Document Number: A3G26H350W17S
Rev. 1, 01/2021

RoHS

RF Power GaN Transistor

A3G26H350W17S

2496–2690 MHz, 59 W Avg., 48 V AIRFAST RF POWER GaN TRANSISTOR

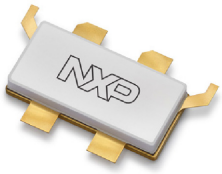
This 59 W asymmetrical Doherty RF power GaN transistor is designed for cellular base station applications requiring very wide instantaneous bandwidth capability covering the frequency range of 2496 to 2690 MHz.

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} = 250 mA, V_{GSB} = −5.5 Vdc, P_{out} = 59 W Avg., Input Signal PAR = 9.9 dB @ 0.01% Probability on CCDF.

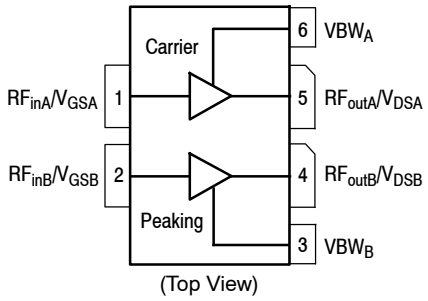
Frequency	G_{ps} (dB)	η_D (%)	Output PAR (dB)	ACPR (dBc)
2496 MHz	13.3	49.9	8.9	–33.2
2590 MHz	13.5	48.5	9.1	–37.2
2690 MHz	13.3	48.5	8.9	–34.5



NI-780S-4S2S

Features

- 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



(Top View)

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}	55	Vdc
Maximum Forward Gate Current, $I_{G\ (A+B)}$, @ T_C = 25°C	I_{GMAX}	58	mA
Storage Temperature Range	T_{stg}	–65 to +150	°C
Case Operating Temperature Range	T_C	–55 to +150	°C
Maximum Channel Temperature	T_{CH}	225	°C

Table 2. Recommended Operating Conditions

Rating	Symbol	Value	Unit
Operating Voltage	V_{DD}	48	Vdc

Table 3. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance by Infrared Measurement, Active Die Surface-to-Case Case Temperature 84°C, P_D = 73 W	$R_{\theta JC}$ (IR)	0.70 (1)	°C/W
Thermal Resistance by Finite Element Analysis, Channel-to-Case Case Temperature 90°C, P_D = 73 W	$R_{\theta CHC}$ (FEA)	1.10 (2)	°C/W

Table 4. ESD Protection Characteristics

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

Table 5. Electrical Characteristics (T_A = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Off Characteristics (3)						
Drain-Source Breakdown Voltage (V_{GS} = –8 Vdc, I_D = 16.2 mAdc) (V_{GS} = –8 Vdc, I_D = 42 mAdc)	 Carrier Peaking	$V_{(BR)DSS}$	 150 150	—	—	Vdc
On Characteristics — Side A, Carrier						
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 16.2 mAdc)		$V_{GS(th)}$	–3.8	–2.7	–2.0	Vdc
Gate Quiescent Voltage (V_{DD} = 48 Vdc, I_{DA} = 250 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}	–8.1	—	—	mAdc
On Characteristics — Side B, Peaking						
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 42 mAdc)		$V_{GS(th)}$	–3.8	–3.1	–2.0	Vdc
Gate-Source Leakage Current (V_{DS} = 150 Vdc, V_{GS} = –8 Vdc)		I_{GSS}	–9.99	—	—	mAdc

1. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.nxp.com/RF and search for AN1955.
2. $R_{\theta CHC}$ (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.
3. Each side of device measured separately.

(continued)

Table 5. 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} = 250 mA, V_{GSB} = −5.5 Vdc, P_{out} = 59 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}	12.0	13.3	15.0	dB
Drain Efficiency	η_D	42.7	48.5	—	%
P_{sat}, Pulsed CW	P_{sat}	55.7	56.6	—	dBm
Adjacent Channel Power Ratio	ACPR	—	–34.5	–27.5	dBc
Wideband Ruggedness (In NXP Doherty Production Test Fixture, 50 ohm system) I_{DQA} = 250 mA, V_{GSB} = –5.5 Vdc, f = 2590 MHz, Additive White Gaussian Noise (AWGN) with 10 dB PAR					
ISBW of 400 MHz at 55 Vdc, 125 W Avg. Modulated Output Power (3 dB Input Overdrive from 59 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} = 250 mA, V_{GSB} = −5.5 Vdc, 2496–2690 MHz Bandwidth					
P_{out} @ 3 dB Compression Point (2)	P3dB	—	420	—	W
AM/PM (Maximum value measured at the P3dB compression point across the 2496–2690 MHz bandwidth)	Φ	—	–9	—	°
VBW Resonance Point (IMD Third Order Intermodulation Inflection Point)	VBW_{res}	—	220	—	MHz
Gain Flatness in 194 MHz Bandwidth @ P_{out} = 59 W Avg.	G_F	—	0.2	—	dB
Gain Variation over Temperature (–40°C to +85°C)	ΔG	—	0.013	—	dB/°C
Output Power Variation over Temperature (–40°C to +85°C)	ΔP1dB	—	0.006	—	dB/°C

