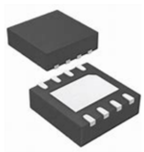
Gallium Nitride 28V 6W RF Power Transistor

NGAH60006PD



DFN8 4x4mm

Description

The NGAH60006PD is an unmatched 6W GaN HEMT, designed for applications up to 6GHz. The transistor is packaged in a surface mounted 4x4mm DFN8 package.
This is a versatile product that can be used in a multitude of applications with different signal formats such as CW, pulsed radar or with complex modulation schemes.

Typical Performance of class AB circuit (On NoleTec fixture):
V_{DD} =28 V, I_{DQ} =30 mA, Pulse 20 µs/10%.

Freq (GHz)	P1dB (dBm)	Gain@ P1dB (dB)	P3dB (dBm)	□Eff@P3 (%)	Note
2.5	39.17	18.7	39.94	62.7	Fixture 1
2.6	39.27	18.8	39.78	64.5	
2.7	39.13	18.9	39.67	63.6	
3.4	39.0	17.5	39.8	65.0	Fixture 2
3.5	38.7	18.4	39.5	66.6	
3.6	38.2	18.2	39.3	67.2	
4.8	38.56	15.0	39.36	61.4	Fixture 3
4.9	38.46	15.2	39.30	61.5	
5	38.10	15.1	39.18	61.7	
5.7	38.74	12.6	39.86	60.4	Fixture 4
5.8	38.60	13.0	39.65	60.0	
5.9	38.16	12.7	39.50	62.2	

Applications and Features

- Suitable for wireless communication infrastructure, wideband amplifiers, EMC testing, Pulsed Radar, ISM etc.
- High Efficiency and Linear Operation
- Thermally Enhanced Industry Standard Package
- High Reliability Metallization Process
- Excellent thermal Stability and Ruggedness
- Compliant to Restriction of Hazardous Substances (RoHS) Directive 2002/95/EC

Important Note: Proper Biasing Sequence for GaN HEMT Transistors

Turning the device ON

1. Set V_{GS} to the pinch-off (V_P) voltage, typically –5V
2. Turn on V_{DS} to nominal supply voltage (28V)
3. Increase V_{GS} until IDS 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 V_P, typically –5V
3. Reduce V_{DS} down to 0V
4. Turn off V_{GS}

Table 1. Maximum Ratings

Ratings	Symbol	Value	Unit
Drain--Source Voltage	V_{DSS}	125	Vdc
Gate--Source Voltage	V_{GS}	-10,+2	Vdc
Operating Voltage	V_{DD}	40	Vdc
Maximum Forward Gate Current @ Tc = 25°C	I_{Gmax}	1.5	mA
Storage Temperature Range	Tstg	-65 to +150	°C
Case Operating Temperature	T_C	+150	°C
Operating Junction Temperature (See note 1)	T_J	+200	°C
Total Device Power Dissipation (Derated above 25°C, see note 2)	P_{DISS}	14	W

Note: 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

Characteristics	Symbol	Value	Unit
Thermal Resistance, Junction to Case T_C= 85°C, T_J=200°C, RF CW operation	RθJC	11	℃/W

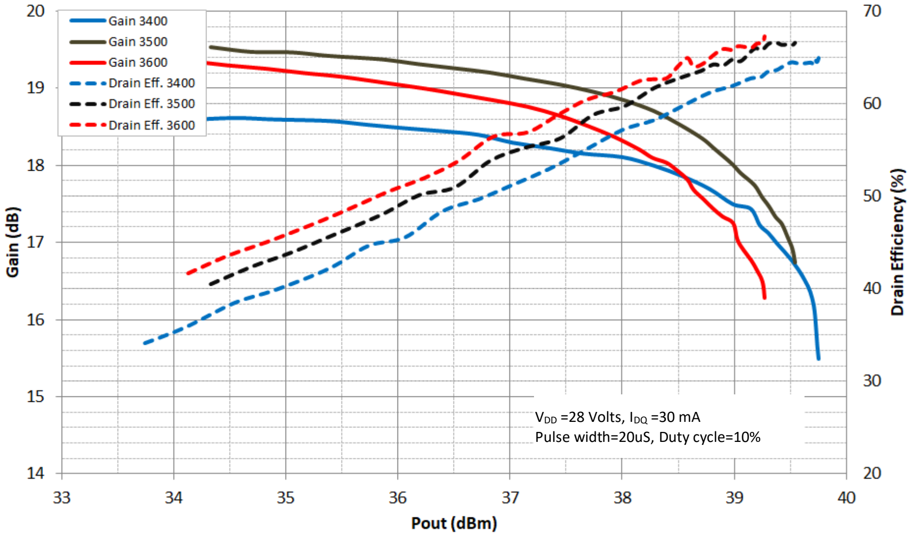
Table 3. Electrical Characteristics (T_C = 25℃ unless otherwise noted)
DC Characteristics

