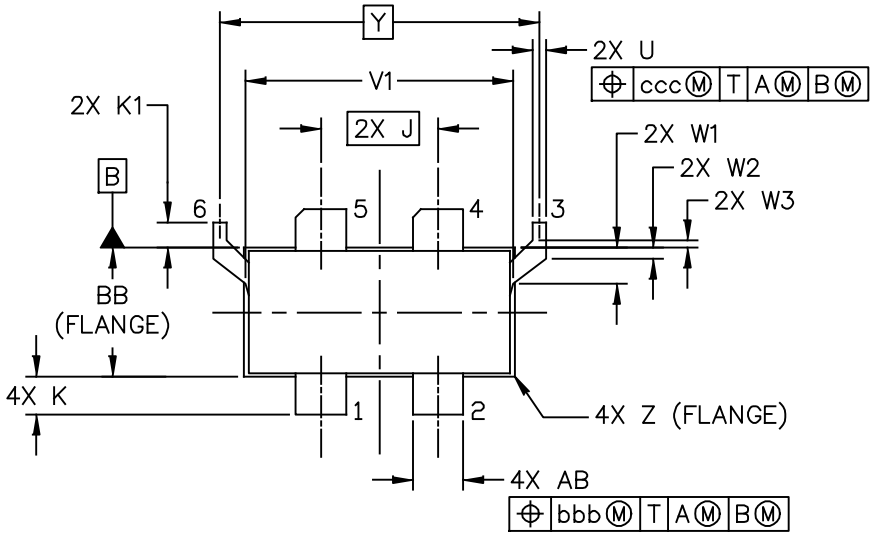


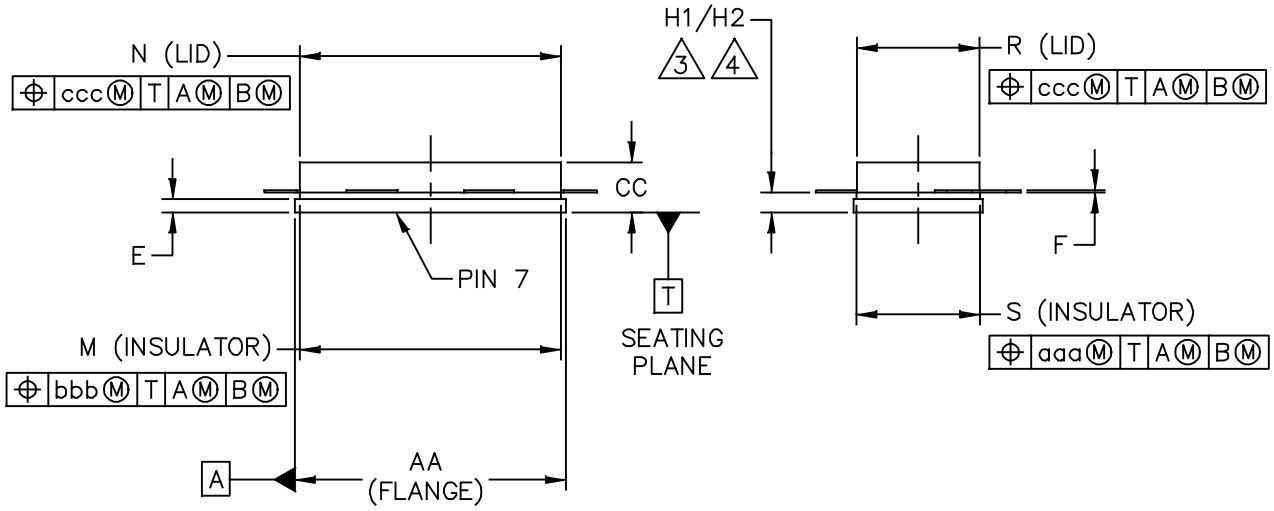
Figure 2. A3G26H200W17S Production Test Circuit Component Layout

Table 6. A3G26H200W17S Production Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C11, C13, C14, C15, C22	10 μF Chip Capacitor	C5750X7S2A106M230KB	TDK
C2, C10	1 μF Chip Capacitor	C3225JB2A105K200AA	TDK
C3, C5, C7, C9, C16, C21	8.2 pF Chip Capacitor	600F8R2BT250XT	ATC
C4, C6	0.5 pF Chip Capacitor	600F0R5BT250XT	ATC
C8, C17	0.3 pF Chip Capacitor	600F0R3BT250XT	ATC
C12, C23	470 μF, 100 V Electrolytic Capacitor	MCGPR100V477M16X32	Multicomp
C18	2.4 pF Chip Capacitor	600F2R4BT250XT	ATC
C19	3.6 pF Chip Capacitor	600F3R6BT250XT	ATC
C20	0.2 pF Chip Capacitor	600F0R2BT250XT	ATC
R1	50 Ω, 10 W Termination Chip Resistor	C10A50Z4	Anaren
R2, R3	3 Ω, 1/4 W Chip Resistor	CRCW12063R00JNEA	Vishay
Z1	2300–2700 MHz Band, 90°, 2 dB Hybrid Coupler	X3C25P1-02S	Anaren
PCB	Rogers RO4350B, 0.020″, ε_r = 3.66	D123805	MTL

PACKAGE DIMENSIONS





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NOTES:

1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M–1994.
3. DIMENSIONS H1 AND H2 ARE MEASURED .030 INCH (0.762 MM) AWAY FROM FLANGE PARALLEL TO DATUM B TO CLEAR EPOXY FLOW OUT. H1 APPLIES TO PINS 1, 2, 4 & 5. H2 APPLIES TO PINS 3 & 6.

DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX	DIM	INCH MIN	INCH MAX	MILLIMETER MIN	MILLIMETER MAX
AA	.805	.815	20.45	20.70	R	.365	.375	9.27	9.53
BB	.380	.390	9.65	9.91	S	.365	.375	9.27	9.53
CC	.125	.170	3.18	4.32	U	.035	.045	0.89	1.14
E	.035	.045	0.89	1.14	V1	.795	.805	20.19	20.45
F	.004	.007	0.10	0.18	W1	.0975	.1175	2.48	2.98
H1	.057	.067	1.45	1.70	W2	.0225	.0425	0.57	1.08
H2	.054	.070	1.37	1.78	W3	.0125	.0325	0.32	0.83
J	.350 BSC		8.89 BSC		Y	.956 BSC		24.28 BSC	
K	.0995	.1295	2.53	3.29	Z	R.000	R.040	R0.00	R1.02
K1	.070	.090	1.78	2.29	AB	.145	.155	3.68	3.94
M	.774	.786	19.66	19.96	aaa	.005		0.13	
N	.772	.788	19.61	20.02	bbb	.010		0.25	
					ccc	.015		0.38	

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PRODUCT DOCUMENTATION, SOFTWARE AND TOOLS

Refer to the following resources to aid your design process.

Application Notes

- AN1908: Solder Reflow Attach Method for High Power RF Devices in Air Cavity Packages
- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Software

- .s2p File

Development Tools

- Printed Circuit Boards

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
0	Mar. 2020	• Initial release of data sheet

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