Table 6. Ordering Information

Device	Tape and Reel Information	Package
A3G26H350W17SR3	R3 Suffix = 250 Units, 44 mm Tape Width, 13−inch Reel	NI−780S−4S2S

1. Part internally input matched.
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 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 (+48 V).
3. Increase V_{GSA} (carrier side) until I_{DQA} current is attained.
4. Increase V_{GSB} (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_{GSA} and V_{GSB}.

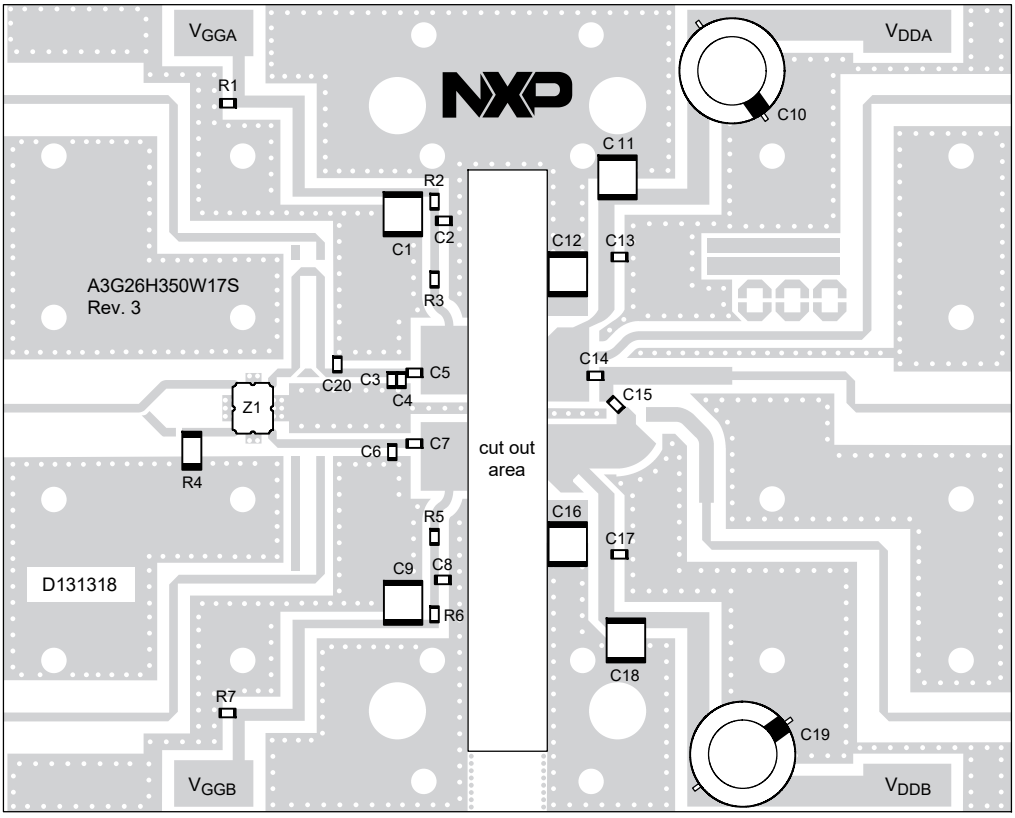
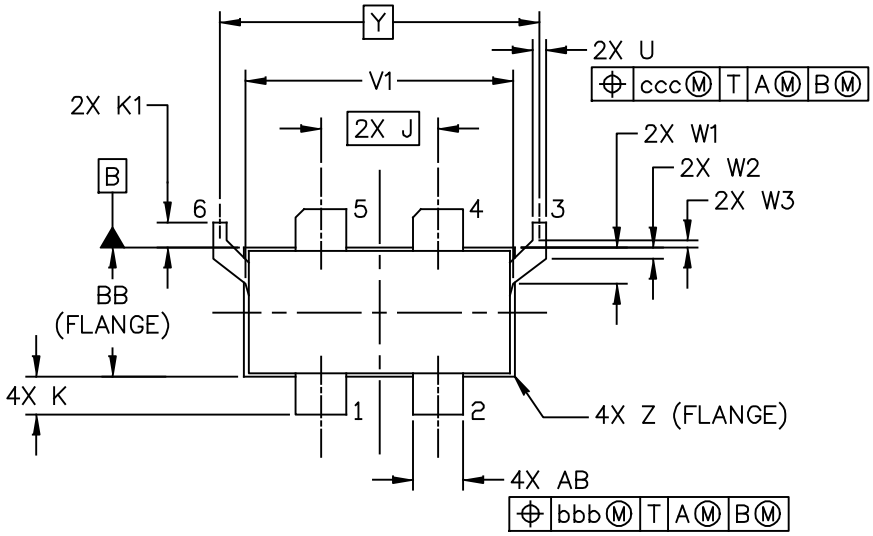