Characteristic	Conditions	Symbol	Min	Typ	Max	Unit
Drain-Source Breakdown Voltage	V_{GS}=-8V; I_{DS}=1.5mA	V_{DSS}		125		V
Gate Threshold Voltage	V_{DS} = 28V, I_D =1.5 mA	$V_{GS(th)}$		-2.7		V
Gate Quiescent Voltage	V_{DS} =28V, I_{DS}=50mA, Measured in Functional Test	$V_{GS(Q)}$		-2.24		V

Functional Tests (In Test Fixture, 50 ohm system) V_{DD} = 28 V_{dc}, I_{DQ} = 30 mA, f = 3.5GHz, Pulsed 20µs/10%

Characteristics	Symbol	Min	Typ	Max	Unit
Power Gain@P1dB	G_{p-1}		18.4		dB
Drain Efficiency @ P_{SAT}	Eff		66.6		%
Saturated Power	P_{SAT}	38	39.5		dBm
Input Return Loss	RTL		-8		dB
Mismatch stress at all phases (Device no damage)	VSWR		10:1		Φ

TYPICAL CHARACTERISTICS



Power Gain and Drain Efficiency vs Output Power

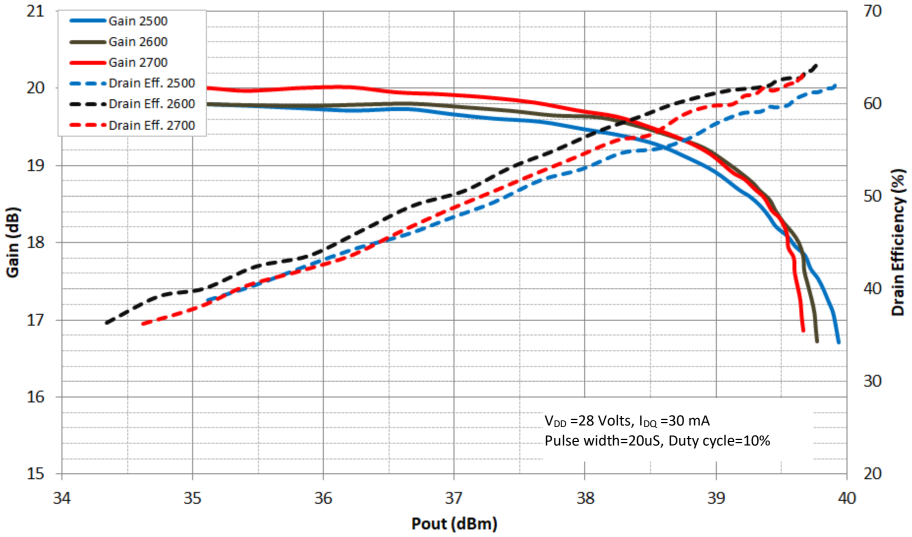
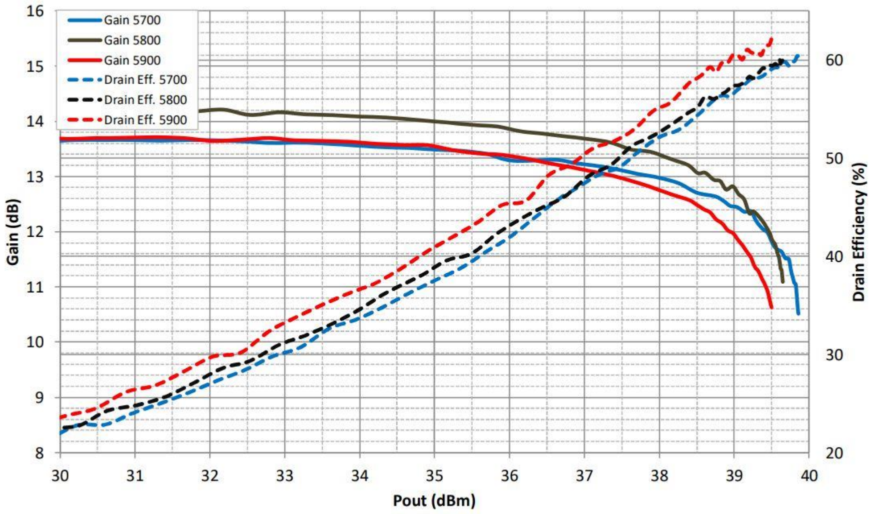
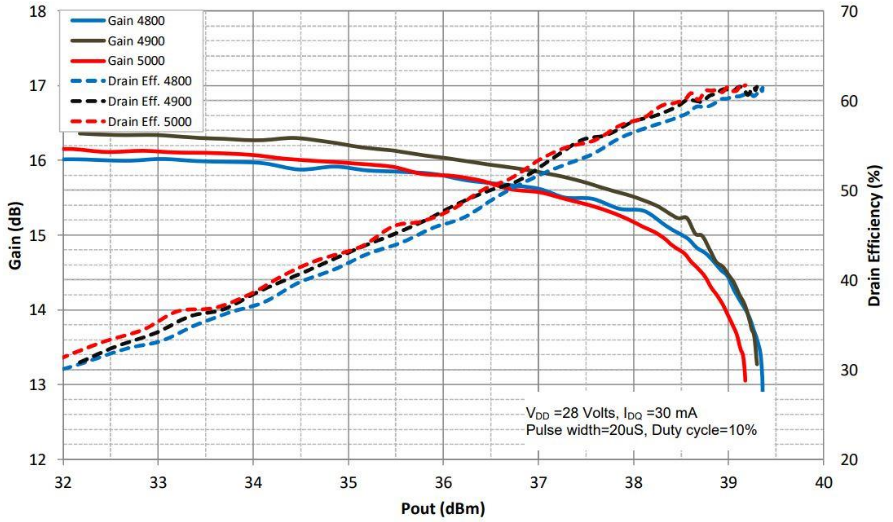


Figure 2. Power Gain and Drain Efficiency vs Output Power



Power Gain and Drain Efficiency vs Output Power



Power Gain and Drain Efficiency vs Output Power

Reference test fixture

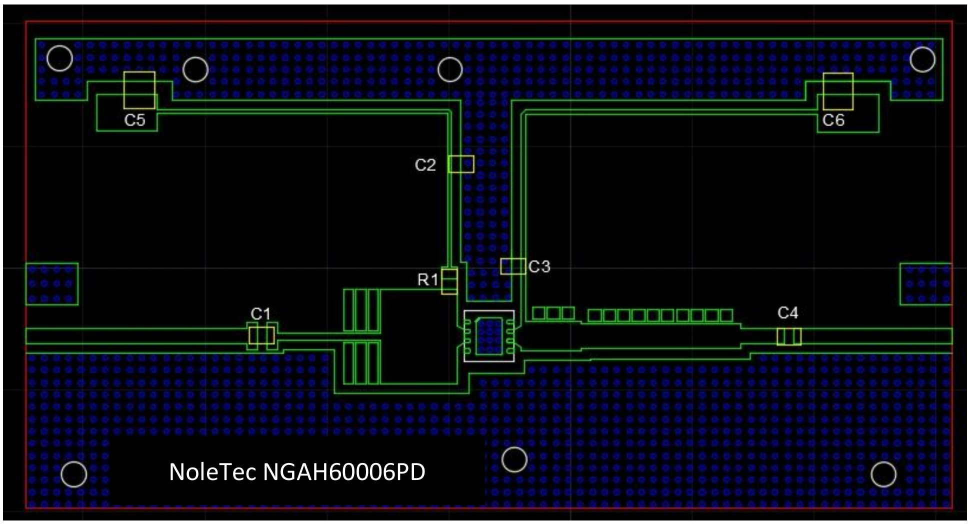


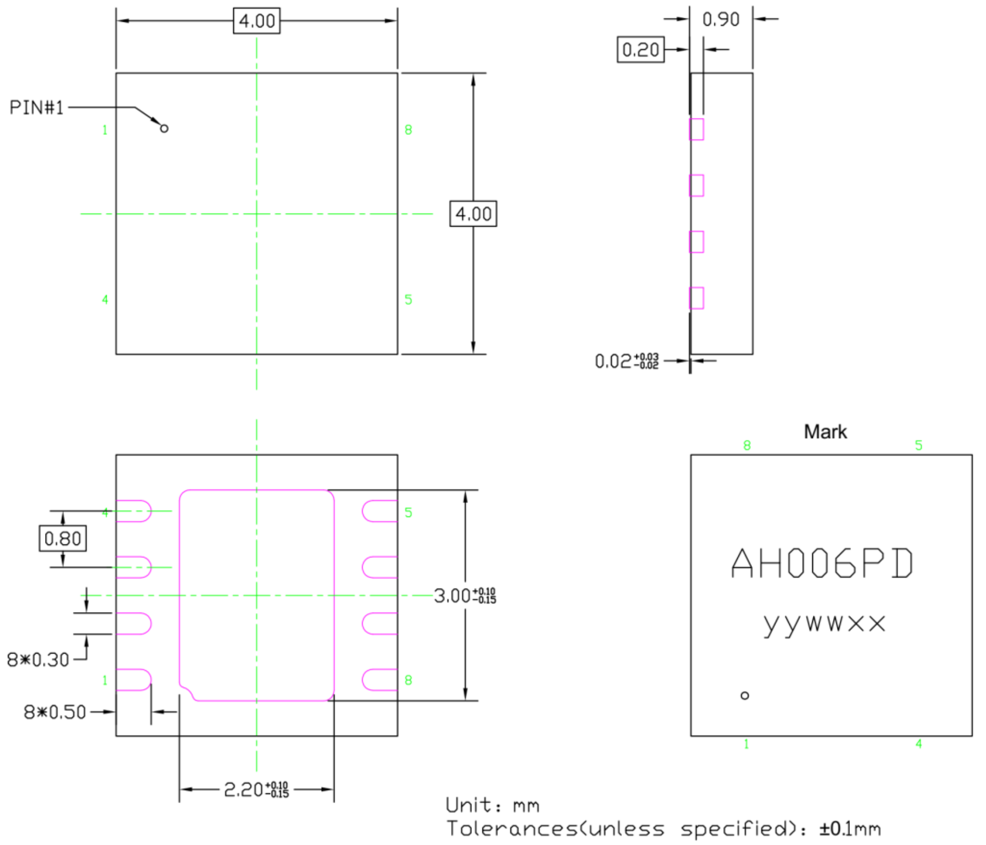
Figure 5. 3400-3600MHz fixture
(note: other bands can reuse the same PCB layout)

Table 4: components designations and values of 3400-3600Mhz fixture

Component	Description	Suggested Manufacturer	P/N
C5、C6	10uF	TDK1206	
C1、C2、C4	8.2pF	ATC600S	
C3	6.8pF	ATC600S	
R1	10Ω	0603	
PCB	0.508mm [0.020"] thick, εr=3.48, Rogers RO4350B, 1 oz. copper		

Package Dimensions

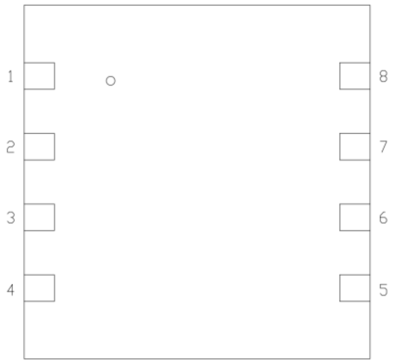
4*4 DFN Package



Notes:

1. All dimensions are in mm;
2. The tolerances unless specified are ±0.1mm.

Pin Configuration (Top view)



Pin No.	Symbol	Description
2, 3	RF IN /VGS	RF Input, Gate Bias
6, 7	RF OUT /VDS	RF Output, Drain Bias
1, 4, 5, 8	NC	Not connected internally. May be connect to PCB ground
Package Base	GND	Ground. Must be soldered to PCB ground plane over tightly stitched array of filled vias (or other equivalent solution) for optimal thermal and RF performance. Solder voiding or other cause of poor thermal transfer between package base and PCB, or between PCB and heatsink underneath the package may result in excessive junction temperatures causing permanent damage to the transistor.

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Notice

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Typical parameters reflect expected average performance as measured in test fixture. It can and do vary in other application circuits.
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