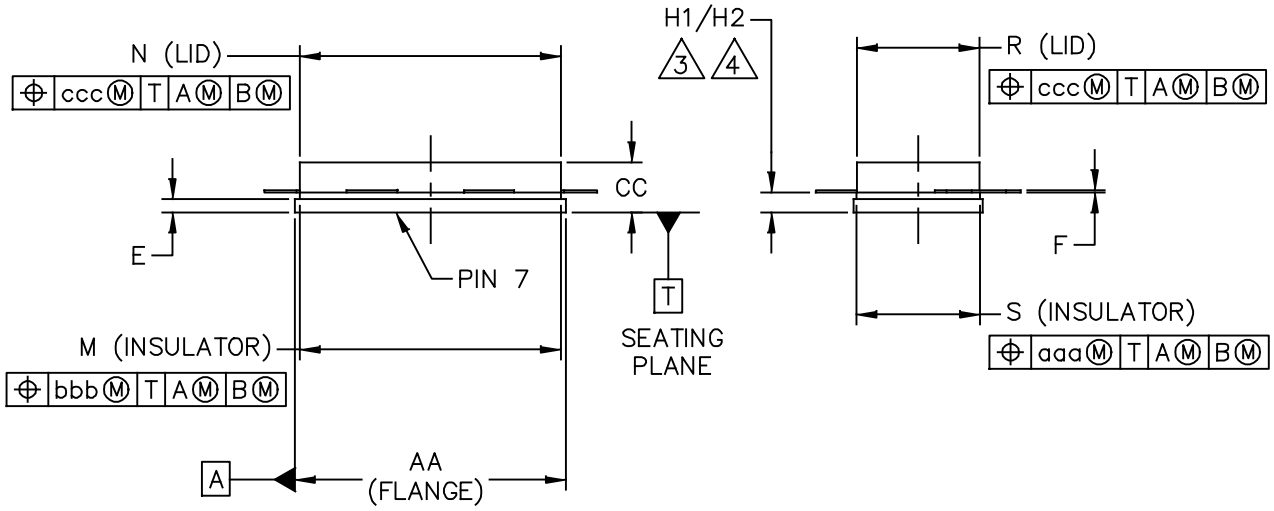
Figure 2. A3G26H350W17S Production Test Circuit Component Layout

Table 7. A3G26H350W17S Production Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1, C9, C11, C12, C16, C18	10 μF Chip Capacitor	C5750X7S2A106M	TDK
C2, C5, C7, C8, C13, C17	8.2 pF Chip Capacitor	600F8R2BT250XT	ATC
C3	1 pF Chip Capacitor	600F1R0BT250XT	ATC
C4	0.5 pF Chip Capacitor	600F0R5BT250XT	ATC
C6	0.9 pF Chip Capacitor	600F0R9BT250XT	ATC
C10, C19	220 μF, 100 V Electrolytic Capacitor	MCGPR100V227M16X26	Multicomp
C14	3.0 pF Chip Capacitor	600F3R0BT250XT	ATC
C15	5.1 pF Chip Capacitor	600F5R1BT250XT	ATC
C20	0.2 pF Chip Capacitor	600F0R2BT250XT	ATC
R1, R7	15 kΩ, 1/4 W Chip Resistor	CRCW120615K0FKEA	Vishay
R2, R6	3 Ω, 1/4 W Chip Resistor	CRCW12063R00JNEA	Vishay
R3, R5	1 Ω, 1/4 W Chip Resistor	CRCW12061R00FKEA	Vishay
R4	50 Ω, 10 W Termination Chip Resistor	C10A50Z4	Anaren
Z1	2300–2900 MHz Band, 90°, 3 dB Hybrid Coupler	X3C26P1-03	Anaren
PCB	Rogers RO4350B, 0.020″, ε_r = 3.66	D131318	MTL

PACKAGE INFORMATION





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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	Nov. 2020	• Initial release of data sheet
1	Jan. 2021	• Table 1, Maximum Ratings: updated operating voltage for complete data sheet standardization, p. 2 • Table 2, Recommended Operating Conditions: added to data sheet, p. 2

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